

PRELIMINARY/ FINAL DRAINAGE REPORT FOR RIVERBEND CROSSING FILINGS NO. 1 AND 2

SEPTEMBER 2018

Prepared for:

Avatar Fountain, LP.
6800 Jericho Tpke., Suite 120W #204
Syosset, NY 11791

Prepared By:



PCD FILE NOS:
SP 187
SF 1843
SF 1844

PRELIMINARY/FINAL DRAINAGE REPORT FOR REIVERBEND CROSSING FILING
NO. 1 AND 2

... applicable master
plan

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

Certification Statement:

This report and plan for the preliminary and final drainage design for the RIVERBEND CROSSING was prepared by me (or under my direct supervision) in accordance with the provisions of City of Colorado Springs/El Paso County Drainage Criteria Manual Volumes 1 and 2 Drainage Design and Technical Criteria for the owners thereof. I understand that El Paso County does not and will not assume liability for drainage facilities designed by others.

David L. Mijares, Colorado PE #40510
For and on behalf of Catamount Engineering

Date

Developer's Statement:

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

AVATAR FOUNTAIN, LP. hereby certifies that the drainage facilities for RIVERBEND CROSSING shall be constructed according to the design presented in this report. I understand that El Paso County does not and will not assume liability for the drainage facilities designed and or certified by my engineer and that the El Paso County reviews drainage plans pursuant to Colorado Revised Statutes, Title 30, Article 28; but cannot, on behalf of RIVERBEND CROSSING guarantee that final drainage design review will absolve AVATAR FOUNTAIN, LP. and/or their successors and/or assigns of future liability for improper design. I further understand that approval of the final plat does not imply approval of my engineer's drainage design.

AVATAR FOUNTAIN, LP.
Business Name

By: Alan Toth

Title: Managing Partner

Address: 6800 Jericho Turnpike, Suite 120W #204
Syosset, NY 11791

El Paso County:

Filed in accordance with the requirements of the El Paso County land Development Code and the Drainage Criteria manual Volumes 1 and 2, and the El Paso County Engineering Criteria Manual, latest revision.

Jennifer Irvine, PE
County Engineer/ECM Administrator

Date

Conditions:

Add a table of contents.

PRELIMINARY/FINAL DRAINAGE REPORT FOR RIVERBEND CROSSING FILING
NO. 1 AND 2

PURPOSE

The purpose of this drainage report is to identify existing drainage patterns and establish outfall scenarios from the proposed development. The site is contained within the West Little Johnson Drainage Basin and outfalls directly to Fountain Creek. The parcel was previously studied in the Little Johnson/Security Creek Drainage Basin Planning Study prepared by Simons, Li and Associates, dated December 1987, and the Preliminary Drainage Report for Riverbend Crossing., prepared by Nolte and Associates, dated February 14, 2007. The Little Johnson Drainage Basin Planning Study identifies the parcel as direct flow into Fountain Creek and does not propose improvements to the adjacent reach. The overall Riverbend development consists of two overall projects, The Riverbend Crossing residential subdivision filings 1 and 2 to be developed in El Paso County; and the Riverbend Crossing Commons Development to be developed within City of Fountain. This report develops broad analysis of both El Paso County and Fountain development parcels and provides Final Drainage Report detail for the residential parcels.

GENERAL LOCATION AND DESCRIPTION

The Riverbend Crossing Developments are located within the NE ¼ of Section 14, Township 15 South and Range 66 West of the 6th principal meridian. The proposed commercial parcel contains approximately 10.69 acres to be developed within the City of Fountain incorporation limits. The existing commercial development is proposed to have the majority of buildings and infrastructure demolished and reconstruction of the site will incorporate access to the proposed commercial development.

The proposed residential developments contain approximately 52.0 acres of undeveloped land with approximately 10 acres located within the existing Fountain Creek 100-year floodplain. Improvements are proposed in the portions of the property identified as outside of the existing floodplain. Residential development is proposed to be completed in 2 filings. Filing No. 1 will contain 136 residential lots situated on approximately 36.5 acres within the easterly and southerly portions of the residential parcel. Filing No. 2 will contain 86 residential lots on approximately 15.5 acres. The 10 acres within the floodplain not proposed for development are contained within the boundary of Filing No. 1.

The overall development is bounded to the north and west by undeveloped land zoned A-5, to the east by U.S. Highway 85/87 and Southmoor Drive, and to the south by Fountain Creek. The easterly portions of the development contained within the City of Fountain incorporation limits are predominantly zoned commercial and the southerly and westerly portions of the development are zoned PUD. An RS-5000 zone is being sought with entitlement applications within the El Paso County portions.

Existing soils on the site consist of Limon clay (Hydrologic Group 'C'), Schamber-Razor complex (Hydrologic Group 'A'), and Nunn clay loam (Hydrologic Group 'C'). Soils have been identified

Include page
numbers.
Unresolved.

as determined by the Natural Resources Conservation Service Web Soil Survey. Hydrologic Group 'C' soils have been used in hydrologic calculations.

The 10.69 acres contained within the commercial site contains existing structures, paved parking, and paved drive aisles with little existing vegetation. The 52.0 acre residential portion remains substantially ungraded and vegetated with native grasses and volunteer trees and shrubs within roadside ditches and established drainage swales.

The property contains an abandoned irrigation pond within the northern portion of the site that was historically supplied by two wells located within the commercial development. There is no active irrigation within the parcel currently. The parcel contains an abandoned sewer outfall crossing the site that previously served the commercial development. The abandoned sewer conveyed sewage to a lagoon system located within the Fountain Creek Floodplain. The lagoon was filled when central sewer became available to the commercial development from Security Sanitation District. No development is proposed in the location of the filled lagoon.

The existing commercial site sits 10-15 feet higher than the undeveloped residential portion of the parcels and runoff sheetflows predominantly at 1%-1.5% to the south and into Southmoor Drive. Flows are contained within the Southmoor Drive roadside ditch and conveyed southwest to Fountain Creek. The undeveloped portion of the Riverbend Crossing Developments falls flows predominantly to the south at an average slope of 1.5%

The majority of the site is located within Shaded Zone X (500-year) floodplain and the southern portion of the site is contained within a F.E.M.A. designated Zone AE (100-year) floodplain per FIRM panels 08041C0763G and 08041C0951 F, effective December 07, 2018. The F.E.M.A. Flood Insurance Rate Map has been provided. The portion of the site within the Zone AE floodplain will not be utilized for residential development.

A portion of the FIRM Panels were further modified by LOMR 17-08-0467P effective 1/15/2019. The LOMR modified floodplain affected by Security Creek and shows 100-YR flood being contained east of the centerline of Highway 85/87. LOMR revisions did not remove shaded zone X contained within the subject property.

EXISTING DRAINAGE

The parcels are located within the West Little Johnson Drainage Basin and are directly tributary to Fountain Creek within the reach. The Little Johnson/Security Creek Drainage Basin Planning Study identifies three separate sub-basins (75, 76, and 77) within the parcel. The majority of the parcels are identified as within Shaded Zone X 500-year floodplain and the southerly portion of the property not proposed for development lies with Zone AE 100-yr floodplain and floodway. The effective firm panel is included in the appendix of the report. The West Little Johnson drainage basin contains approximately five square miles located in the semi-arid region of the high plains. Precipitation within the basin ranges from 14 to 16 inches per year with thunderstorms typical in the summer months.

The existing drainage patterns for the parcel were summarized in the “Preliminary Drainage Study Riverbend Crossing”, prepared by Nolte and Associates, inc. dated 2/14/2007. No development within the parcel has been pursued since the Nolte analysis was completed and the existing drainage analysis has been accepted in this report. The northerly adjacent parcel has been developed for use as St. Dominic Catholic Church. Flows from the Church are collected on-site and conveyed to an existing full spectrum extended detention basin within the southwest corner of the church parcel. Outfall from the extended detention basin is piped to outfall to an existing swale within a drainage easement on agricultural property west of the Riverbend properties and does not enter the subject property. No other changes to surrounding properties are evident.

The report indicates the 3 sub-basins identified in the Drainage Basin Planning Study as sub-basins 75, 76, and 77. The basins are direct flow basins directly tributary to Fountain Creek and traverse the site from north to south where they enter Fountain Creek.

Basin 77 represents the existing commercial center development northwest of proposed Riverbend Crossing Filings No. 1 and 2 and the southeasterly portion of the residential filings. Redevelopment of the commercial development within the City of Fountain is being concurrently pursued by the developer of both properties. Existing flows entering the residential portion at the southern limits of the commercial development were modeled as $Q_5=25.99$ cfs, $Q_{100}=45.15$ cfs in the Preliminary Drainage Report and are conveyed in a drainage swale to outfall within Fountain Creek. Total outfall to Fountain Creek from Basin 77 was $Q_5=15.28$ cfs, $Q_{100}=31.70$ cfs.

Basin 76 represents the central portion of the undeveloped parcel and the northwesterly portion of the existing commercial development and is directly tributary to Fountain Creek. The property north of Basin 76 is contained within the St. Dominic’s Church Subdivision. Storm runoff from the St. Dominic’s Church Subdivision is collected on-site and conveyed through a private detention pond prior to historic release east of the parcel. The Preliminary Drainage Report shows $Q_5=6.89$ cfs, $Q_{100}=12.07$ cfs entering the residential parcel from the northwest corner of the commercial development and exhibits $Q_5=11.87$ cfs, $Q_{100}=28.05$ cfs leaving the site and entering Fountain Creek.



west?

Basin 75 contains the westerly portion of the proposed residential development. The preliminary drainage report indicates that $Q_5=20.28$ cfs, $Q_{100}=45.99$ cfs enter the west side of the parcel from the adjacent agricultural property. Topography does not indicate a channelized flow but rather overland flow from the west. The anticipated long term use for the adjacent parcel is to remain

agricultural. The foundation that owns the parcel is extending an irrigation ditch along the west boundary of the subject property to divert flows from the adjacent parcel south to Fountain Creek. An additional 15' setback is proposed in the residential development plan to allow for grading of a fill slope to convey flows south to Fountain Creek.

DEVELOPED DRAINAGE BASINS

The intent of the proposed development is to follow closely to historic drainage patterns while satisfying current El Paso County development and water quality criteria. The area of the site proposed for impervious development will be contained within the parking/private roadway section and private on-site storm sewer system conveying flows to a full spectrum detention basin and water quality facility within the southeast portion of the site prior to outfall to Fountain Creek.

Development of the site includes 225 residential lots, roadway and utility infrastructure to be constructed in 2 filings. Due to limited grade within the site necessitating flat roadway sections minimal drainage will be conveyed within the street roadway sections and drainage will primarily be conveyed in public storm drain systems conveying flows to outfall within a private extended detention basin. The private extended detention basin will be developed to accept developed runoff from the proposed redeveloped commercial center along the parcel's northeasterly boundary.

Flows generated within the proposed commercial center redevelopment will be conveyed within the commercial curb lines and private storm drain to be constructed along the southerly property boundary and outfall directly to the proposed shared extended detention basin.

Offsite Basins

Offsite flow (Historic sub-basin 75) generates runoff of $Q_5=20.28$ cfs, $Q_{100}=45.99$ cfs from the adjacent westerly agricultural parcel currently enter the property at an existing low point along the westerly boundary. Flows will be conveyed in a 10' wide constructed grass swale at 0.5% with 3:1 side slopes from the existing low point south approximately 300' to outfall within the adjacent reach of Fountain Creek. See calculations in the Appendix.

Historic Basins 76 and 77 have been remodeled in this report as either 'B' designated basins within the interior or 'C' basins representing the commercial development. 'B' designated basins will be conveyed within interior street, inlet, and storm sewer conveyance systems to the proposed full spectrum pond proposed with the development. 'C' designated basins will be conveyed in a separate storm sewer system developed in conjunction with commercial redevelopment to outfall to the shared on-site extended detention system. The detailed drainage plan for the commercial development is currently under review with the city of Fountain and a composite basin representing the commercial development is utilized in calculation for sizing the shared pond. Runoff from the commercial development will not directly enter the Riverbend Crossing residential development with the exception of storm sewer outfall directly to the pond.

Per review comments on the preliminary, the swale shall be located within a tract.

'A Basins'

Basin A1 (1.30 Acres, $Q_2=0.2$ cfs, $Q_5=0.2$ cfs) consists of the proposed diversion Development will consist of a grass lined Creek.

Update narrative to discuss why no WQCV is provided for this basin. Per the recent ECM update 100% of the applicable development site must be captured for WQ with specific exclusions. Identify the specific criteria in ECM I.7.1.B which excludes Basin A from providing permanent WQCV.

'B Basins'

'B' designated basins consist of the majority of the residential development. Runoff from 'B' basins will primarily sheetflow to residential street sections, be collected in Type 'R' inlets and conveyed in public storm drainage systems to the extended detention basin.

BASIN	AREA	Q_2	Q_5	Q_{10}	Q_{25}	Q_{50}	Q_{100}	Type R
B1	1.70	2.1	2.8	3.8	4.9	5.8	6.9	10'
B2	1.33	2.0	2.7	3.7	4.8	5.7	6.8	10'
B3	2.29	2.9	4.0	5.2	6.6	7.9	9.3	10'
B4	1.26	1.8	2.5	3.5	4.6	5.6	6.7	5'
B5	3.57	4.8	6.6	8.8	11.1	13.4	15.7	10'
B6	1.67	2.1	2.8	3.8	4.9	5.8	6.9	10'
B7	3.79	4.0	5.7	7.7	9.9	11.9	14.2	10'
B8	0.33	0.5	0.7	0.9	1.1	1.3	1.6	5'
B9	3.19	4.3	5.9	7.6	9.5	11.3	13.2	10'
B10	2.15	3.0	4.0	5.2	6.5	7.6	9.0	10'
B11	4.41	6.0	8.2	10.6	13.2	15.7	18.4	15'
B12	3.74	5.1	7.0	9.0	11.3	13.3	15.6	10'
B13	1.96	2.6	3.5	4.6	5.7	6.7	7.9	DP-A1
B14	1.35	1.8	2.5	3.2	4.0	4.7	5.5	5'
B15	1.15	1.2	1.6	2.1	2.6	3.1	3.7	5'
B16	2.19	2.4	3.3	4.2	5.3	6.3	7.4	DP-A1
B17	0.87	1.2	1.7	2.2	2.7	3.2	3.7	AREA
B18	4.86	1.9	3.6	5.8	8.5	10.7	13.3	POND

The development contains roadways with minimum grades of 1.0%. Roadway conveyance at minimum grade of 1.0% is $Q_5=8.5$ cfs and $Q_{100}=37$ cfs exceeding individual basin runoff. Inlets were developed in sump locations throughout the development and flow-by is not anticipated. Inlet calculations for Basins B1 through B16 are provided in the appendix. Lots will be developed with side lot line swales directed to the streets. Lot templates for 'A' lot grading, 'B' lot grading, and a limited number of Walkout units will be provided in the final grading plan.

Basin B13 and Basin B16 are combined in the southerly knuckle at design Point A1. Combined flows at Design Point 1B of $Q_5=6.3$ cfs and $Q_{100}=13.9$ cfs are collected in a 20' sump inlet within the knuckle. Inlet calculation is provided in the appendix.

Is this a typo? If not, update the drainage map and proposed design points summary table to include design point 1B.

'C Basins'

Basin C (11.25 Acres, $Q_2=20.6$ cfs, $Q_5=26.3$ cfs, $Q_{10}=31.5$ cfs, $Q_{25}=37.3$ cfs, $Q_{50}=42.4$ cfs, and $Q_{100}=48.0$ cfs) represents the combined flow generated within the commercial development. Runoff generated within the commercial development sheetflows within the proposed curb line and is collected within private inlets on-site and will be conveyed in a private storm sewer to outfall within the shared extended detention basin at Design Point P.

Update to reference the FDR for the commercial site within Fountain for the detailed drainage analysis. State whether or not the report is approved or under review at this time.

Storm Sewer

Flows collected within 'B' designated basin inlets will be conveyed in a public storm sewer system located predominantly within the street ROW which outfalls to the private extended detention basin. Mannings equation calculations are provided in the appendix of this report. Hydraulic Grade Line Calculations will be developed upon development of initial review comments.

Unresolved. Revise sentence. Initial review has occurred. Include HGL calculations in the appendix.

Pipe Design Point 1 ($Q_5=5.4$ cfs and $Q_{100}=12.4$) represents combined flows from basins B1 and B2 and will be conveyed in a public 24" RCP at a minimum grade of 0.5%.

Pipe Design Point 2 ($Q_5=6.4$ cfs and $Q_{100}=14.6$) represents combined flows from basins B3 and B4 and will be conveyed in a public 24" RCP at a minimum grade of 1.8%.

Pipe Design Point 3 ($Q_5=14.9$ cfs and $Q_{100}=33.6$) represents combined flows from basins B5 and B6 and Pipe Design Point 2. Combined flows will be conveyed in a public 30" RCP at a minimum grade of 0.65%.

Pipe Design Point 5 ($Q_5=6.3$ cfs and $Q_{100}=15.5$) represents combined flows from basins B7 and B8 and will be conveyed in a public 24" RCP at a minimum grade of 0.5%.

Pipe Design Point 6 ($Q_5=15.8$ cfs and $Q_{100}=36.5$) represents combined flows from basins B9 and B10 and Pipe Design Point 5. Combined flows will be conveyed in a public 30" RCP at a minimum grade of 0.66%.

Pipe Design Point 7 ($Q_5=36.5$ cfs and $Q_{100}=82.5$) represents combined flows from Pipe Design Points 6 and 11. Combined flows will be conveyed in a public 42" RCP at a minimum grade of 0.7%.

Pipe Design Point 8 ($Q_5=15.2$ cfs and $Q_{100}=33.9$) represents combined flows from basins B11 and B12 and will be conveyed in a public 30" RCP at a minimum grade of 0.70%.

Pipe Design Point 9 ($Q_5=21.1$ cfs and $Q_{100}=46.9$) represents combined flows from Basin B9 and Pipe Design Point 8. Combined flows will be conveyed in a public 36" RCP at a minimum grade of 0.50%.

Pipe Design Point 10 ($Q_5=23.4$ cfs and $Q_{100}=52.1$) represents combined flows from Pipe Design Point 9 and overland Design Point A1. Combined flows will be conveyed in a private 36" RCP pipe at a minimum grade of 0.065%.

Pipe Design Point 11 ($Q_5=23.8$ cfs and $Q_{100}=53.0$) represents combined flows from Pipe Design Point 10 and Basin B15. Combined flows will be conveyed in a private 36" RCP pipe at a minimum grade of 0.065%.

Pipe Design Point 4 ($Q_5=53.0$ cfs and $Q_{100}=119.9$) represents combined flows from Pipe Design Points 1,3, and 7. Combined flows will be conveyed in a private 48" RCP at a minimum grade of 0.75%.

Pipe Design Point 12 ($Q_5=54.3$ cfs and $Q_{100}=122.6$) represents combined flows from Pipe Design Points 4,1,3, and Basin B17. Combined flows will be conveyed in a private 48" RCP at a minimum grade of 0.75%.

EXTENDED DETENTION BASIN

The parcel proposes to develop 54.90 acres within the West Little Johnson Drainage tributary to Fountain Creek requiring development of water quality treatment and detention per the criteria of the El Paso County Drainage Criteria Manual Volume 2. An extended detention basin will be developed to provide water quality and full spectrum detention for both the Riverbend Crossing residential development Filings No. 1 and 2 and the Riverbend Crossing Commons Commercial development within the City of Fountain. The proposed Extended Detention Basin located in the southerly portion of the development has 54.90 tributary acres of development with an average imperviousness of 65.40%. Full spectrum pond development requires 1.170 acre-ft of water quality capture volume ponding to an elevation of 5685.95, an EURV volume of 2.542-acre ft, and a total volume of 6.1169 acre-ft ponding to an elevation of 5689.98 providing full spectrum detention including the 100-YR event.

Revise: Per the calculation provided EURV=3.71 ac-ft and 100yr=6.17 ac-ft the Riverbend

Runoff generated within the site will be conveyed to the pond through storm sewer systems or as direct sheetflow. The storm sewer systems will outfall directly to 6" concrete forebays with baffle providing adequate protection at discharge point. The concrete forebays require a total volume of 1,525 cubic feet of volume (2% of the design WQCV). The forebay will be constructed of a concrete slab with sides conforming to the pond slopes and 1' wall with a 9" rectangular notch which outfalls to the proposed trickle channel at the downstream end.

The pond will be constructed with 4:1 minimum side slopes to be vegetated per the final landscape plan. A 4' wide by 6" deep concrete trickle channel with a 0.5% longitudinal slope will convey low flows across the pond bottom to the micropool/outlet structure. The trickle channel will outfall to a 17' long by 7' wide by 2.5' deep concrete micropool. The micropool will provide a surface area of 120 square feet and an initial surcharge volume of 80 cubic feet utilizing an 8" initial surcharge depth.

A portion of the pond is situated below the Base Flood Elevation of the 100-YR recurrence event within the adjacent portion of Fountain Creek, 5689.00. Excess volume exceeding the 100-YR event volume above the base flood elevation was incorporated into the pond to overcome backwater effects should the subdivision experience a 100-YR event concurrent with passage of maximum flood event within the adjacent reach of Fountain Creek.

The outlet structure will consist of a concrete box with orifice plate and screen providing water quality outlet and weir with trash rack for larger storm outfall. The pond will outfall through a private 30" RCP pipe system directly to Fountain Creek.

The emergency spillway will consist of a 60' weir along the southerly end of the pond at an elevation of 5691.00. The overflow area will consist of 12" depth of type VL soil riprap.

Outfall from the extended detention basin of $Q_2=1.0$ cfs, $Q_5=2.6$ cfs, $Q_{10}=7.8$ cfs, $Q_{25}=18.2$ cfs, $Q_{50}=27.2$ cfs, and $Q_{100}=36.4$ will be conveyed in a private 30" RCP. Combined flows at Design P-out is less than historic runoff from basins 75, 76, and 77. Outfall from the onsite extended detention basin will be conveyed directly to Fountain Creek through the private 30" HDPE and full spectrum release will have no impacts on the Fountain Creek Drainage.

4-STEP PROCESS

RUNOFF REDUCTION

The development addresses Low Impact Development strategies primarily through the utilization of landscape swales within sides and rear yards to capture and convey runoff from buildings and walkways through swales with collection and storm conveyance systems.

TREAT AND SLOW RELEASE

On-site flow is directed to the on-site private proposed full spectrum extended detention basin constructed with development of the project which outfalls directly to historic outfall within Fountain Creek. The extended detention basin provides Water Quality Capture Volume required for this site and concurrent commercial development and attenuates release of flows to approximate historic runoff.

CHANNEL STABILIZATION

The ultimate recipient of runoff from the site is Fountain Creek. Flows from the site are tributary to the full spectrum extended detention basin constructed on site with development of the Riverbend Crossing community and commercial center attenuating flows to predevelopment levels. Existing slopes adjacent to Fountain Creek will be anchored with rip rap toe protection and excessive slopes will be lain back to a slope of 2.5 Horizontal to 1' Vertical. 100=YR slope protection will be installed within reconstructed slopes.

SOURCE CONTROLS

A Grading, Erosion Control, and Stormwater Quality Plan and narrative will be approved by El Paso County prior to any soil disturbance. The erosion control plan will include specific source control BMP's as well as defined overall site management practices for the construction period. The grading narrative will address materials storage and spill containment during construction operations.

List each step as a subheader.

Step 2 does not address Stabilize Drainageways.

Unresolved. Per ECM Appendix I Section I.7.2 subheaders are:

Step 1: Employ Runoff Reduction Practices

Step 2: Stabilized Drainage Way

Step 3: Provide WQCV

Step 4: Consider Need for Industrial and Commercial BMPs

COST ESTIMATE

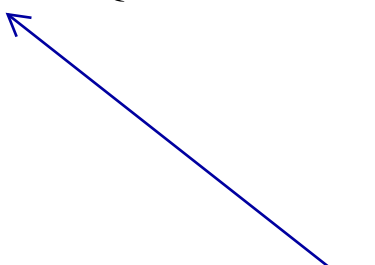
Public Improvements Non-reimbursable

5' Type R Inlet	2 EA	@ \$ 3,800/EA	\$ 7,600
10' Type R Inlet	9 EA	@ \$ 5,500/EA	\$ 49,500
15' Type R Inlet	1 EA	@ \$ 8,000/EA	\$ 8,000
20' Type R Inlet	1 EA	@ \$ 10,000/EA	\$ 10,000
Type I Manhole	11 EA	@ \$ 4,000/EA	\$ 40,000
18" RCP	213 LF	@ \$ 45/LF	\$ 9,585
24" RCP	2,102 LF	@ \$ 55/LF	\$ 115,610
30" RCP	1,411 LF	@ \$ 68/LF	\$ 95,948
42" RCP	152 LF	@ \$ 90/LF	\$ 13,680
48" RCP	151 LF	@ \$ 110/LF	\$ 16,610

SUBTOTAL	\$ 366,533
<i>10% CONTINGENCY</i>	<i>\$ 36,653</i>
<u>TOTAL</u>	<u>\$ 403,168</u>

Private Improvements Non-reimbursable

48" HDPE	552 LF	@ \$ 85/LF	\$ 46,920
WATER QUALITY POND	1 EA	@ \$ 65,000/EA	\$ 65,000
	SUBTOTAL		\$ 111,920
	<i>10% CONTINGENCY</i>		<i>\$ 11,192</i>
	<u>TOTAL</u>		<u>\$ 123,112</u>



Include the riprap
bank stabilization
along Fountain Creek

DRAINAGE FEE CALCULATION

Riverbend Crossing Filing No. 1 contains 36.5 acres to be platted within the West Little Johnson Drainage Basin. Riverbend Crossing Filing No. 2 contains 15.5 acres to be platted within the West Little Johnson Drainage Basin. The 2018 fee for the West Little Johnson Drainage Basin (A miscellaneous Drainage Basin) is \$1,133/ per impervious acre.

Filing No.1-36.547 total acres.

Use	Acres	Imperviousness
1/8 acre or less	23.45	65%
Open Space	13.09	7%
Composite Imperviousness:	44.2%	

$$36.547 \text{ acres} \times 44.2\% \times \$1,133.00 = \$18,311$$

Filing No.2-15.452 total acres.

Use	Acres	Imperviousness
1/8 acre or less	14.48	65%
Open Space	0.97	7%
Composite Imperviousness:	61.4%	

$$15.452 \text{ acres} \times 61.4\% \times \$1,133.00 = \$10,742$$

DRAINAGE METHODOLOGY

This drainage report was prepared in accordance to the criteria established in the City of Colorado Springs/El Paso County Drainage Criteria Manual Volumes 1 and 2, as revised May 2014.

The rational method for drainage basin study areas of less than 100 acres was utilized in the analysis. For the Rational Method, flows were calculated for the 2, 5, 10, 25, 50, and 100-year recurrence intervals. The average runoff coefficients, 'C' values, are taken from Table 6-6 and the Intensity-Duration-Frequency curves are taken from Figure 6-5 of the City Drainage Criteria Manual. Time of concentration for overland flow and storm drain or gutter flow are calculated per Section 3.2 of the City Drainage Criteria Manual. Calculations for the Rational Method are shown in the Appendix of this report.

Remove.

Urban Drainage and Flood Control District methodology was utilized for determination of street capacity, inlet sizing, and extended detention basin design. UD-Inlet Version 4.05 was utilized in street capacity and inlet sizing calculations. UD-Culvert Version 3.05 was utilized in developing preliminary pipe sizing. Details and analysis of final storm drain conveyance and collection system will be developed in an addendum to the final drainage report submitted with Private Storm Sewer Plans for Fillmore Apartments Subdivision. Preliminary sizing calculations were provided in the appendix of this report. UD-Detention version 3.07 was utilized in development of extended detention basin and outfall. Calculations are included in the appendix of this report.

Since this report is associated with the final plats, final design must be provided with this report. Unresolved.

SUMMARY

Development of Riverbend Crossing Filings No. 1 and No. 2 will require that flows be treated for water quality and be detained to historic levels prior to release from the site. Site runoff and storm drain and appurtenances will not adversely affect the downstream and surrounding developments. This report is in general conformance with all previously approved reports which included this site. Facilities will be owned or maintained by the Riverbend Crossing Metropolitan District.

REFERENCES:

City of Colorado Springs Engineering Division Drainage Criteria Manual Volumes 1 and 2, revised May 2014

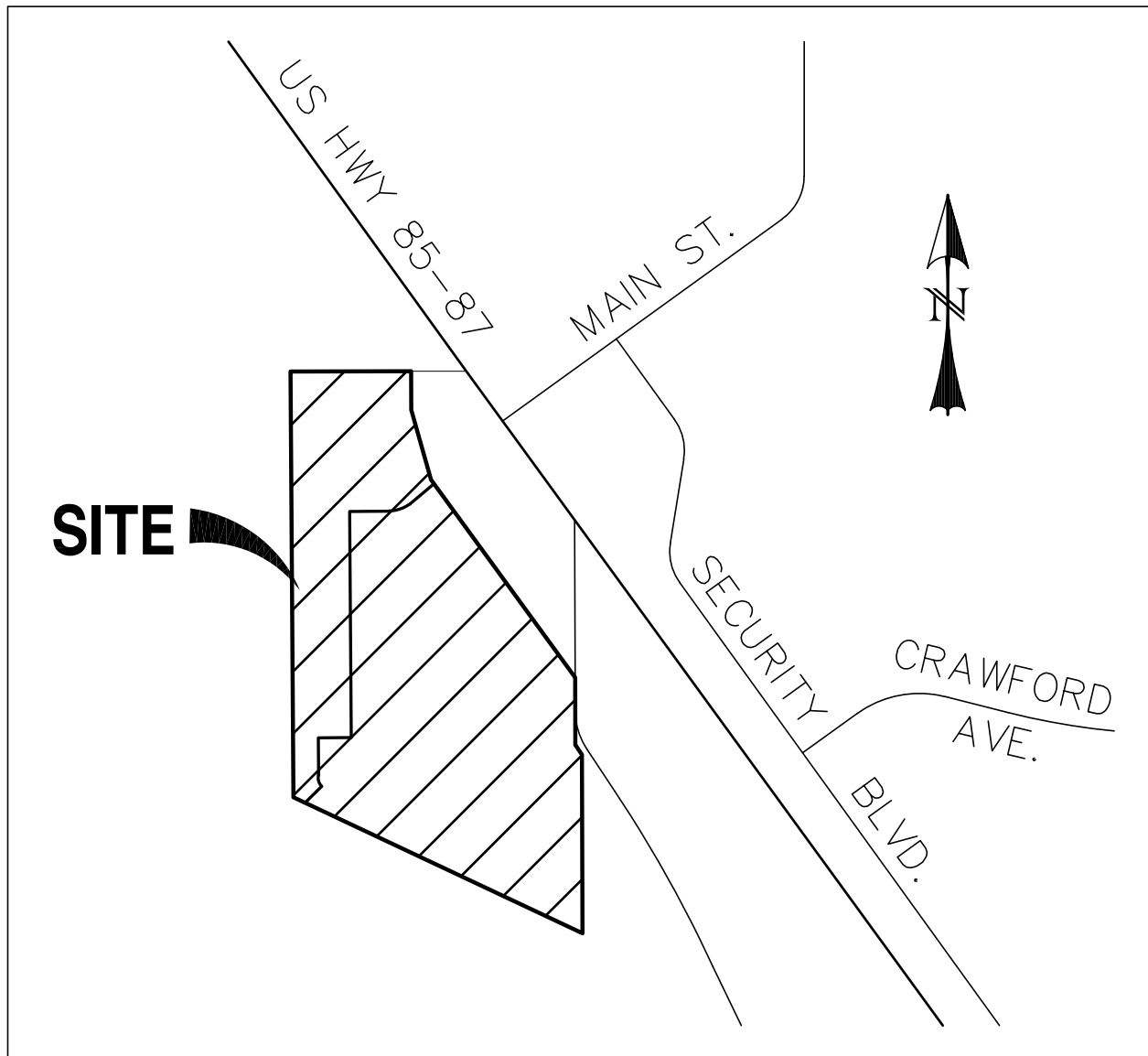
“Little Johnson/Security Creek Drainage Basin Planning Study” prepared by Simons, Li and Associates, Inc. dated December 1987.

“Preliminary Drainage Study Riverbend Crossing” prepared by Nolte and Associates, Inc.” accepted February 2017.

“Preliminary/Final Drainage Report for St. Dominic’s Church Subdivision”, accepted October 2007.

Natural Resources Conservation Service Web Soil Survey

APPENDIX



VICINITY MAP

SCALE: N.T.S.



PO BOX 692 DIVIDE, CO 80814 (719) 426-2124

RIVERBEND CROSSING

VICINITY MAP

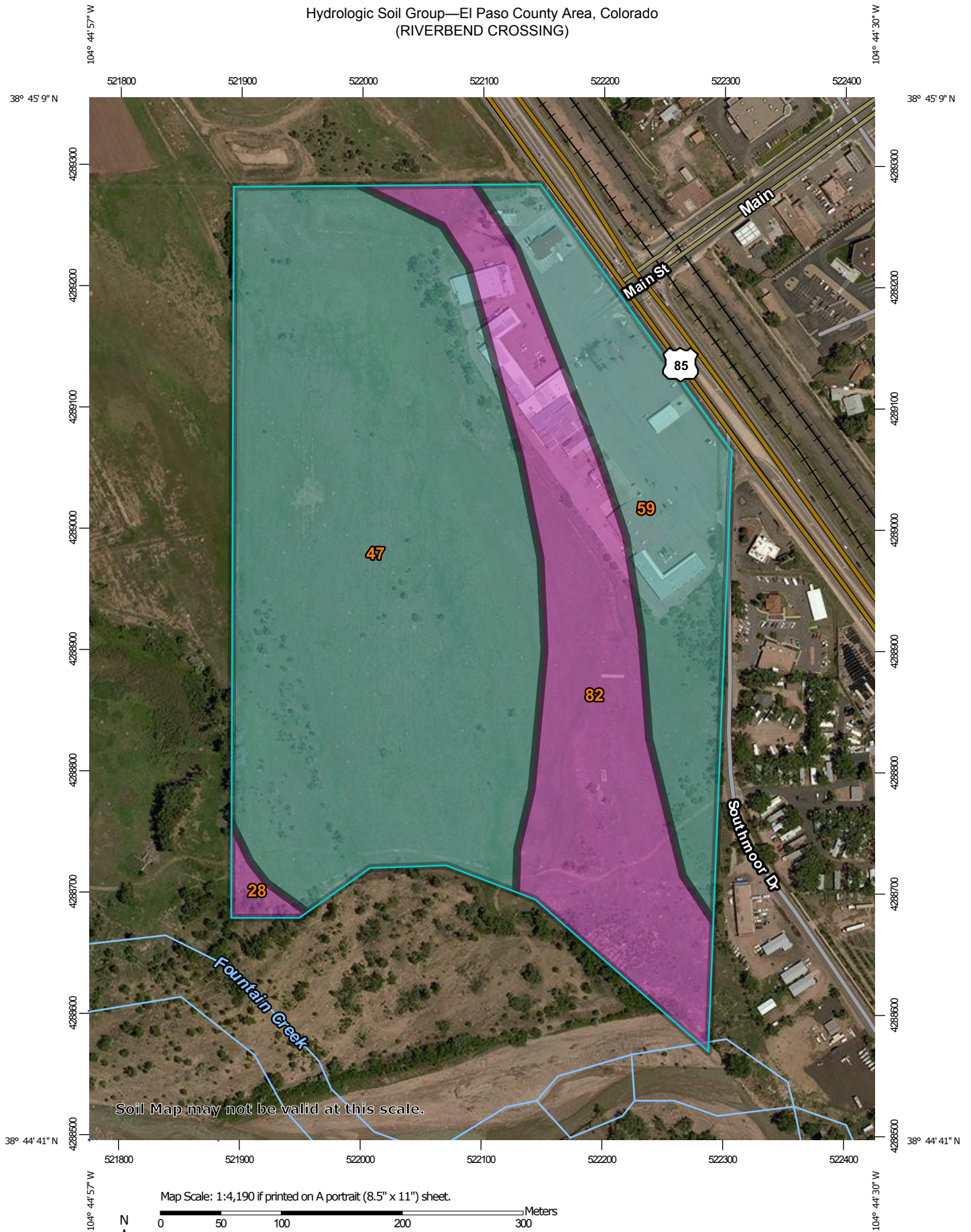
SCALE: NTS

JOB NO.: 17-114

DATE: 09/05/18

SHEET: 1 OF 1


Hydrologic Soil Group—El Paso County Area, Colorado (RIVERBEND CROSSING)



Hydrologic Soil Group—El Paso County Area, Colorado
(RIVERBEND CROSSING)

MAP LEGEND

Area of Interest (AOI)









 Area of Interest (AOI)

Soils

Soil Rating Polygons





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

Soil Rating Lines

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

Soil Rating Points






 A
 A/D
 B
 B/D

 C
 C/D
 D
 Not rated or not available


Water Features

 Streams and Canals

Transportation

 Rails
 Interstate Highways
 US Routes
 Major Roads
 Local Roads

Background

 Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: El Paso County Area, Colorado
 Survey Area Data: Version 15, Oct 10, 2017

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

Date(s) aerial images were photographed: Apr 15, 2011—Jun 17, 2014

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
28	Ellicott loamy coarse sand, 0 to 5 percent slopes	A	0.5	0.9%
47	Limon clay, 0 to 3 percent slopes	C	32.6	57.0%
59	Nunn clay loam, 0 to 3 percent slopes	C	10.2	17.8%
82	Schamber-Razor complex, 8 to 50 percent slopes	A	13.9	24.3%
Totals for Area of Interest			57.2	100.0%

Description

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

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

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

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

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

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

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

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

HYDROLOGIC AND HYDRAULIC CALCULATIONS

PROPOSED DRAINAGE DESIGN - RATIONAL ANALYSIS

											CONVEYANCE TC							TT	INTENSITY							TOTAL FLOWS						
BASIN	AREA TOTAL (Acres)	C ₂	C ₅	C ₁₀	C ₂₅	C ₅₀	C ₁₀₀	Length (ft)	Height (ft)	TI (min)	Length (ft)	Height (ft)	C _v	Slope (%)	Velocity (fps)	TC (min)	TOTAL (min)	I ₂ (in/hr)	I ₅ (in/hr)	I ₁₀ (in/hr)	I ₂₅ (in/hr)	I ₅₀ (in/hr)	I ₁₀₀ (in/hr)	Q ₂ (c.f.s.)	Q ₅ (c.f.s.)	Q ₁₀ (c.f.s.)	Q ₂₅ (c.f.s.)	Q ₅₀ (c.f.s.)	Q ₁₀₀ (c.f.s.)			
A1 Landscape	1.30 1.30	0.09 0.09	0.19 0.19	0.29 0.29	0.40 0.40	0.46 0.46	0.52 0.52	70	1.8	10.1	1373	10	15	0.7%	1.3	17.9	27.9	2.1	2.6	3.0	3.5	3.9	4.3	0.2	0.6	1.1	1.8	2.3	2.9			
B1 Residential 1/8 acre Landscape	1.70 1.50 0.20	0.41 0.45 0.09	0.45 0.49 0.19	0.51 0.54 0.29	0.57 0.59 0.40	0.60 0.62 0.46	0.63 0.65 0.52	100	2	9.3	382	3.8	20	1.0%	2.0	3.2	12.5	3.0	3.8	4.4	5.1	5.7	6.4	2.1	2.9	3.8	4.9	5.8	6.9			
B2 Residential 1/8 acre	1.33 1.33	0.45 0.45	0.49 0.49	0.54 0.54	0.59 0.59	0.62 0.62	0.65 0.65	83	1.6	8.1	252	2.5	20	1.0%	2.0	2.1	10.2	3.3	4.1	4.8	5.5	6.2	6.9	2.0	2.7	3.4	4.3	5.1	6.0			
B3 Residential 1/8 acre Landscape	2.29 2.04 0.25	0.41 0.45 0.09	0.46 0.49 0.19	0.51 0.54 0.29	0.57 0.59 0.40	0.60 0.62 0.46	0.64 0.65 0.52	100	2	9.2	344	3	20	0.9%	1.9	3.1	12.3	3.0	3.8	4.5	5.1	5.7	6.4	2.9	4.0	5.2	6.6	7.9	9.3			
B4 Residential 1/8 acre	1.26 1.26	0.45 0.45	0.49 0.49	0.54 0.54	0.59 0.59	0.62 0.62	0.65 0.65	84	1.6	8.2	312	4	20	1.3%	2.3	2.3	10.5	3.2	4.1	4.7	5.4	6.1	6.8	1.8	2.5	3.2	4.0	4.8	5.6			
B5 Residential 1/8 acre	3.57 3.57	0.45 0.45	0.49 0.49	0.54 0.54	0.59 0.59	0.62 0.62	0.65 0.65	100	2	8.8	320	11	7	3.4%	1.3	4.1	12.9	3.0	3.8	4.4	5.0	5.6	6.3	4.8	6.6	8.4	10.5	12.5	14.6			
B6 Residential 1/8 acre	1.67 1.67	0.45 0.45	0.49 0.49	0.54 0.54	0.59 0.59	0.62 0.62	0.65 0.65	100	2	8.8	100 710	2 12	7 20	2.0% 1.7%	1.0 2.6	1.7 4.6	15.0	2.8	3.5	4.1	4.7	5.3	5.9	2.1	2.9	3.7	4.6	5.5	6.4			
B7 Residential 1/8 acre Landscape	3.79 2.91 0.88	0.37 0.45 0.09	0.42 0.49 0.19	0.48 0.54 0.29	0.55 0.59 0.40	0.58 0.62 0.46	0.62 0.65 0.52	100	12	5.4	100 780	3 6	7 20	3.0% 0.8%	1.2 1.8	1.4 7.4	14.2	2.9	3.6	4.2	4.8	5.4	6.1	4.0	5.7	7.7	9.9	11.9	14.2			

Calculated by: DLM
Date: 8/12/2018

PROPOSED DRAINAGE DESIGN - RATIONAL ANALYSIS

BASIN	AREA TOTAL (Acres)								CONVEYANCE TC							TT	INTENSITY							TOTAL FLOWS					
		C ₂	C ₅	C ₁₀	C ₂₅	C ₅₀	C ₁₀₀	Length	Height	TI	Length	Height	C _v	Slope	Velocity	TC	TOTAL	I ₂	I ₅	I ₁₀	I ₂₅	I ₅₀	I ₁₀₀	Q ₂	Q ₅	Q ₁₀	Q ₂₅	Q ₅₀	Q ₁₀₀
								(ft)	(ft)	(min)	(ft)	(ft)		(%)	(fps)	(min)	(min)	(in/hr)	(in/hr)	(in/hr)	(in/hr)	(in/hr)	(in/hr)	(c.f.s.)	(c.f.s.)	(c.f.s.)	(c.f.s.)	(c.f.s.)	(c.f.s.)
B8 <i>Residential 1/8 acre</i>	0.33 0.33	0.45 0.45	0.49 0.49	0.54 0.54	0.59 0.59	0.62 0.62	0.65 0.65	75	1.5	7.6	124	1.5	20	1.2%	2.2	0.9	8.5	3.5	4.4	5.1	5.8	6.6	7.3	0.5	0.7	0.9	1.1	1.3	1.6
B9 <i>Residential 1/8 acre</i>	3.19 3.19	0.45 0.45	0.49 0.49	0.54 0.54	0.59 0.59	0.62 0.62	0.65 0.65	100	4	7.0	810	12	20	1.5%	2.4	5.5	12.5	3.0	3.8	4.4	5.1	5.7	6.4	4.3	5.9	7.6	9.5	11.3	13.2
B10 <i>Residential 1/8 acre</i>	2.15 2.15	0.45 0.45	0.49 0.49	0.54 0.54	0.59 0.59	0.62 0.62	0.65 0.65	73	1.5	7.4	720	11	20	1.5%	2.5	4.9	12.3	3.1	3.8	4.5	5.1	5.7	6.4	3.0	4.0	5.2	6.5	7.6	9.0
B11 <i>Residential 1/8 acre</i>	4.41 4.41	0.45 0.45	0.49 0.49	0.54 0.54	0.59 0.59	0.62 0.62	0.65 0.65	100	2	8.8	515	7.5	20	1.5%	2.4	3.6	12.3	3.0	3.8	4.5	5.1	5.7	6.4	6.0	8.2	10.6	13.2	15.7	18.4
B12 <i>Residential 1/8 acre</i>	3.74 3.74	0.45 0.45	0.49 0.49	0.54 0.54	0.59 0.59	0.62 0.62	0.65 0.65	100	6	6.1	40 803	0.8 12	7 20	2.0% 1.5%	1.0 2.4	0.7 5.5	12.2	3.1	3.8	4.5	5.1	5.7	6.4	5.1	7.0	9.0	11.3	13.3	15.6
B13 <i>Residential 1/8 acre</i>	1.96 1.96	0.45 0.45	0.49 0.49	0.54 0.54	0.59 0.59	0.62 0.62	0.65 0.65	100	2	8.8	657	9	20	1.4%	2.3	4.7	13.4	2.9	3.7	4.3	4.9	5.5	6.2	2.6	3.5	4.6	5.7	6.7	7.9
B14 <i>Residential 1/8 acre</i>	1.35 1.35	0.45 0.45	0.49 0.49	0.54 0.54	0.59 0.59	0.62 0.62	0.65 0.65	100	2	8.8	554	7.5	20	1.4%	2.3	4.0	12.7	3.0	3.8	4.4	5.0	5.7	6.3	1.8	2.5	3.2	4.0	4.7	5.5
B15 <i>Residential 1/8 acre</i>	1.15 1.15	0.45 0.45	0.49 0.49	0.54 0.54	0.59 0.59	0.62 0.62	0.65 0.65	50	2	4.9	1026	20	7	1.9%	1.0	17.5	22.4	2.3	2.9	3.4	3.9	4.4	4.9	1.2	1.6	2.1	2.6	3.1	3.7
B16 <i>Residential 1/8 acre</i>	2.19 2.19	0.45 0.45	0.49 0.49	0.54 0.54	0.59 0.59	0.62 0.62	0.65 0.65	50	2	4.9	934	20	7	2.1%	1.0	15.2	20.1	2.5	3.1	3.6	4.1	4.6	5.2	2.4	3.3	4.2	5.3	6.3	7.4

Calculated by: DLM
Date: 8/12/2018

PROPOSED DRAINAGE DESIGN - RATIONAL ANALYSIS

									CONVEYANCE TC							TT	INTENSITY							TOTAL FLOWS						
BASIN	AREA TOTAL (Acres)	C ₂	C ₅	C ₁₀	C ₂₅	C ₅₀	C ₁₀₀	Length	Height	TI	Length	Height	C _V	Slope	Velocity	TC	TOTAL	I ₂	I ₅	I ₁₀	I ₂₅	I ₅₀	I ₁₀₀	Q ₂	Q ₅	Q ₁₀	Q ₂₅	Q ₅₀	Q ₁₀₀	
									(ft)	(ft)	(min)	(ft)	(ft)		(%)	(fps)	(min)	(min)	(in/hr)	(in/hr)	(in/hr)	(in/hr)	(in/hr)	(in/hr)	(c.f.s.)	(c.f.s.)	(c.f.s.)	(c.f.s.)	(c.f.s.)	(c.f.s.)
B17 <i>Residential 1/8 acre</i>	0.87 <i>0.87</i>	0.45 <i>0.45</i>	0.49 <i>0.49</i>	0.54 <i>0.54</i>	0.59 <i>0.59</i>	0.62 <i>0.62</i>	0.65 <i>0.65</i>	75	1.5	7.6	428	4	20	0.9%	1.9	3.7	11.3	3.2	3.9	4.6	5.3	5.9	6.6	1.2	1.7	2.2	2.7	3.2	3.7	
B18 <i>Landscape Residential 1/8 acre</i>	4.86 <i>3.88 0.98</i>	0.16 <i>0.09 0.45</i>	0.25 <i>0.19 0.49</i>	0.34 <i>0.29 0.54</i>	0.44 <i>0.40 0.59</i>	0.49 <i>0.46 0.62</i>	0.55 <i>0.52 0.65</i>	100	6	8.5	527	5	7	0.9%	0.7	12.9	21.4	2.4	3.0	3.5	4.0	4.5	5.0	1.9	3.6	5.8	8.5	10.7	13.3	
C <i>Commercial</i>	11.25 <i>11.25</i>	0.80 <i>0.80</i>	0.82 <i>0.82</i>	0.84 <i>0.84</i>	0.87 <i>0.87</i>	0.88 <i>0.88</i>	0.89 <i>0.89</i>	100	2	4.0	2314	23	20	1.0%	2.0	19.3	23.4	2.3	2.9	3.3	3.8	4.3	4.8	20.6	26.3	31.5	37.3	42.4	48.0	

Calculated by: DLM
Date: 8/12/2018

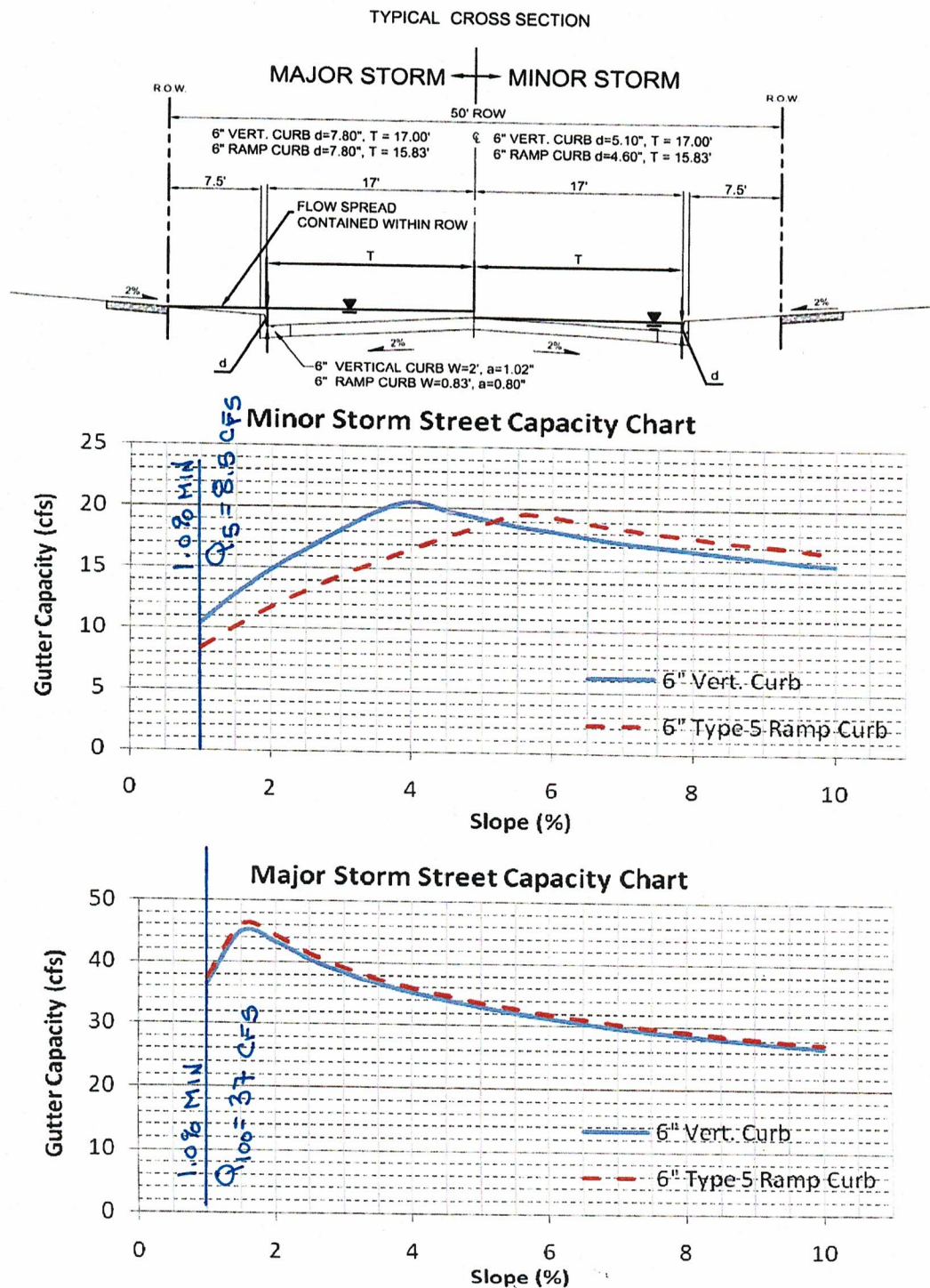
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DESIGN POINT	AREA TOTAL (Acres)	WEIGHTED						TT	INTENSITY						TOTAL FLOWS					
		C ₂	C ₅	C ₁₀	C ₂₅	C ₅₀	C ₁₀₀	TOTAL (min)	I ₂ (in/hr)	I ₅ (in/hr)	I ₁₀ (in/hr)	I ₂₅ (in/hr)	I ₅₀ (in/hr)	I ₁₀₀ (in/hr)	Q ₂ (c.f.s.)	Q ₅ (c.f.s.)	Q ₁₀ (c.f.s.)	Q ₂₅ (c.f.s.)	Q ₅₀ (c.f.s.)	Q ₁₀₀ (c.f.s.)
1	3.03	0.43	0.47	0.52	0.58	0.61	0.64	12.5	3.0	3.8	4.4	5.1	5.7	6.4	3.9	5.4	7.0	8.9	10.5	12.4
BASIN B1	1.70	0.41	0.45	0.51	0.57	0.60	0.63	12.5												
BASIN B2	1.33	0.45	0.49	0.54	0.59	0.62	0.65	10.2												
2	3.55	0.42	0.47	0.52	0.58	0.61	0.64	12.3	3.0	3.8	4.5	5.1	5.7	6.4	4.6	6.4	8.3	10.4	12.4	14.6
BASIN B3	2.29	0.41	0.46	0.51	0.57	0.60	0.64	12.3												
BASIN B4	1.26	0.45	0.49	0.54	0.59	0.62	0.65	10.5												
3	8.79	0.44	0.48	0.53	0.58	0.62	0.65	15.0	2.8	3.5	4.1	4.7	5.3	5.9	10.9	14.9	19.2	24.1	28.6	33.6
BASIN B5	3.57	0.45	0.49	0.54	0.59	0.62	0.65	12.9												
BASIN B6	1.67	0.45	0.49	0.54	0.59	0.62	0.65	15.0												
DP-2	3.55	0.42	0.47	0.52	0.58	0.61	0.64	12.3												
4	37.92	0.44	0.48	0.53	0.58	0.61	0.65	22.4	2.3	2.9	3.4	3.9	4.4	4.9	38.7	53.0	68.6	86.1	102.0	119.9
DP-1	3.03	0.43	0.47	0.52	0.58	0.61	0.64	12.5												
DP-7	26.10	0.44	0.48	0.53	0.58	0.61	0.65	22.4												
DP-3	8.79	0.44	0.48	0.53	0.58	0.62	0.65	15.0												
5	4.12	0.37	0.43	0.49	0.55	0.59	0.62	14.2	2.9	3.6	4.2	4.8	5.4	6.1	4.4	6.3	8.4	10.9	13.0	15.5
BASIN B7	3.79	0.37	0.42	0.48	0.55	0.58	0.62	14.2												
BASIN B8	0.33	0.45	0.49	0.54	0.59	0.62	0.65	8.5												
6	9.46	0.42	0.46	0.52	0.57	0.61	0.64	14.2	2.9	3.6	4.2	4.8	5.4	6.1	11.3	15.8	20.6	26.0	31.0	36.5
BASIN B9	3.19	0.45	0.49	0.54	0.59	0.62	0.65	12.5												
BASIN B10	2.15	0.45	0.49	0.54	0.59	0.62	0.65	12.3												
DP 5	4.12	0.37	0.43	0.49	0.55	0.59	0.62	14.2												
7	26.10	0.44	0.48	0.53	0.58	0.61	0.65	22.4	2.3	2.9	3.4	3.9	4.4	4.9	26.7	36.5	47.2	59.3	70.2	82.5
DP-11	16.64	0.45	0.49	0.54	0.59	0.62	0.65	22.4												
DP-6	9.46	0.42	0.46	0.52	0.57	0.61	0.64	14.2												
8	8.15	0.45	0.49	0.54	0.59	0.62	0.65	12.3	3.0	3.8	4.5	5.1	5.7	6.4	11.2	15.2	19.6	24.5	28.9	33.9
BASIN B11	4.41	0.45	0.49	0.54	0.59	0.62	0.65	12.3												
BASIN B12	3.74	0.45	0.49	0.54	0.59	0.62	0.65	12.2												
9	11.34	0.45	0.49	0.54	0.59	0.62	0.65	12.5	3.0	3.8	4.4	5.1	5.7	6.4	15.5	21.1	27.1	33.8	40.0	46.9
B9	3.19	0.45	0.49	0.54	0.59	0.62	0.65	12.5												
DP-8	8.15	0.45	0.49	0.54	0.59	0.62	0.65	12.3												
A1	4.15	0.45	0.49	0.54	0.59	0.62	0.65	20.1	2.5	3.1	3.6	4.1	4.6	5.2	4.6	6.3	8.1	10.1	11.9	13.9
BASIN B13	1.96	0.45	0.49	0.54	0.59	0.62	0.65	13.4												
BASIN B16	2.19	0.45	0.49	0.54	0.59	0.62	0.65	20.1												
10	15.49	0.45	0.49	0.54	0.59	0.62	0.65	20.1	2.5	3.1	3.6	4.1	4.6	5.2	17.2	23.4	30.1	37.5	44.4	52.1
DP A1	4.15	0.45	0.49	0.54	0.59	0.62	0.65	20.1												
DP-9	11.34	0.45	0.49	0.54	0.59	0.62	0.65	12.5												
11	16.64	0.45	0.49	0.54	0.59	0.62	0.65	22.4	2.3	2.9	3.4	3.9	4.4	4.9	17.5	23.8	30.6	38.2	45.2	53.0
BASIN B15	1.15	0.45	0.49	0.54	0.59	0.62	0.65	22.4												
DP-10	15.49	0.45	0.49	0.54	0.59	0.62	0.65	20.1												
12	38.79	0.44	0.48	0.53	0.58	0.61	0.65	22.4	2.3	2.9	3.4	3.9	4.4	4.9	39.6	54.3	70.2	88.1	104.3	122.6
BASIN B17	0.87	0.45	0.49	0.54	0.59	0.62	0.65	11.3												
DP-4	37.92	0.44	0.48	0.53	0.58	0.61	0.65	22.4												
P-IN	54.90	0.49	0.53	0.58	0.63	0.66	0.69	23.4	2.3	2.9	3.3	3.8	4.3	4.8	61.2	83.0	105.7	131.6	154.8	180.8
BASIN B18	4.86	0.16	0.25	0.34	0.44	0.49	0.55	21.4												
BASIN C	11.25	0.80	0.82	0.84	0.87	0.88	0.89	23.4												
DP-12	38.79	0.44	0.48	0.53	0.58	0.61	0.65	22.4												
P-OUT	54.90								POND ROUTED						1.0	2.6	7.8	18.2	27.2	36.4
POND OUTLET									SEE UD DENTIONION											

Calculated by: DLM

Date: 8/12/2018

Figure 7-7. Street Capacity Charts Residential (Detached Sidewalk)



These charts shall only be used for the standard street sections as shown. The capacity shown is based on $\frac{1}{2}$ the street section as calculated by the UD-Inlet spreadsheets. Minor storm capacities are based on no crown overtopping, curb height or maximum allowable spread widths. Major storm capacities are based on flow being contained within the public right-of-way, including conveyance capacity behind the curb. The UDFCD Safety Reduction Factor was applied. An 'n_{STREET}' of 0.016 and 'n_{BACK}' of 0.020 was used. Calculations were done using UD-Inlet 3.00.xls, March, 2011.

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

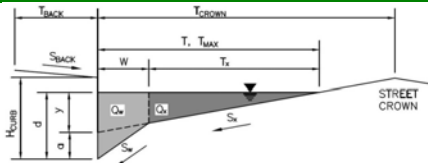
(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project:

Riverbend Crossing

Inlet ID:

B1

**Gutter Geometry (Enter data in the blue cells)**

Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

Max. Allowable Spread for Minor & Major Storm

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Check boxes are not applicable in SUMP conditions

MINOR STORM Allowable Capacity is based on Depth Criterion

MAJOR STORM Allowable Capacity is based on Depth Criterion

$T_{BACK} = 7.5$ ft
 $S_{BACK} = 0.020$ ft/ft
 $n_{BACK} = 0.020$

$H_{CURB} = 6.00$ inches
 $T_{CROWN} = 17.0$ ft
 $W = 2.00$ ft
 $S_x = 0.020$ ft/ft
 $S_w = 0.083$ ft/ft
 $S_o = 0.000$ ft/ft
 $n_{STREET} = 0.016$

	Minor Storm	Major Storm	
$T_{MAX} =$	17.0	17.0	ft
$d_{MAX} =$	5.1	7.8	inches
	<input type="checkbox"/>	<input type="checkbox"/>	

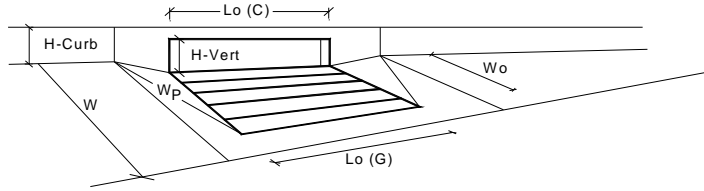
	Minor Storm	Major Storm	
$Q_{allow} =$	SUMP	SUMP	cfs

For local road this is mainly back of sidewalk. Revise the manning's n. Unresolved

14" gutter for Optional Type C curb Unresolved

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)

Type of Inlet
Local Depression (additional to continuous gutter depression 'a' from above)
Number of Unit Inlets (Grate or Curb Opening)
Water Depth at Flowline (outside of local depression)

Grate Information

Length of a Unit Grate
Width of a Unit Grate
Area Opening Ratio for a Grate (typical values 0.15-0.90)
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)
Grate Weir Coefficient (typical value 2.15 - 3.60)
Grate Orifice Coefficient (typical value 0.60 - 0.80)

Curb Opening Information

Length of a Unit Curb Opening
Height of Vertical Curb Opening in Inches
Height of Curb Orifice Throat in Inches
Angle of Throat (see USDCM Figure ST-5)
Side Width for Depression Pan (typically the gutter width of 2 feet)
Clogging Factor for a Single Curb Opening (typical value 0.10)
Curb Opening Weir Coefficient (typical value 2.3-3.7)
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)

Low Head Performance Reduction (Calculated)

Depth for Grate Midwidth
Depth for Curb Opening Weir Equation
Combination Inlet Performance Reduction Factor for Long Inlets
Curb Opening Performance Reduction Factor for Long Inlets
Grated Inlet Performance Reduction Factor for Long Inlets

Total Inlet Interception Capacity (assumes clogged condition)

Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)

	MINOR	MAJOR	
Type =	CDOT Type R Curb Opening		
a_{local} =	3.00	3.00	inches
No =	1	1	
Ponding Depth =	5.1	7.8	inches
	MINOR	MAJOR	<input checked="" type="checkbox"/> Override Depths
$L_o (G)$ =	N/A	N/A	feet
W_o =	N/A	N/A	feet
A_{ratio} =	N/A	N/A	
$C_r (G)$ =	N/A	N/A	
$C_w (G)$ =	N/A	N/A	
$C_o (G)$ =	N/A	N/A	
	MINOR	MAJOR	
$L_o (C)$ =	10.00	10.00	feet
H_{vert} =	6.00	6.00	inches
H_{throat} =	6.00	6.00	inches
Theta =	63.40	63.40	degrees
W_p =	2.00	2.00	feet
$C_r (C)$ =	0.10	0.10	
$C_w (C)$ =	3.60	3.60	
$C_o (C)$ =	0.67	0.67	
	MINOR	MAJOR	
d_{Grate} =	N/A	N/A	ft
d_{Curb} =	0.26	0.48	ft
$RF_{Combination}$ =	0.48	0.74	
RF_{Curb} =	0.88	1.00	
RF_{Grate} =	N/A	N/A	
	MINOR	MAJOR	
Q_a =	5.3	15.5	cfs
$Q_{PEAK REQUIRED}$ =	2.9	6.9	cfs

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

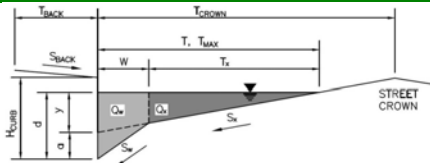
(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project:

Riverbend Crossing

Inlet ID:

B2

**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)

 $n_{BACK} = 0.020$

Height of Curb at Gutter Flow Line

 $H_{CURB} = 6.00$ inches

Distance from Curb Face to Street Crown

 $T_{CROWN} = 17.0$ ft

Gutter Width

 $W = 2.00$ ft

Street Transverse Slope

 $S_X = 0.020$ ft/ft

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

 $S_W = 0.083$ ft/ft

Street Longitudinal Slope - Enter 0 for sump condition

 $S_O = 0.000$ ft/ft

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

 $n_{STREET} = 0.016$

Max. Allowable Spread for Minor & Major Storm

	Minor Storm	Major Storm	
$T_{MAX} =$	17.0	17.0	ft
$d_{MAX} =$	5.1	7.8	inches

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

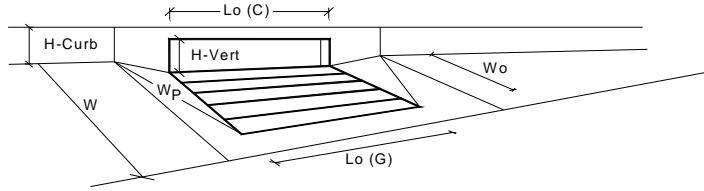
Check boxes are not applicable in SUMP conditions

☐☐**MINOR STORM Allowable Capacity is based on Depth Criterion****MAJOR STORM Allowable Capacity is based on Depth Criterion**

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

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)		MINOR		MAJOR	
Type of Inlet	CDOT Type R Curb Opening	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)		a _{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)		No =	1	1	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	5.1	7.8	inches
Grate Information			MINOR	MAJOR	<input checked="" type="checkbox"/> 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 _r (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) =	10.00	10.00	feet
Height of Vertical Curb Opening in Inches		H _{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches		H _{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)		Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W _p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)		C _r (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} =	0.26	0.48	ft
Combination Inlet Performance Reduction Factor for Long Inlets		RF _{Combination} =	0.48	0.74	
Curb Opening Performance Reduction Factor for Long Inlets		RF _{Curb} =	0.88	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets		RF _{Grate} =	N/A	N/A	
Total Inlet Interception Capacity (assumes clogged condition)			MINOR	MAJOR	
		Q _a =	5.3	15.5	cfs
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)		Q _{PEAK REQUIRED} =	2.7	6.0	cfs

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

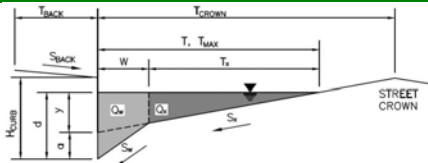
(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project:

Riverbend Crossing

Inlet ID:

B3

**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)

 $n_{BACK} = 0.020$

Height of Curb at Gutter Flow Line

 $H_{CURB} = 6.00$ inches

Distance from Curb Face to Street Crown

 $T_{CROWN} = 17.0$ ft

Gutter Width

 $W = 2.00$ ft

Street Transverse Slope

 $S_X = 0.020$ ft/ft

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

 $S_W = 0.083$ ft/ft

Street Longitudinal Slope - Enter 0 for sump condition

 $S_O = 0.000$ ft/ft

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

 $n_{STREET} = 0.016$

Max. Allowable Spread for Minor & Major Storm

	Minor Storm	Major Storm	
$T_{MAX} =$	17.0	17.0	ft
$d_{MAX} =$	5.1	7.8	inches

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

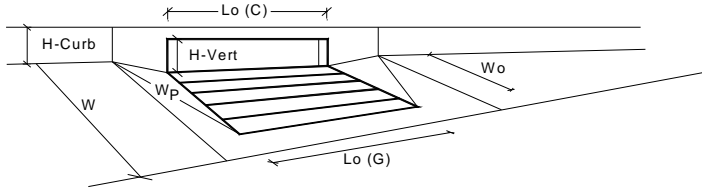
Check boxes are not applicable in SUMP conditions

☐☐**MINOR STORM Allowable Capacity is based on Depth Criterion****MAJOR STORM Allowable Capacity is based on Depth Criterion**

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

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)		MINOR		MAJOR	
Type of Inlet	CDOT Type R Curb Opening	Type = CDOT Type R Curb Opening			
Local Depression (additional to continuous gutter depression 'a' from above)		$a_{local} = 3.00$	3.00	inches	
Number of Unit Inlets (Grate or Curb Opening)		$N_o = 1$	1		
Water Depth at Flowline (outside of local depression)		Ponding Depth = 5.1	7.8	inches	
Grate Information		MINOR		MAJOR <input checked="" type="checkbox"/> 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)		$C_r (G) = N/A$	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		$L_o (C) = 10.00$	10.00	feet	
Height of Vertical Curb Opening in Inches		$H_{vert} = 6.00$	6.00	inches	
Height of Curb Orifice Throat in Inches		$H_{throat} = 6.00$	6.00	inches	
Angle of Throat (see USDCM Figure ST-5)		Theta = 63.40	63.40	degrees	
Side Width for Depression Pan (typically the gutter width of 2 feet)		$W_p = 2.00$	2.00	feet	
Clogging Factor for a Single Curb Opening (typical value 0.10)		$C_r (C) = 0.10$	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		$d_{Curb} = 0.26$	0.48	ft	
Combination Inlet Performance Reduction Factor for Long Inlets		$RF_{Combination} = 0.48$	0.74		
Curb Opening Performance Reduction Factor for Long Inlets		$RF_{Curb} = 0.88$	1.00		
Grated Inlet Performance Reduction Factor for Long Inlets		$RF_{Grate} = N/A$	N/A		
Total Inlet Interception Capacity (assumes clogged condition)		MINOR		MAJOR	
		$Q_a = 5.3$	15.5	cfs	
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)		$Q_{PEAK REQUIRED} = 4.0$	9.3	cfs	

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

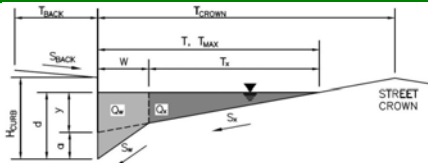
(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project:

Riverbend Crossing

Inlet ID:

B4

**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)

 $n_{BACK} = 0.020$

Height of Curb at Gutter Flow Line

 $H_{CURB} = 6.00$ inches

Distance from Curb Face to Street Crown

 $T_{CROWN} = 17.0$ ft

Gutter Width

 $W = 2.00$ ft

Street Transverse Slope

 $S_X = 0.020$ ft/ft

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

 $S_W = 0.083$ ft/ft

Street Longitudinal Slope - Enter 0 for sump condition

 $S_O = 0.000$ ft/ft

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

 $n_{STREET} = 0.016$

Max. Allowable Spread for Minor & Major Storm

	Minor Storm	Major Storm	
$T_{MAX} =$	17.0	17.0	ft

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

	Minor Storm	Major Storm	
$d_{MAX} =$	5.1	7.8	inches

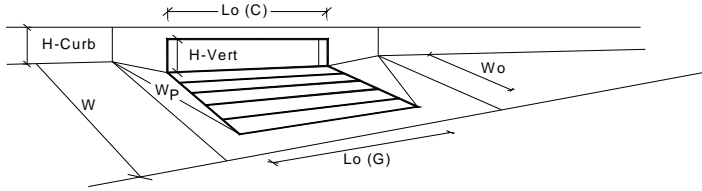
Check boxes are not applicable in SUMP conditions

**MINOR STORM Allowable Capacity is based on Depth Criterion****MAJOR STORM Allowable Capacity is based on Depth Criterion**

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

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)		MINOR		MAJOR	
Type of Inlet	CDOT Type R Curb Opening	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)		a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)		No =	1	1	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	5.1	7.8	inches
Grate Information			MINOR	MAJOR	<input checked="" type="checkbox"/> 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)		$C_r (G)$ =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)		$C_w (G)$ =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)		$C_o (G)$ =	N/A	N/A	
Curb Opening Information			MINOR	MAJOR	
Length of a Unit Curb Opening		$L_o (C)$ =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches		H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches		H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)		Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)		$C_r (C)$ =	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} =	0.26	0.48	ft
Combination Inlet Performance Reduction Factor for Long Inlets		$RF_{Combination}$ =	0.65	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	
Total Inlet Interception Capacity (assumes clogged condition)			MINOR	MAJOR	
		Q_a =	3.7	9.0	cfs
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)		$Q_{PEAK REQUIRED}$ =	2.5	5.6	cfs

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

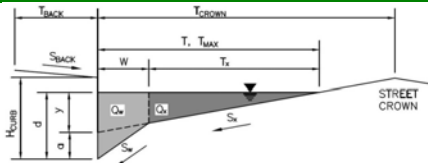
(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project:

Riverbend Crossing

Inlet ID:

B5

**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)

 $n_{BACK} = 0.020$

Height of Curb at Gutter Flow Line

 $H_{CURB} = 6.00$ inches

Distance from Curb Face to Street Crown

 $T_{CROWN} = 17.0$ ft

Gutter Width

 $W = 2.00$ ft

Street Transverse Slope

 $S_X = 0.020$ ft/ft

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

 $S_W = 0.083$ ft/ft

Street Longitudinal Slope - Enter 0 for sump condition

 $S_O = 0.000$ ft/ft

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

 $n_{STREET} = 0.016$

Max. Allowable Spread for Minor & Major Storm

	Minor Storm	Major Storm	
$T_{MAX} =$	17.0	17.0	ft
$d_{MAX} =$	5.1	7.8	inches

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

 $d_{MAX} = 5.1$ inches

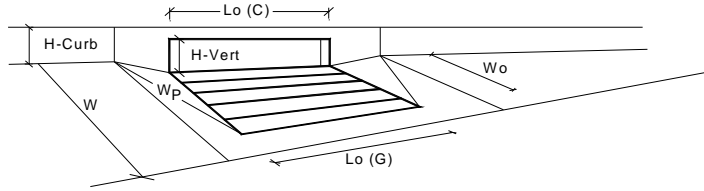
Check boxes are not applicable in SUMP conditions

☐☐**MINOR STORM Allowable Capacity is based on Depth Criterion****MAJOR STORM Allowable Capacity is based on Depth Criterion**

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

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)

Type of Inlet
Local Depression (additional to continuous gutter depression 'a' from above)
Number of Unit Inlets (Grate or Curb Opening)
Water Depth at Flowline (outside of local depression)

Grate Information

Length of a Unit Grate
Width of a Unit Grate
Area Opening Ratio for a Grate (typical values 0.15-0.90)
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)
Grate Weir Coefficient (typical value 2.15 - 3.60)
Grate Orifice Coefficient (typical value 0.60 - 0.80)

Curb Opening Information

Length of a Unit Curb Opening
Height of Vertical Curb Opening in Inches
Height of Curb Orifice Throat in Inches
Angle of Throat (see USDCM Figure ST-5)
Side Width for Depression Pan (typically the gutter width of 2 feet)
Clogging Factor for a Single Curb Opening (typical value 0.10)
Curb Opening Weir Coefficient (typical value 2.3-3.7)
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)

Low Head Performance Reduction (Calculated)

Depth for Grate Midwidth
Depth for Curb Opening Weir Equation
Combination Inlet Performance Reduction Factor for Long Inlets
Curb Opening Performance Reduction Factor for Long Inlets
Grated Inlet Performance Reduction Factor for Long Inlets

Total Inlet Interception Capacity (assumes clogged condition)

WARNING: Inlet Capacity less than Q Peak for Minor Storm

	MINOR	MAJOR	
Type =	CDOT Type R Curb Opening		
a_{local} =	3.00	3.00	inches
No =	1	1	
Ponding Depth =	5.5	7.8	inches
	MINOR	MAJOR	<input checked="" type="checkbox"/> Override Depths
$L_o (G)$ =	N/A	N/A	feet
W_o =	N/A	N/A	feet
A_{ratio} =	N/A	N/A	
$C_r (G)$ =	N/A	N/A	
$C_w (G)$ =	N/A	N/A	
$C_o (G)$ =	N/A	N/A	
	MINOR	MAJOR	
$L_o (C)$ =	10.00	10.00	feet
H_{vert} =	6.00	6.00	inches
H_{throat} =	6.00	6.00	inches
Theta =	63.40	63.40	degrees
W_p =	2.00	2.00	feet
$C_r (C)$ =	0.10	0.10	
$C_w (C)$ =	3.60	3.60	
$C_o (C)$ =	0.67	0.67	
	MINOR	MAJOR	
d_{Grate} =	N/A	N/A	ft
d_{Curb} =	0.29	0.48	ft
$RF_{Combination}$ =	0.52	0.74	
RF_{Curb} =	0.90	1.00	
RF_{Grate} =	N/A	N/A	
	MINOR	MAJOR	
Q_a =	6.6	15.5	cfs
$Q_{PEAK REQUIRED}$ =	6.6	14.6	cfs

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

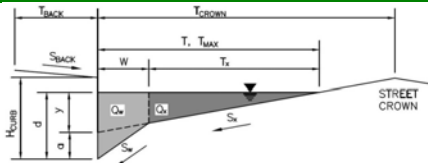
(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project:

Riverbend Crossing

Inlet ID:

B6

**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)

 $n_{BACK} = 0.020$

Height of Curb at Gutter Flow Line

 $H_{CURB} = 6.00$ inches

Distance from Curb Face to Street Crown

 $T_{CROWN} = 17.0$ ft

Gutter Width

 $W = 2.00$ ft

Street Transverse Slope

 $S_X = 0.020$ ft/ft

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

 $S_W = 0.083$ ft/ft

Street Longitudinal Slope - Enter 0 for sump condition

 $S_O = 0.000$ ft/ft

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

 $n_{STREET} = 0.016$

Max. Allowable Spread for Minor & Major Storm

	Minor Storm	Major Storm	
$T_{MAX} =$	17.0	17.0	ft
$d_{MAX} =$	5.1	7.8	inches

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Check boxes are not applicable in SUMP conditions

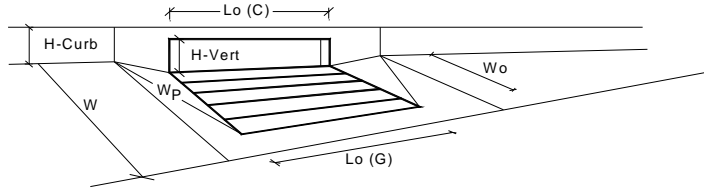
☐☐**MINOR STORM Allowable Capacity is based on Depth Criterion**

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

MAJOR STORM Allowable Capacity is based on Depth Criterion

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)		MINOR		MAJOR	
Type of Inlet	CDOT Type R Curb Opening	CDOT Type R Curb Opening			
Local Depression (additional to continuous gutter depression 'a' from above)		$a_{local} = 3.00$	3.00	inches	
Number of Unit Inlets (Grate or Curb Opening)		$N_o = 1$	1		
Water Depth at Flowline (outside of local depression)		Ponding Depth = 5.5	7.8	inches	
Grate Information		MINOR		MAJOR	
Length of a Unit Grate		$L_o (G) = N/A$	N/A	<input checked="" type="checkbox"/> Override Depths	
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)		$C_r (G) = N/A$	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		$L_o (C) = 10.00$	10.00	feet	
Height of Vertical Curb Opening in Inches		$H_{vert} = 6.00$	6.00	inches	
Height of Curb Orifice Throat in Inches		$H_{throat} = 6.00$	6.00	inches	
Angle of Throat (see USDCM Figure ST-5)		Theta = 63.40	63.40	degrees	
Side Width for Depression Pan (typically the gutter width of 2 feet)		$W_p = 2.00$	2.00	feet	
Clogging Factor for a Single Curb Opening (typical value 0.10)		$C_r (C) = 0.10$	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		$d_{Curb} = 0.29$	0.48	ft	
Combination Inlet Performance Reduction Factor for Long Inlets		$RF_{Combination} = 0.52$	0.74		
Curb Opening Performance Reduction Factor for Long Inlets		$RF_{Curb} = 0.90$	1.00		
Grated Inlet Performance Reduction Factor for Long Inlets		$RF_{Grate} = N/A$	N/A		
Total Inlet Interception Capacity (assumes clogged condition)		MINOR		MAJOR	
		$Q_a = 6.6$	15.5	cfs	
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)		$Q_{PEAK REQUIRED} = 2.9$	6.4	cfs	

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

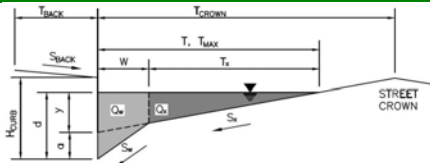
(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project:

Riverbend Crossing

Inlet ID:

B7

**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)

 $n_{BACK} = 0.020$

Height of Curb at Gutter Flow Line

 $H_{CURB} = 6.00$ inches

Distance from Curb Face to Street Crown

 $T_{CROWN} = 17.0$ ft

Gutter Width

 $W = 2.00$ ft

Street Transverse Slope

 $S_X = 0.020$ ft/ft

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

 $S_W = 0.083$ ft/ft

Street Longitudinal Slope - Enter 0 for sump condition

 $S_O = 0.000$ ft/ft

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

 $n_{STREET} = 0.016$

Max. Allowable Spread for Minor & Major Storm

	Minor Storm	Major Storm	
$T_{MAX} =$	17.0	17.0	ft

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

	Minor Storm	Major Storm	
$d_{MAX} =$	5.5	7.8	inches

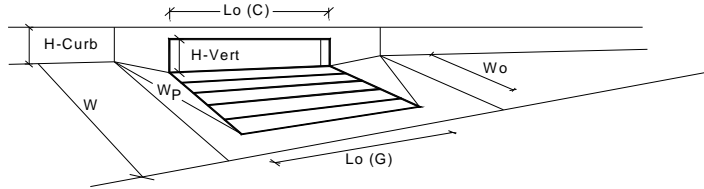
Check boxes are not applicable in SUMP conditions

**MINOR STORM Allowable Capacity is based on Depth Criterion****MAJOR STORM Allowable Capacity is based on Depth Criterion**

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

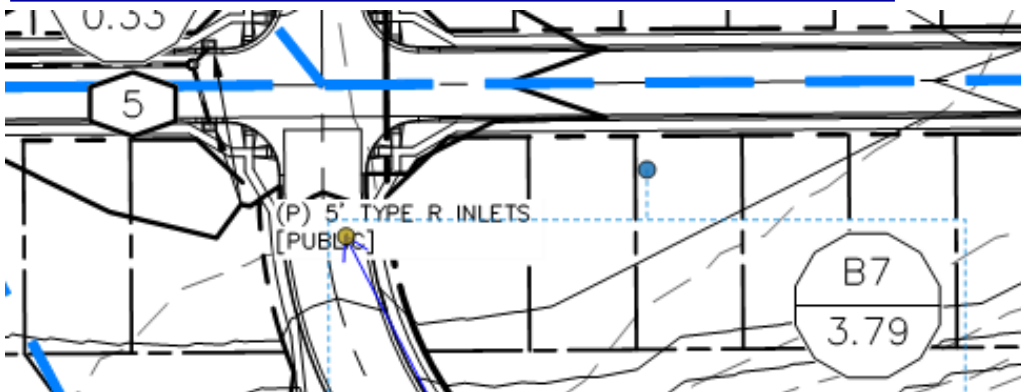
INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)	MINOR	MAJOR	
Type of Inlet	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	1	1	
Water Depth at Flowline (outside of local depression)	5.5	7.8	inches
Grate Information	MINOR	MAJOR	<input checked="" type="checkbox"/> Override Depths
Length of a Unit Grate	N/A	N/A	feet
Width of a Unit Grate	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	N/A	N/A	
Curb Opening Information	MINOR	MAJOR	
Length of a Unit Curb Opening	10.00	10.00	feet
Height of Vertical Curb Opening in Inches	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	0.67	0.67	
Low Head Performance Reduction (Calculated)	MINOR	MAJOR	
Depth for Grate Midwidth	N/A	N/A	ft
Depth for Curb Opening Weir Equation	0.29	0.48	ft
Combination Inlet Performance Reduction Factor for Long Inlets	0.52	0.74	
Curb Opening Performance Reduction Factor for Long Inlets	0.90	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	N/A	N/A	
Total Inlet Interception Capacity (assumes clogged condition)	MINOR	MAJOR	
	6.6	15.5	cfs
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	5.7	14.2	cfs

The inlet calculation for basin B7 indicates a 10' inlet. Revise the drainage map.
Unresolved. Check all the other inlets for consistency.



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

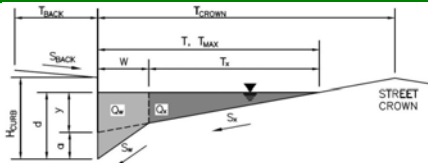
(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project:

Riverbend Crossing

Inlet ID:

B8

**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)

 $n_{BACK} = 0.020$

Height of Curb at Gutter Flow Line

 $H_{CURB} = 6.00$ inches

Distance from Curb Face to Street Crown

 $T_{CROWN} = 17.0$ ft

Gutter Width

 $W = 2.00$ ft

Street Transverse Slope

 $S_X = 0.020$ ft/ft

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

 $S_W = 0.083$ ft/ft

Street Longitudinal Slope - Enter 0 for sump condition

 $S_O = 0.000$ ft/ft

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

 $n_{STREET} = 0.016$

Max. Allowable Spread for Minor & Major Storm

	Minor Storm	Major Storm	
$T_{MAX} =$	17.0	17.0	ft
$d_{MAX} =$	5.1	7.8	inches

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

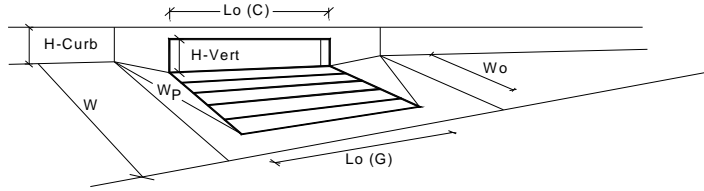
Check boxes are not applicable in SUMP conditions

**MINOR STORM Allowable Capacity is based on Depth Criterion****MAJOR STORM Allowable Capacity is based on Depth Criterion**

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

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)		MINOR		MAJOR	
Type of Inlet	CDOT Type R Curb Opening	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)		a _{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)		No =	1	1	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	5.1	7.8	inches
Grate Information		MINOR		MAJOR	
Length of a Unit Grate		L _g (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 _r (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 _c (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches		H _{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches		H _{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)		Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W _p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)		C _r (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} =	0.26	0.48	ft
Combination Inlet Performance Reduction Factor for Long Inlets		RF _{Combination} =	0.65	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	
Total Inlet Interception Capacity (assumes clogged condition)		MINOR		MAJOR	
		Q _a =	3.7	9.0	cfs
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)		Q _{PEAK REQUIRED} =	0.7	1.6	cfs

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

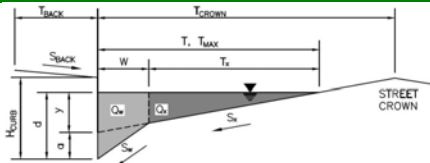
(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project:

Riverbend Crossing

Inlet ID:

B9

**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)

 $n_{BACK} = 0.020$

Height of Curb at Gutter Flow Line

 $H_{CURB} = 6.00$ inches

Distance from Curb Face to Street Crown

 $T_{CROWN} = 17.0$ ft

Gutter Width

 $W = 2.00$ ft

Street Transverse Slope

 $S_x = 0.020$ ft/ft

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

 $S_w = 0.083$ ft/ft

Street Longitudinal Slope - Enter 0 for sump condition

 $S_o = 0.000$ ft/ft

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

 $n_{STREET} = 0.016$

Max. Allowable Spread for Minor & Major Storm

	Minor Storm	Major Storm	
$T_{MAX} =$	17.0	17.0	ft

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

	Minor Storm	Major Storm	
$d_{MAX} =$	5.5	7.8	inches

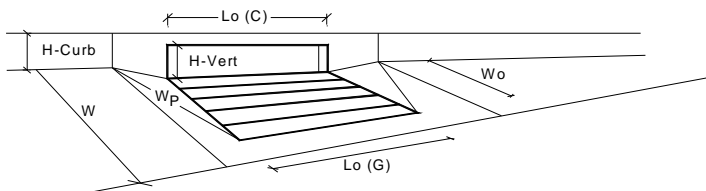
Check boxes are not applicable in SUMP conditions

**MINOR STORM Allowable Capacity is based on Depth Criterion****MAJOR STORM Allowable Capacity is based on Depth Criterion**

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

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)

Type of Inlet
Local Depression (additional to continuous gutter depression 'a' from above)
Number of Unit Inlets (Grate or Curb Opening)
Water Depth at Flowline (outside of local depression)

Grate Information

Length of a Unit Grate
Width of a Unit Grate
Area Opening Ratio for a Grate (typical values 0.15-0.90)
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)
Grate Weir Coefficient (typical value 2.15 - 3.60)
Grate Orifice Coefficient (typical value 0.60 - 0.80)

Curb Opening Information

Length of a Unit Curb Opening
Height of Vertical Curb Opening in Inches
Height of Curb Orifice Throat in Inches
Angle of Throat (see USDCM Figure ST-5)
Side Width for Depression Pan (typically the gutter width of 2 feet)
Clogging Factor for a Single Curb Opening (typical value 0.10)
Curb Opening Weir Coefficient (typical value 2.3-3.7)
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)

Low Head Performance Reduction (Calculated)

Depth for Grate Midwidth
Depth for Curb Opening Weir Equation
Combination Inlet Performance Reduction Factor for Long Inlets
Curb Opening Performance Reduction Factor for Long Inlets
Grated Inlet Performance Reduction Factor for Long Inlets

Total Inlet Interception Capacity (assumes clogged condition)

Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)

	MINOR	MAJOR	
Type =	CDOT Type R Curb Opening		
a_{local} =	3.00	3.00	inches
No =	1	1	
Ponding Depth =	5.5	7.8	inches
	MINOR	MAJOR	<input checked="" type="checkbox"/> Override Depths
$L_o (G)$ =	N/A	N/A	feet
W_o =	N/A	N/A	feet
A_{ratio} =	N/A	N/A	
$C_r (G)$ =	N/A	N/A	
$C_w (G)$ =	N/A	N/A	
$C_o (G)$ =	N/A	N/A	
	MINOR	MAJOR	
$L_o (C)$ =	10.00	10.00	feet
H_{vert} =	6.00	6.00	inches
H_{throat} =	6.00	6.00	inches
Theta =	63.40	63.40	degrees
W_p =	2.00	2.00	feet
$C_r (C)$ =	0.10	0.10	
$C_w (C)$ =	3.60	3.60	
$C_o (C)$ =	0.67	0.67	
	MINOR	MAJOR	
d_{Grate} =	N/A	N/A	ft
d_{Curb} =	0.29	0.48	ft
$RF_{Combination}$ =	0.52	0.74	
RF_{Curb} =	0.90	1.00	
RF_{Grate} =	N/A	N/A	
	MINOR	MAJOR	
Q_a =	6.6	15.5	cfs
$Q_{PEAK REQUIRED}$ =	5.9	13.2	cfs

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

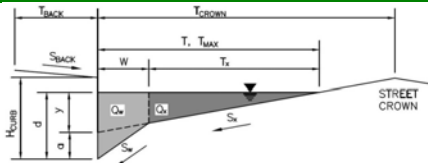
(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project:

Riverbend Crossing

Inlet ID:

B10

**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)

 $n_{BACK} = 0.020$

Height of Curb at Gutter Flow Line

 $H_{CURB} = 6.00$ inches

Distance from Curb Face to Street Crown

 $T_{CROWN} = 17.0$ ft

Gutter Width

 $W = 2.00$ ft

Street Transverse Slope

 $S_X = 0.020$ ft/ft

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

 $S_W = 0.083$ ft/ft

Street Longitudinal Slope - Enter 0 for sump condition

 $S_O = 0.000$ ft/ft

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

 $n_{STREET} = 0.016$

Max. Allowable Spread for Minor & Major Storm

	Minor Storm	Major Storm	
$T_{MAX} =$	17.0	17.0	ft

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

	Minor Storm	Major Storm	
$d_{MAX} =$	5.5	7.8	inches

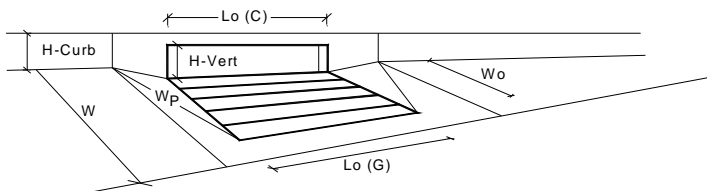
Check boxes are not applicable in SUMP conditions

**MINOR STORM Allowable Capacity is based on Depth Criterion****MAJOR STORM Allowable Capacity is based on Depth Criterion**

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

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)

Type of Inlet CDOT Type R Curb Opening
 Local Depression (additional to continuous gutter depression 'a' from above)
 Number of Unit Inlets (Grate or Curb Opening)
 Water Depth at Flowline (outside of local depression)

Grate Information

Length of a Unit Grate
 Width of a Unit Grate
 Area Opening Ratio for a Grate (typical values 0.15-0.90)
 Clogging Factor for a Single Grate (typical value 0.50 - 0.70)
 Grate Weir Coefficient (typical value 2.15 - 3.60)
 Grate Orifice Coefficient (typical value 0.60 - 0.80)

Curb Opening Information

Length of a Unit Curb Opening
 Height of Vertical Curb Opening in Inches
 Height of Curb Orifice Throat in Inches
 Angle of Throat (see USDCM Figure ST-5)
 Side Width for Depression Pan (typically the gutter width of 2 feet)
 Clogging Factor for a Single Curb Opening (typical value 0.10)
 Curb Opening Weir Coefficient (typical value 2.3-3.7)
 Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)

Low Head Performance Reduction (Calculated)

Depth for Grate Midwidth
 Depth for Curb Opening Weir Equation
 Combination Inlet Performance Reduction Factor for Long Inlets
 Curb Opening Performance Reduction Factor for Long Inlets
 Grated Inlet Performance Reduction Factor for Long Inlets

Total Inlet Interception Capacity (assumes clogged condition)

Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)

	MINOR	MAJOR	
Type =	CDOT Type R Curb Opening		
a_{local} =	3.00	3.00	inches
No =	1	1	
Ponding Depth =	5.5	7.8	inches
	MINOR	MAJOR	<input checked="" type="checkbox"/> Override Depths
L_o (G) =	N/A	N/A	feet
W_o =	N/A	N/A	feet
A_{ratio} =	N/A	N/A	
C_r (G) =	N/A	N/A	
C_w (G) =	N/A	N/A	
C_o (G) =	N/A	N/A	
	MINOR	MAJOR	
L_o (C) =	10.00	10.00	feet
H_{vert} =	6.00	6.00	inches
H_{throat} =	6.00	6.00	inches
Theta =	63.40	63.40	degrees
W_p =	2.00	2.00	feet
C_r (C) =	0.10	0.10	
C_w (C) =	3.60	3.60	
C_o (C) =	0.67	0.67	
	MINOR	MAJOR	
d_{Grate} =	N/A	N/A	ft
d_{Curb} =	0.29	0.48	ft
$RF_{Combination}$ =	0.52	0.74	
RF_{Curb} =	0.90	1.00	
RF_{Grate} =	N/A	N/A	
	MINOR	MAJOR	
Q_a =	6.6	15.5	cfs
$Q_{PEAK REQUIRED}$ =	4.0	9.0	cfs

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

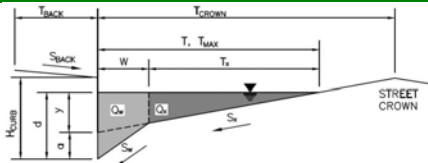
(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project:

Riverbend Crossing

Inlet ID:

B11

**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)

 $n_{BACK} = 0.020$

Height of Curb at Gutter Flow Line

 $H_{CURB} = 6.00$ inches

Distance from Curb Face to Street Crown

 $T_{CROWN} = 17.0$ ft

Gutter Width

 $W = 2.00$ ft

Street Transverse Slope

 $S_x = 0.020$ ft/ft

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

 $S_w = 0.083$ ft/ft

Street Longitudinal Slope - Enter 0 for sump condition

 $S_o = 0.000$ ft/ft

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

 $n_{STREET} = 0.016$

Max. Allowable Spread for Minor & Major Storm

	Minor Storm	Major Storm	
$T_{MAX} =$	17.0	17.0	ft

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

	Minor Storm	Major Storm	
$d_{MAX} =$	5.5	7.8	inches

Check boxes are not applicable in SUMP conditions

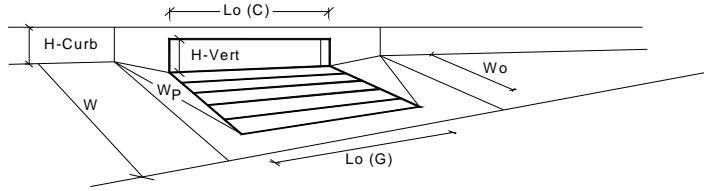
**MINOR STORM Allowable Capacity is based on Depth Criterion**

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

MAJOR STORM Allowable Capacity is based on Depth Criterion

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)		MINOR		MAJOR	
Type of Inlet	CDOT Type R Curb Opening	Type = CDOT Type R Curb Opening			
Local Depression (additional to continuous gutter depression 'a' from above)		a _{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)		No =	1	1	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	5.7	7.8	inches
Grate Information		MINOR		MAJOR	
Length of a Unit Grate		L _g (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 _r (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) =	15.00	15.00	feet
Height of Vertical Curb Opening in Inches		H _{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches		H _{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)		Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W _p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)		C _r (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} =	0.31	0.48	ft
Combination Inlet Performance Reduction Factor for Long Inlets		RF _{Combination} =	0.54	0.74	
Curb Opening Performance Reduction Factor for Long Inlets		RF _{Curb} =	0.77	0.88	
Grated Inlet Performance Reduction Factor for Long Inlets		RF _{Grate} =	N/A	N/A	
Total Inlet Interception Capacity (assumes clogged condition)		MINOR		MAJOR	
		Q _a =	8.5	19.1	cfs
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)		Q _{PEAK REQUIRED} =	8.2	18.4	cfs

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

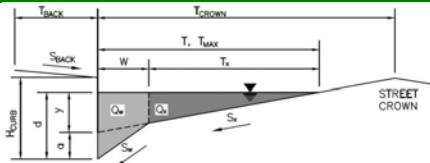
(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project:

Riverbend Crossing

Inlet ID:

B12

**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)

 $n_{BACK} = 0.020$

Height of Curb at Gutter Flow Line

 $H_{CURB} = 6.00$ inches

Distance from Curb Face to Street Crown

 $T_{CROWN} = 17.0$ ft

Gutter Width

 $W = 2.00$ ft

Street Transverse Slope

 $S_X = 0.020$ ft/ft

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

 $S_W = 0.083$ ft/ft

Street Longitudinal Slope - Enter 0 for sump condition

 $S_O = 0.000$ ft/ft

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

 $n_{STREET} = 0.016$

Max. Allowable Spread for Minor & Major Storm

	Minor Storm	Major Storm	
$T_{MAX} =$	17.0	17.0	ft

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

	Minor Storm	Major Storm	
$d_{MAX} =$	5.5	7.8	inches

Check boxes are not applicable in SUMP conditions

☐☐

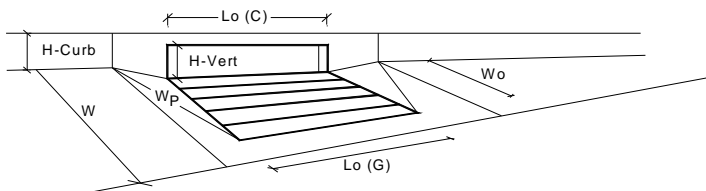
MINOR STORM Allowable Capacity is based on Depth Criterion

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

MAJOR STORM Allowable Capacity is based on Depth Criterion

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)

Type of Inlet
Local Depression (additional to continuous gutter depression 'a' from above)
Number of Unit Inlets (Grate or Curb Opening)
Water Depth at Flowline (outside of local depression)

Grate Information

Length of a Unit Grate
Width of a Unit Grate
Area Opening Ratio for a Grate (typical values 0.15-0.90)
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)
Grate Weir Coefficient (typical value 2.15 - 3.60)
Grate Orifice Coefficient (typical value 0.60 - 0.80)

Curb Opening Information

Length of a Unit Curb Opening
Height of Vertical Curb Opening in Inches
Height of Curb Orifice Throat in Inches
Angle of Throat (see USDCM Figure ST-5)
Side Width for Depression Pan (typically the gutter width of 2 feet)
Clogging Factor for a Single Curb Opening (typical value 0.10)
Curb Opening Weir Coefficient (typical value 2.3-3.7)
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)

Low Head Performance Reduction (Calculated)

Depth for Grate Midwidth
Depth for Curb Opening Weir Equation
Combination Inlet Performance Reduction Factor for Long Inlets
Curb Opening Performance Reduction Factor for Long Inlets
Grated Inlet Performance Reduction Factor for Long Inlets

Total Inlet Interception Capacity (assumes clogged condition)

Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)

	MINOR	MAJOR	
Type =	CDOT Type R Curb Opening		
a_{local} =	3.00	3.00	inches
No =	1	1	
Ponding Depth =	5.5	7.8	inches
	MINOR	MAJOR	<input checked="" type="checkbox"/> Override Depths
L_o (G) =	N/A	N/A	feet
W_o =	N/A	N/A	feet
A_{ratio} =	N/A	N/A	
C_r (G) =	N/A	N/A	
C_w (G) =	N/A	N/A	
C_o (G) =	N/A	N/A	
	MINOR	MAJOR	
L_o (C) =	15.00	15.00	feet
H_{vert} =	6.00	6.00	inches
H_{throat} =	6.00	6.00	inches
Theta =	63.40	63.40	degrees
W_p =	2.00	2.00	feet
C_r (C) =	0.10	0.10	
C_w (C) =	3.60	3.60	
C_o (C) =	0.67	0.67	
	MINOR	MAJOR	
d_{Grate} =	N/A	N/A	ft
d_{Curb} =	0.29	0.48	ft
$RF_{Combination}$ =	0.52	0.74	
RF_{Curb} =	0.75	0.88	
RF_{Grate} =	N/A	N/A	
	MINOR	MAJOR	
Q_a =	7.6	19.1	cfs
$Q_{PEAK REQUIRED}$ =	7.0	15.6	cfs

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

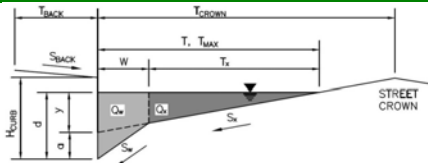
(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project:

Riverbend Crossing

Inlet ID:

A1

**Gutter Geometry (Enter data in the blue cells)**

Maximum Allowable Width for Spread Behind Curb

 $T_{BACK} = 5.5$ ft

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

 $S_{BACK} = 0.020$ ft/ft

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

 $n_{BACK} = 0.020$

Height of Curb at Gutter Flow Line

 $H_{CURB} = 6.00$ inches

Distance from Curb Face to Street Crown

 $T_{CROWN} = 50.0$ 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)

 $n_{STREET} = 0.016$

Max. Allowable Spread for Minor & Major Storm

	Minor Storm	Major Storm	
$T_{MAX} =$	50.0	50.0	ft
$d_{MAX} =$	5.5	8.1	inches

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Check boxes are not applicable in SUMP conditions

☐☐

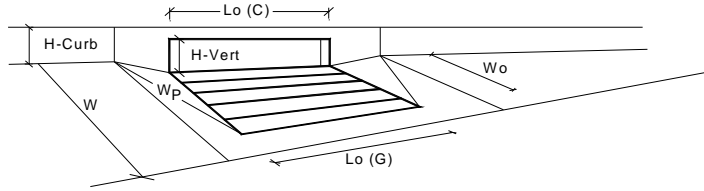
MINOR STORM Allowable Capacity is based on Depth Criterion

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

MAJOR STORM Allowable Capacity is based on Depth Criterion

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)		MINOR		MAJOR	
Type of Inlet	CDOT Type R Curb Opening	Type = CDOT Type R Curb Opening			
Local Depression (additional to continuous gutter depression 'a' from above)		a _{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)		No =	1	1	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	6.0	8.5	inches
Grate Information		MINOR		MAJOR	
Length of a Unit Grate		L _g (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 _r (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) =	15.00	15.00	feet
Height of Vertical Curb Opening in Inches		H _{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches		H _{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)		Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W _p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)		C _r (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	0.54	ft
Combination Inlet Performance Reduction Factor for Long Inlets		RF _{Combination} =	0.57	0.80	
Curb Opening Performance Reduction Factor for Long Inlets		RF _{Curb} =	0.79	0.91	
Grated Inlet Performance Reduction Factor for Long Inlets		RF _{Grate} =	N/A	N/A	
Total Inlet Interception Capacity (assumes clogged condition)		MINOR		MAJOR	
		Q _a =	9.7	23.4	cfs
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)		Q _{PEAK REQUIRED} =	6.3	13.9	cfs

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

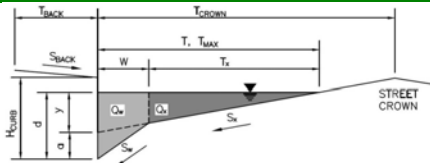
(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project:

Riverbend Crossing

Inlet ID:

B14

**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)

 $n_{BACK} = 0.020$

Height of Curb at Gutter Flow Line

 $H_{CURB} = 6.00$ inches

Distance from Curb Face to Street Crown

 $T_{CROWN} = 17.0$ ft

Gutter Width

 $W = 2.00$ ft

Street Transverse Slope

 $S_X = 0.020$ ft/ft

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

 $S_W = 0.083$ ft/ft

Street Longitudinal Slope - Enter 0 for sump condition

 $S_O = 0.000$ ft/ft

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

 $n_{STREET} = 0.016$

Max. Allowable Spread for Minor & Major Storm

	Minor Storm	Major Storm	
$T_{MAX} =$	17.0	17.0	ft

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

	Minor Storm	Major Storm	
$d_{MAX} =$	5.1	7.8	inches

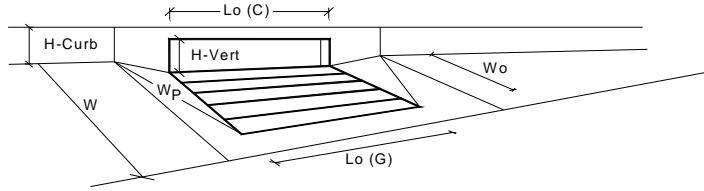
Check boxes are not applicable in SUMP conditions

**MINOR STORM Allowable Capacity is based on Depth Criterion****MAJOR STORM Allowable Capacity is based on Depth Criterion**

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

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)		MINOR		MAJOR	
Type of Inlet	CDOT Type R Curb Opening	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)		a _{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)		No =	1	1	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	5.1	7.8	inches
Grate Information			MINOR	MAJOR	<input checked="" type="checkbox"/> Override Depths
Length of a Unit Grate		L _g (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 _r (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)		C _w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)		C _o (G) =	N/A	N/A	
Curb Opening Information			MINOR	MAJOR	
Length of a Unit Curb Opening		L _o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches		H _{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches		H _{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)		Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W _p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)		C _r (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} =	0.26	0.48	ft
Combination Inlet Performance Reduction Factor for Long Inlets		RF _{Combination} =	0.65	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	
Total Inlet Interception Capacity (assumes clogged condition)			MINOR	MAJOR	
		Q _a =	3.7	9.0	cfs
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)		Q _{PEAK REQUIRED} =	2.5	5.5	cfs

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

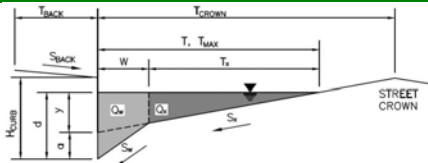
(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project:

Riverbend Crossing

Inlet ID:

B15

**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)

 $n_{BACK} = 0.020$

Height of Curb at Gutter Flow Line

 $H_{CURB} = 6.00$ inches

Distance from Curb Face to Street Crown

 $T_{CROWN} = 17.0$ ft

Gutter Width

 $W = 2.00$ ft

Street Transverse Slope

 $S_X = 0.020$ ft/ft

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

 $S_W = 0.083$ ft/ft

Street Longitudinal Slope - Enter 0 for sump condition

 $S_O = 0.000$ ft/ft

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

 $n_{STREET} = 0.016$

Max. Allowable Spread for Minor & Major Storm

	Minor Storm	Major Storm	
$T_{MAX} =$	17.0	17.0	ft

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

	Minor Storm	Major Storm	
$d_{MAX} =$	5.1	7.8	inches

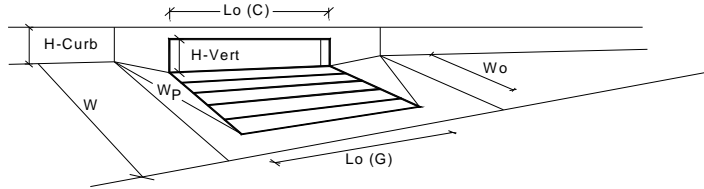
Check boxes are not applicable in SUMP conditions

**MINOR STORM Allowable Capacity is based on Depth Criterion****MAJOR STORM Allowable Capacity is based on Depth Criterion**

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

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017

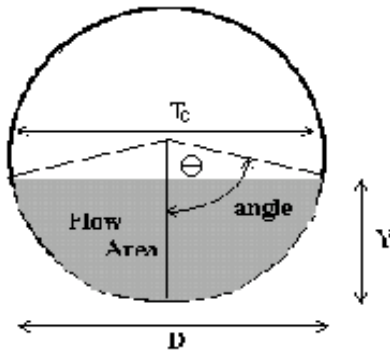


Design Information (Input)		MINOR		MAJOR	
Type of Inlet	CDOT Type R Curb Opening	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)		a _{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)		No =	1	1	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	5.1	5.6	inches
Grate Information		MINOR		MAJOR	
Length of a Unit Grate		L _g (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 _r (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 _c (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches		H _{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches		H _{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)		Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W _p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)		C _r (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} =	0.26	0.30	ft
Combination Inlet Performance Reduction Factor for Long Inlets		RF _{Combination} =	0.65	0.72	
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	
Total Inlet Interception Capacity (assumes clogged condition)		MINOR		MAJOR	
		Q _a =	3.7	4.6	cfs
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)		Q _{PEAK REQUIRED} =	1.6	3.7	cfs

CIRCULAR CONDUIT FLOW (Normal & Critical Depth Computation)

Project: Riverbend Crossing

Pipe ID: Pipe Design Point 1



Design Information (Input)

Pipe Invert Slope	So =	0.0050	ft/ft
Pipe Manning's n-value	n =	0.0130	
Pipe Diameter	D =	24.00	inches
Design discharge	Q =	11.50	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 =	16.04	cfs

Calculation of Normal Flow Condition

Half Central Angle ($0 < \theta < 3.14$)	Theta =	1.83	radians
Flow area	An =	2.07	sq ft
Top width	Tn =	1.93	ft
Wetted perimeter	Pn =	3.65	ft
Flow depth	Yn =	1.25	ft
Flow velocity	Vn =	5.55	fps
Discharge	Qn =	11.50	cfs
Percent Full Flow	Flow =	71.7%	of full flow
Normal Depth Froude Number	Fr _n =	0.95	subcritical

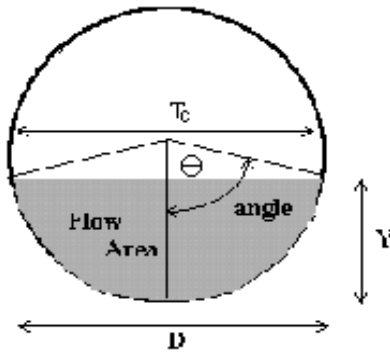
Calculation of Critical Flow Condition

Half Central Angle ($0 < \theta_c < 3.14$)	Theta-c =	1.79	radians
Critical flow area	Ac =	2.00	sq ft
Critical top width	Tc =	1.95	ft
Critical flow depth	Yc =	1.22	ft
Critical flow velocity	Vc =	5.75	fps
Critical Depth Froude Number	Fr _c =	1.00	

CIRCULAR CONDUIT FLOW (Normal & Critical Depth Computation)

Project: Riverbend Crossing

Pipe ID: Pipe Design Point 2



Design Information (Input)

Pipe Invert Slope	So =	0.0179	ft/ft
Pipe Manning's n-value	n =	0.0130	
Pipe Diameter	D =	24.00	inches
Design discharge	Q =	14.60	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 =	30.35	cfs

Calculation of Normal Flow Condition

Half Central Angle ($0 < \text{Theta} < 3.14$)	Theta =	1.55	radians
Flow area	An =	1.53	sq ft
Top width	Tn =	2.00	ft
Wetted perimeter	Pn =	3.10	ft
Flow depth	Yn =	0.98	ft
Flow velocity	Vn =	9.57	fps
Discharge	Qn =	14.60	cfs
Percent Full Flow	Flow =	48.1%	of full flow
Normal Depth Froude Number	Fr _n =	1.93	supercritical

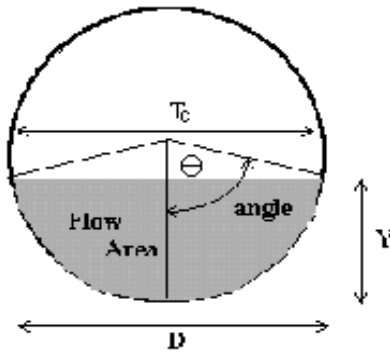
Calculation of Critical Flow Condition

Half Central Angle ($0 < \text{Theta-c} < 3.14$)	Theta-c =	1.96	radians
Critical flow area	Ac =	2.31	sq ft
Critical top width	Tc =	1.85	ft
Critical flow depth	Yc =	1.38	ft
Critical flow velocity	Vc =	6.33	fps
Critical Depth Froude Number	Fr _c =	1.00	

CIRCULAR CONDUIT FLOW (Normal & Critical Depth Computation)

Project: Riverbend Crossing

Pipe ID: Pipe Design Point 3



Design Information (Input)

Pipe Invert Slope	So =	0.0065	ft/ft
Pipe Manning's n-value	n =	0.0130	
Pipe Diameter	D =	30.00	inches
Design discharge	Q =	32.50	cfs

Full-flow Capacity (Calculated)

Full-flow area	Af =	4.91	sq ft
Full-flow wetted perimeter	Pf =	7.85	ft
Half Central Angle	Theta =	3.14	radians
Full-flow capacity	Qf =	33.16	cfs

Calculation of Normal Flow Condition

Half Central Angle ($0 < \theta < 3.14$)	Theta =	2.22	radians
Flow area	An =	4.22	sq ft
Top width	Tn =	1.99	ft
Wetted perimeter	Pn =	5.55	ft
Flow depth	Yn =	2.01	ft
Flow velocity	Vn =	7.70	fps
Discharge	Qn =	32.50	cfs
Percent Full Flow	Flow =	98.0%	of full flow
Normal Depth Froude Number	Fr _n =	0.93	subcritical

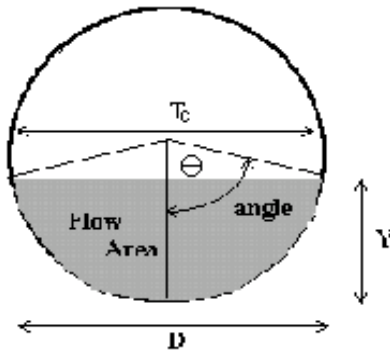
Calculation of Critical Flow Condition

Half Central Angle ($0 < \theta_c < 3.14$)	Theta-c =	2.16	radians
Critical flow area	Ac =	4.09	sq ft
Critical top width	Tc =	2.08	ft
Critical flow depth	Yc =	1.94	ft
Critical flow velocity	Vc =	7.95	fps
Critical Depth Froude Number	Fr _c =	1.00	

CIRCULAR CONDUIT FLOW (Normal & Critical Depth Computation)

Project: Riverbend Crossing

Pipe ID: Pipe Design Point 4



Design Information (Input)

Pipe Invert Slope	So =	0.0070	ft/ft
Pipe Manning's n-value	n =	0.0130	
Pipe Diameter	D =	48.00	inches
Design discharge	Q =	119.90	cfs

Full-flow Capacity (Calculated)

Full-flow area	Af =	12.57	sq ft
Full-flow wetted perimeter	Pf =	12.57	ft
Half Central Angle	Theta =	3.14	radians
Full-flow capacity	Qf =	120.50	cfs

Calculation of Normal Flow Condition

Half Central Angle ($0 < \theta < 3.14$)	Theta =	2.25	radians
Flow area	An =	10.97	sq ft
Top width	Tn =	3.11	ft
Wetted perimeter	Pn =	9.01	ft
Flow depth	Yn =	3.26	ft
Flow velocity	Vn =	10.93	fps
Discharge	Qn =	119.90	cfs
Percent Full Flow	Flow =	99.5%	of full flow
Normal Depth Froude Number	Fr _n =	1.03	supercritical

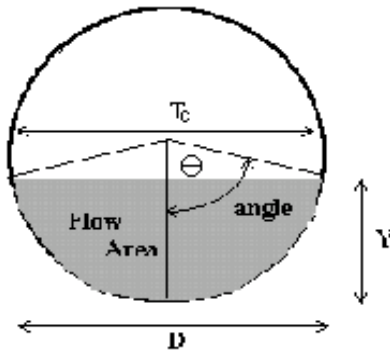
Calculation of Critical Flow Condition

Half Central Angle ($0 < \theta_c < 3.14$)	Theta-c =	2.28	radians
Critical flow area	Ac =	11.08	sq ft
Critical top width	Tc =	3.05	ft
Critical flow depth	Yc =	3.30	ft
Critical flow velocity	Vc =	10.82	fps
Critical Depth Froude Number	Fr _c =	1.00	

CIRCULAR CONDUIT FLOW (Normal & Critical Depth Computation)

Project: Riverbend Crossing

Pipe ID: Pipe Design Point 5



Design Information (Input)

Pipe Invert Slope	So =	0.0050	ft/ft
Pipe Manning's n-value	n =	0.0130	
Pipe Diameter	D =	24.00	inches
Design discharge	Q =	15.50	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 =	16.04	cfs

Calculation of Normal Flow Condition

Half Central Angle ($0 < \theta < 3.14$)	Theta =	2.19	radians
Flow area	An =	2.67	sq ft
Top width	Tn =	1.63	ft
Wetted perimeter	Pn =	4.38	ft
Flow depth	Yn =	1.58	ft
Flow velocity	Vn =	5.82	fps
Discharge	Qn =	15.50	cfs
Percent Full Flow	Flow =	96.6%	of full flow
Normal Depth Froude Number	Fr _n =	0.80	subcritical

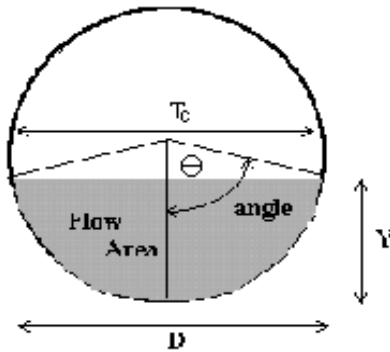
Calculation of Critical Flow Condition

Half Central Angle ($0 < \theta_c < 3.14$)	Theta-c =	2.00	radians
Critical flow area	Ac =	2.38	sq ft
Critical top width	Tc =	1.82	ft
Critical flow depth	Yc =	1.42	ft
Critical flow velocity	Vc =	6.50	fps
Critical Depth Froude Number	Fr _c =	1.00	

CIRCULAR CONDUIT FLOW (Normal & Critical Depth Computation)

Project: Riverbend Crossing

Pipe ID: Pipe Design Point 6



Design Information (Input)

Pipe Invert Slope	So =	0.0660	ft/ft
Pipe Manning's n-value	n =	0.0130	
Pipe Diameter	D =	30.00	inches
Design discharge	Q =	33.20	cfs

Full-flow Capacity (Calculated)

Full-flow area	Af =	4.91	sq ft
Full-flow wetted perimeter	Pf =	7.85	ft
Half Central Angle	Theta =	3.14	radians
Full-flow capacity	Qf =	105.66	cfs

Calculation of Normal Flow Condition

Half Central Angle ($0 < \theta < 3.14$)	Theta =	1.34	radians
Flow area	An =	1.74	sq ft
Top width	Tn =	2.43	ft
Wetted perimeter	Pn =	3.35	ft
Flow depth	Yn =	0.96	ft
Flow velocity	Vn =	19.05	fps
Discharge	Qn =	33.21	cfs
Percent Full Flow	Flow =	31.4%	of full flow
Normal Depth Froude Number	Fr _n =	3.97	supercritical

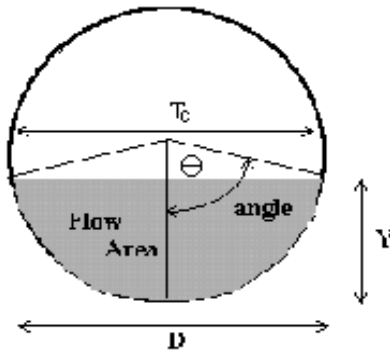
Calculation of Critical Flow Condition

Half Central Angle ($0 < \theta_c < 3.14$)	Theta-c =	2.18	radians
Critical flow area	Ac =	4.13	sq ft
Critical top width	Tc =	2.06	ft
Critical flow depth	Yc =	1.96	ft
Critical flow velocity	Vc =	8.04	fps
Critical Depth Froude Number	Fr _c =	1.00	

CIRCULAR CONDUIT FLOW (Normal & Critical Depth Computation)

Project: Riverbend Crossing

Pipe ID: Pipe Design Point 7



Design Information (Input)

Pipe Invert Slope	So =	0.0070	ft/ft
Pipe Manning's n-value	n =	0.0130	
Pipe Diameter	D =	42.00	inches
Design discharge	Q =	82.50	cfs

Full-flow Capacity (Calculated)

Full-flow area	Af =	9.62	sq ft
Full-flow wetted perimeter	Pf =	11.00	ft
Half Central Angle	Theta =	3.14	radians
Full-flow capacity	Qf =	84.40	cfs

Calculation of Normal Flow Condition

Half Central Angle ($0 < \theta < 3.14$)	Theta =	2.21	radians
Flow area	An =	8.25	sq ft
Top width	Tn =	2.80	ft
Wetted perimeter	Pn =	7.75	ft
Flow depth	Yn =	2.80	ft
Flow velocity	Vn =	10.00	fps
Discharge	Qn =	82.50	cfs
Percent Full Flow	Flow =	97.7%	of full flow
Normal Depth Froude Number	Fr _n =	1.03	supercritical

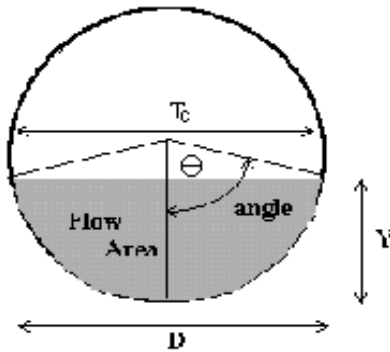
Calculation of Critical Flow Condition

Half Central Angle ($0 < \theta_c < 3.14$)	Theta-c =	2.24	radians
Critical flow area	Ac =	8.34	sq ft
Critical top width	Tc =	2.75	ft
Critical flow depth	Yc =	2.83	ft
Critical flow velocity	Vc =	9.89	fps
Critical Depth Froude Number	Fr _c =	1.00	

CIRCULAR CONDUIT FLOW (Normal & Critical Depth Computation)

Project: Riverbend Crossing

Pipe ID: Pipe Design Point 8



Design Information (Input)

Pipe Invert Slope	So =	0.0070	ft/ft
Pipe Manning's n-value	n =	0.0130	
Pipe Diameter	D =	30.00	inches
Design discharge	Q =	33.90	cfs

Full-flow Capacity (Calculated)

Full-flow area	Af =	4.91	sq ft
Full-flow wetted perimeter	Pf =	7.85	ft
Half Central Angle	Theta =	3.14	radians
Full-flow capacity	Qf =	34.41	cfs

Calculation of Normal Flow Condition

Half Central Angle ($0 < \theta < 3.14$)	Theta =	2.23	radians
Flow area	An =	4.24	sq ft
Top width	Tn =	1.98	ft
Wetted perimeter	Pn =	5.58	ft
Flow depth	Yn =	2.02	ft
Flow velocity	Vn =	7.99	fps
Discharge	Qn =	33.90	cfs
Percent Full Flow	Flow =	98.5%	of full flow
Normal Depth Froude Number	Fr _n =	0.96	subcritical

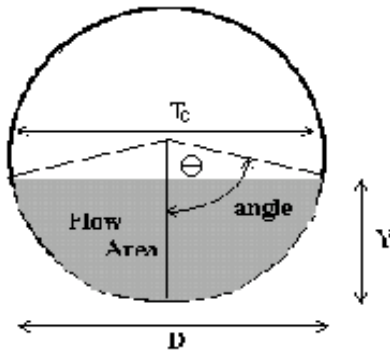
Calculation of Critical Flow Condition

Half Central Angle ($0 < \theta_c < 3.14$)	Theta-c =	2.19	radians
Critical flow area	Ac =	4.17	sq ft
Critical top width	Tc =	2.03	ft
Critical flow depth	Yc =	1.98	ft
Critical flow velocity	Vc =	8.13	fps
Critical Depth Froude Number	Fr _c =	1.00	

CIRCULAR CONDUIT FLOW (Normal & Critical Depth Computation)

Project: Riverbend Crossing

Pipe ID: Pipe Design Point 9



Design Information (Input)

Pipe Invert Slope	So =	0.0050	ft/ft
Pipe Manning's n-value	n =	0.0130	
Pipe Diameter	D =	36.00	inches
Design discharge	Q =	46.90	cfs

Full-flow Capacity (Calculated)

Full-flow area	Af =	7.07	sq ft
Full-flow wetted perimeter	Pf =	9.42	ft
Half Central Angle	Theta =	3.14	radians
Full-flow capacity	Qf =	47.29	cfs

Calculation of Normal Flow Condition

Half Central Angle ($0 < \theta < 3.14$)	Theta =	2.25	radians
Flow area	An =	6.15	sq ft
Top width	Tn =	2.34	ft
Wetted perimeter	Pn =	6.74	ft
Flow depth	Yn =	2.44	ft
Flow velocity	Vn =	7.63	fps
Discharge	Qn =	46.90	cfs
Percent Full Flow	Flow =	99.2%	of full flow
Normal Depth Froude Number	Fr _n =	0.83	subcritical

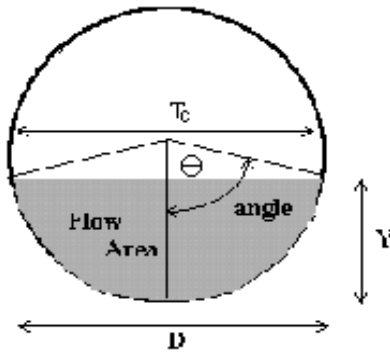
Calculation of Critical Flow Condition

Half Central Angle ($0 < \theta_c < 3.14$)	Theta-c =	2.08	radians
Critical flow area	Ac =	5.64	sq ft
Critical top width	Tc =	2.62	ft
Critical flow depth	Yc =	2.23	ft
Critical flow velocity	Vc =	8.32	fps
Critical Depth Froude Number	Fr _c =	1.00	

CIRCULAR CONDUIT FLOW (Normal & Critical Depth Computation)

Project: Riverbend Crossing

Pipe ID: Pipe Design Point 10



Design Information (Input)

Pipe Invert Slope	So =	0.0065	ft/ft
Pipe Manning's n-value	n =	0.0130	
Pipe Diameter	D =	36.00	inches
Design discharge	Q =	52.10	cfs

Full-flow Capacity (Calculated)

Full-flow area	Af =	7.07	sq ft
Full-flow wetted perimeter	Pf =	9.42	ft
Half Central Angle	Theta =	3.14	radians
Full-flow capacity	Qf =	53.92	cfs

Calculation of Normal Flow Condition

Half Central Angle ($0 < \theta < 3.14$)	Theta =	2.19	radians
Flow area	An =	6.00	sq ft
Top width	Tn =	2.44	ft
Wetted perimeter	Pn =	6.57	ft
Flow depth	Yn =	2.37	ft
Flow velocity	Vn =	8.69	fps
Discharge	Qn =	52.10	cfs
Percent Full Flow	Flow =	96.6%	of full flow
Normal Depth Froude Number	Fr _n =	0.98	subcritical

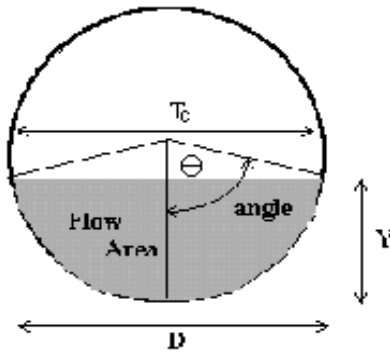
Calculation of Critical Flow Condition

Half Central Angle ($0 < \theta_c < 3.14$)	Theta-c =	2.17	radians
Critical flow area	Ac =	5.93	sq ft
Critical top width	Tc =	2.48	ft
Critical flow depth	Yc =	2.35	ft
Critical flow velocity	Vc =	8.78	fps
Critical Depth Froude Number	Fr _c =	1.00	

CIRCULAR CONDUIT FLOW (Normal & Critical Depth Computation)

Project: Riverbend Crossing

Pipe ID: Pipe Design Point 11



Design Information (Input)

Pipe Invert Slope	So =	0.0065	ft/ft
Pipe Manning's n-value	n =	0.0130	
Pipe Diameter	D =	36.00	inches
Design discharge	Q =	53.00	cfs

Full-flow Capacity (Calculated)

Full-flow area	Af =	7.07	sq ft
Full-flow wetted perimeter	Pf =	9.42	ft
Half Central Angle	Theta =	3.14	radians
Full-flow capacity	Qf =	53.92	cfs

Calculation of Normal Flow Condition

Half Central Angle ($0 < \theta < 3.14$)	Theta =	2.23	radians
Flow area	An =	6.10	sq ft
Top width	Tn =	2.38	ft
Wetted perimeter	Pn =	6.68	ft
Flow depth	Yn =	2.41	ft
Flow velocity	Vn =	8.69	fps
Discharge	Qn =	53.00	cfs
Percent Full Flow	Flow =	98.3%	of full flow
Normal Depth Froude Number	Fr _n =	0.96	subcritical

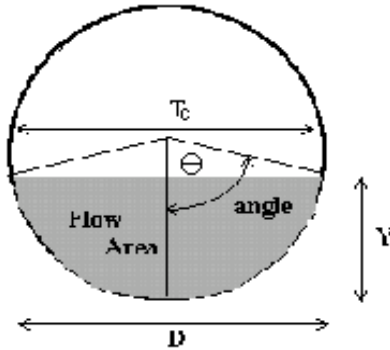
Calculation of Critical Flow Condition

Half Central Angle ($0 < \theta_c < 3.14$)	Theta-c =	2.19	radians
Critical flow area	Ac =	5.98	sq ft
Critical top width	Tc =	2.45	ft
Critical flow depth	Yc =	2.37	ft
Critical flow velocity	Vc =	8.86	fps
Critical Depth Froude Number	Fr _c =	1.00	

CIRCULAR CONDUIT FLOW (Normal & Critical Depth Computation)

Project: Riverbend Crossing

Pipe ID: Pipe Design Point 12



Design Information (Input)

Pipe Invert Slope	So =	0.0075	ft/ft
Pipe Manning's n-value	n =	0.0130	
Pipe Diameter	D =	48.00	inches
Design discharge	Q =	122.60	cfs

Full-flow Capacity (Calculated)

Full-flow area	Af =	12.57	sq ft
Full-flow wetted perimeter	Pf =	12.57	ft
Half Central Angle	Theta =	3.14	radians
Full-flow capacity	Qf =	124.73	cfs

Calculation of Normal Flow Condition

Half Central Angle ($0 < \theta < 3.14$)	Theta =	2.23	radians
Flow area	An =	10.84	sq ft
Top width	Tn =	3.17	ft
Wetted perimeter	Pn =	8.90	ft
Flow depth	Yn =	3.22	ft
Flow velocity	Vn =	11.31	fps
Discharge	Qn =	122.60	cfs
Percent Full Flow	Flow =	98.3%	of full flow
Normal Depth Froude Number	Fr _n =	1.08	supercritical

Calculation of Critical Flow Condition

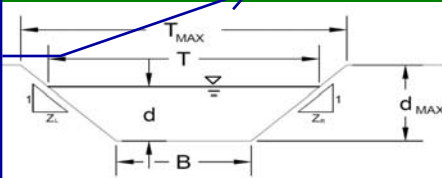
Half Central Angle ($0 < \theta_c < 3.14$)	Theta-c =	2.30	radians
Critical flow area	Ac =	11.18	sq ft
Critical top width	Tc =	2.99	ft
Critical flow depth	Yc =	3.33	ft
Critical flow velocity	Vc =	10.97	fps
Critical Depth Froude Number	Fr _c =	1.00	

Update Project Name and ID. Staff's assuming this is for the channel in basin A.

AREA INLET IN A TRAPEZOIDAL GRASS-LINED CHANNEL

Enter Your Project Name Here

Enter Your Inlet ID Here



Grass Type	Limiting Manning's n
A	0.06
B	0.04
C	0.033
D	0.03
E	0.024

Analysis of Trapezoidal Grass-Lined Channel Using SCS Method

NRCS Vegetal Retardance (A, B, C, D, or E)

Manning's n (Leave cell D16 blank to manually enter an n value)

Channel Invert Slope

Bottom Width

Left Side Slope

Right Side Slope

Check one of the following soil types:

Soil Type:	Max. Velocity (V _{MAX})	Max Froude No. (F _{MAX})
Sandy	5.0 fps	0.50
Non-Sandy	7.0 fps	0.80

A, B, C, D or E

n =	0.035	
S ₀ =	0.0040	ft/ft
B =	10.00	ft
Z1 =	4.00	ft/ft
Z2 =	4.00	ft/ft

Choose One:

- ☒ Sandy
☐ Non-Sandy

side slope does not match the drainage map.

Max. Allowable Top Width of Channel for Minor & Major Storm

Max. Allowable Water Depth in Channel for Minor & Major Storm

	Minor Storm	Major Storm	
T _{MAX} =	22.00	22.00	feet
d _{MAX} =	0.80	1.25	feet

Maximum Channel Capacity Based On Allowable Top Width

Max. Allowable Top Width

Water Depth

Flow Area

Wetted Perimeter

Hydraulic Radius

Manning's n based on NRCS Vegetal Retardance

Flow Velocity

Velocity-Depth Product

Hydraulic Depth

Froude Number

Max. Flow Based On Allowable Top Width

	Minor Storm	Major Storm	
T _{MAX} =	22.00	22.00	ft
d =	1.50	1.50	ft
A =	24.00	24.00	sq ft
P =	22.37	22.37	ft
R =	1.07	1.07	ft
n =	0.035	0.035	
V =	2.82	2.82	fps
VR =	3.03	3.03	ft ³ /s
D =	1.09	1.09	ft
Fr =	0.48	0.48	
Q _T =	67.72	67.72	cfs

Maximum Channel Capacity Based On Allowable Water Depth

Max. Allowable Water Depth

Top Width

Flow Area

Wetted Perimeter

Hydraulic Radius

Manning's n based on NRCS Vegetal Retardance

Flow Velocity

Velocity-Depth Product

Hydraulic Depth

Froude Number

Max. Flow Based On Allowable Water Depth

	Minor Storm	Major Storm	
d _{MAX} =	0.80	1.25	feet
T =	16.40	20.00	feet
A =	10.56	18.75	square feet
P =	16.60	20.31	feet
R =	0.64	0.92	feet
n =	0.035	0.035	
V =	1.99	2.55	fps
VR =	1.27	2.36	ft ³ /s
D =	0.64	0.94	feet
Fr =	0.44	0.46	
Q _d =	21.03	47.87	cfs

Allowable Channel Capacity Based On Channel Geometry

MINOR STORM Allowable Capacity is based on Depth Criterion

MAJOR STORM Allowable Capacity is based on Depth Criterion

	Minor Storm	Major Storm	
Q _{allow} =	21.03	47.87	cfs
d _{allow} =	0.80	1.25	ft

Water Depth in Channel Based On Design Peak Flow

Design Peak Flow

Water Depth

Top Width

Flow Area

Wetted Perimeter

Hydraulic Radius

Manning's n based on NRCS Vegetal Retardance

Flow Velocity

Velocity-Depth Product

Hydraulic Depth

Froude Number

	Minor Storm	Major Storm	
Q _d =	20.28	46.00	cfs
d =	0.78	1.22	feet
T =	16.27	19.79	feet
A =	10.30	18.23	square feet
P =	16.47	20.09	feet
R =	0.63	0.91	feet
n =	0.035	0.035	
V =	1.97	2.52	fps
VR =	1.23	2.29	ft ³ /s
D =	0.63	0.92	feet
Fr =	0.44	0.46	

Minor storm max. allowable capacity GOOD - greater than flow given on sheet 'Q-Peak'

Major storm max. allowable capacity GOOD - greater than flow given on sheet 'Q-Peak'

AREA INLET IN A TRAPEZOIDAL GRASS-LINED CHANNEL

Enter Your Project Name Here

Enter Your Inlet ID Here

Inlet Design Information (Input)

Type of Inlet

Inlet Type =

Angle of Inclined Grate (must be ≤ 30 degrees)

Width of Grate

Length of Grate

Open Area Ratio

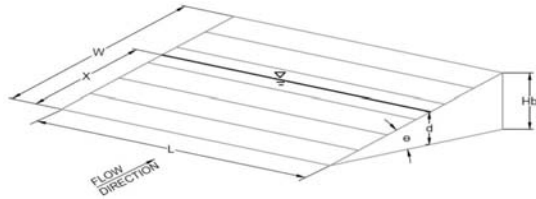
Height of Inclined Grate

Clogging Factor

Grate Discharge Coefficient

Orifice Coefficient

Weir Coefficient



$\theta =$ degrees

$W =$ feet

$L =$ feet

$ARATIO =$

$H_B =$ feet

$C_1 =$

$C_d =$

$C_o =$

$C_w =$

Water Depth at Inlet (for depressed inlets, 1 foot is added for depression)

$d =$

MINOR	MAJOR
<input type="text"/>	<input type="text"/>

Grate Capacity as a Weir

Submerged Side Weir Length

Inclined Side Weir Flow

Base Weir Flow

Interception without Clogging

Interception with Clogging

$X =$ feet

$Q_{ws} =$ cfs

$Q_{wb} =$ cfs

$Q_{wi} =$ cfs

$Q_{wi} =$ cfs

Grate Capacity as an Orifice

Interception without Clogging

Interception with Clogging

$Q_{oi} =$ cfs

$Q_{oi} =$ cfs

Total Inlet Interception Capacity (assumes clogged condition)

$Q_a =$ cfs

Bypassed Flow, $Q_b =$ cfs

Capture Percentage = $Q_a/Q_o = C\%$ %

Design Procedure Form: Extended Detention Basin (EDB)

UD-BMP (Version 3.06, November 2016)

Sheet 1 of 4

Designer: David Mijares
Company: Catamount
Date: September 12, 2019
Project: Riverbend Crossing
Location: Extended Detention Basin 1

1. Basin Storage Volume

- A) Effective Imperviousness of Tributary Area, I_a
- B) Tributary Area's Imperviousness Ratio ($i = I_a / 100$)
- C) Contributing Watershed Area
- D) For Watersheds Outside of the Denver Region, Depth of Average Runoff Producing Storm
- E) Design Concept
(Select EURV when also designing for flood control)
- F) Design Volume (WQCV) Based on 40-hour Drain Time
($V_{DESIGN} = (1.0 * (0.91 * I^3 - 1.19 * I^2 + 0.78 * I) / 12 * Area)$)
- G) For Watersheds Outside of the Denver Region, Water Quality Capture Volume (WQCV) Design Volume
($V_{WQCV\ OTHER} = (d_6 * (V_{DESIGN} / 0.43))$)
- H) User Input of Water Quality Capture Volume (WQCV) Design Volume
(Only if a different WQCV Design Volume is desired)
- I) Predominant Watershed NRCS Soil Group
- 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: $EURV_{C/D} = 1.20 * i^{1.08}$

$I_a = 65.4$ %

$i = 0.654$

Area = 54.900 ac

$d_6 =$ in

Choose One

- ☒ Water Quality Capture Volume (WQCV)
☐ Excess Urban Runoff Volume (EURV)

$V_{DESIGN} = 1.170$ ac-ft

$V_{DESIGN\ OTHER} =$ ac-ft

$V_{DESIGN\ USER} =$ ac-ft

Choose One

- ☐ A
☐ B
☐ C / D

WQCV selected. Soil group not required.

EURV = ac-ft

2. Basin Shape: Length to Width Ratio

(A basin length to width ratio of at least 2:1 will improve TSS reduction.)

L : W = 4.0 : 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 with Pipe outfalls and Energy Baffle per Urban Drainage Criteria

Design Procedure Form: Extended Detention Basin (EDB)

Sheet 2 of 4

Designer: David Mijares
Company: Catamount
Date: September 12, 2019
Project: Riverbend Crossing
Location: Extended Detention Basin 1

5. Forebay

A) Minimum Forebay Volume
($V_{FMIN} = 3\%$ of the WQCV)

$V_{FMIN} = 0.035$ ac-ft

B) Actual Forebay Volume

$V_F = 0.035$ ac-ft

C) Forebay Depth
($D_F = 30$ inch maximum)

$D_F = 30.0$ in

D) Forebay Discharge

i) Undetained 100-year Peak Discharge

$Q_{100} = 180.80$ cfs

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

$Q_F = 3.62$ 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 $W_N = 9.3$ in

6. Trickle Channel

A) Type of Trickle Channel

Choose One
☒ Concrete
☐ Soft Bottom

F) Slope of Trickle Channel

$S =$ ft / ft

7. Micropool and Outlet Structure

A) Depth of Micropool (2.5-feet minimum)

$D_M =$ ft

B) Surface Area of Micropool (10 ft² minimum)

$A_M =$ sq ft

C) Outlet Type

Choose One
☐ Orifice Plate
☐ Other (Describe):

D) Smallest Dimension of Orifice Opening Based on Hydrograph Routing
(Use UD-Detention)

$D_{orifice} =$ inches

E) Total Outlet Area

$A_{ot} =$ square inches

Design Procedure Form: Extended Detention Basin (EDB)

Sheet 3 of 4

Designer: David Mijares
Company: Catamount
Date: September 12, 2019
Project: Riverbend Crossing
Location: Extended Detention Basin 1

8. Initial Surcharge Volume

- A) Depth of Initial Surcharge Volume
(Minimum recommended depth is 4 inches)
- B) Minimum Initial Surcharge Volume
(Minimum volume of 0.3% of the WQCV)
- C) Initial Surcharge Provided Above Micropool

$D_{IS} =$ _____ in

$V_{IS} =$ _____ cu ft

$V_s =$ _____ cu ft

9. Trash Rack

- A) Water Quality Screen Open Area: $A_t = A_{tot} * 38.5 * (e^{-0.095D})$
- 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 area to the total screen area for the material specified.)

Other (Y/N): ☒ N

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

D) Total Water Quality Screen Area (based on screen type)

E) Depth of Design Volume (EURV or WQCV)
(Based on design concept chosen under 1E)

F) Height of Water Quality Screen (H_{TR})

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

$A_t =$ _____ square inches

User Ratio = _____

$A_{total} =$ _____ sq. in.

$H =$ _____ feet

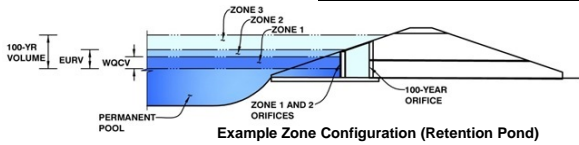
$H_{TR} =$ _____ inches

$W_{opening} =$ _____ inches

Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)

Project: RIVERBEND CROSSING
Basin ID: EXTENDED DETENTION BASIN



	Stage (ft)	Zone Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.95	1.170	Orifice Plate
Zone 2 (EURV)	5.08	2.542	Orifice Plate
Zone 3 (100-year)	6.74	2.458	Weir&Pipe (Restrict)
		6.169	Total

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

Underdrain Orifice Invert Depth = ft (distance below the filtration media surface)
Underdrain Orifice Diameter = inches

Calculated Parameters for Underdrain

Underdrain Orifice Area = ft²
Underdrain Orifice Centroid = feet

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

Invert of Lowest Orifice = ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate = ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing = inches
Orifice Plate: Orifice Area per Row = inches

Calculated Parameters for Plate

WQ Orifice Area per Row = ft²
Elliptical Half-Width = feet
Elliptical Slot Centroid = feet
Elliptical Slot Area = ft²

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	1.69	3.39					
Orifice Area (sq. inches)	5.56	5.56	12.00					

	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	
Invert of Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter =	N/A	N/A	inches

Calculated Parameters for Vertical Orifice

	Not Selected	Not Selected	
Vertical Orifice Area =	N/A	N/A	ft ²
Vertical Orifice Centroid =	N/A	N/A	feet

User Input: Overflow Weir (Dropbox) and Grate (Flat or Sloped)

	Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, H _o =	5.08	N/A	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	8.00	N/A	feet
Overflow Weir Slope =	4.00	N/A	H:V (enter zero for flat grate)
Horiz. Length of Weir Sides =	6.00	N/A	feet
Overflow Grate Open Area % =	70%	N/A	% grate open area/total area
Debris Clogging % =	50%	N/A	%

Calculated Parameters for Overflow Weir

	Zone 3 Weir	Not Selected	
Height of Grate Upper Edge, H _t =	6.58	N/A	feet
Over Flow Weir Slope Length =	6.18	N/A	feet
Grate Open Area / 100-yr Orifice Area =	7.06	N/A	should be ≥ 4
Overflow Grate Open Area w/o Debris =	34.63	N/A	ft ²
Overflow Grate Open Area w/ Debris =	17.32	N/A	ft ²

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

	Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	2.00	N/A	ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter =	30.00	N/A	inches
Restrictor Plate Height Above Pipe Invert =	30.00		inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 3 Restrictor	Not Selected	
Outlet Orifice Area =	4.91	N/A	ft ²
Outlet Orifice Centroid =	1.25	N/A	feet
Half-Central Angle of Restrictor Plate on Pipe =	3.14	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage = ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length = feet
Spillway End Slopes = H:V
Freeboard above Max Water Surface = feet

Calculated Parameters for Spillway

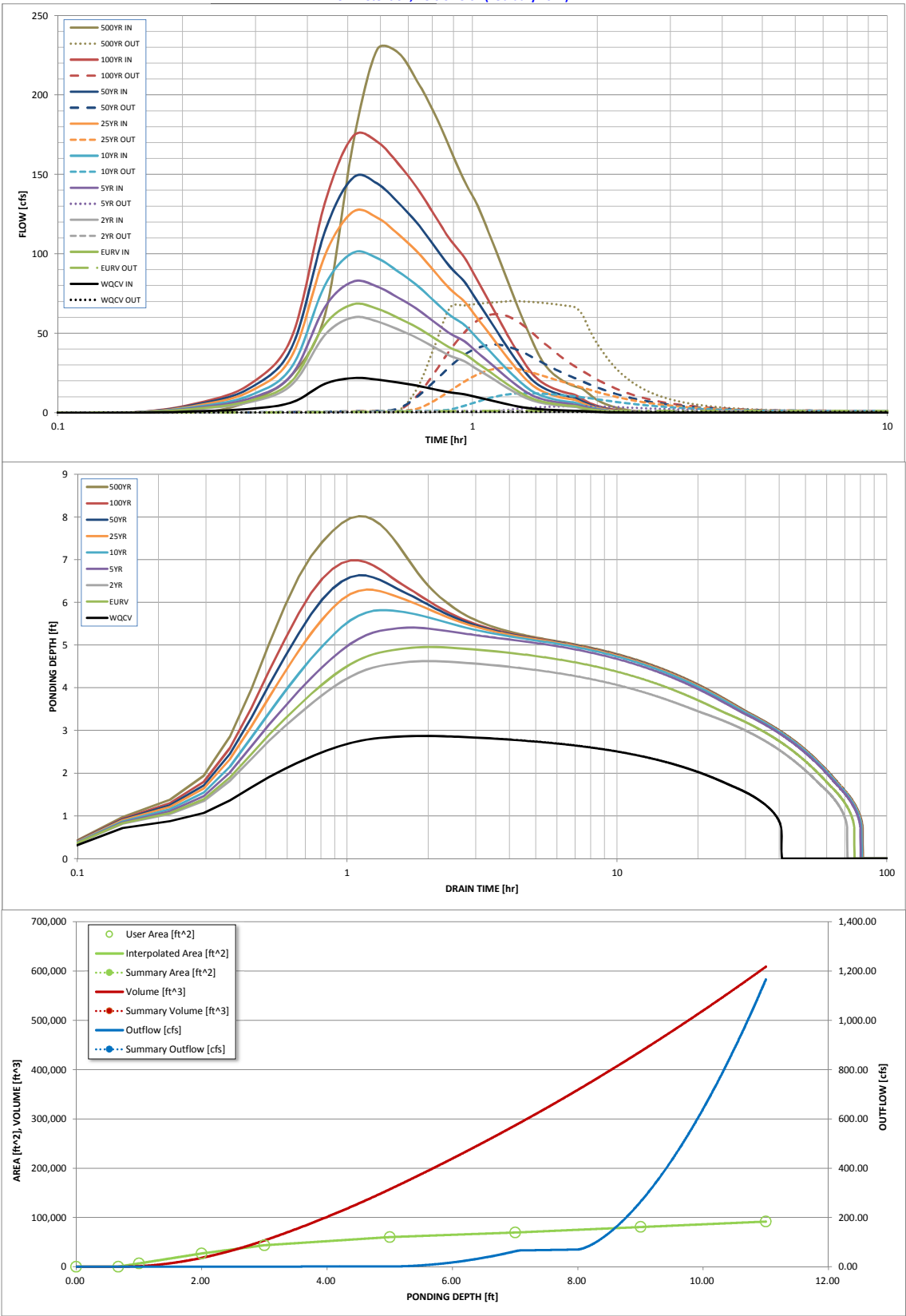
Spillway Design Flow Depth = feet
Stage at Top of Freeboard = feet
Basin Area at Top of Freeboard = acres

Routed Hydrograph Results

	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Design Storm Return Period =									
One-Hour Rainfall Depth (in) =	0.53	1.07	1.19	1.50	1.75	2.00	2.25	2.52	3.14
Calculated Runoff Volume (acre-ft) =	1.170	3.712	3.254	4.504	5.530	6.972	8.198	9.691	12.843
OPTIONAL Override Runoff Volume (acre-ft) =									
Inflow Hydrograph Volume (acre-ft) =	1.169	3.707	3.250	4.499	5.516	6.964	8.180	9.671	12.826
Predevelopment Unit Peak Flow, q (cfs/acre) =	0.00	0.00	0.01	0.11	0.30	0.70	0.97	1.32	2.01
Predevelopment Peak Q (cfs) =	0.0	0.0	0.7	6.1	16.7	38.3	53.1	72.3	110.4
Peak Inflow Q (cfs) =	21.8	68.2	60.0	82.5	100.7	126.4	147.8	173.9	228.4
Peak Outflow Q (cfs) =	0.5	1.3	1.2	4.2	12.3	28.2	42.8	61.8	70.5
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.7	0.7	0.7	0.8	0.9	0.6
Structure Controlling Flow =	Plate	Plate	Plate	Overflow Grate 1	Overflow Grate 1	Overflow Grate 1	Overflow Grate 1	Overflow Grate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	0.1	0.3	0.8	1.2	1.7	2.0
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	69	65	72	71	69	67	66	62
Time to Drain 99% of Inflow Volume (hours) =	40	74	69	77	77	77	76	75	74
Maximum Ponding Depth (ft) =	2.87	4.95	4.62	5.41	5.82	6.30	6.63	6.98	8.02
Area at Maximum Ponding Depth (acres) =	0.95	1.37	1.31	1.42	1.47	1.52	1.56	1.59	1.72
Maximum Volume Stored (acre-ft) =	1.095	3.536	3.093	4.166	4.759	5.491	5.998	6.549	8.256

Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)



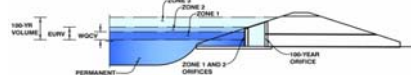
S-A-V-D Chart Axis Override	X-axis	Left Y-Axis	Right Y-Axis
minimum bound			
maximum bound			

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

UD-Detention, Version 3.07 (February 2017)

Basin ID: EXTENDED DETENTION BASIN

— 2014/15



Example Zone Configuration (Retention Pond)

Required Volume Calculation

Selected BMP Type	EDB	
Watershed Area	54.90	acres
Watershed Length	1.921	feet
Watershed Slope	0.027	feet
Watershed Imperviousness	65.40%	percent
Percentage Hydrologic Soil Group A	24.3%	percent
Percentage Hydrologic Soil Group B	0.0%	percent
Percentage Hydrologic Soil Groups CD	75.7%	percent
Desired WQV Drain Time	4.0	hours
Location for 1-h Rainfall Event	Dewey	Capitol Building
Water Quality Capture Volume (WQCV)	1.70	acre-feet
Excess Urban Runoff Volume (EURV)	3.752	acre-feet
2-yr Runoff Volume (P1 = 1.19 in.)	3.214	acre-feet
5-yr Runoff Volume (P1 = 1.5 in.)	4.504	acre-feet
10-yr Runoff Volume (P1 = 1.75 in.)	5.530	acre-feet
25-yr Runoff Volume (P1 = 2 in.)	6.992	acre-feet
50-yr Runoff Volume (P1 = 2.25 in.)	8.178	acre-feet
100-yr Runoff Volume (P1 = 2.52 in.)	9.691	acre-feet
500-yr Runoff Volume (P1 = 3.14 in.)	12.843	acre-feet
Approximate 2-yr Detention Volume	3.058	acre-feet
Approximate 5-yr Detention Volume	4.247	acre-feet
Approximate 10-yr Detention Volume	4.914	acre-feet
Approximate 25-yr Detention Volume	5.393	acre-feet
Approximate 50-yr Detention Volume	5.647	acre-feet
Approximate 100-yr Detention Volume	6.169	acre-feet

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

Stage-Storage Calculation

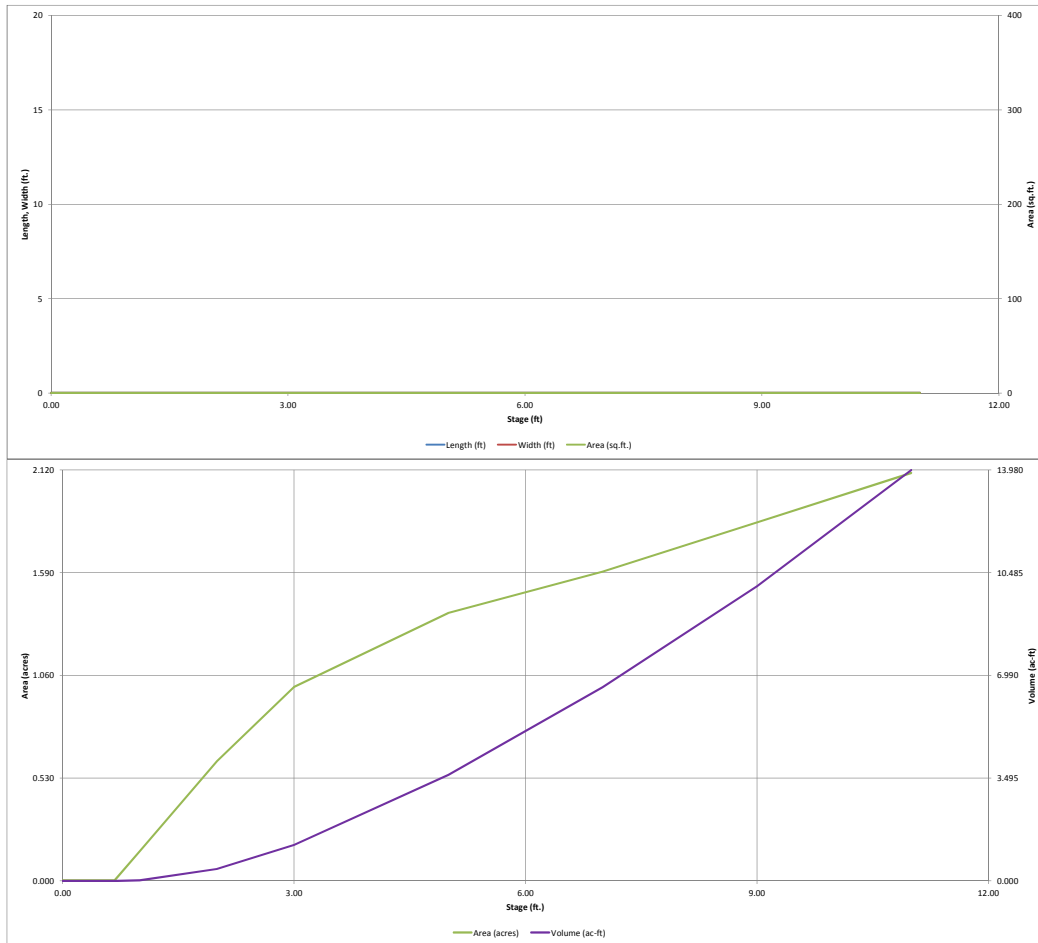
Zone 1 Volume (V_{WC1})	1.170	acre-feet
Zone 2 Volume (V_{EURV} - Zone 1)	2.542	acre-feet
Zone 3 Volume (100 Year - Zones 1 & 2)	2.458	acre-feet
Total Detention Basin Volume	6.169	acre-feet
Initial Surcharge Volume (ISV)	user	ft ³
Initial Surcharge Depth (ISD)	user	ft
Total Available Detention Depth (H_{ADM})	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_{MB})	user	ft/V
Basin Length-to-Width Ratio (R_{LMB})	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_{FLOOB})	user	ft
Length of Basin Floor (L_{FLOOB})	user	ft
Width of Basin Floor (W_{FLOOB})	user	ft
Area of Basin Floor (A_{FLOOB})	user	ft ²
Volume of Basin Floor (V_{FLOOB})	user	ft ³
Depth of Main Basin (H_{MB})	user	ft
Length of Main Basin (L_{MB})	user	ft
Width of Main Basin (W_{MB})	user	ft
Area of Main Basin (A_{MB})	user	ft ²
Volume of Main Basin (V_{MB})	user	ft ³
Calculated Total Basin Volume (V_{MB})	user	acre-feet

Depth Increment =	1	ft							
		Optional				Optional			

[illegible]

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

UD-Detention, Version 3.07 (February 2017)



FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Fountain Creek (cont.)								
BU	104,500	560	2,948	8.9	5608.6	5608.6	5608.6	0.0
BV	105,500	640	4,060	6.5	5614.2	5614.2	5614.3	0.1
BW	106,524	432	3,160	8.2	5620.0	5620.0	5620.7	0.7
BX	107,580	163	1,609	16.2	5623.9	5623.9	5624.2	0.3
BY	108,824	354	3,684	7.1	5634.6	5634.6	5634.6	0.0
BZ	109,747	430	2,945	8.8	5638.0	5638.0	5638.0	0.0
CA	110,486	241	2,776	9.4	5642.6	5642.6	5642.6	0.0
CB	111,228	384	4,253	6.1	5646.3	5646.3	5646.3	0.0
CC	113,189	340	3,304	7.9	5657.5	5657.5	5657.6	0.1
CD	115,609	169	1,696	15.3	5669.2	5669.2	5669.3	0.1
CE	117,000	461	5,232	5.0	5676.8	5676.8	5677.4	0.6
CF	118,746	350	2,798	9.3	5682.9	5682.9	5682.9	0.0
CG	119,965	700	8,842	2.9	5691.7	5691.7	5692.7	1.0
CH	121,500	837	5,247	5.0	5694.5	5694.5	5694.7	0.2
CI	123,000	1,908	10,866	2.4	5707.2	5707.2	5707.2	0.0
CJ	124,455	960	5,500	4.7	5711.3	5711.3	5711.7	0.4
CK	125,500	627	4,527	5.7	5716.6	5716.6	5716.6	0.0
CL	127,000	935	6,844	3.7	5723.5	5723.5	5723.7	0.2
CM	128,000	735	3,894	6.6	5727.3	5727.3	5727.4	0.1
CN	129,150	807	4,142	6.2	5733.4	5733.4	5733.7	0.3
CO	129,880	966	4,104	6.2	5736.5	5736.5	5736.6	0.1
CP	130,854	405	2,110	12.1	5741.3	5741.3	5741.3	0.0
CQ	131,623	1,299	5,023	5.1	5747.1	5747.1	5747.1	0.0
CR	132,429	703	4,341	5.9	5751.0	5751.0	5751.1	0.1

¹Feet Above El Paso – Pueblo County Line.

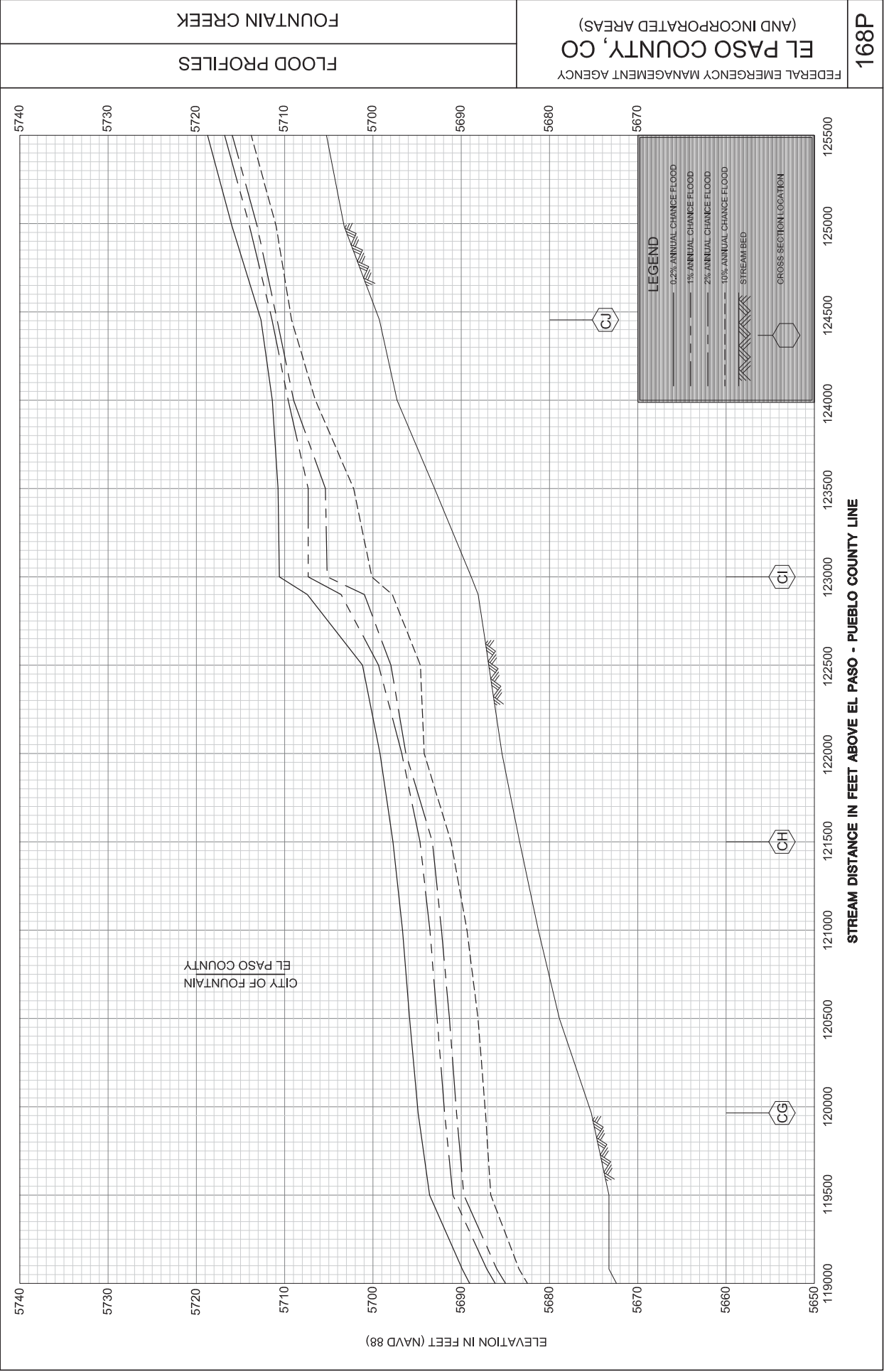
TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

**EL PASO COUNTY, CO
AND INCORPORATED AREAS**

FLOODWAY DATA

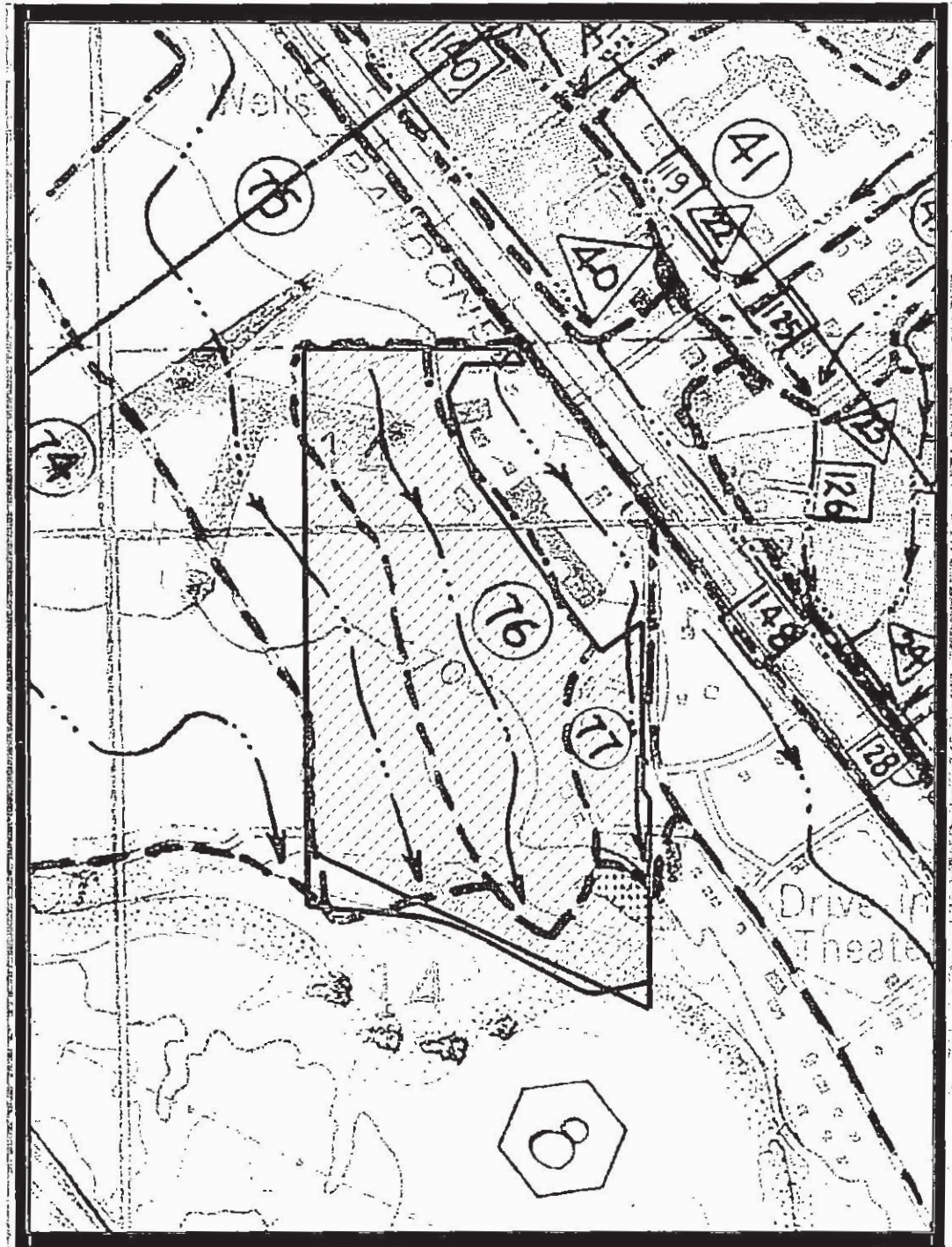
FOUNTAIN CREEK

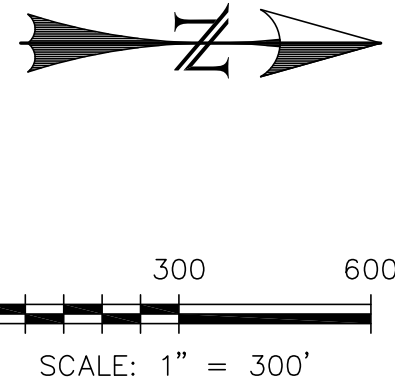
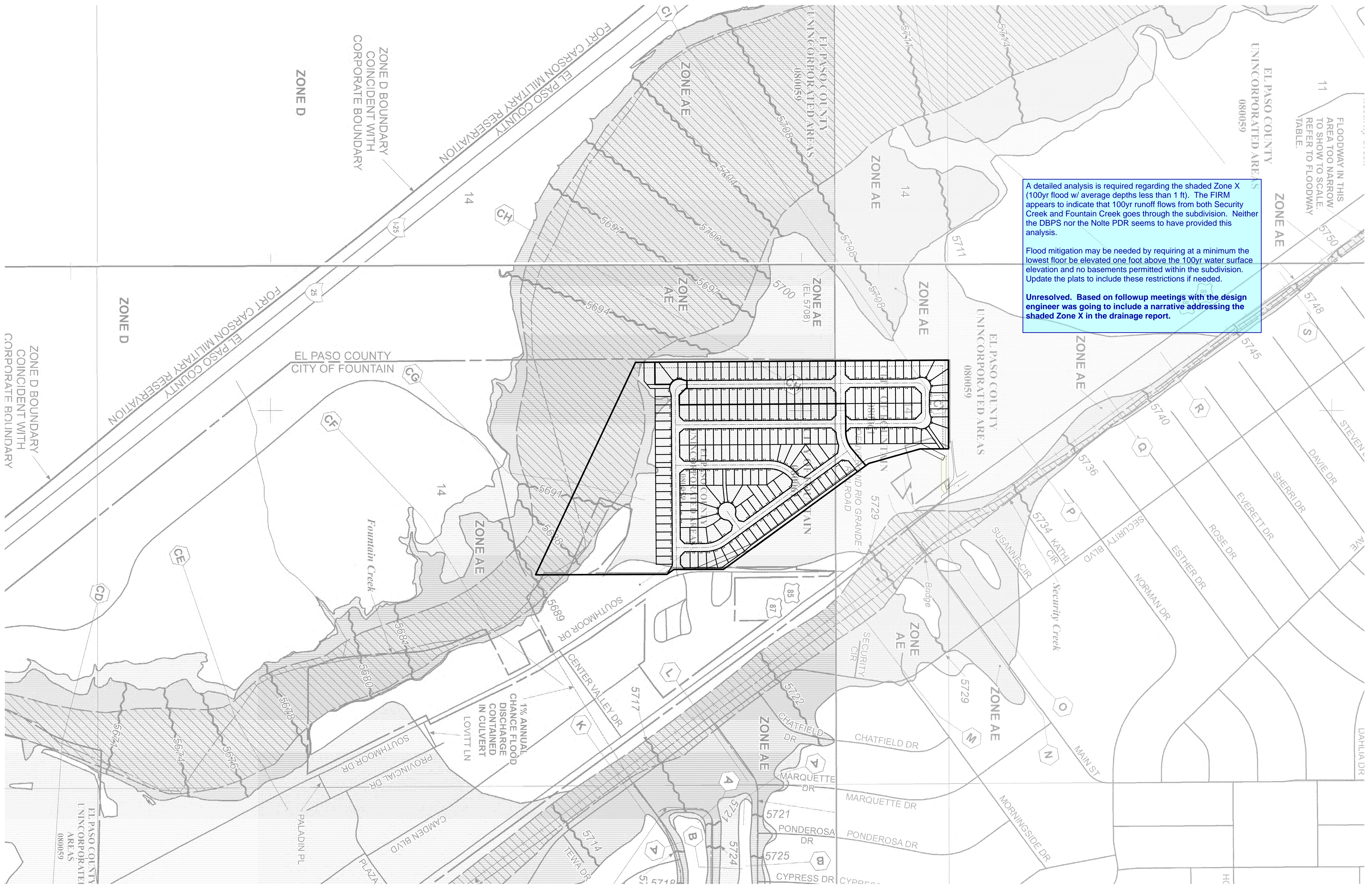



DRAINAGE MAP

FIGURE A4 – Drainage Patterns as Depicted in the DBPS

Add a north arrow.

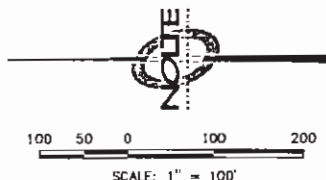
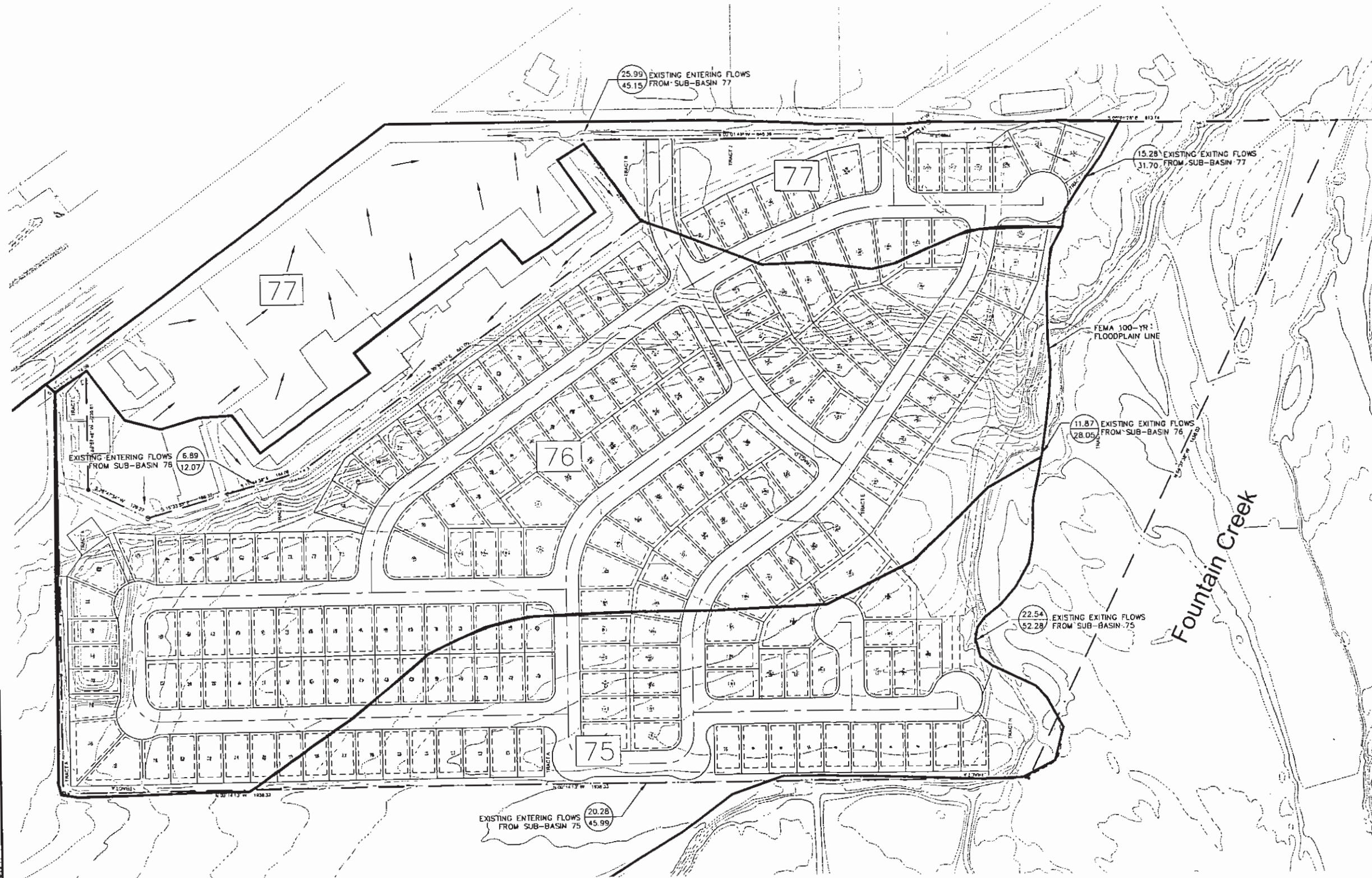




PREPARED FOR: COMPANY NAME ADDRESS CITY, STATE ZIP PHONE	 PO BOX 692 DIVIDE, CO 80814 (719) 426-2124	COMPOSITE FIRM MAP RIVERBEND DEVELOPMENTS		DRAWN BY: DLM
		FIRM PANELS- 744G,763G,932G,AND 951G		SCALE: 1"=300' DATE: 09/11/19
				JOB NUMBER SHEET 17-114 1 OF 1

RIVERBEND CROSSING

EXISTING DRAINAGE CONDITONS MAP



EXISTING DRAINAGE BASINS 75, 76 AND 77 WERE TAKEN FROM THE APPROVED LITTLE JOHNSON DRAINAGE BASIN
PLANNING STUDY, DATED: APRIL, 1988

WATERSHED	TOTAL AREA (acres)	COMPOSITE RAINFALL COEFF., C		COMPOSITE RAINFALL COEFF., C	OVERLAND COMPONENT				CHANNEL COMPONENT				TOTAL T _r (min)	HUNNIFORD COEFFICIENT, C		INTENSITY (in/hr)		FLOWS (cfs)				
		C	Area (acres)		Length (ft)	Height (ft)	Slope	T _r (min)	Length (ft)	Height (ft)	Slope	T _r (min)		C ₁	C ₂	T ₁ (min)	T ₂ (min)	Q ₁ (cfs)	Q ₂ (cfs)			
75 (IN)	59.11	0.25	59.11	0	0.25	1000	24	0.024	37.05	8.0	2	0.186	7.1	0.5	11.34	40.01	0.25	0.25	1.5	2.0	22.54	52.30
75 (OUT)	73.6	0.25	73.6	0	0.25	1000	24	0.024	37.05	10.0	20	0.023	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
76 (IN)	7.0	0.25	7.0	0	0.25	1000	24	0.024	37.05	10.0	20	0.023	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
76 (OUT)	34	0.25	34	0	0.25	1000	24	0.024	37.05	10.0	20	0.023	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
77 (IN)	7.37	0.25	7.37	0	0.25	1000	24	0.024	37.05	10.0	20	0.023	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
77 (OUT)	12.72	0.25	12.72	0	0.25	1000	24	0.024	37.05	10.0	20	0.023	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0

LEGEND	
	BOUNDARY
	EXISTING MAJOR CONTOURS
	EXISTING MINOR CONTOURS
	5-YR. FLOW (cfs) 100-YR. FLOW (cfs) FLOW DIRECTION ARROW
	SUB-BASIN BOUNDARY
	SUB-BASIN IDENTIFICATION

RIVERBEND CROSSING EXISTING DRAINAGE CONDITIONS

CAUTION
The engineer preparing these plans will not be responsible for, or liable for, unanticipated changes to or lack of these plans. All changes to the plans must be approved by the engineer of record.

DATE SUBMITTED: FEB 17, 2006

PREPARED FOR: DR HORTON - MELODY SERIES

DR HORTON - MELODY SERIES

NOTE

BEYOND ENGINEERING

COLORADO SPRINGS, CO 80918
WWW.HOTE.COM

5325 N. ACADEMY BLVD., SUITE 304
719.588.8500 TEL 719.588.8200 FAX

PRELIMINARY
NOT FOR CONSTRUCTION

SHEET NUMBER

DP01

1 of 2 SHEETS

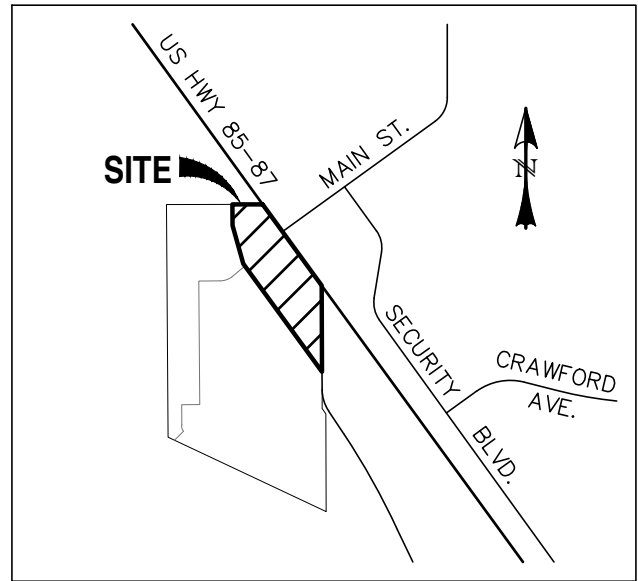
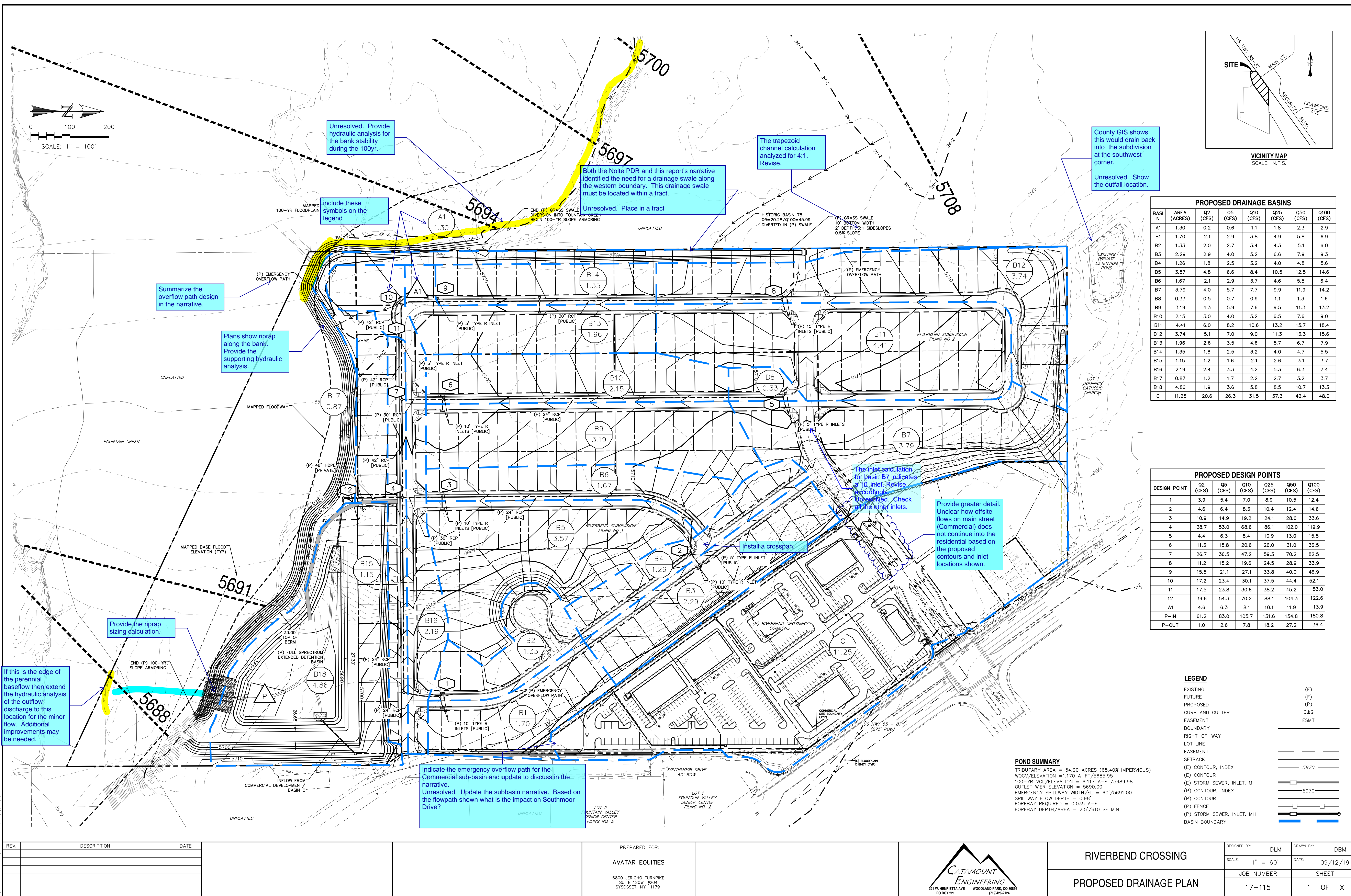
SCALE

VERTICAL: N/A

HORIZONTAL: 1" = 100'

JOB NUMBER

CSB011202



PROPOSED DRAINAGE BASINS						
BASIN	AREA (ACRES)	Q2 (CFS)	Q5 (CFS)	Q10 (CFS)	Q25 (CFS)	Q50 (CFS)
A1	1.30	0.2	0.6	1.1	1.8	2.3
B1	1.70	2.1	2.9	3.8	4.9	5.8
B2	1.33	2.0	2.7	3.4	4.3	5.1
B3	2.29	2.9	4.0	5.2	6.6	7.9
B4	1.26	1.8	2.5	3.2	4.0	4.8
B5	3.57	4.8	6.6	8.4	10.5	12.5
B6	1.67	2.1	2.9	3.7	4.6	5.5
B7	3.79	4.0	5.7	7.7	9.9	11.9
B8	0.33	0.5	0.7	0.9	1.1	1.3
B9	3.19	4.3	5.9	7.6	9.5	11.3
B10	2.15	3.0	4.0	5.2	6.5	7.6
B11	4.41	6.0	8.2	10.6	13.2	15.7
B12	3.74	5.1	7.0	9.0	11.3	13.3
B13	1.96	2.6	3.5	4.6	5.7	6.7
B14	1.35	1.8	2.5	3.2	4.0	4.7
B15	1.15	1.2	1.6	2.1	2.6	3.1
B16	2.19	2.4	3.3	4.2	5.3	6.3
B17	0.87	1.2	1.7	2.2	2.7	3.2
B18	4.86	1.9	3.6	5.8	8.5	10.7
C	11.25	20.6	26.3	31.5	37.3	42.4

PROPOSED DESIGN POINTS						
DESIGN POINT	Q2 (CFS)	Q5 (CFS)	Q10 (CFS)	Q25 (CFS)	Q50 (CFS)	Q100 (CFS)
1	3.9	5.4	7.0	8.9	10.5	12.4
2	4.6	6.4	8.3	10.4	12.4	14.6
3	10.9	14.9	19.2	24.1	28.6	33.6
4	38.7	53.0	68.6	86.1	102.0	119.9
5	4.4	6.3	8.4	10.9	13.0	15.5
6	11.3	15.8	20.6	26.0	31.0	36.5
7	26.7	36.5	47.2	59.3	70.2	82.5
8	11.2	15.2	19.6	24.5	28.9	33.9
9	15.5	21.1	27.1	33.8	40.0	46.9
10	17.2	23.4	30.1	37.5	44.4	52.1
11	17.5	23.8	30.6	38.2	45.2	53.0
12	39.6	54.3	70.2	88.1	104.3	122.6
A1	4.6	6.3	8.1	10.1	11.9	13.9
P-IN	61.2	83.0	105.7	131.6	154.8	180.8
P-OUT	1.0	2.6	7.8	18.2	27.2	36.4

LEGEND

EXISTING	(E)
FUTURE	(F)
PROPOSED	(P)
CURB AND GUTTER	C&G
EASEMENT	ESMT
BOUNDARY	
RIGHT-OF-WAY	
LOT LINE	
EASEMENT	
SETBACK	
(E) CONTOUR, INDEX	
(E) CONTOUR	
(E) STORM SEWER, INLET, MH	
(P) CONTOUR, INDEX	
(P) CONTOUR	
(P) FENCE	
(P) STORM SEWER, INLET, MH	
BASIN BOUNDARY	

POND SUMMARY

TRIBUTARY AREA = 54.90 ACRES (65.40% IMPERVIOUS)
WQV/ELEVATION = 11.70 A-FT/5685.95
100-YR VOL/ELEVATION = 6.117 A-FT/5689.98
OUTLET WIER ELEVATION = 5690.00
EMERGENCY SPILLWAY WIDTH/EL = 60'/5691.00
SPILLWAY FLOW DEPTH = 0.98'
FOREBAY REQUIRED = 0.035 A-FT
FOREBAY DEPTH/AREA = 2.5'/610 SF MIN

REV.	DESCRIPTION	DATE

PREPARED FOR:
AVATAR EQUITIES

6800 JERICHO TURNPIKE
SUITE 120W, #204
SYOSSET, NY 11791



RIVERBEND CROSSING

PROPOSED DRAINAGE PLAN

DESIGNED BY:	DLM	DRAWN BY:	DBM
SCALE:	1" = 60'	DATE:	09/12/19
JOB NUMBER	17-115	SHEET	1 OF X