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PRELIMINARY DRAINAGE REPORT FOR KETTLE CREEK NORTH DEVELOPMENT PLAN AND FINAL DRAINAGE REPORT FOR KETTLE CREEK NORTH FILING NO. 1

JULY 2020

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PRELIIMINARY DRAINAGE REPORT FOR KETTLE CREEK NORTH DEVELOPMENT PLAN AND FINAL DRAINAGE REPORT FOR KETTLE CREEK NORTH FILING NO. 1

Engineer's Statement

This report and plan for the drainage design of **Kettle Creek North** 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):_____

Marc A. Whorton, Colorado P.E. No. 37155 Date

Developer's Statement

Jovenchi, LLC hereby certifies that the drainage facilities for **Kettle Creek North** 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 **Jovenchi, LLC** , guarantee that final drainage design review will absolve **Jovenchi, LLC** and/or their successors and/or assigns of future liability for improper design. I further understand that approval of the PUD Concept Plan does not imply approval of my engineer's drainage design.

Jovenchi, LLC

Name of Developer

_____

Signed Name

_____

Printed Name

_____

Title

4779 N. Academy Blvd.

Colorado Springs, CO 80918

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:

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APPENDICES

PURPOSE

This document is the Preliminary Drainage Report for Kettle Creek North Development Plan and the Final Drainage Report for Kettle Creek North Filing No. 1. The purpose of this report is to identify onsite and offsite drainage patterns, locate and identify tributary or downstream drainage facilities and establish a design for the required drainage facilities meeting all applicable criteria. This report serves as the overall Kettle Creek North project drainage design and is consistent with the Kettle Creek North MDDP. Separate Final Drainage Reports are required with each individual Final Plat and addendums needed to finalize exact detention/water quality facilities and basin fees.

At this time, the first phase Development Plan is proposed along with the Filing 1 Final Plat.

GENERAL DESCRIPTION

Kettle Creek North is a portion of the Jovenchi, LLC land holdings south of Kettle Creek within Section 22, Township 12 South, Range 66 West of the 6th Principal Meridian in El Paso County, Colorado. As mentioned above, the first phase Development Plan and Final Plat are being proposed at this time. The remaining Jovenchi, LLC property within and north of Kettle Creek is anticipated to be sold to TOPS, while their property east over to Howells Road is anticipated to be planned for future residential use. This first residential development phase is the focus of this report. It covers approximately 61.72 acres and is planned to be phased into multiple Filings. More specifically, the site is located south of Kettle Creek (generally following the identified Preble's meadow jumping mouse (PMJM) habitat line), just north of Thunder Mountain Ave., east of Powers Blvd. and west of Howells Road. The existing North Fork Development (single-family homes) sits directly south of the site with all site access taken directly from Thunder Mountain Ave. Phasing of the development is anticipated and will be determined by market conditions. However, phasing is anticipated to be from west to east, with Filing No. 1 starting on the west end. The existing full-spectrum detention facility (Powers Pond) in the North Fork at Briargate development will handle and treat this development.

The average soil condition of the entire site reflects Hydrologic Group "B" (Peyton-Pring complex made up of sandy loam and sandy clay loam along with Kettle gravelly loamy sand) as determined by the "Web Soil Survey of El Paso County Area," prepared by the National Resources Conservation Service (see map in Appendix).

EXISTING DRAINAGE CONDITIONS

The site is located within the Kettle Creek Drainage Basin and was studied in the "Kettle Creek Drainage Basin Planning Study," by JR Engineering LLC, approved May 2015. The site lies within a portion of basins 21 and 28 as presented in the DBPS. (See Appendix) The site was most recently studied in the "Kettle Creek North MDDP", by Classic Consulting, approved October 2019. All drainage design remain consistent with this report. Westerly portions of the site have been accounted for in the North Fork at Briargate MDDP and most recently in the North Fork at Briargate Filing 7 Final Drainage Report and associated addendums. Runoff from the westerly portion of the property sheet flows in a southwesterly direction, partially towards a temporary sediment basin constructed with the North Fork development, partially towards Thunder Mountain Ave. and partially off-site towards Powers Blvd. and Kettle Creek. **Design Point H7 (Q_5 = 4 cfs, Q_{100} = 26 cfs)** represents sheet flow from Basin H-7 that is directly tributary to the temporary sediment basin constructed along with the North Fork Development. **Design Point H6 (Q_5 = 1 cfs, Q_{100} = 9 cfs)** represents sheet flow from Basin H-6 that is directly tributary to Thunder Mountain Ave. This flow has been accounted for within the North Fork Development and their associated storm sewer system. **Design Point H8 (Q_5 = 4 cfs, Q_{100} = 26 cfs)** represents sheet flow from Basin H-8 that travels in a westerly direction and off-site towards Kettle Creek. The flows that enter Thunder Mountain Ave. and collected by the on-site temporary sediment basin are then routed via storm sewer directly into the existing detention basin (Powers Pond) recently constructed by the North Fork Development. This facility has been planned previously to handle the developed flows from this portion of the site. (See proposed Drainage Conditions) Near the middle of the site a diversion swale was previously constructed routing some of the flows due north towards the creek. **Design Point H5 (Q_5 = 3 cfs, Q_{100} = 22 cfs)** represents this sheet flow from Basin H-5. This facility will be removed upon development. **Design Point H4 (Q_5 = 2 cfs, Q_{100} = 13 cfs)** represents sheet flow from Basin H-4 that travels in a northwesterly direction and off-site towards Kettle Creek. The existing topography for this portion of the site contains slopes ranging from 2% to 6% and is covered in native grasses with some sparse shrubs and trees along the northerly boundary.

Kettle Creek is a designated corridor for PMJM habitat as described in the DBPS. However, the westerly portion of the north boundary of the proposed PUD Concept Plan is the identified PMJM habitat line. The Kettle Creek DBPS also discusses limited channel stabilization in the form of check structures conceptually located based on mean channel velocities determined by the HEC-RAS model. However, no channel

improvements may be feasible based on the presence of the PMJM and the associated setback of 361 feet from the edge of creek for all development. **The need for channel improvements within Kettle Creek adjacent to this development is being further analyzed in a separate report. This separate report will be reviewed and approved by City stormwater staff prior to the approval of this Final Drainage report and recordation of the first Final Plat.**

PROPOSED DRAINAGE CONDITIONS

Developed runoff from the Kettle Creek North development will be conveyed via surface drainage and public storm sewer systems to multiple storm water quality facilities located on and off-site. All proposed facilities will be designed and installed per the latest City of Colorado Springs drainage criteria and detailed in this report. See the following general descriptions of the anticipated developed design points and how all on and off-site developed flows will be mitigated:

A portion of the future Kettle Creek North development just to the west of the proposed development plan is anticipated to be tributary to the existing Powers Pond via the proposed storm system. Thus, **Design Point 1 (Q_5 = 13 cfs, Q_{100} = 31 cfs)** represents an off-site future sump condition (Basin OS-1). Inlets will be sized with this future development with the collected flows routed via future public 30" RCP storm system towards the proposed Pipe Run 1.

Design Point 2 (Q_5 = 3 cfs, Q_{100} = 6 cfs) represents off-site future developed flow from Basin OS-2 that is anticipated to contain future lots and roads. These future flows travel as curb flow towards Design Point 4. **Design Point 3 (Q_5 = 2 cfs, Q_{100} = 5 cfs)** represents off-site future developed flow from Basin OS-3 that is anticipated to contain future lots and roads. These future flows travel as curb flow towards Design Point 8. Basin OS-5 (Q_5 = 0.1 cfs, Q_{100} = 0.9 cfs) represents the anticipated future rear yards that contain no impervious area that will continue to sheet flow off-site.

Design Point 4 (Q_5 = 6 cfs, Q_{100} = 13 cfs) represents the developed flow from DP 2 and Basins A and OS-4. These combined flows travel as curb flow towards DP 6. The street grade at this location is 4.0%. Thus, the street capacity for a residential street with detached sidewalks and vertical curb equals Q_5 = 20+ cfs, Q_{100} =

35 cfs (reference street capacity chart Fig. 7-7 in Appendix). **Design Point 5 (Q_5 = 3 cfs, Q_{100} = 6 cfs)** represents the developed flow from basin B. At this location, public 5' Type R At-grade inlet will be installed and collect 73% of the 5 yr. flows and 51% of the 100 yr. flows. The flow-by at this location then equals (Q_5 = 0.8 cfs, Q_{100} = 2.9 cfs). This flow-by then travels as curb flow towards DP 6. **Design Point 6 (Q_5 = 8 cfs, Q_{100} = 19 cfs)** represents the developed flow from Basin C, DP 4 and flow-by from DP 5. At this location, a public 10' Type R At-grade inlet will be installed and collect 81% of the 5 yr. flows and 51% of the 100 yr. flows. The flow-by at this location then equals (Q_5 = 1.5 cfs, Q_{100} = 9.5 cfs). This flow-by then travels as curb flow towards DP 7. The street grade at this location is 4.0%. Thus, the street capacity for a residential street with detached sidewalks and ramp curb equals Q_5 = 16+ cfs, Q_{100} = 36 cfs (reference street capacity chart Fig. 7-7 in Appendix).

Design Point 7 (Q_5 = 5 cfs, Q_{100} = 17 cfs) represents the developed flows from Basin D and flow-by from DP 6. At this location, a public 10' Type R Sump inlet will be installed to completely collect both the 5 yr. and 100 yr. flows. **Design Point 8 (Q_5 = 6 cfs, Q_{100} = 13 cfs)** represents the developed flows from Basin E and DP 3. At this location, a public 10' Type R Sump inlet will be installed to completely collect both the 5 yr. and 100 yr. flows. The emergency overflow for this sump condition will be ponding of 1.0' and then spillover the highpoint at the intersection.

Design Point 9 (Q_5 = 1 cfs, Q_{100} = 5 cfs) represents sheet flow from off-site Basin OS-8 and Basin F2. The developed flows within Basin F2 will be collected via a concrete chase section at the rear of the lots and then routed towards DP 9. At this location, a private Rain Garden will treat the developed flows prior to release towards Kettle Creek.

Design Point 10 (Q_5 = 2 cfs, Q_{100} = 8 cfs) represents the developed flow from basins OS-6, G and a portion of the 100 yr. flow-by from OS-1. At this location, an existing public 10' D-10-R At-grade inlet collects a portion of these developed flows. This facility collects 100% of the 5 yr. flows and 86% of the 100 yr. flows. The flow-by at this location then equals (Q_5 = 0.0 cfs, Q_{100} = 1.1 cfs). This flow-by then travels as curb flow in a westerly direction towards DP 15. The street grade at this location is 4.0%. Thus, the street capacity for a collector street with detached sidewalks and 8" vertical curb equals Q_5 = 18 cfs, Q_{100} = 77 cfs (reference street capacity chart Fig. 7-6 in Appendix).

Design Point 11 (Q_5 = 3 cfs, Q_{100} = 7 cfs) represents the developed flows from Basin J. At this location, a public 5' Type R Sump inlet will be installed to completely collect both the 5 yr. and 100 yr. flows. **Design Point 12 (Q_5 = 2 cfs, Q_{100} = 4 cfs)** represents the developed flows from Basin K. At this location, a public 5' Type R Sump inlet will be installed to completely collect both the 5 yr. and 100 yr. flows. The emergency overflow for this sump condition will be ponding of 1.0' and then spillover the highpoint at the intersection with Thunder Mountain Ave. The collected developed flows from this sump condition are then routed via a public 24" RCP towards the existing 36" RCP stub out of the back of the existing 14' inlet at DP 15 in Thunder Mountain Ave.

Design Point 13 (Q_5 = 3 cfs, Q_{100} = 8 cfs) represents the developed flows from Basin L. At this location, a public 5' Type R Sump inlet will be installed to completely collect both the 5 yr. and 100 yr. flows. **Design Point 14 (Q_5 = 2 cfs, Q_{100} = 4 cfs)** represents the developed flows from Basin M. At this location, a public 5' Type R Sump inlet will be installed to completely collect both the 5 yr. and 100 yr. flows. The emergency overflow for this sump condition will be ponding of 1.0' and then spillover the highpoint at the intersection with Thunder Mountain Ave. The collected developed flows from this sump condition are also routed via a public 24" RCP towards the existing 36" RCP stub out of the back of the existing 14' inlet at DP 15 in Thunder Mountain Ave.

Design Point 15 (Q_5 = 4 cfs, Q_{100} = 10 cfs) represents the developed flow from basins OS-7, H, I and the flow-by from DP-10. At this location, an existing public 14' D-10-R At-grade inlet collects a portion of these developed flows. This facility collects 100% of the 5 yr. flows and 95% of the 100 yr. flows. The flow-by at this location then equals (Q_5 = 0.0 cfs, Q_{100} = 0.5 cfs). This flow-by then travels as curb flow in a westerly direction towards DP 33. The street grade at this location is 4.0%. Thus, the street capacity for a collector street with detached sidewalks and 8" vertical curb equals Q_5 = 18 cfs, Q_{100} = 77 cfs (reference street capacity chart Fig. 7-6 in Appendix).

Design Point 16 (Q_5 = 1.0 cfs, Q_{100} = 3.2 cfs) represents developed sheet flow from Basin Q. The developed flows within this Basin will be collected via a concrete chase section at the rear of the lots and then routed towards DP 16. At this location, a private area drain will completely collect the developed flows and then routed towards the proposed on-site public storm system via a private 18" RCP within a storm esmt.

Design Point 17 (Q_5 = 3 cfs, Q_{100} = 7 cfs) represents the developed flow from Basin N. These developed flows then travel as curb flow towards DP 18. The street grade at this location is 4.0%. Thus, the street capacity for a residential street with detached sidewalks and vertical curb equals Q_5 = 20+ cfs, Q_{100} = 35 cfs (reference street capacity chart Fig. 7-7 in Appendix).

Design Point 18 (Q_5 = 6 cfs, Q_{100} = 14 cfs) represents the developed flow from Basin O and DP 17. These combined developed flows then travel as curb flow towards DP 18. The street grade at this location is 4.0%. Thus, the street capacity for a residential street with detached sidewalks and vertical curb equals Q_5 = 20+ cfs, Q_{100} = 35 cfs (reference street capacity chart Fig. 7-7 in Appendix).

Design Point 19 (Q_5 = 2 cfs, Q_{100} = 4 cfs) represents the developed flow from Basin P. These developed flows travel as curb flow towards DP 24. The street grade at this location is 4.0%. Thus, the street capacity for a residential street with detached sidewalks and vertical curb equals Q_5 = 20+ cfs, Q_{100} = 35 cfs (reference street capacity chart Fig. 7-7 in Appendix).

Design Point 20 (Q_5 = 3 cfs, Q_{100} = 7 cfs) represents the developed flow from Basin S. At this location, a public 10' Type R At-grade inlet will be installed and collect 100% of the 5 yr. flows and 83% of the 100 yr. flows. The flow-by at this location then equals (Q_5 = 0.0 cfs, Q_{100} = 1.2 cfs). This flow-by then travels as curb flow towards DP 21. The street grade at this location is 4.0%. Thus, the street capacity for a residential street with detached sidewalks and ramp curb equals Q_5 = 16+ cfs, Q_{100} = 36 cfs (reference street capacity chart Fig. 7-7 in Appendix). **Design Point 21 (Q_5 = 10 cfs, Q_{100} = 22 cfs)** represents the developed flow from Basins R, T, DP 18 and flow-by from DP 20. At this location, a public 10' Type R At-grade inlet will be installed and collect 71% of the 5 yr. flows and 47% of the 100 yr. flows. The flow-by at this location then equals (Q_5 = 2.9 cfs, Q_{100} = 11.8 cfs). This flow-by then travels as curb flow towards DP 26. The street grade at this location is 1.5%. Thus, the street capacity for a residential street with detached sidewalks and 6" vertical curb equals Q_5 = 13 cfs, Q_{100} = 45+ cfs (reference street capacity chart Fig. 7-7 in Appendix).

Design Point 22 (Q_5 = 6 cfs, Q_{100} = 16 cfs) represents the developed flows from Basin U and flow-by from DP 21. At this location, a public 10' Type R Sump inlet will be installed to completely collect both the 5 yr. and 100 yr. flows. **Design Point 23 (Q_5 = 2 cfs, Q_{100} = 7 cfs)** represents the developed flows from Basin V and a portion of the 100 yr. flow-by from DP 21. At this location, a public 5' Type R Sump inlet will be installed to

completely collect both the 5 yr. and 100 yr. flows. The emergency overflow for this sump condition will be ponding of 1.0' and then spillover the highpoint at the intersection to the north.

Design Point 24 (Q_5 = 6 cfs, Q_{100} = 12 cfs) represents the developed flow from Basin W and DP 19. At this location, a public 5' Type R At-grade inlet will be installed and collect 51% of the 5 yr. flows and 34% of the 100 yr. flows. The flow-by at this location then equals (Q_5 = 2.9 cfs, Q_{100} = 7.9 cfs). This flow-by then travels as curb flow towards DP 27. The street grade at this location is 1.5%. Thus, the street capacity for a residential street with detached sidewalks and ramp curb equals Q_5 = 10 cfs, Q_{100} = 46+ cfs (reference street capacity chart Fig. 7-7 in Appendix).

Design Point 25 (Q_5 = 2 cfs, Q_{100} = 4 cfs) represents the developed flow from Basin X. These developed flows then travel as curb flow towards DP 26. The street grade at this location is 1.5%. Thus, the street capacity for a residential street with detached sidewalks and vertical curb equals Q_5 = 13 cfs, Q_{100} = 45 cfs (reference street capacity chart Fig. 7-7 in Appendix).

Design Point 26 (Q_5 = 4 cfs, Q_{100} = 13 cfs) represents the developed flows from Basin Y, DP 25 and portion of 100 yr. flow-by from DP 21. At this location, a public 10' Type R Sump inlet will be installed to completely collect both the 5 yr. and 100 yr. flows. **Design Point 27 (Q_5 = 6 cfs, Q_{100} = 17 cfs)** represents the developed flows from Basin Z and flow-by from DP 24. At this location, a public 10' Type R Sump inlet will be installed to completely collect both the 5 yr. and 100 yr. flows. The emergency overflow for this sump condition will be ponding of 1.0' and then spillover the highpoint to the west.

Design Point 28 (Q_5 = 2 cfs, Q_{100} = 4 cfs) represents the developed flow from Basin BB1. At this location, a public 10' Type R At-grade inlet will be installed and collect 100% of the 5 yr. flows and 99% of the 100 yr. flows. The flow-by at this location then equals (Q_5 = 0.0 cfs, Q_{100} = 0.1 cfs). This flow-by then travels as curb flow towards DP 33. **Design Point 29 (Q_5 = 0.7 cfs, Q_{100} = 1.7 cfs)** represents the developed flow from Basin BB2. At this location, a public 5' Type R At-grade inlet will be installed and collect 88% of the 5 yr. flows and 92% of the 100 yr. flows. The flow-by at this location then equals (Q_5 = 0.1 cfs, Q_{100} = 0.1 cfs). This flow-by then also travels as curb flow towards DP 33. The collected developed flows from these facilities are then routed via a public 24" RCP with a proposed connection to the public storm system within Thunder Mountain Ave.

Design Point 30 (Q_5 = 3 cfs, Q_{100} = 7 cfs) represents the developed flow from Basin CC. These developed flows then travel as curb flow towards DP 33. The street grade at this location is 4.0%. Thus, the street capacity for a collector street with detached sidewalks and 8" vertical curb equals Q_5 = 18 cfs, Q_{100} = 77 cfs (reference street capacity chart Fig. 7-6 in Appendix).

Design Point 31 (Q_5 = 3 cfs, Q_{100} = 7 cfs) represents the developed flow from Basin DD1. At this location, a public 10' Type R At-grade inlet will be installed and collect 100% of the 5 yr. flows and 83% of the 100 yr. flows. The flow-by at this location then equals (Q_5 = 0.0 cfs, Q_{100} = 1.2 cfs). This flow-by then travels as curb flow towards DP 33. **Design Point 32 (Q_5 = 2 cfs, Q_{100} = 4 cfs)** represents the developed flow from Basin DD2. At this location, a public 10' Type R At-grade inlet will be installed and collect 100% of the 5 yr. flows and 99% of the 100 yr. flows. The flow-by at this location then equals (Q_5 = 0.0 cfs, Q_{100} = 0.0 cfs). This flow-by then also travels as curb flow towards DP 33. The collected developed flows from these facilities are then routed via a public 24" RCP with a proposed connection to the public storm system within Thunder Mountain Ave.

Design Point 33 (Q_5 = 4.7 cfs, Q_{100} = 12 cfs) represents the developed flow from basins OS-10, EE and the flow-by from DP-31 and DP-32. At this location, an existing public 6' D-10-R Sump inlet continues to collect these developed flows. The street grade approaching this location is 2.0%. Thus, the street capacity for a collector street with detached sidewalks and 8" vertical curb equals Q_5 = 13 cfs, Q_{100} = 96 cfs (reference street capacity chart Fig. 7-6 in Appendix). The emergency overflow for this sump condition will remain the same with ponding of 1.0' and then spillover the highpoint in Thunder Mountain Ave. further to the west.

Design Point 34 (Q_5 = 2 cfs, Q_{100} = 5 cfs) represents the developed flows from Basin FF. At this location, a public 5' Type R Sump inlet will be installed to completely collect both the 5 yr. and 100 yr. flows. **Design Point 35 (Q_5 = 1 cfs, Q_{100} = 3 cfs)** represents the developed flows from Basin GG. At this location, a public 5' Type R Sump inlet will be installed to completely collect both the 5 yr. and 100 yr. flows. The emergency overflow for this sump condition will be ponding of 1.0' and then spillover the highpoint at the intersection to the south.

Design Point 36 (Q_5 = 3 cfs, Q_{100} = 8 cfs) represents the developed flow from basins OS-11 and HH. At this location, an existing public 6' D-10-R Sump inlet continues to collect these developed flows. The street grade approaching this location is 1.5%. Thus, the street capacity for a collector street with detached sidewalks

and 8" vertical curb equals Q_5 = 11 cfs, Q_{100} = 99+ cfs (reference street capacity chart Fig. 7-6 in Appendix). The emergency overflow for this sump condition will remain the same with ponding of 1.0' and then spillover the curb to the west and directly into the existing Powers Pond.

Design Point 37 (Q_5 = 4 cfs, Q_{100} = 9 cfs) represents the developed flows from Basin II. At this location, a public 5' Type R Sump inlet will be installed to completely collect both the 5 yr. and 100 yr. flows. The emergency overflow for this sump condition will be ponding of 8" and then spillover the back of sidewalk and then directly into the existing Powers Pond.

Design Point 38 (Q_5 = 2 cfs, Q_{100} = 5 cfs) represents the developed flows from Basin JJ. At this location, a public 5' Type R Sump inlet will be installed to completely collect both the 5 yr. and 100 yr. flows. **Design Point 39 (Q_5 = 1 cfs, Q_{100} = 2 cfs)** represents the developed flows from Basin KK. At this location, a public 5' Type R Sump inlet will be installed to completely collect both the 5 yr. and 100 yr. flows. The emergency overflow for this sump condition will be ponding of 1.0' and then spillover the highpoint to the west.

Design Point 40 (Q_5 = 1 cfs, Q_{100} = 4 cfs) represents the developed flows from Basin LL. At this location, a public 5' Type R Sump inlet will be installed to completely collect both the 5 yr. and 100 yr. flows. The emergency overflow for this sump condition will be ponding of 8" and then spillover the back of sidewalk and then directly into the existing Powers Pond.

Design Point 41 (Q_5 = 1.5 cfs, Q_{100} = 4.7 cfs) represents rear yard sheet flow from Basin MM. The developed flows will be collected via a concrete chase section at the rear of the lots and then routed towards DP 41. At this location, a private area drain will be installed within the expanded rear yard drainage esmt. to completely collect these developed flows. The emergency overflow will be 1.0' and then over the highpoint to the west. The collected flows will be routed via a private 15" storm pipe to the west towards Design Point 42 and then ultimately directly into the existing Powers Pond at the proposed forebay. **Design Point 42 (Q_5 = 0.4 cfs, Q_{100} = 1.3 cfs)** represents rear yard sheet flow from Basin NN. Again, the developed flows will be collected via a concrete chase section at the rear of the lots and then routed towards DP 42. At this location, a private area drain will be installed within the expanded rear yard drainage esmt. to completely collect these developed flows. The emergency overflow will be 1.0' and then over the highpoint to the west. The collected flows will combine with the collected flows from DP-41 and be routed via a private 18" storm pipe to the west and

south and then ultimately directly into the existing Powers Pond at the proposed forebay. **Design Point 43 (Q_5 = 0.2 cfs, Q_{100} = 0.7 cfs)** represents rear yard sheet flow from Basin OO. The developed flows will be collected via a concrete chase section at the rear of the lots and then routed towards DP 43. At this location, a private area drain will be installed within the expanded rear yard drainage esmt. to completely collect these developed flows. The emergency overflow will be 1.0' and then over the highpoint to the east. The collected flows will be routed via a private 12" storm pipe to the east and then combined with the collected flows from DP-41 and DP-42 and then routed via the private 18" storm pipe directly into the existing Powers Pond at the proposed forebay.

The total developed flows entering the existing Powers Pond at the **new proposed forebay (Pipe Runs 27 & 31) equal (Q_5 = 48 cfs, Q_{100} = 115 cfs)**. Based on the UD-BMP spreadsheet (See Appendix) the required forebay size equals 0.022 ac-ft at a 30" depth with a 8.1" notch. The proposed forebay will be designed to meet these requirements with a 7' wide concrete trickle channel routing the flows towards the existing outlet structure. The total proposed developed flows entering the existing Powers Pond at the existing 72" RCP and existing concrete forebay **(Pipe Run 68) equals (Q_5 = 134 cfs, Q_{100} = 293 cfs)**. This compares to the previously anticipated developed flows as presented by **(Pipe Run 36 – North Fork at Briargate Filing 7 Amendment 1) equals (Q_5 = 166 cfs, Q_{100} = 364 cfs)**. Thus, this existing forebay continues to adequately capture and convey the developed flows at this location.

STORM WATER QUALITY/DETENTION

This proposed development is required to provide detention/SWQ to account for the increased impervious area associated with typical development. A proposed on-site private rain garden along with the existing public extended detention basin (Powers Pond) including stormwater quality features and full-spectrum detention will be provided for this development. These two facilities will handle detention and SWQ for all the public streets and impervious areas within the development. The private rain garden is proposed to be constructed along with the phase 4 portion of development with ownership and maintenance by the HOA. The existing Powers Pond is currently owned and maintained by the City of Colorado Springs as a public facility.

The private Rain Garden is planned to capture rear yards of proposed lots that cannot be physically routed to the existing Powers Pond. This facility will treat all impervious tributary area (1.88 ac.) prior to releasing flows towards Kettle Creek. The total flow entering this facility equals (Q_5 = 1 cfs, Q_{100} = 5 cfs). Per the UD-BMP spreadsheet for 1.88 ac. with a effective impervious area of 10.5%, 372 CF WQCV is required. 1620 CF is proposed for this rain garden and will be formally designed along with the Phase 4 storm construction drawings.

The existing public Powers Pond design for the North Fork at Briargate subdivision accounted for this proposed development. However, tributary acreage, density and imperviousness were only anticipated at that time. Now that the exact tributary acreage and imperviousness are known for the Kettle Creek North development, this report re-analyzes the entire tributary area and imperviousness for this existing facility. The UD-BMP spreadsheet along with the UD-Detention spreadsheet were used to calculate the required volume for the EURV and 100-year release. User input 1-hour precipitation values in the UD-Detention spreadsheet were taken from Table 6-2 Volume 1 Colorado Springs Drainage Criteria Manual. The UD-BMP IRF spreadsheet (see appendix) was used to calculate the overall total site imperviousness for all basins tributary to the existing Powers Pond facility. This total tributary area is 291.7 acres. Per the spread sheet a 40.6% effective imperviousness for the 100-year event will be utilized. Per UD-Detention and UD-BMP spreadsheets a 4.41 ac-ft WQCV is required, and a 8.04 ac-ft EURV is required, with a total required Basin Volume of 23.57 ac-ft. The current constructed Powers Pond allows for 5.12 ac-ft WQCV, 11.49 ac-ft EURV and total basin volume of 28.64 ac-ft. Thus, the current pond sizing continues to meet the stormwater quality requirements. However, based on the existing 30'x4' outlet structure box elevation the orifice plate will need to be replaced based on the ultimate total site imperviousness. The outlet structure plate will continue to have a 3-hole configuration with 3 individual rectangular openings spaced 30 inches apart. The following is the adjusted plate design: bottom two holes will be 16.0 sq. in. with the top hole being 32.0 sq. in. Other than the change in the orifice plate, the outlet box sizing, elevations, 48" RCP outlet pipe and emergency overflow weir remain the same. Construction documents showing this change in orifice plate design will be provided and approved by City Stormwater Enterprise along with the Inspection and Maintenance Plan.

DRAINAGE CRITERIA

Hydrologic calculations were performed using the City of Colorado Springs Drainage Criteria Manual, as revised in May 2014. Stormwater quality analysis and calculations were performed using the Drainage Criteria Manual, Volume 2 and Urban Drainage Flood Control District. The Rational Method was used to estimate stormwater runoff anticipated from design storms for the 2-year, 5 year, and 100-year recurrence interval.

All stormwater flows are within street capacity at per the current Engineering Criteria Manual. All basins/design points have been evaluated to ensure that the gutter capacity has not been exceeded for this development. In the event of clogging or inlet failure, emergency overflow routing for each inlet will either be provided by overtopping the nearby high point in the roadway to the next downstream inlet, or will be provided in an emergency overflow swale between lots in a defined drainage easement or tract. In addition, where adjacent uphill lots are proposed to drain through a lower adjacent lot (upstream rear yard to downstream rear yard), only one lot is allowed to be conveyed through a downstream lot. Side yard swales are required on the lower lots to convey the combined rear yard drainage to the street.

Storm Sewer plans have not been completed at this time. An addendum to this report at the time of Storm Sewer construction drawing submittal will be required that includes any changes to the initial storm sewer design detailing in this report and additional calculations for the required 5 and 100 year HGL lines.

The City of Colorado Springs has required 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 helps to achieve storm water permit requirements. This site conceptually adheres to this Four Step Process as follows:

1. **Employ Runoff Reduction Practices:** Development of project site is anticipated to be single family residential, with homes and associated landscaping. Proposed impervious areas (roof tops, patios) will sheet flow across landscaped ground to slow runoff and increase time of concentration prior to

being conveyed to the proposed public streets. This will minimize directly connected impervious areas within the project site. (IRF spreadsheets included in Appendix)

2. **Implement BMP's that provide a Water Quality Capture Volume with slow release:** Runoff from this site will be treated through capture and slow release of the EURV in a permanent Extended Detention Basin designed per current City of Colorado Springs drainage criteria.

3. **Stabilize Drainageways:** This site will utilize existing storm sewer adjacent to the site along with proposed storm systems within the development. These facilities will intercept and direct the on-site development flows directly to the existing and proposed ponds. The existing drainageways will generally see a significant reduction in flows based on much of the tributary areas being captured on-site and routed to the ponds. The Kettle Creek channel corridor adjacent to this property will be analyzed in a separate report to determine if channel improvements are necessary. This separate report will be reviewed and approved by City stormwater staff prior to the approval of this Final Drainage report and recordation of the first Final Plat.

4. **Implement Site Specific and Other Source Control BMP's**: A site specific storm water quality and erosion control plan and narrative will be submitted and approved by City Engineering along with this Final Drainage Report for Filing No. 1 prior to any disturbance within the project area. Details such as site specific source control construction BMP's as well as permanent BMP's will be detailed in this plan and narrative to protect receiving waters.

FLOODPLAIN STATEMENT

No portion of this site are located within a floodplain as determined by the Flood Insurance Rate Maps (F.I.R.M.) Map Number 08041C0507G effective date, December 7, 2018 (See Appendix).

DRAINAGE AND BRIDGE FEES

This development lies within the Kettle Creek Drainage Basin. Per the Kettle Creek DBPS, there are no drainage or bridge fees owed at this time, as this is a closed basin. The developer is financially responsible for all required on-site storm sewer and adjacent channel improvements for this development with no reimbursement.

CONSTRUCTION COST OPINION FILING NO. 1

Public and private Drainage Facilities Non-reimbursable

ITEM	DESCRIPTION	QUANTITY	UNIT COST	COST
1.	5' Type R Inlet	6 EACH	$5,800/EA	$ 34,800.00
2.	10' Type R Inlet	4 EACH	$7,200/EA	$ 28,800.00
3.	Area Drain	3 EACH	$2,500/EA	$ 7,500.00
4.	12" ADS Storm Drain	330 LF	$30/LF	$ 9,900.00
5.	18" RCP Storm Drain	225 LF	$54/LF	$ 12,150.00
6.	24" RCP Storm Drain	730 LF	$66/LF	$ 48,180.00
7.	30" RCP Storm Drain	65 LF	$90/LF	$ 5,850.00
8.	42" RCP Storm Drain	1270 LF	$170/LF	$ 215,900.00
9.	48" RCP Storm Drain	515 LF	$223/LF	$ 114,845.00
10.	Type II Storm MH	6 EACH	$3,000/EA	$ 18,000.00
11.	Type I Storm MH	4 EACH	$8,000/EA	$ 32,000.00
SUB-TOTAL				$ 527,925.00
10% ENGINEERING				$ 52,792.50
5% CONTINGENCIES				$ 26,396.25
TOTAL				**$ 607,113.75**

POWERS POND MODIFICATIONS

Public Drainage Facilities Non-reimbursable. Pond assurances will be paid prior to approval of the permanent BMP plans and not as a part of the Plat recording fees.

ITEM	DESCRIPTION	QUANTITY	UNIT COST	COST
1.	Concrete Forebay	1 EA	$60,000.00	$ 60,000.00
2.	48" RCP Storm Drain	80 LF	$223/LF	$ 17,840.00
3.	18" RCP Storm Drain	100 LF	$54/LF	$ 5,400.00

4.	Orifice Plate Modification	1 EA	$5,000.00/EA	$ 5,000.00
5.	Trickle Channel (reinforced)	240LF	$80.00/LF	$ 19,200.00
SUB-TOTAL				$ 107,440.00
15% ENGINEERING & CONTINGENCY				$ 16,116.00
TOTAL				**$ 123,556.00**

CONSTRUCTION COST OPINION FILING NO. 2

Public Drainage Facilities Non-reimbursable

ITEM	DESCRIPTION	QUANTITY	UNIT COST	COST
1.	5' Type R Inlet	3 EACH	$5,800/EA	$ 17,400.00
2.	10' Type R Inlet	4 EACH	$7,200/EA	$ 28,800.00
3.	18" RCP Storm Drain	95 LF	$54/LF	$ 5,130.00
4.	24" RCP Storm Drain	155 LF	$66/LF	$ 10,230.00
5.	30" RCP Storm Drain	80 LF	$90/LF	$ 7,200.00
6.	36" RCP Storm Drain	155 LF	$130/LF	$ 20,150.00
7.	42" RCP Storm Drain	355 LF	$170/LF	$ 60,350.00
8.	Type II Storm MH	4 EACH	$3,000/EA	$ 12,000.00
9.	Type I Storm MH	3 EACH	$8,000/EA	$ 24,000.00
SUB-TOTAL				$ 185,260.00
10% ENGINEERING				$ 18,526.00
5% CONTINGENCIES				$ 9,263.00
TOTAL				**$ 213,049.00**

CONSTRUCTION COST OPINION FILING NO. 3

Public and private Drainage Facilities Non-reimbursable

ITEM	DESCRIPTION	QUANTITY	UNIT COST	COST
1.	5' Type R Inlet	4 EACH	$5,800/EA	$ 17,400.00
2.	Area Drain	1 EACH	$2,500/EA	$ 2,500.00
3.	18" RCP Storm Drain	245 LF	$54/LF	$ 13,230.00
4.	24" RCP Storm Drain	410 LF	$66/LF	$ 27,060.00
5.	30" RCP Storm Drain	75 LF	$90/LF	$ 6,750.00
6.	36" RCP Storm Drain	750 LF	$130/LF	$ 97,500.00

7.	Type II Storm MH	4 EACH	$3,000/EA	$ 12,000.00
8.	Type I Storm MH	2 EACH	$8,000/EA	$ 16,000.00
SUB-TOTAL				$ 192,440.00
10% ENGINEERING				$ 19,244.00
5% CONTINGENCIES				$ 9,622.00
TOTAL				**$ 221,306.00**

CONSTRUCTION COST OPINION FILING NO. 4

Public and private Drainage Facilities Non-reimbursable

ITEM	DESCRIPTION	QUANTITY	UNIT COST	COST
1.	5' Type R Inlet	1 EACH	$5,800/EA	$ 17,400.00
2.	10' Type R Inlet	3 EACH	$7,200/EA	$ 21,600.00
3.	Area Drain	1 EACH	$2,500/EA	$ 2,500.00
4.	18" RCP Storm Drain	60 LF	$54/LF	$ 3,240.00
5.	24" RCP Storm Drain	35 LF	$66/LF	$ 2,310.00
6.	30" RCP Storm Drain	750 LF	$90/LF	$ 67,500.00
7.	36" RCP Storm Drain	240 LF	$130/LF	$ 31,200.00
8.	Type II Storm MH	4 EACH	$3,000/EA	$ 12,000.00
9.	Type I Storm MH	2 EACH	$8,000/EA	$ 16,000.00
SUB-TOTAL				$ 173,750.00
10% ENGINEERING				$ 17,375.00
5% CONTINGENCIES				$ 8,687.50
TOTAL				**$ 199,812.50**

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

Runoff from the proposed Kettle Creek North development is anticipated to be collected in on-site storm sewer systems and routed to multiple detention/storm water quality facilities. The treated runoff from the these facilities is to be released into the adjacent Kettle Creek channel. This development remains consistent with the Kettle Creek DBPS and the anticipated residential land-use and remains in compliance with the City of Colorado Springs Drainage Criteria Manual.

PREPARED BY:

Classic Consulting Engineers & Surveyors, LLC

Marc A. Whorton, P.E.
Project Manager

maw/247080/REPORTS/MDDP.docx

REFERENCES

1. City of Colorado Springs/County of El Paso Drainage Criteria Manual dated October 1991.

2. City of Colorado Springs Drainage Criteria Manual dated May 2014.

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

4. "Kettle Creek Drainage Basin Planning Study," prepared by JR Engineering LLC, approved May 2015.

5. "Master Development Drainage Plan for North Fork at Briargate", prepared by JR Engineering LLC, approved June 2014.

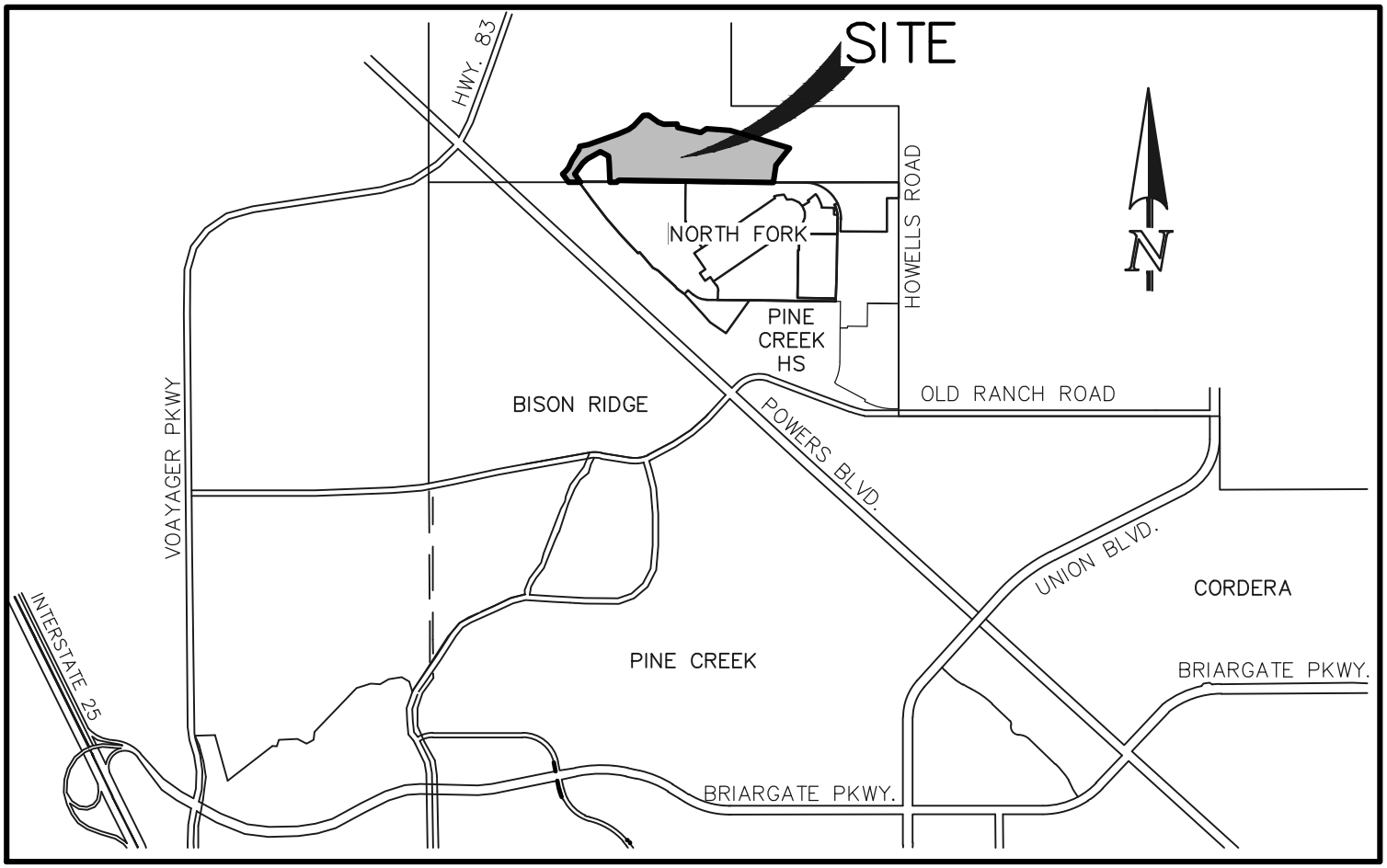
6. "Addendum #1 Final Drainage Report for North Fork at Briargate Filings 3, 4, 5, 6 & 7", prepared by Classic Consulting Engineers & Surveyors, approved June 2018.

7. "Master Development Drainage Plan for Kettle Creek North PUD Concept Plan", prepared by Classic Consulting Engineers & Surveyors, approved October 2019.

APPENDIX

VICINITY MAP

CLASSIC SM
CONSULTING
ENGINEERS & SURVEYORS



VICINITY MAP

N.T.S.

SOILS MAP (S.C.S SURVEY)

Map Scale: 1:8,670 if printed on A landscape (11" x 8.5") sheet.

N

0 100 200 400 600 Meters

0 400 800 1600 2400 Feet

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

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 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—Sep 23, 2018

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
41	Kettle gravelly loamy sand, 8 to 40 percent slopes	134.4	43.5%
68	Peyton-Pring complex, 3 to 8 percent slopes	146.3	47.4%
71	Pring coarse sandy loam, 3 to 8 percent slopes	3.8	1.2%
83	Stapleton sandy loam, 3 to 8 percent slopes	0.7	0.2%
85	Stapleton-Bernal sandy loams, 3 to 20 percent slopes	23.7	7.7%
Totals for Area of Interest		**309.0**	**100.0%**

El Paso County Area, Colorado

68—Peyton-Pring complex, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 369f
Elevation: 6,800 to 7,600 feet
Farmland classification: Not prime farmland

Map Unit Composition

Peyton and similar soils: 40 percent
Pring and similar soils: 30 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Peyton

Setting

Landform: Hills
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Arkosic alluvium derived from sedimentary rock and/or arkosic residuum weathered from sedimentary rock

Typical profile

A - 0 to 12 inches: sandy loam
Bt - 12 to 25 inches: sandy clay loam
BC - 25 to 35 inches: sandy loam
C - 35 to 60 inches: sandy loam

Properties and qualities

Slope: 3 to 5 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 7.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4c
Hydrologic Soil Group: B
Ecological site: Sandy Divide (R049BY216CO)
Hydric soil rating: No

Description of Pring

Setting

Landform: Hills
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Arkosic alluvium derived from sedimentary rock

Typical profile

A - 0 to 14 inches: coarse sandy loam
C - 14 to 60 inches: gravelly sandy loam

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 6.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B
Ecological site: Loamy Park (R048AY222CO)
Hydric soil rating: No

Minor Components

Other soils

Percent of map unit:
Hydric soil rating: No

Pleasant

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

Data Source Information

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 17, Sep 13, 2019

El Paso County Area, Colorado

41—Kettle gravelly loamy sand, 8 to 40 percent slopes

Map Unit Setting

National map unit symbol: 368h
Elevation: 7,000 to 7,700 feet
Farmland classification: Not prime farmland

Map Unit Composition

Kettle and similar soils: 85 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Kettle

Setting

Landform: Hills
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Sandy alluvium derived from arkose

Typical profile

E - 0 to 16 inches: gravelly loamy sand
Bt - 16 to 40 inches: gravelly sandy loam
C - 40 to 60 inches: extremely gravelly loamy sand

Properties and qualities

Slope: 8 to 40 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat excessively drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Other soils

Percent of map unit:
Hydric soil rating: No

Pleasant

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

Data Source Information

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 17, Sep 13, 2019

F.E.M.A. MAP

NOTES TO USERS

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

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

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

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

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

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

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

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

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

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

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

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

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

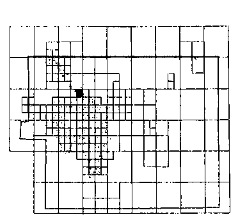
Contact **FEMA Map Service Center** (MSC) via the FEMA Map Information eXchange (FMIX) 1-877-336-2627 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this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

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

El Paso County Vertical Datum Offset Table

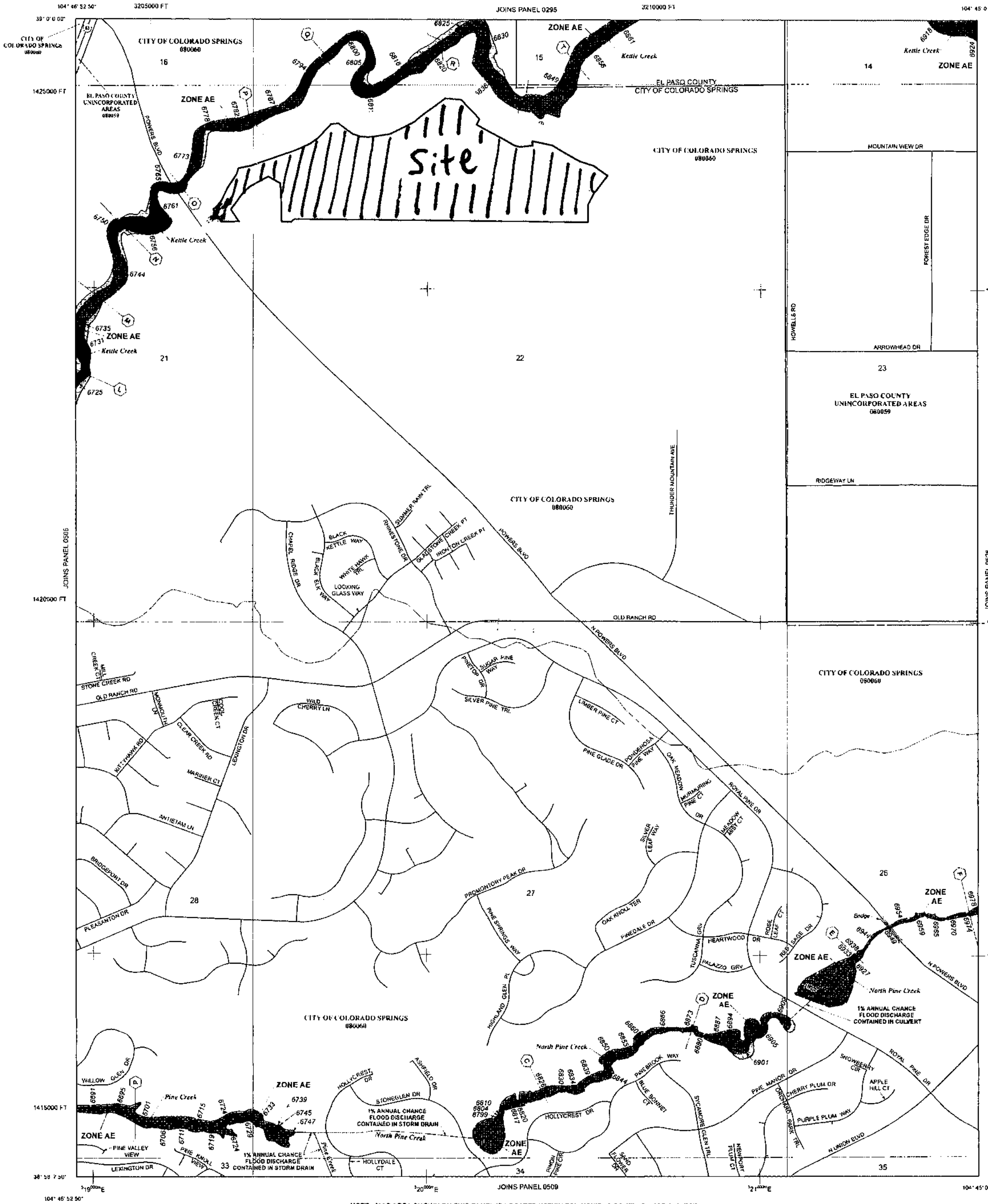
Flooding Source	Vertical Datum Offset (ft)
REFER TO SECTION 3.3 OF THE EL PASO COUNTY FLOOD INSURANCE STUDY FOR STREAM BY STREAM VERTICAL DATUM CONVERSION INFORMATION	

Panel Location Map



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

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



LEGEND

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

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

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

FLOODWAY AREAS IN ZONE AE

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

OTHER FLOOD AREAS

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

OTHER AREAS

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

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

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

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

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

(A)——(A)	Cross section line
(23)- - - -(23)	Transect line
97° 07' 30.00" 32° 22' 30.00"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
4276000mN	1000-meter Universal Transverse Mercator grid ticks, zone 13
6000000 FT	5000-foot grid ticks: Colorado State Plane coordinate system, central zone (FIPSZONE 0502), Lambert Conformal Conic Projection
DX5510 ×	Bench mark (see explanation in Notes to Users section of this FIRM panel)
• M1.5	River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

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

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

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

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

MAP SCALE 1" = 500'

250 0 500 1000 FEET
150 0 150 300 METERS

NFIP — NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0507G

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

PANEL 507 OF 1300

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
COLORADO SPRINGS, CITY OF	080060	0507	G
EL PASO COUNTY	080059	0507	G

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

MAP NUMBER 08041C0507G

MAP REVISED DECEMBER 7, 2018

Federal Emergency Management Agency

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

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

3.2 Time of Concentration

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

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

JOB NAME: *KETTLE CREEK NORTH DEVELOPMENT*
JOB NUMBER: *2553.00*
DATE: *05/07/20*
CALCULATED BY: *MAW*

FINAL DRAINAGE REPORT ~ BASIN RUNOFF COEFFICIENT SUMMARY

		IMPERVIOUS AREA / STREETS							LANDSCAPE/UNDEVELOPED AREAS							WEIGHTED			WEIGHTED CA		
BASIN	TOTAL AREA (AC)	AREA (AC)	C(2)	C(5)	C(10)	C(25)	C(50)	C(100)	AREA (AC)	C(2)	C(5)	C(10)	C(25)	C(50)	C(100)	C(2)	C(5)	C(100)	CA(2)	CA(5)	CA(100)
OS-1	11.10	4.00	0.89	0.90	0.92	0.94	0.95	0.96	7.10	0.02	0.08	0.15	0.25	0.30	0.35	0.33	0.38	0.57	**3.70**	**4.17**	**6.33**
OS-2	1.70	0.80	0.89	0.90	0.92	0.94	0.95	0.96	0.90	0.02	0.08	0.15	0.25	0.30	0.35	0.43	0.47	0.64	**0.73**	**0.79**	**1.08**
OS-3	1.30	0.65	0.89	0.90	0.92	0.94	0.95	0.96	0.65	0.02	0.08	0.15	0.25	0.30	0.35	0.46	0.49	0.66	**0.59**	**0.64**	**0.85**
OS-4	0.39	0.09	0.89	0.90	0.92	0.94	0.95	0.96	0.30	0.02	0.08	0.15	0.25	0.30	0.35	0.22	0.27	0.49	**0.09**	**0.11**	**0.19**
OS-5	0.31	0.00	0.89	0.90	0.92	0.94	0.95	0.96	0.31	0.02	0.08	0.15	0.25	0.30	0.35	0.02	0.08	0.35	**0.01**	**0.02**	**0.11**
OS-6	0.81	0.43	0.89	0.90	0.92	0.94	0.95	0.96	0.38	0.02	0.08	0.15	0.25	0.30	0.35	0.48	0.52	0.67	**0.39**	**0.42**	**0.55**
OS-7	0.74	0.60	0.89	0.90	0.92	0.94	0.95	0.96	0.14	0.02	0.08	0.15	0.25	0.30	0.35	0.73	0.74	0.84	**0.54**	**0.55**	**0.63**
OS-8	0.78	0.00	0.89	0.90	0.92	0.94	0.95	0.96	0.78	0.02	0.08	0.15	0.25	0.30	0.35	0.02	0.08	0.35	**0.02**	**0.06**	**0.27**
OS-9	0.34	0.27	0.89	0.90	0.92	0.94	0.95	0.96	0.07	0.02	0.08	0.15	0.25	0.30	0.35	0.71	0.73	0.83	**0.24**	**0.25**	**0.28**
OS-10	0.35	0.27	0.89	0.90	0.92	0.94	0.95	0.96	0.08	0.02	0.08	0.15	0.25	0.30	0.35	0.69	0.71	0.82	**0.24**	**0.25**	**0.29**
OS-11	1.00	0.69	0.89	0.90	0.92	0.94	0.95	0.96	0.31	0.02	0.08	0.15	0.25	0.30	0.35	0.62	0.65	0.77	**0.62**	**0.65**	**0.77**
A	1.60	0.76	0.89	0.90	0.92	0.94	0.95	0.96	0.84	0.02	0.08	0.15	0.25	0.30	0.35	0.43	0.47	0.64	**0.69**	**0.75**	**1.02**
B	1.90	0.75	0.89	0.90	0.92	0.94	0.95	0.96	1.15	0.02	0.08	0.15	0.25	0.30	0.35	0.36	0.40	0.59	**0.69**	**0.77**	**1.12**
C	0.85	0.46	0.89	0.90	0.92	0.94	0.95	0.96	0.39	0.02	0.08	0.15	0.25	0.30	0.35	0.49	0.52	0.68	**0.42**	**0.45**	**0.58**
D	2.50	0.93	0.89	0.90	0.92	0.94	0.95	0.96	1.57	0.02	0.08	0.15	0.25	0.30	0.35	0.34	0.39	0.58	**0.86**	**0.96**	**1.44**
E	2.20	1.11	0.89	0.90	0.92	0.94	0.95	0.96	1.09	0.02	0.08	0.15	0.25	0.30	0.35	0.46	0.49	0.66	**1.01**	**1.09**	**1.45**
F1	0.21	0.00	0.89	0.90	0.92	0.94	0.95	0.96	0.21	0.02	0.08	0.15	0.25	0.30	0.35	0.02	0.08	0.35	**0.00**	**0.02**	**0.07**
F2	1.10	0.22	0.89	0.90	0.92	0.94	0.95	0.96	0.88	0.02	0.08	0.15	0.25	0.30	0.35	0.19	0.24	0.47	**0.21**	**0.27**	**0.52**
G	0.33	0.18	0.89	0.90	0.92	0.94	0.95	0.96	0.15	0.02	0.08	0.15	0.25	0.30	0.35	0.49	0.53	0.68	**0.16**	**0.17**	**0.23**
H	0.44	0.15	0.89	0.90	0.92	0.94	0.95	0.96	0.29	0.02	0.08	0.15	0.25	0.30	0.35	0.32	0.36	0.56	**0.14**	**0.16**	**0.25**
I	1.10	0.41	0.89	0.90	0.92	0.94	0.95	0.96	0.69	0.02	0.08	0.15	0.25	0.30	0.35	0.34	0.39	0.58	**0.38**	**0.42**	**0.64**
J	2.20	0.82	0.89	0.90	0.92	0.94	0.95	0.96	1.38	0.02	0.08	0.15	0.25	0.30	0.35	0.34	0.39	0.58	**0.76**	**0.85**	**1.27**
K	0.79	0.49	0.89	0.90	0.92	0.94	0.95	0.96	0.30	0.02	0.08	0.15	0.25	0.30	0.35	0.56	0.59	0.73	**0.44**	**0.47**	**0.58**
L	2.30	0.94	0.89	0.90	0.92	0.94	0.95	0.96	1.36	0.02	0.08	0.15	0.25	0.30	0.35	0.38	0.42	0.60	**0.86**	**0.95**	**1.38**
M	0.85	0.54	0.89	0.90	0.92	0.94	0.95	0.96	0.31	0.02	0.08	0.15	0.25	0.30	0.35	0.57	0.60	0.74	**0.49**	**0.51**	**0.63**
N	1.70	0.98	0.89	0.90	0.92	0.94	0.95	0.96	0.72	0.02	0.08	0.15	0.25	0.30	0.35	0.52	0.55	0.70	**0.89**	**0.94**	**1.19**
O	1.90	0.90	0.89	0.90	0.92	0.94	0.95	0.96	1.00	0.02	0.08	0.15	0.25	0.30	0.35	0.43	0.47	0.64	**0.82**	**0.89**	**1.21**
P	1.00	0.58	0.89	0.90	0.92	0.94	0.95	0.96	0.42	0.02	0.08	0.15	0.25	0.30	0.35	0.52	0.56	0.70	**0.52**	**0.56**	**0.70**
Q	1.00	0.18	0.89	0.90	0.92	0.94	0.95	0.96	0.82	0.02	0.08	0.15	0.25	0.30	0.35	0.18	0.23	0.46	**0.18**	**0.23**	**0.46**
R	1.00	0.50	0.89	0.90	0.92	0.94	0.95	0.96	0.50	0.02	0.08	0.15	0.25	0.30	0.35	0.46	0.49	0.66	**0.46**	**0.49**	**0.66**
S	2.40	0.77	0.89	0.90	0.92	0.94	0.95	0.96	1.63	0.02	0.08	0.15	0.25	0.30	0.35	0.30	0.34	0.55	**0.72**	**0.82**	**1.31**
T	0.90	0.59	0.89	0.90	0.92	0.94	0.95	0.96	0.31	0.02	0.08	0.15	0.25	0.30	0.35	0.59	0.62	0.75	**0.53**	**0.56**	**0.67**
U	2.60	0.88	0.89	0.90	0.92	0.94	0.95	0.96	1.72	0.02	0.08	0.15	0.25	0.30	0.35	0.31	0.36	0.56	**0.82**	**0.93**	**1.45**
V	1.00	0.49	0.89	0.90	0.92	0.94	0.95	0.96	0.51	0.02	0.08	0.15	0.25	0.30	0.35	0.45	0.48	0.65	**0.45**	**0.48**	**0.65**
W	2.30	1.15	0.89	0.90	0.92	0.94	0.95	0.96	1.15	0.02	0.08	0.15	0.25	0.30	0.35	0.46	0.49	0.66	**1.05**	**1.13**	**1.51**
X	1.10	0.60	0.89	0.90	0.92	0.94	0.95	0.96	0.50	0.02	0.08	0.15	0.25	0.30	0.35	0.49	0.53	0.68	**0.54**	**0.58**	**0.75**
Y	1.50	0.56	0.89	0.90	0.92	0.94	0.95	0.96	0.94	0.02	0.08	0.15	0.25	0.30	0.35	0.34	0.39	0.58	**0.52**	**0.58**	**0.87**
Z	2.50	1.20	0.89	0.90	0.92	0.94	0.95	0.96	1.30	0.02	0.08	0.15	0.25	0.30	0.35	0.44	0.47	0.64	**1.09**	**1.18**	**1.61**

JOB NAME: *KETTLE CREEK NORTH DEVELOPMENT*
JOB NUMBER: *2553.00*
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FINAL DRAINAGE REPORT ~ BASIN RUNOFF COEFFICIENT SUMMARY

		IMPERVIOUS AREA / STREETS							LANDSCAPE/UNDEVELOPED AREAS							WEIGHTED			WEIGHTED CA		
BASIN	TOTAL AREA (AC)	AREA (AC)	C(2)	C(5)	C(10)	C(25)	C(50)	C(100)	AREA (AC)	C(2)	C(5)	C(10)	C(25)	C(50)	C(100)	C(2)	C(5)	C(100)	**CA(2)**	**CA(5)**	**CA(100)**
AA	2.20	0.00	0.89	0.90	0.92	0.94	0.95	0.96	2.20	0.02	0.08	0.15	0.25	0.30	0.35	0.02	0.08	0.35	**0.04**	**0.18**	**0.77**
BB1	1.20	0.57	0.89	0.90	0.92	0.94	0.95	0.96	0.63	0.02	0.08	0.15	0.25	0.30	0.35	0.43	0.47	0.64	**0.52**	**0.56**	**0.77**
BB2	0.40	0.19	0.89	0.90	0.92	0.94	0.95	0.96	0.21	0.02	0.08	0.15	0.25	0.30	0.35	0.43	0.47	0.64	**0.17**	**0.19**	**0.26**
CC	1.30	0.57	0.89	0.90	0.92	0.94	0.95	0.96	0.73	0.02	0.08	0.15	0.25	0.30	0.35	0.40	0.44	0.62	**0.52**	**0.57**	**0.80**
DD1	2.10	0.95	0.89	0.90	0.92	0.94	0.95	0.96	1.15	0.02	0.08	0.15	0.25	0.30	0.35	0.41	0.45	0.63	**0.87**	**0.95**	**1.31**
DD2	1.10	0.52	0.89	0.90	0.92	0.94	0.95	0.96	0.58	0.02	0.08	0.15	0.25	0.30	0.35	0.43	0.47	0.64	**0.47**	**0.51**	**0.70**
EE	0.81	0.37	0.89	0.90	0.92	0.94	0.95	0.96	0.44	0.02	0.08	0.15	0.25	0.30	0.35	0.42	0.45	0.63	**0.34**	**0.37**	**0.51**
FF	1.40	0.55	0.89	0.90	0.92	0.94	0.95	0.96	0.85	0.02	0.08	0.15	0.25	0.30	0.35	0.36	0.40	0.59	**0.51**	**0.56**	**0.83**
GG	0.80	0.41	0.89	0.90	0.92	0.94	0.95	0.96	0.39	0.02	0.08	0.15	0.25	0.30	0.35	0.47	0.50	0.66	**0.37**	**0.40**	**0.53**
HH	0.76	0.18	0.89	0.90	0.92	0.94	0.95	0.96	0.58	0.02	0.08	0.15	0.25	0.30	0.35	0.23	0.27	0.49	**0.17**	**0.21**	**0.38**
II	2.60	1.18	0.89	0.90	0.92	0.94	0.95	0.96	1.42	0.02	0.08	0.15	0.25	0.30	0.35	0.41	0.45	0.63	**1.08**	**1.18**	**1.63**
JJ	1.20	0.62	0.89	0.90	0.92	0.94	0.95	0.96	0.58	0.02	0.08	0.15	0.25	0.30	0.35	0.47	0.50	0.67	**0.56**	**0.60**	**0.80**
KK	0.52	0.31	0.89	0.90	0.92	0.94	0.95	0.96	0.21	0.02	0.08	0.15	0.25	0.30	0.35	0.54	0.57	0.71	**0.28**	**0.30**	**0.37**
LL	0.85	0.37	0.89	0.90	0.92	0.94	0.95	0.96	0.48	0.02	0.08	0.15	0.25	0.30	0.35	0.40	0.44	0.62	**0.34**	**0.37**	**0.52**
MM	1.60	0.33	0.89	0.90	0.92	0.94	0.95	0.96	1.27	0.02	0.08	0.15	0.25	0.30	0.35	0.20	0.25	0.48	**0.32**	**0.40**	**0.76**
NN	0.37	0.09	0.89	0.90	0.92	0.94	0.95	0.96	0.28	0.02	0.08	0.15	0.25	0.30	0.35	0.23	0.28	0.50	**0.09**	**0.10**	**0.18**
OO	0.21	0.05	0.89	0.90	0.92	0.94	0.95	0.96	0.16	0.02	0.08	0.15	0.25	0.30	0.35	0.23	0.28	0.50	**0.05**	**0.06**	**0.10**
PP	0.62	0.00	0.89	0.90	0.92	0.94	0.95	0.96	0.62	0.02	0.08	0.15	0.25	0.30	0.35	0.02	0.08	0.35	**0.01**	**0.05**	**0.22**
QQ	2.30	0.19	0.89	0.90	0.92	0.94	0.95	0.96	2.11	0.02	0.08	0.15	0.25	0.30	0.35	0.09	0.15	0.40	**0.21**	**0.34**	**0.92**

JOB NAME: ***KETTLE CREEK NORTH DEVELOPMENT***
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$$t_i = \frac{0.395(1.1 - C_5)\sqrt{L}}{S^{0.33}} \qquad V = C_v S_w^{0.5} \qquad \text{Tc=L/V}$$

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

Table 6-7. Conveyance Coefficient, C_v

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

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

FINAL DRAINAGE REPORT ~ BASIN RUNOFF SUMMARY

BASIN	WEIGHTED						OVERLAND				STREET / CHANNEL FLOW				Tc	INTENSITY						TOTAL FLOWS		
	CA(2)	CA(5)	CA(10)	CA(25)	CA(50)	CA(100)	C(5)	Length (ft)	Height (ft)	Tc (min)	Length (ft)	Slope (%)	Velocity (fps)	Tc (min)	TOTAL (min)	I(2) (in/hr)	I(5) (in/hr)	I(10) (in/hr)	I(25) (in/hr)	I(50) (in/hr)	I(100) (in/hr)	Q(2) (cfs)	Q(5) (cfs)	Q(100) (cfs)
OS-1	3.70	4.17	4.75	5.54	5.93	6.33	0.08	100	2	14.7	840	3.5%	3.7	3.7	18.4	2.57	3.22	3.75	4.29	4.82	5.40	10	**13**	**34**
OS-2	0.73	0.79	0.87	0.98	1.03	1.08	0.08	100	2	14.7	420	4.0%	4.0	1.8	16.4	2.71	3.39	3.95	4.52	5.08	5.69	2	**3**	**6**
OS-3	0.59	0.64	0.70	0.77	0.81	0.85	0.08	100	2	14.7	420	4.0%	4.0	1.8	16.4	2.71	3.39	3.95	4.52	5.08	5.69	2	**2**	**5**
OS-4	0.09	0.11	0.13	0.16	0.18	0.19	0.08	50	2	8.2					8.2	3.53	4.42	5.16	5.89	6.63	7.42	0.3	**0.5**	**1.4**
OS-5	0.01	0.02	0.05	0.08	0.09	0.11	0.08	30	2	5.4					5.4	4.03	5.06	5.90	6.74	7.58	8.49	0.0	**0.1**	**0.9**
OS-6	0.39	0.42	0.45	0.50	0.52	0.55	0.08	100	2	14.7	390	4.0%	4.0	1.6	16.3	2.72	3.40	3.97	4.53	5.10	5.71	1	**1**	**3**
OS-7	0.54	0.55	0.57	0.60	0.61	0.63	0.08	20	0.5	6.1	1100	4.0%	4.0	4.6	10.7	3.22	4.03	4.70	5.38	6.05	6.77	2	**2**	**4**
OS-8	0.02	0.06	0.12	0.20	0.23	0.27	0.08	240	26	13.0					13.0	2.98	3.74	4.36	4.98	5.60	6.27	0.0	**0.2**	**1.7**
OS-9	0.24	0.25	0.26	0.27	0.28	0.28	0.08	20	0.5	6.1	450	4.0%	4.0	1.9	8.0	3.57	4.47	5.22	5.96	6.71	7.51	0.9	**1.1**	**2.1**
OS-10	0.24	0.25	0.26	0.27	0.28	0.29	0.08	20	0.5	6.1	450	4.0%	4.0	1.9	8.0	3.57	4.47	5.22	5.96	6.71	7.51	0.9	**1.1**	**2.2**
OS-11	0.62	0.65	0.68	0.73	0.75	0.77	0.08	50	1.5	9.1	250	1.5%	2.4	1.7	10.8	3.21	4.02	4.69	5.36	6.03	6.75	2	**3**	**5**
A	0.69	0.75	0.83	0.92	0.97	1.02	0.08	100	2	14.7	250	1.5%	2.4	1.7	16.4	2.71	3.39	3.96	4.52	5.09	5.69	2	**3**	**6**
B	0.69	0.77	0.86	0.99	1.06	1.12	0.08	100	2	14.7	360	2.2%	3.0	2.0	16.7	2.69	3.36	3.92	4.48	5.04	5.64	2	**3**	**6**
C	0.42	0.45	0.48	0.53	0.55	0.58	0.08	50	1	10.4	360	2.2%	3.0	2.0	12.4	3.04	3.81	4.44	5.08	5.71	6.39	1	**2**	**4**
D	0.86	0.96	1.09	1.27	1.35	1.44	0.08	100	2	14.7	400	2.0%	2.8	2.4	17.0	2.66	3.33	3.89	4.44	5.00	5.59	2	**3**	**8**
E	1.01	1.09	1.18	1.32	1.38	1.45	0.08	100	2	14.7	700	4.2%	4.1	2.8	17.5	2.63	3.29	3.84	4.39	4.94	5.52	3	**4**	**8**
F1	0.00	0.02	0.03	0.05	0.06	0.07	0.08	55	4	7.1					7.1	3.70	4.64	5.42	6.19	6.97	7.80	0.0	**0.1**	**0.6**
F2	0.21	0.27	0.33	0.43	0.47	0.52	0.08	70	7	7.2	120	1.5%	2.4	0.8	8.0	3.56	4.46	5.20	5.95	6.69	7.49	1	**1**	**4**
G	0.16	0.17	0.19	0.21	0.22	0.23	0.08	100	2	14.7	100	2.0%	2.8	0.6	15.2	2.79	3.50	4.08	4.66	5.25	5.87	0.5	**0.6**	**1.3**
H	0.14	0.16	0.18	0.21	0.23	0.25	0.08	100	2	14.7	60	1.5%	2.4	0.4	15.1	2.81	3.52	4.10	4.69	5.27	5.90	0.4	**0.6**	**1.4**

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$$t_i = \frac{0.395(1.1 - C_5)\sqrt{L}}{S^{0.33}} \qquad V = C_v S_w^{0.5} \qquad \text{Tc=L/V}$$

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

Table 6-7. Conveyance Coefficient, C_v

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

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

FINAL DRAINAGE REPORT ~ BASIN RUNOFF SUMMARY

BASIN	WEIGHTED CA(2)	CA(5)	CA(10)	CA(25)	CA(50)	CA(100)	OVERLAND C(5)	Length (ft)	Height (ft)	Tc (min)	STREET / CHANNEL FLOW Length (ft)	Slope (%)	Velocity (fps)	Tc (min)	Tc TOTAL (min)	INTENSITY I(2) (in/hr)	I(5) (in/hr)	I(10) (in/hr)	I(25) (in/hr)	I(50) (in/hr)	I(100) (in/hr)	TOTAL FLOWS Q(2) (cfs)	Q(5) (cfs)	Q(100) (cfs)
I	0.38	0.42	0.48	0.56	0.60	0.64	0.08	100	2	14.7	160	2.0%	2.8	0.9	15.6	2.77	3.46	4.04	4.62	5.19	5.81	1	1	4
J	0.76	0.85	0.96	1.12	1.19	1.27	0.08	100	2	14.7	360	2.0%	2.8	2.1	16.8	2.68	3.35	3.91	4.47	5.03	5.63	2	3	7
K	0.44	0.47	0.50	0.54	0.56	0.58	0.08	50	1	10.4	360	2.0%	2.8	2.1	12.5	3.03	3.80	4.43	5.06	5.70	6.37	1	2	4
L	0.86	0.95	1.07	1.22	1.30	1.38	0.08	100	2	14.7	400	1.5%	2.4	2.7	17.4	2.64	3.30	3.85	4.40	4.95	5.54	2	3	8
M	0.49	0.51	0.54	0.59	0.61	0.63	0.08	50	1	10.4	400	1.5%	2.4	2.7	13.1	2.98	3.73	4.35	4.97	5.59	6.26	1	2	4
N	0.89	0.94	1.01	1.10	1.15	1.19	0.08	100	2	14.7	170	1.5%	2.4	1.2	15.8	2.75	3.44	4.02	4.59	5.16	5.78	2	3	7
O	0.82	0.89	0.98	1.10	1.16	1.21	0.08	100	2	14.7	300	1.5%	2.4	2.0	16.7	2.69	3.36	3.92	4.48	5.04	5.64	2	3	7
P	0.52	0.56	0.60	0.65	0.68	0.70	0.08	100	2	14.7	450	3.0%	3.5	2.2	16.8	2.68	3.35	3.91	4.47	5.02	5.62	1	2	4
Q	0.18	0.23	0.29	0.37	0.42	0.46	0.08	60	3	8.4	300	4.0%	4.0	1.3	9.6	3.34	4.18	4.88	5.58	6.28	7.03	1	1	3
R	0.46	0.49	0.54	0.60	0.63	0.66	0.08	100	2	14.7	300	4.0%	4.0	1.3	15.9	2.74	3.43	4.01	4.58	5.15	5.76	1	2	4
S	0.72	0.82	0.95	1.13	1.22	1.31	0.08	100	2	14.7	515	2.0%	2.8	3.0	17.7	2.62	3.27	3.82	4.37	4.91	5.50	2	3	7
T	0.53	0.56	0.59	0.63	0.65	0.67	0.08	50	1	10.4	520	2.0%	2.8	3.1	13.4	2.94	3.69	4.30	4.92	5.53	6.19	2	2	4
U	0.82	0.93	1.07	1.26	1.35	1.45	0.08	100	2	14.7	350	1.5%	2.4	2.4	17.0	2.66	3.33	3.89	4.44	5.00	5.59	2	3	8
V	0.45	0.48	0.53	0.59	0.62	0.65	0.08	100	2	14.7	100	1.5%	2.4	0.7	15.3	2.79	3.49	4.07	4.65	5.23	5.86	1	2	4
W	1.05	1.13	1.23	1.37	1.44	1.51	0.08	100	2	14.7	650	2.5%	3.2	3.4	18.1	2.59	3.24	3.78	4.32	4.86	5.44	3	4	8
X	0.54	0.58	0.63	0.69	0.72	0.75	0.08	100	2	14.7	150	1.5%	2.4	1.0	15.7	2.76	3.46	4.03	4.61	5.18	5.80	2	2	4
Y	0.52	0.58	0.66	0.76	0.81	0.87	0.08	100	2	14.7	200	1.5%	2.4	1.4	16.0	2.73	3.42	3.99	4.56	5.14	5.75	1	2	5
Z	1.09	1.18	1.30	1.45	1.53	1.61	0.08	100	2	14.7	560	1.5%	2.4	3.8	18.5	2.57	3.21	3.74	4.28	4.81	5.39	3	4	9
AA	0.04	0.18	0.33	0.55	0.66	0.77	0.08	80	2	12.2					12.2	3.06	3.83	4.47	5.11	5.75	6.44	0.1	0.7	5
BB1	0.52	0.56	0.62	0.69	0.73	0.77	0.08	100	2	14.7	200	2.0%	2.8	1.2	15.8	2.75	3.44	4.01	4.59	5.16	5.78	1	2	4
BB2	0.17	0.19	0.21	0.23	0.24	0.26	0.08	50	1	10.4	200	2.0%	2.8	1.2	11.5	3.12	3.91	4.57	5.22	5.87	6.57	0.5	0.7	1.7

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$$t_i = \frac{0.395(1.1 - C_5)\sqrt{L}}{S^{0.33}} \qquad V = C_v S_w^{0.5} \qquad \text{Tc=L/V}$$

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

Table 6-7. Conveyance Coefficient, C_v

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

FINAL DRAINAGE REPORT ~ BASIN RUNOFF SUMMARY

BASIN	WEIGHTED CA(2)	CA(5)	CA(10)	CA(25)	CA(50)	CA(100)	OVERLAND C(5)	Length (ft)	Height (ft)	Tc (min)	STREET / CHANNEL FLOW Length (ft)	Slope (%)	Velocity (fps)	Tc (min)	Tc TOTAL (min)	INTENSITY I(2) (in/hr)	I(5) (in/hr)	I(10) (in/hr)	I(25) (in/hr)	I(50) (in/hr)	I(100) (in/hr)	TOTAL FLOWS Q(2) (cfs)	Q(5) (cfs)	Q(100) (cfs)
CC	0.52	0.57	0.63	0.72	0.76	0.80	0.08	100	2	14.7	150	1.5%	2.4	1.0	15.7	2.76	3.46	4.03	4.61	5.18	5.80	1	**2**	**5**
DD1	0.87	0.95	1.05	1.18	1.25	1.31	0.08	100	2	14.7	410	1.5%	2.4	2.8	17.4	2.63	3.29	3.84	4.39	4.94	5.53	2	**3**	**7**
DD2	0.47	0.51	0.57	0.63	0.67	0.70	0.08	50	1	10.4	410	1.5%	2.4	2.8	13.1	2.97	3.72	4.34	4.96	5.58	6.24	1	**2**	**4**
EE	0.34	0.37	0.41	0.46	0.48	0.51	0.08	100	2	14.7	130	3.0%	3.5	0.6	15.3	2.79	3.49	4.08	4.66	5.24	5.86	1	**1**	**3**
FF	0.51	0.56	0.63	0.73	0.78	0.83	0.08	100	2	14.7	170	1.5%	2.4	1.2	15.8	2.75	3.44	4.02	4.59	5.16	5.78	1	**2**	**5**
GG	0.37	0.40	0.44	0.48	0.51	0.53	0.08	100	2	14.7	170	1.5%	2.4	1.2	15.8	2.75	3.44	4.02	4.59	5.16	5.78	1	**1**	**3**
HH	0.17	0.21	0.25	0.31	0.35	0.38	0.08	90	5	9.9					9.9	3.30	4.14	4.83	5.52	6.21	6.95	1	**1**	**3**
II	1.08	1.18	1.30	1.46	1.55	1.63	0.08	100	2	14.7	280	1.5%	2.4	1.9	16.6	2.69	3.37	3.94	4.50	5.06	5.66	3	**4**	**9**
JJ	0.56	0.60	0.66	0.73	0.76	0.80	0.08	100	2	14.7	300	1.5%	2.4	2.0	16.7	2.69	3.36	3.92	4.48	5.04	5.64	2	**2**	**5**
KK	0.28	0.30	0.32	0.34	0.36	0.37	0.08	50	1	10.4	200	1.5%	2.4	1.4	11.7	3.11	3.89	4.54	5.19	5.84	6.53	0.9	**1.2**	**2.4**
LL	0.34	0.37	0.41	0.47	0.50	0.52	0.08	50	1	10.4	70	1.5%	2.4	0.5	10.8	3.20	4.01	4.68	5.35	6.01	6.73	1.1	**1.5**	**3.5**
MM	0.32	0.40	0.49	0.63	0.69	0.76	0.08	65	2	10.2	500	1.5%	2.4	3.4	13.6	2.92	3.66	4.27	4.88	5.49	6.15	0.9	**1.5**	**4.7**
NN	0.09	0.10	0.12	0.15	0.17	0.18	0.08	60	3	8.4	70	1.0%	2.0	0.6	9.0	3.42	4.29	5.01	5.72	6.44	7.21	0.3	**0.4**	**1.3**
OO	0.05	0.06	0.07	0.09	0.10	0.10	0.08	60	3	8.4	70	1.0%	2.0	0.6	9.0	3.42	4.29	5.01	5.72	6.44	7.21	0.2	**0.2**	**0.7**
PP	0.01	0.05	0.09	0.16	0.19	0.22	0.08	90	3	11.7					11.7	3.10	3.89	4.54	5.18	5.83	6.53	0.0	**0.2**	**1.4**
QQ	0.21	0.34	0.49	0.71	0.81	0.92	0.08	130	20	8.5					8.5	3.49	4.37	5.10	5.83	6.55	7.34	0.7	**1.5**	**7**

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FINAL DRAINAGE REPORT ~ SURFACE ROUTING SUMMARY

Design Point(s)	Contributing Basins	Equivalent CA(5)	Equivalent CA(100)	Maximum Tc	Intensity		Flow		Inlet Size
					I(5)	I(100)	Q(5)	Q(100)	
1	OS-1	4.17	5.69	18.4	3.22	5.40	13	31	Future Inlets
2	OS-2	0.79	1.08	16.4	3.39	5.69	3	6	Future curb flow
3	OS-3	0.64	0.85	16.4	3.39	5.69	2	5	Future curb flow
4	DP-2, OS-4, A	1.65	2.30	16.6	3.37	5.66	6	13	Prop. Crosspan
5	B	0.77	1.12	16.7	3.36	5.64	3	6	Prop. 5' At-grade Inlet
6	DP-4, C and Flow-by from DP-5	2.30	3.43	16.7	3.36	5.64	8	19	Prop. 10' Type R At-grade Inlet
7	D and Flow-by from DP-6	1.40	3.12	17.7	3.27	5.50	5	17	Prop. 10' Type R Sump Inlet
8	DP-3, E	1.72	2.30	17.5	3.29	5.52	6	13	Prop. 10' Type R Sump Inlet
9	OS-8, F-2	0.33	0.79	13.0	3.74	6.27	1	5	SWQ Facility
10	OS-6, G and portion of 100 yr. Flow-by from OS-1	0.59	1.40	16.3	3.40	5.71	2	8	Ex. 10' D-10-R At-grade Inlet
11	J	0.85	1.27	16.8	3.35	5.63	3	7	Prop. 5' Type R Sump Inlet
12	K	0.47	0.58	12.5	3.80	6.37	2	4	Prop. 5' Type R Sump Inlet

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FINAL DRAINAGE REPORT ~ SURFACE ROUTING SUMMARY

Design Point(s)	Contributing Basins	Equivalent CA(5)	Equivalent CA(100)	Maximum Tc	Intensity		Flow		Inlet Size
					I(5)	I(100)	Q(5)	Q(100)	
13	L	0.95	1.38	17.4	3.30	5.54	3	8	Prop. 5' Type R Sump Inlet
14	M	0.51	0.63	13.1	3.73	6.26	2	4	Prop. 5' Type R Sump Inlet
15	OS-7, H, I and Flow-by from DP-10	1.13	1.70	15.6	3.46	5.81	4	10	Ex. 14' D-10-R At-grade Inlet
16	Q	0.23	0.46	9.6	4.18	7.03	1.0	3.2	D-9 Area Inlet or equiv.
17	N	0.94	1.19	15.8	3.44	5.78	3	7	Prop. Crosspan
18	DP-17, O	1.83	2.41	16.7	3.36	5.64	6	14	Prop. Crosspan
19	P	0.56	0.70	16.8	3.35	5.62	2	4	Curb Flow
20	S	0.82	1.31	17.7	3.27	5.50	3	7	Prop. 10' Type R At-grade Inlet
21	DP-18, R, T, Flow-by from DP-20	2.88	3.96	17.0	3.33	5.60	10	22	Prop. 10' Type R At-grade Inlet
22	U and Flow-by from DP-21	1.76	2.86	17.7	3.27	5.50	6	16	Prop. 10' Type R Sump Inlet
23	V, Portion of DP-21 100 yr.	0.48	1.24	17.0	3.33	5.60	2	7	Prop. 5' Type R Sump Inlet
24	DP-19, W	1.68	2.21	17.1	3.32	5.58	6	12	Prop. 5' Type R At-grade Inlet

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FINAL DRAINAGE REPORT ~ SURFACE ROUTING SUMMARY

Design Point(s)	Contributing Basins	Equivalent CA(5)	Equivalent CA(100)	Maximum Tc	Intensity		Flow		Inlet Size
					I(5)	I(100)	Q(5)	Q(100)	
25	X	0.58	0.75	15.7	3.46	5.80	2	4	Prop. Crosspan
26	DP-25, Y and Portion of 100 yr. DP-21 Flow-by	1.16	2.21	16.0	3.42	5.75	4	13	Prop. 10' Type R Sump Inlet
27	Z and Flow-by from DP-24	2.01	3.07	18.5	3.21	5.39	6	17	Prop. 10' Type R Sump Inlet
28	BB1	0.56	0.77	15.8	3.44	5.78	2	4	Prop. 10' Type R At-grade Inlet
29	BB2	0.19	0.26	11.5	3.91	6.57	0.7	1.7	Prop. 5' Type R At-grade Inlet
30	CC, OS-9, Flow-by from DP-28, DP-29 and DP-15	0.84	1.20	15.8	3.44	5.78	3	7	Prop. Crosspan
31	DD1	0.95	1.31	17.4	3.29	5.53	3	7	Prop. 10' Type R At-grade Inlet
32	DD2	0.51	0.70	13.1	3.72	6.24	2	4	Prop. 10' Type R At-grade Inlet
33	EE, OS-10, DP-30, Flow-by from DP-31 and DP-32	1.46	2.23	17.7	3.27	5.49	4.7	12	Ex. 6' D-10-R Sump Inlet
34	FF	0.56	0.83	15.8	3.44	5.78	2	5	Prop. 5' Type R Sump Inlet
35	GG	0.40	0.53	15.8	3.44	5.78	1	3	Prop. 5' Type R Sump Inlet
36	HH, OS-11	0.85	1.15	10.8	4.02	6.75	3	8	Ex. 6' D-10-R Sump Inlet

JOB NAME: *KETTLE CREEK NORTH DEVELOPMENT*
JOB NUMBER: *2553.00*
DATE: *05/07/20*
CALCULATED BY: *MAW*

FINAL DRAINAGE REPORT ~ SURFACE ROUTING SUMMARY

Design Point(s)	Contributing Basins	Equivalent CA(5)	Equivalent CA(100)	Maximum Tc	Intensity		Flow		Inlet Size
					I(5)	I(100)	Q(5)	Q(100)	
37	II	1.18	1.63	16.6	3.37	5.66	4	9	Prop. 5' Type R Sump Inlet
38	JJ	0.60	0.80	16.7	3.36	5.64	2	5	Prop. 5' Type R Sump Inlet
39	KK	0.30	0.37	11.7	3.89	6.53	1	2	Prop. 5' Type R Sump Inlet
40	LL	0.37	0.52	10.8	4.01	6.73	1	4	Prop. 5' Type R Sump Inlet
41	MM	0.40	0.76	13.6	3.66	6.15	1.5	4.7	D-9 Area Inlet or equiv.
42	NN	0.10	0.18	9.0	4.29	7.21	0.4	1.3	D-9 Area Inlet or equiv.
43	OO	0.06	0.10	9.0	4.29	7.21	0.2	0.7	D-9 Area Inlet or equiv.
NEW PROPOSED FOREBAY	**Pipe Runs 27 & 31**	**16.74**	**24.02**	**23.5**	**2.85**	**4.78**	**48**	**115**	**Proposed Conc. Forebay**

JOB NAME: ***KETTLE CREEK NORTH DEVELOPMENT***
JOB NUMBER: ***2553.00***
DATE: ***05/07/20***
CALCULATED BY: ***MAW***

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

FINAL DRAINAGE REPORT ~ PIPE ROUTING SUMMARY

Pipe Run	Contributing Basins	Equivalent CA(5)	Equivalent CA(100)	Maximum Tc	Intensity		Flow		Pipe Size*
					I(5)	I(100)	Q(5)	Q(100)	
1	DP-1	0.00	0.00	20.4	3.06	5.14	0	0	30" RCP
2	DP-5 Collected	0.56	0.57	16.8	3.35	5.63	2	3	18" RCP
3	PR-1, PR-2	0.56	0.57	20.4	3.06	5.14	2	3	30" RCP
4	DP-6 Collected	1.86	1.75	16.7	3.36	5.64	6	10	24" RCP
5	PR-3, PR-4	2.42	2.32	20.7	3.04	5.10	7	12	30" RCP
6	DP-7	1.40	3.12	17.7	3.27	5.50	5	17	24" RCP
7	DP-8	1.72	2.30	17.5	3.29	5.52	6	13	24" RCP
8	PR-5, PR-6, PR-7	5.55	7.74	21.3	3.00	5.03	17	39	36" RCP
9	DP-16	0.23	0.46	9.6	4.18	7.03	1	3	18" RCP
10	PR-8, PR-9	5.77	8.20	21.8	2.96	4.97	17	41	36" RCP
11	DP-20 Collected	0.82	1.09	17.7	3.27	5.50	3	6	18" RCP
12	PR-10, PR-11	6.60	9.29	21.9	2.95	4.96	19	46	36" RCP

JOB NAME: ***KETTLE CREEK NORTH DEVELOPMENT***
JOB NUMBER: ***2553.00***
DATE: ***05/07/20***
CALCULATED BY: ***MAW***

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

FINAL DRAINAGE REPORT ~ PIPE ROUTING SUMMARY

Pipe Run	Contributing Basins	Equivalent CA(5)	Equivalent CA(100)	Maximum Tc	Intensity		Flow		Pipe Size*
					I(5)	I(100)	Q(5)	Q(100)	
13	DP-21 Collected	2.04	1.86	17.0	3.33	5.60	7	10	24" RCP
14	PR-12, PR-13	8.64	11.15	22.2	2.93	4.92	25	55	42" RCP
15	DP-22	1.76	2.86	17.7	3.27	5.50	6	16	24" RCP
16	DP-23	0.48	1.24	17.0	3.33	5.60	2	7	18" RCP
17	PR-15, PR-16	2.25	4.10	17.8	3.27	5.48	7	22	30" RCP
18	DP-24 Collected	0.86	0.75	17.1	3.32	5.58	3	4	18" RCP
19	PR-14, PR17, PR-18	11.74	16.00	23.0	2.88	4.83	34	77	42" RCP
20	DP-26	1.16	2.21	16.0	3.42	5.75	4	13	24" RCP
21	DP-27	2.01	3.07	18.5	3.21	5.39	6	17	24" RCP
22	PR-19, PR-20, PR-21	14.91	21.28	23.3	2.86	4.80	43	102	48" RCP
23	DP-38	0.60	0.80	16.7	3.36	5.64	2	5	18" RCP
24	DP-39	0.30	0.37	11.7	3.89	6.53	1	2	18" RCP

JOB NAME: ***KETTLE CREEK NORTH DEVELOPMENT***
JOB NUMBER: ***2553.00***
DATE: ***05/07/20***
CALCULATED BY: ***MAW***

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

FINAL DRAINAGE REPORT ~ PIPE ROUTING SUMMARY

Pipe Run	Contributing Basins	Equivalent CA(5)	Equivalent CA(100)	Maximum Tc	Intensity		Flow		Pipe Size*
					I(5)	I(100)	Q(5)	Q(100)	
25	PR-22, PR-23, PR-24	15.81	22.45	23.5	2.85	4.78	45	107	48" RCP
26	DP-40	0.37	0.52	10.8	4.01	6.73	1	4	18" RCP
27	**PR-25, PR-26**	**16.18**	**22.97**	**23.5**	**2.85**	**4.78**	**46**	**110**	**48" RCP**
28	DP-41	0.40	0.76	13.6	3.66	6.15	1.5	4.7	15" HDPE
29	PR-28, DP-42	0.50	0.95	13.7	3.65	6.13	2	6	18" HDPE
30	DP-43	0.06	0.10	14.0	3.62	6.08	0.2	0.6	12" HDPE
31	**PR-29, PR-30**	**0.56**	**1.05**	**14.3**	**3.59**	**6.02**	**2**	**6**	**18" HDPE**
32	DP-34	0.56	0.83	15.8	3.44	5.78	2	5	18" RCP
33	DP-35	0.40	0.53	15.8	3.44	5.78	1	3	18" RCP
34	PR-32, PR-33	0.96	1.36	16.8	3.35	5.62	3	8	24" RCP
35	DP-37	1.18	1.63	16.6	3.37	5.66	4	9	18" RCP
36	PR-34, PR-35	2.14	2.99	16.9	3.34	5.61	7	17	30" RCP

JOB NAME: ***KETTLE CREEK NORTH DEVELOPMENT***
JOB NUMBER: ***2553.00***
DATE: ***05/07/20***
CALCULATED BY: ***MAW***

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

FINAL DRAINAGE REPORT ~ PIPE ROUTING SUMMARY

Pipe Run	Contributing Basins	Equivalent CA(5)	Equivalent CA(100)	Maximum Tc	Intensity		Flow		Pipe Size*
					I(5)	I(100)	Q(5)	Q(100)	
37	DP-11	0.85	1.27	16.8	3.35	5.63	3	7	18" RCP
38	DP-12	0.47	0.58	12.5	3.80	6.37	2	4	18" RCP
39	PR-37, PR-38	1.31	1.85	17.2	3.32	5.57	4	10	24" RCP
40	DP-13	0.95	1.38	17.4	3.30	5.54	3	8	18" RCP
41	DP-14	0.51	0.63	13.1	3.73	6.26	2	4	18" RCP
42	PR-40, PR-41	1.47	2.01	17.5	3.29	5.53	5	11	24" RCP
43	PR-39, PR-42	2.78	3.85	17.6	3.28	5.51	9	21	30" RCP
44	DP-28 Collected	0.56	0.76	15.8	3.44	5.78	2	4	18" RCP
45	DP-29 Collected	0.17	0.24	11.5	3.91	6.57	0.6	1.5	18" RCP
46	PR-44, PR-45	0.73	1.00	15.9	3.43	5.76	2	6	18" RCP
47	DP-31 Collected	0.95	1.09	17.4	3.29	5.53	3.1	6.0	18" RCP
48	DP-32 Collected	0.51	0.70	13.1	3.72	6.24	2	4	18" RCP

JOB NAME: ***KETTLE CREEK NORTH DEVELOPMENT***
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* PIPES ARE LISTED AT MAXIMUM SIZE REQUIRED TO ACCOMMODATE Q100 FLOWS AT MINIMUM GRADE.
REFER TO INDIVIDUAL PIPE SHEETS FOR HYDRAULIC INFORMATION.

FINAL DRAINAGE REPORT ~ PIPE ROUTING SUMMARY

Pipe Run	Contributing Basins	Equivalent CA(5)	Equivalent CA(100)	Maximum Tc	Intensity		Flow		Pipe Size*
					I(5)	I(100)	Q(5)	Q(100)	
49	PR-47, PR-48	1.46	1.79	17.4	3.29	5.53	5	10	24" RCP
50	DP-33	1.46	2.23	17.7	3.27	5.49	4.7	12	Ex. 18"' RCP
51	North Fork Filing 3-7 FDR Amendment 1 PR-14	23.45	34.84	23.3	2.86	4.80	67	167	Ex. 48" RCP
52	DP-10 Collected	0.59	1.21	16.3	3.40	5.71	2	7	Ex. 18"' RCP
53	PR-51, PR-52	24.04	36.05	23.3	2.86	4.80	69	173	Ex. 48" RCP
54	North Fork Filing 3-7 FDR Amendment 1 PR-17	0.82	0.87	9.5	4.21	7.06	3	6	Ex. 18"' RCP
55	PR-53, PR-54	24.86	36.92	23.6	2.84	4.77	71	176	Ex. 48" RCP
56	North Fork Filing 3-7 FDR Amendment 1 PR-19	1.00	1.01	10.3	4.08	6.86	4	7	Ex. 18"' RCP
57	PR-55, PR-56	25.86	37.93	23.8	2.83	4.75	73	180	Ex. 48" RCP
58	North Fork Filing 3-7 FDR Amendment 1 PR-24	7.52	9.46	10.3	4.08	6.86	31	65	Ex. 36" RCP
59	PR-57, PR-58	33.38	47.39	24.0	2.82	4.73	94	224	Ex. 54" RCP
60	DP-15 Collected, PR-43	3.91	5.47	17.6	3.28	5.51	13	30	Ex. 36" RCP

JOB NAME: ***KETTLE CREEK NORTH DEVELOPMENT***
JOB NUMBER: ***2553.00***
DATE: ***05/07/20***
CALCULATED BY: ***MAW***

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

FINAL DRAINAGE REPORT ~ PIPE ROUTING SUMMARY

Pipe Run	Contributing Basins	Equivalent CA(5)	Equivalent CA(100)	Maximum Tc	Intensity		Flow		
					I(5)	I(100)	Q(5)	Q(100)	Pipe Size*
61	PR-59, PR-60	37.29	52.85	24.0	2.82	4.73	105	250	Ex. 60" RCP
62	PR-61, PR-46	38.02	53.85	24.0	2.82	4.73	107	255	Ex. 60" RCP
63	North Fork Filing 3-7 FDR Amendment 1 PR-28	2.09	1.93	11.9	3.87	6.49	8	13	Ex. 24" RCP
64	PR-62, PR-63, PR-49	41.57	57.57	24.5	2.78	4.67	116	269	Ex. 60" RCP
65	North Fork Filing 3-7 FDR Amendment 1 PR-32A	3.05	4.31	11.9	3.87	6.49	12	28	Ex. 24" RCP
66	PR-64, PR-65, PR-50	46.08	59.79	24.7	2.77	4.65	128	278	Ex. 60" RCP
67	North Fork Filing 3-7 FDR Amendment 1 PR-35	0.69	0.79	8.5	4.37	7.34	3	6	Ex. 18" RCP
68	**PR-66, PR-67, PR-36**	**48.91**	**63.57**	**25.1**	**2.75**	**4.61**	**134**	**293**	**Ex. 72" RCP**
Exist. 72" RCP Outfall	**North Fork Filing 7 FDR Amendment 1 PR-36**	**60.19**	**78.82**	**25.1**	**2.75**	**4.61**	**166**	**364**	**Ex. 72" RCP**

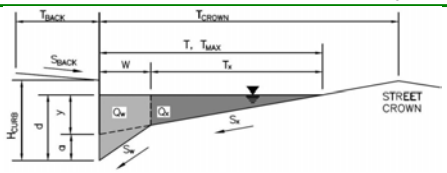
Version 4.05 Released March 2017

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

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

Project: KEETTLE CREEK NORTH DEVELOPMENT

Inlet ID: DP-5



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.010	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

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

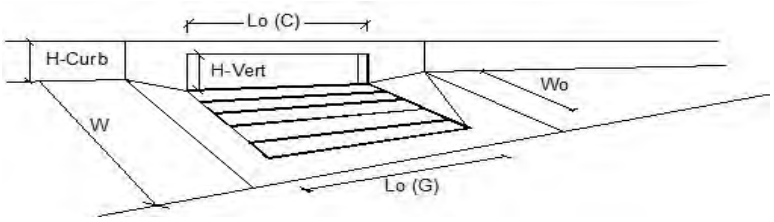
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	**Q_{allow} =**	**10.9**	**10.9**	**cfs**

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 =	5.00	5.00	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 =**	**2.2**	**3.1**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.8**	**2.9**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**73**	**51**	**%**

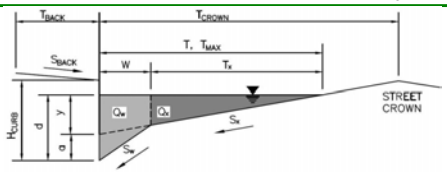
Version 4.05 Released March 2017

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

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

Project: KEETTLE CREEK NORTH DEVELOPMENT

Inlet ID: DP-6



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.040	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

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

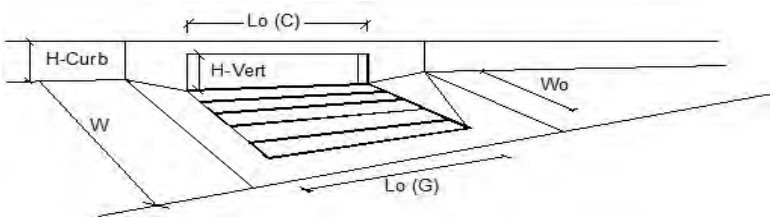
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	**Q_{allow} =**	**16.3**	**21.7**	**cfs**

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	CDOT Type R Curb Opening	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 =	10.00	10.00	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 =**	**6.2**	**9.8**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**1.5**	**9.5**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**81**	**51**	**%**

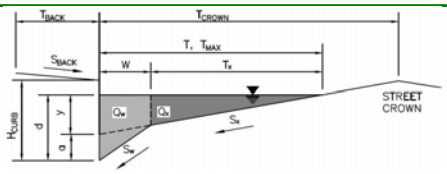
Version 4.05 Released March 2017

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

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

Project: KEETTLE CREEK NORTH DEVELOPMENT

Inlet ID: DP-7



Gutter Geometry (Enter data in the blue cells)

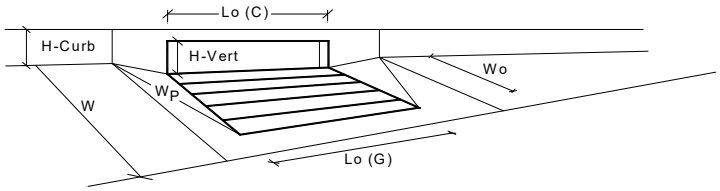
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches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

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

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

INLET IN A SUMP OR SAG LOCATION

Version 4.05 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	12.0	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	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} =	0.33	0.83	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.57	1.00	
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 =**	**8.3**	**25.5**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	4.6	17.2	cfs

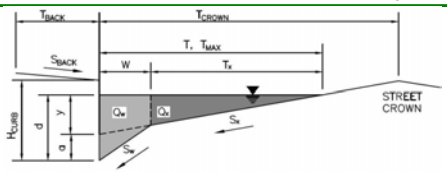
Version 4.05 Released March 2017

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

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

Project: KEETTLE CREEK NORTH DEVELOPMENT

Inlet ID: DP-8



Gutter Geometry (Enter data in the blue cells)

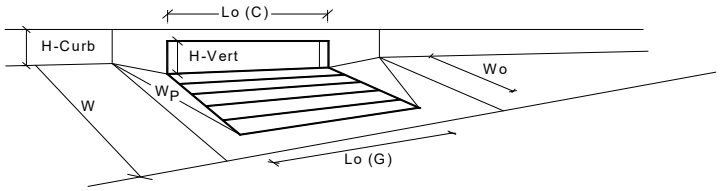
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches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

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

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

INLET IN A SUMP OR SAG LOCATION

Version 4.05 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	12.0	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	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} =	0.33	0.83	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.57	1.00	
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 =**	**8.3**	**25.5**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	6.0	13.0	cfs

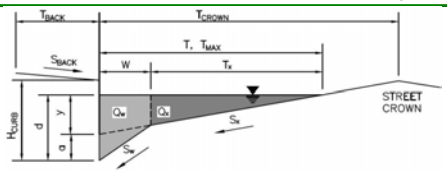
Version 4.05 Released March 2017

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

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

Project: KEETTLE CREEK NORTH DEVELOPMENT

Inlet ID: DP-10



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} =	8.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	16.0	ft
Gutter Width	W =	3.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.040	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} =	16.0	16.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☐	check = yes

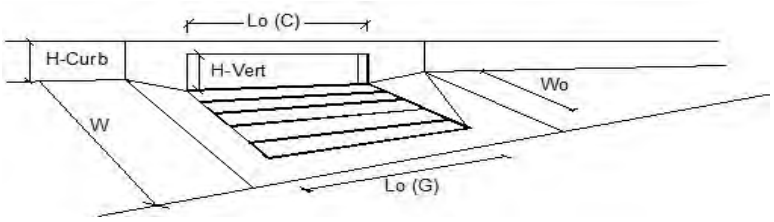
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	**Q_{allow} =**	**11.8**	**21.2**	**cfs**

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)	Colorado Springs D-10-R		MINOR	MAJOR	
Type of Inlet		Type =	Colorado Springs D-10-R		
Local Depression (additional to continuous gutter depression 'a')		a_{LOCAL} =	4.0	4.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)		L_o =	10.00	10.00	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 =**	**2.0**	**6.9**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**1.1**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**86**	**%**

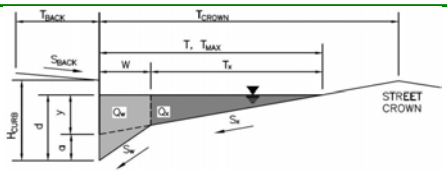
Version 4.05 Released March 2017

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

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

Project: KEETTLE CREEK NORTH DEVELOPMENT

Inlet ID: DP-11



Gutter Geometry (Enter data in the blue cells)

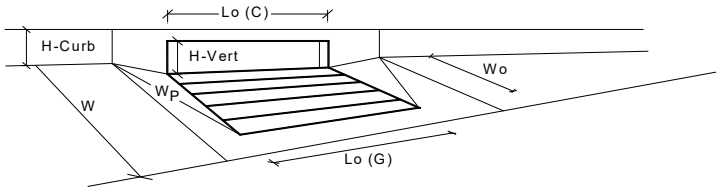
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches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

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

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

INLET IN A SUMP OR SAG LOCATION

Version 4.05 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	12.0	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	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} =	0.33	0.83	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 =**	**5.4**	**12.3**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	3.0	7.0	cfs

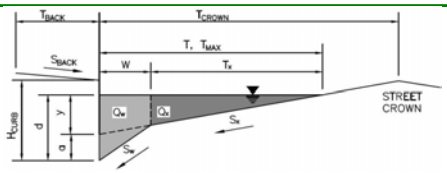
Version 4.05 Released March 2017

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

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

Project: KEETTLE CREEK NORTH DEVELOPMENT

Inlet ID: DP-12



Gutter Geometry (Enter data in the blue cells)

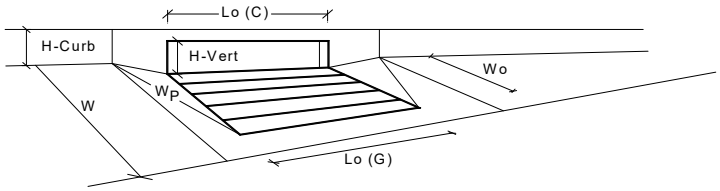
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches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

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

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

INLET IN A SUMP OR SAG LOCATION

Version 4.05 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	12.0	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	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} =	0.33	0.83	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 =**	**5.4**	**12.3**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	2.0	4.0	cfs

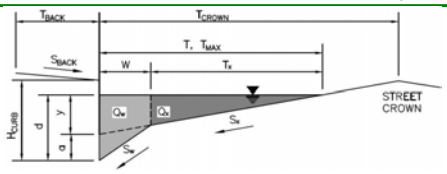
Version 4.05 Released March 2017

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

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

Project: KEETTLE CREEK NORTH DEVELOPMENT

Inlet ID: DP-13



Gutter Geometry (Enter data in the blue cells)

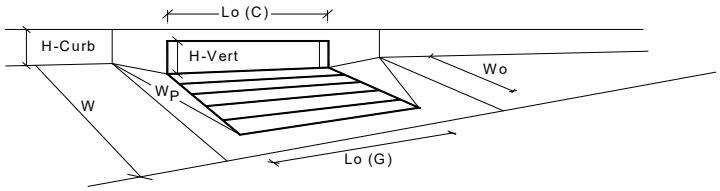
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches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

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

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

INLET IN A SUMP OR SAG LOCATION

Version 4.05 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	12.0	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	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} =	0.33	0.83	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 =**	**5.4**	**12.3**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	3.0	8.0	cfs

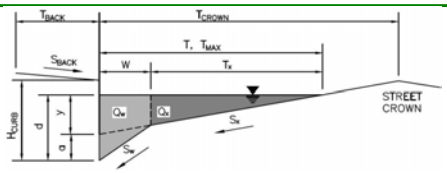
Version 4.05 Released March 2017

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

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

Project: KEETTLE CREEK NORTH DEVELOPMENT

Inlet ID: DP-14



Gutter Geometry (Enter data in the blue cells)

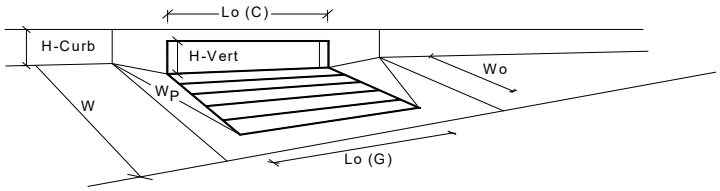
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches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

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

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

INLET IN A SUMP OR SAG LOCATION

Version 4.05 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	12.0	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	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} =	0.33	0.83	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 =**	**5.4**	**12.3**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	2.0	4.0	cfs

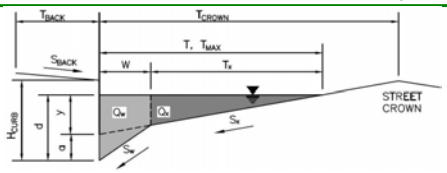
Version 4.05 Released March 2017

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

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

Project: KEETTLE CREEK NORTH DEVELOPMENT

Inlet ID: DP-15



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} =	8.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	16.0	ft
Gutter Width	W =	3.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.040	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} =	16.0	16.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☐	check = yes

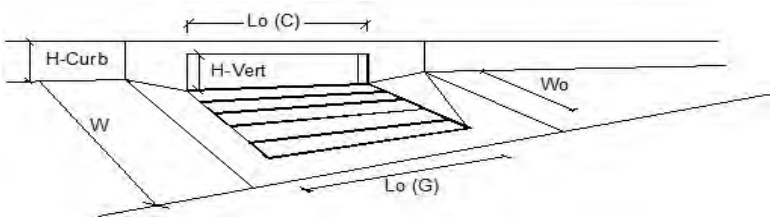
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	**Q_{allow} =**	**11.8**	**21.2**	**cfs**

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)	Colorado Springs D-10-R		MINOR	MAJOR	
Type of Inlet		Type =	Colorado Springs D-10-R		
Local Depression (additional to continuous gutter depression 'a')		a_{LOCAL} =	4.0	4.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)		L_o =	14.00	14.00	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 =**	**4.0**	**9.4**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.5**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**95**	**%**

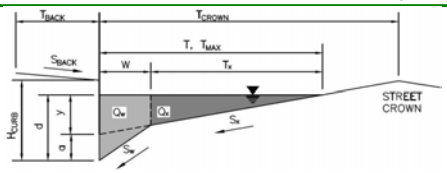
Version 4.05 Released March 2017

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

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

Project: KEETTLE CREEK NORTH DEVELOPMENT

Inlet ID: DP-20



Gutter Geometry (Enter data in the blue cells)

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

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

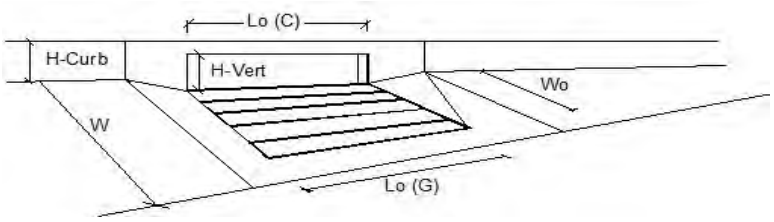
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	**Q_{allow} =**	**15.4**	**15.4**	**cfs**

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	CDOT Type R Curb Opening	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 =	10.00	10.00 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 =**	**3.0**	**5.8**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**1.2**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**83**	**%**

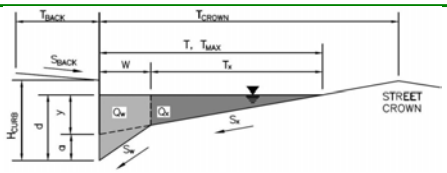
Version 4.05 Released March 2017

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

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

Project: KEETTLE CREEK NORTH DEVELOPMENT

Inlet ID: DP-21



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.023	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

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

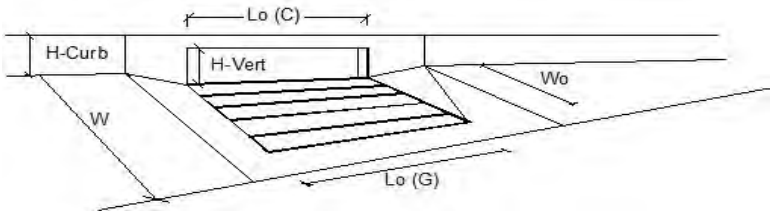
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	**Q_{allow} =**	**16.5**	**16.5**	**cfs**

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

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

INLET ON A CONTINUOUS GRADE

Version 4.05 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')		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 =	10.00	10.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)		W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)		C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		C_f-C =	0.10	0.10	

Street Hydraulics: WARNING: Q > ALLOWABLE Q FOR MAJOR STORM		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**7.1**	**10.4**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**2.9**	**11.8**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**71**	**47**	**%**

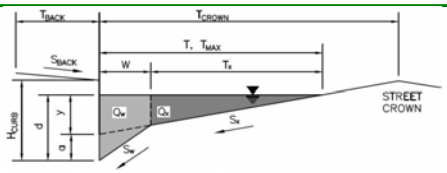
Version 4.05 Released March 2017

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

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

Project: KEETTLE CREEK NORTH DEVELOPMENT

Inlet ID: DP-22



Gutter Geometry (Enter data in the blue cells)

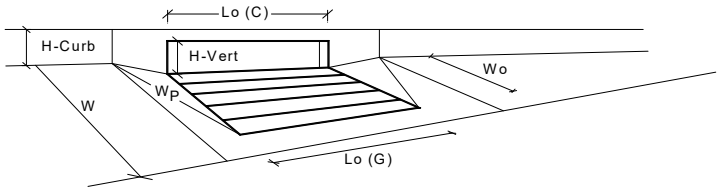
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches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

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

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

INLET IN A SUMP OR SAG LOCATION

Version 4.05 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	12.0	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	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} =	0.33	0.83	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.57	1.00	
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 =**	**8.3**	**25.5**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	5.8	15.7	cfs

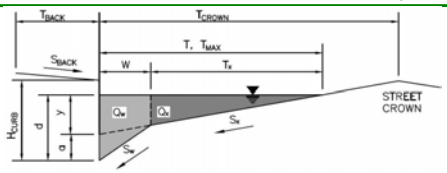
Version 4.05 Released March 2017

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

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

Project: KEETTLE CREEK NORTH DEVELOPMENT

Inlet ID: DP-23



Gutter Geometry (Enter data in the blue cells)

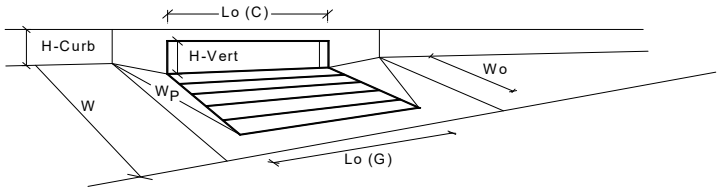
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches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

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

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

INLET IN A SUMP OR SAG LOCATION

Version 4.05 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	12.0	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	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} =	0.33	0.83	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 =**	**5.4**	**12.3**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	2.0	7.0	cfs

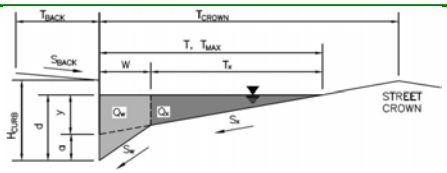
Version 4.05 Released March 2017

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

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

Project: KEETTLE CREEK NORTH DEVELOPMENT

Inlet ID: DP-24



Gutter Geometry (Enter data in the blue cells)

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

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

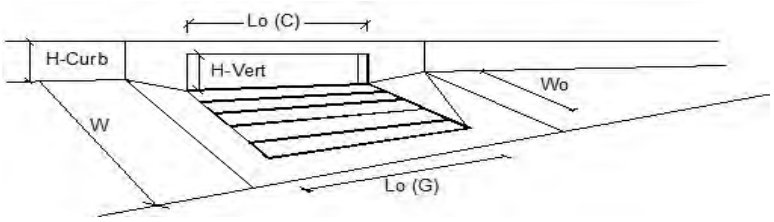
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	**Q_{allow} =**	**13.3**	**13.3**	**cfs**

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	CDOT Type R Curb Opening	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 =	5.00	5.00 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 =**	**3.1**	**4.1**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**2.9**	**7.9**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**51**	**34**	**%**

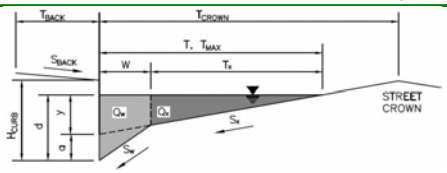
Version 4.05 Released March 2017

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

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

Project: KEETTLE CREEK NORTH DEVELOPMENT

Inlet ID: DP-26



Gutter Geometry (Enter data in the blue cells)

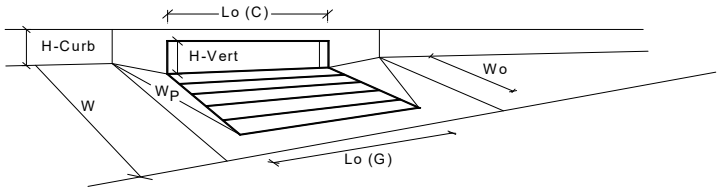
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches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

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

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

INLET IN A SUMP OR SAG LOCATION

Version 4.05 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	12.0	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	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} =	0.33	0.83	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.57	1.00	
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 =**	**8.3**	**25.5**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	4.0	13.0	cfs

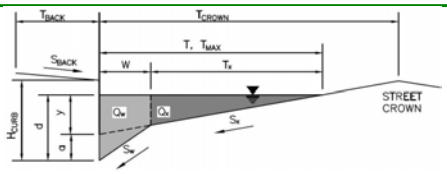
Version 4.05 Released March 2017

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

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

Project: KEETTLE CREEK NORTH DEVELOPMENT

Inlet ID: DP-27



Gutter Geometry (Enter data in the blue cells)

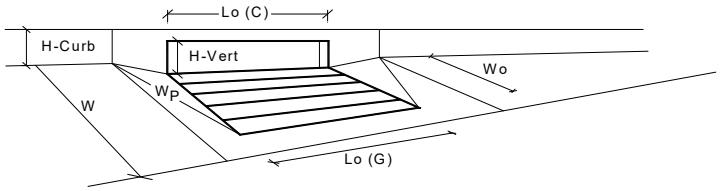
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches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

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

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

INLET IN A SUMP OR SAG LOCATION

Version 4.05 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	12.0	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	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} =	0.33	0.83	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.57	1.00	
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 =**	**8.3**	**25.5**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	6.4	16.5	cfs

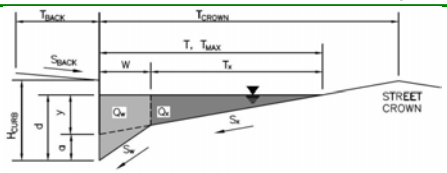
Version 4.05 Released March 2017

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

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

Project: KEETTLE CREEK NORTH DEVELOPMENT

Inlet ID: DP-28



Gutter Geometry (Enter data in the blue cells)

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

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

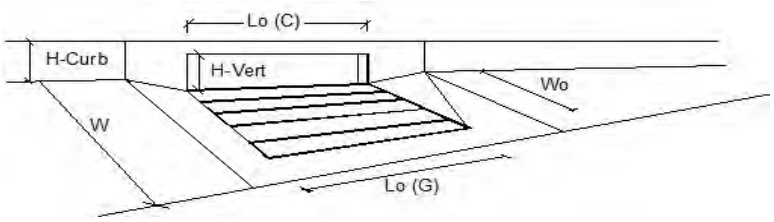
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	**Q_{allow} =**	**15.4**	**15.4**	**cfs**

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	CDOT Type R Curb Opening	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 =	10.00	10.00 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 =**	**2.0**	**3.9**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.1**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**99**	**%**

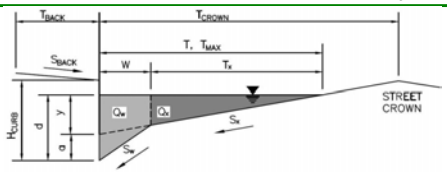
Version 4.05 Released March 2017

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

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

Project: KEETTLE CREEK NORTH DEVELOPMENT

Inlet ID: DP-29



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.029	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

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

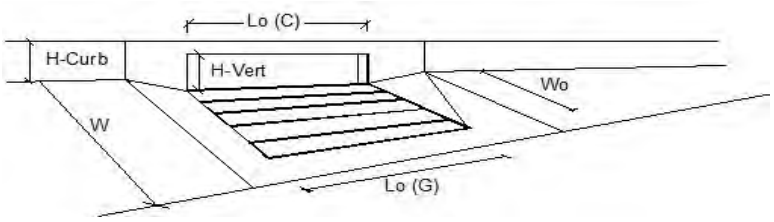
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	**Q_{allow} =**	**17.9**	**18.5**	**cfs**

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	CDOT Type R Curb Opening	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 =	5.00	5.00 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 =**	**0.6**	**1.6**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.1**	**0.1**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**88**	**92**	**%**

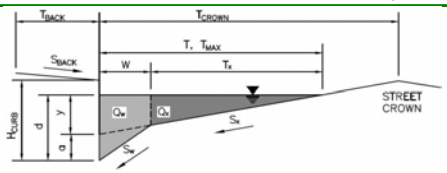
Version 4.05 Released March 2017

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

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

Project: KEETTLE CREEK NORTH DEVELOPMENT

Inlet ID: DP-31



Gutter Geometry (Enter data in the blue cells)

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

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

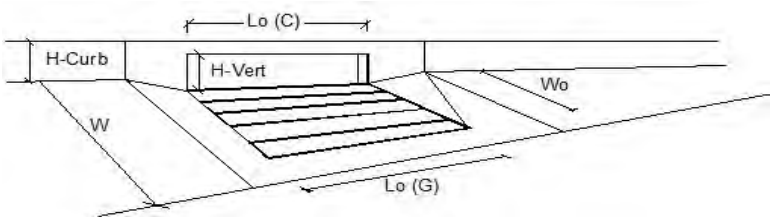
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	**Q_{allow} =**	**13.3**	**13.3**	**cfs**

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)	CDOT Type R Curb Opening		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 =	10.00	10.00	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 =**	**3.0**	**5.8**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**1.2**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**83**	**%**

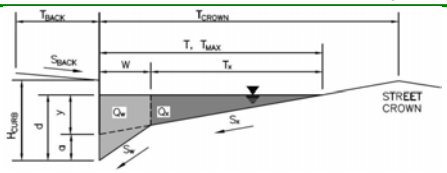
Version 4.05 Released March 2017

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

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

Project: KEETTLE CREEK NORTH DEVELOPMENT

Inlet ID: DP-32



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.028	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

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

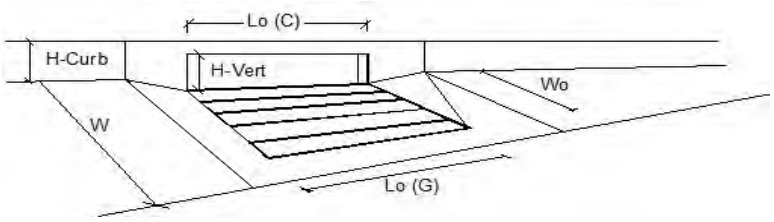
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	**Q_{allow} =**	**18.1**	**18.2**	**cfs**

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	CDOT Type R Curb Opening	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 =	10.00	10.00 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 =**	**2.0**	**4.0**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.0**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**99**	**%**

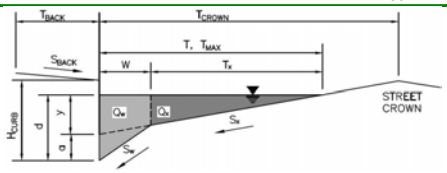
Version 4.05 Released March 2017

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

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

Project: KEETTLE CREEK NORTH DEVELOPMENT

Inlet ID: DP-33



Gutter Geometry (Enter data in the blue cells)

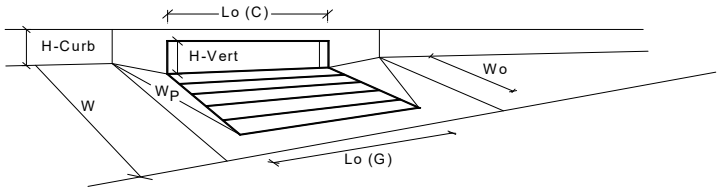
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	12.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	8.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	3.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

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

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

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)	Colorado Springs D-10-R			
		MINOR	MAJOR	
Type of Inlet	Type =	Colorado Springs D-10-R		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	4.00	4.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	12.0	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	6.00	6.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	8.00	8.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	8.00	8.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	81.00	81.00	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	3.00	3.00	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} =	0.25	0.75	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.71	1.00	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**4.7**	**19.8**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	4.7	12.0	cfs

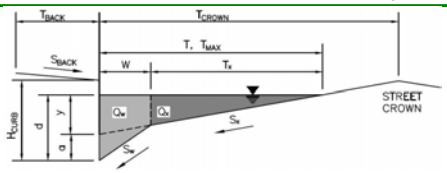
Version 4.05 Released March 2017

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

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

Project: KEETTLE CREEK NORTH DEVELOPMENT

Inlet ID: DP-34



Gutter Geometry (Enter data in the blue cells)

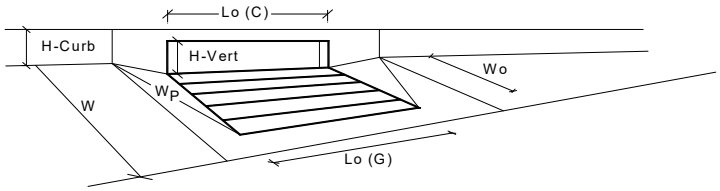
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches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

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

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

INLET IN A SUMP OR SAG LOCATION

Version 4.05 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	12.0	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	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} =	0.33	0.83	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 =**	**5.4**	**12.3**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	2.0	5.0	cfs

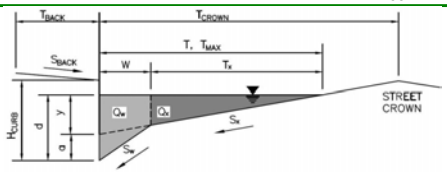
Version 4.05 Released March 2017

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

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

Project: KEETTLE CREEK NORTH DEVELOPMENT

Inlet ID: DP-35



Gutter Geometry (Enter data in the blue cells)

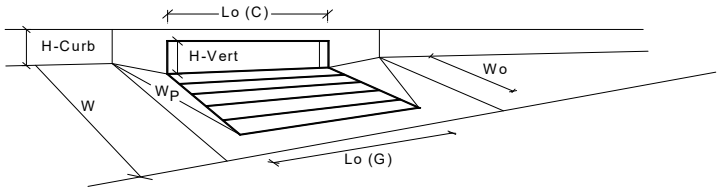
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches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

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

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

INLET IN A SUMP OR SAG LOCATION

Version 4.05 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	12.0	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	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} =	0.33	0.83	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 =**	**5.4**	**12.3**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	1.0	3.0	cfs

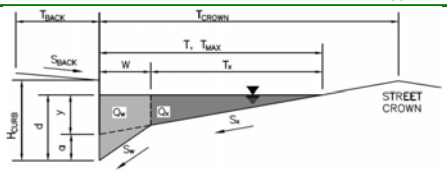
Version 4.05 Released March 2017

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

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

Project: KEETTLE CREEK NORTH DEVELOPMENT

Inlet ID: DP-36



Gutter Geometry (Enter data in the blue cells)

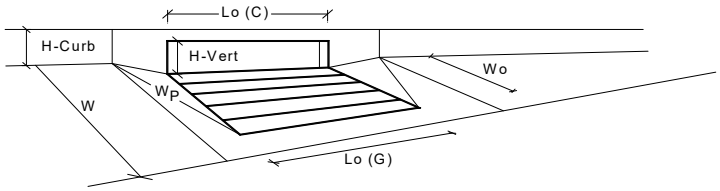
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	3.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

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

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

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)	Colorado Springs D-10-R			
		MINOR	MAJOR	
Type of Inlet	Type =	Colorado Springs D-10-R		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	4.00	4.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	8.0	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	6.00	6.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	8.00	8.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	8.00	8.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	81.00	81.00	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	3.00	3.00	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} =	0.25	0.42	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.71	0.94	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**4.7**	**10.2**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	3.0	8.0	cfs

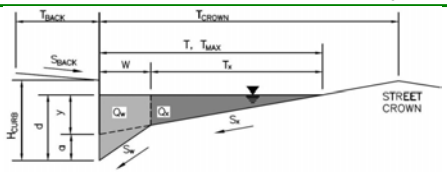
Version 4.05 Released March 2017

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

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

Project: KEETTLE CREEK NORTH DEVELOPMENT

Inlet ID: DP-37



Gutter Geometry (Enter data in the blue cells)

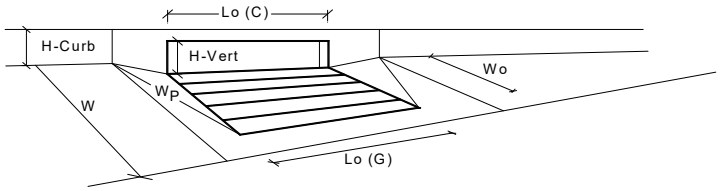
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches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

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

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

INLET IN A SUMP OR SAG LOCATION

Version 4.05 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	8.0	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	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} =	0.33	0.50	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 =**	**5.4**	**9.3**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	4.0	9.0	cfs

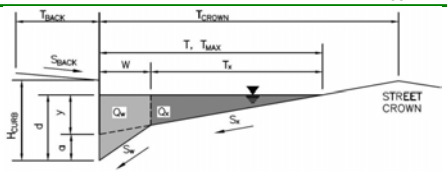
Version 4.05 Released March 2017

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

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

Project: KEETTLE CREEK NORTH DEVELOPMENT

Inlet ID: DP-38



Gutter Geometry (Enter data in the blue cells)

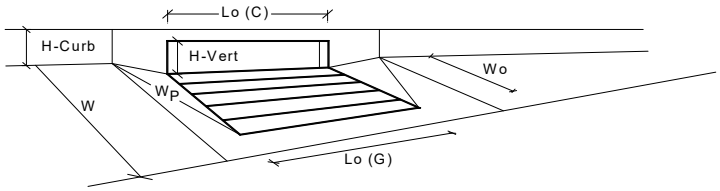
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches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

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

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

INLET IN A SUMP OR SAG LOCATION

Version 4.05 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	12.0	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	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} =	0.33	0.83	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 =**	**5.4**	**12.3**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	2.0	5.0	cfs

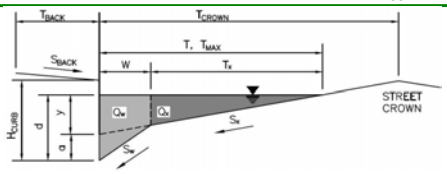
Version 4.05 Released March 2017

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

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

Project: KEETTLE CREEK NORTH DEVELOPMENT

Inlet ID: DP-39



Gutter Geometry (Enter data in the blue cells)

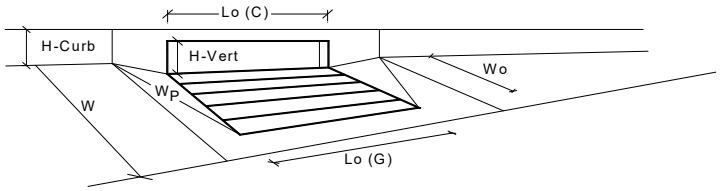
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches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

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

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

INLET IN A SUMP OR SAG LOCATION

Version 4.05 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	12.0	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	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} =	0.33	0.83	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 =**	**5.4**	**12.3**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	1.0	2.0	cfs

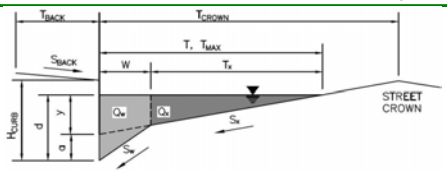
Version 4.05 Released March 2017

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

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

Project: KEETTLE CREEK NORTH DEVELOPMENT

Inlet ID: DP-40



Gutter Geometry (Enter data in the blue cells)

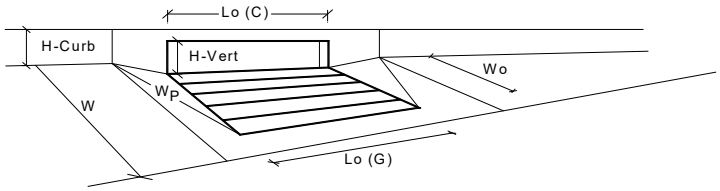
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches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

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

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

INLET IN A SUMP OR SAG LOCATION

Version 4.05 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	8.0	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	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} =	0.33	0.50	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 =**	**5.4**	**9.3**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	1.0	4.0	cfs

STORMWATER QUALITY CALCULATIONS

CLASSIC SM
CONSULTING
ENGINEERS & SURVEYORS

Worksheet Protected

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
***Minor Storm: 1-Hour Rain Depth	5-Year Event	1.50	inches
***Major Storm: 1-Hour Rain Depth	100-Year Event	2.52	inches
Optional User Defined Storm	CUHP		
(CUHP) NOAA 1 Hour Rainfall Depth and Frequency for User Defined Storm	100-Year Event	2.52	

Max Intensity for Optional User Defined Storm: 2.51496

Designer: Marc A. Whorton, P.E.
Company: Classic Consulting
Date: May 14, 2020
Project: KETTLE CREEK NORTH DEVELOPMENT PLAN - MDDP (Sheet 1)
Location: Colorado Springs, CO

SITE INFORMATION (USER-INPUT)

Sub-basin Identifier	DP-1	DP-2	DP-3	DP-4	DP-5	DP-6	DP-7	DP-8	DP-10	DP-11	DP-12	DP-13	DP-14	DP-15
Receiving Pervious Area Soil Type	Loamy Sand	Loamy Sand	Loamy Sand	Loamy Sand	Loamy Sand	Loamy Sand	Loamy Sand	Loamy Sand	Loamy Sand	Loamy Sand	Loamy Sand	Loamy Sand	Loamy Sand	Loamy Sand
Total Area (ac., Sum of DCIA, UIA, RPA, & SPA)	11.100	1.700	1.300	1.990	1.900	0.850	2.500	2.200	1.140	2.200	0.790	2.300	0.850	2.280
Directly Connected Impervious Area (DCIA, acres)	2.900	0.500	0.300	0.450	0.270	0.320	0.430	0.560	0.510	0.310	0.310	0.340	0.340	0.770
Unconnected Impervious Area (UIA, acres)	1.100	0.300	0.350	0.400	0.480	0.140	0.500	0.550	0.100	0.510	0.180	0.600	0.200	0.390
Receiving Pervious Area (RPA, acres)	0.700	0.200	0.200	0.500	0.600	0.140	0.470	0.400	0.250	0.640	0.170	0.790	0.180	0.440
Separate Pervious Area (SPA, acres)	6.400	0.700	0.450	0.640	0.550	0.250	1.100	0.690	0.280	0.740	0.130	0.570	0.130	0.680
RPA Treatment Type: Conveyance (C), Volume (V), or Permeable Pavement (PP)	C	C	C	C	C	C	C	C	C	C	C	C	C	C

CALCULATED RESULTS (OUTPUT)

Total Calculated Area (ac, check against input)	11.100	1.700	1.300	1.990	1.900	0.850	2.500	2.200	1.140	2.200	0.790	2.300	0.850	2.280
Directly Connected Impervious Area (DCIA, %)	26.1%	29.4%	23.1%	22.6%	14.2%	37.6%	17.2%	25.5%	44.7%	14.1%	39.2%	14.8%	40.0%	33.8%
Unconnected Impervious Area (UIA, %)	9.9%	17.6%	26.9%	20.1%	25.3%	16.5%	20.0%	25.0%	8.8%	23.2%	22.8%	26.1%	23.5%	17.1%
Receiving Pervious Area (RPA, %)	6.3%	11.8%	15.4%	25.1%	31.6%	16.5%	18.8%	18.2%	21.9%	29.1%	21.5%	34.3%	21.2%	19.3%
Separate Pervious Area (SPA, %)	57.7%	41.2%	34.6%	32.2%	28.9%	29.4%	44.0%	31.4%	24.6%	33.6%	16.5%	24.8%	15.3%	29.8%
A_R (RPA / UIA)	0.636	0.667	0.571	1.250	1.250	1.000	0.940	0.727	2.500	1.255	0.944	1.317	0.900	1.128
I_a Check	0.610	0.600	0.640	0.440	0.440	0.500	0.520	0.580	0.290	0.440	0.510	0.430	0.530	0.470
f / I for WQCV Event:	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6
f / I for 5-Year Event:	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
f / I for 100-Year Event:	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
f / I for Optional User Defined Storm CUHP:	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39
IRF for WQCV Event:	0.67	0.66	0.69	0.57	0.57	0.61	0.62	0.65	0.49	0.57	0.61	0.57	0.62	0.59
IRF for 5-Year Event:	0.91	0.91	0.91	0.88	0.88	0.89	0.89	0.90	0.85	0.88	0.89	0.88	0.89	0.88
IRF for 100-Year Event:	0.93	0.93	0.93	0.90	0.90	0.91	0.92	0.92	0.88	0.90	0.91	0.90	0.92	0.91
IRF for Optional User Defined Storm CUHP:	0.93	0.93	0.93	0.90	0.90	0.91	0.92	0.92	0.88	0.90	0.91	0.90	0.92	0.91
Total Site Imperviousness: I_{total}	36.0%	47.1%	50.0%	42.7%	39.5%	54.1%	37.2%	50.5%	53.5%	37.3%	62.0%	40.9%	63.5%	50.9%
Effective Imperviousness for WQCV Event:	32.8%	41.1%	41.5%	34.1%	28.7%	47.6%	29.5%	41.7%	49.0%	27.3%	53.2%	29.5%	54.7%	43.8%
Effective Imperviousness for 5-Year Event:	35.1%	45.4%	47.7%	40.3%	36.4%	52.3%	35.1%	48.0%	52.2%	34.5%	59.6%	37.7%	61.1%	48.9%
Effective Imperviousness for 100-Year Event:	35.3%	45.8%	48.2%	40.8%	37.0%	52.7%	35.5%	48.6%	52.5%	35.0%	60.1%	38.3%	61.6%	49.3%
Effective Imperviousness for Optional User Defined Storm CUHP:	35.3%	45.8%	48.2%	40.8%	37.0%	52.7%	35.5%	48.6%	52.5%	35.0%	60.1%	38.3%	61.6%	49.3%

LID / EFFECTIVE IMPERVIOUSNESS CREDITS

WQCV Event CREDIT: Reduce Detention By:	5.5%	7.9%	10.8%	12.4%	17.5%	8.2%	12.9%	11.1%	5.8%	17.2%	11.5%	17.6%	11.7%	9.0%
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:	2.0%	2.7%	3.5%	4.6%	6.3%	2.7%	4.6%	3.7%	2.0%	6.2%	3.1%	6.4%	3.0%	3.1%
User Defined CUHP CREDIT: Reduce Detention By:	1.5%	2.4%	3.3%	3.8%	4.9%	2.6%	3.5%	3.5%	1.9%	4.6%	3.6%	5.0%	3.6%	2.9%

Total Site Imperviousness:	**42.6%**
Total Site Effective Imperviousness for WQCV Event:	**35.9%**
Total Site Effective Imperviousness for 5-Year Event:	**40.8%**
Total Site Effective Imperviousness for 100-Year Event:	**41.1%**
Total Site Effective Imperviousness for Optional User Defined Storm CUHP:	**41.1%**

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

Worksheet Protected

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
***Minor Storm: 1-Hour Rain Depth	5-Year Event	1.50	inches
***Major Storm: 1-Hour Rain Depth	100-Year Event	2.52	inches
Optional User Defined Storm	CUHP		
(CUHP) NOAA 1 Hour Rainfall Depth and Frequency for User Defined Storm	100-Year Event	2.52	
Max Intensity for Optional User Defined Storm	2.51496		

Designer: Marc A. Whorton, P.E.
Company: Classic Consulting
Date: May 14, 2020
Project: KETTLE CREEK NORTH DEVELOPMENT PLAN - MDDP (Sheet 2)
Location: Colorado Springs, CO

SITE INFORMATION (USER-INPUT)

Sub-basin Identifier	Sheet 1	DP-16	DP-17	DP-18	DP-19	DP-20	DP-21	DP-22	DP-23	DP-24	DP-25	DP-26	DP-27	DP 28-30
Receiving Pervious Area Soil Type	Loamy Sand	Loamy Sand	Loamy Sand	Loamy Sand	Loamy Sand	Loamy Sand	Loamy Sand	Loamy Sand	Loamy Sand	Loamy Sand	Loamy Sand	Loamy Sand	Loamy Sand	Loamy Sand
Total Area (ac., Sum of DCIA, UIA, RPA, & SPA)	33.100	1.000	1.700	1.900	1.000	2.400	1.900	2.600	1.000	2.300	1.100	1.500	2.500	3.240
Directly Connected Impervious Area (DCIA, acres)	8.310	0.000	0.580	0.500	0.350	0.370	0.620	0.450	0.310	0.500	0.350	0.400	0.700	0.850
Unconnected Impervious Area (UIA, acres)	5.800	0.180	0.400	0.400	0.230	0.400	0.470	0.430	0.180	0.650	0.250	0.160	0.500	0.750
Receiving Pervious Area (RPA, acres)	5.680	0.720	0.300	0.550	0.160	0.800	0.430	0.800	0.170	0.450	0.150	0.250	0.320	1.100
Separate Pervious Area (SPA, acres)	13.310	0.100	0.420	0.450	0.260	0.830	0.380	0.920	0.340	0.700	0.350	0.690	0.980	0.540
RPA Treatment Type: Conveyance (C), Volume (V), or Permeable Pavement (PP)	C	C	C	C	C	C	C	C	C	C	C	C	C	C

CALCULATED RESULTS (OUTPUT)

Total Calculated Area (ac, check against input)	33.100	1.000	1.700	1.900	1.000	2.400	1.900	2.600	1.000	2.300	1.100	1.500	2.500	3.240
Directly Connected Impervious Area (DCIA, %)	25.1%	0.0%	34.1%	26.3%	35.0%	15.4%	32.6%	17.3%	31.0%	21.7%	31.8%	26.7%	28.0%	26.2%
Unconnected Impervious Area (UIA, %)	17.5%	18.0%	23.5%	21.1%	23.0%	16.7%	24.7%	16.5%	18.0%	28.3%	22.7%	10.7%	20.0%	23.1%
Receiving Pervious Area (RPA, %)	17.2%	72.0%	17.6%	28.9%	16.0%	33.3%	22.6%	30.8%	17.0%	19.6%	13.6%	16.7%	12.8%	34.0%
Separate Pervious Area (SPA, %)	40.2%	10.0%	24.7%	23.7%	26.0%	34.6%	20.0%	35.4%	34.0%	30.4%	31.8%	46.0%	39.2%	16.7%
A_R (RPA / UIA)	0.979	4.000	0.750	1.375	0.696	2.000	0.915	1.860	0.944	0.692	0.600	1.563	0.640	1.467
I_a Check	0.510	0.200	0.570	0.420	0.590	0.330	0.520	0.350	0.510	0.590	0.630	0.390	0.610	0.410
f / I for WQCV Event:	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6
f / I for 5-Year Event:	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
f / I for 100-Year Event:	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
f / I for Optional User Defined Storm CUHP:	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39
IRF for WQCV Event:	0.61	0.43	0.65	0.56	0.66	0.51	0.62	0.52	0.61	0.66	0.68	0.54	0.67	0.55
IRF for 5-Year Event:	0.89	0.84	0.90	0.88	0.91	0.86	0.89	0.86	0.89	0.91	0.91	0.87	0.91	0.87
IRF for 100-Year Event:	0.91	0.86	0.92	0.90	0.93	0.89	0.92	0.89	0.91	0.93	0.93	0.90	0.93	0.90
IRF for Optional User Defined Storm CUHP:	0.91	0.86	0.92	0.90	0.93	0.89	0.92	0.89	0.91	0.93	0.93	0.90	0.93	0.90
Total Site Imperviousness: I_{total}	42.6%	18.0%	57.6%	47.4%	58.0%	32.1%	57.4%	33.8%	49.0%	50.0%	54.5%	37.3%	48.0%	49.4%
Effective Imperviousness for WQCV Event:	35.8%	7.8%	49.3%	38.1%	50.1%	23.9%	47.9%	25.9%	42.0%	40.3%	47.3%	32.5%	41.4%	39.1%
Effective Imperviousness for 5-Year Event:	40.7%	15.1%	55.3%	44.8%	55.8%	29.8%	54.7%	31.6%	47.0%	47.3%	52.5%	36.0%	46.2%	46.5%
Effective Imperviousness for 100-Year Event:	41.1%	15.6%	55.8%	45.3%	56.3%	30.2%	55.3%	32.0%	47.4%	47.9%	53.0%	36.2%	46.6%	47.0%
Effective Imperviousness for Optional User Defined Storm CUHP:	41.1%	15.6%	55.8%	45.3%	56.3%	30.2%	55.3%	32.0%	47.4%	47.9%	53.0%	36.2%	46.6%	47.0%

LID / EFFECTIVE IMPERVIOUSNESS CREDITS

WQCV Event CREDIT: Reduce Detention By:	9.7%	49.8%	10.6%	12.2%	10.0%	17.1%	11.9%	15.3%	9.0%	12.4%	9.2%	8.0%	8.7%	13.3%
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:	3.5%	15.1%	3.1%	4.4%	2.9%	6.1%	3.6%	5.6%	3.2%	4.1%	2.8%	3.1%	2.9%	4.7%
User Defined CUHP CREDIT: Reduce Detention By:	2.9%	8.9%	3.3%	3.9%	3.1%	4.3%	3.8%	4.0%	2.9%	3.8%	2.8%	2.3%	2.6%	4.3%

Total Site Imperviousness:	**43.8%**
Total Site Effective Imperviousness for WQCV Event:	**36.4%**
Total Site Effective Imperviousness for 5-Year Event:	**41.7%**
Total Site Effective Imperviousness for 100-Year Event:	**42.2%**
Total Site Effective Imperviousness for Optional User Defined Storm CUHP:	**42.2%**

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

Worksheet Protected

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
***Minor Storm: 1-Hour Rain Depth	5-Year Event	1.50	inches
***Major Storm: 1-Hour Rain Depth	100-Year Event	2.52	inches
Optional User Defined Storm	CUHP		
(CUHP) NOAA 1 Hour Rainfall Depth and Frequency for User Defined Storm	100-Year Event	2.52	
Max Intensity for Optional User Defined Storm	2.51496		

Designer: Marc A. Whorton, P.E.
Company: Classic Consulting
Date: May 14, 2020
Project: KETTLE CREEK NORTH DEVELOPMENT PLAN - MDDP (Sheet 3)
Location: Colorado Springs, CO

SITE INFORMATION (USER-INPUT)

Sub-basin Identifier	Sheet 2	DP 31-33	DP-34	DP-35	DP-36	DP-37	DP-38	DP-39	DP-40	DP-41	DP-42	DP-43	PP	
Receiving Pervious Area Soil Type	Loamy Sand	Loamy Sand	Loamy Sand	Loamy Sand	Loamy Sand	Loamy Sand	Loamy Sand	Loamy Sand	Loamy Sand	Loamy Sand	Loamy Sand	Loamy Sand	Loamy Sand	
Total Area (ac., Sum of DCIA, UIA, RPA, & SPA)	57.240	4.360	1.400	0.800	1.760	2.600	1.200	0.520	0.850	1.600	0.370	0.210	0.620	
Directly Connected Impervious Area (DCIA, acres)	14.290	1.020	0.200	0.190	0.480	0.640	0.320	0.180	0.230	0.000	0.000	0.000	0.000	
Unconnected Impervious Area (UIA, acres)	10.800	1.090	0.350	0.220	0.390	0.540	0.300	0.130	0.140	0.330	0.090	0.050	0.000	
Receiving Pervious Area (RPA, acres)	11.880	1.130	0.460	0.140	0.660	0.400	0.200	0.110	0.080	0.880	0.210	0.100	0.000	
Separate Pervious Area (SPA, acres)	20.270	1.120	0.390	0.250	0.230	1.020	0.380	0.100	0.400	0.390	0.070	0.060	0.620	
RPA Treatment Type: Conveyance (C), Volume (V), or Permeable Pavement (PP)	C	C	C	C	C	C	C	C	C	C	C	C	C	

CALCULATED RESULTS (OUTPUT)

Total Calculated Area (ac, check against input)	57.240	4.360	1.400	0.800	1.760	2.600	1.200	0.520	0.850	1.600	0.370	0.210	0.620	
Directly Connected Impervious Area (DCIA, %)	25.0%	23.4%	14.3%	23.8%	27.3%	24.6%	26.7%	34.6%	27.1%	0.0%	0.0%	0.0%	0.0%	
Unconnected Impervious Area (UIA, %)	18.9%	25.0%	25.0%	27.5%	22.2%	20.8%	25.0%	25.0%	16.5%	20.6%	24.3%	23.8%	0.0%	
Receiving Pervious Area (RPA, %)	20.8%	25.9%	32.9%	17.5%	37.5%	15.4%	16.7%	21.2%	9.4%	55.0%	56.8%	47.6%	0.0%	
Separate Pervious Area (SPA, %)	35.4%	25.7%	27.9%	31.3%	13.1%	39.2%	31.7%	19.2%	47.1%	24.4%	18.9%	28.6%	100.0%	
A_R (RPA / UIA)	1.100	1.037	1.314	0.636	1.692	0.741	0.667	0.846	0.571	2.667	2.333	2.000	0.000	
I_a Check	0.480	0.490	0.430	0.610	0.370	0.570	0.600	0.540	0.640	0.270	0.300	0.330	1.000	
f / I for WQCV Event:	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	
f / I for 5-Year Event:	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	
f / I for 100-Year Event:	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	
f / I for Optional User Defined Storm CUHP:	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	
IRF for WQCV Event:	0.59	0.60	0.57	0.67	0.53	0.65	0.66	0.63	0.69	0.47	0.49	0.51	1.00	
IRF for 5-Year Event:	0.89	0.89	0.88	0.91	0.87	0.90	0.91	0.90	0.91	0.85	0.86	0.86	1.00	
IRF for 100-Year Event:	0.91	0.91	0.90	0.93	0.89	0.92	0.93	0.92	0.93	0.88	0.88	0.89	1.00	
IRF for Optional User Defined Storm CUHP:	0.91	0.91	0.90	0.93	0.89	0.92	0.93	0.92	0.93	0.88	0.88	0.89	1.00	
Total Site Imperviousness: I_{total}	43.8%	48.4%	39.3%	51.3%	49.4%	45.4%	51.7%	59.6%	43.5%	20.6%	24.3%	23.8%	0.0%	
Effective Imperviousness for WQCV Event:	36.2%	38.4%	28.4%	42.1%	39.1%	38.0%	43.2%	50.3%	38.4%	9.8%	12.0%	12.1%	0.0%	
Effective Imperviousness for 5-Year Event:	41.7%	45.6%	36.2%	48.7%	46.5%	43.3%	49.3%	57.0%	42.1%	17.5%	20.8%	20.5%	0.0%	
Effective Imperviousness for 100-Year Event:	42.1%	46.2%	36.8%	49.3%	47.0%	43.8%	49.9%	57.6%	42.4%	18.1%	21.4%	21.1%	0.0%	
Effective Imperviousness for Optional User Defined Storm CUHP:	42.1%	46.2%	36.8%	49.3%	47.0%	43.8%	49.9%	57.6%	42.4%	18.1%	21.4%	21.1%	0.0%	

LID / EFFECTIVE IMPERVIOUSNESS CREDITS

WQCV Event CREDIT: Reduce Detention By:	10.7%	13.0%	17.7%	11.6%	13.4%	10.0%	10.7%	11.8%	7.2%	44.3%	41.2%	39.7%	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:	3.9%	4.6%	6.4%	3.8%	4.8%	3.5%	3.5%	3.4%	2.6%	13.5%	12.9%	12.7%	N/A	N/A
User Defined CUHP CREDIT: Reduce Detention By:	3.3%	4.1%	4.9%	3.6%	4.4%	3.0%	3.3%	3.7%	2.1%	8.3%	8.2%	7.8%	0.0%	

Total Site Imperviousness:	**43.5%**
Total Site Effective Imperviousness for WQCV Event:	**35.5%**
Total Site Effective Imperviousness for 5-Year Event:	**41.3%**
Total Site Effective Imperviousness for 100-Year Event:	**41.7%**
Total Site Effective Imperviousness for Optional User Defined Storm CUHP:	**41.7%**

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

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	
***Minor Storm: 1-Hour Rain Depth	5-Year Event	1.50	inches	
***Major Storm: 1-Hour Rain Depth	100-Year Event	2.52	inches	
Optional User Defined Storm	CUHP			
(CUHP) NOAA 1 Hour Rainfall Depth and Frequency for User Defined Storm	100-Year Event	2.52		
Max Intensity for Optional User Defined Storm	2.51496			

Designer:	**Marc A. Whorton, P.E.**
Company:	**Classic Consulting**
Date:	**June 26, 2020**
Project:	**KETTLE CREEK NORTH DEVELOPMENT PLAN - DP 9 (Rain Garden)**
Location:	**Colorado Springs, CO**

SITE INFORMATION (USER-INPUT)

Sub-basin Identifier	OS-8	F2												
Receiving Pervious Area Soil Type	Loamy Sand	Loamy Sand												
Total Area (ac., Sum of DCIA, UIA, RPA, & SPA)	0.780	1.100												
Directly Connected Impervious Area (DCIA, acres)	0.000	0.000												
Unconnected Impervious Area (UIA, acres)	0.000	0.220												
Receiving Pervious Area (RPA, acres)	0.000	0.300												
Separate Pervious Area (SPA, acres)	0.780	0.580												
RPA Treatment Type: Conveyance (C), Volume (V), or Permeable Pavement (PP)	C	C												

CALCULATED RESULTS (OUTPUT)

Total Calculated Area (ac, check against input)	0.780	1.100												
Directly Connected Impervious Area (DCIA, %)	0.0%	0.0%												
Unconnected Impervious Area (UIA, %)	0.0%	20.0%												
Receiving Pervious Area (RPA, %)	0.0%	27.3%												
Separate Pervious Area (SPA, %)	100.0%	52.7%												
A_R (RPA / UIA)	0.000	1.364												
I_a Check	1.000	0.420												
f / I for WQCV Event:	3.6	3.6												
f / I for 5-Year Event:	0.5	0.5												
f / I for 100-Year Event:	0.4	0.4												
f / I for Optional User Defined Storm CUHP:	0.39	0.39												
IRF for WQCV Event:	1.00	0.56												
IRF for 5-Year Event:	1.00	0.88												
IRF for 100-Year Event:	1.00	0.90												
IRF for Optional User Defined Storm CUHP:	1.00	0.90												
Total Site Imperviousness: I_{total}	0.0%	20.0%												
Effective Imperviousness for WQCV Event:	0.0%	11.2%												
Effective Imperviousness for 5-Year Event:	0.0%	17.5%												
Effective Imperviousness for 100-Year Event:	0.0%	18.0%												
Effective Imperviousness for Optional User Defined Storm CUHP:	0.0%	18.0%												

LID / EFFECTIVE IMPERVIOUSNESS CREDITS

WQCV Event CREDIT: Reduce Detention By:	N/A	36.3%	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:	N/A	11.0%	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:	0.0%	6.7%												

Total Site Imperviousness:	**11.7%**
Total Site Effective Imperviousness for WQCV Event:	**6.6%**
Total Site Effective Imperviousness for 5-Year Event:	**10.3%**
Total Site Effective Imperviousness for 100-Year Event:	**10.5%**
Total Site Effective Imperviousness for Optional User Defined Storm CUHP:	**10.5%**

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

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	
***Minor Storm: 1-Hour Rain Depth	5-Year Event	1.50	inches	
***Major Storm: 1-Hour Rain Depth	100-Year Event	2.52	inches	
Optional User Defined Storm	CUHP			
(CUHP) NOAA 1 Hour Rainfall Depth and Frequency for User Defined Storm	100-Year Event	2.52		
Max Intensity for Optional User Defined Storm	2.51496			

Designer: Marc A. Whorton, P.E.
Company: Classic Consulting
Date: June 30, 2020
Project: KETTLE CREEK NORTH DEVELOPMENT PLAN - EXIST. POWERS POND
Location: Colorado Springs, CO

SITE INFORMATION (USER-INPUT)

Sub-basin Identifier	OS-4	D-2A	D-2B	D-3A	D-3B	SS	EE	PP	F3	F4	F5	F6	F7	KCN
Receiving Pervious Area Soil Type	Loamy Sand	Loamy Sand	Loamy Sand	Loamy Sand	Loamy Sand	Loamy Sand	Loamy Sand	Loamy Sand	Loamy Sand	Loamy Sand	Loamy Sand	Loamy Sand	Loamy Sand	Loamy Sand
Total Area (ac., Sum of DCIA, UIA, RPA, & SPA)	11.200	12.400	8.700	4.200	7.000	6.400	7.100	14.700	17.300	36.100	26.900	32.100	34.100	73.500
Directly Connected Impervious Area (DCIA, acres)	1.000	1.000	3.300	2.000	3.500	0.000	3.500	0.500	5.200	13.500	10.300	12.800	13.500	18.400
Unconnected Impervious Area (UIA, acres)	0.200	0.650	1.000	0.500	1.000	0.000	1.500	0.000	2.000	3.700	2.500	3.800	3.500	13.500
Receiving Pervious Area (RPA, acres)	3.500	4.000	2.100	1.500	2.000	0.000	1.500	0.000	7.000	12.600	7.000	8.000	8.500	15.200
Separate Pervious Area (SPA, acres)	6.500	6.750	2.300	0.200	0.500	6.400	0.600	14.200	3.100	6.300	7.100	7.500	8.600	26.400
RPA Treatment Type: Conveyance (C), Volume (V), or Permeable Pavement (PP)	C	C	C	C	C	C	C	C	C	C	C	C	C	C

CALCULATED RESULTS (OUTPUT)

Total Calculated Area (ac, check against input)	11.200	12.400	8.700	4.200	7.000	6.400	7.100	14.700	17.300	36.100	26.900	32.100	34.100	73.500
Directly Connected Impervious Area (DCIA, %)	8.9%	8.1%	37.9%	47.6%	50.0%	0.0%	49.3%	3.4%	30.1%	37.4%	38.3%	39.9%	39.6%	25.0%
Unconnected Impervious Area (UIA, %)	1.8%	5.2%	11.5%	11.9%	14.3%	0.0%	21.1%	0.0%	11.6%	10.2%	9.3%	11.8%	10.3%	18.4%
Receiving Pervious Area (RPA, %)	31.3%	32.3%	24.1%	35.7%	28.6%	0.0%	21.1%	0.0%	40.5%	34.9%	26.0%	24.9%	24.9%	20.7%
Separate Pervious Area (SPA, %)	58.0%	54.4%	26.4%	4.8%	7.1%	100.0%	8.5%	96.6%	17.9%	17.5%	26.4%	23.4%	25.2%	35.9%
A_R (RPA / UIA)	17.500	6.154	2.100	3.000	2.000	0.000	1.000	0.000	3.500	3.405	2.800	2.105	2.429	1.126
I_a Check	0.050	0.140	0.320	0.250	0.330	1.000	0.500	1.000	0.220	0.230	0.260	0.320	0.290	0.470
f / I for WQCV Event:	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6
f / I for 5-Year Event:	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
f / I for 100-Year Event:	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
f / I for Optional User Defined Storm CUHP:	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39
IRF for WQCV Event:	0.11	0.30	0.50	0.46	0.51	1.00	0.61	1.00	0.45	0.45	0.47	0.50	0.49	0.59
IRF for 5-Year Event:	0.21	0.59	0.86	0.85	0.86	1.00	0.89	1.00	0.84	0.84	0.85	0.86	0.85	0.88
IRF for 100-Year Event:	0.22	0.61	0.88	0.87	0.89	1.00	0.91	1.00	0.87	0.87	0.88	0.88	0.88	0.91
IRF for Optional User Defined Storm CUHP:	0.22	0.61	0.88	0.87	0.89	1.00	0.91	1.00	0.87	0.87	0.88	0.88	0.88	0.91
Total Site Imperviousness: I_{total}	10.7%	13.3%	49.4%	59.5%	64.3%	0.0%	70.4%	3.4%	41.6%	47.6%	47.6%	51.7%	49.9%	43.4%
Effective Imperviousness for WQCV Event:	9.1%	9.6%	43.7%	53.1%	57.3%	0.0%	62.1%	3.4%	35.2%	42.0%	42.6%	45.8%	44.6%	35.8%
Effective Imperviousness for 5-Year Event:	9.3%	11.1%	47.8%	57.7%	62.3%	0.0%	68.1%	3.4%	39.8%	46.0%	46.2%	50.0%	48.4%	41.3%
Effective Imperviousness for 100-Year Event:	9.3%	11.2%	48.1%	58.0%	62.7%	0.0%	68.6%	3.4%	40.1%	46.3%	46.4%	50.3%	48.6%	41.7%
Effective Imperviousness for Optional User Defined Storm CUHP:	9.3%	11.2%	48.1%	58.0%	62.7%	0.0%	68.6%	3.4%	40.1%	46.3%	46.4%	50.3%	48.6%	41.7%

LID / EFFECTIVE IMPERVIOUSNESS CREDITS

WQCV Event CREDIT: Reduce Detention By:	12.8%	23.4%	7.4%	8.3%	9.6%	N/A	12.1%	0.0%	9.4%	7.4%	6.5%	7.5%	6.8%	10.7%
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:	15.9%	18.1%	2.7%	2.5%	2.4%	N/A	2.5%	0.1%	3.7%	2.8%	2.4%	2.6%	2.4%	3.9%
User Defined CUHP CREDIT: Reduce Detention By:	7.8%	9.8%	2.5%	2.8%	3.0%	0.0%	3.5%	0.0%	3.0%	2.5%	2.2%	2.5%	2.3%	3.3%

Total Site Imperviousness:	**41.9%**
Total Site Effective Imperviousness for WQCV Event:	**36.4%**
Total Site Effective Imperviousness for 5-Year Event:	**40.3%**
Total Site Effective Imperviousness for 100-Year Event:	**40.6%**
Total Site Effective Imperviousness for Optional User Defined Storm CUHP:	**40.6%**

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 3.07, March 2018)

Designer: Marc A. Whorton, P.E.
Company: Classic Consulting
Date: July 6, 2020
Project: Kettle Creek North Development Plan
Location: Proposed Northerly Storm Outfall Forebay

1. Basin Storage Volume

A) Effective Imperviousness of Tributary Area, I_a — I_a = 41.7 %

B) Tributary Area's Imperviousness Ratio ($i = I_a / 100$) — i = 0.417

C) Contributing Watershed Area — Area = 49.190 ac

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

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

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

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

G) For Watersheds Outside of the Denver Region, Water Quality Capture Volume (WQCV) Design Volume
($V_{WQCV\ OTHER} = (d_6 * (V_{DESIGN}/0.43))$
$V_{DESIGN\ OTHER}$ = 0.738 ac-ft

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

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

J) Excess Urban Runoff Volume (EURV) Design Volume
For HSG A: $EURV_A = 1.68 * i^{1.28}$
For HSG B: $EURV_B = 1.36 * i^{1.08}$
For HSG C/D: $EURV_{C/D} = 1.20 * i^{1.08}$
$EURV_{DESIGN}$ = 2.168 ac-f t

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

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

3. Basin Side Slopes

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

4. Inlet

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

5. Forebay

A) Minimum Forebay Volume
(V_{FMIN} = 3% of the WQCV)
V_{FMIN} = 0.022 ac-ft

B) Actual Forebay Volume
V_F = 0.022 ac-ft

C) Forebay Depth
(D_F = 30 inch maximum)
D_F = 30.0 in

D) Forebay Discharge

i) Undetained 100-year Peak Discharge
Q_{100} = 115.00 cfs

ii) Forebay Discharge Design Flow
($Q_F = 0.02 * Q_{100}$)
Q_F = 2.30 cfs

E) Forebay Discharge Design

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

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

G) Rectangular Notch Width
Calculated W_N = 8.1 in

Design Procedure Form: Rain Garden (RG)

UD-BMP (Version 3.07, March 2018)

Designer: Marc A. Whorton, P.E.
Company: Classic Consulting
Date: July 9, 2020
Project: Kettle Creek North
Location: Design Point 9

1. Basin Storage Volume		
A) Effective Imperviousness of Tributary Area, I_a (100% if all paved and roofed areas upstream of rain garden)	I_a = 10.5	%
B) Tributary Area's Imperviousness Ratio (i = I_a/100)	i = 0.105	
C) Water Quality Capture Volume (WQCV) for a 12-hour Drain Time (WQCV= 0.8 * (0.91* i^3 - 1.19 * i^2 + 0.78 * i)	WQCV = 0.06	watershed inches
D) Contributing Watershed Area (including rain garden area)	Area = 81,893	sq ft
E) Water Quality Capture Volume (WQCV) Design Volume Vol = (WQCV / 12) * Area	V_{WQCV} =	cu ft
F) For Watersheds Outside of the Denver Region, Depth of Average Runoff Producing Storm	d_6 = 0.42	in
G) For Watersheds Outside of the Denver Region, Water Quality Capture Volume (WQCV) Design Volume	$V_{WQCV\ OTHER}$ = 372	cu ft
H) User Input of Water Quality Capture Volume (WQCV) Design Volume (Only if a different WQCV Design Volume is desired)	$V_{WQCV\ USER}$ =	cu ft
2. Basin Geometry		
A) WQCV Depth (12-inch maximum)	D_{WQCV} = 12	in
B) Rain Garden Side Slopes (Z = 4 min., horiz. dist per unit vertical) (Use "0" if rain garden has vertical walls)	Z = 4.00	ft / ft
C) Mimimum Flat Surface Area	A_{Min} = 172	sq ft
D) Actual Flat Surface Area	A_{Actual} = 1060	sq ft
E) Area at Design Depth (Top Surface Area)	A_{Top} = 2180	sq ft
F) Rain Garden Total Volume (V_T= ((A_{Top} + A_{Actual}) / 2) * Depth)	V_T= 1,620	cu ft
3. Growing Media	Choose One: (•) 18" Rain Garden Growing Media ( ) Other (Explain):	
4. Underdrain System		
A) Are underdrains provided?	Choose One: (•) YES ( ) NO	
B) Underdrain system orifice diameter for 12 hour drain time		
i) Distance From Lowest Elevation of the Storage Volume to the Center of the Orifice	y = 2.0	ft
ii) Volume to Drain in 12 Hours	Vol_{12} = 372	cu ft
iii) Orifice Diameter, 3/8" Minimum	D_O = 7/16	in

Design Procedure Form: Rain Garden (RG)

Designer: Marc A. Whorton, P.E.
Company: Classic Consulting
Date: July 9, 2020
Project: Kettle Creek North
Location: Design Point 9

5. Impermeable Geomembrane Liner and Geotextile Separator Fabric A) Is an impermeable liner provided due to proximity of structures or groundwater contamination?	Choose One ○ YES ◉ NO
6. Inlet / Outlet Control A) Inlet Control	Choose One ○ Sheet Flow- No Energy Dissipation Required ◉ Concentrated Flow- Energy Dissipation Provided
7. Vegetation	Choose One ◉ Seed (Plan for frequent weed control) ○ Plantings ○ Sand Grown or Other High Infiltration Sod
8. Irrigation A) Will the rain garden be irrigated?	Choose One ○ YES ○ NO

Notes:

DETENTION CALCULATIONS

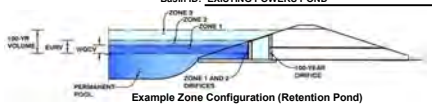
CLASSIC SM
CONSULTING
ENGINEERS & SURVEYORS

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

UD-Detention, Version 3.07 (February 2017)

Project: KETTLE CREEK NORTH DEVELOPMENT PLAN

Basin ID: EXISTING POWERS POND



Example Zone Configuration (Retention Pond)

Required Volume Calculation

Selected BMP Type =	EDB		
Watershed Area =	291.70	acres	
Watershed Length =	7,250	ft	
Watershed Slope =	0.030	ft/ft	
Watershed Imperviousness =	40.60%	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) =	4.410	acre-feet	
Excess Urban Runoff Volume (EURV) =	12.452	acre-feet	
2-yr Runoff Volume (P1 = 1.19 in.) =	9.834	acre-feet	1.19 inches
5-yr Runoff Volume (P1 = 1.5 in.) =	13.661	acre-feet	1.50 inches
10-yr Runoff Volume (P1 = 1.75 in.) =	19.340	acre-feet	1.75 inches
25-yr Runoff Volume (P1 = 2 in.) =	28.924	acre-feet	2.00 inches
50-yr Runoff Volume (P1 = 2.25 in.) =	35.392	acre-feet	2.25 inches
100-yr Runoff Volume (P1 = 2.52 in.) =	43.867	acre-feet	2.52 inches
500-yr Runoff Volume (P1 = 3.85 in.) =	74.813	acre-feet	3.85 inches
Approximate 2-yr Detention Volume =	9.193	acre-feet	
Approximate 5-yr Detention Volume =	12.824	acre-feet	
Approximate 10-yr Detention Volume =	17.600	acre-feet	
Approximate 25-yr Detention Volume =	19.646	acre-feet	
Approximate 50-yr Detention Volume =	20.610	acre-feet	
Approximate 100-yr Detention Volume =	23.573	acre-feet	

Optional User Override 1-hr Precipitation

Stage-Storage Calculation

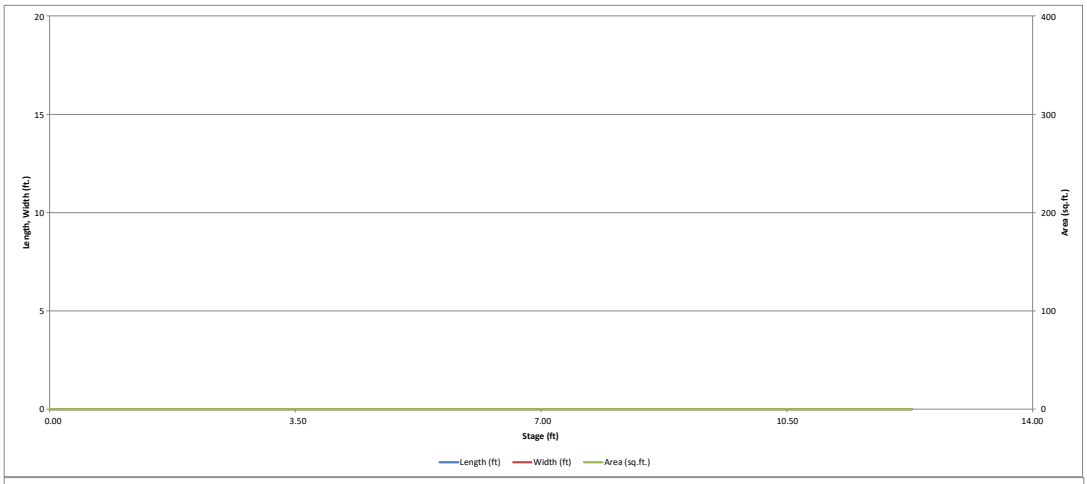
Zone 1 Volume (WQCV) =	4.410	acre-feet
Zone 2 Volume (EURV - Zone 1) =	8.041	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	11.122	acre-feet
Total Detention Basin Volume =	23.573	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	user	acre-feet

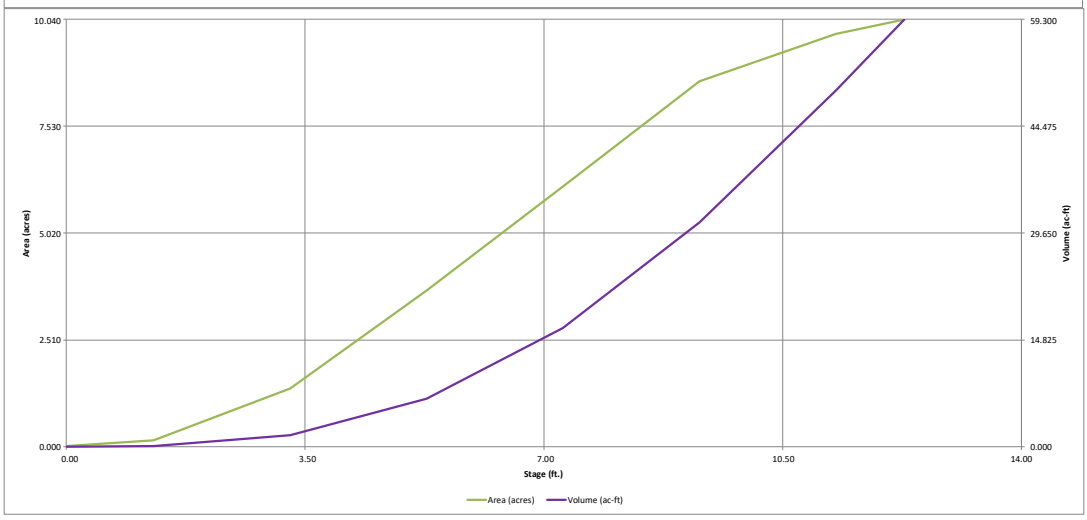
Depth Increment = ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	908	0.021		
6836	--	1.28	--	--	--	6,828	0.157	4,883	0.112
6838	--	3.28	--	--	--	59,721	1.371	71,500	1.641
6840	--	5.28	--	--	--	159,827	3.669	291,048	6.682
6842	--	7.28	--	--	--	266,099	6.109	716,973	16.459
6844	--	9.28	--	--	--	373,792	8.581	1,356,864	31.149
6846	--	11.28	--	--	--	422,367	9.696	2,153,023	49.427
6847	--	12.28	--	--	--	437,298	10.039	2,582,856	59.294

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

UD-Detention, Version 3.07 (February 2017)



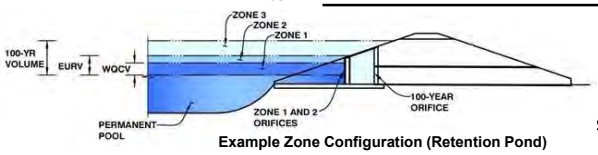


Detention Basin Outlet Structure Design

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)	4.59	4.410	Orifice Plate
Zone 2 (EURV)	6.58	8.041	Orifice Plate
Zone 3 (100-year)	8.34	11.122	Weir&Pipe (Restrict)
		23.573	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 =	7.43	ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing =	30.00	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	2.50	5.00					
Orifice Area (sq. inches)	16.00	16.00	32.00					

	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 =	7.43	N/A	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	30.00	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 % =	65%	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 =	8.43	N/A	feet
Over Flow Weir Slope Length =	4.12	N/A	feet
Grate Open Area / 100-yr Orifice Area =	6.40	N/A	should be ≥ 4
Overflow Grate Open Area w/o Debris =	80.40	N/A	ft^2
Overflow Grate Open Area w/ Debris =	40.20	N/A	ft^2

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

	Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	0.22	N/A	ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter =	48.00	N/A	inches
Restrictor Plate Height Above Pipe Invert =	48.00		inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 3 Restrictor	Not Selected	
Outlet Orifice Area =	12.57	N/A	ft^2
Outlet Orifice Centroid =	2.00	N/A	feet
Half-Central Angle of Restrictor Plate on Pipe =	3.14	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	9.53	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	200.00	feet
Spillway End Slopes =	4.00	H:V
Freeboard above Max Water Surface =	1.00	feet

Calculated Parameters for Spillway

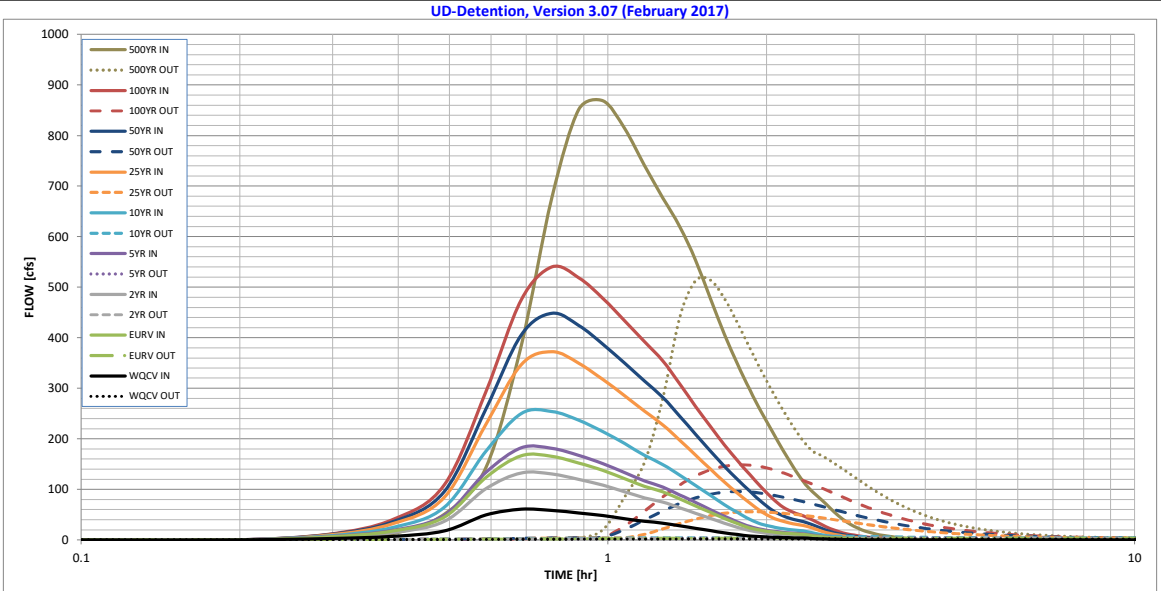
Spillway Design Flow Depth=	0.92	feet
Stage at Top of Freeboard =	11.45	feet
Basin Area at Top of Freeboard =	9.75	acres

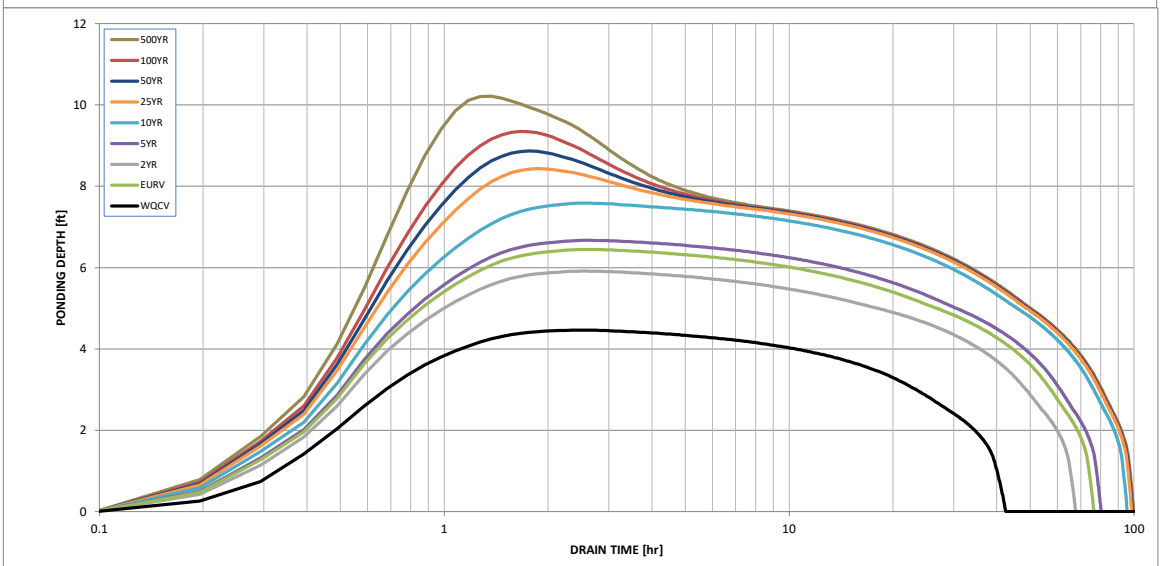
Routed Hydrograph Results

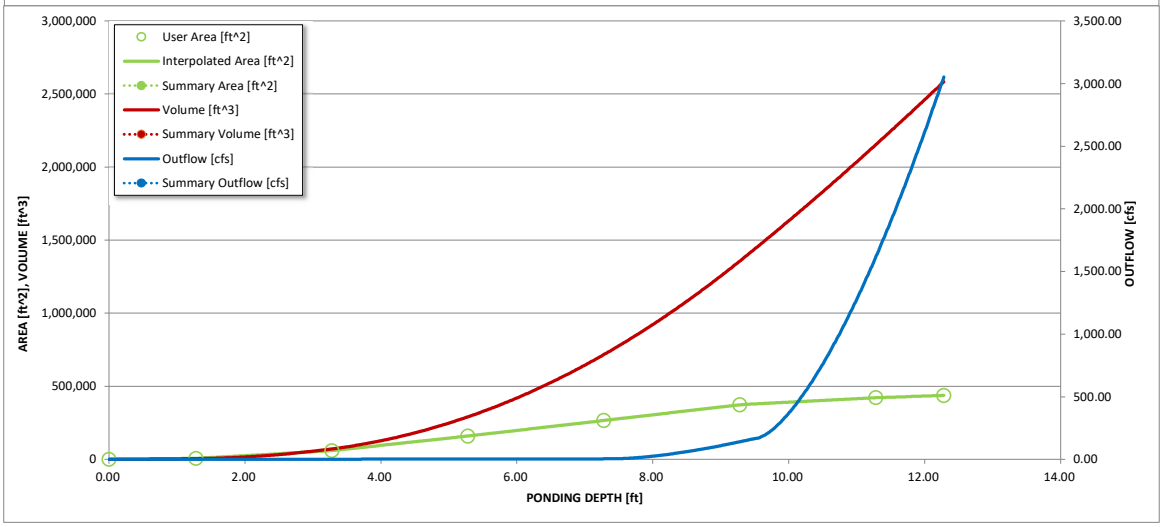
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	0.53	1.07	1.19	1.50	1.75	2.00	2.25	2.52	3.85
Calculated Runoff Volume (acre-ft) =	4.410	12.452	9.834	13.661	19.340	28.924	35.392	43.867	74.813
OPTIONAL Override Runoff Volume (acre-ft) =									
Inflow Hydrograph Volume (acre-ft) =	4.408	12.438	9.827	13.649	19.326	28.913	35.373	43.843	74.777
Predevelopment Unit Peak Flow, q (cfs/acre) =	0.00	0.00	0.01	0.02	0.16	0.54	0.75	1.02	1.86
Predevelopment Peak Q (cfs) =	0.0	0.0	2.9	4.912	46.1	158.7	220.0	298.5	542.9
Peak Inflow Q (cfs) =	60.8	166.6	132.7	182.2	254.1	372.3	448.4	540.2	868.8
Peak Outflow Q (cfs) =	1.9	3.7	3.3	3.856	7.2	56.0	95.8	148.5	514.0
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.8	0.2	0.4	0.4	0.5	0.9
Structure Controlling Flow =	Plate	Plate	Plate	Plate	Overflow Grate 1	Overflow Grate 1	Overflow Grate 1	Overflow Grate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	0.0	0.6	1.1	1.8	2.1
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	39	69	61	72	85	84	82	80	73
Time to Drain 99% of Inflow Volume (hours) =	41	73	65	77	91	92	92	91	86
Maximum Ponding Depth (ft) =	4.46	6.44	5.91	6.67	7.58	8.43	8.87	9.35	10.21
Area at Maximum Ponding Depth (acres) =	2.73	5.08	4.44	5.35	6.48	7.52	8.06	8.61	9.09
Maximum Volume Stored (acre-ft) =	4.059	11.758	9.235	12.906	18.348	24.227	27.654	31.665	39.280

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]
5.87 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:52	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hydrograph	0:11:44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Constant	0:17:37	2.51	5.84	4.89	6.25	7.81	9.44	10.25	11.08	12.74
0.851	0:23:29	6.99	17.63	14.39	19.07	24.98	32.15	36.13	40.60	50.91
	0:29:21	17.94	45.31	36.98	49.03	64.41	84.37	95.80	108.74	142.84
	0:35:13	49.19	123.67	101.07	133.74	175.30	228.42	258.74	293.25	385.68
	0:41:05	60.76	166.60	132.69	182.16	250.13	347.05	406.09	475.75	677.04
	0:46:58	58.51	165.13	130.36	181.25	254.06	372.26	448.39	540.17	851.57
	0:52:50	53.32	152.08	119.70	167.14	236.59	349.53	424.35	518.65	868.77
	0:58:42	48.03	137.30	108.02	150.93	214.23	316.95	386.78	477.66	813.51
	1:04:34	42.04	121.12	95.11	133.23	190.33	285.24	349.59	433.38	740.38
	1:10:26	36.71	106.12	83.29	116.76	167.51	254.67	314.02	391.68	676.46
	1:16:19	33.12	94.86	74.63	104.26	148.79	227.51	281.86	353.78	619.42
	1:22:11	27.78	80.84	63.33	89.01	128.16	197.06	244.30	308.27	553.17
	1:28:03	23.03	67.32	52.69	74.15	107.50	167.53	208.77	264.14	476.86
	1:33:55	18.26	54.27	42.31	59.87	87.96	139.77	175.64	224.04	407.33
	1:39:47	14.12	42.48	33.04	46.91	69.87	114.50	145.81	188.35	348.03
	1:45:40	10.56	32.28	25.02	35.72	54.30	92.52	119.59	156.88	296.69
	1:51:32	7.91	23.81	18.50	26.39	40.88	72.96	96.35	129.14	252.84
	1:57:24	6.35	18.80	14.67	20.78	31.40	56.09	75.53	103.97	213.19
	2:03:16	5.35	15.72	12.29	17.34	25.83	43.95	58.08	81.73	176.83
	2:09:08	4.65	13.57	10.63	14.96	22.09	36.66	47.56	64.59	143.67
	2:15:01	4.16	12.07	9.47	13.29	19.51	31.84	40.86	54.23	115.33
	2:20:53	3.81	11.00	8.64	12.10	17.66	28.43	36.22	47.54	95.33
	2:26:45	2.84	8.54	6.63	9.45	14.07	23.24	29.90	39.51	79.30
	2:32:37	2.06	6.15	4.78	6.80	10.20	17.30	22.59	30.29	63.00
	2:38:29	1.52	4.57	3.55	5.05	7.52	12.57	16.45	22.36	47.73
	2:44:22	1.13	3.39	2.64	3.75	5.60	9.32	12.11	16.53	35.74
	2:50:14	0.83	2.51	1.95	2.78	4.17	7.05	9.20	12.34	26.68
	2:56:06	0.60	1.82	1.41	2.01	3.05	5.28	6.92	9.39	20.02
	3:01:58	0.43	1.31	1.02	1.45	2.22	3.92	5.19	7.07	15.17
	3:07:50	0.30	0.94	0.73	1.04	1.63	2.92	3.89	5.35	11.56
	3:13:43	0.20	0.63	0.48	0.70	1.13	2.15	2.93	4.09	8.86
	3:19:35	0.11	0.38	0.29	0.42	0.72	1.49	2.10	3.04	6.92
	3:25:27	0.05	0.19	0.14	0.22	0.40	0.96	1.41	2.14	5.27
	3:31:19	0.01	0.06	0.05	0.08	0.18	0.54	0.86	1.40	3.85
	3:37:11	0.00	0.00	0.00	0.00	0.04	0.24	0.44	0.82	2.65
	3:43:04	0.00	0.00	0.00	0.00	0.00	0.06	0.16	0.39	1.68
	3:48:56	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.12	0.92
	3:54:48	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.39
	4:00:40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.08
	4:06:32	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:12:25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:18:17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:24:09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:53	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:41:46	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:47:38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:53:30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:59:22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:11:07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:16:59	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:22:51	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:28:43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:34:35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:46:20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:52:12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:58:04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:03:56	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:09:49	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:15:41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:21:33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:27:25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:33:17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:39:10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:45:02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:50:54	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:56:46	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	7:02:38	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.

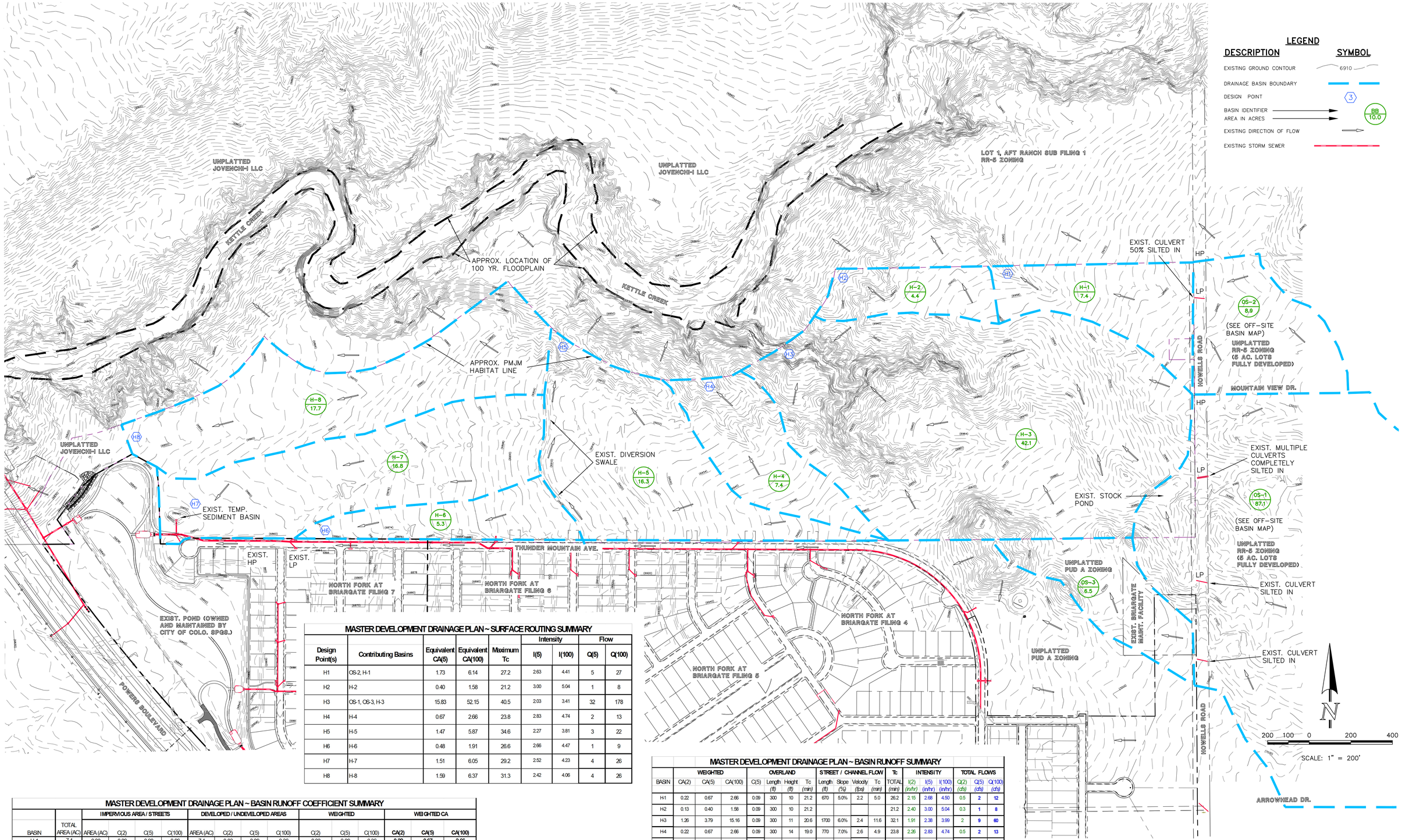
The user should graphically compare the summary S-A-V-D table to the full S-A-V-D table in the chart to confirm it captures all key transition points.

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).

DRAINAGE MAPS



MASTER DEVELOPMENT DRAINAGE PLAN ~ SURFACE ROUTING SUMMARY

Design Point(s)	Contributing Basins	Equivalent CA(5)	Equivalent CA(100)	Maximum Tc	Intensity I(5)	Intensity I(100)	Flow Q(5)	Flow Q(100)
H1	OS-2, H-1	1.73	6.14	27.2	2.63	4.41	5	27
H2	H-2	0.40	1.58	21.2	3.00	5.04	1	8
H3	OS-1, OS-3, H-3	15.83	52.15	40.5	2.03	3.41	32	178
H4	H-4	0.67	2.66	23.8	2.83	4.74	2	13
H5	H-5	1.47	5.87	34.6	2.27	3.81	3	22
H6	H-6	0.48	1.91	26.6	2.66	4.47	1	9
H7	H-7	1.51	6.05	29.2	2.52	4.23	4	26
H8	H-8	1.59	6.37	31.3	2.42	4.06	4	26

MASTER DEVELOPMENT DRAINAGE PLAN ~ BASIN RUNOFF COEFFICIENT SUMMARY

BASIN	TOTAL AREA (AC)	IMPERVIOUS AREA / STREETS AREA (AC)	C(2)	C(5)	C(100)	DEVELOPED / UNDEVELOPED AREAS AREA (AC)	C(2)	C(5)	C(100)	WEIGHTED C(2)	WEIGHTED C(5)	WEIGHTED C(100)	WEIGHTED CA CA(2)	CA(5)	CA(100)
H-1	7.4	0.00	0.89	0.90	0.96	7.4	0.03	0.09	0.36	0.03	0.09	0.36	**0.22**	**0.67**	**2.66**
H-2	4.4	0.00	0.89	0.90	0.96	4.4	0.03	0.09	0.36	0.03	0.09	0.36	**0.13**	**0.40**	**1.58**
H-3	42.1	0.00	0.89	0.90	0.96	42.1	0.03	0.09	0.36	0.03	0.09	0.36	**1.26**	**3.79**	**15.16**
H-4	7.4	0.00	0.89	0.90	0.96	7.4	0.03	0.09	0.36	0.03	0.09	0.36	**0.22**	**0.67**	**2.66**
H-5	16.3	0.00	0.89	0.90	0.96	16.3	0.03	0.09	0.36	0.03	0.09	0.36	**0.49**	**1.47**	**5.87**
H-6	5.3	0.00	0.89	0.90	0.96	5.3	0.03	0.09	0.36	0.03	0.09	0.36	**0.16**	**0.48**	**1.91**
H-7	16.8	0.00	0.89	0.90	0.96	16.8	0.03	0.09	0.36	0.03	0.09	0.36	**0.50**	**1.51**	**6.05**
H-8	17.7	0.00	0.89	0.90	0.96	17.7	0.03	0.09	0.36	0.03	0.09	0.36	**0.53**	**1.59**	**6.37**
OS-1	87.1	0.00	0.89	0.90	0.96	87.1	0.05	0.12	0.39	0.05	0.12	0.39	**4.36**	**10.45**	**33.97**
OS-2	8.9	0.00	0.89	0.90	0.96	8.9	0.05	0.12	0.39	0.05	0.12	0.39	**0.45**	**1.07**	**3.47**
OS-3	6.5	2.00	0.57	0.59	0.70	4.5	0.03	0.09	0.36	0.20	0.24	0.46	**1.28**	**1.59**	**3.02**

MASTER DEVELOPMENT DRAINAGE PLAN ~ BASIN RUNOFF SUMMARY

BASIN	WEIGHTED CA(2)	WEIGHTED CA(5)	WEIGHTED CA(100)	OVERLAND C(5)	OVERLAND Length (ft)	OVERLAND Height (ft)	OVERLAND Tc (min)	STREET / CHANNEL FLOW Length (ft)	Slope (%)	Velocity (fps)	Tc (min)	Tc TOTAL (min)	INTENSITY I(2) (in/hr)	INTENSITY I(5) (in/hr)	INTENSITY I(100) (in/hr)	TOTAL FLOWS Q(2) (cfs)	Q(5) (cfs)	Q(100) (cfs)
H-1	0.22	0.67	2.66	0.09	300	10	21.2	670	5.0%	2.2	5.0	26.2	2.15	2.68	4.50	0.5	**2**	**12**
H-2	0.13	0.40	1.58	0.09	300	10	21.2					21.2	2.40	3.00	5.04	0.3	**1**	**8**
H-3	1.26	3.79	15.16	0.09	300	11	20.6	1700	6.0%	2.4	11.6	32.1	1.91	2.38	3.99	2	**9**	**60**
H-4	0.22	0.67	2.66	0.09	300	14	19.0	770	7.0%	2.6	4.9	23.8	2.26	2.83	4.74	0.5	**2**	**13**
H-5	0.49	1.47	5.87	0.09	300	10	21.2	1600	4.0%	2.0	13.3	34.6	1.82	2.27	3.81	0.9	**3**	**22**
H-6	0.16	0.48	1.91	0.09	300	14	19.0	850	3.5%	1.9	7.6	26.6	2.13	2.66	4.47	0.3	**1**	**9**
H-7	0.50	1.51	6.05	0.09	300	8	22.9	600	2.5%	1.6	6.3	29.2	2.02	2.52	4.23	1	**4**	**26**
H-8	0.53	1.59	6.37	0.09	300	7	23.9	700	2.5%	1.6	7.4	31.3	1.94	2.42	4.06	1	**4**	**26**
OS-1	4.36	10.45	33.97	0.12	300	14	18.4	2200	3.5%	2.4	15.1	33.5	1.85	2.32	3.89	8	**24**	**132**
OS-2	0.45	1.07	3.47	0.12	300	12	19.4	270	3.7%	1.9	2.3	21.7	2.37	2.96	4.98	1	**3**	**17**
OS-3	1.28	1.59	3.02	0.09	300	10	21.2	500	3.2%	1.8	4.7	25.9	2.16	2.70	4.54	3	**4**	**14**

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KETTLE CREEK NORTH DEVELOPMENT & KETTLE CREEK NORTH FILING NO. 1

PRELIMINARY & FINAL DRAINAGE REPORT

DEVELOPED DRAINAGE MAP

CLASSIC CONSULTING

DESIGNED BY	MAW	SCALE		DATE	7/2/20
DRAWN BY	MAW	(H) 1"= 200'		SHEET	1 OF 4
CHECKED BY		(V) 1"= N/A		JOB NO.	2553.00

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FINAL DRAINAGE REPORT ~ BASIN RUNOFF SUMMARY

BASIN	WEIGHTED CA(2)	WEIGHTED CA(5)	WEIGHTED CA(100)	OVERLAND C(5)	OVERLAND Length (ft)	OVERLAND Height (ft)	OVERLAND Tc (min)	STREET / CHANNEL FLOW Length (ft)	STREET / CHANNEL FLOW Slope (%)	STREET / CHANNEL FLOW Velocity (fps)	STREET / CHANNEL FLOW Tc (min)	Tc TOTAL (min)	INTENSITY I(2) (in/hr)	INTENSITY I(5) (in/hr)	INTENSITY I(100) (in/hr)	TOTAL FLOWS Q(2) (cfs)	TOTAL FLOWS Q(5) (cfs)	TOTAL FLOWS Q(100) (cfs)
OS-1	3.70	4.17	6.33	0.08	100	2	14.7	840	3.5%	3.7	3.7	18.4	2.57	3.22	5.40	10	13	34
OS-2	0.73	0.79	1.08	0.08	100	2	14.7	420	4.0%	4.0	1.8	16.4	2.71	3.39	5.69	2	3	6
OS-3	0.59	0.64	0.85	0.08	100	2	14.7	420	4.0%	4.0	1.8	16.4	2.71	3.39	5.69	2	2	5
OS-4	0.09	0.11	0.19	0.08	50	2	8.2					8.2	3.53	4.42	7.42	0.3	0.5	1.4
OS-5	0.01	0.02	0.11	0.08	30	2	5.4					5.4	4.03	5.06	8.49	0.0	0.1	0.9
OS-6	0.39	0.42	0.55	0.08	100	2	14.7	360	4.0%	4.0	1.6	16.3	2.72	3.40	5.71	1	1	3
OS-7	0.54	0.55	0.63	0.08	20	0.5	6.1	1100	4.0%	4.0	4.6	10.7	3.22	4.03	6.77	2	2	4
OS-8	0.02	0.05	0.27	0.08	240	26	13.0					13.0	2.98	3.74	6.27	0.0	0.2	1.7
OS-9	0.24	0.25	0.28	0.08	20	0.5	6.1	450	4.0%	4.0	1.9	8.0	3.57	4.47	7.51	0.9	1.1	2.1
OS-10	0.24	0.25	0.29	0.08	20	0.5	6.1	450	4.0%	4.0	1.9	8.0	3.57	4.47	7.51	0.9	1.1	2.2
OS-11	0.62	0.65	0.77	0.08	50	1.5	9.1	250	1.5%	2.4	1.7	10.8	3.21	4.02	6.75	2	3	5
A	0.69	0.75	1.02	0.08	100	2	14.7	250	1.5%	2.4	1.7	16.4	2.71	3.39	5.69	2	3	6
B	0.69	0.77	1.12	0.08	100	2	14.7	360	2.2%	3.0	2.0	16.7	2.69	3.36	5.64	2	3	6
C	0.42	0.45	0.58	0.08	50	1	10.4	360	2.2%	3.0	2.0	12.4	3.04	3.81	6.39	1	2	4
D	0.86	0.96	1.44	0.08	100	2	14.7	400	2.0%	2.8	2.4	17.0	2.66	3.33	5.59	2	3	8
E	1.01	1.09	1.45	0.08	100	2	14.7	700	4.2%	4.1	2.8	17.5	2.63	3.29	5.52	3	4	8
F1	0.00	0.02	0.07	0.08	55	4	7.1					7.1	3.70	4.64	7.80	0.0	0.1	0.6
F2	0.21	0.27	0.52	0.08	70	7	7.2	120	1.5%	2.4	0.8	8.0	3.55	4.46	7.49	1	1	4

FINAL DRAINAGE REPORT ~ BASIN RUNOFF SUMMARY

BASIN	WEIGHTED CA(2)	WEIGHTED CA(5)	WEIGHTED CA(100)	OVERLAND C(5)	OVERLAND Length (ft)	OVERLAND Height (ft)	OVERLAND Tc (min)	STREET / CHANNEL FLOW Length (ft)	STREET / CHANNEL FLOW Slope (%)	STREET / CHANNEL FLOW Velocity (fps)	STREET / CHANNEL FLOW Tc (min)	Tc TOTAL (min)	INTENSITY I(2) (in/hr)	INTENSITY I(5) (in/hr)	INTENSITY I(100) (in/hr)	TOTAL FLOWS Q(2) (cfs)	TOTAL FLOWS Q(5) (cfs)	TOTAL FLOWS Q(100) (cfs)
G	0.16	0.17	0.23	0.08	100	2	14.7	100	2.0%	2.8	0.6	15.2	2.79	3.50	5.87	0.5	0.6	1.3
H	0.14	0.16	0.25	0.08	100	2	14.7	60	1.5%	2.4	0.4	15.1	2.81	3.52	5.90	0.4	0.6	1.4
I	0.38	0.42	0.64	0.08	100	2	14.7	160	2.0%	2.8	0.9	15.6	2.77	3.46	5.81	1	1	4
J	0.76	0.85	1.27	0.08	100	2	14.7	360	2.0%	2.8	2.1	16.8	2.68	3.35	5.63	2	3	7
K	0.44	0.47	0.58	0.08	50	1	10.4	360	2.0%	2.8	2.1	12.5	3.03	3.80	6.37	1	2	4
L	0.86	0.95	1.38	0.08	100	2	14.7	400	1.5%	2.4	2.7	17.4	2.64	3.30	5.54	2	3	8
M	0.49	0.51	0.63	0.08	50	1	10.4	400	1.5%	2.4	2.7	13.1	2.98	3.73	6.26	1	2	4
N	0.89	0.94	1.19	0.08	100	2	14.7	170	1.5%	2.4	1.2	15.8	2.75	3.44	5.78	2	3	7
O	0.82	0.89	1.21	0.08	100	2	14.7	300	1.5%	2.4	2.0	16.7	2.69	3.36	5.64	2	3	7
P	0.52	0.56	0.70	0.08	100	2	14.7	450	3.0%	3.5	2.2	16.8	2.68	3.35	5.62	1	2	4
Q	0.18	0.23	0.46	0.08	60	3	8.4	300	4.0%	4.0	1.3	9.6	3.34	4.18	7.03	1	1	3
R	0.46	0.49	0.66	0.08	100	2	14.7	300	4.0%	4.0	1.3	15.9	2.74	3.43	5.76	1	2	4
S	0.72	0.82	1.31	0.08	100	2	14.7	515	2.0%	2.8	3.0	17.7	2.62	3.27	5.50	2	3	7
T	0.53	0.56	0.67	0.08	50	1	10.4	520	2.0%	2.8	3.1	13.4	2.94	3.69	6.19	2	2	4
U	0.82	0.93	1.45	0.08	100	2	14.7	350	1.5%	2.4	2.4	17.0	2.66	3.33	5.59	2	3	8
V	0.45	0.48	0.65	0.08	100	2	14.7	100	1.5%	2.4	0.7	15.3	2.79	3.49	5.86	1	2	4
W	1.05	1.13	1.51	0.08	100	2	14.7	650	2.5%	3.2	3.4	18.1	2.59	3.24	5.44	3	4	8
X	0.54	0.58	0.75	0.08	100	2	14.7	150	1.5%	2.4	1.0	15.7	2.76	3.46	5.80	2	2	4
Y	0.52	0.58	0.87	0.08	100	2	14.7	200	1.5%	2.4	1.4	16.0	2.73	3.42	5.75	1	2	5
Z	1.09	1.18	1.61	0.08	100	2	14.7	560	1.5%	2.4	3.8	18.5	2.57	3.21	5.39	3	4	9
AA	0.04	0.18	0.77	0.08	80	2	12.2					12.2	3.06	3.83	6.44	0.1	0.7	5
BB1	0.52	0.56	0.77	0.08	100	2	14.7	200	2.0%	2.8	1.2	15.8	2.75	3.44	5.78	1	2	4
BB2	0.17	0.19	0.26	0.08	50	1	10.4	200	2.0%	2.8	1.2	11.5	3.12	3.91	6.57	0.5	0.7	1.7

FINAL DRAINAGE REPORT ~ PIPE ROUTING SUMMARY

Pipe Run	Contributing Basins	Equivalent CA(5)	Equivalent CA(100)	Maximum Tc	Intensity I(5)	Intensity I(100)	Flow Q(5)	Flow Q(100)	Pipe Size*
37	DP-11	0.85	1.27	16.8	3.35	5.63	3	7	18" RCP
38	DP-12	0.47	0.58	12.5	3.80	6.37	2	4	18" RCP
39	PR-37, PR-38	1.31	1.85	17.2	3.32	5.57	4	10	24" RCP
40	DP-13	0.95	1.38	17.4	3.30	5.54	3	8	18" RCP
41	DP-14	0.51	0.63	13.1	3.73	6.26	2	4	18" RCP
42	PR-40, PR-41	1.47	2.01	17.5	3.29	5.53	5	11	24" RCP
43	PR-39, PR-42	2.78	3.85	17.6	3.28	5.51	9	21	30" RCP
44	DP-28 Colleded	0.56	0.76	15.8	3.44	5.78	2	4	18" RCP
45	DP-29 Colleded	0.17	0.24	11.5	3.91	6.57	0.6	1.5	18" RCP
46	PR-44, PR-45	0.73	1.00	15.9	3.43	5.76	2	6	18" RCP
47	DP-31 Colleded	0.95	1.09	17.4	3.29	5.53	3.1	6.0	18" RCP
48	DP-32 Colleded	0.51	0.70	13.1	3.72	6.24	2	4	18" RCP
49	PR-47, PR-48	1.46	1.79	17.4	3.29	5.53	5	10	24" RCP
50	DP-33	1.46	2.23	17.7	3.27	5.49	4.7	12	Ex. 18"" RCP
51	North Fork Filing 3-7 FDR Amendment 1 PR-14	23.45	34.84	23.3	2.86	4.80	67	167	Ex. 48" RCP
52	DP-10 Colleded	0.59	1.21	16.3	3.40	5.71	2	7	Ex. 18"" RCP
53	PR-51, PR-52	24.04	36.05	23.3	2.86	4.80	69	173	Ex. 48" RCP
54	North Fork Filing 3-7 FDR Amendment 1 PR-17	0.82	0.87	9.5	4.21	7.06	3	6	Ex. 18"" RCP
55	PR-53, PR-54	24.86	36.92	23.6	2.84	4.77	71	176	Ex. 48" RCP
56	North Fork Filing 3-7 FDR Amendment 1 PR-19	1.00	1.01	10.3	4.08	6.86	4	7	Ex. 18"" RCP
57	PR-55, PR-56	25.86	37.93	23.8	2.83	4.75	73	180	Ex. 48" RCP
58	North Fork Filing 3-7 FDR Amendment 1 PR-24	7.52	9.46	10.3	4.08	6.86	31	65	Ex. 36" RCP
59	PR-57, PR-58	33.38	47.39	24.0	2.82	4.73	94	224	Ex. 54" RCP
60	DP-15 Colleded, PR-43	3.91	5.47	17.6	3.28	5.51	13	30	Ex. 36" RCP
61	PR-59, PR-60	37.29	52.85	24.0	2.82	4.73	105	250	Ex. 60" RCP
62	PR-61, PR-46	38.02	53.85	24.0	2.82	4.73	107	255	Ex. 60" RCP

FINAL DRAINAGE REPORT ~ SURFACE ROUTING SUMMARY

Design Point(s)	Contributing Basins	Equivalent CA(5)	Equivalent CA(100)	Maximum Tc	Intensity I(5)	Intensity I(100)	Flow Q(5)	Flow Q(100)	Inlet Size
1	OS-1	4.17	5.69	18.4	3.22	5.40	13	31	Future Inlets
2	OS-2	0.79	1.08	16.4	3.39	5.69	3	6	Future curb flow
3	OS-3	0.64	0.85	16.4	3.39	5.69	2	5	Future curb flow
4	DP-2, OS-4, A	1.65	2.30	16.6	3.37	5.66	6	13	Prop. Crosspan
5	B	0.77	1.12	16.7	3.36	5.64	3	6	Prop. 5' At-grade Inlet
6	DP-4, C and Flow-by from DP-5	2.30	3.43	16.7	3.36	5.64	8	19	Prop. 10' Type R At-grade Inlet
7	D and Flow-by from DP-6	1.40	3.12	17.7	3.27	5.50	5	17	Prop. 10' Type R Sump Inlet
8	DP-3, E	1.72	2.30	17.5	3.29	5.52	6	13	Prop. 10' Type R Sump Inlet
9	OS-8, F-2	0.33	0.79	13.0	3.74	6.27	1	5	SWQ Facility
10	OS-6, G and portion of 100 yr. Flow-by from OS-1	0.59	1.40	16.3	3.40	5.71	2	8	Ex. 10' D-10-R At-grade Inlet
11	J	0.85	1.27	16.8	3.35	5.63	3	7	Prop. 5' Type R Sump Inlet
12	K	0.47	0.58	12.5	3.80	6.37	2	4	Prop. 5' Type R Sump Inlet
13	L	0.95	1.38	17.4	3.30	5.54	3	8	Prop. 5' Type R Sump Inlet
14	M	0.51	0.63	13.1	3.73	6.26	2	4	Prop. 5' Type R Sump Inlet
15	OS-7, H, I and Flow-by from DP-10	1.13	1.70	15.6	3.46	5.81	4	10	Ex. 14' D-10-R At-grade Inlet

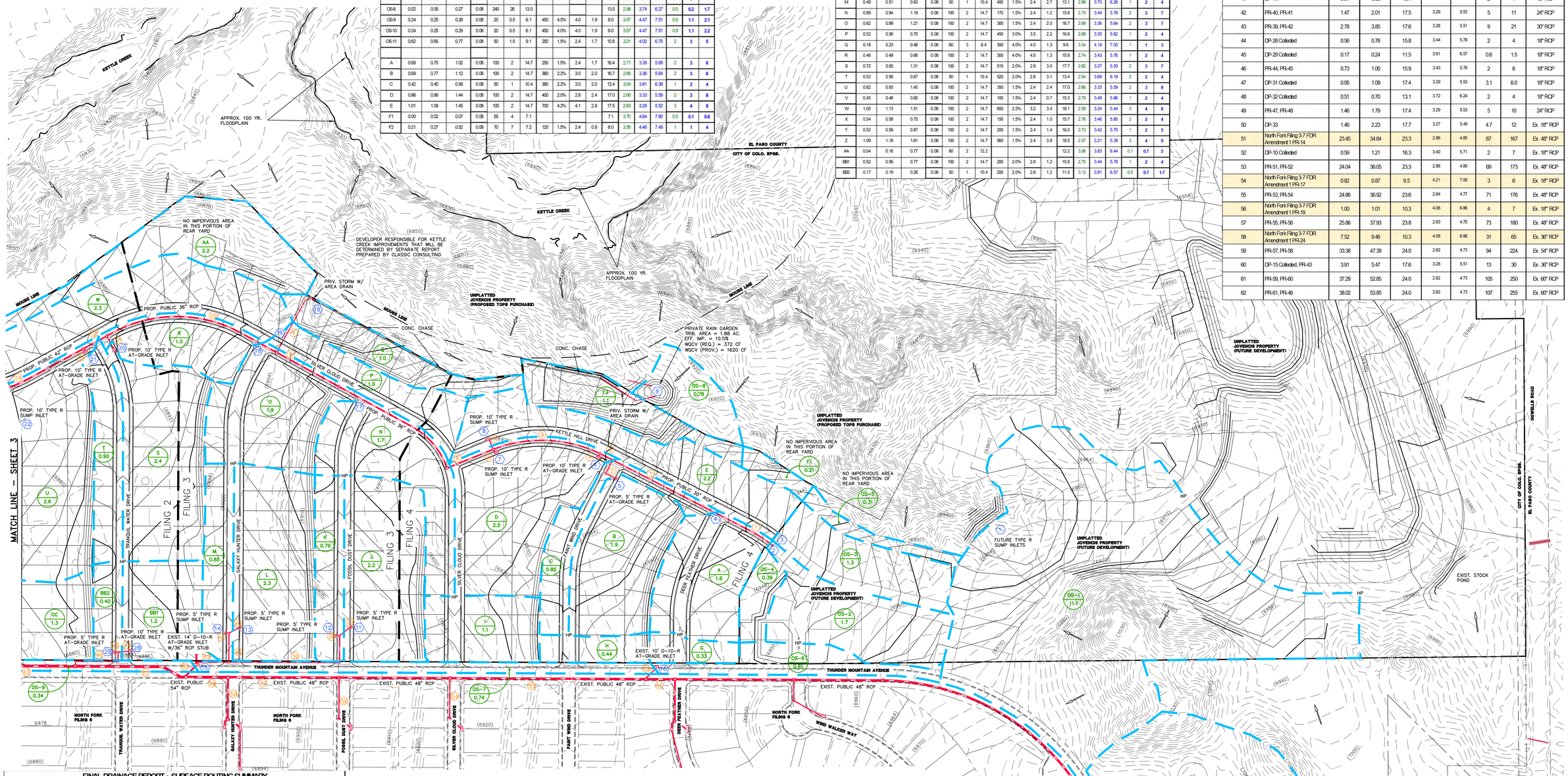
FINAL DRAINAGE REPORT ~ SURFACE ROUTING SUMMARY

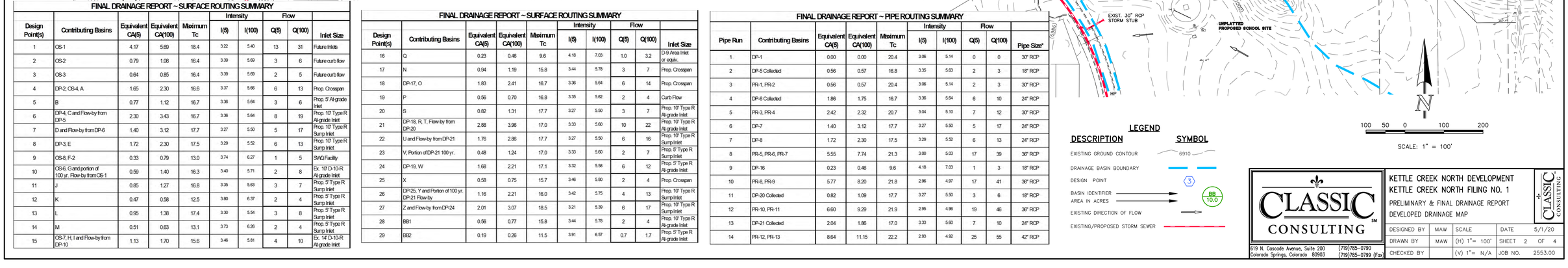
Design Point(s)	Contributing Basins	Equivalent CA(5)	Equivalent CA(100)	Maximum Tc	Intensity I(5)	Intensity I(100)	Flow Q(5)	Flow Q(100)	Inlet Size
16	Q	0.23	0.46	9.6	4.18	7.03	1.0	3.2	D-9 Area Inlet or equiv.
17	N	0.94	1.19	15.8	3.44	5.78	3	7	Prop. Crosspan
18	DP-17, O	1.83	2.41	16.7	3.36	5.64	6	14	Prop. Crosspan
19	P	0.56	0.70	16.8	3.35	5.62	2	4	Curb Flow
20	S	0.82	1.31	17.7	3.27	5.50	3	7	Prop. 10' Type R At-grade Inlet
21	DP-18, R, T, Flow-by from DP-20	2.88	3.96	17.0	3.33	5.60	10	22	Prop. 10' Type R At-grade Inlet
22	U and Flow-by from DP-21	1.76	2.86	17.7	3.27	5.50	6	16	Prop. 10' Type R Sump Inlet
23	V, Portion of DP-21 100 yr.	0.48	1.24	17.0	3.33	5.60	2	7	Prop. 5' Type R Sump Inlet
24	DP-19, W	1.68	2.21	17.1	3.32	5.58	6	12	Prop. 5' Type R At-grade Inlet
25	X	0.58	0.75	15.7	3.46	5.80	2	4	Prop. Crosspan
26	DP-25, Y and Portion of 100 yr. DP-21 Flow-by	1.16	2.21	16.0	3.42	5.75	4	13	Prop. 10' Type R Sump Inlet
27	Z and Flow-by from DP-24	2.01	3.07	18.5	3.21	5.39	6	17	Prop. 10' Type R Sump Inlet
28	BB1	0.56	0.77	15.8	3.44	5.78	2	4	Prop. 10' Type R At-grade Inlet
29	BB2	0.19	0.26	11.5	3.91	6.57	0.7	1.7	Prop. 5' Type R At-grade Inlet

FINAL DRAINAGE REPORT ~ PIPE ROUTING SUMMARY

Pipe Run	Contributing Basins	Equivalent CA(5)	Equivalent CA(100)	Maximum Tc	Intensity I(5)	Intensity I(100)	Flow Q(5)	Flow Q(100)	Pipe Size*
1	DP-1	0.00	0.00	20.4	3.06	5.14	0	0	30" RCP
2	DP-5 Colleded	0.56	0.57	16.8	3.35	5.63	2	3	18" RCP
3	PR-1, PR-2	0.56	0.57	20.4	3.06	5.14	2	3	30" RCP
4	DP-6 Colleded	1.86	1.75	16.7	3.36	5.64	6	10	24" RCP
5	PR-3, PR-4	2.42	2.32	20.7	3.04	5.10	7	12	30" RCP
6	DP-7	1.40	3.12	17.7	3.27	5.50	5	17	24" RCP
7	DP-8	1.72	2.30	17.5	3.29	5.52	6	13	24" RCP
8	PR-5, PR-6, PR-7	5.55	7.74	21.3	3.00	5.03	17	39	36" RCP
9	DP-16	0.23	0.46	9.6	4.18	7.03	1	3	18" RCP
10	PR-8, PR-9	5.77	8.20	21.8	2.96	4.97	17	41	36" RCP
11	DP-20 Colleded	0.82	1.09	17.7	3.27	5.50	3	6	18" RCP
12	PR-10, PR-11	6.60	9.29	21.9	2.95	4.96	19	46	36" RCP
13	DP-21 Colleded	2.04	1.86	17.0	3.33	5.60	7	10	24" RCP
14	PR-12, PR-13	8.64	11.15	22.2	2.93	4.92	25	55	42" RCP

MATCH LINE – SHEET 3





LEGEND

DESCRIPTION	SYMBOL
EXISTING GROUND CONTOUR	6910
DRAINAGE BASIN BOUNDARY	
DESIGN POINT	3
BASIN IDENTIFIER / AREA IN ACRES	BB 10.0
EXISTING DIRECTION OF FLOW	
EXISTING/PROPOSED STORM SEWER	

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KETTLE CREEK NORTH DEVELOPMENT
KETTLE CREEK NORTH FILING NO. 1
PRELIMINARY & FINAL DRAINAGE REPORT
DEVELOPED DRAINAGE MAP

CLASSIC CONSULTING

DESIGNED BY	MAW	SCALE		DATE	5/1/20
DRAWN BY	MAW	(H) 1"= 100'		SHEET	2 OF 4
CHECKED BY		(V) 1"= N/A		JOB NO.	2553.00

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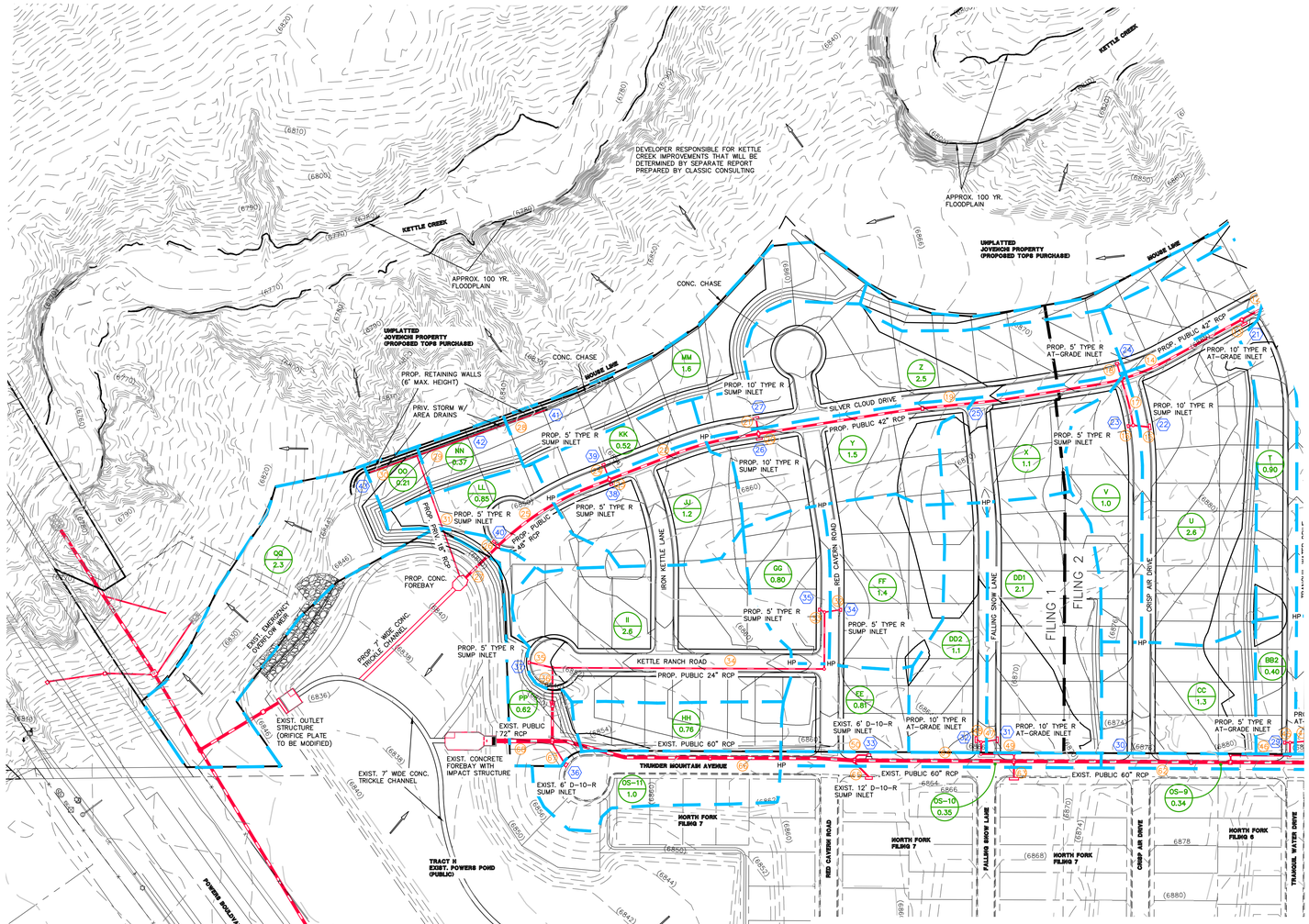

LEGEND

DESCRIPTION	SYMBOL
EXISTING GROUND CONTOUR	6910
DRAINAGE BASIN BOUNDARY	
DESIGN POINT	3
BASIN IDENTIFIER / AREA IN ACRES	BB 10.0
EXISTING DIRECTION OF FLOW	
EXISTING/PROPOSED STORM SEWER	

FINAL DRAINAGE REPORT ~ BASIN RUNOFF SUMMARY

BASIN	WEIGHTED CA(2)	WEIGHTED CA(5)	WEIGHTED CA(100)	OVERLAND C(5)	OVERLAND Length (ft)	OVERLAND Height (ft)	OVERLAND Tc (min)	STREET / CHANNEL FLOW Length (ft)	STREET / CHANNEL FLOW Slope (%)	STREET / CHANNEL FLOW Velocity (fps)	STREET / CHANNEL FLOW Tc (min)	Tc TOTAL (min)	INTENSITY I(2) (in/hr)	INTENSITY I(5) (in/hr)	INTENSITY I(100) (in/hr)	TOTAL FLOWS Q(2) (cfs)	TOTAL FLOWS Q(5) (cfs)	TOTAL FLOWS Q(100) (cfs)
OS-9	0.24	0.25	0.28	0.08	20	0.5	6.1	450	4.0%	4.0	1.9	8.0	3.57	4.47	7.51	0.9	**1.1**	**2.1**
OS-10	0.24	0.25	0.29	0.08	20	0.5	6.1	450	4.0%	4.0	1.9	8.0	3.57	4.47	7.51	0.9	**1.1**	**2.2**
OS-11	0.62	0.65	0.77	0.08	50	1.5	9.1	250	1.5%	2.4	1.7	10.8	3.21	4.02	6.75	2	**3**	**5**
T	0.53	0.56	0.67	0.08	50	1	10.4	520	2.0%	2.8	3.1	13.4	2.94	3.69	6.19	2	**2**	**4**
U	0.82	0.93	1.45	0.08	100	2	14.7	350	1.5%	2.4	2.4	17.0	2.66	3.33	5.59	2	**3**	**8**
V	0.45	0.48	0.65	0.08	100	2	14.7	100	1.5%	2.4	0.7	15.3	2.79	3.49	5.86	1	**2**	**4**
W	1.05	1.13	1.51	0.08	100	2	14.7	650	2.5%	3.2	3.4	18.1	2.59	3.24	5.44	3	**4**	**8**
X	0.54	0.58	0.75	0.08	100	2	14.7	150	1.5%	2.4	1.0	15.7	2.76	3.46	5.80	2	**2**	**4**
Y	0.52	0.56	0.87	0.08	100	2	14.7	200	1.5%	2.4	1.4	16.0	2.73	3.42	5.75	1	**2**	**5**
Z	1.09	1.18	1.61	0.08	100	2	14.7	560	1.5%	2.4	3.8	18.5	2.57	3.21	5.39	3	**4**	**9**
AA	0.04	0.18	0.77	0.08	80	2	12.2					12.2	3.06	3.83	6.44	0.1	**0.7**	**5**
BB1	0.52	0.56	0.77	0.08	100	2	14.7	200	2.0%	2.8	1.2	15.8	2.75	3.44	5.78	1	**2**	**4**
BB2	0.17	0.19	0.26	0.08	50	1	10.4	200	2.0%	2.8	1.2	11.5	3.12	3.91	6.57	0.5	**0.7**	**1.7**
CC	0.52	0.57	0.80	0.08	100	2	14.7	150	1.5%	2.4	1.0	15.7	2.76	3.46	5.80	1	**2**	**5**
DD1	0.87	0.95	1.31	0.08	100	2	14.7	410	1.5%	2.4	2.8	17.4	2.63	3.29	5.53	2	**3**	**7**
DD2	0.47	0.51	0.70	0.08	50	1	10.4	410	1.5%	2.4	2.8	13.1	2.97	3.72	6.24	1	**2**	**4**
EE	0.34	0.37	0.51	0.08	100	2	14.7	130	3.0%	3.5	0.6	15.3	2.79	3.49	5.86	1	**1**	**3**
FF	0.51	0.56	0.83	0.08	100	2	14.7	170	1.5%	2.4	1.2	15.8	2.75	3.44	5.78	1	**2**	**5**
GG	0.37	0.40	0.53	0.08	100	2	14.7	170	1.5%	2.4	1.2	15.8	2.75	3.44	5.78	1	**1**	**3**
HH	0.17	0.21	0.38	0.08	90	5	9.9					9.9	3.30	4.14	6.95	1	**1**	**3**
II	1.08	1.18	1.63	0.08	100	2	14.7	280	1.5%	2.4	1.9	16.6	2.69	3.37	5.66	3	**4**	**9**
JJ	0.56	0.60	0.80	0.08	100	2	14.7	300	1.5%	2.4	2.0	16.7	2.69	3.36	5.64	2	**2**	**5**
KK	0.28	0.30	0.37	0.08	50	1	10.4	200	1.5%	2.4	1.4	11.7	3.11	3.89	6.53	0.9	**1.2**	**2.4**
LL	0.34	0.37	0.52	0.08	50	1	10.4	70	1.5%	2.4	0.5	10.8	3.20	4.01	6.73	1.1	**1.5**	**3.5**
MM	0.32	0.40	0.76	0.08	65	2	10.2	500	1.5%	2.4	3.4	13.6	2.92	3.66	6.15	0.9	**1.5**	**4.7**
NN	0.09	0.10	0.18	0.08	60	3	8.4	70	1.0%	2.0	0.6	9.0	3.42	4.29	7.21	0.3	**0.4**	**1.3**
OO	0.05	0.06	0.10	0.08	60	3	8.4	70	1.0%	2.0	0.6	9.0	3.42	4.29	7.21	0.2	**0.2**	**0.7**
PP	0.01	0.05	0.22	0.08	90	3	11.7					11.7	3.10	3.89	6.53	0.0	**0.2**	**1.4**
QQ	0.21	0.34	0.92	0.08	130	20	8.5					8.5	3.49	4.37	7.34	0.7	**1.5**	**7**

FINAL DRAINAGE REPORT ~ SURFACE ROUTING SUMMARY

Design Point(s)	Contributing Basins	Equivalent CA(5)	Equivalent CA(100)	Maximum Tc	Intensity I(5)	Intensity I(100)	Flow Q(5)	Flow Q(100)	Inlet Size
21	DP-18, R, T, Flow-by from DP-20	2.88	3.96	17.0	3.33	5.60	10	22	Prop. 10' Type R At-grade Inlet
22	U and Flow-by from DP-21	1.76	2.86	17.7	3.27	5.50	6	16	Prop. 10' Type R Sump Inlet
23	V, Portion of DP-21 100 yr.	0.48	1.24	17.0	3.33	5.60	2	7	Prop. 5' Type R Sump Inlet
24	DP-19, W	1.68	2.21	17.1	3.32	5.58	6	12	Prop. 5' Type R At-grade Inlet
25	X	0.58	0.75	15.7	3.46	5.80	2	4	Prop. Crosspan
26	DP-25, Y and Portion of 100 yr. DP-21 Flow-by	1.16	2.21	16.0	3.42	5.75	4	13	Prop. 10' Type R Sump Inlet
27	Z and Flow-by from DP-24	2.01	3.07	18.5	3.21	5.39	6	17	Prop. 10' Type R Sump Inlet
28	BB1	0.56	0.77	15.8	3.44	5.78	2	4	Prop. 10' Type R At-grade Inlet
29	BB2	0.19	0.26	11.5	3.91	6.57	0.7	1.7	Prop. 5' Type R At-grade Inlet
30	CC, OS-9, Flow-by from DP-28, DP-29 and DP-15	0.84	1.20	15.8	3.44	5.78	3	7	Prop. Crosspan
31	DD1	0.95	1.31	17.4	3.29	5.53	3	7	Prop. 10' Type R At-grade Inlet
32	DD2	0.51	0.70	13.1	3.72	6.24	2	4	Prop. 10' Type R At-grade Inlet
33	EE, OS-10, DP-30, Flow-by from DP-31 and DP-32	1.46	2.23	17.7	3.27	5.49	4.7	12	Ex. 6' D-10-R Sump Inlet
34	FF	0.56	0.83	15.8	3.44	5.78	2	5	Prop. 5' Type R Sump Inlet
35	GG	0.40	0.53	15.8	3.44	5.78	1	3	Prop. 5' Type R Sump Inlet
36	HH, OS-11	0.85	1.15	10.8	4.02	6.75	3	8	Ex. 6' D-10-R Sump Inlet
37	II	1.18	1.63	16.6	3.37	5.66	4	9	Prop. 5' Type R Sump Inlet
38	JJ	0.60	0.80	16.7	3.36	5.64	2	5	Prop. 5' Type R Sump Inlet
39	KK	0.30	0.37	11.7	3.89	6.53	1	2	Prop. 5' Type R Sump Inlet
40	LL	0.37	0.52	10.8	4.01	6.73	1	4	Prop. 5' Type R Sump Inlet
41	MM	0.40	0.76	13.6	3.66	6.15	1.5	4.7	D-9 Area Inlet or equiv.
42	NN	0.10	0.18	9.0	4.29	7.21	0.4	1.3	D-9 Area Inlet or equiv.
43	OO	0.06	0.10	9.0	4.29	7.21	0.2	0.7	D-9 Area Inlet or equiv.
NEW PROPOSED FOREBAY	**Pipe Runs 27 & 31**	**16.74**	**24.02**	**23.5**	**2.85**	**4.78**	**48**	**115**	**Proposed Conc. Forebay**

FINAL DRAINAGE REPORT ~ PIPE ROUTING SUMMARY

Pipe Run	Contributing Basins	Equivalent CA(5)	Equivalent CA(100)	Maximum Tc	Intensity I(5)	Intensity I(100)	Flow Q(5)	Flow Q(100)	Pipe Size*
13	DP-21 Collected	2.04	1.86	17.0	3.33	5.60	7	10	24" RCP
14	PR-12, PR-13	8.64	11.15	22.2	2.93	4.92	25	55	42" RCP
15	DP-22	1.76	2.86	17.7	3.27	5.50	6	16	24" RCP
16	DP-23	0.48	1.24	17.0	3.33	5.60	2	7	18" RCP
17	PR-15, PR-16	2.25	4.10	17.8	3.27	5.48	7	22	30" RCP
18	DP-24 Collected	0.86	0.75	17.1	3.32	5.58	3	4	18" RCP
19	PR-14, PR17, PR-18	11.74	16.00	23.0	2.88	4.83	34	77	42" RCP
20	DP-26	1.16	2.21	16.0	3.42	5.75	4	13	24" RCP
21	DP-27	2.01	3.07	18.5	3.21	5.39	6	17	24" RCP
22	PR-19, PR-20, PR-21	14.91	21.28	23.3	2.86	4.80	43	102	48" RCP
23	DP-38	0.60	0.80	16.7	3.36	5.64	2	5	18" RCP
24	DP-39	0.30	0.37	11.7	3.89	6.53	1	2	18" RCP
25	PR-22, PR-23, PR-24	15.81	22.45	23.5	2.85	4.78	45	107	48" RCP
26	DP-40	0.37	0.52	10.8	4.01	6.73	1	4	18" RCP
27	**PR-25, PR-26**	**16.18**	**22.97**	**23.5**	**2.85**	**4.78**	**46**	**110**	**48" RCP**
28	DP-41	0.40	0.76	13.6	3.66	6.15	1.5	4.7	15" HDPE
29	PR-28, DP-42	0.50	0.95	13.7	3.65	6.13	2	6	18" HDPE
30	DP-43	0.06	0.10	14.0	3.62	6.08	0.2	0.6	12" HDPE
31	**PR-29, PR-30**	**0.56**	**1.05**	**14.3**	**3.59**	**6.02**	**2**	**6**	**18" HDPE**
32	DP-34	0.56	0.83	15.8	3.44	5.78	2	5	18" RCP
33	DP-35	0.40	0.53	15.8	3.44	5.78	1	3	18" RCP
34	PR-32, PR-33	0.95	1.36	16.8	3.35	5.62	3	8	24" RCP
35	DP-37	1.18	1.63	16.6	3.37	5.66	4	9	18" RCP
36	PR-34, PR-35	2.14	2.99	16.9	3.34	5.61	7	17	30" RCP
37	DP-11	0.85	1.27	16.8	3.35	5.63	3	7	18" RCP
38	DP-12	0.47	0.58	12.5	3.80	6.37	2	4	18" RCP
39	PR-37, PR-38	1.31	1.85	17.2	3.32	5.57	4	10	24" RCP
40	DP-13	0.95	1.38	17.4	3.30	5.54	3	8	18" RCP
41	DP-14	0.51	0.63	13.1	3.73	6.26	2	4	18" RCP
42	PR-40, PR-41	1.47	2.01	17.5	3.29	5.53	5	11	24" RCP
43	PR-39, PR-42	2.78	3.85	17.6	3.28	5.51	9	21	30" RCP
44	DP-28 Collected	0.56	0.76	15.8	3.44	5.78	2	4	18" RCP
45	DP-29 Collected	0.17	0.24	11.5	3.91	6.57	0.6	1.5	18" RCP
46	PR-44, PR-45	0.73	1.00	15.9	3.43	5.76	2	6	18" RCP
47	DP-31 Collected	0.95	1.09	17.4	3.29	5.53	3.1	6.0	18" RCP
48	DP-32 Collected	0.51	0.70	13.1	3.72	6.24	2	4	18" RCP
49	PR-47, PR-48	1.46	1.79	17.4	3.29	5.53	5	10	24" RCP
50	DP-33	1.46	2.23	17.7	3.27	5.49	4.7	12	Ex. 18" RCP
51	North Fork Filing 3-7 FDR Amendment 1 PR-14	23.45	34.84	23.3	2.86	4.80	67	167	Ex. 48" RCP
52	DP-10 Collected	0.59	1.21	16.3	3.40	5.71	2	7	Ex. 18" RCP
53	PR-51, PR-52	24.04	36.05	23.3	2.86	4.80	69	173	Ex. 48" RCP
54	North Fork Filing 3-7 FDR Amendment 1 PR-17	0.82	0.87	9.5	4.21	7.06	3	6	Ex. 18" RCP
55	PR-53, PR-54	24.86	36.92	23.6	2.84	4.77	71	176	Ex. 48" RCP
56	North Fork Filing 3-7 FDR Amendment 1 PR-19	1.00	1.01	10.3	4.08	6.86	4	7	Ex. 18" RCP
57	PR-55, PR-56	25.86	37.93	23.8	2.83	4.75	73	180	Ex. 48" RCP
58	North Fork Filing 3-7 FDR Amendment 1 PR-24	7.52	9.46	10.3	4.08	6.86	31	65	Ex. 36" RCP
59	PR-57, PR-58	33.38	47.39	24.0	2.82	4.73	94	224	Ex. 54" RCP
60	DP-15 Collected, PR-43	3.91	5.47	17.6	3.28	5.51	13	30	Ex. 36" RCP
61	PR-59, PR-60	37.29	52.85	24.0	2.82	4.73	105	250	Ex. 60" RCP
62	PR-61, PR-46	38.02	53.85	24.0	2.82	4.73	107	255	Ex. 60" RCP
63	North Fork Filing 3-7 FDR Amendment 1 PR-28	2.09	1.93	11.9	3.87	6.49	8	13	Ex. 24" RCP
64	PR-62, PR-63, PR-49	41.57	57.57	24.5	2.78	4.67	116	269	Ex. 60" RCP
65	North Fork Filing 3-7 FDR Amendment 1 PR-32A	3.05	4.31	11.9	3.87	6.49	12	28	Ex. 24" RCP
66	PR-64, PR-65, PR-50	46.08	59.79	24.7	2.77	4.65	128	278	Ex. 60" RCP
67	North Fork Filing 3-7 FDR Amendment 1 PR-35	0.69	0.79	8.5	4.37	7.34	3	6	Ex. 18" RCP
68	**PR-66, PR-67, PR-36**	**48.91**	**63.57**	**25.1**	**2.75**	**4.61**	**134**	**293**	**Ex. 72" RCP**
Exist. 72" RCP Outfall	**North Fork Filing 7 FDR Amendment 1 PR-36**	**60.19**	**78.82**	**25.1**	**2.75**	**4.61**	**166**	**364**	**Ex. 72" RCP**

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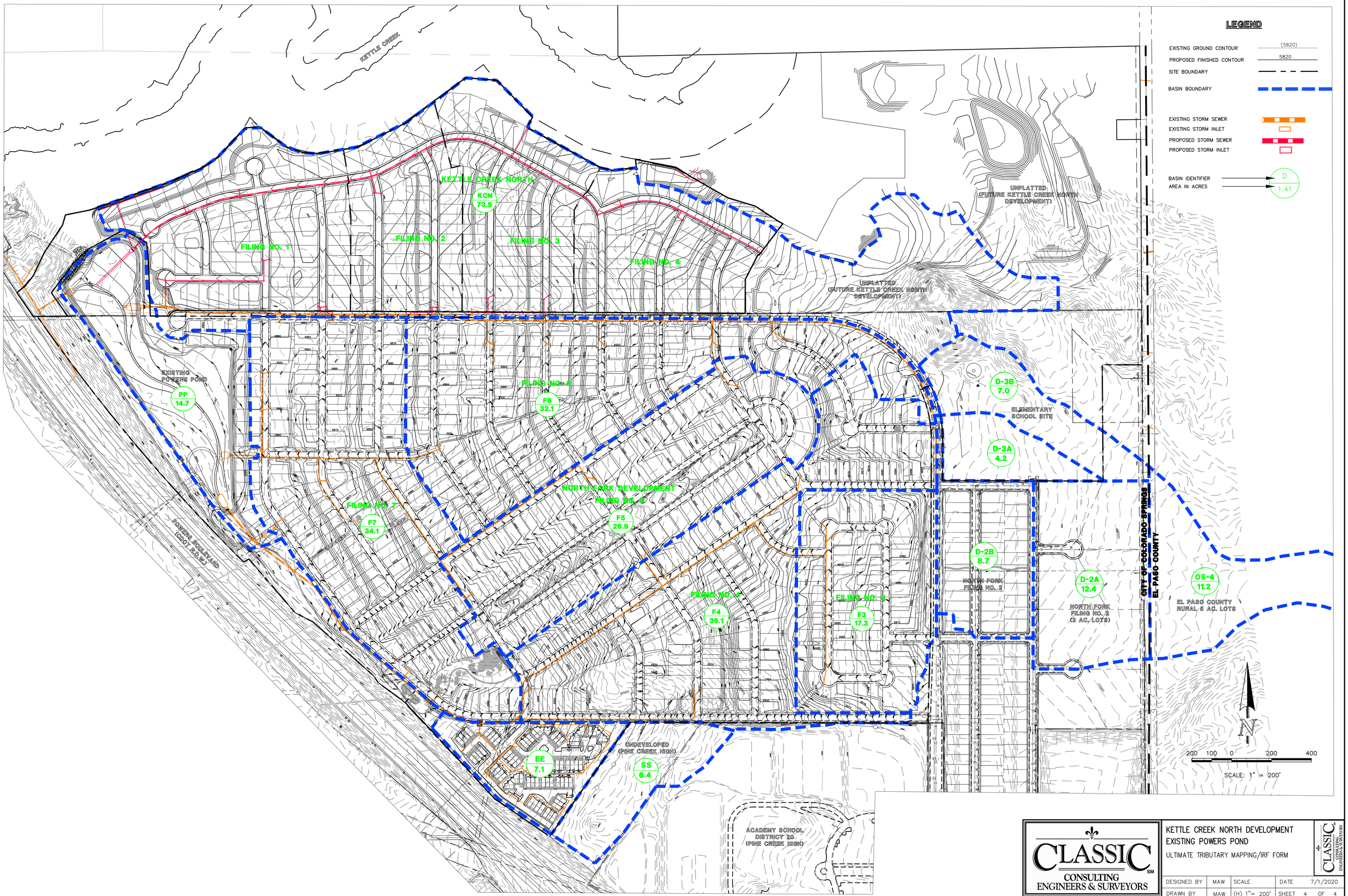
KETTLE CREEK NORTH DEVELOPMENT & KETTLE CREEK NORTH FILING NO. 1

PRELIMINARY & FINAL DRAINAGE REPORT

DEVELOPED DRAINAGE MAP

DESIGNED BY	MAW	SCALE		DATE	5/1/20
DRAWN BY	MAW	(H) 1"= 100'		SHEET	3 OF 4
CHECKED BY		(V) 1"= N/A		JOB NO.	2553.00



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KETTLE CREEK NORTH DEVELOPMENT
EXISTING POWERS POND
ULTIMATE TRIBUTARY MAPPING/IRF FORM

CLASSIC CONSULTING ENGINEERS & SURVEYORS

DESIGNED BY	MAW	SCALE		DATE	7/1/2020
DRAWN BY	MAW	(H) 1"= 200'		SHEET	4 OF 4
CHECKED BY		(V) 1"= N/A		JOB NO.	2553.00

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