FINAL DRAINAGE REPORT FOR BANNING LEWIS RANCH FILINGS NO. 40, 41, & 42 (VILLAGE B1)

April 2020

Prepared for:
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FINAL DRAINAGE REPORT FOR BANNING LEWIS RANCH FILINGS NO. 40, 41, 42 (VILLAGE B1)

Banning Lewis Ranch Filings 40, 41, & 42
Engineer's Statement

This report and plan for the drainage design of **Banning Lewis Ranch Filings 40, 42, & 43** was prepared by me (or under my direct supervision) and is correct to the best of my knowledge and belief. Said report and plan has been prepared in accordance with the City of Colorado Springs Drainage Criteria Manual and is in conformity with the master plan of the drainage basin. I understand that the City of Colorado Springs does not and will not assume liability for drainage facilities designed by others. I accept responsibility for any liability caused by any negligent acts, errors or omissions on my part in preparing this report.

SIGNATURE (Affix Seal): _____

Colorado P.E. No. 29794 Date

Developer's Statement

Walton Colorado, LLC hereby certifies that the drainage facilities for **Banning Lewis Ranch Filings No. 40, 41, & 42** shall be constructed according to the design presented in this report. I understand that the City of Colorado Springs does not and will not assume liability for the drainage facilities designed and/or certified by my engineer and that are submitted to the City of Colorado Springs pursuant to section 7.7.906 of the City Code; and cannot, on behalf of **Banning Lewis Ranch Filings No. 40, 41, & 42,** guarantee that final drainage design review will absolve **Walton Colorado, LLC** 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.

Walton Colorado, LLC
Name of Developer

Authorized Signature Date

Printed Name

Title

14614 N. Kierland Blvd. #120
Scottsdale, AZ 85254
Address:

City of Colorado Springs Statement:

Filed in accordance with Section 7.7.906 of the Code of the City of Colorado Springs, 2001, as amended.

For City Engineer Date

Conditions: A temporary FSD facility is being constructed as an interim measure until downstream regional detention facility, located south of future Village B1 development, is constructed. If the downstream facility is not constructed within five years of the approval date of this report, it is the owner's responsibility to provide permanent full spectrum detention for this site. Subsequent report approvals will not extend this deadline."

CLASSIC CONSULTING ENGINEERS & SURVEYORS

TABLE OF CONTENTS:

APPENDICES

CLASSIC CONSULTING ENGINEERS & SURVEYORS

FINAL DRAINAGE REPORT FOR BANNING LEWIS RANCH FILINGS NO. 40, 41, 42 (VILLAGE B1)

PURPOSE

This document is the Final Drainage Report for Banning Lewis Ranch Filings No. 40, 41, & 42. The purpose of this report is to identify onsite and offsite drainage patterns, storm sewer, inlet locations, and areas tributary to the site, and to safely route developed storm water runoff to adequate outfall facilities. A Development Plan & Final Plats for Filings 40, 41, & 42 have been submitted concurrently with this report.

GENERAL DESCRIPTION

Banning Lewis Ranch Filing 40 is 15.639 acres of proposed single-family development (60 lots) and roadway infrastructure. Filing 41 is 3.753 acres of '4-pack' single-family home lots (36 lots total). Each 4 units of Filing 41 is served by a shared driveway off typical residential roadways. Filing 42 is 12.692 acres of proposed single-family development (65 lots) and roadway infrastructure. The area of Banning Lewis Ranch that these filings are in are north of Dublin Blvd. and east of Banning Lewis Parkway in Village B1. All three Filings are within the existing platted Banning Lewis Parkway right-of-way that was originally dedicated to the City of Colorado Springs when the Parkway was to be a multi-lane expressway. A right-of-way vacation is currently in process to remove the portion of the existing right-of-way no longer needed for the major arterial classification that Banning Lewis Parkway now is. These Filings are located in Section 10 of Township 13 South, Range 65 West of the Sixth Principal Meridian in the City of Colorado Springs, County of El Paso, State of Colorado. All of the proposed Filings are north of Dublin Blvd. and north of the extension of Redcloud Peak Drive, east of Banning Lewis Parkway, and west and south of undeveloped land.

The overall drainage patterns are in conformance with the "Phases I and II Banning Lewis Ranch Master Development Drainage Plan Update," by Kiowa Engineering Corporation dated December 6, 2012. A "Preliminary Drainage Report for Banning Lewis Ranch – Village B1 PUD Concept Plan," by Classic Consulting Engineers & Surveyors, LLC dated January 2020 was completed and accompanied the Zone Change, Master Plan Amendment, and R.O.W. Vacation associated with Village B1. This report and final design are in general conformance with these previously approved reports.

The average soil condition of the proposed Village B1 Filings reflects Hydrologic Group "A" (Blakeland-Fluvaquentic Haplaquolls) as determined by the "Soil Survey of El Paso County Area," prepared by the National Cooperative Soil Survey (see map in Appendix). Per the Drainage Criteria Manual Group "A" soil coefficients are not to be used when overlot grading has occurred. Per the "Phases I and II Banning Lewis Ranch Master Development Drainage Plan Update," by Kiowa Engineering Corporation; Group "B" soil coefficients were used in the calculations as well as for sizing the Excess Urban Runoff Volume.

EXISTING DRAINAGE CONDITIONS

The proposed site currently predominantly drains in a south-easterly direction as sheet flow directly into the East Fork of Sand Creek channel. This area was studied in the "Sand Creek Drainage Basin Planning Study" by Kiowa Engineering Corporation in 1989. The Drainage Basin Planning Study anticipated this portion of Banning Lewis Ranch would be developed as "Multi-Family Residential" (see "proposed land use" DBPS map attached). The DBPS defined drainage corridor (Segment 84) runs along the eastern boundary of the proposed Village B1 area. The approved Sand Creek Drainage Basin Planning Study reflects improvements in the drainage segment in order to convey developed flows to downstream regional Detention Facilities. No Regional Detention Facilities were anticipated within the Banning Lewis Ranch Filings 40-42 area (see attachments) per the original DBPS.

More importantly, the overall site was also previously studied in the "Phase I and II Banning Lewis Ranch Master Development Drainage Plan Update" dated March 2013 by Kiowa Engineering Corporation. The attached "Existing Condition Hydrology Basin Map" and "Proposed Facilities Plan" map is from that approved Master Development Drainage Plan with the proposed Filings boundary indicated. The approved MDDP (and update) reflects a composite CN value of 60 which is reflective of urban single-family development (1/4-acre lots) for the Banning Lewis Ranch Village B1 area. This deviated from the land uses reflected in the DBPS, but does better emulate the anticipated land uses of this area. The main component of the MDDP update was to introduce sub-regional Full Spectrum Detention (FSD) to the Oakwood Homes holdings of Banning Lewis Ranch, including this site. The proposed Filings 40-42 are within the tributary area to the MDDP Full Spectrum Detention Pond 155. The site sits along the western side of Reach 152 from the MDDP.

A detailed Existing Conditions analysis was completed to determine exact tributary areas and drainage patterns in and around the proposed Filings 40-42.

Design Point 52 (M.D.D.P. Q_5 = 41 cfs, Q_{100}= 376 cfs) consists of runoff from Basin OS-1, 902.40 acres of off-site tributary area described and quantified in the MDDP Update by Kiowa Engineering. Per the Sand Creek DBPS and MDDP Update, this runoff is to drain south-east along Reach 152, which is the more defined Sand Creek Tributary channel east of Filings 40-42. Reach 152 is a very well vegetated natural drainage channel that is to remain undisturbed with the development of Filings 40-42.

Design Point 1 (Q_5 = 4.4 cfs, Q_{100}= 32.4 cfs) consists of runoff from Basin OS-2, 18.53 acres of off-site, undeveloped area north of the proposed boundary and south of existing Woodmen Blvd. This area drains straight south, through the proposed development and eventually onto the planned Banning Lewis Parkway and sump inlet at DP-30. Future development of this basin will adhere to City of Colorado Springs Full Spectrum Detention and Water Quality prior to releasing to existing drainage patterns (Design Point 1) and will likely route restricted runoff into Reach 152 prior to the proposed site boundary. Therefore, we are confident this runoff at Design Point 1 will be much less in the ultimate developed conditions than quantified here.

Design Point 2 (Q_5 = 5.6 cfs, Q_{100}= 41.3 cfs) consists of runoff from Basin EX-C, 19.38 acres of on-site, undeveloped area of the proposed Filings 40-42. This area drains south-east and directly into Reach 152 and the existing floodplain/wetlands area. The limits of this basin correspond with the developable and Filing boundary of the proposed improvements.

Design Point 3 (Q_5 = 0.5 cfs, Q_{100}= 3.4 cfs) consists of runoff from Basin EX-B, 1.21 acres of on-site, undeveloped area of the proposed Filings 40-42. This area drains south, directly into the existing channel and existing box culvert outfall area (Reach 157 per MDDP), west of Banning Lewis Parkway. The limits of this basin correspond with the developable and Filing boundary of the proposed improvements.

Design Point 28B (Q_5 = 7.9 cfs, Q_{100}= 14.1 cfs) consists of runoff from Basin NN, 2.19 acres of planned Banning Lewis Parkway located along the western boundary of the site. Banning Lewis Parkway was designed with drainage improvements installed per the "Final Drainage Report for Banning Lewis Ranch Filings 16, 19A, 19B, & 20 and Amendment to Phases I and II Banning Lewis Ranch Master Development Drainage

Plan Update," by Classic Consulting Engineers & Surveyors, dated January 2017. An existing 15' Type R inlet at this location along Banning Lewis Parkway will intercept a portion of this runoff, while the remainder continues to the sump inlet at DP-30. Please see Developed Conditions Analysis for more accurate description of runoff to Banning Lewis Parkway as development will truncate to allowable limits. At this time, Banning Lewis Parkway is not constructed, however the storm sewer improvements are.

Design Point 30 (Q_5 = 11.9 cfs, Q_{100}= 61.0 cfs) consists of runoff from Basins BBB, OS-2 (DP-1), EX-A, and the flow-by from DP-28B. Basin BBB is 1.96 acres of planned Banning Lewis Parkway located to the south and along the western boundary of the site. Basin EX-A is 13.06 acres of undeveloped on-site land that drains onto Banning Lewis Parkway in the existing conditions. The proposed development will truncate a lot of this upstream land and therefore the developed conditions will show more accurately the runoff rates at this existing 10' Type R inlet at this location along Banning Lewis Parkway. This runoff and existing storm system discharges into the existing Full Spectrum Detention Facility 184 located south-east of Design Point 30 and installed with the Filing 19 & 20 subdivisions.

PROPOSED DRAINAGE CONDITIONS

All of the proposed Filings will have Public roadways and Public storm sewer to be owned and maintained by the City of Colorado Springs. The proposed temporary Full Spectrum Detention Pond will be Privately owned by the Banning Lewis Ranch Metropolitan District. A future permanent facility (Pond 155) will be installed to the south of the proposed filings and will ultimately be a Public, City owned and maintained facility.

Per the current City of Colorado Springs Drainage Criteria for stormwater capacity within street sections, the following summaries of Figures 7-2, 7-5, and 7-7 applies: Redcloud Peak Drive (Collector), Banning Lewis Ranch (Principal Arterial), all other proposed roads are Residential.

Street Type	*Allowable – Initial Storm (5 yr)*	*Allowable–Major Storm (100 yr)*
Residential w/Ramp Curb	1.5% street slope = 10 cfs 2% street slope = 12 cfs 3% street slope = 14 cfs	1.5% street slope = 46 cfs 2% street slope = 44 cfs 3% street slope = 39 cfs

	4% street slope = 16.5 cfs No curb overtopping.	4% street slope = 36 cfs 12" maximum depth at flowline.
Residential w/Vertical Curb (6" Vertical Curb)	1.5% street slope = 13 cfs 2% street slope = 15 cfs 3% street slope = 18 cfs 4% street slope = 20.5 cfs No curb overtopping.	1.5% street slope = 45 cfs 2% street slope = 43 cfs 3% street slope = 38 cfs 4% street slope = 35 cfs 12" maximum depth at flowline.
Collector Street w/o Parking (6" Vertical Curb)	1.5% street slope = 11 cfs 2% street slope = 13 cfs 3% street slope = 16 cfs 4% street slope = 18 cfs No curb overtopping.	1.5% street slope = 62 cfs 2% street slope = 60 cfs 3% street slope = 52 cfs 4% street slope = 48 cfs Contain within R.O.W.
Principal Arterial Type II 142' R.O.W. – 6" Vertical Curb	1% street slope = 18 cfs 1.5% street slope = 22 cfs 2% street slope = 25 cfs 3% street slope = 23 cfs 4% street slope = 20.5 cfs No crown, curb overtopping or maximum allowable spread width.	1% street slope = 65 cfs 1.5% street slope = 81 cfs 2% street slope = 78 cfs 3% street slope = 68 cfs 4% street slope = 64 cfs Contain within R.O.W.

At-grade inlets and sump (low-points) were designed in a way that street capacity is not an issue anywhere within the proposed Filings or surrounding arterial and collector roadways. Street capacity has also been verified at each design point by using the UD-Inlet Excel workbook (located in Appendix) from Urban Drainage Flood Control District (UDFCD). Inlet sizing is also per the UD-Inlet Excel workbook. Drainage from individual lots are assumed to travel in side-lot swales to the street. One Site-Level Low Impact Development forms (IRF forms) is included in the Appendix of this report, for the land tributary to the proposed temporary full spectrum detention and water quality facility. A detailed description of the developed flows for Banning Lewis Ranch Filings 40 through 42 and surrounding roadway infrastructure is as follows:

Design Point 1 (Q_5 = 3.6 cfs, Q_{100}= 7.3 cfs) consists of runoff from Basin A, 1.44 acres of proposed Feathergrass Drive/Napier Way and Filing 42 typical single-family home lots. A proposed 5' Type-R sump inlet at this low point will intercept the entirety of this concentrated runoff and a proposed 18" RCP (Pipe 1)

will convey the runoff to an adjacent manhole. In the event this inlet was completely clogged, the stormwater would overtop the high point to the south in Napier Way and drain to the south to the low point at Design Point 3.

Design Point 2 (Q_5 = 2.8 cfs, Q_{100}= 5.7 cfs) consists of runoff from Basin B, 1.09 acres of proposed Feathergrass Drive/Napier Way and Filing 42 typical single-family home lots. A proposed 5' Type-R sump inlet at this low point will intercept the entirety of this concentrated runoff and a proposed 18" RCP (Pipe 2) will convey the runoff to an adjacent manhole. Pipe 3/5 (24" RCP, Q_5 = 6.4 cfs, Q_{100}= 13.0 cfs) conveys the combined runoff from this manhole (Pipes 1 & 2) to the south-east within Napier Way. In the event this inlet was completely clogged, the stormwater would overtop the high point to the south in Napier Way and drain to the south to the low point at Design Point 3.

Design Point 3 (Q_5 = 2.1 cfs, Q_{100}= 4.2 cfs) consists of runoff from Basin C, 0.83 acres of proposed Water Meadow Drive and Napier Way and Filing 42 typical single-family home lots. A proposed 5' Type-R sump inlet at this low point will intercept the entirety of this concentrated runoff and a proposed 18" RCP (Pipe 4) will convey the runoff to the sump inlet across the street at DP-4. In the event this inlet was completely clogged, the stormwater would overtop the crown of the road and the high point to the south in Napier Way and drain to the south-east to the low point at Design Points 5 & 6.

Design Point 4 (Q_5 = 2.2 cfs, Q_{100}= 4.3 cfs) consists of runoff from Basin D, 0.73 acres of proposed Water Meadow Drive and Napier Way and Filing 42 typical single-family home lots. A proposed 5' Type-R sump inlet at this low point will intercept the entirety of this concentrated runoff and a proposed 18" RCP (Pipe 6, Q_5 = 4.1 cfs, Q_{100}= 8.0 cfs) will convey the combined runoff from this inlet and Pipe 4, to an adjacent manhole to the east within Napier Way. This manhole connects with Pipe 5 and a proposed 24" RCP (Pipe 7, Q_5 = 10.1 cfs, Q_{100}= 20.1 cfs) conveys the combined runoff south-east within Napier Way toward the inlets at Design Points 5 & 6. In the event this inlet was completely clogged, the stormwater would overtop the high point to the south in Napier Way and drain to the south-east to the low point at Design Points 5 & 6.

Design Point 5 (Q_5 = 1.5 cfs, Q_{100}= 2.9 cfs) consists of runoff from Basin G, 0.50 acres of proposed Napier Way and Filing 42 typical single-family home lots. A proposed 5' Type-R sump inlet at this low point will intercept the entirety of this concentrated runoff and a proposed 18" RCP (Pipe 8) will convey the runoff to an adjacent manhole within Napier Way. In the event this inlet was completely clogged, the stormwater would

overtop the crown of the road and the high point to the south in Napier Way and drain to the south-east onto Redcloud Peak Drive and to the low point at Design Point 9.

Design Point 6 (Q_5 = 2.3 cfs, Q_{100}= 4.8 cfs) consists of runoff from Basin H, 1.05 acres of proposed Napier Way and Filing 42 typical single-family home lots. A proposed 5' Type-R sump inlet at this low point will intercept the entirety of this concentrated runoff and a proposed 18" RCP (Pipe 9) will convey the runoff to an adjacent manhole within Napier Way. This manhole connects with Pipes 7 & 8 and a proposed 30" RCP (Pipe 10, Q_5 = 13.5 cfs, Q_{100}= 27.1 cfs) conveys the combined runoff south-east within Napier Way then south-west in Redcloud Peak Drive and eventually into the proposed temporary Full Spectrum Detention and Water Quality Facility. In the event this inlet was completely clogged, the stormwater would overtop the crown of the road and the high point to the south in Napier Way and drain to the south-east onto Redcloud Peak Drive and to the low point at Design Point 9.

Design Point 7 (Q_5 = 3.6 cfs, Q_{100}= 7.6 cfs) consists of runoff from Basin Q, 1.69 acres of proposed Lone Oak Lane and Filing 40 typical single-family home lots. A proposed 5' Type-R sump inlet at this low point will intercept the entirety of this concentrated runoff and a proposed 18" RCP (Pipe 11) will convey the runoff to an adjacent manhole, combining with Pipe 12. In the event this inlet was completely clogged, the stormwater would overtop the high point to the south in Loan Oak Way and drain to the south-east onto Redcloud Peak Drive and the low point at Design Point 9.

Design Point 8 (Q_5 = 3.0 cfs, Q_{100}= 6.2 cfs) consists of runoff from Basin R, 1.36 acres of proposed Lone Oak Lane and Filing 40 typical single-family home lots. A proposed 5' Type-R sump inlet at this low point will intercept the entirety of this concentrated runoff and a proposed 18" RCP (Pipe 12) will convey the runoff to an adjacent manhole, combining with Pipe 11. A proposed 24" RCP (Pipe 13, Q_5 = 6.7 cfs, Q_{100}= 13.8 cfs) conveys the combined runoff south-east within Loan Oak Lane toward Redcloud Peak Drive. In the event this inlet was completely clogged, the stormwater would overtop the high point to the south in Loan Oak Way and drain to the south-east onto Redcloud Peak Drive and the low point at Design Point 9.

Design Point 9 (Q_5 = 5.4 cfs, Q_{100}= 10.8 cfs) consists of runoff from Basin J, 2.06 acres of proposed Lone Oak Lane, Napier Way, Redcloud Peak Drive and Filing 40 & 42 typical single-family home lots. A proposed 10' Type-R sump inlet at this low point will intercept the entirety of this concentrated runoff and a proposed 24" RCP (Pipe 14) will convey the runoff to an adjacent manhole, combining with Pipe 15. In the event this

inlet was completely clogged, the stormwater would overtop the high point to the south-west in Redcloud Peak Drive and drain to the south-west to the low point at Design Point 22.

Design Point 10 (Q_5 = 1.9 cfs, Q_{100}= 3.4 cfs) consists of runoff from Basin K, 0.70 acres of proposed Redcloud Peak Drive. A proposed 5' Type-R sump inlet at this low point will intercept the entirety of this concentrated runoff and a proposed 18" RCP (Pipe 15) will convey the runoff to an adjacent manhole, combining with Pipe 14. A proposed 24" RCP (Pipe 16, Q_5 = 7.2 cfs, Q_{100}= 14.1 cfs) conveys the combined runoff north-east within Redcloud Peak Drive to another junction manhole, combining with Pipes 13 & 10. A proposed 36" RCP (Pipe 17, Q_5 = 26.2 cfs, Q_{100}= 52.6 cfs) conveys the combined runoff south-west into the temporary Detention/Water Quality Facility located at Design Point 24. In the event this inlet was completely clogged, the stormwater would overtop the high point to the south-west in Redcloud Peak Drive and drain to the south-west to the low point at Design Point 23.

Design Point 11 (Q_5 = 5.2 cfs, Q_{100}= 10.4 cfs) consists of runoff from Basin E, 1.71 acres of proposed Graze Field Lane, Water Meadow Drive, and Filing 42 typical single-family home lots. A proposed 10' Type-R sump inlet at this low point will intercept the entirety of this concentrated runoff and a proposed 24" RCP (Pipe 18) will convey the runoff to an adjacent manhole, combining with Pipe 19. In the event this inlet was completely clogged, the stormwater would overtop the high point to the west at the Water Meadow Drive/Silvergrass Drive intersection and drain to the south down Silvergrass Drive to the low point at Design Point 16.

Design Point 12 (Q_5 = 1.1 cfs, Q_{100}= 2.2 cfs) consists of runoff from Basin F, 0.39 acres of proposed Water Meadow Drive, and Filing 42 typical single-family home lots. A proposed 5' Type-R sump inlet at this low point will intercept the entirety of this concentrated runoff and a proposed 18" RCP (Pipe 19) will convey the runoff to an adjacent manhole, combining with Pipe 18. A proposed 24" RCP (Pipe 20, Q_5 = 5.9 cfs, Q_{100}= 11.7 cfs) conveys the combined runoff west then south within Water Meadow Drive then Silvergrass Drive toward the sump inlets at Design Points 15 & 16. In the event this inlet was completely clogged, the stormwater would overtop the high point to the west at the Water Meadow Drive/Silvergrass Drive intersection and drain to the south down Silvergrass Drive to the low point at Design Point 16.

Design Point 13 (Q_5 = 3.2 cfs, Q_{100}= 6.7 cfs) consists of runoff from Basin N, 1.50 acres of proposed Loan Oak Lane and Filing 40 typical single-family home lots. A proposed 5' Type-R sump inlet at this low point

will intercept the entirety of this concentrated runoff and a proposed 18" RCP (Pipe 21) will convey the runoff to an adjacent manhole, combining with Pipe 22. In the event this inlet was completely clogged, the stormwater would overtop the high point to the west in Loan Oak Lane and drain west then to the south down Silvergrass Drive to the low point at Design Point 16.

Design Point 14 (Q_5 = 1.9 cfs, Q_{100}= 4.0 cfs) consists of runoff from Basin P, 0.85 acres of proposed Loan Oak Lane and Filing 40 typical single-family home lots. A proposed 5' Type-R sump inlet at this low point will intercept the entirety of this concentrated runoff and a proposed 18" RCP (Pipe 22) will convey the runoff to an adjacent manhole, combining with Pipe 21. A proposed 24" RCP (Pipe 23, Q_5 = 5.1 cfs, Q_{100}= 10.6 cfs) conveys the combined runoff west to a junction manhole at the Silvergrass/Loan Oak intersection. A proposed 24" RCP (Pipe 24, Q_5 = 10.2 cfs, Q_{100}= 20.8 cfs) conveys the combined runoff from Pipes 20 & 23 to the south within Silvergrass Drive toward the sump inlets at Design Points 15 & 16. In the event this inlet was completely clogged, the stormwater would overtop the high point to the west in Loan Oak Lane and drain west then to the south down Silvergrass Drive to the low point at Design Point 16.

Design Point 15 (Q_5 = 6.0 cfs, Q_{100}= 12.1 cfs) consists of runoff from Basin L, 2.27 acres of proposed Silvergrass Drive and Filing 41, 4-pack style single-family home lots. A proposed 10' Type-R sump inlet at this low point will intercept the entirety of this concentrated runoff and a proposed 24" RCP (Pipe 25) will convey the runoff to an adjacent manhole, combining with Pipes 24 & 26. In the event this inlet was completely clogged, the stormwater would overtop the high point to the south in Silvergrass Drive to the low point at Design Point 18.

Design Point 16 (Q_5 = 4.6 cfs, Q_{100}= 8.8 cfs) consists of runoff from Basin M, 1.32 acres of proposed Silvergrass Drive, Loan Oak Lane, Green Stalk Circle and Filing 40 typical single-family home lots. A proposed 10' Type-R sump inlet at this low point will intercept the entirety of this concentrated runoff and a proposed 18" RCP (Pipe 26) will convey the runoff to an adjacent manhole, combining with Pipes 24 & 25. A proposed 36" RCP (Pipe 27, Q_5 = 19.3 cfs, Q_{100}= 38.8 cfs) conveys the combined runoff to the south within Silvergrass Drive toward the sump inlets at Design Points 17 & 18. In the event this inlet was completely clogged, the stormwater would overtop the high point to the south in Silvergrass Drive to the low point at Design Point 17.

Design Point 17 (Q_5 = 3.1 cfs, Q_{100}= 6.5 cfs) consists of runoff from Basin U, 1.35 acres of proposed Silvergrass Drive, Green Stalk Circle, and Filing 40 typical single-family home lots. A proposed 5' Type-R sump inlet at this low point will intercept the entirety of this concentrated runoff and a proposed 18" RCP (Pipe 28) will convey the runoff to an adjacent manhole, combining with Pipes 27 & 29. In the event this inlet was completely clogged, the stormwater would overtop the high point to the south in Silvergrass Drive to the low point at Design Point 22 in Redcloud Peak Drive.

Design Point 18 (Q_5 = 4.1 cfs, Q_{100}= 8.1 cfs) consists of runoff from Basin V, 1.44 acres of proposed Silvergrass Drive, Sideoats Court, and Filing 41 4-pack style single-family home lots. A proposed 10' Type-R sump inlet at this low point will intercept the entirety of this concentrated runoff and a proposed 18" RCP (Pipe 29) will convey the runoff to an adjacent manhole, combining with Pipes 27 & 28. A proposed 36" RCP (Pipe 30, Q_5 = 25.5 cfs, Q_{100}= 51.6 cfs) conveys the combined runoff to the south within Silvergrass Drive to another junction manhole with the laterals within Green Stalk Circle and Sideoats Court (Pipes 33 & 34). In the event this inlet was completely clogged, the stormwater would overtop the high point to the south in Silvergrass Drive to the low point at Design Point 22 in Redcloud Peak Drive.

Design Point 19 (Q_5 = 3.6 cfs, Q_{100}= 7.4 cfs) consists of runoff from Basin S, 1.62 acres of proposed Green Stalk Circle and Filing 40 typical single-family home lots. A proposed 5' Type-R sump inlet at this low point will intercept the entirety of this concentrated runoff and a proposed 18" RCP (Pipe 31) will convey the runoff to an adjacent manhole, combining with Pipe 32. In the event this inlet was completely clogged, the stormwater would overtop the high point to the south in Green Stalk Circle and drain south to the low point at Design Point 17 in Silvergrass Drive.

Design Point 20 (Q_5 = 1.9 cfs, Q_{100}= 3.9 cfs) consists of runoff from Basin T, 0.82 acres of proposed Green Stalk Circle and Filing 40 typical single-family home lots. A proposed 5' Type-R sump inlet at this low point will intercept the entirety of this concentrated runoff and a proposed 18" RCP (Pipe 32) will convey the runoff to an adjacent manhole, combining with Pipe 31. A proposed 24" RCP (Pipe 33, Q_5 = 5.5 cfs, Q_{100}= 11.2 cfs) conveys the combined runoff to the south within Green Stalk Circle to another junction manhole with the storm main within Silvergrass Drive (Pipes 30 & 34). In the event this inlet was completely clogged, the stormwater would overtop the high point to the south in Green Stalk Circle and drain south to the low point at Design Point 17 in Silvergrass Drive.

Design Point 21 (Q_5 = 2.1 cfs, Q_{100}= 4.2 cfs) consists of runoff from Basin W, 0.73 acres of proposed Sideoats Court and Filing 40 typical single-family home lots. A proposed 5' Type-R sump inlet at this low point will intercept the entirety of this concentrated runoff and a proposed 18" RCP (Pipe 34) will convey the runoff to the junction manhole at the intersection with Silvergrass Drive, combining with Pipes 30 & 33. A proposed 42" RCP (Pipe 35, Q_5 = 32.3 cfs, Q_{100}= 65.5 cfs) conveys the combined runoff to the south-east within Silvergrass Drive and eventually into the temporary detention/water quality facility at Design Point 24. In the event this inlet was completely clogged, the stormwater would overtop the adjacent curb and walk of the cul-de-sac and drain west down the landscaped area and onto Banning Lewis Parkway.

Design Point 22 (Q_5 = 3.5 cfs, Q_{100}= 7.4 cfs) consists of runoff from Basin X, 1.35 acres of proposed Silvergrass Drive, Redcloud Peak Drive, and Filing 40 typical single-family home lots. A proposed 10' Type-R sump inlet at this low point will intercept the entirety of this concentrated runoff and a proposed 18" RCP (Pipe 45) will convey the runoff to the sump inlet across the street at Design Point 23. In the event this inlet was completely clogged, the stormwater would overtop the high point in Redcloud Peak Drive to the south and continue along Redcloud Peak Drive and onto Banning Lewis Parkway to the existing sump inlet at Design Point 30.

Design Point 23 (Q_5 = 1.6 cfs, Q_{100}= 2.9 cfs) consists of runoff from Basin Y, 0.70 acres of proposed Redcloud Peak Drive. A proposed 5' Type-R sump inlet at this low point will intercept the entirety of this concentrated runoff and a proposed 24" RCP (Pipe 46, Q_5 = 5.0 cfs, Q_{100}= 10.1 cfs) will convey the combined runoff from this sump inlet and Pipe 45, to a junction manhole with the main within Silvergrass Drive (Pipe 35). A proposed 42" RCP (Pipe 47, Q_5 = 36.2 cfs, Q_{100}= 73.3 cfs) conveys the combined runoff to the south-east into the temporary detention/water quality facility at Design Point 24. In the event this inlet was completely clogged, the stormwater would overtop the high point in Redcloud Peak Drive to the south and continue along Redcloud Peak Drive and onto Banning Lewis Parkway to the existing sump inlet at Design Point 30.

Design Point 24 (Q_5 = 61.6 cfs, Q_{100}= 126.2 cfs) consists of the total runoff from the proposed Filings 40-42 that drains into the proposed Temporary Full Spectrum Detention and Storm Water Quality Facility, including Basin EE, 1.19 acres of the pond and adjacent slope/landscape area. This facility will be removed and the storm system extended to the ultimate pond downstream (Pond 155 per MDDP) when the future development, south of Filing 40 is developed. The runoff consists of that from Pipes 14 & 47, each of which

have riprap pad protection at the outfall points (Sizing in Appendix). Pipe 17 requires Type L riprap (D50 = 9") 9' wide, 30' length and Pipe 47 requires Type M riprap (D50 = 12") 10' wide, 35' length.

Per the City of Colorado Springs Drainage Criteria Manual Vol. 1, Chapter 6, Table 6-2, 1-hour rainfall depths were used in the UD-Detention workbook and outlet drain time calculations. These values are: 2-year = 1.19", 5-year = 1.50", 10-year = 1.75", 25-year = 2.00", 50-year = 2.25", and 100-year = 2.52". A Site-Level Low Impact Development (LID) Credit by Impervious Reduction Faction (IRF) Method spreadsheet from UDFCD is located in the Appendix for the proposed runoff into the Temporary Pond, 28.17 acres at 61.9% impervious. The UD-Detention 3.07 was used to verify the pond volume and release rates for a full spectrum detention facility. This spreadsheet was used to size the three orifice holes on the face of the 4' x 4' outlet box (lowest orifice 1.5"x 2.3", middle orifice 2"x 2.3", and upper orifice 2"x 3"). The top of the outlet box is at elevation 6832.10 and the proposed riprap spillway (Type 'M' D_{50} = 12", width 30') will be located at an elevation 6835.00 (9' above the pond bottom). In the event of complete outlet box and pipe failure, the emergency spillway will pass the entire incoming 100-year event with a height less than 2.0'. The top of pond berm is at elevation 6838.00, providing a minimum 1' freeboard over the emergency overflow water surface elevation. The pond outlet box has as 24" RCP (Pipe 48, Q_5 = 0.8 cfs, Q_{100}= 31.1 cfs) outlet pipe that daylights on the south end of the pond with riprap pad protection (Type M, D50 = 12", 9' wide, 13' length) prior to the native ground existing drainage path to the Sand Creek tributary channel. The native ground downstream of the pipe release point and Reach 152 per MDDP, is very well vegetated and has more than adequate capacity for this restricted release rate, that is also less than Existing Conditions Design Point 2 at this location. Per the UD-Detention spreadsheet, this temporary facility releases the developed runoff at below predevelopment rates and at the required infiltration times for all storm events. Therefore, Full Spectrum Detention and water quality is provided for this developed runoff. As this is a temporary facility, it will be owned and maintained by the Banning Lewis Ranch Metropolitan District.

Design Point 25 (Q_5 = 5.0 cfs, Q_{100}= 34.3 cfs) consists of runoff from Basin OS-2, 18.53 acres of undeveloped, off-site land to the north of the proposed filings, and the runoff from Basin BB, 0.82 acres of open space and the rear lots of Filing 42, along Feathergrass Drive. The runoff from Basin OS-2, as described in the Existing Conditions, is the current tributary land south of Woodmen Blvd. that sheet flows south to the boundary line of the proposed filings. Basin BB drains to the north and into this proposed concrete curb chase that is attached to the 5' concrete walk/trail encompassing the Banning Lewis Ranch development. This proposed 5' wide curb chase w/6" curb heights on each side slopes from west to east and releases this

runoff into the native ground corridor (East Fork Sand Creek, Reach 152) to the east, in conformance with the DBPS and M.D.D.P. Update. As this runoff is undeveloped in nature, detention and storm water quality treatment is not required.

Design Point 28B (Q_5 = 10.2 cfs, Q_{100}= 20.0 cfs) consists of runoff from Basin NN, 2.19 acres of planned Banning Lewis Parkway located along the western boundary of the site, and from Basin AA, 1.62 acres of Water Meadow Drive, Filing 42 lots, and adjacent landscaped area. Banning Lewis Parkway was designed with drainage improvements installed per the "Final Drainage Report for Banning Lewis Ranch Filings 16, 19A, 19B, & 20 and Amendment to Phases I and II Banning Lewis Ranch Master Development Drainage Plan Update," by Classic Consulting Engineers & Surveyors, dated January 2017. An existing 15' Type R inlet at this location along Banning Lewis Parkway will intercept a portion of this runoff (Q_5 = 9.0 cfs, Q_{100}= 13.2 cfs), while the remainder continues to the sump inlet at DP-30 (Flow-by Q_5 = 1.2 cfs, Q_{100}= 6.8 cfs). With the construction of Filings 40-42, this portion of Banning Lewis Parkway will be constructed.

Design Point 30 (Q_5 = 11.4 cfs, Q_{100}= 26.7 cfs) consists of runoff from Basins BBB, Z, and the flow-by from DP-28B. Basin BBB is 1.96 acres of planned Banning Lewis Parkway located to the south and along the western boundary of the site. Basin Z is 1.77 acres of proposed Redcloud Peak Drive, Filings 40 lots, and adjacent landscaping area that drains onto Banning Lewis Parkway and to this inlet. The existing 10' Type R sump inlet at this location was installed with the Filing 19/20 construction, but Banning Lewis Parkway curb and asphalt paving was not. The runoff to this location has increased due to the developed conditions of Basin Z and therefore this inlet needs to be upsized to a 15' Type R Sump Inlet. The downstream pipe and storm system (including existing Pond 184 to the south) have adequate capacity for this incremental increase in runoff at Design Point 30.

EROSION CONTROL PLAN

The City of Colorado Springs Drainage Criteria Manual specifies an Erosion Control Plan and associated cost estimate be submitted with the Final Drainage Report. We respectfully request that the Erosion Control Plan and cost estimate be submitted in conjunction with the Grading Plan and construction assurances posted prior to obtaining a grading permit.

DRAINAGE CRITERIA & VARIANCE REQUEST

Hydrologic calculations were performed using the City of Colorado Springs Drainage Criteria Manual, May 2014. Stormwater quality analysis and Extended Detention Basin (EDB) design for the proposed temporary detention facility are per the Urban Drainage and Flood Control District Manual and UD-BMP Version 3.07 spreadsheet. The Rational Method was used to estimate stormwater runoff to the proposed inlets, storm sewer pipes, and outfall locations. The UDFCD UD-Inlet Excel workbook was used to verify street capacities, size sump inlets, and calculate interception and flow-by rates of at-grade inlets. Hydraulic grade lines (HGLs) for minor and major storm events will be provided as an Addendum to this report and with the construction drawings for the proposed filings. Preliminary pipe calculations have been included using the Bentley FlowMaster V8i for the 100-year storm event flow rates.

The use of a temporary pond is required to have a Variance request/approval per the Policy Clarification issued by the City of Colorado Springs on January 8, 2019. Per this clarification, an Inspection and Maintenance (I & M) Plan must be submitted with an approved Revocable Permit for the temporary FSD (full spectrum detention) facility. Financial assurance will be collected for the amount required to transition the temporary FSD to a Permanent BMP. Temporary FSD facilities that will be removed in the future must be on a parcel that has a recorded obligation to hold the pond pursuant to the final drainage report for the site. A Private Easement will be granted around the limits of the temporary pond and improvements, only to be removed with the future Final Plat and construction of the downstream permanent FSD. This temporary FSD facility may be utilized until such time as 50% development of the proposed permanent FSD facility tributary area occurs, or for a period of up to five years from the date of original drainage report approval, whichever date comes first. No extensions will be granted. If the downstream regional or sub-regional facility has not been constructed within 5 years of the date of original drainage report approval, it shall be the owner's responsibility to provide permanent full spectrum detention for the site.

STORMWATER QUALITY

The City of Colorado Springs requires the Four Step Process for receiving water protection that focuses on reducing runoff volumes, treating the water quality capture volume (WQCV), stabilizing drainage ways, and implementing long-term source controls. The Four Step Process pertains to management of smaller, frequently occurring storm events, as opposed to larger storms for which drainage and flood control

infrastructure are sized. Implementation of these four steps to achieve stormwater permit requirements is required. The site adheres to this Four Step Process as follows:

1. All developed runoff from the proposed site will be collected in the proposed storm system and routed to either the existing permanent full spectrum detention and water quality facility (Pond 184) or to a proposed temporary detention and water quality facility south of Filing 40 at Design Point 24. Individual home roof downspouts will be directed onto pervious landscape areas per the exhibits located in the Appendix. The additional grass buffer BMP provides the following: 1) Minimize directly impervious areas. 2) Provides initial pollutant and sediment removal before entering the storm system. Rear yard flows of those proposed lots adjacent to public streets will be directed over a grass buffer area (both landscaped and native grasses) to provide treatment of these small rear year areas.

2. The temporary pond provides Detention and Stormwater Quality Treatment for the entirety of the proposed development. The facilities in conjunction with Step 1 implementation above will address all required Water Quality Capture Volume and Slow Release Requirements.

3. The recipient of the drainage flows from the site is Reach 152 per the Kiowa Engineering MDDP and is the existing un-improved drainage channel at the east of the development and at the outfall of the Temporary Pond. The downstream corridor is very well established and as the detained developed release rate is far less than historic, no additional erosion will occur. Channel Improvements may be warranted as development occurs adjacent to Reach 152 and will be detailed with future reports.

4. A site-specific stormwater quality and erosion control plan and narrative will be submitted and approved by City Engineering prior to any disturbance within the project area. Details such as site specific source control construction BMPs as well as permanent BMPs will be detailed in this plan and narrative to protect receiving waters. Such construction BMPs include temporary sediment basins, inlet protection, silt fence, vehicle tracking control, and concrete washout areas.

FLOODPLAIN STATEMENT

No portion of this site is located within a floodplain as determined by the Flood Insurance Rate Maps (F.I.R.M.) Map Number 08041C 0545G effective date, December 7, 2018 (See Appendix).

DRAINAGE AND BRIDGE FEES FILING NO. 40, 41, & 42

Filings 40, 41, & 42 lie within Sand Creek Drainage Basin boundaries. Per the current Development Plan Agreement between d.b.a. Oakwood Homes (developer) and the City, the Drainage, Pond and Bridge fee obligations to-date as well as future fee obligations will be deferred at the time of platting as the cost of required facilities exceeds the over-all fee obligations for this development. This agreement was with the previous owner and must be updated/re-approved with the recent change in ownership. A letter from the Developer acknowledging the need for the new agreement and statements on what is to be done if the new agreement is not approved is located in the Appendix of this report. However, the year 2020 drainage and bridge fees for each of the proposed Filings area are as follows:

Drainage Fees <u>Filing No. 40</u>	
$13,309/acre x 15.639 acres	$ 208,139.45
Bridge Fees:	
$791/acre x 15.639 acres	$ 12,370.45
Pond Fees:	
$1,070/acre x 15.639 acres	$ 16,733.73
Pond Facility Fees:	
$3,823/acre x 15.639 acres	$ 59,787.90
Surcharge Fees:	
$1,386/acre x 15.639 acres	$ 21,675.65
TOTALS:	**<u>$ 318,707.18</u>**

Drainage Fees <u>Filing No. 41</u>	
$13,309/acre x 3.753 acres	$ 49,948.68
Bridge Fees:	
$791/acre x 3.753 acres	$ 2,968.62
Pond Fees:	
$1,070/acre x 3.753 acres	$ 4,015.71
Pond Facility Fees:	
$3,823/acre x 3.753 acres	$ 14,347.72
Surcharge Fees:	
$1,386/acre x 3.753 acres	$ 5,201.66
TOTALS:	**<u>$ 76,482.39</u>**

Drainage Fees <u>Filing No. 42</u>	
$13,309/acre x 12.692 acres	$ 168,917.83
Bridge Fees:	
$791/acre x 12.692 acres	$ 10,039.37
Pond Fees:	
$1,070/acre x 12.692 acres	$ 13,580.44
Pond Facility Fees:	
$3,823/acre x 12.692 acres	$ 48,521.52
Surcharge Fees:	
$1,386/acre x 12.692 acres	$ 17,591.11
TOTALS:	**<u>$ 258,650.27</u>**

Fees are due prior to plat recordation. Also, prior to issuance of building permits the plat will need to be recorded and appropriate drainage facility and erosion control assurances will need to be posted.

CONSTRUCTION COST OPINION

Public Drainage Facilities Non-reimbursable (FILING NO. 40)

ITEM	DESCRIPTION	QUANTITY	UNIT COST	COST
1.	5' Type-R Inlet	10 EACH	$4,000/EA	$ 40,000.00
2.	10' Type-R Inlet	5 EACH	$6,000/EA	$ 30,000.00
3.	15' D-10-R Inlet	1 EACH	$8,000/EA	$ 8,000.00
4.	18" RCP Storm Drain	508 LF	$55/LF	$ 27,940.00
5.	24" RCP Storm Drain	1,545 LF	$70/LF	$ 108,150.00
6.	30" RCP Storm Drain	150 LF	$95/LF	$ 14,250.00
7.	36" RCP Storm Drain	596 LF	$140/LF	$ 83,440.00
8.	42" RCP Storm Drain	395 LF	$170/LF	$ 67,150.00
9.	14' x 6' Box Culvert	74 LF	$650/LF	$ 48,100.00
10.	Type I Storm MH	5 EACH	$6,500/EA	$ 32,500.00
11.	Type II Storm MH	9 EACH	$5,300/EA	$ 47,700.00
	SUB-TOTAL			$ 507,230.00
	10% ENGINEERING			$ 50,723.00
	5% CONTINGENCIES			<u>$ 25,361.50</u>
	TOTAL			**<u>$ 583,314.50</u>**

Private Drainage Facilities Non-reimbursable (FILING NO. 40)

ITEM	DESCRIPTION	QUANTITY	UNIT COST	COST
1.	24" RCP Storm Drain	95 LF	$70/LF	$ 6,650.00
2.	Temp. Pond Outlet (4' x 4')	1 EACH	$6,500/EA	$ 6,500.00
	SUB-TOTAL			$ 13,150.00
	10% ENGINEERING			$ 1,315.00
	5% CONTINGENCIES			$ 657.50
	TOTAL			**$ 15,122.50**

Public Drainage Facilities Non-reimbursable (FILING NO. 42)

ITEM	DESCRIPTION	QUANTITY	UNIT COST	COST
1.	5' Type-R Inlet	7 EACH	$4,000/EA	$ 28,000.00
2.	10' Type-R Inlet	1 EACH	$6,000/EA	$ 6,000.00
3.	18" RCP Storm Drain	145 LF	$55/LF	$ 7,975.00
4.	24" RCP Storm Drain	505 LF	$70/LF	$ 35,350.00
5.	30" RCP Storm Drain	490 LF	$95/LF	$ 46,550.00
6.	Type I Storm MH	1 EACH	$6,500/EA	$ 6,500.00
7.	Type II Storm MH	4 EACH	$5,300/EA	$ 21,200.00
	SUB-TOTAL			$ 151,575.00
	10% ENGINEERING			$ 15,157.50
	5% CONTINGENCIES			$ 7,578.75
	TOTAL			**$ 174,311.25**

Public Drainage Facilities Non-reimbursable – COST FOR PERMANENT POND

ITEM	DESCRIPTION	QUANTITY	UNIT COST	COST
1.	36" Impact/Forebay	1 EACH	$35,000/EA	$ 35,000.00
2.	42" Impact/Forebay	1 EACH	$35,000/EA	$ 35,000.00
3.	Trickle Channel	290 LF	$79/EA	$ 22,910.00
4.	Outlet Box (8' x 4')	1 EACH	$25,000/EA	$ 25,000.00
	SUB-TOTAL			$ 117,910.00
	10% ENGINEERING			$ 11,791.00
	5% CONTINGENCIES			$ 5,895.50
	TOTAL (DETENTION POND)			**$ 135,596.50**

CLASSIC CONSULTING ENGINEERS & SURVEYORS

Classic Consulting Engineers & Surveyors cannot and does not guarantee that the construction cost will not vary from these opinions of probable construction costs. These opinions represent our best judgment as design professionals familiar with the construction industry and this development in particular.

SUMMARY

The developed runoff from the proposed Banning Lewis Ranch Filings 40, 41, & 42 is collected in a proposed Public storm sewer system and routed to a private temporary full spectrum detention/water quality pond. This report is in general conformance with all applicable master drainage studies and previous reports for the Banning Lewis Ranch area. All drainage facilities were sized using the current City of Colorado Springs Drainage Criteria and Urban Drainage and Flood Control District Criteria and will safely discharge storm water runoff to adequate outfalls. Therefore, the developed site runoff and proposed stormwater facilities will not adversely affect the downstream and surrounding developments.

PREPARED BY:

Classic Consulting Engineers & Surveyors, LLC

Matthew Larson
Project Manager

mal/257003/BLR 40-42-FDR.doc

REFERENCES

1. City of Colorado Springs Drainage Criteria Manuals Volume 1 & 2, May 2014.

2. "Sand Creek Drainage Basin Planning Study," Kiowa Engineering Corp, dated March 1996.

3. "Phases 1 and II Banning Lewis Ranch Master Development Drainage Plan Update," by Kiowa Engineering Corporation dated December 6, 2012.

4. Drainage Criteria Manual (Volume 3) latest revision April 2008, Urban Drainage and Flood Criteria District.

5. "Preliminary Drainage Report for Banning Lewis Ranch – Village B1 PUD Concept Plan," by Classic Consulting Engineers and Surveyors, LLC dated January 2020.

6. "Final Drainage Report for Banning Lewis Ranch Filings 16, 19A, 19B, & 20 and Amendment to Phases I and II Banning Lewis Ranch Master Development Drainage Plan Update," by Classic Consulting Engineers and Surveyors, LLC dated January 2017.

APPENDIX

OAKWOOD
HOMES

March 5, 2018

City of Colorado Springs
Water Resources Engineering Division
30 South Nevada, Suite 401
Colorado Springs, CO 80903

RE: Banning Lewis Ranch Village 3 – Filings 21, 22, 23, & 25 Drainage & Bridge Basin Fees

ATTN: Steve Rossoll

Prior to the recent change in ownership of the Oakwood Homes holdings in Banning Lewis Ranch, a Development Agreement with the City has been used to defer the Drainage Basin Fees associated with platting lots in Banning Lewis Ranch. Per this DA (Development Agreement) the Drainage, Pond, and Bridge fee obligations to-date as well as future obligations will be deferred at the time of platting as the cost of the required facilities exceeds the over-all fee obligations for Banning Lewis Ranch.

We, the developer, understand that this agreement may need to be updated/re-approved due to the change in ownership and understand that the drainage fees are being deferred pending approval of the new DA. If for any reason the updated/revised DA is not approved, then we, the developer, will be responsible for paying all applicable drainage fees per the drainage fee schedule. We acknowledge that the City can and may withhold building permits until the fees are paid.

Sincerely,

Aric Jones
Assistant Secretary
Clayton Properties Group II Inc.,
DBA Oakwood Colorado Springs

WATER RESOURCES
ENGINEERING DIVISION

POLICY STATEMENT AND CLARIFICATION

SUBJECT: TEMPORARY FULL SPECTRUM DETENTION (FSD) FACILITIES

DATE: JANUARY 8, 2019

OVERVIEW:
The 2014 City of Colorado Springs Drainage Criteria Manual (DCM) allows for the use of temporary (non-construction) Best Management Practices (BMPs). However, only design guidance for permanent Full Spectrum Detention (FSD) BMPs is provided. When a proposed regional or sub-regional BMP will provide the required detention for a site, initial phases of construction may occur prior to the construction of the downstream BMP. This document describes the temporary FSD BMP requirements for such instances.

DETAILS:
The DCM provides the following guidance:

Volume 1, Chapter 3, Section 2.5 states, "Where projects are expected to be phased, master plans shall address the conditions that may occur in the period between development phases, including interim improvements, to comply with this Manual."

Volume 1, Chapter 3, Section 6.4 states, "Detention facilities shall be provided for all new development sites larger than 1 acre unless an approved basin plan includes the site being developed."

Volume 1, Chapter 3, Section 6.5 states, "Unless an alternative detention concept is approved through a master planning process, the full spectrum detention approach, as defined in Chapter 13 of this Manual, shall be implemented as the standard detention approach."

Volume 1, Chapter 13, Section 3.1 states, "A new development must implement regional or sub-regional detention at a subdivision or project scale instead of providing on-site detention basins at the time each lot is developed. For large subdivisions, regional or sub-regional detention should be implemented by the first sub-divider rather than passing on the responsibility for detention to owners of individual filings."

Volume 1, Chapter 13, Section 3.1.1 states, "If the regional pond has not been constructed, temporary on-site detention (and water quality treatment) may be required for individual development projects until regional detention is completed, the requirement for constructing regional detention or for temporary on-site detention will depend on the specific conditions of the proposed development."

Volume 1, Chapter 13, Section 3.1.2 states, "The conditions listed previously for regional detention shall be adhered to for sub-regional facilities."

POLICY:
Temporary FSD facilities will be allowed on a case by case basis, and will require a variance for use. Where allowed, the temporary FSD facility must function as a full spectrum detention facility in terms of design volumes and drain times. The 100-year release, orifice sizing, and orifice spacing must be designed in accordance with published criteria for Permanent BMPs.

Temporary facilities must include erosion mitigation measures as necessary, such as riprap protection at concentrated flow inlets.

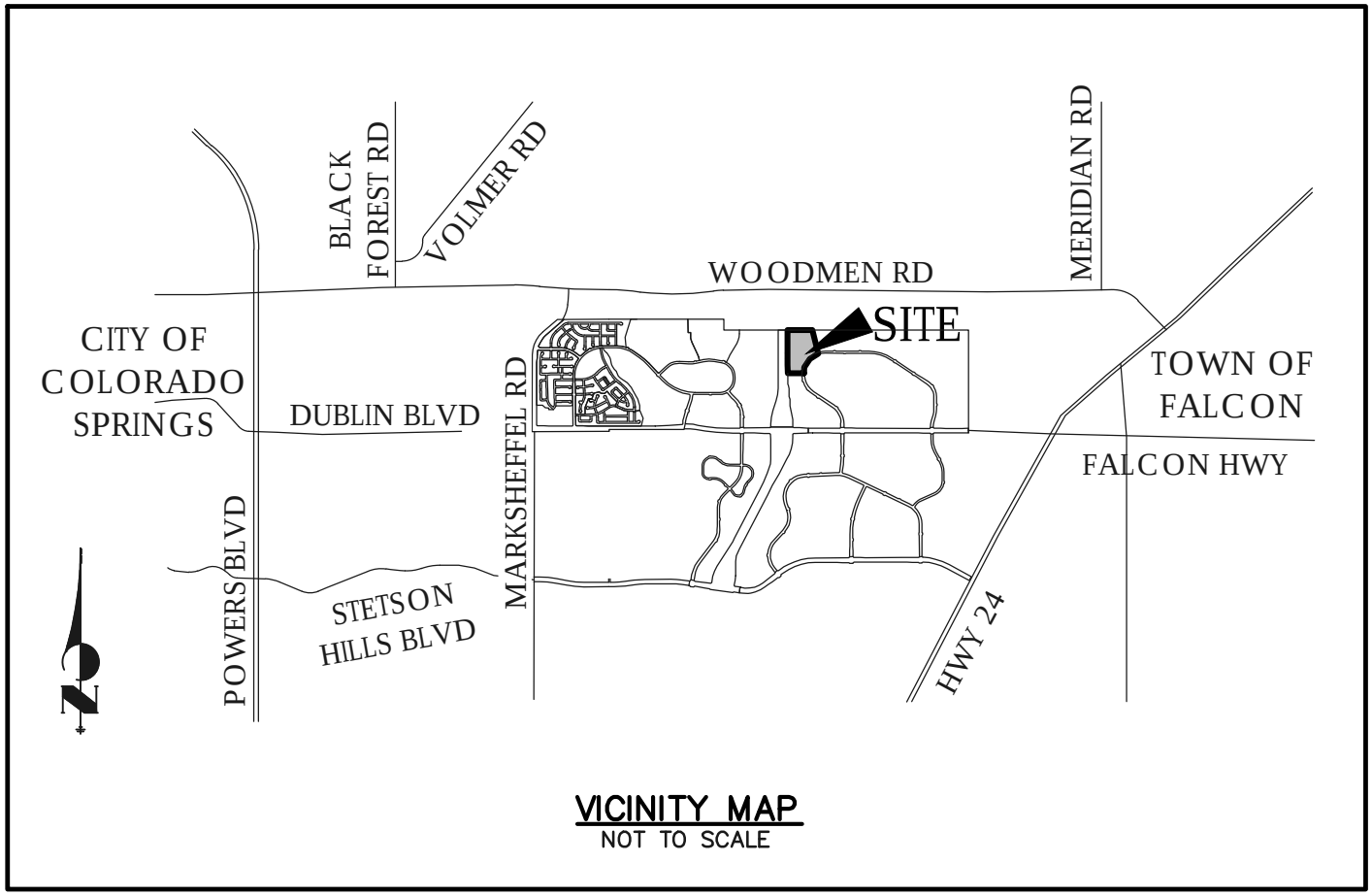
An Inspection and Maintenance (I&M) Plan must be submitted with an approved Revocable Permit for the temporary FSD facility. Financial assurances will be collected for the amount required to transition the temporary FSD facility to a Permanent BMP. Temporary FSD facilities that will be modified into regional or semi-regional Permanent BMPs must be platted, located either on tract that has been dedicated to the City or a public easement, and privately maintained. Temporary FSD facilities that will be modified into on-site facilities must be platted, and must be privately maintained. Temporary FSD facilities that will be removed in the future must be on a parcel that has a recorded obligation to hold the pond pursuant to the final drainage report for the site. No drainage reimbursements will be available for temporary facilities.

The temporary FSD facility may be utilized until such time as 50% of the development of the proposed permanent FSD facility tributary area occurs, or for a period of up to five years from the date of original drainage report approval, whichever date comes first. No extensions will be granted. If the downstream regional or sub-regional facility has not been constructed within five years of the date of original drainage report approval, it shall be the owner's responsibility to provide permanent full spectrum detention for the site. The drainage report containing the temporary FSD facility calculations must have the following disclaimer statement included as a condition of approval:

"A temporary FSD facility is being constructed as an interim measure until the downstream regional detention facility, located _____, is constructed. If the downstream facility is not constructed within five years of the approval date of this report, it is the owner's responsibility to provide permanent full spectrum detention for the site. Subsequent report approvals will not extend this deadline."

VICINITY MAP

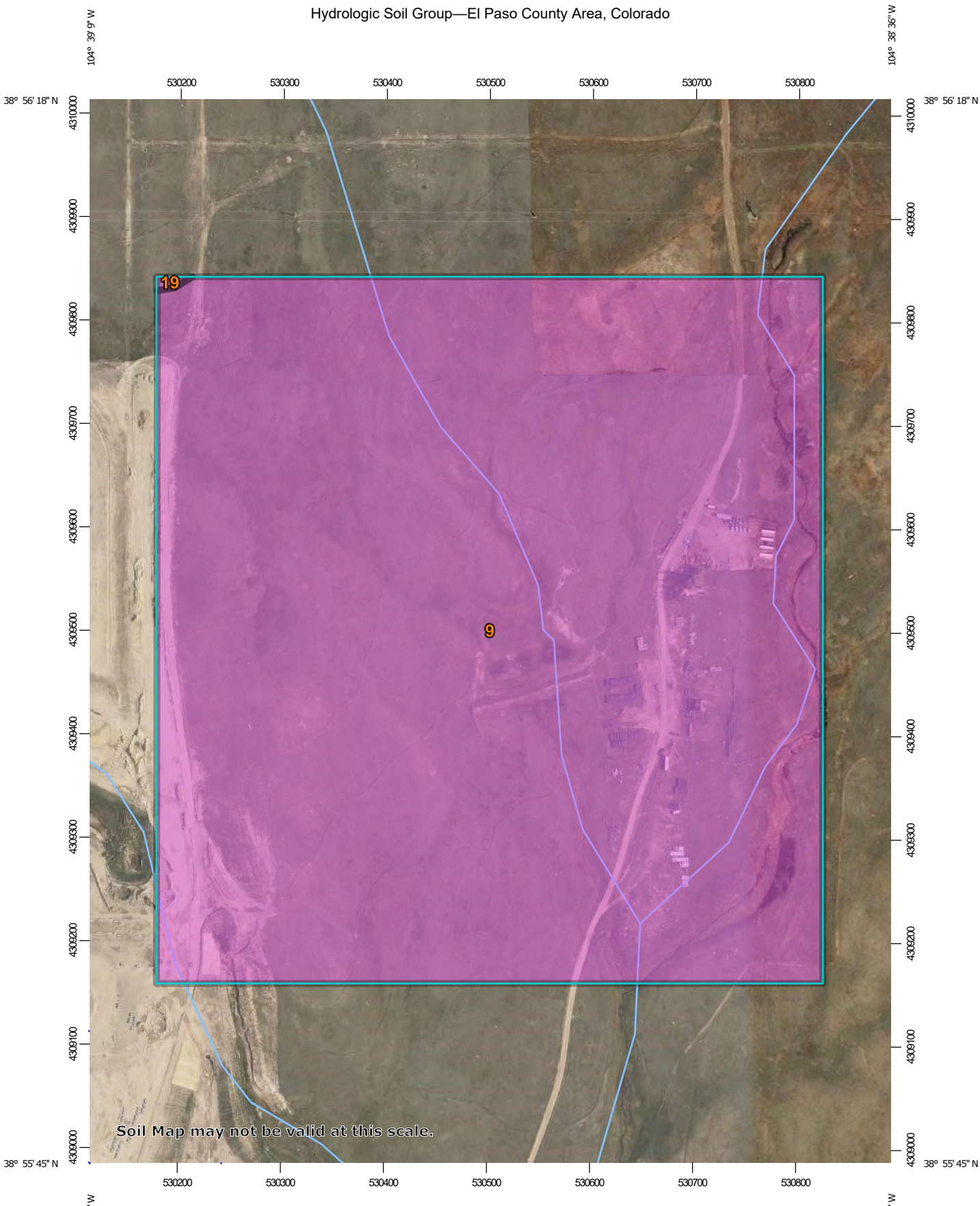
CLASSIC SM
CONSULTING
ENGINEERS & SURVEYORS



VICINITY MAP
NOT TO SCALE

SOILS MAP (S.C.S SURVEY)

CLASSIC SM
CONSULTING
ENGINEERS & SURVEYORS



Map Scale: 1:5,010 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 50 100 200 300

Feet
0 200 400 800 1200

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

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil 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 17, Sep 13, 2019

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

Date(s) aerial images were photographed: Aug 19, 2018—May 26, 2019

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
9	Blakeland-Fluvaquentic Haplaquolls	A	109.5	99.9%
19	Columbine gravelly sandy loam, 0 to 3 percent slopes	A	0.1	0.1%
Totals for Area of Interest			**109.6**	**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

F.E.M.A. MAP

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ENGINEERS & SURVEYORS

National Flood Hazard Layer FIRMette

FEMA

38°56'11.15"N

104°39'18.22"W

104°38'40.76"W

38°55'43.16"N

Feet

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

1:6,000

Legend

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

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

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

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

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

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

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

N

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

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

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 4/26/2020 at 10:10:38 AM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

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

LOT INFILTRATION EXHIBITS

CLASSIC SM
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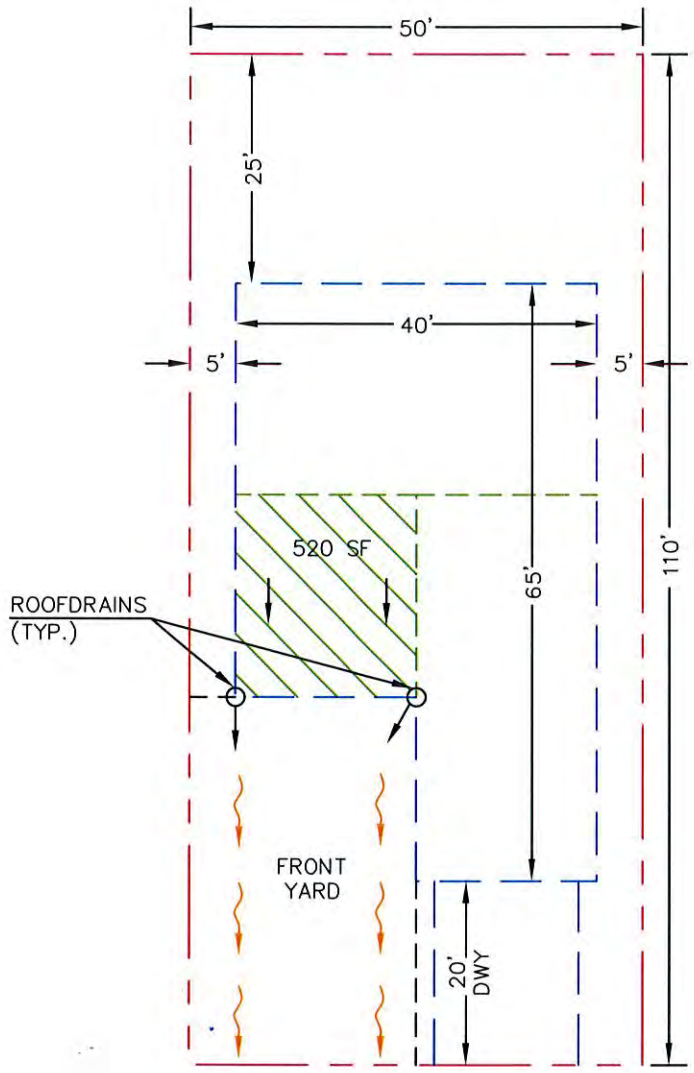

TYPICAL LOT (SIZE MAY VARY)

LOT SIZE: 5500 SF

40% LOT COVERAGE: 2200 SF FOOTPRINT + 20'x20' DRIVEWAY = 2600 SF IMPERVIOUSNESS

20% OF IMPERVIOUS: 20% OF 2600 SF= 520 SF MIN. TREATED AREA

10% OF IMPERVIOUS: 10% OF 2600 SF= 260 SF MIN. TREATMENT AREA

SINGLE FAMILY RESIDENTAIL
APPROACH TO SATISFYING
STEP 1
2519.00
SHEET 1 OF 1
03/22/17

NOTE:

BOTH TREATED AREA AND TREATMENT AREA CAN BE ANY PART OF HOME/HARDSCAPE OR LOT.

DOWNSPOUTS TO BE RELEASED WITHIN LOT AREA DISTANCE TO ENSURE REQUIRED TREATMENT AREA DISTANCE IS ACHIEVED (15' MINIMUM).

SCALE
1"= 20'

CLASSIC SM
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Colorado Springs, Colorado 80903
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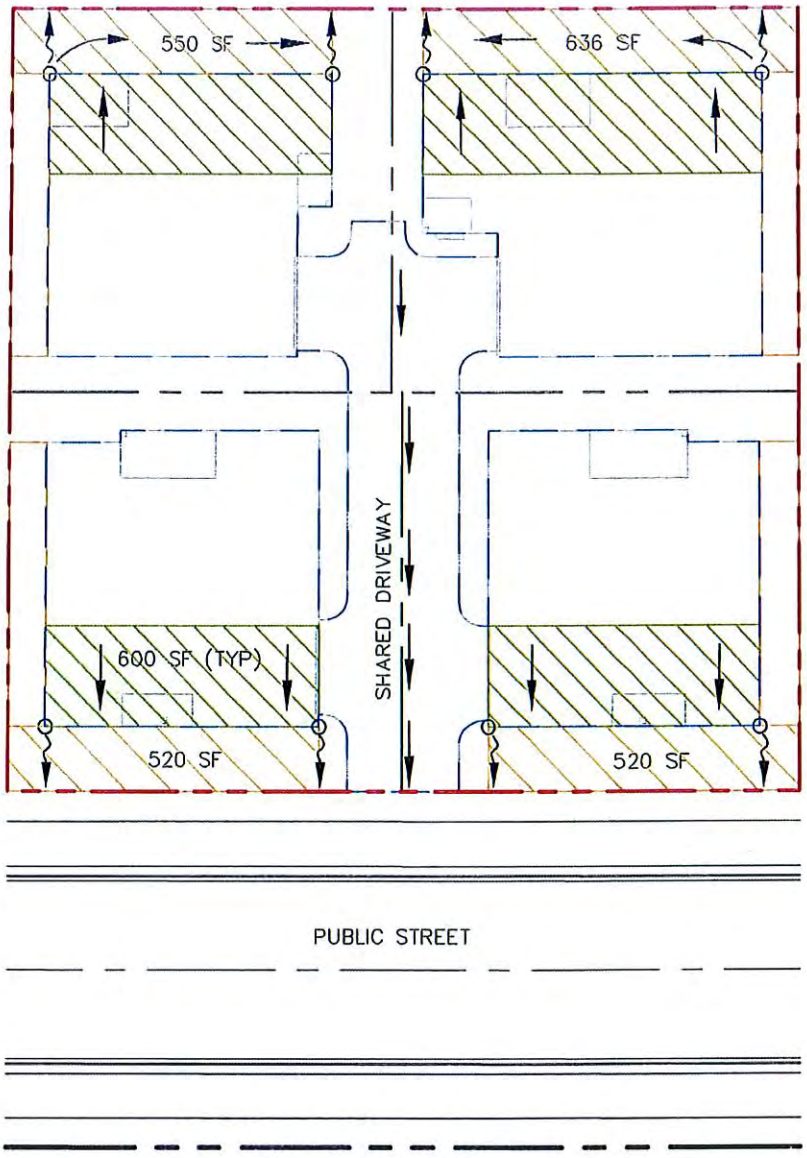

LOT SIZE: 18,545 SF (ALL 4 LOTS)

LOT COVERAGE: 11,910 SF (BUILDING FOOTPRINT + SHARED DRIVEWAY) IMPERVIOUSNESS

20% OF IMPERVIOUS: 20% OF 11,910 SF= 2,382 SF MIN. TREATED AREA

10% OF IMPERVIOUS: 10% OF 11,910 SF= 1,191 SF MIN. TREATMENT AREA

NOTE: DOWNSPOUTS TO BE DIRECTED TO ADJACENT LANDSCAPED AREAS WHERE POSSIBLE TO MINIMIZE DIRECT RELEASE ONTO SHARED DRIVEWAY

BLR FILING 18 TYPICAL 4 PACK
APPROACH TO SATISFYING STEP 1
2366.38
3/23/17

SCALE
1"= 30'

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CALCULATIONS
EXISTING CONDITIONS

CLASSIC SM
CONSULTING
ENGINEERS & SURVEYORS

JOB NAME: ***Banning Lewis Ranch Filings 40-42***
JOB NUMBER: ***2570.03***
DATE: ***04/02/20***
CALCULATED BY: ***MAL***

FINAL DRAINAGE REPORT ~ BASIN RUNOFF COEFFICIENT SUMMARY (EXISTING CONDITIONS)

BASIN	TOTAL AREA (AC)	IMPERVIOUS AREA / STREETS			LOTS/LANDSCAPE/UNDEV. AREAS (NOT PAVEMENT)			WEIGHTED		WEIGHTED CA					
		AREA (AC)	C(5)	C(100)	AREA (AC)	C(5)	C(100)	C(5)	C(100)	CA(2)	CA(5)	CA(10)	CA(25)	CA(50)	CA(100)
OS-2	18.53	0.00	0.90	0.96	18.53	0.08	0.35	0.08	0.35	0.37	1.48	2.78	4.63	5.56	6.49
EX-A	13.06	0.00	0.90	0.96	13.06	0.08	0.35	0.08	0.35	0.26	1.04	1.96	3.27	3.92	4.57
EX-B	1.21	0.00	0.90	0.96	1.21	0.08	0.35	0.08	0.35	0.02	0.10	0.18	0.30	0.36	0.42
EX-C	19.38	0.00	0.90	0.96	19.38	0.08	0.35	0.08	0.35	0.39	1.55	2.91	4.85	5.81	6.78
NN	2.19	2.15	0.90	0.96	0.04	0.08	0.35	0.89	0.95	1.91	1.94	1.98	2.03	2.05	2.08
BBB	1.96	1.96	0.90	0.96	0.00	0.45	0.59	0.90	0.96	1.74	1.76	1.80	1.84	1.86	1.88

JOB NAME: Banning Lewis Ranch Filings 40-42
JOB NUMBER: **2570.03**
DATE: **4/2/2020**
CALC'D BY: **MAL**

FINAL DRAINAGE REPORT ~ BASIN RUNOFF SUMMARY (EXISTING CONDITIONS)

BASIN	WEIGHTED		OVERLAND				STREET / CHANNEL FLOW				Tc	INTENSITY		TOTAL FLOWS	
	CA(5)	CA(100)	C(5)	Length (ft)	Height (ft)	Tc (min)	Length (ft)	Slope (%)	Velocity (fps)	Tc (min)	TOTAL (min)	I(5) (in/hr)	I(100) (in/hr)	Q(5) (cfs)	Q(100) (cfs)
OS-2	1.48	6.49	0.08	180	8	15.1	1590	1.4%	4.1	6.4	21.5	2.98	5.00	4.4	32.4
EX-A	1.04	4.57	0.08	200	4	20.7	1280	1.5%	4.3	5.0	25.7	2.71	4.55	2.8	20.8
EX-B	0.10	0.42	0.08	100	22	6.6	100	18.0%	14.8	0.1	6.8	4.72	7.92	0.5	3.4
EX-C	1.55	6.78	0.08	100	4	11.7	830	2.9%	6.0	2.3	14.0	3.63	6.09	5.6	41.3
NN	1.94	2.08	0.08	10	0.1	5.8	1250	1.6%	4.4	4.7	10.5	4.05	6.80	7.9	14.1
BBB	1.76	1.88	0.08	10	1	2.7	580	1.3%	4.0	2.4	5.1	5.13	8.61	9.0	16.2

JOB NAME:	***Banning Lewis Ranch Filings 40-42***
JOB NUMBER:	***2570.03***
DATE:	***04/02/20***
CALCULATED BY:	***MAL***

FINAL DRAINAGE REPORT ~ SURFACE ROUTING SUMMARY (EXISTING CONDITIONS)

Design Point(s)	Contributing Basins	Equivalent CA(5)	Equivalent CA(100)	Maximum Tc	Intensity		Flow		Inlet Size
					I(5)	I(100)	Q(5)	Q(100)	
1	BASIN OS-2	1.48	6.49	21.5	2.98	5.00	4.4	32.4	SURFACE FLOW
2	BASIN EX-C	1.55	6.78	14.0	3.63	6.09	5.6	41.3	SURFACE FLOW
3	BASIN EX-B	0.10	0.42	6.8	4.72	7.92	0.5	3.4	SURFACE FLOW
28B	BASIN NN	1.94	2.08	10.5	4.05	6.80	7.9	14.1	EX. 15' Type R At-Grade
30	BASIN BBB + BASIN OS-2 + BASIN EX-A + FB DP-28B	4.38	13.40	25.7	2.71	4.55	11.9	61.0	EX. 10' Type R Sump

JOB NAME:	***Banning Lewis Ranch Filings 40-42***
JOB NUMBER:	***2570.03***
DATE:	***04/02/20***
CALCULATED BY:	***MAL***

At-Grade Inlet - Flow Routing (EXISTING CONDITIONS)

Design Point	TOTAL						INTERCEPTED				FLOW-BY			
	CA5	CA100	I5	I100	Q5	Q100	Q5	Q100	CA5	CA100	Q5	Q100	CA5	CA100
28B	1.94	2.08	4.05	6.80	7.9	14.1	7.5	11.0	1.85	1.62	0.4	3.1	0.09	0.46

CALCULATIONS
DEVELOPED CONDITIONS

CLASSIC SM
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JOB NAME: ***Banning Lewis Ranch Filings 40-42***
JOB NUMBER: ***2570.03***
DATE: ***04/02/20***
CALCULATED BY: ***MAL***

FINAL DRAINAGE REPORT ~ BASIN RUNOFF COEFFICIENT SUMMARY (DEVELOPED CONDITIONS)

BASIN	TOTAL AREA (AC)	IMPERVIOUS AREA / STREETS			LOTS/LANDSCAPE/UNDEV. AREAS (NOT PAVEMENT)			WEIGHTED		WEIGHTED CA					
		AREA (AC)	C(5)	C(100)	AREA (AC)	C(5)	C(100)	C(5)	C(100)	CA(2)	CA(5)	CA(10)	CA(25)	CA(50)	CA(100)
OS-2	18.53	0.00	0.90	0.96	18.53	0.08	0.35	0.08	0.35	0.37	1.48	2.78	4.63	5.56	6.49
A	1.44	0.37	0.90	0.96	1.07	0.45	0.59	0.57	0.69	0.77	0.81	0.86	0.93	0.96	0.99
B	1.09	0.34	0.90	0.96	0.75	0.45	0.59	0.59	0.71	0.61	0.64	0.68	0.72	0.75	0.77
C	0.83	0.33	0.90	0.96	0.50	0.45	0.59	0.63	0.74	0.50	0.52	0.55	0.58	0.60	0.61
D	0.73	0.34	0.90	0.96	0.39	0.45	0.59	0.66	0.76	0.46	0.48	0.50	0.53	0.55	0.56
E	1.71	0.59	0.90	0.96	1.12	0.45	0.59	0.61	0.72	0.98	1.04	1.09	1.16	1.20	1.23
F	0.39	0.15	0.90	0.96	0.24	0.45	0.59	0.62	0.73	0.23	0.24	0.26	0.27	0.28	0.29
G	0.50	0.20	0.90	0.96	0.30	0.45	0.59	0.63	0.74	0.30	0.32	0.33	0.35	0.36	0.37
H	1.05	0.20	0.90	0.96	0.85	0.45	0.59	0.54	0.66	0.53	0.56	0.60	0.65	0.67	0.69
J	2.06	0.89	0.90	0.96	1.17	0.39	0.55	0.61	0.73	1.20	1.26	1.33	1.42	1.47	1.50
K	0.47	0.47	0.90	0.96	0.00	0.45	0.59	0.90	0.96	0.42	0.42	0.43	0.44	0.45	0.45
L	2.27	0.51	0.90	0.96	1.76	0.56	0.71	0.64	0.77	1.39	1.44	1.53	1.64	1.68	1.74
M	1.32	0.67	0.90	0.96	0.65	0.45	0.59	0.68	0.78	0.86	0.90	0.93	0.98	1.01	1.03
N	1.50	0.21	0.90	0.96	1.29	0.45	0.59	0.51	0.64	0.72	0.77	0.83	0.89	0.93	0.96
P	0.85	0.20	0.90	0.96	0.65	0.45	0.59	0.56	0.68	0.44	0.47	0.50	0.54	0.56	0.58

JOB NAME: ***Banning Lewis Ranch Filings 40-42***
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FINAL DRAINAGE REPORT ~ BASIN RUNOFF COEFFICIENT SUMMARY (DEVELOPED CONDITIONS)

BASIN	TOTAL AREA (AC)	IMPERVIOUS AREA / STREETS			LOTS/LANDSCAPE/UNDEV. AREAS (NOT PAVEMENT)			WEIGHTED		WEIGHTED CA					
		AREA (AC)	C(5)	C(100)	AREA (AC)	C(5)	C(100)	C(5)	C(100)	CA(2)	CA(5)	CA(10)	CA(25)	CA(50)	CA(100)
Q	1.69	0.28	0.90	0.96	1.41	0.45	0.59	0.52	0.65	0.83	0.89	0.95	1.02	1.07	1.10
R	1.36	0.27	0.90	0.96	1.09	0.45	0.59	0.54	0.66	0.69	0.73	0.78	0.84	0.88	0.90
S	1.62	0.30	0.90	0.96	1.32	0.45	0.59	0.53	0.66	0.81	0.86	0.92	0.99	1.04	1.07
T	0.82	0.21	0.90	0.96	0.61	0.45	0.59	0.57	0.68	0.44	0.46	0.49	0.53	0.55	0.56
U	1.35	0.51	0.90	0.96	0.84	0.33	0.51	0.55	0.68	0.69	0.74	0.79	0.85	0.89	0.92
V	1.44	0.36	0.90	0.96	1.08	0.56	0.71	0.65	0.77	0.89	0.93	0.98	1.05	1.08	1.11
W	0.73	0.36	0.90	0.96	0.37	0.36	0.53	0.63	0.74	0.44	0.46	0.48	0.51	0.53	0.54
X	1.35	0.56	0.90	0.96	0.79	0.31	0.5	0.55	0.69	0.70	0.75	0.80	0.87	0.90	0.93
Y	0.41	0.38	0.90	0.96	0.03	0.08	0.35	0.84	0.92	0.34	0.34	0.35	0.36	0.37	0.38
Z	1.77	0.55	0.90	0.96	1.22	0.20	0.42	0.42	0.59	0.66	0.74	0.82	0.93	0.99	1.04
AA	1.62	0.00	0.90	0.96	1.62	0.36	0.53	0.36	0.53	0.52	0.58	0.66	0.76	0.83	0.86
BB	0.82	0.00	0.90	0.96	0.82	0.23	0.45	0.23	0.45	0.15	0.19	0.24	0.30	0.34	0.37
CC	0.46	0.00	0.90	0.96	0.46	0.39	0.55	0.39	0.55	0.16	0.18	0.20	0.23	0.24	0.25
DD	0.81	0.00	0.90	0.96	0.81	0.45	0.59	0.45	0.59	0.33	0.36	0.40	0.44	0.46	0.48
EE	1.19	0.00	0.90	0.96	1.19	0.08	0.35	0.08	0.35	0.02	0.10	0.18	0.30	0.36	0.42
NN	2.19	2.15	0.90	0.96	0.04	0.08	0.35	0.89	0.95	1.91	1.94	1.98	2.03	2.05	2.08
BBB	1.96	1.96	0.90	0.96	0.00	0.45	0.59	0.90	0.96	1.74	1.76	1.80	1.84	1.86	1.88

JOB NAME: Banning Lewis Ranch Filings 40-42
JOB NUM **2570.03**
DATE: **4/2/2020**
CALC'D B **MAL**

FINAL DRAINAGE REPORT ~ BASIN RUNOFF SUMMARY (DEVELOPED CONDITIONS)

BASIN	WEIGHTED		OVERLAND				STREET / CHANNEL FLOW				Tc	INTENSITY		TOTAL FLOWS	
	CA(5)	CA(100)	C(5)	Length (ft)	Height (ft)	Tc (min)	Length (ft)	Slope (%)	Velocity (fps)	Tc (min)	TOTAL (min)	I(5) (in/hr)	I(100) (in/hr)	Q(5) (cfs)	Q(100) (cfs)
OS-2	1.48	6.49	0.08	180	8	15.1	1590	1.4%	4.1	6.4	21.5	2.98	5.00	4.4	32.4
A	0.81	0.99	0.45	60	1.2	7.2	380	2.6%	5.6	1.1	8.4	4.40	7.39	3.6	7.3
B	0.64	0.77	0.45	60	1.2	7.2	380	2.6%	5.6	1.1	8.4	4.40	7.39	2.8	5.7
C	0.52	0.61	0.45	100	2	9.3	215	1.5%	4.3	0.8	10.2	4.10	6.89	2.1	4.2
D	0.48	0.56	0.45	50	1	6.6	215	1.5%	4.3	0.8	7.4	4.57	7.68	2.2	4.3
E	1.04	1.23	0.08	10	0.2	4.6	300	3.0%	6.1	0.8	5.5	5.04	8.46	5.2	10.4
F	0.24	0.29	0.45	50	1	6.6	150	1.5%	4.3	0.6	7.2	4.63	7.77	1.1	2.2
G	0.32	0.37	0.45	50	1	6.6	190	2.0%	4.9	0.6	7.2	4.61	7.75	1.5	2.9
H	0.56	0.69	0.45	100	2	9.3	190	2.0%	4.9	0.6	10.0	4.13	6.94	2.3	4.8
J	1.26	1.50	0.45	50	1	6.6	620	1.6%	4.4	2.3	8.9	4.30	7.22	5.4	10.8

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FINAL DRAINAGE REPORT ~ BASIN RUNOFF SUMMARY (DEVELOPED CONDITIONS)

BASIN	WEIGHTED		OVERLAND				STREET / CHANNEL FLOW				Tc	INTENSITY		TOTAL FLOWS	
	CA(5)	CA(100)	C(5)	Length (ft)	Height (ft)	Tc (min)	Length (ft)	Slope (%)	Velocity (fps)	Tc (min)	TOTAL (min)	I(5) (in/hr)	I(100) (in/hr)	Q(5) (cfs)	Q(100) (cfs)
K	0.42	0.45	0.08	10	0.1	5.8	480	1.5%	4.3	1.9	7.7	4.52	7.59	1.9	3.4
L	1.44	1.74	0.56	100	2	7.8	580	1.8%	4.7	2.1	9.8	4.16	6.98	6.0	12.1
M	0.90	1.03	0.45	20	1	3.1	580	1.8%	4.7	2.1	5.1	5.13	8.61	4.6	8.8
N	0.77	0.96	0.45	100	2	9.3	180	1.5%	4.3	0.7	10.0	4.12	6.92	3.2	6.7
P	0.47	0.58	0.45	100	2	9.3	180	1.5%	4.3	0.7	10.0	4.12	6.92	1.9	4.0
Q	0.89	1.10	0.45	100	2	9.3	290	3.1%	6.2	0.8	10.1	4.11	6.90	3.6	7.6
R	0.73	0.90	0.45	100	2	9.3	290	3.1%	6.2	0.8	10.1	4.11	6.90	3.0	6.2
S	0.86	1.07	0.45	100	2	9.3	200	1.5%	4.3	0.8	10.1	4.11	6.90	3.6	7.4
T	0.46	0.56	0.45	100	2	9.3	115	1.5%	4.3	0.4	9.8	4.16	6.99	1.9	3.9
U	0.74	0.92	0.08	40	1	8.6	240	2.0%	4.9	0.8	9.4	4.22	7.08	3.1	6.5
V	0.93	1.11	0.56	100	2	7.8	240	2.0%	4.9	0.8	8.6	4.36	7.32	4.1	8.1

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BASIN	WEIGHTED		OVERLAND				STREET / CHANNEL FLOW				Tc	INTENSITY		TOTAL FLOWS	
	CA(5)	CA(100)	C(5)	Length (ft)	Height (ft)	Tc (min)	Length (ft)	Slope (%)	Velocity (fps)	Tc (min)	TOTAL (min)	I(5) (in/hr)	I(100) (in/hr)	Q(5) (cfs)	Q(100) (cfs)
W	0.46	0.54	0.45	50	1	6.6	220	1.8%	4.7	0.8	7.4	4.58	7.70	2.1	4.2
X	0.75	0.93	0.08	30	2	5.4	370	1.5%	4.3	1.4	6.8	4.70	7.89	3.5	7.4
Y	0.34	0.38	0.08	10	0.1	5.8	370	1.5%	4.3	1.4	7.3	4.61	7.74	1.6	2.9
Z	0.74	1.04	0.08	50	2	8.2	310	3.2%	6.3	0.8	9.1	4.28	7.18	3.2	7.5
AA	0.58	0.86	0.45	50	1	6.6	25	16.0%	14.0	0.0	6.6	4.75	7.97	2.8	6.8
BB	0.19	0.37	0.45	60	2	6.1	25	8.0%	9.9	0.0	6.2	4.86	8.16	0.9	3.0
CC	0.18	0.25	0.45	60	4	4.9	0	1.5%	4.3	0.0	5.0	5.17	8.68	0.9	2.2
DD	0.36	0.48	0.45	60	8	3.9	0	1.5%	4.3	0.0	5.0	5.17	8.68	1.9	4.1
EE	0.10	0.42	0.08	50	12	4.6	140	1.0%	3.5	0.7	5.2	5.10	8.57	0.5	3.6
NN	1.94	2.08	0.08	10	0.1	5.8	1250	1.6%	4.4	4.7	10.5	4.05	6.80	7.9	14.1
BBB	1.76	1.88	0.08	10	1	2.7	580	1.3%	4.0	2.4	5.1	5.13	8.61	9.0	16.2

JOB NAME:	***Banning Lewis Ranch Filings 40-42***
JOB NUMBER:	***2570.03***
DATE:	***04/02/20***
CALCULATED BY:	***MAL***

FINAL DRAINAGE REPORT ~ SURFACE ROUTING SUMMARY (DEVELOPED CONDITIONS)

Design Point(s)	Contributing Basins	Equivalent CA(5)	Equivalent CA(100)	Maximum Tc	Intensity		Flow		Inlet Size
					I(5)	I(100)	Q(5)	Q(100)	
1	BASIN A	0.81	0.99	8.4	4.40	7.39	3.6	7.3	5' TYPE R SUMP
2	BASIN B	0.64	0.77	8.4	4.40	7.39	2.8	5.7	5' TYPE R SUMP
3	BASIN C	0.52	0.61	10.2	4.10	6.89	2.1	4.2	5' TYPE R SUMP
4	BASIN D	0.48	0.56	7.4	4.57	7.68	2.2	4.3	5' TYPE R SUMP
5	BASIN G	0.32	0.37	7.2	4.61	7.75	1.5	2.9	5' TYPE R SUMP
6	BASIN H	0.56	0.69	10.0	4.13	6.94	2.3	4.8	5' TYPE R SUMP
7	BASIN Q	0.89	1.10	10.1	4.11	6.90	3.6	7.6	5' TYPE R SUMP
8	BASIN R	0.73	0.90	10.1	4.11	6.90	3.0	6.2	5' TYPE R SUMP
9	BASIN J	1.26	1.50	8.9	4.30	7.22	5.4	10.8	10' TYPE R SUMP
10	BASIN K	0.42	0.45	7.7	4.52	7.59	1.9	3.4	5' TYPE R SUMP
11	BASIN E	1.04	1.23	5.5	5.04	8.46	5.2	10.4	10' TYPE R SUMP
12	BASIN F	0.24	0.29	7.2	4.63	7.77	1.1	2.2	5' TYPE R SUMP
13	BASIN N	0.77	0.96	10.0	4.12	6.92	3.2	6.7	5' TYPE R SUMP

JOB NAME:	***Banning Lewis Ranch Filings 40-42***
JOB NUMBER:	***2570.03***
DATE:	***04/02/20***
CALCULATED BY:	***MAL***

FINAL DRAINAGE REPORT ~ SURFACE ROUTING SUMMARY (DEVELOPED CONDITIONS)

Design Point(s)	Contributing Basins	Equivalent CA(5)	Equivalent CA(100)	Maximum Tc	Intensity		Flow		Inlet Size
					I(5)	I(100)	Q(5)	Q(100)	
14	BASIN P	0.47	0.58	10.0	4.12	6.92	1.9	4.0	5' TYPE R SUMP
15	BASIN L	1.44	1.74	9.8	4.16	6.98	6.0	12.1	10' TYPE R SUMP
16	BASIN M	0.90	1.03	5.1	5.13	8.61	4.6	8.8	10' TYPE R SUMP
17	BASIN U	0.74	0.92	9.4	4.22	7.08	3.1	6.5	5' TYPE R SUMP
18	BASIN V	0.93	1.11	8.6	4.36	7.32	4.1	8.1	10' TYPE R SUMP
19	BASIN S	0.86	1.07	10.1	4.11	6.90	3.6	7.4	5' TYPE R SUMP
20	BASIN T	0.46	0.56	9.8	4.16	6.99	1.9	3.9	5' TYPE R SUMP
21	BASIN W	0.46	0.54	7.4	4.58	7.70	2.1	4.2	5' TYPE R SUMP
22	BASIN X	0.75	0.93	6.8	4.70	7.89	3.5	7.4	10' TYPE R SUMP
23	BASIN Y	0.34	0.38	7.3	4.61	7.74	1.6	2.9	5' TYPE R SUMP
24	BASIN EE + PIPE 17 + PIPE 47	16.14	19.68	12.3	3.82	6.41	61.6	126.2	TEMP. POND 'A'
25	BASIN OS-2 + BASIN BB	1.67	6.85	21.5	2.98	5.00	5.0	34.3	CONC. CHASE TO OPEN SPACE
28B	BASIN NN + BASIN AA	2.52	2.94	10.5	4.05	6.80	10.2	20.0	EX. 15' Type R At-Grade
30	BASIN BBB + BASIN Z + Flow-By DP-28B	2.80	3.92	10.5	4.05	6.80	11.4	26.7	EX. 10' Type R Sump

JOB NAME: ***Banning Lewis Ranch Filings 40-42***
JOB NUMBER: ***2570.03***
DATE: ***04/02/20***
CALCULATED BY: ***MAL***

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

FINAL DRAINAGE REPORT ~ PIPE ROUTING SUMMARY (DEVELOPED CONDITIONS)

Pipe Run	Contributing Basins	Equivalent CA(5)	Equivalent CA(100)	Maximum Tc	Intensity		Flow		
					I(5)	I(100)	Q(5)	Q(100)	Pipe Size*
1	DP-1	0.81	0.99	8.4	4.40	7.39	3.6	7.3	18"
2	DP-2	0.64	0.77	8.4	4.40	7.39	2.8	5.7	18"
3	PIPE 1 + PIPE 2	1.46	1.76	8.4	4.40	7.39	6.4	13.0	24"
4	DP-3	0.52	0.61	10.2	4.10	6.89	2.1	4.2	18"
5	PIPE 3	1.46	1.76	8.4	4.40	7.39	6.4	13.0	24"
6	DP-4 + PIPE 4	1.00	1.17	10.2	4.10	6.89	4.1	8.0	18"
7	PIPE 5 + PIPE 6	2.46	2.92	10.2	4.10	6.89	10.1	20.1	24"
8	DP-5	0.32	0.37	7.2	4.61	7.75	1.5	2.9	18"
9	DP-6	0.56	0.69	10.0	4.13	6.94	2.3	4.8	18"

JOB NAME: ***Banning Lewis Ranch Filings 40-42***
JOB NUMBER: ***2570.03***
DATE: ***04/02/20***
CALCULATED BY: ***MAL***

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

FINAL DRAINAGE REPORT ~ PIPE ROUTING SUMMARY (DEVELOPED CONDITIONS)

Pipe Run	Contributing Basins	Equivalent CA(5)	Equivalent CA(100)	Maximum Tc	Intensity		Flow		Pipe Size*
					I(5)	I(100)	Q(5)	Q(100)	
10	PIPE 7 + PIPE 8 + PIPE 9	3.34	3.99	10.6	4.04	6.79	13.5	27.1	30"
11	DP-7	0.89	1.10	10.1	4.11	6.90	3.6	7.6	18"
12	DP-8	0.73	0.90	10.1	4.11	6.90	3.0	6.2	18"
13	PIPE 11 + PIPE 12	1.62	2.00	10.1	4.11	6.90	6.7	13.8	24"
14	DP-9	1.26	1.50	8.9	4.30	7.22	5.4	10.8	24"
15	DP-10	0.42	0.45	7.7	4.52	7.59	1.9	3.4	18"
16	PIPE 14 + PIPE 15	1.68	1.95	8.9	4.30	7.22	7.2	14.1	24"
17	PIPE 10 + PIPE 13 + PIPE 16	6.64	7.94	11.3	3.95	6.63	26.2	52.6	36"
18	DP-11	1.04	1.23	5.5	5.04	8.46	5.2	10.4	24"
19	DP-12	0.24	0.29	7.2	4.63	7.77	1.1	2.2	18"

JOB NAME: ***Banning Lewis Ranch Filings 40-42***
JOB NUMBER: ***2570.03***
DATE: ***04/02/20***
CALCULATED BY: ***MAL***

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

FINAL DRAINAGE REPORT ~ PIPE ROUTING SUMMARY (DEVELOPED CONDITIONS)

Pipe Run	Contributing Basins	Equivalent CA(5)	Equivalent CA(100)	Maximum Tc	Intensity		Flow		Pipe Size*
					I(5)	I(100)	Q(5)	Q(100)	
20	PIPE 18 + PIPE 19	1.28	1.51	7.2	4.63	7.77	5.9	11.7	24"
21	DP-13	0.77	0.96	10.0	4.12	6.92	3.2	6.7	18"
22	DP-14	0.47	0.58	10.0	4.12	6.92	1.9	4.0	18"
23	PIPE 21 + PIPE 22	1.24	1.54	10.0	4.12	6.92	5.1	10.6	24"
24	PIPE 20 + PIPE 23	2.52	3.05	10.5	4.05	6.81	10.2	20.8	24"
25	DP-15	1.44	1.74	9.8	4.16	6.98	6.0	12.1	24"
26	DP-16	0.90	1.03	5.1	5.13	8.61	4.6	8.8	18"
27	PIPE 24 + PIPE 25 + PIPE 26	4.86	5.82	11.1	3.98	6.68	19.3	38.8	36"
28	DP-17	0.74	0.92	9.4	4.22	7.08	3.1	6.5	18"
29	DP-18	0.93	1.11	8.6	4.36	7.32	4.1	8.1	18"
30	PIPE 27 + PIPE 28 + PIPE 29	6.53	7.85	11.5	3.92	6.57	25.5	51.6	36"

JOB NAME: ***Banning Lewis Ranch Filings 40-42***
JOB NUMBER: ***2570.03***
DATE: ***04/02/20***
CALCULATED BY: ***MAL***

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

FINAL DRAINAGE REPORT ~ PIPE ROUTING SUMMARY (DEVELOPED CONDITIONS)

Pipe Run	Contributing Basins	Equivalent CA(5)	Equivalent CA(100)	Maximum Tc	Intensity		Flow		
					I(5)	I(100)	Q(5)	Q(100)	Pipe Size*
31	DP-19	0.86	1.07	10.1	4.11	6.90	3.6	7.4	18"
32	DP-20	0.46	0.56	9.8	4.16	6.99	1.9	3.9	18"
33	PIPE 31 + PIPE 32	1.33	1.63	10.1	4.11	6.90	5.5	11.2	24"
34	DP-21	0.46	0.54	7.4	4.58	7.70	2.1	4.2	18"
35	PIPE 30 + PIPE 33 + PIPE 34	8.31	10.02	11.7	3.89	6.54	32.3	65.5	42"
45	DP-22	0.75	0.93	6.8	4.70	7.89	3.5	7.4	18"
46	DP-23 + PIPE 45	1.09	1.31	7.3	4.61	7.74	5.0	10.1	24"
47	PIPE 35 + PIPE 46	9.40	11.33	12.0	3.85	6.47	36.2	73.3	42"
48	TEMP. POND OUTFALL	0.22	4.85	12.3	3.82	6.41	0.8	31.1	24"

JOB NAME:	***Banning Lewis Ranch Filings 40-42***
JOB NUMBER:	***2570.03***
DATE:	***04/02/20***
CALCULATED BY:	***MAL***

At-Grade Inlet - Flow Routing (DEVELOPED CONDITIONS)

Design Point	TOTAL						INTERCEPTED				FLOW-BY			
	CA5	CA100	I5	I100	Q5	Q100	Q5	Q100	CA5	CA100	Q5	Q100	CA5	CA100
28B	2.52	2.94	4.05	6.80	10.2	20.0	9.0	13.2	2.22	1.94	1.2	6.8	0.30	1.00

JOB NAME:	***Banning Lewis Ranch Filings 40-42***
JOB NUMBER:	***2570.03***
DATE:	***04/02/20***
CALCULATED BY:	***MAL***

FINAL DRAINAGE REPORT ~ PIPE TRAVEL TIMES

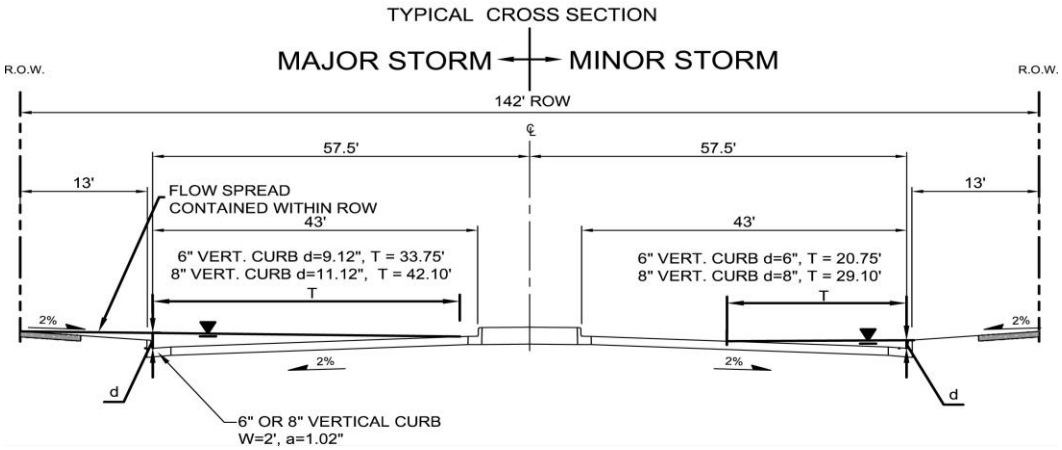
PIPE RUN	STREET / CHANNEL FLOW				
	Pipe Diameter	Length	Slope	Velocity	Tc
	(ft)	*(ft)*	*(%)*	*(fps)*	*(min)*
3	2.0	140	0.5%	5.1	0.5
7	2.0	250	2.0%	10.2	0.4
10	2.5	350	1.0%	8.4	0.7
17	3.0	100	0.5%	6.7	0.2
20	2.0	360	3.0%	12.5	0.5
24	2.0	340	2.0%	10.2	0.6
27	3.0	370	2.0%	13.4	0.5
30	3.0	70	0.5%	6.7	0.2
35	3.5	200	1.0%	10.5	0.3
47	3.5	120	0.5%	7.4	0.3

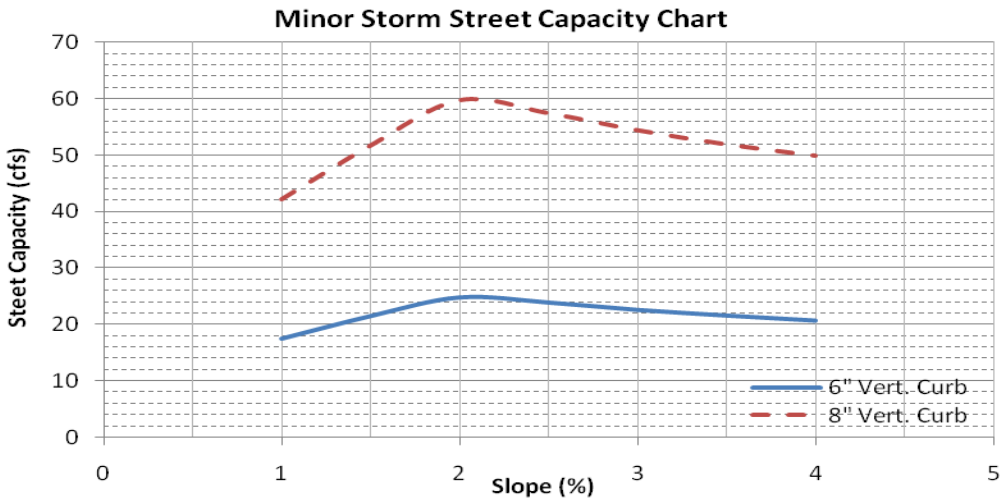
STREET CAPACITY (DCM)

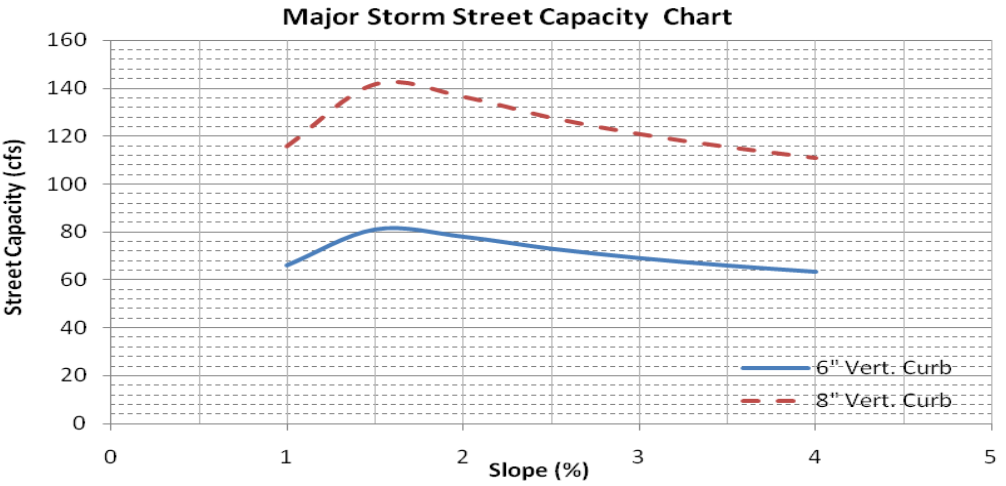
INLET CALCULATIONS (UD-INLET)

CLASSIC SM
CONSULTING
ENGINEERS & SURVEYORS

Figure 7-2. Street Capacity Charts Principal Arterial Type II

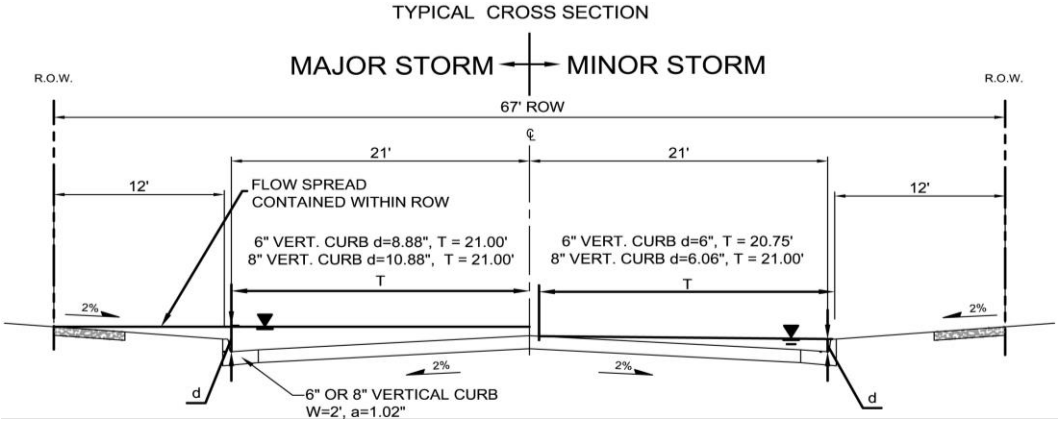


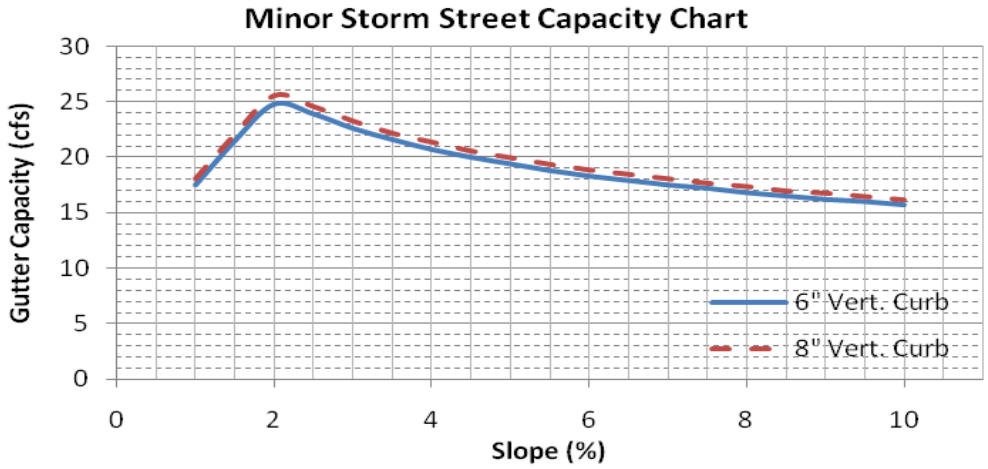


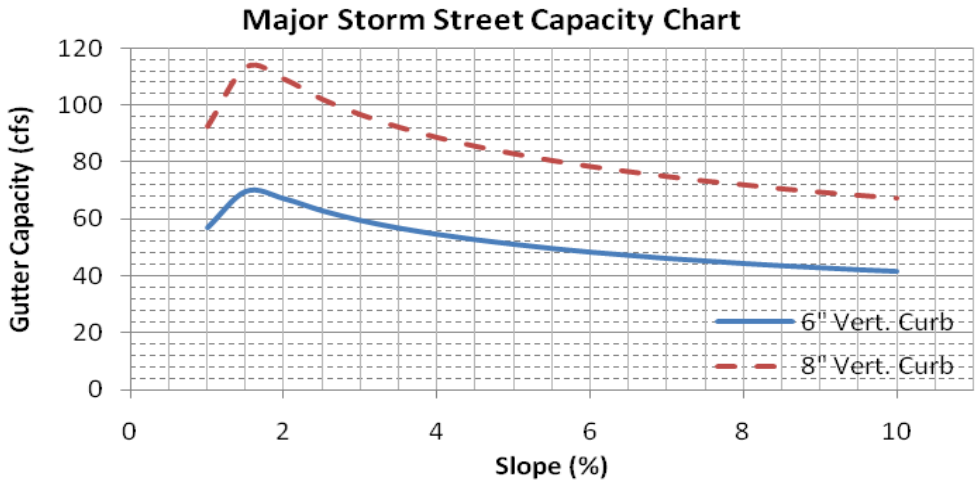


These charts shall only be used for the standard street sections as shown. The capacity shown is based on ½ the street section as calculated by the UD-Inlet spreadsheets. Minor storm capacities are based on no crown overtopping, curb height or maximum allowable spread widths. Major storm capacities are based on flow being containing 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.

Figure 7-5. Street Capacity Charts Collector (with Parking)

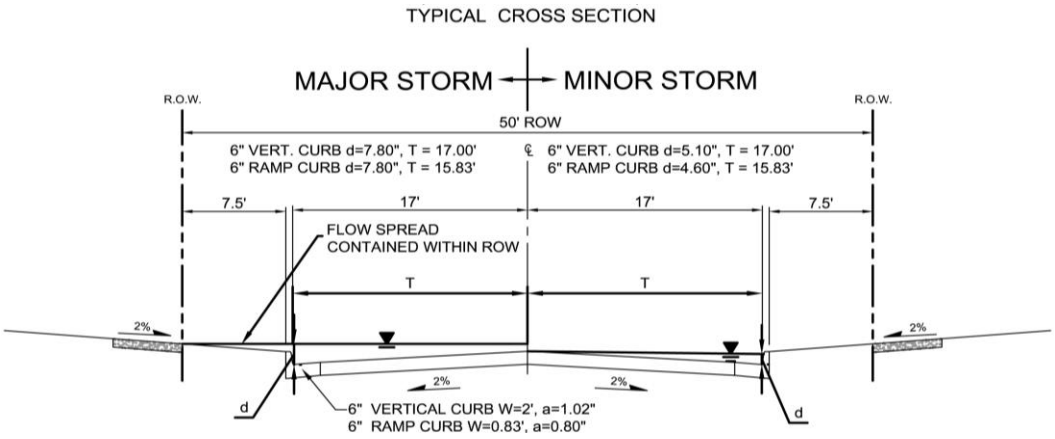


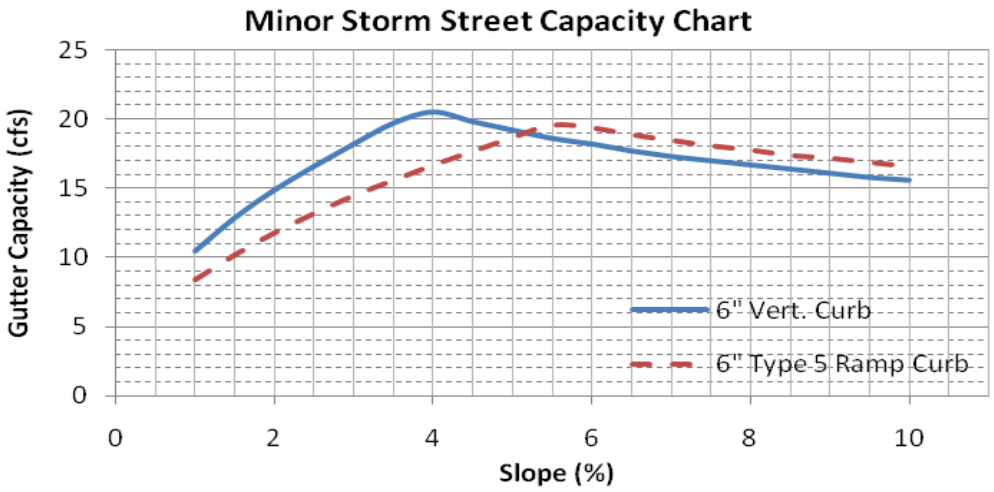


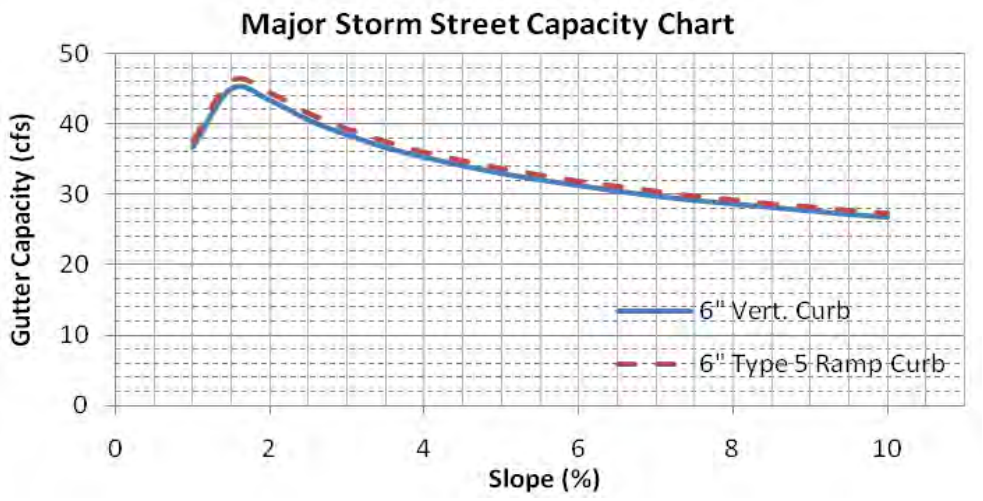


These charts shall only be used for the standard street sections as shown. The capacity shown is based on ½ the street section as calculated by the UD-Inlet spreadsheets. Minor storm capacities are based on no crown overtopping, curb height or maximum allowable spread widths. Major storm capacities are based on flow being containing 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.

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 ½ 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 containing 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.

Version 4.05 Released March 2017

INLET MANAGEMENT

Worksheet Protected

INLET NAME	DP-1 INLET	DP-2 INLET	DP-3 INLET	DP-4 INLET	DP-5 INLET	DP-6 INLET
Site Type (Urban or Rural)	URBAN	URBAN	URBAN	URBAN	URBAN	URBAN
Inlet Application (Street or Area)	STREET	STREET	STREET	STREET	STREET	STREET
Hydraulic Condition	In Sump	In Sump	In Sump	In Sump	In Sump	In Sump
Inlet Type	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type R Curb Opening

USER-DEFINED INPUT

User-Defined Design Flows

Minor Q_{Known} (cfs)	3.6	2.8	2.1	2.2	1.5	2.3
Major Q_{Known} (cfs)	7.3	5.7	4.2	4.3	2.9	4.8

Bypass (Carry-Over) Flow from Upstream

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

Watershed Characteristics

Subcatchment Area (acres)						
Percent Impervious						
NRCS Soil Type						

Watershed Profile

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

Minor Storm Rainfall Input

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

Major Storm Rainfall Input

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

CALCULATED OUTPUT

Minor Total Design Peak Flow, Q (cfs)	**3.6**	**2.8**	**2.1**	**2.2**	**1.5**	**2.3**
Major Total Design Peak Flow, Q (cfs)	**7.3**	**5.7**	**4.2**	**4.3**	**2.9**	**4.8**
Minor Flow Bypassed Downstream, Q_b (cfs)	N/A	N/A	N/A	N/A	N/A	N/A
Major Flow Bypassed Downstream, Q_b (cfs)	N/A	N/A	N/A	N/A	N/A	N/A

Minor Storm (Calculated) Analysis of Flow Time

C	N/A	N/A	N/A	N/A	N/A	N/A
C_5	N/A	N/A	N/A	N/A	N/A	N/A
Overland Flow Velocity, Vi	N/A	N/A	N/A	N/A	N/A	N/A
Channel Flow Velocity, Vt	N/A	N/A	N/A	N/A	N/A	N/A
Overland Flow Time, Ti	N/A	N/A	N/A	N/A	N/A	N/A
Channel Travel Time, Tt	N/A	N/A	N/A	N/A	N/A	N/A
Calculated Time of Concentration, T_c	N/A	N/A	N/A	N/A	N/A	N/A
Regional T_c	N/A	N/A	N/A	N/A	N/A	N/A
Recommended T_c	N/A	N/A	N/A	N/A	N/A	N/A
T_c selected by User	N/A	N/A	N/A	N/A	N/A	N/A
Design Rainfall Intensity, I	N/A	N/A	N/A	N/A	N/A	N/A
Calculated Local Peak Flow, Q_p	N/A	N/A	N/A	N/A	N/A	N/A

Major Storm (Calculated) Analysis of Flow Time

C	N/A	N/A	N/A	N/A	N/A	N/A
C_5	N/A	N/A	N/A	N/A	N/A	N/A
Overland Flow Velocity, Vi	N/A	N/A	N/A	N/A	N/A	N/A
Channel Flow Velocity, Vt	N/A	N/A	N/A	N/A	N/A	N/A
Overland Flow Time, Ti	N/A	N/A	N/A	N/A	N/A	N/A
Channel Travel Time, Tt	N/A	N/A	N/A	N/A	N/A	N/A
Calculated Time of Concentration, T_c	N/A	N/A	N/A	N/A	N/A	N/A
Regional T_c	N/A	N/A	N/A	N/A	N/A	N/A
Recommended T_c	N/A	N/A	N/A	N/A	N/A	N/A
T_c selected by User	N/A	N/A	N/A	N/A	N/A	N/A
Design Rainfall Intensity, I	N/A	N/A	N/A	N/A	N/A	N/A
Calculated Local Peak Flow, Q_p	N/A	N/A	N/A	N/A	N/A	N/A

Version 4.05 Released March 2017

INLET MANAGEMENT

Worksheet Protected

INLET NAME	DP-7 INLET	DP-8 INLET	DP-9 INLET	DP-10 INLET	DP-11 INLET	DP-12 INLET
Site Type (Urban or Rural)	URBAN	URBAN	URBAN	URBAN	URBAN	URBAN
Inlet Application (Street or Area)	STREET	STREET	STREET	STREET	STREET	STREET
Hydraulic Condition	In Sump	In Sump	In Sump	In Sump	In Sump	In Sump
Inlet Type	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type R Curb Opening

USER-DEFINED INPUT

User-Defined Design Flows

Minor Q_{Known} (cfs)	3.6	3.0	5.4	1.9	5.2	1.1
Major Q_{Known} (cfs)	7.6	6.2	10.8	3.4	10.4	2.2

Bypass (Carry-Over) Flow from Upstream

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

Watershed Characteristics

Subcatchment Area (acres)						
Percent Impervious						
NRCS Soil Type						

Watershed Profile

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

Minor Storm Rainfall Input

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

Major Storm Rainfall Input

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

CALCULATED OUTPUT

Minor Total Design Peak Flow, Q (cfs)	**3.6**	**3.0**	**5.4**	**1.9**	**5.2**	**1.1**
Major Total Design Peak Flow, Q (cfs)	**7.6**	**6.2**	**10.8**	**3.4**	**10.4**	**2.2**
Minor Flow Bypassed Downstream, Q_b (cfs)	N/A	N/A	N/A	N/A	N/A	N/A
Major Flow Bypassed Downstream, Q_b (cfs)	N/A	N/A	N/A	N/A	N/A	N/A

Minor Storm (Calculated) Analysis of Flow T

C	N/A	N/A	N/A	N/A	N/A	N/A
C_5	N/A	N/A	N/A	N/A	N/A	N/A
Overland Flow Velocity, Vi	N/A	N/A	N/A	N/A	N/A	N/A
Channel Flow Velocity, Vt	N/A	N/A	N/A	N/A	N/A	N/A
Overland Flow Time, Ti	N/A	N/A	N/A	N/A	N/A	N/A
Channel Travel Time, Tt	N/A	N/A	N/A	N/A	N/A	N/A
Calculated Time of Concentration, T_c	N/A	N/A	N/A	N/A	N/A	N/A
Regional T_c	N/A	N/A	N/A	N/A	N/A	N/A
Recommended T_c	N/A	N/A	N/A	N/A	N/A	N/A
T_c selected by User	N/A	N/A	N/A	N/A	N/A	N/A
Design Rainfall Intensity, I	N/A	N/A	N/A	N/A	N/A	N/A
Calculated Local Peak Flow, Q_p	N/A	N/A	N/A	N/A	N/A	N/A

Major Storm (Calculated) Analysis of Flow T

C	N/A	N/A	N/A	N/A	N/A	N/A
C_5	N/A	N/A	N/A	N/A	N/A	N/A
Overland Flow Velocity, Vi	N/A	N/A	N/A	N/A	N/A	N/A
Channel Flow Velocity, Vt	N/A	N/A	N/A	N/A	N/A	N/A
Overland Flow Time, Ti	N/A	N/A	N/A	N/A	N/A	N/A
Channel Travel Time, Tt	N/A	N/A	N/A	N/A	N/A	N/A
Calculated Time of Concentration, T_c	N/A	N/A	N/A	N/A	N/A	N/A
Regional T_c	N/A	N/A	N/A	N/A	N/A	N/A
Recommended T_c	N/A	N/A	N/A	N/A	N/A	N/A
T_c selected by User	N/A	N/A	N/A	N/A	N/A	N/A
Design Rainfall Intensity, I	N/A	N/A	N/A	N/A	N/A	N/A
Calculated Local Peak Flow, Q_p	N/A	N/A	N/A	N/A	N/A	N/A

Version 4.05 Released March 2017

INLET MANAGEMENT

Worksheet Protected

INLET NAME	DP-13 INLET	DP-14 INLET	DP-15 INLET	DP-16 INLET	DP-17 INLET	DP-18 INLET
Site Type (Urban or Rural)	URBAN	URBAN	URBAN	URBAN	URBAN	URBAN
Inlet Application (Street or Area)	STREET	STREET	STREET	STREET	STREET	STREET
Hydraulic Condition	In Sump	In Sump	In Sump	In Sump	In Sump	In Sump
Inlet Type	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type R Curb Opening

USER-DEFINED INPUT

User-Defined Design Flows

Minor Q_{Known} (cfs)	3.2	1.9	6.0	4.6	3.1	4.1
Major Q_{Known} (cfs)	6.7	4.0	12.1	8.8	6.5	8.1

Bypass (Carry-Over) Flow from Upstream

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

Watershed Characteristics

Subcatchment Area (acres)						
Percent Impervious						
NRCS Soil Type						

Watershed Profile

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

Minor Storm Rainfall Input

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

Major Storm Rainfall Input

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

CALCULATED OUTPUT

Minor Total Design Peak Flow, Q (cfs)	**3.2**	**1.9**	**6.0**	**4.6**	**3.1**	**4.1**
Major Total Design Peak Flow, Q (cfs)	**6.7**	**4.0**	**12.1**	**8.8**	**6.5**	**8.1**
Minor Flow Bypassed Downstream, Q_b (cfs)	N/A	N/A	N/A	N/A	N/A	N/A
Major Flow Bypassed Downstream, Q_b (cfs)	N/A	N/A	N/A	N/A	N/A	N/A

Minor Storm (Calculated) Analysis of Flow T

C	N/A	N/A	N/A	N/A	N/A	N/A
C_5	N/A	N/A	N/A	N/A	N/A	N/A
Overland Flow Velocity, Vi	N/A	N/A	N/A	N/A	N/A	N/A
Channel Flow Velocity, Vt	N/A	N/A	N/A	N/A	N/A	N/A
Overland Flow Time, Ti	N/A	N/A	N/A	N/A	N/A	N/A
Channel Travel Time, Tt	N/A	N/A	N/A	N/A	N/A	N/A
Calculated Time of Concentration, T_c	N/A	N/A	N/A	N/A	N/A	N/A
Regional T_c	N/A	N/A	N/A	N/A	N/A	N/A
Recommended T_c	N/A	N/A	N/A	N/A	N/A	N/A
T_c selected by User	N/A	N/A	N/A	N/A	N/A	N/A
Design Rainfall Intensity, I	N/A	N/A	N/A	N/A	N/A	N/A
Calculated Local Peak Flow, Q_p	N/A	N/A	N/A	N/A	N/A	N/A

Major Storm (Calculated) Analysis of Flow T

C	N/A	N/A	N/A	N/A	N/A	N/A
C_5	N/A	N/A	N/A	N/A	N/A	N/A
Overland Flow Velocity, Vi	N/A	N/A	N/A	N/A	N/A	N/A
Channel Flow Velocity, Vt	N/A	N/A	N/A	N/A	N/A	N/A
Overland Flow Time, Ti	N/A	N/A	N/A	N/A	N/A	N/A
Channel Travel Time, Tt	N/A	N/A	N/A	N/A	N/A	N/A
Calculated Time of Concentration, T_c	N/A	N/A	N/A	N/A	N/A	N/A
Regional T_c	N/A	N/A	N/A	N/A	N/A	N/A
Recommended T_c	N/A	N/A	N/A	N/A	N/A	N/A
T_c selected by User	N/A	N/A	N/A	N/A	N/A	N/A
Design Rainfall Intensity, I	N/A	N/A	N/A	N/A	N/A	N/A
Calculated Local Peak Flow, Q_p	N/A	N/A	N/A	N/A	N/A	N/A

Version 4.05 Released March 2017

INLET MANAGEMENT

Worksheet Protected

INLET NAME	DP-19 INLET	DP-20 INLET	DP-21 INLET	DP-22 INLET	DP-23 INLET	DP-28B INLET
Site Type (Urban or Rural)	URBAN	URBAN	URBAN	URBAN	URBAN	URBAN
Inlet Application (Street or Area)	STREET	STREET	STREET	STREET	STREET	STREET
Hydraulic Condition	In Sump	In Sump	In Sump	In Sump	In Sump	On Grade
Inlet Type	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type R Curb Opening

USER-DEFINED INPUT

User-Defined Design Flows

Minor Q_{Known} (cfs)	3.6	1.9	2.1	3.5	1.6	10.2
Major Q_{Known} (cfs)	7.4	3.9	4.2	7.4	2.9	20.0

Bypass (Carry-Over) Flow from Upstream

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

Watershed Characteristics

Subcatchment Area (acres)						
Percent Impervious						
NRCS Soil Type						

Watershed Profile

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

Minor Storm Rainfall Input

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

Major Storm Rainfall Input

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

CALCULATED OUTPUT

Minor Total Design Peak Flow, Q (cfs)	**3.6**	**1.9**	**2.1**	**3.5**	**1.6**	**10.2**
Major Total Design Peak Flow, Q (cfs)	**7.4**	**3.9**	**4.2**	**7.4**	**2.9**	**20.0**
Minor Flow Bypassed Downstream, Q_b (cfs)	N/A	N/A	N/A	N/A	N/A	1.2
Major Flow Bypassed Downstream, Q_b (cfs)	N/A	N/A	N/A	N/A	N/A	6.8

Minor Storm (Calculated) Analysis of Flow T

C	N/A	N/A	N/A	N/A	N/A	N/A
C_5	N/A	N/A	N/A	N/A	N/A	N/A
Overland Flow Velocity, Vi	N/A	N/A	N/A	N/A	N/A	N/A
Channel Flow Velocity, Vt	N/A	N/A	N/A	N/A	N/A	N/A
Overland Flow Time, Ti	N/A	N/A	N/A	N/A	N/A	N/A
Channel Travel Time, Tt	N/A	N/A	N/A	N/A	N/A	N/A
Calculated Time of Concentration, T_c	N/A	N/A	N/A	N/A	N/A	N/A
Regional T_c	N/A	N/A	N/A	N/A	N/A	N/A
Recommended T_c	N/A	N/A	N/A	N/A	N/A	N/A
T_c selected by User	N/A	N/A	N/A	N/A	N/A	N/A
Design Rainfall Intensity, I	N/A	N/A	N/A	N/A	N/A	N/A
Calculated Local Peak Flow, Q_p	N/A	N/A	N/A	N/A	N/A	N/A

Major Storm (Calculated) Analysis of Flow T

C	N/A	N/A	N/A	N/A	N/A	N/A
C_5	N/A	N/A	N/A	N/A	N/A	N/A
Overland Flow Velocity, Vi	N/A	N/A	N/A	N/A	N/A	N/A
Channel Flow Velocity, Vt	N/A	N/A	N/A	N/A	N/A	N/A
Overland Flow Time, Ti	N/A	N/A	N/A	N/A	N/A	N/A
Channel Travel Time, Tt	N/A	N/A	N/A	N/A	N/A	N/A
Calculated Time of Concentration, T_c	N/A	N/A	N/A	N/A	N/A	N/A
Regional T_c	N/A	N/A	N/A	N/A	N/A	N/A
Recommended T_c	N/A	N/A	N/A	N/A	N/A	N/A
T_c selected by User	N/A	N/A	N/A	N/A	N/A	N/A
Design Rainfall Intensity, I	N/A	N/A	N/A	N/A	N/A	N/A
Calculated Local Peak Flow, Q_p	N/A	N/A	N/A	N/A	N/A	N/A

Version 4.05 Released March 2017

INLET MANAGEMENT

Worksheet Protected

INLET NAME	DP-30 INLET	DP-28B-EXIST
Site Type (Urban or Rural)	URBAN	URBAN
Inlet Application (Street or Area)	STREET	STREET
Hydraulic Condition	In Sump	On Grade
Inlet Type	CDOT Type R Curb Opening	CDOT Type R Curb Opening

USER-DEFINED INPUT

User-Defined Design Flows

Minor Q_{Known} (cfs)	10.2	7.9
Major Q_{Known} (cfs)	19.9	14.1

Bypass (Carry-Over) Flow from Upstream

Receive Bypass Flow from:	User-Defined	No Bypass Flow Received
Minor Bypass Flow Received, Q_b (cfs)	1.2	
Major Bypass Flow Received, Q_b (cfs)	6.8	

Watershed Characteristics

Subcatchment Area (acres)		
Percent Impervious		
NRCS Soil Type		

Watershed Profile

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

Minor Storm Rainfall Input

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

Major Storm Rainfall Input

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

CALCULATED OUTPUT

Minor Total Design Peak Flow, Q (cfs)	**11.4**	**7.9**
Major Total Design Peak Flow, Q (cfs)	**26.7**	**14.1**
Minor Flow Bypassed Downstream, Q_b (cfs)	N/A	0.4
Major Flow Bypassed Downstream, Q_b (cfs)	N/A	3.1

Minor Storm (Calculated) Analysis of Flow T

C	N/A	N/A
C_5	N/A	N/A
Overland Flow Velocity, Vi	N/A	N/A
Channel Flow Velocity, Vt	N/A	N/A
Overland Flow Time, Ti	N/A	N/A
Channel Travel Time, Tt	N/A	N/A
Calculated Time of Concentration, T_c	N/A	N/A
Regional T_c	N/A	N/A
Recommended T_c	N/A	N/A
T_c selected by User	N/A	N/A
Design Rainfall Intensity, I	N/A	N/A
Calculated Local Peak Flow, Q_p	N/A	N/A

Major Storm (Calculated) Analysis of Flow T

C	N/A	N/A
C_5	N/A	N/A
Overland Flow Velocity, Vi	N/A	N/A
Channel Flow Velocity, Vt	N/A	N/A
Overland Flow Time, Ti	N/A	N/A
Channel Travel Time, Tt	N/A	N/A
Calculated Time of Concentration, T_c	N/A	N/A
Regional T_c	N/A	N/A
Recommended T_c	N/A	N/A
T_c selected by User	N/A	N/A
Design Rainfall Intensity, I	N/A	N/A
Calculated Local Peak Flow, Q_p	N/A	N/A

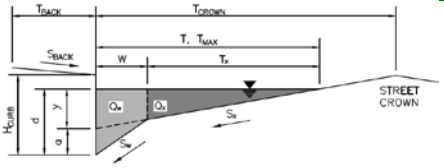
Version 4.05 Released March 2017

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

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

Project: Enter Your Project Name Here

Inlet ID: DP-1 INLET



Gutter Geometry (Enter data in the blue cells)

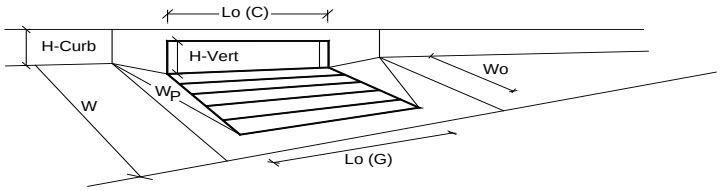
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
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 =	0.063	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	15.8	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	5.1	7.8	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	5.1	7.8	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	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_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.30	0.53	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	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**4.6**	**9.6**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	3.6	7.3	cfs

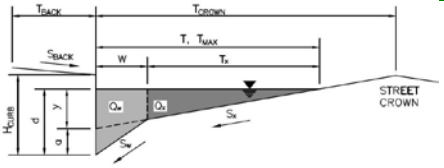
Version 4.05 Released March 2017

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

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

Project: Enter Your Project Name Here

Inlet ID: DP-2 INLET



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} =	0.200	ft/ft
Warning 01 Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.200	
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 =	0.063	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

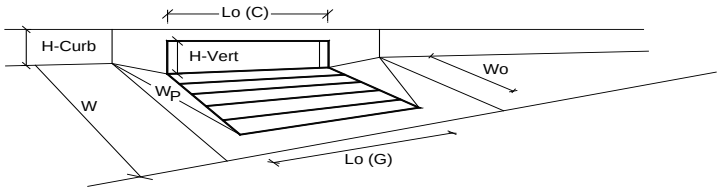
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	15.8	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	5.1	7.8	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

Warning 01: Manning's n-value does not meet the USDCM recommended design range.

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	5.1	7.8	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	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_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.30	0.53	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	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**4.6**	**9.6**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	2.8	5.7	cfs

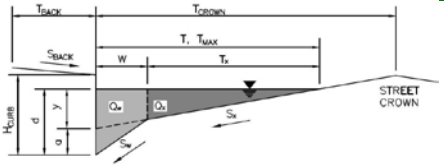
Version 4.05 Released March 2017

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

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

Project: Enter Your Project Name Here

Inlet ID: DP-3 INLET



Gutter Geometry (Enter data in the blue cells)

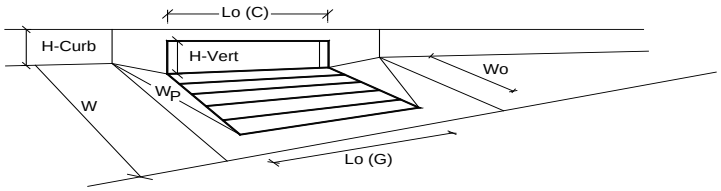
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
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 =	0.063	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	15.8	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	5.1	7.8	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	5.1	7.8	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	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_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.30	0.53	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	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**4.6**	**9.6**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	2.1	4.2	cfs

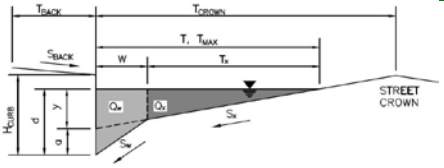
Version 4.05 Released March 2017

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

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

Project: Enter Your Project Name Here

Inlet ID: DP-4 INLET



Gutter Geometry (Enter data in the blue cells)

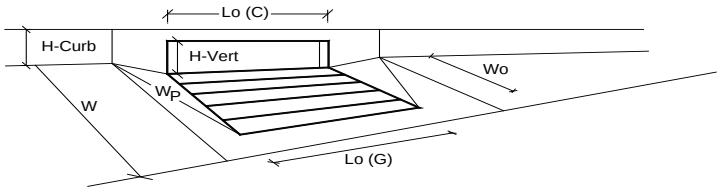
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
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 =	0.063	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	15.8	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	5.1	7.8	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	5.1	7.8	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	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_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.30	0.53	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	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**4.6**	**9.6**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	2.2	4.3	cfs

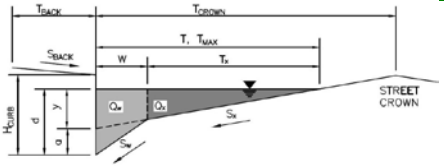
Version 4.05 Released March 2017

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

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

Project: Enter Your Project Name Here

Inlet ID: DP-5 INLET



Gutter Geometry (Enter data in the blue cells)

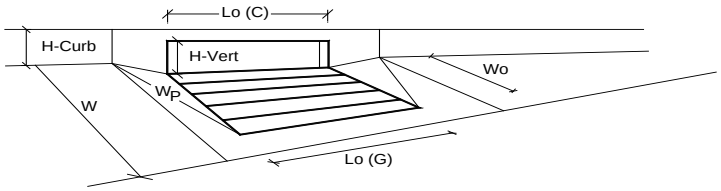
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
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 =	0.063	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	15.8	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	5.1	7.8	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	5.1	7.8	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	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_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.30	0.53	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	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**4.6**	**9.6**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	1.5	2.9	cfs

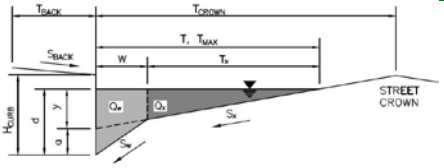
Version 4.05 Released March 2017

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

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

Project: Enter Your Project Name Here

Inlet ID: DP-6 INLET



Gutter Geometry (Enter data in the blue cells)

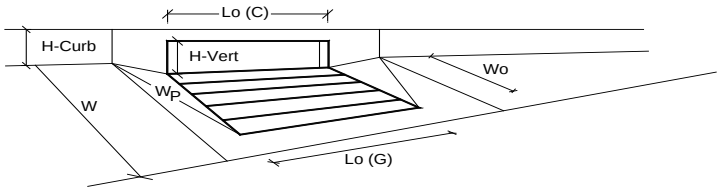
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
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 =	0.063	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	15.8	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	5.1	7.8	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	5.1	7.8	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	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_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.30	0.53	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	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**4.6**	**9.6**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	2.3	4.8	cfs

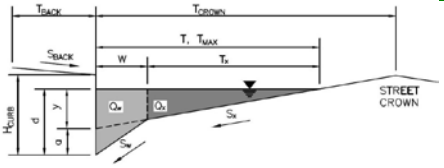
Version 4.05 Released March 2017

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

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

Project: Enter Your Project Name Here

Inlet ID: DP-7 INLET



Gutter Geometry (Enter data in the blue cells)

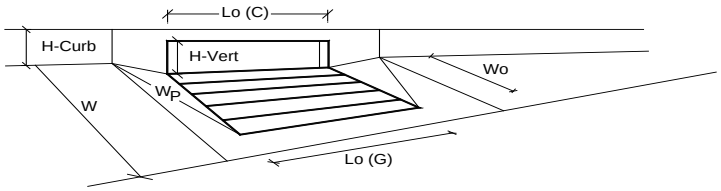
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
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 =	0.063	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	15.8	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	5.1	7.8	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	5.1	7.8	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	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_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.30	0.53	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	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**4.6**	**9.6**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	3.6	7.6	cfs

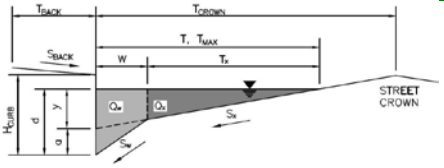
Version 4.05 Released March 2017

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

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

Project: Enter Your Project Name Here

Inlet ID: DP-8 INLET



Gutter Geometry (Enter data in the blue cells)

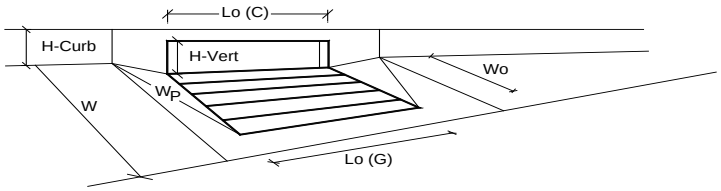
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
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 =	0.063	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	15.8	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	5.1	7.8	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)	CDOT Type R Curb Opening		MINOR	MAJOR	
Type of Inlet		Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' 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	☑ Override Depths
Length of a Unit Grate		L_o (G) =	N/A	N/A	feet
Width of a Unit Grate		W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)		A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)		C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)		C_o (G) =	N/A	N/A	
Curb Opening Information			MINOR	MAJOR	
Length of a Unit Curb Opening		L_o (C) =	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_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)		C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)		C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)			MINOR	MAJOR	
Depth for Grate Midwidth		d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation		d_{Curb} =	0.30	0.53	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	
			MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)		**Q_a =**	**4.6**	**9.6**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)		$Q_{PEAK\ REQUIRED}$ =	3.0	6.2	cfs

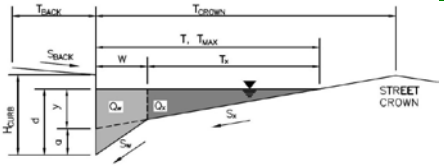
Version 4.05 Released March 2017

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

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

Project: Enter Your Project Name Here

Inlet ID: DP-9 INLET



Gutter Geometry (Enter data in the blue cells)

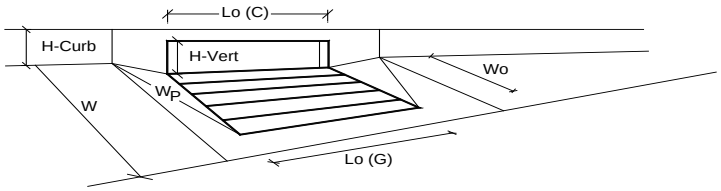
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	12.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	21.0	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 =	0.063	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	20.8	21.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	8.9	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	8.9	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	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_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.38	0.62	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.57	0.84	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.93	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**9.9**	**20.6**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	5.4	10.8	cfs

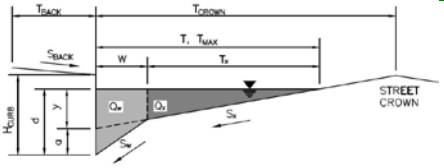
Version 4.05 Released March 2017

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

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

Project: Enter Your Project Name Here

Inlet ID: DP-10 INLET



Gutter Geometry (Enter data in the blue cells)

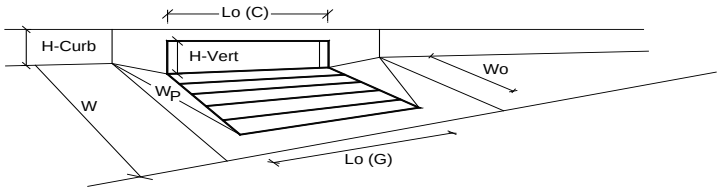
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	12.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	21.0	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 =	0.063	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	20.8	21.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	8.9	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	8.9	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	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_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.38	0.62	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.77	1.00	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**6.4**	**10.6**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	1.9	3.4	cfs

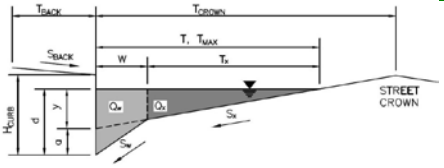
Version 4.05 Released March 2017

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

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

Project: Enter Your Project Name Here

Inlet ID: DP-11 INLET



Gutter Geometry (Enter data in the blue cells)

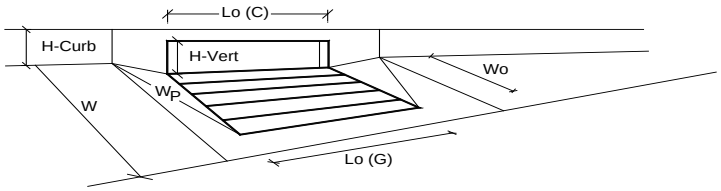
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
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 =	0.063	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	15.8	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	5.1	7.8	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	5.1	7.8	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	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_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.30	0.53	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	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**6.6**	**17.5**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	5.2	10.4	cfs

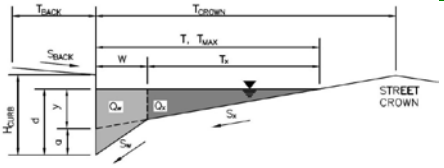
Version 4.05 Released March 2017

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

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

Project: Enter Your Project Name Here

Inlet ID: DP-12 INLET



Gutter Geometry (Enter data in the blue cells)

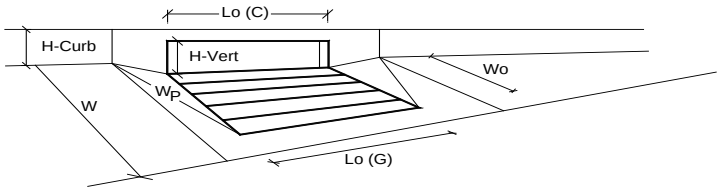
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
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 =	0.063	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	15.8	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	5.1	7.8	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	5.1	7.8	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	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_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.30	0.53	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	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**4.6**	**9.6**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	1.1	2.2	cfs

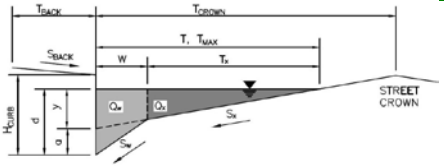
Version 4.05 Released March 2017

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

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

Project: Enter Your Project Name Here

Inlet ID: DP-13 INLET



Gutter Geometry (Enter data in the blue cells)

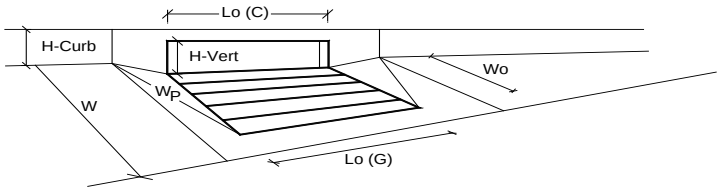
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
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 =	0.063	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	15.8	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	5.1	7.8	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	5.1	7.8	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	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_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.30	0.53	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	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**4.6**	**9.6**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	3.2	6.7	cfs

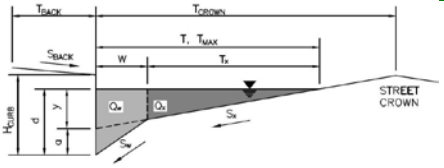
Version 4.05 Released March 2017

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

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

Project: Enter Your Project Name Here

Inlet ID: DP-14 INLET



Gutter Geometry (Enter data in the blue cells)

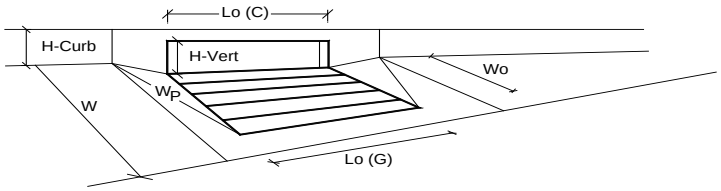
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
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 =	0.063	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	15.8	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	5.1	7.8	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	5.1	7.8	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	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_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.30	0.53	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	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**4.6**	**9.6**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	1.9	4.0	cfs

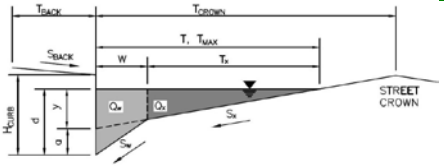
Version 4.05 Released March 2017

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

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

Project: Enter Your Project Name Here

Inlet ID: DP-15 INLET



Gutter Geometry (Enter data in the blue cells)

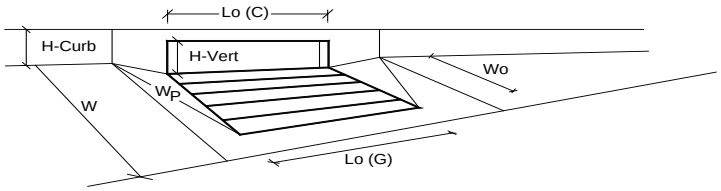
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
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 =	0.063	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	15.8	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	5.1	7.8	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	5.1	7.8	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	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_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.30	0.53	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	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**6.6**	**17.5**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	6.0	12.1	cfs

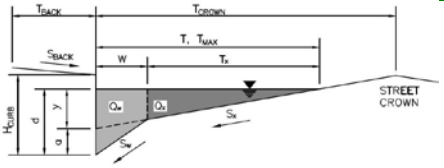
Version 4.05 Released March 2017

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

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

Project: Enter Your Project Name Here

Inlet ID: DP-16 INLET



Gutter Geometry (Enter data in the blue cells)

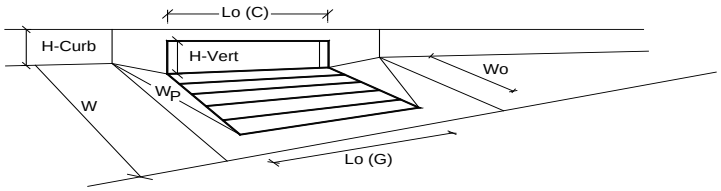
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
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 =	0.063	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	15.8	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	5.1	7.8	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	5.1	7.8	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	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_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	

Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.30	0.53	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	

		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**6.6**	**17.5**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	4.6	8.8	cfs

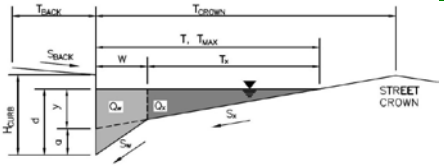
Version 4.05 Released March 2017

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

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

Project: Enter Your Project Name Here

Inlet ID: DP-17 INLET



Gutter Geometry (Enter data in the blue cells)

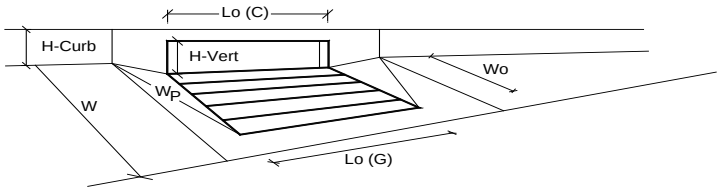
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
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 =	0.063	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	15.8	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	5.1	7.8	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	5.1	7.8	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	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_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.30	0.53	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	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**4.6**	**9.6**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	3.1	6.5	cfs

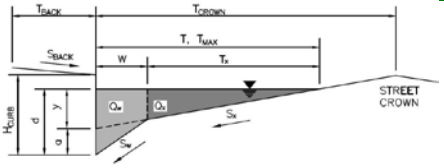
Version 4.05 Released March 2017

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

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

Project: Enter Your Project Name Here

Inlet ID: DP-18 INLET



Gutter Geometry (Enter data in the blue cells)

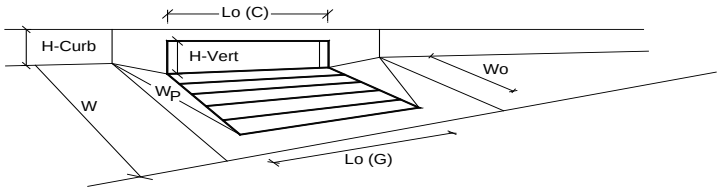
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
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 =	0.063	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	15.8	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	5.1	7.8	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	4.8	5.1	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	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_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.28	0.30	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.45	0.48	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.86	0.88	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**5.7**	**6.6**	**cfs**
WARNING: Inlet Capacity less than Q Peak for Major Storm	$Q_{PEAK\ REQUIRED}$ =	4.1	8.1	cfs

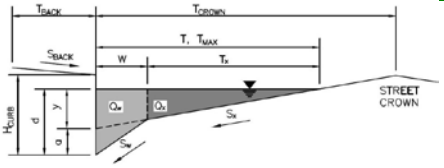
Version 4.05 Released March 2017

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

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

Project: Enter Your Project Name Here

Inlet ID: DP-19 INLET



Gutter Geometry (Enter data in the blue cells)

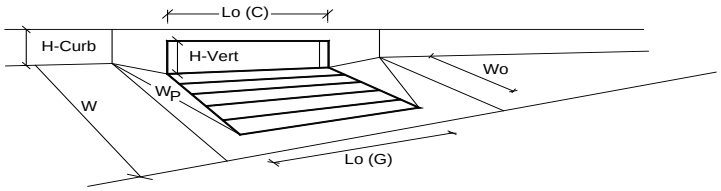
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
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 =	0.063	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	15.8	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	5.1	7.8	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	5.1	7.8	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	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_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.30	0.53	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	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**4.6**	**9.6**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	3.6	7.4	cfs

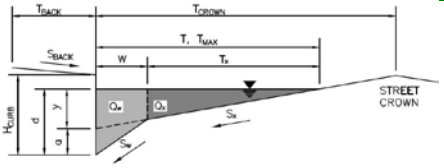
Version 4.05 Released March 2017

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

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

Project: Enter Your Project Name Here

Inlet ID: DP-20 INLET



Gutter Geometry (Enter data in the blue cells)

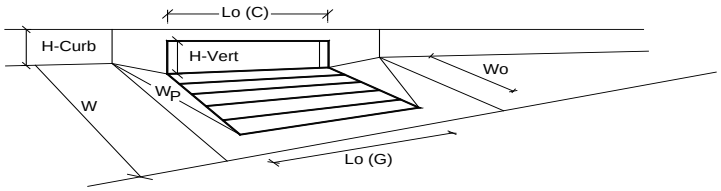
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
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 =	0.063	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	15.8	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	5.1	7.8	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	5.1	7.8	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	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_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.30	0.53	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	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**4.6**	**9.6**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	1.9	3.9	cfs

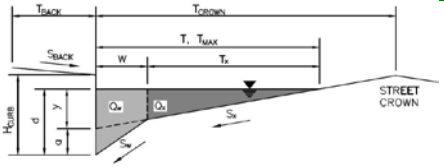
Version 4.05 Released March 2017

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

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

Project: Enter Your Project Name Here

Inlet ID: DP-21 INLET



Gutter Geometry (Enter data in the blue cells)

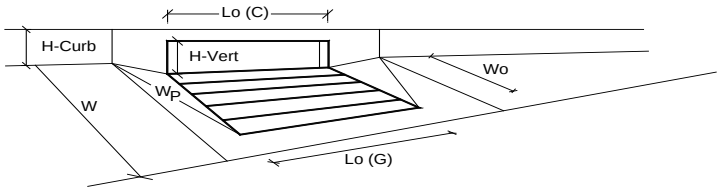
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
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 =	0.063	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	15.8	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	5.1	7.8	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	5.1	7.8	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	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_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.30	0.53	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	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**4.6**	**9.6**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	2.1	4.2	cfs

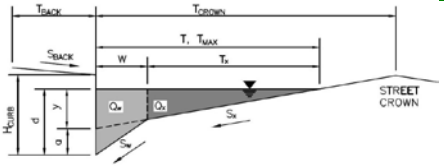
Version 4.05 Released March 2017

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

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

Project: Enter Your Project Name Here

Inlet ID: DP-22 INLET



Gutter Geometry (Enter data in the blue cells)

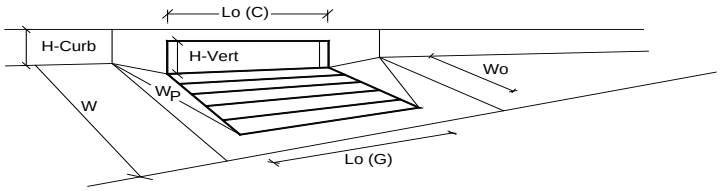
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	12.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	21.0	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 =	0.063	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	20.8	21.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	8.9	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	8.9	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	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_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.38	0.62	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.77	1.00	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**6.4**	**10.6**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	3.5	7.4	cfs

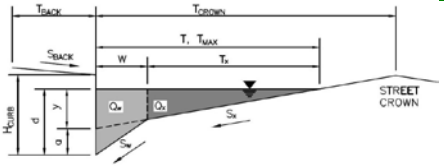
Version 4.05 Released March 2017

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

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

Project: Enter Your Project Name Here

Inlet ID: DP-23 INLET



Gutter Geometry (Enter data in the blue cells)

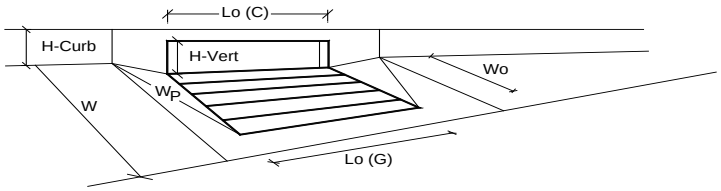
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	12.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	21.0	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 =	0.063	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	20.8	21.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	8.9	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	8.9	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	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_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.38	0.62	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.77	1.00	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**6.4**	**10.6**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	1.6	2.9	cfs

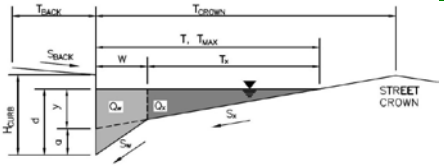
Version 4.05 Released March 2017

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

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

Project: Enter Your Project Name Here

Inlet ID: DP-28B INLET



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	13.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	43.0	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 =	0.063	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.013	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	43.0	43.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	9.1	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

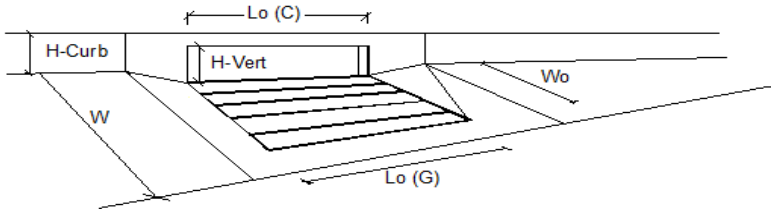
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**20.0**	**75.0**	**cfs**

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

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

INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	15.00	15.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	

Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**9.0**	**13.2**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**1.2**	**6.8**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**88**	**66**	**%**

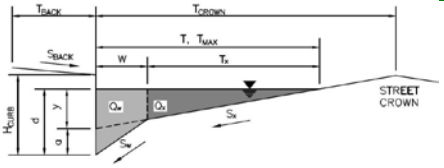
Version 4.05 Released March 2017

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

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

Project: Enter Your Project Name Here

Inlet ID: DP-30 INLET



Gutter Geometry (Enter data in the blue cells)

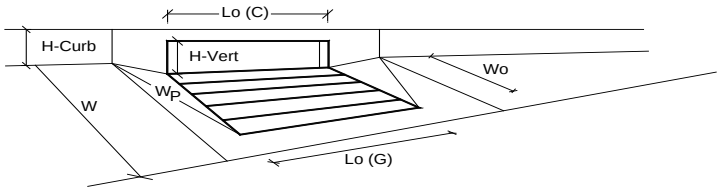
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	13.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	43.0	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 =	0.063	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	43.0	43.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	9.1	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	9.1	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	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_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.38	0.63	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.57	0.86	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.79	0.94	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**11.6**	**29.9**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	11.4	26.7	cfs

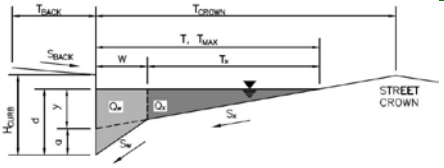
Version 4.05 Released March 2017

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

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

Project: Enter Your Project Name Here

Inlet ID: DP-28B-EXIST



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	13.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	43.0	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 =	0.063	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.013	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	43.0	43.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	9.1	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

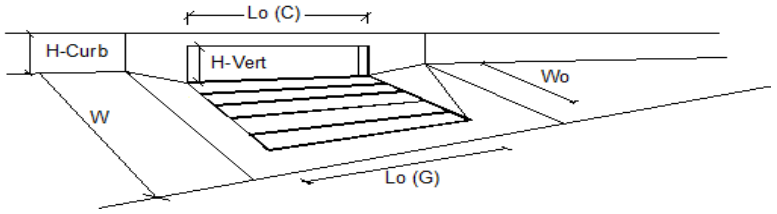
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**20.0**	**75.0**	**cfs**

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

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

INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	15.00	15.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	

Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**7.5**	**11.0**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.4**	**3.1**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**95**	**78**	**%**

PRELIMINARY PIPE (FLOWMASTER)

RIPRAP PROTECTION (UD-CULVERT)

CLASSIC SM
CONSULTING
ENGINEERS & SURVEYORS

Worksheet for Pipe - 1

Project Description	
Friction Method	Manning Formula
Solve For	Full Flow Slope

Input Data	
Roughness Coefficient	0.013
Channel Slope	0.005 ft/ft
Normal Depth	18.0 in
Diameter	18.0 in
Discharge	7.30 cfs

Results	
Channel Slope	0.005 ft/ft
Normal Depth	18.0 in
Flow Area	1.8 ft²
Wetted Perimeter	4.7 ft
Hydraulic Radius	4.5 in
Top Width	0.00 ft
Critical Depth	12.6 in
Percent Full	100.0 %
Critical Slope	0.007 ft/ft
Velocity	4.13 ft/s
Velocity Head	0.27 ft
Specific Energy	1.77 ft
Froude Number	(N/A)
Maximum Discharge	7.85 cfs
Discharge Full	7.30 cfs
Slope Full	0.005 ft/ft
Flow Type	Critical

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

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	100.0 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	18.0 in
Critical Depth	12.6 in
Channel Slope	0.005 ft/ft
Critical Slope	0.007 ft/ft

Worksheet for Pipe - 2

Project Description	
Friction Method	Manning Formula
Solve For	Full Flow Slope

Input Data		
Roughness Coefficient	0.013	
Channel Slope	0.003	ft/ft
Normal Depth	18.0	in
Diameter	18.0	in
Discharge	5.70	cfs

Results		
Channel Slope	0.003	ft/ft
Normal Depth	18.0	in
Flow Area	1.8	ft²
Wetted Perimeter	4.7	ft
Hydraulic Radius	4.5	in
Top Width	0.00	ft
Critical Depth	11.1	in
Percent Full	100.0	%
Critical Slope	0.006	ft/ft
Velocity	3.23	ft/s
Velocity Head	0.16	ft
Specific Energy	1.66	ft
Froude Number	(N/A)	
Maximum Discharge	6.13	cfs
Discharge Full	5.70	cfs
Slope Full	0.003	ft/ft
Flow Type	Critical	

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

GVF Output Data		
Upstream Depth	0.0	in
Profile Description	N/A	
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.0	%
Normal Depth Over Rise	100.0	%
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	18.0	in
Critical Depth	11.1	in
Channel Slope	0.003	ft/ft
Critical Slope	0.006	ft/ft

Worksheet for Pipe - 3

Project Description	
Friction Method	Manning Formula
Solve For	Full Flow Slope

Input Data	
Roughness Coefficient	0.013
Channel Slope	0.003 ft/ft
Normal Depth	24.0 in
Diameter	24.0 in
Discharge	13.00 cfs

Results	
Channel Slope	0.003 ft/ft
Normal Depth	24.0 in
Flow Area	3.1 ft²
Wetted Perimeter	6.3 ft
Hydraulic Radius	6.0 in
Top Width	0.00 ft
Critical Depth	15.6 in
Percent Full	100.0 %
Critical Slope	0.006 ft/ft
Velocity	4.14 ft/s
Velocity Head	0.27 ft
Specific Energy	2.27 ft
Froude Number	(N/A)
Maximum Discharge	13.98 cfs
Discharge Full	13.00 cfs
Slope Full	0.003 ft/ft
Flow Type	Critical

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

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	100.0 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	24.0 in
Critical Depth	15.6 in
Channel Slope	0.003 ft/ft
Critical Slope	0.006 ft/ft

Worksheet for Pipe - 4

Project Description	
Friction Method	Manning Formula
Solve For	Full Flow Slope

Input Data	
Roughness Coefficient	0.013
Channel Slope	0.002 ft/ft
Normal Depth	18.0 in
Diameter	18.0 in
Discharge	4.20 cfs

Results	
Channel Slope	0.002 ft/ft
Normal Depth	18.0 in
Flow Area	1.8 ft²
Wetted Perimeter	4.7 ft
Hydraulic Radius	4.5 in
Top Width	0.00 ft
Critical Depth	9.4 in
Percent Full	100.0 %
Critical Slope	0.005 ft/ft
Velocity	2.38 ft/s
Velocity Head	0.09 ft
Specific Energy	1.59 ft
Froude Number	(N/A)
Maximum Discharge	4.52 cfs
Discharge Full	4.20 cfs
Slope Full	0.002 ft/ft
Flow Type	Critical

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

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	100.0 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	18.0 in
Critical Depth	9.4 in
Channel Slope	0.002 ft/ft
Critical Slope	0.005 ft/ft

Worksheet for Pipe - 5

Project Description	
Friction Method	Manning Formula
Solve For	Full Flow Slope

Input Data	
Roughness Coefficient	0.013
Channel Slope	0.003 ft/ft
Normal Depth	24.0 in
Diameter	24.0 in
Discharge	13.00 cfs

Results	
Channel Slope	0.003 ft/ft
Normal Depth	24.0 in
Flow Area	3.1 ft²
Wetted Perimeter	6.3 ft
Hydraulic Radius	6.0 in
Top Width	0.00 ft
Critical Depth	15.6 in
Percent Full	100.0 %
Critical Slope	0.006 ft/ft
Velocity	4.14 ft/s
Velocity Head	0.27 ft
Specific Energy	2.27 ft
Froude Number	(N/A)
Maximum Discharge	13.98 cfs
Discharge Full	13.00 cfs
Slope Full	0.003 ft/ft
Flow Type	Critical

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

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	100.0 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	24.0 in
Critical Depth	15.6 in
Channel Slope	0.003 ft/ft
Critical Slope	0.006 ft/ft

Worksheet for Pipe - 6

Project Description	
Friction Method	Manning Formula
Solve For	Full Flow Slope

Input Data	
Roughness Coefficient	0.013
Channel Slope	0.006 ft/ft
Normal Depth	18.0 in
Diameter	18.0 in
Discharge	8.00 cfs

Results	
Channel Slope	0.006 ft/ft
Normal Depth	18.0 in
Flow Area	1.8 ft²
Wetted Perimeter	4.7 ft
Hydraulic Radius	4.5 in
Top Width	0.00 ft
Critical Depth	13.2 in
Percent Full	100.0 %
Critical Slope	0.007 ft/ft
Velocity	4.53 ft/s
Velocity Head	0.32 ft
Specific Energy	1.82 ft
Froude Number	(N/A)
Maximum Discharge	8.61 cfs
Discharge Full	8.00 cfs
Slope Full	0.006 ft/ft
Flow Type	Critical

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

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	100.0 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	18.0 in
Critical Depth	13.2 in
Channel Slope	0.006 ft/ft
Critical Slope	0.007 ft/ft

Worksheet for Pipe - 7

Project Description	
Friction Method	Manning Formula
Solve For	Full Flow Slope

Input Data	
Roughness Coefficient	0.013
Channel Slope	0.008 ft/ft
Normal Depth	24.0 in
Diameter	24.0 in
Discharge	20.10 cfs

Results	
Channel Slope	0.008 ft/ft
Normal Depth	24.0 in
Flow Area	3.1 ft²
Wetted Perimeter	6.3 ft
Hydraulic Radius	6.0 in
Top Width	0.00 ft
Critical Depth	19.3 in
Percent Full	100.0 %
Critical Slope	0.008 ft/ft
Velocity	6.40 ft/s
Velocity Head	0.64 ft
Specific Energy	2.64 ft
Froude Number	(N/A)
Maximum Discharge	21.62 cfs
Discharge Full	20.10 cfs
Slope Full	0.008 ft/ft
Flow Type	Critical

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

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	100.0 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	24.0 in
Critical Depth	19.3 in
Channel Slope	0.008 ft/ft
Critical Slope	0.008 ft/ft

Worksheet for Pipe - 8

Project Description	
Friction Method	Manning Formula
Solve For	Full Flow Slope

Input Data		
Roughness Coefficient	0.013	
Channel Slope	0.001	ft/ft
Normal Depth	18.0	in
Diameter	18.0	in
Discharge	2.90	cfs

Results		
Channel Slope	0.001	ft/ft
Normal Depth	18.0	in
Flow Area	1.8	ft²
Wetted Perimeter	4.7	ft
Hydraulic Radius	4.5	in
Top Width	0.00	ft
Critical Depth	7.8	in
Percent Full	100.0	%
Critical Slope	0.005	ft/ft
Velocity	1.64	ft/s
Velocity Head	0.04	ft
Specific Energy	1.54	ft
Froude Number	(N/A)	
Maximum Discharge	3.12	cfs
Discharge Full	2.90	cfs
Slope Full	0.001	ft/ft
Flow Type	Critical	

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

GVF Output Data		
Upstream Depth	0.0	in
Profile Description	N/A	
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.0	%
Normal Depth Over Rise	100.0	%
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	18.0	in
Critical Depth	7.8	in
Channel Slope	0.001	ft/ft
Critical Slope	0.005	ft/ft

Worksheet for Pipe - 9

Project Description	
Friction Method	Manning Formula
Solve For	Full Flow Slope

Input Data		
Roughness Coefficient	0.013	
Channel Slope	0.002	ft/ft
Normal Depth	18.0	in
Diameter	18.0	in
Discharge	4.80	cfs

Results		
Channel Slope	0.002	ft/ft
Normal Depth	18.0	in
Flow Area	1.8	ft²
Wetted Perimeter	4.7	ft
Hydraulic Radius	4.5	in
Top Width	0.00	ft
Critical Depth	10.1	in
Percent Full	100.0	%
Critical Slope	0.006	ft/ft
Velocity	2.72	ft/s
Velocity Head	0.11	ft
Specific Energy	1.61	ft
Froude Number	(N/A)	
Maximum Discharge	5.16	cfs
Discharge Full	4.80	cfs
Slope Full	0.002	ft/ft
Flow Type	Critical	

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

GVF Output Data		
Upstream Depth	0.0	in
Profile Description	N/A	
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.0	%
Normal Depth Over Rise	100.0	%
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	18.0	in
Critical Depth	10.1	in
Channel Slope	0.002	ft/ft
Critical Slope	0.006	ft/ft

Worksheet for Pipe - 10

Project Description	
Friction Method	Manning Formula
Solve For	Full Flow Slope

Input Data	
Roughness Coefficient	0.013
Channel Slope	0.004 ft/ft
Normal Depth	30.0 in
Diameter	30.0 in
Discharge	27.10 cfs

Results	
Channel Slope	0.004 ft/ft
Normal Depth	30.0 in
Flow Area	4.9 ft²
Wetted Perimeter	7.9 ft
Hydraulic Radius	7.5 in
Top Width	0.00 ft
Critical Depth	21.3 in
Percent Full	100.0 %
Critical Slope	0.006 ft/ft
Velocity	5.52 ft/s
Velocity Head	0.47 ft
Specific Energy	2.97 ft
Froude Number	(N/A)
Maximum Discharge	29.15 cfs
Discharge Full	27.10 cfs
Slope Full	0.004 ft/ft
Flow Type	Critical

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

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	100.0 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	30.0 in
Critical Depth	21.3 in
Channel Slope	0.004 ft/ft
Critical Slope	0.006 ft/ft

Worksheet for Pipe - 11

Project Description	
Friction Method	Manning Formula
Solve For	Full Flow Slope

Input Data	
Roughness Coefficient	0.013
Channel Slope	0.005 ft/ft
Normal Depth	18.0 in
Diameter	18.0 in
Discharge	7.60 cfs

Results	
Channel Slope	0.005 ft/ft
Normal Depth	18.0 in
Flow Area	1.8 ft²
Wetted Perimeter	4.7 ft
Hydraulic Radius	4.5 in
Top Width	0.00 ft
Critical Depth	12.8 in
Percent Full	100.0 %
Critical Slope	0.007 ft/ft
Velocity	4.30 ft/s
Velocity Head	0.29 ft
Specific Energy	1.79 ft
Froude Number	(N/A)
Maximum Discharge	8.18 cfs
Discharge Full	7.60 cfs
Slope Full	0.005 ft/ft
Flow Type	Critical

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

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	100.0 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	18.0 in
Critical Depth	12.8 in
Channel Slope	0.005 ft/ft
Critical Slope	0.007 ft/ft

Worksheet for Pipe - 12

Project Description	
Friction Method	Manning Formula
Solve For	Full Flow Slope

Input Data		
Roughness Coefficient	0.013	
Channel Slope	0.003	ft/ft
Normal Depth	18.0	in
Diameter	18.0	in
Discharge	6.20	cfs

Results		
Channel Slope	0.003	ft/ft
Normal Depth	18.0	in
Flow Area	1.8	ft^2
Wetted Perimeter	4.7	ft
Hydraulic Radius	4.5	in
Top Width	0.00	ft
Critical Depth	11.5	in
Percent Full	100.0	%
Critical Slope	0.006	ft/ft
Velocity	3.51	ft/s
Velocity Head	0.19	ft
Specific Energy	1.69	ft
Froude Number	(N/A)	
Maximum Discharge	6.67	cfs
Discharge Full	6.20	cfs
Slope Full	0.003	ft/ft
Flow Type	Critical	

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

GVF Output Data		
Upstream Depth	0.0	in
Profile Description	N/A	
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.0	%
Normal Depth Over Rise	100.0	%
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	18.0	in
Critical Depth	11.5	in
Channel Slope	0.003	ft/ft
Critical Slope	0.006	ft/ft

Worksheet for Pipe - 13

Project Description	
Friction Method	Manning Formula
Solve For	Full Flow Slope

Input Data	
Roughness Coefficient	0.013
Channel Slope	0.004 ft/ft
Normal Depth	24.0 in
Diameter	24.0 in
Discharge	13.80 cfs

Results	
Channel Slope	0.004 ft/ft
Normal Depth	24.0 in
Flow Area	3.1 ft²
Wetted Perimeter	6.3 ft
Hydraulic Radius	6.0 in
Top Width	0.00 ft
Critical Depth	16.1 in
Percent Full	100.0 %
Critical Slope	0.006 ft/ft
Velocity	4.39 ft/s
Velocity Head	0.30 ft
Specific Energy	2.30 ft
Froude Number	(N/A)
Maximum Discharge	14.84 cfs
Discharge Full	13.80 cfs
Slope Full	0.004 ft/ft
Flow Type	Critical

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

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	100.0 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	24.0 in
Critical Depth	16.1 in
Channel Slope	0.004 ft/ft
Critical Slope	0.006 ft/ft

Worksheet for Pipe - 14

Project Description	
Friction Method	Manning Formula
Solve For	Full Flow Slope

Input Data		
Roughness Coefficient	0.013	
Channel Slope	0.002	ft/ft
Normal Depth	24.0	in
Diameter	24.0	in
Discharge	10.80	cfs

Results		
Channel Slope	0.002	ft/ft
Normal Depth	24.0	in
Flow Area	3.1	ft²
Wetted Perimeter	6.3	ft
Hydraulic Radius	6.0	in
Top Width	0.00	ft
Critical Depth	14.1	in
Percent Full	100.0	%
Critical Slope	0.005	ft/ft
Velocity	3.44	ft/s
Velocity Head	0.18	ft
Specific Energy	2.18	ft
Froude Number	(N/A)	
Maximum Discharge	11.62	cfs
Discharge Full	10.80	cfs
Slope Full	0.002	ft/ft
Flow Type	Critical	

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

GVF Output Data		
Upstream Depth	0.0	in
Profile Description	N/A	
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.0	%
Normal Depth Over Rise	100.0	%
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	24.0	in
Critical Depth	14.1	in
Channel Slope	0.002	ft/ft
Critical Slope	0.005	ft/ft

Worksheet for Pipe - 15

Project Description	
Friction Method	Manning Formula
Solve For	Full Flow Slope

Input Data		
Roughness Coefficient	0.013	
Channel Slope	0.001	ft/ft
Normal Depth	18.0	in
Diameter	18.0	in
Discharge	3.40	cfs

Results		
Channel Slope	0.001	ft/ft
Normal Depth	18.0	in
Flow Area	1.8	ft²
Wetted Perimeter	4.7	ft
Hydraulic Radius	4.5	in
Top Width	0.00	ft
Critical Depth	8.4	in
Percent Full	100.0	%
Critical Slope	0.005	ft/ft
Velocity	1.92	ft/s
Velocity Head	0.06	ft
Specific Energy	1.56	ft
Froude Number	(N/A)	
Maximum Discharge	3.66	cfs
Discharge Full	3.40	cfs
Slope Full	0.001	ft/ft
Flow Type	Critical	

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

GVF Output Data		
Upstream Depth	0.0	in
Profile Description	N/A	
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.0	%
Normal Depth Over Rise	100.0	%
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	18.0	in
Critical Depth	8.4	in
Channel Slope	0.001	ft/ft
Critical Slope	0.005	ft/ft

Worksheet for Pipe - 16

Project Description	
Friction Method	Manning Formula
Solve For	Full Flow Slope

Input Data	
Roughness Coefficient	0.013
Channel Slope	0.004 ft/ft
Normal Depth	24.0 in
Diameter	24.0 in
Discharge	14.10 cfs

Results	
Channel Slope	0.004 ft/ft
Normal Depth	24.0 in
Flow Area	3.1 ft²
Wetted Perimeter	6.3 ft
Hydraulic Radius	6.0 in
Top Width	0.00 ft
Critical Depth	16.2 in
Percent Full	100.0 %
Critical Slope	0.006 ft/ft
Velocity	4.49 ft/s
Velocity Head	0.31 ft
Specific Energy	2.31 ft
Froude Number	(N/A)
Maximum Discharge	15.17 cfs
Discharge Full	14.10 cfs
Slope Full	0.004 ft/ft
Flow Type	Critical

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

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	100.0 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	24.0 in
Critical Depth	16.2 in
Channel Slope	0.004 ft/ft
Critical Slope	0.006 ft/ft

Worksheet for Pipe - 17

Project Description	
Friction Method	Manning Formula
Solve For	Full Flow Slope

Input Data		
Roughness Coefficient	0.013	
Channel Slope	0.006	ft/ft
Normal Depth	36.0	in
Diameter	36.0	in
Discharge	52.60	cfs

Results		
Channel Slope	0.006	ft/ft
Normal Depth	36.0	in
Flow Area	7.1	ft²
Wetted Perimeter	9.4	ft
Hydraulic Radius	9.0	in
Top Width	0.00	ft
Critical Depth	28.3	in
Percent Full	100.0	%
Critical Slope	0.007	ft/ft
Velocity	7.44	ft/s
Velocity Head	0.86	ft
Specific Energy	3.86	ft
Froude Number	(N/A)	
Maximum Discharge	56.58	cfs
Discharge Full	52.60	cfs
Slope Full	0.006	ft/ft
Flow Type	Critical	

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

GVF Output Data		
Upstream Depth	0.0	in
Profile Description	N/A	
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.0	%
Normal Depth Over Rise	100.0	%
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	36.0	in
Critical Depth	28.3	in
Channel Slope	0.006	ft/ft
Critical Slope	0.007	ft/ft

Worksheet for Pipe - 18

Project Description	
Friction Method	Manning Formula
Solve For	Full Flow Slope

Input Data	
Roughness Coefficient	0.013
Channel Slope	0.002 ft/ft
Normal Depth	24.0 in
Diameter	24.0 in
Discharge	10.40 cfs

Results	
Channel Slope	0.002 ft/ft
Normal Depth	24.0 in
Flow Area	3.1 ft²
Wetted Perimeter	6.3 ft
Hydraulic Radius	6.0 in
Top Width	0.00 ft
Critical Depth	13.9 in
Percent Full	100.0 %
Critical Slope	0.005 ft/ft
Velocity	3.31 ft/s
Velocity Head	0.17 ft
Specific Energy	2.17 ft
Froude Number	(N/A)
Maximum Discharge	11.19 cfs
Discharge Full	10.40 cfs
Slope Full	0.002 ft/ft
Flow Type	Critical

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

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	100.0 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	24.0 in
Critical Depth	13.9 in
Channel Slope	0.002 ft/ft
Critical Slope	0.005 ft/ft

Worksheet for Pipe - 19

Project Description	
Friction Method	Manning Formula
Solve For	Full Flow Slope

Input Data	
Roughness Coefficient	0.013
Channel Slope	0.000 ft/ft
Normal Depth	18.0 in
Diameter	18.0 in
Discharge	2.20 cfs

Results	
Channel Slope	0.000 ft/ft
Normal Depth	18.0 in
Flow Area	1.8 ft²
Wetted Perimeter	4.7 ft
Hydraulic Radius	4.5 in
Top Width	0.00 ft
Critical Depth	6.7 in
Percent Full	100.0 %
Critical Slope	0.005 ft/ft
Velocity	1.24 ft/s
Velocity Head	0.02 ft
Specific Energy	1.52 ft
Froude Number	(N/A)
Maximum Discharge	2.37 cfs
Discharge Full	2.20 cfs
Slope Full	0.000 ft/ft
Flow Type	Critical

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

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	100.0 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	18.0 in
Critical Depth	6.7 in
Channel Slope	0.000 ft/ft
Critical Slope	0.005 ft/ft

Worksheet for Pipe - 20

Project Description	
Friction Method	Manning Formula
Solve For	Full Flow Slope

Input Data		
Roughness Coefficient	0.013	
Channel Slope	0.003	ft/ft
Normal Depth	24.0	in
Diameter	24.0	in
Discharge	11.70	cfs

Results		
Channel Slope	0.003	ft/ft
Normal Depth	24.0	in
Flow Area	3.1	ft²
Wetted Perimeter	6.3	ft
Hydraulic Radius	6.0	in
Top Width	0.00	ft
Critical Depth	14.7	in
Percent Full	100.0	%
Critical Slope	0.006	ft/ft
Velocity	3.72	ft/s
Velocity Head	0.22	ft
Specific Energy	2.22	ft
Froude Number	(N/A)	
Maximum Discharge	12.59	cfs
Discharge Full	11.70	cfs
Slope Full	0.003	ft/ft
Flow Type	Critical	

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

GVF Output Data		
Upstream Depth	0.0	in
Profile Description	N/A	
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.0	%
Normal Depth Over Rise	100.0	%
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	24.0	in
Critical Depth	14.7	in
Channel Slope	0.003	ft/ft
Critical Slope	0.006	ft/ft

Worksheet for Pipe - 21

Project Description	
Friction Method	Manning Formula
Solve For	Full Flow Slope

Input Data	
Roughness Coefficient	0.013
Channel Slope	0.004 ft/ft
Normal Depth	18.0 in
Diameter	18.0 in
Discharge	6.70 cfs

Results	
Channel Slope	0.004 ft/ft
Normal Depth	18.0 in
Flow Area	1.8 ft²
Wetted Perimeter	4.7 ft
Hydraulic Radius	4.5 in
Top Width	0.00 ft
Critical Depth	12.0 in
Percent Full	100.0 %
Critical Slope	0.007 ft/ft
Velocity	3.79 ft/s
Velocity Head	0.22 ft
Specific Energy	1.72 ft
Froude Number	(N/A)
Maximum Discharge	7.21 cfs
Discharge Full	6.70 cfs
Slope Full	0.004 ft/ft
Flow Type	Critical

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

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	100.0 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	18.0 in
Critical Depth	12.0 in
Channel Slope	0.004 ft/ft
Critical Slope	0.007 ft/ft

Worksheet for Pipe - 22

Project Description	
Friction Method	Manning Formula
Solve For	Full Flow Slope

Input Data	
Roughness Coefficient	0.013
Channel Slope	0.001 ft/ft
Normal Depth	18.0 in
Diameter	18.0 in
Discharge	4.00 cfs

Results	
Channel Slope	0.001 ft/ft
Normal Depth	18.0 in
Flow Area	1.8 ft²
Wetted Perimeter	4.7 ft
Hydraulic Radius	4.5 in
Top Width	0.00 ft
Critical Depth	9.2 in
Percent Full	100.0 %
Critical Slope	0.005 ft/ft
Velocity	2.26 ft/s
Velocity Head	0.08 ft
Specific Energy	1.58 ft
Froude Number	(N/A)
Maximum Discharge	4.30 cfs
Discharge Full	4.00 cfs
Slope Full	0.001 ft/ft
Flow Type	Critical

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

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	100.0 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	18.0 in
Critical Depth	9.2 in
Channel Slope	0.001 ft/ft
Critical Slope	0.005 ft/ft

Worksheet for Pipe - 23

Project Description	
Friction Method	Manning Formula
Solve For	Full Flow Slope

Input Data		
Roughness Coefficient	0.013	
Channel Slope	0.002	ft/ft
Normal Depth	24.0	in
Diameter	24.0	in
Discharge	10.60	cfs

Results		
Channel Slope	0.002	ft/ft
Normal Depth	24.0	in
Flow Area	3.1	ft²
Wetted Perimeter	6.3	ft
Hydraulic Radius	6.0	in
Top Width	0.00	ft
Critical Depth	14.0	in
Percent Full	100.0	%
Critical Slope	0.005	ft/ft
Velocity	3.37	ft/s
Velocity Head	0.18	ft
Specific Energy	2.18	ft
Froude Number	(N/A)	
Maximum Discharge	11.40	cfs
Discharge Full	10.60	cfs
Slope Full	0.002	ft/ft
Flow Type	Critical	

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

GVF Output Data		
Upstream Depth	0.0	in
Profile Description	N/A	
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.0	%
Normal Depth Over Rise	100.0	%
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	24.0	in
Critical Depth	14.0	in
Channel Slope	0.002	ft/ft
Critical Slope	0.005	ft/ft

Worksheet for Pipe - 24

Project Description	
Friction Method	Manning Formula
Solve For	Full Flow Slope

Input Data	
Roughness Coefficient	0.013
Channel Slope	0.008 ft/ft
Normal Depth	24.0 in
Diameter	24.0 in
Discharge	20.80 cfs

Results	
Channel Slope	0.008 ft/ft
Normal Depth	24.0 in
Flow Area	3.1 ft²
Wetted Perimeter	6.3 ft
Hydraulic Radius	6.0 in
Top Width	0.00 ft
Critical Depth	19.6 in
Percent Full	100.0 %
Critical Slope	0.008 ft/ft
Velocity	6.62 ft/s
Velocity Head	0.68 ft
Specific Energy	2.68 ft
Froude Number	(N/A)
Maximum Discharge	22.37 cfs
Discharge Full	20.80 cfs
Slope Full	0.008 ft/ft
Flow Type	Critical

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

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	100.0 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	24.0 in
Critical Depth	19.6 in
Channel Slope	0.008 ft/ft
Critical Slope	0.008 ft/ft

Worksheet for Pipe - 25

Project Description	
Friction Method	Manning Formula
Solve For	Full Flow Slope

Input Data		
Roughness Coefficient	0.013	
Channel Slope	0.003	ft/ft
Normal Depth	24.0	in
Diameter	24.0	in
Discharge	12.10	cfs

Results		
Channel Slope	0.003	ft/ft
Normal Depth	24.0	in
Flow Area	3.1	ft²
Wetted Perimeter	6.3	ft
Hydraulic Radius	6.0	in
Top Width	0.00	ft
Critical Depth	15.0	in
Percent Full	100.0	%
Critical Slope	0.006	ft/ft
Velocity	3.85	ft/s
Velocity Head	0.23	ft
Specific Energy	2.23	ft
Froude Number	(N/A)	
Maximum Discharge	13.02	cfs
Discharge Full	12.10	cfs
Slope Full	0.003	ft/ft
Flow Type	Critical	

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

GVF Output Data		
Upstream Depth	0.0	in
Profile Description	N/A	
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.0	%
Normal Depth Over Rise	100.0	%
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	24.0	in
Critical Depth	15.0	in
Channel Slope	0.003	ft/ft
Critical Slope	0.006	ft/ft

Worksheet for Pipe - 26

Project Description	
Friction Method	Manning Formula
Solve For	Full Flow Slope

Input Data	
Roughness Coefficient	0.013
Channel Slope	0.007 ft/ft
Normal Depth	18.0 in
Diameter	18.0 in
Discharge	8.80 cfs

Results	
Channel Slope	0.007 ft/ft
Normal Depth	18.0 in
Flow Area	1.8 ft²
Wetted Perimeter	4.7 ft
Hydraulic Radius	4.5 in
Top Width	0.00 ft
Critical Depth	13.8 in
Percent Full	100.0 %
Critical Slope	0.008 ft/ft
Velocity	4.98 ft/s
Velocity Head	0.39 ft
Specific Energy	1.89 ft
Froude Number	(N/A)
Maximum Discharge	9.47 cfs
Discharge Full	8.80 cfs
Slope Full	0.007 ft/ft
Flow Type	Critical

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

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	100.0 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	18.0 in
Critical Depth	13.8 in
Channel Slope	0.007 ft/ft
Critical Slope	0.008 ft/ft

Worksheet for Pipe - 27

Project Description	
Friction Method	Manning Formula
Solve For	Full Flow Slope

Input Data		
Roughness Coefficient	0.013	
Channel Slope	0.003	ft/ft
Normal Depth	36.0	in
Diameter	36.0	in
Discharge	38.80	cfs

Results		
Channel Slope	0.003	ft/ft
Normal Depth	36.0	in
Flow Area	7.1	ft²
Wetted Perimeter	9.4	ft
Hydraulic Radius	9.0	in
Top Width	0.00	ft
Critical Depth	24.3	in
Percent Full	100.0	%
Critical Slope	0.005	ft/ft
Velocity	5.49	ft/s
Velocity Head	0.47	ft
Specific Energy	3.47	ft
Froude Number	(N/A)	
Maximum Discharge	41.74	cfs
Discharge Full	38.80	cfs
Slope Full	0.003	ft/ft
Flow Type	Critical	

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

GVF Output Data		
Upstream Depth	0.0	in
Profile Description	N/A	
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.0	%
Normal Depth Over Rise	100.0	%
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	36.0	in
Critical Depth	24.3	in
Channel Slope	0.003	ft/ft
Critical Slope	0.005	ft/ft

Worksheet for Pipe - 28

Project Description	
Friction Method	Manning Formula
Solve For	Full Flow Slope

Input Data	
Roughness Coefficient	0.013
Channel Slope	0.004 ft/ft
Normal Depth	18.0 in
Diameter	18.0 in
Discharge	6.50 cfs

Results	
Channel Slope	0.004 ft/ft
Normal Depth	18.0 in
Flow Area	1.8 ft²
Wetted Perimeter	4.7 ft
Hydraulic Radius	4.5 in
Top Width	0.00 ft
Critical Depth	11.8 in
Percent Full	100.0 %
Critical Slope	0.006 ft/ft
Velocity	3.68 ft/s
Velocity Head	0.21 ft
Specific Energy	1.71 ft
Froude Number	(N/A)
Maximum Discharge	6.99 cfs
Discharge Full	6.50 cfs
Slope Full	0.004 ft/ft
Flow Type	Critical

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

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	100.0 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	18.0 in
Critical Depth	11.8 in
Channel Slope	0.004 ft/ft
Critical Slope	0.006 ft/ft

Worksheet for Pipe - 29

Project Description	
Friction Method	Manning Formula
Solve For	Full Flow Slope

Input Data	
Roughness Coefficient	0.013
Channel Slope	0.006 ft/ft
Normal Depth	18.0 in
Diameter	18.0 in
Discharge	8.10 cfs

Results	
Channel Slope	0.006 ft/ft
Normal Depth	18.0 in
Flow Area	1.8 ft²
Wetted Perimeter	4.7 ft
Hydraulic Radius	4.5 in
Top Width	0.00 ft
Critical Depth	13.2 in
Percent Full	100.0 %
Critical Slope	0.007 ft/ft
Velocity	4.58 ft/s
Velocity Head	0.33 ft
Specific Energy	1.83 ft
Froude Number	(N/A)
Maximum Discharge	8.71 cfs
Discharge Full	8.10 cfs
Slope Full	0.006 ft/ft
Flow Type	Critical

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

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	100.0 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	18.0 in
Critical Depth	13.2 in
Channel Slope	0.006 ft/ft
Critical Slope	0.007 ft/ft

Worksheet for Pipe - 30

Project Description	
Friction Method	Manning Formula
Solve For	Full Flow Slope

Input Data		
Roughness Coefficient	0.013	
Channel Slope	0.006	ft/ft
Normal Depth	36.0	in
Diameter	36.0	in
Discharge	51.60	cfs

Results		
Channel Slope	0.006	ft/ft
Normal Depth	36.0	in
Flow Area	7.1	ft²
Wetted Perimeter	9.4	ft
Hydraulic Radius	9.0	in
Top Width	0.00	ft
Critical Depth	28.0	in
Percent Full	100.0	%
Critical Slope	0.007	ft/ft
Velocity	7.30	ft/s
Velocity Head	0.83	ft
Specific Energy	3.83	ft
Froude Number	(N/A)	
Maximum Discharge	55.51	cfs
Discharge Full	51.60	cfs
Slope Full	0.006	ft/ft
Flow Type	Critical	

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

GVF Output Data		
Upstream Depth	0.0	in
Profile Description	N/A	
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.0	%
Normal Depth Over Rise	100.0	%
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	36.0	in
Critical Depth	28.0	in
Channel Slope	0.006	ft/ft
Critical Slope	0.007	ft/ft

Worksheet for Pipe - 31

Project Description	
Friction Method	Manning Formula
Solve For	Full Flow Slope

Input Data	
Roughness Coefficient	0.013
Channel Slope	0.005 ft/ft
Normal Depth	18.0 in
Diameter	18.0 in
Discharge	7.40 cfs

Results	
Channel Slope	0.005 ft/ft
Normal Depth	18.0 in
Flow Area	1.8 ft²
Wetted Perimeter	4.7 ft
Hydraulic Radius	4.5 in
Top Width	0.00 ft
Critical Depth	12.6 in
Percent Full	100.0 %
Critical Slope	0.007 ft/ft
Velocity	4.19 ft/s
Velocity Head	0.27 ft
Specific Energy	1.77 ft
Froude Number	(N/A)
Maximum Discharge	7.96 cfs
Discharge Full	7.40 cfs
Slope Full	0.005 ft/ft
Flow Type	Critical

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

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	100.0 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	18.0 in
Critical Depth	12.6 in
Channel Slope	0.005 ft/ft
Critical Slope	0.007 ft/ft

Worksheet for Pipe - 32

Project Description	
Friction Method	Manning Formula
Solve For	Full Flow Slope

Input Data	
Roughness Coefficient	0.013
Channel Slope	0.001 ft/ft
Normal Depth	18.0 in
Diameter	18.0 in
Discharge	3.90 cfs

Results	
Channel Slope	0.001 ft/ft
Normal Depth	18.0 in
Flow Area	1.8 ft²
Wetted Perimeter	4.7 ft
Hydraulic Radius	4.5 in
Top Width	0.00 ft
Critical Depth	9.1 in
Percent Full	100.0 %
Critical Slope	0.005 ft/ft
Velocity	2.21 ft/s
Velocity Head	0.08 ft
Specific Energy	1.58 ft
Froude Number	(N/A)
Maximum Discharge	4.20 cfs
Discharge Full	3.90 cfs
Slope Full	0.001 ft/ft
Flow Type	Critical

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

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	100.0 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	18.0 in
Critical Depth	9.1 in
Channel Slope	0.001 ft/ft
Critical Slope	0.005 ft/ft

Worksheet for Pipe - 33

Project Description	
Friction Method	Manning Formula
Solve For	Full Flow Slope

Input Data	
Roughness Coefficient	0.013
Channel Slope	0.002 ft/ft
Normal Depth	24.0 in
Diameter	24.0 in
Discharge	11.20 cfs

Results	
Channel Slope	0.002 ft/ft
Normal Depth	24.0 in
Flow Area	3.1 ft²
Wetted Perimeter	6.3 ft
Hydraulic Radius	6.0 in
Top Width	0.00 ft
Critical Depth	14.4 in
Percent Full	100.0 %
Critical Slope	0.005 ft/ft
Velocity	3.57 ft/s
Velocity Head	0.20 ft
Specific Energy	2.20 ft
Froude Number	(N/A)
Maximum Discharge	12.05 cfs
Discharge Full	11.20 cfs
Slope Full	0.002 ft/ft
Flow Type	Critical

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

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	100.0 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	24.0 in
Critical Depth	14.4 in
Channel Slope	0.002 ft/ft
Critical Slope	0.005 ft/ft

Worksheet for Pipe - 34

Project Description	
Friction Method	Manning Formula
Solve For	Full Flow Slope

Input Data	
Roughness Coefficient	0.013
Channel Slope	0.002 ft/ft
Normal Depth	18.0 in
Diameter	18.0 in
Discharge	4.20 cfs

Results	
Channel Slope	0.002 ft/ft
Normal Depth	18.0 in
Flow Area	1.8 ft²
Wetted Perimeter	4.7 ft
Hydraulic Radius	4.5 in
Top Width	0.00 ft
Critical Depth	9.4 in
Percent Full	100.0 %
Critical Slope	0.005 ft/ft
Velocity	2.38 ft/s
Velocity Head	0.09 ft
Specific Energy	1.59 ft
Froude Number	(N/A)
Maximum Discharge	4.52 cfs
Discharge Full	4.20 cfs
Slope Full	0.002 ft/ft
Flow Type	Critical

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

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	100.0 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	18.0 in
Critical Depth	9.4 in
Channel Slope	0.002 ft/ft
Critical Slope	0.005 ft/ft

Worksheet for Pipe - 35

Project Description	
Friction Method	Manning Formula
Solve For	Full Flow Slope

Input Data		
Roughness Coefficient	0.013	
Channel Slope	0.004	ft/ft
Normal Depth	42.0	in
Diameter	42.0	in
Discharge	65.50	cfs

Results		
Channel Slope	0.004	ft/ft
Normal Depth	42.0	in
Flow Area	9.6	ft²
Wetted Perimeter	11.0	ft
Hydraulic Radius	10.5	in
Top Width	0.00	ft
Critical Depth	30.4	in
Percent Full	100.0	%
Critical Slope	0.006	ft/ft
Velocity	6.81	ft/s
Velocity Head	0.72	ft
Specific Energy	4.22	ft
Froude Number	(N/A)	
Maximum Discharge	70.46	cfs
Discharge Full	65.50	cfs
Slope Full	0.004	ft/ft
Flow Type	Critical	

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

GVF Output Data		
Upstream Depth	0.0	in
Profile Description	N/A	
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.0	%
Normal Depth Over Rise	100.0	%
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	42.0	in
Critical Depth	30.4	in
Channel Slope	0.004	ft/ft
Critical Slope	0.006	ft/ft

Worksheet for Pipe - 45

Project Description	
Friction Method	Manning Formula
Solve For	Full Flow Slope

Input Data	
Roughness Coefficient	0.013
Channel Slope	0.005 ft/ft
Normal Depth	18.0 in
Diameter	18.0 in
Discharge	7.40 cfs

Results	
Channel Slope	0.005 ft/ft
Normal Depth	18.0 in
Flow Area	1.8 ft²
Wetted Perimeter	4.7 ft
Hydraulic Radius	4.5 in
Top Width	0.00 ft
Critical Depth	12.6 in
Percent Full	100.0 %
Critical Slope	0.007 ft/ft
Velocity	4.19 ft/s
Velocity Head	0.27 ft
Specific Energy	1.77 ft
Froude Number	(N/A)
Maximum Discharge	7.96 cfs
Discharge Full	7.40 cfs
Slope Full	0.005 ft/ft
Flow Type	Critical

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

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	100.0 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	18.0 in
Critical Depth	12.6 in
Channel Slope	0.005 ft/ft
Critical Slope	0.007 ft/ft

Worksheet for Pipe - 46

Project Description	
Friction Method	Manning Formula
Solve For	Full Flow Slope

Input Data	
Roughness Coefficient	0.013
Channel Slope	0.002 ft/ft
Normal Depth	24.0 in
Diameter	24.0 in
Discharge	10.10 cfs

Results	
Channel Slope	0.002 ft/ft
Normal Depth	24.0 in
Flow Area	3.1 ft²
Wetted Perimeter	6.3 ft
Hydraulic Radius	6.0 in
Top Width	0.00 ft
Critical Depth	13.6 in
Percent Full	100.0 %
Critical Slope	0.005 ft/ft
Velocity	3.21 ft/s
Velocity Head	0.16 ft
Specific Energy	2.16 ft
Froude Number	(N/A)
Maximum Discharge	10.86 cfs
Discharge Full	10.10 cfs
Slope Full	0.002 ft/ft
Flow Type	Critical

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

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	100.0 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	24.0 in
Critical Depth	13.6 in
Channel Slope	0.002 ft/ft
Critical Slope	0.005 ft/ft

Worksheet for Pipe - 47

Project Description	
Friction Method	Manning Formula
Solve For	Full Flow Slope

Input Data	
Roughness Coefficient	0.013
Channel Slope	0.005 ft/ft
Normal Depth	42.0 in
Diameter	42.0 in
Discharge	73.30 cfs

Results	
Channel Slope	0.005 ft/ft
Normal Depth	42.0 in
Flow Area	9.6 ft²
Wetted Perimeter	11.0 ft
Hydraulic Radius	10.5 in
Top Width	0.00 ft
Critical Depth	32.2 in
Percent Full	100.0 %
Critical Slope	0.006 ft/ft
Velocity	7.62 ft/s
Velocity Head	0.90 ft
Specific Energy	4.40 ft
Froude Number	(N/A)
Maximum Discharge	78.85 cfs
Discharge Full	73.30 cfs
Slope Full	0.005 ft/ft
Flow Type	Critical

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

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	100.0 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	42.0 in
Critical Depth	32.2 in
Channel Slope	0.005 ft/ft
Critical Slope	0.006 ft/ft

Worksheet for Pipe - 48

Project Description	
Friction Method	Manning Formula
Solve For	Full Flow Slope

Input Data	
Roughness Coefficient	0.013
Channel Slope	0.019 ft/ft
Normal Depth	24.0 in
Diameter	24.0 in
Discharge	31.10 cfs

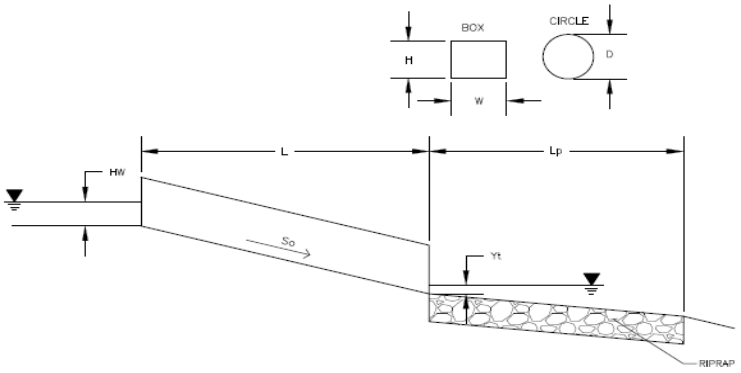
Results	
Channel Slope	0.019 ft/ft
Normal Depth	24.0 in
Flow Area	3.1 ft²
Wetted Perimeter	6.3 ft
Hydraulic Radius	6.0 in
Top Width	0.00 ft
Critical Depth	22.5 in
Percent Full	100.0 %
Critical Slope	0.016 ft/ft
Velocity	9.90 ft/s
Velocity Head	1.52 ft
Specific Energy	3.52 ft
Froude Number	(N/A)
Maximum Discharge	33.45 cfs
Discharge Full	31.10 cfs
Slope Full	0.019 ft/ft
Flow Type	Critical

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

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	100.0 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	24.0 in
Critical Depth	22.5 in
Channel Slope	0.019 ft/ft
Critical Slope	0.016 ft/ft

Determination of Culvert Headwater and Outlet Protection

Project: Blue cells are for user data entry
Basin ID: Green cells are calculated values



Soil Type:
Choose One:
(•) Sandy
( ) Non-Sandy

Supercritical Flow! Using Da to calculate protection type.

Design Information (Input):

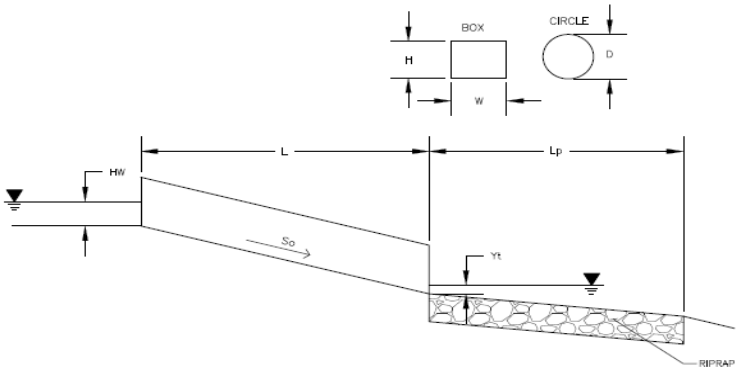
	Design Discharge	Q =	52.6	cfs
Circular Culvert:				
	Barrel Diameter in Inches	D =	36	inches
	Inlet Edge Type (Choose from pull-down list)		Grooved End Projection	
Box Culvert:			**OR**	
	Barrel Height (Rise) in Feet	Height (Rise) =		ft
	Barrel Width (Span) in Feet	Width (Span) =		ft
	Inlet Edge Type (Choose from pull-down list)			
	Number of Barrels	No =	1	
	Inlet Elevation	Elev IN =	6828.8	ft
	Outlet Elevation **OR** Slope	Elev OUT =	6828	ft
	Culvert Length	L =	80	ft
	Manning's Roughness	n =	0.013	
	Bend Loss Coefficient	k_b =	0	
	Exit Loss Coefficient	k_x =	1	
	Tailwater Surface Elevation	Elev Y_t =		ft
	Max Allowable Channel Velocity	V =	5	ft/s

Required Protection (Output):

Tailwater Surface Height	Y_t =	1.20	ft
Flow Area at Max Channel Velocity	A_t =	10.52	ft^2
Culvert Cross Sectional Area Available	A =	7.07	ft^2
Entrance Loss Coefficient	k_e =	0.20	
Friction Loss Coefficient	k_f =	0.58	
Sum of All Losses Coefficients	k_s =	1.78	ft
Culvert Normal Depth	Y_n =	2.01	ft
Culvert Critical Depth	Y_c =	2.36	ft
Tailwater Depth for Design	d =	2.68	ft
Adjusted Diameter **OR** Adjusted Rise	D_a =	2.50	ft
Expansion Factor	1/(2*tan(Θ)) =	5.23	
Flow/Diameter$^{2.5}$ **OR** Flow/(Span * Rise$^{1.5}$)	Q/D^2.5 =	3.37	$ft^{0.5}/s$
Froude Number	Fr =	1.39	**Supercritical!**
Tailwater/Adjusted Diameter **OR** Tailwater/Adjusted Rise	Yt/D =	0.48	
Inlet Control Headwater	HW_I =	3.81	ft
Outlet Control Headwater	HW_O =	3.41	
Design Headwater Elevation	**HW =**	**6,832.61**	**ft**
Headwater/Diameter OR Headwater/Rise Ratio	**HW/D =**	**1.27**	
Minimum Theoretical Riprap Size	d_{50} =	9	in
Nominal Riprap Size	d_{50} =	9	in
UDFCD Riprap Type	**Type =**	**L**	
Length of Protection	**L_p =**	**30**	**ft**
Width of Protection	**T =**	**9**	**ft**

Determination of Culvert Headwater and Outlet Protection

Project: Blue cells are for user data entry
Basin ID: Green cells are calculated values



Soil Type:
Choose One:
(•) Sandy
( ) Non-Sandy

Supercritical Flow! Using Da to calculate protection type.

Design Information (Input):

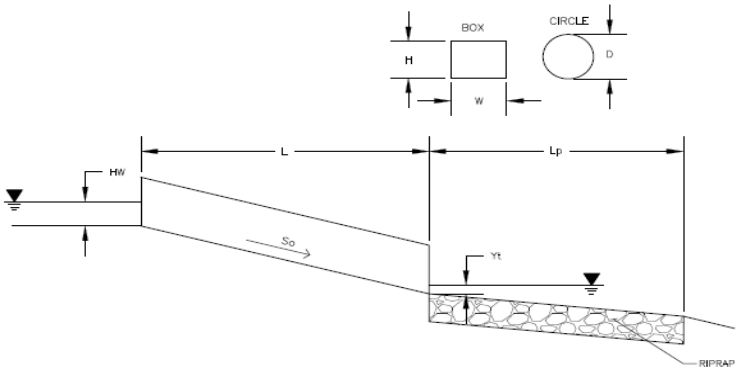
	Design Discharge	Q =	73.3	cfs
Circular Culvert:				
	Barrel Diameter in Inches	D =	42	inches
	Inlet Edge Type (Choose from pull-down list)		Grooved End Projection	
Box Culvert:			**OR**	
	Barrel Height (Rise) in Feet	Height (Rise) =		ft
	Barrel Width (Span) in Feet	Width (Span) =		ft
	Inlet Edge Type (Choose from pull-down list)			
	Number of Barrels	No =	1	
	Inlet Elevation	Elev IN =	6828.8	ft
	Outlet Elevation **OR** Slope	Elev OUT =	6828	ft
	Culvert Length	L =	80	ft
	Manning's Roughness	n =	0.013	
	Bend Loss Coefficient	k_b =	0	
	Exit Loss Coefficient	k_x =	1	
	Tailwater Surface Elevation	Elev Y_t =		ft
	Max Allowable Channel Velocity	V =	5	ft/s

Required Protection (Output):

Tailwater Surface Height	Y_t =	1.40	ft
Flow Area at Max Channel Velocity	A_t =	14.66	ft^2
Culvert Cross Sectional Area Available	A =	9.62	ft^2
Entrance Loss Coefficient	k_e =	0.20	
Friction Loss Coefficient	k_f =	0.47	
Sum of All Losses Coefficients	k_s =	1.67	ft
Culvert Normal Depth	Y_n =	2.21	ft
Culvert Critical Depth	Y_c =	2.68	ft
Tailwater Depth for Design	d =	3.09	ft
Adjusted Diameter **OR** Adjusted Rise	D_a =	2.86	ft
Expansion Factor	1/(2*tan(Θ)) =	5.54	
Flow/Diameter$^{2.5}$ **OR** Flow/(Span * Rise$^{1.5}$)	Q/D^2.5 =	3.20	$ft^{0.5}/s$
Froude Number	Fr =	1.46	**Supercritical!**
Tailwater/Adjusted Diameter **OR** Tailwater/Adjusted Rise	Yt/D =	0.49	
Inlet Control Headwater	HW_I =	4.24	ft
Outlet Control Headwater	HW_O =	3.79	
Design Headwater Elevation	**HW =**	**6,833.04**	**ft**
Headwater/Diameter OR Headwater/Rise Ratio	**HW/D =**	**1.21**	
Minimum Theoretical Riprap Size	d_{50} =	10	in
Nominal Riprap Size	d_{50} =	12	in
UDFCD Riprap Type	**Type =**	**M**	
Length of Protection	**L_p =**	**35**	**ft**
Width of Protection	**T =**	**10**	**ft**

Determination of Culvert Headwater and Outlet Protection

Project: Blue cells are for user data entry
Basin ID: Green cells are calculated values



Soil Type:
Choose One:
(•) Sandy
( ) Non-Sandy

Design Information (Input):

	Design Discharge	Q =	31.1	cfs
Circular Culvert:				
	Barrel Diameter in Inches	D =	24	inches
	Inlet Edge Type (Choose from pull-down list)		Grooved End Projection	
Box Culvert:			**OR**	
	Barrel Height (Rise) in Feet	Height (Rise) =		ft
	Barrel Width (Span) in Feet	Width (Span) =		ft
	Inlet Edge Type (Choose from pull-down list)			
	Number of Barrels	No =	1	
	Inlet Elevation	Elev IN =	6824.8	ft
	Outlet Elevation **OR** Slope	Elev OUT =	6824	ft
	Culvert Length	L =	80	ft
	Manning's Roughness	n =	0.013	
	Bend Loss Coefficient	k_b =	0	
	Exit Loss Coefficient	k_x =	1	
	Tailwater Surface Elevation	Elev Y_t =		ft
	Max Allowable Channel Velocity	V =	5	ft/s

Required Protection (Output):

Tailwater Surface Height	Y_t =	0.80	ft
Flow Area at Max Channel Velocity	A_t =	6.22	ft^2
Culvert Cross Sectional Area Available	A =	3.14	ft^2
Entrance Loss Coefficient	k_e =	0.20	
Friction Loss Coefficient	k_f =	0.99	
Sum of All Losses Coefficients	k_s =	2.19	ft
Culvert Normal Depth	Y_n =	1.15	ft
Culvert Critical Depth	Y_c =	1.88	ft
Tailwater Depth for Design	d =	1.94	ft
Adjusted Diameter **OR** Adjusted Rise	D_a =	-	ft
Expansion Factor	1/(2*tan(Θ)) =	2.12	
Flow/Diameter$^{2.5}$ **OR** Flow/(Span * Rise$^{1.5}$)	Q/D^2.5 =	5.50	$ft^{0.5}/s$
Froude Number	Fr =	-	**Pressure flow!**
Tailwater/Adjusted Diameter **OR** Tailwater/Adjusted Rise	Yt/D =	0.40	
Inlet Control Headwater	HW_I =	4.49	ft
Outlet Control Headwater	HW_O =	4.47	
Design Headwater Elevation	**HW =**	**6,829.29**	**ft**
Headwater/Diameter OR Headwater/Rise Ratio	**HW/D =**	**2.24**	**HW/D > 1.5!**
Minimum Theoretical Riprap Size	d_{50} =	9	in
Nominal Riprap Size	d_{50} =	12	in
UDFCD Riprap Type	**Type =**	**M**	
Length of Protection	**L_p =**	**13**	**ft**
Width of Protection	**T =**	**9**	**ft**

IRF FORM

TEMPORARY POND SIZING

AND POND DESIGN

CLASSIC SM
CONSULTING
ENGINEERS & SURVEYORS

Site-Level Low Impact Development (LID) Design Effective Impervious Calculator

LID Credit by Impervious Reduction Factor (IRF) Method

UD-BMP (Version 3.06, November 2016)

User Input

Calculated cells

***Design Storm: 1-Hour Rain Depth	WQCV Event	0.53	inches	**Designer:**	**M. LARSON**
***Minor Storm: 1-Hour Rain Depth	5-Year Event	1.50	inches	**Company:**	**CLASSIC CONSULTING**
***Major Storm: 1-Hour Rain Depth	100-Year Event	2.52	inches	**Date:**	**April 5, 2020**
Optional User Defined Storm	CUHP			**Project:**	**BLR FILINGS 40-42**
(CUHP) NOAA 1 Hour Rainfall Depth and Frequency for User Defined Storm	100-Year Event			**Location:**	**TEMPORARY POND**

Max Intensity for Optional User Defined Storm: 0

SITE INFORMATION (USER-INPUT)

Sub-basin Identifier	TRIB	POND												
Receiving Pervious Area Soil Type	Sandy Loam	Sandy Loam												
Total Area (ac., Sum of DCIA, UIA, RPA, & SPA)	26.980	1.190												
Directly Connected Impervious Area (DCIA, acres)	15.700	0.000												
Unconnected Impervious Area (UIA, acres)	1.750	0.000												
Receiving Pervious Area (RPA, acres)	8.650	1.190												
Separate Pervious Area (SPA, acres)	0.880	0.000												
RPA Treatment Type: Conveyance (C), Volume (V), or Permeable Pavement (PP)	C	C												

CALCULATED RESULTS (OUTPUT)

Total Calculated Area (ac, check against input)	26.980	1.190												
Directly Connected Impervious Area (DCIA, %)	58.2%	0.0%												
Unconnected Impervious Area (UIA, %)	6.5%	0.0%												
Receiving Pervious Area (RPA, %)	32.1%	100.0%												
Separate Pervious Area (SPA, %)	3.3%	0.0%												
A_R (RPA / UIA)	4.943	0.000												
I_a Check	0.170	1.000												
f / I for WQCV Event:	2.0	2.0												
f / I for 5-Year Event:	0.5	0.5												
f / I for 100-Year Event:	0.3	0.3												
f / I for Optional User Defined Storm CUHP:														
IRF for WQCV Event:	0.38	1.00												
IRF for 5-Year Event:	0.72	1.00												
IRF for 100-Year Event:	0.75	1.00												
IRF for Optional User Defined Storm CUHP:														
Total Site Imperviousness: I_{total}	64.7%	0.0%												
Effective Imperviousness for WQCV Event:	60.6%	0.0%												
Effective Imperviousness for 5-Year Event:	62.9%	0.0%												
Effective Imperviousness for 100-Year Event:	63.1%	0.0%												
Effective Imperviousness for Optional User Defined Storm CUHP:														

LID / EFFECTIVE IMPERVIOUSNESS CREDITS

WQCV Event CREDIT: Reduce Detention By:	5.8%	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
This line only for 10-Year Event	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
100-Year Event CREDIT**: Reduce Detention By:	2.4%	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
User Defined CUHP CREDIT: Reduce Detention By:														

Total Site Imperviousness:	**61.9%**
Total Site Effective Imperviousness for WQCV Event:	**58.1%**
Total Site Effective Imperviousness for 5-Year Event:	**60.2%**
Total Site Effective Imperviousness for 100-Year Event:	**60.4%**
Total Site Effective Imperviousness for Optional User Defined Storm CUHP:	

Notes:

* Use Green-Ampt average infiltration rate values from Table 3-3.

** Flood control detention volume credits based on empirical equations from Storage Chapter of USDCM.

*** Method assumes that 1-hour rainfall depth is equivalent to 1-hour intensity for calculation purposed

Design Procedure Form: Extended Detention Basin (EDB)

UD-BMP (Version 3.06, November 2016)

Designer: M. LARSON
Company: CLASSIC CONSULTING
Date: April 24, 2020
Project: BLR FILINGS 40-42
Location: TEMPORARY POND

1. Basin Storage Volume	
A) Effective Imperviousness of Tributary Area, I_a	I_a = 61.9 %
B) Tributary Area's Imperviousness Ratio ($i = I_a / 100$)	i = 0.619
C) Contributing Watershed Area	Area = 28.170 ac
D) For Watersheds Outside of the Denver Region, Depth of Average Runoff Producing Storm	d_6 = 0.42 in
E) Design Concept (Select EURV when also designing for flood control)	Choose One: ○ Water Quality Capture Volume (WQCV) ◉ Excess Urban Runoff Volume (EURV)
F) Design Volume (WQCV) Based on 40-hour Drain Time ($V_{DESIGN} = (1.0 * (0.91 * i^3 - 1.19 * i^2 + 0.78 * i) / 12 * Area$)	V_{DESIGN}= 0.570 ac-ft
G) For Watersheds Outside of the Denver Region, Water Quality Capture Volume (WQCV) Design Volume ($V_{WQCV\ OTHER} = (d_6 * (V_{DESIGN}/0.43))$	$V_{DESIGN\ OTHER}$= 0.556 ac-ft
H) User Input of Water Quality Capture Volume (WQCV) Design Volume (Only if a different WQCV Design Volume is desired)	$V_{DESIGN\ USER}$= ac-ft
I) Predominant Watershed NRCS Soil Group	Choose One: ○ A ◉ B ○ C / D
J) Excess Urban Runoff Volume (EURV) Design Volume For HSG A: $EURV_A = 1.68 * i^{1.28}$ For HSG B: $EURV_B = 1.36 * i^{1.08}$ For HSG C/D: $EURV_{C/D} = 1.20 * i^{1.08}$	EURV = 1.902 ac-f t
2. Basin Shape: Length to Width Ratio (A basin length to width ratio of at least 2:1 will improve TSS reduction.)	L : W = 3.0 : 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:	

Design Procedure Form: Extended Detention Basin (EDB)

Designer:	**M. LARSON**
Company:	**CLASSIC CONSULTING**
Date:	**April 24, 2020**
Project:	**BLR FILINGS 40-42**
Location:	**TEMPORARY POND**

5. Forebay

A) Minimum Forebay Volume (V_{FMIN} = 3% of the WQCV) — V_{FMIN} = 0.017 ac-ft

B) Actual Forebay Volume — V_F = 0.020 ac-ft

C) Forebay Depth (D_F = 18 inch maximum) — D_F = 12.0 in

D) Forebay Discharge

i) Undetained 100-year Peak Discharge — Q_{100} = 120.00 cfs

ii) Forebay Discharge Design Flow ($Q_F = 0.02 * Q_{100}$) — Q_F = 2.40 cfs

E) Forebay Discharge Design

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

(flow too small for berm w/ pipe)

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

G) Rectangular Notch Width — Calculated W_N = 11.0 in

6. Trickle Channel

A) Type of Trickle Channel

Choose One
- ○ Concrete
- ◉ Soft Bottom

PROVIDE A CONSISTENT LONGITUDINAL SLOPE FROM FOREBAY TO MICROPOOL WITH NO MEANDERING. RIPRAP AND SOIL RIPRAP LINED CHANNELS ARE NOT RECOMMENDED. MINIMUM DEPTH OF 1.5 FEET

F) Slope of Trickle Channel — S = 0.0100 ft / ft

7. Micropool and Outlet Structure

A) Depth of Micropool (2.5-feet minimum) — D_M = 2.5 ft

B) Surface Area of Micropool (10 ft^2 minimum) — A_M = 50 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)

Designer: M. LARSON
Company: CLASSIC CONSULTING
Date: April 24, 2020
Project: BLR FILINGS 40-42
Location: TEMPORARY POND

8. Initial Surcharge Volume	
A) Depth of Initial Surcharge Volume (Minimum recommended depth is 4 inches)	D_{IS} = 6 in
B) Minimum Initial Surcharge Volume (Minimum volume of 0.3% of the WQCV)	V_{IS} = 72.7 cu ft
C) Initial Surcharge Provided Above Micropool	V_s = 25.0 cu ft
9. Trash Rack	
A) Water Quality Screen Open Area: $A_t = A_{ot} * 38.5*(e^{-0.095D})$	A_t = square inches
B) Type of Screen (If specifying an alternative to the materials recommended in the USDCM, indicate "other" and enter the ratio of the total open are to the total screen are for the material specified.)	
Other (Y/N): N	
C) Ratio of Total Open Area to Total Area (only for type 'Other')	User Ratio =
D) Total Water Quality Screen Area (based on screen type)	A_{total} = sq. in.
E) Depth of Design Volume (EURV or WQCV) (Based on design concept chosen under 1E)	H= feet
F) Height of Water Quality Screen (H_{TR})	H_{TR}= inches
G) Width of Water Quality Screen Opening ($W_{opening}$) (Minimum of 12 inches is recommended)	$W_{opening}$ = inches

Design Procedure Form: Extended Detention Basin (EDB)

Designer: M. LARSON
Company: CLASSIC CONSULTING
Date: April 24, 2020
Project: BLR FILINGS 40-42
Location: TEMPORARY POND

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

Notes:

JOB NAME: BLR 40-42
JOB NUMBER: 2570.03
DATE: 04/24/20
CALCULATED BY: MAL

TOTAL VOLUME

POND SIZING WITH PONDPACK EQUATION:
INSERT POND DESIGN SIZE INFO: (RED)

POND ELEVATION : (from lowest to highest)	**AREA (BTM to TOP):**		
6826.00		-	acres
6826.00	150	0.00	acres
6828.00	13,585	0.31	acres
6830.00	19,080	0.44	acres
6832.00	25,025	0.57	acres
6834.00	31,296	0.72	acres
6836.00	38,104	0.87	acres
6838.00	45,320	1.04	acres
		-	acres
		-	acres
		-	acres
		-	acres

PRELIMINARY SIZE:

VOLUME = 1/3{(EL2-EL1)*(A1+A2+((A1*A2)^.5))}

						CUMMULATIVE VOLUME:
-	AC-FT	from	6,826	to	6,826	
0.23	AC-FT	from	6,826	to	6,828	0.23
0.74	AC-FT	from	6,828	to	6,830	0.97
1.00	AC-FT	from	6,830	to	6,832	1.97
1.28	AC-FT	from	6,832	to	6,834	3.25
1.57	AC-FT	from	6,834	to	6,836	4.82
1.89	AC-FT	from	6,836	to	6,838	6.71
-	AC-FT	from	6,838	to	-	6.71
-	AC-FT	from	-	to	-	6.71
-	AC-FT	from	-	to	-	6.71
-	AC-FT	from	-	to	-	6.71

*SIZING IS FOR PRELIMINARY PURPOSES ONLY.

VOLUME = 6.71 AC-FT

APPROXIMATE SURFACE AREA REQUIREMENT

POND DEPTH (FT)	**POND VOLUME** AC-FT		CF	**SURFACE AREA** (SF)
4	6.71	=	#######	73,112
6	6.71	=	#######	48,741
8	6.71	=	#######	36,556
10	6.71	=	#######	29,245

JOB NAME: BLR 40-42
JOB NUMBER: 2570.03
DATE: 04/24/20
CALCULATED BY: MAL

EURV/TOP OF BOX

POND SIZING WITH PONDPACK EQUATION:
INSERT POND DESIGN SIZE INFO: (RED)

POND ELEVATION : (from lowest to highest)	**AREA (BTM to TOP):**		
6826.00		-	acres
6826.00	150	0.00	acres
6828.00	13,585	0.31	acres
6830.00	19,080	0.44	acres
6832.00	25,025	0.57	acres
6832.10	25,500	0.59	acres
		-	acres
		-	acres
		-	acres
		-	acres
		-	acres
		-	acres

PRELIMINARY SIZE:

VOLUME = 1/3{(EL2-EL1)*(A1+A2+((A1*A2)^.5))}

						CUMMULATIVE VOLUME:
-	AC-FT	from	6,826	to	6,826	
0.23	AC-FT	from	6,826	to	6,828	0.23
0.74	AC-FT	from	6,828	to	6,830	0.97
1.00	AC-FT	from	6,830	to	6,832	1.97
0.06	AC-FT	from	6,832	to	6,832	2.03
-	AC-FT	from	6,832	to	-	2.03
-	AC-FT	from	-	to	-	2.03
-	AC-FT	from	-	to	-	2.03
-	AC-FT	from	-	to	-	2.03
-	AC-FT	from	-	to	-	2.03
-	AC-FT	from	-	to	-	2.03

*SIZING IS FOR PRELIMINARY PURPOSES ONLY.

VOLUME = 2.03 AC-FT

APPROXIMATE SURFACE AREA REQUIREMENT

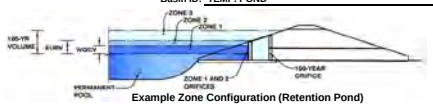
POND DEPTH (FT)	**POND VOLUME** AC-FT		CF	**SURFACE AREA** (SF)
4	2.03	=	88,224	22,056
6	2.03	=	88,224	14,704
8	2.03	=	88,224	11,028
10	2.03	=	88,224	8,822

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

UD-Detention, Version 3.07 (February 2017)

Project: BLR B1

Basin ID: TEMP. POND



Example Zone Configuration (Retention Pond)

Required Volume Calculation

Selected BMP Type =	EDB		
Watershed Area =	28.48	acres	
Watershed Length =	1,453	ft	
Watershed Slope =	0.016	ft/ft	
Watershed Imperviousness =	61.30%	percent	
Percentage Hydrologic Soil Group A =	0.0%	percent	
Percentage Hydrologic Soil Group B =	100.0%	percent	
Percentage Hydrologic Soil Groups C/D =	0.0%	percent	
Desired WQCV Drain Time =	40.0	hours	
Location for 1-hr Rainfall Depths =	User Input		
Water Quality Capture Volume (WQCV) =	0.571	acre-feet	Optional User Override 1-hr Precipitation
Excess Urban Runoff Volume (EURV) =	1.897	acre-feet	
2-yr Runoff Volume (P1 = 1.19 in.) =	1.561	acre-feet	1.19 inches
5-yr Runoff Volume (P1 = 1.5 in.) =	2.097	acre-feet	1.50 inches
10-yr Runoff Volume (P1 = 1.75 in.) =	2.724	acre-feet	1.75 inches
25-yr Runoff Volume (P1 = 2 in.) =	3.567	acre-feet	2.00 inches
50-yr Runoff Volume (P1 = 2.25 in.) =	4.172	acre-feet	2.25 inches
100-yr Runoff Volume (P1 = 2.52 in.) =	4.966	acre-feet	2.52 inches
500-yr Runoff Volume (P1 = 3.1 in.) =	6.539	acre-feet	3.10 inches
Approximate 2-yr Detention Volume =	1.462	acre-feet	
Approximate 5-yr Detention Volume =	1.970	acre-feet	
Approximate 10-yr Detention Volume =	2.531	acre-feet	
Approximate 25-yr Detention Volume =	2.735	acre-feet	
Approximate 50-yr Detention Volume =	2.850	acre-feet	
Approximate 100-yr Detention Volume =	3.103	acre-feet	

Stage-Storage Calculation

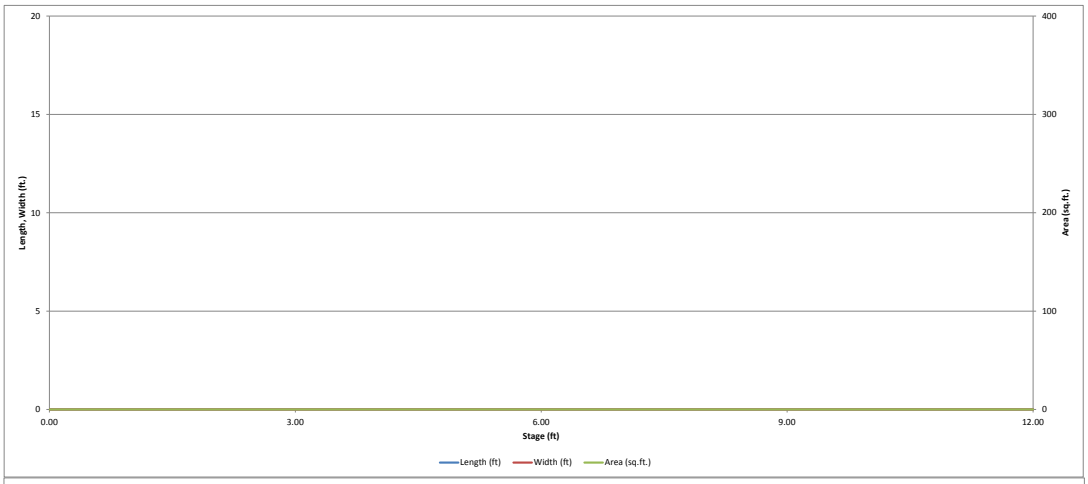
Zone 1 Volume (WQCV) =	0.571	acre-feet
Zone 2 Volume (EURV - Zone 1) =	1.326	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	1.206	acre-feet
Total Detention Basin Volume =	3.103	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	user	acre-feet

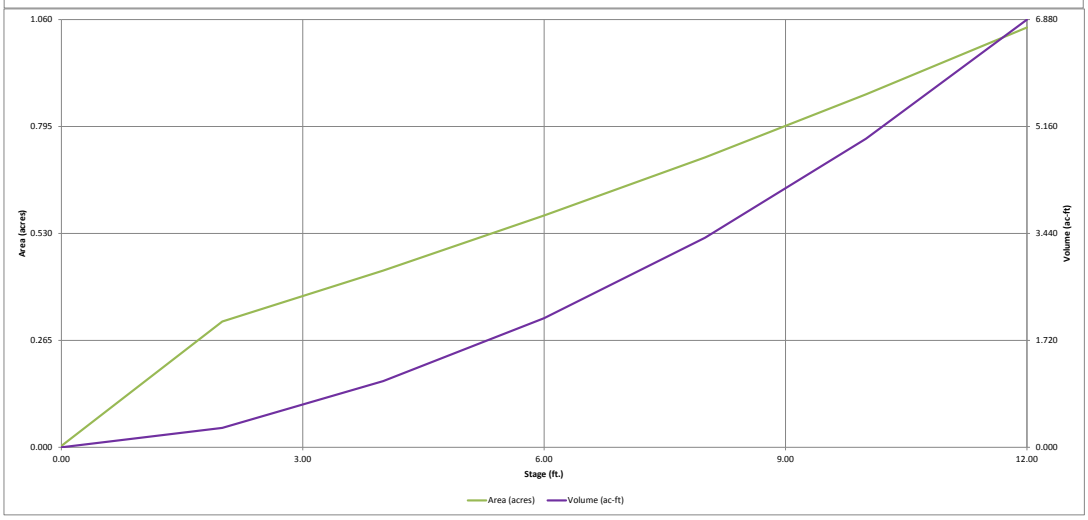
Depth Increment = 0.1 ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	150	0.003		
	--	2.00	--	--	--	13,585	0.312	13,599	0.312
	--	4.00	--	--	--	19,080	0.438	46,400	1.065
	--	6.00	--	--	--	25,025	0.574	90,505	2.078
	--	8.00	--	--	--	31,296	0.718	146,826	3.371
	--	10.00	--	--	--	38,104	0.875	216,226	4.964
	--	12.00	--	--	--	45,320	1.040	299,650	6.879

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

UD-Detention, Version 3.07 (February 2017)



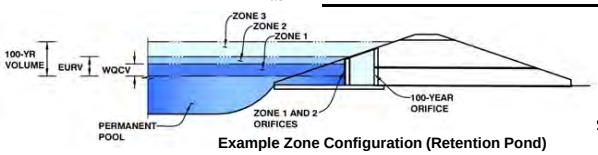


Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)

Project:

Basin ID:



Example Zone Configuration (Retention Pond)

	Stage (ft)	Zone Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.77	0.571	Orifice Plate
Zone 2 (EURV)	5.68	1.326	Orifice Plate
Zone 3 (100-year)	7.63	1.206	Weir&Pipe (Circular)
		3.103	Total

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

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

Calculated Parameters for Underdrain

Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Centroid =	N/A	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 =	0.00	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate =	6.10	ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing =	24.40	inches
Orifice Plate: Orifice Area per Row =	N/A	inches

Calculated Parameters for Plate

WQ Orifice Area per Row =	N/A	ft^2
Elliptical Half-Width =	N/A	feet
Elliptical Slot Centroid =	N/A	feet
Elliptical Slot Area =	N/A	ft^2

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	2.03	4.07					
Orifice Area (sq. inches)	3.50	4.50	6.00					

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

User Input: Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected	
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, Ho =	6.10	N/A	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	4.00	N/A	feet
Overflow Weir Slope =	4.00	N/A	H:V (enter zero for flat grate)
Horiz. Length of Weir Sides =	4.00	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 =	7.10	N/A	feet
Over Flow Weir Slope Length =	4.12	N/A	feet
Grate Open Area / 100-yr Orifice Area =	3.67	N/A	should be ≥ 4
Overflow Grate Open Area w/o Debris =	11.54	N/A	ft^2
Overflow Grate Open Area w/ Debris =	5.77	N/A	ft^2

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

	Zone 3 Circular	Not Selected	
Depth to Invert of Outlet Pipe =	3.00	N/A	ft (distance below basin bottom at Stage = 0 ft)
Circular Orifice Diameter =	24.00	N/A	inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 3 Circular	Not Selected	
Outlet Orifice Area =	3.14	N/A	ft^2
Outlet Orifice Centroid =	1.00	N/A	feet
Half-Central Angle of Restrictor Plate on Pipe =	N/A	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	9.00	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	15.00	feet
Spillway End Slopes =	4.00	H:V
Freeboard above Max Water Surface =	1.00	feet

Calculated Parameters for Spillway

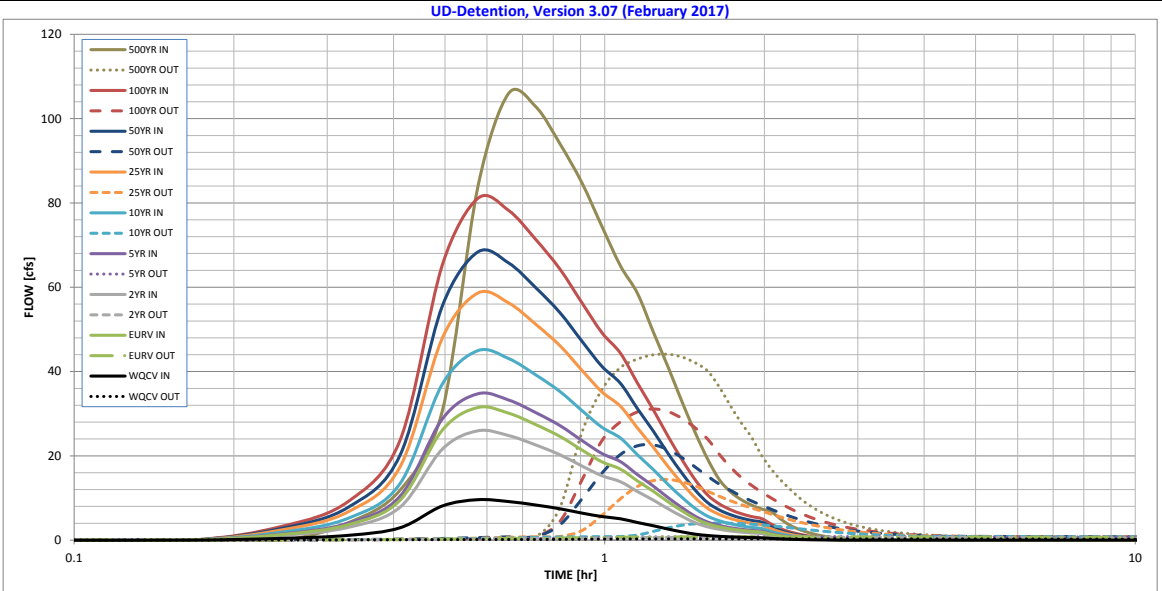
Spillway Design Flow Depth=	1.26	feet
Stage at Top of Freeboard =	11.26	feet
Basin Area at Top of Freeboard =	0.98	acres

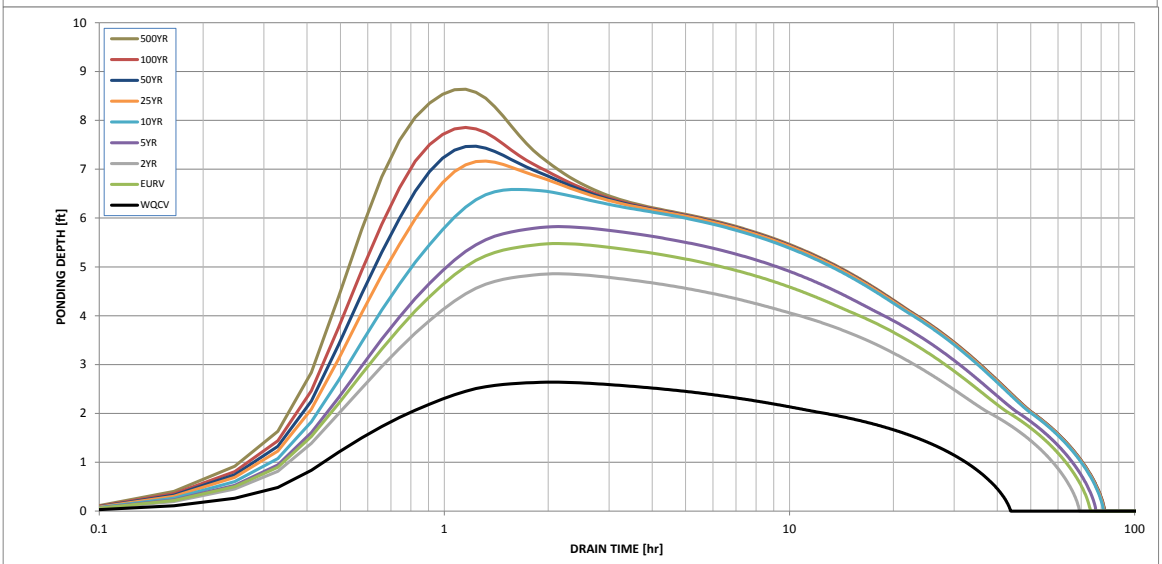
Routed Hydrograph Results

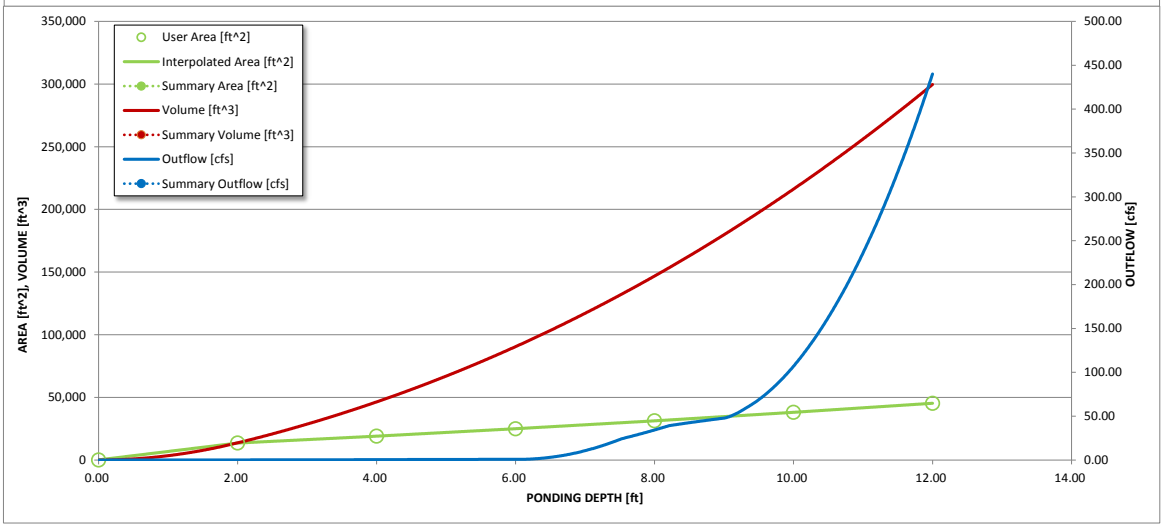
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	0.53	1.07	1.19	1.50	1.75	2.00	2.25	2.52	3.10
Calculated Runoff Volume (acre-ft) =	0.571	1.897	1.561	2.097	2.724	3.567	4.172	4.966	6.539
OPTIONAL Override Runoff Volume (acre-ft) =									
Inflow Hydrograph Volume (acre-ft) =	0.570	1.896	1.559	2.095	2.722	3.564	4.169	4.962	6.528
Predevelopment Unit Peak Flow, q (cfs/acre) =	0.00	0.00	0.01	0.02	0.20	0.68	0.93	1.26	1.83
Predevelopment Peak Q (cfs) =	0.0	0.0	0.4	0.603	5.8	19.2	26.6	35.8	52.2
Peak Inflow Q (cfs) =	9.6	31.5	25.9	34.7	44.9	58.6	68.4	81.1	106.0
Peak Outflow Q (cfs) =	0.3	0.8	0.7	0.841	4.1	14.4	22.6	31.1	44.1
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	1.4	0.7	0.7	0.8	0.9	0.8
Structure Controlling Flow =	Plate	Plate	Plate	Plate	Overflow Grate 1	Overflow Grate 1	Overflow Grate 1	Overflow Grate 1	Overflow Grate 1
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	0.3	1.2	1.9	2.6	3.7
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	40	66	62	68	70	68	66	64	60
Time to Drain 99% of Inflow Volume (hours) =	**42**	71	66	73	76	76	75	74	72
Maximum Ponding Depth (ft) =	2.64	5.48	4.86	5.82	6.59	7.17	7.47	7.86	8.64
Area at Maximum Ponding Depth (acres) =	0.35	0.54	0.50	0.56	0.62	0.66	0.68	0.71	0.77
Maximum Volume Stored (acre-ft) =	0.528	1.783	1.462	1.975	2.423	2.793	3.000	3.264	3.839

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 Outlet Structure Design

Outflow Hydrograph Workbook Filename:

Storm Inflow Hydrographs **UD-Detention, Version 3.07 (February 2017)**

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

Time Interval	SOURCE	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK
	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
4.94 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:04:56	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hydrograph Constant	0:09:53	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:14:49	0.43	1.35	1.12	1.49	1.91	2.46	2.84	3.31	4.18
1.012	0:19:46	1.15	3.70	3.06	4.07	5.25	6.80	7.88	9.27	11.90
	0:24:42	2.95	9.50	7.85	10.46	13.48	17.46	20.24	23.80	30.57
	0:29:38	8.10	26.07	21.56	28.71	36.98	47.88	55.49	65.22	83.70
	0:34:35	9.60	31.46	25.93	34.72	44.95	58.62	68.36	81.08	105.96
	0:39:31	9.15	30.12	24.81	33.25	43.09	56.30	65.78	78.24	102.86
	0:44:28	8.33	27.42	22.59	30.26	39.22	51.23	59.91	71.36	94.04
	0:49:24	7.44	24.61	20.26	27.18	35.27	46.13	53.97	64.30	84.79
	0:54:20	6.42	21.39	17.58	23.64	30.74	40.31	47.21	56.32	74.42
	0:59:17	5.59	18.58	15.28	20.55	26.77	35.16	41.22	49.21	65.09
	1:04:13	5.07	16.85	13.86	18.63	24.23	31.77	37.21	44.36	58.55
	1:09:10	4.18	14.04	11.53	15.54	20.24	26.59	31.19	37.26	49.35
	1:14:06	3.41	11.58	9.49	12.82	16.73	22.02	25.84	30.90	40.99
	1:19:02	2.62	9.07	7.41	10.06	13.18	17.41	20.48	24.55	32.71
	1:23:59	1.95	6.91	5.62	7.67	10.10	13.41	15.82	19.01	25.42
	1:28:55	1.41	5.07	4.11	5.65	7.48	9.99	11.82	14.25	19.13
	1:33:52	1.09	3.85	3.14	4.28	5.65	7.51	8.86	10.65	14.24
	1:38:48	0.90	3.14	2.56	3.48	4.57	6.05	7.12	8.54	11.37
	1:43:44	0.77	2.65	2.16	2.94	3.86	5.10	6.00	7.18	9.55
	1:48:41	0.67	2.32	1.89	2.57	3.36	4.44	5.22	6.24	8.28
	1:53:37	0.61	2.08	1.70	2.30	3.01	3.97	4.66	5.58	7.39
	1:58:34	0.56	1.91	1.56	2.11	2.76	3.64	4.27	5.10	6.76
	2:03:30	0.41	1.41	1.15	1.56	2.05	2.70	3.19	3.82	5.11
	2:08:26	0.30	1.03	0.84	1.14	1.49	1.96	2.31	2.76	3.69
	2:13:23	0.22	0.75	0.62	0.84	1.10	1.45	1.70	2.05	2.73
	2:18:19	0.16	0.56	0.46	0.62	0.81	1.08	1.27	1.52	2.03
	2:23:16	0.12	0.41	0.33	0.45	0.59	0.79	0.93	1.12	1.49
	2:28:12	0.08	0.29	0.23	0.32	0.42	0.56	0.67	0.80	1.08
	2:33:08	0.06	0.21	0.17	0.23	0.31	0.41	0.48	0.58	0.78
	2:38:05	0.04	0.14	0.12	0.16	0.21	0.29	0.34	0.41	0.55
	2:43:01	0.02	0.09	0.07	0.10	0.14	0.18	0.22	0.27	0.36
	2:47:58	0.01	0.05	0.04	0.05	0.07	0.10	0.12	0.15	0.21
	2:52:54	0.00	0.02	0.01	0.02	0.03	0.05	0.06	0.07	0.10
	2:57:50	0.00	0.00	0.00	0.00	0.01	0.01	0.02	0.02	0.03
	3:02:47	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:07:43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:12:40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:17:36	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:22:32	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:27:29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:32:25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:37:22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:42:18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:47:14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:52:11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:57:07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:02:04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:07:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:11:56	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:16:53	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:21:49	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:26:46	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:31:42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:36:38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:41:35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:46:31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:51:28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:56:24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:01:20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:06:17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:11:13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:16:10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:21:06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:26:02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:59	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:55	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:52	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:48	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)

Summary Stage-Area-Volume-Discharge Relationships

The user can create a summary S-A-V-D by entering the desired stage increments and the remainder of the table will populate automatically.

The user should graphically compare the summary S-A-V-D table to the full S-A-V-D table in the chart to confirm it captures all key transition points.

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

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

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

Figure 13-12c. Emergency Spillway Protection

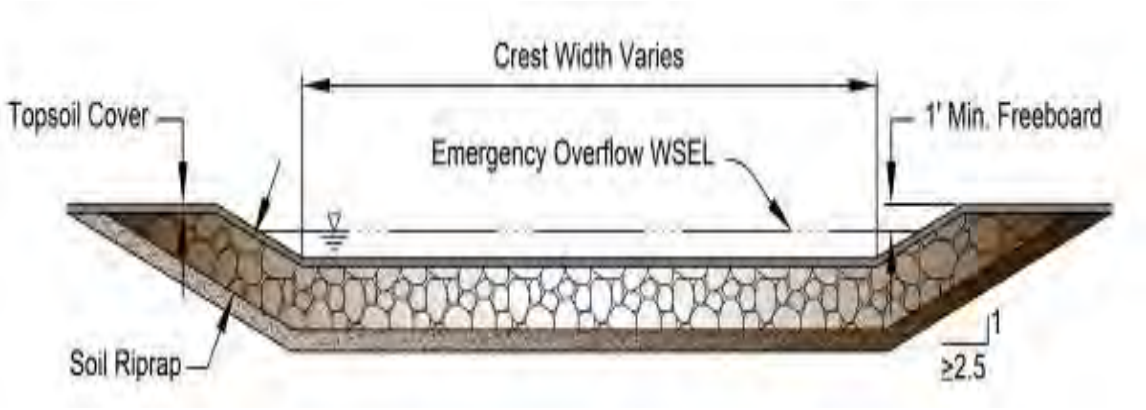
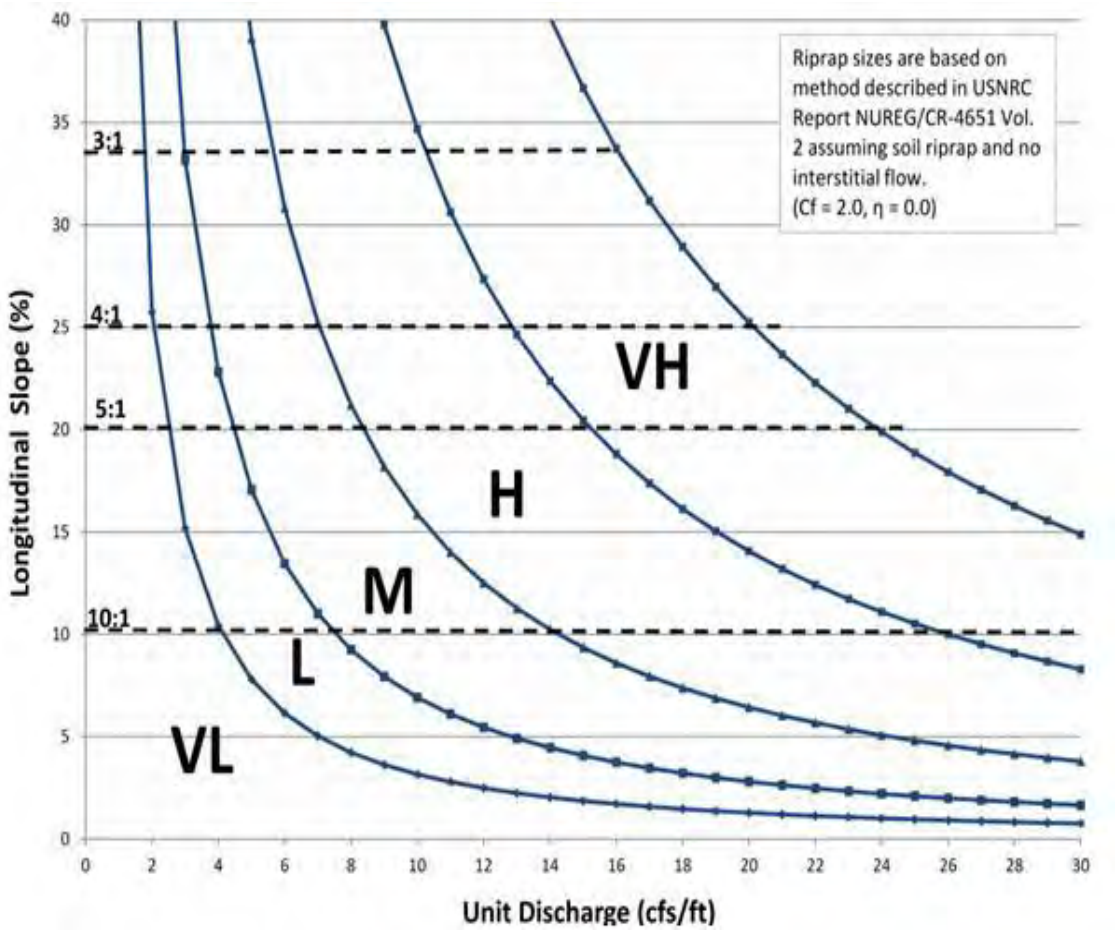


Figure 13-12d. Riprap Types for Emergency Spillway Protection



4:1

4.2 cfs/ft

TYPE M RIPRAP REQUIRED

MDDP/DBPS REFERENCE DOCUMENTS

CLASSIC SM
CONSULTING
ENGINEERS & SURVEYORS

STAPLETON DR.

RESEARCH PKWY

DUBLIN RD.

US 24

BRIDLESPUR RD

BARNES RD

BANNING-LEWIS PKWY

94

PROPOSED VILLAGE B

POWERS BLVD.

WOODMEN RD.

FOUNTAIN CREEK

LEGEND

- MULTI-FAMILY RESIDENTIAL
- SINGLE FAMILY RESIDENTIAL
- LARGE LOT RESIDENTIAL
- OFFICE / RETAIL / COMMERCIAL
- INDUSTRIAL
- INSTITUTIONAL
- OPEN SPACE / PARK
- AGRICULTURAL / RANCHETTE (5 Ac+)

Kiowa Engineering Corporation

419 W. Bijou Street
Colorado Springs, Colorado
80905-1308

SAND CREEK DRAINAGE BASIN PLANNING STUDY

PROPOSED LAND USE

Project No.	90.04.09
Date:	9/90
Design:	
Drawn:	EAK
Check:	
Revisions:	

7

FIG. II-3

UNINCORPORATED EL PASO COUNTY

WOODMEN RD.

MATCH SHEET EF-34

NEW TWIN 8'Hx8'W CBC

NEW 8'Hx15'W CBC

CHECK

NEW RIPRAP CHANNEL
BW=10', D=3', Q100 =920 cfs

EL PASO COUNTY

CITY OF COLORADO SPRINGS

NEW RIPRAP CHANNEL
BW=45', D=3'
Q100=1510cfs

STA 615+50 DROP

STA 608+00 DROP

STA 603+80 DROP

STA 602+00 DROP

STA 600+20 DROP

STA 598+50 DROP

STA596+65 DROP

PRESERVE EX. POND & EMBANKMENT

STA592+00 CHECK

STA586+40 DROP

STA581+30 DROP

STA583+70 DROP

NEW RIPRAP CHANNEL
BW=40' D=4', Q100=1920cfs

STA578+50 DROP

UPSTREAM LIMIT OF STUDY

TOY RANCH TRIBUTARY REACH TR-3

NEW RIPRAP CHANNEL
BW=15', D=4', Q100=780cfs

TOY RANCH TRIBUTARY
DETENTION BASIN #1

EAST FORK SAND CREEK SUBTRIBUTARY REACH EFST-2

EAST FORK SAND CREEK REACH EF-T-7

BANNING-LEWIS PARKWAY

MARKSHEFFEL RD.

ON-SITE OR SUBREGIONAL DETENTION REQUIRED IN THIS SUBBASIN

DROPS

FOREBAY

DETENTION SITES TO LIMIT FLOWS TO EXIST. CONDITIONS

TWIN 8'Hx8'Wx350'CBC

NEW RIPRAP CHANNEL
BW=30', D=4', Q100=1510cfs

5'Wx8'Hx150'CBC

CHECKS

MATCH SHT EF-33

STA271+00 DROP

5'Wx8'Hx150'CBC

DUBLIN RD.

5'Hx6'Wx150'CBC

Q_{100}(EX)=40cfs

Q_{100} (EX.)=90cfs

TOY RANCHES SUBDIVISION

TOY RANCH TRIBUTARY DETENTION BASIN # 1

Q_{in}^{100} = 940 cfs

Q_{out}^{100} = 280 cfs

100-YR. VOL.= 45 A.F.

WQ VOL = 14.8 AF

WQ DISCHARGE = 4.5 cfs

TRIBUTARY AREA=403Ac

STA261+60 DROP

STA255+90 DROP

STA250+00 DROP

EL PASO COUNTY

CITY OF COLORADO SPRINGS

STAPLETON DRIVE

NEW RIPRAP CHANNEL
BW=10', D=4', Q100= 500cfs

STA562+00 CHECK

STA559+00 CHECK

STA556+00 CHECK

STA553+00 CHECK

STA550+00 CHECK

STA547+00 CHECK

STA544+00 CHECK

STA541+00 CHECK

STA538+00 CHECK

STA535+00 CHECK

STA532+00 CHECK

10'Wx6'Hx300'CBC

NEW RIPRAP CHANNEL
BW=15', D=4', Q100=800cfs

STA529+00 CHECK

STA526+00 CHECK

150' LONG CLEAR SPAN BRIDGE

EAST FORK SAND CREEK
DETENTION BASIN # 4

Q_{in}^{100} = 5416 cfs

Q_{out}^{100} = 3,113 cfs

100-YR. VOL.=202 A.F.

WQ VOL =39.7 AF

WQ DISCHARGE = 12.0 cfs

TRIBUTARY AREA=806.4 Ac.

MATCH SHT EF-29

EFSC DETENTION BASIN #4

N

0' 500' 1000' 1500'
SCALE IN FEET

VILLAGE B SITE

CHANNEL IMPROVEMENTS

SEGMENT NO.	BOTTOM WIDTH (FT)	CHANNEL TYPE
54	110	10-YEAR RIPRAP LININGS 4' DEPTH
73	40	100-YEAR RIPRAP LININGS 3' DEPTH
74A	15	100-YEAR RIPRAP LININGS 5' DEPTH
74	30	100-YEAR RIPRAP LININGS 4' DEPTH
58	10	100-YEAR RIPRAP LININGS 5' DEPTH
70	10	100-YEAR RIPRAP LININGS 4' DEPTH

FOR PROFILE SEE SHEETS EFP-10, EFP-11, STP-4, STP-5

FOR IMPROVEMENTS IN THIS AREA, SEE SHEET EF-31

THIS DRAWING IS A MASTER PLANNING SHEET REPRESENTING PRELIMINARY AND CONCEPTUAL ENGINEERING. IT SHOULD NOT BE USED FOR CONSTRUCTION PURPOSES. THESE PLANS ARE SUBJECT TO CHANGE.

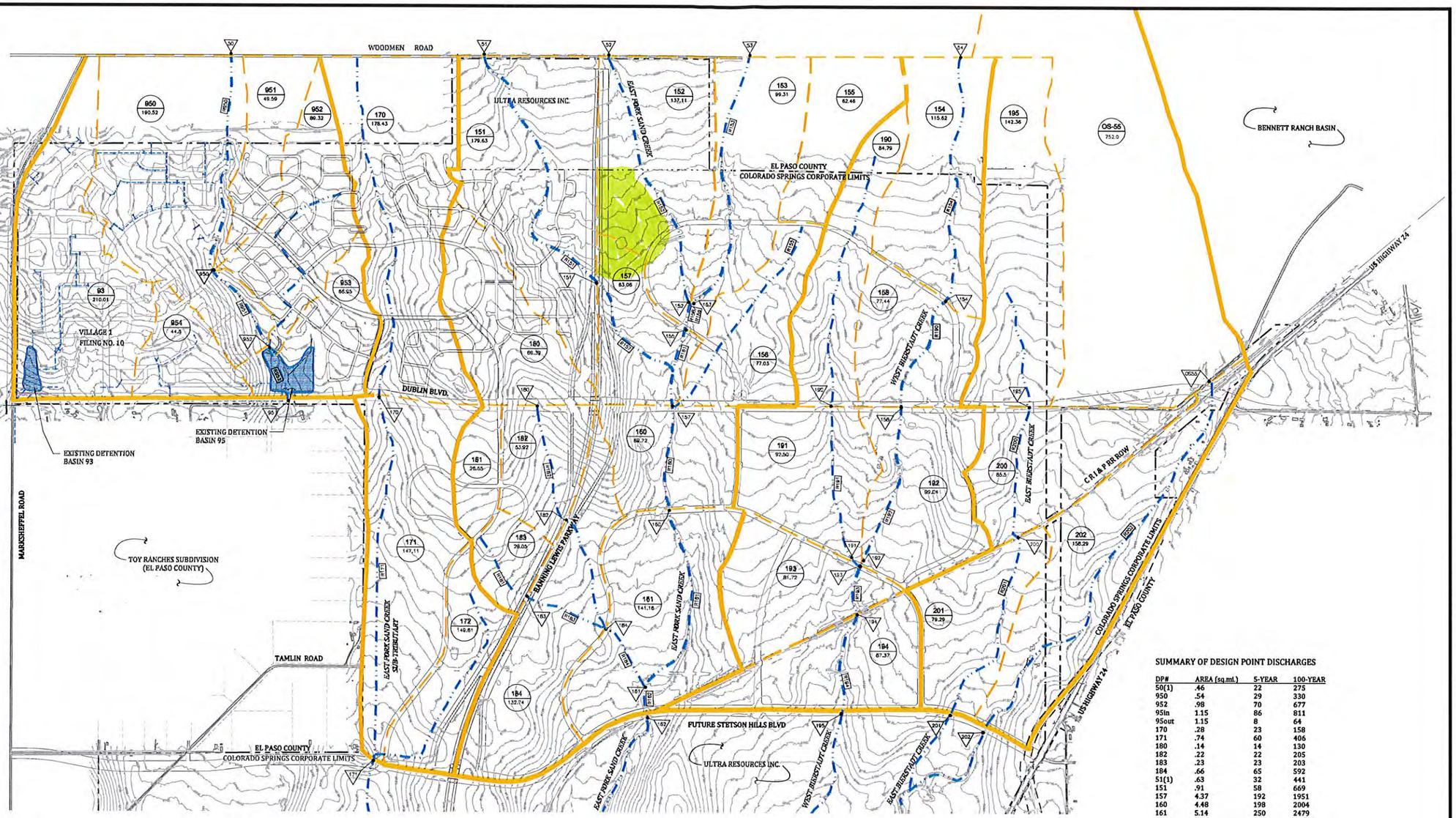
Kiowa Engineering Corporation
419 W. Bijou Street
Colorado Springs, Colorado
80905-1308

EAST FORK SAND CREEK DRAINAGE BASIN PLANNING STUDY

PRELIMINARY PLANS

Project No. 8811.23
Date: 6/89
Design: JYC
Drawn: EAK
Check:
Revisions:

EF-32



LEGEND	
R / 10.24	DRAINAGE BASIN DESIGNATION / DRAINAGE BASIN AREA IN ACRES
1	DESIGN POINT
	SUB-DRAINAGE BASIN DIVIDE
	MASTER DRAINAGE BASIN DIVIDE

0 600' 1200'
SCALE: 1"=600'
CONTOUR INTERVAL = 5'

VILLAGE B

SUMMARY OF DESIGN POINT DISCHARGES

DP#	AREA (sq.mi.)	5-YEAR	100-YEAR
50(1)	.46	22	275
950	.54	29	330
952	.98	70	677
95in	1.15	86	811
95out	1.15	8	64
170	.28	23	158
171	.74	60	406
180	.14	14	130
182	.22	22	205
183	.23	23	203
184	.66	65	592
51(1)	.63	32	441
151	.91	58	669
157	4.37	192	1951
160	4.48	198	2004
161	5.14	250	2479
162	5.36	268	2639
52(1)	1.41	41	376
152	1.62	46	408
OSS3(1)	1.37	62	742
153	1.52	75	853
155	3.15	111	1102
190	.13	13	113
191	.28	27	239
54(1)	.61	32	467
154	.79	48	605
158	.91	59	710
192	1.06	70	808
193	1.34	95	1027
194	1.47	106	1125
195	1.61	115	1202
200	.37	36	302
201	.50	40	342
OSS5	.41	39	311
202	.66	59	469

(1) 100-YEAR PEAK DISCHARGES AT THESE DESIGN POINTS CALIBRATED TO MATCH EXISTING CONDITION UNIT DISCHARGES FROM THE SAND CREEK DRAINAGE BASIN PLANNING STUDY, 1996.

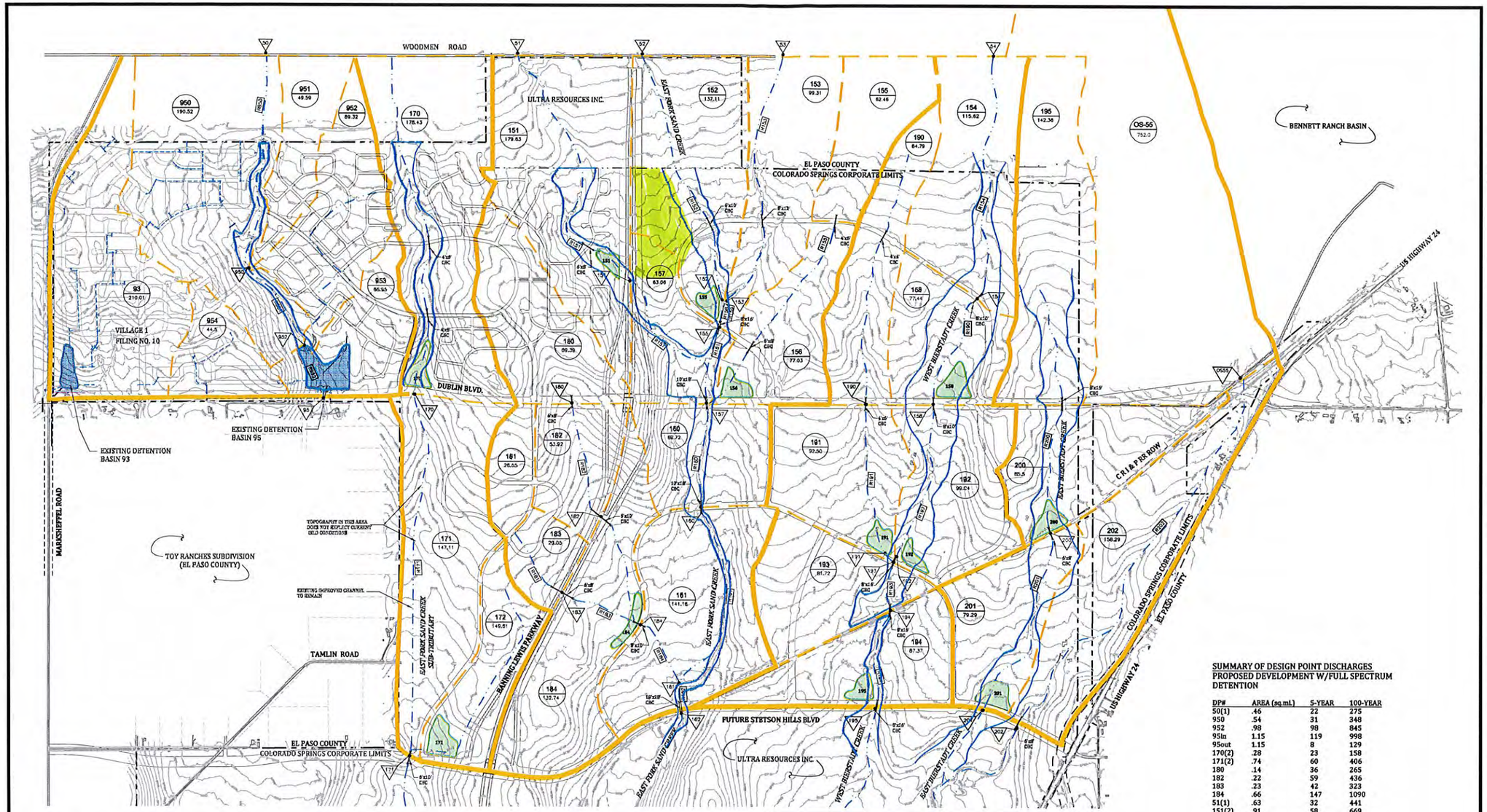
Kiowa Engineering Corporation
1604 South 21st Street
Colorado Springs, Colorado 80904
(719) 635-7342

BANNING LEWIS RANCH
MASTER DEVELOPMENT DRAINAGE PLAN UPDATE
EXISTING CONDITION HYDROLOGIC BASIN MAP
COLORADO SPRINGS, COLORADO

Project No:	12042
Date:	December 6, 2012
Design:	RNW
Drawn:	EAK
Check:	RNW
Revisions:	

DP1

12042 DP1 EX HYDROLOGY Dec 02, 2012



LEGEND

- R / 10.24 — DRAINAGE BASIN DESIGNATION / DRAINAGE BASIN AREA IN ACRES
- DESIGN POINT
- (06) HEC-RAS CROSS SECTION
- SUB-DRAINAGE BASIN DIVIDE
- MASTER DRAINAGE BASIN DIVIDE
- FLOW DIRECTION
- TIME OF CONCENTRATION PATH
- OPEN WATER
- 100-YEAR FLOODPLAIN
- FULL SPECTRUM DETENTION BASIN w/ OUTFALL LOCATION

VILLAGE B

0 600' 1200'

SCALE: 1"=600'
CONTOUR INTERVAL = 5'

FSD EXCESS URBAN RUNOFF VOLUME (EURV)

FSD BASIN	DRAINAGE AREA (acre)	EURV (acre-feet)	TOTAL VOLUME (1) (acre-feet)	SURFACE AREA (2) (acre)
170	178.4	7.6	12.5	3.1
171	296.7	9.3	16.0	4.0
184	304	15.3	24.9	6.2
151	179.6	3.9	7.1	1.8
152	137.1	2.9	5.3	1.3
153	99.3	1.1	2.3	.60
156	203.0	2.5	5.1	1.3
161	237.9	5.1	9.3	2.3
191	177.0	6.4	10.9	2.7
158	193.0	5.6	10.0	2.5
192	99.0	3.6	6.1	1.5
195	168.0	6.8	11.3	2.8
200	227.9	8.3	14.0	3.5
201	237.6	4.8	8.9	2.2

(1) Total includes EURV, 5-year and 100-year storage volumes

(2) Surface area includes storage pool, freeboard, embankment and buffer around 100-Year storage pool. 4' average storage depth assumed.

SUMMARY OF DESIGN POINT DISCHARGES PROPOSED DEVELOPMENT W/FULL SPECTRUM DETENTION

DP#	AREA (sq.mL)	5-YEAR	100-YEAR
50(1)	.46	22	275
950	.54	31	348
952	.98	98	845
95in	1.15	119	998
95out	1.15	8	129
170(2)	.28	23	158
171(2)	.74	60	406
180	.14	36	265
182	.22	59	436
183	.23	42	323
184	.66	147	1090
51(1)	.63	32	441
151(2)	.91	58	669
157(2)	4.37	192	1951
160(2)	4.48	198	2094
161	5.14	381	3230
162	5.36	268	2639
52(1)	1.41	41	376
152(2)	1.62	46	408
OS53(1)	1.37	62	742
153	1.52	77	868
155(2)	3.15	111	1102
190	.13	20	155
191	.28	48	363
54(1)	.61	32	467
154(2)	.79	48	605
158(2)	.91	59	710
192(2)	1.06	70	808
193(2)	1.34	93	1027
194(2)	1.47	106	1125
SB195(2)	.22	22	180
195(2)	1.61	115	1202
200(2)	.36	36	302
201(2)	.48	40	342
OS55	.41	39	311
202	.66	67	516

(1) 100-YEAR PEAK DISCHARGES AT THESE DESIGN POINTS CALIBRATED TO MATCH EXISTING CONDITION UNIT DISCHARGES FROM THE SAND CREEK DRAINAGE BASIN PLANNING STUDY, 1996.

(2) PEAK DISCHARGES AT THESE DESIGN POINTS ARE BASED UPON EXISTING DEVELOPMENT CONDITIONS AND REPRESENT THE REQUIRED RELEASE RATES ALONG THE RECEIVING MAJOR DRAINAGEWAYS.

Kiowa Engineering Corporation
1604 South 21st Street
Colorado Springs, Colorado 80904
(719) 630-7342

BANNING LEWIS RANCH
MASTER DEVELOPMENT DRAINAGE PLAN UPDATE
PROPOSED FACILITIES PLAN
COLORADO SPRINGS, COLORADO

Project No.:	12042
Date:	DECEMBER 6, 2012
Design:	RNW
Drawn:	EAK
Check:	RNW
Revisions:	

DP3

DRAINAGE MAPS

CLASSIC SM
CONSULTING
ENGINEERS & SURVEYORS

EXISTING WOODMEN BLVD.

MDDP DP-52

OS-1 902.40

OS-2 18.53

OS-2 18.53

REACH 152

REACH 153

UNPLATTED

UNPLATTED

FILING 42

BANNING LEWIS PARKWAY (142' ROW)

EXISTING BANNING LEWIS RANCH FILING NO. 16B

FILING 42 FILING 40

FILING 42

MATCHLINE ~ SEE SHEET 2

MATCHLINE ~ SEE SHEET 2

LEGEND

EXISTING GROUND CONTOUR	(6700)
EXISTING BASIN BOUNDARY	
MDDP CHANNEL REACH	
EXISTING STORM SEWER	
EXISTING STORM INLET	
EXISTING TYPE 2 MANHOLE	
EXISTING TYPE I MANHOLE	
BASIN IDENTIFIER	D
AREA IN ACRES	1.41
DESIGN POINT	1
DIRECTION OF DRAINAGE	

N

100 50 0 100 200

SCALE: 1" = 100'

CLASSIC CONSULTING SM

619 N. Cascade Avenue, Suite 200 (719)785-0790
Colorado Springs, Colorado 80903 (719)785-0799(Fax)

BANNING LEWIS RANCH FILING 40-42

FINAL DRAINAGE REPORT
EXISTING CONDITIONS MAP

CLASSIC CONSULTING

DESIGNED BY	MAL	SCALE		DATE	04/21/20
DRAWN BY	MAL	(H) 1"= 100'		SHEET	1 OF 2
CHECKED BY		(V) 1"= N/A		JOB NO.	2570.03

N:\2570\03\DRAWINGS\DEVELOPMENT\2570-03-FDR-EXIST.dwg, 4/25/2020 3:01:15 PM, 1:1

MATCHLINE ~ SEE SHEET 1

MATCHLINE ~ SEE SHEET 1

BANNING LEWIS PARKWAY (142' ROW)

EXISTING WINTERSTONE COURT

EXISTING VALLEY RUN COURT

EXISTING BANNING LEWIS RANCH FILING NO. 18B

EXISTING DOME RUN COURT

EXISTING REDCLOUD PEAK DRIVE

EXISTING BANNING LEWIS RANCH FILING NO. 19A

FILING 42
FILING 40

FILING 41

FILING 42
FILING 40

FILING 42
FILING 40

FILING 41

FILING 40

FILING 42
FILING 40

FILING 40

EX-A
13.06

EX-C
19.38

NN
2.19

28B

BBB
1.96

EX-B
1.21

2

3

30

UNPLATTED

UNPLATTED

TRACT A
BANNING LEWIS RANCH FILING NO. 4

TRACT B
BANNING LEWIS RANCH FILING NO. 4

EXISTING JURISDICTIONAL WETLANDS

EXISTING JURISDICTIONAL WETLANDS

EFFECTIVE 100-YR FEMA FLOODPLAIN

REACH 152

REACH 153

REACH 157

REACH 158/159

153

FUTURE POND 155 LOCATION PER MDDP

EXISTING POND 151 FULL SPECTRUM DETENTION

N

100 50 0 100 200

SCALE: 1" = 100'

LEGEND

- EXISTING GROUND CONTOUR (6700)
- EXISTING BASIN BOUNDARY
- MDDP CHANNEL REACH
- EXISTING STORM SEWER
- EXISTING STORM INLET
- EXISTING TYPE 2 MANHOLE
- EXISTING TYPE I MANHOLE
- BASIN IDENTIFIER D / AREA IN ACRES 1.41
- DESIGN POINT 1
- DIRECTION OF DRAINAGE

BASIN RUNOFF

BASIN	Q5 (CFS)	Q100 (CFS)	ACREAGE
OS-2	4.4	32.4	18.53
EX-A	2.8	20.8	13.06
EX-B	0.5	3.4	1.21
EX-C	5.6	41.3	19.38
NN	7.9	14.1	2.19
BBB	9.0	16.2	1.96

DESIGN POINT SUMMARY

DESIGN POINT	Q5 (CFS)	Q100 (CFS)	FEATURE
1	4.4	32.4	SURFACE FLOW
2	5.6	41.3	SURFACE FLOW
3	0.5	3.4	SURFACE FLOW
28B	7.9	14.1	EX. 15' TYPE R (AT-GRADE)
30	11.9	61.0	EX. 10' TYPE R (SUMP)

CLASSIC CONSULTING SM
619 N. Cascade Avenue, Suite 200 (719)785-0790
Colorado Springs, Colorado 80903 (719)785-0799(Fax)

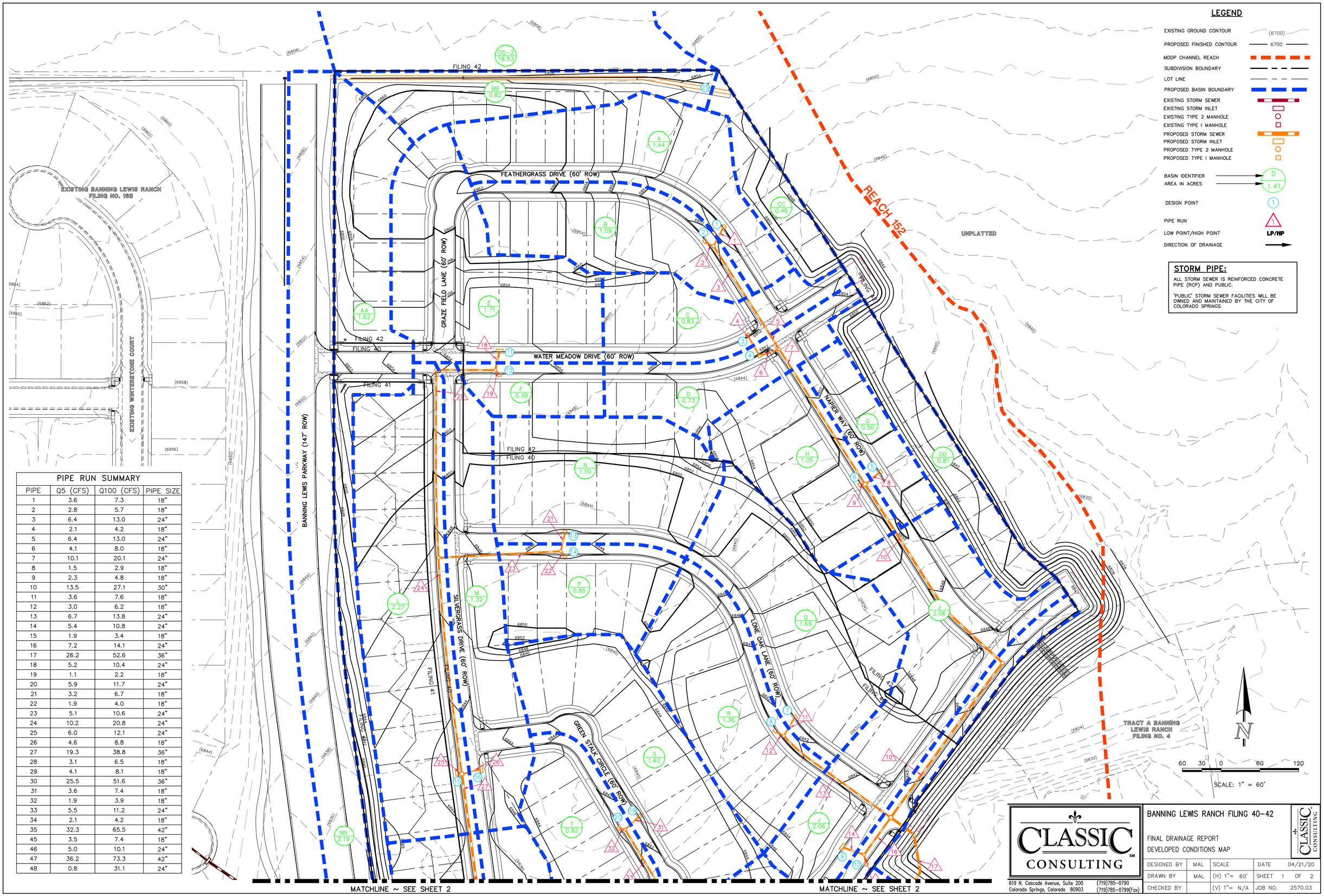
BANNING LEWIS RANCH FILING 40-42

FINAL DRAINAGE REPORT
EXISTING CONDITIONS MAP

CLASSIC CONSULTING

DESIGNED BY	MAL	SCALE	DATE 04/21/20
DRAWN BY	MAL	(H) 1"= 100'	SHEET 2 OF 2
CHECKED BY		(V) 1"= N/A	JOB NO. 2570.03

N:\257003\DRAWINGS\DEVELOPMENT\257003-EDR-EXIST.dwg, 4/25/2020 2:59:52 PM, 1:1



LEGEND

- EXISTING GROUND CONTOUR (6700)
- PROPOSED FINISHED CONTOUR 6700
- MDDP CHANNEL REACH
- SUBDIVISION BOUNDARY
- LOT LINE
- PROPOSED BASIN BOUNDARY
- EXISTING STORM SEWER
- EXISTING STORM INLET
- EXISTING TYPE 2 MANHOLE
- EXISTING TYPE I MANHOLE
- PROPOSED STORM SEWER
- PROPOSED STORM INLET
- PROPOSED TYPE 2 MANHOLE
- PROPOSED TYPE I MANHOLE
- BASIN IDENTIFIER / AREA IN ACRES (D / 1.41)
- DESIGN POINT (1)
- PIPE RUN (1)
- LOW POINT/HIGH POINT LP/HP
- DIRECTION OF DRAINAGE

STORM PIPE:

ALL STORM SEWER IS REINFORCED CONCRETE PIPE (RCP) AND PUBLIC.

"PUBLIC" STORM SEWER FACILITIES WILL BE OWNED AND MAINTAINED BY THE CITY OF COLORADO SPRINGS

PIPE RUN SUMMARY

PIPE	Q5 (CFS)	Q100 (CFS)	PIPE SIZE
1	3.6	7.3	18"
2	2.8	5.7	18"
3	6.4	13.0	24"
4	2.1	4.2	18"
5	6.4	13.0	24"
6	4.1	8.0	18"
7	10.1	20.1	24"
8	1.5	2.9	18"
9	2.3	4.8	18"
10	13.5	27.1	30"
11	3.6	7.6	18"
12	3.0	6.2	18"
13	6.7	13.8	24"
14	5.4	10.8	24"
15	1.9	3.4	18"
16	7.2	14.1	24"
17	26.2	52.6	36"
18	5.2	10.4	24"
19	1.1	2.2	18"
20	5.9	11.7	24"
21	3.2	6.7	18"
22	1.9	4.0	18"
23	5.1	10.6	24"
24	10.2	20.8	24"
25	6.0	12.1	24"
26	4.6	8.8	18"
27	19.3	38.8	36"
28	3.1	6.5	18"
29	4.1	8.1	18"
30	25.5	51.6	36"
31	3.6	7.4	18"
32	1.9	3.9	18"
33	5.5	11.2	24"
34	2.1	4.2	18"
35	32.3	65.5	42"
45	3.5	7.4	18"
46	5.0	10.1	24"
47	36.2	73.3	42"
48	0.8	31.1	24"

CLASSIC CONSULTING SM
619 N. Cascade Avenue, Suite 200 (719)785-0790
Colorado Springs, Colorado 80903 (719)785-0799(Fax)

BANNING LEWIS RANCH FILING 40-42

FINAL DRAINAGE REPORT
DEVELOPED CONDITIONS MAP

CLASSIC CONSULTING

DESIGNED BY	MAL	SCALE		DATE	04/21/20
DRAWN BY	MAL	(H) 1"= 60'		SHEET 1	OF 2
CHECKED BY		(V) 1"= N/A		JOB NO.	2570.03

BASIN RUNOFF			
BASIN	Q5 (CFS)	Q100 (CFS)	ACREAGE
OS-2	4.4	32.4	18.53
A	3.6	7.3	1.44
B	2.8	5.7	1.09
C	2.1	4.2	0.83
D	2.2	4.3	0.73
E	5.2	10.4	1.71
F	1.1	2.2	0.39
G	1.5	2.9	0.50
H	2.3	4.8	1.05
J	5.4	10.8	2.06
K	1.9	3.4	0.47
L	6.0	12.1	2.27
M	4.6	8.8	1.32
N	3.2	6.7	1.50
P	1.9	4.0	0.85
Q	3.6	7.6	1.69
R	3.0	6.2	1.36
S	3.6	7.4	1.62
T	1.9	3.9	0.82
U	3.1	6.5	1.35
V	4.1	8.1	1.44
W	2.1	4.2	0.73
X	3.5	7.4	1.35
Y	1.6	2.9	0.41
Z	3.2	7.5	1.77
AA	2.8	6.8	1.62
BB	0.9	3.0	0.82
CC	0.9	2.2	0.46
DD	1.9	4.1	0.81
EE	0.5	3.6	1.19
NN	7.9	14.1	2.19
BBB	9.0	16.2	1.96

DESIGN POINT SUMMARY			
DESIGN POINT	Q5 (CFS)	Q100 (CFS)	FEATURE
1	3.6	7.3	5' TYPE R (SUMP)
2	2.8	5.7	5' TYPE R (SUMP)
3	2.1	4.2	5' TYPE R (SUMP)
4	2.2	4.3	5' TYPE R (SUMP)
5	1.5	2.9	5' TYPE R (SUMP)
6	2.3	4.8	5' TYPE R (SUMP)
7	3.6	7.6	5' TYPE R (SUMP)
8	3.0	6.2	5' TYPE R (SUMP)
9	5.4	10.8	10' TYPE R (SUMP)
10	1.9	3.4	5' TYPE R (SUMP)
11	5.2	10.4	10' TYPE R (SUMP)
12	1.1	2.2	5' TYPE R (SUMP)
13	3.2	6.7	5' TYPE R (SUMP)
14	1.9	4.0	5' TYPE R (SUMP)
15	6.0	12.1	10' TYPE R (SUMP)
16	4.6	8.8	10' TYPE R (SUMP)
17	3.1	6.5	5' TYPE R (SUMP)
18	4.1	8.1	10' TYPE R (SUMP)
19	3.6	7.4	5' TYPE R (SUMP)
20	1.9	3.9	5' TYPE R (SUMP)
21	2.1	4.2	5' TYPE R (SUMP)
22	3.5	7.4	10' TYPE R (SUMP)
23	1.6	2.9	5' TYPE R (SUMP)
24	61.6	126.2	TEMPORARY POND
25	5.0	34.3	CONCRETE CHASE
28B	10.2	20.0	EX. 15' TYPE-R (AT-GRADE)
30	11.4	26.7	EX. 10' TYPE-R (SUMP)

MATCHLINE ~ SEE SHEET 1

MATCHLINE ~ SEE SHEET 1

MATCHLINE ~ SEE SHEET 1

EXISTING LEWIS RANCH FILING NO. 15B

EXISTING DOME RUN COURT

EXISTING REDCLOUD PEAK DRIVE

BANNING LEWIS PARKWAY (147' ROW)

FILING 44

GREEN STALK CIRCLE (60' ROW)

REDCLOUD PEAK DRIVE (67' ROW)

FILING 40

SIDEOATS COURT

TRACT A BANNING LEWIS RANCH FILING NO. 4

TRACT B BANNING LEWIS RANCH FILING NO. 4

EXISTING JURISDICTIONAL WETLANDS

UNPLATTED

UNPLATTED

REACH 152

REACH 157

EXISTING POND 151 FULL SPECTRUM DETENTION

FUTURE POND 155 LOCATION PER MDDP

SCALE: 1" = 60'

LEGEND

- EXISTING GROUND CONTOUR (6700)
- PROPOSED FINISHED CONTOUR 6700
- MDDP CHANNEL REACH
- SUBDIVISION BOUNDARY
- LOT LINE
- PROPOSED BASIN BOUNDARY
- EXISTING STORM SEWER
- EXISTING STORM INLET
- EXISTING TYPE 2 MANHOLE
- EXISTING TYPE I MANHOLE
- PROPOSED STORM SEWER
- PROPOSED STORM INLET
- PROPOSED TYPE 2 MANHOLE
- PROPOSED TYPE I MANHOLE
- BASIN IDENTIFIER / AREA IN ACRES (D / 1.41)
- DESIGN POINT (1)
- PIPE RUN
- LOW POINT/HIGH POINT (LP/HP)
- DIRECTION OF DRAINAGE

STORM PIPE:

ALL STORM SEWER IS REINFORCED CONCRETE PIPE (RCP) AND PUBLIC.

'PUBLIC' STORM SEWER FACILITIES WILL BE OWNED AND MAINTAINED BY THE CITY OF COLORADO SPRINGS

CLASSIC CONSULTING SM
619 N. Cascade Avenue, Suite 200
Colorado Springs, Colorado 80903
(719)785-0790
(719)785-0799(Fax)

BANNING LEWIS RANCH FILING 40-42

FINAL DRAINAGE REPORT
DEVELOPED CONDITIONS MAP

CLASSIC CONSULTING

DESIGNED BY	MAL	SCALE		DATE	04/21/20
DRAWN BY	MAL	(H) 1"=	60'	SHEET	2 OF 2
CHECKED BY		(V) 1"=	N/A	JOB NO.	2570.03

N:\2570\03\DRAWINGS\DEVELOPMENT\2570\03-FDR-DEV.dwg, 4/25/2020 9:13:24 PM, 1:1