EPC STORMWATER REVIEW COMMENTS
IN ORANGE BOXES WITH BLACK TEXT

FINAL DRAINAGE REPORT

FOR

FALCON DISTRICT 49 TRANSPORTATION FACILITY, FALCON, CO

Owner: RTA Architects, 19 South Tejon St, Suite 300, Colorado Springs, CO. 80903.

Engineer: JVA, Inc.
1319 Spruce Street
Boulder, CO 80301
Attn. Cooper W. Karsh
(303)565-4961

May 23, 2022
Revised September 20, 2022
Revised February 01, 2023

Engineer of Record:

Cooper W. Karsh P.E.
Registered Professional Engineer
State of Colorado No. 50723

PPR2236

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 applicable master plan of the drainage basin. I accept responsibility for any liability caused by any negligent acts, errors or omissions on my part in preparing this report.

2/1/23

Cooper Karsh, PE, CFM PE #50723 Date

Owner/Developer's Statement:

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

2/1/23 14:58 MST

[Name, Title] Lou Fletcher, Executive Director Date

[Business Name]

[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.

Joshua Palmer, P.E. Date

County Engineer / ECM Administrator

Conditions:

Table of Contents

A. GENERAL LOCATION AND DESCRIPTION

1. Location

District 49 (D49) Transportation Centre is in Falcon at 12050 Falcon Highway. The subject site is located east of Meridian Road, west of Chief Road and south of Highway 24.

The site is bound by Saint Benedict Church to the east, residential homes to the west and Highway 24 to the north. The site is in the jurisdiction of El Paso County. The property is accessed at two locations: via Falcon Highway south of the subject site and Swingline Road, north of the site. Refer to Figure 1 for the site location.

The subject site is in the Falcon CHWS1400 drainage basin. There is an existing creek which runs in a north-south direction, along the western boundary of the site and parallel to Gelbvieh Road.

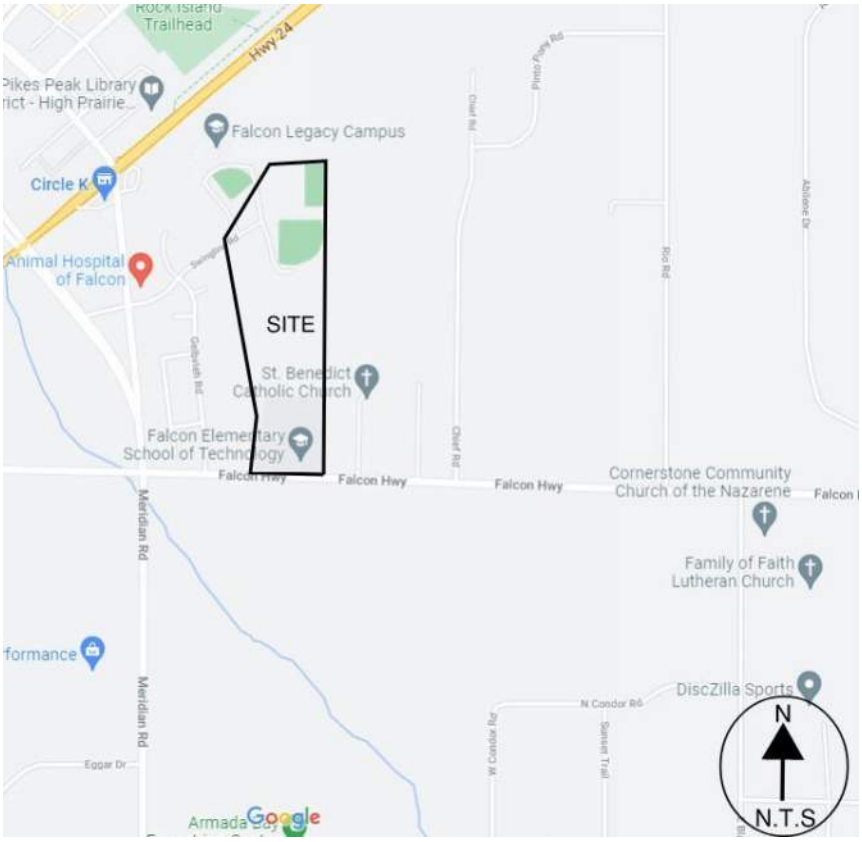


Figure 1- Site Location Map (Google © 2022 Imagery)

2. Description of Existing Site

The existing development site area is 54 acres and approximately 40% of impermeable surfaces. The site comprises of an elementary school building, a running track with granular finish, a baseball field and a maintenance yard building.

The site generally falls in a north-south direction, from an existing elevation of 6,820 ft northwest of the site to 6,782 ft southwest of the site. This fall in elevation is over 2,714 ft in length or 1.4% in gradient. An internal gravel access road within the site acts as catchment

divide with one basin discharging in a south easterly direction and a second in a south westerly direction. Refer to the JVA General Location Map drawing which shows sub-basins H-1, OS-1 & OS-2 discharging into a local depression, sub-basins OS-3, H-2 & H3 discharging into a wetland on-site, which eventually discharge into the Falcon Highway culvert.

The site is covered with soils found in hydrologic soil group A.

There is an existing creek which runs along the western boundary of the site which is a tributary to the Black Squirrel Creek and forms part of the Falcon CHWS1400 drainage basin. Refer to Appendix A which shows the site on El Paso Drainage Basins Map, extract from the Muller Engineering Company (1988).

Refer to the JVA Existing Condition Drainage Map drawing for the existing development and site boundary. Design point at Falcon Highway is highlighted to show historic peak storm runoff rates.

B. DRAINAGE BASINS AND SUB-BASINS

1. Major Basin Description

D49 Transportation Centre lies in the Falcon CHWS1400 drainage basin and a review of the Falcon Drainage Basin Planning Study (DBPS) – Final, dated September 2015 was carried out. The main findings were:

- The Falcon watershed flows southeasterly from the southern slope of the Black Forest. The subject site is in the Middle Tributary Basin as shown on Figure 3-2 of the Falcon DBPS report.
- Figure 2-1 Environmental Features from the Falcon DBPS indicates that the subject site lies outside of the shallow (greater than 20 ft below surface) ground water area.
- No improvements from the DBPS are intended to be included in this project.

The project is located within FEMA flood map number 08041C0561G effective July 12, 2018. Part of the site is located within Zone AE, which is defined by FEMA as areas predicted to be in special flood hazard zone with base flood elevations determined. Note, the FEMA maps display information on a larger scale. A survey was commissioned to plot the predicted flooding Zone AE on the subject site boundary and this information is available in Append ling Zone AE. Refer to the J

There a that will impact the propose

Elaborate and explain why/provide justification. Per DCM 1.4.2 "Developers in and along a drainage way are required to implement the proper measures to maintain or create stable characteristics of the drainage way. The principal ovjective is to limit excessive erosion in and along the channel..."

2. Existing Sub-basin Description

D49 Transportation Centre is split into three drainage catchments. An internal gravel access road within the site acts as catchment divide with one basin discharging in a south easterly direction and the remaining basins in a south westerly direction. Refer to the JVA Existing Condition Drainage map which shows sub-basin OS-1 discharging into a local depression

northeast , sub-basins OS-2 and H-1 discharging into a local depression east of the site and OS-3, H-2 & H-3 discharging into a wetland south of the site. The existing site has five drainage sub-basins which sheetflow to the tree design points as described below.

- Basin OS-1 is covered by vegetation, located northeast of the site. The sub-basin will remain undeveloped as per existing configurations. OS-1 sheetflows to design point 1. Sub-basin OS-1 has peak rate of runoff of 2.26 cfs and 8.82 cfs for the minor and major storm respectively.

- Basin OS-2 is covered by vegetation and asphalt paving, located north of the site. OS-2 sheetflows to design point 2. Sub-basin OS-2 has peak rate of runoff of 8.36 cfs and 16.26 cfs for the minor and major storm respectively.

- Basin OS-3 is the existing school, car parking lot and local access. The sub-basin is located northwest of the site. OS-3 sheetflows to design point 3. Sub-basin OS-3 has peak rate of runoff of 16.80 cfs and 32.57 cfs for the minor and major storm respectively.

- Basin H-1 is the existing baseball field, gravel road and maintenance yard. The sub-basin is located east of the site. H-1 sheetflows to design point 2. Sub-basin H-1 has peak rate of runoff of 13.02 cfs and 34.00 cfs for the minor and major storm respectively.

- Basin H-2 is the existing gravel running track, gravel road and wetland. The sub-basin is located west of the site. H-2 sheetflows to design point 3. Sub-basin H-2 has peak rate of runoff of 16.66 cfs and 41.34 cfs for the minor and major storm respectively.

- Basin H-3 is the existing school, parking lot and local access. The sub-basin is located south of the site. H-3 sheetflows to design point 4. Sub-basin H-3 has peak rate of runoff of 25.08 cfs and 47.11 cfs for the minor and major storm respectively.

Refer to Fig 1 in Appendix C for a copy of the existing condition drainage map which shows existing sub-basins and peak storm runoff rates.

3. Proposed Sub-basin Description

The proposed development will include 13 sub-basins which are shown on the JVA drawing Proposed Drainage Plan, Figure 2.

The new development will have five off-site drainage basins including OS-1, OS-2, OS-3, OS-4 and OS-5. Sub-basins OS-2, OS-3 and OS-4 will be intercepted to discharge into the existing Black Squirrel Creek. OS1 and OS-5 will remain as is and will discharge into the existing design points as per historical drainage configurations.

The remaining eight sub-basins include the following:

- Basin A1 is a future buildout as part of Phase 2. The basin is located north of the proposed building and comprises of soft and hard surfaces equivalent to 2.61ac. As part of Phase 2, basin A1 will be collected via a storm system to discharge into the extended basin which will be built as part of Phase 1. The proposed storm system for basin A1 will be built as part of Phase 2. Water quality and detention will be provided. Prior to construction, a final drainage report will be submitted to show that

drainage requirements are met. Basin A1 has peak rate of runoff of 8.46 cfs and 17.56 cfs for the minor and major storm respectively.

- Basin A2 is an existing wetland west of the proposed detention basin equivalent to 3.66 ac. The basin is covered by vegetation, located downstream of the detention basin. The basin will remain undeveloped as per existing configurations. Basin A2 has peak rate of runoff of 2.02 cfs and 7.37 cfs for the minor and major storm respectively.
- Basin A3 is the proposed bus lot located northeast and half of the proposed building's roof equivalent to 9.72 ac. It is anticipated that the parking lot will be paved in the near future, therefore, this bus lot is added as a paved area in the calculations for water quality and detention. Runoff from this basin will be collected by an inlet to discharge into the pond using a pipework system. A swale which will act as an overflow conveyance system will be constructed to run parallel to the storm system. During critical events and where storm flows exceed 8.0 cfs, flows will bypass the inlet to discharge into the adjacent swale, which has a discharge capacity of 95.64 cfs. Basin A3 has peak rate of runoff of 38.26 cfs and 72.38 cfs for the minor and major storm respectively.
- Basin A4 is the existing workshop equivalent to 2.92 ac. It is located southwest of the proposed building. The basin mainly comprises of existing buildings and gravel surface. Basin A4 runoff sheet flows into the proposed overflow swale to discharge into the detention pond for water quality and attenuation. Basin A4 has peak rate of runoff of 9.07 cfs and 16.23 cfs for the minor and major storm respectively.
- Basin A5 is half of the proposed building and staff car parking lot equivalent to 1.11 ac. It comprises of roofs, concrete and gravel surfaces. Runoff from this basin will be collected via series of downspouts and pipework system to discharge into adjacent manhole and swale which will eventually discharge into the water quality and attenuation. Basin A5 has peak rate of runoff of 2.35 cfs and 5.12 cfs for the minor and major storm respectively.
- Basin A6 is located south of the proposed building and is mainly a gravel yard with a concrete base to store fuel on site equivalent to 6.58 ac. Basin A6 runoff sheet flows into the proposed overflow swale to discharge into the detention pond for water quality and attenuation. Basin A6 has peak rate of runoff of 12.69 cfs and 25.88 cfs for the minor and major storm respectively.
- Basin A7 is the proposed detention basin and a gravel access road east of the basin equivalent to 2.63 ac. Basin A7 runoff sheet flows into the detention pond for water quality and attenuation. It has peak rate of runoff of 2.46 cfs and 6.82 cfs for the minor and major storm respectively.
- Basin A8 is the proposed staff parking lot and access, adjacent to the elementary school equivalent to 1.02 ac. Runoff from this basin sheet flows and discharge onto the proposed grass buffer for water quality prior to discharge to the outfall point at Falcon Highway. Basin A8 has peak rate of runoff of 1.84 cfs and 3.73 cfs for the minor and major storm respectively.

Unresolved. Explain why basin A2 does not drain into a permanent WQ facility. See ECM I.7.1.B for exclusions from permanent WQ. If this is intended to be undeveloped land that will remain undeveloped then state as such.

State the specific exclusion from water quality. See ECM I.7.1.B for allowable exclusions.

Unresolved. See review #1 comment to the site plan and Traffic Study. This needs to be asphalt paving if the projected ADT is 200 trips. Update narrative once TIS is updated in the next submittal.

C. DRAINAGE DESIGN CRITERIA

1. Development Criteria Reference

- El Paso County Colorado Drainage Criteria Manual.
- Falcon Drainage Basin Planning Study – Selected Plan Report – Final – September 2015.
- Intensity, Duration, Frequency (IDF) values for the 2-year, 5-year, 10-year, 25-year, 50-year & 100-year from the City of Colorado Springs Drainage Criteria Manual Vol 1, May 2014 were used for the analysis for the site.

2. Previous Drainage Studies

D49 Transportation Centre lies in the Falcon CHWS1400 drainage basin and a review of the Falcon Drainage Basin Planning Study (DBPS) – Final, dated September 2015 was carried out. The proposed site layout takes cognizance of the findings of the above-named report.

3. Floodplain Analysis

Proposed structures and access are located outside of the predicted flooding Zone AE. In addition, proposed finished elevations are above base flood zone elevations in the vicinity. Note, the survey information shown on our layouts was created based on a local adjacent site datum. The adjacent base flood elevation of 6808 is shown in NAVD88. Per surveyor, 3.8 ft must be added to the survey elevations to convert from the local datum to navd88. Therefore, the building's finished floor elevation is approximately 3.8 ft above 100-year flood elevation. The proposed Maintenance Building is located approximately 220 ft away from the predicted flooding zone. Refer to the JVA Grading & Drainage Plan drawing which shows outline of the predicted flooding Zone AE and the proposed site layout, outside of this zone. No significant disturbance within the floodplain is anticipated with this project.

4. Hydrologic Criteria

Rainfall data and intensity values were determined using the criteria in El Paso County Drainage Criteria Manual and the Mile High Flood District Urban Storm Drainage Criteria Manual (USDCM). Intensity, Duration, Frequency (IDF) values for the 2-year, 5-year, 10-year, 25-year, 50-year & 100-year from the City of Colorado Springs Drainage Criteria Manual Vol 1, May 2014 were used for the analysis for the site. Output calculation spreadsheets are provided in Appendix B.

The Rational Method (Q=CIA) was used to determine the storm runoff (Q) from the areas tributary to the proposed storm system, with composite runoff coefficients (C) and contributing areas (A) given for design points in sub-basins. Rainfall, basin coefficients, and other calculated site characteristics are shown in Appendix B.

The design frequencies are the 5 and 100-year events for the minor and major storms respectively. The 5-year storm with a 1-hour point rainfall of 1.50 inches and the 100-year storm, with a 1-hour point rainfall of 2.52 inches were used.

Detention volume and WQCV was obtained by calculating the required volume of storage using the Mile High Flood District (MHFD) detention design V4.06 in line with El Paso County drainage requirements. The proposed detention basin is an extended 40-hour drain time. A full The Rational Formula and C-values based on the El Paso County Colorado Drainage Criteria

Manual were used to estimate storage requirements. The proposed detention basin is also designed to accommodate Phase 2 of the proposed development. Output calculation spreadsheets are provided in Appendix B.

D. DRAINAGE FACILITY DESIGN

1. General Concept

The proposed development has been designed to meet the requirements of El Paso County Drainage Criteria Manual. Off-site flow analysis was carried out for the fully developed conditions. The hydrologic analysis was based on existing site characteristics as the site is fully developed. The off-site area forms part of the Falcon major drainage basin. As part of the proposed works, runoff from this basin will be intercepted at the property boundary and diverted to discharge into the creek running along the western boundary of the site. Refer to the JVA drawing Proposed Drainage Plan which shows off-site drainage diversion and discharge into the creek.

The proposed development includes the construction of a maintenance building, an internal access road and car parking equivalent to 25.64 acres. The proposed development will also include the construction of a new detention basin as part of the proposed drainage system. The proposed works form part of a phased development. Refer to the Architect drawings and report for an outline of the phased works. Runoff from the site will be collected through a series of inlets and swales. Onsite run off will be routed to a new detention basin which will provide attenuation and water quality enhancement. Overflow from the detention basin will discharge onto the existing creek running along the western boundary of the site. The onsite detention basin will treat rainfall runoff for water quality and provide attenuation for most of the site. Storm discharges from the detention basin comply with El Paso County criteria for allowable release rates. The detention basin is designed to cater for the future development as part of phased works. Due to site constraints including site elevation, storm runoff from the developed southern portion of the site equivalent to 1.02 acres will not be routed to the new detention basin but to a grass buffer to provide water quality. Refer to Appendix B for a copy of UD-BMP design sheet for this area.

In order to achieve WQ Treatment requirements, please provide runoff reduction calculations, not calculations for a grass buffer.

Soils on the property have been classified by the Natural Resources Conservation Service (NRCS) as hydrologic soil type ‘A’. Group A soils are described as soil with high infiltration rate and low runoff potential. Appendix A of this report provides more information on the soil type, report obtained from the NRCS.

Part of the site area is located within Zone AE of the FEMA flood map number 08041C0561G effective July 12, 2018. Zone AE is defined by FEMA as areas determined to be in special flood hazard zone with base flood elevations determined. The proposed site layout is located outside of this zone. The proposed maintenance building is located 220 ft away from the flooding zone. The subject site is in the Falcon CHWS1400 drainage basin, see Figure 2 and Appendix A for further information.

Unresolved. Identify what basin this section southern portion is in. As stated in the previous comment, provide an exhibit showing the grass bugger area and the tributary area.

Figure 2 - Subject Site's Major Basin - Source Falcon Drainage Basin Planning Study report

2. Specific Details

Runoff from the new car park south of the detention basin will be treated prior to release into the wetland. Due to site constrain this area equivalent to 1.02 ac is downstream of the detention pond. Therefore, a grass buffer is provided.

A section of the gravel road equivalent to 0.4 ac will not discharge into the proposed detention basin due to site constraints. This section is added to OS-4 and A2 sub-basins. Water quality will be provided via swales and vegetated wetland.

Storm system east of the proposed building is designed to overflow into the adjacent swale during extreme events. The swale is designed to accommodate runoff from the site for storms up to and including the 100-year return period. Please refer to Appendix B for a copy of the swale calculations, hydraulic grade lines and pipe properties.

A limited amount of irrigation is proposed as part of the improvements.

The proposed improvements will provide adequate storage and water quality enhancement via extended detention basin, which will limit peak runoff rates to allowable release rates. In addition, the proposed drainage system will have no impact to adjacent properties and or storm conveyance systems in the vicinity.

The stormwater detention pond facility and all its components will be constructed by the Applicant in accordance with the plans and specifications described in this report and Final Construction Plans. The storm drain system and detention facilities are private and will remain private. Maintenance of the storm infrastructure will be carried out by School District 49. The detention pond and its outlet structure will operate and be maintained in good working order and as directed by El Paso County. The project is located within the Falcon Drainage Basin which is part of the El Paso County Drainage fee program. However, no drainage and bridge are assed with the site development plan application. It is our understanding that all drainage fees are waived as part of the proposed development and will not be assessed with this application. The detention pond and its outlet structure will be inspected quarterly and after any significant rainfall during the first years of operation. Inspection and maintenance will be carried out by the Operation Crew on-site. At any time during the inspections appropriate means will be selected to clean and maintain the facility to its intended working order. The Post-Construction Stormwater Control Operations and Maintenance Agreement entered by the Applicant and El Paso County shall constitute a contract or as directed by El Paso County.

Delete this sentence.

3. BMP Selection Process

The following steps were considered in selecting structural BMP's for the project.

Step 1: Runoff reduction practices

Efforts are employed to reduce runoff rates and volume by the use of grass-lined swales, grass buffer and gravel roads. These measures will promote infiltration which reduce runoff volumes. The use of swales will increase travel time, which will attenuate peak runoff rates.

Step 2: Stabilize Drainageways

To reduce erosion risks and improve water quality an extended detention basin with concrete-lined channel and level spreaders are used. These measures will allow runoff to attenuate and suspended sediments to settle. At the outfall level spreader will reduce the risk of erosion and stabilize drainageways.

Step 3: Provide Water Capture Volume

Water capture volume is provided for the redevelopment including Phase 2 as per City of Colorado Springs requirements. WQCV is provided in the extended detention basin with a 40 hour drain time. This measure will promote settling of suspended particles to offer a greater water quality.

WQ is also provided via runoff reduction

Step 3: Consider Need for Industrial and Commercial BMP's

The nature of this redevelopment will not require a specialized BMP's. However, as part of the construction an extended sediment basin will be used to manage runoff from the site. The proposed Grading and Erosion Control will be implemented to ensure spills and runoff are under control.

E. CONCLUSION

The above drainage reports have been prepared in accordance with the El Paso County Drainage Criteria Manual.

1. Summary of Concept

- The site is protected from adverse stormwater drainage impacts to the maximum extent possible.
- Measures are proposed to provide adequate on-site drainage and enhancement to stormwater quality. Stormwater quality is provided through extended detention basin.
- The proposed development has no effect on adjacent, upstream, and downstream sites.

Provide a section for the pond cost estimate. This estimate will need to be included in the Financial Assurance Estimate Form.

2022 Financial Assurance Estimate Form
(with pre-plat construction)

Updated: 11/4/2021

PROJECT INFORMATION		
D49 Transportation Center	12/16/2022	PPR - 22-036
Project Name	Date	PCD File No.

Description	Quantity	Units	Unit Cost		Total	(with Pre-Plat Construction) % Complete	Remaining	
SECTION 1 - GRADING AND EROSION CONTROL (Construction and Permanent BMPs)								
* Earthwork								*
less than 1,000; $5,300 min		CY	$ 8.00	=	$ -		$ -	*
1,000-5,000; $8,000 min		CY	$ 6.00	=	$ -		$ -	*
5,001-20,000; $30,000 min		CY	$ 5.00	=	$ -		$ -	*
20,001-50,000; $100,000 min	30,875	CY	$ 3.50	=	$ 108,062 -		$ 108,062 -	*
50,001-200,000; $175,000 min		CY	$ 2.50	=	$ -		$ -	*
greater than 200,000; $500,000 min		CY	$ 2.00	=	$ -		$ -	*
* Permanent Seeding (inc. noxious weed mgmnt)		AC	$ 886.00	=	$ -		$ -	*
* Mulching		AC	$ 831.00	=	$ -		$ -	*
* Permanent Erosion Control Blanket		SY	$ 7.00	=	$ -		$ -	*
* Permanent Pond/BMP Construction		CY	$ 22.00	=	$ -		$ -	*
* Permanent Pond/BMP (provide engineer's estimate)		EA		=	$ -		$ -	*
		EA		=	$ -		$ -	*
Safety Fence		LF	$ 3.00	=	$ -		$ -	

F. REFERENCES

- "El Paso County Drainage Criteria Manual," October 2018.
- City of Colorado Springs Drainage Criteria Manual Vol 1, May 2014
- "Urban Storm Drainage Criteria Manual," Urban Drainage and Flood Control District, Revised 2018.
- Point Precipitation Frequency Estimates, NOAA National Weather Service. Online at https://hdsc.nws.noaa.gov, accessed February 2022.
- FEMA Flood Map Service Center. Online at https://msc.fema.gov/portal, accessed February 2022.
- Web Soil Survey, Natural Resources Conservation Service, United States Department of Agriculture. Online at: http://websoilsurvey.nrcs.usda.gov, accessed February 2022.

In accordance with the MHFD, runoff reduction has several requirements that must be met:
- All RPA/SPA areas will need to be within a no build/drainage easement (or tract) and discussed in the maintenance agreement and O&M manual.

- RPA vegetation should be turf grass (from seed [provide appropriate seed mix] or sod).

- Turf grass vegetation should have a uniform density of at least 80%.

- Irrigation (temp or permanent) is necessary to establish sufficient vegetation and not just weeds.

- Show suitability of topsoil of RPA and steps for proper preparation of topsoil per recommendations in MHFD detail T-0 Table RR-3

- RPA/SPA limits must be shown on GEC Plans (not just FDR) so our SW inspectors and the QSM know that these areas are to remain pervious, vegetated (80%), and irrigated post-construction. Our SW inspectors do not look at drainage reports.

- Provide a figure showing all proposed UIA, RPA and SPA areas to be utilized for runoff reduction.

- Provide a detail for the UIA:RPA interface that shows the recommended vertical drop of 4".

- Show signage to be posted in RPAs so maintenance personnel and owners know that the area is a water quality treatment area (not just a regular grassy area and/or an SPA).

Appendix A - FEMA Floodplain Map Information

NOTES TO USERS

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

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

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

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

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

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) zone 13. The **horizontal datum** was NAD83, GRS80 spheroid. Differences in datum, spheroid, projection or UTM zones zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the **North American Vertical Datum of 1988 (NAVD88)**. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov/ or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, MD 20910-3282

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

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

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

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

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

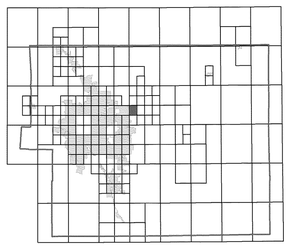
Contact **FEMA Map Service Center** (MSC) via the FEMA Map Information eXchange (FMIX) 1-877-336-2627 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this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

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

El Paso County Vertical Datum Offset Table

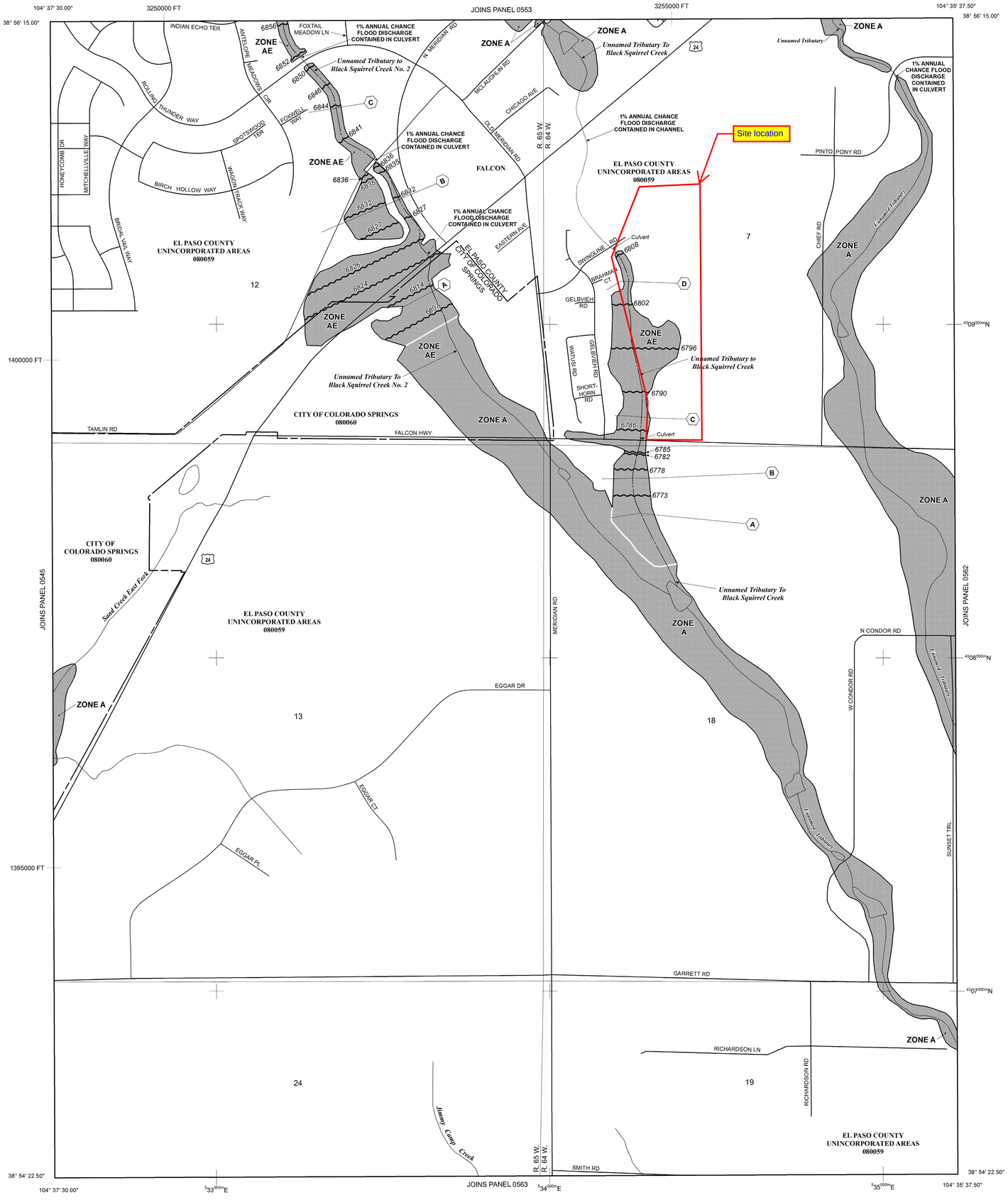
Flooding Source	Vertical Datum Offset (ft)
REFER TO SECTION 3.3 OF THE EL PASO COUNTY FLOOD INSURANCE STUDY FOR STREAM BY STREAM VERTICAL DATUM CONVERSION INFORMATION	

Panel Location Map



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

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



NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 13 SOUTH, RANGE 64 WEST, AND TOWNSHIP 13 SOUTH, RANGE 65 WEST.

LEGEND

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

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

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

FLOODWAY AREAS IN ZONE AE

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

OTHER FLOOD AREAS

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

OTHER AREAS

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

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

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

Floodplain boundary
Floodway boundary
Zone D Boundary
CBRS and OPA boundary
Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
513 — Base Flood Elevation line and value; elevation in feet*
(EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988 (NAVD 88)

A — A Cross section line
23 — 23 Transect line
97° 07' 30.00" / 32° 22' 30.00" Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
4275000mN 1000-meter Universal Transverse Mercator grid ticks, zone 13
6000000 FT 5000-foot grid ticks: Colorado State Plane coordinate system, central zone (FIPSZONE 0502), Lambert Conformal Conic Projection
DX5510 Bench mark (see explanation in Notes to Users section of this FIRM panel)
M1.5 River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
MARCH 17, 1997

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

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

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

MAP SCALE 1" = 500'
250 0 500 1000 FEET
150 0 150 300 METERS

NFIP
NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0561G

FIRM
FLOOD INSURANCE RATE MAP
EL PASO COUNTY, COLORADO
AND INCORPORATED AREAS

PANEL 561 OF 1300

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
COLORADO SPRINGS, CITY OF	080060	0561	G
EL PASO COUNTY	080059	0561	G

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

MAP NUMBER
08041C0561G

MAP REVISED
DECEMBER 7, 2018

Federal Emergency Management Agency

Appendix A - Drainage Basins El Paso County , Co.

Drainage Basins

El Paso County
Colorado

Legend

- Drainage Basins Source: Muller Engineering Company (1988)
- US Interstate Highways
- US Highways
- Colorado State Highways
- Major Roadways
- Local Streets & Roads

Creeks

- Perennial
- Intermittent
- Lakes & Reservoirs
- Summits
- Unincorporated Urban Areas
- Incorporated Cities
- Military
- Forest
- County Lines

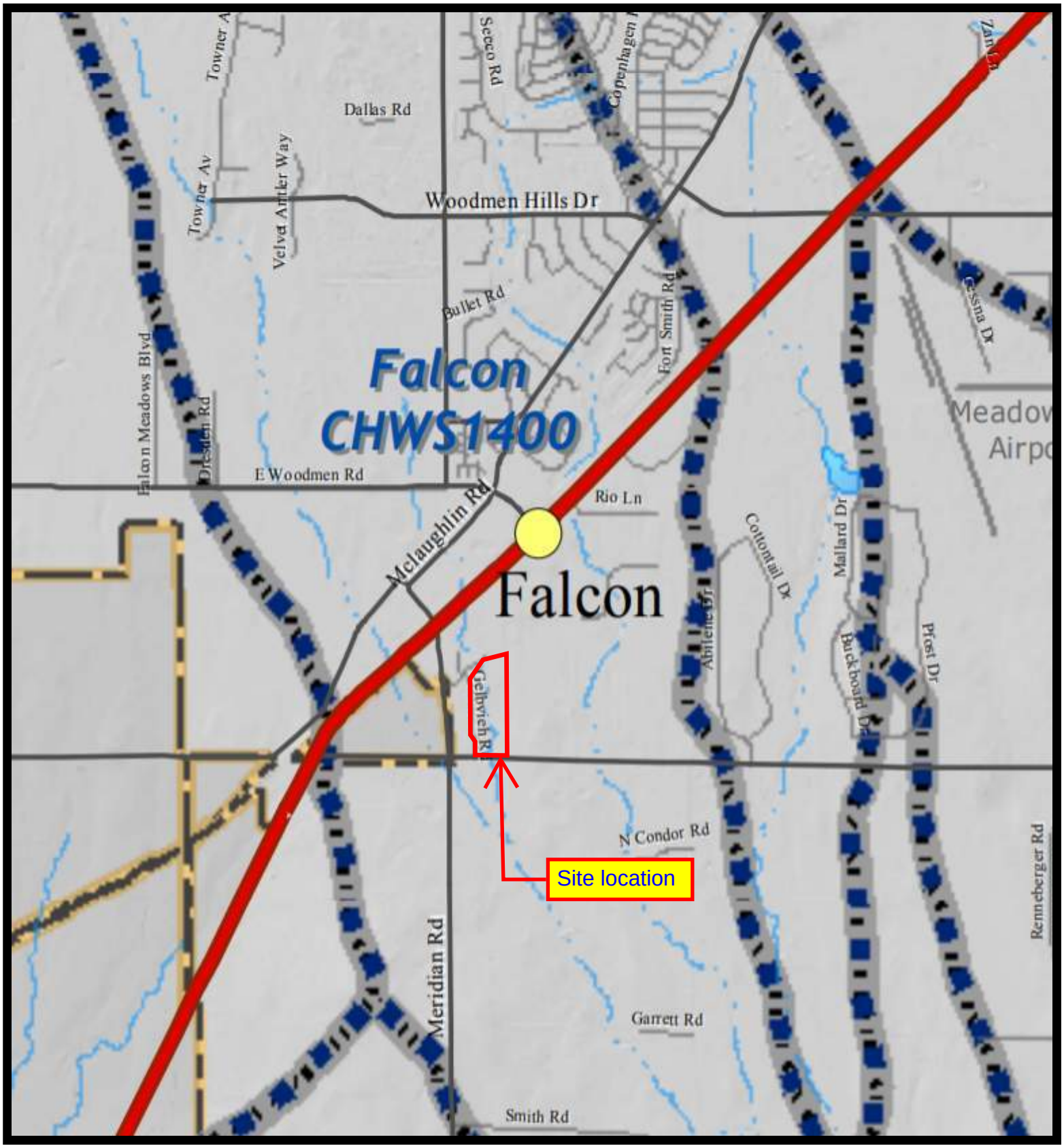
N W E S

Miles

0 0.5 1 2 3 4 5

Douglas County
Elbert County
Teller County
Lincoln County
Fremont County
Pueblo County

Upper Monument Creek FOMO5800
Monument Rock FOMO5000
Dirty Woman Creek FOMO5200
West Cherry Creek CYCY0400
East Cherry Creek CYCY0200
West Kiowa Creek KIKI0200
East Kiowa Creek KIKI0400
Bijou Creek BIBI0200
Upper Big Sandy Creek BGBG1400
Lenard BGBG1200
Antelope Creek BGBG0800
Simla BGBG0400
Ramah BGBG0600
Calhan BGBG1000
Mustang Creek BGBG0200
Jackson Creek FOMO4400
Black Forest FOMO4200
Black Squirrel Creek FOMO3600
Monument Branch FOMO3800
Beaver Creek FOMO4600
Pike National Forest
Air Force Academy FOMO3200
USAF Academy
Kettle Creek FOMO3000
Upper Black Squirrel CHBS2000
Upper Bracket Creek CHBR0600
North Fork HOHO0400
Peyton
Bennett Ranch CHWS1200
Geick Ranch CHMS0400
La Vega Ranch CHBR0400
Horse Creek HOHO0600
Hook And Line Ranch CHBS1800
Falcon CHWS1400
Falcon
Baggett CHBR0200
Little Horse Creek HOHO0200
Steels Fork HOPO1000
Cottonwood Creek FOMO2200
Pine Creek FOMO2800
South Pine Creek FOMO2600
Dry Creek FOMO2400
Crystola
Upper Fountain FOFO7600
Cheyenne Canon FOFO5800
Douglas Creek FOMO1000
Templeton Gap FOMO1200
Cascade
Williams Canyon FOFO7200
Manitou Reservoir FOFO7400
MANITOU SPRINGS
COLORADO SPRINGS
Shooks Run FOFO4400
Sand Creek FOFO4000
Solbers Ranch CHWS0800
Haegler Ranch CHMS0200
Curtis Ranch CHWS1000
West Big Springs Creek CHBG0200
Upper Big Springs Creek CHBG0400
Rush HOPO0800
Livestock Company CHWS0400
West Squirrel CHWS0600
Ellicott
Yoder
Rush
Ellicott CHBS1600
Lower Big Springs Creek CHBS1400
Telephone Exchange CHWS0200
Ellicott Consolidated CHBS1200
Upper Pond Creek HOPO0600
Lower Pond Creek HOPO0400
Ruxton Creek FOFO7000
Upper Beaver Creek BEBE0400
Sutherland Creek FOFO6400
Bear Creek FOFO4800
Spring Creek FOFO4200
Peterson AFB
Peterson Field FOFO3400
Municipal Airport
Jimmy Camp Creek FOFO2000
Upper East Chico CHEC0400
Schriever AFB
AFA Aux Field
Crows Roost CHBS1000
Drennan CHDS0400
Middle East Chico CHEC0200
Truckton
Windmill Gulch FOFO3000
Fishers Canyon FOFO3600
Southwest Area FOFO4600
Pike National Forest
Big Johnson FOFO2600
Upper Williams Creek FOWI0600
Upper Chico Creek CHCH1600
Upper Dry Squirrel CHDS0200
Haynes Creek HAHA0600
St.lukes HOPO0200
Lower Black Squirrel CHBS0600
Squirrel Creek CHBS0200
Fort Carson FOFO2200
Little Fountain Creek FOFO1800
Upper Williams Tributary FOWI0400
West Chico Tributary CHCH1200
Chico Creek CHCH1400
Calhan Reservoir FOFO1400
FOUNTAIN
Fort Carson
Lower Williams Creek FOFO1000
Lower Williams Tributary FOWI0200
Sand Canyon FOFO1600
Lower Dry Squirrel CHDS0400
Lower East Chico CHCH0800
East Kramer KRKR0600
Kramer Creek KRKR0400
East Haynes HAHA0400
Turkey Creek TUTU0200
Hammer Ranch CHCH0600
Finch Ranch CHCH0400
Windmill CHCH0200
West Haynes HAHA0200
West Kramer KRKR0200
Sand Creek FOFO0600
Williams Ranch FOFO0400
Midway Ranch FOFO0800
Red Creek BEBE0200
West Chico Creek CHCH0600
Young Hollow FOFO0200



Drainage Basins

El Paso County
Colorado

Legend

- Drainage Basins
- US Interstate Highways
- US Highways
- Colorado State Highways
- Major Roadways
- Local Streets & Roads

Creeks

- Perennial
- Intermittent
- Lakes & Reservoirs
- Summits
- Unincorporated Urban Areas
- Incorporated Cities
- Military
- Forest
- County Lines

N
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APPENDIX B – CALCULATIONS

JVA Incorporated
214 8th Street, S 210
Glenwood Springs, CO 81601
Ph: (970) 404 3100

Job Name: D49 Transportation Center
Job Number: 3456c
Date: 1/30/23
By: AMB

D49 Transportation Center

Historic Runoff Coefficient & Time of Concentration Calculations

Location: El Paso County
Minor Design Storm: 5
Major Design Storm: 100
Soil Type: A

Table 6-6. Runoff Coefficients for Rational Method
(Source: UDFCD 2001)

Land Use or Surface Characteristics	Percent Imperviousness	Runoff Coefficients											
		2-year		5-year		10-year		25-year		50-year		100-year	
		HSG A&B	HSG C&D	HSG A&B	HSG C&D	HSG A&B	HSG C&D	HSG A&B	HSG C&D	HSG A&B	HSG C&D	HSG A&B	HSG C&D
Business													
Commercial Areas	95	0.79	0.80	0.81	0.82	0.83	0.84	0.85	0.87	0.87	0.88	0.88	0.89
Neighborhood Areas	70	0.45	0.49	0.49	0.53	0.53	0.57	0.58	0.62	0.60	0.65	0.62	0.68
Residential													
1/8 Acre or less	65	0.41	0.45	0.45	0.49	0.49	0.54	0.54	0.59	0.57	0.62	0.59	0.65
1/4 Acre	40	0.23	0.28	0.30	0.35	0.36	0.42	0.42	0.50	0.46	0.54	0.50	0.58
1/3 Acre	30	0.18	0.22	0.25	0.30	0.32	0.38	0.39	0.47	0.43	0.52	0.47	0.57
1/2 Acre	25	0.15	0.20	0.22	0.28	0.30	0.36	0.37	0.46	0.41	0.51	0.46	0.56
1 Acre	20	0.12	0.17	0.20	0.26	0.27	0.34	0.35	0.44	0.40	0.50	0.44	0.55
Industrial													
Light Areas	80	0.57	0.60	0.59	0.63	0.63	0.66	0.66	0.70	0.68	0.72	0.70	0.74
Heavy Areas	90	0.71	0.73	0.73	0.75	0.75	0.77	0.78	0.80	0.80	0.82	0.81	0.83
Parks and Cemeteries	7	0.05	0.09	0.12	0.19	0.20	0.29	0.30	0.40	0.34	0.46	0.39	0.52
Playgrounds	13	0.07	0.13	0.16	0.23	0.24	0.33	0.32	0.42	0.37	0.48	0.41	0.54
Railroad Yard Areas	40	0.23	0.28	0.30	0.35	0.36	0.42	0.42	0.50	0.46	0.54	0.50	0.58
Undeveloped Areas													
Historic Flow Analysis—Greenbelts, Agriculture	2	0.03	0.05	0.09	0.16	0.17	0.26	0.26	0.38	0.31	0.45	0.36	0.51
Pasture/Meadow	0	0.02	0.04	0.08	0.15	0.15	0.25	0.25	0.37	0.30	0.44	0.35	0.50
Forest	0	0.02	0.04	0.08	0.15	0.15	0.25	0.25	0.37	0.30	0.44	0.35	0.50
Exposed Rock	100	0.89	0.89	0.90	0.90	0.92	0.92	0.94	0.94	0.95	0.95	0.96	0.96
Offsite Flow Analysis (when landuse is undefined)	45	0.26	0.31	0.32	0.37	0.38	0.44	0.44	0.53	0.48	0.55	0.51	0.59
Streets													
Paved	100	0.89	0.89	0.90	0.90	0.92	0.92	0.94	0.94	0.95	0.95	0.96	0.96
Gravel	80	0.57	0.60	0.59	0.63	0.63	0.66	0.66	0.70	0.68	0.72	0.70	0.74
Drive and Walks	100	0.89	0.89	0.90	0.90	0.92	0.92	0.94	0.94	0.95	0.95	0.96	0.96
Roofs	90	0.71	0.73	0.73	0.75	0.75	0.77	0.78	0.80	0.80	0.82	0.81	0.83
Lawns	0	0.02	0.04	0.08	0.15	0.15	0.25	0.25	0.37	0.30	0.44	0.35	0.50

	I%	C2	C5	C10	C100
Streets Paved	100%	0.89	0.90	0.92	0.96
Concrete Drives/Walks	100%	0.89	0.90	0.92	0.96
Roof	90%	0.71	0.75	0.75	0.81
Gravel	80%	0.57	0.63	0.63	0.70
Landscaping (B soil)	0%	0.02	0.15	0.15	0.35
Landscaping (C/D soil)	0%	0.02	0.15	0.15	0.35
Playground	13%	0.07	0.23	0.24	0.41
Artificial Turf	0%	0.02	0.15	0.15	0.35

Basin Design Data

	I (%) =	100%	100%	90%	80%	13%	0%	0%	0%			I (%)	Runoff Coeff's				Initial Overland Time (t_i)			Travel Time (t_t) x 60)		t_t=Length/(Velocity				t_c Comp	tc Urbanized Check ON		t_c Final
Basin Name	Design Point	A_{paved} streets (sf)	$A_{drives/conc}$ (sf)	A_{roof} (sf)	A_{gravel} (sf)	A_{plygnd} (sf)	$A_{art.\ turf}$ (sf)	$A_{lscape\ (A\ soil)}$ (sf)	$A_{lscape\ (C/D\ soil)}$ (sf)	A_{Total} (sf)	A_{Total} (ac)	Imp (%)	C2	C5	C10	C100	Upper most Length (ft)	Slope (%)	t_i (min)	Length (ft)	Slope (%)	Type of Land Surface	K	Velocity (fps)	t_t (min)	Time of Conc $t_i + t_t = t_c$	Total Length (ft)	t_c=(L/180)+ 10 (min.)	Min t_c
OS-1	1							194,156		194,156	4.46	0.0%	0.02	0.15	0.15	0.35	100	1.1%	16.9	869	1.3%	Short Pasture and lawns	7	0.8	18.1	35.0	969	15.4	15.4
OS-2	2	95,838						37,602		133,440	3.06	71.8%	0.64	0.69	0.70	0.79	100	1.0%	7.5	500	2.3%	Paved areas & shallow paved swales	20	3.0	2.7	10.3	600	13.3	10.3
OS-3	3	214,581						93,687		308,268	7.08	69.6%	0.63	0.67	0.69	0.77	100	1.0%	7.8	610	2.0%	Short Pasture and lawns	7	1.0	10.3	18.1	710	13.9	13.9
H-1	2	4,281	3,888	5,392	159,153			434,626		607,340	13.94	23.1%	0.18	0.29	0.29	0.45	100	1.1%	14.4	1328	1.1%	Short Pasture and lawns	7	0.7	30.1	44.5	1428	17.9	17.9
H-2	3	30,298	820		219,316			494,028		744,462	17.09	27.7%	0.22	0.32	0.32	0.48	100	3.0%	9.9	1824	2.5%	Short Pasture and lawns	7	1.1	27.5	37.3	1924	20.7	20.7
H-3	3	236,323	16,837	44,852	13,512			54,048		365,572	8.39	83.2%	0.73	0.76	0.77	0.84	100	5.0%	3.6	650	5.0%	Short Pasture and lawns	7	1.6	6.9	10.6	750	14.2	10.6
SITE (FALCON HWY)		481,201	17,657	44,852	232,828	0	0	641,763	0	1,418,301	32.56	51.2%	0.44	0.51	0.52	0.64													

			Runoff Coeff's				Rainfall Intensities (in/hr)				Area		Flow Rates (cfs)			
Basin Name	Design Point	Time of Conc (tc)	C2	C5	C10	C100	2	5	10	100	A_{Total} (sf)	A_{Total} (ac)	Q2	Q5	Q10	Q100
OS-1	1	15.4	0.02	0.15	0.15	0.35	2.68	3.37	3.97	5.65	194,156	4.46	0.24	2.26	2.65	8.82
OS-2	2	10.3	0.64	0.69	0.70	0.79	3.17	3.96	4.66	6.73	133,440	3.06	6.26	8.36	10.03	16.26
OS-3	3	13.9	0.63	0.67	0.69	0.77	2.81	3.53	4.15	5.94	308,268	7.08	12.44	16.80	20.17	32.57
H-1	2	17.9	0.18	0.29	0.29	0.45	2.56	3.21	3.77	5.37	607,340	13.94	6.48	13.02	15.31	34.00
H-2	3	20.7	0.22	0.32	0.32	0.48	2.42	3.02	3.54	5.05	744,462	17.09	9.01	16.66	19.60	41.34
H-3	3	10.6	0.73	0.76	0.77	0.84	3.14	3.93	4.62	6.67	365,572	8.39	19.17	25.08	30.01	47.11
										TOTAL SITE (FALCON HWY)	1,418,301	32.56	40.62	58.53	69.77	121.02

3.2.1 Overland (Initial) Flow Time

The overland flow time, t_i, may be calculated using Equation 6-8.

$$t_i = \frac{0.395(1.1 - C_5)\sqrt{L}}{S^{0.33}} \quad \text{(Eq. 6-8)}$$

Where:

t_i = overland (initial) flow time (min)
C_5 = runoff coefficient for 5-year frequency (see Table 6-6)
L = length of overland flow (300 ft maximum for non-urban land uses, 100 ft maximum for urban land uses)
S = average basin slope (ft/ft)

Note that in some urban watersheds, the overland flow time may be very small because flows quickly concentrate and channelize.

3.2.2 Travel Time

For catchments with overland and channelized flow, the time of concentration needs to be considered in combination with the travel time, t_t, which is calculated using the hydraulic properties of the swale, ditch, or channel. For preliminary work, the overland travel time, t_t, can be estimated with the help of Figure 6-25 or Equation 6-9 (Guo 1999).

$$V = C_v S_w^{0.5} \quad \text{(Eq. 6-9)}$$

Where:

V = velocity (ft/s)
C_v = conveyance coefficient (from Table 6-7)
S_w = watercourse slope (ft/ft)

A composite runoff coefficient is calculated using the relationship:

$$C = \frac{\sum_{i=1}^{n} C_i A_i}{A_t} \quad (5\text{-}2)$$

where:

C_i = individual runoff coefficient corresponding to surface type;

A_i = area of surface type corresponding to C_i;

A_t = total drainage area for which composite runoff coefficient is applicable;

n = total number of surface types in drainage areas; and

C = the composite runoff coefficient.

JVA Incorporated
214 8th Street, S 210
Glenwood Springs, CO 81601
Ph: (970) 404 3100

Job Name: D49 Transportation Center
Job Number: 3456c
Date: 1/30/23
By: AMB

	I%	C2	C5	C10	C100
Streets Paved	100%	0.89	0.90	0.92	0.96
Concrete Drives/Walks	100%	0.89	0.90	0.92	0.96
Roof	90%	0.71	0.75	0.75	0.81
Gravel	80%	0.57	0.63	0.63	0.70
Landscaping (B soil)	0%	0.02	0.15	0.15	0.35
Landscaping (C/D soil)	0%	0.02	0.15	0.15	0.35
Playground	13%	0.07	0.23	0.24	0.41
Artificial Turf	0%	0.02	0.15	0.15	0.35

D49 Transportation Center

Composite Runoff Coefficient Calculations

Location: El Paso County
Minor Design Storm: 5
Major Design Storm: 100
Soil Type: A

Basin Design Data

	I (%) =	100%	100%	90%	80%	13%	0%	0%	0%			I (%)	Runoff Coeff's			
Basin Name	Design Point	A_{paved} streets (sf)	$A_{drives/conc}$ (sf)	A_{roof} (sf)	A_{gravel} (sf)	A_{plygnd} (sf)	$A_{art.\ turf}$ (sf)	$A_{lscape\ (A\ soil)}$ (sf)	$A_{lscape\ (C/D\ soil)}$ (sf)	A_{Total} (sf)	A_{Total} (ac)	Imp (%)	C2	C5	C10	C100
OS-1	1							194,298		194,298	4.46	0.0%	0.02	0.15	0.15	0.35
OS-2	2	82,559						81,826		164,385	3.77	50.2%	0.46	0.53	0.54	0.66
OS-3	3	115,416								227,860	5.23	56.8%	0.50	0.57	0.58	0.69
A1	3	87,000	0	0						117,000	2.69	74.4%	0.67	0.71	0.72	0.80
A2	5	0	0	0						159,462	3.66	3.8%	0.05	0.17	0.17	0.37
A3	6	393,733	~~13,027~~	~~16,621~~						423,381	9.72	99.6%	0.88	0.89	0.91	0.95
A4	7	126,589	0	0						126,589	2.91	100.0%	0.89	0.90	0.92	0.96
A5	8		12,410	17,441						48,184	1.11	58.3%	0.49	0.56	0.57	0.67
A6	9									286,599	6.58	67.9%	0.49	0.56	0.56	0.65
A7	10	0			26,707			88,072		114,779	2.63	18.6%	0.15	0.26	0.26	0.43
A8	11		3,717		28,778			11,895		44,390	1.02	60.2%	0.45	0.52	0.53	0.63
OS-4	4	14,874			11,406			42,889		69,169	1.59	34.7%	0.30	0.39	0.39	0.54
OS-5	12	180,746	19,641	37,209				76,798		314,394	7.22	74.4%	0.66	0.70	0.71	0.79

Unresolved. Site plan shows the bus parking as gravel. Adjust or explain in the basin description why you assumed asphalt paving.

A composite runoff coefficient is calculated using the relationship:

$$C = \frac{\sum_{i=1}^{n} C_i A_i}{A_t} \qquad (5\text{-}2)$$

where:

C_i = individual runoff coefficient corresponding to surface type;

A_i = area of surface type corresponding to C_i;

A_t = total drainage area for which composite runoff coefficient is applicable;

n = total number of surface types in drainage areas; and

C = the composite runoff coefficient.

Table 6-6. Runoff Coefficients for Rational Method
(Source: UDFCD 2001)

Land Use or Surface Characteristics	Percent Impervious	Runoff Coefficients											
		2-year		5-year		10-year		25-year		50-year		100-year	
		HSG A&B	HSG C&D	HSG A&B	HSG C&D	HSG A&B	HSG C&D	HSG A&B	HSG C&D	HSG A&B	HSG C&D	HSG A&B	HSG C&D
Business													
Commercial Areas	95	0.79	0.80	0.81	0.82	0.83	0.84	0.85	0.87	0.87	0.88	0.88	0.89
Neighborhood Areas	70	0.45	0.49	0.49	0.53	0.53	0.57	0.58	0.62	0.60	0.65	0.62	0.68
Residential													
1/8 Acre or less	65	0.41	0.45	0.45	0.49	0.49	0.54	0.54	0.59	0.57	0.62	0.59	0.65
1/4 Acre	40	0.23	0.28	0.30	0.35	0.36	0.42	0.42	0.50	0.46	0.54	0.50	0.58
1/3 Acre	30	0.18	0.22	0.25	0.30	0.32	0.38	0.39	0.47	0.43	0.52	0.47	0.57
1/2 Acre	25	0.15	0.20	0.22	0.28	0.30	0.36	0.37	0.46	0.41	0.51	0.46	0.56
1 Acre	20	0.12	0.17	0.20	0.26	0.27	0.34	0.35	0.44	0.40	0.50	0.44	0.55
Industrial													
Light Areas	80	0.57	0.60	0.59	0.63	0.63	0.66	0.66	0.70	0.68	0.72	0.70	0.74
Heavy Areas	90	0.71	0.73	0.73	0.75	0.75	0.77	0.78	0.80	0.80	0.82	0.81	0.83
Parks and Cemeteries	7	0.05	0.09	0.12	0.19	0.20	0.29	0.30	0.40	0.34	0.46	0.39	0.52
Playgrounds	13	0.07	0.13	0.16	0.23	0.24	0.31	0.32	0.42	0.37	0.48	0.41	0.54
Railroad Yard Areas	40	0.23	0.28	0.30	0.35	0.36	0.42	0.42	0.50	0.46	0.54	0.50	0.58
Undeveloped Areas													
Historic Flow Analysis--Greenbelts, Agriculture	2	0.03	0.05	0.09	0.16	0.17	0.26	0.26	0.38	0.31	0.45	0.36	0.51
Pasture/Meadow	0	0.02	0.04	0.08	0.15	0.15	0.25	0.25	0.37	0.30	0.44	0.35	0.50
Forest	0	0.02	0.04	0.08	0.15	0.15	0.25	0.25	0.37	0.30	0.44	0.35	0.50
Exposed Rock	100	0.89	0.89	0.90	0.90	0.92	0.92	0.94	0.94	0.95	0.95	0.96	0.96
Offsite Flow Analysis (when landuse is undefined)	45	0.26	0.31	0.32	0.37	0.38	0.44	0.44	0.51	0.48	0.55	0.51	0.59
Streets													
Paved	100	0.89	0.89	0.90	0.90	0.92	0.92	0.94	0.94	0.95	0.95	0.96	0.96
Gravel	80	0.57	0.60	0.59	0.63	0.63	0.66	0.66	0.70	0.68	0.72	0.70	0.74
Drive and Walks	100	0.89	0.89	0.90	0.90	0.92	0.92	0.94	0.94	0.95	0.95	0.96	0.96
Roofs	90	0.71	0.73	0.73	0.75	0.75	0.77	0.78	0.80	0.80	0.82	0.81	0.83
Lawns	0	0.02	0.04	0.08	0.15	0.15	0.25	0.25	0.37	0.30	0.44	0.35	0.50

JVA Incorporated
214 8th Street, S 210
Glenwood Springs, CO 81601
Ph: (970) 404 3100

Job Name: D49 Transportation Center
Job Number: 3456c
Date: 1/30/23
By: AMB

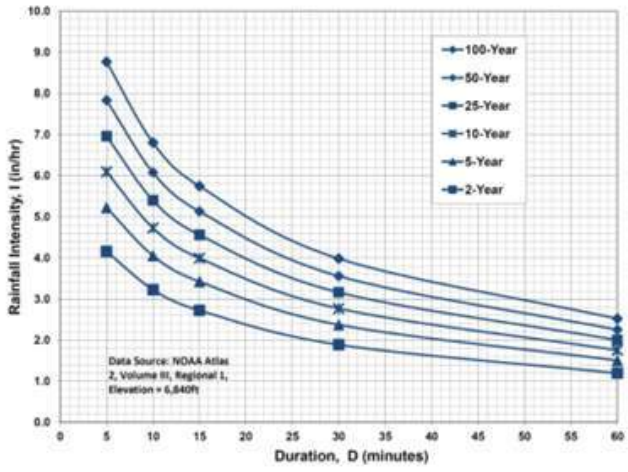
D49 Transportation Center

Time of Concentration Calculations

Location: El Paso County
Minor Design Storm: 5
Major Design Storm: 100
Soil Type: A

Sub-Basin Data				Initial Overland Time (t_i)			Travel Time (t_t) t_t=Length/(Velocity x 60)						t_c Comp	tc Urbanized Check ON		t_c Final
Basin Name	Design Point	A_{Total} (ac)	C5	Upper most Length (ft)	Slope (%)	t_i (min)	Length (ft)	Slope (%)	Type of Land Surface	C_v	Velocity (fps)	t_t (min)	Time of Conc $t_i + t_t = t_c$	Total Length (ft)	t_c=(L/180)+ 10 (min)	Min t_c
OS-1	1	4.46	0.15	100	1.7%	14.5	400	1.0%	Short Pasture and lawns	7	0.7	9.5	24.1	500	12.8	12.8
OS-2	2	3.77	0.53	100	2.0%	8.3	2790	0.5%	Short Pasture and lawns	7	0.5	93.9	102.3	2890	26.1	26.1
OS-3	3	5.23	0.57	100	1.7%	8.2	2285	0.5%	Short Pasture and lawns	7	0.5	76.9	85.1	2385	23.3	23.3
A1	3	2.69	0.71	100	2.0%	5.7	150	1.0%	Paved areas & shallow paved swales	20	2.0	1.3	7.0	250	11.4	7.0
A2	5	3.66	0.17	100	1.8%	14.0	1210	0.6%	Short Pasture and lawns	7	0.5	37.2	51.2	1310	17.3	17.3
A3	6	9.72	0.89	100	2.0%	3.0	780	2.0%	Paved areas & shallow paved swales	20	2.8	4.6	7.6	880	14.9	7.6
A4	7	2.91	0.90	100	1.6%	3.1	700	0.8%	Short Pasture and lawns	7	0.6	19.2	22.4	800	14.4	14.4
A5	8	1.11	0.56	100	1.0%	9.9	350	4.0%	Paved areas & shallow paved swales	20	4.0	1.5	11.4	450	12.5	11.4
A6	9	6.58	0.56	100	1.0%	10.0	1100	4.0%	Paved areas & shallow paved swales	20	4.0	4.6	14.5	1200	16.7	14.5
A7	10	2.63	0.26	100	2.8%	10.9	437	0.5%	Paved areas & shallow paved swales	20	1.4	5.2	16.1	537	13.0	13.0
A8	11	1.02	0.52	100	3.0%	7.3	680	0.5%	Short Pasture and lawns	7	0.5	22.9	30.2	780	14.3	14.3
OS-4	4	1.59	0.39	100	2.2%	10.0	1965	0.6%	Short Pasture and lawns	7	0.5	60.4	70.4	2065	21.5	21.5
OS-5	12	7.22	0.70	100	1.5%	6.4	615	0.5%	Paved areas & shallow paved swales	20	1.4	7.2	13.7	715	14.0	13.7

Figure 6-5. Colorado Springs Rainfall Intensity Duration Frequency



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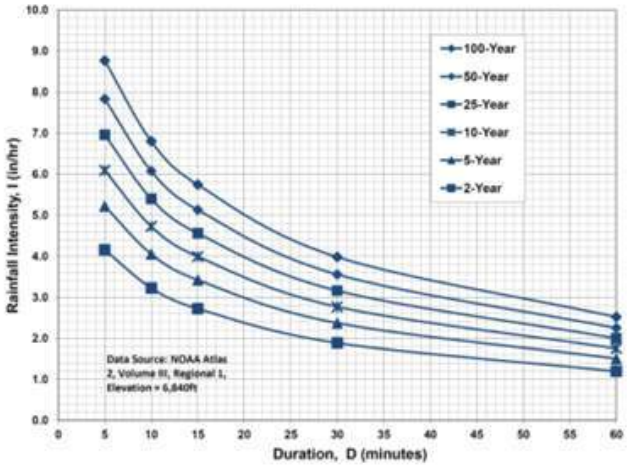
D49 Transportation Center

Time of Concentration Calculations

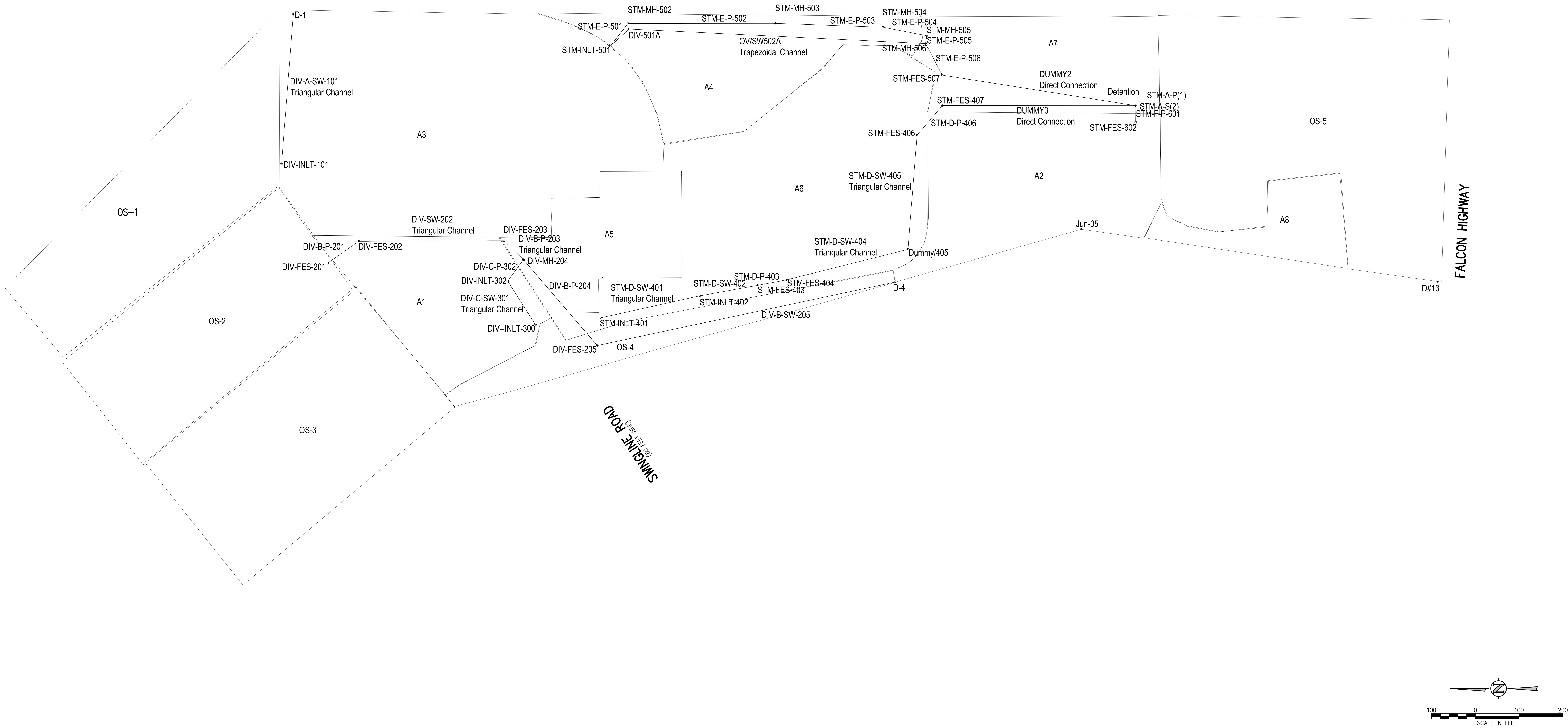
Location: El Paso County
Minor Design Storm: 5
Major Design Storm: 100
Soil Type: A

Sub-Basin Data				Initial Overland Time (t_i)			Travel Time (t_t) t_t=Length/(Velocity x 60)						t_c Comp	tc Urbanized Check ON		t_c Final
Basin Name	Design Point	A_{Total} (ac)	C100	Upper most Length (ft)	Slope (%)	t_i (min)	Length (ft)	Slope (%)	Type of Land Surface	C_v	Velocity (fps)	t_t (min)	Time of Conc $t_i + t_t = t_c$	Total Length (ft)	t_c=(L/180)+ 10 (min)	Min t_c
OS-1	1	4.46	0.35	100	1.7%	11.5	400	1.0%	Short Pasture and lawns	7	0.7	9.5	21.0	500	12.8	12.8
OS-2	2	3.77	0.66	100	2.0%	6.5	2790	0.5%	Short Pasture and lawns	7	0.5	93.9	100.4	2890	26.1	26.1
OS-3	3	5.23	0.69	100	1.7%	6.4	2285	0.5%	Short Pasture and lawns	7	0.5	76.9	83.3	2385	23.3	23.3
A1	3	2.69	0.80	100	2.0%	4.3	150	1.0%	Paved areas & shallow paved swales	20	2.0	1.3	5.6	250	11.4	5.6
A2	5	3.66	0.37	100	1.8%	11.1	1210	0.6%	Short Pasture and lawns	7	0.5	37.2	48.2	1310	17.3	17.3
A3	6	9.72	0.95	100	2.0%	2.1	780	2.0%	Paved areas & shallow paved swales	20	2.8	4.6	6.7	880	14.9	6.7
A4	7	2.91	0.96	100	1.6%	2.2	700	0.8%	Short Pasture and lawns	7	0.6	19.2	21.4	800	14.4	14.4
A5	8	1.11	0.67	100	1.0%	7.8	350	4.0%	Paved areas & shallow paved swales	20	4.0	1.5	9.3	450	12.5	9.3
A6	9	6.58	0.65	100	1.0%	8.3	1100	4.0%	Paved areas & shallow paved swales	20	4.0	4.6	12.9	1200	16.7	12.9
A7	10	2.63	0.43	100	2.8%	8.7	437	0.5%	Paved areas & shallow paved swales	20	1.4	5.2	13.8	537	13.0	13.0
A8	11	1.02	0.63	100	3.0%	6.0	680	0.5%	Short Pasture and lawns	7	0.5	22.9	28.9	780	14.3	14.3
OS-4	4	1.59	0.54	100	2.2%	7.9	1965	0.6%	Short Pasture and lawns	7	0.5	60.4	68.3	2065	21.5	21.5
OS-5	12	7.22	0.79	100	1.5%	4.9	615	0.5%	Paved areas & shallow paved swales	20	1.4	7.2	12.2	715	14.0	12.2

Figure 6-5. Colorado Springs Rainfall Intensity Duration Frequency



Summary Table Developed Runoff				
Basins	Design Points	Area (Acres)	5-Year	100-Year
OS-2	2	3.52	5.14	10.69
OS-3	3	5.23	8.12	16.43
OS-4	4	1.59	1.76	4.07
OS-5	12	7.22	17.80	35.28
A2	5	3.66	1.97	7.18
A8	11	1.02	1.84	3.73
Detention Basin (Restricted Discharge)	10	22.79	10.50	41.50
Total (Falcon HWY)			47.13	118.88
Existing			58.53	121.02



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D49 TRANSPORTATION CENTER

SCHOOL DISTRICT NO 49

11971 SWINGLINE ROAD
PEYTON, CO 80831

SHEET TITLE
SSA – NETWORK PLAN LAYOUT

RTA PROJECT NUMBER
2021-041.00
DATE
01/25/2023
REVISIONS

REVISIONS

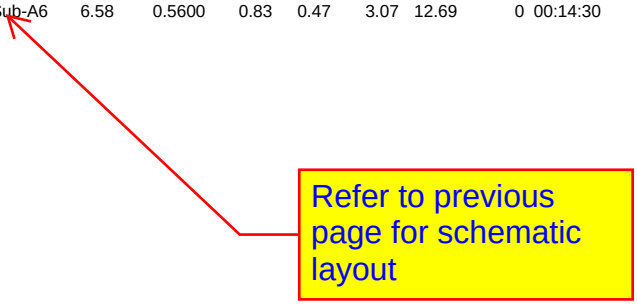
#	DATE	DESCRIPTION
1	05/06/2022	ADDENDUM 01
2	06/29/2022	ASI-01
3	12/06/2022	PR1

QA/QC APPROVAL: **CWK/HCM**
DRAWN BY: **TWW/AMB**
CHECKED BY: **CWK**

ISSUED FOR:
CONSTRUCTION DOCUMENTS
SHEET NO.
FIG–3

Subbasin Summary

SN	Subbasin ID	Area (ac)	Weighted Runoff Coefficient	Total Rainfall (in)	Total Runoff (in)	Total Runoff Volume (ac-in)	Peak Runoff (cfs)	Time of Concentration (days hh:mm:ss)
1	A1	2.61	0.7100	0.53	0.38	0.99	8.46	0 00:07:00
2	A2	3.66	0.1700	0.91	0.16	0.57	1.97	0 00:17:18
3	A3	9.72	0.8900	0.57	0.50	4.89	38.26	0 00:07:36
4	A4	2.92	0.9000	0.83	0.74	2.17	9.07	0 00:14:24
5	A5	1.11	0.5600	0.71	0.40	0.44	2.35	0 00:11:24
6	A7	2.63	0.2600	0.78	0.20	0.53	2.46	0 00:13:00
7	A8	1.02	0.5200	0.83	0.43	0.44	1.84	0 00:14:18
8	OS-1	4.46	0.1500	0.77	0.12	0.52	2.42	0 00:12:48
9	OS-2	3.77	0.5300	1.12	0.60	2.24	5.14	0 00:26:06
10	OS-3	5.23	0.5700	1.06	0.60	3.16	8.12	0 00:23:18
11	OS-4	1.59	0.3900	1.02	0.40	0.63	1.76	0 00:21:30
12	OS-5	7.22	0.7000	0.80	0.56	4.05	17.80	0 00:13:42
13	Sub-A6	6.58	0.5600	0.83	0.47	3.07	12.69	0 00:14:30



Update the narrative to describe the software used.

Node Summary

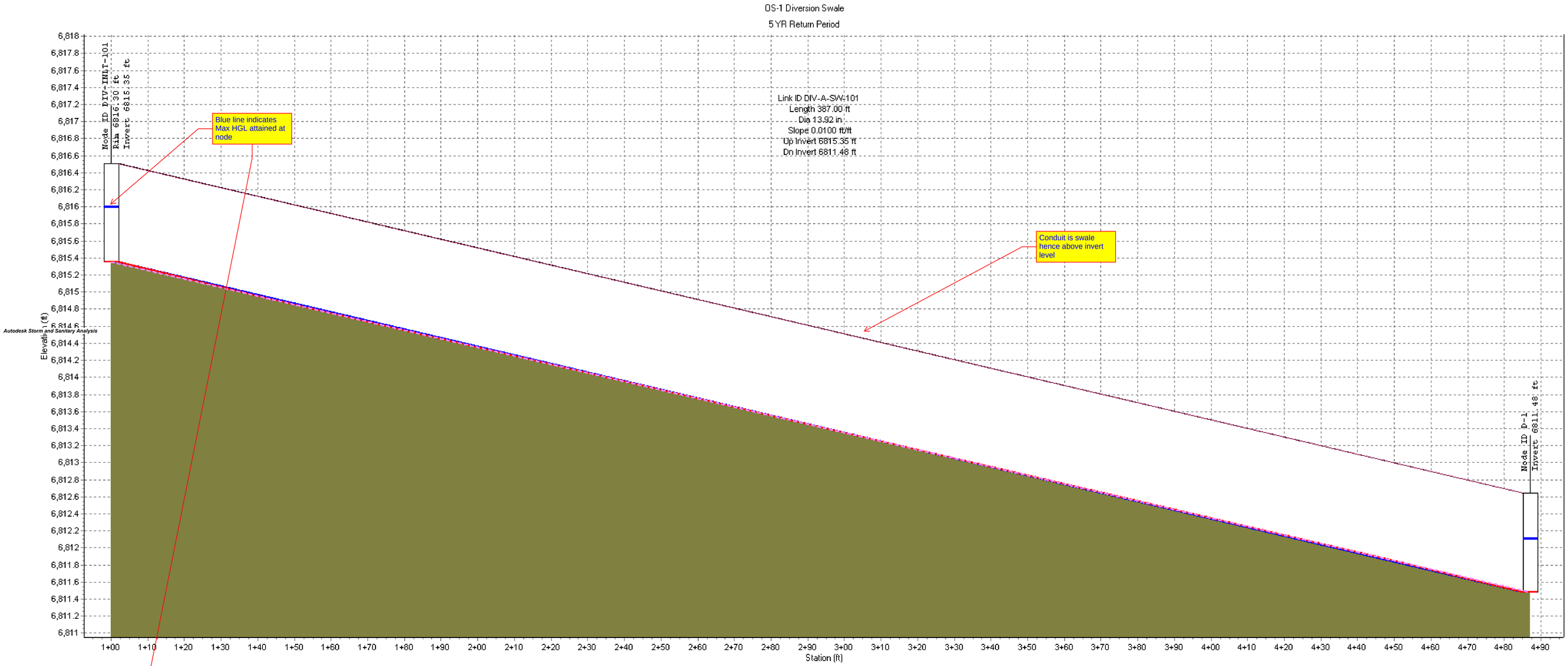
SN	Element ID	Element Type	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Initial Water Elevation (ft)	Surcharge Elevation (ft)	Ponded Area (ft²)	Peak Inflow (cfs)	Max HGL Elevation Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	DIV-501A	Junction	6800.23	6802.39	6800.23	0.00	0.00	38.26	6801.56	0.00	0.83	0 00:00	0.00	0.00
2	DIV-FES-201	Junction	6811.55	6815.42	6811.55	0.00	0.00	5.14	6812.08	0.00	3.34	0 00:00	0.00	0.00
3	DIV-FES-202	Junction	6809.01	6812.20	6809.01	0.00	0.00	5.14	6809.79	0.00	3.29	0 00:00	0.00	0.00
4	DIV-FES-203	Junction	6805.69	6807.03	6805.69	0.00	0.00	5.03	6806.47	0.00	3.29	0 00:00	0.00	0.00
5	DIV-FES-205	Junction	6801.76	6810.09	6804.09	0.00	0.00	12.26	6802.89	0.00	7.19	0 00:00	0.00	0.00
6	DIV-INLT-101	Junction	6815.35	6816.30	6815.35	0.00	0.00	2.42	6816.00	0.00	0.51	0 00:00	0.00	0.00
7	DIV--INLT-300	Junction	6809.13	6815.13	6809.13	6815.13	0.00	0.00	6809.13	0.00	6.00	0 00:00	0.00	0.00
8	DIV-INLT-302	Junction	6804.71	6809.12	6804.71	0.00	0.00	10.89	6805.72	0.00	3.40	0 00:00	0.00	0.00
9	DIV-MH-204	Junction	6803.24	6809.60	6804.35	0.00	0.00	12.29	6805.36	0.00	4.24	0 00:00	0.00	0.00
10	Dummy/405	Junction	6796.69	6797.69	6796.69	0.00	0.00	2.14	6797.28	0.00	0.41	0 00:00	0.00	0.00
11	Jun-05	Junction	0.00	6.00	0.00	6.00	0.00	1.97	0.00	0.00	6.00	0 00:00	0.00	0.00
12	STM-A-S(2)	Junction	6790.65	6795.41	6790.65	6795.41	0.00	2.46	6791.21	0.00	4.21	0 00:00	0.00	0.00
13	STM-FES-403	Junction	6800.64	6801.97	6800.64	0.00	0.00	2.22	6801.24	0.00	0.89	0 00:00	0.00	0.00
14	STM-FES-404	Junction	6800.00	6801.34	6800.00	0.00	0.00	2.22	6800.60	0.00	0.90	0 00:00	0.00	0.00
15	STM-FES-406	Junction	6793.53	6796.40	6793.53	0.00	0.00	14.43	6794.38	0.00	2.03	0 00:00	0.00	0.00
16	STM-FES-407	Junction	6793.07	6799.07	6793.07	6799.07	0.00	14.36	6793.91	0.00	5.15	0 00:00	0.00	0.00
17	STM-FES-507	Junction	6793.35	6799.35	6793.35	6799.35	0.00	39.99	6794.71	0.00	4.64	0 00:00	0.00	0.00
18	STM-INLT-401	Junction	6804.25	6807.00	6804.25	0.00	0.00	2.35	6804.84	0.00	2.16	0 00:00	0.00	0.00
19	STM-INLT-402	Junction	6802.04	6802.70	6802.04	0.00	0.00	2.24	6802.64	0.00	1.10	0 00:00	0.00	0.00
20	STM-MH-502	Junction	6797.36	6802.32	6797.36	0.00	0.00	0.00	6797.36	0.00	4.96	0 00:00	0.00	0.00
21	STM-MH-503	Junction	6795.70	6799.11	6795.70	0.00	0.00	0.00	6795.70	0.00	3.41	0 00:00	0.00	0.00
22	STM-MH-504	Junction	6794.29	6797.77	6794.29	0.00	0.00	0.00	6794.29	0.00	3.48	0 00:00	0.00	0.00
23	STM-MH-505	Junction	6793.88	6797.71	6793.88	0.00	0.00	0.00	6793.95	0.00	3.76	0 00:00	0.00	0.00
24	STM-MH-506	Junction	6793.77	6797.96	6793.70	0.00	0.00	40.00	6796.64	0.00	1.32	0 00:00	0.00	0.00
25	D#13	Outfall	6777.00					19.55	6777.00					
26	D-1	Outfall	6811.48					2.28	6812.11					
27	D-4	Outfall	6796.74					12.96	6798.69					
28	STM-FES-602	Outfall	6790.50					26.42	6793.00					
29	STM-INLT-501	Flow Diversions	6797.72	6800.47	6797.72		0.00	0.00	6800.47				0.00	0.00
30	Detention	Storage Node	6790.65	6795.33	6790.65		18019.69	50.81	6795.95				0.00	24.00

Link Summary

SN	Element ID	Element Type	From (Inlet) Node	To (Outlet) Node	Length	Inlet Invert Elevation	Outlet Invert Elevation	Average Slope	Diameter or Height	Manning's Roughness	Peak Flow	Design Flow Capacity	Peak Flow/ Design Flow Ratio	Peak Flow Velocity	Peak Flow Depth	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged	Reported Condition
					(ft)	(ft)	(ft)	(%)	(in)		(cfs)	(cfs)		(ft/sec)	(ft)		(min)	
1	DIV-B-P-201	Pipe	DIV-FES-201	DIV-FES-202	77.09	6811.55	6809.01	3.3000	18.000	0.0130	5.14	19.07	0.27	9.16	0.53	0.35	0.00	Calculated
2	DIV-B-P-204	Pipe	DIV-MH-204	DIV-FES-205	223.69	6803.24	6801.90	0.6000	36.000	0.0130	12.26	51.66	0.24	5.99	0.99	0.33	0.00	Calculated
3	DIV-C--P-302	Pipe	DIV-INLT-302	DIV-MH-204	60.82	6804.71	6804.35	0.5900	30.000	0.0130	10.83	31.56	0.34	5.84	1.01	0.40	0.00	Calculated
4	DUMMY2	Pipe	STM-FES-507	Detention	447.75	6793.35	6790.65	0.6000	0.000	0.0150	39.99	0.00	0.01	0.00	0.78	0.19	0.00	Calculated
5	DUMMY3	Pipe	STM-FES-407	Detention	441.60	6793.07	6790.65	0.5500	0.000	0.0150	14.36	0.00	0.01	0.00	0.78	0.19	0.00	Calculated
6	STM-A-P(1)	Pipe	STM-A-S(2)	Detention	1.07	6791.00	6790.65	32.7100	18.000	0.0130	2.46	60.08	0.04	16.72	0.21	0.14	0.00	Calculated
7	STM-D-P-403	Pipe	STM-FES-403	STM-FES-404	64.00	6800.64	6800.00	0.9900	18.000	0.0130	2.22	10.47	0.21	4.71	0.47	0.31	0.00	Calculated
8	STM-D-P-406	Pipe	STM-FES-406	STM-FES-407	91.95	6793.53	6793.07	0.5000	30.000	0.0130	14.36	58.24	0.25	4.92	0.85	0.34	0.00	Calculated
9	STM-E-P-501	Pipe	STM-INLT-501	STM-MH-502	71.49	6797.72	6797.36	0.5000	18.000	0.0130	0.00	7.43	0.00	0.00	0.00	0.00	0.00	Calculated
10	STM-E-P-502	Pipe	STM-MH-502	STM-MH-503	332.31	6797.36	6795.70	0.5000	18.000	0.0130	0.00	7.43	0.00	0.00	0.00	0.00	0.00	Calculated
11	STM-E-P-503	Pipe	STM-MH-503	STM-MH-504	282.08	6795.45	6794.29	0.4100	12.000	0.0130	0.00	2.52	0.00	0.00	0.00	0.00	0.00	Calculated
12	STM-E-P-504	Pipe	STM-MH-504	STM-MH-505	66.89	6794.29	6793.95	0.5000	18.000	0.0150	0.00	6.44	0.00	0.00	0.00	0.00	0.00	Calculated
13	STM-E-P-505	Pipe	STM-MH-505	STM-MH-506	14.35	6793.88	6793.70	1.2500	18.000	0.0150	0.00	8.04	0.00	0.00	0.00	0.00	0.00	Calculated
14	STM-E-P-506	Pipe	STM-MH-506	STM-FES-507	83.73	6793.77	6793.35	0.5000	36.000	0.0130	39.99	94.34	0.42	6.40	1.36	0.45	0.00	Calculated
15	STM-F-P-601	Pipe	Detention	STM-FES-602	38.38	6790.65	6790.50	0.4000	30.000	0.0130	26.42	25.86	1.02	12.57	2.29	0.92	0.00	> CAPACITY
16	DIV-A-SW-101	Channel	DIV-INLT-101	D-1	387.00	6815.35	6811.48	1.0000	13.920	0.0300	2.28	11.44	0.20	6.42	0.63	0.54	0.00	
17	DIV-B-P-203	Channel	DIV-FES-203	DIV-MH-204	61.35	6805.69	6804.61	1.7700	30.600	0.0320	5.03	148.65	0.03	3.02	0.72	0.28	0.00	
18	DIV-B-SW-205	Channel	DIV-FES-205	D-4	766.20	6801.90	6797.80	0.5400	28.800	0.0320	11.87	164.74	0.07	2.28	0.89	0.37	0.00	
19	DIV-C-SW-301	Channel	DIV--INLT-300	DIV-INLT-302	118.51	6809.13	6805.69	2.9000	14.400	0.0320	0.00	80.73	0.00	0.00	0.00	0.00	0.00	
20	DIV-SW-202	Channel	DIV-FES-202	DIV-FES-203	331.48	6809.01	6805.69	1.0000	48.840	0.0320	5.03	415.78	0.01	3.80	0.78	0.19	0.00	
21	OV/SW502A	Channel	DIV-501A	STM-MH-506	665.00	6800.23	6795.38	0.7300	24.000	0.0320	33.92	89.63	0.38	7.10	1.24	0.62	0.00	
22	OVERLOW	Channel	STM-INLT-501	DIV-501A	57.87	6800.47	6800.23	0.4100	24.000	0.0320	0.00	67.59	0.00	0.00	0.00	0.00	0.00	
23	STM-D-SW-401	Channel	STM-INLT-401	STM-INLT-402	231.95	6804.25	6802.04	0.9500	20.400	0.0320	2.24	40.08	0.06	5.34	0.57	0.34	0.00	
24	STM-D-SW-402	Channel	STM-INLT-402	STM-FES-403	135.86	6802.04	6800.64	1.0300	12.000	0.0320	2.22	8.60	0.26	2.07	0.60	0.60	0.00	
25	STM-D-SW-404	Channel	STM-FES-404	Dummy/405	313.50	6800.00	6796.69	1.0600	12.000	0.0320	2.14	8.71	0.25	2.20	0.59	0.59	0.00	
26	STM-D-SW-405	Channel	Dummy/405	STM-FES-406	240.42	6796.69	6793.51	1.3200	12.000	0.0320	2.11	9.71	0.22	2.27	0.56	0.56	0.00	

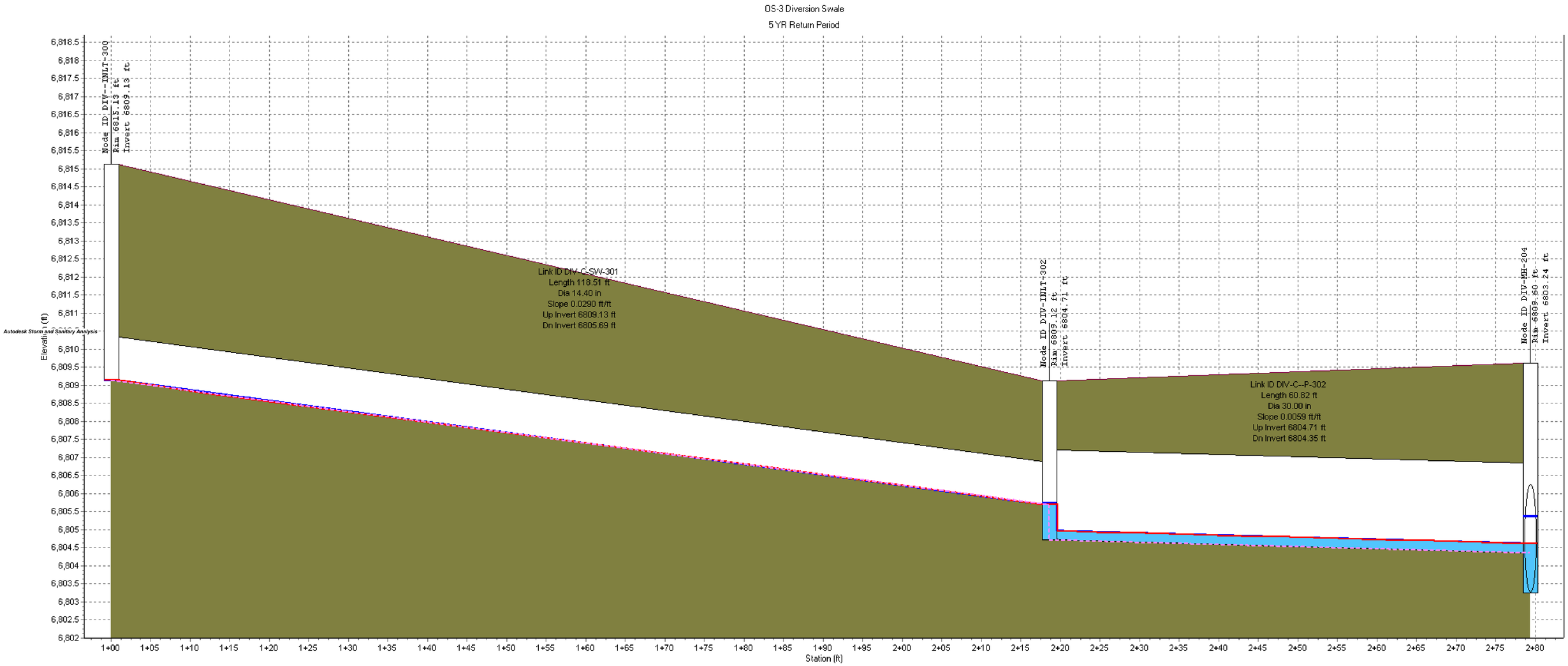
Junction Results

SN	Element ID	Peak Inflow (cfs)	Peak Lateral Inflow (cfs)	Max HGL Elevation Attained (ft)	Max HGL Depth Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Average HGL Elevation Attained (ft)	Average HGL Depth Attained (ft)	Time of Max HGL Occurrence (days hh:mm)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	DIV-501A	38.26	38.26	6801.56	1.33	0.00	0.83	6800.24	0.01	0 00:07	0 00:00	0.00	0.00
2	DIV-FES-201	5.14	5.14	6812.08	0.53	0.00	3.34	6811.56	0.01	0 00:26	0 00:00	0.00	0.00
3	DIV-FES-202	5.14	0.00	6809.79	0.78	0.00	3.29	6809.03	0.02	0 00:26	0 00:00	0.00	0.00
4	DIV-FES-203	5.03	0.00	6806.47	0.78	0.00	3.29	6805.72	0.03	0 00:27	0 00:00	0.00	0.00
5	DIV-FES-205	12.26	0.00	6802.89	1.13	0.00	7.19	6801.93	0.17	0 00:24	0 00:00	0.00	0.00
6	DIV-INLT-101	2.42	2.42	6816.00	0.65	0.00	0.51	6815.36	0.01	0 00:13	0 00:00	0.00	0.00
7	DIV--INLT-300	0.00	0.00	6809.13	0.00	0.00	6.00	6809.13	0.00	0 00:00	0 00:00	0.00	0.00
8	DIV-INLT-302	10.89	10.89	6805.72	1.01	0.00	3.40	6805.69	0.98	0 00:07	0 00:00	0.00	0.00
9	DIV-MH-204	12.29	0.00	6805.36	2.12	0.00	4.24	6804.63	1.39	0 00:07	0 00:00	0.00	0.00
10	Dummy/405	2.14	0.00	6797.28	0.59	0.00	0.41	6796.70	0.01	0 00:15	0 00:00	0.00	0.00
11	Jun-05	1.97	1.97	0.00	0.00	0.00	6.00	0.00	0.00	0 00:00	0 00:00	0.00	0.00
12	STM-A-S(2)	2.46	2.46	6791.21	0.56	0.00	4.21	6791.00	0.35	0 00:13	0 00:00	0.00	0.00
13	STM-FES-403	2.22	0.00	6801.24	0.60	0.00	0.89	6800.65	0.01	0 00:13	0 00:00	0.00	0.00
14	STM-FES-404	2.22	0.00	6800.60	0.60	0.00	0.90	6800.01	0.01	0 00:13	0 00:00	0.00	0.00
15	STM-FES-406	14.43	12.69	6794.38	0.85	0.00	2.03	6793.55	0.02	0 00:14	0 00:00	0.00	0.00
16	STM-FES-407	14.36	0.00	6793.91	0.84	0.00	5.15	6793.08	0.01	0 00:14	0 00:00	0.00	0.00
17	STM-FES-507	39.99	0.00	6794.71	1.36	0.00	4.64	6793.37	0.02	0 00:10	0 00:00	0.00	0.00
18	STM-INLT-401	2.35	2.35	6804.84	0.59	0.00	2.16	6804.26	0.01	0 00:11	0 00:00	0.00	0.00
19	STM-INLT-402	2.24	0.00	6802.64	0.60	0.00	1.10	6802.05	0.01	0 00:12	0 00:00	0.00	0.00
20	STM-MH-502	0.00	0.00	6797.36	0.00	0.00	4.96	6797.36	0.00	0 00:00	0 00:00	0.00	0.00
21	STM-MH-503	0.00	0.00	6795.70	0.00	0.00	3.41	6795.70	0.00	0 00:00	0 00:00	0.00	0.00
22	STM-MH-504	0.00	0.00	6794.29	0.00	0.00	3.48	6794.29	0.00	0 00:00	0 00:00	0.00	0.00
23	STM-MH-505	0.00	0.00	6793.95	0.07	0.00	3.76	6793.95	0.07	0 00:00	0 00:00	0.00	0.00
24	STM-MH-506	40.00	9.07	6796.64	2.87	0.00	1.32	6795.39	1.62	0 00:09	0 00:00	0.00	0.00



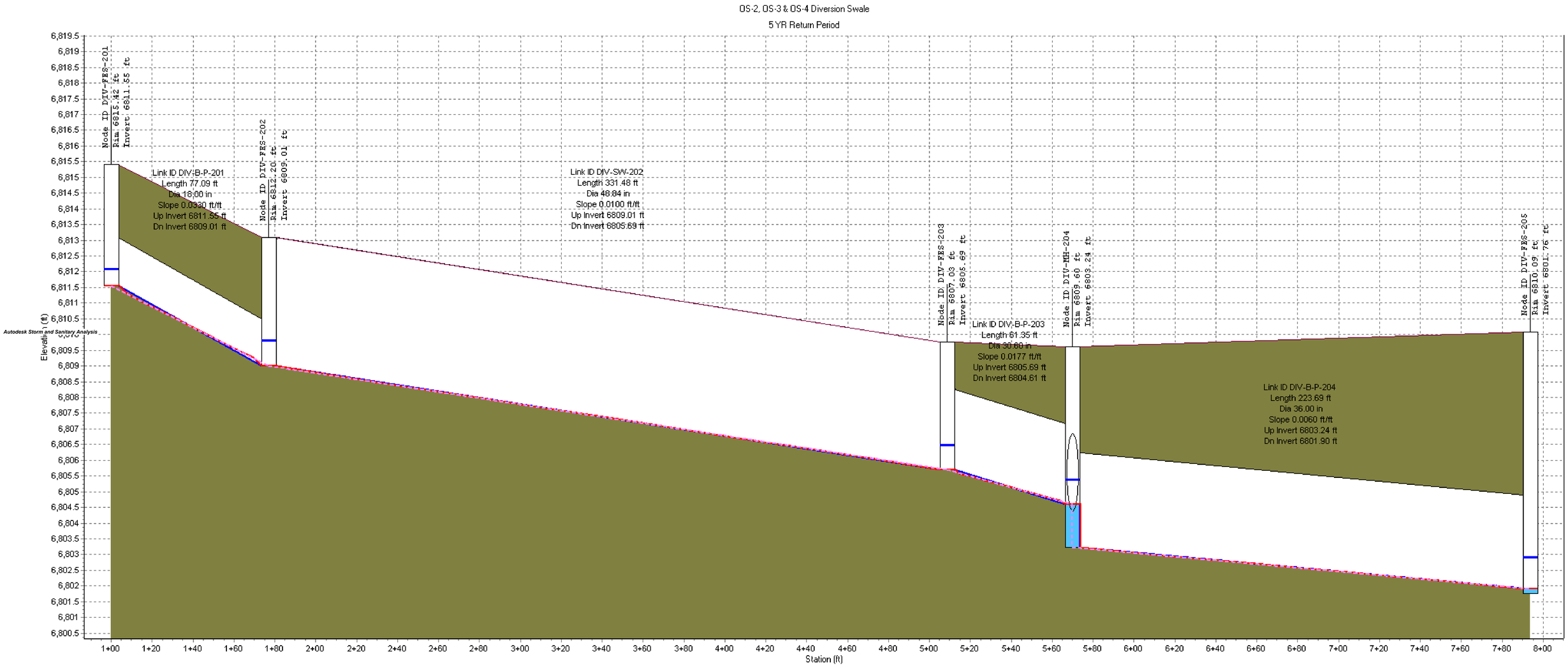
Node ID:	DIV-INLT-101	D-1
Rim (ft):	6816.30	
Invert (ft):	6815.35	6811.48
Min Pipe Cover (ft):	0.00	
Max HGL (ft):	6816.00	6812.11

Link ID:	DIV-A-SW-101
Length (ft):	387.00
Dia (in):	13.92
Slope (ft/ft):	0.0100
Up Invert (ft):	6815.35
Dn Invert (ft):	6811.48
Max Q (cfs):	2.28
Max Vel (ft/s):	6.42
Max Depth (ft):	0.63



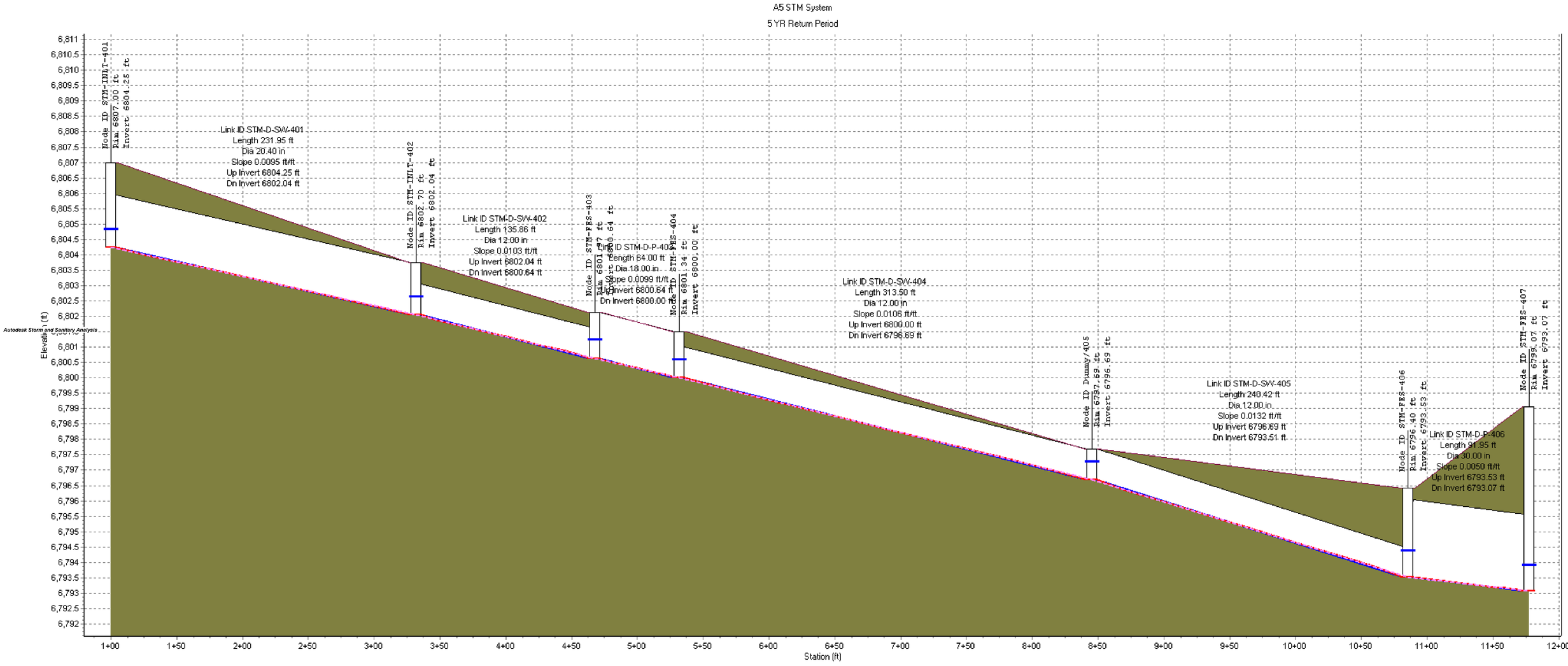
Node ID:	DIV--INLT-300	DIV-INLT-302	DIV-MH-204
Rim (ft):	6815.13	6809.12	6809.60
Invert (ft):	6809.13	6804.71	6803.24
Min Pipe Cover (ft):	4.80	1.91	2.44
Max HGL (ft):	6809.13	6805.72	6805.36

Link ID:	DIV-C-SW-301	DIV-C--P-302
Length (ft):	118.51	60.82
Dia (in):	14.40	30.00
Slope (ft/ft):	0.0290	0.0059
Up Invert (ft):	6809.13	6804.71
Dn Invert (ft):	6805.69	6804.35
Max Q (cfs):	0.00	10.83
Max Vel (ft/s):	0.00	5.84
Max Depth (ft):	0.00	1.01



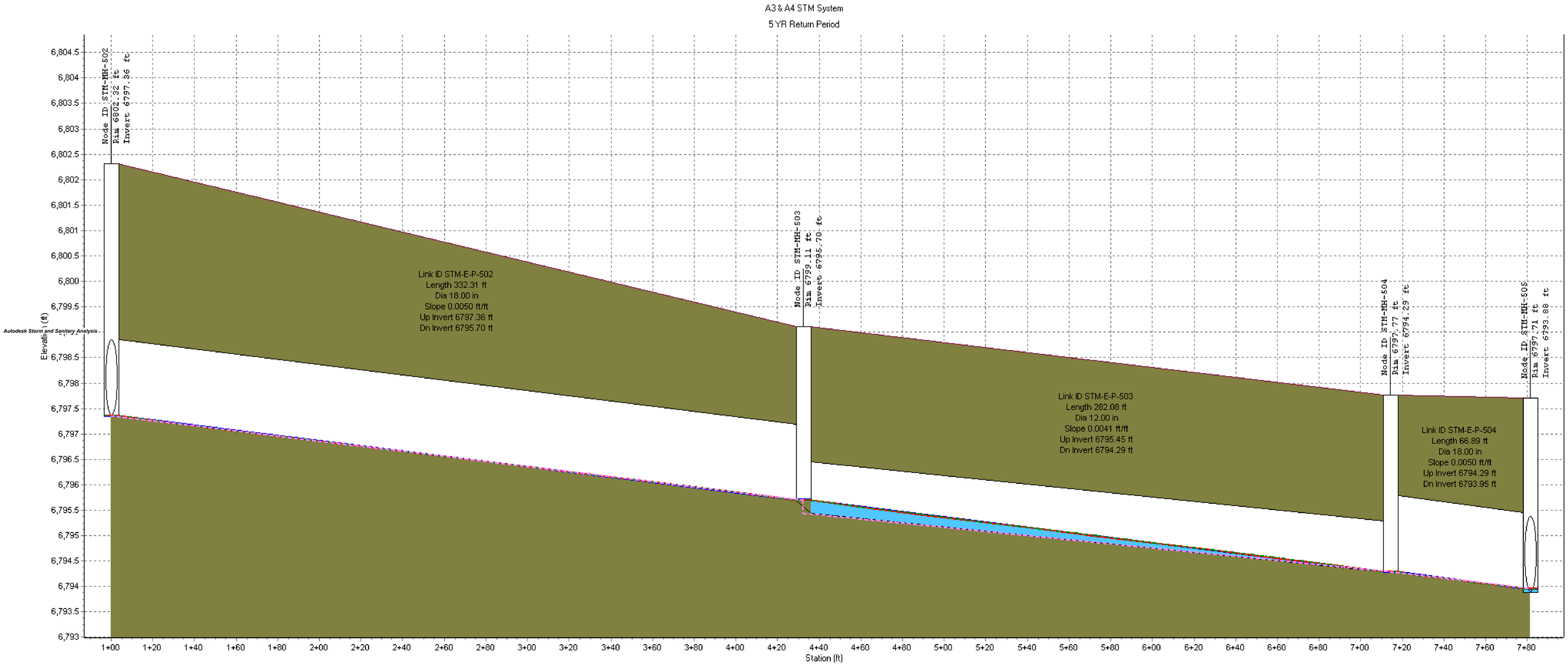
Node ID:	DIV-FES-201	DIV-FES-202	DIV-FES-203	DIV-MH-204	DIV-FES-205
Rim (ft):	6815.42	6812.20	6807.03	6809.60	6810.09
Invert (ft):	6811.55	6809.01	6805.69	6803.24	6801.76
Min Pipe Cover (ft):	2.37	0.00	0.00	2.44	5.19
Max HGL (ft):	6812.08	6809.79	6806.47	6805.36	6802.89

Link ID:	DIV-B-P-201	DIV-SW-202	DIV-B-P-203	DIV-B-P-204
Length (ft):	77.09	331.48	61.35	223.69
Dia (in):	18.00	48.84	30.60	36.00
Slope (ft/ft):	0.0330	0.0100	0.0177	0.0060
Up Invert (ft):	6811.55	6809.01	6805.69	6803.24
Dn Invert (ft):	6809.01	6805.69	6804.61	6801.90
Max Q (cfs):	5.14	5.03	5.03	12.26
Max Vel (ft/s):	9.16	3.80	3.02	5.99
Max Depth (ft):	0.53	0.78	0.72	0.99



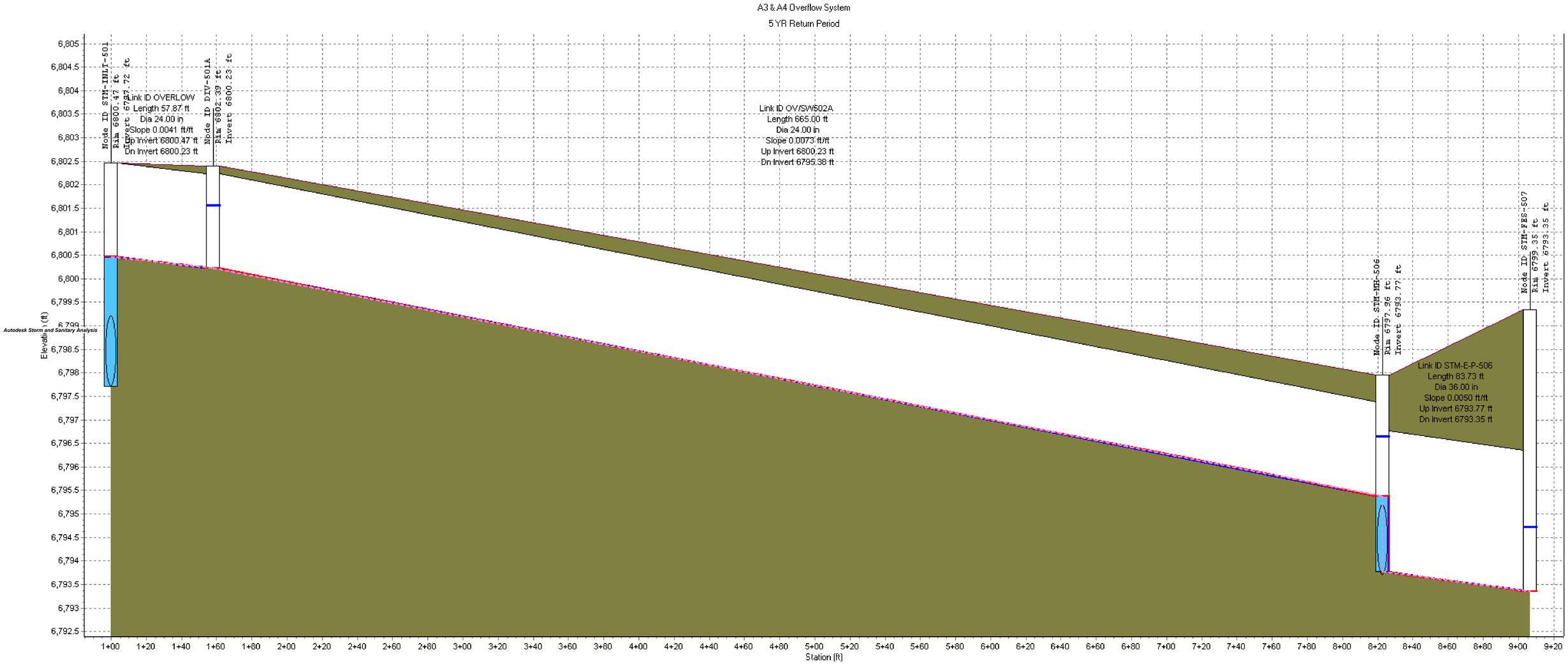
Node ID:		STM-INLT-402	STM-FES-403	STM-FES-404	Dummy/405	STM-FES-406	STM-FES-407
Rim (ft):	6807.00	6802.70	6801.97	6801.34	6797.69	6796.40	6799.07
Invert (ft):	6804.25	6802.04	6800.64	6800.00	6796.69	6793.53	6793.07
Min Pipe Cover (ft):	1.05	0.00	0.00	0.00	0.00	0.37	3.50
Max HGL (ft):	6804.84	6802.64	6801.24	6800.60	6797.28	6794.38	6793.91

Link ID:	STM-D-SW-401	STM-D-SW-402	STM-D-P-403	STM-D-SW-404	STM-D-SW-405	STM-D-P-406
Length (ft):	231.95	135.86	64.00	313.50	240.42	91.95
Dia (in):	20.40	12.00	18.00	12.00	12.00	30.00
Slope (ft/ft):	0.0095	0.0103	0.0099	0.0106	0.0132	0.0050
Up Invert (ft):	6804.25	6802.04	6800.64	6800.00	6796.69	6793.53
Dn Invert (ft):	6802.04	6800.64	6800.00	6796.69	6793.51	6793.07
Max Q (cfs):	2.24	2.22	2.22	2.14	2.11	14.36
Max Vel (ft/s):	5.34	2.07	4.71	2.20	2.27	4.92
Max Depth (ft):	0.57	0.60	0.47	0.59	0.56	0.85



Node ID:	STM-MH-502	STM-MH-503	STM-MH-504	STM-MH-505
Rim (ft):	6802.32	6799.11	6797.77	6797.71
Invert (ft):	6797.36	6795.70	6794.29	6793.88
Min Pipe Cover (ft):	3.46	1.91	1.98	2.26
Max HGL (ft):	6797.36	6795.70	6794.29	6793.95

Link ID:	STM-E-P-502	STM-E-P-503	STM-E-P-504
Length (ft):	332.31	282.08	66.89
Dia (in):	18.00	12.00	18.00
Slope (ft/ft):	0.0050	0.0041	0.0050
Up Invert (ft):	6797.36	6795.45	6794.29
Dn Invert (ft):	6795.70	6794.29	6793.95
Max Q (cfs):	0.00	0.00	0.00
Max Vel (ft/s):	0.00	0.00	0.00
Max Depth (ft):	0.00	0.00	0.00



Node ID:		DIV-501A			STM-MH-506	STM-FES-507
Rim (ft):	6800.47	6802.39			6797.96	6799.35
Invert (ft):	6797.72	6800.23			6793.77	6793.35
Min Pipe Cover (ft):		0.16			0.58	3.00
Max HGL (ft):	6800.47	6801.56			6796.64	6794.71

Link ID:	OVERLOW	OV/SW502A	STM-E-P-506
Length (ft):	57.87	665.00	83.73
Dia (in):	24.00	24.00	36.00
Slope (ft/ft):	0.0041	0.0073	0.0050
Up Invert (ft):	6800.47	6800.23	6793.77
Dn Invert (ft):	6800.23	6795.38	6793.35
Max Q (cfs):	0.00	33.92	39.99
Max Vel (ft/s):	0.00	7.10	6.40
Max Depth (ft):	0.00	1.24	1.36

Subbasin Summary

SN	Subbasin ID	Area (ac)	Weighted Runoff Coefficient	Total Rainfall (in)	Total Runoff (in)	Total Runoff Volume (ac-in)	Peak Runoff (cfs)	Time of Concentration (days hh:mm:ss)
1	A1	2.61	0.8000	0.80	0.64	1.66	17.56	0 00:05:36
2	A2	3.66	0.3700	1.53	0.57	2.07	7.18	0 00:17:18
3	A3	9.72	0.9500	0.87	0.83	8.04	72.38	0 00:06:42
4	A4	2.92	0.9600	1.38	1.33	3.88	16.23	0 00:14:24
5	A5	1.11	0.6700	1.07	0.72	0.80	5.12	0 00:09:18
6	A7	2.63	0.4300	1.31	0.56	1.48	6.82	0 00:13:00
7	A8	1.02	0.6300	1.39	0.87	0.89	3.73	0 00:14:18
8	OS-1	4.46	0.3500	1.30	0.45	2.02	9.47	0 00:12:48
9	OS-2	3.77	0.6600	1.87	1.24	4.66	10.69	0 00:26:06
10	OS-3	5.23	0.6900	1.77	1.22	6.39	16.43	0 00:23:18
11	OS-4	1.59	0.5400	1.70	0.92	1.46	4.07	0 00:21:30
12	OS-5	7.22	0.7900	1.25	0.99	7.16	35.28	0 00:12:12
13	Sub-A6	6.58	0.6500	1.29	0.84	5.53	25.88	0 00:12:54

Node Summary

SN	Element ID	Element Type	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Initial Water Elevation (ft)	Surcharge Elevation (ft)	Ponded Area (ft²)	Peak Inflow (cfs)	Max HGL Elevation Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	DIV-501A	Junction	6800.23	6802.39	6800.23	0.00	0.00	72.38	6802.04	0.00	0.35	0 00:00	0.00	0.00
2	DIV-FES-201	Junction	6811.55	6815.42	6811.55	0.00	0.00	10.69	6812.35	0.00	3.07	0 00:00	0.00	0.00
3	DIV-FES-202	Junction	6809.01	6812.20	6809.01	0.00	0.00	10.67	6810.04	0.00	3.04	0 00:00	0.00	0.00
4	DIV-FES-203	Junction	6805.69	6807.03	6805.69	0.00	0.00	10.49	6806.72	0.00	3.05	0 00:00	0.00	0.00
5	DIV-FES-205	Junction	6801.76	6810.09	6804.09	0.00	0.00	25.16	6803.38	0.00	6.71	0 00:00	0.00	0.00
6	DIV-INLT-101	Junction	6815.35	6816.30	6815.35	0.00	0.00	9.47	6816.43	0.00	0.08	0 00:00	0.00	0.00
7	DIV--INLT-300	Junction	6809.13	6815.13	6809.13	6815.13	0.00	0.00	6809.13	0.00	6.00	0 00:00	0.00	0.00
8	DIV-INLT-302	Junction	6804.71	6809.12	6804.71	0.00	0.00	21.55	6806.23	0.00	2.90	0 00:00	0.00	0.00
9	DIV-MH-204	Junction	6803.24	6809.60	6804.35	0.00	0.00	25.23	6805.86	0.00	3.74	0 00:00	0.00	0.00
10	Dummy/405	Junction	6796.69	6797.69	6796.69	0.00	0.00	4.67	6797.48	0.00	0.21	0 00:00	0.00	0.00
11	Jun-05	Junction	0.00	6.00	0.00	6.00	0.00	7.18	0.00	0.00	6.00	0 00:00	0.00	0.00
12	STM-A-S(2)	Junction	6790.65	6795.41	6790.65	6795.41	0.00	6.82	6791.34	0.00	4.07	0 00:00	0.00	0.00
13	STM-FES-403	Junction	6800.64	6801.97	6800.64	0.00	0.00	4.84	6801.45	0.00	0.69	0 00:00	0.00	0.00
14	STM-FES-404	Junction	6800.00	6801.34	6800.00	0.00	0.00	4.84	6800.80	0.00	0.70	0 00:00	0.00	0.00
15	STM-FES-406	Junction	6793.53	6796.40	6793.53	0.00	0.00	30.26	6794.81	0.00	1.60	0 00:00	0.00	0.00
16	STM-FES-407	Junction	6793.07	6799.07	6793.07	6799.07	0.00	30.11	6794.34	0.00	4.72	0 00:00	0.00	0.00
17	STM-FES-507	Junction	6793.35	6799.35	6793.35	6799.35	0.00	73.76	6795.35	0.00	4.00	0 00:00	0.00	0.00
18	STM-INLT-401	Junction	6804.25	6807.00	6804.25	0.00	0.00	5.12	6805.04	0.00	1.96	0 00:00	0.00	0.00
19	STM-INLT-402	Junction	6802.04	6802.70	6802.04	0.00	0.00	4.89	6802.85	0.00	0.89	0 00:00	0.00	0.00
20	STM-MH-502	Junction	6797.36	6802.32	6797.36	0.00	0.00	0.00	6797.36	0.00	4.96	0 00:00	0.00	0.00
21	STM-MH-503	Junction	6795.70	6799.11	6795.70	0.00	0.00	0.00	6795.70	0.00	3.41	0 00:00	0.00	0.00
22	STM-MH-504	Junction	6794.29	6797.77	6794.29	0.00	0.00	0.00	6794.29	0.00	3.48	0 00:00	0.00	0.00
23	STM-MH-505	Junction	6793.88	6797.71	6793.88	0.00	0.00	0.00	6793.95	0.00	3.76	0 00:00	0.00	0.00
24	STM-MH-506	Junction	6793.77	6797.96	6793.70	0.00	0.00	73.78	6797.09	0.00	0.87	0 00:00	0.00	0.00
25	D#13	Outfall	6777.00					38.45	6777.00					
26	D-1	Outfall	6811.48					9.09	6812.54					
27	D-4	Outfall	6796.74					27.15	6798.97					
28	STM-FES-602	Outfall	6790.50					25.88	6793.00					
29	STM-INLT-501	Flow Diversions	6797.72	6800.47	6797.72		0.00	0.00	6800.47				0.00	0.00
30	Detention	Storage Node	6790.65	6795.33	6790.65		18019.69	96.50	6797.46				0.01	45.00

Link Summary

SN	Element ID	Element Type	From (Inlet) Node	To (Outlet) Node	Length	Inlet Invert Elevation	Outlet Invert Elevation	Average Slope	Diameter or Height	Manning's Roughness	Peak Flow	Design Flow Capacity	Peak Flow/ Design Flow Ratio	Peak Flow Velocity	Peak Flow Depth	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged	Reported Condition
					(ft)	(ft)	(ft)	(%)	(in)		(cfs)	(cfs)		(ft/sec)	(ft)		(min)	
1	DIV-B-P-201	Pipe	DIV-FES-201	DIV-FES-202	77.09	6811.55	6809.01	3.3000	18.000	0.0130	10.67	19.07	0.56	11.10	0.80	0.54	0.00	Calculated
2	DIV-B-P-204	Pipe	DIV-MH-204	DIV-FES-205	223.69	6803.24	6801.90	0.6000	36.000	0.0130	25.16	51.66	0.49	7.27	1.48	0.49	0.00	Calculated
3	DIV-C--P-302	Pipe	DIV-INLT-302	DIV-MH-204	60.82	6804.71	6804.35	0.5900	30.000	0.0130	21.39	31.56	0.68	6.93	1.51	0.60	0.00	Calculated
4	DUMMY2	Pipe	STM-FES-507	Detention	447.75	6793.35	6790.65	0.6000	0.000	0.0150	73.76	0.00	0.03	0.00	1.02	0.25	0.00	Calculated
5	DUMMY3	Pipe	STM-FES-407	Detention	441.60	6793.07	6790.65	0.5500	0.000	0.0150	30.11	0.00	0.03	0.00	1.02	0.25	0.00	Calculated
6	STM-A-P(1)	Pipe	STM-A-S(2)	Detention	1.07	6791.00	6790.65	32.7100	18.000	0.0130	6.82	60.08	0.11	22.54	0.34	0.23	0.00	Calculated
7	STM-D-P-403	Pipe	STM-FES-403	STM-FES-404	64.00	6800.64	6800.00	0.9900	18.000	0.0130	4.84	10.47	0.46	5.81	0.72	0.48	0.00	Calculated
8	STM-D-P-406	Pipe	STM-FES-406	STM-FES-407	91.95	6793.53	6793.07	0.5000	30.000	0.0130	30.11	58.24	0.52	5.99	1.27	0.51	0.00	Calculated
9	STM-E-P-501	Pipe	STM-INLT-501	STM-MH-502	71.49	6797.72	6797.36	0.5000	18.000	0.0130	0.00	7.43	0.00	0.00	0.00	0.00	0.00	Calculated
10	STM-E-P-502	Pipe	STM-MH-502	STM-MH-503	332.31	6797.36	6795.70	0.5000	18.000	0.0130	0.00	7.43	0.00	0.00	0.00	0.00	0.00	Calculated
11	STM-E-P-503	Pipe	STM-MH-503	STM-MH-504	282.08	6795.45	6794.29	0.4100	12.000	0.0130	0.00	2.52	0.00	0.00	0.00	0.00	0.00	Calculated
12	STM-E-P-504	Pipe	STM-MH-504	STM-MH-505	66.89	6794.29	6793.95	0.5000	18.000	0.0150	0.00	6.44	0.00	0.00	0.00	0.00	0.00	Calculated
13	STM-E-P-505	Pipe	STM-MH-505	STM-MH-506	14.35	6793.88	6793.70	1.2500	18.000	0.0150	0.00	8.04	0.00	0.00	0.00	0.00	0.00	Calculated
14	STM-E-P-506	Pipe	STM-MH-506	STM-FES-507	83.73	6793.77	6793.35	0.5000	36.000	0.0130	73.76	94.34	0.78	7.39	2.00	0.67	0.00	Calculated
15	STM-F-P-601	Pipe	Detention	STM-FES-602	38.38	6790.65	6790.50	0.4000	30.000	0.0130	25.88	25.86	1.00	12.62	2.28	0.91	0.00	> CAPACITY
16	DIV-A-SW-101	Channel	DIV-INLT-101	D-1	387.00	6815.35	6811.48	1.0000	13.920	0.0300	9.09	11.44	0.79	8.43	1.06	0.91	0.00	
17	DIV-B-P-203	Channel	DIV-FES-203	DIV-MH-204	61.35	6805.69	6804.61	1.7700	30.600	0.0320	10.49	148.65	0.07	3.63	0.94	0.37	0.00	
18	DIV-B-SW-205	Channel	DIV-FES-205	D-4	766.20	6801.90	6797.80	0.5400	28.800	0.0320	24.50	164.74	0.15	2.59	1.17	0.49	0.00	
19	DIV-C-SW-301	Channel	DIV--INLT-300	DIV-INLT-302	118.51	6809.13	6805.69	2.9000	14.400	0.0320	0.00	80.73	0.00	0.00	0.00	0.00	0.00	
20	DIV-SW-202	Channel	DIV-FES-202	DIV-FES-203	331.48	6809.01	6805.69	1.0000	48.840	0.0320	10.49	415.78	0.03	4.44	1.02	0.25	0.00	
21	OV/SW502A	Channel	DIV-501A	STM-MH-506	665.00	6800.23	6795.38	0.7300	24.000	0.0320	64.39	89.63	0.72	8.82	1.69	0.84	0.00	
22	OVERLOW	Channel	STM-INLT-501	DIV-501A	57.87	6800.47	6800.23	0.4100	24.000	0.0320	0.00	67.59	0.00	0.00	0.00	0.00	0.00	
23	STM-D-SW-401	Channel	STM-INLT-401	STM-INLT-402	231.95	6804.25	6802.04	0.9500	20.400	0.0320	4.89	40.08	0.12	6.48	0.77	0.45	0.00	
24	STM-D-SW-402	Channel	STM-INLT-402	STM-FES-403	135.86	6802.04	6800.64	1.0300	12.000	0.0320	4.84	8.60	0.56	2.52	0.81	0.81	0.00	
25	STM-D-SW-404	Channel	STM-FES-404	Dummy/405	313.50	6800.00	6796.69	1.0600	12.000	0.0320	4.67	8.71	0.54	2.61	0.79	0.79	0.00	
26	STM-D-SW-405	Channel	Dummy/405	STM-FES-406	240.42	6796.69	6793.51	1.3200	12.000	0.0320	4.60	9.71	0.47	2.75	0.75	0.75	0.00	

Junction Results

SN	Element ID	Peak Inflow (cfs)	Peak Lateral Inflow (cfs)	Max HGL Elevation Attained (ft)	Max HGL Depth Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Average HGL Elevation Attained (ft)	Average HGL Depth Attained (ft)	Time of Max HGL Occurrence (days hh:mm)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	DIV-501A	72.38	72.38	6802.04	1.81	0.00	0.35	6800.24	0.01	0 00:06	0 00:00	0.00	0.00
2	DIV-FES-201	10.69	10.69	6812.35	0.80	0.00	3.07	6811.57	0.02	0 00:26	0 00:00	0.00	0.00
3	DIV-FES-202	10.67	0.00	6810.04	1.03	0.00	3.04	6809.04	0.03	0 00:26	0 00:00	0.00	0.00
4	DIV-FES-203	10.49	0.00	6806.72	1.03	0.00	3.05	6805.72	0.03	0 00:27	0 00:00	0.00	0.00
5	DIV-FES-205	25.16	0.00	6803.38	1.62	0.00	6.71	6801.94	0.18	0 00:24	0 00:00	0.00	0.00
6	DIV-INLT-101	9.47	9.47	6816.43	1.08	0.00	0.08	6815.36	0.01	0 00:13	0 00:00	0.00	0.00
7	DIV--INLT-300	0.00	0.00	6809.13	0.00	0.00	6.00	6809.13	0.00	0 00:00	0 00:00	0.00	0.00
8	DIV-INLT-302	21.55	21.55	6806.23	1.52	0.00	2.90	6805.70	0.99	0 00:05	0 00:00	0.00	0.00
9	DIV-MH-204	25.23	0.00	6805.86	2.62	0.00	3.74	6804.64	1.40	0 00:05	0 00:00	0.00	0.00
10	Dummy/405	4.67	0.00	6797.48	0.79	0.00	0.21	6796.70	0.01	0 00:12	0 00:00	0.00	0.00
11	Jun-05	7.18	7.18	0.00	0.00	0.00	6.00	0.00	0.00	0 00:00	0 00:00	0.00	0.00
12	STM-A-S(2)	6.82	6.82	6791.34	0.69	0.00	4.07	6791.00	0.35	0 00:13	0 00:00	0.00	0.00
13	STM-FES-403	4.84	0.00	6801.45	0.81	0.00	0.69	6800.65	0.01	0 00:11	0 00:00	0.00	0.00
14	STM-FES-404	4.84	0.00	6800.80	0.80	0.00	0.70	6800.01	0.01	0 00:11	0 00:00	0.00	0.00
15	STM-FES-406	30.26	25.88	6794.81	1.28	0.00	1.60	6793.55	0.02	0 00:13	0 00:00	0.00	0.00
16	STM-FES-407	30.11	0.00	6794.34	1.27	0.00	4.72	6793.08	0.01	0 00:13	0 00:00	0.00	0.00
17	STM-FES-507	73.76	0.00	6795.35	2.00	0.00	4.00	6793.37	0.02	0 00:08	0 00:00	0.00	0.00
18	STM-INLT-401	5.12	5.12	6805.04	0.79	0.00	1.96	6804.26	0.01	0 00:09	0 00:00	0.00	0.00
19	STM-INLT-402	4.89	0.00	6802.85	0.81	0.00	0.89	6802.05	0.01	0 00:10	0 00:00	0.00	0.00
20	STM-MH-502	0.00	0.00	6797.36	0.00	0.00	4.96	6797.36	0.00	0 00:00	0 00:00	0.00	0.00
21	STM-MH-503	0.00	0.00	6795.70	0.00	0.00	3.41	6795.70	0.00	0 00:00	0 00:00	0.00	0.00
22	STM-MH-504	0.00	0.00	6794.29	0.00	0.00	3.48	6794.29	0.00	0 00:00	0 00:00	0.00	0.00
23	STM-MH-505	0.00	0.00	6793.95	0.07	0.00	3.76	6793.95	0.07	0 00:00	0 00:00	0.00	0.00
24	STM-MH-506	73.78	16.23	6797.09	3.32	0.00	0.87	6795.39	1.62	0 00:08	0 00:00	0.00	0.00

Channel Results

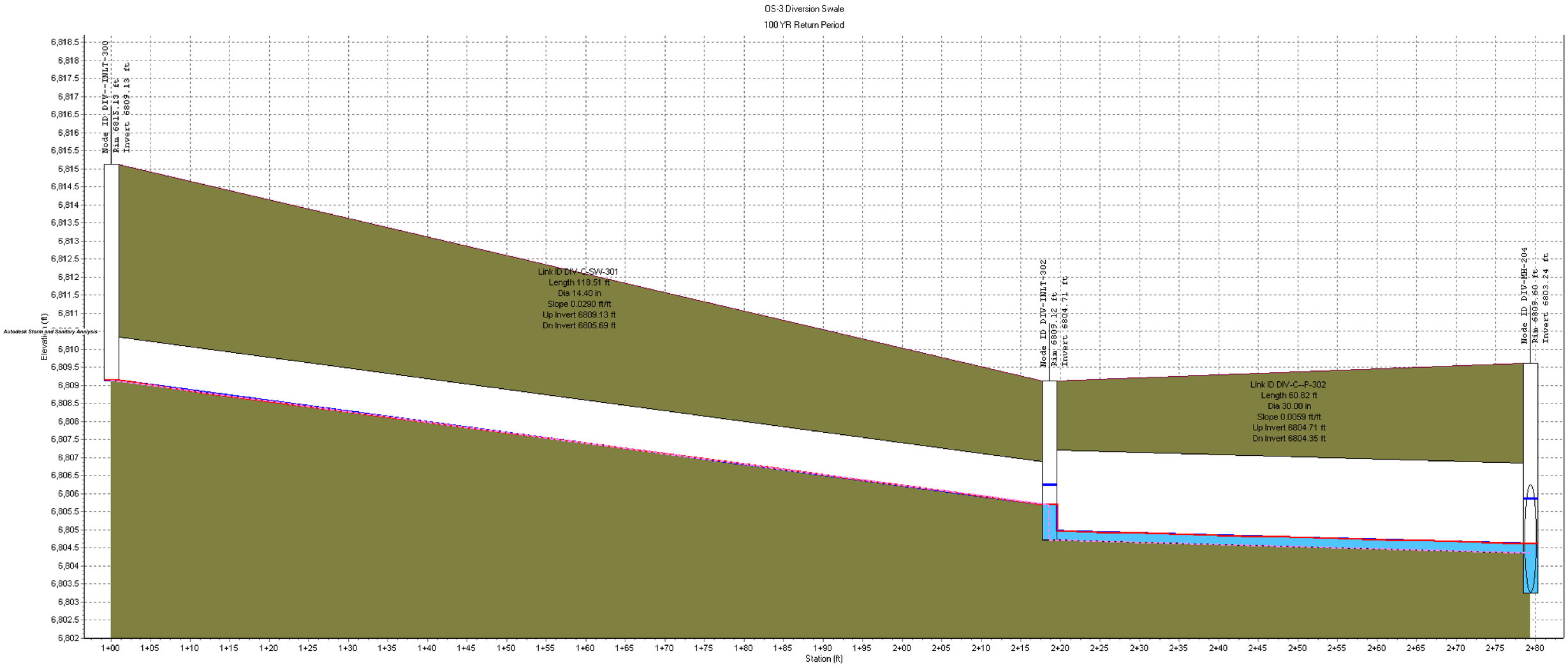
SN	Element ID	Peak Flow (cfs)	Time of Peak Flow Occurrence (days hh:mm)	Design Flow Capacity (cfs)	Peak Flow/ Design Flow Ratio	Peak Flow Velocity (ft/sec)	Travel Time (min)	Peak Flow Depth (ft)	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged (min)	Froude Number	Reported Condition
1	DIV-A-SW-101	9.09	0 00:14	11.44	0.79	8.43	0.77	1.06	0.91	0.00		
2	DIV-B-P-203	10.49	0 00:27	148.65	0.07	3.63	0.28	0.94	0.37	0.00		
3	DIV-B-SW-205	24.50	0 00:29	164.74	0.15	2.59	4.93	1.17	0.49	0.00		
4	DIV-C-SW-301	0.00	0 00:00	80.73	0.00	0.00		0.00	0.00	0.00		
5	DIV-SW-202	10.49	0 00:27	415.78	0.03	4.44	1.24	1.02	0.25	0.00		
6	OV/SW502A	64.39	0 00:08	89.63	0.72	8.82	1.26	1.69	0.84	0.00		
7	OVERLOW	0.00	0 00:00	67.59	0.00	0.00		0.00	0.00	0.00		
8	STM-D-SW-401	4.89	0 00:10	40.08	0.12	6.48	0.60	0.77	0.45	0.00		
9	STM-D-SW-402	4.84	0 00:11	8.60	0.56	2.52	0.90	0.81	0.81	0.00		
10	STM-D-SW-404	4.67	0 00:12	8.71	0.54	2.61	2.00	0.79	0.79	0.00		
11	STM-D-SW-405	4.60	0 00:14	9.71	0.47	2.75	1.46	0.75	0.75	0.00		

Pipe Results

SN	Element ID	Peak Flow (cfs)	Time of Peak Flow Occurrence (days hh:mm)	Design Flow Capacity (cfs)	Peak Flow/ Design Flow Ratio	Peak Flow Velocity (ft/sec)	Travel Time (min)	Peak Flow Depth (ft)	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged (min)	Froude Number	Reported Condition
1	DIV-B-P-201	10.67	0 00:26	19.07	0.56	11.10	0.12	0.80	0.54	0.00		Calculated
2	DIV-B-P-204	25.16	0 00:24	51.66	0.49	7.27	0.51	1.48	0.49	0.00		Calculated
3	DIV-C--P-302	21.39	0 00:05	31.56	0.68	6.93	0.15	1.51	0.60	0.00		Calculated
4	DUMMY2	73.76	0 00:08	0.00	0.03	0.00		1.02	0.25	0.00		Calculated
5	DUMMY3	30.11	0 00:13	0.00	0.03	0.00		1.02	0.25	0.00		Calculated
6	STM-A-P(1)	6.82	0 00:13	60.08	0.11	22.54	0.00	0.34	0.23	0.00		Calculated
7	STM-D-P-403	4.84	0 00:11	10.47	0.46	5.81	0.18	0.72	0.48	0.00		Calculated
8	STM-D-P-406	30.11	0 00:13	58.24	0.52	5.99	0.26	1.27	0.51	0.00		Calculated
9	STM-E-P-501	0.00	0 00:00	7.43	0.00	0.00		0.00	0.00	0.00		Calculated
10	STM-E-P-502	0.00	0 00:00	7.43	0.00	0.00		0.00	0.00	0.00		Calculated
11	STM-E-P-503	0.00	0 00:00	2.52	0.00	0.00		0.00	0.00	0.00		Calculated
12	STM-E-P-504	0.00	0 00:00	6.44	0.00	0.00		0.00	0.00	0.00		Calculated
13	STM-E-P-505	0.00	0 00:00	8.04	0.00	0.00		0.00	0.00	0.00		Calculated
14	STM-E-P-506	73.76	0 00:08	94.34	0.78	7.39	0.19	2.00	0.67	0.00		Calculated
15	STM-F-P-601	25.88	0 00:04	25.86	1.00	12.62	0.05	2.28	0.91	0.00		> CAPACITY

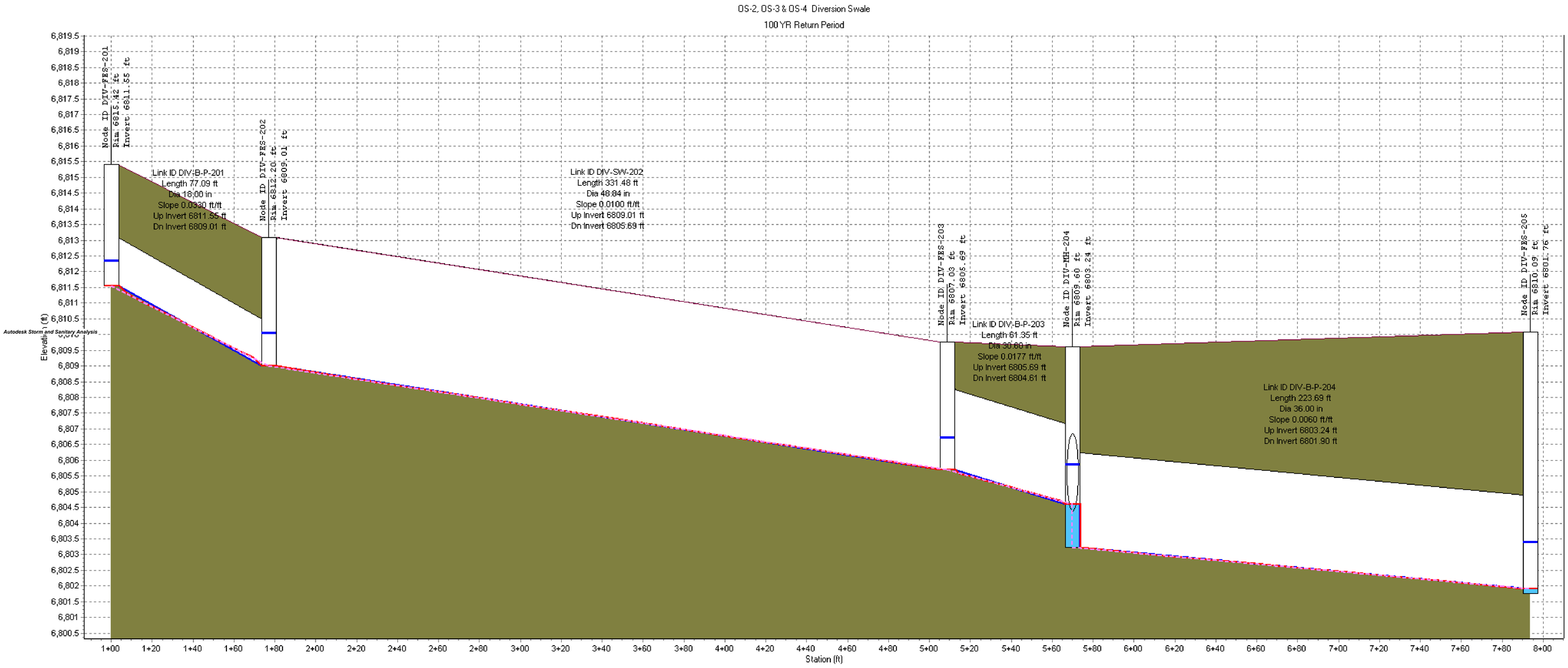
Node ID:	DIV-INLT-101	D-1
Rim (ft):	6816.30	
Invert (ft):	6815.35	6811.48
Min Pipe Cover (ft):	0.00	
Max HGL (ft):	6816.43	6812.54

Link ID:	DIV-A-SW-101
Length (ft):	387.00
Dia (in):	13.92
Slope (ft/ft):	0.0100
Up Invert (ft):	6815.35
Dn Invert (ft):	6811.48
Max Q (cfs):	9.09
Max Vel (ft/s):	8.43
Max Depth (ft):	1.06



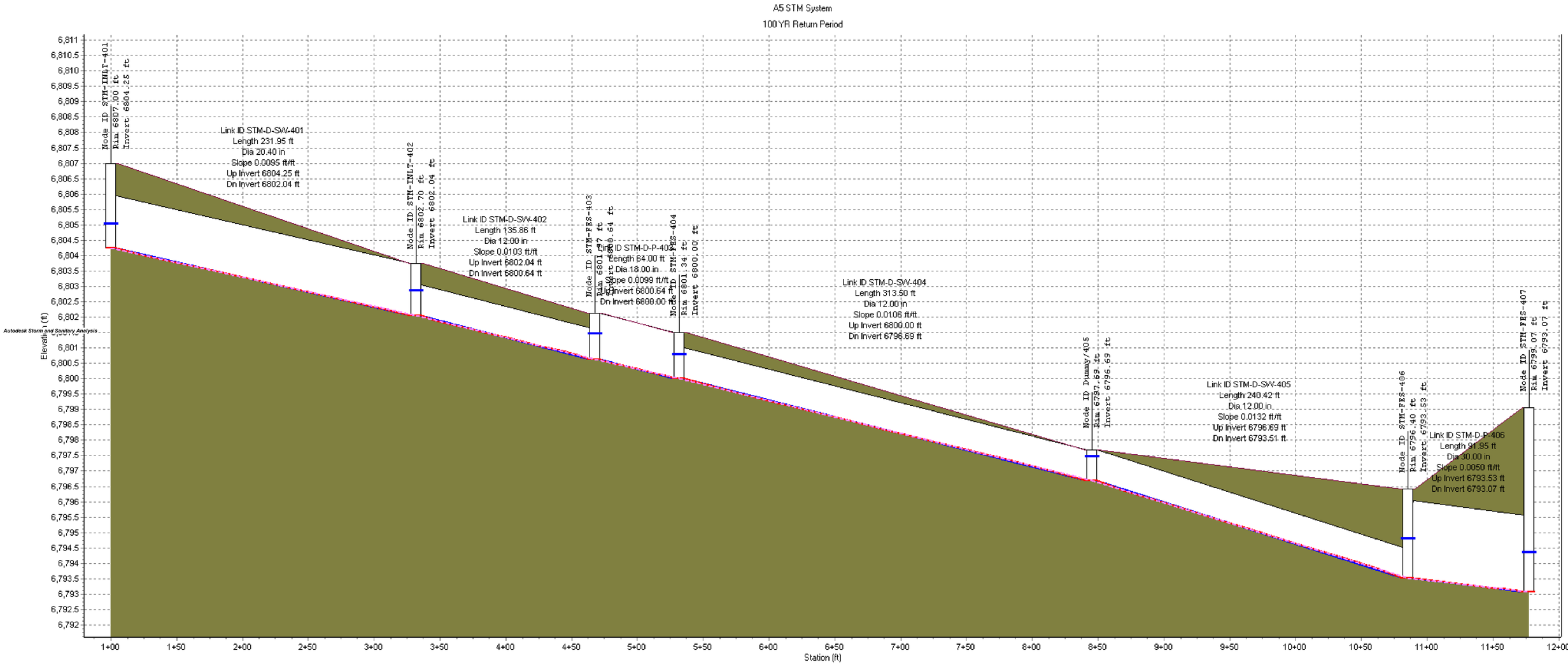
Node ID:	DIV--INLT-300	DIV-INLT-302	DIV-MH-204
Rim (ft):	6815.13	6809.12	6809.60
Invert (ft):	6809.13	6804.71	6803.24
Min Pipe Cover (ft):	4.80	1.91	2.44
Max HGL (ft):	6809.13	6806.23	6805.86

Link ID:	DIV-C-SW-301	DIV-C--P-302
Length (ft):	118.51	60.82
Dia (in):	14.40	30.00
Slope (ft/ft):	0.0290	0.0059
Up Invert (ft):	6809.13	6804.71
Dn Invert (ft):	6805.69	6804.35
Max Q (cfs):	0.00	21.39
Max Vel (ft/s):	0.00	6.93
Max Depth (ft):	0.00	1.51



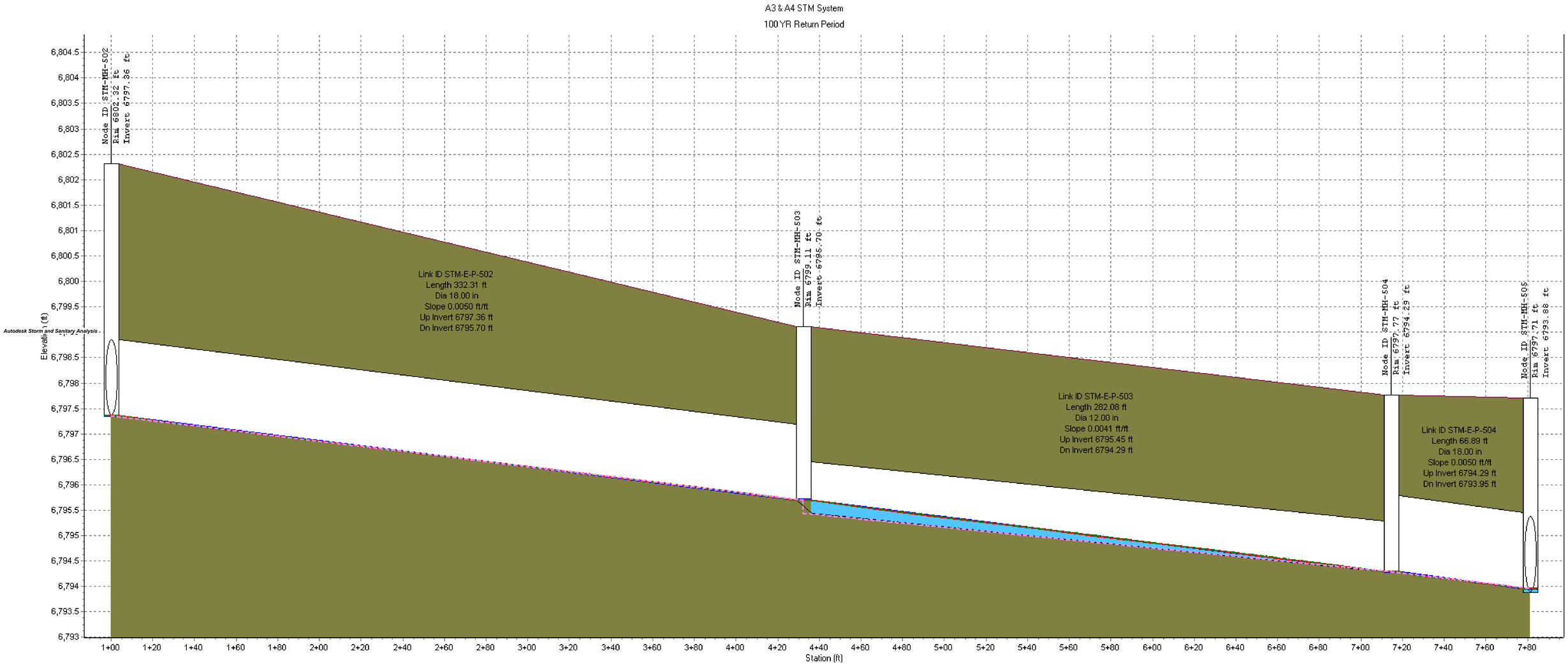
Node ID:	DIV-FES-201	DIV-FES-202	DIV-FES-203	DIV-MH-204	DIV-FES-205
Rim (ft):	6815.42	6812.20	6807.03	6809.60	6810.09
Invert (ft):	6811.55	6809.01	6805.69	6803.24	6801.76
Min Pipe Cover (ft):	2.37	0.00	0.00	2.44	5.19
Max HGL (ft):	6812.35	6810.04	6806.72	6805.86	6803.38

Link ID:	DIV-B-P-201	DIV-SW-202	DIV-B-P-203	DIV-B-P-204
Length (ft):	77.09	331.48	61.35	223.69
Dia (in):	18.00	48.84	30.60	36.00
Slope (ft/ft):	0.0330	0.0100	0.0177	0.0060
Up Invert (ft):	6811.55	6809.01	6805.69	6803.24
Dn Invert (ft):	6809.01	6805.69	6804.61	6801.90
Max Q (cfs):	10.67	10.49	10.49	25.16
Max Vel (ft/s):	11.10	4.44	3.63	7.27
Max Depth (ft):	0.80	1.02	0.94	1.48



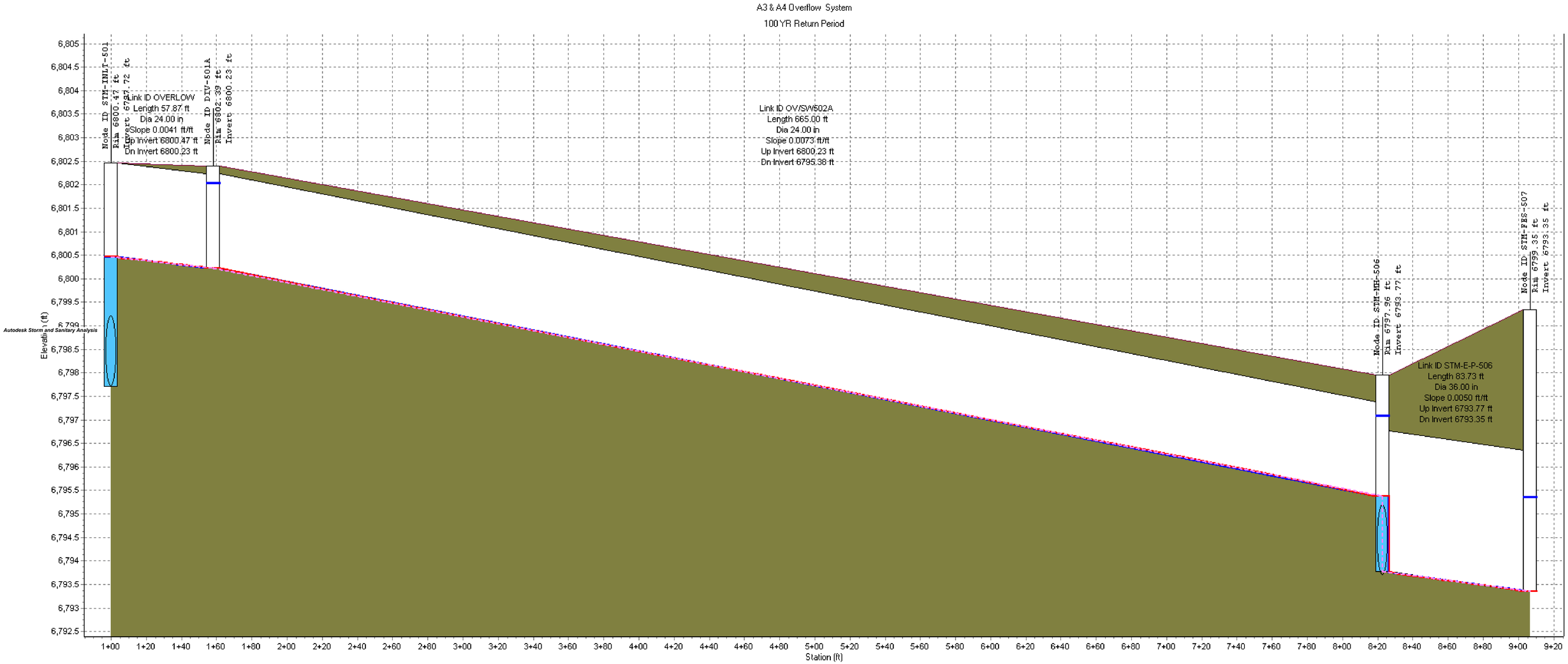
Node ID:		STM-INLT-402	STM-FES-403	STM-FES-404	Dummy/405	STM-FES-406	STM-FES-407
Rim (ft):	6807.00	6802.70	6801.97	6801.34	6797.69	6796.40	6799.07
Invert (ft):	6804.25	6802.04	6800.64	6800.00	6796.69	6793.53	6793.07
Min Pipe Cover (ft):	1.05	0.00	0.00	0.00	0.00	0.37	3.50
Max HGL (ft):	6805.04	6802.85	6801.45	6800.80	6797.48	6794.81	6794.34

Link ID:	STM-D-SW-401	STM-D-SW-402	STM-D-P-403	STM-D-SW-404	STM-D-SW-405	STM-D-P-406
Length (ft):	231.95	135.86	64.00	313.50	240.42	91.95
Dia (in):	20.40	12.00	18.00	12.00	12.00	30.00
Slope (ft/ft):	0.0095	0.0103	0.0099	0.0106	0.0132	0.0050
Up Invert (ft):	6804.25	6802.04	6800.64	6800.00	6796.69	6793.53
Dn Invert (ft):	6802.04	6800.64	6800.00	6796.69	6793.51	6793.07
Max Q (cfs):	4.89	4.84	4.84	4.67	4.60	30.11
Max Vel (ft/s):	6.48	2.52	5.81	2.61	2.75	5.99
Max Depth (ft):	0.77	0.81	0.72	0.79	0.75	1.27



Node ID:	STM-MH-502	STM-MH-503	STM-MH-504	STM-MH-505
Rim (ft):	6802.32	6799.11	6797.77	6797.71
Invert (ft):	6797.36	6795.70	6794.29	6793.88
Min Pipe Cover (ft):	3.46	1.91	1.98	2.26
Max HGL (ft):	6797.36	6795.70	6794.29	6793.95

Link ID:	STM-E-P-502	STM-E-P-503	STM-E-P-504
Length (ft):	332.31	282.08	66.89
Dia (in):	18.00	12.00	18.00
Slope (ft/ft):	0.0050	0.0041	0.0050
Up Invert (ft):	6797.36	6795.45	6794.29
Dn Invert (ft):	6795.70	6794.29	6793.95
Max Q (cfs):	0.00	0.00	0.00
Max Vel (ft/s):	0.00	0.00	0.00
Max Depth (ft):	0.00	0.00	0.00



Node ID:		DIV-501A			STM-MH-506	STM-FES-507
Rim (ft):	6800.47	6802.39			6797.96	6799.35
Invert (ft):	6797.72	6800.23			6793.77	6793.35
Min Pipe Cover (ft):		0.16			0.58	3.00
Max HGL (ft):	6800.47	6802.04			6797.09	6795.35

Link ID:	OVERLOW	OV/SW502A	STM-E-P-506
Length (ft):	57.87	665.00	83.73
Dia (in):	24.00	24.00	36.00
Slope (ft/ft):	0.0041	0.0073	0.0050
Up Invert (ft):	6800.47	6800.23	6793.77
Dn Invert (ft):	6800.23	6795.38	6793.35
Max Q (cfs):	0.00	64.39	73.76
Max Vel (ft/s):	0.00	8.82	7.39
Max Depth (ft):	0.00	1.69	2.00

OS-1_Diversion Swale

Project Description	
Friction Method	Manning Formula
Solve For	Discharge

Input Data	
Roughness Coefficient	0.030
Channel Slope	0.011 ft/ft
Normal Depth	12.0 in
Left Side Slope	3.000 H:V
Right Side Slope	3.000 H:V

Results	
Discharge	9.48 cfs
Flow Area	3.0 ft²
Wetted Perimeter	6.3 ft
Hydraulic Radius	5.7 in
Top Width	6.00 ft
Critical Depth	10.9 in
Critical Slope	0.018 ft/ft
Velocity	3.16 ft/s
Velocity Head	0.16 ft
Specific Energy	1.16 ft
Froude Number	0.788
Flow Type	Subcritical

Swale discharge capacity, note peak inflow equivalent to 9.47 cfs for the 100 year return period.

9.48 > 9.47 cfs

OK

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	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	12.0 in
Critical Depth	10.9 in
Channel Slope	0.011 ft/ft
Critical Slope	0.018 ft/ft

OS-2_Diversion Swale

Project Description	
Friction Method	Manning Formula
Solve For	Discharge

Input Data	
Roughness Coefficient	0.030
Channel Slope	0.011 ft/ft
Normal Depth	30.6 in
Left Side Slope	3.000 H:V
Right Side Slope	3.000 H:V

Results	
Discharge	115.04 cfs
Flow Area	19.5 ft²
Wetted Perimeter	16.1 ft
Hydraulic Radius	14.5 in
Top Width	15.30 ft
Critical Depth	29.6 in
Critical Slope	0.013 ft/ft
Velocity	5.90 ft/s
Velocity Head	0.54 ft
Specific Energy	3.09 ft
Froude Number	0.921
Flow Type	Subcritical

Swale discharge capacity, note peak inflow equivalent to 16.66 cfs for the 100 year return period.

115.04 > 16.66 cfs

OK

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	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	30.6 in
Critical Depth	29.6 in
Channel Slope	0.011 ft/ft
Critical Slope	0.013 ft/ft

OS-2 & OS-3_Diversion Swale

Project Description	
Friction Method	Manning Formula
Solve For	Discharge

Input Data	
Roughness Coefficient	0.030
Channel Slope	0.005 ft/ft
Normal Depth	28.8 in
Left Side Slope	7.500 H:V
Right Side Slope	7.500 H:V

Results	
Discharge	173.22 cfs
Flow Area	43.2 ft²
Wetted Perimeter	36.3 ft
Hydraulic Radius	14.3 in
Top Width	36.00 ft
Critical Depth	24.2 in
Critical Slope	0.013 ft/ft
Velocity	4.01 ft/s
Velocity Head	0.25 ft
Specific Energy	2.65 ft
Froude Number	0.645
Flow Type	Subcritical

Swale discharge capacity, note peak inflow equivalent to 42.10 cfs for the 100 year return period.

173.22 > 42.10 cfs

OK

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	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	28.8 in
Critical Depth	24.2 in
Channel Slope	0.005 ft/ft
Critical Slope	0.013 ft/ft

Provide hydraulic analysis for the swale in basin OS-4.

OS-3_Diversion Swale

Project Description	
Friction Method	Manning Formula
Solve For	Discharge

Input Data	
Roughness Coefficient	0.030
Channel Slope	0.029 ft/ft
Normal Depth	14.4 in
Left Side Slope	3.000 H:V
Right Side Slope	3.000 H:V

Results	
Discharge	25.03 cfs
Flow Area	4.3 ft²
Wetted Perimeter	7.6 ft
Hydraulic Radius	6.8 in
Top Width	7.20 ft
Critical Depth	16.1 in
Critical Slope	0.016 ft/ft
Velocity	5.79 ft/s
Velocity Head	0.52 ft
Specific Energy	1.72 ft
Froude Number	1.319
Flow Type	Supercritical

Swale discharge capacity, note peak inflow equivalent to 24.21 cfs for the 100 year return period.

25.03 > 24.21 cfs

OK

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	14.4 in
Critical Depth	16.1 in
Channel Slope	0.029 ft/ft
Critical Slope	0.016 ft/ft

A-3 & A4 _ Swale

Project Description	
Friction Method	Manning Formula
Solve For	Discharge

Input Data	
Roughness Coefficient	0.030
Channel Slope	0.007 ft/ft
Normal Depth	24.0 in
Left Side Slope	3.000 H:V
Right Side Slope	3.000 H:V
Bottom Width	4.00 ft

Results	
Discharge	95.64 cfs
Flow Area	20.0 ft²
Wetted Perimeter	16.6 ft
Hydraulic Radius	14.4 in
Top Width	16.00 ft
Critical Depth	20.9 in
Critical Slope	0.013 ft/ft
Velocity	4.78 ft/s
Velocity Head	0.36 ft
Specific Energy	2.36 ft
Froude Number	0.754
Flow Type	Subcritical

Swale discharge capacity, note peak inflow equivalent to 73.78 cfs for the 100 year return period.

95.64 > 73.78 cfs

OK

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	(N/A) ft/s
Upstream Velocity	(N/A) ft/s
Normal Depth	24.0 in
Critical Depth	20.9 in
Channel Slope	0.007 ft/ft
Critical Slope	0.013 ft/ft

A-5_Swale

Project Description	
Friction Method	Manning Formula
Solve For	Discharge

Input Data	
Roughness Coefficient	0.030
Channel Slope	0.013 ft/ft
Normal Depth	12.0 in
Left Side Slope	3.000 H:V
Right Side Slope	3.000 H:V

Results	
Discharge	10.38 cfs
Flow Area	3.0 ft²
Wetted Perimeter	6.3 ft
Hydraulic Radius	5.7 in
Top Width	6.00 ft
Critical Depth	11.3 in
Critical Slope	0.018 ft/ft
Velocity	3.46 ft/s
Velocity Head	0.19 ft
Specific Energy	1.19 ft
Froude Number	0.863
Flow Type	Subcritical

Swale discharge capacity, note peak inflow equivalent to 4.67 cfs for the 100 year return period.

10.38 > 4.67 cfs

OK

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	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	12.0 in
Critical Depth	11.3 in
Channel Slope	0.013 ft/ft
Critical Slope	0.018 ft/ft

A grass buffer alone does not provide WQ. Please provide runoff reduction calculations (separate tab in UD-BMP form).

Design Procedure Form: Grass Buffer (GB)

UD-BMP (Version 3.07, March 2018)

Designer: AMB
Company: JVA
Date: January 30, 2023
Project: D49 Transportation Center
Location: South Staff Car Park

1. Design Discharge
   A) 2-Year Peak Flow Rate of the Area Draining to the Grass Buffer — Q_2 = 1.0 cfs

See comments on sheet C1.8

2. Minimum Width of Grass Buffer — W_G = 20 ft

3. Length of Grass Buffer (14' or greater recommended) — L_G = 442 ft

4. Buffer Slope (in the direction of flow, not to exceed 0.1 ft / ft) — S_G = 0.007 ft / ft

5. Flow Characteristics (sheet or concentrated)
   A) Does runoff flow into the grass buffer across the entire width of the buffer? — Choose One: (•) Yes ( ) No
   B) Watershed Flow Length — F_L = 465 ft
   C) Interface Slope (normal to flow) — S_I = 0.030 ft / ft
   D) Type of Flow
   Sheet Flow: $F_L * S_I \leq 1$
   Concentrated Flow: $F_L * S_I > 1$
   CONCENTRATED FLOW

6. Flow Distribution for Concentrated Flows
   Choose One: ( ) None (sheet flow); ( ) Slotted Curbing; ( ) Level Spreader; (•) Other (Explain):
   Majority gravel surface. cross slope runoff to discharge onto grass buffer

7 Soil Preparation
(Describe soil amendment)

8 Vegetation (Check the type used or describe "Other")
   Choose One: (•) Existing Xeric Turf Grass; ( ) Irrigated Turf Grass; ( ) Other (Explain):

9. Irrigation
(*Select None if existing buffer area has 80% vegetation AND will not be disturbed during construction.)
   Choose One: ( ) Temporary; ( ) Permanent; (•) None*

10. Outflow Collection (Check the type used or describe "Other")
   Choose One: ( ) Grass Swale; ( ) Street Gutter; ( ) Storm Sewer Inlet; (•) Other (Explain):
   Sheet flows onto adjacent wetland

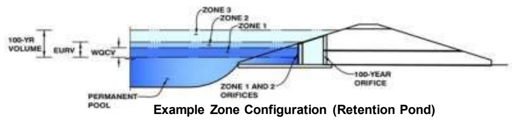
Notes:

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project:

Basin ID:



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	**EDB**	
Watershed Area =	25.64	acres
Watershed Length =	1,521	ft
Watershed Length to Centroid =	760	ft
Watershed Slope =	0.013	ft/ft
Watershed Imperviousness =	79.00%	percent
Percentage Hydrologic Soil Group A =	100.0%	percent
Percentage Hydrologic Soil Group B =	0.0%	percent
Percentage Hydrologic Soil Groups C/D =	0.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

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

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	0.688	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	2.655	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	1.908	acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	2.475	acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	2.930	acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	3.465	acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	3.988	acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	4.596	acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 3.46 in.) =	6.652	acre-feet	3.46	inches
Approximate 2-yr Detention Volume =	1.742	acre-feet		
Approximate 5-yr Detention Volume =	2.266	acre-feet		
Approximate 10-yr Detention Volume =	2.706	acre-feet		
Approximate 25-yr Detention Volume =	3.217	acre-feet		
Approximate 50-yr Detention Volume =	3.516	acre-feet		
Approximate 100-yr Detention Volume =	3.795	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.688	acre-feet
Zone 2 Volume (5-year - Zone 1) =	1.577	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	1.529	acre-feet
Total Detention Basin Volume =	3.795	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

Table 6-2. Rainfall Depths for Colorado Springs

Return Period	1-Hour Depth	6-Hour Depth	24-Hour Depth
2	1.19	1.70	2.10
5	1.50	2.10	2.70
10	1.75	2.40	3.20
25	2.00	2.90	3.60
50	2.25	3.20	4.20
100	2.52	3.50	4.60

Where Z= 6,840 ft/100

Depth Increment = ft

Stage 0 - 6790.65

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	--	--	--	385	0.009		
6791	--	0.35	--	--	--	385	0.009	135	0.003
	--	1.35	--	--	--	6,405	0.147	3,530	0.081
	--	2.35	--	--	--	21,188	0.486	17,326	0.398
	--	3.35	--	--	--	38,544	0.885	47,192	1.083
	--	4.05	--	--	--	50,064	1.149	78,204	1.795
	--	4.35	--	--	--	54,909	1.261	93,950	2.157
	--	4.55	--	--	--	57,947	1.330	105,236	2.416
	--	5.35	--	--	--	68,379	1.570	155,766	3.576
	--	5.55	--	--	--	70,555	1.620	169,659	3.895
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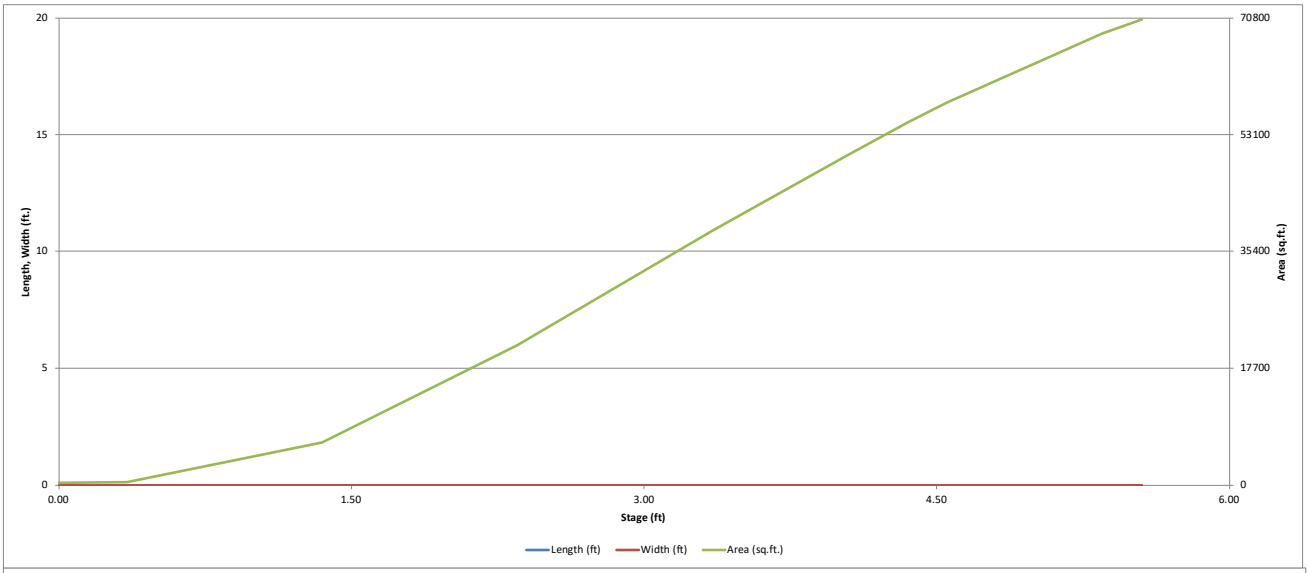
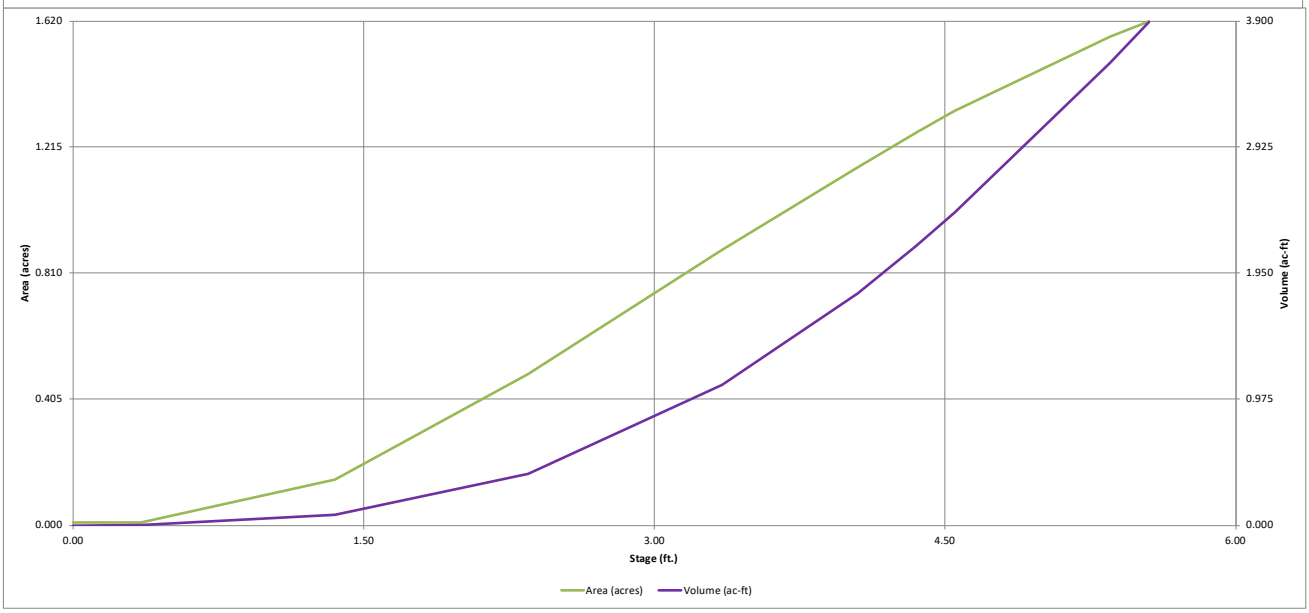
Update as necessary when all basins are accounted for regarding water quality.

Provide the forebay sizing calculation for the EDB which includes the notch width.

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)



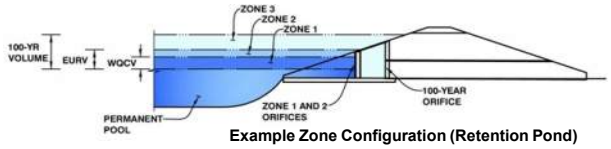


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project:

Basin ID:



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.85	0.688	Orifice Plate
Zone 2 (5-year)	4.44	1.577	Rectangular Orifice
Zone 3 (100-year)	5.49	1.529	Weir&Pipe (Circular)
Total (all zones)		3.795	

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

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

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

			Calculated Parameters for Plate		
Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	1.410E-02	ft^2
Depth at top of Zone using Orifice Plate =	2.85	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	8.60	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	2.03	sq. inches (diameter = 1-5/8 inches)	Elliptical Slot Area =	N/A	ft^2

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	0.70	1.40	2.10				
Orifice Area (sq. inches)	2.03	2.03	2.03	2.03				

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

User Input: Vertical Orifice (Circular or Rectangular)

	Zone 2 Rectangular	Not Selected		Calculated Parameters for Vertical Orif	Zone 2 Rectangular	Not Selected
Invert of Vertical Orifice =	2.86	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	3.25	N/A
Depth at top of Zone using Vertical Orifice =	3.43	N/A	ft (relative to b	oid =	0.50	N/A
Vertical Orifice Height =	12.00	N/A	inches			
Vertical Orifice Width =	39.00		inches			

Update. This is typically greater than zero. Does zero function similar to setting the plate invert to 30". Staff is interpreting 0ft as the outlet pipe being blocked.

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapez

	Zone 3 Weir	Not Selected		Calculated Parameters for Overflow W	Zone 3 Weir	Not Selected
Overflow Weir Front Edge Height, Ho =	3.85	N/A	ft (relative to ba	H_t =	3.85	N/A
Overflow Weir Front Edge Length =	11.33	N/A	feet	gth =	2.91	N/A
Overflow Weir Grate Slope =	0.00	N/A	H:V	ea =	4.67	N/A
Horiz. Length of Weir Sides =	2.91	N/A	feet	ris =	22.95	N/A
Overflow Grate Type =	Type C Grate	N/A		ris =	22.95	N/A
Debris Clogging % =	0%	N/A	%			

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

	Zone 3 Circular	Not Selected		Calculated Parameters for Outlet Pipe w/ Flow Restriction Pla	Zone 3 Circular	Not Selected
Depth to Invert of Outlet Pipe =	0.00	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	4.91	N/A
Circular Orifice Diameter =	30.00	N/A	inches	Outlet Orifice Centroid =	1.25	N/A
				Half-Central Angle of Restrictor Plate on Pipe =	N/A	N/A

User Input: Emergency Spillway (Rectangular or Trapezoidal)

			Calculated Parameters for Spillway		
Spillway Invert Stage=	4.35	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	1.10	feet
Spillway Crest Length =	20.00	feet	Stage at Top of Freeboard =	6.45	feet
Spillway End Slopes =	3.00	H:V	Basin Area at Top of Freeboard =	1.62	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	3.89	acre-ft

n the narrative why you included an predevelopment flows and describe ess and method used to obtain these

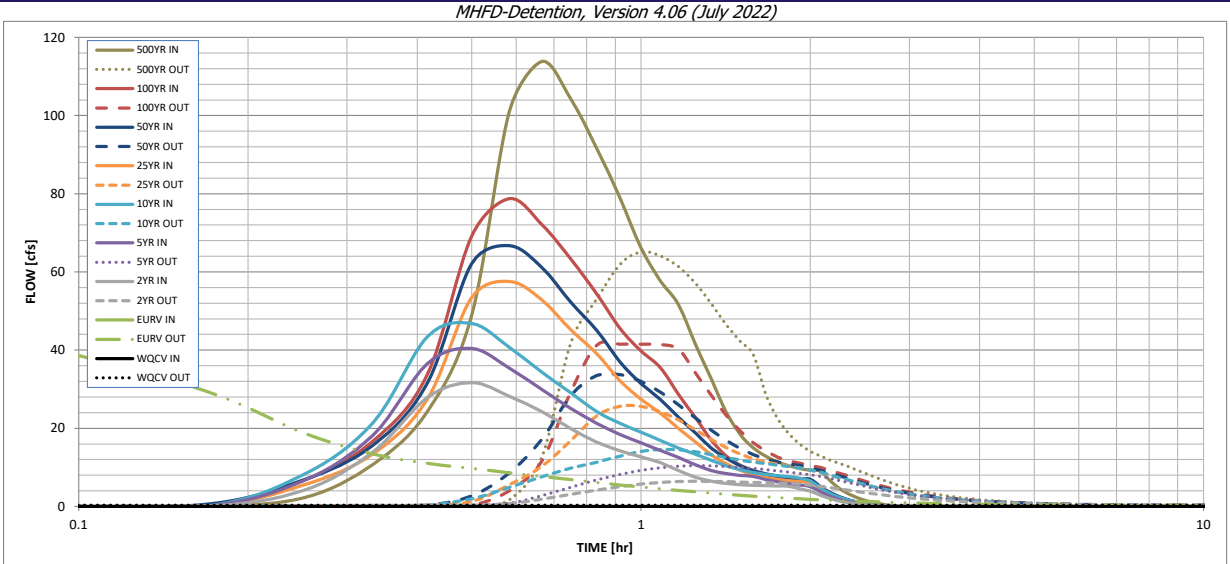
typically left blank and calculated CUHP Predevelopment Peak Q are used.

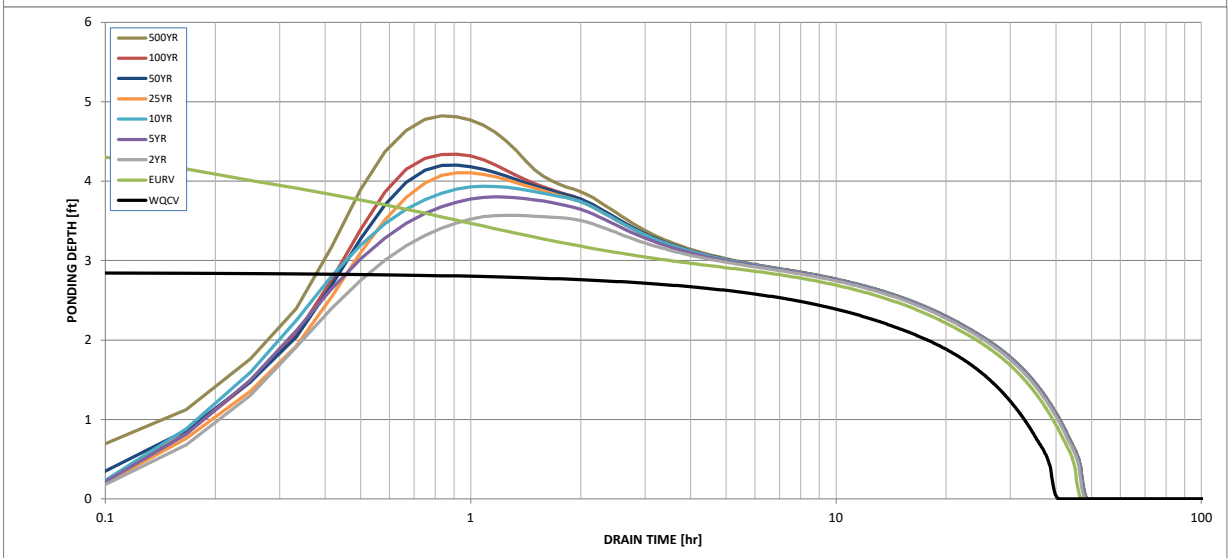
override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AI

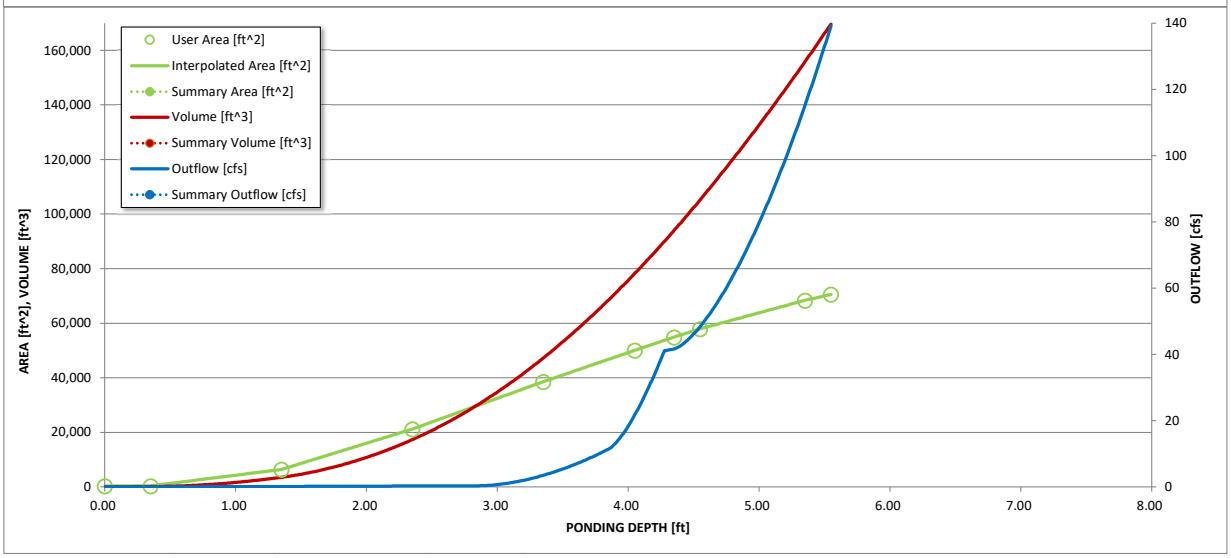
	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
	N/A	1.19	1.50	1.75	2.00	2.25	2.52
	2.655	1.908	2.475	2.930	3.465	3.988	4.596
	N/A	1.908	2.475	2.930	3.465	3.988	4.596
	N/A	0.2	0.3	0.5	4.2	8.4	13.7
	N/A	40.6	58.5	69.8	75.1	88.9	121.0
	N/A	1.58	2.28	2.72	2.93	3.47	4.72
	N/A	31.7	40.4	46.8	57.6	66.7	78.7
	50.9	6.4	10.5	14.6	25.6	33.8	41.5
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	0.2	0.2	0.3	0.4	0.3
Structure Controlling Flow =	Plate	Spillway	Vertical Orifice 1	Vertical Orifice 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1
Max Velocity through Grate 1 (fps) =	N/A	1.10	N/A	N/A	0.1	0.5	0.8	1.1
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	35	36	38	37	36	35	34	32
Time to Drain 99% of Inflow Volume (hours) =	**38**	41	43	42	42	41	41	40
Maximum Ponding Depth (ft) =	2.85	4.73	3.57	3.80	3.93	4.10	4.20	4.34
Area at Maximum Ponding Depth (acres) =	0.69	1.38	0.96	1.05	1.10	1.17	1.20	1.25
Maximum Volume Stored (acre-ft) =	0.691	2.660	1.278	1.520	1.660	1.853	1.960	2.132
WSE (Stage 0 = 6790.65)	6793.500	6795.380	6794.219	6794.452	6794.584	6794.752	6794.849	6794.987

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)







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

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename:

Inflow Hydrographs

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

	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.45	0.04	2.16
	0:15:00	0.00	0.00	3.98	6.47	8.01	5.38	6.68	6.54	10.74
	0:20:00	0.00	0.00	13.94	18.20	21.33	13.42	15.59	16.74	24.25
	0:25:00	0.00	0.00	27.86	36.54	43.39	27.41	31.54	33.70	48.92
	0:30:00	0.00	0.00	31.70	40.42	46.82	53.48	62.16	69.20	101.13
	0:35:00	0.00	0.00	28.17	35.34	40.66	57.58	66.70	78.71	113.88
	0:40:00	0.00	0.00	24.24	29.86	34.31	52.77	61.10	72.06	104.19
	0:45:00	0.00	0.00	19.89	25.06	29.04	45.15	52.18	63.29	91.71
	0:50:00	0.00	0.00	16.48	21.29	24.28	39.15	45.14	54.45	79.03
	0:55:00	0.00	0.00	14.25	18.41	21.25	32.20	36.99	45.61	66.10
	1:00:00	0.00	0.00	12.65	16.25	19.00	27.45	31.47	39.75	57.65
	1:05:00	0.00	0.00	11.17	14.29	16.88	23.84	27.31	35.46	51.51
	1:10:00	0.00	0.00	9.15	12.49	14.92	19.91	22.75	28.57	41.33
	1:15:00	0.00	0.00	7.48	10.61	13.34	16.47	18.75	22.65	32.59
	1:20:00	0.00	0.00	6.44	9.19	11.81	13.15	14.90	16.91	24.17
	1:25:00	0.00	0.00	5.89	8.42	10.36	10.95	12.37	12.96	18.42
	1:30:00	0.00	0.00	5.59	7.97	9.37	9.25	10.43	10.58	14.94
	1:35:00	0.00	0.00	5.43	7.67	8.68	8.14	9.17	9.14	12.82
	1:40:00	0.00	0.00	5.32	6.89	8.19	7.39	8.33	8.15	11.35
	1:45:00	0.00	0.00	5.23	6.27	7.86	6.91	7.78	7.50	10.38
	1:50:00	0.00	0.00	5.17	5.83	7.62	6.57	7.39	7.03	9.69
	1:55:00	0.00	0.00	4.47	5.50	7.24	6.35	7.14	6.72	9.24
	2:00:00	0.00	0.00	3.91	5.09	6.55	6.20	6.97	6.58	9.03
	2:05:00	0.00	0.00	2.85	3.72	4.74	4.54	5.10	4.82	6.62
	2:10:00	0.00	0.00	2.01	2.61	3.33	3.19	3.58	3.40	4.66
	2:15:00	0.00	0.00	1.40	1.82	2.33	2.24	2.51	2.40	3.29
	2:20:00	0.00	0.00	0.96	1.23	1.61	1.54	1.73	1.66	2.27
	2:25:00	0.00	0.00	0.64	0.81	1.08	1.04	1.16	1.11	1.52
	2:30:00	0.00	0.00	0.41	0.54	0.72	0.71	0.79	0.76	1.03
	2:35:00	0.00	0.00	0.24	0.34	0.44	0.45	0.50	0.48	0.65
	2:40:00	0.00	0.00	0.12	0.19	0.23	0.24	0.27	0.26	0.35
	2:45:00	0.00	0.00	0.05	0.08	0.09	0.10	0.11	0.11	0.15
	2:50:00	0.00	0.00	0.01	0.02	0.02	0.02	0.02	0.02	0.03
	2:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

JVA Incorporated
214 8th Street, S 210
Glenwood Springs, CO 81601
Ph: (970) 404 3100

Job Name: D49 Transportation Center
Job Number: 3456c
Date: 1/31/23
By: AMB

RIPRAP PROTECTION DOWNSTREAM OF PIPE OUTLETS (UDFCD VOL 1 - MAJOR DRAINAGE)

Can be used for Froude Parameter (Q/D^2.5) <6.0 This only applies to Circular Pipes

Allowable Velocity
5.5 fps For Erosive Soils
7.7 fps For Erosive Resistant Soils

Lp=(ex factor)(At/yt -D)
At=Q/allowable Velocity
Min Lp= 3D
W = height of culvert or Normal Depth

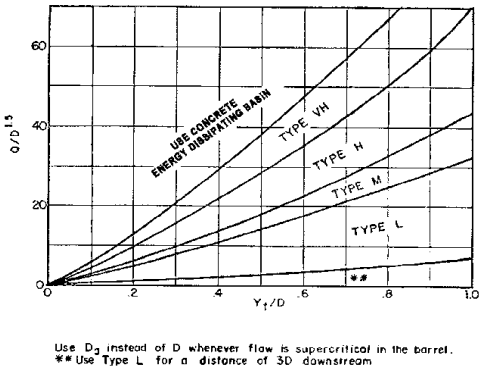
TABLE HS-9

Median (i.e., D_{50}) Size of District's Riprap

Riprap Type	D_{50}—Median Rock Size (inches)
L	9
M	12
H	18
B18	18 (grouted)

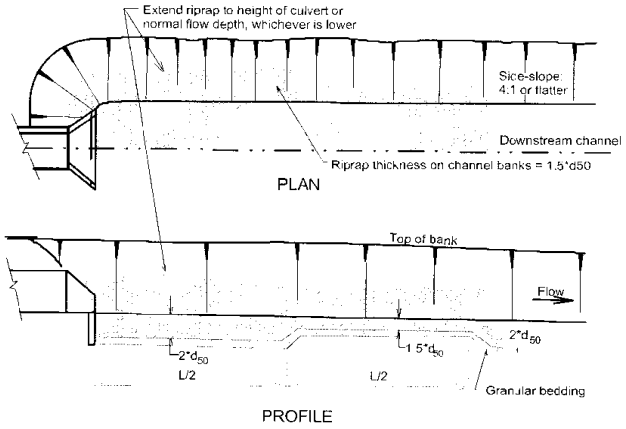
100-year Flow Conditions

Location	Flow Q (cfs)	Diameter D (ft)	Froude Q/D^2.5	V (ft/s)	Yt depth of water at outlet (ft)	Yt/D	Riprap Size (from Fig MD-21)	d50 (in)	Expansion Factor (from MD-23)	Soil Erodibility	At (ft^2)	T (ft)	L (ft)	W (ft)	Total (cf)	Total (cy)
Outfall at Pond	41.5	2.5	4.20	5.3	0.3	0.1	L	9	2.1	Erosive	7.55	1.1	47.6	10.0	535	19.8
Inlet at sub-basin OS-4	25.2	3.0	1.61	7.27	0.3	0.1	L	9	2.1	Erosive	4.57	1.1	25.7	12.0	347	12.9
Inlet at sub-basin A1	10.7	1.5	3.88	11.1	0.3	0.2	L	9	2.1	Erosive	1.94	1.1	10.5	6.0	71	2.6



Use D_3 instead of D whenever flow is supercritical in the barrel.
** Use Type L for a distance of 3D downstream

Figure MD-21—Riprap Erosion Protection at Circular Conduit Outlet Valid for $Q/D^{2.5} \leq 6.0$



NOTES: 1. Headwall with wingwalls or flared end section required at all culvert outlets.
2. Cutoff wall required at end of wingwall aprons and end section. Minimum depth of cutoff wall = 2*d50 or 3-feet, whichever is deeper.
3. Provide joint fasteners for flared end sections.

Figure MD-25—Culvert and Pipe Outlet Erosion Protection

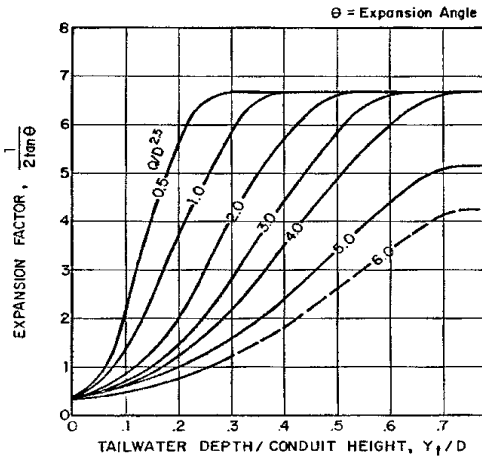


Figure MD-23—Expansion Factor for Circular Conduits

APPENDIX C – FIGURES

DESIGN POINT AND ULTIMATE DISCHARGE LOCATION FOR CATCHMENT OS-1.
Q5 = 2.26 CFS
Q100= 8.82 CFS

DESIGN POINT AND ULTIMATE DISCHARGE LOCATION FOR CATCHMENTS OS-2 & H-1.
Q5 = 21.38 CFS
Q100= 50.26 CFS

RIDGE AT 6797 CONTOUR WHICH PREVENTS OFF-SITE RUNOFF ENTERING SITE

LIMITED INFORMATION AVAILABLE IN THIS AREA. Basins AND IMPERVIOUS CALCULATIONS FROM BEST AVAILABLE INFORMATION, SUCH AS AERIAL PHOTOGRAPHY AND TOPOGRAPHICAL DATABASES (ESRI, GOOGLE). NOT PROVIDED BY TOPOGRAPHICAL SURVEY.

OS-1 | .35 | 4.46

OS-2 | .79 | 3.06

H-1 | .45 | 3.94

H-2 | .48 | 17.09

H-3 | .84 | 8.39

ZONE AE BOUNDARY

FALCON HWY CULVERT CROSSING DESIGN POINT AND ULTIMATE DISCHARGE LOCATION FOR CATCHMENTS OS-3, H-2 & H-3.
Q5 = 58.53 CFS
Q100= 121.02 CFS

FALCON HWY

Delineate all offsite basins draining onto the site. Update runoff calculations to include offsite basin. Unresolved. The runoff identified at DP5 is low. This should include all flows not just site flows. See Falcon DBPS for flows crossing Hwy 24 (MT 3) Swingline (MT 2) and Falcon Highway (MT 1)

SUMMARY TABLE HISTORIC RUNOFF

BASINS	DESIGN POINT	AREA (ACRES)	5-YEAR	100-YEAR
OS-1	1	4.46	2.26	8.82
OS-2	2	3.06	8.36	16.26
OS-3	3	7.08	16.80	32.57
H-1	2	13.94	13.02	34.00
H-2	3	17.09	16.66	41.34
H-3	4	8.39	25.08	47.11
TOTAL (FALCON HWY)	5	32.56	58.53	121.02

DRAINAGE MAP LEGEND

- EXISTING INDEX CONTOUR
- EXISTING INTERMEDIATE CONTOUR
- PROPOSED INDEX CONTOUR
- PROPOSED INTERMEDIATE CONTOUR
- EXISTING SPOT ELEVATION
- PROPOSED SPOT ELEVATION
- HISTORIC DRAINAGE BASIN BOUNDARY (MAJOR BASIN)
- HISTORIC DRAINAGE BASIN BOUNDARY (SUB BASIN)
- DEVELOPED DRAINAGE BASIN BOUNDARY (MAJOR BASIN)
- DEVELOPED DRAINAGE BASIN BOUNDARY (SUB BASIN)
- DIRECTION OF FLOW (HISTORIC)
- DIRECTION OF FLOW (DEVELOPED)
- BASIN DESIGN POINT
- DRAINAGE BASIN IDENTIFICATION BUBBLE

A = DEVELOPED BASIN DESIGNATION
.50 = 100-YR RUNOFF COEFFICIENT
1.0 = AREA ACRES

100 0 100 200
SCALE IN FEET

NOT FOR CONSTRUCTION

RTA ARCHITECTS
19 SOUTH TEJON ST., SUITE 300
COLORADO SPRINGS, CO. 80903
TELE. 719-471-7566
FAX. 719-471-1174
www.rtaarchitects.com

NO.	DATE	DES'D	D'WN	REVISION DESCRIPTION
2	02/01/23	AMB	AMB	RESPONSE TO COUNTY COMMENTS REVIEW #2
1	09/20/22	AMB	AMB	RESPONSE TO COUNTY COMMENTS REVIEW #1

DESIGNED BY:	AMB
DRAWN BY:	AMB
CHECKED BY:	CWK
JOB #:	3456c
DATE:	MAY 23, 2022

D49 TRANSPORTATION CENTER
SCHOOL DISTRICT NO 49

EXISTING CONDITION DRAINAGE MAP

SHEET NO.
FIG 1

J:\3456c\Drawing\Exhibits-Figures\3456c-Existing Drainage Map.dwg, 1/30/2023 - 11:24 AM, AMB

Label all swales and channels on this drainage map so calculations are easily identifiable in the appendix.

We need to know how much disturbed area is untreated and if there are any exclusions that apply to those areas. So please create a basic overview map (or modify an existing drainage map) with color shading/hatching that shows areas tributary to each PBMP (pond, runoff reduction, etc.) and those disturbed areas that are not treated by a PBMP, with the applicable exclusion labeled (ex: 20% up to 1ac of development can be excluded per ECM App I.7.1.C.1 and exclusions listed in ECM App I.7.1.B.#). An accompanying summary table on this map would also be very helpful (example provided):

Basin ID	Total Area (ac)	Total Proposed Disturbed Area (ac)	Area Trib to Pond A (ac)	Disturbed Area Treated via Runoff Reduction (ac)	Area Excluded from WQ per ECM App I.7.1.C.1 (ac)	Area Excluded from WQ per ECM App I.7.1.B.# (ac)	Applic Exclus (App I.
A	4.50	4.50	4.50	-	-	-	
B	1.25	1.25	-	1.00	0.25	-	
C	6.00	4.00	-	-	-	4.00	ECM
D	2.50	2.50	1.00	-	0.50	1.00	ECM
E	3.00	-	3.00	-	-	-	
F	8.25	-	-	-	-	-	
Total	25.50	12.25	8.50	1.00	0.75	5.00	
Comments		[For each row, the sum of the values in Columns 4-7 must be greater than or equal to the value in Column 3 above.]	[Values in this column can be more than Column 3 if over-treating non-disturbed areas.]	See RR calc spreadsheet.	[Total must be <20% of site and <1ac.]		

Unresolved. Provide the sizing calculation for each of the forebays. Recommend using UD-BMP

this portion of the project needs WQ or must fall under an ECM exclusion. All areas must be discussed in the DR text. unresolved.

this portion of the project needs WQ or must fall under an ECM exclusion. Note: runoff reduction can not be within a floodplain unresolved.

this portion of the project needs WQ or must fall under an ECM exclusion. Note: runoff reduction can not be within a floodplain unresolved.

provide hydraulic analysis for the level spreader. The report does not identify the necessary width for the level spreader.

Unresolved. Show design point for combined flow.

Unresolved. Drainage report to include hydraulic analysis of the drainage path from the pond outfall to the suitable outfall location defined in ECM Chapter 3 section 3.2.4. Analysis will likely be to the culvert at Falcon Hwy.

Identify and provide construction plans for necessary offsite improvements so the conveyance is hydraulically adequate.

Provide a narrative explaining your findings on whether or not the drainageway from DP 5 to DP 13 is stable. As stated in an earlier comment the developer in and along a drainageway are required to implement the proper measures to maintain or create stable characteristics of the drainage way.

Update to provide channel hydraulic calculation and label channel and analysis to it is easily identifiable.

Since the grading and drainage plan is diverting flows then channel analysis (highlighted in blue) must be provided to ensure the receiving channel does not have negative impacts to the channel. Offsite improvements may be required to the receiving channel.

Unresolved.

Show the Grass buffer area. The calculation noted 442 LF for the length and it's unclear how this is accomplished. Keep in mind the length is the distance along the sheet flow direction prior to going into the drainage way. Water Quality must be provided before it discharges into the creek.

As noted by MHFD DCM Grass buffer is for LID/Volume Reduction and does not function for WQCV.

Provide the associated runoff reduction worksheet to show that provided the design reduces volume for WQCV down to zero or provide a standard permanent WQ facility.

LIMITED INFORMATION AVAILABLE IN THIS AREA. Basins AND IMPERVIOUS CALCULATIONS FROM BEST AVAILABLE INFORMATION, SUCH AS AERIAL PHOTOGRAPHY AND TOPOGRAPHICAL DATABASES (ESRI, GOOGLE). NOT PROVIDED BY TOPOGRAPHICAL SURVEY.

PROPOSED INLET

CALCULATIONS ASSUME ASPHALT PAVED PARKING AT FULL BUILD-OUT CONDITIONS

PROPOSED EXTENDED DETENTION BASIN

DRAINAGE SWALE TO LEVEL SPREADER DISCHARGE

BASIN A8 DISCHARGES TO PROPOSED GRASS BUFFER

FALCON HWY CULVERT CROSSING DESIGN POINT AND ULTIMATE DISCHARGE LOCATION FOR CATCHMENTS OS-2, OS-3, OS-4, OS-5, A2, A8 & DETENTION BASIN
Q5 = 47.13 CFS
Q100= 118.88 CFS

ZONE AE BOUNDARY

OFF-SITE RUNOFF DISCHARGE POINT INTO THE EXISTING CREEK RUNNING ALONG THE BOUNDARY

IMPERVIOUS CALCULATIONS ACCOUNT FOR FUTURE PARKING LOT CONSTRUCTION

OFF-SITE RUNOFF INTERCEPTED AT THE NEW DEVELOPMENT SITE

EXISTING HWY 24 DITCH WHICH PREVENTS OFF-SITE RUNOFF ENTERING SITE

HWY 24

FALCON HWY

OS-1 .35 | 4.46
OS-2 .66 | 3.52
OS-3 .69 | 5.23
OS-5 .79 | 7.22
A1 .80 | 2.69
A2 .37 | 3.66
A3 .95 | 9.72
A4 .96 | 2.91
A5 .67 | 1.11
A6 .65 | 6.58
A7 .43 | 2.67
A8 .63 | 1.02

Summary Table Developed Runoff

Basins	Design Points	Area (Acres)	5-Year	
OS-2	2	3.52	5.14	
OS-3	3	5.23	8.12	
OS-4	4	1.59	1.76	
OS-5	12	7.22	17.80	
A2	5	3.66	1.97	
A8	11	1.02	1.84	3.73
Detention Basin (Restricted Discharge)	10	22.79	10.50	41.50
Total (Falcon HWY)			47.13	118.88
Existing			58.53	121.02

Summary table is confusing. this seems to be for the individual basins but you are also referencing the design points.

Please provide a summary table for combined flows at the design points Example: DP 4 should show the combined flows from basins OS2, OS3, OS-4 and A1.
DP 5 would be the combined flows from A2 and pond release

DP 13 for the total.

Grass Buffer	
Functions	
LID/Volume Red.	Yes
WQCV Capture	No
WQCV+Flood Control	No
Fact Sheet Includes EURV Guidance	No
Typical Effectiveness for Targeted Pollutants[3]	
Sediment/Solids	Good
Nutrients	Moderate

DEVELOPED DRAINAGE BASIN BOUNDARY (SUB BASIN)
DIRECTION OF FLOW (HISTORIC)
DIRECTION OF FLOW (DEVELOPED)
BASIN DESIGN POINT
DRAINAGE BASIN IDENTIFICATION BUBBLE
A = DEVELOPED BASIN DESIGNATION
.50 = 100-YR RUNOFF COEFFICIENT
1.0 = AREA ACRES
GRAVEL PAVING
PHASE 2 DEVELOPMENT

SCALE IN FEET: 100 0 100 200

NO.	DATE	DES'D	D'WN
3	02/01/23	AMB	AMB
2	09/20/22	AMB	AMB
1		AMB	AMB

REVISION DESCRIPTION
RESPONSE TO COUNTY COMMENTS REVIEW #1
RESPONSE TO COUNTY COMMENTS REVIEW #2

DESIGNED BY: AMB
DRAWN BY: AMB
CHECKED BY: CWK
3456c
AY 23, 2022
VA, INC.

D49 TRANSPORTATION
SCHOOL DIS

PROPOSED DRAINAGE PLAN

SHEET NO.
FIG 2

...\3456c\Drawings\Exhibits-Figures\3456c- Proposed Drainage Plan.dwg, 1/30/2023 - 11:26 AM, AMB