INNOVATIVE DESIGN. **CLASSIC RESULTS.**

PRELIMINARY/FINAL DRAINAGE REPORT
FOR
MONUMENT JUNCTION
(PHASE 1 PD SITE PLAN)

August 2021

Prepared for:
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COLORADO SPRINGS, CO 80921

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PRELIMINARY/FINAL DRAINAGE REPORT FOR MONUMENT JUNCTION – PHASE 1 PD SITE PLAN

DRAINAGE REPORT STATEMENT

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 Town for drainage reports and said report is in conformity with the master plan of the drainage basin. I accept responsibility for any liability caused by any negligent acts, errors, or omissions on my part in preparing this report.

_____ _____
Marc A. Whorton, Colorado P.E. #37155 Date

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

Business Name: CLASSIC COMPANIES

By: _____

Title: _____

Address: 2138 FLYING HORSE CLUB DR.

COLORADO SPRINGS, CO 80921

TOWN OF MONUMENT ONLY:
Filed in accordance with Sections 12.13.010 of the Subdivision Ordinance for the Town of Monument, revised 1997 and 13.11.160 of the Zoning Ordinance for the Town of Monument, revised 1997.

_____ _____
For Town of Monument Date

Conditions:

CLASSIC CONSULTING ENGINEERS & SURVEYORS

PRELIMINARY/FINAL DRAINAGE REPORT FOR MONUMENT JUNCTION – PHASE 1 PD SITE PLAN

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CLASSIC CONSULTING ENGINEERS & SURVEYORS

PURPOSE

This document is the Preliminary/Final Drainage Report for Monument Junction – Phase 1 PD Site Plan. The purpose of this report is to identify the existing drainage patterns, define and detail practical solutions for the conveyance and attenuation of developed flows to minimize drainage impacts on-site and off-site resulting from this development. The drainage improvements proposed in this report remain generally consistent with the previous study prepared for this site, "Master Development Drainage Plan for The Village".

GENERAL DESCRIPTION

The Phase 1 PD Site Plan for Monument Junction consists of approximately 39.84 acres of parks and residential development all located east of Jackson Creek Parkway, in a portion of the Section 14 and a portion of section 23, township 11 south, range 67 west of the 6th principal meridian, in the Town of Monument, County of El Paso, State of Colorado. The site is bounded on the north by State Hwy 105, to the south by existing Bowstring Road, to the west by existing Jackson Creek Parkway and to the east by the existing Village Center at Woodmoor commercial and residential developments. This portion of the overall property represents the first phase of the Monument Junction development.

The average soil condition reflects Hydrologic Group "B" (Tomah-Crowfoot loamy sands) as determined by the "Web Soil Survey of El Paso County Area," prepared by the Soil Conservation Service (see map in Appendix).

EXISTING DRAINAGE CONDITIONS

The site is bisected by two different major drainage basins. The southerly portion of the site is located within the Teachout Drainage Basin with the northerly portion being in the Dirty Woman Creek Drainage Basin. Existing slopes range from 1% to 3% and ground cover is predominantly native grasses with a few trees scattered throughout the site. The current drainage patterns in the Dirty Woman Creek Drainage Basin travel in a westerly direction towards an existing 60" RCP culvert that crosses Jackson Creek Parkway, and eventually to a grated inlet with a 48" RCP culvert that crosses an existing earth berm along the I-25 exit ramp. The current drainage patterns in the Teachout Drainage Basin travel in a southwesterly direction to existing roadside ditches along Bowstring Road and Jackson Creek Parkway. Once the flows reach the sideroad ditch along Jackson Creek Parkway, they then travel in a southerly direction.

Various existing developments along the easterly property line release developed flows directly onto this site. The land uses for these adjacent properties include various residential uses and commercial/office uses along with a church site. These off-site flows are represented by Basins OS-1 through OS-7C. Some of these basins release untreated developed flows directly on-site (Basins OS-1, OS-2 and OS-6 – OS-7C), while others are routed through a pond facility prior to entering the property (Basins OS-3 – OS-5). Another significant source of off-site flow that directly enters the property at the southeast corner is the release of the Village Center at Woodmoor Pond #3. This facility detains and treats a large acreage of the Village Center at Woodmoor property to the east and then releases stormwater flows onto the property just north of White Marble Dr. The Village Center at Woodmoor development was studied as a part of the Drainage Analysis Addendum No. 2 Village Center at Woodmoor," prepared by Classic Consulting Engineers and Surveyors (CCES), approved August 2007 and the "Drainage Letter Amendment for the Drainage Analysis Addendum Village Center at Woodmoor" by CCES, approved October 2010. Existing Detention Pond 3 is a detention facility that was constructed in 2008. This facility was enlarged to provide over detention to reduce the release rate from contributing basins and help the town address the pre-existing downstream erosion conditions. The release of this facility currently sheet flows across the southeast corner of the property and travels towards the existing sideroad ditch along the north side of Bowstring Drive. Bowstring Dr. and the adjacent lots served by this roadway are not within the Town of Monument. This roadway is owned and maintained by El Paso County. These off-site flows are then conveyed in a southwesterly direction in this El Paso County sideroad ditch within the Bowstring Dr. public Right-of-Way. As Bowstring Dr. curves and heads south, these flows then enter the sideroad ditch along the east side of Jackson Creek Pkwy. The exact quantity of these off-site flows from the existing Woodmoor Pond #3 are not described in this report as they are just a pass through and an existing off-site condition that the Monument Junction development will continue to allow and provide the adequate corridor to convey these flows.

The following basins describe both off-site and on-site predevelopment conditions. At the time of the writing of this report, existing drainage reports for these various off-site developments were not available from the Town of Monument. It is assumed that the existing detention facilities mentioned below adhere to the Town of Monument design standards to release historic flows from these facilities. The off-site basin runoff coefficient values and quantities were determined based on recent site visits and applying the current Town of Monument drainage criteria.

Basin OS-1 (Q_5= 5 cfs, Q_{100}= 12 cfs) consists of both developed and undeveloped conditions from the adjacent Trinity Lutheran Church property. This basin is made up of the existing church building and parking lots along with

the large undeveloped field at the west side of the property. The building and parking areas are conveyed directly into the native field area via curb cuts and then sheets flows in a southwesterly direction towards the Monument Junction property. Based on a recent field visit, there is no evidence of any detention or stormwater quality provided on this site.

Basin OS-2 (Q_5= 0.5 cfs, Q_{100}= 1 cfs) consists of a small portion of the Monument Villas Townhome development including mainly landscaping. These developed flows sheet flow directly onto the Monument Junction property. The majority of this off-site development is captured in two separate ponds that will be described later as they release flows from off-site basins OS-4 and OS-5.

Basin OS-3 (Q_5= 4 cfs, Q_{100}= 11 cfs) consists of a developed basin within the Valley Vista Estates subdivision that includes several retail lots, portion of an office/warehouse development and a public road (Cipriani Loop). Based on a recent site visit, the retail lots seem to provide detention/stormwater quality on their properties prior to release. The total developed off-site flows in this basin are then routed through the existing pond notated as "existing pond #1" at the northeast corner of the property prior to entering the Monument Junction property.

Basin OS-4 (Q_5= 0.9 cfs, Q_{100}= 6 cfs) consists of a developed basin within the northern half of the Monument Villas Townhome subdivision. The developed flows within this basin are conveyed to a facility notated as "existing pond #2" just south of the previously mentioned pond #1 at the northeast corner of the property. This facility appears to provide detention and stormwater quality for this portion of the subdivision. The release from this facility then directly enters the Monument Junction property.

Basin OS-5 (Q_5= 1.2 cfs, Q_{100}= 8 cfs) consists of a developed basin within the southern half of the Monument Villas Townhome subdivision. The developed flows within this basin are conveyed to a facility notated as "existing pond #3" near the northeast corner of the property. This facility appears to provide detention and stormwater quality for this portion of the subdivision. The release from this facility then directly enters the Monument Junction property.

Basin OS-6 (Q_5= 1 cfs, Q_{100}= 3 cfs) consists of a small portion of the Village Center at Woodmoor residential development including portions of rooftops and mainly rear yards and landscaping. These developed flows then sheet flow directly onto the Monument Junction property.

Basin OS-7A (Q_5= 0.7 cfs, Q_{100}= 2 cfs) consists of a small southerly portion of the Village Center at Woodmoor residential development including portions of rooftops, rear yards and landscaping. These developed flows then sheet flow directly onto the Monument Junction property.

Basin OS-7B (Q_5= 0.2 cfs, Q_{100}= 1 cfs) consists of a small portion of the Village Center at Woodmoor park and pond area including landscaping and local trails. These developed flows then sheet flow directly onto the Monument Junction property.

Basin OS-7C (Q_5= 2 cfs, Q_{100}= 4 cfs) consists of a portion of the Village Center at Woodmoor Filing No. 1 residential development including portions of rooftops, front yards and White Marble Dr. roadway. These developed flows sheet flow into the roadway and then travel as curb and gutter flow towards the Monument Junction property. These untreated developed flows enter the property just south of the existing Village Center at Woodmoor pond #3 at the termination of White Marble Dr. These flows then combine with the flows from the release of pond #3 and sheet flow across the Monument Junction property towards the sideroad ditch along Bowstring Dr. as mentioned earlier.

Basin EX1 (Q_5= 4 cfs, Q_{100}= 26 cfs) consists of all the undeveloped on-site property within the Dirty Women Creek drainage basin. These flows travel as sheet flow in a westerly direction towards the sideroad ditch along Jackson Creek Pkwy. and ultimately to the existing 60" RCP culvert crossing the roadway.

Basin EX2 (Q_5= 4 cfs, Q_{100}= 29 cfs) consists of all the undeveloped on-site property within the Teachout Creek drainage basin. These flows travel as sheet flow in a southwesterly direction towards the sideroad ditch along Bowstring Dr. and Jackson Creek Pkwy. Upon these flows entering the sideroad ditch along Jackson Creek Pkwy., they are conveyed in a southerly direction off-site.

Basin OS-8 (Q_5= 1.6 cfs, Q_{100}= 5 cfs) consists of the off-site property within the existing Right-of-Way for Jackson Creek Pkwy within the Dirty Women Creek drainage basin. Portions of this basin include the existing paved roadway. These flows travel as sideroad ditch flows conveyed in a southerly direction towards the existing 60" RCP culvert crossing the roadway.

Basin OS-9 (Q_5= 0.4 cfs, Q_{100}= 3 cfs) consists of the off-site property within the existing Right-of-Way for Jackson Creek Pkwy within the Teachout Creek drainage basin. Portions of this basin include the existing paved roadway. These flows travel as sideroad ditch flows conveyed in a southerly direction.

Design Point H1 (Q_5= 14 cfs, Q_{100}= 59 cfs) consists of the total on-site and off-site predevelopment flows within the Dirty Women Creek drainage basin. These flows are then captured by the existing 60" RCP culvert crossing Jackson Creek Pkwy. Based on a recent site visit, there is no evidence of flows overtopping the roadway and thus this existing facility seems to handle the predevelopment flows adequately.

Design Point H2 (Q_5= 5 cfs, Q_{100}= 32 cfs) consists of the total on-site and off-site predevelopment flows within the Teachout Creek drainage basin except the release from Village Center at Woodmoor Pond #3. As mentioned previously, the release from this facility is conveyed across the southeast corner of the property and then enters the sideroad ditch along Bowstring Dr. until further downstream being conveyed into the sideroad ditch along Jackson Creek Pkwy., which is at this point off of the Monument Junction property. The on-site predeveloped flows sheet flow across the site towards the sideroad ditch east of Jackson Creek Pkwy. This ditch then conveys these flows further south off property.

PROPOSED DRAINAGE CONDITIONS

Developed runoff from the Monument Junction Phase 1 PD Site Plan community will be conveyed via surface drainage and public storm sewer systems to a permanent storm water quality facility located on-site at the southwest corner. All proposed facilities will be designed and installed per the latest Town of Monument drainage criteria and detailed in this report. See the following general descriptions of the anticipated developed design points and how all on and off-site developed flows will be mitigated:

Design Point 1 (Q_5= 5 cfs, Q_{100}= 17 cfs) consists of off-site flows from Basins OS-3, OS-4 and a portion of OS-2. The point discharges from the existing ponds #1 and #2 and sheet flows from a portion of Basin OS-2 release onto the property where these flows will be conveyed via proposed ditch to Design Point 1. At this location a proposed 24" RCP will completely collect these off-site flows and route them to the on-site public storm system.

Design Point 2 (Q_5= 1 cfs, Q_{100}= 8 cfs) consists of off-site flows from Basin OS-5. The point discharge from the existing pond #3 release onto the property at this location where a proposed 24" RCP will completely collect these off-site flows and route them to the on-site public storm system.

Design Point 3 (Q_5= 7 cfs, Q_{100}= 16 cfs) consists of off-site flows from the remaining portion of Basin OS-2, approximately 50% of Basin OS-1 and Basin A. The developed flows will be conveyed into the street where they travel as curb and gutter flow towards Design Point 3. At this location, an 8' D-10-R sump inlet will collect all of the 5-yr. flows and approximately 50% of the 100-yr. flows. The uncaptured 100-yr. flows will overtop the crown of the roadway near the intersection and enter Basin G1 where they will be collected further downstream. A proposed 24" RCP will convey the collected flows and route them to the downstream public storm system. The downstream public storm system is a proposed 30" RCP and represented by Pipe Run 5.

Design Point 4 (Q_5= 3 cfs, Q_{100}= 16 cfs) consists of the uncollected 100-yr. developed flows bypassing Design Point 3 and Basin G1. These developed flows will be conveyed into the street where they travel as curb and gutter flow towards Design Point 4. At this location, an 8' D-10-R at-grade inlet will collect all of the 5-yr. flows and 52% of the 100-yr. flows. The uncaptured 100-yr. flows will bypass this facility and be conveyed further downstream towards Design Pont 5. The collected flows are routed via an 18" RCP towards the downstream public storm system. The downstream public storm system remains a proposed 30" RCP and represented by Pipe Run 7.

Design Point 5 (Q_5= 2 cfs, Q_{100}= 13 cfs) consists of uncollected 100-yr. developed flows bypassing Design Point 4 and Basin G2. The developed flows from Basin G2 will be conveyed into the street where they travel as curb and gutter flow towards Design Point 5. At this location, an 8' D-10-R sump inlet will completely collect both the 5-yr. and 100-yr. flows. The collected flows are routed via a 24" RCP towards the downstream public storm system.

Design Point 6 (Q_5= 5 cfs, Q_{100}= 11 cfs) consists of developed flows from Basins B and H. These developed flows will be conveyed into the street where they travel as curb and gutter flow towards Design Point 6. At this location, a 6' D-10-R sump inlet will completely collect both the 5-yr. and 100-yr. flows. The collected flows are then routed via a 24" RCP towards the downstream public storm system. The downstream public storm system is a proposed 36" RCP and represented by Pipe Run 10.

Design Point 7 (Q_5= 5 cfs, Q_{100}= 13 cfs) consists of developed flows from Basin N1. These developed flows will be conveyed into the street where they travel as curb and gutter flow towards Design Point 7. At this location, a 6'

D-10-R sump inlet will completely collect both the 5-yr. and 100-yr. flows. The collected flows are routed via a 24" RCP towards the downstream public storm system.

Design Point 8 (Q_5= 1 cfs, Q_{100}= 2 cfs) consists of developed flows from the small Basin N2. These developed flows will be conveyed into the street where they travel as curb and gutter flow towards Design Point 8. At this location, a 4' D-10-R sump inlet will completely collect both the 5-yr. and 100-yr. flows. The collected flows are then routed via an 18" RCP towards the downstream public storm system. The downstream public storm system is a proposed 42" RCP and represented by Pipe Run 13.

Design Point 9 (Q_5= 5 cfs, Q_{100}= 12 cfs) consists of developed flows from Basin I. The developed flows from this Basin will be conveyed into the street where they travel as curb and gutter flow towards Design Point 9. At this location, a Town Std. concrete crosspan will be installed to help route the flows further downstream.

Design Point 10 (Q_5= 7 cfs, Q_{100}= 16 cfs) consists of developed flows from Design Point 9 and Basin J. These combined developed flows will be conveyed into the street where they travel as curb and gutter flow towards Design Point 10. At this location, an 8' D-10-R sump inlet will completely collect both the 5-yr. and 100-yr. flows. The collected flows are routed via a 24" RCP towards the downstream public storm system.

Design Point 11 (Q_5= 3 cfs, Q_{100}= 7 cfs) consists of developed flows from Basin K1. These developed flows will be conveyed into the street where they travel as curb and gutter flow towards Design Point 11. At this location, a 4' D-10-R sump inlet will completely collect both the 5-yr. and 100-yr. flows. The collected flows are then routed via an 18" RCP towards the downstream public storm system. The downstream public storm system is a proposed 42" RCP and represented by Pipe Run 16. The combined developed flows within this facility at this location represent the total flow entering the proposed Pond 1 from the **Northerly Pipe Outfall. (Q_5= 35 cfs, Q_{100}= 91 cfs)**

Design Point 12 (Q_5= 5 cfs, Q_{100}= 13 cfs) consists of developed flows from Basins C, OS-6 and the remaining portion of off-site Basin OS-1. These developed flows will be conveyed into the street where they travel as curb and gutter flow towards Design Point 12. At this location, a 6' D-10-R sump inlet will completely collect both the 5-yr. and 100-yr. flows. The collected flows are routed via a 24" RCP towards the downstream public storm system.

Design Point 13 (Q_5= 2 cfs, Q_{100}= 5 cfs) consists of developed flows from Basin D. These developed flows will be conveyed into the street where they travel as curb and gutter flow towards Design Point 13. At this location, a 4'

D-10-R sump inlet will completely collect both the 5-yr. and 100-yr. flows. The collected flows are then routed via an 18" RCP towards the downstream public storm system. The downstream public storm system is a proposed 24" RCP and represented by Pipe Run 19.

Design Point 14 (Q_5= 2 cfs, Q_{100}= 5 cfs) consists of developed flows from Basins E and OS-7A. These developed flows will be conveyed into the street where they travel as curb and gutter flow towards Design Point 14. At this location, a 4' D-10-R sump inlet will completely collect both the 5-yr. and 100-yr. flows. The collected flows are routed via an 18" RCP towards the downstream public storm system.

Design Point 15 (Q_5= 1 cfs, Q_{100}= 2 cfs) consists of developed flows from the small Basin F. These developed flows will be conveyed into the street where they travel as curb and gutter flow towards Design Point 15. At this location, a 4' D-10-R sump inlet will completely collect both the 5-yr. and 100-yr. flows. The collected flows are then routed via an 18" RCP towards the downstream public storm system. The downstream public storm system is a proposed 30" RCP and represented by Pipe Run 22.

Design Point 16 (Q_5= 2 cfs, Q_{100}= 5 cfs) consists of developed flows from Basins OS-7B and K2. These developed flows will be conveyed into the street where they travel as curb and gutter flow towards Design Point 16. At this location, a 6' D-10-R sump inlet will completely collect both the 5-yr. and 100-yr. flows. The collected flows are then routed via an 18" RCP towards the downstream public storm system. The downstream public storm system remains as a proposed 30" RCP and represented by Pipe Run 24.

Design Point 17 (Q_5= 2 cfs, Q_{100}= 5 cfs) consists of developed flows from Basin L. These developed flows will be conveyed into the street where they travel as curb and gutter flow towards Design Point 17. At this location, a 6' D-10-R sump inlet will completely collect both the 5-yr. and 100-yr. flows. The collected flows are then routed via an 18" RCP towards the downstream public storm system. The downstream public storm system at this location is a proposed 30" RCP and represented by Pipe Run 26. The combined developed flows within this facility represent the total flow entering the proposed Pond 1 from the **Easterly Pipe Outfall. (Q_5= 14 cfs, Q_{100}= 32 cfs)**

Design Point 18 (Q_5= 49 cfs, Q_{100}= 126 cfs) represents the **total inflow to the proposed Pond 1**. This includes Basin M (Q_5= 1.2 cfs, Q_{100}= 5 cfs) which consists of the actual proposed pond area itself. This proposed detention facility is an Extended Detention Basin (EDB) storm water quality facility with a full spectrum outlet box. This facility will drain the EURV volume in a 72 hour drain time and will be constructed with associated fore bays, trickle

channels, micro pool, well screen, orifice plate, and 100-year outlet conveyance per the current drainage criteria manual. It will be private and owned and maintained by an HOA, Metro District or other private entity.

The following represents the required design for this facility (See Appendix):

Pond 1

Total tributary area: 49.94 ac.

Effective Imperviousness: 55.0%

Required EURV: 2.041 ac-ft.

Provided EURV: 2.964 ac-ft.

Total volume provided: 6.015 ac-ft.

Top of Micropool elev: 7011.00

6'x4' Conc. Outlet box with front edge height of 5.37' at 4:1 slope and 24" RCP outfall pipe

Orifice Plate design: Bottom hole = 4.0 sq-in. and top 2 holes = 6.0 sq-in. spaced 21.5"

Pond design release: **(Q_2 = 0.9 cfs, Q_5 = 5.0 cfs, Q_{100} = 29.1 cfs)**

Pre-developed flows: **(Q_2 = 1.0 cfs, Q_5 = 5.0 cfs, Q_{100} = 32.0 cfs)**

Design Point 19 (Q_5= 1 cfs, Q_{100}= 2 cfs) consists of developed flows from Basins S and JCP1. These developed flows sheet flow directly into the sideroad ditch along Jackson Creek Parkway and then are conveyed towards Design Point 19. At this location, an 18" RCP culvert will be installed to completely convey the flows under the proposed public roadway connection to Jackson Creek Parkway. This facility is temporary until Jackson Creek Parkway is improved (by others) to its ultimate state of an urban Minor Arterial. At that time, this facility along with the sideroad ditch will be removed and replaced by curb and gutter with a downstream storm system to handle these flows.

Design Point 20 (Q_5= 4 cfs, Q_{100}= 12 cfs) consists of developed flows from Basins R, JCP2 and the previously mentioned flows from Design Point 19. These developed flows sheet flow directly into the sideroad ditch along Jackson Creek Parkway and then are conveyed as ditch flows towards Design Point 20. At this location, an existing 60" RCP culvert conveys the flows under Jackson Creek Parkway. Given the proposed grading of the development, the tributary acreage and flows quantities to this facility has been significantly reduced. See the following comparison at **Design Point 20**:

Developed Flows: **(Q_5 = 4 cfs, Q_{100} = 12 cfs)**

Pre-developed flows: **(Q_5 = 14 cfs, Q_{100} = 59 cfs)**

Thus, this facility continues to adequately handle the developed flows at this point. Erosion control will be installed within the sideroad ditch and around the existing culvert entrance to help mitigate erosion and sediment transport downstream. Again, this facility is temporary until Jackson Creek Parkway is improved (by others) to its ultimate state of an urban Minor Arterial. At that time, this facility along with the sideroad ditch will be removed and replaced by curb and gutter with a downstream storm system to handle these flows.

Design Point 21 (Q_5= 2 cfs, Q_{100}= 4 cfs) consists of developed flows from Basins O and JCP3. These developed flows sheet flow directly into the sideroad ditch along Jackson Creek Parkway and then are conveyed towards Design Point 21. At this location, an 18" RCP culvert will be installed to completely convey the flows under the proposed public roadway connection to Jackson Creek Parkway. This facility is temporary until Jackson Creek Parkway is improved (by others) to its ultimate state of an urban Minor Arterial. At that time, this facility along with the sideroad ditch will be removed and replaced by curb and gutter with a downstream storm system to handle these flows.

Design Point 22 (Q_5= 4 cfs, Q_{100}= 11 cfs) consists of developed flows from Basins P, JCP4 and the previously mentioned flows from Design Point 21. These developed flows sheet flow directly into the sideroad ditch along Jackson Creek Parkway and then are conveyed as ditch flows towards Design Point 22. Given the proposed grading of the development, the tributary acreage and flows quantities to this facility has been reduced. See the following comparison at **Design Point 22**:

Developed Flows: **(Q_5 = 4 cfs, Q_{100} = 11 cfs)**

Pre-developed flows: **(Q_5 = 5 cfs, Q_{100} = 32 cfs)**

Thus, the sideroad ditch in this location continues to adequately convey the developed flows further downstream. Erosion control will be installed within the sideroad ditch to help mitigate erosion and sediment transport downstream.

DRAINAGE CRITERIA

Hydrologic calculations were performed using the Town of Monument Standards, which follow the City of Colorado Springs/El Paso County Drainage Criteria Manual, as revised in May 2014. The Rational Method was used to estimate storm water runoff anticipated from design storms for the 5 year and 100-year recurrence interval for local storm inlet and pipe facility sizing. Runoff Coefficients are based on the imperviousness of the particular land use and the hydrologic soil type in accordance with Table 6-6. The average rainfall intensity, by recurrence interval found in the Intensity-Duration-Frequency (IDF) curves in Figure 6-5. (See Appendix)

The UD-BMP spreadsheet (ver. 3.07) along with the MHFD-Detention spreadsheet (ver. 4.03) were used to calculate the required volume for the EURV and 100-year release. User input 1-hour precipitation values in the UD-Detention spreadsheet were taken from Table 6-2 Volume 1 Colorado Springs Drainage Criteria Manual.

FLOODPLAIN STATEMENT

No portion of this site is located within a floodplain as determined by the Flood Insurance Rate Maps (F.I.R.M.) Map Number 08041C0278G effective date, December 7, 2018 (See Appendix).

SUMMARY

Construction of Monument Junction – Phase 1 PD Site Plan will not adversely affect the surrounding developments. All drainage facilities were sized using the current Drainage Criteria and will safely discharge storm water runoff to adequate outfalls. Developed flows will either be routed to the on-site detention facility and slowly released at historic rates or allowed to continue to sheet flow off-site at rates equal to or very near those of historic levels. All existing downstream facilities will not be significantly affected upon the construction of this development.

PREPARED BY:
Classic Consulting Engineers & Surveyors, LLC

Marc A. Whorton, P.E.
Project Manager

maw/130201/Reports/FDR – Phase 1 PD Site Plan.doc

CLASSIC CONSULTING ENGINEERS & SURVEYORS

REFERENCES

1. City of Colorado Springs/County of El Paso Drainage Criteria Manual dated May 2014.

2. "Drainage Analysis Addendum No.2 Village Center at Woodmoor" Classic Consulting Engineers and Surveyors, dated June 2009.

3. "Village Center @ Woodmoor Filing No.1" Berge-Brewer and Associates, Inc., dated January 2005.

4. "Drainage Basin Planning Study Dirty Woman Creek and Crystal Creek El Paso County," Kiowa Engineering Corporation, dated September 1993.

5. "MDDP for The Village" Classic Consulting, dated February 2020

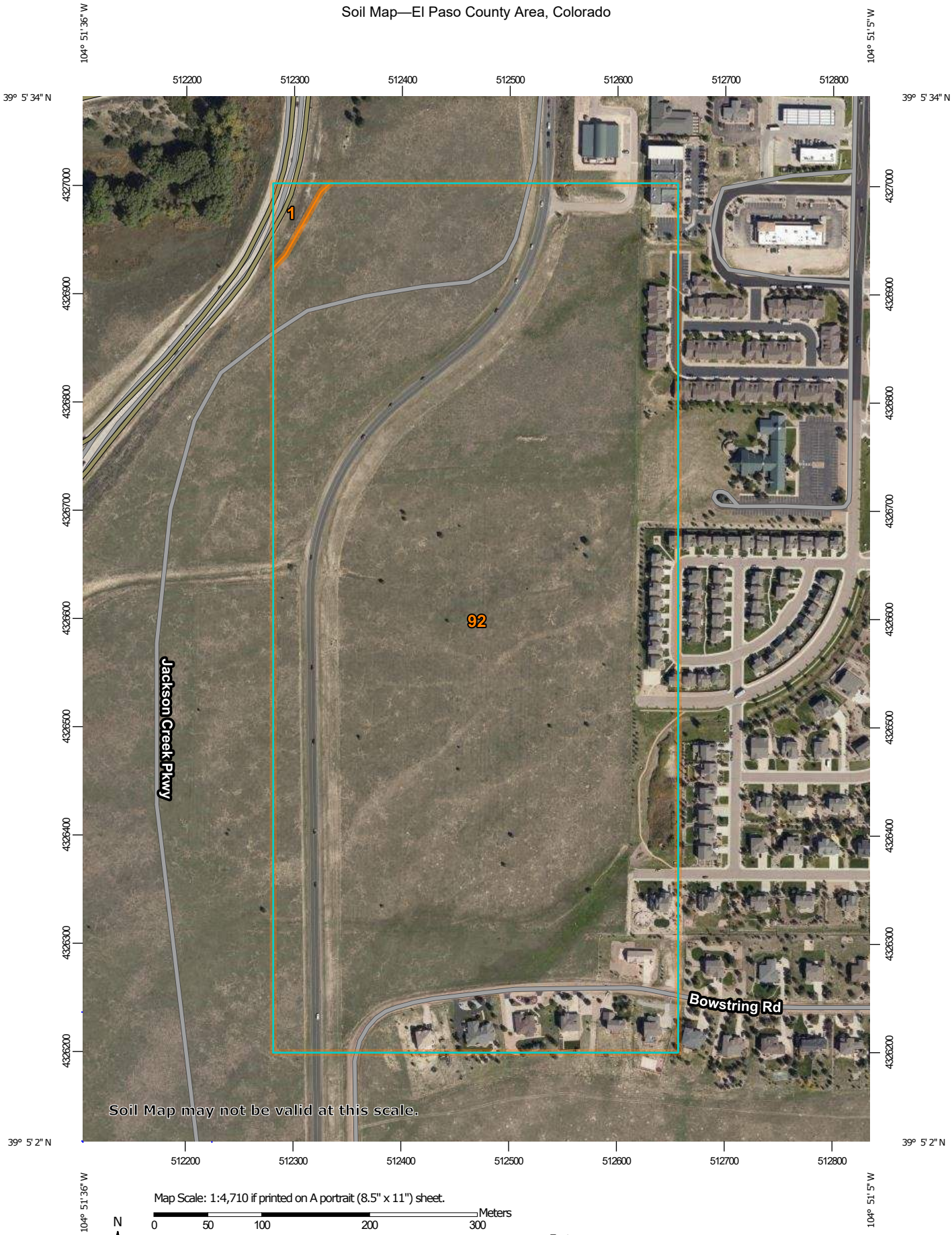
APPENDIX

VICINITY MAP

MONUMENT JUNCTION
PHASE 1 PD SITE PLAN
VICINITY MAP

SOILS MAP (WEB SOIL SURVEY)

Soil Map—El Paso County Area, Colorado



Map Scale: 1:4,710 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 50 100 200 300

Feet: 0 200 400 800 1200

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

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Map Unit Polygons

Soil Map Unit Lines

Soil Map Unit Points

Special Point Features

Blowout

Borrow Pit

Clay Spot

Closed Depression

Gravel Pit

Gravelly Spot

Landfill

Lava Flow

Marsh or swamp

Mine or Quarry

Miscellaneous Water

Perennial Water

Rock Outcrop

Saline Spot

Sandy Spot

Severely Eroded Spot

Sinkhole

Slide or Slip

Sodic Spot

Spoil Area

Stony Spot

Very Stony Spot

Wet Spot

Other

Special Line Features

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 18, Jun 5, 2020

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

Date(s) aerial images were photographed: Aug 19, 2018—Sep 23, 2018

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
1	Alamosa loam, 1 to 3 percent slopes	0.5	0.7%
92	Tomah-Crowfoot loamy sands, 3 to 8 percent slopes	74.3	99.3%
Totals for Area of Interest		**74.8**	**100.0%**

El Paso County Area, Colorado

92—Tomah-Crowfoot loamy sands, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 36b9
Elevation: 7,300 to 7,600 feet
Farmland classification: Not prime farmland

Map Unit Composition

Tomah and similar soils: 50 percent
Crowfoot and similar soils: 30 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Tomah

Setting

Landform: Hills, alluvial fans
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from arkose and/or residuum weathered from arkose

Typical profile

A - 0 to 10 inches: loamy sand
E - 10 to 22 inches: coarse sand
C - 48 to 60 inches: coarse sand

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 2.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Ecological site: R049XB216CO - Sandy Divide
Hydric soil rating: No

Description of Crowfoot

Setting

Landform: Alluvial fans, hills

Landform position (three-dimensional): Side slope, crest
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium

Typical profile

A - 0 to 12 inches: loamy sand
E - 12 to 23 inches: sand
Bt - 23 to 36 inches: sandy clay loam
C - 36 to 60 inches: coarse sand

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 4.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Ecological site: R049XB216CO - Sandy Divide
Hydric soil rating: No

Minor Components

Other soils

Percent of map unit:
Hydric soil rating: No

Pleasant

Percent of map unit:
Landform: Depressions
Hydric soil rating: Yes

Data Source Information

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 18, Jun 5, 2020

F.E.M.A. MAP

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.

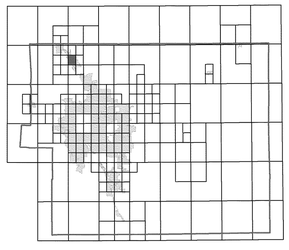
Contact **FEMA Map Service Center** (MSC) via the FEMA Map Information eXchange (FMIX) 1-877-336-2627 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this 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

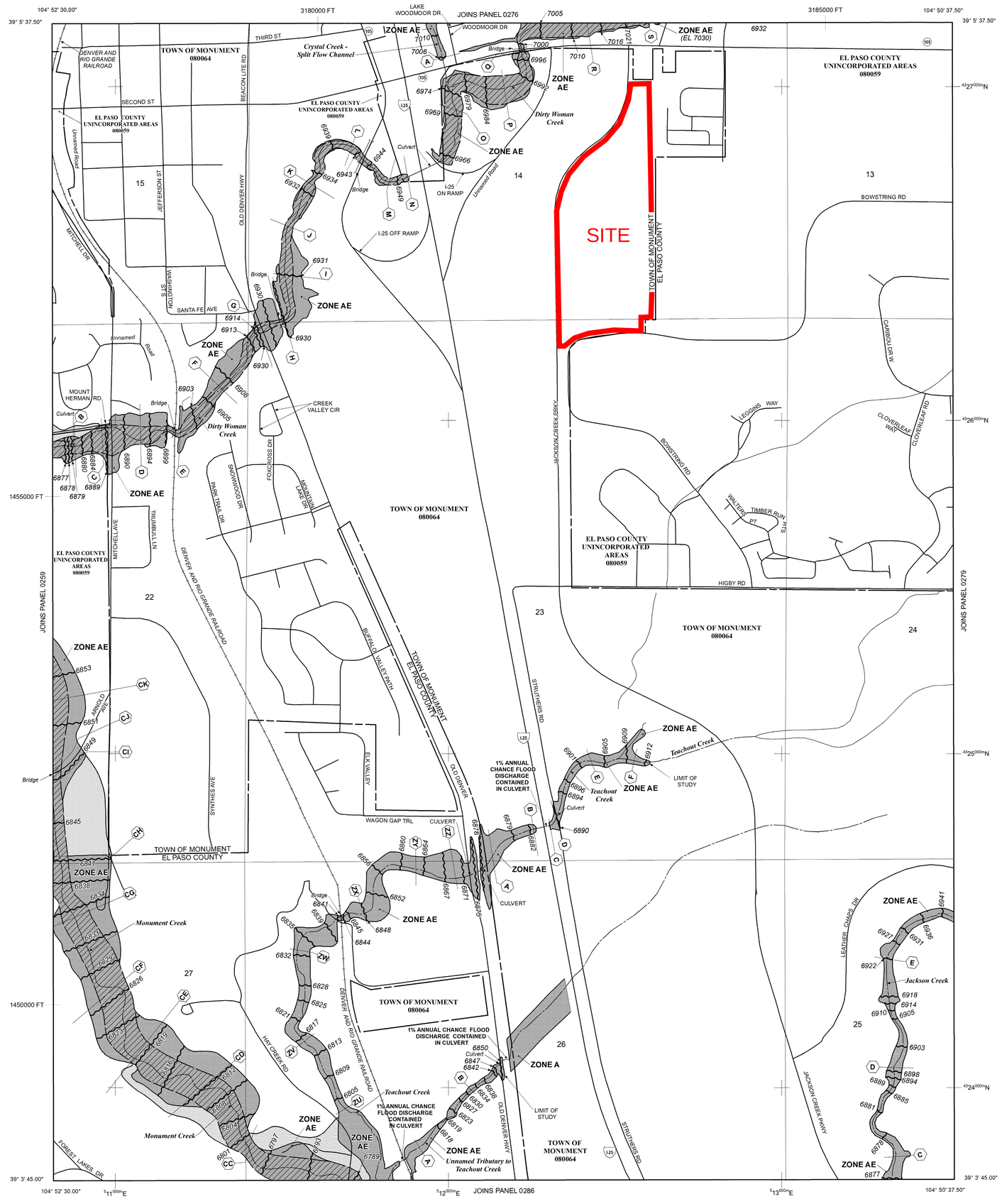
Flooding Source	Vertical Datum Offset (ft)
REFER TO SECTION 3.3 OF THE EL PASO COUNTY FLOOD INSURANCE STUDY FOR STREAM BY STREAM VERTICAL DATUM CONVERSION INFORMATION	

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 11 SOUTH, RANGE 67 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)
$^{42}75^{000m}$N	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 0278G

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

PANEL 278 OF 1300

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
EL PASO COUNTY	080059	0278	G
MONUMENT, TOWN OF	080064	0278	G

Notice: This map was reissued on 05/15/2020 to make a correction.This version replaces any previous versions. See the Notice-to-User Letter that accompanied this correction for details.

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
08041C0278G

MAP REVISED
DECEMBER 7, 2018

Federal Emergency Management Agency

HYDROLOGIC / HYDRAULIC CALCULATIONS

For Colorado Springs and much of the Fountain Creek watershed, the 1-hour depths are fairly uniform and are summarized in Table 6-2. Depending on the location of the project, rainfall depths may be calculated using the described method and the NOAA Atlas maps shown in Figures 6-6 through 6-17.

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

These depths can be applied to the design storms or converted to intensities (inches/hour) for the Rational Method as described below. However, as the basin area increases, it is unlikely that the reported point rainfalls will occur uniformly over the entire basin. To account for this characteristic of rain storms an adjustment factor, the Depth Area Reduction Factor (DARF) is applied. This adjustment to rainfall depth and its effect on design storms is also described below. The UDFCD UD-Rain spreadsheet, available on UDFCD's website, also provides tools to calculate point rainfall depths and Intensity-Duration-Frequency curves[2] and should produce similar depth calculation results.

2.2 Design Storms

Design storms are used as input into rainfall/runoff models and provide a representation of the typical temporal distribution of rainfall events when the creation or routing of runoff hydrographs is required. It has long been observed that rainstorms in the Front Range of Colorado tend to occur as either short-duration, high-intensity, localized, convective thunderstorms (cloud bursts) or longer-duration, lower-intensity, broader, frontal (general) storms. The significance of these two types of events is primarily determined by the size of the drainage basin being studied. Thunderstorms can create high rates of runoff within a relatively small area, quickly, but their influence may not be significant very far downstream. Frontal storms may not create high rates of runoff within smaller drainage basins due to their lower intensity, but tend to produce larger flood flows that can be hazardous over a broader area and extend further downstream.

- **Thunderstorms**: Based on the extensive evaluation of rain storms completed in the Carlton study (Carlton 2011), it was determined that typical thunderstorms have a duration of about 2 hours. The study evaluated over 300,000 storm cells using gage-adjusted NEXRAD data, collected over a 14-year period (1994 to 2008). Storms lasting longer than 3 hours were rarely found. Therefore, the results of the Carlton study have been used to define the shorter duration design storms.

  To determine the temporal distribution of thunderstorms, 22 gage-adjusted NEXRAD storm cells were studied in detail. Through a process described in a technical memorandum prepared by the City of Colorado Springs (City of Colorado Springs 2012), the results of this analysis were interpreted and normalized to the 1-hour rainfall depth to create the distribution shown in Table 6-3 with a 5 minute time interval for drainage basins up to 1 square mile in size. This distribution represents the rainfall

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

3.2 Time of Concentration

One of the basic assumptions underlying the Rational Method is that runoff is a function of the average rainfall rate during the time required for water to flow from the hydraulically most remote part of the drainage area under consideration to the design point. However, in practice, the time of concentration can be an empirical value that results in reasonable and acceptable peak flow calculations.

For urban areas, the time of concentration (t_c) consists of an initial time or overland flow time (t_i) plus the travel time (t_t) in the storm sewer, paved gutter, roadside drainage ditch, or drainage channel. For non-urban areas, the time of concentration consists of an overland flow time (t_i) plus the time of travel in a concentrated form, such as a swale or drainageway. The travel portion (t_t) of the time of concentration can be estimated from the hydraulic properties of the storm sewer, gutter, swale, ditch, or drainageway. Initial time, on the other hand, will vary with surface slope, depression storage, surface cover, antecedent rainfall, and infiltration capacity of the soil, as well as distance of surface flow. The time of concentration is represented by Equation 6-7 for both urban and non-urban areas.

Table 6-7. Conveyance Coefficient, C_v

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

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

The travel time is calculated by dividing the flow distance (in feet) by the velocity calculated using Equation 6-9 and converting units to minutes.

The time of concentration (t_c) is then the sum of the overland flow time (t_i) and the travel time (t_t) per Equation 6-7.

3.2.3 First Design Point Time of Concentration in Urban Catchments

Using this procedure, the time of concentration at the first design point (typically the first inlet in the system) in an urbanized catchment should not exceed the time of concentration calculated using Equation 6-10. The first design point is defined as the point where runoff first enters the storm sewer system.

$$t_c = \frac{L}{180} + 10 \qquad \text{(Eq. 6-10)}$$

Where:

t_c = maximum time of concentration at the first design point in an urban watershed (min)

L = waterway length (ft)

Equation 6-10 was developed using the rainfall-runoff data collected in the Denver region and, in essence, represents regional "calibration" of the Rational Method. Normally, Equation 6-10 will result in a lesser time of concentration at the first design point and will govern in an urbanized watershed. For subsequent design points, the time of concentration is calculated by accumulating the travel times in downstream drainageway reaches.

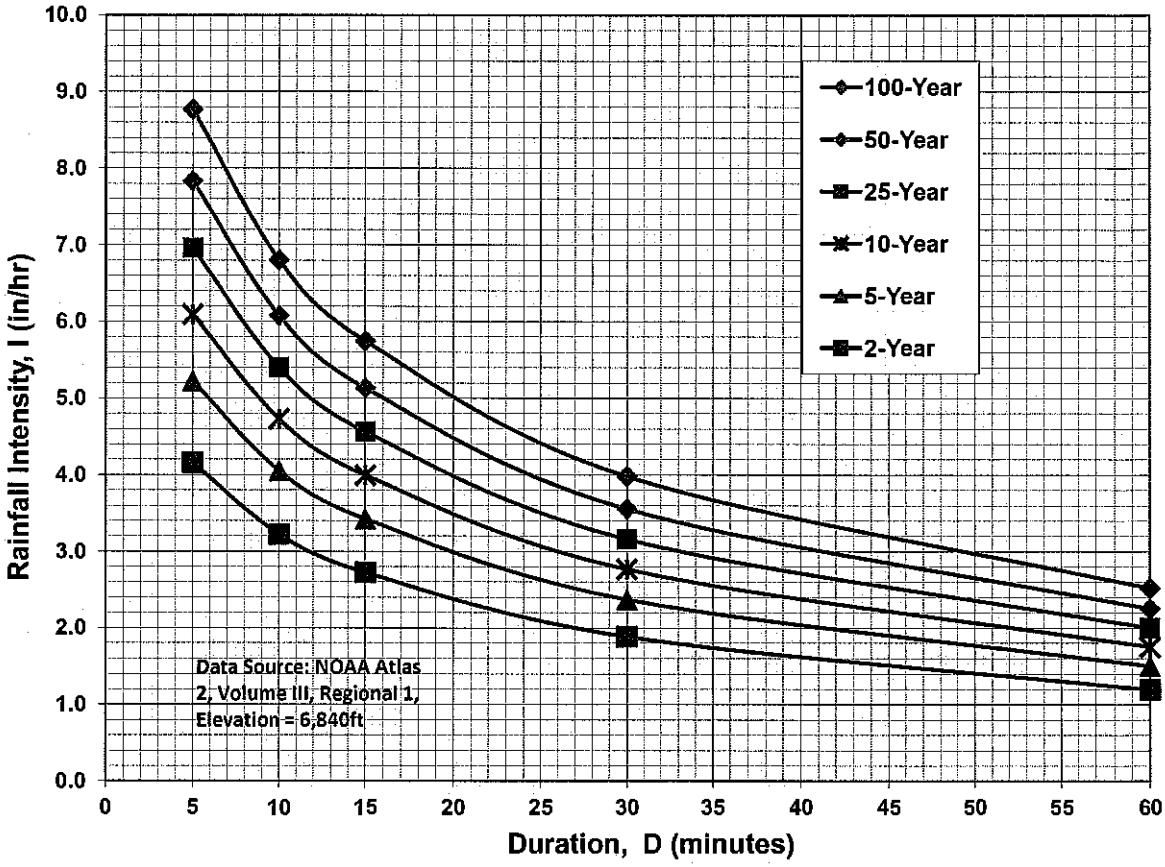
3.2.4 Minimum Time of Concentration

If the calculations result in a t_c of less than 10 minutes for undeveloped conditions, it is recommended that a minimum value of 10 minutes be used. The minimum t_c for urbanized areas is 5 minutes.

3.2.5 Post-Development Time of Concentration

As Equation 6-8 indicates, the time of concentration is a function of the 5-year runoff coefficient for a drainage basin. Typically, higher levels of imperviousness (higher 5-year runoff coefficients) correspond to shorter times of concentration, and lower levels of imperviousness correspond to longer times of

Figure 6-5. Colorado Springs Rainfall Intensity Duration Frequency



IDF Equations

$I_{100} = -2.52 \ln(D) + 12.735$

$I_{50} = -2.25 \ln(D) + 11.375$

$I_{25} = -2.00 \ln(D) + 10.111$

$I_{10} = -1.75 \ln(D) + 8.847$

$I_{5} = -1.50 \ln(D) + 7.583$

$I_{2} = -1.19 \ln(D) + 6.035$

Note: Values calculated by equations may not precisely duplicate values read from figure.

JOB NAME: *MONUMENT JUNCTION - PHASE 1 PD SITE PLAN*
JOB NUMBER: *1302.01*
DATE: *08/11/21*
CALCULATED BY: *MAW*

FINAL DRAINAGE REPORT ~ BASIN RUNOFF COEFFICIENT SUMMARY

		DEVELOPED AREA/IMPERVIOUS AREA				LANDSCAPE/UNDEVELOPED AREAS				WEIGHTED			WEIGHTED CA		
BASIN	TOTAL AREA (AC)	AREA (AC)	C(2)	C(5)	C(100)	AREA (AC)	C(2)	C(5)	C(100)	C(2)	C(5)	C(100)	**CA(2)**	**CA(5)**	**CA(100)**
OS-1	3.90	1.50	0.89	0.90	0.96	2.40	0.02	0.08	0.35	0.35	0.40	0.58	**1.38**	**1.54**	**2.28**
OS-2	0.33	0.20	0.41	0.45	0.59	0.13	0.02	0.08	0.35	0.26	0.30	0.50	**0.08**	**0.10**	**0.16**
OS-3	3.80	2.00	0.45	0.49	0.62	1.80	0.03	0.09	0.36	0.25	0.30	0.50	**0.95**	**1.14**	**1.89**
OS-4	2.50	2.50	0.03	0.09	0.36	0.00	0.02	0.08	0.35	0.03	0.09	0.36	**0.08**	**0.23**	**0.90**
OS-5	4.60	4.60	0.03	0.09	0.36	0.00	0.02	0.08	0.35	0.03	0.09	0.36	**0.14**	**0.41**	**1.66**
OS-6	0.82	0.50	0.41	0.45	0.59	0.32	0.02	0.08	0.35	0.26	0.31	0.50	**0.21**	**0.25**	**0.41**
OS-7A	0.39	0.32	0.41	0.45	0.59	0.07	0.02	0.08	0.35	0.34	0.38	0.55	**0.13**	**0.15**	**0.21**
OS-7B	0.30	0.00	0.89	0.90	0.96	0.30	0.05	0.12	0.39	0.05	0.12	0.39	**0.02**	**0.04**	**0.12**
OS-7C	1.00	1.00	0.41	0.45	0.59	0.00	0.02	0.08	0.35	0.41	0.45	0.59	**0.41**	**0.45**	**0.59**
OS-8	2.70	0.54	0.89	0.90	0.96	2.16	0.03	0.09	0.36	0.20	0.25	0.48	**0.55**	**0.68**	**1.30**
OS-9	1.90	0.00	0.89	0.90	0.96	1.90	0.03	0.09	0.36	0.03	0.09	0.36	**0.06**	**0.17**	**0.68**
EX1	18.10	18.10	0.03	0.09	0.36	0.00	0.02	0.08	0.35	0.03	0.09	0.36	**0.54**	**1.63**	**6.52**
EX2	21.50	21.50	0.03	0.09	0.36	0.00	0.02	0.08	0.35	0.03	0.09	0.36	**0.65**	**1.94**	**7.74**

JOB NAME: *MONUMENT JUNCTION - PHASE 1 PD SITE PLAN*
JOB NUMBER: *1302.01*
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CALC'D BY: *MAW*

Return Period	1-Hour Depth
2	1.19
5	1.50
10	1.75
25	2.00
50	2.25
100	2.52

$$t_i = \frac{0.395(1.1 - C_5)\sqrt{L}}{S^{0.33}}$$

$$V = C_v S_w^{0.5}$$

Tc=L/V

Table 6-7. Conveyance Coefficient, C_v

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

$$t_c = \frac{L}{180} + 10$$

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

FINAL DRAINAGE REPORT ~ BASIN RUNOFF SUMMARY

BASIN	WEIGHTED CA(2)	CA(5)	CA(100)	OVERLAND C(5)	Length (ft)	Height (ft)	Tc (min)	STREET / CHANNEL FLOW Length (ft)	Slope (%)	Velocity (fps)	Tc (min)	Tc TOTAL (min)	INTENSITY I(2) (in/hr)	I(5) (in/hr)	I(100) (in/hr)	TOTAL FLOWS Q(2) (cfs)	Q(5) (cfs)	Q(100) (cfs)
OS-1	1.38	1.54	2.28	0.08	100	2	14.7	500	2.5%	1.6	5.3	19.9	2.47	3.10	5.20	3	**5**	**12**
OS-2	0.08	0.10	0.16	0.08	30	2	5.4					5.4	4.03	5.06	8.49	0.3	**0.5**	**1**
OS-3	0.95	1.14	1.89	0.09	60	1.2	11.2	260	2.0%	1.4	3.1	14.3	2.87	3.59	6.03	2.7	**4**	**11**
OS-4	0.08	0.23	0.90	0.08	30	0.6	8.0	300	1.5%	1.2	4.1	12.1	3.07	3.84	6.45	0.2	**0.9**	**6**
OS-5	0.14	0.41	1.66	0.08	300	10	21.4					21.4	2.39	2.99	5.01	0.3	**1.2**	**8**
OS-6	0.21	0.25	0.41	0.08	70	6	7.6	200	1.5%	1.2	2.7	10.3	3.26	4.08	6.86	0.7	**1.0**	**3**
OS-7A	0.13	0.15	0.21	0.08	70	8	6.9					6.9	3.74	4.69	7.87	0.5	**0.7**	**2**
OS-7B	0.02	0.04	0.12	0.12	30	2	5.2					5.2	4.08	5.12	8.59	0.1	**0.2**	**1**
OS-7C	0.41	0.45	0.59	0.08	50	1	10.4	250	3.0%	1.7	2.4	12.8	3.00	3.76	6.32	1.2	**2**	**4**
OS-8	0.55	0.68	1.30	0.09	250	6	21.6	1000	2.0%	1.4	11.8	33.4	1.86	2.32	3.89	1.0	**1.6**	**5**
OS-9	0.06	0.17	0.68	0.09	80	3	10.5	1050	1.1%	1.0	16.7	27.2	2.10	2.63	4.41	0.1	**0.4**	**3**
EX1	0.54	1.63	6.52	0.08	300	7	24.1	790	2.5%	1.6	8.3	32.4	1.89	2.36	3.97	1	**4**	**26**
EX2	0.65	1.94	7.74	0.08	300	8	23.1	1090	2.0%	1.4	12.8	35.9	1.77	2.21	3.71	1	**4**	**29**

JOB NAME: *MONUMENT JUNCTION - PHASE 1 PD SITE PLAN*
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FINAL DRAINAGE REPORT ~ SURFACE ROUTING SUMMARY

Design Point(s)	Contributing Basins	Equivalent CA(5)	Equivalent CA(100)	Maximum Tc	Intensity		Flow		Inlet Size
					I(5)	I(100)	Q(5)	Q(100)	
H1	EX1, OS-1 thru OS-6 and OS-8	5.98	15.11	33.4	2.32	3.89	14	59	EXIST. 60" RCP CULVERT
H2	EX2, OS-7A, OS-7B and OS-9	2.29	8.75	35.9	2.21	3.71	5	32	EXIST. SIDE ROAD DITCH

JOB NAME: *MONUMENT JUNCTION - PHASE 1 PD SITE PLAN*
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FINAL DRAINAGE REPORT ~ BASIN RUNOFF COEFFICIENT SUMMARY

		DEVELOPED AREA/IMPERVIOUS AREA				LANDSCAPE/UNDEVELOPED AREAS				WEIGHTED			WEIGHTED CA		
BASIN	TOTAL AREA (AC)	AREA (AC)	C(2)	C(5)	C(100)	AREA (AC)	C(2)	C(5)	C(100)	C(2)	C(5)	C(100)	**CA(2)**	**CA(5)**	**CA(100)**
A	3.10	3.10	0.41	0.45	0.59	0.00	0.02	0.08	0.35	0.41	0.45	0.59	**1.27**	**1.40**	**1.83**
B	1.40	1.40	0.41	0.45	0.59	0.00	0.02	0.08	0.35	0.41	0.45	0.59	**0.57**	**0.63**	**0.83**
C	1.70	1.70	0.41	0.45	0.59	0.00	0.02	0.08	0.35	0.41	0.45	0.59	**0.70**	**0.77**	**1.00**
D	1.50	1.50	0.41	0.45	0.59	0.00	0.02	0.08	0.35	0.41	0.45	0.59	**0.62**	**0.68**	**0.89**
E	1.00	1.00	0.41	0.45	0.59	0.00	0.02	0.08	0.35	0.41	0.45	0.59	**0.41**	**0.45**	**0.59**
F	0.70	0.70	0.41	0.45	0.59	0.00	0.02	0.08	0.35	0.41	0.45	0.59	**0.29**	**0.32**	**0.41**
G1	2.90	2.30	0.41	0.45	0.59	0.60	0.02	0.08	0.35	0.33	0.37	0.54	**0.96**	**1.08**	**1.57**
G2	1.80	1.80	0.41	0.45	0.59	0.00	0.02	0.08	0.35	0.41	0.45	0.59	**0.74**	**0.81**	**1.06**
H	2.10	2.10	0.41	0.45	0.59	0.00	0.02	0.08	0.35	0.41	0.45	0.59	**0.86**	**0.95**	**1.24**
I	3.70	3.40	0.41	0.45	0.59	0.30	0.02	0.08	0.35	0.38	0.42	0.57	**1.40**	**1.55**	**2.11**
J	1.30	1.30	0.41	0.45	0.59	0.00	0.02	0.08	0.35	0.41	0.45	0.59	**0.53**	**0.59**	**0.77**
K1	2.20	2.20	0.41	0.45	0.59	0.00	0.02	0.08	0.35	0.41	0.45	0.59	**0.90**	**0.99**	**1.30**
K2	1.30	1.30	0.41	0.45	0.59	0.00	0.02	0.08	0.35	0.41	0.45	0.59	**0.53**	**0.59**	**0.77**
L	1.50	1.50	0.33	0.38	0.55	0.00	0.02	0.08	0.35	0.33	0.38	0.55	**0.50**	**0.57**	**0.83**
M	2.20	0.30	0.33	0.38	0.55	1.90	0.05	0.12	0.39	0.09	0.16	0.41	**0.19**	**0.34**	**0.91**
N1	4.50	2.90	0.41	0.45	0.59	1.60	0.05	0.12	0.39	0.28	0.33	0.52	**1.27**	**1.50**	**2.34**
N2	0.40	0.40	0.41	0.45	0.59	0.00	0.02	0.08	0.35	0.41	0.45	0.59	**0.16**	**0.18**	**0.24**
O	0.85	0.60	0.41	0.45	0.59	0.25	0.02	0.08	0.35	0.30	0.34	0.52	**0.25**	**0.29**	**0.44**
P	1.70	1.10	0.41	0.45	0.59	0.60	0.02	0.08	0.35	0.27	0.32	0.51	**0.46**	**0.54**	**0.86**
Q	1.60	0.00	0.89	0.90	0.96	1.60	0.02	0.08	0.35	0.02	0.08	0.35	**0.03**	**0.13**	**0.56**
R	1.70	0.70	0.41	0.45	0.59	1.00	0.05	0.12	0.39	0.20	0.26	0.47	**0.34**	**0.44**	**0.80**
S	0.48	0.03	0.89	0.90	0.96	0.45	0.05	0.12	0.39	0.10	0.17	0.43	**0.05**	**0.08**	**0.20**
T	0.18	0.00	0.89	0.90	0.96	0.18	0.05	0.12	0.39	0.05	0.12	0.39	**0.01**	**0.02**	**0.07**

JOB NAME: *MONUMENT JUNCTION - PHASE 1 PD SITE PLAN*
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FINAL DRAINAGE REPORT ~ BASIN RUNOFF COEFFICIENT SUMMARY

		DEVELOPED AREA/IMPERVIOUS AREA				LANDSCAPE/UNDEVELOPED AREAS				WEIGHTED			WEIGHTED CA		
BASIN	TOTAL AREA (AC)	AREA (AC)	C(2)	C(5)	C(100)	AREA (AC)	C(2)	C(5)	C(100)	C(2)	C(5)	C(100)	**CA(2)**	**CA(5)**	**CA(100)**
JCP1	0.51	0.05	0.79	0.81	0.88	0.46	0.02	0.08	0.35	0.10	0.15	0.40	**0.05**	**0.08**	**0.21**
JCP2	2.00	0.65	0.79	0.81	0.88	1.35	0.02	0.08	0.35	0.27	0.32	0.52	**0.54**	**0.63**	**1.04**
JCP3	0.43	0.13	0.79	0.81	0.88	0.30	0.02	0.08	0.35	0.25	0.30	0.51	**0.11**	**0.13**	**0.22**
JCP4	1.60	0.30	0.79	0.81	0.88	1.30	0.02	0.08	0.35	0.16	0.22	0.45	**0.26**	**0.35**	**0.72**
JCP5	2.50	2.50	0.79	0.81	0.88	0.00	0.02	0.08	0.35	0.79	0.81	0.88	**1.98**	**2.03**	**2.20**
OS-1	3.90	1.50	0.89	0.90	0.96	2.40	0.02	0.08	0.35	0.35	0.40	0.58	**1.38**	**1.54**	**2.28**
OS-2	0.33	0.20	0.41	0.45	0.59	0.13	0.02	0.08	0.35	0.26	0.30	0.50	**0.08**	**0.10**	**0.16**
OS-3	3.80	2.00	0.45	0.49	0.62	1.80	0.03	0.09	0.36	0.25	0.30	0.50	**0.95**	**1.14**	**1.89**
OS-4	2.50	2.50	0.03	0.09	0.36	0.00	0.02	0.08	0.35	0.03	0.09	0.36	**0.08**	**0.23**	**0.90**
OS-5	4.60	4.60	0.03	0.09	0.36	0.00	0.02	0.08	0.35	0.03	0.09	0.36	**0.14**	**0.41**	**1.66**
OS-6	0.82	0.50	0.41	0.45	0.59	0.32	0.02	0.08	0.35	0.26	0.31	0.50	**0.21**	**0.25**	**0.41**
OS-7A	0.39	0.32	0.41	0.45	0.59	0.07	0.02	0.08	0.35	0.34	0.38	0.55	**0.13**	**0.15**	**0.21**
OS-7B	0.30	0.00	0.89	0.90	0.96	0.30	0.05	0.12	0.39	0.05	0.12	0.39	**0.02**	**0.04**	**0.12**
OS-7C	1.00	1.00	0.41	0.45	0.59	0.00	0.02	0.08	0.35	0.41	0.45	0.59	**0.41**	**0.45**	**0.59**

JOB NAME: *MONUMENT JUNCTION - PHASE 1 PD SITE PLAN*
JOB NUMBER: *1302.01*
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Return Period	1-Hour Depth
2	1.19
5	1.50
10	1.75
25	2.00
50	2.25
100	2.52

$$t_i = \frac{0.395(1.1 - C_5)\sqrt{L}}{S^{0.33}}$$

$$V = C_v S_w^{0.5}$$

Tc=L/V

Table 6-7. Conveyance Coefficient, C_v

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

$$t_c = \frac{L}{180} + 10$$

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

FINAL DRAINAGE REPORT ~ BASIN RUNOFF SUMMARY

BASIN	WEIGHTED CA(2)	WEIGHTED CA(5)	WEIGHTED CA(100)	OVERLAND C(5)	OVERLAND Length (ft)	OVERLAND Height (ft)	OVERLAND Tc (min)	STREET / CHANNEL FLOW Length (ft)	STREET / CHANNEL FLOW Slope (%)	STREET / CHANNEL FLOW Velocity (fps)	STREET / CHANNEL FLOW Tc (min)	Tc TOTAL (min)	INTENSITY I(2) (in/hr)	INTENSITY I(5) (in/hr)	INTENSITY I(100) (in/hr)	TOTAL FLOWS Q(2) (cfs)	TOTAL FLOWS Q(5) (cfs)	TOTAL FLOWS Q(100) (cfs)
A	1.27	1.40	1.83	0.08	100	2	14.7	480	1.5%	2.4	3.3	17.9	2.60	3.25	5.46	3	5	10
B	0.57	0.63	0.83	0.08	50	1	10.4	400	1.5%	2.4	2.7	13.1	2.98	3.73	6.26	2	2	5
C	0.70	0.77	1.00	0.08	100	2	14.7	200	1.5%	2.4	1.4	16.0	2.73	3.42	5.75	2	3	6
D	0.62	0.68	0.89	0.08	100	2	14.7	250	1.5%	2.4	1.7	16.4	2.71	3.39	5.69	2	2	5
E	0.41	0.45	0.59	0.08	100	2	14.7	200	1.5%	2.4	1.4	16.0	2.73	3.42	5.75	1	2	3
F	0.29	0.32	0.41	0.08	100	2	14.7	200	1.5%	2.4	1.4	16.0	2.73	3.42	5.75	0.8	1.1	2
G1	0.96	1.08	1.57	0.08	100	2	14.7	225	2.0%	2.8	1.3	16.0	2.74	3.43	5.75	3	4	9
G2	0.74	0.81	1.06	0.08	100	2	14.7	450	2.0%	2.8	2.7	17.3	2.64	3.31	5.55	2	3	6
H	0.86	0.95	1.24	0.08	80	1.6	13.1	600	1.5%	2.4	4.1	17.2	2.65	3.32	5.57	2	3	7
I	1.40	1.55	2.11	0.08	100	2	14.7	450	1.5%	2.4	3.1	17.7	2.61	3.27	5.49	4	5	12
J	0.53	0.59	0.77	0.08	100	2	14.7	200	1.5%	2.4	1.4	16.0	2.73	3.42	5.75	1	2	4
K1	0.90	0.99	1.30	0.08	100	2	14.7	280	2.0%	2.8	1.6	16.3	2.71	3.40	5.70	2	3	7
K2	0.53	0.59	0.77	0.08	100	2	14.7	325	2.0%	2.8	1.9	16.6	2.69	3.37	5.66	1	2	4
L	0.50	0.57	0.83	0.08	100	2	14.7	320	2.0%	2.8	1.9	16.5	2.70	3.37	5.66	1	2	5
M	0.19	0.34	0.91	0.12	100	2	14.1	250	1.5%	2.4	1.7	15.8	2.75	3.45	5.78	0.5	1.2	5

JOB NAME: *MONUMENT JUNCTION - PHASE 1 PD SITE PLAN*
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Return Period	1-Hour Depth
2	1.19
5	1.50
10	1.75
25	2.00
50	2.25
100	2.52

$$t_i = \frac{0.395(1.1 - C_5)\sqrt{L}}{S^{0.33}}$$

$$V = C_v S_w^{0.5}$$

Tc=L/V

Table 6-7. Conveyance Coefficient, C_v

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

$$t_c = \frac{L}{180} + 10$$

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

FINAL DRAINAGE REPORT ~ BASIN RUNOFF SUMMARY

BASIN	WEIGHTED CA(2)	WEIGHTED CA(5)	WEIGHTED CA(100)	OVERLAND C(5)	OVERLAND Length (ft)	OVERLAND Height (ft)	OVERLAND Tc (min)	STREET / CHANNEL FLOW Length (ft)	STREET / CHANNEL FLOW Slope (%)	STREET / CHANNEL FLOW Velocity (fps)	STREET / CHANNEL FLOW Tc (min)	Tc TOTAL (min)	INTENSITY I(2) (in/hr)	INTENSITY I(5) (in/hr)	INTENSITY I(100) (in/hr)	TOTAL FLOWS Q(2) (cfs)	TOTAL FLOWS Q(5) (cfs)	TOTAL FLOWS Q(100) (cfs)
N1	1.27	1.50	2.34	0.12	100	2	14.1	700	2.0%	2.8	4.1	18.2	2.58	3.23	5.42	3	**5**	**13**
N2	0.16	0.18	0.24	0.08	50	1	10.4	80	1.5%	2.4	0.5	10.9	3.19	4.00	6.71	0.5	**0.7**	**2**
O	0.25	0.29	0.44	0.08	50	1	10.4	300	2.0%	2.8	1.8	12.1	3.07	3.84	6.45	0.8	**1.1**	**3**
P	0.46	0.54	0.86	0.08	90	3	11.7					11.7	3.10	3.89	6.53	1	**2**	**6**
Q	0.03	0.13	0.56	0.08	100	2	14.7	475	2.0%	1.4	5.6	20.2	2.46	3.07	5.15	0.1	**0.4**	**3**
R	0.34	0.44	0.80	0.12	90	4	10.3					10.3	3.26	4.09	6.87	1	**2**	**6**
S	0.05	0.08	0.20	0.12	100	2	14.1	100	2.0%	2.8	0.6	14.7	2.84	3.55	5.97	0.1	**0.3**	**1**
T	0.01	0.02	0.07	0.12	80	3.2	10.0					10.0	3.29	4.13	6.93	0.03	**0.1**	**0.5**
JCP1	0.05	0.08	0.21	0.00	140	4	16.6	150	2.0%	1.4	1.8	18.4	2.57	3.22	5.40	0.1	**0.2**	**1.1**
JCP2	0.54	0.63	1.04	0.08	50	1.5	9.1	750	2.0%	1.4	8.8	17.9	2.60	3.26	5.47	1	**2**	**6**
JCP3	0.11	0.13	0.22	0.08	40	2	6.8	100	1.0%	1.0	1.7	8.5	3.49	4.37	7.34	0.4	**0.6**	**2**
JCP4	0.26	0.35	0.72	0.09	40	2	6.8	850	1.0%	1.0	14.2	20.9	2.41	3.02	5.07	0.6	**1.0**	**4**
JCP5	1.98	2.03	2.20	0.08	20	0.4	6.6	1300	1.0%	1.0	21.7	28.2	2.06	2.57	4.32	4	**5**	**10**

JOB NAME: *MONUMENT JUNCTION - PHASE 1 PD SITE PLAN*
JOB NUMBER: *1302.01*
DATE: *08/11/21*
CALC'D BY: *MAW*

Return Period	1-Hour Depth
2	1.19
5	1.50
10	1.75
25	2.00
50	2.25
100	2.52

$$t_i = \frac{0.395(1.1 - C_5)\sqrt{L}}{S^{0.33}}$$

$$V = C_v S_w^{0.5}$$

Tc=L/V

Table 6-7. Conveyance Coefficient, C_v

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

$$t_c = \frac{L}{180} + 10$$

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

FINAL DRAINAGE REPORT ~ BASIN RUNOFF SUMMARY

BASIN	WEIGHTED CA(2)	WEIGHTED CA(5)	WEIGHTED CA(100)	OVERLAND C(5)	OVERLAND Length (ft)	OVERLAND Height (ft)	OVERLAND Tc (min)	STREET / CHANNEL FLOW Length (ft)	STREET / CHANNEL FLOW Slope (%)	STREET / CHANNEL FLOW Velocity (fps)	STREET / CHANNEL FLOW Tc (min)	Tc TOTAL (min)	INTENSITY I(2) (in/hr)	INTENSITY I(5) (in/hr)	INTENSITY I(100) (in/hr)	TOTAL FLOWS Q(2) (cfs)	TOTAL FLOWS Q(5) (cfs)	TOTAL FLOWS Q(100) (cfs)
OS-1	1.38	1.54	2.28	0.08	100	2	14.7	500	2.5%	1.6	5.3	19.9	2.47	3.10	5.20	3	**5**	**12**
OS-2	0.08	0.10	0.16	0.08	30	2	5.4					5.4	4.03	5.06	8.49	0.3	**0.5**	**1**
OS-3	0.95	1.14	1.89	0.09	60	1.2	11.2	260	2.0%	1.4	3.1	14.3	2.87	3.59	6.03	2.7	**4**	**11**
OS-4	0.08	0.23	0.90	0.08	30	0.6	8.0	300	1.5%	1.2	4.1	12.1	3.07	3.84	6.45	0.2	**0.9**	**6**
OS-5	0.14	0.41	1.66	0.08	300	10	21.4					21.4	2.39	2.99	5.01	0.3	**1.2**	**8**
OS-6	0.21	0.25	0.41	0.08	70	6	7.6	200	1.5%	1.2	2.7	10.3	3.26	4.08	6.86	0.7	**1.0**	**3**
OS-7A	0.13	0.15	0.21	0.08	70	8	6.9					6.9	3.74	4.69	7.87	0.5	**0.7**	**2**
OS-7B	0.02	0.04	0.12	0.12	30	2	5.2					5.2	4.08	5.12	8.59	0.1	**0.2**	**1**
OS-7C	0.41	0.45	0.59	0.08	50	1	10.4	250	3.0%	1.7	2.4	12.8	3.00	3.76	6.32	1.2	**2**	**4**

JOB NAME: *MONUMENT JUNCTION - PHASE 1 PD SITE PLAN*
JOB NUMBER: *1302.01*
DATE: *08/11/21*
CALCULATED BY: *MAW*

FINAL DRAINAGE REPORT ~ SURFACE ROUTING SUMMARY

Design Point(s)	Contributing Basins	Equivalent CA(5)	Equivalent CA(100)	Maximum Tc	Intensity		Flow		Inlet Size
					I(5)	I(100)	Q(5)	Q(100)	
1	OS-3, OS-4, 1/3 OS-2	1.40	2.84	14.6	3.56	5.98	5	17	24" RCP
2	OS-5	0.41	1.66	21.4	2.99	5.01	1	8	24" RCP
3	A, 50% OS-1, 2/3 OS-2	2.23	3.08	19.9	3.10	5.20	7	16	8' D-10-R SUMP INLET
4	G1, Flow-by from DP-3 (50% 100 yr.)	1.08	3.11	20.2	3.07	5.16	3	16	8' D-10-R AT-GRADE INLET
5	G2, Flow-by from DP-4 (50% 100 yr.)	0.81	2.62	20.2	3.07	5.16	2	13	8' D-10-R SUMP INLET
6	B, H	1.58	2.07	17.2	3.32	5.57	5	11	6' D-10-R SUMP INLET
7	N1	1.50	2.34	18.2	3.23	5.42	5	13	6' D-10-R SUMP INLET
8	N2	0.18	0.24	10.9	4.00	6.71	1	2	4' D-10-R SUMP INLET
9	I	1.55	2.11	17.7	3.27	5.49	5	12	STD. CROSSPAN
10	J, Flow-by from DP-9	2.14	2.88	17.9	3.25	5.46	7	16	8' D-10-R SUMP INLET
11	K1	0.99	1.30	16.3	3.40	5.70	3	7	4' D-10-R SUMP INLET
12	C, 50% OS-1, OS-6	1.79	2.55	20.4	3.06	5.13	5	13	6' D-10-R SUMP INLET
13	D	0.68	0.89	16.4	3.39	5.69	2	5	4' D-10-R SUMP INLET
14	E, OS-7A	0.60	0.80	16.0	3.42	5.75	2	5	4' D-10-R SUMP INLET
15	F	0.32	0.41	16.0	3.42	5.75	1	2	4' D-10-R SUMP INLET

JOB NAME: *MONUMENT JUNCTION - PHASE 1 PD SITE PLAN*
JOB NUMBER: *1302.01*
DATE: *08/11/21*
CALCULATED BY: *MAW*

FINAL DRAINAGE REPORT ~ SURFACE ROUTING SUMMARY

Design Point(s)	Contributing Basins	Equivalent CA(5)	Equivalent CA(100)	Maximum Tc	Intensity		Flow		Inlet Size
					I(5)	I(100)	Q(5)	Q(100)	
16	K2, OS-7B	0.62	0.88	16.6	3.37	5.66	2	5	6' D-10-R SUMP INLET
17	L	0.57	0.83	16.5	3.37	5.66	2	5	6' D-10-R SUMP INLET
18	**TOTAL INFLOW POND 1 (DP-1 thru DP-17, incl. M)**	**17.23**	**26.28**	**23.4**	**2.85**	**4.79**	**49**	**126**	**POND 1**
19	S, JCP1	0.16	0.41	18.4	3.22	5.40	1	2	18" RCP CULVERT
20	R, JCP2, DP-19	1.23	2.26	19.9	3.10	5.20	4	12	TEMP. SEDIMENT BASIN AT EXIST. 60" RCP CULVERT
21	O, JCP3	0.42	0.66	12.3	3.82	6.41	2	4	18" RCP CULVERT
22	P, JCP4, DP-21	1.31	2.24	20.9	3.02	5.07	4	11	EXIST. SIDEROAD DITCH
H1	EX1, OS-1 thru OS-6 and OS-8	5.98	15.11	33.4	2.32	3.89	14	59	EXIST. 60" RCP CULVERT
H2	EX2, OS-7A, OS-7B and OS-9	2.29	8.75	35.9	2.21	3.71	5	32	EXIST. SIDE ROAD DITCH

JOB NAME: *MONUMENT JUNCTION - PHASE 1 PD SITE PLAN*
JOB NUMBER: *1302.01*
DATE: *08/11/21*
CALCULATED BY: *MAW*

* PIPES ARE LISTED AT MAXIMUM SIZE REQUIRED TO ACCOMMODATE Q100 FLOWS AT MINIMUM GRADE.
REFER TO INDIVIDUAL PIPE SHEETS FOR HYDRAULIC INFORMATION.

FINAL DRAINAGE REPORT ~ PIPE ROUTING SUMMARY

Pipe Run	Contributing Basins	Equivalent CA(5)	Equivalent CA(100)	Maximum Tc	Intensity		Flow		Pipe Size*
					I(5)	I(100)	Q(5)	Q(100)	
1	DP-1	1.40	2.84	14.6	3.56	5.98	5	17	24" RCP
2	DP-2	0.41	1.66	21.4	2.99	5.01	1	8	24" RCP
3	PR-1, PR-2	1.81	4.50	21.9	2.95	4.95	5	22	30" RCP
4	DP-3 Intercepted	2.23	1.54	19.9	3.10	5.20	7	8	24" RCP
5	PR-3, PR-4	4.05	6.04	22.3	2.92	4.91	12	30	30" RCP
6	DP-4 Intercepted	1.08	1.55	20.2	3.07	5.16	3	8	18" RCP
7	PR-5, PR-6	5.13	7.59	22.6	2.90	4.87	15	37	30" RCP
8	DP-5	0.81	2.62	20.2	3.07	5.16	2	13	24" RCP
9	DP-6	1.58	2.07	17.2	3.32	5.57	5	11	24" RCP
10	PR-7, PR-8, PR-9	7.52	12.27	22.9	2.88	4.84	22	59	36" RCP
11	DP-7	1.50	2.34	18.2	3.23	5.42	5	13	24" RCP
12	DP-8	0.18	0.24	10.9	4.00	6.71	1	2	18" RCP

JOB NAME: *MONUMENT JUNCTION - PHASE 1 PD SITE PLAN*
JOB NUMBER: *1302.01*
DATE: *08/11/21*
CALCULATED BY: *MAW*

* PIPES ARE LISTED AT MAXIMUM SIZE REQUIRED TO ACCOMMODATE Q100 FLOWS AT MINIMUM GRADE.
REFER TO INDIVIDUAL PIPE SHEETS FOR HYDRAULIC INFORMATION.

FINAL DRAINAGE REPORT ~ PIPE ROUTING SUMMARY

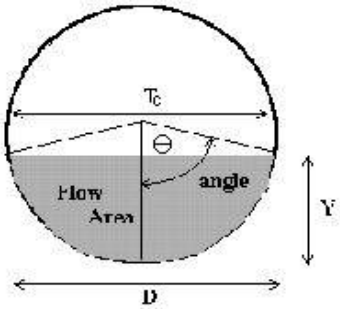
Pipe Run	Contributing Basins	Equivalent CA(5)	Equivalent CA(100)	Maximum Tc	Intensity		Flow		Pipe Size*
					I(5)	I(100)	Q(5)	Q(100)	
13	PR-10, PR-11, PR-12	9.19	14.84	23.2	2.86	4.81	26	71	42" RCP
14	DP-10	2.14	2.88	17.9	3.25	5.46	7	16	24" RCP
15	DP-11	0.99	1.30	16.3	3.40	5.70	3	7	18" RCP
16	**PR-13, PR-14, PR-15 NORTHERLY PIPE OUTFALL**	**12.32**	**19.02**	**23.4**	**2.85**	**4.79**	**35**	**91**	**42" RCP**
17	DP-12	1.79	2.55	20.4	3.06	5.13	5	13	24" RCP
18	DP-13	0.68	0.89	16.4	3.39	5.69	2	5	18" RCP
19	PR-17, PR-18	2.46	3.44	20.6	3.04	5.11	7	18	24" RCP
20	DP-14	0.60	0.80	16.0	3.42	5.75	2	5	18" RCP
21	DP-15	0.32	0.41	16.0	3.42	5.75	1	2	18" RCP
22	PR-19, PR-20, PR-21	3.38	4.65	20.9	3.02	5.07	10	24	30" RCP
23	DP-16	0.62	0.88	16.6	3.37	5.66	2	5	18" RCP
24	PR-22, PR-23	4.00	5.54	21.3	2.99	5.02	12	28	30" RCP
25	DP-17	0.57	0.83	16.5	3.37	5.66	2	5	18" RCP
26	**PR-24, PR-25 EASTERLY STORM OUTFALL**	**4.57**	**6.36**	**21.3**	**2.99**	**5.02**	**14**	**32**	**30" RCP**

CIRCULAR CONDUIT FLOW (Normal & Critical Depth Computation)

MHFD-Culvert, Version 4.00 (May 2020)

Project: MONUMENT JUNCTION - PHASE 1 PD SITE PLAN

Pipe ID: DP-1



Design Information (Input)			
Pipe Invert Slope	So =	0.0200	ft/ft
Pipe Manning's n-value	n =	0.0130	
Pipe Diameter	D =	24.00	inches
Design discharge	Q =	17.00	cfs

Full-Flow Capacity (Calculated)			
Full-flow area	Af =	3.14	sq ft
Full-flow wetted perimeter	Pf =	6.28	ft
Half Central Angle	Theta =	3.14	radians
Full-flow capacity	Qf =	32.08	cfs

Calculation of Normal Flow Condition			
Half Central Angle (0<Theta<3.14)	Theta =	1.61	radians
Flow area	An =	1.64	sq ft
Top width	Tn =	2.00	ft
Wetted perimeter	Pn =	3.21	ft
Flow depth	Yn =	1.04	ft
Flow velocity	Vn =	10.36	fps
Discharge	Qn =	17.00	cfs
Percent of Full Flow	Flow =	53.0%	of full flow
Normal Depth Froude Number	Fr_n =	2.01	supercritical

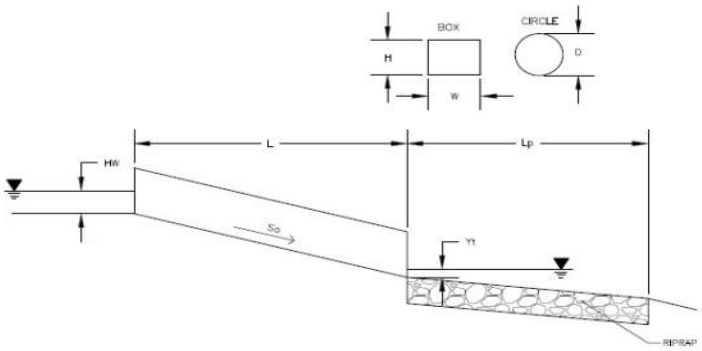
Calculation of Critical Flow Condition			
Half Central Angle (0<Theta-c<3.14)	Theta-c =	2.08	radians
Critical flow area	Ac =	2.50	sq ft
Critical top width	Tc =	1.75	ft
Critical flow depth	Yc =	1.49	ft
Critical flow velocity	Vc =	6.79	fps
Critical Depth Froude Number	Fr_c =	1.00	

DETERMINATION OF CULVERT HEADWATER AND OUTLET PROTECTION

MHFD-Culvert, Version 4.00 (May 2020)

Project: MONUMENT JUNCTION - PHASE 1 PD SITE PLAN

ID: DP-1



Soil Type:

Choose One:
- ○ Sandy
- ◉ Non-Sandy

Supercritical Flow! Using Adjusted Diameter to calculate protection type.

Design Information:

Design Discharge	Q =	17	cfs
Circular Culvert:			
Barrel Diameter in Inches	D =	24	inches
Inlet Edge Type (Choose from pull-down list)		Square Edge Projecting	
OR:			
Box Culvert:		**OR**	
Barrel Height (Rise) in Feet	H (Rise) =		ft
Barrel Width (Span) in Feet	W (Span) =		ft
Inlet Edge Type (Choose from pull-down list)			
Number of Barrels	# Barrels =	1	
Inlet Elevation	Elev IN =	7050	ft
Outlet Elevation **OR** Slope	Elev OUT =	7049	ft
Culvert Length	L =	100	ft
Manning's Roughness	n =	0.013	
Bend Loss Coefficient	k_b =	0	
Exit Loss Coefficient	k_x =	1	
Tailwater Surface Elevation	$Y_{t,\ Elevation}$ =		ft
Max Allowable Channel Velocity	V =	7	ft/s

Calculated Results:

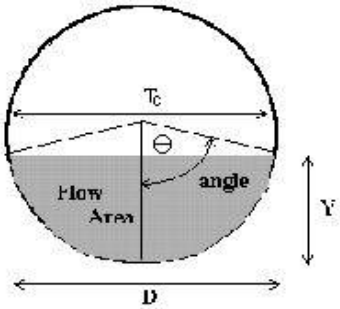
Culvert Cross Sectional Area Available	A =	3.14	ft^2
Culvert Normal Depth	Y_n =	1.29	ft
Culvert Critical Depth	Y_c =	1.49	ft
Froude Number	Fr =	1.32	**Supercritical!**
Entrance Loss Coefficient	k_e =	0.20	
Friction Loss Coefficient	k_f =	1.23	
Sum of All Loss Coefficients	k_s =	2.43	ft
Headwater:			
Inlet Control Headwater	HW_I =	2.54	ft
Outlet Control Headwater	HW_O =	1.85	ft
Design Headwater Elevation	**HW =**	**7052.54**	**ft**
Headwater/Diameter OR Headwater/Rise Ratio	**HW/D =**	**1.27**	
Outlet Protection:			
Flow/(Diameter^2.5)	Q/D^2.5 =	3.01	$ft^{0.5}/s$
Tailwater Surface Height	Y_t =	0.80	ft
Tailwater/Diameter	Yt/D =	0.40	
Expansion Factor	1/(2*tan(Θ)) =	4.38	
Flow Area at Max Channel Velocity	A_t =	2.43	ft^2
Width of Equivalent Conduit for Multiple Barrels	W_{eq} =	-	ft
Length of Riprap Protection	**L_p =**	**6**	**ft**
Width of Riprap Protection at Downstream End	**T =**	**4**	**ft**
Adjusted Diameter for Supercritical Flow	Da =	1.65	ft
Minimum Theoretical Riprap Size	d_{50} min=	5	in
Nominal Riprap Size	d_{50} nominal=	6	in
MHFD Riprap Type	**Type =**	**VL**	

CIRCULAR CONDUIT FLOW (Normal & Critical Depth Computation)

MHFD-Culvert, Version 4.00 (May 2020)

Project: MONUMENT JUNCTION - PHASE 1 PD SITE PLAN

Pipe ID: DP-2



Design Information (Input)			
Pipe Invert Slope	So =	0.0200	ft/ft
Pipe Manning's n-value	n =	0.0130	
Pipe Diameter	D =	24.00	inches
Design discharge	Q =	8.00	cfs

Full-Flow Capacity (Calculated)			
Full-flow area	Af =	3.14	sq ft
Full-flow wetted perimeter	Pf =	6.28	ft
Half Central Angle	Theta =	3.14	radians
Full-flow capacity	Qf =	32.08	cfs

Calculation of Normal Flow Condition			
Half Central Angle (0<Theta<3.14)	Theta =	1.25	radians
Flow area	An =	0.94	sq ft
Top width	Tn =	1.90	ft
Wetted perimeter	Pn =	2.49	ft
Flow depth	Yn =	0.68	ft
Flow velocity	Vn =	8.48	fps
Discharge	Qn =	8.00	cfs
Percent of Full Flow	Flow =	24.9%	of full flow
Normal Depth Froude Number	Fr_n =	2.12	supercritical

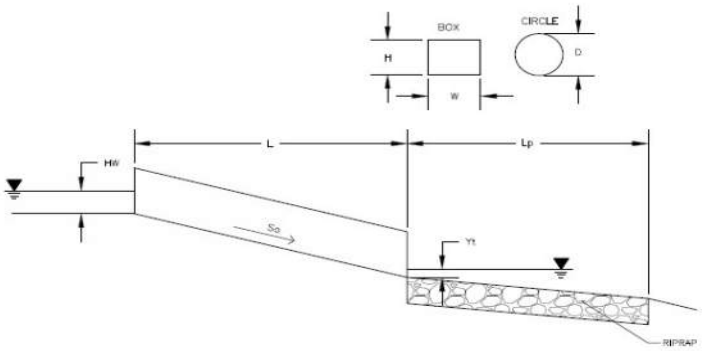
Calculation of Critical Flow Condition			
Half Central Angle (0<Theta-c<3.14)	Theta-c =	1.58	radians
Critical flow area	Ac =	1.58	sq ft
Critical top width	Tc =	2.00	ft
Critical flow depth	Yc =	1.01	ft
Critical flow velocity	Vc =	5.05	fps
Critical Depth Froude Number	Fr_c =	1.00	

DETERMINATION OF CULVERT HEADWATER AND OUTLET PROTECTION

MHFD-Culvert, Version 4.00 (May 2020)

Project: MONUMENT JUNCTION - PHASE 1 PD SITE PLAN

ID: DP-2



Soil Type:

Choose One:
- ○ Sandy
- ◉ Non-Sandy

Supercritical Flow! Using Adjusted Diameter to calculate protection type.

Design Information:

Design Discharge	Q =	8	cfs
Circular Culvert:			
Barrel Diameter in Inches	D =	18	inches
Inlet Edge Type (Choose from pull-down list)		Square Edge Projecting	
OR:			
Box Culvert:		**OR**	
Barrel Height (Rise) in Feet	H (Rise) =		ft
Barrel Width (Span) in Feet	W (Span) =		ft
Inlet Edge Type (Choose from pull-down list)			
Number of Barrels	# Barrels =	1	
Inlet Elevation	Elev IN =	7050	ft
Outlet Elevation **OR** Slope	Elev OUT =	7049	ft
Culvert Length	L =	100	ft
Manning's Roughness	n =	0.013	
Bend Loss Coefficient	k_b =	0	
Exit Loss Coefficient	k_x =	1	
Tailwater Surface Elevation	$Y_{t,\ Elevation}$ =		ft
Max Allowable Channel Velocity	V =	7	ft/s

Calculated Results:

Culvert Cross Sectional Area Available	A =	1.77	ft^2
Culvert Normal Depth	Y_n =	0.98	ft
Culvert Critical Depth	Y_c =	1.10	ft
Froude Number	Fr =	1.25	**Supercritical!**
Entrance Loss Coefficient	k_e =	0.20	
Friction Loss Coefficient	k_f =	1.81	
Sum of All Loss Coefficients	k_s =	3.01	ft
Headwater:			
Inlet Control Headwater	HW_I =	1.84	ft
Outlet Control Headwater	HW_O =	1.26	ft
Design Headwater Elevation	**HW =**	**7051.84**	**ft**
Headwater/Diameter OR Headwater/Rise Ratio	**HW/D =**	**1.23**	
Outlet Protection:			
Flow/(Diameter^2.5)	Q/D^2.5 =	2.90	$ft^{0.5}/s$
Tailwater Surface Height	Y_t =	0.60	ft
Tailwater/Diameter	Yt/D =	0.40	
Expansion Factor	1/(2*tan(Θ)) =	4.51	
Flow Area at Max Channel Velocity	A_t =	1.14	ft^2
Width of Equivalent Conduit for Multiple Barrels	W_{eq} =	-	ft
Length of Riprap Protection	**L_p =**	**5**	**ft**
Width of Riprap Protection at Downstream End	**T =**	**3**	**ft**
Adjusted Diameter for Supercritical Flow	Da =	1.24	ft
Minimum Theoretical Riprap Size	d_{50} min=	4	in
Nominal Riprap Size	d_{50} nominal=	6	in
MHFD Riprap Type	**Type =**	**VL**	

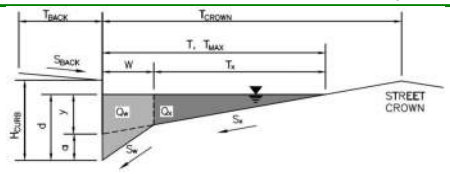
Version 4.06 Released August 2018

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

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

Project: **MONUMENT JUNCTION - PHASE 1 PD SITE PLAN**

Inlet ID: **DP3**



Gutter Geometry (Enter data in the blue cells)

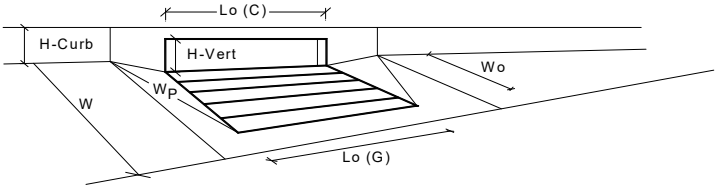
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.020	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

Version 4.06 Released August 2018



Design Information (Input)	Colorado Springs D-10-R		MINOR	MAJOR	
Type of Inlet		Type =	Colorado Springs D-10-R		
Local Depression (additional to continuous gutter depression 'a' from above)		a_{local} =	4.00	4.00	inches
Number of Unit Inlets (Grate or Curb Opening)		No =	1	1	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	6.0	6.0	inches
Grate Information			MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate		L_o (G) =	N/A	N/A	feet
Width of a Unit Grate		W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)		A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)		C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)		C_o (G) =	N/A	N/A	
Curb Opening Information			MINOR	MAJOR	
Length of a Unit Curb Opening		L_o (C) =	8.00	8.00	feet
Height of Vertical Curb Opening in Inches		H_{vert} =	8.00	8.00	inches
Height of Curb Orifice Throat in Inches		H_{throat} =	8.00	8.00	inches
Angle of Throat (see USDCM Figure ST-5)		Theta =	81.00	81.00	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)		C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)		C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)		C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)			MINOR	MAJOR	
Depth for Grate Midwidth		d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation		d_{Curb} =	0.33	0.33	ft
Combination Inlet Performance Reduction Factor for Long Inlets		$RF_{Combination}$ =	0.61	0.61	
Curb Opening Performance Reduction Factor for Long Inlets		RF_{Curb} =	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets		RF_{Grate} =	N/A	N/A	
			MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)		**Q_a =**	**7.6**	**7.6**	**cfs**
WARNING: Inlet Capacity less than Q Peak for Major Storm		$Q_{PEAK\ REQUIRED}$ =	7.0	16.0	cfs

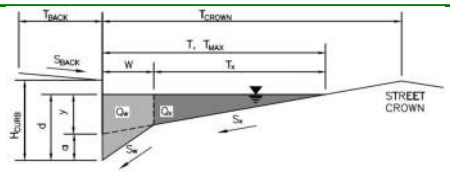
Version 4.06 Released August 2018

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

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

Project: **MONUMENT JUNCTION - PHASE 1 PD SITE PLAN**

Inlet ID: **DP4**



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.015	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.020	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☐	check = yes

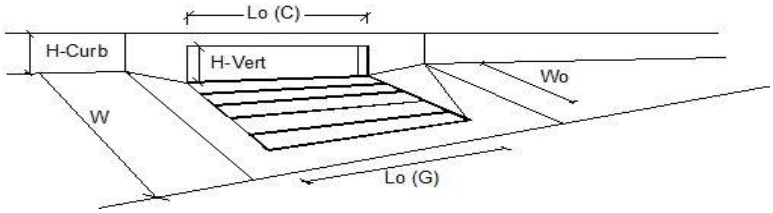
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	**Q_{allow} =**	**10.6**	**10.6**	**cfs**

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

WARNING: MAJOR STORM max. allowable capacity is less than the design flow given on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

Version 4.06 Released August 2018



Design Information (Input)	Colorado Springs D-10-R		MINOR	MAJOR	
Type of Inlet		Type =	Colorado Springs D-10-R		
Local Depression (additional to continuous gutter depression 'a')		a_{LOCAL} =	4.0	4.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)		L_o =	8.00	8.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)		W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)		C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		C_f-C =	0.10	0.10	

Street Hydraulics: WARNING: Q > ALLOWABLE Q FOR MAJOR STORM		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**3.0**	**8.2**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**7.8**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**52**	**%**

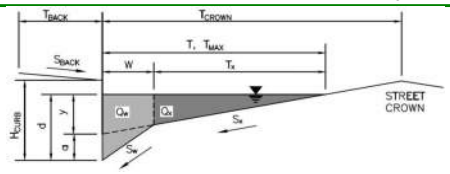
Version 4.06 Released August 2018

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

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

Project: **MONUMENT JUNCTION - PHASE 1 PD SITE PLAN**

Inlet ID: **DP5**



Gutter Geometry (Enter data in the blue cells)

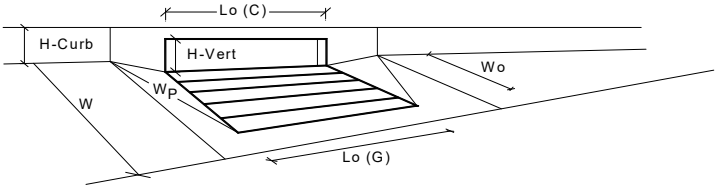
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.020	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	12.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

Version 4.06 Released August 2018



Design Information (Input)	Colorado Springs D-10-R		MINOR	MAJOR	
Type of Inlet		Type =	Colorado Springs D-10-R		
Local Depression (additional to continuous gutter depression 'a' from above)		a_{local} =	4.00	4.00	inches
Number of Unit Inlets (Grate or Curb Opening)		No =	1	1	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	6.0	12.0	inches
Grate Information			MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate		L_o (G) =	N/A	N/A	feet
Width of a Unit Grate		W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)		A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)		C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)		C_o (G) =	N/A	N/A	
Curb Opening Information			MINOR	MAJOR	
Length of a Unit Curb Opening		L_o (C) =	6.00	6.00	feet
Height of Vertical Curb Opening in Inches		H_{vert} =	8.00	8.00	inches
Height of Curb Orifice Throat in Inches		H_{throat} =	8.00	8.00	inches
Angle of Throat (see USDCM Figure ST-5)		Theta =	81.00	81.00	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)		C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)		C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)		C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)			MINOR	MAJOR	
Depth for Grate Midwidth		d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation		d_{Curb} =	0.33	0.83	ft
Combination Inlet Performance Reduction Factor for Long Inlets		$RF_{Combination}$ =	0.71	1.00	
Curb Opening Performance Reduction Factor for Long Inlets		RF_{Curb} =	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets		RF_{Grate} =	N/A	N/A	
			MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)		**Q_a =**	**6.1**	**19.8**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)		$Q_{PEAK\ REQUIRED}$ =	2.0	13.0	cfs

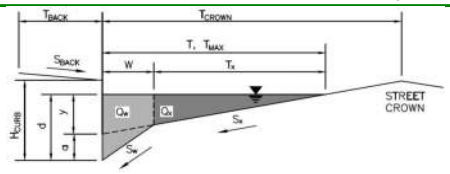
Version 4.06 Released August 2018

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

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

Project: **MONUMENT JUNCTION - PHASE 1 PD SITE PLAN**

Inlet ID: **DP6**



Gutter Geometry (Enter data in the blue cells)

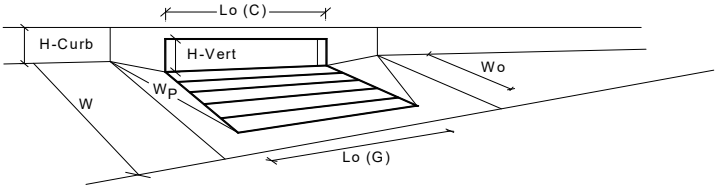
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.020	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	12.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

Version 4.06 Released August 2018



Design Information (Input)	Colorado Springs D-10-R		MINOR	MAJOR	
Type of Inlet		Type =	Colorado Springs D-10-R		
Local Depression (additional to continuous gutter depression 'a' from above)		a_{local} =	4.00	4.00	inches
Number of Unit Inlets (Grate or Curb Opening)		No =	1	1	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	6.0	12.0	inches
Grate Information			MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate		L_o (G) =	N/A	N/A	feet
Width of a Unit Grate		W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)		A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)		C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)		C_o (G) =	N/A	N/A	
Curb Opening Information			MINOR	MAJOR	
Length of a Unit Curb Opening		L_o (C) =	6.00	6.00	feet
Height of Vertical Curb Opening in Inches		H_{vert} =	8.00	8.00	inches
Height of Curb Orifice Throat in Inches		H_{throat} =	8.00	8.00	inches
Angle of Throat (see USDCM Figure ST-5)		Theta =	81.00	81.00	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)		C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)		C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)		C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)			MINOR	MAJOR	
Depth for Grate Midwidth		d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation		d_{Curb} =	0.33	0.83	ft
Combination Inlet Performance Reduction Factor for Long Inlets		$RF_{Combination}$ =	0.71	1.00	
Curb Opening Performance Reduction Factor for Long Inlets		RF_{Curb} =	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets		RF_{Grate} =	N/A	N/A	
			MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)		**Q_a =**	**6.1**	**19.8**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)		$Q_{PEAK\ REQUIRED}$ =	5.0	11.0	cfs

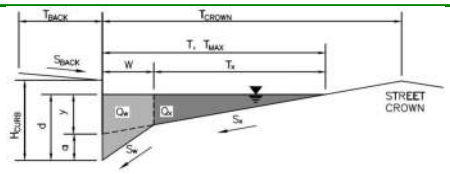
Version 4.06 Released August 2018

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

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

Project: **MONUMENT JUNCTION - PHASE 1 PD SITE PLAN**

Inlet ID: **DP7**



Gutter Geometry (Enter data in the blue cells)

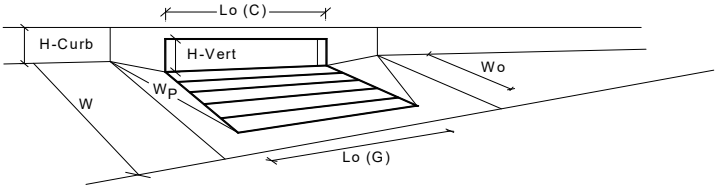
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.020	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	12.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

Version 4.06 Released August 2018



Design Information (Input)	Colorado Springs D-10-R		MINOR	MAJOR	
Type of Inlet		Type =	Colorado Springs D-10-R		
Local Depression (additional to continuous gutter depression 'a' from above)		a_{local} =	4.00	4.00	inches
Number of Unit Inlets (Grate or Curb Opening)		No =	1	1	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	6.0	12.0	inches
Grate Information			MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate		L_o (G) =	N/A	N/A	feet
Width of a Unit Grate		W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)		A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)		C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)		C_o (G) =	N/A	N/A	
Curb Opening Information			MINOR	MAJOR	
Length of a Unit Curb Opening		L_o (C) =	6.00	6.00	feet
Height of Vertical Curb Opening in Inches		H_{vert} =	8.00	8.00	inches
Height of Curb Orifice Throat in Inches		H_{throat} =	8.00	8.00	inches
Angle of Throat (see USDCM Figure ST-5)		Theta =	81.00	81.00	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)		C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)		C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)		C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)			MINOR	MAJOR	
Depth for Grate Midwidth		d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation		d_{Curb} =	0.33	0.83	ft
Combination Inlet Performance Reduction Factor for Long Inlets		$RF_{Combination}$ =	0.71	1.00	
Curb Opening Performance Reduction Factor for Long Inlets		RF_{Curb} =	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets		RF_{Grate} =	N/A	N/A	
			MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)		**Q_a =**	**6.1**	**19.8**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)		$Q_{PEAK\ REQUIRED}$ =	5.0	13.0	cfs

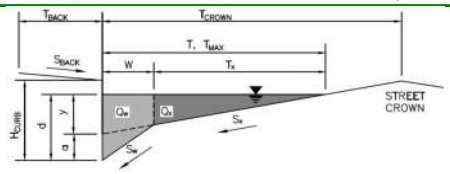
Version 4.06 Released August 2018

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

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

Project: **MONUMENT JUNCTION - PHASE 1 PD SITE PLAN**

Inlet ID: **DP8**



Gutter Geometry (Enter data in the blue cells)

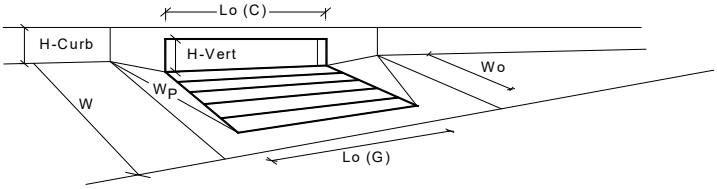
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	12.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

Version 4.06 Released August 2018



Design Information (Input) Colorado Springs D-10-R		MINOR	MAJOR	
Type of Inlet	Type =	Colorado Springs D-10-R		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	4.00	4.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	12.0	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	4.00	4.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	8.00	8.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	8.00	8.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	81.00	81.00	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.33	0.83	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.85	1.00	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**4.6**	**12.6**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	1.0	2.0	cfs

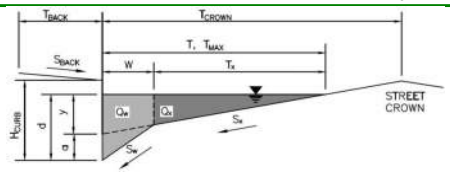
Version 4.06 Released August 2018

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

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

Project: **MONUMENT JUNCTION - PHASE 1 PD SITE PLAN**

Inlet ID: **DP10**



Gutter Geometry (Enter data in the blue cells)

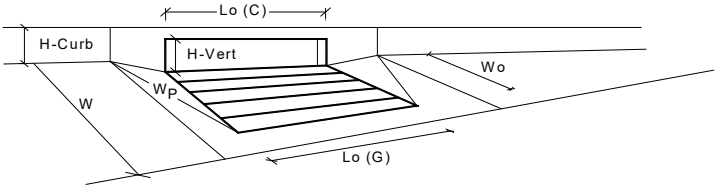
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.020	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	12.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

Version 4.06 Released August 2018



Design Information (Input)	Colorado Springs D-10-R		MINOR	MAJOR	
Type of Inlet		Type =	Colorado Springs D-10-R		
Local Depression (additional to continuous gutter depression 'a' from above)		a_{local} =	4.00	4.00	inches
Number of Unit Inlets (Grate or Curb Opening)		No =	1	1	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	6.0	12.0	inches
Grate Information			MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate		L_o (G) =	N/A	N/A	feet
Width of a Unit Grate		W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)		A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)		C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)		C_o (G) =	N/A	N/A	
Curb Opening Information			MINOR	MAJOR	
Length of a Unit Curb Opening		L_o (C) =	8.00	8.00	feet
Height of Vertical Curb Opening in Inches		H_{vert} =	8.00	8.00	inches
Height of Curb Orifice Throat in Inches		H_{throat} =	8.00	8.00	inches
Angle of Throat (see USDCM Figure ST-5)		Theta =	81.00	81.00	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)		C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)		C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)		C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)			MINOR	MAJOR	
Depth for Grate Midwidth		d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation		d_{Curb} =	0.33	0.83	ft
Combination Inlet Performance Reduction Factor for Long Inlets		$RF_{Combination}$ =	0.61	1.00	
Curb Opening Performance Reduction Factor for Long Inlets		RF_{Curb} =	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets		RF_{Grate} =	N/A	N/A	
			MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)		**Q_a =**	**7.6**	**26.4**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)		$Q_{PEAK\ REQUIRED}$ =	7.0	16.0	cfs

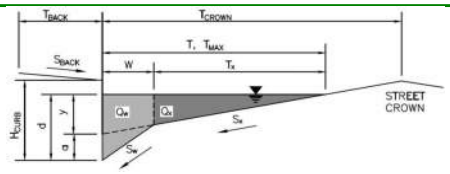
Version 4.06 Released August 2018

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

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

Project: **MONUMENT JUNCTION - PHASE 1 PD SITE PLAN**

Inlet ID: **DP11**



Gutter Geometry (Enter data in the blue cells)

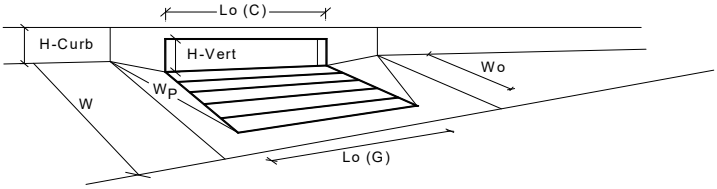
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.020	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	12.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

Version 4.06 Released August 2018



Design Information (Input) Colorado Springs D-10-R		MINOR	MAJOR	
Type of Inlet	Type =	Colorado Springs D-10-R		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	4.00	4.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	12.0	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	4.00	4.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	8.00	8.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	8.00	8.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	81.00	81.00	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.33	0.83	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.85	1.00	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	Q_a =	**4.6**	**12.6**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	3.0	7.0	cfs

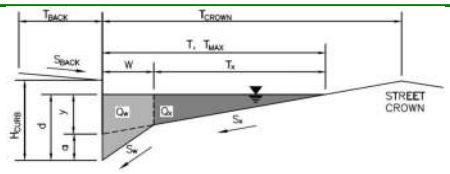
Version 4.06 Released August 2018

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

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

Project: **MONUMENT JUNCTION - PHASE 1 PD SITE PLAN**

Inlet ID: **DP12**



Gutter Geometry (Enter data in the blue cells)

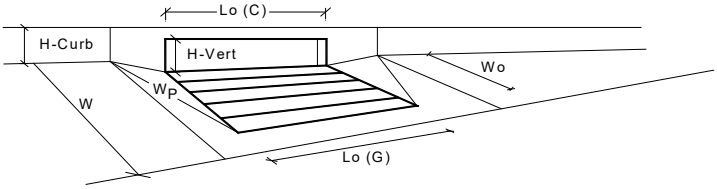
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.020	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	12.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

Version 4.06 Released August 2018



Design Information (Input) Colorado Springs D-10-R		MINOR	MAJOR	
Type of Inlet	Type =	Colorado Springs D-10-R		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	4.00	4.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	12.0	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	6.00	6.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	8.00	8.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	8.00	8.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	81.00	81.00	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.33	0.83	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.71	1.00	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**6.1**	**19.8**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	5.0	13.0	cfs

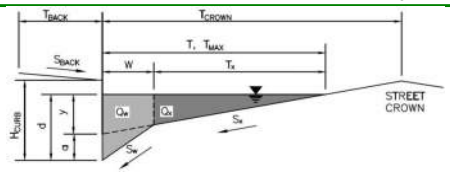
Version 4.06 Released August 2018

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

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

Project: **MONUMENT JUNCTION - PHASE 1 PD SITE PLAN**

Inlet ID: **DP13**



Gutter Geometry (Enter data in the blue cells)

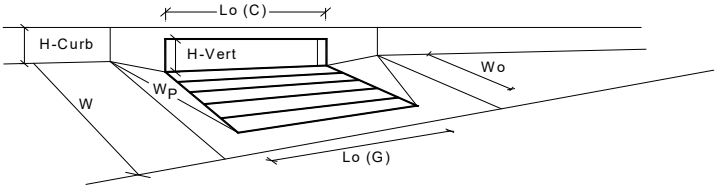
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.020	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	12.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

Version 4.06 Released August 2018



Design Information (Input)	Colorado Springs D-10-R		MINOR	MAJOR	
Type of Inlet		Type =	Colorado Springs D-10-R		
Local Depression (additional to continuous gutter depression 'a' from above)		a_{local} =	4.00	4.00	inches
Number of Unit Inlets (Grate or Curb Opening)		No =	1	1	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	6.0	12.0	inches
Grate Information			MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate		L_o (G) =	N/A	N/A	feet
Width of a Unit Grate		W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)		A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)		C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)		C_o (G) =	N/A	N/A	
Curb Opening Information			MINOR	MAJOR	
Length of a Unit Curb Opening		L_o (C) =	4.00	4.00	feet
Height of Vertical Curb Opening in Inches		H_{vert} =	8.00	8.00	inches
Height of Curb Orifice Throat in Inches		H_{throat} =	8.00	8.00	inches
Angle of Throat (see USDCM Figure ST-5)		Theta =	81.00	81.00	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)		C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)		C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)		C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)			MINOR	MAJOR	
Depth for Grate Midwidth		d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation		d_{Curb} =	0.33	0.83	ft
Combination Inlet Performance Reduction Factor for Long Inlets		$RF_{Combination}$ =	0.85	1.00	
Curb Opening Performance Reduction Factor for Long Inlets		RF_{Curb} =	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets		RF_{Grate} =	N/A	N/A	
			MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)		**Q_a =**	**4.6**	**12.6**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)		$Q_{PEAK\ REQUIRED}$ =	2.0	5.0	cfs

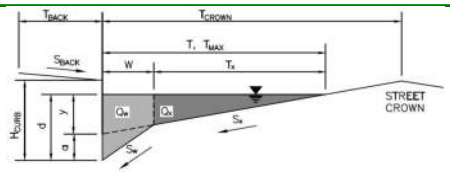
Version 4.06 Released August 2018

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

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

Project: **MONUMENT JUNCTION - PHASE 1 PD SITE PLAN**

Inlet ID: **DP14**



Gutter Geometry (Enter data in the blue cells)

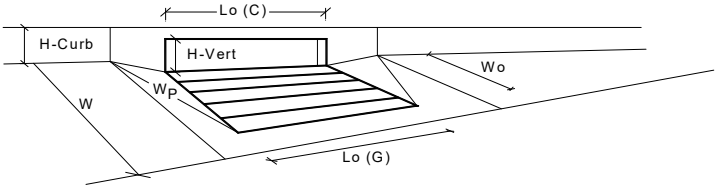
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.020	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	12.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

Version 4.06 Released August 2018



Design Information (Input)	Colorado Springs D-10-R		MINOR	MAJOR	
Type of Inlet		Type =	Colorado Springs D-10-R		
Local Depression (additional to continuous gutter depression 'a' from above)		a_{local} =	4.00	4.00	inches
Number of Unit Inlets (Grate or Curb Opening)		No =	1	1	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	6.0	12.0	inches
Grate Information			MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate		L_o (G) =	N/A	N/A	feet
Width of a Unit Grate		W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)		A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)		C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)		C_o (G) =	N/A	N/A	
Curb Opening Information			MINOR	MAJOR	
Length of a Unit Curb Opening		L_o (C) =	4.00	4.00	feet
Height of Vertical Curb Opening in Inches		H_{vert} =	8.00	8.00	inches
Height of Curb Orifice Throat in Inches		H_{throat} =	8.00	8.00	inches
Angle of Throat (see USDCM Figure ST-5)		Theta =	81.00	81.00	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)		C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)		C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)		C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)			MINOR	MAJOR	
Depth for Grate Midwidth		d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation		d_{Curb} =	0.33	0.83	ft
Combination Inlet Performance Reduction Factor for Long Inlets		$RF_{Combination}$ =	0.85	1.00	
Curb Opening Performance Reduction Factor for Long Inlets		RF_{Curb} =	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets		RF_{Grate} =	N/A	N/A	
			MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)		**Q_a =**	**4.6**	**12.6**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)		$Q_{PEAK\ REQUIRED}$ =	2.0	5.0	cfs

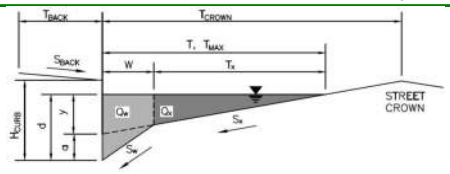
Version 4.06 Released August 2018

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

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

Project: **MONUMENT JUNCTION - PHASE 1 PD SITE PLAN**

Inlet ID: **DP15**



Gutter Geometry (Enter data in the blue cells)

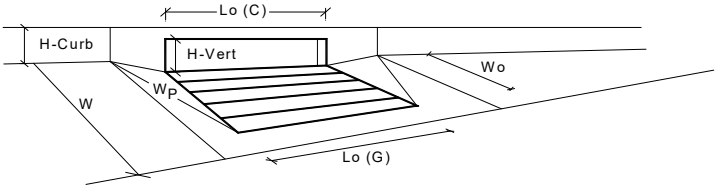
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	12.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

Version 4.06 Released August 2018



Design Information (Input)	Colorado Springs D-10-R		MINOR	MAJOR	
Type of Inlet		Type =	Colorado Springs D-10-R		
Local Depression (additional to continuous gutter depression 'a' from above)		a_{local} =	4.00	4.00	inches
Number of Unit Inlets (Grate or Curb Opening)		No =	1	1	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	6.0	12.0	inches
Grate Information			MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate		L_o (G) =	N/A	N/A	feet
Width of a Unit Grate		W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)		A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)		C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)		C_o (G) =	N/A	N/A	
Curb Opening Information			MINOR	MAJOR	
Length of a Unit Curb Opening		L_o (C) =	4.00	4.00	feet
Height of Vertical Curb Opening in Inches		H_{vert} =	8.00	8.00	inches
Height of Curb Orifice Throat in Inches		H_{throat} =	8.00	8.00	inches
Angle of Throat (see USDCM Figure ST-5)		Theta =	81.00	81.00	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)		C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)		C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)		C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)			MINOR	MAJOR	
Depth for Grate Midwidth		d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation		d_{Curb} =	0.33	0.83	ft
Combination Inlet Performance Reduction Factor for Long Inlets		$RF_{Combination}$ =	0.85	1.00	
Curb Opening Performance Reduction Factor for Long Inlets		RF_{Curb} =	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets		RF_{Grate} =	N/A	N/A	
			MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)		**Q_a =**	**4.6**	**12.6**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)		$Q_{PEAK\ REQUIRED}$ =	1.0	2.0	cfs

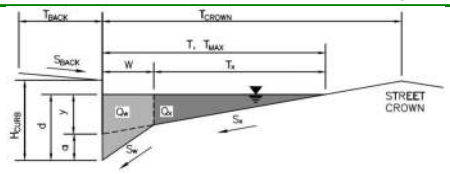
Version 4.06 Released August 2018

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

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

Project: **MONUMENT JUNCTION - PHASE 1 PD SITE PLAN**

Inlet ID: **DP16**



Gutter Geometry (Enter data in the blue cells)

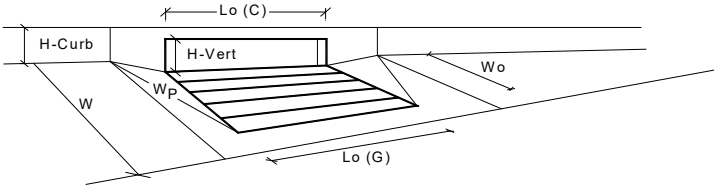
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.020	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

Version 4.06 Released August 2018



Design Information (Input)	Colorado Springs D-10-R		MINOR	MAJOR	
Type of Inlet		Type =	Colorado Springs D-10-R		
Local Depression (additional to continuous gutter depression 'a' from above)		a_{local} =	4.00	4.00	inches
Number of Unit Inlets (Grate or Curb Opening)		No =	1	1	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	6.0	6.0	inches
Grate Information			MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate		L_o (G) =	N/A	N/A	feet
Width of a Unit Grate		W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)		A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)		C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)		C_o (G) =	N/A	N/A	
Curb Opening Information			MINOR	MAJOR	
Length of a Unit Curb Opening		L_o (C) =	6.00	6.00	feet
Height of Vertical Curb Opening in Inches		H_{vert} =	8.00	8.00	inches
Height of Curb Orifice Throat in Inches		H_{throat} =	8.00	8.00	inches
Angle of Throat (see USDCM Figure ST-5)		Theta =	81.00	81.00	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)		C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)		C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)		C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)			MINOR	MAJOR	
Depth for Grate Midwidth		d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation		d_{Curb} =	0.33	0.33	ft
Combination Inlet Performance Reduction Factor for Long Inlets		$RF_{Combination}$ =	0.71	0.71	
Curb Opening Performance Reduction Factor for Long Inlets		RF_{Curb} =	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets		RF_{Grate} =	N/A	N/A	
			MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)		**Q_a =**	**6.1**	**6.1**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)		$Q_{PEAK\ REQUIRED}$ =	2.0	5.0	cfs

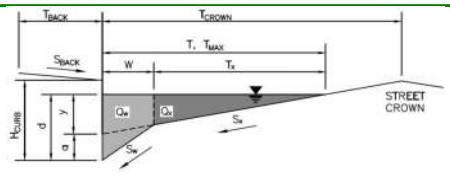
Version 4.06 Released August 2018

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

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

Project: **MONUMENT JUNCTION - PHASE 1 PD SITE PLAN**

Inlet ID: **DP17**



Gutter Geometry (Enter data in the blue cells)

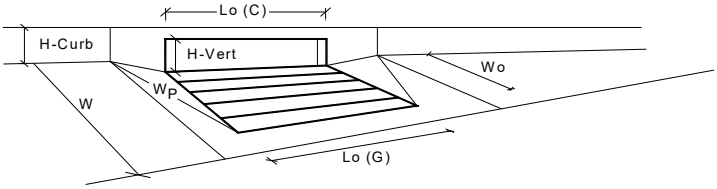
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.020	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	8.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

Version 4.06 Released August 2018



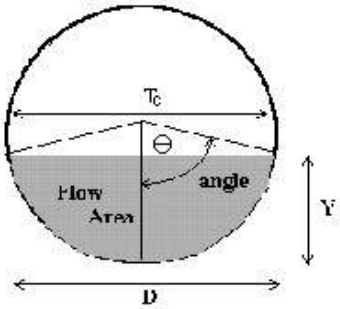
Design Information (Input)	Colorado Springs D-10-R		MINOR	MAJOR	
Type of Inlet		Type =	Colorado Springs D-10-R		
Local Depression (additional to continuous gutter depression 'a' from above)		a_{local} =	4.00	4.00	inches
Number of Unit Inlets (Grate or Curb Opening)		No =	1	1	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	6.0	8.0	inches
Grate Information			MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate		L_o (G) =	N/A	N/A	feet
Width of a Unit Grate		W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)		A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)		C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)		C_o (G) =	N/A	N/A	
Curb Opening Information			MINOR	MAJOR	
Length of a Unit Curb Opening		L_o (C) =	6.00	6.00	feet
Height of Vertical Curb Opening in Inches		H_{vert} =	8.00	8.00	inches
Height of Curb Orifice Throat in Inches		H_{throat} =	8.00	8.00	inches
Angle of Throat (see USDCM Figure ST-5)		Theta =	81.00	81.00	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)		C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)		C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)		C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)			MINOR	MAJOR	
Depth for Grate Midwidth		d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation		d_{Curb} =	0.33	0.50	ft
Combination Inlet Performance Reduction Factor for Long Inlets		$RF_{Combination}$ =	0.71	0.94	
Curb Opening Performance Reduction Factor for Long Inlets		RF_{Curb} =	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets		RF_{Grate} =	N/A	N/A	
			MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)		**Q_a =**	**6.1**	**11.2**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)		$Q_{PEAK\ REQUIRED}$ =	2.0	5.0	cfs

CIRCULAR CONDUIT FLOW (Normal & Critical Depth Computation)

MHFD-Culvert, Version 4.00 (May 2020)

Project: MONUMENT JUNCTION - PHASE 1 PD SITE PLAN

Pipe ID: DP-19



Design Information (Input)			
Pipe Invert Slope	So =	0.0200	ft/ft
Pipe Manning's n-value	n =	0.0130	
Pipe Diameter	D =	18.00	inches
Design discharge	Q =	2.00	cfs

Full-Flow Capacity (Calculated)			
Full-flow area	Af =	1.77	sq ft
Full-flow wetted perimeter	Pf =	4.71	ft
Half Central Angle	Theta =	3.14	radians
Full-flow capacity	Qf =	14.90	cfs

Calculation of Normal Flow Condition			
Half Central Angle (0<Theta<3.14)	Theta =	1.04	radians
Flow area	An =	0.34	sq ft
Top width	Tn =	1.29	ft
Wetted perimeter	Pn =	1.56	ft
Flow depth	Yn =	0.37	ft
Flow velocity	Vn =	5.87	fps
Discharge	Qn =	2.00	cfs
Percent of Full Flow	Flow =	13.4%	of full flow
Normal Depth Froude Number	Fr_n =	2.02	supercritical

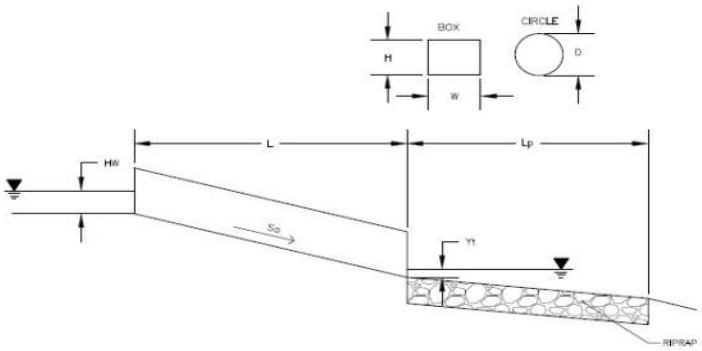
Calculation of Critical Flow Condition			
Half Central Angle (0<Theta-c<3.14)	Theta-c =	1.28	radians
Critical flow area	Ac =	0.56	sq ft
Critical top width	Tc =	1.44	ft
Critical flow depth	Yc =	0.53	ft
Critical flow velocity	Vc =	3.55	fps
Critical Depth Froude Number	Fr_c =	1.00	

DETERMINATION OF CULVERT HEADWATER AND OUTLET PROTECTION

MHFD-Culvert, Version 4.00 (May 2020)

Project: MONUMENT JUNCTION - PHASE 1 PD SITE PLAN

ID: DP-19



Soil Type:

Choose One:
- ○ Sandy
- ◉ Non-Sandy

Supercritical Flow! Using Adjusted Diameter to calculate protection type.

Design Information:

Design Discharge	Q =	2	cfs
Circular Culvert:			
Barrel Diameter in Inches	D =	18	inches
Inlet Edge Type (Choose from pull-down list)		Square Edge Projecting	
OR:			
Box Culvert:		**OR**	
Barrel Height (Rise) in Feet	H (Rise) =		ft
Barrel Width (Span) in Feet	W (Span) =		ft
Inlet Edge Type (Choose from pull-down list)			
Number of Barrels	# Barrels =	1	
Inlet Elevation	Elev IN =	7037.5	ft
Outlet Elevation **OR** Slope	Elev OUT =	7037	ft
Culvert Length	L =	50	ft
Manning's Roughness	n =	0.013	
Bend Loss Coefficient	k_b =	0	
Exit Loss Coefficient	k_x =	1	
Tailwater Surface Elevation	$Y_{t,\ Elevation}$ =		ft
Max Allowable Channel Velocity	V =	7	ft/s

Calculated Results:

Culvert Cross Sectional Area Available	A =	1.77	ft^2
Culvert Normal Depth	Y_n =	0.44	ft
Culvert Critical Depth	Y_c =	0.53	ft
Froude Number	Fr =	1.43	**Supercritical!**
Entrance Loss Coefficient	k_e =	0.20	
Friction Loss Coefficient	k_f =	0.91	
Sum of All Loss Coefficients	k_s =	2.11	ft
Headwater:			
Inlet Control Headwater	HW_I =	0.75	ft
Outlet Control Headwater	HW_O =	N/A	ft
Design Headwater Elevation	**HW =**	**N/A**	**ft**
Headwater/Diameter OR Headwater/Rise Ratio	**HW/D =**	**N/A**	

Outlet Control Headwater Approximation Method Inaccurate for Low Flow - Backwater Calculations Required

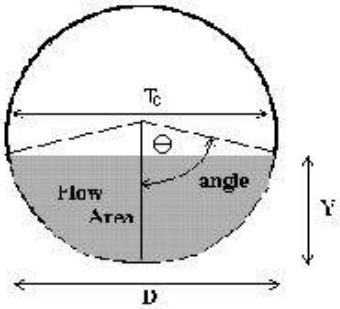
Outlet Protection:			
Flow/(Diameter^2.5)	Q/D^2.5 =	0.73	$ft^{0.5}/s$
Tailwater Surface Height	Y_t =	0.60	ft
Tailwater/Diameter	Yt/D =	0.40	
Expansion Factor	1/(2*tan(Θ)) =	6.70	
Flow Area at Max Channel Velocity	A_t =	0.29	ft^2
Width of Equivalent Conduit for Multiple Barrels	W_{eq} =	-	ft
Length of Riprap Protection	**L_p =**	**5**	**ft**
Width of Riprap Protection at Downstream End	**T =**	**3**	**ft**
Adjusted Diameter for Supercritical Flow	Da =	0.97	ft
Minimum Theoretical Riprap Size	d_{50} min=	1	in
Nominal Riprap Size	d_{50} nominal=	6	in
MHFD Riprap Type	**Type =**	**VL**	

CIRCULAR CONDUIT FLOW (Normal & Critical Depth Computation)

MHFD-Culvert, Version 4.00 (May 2020)

Project: MONUMENT JUNCTION - PHASE 1 PD SITE PLAN

Pipe ID: DP-21



Design Information (Input)			
Pipe Invert Slope	So =	0.0200	ft/ft
Pipe Manning's n-value	n =	0.0130	
Pipe Diameter	D =	18.00	inches
Design discharge	Q =	4.00	cfs

Full-Flow Capacity (Calculated)			
Full-flow area	Af =	1.77	sq ft
Full-flow wetted perimeter	Pf =	4.71	ft
Half Central Angle	Theta =	3.14	radians
Full-flow capacity	Qf =	14.90	cfs

Calculation of Normal Flow Condition			
Half Central Angle (0<Theta<3.14)	Theta =	1.27	radians
Flow area	An =	0.56	sq ft
Top width	Tn =	1.43	ft
Wetted perimeter	Pn =	1.91	ft
Flow depth	Yn =	0.53	ft
Flow velocity	Vn =	7.15	fps
Discharge	Qn =	4.00	cfs
Percent of Full Flow	Flow =	26.9%	of full flow
Normal Depth Froude Number	Fr_n =	2.02	supercritical

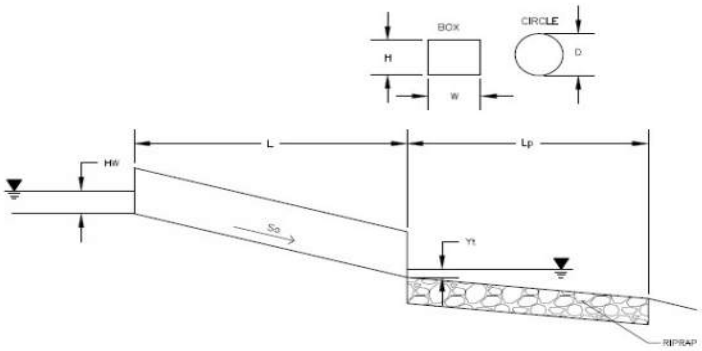
Calculation of Critical Flow Condition			
Half Central Angle (0<Theta-c<3.14)	Theta-c =	1.59	radians
Critical flow area	Ac =	0.91	sq ft
Critical top width	Tc =	1.50	ft
Critical flow depth	Yc =	0.77	ft
Critical flow velocity	Vc =	4.41	fps
Critical Depth Froude Number	Fr_c =	1.00	

DETERMINATION OF CULVERT HEADWATER AND OUTLET PROTECTION

MHFD-Culvert, Version 4.00 (May 2020)

Project: MONUMENT JUNCTION - PHASE 1 PD SITE PLAN

ID: DP-21



Soil Type:

Choose One:
- ○ Sandy
- ◉ Non-Sandy

Supercritical Flow! Using Adjusted Diameter to calculate protection type.

Design Information:

Design Discharge	Q =	4	cfs
Circular Culvert:			
Barrel Diameter in Inches	D =	18	inches
Inlet Edge Type (Choose from pull-down list)		Square Edge Projecting	
OR:			
Box Culvert:		**OR**	
Barrel Height (Rise) in Feet	H (Rise) =		ft
Barrel Width (Span) in Feet	W (Span) =		ft
Inlet Edge Type (Choose from pull-down list)			
Number of Barrels	# Barrels =	1	
Inlet Elevation	Elev IN =	7018	ft
Outlet Elevation **OR** Slope	Elev OUT =	7017.5	ft
Culvert Length	L =	50	ft
Manning's Roughness	n =	0.013	
Bend Loss Coefficient	k_b =	0	
Exit Loss Coefficient	k_x =	1	
Tailwater Surface Elevation	$Y_{t,\ Elevation}$ =		ft
Max Allowable Channel Velocity	V =	7	ft/s

Calculated Results:

Culvert Cross Sectional Area Available	A =	1.77	ft^2
Culvert Normal Depth	Y_n =	0.64	ft
Culvert Critical Depth	Y_c =	0.77	ft
Froude Number	Fr =	1.40	**Supercritical!**
Entrance Loss Coefficient	k_e =	0.20	
Friction Loss Coefficient	k_f =	0.91	
Sum of All Loss Coefficients	k_s =	2.11	ft
Headwater:			
Inlet Control Headwater	HW_I =	1.12	ft
Outlet Control Headwater	HW_O =	N/A	ft
Design Headwater Elevation	**HW =**	**N/A**	**ft**
Headwater/Diameter OR Headwater/Rise Ratio	**HW/D =**	**N/A**	

Outlet Control Headwater Approximation Method Inaccurate for Low Flow - Backwater Calculations Required

Outlet Protection:			
Flow/(Diameter^2.5)	Q/D^2.5 =	1.45	$ft^{0.5}/s$
Tailwater Surface Height	Y_t =	0.60	ft
Tailwater/Diameter	Yt/D =	0.40	
Expansion Factor	1/(2*tan(Θ)) =	6.27	
Flow Area at Max Channel Velocity	A_t =	0.57	ft^2
Width of Equivalent Conduit for Multiple Barrels	W_{eq} =	-	ft
Length of Riprap Protection	**L_p =**	**5**	**ft**
Width of Riprap Protection at Downstream End	**T =**	**3**	**ft**
Adjusted Diameter for Supercritical Flow	Da =	1.07	ft
Minimum Theoretical Riprap Size	d_{50} min=	2	in
Nominal Riprap Size	d_{50} nominal=	6	in
MHFD Riprap Type	**Type =**	**VL**	

STORMWATER QUALITY CALCULATIONS

Design Procedure Form: Extended Detention Basin (EDB)

UD-BMP (Version 3.07, March 2018)

Designer:	**Marc A. Whorton, P.E.**
Company:	**Classic Consulting**
Date:	**August 11, 2021**
Project:	**Monument Junction - Phase 1 PD Site Plan**
Location:	**Pond 1 - North Forebay**

1. Basin Storage Volume	
A) Effective Imperviousness of Tributary Area, I_a	I_a = 55.0 %
B) Tributary Area's Imperviousness Ratio ($i = I_a / 100$)	i = 0.550
C) Contributing Watershed Area	Area = 36.580 ac
D) For Watersheds Outside of the Denver Region, Depth of Average Runoff Producing Storm	d_6 = 0.42 in
E) Design Concept (Select EURV when also designing for flood control)	Choose One: ○ Water Quality Capture Volume (WQCV) ◉ Excess Urban Runoff Volume (EURV)
F) Design Volume (WQCV) Based on 40-hour Drain Time ($V_{DESIGN} = (1.0 * (0.91 * i^3 - 1.19 * i^2 + 0.78 * i) / 12 * Area$)	V_{DESIGN}= ac-ft
G) For Watersheds Outside of the Denver Region, Water Quality Capture Volume (WQCV) Design Volume ($V_{WQCV\ OTHER} = (d_6*(V_{DESIGN}/0.43))$	$V_{DESIGN\ OTHER}$= 0.656 ac-ft
H) User Input of Water Quality Capture Volume (WQCV) Design Volume (Only if a different WQCV Design Volume is desired)	$V_{DESIGN\ USER}$= ac-ft
I) NRCS Hydrologic Soil Groups of Tributary Watershed	
i) Percentage of Watershed consisting of Type A Soils	HSG_A = 0 %
ii) Percentage of Watershed consisting of Type B Soils	HSG_B = 100 %
iii) Percentage of Watershed consisting of Type C/D Soils	$HSG_{C/D}$ = 0 %
J) Excess Urban Runoff Volume (EURV) Design Volume For HSG A: $EURV_A = 1.68 * i^{1.28}$ For HSG B: $EURV_B = 1.36 * i^{1.08}$ For HSG C/D: $EURV_{C/D} = 1.20 * i^{1.08}$	$EURV_{DESIGN}$ = 2.174 ac-f t
K) User Input of Excess Urban Runoff Volume (EURV) Design Volume (Only if a different EURV Design Volume is desired)	$EURV_{DESIGN\ USER}$= ac-f t
2. Basin Shape: Length to Width Ratio (A basin length to width ratio of at least 2:1 will improve TSS reduction.)	L : W = 2.0 : 1
3. Basin Side Slopes	
A) Basin Maximum Side Slopes (Horizontal distance per unit vertical, 4:1 or flatter preferred)	Z = 4.00 ft / ft
4. Inlet	
A) Describe means of providing energy dissipation at concentrated inflow locations:	Concrete Forebay
5. Forebay	
A) Minimum Forebay Volume (V_{FMIN} = 3% of the WQCV)	V_{FMIN} = 0.020 ac-ft
B) Actual Forebay Volume	V_F = 0.020 ac-ft
C) Forebay Depth (D_F = 30 inch maximum)	D_F = 30.0 in
D) Forebay Discharge	
i) Undetained 100-year Peak Discharge	Q_{100} = 91.00 cfs
ii) Forebay Discharge Design Flow ($Q_F = 0.02 * Q_{100}$)	Q_F = 1.82 cfs
E) Forebay Discharge Design	Choose One: ○ Berm With Pipe ◉ Wall with Rect. Notch ○ Wall with V-Notch Weir
F) Discharge Pipe Size (minimum 8-inches)	Calculated D_P = in
G) Rectangular Notch Width	Calculated W_N = 7.7 in

Design Procedure Form: Extended Detention Basin (EDB)

Designer:	**Marc A. Whorton, P.E.**
Company:	**Classic Consulting**
Date:	**August 11, 2021**
Project:	**Monument Junction - Phase 1 PD Site Plan**
Location:	**Pond 1 - North Forebay**

6. Trickle Channel	
A) Type of Trickle Channel	Choose One: (●) Concrete ( ) Soft Bottom
F) Slope of Trickle Channel	S = 0.0100 ft / ft
7. Micropool and Outlet Structure	
A) Depth of Micropool (2.5-feet minimum)	D_M = 2.5 ft
B) Surface Area of Micropool (10 ft^2 minimum)	A_M = 170 sq ft
C) Outlet Type	Choose One: (●) Orifice Plate ( ) Other (Describe):
D) Smallest Dimension of Orifice Opening Based on Hydrograph Routing (Use UD-Detention)	$D_{orifice}$ = 2.25 inches
E) Total Outlet Area	A_{ot} = 16.00 square inches
8. Initial Surcharge Volume	
A) Depth of Initial Surcharge Volume (Minimum recommended depth is 4 inches)	D_{IS} = 6 in
B) Minimum Initial Surcharge Volume (Minimum volume of 0.3% of the WQCV)	V_{IS} = 86 cu ft
C) Initial Surcharge Provided Above Micropool	V_s= 85.0 cu ft
9. Trash Rack	
A) Water Quality Screen Open Area: $A_t = A_{ot} * 38.5*(e^{-0.095D})$	A_t = 497 square inches
B) Type of Screen (If specifying an alternative to the materials recommended in the USDCM, indicate "other" and enter the ratio of the total open are to the total screen are for the material specified.)	*Aluminum Amico-Klemp SR Series with Cross Rods 2" O.C.*
Other (Y/N): N	
C) Ratio of Total Open Area to Total Area (only for type 'Other')	User Ratio =
D) Total Water Quality Screen Area (based on screen type)	A_{total} = 701 sq. in.
E) Depth of Design Volume (EURV or WQCV) (Based on design concept chosen under 1E)	H= 5.37 feet
F) Height of Water Quality Screen (H_{TR})	H_{TR}= 92.44 inches
G) Width of Water Quality Screen Opening ($W_{opening}$) (Minimum of 12 inches is recommended)	$W_{opening}$ = 12.0 inches **VALUE LESS THAN RECOMMENDED MIN. WIDTH. WIDTH HAS BEEN SET TO 12 INCHES.**

Design Procedure Form: Extended Detention Basin (EDB)

Designer: Marc A. Whorton, P.E.
Company: Classic Consulting
Date: August 11, 2021
Project: Monument Junction - Phase 1 PD Site Plan
Location: Pond 1 - North Forebay

10. Overflow Embankment A) Describe embankment protection for 100-year and greater overtopping:	Buried Rip-Rap
B) Slope of Overflow Embankment (Horizontal distance per unit vertical, 4:1 or flatter preferred)	Ze = 4.00 ft / ft
11. Vegetation	Choose One ○ Irrigated ● Not Irrigated
12. Access A) Describe Sediment Removal Procedures	

Notes:

Design Procedure Form: Extended Detention Basin (EDB)

UD-BMP (Version 3.07, March 2018)

Designer:	**Marc A. Whorton, P.E.**
Company:	**Classic Consulting**
Date:	**August 11, 2021**
Project:	**Monument Junction - Phase 1 PD Site Plan**
Location:	**Pond 1 - East Forebay**

1. Basin Storage Volume

A) Effective Imperviousness of Tributary Area, I_a — I_a = 55.0 %

B) Tributary Area's Imperviousness Ratio ($i = I_a / 100$) — i = 0.550

C) Contributing Watershed Area — Area = 11.160 ac

D) For Watersheds Outside of the Denver Region, Depth of Average Runoff Producing Storm — d_6 = 0.42 in

E) Design Concept (Select EURV when also designing for flood control)

Choose One
- ○ Water Quality Capture Volume (WQCV)
- ● Excess Urban Runoff Volume (EURV)

F) Design Volume (WQCV) Based on 40-hour Drain Time
($V_{DESIGN} = (1.0 * (0.91 * i^3 - 1.19 * i^2 + 0.78 * i) / 12 * Area$)
— V_{DESIGN}= ac-ft

G) For Watersheds Outside of the Denver Region, Water Quality Capture Volume (WQCV) Design Volume
($V_{WQCV\ OTHER} = (d_6*(V_{DESIGN}/0.43))$
— $V_{DESIGN\ OTHER}$= 0.200 ac-ft

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

I) NRCS Hydrologic Soil Groups of Tributary Watershed
- i) Percentage of Watershed consisting of Type A Soils — HSG_A = 0 %
- ii) Percentage of Watershed consisting of Type B Soils — HSG_B = 100 %
- iii) Percentage of Watershed consisting of Type C/D Soils — $HSG_{C/D}$ = 0 %

J) Excess Urban Runoff Volume (EURV) Design Volume
For HSG A: $EURV_A = 1.68 * i^{1.28}$
For HSG B: $EURV_B = 1.36 * i^{1.08}$
For HSG C/D: $EURV_{C/D} = 1.20 * i^{1.08}$
— $EURV_{DESIGN}$ = 0.663 ac-f t

K) User Input of Excess Urban Runoff Volume (EURV) Design Volume (Only if a different EURV Design Volume is desired) — $EURV_{DESIGN\ USER}$= ac-f t

2. Basin Shape: Length to Width Ratio
(A basin length to width ratio of at least 2:1 will improve TSS reduction.) — L : W = 2.0 : 1

3. Basin Side Slopes

A) Basin Maximum Side Slopes
(Horizontal distance per unit vertical, 4:1 or flatter preferred) — Z = 4.00 ft / ft

4. Inlet

A) Describe means of providing energy dissipation at concentrated inflow locations: — Concrete Forebay

5. Forebay

A) Minimum Forebay Volume
(V_{FMIN} = 3% of the WQCV) — V_{FMIN} = 0.006 ac-ft

B) Actual Forebay Volume — V_F = 0.006 ac-ft

C) Forebay Depth
(D_F = 18 inch maximum) — D_F = 18.0 in

D) Forebay Discharge

i) Undetained 100-year Peak Discharge — Q_{100} = 32.00 cfs

ii) Forebay Discharge Design Flow
($Q_F = 0.02 * Q_{100}$) — Q_F = 0.64 cfs

E) Forebay Discharge Design

Choose One
- ○ Berm With Pipe
- ● Wall with Rect. Notch
- ○ Wall with V-Notch Weir

Flow too small for berm w/ pipe

F) Discharge Pipe Size (minimum 8-inches) — Calculated D_P = in

G) Rectangular Notch Width — Calculated W_N = 4.9 in

Design Procedure Form: Extended Detention Basin (EDB)

Designer:	**Marc A. Whorton, P.E.**
Company:	**Classic Consulting**
Date:	**August 11, 2021**
Project:	**Monument Junction - Phase 1 PD Site Plan**
Location:	**Pond 1 - East Forebay**

6. Trickle Channel	
A) Type of Trickle Channel	Choose One: (●) Concrete ( ) Soft Bottom
F) Slope of Trickle Channel	S = 0.0100 ft / ft
7. Micropool and Outlet Structure	
A) Depth of Micropool (2.5-feet minimum)	D_M = 2.5 ft
B) Surface Area of Micropool (10 ft^2 minimum)	A_M = 170 sq ft
C) Outlet Type	Choose One: (●) Orifice Plate ( ) Other (Describe):
D) Smallest Dimension of Orifice Opening Based on Hydrograph Routing (Use UD-Detention)	$D_{orifice}$ = 2.25 inches
E) Total Outlet Area	A_{ot} = 16.00 square inches
8. Initial Surcharge Volume	
A) Depth of Initial Surcharge Volume (Minimum recommended depth is 4 inches)	D_{IS} = 6 in
B) Minimum Initial Surcharge Volume (Minimum volume of 0.3% of the WQCV)	V_{IS} = 26 cu ft
C) Initial Surcharge Provided Above Micropool	V_s= 85.0 cu ft
9. Trash Rack	
A) Water Quality Screen Open Area: $A_t = A_{ot} * 38.5*(e^{-0.095D})$	A_t = 497 square inches
B) Type of Screen (If specifying an alternative to the materials recommended in the USDCM, indicate "other" and enter the ratio of the total open are to the total screen are for the material specified.)	*Aluminum Amico-Klemp SR Series with Cross Rods 2" O.C.*
Other (Y/N): N	
C) Ratio of Total Open Area to Total Area (only for type 'Other')	User Ratio =
D) Total Water Quality Screen Area (based on screen type)	A_{total} = 701 sq. in.
E) Depth of Design Volume (EURV or WQCV) (Based on design concept chosen under 1E)	H= 5.37 feet
F) Height of Water Quality Screen (H_{TR})	H_{TR}= 92.44 inches
G) Width of Water Quality Screen Opening ($W_{opening}$) (Minimum of 12 inches is recommended)	$W_{opening}$ = 12.0 inches **VALUE LESS THAN RECOMMENDED MIN. WIDTH. WIDTH HAS BEEN SET TO 12 INCHES.**

Design Procedure Form: Extended Detention Basin (EDB)

Designer: Marc A. Whorton, P.E.
Company: Classic Consulting
Date: August 11, 2021
Project: Monument Junction - Phase 1 PD Site Plan
Location: Pond 1 - East Forebay

10. Overflow Embankment A) Describe embankment protection for 100-year and greater overtopping:	Buried Rip-Rap
B) Slope of Overflow Embankment (Horizontal distance per unit vertical, 4:1 or flatter preferred)	Ze = 4.00 ft / ft
11. Vegetation	Choose One ○ Irrigated ● Not Irrigated
12. Access A) Describe Sediment Removal Procedures	

Notes:

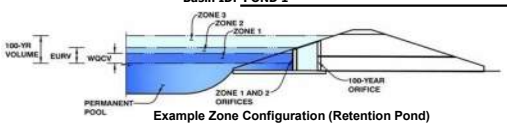
DETENTION FACILITY CALCULATIONS

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.03 (May 2020)

Project: **MONUMENT JUNCTION - PHASE 1 PD SITE PLAN**

Basin ID: **POND 1**



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	**EDB**	
Watershed Area =	49.94	acres
Watershed Length =	2,500	ft
Watershed Length to Centroid =	1,250	ft
Watershed Slope =	0.020	ft/ft
Watershed Imperviousness =	55.00%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	100.0%	percent
Percentage Hydrologic Soil Groups C/D =	0.0%	percent
Target WQCV Drain Time =	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.

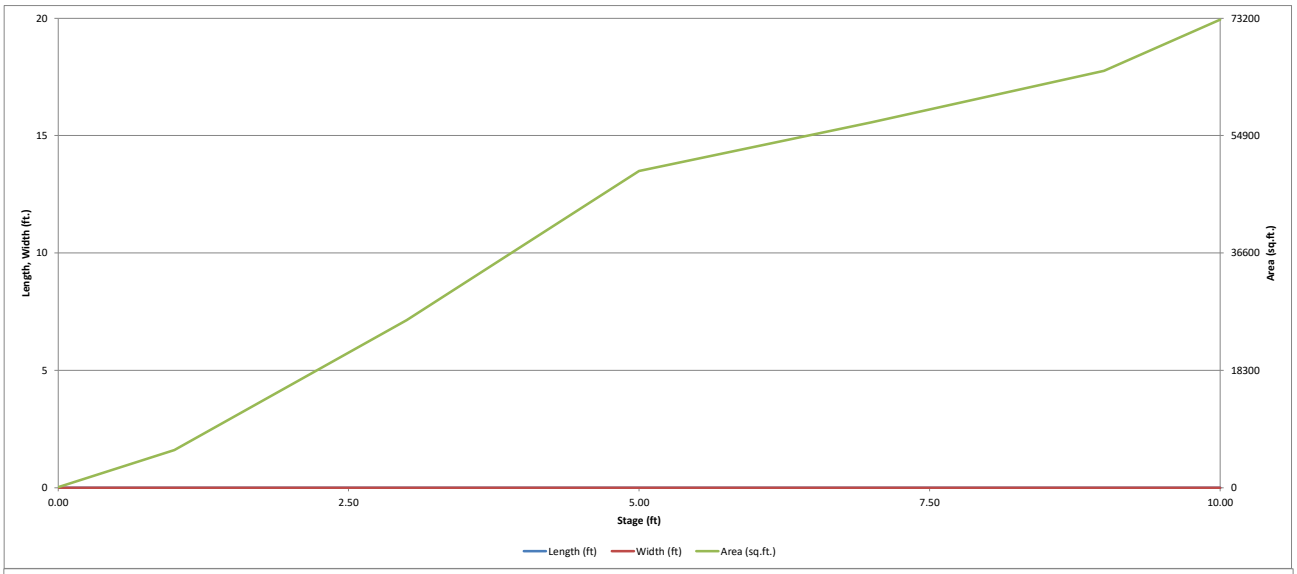
			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	0.917	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	2.959	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	2.780	acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	3.901	acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	4.876	acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	6.146	acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	7.195	acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	8.510	acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 3.85 in.) =	14.338	acre-feet	3.85	inches
Approximate 2-yr Detention Volume =	2.255	acre-feet		
Approximate 5-yr Detention Volume =	3.066	acre-feet		
Approximate 10-yr Detention Volume =	4.002	acre-feet		
Approximate 25-yr Detention Volume =	4.350	acre-feet		
Approximate 50-yr Detention Volume =	4.541	acre-feet		
Approximate 100-yr Detention Volume =	5.010	acre-feet		

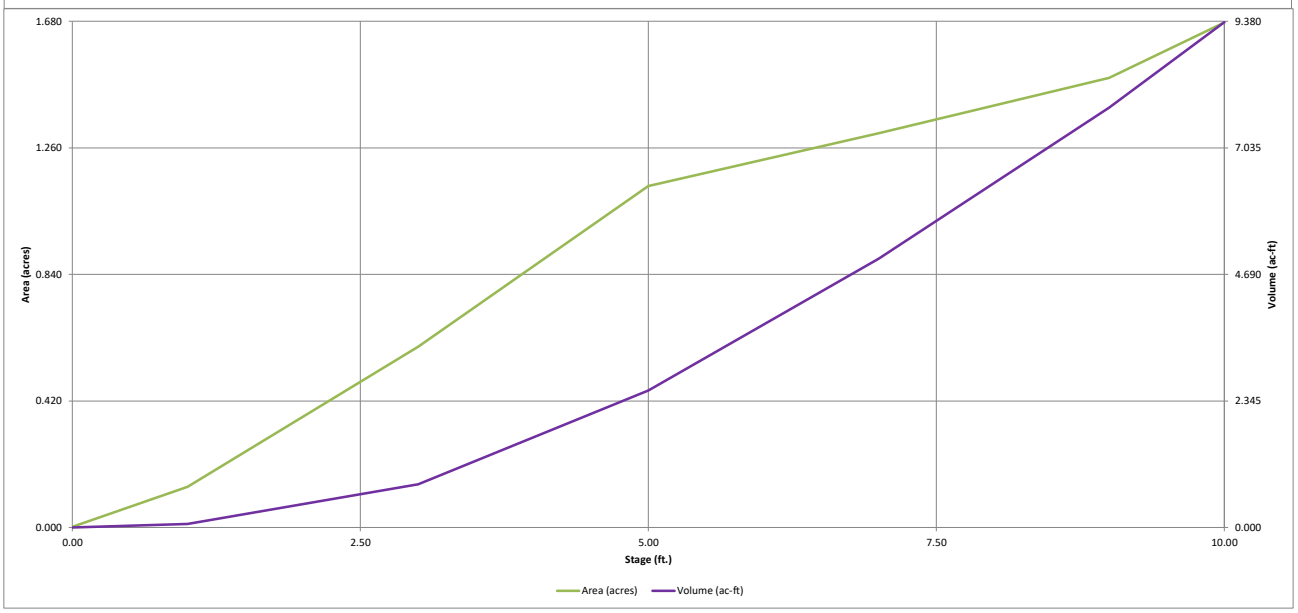
Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.917	acre-feet
Zone 2 Volume (EURV - Zone 1) =	2.041	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	2.052	acre-feet
Total Detention Basin Volume =	5.010	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	**user**	acre-feet

Depth Increment = ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	100	0.002		
7012	--	1.00	--	--	--	5,895	0.135	2,997	0.069
7014	--	3.00	--	--	--	26,145	0.600	35,037	0.804
7016	--	5.00	--	--	--	49,392	1.134	110,574	2.538
7018	--	7.00	--	--	--	56,988	1.308	216,954	4.981
7020	--	9.00	--	--	--	65,017	1.493	338,959	7.781
7021	--	10.00	--	--	--	73,000	1.676	407,968	9.366


20
15
10
5
0
Length, Width (ft.)
73200
54900
36600
18300
0
Area (sq.ft.)
0.00
2.50
5.00
7.50
10.00
Stage (ft)
Length (ft)
Width (ft)
Area (sq.ft.)

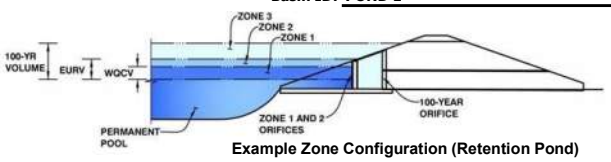

1.680
1.260
0.840
0.420
0.000
Area (acres)
9.380
7.035
4.690
2.345
0.000
Volume (ac-ft)
0.00
2.50
5.00
7.50
10.00
Stage (ft.)
Area (acres)
Volume (ac-ft)

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.03 (May 2020)

Project: **MONUMENT JUNCTION - PHASE 1 PD SITE PLAN**

Basin ID: **POND 1**



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.19	0.917	Orifice Plate
Zone 2 (EURV)	5.37	2.041	Orifice Plate
Zone 3 (100-year)	7.03	2.052	Weir&Pipe (Restrict)
Total (all zones)		5.010	

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

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

Calculated Parameters for Underdrain

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

Invert of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	N/A	ft^2
Depth at top of Zone using Orifice Plate =	5.37	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	21.50	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	N/A	inches	Elliptical Slot Area =	N/A	ft^2

Calculated Parameters for Plate

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.79	3.58					
Orifice Area (sq. inches)	4.00	6.00	6.00					

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

User Input: Vertical Orifice (Circular or Rectangular)

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

Calculated Parameters for Vertical Orifice

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

	Zone 3 Weir	Not Selected			Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	5.37	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	6.37	N/A	feet
Overflow Weir Front Edge Length =	6.00	N/A	feet	Overflow Weir Slope Length =	4.12	N/A	feet
Overflow Weir Grate Slope =	4.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	8.98	N/A	
Horiz. Length of Weir Sides =	4.00	N/A	feet	Overflow Grate Open Area w/o Debris =	18.55	N/A	ft^2
Overflow Grate Open Area % =	75%	N/A	%, grate open area/total area	Overflow Grate Open Area w/ Debris =	9.28	N/A	ft^2
Debris Clogging % =	50%	N/A	%				

Calculated Parameters for Overflow Weir

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

	Zone 3 Restrictor	Not Selected			Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	1.50	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	2.07	N/A	ft^2
Outlet Pipe Diameter =	24.00	N/A	inches	Outlet Orifice Centroid =	0.71	N/A	feet
Restrictor Plate Height Above Pipe Invert =	15.00		inches	Half-Central Angle of Restrictor Plate on Pipe =	1.82	N/A	radians

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	8.00	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.98	feet
Spillway Crest Length =	40.00	feet	Stage at Top of Freeboard =	9.98	feet
Spillway End Slopes =	3.00	H:V	Basin Area at Top of Freeboard =	1.67	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	9.33	acre-ft

Calculated Parameters for Spillway

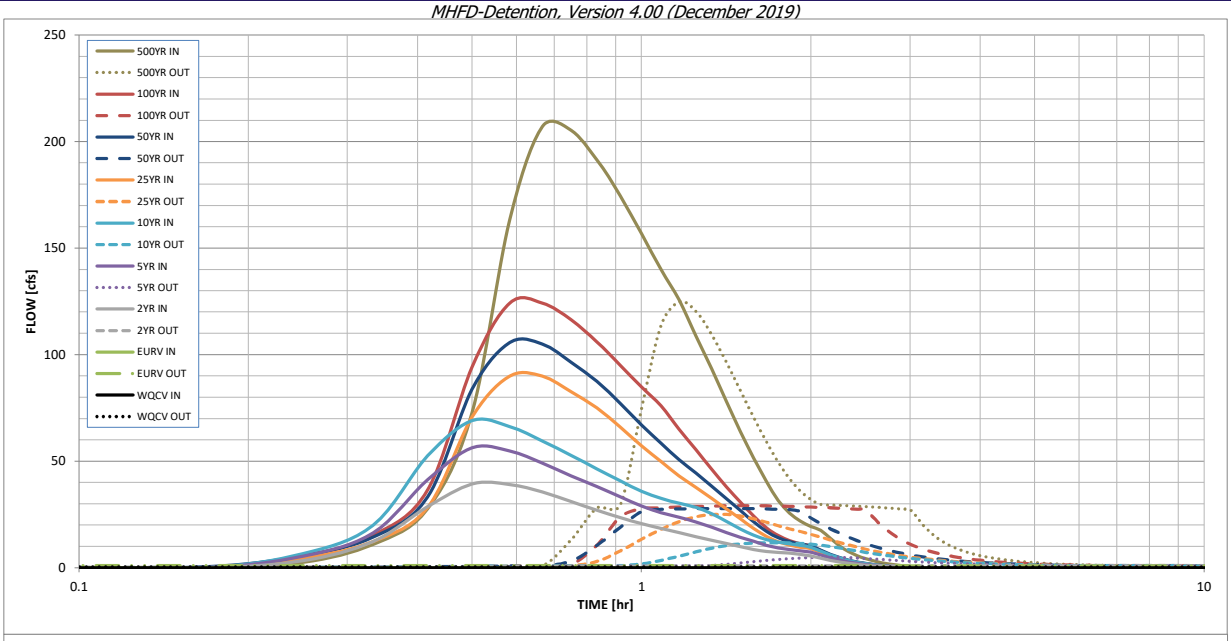
Routed Hydrograph Results

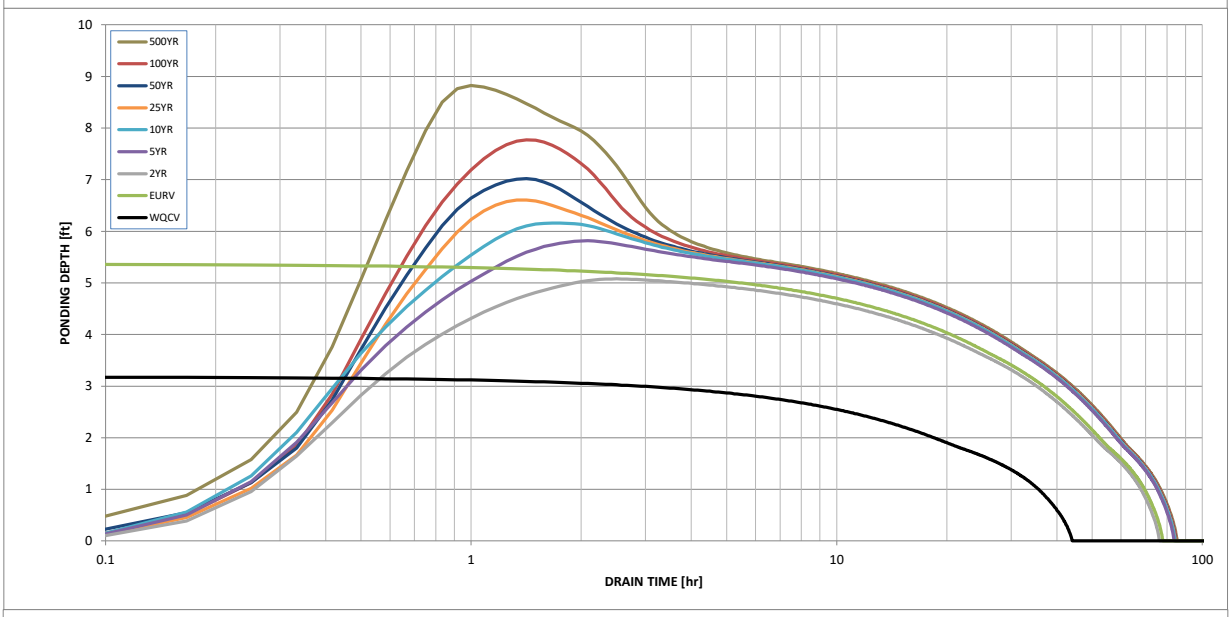
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

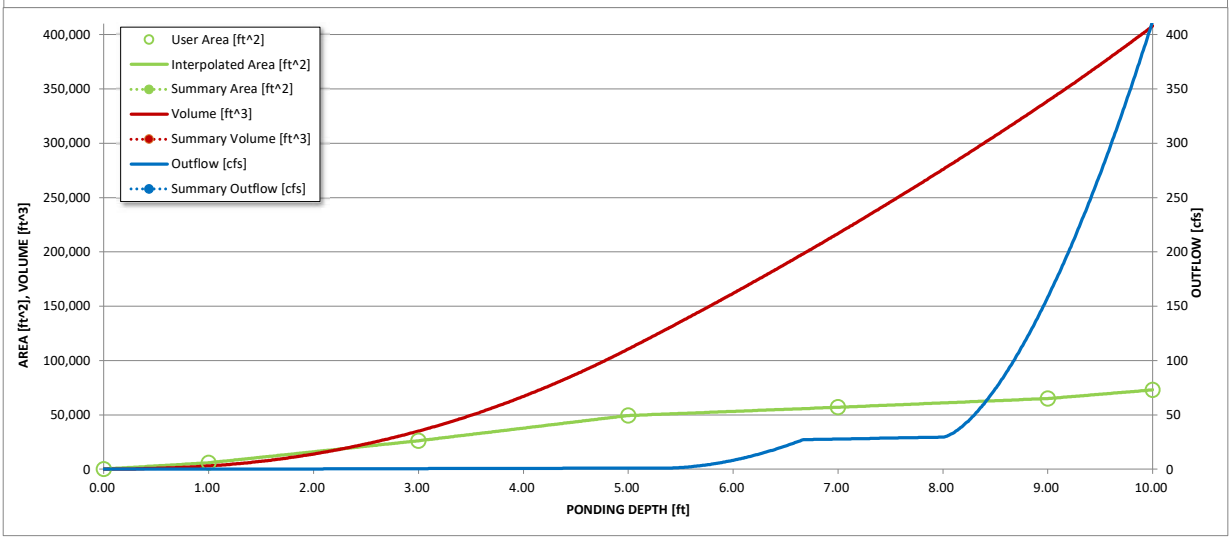
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.85
CUHP Runoff Volume (acre-ft) =	0.917	2.959	2.780	3.901	4.876	6.146	7.195	8.510	14.338
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	2.780	3.901	4.876	6.146	7.195	8.510	14.338
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	4.6	12.8	19.6	35.4	44.4	57.0	106.2
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A		5.0				32.0	
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.09	0.10	0.39	0.71	0.89	0.64	2.13
Peak Inflow Q (cfs) =	N/A	N/A	39.3	56.3	69.0	89.9	105.6	124.2	207.1
Peak Outflow Q (cfs) =	0.5	1.0	0.9	5.0	11.7	25.0	27.8	29.1	124.8
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	1.0	0.6	0.7	0.6	0.9	1.2
Structure Controlling Flow =	Plate	Overflow Weir 1	Plate	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Outlet Plate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	0.2	0.6	1.3	1.4	1.5	1.6
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	40	68	67	71	70	67	65	63	56
Time to Drain 99% of Inflow Volume (hours) =	**42**	74	72	78	78	77	76	75	71
Maximum Ponding Depth (ft) =	3.19	5.37	5.08	5.82	6.16	6.61	7.02	7.77	8.82
Area at Maximum Ponding Depth (acres) =	0.65	1.17	1.14	1.20	1.23	1.27	1.31	1.38	1.48
Maximum Volume Stored (acre-ft) =	0.923	2.964	2.618	3.485	3.900	4.464	4.994	6.015	7.514

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.00 (December 2019)







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	0.37	0.04	2.51
	0:15:00	0.00	0.00	3.25	5.31	6.58	4.42	5.60	5.40	10.99
	0:20:00	0.00	0.00	12.26	16.37	19.92	12.24	14.34	15.25	27.52
	0:25:00	0.00	0.00	28.63	41.25	52.51	28.11	33.09	36.39	72.70
	0:30:00	0.00	0.00	39.29	56.26	69.05	70.68	83.70	94.16	163.41
	0:35:00	0.00	0.00	39.06	54.77	66.24	89.90	105.63	124.21	207.09
	0:40:00	0.00	0.00	35.58	49.01	59.36	89.85	104.99	124.17	205.22
	0:45:00	0.00	0.00	31.01	43.04	52.74	82.51	96.31	116.29	191.49
	0:50:00	0.00	0.00	26.93	38.12	46.43	75.00	87.52	106.01	174.69
	0:55:00	0.00	0.00	23.54	33.33	40.76	66.05	77.19	95.02	156.67
	1:00:00	0.00	0.00	20.61	28.95	35.82	57.24	67.00	84.84	139.88
	1:05:00	0.00	0.00	18.48	25.84	32.48	49.79	58.37	75.98	125.74
	1:10:00	0.00	0.00	16.41	23.73	30.24	43.12	50.68	65.02	108.65
	1:15:00	0.00	0.00	14.54	21.49	28.29	37.72	44.42	55.34	93.41
	1:20:00	0.00	0.00	12.90	18.97	25.39	32.49	38.24	46.20	77.99
	1:25:00	0.00	0.00	11.33	16.53	21.68	27.61	32.44	37.92	63.82
	1:30:00	0.00	0.00	9.84	14.29	18.18	22.86	26.77	30.72	51.54
	1:35:00	0.00	0.00	8.53	12.36	15.23	18.46	21.51	24.25	40.56
	1:40:00	0.00	0.00	7.60	10.51	13.19	14.70	17.03	18.75	31.52
	1:45:00	0.00	0.00	7.13	9.26	12.01	12.14	14.03	15.06	25.61
	1:50:00	0.00	0.00	6.91	8.47	11.25	10.61	12.22	12.79	21.89
	1:55:00	0.00	0.00	6.23	7.89	10.54	9.63	11.05	11.27	19.38
	2:00:00	0.00	0.00	5.55	7.31	9.63	8.96	10.23	10.19	17.56
	2:05:00	0.00	0.00	4.48	5.92	7.77	7.22	8.23	8.02	13.82
	2:10:00	0.00	0.00	3.46	4.55	5.96	5.49	6.24	5.93	10.22
	2:15:00	0.00	0.00	2.67	3.50	4.56	4.18	4.73	4.40	7.57
	2:20:00	0.00	0.00	2.05	2.67	3.44	3.16	3.57	3.31	5.67
	2:25:00	0.00	0.00	1.56	2.02	2.57	2.39	2.69	2.50	4.26
	2:30:00	0.00	0.00	1.18	1.50	1.91	1.77	1.99	1.87	3.18
	2:35:00	0.00	0.00	0.88	1.09	1.41	1.31	1.46	1.39	2.36
	2:40:00	0.00	0.00	0.64	0.80	1.05	0.98	1.10	1.05	1.78
	2:45:00	0.00	0.00	0.45	0.57	0.76	0.72	0.80	0.76	1.29
	2:50:00	0.00	0.00	0.30	0.39	0.51	0.49	0.55	0.53	0.88
	2:55:00	0.00	0.00	0.18	0.24	0.31	0.31	0.35	0.33	0.55
	3:00:00	0.00	0.00	0.09	0.13	0.16	0.17	0.19	0.18	0.30
	3:05:00	0.00	0.00	0.04	0.06	0.07	0.07	0.08	0.08	0.12
	3:10:00	0.00	0.00	0.01	0.01	0.01	0.02	0.02	0.02	0.02
	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

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.03 (May 2020)

Summary Stage-Area-Volume-Discharge Relationships

The user can create a summary S-A-V-D by entering the desired stage increments and the remainder of the table will populate automatically.
The user should graphically compare the summary S-A-V-D table to the full S-A-V-D table in the chart to confirm it captures all key transition points.

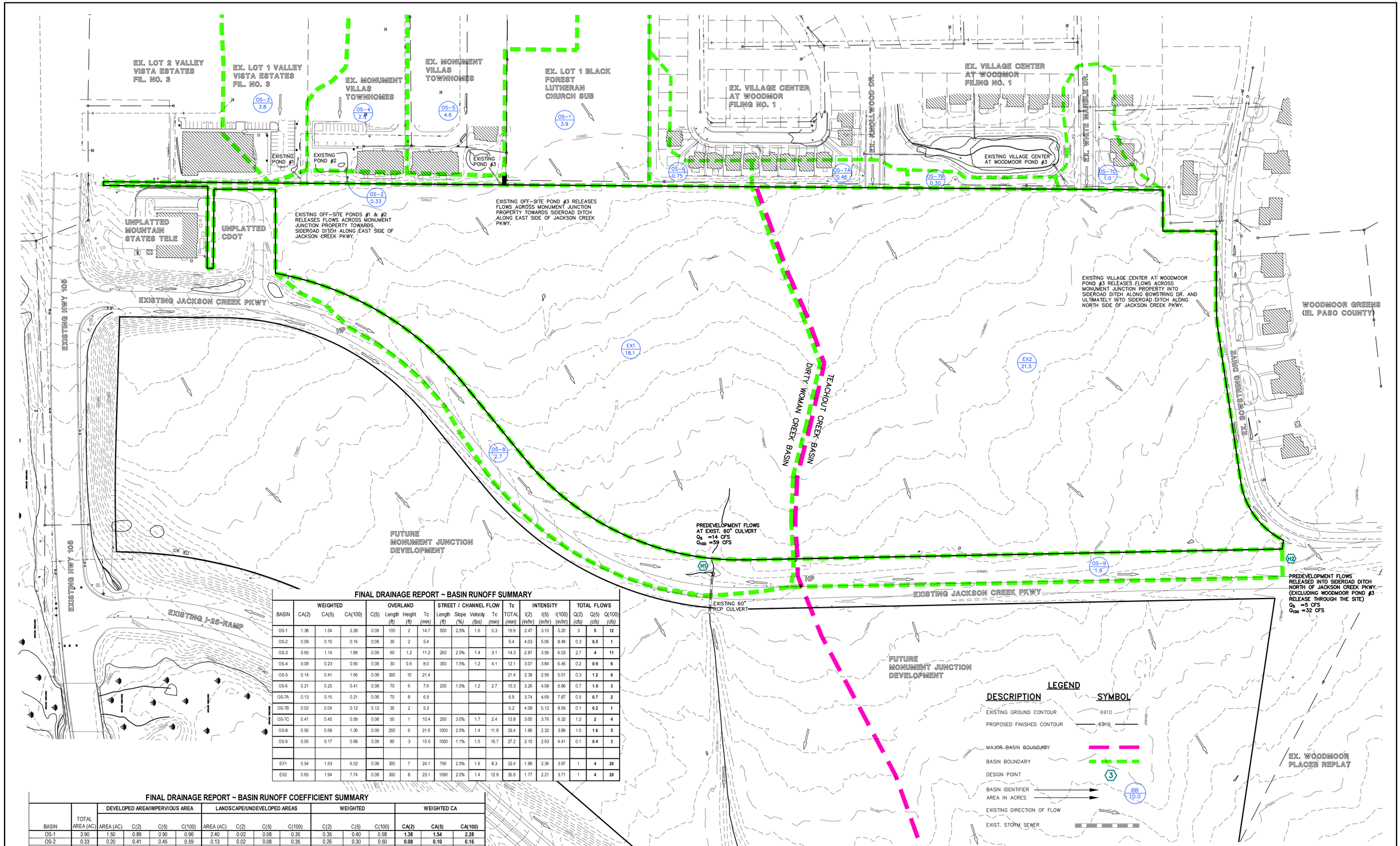
Stage - Storage Description	Stage [ft]	Area [ft^2]	Area [acres]	Volume [ft^3]	Volume [ac-ft]	Total Outflow [cfs]

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

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

DRAINAGE MAPS

(EXISTING & PROPOSED)



FINAL DRAINAGE REPORT ~ BASIN RUNOFF SUMMARY

BASIN	WEIGHTED CA(2)	WEIGHTED CA(5)	WEIGHTED CA(100)	OVERLAND C(5)	OVERLAND Length (ft)	OVERLAND Height (ft)	OVERLAND Tc (min)	STREET / CHANNEL FLOW Length (ft)	STREET / CHANNEL FLOW Slope (%)	STREET / CHANNEL FLOW Velocity (fps)	STREET / CHANNEL FLOW Tc (min)	Tc TOTAL (min)	INTENSITY I(2) (in/hr)	INTENSITY I(5) (in/hr)	INTENSITY I(100) (in/hr)	TOTAL FLOWS Q(2) (cfs)	TOTAL FLOWS Q(5) (cfs)	TOTAL FLOWS Q(100) (cfs)
OS-1	1.38	1.54	2.28	0.08	100	2	14.7	500	2.5%	1.6	5.3	19.9	2.47	3.10	5.20	3	**5**	**12**
OS-2	0.08	0.10	0.16	0.08	30	2	5.4					5.4	4.03	5.06	8.49	0.3	**0.5**	**1**
OS-3	0.95	1.14	1.89	0.09	60	1.2	11.2	260	2.0%	1.4	3.1	14.3	2.87	3.59	6.03	2.7	**4**	**11**
OS-4	0.08	0.23	0.90	0.06	30	0.6	8.0	300	1.5%	1.2	4.1	12.1	3.07	3.84	6.45	0.2	**0.9**	**6**
OS-5	0.14	0.41	1.66	0.08	300	10	21.4					21.4	2.39	2.99	5.01	0.3	**1.2**	**8**
OS-6	0.21	0.25	0.41	0.08	70	6	7.6	200	1.5%	1.2	2.7	10.3	3.26	4.08	6.86	0.7	**1.0**	**3**
OS-7A	0.13	0.15	0.21	0.08	70	8	6.9					6.9	3.74	4.69	7.87	0.5	**0.7**	**2**
OS-7B	0.02	0.04	0.12	0.12	30	2	5.2					5.2	4.08	5.12	8.59	0.1	**0.2**	**1**
OS-7C	0.41	0.45	0.59	0.08	50	1	10.4	250	3.0%	1.7	2.4	12.8	3.00	3.76	6.32	1.2	**2**	**4**
OS-8	0.55	0.68	1.30	0.09	250	6	21.6	1000	2.0%	1.4	11.8	33.4	1.86	2.32	3.89	1.0	**1.6**	**5**
OS-9	0.06	0.17	0.68	0.09	80	3	10.5	1050	1.1%	1.0	16.7	27.2	2.10	2.63	4.41	0.1	**0.4**	**3**
EX1	0.54	1.63	6.52	0.08	300	7	24.1	790	2.5%	1.6	8.3	32.4	1.89	2.36	3.97	1	**4**	**26**
EX2	0.65	1.94	7.74	0.08	300	8	23.1	1090	2.0%	1.4	12.8	35.9	1.77	2.21	3.71	1	**4**	**29**

FINAL DRAINAGE REPORT ~ BASIN RUNOFF COEFFICIENT SUMMARY

BASIN	TOTAL AREA (AC)	DEVELOPED AREA/IMPERVIOUS AREA: AREA (AC)	C(2)	C(5)	C(100)	LANDSCAPE/UNDEVELOPED AREAS: AREA (AC)	C(2)	C(5)	C(100)	WEIGHTED C(2)	WEIGHTED C(5)	WEIGHTED C(100)	WEIGHTED CA CA(2)	CA(5)	CA(100)
OS-1	3.90	1.50	0.89	0.90	0.96	2.40	0.02	0.08	0.35	0.35	0.40	0.58	**1.38**	**1.54**	**2.28**
OS-2	0.33	0.20	0.41	0.45	0.59	0.13	0.02	0.08	0.35	0.26	0.30	0.50	**0.08**	**0.10**	**0.16**
OS-3	3.80	2.00	0.45	0.49	0.62	1.80	0.03	0.09	0.36	0.25	0.30	0.50	**0.95**	**1.14**	**1.89**
OS-4	2.50	2.50	0.03	0.09	0.36	0.00	0.02	0.08	0.35	0.03	0.09	0.36	**0.08**	**0.23**	**0.90**
OS-5	4.60	4.60	0.03	0.09	0.36	0.00	0.02	0.08	0.35	0.03	0.09	0.36	**0.14**	**0.41**	**1.66**
OS-6	0.82	0.50	0.41	0.45	0.59	0.32	0.02	0.08	0.35	0.26	0.31	0.50	**0.21**	**0.25**	**0.41**
OS-7A	0.39	0.32	0.41	0.45	0.59	0.07	0.02	0.08	0.35	0.34	0.38	0.55	**0.13**	**0.15**	**0.21**
OS-7B	0.30	0.00	0.89	0.90	0.96	0.30	0.05	0.12	0.39	0.05	0.12	0.39	**0.02**	**0.04**	**0.12**
OS-7C	1.00	1.00	0.41	0.45	0.59	0.00	0.02	0.08	0.35	0.41	0.45	0.59	**0.41**	**0.45**	**0.59**
OS-8	2.70	0.54	0.89	0.90	0.96	2.16	0.03	0.09	0.36	0.20	0.25	0.48	**0.55**	**0.68**	**1.30**
OS-9	1.90	0.00	0.89	0.90	0.96	1.90	0.03	0.09	0.36	0.03	0.09	0.36	**0.06**	**0.17**	**0.68**
EX1	18.10	18.10	0.03	0.09	0.36	0.00	0.02	0.08	0.35	0.03	0.09	0.36	**0.54**	**1.63**	**6.52**
EX2	21.50	21.50	0.03	0.09	0.36	0.00	0.02	0.08	0.35	0.03	0.09	0.36	**0.65**	**1.94**	**7.74**

FINAL DRAINAGE REPORT ~ SURFACE ROUTING SUMMARY

Design Point(s)	Contributing Basins	Equivalent CA(5)	Equivalent CA(100)	Maximum Tc	Intensity I(5)	Intensity I(100)	Flow Q(5)	Flow Q(100)	Inlet Size
H1	EX1, OS-1 thru OS-6 and OS-8	5.98	15.11	33.4	2.32	3.89	14	59	EXIST. 60" RCP CULVERT
H2	EX2, OS-7A, OS-7B and OS-9	2.29	8.75	35.9	2.21	3.71	5	32	EXIST. SIDE ROAD DITCH

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MONUMENT JUNCTION
PHASE 1 PD SITE PLAN
PRELIMINARY/FINAL DRAINAGE REPORT
PRE-DEVELOPED DRAINAGE MAP

CLASSIC CONSULTING

DESIGNED BY	MAW	SCALE		DATE	7/1/21
DRAWN BY	MAW	(H) 1"= 100'		SHEET 1	OF 2
CHECKED BY		(V) 1"= N/A		JOB NO.	1302.10

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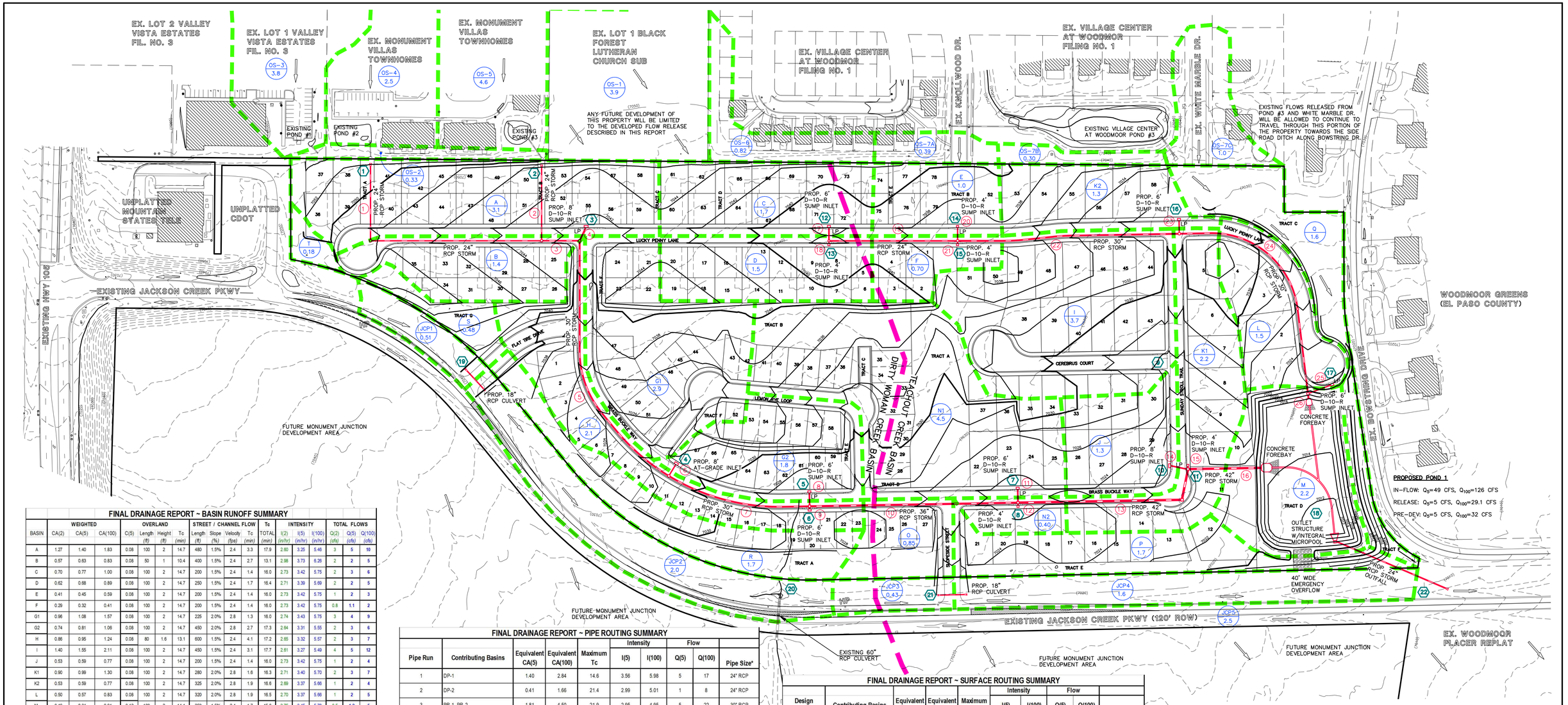

FINAL DRAINAGE REPORT ~ BASIN RUNOFF SUMMARY

BASIN	WEIGHTED CA(2)	WEIGHTED CA(5)	WEIGHTED CA(100)	OVERLAND C(5)	OVERLAND Length (ft)	OVERLAND Height (ft)	OVERLAND Tc (min)	STREET / CHANNEL FLOW Length (ft)	STREET / CHANNEL FLOW Slope (%)	STREET / CHANNEL FLOW Velocity (fps)	STREET / CHANNEL FLOW Tc (min)	Tc TOTAL (min)	INTENSITY I(2) (in/hr)	INTENSITY I(5) (in/hr)	INTENSITY I(100) (in/hr)	TOTAL FLOWS Q(2) (cfs)	TOTAL FLOWS Q(5) (cfs)	TOTAL FLOWS Q(100) (cfs)
A	1.27	1.40	1.83	0.08	100	2	14.7	480	1.5%	2.4	3.3	17.9	2.60	3.25	5.46	3	5	10
B	0.57	0.63	0.83	0.08	50	1	10.4	400	1.5%	2.4	2.7	13.1	2.98	3.73	6.26	2	2	5
C	0.70	0.77	1.00	0.08	100	2	14.7	200	1.5%	2.4	1.4	16.0	2.73	3.42	5.75	2	3	6
D	0.62	0.68	0.89	0.08	100	2	14.7	250	1.5%	2.4	1.7	16.4	2.71	3.39	5.69	2	2	5
E	0.41	0.45	0.59	0.08	100	2	14.7	200	1.5%	2.4	1.4	16.0	2.73	3.42	5.75	1	2	3
F	0.29	0.32	0.41	0.08	100	2	14.7	200	1.5%	2.4	1.4	16.0	2.73	3.42	5.75	0.8	1.1	2
G1	0.96	1.08	1.57	0.08	100	2	14.7	225	2.0%	2.8	1.3	16.0	2.74	3.43	5.75	3	4	9
G2	0.74	0.81	1.06	0.08	100	2	14.7	450	2.0%	2.8	2.7	17.3	2.64	3.31	5.55	2	3	6
H	0.86	0.95	1.24	0.08	80	1.6	13.1	600	1.5%	2.4	4.1	17.2	2.65	3.32	5.57	2	3	7
I	1.40	1.55	2.11	0.08	100	2	14.7	450	1.5%	2.4	3.1	17.7	2.61	3.27	5.49	4	5	12
J	0.53	0.59	0.77	0.08	100	2	14.7	200	1.5%	2.4	1.4	16.0	2.73	3.42	5.75	1	2	4
K1	0.90	0.99	1.30	0.08	100	2	14.7	280	2.0%	2.8	1.6	16.3	2.71	3.40	5.70	2	3	7
K2	0.53	0.59	0.77	0.08	100	2	14.7	325	2.0%	2.8	1.9	16.6	2.69	3.37	5.66	1	2	4
L	0.50	0.57	0.83	0.08	100	2	14.7	320	2.0%	2.8	1.9	16.5	2.70	3.37	5.66	1	2	5
M	0.19	0.34	0.91	0.12	100	2	14.1	250	1.5%	2.4	1.7	15.8	2.75	3.45	5.78	0.5	1.2	5
N1	1.27	1.50	2.34	0.12	100	2	14.1	700	2.0%	2.8	4.1	18.2	2.58	3.23	5.42	3	5	13
N2	0.16	0.18	0.24	0.08	50	1	10.4	80	1.5%	2.4	0.5	10.9	3.19	4.00	6.71	0.5	0.7	2
O	0.25	0.29	0.44	0.08	50	1	10.4	300	2.0%	2.8	1.8	12.1	3.07	3.84	6.45	0.8	1.1	3
P	0.46	0.54	0.86	0.08	90	3	11.7					11.7	3.10	3.89	6.53	1	2	6
Q	0.03	0.13	0.56	0.08	100	2	14.7	475	2.0%	1.4	5.6	20.2	2.46	3.07	5.15	0.1	0.4	3
R	0.34	0.44	0.80	0.12	90	4	10.3					10.3	3.26	4.09	6.87	1	2	6
S	0.05	0.08	0.20	0.12	100	2	14.1	100	2.0%	2.8	0.6	14.7	2.84	3.55	5.97	0.1	0.3	1
T	0.01	0.02	0.07	0.12	80	3.2	10.0					10.0	3.29	4.13	6.93	0.03	0.1	0.5
U	5.39	5.57	6.26	0.08	30	0.6	8.0	400	1.5%	2.4	2.7	10.7	3.21	4.02	6.75	17	22	42
V	4.82	5.24	6.63	0.08	80	2.4	11.5	800	2.0%	2.8	4.7	16.2	2.72	3.41	5.72	13	18	38
W	0.95	1.03	1.30	0.08	50	1.5	9.1	250	2.0%	2.8	1.5	10.5	3.23	4.05	6.80	3	4	9
X	1.42	1.46	1.58	0.08	15	0.3	5.7	650	2.0%	2.8	3.8	9.5	3.36	4.21	7.06	5	6	11
Y	0.24	0.56	1.83	0.12	100	2	14.1	300	1.0%	2.0	2.5	16.6	2.69	3.37	5.66	1	2	10
Z	6.68	7.34	9.62	0.12	100	2	14.1	750	1.5%	2.4	5.1	19.2	2.52	3.15	5.29	17	23	51
AA	0.02	0.07	0.31	0.08	100	10	8.6					8.6	3.47	4.35	7.31	0.1	0.3	2
JCP1	0.05	0.08	0.21	0.00	140	4	16.6	150	2.0%	1.4	1.8	18.4	2.57	3.22	5.40	0.1	0.2	1.1
JCP2	0.54	0.63	1.04	0.08	50	1.5	9.1	750	2.0%	1.4	8.8	17.9	2.60	3.26	5.47	1	2	6
JCP3	0.11	0.13	0.22	0.08	40	2	6.8	100	1.0%	1.0	1.7	8.5	3.49	4.37	7.34	0.4	0.6	2
JCP4	0.26	0.35	0.72	0.09	40	2	6.8	850	1.0%	1.0	14.2	20.9	2.41	3.02	5.07	0.6	1.0	4
JCP5	1.98	2.03	2.20	0.08	20	0.4	6.6	1300	1.0%	1.0	21.7	28.2	2.06	2.57	4.32	4	5	10
OS-1	1.38	1.54	2.28	0.08	100	2	14.7	500	2.5%	1.6	5.3	19.9	2.47	3.10	5.20	3	5	12
OS-2	0.08	0.10	0.16	0.08	30	2	5.4					5.4	4.03	5.06	8.49	0.3	0.5	1
OS-3	0.95	1.14	1.89	0.09	60	1.2	11.2	260	2.0%	1.4	3.1	14.3	2.87	3.59	6.03	2.7	4	11
OS-4	0.08	0.23	0.90	0.08	30	0.6	8.0	300	1.5%	1.2	4.1	12.1	3.07	3.84	6.45	0.2	0.9	6
OS-5	0.14	0.41	1.66	0.08	300	10	21.4					21.4	2.39	2.99	5.01	0.3	1.2	8
OS-6	0.21	0.25	0.41	0.08	70	6	7.6	200	1.5%	1.2	2.7	10.3	3.26	4.08	6.86	0.7	1.0	3
OS-7A	0.13	0.15	0.21	0.08	70	8	6.9					6.9	3.74	4.69	7.87	0.5	0.7	2
OS-7B	0.02	0.04	0.12	0.12	30	2	5.2					5.2	4.08	5.12	8.59	0.1	0.2	1
OS-7C	0.41	0.45	0.59	0.08	50	1	10.4	250	3.0%	1.7	2.4	12.8	3.00	3.76	6.32	1.2	2	4

FINAL DRAINAGE REPORT ~ PIPE ROUTING SUMMARY

Pipe Run	Contributing Basins	Equivalent CA(5)	Equivalent CA(100)	Maximum Tc	Intensity I(5)	Intensity I(100)	Flow Q(5)	Flow Q(100)	Pipe Size*
1	DP-1	1.40	2.84	14.6	3.56	5.98	5	17	24" RCP
2	DP-2	0.41	1.66	21.4	2.99	5.01	1	8	24" RCP
3	PR-1, PR-2	1.81	4.50	21.9	2.95	4.95	5	22	30" RCP
4	DP-3 Intercepted	2.23	1.54	19.9	3.10	5.20	7	8	24" RCP
5	PR-3, PR-4	4.05	6.04	22.3	2.92	4.91	12	30	30" RCP
6	DP-4 Intercepted	1.08	1.55	20.2	3.07	5.16	3	8	18" RCP
7	PR-5, PR-6	5.13	7.59	22.6	2.90	4.87	15	37	30" RCP
8	DP-5	0.81	2.62	20.2	3.07	5.16	2	13	24" RCP
9	DP-6	1.58	2.07	17.2	3.32	5.57	5	11	24" RCP
10	PR-7, PR-8, PR-9	7.52	12.27	22.9	2.88	4.84	22	59	36" RCP
11	DP-7	1.50	2.34	18.2	3.23	5.42	5	13	24" RCP
12	DP-8	0.18	0.24	10.9	4.00	6.71	1	2	18" RCP
13	PR-10, PR-11, PR-12	9.19	14.84	23.2	2.86	4.81	26	71	42" RCP
14	DP-10	2.14	2.88	17.9	3.25	5.46	7	16	24" RCP
15	DP-11	0.99	1.30	16.3	3.40	5.70	3	7	18" RCP
16	**PR-13, PR-14, PR-15 NORTHERLY PIPE OUTFALL**	**12.32**	**19.02**	**23.4**	**2.85**	**4.79**	**35**	**91**	**42" RCP**
17	DP-12	1.79	2.55	20.4	3.06	5.13	5	13	24" RCP
18	DP-13	0.68	0.89	16.4	3.39	5.69	2	5	18" RCP
19	PR-17, PR-18	2.46	3.44	20.6	3.04	5.11	7	18	24" RCP
20	DP-14	0.60	0.80	16.0	3.42	5.75	2	5	18" RCP
21	DP-15	0.32	0.41	16.0	3.42	5.75	1	2	18" RCP
22	PR-19, PR-20, PR-21	3.38	4.65	20.9	3.02	5.07	10	24	30" RCP
23	DP-16	0.62	0.88	16.6	3.37	5.66	2	5	18" RCP
24	PR-22, PR-23	4.00	5.54	21.3	2.99	5.02	12	28	30" RCP
25	DP-17	0.57	0.83	16.5	3.37	5.66	2	5	18" RCP
26	**PR-24, PR-25 EASTERLY STORM OUTFALL**	**4.57**	**6.36**	**21.3**	**2.99**	**5.02**	**14**	**32**	**30" RCP**

FINAL DRAINAGE REPORT ~ SURFACE ROUTING SUMMARY

Design Point(s)	Contributing Basins	Equivalent CA(5)	Equivalent CA(100)	Maximum Tc	Intensity I(5)	Intensity I(100)	Flow Q(5)	Flow Q(100)	Inlet Size
1	OS-3, OS-4, 1/3 OS-2	1.40	2.84	14.6	3.56	5.98	5	17	24" RCP
2	OS-5	0.41	1.66	21.4	2.99	5.01	1	8	24" RCP
3	A, 50% OS-1, 2/3 OS-2	2.23	3.08	19.9	3.10	5.20	7	16	8' D-10-R SUMP INLET
4	G1, Flow-by from DP-3 (50% 100 yr.)	1.08	3.11	20.2	3.07	5.16	3	16	8' D-10-R AT-GRADE INLET
5	G2, Flow-by from DP-4 (50% 100 yr.)	0.81	2.62	20.2	3.07	5.16	2	13	8' D-10-R SUMP INLET
6	B, H	1.58	2.07	17.2	3.32	5.57	5	11	6' D-10-R SUMP INLET
7	N1	1.50	2.34	18.2	3.23	5.42	5	13	6' D-10-R SUMP INLET
8	N2	0.18	0.24	10.9	4.00	6.71	1	2	4' D-10-R SUMP INLET
9	I	1.55	2.11	17.7	3.27	5.49	5	12	STD. CROSSPAN
10	J, Flow-by from DP-9	2.14	2.88	17.9	3.25	5.46	7	16	8' D-10-R SUMP INLET
11	K1	0.99	1.30	16.3	3.40	5.70	3	7	4' D-10-R SUMP INLET
12	C, 50% OS-1, OS-6	1.79	2.55	20.4	3.06	5.13	5	13	6' D-10-R SUMP INLET
13	D	0.68	0.89	16.4	3.39	5.69	2	5	4' D-10-R SUMP INLET
14	E, OS-7A	0.60	0.80	16.0	3.42	5.75	2	5	4' D-10-R SUMP INLET
15	F	0.32	0.41	16.0	3.42	5.75	1	2	4' D-10-R SUMP INLET
16	K2, OS-7B	0.62	0.88	16.6	3.37	5.66	2	5	6' D-10-R SUMP INLET
17	L	0.57	0.83	16.5	3.37	5.66	2	5	6' D-10-R SUMP INLET
18	**TOTAL INFLOW POND 1 (DP-1 thru DP-17, incl. M)**	**17.23**	**26.28**	**23.4**	**2.85**	**4.79**	**49**	**126**	**POND 1**
19	S, JCP1	0.16	0.41	18.4	3.22	5.40	1	2	18" RCP CULVERT
20	R, JCP2, DP-19	1.23	2.26	19.9	3.10	5.20	4	12	TEMP. SEDIMENT BASIN AT EXIST. 60" RCP CULVERT
21	O, JCP3	0.42	0.66	12.3	3.82	6.41	2	4	18" RCP CULVERT
22	P, JCP4, DP-21	1.31	2.24	20.9	3.02	5.07	4	11	EXIST. SIDEROAD DITCH

LEGEND

DESCRIPTION	SYMBOL
EXISTING GROUND CONTOUR	6910
PROPOSED FINISHED CONTOUR	6910
MAJOR BASIN BOUNDARY	
BASIN BOUNDARY	
DESIGN POINT	3
PIPE ROUTING	5
EROSION/SEDIMENT CONTROL BMP	
BASIN IDENTIFIER / AREA IN ACRES	BB 10.0
EXISTING DIRECTION OF FLOW	
PROPOSED DIRECTION OF FLOW	
EXIST. STORM SEWER	
PROPOSED STORM SEWER	

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100 50 0 100 200

SCALE: 1" = 100'

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MONUMENT JUNCTION
PHASE 1 PD SITE PLAN
PRELIMINARY/FINAL DRAINAGE REPORT
DEVELOPED DRAINAGE MAP

DESIGNED BY	MAW	SCALE		DATE	6/1/2021
DRAWN BY	MAW	(H) 1"= 100'		SHEET 2	OF 2
CHECKED BY		(V) 1"= N/A		JOB NO.	1302.01

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