PRELIMINARY DRAINAGE REPORT

FOR

FALCON RESERVE FILING NO. 1

EL PASO COUNTY, COLORADO

MAY 2026

Prepared for:

The Landhuis Company
212 N. Wahsatch Ave, Suite 301
Colorado Springs, CO 80903
(719) 635-3200

Prepared by:

CIVIL CONSULTANTS, INC.

212 N. Wahsatch Avenue, Suite 305
Colorado Springs, CO 80903
(719) 955-5485

Project #43-144

PCD Project # SP252 & P255

PRELIMINARY DRAINAGE REPORT
FOR
FALCON RESERVE FILING NO. 1

DRAINAGE PLAN STATEMENTS

ENGINEERS STATEMENT

The attached drainage plan and report was 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 omission on my part in preparing this report.

Virgil A. Sanchez, P.E. #37160
For and on Behalf of M&S Civil Consultants, Inc

DEVELOPER'S STATEMENT

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

BY:_____

TITLE: Developer

DATE: 05/06/26

ADDRESS: The Landhuis Company
212 N. Wahstach Ave, Suite 301
Colorado Springs, CO 80903

EL PASO COUNTY'S STATEMENT

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

BY:_____ DATE:_____

Joshua Palmer, P.E.
County Engineer/ECM Administrator

CONDITIONS

PRELIMINARY DRAINAGE REPORT
FOR
FALCON RESERVE FILING NO. 1

TABLE OF CONTENTS

PURPOSE	4
GENERAL LOCATION	4
PROPERTY DESCRIPTION	4
SOILS	5
FLOODPLAIN STATEMENT	5
DRAINAGE BASIN	5
PREVIOUS STUDIES	5
DRAINAGE CRITIERA	7
HYDROLOGIC CALCULATIONS	7
HYDRAULIC CALCULATIONS	8
FOUR STEP PROCESS	8
EXISTING DRAINAGE CHARACTERISTICS	9
PROPOSED DRAINAGE CHARACTERISTICS	14
HYDRAULIC ANALYSIS, WATER QUALITY PROVISIONS AND MAINTENANCE	22
CONSTRUCTION COST ESTIMATE FOR DETENTION PONDS	25
EROSION CONTROL	26
DRAINAGE AND BRIDGE FEES	26
SUMMARY	26
REFERENCES	27

PRELIMINARY DRAINAGE REPORT
FOR
FALCON RESERVE FILING NO. 1

PURPOSE

This PRELIMINARY Drainage Report for Falcon Reserve Filing No. 1 is in support of the Final Plat, Preliminary Plan and Construction plans for the subject site. This report functions to identify the existing and proposed runoff patterns and recommend proposed drainage improvements which are intended to safely convey runoff through the proposed development, while minimizing impacts to downstream facilities and adjacent properties.

GENERAL LOCATION

The Falcon Reserve Filing No. 1 site is located in unincorporated El Paso County Colorado which is in the southeast quarter of the southeast quarter of Section 25, Township 12 South, Range 65 West of the 6th P.M. in El Paso County, Colorado. The parcel is bound to the north by existing single family residential Paint Brush Hills Filing No.4 and to the west by Liberty Grove Drive, to the south by existing Stapleton Road and to the east by existing Meridian Road. A Vicinity Map has been included in the appendix of this report.

PROPERTY DESCRIPTION

The Falcon Reserve Filing No.1 site consists of approximately 40 acres. The site is currently undeveloped. Existing ground cover consists of native or introduced grasses in fair condition. A dozen or so trees are located around the perimeter of the site. The existing site terrain generally slopes from northwest to southeast at approximately 3%. Existing roadside swales are located along the south and east sides of the site.

The upper reach of the East Tributary of Falcon Basin flows southeast through the site. In the existing condition two detention ponds are located on the site; at the northeast and southwest corners of the site. A detention pond (Paint Brush Hills Pond No. 4) is located offsite just to the northwest corner of the site. Flows conveyed through and along the site are collected by an existing box culvert which travels underneath the intersection of Meridian and Stapleton roadways.

Telephone and gas lines are located along the north boundary, while cable and electric are located along the west property lines. Overhead utility lines and existing decorative wood fence are located along the south and east edges of the site. A sanitary sewer line runs along the eastern boundary of the site. No known irrigation facilities are located on the site.

The site is currently undeveloped and is currently zoned as Commercial Regional, “CR”, as identified by El Paso County and can be found under schedule number 5225400001. A rezone has been requested to develop this property into Residential Multi-Dwelling, “RM-12”.

SOILS

The United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) Web Soil Survey data base indicates that the soils for this project watershed area have been delineated, as Columbine Gravelly Sandy Loam (14), Pring Coarse Sandy Loam, (71), and Stapleton Sandy Loam is characterized as Hydrologic Soil Types “A” and "B". A Soils Map is provided in the appendix of this report.

FLOOD STATEMENT

No portion of this site is within a designated F.E.M.A. floodplain as determined by the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) Panel No. 08041C0551G dated (12/7/2018 not printed). Refer to the appendix of this report.

DRAINAGE BASINS

Falcon Reserve Filing No.1 is located in the East Tributary of the Falcon Basin. The Falcon DBPS recommends that a channel with small drops structures with toe protection be installed across the site. A sub regional Pond SR6 is recommended to be constructed on the southeast corner of the site. In lieu of a sub-regional pond the existing ponds 1-3 will be upgraded to full spectrum ponds and an onsite full spectrum pond 4 will be constructed.

PREVIOUS STUDIES

The drainage basin area which encompasses Falcon Reserve Filing No.1 has been studied numerous times. Below is short outline of the assumptions regarding the lands of the subject site and those based upon the previously assembled and approved drainage reports and those that may include or be adjacent to the subject site.

“Falcon Drainage Basin Planning Study, Selected Plan Report Final – September 2015” prepared by Matrix Design Group.

- Identifies project area within East Tributary of Falcon Drainage Basin
    - Determines Historic, Existing, and Future Peak Flow Rates and Flow Volumes at NW corner of Stapleton Drive and Meridian Road (DP Jet 020) for 2, 5, 10, 100-year events.
        - 100-year historic flow 200 cfs
        - 100-year developed flow 390 cfs
- Identifies deficiencies of PBH Pond #4 (known as Pond 1 by M& S Civil), but doesn’t recommend reconstruction
- Identifies deficiencies (HW/D) of existing dual 6’x2.5 RCBC at Stapleton Dr/Meridan Rd
- Notes erosion along the southern boundary of parcel
- Recommends construction of small drop structures with toe protection across parcel.

- Recommends sub-regional detention pond to be constructed on subject site (SR6)
    - EURV + 100 outlet configuration
    - 100-year peak discharge of 200 cfs
- Recommends replacement of (2) 6'x2.5 RCBC w/ (2) 12'x4' RCBC through the intersection of Stapleton and Meridian Road
- Establishes costs for drainage improvements (to be discussed in detail).
    - Assumes 15% engineering and 20% contingencies

"Conceptual Drainage Analysis for Falcon Reserve, El Paso County, Colorado" prepared by Core Engineering Group, March 2014.

- Concept study that made recommendations of large scale drainage improvements based upon modifying Falcon Reserve Study. Doesn't provide a detailed on site analysis
- Provides a Peak flow rate comparison of KKBNA, Matrix and Core Engineering flow rates for proposed condition
- Recommends removal of Pond in NE corner of site, due to planned roadway entrance near location, with installation of 5'x5' RCBC or channel along east boundary
- Recommends no improvements to PBH Pond #4 (known as Pond 1 by M&S Civil) at NW corner of site.
- Recommended construction of channel along north property line to convey flows from aforementioned pond. Swale should be sized for pre-detained flows which can also coincide as an emergency spillway
- Recommends removal of Pond 3 and construction of 48" RCP along south boundary
- Recommends construction of the DBPS regional pond at the southeast corner of the site
- Estimates a volume of 23.87 acre-ft of storage and 5- and 100-year release rates of 43 and 195 cfs
- Does not make recommendation to replace existing of culvert crossing under Stapleton Drive

"Falcon Reserve Drainage Study" prepared by LDC Inc., February 2006.

- Concept study that made recommendations of large scale drainage improvements to accompany the proposed construction of 126 residential lots. Does not provide a detailed onsite analysis
- Recommends no improvements to PBH Pond #4 (known as Pond 1 by M&S Civil)
- Recommends removal of (Pond 2 and Pond 3)
- Recommends construction of a channel along north property line to convey flows from existing pond
- Recommends construction of 5'x5' RCBC or Channel along east boundary
- Recommends construction of 48" RCP along south boundary
- Recommends construction of the DBPS regional pond

"Master Development Drainage Plan, Falcon Reserve Filing No.1, prepared by MVE, Inc., September 12, 2000.

- MDDP study that made recommendations of large scale drainage improvements for the site based upon modifying the concepts within the previous KKBNA study

- Updates “Drainage Analysis for Paint Brush Hills Filing No. 4” by utilizing the currently required Type IIA Rainfall Distribution vs. the Type II
- Verifies volume deficiencies in Pond 1 NE corner of site (known as Pond 2 by M&S Civil), PBH Pond #4 (known as Pond 1 by M&S Civil), and Pond 3 (SW corner of site)
- Estimates “historic” peak flows of 69 cfs, 255 cfs, existing peak flows of 197 cfs and 452 cfs at the southeast corner of the site in the 5- and 100-year storm events respectively
- Estimates the culvert under Stapleton to have a capacity of 275 cfs before culvert headwater begins to encroach on the roadway shoulders. Calculates 100-year peak flow of 334 thru culvert with 118 cfs conveyed over the roadway thru the intersection
- Anticipates site to be comprised of 122 - 1/4 acre single family residential lots, with a 6.3 acre multi-family site
- Revises PBH Pond #4 (known as Pond 1 by M&S Civil) by realigning outlet pipe to proposed grasslined swale which with drop structure that skirts the northern boundary of the parcel
- Removes existing Ponds at NE and SW corners of site (Pond 2 and 3)
- Recommends construction of grasslined swale with drop structures along eastern boundary of site
- Recommends 48” storm sewer along southern boundary to convey flows from offsite and onsite areas easterly
- Recommends construction of 19 acre-foot Regional Detention Facility to be constructed in southeast corner of site, reducing developed flows of 248 and 564 cfs to 12 cfs and 167 cfs in the 5- and 100-year storm events respectively
- Per the report flows along the boundary of the site (rights of way, etc.) bypass pond and are allowed to freely discharge to the culvert under Stapleton Road

"Drainage Analysis for Paintbrush Hills Filing No.4”, prepared by KKBNA, December 1986.

- Report evaluative drainage reaching the 109.40 acres located north and west of the subject site.
- Identified subject site for commercial use
- Established Ponds 1-3 which were to be constructed to detain runoff at the NE and SW corners of the future commercial area and one (Pond 2) to be constructed just to the NW of the subject site
- Estimated Historic and Developed 100-year flow rates at Stapleton of 316 cfs and 460 cfs
- Recommended construction of (3) 30” CMPs at 4.75% to convey the 5-year discharge under Stapleton Road

DRAINAGE CRITERIA

Hydrology calculations were performed using the City of Colorado Springs/El Paso County Drainage Criteria Manual, as revised in November 1991 and October 1994 with County adopted Chapter 6 and Section 3.2.1 of Chapter 13 of the City of Colorado Springs/El Paso County Drainage Criteria Manual as revised in May 2014 and the El Paso County Engineering Criteria Manual (ECM) as revised in July 2019.

HYDROLOGIC CALCULATIONS

The Rational Method was used to estimate stormwater runoff anticipated from design storms with 5-year and 100-year recurrence intervals. The previous models and analysis were considered and incorporated

when determining and sizing the detention ponds, spillways and drainage ways Basins were analyzed and delineated (see Existing Conditions Map & Proposed Conditions Map in the Appendix) in order to determine areas and C coefficients. Overland flow and channelized flow paths were analyzed for each sub-basin in order to determine times of concentration. Table 6-6 Volume 1 of DCM was used for corresponding runoff coefficients.

HYDRAULIC CALCULATIONS

Hydraulic calculations were estimated using the Manning's Formula and the methods described in the El Paso County Storm Drainage Design Criteria manual. The relevant data sheets are included in the appendix of this report. The Urban Drainage and Flood Control District (UDFCD) manual. UD-Inlet v5.03 from UDFCD was used to calculate street and inlet capacities The sizing for the full spectrum detention facility has been determined using the guidelines set forth in the Urban Drainage and Flood Control District Criteria Manual. Refer to the UDFCD MHFD-Detention, Version 4.06, Excel Workbook located within the appendix of this report for calculations.

FOUR STEP PROCESS

Step1 Employ Runoff Reduction Practices – Approx. 2.2 acres of proposed land (pervious surface) within the project has been set aside for an EDB facility Pond 4. The three existing ponds 1-3 will be revised to full spectrum and capture offsite flows. Also roof drains will be directed to landscaped areas to minimize direct connection of impervious surfaces.

Step 2 Stabilize Drainageways – Onsite Pond 4 will outfall into a proposed storm system at Design Point 20 will outfall into a riprap lined basin. The discharged runoff will be conveyed downstream by an existing dual box culvert that runs under the Meridian Road/Stapleton Road intersection and discharges to an existing swale southeast of the site. Runoff reaching the existing culvert have been restricted to less than the existing condition. As such the development of the subject site, is not anticipated to have negative effect on the downstream drainageway.

Step 3 Provide Water Quality Capture Volume – The existing ponds (as shown in the drainage map by M&S Civil) Pond 1, Pond 2, and Pond 3 will be retrofitted to Full Spectrum Extended Drainage Basin and will provide WQCV. The onsite proposed pond 4 will provide Full Spectrum Detention and WQCV. A small portion (0.58 acres backyard lots) of the site is not being treated for water quality. Every available effort was made to capture these developed flows, through the ex 15’ curb cut at Pond 3, as described in the Proposed Detailed Drainage Discussion Design Point EX03. The flowby is directed to an existing swale located just south of the site and conveyed downstream.

Step 4 Consider Need for Industrial and Commercial BMP's – There are no commercial or industrial components to this development, therefore no BMPs of this nature are required. The existing Ponds (Pond 1, Pond 2, and Pond 3), as shown in the drainage map by M&S Civil, will be retrofitted to a Full Spectrum Extended Drainage Basin and will provide WQCV. The onsite proposed pond 4 will provide Full Spectrum Detention and WQCV.

EXISTING DRAINAGE CHARACTERISTICS

The purposes of this document are to evaluate preliminary drainage design which aligns and yet varies from the previous concept studies and drainage basin planning studies for the area. Given the numerous times in which the existing facilities have been analyzed deemed to be considered insufficient M&S Civil will provide an existing conditions analysis and refer to the Concept Drainage Analysis Cover Letter prepared by MS Civil Consultants, Inc., dated October 2021, for the evaluation of historic and existing condition flow rates. Refer to the appendix for hydrologic and hydraulic calculations and the existing conditions drainage map. Within the discussion of the Existing Drainage Characteristics the ponds will be identified as they are labeled on the Existing Conditions Drainage Map within the appendix.

Existing Drainage Discussion

Offsite Basin A1

This offsite drainage **Basin A1** is approximately 29.5 acres in size and is located to the north and west of the subject site. **Basin A1** consists of existing Paint Brush Hills Filing No. 9 (single family residential lots) and portions of Londonderry Drive. The calculated runoff produced within this area totals approximately 24.5 cfs and 78.6 cfs in the 5 and 100-year events respectively. Storm water produced by the basin continues south and east through PBH Filings 4 and 5 via existing storm sewer systems and an existing grass-lined channel and outfall into existing detention Pond 1 **(Design Point 1 (DP1))**, located within **Basin B4**.

Offsite Basin B1

This offsite drainage **Basin B1** is approximately 49.26 acres in size and is located to the north and west of the subject site. **Basin B** consists of portions of existing Paint Brush Hills Filing No. 5, 13A (single family residential lots) and a portion of Falcon Middle School. The calculated runoff produced within this area totals approximately 31.4 cfs and 116.0 cfs in the 5 and 100-year events respectively. Runoff from **Basin A1** and **B1** combine and are routed via existing storm sewer systems and an existing grass-lined channel and outfall into existing detention Pond 1 **(DP1)**, located within **Basin B4**.

Offsite Basin B2

This offsite drainage **Basin B2** is approximately 4.20 acres in size and is located to the north and west of the subject site. **Basin B2** consists of portions of existing Paint Brush Hills Filing No. 4, 5 (single family residential lots). The calculated runoff produced within this area totals approximately 3.9 cfs and 12.1 cfs in the 5 and 100-year events respectively. Runoff from **Basin A1, B1** and **B2** combine and are routed via existing storm sewer systems and an existing grass-lined channel and outfall into existing detention Pond 1 **(DP1)**, located within **Basin B4**.

Offsite Basin B3

This offsite drainage **Basin B3** is approximately 1.22 acres in size and is located to the north and west of the subject site. **Basin B3** consists of a small portion of existing Paint Brush Hills Filing No. 4 (single family residential lots) and a portion of Liberty Grove Drive and Cranston Drive. The calculated runoff produced

within this area totals approximately 2.8 cfs and 5.9 cfs in the 5 and 100-year events respectively. Runoff from **Basin A1, B1**, **B2** and **B3** combine and are routed via existing storm sewer systems and an existing grass-lined channel and outfall into existing detention Pond 1**(DP1)**, located within **Basin B4**.

Offsite Basin B4

This offsite drainage **Basin B4** is approximately 6.46 acres in size and is located to the north and west of the subject site. **Basin B4** consists of a small portion of existing Paint Brush Hills Filing No. 4 (single family residential lots) and a portion of existing grass-lined swale and existing detention Pond 1. The calculated runoff produced within this area totals approximately 3.6 cfs and 16.3 cfs in the 5 and 100-year events respectively. Runoff from **Basin A1, B1**, **B2, B3** and **B4** combine and are routed via existing storm sewer systems and an existing grass-lined channel and outfall into existing detention Pond 1 **(DP1)**, located within **Basin B4**. The cumulative flows reaching existing pond 1**(DP1)** are approximately 55.5 cfs and 192.4 cfs in the 5 and 100-year events respectively. These flows are routed via an existing 42" CMP culvert into **Basin E1** and ultimately to **Design Point 4 (DP4).**

Onsite Basin C

This onsite drainage **Basin C** is approximately 2.13 acres in size and is located along the northern property line of the subject site. **Basin C** consists of portions of an existing swale and undeveloped land. The calculated runoff produced within this area totals approximately 0.9 cfs and 4.9 cfs in the 5 and 100-year events respectively. Runoff from **Basin C** discharges to a small existing detention Pond 2 **(Design Point 2 (DP2))** located at the northeast corner of the site.

Offsite Basin C1

This offsite drainage **Basin C1** is approximately 3.27 acres in size and is located to the north of the subject site. **Basin C1** consists of portions of existing Paint Brush Hills Filing No. 4 (single family residential lots). The calculated runoff produced within this area totals approximately 2.8 cfs and 10.0 cfs in the 5 and 100-year events respectively. Runoff from **Basin C1** discharges to a small existing detention Pond 2 **(Design Point 2 (DP2))** located at the northeast corner of the site.

Offsite Basin C2

This offsite drainage **Basin C2** is approximately 10.67 acres in size and is located to the north of the subject site. **Basin C2** consists of portions of existing Paint Brush Hills Filing No. 4 (single family residential lots). The calculated runoff produced within this area totals approximately 7.1 cfs and 24.8 cfs in the 5 and 100-year events respectively. Runoff from **Basin C2** is routed via curb and gutter to an existing 9' CDOT Type 13 combination inlet. Flows from this inlet combine with flows from **Basin C3** and are conveyed via an existing 36" RCP storm sewer to an existing detention Pond 2 **(Design Point 2 (DP2))** located at the northeast corner of the site.

Offsite Basin C3

This offsite drainage **Basin C3** is approximately 22.78 acres in size and is located to the north of the subject site. **Basin C3** consists of portions of existing Paint Brush Hills Filing No. 4 (single family residential lots).

The calculated runoff produced within this area totals approximately 20.8 cfs and 59.5 cfs in the 5 and 100-year events respectively. Runoff from **Basin C3** is routed via curb and gutter to an existing 9' CDOT Type 13 combination inlet. Flows from this inlet combine with flows from **Basin C2** and are conveyed via an existing 30" RCP storm sewer to an existing detention Pond 2 **(Design Point 2 (DP2))** located at the northeast corner of the site.

Offsite Basin C4

This offsite drainage **Basin C4** is approximately 21.69 acres in size and is located to the north of the subject site. **Basin C4** consists of portions of existing Paint Brush Hills Filing No. 4, 6, 7, 8, 9 (single family residential lots) and a portion of Londonderry Drive. The calculated runoff produced within this area totals approximately 18.0 cfs and 51.5 cfs in the 5 and 100-year events respectively. Runoff from **Basin C4** is routed via curb and gutter to an existing grass-lined swale. Flows are conveyed by an existing 24" CMP to an existing detention Pond 2 **(Design Point 2 (DP2))** located at the northeast corner of the site. The cumulative flows reaching existing pond 2 **(DP2)** are approximately 45.9 cfs and 138.2 cfs in the 5 and 100-year events respectively. These flows are routed via an existing 30" CMP culvert into an existing swale (**EX1-EX1**) within **Basin F1** and ultimately to **Design Point 5 (DP5).** The cumulative flows within the existing swale are approximately 53.7 cfs and 158.0 cfs in the 5 and 100-year events respectively. The existing swale will overtop onto Meridian Road in the 100-year event, see existing swale section in the appendix.

Offsite Basin D1

This offsite drainage **Basin D1** is approximately 16.01 acres in size and is located to the west of the subject site. **Basin D1** consists of portions of existing Paint Brush Hills Filing No. 4 (single family residential lots). The calculated runoff produced within this area totals approximately 12.1 cfs and 42.5 cfs in the 5 and 100-year events respectively. Runoff from **Basin D1** is routed via curb and gutter to an existing 10' Type R inlet, located north of the Liberty Drive/Waterbury Drive intersection. The intercepted flow will combine with flows from **Basins D2, D3, D5** and be conveyed by existing storm sewer infrastructure to an existing detention Pond 3 **(Design Point 3 (DP3)),** located to the southwest corner of the site. Flowby will continue south along Liberty Drive to an existing 10' Type R inlet south of the Liberty Drive/Waterbury Drive intersection.

Offsite Basin D2

This offsite drainage **Basin D2** is approximately 10.14 acres in size and is located to the west of the subject site. **Basin D2** consists of portions of existing Paint Brush Hills Filing No. 4 (single family residential lots). The calculated runoff produced within this area totals approximately 7.2 cfs and 25.3 cfs in the 5 and 100-year events respectively. Runoff from **Basin D2** is routed via curb and gutter to an existing 10' Type R inlet, located west of the Liberty Drive/Waterbury Drive intersection. The intercepted flow will combine with flows from **Basins D1, D3, D5** and be conveyed by existing storm sewer infrastructure to an existing detention Pond 3 **(Design Point 3 (DP3)),** located to the southwest corner of the site. Flowby will continue east and south along Waterbury Drive and Liberty Drive to an existing 10' Type R inlet south of the Liberty Drive/Waterbury Drive intersection.

Offsite Basin D3

This offsite drainage **Basin D3** is approximately 9.30 acres in size and is located to the west of the subject site. **Basin D3** consists of portions of existing Paint Brush Hills Filing No. 4 (single family residential lots), Scenic View at Paint Brush Hills Subdivision and a small portion of the Falcon Middle School. The calculated runoff produced within this area totals approximately 6.1 cfs and 22.3 cfs in the 5 and 100-year events respectively. Runoff from **Basin D3** is routed via curb and gutter to an existing 10' Type R inlet, located west of the Liberty Drive/Waterbury Drive intersection. The intercepted flow will combine with flows from **Basins D1, D2, D5** and be conveyed by existing storm sewer infrastructure to an existing detention Pond 3 **(Design Point 3 (DP3)),** located to the southwest corner of the site. Flowby will continue east and south along Waterbury Drive and Liberty Drive to an existing 10' Type R inlet south of the Liberty Drive/Waterbury Drive intersection.

Offsite Basin D4

This offsite drainage **Basin D4** is approximately 9.36 acres in size and is located to the west of the subject site. **Basin D4** consists of portions of existing Paint Brush Hills Filing No. 4 (single family residential lots), Scenic View at Paint Brush Hills Subdivision and portions of the Stapleton Drive. The calculated runoff produced within this area totals approximately 9.4 cfs and 26.9 cfs in the 5 and 100-year events respectively. Runoff from **Basin D4** is routed via a roadside swale running along existing Stableton Drive to an existing 24" RCP culvert which crosses under Liberty Drive. The flow prior to entering the existing 24" RCP culvert will combine with flowby from **Basins D1, D2, D3, D5** via an existing 15' curb cut and be conveyed by the existing 24" RCP culvert to an existing detention Pond 3 **(Design Point 3 (DP3)),** located to the southwest corner of the site. For the existing condition it is assumed the existing 15' curbcut will capture all the flow. Analysis will be provided in the proposed drainage condition.

Offsite Basin D5

This offsite drainage **Basin D5** is approximately 0.09 acres in size and is located to the west of the subject site. **Basin D5** consists of a small portion of the existing Liberty Drive/Waterbury Drive intersection. The calculated runoff produced within this area totals approximately 0.4 cfs and 0.7 cfs in the 5 and 100-year events respectively. Runoff from **Basin D5** is routed via crosspan and curb and gutter to an existing 10' Type R inlet, located south of the Liberty Drive/Waterbury Drive intersection. The intercepted flow will combine with flows from **Basins D1, D2, D3** and be conveyed by existing storm sewer infrastructure to an existing detention Pond 3 **(Design Point 3 (DP3)),** located to the southwest corner of the site. Flowby will continue south along Liberty Drive to an existing 15' wide curbcut, prior to the Liberty Drive/Stapleton Drive intersection. The flowby will combine with flows from **Basin D4** and be conveyed by the existing 24" RCP culvert to an existing detention Pond 3 **(Design Point 3 (DP3)),** located to the southwest corner of the site.

Offsite Basin D6

This offsite drainage **Basin D6** is approximately 2.05 acres in size and is located to the west of the subject site. **Basin D6** consists of portions of existing Paint Brush Hills Filing No. 4 (single family residential lots) and a portion of the east half of existing Liberty Drive. The calculated runoff produced within this area totals approximately 2.8 cfs and 7.0 cfs in the 5 and 100-year events respectively. Runoff from **Basin D6** is

routed via curb and gutter to an existing 15' curbcut, located prior to the Liberty Drive/Stapleton Drive intersection. The flow will be conveyed by the existing 15' curbcut to an existing detention Pond 3 **(Design Point 3 (DP3)),** located to the southwest corner of the site. The cumulative flows reaching existing pond 3 **(DP3)** are approximately 34.8 cfs and 114.4 cfs in the 5 and 100-year events respectively. These flows are routed via an existing 24" CMP culvert into an existing swale (**EX2-EX2**) within **Basin F2** and ultimately to **Design Point 5 (DP5).** For the existing condition it is assumed the existing 15' curbcut will capture all the flow. Analysis will be provided in the proposed drainage condition. The cumulative flows within the existing swale (**EX2-EX2**) are approximately 42.3 cfs and 137.0 cfs in the 5 and 100-year events respectively. The existing swale will carry the 5 and 100-year events, see existing swale section in the appendix.

Onsite Basin E1

This drainage **Basin E1** includes runoff from the proposed 36.10-acre Falcon Reserve Filing No.1 residential subdivision. The calculated runoff produced within this area totals approximately 13.6 cfs and 74.0 cfs in the 5 and 100-year events respectively. Runoff from **Basin E1** will be conveyed by sheet flow and various swales to the southeast corner of the property. The cumulative flows from **Basin E1** and **DP1** reaching the southeast corner of the site **(DP4)** are approximately 59.8 cfs and 228.0 cfs in the 5 and 100-year events respectively. These flows are routed to **Design Point 5 (DP5),** via natural topography**.**

Onsite/Offsite Basin F1

This drainage basin **F1** is approximately 3.13 acres and includes runoff from the periphery of Falcon Reserve Filing No.1 residential subdivision and the adjacent roadway corridors (Meridian Road). The calculated runoff produced within this area totals approximately 4.6 cfs and 10.2 cfs in the 5 and 100-year events respectively. Runoff from **Basin F1** will be conveyed via existing roadside swale to the existing dual box culvert at NW corner of Stapleton Road and Meridian Road at **Design Point 5 (DP5)**. The existing swale adjacent to Meridian will not carry the 100-year event, see existing swale section in the appendix.

Onsite/Offsite Basin F2

This drainage basin **F2** is approximately 1.44 acres and includes runoff from the periphery of Falcon Reserve Filing No.1 residential subdivision and the adjacent roadway corridors (Stapleton Drive). The calculated runoff produced within this area totals approximately 2.4 cfs and 5.5 cfs in the 5 and 100-year events respectively. Runoff from **Basin F2** will be conveyed via an existing roadside swale to an existing 36" CMP culvert. The existing 36" culvert will outfall to an existing dual box culvert **(Pipe Run 1 (PR1))** at NW corner of Stapleton Road and Meridian Road at **Design Point 5 (DP5)**. The cumulative flows from **Basin F1** (routed via an existing roadside swale), **Basin F2** (routed via an existing roadside swale), **DP2** (cumulative flows from Ex Pond 2 which outfalls to the existing roadside swale located within Basin F1)**, DP3** (cumulative flows from Ex Pond 3 which outfalls to the existing roadside swale located within Basin F2) and **DP4** (cumulative flows from Basins E1 and DP1 which flow directly to DP5) reaching the southeast corner of the site **(DP5)** are approximately 134.2 cfs and 455.8 cfs in the 5 and 100-year events respectively. The existing swale adjacent to Stapleton Drive will carry the 5 and 100-year events, see existing swale section in the appendix. These flows are routed under Stapleton Drive to the southeast corner of the Stapleton

Drive/Meridian Road intersection via an existing dual box culvert to an existing swale which is adjacent to Stapleton Road**.**

PROPOSED DRAINAGE CHARACTERISTICS

The following paragraphs detail the proposed drainage patterns. Refer to the appendix for hydrologic and hydraulic calculations and the proposed conditions drainage map. Within the discussion of the Proposed Drainage Characteristics the ponds will be identified as they are labeled on the Proposed Conditions Drainage Map within the appendix.

Detailed Drainage Discussion

Design Point EX-1.1 (DP1.1, offsite area northwest of Pond 1)
DPEX-1.1 consists of approximately 82.34 acres of existing Paint Brush Hills Pond 4, 5, 9, 13A northwest of the proposed site. The calculated runoff for **Basin A1, B1** and a portion of **B4** is 49.5 cfs and 173.3 cfs in the 5 and 100-year events respectively. Runoff from the basin is collected and conveyed via a riprap lined swale and two proposed 36" RCP culverts **(PR1.**1(Q5=24.75 Q100=86.65 cfs/ per culvert)). These culverts will outfall into a proposed forebay for Pond 1 for water quality treatment. See appendix for swale and culvert calculations.

Design Point EX-1.2 (DP1.2, offsite area north of Pond 1)
DPEX-1.2 consists of approximately 5.42 acres of existing Paint Brush Hills Pond 4,5 northwest of the proposed site The calculated runoff for **Basin B2** and **B3** is 6.3 cfs and 17.1 cfs in the 5 and 100-year events respectively. Runoff from the basin is collected and conveyed via a riprap line swale and a proposed 24" RCP culvert **(PR1.2**(Q5=6.3 Q100=17.1 cfs)**)**. The culvert will outfall into a proposed forebay for Pond 1 for water quality treatment. See appendix for swale and culvert calculations.

Design Point EX-IN1 (DP EX-IN1, offsite area north of Pond 2)
DP EX-IN1 is approximately 22.78 acres (**Basin C3)** in size and is located to the north of the subject site. **DP EX-IN1** consists of portions of existing Paint Brush Hills Filing No. 4 (single family residential lots) and portions of **Basin C2** (in the 100-year event split flow). Due to the capacity of the street section (Cranston Drive), a split flow was calculated for **DP EX-IN1,** in the 100-year event. The total calculated runoff produced within this area is 21.9 cfs and 76.5 cfs (all of Cranston Drive Street section 100-year event) in the 5 and 100-year events respectively and 10.9 cfs and 38.3 cfs (northwest half of Cranston Drive) in the 5 and 100-year events respectively. The Runoff from **DP EX-IN1** is routed via curb and gutter to an existing 9' CDOT Type 13 combination inlet. Intercepted flow will be conveyed by an existing 30" RCP pipe (**PRE1** (Q5=10.9 Q100=34.1 cfs)) to **DP EX-IN2**. Excess runoff will be overflow to the inlet at **DP EX-IN2.** The existing storm system will convey the combined flow to **Design Point 2.1 (DP2.1)** and ultimately to detention Pond 2 **(Design Point 2 (DP2))** located at the northeast corner of the site for water quality treatment.

Design Point EX-IN2 (DP EX-IN2, offsite area north of Pond 2)
DP EX-IN2 is approximately 10.67 acres (**Basin C2)** in size and is located to the north of the subject site. **DP EX-IN2** consists of portions of existing Paint Brush Hills Filing No. 4 (single family residential lots)

and portions of **Basin C3** (in the 100-year event split flow). Due to the capacity of the street section (Cranston Drive), a split flow was calculated for **DP EX-IN2,** in the 100-year event. The total calculated runoff produced within this area is 21.9 cfs and 76.5 cfs (all of Cranston Drive Street section 100-year event) in the 5 and 100-year events respectively and 10.9 cfs and 38.3 cfs (southeast half of Cranston Drive) in the 5 and 100-year events respectively. Runoff from **DP EX-IN2** is routed via curb and gutter to an existing 9' CDOT Type 13 combination inlet. Intercepted flow will combine with flows from **PRE1** and be conveyed by an existing 36" RCP pipe (**PRE2** (Q5=21.9 Q100=68.2 cfs)) to **DP2.1.** Excess runoff will be overflow to the sump inlet at **DP 2.1.** Flows will ultimately be routed to detention Pond 2 **(DP2)** located at the northeast corner of the site for water quality treatment.

Design Point EX-CUL (DP EX-CUL, offsite area north of Pond 2)

DP EX-CUL is approximately 21.69 acres in size and is located to the north of the subject site. **DP EX-CUL** consists of portions of existing Paint Brush Hills Filing No. 4, 6, 7, 8, 9 (single family residential lots) and a portion of Londonderry Drive. The calculated runoff for **Basin C4** produced within this area totals 18.0 cfs and 51.5 cfs in the 5 and 100-year events respectively. Runoff from **DP EX-CUL** is routed via curb and gutter to an existing grass-lined swale. Flows are conveyed by an existing 24" CMP to detention Pond 2 **(Design Point 2 (DP2))** located at the northeast corner of the site for water quality treatment.

Design Point EX-IN3/EX01 (DP EX-IN3/EX01, offsite area northwest of Pond 3)

DP EX-IN3 is approximately 16.01 acres **(Basin D1)** in size and is located to the west of the subject site. **DP EX-IN3** consists of portions of existing Paint Brush Hills Filing No. 4 (single family residential lots) and a portion of **Basin **D6** (in the 100-year event). Due to the capacity of the street section (Liberty Drive), a split flow was calculated for **DP EX-IN3,** in the 100-year event. The total calculated runoff produced within this area is 12.1 cfs and 50.5 cfs (all of Liberty Drive Street section 100-year event) in the 5 and 100-year events respectively and 2.6 cfs and 25.2 cfs (west half of Liberty Drive) in the 5 and 100-year events respectively. Runoff from **DP EX-IN3** is routed via curb and gutter to an existing 10' Type R inlet, located north of the Liberty Drive/Waterbury Drive intersection. The intercepted flow **(PRE4** (Q5=7.7 Q100=10.8 cfs)) will be conveyed by an existing storm sewer system to **DP EX-02** and ultimately to detention Pond 3 **(Design Point 3 (DP3)),** for water quality treatment, located to the southwest corner of the site. Flowby will continue south along Liberty Drive to **DP EX-02** an existing 10' Type R inlet south of the Liberty Drive/Waterbury Drive intersection.

Design Point EX-IN4 (DP EX-IN4, offsite area northwest of Pond 3)

DP EX-IN4 is approximately 10.14 acres **(Basin D2)** in size and is located to the west of the subject site. **DP EX-IN4** consists of portions of existing Paint Brush Hills Filing No. 4 (single family residential lots). The calculated runoff produced within this area totals 7.2 cfs and 25.3 cfs in the 5 and 100-year events respectively. Runoff from **DP EX-IN4** is routed via curb and gutter to an existing 10' Type R inlet, located west of the Liberty Drive/Waterbury Drive intersection. The intercepted flow **(PRE5** (Q5=5.9 Q100=10.9 cfs)) will be conveyed by an existing storm sewer system to **DP EX-IN5** and ultimately to detention Pond 3 **(Design Point 3 (DP3)),** for water quality treatment, located to the southwest corner of the site. Flowby will continue east and south along Waterbury Drive and Liberty Drive to **DP EX-02** an existing 10' Type R inlet south of the Liberty Drive/Waterbury Drive intersection.

Design Point EX-IN5 (DP EX-IN5, offsite area northwest of Pond 3)

DP EX-IN5 is approximately 9.30 acres **(Basin D3)** in size and is located to the west of the subject site. **DP EX-IN5** consists of portions of existing Paint Brush Hills Filing No. 4 (single family residential lots), Scenic View at Paint Brush Hills Subdivision and a small portion of the Falcon Middle School. The calculated runoff produced within this area totals 6.1 cfs and 22.3 cfs in the 5 and 100-year events respectively. Runoff from **DP EX-IN5** is routed via curb and gutter to an existing 10' Type R inlet, located west of the Liberty Drive/Waterbury Drive intersection. The combined intercepted flow from **DP EX-IN4** and **DP EX-IN5 (PRE6** (Q5=11.1 Q100=20.9 cfs)) will be conveyed by an existing storm sewer system to **DP EX-IN6** and ultimately to detention Pond 3 **(Design Point 3 (DP3)),** for water quality treatment, located to the southwest corner of the site. Flowby will continue east and south along Waterbury Drive and Liberty Drive to **DP EX-02** an existing 10' Type R inlet south of the Liberty Drive/Waterbury Drive intersection.

Design Point EX-IN6/EX02 (DP EX-IN6/EX02, offsite area northwest of Pond 3)

DP EX-IN6 is approximately 0.09 acre **(Basin D5)** in size and is located to the west of the subject site. **DP EX-IN6** consists of a small portion of the existing Liberty Drive/Waterbury Drive intersection and a portion of **Basin **D6** (in the 100-year event). Due to the capacity of the street section (Liberty Drive), a split flow was calculated for **DP EX-IN6,** in the 100-year event. The total calculated runoff produced from **DP EX-IN6** and flowby from **DP EX01**, **DP EX-IN4** and **DP EX-IN5** within this area totals 8.9 cfs and 62.9 cfs (all of Liberty Drive-street section 100-year event) in the 5 and 100-year events respectively and 8.9 cfs and 31.4 cfs (west half of Liberty Drive) in the 5 and 100-year events respectively. Runoff from **DP EX-IN6** is routed via crosspan and curb and gutter to an existing 10' Type R inlet, located south of the Liberty Drive/Waterbury Drive intersection. The intercepted flow will combine with flows from **PR E4** and **PR E6** and be conveyed by an existing 24" RCP storm sewer system **(PRE7** (Q5=24.7 Q100=42.7 cfs**)** to detention Pond 3 **(Design Point 3 (DP3)),** for water quality treatment, located to the southwest corner of the site. Flowby will continue south along Liberty Drive till it reaches an existing 15' wide curbcut, prior to the Liberty Drive/Stapleton Drive intersection **(Design Point EX03, DP EX03).**

Design Point EX03 (DP EX03, offsite area west of Pond 3)

DP EX03 consists of existing Liberty Drive and a portion of flowby from Waterbury Drive and Liberty Drive inlets and **Basin**D6**. Due to the capacity of the street section (Liberty Drive), a split flow was calculated for **DP EX03,** in the 100-year event. Runoff from the proposed backyards of lots between Salen Court and Waterbury Drive will be part of the 20% of total site Water Quality exclusion per El Paso County Engineering Criteria Manual Chapter 3.2.5. The calculated total runoff produced within this street section totals 6.1 cfs and 52.3 cfs (all of Liberty Drive-street section 100-year event) in the 5 and 100-year events respectively and 6.1 cfs and 26.2 cfs (half of Liberty Drive) in the 5 and 100-year events respectively. Runoff from **DP EX03** is routed via curb and gutter to existing 15' curbcuts on both sides of the street. The existing 15' curbcut on the west side of Liberty Drive will approximately intercept (Q5=3.2 Q100=8.0 cfs**),** which will be routed to a roadside swale in **Basin D4.** The remainder of the flow (Q5=2.9 Q100=18.2 cfs) will be routed south. A small portion of the 100 year flow (Q5=0.0 Q100=10.6 cfs**)** will transfer over the crown of Liberty Drive to the east. The remainder will be routed via a curb return and an existing 6' curb cut to a roadside swale in **Basin D4** which will then be routed to east in an existing 24" RCP culvert into detention pond 3 for water quality treatment. The existing 15' curbcut on the east side of Liberty Drive will approximately intercept (Q5=2.2 Q100=8.0 cfs**)** which will be routed to detention pond 3 for water quality treatment. The remainder of the flow (Q5=1.2 Q100=18.2 cfs) and the flowby from the

westside of Liberty Drive will be routed via a curb return and an existing 6' curbcut to a roadside swale in **Basin **F2** which will then be routed west to **Design Point 16 (DP16)**.

Design Point EX04 (DP EX04, offsite area west of Pond 3)

DP EX04 consists of portions of existing Paint Brush Hills Filing No. 4 (single family residential lots) and portions of existing Liberty Drive contained within the west half of **DP EX03** minus the flowby transferred to the east of Liberty Drive. The calculated total runoff produced to this design point is 11.7 cfs and 40.7 cfs in the 5 and 100-year events respectively. Runoff from **DP EX04** is routed to east in an existing 24" RCP culvert **(PRE8** (Q5=11.7 Q100=40.7 cfs**)** to detention Pond 3 for water quality treatment. This report assumes all flow reaches **Pond 3.**

Design Point 1 (DP1, Offsite Pond 1)

DP1 consists of approximately 90.64 acres of existing Paint Brush Hills Pond 4, 5, 9, 13A northwest of the proposed site The cumulative runoff for **Basin A1, B1, B2, B3** and **B4** is 55.5 cfs and 192.4 cfs in the 5 and 100-year events respectively. **Basin B4** has a proposed rip rap lined swale (Section P2-P2) to dissipate the flows before combining with the flows from **DP1**. **Basin B2** has a proposed rip rap lined swale (Section P3-P3) to dissipate the flows before combining with from **DP1**. Calculations for the swales can be found in the appendix of this report. Runoff from the basin is collected and conveyed via an existing grass-lined channel, existing storm sewer systems and proposed culverts to Pond 1, located at the northwest corner of the site for water quality treatment. Pond 1 will be revised to provide full spectrum detention and WQCV. The emergency overflow path, a proposed 60' grasslined swale, shall route runoff through **Basin M** and ultimately to Pond 2. The outlet structure shall release flows to a proposed 36" RCP (**PR22**(Q5=15.2 Q100=64.3 cfs)) and will be routed to **PR24.** See Water Quality Provisions and Maintenance for a discussion of Pond 1. See calculations for swale in the appendix.

Design Point 2.1 (DP 2.1)

DP 2.1 consists of Basin **M** (2.11 acres), offsite **Basin C1** (3.27 acres) and flowby from **EX-IN2**. The combined calculated runoff produced within this area totals 2.9 cfs and 15.7 cfs in the 5 and 100-year events respectively. Runoff from **DP 2.1** is routed via a proposed 60' grasslined swale to a proposed CDOT Type D inlet. The captured flow will combine with flows from **PRE2/PR19** and be conveyed by a proposed 36" RCP pipe (**PR20** (Q5=24.8 Q100=83.9 cfs)) to **DP2,** detention pond 2, for water quality treatment, located at the northeast corner of the site.

Design Point 2 (DP2, Onsite Pond 2)

DP2 consists of approximately 61.99 acres of existing Paint Brush Hills Pond 4, 6, 7, 8, 9 north of the proposed site and a portion of the northern edge of the site. The cumulative runoff for **Basin N, PR20,** and **PR21** is 41.0 cfs and 130.3 cfs in the 5 and 100-year events respectively. Runoff from the basin is collected and conveyed via an existing grass-lined channel, existing storm sewer systems and proposed culverts to Pond 2, for water quality treatment, located at the northeast corner of the site. Pond 2 will be revised to provide full spectrum detention and WQCV. The emergency overflow path shall release runoff into **Basin **F1.1** and ultimately to **Design Point 18 (DP18).** The outlet structure shall release flows to a proposed 36" RCP (**PR23**(Q5=10.6 Q100=50.6 cfs)) and be routed to **PR24**. The cumulative flow from **PR22** and **PR23** will be routed via a proposed 48" RCP pipe (**PR24** (Q5=24.9 Q100=111.0 cfs)) and outfall onto a proposed 12.5' x 7.1' Type L riprap pad within **Basin O** and ultimately via a proposed 10' wide swale to **Design Point 19 (DP19).** See Water Quality Provisions and Maintenance for a discussion of Pond 2.

Design Point 3 (DP3, Onsite Pond 3)

DP3 consists of approximately 49.37 acres of existing Paint Brush Hills Pond 4, Scenic View at Paint Brush Hills Subdivision, a small portion of the Falcon Middle School west of the proposed site and a portion of the western edge of the site. The cumulative runoff for **Basin P, PR25, PR26** and partial capture of **Basin **D6** by an existing 15' curbcut is 40.4 cfs and 94.6 cfs in the 5 and 100-year events respectively. Runoff from the basin is collected and conveyed via an existing storm sewer system and proposed culverts to Pond 3, for water quality treatment, located at the southwest corner of the site. Pond 3 will be revised to provide full spectrum detention and WQCV. The emergency overflow path shall release runoff into **Basin **F2** and ultimately to **Design Point 16 (DP16).** The outlet structure shall release flows to a proposed 36" RCP (**PR27**(Q5=8.7 Q100=49.8 cfs)) and outfall onto a proposed 5.5' x 4.5' Type L riprap pad within **Basin Q** and ultimately via a proposed 8' wide swale to **Design Point 17 (DP17)**. See Water Quality Provisions and Maintenance for a discussion of Pond 3.

Design Point 4 (DP4)

DP 4 consists of **Basin A** (2.37 acres) single family lots. The calculated runoff produced within this area totals 3.2 cfs and 8.2 cfs in the 5 and 100-year events respectively. Runoff from **DP4** is routed via proposed curb and gutter to a proposed 10' CDOT Type R at-grade inlet. The intercepted flow will be conveyed by a proposed 15" RCP pipe (**PR1** (Q5=3.2 Q100=6.3 cfs)) and continues downstream via the proposed storm sewer system to **Design Point 15 (DP15),** for water quality treatment. The flowby will be routed to **Design Point 14 (DP14)** and ultimately conveyed to Pond 4 for water quality treatment.

Design Point 5 (DP5)

DP 5 consists of **Basin B** (1.08 acres) single family lots. The calculated runoff produced within this area totals 1.7 cfs and 3.9 cfs in the 5 and 100-year events respectively. Runoff from **DP5** is routed via proposed curb and gutter to a proposed 10' CDOT Type R at-grade inlet. The intercepted flow will be conveyed by a proposed 15" RCP pipe (**PR2** (Q5=1.7 Q100=3.9 cfs)) and continues downstream via **t**he proposed storm sewer system to Pond 4 for water quality treatment. The flowby will be routed to **Design Point 13 (DP13)** and ultimately routed to Pond 4 for water quality treatment. The cumulative flow from **PR1** and **PR2** will be routed via a proposed 18" RCP pipe (**PR3** (Q5=4.8 Q100=9.9 cfs)) to **PR7.**

Design Point 6 (DP6)

DP 6 consists of **Basin E** (4.01 acres) single family lots. The calculated runoff produced within this area totals 5.7 cfs and 14.1 cfs in the 5 and 100-year events respectively. Runoff from **DP6** is routed via proposed curb and gutter to a proposed 15' CDOT Type R at-grade inlet. The intercepted flow will be conveyed by a proposed 18" RCP pipe (**PR4** (Q5=5.7 Q100=11.4 cfs)) and continues downstream via the proposed storm sewer system and ultimately to Pond 4 for water quality treatment**.** The flowby will be routed to **Design Point 13 (DP13)** and ultimately to conveyed to Pond 4 for water quality treatment

Design Point 7 (DP7)

DP7 consists of **Basin F** (1.51 acres) single family lots. The calculated runoff produced within this area totals 2.7 cfs and 5.9 cfs in the 5 and 100-year events respectively. Runoff from **DP7** is routed via proposed curb and gutter to a proposed 10' CDOT Type R at-grade inlet. The intercepted flow will be conveyed by a proposed 15" RCP pipe (**PR5** (Q5=2.7 Q100=5.2 cfs)) and continues downstream to via the proposed storm sewer system and ultimately to Pond 4 for water quality treatment**.** The flowby will be routed to **Design**

Point 13 (DP13) and ultimately to Pond 4 for water quality treatment The cumulative flow from **PR4** and **PR5** will be routed via a proposed 24" RCP pipe (**PR6** (Q5=8.3 Q100=16.4 cfs)) to **PR7.** The cumulative flow from **PR3** and **PR6** will be routed via a proposed 24" RCP pipe (**PR7** (Q5=12.7 Q100=25.6 cfs)) to **PR9.**

Design Point 8 (DP8)

DP8 consists of **Basin J** (3.57 acres) single family lots. The calculated runoff produced within this area totals 6.3 cfs and 13.9 cfs in the 5 and 100-year events respectively. Runoff from **DP 8** is routed via proposed curb and gutter to a proposed 15' CDOT Type R at-grade inlet. The intercepted flow will be conveyed by a proposed 24" RCP pipe (**PR8** (Q5=6.3 Q100=11.3 cfs)) and continues downstream via the proposed storm sewer system to **PR9**, and ultimately Pond 4 for water quality treatment**.** The flowby will be routed to **Design Point 11 (DP11)** and ultimately to Pond 4 for water quality treatment. The cumulative flow from **PR7** and **PR8** will be routed via a proposed 30" RCP pipe (**PR9** (Q5=18.3 Q100=35.4 cfs)) to **PR14.**

Design Point 9 (DP9)

DP9 consists of **Basin G** (1.99 acres) single family lots. The calculated runoff produced within this area totals 2.9 cfs and 6.9 cfs in the 5 and 100-year events respectively. Runoff from **DP9** is routed via proposed curb and gutter to a proposed 10' CDOT Type R at-grade inlet. The intercepted flow will be conveyed by a proposed 15" RCP pipe (**PR10** (Q5=2.9 Q100=5.8 cfs)) and continues downstream to PR12 and continue downstream via the proposed storm sewer system and ultimately to Pond 4 for water quality treatment. The flowby will be routed to **Design Point 11 (DP11)** and ultimately to Pond 4 for water quality treatment.

Design Point 10 (DP10)

DP10 consists of **Basin H** (0.68 acres) single family lots. The calculated runoff produced within this area totals 1.7 cfs and 3.5 cfs in the 5 and 100-year events respectively. Runoff from **DP10** is routed via proposed curb and gutter to a proposed 5' CDOT Type R at-grade inlet. The intercepted flow will be conveyed by a proposed 15" RCP pipe (**PR11** (Q5=1.6 Q100=2.4 cfs)) and continues downstream to **PR12** via the proposed storm sewer system and ultimately to Pond 4 for water quality treatment. The flowby will be routed to **Design Point 12 (DP12)** and ultimately to Pond 4 for water quality treatment. The cumulative flow from **PR10** and **PR11** will be routed via a proposed 18" RCP pipe (**PR12** (Q5=4.2 Q100=7.7 cfs)) to **PR16.**

Design Point 11 (DP11)

DP11 consists of **Basin K** (1.80 acres) single family lots and flowby from **DP8** and **DP9**. The calculated runoff produced within this area totals 3.1 cfs and 10.6 cfs in the 5 and 100-year events respectively. Runoff from **DP 11** is routed via proposed curb and gutter to a proposed 15' CDOT Type R sump inlet. The intercepted flow will be conveyed by a proposed 18" RCP pipe (**PR13** (Q5=3.1 Q100=10.6 cfs)). The cumulative flow from **PR13** and **PR9** will be routed via a proposed 36" RCP pipe (**PR14** (Q5=21.2 Q100=45.3 cfs)) and continues downstream to **PR16** via the proposed storm sewer system and ultimately to Pond 4 for water quality treatment. In the event of clogging or total inlet failure, the overflow will over top the crown to **DP12**.

Design Point 12 (DP12)

DP12 consists of **Basin I** (1.49 acres) single family lots and flowby from **DP10**. The calculated runoff produced within this area totals 2.9 cfs and 7.2 cfs in the 5 and 100-year events respectively. Runoff from **DP 12** is routed via proposed curb and gutter to a proposed 10' CDOT Type R sump inlet. The intercepted

flow will be conveyed by a proposed 15" RCP pipe (**PR15** (Q5=2.9 Q100=7.2 cfs)) and continues downstream to **PR16** via the proposed storm sewer system and ultimately to Pond 4 for water quality treatment. The cumulative flow from **PR12, PR14** and **PR15** will be routed via a proposed 36" RCP pipe (**PR16** (Q5=23.7 Q100=51.5 cfs)) to proposed detention Pond 4 (**DP15).** In the event of clogging or total inlet failure, the overflow will over top the curb and gutter into **DP15,** Pond 4.

Design Point 13 (DP13)

DP13 consists of **Basin D** (3.44 acres) single family lots and flowby from **DP5, DP6** and **DP7**. The calculated runoff produced within this area totals 4.3 cfs and 13.2 cfs in the 5 and 100-year events respectively. Runoff from **DP13** is routed via proposed curb and gutter to a proposed 15' CDOT Type R at-grade inlet. The intercepted flow will be conveyed by a proposed 18" RCP pipe (**PR17** (Q5=4.3 Q100=11.4 cfs)) and continues downstream to **PR18** via the proposed storm sewer system and ultimately to Pond 4 for water quality treatment. The flowby will be routed to **Design Point 14 (DP14)**.

Design Point 14 (DP14)

DP14 consists of **Basin C** (3.77 acres) single family lots and flowby from **DP4** and **DP13.** The calculated runoff produced within this area totals 3.9 cfs and 13.2 cfs in the 5 and 100-year events respectively. Runoff from **DP14** is routed via proposed curb and gutter to a proposed 15' CDOT Type R sump inlet. The combined intercepted flow will be conveyed by a proposed 18" RCP pipe (**PR18** (Q5=8.0 Q100=24.0 cfs)) and continues downstream to proposed detention Pond 4, **DP15.** In the event of clogging or total inlet failure, the overflow will over top the curb and gutter into **DP15,** Pond 4.

Design Point 15 (DP15, Onsite Pond 4)

DP15 consists of approximately 28.40 acres of Falcon Reserve Filing No. 1 single family lots. The cumulative runoff for **Basin L, PR16,** and **PR18** is 28.9 cfs and 72.3 cfs in the 5 and 100-year events respectively. Runoff from the basin is collected and conveyed via the proposed storm sewer system and proposed culverts to Pond 4, located at the southeast corner of the site. Pond 4 will provide full spectrum detention and WQCV. The emergency overflow path shall release runoff into **Basin **F2.1** and ultimately to **Design Point 20 (DP20).** The outlet structure shall release flows to a proposed 36" RCP (**PR28**(Q5=4.4 Q100=33.92 cfs)) to **DP20**. See Water Quality Provisions and Maintenance for a discussion of Pond 4.

Design Point 16 (DP16)

DP16 consists of **Basin **F2** (1.85 acres) and flowby from half of **DP EX03.** The calculated runoff produced within this area totals 2.5 cfs and 28.7 cfs in the 5 and 100-year events respectively. Runoff from **DP 16** is routed via an existing grass lined swale to an existing 36" CMP culvert. Runoff from the proposed south slope of pond 3 will be part of the 20% of total site Water Quality exclusion per El Paso County Engineering Criteria Manual Chapter 3.2.5. The intercepted flow will be conveyed by an existing 36" CMP culvert (**PRE09** (Q5=2.5 Q100=28.7 cfs)) downstream to **DP20.** The runoff from **DP16** is not routed to Pond 4 to be treated for water quality. No construction proposed for this area, only grading and the area will be seeded and mulched. In house calculations were done and determined that the flow to the swale in the proposed condition is less than the flow to the swale in the existing condition. The existing swale adjacent to Stapleton Drive will carry the 5 and 100-year events, see proposed condition existing swale section in the appendix.

Design Point 17 (DP17)

DP17 consists of **Basin Q** (1.68 acres) and **PR27.** The calculated runoff produced within this area totals 13.2 cfs and 75.2 cfs in the 5 and 100-year events respectively. Runoff from **Basin Q** will be part of the

20% of total site Water Quality exclusion per El Paso County Engineering Criteria Manual Chapter 3.2.5. Runoff from **DP 17** is routed via a proposed 8' grass lined swale to the existing riprap at **DP20.** Grass lined swale to be lined with North American Green SC150 or approved equal. See proposed condition proposed swale section in the appendix. The runoff from **DP17** is not routed to Pond 4 to be treated for water quality. No construction proposed for this area, only grading and the area will be seeded and mulched.

Design Point 18 (DP18)

DP18 consists of **Basin **F1.1** (1.94 acres) and **Basin **F1** (1.50 acres) roadside swales adjacent to Meridian Road. Runoff from the proposed east slope of pond 2 will be part of the 20% of total site Water Quality exclusion per El Paso County Engineering Criteria Manual Chapter 3.2.5. The calculated runoff produced within this area totals 3.2 cfs and 8.7 cfs in the 5 and 100-year events respectively. Runoff from **DP18** is routed via an existing grass lined swale to an existing riprap at **DP20.** The existing swale adjacent to Meridian Drive will carry the 5 and 100-year events, see proposed condition existing swale section in the appendix. The runoff from **DP18** is not routed to Pond 4 to be treated for water quality. No construction proposed for this area, only grading and the area will be seeded and mulched.

Design Point 19 (DP19)

DP19 consists of **Basin O** (1.07 acres) and **PR24.** Runoff from **Basin O** will be part of the 20% of total site Water Quality exclusion per El Paso County Engineering Criteria Manual Chapter 3.2.5. The calculated runoff produced within this area totals 22.8 cfs and 101.6 cfs in the 5 and 100-year events respectively. Runoff from **DP 19** is routed via a proposed 10' grass lined swale to the existing riprap at **DP20.** Grass lined swale to be lined with North American Green SC150 or approved equal. See proposed condition existing swale section in the appendix. The runoff from **DP19** is not routed to Pond 4 to be treated for water quality. No construction proposed for this area, only grading and the area will be seeded and mulched.

Design Point 20 (DP20)

DP20 consists of **Basin **F2.1** (0.44 acres) and flow from **DP17, DP18, DP19, PR28** and **PRE9**. Runoff from the proposed southeast slope of pond 4 will be part of the 20% of total site Water Quality exclusion per El Paso County Engineering Criteria Manual Chapter 3.2.5. The cumulative calculated runoff produced within this area totals 49.2 cfs and 259.8 cfs in the 5 and 100-year events respectively. Runoff from **DP20** is routed via an existing riprap pad to an existing dual box culvert. The intercepted flow will be conveyed by an existing dual box culvert (**PRE10** (Q5=49.2 Q100=259.8 cfs)) downstream under the Meridian Road/Stapleton Road intersection to an existing swale southeast of the site. As shown in the appendix of this report, for the "Proposed Condition the Existing Dual 2.5'x6.0' RCBC, at 53% full, the flow is 129.9 cfs per box culvert, see appendix for Box Culvert Mannings Pipe Flow Calculator. The invert at the box culvert is 7078.72 and the headwall elevation is 7082.97 which calculates to a headwall has a depth of 4.3'. The headwater depth is 4.3' (nomograph in the appendix) with 1.03' of freeboard per existing 7084.00 contour shown on Proposed Condition Drainage Map. The surrounding area around the headwall has a spot elevation of 7085.06'as determined by MS Civil survey. Spot elevations taken at and around the box culvert conducted by MS Civil Consultants confirm height and free board, see appendix for Headwater Depth for Box Culverts with Inlet Control nomograph.

HYDRAULIC ANALYSIS, WATER QUALITY PROVISIONS AND MAINTENANCE

Design Point 1 (northwest corner of site)

Per the MDDP for Falcon Reserve by MVE, the pond, at this location, flows currently leave the pond via an existing 42" CMP where they flow southeasterly across the site.

Previous modeling of the existing pond and outlet structure within the 2013 Matrix DBPS indicates that the 100-year flows overtop the existing embankment of Paint Brush Hills Pond #4 (known as Pond 1 by M&S Civil). Recommendations within that report indicate that it is "recommend that on-site detention be incorporate upstream of this pond to reduce flooding at these locations."

The LDC Drainage Map that has proposed changes made by Core Engineering Reports for Falcon Reserve indicated that the runoff from the facility (Ex. Pond A-1), known as Pond 1 by M&S Civil, could be routed to the southeast via a channel relocated to the DBPS recommended sub-regional pond which could be located at the southeast corner of the site. Per the LDC report a 5' 4:1 5' deep channel with drops would be need to convey runoff east.

Per the "Drainage Analysis for Paintbrush Hills Filing No.4", prepared by KKBNA, the report and drainage map have calculated the flow amount and detention pond (1-3) sizing with the "Procedures for Determining Peak Flows in Colorado," including T.R.55 by the SCS. Pond #2 (known as Pond 1 by M&S Civil) has SCS calculated inflow of Q5=83 cfs, Q100=200 cfs compared to M&S Civil rational method Q5=55.5 cfs, Q100=192.4 cfs. The criteria and methodologies have changed over the years but the similar output is an approximation only, the result are not to be considered as equivalent as two different methodologies were used to determine the results. The KKBNA has a calculated pond volume of 4.1 ac-ft with release rates of Q5=43 cfs Q100=133 cfs compared to M&S Civil MHFD volume of 4.624 ac-ft with release rates of Q5=15.2 cfs, Q100=64.3 cfs. The criteria and methodologies have changed over the years and the results differ due to the present-day requirement of water quality being provided in ponds 1-3.

M&S Civil recommends expanding the pond by lowering its invert and replacing the outlet structure to function as a Full Spectrum Detention Facility. The proposed full spectrum detention (FSD) pond functions to provide detention and water quality for the existing Paint Brush Hills #'s 4, 5, 9, 13A development. This full spectrum detention pond will function to treat approximately 90.64 acres of 24.20% impervious, tributary area by providing 1.003 acre-feet of storage for the water quality event, 2.213-acre feet of storage at the EURV storm event, and 4.624 acre-feet of storage in the 100-year event. The 60' wide emergency spillway is designed with a foot of freeboard in the 100-year event. This spillway safely conveys flows to a proposed 60' wide swale in the event of outlet clogging or failure. The spillway will be armored with riprap and a cutoff wall.

The proposed FSD pond will be privately owned and maintained by the existing Paint Brush Hills Metropolitan District. Access to the pond shall be granted to the owner/district and El Paso County for access and maintenance of the private facility. A private maintenance agreement document shall accompany the Final Drainage Report by M&S Civil Consultants, Inc. submittal.

Design Point 2 (northeast corner of site)
Flows currently leave the facility via an existing 24" CMP where they discharge to the Meridian Road Right of Way.

Previous modeling of the existing facility (by MVE) indicates that the 100-year flows overtop the existing embankment of Pond 2 (aka Pond A-1). Recommendations within the report by MVE indicate that it is "recommend that on-site detention be incorporate upstream of this pond to reduce flooding at these locations."

The LDC and Core Engineering Reports for Falcon Reserve indicated that runoff reaching existing Pond 2 (A-1*) be relocated to the DBPS recommended sub-regional pond which could be located at the southeast corner of the site. LDC concurrence to remove the pond is caveated by the anticipation of an access to be located from Meridian Roadway. Per the LDC report a 5'x5' RCBC is to be provided to convey the runoff from **DP1** and **DP2** south to the regional pond.

Per the "Drainage Analysis for Paintbrush Hills Filing No.4", prepared by KKBNA, the report and drainage map have calculated the flow amount and detention pond (1-3) sizing with the "Procedures for Determining Peak Flows in Colorado," including T.R.55 by the SCS. Pond #1 (known as Pond 2 by M&S Civil) has SCS calculated inflow of Q5=68 cfs, Q100=150 cfs compared to M&S Civil rational method Q5=41.0 cfs, Q100=130.3 cfs. The criteria and methodologies have changed over the years but the similar output is an approximation only, the result are not to be considered as equivalent as two different methodologies were used to determine the results. The KKBNA has a calculated pond volume of 2.35 ac-ft with release rates of Q5=25 cfs Q100=77 cfs compared to M&S Civil MHFD volume of 4.252 ac-ft with release rates of Q5=10.2 cfs, Q100=42.0 cfs. The criteria and methodologies have changed over the years and the results differ due to the present day requirement of water quality being provided in ponds 1-3.

In early meetings with El Paso County, it was determined that access will not be permitted to the site from Meridian Road. Given this, M&S Civil recommends retaining and expanding the pond by lowering its invert and adding an outlet structure to function as a Full Spectrum Detention Facility. The proposed full spectrum detention (FSD) pond functions to provide detention and water quality for the existing Paint Brush Hills #'s 4, 6, 7, 8, 9 developments. This full spectrum detention pond will function to treat approximately 61.99 acres of 29.80% impervious, tributary area by providing 0.780 acre-feet of storage for the water quality event, 1.897-acre feet of storage at the EURV storm event, and 3.772 acre-feet of storage in the 100-year event. The 28' wide emergency spillway is designed with a foot of freeboard in the 100-year event. This spillway safely conveys flows to an existing swale, adjacent to Meridian Road,

The proposed FSD pond will be privately owned and maintained by the existing Paint Brush Hills Metropolitan District. Access to the pond shall be granted to the owner/district and El Paso County for access and maintenance of the private facility. A private maintenance agreement document shall accompany Final Drainage Report by M&S Civil Consultants, Inc. submittal.

Design Point 3 (southwest corner of site)
Flows leaving the pond currently outfall to the roadside swale located within the north half of the Stapleton Right of Way.

Previous modeling of the existing facility (by MVE) indicates that the 100-year flows overtop the existing embankment of Pond 3 (aka Pond A-3). Recommendations within the report by MVE indicate that it is

“recommended that on-site detention be incorporate upstream of this pond to reduce flooding at these locations.”

Per the "Drainage Analysis for Paintbrush Hills Filing No.4”, prepared by KKBNA, the report and drainage map have calculated the flow amount and detention pond (1-3) sizing with the “Procedures for Determining Peak Flows in Colorado,” including T.R.55 by the SCS. Pond #3 (known as Pond 3 by M&S Civil) has SCS calculated inflow of Q5=72 cfs, Q100=157 cfs compared to M&S Civil rational method Q5=40.4 cfs, Q100=94.6 cfs. The criteria and methodologies have changed over the years but the output is an approximation only, the result are not to be considered as equivalent as two different methodologies were used to determine the results. The KKBNA has a calculated pond volume of 1.72 ac-ft with release rates of Q5=20 cfs Q100=57 cfs compared to M&S Civil MHFD volume of 3.163 ac-ft with release rates of Q5=8.7 cfs, Q100=49.8 cfs. The criteria and methodologies have changed over the years and the results differ due to the present-day requirement of water quality being provided in ponds 1-3.

In lieu of routing the flows to sub regional facility M&S Civil recommends retaining and expanding the pond by lowering its invert and adding an outlet structure to function as a Full Spectrum Detention Facility. The proposed full spectrum detention (FSD) pond functions to provide detention and water quality for the existing Paint Brush Hills # 4, Scenic View at Paint Brush Hills Subdivision and a small portion of the Falcon Middle School development. This full spectrum detention pond will function to treat approximately 49.37 acres of 28.40% impervious, tributary area by providing 0.603 acre-feet of storage for the water quality event, 1.434-acre feet of storage at the EURV storm event, and 3.163 acre-feet of storage in the 100-year event. The 76’ wide emergency spillway is designed with a foot of freeboard in the 100-year event. This spillway safely conveys flows to an existing swale, adjacent to Stapleton Drive, in the event of outlet clogging or failure. The spillway will be armored with riprap and a cutoff wall.

The proposed FSD pond will be privately owned and maintained by the existing Paint Brush Hills Metropolitan District. Access to the pond shall be granted to the owner/district and El Paso County for access and maintenance of the private facility. A private maintenance agreement document shall accompany The Final Drainage Report by M&S Civil Consultants, Inc. submittal.

Design Point 15 (southeast corner of site)

The proposed full spectrum detention (FSD) pond functions to provide detention and water quality for the proposed Falcon Reserve Filing No.1 development. This full spectrum detention pond will function to treat approximately 28.40 acres of 52.70% impervious, tributary area by providing 0.508 acre-feet of storage for the water quality event, 1.610-acre feet of storage at the EURV storm event, and 2.647 acre-feet of storage in the 100-year event. The 23’ wide emergency spillway is designed with a foot of freeboard in the 100-year event. This spillway safely conveys flows to a pair of existing box culverts, at the Stapleton Drive/Meridian Road intersection, in the event of outlet clogging or failure. The spillway will be armored with riprap and a cutoff wall.

The proposed FSD pond will be privately owned and maintained by the existing Paint Brush Hills Metropolitan District. Access to the pond shall be granted to the owner/district and El Paso County for access and maintenance of the private facility. A private maintenance agreement document shall accompany the Final Drainage Report by M&S Civil Consultants, Inc. submittal.

Design Point 20 (NW corner of Stapleton and Meridian Road)

DP20 includes runoff conveyed by the outlet pipes of the 4 ponds and the flows from **Basin **F2.1, DP17, DP18, DP19, PRE9 and PR28** that culminates at the existing dual 2.5'x6' reinforced concrete box culvert. It is anticipated that a riprap stilling basin will need to be revised to accommodate the pipe runs **PR28** just upstream of the existing box culvert to reduce flow velocities and prevent erosion. The calculated runoff reaching the existing dual 2.5' x 6' RCBC is 49.2 cfs and 259.8 cfs in the 5 and 100-year events respectively. In the existing condition, the calculated runoff to the existing dual 2.5' x 6' RCBC is 134.2 cfs and 455.8 cfs in the 5 and 100-year events respectively. The invert at the box culvert is 7078.72 and the headwall elevation is 7082.97 which calculates to a headwall has a depth of 4.3'. The headwater depth is 4.3' (nomograph in the appendix) with 1.03' of freeboard per existing 7084.00 contour shown on Proposed Condition Drainage Map. The surrounding area around the headwall has a spot elevation of 7085.06'as determined by MS Civil survey. Spot elevations taken at and around the box culvert conducted by MS Civil Consultants confirm height and free board, see appendix for Headwater Depth for Box Culverts with Inlet Control nomograph. M&S Civil does not see the need to improve the culvert under Meridian Road as increasing its size will likely require the need to raise the roadway section which would substantially increase costs over those defined within the DBPS.

CONSTRUCTION COST ESTIMATE FOR DETENTION PONDS

Total Construction Costs

Infrastructure and Ponds 1-4 (without land costs)		$1,004,551.00
Engineering / Const Admin	(15%)	$150,682.65
Contingencies	(20%)	$200,910.20
		$1,356,143.85

2015 DPBS Estimated Costs

Paint Brush Hills Pond #4	(no improvements)	$0.00
Small Drop Structure Reach (RET020)	1915 LF	$1,169,444.00
Sub Regional Pond SR6	1 LS	$251,817.00
		$1,421,261.00
Present Value Factor (2016-2025)	**(1.78% avg increase)**	$ 25,298.45
2025 dollars		$1,446,559.45

(Per El Paso County, based on drainage basin fee increases during that time period, the allowable increase is a factor of 1.78.)

The Development of the Falcon Reserve Filing No. 1 site shall require addressing the large offsite flows that reach the site. The recommendations made within this drainage analysis can be used as the basis for development of a preliminary plan. See below for the recommendation provided in the Concept Drainage Analysis for Falcon Reserve Filing No. 1 PCD DR214:

- Can be provided at less cost that those plan for and describe by the Falcon Drainage Planning Study.
- Results in no disruption to the intersection of Meridian Road and Stapleton Road by forgoing the installation of a new RCBC.
- With the exception of HW/D for the existing RCBC (MR/SR intersection), the development of the

parcel would meet El Paso County (ECP) Drainage Criteria.

- Amends but does not negatively alter downstream drainage recommendations or flow rates.
- Will reduce EPC maintenance of sub-regional pond by placing maintenance of 4 Ponds to Paint Brush Hills Metro District
- Will reduce the release rate below the future rates anticipated by the DPBS and more closely mimic historic release rates.
- No offsite drainage improvements will be required other than the PBH Pond #4 and Right of Way and ditch improvements.

EROSION CONTROL

It is the policy of the El Paso County that M&S Civil Consultants submit a grading and erosion control plan with the final drainage report. A stormwater management plan will be provided to accompany the grading and erosion control plans.

DRAINAGE & BRIDGE FEES

Drainage and Bridge Fees for the **Falcon Reserve Filing No. 1** site are as follows:

	Acres		**Imperviousness**		**Falcon Drainage Basin Fee**		
2021 Drainage Fees:	39.376	x	52.8%	x	$31,885.00	=	$662,905.99
2021 Bridge Fees:	39.376	x	52.8%	x	$4,380.00	=	$91062.51
						Total	**$753,968.50**

M &S Civil Consultants, Inc. (M &S) cannot and does not guarantee the construction cost will not vary from these opinions of probable costs. These opinions represent our best judgment as design professionals familiar with the construction industry and this development in particular. The above is only an estimate of the facility cost and drainage basin fee amounts in 2021.

SUMMARY

This Preliminary Drainage Report is in general compliance with the required drainage design criteria requirement for El Paso County and with prior hydrologic studies and reports. The post construction runoff will be discharged to downstream property at rates that are below historic discharge rates. In the historic condition, the total flows leaving the site are 134.2 cfs and 455.8 cfs in the 5 year and 100-year storm events. Through the proposed implementation of water quality and detention facility and the design and placement of storm sewer infrastructure components, the overall discharge rates are reduced to Q5=49.2 cfs and Q100=259.8 cfs in the developed condition, respectively. As such, the Falcon Reserve Filing No.1 development will not adversely affect the surrounding development or downstream properties and/or water quality.

REFERENCES

City of Colorado Springs/El Paso County and City of Colorado Springs Drainage Criteria Manual" City of Colorado Springs, May 2014 https://coloradosprings.gov/stormwater-enterprise/page/stormwater-criteria

Drainage Criteria Manual County of El Paso, Colorado Volume 1, Volume 1 Update https://library.municode.com/co/el_paso_county/codes/drainage_criteria_manual

HEC-HMS Version 4.2.1, https://www.hec.usace.army.mil/software/hec-hms/downloads.aspx

Mile High Flood District Software Excel Detention Design https://mhfd.org/resources/software/

Flood Insurance Rate Map (FIRM), Federal Emergency Management Agency, Effective date March 17, 1997; revised March 4, 2004.

FEMA Map Service Center https://msc.fema.gov/portal/advanceSearch

El Paso County Assessor https://property.spatialest.com/co/elpaso/#/property/4230319053

Web Soil Survey. https://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx

"Conceptual Drainage Analysis for Falcon Reserve, El Paso County, Colorado, prepared by Core Engineering Group, March 2014.

“Drainage Analysis for Paint Brush Hills Filing No. 4” prepared by KKBNA, December 1986

“Falcon Drainage Basin Planning Study, Selected Plan Report Final – September 2015” prepared by Matrix Design Group.

“Falcon Reserve Drainage Study” prepared by LDC Inc., February 2006.

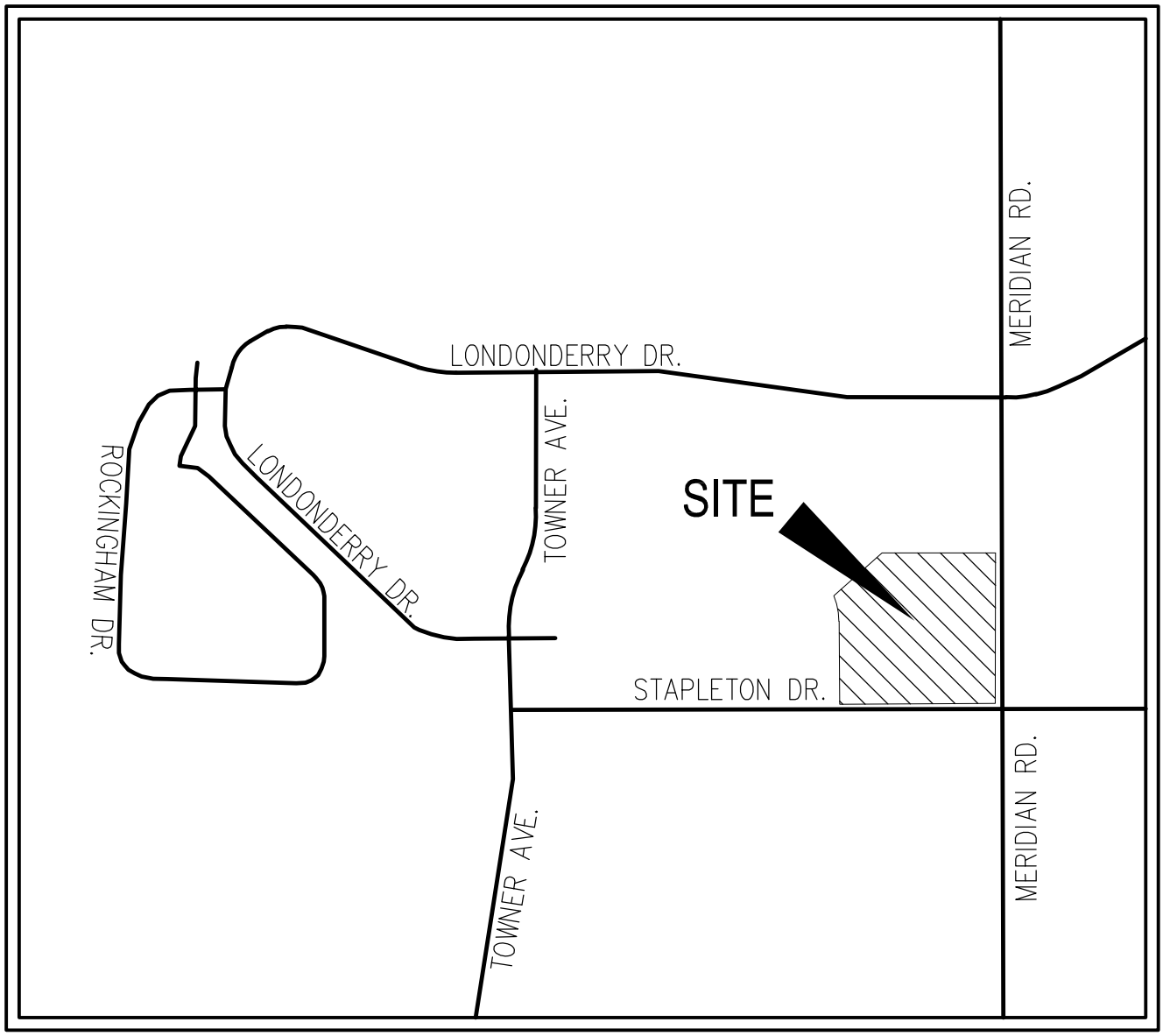
"Master Development Drainage Plan, Falcon Reserve Filing No.1” prepared by MVE, Inc., September 12, 2000.

Concept Drainage Analysis for Falcon Reserve Filing No. 1 PCD DR214 prepared by MS Civil Consultants, May 2024

.

APPENDIX

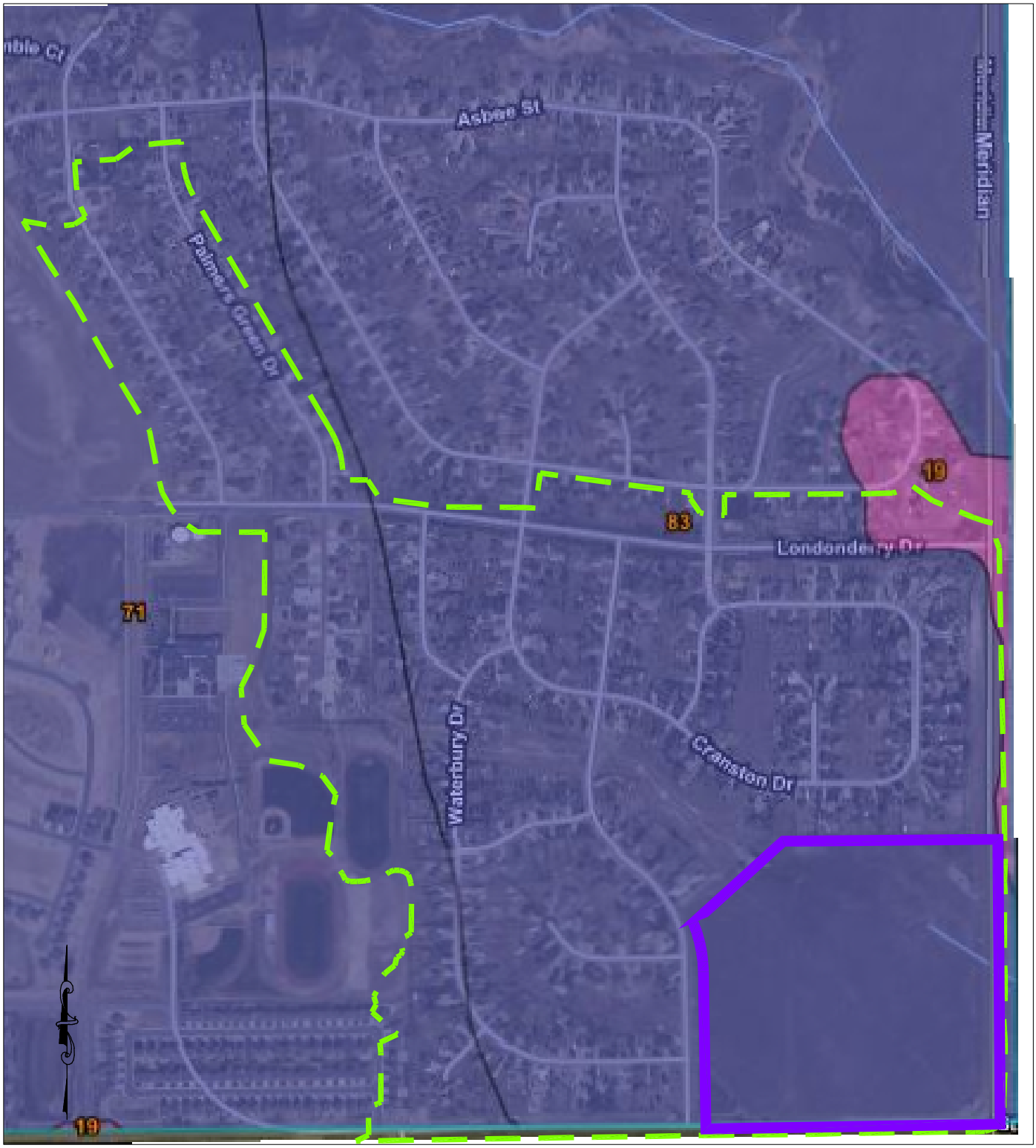
VICINITY MAP



VICINITY MAP

N.T.S.

SOILS MAP



NOT TO SCALE

FALCON RESERVE
FILING NO. 1

Summary by Map Unit — El Paso County Area, Colorado (CO625)

Map unit symbol	Map unit name	Rating
19	Columbine gravelly sandy loam, 0 to 3 percent slopes	A
71	Pring coarse sandy loam, 3 to 8 percent slopes	B
83	Stapleton sandy loam, 3 to 8 percent slopes	B

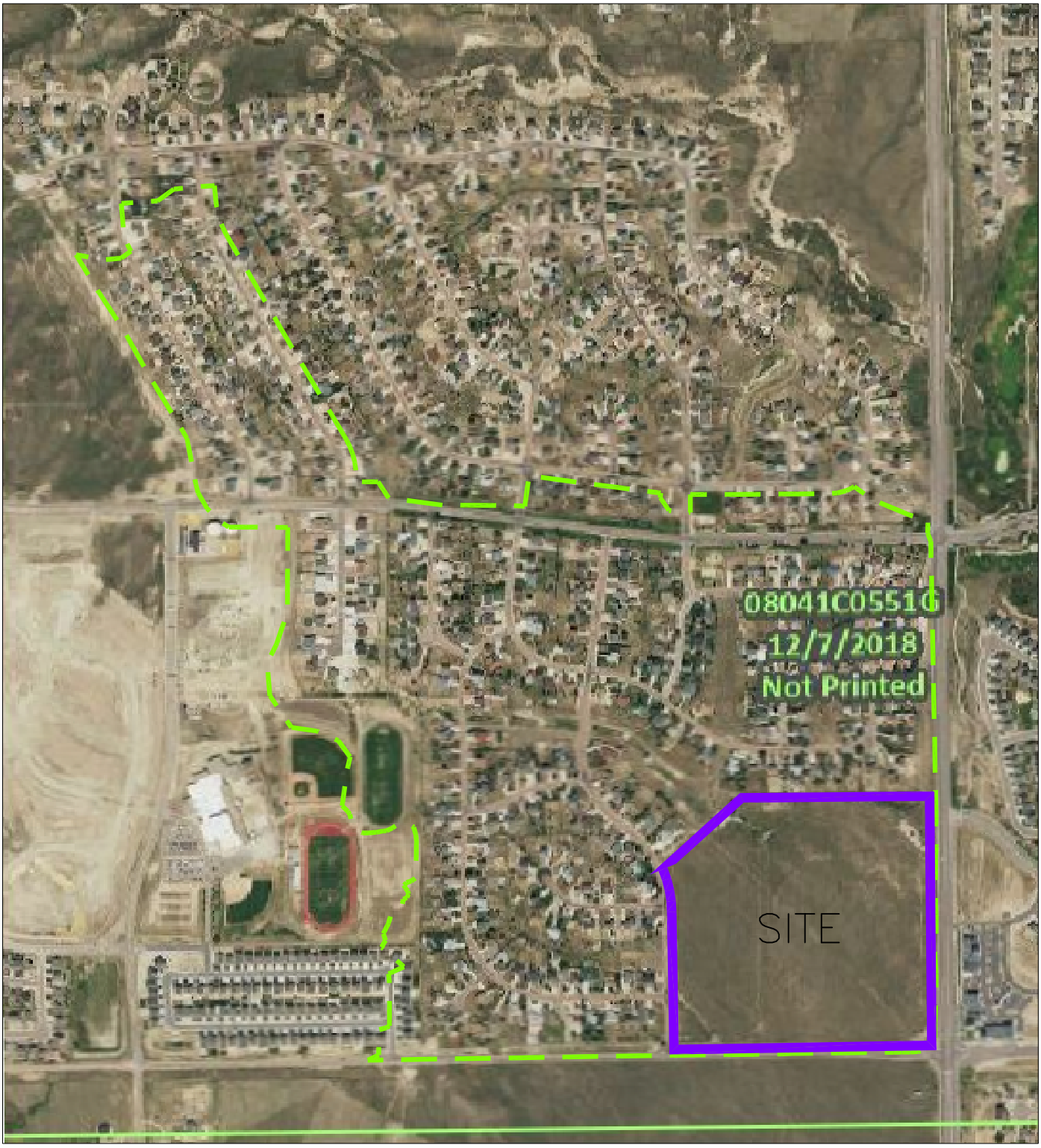
TYPE A SOILS

TYPE B SOILS

SOILS MAP

CIVIL CONSULTANTS, INC.

FEMA MAP



NO MAPPED FLOODPLAIN ZONE 'A', ZONE 'A/E' OR ZONE 'X' PRESENT WITHIN THE WATERSHED OR ADJACENT TO THE SITE

NOT TO SCALE

FALCON RESERVE FILING NO. 1

FLOODPLAIN MAP

CIVIL CONSULTANTS, INC.

National Flood Hazard Layer FIRMette

FEMA

104°36'55"W 38°58'31"N

104°36'18"W 38°58'3"N

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

1:6,000

Basemap Imagery Source: USGS National Map 2023

Legend

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

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

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

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

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

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

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

N

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

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

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 11/18/2025 at 7:03 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

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

HYDROLOGIC CALCULATIONS

FALCON RESERVE FILING NO. 1
EXISTING CONDITIONS
(Area Runoff Coefficient Summary)

			STREETS			*DEVELOPMENT*			*OPEN SPACE / LANDSCAPING*				
BASIN	**TOTAL AREA** *(SF)*	**TOTAL AREA** *(Acres)*	**AREA** *(Acres)*	**C_5**	**C_{100}**	**AREA** *(Acres)*	**C_5**	**C_{100}**	**AREA** *(Acres)*	**C_5**	**C_{100}**	**C_5**	**C_{100}**
A1	**1284951.077**	29.50	1.45	0.90	0.96	28.05	0.22	0.46	0.00	0.12	0.39	**0.25**	**0.48**
B1	**2145946.281**	49.26	0.75	0.90	0.96	35.65	0.22	0.46	12.86	0.12	0.39	**0.20**	**0.45**
B2	**182820.655**	4.20	0.37	0.90	0.96	3.51	0.22	0.46	0.32	0.12	0.39	**0.27**	**0.50**
B3	**53200.105**	1.22	0.66	0.90	0.96	0.22	0.22	0.46	0.34	0.12	0.39	**0.56**	**0.71**
B4	**281197.991**	6.46	0.00	0.90	0.96	2.29	0.22	0.46	4.17	0.12	0.39	**0.16**	**0.41**
C	**92687.993**	2.13	0.00	0.90	0.96	0.00	0.22	0.46	2.13	0.12	0.39	**0.12**	**0.39**
C1	**142408.855**	3.27	0.00	0.90	0.96	3.27	0.22	0.46	0.00	0.12	0.39	**0.22**	**0.46**
C2	**464632.547**	10.67	0.00	0.90	0.96	10.67	0.22	0.46	0.00	0.12	0.39	**0.22**	**0.46**
C3	**992481.477**	22.78	0.32	0.90	0.96	20.78	0.22	0.46	1.68	0.12	0.39	**0.22**	**0.46**
C4	**944917.366**	21.69	3.63	0.90	0.96	12.83	0.22	0.46	5.23	0.12	0.39	**0.31**	**0.53**
D1	**697206.606**	16.01	0.00	0.90	0.96	16.01	0.22	0.46	0.00	0.12	0.39	**0.22**	**0.46**
D2	**441658.436**	10.14	0.00	0.90	0.96	10.14	0.22	0.46	0.00	0.12	0.39	**0.22**	**0.46**
D3	**405216.216**	9.30	0.00	0.90	0.96	8.34	0.22	0.46	0.96	0.12	0.39	**0.21**	**0.45**
D4	**407709.294**	9.36	1.19	0.90	0.96	6.60	0.24	0.47	1.57	0.12	0.39	**0.30**	**0.52**
D5	**3709.640**	0.09	0.09	0.90	0.96	0.00	0.22	0.46	0.00	0.12	0.39	**0.90**	**0.96**
D6	**89219.344**	2.05	0.52	0.90	0.96	1.37	0.22	0.46	0.16	0.12	0.39	**0.38**	**0.58**
E1	**1572396.699**	36.10	0.00	0.90	0.96	0.00	0.30	0.50	36.10	0.12	0.39	**0.12**	**0.39**
F1	**136555.886**	3.13	1.56	0.90	0.96	0.00	0.22	0.46	1.57	0.12	0.39	**0.51**	**0.67**
F2	**62792.500**	1.44	0.64	0.90	0.96	0.00	0.22	0.46	0.80	0.12	0.39	**0.47**	**0.64**

FALCON RESERVE FILING NO. 1
EXISTING CONDITIONS
(Area Drainage Summary)

From Area Runoff Coefficient Summary				*OVERLAND*				*STREET / CHANNEL FLOW*				*Time of Travel (T_t)*		*INTENSITY **		*TOTAL FLOWS*	
BASIN	**AREA TOTAL** *(Acres)*	**C_5** *From DCM Table 5-1*	**C_{100}** *From DCM Table 5-1*	**C_5**	**Length** *(ft)*	**Height** *(ft)*	**T_C** *(min)*	**Length** *(ft)*	**Slope** *(%)*	**Velocity** *(fps)*	**T_t** *(min)*	**TOTAL** *(min)*	**CHECK** *(min)*	**I_5** *(in/hr)*	**I_{100}** *(in/hr)*	**Q_5** *(c.f.s.)*	**Q_{100}** *(c.f.s.)*
A1	29.50	0.25	0.48	0.25	100	6	8.5	1575	2.0%	2.8	9.2	17.7	19.3	3.3	5.5	***24.5***	***78.6***
B1	49.26	0.20	0.45	0.20	100	2.0	12.9	1620	2.5%	3.1	8.6	21.5	19.6	3.1	5.2	***31.4***	***116.0***
B2	4.20	0.27	0.50	0.27	100	2	11.9	933	2.8%	3.3	4.7	16.5	15.7	3.4	5.8	***3.9***	***12.1***
B3	1.22	0.56	0.71	0.56	22	0.4	3.8	1258	2.4%	3.1	6.8	10.6	17.1	4.0	6.8	***2.8***	***5.9***
B4	6.46	0.16	0.41	0.16	100	2.0	13.6	609	3.9%	3.0	3.4	17.0	13.9	3.6	6.1	***3.6***	***16.3***
C	2.13	0.12	0.39	0.12	100	2.0	14.1	845	2.7%	2.5	5.7	19.8	15.3	3.5	5.9	***0.9***	***4.9***
C1	3.27	0.22	0.46	0.22	100	4.0	10.1	261	3.5%	3.8	1.2	11.2	12.0	4.0	6.6	***2.8***	***10.0***
C2	10.67	0.22	0.46	0.22	100	2.0	12.6	1897	1.9%	2.8	11.5	24.1	21.1	3.0	5.1	***7.1***	***24.8***
C3	22.78	0.31	0.53	0.31	100	3.0	9.9	2038	1.6%	2.5	13.6	23.5	21.9	3.0	5.0	***20.8***	***59.5***
C4	21.69	0.31	0.53	0.31	100	4.0	9.0	2816	2.1%	2.2	21.8	30.8	26.2	2.7	4.5	***18.0***	***51.5***
D1	16.01	0.22	0.46	0.22	100	4.0	10.1	1200	3.0%	3.5	5.8	15.8	17.2	3.4	5.8	***12.1***	***42.5***
D2	10.14	0.22	0.46	0.22	100	3.0	11.1	1599	3.5%	3.7	7.1	18.2	19.4	3.2	5.4	***7.2***	***25.3***
D3	9.30	0.21	0.45	0.21	100	3.0	11.2	1766	3.4%	3.7	8.0	19.2	20.4	3.2	5.3	***6.1***	***22.3***
D4	9.36	0.30	0.52	0.30	100	2.0	11.4	1235	2.9%	2.6	8.1	19.5	17.4	3.3	5.5	***9.4***	***26.9***
D5	0.09	0.90	0.96	0.90	90	1.8	2.7	0	0.0%	0.0	0.0	5.0	10.5	5.2	8.7	***0.4***	***0.7***
D6	2.05	0.38	0.58	0.38	50	1.0	7.3	1566	2.7%	3.3	7.9	15.2	19.0	3.5	5.9	***2.8***	***7.0***
E1	36.10	0.12	0.39	0.12	100	3.0	12.3	1597	2.6%	2.4	11.0	23.3	19.4	3.1	5.3	***13.6***	***74.0***
F1	3.13	0.51	0.67	0.51	30	0.2	6.7	2332	1.8%	2.0	19.3	26.0	23.1	2.9	4.8	***4.6***	***10.2***
F2	1.44	0.47	0.64	0.47	50	1.0	6.4	1172	2.2%	2.2	8.7	15.2	16.8	3.5	5.9	***2.4***	***5.5***

* Intensity equations assume a minimum travel time of 5 minutes.

Calculated by: GT
Date: 7/172025
Checked by: VAS

FALCON RESERVE FILING NO. 1
EXISTING CONDITIONS
(Surface Routing Summary)

From Area Runoff Coefficient Summary				*OVERLAND*				*PIPE / CHANNEL FLOW*				*Time of Travel (T_t)*	*INTENSITY **		*TOTAL FLOWS*		
DESIGN POINT	**CONTRIBUTING BASINS**	**CA_5**	**CA_{100}**	**C_5**	**Length** *(ft)*	**Height** *(ft)*	**T_C** *(min)*	**Length** *(ft)*	**Slope** *(%)*	**Velocity** *(fps)*	**T_t** *(min)*	**TOTAL** *(min)*	**I_5** *(in/hr)*	**I_{100}** *(in/hr)*	**Q_5** *(c.f.s.)*	**Q_{100}** *(c.f.s.)*	COMMENTS
1	**Basin A1**	7.48	14.29	Basin B1 Tc was used			19.6	881	2.7%	2.5	6.0	25.5	2.7	4.6	***55.5***	***192.4***	EX POND 1
	Basin B1	10.06	22.14														
	Basin B2	1.14	2.09														
	Basin B3	0.68	0.87														
	Basin B4	1.00	2.68														
	Total	20.37	42.07														
2	**Basin C**	0.26	0.83	Basin C4 Tc was used			26.2					26.2	2.7	4.5	***45.9***	***138.2***	
	Basin C1	0.72	1.50														EX POND 2
	Basin C2	2.35	4.91														
	Basin C3	7.06	12.00														
	Basin C4	6.72	11.43														
	Total	17.09	30.67														
3	**Basin D1**	3.52	7.36	Basin D3 Tc was used			19.2	258	2.3%	3.0	1.4	20.6	3.0	5.1	***34.8***	***114.4***	EX POND 3
	Basin D2	2.23	4.66														
	Basin D3	1.95	4.21														
	Basin D4	2.84	4.86														
	Basin D5	0.08	0.08														
	Basin D6	0.79	1.19														
	Total	11.41	22.37														
4	**Basin E1**	4.33	14.08	Design Point 1 Tc was used			19.6	1697	2.6%	2.4	11.7	31.2	2.4	4.1	***59.8***	***228.0***	SOUTHEAST CORNER OF BASIN E1
	DP 1	20.37	42.07														
	Total	24.70	56.15														
5	**Basin F1**	1.59	2.11	Design Point 4 was used			31.2					31.2	2.4	4.1	***134.2***	***455.8***	EXISTING DUAL 2.5' x 6' RCBC
	Basin f2	0.67	0.93														
	DP 2	17.09	30.67														
	DP 3	11.41	22.37														
	DP 4	24.70	56.15														
	Total	55.47	112.22														

* Intensity equations assume a minimum travel time of 5 minutes.

Calculated by: GT
Date: 7/17/2025
Checked by: VAS

FALCON RESERVE FILING NO. 1
EXISTING CONDITIONS
(Storm Sewer Routing Summary)

PIPE	*Contributing Pipes/Design Points*	*Equivalent CA_5*	*Equivalent CA_{100}*	*Maximum T_C*	*Intensity**		*Flow*	
					I_5	*I_{100}*	*Q_5*	*Q_{100}*
PR1	**DP5**	55.47	112.22	31.2	2.4	4.1	***134.2***	***455.8***

* Intensity equations assume a minimum travel time of 5 minutes.

DP - Design Point
EX - Existing Design Point
PR - Pipe Run
FB- Flow By from Design Point
IN- Proposed Inlet
IN-A(#)- Existing Inlet

Calculated by: GT
Date: 7/17/2025
Checked by: VAS

FALCON RESERVE FILING NO. 1
PROPOSED CONDITIONS
(Area Runoff Coefficient Summary)

			STREETS			*DEVELOPMENT*			*OPEN SPACE / LANDSCAPING*			*WEIGHTED*	
BASIN	**TOTAL AREA** *(SF)*	**TOTAL AREA** *(Acres)*	**AREA** *(Acres)*	**C_5**	**C_{100}**	**AREA** *(Acres)*	**C_5**	**C_{100}**	**AREA** *(Acres)*	**C_5**	**C_{100}**	**C_5**	**C_{100}**
A1	**1284951.077**	29.50	1.45	0.90	0.96	28.05	0.22	0.46	0.00	0.12	0.39	**0.25**	**0.48**
B1	**2145946.281**	49.26	0.75	0.90	0.96	35.65	0.22	0.46	12.86	0.12	0.39	**0.20**	**0.45**
B2	**182820.655**	4.20	0.37	0.90	0.96	3.51	0.22	0.46	0.32	0.12	0.39	**0.27**	**0.50**
B3	**53200.105**	1.22	0.66	0.90	0.96	0.22	0.22	0.46	0.34	0.12	0.39	**0.56**	**0.71**
B4	**281197.991**	6.46	0.00	0.90	0.96	2.29	0.22	0.46	4.17	0.12	0.39	**0.16**	**0.41**
C1	**142408.855**	3.27	0.00	0.90	0.96	3.27	0.22	0.46	0.00	0.12	0.39	**0.22**	**0.46**
C2	**464632.547**	10.67	0.00	0.90	0.96	10.67	0.22	0.46	0.00	0.12	0.39	**0.22**	**0.46**
C3	**992481.477**	22.78	0.32	0.90	0.96	20.78	0.22	0.46	1.68	0.12	0.39	**0.22**	**0.46**
C4	**944751.991**	21.69	3.63	0.90	0.96	12.83	0.22	0.46	5.23	0.12	0.39	**0.31**	**0.53**
D1	**697206.606**	16.01	0.00	0.90	0.96	16.01	0.22	0.46	0.00	0.12	0.39	**0.22**	**0.46**
D2	**441658.436**	10.14	0.00	0.90	0.96	10.14	0.22	0.46	0.00	0.12	0.39	**0.22**	**0.46**
D3	**405216.216**	9.30	0.00	0.90	0.96	8.34	0.22	0.46	0.96	0.12	0.39	**0.21**	**0.45**
D4	**407709.294**	9.36	1.19	0.90	0.96	6.60	0.24	0.47	1.57	0.12	0.39	**0.30**	**0.52**
D5	**3709.640**	0.09	0.09	0.90	0.96	0.00	0.22	0.22	0.00	0.12	0.39	**0.90**	**0.96**
****D6**	**127441.193**	2.93	0.60	0.90	0.96	2.00	0.25	0.44	0.33	0.12	0.39	**0.37**	**0.54**
****F1**	**65419.185**	1.50	0.71	0.90	0.96	0.00	0.40	0.56	0.79	0.12	0.39	**0.49**	**0.66**
****F1.1**	**84368.429**	1.94	0.24	0.90	0.96	0.00	0.22	0.46	1.70	0.12	0.39	**0.22**	**0.46**
****F2**	**80414.352**	1.85	0.44	0.90	0.96	0.00	0.40	0.56	1.41	0.12	0.39	**0.31**	**0.53**
****F2.2**	**18949.432**	0.44	0.03	0.90	0.96	0.00	0.25	0.44	0.41	0.12	0.39	**0.17**	**0.43**
A	**103360.548**	2.37	0.00	0.90	0.96	1.88	0.41	0.57	0.49	0.12	0.39	**0.35**	**0.53**
B	**46891.137**	1.08	0.00	0.90	0.96	1.08	0.41	0.57	0.00	0.12	0.39	**0.41**	**0.57**
C	**164070.994**	3.77	0.00	0.90	0.96	3.07	0.40	0.56	0.70	0.12	0.39	**0.35**	**0.53**
D	**149740.382**	3.44	0.00	0.90	0.96	3.04	0.43	0.58	0.40	0.12	0.39	**0.39**	**0.56**
E	**174818.857**	4.01	0.00	0.90	0.96	3.69	0.40	0.57	0.32	0.12	0.39	**0.38**	**0.56**
F	**65915.302**	1.51	0.00	0.90	0.96	1.51	0.45	0.59	0.00	0.12	0.39	**0.45**	**0.59**
G	**86860.973**	1.99	0.00	0.90	0.96	1.99	0.40	0.56	0.00	0.12	0.39	**0.40**	**0.56**
H	**29421.082**	0.68	0.16	0.90	0.96	0.52	0.45	0.59	0.00	0.12	0.39	**0.56**	**0.68**
I	**64731.369**	1.49	0.00	0.90	0.96	1.49	0.45	0.59	0.00	0.12	0.39	**0.45**	**0.59**
J	**155724.198**	3.57	0.00	0.90	0.96	3.57	0.45	0.59	0.00	0.12	0.39	**0.45**	**0.59**
K	**78346.413**	1.80	0.00	0.90	0.96	1.80	0.45	0.59	0.00	0.12	0.39	**0.45**	**0.59**
L	**113157.814**	2.60	0.00	0.90	0.96	0.22	0.43	0.58	2.38	0.12	0.39	**0.15**	**0.41**
M	**92114.376**	2.11	0.00	0.90	0.96	0.00	0.45	0.59	2.11	0.12	0.39	**0.12**	**0.39**
N	**64060.632**	1.47	0.00	0.90	0.96	0.00	0.45	0.59	1.47	0.12	0.39	**0.12**	**0.39**
O	**46435.319**	1.07	0.00	0.90	0.96	0.00	0.45	0.59	1.07	0.12	0.39	**0.12**	**0.39**
P	**67500.177**	1.55	0.00	0.90	0.96	0.00	0.45	0.59	1.55	0.12	0.39	**0.12**	**0.39**
Q	**73302.958**	1.68	0.00	0.90	0.96	0.00	0.45	0.59	1.68	0.12	0.39	**0.12**	**0.39**

***** Revised from existing condition basin map***

FALCON RESERVE FILING NO. 1
PROPOSED CONDITIONS
(Area Drainage Summary)

From Area Runoff Coefficient Summary				*OVERLAND*				*STREET / CHANNEL FLOW*				*Time of Travel (T_t)*		*INTENSITY **		*TOTAL FLOWS*	
BASIN	**AREA TOTAL** *(Acres)*	C_5	C_{100}	C_5	**Length** *(ft)*	**Height** *(ft)*	T_C *(min)*	**Length** *(ft)*	**Slope** *(%)*	**Velocity** *(fps)*	T_t *(min)*	**TOTAL** *(min)*	**CHECK** *(min)*	I_5 *(in/hr)*	I_{100} *(in/hr)*	Q_5 *(c.f.s.)*	Q_{100} *(c.f.s.)*
A1	29.50	0.25	0.48	0.25	100	6	8.5	1575	2.0%	2.8	9.2	17.7	19.3	3.3	5.5	***24.5***	***78.6***
B1	49.26	0.20	0.45	0.20	100	2.0	12.9	1620	2.5%	3.1	8.6	21.5	19.6	3.1	5.2	***31.4***	***116.0***
B2	4.20	0.27	0.50	0.27	100	2	11.9	933	2.8%	3.3	4.7	16.5	15.7	3.4	5.8	***3.9***	***12.1***
B3	1.22	0.56	0.71	0.56	22	0.4	3.8	1258	2.4%	3.1	6.8	10.6	17.1	4.0	6.8	***2.8***	***5.9***
B4	6.46	0.16	0.41	0.16	100	2.0	13.6	609	3.9%	3.0	3.4	17.0	13.9	3.6	6.1	***3.6***	***16.3***
C1	3.27	0.22	0.46	0.22	100	4.0	10.1	261	3.5%	3.8	1.2	11.2	12.0	4.0	6.6	***2.8***	***10.0***
C2	10.67	0.22	0.46	0.22	100	2.0	12.6	1897	1.9%	2.8	11.5	24.1	21.1	3.0	5.1	***7.1***	***24.8***
C3	22.78	0.22	0.46	0.22	100	3.0	11.0	2038	1.6%	2.5	13.6	24.6	21.9	3.0	5.0	***15.0***	***52.2***
C4	21.69	0.31	0.53	0.31	100	4.0	9.0	2816	2.1%	2.2	21.8	30.8	26.2	2.7	4.5	***18.0***	***51.5***
D1	16.01	0.22	0.46	0.22	100	4.0	10.1	1200	3.0%	3.5	5.8	15.8	17.2	3.4	5.8	***12.1***	***42.5***
D2	10.14	0.22	0.46	0.22	100	3.0	11.1	1599	3.5%	3.7	7.1	18.2	19.4	3.2	5.4	***7.2***	***25.3***
D3	9.30	0.21	0.45	0.21	100	3.0	11.2	1766	3.4%	3.7	8.0	19.2	20.4	3.2	5.3	***6.1***	***22.3***
D4	9.36	0.30	0.52	0.30	100	2.0	11.4	1235	2.9%	2.6	8.1	19.5	17.4	3.3	5.5	***9.4***	***26.9***
D5	0.09	0.90	0.96	0.90	90	1.8	2.7	0	0.0%	0.0	0.0	5.0	10.5	5.2	8.7	***0.4***	***0.7***
*****D6***	2.93	0.37	0.54	0.37	50	1.0	7.4	1568	2.7%	3.3	8.0	15.4	19.0	3.5	5.8	***3.8***	***9.3***
*****F1***	1.50	0.49	0.66	0.49	30	0.2	6.9	1070	1.7%	2.0	9.1	16.0	16.1	3.4	5.7	***2.5***	***5.7***
*****F1.1***	1.94	0.22	0.46	0.22	66	6.0	6.3	1024	2.0%	2.1	8.0	14.3	16.1	3.6	6.0	***1.5***	***5.4***
*****F2***	1.85	0.31	0.53	0.31	100	8.0	7.2	851	2.2%	2.2	6.4	13.6	15.3	3.7	6.2	***2.1***	***6.0***
*****F2.2***	0.44	0.17	0.43	0.17	60	7.0	5.8					5.0	10.3	5.2	8.7	***0.4***	***1.6***
A	2.37	0.35	0.53	0.35	100	4.0	8.6	617	2.5%	3.2	3.3	11.8	14.0	3.9	6.5	***3.2***	***8.2***
B	1.08	0.41	0.57	0.41	100	2.0	9.9	574	2.5%	3.2	3.0	12.9	13.7	3.7	6.3	***1.7***	***3.9***
C	3.77	0.35	0.53	0.35	100	3.0	9.4	912	1.8%	2.6	5.7	15.2	15.6	3.5	5.9	***4.6***	***11.7***
D	3.44	0.39	0.56	0.39	100	3.0	8.9	828	1.8%	2.7	5.1	14.0	15.2	3.6	6.1	***4.9***	***11.7***
E	4.01	0.38	0.56	0.38	100	3.0	9.1	687	2.6%	3.2	3.5	12.6	14.4	3.8	6.3	***5.7***	***14.1***
F	1.51	0.45	0.59	0.45	100	3.0	8.2	572	2.6%	3.2	3.0	11.1	13.7	4.0	6.7	***2.7***	***5.9***
G	1.99	0.40	0.56	0.40	100	2.0	10.1	726	2.8%	3.3	3.6	13.7	14.6	3.7	6.1	***2.9***	***6.9***
H	0.68	0.56	0.68	0.56	100	3.0	6.8	134	3.0%	3.5	0.6	7.4	11.3	4.6	7.7	***1.7***	***3.5***
I	1.49	0.45	0.59	0.45	100	3.0	8.2	232	2.2%	2.9	1.3	9.5	11.8	4.2	7.1	***2.8***	***6.2***
J	3.57	0.45	0.59	0.45	100	3.0	8.2	675	3.1%	3.5	3.2	11.4	14.3	3.9	6.6	***6.3***	***13.9***
K	1.80	0.45	0.59	0.45	100	3.0	8.2	264	1.9%	2.7	1.6	9.8	12.0	4.2	7.0	***3.4***	***7.4***
L	2.60	0.15	0.41	0.15	84	4.0	9.4	375	4.7%	4.3	1.4	10.9	12.6	4.0	6.7	***1.5***	***7.1***
M	2.11	0.12	0.39	0.12	90	3.0	11.3	601	3.0%	3.5	2.9	14.2	13.8	3.6	6.1	***0.9***	***5.0***
N	1.47	0.12	0.39	0.12	63	12.0	5.3	310	0.6%	1.6	3.2	8.5	12.1	4.4	7.3	***0.8***	***4.2***
O	1.07	0.12	0.39	0.12	52	5.0	6.0	1151	2.0%	2.1	9.1	15.1	16.7	3.5	5.9	***0.4***	***2.4***
P	1.55	0.12	0.39	0.12	56	12.0	4.8	247	0.8%	1.8	2.3	7.1	11.7	4.6	7.8	***0.9***	***4.7***
Q	1.68	0.12	0.39	0.12	100	9.0	8.6	827	2.2%	2.2	6.1	14.7	15.2	3.6	6.0	***0.7***	***3.9***

* Intensity equations assume a minimum travel time of 5 minutes.

***** Revised from existing condition basin map***

Calculated by: GT
Date: 7/15/2025
Checked by: VAS

FALCON RESERVE FILING NO. 1
PROPOSED CONDITIONS
(Surface Routing Summary)

From Area Runoff Coefficient Summary				*OVERLAND*				*PIPE / CHANNEL FLOW*				*Time of Travel (T_t)*	*INTENSITY **		*TOTAL FLOWS*		
DESIGN POINT	**CONTRIBUTING BASINS**	**CA_5**	**CA_{100}**	**C_5**	**Length (ft)**	**Height (ft)**	**T_C (min)**	**Length (ft)**	**Slope (%)**	**Velocity (fps)**	**T_t (min)**	**TOTAL (min)**	**I_5 (in/hr)**	**I_{100} (in/hr)**	**Q_5 (c.f.s.)**	**Q_{100} (c.f.s.)**	COMMENTS
EX-1.1	**Basin A1**	7.48	14.29	Basin B1 Tc was used			19.6	881	2.7%	2.5	6.0	25.5	2.7	4.6	***49.5***	***173.3***	PROP DUAL 36" RCP CULVERTS
	Basin B1	10.06	22.14														
	Partial Basin B4	0.64	1.47														
	Total	18.18	37.90														
EX-1.2	**Basin B2**	1.14	2.09	Basin B2 Tc was used								15.7	3.4	5.8	***6.3***	***17.1***	PROP 24" RCP CULVERT
	Basin B3	0.68	0.87														
	Total	1.83	2.96														
EX-IN1	**Combined Basin C2 and C3 split**	7.41	15.43	Basin C3 Tc was used								21.9	3.0	5.0	***21.9***	***76.5***	EX 9' CDOT TYPE 13 COMBINATION INLET
	Combined flows split over EX-IN1 and EX-IN2	3.70	7.71												***10.9***	***38.3***	Combined flows split over EX-IN1 and EX-IN2
EX-IN2	**Combined Basin C2 and C3 split**	7.41	15.43	Basin C3 Tc was used								21.9	3.0	5.0	***21.9***	***76.5***	EX 9' CDOT TYPE 13 COMBINATION INLET
	Combined flows split over EX-IN1 and EX-IN2	3.70	7.71												***10.9***	***38.3***	Combined flows split over EX-IN1 and EX-IN2
	Total																
EX-CUL	**Basin C4**	6.72	11.43	Basin C4 Tc was used								26.2	2.7	4.5	***18.0***	***51.5***	EX 24" CULVERT W/FES
EX-IN3/EX01	**Basin D1**	3.52	7.36	Basin D1 Tc was used								15.8	3.4	5.8	***12.1***	***50.5***	Total Flow within Liberty Street Section
	Basin **D6 @ EX-IN3		1.38													***25.2***	EX 10' CDOT TYPE R INLET FLOWS SPLIT Q100/side
	Total	3.52	8.74												***2.6***		Q5 Contained within Crown for Basin **D6
EX-IN4	**Basin D2**	2.23	4.66	Basin D2 Tc was used								18.2	3.2	5.4	***7.2***	***25.3***	EX 10' CDOT TYPE R INLET
EX-IN5	**Basin D3**	1.95	4.21	Basin D3 Tc was used								19.2	3.2	5.3	***6.1***	***22.3***	EX 10' CDOT TYPE R INLET
EX-IN6/EX02	**FB EX-IN3/EX01**	1.28	2.50	Basin D3 Tc was used								19.2	3.2	5.3	***8.9***	***62.9***	Total Flow within Liberty Street Section
	FB EX-IN4	0.41	2.66													***31.4***	EX 10' CDOT TYPE R INLET Q100/side
	FB EX-IN5	0.27	2.27														
	Basin D5	0.08	0.08														
	Basin **D6 @ EXIN6	0.79	4.37												***2.5***		Q5 Contained within Crown for Basin **D6
	Total	2.83	11.88														
EX03	**FB EX-IN6/EX02**	0.74	3.69	Basin **D6 Tc was used								19.0	3.2	5.3	***6.1***	***52.3***	Total Flow within Libery Street Section
Flow that is contained	**Basin D4 Street Section Only**	0.10	0.11													***26.2***	EX 15' CURBCUT/Q100 SIDE
within Liberty street section	**Basin **D6 @ Stapleton**	1.08	6.04												***3.4***		Q5 for Basin **D6
	Total	1.91	9.84														
EX04	**Basin D4 exclude D4 street section**	2.74	4.75	Basin D3 Tc was used			19.2					19.2	3.2	5.3	***11.7***	***40.7***	EX 24" RCP CULVERT
	1/2 DP-EX03 westside minus FB transferred over crown	0.96	2.93														
		3.70	7.69														
1	**Basin A1**	7.48	14.29	Basin B1 Tc was used			19.6	881	2.7%	2.5	6.0	25.5	2.7	4.6	***55.5***	***192.4***	POND 1
	Basin B1	10.06	22.14														
	Basin B2	1.14	2.09														
	Basin B3	0.68	0.87														
	Basin B4	1.00	2.68														
	Total	20.37	42.07														
2.1	**Basin M**	0.25	0.82	DP EX-IN2 Tc was used								21.9	3.0	5.0	***2.9***	***15.7***	PROP CDOT TYPE D INLET
	Basin C1	0.72	1.50														
	FB DP EX-IN2	0.00	0.84														
	Total	0.97	3.17														
2	**PR21**	6.72	11.43	Pipe Run 21 Tc Used								26.2	2.7	4.5	***41.0***	***130.3***	POND 2
	PR20	8.38	16.92														
	Basin N	0.18	0.57														
	Total	15.27	28.92														
3	**Basin P**	0.19	0.60	Pipe Run 26 Tc was used								19.2	3.2	5.3	***40.4***	***94.6***	POND 3
	PR25	7.84	8.07														
	PR26	3.70	7.69														
	EX 15' CURBCUT PARTIAL CAPTURE OF **DP6 @ STAPLETON	1.08	1.50														
	Total	12.80	17.87														
4	**Basin A**	0.83	1.26	Basin A Tc was used								11.8	3.9	6.5	***3.2***	***8.2***	PROP 10' CDOT TYPE R INLET
5	**Basin B**	0.44	0.61	Basin B Tc was used								12.9	3.7	6.3	***1.7***	***3.9***	PROP 10' CDOT TYPE R INLET

FALCON RESERVE FILING NO. 1
PROPOSED CONDITIONS
(Surface Routing Summary)

From Area Runoff Coefficient Summary				*OVERLAND*				*PIPE / CHANNEL FLOW*				*Time of Travel (T_t)*	*INTENSITY **		*TOTAL FLOWS*		
DESIGN POINT	**CONTRIBUTING BASINS**	**CA_5**	**CA_{100}**	**C_5**	**Length (ft)**	**Height (ft)**	**T_C (min)**	**Length (ft)**	**Slope (%)**	**Velocity (fps)**	**T_t (min)**	**TOTAL (min)**	**I_5 (in/hr)**	**I_{100} (in/hr)**	**Q_5 (c.f.s.)**	**Q_{100} (c.f.s.)**	COMMENTS
6	**Basin E**	1.51	2.23	Basin E Tc was used								12.6	3.8	6.3	***5.7***	***14.1***	PROP 15' CDOT TYPE R INLET
7	**Basin F**	0.68	0.89	Basin F Tc was used								11.1	4.0	6.7	***2.7***	***5.9***	PROP 10' CDOT TYPE R INLET
8	**Basin J**	1.61	2.11	Basin J Tc was used								11.4	3.9	6.6	***6.3***	***13.9***	PROP 15' CDOT TYPE R INLET
9	**Basin G**	0.80	1.12	Basin G Tc was used								13.7	3.7	6.1	***2.9***	***6.9***	PROP 10' CDOT TYPE R INLET
10	**Basin H**	0.38	0.46	Basin H Tc was used								7.4	4.6	7.7	***1.7***	***3.5***	PROP 5' CDOT TYPE R INLET
11	**Basin K**	0.81	1.06	DP8 Tc was used			11.4	96	2.3%	3.0	0.5	11.9	3.9	6.5	***3.1***	***10.6***	PROP 15' CDOT TYPE R INLET
	FB DP8	0.00	0.40														
	FB DP9	0.0	0.17														
	Total	0.81	1.63														
12	**Basin I**	0.67	0.88	Basin I Tc was used								9.5	4.2	7.1	***2.9***	***7.2***	PROP 10' CDOT TYPE R INLET
	FB DP10	0.03	0.15														
	Total	0.70	1.02														
13	**Basin D**	1.35	1.92	Basin D Tc was used			14.0	749	1.8%	2.7	4.7	18.7	3.2	5.4	***4.3***	***13.2***	PROP 15' CDOT TYPE R INLET
	FB DP5	0.00	0.00														
	FB DP6	0.00	0.43														
	FB DP7	0.0	0.11														
	Total	1.35	2.46														
14	**Basin C**	1.31	1.99	Basin C Tc was used			15.2	963	1.8%	2.7	6.0	21.2	3.0	5.0	***3.9***	***13.2***	PROP 15' CDOT TYPE R INLET
	FB DP4	0.00	0.30														
	FB DP13	0.00	0.34														
	Total	1.31	2.62														
15	**Basin L**	0.38	1.05	PR18 Tc was used								21.2	3.0	5.0	***28.9***	***72.3***	POND 4
	PR16	6.58	8.52														
	PR18	2.7	4.75														
	Total	9.63	14.33														
16	**Basin **F2**	0.56	0.97	DP EX03 Tc was used			19.0	1242	2.2%	2.2	7.2	26.2	2.7	4.5	***2.5***	***28.7***	EXISTING 3' WIDE SWALE
	FB FROM EX 15' CURBCUT EX03 Q100 Flow EASTSIDE LIBERTY	0.38	3.41														
	FB WESTSIDE OF LIBERTY OVER CROWN	0.00	1.99														
	Total	0.94	6.37														
17	**Basin Q**	0.20	0.66	Basin Q Tc was used			14.7					14.7	3.6	6.0	***13.2***	***75.2***	PROPOSED 8' SWALE
	PR27	3.5	11.96														
	Total	3.71	12.62														
18	**Basin **F1**	0.73	0.99	Basin **F1 Tc was used			16.0	1131	2.0%	2.1	8.9	24.9	2.8	4.6	***3.2***	***8.7***	EXISTING 3' WIDE SWALE
	Basin **F1.1	0.42	0.89														
	Total	1.15	1.88														
19	**Basin O**	0.13	0.42	PR24 Tc was used			31.7	686	2.0%	2.1	5.4	37.1	2.2	3.6	***22.8***	***101.6***	PROPOSED 10' WIDE SWALE
	PR24	10.40	27.59														
	Total	10.53	28.01														
20	**Basin **F2.1**	0.08	0.19	DP18 Tc was used			24.9	159	3.8%	2.9	0.9	25.8	2.7	4.5	***49.2***	***259.8***	EXISTING DUAL 2.5'x6.0' RCBC
	DP17	3.71	12.62														
	DP18	1.15	1.88														
	DP19	10.53	28.01														
	PRE9	0.94	6.37														
	PR28	1.77	8.14														
	Total	18.18	57.21														

* Intensity equations assume a minimum travel time of 5 minutes.

Calculated by: GT
Date: 8/11/2025
Checked by: VAS

FALCON RESERVE FILING NO. 1
PROPOSED CONDITIONS
(Storm Sewer Routing Summary)

PIPE	Contributing Pipes/Design Points	Equivalent CA_5	Equivalent CA_{100}	Maximum T_C	Intensity*		Flow	
					I_5	I_{100}	Q_5	Q_{100}
PRE1	EX-IN1	3.70	6.88	21.9	3.0	5.0	10.9	34.1
PRE2	EX-IN2,PRE1	7.41	13.75	21.9	3.0	5.0	21.9	68.2
PRE3	EX-CUL	6.72	11.43	26.2	2.7	4.5	18.0	51.5
PRE4	EX-IN3	2.24	1.87	15.8	3.4	5.8	7.7	10.8
PRE5	EX-IN4	1.83	2.01	18.2	3.2	5.4	5.9	10.9
PRE6	EX-IN5, PRE5	3.51	3.95	19.2	3.2	5.3	11.1	20.9
PRE7	EX-IN6, PRE4, PRE6	7.84	8.07	19.2	3.2	5.3	24.7	42.7
PRE8	EX04	3.70	7.69	19.2	3.2	5.3	11.7	40.7
PRE9	DP16	0.94	6.37	26.2	2.7	4.5	2.5	28.7
PRE10	DP20	18.18	57.21	25.8	2.7	4.5	49.2	259.8
PR1.1	DP1.1	18.18	37.90	25.5	2.7	4.6	49.5	173.3
PR1.2	DP1.2	1.83	2.96	15.7	3.4	5.8	6.3	17.1
PR1	DP4	0.83	0.97	11.8	3.9	6.5	3.2	6.3
PR2	DP5	0.44	0.61	12.9	3.7	6.3	1.7	3.9
PR3	PR1, PR2	1.27	1.58	12.9	3.7	6.3	4.8	9.9
PR4	DP6	1.51	1.80	12.6	3.8	6.3	5.7	11.4
PR5	DP7	0.68	0.78	11.1	4.0	6.7	2.7	5.2
PR6	PR4, PR5	2.20	2.58	12.6	3.8	6.3	8.3	16.4
PR7	PR3, PR6	3.47	4.16	13.6	3.7	6.2	12.7	25.6
PR8	DP8	1.61	1.71	11.4	3.9	6.6	6.3	11.3
PR9	PR7, PR8	5.08	5.87	14.2	3.6	6.0	18.3	35.4
PR10	DP9	0.80	0.94	13.7	3.7	6.1	2.9	5.8
PR11	DP10	0.35	0.31	7.4	4.6	7.7	1.6	2.4
PR12	PR10, PR11	1.15	1.26	13.7	3.7	6.1	4.2	7.7
PR13	DP11	0.81	1.63	11.9	3.9	6.5	3.1	10.6
PR14	PR9, PR13	5.89	7.50	14.2	3.6	6.0	21.2	45.3
PR15	DP12	0.70	1.02	9.5	4.2	7.1	2.9	7.2
PR16	PR14, PR15	6.58	8.52	14.2	3.6	6.0	23.7	51.5
PR17	DP13	1.35	2.13	18.7	3.2	5.4	4.3	11.4
PR18	DP14, PR17	2.67	4.75	21.2	3.0	5.0	8.0	24.0
PR19	PRE2	7.41	13.75	21.9	3.0	5.0	21.9	68.2
PR20	DP2.1, PR19	8.38	16.92	21.9	3.0	5.0	24.8	83.9
PR21	PRE3	6.72	11.43	26.2	2.7	4.5	18.0	51.5
PR22	POND 1 RELEASE	6.13	15.44	30.0	2.5	4.2	15.2	64.3
PR23	POND 2 RELEASE	4.27	12.15	30.0	2.5	4.2	10.6	50.6
PR24	PR22, PR23	10.40	27.59	31.7	2.4	4.0	24.9	111.0
PR25	PRE7	7.84	8.07	19.2	3.2	5.3	24.7	42.7
PR26	PRE8	3.70	7.69	19.2	3.2	5.3	11.7	40.7
PR27	POND 3 RELEASE	3.51	11.96	30.0	2.5	4.2	8.7	49.8
PR28	POND 4 RELEASE	1.77	8.14	30.0	2.5	4.2	4.4	33.9

* Intensity equations assume a minimum travel time of 5 minutes.

DP - Design Point
EX - Existing Design Point
PR - Pipe Run
FB- Flow By from Design Point
IN- Proposed Inlet
IN-A(#)- Existing Inlet

Calculated by: GT
Date: 8/11/2025
Checked by: VAS

Imperviousness of Falcon Reserve Filing No. 1 Tributary to Pond 4				
Contributing Basins	*Area (Acres)*	C_5	*Impervious % (I)*	*(Acres)*(I)*
A	2.37	0.35	48	113.90
B	1.08	0.41	58	62.76
C	3.77	0.35	48	181.92
D	3.44	0.39	55	189.07
E	4.01	0.38	52	208.69
F	1.51	0.45	65	98.36
G	1.99	0.40	57	113.06
H	0.68	0.56	76	51.33
I	1.49	0.45	65	96.59
J	3.57	0.45	65	232.37
K	1.80	0.45	65	116.91
L	2.60	0.15	12	29.87
Totals	***28.3***			***1494.83***
Imperviousness of WQ Pond 4	***52.8***	**%**		

Imperviousness of Falcon Reserve Filing No. 1 Tributary to Pond 1				
Contributing Basins	*Area (Acres)*	C_5	*Impervious % (I)*	*(Acres)*(I)*
A1	29.50	0.25	30	884.95
B1	49.26	0.20	20	985.28
B2	4.20	0.27	34	142.70
B3	1.22	0.56	77	94.04
B4	6.46	0.16	14	90.38
Totals	***90.64***			***2197.35***
Imperviousness of WQ Pond 1	***24.2***			

Imperviousness of Falcon Reserve Filing No. 1 Tributary to Pond 2				
Contributing Basins	*Area (Acres)*	C_5	*Impervious % (I)*	*(Acres)*(I)*
C1	3.27	0.22	25	81.73
C2	10.67	0.22	25	266.66
C3	22.78	0.22	25	569.61
C4	21.69	0.31	42	904.41
M	2.11	0.12	7	14.80
N	1.47	0.12	7	10.29
Totals	***61.99***			***1847.51***
Imperviousness of WQ Pond 2	***29.8***			

Imperviousness of Falcon Reserve Filing No. 1 Tributary to Pond 3				
Contributing Basins	*Area (Acres)*	C_5	*Impervious % (I)*	*(Acres)*(I)*
D1	16.01	0.22	25	400.14
D2	10.14	0.22	25	253.48
D3	9.30	0.21	22	204.65
D4	9.36	0.30	40	374.39
D5	0.09	0.90	100	8.52
*****D6***	2.93	0.37	52	152.13
P	1.55	0.12	7	10.85
Totals	***49.37***			***1404.16***
Imperviousness of WQ Pond 3	***28.4***			

HYDRAULIC CALCULATIONS / EDB WQCV CALCULATIONS

MHFD-Inlet, Version 5.03 (August 2023)

INLET MANAGEMENT

Worksheet Protected

INLET NAME	EX-IN1	EX-IN2	EX-IN3	EX-IN4	EX-IN5	EX-IN6	DP4-IN1	DP5-IN2	DP6-IN3
Site Type (Urban or Rural)	URBAN	URBAN	URBAN	URBAN	URBAN	URBAN	URBAN	URBAN	URBAN
Inlet Application (Street or Area)	STREET	STREET	STREET	STREET	STREET	STREET	STREET	STREET	STREET
Hydraulic Condition	In Sump	In Sump	On Grade	On Grade	On Grade	On Grade	On Grade	On Grade	On Grade
Inlet Type	CDOT/Denver 13 Combination	CDOT/Denver 13 Combination	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type R Curb Opening

USER-DEFINED INPUT

User-Defined Design Flows

Minor Q_{Known} (cfs)	10.9	10.9	12.1	7.2	6.1	8.9	3.2	1.7	5.7
Major Q_{Known} (cfs)	38.3	38.3	25.2	25.3	22.3	31.4	8.2	3.9	14.1

Bypass (Carry-Over) Flow from Upstream Inlets must be organized from upstream (left) to downstream (right) in order for bypass flows to be linked.

Receive Bypass Flow from:	No Bypass Flow Received	No Bypass Flow Received	No Bypass Flow Received	No Bypass Flow Received	No Bypass Flow Received	No Bypass Flow Received	No Bypass Flow Received	No Bypass Flow Received	No Bypass Flow Received
Minor Bypass Flow Received, Q_b (cfs)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Major Bypass Flow Received, Q_b (cfs)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Watershed Characteristics

Subcatchment Area (acres)									
Percent Impervious									
NRCS Soil Type									

Watershed Profile

Overland Slope (ft/ft)									
Overland Length (ft)									
Channel Slope (ft/ft)									
Channel Length (ft)									

Minor Storm Rainfall Input

Design Storm Return Period, T_r (years)									
One-Hour Precipitation, P_1 (inches)									

Major Storm Rainfall Input

Design Storm Return Period, T_r (years)									
One-Hour Precipitation, P_1 (inches)									

CALCULATED OUTPUT

Minor Total Design Peak Flow, Q (cfs)	**10.9**	**10.9**	**12.1**	**7.2**	**6.1**	**8.9**	**3.2**	**1.7**	**5.7**
Major Total Design Peak Flow, Q (cfs)	**38.3**	**38.3**	**25.2**	**25.3**	**22.3**	**31.4**	**8.2**	**3.9**	**14.1**
Minor Flow Bypassed Downstream, Q_b (cfs)	N/A	N/A	4.4	1.3	0.8	2.3	0.0	0.0	0.0
Major Flow Bypassed Downstream, Q_b (cfs)	N/A	N/A	14.4	14.4	12.0	19.5	1.9	0.0	2.7

MHFD-Inlet, Version 5.03 (August 2023)

INLET MANAGEMENT

Worksheet Protected

INLET NAME	DP7-IN4	DP8-IN5	DP9-IN6	DP10-IN7	DP11-IN8	DP12-IN9	DP13-IN10	DP14-IN11	DP2.1-IN12
Site Type (Urban or Rural)	URBAN	URBAN	URBAN	URBAN	URBAN	URBAN	URBAN	URBAN	URBAN
Inlet Application (Street or Area)	STREET	STREET	STREET	STREET	STREET	STREET	STREET	STREET	AREA
Hydraulic Condition	On Grade	On Grade	On Grade	On Grade	In Sump	In Sump	On Grade	In Sump	Swale
Inlet Type	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type D (In Series & Depressed)

USER-DEFINED INPUT

User-Defined Design Flows

Minor Q_{known} (cfs)	2.7	6.3	2.9	1.7	3.1	2.9	4.3	3.9	2.9
Major Q_{known} (cfs)	5.9	13.9	6.9	3.5	10.6	7.2	13.2	13.2	15.7

Bypass (Carry-Over) Flow from Upstream

Receive Bypass Flow from:	No Bypass Flow Received	No Bypass Flow Received	No Bypass Flow Received	No Bypass Flow Received	No Bypass Flow Received	No Bypass Flow Received	No Bypass Flow Received	No Bypass Flow Received	No Bypass Flow Received
Minor Bypass Flow Received, Q_b (cfs)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Major Bypass Flow Received, Q_b (cfs)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Watershed Characteristics

Subcatchment Area (acres)									
Percent Impervious									
NRCS Soil Type									

Watershed Profile

Overland Slope (ft/ft)									
Overland Length (ft)									
Channel Slope (ft/ft)									
Channel Length (ft)									

Minor Storm Rainfall Input

Design Storm Return Period, T_r (years)									
One-Hour Precipitation, P_1 (inches)									

Major Storm Rainfall Input

Design Storm Return Period, T_r (years)									
One-Hour Precipitation, P_1 (inches)									

CALCULATED OUTPUT

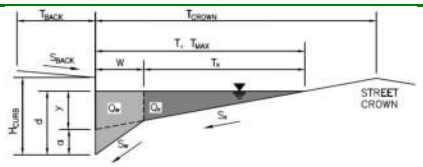
Minor Total Design Peak Flow, Q (cfs)	**2.7**	**6.3**	**2.9**	**1.7**	**3.1**	**2.9**	**4.3**	**3.9**	**2.9**
Major Total Design Peak Flow, Q (cfs)	**5.9**	**13.9**	**6.9**	**3.5**	**10.6**	**7.2**	**13.2**	**13.2**	**15.7**
Minor Flow Bypassed Downstream, Q_b (cfs)	0.0	0.0	0.0	0.1	N/A	N/A	0.0	N/A	0.0
Major Flow Bypassed Downstream, Q_b (cfs)	0.7	2.6	1.1	1.1	N/A	N/A	1.8	N/A	0.0

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

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

Project: **FALCON RESERVE FILING NO.1**

Inlet ID: **EX-IN1**



Gutter Geometry:

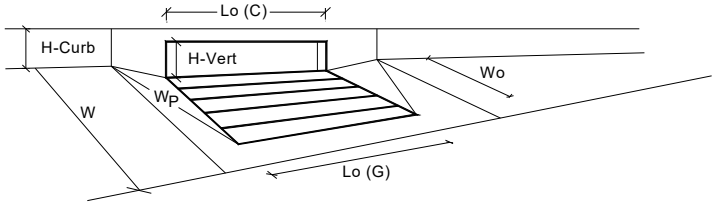
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	13.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	16.0	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} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	16.0	16.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.4	12.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is not applicable to Sump Condition				
MAJOR STORM Allowable Capacity is not applicable to Sump Condition	Q_{allow} =	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.03 (August 2023)



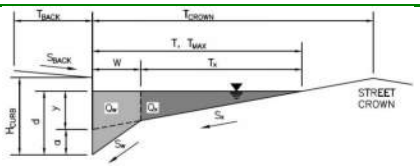
Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT/Denver 13 Combination		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	2.00	2.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	3	3	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	8.0	12.0	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	3.00	3.00	feet
Width of a Unit Grate	W_o =	1.73	1.73	feet
Open Area Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	0.43	0.43	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	0.50	0.50	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	3.30	3.30	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	0.60	0.60	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	3.00	3.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.50	6.50	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	5.25	5.25	inches
Angle of Throat	Theta =	0.00	0.00	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) =	3.70	3.70	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.66	0.66	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	0.69	1.02	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.50	0.83	ft
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	0.75	1.00	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	N/A	N/A	
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.75	1.00	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**16.8**	**34.1**	**cfs**
WARNING: Inlet Capacity < Q Peak for Major Storm	$Q_{PEAK\ REQUIRED}$ =	10.9	38.3	cfs

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

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

Project: **FALCON RESERVE FILING NO.1**

Inlet ID: **EX-IN2**



Gutter Geometry:

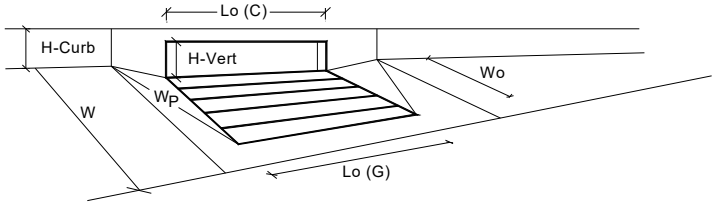
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	13.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	16.0	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} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	16.0	16.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.4	12.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is not applicable to Sump Condition				
MAJOR STORM Allowable Capacity is not applicable to Sump Condition	Q_{allow} =	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.03 (August 2023)



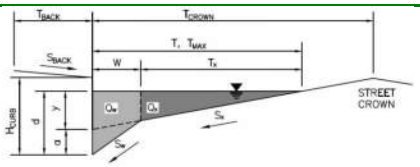
Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT/Denver 13 Combination		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	2.00	2.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	3	3	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	12.0	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	3.00	3.00	feet
Width of a Unit Grate	W_o =	1.73	1.73	feet
Open Area Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	0.43	0.43	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	0.50	0.50	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	3.30	3.30	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	0.60	0.60	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	3.00	3.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.50	6.50	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	5.25	5.25	inches
Angle of Throat	Theta =	0.00	0.00	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) =	3.70	3.70	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.66	0.66	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	0.52	1.02	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.33	0.83	ft
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	0.57	1.00	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	N/A	N/A	
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.57	1.00	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**7.5**	**34.1**	**cfs**
WARNING: Inlet Capacity < Q Peak for Minor and Major Storms	$Q_{PEAK\ REQUIRED}$ =	10.9	38.3	cfs

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

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

Project: **FALCON RESERVE FILING NO.1**

Inlet ID: **EX-IN3**



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	18.0	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} =	22.0	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 =	0.020	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	20.0	22.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	5.8	12.0	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☐	

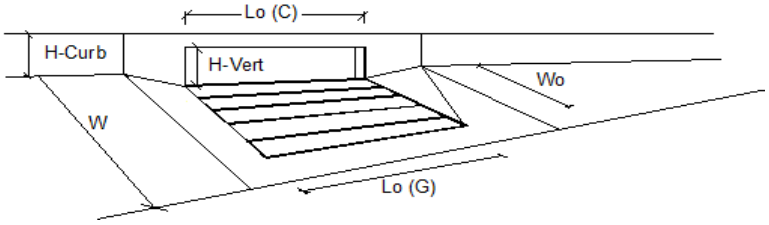
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	Q_{allow} =	**17.4**	**29.5**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 12.10 cfs on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design peak flow of 25.20 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)



Design Information (Input)	CDOT Type R Curb Opening		MINOR	MAJOR	
Type of Inlet		Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')		a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		No =	2	2	
Length of a Single Unit Inlet (Grate or Curb Opening)		L_o =	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)		W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)		C_f (G) =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		C_f (C) =	0.10	0.10	
Street Hydraulics: OK - Q < Allowable Street Capacity'			MINOR	MAJOR	
Total Inlet Interception Capacity		**Q =**	**7.7**	**10.8**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)		**Q_b =**	**4.4**	**14.4**	**cfs**
Capture Percentage = Q_a/Q_o		**C% =**	**64**	**43**	**%**

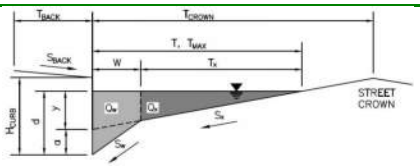
MHFD-Inlet, Version 5.03 (August 2023)

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

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

Project: **FALCON RESERVE FILING NO.1**

Inlet ID: **EX-IN4**



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	13.5	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} =	16.0	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 =	0.020	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	16.0	16.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.4	12.0	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☐	

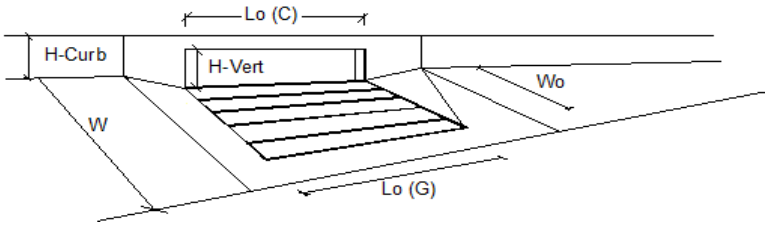
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	**Q_{allow} =**	**6.7**	**13.2**	**cfs**

WARNING: MINOR STORM max. allowable capacity is less than the design peak flow of 7.20 cfs on sheet 'Inlet Management'

WARNING: MAJOR STORM max. allowable capacity is less than the design peak flow of 25.30 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

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')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	2	2	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f (G) =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f (C) =	0.10	0.10	

Street Hydraulics: WARNING: Q > ALLOWABLE Q FOR MINOR & MAJOR STORM		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**5.9**	**10.9**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**1.3**	**14.4**	**cfs**
Capture Percentage = Q_a/Q_o	**C% =**	**82**	**43**	**%**

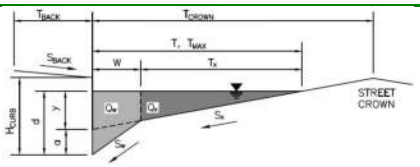
MHFD-Inlet, Version 5.03 (August 2023)

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

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

Project: **FALCON RESERVE FILING NO.1**

Inlet ID: **EX-IN5**



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	13.5	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} =	16.0	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 =	0.020	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	16.0	16.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.4	12.0	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☐	

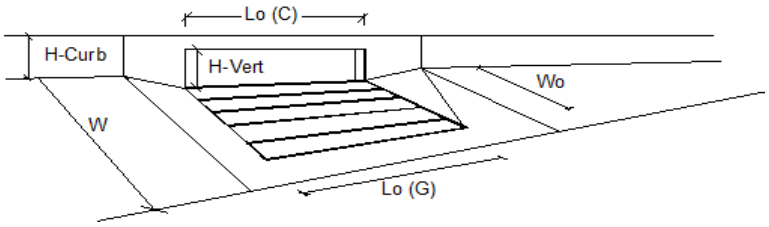
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	Q_{allow} =	**6.7**	**13.2**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 6.10 cfs on sheet 'Inlet Management'

WARNING: MAJOR STORM max. allowable capacity is less than the design peak flow of 22.30 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)



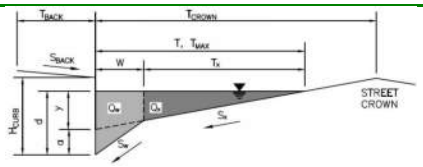
Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	2	2	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f (G) =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f (C) =	0.10	0.10	

Street Hydraulics: WARNING: Q > ALLOWABLE Q FOR MAJOR STORM		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**5.3**	**10.3**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.8**	**12.0**	**cfs**
Capture Percentage = Q_a/Q_o	**C% =**	**87**	**46**	**%**

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

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

Project: **FALCON RESERVE FILING NO.1**
Inlet ID: **EX-IN6**



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	18.0	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} =	22.0	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 =	0.020	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

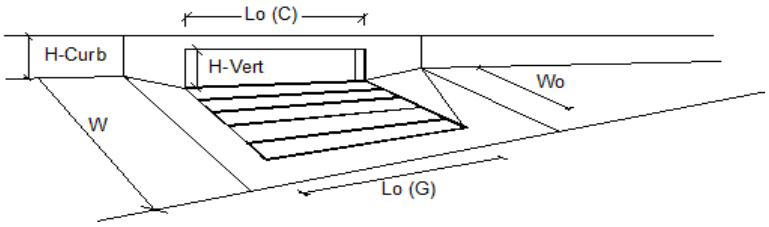
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	20.0	22.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	5.8	12.0	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☐	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	Q_{allow} =	**17.4**	**29.5**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 8.90 cfs on sheet 'Inlet Management'
WARNING: MAJOR STORM max. allowable capacity is less than the design peak flow of 31.40 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

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')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	2	2	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f (G) =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f (C) =	0.10	0.10	

Street Hydraulics: WARNING: Q > ALLOWABLE Q FOR MAJOR STORM		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**6.6**	**11.9**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**2.3**	**19.5**	**cfs**
Capture Percentage = Q_a/Q_o	**C% =**	**74**	**38**	**%**

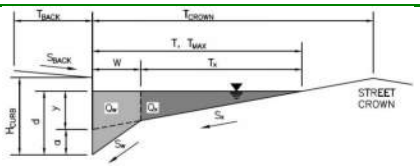
MHFD-Inlet, Version 5.03 (August 2023)

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

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

Project: **FALCON RESERVE FILING NO.1**

Inlet ID: **DP4-IN1**



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	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} =	17.0	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 =	0.025	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.6	12.0	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☐	

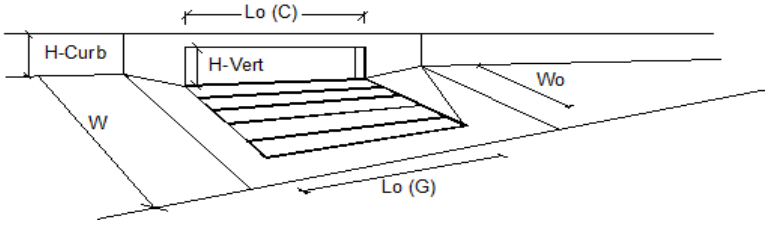
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	**Q_{allow} =**	**8.8**	**17.2**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 3.20 cfs on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design peak flow of 8.20 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)



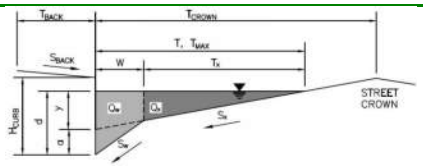
Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	2	2	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f (G) =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f (C) =	0.10	0.10	

Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**3.2**	**6.3**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**1.9**	**cfs**
Capture Percentage = Q_a/Q_o	**C% =**	**100**	**77**	**%**

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

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

Project: **FALCON RESERVE FILING NO.1**
Inlet ID: **DP5-IN2**



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	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} =	17.0	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 =	0.025	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

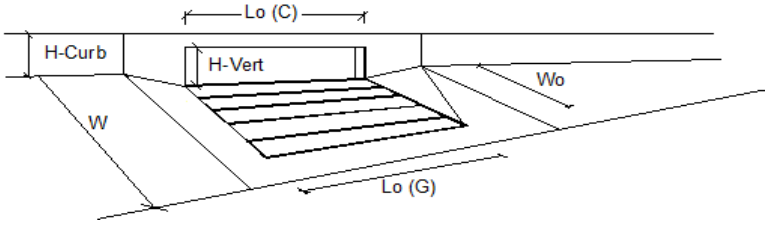
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.6	12.0	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☐	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	**Q_{allow} =**	**8.8**	**17.2**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 1.70 cfs on sheet 'Inlet Management'
Major storm max. allowable capacity GOOD - greater than the design peak flow of 3.90 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

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')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	2	2	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f (G) =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f (C) =	0.10	0.10	

Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**1.7**	**3.9**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.0**	**cfs**
Capture Percentage = Q_a/Q_o	**C% =**	**100**	**99**	**%**

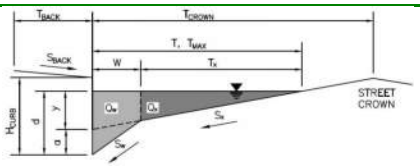
MHFD-Inlet, Version 5.03 (August 2023)

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

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

Project: **FALCON RESERVE FILING NO.1**

Inlet ID: **DP6-IN3**



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	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} =	17.0	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 =	0.026	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.6	12.0	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☐	

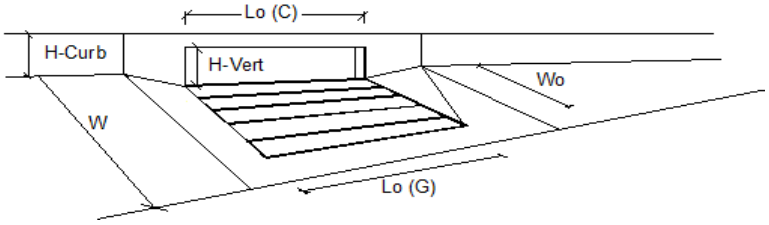
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	**Q_{allow} =**	**8.9**	**17.5**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 5.70 cfs on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design peak flow of 14.10 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

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')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	3	3	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f (G) =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f (C) =	0.10	0.10	

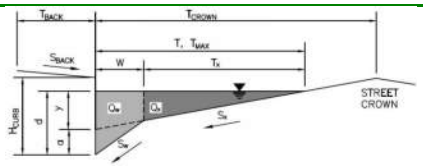
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**5.7**	**11.4**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**2.7**	**cfs**
Capture Percentage = Q_a/Q_o	**C% =**	**100**	**81**	**%**

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

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

Project: **FALCON RESERVE FILING NO.1**

Inlet ID: **DP7-IN4**



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	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} =	17.0	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 =	0.026	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.6	12.0	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☐	

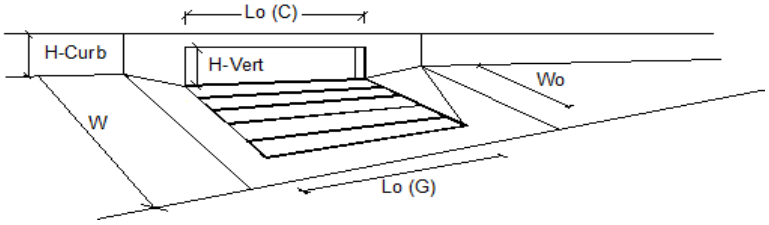
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	Q_{allow} =	**8.9**	**17.5**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 2.70 cfs on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design peak flow of 5.90 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)



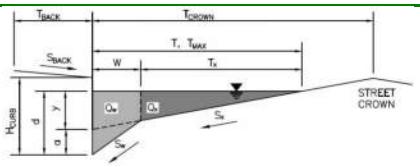
Design Information (Input)	CDOT Type R Curb Opening		MINOR	MAJOR	
Type of Inlet		Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')		a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		No =	2	2	
Length of a Single Unit Inlet (Grate or Curb Opening)		L_o =	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)		W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)		C_f (G) =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		C_f (C) =	0.10	0.10	
Street Hydraulics: OK - Q < Allowable Street Capacity'			MINOR	MAJOR	
Total Inlet Interception Capacity		**Q =**	**2.7**	**5.2**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)		**Q_b =**	**0.0**	**0.7**	**cfs**
Capture Percentage = Q_a/Q_o		**C% =**	**100**	**88**	**%**

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

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

Project: **FALCON RESERVE FILING NO.1**

Inlet ID: **DP8-IN5**



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	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} =	17.0	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 =	0.031	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.6	12.0	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☐	

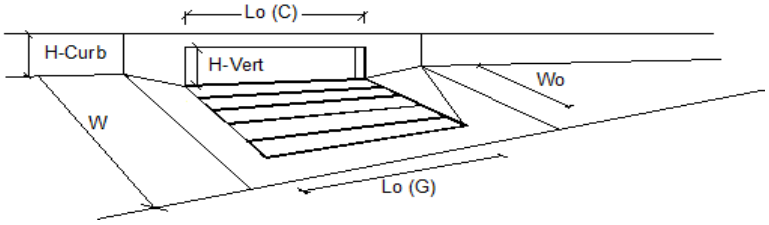
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	**Q_{allow} =**	**9.8**	**19.1**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 6.30 cfs on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design peak flow of 13.90 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

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')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	3	3	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f (G) =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f (C) =	0.10	0.10	

Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**6.3**	**11.3**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**2.6**	**cfs**
Capture Percentage = Q_a/Q_o	**C% =**	**100**	**82**	**%**

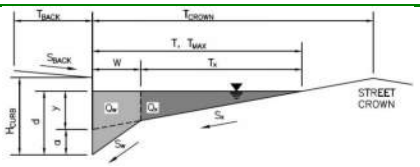
MHFD-Inlet, Version 5.03 (August 2023)

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

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

Project: **FALCON RESERVE FILING NO.1**

Inlet ID: **DP9-IN6**



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	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} =	17.0	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 =	0.035	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.6	12.0	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☐	

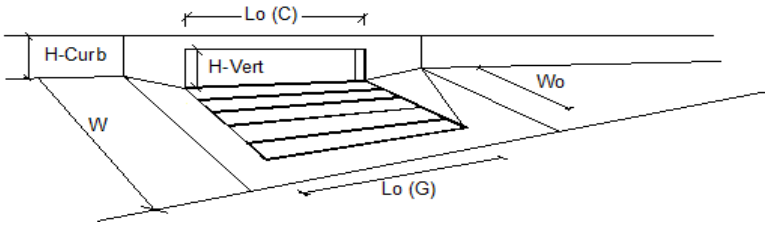
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	Q_{allow} =	**10.4**	**20.3**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 2.90 cfs on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design peak flow of 6.90 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)



Design Information (Input)	CDOT Type R Curb Opening		MINOR	MAJOR	
Type of Inlet		Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')		a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		No =	2	2	
Length of a Single Unit Inlet (Grate or Curb Opening)		L_o =	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)		W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)		C_f (G) =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		C_f (C) =	0.10	0.10	
Street Hydraulics: OK - Q < Allowable Street Capacity'			MINOR	MAJOR	
Total Inlet Interception Capacity		**Q =**	**2.9**	**5.8**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)		**Q_b =**	**0.0**	**1.1**	**cfs**
Capture Percentage = Q_a/Q_o		**C% =**	**100**	**84**	**%**

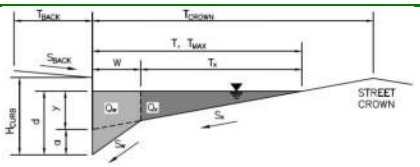
MHFD-Inlet, Version 5.03 (August 2023)

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

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

Project: **FALCON RESERVE FILING NO.1**

Inlet ID: **DP10-IN7**



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	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} =	17.0	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 =	0.035	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.6	12.0	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☐	

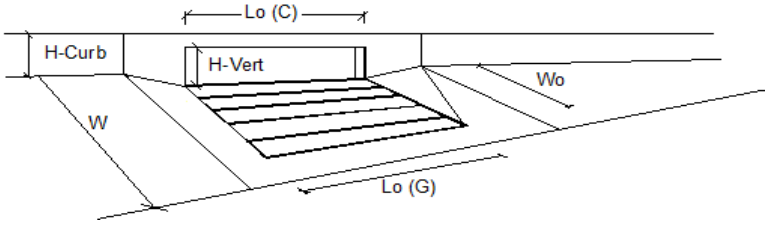
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	Q_{allow} =	**10.4**	**20.3**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 1.70 cfs on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design peak flow of 3.50 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

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')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f (G) =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f (C) =	0.10	0.10	

Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**1.6**	**2.4**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.1**	**1.1**	**cfs**
Capture Percentage = Q_a/Q_o	**C% =**	**92**	**69**	**%**

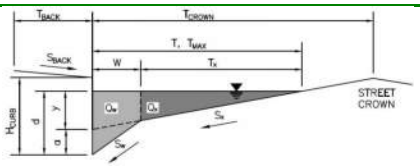
MHFD-Inlet, Version 5.03 (August 2023)

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

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

Project: **FALCON RESERVE FILING NO.1**

Inlet ID: **DP11-IN8**



Gutter Geometry:

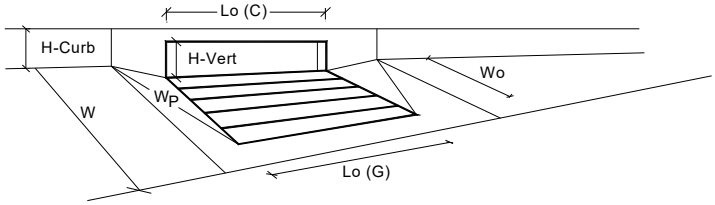
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	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} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.6	12.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is not applicable to Sump Condition				
MAJOR STORM Allowable Capacity is not applicable to Sump Condition	**Q_{allow} =**	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.03 (August 2023)



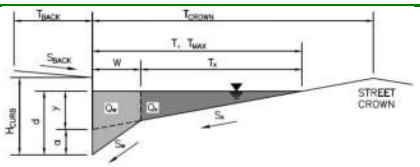
Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	3	3	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	4.6	7.0	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} =	0.22	0.42	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} =	0.69	0.84	
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 =**	**4.5**	**14.6**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)	$Q_{PEAK\ REQUIRED}$ =	3.1	10.6	cfs

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

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

Project: **FALCON RESERVE FILING NO.1**

Inlet ID: **DP12-IN9**



Gutter Geometry:

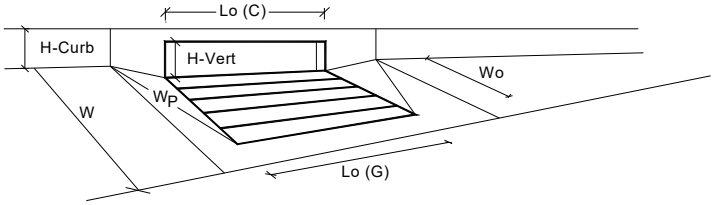
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	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} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.6	12.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is not applicable to Sump Condition				
MAJOR STORM Allowable Capacity is not applicable to Sump Condition	**Q_{allow} =**	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.03 (August 2023)

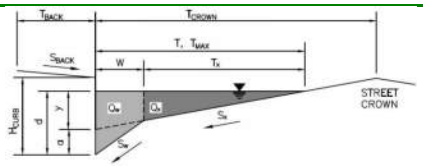


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	2	2	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	4.6	6.0	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} =	0.22	0.33	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} =	0.84	0.93	
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 =**	**3.9**	**8.3**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)	$Q_{PEAK\ REQUIRED}$ =	2.9	7.2	cfs

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

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

Project: **FALCON RESERVE FILING NO.1**
Inlet ID: **DP13-IN10**



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	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} =	17.0	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 =	1.500	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

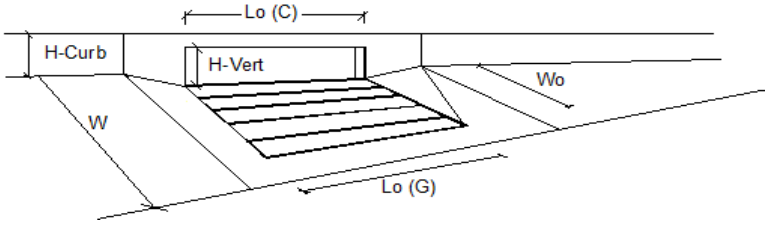
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.6	12.0	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☐	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	**5.5**	**34.0**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 4.30 cfs on sheet 'Inlet Management'
Major storm max. allowable capacity GOOD - greater than the design peak flow of 13.20 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

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')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	3	3	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f (G) =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f (C) =	0.10	0.10	

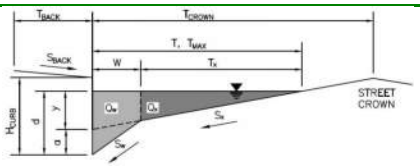
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**4.3**	**11.4**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**1.8**	**cfs**
Capture Percentage = Q_a/Q_o	**C% =**	**100**	**86**	**%**

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

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

Project: **FALCON RESERVE FILING NO.1**

Inlet ID: **DP14-IN11**



Gutter Geometry:

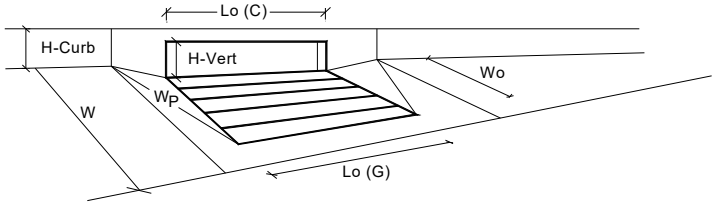
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	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} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.6	12.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is not applicable to Sump Condition				
MAJOR STORM Allowable Capacity is not applicable to Sump Condition	Q_{allow} =	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.03 (August 2023)

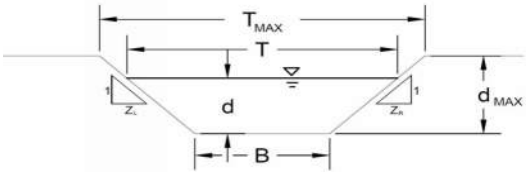


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	3	3	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	4.6	7.0	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} =	0.22	0.42	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} =	0.69	0.84	
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 =**	**4.5**	**14.6**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)	$Q_{PEAK\ REQUIRED}$ =	3.9	13.2	cfs

AREA INLET IN A SWALE

FALCON RESERVE FILING NO.1

DP2.1-IN12



This worksheet uses the NRCS vegetal retardance method to determine Manning's n for grass-lined channels.

An override Manning's n can be entered for other channel materials.

Analysis of Trapezoidal Channel (Grass-Lined uses SCS Method)

NRCS Vegetal Retardance (A, B, C, D, or E)	A, B, C, D, or E =		
Manning's n (Leave cell D16 blank to manually enter an n value)	n =	0.025	
Channel Invert Slope	S_O =	0.0300	ft/ft
Bottom Width	B =	12.00	ft
Left Side Slope	Z1 =	4.00	ft/ft
Right Side Sloe	Z2 =	4.00	ft/ft

Check one of the following soil types:

Soil Type:	Max. Velocity (V_{MAX})	Max Froude No. (F_{MAX})
Non-Cohesive	5.0 fps	0.60
Cohesive	7.0 fps	0.80
Paved	N/A	N/A

Choose One:
- ( ) Non-Cohesive
- (•) Cohesive
- ( ) Paved

		Minor Storm	Major Storm	
Maximum Allowable Top Width of Channel for Minor & Major Storm	T_{MAX} =	**16.00**	**20.00**	**ft**
Maximum Allowable Water Depth in Channel for Minor & Major Storm	d_{MAX} =	**0.50**	**1.00**	**ft**

Allowable Channel Capacity Based On Channel Geometry

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	**41.4**	**141.2**	**cfs**
MAJOR STORM Allowable Capacity is based on Depth Criterion	d_{allow} =	**0.50**	**1.00**	**ft**

Water Depth in Channel Based On Design Peak Flow

Design Peak Flow	Q_o =	**2.9**	**15.7**	**cfs**
Water Depth	**d** =	**0.10**	**0.28**	**ft**

Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'
Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

AREA INLET IN A SWALE

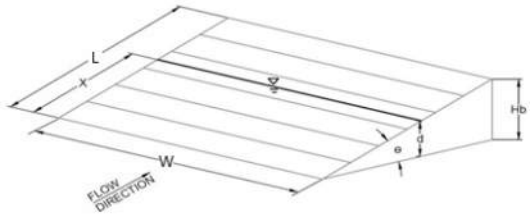
FALCON RESERVE FILING NO.1

DP2.1-IN12

Inlet Design Information (Input)

Type of Inlet	CDOT Type D (In Series & Depressed)	Inlet Type =	CDOT Type D (In Series & Depressed)

Angle of Inclined Grade (must be <= 30 degrees)	θ =	0.00	degrees
Width of Grade	W =	3.00	ft
Length of Grade	L =	6.00	ft
Open Area Ratio	A_{RATIO} =	0.70	
Height of Inclined Grade	H_B =	0.00	ft
Clogging Factor	C_f =	0.38	
Grade Discharge Coefficient	C_d =	0.72	
Orifice Coefficient	C_o =	0.48	
Weir Coefficient	C_w =	1.53	



		MINOR	MAJOR	
Water Depth at Inlet (for depressed inlets, 1 foot is added for depression)	d =	1.10	1.28	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**31.7**	**34.2**	**cfs**
Bypassed Flow	**Q_b =**	**0.0**	**0.0**	**cfs**
Capture Percentage = Qa/Qo	**C% =**	**100**	**100**	**%**

Warning 04: Froude No. exceeds USDCM Volume I recommendation.

Manning Formula Uniform Pipe Flow at Given Slope and Depth

Printable Title

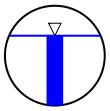
Printable Subtitle

Inputs

Pipe diameter, d_0	36	in
Manning roughness, n	0.013	
Pressure slope (possibly ? equal to pipe slope), S_0	0.025	rise/run
Relative flow depth, y/d_0	70	%

Results

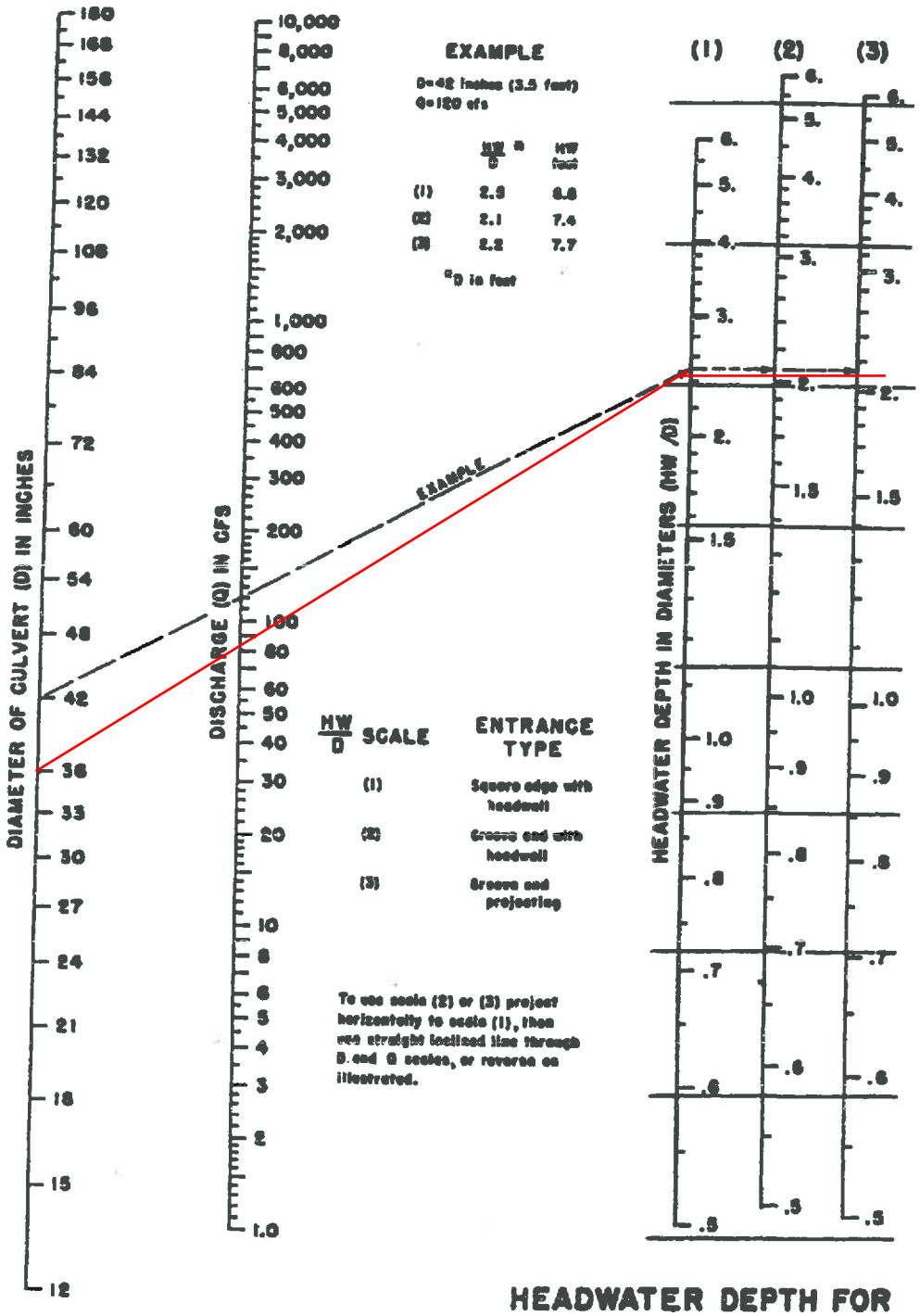
Flow depth, y	2.1000	ft
Flow area, a	5.2851	ft^2
Pipe area, a0	7.0687	ft^2
Relative area, a/a0	0.7477	fraction
Wetted perimeter, P_w	5.9469	ft
Hydraulic radius, R_h	0.8887	ft
Top width, T	2.7495	ft
Velocity, v	16.7053	ft/sec
Velocity head, h_v	4.3372	ft H2O
Froude number, F	2.12	
Average shear stress (tractive force), tau	1.3870	psf
Flow, Q (See notes)	88.2861	cfs
Full flow, Q0	105.4492	cfs
Ratio to full flow, Q/Q0	0.8372	fraction



Notes:

This is the flow and depth inside an *infinitely long* pipe.
Getting the flow into the pipe may require significantly higher headwater depth. Add at least 1.5 times the velocity head to get the headwater depth or see my 2-minute tutorial for standard culvert headwater calculations using HY-8.

PR1.1 Q100= 173.3 cfs TOTAL
Q100=86.7 cfs/36" RCP



HEADWATER SCALES 2 & 3
REVISED MAY 1964

BUREAU OF PUBLIC ROADS JAN. 1963

HEADWATER DEPTH FOR CONCRETE PIPE CULVERTS WITH INLET CONTROL

HDR Infrastructure, Inc.
A Centerra Company

The City of Colorado Springs / El Paso County
Drainage Criteria Manual

Date: OCT. 1987

Figure: 9-34

PROP 36" CMP
DP1.1 Q100=86.7 cfs

9-62

INLET (3)
HW/D 2.1
HW 6.3'

Manning Formula Uniform Pipe Flow at Given Slope and Depth

Printable Title

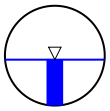
Printable Subtitle

Inputs

Pipe diameter, d_0	36	in
Manning roughness, n	0.013	
Pressure slope (possibly ? equal to pipe slope), S_0	0.01	rise/run
Relative flow depth, y/d_0	46	%

Results

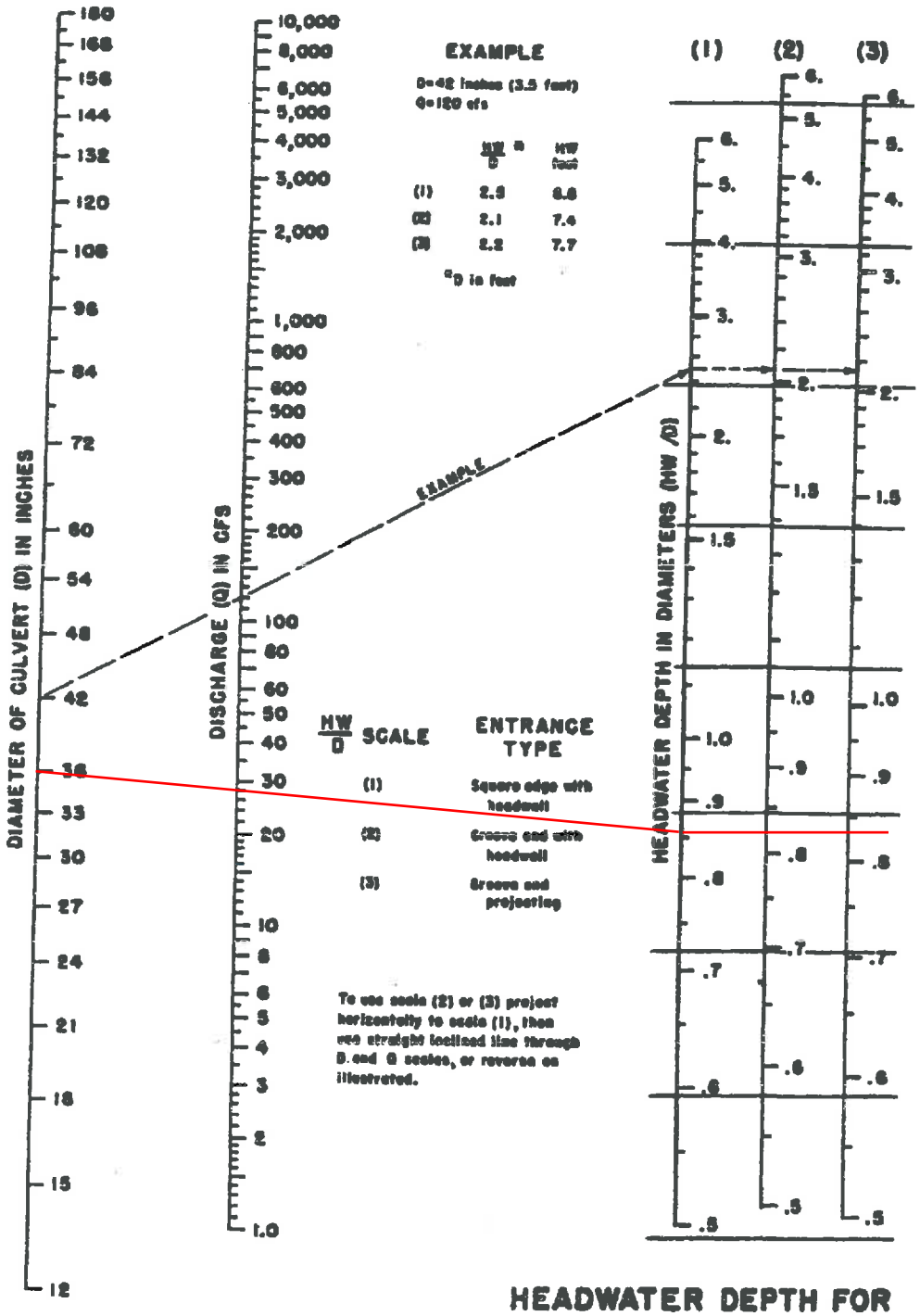
Flow depth, y	1.3800	ft
Flow area, a	3.1747	ft^2
Pipe area, a0	7.0687	ft^2
Relative area, a/a0	0.4491	fraction
Wetted perimeter, P_w	4.4721	ft
Hydraulic radius, R_h	0.7099	ft
Top width, T	2.9904	ft
Velocity, v	9.0957	ft/sec
Velocity head, h_v	1.2858	ft H2O
Froude number, F	1.56	
Average shear stress (tractive force), tau	0.4432	psf
Flow, Q (See notes)	28.8751	cfs
Full flow, Q0	66.6919	cfs
Ratio to full flow, Q/Q0	0.4330	fraction



Notes:

This is the flow and depth inside an *infinitely long* pipe.
Getting the flow into the pipe may require significantly higher headwater depth. Add at least 1.5 times the velocity head to get the headwater depth or see my 2-minute tutorial for standard culvert headwater calculations using HY-8.

EXISTING 36" CMP IN THE PROPOSED CONDITION BASIN **F2 &
FLOWBY FROM EX03 EAST AND WEST SIDE OF LIBERTY
SECTION EX2-EX2 Q5= 2.5 CFS, Q100=28.7 cfs



HEADWATER SCALES 2&3
REVISED MAY 1964

BUREAU OF PUBLIC ROADS JAN. 1963

HEADWATER DEPTH FOR CONCRETE PIPE CULVERTS WITH INLET CONTROL

HDR Infrastructure, Inc
A Centerra Company

The City of Colorado Springs / El Paso County
Drainage Criteria Manual

Date
OCT. 1987

EX 36" CMP IN
PROPOSED CONDITION
DP16 Q100=28.7 cfs

9-62

INLET (3)
HW/D 0.83
HW 2.5'

Figure
9-34

Manning Formula Uniform Pipe Flow at Given Slope and Depth

Printable Title

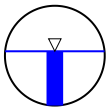
Printable Subtitle

Inputs

Pipe diameter, d_0	54	in
Manning roughness, n	0.013	
Pressure slope (possibly ? equal to pipe slope), S_0	0.0132	rise/run
Relative flow depth, y/d_0	54.4	%

Results

Flow depth, y	2.4480	ft
Flow area, a	8.8421	ft^2
Pipe area, a0	15.9045	ft^2
Relative area, a/a0	0.5560	fraction
Wetted perimeter, P_w	7.4650	ft
Hydraulic radius, R_h	1.1844	ft
Top width, T	4.4825	ft
Velocity, v	14.7009	ft/sec
Velocity head, h_v	3.3588	ft H2O
Froude number, F	1.85	
Average shear stress (tractive force), tau	0.9761	psf
Flow, Q (See notes)	129.9815	cfs
Full flow, Q0	225.9108	cfs
Ratio to full flow, Q/Q0	0.5754	fraction



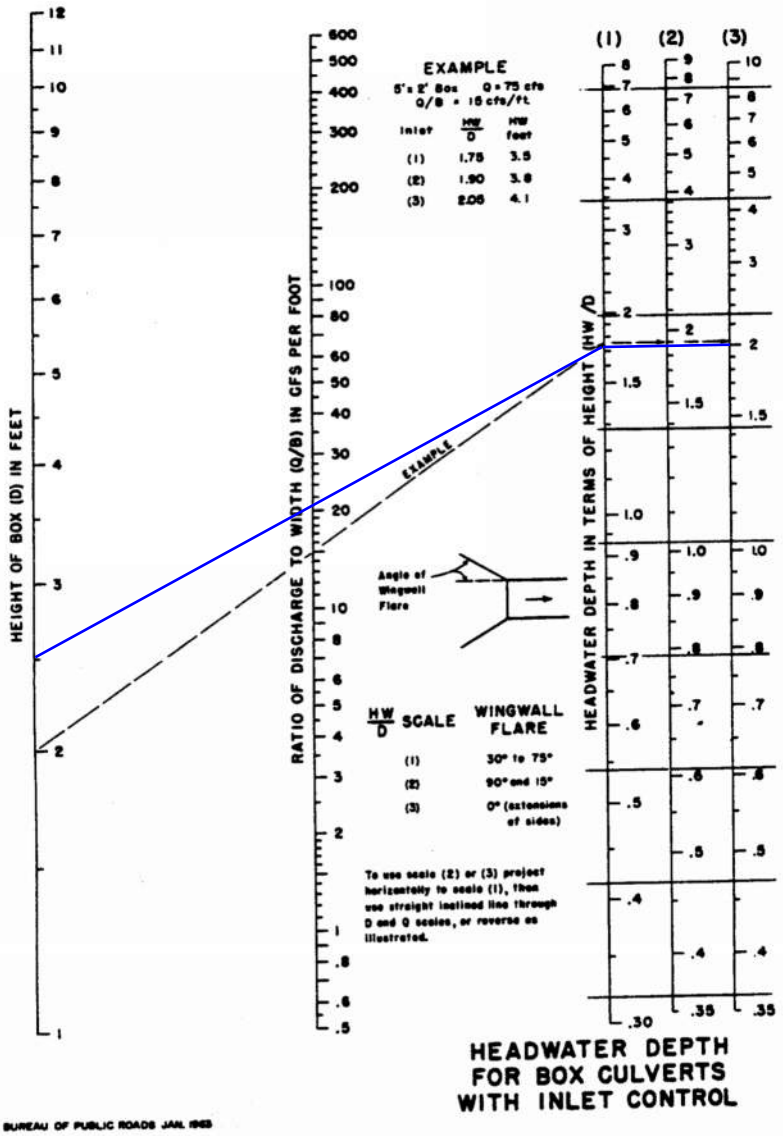
Notes:

This is the flow and depth inside an *infinitely long* pipe.
Getting the flow into the pipe may require significantly higher headwater depth. Add at least 1.5 times the velocity head to get the headwater depth or see my 2-minute tutorial for standard culvert headwater calculations using HY-8.

PROPOSED CONDITION MAP
EXISTING DUAL 2.5'x6.0' RCBC
PR EX10 Q100=259.8 cfs/2=129.9 cfs
PIPE EQUIVALENT AREA FOR
1-2.5'x6.0' RCBS IS 54" RCP

DUAL 2.5' X 6' RCBC
Q100=249.7 CFS
Q100/2=124.8 CFS

INLET	HW/D	HW
(1)	1.72	4.3'



HDR Infrastructure, Inc.
A Centerra Company

The City of Colorado Springs / El Paso County
Drainage Criteria Manual

Date
OCT. 1987

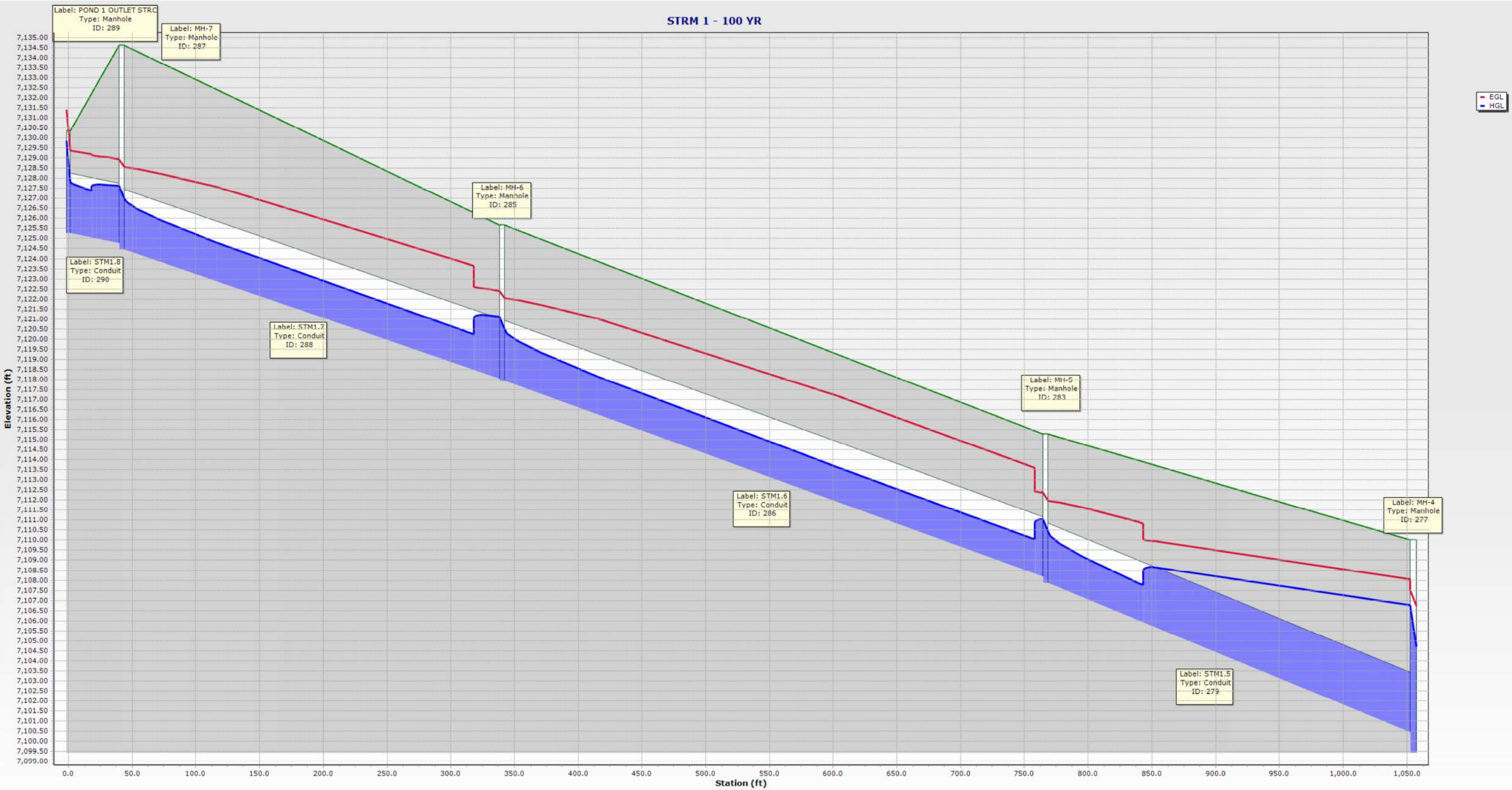
Figure
9-30


POND 1 OUTLET STRC
STM1.8
MH-7
STM1.7
MH-6
STM1.6
MH-5
STM1.5
POND 2 OUTLET STRC
STM2.1
MH-4
STM1.4
O-7

FlexTable: Conduit Table

Label	ID	Upstream Structure	Flow (cfs)	Flow / Capacity (Design) (%)	Length (Unified) (ft)	Velocity (ft/s)	Depth (Normal) (ft)	Depth (Critical) (ft)	Energy Grade Line (Out) (ft)	Energy Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Hydraulic Grade Line (In) (ft)	Headloss (ft)	Upstream Structure Hydraulic Grade Line (In) (ft)
STM1.4	278	MH-4	110.00	146.8	297.4	11.43	(N/A)	3.17	7,103.20	7,106.73	7,100.96	7,104.70	3.74	7,106.77
STM1.5	279	MH-5	64.30	60.1	288.7	15.82	1.68	2.57	7,108.06	7,111.98	7,106.77	7,110.43	3.67	7,111.05
STM2.1	281	POND 2 OUTLET STRC	49.50	74.7	31.4	7.00	1.93	2.29	7,107.53	7,107.70	7,106.77	7,106.94	0.17	7,106.38
STM1.6	286	MH-6	64.30	63.7	426.1	15.14	1.74	2.57	7,112.37	7,122.05	7,111.05	7,120.50	9.45	7,121.12
STM1.7	288	MH-7	64.30	65.8	298.6	14.76	1.78	2.57	7,122.41	7,128.57	7,121.12	7,127.02	5.90	7,127.64
STM1.8	290	POND 1 OUTLET STRC	64.30	87.9	41.6	11.67	2.18	2.57	7,128.96	7,129.37	7,127.64	7,127.82	0.18	7,129.86

Upstream Structure Velocity (In-Governing) (ft/s)	Upstream Structure Headloss Coefficient	Upstream Structure Headloss (ft)	Elevation Ground (Start) (ft)	Elevation Ground (Stop) (ft)	Invert (Start) (ft)	Invert (Stop) (ft)	Conduit Description
7.00	1.020	2.07	7,101.79	7,110.00	7,097.79	7,099.44	Circle - 42.0 in
9.20	0.400	0.62	7,110.00	7,115.27	7,100.44	7,107.86	Circle - 36.0 in
7.00	1.320	1.01	7,110.00	7,105.37	7,100.44	7,100.75	Circle - 36.0 in
9.10	0.400	0.62	7,115.27	7,125.67	7,108.16	7,117.93	Circle - 36.0 in
9.20	0.400	0.62	7,125.67	7,134.62	7,118.03	7,124.45	Circle - 36.0 in
9.96	1.320	2.04	7,134.62	7,130.35	7,124.75	7,125.25	Circle - 36.0 in


STRM 1 - 100 YR
Label: POND 1 OUTLET STRC
Type: Manhole
ID: 289
Label: MH-7
Type: Manhole
ID: 287
Label: MH-6
Type: Manhole
ID: 285
Label: MH-5
Type: Manhole
ID: 283
Label: MH-4
Type: Manhole
ID: 277
Label: STM1.8
Type: Conduit
ID: 290
Label: STM1.7
Type: Conduit
ID: 288
Label: STM1.6
Type: Conduit
ID: 286
Label: STM1.5
Type: Conduit
ID: 279
EGL
HGL
Elevation (ft)
Station (ft)

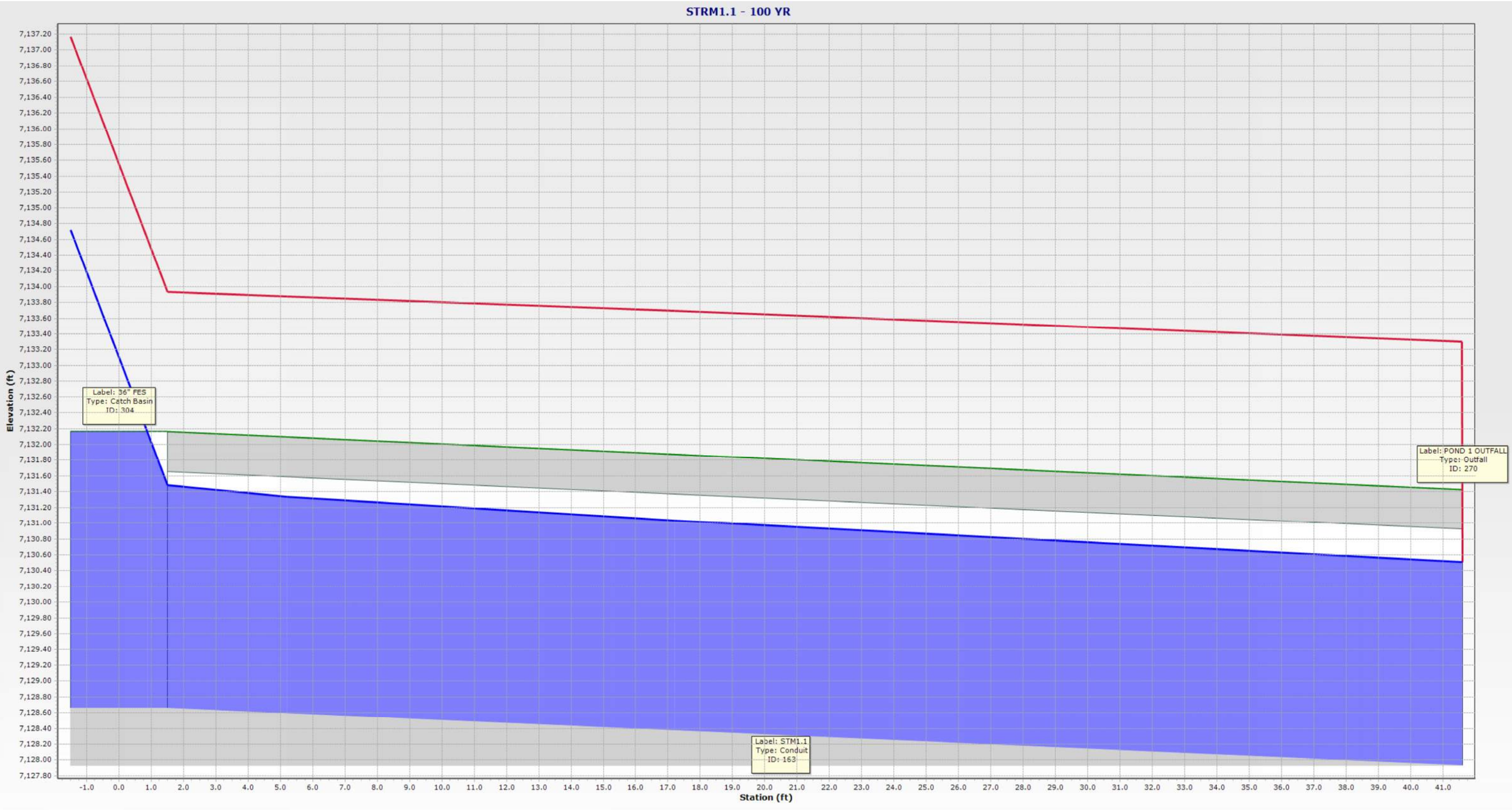

STRM 2.1 - 100 YR
Label: MH-4
Type: Manhole
ID: 277
Label: POND 2 OUTLET STRC
Type: Manhole
ID: 280
Label: STM2.1
Type: Conduit
ID: 281
EGL
HGL
Elevation (ft)
Station (ft)
7,110.00
7,109.80
7,109.60
7,109.40
7,109.20
7,109.00
7,108.80
7,108.60
7,108.40
7,108.20
7,108.00
7,107.80
7,107.60
7,107.40
7,107.20
7,107.00
7,106.80
7,106.60
7,106.40
7,106.20
7,106.00
7,105.80
7,105.60
7,105.40
7,105.20
7,105.00
7,104.80
7,104.60
7,104.40
7,104.20
7,104.00
7,103.80
7,103.60
7,103.40
7,103.20
7,103.00
7,102.80
7,102.60
7,102.40
7,102.20
7,102.00
7,101.80
7,101.60
7,101.40
7,101.20
7,101.00
7,100.80
7,100.60
7,100.40
7,100.20
7,100.00
7,099.80
7,099.60
7,099.40
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0
11.0
12.0
13.0
14.0
15.0
16.0
17.0
18.0
19.0
20.0
21.0
22.0
23.0
24.0
25.0
26.0
27.0
28.0
29.0
30.0
31.0
32.0
33.0

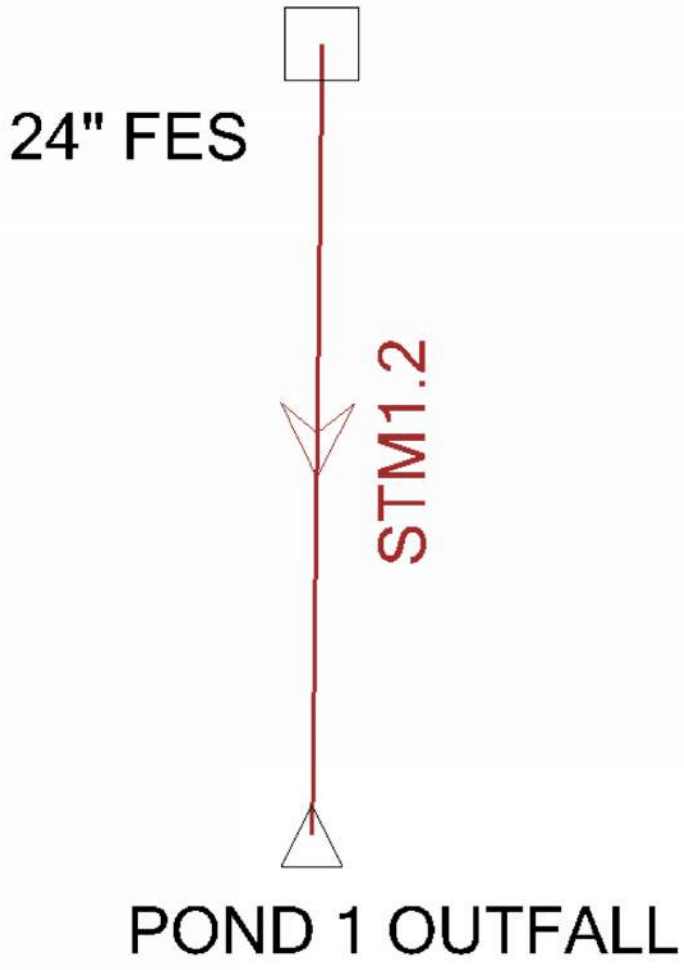

POND 1 OUTFALL
STM1.1
36" FES

FlexTable: Conduit Table

Label	ID	Upstream Structure	Flow (cfs)	Flow / Capacity (Design) (%)	Length (Unified) (ft)	Velocity (ft/s)	Depth (Normal) (ft)	Depth (Critical) (ft)	Energy Grade Line (Out) (ft)	Energy Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Hydraulic Grade Line (In) (ft)	Headloss (ft)	Upstream Structure Hydraulic Grade Line (In) (ft)
STM1.1	163	36" FES	86.65	98.1	41.6	14.25	2.41	2.82	7,133.30	7,133.93	7,130.51	7,131.48	0.98	7,134.72

Upstream Structure Velocity (In-Governing) (ft/s)	Upstream Structure Headloss Coefficient	Upstream Structure Headloss (ft)	Elevation Ground (Start) (ft)	Elevation Ground (Stop) (ft)	Invert (Start) (ft)	Invert (Stop) (ft)	Conduit Description
12.56	1.320	3.23	7,132.16	7,131.43	7,128.66	7,127.93	Circle - 36.0 in


STRM1.1 - 100 YR
EGL
HGL
Elevation (ft)
Station (ft)
Label: 36" FES
Type: Catch Basin
ID: 304
Label: POND 1 OUTFALL
Type: Outfall
ID: 270
Label: STM1.1
Type: Conduit
ID: 163

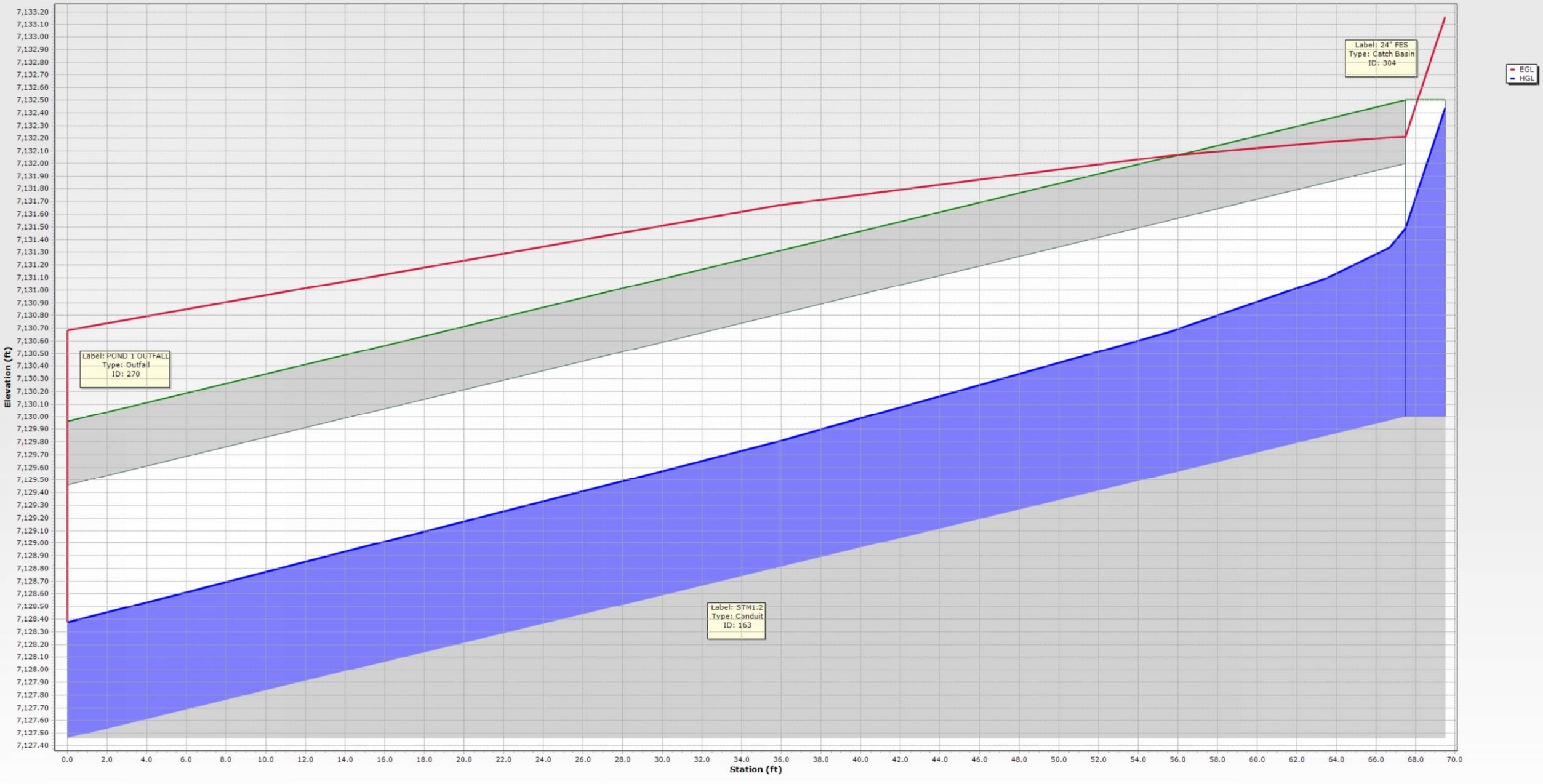

24" FES
STM1.2
POND 1 OUTFALL

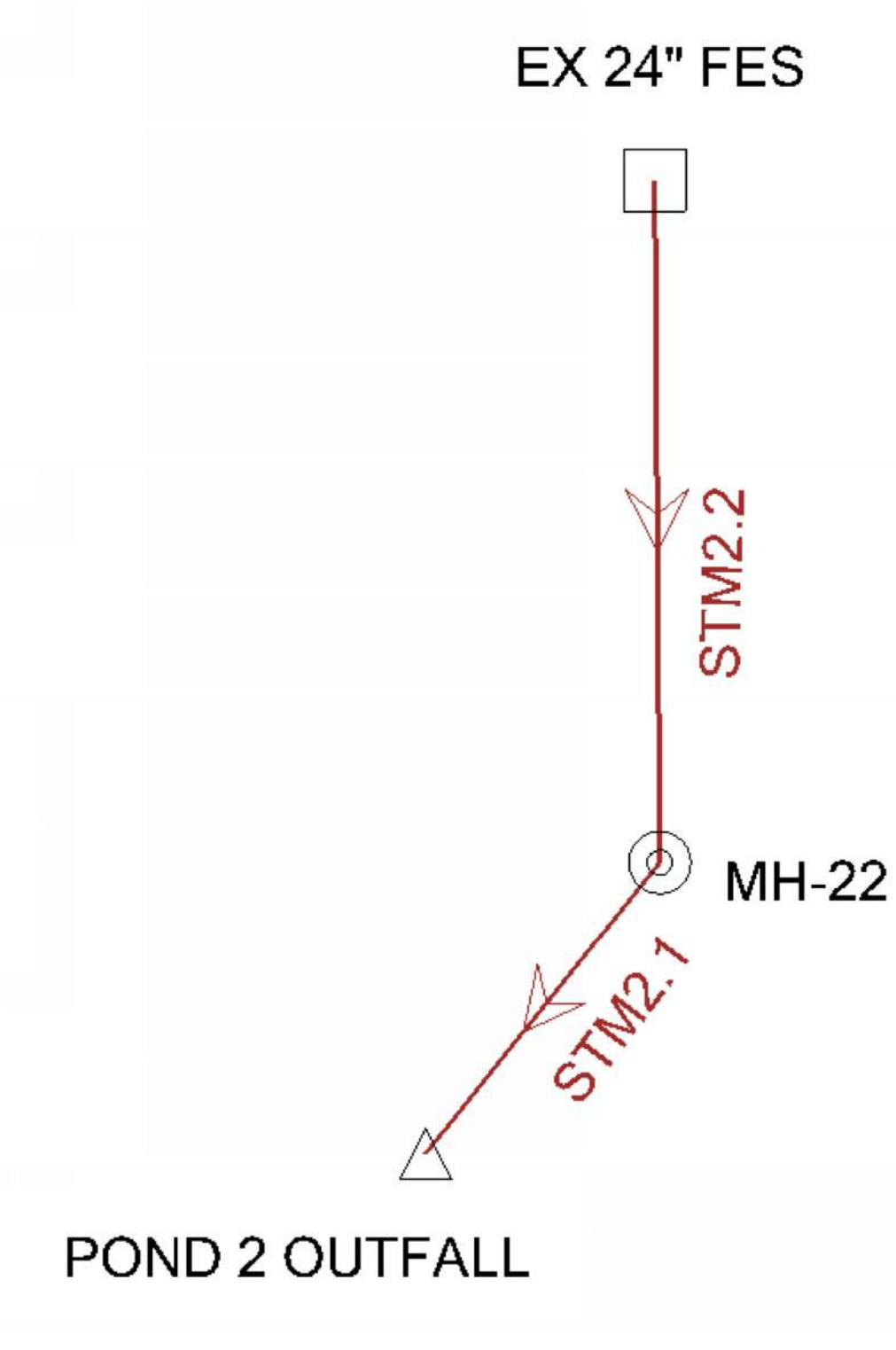
FlexTable: Conduit Table

Label	ID	Upstream Structure	Flow (cfs)	Flow / Capacity (Design) (%)	Length (Unified) (ft)	Velocity (ft/s)	Depth (Normal) (ft)	Depth (Critical) (ft)	Energy Grade Line (Out) (ft)	Energy Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Hydraulic Grade Line (In) (ft)	Headloss (ft)	Upstream Structure Hydraulic Grade Line (In) (ft)
STM1.2	163	24" FES	17.10	39.3	68.5	13.03	0.87	1.49	7,130.68	7,132.21	7,128.38	7,131.49	3.11	7,132.44

Upstream Structure Velocity (In-Governing) (ft/s)	Upstream Structure Headloss Coefficient	Upstream Structure Headloss (ft)	Elevation Ground (Start) (ft)	Elevation Ground (Stop) (ft)	Invert (Start) (ft)	Invert (Stop) (ft)	Conduit Description
6.81	1.320	0.95	7,132.50	7,129.96	7,130.00	7,127.46	Circle - 24.0 in

STRM1.2 - 100 YR



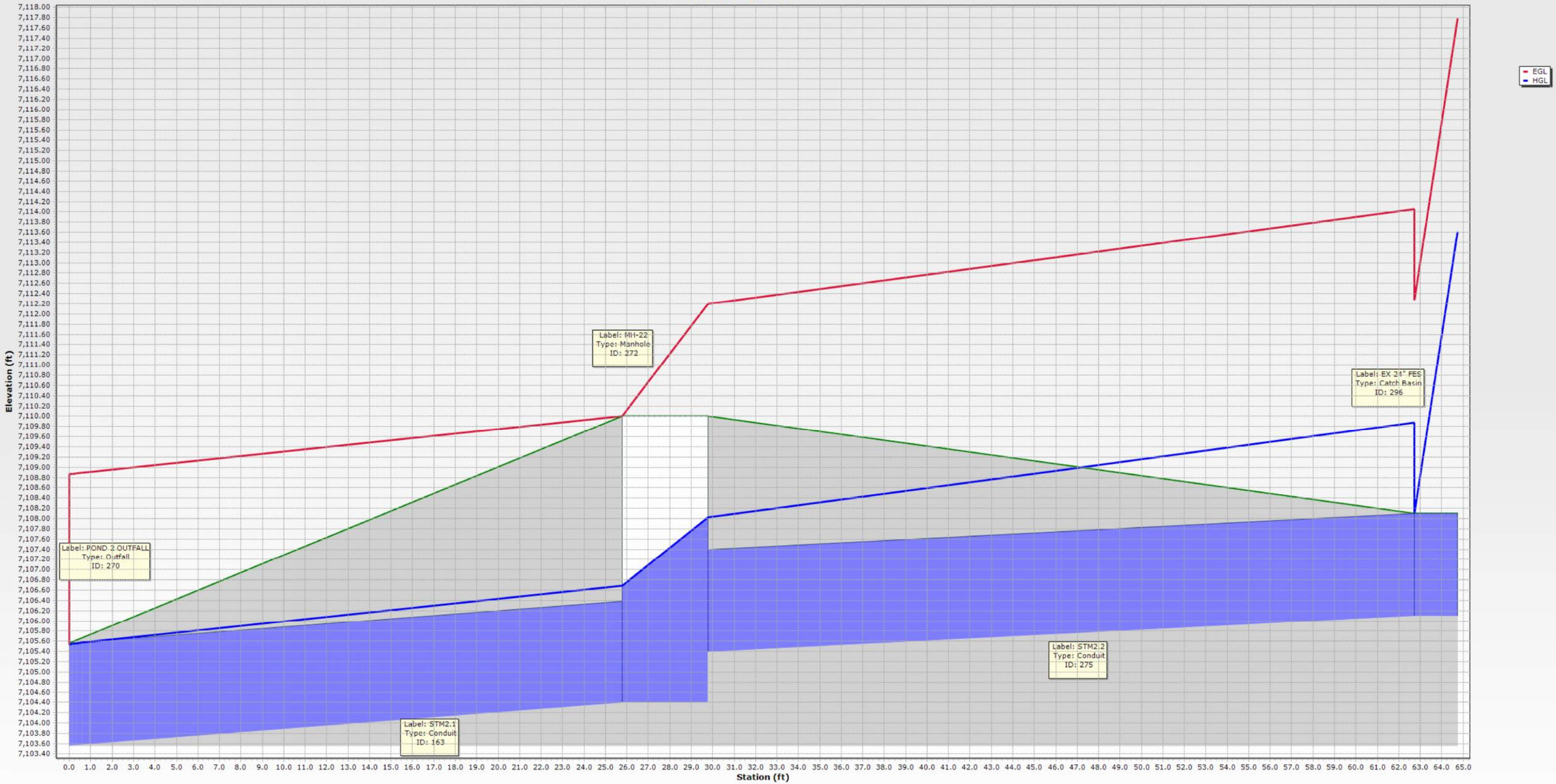

EX 24" FES
STM2.2
MH-22
STM2.1
POND 2 OUTFALL

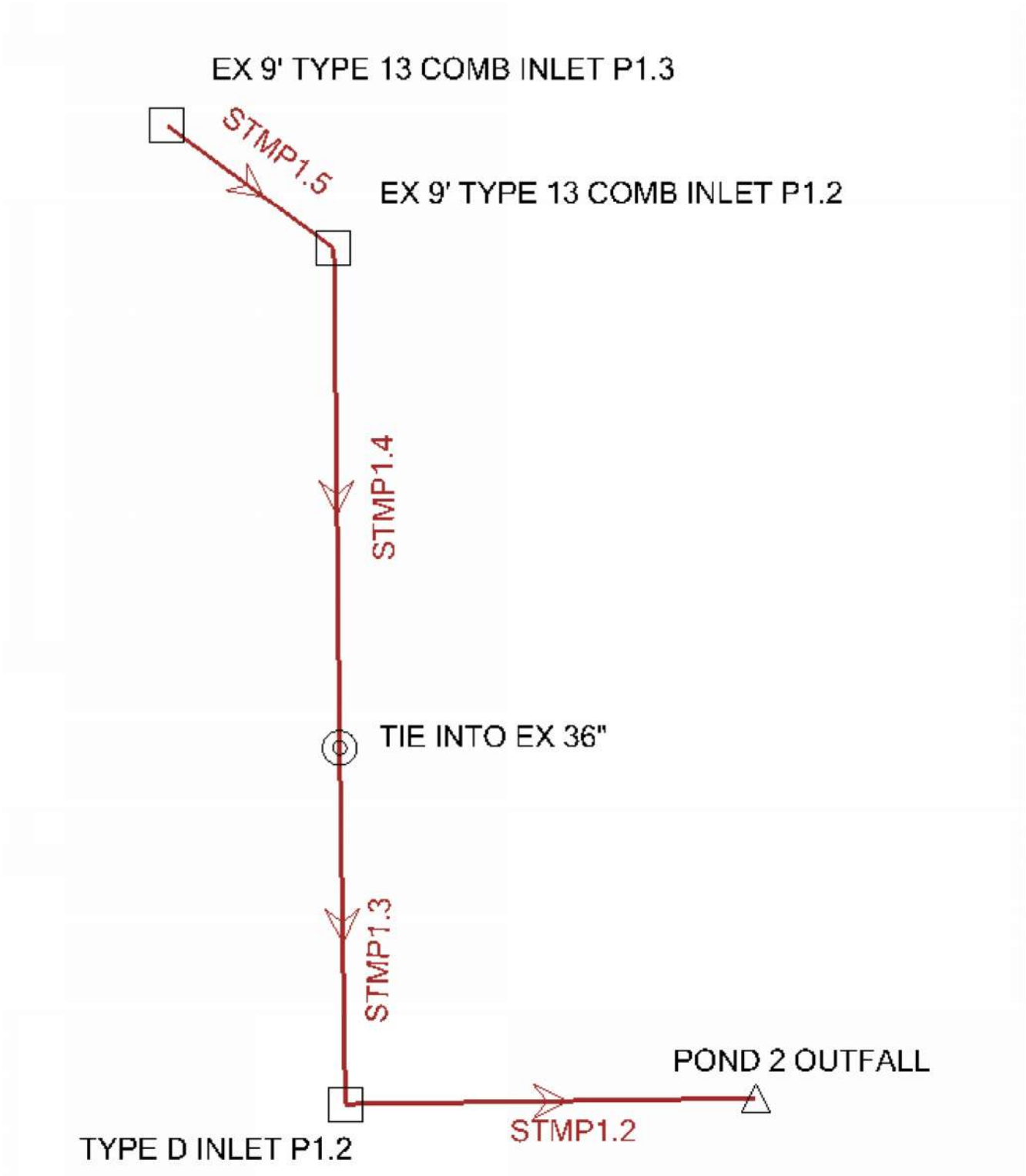
FlexTable: Conduit Table

Label	ID	Upstream Structure	Flow (cfs)	Flow / Capacity (Design) (%)	Length (Unified) (ft)	Velocity (ft/s)	Depth (Normal) (ft)	Depth (Critical) (ft)	Energy Grade Line (Out) (ft)	Energy Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Hydraulic Grade Line (In) (ft)	Headloss (ft)	Upstream Structure Hydraulic Grade Line (In) (ft)
STM2.1	163	MH-22	45.90	117.4	27.8	14.61	(N/A)	1.97	7,108.87	7,110.01	7,105.53	7,106.69	1.16	7,108.02
STM2.2	275	EX 24" FES	51.50	162.0	36.0	16.39	(N/A)	1.98	7,112.20	7,114.06	7,108.02	7,109.88	1.86	7,113.61

Upstream Structure Velocity (In-Governing) (ft/s)	Upstream Structure Headloss Coefficient	Upstream Structure Headloss (ft)	Elevation Ground (Start) (ft)	Elevation Ground (Stop) (ft)	Invert (Start) (ft)	Invert (Stop) (ft)	Conduit Description
16.39	0.400	1.33	7,110.00	7,105.56	7,104.39	7,103.56	Circle - 24.0 in
16.39	1.320	5.51	7,110.00	7,108.10	7,105.39	7,106.10	Circle - 24.0 in

STRM 2.2 - 100 YR

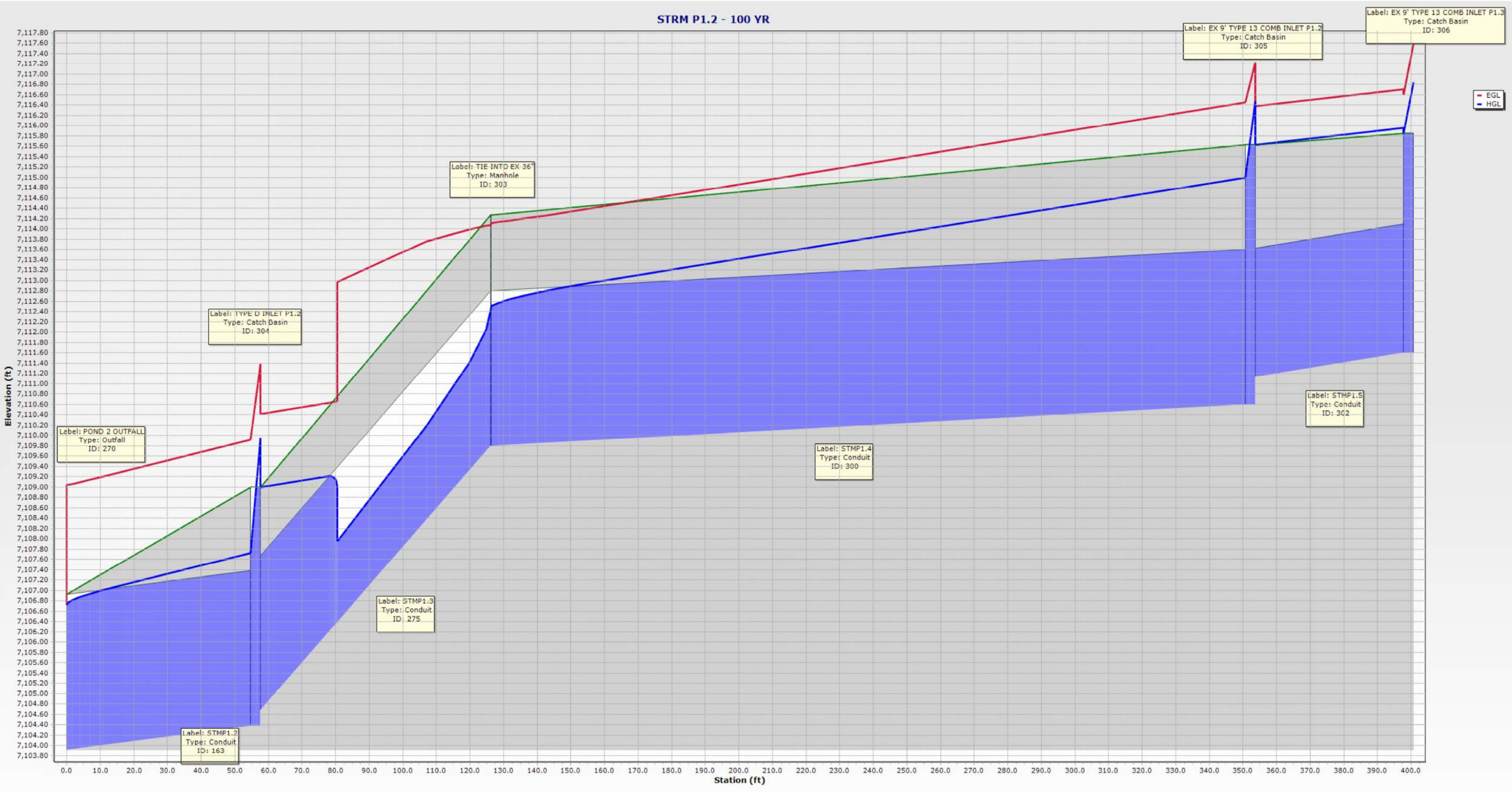


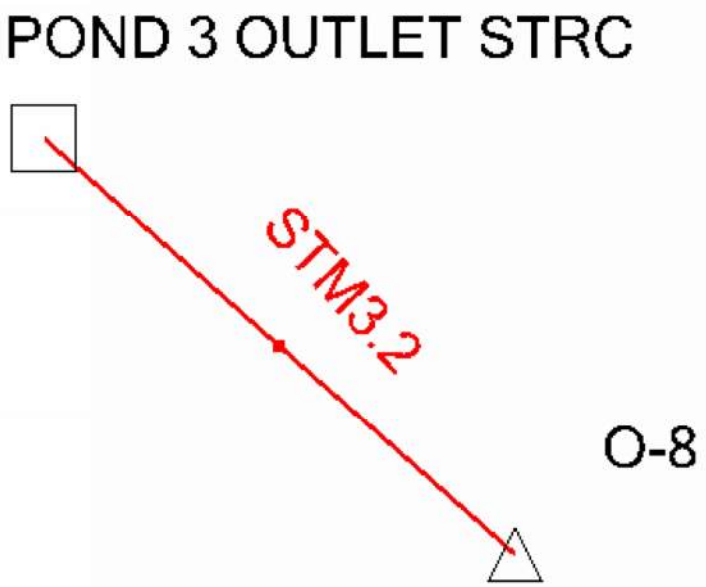

EX 9' TYPE 13 COMB INLET P1.3
STMP1.5
EX 9' TYPE 13 COMB INLET P1.2
STMP1.4
TIE INTO EX 36"
STMP1.3
POND 2 OUTFALL
STMP1.2
TYPE D INLET P1.2

FlexTable: Conduit Table

Label	ID	Upstream Structure	Flow (cfs)	Flow / Capacity (Design) (%)	Length (Unified) (ft)	Velocity (ft/s)	Depth (Normal) (ft)	Depth (Critical) (ft)	Energy Grade Line (Out) (ft)	Energy Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Hydraulic Grade Line (In) (ft)	Headloss (ft)	Upstream Structure Hydraulic Grade Line (In) (ft)
STMP1.2	163	TYPE D INLET P1.2	83.90	139.1	56.3	11.87	(N/A)	2.80	7,109.04	7,109.92	7,106.72	7,107.73	1.00	7,109.96
STMP1.3	275	TIE INTO EX 36"	67.60	37.5	70.0	23.69	1.27	2.62	7,110.42	7,114.08	7,109.00	7,112.42	3.42	7,112.51
STMP1.4	300	EX 9' TYPE 13 COMB INLET P1.2	68.20	171.6	225.9	9.65	(N/A)	2.63	7,114.11	7,116.45	7,112.51	7,115.00	2.49	7,116.48
STMP1.5	302	EX 9' TYPE 13 COMB INLET P1.3	34.10	83.2	47.1	6.95	1.74	1.99	7,116.38	7,116.71	7,115.63	7,115.96	0.33	7,116.84

Upstream Structure Velocity (In-Governing) (ft/s)	Upstream Structure Headloss Coefficient	Upstream Structure Headloss (ft)	Elevation Ground (Start) (ft)	Elevation Ground (Stop) (ft)	Invert (Start) (ft)	Invert (Stop) (ft)	Conduit Description
9.56	1.020	2.23	7,109.00	7,106.92	7,104.38	7,103.92	Circle - 36.0 in
10.16	0.050	0.08	7,109.00	7,114.27	7,104.68	7,109.80	Circle - 36.0 in
6.95	1.020	1.48	7,114.27	7,115.63	7,109.80	7,110.60	Circle - 36.0 in
6.95	1.320	0.99	7,115.63	7,115.85	7,111.13	7,111.60	Circle - 30.0 in


STRM P1.2 - 100 YR
Label: EX 9' TYPE 13 COMB INLET P1.3
Type: Catch Basin
ID: 306
Label: EX 9' TYPE 13 COMB INLET P1.2
Type: Catch Basin
ID: 305
Label: TIE INTO EX 36"
Type: Manhole
ID: 303
Label: TYPE D INLET P1.2
Type: Catch Basin
ID: 304
Label: POND 2 OUTFALL
Type: Outfall
ID: 270
Label: STMP1.5
Type: Conduit
ID: 302
Label: STMP1.4
Type: Conduit
ID: 300
Label: STMP1.3
Type: Conduit
ID: 275
Label: STMP1.2
Type: Conduit
ID: 163
EGL
HGL
Elevation (ft)
Station (ft)

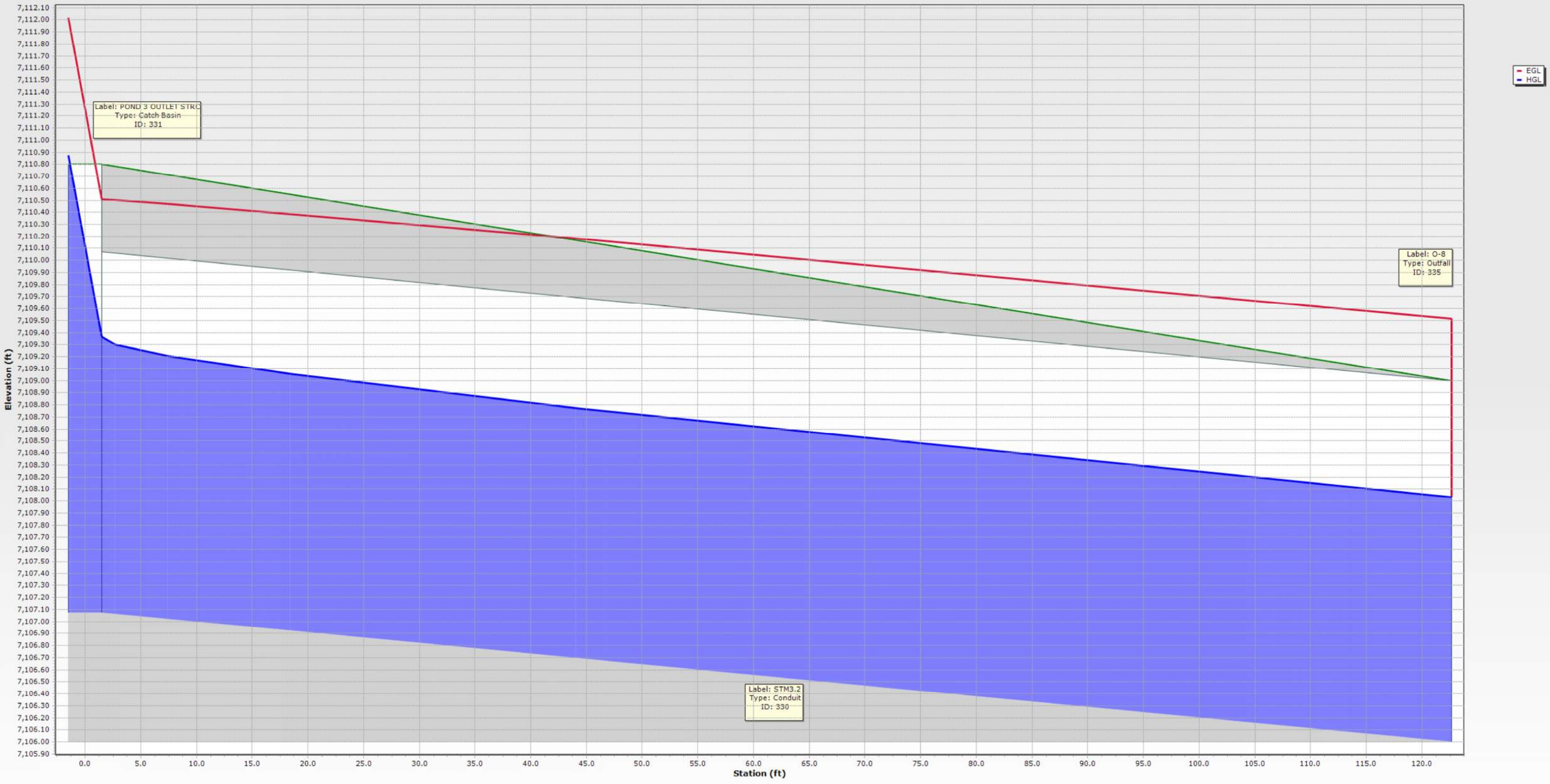

POND 3 OUTLET STRC
STM3.2
O-8

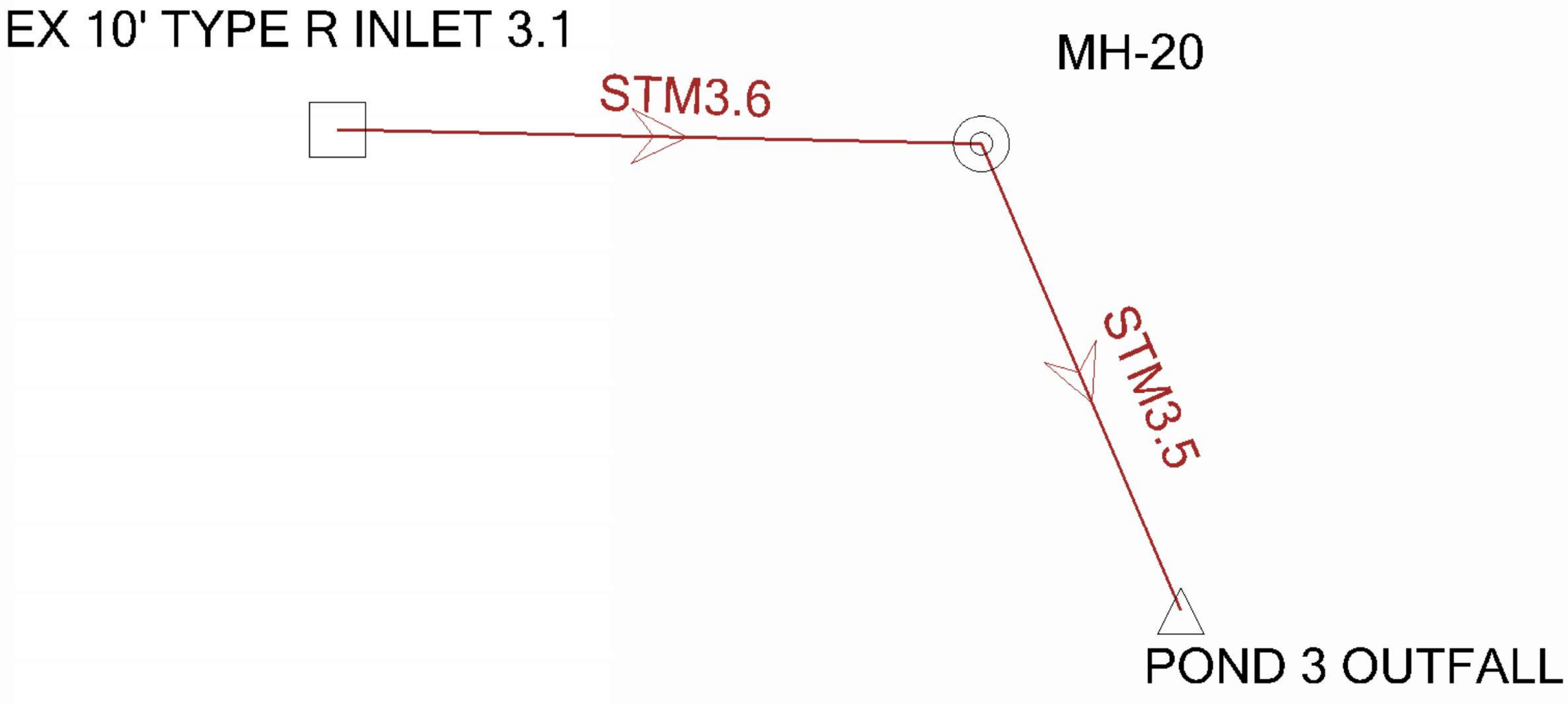
FlexTable: Conduit Table

Label	ID	Upstream Structure	Flow (cfs)	Flow / Capacity (Design) (%)	Length (Unified) (ft)	Velocity (ft/s)	Depth (Normal) (ft)	Depth (Critical) (ft)	Energy Grade Line (Out) (ft)	Energy Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Hydraulic Grade Line (In) (ft)	Headloss (ft)	Upstream Structure Hydraulic Grade Line (In) (ft)
STM3.2	330	POND 3 OUTLET STRC	49.80	79.9	122.7	9.79	2.03	2.30	7,109.51	7,110.51	7,108.03	7,109.37	1.33	7,110.88

Upstream Structure Velocity (In-Governing) (ft/s)	Upstream Structure Headloss Coefficient	Upstream Structure Headloss (ft)	Elevation Ground (Start) (ft)	Elevation Ground (Stop) (ft)	Invert (Start) (ft)	Invert (Stop) (ft)	Conduit Description
8.57	1.320	1.51	7,109.00	7,110.80	7,106.00	7,107.07	Circle - 36.0 in

STRM 3 - 100 YR

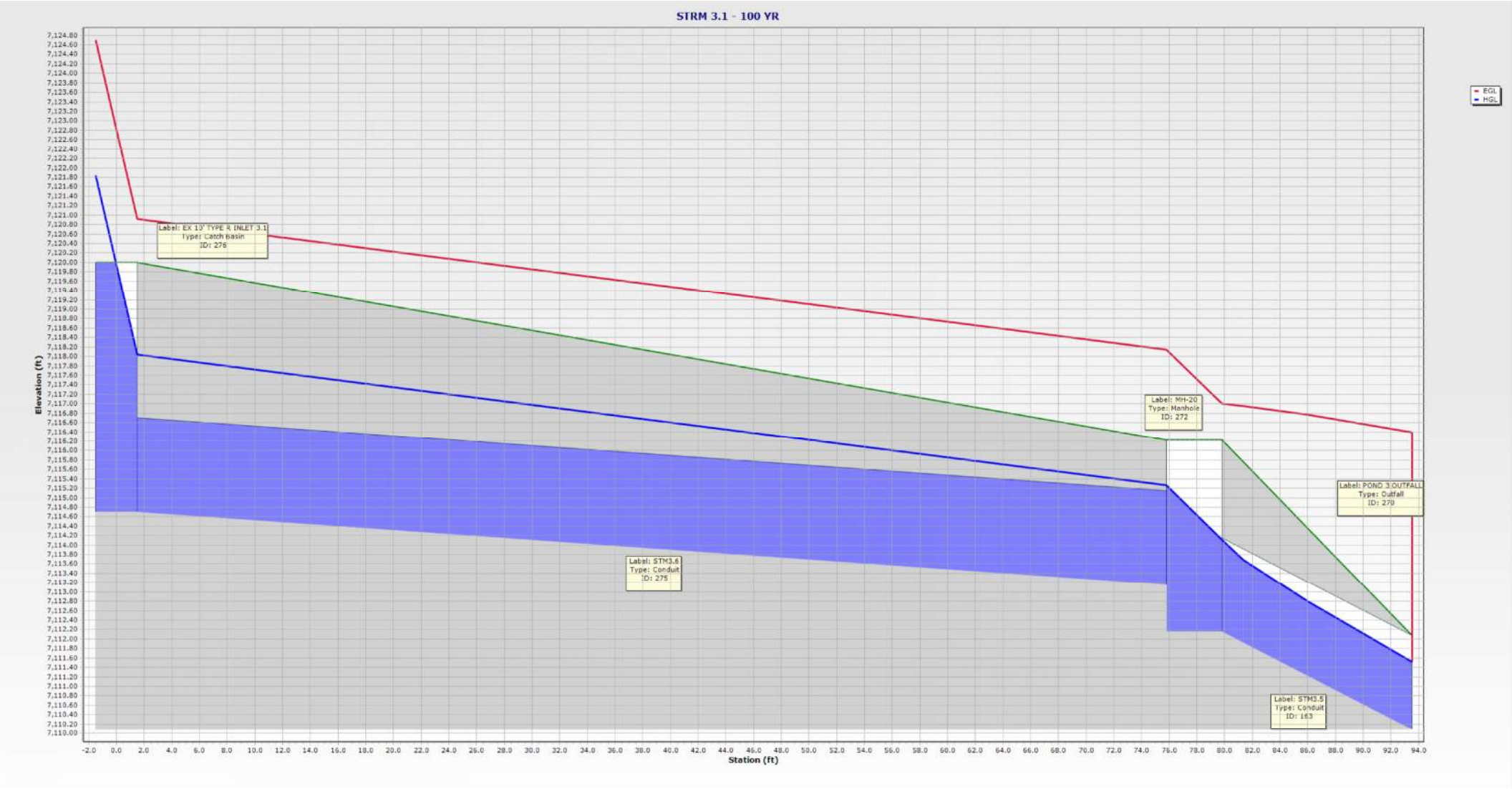

EGL
HGL
Label: POND 3 OUTLET STRC
Type: Catch Basin
ID: 331
Label: O-8
Type: Outfall
ID: 335
Label: STM3.2
Type: Conduit
ID: 330
Elevation (ft)
Station (ft)
7,112.10
7,112.00
7,111.90
7,111.80
7,111.70
7,111.60
7,111.50
7,111.40
7,111.30
7,111.20
7,111.10
7,111.00
7,110.90
7,110.80
7,110.70
7,110.60
7,110.50
7,110.40
7,110.30
7,110.20
7,110.10
7,110.00
7,109.90
7,109.80
7,109.70
7,109.60
7,109.50
7,109.40
7,109.30
7,109.20
7,109.10
7,109.00
7,108.90
7,108.80
7,108.70
7,108.60
7,108.50
7,108.40
7,108.30
7,108.20
7,108.10
7,108.00
7,107.90
7,107.80
7,107.70
7,107.60
7,107.50
7,107.40
7,107.30
7,107.20
7,107.10
7,107.00
7,106.90
7,106.80
7,106.70
7,106.60
7,106.50
7,106.40
7,106.30
7,106.20
7,106.10
7,106.00
7,105.90
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

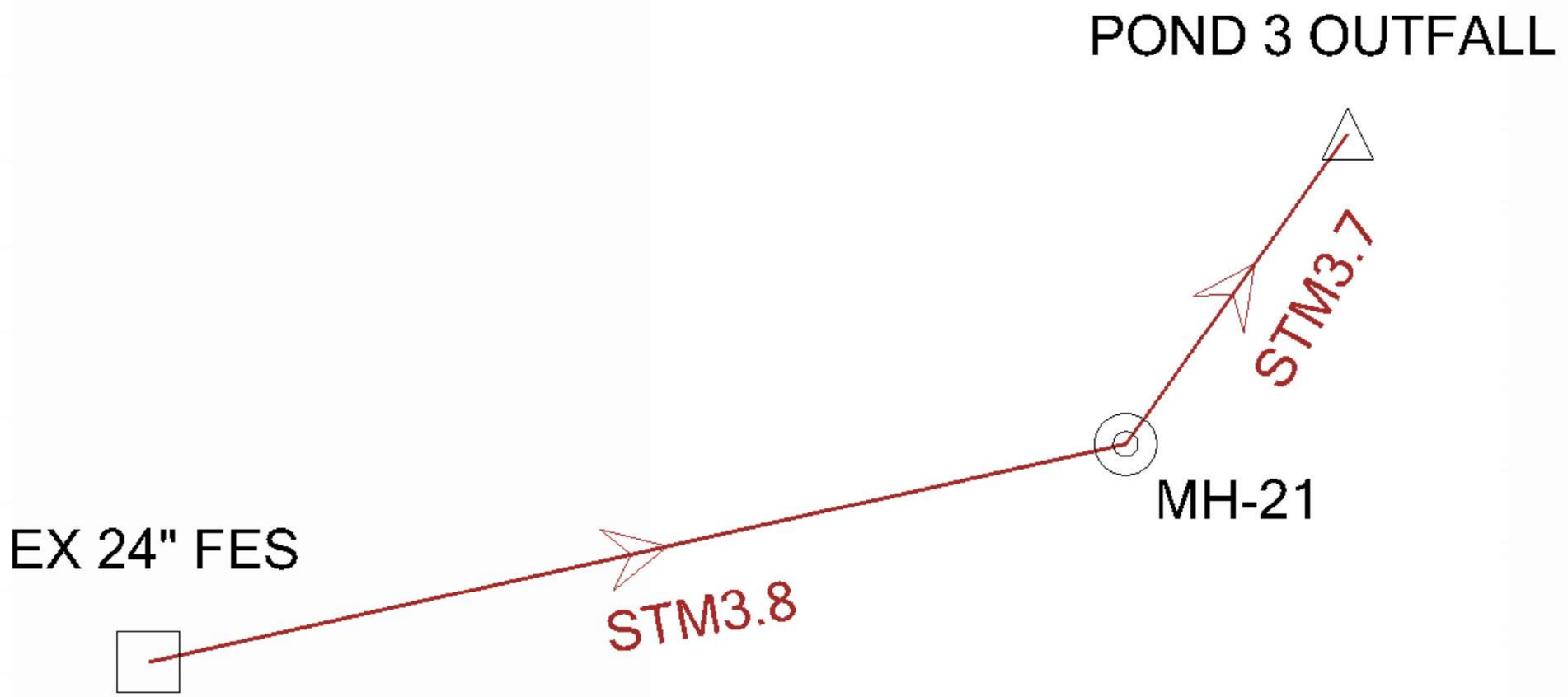

EX 10' TYPE R INLET 3.1
MH-20
STM3.6
STM3.5
POND 3 OUTFALL

FlexTable: Conduit Table

Label	ID	Upstream Structure	Flow (cfs)	Flow / Capacity (Design) (%)	Length (Unified) (ft)	Velocity (ft/s)	Depth (Normal) (ft)	Depth (Critical) (ft)	Energy Grade Line (Out) (ft)	Energy Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Hydraulic Grade Line (In) (ft)	Headloss (ft)	Upstream Structure Hydraulic Grade Line (In) (ft)
STM3.5	163	MH-20	42.70	52.0	15.7	26.38	1.02	1.96	7,116.40	7,117.01	7,111.51	7,114.11	2.60	7,115.27
STM3.6	275	EX 10' TYPE R INLET 3.1	42.70	133.7	77.8	13.59	(N/A)	1.96	7,118.14	7,120.91	7,115.27	7,118.04	2.77	7,121.83

Upstream Structure Velocity (In-Governing) (ft/s)	Upstream Structure Headloss Coefficient	Upstream Structure Headloss (ft)	Elevation Ground (Start) (ft)	Elevation Ground (Stop) (ft)	Invert (Start) (ft)	Invert (Stop) (ft)	Conduit Description
13.59	0.400	1.16	7,116.22	7,112.08	7,112.15	7,110.08	Circle - 24.0 in
13.59	1.320	3.79	7,116.22	7,120.00	7,113.15	7,114.70	Circle - 24.0 in

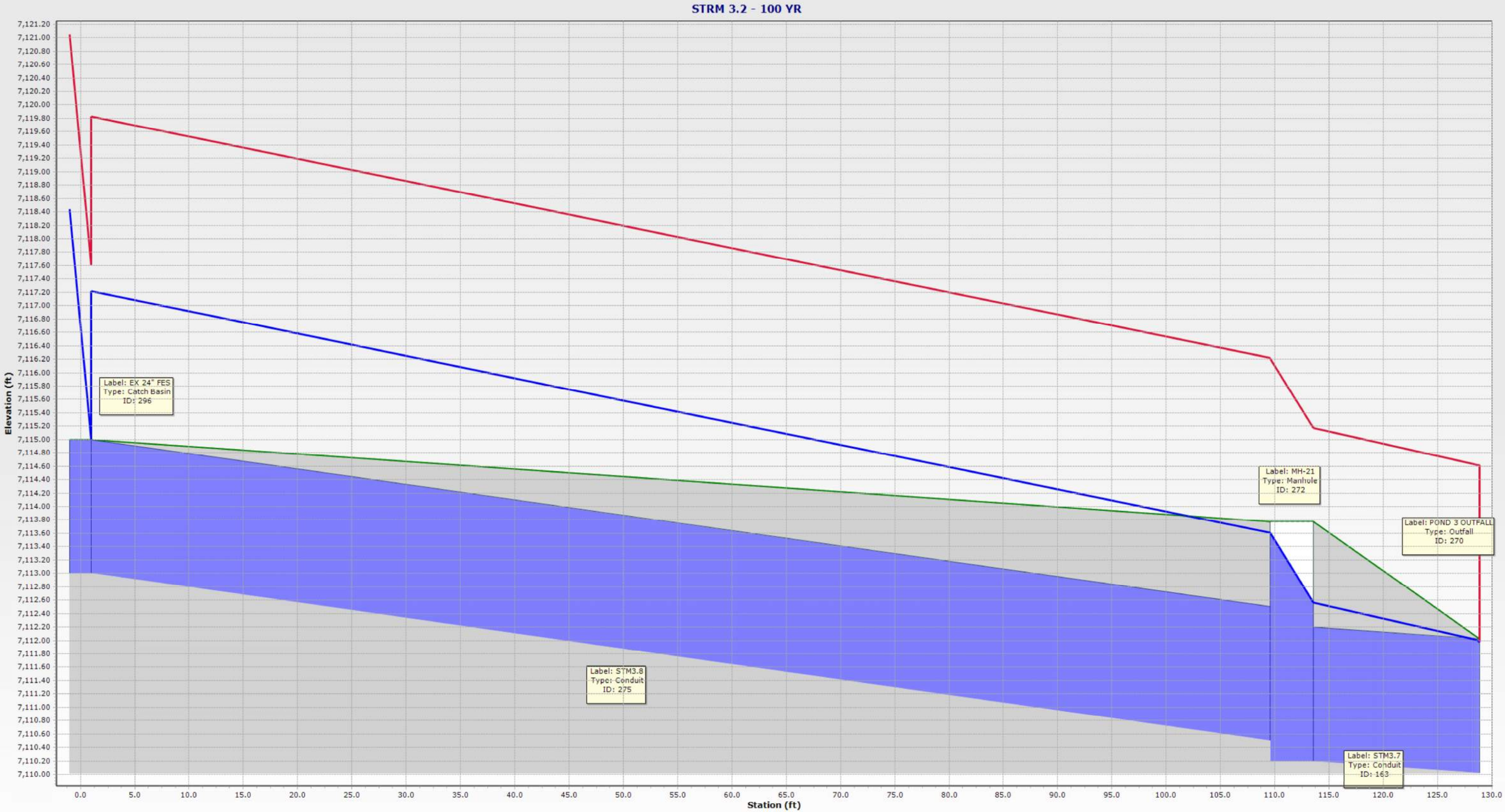

STRM 3.1 - 100 YR
EGL
HGL
Label: EX 10' TYPE R INLET 3.1
Type: Catch Basin
ID: 276
Label: MH-20
Type: Manhole
ID: 272
Label: POND 3 OUTFALL
Type: Outfall
ID: 279
Label: STM3.6
Type: Conduit
ID: 275
Label: STM3.5
Type: Conduit
ID: 163
Elevation (ft)
Station (ft)

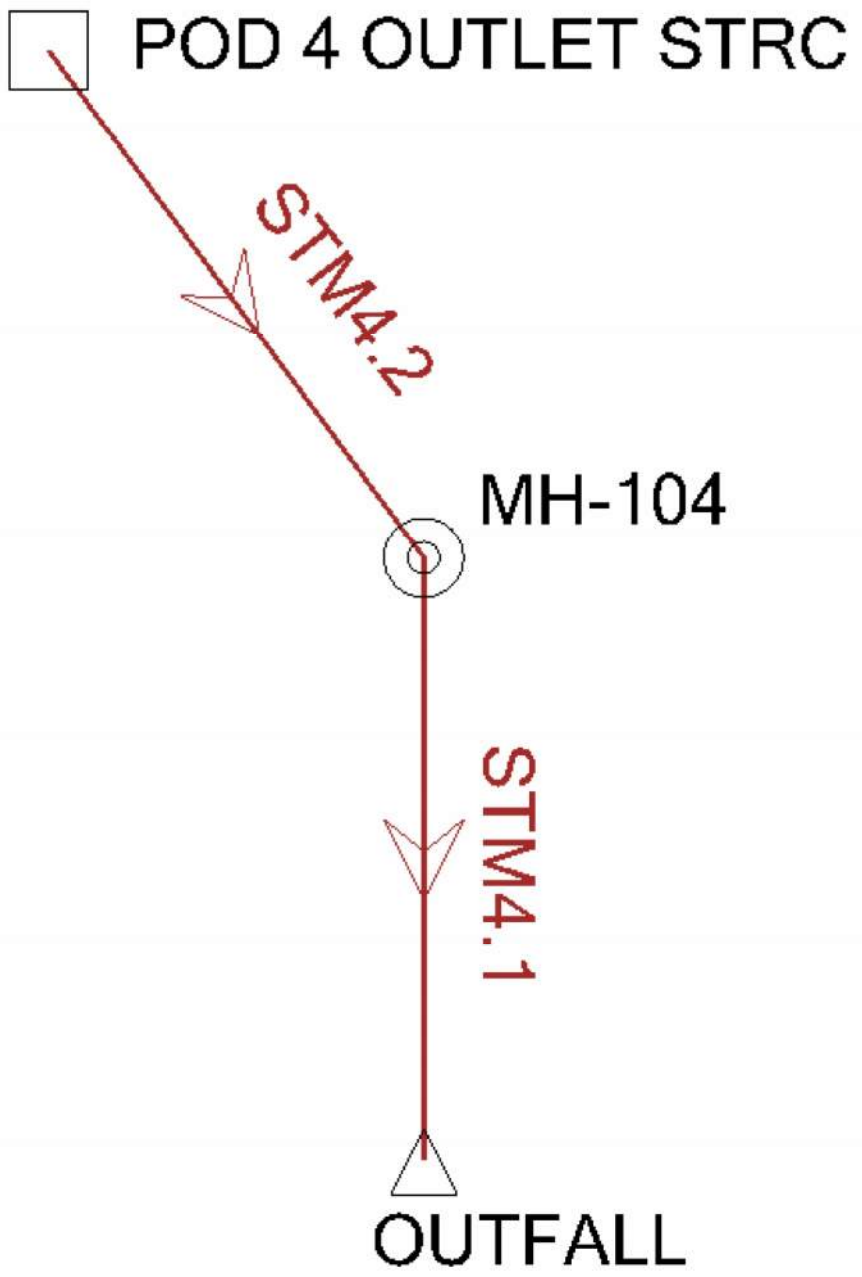

POND 3 OUTFALL
STM3.7
MH-21
EX 24" FES
STM3.8

FlexTable: Conduit Table

Label	ID	Upstream Structure	Flow (cfs)	Flow / Capacity (Design) (%)	Length (Unified) (ft)	Velocity (ft/s)	Depth (Normal) (ft)	Depth (Critical) (ft)	Energy Grade Line (Out) (ft)	Energy Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Hydraulic Grade Line (In) (ft)	Headloss (ft)	Upstream Structure Hydraulic Grade Line (In) (ft)
STM3.7	163	MH-21	40.70	176.4	17.3	12.96	(N/A)	1.96	7,114.61	7,115.17	7,111.98	7,112.56	0.59	7,113.61
STM3.8	275	EX 24" FES	40.70	120.2	111.6	12.96	(N/A)	1.96	7,116.22	7,119.83	7,113.61	7,117.22	3.61	7,118.44

Upstream Structure Velocity (In-Governing) (ft/s)	Upstream Structure Headloss Coefficient	Upstream Structure Headloss (ft)	Elevation Ground (Start) (ft)	Elevation Ground (Stop) (ft)	Invert (Start) (ft)	Invert (Stop) (ft)	Conduit Description
12.96	0.400	1.04	7,113.78	7,112.02	7,110.20	7,110.02	Circle - 24.0 in
12.96	1.320	3.44	7,113.78	7,115.00	7,110.50	7,113.00	Circle - 24.0 in

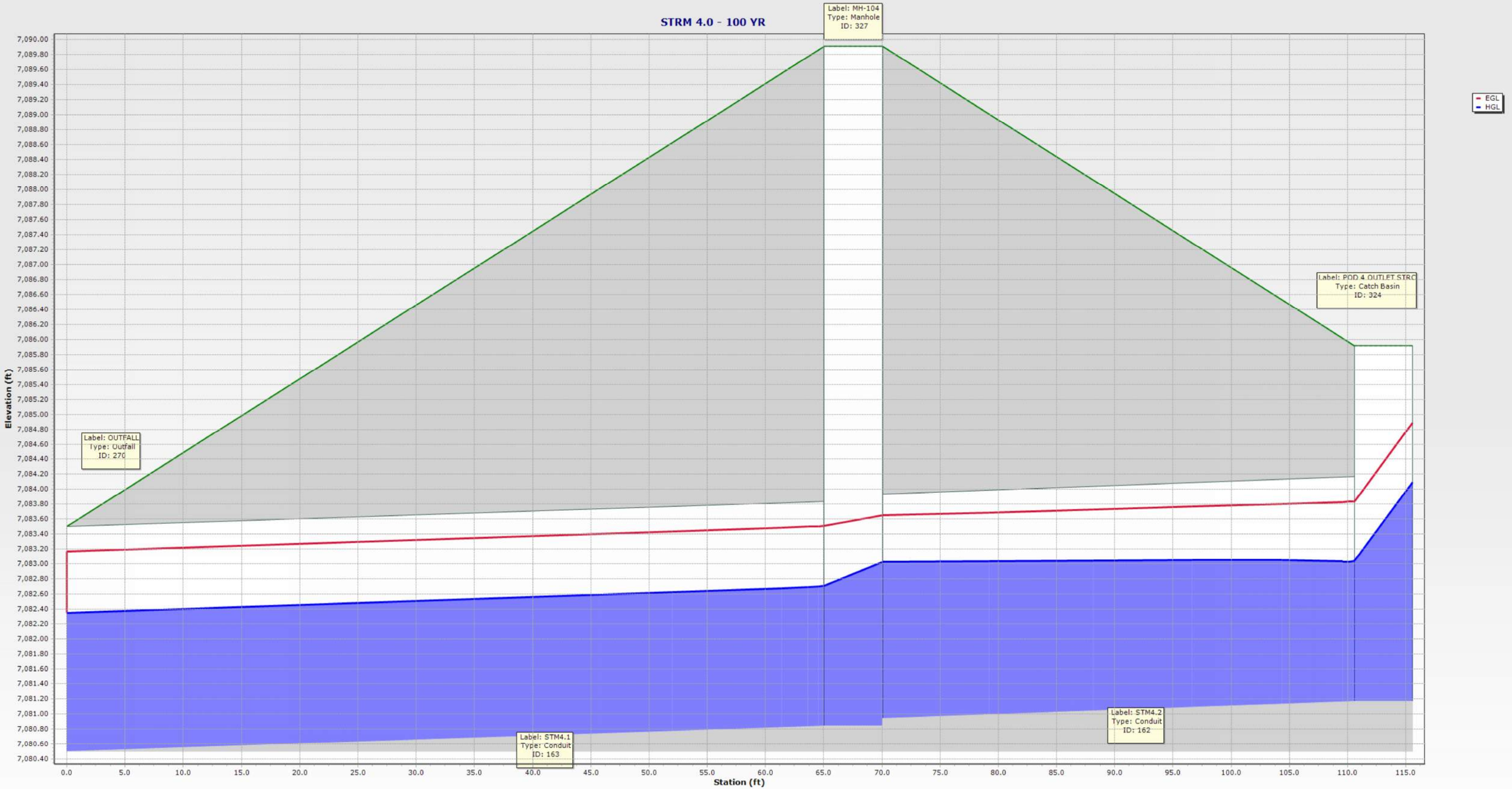

STRM 3.2 - 100 YR
EGL
HGL
Elevation (ft)
Station (ft)
Label: EX 24" FES
Type: Catch Basin
ID: 296
Label: STM3.8
Type: Conduit
ID: 275
Label: MH-21
Type: Manhole
ID: 272
Label: POND 3 OUTFALL
Type: Outfall
ID: 270
Label: STM3.7
Type: Conduit
ID: 163

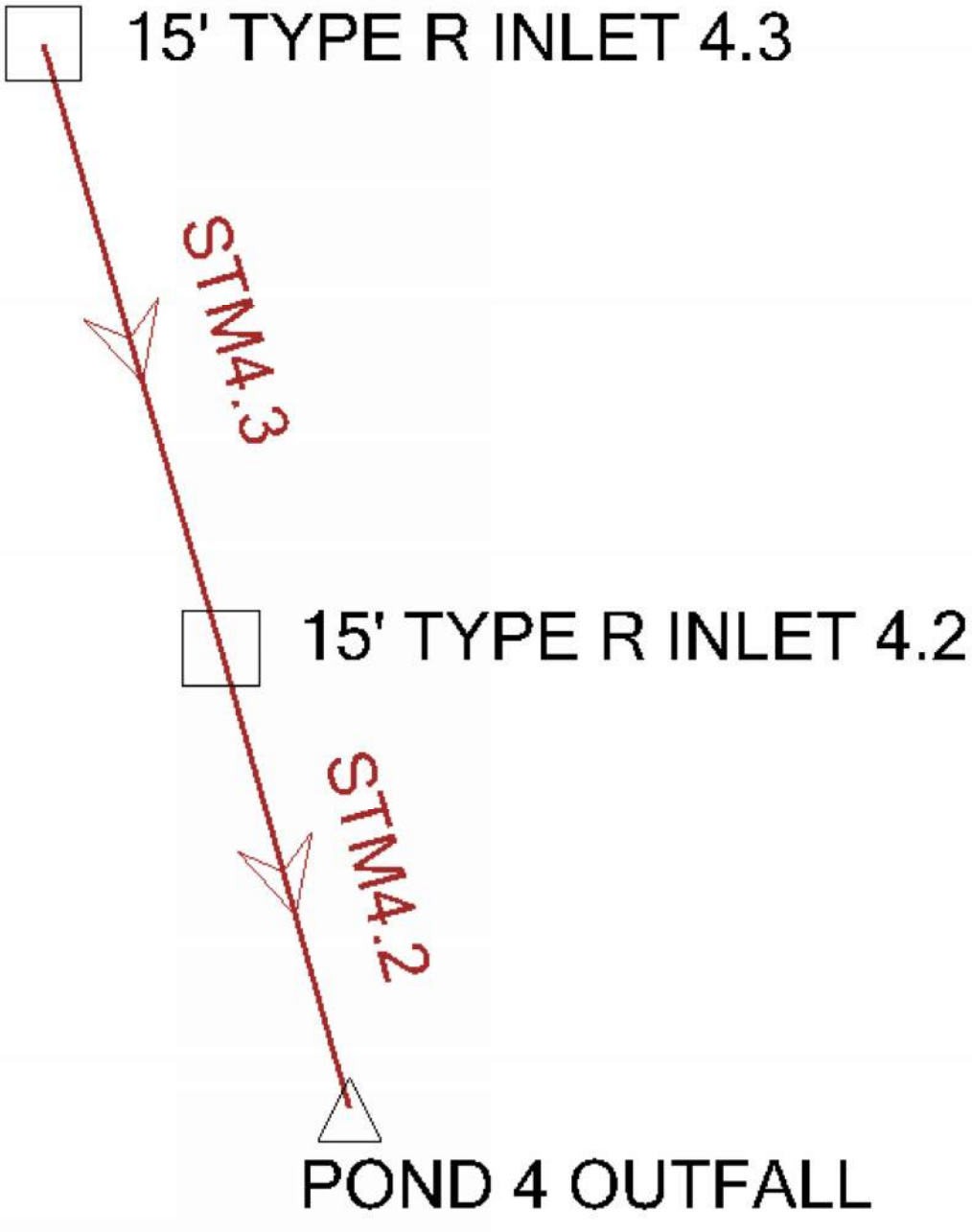

POD 4 OUTLET STRC
STM4.2
MH-104
STM4.1
OUTFALL

FlexTable: Conduit Table

Label	ID	Upstream Structure	Flow (cfs)	Flow / Capacity (Design) (%)	Length (Unified) (ft)	Velocity (ft/s)	Depth (Normal) (ft)	Depth (Critical) (ft)	Energy Grade Line (Out) (ft)	Energy Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Hydraulic Grade Line (In) (ft)	Headloss (ft)	Upstream Structure Hydraulic Grade Line (In) (ft)
STM4.2	162	POD 4 OUTLET STRC	33.20	70.0	45.5	7.26	1.85	1.87	7,083.65	7,083.84	7,083.03	7,083.04	0.01	7,084.09
STM4.1	163	MH-104	33.20	70.2	67.6	7.25	1.85	1.87	7,083.17	7,083.51	7,082.35	7,082.71	0.36	7,083.03

Upstream Structure Velocity (In-Governing) (ft/s)	Upstream Structure Headloss Coefficient	Upstream Structure Headloss (ft)	Elevation Ground (Start) (ft)	Elevation Ground (Stop) (ft)	Invert (Start) (ft)	Invert (Stop) (ft)	Conduit Description
7.16	1.320	1.05	7,089.91	7,085.91	7,080.94	7,081.17	Circle - 36.0 in
6.32	0.400	0.32	7,089.91	7,083.50	7,080.84	7,080.50	Circle - 36.0 in

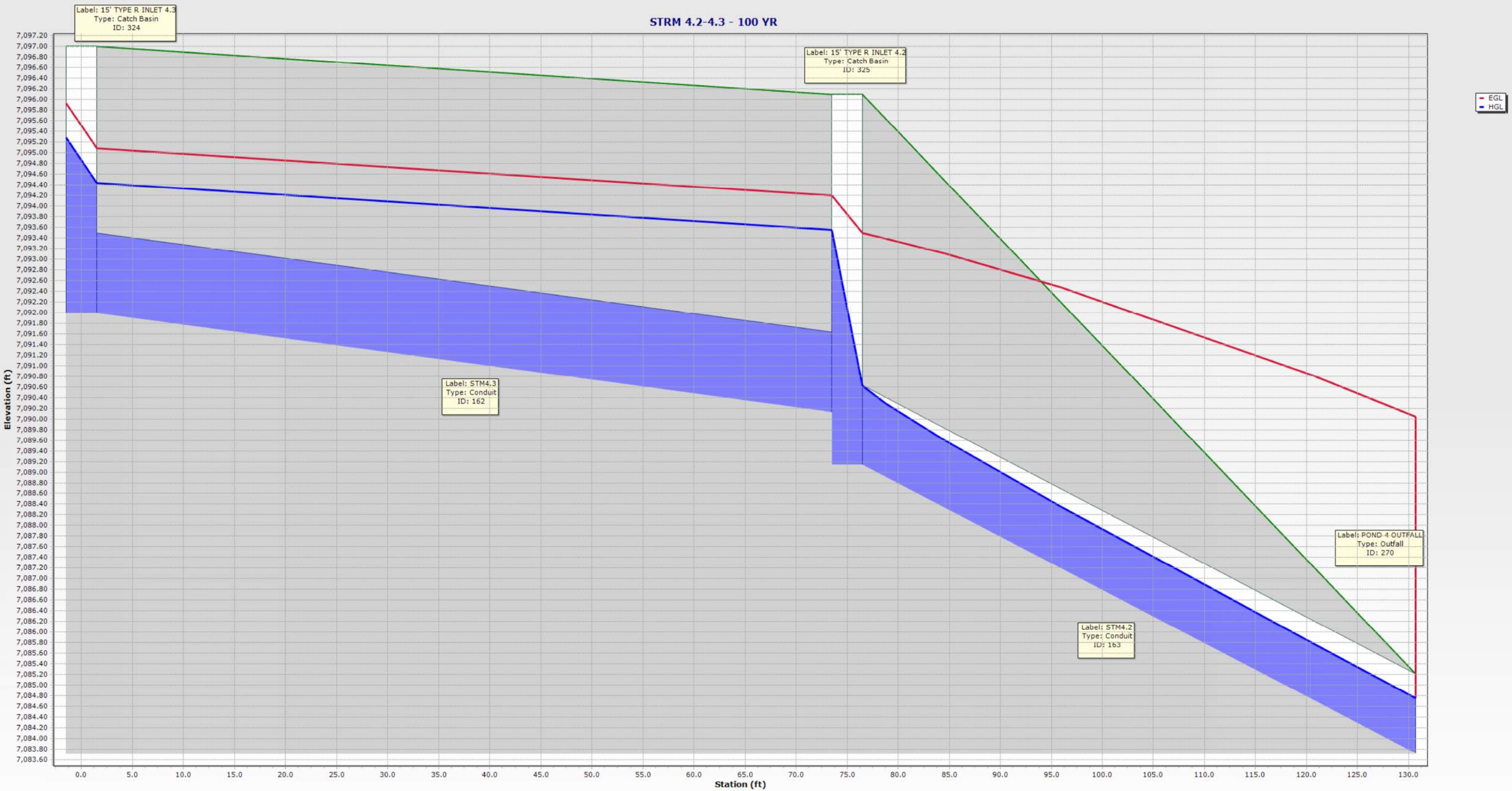

STRM 4.0 - 100 YR
Label: MH-104
Type: Manhole
ID: 327
Label: POD 4 OUTLET STRC
Type: Catch Basin
ID: 324
Label: OUTFALL
Type: Outfall
ID: 270
Label: STM4.1
Type: Conduit
ID: 163
Label: STM4.2
Type: Conduit
ID: 162
EGL
HGL
Elevation (ft)
Station (ft)
7,090.00
7,089.80
7,089.60
7,089.40
7,089.20
7,089.00
7,088.80
7,088.60
7,088.40
7,088.20
7,088.00
7,087.80
7,087.60
7,087.40
7,087.20
7,087.00
7,086.80
7,086.60
7,086.40
7,086.20
7,086.00
7,085.80
7,085.60
7,085.40
7,085.20
7,085.00
7,084.80
7,084.60
7,084.40
7,084.20
7,084.00
7,083.80
7,083.60
7,083.40
7,083.20
7,083.00
7,082.80
7,082.60
7,082.40
7,082.20
7,082.00
7,081.80
7,081.60
7,081.40
7,081.20
7,081.00
7,080.80
7,080.60
7,080.40
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

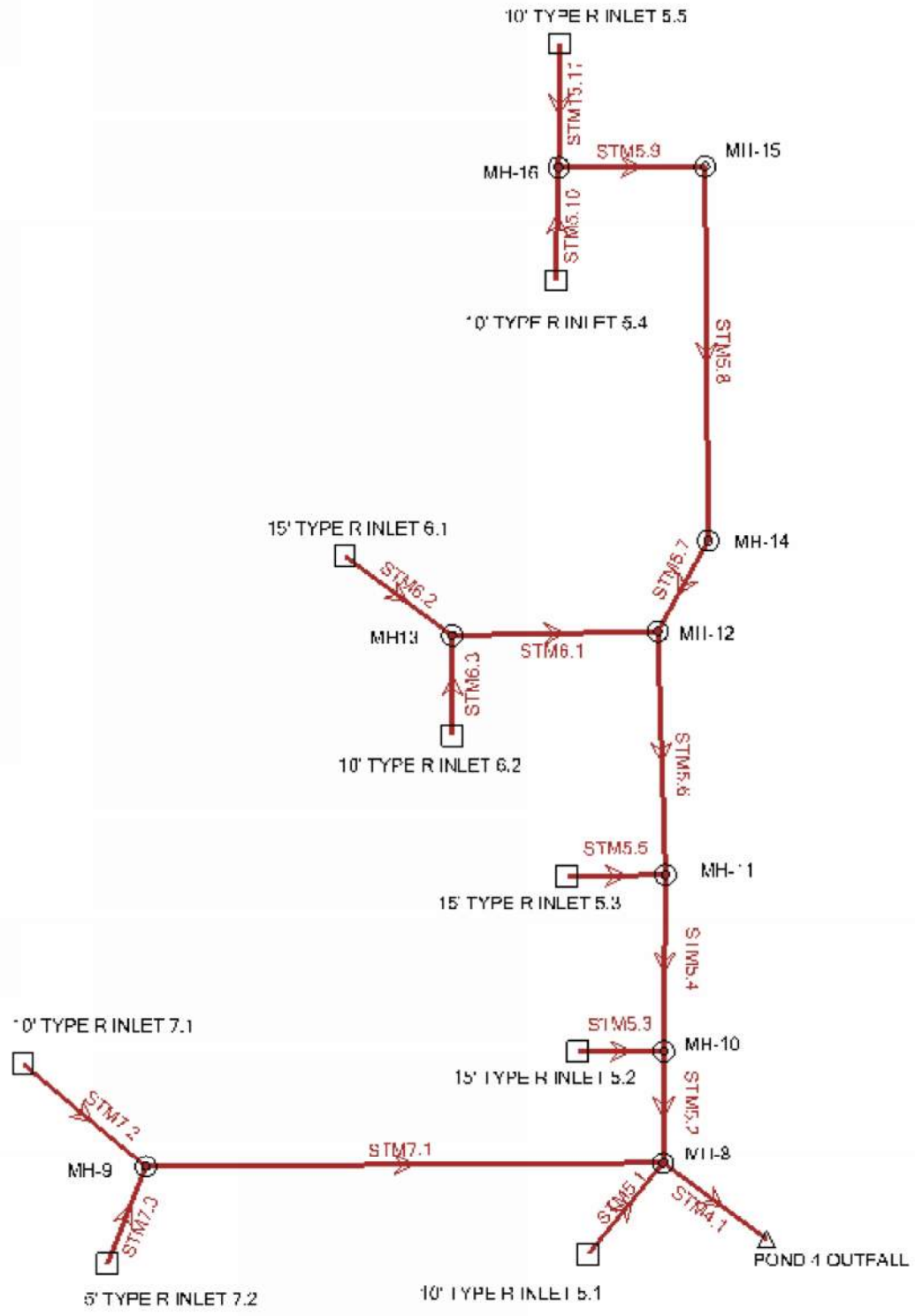

15' TYPE R INLET 4.3
STM4.3
15' TYPE R INLET 4.2
STM4.2
POND 4 OUTFALL

FlexTable: Conduit Table

Label	ID	Upstream Structure	Flow (cfs)	Flow / Capacity (Design) (%)	Length (Unified) (ft)	Velocity (ft/s)	Depth (Normal) (ft)	Depth (Critical) (ft)	Energy Grade Line (Out) (ft)	Energy Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Hydraulic Grade Line (In) (ft)	Headloss (ft)	Upstream Structure Hydraulic Grade Line (In) (ft)
STM4.3	162	15' TYPE R INLET 4.3	11.40	68.9	75.0	6.45	0.92	1.29	7,094.20	7,095.08	7,093.55	7,094.43	0.88	7,095.29
STM4.2	163	15' TYPE R INLET 4.2	24.00	73.3	55.7	20.25	0.95	1.48	7,090.04	7,093.49	7,084.76	7,090.61	5.86	7,093.55

Upstream Structure Velocity (In-Governing) (ft/s)	Upstream Structure Headloss Coefficient	Upstream Structure Headloss (ft)	Elevation Ground (Start) (ft)	Elevation Ground (Stop) (ft)	Invert (Start) (ft)	Invert (Stop) (ft)	Conduit Description
6.45	1.320	0.85	7,096.09	7,097.00	7,090.13	7,091.99	Circle - 18.0 in
6.45	1.020	2.93	7,096.09	7,085.22	7,089.13	7,083.72	Circle - 18.0 in

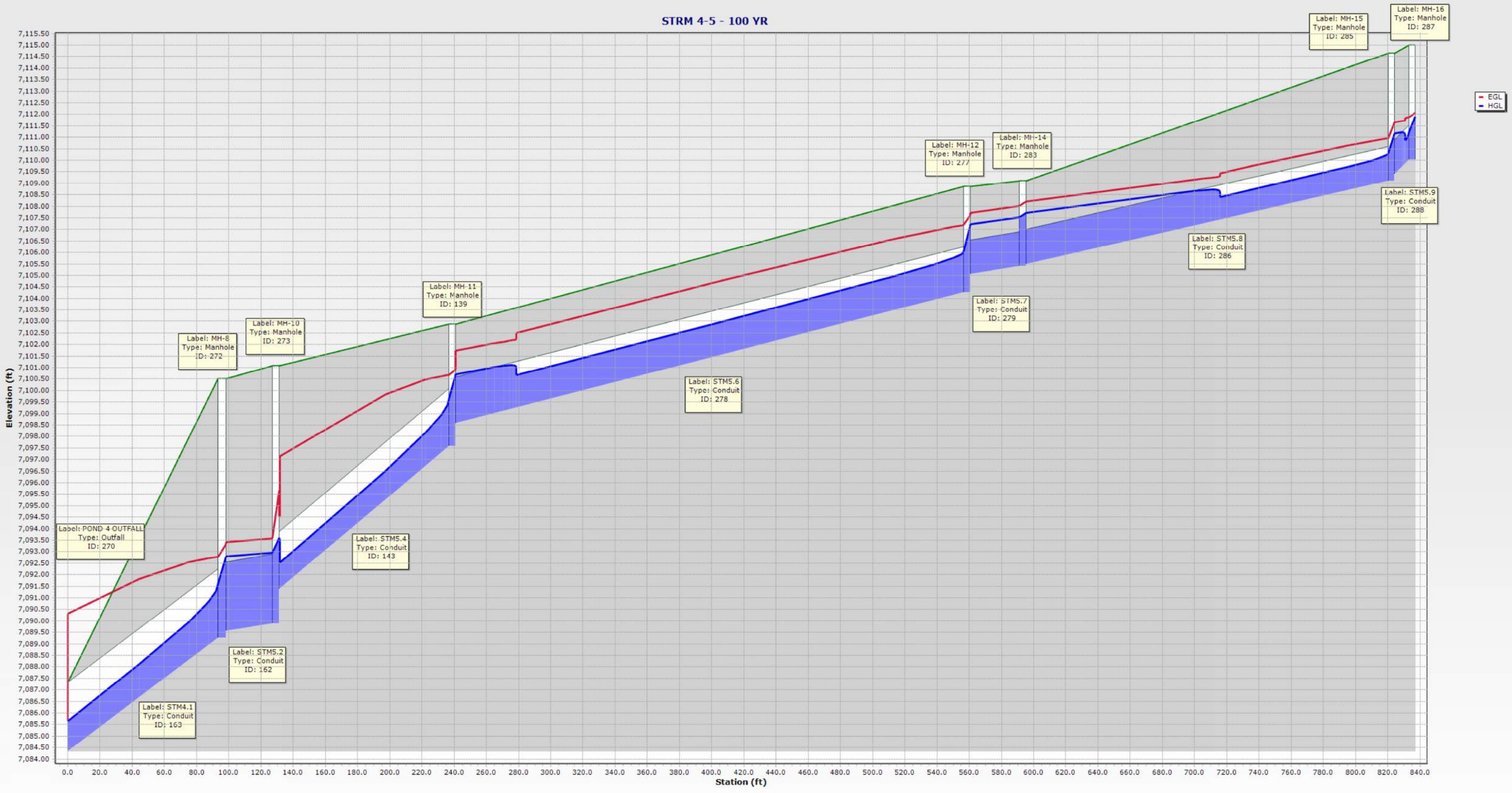

STRM 4.2-4.3 - 100 YR
Label: 15' TYPE R INLET 4.3
Type: Catch Basin
ID: 324
Label: 15' TYPE R INLET 4.2
Type: Catch Basin
ID: 325
Label: STM4.3
Type: Conduit
ID: 162
Label: STM4.2
Type: Conduit
ID: 163
Label: POND 4 OUTFALL
Type: Outfall
ID: 270
EGL
HGL
Elevation (ft)
Station (ft)

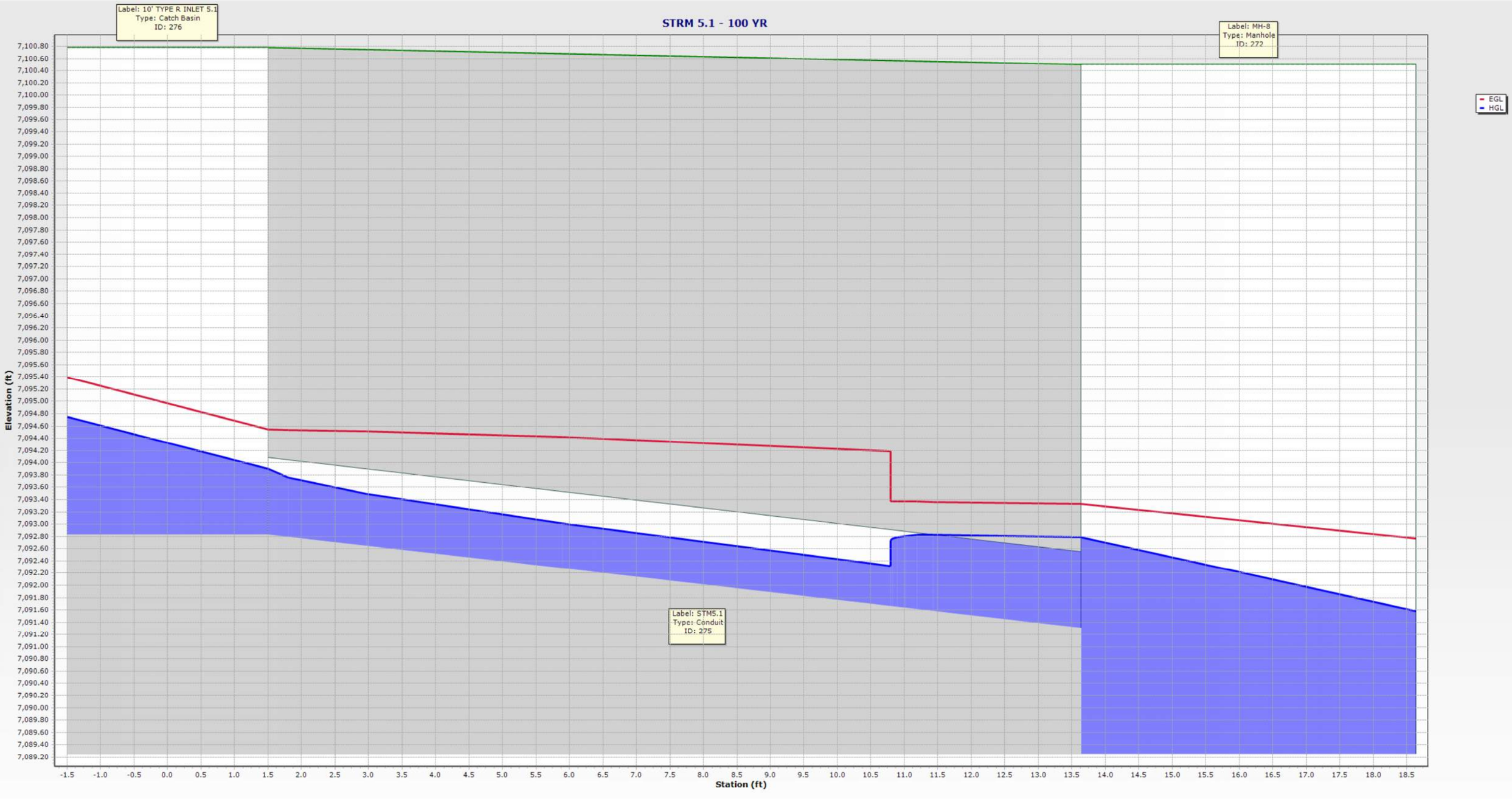

10' TYPE R INLET 5.5
STM5.11
STM5.9
MH-15
MH-16
STM5.10
10' TYPE R INLET 5.4
STM5.8
15' TYPE R INLET 6.1
STM6.2
STM5.7
MH-14
MH13
STM6.1
MH-12
STM6.3
10' TYPE R INLET 6.2
STM5.6
STM5.5
MH-11
15' TYPE R INLET 5.3
STM5.4
10' TYPE R INLET 7.1
STM5.3
MH-10
15' TYPE R INLET 5.2
STM7.2
STM5.2
MH-9
STM7.1
MH-8
STM7.3
STM5.1
STM4.1
POND 1 OUTFALL
5' TYPE R INLET 7.2
10' TYPE R INLET 5.1

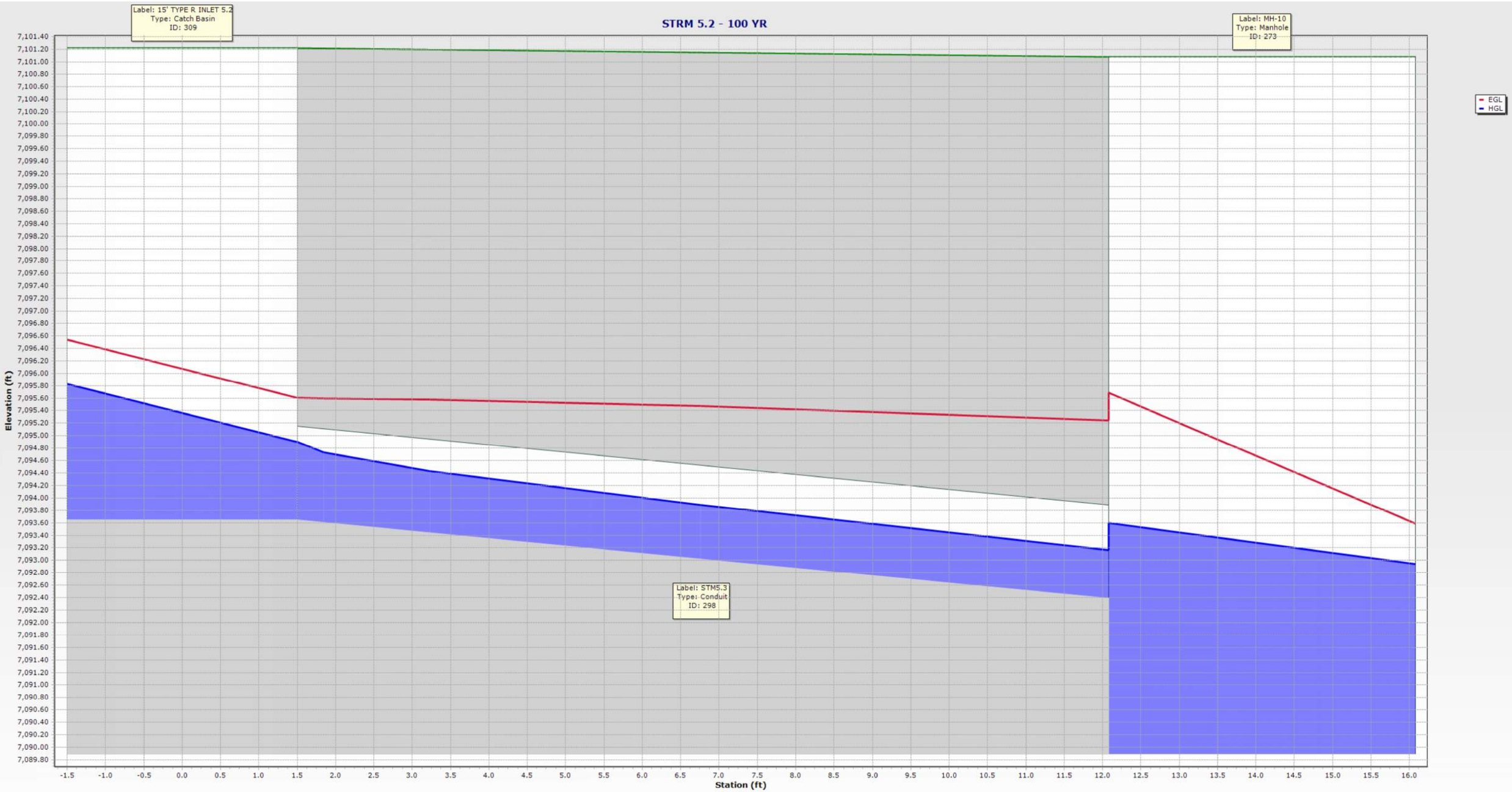
FlexTable: Conduit Table

Label	ID	Upstream Structure	Flow (cfs)	Flow / Capacity (Design) (%)	Length (Unified) (ft)	Velocity (ft/s)	Depth (Normal) (ft)	Depth (Critical) (ft)	Energy Grade Line (Out) (ft)	Energy Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Hydraulic Grade Line (In) (ft)	Headloss (ft)	Upstream Structure Hydraulic Grade Line (In) (ft)
STM5.4	143	MH-11	35.40	36.3	109.6	18.28	1.04	2.02	7,094.52	7,100.69	7,093.60	7,099.61	6.01	7,100.71
STM5.2	162	MH-10	45.30	67.4	33.5	6.41	1.80	2.19	7,093.43	7,093.58	7,092.79	7,092.95	0.15	7,093.60
STM4.1	163	MH-8	51.50	34.1	95.7	19.34	1.21	2.33	7,090.32	7,092.77	7,085.65	7,091.58	5.93	7,092.79
STM5.1	275	10' TYPE R INLET 5.1	7.20	36.2	16.1	14.91	0.52	1.07	7,093.33	7,094.54	7,092.79	7,093.90	1.11	7,094.75
STM5.6	278	MH-12	25.60	85.1	319.8	10.75	1.42	1.78	7,101.74	7,107.20	7,100.71	7,106.03	5.32	7,107.22
STM5.7	279	MH-14	9.90	93.6	34.5	5.60	1.15	1.21	7,107.71	7,108.02	7,107.22	7,107.53	0.31	7,107.72
STM6.1	281	MH13	16.40	66.6	28.7	5.22	1.19	1.46	7,107.64	7,107.80	7,107.22	7,107.37	0.15	7,107.80
STM5.8	286	MH-15	9.90	75.3	229.0	8.17	0.97	1.21	7,108.21	7,110.95	7,107.72	7,110.30	2.58	7,111.16
STM5.9	288	MH-16	9.90	42.6	12.9	12.62	0.68	1.21	7,111.65	7,111.88	7,111.16	7,111.23	0.07	7,111.90
STM15.11	290	10' TYPE R INLET 5.5	6.30	93.2	24.7	5.13	0.96	1.01	7,112.31	7,112.54	7,111.90	7,112.13	0.23	7,112.67
STM7.1	292	MH-9	7.70	36.9	317.1	10.92	0.63	1.08	7,093.09	7,105.41	7,092.79	7,104.91	12.11	7,105.17
STM7.2	294	10' TYPE R INLET 7.1	5.80	89.1	35.5	5.99	0.92	0.97	7,105.61	7,105.96	7,105.17	7,105.46	0.30	7,106.12
STM7.3	296	5' TYPE R INLET 7.2	2.40	37.2	5.0	4.87	0.53	0.62	7,105.24	7,105.25	7,105.17	7,105.17	0.00	7,105.28
STM5.3	298	15' TYPE R INLET 5.2	10.60	33.7	14.1	16.05	0.60	1.25	7,095.25	7,095.60	7,093.16	7,094.90	1.74	7,095.83
STM5.5	300	15' TYPE R INLET 5.3	11.30	51.0	4.2	3.60	1.01	1.21	7,100.91	7,100.92	7,100.71	7,100.72	0.01	7,100.99
STM5.10	302	10' TYPE R INLET 5.4	3.90	29.1	6.3	3.18	0.46	0.80	7,112.05	7,112.08	7,111.90	7,111.92	0.02	7,112.13
STM6.2	304	15' TYPE R INLET 6.1	11.40	88.0	34.9	6.45	1.09	1.29	7,108.45	7,108.86	7,107.80	7,108.21	0.41	7,109.07
STM6.3	306	10' TYPE R INLET 6.2	5.20	81.6	6.2	4.24	0.86	0.92	7,108.08	7,108.12	7,107.80	7,107.84	0.04	7,108.21

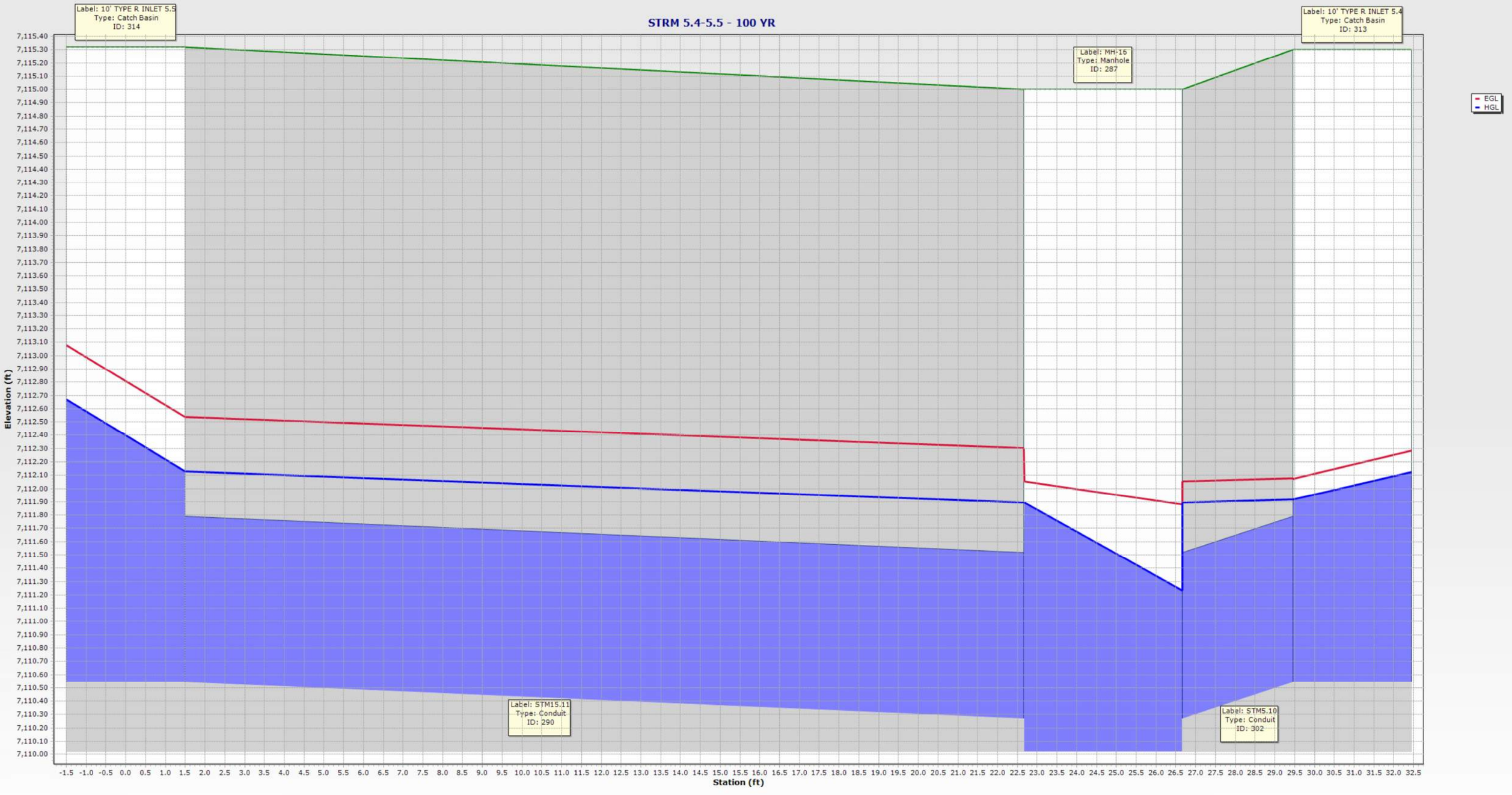
Upstream Structure Velocity (In-Governing) (ft/s)	Upstream Structure Headloss Coefficient	Upstream Structure Headloss (ft)	Elevation Ground (Start) (ft)	Elevation Ground (Stop) (ft)	Invert (Start) (ft)	Invert (Stop) (ft)	Conduit Description
3.60	1.020	1.10	7,101.08	7,102.89	7,091.39	7,097.59	Circle - 30.0 in
11.59	1.020	0.65	7,100.50	7,101.08	7,089.55	7,089.89	Circle - 36.0 in
5.87	1.020	1.21	7,100.50	7,087.34	7,089.25	7,084.34	Circle - 36.0 in
6.43	1.320	0.85	7,100.50	7,100.78	7,091.30	7,092.83	Circle - 15.0 in
5.22	1.020	1.19	7,102.89	7,108.85	7,098.59	7,104.25	Circle - 24.0 in
5.60	0.400	0.20	7,108.85	7,109.11	7,105.05	7,105.40	Circle - 18.0 in
6.45	1.020	0.43	7,108.85	7,109.73	7,104.55	7,104.89	Circle - 24.0 in
5.60	1.320	0.86	7,109.11	7,114.66	7,105.50	7,109.09	Circle - 18.0 in
3.18	1.020	0.66	7,114.66	7,115.00	7,109.39	7,110.02	Circle - 18.0 in
5.13	1.320	0.54	7,115.00	7,115.32	7,110.27	7,110.54	Circle - 15.0 in
2.21	0.520	0.26	7,100.50	7,108.02	7,091.30	7,103.83	Circle - 18.0 in
5.65	1.320	0.65	7,108.02	7,108.99	7,104.13	7,104.49	Circle - 15.0 in
2.31	1.320	0.11	7,108.02	7,108.47	7,104.13	7,104.18	Circle - 15.0 in
6.73	1.320	0.93	7,101.08	7,101.22	7,092.39	7,093.65	Circle - 18.0 in
3.60	1.320	0.27	7,102.89	7,103.19	7,098.59	7,098.63	Circle - 24.0 in
3.18	1.320	0.21	7,115.00	7,115.30	7,110.27	7,110.54	Circle - 15.0 in
6.45	1.320	0.85	7,109.73	7,110.71	7,105.39	7,105.92	Circle - 18.0 in
4.24	1.320	0.37	7,109.73	7,110.09	7,105.94	7,106.00	Circle - 15.0 in

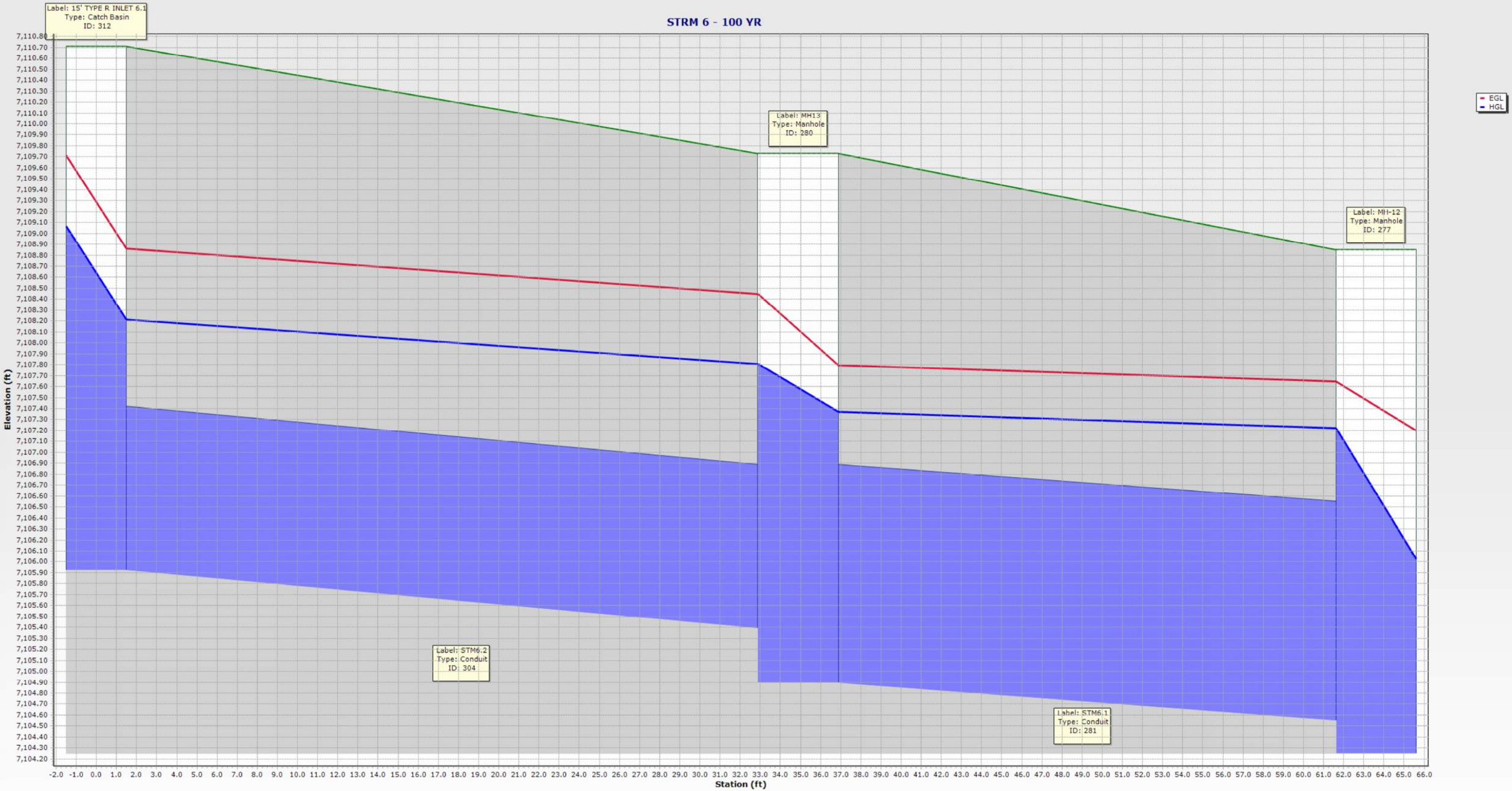

STRM 4-5 - 100 YR
Elevation (ft)
Station (ft)
EGL
HGL
Label: MH-8
Type: Manhole
ID: 272
Label: MH-10
Type: Manhole
ID: 273
Label: MH-11
Type: Manhole
ID: 139
Label: MH-12
Type: Manhole
ID: 277
Label: MH-14
Type: Manhole
ID: 283
Label: MH-15
Type: Manhole
ID: 285
Label: MH-16
Type: Manhole
ID: 287
Label: POND 4 OUTFALL
Type: Outfall
ID: 270
Label: STM4.1
Type: Conduit
ID: 163
Label: STM5.2
Type: Conduit
ID: 162
Label: STM5.4
Type: Conduit
ID: 143
Label: STM5.6
Type: Conduit
ID: 278
Label: STM5.7
Type: Conduit
ID: 279
Label: STM5.8
Type: Conduit
ID: 286
Label: STM5.9
Type: Conduit
ID: 288


STRM 5.1 - 100 YR
Label: 10' TYPE R INLET 5.1
Type: Catch Basin
ID: 276
Label: MH-8
Type: Manhole
ID: 272
Label: STM5.1
Type: Conduit
ID: 275
EGL
HGL
Elevation (ft)
Station (ft)

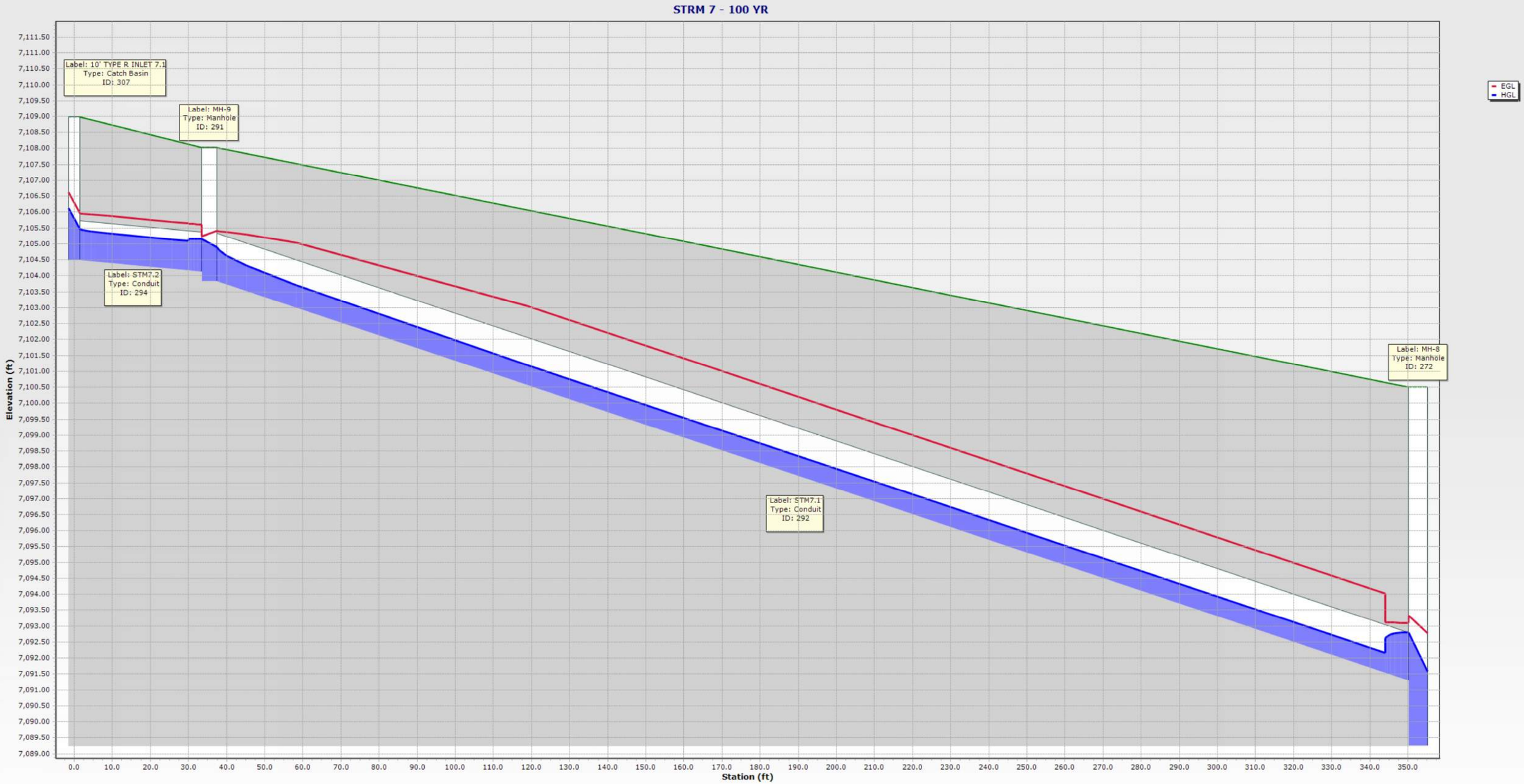

STRM 5.2 - 100 YR
Label: 15' TYPE R INLET 5.2
Type: Catch Basin
ID: 309
Label: MH-10
Type: Manhole
ID: 273
Label: STM5.3
Type: Conduit
ID: 298
EGL
HGL
Elevation (ft)
Station (ft)

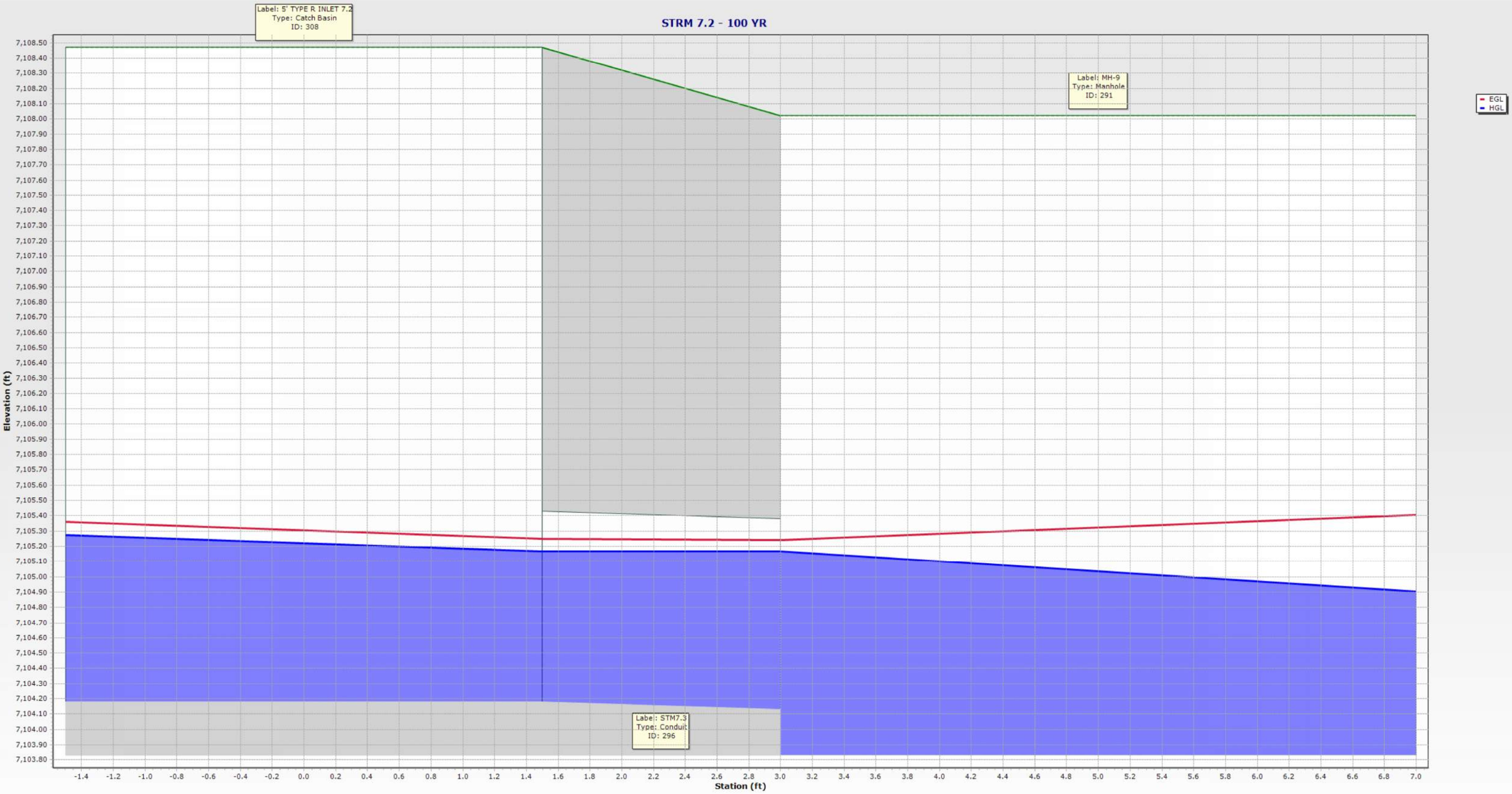

STRM 5.3 PRO - 100 YR
Label: 15' TYPE R INLET 5.3
Type: Catch Basin
ID: 310
Label: MH-11
Type: Manhole
ID: 139
Label: STM5.5
Type: Conduit
ID: 300
EGL
HGL
Elevation (ft)
Station (ft)


STRM 5.4-5.5 - 100 YR
Label: 10' TYPE R INLET 5.5
Type: Catch Basin
ID: 314
Label: MH-16
Type: Manhole
ID: 287
Label: 10' TYPE R INLET 5.4
Type: Catch Basin
ID: 313
EGL
HGL
Label: STM15.11
Type: Conduit
ID: 290
Label: STM5.10
Type: Conduit
ID: 302
Elevation (ft)
Station (ft)


STRM 6 - 100 YR
Label: 15' TYPE R INLET 6.1
Type: Catch Basin
ID: 312
Label: MH13
Type: Manhole
ID: 280
Label: MH-12
Type: Manhole
ID: 277
Label: STM6.2
Type: Conduit
ID: 304
Label: STM6.1
Type: Conduit
ID: 281
EGL
HGL
Elevation (ft)
Station (ft)


STRM 6.2 - 100 YR
Label: 10' TYPE R INLET 6.2
Type: Catch Basin
ID: 311
Label: MH13
Type: Manhole
ID: 280
Label: STM6.3
Type: Conduit
ID: 306
EGL
HGL
Elevation (ft)
Station (ft)


STRM 7 - 100 YR
Label: 10' TYPE R INLET 7.1
Type: Catch Basin
ID: 307
Label: MH-9
Type: Manhole
ID: 291
Label: STM7.2
Type: Conduit
ID: 294
Label: STM7.1
Type: Conduit
ID: 292
Label: MH-8
Type: Manhole
ID: 272
EGL
HGL
Elevation (ft)
Station (ft)


STRM 7.2 - 100 YR
Label: 5' TYPE R INLET 7.2
Type: Catch Basin
ID: 308
Label: MH-9
Type: Manhole
ID: 291
Label: STM7.3
Type: Conduit
ID: 296
EGL
HGL
Elevation (ft)
Station (ft)

CIVIL CONSULTANTS, INC.

20 BOULDER CRESCENT, STE 110
COLORADO SPRINGS, CO 80903
(719) 955-5485

PROJECT: FALCON RESERVE FILING NO. 1

DATE: 5/10/25 POND 1 WEST & NORTH FOREBAY

POND 1 MICROPOOL

90.64 ACRES @ 24.2% WATERSHED IMPERVIOUS

PER MHFD VOL 3 CHAP 4 T-6 EDB #7 MICROPOOLS 150 SQFT MINIMUM MICROPOOL 78 SQFT (ACTUAL) > 150 SQFT REQ.

POND 1 MINIMUM FOREBAY VOLUME

WQCV FROM MHFD - VOL 3 CHAP 4 TABLE 14-12 & MHFD - DETENTION POND SHEET

1% OF WQCV = 1.003 AC-FT (43560 cuft/Acft) x 1% = 436.91 CUFT (DESIGN)

2 - FOREBAYS = WEST & NORTH

PROPOSED RATIONAL SHEET POND 1 Q_{100} = 192.4 cfs

NORTH FOREBAY 24" RCP = 17.1 cfs WEST FOREBAY 2-36" = 173.3

NORTH FOREBAY 17.1 cfs ÷ 192.4 cfs = 8.9% ≅ 9%

WEST FOREBAY 173.3 cfs ÷ 192.4 cfs = 90.0% ≅ 90%

NORTH FOREBAY - 436.91 cuft x 9% = 39.32 cu ft (DESIGN)
92.25 sq ft x 0.75 ft = 69.19 cu ft (ACTUAL) > 39.32 CUFT (DESIGN)

WEST FOREBAY - 436.91 cu ft x 90% = 393.22 CUFT (DESIGN)
470.45 sq ft x 1.75 ft = 823.29 cu ft (ACTUAL) > 439.91 CUFT (DESIGN)

FOREBAY RELEASE

$W_S = 9.23 (A_{FB}/t)(1/\sqrt{h_{MAX}})$ EQN 4-1 MHFD CHAP 4 VOL 3

NORTH FOREBAY $W = 9.23 (92.25 \text{ sqft}/300 \text{ sec})(1/\sqrt{0.75'}) = 3.3''$

WEST FOREBAY $W = 9.23 (470.45 \text{ sqft}/300 \text{ sec})(1/\sqrt{1.75 \text{ ft}}) = 10.9''$

CIVIL CONSULTANTS, INC.
20 BOULDER CRESCENT, STE 110
COLORADO SPRINGS, CO 80903
(719) 955-5485

PROJECT: FALCON PRESERVE FILING No 1

DATE: 5/12/25 POND 2 WEST & NORTH FOREBAY

POND 2 MICROPOOL
6.99 AC @ 29.8% IMPERVIOUS

PER MHFD VOL 3 CHAPT-6 EDB #7 MICROPOOLS 15 SQFT MIN.
MICROPOOL 79 SQFT (ACTUAL) > 15 SQFT REQ.

POND 2 MIN FOREBAY VOL.
WQCV FROM MHFD VOL 3 CHAP 4 TABLE 4-12 & MHFD-DET. POND SHEET
1% OF WQCV = 0.783 AC-FT (43560 SQFT/ACFT) x 1% = 341.07 CU FT (DESIGN)
2-FOREBAYS WEST & NORTH
PROPOSED RAT. SHEET POND 2 Q_{100} = 130.3 cfs

NORTH FOREBAY 24" RCP = 51.5 cfs, WEST FOREBAY 36" RCP = 83.9 cfs
NORTH FOREBAY 51.5 cfs / 130.3 cfs = 39.5%
WEST FOREBAY 83.9 cfs / 130.3 cfs = 64.4%

NORTH FOREBAY 341.07 CUFT x 39.5% = 134.72 CUFT (DESIGN)
124.38 SQFT x 1.25 ft = 155.48 CUFT (ACTUAL) > 134.72 CUFT (DESIGN)
WEST FOREBAY 341.07 CUFT x 64.4% = 219.65 CUFT (DESIGN)
154.60 SQFT x 1.75 = 270.55 CUFT (ACTUAL) > 219.65 CUFT (DESIGN)

FOREBAY RELEASE

$$W = 9.23\,(AFB/t)\,(1/\sqrt{h_{MAX}})$$ EQN 4-1 MHFD CHAP 4 VOL 3

NORTH FOREBAY $W = 9.23\,(124.38\ \text{SQFT}/300\text{SEC})\,(1/\sqrt{1.25'}) = 3.4''$
WEST FOREBAY $W = 9.23\,(154.60\ \text{SQFT}/300\text{SEC})\,(1/\sqrt{1.75''}) = 3.6''$

CIVIL CONSULTANTS, INC.

20 BOULDER CRESCENT, STE 110
COLORADO SPRINGS, CO 80903
(719) 955-5485

PROJECT: FALCON RESERVE FILING No 1

DATE: 5/13/25 POND 3 NORTH & SOUTH FOREBAY

POND 3 MICRO POOL

49.37 ACRES @ 28.40% IMPERVIOUS

PER MHFD CHAP 4 VOL 3 T-6 EDB #7 MICROPOOL 15 SQFT MINIMUM
MICROPOOL 59.78 SQFT (ACTUAL) > 15 SQFT REQ.

POND 1 MINIMUM FOREBAY VOLUME

WQCV FROM MHFD VOL 3 CHAP 4 TABLE 4-12 & MHFD-DET POND SHEET

1% OF WQCV = 0.603 AC-FT $\left(43560 \frac{\text{CU FT}}{\text{AC FT}}\right)$ x 1.0% = 262.67 CU FT

2 - FOREBAYS NORTH & SOUTH

PROPOSED RATIONAL SHEET POND 3 Q_{100} = 94.6 cfs

NORTH FOREBAY 24" RCP = 42.7 cfs, SOUTH FOREBAY 24" RCP = 40.7 cfs

NORTH FOREBAY 42.7 cfs ÷ 94.6 cfs = 45.1%

SOUTH FOREBAY 40.7 cfs ÷ 94.6 cfs = 43.0%

NORTH FOREBAY 262.67 CU FT x 45.1% = 118.46 CU FT (DESIGN)
105.22 SQFT x 1.25 FT = 131.53 CU FT (ACTUAL) > 118.46 CU FT (DESIGN)

SOUTH FOREBAY 262.67 CU FT x 43.0% = 112.95 CU FT (DESIGN)
169.60 SQFT x 1.0 FT = 169.60 CU FT (ACTUAL) > 112.95 CU FT (DESIGN)

FOREBAY RELEASE

$W = 9.23 (A_{FB}/t)(1/\sqrt{h_{MAX}})$ EQN 4-1 MHFD CHAP. 4 VOL 3

NORTH FOREBAY $W = 9.23 (105.22 \text{ SQFT}/300 \text{ sec})(1/\sqrt{1.25 \text{ ft}}) = 2.9''$

SOUTH FOREBAY $W = 9.23 (169.60 \text{ SQFT}/300 \text{ sec})(1/\sqrt{1.0 \text{ ft}}) = 5.2''$

CIVIL CONSULTANTS, INC.

20 BOULDER CRESCENT, STE 110
COLORADO SPRINGS, CO 80903
(719) 955-5485

PROJECT: FALCON RESERVE FILING NO. 1

DATE: 6/13/25 POND 4 WEST & NORTH FOREBAYS

POND 4 MICROPOOL

28.4 AC @ 52.7 % IMPERVIOUS

PER MHFD VOL 3 CHAP 4 T-6 EBD #7 MICROPOOL 15 SQFT MIN.
MICROPOOL 40 SQFT (ACTUAL) > 15 SQFT REQ.

POND 4 MIN FOREBAY VOL

WQCV FROM MHFD VOL 3 CHAP 4 TABLE 4-12 & MHFD DET POND SHEET

1% OF WQCV = 0.509 AC-FT (43560 $\frac{\text{CUFT}}{\text{AC-FT}}$) x 1% = 221.72 CU FT (DESIGN)
2 - FOREBAYS WEST & NORTH
PROPOSED RAT. SHEET POND 4 Q_{100} = 72.4 cfs

WEST FOREBAY 36" RCP = 51.5 cfs, NORTH FOREBAY 24" = 24.0 cfs
WEST FOREBAY 51.5 cfs / 72.4 cfs = 71.1%
NORTH FOREBAY 24.0 cfs / 72.4 cfs = 33.1%

WEST FOREBAY 221.72 CUFT x 71.1% = 157.64 CU FT (DESIGN)
155.79 SQFT x 1.25 = 194.74 CUFT (ACTUAL) > 157.64 CUFT (DESIGN)
NORTH FOREBAY 221.72 CUFT x 33.1% = 73.39 CUFT (DESIGN)
70.33 SQFT x 1.25 = 87.91 CUFT (ACTUAL) > 73.39 CUFT (DESIGN)

FOREBAY RELEASE

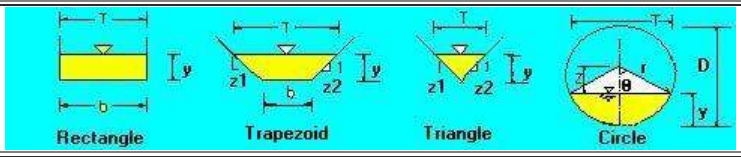
$W = 9.23 (A_{FB}/t)(1/\sqrt{h_{max}})$ EQN 4-1 MHFD CHAP 4 VOL 3

WEST FOREBAY $W = 9.23 (155.79 \text{ SQFT}/300 \text{ sec})(1/\sqrt{1.25'}) = 4.3"$

NORTH FOREBAY $W = 9.23 (70.33 \text{ SQFT}/300 \text{ sec})(1/\sqrt{1.25'}) = 1.9"$

The open channel flow calculator

Select Channel Type: Trapezoid



Velocity(V)&Discharge(Q)

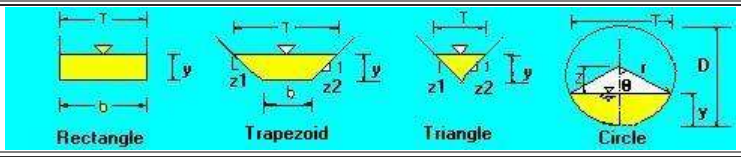
Select unit system: Feet(ft)

Channel slope: .03 ft/ft	Water depth(y): 0.5 ft	Bottom width(b) 60 ft
Flow velocity 6.3417 ft/s	LeftSlope (z_1): 4 to 1 (H:V)	RightSlope (z_2): 4 to 1 (H:V)
Flow discharge 196.592 ft^3/s	Input n value 0.025 or select n	
Calculate!	Status: Calculation finished	Reset
Wetted perimeter 64.12 ft	Flow area 31 ft^2	Top width(T) 64 ft
Specific energy 1.12 ft	Froude number 1.61	Flow status Supercritical flow
Critical depth 0.69 ft	Critical slope 0.0104 ft/ft	Velocity head 0.62 ft

SECTION P1-P1 Q100= 192.4 cfs
PROPOSED 60 ' LOW FLOW
SWALE ADDRESSED IN REPORT

The open channel flow calculator

Select Channel Type: Trapezoid



Velocity(V)&Discharge(Q)

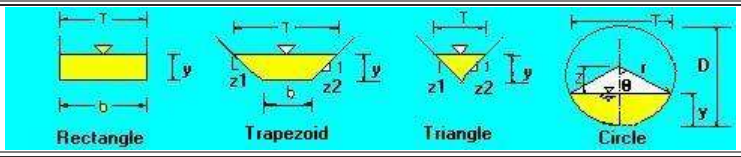
Select unit system: Feet(ft)

Channel slope: .05 ft/ft	Water depth(y): 1.21 ft	Bottom width(b) 8 ft
Flow velocity 12.3808 ft/s	LeftSlope (z_1): 3 to 1 (H:V)	RightSlope (z_2): 3 to 1 (H:V)
Flow discharge 174.2258 ft^3/s	Input n value 0.025 or select n	
Calculate!	Status: Calculation finished	Reset
Wetted perimeter 15.65 ft	Flow area 14.07 ft^2	Top width(T) 15.26 ft
Specific energy 3.59 ft	Froude number 2.27	Flow status Supercritical flow
Critical depth 1.92 ft	Critical slope 0.0086 ft/ft	Velocity head 2.38 ft

PROPOSED GRADE SECTION P2-P2 Q100= 173.3 cfs
PROPOSED SWALE TO BE RIPRAP LINED.

The open channel flow calculator

Select Channel Type: Trapezoid



Velocity(V)&Discharge(Q)

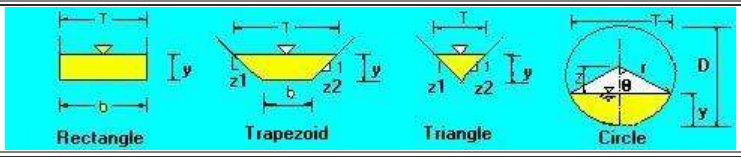
Select unit system: Feet(ft)

Channel slope: .0625 ft/ft	Water depth(y): 0.5 ft	Bottom width(b) 3 ft
Flow velocity 7.5912 ft/s	LeftSlope (z_1): 3 to 1 (H:V)	RightSlope (z_2): 3 to 1 (H:V)
Flow discharge 17.0803 ft^3/s	Input n value 0.025 or select n	
Calculate!	Status: Calculation finished	Reset
Wetted perimeter 6.16 ft	Flow area 2.25 ft^2	Top width(T) 6 ft
Specific energy 1.39 ft	Froude number 2.18	Flow status Supercritical flow
Critical depth 0.77 ft	Critical slope 0.0116 ft/ft	Velocity head 0.89 ft

PROPOSED GRADE SECTION P3-P3 Q100= 17.1 cfs
PROPOSED SWALE TO BE RIPRAP LINED.

The open channel flow calculator

Select Channel Type: Trapezoid



Velocity(V)&Discharge(Q)

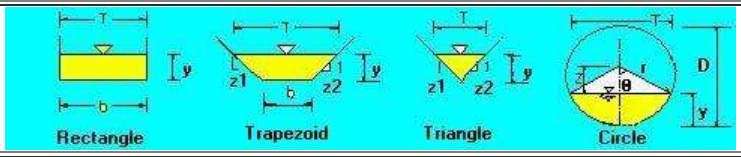
Select unit system: Feet(ft)

Channel slope: .022 ft/ft	Water depth(y): 0.89 ft	Bottom width(b) 3.0 ft
Flow velocity 5.397 ft/s	LeftSlope (z_1): 27 to 1 (H:V)	RightSlope (z_2): 13 to 1 (H:V)
Flow discharge 99.9097 ft^3/s	Input n value 0.025 or select n	
Calculate!	Status: Calculation finished	Reset
Wetted perimeter 38.65 ft	Flow area 18.51 ft^2	Top width(T) 38.6 ft
Specific energy 1.34 ft	Froude number 1.37	Flow status Supercritical flow
Critical depth 1.02 ft	Critical slope 0.0111 ft/ft	Velocity head 0.45 ft

EXISTING SWALE IN THE EXISTING CONDITION BASIN F1 & DP2
SECTION EX1-EX1 Q5= 53.7 CFS, Q100=158.0 cfs
MERIDIAN APPROXIMATE EDGE OF PAVEMENT HEIGHT 0.89'
OVERTOPPING OF EDGE OF PAVEMENT ONTO MERIDIAN IN
100 YEAR EVENT.

The open channel flow calculator

Select Channel Type: Trapezoid



Velocity(V)&Discharge(Q)

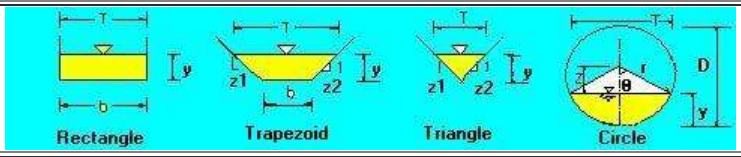
Select unit system: Feet(ft)

Channel slope: .022 ft/ft	Water depth(y): 0.89 ft	Bottom width(b) 3.0 ft
Flow velocity 5.397 ft/s	LeftSlope (z_1): 27 to 1 (H:V)	RightSlope (z_2): 13 to 1 (H:V)
Flow discharge 99.9097 ft^3/s	Input n value 0.025 or select n	
Calculate!	Status: Calculation finished	Reset
Wetted perimeter 38.65 ft	Flow area 18.51 ft^2	Top width(T) 38.6 ft
Specific energy 1.34 ft	Froude number 1.37	Flow status Supercritical flow
Critical depth 1.02 ft	Critical slope 0.0111 ft/ft	Velocity head 0.45 ft

EXISTING SWALE IN THE PROPOSED CONDITION BASIN **F1 & BASIN **F1.1
SECTION EX1-EX1 Q5= 3.2 CFS, Q100= 8.7 cfs
MERIDIAN APPROXIMATE EDGE OF PAVEMENT HEIGHT 0.89'
EXISTING SWALE IN CONFORMANCE IN THE 5 AND 100 YEAR EVENT

The open channel flow calculator

Select Channel Type: Trapezoid



Velocity(V)&Discharge(Q)

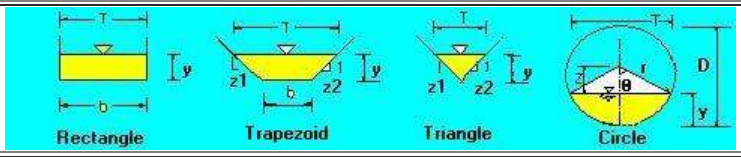
Select unit system: Feet(ft)

Channel slope: .022 ft/ft	Water depth(y): 1.5 ft	Bottom width(b) 3.0 ft
Flow velocity 7.5063 ft/s	LeftSlope (z1): 21 to 1 (H:V)	RightSlope (z2): 18 to 1 (H:V)
Flow discharge 363.1153 ft^3/s	Input n value 0.025 or select n	
Calculate!	Status: Calculation finished	Reset
Wetted perimeter 61.58 ft	Flow area 48.38 ft^2	Top width(T) 61.5 ft
Specific energy 2.37 ft	Froude number 1.49	Flow status Supercritical flow
Critical depth 1.77 ft	Critical slope 0.0093 ft/ft	Velocity head 0.87 ft

EXISTING SWALE IN THE EXISTING CONDITION BASIN F2 & DP3
SECTION EX2-EX2 Q5= 42.3 CFS, Q100=137.0 cfs
STAPLETON APPROXIMATE EDGE OF PAVEMENT HEIGHT 1.5'
EXISTING SWALE IN CONFORMANCE WITH 5 AND 100 YEAR EVENT. NO OVER TOPPING ONTO STAPLETON.

The open channel flow calculator

Select Channel Type: Trapezoid



Velocity(V)&Discharge(Q)

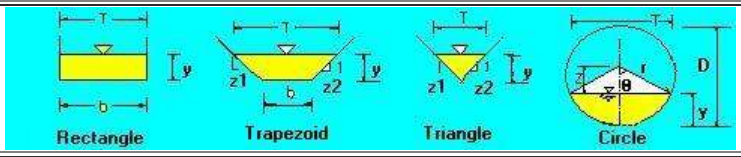
Select unit system: Feet(ft)

Channel slope: .022 ft/ft	Water depth(y): 1.5 ft	Bottom width(b) 3.0 ft
Flow velocity 7.5063 ft/s	LeftSlope (z_1): 21 to 1 (H:V)	RightSlope (z_2): 18 to 1 (H:V)
Flow discharge 363.1153 ft^3/s	Input n value 0.025 or select n	
Calculate!	Status: Calculation finished	Reset
Wetted perimeter 61.58 ft	Flow area 48.38 ft^2	Top width(T) 61.5 ft
Specific energy 2.37 ft	Froude number 1.49	Flow status Supercritical flow
Critical depth 1.77 ft	Critical slope 0.0093 ft/ft	Velocity head 0.87 ft

EXISTING SWALE IN THE PROPOSED CONDITION BASIN **F2 &
FLOWBY FROM EX03 EAST AND WEST SIDE OF LIBERTY
SECTION EX2-EX2 Q5= 2.5 CFS, Q100=28.7 cfs
STAPLETON APPROXIMATE EDGE OF PAVEMENT HEIGHT 1.5'
EXISTING SWALE IN CONFORMANCE IN THE 5 AND 100 YEAR EVENT.
NO OVER TOPPING ONTO STAPLETON.

The open channel flow calculator

Select Channel Type: Trapezoid



Velocity(V)&Discharge(Q)

Select unit system: Feet(ft)

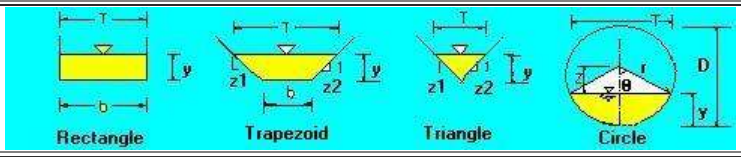
Channel slope: .022 ft/ft	Water depth(y): 0.96 ft	Bottom width(b) 8 ft
Flow velocity 7.2276 ft/s	LeftSlope (z_1): 3 to 1 (H:V)	RightSlope (z_2): 3 to 1 (H:V)
Flow discharge 75.491 ft^3/s	Input n value 0.025 or select n	
Calculate!	Status: Calculation finished	Reset
Wetted perimeter 14.07 ft	Flow area 10.44 ft^2	Top width(T) 13.76 ft
Specific energy 1.77 ft	Froude number 1.46	Flow status Supercritical flow
Critical depth 1.2 ft	Critical slope 0.0097 ft/ft	Velocity head 0.81 ft

PROPOSED SWALE IN THE PROPOSED CONDITION DP17
SECTION E2-E2 Q5= 13.2 CFS, Q100=75.2 cfs

SWALE TO BE LINED WITH NORTH AMERICAN
GREEN SC 150 OR APPROVED EQUAL

The open channel flow calculator

Select Channel Type: Trapezoid



Velocity(V)&Discharge(Q)

Select unit system: Feet(ft)

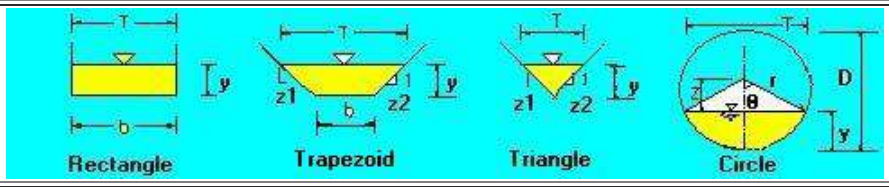
Channel slope: .02 ft/ft	Water depth(y): 1.01 ft	Bottom width(b) 10 ft
Flow velocity 7.2626 ft/s	LeftSlope (z_1): 3 to 1 (H:V)	RightSlope (z_2): 3 to 1 (H:V)
Flow discharge 95.5776 ft^3/s	Input n value 0.025 or select n	
Calculate!	Status: Calculation finished	Reset
Wetted perimeter 16.39 ft	Flow area 13.16 ft^2	Top width(T) 16.06 ft
Specific energy 1.83 ft	Froude number 1.41	Flow status Supercritical flow
Critical depth 1.24 ft	Critical slope 0.0094 ft/ft	Velocity head 0.82 ft

PROPOSED SWALE IN THE PROPOSED CONDITION DP19
SECTION E1-E1 Q5= 22.4 CFS, Q100= 101.6 cfs

SWALE TO BE LINED WITH NORTH AMERICAN
GREEN SC 150 OR APPROVED EQUAL

The open channel flow calculator

Select Channel Type: Trapezoid



Velocity(V)&Discharge(Q)

Select unit system: Feet(ft)

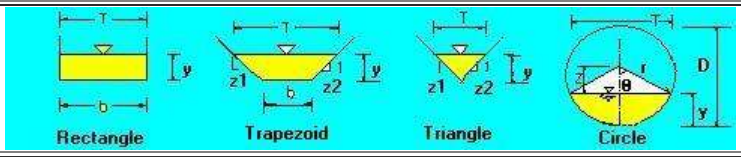
Channel slope: .01 ft/ft	Water depth(y): 2.11 ft	Bottom W(b) 6 ft
Flow velocity 6.5509 ft/s	LeftSlope (z_1): 7.5 to 1 (H:V)	RightSlope (z_2): 18 to 1 (H:V)
Flow discharge 454.792 ft^3/s	Input n value 0.025 or select n	
Calculate!	Status: Calculation finished	Reset
Wetted perimeter 60 ft	Flow area 69.42 ft^2	Top width(T) 59.81 ft
Specific energy 2.78 ft	Froude number 1.07	Flow status Supercritical flow
Critical depth 2.18 ft	Critical slope 0.0086 ft/ft	Velocity head 0.67 ft

EXISTING CONDITION
SECTION E3-E3
Q100=455.8 cfs

ASSUMING ALL TRIBUTARY
FLOW CROSSED THE
INTERSECTION TO THIS SIDE.

The open channel flow calculator

Select Channel Type: Trapezoid



Velocity(V)&Discharge(Q)

Select unit system: Feet(ft)

Channel slope: .01 ft/ft	Water depth(y): 1.65 ft	Bottom width(b) 6 ft
Flow velocity 5.6429 ft/s	LeftSlope (z_1): 7.5 to 1 (H:V)	RightSlope (z_2): 18 to 1 (H:V)
Flow discharge 251.7384 ft^3/s	Input n value 0.025 or select n	
Calculate!	Status: Calculation finished	Reset
Wetted perimeter 48.23 ft	Flow area 44.61 ft^2	Top width(T) 48.08 ft
Specific energy 2.14 ft	Froude number 1.03	Flow status Supercritical flow
Critical depth 1.68 ft	Critical slope 0.0093 ft/ft	Velocity head 0.49 ft

PROPOSED CONDITION SECTION E3-E3 Q100= 259.8 cfs
NO MODIFICATIONS TO THE CHANNEL ARE PROPOSED. WOODMEN HILLS METRO DISTRICT IS RESPONSIBLE FOR THIS CHANNEL.

CIVIL CONSULTANTS, INC.

212 N. Wahsatch Ave., Ste. 305
Colorado Springs, CO
719.955.5485

Project: Falcon Reserve

Date: Estimating Curb Cut Capacity

15' Curb Openings (EXISTING) PAVE

$$L_T = 0.6\, Q^{0.42} S_L^{0.3} \left(\frac{1}{n\, S_x}\right)^{0.6}$$

$Q_{1/2}$ = 26.2 cfs X slope = 2.0% L slope = 3.0%

$$L_T = 0.6\,(26.2)^{0.42}(0.02)^{0.3}\left(\frac{1}{0.013 \times 0.03}\right)^{0.6}$$

$$L_T = 3.94 \times .309 \times 111.0$$

$$L_T = 81.19$$

Effeciency of the curb opening @ 15'

$$E = 1 - \left(1 - L/L_T\right)^{1.8}$$

$$E = 1 - \left(1 - 15/81.19\right)^{1.8} = 0.307$$

Q_{15CAP} =

$26.2 \times 0.307 =$ 8.04 CFS (EACH SIDE)

CIVIL CONSULTANTS, INC.
212 N. Wahsatch Ave., Ste. 305
Colorado Springs, CO
719.955.5485

Project: FALCON RESERVE

Date: Estimating Sump Curb Cut

6' SUMP CURB CUTS (PAIR)

ASSUME PONDING + VELOCITY = 0

ASSUME CREST FLAT

ASSUME MAX DEPTH = MAX PONDING DEPTH AT EACH LOCATION

WEST SIDE

ELEV. 13.08 > AVG = 13.10 @ L.P.
ELEV. 13.13

MAX PONDING DEPTH @ ℄ ROAD = 13.45 ±

USE RETANGULAR WEIR FORMULA =

$Q = 3.2 \times L \times H^{1.5}$ — Assume max depth 0.2' HIGHER THAN CROWN.

$= 3.2 \times 6' \times 0.55^{1.5} = 7.6$ cfs

WEST SIDE = 24.2 cfs − 8.04 − 7.6 = 10.6 BYPASS

FLOW CROSSES CENTERLINE

BROAD CRESTED WEIR

$$\times 14.66 \sqrt{\frac{L = 45'}{H = 0.33}} \times 14.66$$

14.33

CIVIL CONSULTANTS, INC.

212 N. Wahsatch Ave., Ste. 305
Colorado Springs, CO
719.955.5485

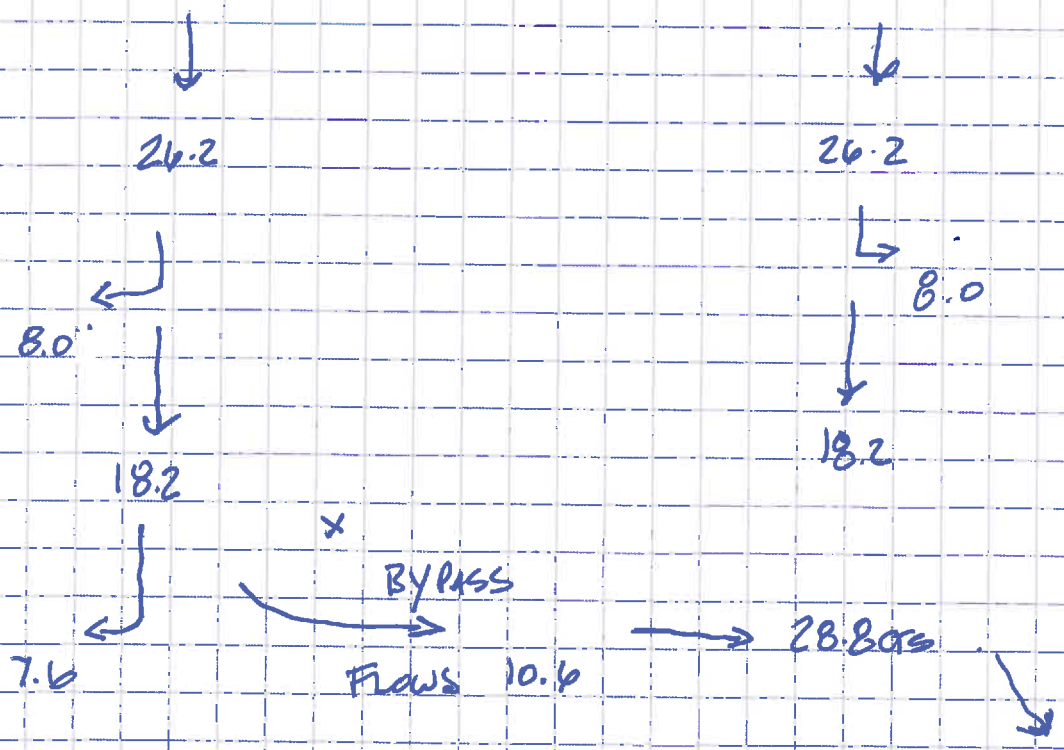
Project: FALCON RESERVE

Date: 12/17/24

$Q = 3.1 \times L \times H_{AVG}^{1.5} = 3.1 \times 45 \times 0.17^{1.5}$

$= 9.8 \sim 10.6$

* ASSUME FLOWS IN EXCESS OF WEST SIDE CAPACITY DIRECTED EAST



MAX PONDING @ EAST 6' CURB OPENING

ASSUME AT GRADE AS THERE IS LIMITED SUMP

CROSS SLOPE = 0.005 (0.5%)

LONG SLOPE = 0.005 (0.5%)

USE INLET FORMULA.

CIVIL CONSULTANTS, INC.

212 N. Wahsatch Ave., Ste. 305
Colorado Springs, CO
719.955.5485

Project: FALCON RESERVE

Date:

28.8 CFS ⟶ TO CURB CUT (6')

↘ TO STAPLETON

$$L_T = 0.6\, Q^{0.42}\, S_L^{0.3} \left(\frac{1}{n\, S_x}\right)^{0.6}$$

$$L_T = 0.6\,(28.8)^{0.42}\,(0.005)^{0.3} \left(\frac{1}{0.013 \times 0.005}\right)^{0.6}$$

$L_T = 163.3'$

Efficiency of curb opening @ 6'

$$E = 1 - \left(1 - L/L_T\right)^{1.8}$$

$$E = 1 - \left(1 - 6/163.3\right)^{1.8} = 0.065 - 7\%$$

28.8 x 0.07 = 2.0 CFS

28.8 CFS ⟶ 2.0 CFS

↘ 26.8 to Stapleton

CIVIL CONSULTANTS, INC.

212 N. Wahsatch Ave., Ste. 305
Colorado Springs, CO
719.955.5485

5

Project: FALCON RESERVE

Date: ESTIMATING CURB CAPACITY

15' Curb Openings (EXISTING) (WEST SIDE)

$$L_T = 0.6\, Q^{0.42} S_L^{0.3} \left(\frac{1}{n S_L}\right)^{0.6}$$

$Q_{WEST} = 6.1$ x slope = 2.0% L slope = 3.0%

$$L_T = 0.6\,(6.1)^{0.42}\,(0.02)^{0.3}\left(\frac{1}{0.013 \times 0.03}\right)^{0.6}$$

$$L_T = 44.02$$

Efficiency of the curb opening @ 15'

$$E = 1 - \left(1 - \frac{L}{L_T}\right)^{1.8}$$

$$E = 1 - \left(1 - \frac{15}{44.02}\right)^{1.8} = 0.53$$

Q_{CAP}

$6.1 * 0.528 = 3.22$ cfs

Flow By = $6.1 - 3.22 = 2.89 \approx 2.9$ cfs

CIVIL CONSULTANTS, INC.

212 N. Wahsatch Ave., Ste. 305
Colorado Springs, CO
719.955.5485

Project: Falcon Reserve

Date:

6' curb opening accepting flow-by of 8.9 cfs (West Side) Sag.

6' sump

Using Rect Weir Eqn estimate ht req'd to accept flow

$Q = 3.2 \times L \times H^{1.5}$

Solve for H, Given Q = 2.9, L = 6'

H = 0.28

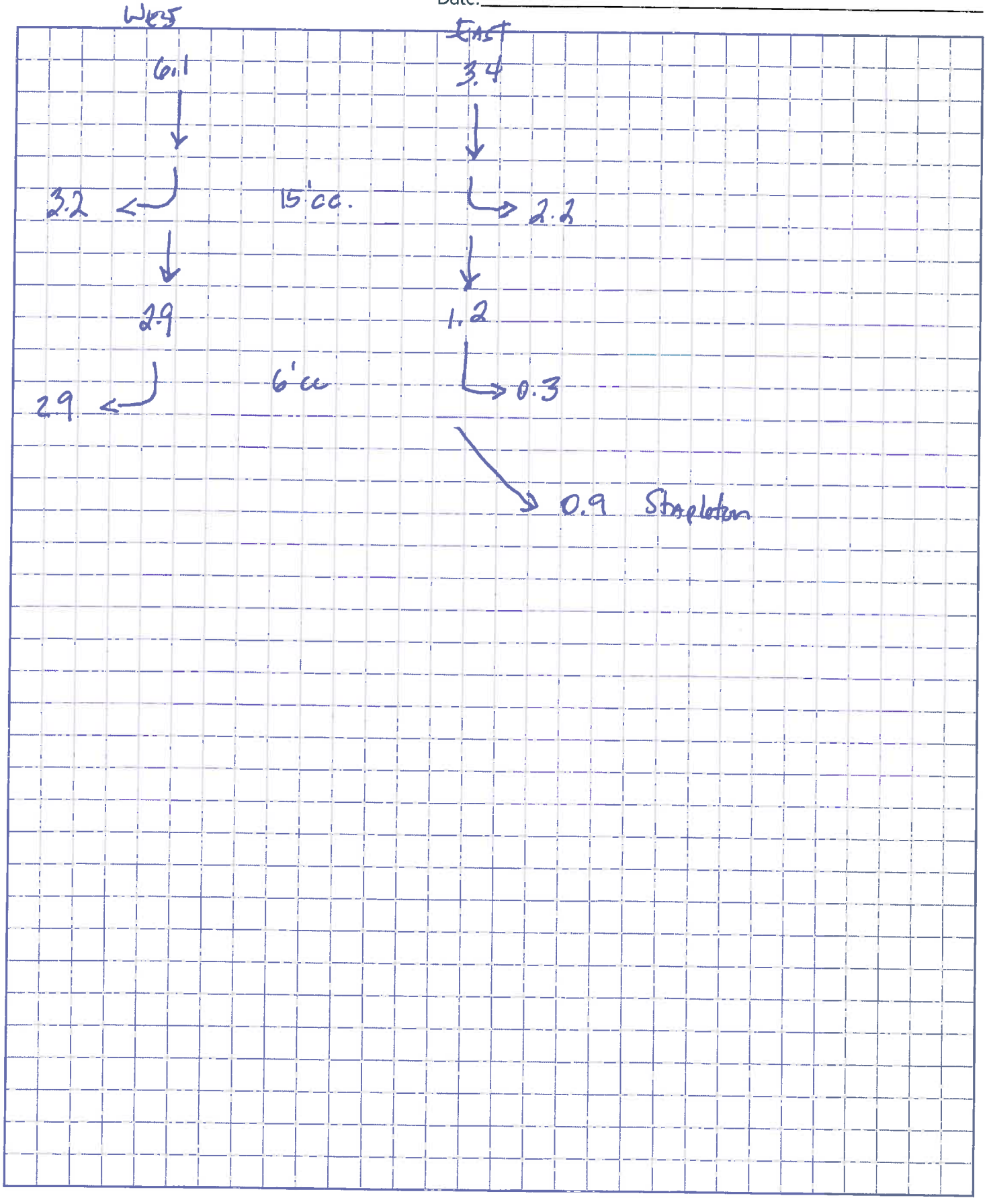
max allowable ht = 13.45 - 13.10 = .35 OK

CIVIL CONSULTANTS, INC.

212 N. Wahsatch Ave., Ste. 305
Colorado Springs, CO
719.955.5485

Project: _____

Date: _____



CIVIL CONSULTANTS, INC.
212 N. Wahsatch Ave., Ste. 305
Colorado Springs, CO
719.955.5485

Project: FALCON RESERVE

Date: ESTIMATING CURB CUT CAPACITY

15' Curb Opening (EXISTING) (EAST SIDE)

$$L_T = 0.6\, Q^{0.42} S_L^{0.3} \left(\frac{1}{n\, S_x}\right)^{0.6}$$

$Q_{EAST} = 3.4$ Xslope = 2.0% Lslope = 3.0%

$$L_T = 0.6\,(3.4)^{0.42}\,(0.02)^{0.3} \left(\frac{1}{0.013 \times 0.03}\right)^{0.6}$$

$L_T = 34.44$

Efficiency of the curb opening @ 15'

$$E = 1 - \left(1 - \frac{L}{L_T}\right)^{1.8}$$

$$1 - \left(1 - \frac{15}{34.44}\right)^{1.8} = 0.64$$

$Q_{cap} = 3.4 \times 0.643 = 2.19$ cfs ≈ 2.2

Flowby $= 3.4 - 2.2 = 1.2$ cfs

CIVIL CONSULTANTS, INC.
212 N. Wahsatch Ave., Ste. 305
Colorado Springs, CO
719.955.5485

Project: Falcon Reserve

Date:

Using inlet formula to solve for 6' curb opening

Q = Flow by from 15' opening Q = 1.2 CFS

Assume at grade conditon as there is limited slope for ponding.

cross slope = 0.005 ft/ft Long. Slope = 0.005 ft/ft

Use Inlet formula.

$$L_T = 0.6\, Q^{0.42} S_L^{0.3} \left(\frac{1}{n S_x}\right)^{0.6}$$

$$L_T = 0.6(1.2)^{0.42}(0.005)^{0.3}\left(\frac{1}{0.013 \times 0.005}\right)^{0.6}$$

$$L_T = 42.98$$

$$E = 1 - \left(1 - \frac{6}{42.98}\right)^{1.8} = .237 \sim 24\%$$

$$1.2 \times 0.24 \sim 0.3$$

$1.2 - 0.3 = 0.9$ flow to Stapleton

100YR - (BOTH SIDES)

Worksheet for Irregular Section - 26.2 cfs

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.030 ft/ft
Discharge	26.20 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00	0.50
0+19	0.13
0+21	0.00
0+21	0.50

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 0.50)	(0+21, 0.50)	0.016

Options	
Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results	
Normal Depth	6.1 in
Roughness Coefficient	0.016
Elevation	0.51 ft
Elevation Range	0.0 to 0.5 ft
Flow Area	4.6 ft²
Wetted Perimeter	21.5 ft
Hydraulic Radius	2.6 in
Top Width	21.00 ft
Normal Depth	6.1 in
Critical Depth	7.8 in
Critical Slope	0.005 ft/ft
Velocity	5.73 ft/s
Velocity Head	0.51 ft
Specific Energy	1.02 ft
Froude Number	2.164
Flow Type	Supercritical

GVF Input Data

Worksheet for Irregular Section - 26.2 cfs

GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	6.1 in
Critical Depth	7.8 in
Channel Slope	0.030 ft/ft
Critical Slope	0.005 ft/ft

5yr (WEST)

Worksheet for Irregular Section - 6.1cfs

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.030 ft/ft
Discharge	6.10 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00	0.50
0+19	0.13
0+21	0.00
0+21	0.50

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 0.50)	(0+21, 0.50)	0.016

Options	
Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results	
Normal Depth	3.9 in
Roughness Coefficient	0.016
Elevation	0.32 ft
Elevation Range	0.0 to 0.5 ft
Flow Area	1.5 ft²
Wetted Perimeter	12.4 ft
Hydraulic Radius	1.5 in
Top Width	12.12 ft
Normal Depth	3.9 in
Critical Depth	4.8 in
Critical Slope	0.007 ft/ft
Velocity	3.98 ft/s
Velocity Head	0.25 ft
Specific Energy	0.57 ft
Froude Number	1.969
Flow Type	Supercritical

GVF Input Data

Worksheet for Irregular Section - 6.1cfs

GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	3.9 in
Critical Depth	4.8 in
Channel Slope	0.030 ft/ft
Critical Slope	0.007 ft/ft

5yr (East)

Worksheet for Irregular Section - 3.4 cfs

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.030 ft/ft
Discharge	3.40 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00	0.50
0+19	0.13
0+21	0.00
0+21	0.50

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 0.50)	(0+21, 0.50)	0.016

Options	
Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results	
Normal Depth	3.3 in
Roughness Coefficient	0.016
Elevation	0.27 ft
Elevation Range	0.0 to 0.5 ft
Flow Area	1.0 ft²
Wetted Perimeter	9.8 ft
Hydraulic Radius	1.2 in
Top Width	9.51 ft
Normal Depth	3.3 in
Critical Depth	4.0 in
Critical Slope	0.008 ft/ft
Velocity	3.47 ft/s
Velocity Head	0.19 ft
Specific Energy	0.46 ft
Froude Number	1.910
Flow Type	Supercritical

GVF Input Data

Worksheet for Irregular Section - 3.4 cfs

GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

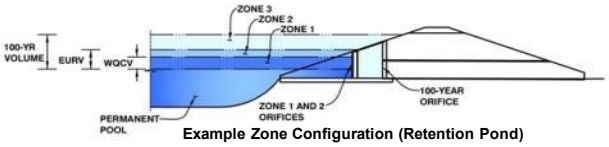
GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	3.3 in
Critical Depth	4.0 in
Channel Slope	0.030 ft/ft
Critical Slope	0.008 ft/ft

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: Falcon Reserve Filing No. 1

Basin ID: Pond 1



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	90.64	acres
Watershed Length =	4,330	ft
Watershed Length to Centroid =	2,119	ft
Watershed Slope =	0.024	ft/ft
Watershed Imperviousness =	24.20%	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 =	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) =	0.997	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	2.213	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	2.337	acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	4.032	acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	5.622	acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	8.124	acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	9.958	acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	12.462	acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 3.14 in.) =	17.213	acre-feet		inches
Approximate 2-yr Detention Volume =	1.548	acre-feet		
Approximate 5-yr Detention Volume =	2.255	acre-feet		
Approximate 10-yr Detention Volume =	3.462	acre-feet		
Approximate 25-yr Detention Volume =	4.151	acre-feet		
Approximate 50-yr Detention Volume =	4.382	acre-feet		
Approximate 100-yr Detention Volume =	5.293	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.997	acre-feet
Zone 2 Volume (EURV - Zone 1) =	1.216	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	3.080	acre-feet
Total Detention Basin Volume =	5.293	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	

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	--	--	--	78	0.002		
	--	0.50	--	--	--	268	0.006	86	0.002
	--	1.50	--	--	--	8,741	0.201	4,591	0.105
	--	2.50	--	--	--	27,169	0.624	22,546	0.518
	--	4.50	--	--	--	34,686	0.796	84,401	1.938
	--	6.50	--	--	--	42,242	0.970	161,329	3.704
	--	8.50	--	--	--	50,157	1.151	253,728	5.825

7125.5

26

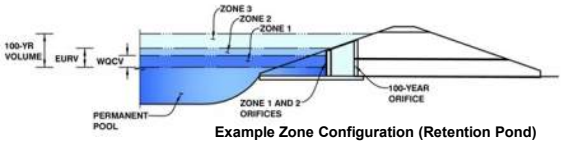
34.00

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: Falcon Reserve Filing No. 1

Basin ID: Pond 1



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.24	0.997	Orifice Plate
Zone 2 (EURV)	4.84	1.216	Orifice Plate
Zone 3 (100-year)	8.03	3.080	Weir&Pipe (Restrict)
Total (all zones)		5.293	

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 =	N/A	ft^2
Depth at top of Zone using Orifice Plate =	4.84	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	19.20	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 (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	1.61	3.23					
Orifice Area (sq. inches)	4.55	2.80	1.80					

	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)

	Not Selected	Not Selected			Not Selected	Not Selected	
Invert of Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	N/A	N/A	ft^2
Depth at top of Zone using Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	N/A	N/A	feet
Vertical Orifice Diameter =	N/A	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 =	4.85	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	4.85	N/A	feet
Overflow Weir Front Edge Length =	5.00	N/A	feet	Overflow Weir Slope Length =	9.00	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	5.98	N/A	
Horiz. Length of Weir Sides =	9.00	N/A	feet	Overflow Grate Open Area w/o Debris =	31.32	N/A	ft^2
Overflow Grate Type =	Type C Grate	N/A		Overflow Grate Open Area w/ Debris =	15.66	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 =	5.24	N/A	ft^2
Outlet Pipe Diameter =	36.00	N/A	inches	Outlet Orifice Centroid =	1.16	N/A	feet
Restrictor Plate Height Above Pipe Invert =	25.00		inches	Half-Central Angle of Restrictor Plate on Pipe =	1.97	N/A	radians

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	7.60	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.70	feet
Spillway Crest Length =	60.00	feet	Stage at Top of Freeboard =	9.30	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	1.15	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	5.82	acre-ft

Calculated Parameters for Spillway

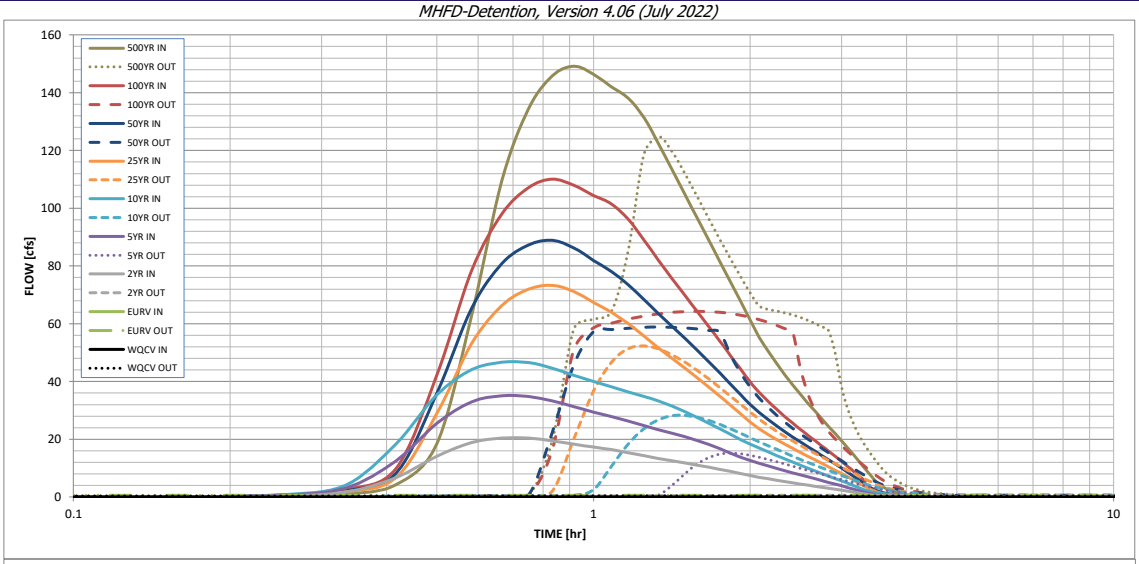
Routed Hydrograph Results

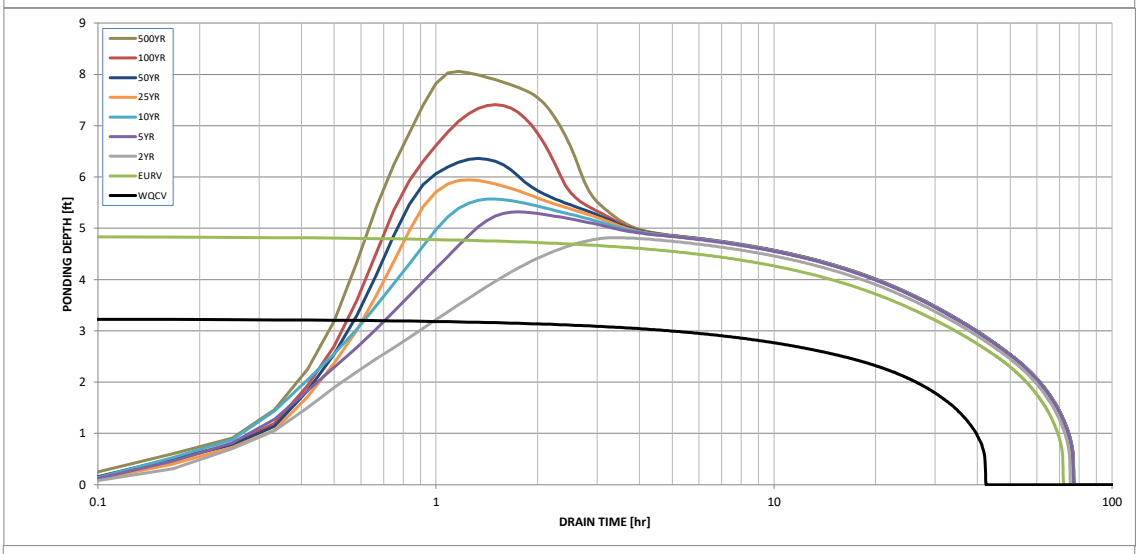
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

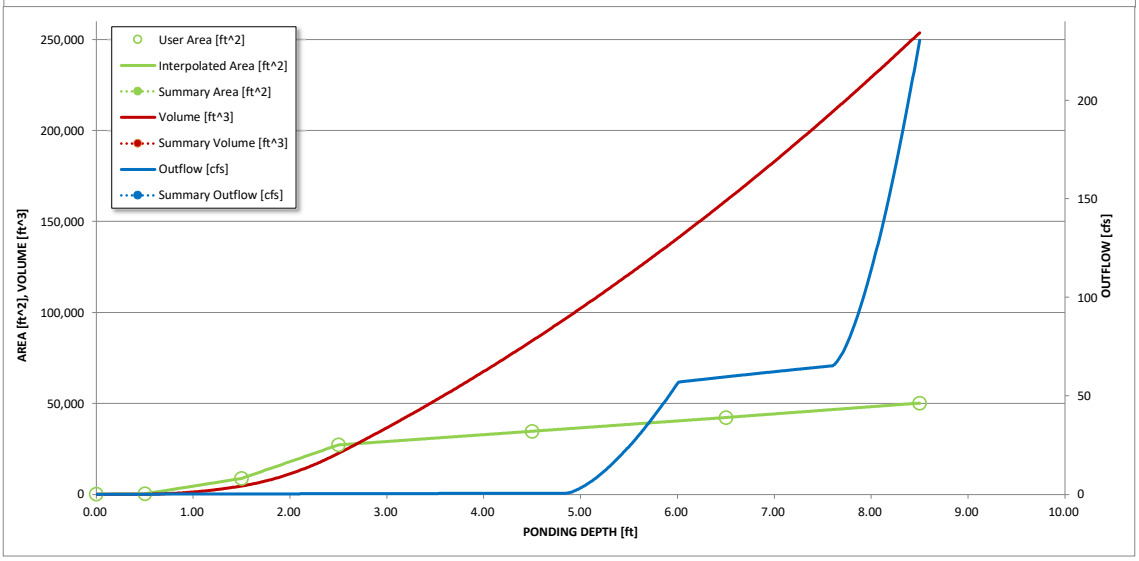
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.14
CUHP Runoff Volume (acre-ft) =	0.997	2.213	2.337	4.032	5.622	8.124	9.958	12.462	17.213
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	2.337	4.032	5.622	8.124	9.958	12.462	17.213
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	6.9	19.4	30.0	55.0	69.2	89.3	125.1
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.08	0.21	0.33	0.61	0.76	0.98	1.38
Peak Inflow Q (cfs) =	N/A	N/A	20.4	35.1	46.6	73.3	88.9	110.0	149.2
Peak Outflow Q (cfs) =	0.4	0.6	0.6	15.2	28.3	52.3	58.9	64.3	124.8
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.8	0.9	1.0	0.9	0.7	1.0
Structure Controlling Flow =	Plate	Plate	Plate	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	0.5	0.9	1.6	1.9	2.0	2.1
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	66	70	68	65	62	59	56	51
Time to Drain 99% of Inflow Volume (hours) =	**41**	70	73	73	72	71	70	68	65
Maximum Ponding Depth (ft) =	3.24	4.84	4.82	5.32	5.57	5.94	6.36	7.41	8.06
Area at Maximum Ponding Depth (acres) =	0.69	0.83	0.82	0.87	0.89	0.92	0.96	1.05	1.11
Maximum Volume Stored (acre-ft) =	1.003	2.213	2.189	2.620	2.839	3.174	3.569	4.624	5.316

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)







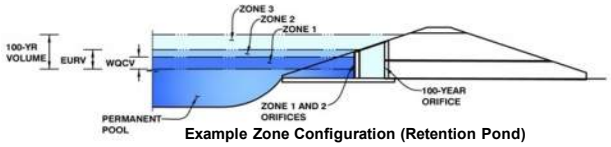
S-A-V-D Chart Axis Override	X-axis	Left Y-Axis	Right Y-Axis
minimum bound			
maximum bound			

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: Falcon Reserve Filing No. 1

Basin ID: Pond 2



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	61.99	acres
Watershed Length =	3,401	ft
Watershed Length to Centroid =	1,399	ft
Watershed Slope =	0.021	ft/ft
Watershed Imperviousness =	29.80%	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 =	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) =	0.779	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	1.895	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	1.925	acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	3.130	acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	4.238	acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	5.916	acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	7.183	acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	8.877	acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 3.14 in.) =	12.147	acre-feet		inches
Approximate 2-yr Detention Volume =	1.355	acre-feet		
Approximate 5-yr Detention Volume =	1.939	acre-feet		
Approximate 10-yr Detention Volume =	2.833	acre-feet		
Approximate 25-yr Detention Volume =	3.289	acre-feet		
Approximate 50-yr Detention Volume =	3.466	acre-feet		
Approximate 100-yr Detention Volume =	4.100	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.779	acre-feet
Zone 2 Volume (EURV - Zone 1) =	1.116	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	2.206	acre-feet
Total Detention Basin Volume =	4.100	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	

Depth Increment = ft

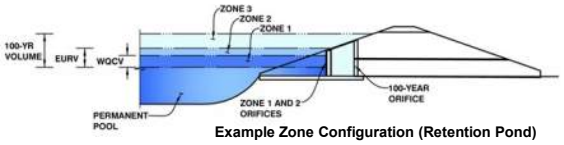
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
7101 **Top of Micropool**	--	0.00	--	--	--	78	0.002		
7102	--	1.00	--	--	--	609	0.014	344	0.008
7103	--	2.00	--	--	--	11,551	0.265	6,423	0.147
7104	--	3.00	--	--	--	30,166	0.693	27,282	0.626
7106	--	5.00	--	--	--	36,790	0.845	94,238	2.163
7108	--	7.00	--	--	--	43,635	1.002	174,663	4.010
7110	--	9.00	--	--	--	50,991	1.171	269,289	6.182

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: Falcon Reserve Filing No. 1

Basin ID: Pond 2



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.22	0.779	Orifice Plate
Zone 2 (EURV)	4.68	1.116	Orifice Plate
Zone 3 (100-year)	7.10	2.206	Weir&Pipe (Restrict)
Total (all zones)		4.100	

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 =	2.063E-02	ft^2
Depth at top of Zone using Orifice Plate =	4.68	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	19.00	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	2.97	sq. inches (diameter = 1-15/16 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 (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	1.56	3.12					
Orifice Area (sq. inches)	2.97	2.97	2.97					

	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)

	Not Selected	Not Selected			Not Selected	Not Selected	
Invert of Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	N/A	N/A	ft^2
Depth at top of Zone using Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	N/A	N/A	feet
Vertical Orifice Diameter =	N/A	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 =	4.69	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	4.69	N/A	feet
Overflow Weir Front Edge Length =	5.00	N/A	feet	Overflow Weir Slope Length =	7.00	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	5.69	N/A	
Horiz. Length of Weir Sides =	7.00	N/A	feet	Overflow Grate Open Area w/o Debris =	24.36	N/A	ft^2
Overflow Grate Type =	Type C Grate	N/A		Overflow Grate Open Area w/ Debris =	12.18	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 =	4.28	N/A	ft^2
Outlet Pipe Diameter =	36.00	N/A	inches	Outlet Orifice Centroid =	1.00	N/A	feet
Restrictor Plate Height Above Pipe Invert =	21.00		inches	Half-Central Angle of Restrictor Plate on Pipe =	1.74	N/A	radians

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	6.78	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.99	feet
Spillway Crest Length =	28.00	feet	Stage at Top of Freeboard =	8.77	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	1.15	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	5.92	acre-ft

Calculated Parameters for Spillway

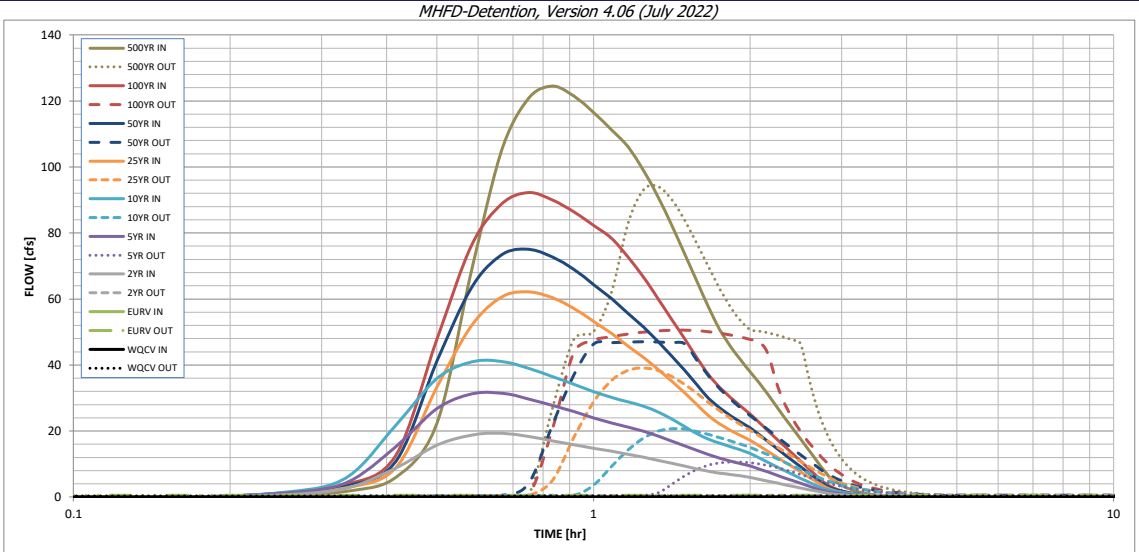
Routed Hydrograph Results

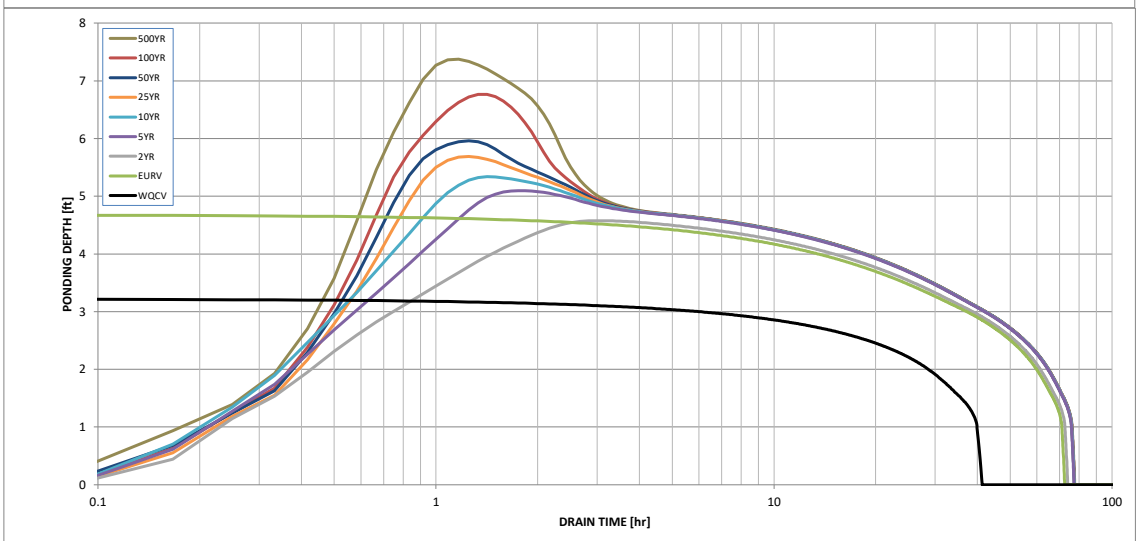
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

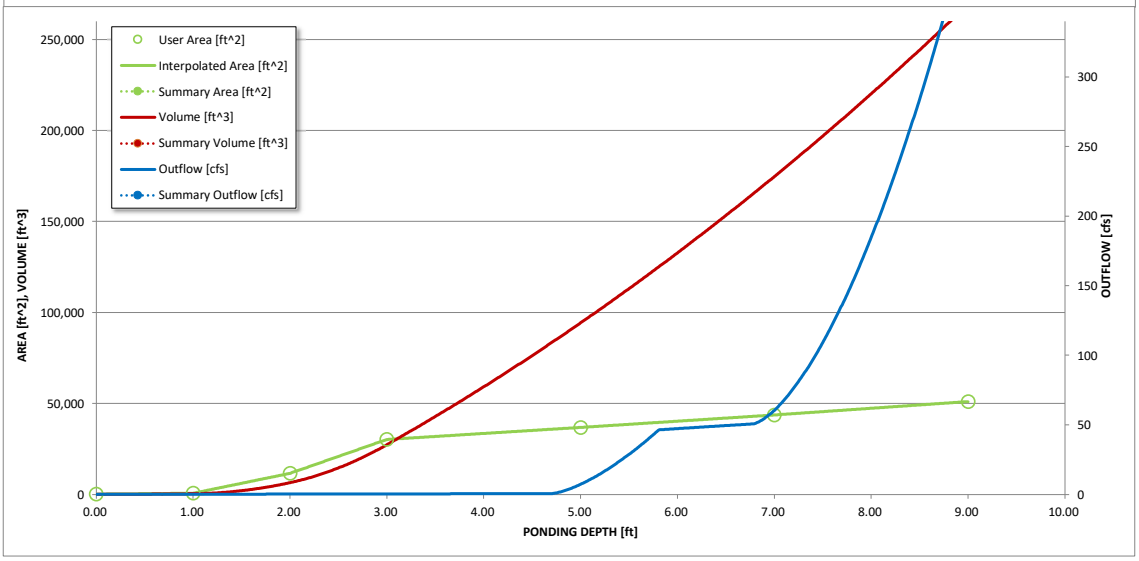
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.14
CUHP Runoff Volume (acre-ft) =	0.779	1.895	1.925	3.130	4.238	5.916	7.183	8.877	12.147
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	1.925	3.130	4.238	5.916	7.183	8.877	12.147
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	5.2	14.6	22.4	41.1	51.6	66.1	92.5
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.08	0.24	0.36	0.66	0.83	1.07	1.49
Peak Inflow Q (cfs) =	N/A	N/A	19.3	31.5	41.1	62.2	75.0	92.2	124.5
Peak Outflow Q (cfs) =	0.3	0.5	0.5	10.6	20.7	39.1	47.1	50.6	94.1
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.7	0.9	1.0	0.9	0.8	1.0
Structure Controlling Flow =	Plate	Plate	Plate	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	0.4	0.8	1.6	1.9	2.0	2.1
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	66	67	68	66	63	61	59	54
Time to Drain 99% of Inflow Volume (hours) =	**40**	70	71	73	72	71	70	69	67
Maximum Ponding Depth (ft) =	3.22	4.68	4.58	5.10	5.34	5.69	5.96	6.77	7.37
Area at Maximum Ponding Depth (acres) =	0.71	0.82	0.81	0.85	0.87	0.90	0.92	0.98	1.03
Maximum Volume Stored (acre-ft) =	0.780	1.897	1.807	2.240	2.446	2.756	3.010	3.772	4.386

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)







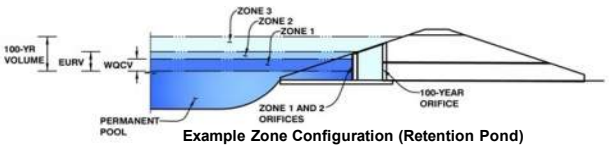
S-A-V-D Chart Axis Override	X-axis	Left Y-Axis	Right Y-Axis
minimum bound			
maximum bound			

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: Falcon Reserve Filing No. 1

Basin ID: Pond 3



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	49.37	acres
Watershed Length =	2,100	ft
Watershed Length to Centroid =	1,046	ft
Watershed Slope =	0.034	ft/ft
Watershed Imperviousness =	28.40%	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 =	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) =	0.602	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	1.433	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	1.463	acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	2.410	acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	3.289	acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	4.631	acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	5.637	acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	6.987	acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 3.14 in.) =	9.582	acre-feet		inches
Approximate 2-yr Detention Volume =	1.019	acre-feet		
Approximate 5-yr Detention Volume =	1.465	acre-feet		
Approximate 10-yr Detention Volume =	2.163	acre-feet		
Approximate 25-yr Detention Volume =	2.529	acre-feet		
Approximate 50-yr Detention Volume =	2.667	acre-feet		
Approximate 100-yr Detention Volume =	3.171	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.602	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.830	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	1.738	acre-feet
Total Detention Basin Volume =	3.171	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	

7107.32

Depth Increment = ft

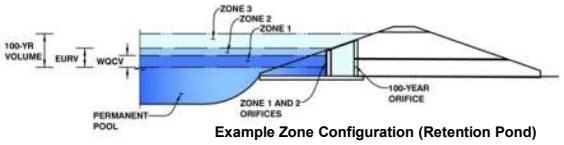
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	60	0.001		
7108	--	0.68	--	--	--	233	0.005	100	0.002
7109	--	1.68	--	--	--	10,047	0.231	5,239	0.120
7110	--	2.68	--	--	--	39,601	0.909	30,063	0.690
7112	--	4.68	--	--	--	46,718	1.072	116,382	2.672
7114	--	6.68	--	--	--	54,382	1.248	217,482	4.993

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: Falcon Reserve Filing No. 1

Basin ID: Pond 3



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.58	0.602	Orifice Plate
Zone 2 (EURV)	3.47	0.830	Orifice Plate
Zone 3 (100-year)	5.14	1.738	Weir&Pipe (Restrict)
Total (all zones)		3.171	

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 =	N/A	ft^2
Depth at top of Zone using Orifice Plate =	3.47	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	13.00	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 (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	1.16	2.31					
Orifice Area (sq. inches)	2.50	2.10	2.00					

	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)

	Not Selected	Not Selected			Not Selected	Not Selected	
Invert of Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	N/A	N/A	ft^2
Depth at top of Zone using Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	N/A	N/A	feet
Vertical Orifice Diameter =	N/A	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 =	3.48	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	3.48	N/A	feet
Overflow Weir Front Edge Length =	5.00	N/A	feet	Overflow Weir Slope Length =	7.00	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	4.87	N/A	
Horiz. Length of Weir Sides =	7.00	N/A	feet	Overflow Grate Open Area w/o Debris =	24.36	N/A	ft^2
Overflow Grate Type =	Type C Grate	N/A		Overflow Grate Open Area w/ Debris =	12.18	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 =	5.01	N/A	ft^2
Outlet Pipe Diameter =	36.00	N/A	inches	Outlet Orifice Centroid =	1.12	N/A	feet
Restrictor Plate Height Above Pipe Invert =	24.00		inches	Half-Central Angle of Restrictor Plate on Pipe =	1.91	N/A	radians

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	5.15	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.53	feet
Spillway Crest Length =	76.00	feet	Stage at Top of Freeboard =	6.68	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	1.25	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	4.99	acre-ft

Calculated Parameters for Spillway

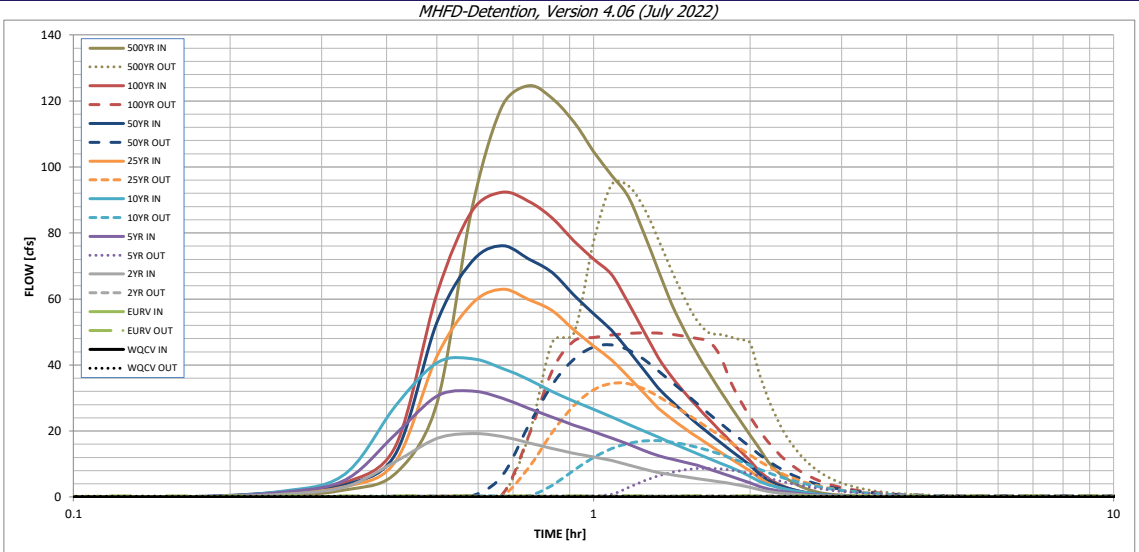
Routed Hydrograph Results

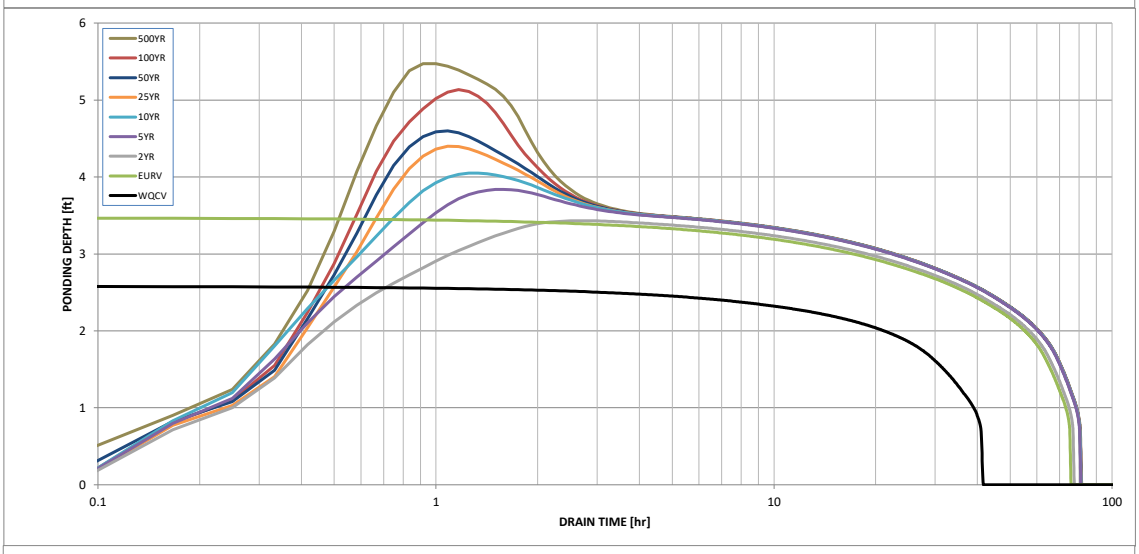
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

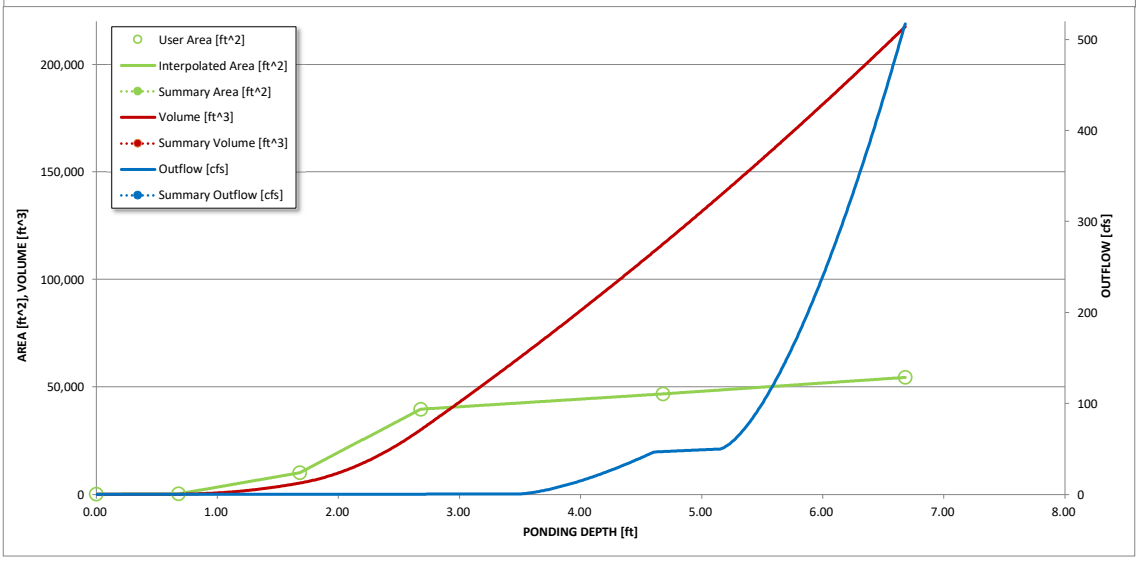
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.14
CUHP Runoff Volume (acre-ft) =	0.602	1.433	1.463	2.410	3.289	4.631	5.637	6.987	9.582
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	1.463	2.410	3.289	4.631	5.637	6.987	9.582
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	5.8	16.2	24.6	43.4	54.4	69.5	96.8
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.12	0.33	0.50	0.88	1.10	1.41	1.96
Peak Inflow Q (cfs) =	N/A	N/A	19.2	32.1	42.0	63.0	76.2	92.3	124.6
Peak Outflow Q (cfs) =	0.3	0.3	0.3	8.7	17.1	34.5	46.1	49.8	94.6
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.5	0.7	0.8	0.8	0.7	1.0
Structure Controlling Flow =	Plate	Plate	Plate	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	0.3	0.7	1.4	1.9	2.0	2.1
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	39	70	71	72	70	67	65	62	57
Time to Drain 99% of Inflow Volume (hours) =	**40**	73	75	77	76	75	74	73	70
Maximum Ponding Depth (ft) =	2.58	3.47	3.43	3.84	4.05	4.40	4.60	5.14	5.48
Area at Maximum Ponding Depth (acres) =	0.84	0.97	0.97	1.00	1.02	1.05	1.07	1.11	1.14
Maximum Volume Stored (acre-ft) =	0.603	1.434	1.395	1.800	2.012	2.364	2.576	3.163	3.546

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)







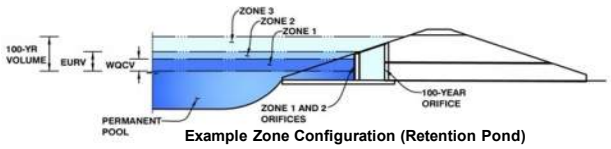
S-A-V-D Chart Axis Override	X-axis	Left Y-Axis	Right Y-Axis
minimum bound			
maximum bound			

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: Falcon Reserve Filing No. 1

Basin ID: Pond 4



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	28.40	acres
Watershed Length =	1,704	ft
Watershed Length to Centroid =	752	ft
Watershed Slope =	0.020	ft/ft
Watershed Imperviousness =	52.70%	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 =	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) =	0.506	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	1.607	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	1.512	acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	2.139	acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	2.686	acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	3.409	acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	4.001	acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	4.747	acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 3.14 in.) =	6.271	acre-feet		inches
Approximate 2-yr Detention Volume =	1.219	acre-feet		
Approximate 5-yr Detention Volume =	1.664	acre-feet		
Approximate 10-yr Detention Volume =	2.185	acre-feet		
Approximate 25-yr Detention Volume =	2.383	acre-feet		
Approximate 50-yr Detention Volume =	2.489	acre-feet		
Approximate 100-yr Detention Volume =	2.760	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.506	acre-feet
Zone 2 Volume (EURV - Zone 1) =	1.101	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	1.154	acre-feet
Total Detention Basin Volume =	2.760	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	

Depth Increment = ft

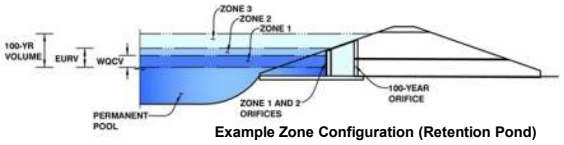
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
7081.53 **Top of Micropool**	--	0.00	--	--	--	60	0.001		
7082	--	0.47	--	--	--	116	0.003	41	0.001
	--	1.47	--	--	--	4,781	0.110	2,490	0.057
	--	2.47	--	--	--	17,316	0.398	13,538	0.311
	--	4.47	--	--	--	32,931	0.756	63,785	1.464
	--	6.47	--	--	--	40,829	0.937	137,545	3.158
	--	8.47	--	--	--	49,683	1.141	228,057	5.235

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: Falcon Reserve Filing No. 1

Basin ID: Pond 4



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.92	0.506	Orifice Plate
Zone 2 (EURV)	4.66	1.101	Orifice Plate
Zone 3 (100-year)	6.04	1.154	Weir&Pipe (Restrict)
Total (all zones)		2.760	

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 =	N/A	ft^2
Depth at top of Zone using Orifice Plate =	4.66	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	17.40	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 (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	1.55	3.11					
Orifice Area (sq. inches)	1.90	3.15	3.50					

	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)

	Not Selected	Not Selected			Not Selected	Not Selected	
Invert of Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	N/A	N/A	ft^2
Depth at top of Zone using Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	N/A	N/A	feet
Vertical Orifice Diameter =	N/A	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 =	4.71	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	4.71	N/A	feet
Overflow Weir Front Edge Length =	5.00	N/A	feet	Overflow Weir Slope Length =	7.00	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	8.03	N/A	
Horiz. Length of Weir Sides =	7.00	N/A	feet	Overflow Grate Open Area w/o Debris =	24.36	N/A	ft^2
Overflow Grate Type =	Type C Grate	N/A		Overflow Grate Open Area w/ Debris =	12.18	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 =	3.04	N/A	ft^2
Outlet Pipe Diameter =	36.00	N/A	inches	Outlet Orifice Centroid =	0.77	N/A	feet
Restrictor Plate Height Above Pipe Invert =	16.00		inches	Half-Central Angle of Restrictor Plate on Pipe =	1.46	N/A	radians

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	5.93	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.99	feet
Spillway Crest Length =	23.00	feet	Stage at Top of Freeboard =	7.92	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	1.08	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	4.62	acre-ft

Calculated Parameters for Spillway

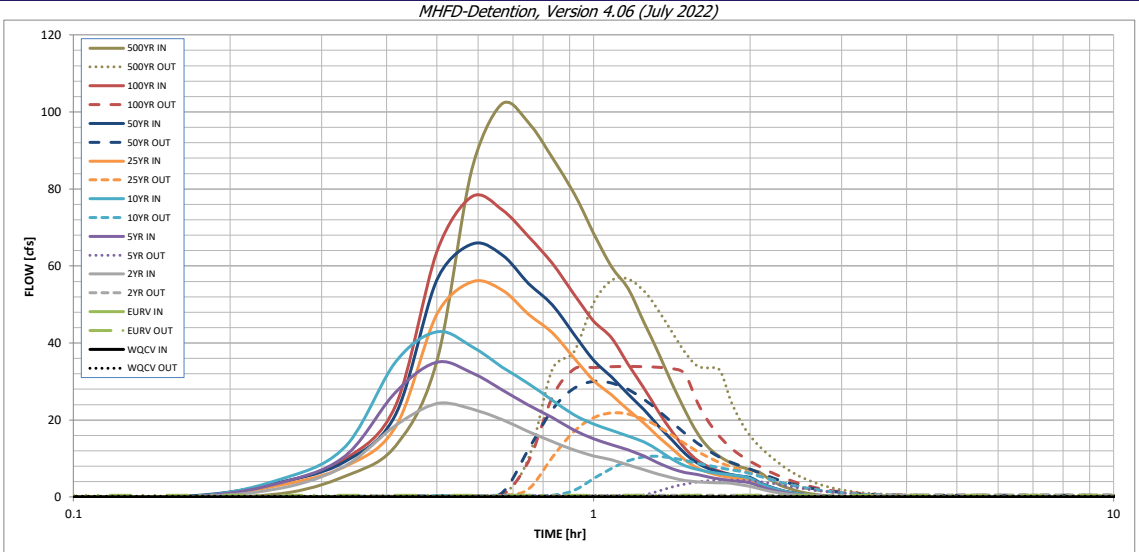
Routed Hydrograph Results

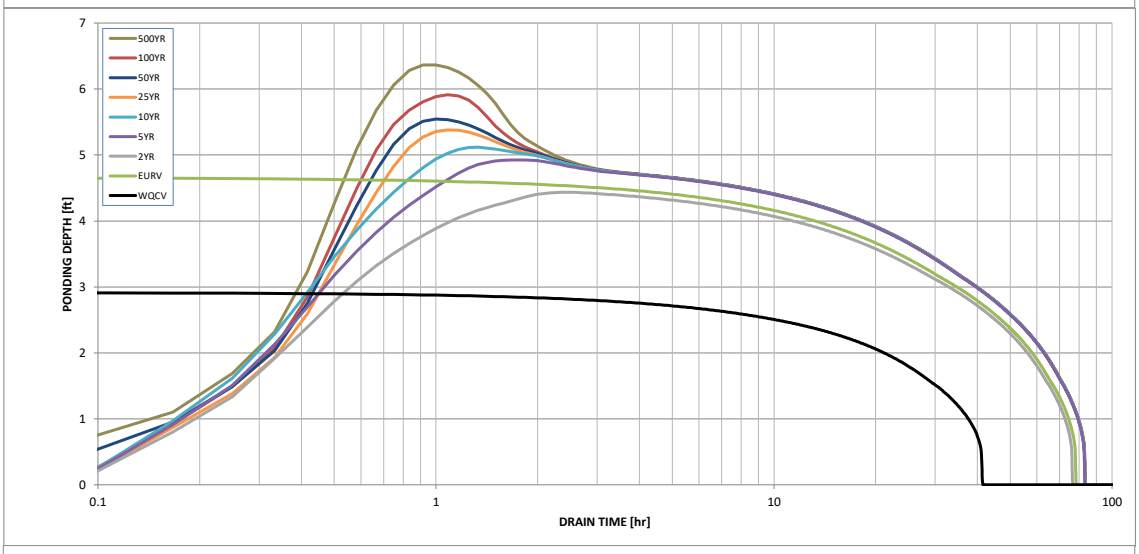
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

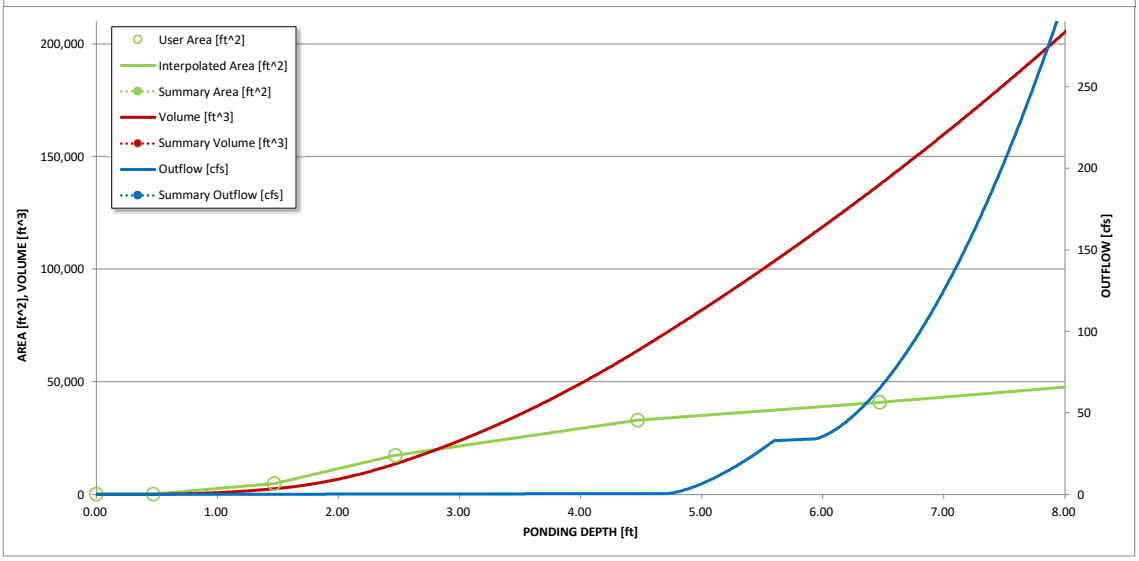
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.14
CUHP Runoff Volume (acre-ft) =	0.506	1.607	1.512	2.139	2.686	3.409	4.001	4.747	6.271
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	1.512	2.139	2.686	3.409	4.001	4.747	6.271
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	3.0	8.4	12.7	22.8	28.6	36.5	50.9
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.11	0.29	0.45	0.80	1.01	1.29	1.79
Peak Inflow Q (cfs) =	N/A	N/A	24.3	35.0	42.9	55.9	65.7	78.0	102.0
Peak Outflow Q (cfs) =	0.2	0.5	0.4	4.4	10.6	21.9	30.0	33.9	56.6
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.5	0.8	1.0	1.1	0.9	1.1
Structure Controlling Flow =	Plate	Plate	Plate	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	0.2	0.4	0.9	1.2	1.4	1.4
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	69	68	72	70	67	66	64	61
Time to Drain 99% of Inflow Volume (hours) =	**40**	75	73	79	78	76	76	74	72
Maximum Ponding Depth (ft) =	2.92	4.66	4.43	4.93	5.12	5.38	5.54	5.92	6.37
Area at Maximum Ponding Depth (acres) =	0.48	0.77	0.75	0.80	0.81	0.84	0.85	0.89	0.93
Maximum Volume Stored (acre-ft) =	0.508	1.610	1.434	1.814	1.967	2.190	2.325	2.647	3.055

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)







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

BACKGROUND INFORMATION

212 N.Wahsatch Avenue, Ste. 305
Colorado Springs, CO 80901
(719) 955-5485

October 22, 2021

El Paso County
Planning and Community Development
2880 International Circle, Suite 110
Colorado Springs, Colorado 80910

RE: Falcon Reserve Filing No.1 - Concept Drainage Analysis

Dear Staff,

This conceptual drainage analysis for Falcon Reserve Filing No.1 has been provided for your review as a foundation to discuss the following:

- Concepts for major drainage improvement from the site, which may differ from those recommended by the 2015 Falcon Drainage Basin Planning Study (DPBS) but function to achieve the same goals and more cost effective for the drainage basin

- Determine if improvements recommended by the DBPS, specially the recommendation to improve the existing box culvert at Meridian and Stapleton are necessary and if so discuss the cost and impacts associate with these improvements.

- Discuss the Stapleton – Briargate Corridor Study planned drainage assumptions and improvements and how they impact the subject site.

- Discuss deficiencies noted by the DBPS that are adjacent to the subject site and confirm that they are/ or are not the responsibility of the developer.

- Determine what drainage improvements associated with development is reimbursable to the developer.

Once your staff has had time to evaluate the analysis and recommendation for concept drainage improvements we would appreciate a chance to meet with your team to discuss the aforementioned discussion items.

Please let us know when you are available.

Respectfully,

Darin L. Moffett, P.E.
For and on behalf of M&S Civil Consultants, Inc.

Conceptual Drainage Analysis

for

Falcon Reserve
El Paso County, CO

Prepared For:

The Landhuis Company
212 N. Wahsatch Avenue, Suite 301
Colorado Springs, CO 80903

By:

Core Engineering Group
15004 1st Avenue S.
Burnsville, MN 55306
(719) 570-1100

Job No. xxx

March, 2014

DESIGN POINT	TRIBUTARY AREA	Q_5 cfs	Q_{100} cfs	COMMENTS
O.S. A.3	–	72.0	157.0	FLOW INTO PIPE
1	5.4	9.5	19.8	FLOW TO INLETS
2	5.2	9.1	18.7	FLOW TO INLET
3	8.0	9.6	17.1	FLOW TO INLET
4	2.6	4.8	9.7	FLOW TO INLET
5	–	105.0	222.3	FLOW INTO POND
6	11.3	25.1	49.0	FLOW INTO POND FROM PHASE II
7	2.3	6.8	13.8	FLOW TO INLET
8	–	93.1	199.0	FLOW FROM OLD POND #1 & DP6
9	TOTAL FLOW	208.0	442.7	
10	–	103.7	311.9	TOTAL FLOW INTO BOX CULVERT Q POND OUT + Q BY PASS

BASIN_A-2	
5YR-86CFS	100YR-211CFS

BASIN_A-1	
5YR-79CFS	100YR-172CFS

NOTE:
PROPOSED CHANGES TO DRAINAGE MAP
(IN COLOR) MADE BY CORE ENGINEERING GROUP

Design Pt. A-2

Ex. Pond A-2

CHANNEL

Design Pt. A-1

Ex. Pond A-1

5'x5' RC BOX CULVERT
or CHANNEL

BASIN_A-4	
5YR-53CFS	100YR-116CFS

BASIN_A-3	
5YR-67CFS	100YR-141CFS

Design Pt. A-3

Ex. Pond A-3

EXISTING 2.5'X13'
RC BOX CULVERT

48" RCP
STORM SEWER

Pond A-4

PHASE I
(PROPOSED SINGLE FAMILY RESIDENCE)
18.76 ACRES

PHASE II
(PROPOSED TOWNHOUSE SITE)
9.47 AC.
(11.19 UNITS/AC)

FALCON RESERVE SUBDIVISION
1,756,151 SQ. FT. 40.316 ACRES

TRACT "A"
TRACT "B"
TRACT "C"
TRACT "D"
1.83 AC.
PROP. DETENTION POND

SALEM COURT
LIBERTY GROVE DR.
MIDDLEBURY CIRCLE
WATERBURY DRIVE
STAPLETON DRIVE
MERIDIAN ROAD

EX. DETENTION POND #2
V = 4.1 ac. ft.
Q_5 = 43 cfs
Q_{100} = 133 cfs

EX. DETENTION POND #3
V = 1.72 ac. ft.
Q_5 = 20 cfs
Q_{100} = 57 cfs
(Ex. Pond & Storm Pipes to be removed)

EX. DETENTION POND #1
V = 2.35 ac. ft.
Q_5 = 25 cfs
Q_{100} = 77 cfs
(Ex. Pond & Storm Pipes to be removed)

FROM SUB-BASIN A-1 (Per Paint Brush Hills Fil. No. 4 Drainage Study)
Q_5 = 68 cfs
Q_{100} = 150 cfs
(Ex. Pond & Storm Pipes to be removed)

INTO CULVERT
Q_5 TOTAL = 111 cfs
Q_{100} TOTAL = 283 cfs

BY PASS FROM NEW POND = FLOW FROM EX. POND #2
Q_5 = 43 cfs
Q_{100} = 133 cfs

PROP. 8' x 5' BOX CULVERT
PROP. 8' CONC. PAN
PROP. FLOW SPLITTER
PROP. 55' DRAINAGE EASEMENT
PROP. 8" CONC. PAN

N47°47'13"E
N89°31'44"E
S89°04'59"W
N00°28'16"W
S00°28'16"E
N00°55'01"W

1013.95'
908.95'
1349.23'
1364.19'
720.00'
556.78'
60.00'
30.00'

R=610.00'
L=230.00'
Δ=21°36'12"

220' @ 2%

P.O.B.

O.S. A-3 72 157

A-1 + A-2 111

1 5.4 0.50 0.60
2 5.2 0.50 0.60
3 8.0 0.50 0.60
4 2.6 0.50 0.60
5 11.3 0.60 0.70
6 3.7 0.50 0.60
7 0.50 0.60
1 1.00 0.00 0.00 ACREAGE

OFF SITE BASIN DESIGNATION
ON SITE BASIN DESIGNATION
DESIGN POINT DESIGNATION
BASIN DELINEATION

EXTEND PIPE FROM EX. 18" CMP LOCATED AT INTERSECTION OF LIBERTY GROVE DR. & STAPLETON DR. TO DAYLIGHT AT EX. 2.5' x 13' BOX CULVERT

60' PUBLIC ROAD
(Book 2933, Page 873)

STATE OF COLORADO
BOARD OF LAND COMMISSIONERS
(Reception No. 202145126)

MERIDIAN RANCH INVESTMENTS INC.
(Reception No. 202145126)

WOODMEN HILLS FILING NO. 11
(Reception No. 202145126)

PAINT BRUSH HILLS FILING NO. 4
(Plat Book C-4, Page 172)

HORIZONTAL SCALE: 1" = 100'
CONTOUR INTERVAL = 2'

SITE BENCHMARK:
CONTROL POINT 200 NO. 4 REBAR
ELEV.=7119.42

LDC, Inc.
PLANNING, SURVEYING, LANDSCAPE ARCHITECTURE
3520 Austin Bluffs Parkway
Colorado Springs, CO 80918
(719) 528-6133 FAX (719) 528-6848

REVISIONS NO.	DESCRIPTION	BY	DATE

PRELIMINARY PLAN - DRAINAGE MAP

CALL BEFORE YOU DIG... 1-800-922-1987
48 HOURS BEFORE YOU DIG, CALL UTILITY LOCATORS FOR LOCATING AND MARKING GAS, ELECTRIC, WATER AND WASTEWATER

FALCON RESERVE
MASTER DEVELOPMENT DRAINAGE PLAN

PROJECT NO. 04086.1
Drawn By: KEM
Checked By:
Date: 02-21-06
Sheet: 1 of 1

DRAINAGE ANALYSIS

FOR

PAINT BRUSH HILLS

FILING NO. 4

DECEMBER 1986

Owner: Paint Brush Hills Partnership
3720 Sinton Road, Suite 200
Colorado Springs, CO 80907

Engineer: KKBNA, Inc., Consulting Engineers
4251 Kipling Street
Wheat Ridge, CO 80033
431-6100

Whereas the basin boundary is well defined, the natural channelization of flows is not as explicit. They appear to flow southeast until they are intercepted by Stapleton and/or Meridian Roads. The flows then parallel the road until they reach a culvert which allows the flows to cross under the road and flow southeast.

PROPOSED BASIN CHARACTERISTICS

Through a series of roads, ditches and open space, the developed flows will be captured and routed to the design point "A". The flows exiting design point "A" will be comparable in quantity to historical flows.

Proposed improvements in this development include public paved streets with curb and gutter, culverts, improved drainage ditches, and detention ponds.

The proposed lots will be 20,000 square feet or greater and will have single-family, detached homes.

PROCEDURE

The procedure used in this report is derived from two sources. The first source, "Procedures for Determining Peak Flows in Colorado," including T.R.55 by the SCS, was used to calculate the flow amounts and detention pond sizing. The second source, "Areawide Urban Runoff Control Manual" (AURCM), by the Pikes Peak Area Council of Governments, was referenced also.

The SCS method for determining flows was used and the 5-year, 24-hour storm determined the rainfall depth. Even though the 100-year, 24-hour storm was calculated and created 500 cfs runoff, that particular storm was used to size the detention facilities as outlined in the AURCM. The

project
project manager
designed by
drawn by
job no.
sheet no.

BENNETT RANCH BASIN
CHWS 1200

FALCON BASIN
CHWS 1400

FUTURE SCHOOL SITE

SUB-BASIN A-2

SUB-BASIN A-1

SUB-BASIN A-3

FUTURE COMMERCIAL AREA

20' PROPOSED UNLINED CHANNEL

20' DRAINAGE EASEMENT

OPEN SPACE

CURB OPENINGS

1-36" CMP #1

1-36" CMP #2

d_{50} = 18"
W = 20'
L = 15'

INFLOW = Q_{100} = 200 cfs
Q_5 = 83 cfs

BEGIN 8" VERTICAL CURB

D-10-R (INLET)

1-24" CMP #3

15' DRAINAGE EASEMENT

15' PROPOSED UNLINED CHANNEL

d_{50} = 12"
W = 15'
L = 15'

POND #1
Volume = 2.35 Ac. Ft.
Release Rate Q_{100} = 77 cfs
Q_5 = 25 cfs

DESIGN POINT 1
INFLOW = Q_{100} = 150 cfs
Q_5 = 68 cfs

DESIGN POINT 2

POND #2
Volume = 4.10 Ac. Ft.
Release Rate Q_{100} = 133 cfs
Q_5 = 43 cfs

TYPICAL 8" CURB

POND #3
Volume = 1.72 Ac. Ft.
Release Rate Q_{100} = 57 cfs
Q_5 = 20 cfs

DESIGN POINT A

DESIGN POINT 3

INFLOW = Q_{100} = 157 cfs
Q_5 = 72 cfs

3-30" CMP
50 L.F. EA.
APPROX. SLOPE = 4.75%
CAPACITY = 103 cfs

LEGEND

- STREET R.O.W.
- STREET CENTERLINE
- FILING NO. 4 BOUNDARY
- x 7200 SPOT ELEVATION
- MAJOR BASIN BOUNDARY
- SUB-BASIN BOUNDARY
- FLOW DIRECTION
- CULVERT

N

200 0 200 400
SCALE: 1" = 200'

NOTE:
1. EXISTING CONTOURS ARE REDRAWN USING INFORMATION FROM A 1972 AERIAL SURVEY.
2. ROADS IN AREAS OTHER THAN FILING NO. 4 ARE DRAWN AS ASSUMED CONFIGURATION BASED ON THE BEST INFORMATION AVAILABLE.

KKBNA
INCORPORATED
CONSULTING ENGINEERS

PAINT BRUSH HILLS
FILING NO. 4

DRAINAGE MAP

no	description of revisions	date	name

date NOVEMBER 1986
job number 9205.01.0007
design by M. SCHOLZ
drawn by C. BURK
checked by R. DOMINICAK

sheet number

D-1

AMENDMENT TO THE FALCON DBPS

DISCUSSION MEETING WITH EPC

212 N.Wahsatch Avenue, Ste. 305
Colorado Springs, CO 80901
(719) 955-5485

October 22, 2021

El Paso County
Planning and Community Development
2880 International Circle, Suite 110
Colorado Springs, Colorado 80910

RE: Falcon Reserve Filing No.1 - Concept Drainage Analysis

Dear Staff,

This conceptual drainage analysis for Falcon Reserve Filing No.1 has been provided for your review as a foundation to discuss the following:

- Concepts for major drainage improvement from the site, which may differ from those recommended by the 2015 Falcon Drainage Basin Planning Study (DPBS) but function to achieve the same goals and more cost effective for the drainage basin

- Determine if improvements recommended by the DBPS, specially the recommendation to improve the existing box culvert at Meridian and Stapleton are necessary and if so discuss the cost and impacts associate with these improvements.

- Discuss the Stapleton – Briargate Corridor Study planned drainage assumptions and improvements and how they impact the subject site.

- Discuss deficiencies noted by the DBPS that are adjacent to the subject site and confirm that they are/ or are not the responsibility of the developer.

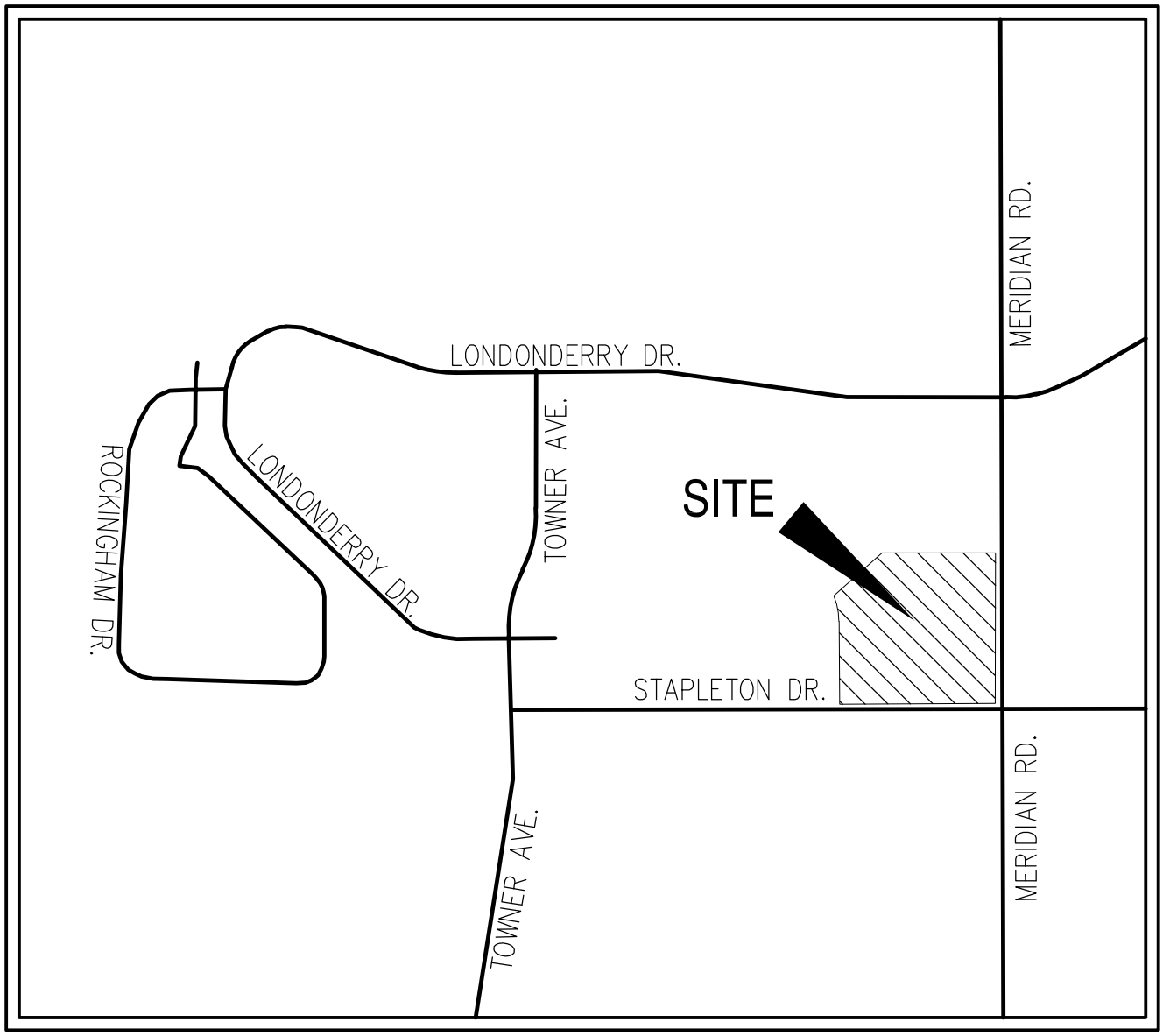
- Determine what drainage improvements associated with development is reimbursable to the developer.

Once your staff has had time to evaluate the analysis and recommendation for concept drainage improvements we would appreciate a chance to meet with your team to discuss the aforementioned discussion items.

Please let us know when you are available.

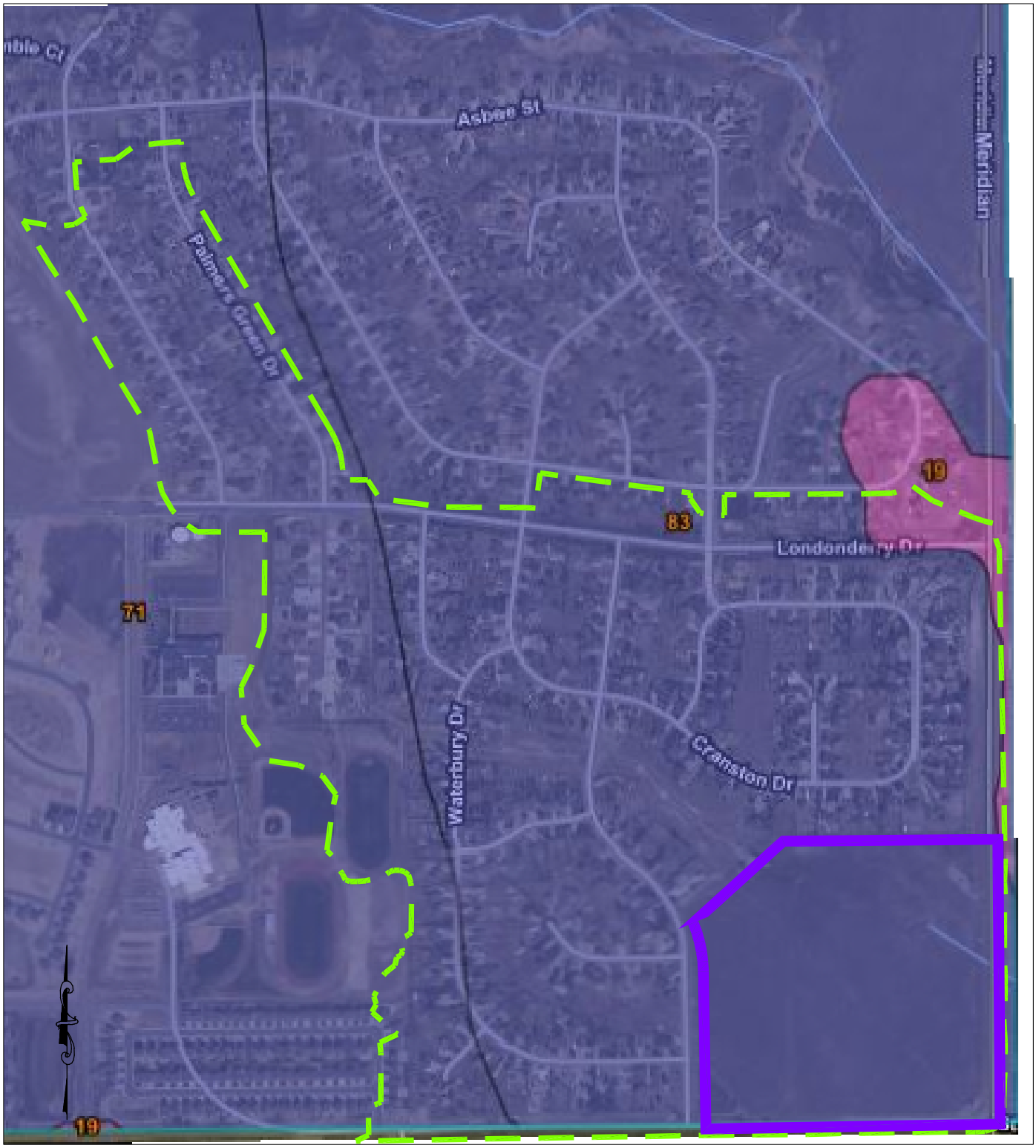
Respectfully,

Darin L. Moffett, P.E.
For and on behalf of M&S Civil Consultants, Inc.



VICINITY MAP

N.T.S.



NOT TO SCALE

FALCON RESERVE
FILING NO. 1

Summary by Map Unit — El Paso County Area, Colorado (CO625)

Map unit symbol	Map unit name	Rating
19	Columbine gravelly sandy loam, 0 to 3 percent slopes	A
71	Pring coarse sandy loam, 3 to 8 percent slopes	B
83	Stapleton sandy loam, 3 to 8 percent slopes	B

TYPE A SOILS

TYPE B SOILS

SOILS MAP

CIVIL CONSULTANTS, INC.

project
project manager
designed by
drawn by
job no.
sheet no.

BENNETT RANCH BASIN
CHWS 1200

FALCON BASIN
CHWS 1400

FUTURE SCHOOL SITE

SUB-BASIN A-2

SUB-BASIN A-1

SUB-BASIN A-3

FUTURE COMMERCIAL AREA

20' PROPOSED UNLINED CHANNEL

20' DRAINAGE EASEMENT

OPEN SPACE

CURB OPENINGS

1-36" CMP #1

1-36" CMP #2

d_{50} = 18"
W = 20'
L = 15'

INFLOW = Q_{100} = 200 cfs
Q_5 = 83 cfs

BEGIN 8" VERTICAL CURB

D-10-R (INLET)

1-24" CMP #3

15' DRAINAGE EASEMENT

15' PROPOSED UNLINED CHANNEL

d_{50} = 12"
W = 15'
L = 15'

POND #1
Volume = 2.35 Ac. Ft.
Release Rate Q_{100} = 77 cfs
Q_5 = 25 cfs

DESIGN POINT 1
INFLOW = Q_{100} = 150 cfs
Q_5 = 68 cfs

DESIGN POINT 2

POND #2
Volume = 4.10 Ac. Ft.
Release Rate Q_{100} = 133 cfs
Q_5 = 43 cfs

TYPICAL 8" CURB

POND #3
Volume = 1.72 Ac. Ft.
Release Rate Q_{100} = 57 cfs
Q_5 = 20 cfs

DESIGN POINT A

DESIGN POINT 3

INFLOW = Q_{100} = 157 cfs
Q_5 = 72 cfs

3-30" CMP
50 L.F. EA.
APPROX. SLOPE = 4.75%
CAPACITY = 103 cfs

LEGEND

- STREET R.O.W.
- STREET CENTERLINE
- FILING NO. 4 BOUNDARY
- x 7200 SPOT ELEVATION
- MAJOR BASIN BOUNDARY
- SUB-BASIN BOUNDARY
- FLOW DIRECTION
- CULVERT

N

200 0 200 400
SCALE: 1" = 200'

NOTE:
1. EXISTING CONTOURS ARE REDRAWN USING INFORMATION FROM A 1972 AERIAL SURVEY.
2. ROADS IN AREAS OTHER THAN FILING NO. 4 ARE DRAWN AS ASSUMED CONFIGURATION BASED ON THE BEST INFORMATION AVAILABLE.

KKBNA
INCORPORATED
CONSULTING ENGINEERS

PAINT BRUSH HILLS
FILING NO. 4

DRAINAGE MAP

no	description of revisions	date	name

date NOVEMBER 1986
job number 9205.01.0007
design by M. SCHOLZ
drawn by C. BURK
checked by R. DOMINICAK

sheet number

D-1

FALCON DRAINAGE BASIN PLANNING STUDY

SELECTED PLAN REPORT

FINAL - SEPTEMBER 2015

Prepared for:

El Paso County Public Services Department
3275 Akers Drive
Colorado Springs, CO 80922

Prepared By:

Matrix Design Group
2435 Research Parkway, Suite 300
Colorado Springs, CO 80920

Matrix Project No. 10.122.003

BOCC

RESOLUTION NO. 15- 387

BOARD OF COUNTY COMMISSIONERS
COUNTY OF EL PASO, STATE OF COLORADO

RESOLUTION TO RECOGNIZE AND ADOPT THE FALCON DRAINAGE BASIN PLANNING STUDY AND TO ESTABLISH A DRAINAGE FEE AND BRIDGE FEE FOR THE BASIN (CHWS1400)

WHEREAS, the Board of County Commissioners of the County of El Paso ("Board") has the authority granted to it under the provisions of §§30-11-101, (1)(e), and 30-11-107, (1)(e), C.R.S., to represent the County and exercise its further powers to address concerns of the County in all cases where no other provisions are made by law; and

WHEREAS, a plan for the development of drainage basins of mutual concern was adopted by the El Paso County Planning Commission as part of the County Master Plan on December 17, 1984 and has been subsequently amended; and

WHEREAS, Section 30-28-133(11), C.R.S., authorizes counties to adopt subdivision regulations providing for the payment of a sum of money or proof of a line of credit or other fees in equitable contribution to the total costs of the drainage facilities in the drainage basin in which the subdivision is located; and

WHEREAS, Section 8.5.5 of the *El Paso County Land Development Code* provides for the assessment of drainage basin and bridge fees and for the repayment to a subdivider, from any surplus basin funds available, of any costs the subdivider incurs because of compliance with the plans for the development of drainage basins in excess of the sum of the drainage basin fees assessed against the subdivider's impervious acreage; and

WHEREAS, the Board of County Commissioners of El Paso County, Colorado, Resolution 87-178A, authorized creation of the *City of Colorado Springs/El Paso County Drainage Criteria Manual* to set forth provisions for drainage policies, criteria, finance, and administration; and

WHEREAS, said manual has been further modified by Resolutions Nos. 88-58, 91-334, 95-81, 01-384, 04-483, 15-42 and others; and

WHEREAS, the El Paso County Public Services Department initiated an update to the Falcon Drainage Basin Planning Study dated December 15, 2000 (approved by the Planning Commission on October 17, 2000 and the Board of County Commissioners on December 14, 2000); and

WHEREAS, in accordance with the procedures outlined in the aforementioned *City of Colorado Springs/El Paso County Drainage Criteria Manual*, the El Paso County Public

Approved
El Paso County
Planning Commission
This 15th day of March 20 16
Chair
Tracey Garcia
Secretary

Chuck Broerman
10/07/2015 12:22:14 PM
Doc $0.00 3
Rec $0.00 Pages
El Paso County, CO
215109527

Sub Regional Detention Alternative[1]						
Pond		Q_2 In (cfs)	Q_2 Out (cfs)	Q_{100} In (cfs)	Q_{100} Out (cfs)	Required Volume (AF)[2]
Paint Brush Hills Pond #4	PBH 4	38	29	200	150	1.34
Paint Brush Hills Pond A	PBH A	35	7	170	140	2.62
Paint Brush Hills Pond B1	PBH B1	80	51	420	270	9.17
Paint Brush Hills Pond B2	PBH B2	51	10	270	180	12.09
Paint Brush Hills Pond C	PBH C	56	3	300	140	6.77
Regional Pond MN	R MN	65	32	850	820	7.53
Regional Pond R1	R R1	110	77	1,600	1,500	25.00
Regional Pond R2	R R2	140	140	2,200	2,200	3.13
Regional Pond WU South	R WUs	47	22	1,100	930	39.54
Sub Regional Pond SR1	SR 1	54	42	610	510	11.03
Sub Regional Pond SR2	SR 2	65	65	840	840	2.05
Sub Regional Pond SR3	SR 3	72	72	910	910	1.03
Sub Regional Pond SR4	SR 4	130	27	1,000	730	19.37
Sub Regional Pond SR6	SR 6	74	9	390	200	11.82
The Meadows Pond #1	M 1	11	0	70	0	3.25
The Meadows Pond #2	M 2	28	5	210	100	7.94
Woodmen Hills Pond #1 North	WH 1N	65	61	390	260	7.13
Woodmen Hills Pond #1 South	WH 1S	61	10	260	260	8.78
Woodmen Hills Pond #2	WH 2	37	10	270	250	9.18
Woodmen Hills Pond #3	WH 3	110	13	530	360	8.35
Woodmen Hills Pond #4	WH 4	110	15	790	260	40.45
Woodmen Hills Pond #5	WH 5	40	1	130	20	4.10
Woodmen Hills Pond H	WH H	140	110	750	750	2.66

Notes

1: Represents future hydrology with retrofit existing detention ponds and 7 new sub regional detention ponds

2: Required volume to highest WSE not including embankment

Reach Alternative	Total (ft)
Natural Channel Design	13,216
Protect in Place	64,325
Roadside Ditch Improvement	7,519
Small Drop Structures w/ Toe Protection	50,750

BURGESS RD
GOODSON RD
MERIDIAN RD
STAPLETON DR
EASTONVILLE RD
JUDGE ORR RD
WOODMEN RD
TAMLIN RD
FALCON HWY
GARRETT RD
MERIDIAN RD
DIVERSION
24

LEGEND

Detention Pond

- Existing
- Proposed
- Existing Watershed Boundary
- Historical and Future Watershed Boundary
- Tributary Basin Boundary
- Subbasin Boundary
- Major Tributary
- Immediate Action Required to Preserve Existing Condition

Reach Alternative

- Natural Channel Design
- Protect In Place
- Roadside Ditch Improvement
- Small Drop Structures w/ Toe Protection

Note:
Infrastructure and channel improvements shown may vary slightly from the final list published in the accompanying report as a result of fee revisions that have occurred following the preparation of this figure. For current information as of September 2015, please see tables in Section 6 of the accompanying report.

Figure 6-1
Selected Plan
Falcon DBPS
El Paso County, CO

0 0.5 1
Miles

NOTE: FIGURE MUST BE VIEWED IN COLOR

PPGA (Pikes Peak Geospatial Alliance)

FILE: E:\JDR\Fig_6-1_selected_plan.mxd, 5/12/2017, dsdrice

Table 6-3. Selected Detention Alternative Results

Location	HEC-HMS Element	Sub Regional Peak Flow (cfs)	
		2-year	100-year
West Tributary			
Raygor Rd.	JWT030	9	85
Stapleton Rd.	JWT120	55	710
Woodmen Rd.	JWT210	81	1,000
Hwy. 24	JWT250	64	980
Falcon Hwy.	JWT260	70	1,000
Garrett Rd.	JWT320	80	1,500
East Blaney Rd.	JWT354	140	2,200
Upstream of Bennett Ranch Tributary	JWT374_Outlet	140	2,200
Middle Tributary			
Woodmen Hills Dr.	JMT010	5	99
Woodmen Rd.	JMT070	31	840
Hwy. 24	JMT106	33	840
Falcon Hwy.	JMT110	34	860
Confluence with West Tributary	RMT114	34	860
East Tributary			
Stapleton Dr.	JET020	9	200
Woodmen Hills Dr.	JET040	10	260
Eastonville Rd.	JET060	13	360
Hwy. 24	JET090	31	300
Pinto Pony Rd.	JET100	32	300
Falcon Hwy.	JET120	50	400
Garrett Rd.	JET160	67	640
Confluence with West Tributary	RET164	66	630

6.2.3. Detention Pond Sizes & Cost Estimate

The detention ponds sizes and costs estimate as a result of selected detention alternative are provided in Table 6-4. Assumptions that were used in developing the detention pond cost estimate are as follows:

- Land requirement for proposed ponds is based on proposed rough grading and the corresponding footprint at the spillway stage.
- Construction cost based on $24,500/ac-ft as documented in the Jimmy Camp Creek DBPS - FSD Costs Memo. Engineering costs were removed from construction cost and added later to the subtotal.
- Land cost was estimated as $50,000/ac based on the current (2013) El Paso County Parks land value of $46,954/ac.
- Improvement cost was estimated at $20,000 per modified pond to retrofit existing outlet structures for EURV/WQCV and 100-yr flood control. Not all existing ponds were retrofit.

Table 6-4. Detention Pond Cost Estimate

Pond	Pond Volume (ac-ft)	Land Requirement (ac)	Construction Cost ($)	Land Cost ($)	Improvement Cost ($)	Total Cost ($)
Paint Brush Hills Pond #4	1.34	-	$ -	$ -	$ -	$ -
Paint Brush Hills Pond A	2.62	-	$ -	$ -	$ 20,000	$ 20,000
Paint Brush Hills Pond B1	9.17	-	$ -	$ -	$ -	$ -
Paint Brush Hills Pond B2	12.09	-	$ -	$ -	$ 20,000	$ 20,000
Paint Brush Hills Pond C	6.77	-	$ -	$ -	$ 20,000	$ 20,000
Regional Pond MN	7.53	-	$ -	$ -	$ 20,000	$ 20,000
Regional Pond R1	25.00	18.8	$ 532,609	$ 940,420	$ -	$ 1,473,028
Regional Pond R2	3.13	5.1	$ 66,634	$ 255,974	$ -	$ 322,608
Regional Pond WU South	39.54	-	$ -	$ -	$ 20,000	$ 20,000
Sub Regional Pond SR1	11.03	3.4	$ 234,987	$ 170,782	$ -	$ 405,769
Sub Regional Pond SR2	2.05	5.2	$ 43,674	$ 257,529	$ -	$ 301,203
Sub Regional Pond SR3	1.03	0.6	$ 21,943	$ 27,609	$ -	$ 49,552
Sub Regional Pond SR4	19.37	20.5	$ 412,665	$ 1,022,834	$ -	$ 1,435,500
Sub Regional Pond SR6	11.82	6.7	$ 251,817	$ 334,260	$ -	$ 586,078
The Meadows Pond #1	3.25	-	$ -	$ -	$ 20,000	$ 20,000
The Meadows Pond #2	7.94	-	$ -	$ -	$ 20,000	$ 20,000
Woodmen Hills Pond #1 North	7.13	-	$ -	$ -	$ 20,000	$ 20,000
Woodmen Hills Pond #1 South	8.78	-	$ -	$ -	$ 20,000	$ 20,000
Woodmen Hills Pond #2	9.18	-	$ -	$ -	$ 20,000	$ 20,000
Woodmen Hills Pond #3	8.35	-	$ -	$ -	$ 20,000	$ 20,000
Woodmen Hills Pond #4	40.45	-	$ -	$ -	$ 240,000	$ 240,000
Woodmen Hills Pond #5	4.10	-	$ -	$ -	$ 20,000	$ 20,000
Woodmen Hills Pond H	2.66	-	$ -	$ -	$ -	$ -
				Subtotal		$ 5,053,738
				Engineering/ Construction Admin. (15%)		$ 758,061
				Contingency (20%)		$ 1,010,748
				Total		**$ 6,822,546**

Additional costs as a percentage of the subtotal construction cost include Engineering/Construction Administration (15%), and Contingency (20%). Detailed quantities and cost estimates are provided in Appendix D.

PROPOSED AND EXISTING DRAINAGE MAP
& REFERENCE MAPS

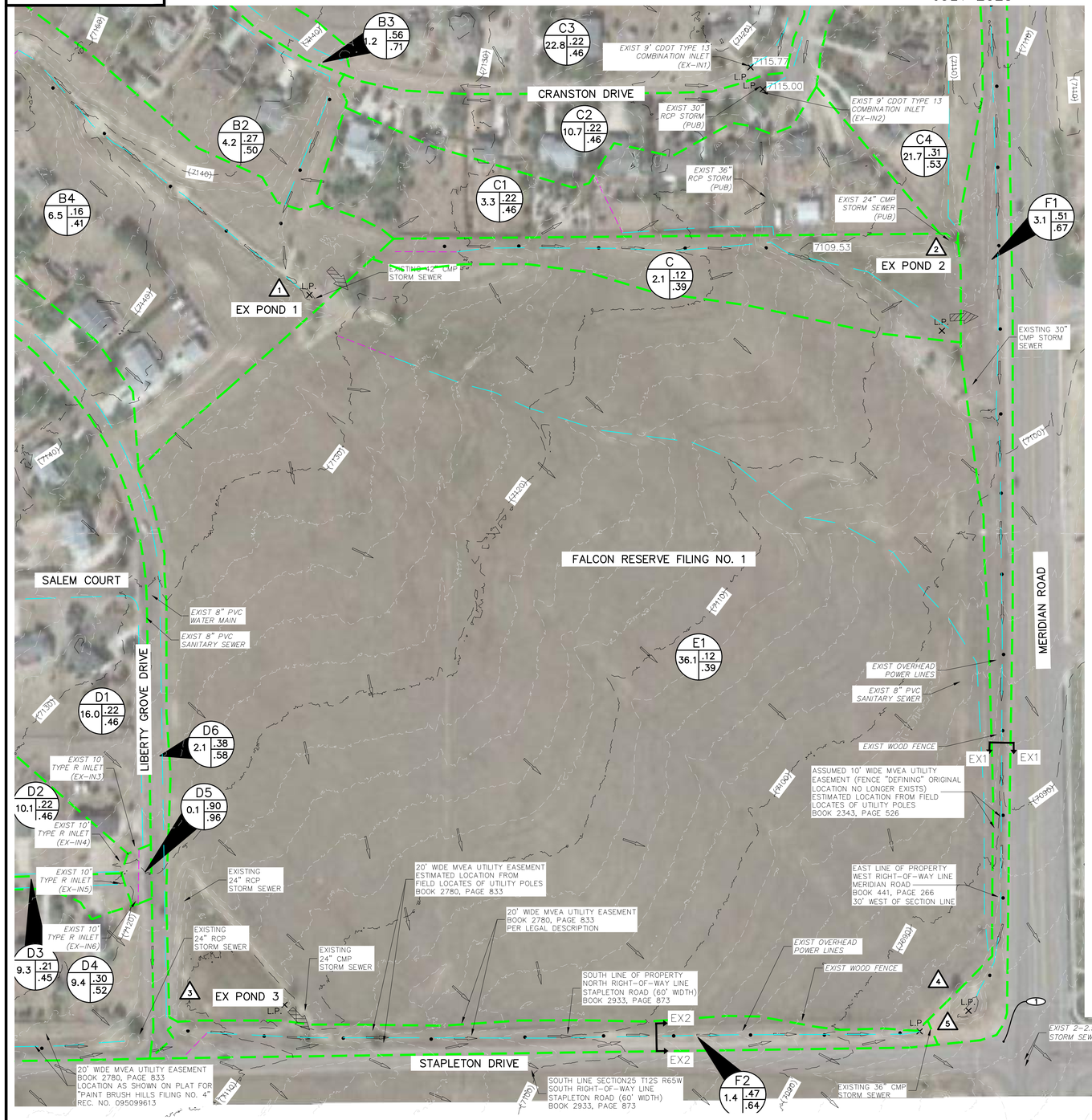
FOR LOCATING & MARKING GAS, ELECTRIC, WATER & TELEPHONE LINES

FOR BURIED UTILITY INFORMATION
48 HRS BEFORE YOU DIG
CALL 1-800-922-1987

FALCON RESERVE FILING NO. 1

EXISTING CONDITIONS DRAINAGE MAP

JULY 2025



BASIN SUMMARY			
BASIN	AREA (ACRES)	Q_5	Q_{100}
A1	29.50	24.5	78.6
B1	49.26	31.4	116.0
B2	4.20	3.9	12.1
B3	1.22	2.8	5.9
B4	6.46	3.6	16.3
C	2.13	0.9	4.9
C1	3.27	2.8	10.0
C2	10.67	7.1	24.8
C3	22.78	20.8	59.5
C4	21.69	18.0	51.5
D1	16.01	12.1	42.5
D2	10.14	7.2	25.3
D3	9.30	6.1	22.3
D4	9.36	9.4	26.9
D5	0.09	0.4	0.7
D6	2.05	2.8	7.0
E1	36.10	13.6	74.0
F1	3.13	4.6	10.2
F2	1.44	2.4	5.5

DESIGN POINT SUMMARY				
DESIGN POINT	Q_5	Q_{100}	BASIN	STRUCTURE
1	55.5	192.4	A1, B1, B2, B3, B4	EX POND 1
2	45.9	138.2	C1, C2, C3, C4	EX POND 2
3	34.8	114.4	D1, D2, D3, D4, D5, D6	EX POND 3
4	59.8	228.0	E1, DP1	SOUTHEAST CORNER OF BASIN E1
5	134.2	455.8	F1, F2, DP2, DP3, DP4	EX DUAL 2.5' x 6' RCBC

STORM SEWER SUMMARY				
PIPE RUN	Q_5	Q_{100}	PIPE SIZE	CONTRIBUTING PIPES/DESIGN POINTS
1	134.2	455.8	EX DUAL 2.5' x 6' RCBC	DP 5

1" = 100'

0 50 100 200

Scale in Feet

LEGEND

BASIN DESIGNATION — Z / 25 / .25 / .35 — C5 / ACRES / C100

1 — SURFACE DESIGN POINT

PROPOSED BASIN BOUNDARY

PIPE RUN LABEL

7070 — PROP MAJ CONT

7072 — PROP MIN CONT

(7070) — EXIST MAJ CONT

(7072) — EXIST MIN CONT

OVERLAND FLOW PATH

CONCENTRATED FLOW PATH

PROPOSED STORM SEWER PIPE

PROPOSED STORM SEWER PIPE (OTHERS)

FUTURE STORM SEWER PIPE

SITE BOUNDARY

PROPOSED UTILITY EASEMENT

PROPOSED DRAINAGE EASEMENT

PROPOSED LANDSCAPE EASEMENT

LOT LINE

ST — STORM SEWER LINE

UE — EX. UNDERGROUND ELECTRIC LINE

SS — EX. SANITARY SEWER LINE

WL — EX. WATER LINE

ST — EX. STORM SEWER LINE

EXISTING SWALE

EXISTING FLOW DIRECTION ARROW

9 — LOT NUMBER

ICV — EX. IRRIGATION VALVE

ST — EX. STORM INLET

G — EX. GAS TEST NODE

T — EX. TELEPHONE PEDESTAL

ELVL — EX. ELECTRIC VAULT

SS — EX. SANITARY MANHOLE

EX. WATER VALVE

PROPOSED RIPRAP

EMERGENCY OVERFLOW DIRECTION

L.P. — LOW POINT

PROPOSED SWALE

PROPOSED FLOW DIRECTION ARROW

H.P. — HIGH POINT

CIVIL CONSULTANTS, INC.
212 N. WAHSATCH AVE., STE 305
COLORADO SPRINGS, CO 80903
PHONE: 719.955.5485

FALCON RESERVE FILING NO. 1

EXISTING DRAINAGE MAP

PROJECT NO. 43-144	SCALE: HORIZONTAL: 1"=100' VERTICAL: NA	DATE: 7/17/25	
DESIGNED BY: GT		SHEET 1 OF 2	EDM
DRAWN BY: GT			
CHECKED BY: DM			

File: O:\43144A-Falcon Reserve\Landfuels\Drainage\Drainage Map\43-144A EDM.dwg Plotstamp: 7/17/2025 4:29 PM

FOR LOCATING & MARKING GAS, ELECTRIC, WATER & TELEPHONE LINES

FOR BURIED UTILITY INFORMATION
48 HRS BEFORE YOU DIG
CALL 1-800-922-1987

FALCON RESERVE FILING NO. 1
EXISTING CONDITIONS DRAINAGE MAP
JULY 2025

BASIN SUMMARY			
BASIN	AREA (ACRES)	Q_5	Q_{100}
A1	29.50	24.5	78.6
B1	49.26	31.4	116.0
B2	4.20	3.9	12.1
B3	1.22	2.8	5.9
B4	6.46	3.6	16.3
C	2.13	0.9	4.9
C1	3.27	2.8	10.0
C2	10.67	7.1	24.8
C3	22.78	20.8	59.5
C4	21.69	18.0	51.5
D1	16.01	12.1	42.5
D2	10.14	7.2	25.3
D3	9.30	6.1	22.3
D4	9.36	9.4	26.9
D5	0.09	0.4	0.7
D6	2.05	2.8	7.0
E1	36.10	13.6	74.0
F1	3.13	4.6	10.2
F2	1.44	2.4	5.5

DESIGN POINT SUMMARY				
DESIGN POINT	Q_5	Q_{100}	BASIN	STRUCTURE
1	55.5	192.4	A1, B1, B2, B3, B4	EX POND 1
2	45.9	138.2	C, C1, C2, C3, C4	EX POND 2
3	34.8	114.4	D1, D2, D3, D4, D5, D6	EX POND 3
4	59.8	228.0	E1, DP1	SOUTHEAST CORNER OF BASIN E1
5	134.2	455.8	F1, F2, DP2, DP3, DP4	EX DUAL 2.5' x 6' RCBC

STORM SEWER SUMMARY				
PIPE RUN	Q_5	Q_{100}	PIPE SIZE	CONTRIBUTING PIPES/DESIGN POINTS
1	134.2	455.8	EX DUAL 2.5' x 6' RCBC	DP 5

LEGEND

BASIN DESIGNATION: Z / 25 / .25 / .35 / C5 / C100 / ACRES

1 — SURFACE DESIGN POINT
PROPOSED BASIN BOUNDARY
PIPE RUN LABEL
7070 — PROP MAJ CONT
7072 — PROP MIN CONT
(7070) — EXIST MAJ CONT
(7072) — EXIST MIN CONT
OVERLAND FLOW PATH
CONCENTRATED FLOW PATH
PROPOSED STORM SEWER PIPE
PROPOSED STORM SEWER PIPE (OTHERS)
FUTURE STORM SEWER PIPE
SITE BOUNDARY
PROPOSED UTILITY EASEMENT
PROPOSED DRAINAGE EASEMENT
PROPOSED LANDSCAPE EASEMENT
LOT LINE
ST — STORM SEWER LINE
UE — EX. UNDERGROUND ELECTRIC LINE
SS — EX. SANITARY SEWER LINE
WL — EX. WATER LINE
ST — EX. STORM SEWER LINE
EXISTING SWALE
EXISTING FLOW DIRECTION ARROW
9 — LOT NUMBER
ICV — EX. IRRIGATION VALVE
ST — EX. STORM INLET
G — EX. GAS TEST NODE
T — EX. TELEPHONE PEDESTAL
ELVL — EX. ELECTRIC VAULT
SS — EX. SANITARY MANHOLE
EX. WATER VALVE
PROPOSED RIPRAP
EMERGENCY OVERFLOW DIRECTION
L.P. — LOW POINT
PROPOSED SWALE
PROPOSED FLOW DIRECTION ARROW
H.P. — HIGH POINT

1" = 200'
0 100 200 400
Scale in Feet

CIVIL CONSULTANTS, INC.
212 N. WAHSATCH AVE., STE 305
COLORADO SPRINGS, CO 80903
PHONE: 719.955.5485

FALCON RESERVE FILING NO. 1
EXISTING OVERALL DRAINAGE MAP

PROJECT NO. 43-144	SCALE: HORIZONTAL: 1"=200' VERTICAL: NA	DATE: 7/17/25	
DESIGNED BY: GT		SHEET 2 OF 2	EDM
DRAWN BY: GT			
CHECKED BY: DM			

File: O:\43144A-Falcon Reserve\Landfiuls\Drainage\Drainage Map\43-144A EDM.dwg Plotstamp: 7/17/2025 4:27 PM

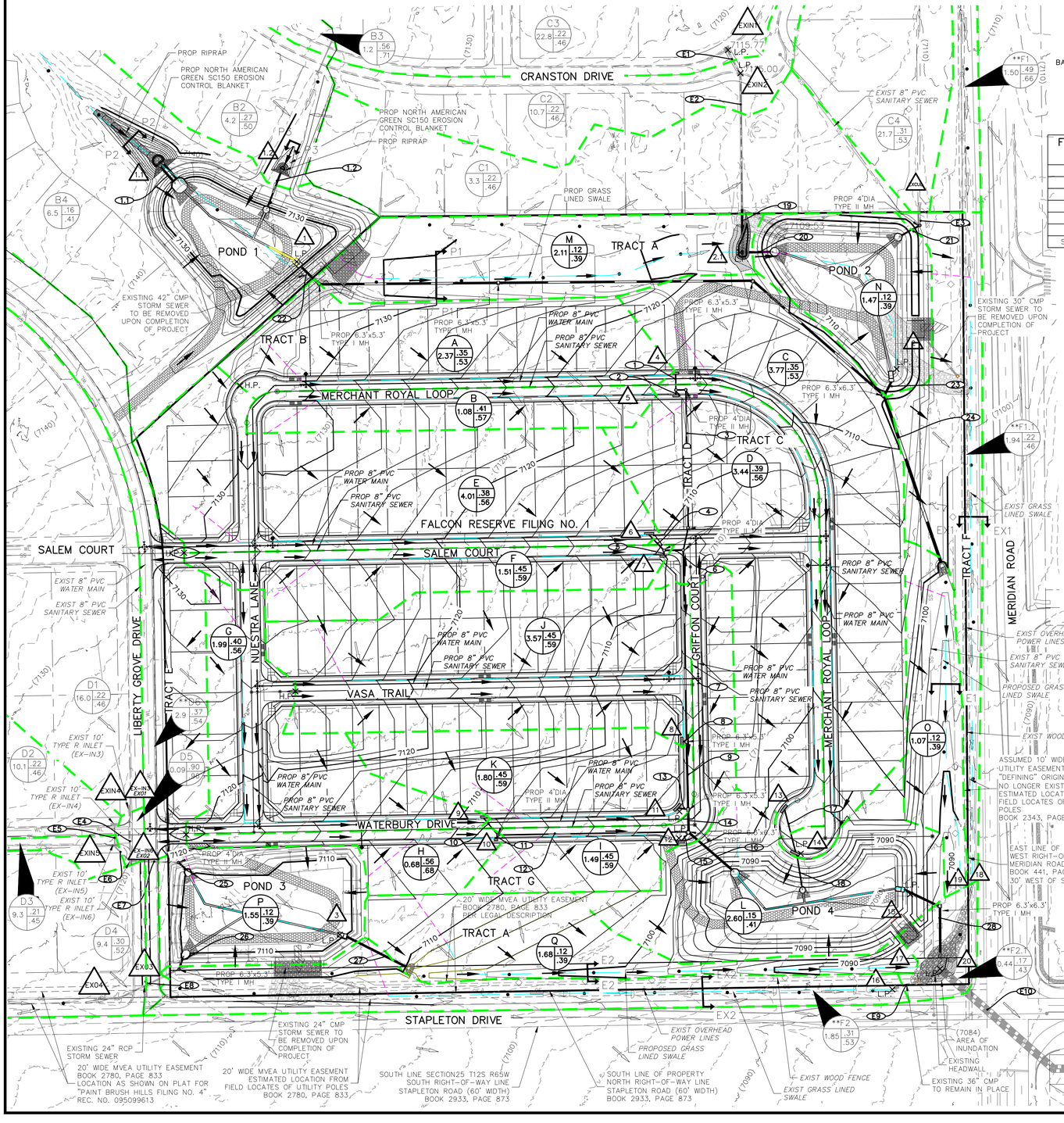
FOR LOCATING & MARKING GAS, ELECTRIC, WATER & TELEPHONE LINES

FOR BURIED UTILITY INFORMATION
48 HRS BEFORE YOU DIG
CALL 1-800-922-1987

FALCON RESERVE FILING NO. 1

PROPOSED CONDITIONS DRAINAGE MAP

AUGUST 2025



BASIN DESIGNATION
Z
25 .25 .35
ACRES C5 C100

EXISTING BASIN LABEL

BASIN DESIGNATION
Z
25 .25 .35
ACRES C5 C100

PROPOSED BASIN LABEL

1

7070
7072
(7070)
(7072)

LEGEND

- SURFACE DESIGN POINT
- PROPOSED BASIN BOUNDARY
- EXISTING BASIN BOUNDARY
- OVERLAND FLOW PATH
- CONCENTRATED FLOW PATH
- PIPE RUN LABEL
- PROP MAJ CONT
- PROP MIN CONT
- EXIST MAJ CONT
- EXIST MIN CONT
- PROPOSED STORM SEWER PIPE
- PROPOSED STORM SEWER PIPE (OTHERS)
- FUTURE STORM SEWER PIPE
- SITE BOUNDARY
- PROPOSED UTILITY EASEMENT
- PROPOSED DRAINAGE EASEMENT
- PROPOSED LANDSCAPE EASEMENT
- LOT LINE
- ST STORM SEWER LINE
- UE EX. UNDERGROUND ELECTRIC LINE
- SS EX. SANITARY SEWER LINE
- WL EX. WATER LINE
- ST EX. STORM SEWER LINE
- EXISTING SWALE
- EXISTING FLOW DIRECTION ARROW
- 9 LOT NUMBER
- ICV EX. IRRIGATION VALVE
- ST EX. STORM INLET
- G EX. GAS TEST NODE
- T EX. TELEPHONE PEDESTAL
- EVLT EX. ELECTRIC VAULT
- SS EX. SANITARY MANHOLE
- EX. WATER VALVE
- PROPOSED RIPRAP
- EMERGENCY OVERFLOW DIRECTION
- L.P. LOW POINT
- PROPOSED SWALE
- PROPOSED FLOW DIRECTION ARROW
- H.P. HP HIGH POINT/LP LOW POINT

FULL SPECTRUM DETENTION POND POND 1 (PRIVATE)	
WQ VOLUME	1.003 AC-FT
EURV VOLUME	2.213 AC-FT
100 YR STORAGE VOLUME	4.624 AC-FT
100 YR WATER SURFACE EL	7132.91
SPILLWAY CREST EL	7133.10
TOP OF EMBANKMENT EL	7136.00
SPILLWAY DESIGN FLOW DEPTH	0.70 FT

FULL SPECTRUM DETENTION POND POND 2 (PRIVATE)	
WQ VOLUME	0.780 AC-FT
EURV VOLUME	1.897 AC-FT
100 YR STORAGE VOLUME	3.772 AC-FT
100 YR WATER SURFACE EL	7107.77
SPILLWAY CREST EL	7107.78
TOP OF EMBANKMENT EL	7110.00
SPILLWAY DESIGN FLOW DEPTH	0.99 FT

FULL SPECTRUM DETENTION POND POND 3 (PRIVATE)	
WQ VOLUME	0.603 AC-FT
EURV VOLUME	1.434 AC-FT
100 YR STORAGE VOLUME	3.163 AC-FT
100 YR WATER SURFACE EL	7112.46
SPILLWAY CREST EL	7112.47
TOP OF EMBANKMENT EL	7114.00
SPILLWAY DESIGN FLOW DEPTH	0.53

FULL SPECTRUM DETENTION POND POND 4 (PRIVATE)	
WQ VOLUME	0.508 AC-FT
EURV VOLUME	1.610 AC-FT
100 YR STORAGE VOLUME	2.647 AC-FT
100 YR WATER SURFACE EL	7087.45
SPILLWAY CREST EL	7087.46
TOP OF EMBANKMENT EL	7092.00
SPILLWAY DESIGN FLOW DEPTH	0.99 FT

BASIN SUMMARY

BASIN	AREA (ACRES)	Q_5	Q_{100}
A1	29.50	24.5	78.6
B1	49.26	31.4	116.0
B2	4.20	3.9	12.1
B3	1.22	2.8	5.9
B4	6.46	3.6	16.3
C1	3.27	2.8	10.0
C2	10.67	7.1	24.8
C3	22.78	15.0	52.2
C4	21.69	18.0	51.5
D1	16.01	12.1	42.5
D2	10.14	7.2	25.3
D3	9.30	6.1	22.3
D4	9.36	9.4	26.9
D5	0.09	0.4	0.7
**D6	2.93	3.8	9.3
**F1	1.50	2.5	5.7
**F1.1	1.94	1.5	5.4
**F2	1.85	2.1	6.0
**F2.1	0.44	0.4	1.6
A	2.37	3.2	8.2
B	1.08	1.7	3.9
C	3.77	4.6	11.7
D	3.44	4.9	11.7
E	4.01	5.7	14.1
F	1.51	2.7	5.9
G	1.99	2.9	6.9
H	0.68	1.7	3.5
I	1.49	2.8	6.2
J	3.57	6.3	13.9
K	1.80	3.4	7.4
L	2.60	1.5	7.1
M	2.11	0.9	5.0
N	1.47	0.8	4.2
O	1.07	0.4	2.4
P	1.55	0.9	4.7
Q	1.68	0.7	3.9

DESIGN POINT SUMMARY

DESIGN POINT	Q_5	Q_{100}	BASIN	STRUCTURE
EX-1.1	49.5	173.3	A1, B1, PARTIAL B4	DUAL 36" RCP CULVERTS
EX-1.2	6.3	17.1	B2, B3	PROP 24" RCP CULVERT
EX-IN1	10.9	38.3	TOTAL C2-C3 SPLIT	EX 9' CDOT TYPE 13 COMBINATION INLET
EX-IN2	10.9	38.3	TOTAL C2-C3 SPLIT	EX 9' CDOT TYPE 13 COMBINATION INLET
EX-CUL	18.0	51.5	C4	EX 24" CULVERT W/FES
EX-IN3/EX01	12.1	25.2	D1, PARTIAL **D6 @ EX-IN3	EX 10 CDOT TYPE R INLET Q100 FLOWS SPLIT
EX-IN4	7.2	25.3	D2	EX 10 CDOT TYPE R INLET
EX-IN5	6.1	22.3	D3	EX 10 CDOT TYPE R INLET
EX-IN6/EX02	8.9	31.4	D5,PARTIAL **D6 @ EX-IN6, FB EX01,EX-IN4,EX-IN5	EX 10 CDOT TYPE R INLET Q100 FLOW SPLIT
EX-03	6.1	26.2	D4 STREET, **D6 @ STAPLETON, FB EX-IN6/EX02	TOTAL FLOW WITHIN LIBERTY STREET SECTION
EX-04	11.7	40.7	D4 EXCLUDE D4 STREET SECTION, ½ DP EX-03 MINUS FB TRANSFER OVER CROWN	EX 24" RCP CULVERT
1	55.5	192.4	A1,B1,B2,B3,B4	POND 1
2.1	2.9	15.7	M,C1,FB DP EX-IN2	PROP CDOT TYPE D INLET
2	41.0	130.3	N,PR20,PR21	POND 2
3	40.4	94.6	P,PR25,PR26, EX 15" CURBCUT PARTIAL CAPTURE **D6 @ STAPLETON	POND 3
4	3.2	8.2	A	PROP 10' TYPE R AT-GRADE INLET (IN-1)
5	1.7	3.9	B	PROP 10' CDOT TYPE R AT-GRADE INLET (IN-2)
6	5.7	14.1	E	PROP 15' CDOT TYPE R AT-GRADE INLET (IN-3)
7	2.7	5.9	F	PROP 10' CDOT TYPE R AT-GRADE INLET (IN-4)
8	6.3	13.9	J	PROP 15' CDOT TYPE R AT-GRADE INLET (IN-5)
9	2.9	6.9	G	PROP 10' TYPE R SUMP INLET (IN-6)
10	1.7	3.5	H	PROP 5' TYPE R AT-GRADE INLET (IN-7)
11	3.1	10.6	K, FB-DP8, FB-DP9	PROP 15' TYPE R SUMP INLET (IN-8)
12	2.9	7.2	I, FB-DP10	PROP 10' TYPE R SUMP INLET (IN-9)
13	4.3	13.2	D, FB-DP5-DP6-DP7	PROP 15' TYPE R AT-GRADE INLET (IN-10)
14	3.9	13.2	C, FB-DP4-DP13	PROP 15' TYPE R SUMP INLET (IN-11)
15	28.9	72.3	L, PR16, PR18	POND 4
16	2.5	28.7	**F2, EASTSIDE FB-15' CURBCUT EX03, WESTSIDE FB EX03 OVER LIBERTY CROWN	EX 3' WIDE SWALE
17	13.2	75.2	Q,PR27	PROP 8' WIDE SWALE
18	3.2	8.7	**F1,**F1.1	EX 3' WIDE SWALE
19	22.8	101.6	O,PR24	PROP 10' WIDE SWALE
20	49.2	259.8	**F2.1,DP17,DP18,DP19,PRE9,PR28	EX DUAL 2.5'x6.0' RCBC

STORM SEWER SUMMARY

PIPE RUN	Q_5	Q_{100}	PIPE SIZE	CONTRIBUTING PIPES/DESIGN POINTS
PRE1	10.9	34.1	EX 30" RCP	EX-IN1
PRE2	21.9	68.2	EX 36" RCP	EX-IN2, PRE1
PRE3	18.0	51.5	EX 24" CMP	EX-CUL
PRE4	7.7	10.8	NA EXISTING	EX-IN3
PRE5	5.9	10.9	NA EXISTING	EX-IN4
PRE6	11.1	20.9	NA EXISTING	EX-IN5, PRE5
PRE7	24.7	42.7	EX 24" RCP	EX-IN6, PRE4, PRE6
PRE8	11.7	40.7	EX 24" RCP	DP EX04
PRE9	2.5	28.7	EX 36" CMP	DP16
PRE10	49.2	259.8	DUAL 2.5'x6' RCBC	DP20
PR1.1	49.5	173.3	DUAL 36" RCP	DP EX-1.1
PR1.2	6.3	17.1	24" RCP	DP EX-1.2
1	3.2	6.3	15" RCP	DP4
2	1.7	3.9	15" RCP	DP5
3	4.8	9.9	18" RCP	PR1, PR2
4	5.7	11.4	18" RCP	DP6
5	2.7	5.2	15" RCP	DP7
6	8.3	16.4	24" RCP	PR4, PR5
7	12.7	25.6	24" RCP	PR3, PR6
8	6.3	11.3	24" RCP	DP8
9	18.3	35.4	30" RCP	PR7, PR8
10	2.9	5.8	15" RCP	DP9
11	1.6	2.4	15" RCP	DP10
12	4.2	7.7	18" RCP	PR10, PR11
13	3.1	10.6	18" RCP	DP11
14	21.2	45.3	36" RCP	PR9, PR13
15	2.9	7.2	15" RCP	DP12
16	23.7	51.5	36" RCP	PR14, PR15
17	4.3	11.4	18" RCP	DP13
18	8.0	24.0	18" RCP	DP14, PR17
19	21.9	68.2	36" RCP	PRE2
20	24.8	83.9	36" RCP	DP2.1, PR19
21	18.0	51.5	24" RCP	PRE3
22	15.2	64.3	36" RCP	POND1 RELEASE
23	10.6	50.6	36" RCP	POND 2 RELEASE
24	24.9	111.0	48" RCP	PR22, PR23
25	24.7	42.7	24" RCP	PRE7
26	11.7	40.7	24" RCP	PRE8
27	8.7	49.8	36" RCP	POND 3 RELEASE
28	4.4	33.9	36" RCP	POND 4 RELEASE

CIVIL CONSULTANTS, INC.
212 N. WAHSATCH AVE., STE 305
COLORADO SPRINGS, CO 80903
PHONE: 719.955.5485

FALCON RESERVE FILING NO. 1

PROPOSED DRAINAGE MAP

PROJECT NO. 43-144	SCALE: HORIZONTAL: 1"=100' VERTICAL: NA	DATE: 05/06/26
DESIGNED BY: GT		
DRAWN BY: GT		FDM
CHECKED BY: VAS		

File: O:\43144A-Falcon Reserve\Landhuis\Drainage\Drainage Map\43-144A FDM.dwg Plotstamp: 5/6/2026 8:47 AM