Final Drainage Report – Filing No. 1

Waterview East Commercial
El Paso County, Colorado

Prepared for:
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Waterview Commercial Investors, LLC
2727 Glen Arbor Drive
Colorado Springs, CO 80920

Prepared by:
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Project #: 196195001

Prepared: March 12, 2026

Add text:
EDARP File No.:
SF269

Kimley»Horn

CERTIFICATION

DESIGN ENGINEER'S STATEMENT

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

SIGNATURE (Affix Seal): _____

Jessica McCallum, P.E.
Colorado P.E. No. 59054 Date

OWNER/DEVELOPER'S STATEMENT

I, the developer, have read and will comply with all the requirements specified in this Drainage Report and Plan.

_____
Name of Developer

_____
Authorized Signature Date

_____
Printed Name

_____
Title

_____
Address:

EL PASO COUNTY

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

_____ _____
Josh Palmer, P.E. Date
County Engineer/ ECM Administrator

Conditions:

GEC Checklist Item EE. Per his request, please also add Josh□s middle initial "J." here

Kimley»Horn

Contents

INTRODUCTION

PURPOSE AND SCOPE OF STUDY

The purpose of this Final Drainage Report – Filing No. 1 (FDR) is to provide the drainage design calculations and drainage exhibit for the infrastructure improvements for Filing No. 1 for the Waterview East Subdivision ("the Project") for Waterview Commercial Investors, LLC. The Project is located within the jurisdictional limits of El Paso County ("the County"). Therefore, the hydrologic and grading design is based on the County's criteria which are described in further detail within the report.

LOCATION

The Project is located within part of the West ½ of Section 9, Township 15 South, Range 65 West of the 6th Principal Meridian, County of El Paso, State of Colorado ("the Site"). The Site is bounded by Powers Boulevard (Highway 21) on the west, The Trails at Aspen Ridge Filing No. 1 to the east and to the south, and Bradley Road to the north. A vicinity map has been provided in the **Appendix A** of this report.

The Site is currently owned by Waterview East Development, LLC. The site is currently being platted.

DESCRIPTION OF PROPERTY

The Site is approximately 21.4 acres consisting of undeveloped land with native vegetation and is characterized primarily by prairie grasses along with some area of scrub brush and a limited occurrence of small oaks. The Site does not currently provide water quality or detention for the Project area. The existing land use is undeveloped vacant land. There are no existing irrigation ditches on the Site.

The existing topography consists of slopes ranging from 1% to 33%.

According to NRCS soil mapping data, USCS Type A and B soils are the primary soil type within the site. Soils present at the Site consist mainly of "Blakeland loamy sand" which represent a moderate hazard for erosion. **Appendix B** contains detailed NRCS soil data.

The development of the overall site (22.1 acres) will include commercial developments, including a convenience store, restaurants, storage units and retail stores. The infrastructure improvements for Filing No. 1 consist of an internal private drive within a Tract, overlot grading of Lots 1 and 2, right turn lane on Legacy Hill Drive, extension of Frontside Drive, utility main extensions, and a private extended detention basin.

A Topographic field survey was completed and updated for the Project by Ridgeline Land Surveying dated February 7th, 2023 and additional topographic information was provided on March 3rd, 2026 which are the basis for design for the drainage improvements.

FLOODPLAIN STATEMENT

The Site is located outside the 100-year floodplain and within Zone X (an area of minimal flood hazard) as noted on the FEMA FIRM Map No. 08041C0768G revised on December 7, 2018 (See **Appendix B**).

DRAINAGE BASINS

MAJOR BASIN DESCRIPTIONS

The western half of the Property lies within the Big Johnson drainage basin, and the eastern half of the Property lies within the West Fork of Jimmy Camp Creek drainage basin. The watershed is generally located in the central portion of El Paso County. Refer to **Appendix A** for the Flood Insurance Rate Map (FIRM) number 08041C0768G effective date, December 7, 2018. There was a Drainage Basin Planning Study conducted for the Big Johnson basin in February 1992; however, there has not been one conducted for the Sand Creek basin. Please see reference in the **Appendix**.

MASTER DRAINAGE REPORT STUDY

The Waterview East commercial development project is part of the "Master Development Drainage Plan Amendment for Waterview East & Preliminary Drainage Plan for Trails at Aspen Ridge" Prepared by: Matrix Design Group September 2019. As outlined in the Master Drainage Plan, the "East Pond" was sized to include flows from the future "Commercial Lot south of Bradley Road and West of Legacy Drive". The Offsite Commercial Development which consists of the Site represented in this FDR is required to provide on-site detention and can outfall to the existing storm sewer stub in the southeast portion of the Site. The allowable flows to the stub are 1.3 cfs and 19.4 cfs in the 5-year and 100-year event, respectively. The proposed 5-year and 100-year release rate from the proposed pond to the stub are 0.4 cfs and 16.1 cfs respectively.

As noted in the Master Drainage Plan, the eastern portion of the Site which is part of the West Fork Jimmy Camp Creek drainage basin will require on site detention. As noted in the Master Drainage Plan, the western portion of the Site which is part of the Big Johnson Reservoir drainage basin for future development will require on-site detention. This report sizes a permanent extended detention basin to treat Lots 1 and 2 and a portion of the west property for future commercial development. Offsite flows are addressed in the existing sub-basin descriptions below.

Excerpts from "Master Development Drainage Plan Amendment for Waterview East & Preliminary Drainage Plan for Trails at Aspen Ridge" Prepared by: Matrix Design Group June 2019 have been provided in **Appendix E**.

EXISTING SUB-BASIN DESCRIPTIONS

Historically, runoff from the Site is split almost directly down the center. The existing sub-basins were modified due to the overlot grading procedures during the early grading permit process. The site has been divided into onsite subbasins, EX-1-EX-9, and one offsite basin, OS-1.

Sub-Basin EX-1
The on-site sub-basin EX-1 is undeveloped consisting of overlot graded conditions and existing vegetation with an area of 2.43 acres along the western property line. Drainage flows overland from east to west at slopes ranging from 6-8%. Flows are collected in the existing roadside ditch along Powers Blvd and travel south where they are conveyed west through an existing 60" CMP under Powers Blvd and into Big Johnson Reservoir. Runoff during the 5-year and 100-year events are 1.00 cfs and 6.38 cfs respectively.

Sub-Basin EX-2
The on-site sub-basin EX-2 is undeveloped consisting of overlot graded conditions and existing vegetation with an area of 3.22 acres comprising the northeast portion of the property. Drainage flows overland from west to east via an existing swale at slopes of 2-8%. Flows are collected in the existing temporary sediment basin and eventually discharge to the curb and gutter within Legacy Hill Drive and are conveyed to an existing 10' Type R curb inlet at the intersection of Legacy Drive and Frontside Drive. Flows are then carried through existing storm infrastructure into East Pond as outlined in the "Master Development Drainage Plan Amendment for Waterview East & Preliminary Drainage Plan for Trails at Aspen Ridge" Prepared by: Matrix Design Group September 2019. Runoff during the 5-year and 100-year events are 1.49 cfs and 9.51 cfs respectively.

Sub-Basin EX-3
The on-site sub-basin EX-3 is undeveloped consisting of overlot graded conditions and existing vegetation with an area of 0.63 acres comprising the east portion of the property. Drainage flows overland from west to east at slopes ranging from 6-15%. Flows are collected in the curb and gutter within Legacy Hill Drive and are conveyed to an existing 10' Type R curb inlet at the intersection of Legacy Drive and Frontside Drive. Flows are then carried through existing storm infrastructure into East Pond as outlined in the "Master Development Drainage Plan Amendment for Waterview East & Preliminary Drainage Plan for Trails at Aspen Ridge" Prepared by: Matrix Design Group September 2019. Runoff during the 5-year and 100-year events are 0.32 cfs and 2.02 cfs respectively.

Sub-Basin EX-4
The on-site sub-basin EX-4 is undeveloped consisting of overlot graded conditions and existing vegetation with an area of 2.63 acres comprising the central portion of the property. Drainage flows overland from west to east at slopes ranging from 2-25%. Flows are collected in the temporary sediment basin and eventually discharge to the curb and gutter within Legacy Hill Drive and are conveyed to an existing 10' Type R curb inlet at the intersection of Legacy Drive and Frontside Drive. Flows are then carried through existing storm infrastructure into East Pond as outlined in the "Master Development Drainage Plan Amendment for Waterview East & Preliminary Drainage Plan for Trails at Aspen Ridge" Prepared by: Matrix Design Group September 2019. Runoff during the 5-year and 100-year events are 1.33 cfs and 8.49 cfs respectively.

Sub-Basin EX-5
The on-site sub-basin EX-5 is undeveloped consisting of overlot graded conditions and existing vegetation with an area of 2.90 acres comprising the eastern property line. Drainage flows overland from west to east at slopes ranging from 5-15%. Flows are collected in the curb and gutter within Legacy Hill Drive and are conveyed to an existing 10' Type R curb inlet at the intersection of Legacy Drive and Frontside Drive. Flows are then carried through existing storm infrastructure into East Pond as outlined in the "Master Development Drainage Plan Amendment for Waterview East & Preliminary Drainage Plan for Trails at Aspen Ridge"

Prepared by: Matrix Design Group September 2019. Runoff during the 5-year and 100-year events are 1.54 cfs and 9.82 cfs respectively.

Sub-Basin EX-6
The on-site sub-basin EX-6 is undeveloped consisting of overlot graded conditions and existing vegetation with an area of 0.97 acres along the eastern property line. Drainage flows overland from east to west at slopes ranging from 5-15%. Flows are collected in an existing temporary sediment basin before ultimately discharging and continuing southeast per historic drainage conditions. Runoff during the 5-year and 100-year events are 0.55 cfs and 3.53 cfs respectively.

Sub-Basin EX-7
The on-site sub-basin EX-7 is undeveloped consisting of overlot graded conditions and existing vegetation with an area of 7.18 acres within the central property of the property. Drainage flows overland from east to west at slopes ranging from 5-15%. Drainage flows overland from north to south via an existing swale at slopes of 1-15%. Flows are collected in the existing temporary sediment basin before ultimately discharging to the existing Powers Boulevard roadside ditch. Runoff during the 5-year and 100-year events are 3.03 cfs and 19.38 cfs respectively.

Sub-Basin EX-8
The on-site sub-basin EX-8 is undeveloped consisting of overlot graded conditions and existing vegetation with an area of 1.17 acres within the southeast portion of the property. Drainage flows overland from east to west at slopes ranging from 5-10%. Flows are discharged to the southeast per historic drainage conditions. Runoff during the 5-year and 100-year events are 0.58 cfs and 3.73 cfs respectively.

Sub-Basin EX-9
The on-site sub-basin EX-9 is undeveloped consisting of overlot graded conditions and existing vegetation with an area of 0.32 acres along the south property line. Drainage flows overland from north to south at slopes of 33%. Flows are discharged to the south per historic drainage conditions. Runoff during the 5-year and 100-year events are 0.22 cfs and 1.42 cfs respectively.

Sub-Basin OS-1
The off-site sub-basin OS-1 is undeveloped consisting of native grasses and shrubs with an area of 0.47 acres comprising the northern boundary of the Site. Drainage flows overland from north to south at slopes ranging from 5-33%. Flows convey via a swale to the existing temporary sediment basin before ultimately collected via existing curb and gutter along Legacy Drive, which are conveyed to an existing 10’ Type R curb inlet at the intersection of Legacy Drive and Frontside Drive. Flows are then carried through existing storm infrastructure into East Pond as outlined in the “Master Development Drainage Plan Amendment for Waterview East & Preliminary Drainage Plan for Trails at Aspen Ridge” Prepared by: Matrix Design Group September 2019. Runoff during the 5-year and 100-year events are 0.22 cfs and 1.42 cfs respectively.

Refer to **Appendix F** for the Existing Drainage Conditions Map.

PROPOSED SUB-BASIN DESCRIPTIONS

For the proposed condition, stormwater will generally maintain historic flow patterns. Sub-basins A1, A2, FD1, PR1, PR2, and P will be routed to the proposed extended detention basin and will outfall from the pond to the existing storm sewer stub. Sub-basins UD1, UD2, FS1, and FS2 will follow historic drainage patterns and are excluded per the exclusions listed in the respective

sub-basin descriptions.

Sub-Basin A1

The on-site sub-basin A1 consists of native vegetation in the northeast portion of the site. Sub-Basin A1 encompasses Lot 1 which is to be developed into a future convenience store. Detailed drainage design of the convenience store and drainage basins will be provided with a separate Site Development Plan and Final Drainage Report submittal. The sub-basin has an area of 2.00 acres and a weighted imperviousness of 95%. Runoff in this basin will be collected by future proposed storm sewer infrastructure and routed to the 18" RCP storm sewer stub (Design Point A1) to discharge to the pond. Runoff during the 5-year and 100-year events are 5.92 cfs and 13.93 cfs respectively.

Sub-Basin A2

The on-site sub-basin A2 consists of native vegetation in the north portion of the site. Sub-Basin A2 encompasses Lot 2 which is to be developed into a commercial user. Detailed drainage design of the commercial store and drainage basins will be provided with a separate Site Development Plan and Final Drainage Report submittal. The sub-basin has an area of 1.50 acres and a weighted imperviousness of 95%. Runoff in this basin will be collected by future proposed storm sewer infrastructure and routed to the 18" RCP storm sewer stub (Design Point A2) to discharge to the pond. Runoff during the 5-year and 100-year events are 4.48 cfs and 10.32 cfs respectively.

Sub-Basin FD1

The on-site sub-basin FD1 consists of native vegetation in the northwest portion of the site and is a future development for commercial uses. The sub-basin has an area of 2.91 acres and a weighted imperviousness of 95%. Runoff in this basin will be collected by future proposed storm sewer infrastructure and routed to the 24" RCP storm sewer stub (Design Point FD1) to discharge to the pond. Runoff during the 5-year and 100-year events are 8.41 cfs and 19.39 cfs respectively.

Sub-Basin FD2

The on-site sub-basin FD2 consists of native vegetation in the west portion of the site and is a future development for commercial uses. The sub-basin has an area of 3.19 acres and a weighted imperviousness of 95%. Runoff in this basin will be collected by future proposed storm sewer infrastructure and routed to the 24" RCP storm sewer stub (Design Point FD2) to discharge to the pond. Runoff during the 5-year and 100-year events are 9.17 cfs and 21.14 cfs respectively.

Sub-Basin PR1

The on-site sub-basin PR1 consists of the proposed private drive. The sub-basin has an area of 0.26 acres and a weighted imperviousness of 100%. Runoff in this basin will be collected by curb and gutter and routed to a proposed private 10' Type 2 curb inlet (Design Point PR1) to discharge to the pond. Runoff during the 5-year and 100-year events are 1.02 cfs and 2.30 cfs respectively.

Sub-Basin PR2

The on-site sub-basin PR2 consists of the proposed private drive. The sub-basin has an area of 0.26 acres and a weighted imperviousness of 100%. Runoff in this basin will be collected by curb and gutter and routed to a proposed private 15' Type 2 curb inlet (Design Point PR2) to discharge to the pond. Runoff during the 5-year and 100-year events are 2.38 cfs and 5.37 cfs respectively.

Sub-Basin P

The on-site sub-basin P consists of the proposed private extended detention basin. The sub-basin has an area of 1.38 acres and a weighted imperviousness of 0%. Runoff in this basin will be collected by the pond and discharge from the proposed outlet structure (Design Point P) before outfalling to the existing storm sewer stub. Runoff during the 5-year and 100-year events are 0.82 cfs and 5.22 cfs respectively.

Sub-Basin FS1

The on-site sub-basin FS1 consists of the north portion of the proposed Frontside Drive extension. The sub-basin has an area of 0.31 acres and a weighted imperviousness of 100%. Runoff in this basin will be collected by curb and gutter and routed to an existing 10' Type 2 curb inlet (Design Point FS1) following the Master Drainage Report design. Runoff during the 5-year and 100-year events are 1.23 cfs and 2.76 cfs respectively.

According to the El Paso County Engineering Criteria Manual, Section I.7.1.B.2.1, This area classifies as "Excluded Roadway Redevelopment." Sub-Basin FS1 and Sub-Basin FS2 total 0.6 acres which is less than 1 acre of additional paved area per mile of roadway to an existing roadway. This area will follow the drainage patterns as described in the Master Report.

Sub-Basin FS2

The on-site sub-basin FS2 consists of the south portion of the proposed Frontside Drive extension. The sub-basin has an area of 0.29 acres and a weighted imperviousness of 100%. Runoff in this basin will be collected by curb and gutter and routed to a proposed private 5' Type 2 curb inlet (Design Point FS2) to discharge to the pond. Runoff during the 5-year and 100-year events are 1.15 cfs and 2.58 cfs respectively.

According to the El Paso County Engineering Criteria Manual, Section I.7.1.B.2.1, This area classifies as "Excluded Roadway Redevelopment." Sub-Basin FS1 and Sub-Basin FS2 total 0.6 acres which is less than 1 acre of additional paved area per mile of roadway to an existing roadway. This area will follow the drainage patterns as described in the Master Report.

Sub-Basin UD1

The on-site sub-basin UD1 consists of native vegetation east of the proposed pond, the proposed right turn lane on Legacy Hill Drive, and a portion of the private drive connecting to Legacy Hill Drive. The sub-basin has an area of 0.70 acres and a weighted imperviousness of 16.5%. Runoff in this basin will flow offsite to Legacy Hill Drive and Frontside Drive curb and gutter and be routed to the existing 10' Type R curb inlet within Frontside Drive (Design Point FS1). Flows from this sub-basin will follow historic flow patterns. Runoff during the 5-year and 100-year events are 0.77 cfs and 4.63 cfs respectively.

According to the El Paso County Engineering Criteria Manual, Section I.7.1.B.2.1, This area

classifies as “Excluded Roadway Redevelopment.” Sub-Basin UD1 consists of the added right-turn lane on Legal Hill Drive which totals 0.05 acres which is less than 1 acre of additional paved area per mile of roadway to an existing roadway. This area will follow the drainage patterns as described in the Master Report.

According to the El Paso County Engineering Criteria Manual, Section I.7.1.B.7, This area classifies as “Land Disturbance to Undeveloped Land that will Remain Undeveloped” for the portion of UD1 that is landscaped area and within a Tract (0.62 acres). This area will follow native drainage patterns and remain undeveloped with no buildings or pavement and therefore classifies as an exclusion.

A portion of the proposed private drive (0.03 acres) that connects to Legal Hill Drive is also not captured and routed to the proposed pond due to existing topography. According to the El Paso County Engineering Criteria Manual, Section I.1.7.C.1.a up to 20% of the Site, not to exceed one (1) acre may be excluded from the WQCV calculations. The total site area of UD1 private drive and UD2 is 0.06 acres.

Sub-Basin UD2

The on-site sub-basin UD2 consists of a small portion of the private drive connection to the extension of Frontside Drive. The sub-basin has an area of 0.03 acres and a weighted imperviousness of 100%. Runoff in this basin will flow offsite to Frontside Drive curb and gutter and be routed to the existing 10’ Type R curb inlet within Frontside Drive (Design Point FS1). Flows from this sub-basin will follow historic flow patterns. Runoff during the 5-year and 100-year events are 0.13 cfs and 0.17 cfs respectively.

Sub-basin UD2 cannot be routed to the proposed pond due to existing topography. According to the El Paso County Engineering Criteria Manual, Section I.1.7.C.1.a up to 20% of the Site, not to exceed one (1) acre may be excluded from the WQCV calculations. The total site area of UD1 private drive and UD2 is 0.06 acres.

Refer to **Appendix F** for the Proposed Drainage Conditions Map.

DRAINAGE DESIGN CRITERIA

DEVELOPMENT CRITERIA REFERENCE

The proposed storm facilities are designed to be in compliance with the El Paso County Drainage Criteria Manual, Volumes 1 and 2 (The “CRITERIA”) and the Mile High Flood Control District Manual (the “MANUAL”). Site drainage is not significantly impacted by such constraints as utilities or existing development.

HYDROLOGIC SOIL GROUP

According to NRCS soil mapping data, USCS Type A and B soils are the primary soil type within the site. Soils present at the Site consist mainly of “Blakeland loamy sand” which represent a moderate hazard for erosion. **Appendix B** contains detailed NRCS soil data.

HYDROLOGIC CRITERIA

The 5-year and 100-year design storm events were used in determining rainfall and runoff for the proposed drainage analysis per chapter 5 of the CRITERIA. Design runoff was calculated using the Rational Method for developed conditions as established in the CRITERIA and MANUAL. Runoff coefficients for the proposed development were determined using Table 5-1 of the CRITERIA by calculating weighted impervious values for each specific site basin. Based upon this approach, the drainage design provided for the Site is conservative and in keeping with the zoning and historic drainage concept for the area.

HYDRAULIC CRITERIA

Hydraulic design of the proposed storm sewer and inlets are provided in **Appendix D**. Applicable design methods were utilized to analyze & size the proposed pond and storm sewer infrastructure which includes the use of the UD-Detention spreadsheet, rational calculations spreadsheet, and FlowMaster.

Proposed Drainage features on-site have been analyzed and sized for the following design storm events:

- Minor Storm: 5-year Storm Event
- Major Storm: 100-year Storm Event

DETENTION

One full spectrum extended detention basin is proposed in order to maintain historic flows and water quality. Mile High Flood District UD-Detention Spreadsheet was utilized to design the pond outlet structures. The full spectrum extended detention basin is to be owned and maintained by The Waterview III Metropolitan District. The UD-Detention spreadsheet used to calculate WQCV and detention is included in **Appendix D**. Detailed information regarding exclusions and WQCV can be found in Step 2 of the Four-Step Process section below.

Detailed pond and outlet structure design can be found in the **Appendix D**. A pond summary table can be found below.

Pond	Contributing Basins	Total Contributing Basin Area (Acre)	WQCV (Ac-ft)	Total Volume Required (Ac-ft)	Total Volume Provided (Ac-ft)	100-YR Pond Outfall (CFS)
P	A1-A2, FD1-FD2, PR1-PR2, P	11.85	0.353	1.893	2.705	16.1

DRAINAGE FACILITY DESIGN

GENERAL CONCEPT

The proposed drainage patterns will be in general conformance with the historic drainage patterns. To maintain historic flows, one full spectrum detention pond is proposed and will

capture and control the flows from the proposed development at less than or equal to historic rates.

Existing and proposed Drainage Maps can be found in **Appendix F**.

DRAINAGE FEE

The project is within the Big Johnson drainage basin, and the West Fork of Jimmy Camp Creek drainage basin which is a part of the El Paso County Drainage Basin Fee Program. Drainage fees consist of:

Drainage Basin	Drainage Basin Acreage	Drainage Fees per acre	Bridge Fees per acre
Big Johnson	11.60 acres	$27,282	$3,523
West Fort of Jimmy Camp Creek	9.83 acres	$0	$0

Total: $357,338

THE FOUR STEP PROCESS

The Project was designed in accordance with the four-step process to minimize adverse impacts of urbanization, as outlined in the El Paso County Engineering Manual for BMP selection as noted below:

Step 1. **Employ Runoff Reduction Practices** – Currently the Site is vacant undeveloped land. Development of the Site will increase current runoff conditions due to increased imperviousness values. The proposed detention pond will be used to capture stormwater, provide water quality treatment, and maintain flows discharging off site at or below historic levels. Individual lot developments will be required to implement runoff reduction techniques and meet the Four Step Process.

typo

Step 2. Provide a Water Quality Capture Volume – Permanent water quality measures and detention facilities will be necessary for the Project. One full ppectrum extended detention basin will treat the areas not excluded with either the Excluded Roadway Redevelopment (ECM Section I.7.1.B.2.1), Land Disturbance to Undeveloped Land that will Remain Undeveloped (ECM Section I.7.1.B.7), or 20% exclusion (ECM Section I.1.7.C.1.a.).

add: "not to exceed 1ac"

Step 3 Stabilize Drainageways– The Site is 5200 ft from Jimmy Camp Creek. There are no open channels on or adjacent to this site, therefore no stabilization will be necessary. All new and re-development projects are required to construct or participate in the funding of channel stabilization measures by paying the Drainage Basin fees required at the time of plat recordation.

Step 4. Implement Site Specific and Other Source Control BMPs – The erosion control construction BMPs of the Project were designed to reduce contamination. Source control BMPs include the use of vehicle tracking control, culvert protection, stockpile management, and stabilized staging areas.

SUMMARY

This report has been prepared in accordance with El Paso County stormwater criteria. It outlines the Site design for the 5-year and 100-year storm events drainage system. The drainage design presented within this report conforms to the criteria presented in the CRITERIA and the MANUAL Additionally, the Site runoff and storm drain facilities will not adversely affect the downstream and surrounding developments.

REFERENCES

1. El Paso County “Engineering Criteria Manual” Volumes 1 & 2, dated October 31, 2018

2. Natural Resources Conservation Service, Web Soil Survey, dated April 29, 2022.

3. Flood Insurance Rate Map, El Paso County, Colorado and Incorporated Areas, Map Number 08041C0768G, Effective Date December 7, 2018, prepared by the Federal Emergency Management Agency (FEMA).

4. Master Development Drainage Plan Amendment for Waterview East & Preliminary Drainage Plan for Trails at Aspen Ridge” Prepared by: Matrix Design Group September 2019.

Include a cost estimate for each PCM with line items for all components (ex: riprap, road base, forebay, trickle channel, outlet structure, outlet pipe, spillway, etc). Input the total value into the FAE form under "Permanent Pond/BMP (provide engineer's estimate)" in Section 1. The total should not include grading, which is a separate line item in Section 1: "Earthwork." The cost estimate should include labor costs (as a separate line item or added into the cost of each component).

APPENDIX

APPENDIX A – VICINITY MAP

Waterview East Commercial
Vicinity Map
(Not to Scale)

APPENDIX B – FEMA FIRM PANEL AND SOILS MAP

National Flood Hazard Layer FIRMette

FEMA

104°41'3"W 38°45'44"N

104°40'25"W 38°45'16"N

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

1:6,000

Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

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 / 17.5 Cross Sections with 1% Annual Chance / Water Surface Elevation
- Coastal Transect
- 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

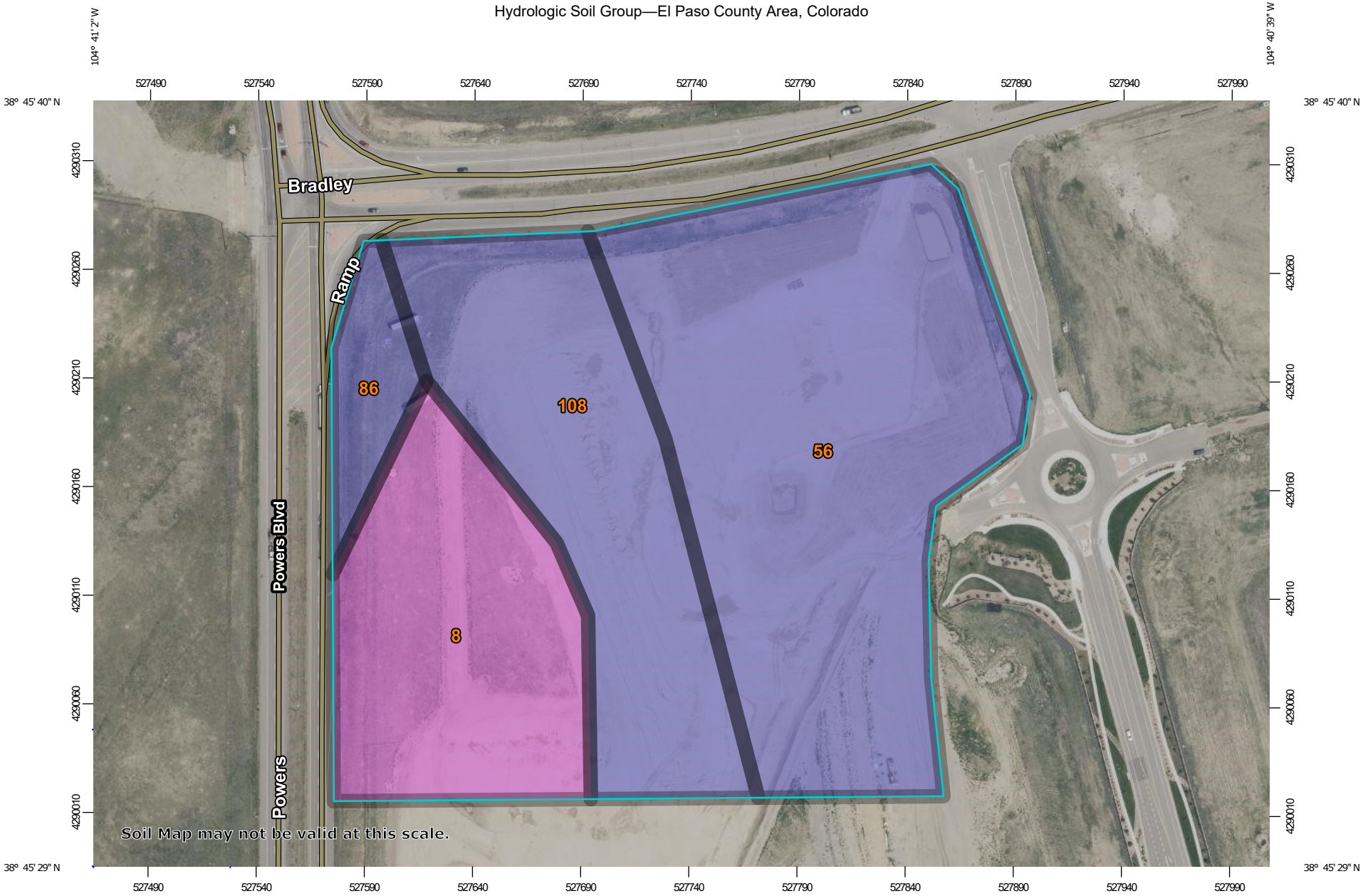
N

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 4/29/2022 at 2:29 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.



Map Scale: 1:2,490 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 35 70 140 210

Feet: 0 100 200 400 600

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 13N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

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

Soil Rating Lines

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

Soil Rating Points

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

Water Features

- Streams and Canals

Transportation

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

Background

- Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 23, Aug 29, 2025

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

Date(s) aerial images were photographed: Jul 23, 2024—Aug 4, 2024

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
8	Blakeland loamy sand, 1 to 9 percent slopes	A	4.3	22.0%
56	Nelson-Tassel fine sandy loams, 3 to 18 percent slopes	B	9.2	47.3%
86	Stoneham sandy loam, 3 to 8 percent slopes	B	0.9	4.8%
108	Wiley silt loam, 3 to 9 percent slopes	B	5.1	25.9%
Totals for Area of Interest			**19.5**	**100.0%**

Description

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

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

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

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

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

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

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

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

APPENDIX C – HYDROLOGIC CALCULATIONS

$$I = \frac{28.5\ P_1}{(10+T_D)^{0.786}}$$

Where:

I = rainfall intensity (inches per hour)

P_1 = one-hour rainfall depth (inches) from NOAA Atlas 14 Point Precipitation Frequency Estimates, Colorado Springs, CO

T_C = storm duration (minutes)

	2-yr	5-yr	10-yr	100-yr
P_1 =	1.01	1.29	1.56	2.75

Time Intensity Frequency Tabulation

TIME	2 YR	5 YR	10 YR	100 YR
5	3.43	4.38	5.29	9.33
10	2.73	3.49	4.22	7.44
15	2.29	2.93	3.54	6.24
30	1.58	2.02	2.45	4.31
60	1.02	1.30	1.58	2.78
120	0.63	0.80	0.97	1.71

Soil Type

Weighted Imperviousness Calculations

SUB-BASIN	AREA (SF)	AREA (Acres)	COMMERCIAL AREA	COMMERCIAL IMPERVIOUSNESS	ROOF C2	ROOF C5	ROOF C10	ROOF C100	LANDSCAPE AREA	LANDSCAPE IMPERVIOUSNESS	LANDSCAPE C2	LANDSCAPE C5	LANDSCAPE C10	LANDSCAPE C100	PAVEMENT AREA	PAVEMENT IMPERVIOUSNESS	PAVEMENT C2	PAVEMENT C5	PAVEMENT C10	PAVEMENT C100	WEIGHTED IMPERVIOUSNESS	WEIGHTED COEFFICIENTS C2	WEIGHTED COEFFICIENTS C5	WEIGHTED COEFFICIENTS C10	WEIGHTED COEFFICIENTS C100
EX1	106,009	2.43		95%	0.71	0.74	0.75	0.80	106,009	0%	0.04	0.15	0.30	0.45		100%	0.89	0.90	0.90	0.95	0.0%	0.04	0.15	0.30	0.45
EX2	140,051	3.22		95%	0.71	0.74	0.75	0.80	140,051	0%	0.04	0.15	0.30	0.45		100%	0.89	0.90	0.90	0.95	0.0%	0.04	0.15	0.30	0.45
EX3	27,246	0.63		95%	0.71	0.74	0.75	0.80	27,246	0%	0.04	0.15	0.30	0.45		100%	0.89	0.90	0.90	0.95	0.0%	0.04	0.15	0.30	0.45
EX4	114,570	2.63		95%	0.71	0.74	0.75	0.80	114,570	0%	0.04	0.15	0.30	0.45		100%	0.89	0.90	0.90	0.95	0.0%	0.04	0.15	0.30	0.45
EX5	126,148	2.90		95%	0.71	0.74	0.75	0.80	126,148	0%	0.04	0.15	0.30	0.45		100%	0.89	0.90	0.90	0.95	0.0%	0.04	0.15	0.30	0.45
EX6	42,130	0.97		95%	0.71	0.74	0.75	0.80	42,130	0%	0.04	0.15	0.30	0.45		100%	0.89	0.90	0.90	0.95	0.0%	0.04	0.15	0.30	0.45
EX7	312,684	7.18		95%	0.71	0.74	0.75	0.80	312,684	0%	0.04	0.15	0.30	0.45		100%	0.89	0.90	0.90	0.95	0.0%	0.04	0.15	0.30	0.45
EX8	51,044	1.17		95%	0.71	0.74	0.75	0.80	51,044	0%	0.04	0.15	0.30	0.45		100%	0.89	0.90	0.90	0.95	0.0%	0.04	0.15	0.30	0.45
EX9	13,732	0.32		95%	0.71	0.74	0.75	0.80	13,732	0%	0.04	0.15	0.30	0.45		100%	0.89	0.90	0.90	0.95	0.0%	0.04	0.15	0.30	0.45
OS1	20,296	0.47		95%	0.71	0.74	0.75	0.80	20,296	0%	0.04	0.15	0.30	0.45		100%	0.89	0.90	0.90	0.95	0.0%	0.04	0.15	0.30	0.45
Total	953,910	21.90	0	95%	0.71	0.74	0.75	0.80	953,910	0%	0.04	0.15	0.30	0.45	0	100%	0.89	0.90	0.90	0.95	0.0%	0.04	0.15	0.30	0.45

McDonald's - Drainage Report
Proposed Runoff Calculations
Time of Concentration

Watercourse Coefficient

Forest & Meadow	2.50	Short Grass Pasture & Lawns	7.00	Grassed Waterway	15.00
Fallow or Cultivation	5.00	Nearly Bare Ground	10.00	Paved Area & Shallow Gutter	20.00

	SUB-BASIN DATA				INITIAL / OVERLAND TIME			TRAVEL TIME T(t)					T(c) CHECK (URBANIZED BASINS)			FINAL T(c)
DESIGN POINT	DRAIN BASIN	AREA sq. ft.	AREA ac.	C(5)	Length ft.	Slope %	T(i) min	Length ft.	Slope %	Coeff.	Velocity fps	T(t) min.	COMP. T(c)	TOTAL LENGTH	L/180+10	min.
EX1	EX1	106,009	2.43	0.15	100	4.0%	11.0	1215	1.0%	10.00	1.0	20.3	31.3	1315	17.3	17.3
EX2	EX2	140,051	3.22	0.15	100	8.7%	8.5	520	3.0%	10.00	1.7	5.0	13.5	620	13.4	13.4
EX3	EX3	27,246	0.63	0.15	100	4.0%	11.0	55	15.0%	10.00	3.9	0.2	11.2	155	10.9	10.9
EX4	EX4	114,570	2.63	0.15	100	9.0%	8.4	341	5.0%	10.00	2.2	2.5	10.9	441	12.5	10.9
EX5	EX5	126,148	2.90	0.15	100	19.0%	6.5	425	5.0%	10.00	2.2	3.2	9.7	525	12.9	9.7
EX6	EX6	42,130	0.97	0.15	100	13.0%	7.4	75	6.0%	10.00	2.4	0.5	7.9	175	11.0	7.9
EX7	EX7	312,684	7.18	0.15	100	25.0%	6.0	1040	1.0%	10.00	1.0	17.3	23.3	1140	16.3	16.3
EX8	EX8	51,044	1.17	0.15	100	2.0%	13.8	140	1.0%	10.00	1.0	2.3	16.1	240	11.3	11.3
EX9	EX9	13,732	0.32	0.15	25	33.0%	2.7	0	0.0%	10.00	0.2	0.0	5.0	25	10.1	5.0
OS1	OS1	20,296	0.47	0.15	100	3.0%	12.1	355	2.5%	10.00	1.6	3.7	15.8	455	12.5	12.5

McDonald's - Drainage Report
Proposed Runoff Calculations
(Rational Method Procedure)

Design Storm 5 Year

BASIN INFORMATION				DIRECT RUNOFF				CUMULATIVE RUNOFF				NOTES
DESIGN POINT	DRAIN BASIN	AREA ac.	RUNOFF COEFF	T(c) min	C x A	I in/hr	Q cfs	T(c) min	C x A	I in/hr	Q cfs	
EX1	EX1	2.43	0.15	17.3	0.37	2.73	1.00					
EX2	EX2	3.22	0.15	13.4	0.48	3.08	1.49					
EX3	EX3	0.63	0.15	10.9	0.09	3.37	0.32					
EX4	EX4	2.63	0.15	10.9	0.39	3.37	1.33					
EX5	EX5	2.90	0.15	9.7	0.43	3.54	1.54					
EX6	EX6	0.97	0.15	7.9	0.15	3.81	0.55					
EX7	EX7	7.18	0.15	16.3	1.08	2.81	3.03					
EX8	EX8	1.17	0.15	11.3	0.18	3.32	0.58					
EX9	EX9	0.32	0.15	5.0	0.05	4.38	0.21					
OS1	OS1	0.47	0.15	12.5	0.07	3.18	0.22					

McDonald's - Drainage Report
Proposed Runoff Calculations
(Rational Method Procedure)

Design Storm *100 Year*

BASIN INFORMATION				DIRECT RUNOFF				CUMULATIVE RUNOFF				NOTES
DESIGN POINT	DRAIN BASIN	AREA ac.	RUNOFF COEFF	T(c) min	C x A	I in/hr	Q cfs	T(c) min	C x A	I in/hr	Q cfs	
EX1	EX1	2.43	0.45	17.3	1.10	5.83	6.38					
EX2	EX2	3.22	0.45	13.4	1.45	6.58	9.51					
EX3	EX3	0.63	0.45	10.9	0.28	7.19	2.02					
EX4	EX4	2.63	0.45	10.9	1.18	7.18	8.49					
EX5	EX5	2.90	0.45	9.7	1.30	7.54	9.82					
EX6	EX6	0.97	0.45	7.9	0.44	8.11	3.53					
EX7	EX7	7.18	0.45	16.3	3.23	6.00	19.38					
EX8	EX8	1.17	0.45	11.3	0.53	7.08	3.73					
EX9	EX9	0.32	0.45	5.0	0.14	9.33	1.32					
OS1	OS1	0.47	0.45	12.5	0.21	6.78	1.42					

SUMMARY - PROPOSED RUNOFF TABLE						
DESIGN POINT	BASIN DESIGNATION	BASIN AREA (ACRES)	DIRECT 5-YR RUNOFF (CFS)	DIRECT 100-YR RUNOFF (CFS)	CUMMULATIVE 5-YR RUNOFF (CFS)	CUMMULATIVE 100-YR RUNOFF (CFS)
EX1	EX1	2.43	1.00	6.38	1.00	6.38
EX2	EX2	3.22	1.49	9.51	1.49	9.51
EX3	EX3	0.63	0.32	2.02	0.32	2.02
EX4	EX4	2.63	1.33	8.49	1.33	8.49
EX5	EX5	2.90	1.54	9.82	1.54	9.82
EX6	EX6	0.97	0.55	3.53	0.55	3.53
EX7	EX7	7.18	3.03	19.38	0.00	0.00
EX8	EX8	1.17	0.58	3.73	0.58	3.73
EX9	EX9	0.32	0.21	1.32	0.21	1.32
OS1	OS1	0.47	0.22	1.42	0.22	1.42

Weighted Imperviousness Calculations

SUB-BASIN	AREA (SF)	AREA (Acres)	COMMERCIAL AREA	COMMERCIAL IMPERVIOUSNESS	ROOF C2	ROOF C5	ROOF C10	ROOF C100	LANDSCAPE AREA	LANDSCAPE IMPERVIOUSNESS	LANDSCAPE C2	LANDSCAPE C5	LANDSCAPE C10	LANDSCAPE C100	PAVEMENT AREA	PAVEMENT IMPERVIOUSNESS	PAVEMENT C2	PAVEMENT C5	PAVEMENT C10	PAVEMENT C100	WEIGHTED IMPERVIOUSNESS	WEIGHTED COEFFICIENTS C2	WEIGHTED COEFFICIENTS C5	WEIGHTED COEFFICIENTS C10	WEIGHTED COEFFICIENTS C100
A1	87,080	2.00	87,080	95%	0.71	0.74	0.75	0.80	0	0%	0.04	0.15	0.30	0.45	0	100%	0.89	0.90	0.90	0.95	95.0%	0.71	0.74	0.75	0.80
A2	65,455	1.50	65,455	95%	0.71	0.74	0.75	0.80	0	0%	0.04	0.15	0.30	0.45	0	100%	0.89	0.90	0.90	0.95	95.0%	0.71	0.74	0.75	0.80
FD 1	126,748	2.91	126,748	95%	0.71	0.74	0.75	0.80	0	0%	0.04	0.15	0.30	0.45	0	100%	0.89	0.90	0.90	0.95	95.0%	0.71	0.74	0.75	0.80
FD 2	138,760	3.19	138,760	95%	0.71	0.74	0.75	0.80	0	0%	0.04	0.15	0.30	0.45	0	100%	0.89	0.90	0.90	0.95	95.0%	0.71	0.74	0.75	0.80
PR 1	11,298	0.26	0	95%	0.71	0.74	0.75	0.80	0	0%	0.04	0.15	0.30	0.45	11,298	100%	0.89	0.90	0.90	0.95	100.0%	0.89	0.90	0.90	0.95
PR 2	26,381	0.61	0	95%	0.71	0.74	0.75	0.80	0	0%	0.04	0.15	0.30	0.45	26,381	100%	0.89	0.90	0.90	0.95	100.0%	0.89	0.90	0.90	0.95
P	60,255	1.38	0	95%	0.71	0.74	0.75	0.80	60,255	0%	0.04	0.15	0.30	0.45	0	100%	0.89	0.90	0.90	0.95	0.0%	0.04	0.15	0.30	0.45
A1-P	515,977	11.85	418,043	95%	0.71	0.74	0.75	0.80	60,255	0%	0.04	0.15	0.30	0.45	37,679	100%	0.89	0.90	0.90	0.95	84.3%	0.64	0.68	0.71	0.77
UD 1	30,463	0.70	0	95%	0.71	0.74	0.75	0.80	25,449	0%	0.04	0.15	0.30	0.45	5,014	100%	0.89	0.90	0.90	0.95	16.5%	0.18	0.27	0.40	0.53
UD 2	1,488	0.03	0	95%	0.71	0.74	0.75	0.80	0	0%	0.04	0.15	0.30	0.45	1,488	100%	0.89	0.90	0.90	0.95	100.0%	0.89	0.90	0.90	0.95
FS 1	13,589	0.31	0	95%	0.71	0.74	0.75	0.80	0	0%	0.04	0.15	0.30	0.45	13,589	100%	0.89	0.90	0.90	0.95	100.0%	0.89	0.90	0.90	0.95
FS 2	12,683	0.29	0	95%	0.71	0.74	0.75	0.80	0	0%	0.04	0.15	0.30	0.45	12,683	100%	0.89	0.90	0.90	0.95	100.0%	0.89	0.90	0.90	0.95
UD1-FS2	58,223	1.34	0	95%	0.71	0.74	0.75	0.80	25,449	0%	0.04	0.15	0.30	0.45	32,774	100%	0.89	0.90	0.90	0.95	56.3%	0.52	0.57	0.64	0.73

McDonald's - Drainage Report
Proposed Runoff Calculations
Time of Concentration

Watercourse Coefficient

Forest & Meadow	2.50	Short Grass Pasture & Lawns	7.00			Grassed Waterway	15.00
Fallow or Cultivation	5.00		Nearly Bare Ground	10.00		Paved Area & Shallow Gutter	20.00

	SUB-BASIN DATA				INITIAL / OVERLAND TIME			TRAVEL TIME T(t)					T(c) CHECK (URBANIZED BASINS)			FINAL T(c)
DESIGN POINT	DRAIN BASIN	AREA sq. ft.	AREA ac.	C(5)	Length ft.	Slope %	T(i) min	Length ft.	Slope %	Coeff.	Velocity fps	T(t) min.	COMP. T(c)	TOTAL LENGTH	L/180+10	min.
A1	A1	87,080	2.00	0.74	100	2.0%	5.2	275	2.0%	20.00	2.8	1.6	6.8	375	12.1	6.8
A2	A2	65,455	1.50	0.74	100	2.0%	5.2	250	2.0%	20.00	2.8	1.5	6.7	350	11.9	6.7
FD 1	FD 1	126,748	2.91	0.74	100	2.0%	5.2	360	2.0%	20.00	2.8	2.1	7.3	460	12.6	7.3
FD 2	FD 2	138,760	3.19	0.74	100	2.0%	5.2	375	2.0%	20.00	2.8	2.2	7.4	475	12.6	7.4
PR 1	PR 1	11,298	0.26	0.90	35	2.5%	1.6	375	1.8%	20.00	2.7	2.3	5.0	410	12.3	5.0
PR 2	PR 2	26,381	0.61	0.90	38	2.0%	1.8	453	3.0%	20.00	3.5	2.2	5.0	491	12.7	5.0
P	P	60,255	1.38	0.15	100	25.0%	6.0	250	25.0%	7.00	3.5	1.2	7.2	350	11.9	7.2
FS1	UD 1	30,463	0.70	0.27	15	2.0%	4.7	571	6.0%	20.00	4.9	1.9	6.6	586	13.3	6.6
FS1	UD 2	1,488	0.03	0.90	60	5.0%	1.7	0	0.0%	20.00	0.3	0.0	5.0	60	10.3	5.0
FS 1	FS 1	13,589	0.31	0.90	26	2.0%	1.5	350	2.0%	20.00	2.8	2.1	5.0	376	12.1	5.0
FS 2	FS 2	12,683	0.29	0.90	26	2.0%	1.5	350	2.0%	20.00	2.8	2.1	5.0	376	12.1	5.0

McDonald's - Drainage Report
Proposed Runoff Calculations
(Rational Method Procedure)

Design Storm *5 Year*

BASIN INFORMATION				DIRECT RUNOFF				CUMULATIVE RUNOFF				NOTES
DESIGN POINT	DRAIN BASIN	AREA ac.	RUNOFF COEFF	T(c) min	C x A	I in/hr	Q cfs	T(c) min	C x A	I in/hr	Q cfs	
A1	A1	2.00	0.74	6.8	1.48	4.00	5.92					
A2	A2	1.50	0.74	6.7	1.11	4.03	4.48					
FD 1	FD 1	2.91	0.74	7.3	2.15	3.91	8.41					
FD 2	FD 2	3.19	0.74	7.4	2.36	3.89	9.17					
PR 1	PR 1	0.26	0.90	5.0	0.23	4.38	1.02					
PR 2	PR 2	0.61	0.90	5.0	0.55	4.38	2.38					
P	P	1.38	0.15	7.2	0.21	3.93	0.82	7.4	8.1	3.89	31.48	cumulative runoff basins A1, A2, PR 1, PR 2, P, FD1, FD2
FS1	UD 1	0.70	0.27	6.6	0.19	4.03	0.77					
FS1	UD 2	0.03	0.90	5.0	0.03	4.38	0.13					
FS 1	FS 1	0.31	0.90	5.0	0.28	4.38	1.23					
FS 2	FS 2	0.29	0.90	5.0	0.26	4.38	1.15					

McDonald's - Drainage Report
Proposed Runoff Calculations
(Rational Method Procedure)

Design Storm 100 Year

BASIN INFORMATION				DIRECT RUNOFF				CUMULATIVE RUNOFF				NOTES
DESIGN POINT	DRAIN BASIN	AREA ac.	RUNOFF COEFF	T(c) min	C x A	I in/hr	Q cfs	T(c) min	C x A	I in/hr	Q cfs	
A1	A1	2.00	0.80	6.8	1.60	8.52	13.63					
A2	A2	1.50	0.80	6.7	1.20	8.58	10.32					
FD 1	FD 1	2.91	0.80	7.3	2.33	8.33	19.39					
FD 2	FD 2	3.19	0.80	7.4	2.55	8.30	21.14					
PR 1	PR 1	0.26	0.95	5.0	0.25	9.33	2.30					
PR 2	PR 2	0.61	0.95	5.0	0.58	9.33	5.37					
P	P	1.38	0.45	7.2	0.62	8.38	5.22	7.4	9.1	5.28	48.16	cumulative runoff basins A1, A2, PR 1, PR 2, P, FD1, FD2
FS1	UD 1	0.70	0.77	6.6	0.54	8.60	4.63					
FS1	UD 2	0.03	0.53	5.0	0.02	9.33	0.17					
FS 1	FS 1	0.31	0.95	5.0	0.30	9.33	2.76					
FS 2	FS 2	0.29	0.95	5.0	0.28	9.33	2.58					

SUMMARY - PROPOSED RUNOFF TABLE						
DESIGN POINT	BASIN DESIGNATION	BASIN AREA (ACRES)	DIRECT 5-YR RUNOFF (CFS)	DIRECT 100-YR RUNOFF (CFS)	CUMMULATIVE 5-YR RUNOFF (CFS)	CUMMULATIVE 100-YR RUNOFF (CFS)
A1	A1	2.00	5.92	13.63	5.92	13.63
A2	A2	1.50	4.48	10.32	4.48	10.32
FD 1	FD 1	2.91	8.41	19.39	8.41	19.39
FD 2	FD 2	3.19	9.17	21.14	9.17	21.14
PR 1	PR 1	0.26	1.02	2.30	1.02	2.30
PR 2	PR 2	0.61	2.38	5.37	2.38	5.37
P	P	1.38	0.82	5.22	31.48	48.16
FS1	UD 1	0.70	0.77	4.63	0.77	4.63
FS1	UD 2	0.03	0.13	0.17	0.13	0.17
FS 1	FS 1	0.31	1.23	2.76	1.23	2.76
FS 2	FS 2	0.29	1.15	2.58	1.15	2.58

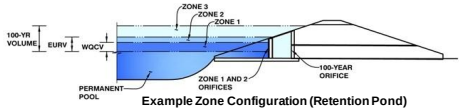
APPENDIX D – HYDRAULIC CALCULATIONS

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.07 (June 2025)

Project: Waterview East Commercial Final Plat 1

Basin ID: A1, A2, FD1, FD2, PR1, PR2, P



Example Zone Configuration (Retention Pond)

Watershed Information

Selected SCM Type =	EDB	
Watershed Area =	11.85	acres
Watershed Length =	985	ft
Watershed Length to Centroid =	415	ft
Watershed Slope =	0.030	ft/ft
Watershed Imperviousness =	84.30%	percent
Percentage Hydrologic Soil Group A =	30.0%	percent
Percentage Hydrologic Soil Group B =	70.0%	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) =	0.353	acre-feet	acre-feet
Excess Urban Runoff Volume (EURV) =	1.179	acre-feet	acre-feet
2-yr Runoff Volume (P1 = 1.01 in.) =	0.774	acre-feet	1.01 inches
5-yr Runoff Volume (P1 = 1.29 in.) =	1.021	acre-feet	1.29 inches
10-yr Runoff Volume (P1 = 1.56 in.) =	1.277	acre-feet	1.56 inches
25-yr Runoff Volume (P1 = 2 in.) =	1.724	acre-feet	2.00 inches
50-yr Runoff Volume (P1 = 2.25 in.) =	1.972	acre-feet	2.25 inches
100-yr Runoff Volume (P1 = 2.75 in.) =	2.486	acre-feet	2.75 inches
500-yr Runoff Volume (P1 = 3.14 in.) =	2.878	acre-feet	inches
Approximate 2-yr Detention Volume =	0.750	acre-feet	
Approximate 5-yr Detention Volume =	0.994	acre-feet	
Approximate 10-yr Detention Volume =	1.259	acre-feet	
Approximate 25-yr Detention Volume =	1.559	acre-feet	
Approximate 50-yr Detention Volume =	1.643	acre-feet	
Approximate 100-yr Detention Volume =	1.893	acre-feet	

Define Zones and Basin Geometry

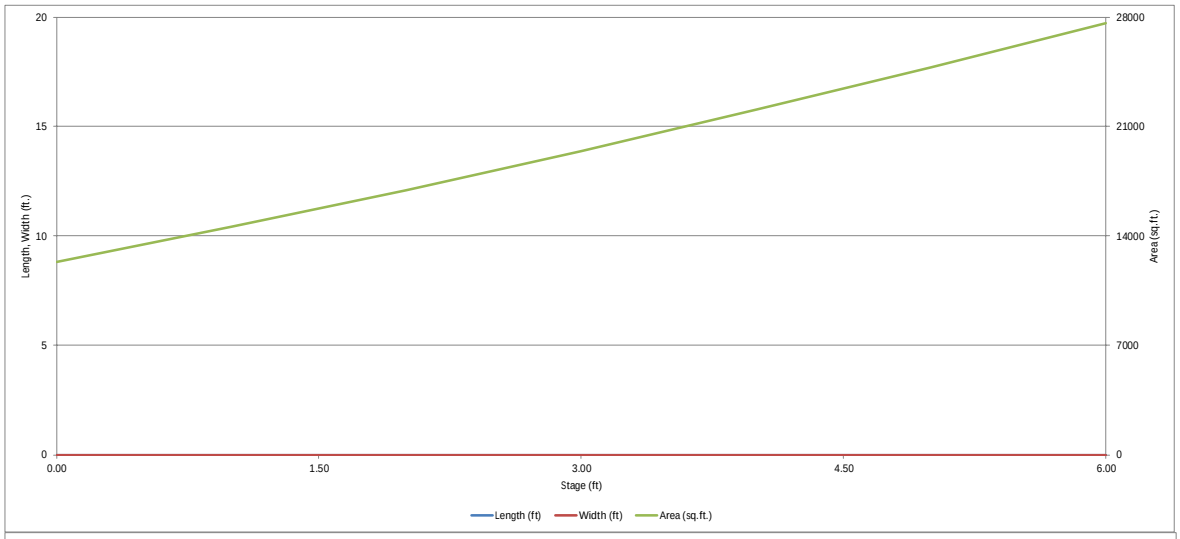
Zone 1 Volume (WQCV) =	0.353	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.827	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.714	acre-feet
Total Detention Basin Volume =	1.893	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (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_{LW}) =	user	
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	user	acre-feet

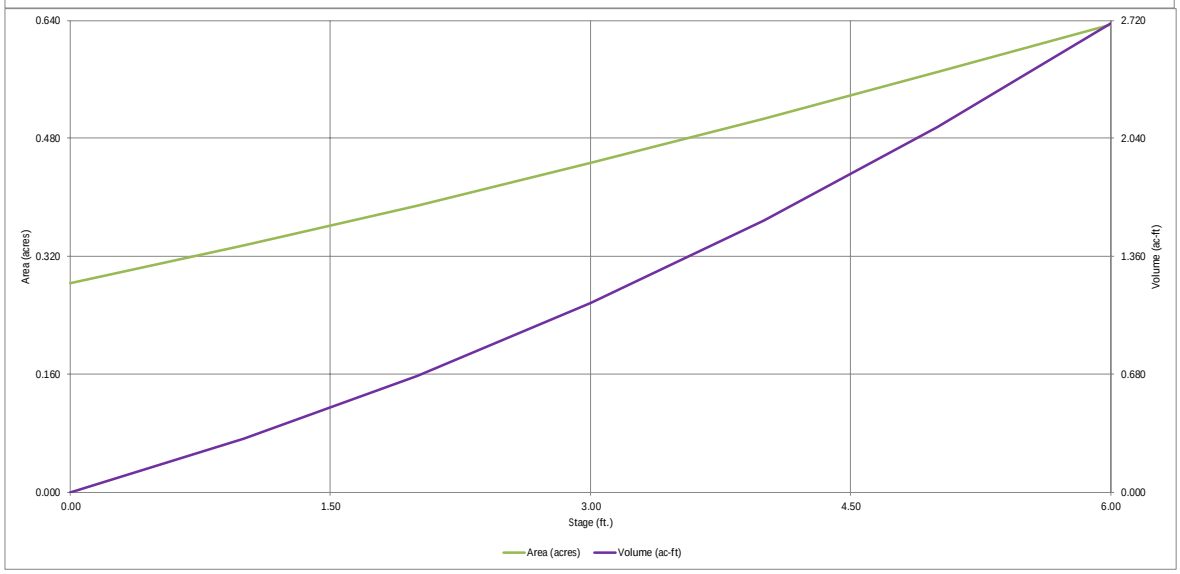
Depth Increment = ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	12,348	0.283		
	--	1.00	--	--	--	14,575	0.335	13,461	0.309
	--	2.00	--	--	--	16,938	0.389	29,218	0.671
	--	3.00	--	--	--	19,438	0.446	47,406	1.088
	--	4.00	--	--	--	22,068	0.507	68,159	1.565
	--	5.00	--	--	--	24,804	0.569	91,595	2.103
	--	6.00	--	--	--	27,640	0.635	117,817	2.705

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.07 (June 2025)



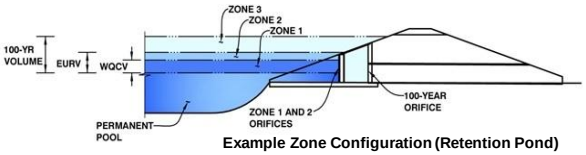


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.07 (June 2025)

Project: Waterview East Commercial Final Plat 1

Basin ID: A1, A2, FD1, FD2, PR1, PR2, P



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	1.13	0.353	Orifice Plate
Zone 2 (EURV)	3.21	0.827	Orifice Plate
Zone 3 (100-year)	4.63	0.714	Weir&Pipe (Restrict)
Total (all zones)		1.893	

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

Underdrain Orifice Invert Depth =		ft (distance below the filtration media surface)	Underdrain Orifice Area =		ft^2
Underdrain Orifice Diameter =		inches	Underdrain Orifice Centroid =		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 SCM)

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 =	3.21	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	N/A	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	N/A	sq. inches	Elliptical Slot Area =	N/A	ft^2

Calculated Parameters for Plate

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

	Row 1 (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	1.60	2.75					
Orifice Area (sq. inches)	5.00	3.00	3.00					

	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 =	3.50	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	3.50	N/A	feet
Overflow Weir Front Edge Length =	6.00	N/A	feet	Overflow Weir Slope Length =	6.00	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V	Grate Area =	14.18	N/A	
Horiz. Length of Weir Sides =	6.00	N/A	feet	Overflow Weir Orifice Area =	25.06	N/A	ft^2
Overflow Grate Type =	Type C Grate	N/A		Overflow Weir Orifice Centroid =	12.53	N/A	ft^2
Debris Clogging % =	50%	N/A	%				

Calculated Parameters for Overflow Weir

based on my comments on Sht C4.15 in the GEC Plans, these depths/elevations do not match what is shown on the plans.

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 =	0.00	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	1.77	N/A	ft^2
Outlet Pipe Diameter =	18.00	N/A	inches	Outlet Orifice Centroid =	0.75	N/A	feet
Restrictor Plate Height Above Pipe Invert =	18.00		inches	Half-Central Angle of Restrictor Plate on Pipe =	3.14	N/A	radians

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	4.10	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.89	feet
✓ Spillway Crest Length =	17.00	feet	Stage at Top of Freeboard =	5.99	feet
✓ Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	0.63	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	2.69	acre-ft

Calculated Parameters for Spillway

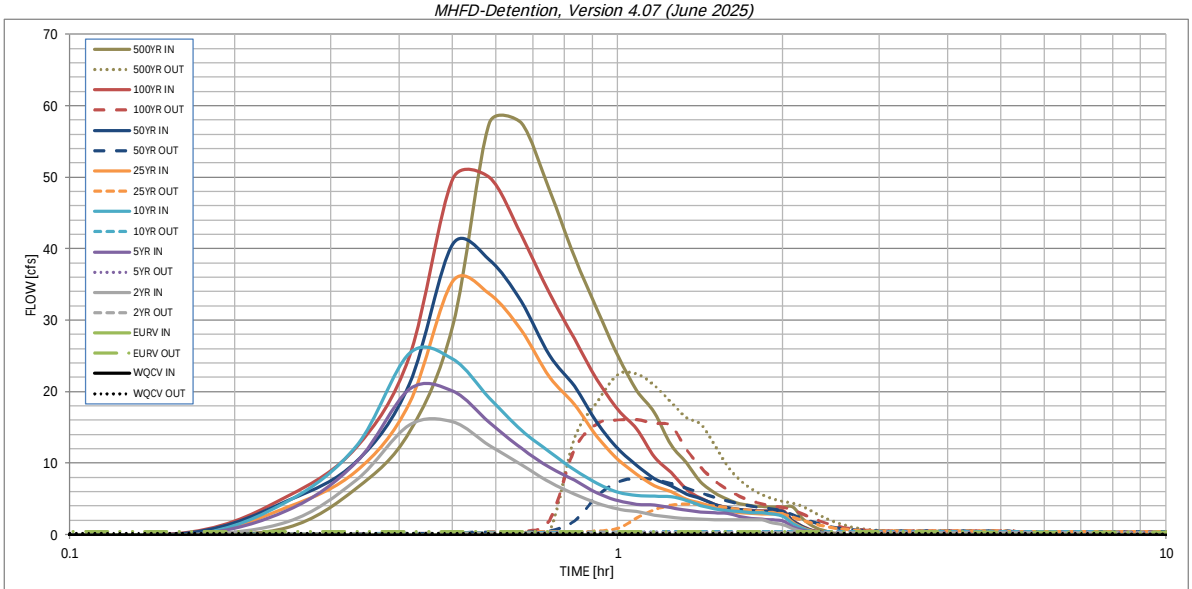
Routed Hydrograph Results

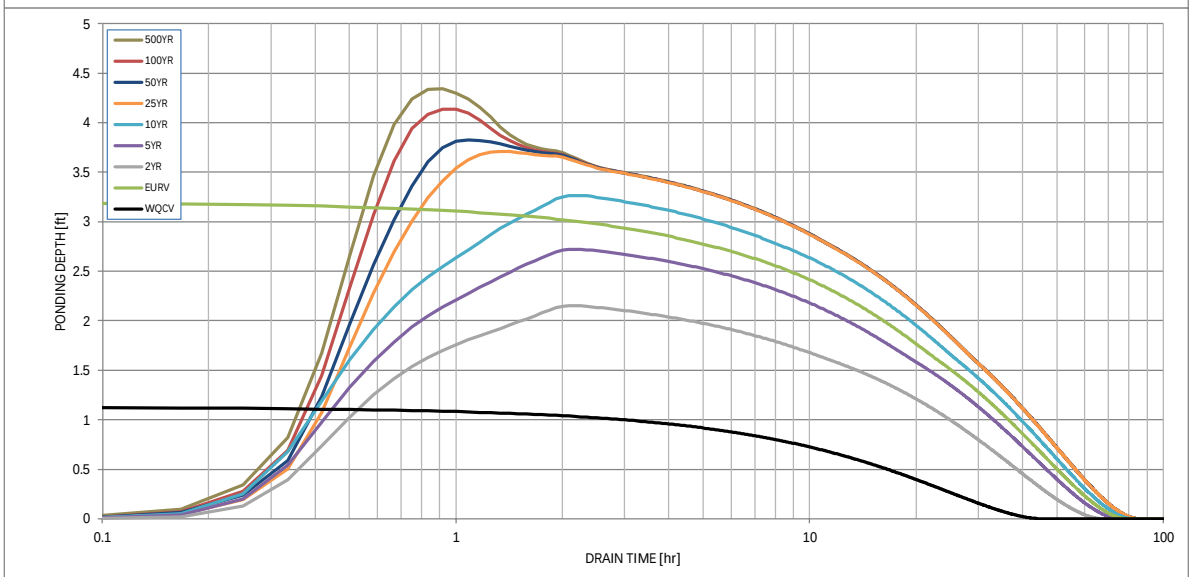
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

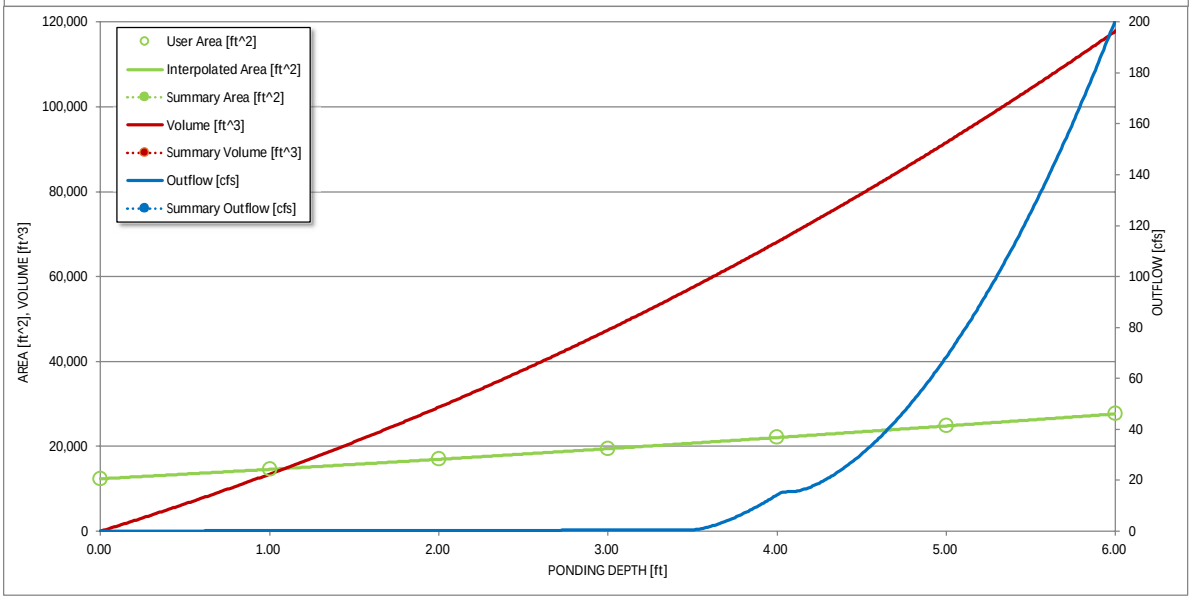
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.01	1.29	1.56	2.00	2.25	2.75	3.14
CUHP Runoff Volume (acre-ft) =	0.353	1.179	0.774	1.021	1.277	1.724	1.972	2.486	2.878
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.774	1.021	1.277	1.724	1.972	2.486	2.878
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.4	0.8	3.2	10.0	12.9	19.2	23.6
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.03	0.07	0.27	0.84	1.09	1.62	2.00
Peak Inflow Q (cfs) =	N/A	N/A	15.8	20.3	25.4	35.5	40.7	50.0	57.6
Peak Outflow Q (cfs) =	0.2	0.5	0.3	0.4	0.5	4.3	7.9	16.1	22.5
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.5	0.2	0.4	0.6	0.8	1.0
Structure Controlling Flow =	Plate	Plate	Plate	Plate	Plate	Overflow Weir 1	Overflow Weir 1	Spillway	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	0.1	0.3	0.6	0.6
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	39	66	57	63	68	69	68	65	64
Time to Drain 99% of Inflow Volume (hours) =	42	72	62	69	74	76	76	74	73
Maximum Ponding Depth (ft) =	1.14	3.21	2.15	2.72	3.27	3.71	3.83	4.14	4.34
Area at Maximum Ponding Depth (acres) =	0.34	0.46	0.40	0.43	0.46	0.49	0.50	0.52	0.53
Maximum Volume Stored (acre-ft) =	0.356	1.183	0.730	0.966	1.206	1.420	1.475	1.636	1.741

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.07 (June 2025)







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

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename:

Inflow Hydrographs

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

	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0	0.00	0.00	0.00	0.00	0.00	0.32	0.41	1.04
	0:15:00	0	0.00	1.84	3.47	4.73	3.89	4.77	5.39	6.51
	0:20:00	0	0.00	7.66	10.13	12.40	8.89	10.25	12.26	14.36
	0:25:00	0	0.00	15.38	20.34	25.35	18.37	21.10	24.90	29.30
	0:30:00	0	0.00	15.77	20.08	24.55	35.50	40.71	49.87	57.60
	0:35:00	0	0.00	12.52	15.74	19.17	33.68	38.45	50.01	57.61
	0:40:00	0	0.00	9.84	12.10	14.66	28.65	32.65	41.91	48.23
	0:45:00	0	0.00	7.38	9.46	11.64	22.09	25.16	33.83	38.93
	0:50:00	0	0.00	5.71	7.65	9.11	18.26	20.81	27.41	31.56
	0:55:00	0	0.00	4.42	5.88	7.19	13.75	15.68	21.72	25.02
	1:00:00	0	0.00	3.60	4.75	5.96	10.56	12.06	17.53	20.21
	1:05:00	0	0.00	3.26	4.30	5.53	8.49	9.72	14.81	17.10
	1:10:00	0	0.00	2.74	4.15	5.39	6.89	7.87	10.89	12.58
	1:15:00	0	0.00	2.46	3.79	5.34	6.03	6.88	8.71	10.07
	1:20:00	0	0.00	2.29	3.43	4.83	5.02	5.72	6.41	7.41
	1:25:00	0	0.00	2.20	3.21	4.12	4.44	5.06	5.11	5.91
	1:30:00	0	0.00	2.13	3.08	3.68	3.77	4.29	4.29	4.95
	1:35:00	0	0.00	2.09	3.00	3.40	3.37	3.82	3.79	4.38
	1:40:00	0	0.00	2.08	2.59	3.23	3.13	3.53	3.53	4.07
	1:45:00	0	0.00	2.08	2.33	3.12	3.00	3.38	3.43	3.96
	1:50:00	0	0.00	2.08	2.18	3.06	2.92	3.29	3.39	3.92
	1:55:00	0	0.00	1.67	2.10	2.92	2.89	3.25	3.39	3.92
	2:00:00	0	0.00	1.42	1.94	2.59	2.88	3.24	3.39	3.92
	2:05:00	0	0.00	0.85	1.16	1.56	1.74	1.96	2.05	2.37
	2:10:00	0	0.00	0.50	0.68	0.92	1.04	1.17	1.23	1.42
	2:15:00	0	0.00	0.27	0.39	0.52	0.59	0.66	0.69	0.80
	2:20:00	0	0.00	0.14	0.21	0.28	0.33	0.37	0.39	0.45
	2:25:00	0	0.00	0.06	0.10	0.12	0.16	0.17	0.18	0.21
	2:30:00	0	0.00	0.02	0.03	0.03	0.05	0.05	0.05	0.06
	2:35:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:40:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:45:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:50:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:55:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:00:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:05:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:10:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:15:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:20:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:25:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:30:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:35:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:40:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:45:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:50:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:55:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:00:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:05:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

PROJECT NAME: Waterview East Commercial
PROJECT NUMBER: 19659001

CALCULATED BY: JJM
CHECKED BY: JJM

Kimley»Horn

DATE STARTED: 3/11/2026

*This spreadsheet is based on the UD-BMP EDB tab. Yellow cells are for user input

Formulas

$WQCV_{DESIGN}$= $a*((0.91*i^3 - 1.19i^2 + 0.78i)/12)*TCA$

Input the proper drain time coefficient (TBL 3-2, Ch. 3 Vol 3, USDCM)

a= 1.0

12 hrs, a = 0.8
24 hrs, a= 0.9
40 hrs*, a=1.0

*Use 1.0 if there is No attenuation

Min. Forebay Vol 3% Source: Tbl EDB 4 UDFCD

FOREBAY NAME	TOTAL CONTRIBUTING AREA (TCA) (ac)	i	$WQCV_{DESIGN}$ (ac-ft)	V_{FMIN} (ac-ft)	V_{FMIN} (cf)	D_F (ft)	A_{FMIN} (SF)
A	6.67	0.95	0.25	0.0075	326.3	1.0	326.3
B	3.80	0.96	0.14	0.0043	188.4	1.0	188.4

Forebay A

Basin(s)	Area (acres)	Weighting Factors (A_i/A_{TOTAL})	i (I%/100%)	(Weighting Factors) * i
A1	2.00	0.30	0.95	0.28
A2	1.50	0.22	0.95	0.21
PR 1	0.26	0.04	1.00	0.04
FD1	2.91	0.44	0.95	0.41
A_{TOTAL}	6.67	acres	$i_{weighted}$	0.95

Forebay B

Basin(s)	Area (acres)	Weighting Factors (A_i/A_{TOTAL})	i (I%/100%)	(Weighting Factors) * i
PR 2	0.61	0.16	1.00	0.16
FD 2	3.19	0.84	0.95	0.80
B_{TOTAL}	3.80	acres	$i_{weighted}$	0.96

PROJECT NAME: Waterview East Commercial
PROJECT NUMBER: 19659001

CALCULATED BY: JJM
CHECKED BY: JJM

MINIMUM DIMENSIONS FOREBAY A

FOREBAY MINIMUM DIMENSIONS

*Check Incoming Pipe size fits requirements of Figure 9-43

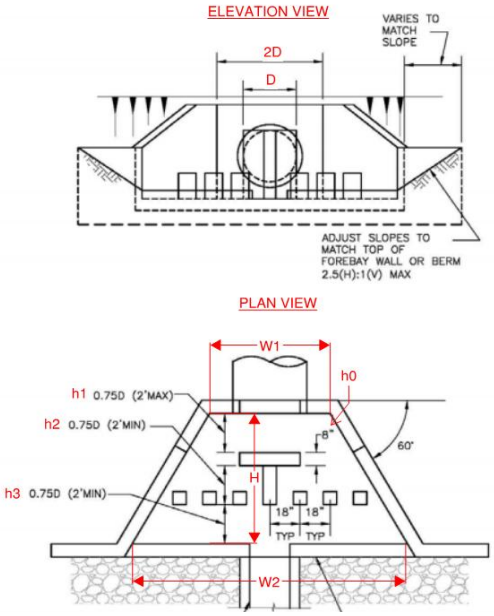
* Sizing follows trapezoidal formula. Need to solve for base width

Min. Area (A)	326.25	SF	
Incoming Pipe Diameter (D)	2.50	ft	
W_1 (2*D)	5.00	ft	FORMULA
h_1	1.88	ft	0.75D (2' MAX)
h_2	2.00	ft	0.75D (2' MIN.)
h_3	2.00	ft	0.75D (2' MIN.)
h_0	0.67	ft	*h_0 is a constant 8"
H (Eh_i)	6.54	ft	

W_2= W_1 +[2*H*tan(30°)]

tan(30°)= 0.58 *This formula ensures degree output

W_2= 12.55 ft



Actual Area= $((W_1+W_2)/2)*H$

A= 57.42 SF

Greater than minimum Area? No. Calculate H using formula below

*If your actual area is smaller than the required forebay area, back-calculate H from required forebay area and determine h3 by subtracting all hi values

A= $((W_1+W_2)/2)*H$

W_2= W_1 +[2*H*tan(30°)]

0= $\tan 30° H^2 + W_1 H - A$

0= 119.13 Goal Seek

New H= 23.7 ft

New W_2= 32.4 ft

New h_3= 19.2 ft

$A_{PROVIDED}$ 476 SF from CAD

HEADWALL TOP ELEV.= Pipe IE + 1.5*D

Pipe IE= 5910.00 ft

HEADWALL TOP ELEV.= 5913.75 ft

FOREBAY NOTCH SIZING: FOREBAY A

Wall with Rect. Notch (W_N equation from UD-BMP spreadsheet)

Undet. 100-year Peak Discharge 45.64 cfs (input from StormCAD)

Forebay Discharge Flow % 2%

Q_F = Undet. 100-yr discharge * Forebay Disch. %

Q_F = 0.91 cfs

Width of Notch(W_N)= $Q_F/(3.33*D_F^{1.5})*12 + 0.2*(D_F*12)$

D_F= 1 ft (Taken from input above)

W_N= 5.7 in

PROJECT NAME: Waterview East Commercial
PROJECT NUMBER: 19659001

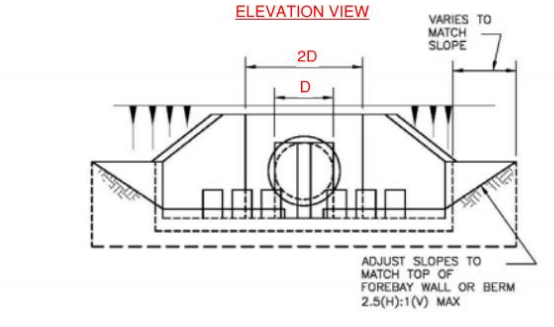
CALCULATED BY: JJM
CHECKED BY: JJM

MINIMUM DIMENSIONS FOREBAY B

FOREBAY MINIMUM DIMENSIONS

*Check Incoming Pipe size fits requirements of Figure 9-43

* Sizing follows trapezoidal formula. Need to solve for base width



Min. Area (A)	188.38	SF	
Incoming Pipe Diameter (D)	2.00	ft	
W_1 (2*D)	4.00	ft	FORMULA
h_1	1.50	ft	0.75D (2' MAX)
h_2	2.00	ft	0.75D (2' MIN.)
h_3	2.00	ft	0.75D (2' MIN.)
h_0	0.67	ft	*h_0 is a constant 8"
H (Eh_i)	6.17	ft	

W_2= W_1 +[2*H*tan(30°)]

tan(30°)= 0.58 *This formula ensures degree output

W_2= 11.12 ft

Actual Area= $((W_1+W_2)/2)*H$

A= 46.62 SF

Greater than minimum Area? No. Calculate W2 using formula below

*If your actual area is smaller than the required forebay area, back-calculate H from required forebay area and determine h3 by subtracting all hi values

A= $((W_1+W_2)/2)*H$

W_2= W_1 +[2*H*tan(30°)]

0= $\tan 30° H^2 + W_1 H - A$

0= 217.04 Goal Seek

New H= 23.3 ft

New W_2= 30.9 ft

New h_3= 19.1 ft

$A_{PROVIDED}$ 488 SF from CAD

HEADWALL TOP ELEV.= Pipe IE + 1.5*D

Pipe IE= 5910.00 ft

HEADWALL TOP ELEV.= 5913.00 ft

FOREBAY NOTCH SIZING: FOREBAY B

Wall with Rect. Notch (W_N equation from UD-BMP spreadsheet)

Undet. 100-year Peak Discharge 26.51 cfs (input from StormCAD)

Forebay Discharge Flow % 2%

Q_F = Undet. 100-yr discharge * Forebay Disch. %

Q_F = 0.53 cfs

Width of Notch(W_N)= $Q_F/(3.33*D_F^{1.5})*12 + 0.2*(D_F*12)$

D_F= 1 ft (Taken from input above)

W_N= 4.3 in

Kimley»Horn

STAGE-STORAGE ISV ANALYSIS

PROJECT NAME:	WATERVIEW EAST COMMERCIAL
CALCULATED BY:	JM
CHECKED BY:	JM

ISV

ELEV. (FT)	AREA (SQ FT)	ACCUM. VOL. (CU FT)	ACCUM. VOL. (AC-FT)	
2.5	30.0	75.0	0.002	SUFFICIENT VOLUME
	WQCV	15,377	0.353	
	ISV (0.3% OF WQCV)	46.1	0.001	

Worksheet for Trickle Channel

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Roughness Coefficient	0.013
Channel Slope	0.011 ft/ft
Normal Depth	6.0 in
Bottom Width	6.00 ft

Results

Discharge	20.44 cfs
Flow Area	3.0 ft²
Wetted Perimeter	7.0 ft
Hydraulic Radius	5.1 in
Top Width	6.00 ft
Critical Depth	8.5 in
Critical Slope	0.004 ft/ft
Velocity	6.81 ft/s
Velocity Head	0.72 ft
Specific Energy	1.22 ft
Froude Number	1.699
Flow Type	Supercritical

GVF Input Data

Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

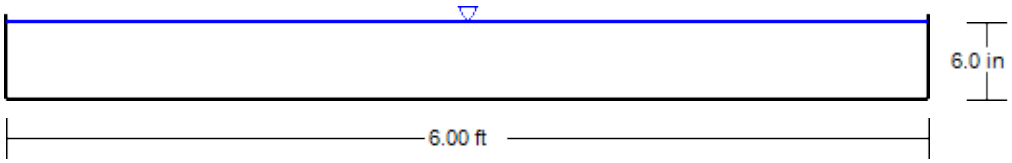
GVF Output Data

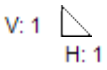
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	6.0 in
Critical Depth	8.5 in
Channel Slope	0.011 ft/ft
Critical Slope	0.004 ft/ft

Cross Section for Trickle Channel

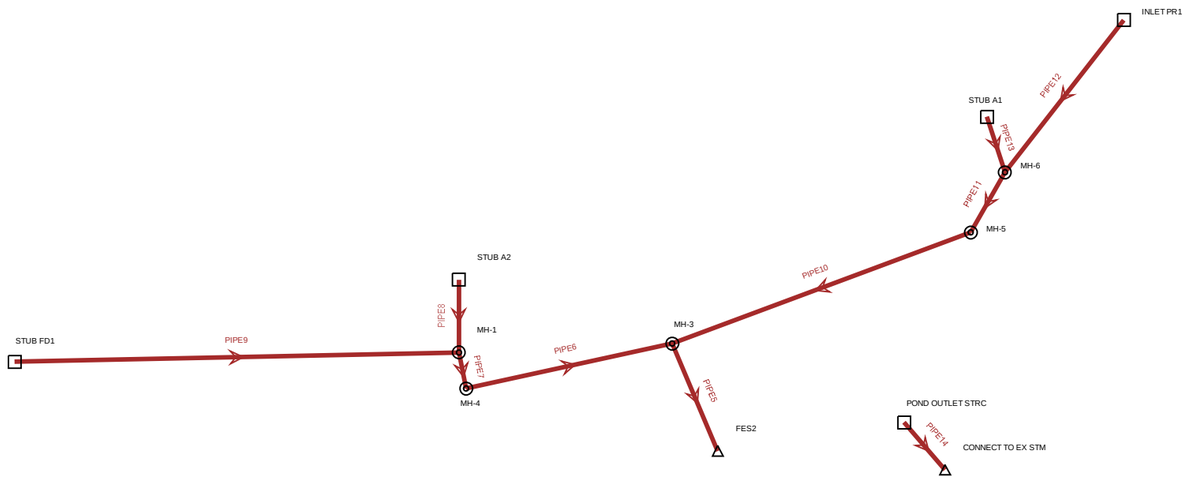
Project Description	
Friction Method	Manning Formula
Solve For	Discharge

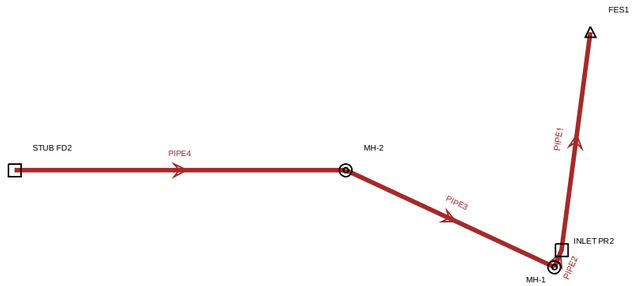
Input Data	
Roughness Coefficient	0.013
Channel Slope	0.011 ft/ft
Normal Depth	6.0 in
Bottom Width	6.00 ft
Discharge	20.44 cfs





Scenario: 100-Year





FlexTable: Catch Basin Table (5-YEAR)

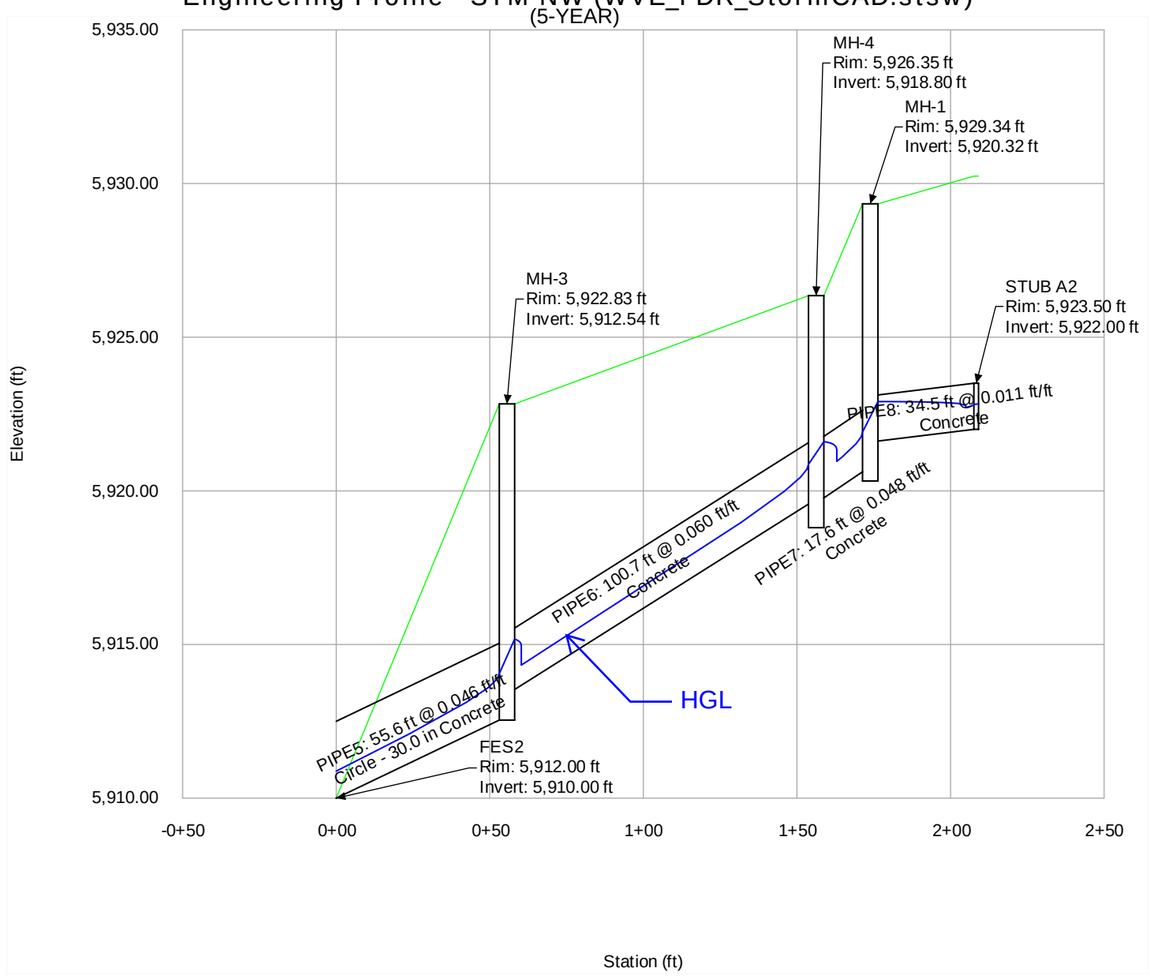
Label	Elevation (Ground) (ft)	Elevation (Invert) (ft)	Capture Efficiency (Calculated) (%)	Flow (Additional Subsurface) (cfs)
INLET PR1	5,921.69	5,916.49	100.0	1.02
STUB A1	5,925.03	5,917.39	100.0	5.92
STUB A2	5,930.24	5,922.00	100.0	4.48
STUB FD1	5,934.62	5,923.99	100.0	8.41
STUB FD2	5,933.07	5,924.80	100.0	9.17
INLET PR2	5,919.42	5,913.49	100.0	2.38
POND OUTLET STRC	5,910.00	5,906.58	100.0	0.40

FlexTable: Conduit Table (5-YEAR)

Label	Start Node	Stop Node	Slope (Calculated) (ft/ft)	Diameter (in)	Flow (cfs)	Velocity (ft/s)	Capacity (Full Flow) (cfs)	Flow / Capacity (Design) (%)	Manning's n	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)
PIPE8	STUB A2	MH-1	0.011	18.0	4.48	5.92	11.04	40.6	0.013	5,922.81	5,922.90
PIPE7	MH-1	MH-4	0.048	24.0	12.89	13.28	49.68	25.9	0.013	5,921.91	5,921.60
PIPE9	STUB FD1	MH-1	0.012	24.0	8.41	7.13	24.78	33.9	0.013	5,925.03	5,922.90
PIPE4	STUB FD2	MH-2	0.045	24.0	9.17	11.77	47.95	19.1	0.013	5,925.88	5,918.30
PIPE6	MH-4	MH-3	0.060	24.0	12.89	14.37	55.39	23.3	0.013	5,920.86	5,915.17
PIPE12	INLET PR1	MH-6	0.009	24.0	1.02	3.54	21.74	4.7	0.013	5,916.83	5,916.70
PIPE11	MH-6	MH-5	0.009	24.0	6.94	6.15	21.72	31.9	0.013	5,916.37	5,915.93
PIPE13	STUB A1	MH-6	0.060	18.0	5.92	11.83	25.72	23.0	0.013	5,918.33	5,916.70
PIPE3	MH-2	MH-1	0.028	24.0	9.17	9.93	37.87	24.2	0.013	5,918.49	5,915.70
PIPE5	MH-3	FES2	0.046	30.0	19.83	14.44	87.67	22.6	0.013	5,914.05	5,910.88
PIPE10	MH-5	MH-3	0.009	24.0	6.94	6.15	21.74	31.9	0.013	5,915.87	5,915.17
PIPE2	MH-1	INLET PR2	0.028	24.0	9.17	9.95	37.94	24.2	0.013	5,915.12	5,914.63
PIPE1	INLET PR2	FES1	0.033	24.0	11.55	11.28	41.31	28.0	0.013	5,914.71	5,910.72
PIPE14	POND OUTLET STRC	CONNECT TO EX STM	0.015	21.0	0.40	3.20	19.20	2.1	0.013	5,906.80	5,906.31

Profile Report

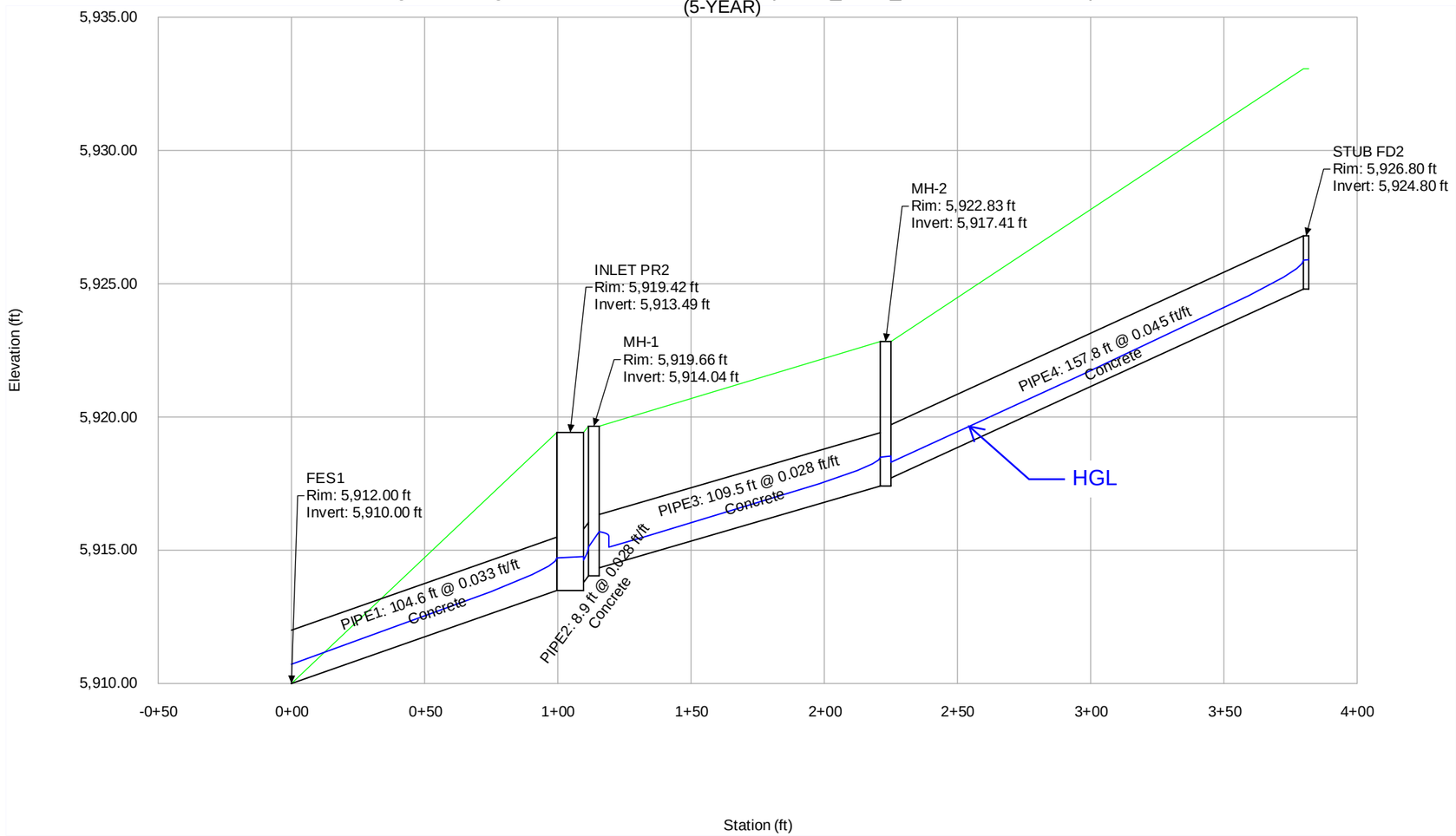
Engineering Profile - STM NW (WVE_FDR_StormCAD.stsw)



Profile Report

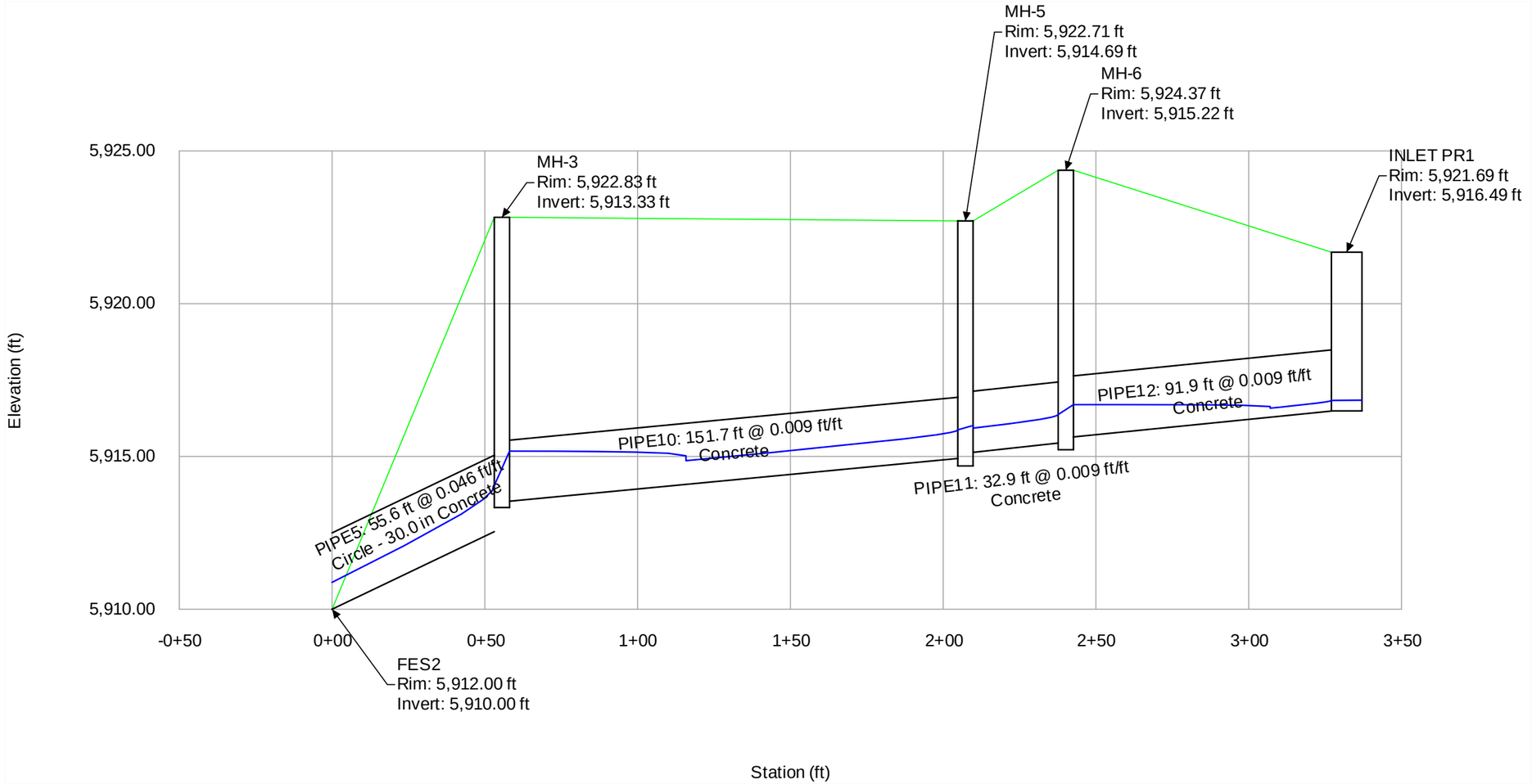
Engineering Profile - STM SOUTH (WVE_FDR_StormCAD.stsw)

(5-YEAR)



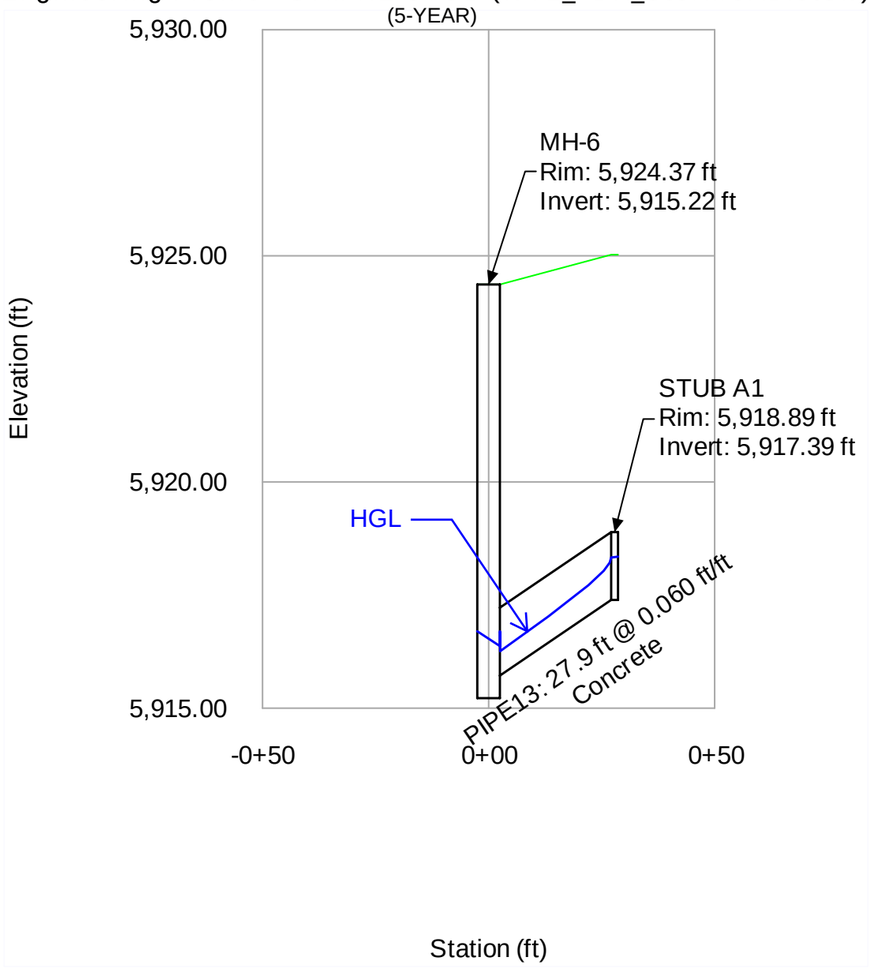
Profile Report

Engineering Profile - STM NE (WVE_FDR_StormCAD.stsw)



Profile Report

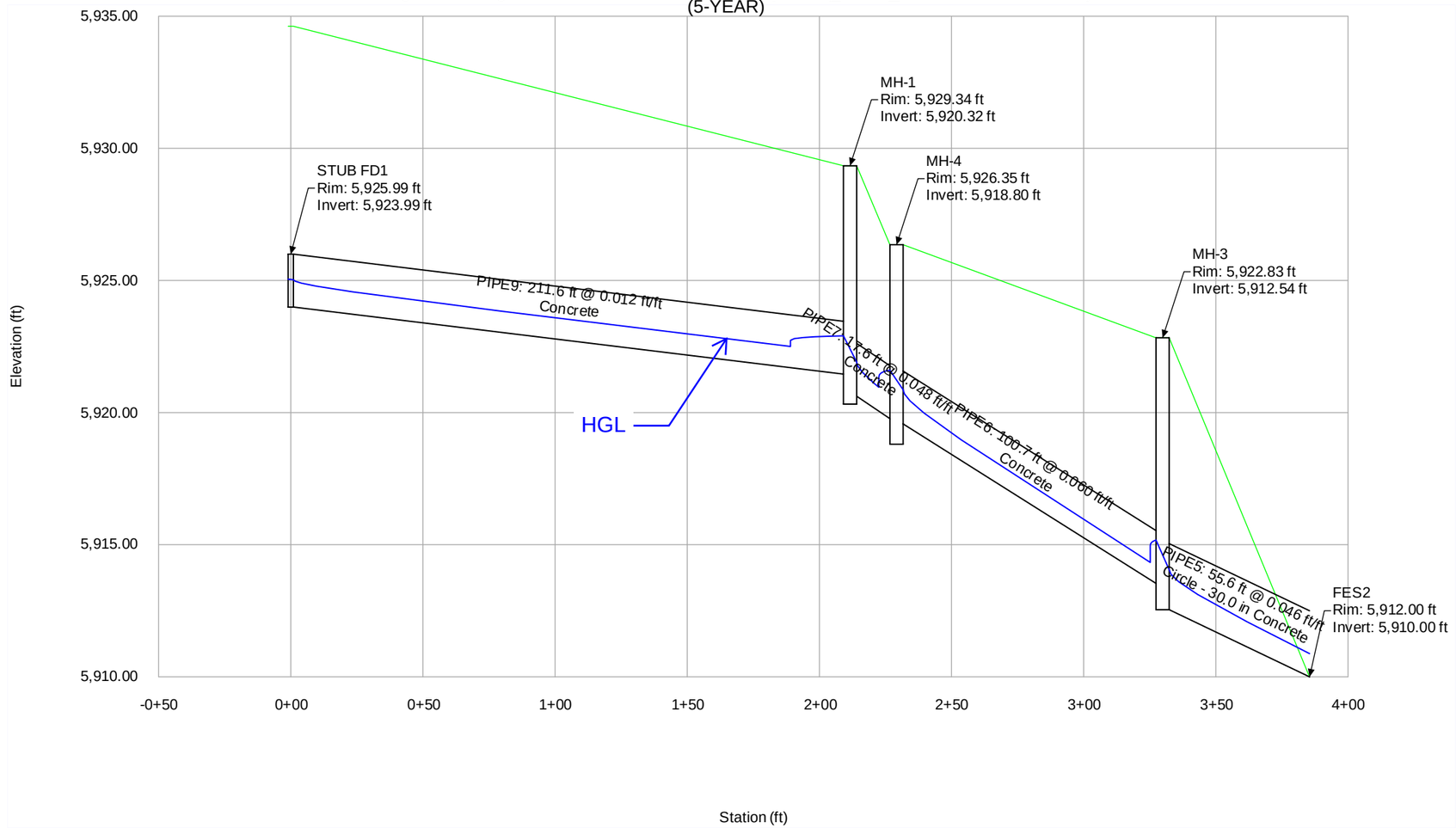
Engineering Profile - STM NE STUB (WVE_FDR_StormCAD.stsw)



Profile Report

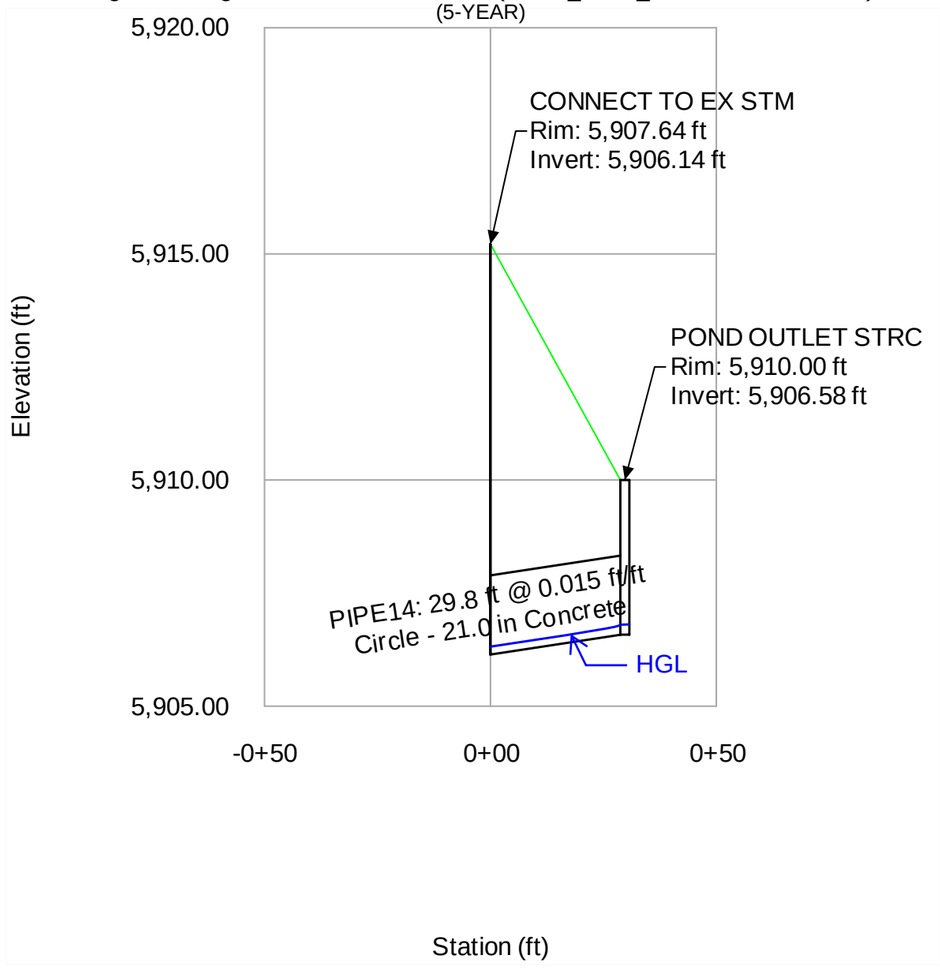
Engineering Profile - STRM WEST (WVE_FDR_StormCAD.stsw)

(5-YEAR)



Profile Report

Engineering Profile - OUTFALL (WVE_FDR_StormCAD.stsw)



FlexTable: Catch Basin Table (100-YEAR)

Label	Elevation (Ground) (ft)	Elevation (Invert) (ft)	Capture Efficiency (Calculated) (%)	Flow (Additional Subsurface) (cfs)
INLET PR1	5,921.69	5,916.49	100.0	2.30
STUB A1	5,925.03	5,917.39	100.0	13.63
STUB A2	5,930.24	5,922.00	100.0	10.32
STUB FD1	5,934.62	5,923.99	100.0	19.39
STUB FD2	5,933.07	5,924.80	100.0	21.14
INLET PR2	5,919.42	5,913.49	100.0	5.37
POND OUTLET STRC	5,910.00	5,906.58	100.0	17.90

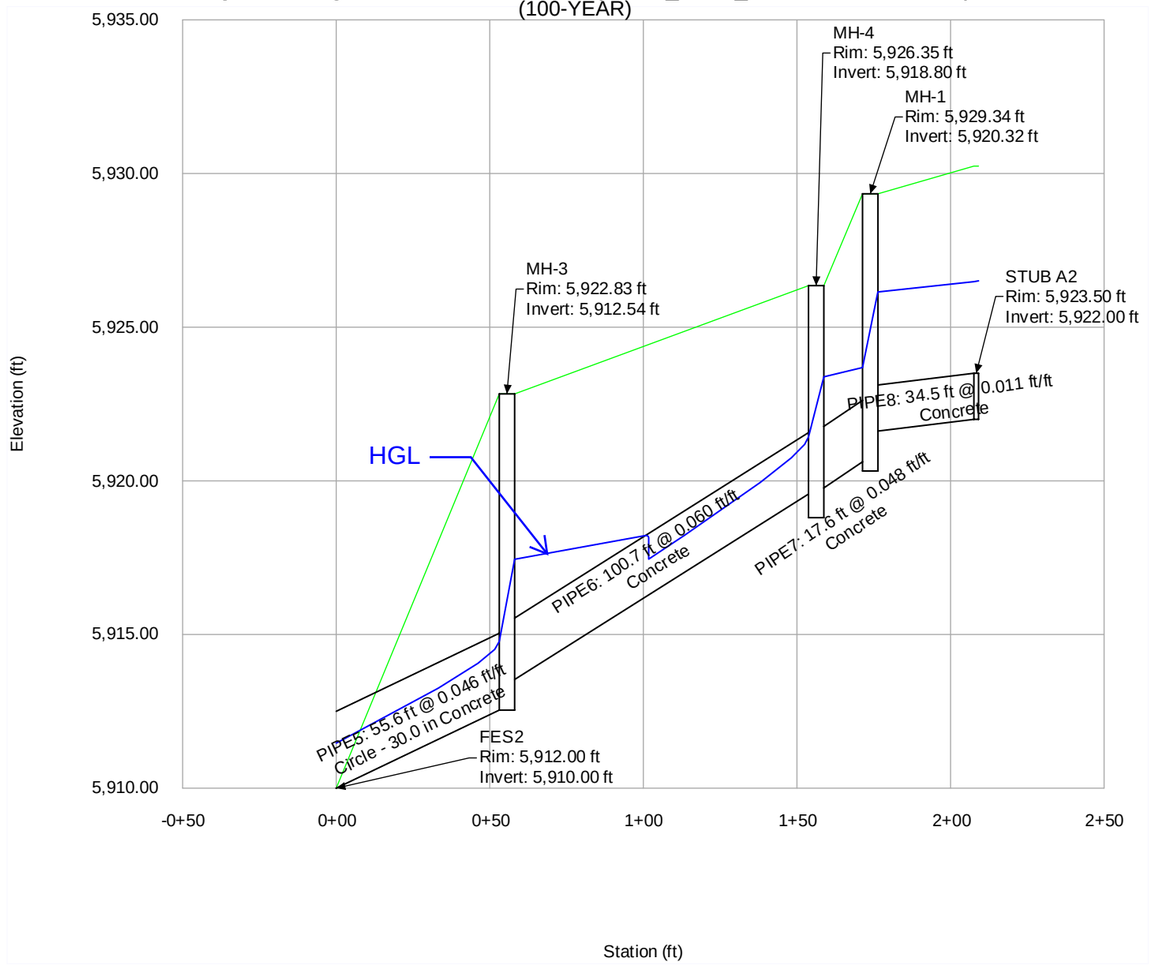
FlexTable: Conduit Table (100-YEAR)

Label	Start Node	Stop Node	Slope (Calculated) (ft/ft)	Diameter (in)	Flow (cfs)	Velocity (ft/s)	Capacity (Full Flow) (cfs)	Flow / Capacity (Design) (%)	Manning's n	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)
PIPE8	STUB A2	MH-1	0.011	18.0	10.32	5.84	11.04	93.5	0.013	5,926.48	5,926.15
PIPE7	MH-1	MH-4	0.048	24.0	29.71	9.46	49.68	59.8	0.013	5,923.69	5,923.38
PIPE9	STUB FD1	MH-1	0.012	24.0	19.39	6.17	24.78	78.3	0.013	5,927.70	5,926.15
PIPE4	STUB FD2	MH-2	0.045	24.0	21.14	14.79	47.95	44.1	0.013	5,926.45	5,918.64
PIPE6	MH-4	MH-3	0.060	24.0	29.71	17.94	55.39	53.6	0.013	5,921.43	5,917.45
PIPE12	INLET PR1	MH-6	0.009	24.0	2.30	0.73	21.74	10.6	0.013	5,918.89	5,918.88
PIPE11	MH-6	MH-5	0.009	24.0	15.93	5.07	21.72	73.3	0.013	5,918.52	5,918.36
PIPE13	STUB A1	MH-6	0.060	18.0	13.63	7.71	25.72	53.0	0.013	5,919.35	5,918.88
PIPE3	MH-2	MH-1	0.028	24.0	21.14	12.39	37.87	55.8	0.013	5,919.06	5,916.88
PIPE5	MH-3	FES2	0.046	30.0	45.64	18.04	87.67	52.1	0.013	5,914.78	5,911.47
PIPE10	MH-5	MH-3	0.009	24.0	15.93	5.07	21.74	73.3	0.013	5,918.20	5,917.45
PIPE2	MH-1	INLET PR2	0.028	24.0	21.14	12.41	37.94	55.7	0.013	5,915.69	5,915.15
PIPE1	INLET PR2	FES1	0.033	24.0	26.51	13.96	41.31	64.2	0.013	5,915.29	5,911.20
PIPE14	POND OUTLET STRC	CONNECT TO EX STM	0.015	21.0	17.90	9.07	19.20	93.2	0.013	5,908.12	5,907.52

Profile Report

Engineering Profile - STM NW (WVE_FDR_StormCAD.stsw)

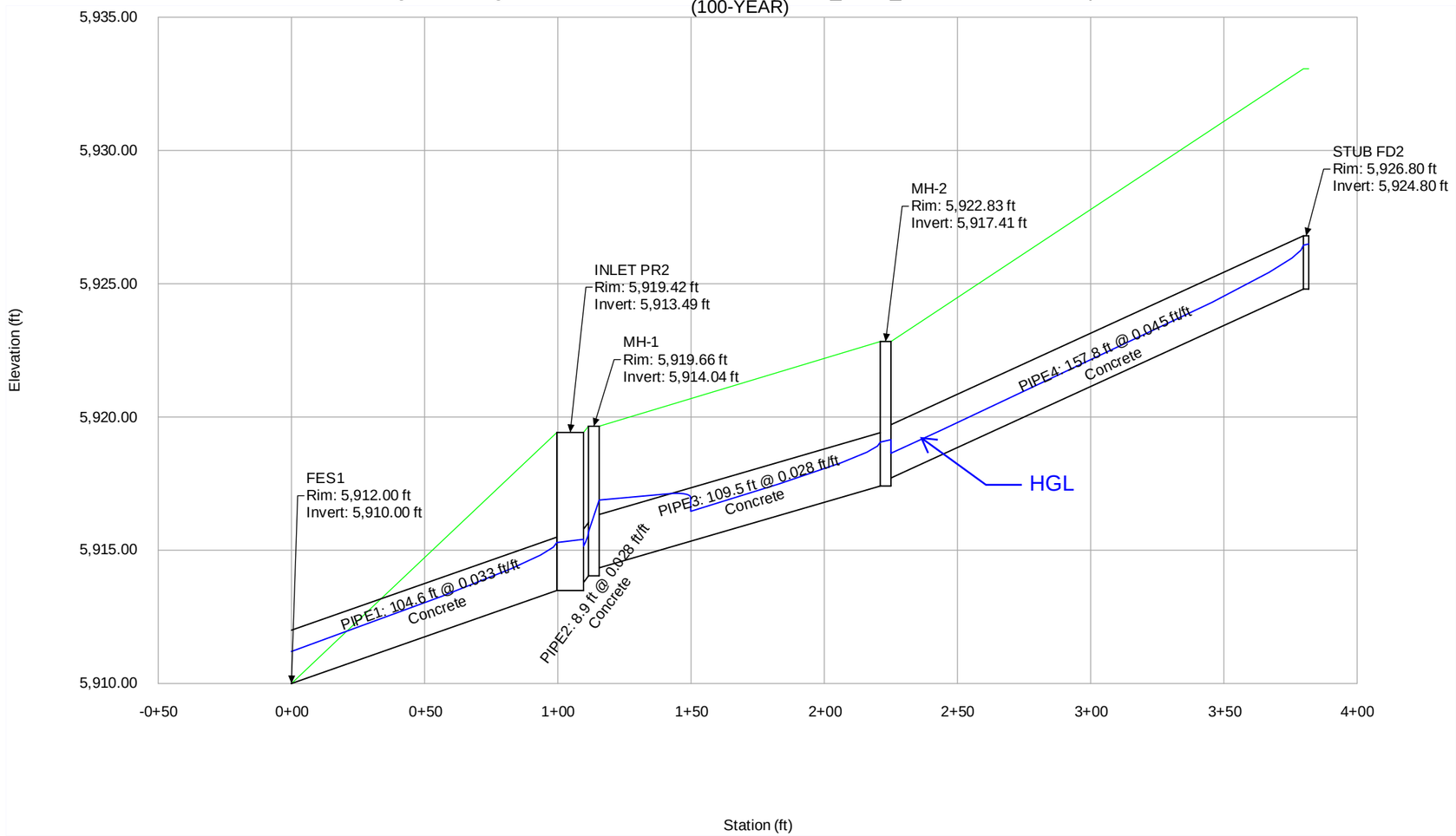
(100-YEAR)



Profile Report

Engineering Profile - STM SOUTH (WVE_FDR_StormCAD.stsw)

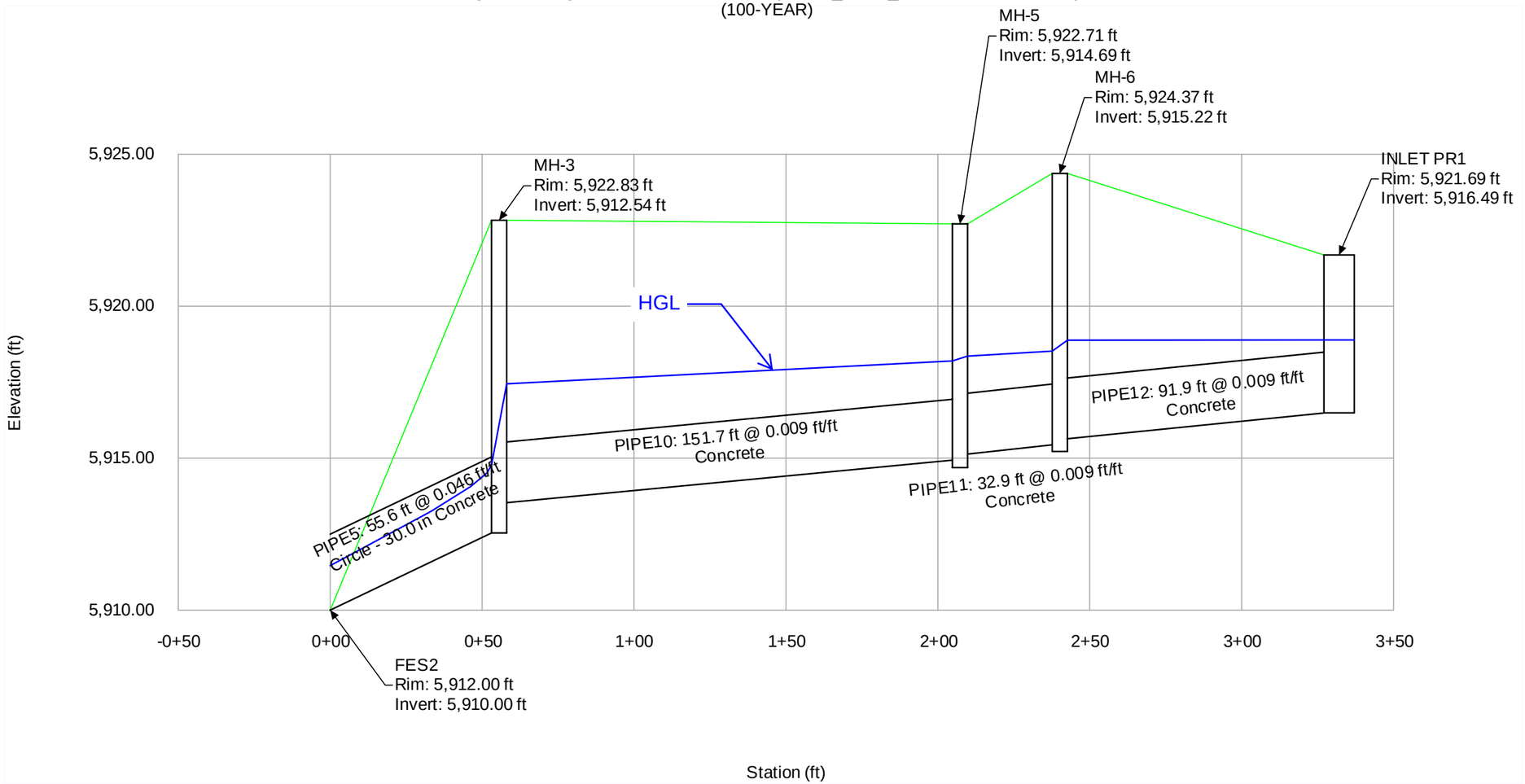
(100-YEAR)



Profile Report

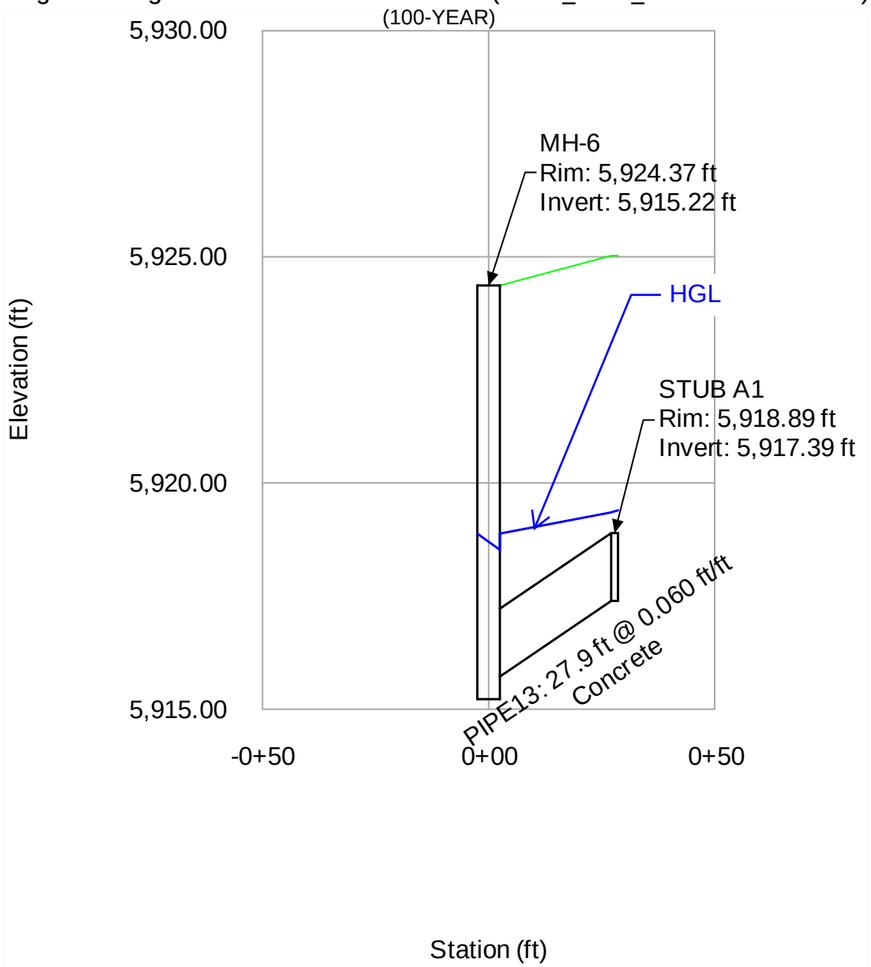
Engineering Profile - STM NE (WVE_FDR_StormCAD.stsw)

(100-YEAR)



Profile Report

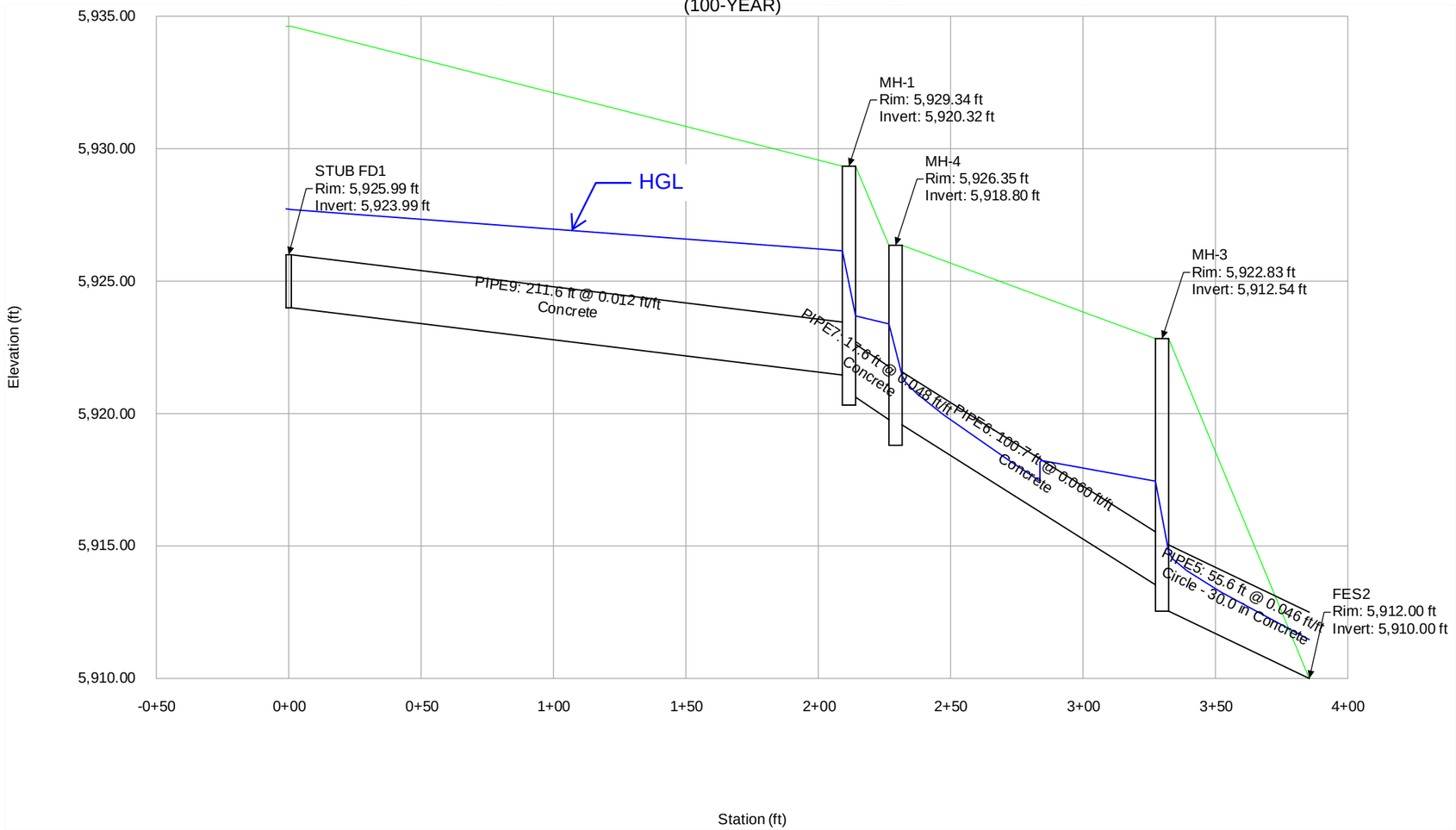
Engineering Profile - STM NE STUB (WVE_FDR_StormCAD.stsw)



Profile Report

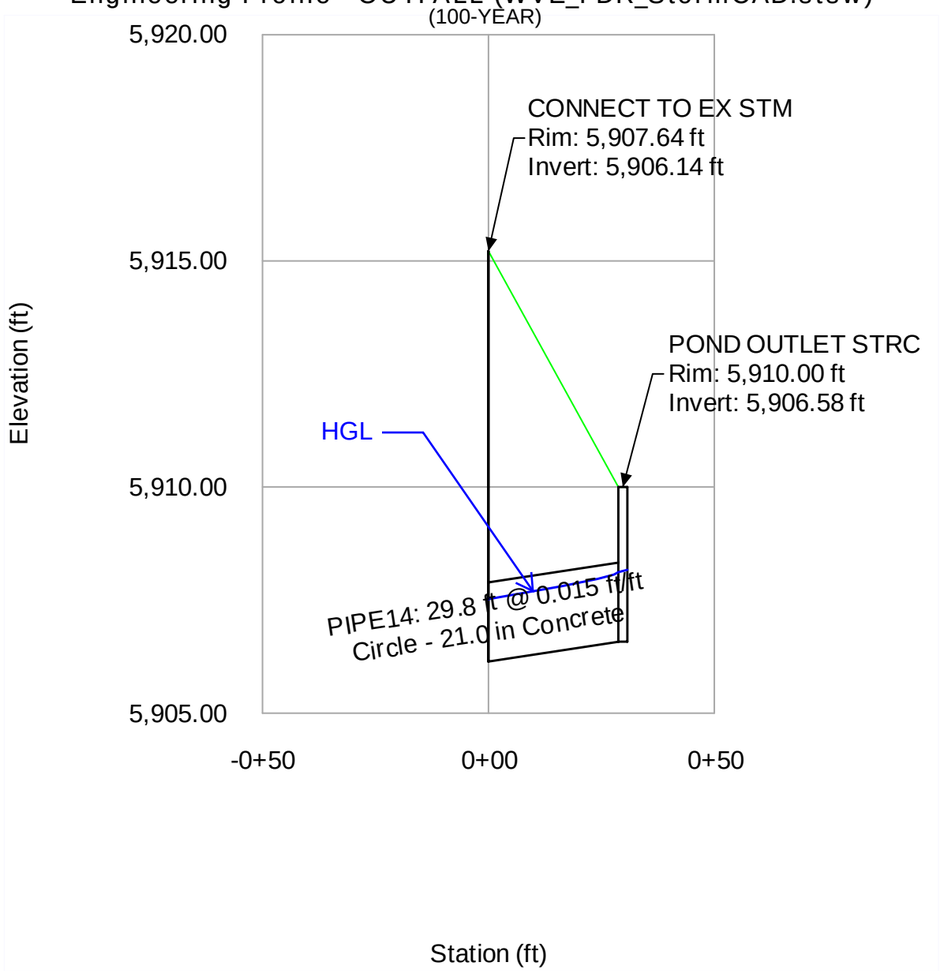
Engineering Profile - STRM WEST (WVE_FDR_StormCAD.stsw)

(100-YEAR)



Profile Report

Engineering Profile - OUTFALL (WVE_FDR_StormCAD.stsw)



APPENDIX E – MASTER DEVELOPMENT DRAINAGE PLANS

b. The ***fully developed conditions*** for the site are as follows:

1. Big Johnson Reservoir:

Under proposed conditions, developed flows for the westernmost drainage basin (Big Johnson Reservoir) will be directed into a proposed full spectrum detention pond on the west side of the site approximately 2,030 feet south of the intersection of Bradley Road and Powers Boulevard. Sub-basins and Design Points within this major basin are summarized in Tables 3.3, 3.4, and 3.5 below:

Table 3.3
Trails at Aspen Ridge
Big Johnson Reservoir
Proposed Conditions - Sub-basin Summary

Basin	Area	Q5	Q100
	acres	cfs	cfs
Big Johnson Reservoir N	14.1	21.2	46.8
O	11.7	17.4	38.4
P	8.52	22.0	43.9
Q	2.4	4.2	8.8
OS-2	11.4	1.7	11.7

Table 3.4
Trails at Aspen Ridge
Big Johnson Reservoir
Proposed Design Point Summary

Design Point	Sub-Basins	Downstream Design Point	Total Area (ac.)	Q(5) (cfs)	Q(100) (cfs)
N	N	P	14.1	21.2	46.8
O	O	P	11.7	17.4	38.4
P (Into West Pond)	N, O, P	West Pond Discharge	34.7	47.6	101.5
West Pond Discharge (UD-Detention)	N, O, P	Powers Ditch		1.0	28.3
Q	Q	Powers Ditch	2.4	4.9	10.3
OS-2 (This sub-basin is just southeast of the Powers and Bradley intersection. Flows which might have flowed across TAR to the Powers ditch will be diverted to the ditch prior to entering the TAR property.)	OS-2	Powers Ditch	11.4	1.7	11.7

Table 3.8
Trails at Aspen Ridge
West Fork - Jimmy Camp Creek
Proposed Design Point Flow Description

Design Point	Description
OS-1	- This design point is at the downstream end of the offsite sub-basin north of Bradley Road. Flows in this sub-basin will sheet flow to the road ditch running along Bradley and Powers Boulevard. Once channelized in the ditch flows will be directed to a proposed 24-inch RCP storm pipe sleeved into one of the existing 42-inch CMP cross road pipes and conveyed on to design point A. - Please note that approximately 7.3 acres of the area tributary to this design point have been diverted from the Big Johnson Reservoir by CDOT construction of Powers Boulevard. Future development of that portion of the tributary sub-basin must redirect these flows to the Big Johnson Reservoir to maintain compliance with the two relevant DBPS reports. - Development of the OS-1 Sub-basin will require onsite detention and an FDR.
A	- This design point is at the manhole (MH-3) receiving flows from DP OS-1 to the north and flows from Sub-basin A captured in the two pairs of inlets on Frontside Drive to the east and west of its intersection with Legacy Drive. These flows will be conveyed on via 30-inch storm pipe to design point B. - Flows from the required onsite detention from the two commercial lots on either side of Legacy Drive will be picked up in the back of the inlets. A 24-inch storm pipe will be stubbed out for the west commercial lot (Inlet 1-A) and an 18-inch will be stubbed out for the east commercial lot (Inlet 3-A).
B	- This design point is at a manhole (MH-108) just downstream of an on-grade inlet (1-B) capturing gutter flows from the west half of Legacy Drive reflected in Sub-basin B. These flows are carried downstream via 30-inch storm pipe to design point C.
C	- This design point is a manhole (MH-6) which combines storm sewer flows from design point B with storm sewer flows from Sub-basin C. Flows in Sub-basin C will sheet flow off the residential lots and into the street curb and gutter. The road gutters will convey these flows on to be captured in four pairs of sump inlets (1-C through 8-C) and conveyed to the design point. The combined flows will be conveyed downstream via 42-inch storm pipe to design point D.
D	- This design point is at a manhole (MH-117) just downstream of an at-grade inlet (1-D) capturing flows from Sub-basin D. Flows in Sub-basin D will sheet flow to the Legacy Road curb and gutter. These gutter flows are captured in the at-grade inlet and combined with storm sewer flows from design point C and carried on via 42-inch storm pipe to design point E.
E	- This design point is located at a manhole (MH-15) just downstream of a pair of sump inlets capturing flows from Sub-basin E. Flows in Sub-basin E will sheet flow across the park area until being captured in the curb and gutter along Falling Rock Drive. Concentrated gutter flows will then be captured by the sump inlets and conveyed on via storm sewer to the design point. These flows will be combined with flows from design point D and carried on via 48-inch storm pipe to design point G.

Rational Method - Proposed Conditions

Project Name:	Trails at Aspen Ridge (Waterview II)
Project Location:	El Paso County, CO
Designer	JTS
Notes:	Proposed Condition

Average Channel Velocity	4	ft/s	(If specific channel vel is used, this will be ignored)
Average Slope for Initial Flow	0.04	ft/ft	(If Elevations are used, this will be ignored)

Channel Flow Type Key

Heavy Meadow	2
Tillage/Field	3
Short Pasture and Lawns	4
Nearly Bare Ground	5
Grassed Waterway	6
Paved Areas	7

		Area		Rational 'C' Values														Flow Lengths											Tc	Rainfall Intensity & Rational Flow Rate				SWMM Values	
				Surface Type 1 Residential 1/8 or less (65% Imp.)			Surface Type 2 Pavement (100% Imp.)			Surface Type 3 Park (7% Imp.)			Surface Type 4 Undeveloped (2% Imp.)			Composite		Percent Impervious	Initial	True Initial	Channel	True Channel	Average (decimal)	Initial	Average (%)	Channel Flow Type (See Key above)	Velocity	Channel	Total	i5	Q5	i100	Q100	Q5	Q100
Sub-basin	**Comments**	sf	acres	C5	C100	Area (SF)	C5	C100	Area (SF)	C5	C100	Area	C5	C100	Area	C5	C100		ft	Length ft	ft	Length ft	Slope	Tc (min)	Slope	Ground Type	(ft/s)	Tc (min)	(min)	in/hr	cfs	in/hr	cfs	cfs	cfs
West Fork-Jimmy Camp Creek OS-1	***- The most northwestern portion of this basin (7.268 Acres) outside of the proposed Trails at Aspen Ridge development was rerouted out of the Big Johnson Reservoir basin by CDOT construction of Powers Boulevard and Bradley Road. Future development of the rerouted area will require routing the flows back to the Big Johnson Reservoir to return the area to compliance with the relevant DBPS studies.***	853,954	19.60	0.45	0.59		0.90	0.96		0.65	0.80		0.09	0.36	853954	0.09	0.36	2.00	780.00	300.00	300.00	780.00	0.10	23.57	1.40	5	1.2	11.0	34.6	2.23	**4.0**	3.75	**26.7**	1.1	16.2
A	***-Drainage area is upstream of two pairs of inlets near roundabout at intersection of Frontside Dr. and Legacy Dr. -Development of adjacent commercial lots will require FDR and onsite detention. -Note: The Commercial development will have 95% impervious (per DCM), but since it is required to detain prior to discharging to storm sewer the C values reflect undeveloped commercial areas.***	804,622	18.47	0.45	0.59	22315	0.90	0.96	78609	0.65	0.80		0.09	0.36	703698	0.18	0.42	13.32	861.00	300.00	869.00	1430.00	0.06	26.77	1.10	7	2.1	11.4	38.1	2.10	**7.0**	3.54	**28.0**	5.0	34.6
B	***- At grade inlet approximately 400 feet downstream of roundabout.***	46,101	1.06	0.45	0.59	46101	0.90	0.96		0.65	0.80		0.09	0.36		0.45	0.59	65.00	185.00	185.00	400.00	400.00	0.04	9.86	3.40	7	3.7	1.8	11.7	3.86	**1.9**	6.48	**4.1**	2.5	7.0
C	***- Includes the area north of Moose Meadow Street and between Beartrack Point and Sidewinder Drive and four pairs of sump inlets***	648,154	14.88	0.45	0.59	627120	0.90	0.96	21034	0.65	0.80		0.09	0.36		0.46	0.60	66.14	162.00	162.00	822.00	822.00	0.05	8.51	3.29	7	3.6	3.8	12.3	3.77	**26.3**	6.34	**57.2**	19.5	58.9
D	***-drainage area upstream of at grade inlet approximately 575 feet south of Moose Meadow Street.***	96,065	2.21	0.45	0.59		0.90	0.96	14,978	0.65	0.80	81087	0.09	0.36		0.69	0.82	21.50	473.00	300.00	555.00	728.00	0.06	8.85	4.00	7	4.0	3.0	11.9	3.83	**5.9**	6.44	**11.8**	4.1	14.2
E	***- Located at a pair of sump inlets at the intersection of Sunday Gulch and Falling Rock Drive.***	373,189	8.57	0.45	0.59	49513	0.90	0.96	40601	0.65	0.80	283075	0.09	0.36		0.65	0.79	24.81	859.00	300.00	1450.00	2009.00	0.07	12.39	4.00	7	4.0	8.4	20.8	2.96	**16.6**	4.97	**33.9**	12.8	39.1
F	***-Represents area captured by at grade inlets on Lazy Ridge Drive and Wagon Hammer Drive, as well as sump inlets west of the intersection of Lookout Court and Sunday Gulch.***	569,234	13.07	0.45	0.59	569234	0.90	0.96		0.65	0.80		0.09	0.36		0.45	0.59	65.00	332.00	300.00	868.00	900.00	0.07	11.14	2.00	7	2.8	5.3	16.4	3.32	**19.7**	5.57	**43.3**	15.4	46.2
G	***-At grade inlet on the east side of Sunday Gulch near intersection with Lookout Court.***	48,227	1.11	0.45	0.59	48227	0.90	0.96		0.65	0.80		0.09	0.36		0.45	0.59	65.00	80.00	80.00	667.00	667.00	0.05	6.12	2.45	7	3.1	3.6	9.7	4.15	**2.1**	6.97	**4.6**	2.1	6.1
H	***-This represents the area draining to Buffalo Horn Drive with the exception any flow by from the at grade inlets in Sub-basin F.***	1,022,296	23.47	0.45	0.59	921233	0.90	0.96	39,492	0.65	0.80	61571	0.09	0.36		0.48	0.62	62.86	250.00	250.00	1074.00	1074.00	0.04	11.13	2.00	7	2.8	6.3	17.5	3.22	**36.6**	5.42	**79.1**	26.8	80.4

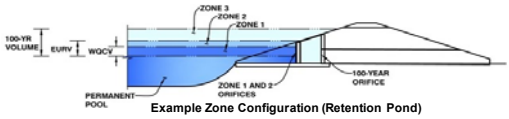
		Area		Rational 'C' Values														Flow Lengths										Tc	Rainfall Intensity & Rational Flow Rate				SWMM Values	
Sub-basin	Comments			Surface Type 1 Residential 1/8 or less (65% Imp.)			Surface Type 2 Pavement (100% Imp.)			Surface Type 3 Park (7% Imp.)			Surface Type 4 Undeveloped (2% Imp.)			Composite		Percent Impervious	Initial	True Initial	Channel	True Channel	Average (decimal)	Initial	Average (%)	Channel Flow Type (See Key above)	Velocity	Channel	Total	i5	Q5	i100	Q100	Q5	Q100
		sf	acres	C5	C100	Area (SF)	C5	C100	Area (SF)	C5	C100	Area	C5	C100	Area	C5	C100		ft	Length ft	ft	Length ft	Slope	Tc (min)	Slope	Ground Type	(ft/s)	Tc (min)	(min)	in/hr	cfs	in/hr	cfs	cfs	cfs
I	*-Represents area draining to the proposed sump inlet at the end of the cul-de-sac on Falling Rock Drive.*	344,236	7.90	0.45	0.59	305401	0.90	0.96	31104	0.65	0.80	7731	0.09	0.36		0.50	0.63	66.86	153.00	153.00	1104.00	1104.00	0.05	7.88	2.61	7	3.2	5.7	13.6	3.62	**14.3**	6.08	**30.4**	10.5	31.8
J	*-Represents drainage area tributary to sump inlets near intersection of Redshirt Point and Big Johnson Drive.*	229,049	5.26	0.45	0.59	70187	0.90	0.96	158,862	0.65	0.80		0.09	0.36		0.76	0.85	89.28	266.00	266.00	909.00	909.00	0.09	4.77	3.20	7	3.6	4.2	9.0	4.27	**17.2**	7.17	**32.2**	11.1	32.7
K	*-This sub-basin is tributary to the future sump inlets near the intersection of Big Johnson Drive and Roundhouse Drive.*	1,414,842	32.48	0.45	0.59	1414842	0.90	0.96		0.65	0.80		0.09	0.36		0.45	0.59	65.00	400.00	300.00	1400.00	1500.00	0.06	13.26	3.50	7	3.7	6.7	19.9	3.02	**44.5**	5.07	**98.0**	33.3	101.7
Marksheffel Tributary to Jimmy Camp Creek *L*	*-Represents entire drainage area to the Northeast Pond.*	330,836	7.59	0.45	0.59	259741	0.90	0.96		0.65	0.80	71095	0.09	0.36		0.49	0.64	52.54	290.00	290.00	490.00	490.00	0.05	10.88	5.40	7	4.6	1.8	12.6	3.73	**14.1**	6.27	**30.5**		
West Fork-Jimmy Camp Creek *M*	*Drainage area in and around East Full Spectrum Detention Pond*	447,971	10.29	0.45	0.59		0.90	0.96		0.65	0.80	447971	0.09	0.36		0.65	0.80	7.00	437.00	300.00	10.00	147.00	0.06	9.32	1.00	7	2.0	1.2	10.5	4.02	**27.1**	6.75	**56.0**	14.2	61.8
Big Johnson Reservoir *N*	*-Represents area upstream of sump inlets near intersection of Natural Bridge Trail and Blue Miner Street.*	614,283	14.10	0.45	0.59	614283	0.90	0.96		0.65	0.80		0.09	0.36		0.45	0.59	65.00	150.00	150.00	1229.00	1229.00	0.03	9.94	2.50	7	3.2	6.5	16.4	3.32	**21.2**	5.58	**46.8**		
O	*-Represents area upstream of sump inlet at intersection of Rainy Creek Trail and Triple Tree Loop*	510,492	11.72	0.45	0.59	510,492	0.90	0.96	0	0.65	0.80	0	0.09	0.36	0	0.45	0.59	65.00	104.00	104.00	1230.00	1230.00	0.02	9.47	1.40	7	2.4	8.7	18.1	3.17	**16.8**	5.32	**37.1**		
P	*-Drainage area in and around the West Pond.*	370,936	8.52	0.45	0.59		0.90	0.96	70,884	0.65	0.80	300052	0.09	0.36		0.70	0.83	24.77	560.00	300.00	378.00	638.00	0.06	9.43	2.00	7	2.8	3.8	13.2	3.67	**22.0**	6.16	**43.9**		
Q	*-This area is infeasible to detain and discharges to the Powers Boulevard Ditch* *-Less than one acre (0.31 Acres) of developed area is within the Big Johnson Reservoir Basin, therefore, compliance with the county's MS4 permit is maintained.*	106,017	2.43	0.45	0.59	38,063	0.90	0.96	0	0.65	0.80	67,954	0.09	0.36	0	0.58	0.72	27.82	143.00	143.00	687.00	687.00	0.06	6.08	3.35	4	1.3	9.0	15.1	3.45	**4.9**	5.80	**10.3**		
R	*-This area is infeasible to detain and discharges to the swale at the southeast corner of the property.* *-Less than one acre (0.67 Acres) of developed area is within the West Fork Jimmy Campr Creek Basin, therefore, compliance with the county's MS4 permit is maintained.*	81,300	1.87	0.45	0.59		0.90	0.96		0.65	0.80	81300	0.09	0.36		0.65	0.80	7.00	21.00	21.00	220.00	220.00	0.33	1.16	10.00	5	3.2	1.2	5.0	5.10	**6.2**	8.58	**12.9**	1.7	7.8
OS-2	*- Commercially zoned lot just southeast of the intersection of Bradley and Powers. This area will be required to provide its own detention which must discharge to the Powers Boulevard Ditch.*	498,467	11.44	0.45	0.59		0.90	0.96		0.65	0.80		0.09	0.36	498467	0.09	0.36	2.00	971.00	300.00	1411.00	2082.00	0.04	34.50	2.83	5	1.7	20.7	55.2	1.67	**1.7**	2.81	**11.7**		

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

UD-Detention, Version 3.07 (February 2017)

Project: Trails at Aspen Ridge

Basin ID: Approximated future detention for Commercial lot South of Bradley Road and West of Legacy Drive



Example Zone Configuration (Retention Pond)

Required Volume Calculation

Selected BMP Type =	EDB	
Watershed Area =	13.43	acres
Watershed Length =	894	ft
Watershed Slope =	0.070	ft/ft
Watershed Imperviousness =	95.00%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	100.0%	percent
Percentage Hydrologic Soil Groups C/D =	0.0%	percent
Desired WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	
Water Quality Capture Volume (WQCV) =	0.501	acre-feet
Excess Urban Runoff Volume (EURV) =	1.436	acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	1.234	acre-feet
5-yr Runoff Volume (P1 = 1.5 in.) =	1.600	acre-feet
10-yr Runoff Volume (P1 = 1.75 in.) =	1.926	acre-feet
25-yr Runoff Volume (P1 = 2 in.) =	2.252	acre-feet
50-yr Runoff Volume (P1 = 2.25 in.) =	2.517	acre-feet
100-yr Runoff Volume (P1 = 2.52 in.) =	2.867	acre-feet
500-yr Runoff Volume (P1 = 3.55 in.) =	4.110	acre-feet
Approximate 2-yr Detention Volume =	1.158	acre-feet
Approximate 5-yr Detention Volume =	1.504	acre-feet
Approximate 10-yr Detention Volume =	1.831	acre-feet
Approximate 25-yr Detention Volume =	1.964	acre-feet
Approximate 50-yr Detention Volume =	2.037	acre-feet
Approximate 100-yr Detention Volume =	2.102	acre-feet

Optional User Override 1-hr Precipitation	
1.19	inches
1.50	inches
1.75	inches
2.00	inches
2.25	inches
2.52	inches
3.55	inches

Stage-Storage Calculation

Zone 1 Volume (WQCV) =	0.501	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.935	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.666	acre-feet
Total Detention Basin Volume =	2.102	acre-feet
Initial Surcharge Volume (ISV) =	65	ft^3
Initial Surcharge Depth (ISD) =	0.33	ft
Total Available Detention Depth (H_{total}) =	4.00	ft
Depth of Trickle Channel (H_{TC}) =	0.50	ft
Slope of Trickle Channel (S_{TC}) =	0.005	ft/ft
Slopes of Main Basin Sides (S_{main}) =	4	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	2	
Initial Surcharge Area (A_{ISV}) =	198	ft^2
Surcharge Volume Length (L_{ISV}) =	14.1	ft
Surcharge Volume Width (W_{ISV}) =	14.1	ft
Depth of Basin Floor (H_{FLOOR}) =	1.22	ft
Length of Basin Floor (L_{FLOOR}) =	262.3	ft
Width of Basin Floor (W_{FLOOR}) =	135.8	ft
Area of Basin Floor (A_{FLOOR}) =	35,621	ft^2
Volume of Basin Floor (V_{FLOOR}) =	15,609	ft^3
Depth of Main Basin (H_{MAIN}) =	1.95	ft
Length of Main Basin (L_{MAIN}) =	278.0	ft
Width of Main Basin (W_{MAIN}) =	151.4	ft
Area of Main Basin (A_{MAIN}) =	42,086	ft^2
Volume of Main Basin (V_{MAIN}) =	75,793	ft^3
Calculated Total Basin Volume (V_{total}) =	**2.102**	acre-feet

Depth Increment = 0.1 ft

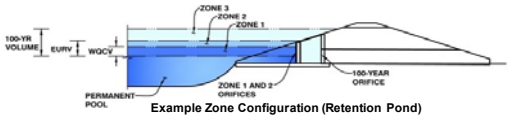
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	0.00		14.1	14.1	198		0.005		
ISV	0.33		14.1	14.1	198		0.005	63	0.001
	0.40		14.1	14.1	198		0.005	77	0.002
	0.50		14.1	14.1	198		0.005	97	0.002
	0.60		14.1	14.1	198		0.005	117	0.003
	0.70		14.1	14.1	198		0.005	137	0.003
	0.80		14.1	14.1	198		0.005	157	0.004
	0.90		26.3	20.1	528		0.012	186	0.004
	1.00		46.7	30.1	1,405		0.032	279	0.006
	1.10		67.1	40.1	2,690		0.062	480	0.011
	1.20		87.5	50.1	4,383		0.101	830	0.019
	1.30		107.9	60.1	6,484		0.149	1,370	0.031
	1.40		128.3	70.1	8,992		0.206	2,141	0.049
	1.50		148.7	80.1	11,909		0.273	3,182	0.073
	1.60		169.1	90.1	15,234		0.350	4,536	0.104
	1.70		189.5	100.1	18,967		0.435	6,243	0.143
	1.80		209.9	110.1	23,108		0.530	8,343	0.192
	1.90		230.3	120.1	27,656		0.635	10,878	0.250
	2.00		250.7	130.1	32,613		0.749	13,888	0.319
Floor	2.05		260.9	135.1	35,245		0.809	15,584	0.358
	2.10		262.8	136.2	35,790		0.822	17,724	0.407
	2.20		263.6	137.0	36,110		0.829	21,319	0.489
Zone 1 (WQCV)	2.22		263.7	137.2	36,174		0.830	22,042	0.506
	2.30		264.4	137.8	36,431		0.836	24,946	0.573
	2.40		265.2	138.6	36,753		0.844	28,605	0.657
	2.50		266.0	139.4	37,077		0.851	32,297	0.741
	2.60		266.8	140.2	37,402		0.859	36,021	0.827
	2.70		267.6	141.0	37,728		0.866	39,777	0.913
	2.80		268.4	141.8	38,056		0.874	43,566	1.000
	2.90		269.2	142.6	38,384		0.881	47,388	1.088
	3.00		270.0	143.4	38,715		0.889	51,243	1.176
	3.10		270.8	144.2	39,046		0.896	55,131	1.266
	3.20		271.6	145.0	39,378		0.904	59,053	1.356
Zone 2 (EURV)	3.29		272.3	145.7	39,679		0.911	62,610	1.437
	3.30		272.4	145.8	39,712		0.912	63,007	1.446
	3.40		273.2	146.6	40,048		0.919	66,995	1.538
	3.50		274.0	147.4	40,384		0.927	71,017	1.630
	3.60		274.8	148.2	40,722		0.935	75,072	1.723
	3.70		275.6	149.0	41,061		0.943	79,161	1.817
	3.80		276.4	149.8	41,401		0.950	83,284	1.912
	3.90		277.2	150.6	41,743		0.958	87,441	2.007
Zone 3 (100-year)	4.00		278.0	151.4	42,086		0.966	91,633	2.104
	4.10		278.8	152.2	42,430		0.974	95,858	2.201
	4.20		279.6	153.0	42,775		0.982	100,119	2.298
	4.30		280.4	153.8	43,122		0.990	104,413	2.397
	4.40		281.2	154.6	43,470		0.998	108,743	2.496
	4.50		282.0	155.4	43,819		1.006	113,107	2.597
	4.60		282.8	156.2	44,170		1.014	117,507	2.698
	4.70		283.6	157.0	44,521		1.022	121,941	2.799
	4.80		284.4	157.8	44,874		1.030	126,411	2.902
	4.90		285.2	158.6	45,229		1.038	130,916	3.005
	5.00		286.0	159.4	45,585		1.046	135,457	3.110
	5.10		286.8	160.2	45,941		1.055	140,033	3.215
	5.20		287.6	161.0	46,300		1.063	144,645	3.321
	5.30		288.4	161.8	46,659		1.071	149,293	3.427
	5.40		289.2	162.6	47,020		1.079	153,977	3.535
	5.50		290.0	163.4	47,382		1.088	158,697	3.643
	5.60		290.8	164.2	47,745		1.096	163,454	3.752
	5.70		291.6	165.0	48,110		1.104	168,246	3.862
	5.80		292.4	165.8	48,476		1.113	173,076	3.973
	5.90		293.2	166.6	48,843		1.121	177,942	4.085

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

UD-Detention, Version 3.07 (February 2017)

Project: Trails at Aspen Ridge

Basin ID: West Fork of Jimmy Camp Creek: East Pond(located in Sub-basin M)



Example Zone Configuration (Retention Pond)

Required Volume Calculation

Selected BMP Type =	EDB	
Watershed Area =	157.90	acres
Watershed Length =	3,742	ft
Watershed Slope =	0.030	ft/ft
Watershed Imperviousness =	45.40%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	87.0%	percent
Percentage Hydrologic Soil Groups C/D =	13.0%	percent
Desired WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	
Water Quality Capture Volume (WQCV) =	2.553	acre-feet
Excess Urban Runoff Volume (EURV) =	7.491	acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	6.103	acre-feet
5-yr Runoff Volume (P1 = 1.5 in.) =	8.512	acre-feet
10-yr Runoff Volume (P1 = 1.75 in.) =	11.664	acre-feet
25-yr Runoff Volume (P1 = 2 in.) =	16.728	acre-feet
50-yr Runoff Volume (P1 = 2.25 in.) =	20.230	acre-feet
100-yr Runoff Volume (P1 = 2.52 in.) =	24.794	acre-feet
500-yr Runoff Volume (P1 = 3.55 in.) =	38.509	acre-feet
Approximate 2-yr Detention Volume =	5.710	acre-feet
Approximate 5-yr Detention Volume =	7.997	acre-feet
Approximate 10-yr Detention Volume =	10.523	acre-feet
Approximate 25-yr Detention Volume =	11.595	acre-feet
Approximate 50-yr Detention Volume =	12.129	acre-feet
Approximate 100-yr Detention Volume =	13.732	acre-feet

Optional User Override 1-hr Precipitation

1.19	inches
1.50	inches
1.75	inches
2.00	inches
2.25	inches
2.52	inches
3.55	inches

Stage-Storage Calculation

Zone 1 Volume (WQCV) =	2.553	acre-feet
Zone 2 Volume (EURV - Zone 1) =	4.938	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	6.241	acre-feet
Total Detention Basin Volume =	13.732	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	user	acre-feet

Depth Increment = 1 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	--	--	--	50	0.001		
5817	--	1.00	--	--	--	1,795	0.041	905	0.021
5818	--	2.00	--	--	--	10,792	0.248	7,108	0.163
5819	--	3.00	--	--	--	33,227	0.763	29,225	0.671
5820	--	4.00	--	--	--	80,330	1.844	86,004	1.974
5821	--	5.00	--	--	--	143,075	3.285	197,706	4.539
5822	--	6.00	--	--	--	158,782	3.645	348,634	8.004
5823	--	7.00	--	--	--	164,044	3.766	510,047	11.709
5824	--	8.00	--	--	--	169,368	3.888	676,753	15.536
5825	--	9.00	--	--	--	174,764	4.012	848,819	19.486
5826	--	10.00	--	--	--	180,213	4.137	1,026,308	23.561

Know what's **below.** **Call** before you dig.

Trails at Aspen Ridge
Proposed Conditions - Sub-basin Summary

Basin	Area	Q5	Q100
	acres	cfs	cfs
West Fork-Jimmy Camp Creek			
West Fork-Jimmy Camp Creek OS-1	19.6	1.1	16.2
A	18.5	5.0	34.6
B	1.1	2.5	7.0
C	14.9	19.5	58.9
D	2.2	4.1	14.2
E	8.6	12.8	39.1
F	13.1	15.4	46.2
G	1.1	2.1	6.1
H	23.5	26.8	80.4
I	7.9	10.5	31.8
J	5.3	11.1	32.7
K	32.5	33.3	101.7
West Fork-Jimmy Camp Creek M	10.3	14.2	61.8
R	1.9	1.7	7.8
Big Johnson Reservoir			
Big Johnson Reservoir N	14.10	21.2	46.8
O	11.72	16.8	37.1
P	8.52	22.0	43.9
Q	2.43	4.9	10.3
OS-2	11.44	1.7	11.7
Marksheffel Tributary to Jimmy Camp Creek			
Marksheffel Tributary to Jimmy Camp Creek L	5.3	17.2	32.2
BR1	0.3	0.8	1.6
BR2	2.8	2.9	7.4

Trails at Aspen Ridge
Big Johnson Reservoir
Proposed Design Point Summary

Design Point	Sub-Basins	Downstream Design Point	Total Area (ac.)	Q(5) (cfs)	Q(100) (cfs)
N	N	P	14.1	21.2	46.8
O	O	P	11.7	16.8	37.1
P (Into West Pond)	N, O, P	West Pond Discharge	34.3	47.1	100.6
West Pond Discharge (UD-Detention)	N, O, P	Powers Ditch		1.0	28.3
Q	Q	Powers Ditch	2.4	4.9	10.3
OS-2	OS-2	Powers Ditch	11.4	1.7	11.7

Trails at Aspen Ridge
West Fork - Jimmy Camp Creek
Proposed Design Point Summary

Design Point	Sub-Basins	Downstream Design Point	Total Area (ac.)	Q(5) (cfs)	Q(100) (cfs)
OS-1	OS-1	A	19.6	4.0	26.7
A	OS-1 & A	B	38.1	11.6	57.5
B	OS-1, A, B	C	39.1	12.4	58.5
C	OS-1, A, B, C	D	54.0	27.3	90.3
D	OS-1, A, B, C, D	E	56.2	30.2	95.6
E	OS-1, A, B, C, D, E	F	64.8	39.3	111.6
F	F	G	13.1	19.7	43.3
G	OS-1, A, B, C, D, E, F, G	M	79.0	46.9	125.9
H	H	M	23.5	36.6	79.1
J	J	K	5.3	17.2	32.2
K	J, K	I	37.7	57.2	121.7
I	J, K, I	M	45.6	59.7	127.2
M (Into East Pond	OS-1, A, B, C, D, E, F, G, J, K, I, H, M	East Pond Discharge	158.4	122.6	287.5
East Pond Discharge (SWMM)	OS-1, A, B, C, D, E, F, G, J, K, I, H, M	Offsite Swale		21.1	127.4
R	R	Offsite Swale	1.9	6.2	12.9

Trails at Aspen Ridge
Marksheffel Tributary to Jimmy Camp Creek
Proposed Design Point Summary

Design Point	Sub-Basins	Downstream Design Point	Total Area (ac.)	Q(5) (cfs)	Q(100) (cfs)
L	L	Northeast Pond Discharge	7.6	14.1	30.5
Northeast Pond Discharge	L	Bradley Road Ditch		0.3	8
BR1	BR1	Bradley Road Ditch	0.3	0.8	1.6
BR2	BR2	Bradley Road Ditch	2.8	2.9	7.4

EX. 48-INCH CMP

BIG JOHNSON RESERVOIR TOTALS
DRAINAGE AREA = 47.9 ACRES
Q100 = 48.8 CFS
Q5 = 6.9 CFS

EX. 60-INCH CMP

POWERS BOULEVARD

POWERS BLVD. 210' R.O.W. (FREEWAY)

TRAILS AT ASPEN RIDGE PUD

WEST POND

EAST POND

NORTHEAST POND

FUTURE FDR REQUIRED FOR DEVELOPMENT OF THIS LOT. ON-SITE DETENTION WILL BE REQUIRED AND MUST DISCHARGE TO THE POWERS BOULEVARD DITCH.

OFFSITE COMMERCIAL DEVELOPMENT AN FDR & ON-SITE DETENTION WILL BE REQUIRED FOR DEVELOPMENT OF THESE LOTS.

FUTURE FDR REQUIRED FOR DEVELOPMENT OF THIS LOT. ON-SITE DETENTION WILL BE REQUIRED. ANTICIPATED DISCHARGE: SOUTHWEST COMMERCIAL Q100 = 19.4 CFS Q5 = 1.3 CFS

FUTURE FDR REQUIRED FOR DEVELOPMENT OF THIS LOT. ON-SITE DETENTION WILL BE REQUIRED. ANTICIPATED DISCHARGE: SOUTHEAST COMMERCIAL Q100 = 4.4 CFS Q5 = 0.3 CFS

FUTURE FDR REQUIRED FOR DEVELOPMENT OF THIS LOT. ON-SITE DETENTION WILL BE REQUIRED. ANTICIPATED DISCHARGE: NORTH COMMERCIAL Q100 = 16.1 CFS Q5 = 1.1 CFS NOTE: THE ABOVE FLOWS DO NOT INCLUDE FLOWS FROM THE AREA DIVERTED FROM BIG JOHNSON RESERVOIR.

COMMERCIAL DEVELOPMENT WILL NOT BE ALLOWED TO DISCHARGE ONTO RESIDENTIAL LOTS

THIS AREA WAS ORIGINALLY IN THE BIG JOHNSON RESERVOIR BASIN. IT WAS REROUTED INTO WEST FORK JIMMY CAMP CREEK BASIN BY THE CDOT POWERS BOULEVARD PROJECT.

Bradley Median Crossroad Culvert
DESIGN POINT BR1
DA= 0.31 Acres
Q100 = 1.61 cfs
Q5 = 0.82 cfs

Future Blackmer Street Crossroad Culvert
DESIGN POINT BR2
DA = 2.81 Acres
Q100 = 7.4 cfs
Q5 = 2.9 cfs

Worst Case Drainage Area: Future Blackmer Street Crossroad Culvert

WEST FORK - JIMMY CAMP CREEK TOTALS:
DRAINAGE AREA = 160.3 Acres
Q100 = 138.3 CFS
Q5 = 27.3 CFS

THESE OFFSITE FLOWS WILL BE DIVERTED TO THE SOUTH.

MARKSHEFFEL TRIBUTARY TO JIMMY CAMP CREEK TOTALS:
DRAINAGE AREA = 7.6 Acres
Q100 = 8.0 CFS
Q5 = 0.3 CFS

LEGEND
DESIGN POINT IDENTIFIER
BASIN IDENTIFICATION
BASIN FLOWS
BASIN AREA
BASIN BOUNDARY
DBPS BASIN BOUNDARY
EXISTING CONTOURS
PROPOSED CONTOURS

GRAPHIC SCALE
150' 0' 150' 300'
(IN FEET)
1 inch = 150 ft.

REFERENCE DRAWINGS
X-886-PR SITE_F1
X-886-PR SITE
10415-Storm Base-2017
X-886-PR STORM
X-Title(Drainage)
X-886-PR STORM_F1
886-PR Legacy Drive-Roundabout
886-PR Legacy Drive

NO.	DATE	DESCRIPTION	BY

REVISIONS

NAME: \\Eros\Projects\19.886.008 Trails at Aspen Ridge\200 Drainage\201 Drainage Reports\MDDP\DWG\2022-MDDP Basins_1_8325_2357.sv$.dwg
PCP: Matrix.ctb
PLOT DATE: Mon Sep 23, 2019 9:57am

BENCHMARK DATA(ELEV.) _____
(DATUM) _____
(DESCRIPTION/LOCATION) _____

VERTICAL BENCHMARK:

BASIS OF BEARING:

PREPARED UNDER MY DIRECT SUPERVISION, FOR AND ON BEHALF OF MATRIX DESIGN GROUP, INC.

Matrix DESIGN GROUP
2435 Research Parkway, Suite
300 Colorado Springs, CO 80920
Phone 719-575-0100
Fax 719-575-0208

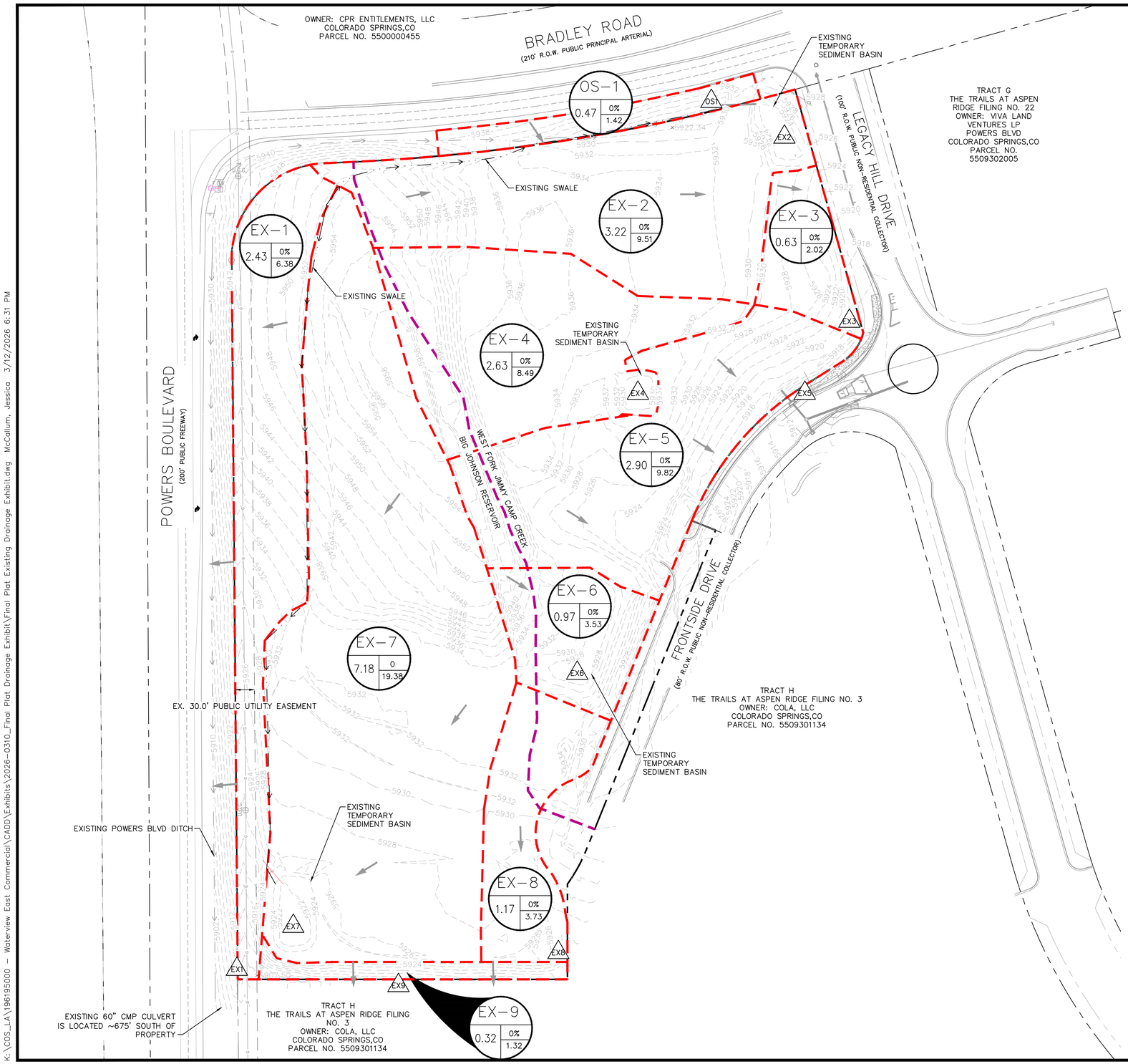
COLA, LLC.

TRAILS AT ASPEN RIDGE: FILING #1 & PUD
MDDP-AMENDMENT & PRELIMINARY DRAINAGE REPORT

DESIGNED BY: JTS
DRAWN BY: JTS
CHECKED BY:
SCALE
HORIZ:
VERT:
DATE ISSUED: September 2019
SHEET NO. 2 OF 2 SHEETS

DR-02

APPENDIX F – DRAINAGE EXHIBITS



LEGEND

A = BASIN DESIGNATION
B = AREA (ACRES)
C = BASIN IMPERVIOUSNESS
D = 100-YR DESIGN STORM RUNOFF (CFS)

- DESIGN POINT
- EXISTING FLOW DIRECTION
- MAJOR DRAINAGE BASIN BOUNDARY
- DRAINAGE BASIN BOUNDARY
- PROPERTY LINE
- PROPOSED MAJOR CONTOUR
- PROPOSED MINOR CONTOUR
- EXISTING MAJOR CONTOUR
- EXISTING MAJOR CONTOUR
- SWALE FLOW DIRECTION

SUMMARY - PROPOSED RUNOFF TABLE

DESIGN POINT	BASIN DESIGNATION	BASIN AREA (ACRES)	DIRECT 5-YR RUNOFF (CFS)	DIRECT 100-YR RUNOFF (CFS)	CUMMULATIVE 5-YR RUNOFF (CFS)	CUMMULATIVE 100-YR RUNOFF (CFS)
EX1	EX1	2.43	1.00	6.38	1.00	6.38
EX2	EX2	3.22	1.49	9.51	1.49	9.51
EX3	EX3	0.63	0.32	2.02	0.32	2.02
EX4	EX4	2.63	1.33	8.49	1.33	8.49
EX5	EX5	2.90	1.54	9.82	1.54	9.82
EX6	EX6	0.97	0.55	3.53	0.55	3.53
EX7	EX7	7.18	3.03	19.38	0.00	0.00
EX8	EX8	1.17	0.58	3.73	0.58	3.73
EX9	EX9	0.32	0.21	1.32	0.21	1.32
OS1	OS1	0.47	0.22	1.42	0.22	1.42

NORTH

GRAPHIC SCALE IN FEET
0 40 80 160

Know what's below. Call before you dig.

NO.	REVISION	BY	DATE	APPR.

Kimley»Horn
2026 KIMLEY-HORN AND ASSOCIATES, INC.
2 North Nevada Avenue, Suite 900
Colorado Springs, Colorado 80903 (719) 453-0180

DESIGNED BY: ANF
DRAWN BY: ANF
CHECKED BY: JJM
DATE: 03/13/2026

WATERVIEW EAST COMMERCIAL
CONSTRUCTION DOCUMENTS
EXISTING DRAINAGE MAP

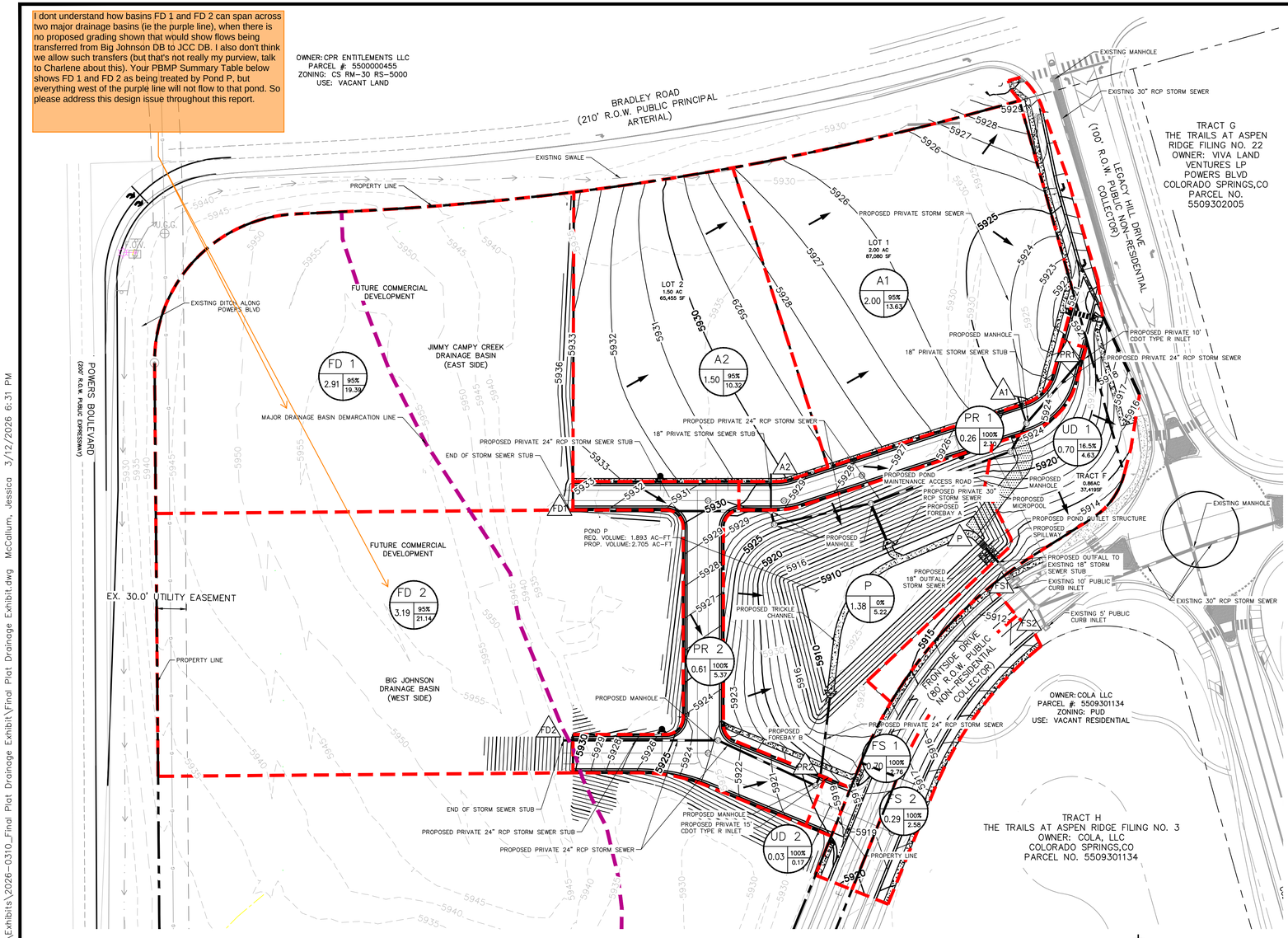
PRELIMINARY
FOR REVIEW ONLY
NOT FOR CONSTRUCTION
Kimley»Horn
Kimley-Horn and Associates, Inc.

PROJECT NO.
196195000

SHEET
DR-EX

K:\COS_LA\196195000 - Waterview East Commercial\CADD\Exhibits\2026-0310_Final Plat Drainage Exhibit\Final Plat Existing Drainage Exhibit.dwg McCallum, Jessica 3/12/2026 6:31 PM

I dont understand how basins FD 1 and FD 2 can span across two major drainage basins (ie the purple line), when there is no proposed grading shown that would show flows being transferred from Big Johnson DB to JCC DB. I also don't think we allow such transfers (but that's not really my purview, talk to Charlene about this). Your PBMP Summary Table below shows FD 1 and FD 2 as being treated by Pond P, but everything west of the purple line will not flow to that pond. So please address this design issue throughout this report.



Please delineate the boundary between filings for this commercial development.

LEGEND

- A = BASIN DESIGNATION
- B = AREA (ACRES)
- C = BASIN IMPERVIOUSNESS
- D = 100-YR DESIGN STORM RUNOFF (CFS)

- DESIGN POINT
- FLOW DIRECTION
- MAJOR DRAINAGE BASIN BOUNDARY
- DRAINAGE BASIN BOUNDARY
- PROPERTY LINE
- PROPOSED MAJOR CONTOUR
- PROPOSED MINOR CONTOUR
- EXISTING MAJOR CONTOUR
- EXISTING MAJOR CONTOUR
- EXISTING DITCH/SWALE
- PROPOSED SWALE
- PROPOSED STORM SEWER
- PROPOSED STORM MANHOLE
- PROPOSED STORM INLET
- EXISTING STORM SEWER
- EXISTING STORM MANHOLE
- EXISTING STORM INLET

SUMMARY - PROPOSED RUNOFF TABLE

DESIGN POINT	BASIN DESIGNATION	BASIN AREA (ACRES)	DIRECT 5-YR RUNOFF (CFS)	DIRECT 100-YR RUNOFF (CFS)	CUMMULATIVE 5-YR RUNOFF (CFS)	CUMMULATIVE 100-YR RUNOFF (CFS)
A1	A1	2.00	5.92	13.63	5.92	13.63
A2	A2	1.50	4.48	10.32	4.48	10.32
FD 1	FD 1	2.91	8.41	19.39	8.41	19.39
FD 2	FD 2	3.19	9.17	21.14	9.17	21.14
PR 1	PR 1	0.26	1.02	2.30	1.02	2.30
PR 2	PR 2	0.61	2.38	5.37	2.38	5.37
P	P	1.38	0.82	5.22	31.48	48.16
FS1	UD 1	0.70	0.77	4.63	0.77	4.63
FS1	UD 2	0.03	0.13	0.17	0.13	0.17
FS 1	FS 1	0.31	1.23	2.76	1.23	2.76
FS 2	FS 2	0.29	1.15	2.58	1.15	2.58

PBMP SUMMARY TABLE

BASINS	PBMP TRIBUTARY AREA (AC)	PBMP
A1-A2, FD1-FD-2, PR1-PR2, P	11.8500	EDB - P
A26, OS1	2.8800	EAST POND

NOTES:
1. SUB-BASINS FS1 AND FS2 NOT TREATED BY A PBMP ARE EXCLUDED BASED ON ECM APP I.7.1.B.2.1 AND I.7.1.B.7.
2. SUB-BASINS UD1 AND UD2 NOT TREATED BY A PBMP ARE EXCLUDED BASED ON ECM APP I.7.1.C.1.A.

The map shows basins as "FD [space] 1" not "FD1" without a space and not "FD-1" with a dash. Please be consistent through maps, tables, reports, calcs, etc to avoid confusion.

where are these basins? I dont see them on the map

Is this only for Filing 1? Please clarify.

Know what's below. Call before you dig.

NO.	REVISION	BY	DATE	APPR.

Kimley»Horn
2026 KIMLEY-HORN AND ASSOCIATES, INC.
2 North Nevada Avenue, Suite 900
Colorado Springs, Colorado 80903 (719) 453-0180

DESIGNED BY: ANF
DRAWN BY: ANF
CHECKED BY: JJM
DATE: 03/13/2026

WATERVIEW EAST COMMERCIAL
CONSTRUCTION DOCUMENTS
PROPOSED DRAINAGE MAP

PRELIMINARY
FOR REVIEW ONLY
NOT FOR CONSTRUCTION
Kimley»Horn
Kimley-Horn and Associates, Inc.

PROJECT NO. 196195000

SHEET DR-1

K:\COS_LA\196195000 - Waterview East Commercial\CADD\Exhibits\2026-0310_Final Plot Drainage Exhibit\Final Plot Drainage Exhibit.dwg McCallum, Jessica 3/12/2026 6:31 PM