PRELIMINARY DRAINAGE PLAN
PUD/SP 21-00X

FINAL DRAINAGE PLAN
CDR 21-00X

THE RIDGE AT LORSON RANCH

MARCH, 2021

Prepared for:

Lorson, LLC
212 N. Wahsatch Ave, Suite 301
Colorado Springs, Colorado 80903
(719) 635-3200

Prepared by:

Core Engineering Group, LLC
15004 1ST Avenue South
Burnsville, MN 55306
(719) 570-1100

Project No. 100.064

CORE
ENGINEERING GROUP

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ENGINEER'S STATEMENT

The attached drainage plan and report were prepared under my direction and supervision and are correct to the best of my knowledge and belief. Said drainage report has been prepared according to the criteria established by El Paso County for drainage reports and said report is in conformity with the master plan of the drainage basin. I accept responsibility for any liability caused by any negligent acts, errors, or omissions on my part in preparing this report.

Richard L. Schindler, P.E. #33997 Date
For and on Behalf of Core Engineering Group, LLC

OWNER'S STATEMENT

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

Lorson, LLC Date

By
Jeff Mark

Title
Manager

Address
212 N. Wahsatch Avenue, Suite 301, Colorado Springs, CO 80903

FLOODPLAIN STATEMENT

To the best of my knowledge and belief, this development is not located within a designated floodplain as shown on Flood Insurance Rate Map Panel No. and 08041C0976 G, dated December 7, 2018. (See Appendix A, FEMA FIRM Exhibit)

Richard L. Schindler, #33997 Date

EL PASO COUNTY

Filed in accordance with the requirements of the El Paso County Land Development Code, Drainage Criteria Manual, Volume 1 and 2, and Engineering Criteria Manual, As Amended.

Jennifer Irvine Date
County Engineer/ECM Administrator

Conditions: _____

1.0 LOCATION and DESCRIPTION

The Ridge at Lorson Ranch is located east of the East Tributary of Jimmy Camp Creek. The site is located on approximately 206.473 acres of vacant land. This project will develop this site into a single-family residential development. The land for the residential lots is currently owned by Love In Action

The site is located in the NE 1/4 of Sections 24 and the SE 1/4 of Section 13, Township 15 South and Range 65 West of the 6th Principal Meridian. The site is bounded on the north by unplatted land owned by Bull Hill, LLC, on the west by The Hills at Lorson Ranch, on the east by unplatted land, and the south by unplatted land in Lorson Ranch. For reference, a vicinity map is included in Appendix A of this report.

Conformance with applicable Drainage Basin Planning Studies

There is an existing (unapproved) DBPS for Jimmy Camp Creek prepared by Wilson & Company in 1987, and is referenced in this report. The only major drainage improvements for this study area according to the 1987 Wilson study was the reconstruction of the East Tributary of Jimmy Camp Creek (East Tributary). In 2014 and in 2018 the East Tributary was reconstructed from downstream of Lorson Boulevard north to the northern property line of Lorson Ranch in accordance with the 1987 study. The last section of the East Tributary (to the south property line of Lorson Ranch) has been designed by Kiowa Engineering and will be completed in 2020. There are no further improvements to be made on the East Tributary. On March 9, 2015 a new DBPS for Jimmy Camp Creek and the East Tributary was completed by Kiowa Engineering. The Kiowa Engineering DBPS for Jimmy Camp Creek has not been adopted by El Paso County but is allowed for concept design. The concept design includes the East Tributary armoring concept and the full spectrum detention pond requirements. The Kiowa DBPS did not calculate drainage fees so current El Paso County drainage/bridge fees apply to this development.

Conformance with Lorson East MDDP by Core Engineering Group

Core Engineering Group has an approved MDDP for Lorson East which covers this study area. This PDR conforms to the MDDP for Lorson East and is referenced in this report. The major infrastructure to be constructed in this site includes outlet structures in Detention/WQ Ponds C2.1 and C4. Both ponds were graded, low flow channels, and forebays were constructed as part of The Hills at Lorson Ranch under PUDSP-20-003. There are also two bridges over the East Tributary that were built in 2018 to provide access to this development across the East Tributary. The bridges are located at Fontaine Boulevard and Lorson Boulevard.

The Ridge at Lorson Ranch is located within the ***"Jimmy Camp Creek Drainage Basin"***, which is a fee basin in El Paso County.

2.0 DRAINAGE CRITERIA

The supporting drainage design and calculations were performed in accordance with the City of Colorado Springs and El Paso County "Drainage Criteria Manual (DCM)", dated November, 1991, the El Paso County "Engineering Criteria Manual", Chapter 6 and Section 3.2.1 Chapter 13 of the City of Colorado Springs Drainage Criteria Manual dated May 2014, and the UDFCD "Urban Storm Drainage Criteria Manual" Volumes 1, 2 and 3 for inlet sizing and full spectrum ponds. No deviations from these published criteria are requested for this site.

The Rational Method as outlined in Section 6.3.0 of the May 2014 "Drainage Criteria Manual" and in Section 3.2.8.F of the El Paso County "Engineering Criteria Manual" was used for basins less than 130 acres to determine the rainfall and runoff conditions for the proposed development of the site. The runoff rates for the 5-year initial storm and 100-year major design storm were calculated.

Current updates to the Drainage Criteria manual for El Paso County states the if detention is necessary, Full Spectrum Detention will be included in the design, based on this criteria, Full Spectrum Detention will be required for this development.

3.0 EXISTING HYDROLOGICAL CONDITIONS

This site is currently undeveloped with native vegetation (grass with no shrubs) and moderate to steep slopes in a westerly direction the East Tributary of Jimmy Camp Creek.

The Soil Conservation Service (SCS) classifies the soils within the site as Manzanola clay loam; Midway Clay Loam, Nelson-Tassel fine Sandy loam; Razor clay loam; and Wiley silt loam [3]. The sandy and silty loams are considered hydrologic soil group B soils with moderate to moderately rapid permeability. The Midway and Razor clay loams are considered hydrologic soil group C/D soils with slow permeability. All of these soils are susceptible to erosion by wind and water, have low bearing strength, moderate shrink-swell potential, and high frost heave potential (see table 3.1 below). The clay loams are difficult to vegetate and comprise of a small portion of the study area. These soils can be mitigated easily by limiting their use as topsoil since they comprise of a small portion of the study area. Weathered bedrock may be encountered beneath some of the site but it can be excavated using conventional techniques.

Table 3.1: SCS Soils Survey

Soil	Hydro. Group	Shrink/Swell Potential	Permeability	Surface Runoff Potential	Erosion Hazard
52-Manzanola Clay Loam	C	High	Slow	Medium	Moderate
54-Midway Clay Loam	D	High	Slow	Medium	Moderate
56-Nelson – Tassel Fine Sandy Loam	B	Moderate	Moderately Rapid	Slow	Moderate
75-Razor Clay Loam	C	High	Slow	Medium	Moderate
108-Wiley Silt Loam	B	Moderate	Moderate	Medium	Moderate

Excerpts from the SCS "Soil Survey of El Paso County Area, Colorado" are provided in ***Appendix A*** for further reference.

For the purpose of preparing hydrologic calculations for this report, the soil of each basin are assumed to be wholly comprised of the majority soil hydrologic group.

An existing electrical easement, with existing transmission towers, is located west side of this site and will be set aside as open space. It is the intent to utilize some of the open space under the towers for detention of storm flow.

This site is not located within the delineated 100-year floodplain of the East Tributary of Jimmy Camp Creek per the Federal Emergency Management Agency (FEMA) Flood Rate Insurance Map (FIRM) number 08041C10976 G, effective December 7, 2018.

Basin OS-B1.1

This existing basin consists of existing flow from undeveloped areas east of Lorson Ranch. Runoff flows overland to the northwest and drains offsite at Design Point 1x. The existing runoff is 2.6cfs and 14.3cfs for the 5-year and 100-year events.

Basin EX-B1

This existing basin consists of existing flow from undeveloped areas within Lorson Ranch near the north property line. Runoff flows overland to the north and drains offsite at Design Point 1x. The existing runoff is 5.6cfs and 31.2cfs for the 5-year and 100-year events.

Design Point 1x

Design Point 1x is the total existing runoff flowing offsite to the north. The developed runoff flowing north will need to be lower than the existing runoff at this design point. The existing runoff is 7.5cfs and 42.0cfs for the 5-year and 100-year events.

Basin C1.1-ex

This existing basin consists of existing flow from undeveloped areas east of the Lorson Boulevard/Walleye Drive intersection. Runoff flows overland to the west and drains into an existing storm sewer system in Lorson/Walleye. The existing runoff is 3.2cfs and 21cfs for the 5-year and 100-year events.

Basin C2.1-ex

This existing basin consists of existing flow from undeveloped areas east of the Fontaine Boulevard/Walleye Drive intersection. Runoff flows overland to the west and drains into an existing storm sewer system in Fontaine/Walleye. The existing runoff is 6.1cfs and 40.2cfs for the 5-year and 100-year events.

Basin C2.2-ex

This existing basin consists of existing flow from undeveloped areas on west side of the site. Runoff flows overland to the west and drains to an existing 42" storm sewer that discharges west into Existing Pond C2.1. The existing runoff is 12.2cfs and 81.8cfs for the 5-year and 100-year events.

Basin C3.1-ex

This existing basin consists of existing flow from undeveloped areas on the central portion of the PUD. Runoff flows overland to the west and drains into an existing storm sewer system at the intersection of Walleye Drive/Grayling Drive. The existing runoff is 2.6cfs and 15.0cfs for the 5-year and 100-year events.

Basin C4.1-ex

This existing basin consists of existing flow from offsite undeveloped areas east of Lorson Ranch. Runoff flows overland to the west into Basin C4.2-ex. The existing runoff is 1.3cfs and 8.7cfs for the 5-year and 100-year events.

Basin C4.2-ex

This existing basin consists of existing flow from undeveloped areas in the northern portion of the PUD. Runoff flows overland to the west to Existing Pond C4 excavated as part of The Hills at Lorson Ranch. The existing runoff is 15.0cfs and 85.1cfs for the 5-year and 100-year events.

Design Point 4x

Design Point 4x is the existing flow entering Exising Pond C4 from Basin C4.1-ex and C4.2-ex. The existing runoff is 15.3cfs and 87.7cfs for the 5-year and 100-year events from these two basins. This flow is then routed south into Existing Pond C3.

Basin EX-F1
This existing basin consists of existing flow from undeveloped areas in the east portions of the PUD. Runoff flows overland eastward and offisite to the adjacent land owner. The existing runoff is 7.3cfs and 44.7cfs for the 5-year and 100-year events.

Basin EX-F2
This existing basin consists of existing flow from undeveloped areas in the east portions of the PUD. Runoff flows overland southeast and offisite to the adjacent land owner. The existing runoff is 9.1cfs and 51.1cfs for the 5-year and 100-year events.

Design Point 2x
Design Point 2x is the total existing flow at the east property line from Basins EX-F1 and EX-F2. The existing runoff is 14.4cfs and 84.9cfs for the 5-year and 100-year events from these two basins. This flows east overland and offsite.

4.0 DEVELOPED HYDROLOGICAL CONDITIONS

Hydrology for the **The Ridge at Lorson Ranch** drainage report was based on the City of Colorado Springs/El Paso County Drainage Criteria. Sub-basins that lie within this project were determined and the 5-year and 100-year peak discharges for the developed conditions have been presented in this report. Based on these flows, storm inlets will be added when the street capacity is exceeded.

Soil type B/C/D has been assumed for the developed hydrologic conditions. See Appendix A for SCS Soils Map.

The time of concentration for each basin and sub-basin was developed using an overland, ditch, street and pipe flow components. The maximum overland flow length for developed conditions was limited to 100 feet. Travel time velocities ranged from 2 to 6 feet per second. The travel time calculations are included in the back of this report.
Runoff coefficients for the various land uses were obtained from Table 6-6 dated May, 2014 from the updated City of Colorado Springs/El Paso County Drainage Criteria Manual. See Appendix B.

Drainage concepts for each of the basins are briefly discussed as follow:

Basin C1.1
This basin consists of runoff from residential development and the east side of Nystrom Terrace and the north side of Aspen Butte Terrace. Runoff will be directed west to Design Point 1 in curb/gutter where it will be collected by a Type R inlet. The developed flow from this basin is 5.6cfs and 12.2cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin C1.2
This basin consists of runoff from residential development and the west side of Nystrom Terrace and the south side of Aspen Butte Terrace. Runoff will be directed west to Design Point 2 in curb/gutter where it will be collected by a Type R inlet. The developed flow from this basin is 2.7cfs and 5.9cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin C1.3
This basin consists of runoff from residential development and the north side of Lorson Blvd. Runoff will be directed south and west in Lorson Boulevard to Design Point 4 in curb/gutter where it will be collected by a Type R inlet. The developed flow from this basin is 14.1cfs and 30.9cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin C1.4
This basin consists of runoff from residential development, Nystrom Terrace, and Walleye Drive. Runoff will be directed west to Walleye Drive, then south to Design Point 1b in curb/gutter where it will be collected by an existing 15' Type R inlet. The developed flow from this basin is 4.2cfs and 9.2cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin C1.5
This basin consists of runoff from future residential development and the south side of Lorson Blvd. Runoff will be directed north and west in Lorson Boulevard to Design Point 6 in curb/gutter where it will be collected by a Type R inlet. The developed flow from this basin is 3.0cfs and 6.6cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin C1.6
This basin consists of runoff from future residential development southeast of Walleye Dr./Lorson Blvd at Design Point 1a. Runoff will be directed north to Design Point 1a by future streets and a future storm sewer sized to handle a portion of the 100-year storm event from this basin. The remaining runoff will continue west in a future street to a future street intersection at Lorson Boulevard west of Brook Trout Trail. The future developed flow from this basin is 12.8cfs and 28.3cfs for the 5/100-year storm event. See the appendix for detailed calculations. This flow is only to be used to size a storm sewer stub from Design Point 6

Basin C3.1
This basin consists of runoff from residential development, Aspen Butte Terrace, Copper Butte Way, and the east half of Split Mountain Drive. Runoff will be directed west and north to Design Point 12 in curb/gutter of Split Mountain Drive where it will be collected by a Type R inlet. The developed flow from this basin is 9.9cfs and 21.8cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin C3.2
This basin consists of runoff from residential development, Mission Peak Place, and the east half of Split Mountain Drive. Runoff will be directed west and north to Design Point 13 in curb/gutter of Split Mountain Drive where it will be collected by a Type R inlet. The developed flow from this basin is 7.9cfs and 17.3cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin C3.3
This basin consists of runoff from residential development, Pearsoll Street, and the east half of Split Mountain Drive. Runoff will be directed west and north to Design Point 15 in curb/gutter of Split Mountain Drive where it will be collected by a Type R inlet. The developed flow from this basin is 8.5cfs and 18.6cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin C3.4
This basin consists of runoff from residential development, Lost Peak Lane, and the east half of Split Mountain Drive. Runoff will be directed west and north to Design Point 17 in curb/gutter of Split Mountain Drive where it will be collected by a Type R inlet. The developed flow from this basin is 7.2cfs and 15.8cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin C3.5
This basin consists of runoff from residential development, Split Mountain Drive, and the south side of Lake Trout Dr. Runoff will be directed north and west to Design Point 19 in curb/gutter of Lake Trout Dr where it will be collected by a Type R inlet. The developed flow from this basin is 10.3cfs and 22.6cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin C3.6a
This basin consists of runoff from residential development and the north side of Lake Trout Dr. Runoff will be directed west to Design Point 20a in curb/gutter of Lake Trout Dr where it will be collected by a

Type R inlet. The developed flow from this basin is 5.6cfs and 12.3cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin C3.6b
This basin consists of runoff from residential development and Lookout Peak Lane. Runoff will be directed west and south to Design Point 21 in curb/gutter of Lake Trout Dr where it will be collected by a Type R inlet. The developed flow from this basin is 7.2cfs and 15.9cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin C3.7
This basin consists of runoff from residential development, Dragontail Terrace, and the south side of Lake Trout Dr. Runoff will be directed north and west to Design Point 23 in curb/gutter of Lake Trout Dr where it will be collected by a Type R inlet. The developed flow from this basin is 8.7cfs and 19.1cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin C3.8
This basin consists of runoff from residential development, Foraker Lane, Raven Ridge Terrace, and the north side of Lake Trout Dr. Runoff will be directed west and south to Design Point 25 in curb/gutter of Lake Trout Dr where it will be collected by a Type R inlet. The developed flow from this basin is 10.0cfs and 22.0cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin C3.9
This basin consists of runoff from residential development, Raven Ridge Terrace, and the south side of Lake Trout Dr. Runoff will be directed north and west to Design Point 27 in curb/gutter of Lake Trout Dr where it will be collected by a Type R inlet. The developed flow from this basin is 8.1cfs and 17.9cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin C3.10
This basin consists of runoff from residential development, Nystrom Terrace, and the south side of Lake Trout Dr. Runoff will be directed north and west to Design Point 29 in curb/gutter of Lake Trout Dr where it will be collected by a Type R inlet. The developed flow from this basin is 9.2cfs and 20.2cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin C4.1
This basin consists of runoff from residential development, Pearsoll Street, Buckner Way, and the south side of Fontaine Boulevard. Runoff will be directed north and west to Fontaine Boulevard where it will flow west to Design Point 31. The developed flow from this basin is 6.4cfs and 14.0cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin C4.2
This basin consists of runoff from residential development and the south side of Fontaine Boulevard. Runoff will be directed north and west to Fontaine Boulevard to Design Point 31. The developed flow from this basin is 4.8cfs and 10.5cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin C4.3
This basin consists of runoff from residential development, Lake Trout Dr, and Nystrom Terrace. Runoff will be directed north and west to Design Point 32 in curb/gutter of Nystrom Terrace where it will be collected by a Type R inlet. The developed flow from this basin is 5.7cfs and 12.4cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin C4.4
This basin consists of runoff from residential development, Lake Trout Dr, and the west side of Walleye Drive. Runoff will be directed west and north to an existing 25' Type R inlet at Design Point 33 in

curb/gutter of Walleye Drive. The developed flow from this basin is 6.2cfs and 13.5cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin C5.1a
This basin consists of runoff from residential development and the south side of Sanderling Street. Runoff will be directed west and south to Design Point 39 in curb/gutter where it will be collected by a Type R inlet. The developed flow from this basin is 4.2cfs and 9.2cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin C5.1b
This basin consists of runoff from residential development and the north side of Gray Wolf Court. Runoff will be directed west to Design Point 36 in curb/gutter where it will be collected by a Type R inlet. The developed flow from this basin is 11.4cfs and 25.2cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin C5.1c
This basin consists of runoff from residential development and the south side of Gray Wolf Court. Runoff will be directed west to Design Point 37 in curb/gutter where it will be collected by a Type R inlet. The developed flow from this basin is 7.4cfs and 16.3cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin C5.1d
This basin consists of runoff from residential development and the north side of Snowfield Court. Runoff will be directed west and north to Design Point 41 in curb/gutter where it will be collected by a Type R inlet. The developed flow from this basin is 9.3cfs and 20.7cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin C5.1e
This basin consists of runoff from residential development and the south side of Snowfield Court. Runoff will be directed west to Design Point 43 in curb/gutter where it will be collected by a Type R inlet. The developed flow from this basin is 10.0cfs and 21.9cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin C5.2
This basin consists of runoff from residential development and the west side of Walleye Drive. Runoff will be directed south to Design Point 45 in curb/gutter where it will be collected by an existing 15' Type R inlet. The developed flow from this basin is 3.7cfs and 8.2cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin C5.3
This basin consists of runoff from residential development and the north side of Fontaine Boulevard. Runoff will be directed west to Design Point 45 in curb/gutter where it will be collected by an existing 15' Type R inlet. The developed flow from this basin is 4.3cfs and 9.5cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin C8.1a
This basin consists of runoff from residential development and the south side of Meridith Ridge Way. Runoff will be directed west to Design Point 47 in curb/gutter where it will be collected by a Type R inlet. The developed flow from this basin is 7.5cfs and 16.4cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin C8.1b
This basin consists of runoff from residential development and the north side of Meridith Ridge Way and Donnas Drive. Runoff will be directed west and south to Design Point 48 in curb/gutter where it will

be collected by a Type R inlet. The developed flow from this basin is 6.3cfs and 13.9cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin C8.1c
This basin consists of runoff from residential development and the north side of Sanderling Street. Runoff will be directed west to Design Point 48 in curb/gutter where it will be collected by a Type R inlet. The developed flow from this basin is 3.4cfs and 7.6cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin C8.2
This basin consists of runoff from residential development and the east side of Walleye Drive. Runoff will be directed west and north to Design Point 51 in curb/gutter where it will be collected by an existing 25' Type R inlet in Walleye Drive. The developed flow from this basin is 4.5cfs and 10.0cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin OS-C4a
This basin consists of runoff from undeveloped offsite land east of Lorson Ranch. Runoff will be directed west to Danis Drive. The existing flow from this basin is 0.8cfs and 5.4cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin C8.3a
This basin consists of runoff from residential development and the east side of Danis Drive. Runoff will be directed north to Design Point 53 in curb/gutter where it will be collected by a Type R inlet. The developed flow from this basin is 10.5cfs and 23.0cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin C8.3b
This basin consists of runoff from residential development and the west side of Rikers Ridge Lane and the south side of Walley Drive. Runoff will be directed west to Design Point 54 in curb/gutter where it will be collected by a Type R inlet. The developed flow from this basin is 6.0cfs and 13.2cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin OS-C4b
This basin consists of runoff from undeveloped offsite land east of Lorson Ranch. Runoff will be directed west to Walleye Drive. The existing flow from this basin is 0.9cfs and 5.5cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin C8.3c
These basins consist of runoff from residential development and the south side of Rikers Ridge Lane and Danis Drive. Runoff will be directed west to Design Point 54 in curb/gutter where it will be collected by a Type R inlet. The developed flow from this basin is 4.5cfs and 9.9cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin C8.3d
This basin consists of runoff from residential development and the north side of Jasons Ridge Way, and Donnas Drive. Runoff will be directed northwest to Design Point 56 in curb/gutter where it will be collected by a Type R inlet. The developed flow from this basin is 8.9cfs and 19.2cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin C8.4
This basin consists of runoff from residential development and the south side of Jasons Ridge Way and Donnas Drive. Runoff will be directed southwest to Design Point 57 in curb/gutter where it will be collected by a Type R inlet. The developed flow from this basin is 11.0cfs and 24.1cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin C8.5
This basin consists of runoff from residential development and the west side of Rikers Ridge Way and north side of Walleye Drive. Runoff will be directed southwest to Design Point 59 in curb/gutter where it will be collected by a Type R inlet. The developed flow from this basin is 7.0cfs and 15.5cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin C8.6
This basin consists of runoff from residential development, west side of Walleye Drive, and the north side of Grayling Drive. Runoff will be directed west to Design Point 62 in curb/gutter where it will be collected by a Type R inlet. The developed flow from this basin is 4.0cfs and 6.4cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin C8.7a
This basin consists of runoff from residential development and the north side of Logans Ridge Lane and the south side of Regan Ridge Drive. Runoff will be directed west to Design Point 63 in curb/gutter where it will be collected by a Type R inlet. The developed flow from this basin is 8.1cfs and 18.0cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin C8.7b
This basin consists of runoff from residential development and the south side of Logans Ridge Lane. Runoff will be directed west to Design Point 63 in curb/gutter where it will be collected by a Type R inlet. The developed flow from this basin is 3.4cfs and 7.6cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin C8.7c
This basin consists of runoff from residential development and the north side of Cody Ridge Way. Runoff will be directed west to Design Point 64 in curb/gutter where it will be collected by a Type R inlet. The developed flow from this basin is 9.4cfs and 21.0cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin C8.7d
This basin consists of runoff from residential development and the east side of Regan Ridge Drive. Runoff will be directed west to Design Point 66 in curb/gutter where it will be collected by a Type R inlet. The developed flow from this basin is 0.6cfs and 1.4cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin C8.7e
This basin consists of runoff from residential development, the east side of Regan Ridge Drive, and Alpine Ridge Lane. Runoff will be directed southwest to Design Point 62 in curb/gutter where it will be collected by a Type R inlet. The developed flow from this basin is 11.1cfs and 24.5cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin OS-B1
This basin consists of runoff from undeveloped offsite land east of Lorson Ranch. Runoff will be directed west to Rikers Ridge Lane. The existing flow from this basin is 2.9cfs and 15.8cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin C8.8a
This basin consists of runoff from residential development, the west/north side of Regan Ridge Drive. Runoff will be directed southwest to Design Point 69 in curb/gutter where it will be collected by an existing 25' Type R inlet. The developed flow from this basin is 7.9cfs and 17.3cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin C8.8
This basin consists of runoff from residential development. Runoff will be directed south directly to existing Pond C4. The developed flow from this basin is 5.9cfs and 21.8cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin F1.1
This basin consists of runoff from residential development. Runoff will be directed west into Basin F1.2. The developed flow from this basin is 5.7cfs and 12.6cfs for the 5/100-year storm event. See the appendix for detailed calculations. Water quality for this basin flowing offsite will be addressed by the Runoff Reduction method for flows crossing open space in Basin F1.2. See water quality section.

Basin F1.1
This basin consists of runoff from open space and will be directed west offsite. The flow from this basin is 3.3cfs and 24.6cfs for the 5/100-year storm event. See the appendix for detailed calculations.

See the Developed Conditions Hydrology Calculations in the back of this report and the Developed Conditions Drainage Map (Map Pocket) for the 5-year and 100-year storm event amounts.

5.0 HYDRAULIC SUMMARY

The sizing of the hydraulic structures and detentions ponds were prepared by using the *Storm Sewer* and *Hydrographs* computer software programs developed by Intellisolve, which conforms to the methods outlined in the "City of Colorado Springs/El Paso County Drainage Criteria Manual". Street capacities and Inlets were sized by Denver Urban Drainage's xcel spreadsheet UD-Inlet.

It is the intent of this drainage report to use the proposed curb/gutter and storm sewer in the streets to convey runoff to detention and water quality ponds then to the East Tributary of Jimmy Camp Creek. Inlet size and location are preliminary only as shown on the storm sewer layout in the appendix. See Appendix C for detailed hydraulic calculations and the storm sewer model.

Table 1: Street Capacities (100-year capacity is only ½ of street)

	Residential Local		Residential Collector		Principal Arterial	
Street Slope	5-year	100-year	5-year	100-year	5-year	100-year
0.5%	6.3	26.4	9.7	29.3	9.5	28.5
0.6%	6.9	28.9	10.6	32.1	10.4	31.2
0.7%	7.5	31.2	11.5	34.6	11.2	33.7
0.8%	8.0	33.4	12.3	37.0	12.0	36.0
0.9%	8.5	35.4	13.0	39.3	12.7	38.2
1.0%	9.0	37.3	13.7	41.4	13.4	40.2
1.4%	10.5	44.1	16.2	49.0	15.9	47.6
1.8%	12.0	45.4	18.4	50.4	18.0	50.4
2.2%	13.3	42.8	19.4	47.5	19.5	47.5
2.6%	14.4	40.7	18.5	45.1	18.5	45.1
3.0%	15.5	39.0	17.7	43.2	17.8	43.2
3.5%	16.7	37.2	16.9	41.3	17.0	41.3
4.0%	17.9	35.7	16.2	39.7	16.3	29.7
4.5%	19.0	34.5	15.7	38.3	15.7	38.3
5.0%	19.9	33.4	15.2	37.1	15.2	37.1

Note: all flows are in cfs (cubic feet per second)

Design Point 1a

Design Point 1a is located south of Lorson Boulevard and Walleye Drive and flow is from future development from Basin C1.6. A 30" storm sewer will be stubbed out from Design Pt. 6 at Lorson Boulevard north towards this design point. The total future flow is 12.8cfs/28.3cfs in the 5/100-year storm events for this basin. In the 5-year storm event 12cfs will be routed north to Design Point 6 (in pipe) and 0.8cfs will be routed to west in the future street (surface flow in street). In the 100-year storm event 20cfs will be routed north to Design Point 6 (in pipe) and 8.3cfs will be routed west in the future street (surface flow in street).

Design Point 1

Design Point 1 is located at the NE corner of Nystrom Terrace at a knuckle and accepts flows from Basin C1.1 The developed conditions are as follows:

(5-year storm)

Tributary Basins: C1.1 **Inlet/MH Number:** Inlet DP1
Upstream flowby: **Total Street Flow:** 5.6cfs

Flow Intercepted: 5.6cfs **Flow Bypassed:** 0
Inlet Size: 10' type R, sump

Street Capacity: Street slope = 1.0%, capacity = 9cfs, okay

(100-year storm)

Tributary Basins: C1.1 **Inlet/MH Number:** Inlet DP1
Upstream flowby: **Total Street Flow:** 12.2cfs

Flow Intercepted: 12.2cfs **Flow Bypassed:**
Inlet Size: 10' type R, sump

Street Capacity: Street slope = 1.0%, capacity = 37cfs (half street) is okay

Design Point 2

Design Point 2 is located at the SW corner of Nystrom Terrace at a knuckle and accepts flows from Basin C1.2 The developed conditions are as follows:

(5-year storm)

Tributary Basins: C1.2 **Inlet/MH Number:** Inlet DP2
Upstream flowby: **Total Street Flow:** 2.7cfs

Flow Intercepted: 2.7cfs **Flow Bypassed:** 0
Inlet Size: 10' type R, sump

Street Capacity: Street slope = 1.0%, capacity = 9cfs, okay

(100-year storm)

Tributary Basins: C1.2 **Inlet/MH Number:** Inlet DP2
Upstream flowby: **Total Street Flow:** 5.9cfs

Flow Intercepted: 5.9cfs **Flow Bypassed:**
Inlet Size: 10' type R, sump

Street Capacity: Street slope = 1.0%, capacity = 37cfs (half street) is okay

Design Point 3

Design Point 3 is the storm sewer pipe flow from Nystrom Terrace to Lorson Boulevard from Design Pt's 1 and 2. The total pipe flow is 8.3cfs/18.1cfs in the 5/100-year storm events in the storm sewer.

Design Point 4

Design Point 4 is located at the NE of Lorson Boulevard and Walleye Drive and accepts flows from Lorson Boulevard (Basin C1.3).

(5-year storm)

Tributary Basins: C1.3 **Inlet/MH Number:** Inlet DP4

Upstream flowby: **Total Street Flow:** 14.1cfs

Flow Intercepted: 13.5cfs **Flow Bypassed:** 0.6cfs to ex. 15' inlet

Inlet Size: 20' type R, on-grade

Street Capacity: Street slope = 2.0%, capacity = 18cfs, okay

(100-year storm)

Tributary Basins: C1.3 **Inlet/MH Number:** Inlet DP4

Upstream flowby: **Total Street Flow:** 30.9cfs

Flow Intercepted: 22.0cfs **Flow Bypassed:** 8.9cfs to ex. 15' inlet

Inlet Size: 20' type R, on-grade

Street Capacity: Street slope = 2.0%, capacity = 50cfs (half street) is okay

The existing 15' inlet was designed to accept 10cfs of upstream flow in the 100-year storm. See final drainage report for CDR 20-007 at Design Point 1b and 1.

Design Point 5

Design Point 5 is the storm sewer pipe flow from Design Pt's 3 and 4. The total pipe flow is 21.8cfs/40.1cfs in the 5/100-year storm events in the storm sewer.

Design Point 6

Design Point 6 is located at the SE of Lorson Boulevard and Walleye Drive and accepts flows from Lorson Boulevard (Basin C1.5).

(5-year storm)

Tributary Basins: C1.5 **Inlet/MH Number:** Inlet DP6
Upstream flowby: **Total Street Flow:** 3.0cfs

Flow Intercepted: 3.0cfs **Flow Bypassed:** 0cfs in curb downstream
Inlet Size: 10' type R, on-grade

Street Capacity: Street slope = 2.0%, capacity = 18cfs, okay

(100-year storm)

Tributary Basins: C1.5 **Inlet/MH Number:** Inlet DP6
Upstream flowby: **Total Street Flow:** 6.6cfs

Flow Intercepted: 5.7cfs **Flow Bypassed:** 0.9cfs in curb downstream
Inlet Size: 10' type R, on-grade

Street Capacity: Street slope = 2.0%, capacity = 50cfs (half street) is okay

Design Point 7

Design Point 7 is the existing 36" storm sewer pipe flow located in Lorson Boulevard. The total pipe flow is 36.8cfs/65.8cfs in the 5/100-year storm events in the storm sewer. Per the drainage report for CDR 20-007 the allowable flow in the existing 36" is 37.1cfs/65.3cfs.

Design Points 8-11 are not used

Design Point 12

Design Point 12 is located at the SE corner of Split Mountain Drive and Mission Peak Place and accepts flows from Basin C3.1.

(5-year storm)

Tributary Basins: C3.1 **Inlet/MH Number:** Inlet DP12
Upstream flowby: **Total Street Flow:** 9.9cfs

Flow Intercepted: 9.3cfs **Flow Bypassed:** 0.6cfs in curb downstream
Inlet Size: 15' type R, on-grade

Street Capacity: Street slope = 2.6%, capacity = 14.4cfs, okay

(100-year storm)

Tributary Basins: C3.1 **Inlet/MH Number:** Inlet DP12
Upstream flowby: **Total Street Flow:** 21.8cfs

Flow Intercepted: 14.8cfs **Flow Bypassed:** 7.0cfs in curb downstream
Inlet Size: 15' type R, on-grade

Street Capacity: Street slope = 2.6%, capacity = 40.7cfs (half street) is okay

Design Point 13

Design Point 13 is located at the SE corner of Split Mountain Drive and Pearsoll Street and accepts flows from Basin C3.2.

(5-year storm)

Tributary Basins: C3.2 **Inlet/MH Number:** Inlet DP13
Upstream flowby: 0.6cfs from Des. Pt 12 **Total Street Flow:** 8.5cfs

Flow Intercepted: 8.3cfs **Flow Bypassed:** 0.2cfs in curb downstream
Inlet Size: 15' type R, on-grade

Street Capacity: Street slope = 2.2%, capacity = 13.3cfs, okay

(100-year storm)

Tributary Basins: C3.2 **Inlet/MH Number:** Inlet DP13
Upstream flowby: 7.0cfs from Des. Pt 12 **Total Street Flow:** 24.3cfs

Flow Intercepted: 15.6cfs **Flow Bypassed:** 8.7cfs in curb downstream
Inlet Size: 15' type R, on-grade

Street Capacity: Street slope = 2.2%, capacity = 42.8cfs (half street) is okay

Design Point 14

Design Point 14 is the storm sewer pipe flow from Design Pt's 12 and 13. The total pipe flow is 17.6cfs/30.4cfs in the 5/100-year storm events in the storm sewer.

Design Point 15

Design Point 15 is located at the SE corner of Split Mountain Drive and Lost Peak Lane and accepts flows from Basin C3.3.

(5-year storm)

Tributary Basins: C3.3 **Inlet/MH Number:** Inlet DP15
Upstream flowby: 0.2cfs from Des. Pt 13 **Total Street Flow:** 8.7cfs

Flow Intercepted: 8.4cfs **Flow Bypassed:** 0.3cfs in curb downstream
Inlet Size: 15' type R, on-grade

Street Capacity: Street slope = 1.9%, capacity = 12.2cfs, okay

(100-year storm)

Tributary Basins: C3.3 **Inlet/MH Number:** Inlet DP15
Upstream flowby: 8.7cfs from Des. Pt 13 **Total Street Flow:** 27.3cfs

Flow Intercepted: 16.5cfs **Flow Bypassed:** 10.8cfs in curb downstream
Inlet Size: 15' type R, on-grade

Street Capacity: Street slope = 1.9%, capacity = 44.0cfs (half street) is okay

Design Point 16
Design Point 16 is the storm sewer pipe flow from Design Pt's 14 and 15. The total pipe flow is 26.0cfs/46.9cfs in the 5/100-year storm events in the storm sewer.

Design Point 17
Design Point 17 is located at the SE corner of Split Mountain Drive and Lake Trout Dr and accepts flows from Basin C3.4.

(5-year storm)
Tributary Basins: C3.4 **Inlet/MH Number:** Inlet DP17
Upstream flowby: 0.3cfs from Des. Pt 15 **Total Street Flow:** 7.5cfs

Flow Intercepted: 7.5cfs **Flow Bypassed:** 0cfs in curb downstream
Inlet Size: 20' type R, on-grade

Street Capacity: Street slope = 3.4%, capacity = 16.5cfs, okay

(100-year storm)
Tributary Basins: C3.4 **Inlet/MH Number:** Inlet DP17
Upstream flowby: 10.8cfs from Des. Pt 15 **Total Street Flow:** 26.7cfs

Flow Intercepted: 20.4cfs **Flow Bypassed:** 6.3cfs in curb downstream
Inlet Size: 20' type R, on-grade

Street Capacity: Street slope = 3.4%, capacity = 37.0cfs (half street) is okay

Design Point 18
Design Point 18 is the storm sewer pipe flow from Design Pt's 16 and 17. The total pipe flow is 33.5cfs/67.3cfs in the 5/100-year storm events in the storm sewer.

Design Point 19
Design Point 19 is located at the SW corner of Split Mountain Drive and Lake Trout Dr and accepts flows from Basin C3.5.

(5-year storm)
Tributary Basins: C3.5 **Inlet/MH Number:** Inlet DP19
Upstream flowby: **Total Street Flow:** 10.3cfs

Flow Intercepted: 10.3cfs **Flow Bypassed:** 0cfs in curb downstream
Inlet Size: 20' type R, on-grade

Street Capacity: Street slope = 2.6%, capacity = 14.4cfs, okay

(100-year storm)
Tributary Basins: C3.5 **Inlet/MH Number:** Inlet DP19
Upstream flowby: 6.3cfs from Des. Pt 17 **Total Street Flow:** 28.8cfs

Flow Intercepted: 21.2cfs **Flow Bypassed:** 7.6cfs in curb downstream
Inlet Size: 20' type R, on-grade

Street Capacity: Street slope = 2.6%, capacity = 40.7cfs (half street) is okay

Design Point 20
Design Point 20 is the storm sewer pipe flow from Design Pt's 18 and 19. The total pipe flow is 43.8cfs/88.5cfs in the 5/100-year storm events in the storm sewer.

Design Point 20a
Design Point 20a is located at the NE corner of Lookout Peak Lane and Lake Trout Dr and accepts flows from Basin C3.6a.

(5-year storm)
Tributary Basins: C3.6a **Inlet/MH Number:** Inlet DP20a
Upstream flowby: **Total Street Flow:** 5.6cfs

Flow Intercepted: 5.6cfs **Flow Bypassed:** 0
Inlet Size: 15' type R, on-grade

Street Capacity: Street slope = 2.1%, capacity = 13.0cfs, okay

(100-year storm)
Tributary Basins: C3.6a **Inlet/MH Number:** Inlet DP20a
Upstream flowby: **Total Street Flow:** 12.3cfs

Flow Intercepted: 10.7cfs **Flow Bypassed:** 1.6cfs in curb downstream
Inlet Size: 15' type R, on-grade

Street Capacity: Street slope = 2.1%, capacity = 42.0cfs (half street) is okay

Design Point 20b
Design Point 20b is the storm sewer pipe flow from Design Pt's 20a and 20. The total pipe flow is 49.4cfs/99.2cfs in the 5/100-year storm events in the storm sewer.

Design Point 21
Design Point 21 is located at the NW corner of Lookout Peak Lane and Lake Trout Dr and accepts flows from Basin C3.6b.

(5-year storm)
Tributary Basins: C3.6b **Inlet/MH Number:** Inlet DP21
Upstream flowby: **Total Street Flow:** 7.2cfs

Flow Intercepted: 7.2cfs **Flow Bypassed:**
Inlet Size: 15' type R, on-grade

Street Capacity: Street slope = 2.1%, capacity = 13.0cfs, okay

(100-year storm)
Tributary Basins: C3.6b **Inlet/MH Number:** Inlet DP21
Upstream flowby: 1.6cfs from Des. Pt 20a **Total Street Flow:** 17.5cfs

Flow Intercepted: 13.1cfs **Flow Bypassed:** 4.4cfs in curb downstream
Inlet Size: 15' type R, on-grade

Street Capacity: Street slope = 2.1%, capacity = 42.0cfs (half street) is okay

Design Point 22 not used

Design Point 23
Design Point 23 is located at the SW corner of Dragontail Terrace and Lake Trout Dr and accepts flows from Basin C3.7.

(5-year storm)
Tributary Basins: C3.7 **Inlet/MH Number:** Inlet DP23
Upstream flowby: **Total Street Flow:** 8.7cfs

Flow Intercepted: 8.4cfs **Flow Bypassed:** 0.3cfs in curb downstream
Inlet Size: 15' type R, on-grade

Street Capacity: Street slope = 2.0%, capacity = 13.0cfs, okay

(100-year storm)
Tributary Basins: C3.7 **Inlet/MH Number:** Inlet DP23
Upstream flowby: 7.6cfs from Des. Pt 19 **Total Street Flow:** 26.7cfs

Flow Intercepted: 16.3cfs **Flow Bypassed:** 10.4cfs in curb downstream
Inlet Size: 15' type R, on-grade

Street Capacity: Street slope = 2.0%, capacity = 42.0cfs (half street) is okay

Design Point 24
Design Point 24 is the storm sewer pipe flow from Design Pt's 20b and 23. The total pipe flow is 57.8cfs/115.5cfs in the 5/100-year storm events in the storm sewer.

Design Point 24a
Design Point 24a is the storm sewer pipe flow from Design Pt's 21 and 24. The total pipe flow is 65cfs/118.6cfs in the 5/100-year storm events in the storm sewer.

Design Point 25
Design Point 25 is located at the NW corner of Nystrom Terr and Lake Trout Dr and accepts flows from Basin C3.8.

(5-year storm)
Tributary Basins: C3.8 **Inlet/MH Number:** Inlet DP25
Upstream flowby: **Total Street Flow:** 10.0cfs

Flow Intercepted: 7.2cfs **Flow Bypassed:** 2.9cfs in curb downstream
Inlet Size: 10' type R, on-grade

Street Capacity: Street slope = 1.1%, capacity = 10.1cfs, okay

(100-year storm)
Tributary Basins: C3.8 **Inlet/MH Number:** Inlet DP25
Upstream flowby: 4.4cfs from Des. Pt 21 **Total Street Flow:** 26.4cfs

Flow Intercepted: 11.3cfs **Flow Bypassed:** 15.1cfs in curb downstream
Inlet Size: 10' type R, on-grade

Street Capacity: Street slope = 1.1%, capacity = 39.0cfs (half street) is okay

Design Point 26 – not used

Design Point 27
Design Point 27 is located at the SW corner of Raven Ridge Terrace and Lake Trout Dr and accepts flows from Basin C3.9.

(5-year storm)
Tributary Basins: C3.9 **Inlet/MH Number:** Inlet DP27
Upstream flowby: 0.3cfs from Des.Pt. 23 **Total Street Flow:** 8.4cfs

Flow Intercepted: 8.4cfs **Flow Bypassed:** 0cfs in curb downstream
Inlet Size: 20' type R, on-grade

Street Capacity: Street slope = 1.7%, capacity = 11.9cfs, okay

(100-year storm)
Tributary Basins: C3.9 **Inlet/MH Number:** Inlet DP27
Upstream flowby: 10.4cfs from Des. Pt 23 **Total Street Flow:** 28.3cfs

Flow Intercepted: 20.7cfs **Flow Bypassed:** 7.6cfs in curb downstream
Inlet Size: 20' type R, on-grade

Street Capacity: Street slope = 1.7%, capacity = 45.0cfs (half street) is okay

Design Point 28
Design Point 28 is the storm sewer pipe flow from Design Pt's 27 and 24a. The total pipe flow is 73.4cfs/132.7cfs in the 5/100-year storm events in the storm sewer.

Design Point 28a
Design Point 28a is the storm sewer pipe flow from Design Pt's 28 and 25. The total pipe flow is 80.6cfs/133.4cfs in the 5/100-year storm events in the storm sewer.

Design Point 29
Design Point 29 is located at the SW corner of Nystrom Terrace and Lake Trout Dr and accepts flows from Basin C3.10.

(5-year storm)
Tributary Basins: C3.10 **Inlet/MH Number:** Inlet DP29
Upstream flowby: 0.3cfs from Des.Pt. 27 **Total Street Flow:** 9.2cfs

Flow Intercepted: 9.2cfs **Flow Bypassed:** 0cfs in curb downstream
Inlet Size: 20' type R, on-grade

Street Capacity: Street slope = 1.0%, capacity = 9.2cfs, okay

(100-year storm)
Tributary Basins: C3.10 **Inlet/MH Number:** Inlet DP29
Upstream flowby: 7.6cfs from Des. Pt 27 **Total Street Flow:** 27.8cfs

Flow Intercepted: 20.5cfs **Flow Bypassed:** 7.3cfs in curb downstream
Inlet Size: 20' type R, on-grade

Street Capacity: Street slope = 1.0%, capacity = 37.3cfs (half street) is okay

Design Point 30
Design Point 30 is the storm sewer pipe flow from Design Pt's 28a and 29. The total pipe flow is 89.8cfs/153.9cfs in the 5/100-year storm events in the storm sewer.

Design Point 31
Design Point 31 is located east of Walleye Drive on the south side of Fontaine Boulevard and accepts flows from Basin C4.1 and C4.2.

(5-year storm)
Tributary Basins: C4.1+C4.2 **Inlet/MH Number:** Inlet DP31
Upstream flowby: **Total Street Flow:** 10.5cfs

Flow Intercepted: 9.7cfs **Flow Bypassed:** 0.8cfs in curb downstream
Inlet Size: 15' type R, on-grade

Street Capacity: Street slope = 4.8%, capacity = 15.7cfs, okay

(100-year storm)
Tributary Basins: C4.1+C4.2 **Inlet/MH Number:** Inlet DP31
Upstream flowby: **Total Street Flow:** 23.2cfs

Flow Intercepted: 15.3cfs **Flow Bypassed:** 7.9cfs in curb downstream
Inlet Size: 15' type R, on-grade

Street Capacity: Street slope = 4.8%, capacity = 38.3cfs (half street) is okay

Design Point 32
Design Point 32 is located on the north end of Nystrom Terr in a cul-de-sac and accepts flows from Basin C4.3

(5-year storm)
Tributary Basins: C4.3 **Inlet/MH Number:** Inlet DP32
Upstream flowby: 2.8cfs from Des. Pt.25 **Total Street Flow:** 10.3 cfs

Flow Intercepted: 10.3cfs **Flow Bypassed:**
Inlet Size: 20' type R, sump

Street Capacity: Street slope = 1.0%, capacity = 9.2cfs, okay

(100-year storm)
Tributary Basins: C4.3 **Inlet/MH Number:** Inlet DP32
Upstream flowby: 15.1cfs from Des.Pt. 25 **Total Street Flow:** 27.5cfs

Flow Intercepted: 27.5cfs **Flow Bypassed:**
Inlet Size: 20' type R, sump

Street Capacity: Street slope = 1.0%, capacity = 37.3cfs (half street) is okay

Design Point 32a

Design Point 32a is the storm sewer pipe flow from Design Pt's 31 and 32. The total pipe flow is 18.2cfs/42.8cfs in the 5/100-year storm events in the storm sewer.

Design Point 33

Design Point 33 is located on Walleye Drive south of Fontaine Boulevard and is an existing 25' type R inlet in a sump condition constructed as part of CDR 20-007.

(5-year storm)

Tributary Basins: C4.4 **Inlet/MH Number:** ex. 25' inlet DP33
Upstream flowby: 0.8cfs from Des.Pt. 31 **Total Street Flow:** 7.0cfs

Flow Intercepted: 7.0cfs **Flow Bypassed:**
Inlet Size: ex 25' type R, sump

Street Capacity: Street slope = 0.7%, capacity = 11.5cfs, okay

(100-year storm)

Tributary Basins: C4.4 **Inlet/MH Number:** ex. 25' inlet DP33
Upstream flowby: 7.3cfs from Des.Pt. 29
7.9cfs from Des. Pt. 31
Total Street Flow: 28.7cfs

Flow Intercepted: 28.7cfs **Flow Bypassed:**
Inlet Size: ex 25' type R, sump

Street Capacity: Street slope = 0.7%, capacity = 34.6cfs (half street) is okay

Design Point 34

Design Point 34 is the storm sewer pipe flow from Design Pt's 30, 32a, and 33. The total pipe flow is 115.0cfs/225.4cfs in the 5/100-year storm events in the existing 54" storm sewer constructed as part of CDR 20-007. The revised calculated flow in the existing 54" storm sewer is slightly more than the design flow in CDR 20-007 of 101.2cfs/218.6cfs in the 5/100-year storm events but the HGL's are not above the top of the 54" storm sewer.

Design Point 35 is not used

Design Point 36

Design Point 36 is located on the north side of Gray Wolf Court and accepts flows from Basin C5.1b

(5-year storm)

Tributary Basins: C5.1b **Inlet/MH Number:** Inlet DP36
Upstream flowby: **Total Street Flow:** 11.4cfs

Flow Intercepted: 4.1cfs **Flow Bypassed:** 7.3cfs in curb downstream
Inlet Size: 5' type R, on-grade

Street Capacity: Street slope = 2.7%, capacity = 14.4cfs, okay

(100-year storm)

Tributary Basins: C5.1b **Inlet/MH Number:** Inlet DP36
Upstream flowby: **Total Street Flow:** 25.2cfs

Flow Intercepted: 5.7cfs **Flow Bypassed:** 19.5cfs in curb downstream
Inlet Size: 5' type R, on-grade

Street Capacity: Street slope = 2.7%, capacity = 40.7cfs (half street) is okay

Design Point 37

Design Point 37 is located on the south side of Gray Wolf Court and accepts flows from Basin C5.1c

(5-year storm)

Tributary Basins: C5.1c **Inlet/MH Number:** Inlet DP37
Upstream flowby: **Total Street Flow:** 7.4cfs

Flow Intercepted: 3.4cfs **Flow Bypassed:** 4.0cfs in curb downstream
Inlet Size: 5' type R, on-grade

Street Capacity: Street slope = 2.0%, capacity = 12.5cfs, okay

(100-year storm)

Tributary Basins: C5.1c **Inlet/MH Number:** Inlet DP37
Upstream flowby: **Total Street Flow:** 16.3cfs

Flow Intercepted: 4.8cfs **Flow Bypassed:** 11.5cfs in curb downstream
Inlet Size: 5' type R, on-grade

Street Capacity: Street slope = 2.0%, capacity = 44.0cfs (half street) is okay

Design Point 38

Design Point 38 is the storm sewer pipe flow from Design Pt's 36 and 37. The total pipe flow is 7.5cfs/10.5cfs in the 5/100-year storm events in the storm sewer.

Design Point 39

Design Point 39 is located at the southeast corner of Gray Wolf Court and Donnas Drive and accepts flows from Basin C5.1a.

(5-year storm)

Tributary Basins: C5.1a **Inlet/MH Number:** Inlet DP39

Upstream flowby: 7.3cfs from Des.Pt.36
4.0cfs from Des.Pt.37 **Total Street Flow:** 15.5cfs

Flow Intercepted: 15.5cfs **Flow Bypassed:**

Inlet Size: 25' type R, on-grade

Street Capacity: Street slope = 1.9%, capacity = 12.0cfs, okay

(100-year storm)

Tributary Basins: C5.1a **Inlet/MH Number:** Inlet DP39

Upstream flowby: 19.5cfs from Des.Pt.36
11.5cfs from Des.Pt.37

Total Street Flow: 40.2cfs

Flow Intercepted: 26.5cfs **Flow Bypassed:** 7.5cfs in curb downstream

Inlet Size: 25' type R, on-grade

Street Capacity: Street slope = 1.9%, capacity = 45.4cfs (half street) is okay

Design Point 40

Design Point 40 is the storm sewer pipe flow from Design Pt's 38 and 39. The total pipe flow is 23.0cfs/37.0cfs in the 5/100-year storm events in the storm sewer.

Design Point 41

Design Point 41 is located south of Gray Wolf Court on the east side of Donnas Drive and accepts flows from Basin C5.1d.

(5-year storm)

Tributary Basins: C5.1d **Inlet/MH Number:** Inlet DP41

Upstream flowby: **Total Street Flow:** 9.3cfs

Flow Intercepted: 9.3cfs **Flow Bypassed:**

Inlet Size: 20' type R, SUMP

Street Capacity: Street slope = 1.4%, capacity = 10.5cfs, okay

(100-year storm)

Tributary Basins: C5.1d **Inlet/MH Number:** Inlet DP41

Upstream flowby: 7.5cfs from Des.Pt.39 **Total Street Flow:** 28.2cfs

Flow Intercepted: 25.1cfs **Flow Bypassed:** 3.1cfs to DP43

Inlet Size: 20' type R, SUMP

Street Capacity: Street slope = 1.4%, capacity = 44.1cfs (half street) is okay

Design Point 42
Design Point 42 is the storm sewer pipe flow from Design Pt's 40 and 41. The total pipe flow is 32.3cfs/62.1cfs in the 5/100-year storm events in the storm sewer.

Design Point 43
Design Point 43 is located south of Gray Wolf Court on the west side of Donnas Drive and accepts flows from Basin C5.1e.

(5-year storm)
Tributary Basins: C5.1e **Inlet/MH Number:** Inlet DP41
Upstream flowby: **Total Street Flow:** 10.0cfs

Flow Intercepted: 10.0cfs **Flow Bypassed:**
Inlet Size: 20' type R, SUMP

Street Capacity: Street slope = 1.4%, capacity = 10.5cfs, okay

(100-year storm)
Tributary Basins: C5.1e **Inlet/MH Number:** Inlet DP41
Upstream flowby: 3.1cfs from Des.Pt.41 **Total Street Flow:** 25.0cfs

Flow Intercepted: 25.1cfs **Flow Bypassed:**
Inlet Size: 20' type R, SUMP

Street Capacity: Street slope = 1.4%, capacity = 44.1cfs (half street) is okay

Design Point 44
Design Point 44 is the storm sewer pipe flow from Design Pt's 42 and 43. The total pipe flow is 42.3cfs/87.1cfs in the 5/100-year storm events in the storm sewer. The FDR for CDR20-007 (Design Point 16a) was designed to accept 42.3cfs/92.5cfs in the existing 36" RCP stub in Fontaine Boulevard.

Design Points 45 & 46

Design Points 45 & 46 are located at the NE corner of Walleye Drive and Fontaine Boulevard and is an existing 15' type R inlet in a sump condition constructed as part of CDR 20-007

(5-year storm)

Tributary Basins: C5.2 & C5.3 **Inlet/MH Number:** ex. 15' inlet
Upstream flowby: **Total Street Flow:** 7.7cfs

Flow Intercepted: 7.7cfs **Flow Bypassed:**
Inlet Size: ex 15' type R, sump

Street Capacity: Street slope = 1.0%, capacity = 13.7cfs, okay

(100-year storm)

Tributary Basins: C5.2 & C5.3 **Inlet/MH Number:** ex. 15' inlet
Upstream flowby: **Total Street Flow:** 17.1cfs

Flow Intercepted: 17.1cfs **Flow Bypassed:**
Inlet Size: ex 15' type R, sump

Street Capacity: Street slope = 1.0%, capacity = 41.4cfs (half street) is okay

The FDR for CDR 20-007 designed the existing inlet to accept 7.9cfs/17.7cfs in the 5/100 year storm events.

Design Point 47

Design Point 47 is located in the SE corner of Meridith Ridge Way and Donnas Drive and accepts flows from Basin C8.1a.

(5-year storm)

Tributary Basins: C8.1a **Inlet/MH Number:** Inlet DP47
Upstream flowby: **Total Street Flow:** 7.5cfs

Flow Intercepted: 6.1cfs **Flow Bypassed:** 1.4cfs
Inlet Size: 10' type R, on-grade

Street Capacity: Street slope = 1.0%, capacity = 9.0cfs, okay

(100-year storm)

Tributary Basins: C8.1a **Inlet/MH Number:** Inlet DP47
Upstream flowby: **Total Street Flow:** 16.4cfs

Flow Intercepted: 9.1cfs **Flow Bypassed:** 7.3cfs
Inlet Size: 10' type R, on-grade

Street Capacity: Street slope = 1.0%, capacity = 37.3cfs (half street) is okay

Design Point 48

Design Point 48 is located in the NE corner of Sanderling Street and Donnas Drive and accepts flows from Basin C8.1c.

(5-year storm)

Tributary Basins: C8.1c **Inlet/MH Number:** Inlet DP48
Upstream flowby: **Total Street Flow:** 3.4cfs

Flow Intercepted: 3.4cfs **Flow Bypassed:**
Inlet Size: 10' type R, on-grade

Street Capacity: Street slope = 1.5%, capacity = 11.0 cfs, okay

(100-year storm)

Tributary Basins: C8.1c **Inlet/MH Number:** Inlet DP48
Upstream flowby: **Total Street Flow:** 7.6cfs

Flow Intercepted: 6.2cfs **Flow Bypassed:** 1.4cfs
Inlet Size: 10' type R, on-grade

Street Capacity: Street slope = 1.5%, capacity = 44.5cfs (half street) is okay

Design Point 49

Design Point 49 is located in the NW corner of Sanderling Street and Donnas Drive and accepts flows from Basin C8.1b.

(5-year storm)

Tributary Basins: C8.1b **Inlet/MH Number:** Inlet DP49
Upstream flowby: 1.4cfs from Des.Pt47 **Total Street Flow:** 7.7 cfs

Flow Intercepted: 7.7cfs **Flow Bypassed:**
Inlet Size: 20' type R, on-grade

Street Capacity: Street slope = 2.8%, capacity = 14.4cfs, okay

(100-year storm)

Tributary Basins: C8.1b **Inlet/MH Number:** Inlet DP49
Upstream flowby: 7.3cfs from Des.Pt.47
1.4cfs from Des.Pt.48
5.1cfs from Des.Pt.57 **Total Street Flow:** 27.7cfs

Flow Intercepted: 20.8cfs **Flow Bypassed:** 6.9cfs
Inlet Size: 20' type R, on-grade

Street Capacity: Street slope = 2.8%, capacity = 40.7cfs (half street) is okay

Design Point 50

Design Point 50 is the storm sewer pipe flow from Design Pt's 48 and 49. The total pipe flow is 11.1cfs/27.0cfs in the 5/100-year storm events in the storm sewer. The FDR for CDR20-007 (Design Point 31a) was designed to accept 8.9cfs/20.9cfs in the existing 30" RCP stub from Walleye Drive at Sanderling Street. However, the existing pipe has capacity to handle the additional pipe flow based on the HGL. See Design Point 52.

Design Point 51

Design Point 51 is located at an existing 25' type R inlet in the SW corner of Grayling Drive and Walleye Drive and accepts flows from Basin C8.2.

(5-year storm)

Tributary Basins: C8.2 **Inlet/MH Number:** existing 25'
Upstream flowby: **Total Street Flow:** 4.5 cfs

Flow Intercepted: 4.5cfs **Flow Bypassed:**
Inlet Size: ex 25' type R, SUMP

Street Capacity: Street slope (collector) = 1.0%, capacity = 13.7cfs, okay

(100-year storm)

Tributary Basins: C8.2 **Inlet/MH Number:** existing 25'
Upstream flowby: 6.9cfs from Des.Pt.49
9.1cfs from Des.Pt.56 **Total Street Flow:** 26.0cfs

Flow Intercepted: 26.0cfs **Flow Bypassed:**
Inlet Size: ex 25' type R, SUMP

Street Capacity: Street slope = 1.0% (collector) , capacity = 41.4cfs (half street) is okay

The FDR for CDR 20-007 (Des.Pt. 31) designed the existing inlet to accept 14.5cfs/30.0cfs in the 5/100 year storm events.

Design Point 52

Design Point 52 is the storm sewer pipe flow from Design Pt's 50 and 51 in an existing 36" storm sewer in Walleye Drive. The total pipe flow is 15.6cfs/53.0cfs in the 5/100-year storm events in the storm sewer. The FDR for CDR20-007 (Design Point 31c) designed the storm sewer to accept 23.4cfs/50.9cfs in the existing 36" RCP storm sewer in Walleye Drive. The existing pipe has capacity to handle the slight increase in pipe flow in the 100yr storm event.

Design Point 53

Design Point 53 is located in the SW corner of Danis Drive and Walleye Drive and accepts flows from Basin C8.3a/OS-C4a.

(5-year storm)

Tributary Basins: C8.3a/OS-C4a **Inlet/MH Number:** Inlet DP53
Upstream flowby: **Total Street Flow:** 10.6cfs

Flow Intercepted: 9.7cfs **Flow Bypassed:** 0.9cfs
Inlet Size: 15' type R, on-grade

Street Capacity: Street slope = 1.4%, capacity = 10.5cfs, okay

(100-year storm)

Tributary Basins: C8.3a/OS-C4a **Inlet/MH Number:** Inlet DP53
Upstream flowby: **Total Street Flow:** 26.5cfs

Flow Intercepted: 16.2cfs **Flow Bypassed:** 10.3cfs
Inlet Size: 15' type R, on-grade

Street Capacity: Street slope = 1.4%, capacity = 44.1cfs (half street) is okay

Design Point 54

Design Point 54 is located in the NE corner of Donnas Drive and Walleye Drive and accepts flows from Basin C8.3b& C8.3c & OS-C4b.

(5-year storm)

Tributary Basins: C8.3b & C8.3c & OS-C4b **Inlet/MH Number:** Inlet DP54
Upstream flowby: 0.9cfs from Des.Pt.53 **Total Street Flow:** 11.8cfs

Flow Intercepted: 11.7cfs **Flow Bypassed:** 0.1cfs
Inlet Size: 20' type R, on-grade

Street Capacity: Street slope = 1.5%, capacity = 11.8cfs, okay

(100-year storm)

Tributary Basins: C8.3b & C8.3c & OS-C4b **Inlet/MH Number:** Inlet DP54
Upstream flowby: 10.3cfs from Des.Pt.53 **Total Street Flow:** 37.6cfs

Flow Intercepted: 24.0cfs **Flow Bypassed:** 13.6cfs
Inlet Size: 20' type R, on-grade

Street Capacity: Street slope = 1.5%, capacity = 45.0cfs (half street) is okay

Design Point 55

Design Point 55 is the storm sewer pipe flow from Design Pt's 53 and 54. The total pipe flow is 21.4cfs/40.2cfs in the 5/100-year storm events in the storm sewer.

Design Point 56

Design Point 56 is located on Walleye Drive south of Donnas Drive and accepts flows from Basin C8.3d

(5-year storm)

Tributary Basins: C8.3d **Inlet/MH Number:** Inlet DP56
Upstream flowby: 0.1cfs from Des.Pt.54 **Total Street Flow:** 9.0cfs

Flow Intercepted: 9.0cfs **Flow Bypassed:**
Inlet Size: 20' type R, on-grade

Street Capacity: Street slope = 1.2%, capacity = 10.0cfs, okay

(100-year storm)

Tributary Basins: C8.3d **Inlet/MH Number:** Inlet DP56
Upstream flowby: 13.6cfs from Des.Pt.54 **Total Street Flow:** 32.8cfs

Flow Intercepted: 32.8cfs **Flow Bypassed:** 9.1cfs
Inlet Size: 20' type R, on-grade

Street Capacity: Street slope = 1.2%, capacity = 38.0cfs (half street) is okay

Design Point 57

Design Point 57 is located at the NE corner of Donnas Drive and Meridith Ridge Way and accepts flows from Basin C8.4

(5-year storm)

Tributary Basins: C8.4 **Inlet/MH Number:** Inlet DP57
Upstream flowby: **Total Street Flow:** 11.0cfs

Flow Intercepted: 11.0cfs **Flow Bypassed:**
Inlet Size: 20' type R, on-grade

Street Capacity: Street slope = 1.0%, capacity = 9.0cfs, okay

(100-year storm)

Tributary Basins: C8.4 **Inlet/MH Number:** Inlet DP57
Upstream flowby: **Total Street Flow:** 24.1cfs

Flow Intercepted: 19.0cfs **Flow Bypassed:** 5.1cfs
Inlet Size: 20' type R, on-grade

Street Capacity: Street slope = 1.0%, capacity = 37.3cfs (half street) is okay

Design Point 58

Design Point 58 is the storm sewer pipe flow from Design Pt's 57 and 47. The total pipe flow is 17.1cfs/28.1cfs in the 5/100-year storm events in the storm sewer.

Design Point 59

Design Point 59 is located on the north side of Walleye Drive south of Broken Top Drive and accepts flows from Basin C8.5

(5-year storm)

Tributary Basins: C8.5 **Inlet/MH Number:** Inlet DP59

Upstream flowby: **Total Street Flow:** 7.0cfs

Flow Intercepted: 5.9cfs **Flow Bypassed:** 1.1cfs

Inlet Size: 10' type R, on-grade

Street Capacity: Street slope = 1.2%, capacity = 10.0cfs, okay

(100-year storm)

Tributary Basins: C8.5 **Inlet/MH Number:** Inlet DP59

Upstream flowby: **Total Street Flow:** 15.5cfs

Flow Intercepted: 8.9cfs **Flow Bypassed:** 6.6cfs

Inlet Size: 10' type R, on-grade

Street Capacity: Street slope = 1.2%, capacity = 38.0cfs (half street) is okay

Design Point 60

Design Point 60 is the storm sewer pipe flow from Design Pt's 55, 56 and 59. The total pipe flow is 32.7cfs/73.3cfs in the 5/100-year storm events in the storm sewer.

Design Point 61

Design Point 61 is the storm sewer pipe flow from Design Pt's 52, 58 and 60 from the C8.1, C8.3, C8.4, and C8.5 basins. The total pipe flow is 44.9cfs/104.1cfs in the 5/100-year storm events in the storm sewer. The FDR for CDR20-007 (Design Point 32) designed the storm sewer to accept 45.1cfs/105.4cfs in the existing 42" RCP storm sewer in Walleye Drive.

Design Point 62

Design Point 62 is located in the NE corner of Grayling Drive and Regan Ridge Drive and accepts flows from Basin C8.6 & C8.7e.

(5-year storm)

Tributary Basins: C8.6 & C8.7e **Inlet/MH Number:** Inlet DP62
Upstream flowby: 1.1 cfs from Des.Pt.59 **Total Street Flow:** 14.3cfs

Flow Intercepted: 14.3cfs **Flow Bypassed:**
Inlet Size: 25' type R, SUMP

Street Capacity: Street slope = 2.5%, capacity = 14.2cfs, okay

(100-year storm)

Tributary Basins: C8.6 & C8.7e **Inlet/MH Number:** Inlet DP62
Upstream flowby: 6.6cfs from Des.Pt.59
2.7cfs from Des.Pt.66 **Total Street Flow:** 37.4cfs

Flow Intercepted: 37.4cfs **Flow Bypassed:**
Inlet Size: 25' type R, SUMP

Street Capacity: Street slope = 2.5%, capacity = 41.4cfs (half street) is okay

Design Point 63

Design Point 63 is located at the SE corner of Regan Ridge Drive and Logans Ridge Lane and accepts flows from Basin C8.7a&b

(5-year storm)

Tributary Basins: C8.7a&b **Inlet/MH Number:** Inlet DP63
Upstream flowby: **Total Street Flow:** 11.5cfs

Flow Intercepted: 10.2cfs **Flow Bypassed:** 1.3cfs
Inlet Size: 15' type R, on-grade

Street Capacity: Street slope = 1.6%, capacity = 11.5cfs, okay

(100-year storm)

Tributary Basins: C8.7a&b **Inlet/MH Number:** Inlet DP63
Upstream flowby: **Total Street Flow:** 25.6cfs

Flow Intercepted: 15.9cfs **Flow Bypassed:** 9.7cfs
Inlet Size: 15' type R, on-grade

Street Capacity: Street slope = 1.6%, capacity = 45.0cfs (half street) is okay

Design Point 64

Design Point 64 is located at the SE corner of Regan Ridge Drive and Cody Ridge Way and accepts flows from Basin C8.7c

(5-year storm)

Tributary Basins: C8.7c **Inlet/MH Number:** Inlet DP64
Upstream flowby: 1.3cfs from Des.Pt.63 **Total Street Flow:** 10.7cfs

Flow Intercepted: 9.8cfs **Flow Bypassed:** 0.9cfs
Inlet Size: 15' type R, on-grade

Street Capacity: Street slope = 4.0%, capacity = 17.9cfs, okay

(100-year storm)

Tributary Basins: C8.7c **Inlet/MH Number:** Inlet DP64
Upstream flowby: 9.7cfs from Des.Pt.63 **Total Street Flow:** 30.6cfs

Flow Intercepted: 17.5cfs **Flow Bypassed:** 13.1cfs
Inlet Size: 15' type R, on-grade

Street Capacity: Street slope = 4.0%, capacity = 35.7cfs (half street) is okay

Design Point 65

Design Point 65 is the storm sewer pipe flow from Design Pt's 63 and 64. The total pipe flow is 20.0cfs/33.4cfs in the 5/100-year storm events in the storm sewer.

Design Point 66

Design Point 66 is located at the NE corner of Regan Ridge Drive and Broken Top Drive and accepts flows from Basin C8.7d

(5-year storm)

Tributary Basins: C8.7d **Inlet/MH Number:** Inlet DP66
Upstream flowby: 0.9cfs from Des.Pt.64 **Total Street Flow:** 1.5cfs

Flow Intercepted: 1.5cfs **Flow Bypassed:**
Inlet Size: 15' type R, on-grade

Street Capacity: Street slope = 2.0%, capacity = 12.5cfs, okay

(100-year storm)

Tributary Basins: C8.7d **Inlet/MH Number:** Inlet DP66
Upstream flowby: 13.1cfs from Des.Pt.64 **Total Street Flow:** 14.5cfs

Flow Intercepted: 11.8cfs **Flow Bypassed:** 2.7cfs
Inlet Size: 15' type R, on-grade

Street Capacity: Street slope = 2.0%, capacity = 44.0cfs (half street) is okay

Design Point 67
Design Point 67 is the storm sewer pipe flow from Design Pt's 65 and 66. The total pipe flow is 21.5cfs/45.2cfs in the 5/100-year storm events in the storm sewer.

Design Point 68
Design Point 68 is the storm sewer pipe flow from Basins C8.6-C8.7e and runby from Des.Pt. 59. The total pipe flow is 33.0cfs/76.5cfs in the 5/100-year storm events in the storm sewer.

Design Point 69
Design Point 69 is located at the NW corner of Regan Ridge Drive and Walleye Drive at an existing 25' Type R sump inlet and accepts flows from Basin OS-B1 & C8.8a

(5-year storm)
Tributary Basins: OS-B1 & C8.8a **Inlet/MH Number:** Inlet DP69
Upstream flowby: **Total Street Flow:** 9.3cfs

Flow Intercepted: 9.3cfs **Flow Bypassed:**
Inlet Size: Ex 25' type R, SUMP

Street Capacity: Street slope = 2.0%, capacity = 12.5cfs, okay

(100-year storm)
Tributary Basins: OS-B1 & C8.8a **Inlet/MH Number:** Inlet DP69
Upstream flowby: **Total Street Flow:** 26.9cfs

Flow Intercepted: 26.9cfs **Flow Bypassed:**
Inlet Size: Ex 25' type R, SUMP

Street Capacity: Street slope = 2.0%, capacity = 44.0cfs (half street) is okay

Design Point 70
Design Point 70 is the storm sewer pipe flow from the offsite basins, C8.7's, and C8.8a basins and runby from Des.Pt.59. The total pipe flow is 34.5cfs/86.3cfs in the 5/100-year storm events in the storm sewer from the xcel spreadsheet calculations. The FDR for CDR20-007 (Design Point 34a) designed the storm sewer to accept 38.2cfs/84.5cfs in the existing 42" RCP storm sewer in Walleye Drive. The storm sewer has capacity for these basins.

Design Point 71
Design Point 71 is located on the east side of this site and is the total flow from Basins F1.1 and F1.2. The total flow from these basins is 8.2cfs/32.2cfs in the 5/100-year storm events. The existing flow calculated at Design Point EX-F flowing east offsite is 14.4cfs/84.9cfs in the 5/100-year storm events. The developed flow is less than existing therefore does not have negative impacts downstream.

6.0 DETENTION AND WATER QUALITY PONDS

Detention and Storm Water Quality for The Ridge at Lorson Ranch is required per El Paso County criteria. We have implemented the Full Spectrum approach for detention for the Denver Urban Drainage Districts specifications. There are four permanent full spectrum ponds previously constructed in The Hills at Lorson Ranch for this development which will incorporate storm water quality features and comply with the Lorson Ranch East MDDP. The ponds have been sized and include access roads, outlet pipes, overflow structures, and low flow channels. This drainage report provides design information on the outlet structure, trickle channel, and the forebays.

Full Spectrum Pond Construction Requirements

All three of the ponds required for this project have been previously graded as part of The Hills at Lorson Ranch (PUDSP 20-003) and include Pond C1, C2.1, C2.2, and C4. The Hills at Lorson Ranch constructed Existing Pond C1 and C2.2 which are complete full spectrum ponds that do not need to be modified and include the full spectrum outlet structure, forebays, outfall storm sewer, and low flow channels. Existing Pond C2.1 and Pond C4 were graded and constructed with forebays, outfall storm sewers, and low flow channels but did not include the full spectrum outlet structure. The outlet structure for these two ponds will be discussed in this section including what type of structure is proposed

Design calculations for Pond C2.1 and Pond C4 spectrum outlet structures are included in this report. The existing ponds currently have a 15' wide gravel access road at a maximum 10% slope to the pond bottom, forebay, storm sewer outfall, and concrete low flow channels. The final design of the Pond C2.1 and Pond C4 will consist of a full spectrum outlet structure and overflow weirs. Soil borings, embankment, slope, and compaction requirements for detention ponds can be found in the geotechnical report for the The Hills at Lorson Ranch prepared by RMG.

Detention Pond C1 (existing pond for information only, See CDR20-007)

This is an existing permanent full spectrum detention pond that includes water quality and discharges downstream to a storm sewer system in Fontaine Boulevard. Pond C1 is designed in the UDCF Full Spectrum spreadsheets for Water Quality and EURV volumes. The 5-year and 100-year flow rates meet the Lorson East MDDP and have been modeled in the full spectrum worksheets. The outlet structure is a standard full spectrum extended detention basin structure and will include an emergency overflow spillway. See map in appendix for watershed areas.

- Watershed Area: 76 acres
- Watershed Imperviousness: 55%
- Hydrologic Soils Group B
- Zone 1 WQCV: 1.397ac-ft, WSEL: 5747.04
- Zone 2 EURV: 4.505ac-ft, WSEL: 5749.21, Top outlet structure set at 5749.50, 3'x6' outlet structure
- (5-yr): 5.006ac-ft, WSEL: 5749.54, 7.1cfs
- Zone 3 (100-yr): 10.736ac-ft, WSEL: 5752.80, 18.1cfs
- Pipe Outlet: 18" RCP at 0.5%
- Overflow Spillway: 28' wide bottom, elevation=5753.40, 4:1 side slopes, flow depth=1.44' 1.16' freeboard
- Micropool Elevation: 5743.40

Detention Pond C2.2 (existing pond for information only, see CDR 20-007)

This is a permanent full spectrum detention pond that includes water quality and discharges downstream to an existing storm sewer in Fontaine Boulevard. Inflow to this pond is from direct

tributary development and outflow from Pond C3. The inflow hydrograph has been modeled in the full spectrum spreadsheets by adding the direct tributary area CUHP hydrograph to the upstream pond outflow hydrograph of Pond C3. The outlet structure, overflow wall, pond forebay and low flow channel will be built as part of the CDR 20-007 project. Pond C2.2 is designed in the UDCF Full Spectrum spreadsheets for Water Quality and EURV volumes. The 5-year and 100-year flow rates meet the Lorson East MDDP and have been modeled in the modeled in the full spectrum worksheets. The outlet structure is a standard full spectrum extended detention basin structure and will include an emergency overflow spillway. See map in appendix for watershed areas. x

- Watershed Area: 45.0 acres
- Watershed Imperviousness: 55%
- Hydrologic Soils Group B (95%), Group C/D (5%)
- Zone 1 WQCV: 0.829ac-ft, WSEL: 5747.25
- Zone 2 EURV: 2.658ac-ft, WSEL: 5749.17, Top outlet structure set at 5751.00, 8'x6' outlet structure
- (5-yr): 4.475ac-ft, WSEL: 5760.88, 2.7cfs
- Zone 3 (100-yr): 6.67ac-ft, WSEL: 5752.75, 42.9cfs
- Pipe Outlet: 30" RCP
- Overflow Spillway: 20' wide bottom, elevation=5754.00, 4:1 side slopes, flow depth=1.51' 1.49' freeboard
- Micropool Elevation: 5744.00

Detention Pond C2.1

This is a permanent full spectrum detention pond that includes water quality and discharges downstream to Pond C2.3. The outlet Structure and overflow wall will be built as part of the final plat for this project. The pond forebay and low flow channel were built as part of the CDR 20-007 project. Pond C2.1 is designed in the UDCF Full Spectrum spreadsheets for Water Quality and EURV volumes. The 5-year and 100-year flow rates meet the Lorson East MDDP and have been modeled in the modeled in the full spectrum worksheets. The outlet structure is a standard full spectrum extended detention basin structure and will include an emergency overflow spillway. The full spectrum print outs are in the appendix of this report. See map in appendix for watershed areas.

- Watershed Area: 74.5 acres
- Watershed Imperviousness: 55%
- Hydrologic Soils Group B
- Zone 1 WQCV: 1.377ac-ft, WSEL: 5763.42
- Zone 2 EURV: 4.415ac-ft, WSEL: 5766.20, Top outlet structure set at 5766.20, 8'x6' outlet structure
- (5-yr): 4.694ac-ft, WSEL: 5766.44, 12.8cfs
- Zone 3 (100-yr): 7.829ac-ft, WSEL: 5768.80, 65.0cfs
- Pipe Outlet: 30" RCP at 0.5%
- Overflow Spillway: 25' wide bottom, elevation=5769.30, 4:1 side slopes, flow depth=1.69' 1.01' freeboard
- Micropool Elevation: 5760.00

Detention Pond C4

This is a permanent full spectrum detention pond that includes water quality and discharges downstream to Pond C3. Pond C4 has been graded. The outlet Structure and overflow wall will be built with the final plat of this project. The pond forebay and low flow channel were built as part of the CDR 20-007 project. Pond C4 is designed in the UDCF Full Spectrum spreadsheets for Water Quality and EURV volumes. The 5-year and 100-year flow rates meet the Lorson East MDDP and have been modeled in the modeled in the full spectrum worksheets. The outlet structure is a standard full

spectrum extended detention basin structure and will include an emergency overflow spillway. The full spectrum print outs are in the appendix of this report. See map in appendix for watershed areas.

- Watershed Area: 81.00 acres
- Watershed Imperviousness: 55%
- Hydrologic Soils Group B (40%), Group C/D (60%)
- Zone 1 WQCV: 1.488ac-ft, WSEL: 5767.97
- Zone 2 EURV: 4.477ac-ft, WSEL: 5770.41, Top outlet structure set at 5770.50, 6'x6' outlet structure
- (5-yr): 3.934ac-ft, WSEL: 5770.84, 16.5cfs
- Zone 3 (100-yr): 10.152ac-ft, WSEL: 5774.34, 43.7cfs
- Pipe Outlet: 24" RCP at 0.5%
- Overflow Spillway: 30' wide bottom, elevation=5775.00, 4:1 side slopes, flow depth=1.87' 1.13' freeboard
- Micropool Elevation: 5765.00

Water Quality for Basin F1.1 (4.23ac)

Developed runoff from this basin flows east offsite (shallow sheet flow) and does not include a water quality pond. Runoff from this basin is from a standard 50'x110' lot with the back 90 feet of the residential lots which flows overland east across a 145' wide open space tract prior to discharging to the east. The Runoff Reduction Method procedure from the Mile High Flood Control District spreadsheet (UD-BMP-V3.07) calculations have been applied to a standard 50' wide lot to address water quality provisions for development in this basin (see appendix). The UIA area is 4500sf (50'x90') and the RPA area is 7250sf (50'x145') per lot which can then be applied to the remaining lots within the basin. The large 145' wide open space tract provides a 100% reduction in the water quality requirements for this basin. Grading within this basin should not channelize flow from backyards and flow should be allowed to pass under any backyard fencing without obstructing or channelizing the overland flow.

7.0 DRAINAGE AND BRIDGE FEES

The Ridge at Lorson Ranch is located within the Jimmy Camp Creek drainage basin which is currently a fee basin in El Paso County. Current El Paso County regulations require drainage and bridge fees to be paid for platting of land as part of the plat recordation process.

Lorson Ranch Metro District will compile and submit to the county on a yearly basis the Drainage and bridge fees for the approved plats and shall show all credits they have received for the same yearly time frame.

Table 7.1: Public Drainage Facility Costs (non-reimbursable)

Item	Quantity	Unit	Unit Cost	Item Total
Inlets/Manholes	65	EA	$5000/EA	$325,000
18" Storm	1820	LF	$35	$63,700
24" Storm	720	LF	$40	$28,800
30" Storm	1330	LF	$45	$59,850
36" Storm	1130	LF	$55	$62,150
42" Storm	245	LF	$65	$15,925
48" Storm	400	LF	$85	$34,000

			Subtotal	$589,425
			Eng/Cont (10%)	$58,942
			Total Est. Cost	$648,367

Table 7.2: Lorson Ranch Metro District Drainage Facility Costs (non-reimbursable)

Item	Quantity	Unit	Unit Cost	Item Total
Full Spectrum Outlets	2	LS	$20,000	$40,000
			Subtotal	$40,000
			Eng/Cont (15%)	$46,000
			Total Est. Cost	$694,367

8.0 FOUR STEP PROCESS

The site has been developed to minimize wherever possible the rate of developed runoff that will leave the site and to provide water quality management for the runoff produced by the site as proposed on the development plan. The following four step process should be considered and incorporated into the storm water collection system and storage facilities where applicable.

Step 1: Employ Runoff Reduction Practices
The Ridge at Lorson Ranch has employed several methods of reducing runoff.

- The street configuration was laid out to minimize the length of streets. Many streets are straight and perpendicular resulting in lots with less wasted space.
- There are large open space buffers under the 325' wide electric transmission easement and on the east side
- Construct outlet structures for two Full Spectrum Detention Ponds. The full spectrum detention mimics existing storm discharges and includes water quality.

Step 2: Stabilize Drainageways
East Tributary of Jimmy Camp Creek is a major drainageway located west of this site. In 2014 and in 2018 the East Tributary of JCC was reconstructed and stabilized per county criteria. The design included a natural sand bottom and armored sides.

Step 3: Provide Water Quality Capture Volume
Treatment of the water quality capture volume (WQCV) is required for all new developments The Ridge at Lorson Ranch will construct two full spectrum stormwater extended detention basins which include Water Quality Volumes and WQ outlet structures.

Step 4: Consider Need for Industrial and Commercial BMP's
There are no commercial or industrial areas within this site.

9.0 CONCLUSIONS

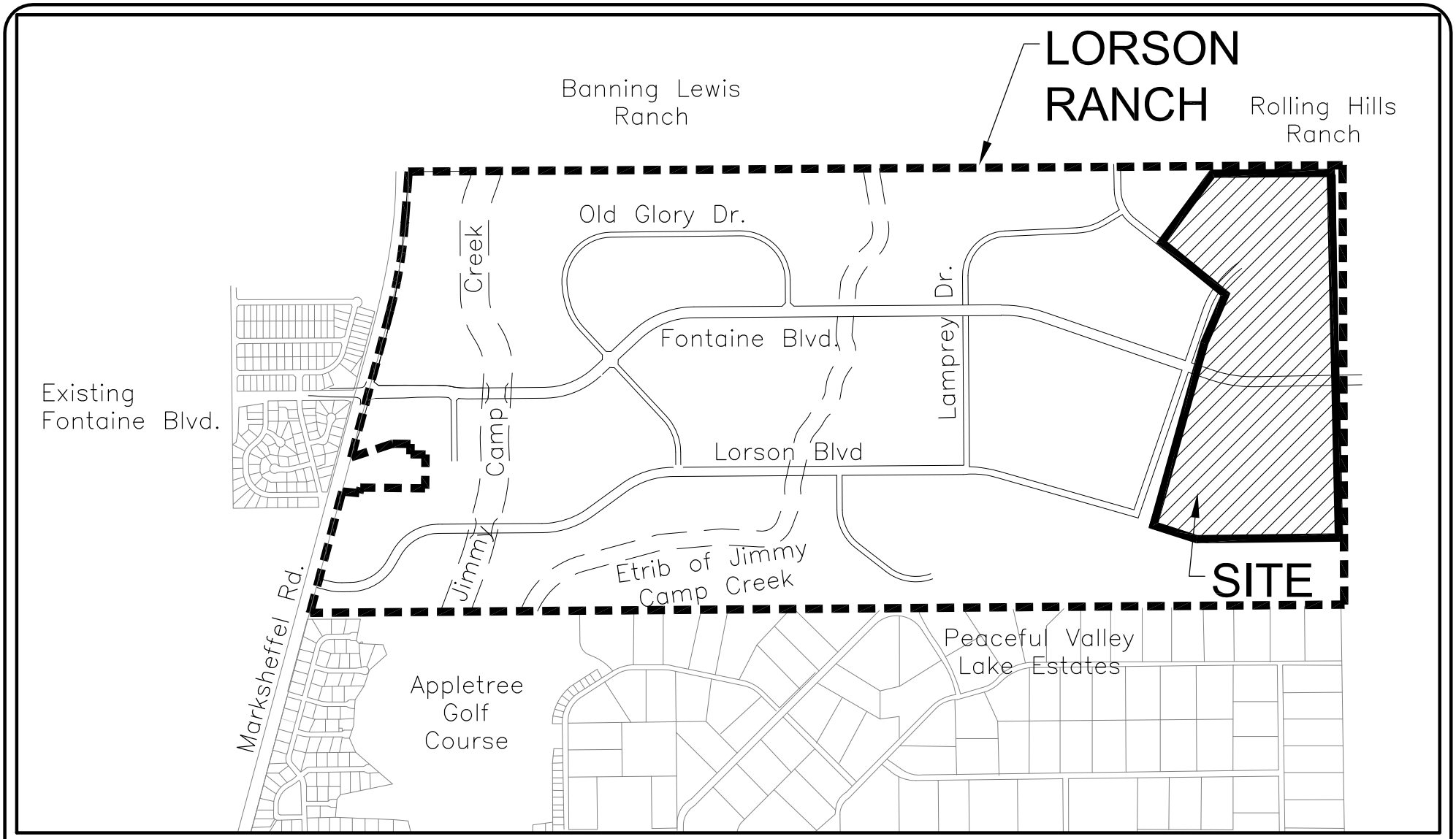
This drainage report has been prepared in accordance with the City of Colorado Springs/El Paso County Drainage Criteria Manual. The proposed development and drainage infrastructure will not cause adverse impacts to adjacent properties or properties located downstream. Several key aspects of the development discussed above are summarized as follows:

- Developed runoff will be conveyed via curb/gutter and storm sewer facilities
- The East Tributary of Jimmy Camp Creek has been reconstructed west of this study area
- Bridges over the East Tributary at Lorson Boulevard and Fontaine Boulevard and have been constructed providing access to this site.
- Detention and water quality for this site area will be provided in three permanent ponds and one runoff reduction area

10.0 REFERENCES

1. City of Colorado Springs/El Paso County Drainage Criteria Manual DCM, dated November, 1991
2. Soil Survey of El Paso County Area, Colorado by USDA, SCS
3. Jimmy Camp Creek Drainage Basin Planning Study, Dated March 9, 2015, by Kiowa Engineering Corporation
4. City of Colorado Springs “Drainage Criteria Manual, Volume 2
5. El Paso County “Engineering Criteria Manual”
6. Lorson Ranch East MDDP, June 30, 2017 by Core Engineering.
7. El Paso County Resolution #15-042, El Paso County adoption of Chapter 6 and Section 3.2.1 of the City of Colorado Springs Drainage Criteria Manual dated May, 2014.
8. Lorson Ranch East MDDP prepared by Core Engineering Group, dated November 27, 2017
9. Final Drainage Report for CDR 20-007 prepared by Core Engineering Group, dated October 22, 2020
10. Final Drainage Report for The Hills at Lorson Ranch Filing No. 1 prepared by Core Engineering Group, Reference SF 21-010

APPENDIX A – VICINTIY MAP, SOILS MAP, FEMA MAP



VICINITY MAP

NO SCALE

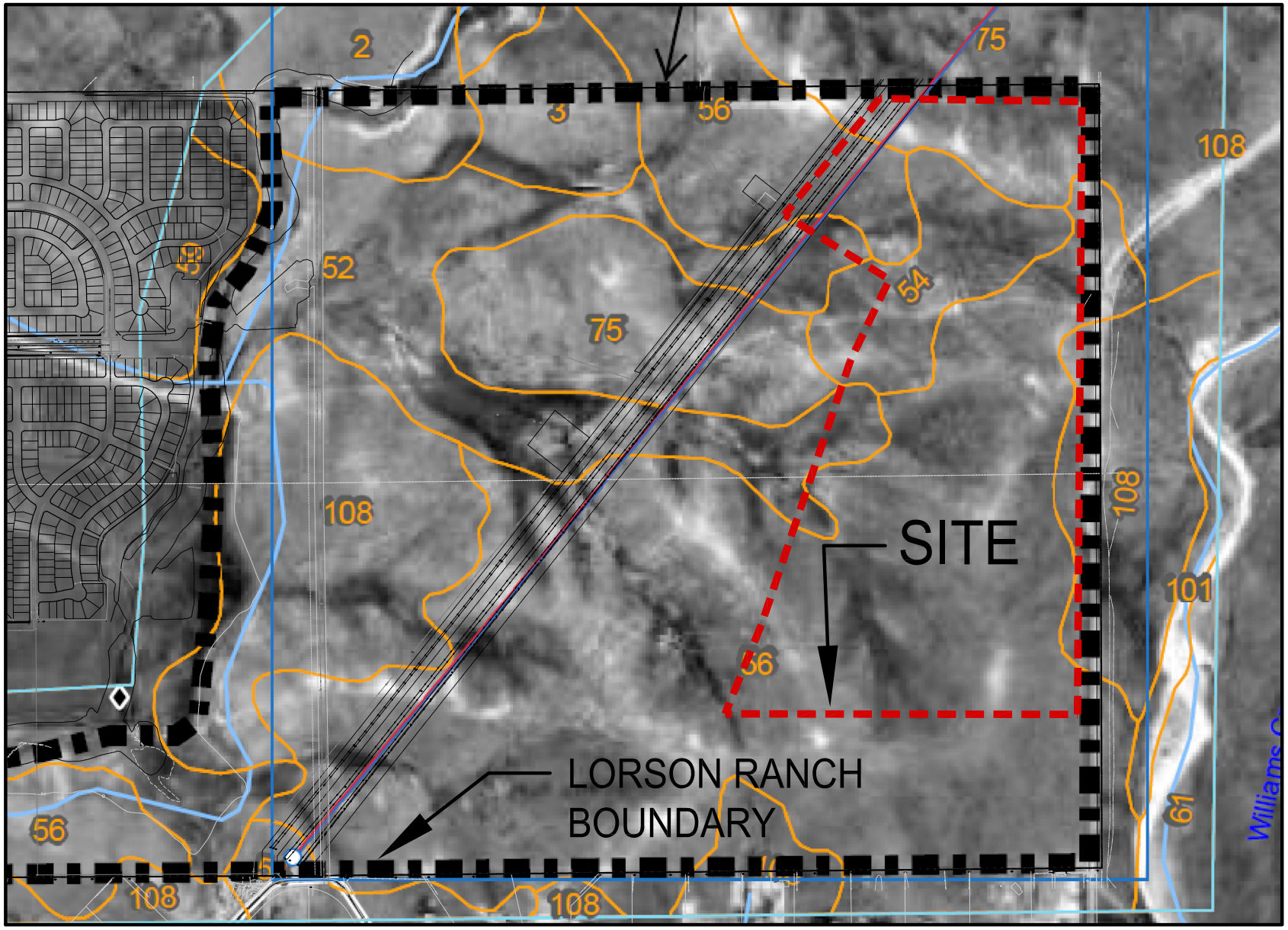
CORE ENGINEERING GROUP

15004 1ST AVE. S.
BURNSVILLE, MN 55306
PH: 719.570.1100

CONTACT: RICHARD L. SCHINDLER, P.E.
EMAIL: Rich@ceg1.com

THE RIDGE AT LORSON RANCH
VICINITY MAP

SCALE:	DATE:	FIGURE NO.
NTS	APRIL, 2021	--



CORE
ENGINEERING GROUP

15004 1ST AVENUE S.
BURNSVILLE, MN 55306
PH: 719.570.1100
CONTACT: RICHARD L. SCHINDLER, P.E.
EMAIL: Rich@ceg1.com

THE RIDGE AT LORSON RANCH
SOILS MAP

SCALE:	DATE:	FIGURE NO.
NTS	APRIL, 2021	--


CITY OF COLORADO SPRINGS
080060
LOMR 19-08-0605P
eff. 5/4/2020
FLOODWAY
Zone AE
Zone AE
EL PASO COUNTY
080059
08041C0957G
eff. 12/7/2018
AREA OF MINIMAL FLOOD HAZARD
Zone X
08041C0976G
eff. 12/7/2018
Zone A
site

APPENDIX B – HYDROLOGY CALCULATIONS

CORE ENGINEERING GROUP

Standard Form SF-2. Storm Drainage System Design (Rational Method Procedure)

Calculated By: Leonard Beasley
Date: Feb. 17, 2021
Checked By: Leonard Beasley

Job No: 100.064
Project: The Ridge at Lorson Ranch
Design Storm: **5 - Year Event (Current)**

Street or Basin	Design Point	Direct Runoff							Total Runoff				Street		Pipe			Travel Time			Remarks
		Area Design	Area (A)	Runoff Coeff. (C)	t_c	CA	i	Q	t_c	∑ (CA)	i	Q	Slope	Street Flow	Design Flow	Slope	Pipe Size	Length	Velocity	tt	
			ac.		min.		in/hr	cfs	min		in/hr	cfs	%	cfs	cfs	%	in	ft	ft/sec	min	
EX-B1			14.42	0.15	28.1	2.16	2.58	5.6													
OS-B1.1			5.64	0.15	21.0	0.85	3.02	2.6													
EX-B	**1X**	20.06							29.7	3.01	2.50	7.5									
C1.1-ex			12.49	0.09	23.8	1.12	2.83	3.2													
C2.1-ex			26.58	0.10	33.6	2.66	2.31	6.1													
C2.2-ex			60.28	0.09	35.1	5.43	2.25	12.2													
C3.1-ex			8.36	0.12	28.6	1.00	2.55	2.6													
OS-C4.1			4.39	0.10	20.7	0.44	3.04	1.3													
C4.2-ex			47.93	0.13	31.6	6.23	2.41	15.0													
C4-ex	**4X**	52.32							34.1	6.67	2.29	15.3									
EX-F1			22.36	0.12	25.8	2.68	2.71	7.3													
EX-F2			17.49	0.15	15.4	2.62	3.48	9.1													
EX-F	**2X**	39.85							25.6	5.31	2.72	14.4									

CORE ENGINEERING GROUP

Standard Form SF-2. Storm Drainage System Design (Rational Method Procedure)

Calculated By: Leonard Beasley
Date: Feb. 17, 2021
Checked By: Leonard Beasley

Job No: 100.064
Project: The Ridge at Lorson Ranch
Design Storm: **100-Year Event (Current)**

Street or Basin	Design Point	Direct Runoff							Total Runoff				Street		Pipe			Travel Time			Remarks
		Area Design	Area (A)	Runoff Coeff. (C)	tc	CA	i	Q	tc	Σ (CA)	i	Q	Slope	Street Flow	Design Flow	Slope	Pipe Size	Length	Velocity	tt	
			ac.		min.		in/hr	cfs	min		in/hr	cfs	%	cfs	cfs	%	in	ft	ft/sec	min	
EX-B1			14.42	0.50	28.1	7.21	4.33	31.2													
OS-B1.1			5.64	0.50	21.0	2.82	5.06	14.3													
EX-B	**1X**	20.06							29.7	10.03	4.19	42.0									
C1.1-ex			12.49	0.36	23.8	4.50	4.75	21.4													
C2.1-ex			26.58	0.39	33.6	10.37	3.88	40.2													
C2.2-ex			60.28	0.36	35.1	21.70	3.77	81.8													
C3.1-ex			8.36	0.42	28.6	3.51	4.28	15.0													
C4.1-ex			4.39	0.39	20.7	1.71	5.10	8.7													
C4.2-ex			47.93	0.44	31.6	21.09	4.04	85.1													
C4-ex	**4X**	52.32							34.1	22.80	3.84	87.7									
EX-F1			22.36	0.44	25.8	9.84	4.55	44.7													
EX-F2			17.49	0.50	15.4	8.75	5.84	51.1													
EX-F	**2X**	39.85							25.6	18.58	4.57	84.9									

CORE ENGINEERING GROUP

Standard Form SF-2. Storm Drainage System Design (Rational Method Procedure)

Calculated By: Leonard Beasley
Date: Feb. 18, 2021
Checked By: Leonard Beasley

Job No: 100.064
Project: The Ridge at Lorson Ranch
Design Storm: **5 - Year Event (Proposed)**

Street or Basin	Design Point	Direct Runoff							Total Runoff				Street		Pipe			Travel Time			Remarks
		Area Design	Area (A)	Runoff Coeff. (C)	t_c	CA	i	Q	t_c	∑ (CA)	i	Q	Slope	Street Flow	Design Flow	Slope	Pipe Size	Length	Velocity	t_t	
			ac.		min.		in/hr	cfs	min		in/hr	cfs	%	cfs	cfs	%	in	ft	ft/sec	min	
C1.1	I-1		3.18	0.45	11.8	1.43	3.89	5.6													
C1.2	I-2		1.52	0.45	11.5	0.68	3.92	2.7													
C1.1-C1.2	**3**	4.70							11.8	2.12	3.89	8.2									
C1.3	I-4		11.61	0.45	26.1	5.22	2.69	14.1													
C1.1-C1.3	**5**	16.31							26.1	7.34	2.69	19.7									
C1.4			2.51	0.45	13.2	1.13	3.72	4.2													
C1.5	I-6		1.61	0.45	9.9	0.72	4.14	3.0													
C1.6			9.35	0.45	20.5	4.21	3.05	12.8													
C1.5-C1.6	**7**	10.96							20.5	6.06	3.05	18.5									
C3.1	I-12		6.20	0.45	14.7	2.79	3.55	9.9													
C3.2	I-13		5.01	0.45	15.3	2.25	3.49	7.9													
C3.1-C3.2	**14**	11.21							16.1	5.04	3.41	17.2									
C3.3	I-15		4.75	0.45	11.2	2.14	3.96	8.5													
C3.1-C3.3	**16**	15.96							18.1	7.18	3.24	23.3									
C3.4	I-17		3.77	0.45	9.4	1.70	4.23	7.2													
C3.1-C3.4	**18**	19.73							18.9	8.88	3.17	28.2									
C3.5	I-19		6.32	0.45	14.1	2.84	3.62	10.3													
C3.1-C3.5	**20**	26.05							19.9	11.72	3.10	36.3									
C3.6a	I-20a		3.15	0.45	11.2	1.42	3.96	5.6													
C3.1-C3.6a	**20b**	29.20							20.0	13.14	3.09	40.6									
C3.6b	I-21		4.80	0.45	16.8	2.16	3.35	7.2													
C3.7	I-23		4.58	0.45	9.4	2.06	4.22	8.7													
C3.1-C3.7	**24**	38.58							21.0	17.36	3.02	52.4									
C3.8	I-25		6.51	0.45	16.1	2.93	3.41	10.0													
C3.9	I-27		4.55	0.45	11.1	2.05	3.97	8.1													
C3.1-C3.9	**28**	49.64							22.3	22.34	2.93	65.4									
C3.10	I-29		6.01	0.45	16.4	2.70	3.39	9.2													
C3.1-C3.10	**30**	55.65							24.4	25.04	2.79	69.9									
C4.1			4.61	0.45	20.3	2.07	3.07	6.4													
C4.2			3.08	0.45	15.7	1.39	3.45	4.8													
C4.1-C4.2	**31**	7.69							20.6	3.46	3.04	10.5									
C4.3			3.07	0.46	10.7	1.41	4.02	5.7													

CORE ENGINEERING GROUP

Standard Form SF-2. Storm Drainage System Design (Rational Method Procedure)

Calculated By: Leonard Beasley
Date: Feb. 18, 2021
Checked By: Leonard Beasley

Job No: 100.064
Project: The Ridge at Lorson Ranch
Design Storm: **5 - Year Event (Proposed)**

Street or Basin	Design Point	Direct Runoff							Total Runoff				Street		Pipe			Travel Time			Remarks
		Area Design	Area (A)	Runoff Coeff. (C)	t_c	CA	i	Q	t_c	Σ (CA)	i	Q	Slope	Street Flow	Design Flow	Slope	Pipe Size	Length	Velocity	t_t	
			ac.		min.		in/hr	cfs	min		in/hr	cfs	%	cfs	cfs	%	in	ft	ft/sec	min	
C4.4			3.29	0.46	10.4	1.51	4.07	6.2													
C4.1-C4.4	**34**	14.05							22.6	6.39	2.91	18.6									
C4.5			0.63	0.90	5.0	0.57	5.17	2.9													
F1.1			4.23	0.45	21.1	1.90	3.01	5.7													
F1.2			12.12	0.08	15.7	0.97	3.45	3.3													
F1.1-F1.2	**35**	16.35							23.5	2.87	2.85	8.2									
C5.1a	I-39		2.33	0.47	12.5	1.10	3.79	4.2													
C5.1b	I-36		6.32	0.45	10.8	2.84	4.02	11.4													
C5.1c	I-37		3.78	0.45	8.6	1.70	4.35	7.4													
C5.1b-C5.1c	**38**	10.10							10.8	4.55	4.02	18.3									
C5.1a-C5.1c	I-39 & **40**	12.43							14.4	5.64	3.58	20.2									
C5.1d	I-41		5.67	0.45	14.0	2.58	3.62	9.3													
C5.1a-C5.1d	**42**	18.10							14.4	4.28	3.58	15.3									
C5.1e	I-43		6.44	0.46	16.5	2.96	3.38	10.0													
C5.1a-C5.1e	**44**	24.54							16.5	11.18	3.38	37.8									
C5.2			1.71	0.49	8.5	0.84	4.37	3.7													
C5.3			2.26	0.46	10.3	1.04	4.09	4.3													
C5.2-C5.3	I-45 & **46**	3.97							10.3	1.88	4.09	7.7									
C8.1a	I-47		4.12	0.45	10.7	1.85	4.03	7.5													
C8.1b	I-49		3.69	0.48	14.6	1.77	3.56	6.3													
C8.1c	I-48		1.88	0.46	11.3	0.86	3.94	3.4													
C8.1	**I-49**	9.69							14.6	4.49	3.56	16.0									

CORE ENGINEERING GROUP

Standard Form SF-2. Storm Drainage System Design (Rational Method Procedure)

Calculated By: Leonard Beasley
Date: Feb. 18, 2021
Checked By: Leonard Beasley

Job No: 100.064
Project: The Ridge at Lorson Ranch
Design Storm: **5 - Year Event (Proposed)**

Street or Basin	Design Point	Direct Runoff							Total Runoff				Street		Pipe			Travel Time			Remarks
		Area Design	Area (A)	Runoff Coeff. (C)	t_c	CA	i	Q	t_c	Σ (CA)	i	Q	Slope	Street Flow	Design Flow	Slope	Pipe Size	Length	Velocity	t_t	
			ac.		min.		in/hr	cfs	min		in/hr	cfs	%	cfs	cfs	%	in	ft	ft/sec	min	
C8.2	I-51		2.12	0.49	8.9	1.04	4.31	4.5													
OS-C4a			2.29	0.09	11.8	0.21	3.88	0.8													
C8.3a	I-53		5.88	0.46	11.8	2.70	3.89	10.5													
OS-C4a-C8.3a	**I-54**	8.17							14.0	2.91	3.62	10.6									
OS-C4b			2.10	0.11	12.7	0.23	3.78	0.9													
C8.3b			3.46	0.48	14.2	1.66	3.61	6.0													
C8.3c (OS-C4b-C8.3c)	I-54	7.89	2.33	0.48	10.7	1.12	4.03	4.5	14.2	3.01	3.61	10.9									
OS-C4a-C8.3c	**I-54**	16.06							20.0	5.92	3.09	18.3									
C8.3d	I-56		5.26	0.48	15.1	2.52	3.51	8.9													
OS-C4a-C8.3d	**I-56**	21.32							20.6	8.45	3.05	25.7									
C8.4	I-57		6.70	0.46	14.5	3.08	3.57	11.0													
C8.1-C8.4	**I-51**	39.83							21.1	12.57	3.01	37.9									
C8.5	I-59		3.84	0.49	13.4	1.88	3.69	7.0													
C8.6			0.79	0.90	5.6	0.71	5.58	4.0													
C8.7a			4.52	0.49	13.7	2.21	3.66	8.1													
C8.7b	I-63		1.77	0.49	11.3	0.87	3.94	3.4													
C8.7a-C8.7b	**I-63**	6.29							13.9	3.08	3.63	11.2									
C8.7c	I-64		4.94	0.49	11.7	2.42	3.90	9.4													
C8.7a-C8.7c	**I-64**	11.23							14.4	5.50	3.59	19.7									
C8.7d	I-66		0.27	0.46	5.0	0.12	5.17	0.6													
C8.7e			6.09	0.47	11.9	2.86	3.87	11.1													
C8.6+C8.7e	I-62								13.4	3.57	3.69	13.2									
C8.7a-C8.7e		17.59							15.4	8.49	3.48	29.5									
C8.6-C8.7e	**I-68**	18.38							15.5	9.20	3.47	31.9									
OS-B1			5.11	0.15	12.7	0.77	3.77	2.9													
C8.8a			5.65	0.49	23.4	2.77	2.86	7.9													
OS-B1-C8.8a	**I-69**	10.76							27.3	3.54	2.62	9.3									
68+69	**I-70**	29.14							27.3	12.74	2.62	33.4									
C8.8			7.80	0.22	15.6	1.72	3.46	5.9													
C8			73.39	0.43	27.5	31.46	2.61	82.2													

CORE ENGINEERING GROUP

Standard Form SF-2. Storm Drainage System Design (Rational Method Procedure)

Calculated By: Leonard Beasley
Date: Feb. 19, 2021
Checked By: Leonard Beasley

Job No: 100.064
Project: The Ridge at Lorson Ranch
Design Storm: **100 - Year Event (Proposed)**

Street or Basin	Design Point	Direct Runoff							Total Runoff				Street		Pipe			Travel Time			Remarks
		Area Design	Area (A)	Runoff Coeff. (C)	t_c	CA	i	Q	t_c	∑ (CA)	i	Q	Slope	Street Flow	Design Flow	Slope	Pipe Size	Length	Velocity	t_t	
			ac.		min.		in/hr	cfs	min		in/hr	cfs	%	cfs	cfs	%	in	ft	ft/sec	min	
C1.1	I-1		3.18	0.59	11.8	1.88	6.52	12.2													
C1.2	I-2		1.52	0.59	11.5	0.90	6.58	5.9													
C1.1-C1.2	**3**	4.70							11.8	2.77	6.52	18.1									
C1.3	I-4		11.61	0.59	26.1	6.85	4.52	30.9													
C1.1-C1.3	**5**	16.31							26.1	9.62	4.52	43.5									
C1.4			2.51	0.59	13.2	1.48	6.24	9.2													
C1.5	I-6		1.61	0.59	9.9	0.95	6.96	6.6													
C1.6			9.35	0.59	20.5	5.52	5.12	28.3													
C1.5-C1.6	**7**	10.96							20.5	7.95	5.12	40.7									
C3.1	I-12		6.20	0.59	14.7	3.66	5.96	21.8													
C3.2	I-13		5.01	0.59	15.3	2.96	5.86	17.3													
C3.1-C3.2	**14**	11.21							16.1	6.61	5.73	37.9									
C3.3	I-15		4.75	0.59	11.2	2.80	6.65	18.6													
C3.1-C3.3	**16**	15.96							18.1	9.42	5.44	51.3									
C3.4	I-17		3.77	0.59	9.4	2.22	7.10	15.8													
C3.1-C3.4	**18**	19.73							18.9	11.64	5.32	62.0									
C3.5	I-19		6.32	0.59	14.1	3.73	6.07	22.6													
C3.1-C3.5	**20**	26.05							19.9	15.37	5.20	80.0									
C3.6a	I-20a		3.15	0.59	11.2	1.86	6.64	12.3													
C3.1-C3.6a	**20b**	29.20							20.0	17.23	5.19	89.3									
C3.6b	I-21		4.80	0.59	16.8	2.83	5.63	15.9													
C3.7	I-23		4.58	0.59	9.4	2.70	7.08	19.1													
C3.1-C3.7	**24**	38.58							21.0	22.76	5.06	115.2									
C3.8	I-25		6.51	0.59	16.1	3.84	5.73	22.0													
C3.9	I-27		4.55	0.59	11.1	2.68	6.66	17.9													
C3.1-C3.9	**28**	49.64							22.3	29.29	4.92	144.0									
C3.10	I-29		6.01	0.59	16.4	3.55	5.69	20.2													
C3.1-C3.10	**30**	55.65							24.4	32.83	4.69	153.9									
C4.1			4.61	0.59	20.3	2.72	5.15	14.0													
C4.2			3.08	0.59	15.7	1.82	5.79	10.5													
C4.1-C4.2	**31**	7.69							20.6	4.54	5.11	23.2									
C4.3			3.07	0.60	10.7	1.84	6.76	12.4													
C4.4			3.29	0.60	10.4	1.97	6.84	13.5													
C4.1-C4.4	**34**	14.05							22.6	8.35	4.88	40.8									

CORE ENGINEERING GROUP

Standard Form SF-2. Storm Drainage System Design (Rational Method Procedure)

Calculated By: Leonard Beasley
Date: Feb. 19, 2021
Checked By: Leonard Beasley

Job No: 100.064
Project: The Ridge at Lorson Ranch
Design Storm: **100 - Year Event (Proposed)**

Street or Basin	Design Point	Direct Runoff							Total Runoff				Street		Pipe			Travel Time			Remarks
		Area Design	Area (A)	Runoff Coeff. (C)	tc	CA	i	Q	tc	∑ (CA)	i	Q	Slope	Street Flow	Design Flow	Slope	Pipe Size	Length	Velocity	tt	
			ac.		min.		in/hr	cfs	min		in/hr	cfs	%	cfs	cfs	%	in	ft	ft/sec	min	
C4.5			0.63	0.96	5.0	0.60	8.68	5.2													
F1.1			4.23	0.59	21.1	2.50	5.05	12.6													
F1.2			12.12	0.35	15.7	4.24	5.79	24.6													
F1.1-F1.2	**35**	16.35							23.5	6.74	4.78	32.2									
C5.1a	I-39		2.33	0.62	12.5	1.44	6.36	9.2													
C5.1b	I-36		6.32	0.59	10.8	3.73	6.75	25.2													
C5.1c	I-37		3.78	0.59	8.6	2.23	7.30	16.3													
C5.1b-C5.1c	**38**	10.10							10.8	5.96	6.75	40.2									
C5.1a-C5.1c	I-39 & **40**	12.43							14.4	7.40	6.01	44.5									
C5.1d	I-41		5.67	0.60	14.0	3.40	6.08	20.7													
C5.1a-C5.1d	**42**	18.10							14.4	10.81	6.01	64.9									
C5.1e	I-43		6.44	0.60	16.5	3.86	5.68	21.9													
C5.1a-C5.1e	**44**	24.54							16.5	14.67	5.68	83.3									
C5.2			1.71	0.65	8.5	1.11	7.33	8.2													
C5.3			2.26	0.61	10.3	1.38	6.87	9.5													
C5.2-C5.3	I-45 & **46**	3.97							10.3	2.49	6.87	17.1									
C8.1a	I-47		4.12	0.59	10.7	2.43	6.76	16.4													
C8.1b	I-49		3.69	0.63	14.6	2.32	5.97	13.9													
C8.1c	I-48		1.88	0.61	11.3	1.15	6.62	7.6													
C8.1	**I-49**	9.69							14.6	5.90	5.97	35.3									
C8.2	I-51		2.12	0.65	8.9	1.38	7.23	10.0													
OS-C4a			2.29	0.36	11.8	0.82	6.51	5.4													
C8.3a	I-53		5.88	0.60	11.8	3.53	6.53	23.0													
OS-C4a-C8.3a	**I-54**	8.17							14.0	4.35	6.08	26.5									

CORE ENGINEERING GROUP

Standard Form SF-2. Storm Drainage System Design (Rational Method Procedure)

Calculated By: Leonard Beasley
Date: Feb. 19, 2021
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Job No: 100.064
Project: The Ridge at Lorson Ranch
Design Storm: **100 - Year Event (Proposed)**

Street or Basin	Design Point	Direct Runoff							Total Runoff				Street		Pipe			Travel Time			Remarks
		Area Design	Area (A)	Runoff Coeff. (C)	t_c	CA	i	Q	t_c	∑ (CA)	i	Q	Slope	Street Flow	Design Flow	Slope	Pipe Size	Length	Velocity	t_t	
			ac.		min.		in/hr	cfs	min		in/hr	cfs	%	cfs	cfs	%	in	ft	ft/sec	min	
OS-C4b			2.10	0.41	12.7	0.86	6.34	5.5													
C8.3b			3.46	0.63	14.2	2.18	6.06	13.2													
C8.3c (OS-C4b-C8.3c)	I-54	7.89	2.33	0.63	10.7	1.47	6.76	9.9	14.2	4.51	6.06	27.3									
OS-C4a-C8.3c	**I-54**	16.06							20.0	8.86	5.18	45.9									
C8.3d	I-56		5.26	0.62	15.1	3.26	5.89	19.2													
OS-C4a-C8.3d	**I-56**	21.32							20.6	11.30	5.12	57.8									
C8.4	I-57		6.70	0.60	14.5	4.02	5.99	24.1													
C8.1-C8.4	**I-51**	39.83							21.1	17.52	5.06	88.6									
C8.5	I-59		3.84	0.65	13.4	2.50	6.20	15.5													
C8.6			0.79	0.96	5.6	0.76	8.40	6.4													
C8.7a			4.52	0.65	13.7	2.94	6.14	18.0													
C8.7b	I-63		1.77	0.65	11.3	1.15	6.62	7.6													
C8.7a-C8.7b	**I-63**	6.29							13.9	4.09	6.10	24.9									
C8.7c	I-64		4.94	0.65	11.7	3.21	6.55	21.0													
C8.7a-C8.7c	**I-64**	11.23							14.4	7.30	6.01	43.8									
C8.7d			0.27	0.61	5.0	0.16	8.68	1.4													
C8.7a-C8.7d	**I-66**	11.50							15.0	7.46	5.91	44.1									
C8.7e			6.09	0.62	11.9	3.78	6.50	24.5													
C8.6+C8.7e	I-62								13.4	4.53	6.19	28.1									
C8.7a-C8.7e		17.59							15.4	11.24	5.84	65.7									
C8.6-C8.7e	**I-68**	18.38							15.5	12.00	5.83	69.9									
OS-B1			5.11	0.49	12.7	2.50	6.33	15.8													
C8.8a			5.65	0.64	23.4	3.62	4.80	17.3													
OS-B1-C8.8a	**I-69**	10.76							27.3	6.12	4.40	26.9									
68+69	**I-70**	29.14							27.3	18.12	4.40	79.7									
C8.8			7.80	0.48	15.6	3.74	5.81	21.8													
C8			73.39	0.60	27.5	44.16	4.39	193.7													

CORE ENGINEERING GROUP
15004 1st Avenue South
Burnsville, MN 55306

PROJECT NAME: *The Ridge at Lorson Ranch*
PROJECT NUMBER: *100.064*
ENGINEER: *LAB*
DATE: *Feb. 17, 2021*

Preliminary Drainage Plan
CURRENT CONDITIONS COEFFICIENT "C" CALCULATIONS

BASIN	Soil No.	Hydro Group	Area	Cover (%)	C5	Wtd. C5	C100	Wtd. C100	Impervious	Type of Cover
C2.1-ex	56	B	20.95	78.82%	0.09	0.07	0.36	0.28	100%	Undeveloped
	52/54	C	5.63	21.18%	0.16	0.03	0.51	0.11	80%	Undeveloped
			26.58	100.00%		0.10		0.39		
C2.2-ex	56	B	58.51	97.06%	0.09	0.09	0.36	0.35	10%	Undeveloped
	52	C	1.77	2.94%	0.16	0.00	0.51	0.01	10%	Undeveloped
			60.28	100.00%		0.09		0.36		
C3.1-ex	56	B	4.95	59.21%	0.09	0.05	0.36	0.21	10%	Undeveloped
	54	D	3.41	40.79%	0.16	0.07	0.51	0.21	10%	Undeveloped
			8.36	100.00%		0.12		0.42		
C4.1-ex	56	B	3.54	80.64%	0.09	0.07	0.36	0.29	10%	Undeveloped
	75	D	0.85	19.36%	0.16	0.03	0.51	0.10	10%	Undeveloped
			4.39	100.00%		0.10		0.39		
C4.2-ex	56/108	B	21.23	44.29%	0.09	0.04	0.36	0.16	10%	Undeveloped
	52/54/75	D	26.70	55.71%	0.16	0.09	0.51	0.28	10%	Undeveloped
			47.93	100.00%		0.13		0.44		
EX-F1	56/108	B	8.74	39.09%	0.08	0.03	0.35	0.14	10%	Undeveloped
	52	C	13.62	60.91%	0.15	0.09	0.50	0.30	10%	Undeveloped
			22.36	100.00%		0.12		0.44		
EX-F2	56/108	B	0.23	1.32%	0.08	0.00	0.35	0.00	10%	Undeveloped
	52	C	17.26	98.68%	0.15	0.15	0.50	0.49	10%	Undeveloped
			17.49	100.00%		0.15		0.50		

CORE ENGINEERING GROUP

Standard Form SF-1. Time of Concentration-Current

Calculated By: Leonard Beasley
Date: Feb. 17, 2021
Checked By: Leonard Beasley

Job No: 100.064
Project: The Ridge at Lorson Ranch

Sub-Basin Data				Initial Overland Time (t_i)				Travel Time (t_t)					t_c Check (urbanized Basins)		Final t_c
BASIN or DESIGN	C_5	AREA (A) acres	NRCS Convey.	LENGTH (L) feet	SLOPE (S) %	VELOCITY (V) ft/sec	τ_i minutes	LENGTH (L) feet	SLOPE (S) %	VELOCITY (V) ft/sec	τ_t minutes	Computed t_c Minutes	TOTAL LENGTH (L) feet	Regional tc tc=(L/180)+10 minutes	USDCM Recommended $t_c=t_i+t_t$ (min)
EX-B1	0.15	14.42	7.0	300.00	4.00%	0.27	18.80	575.00	4.00%	1.40	6.85				
			20.0					375.00	1.60%	2.53	2.47	28.12	1250.00	16.94	16.94
OS-B1.1	0.15	5.64	20.0	300.00	4.00%	0.27	18.80	550.00	4.40%	4.20	2.19	20.99	850.00	14.72	14.72
EX-B1	0.15	20.06	20.0	300.00	2.00%	0.21	23.63	650.00	0.80%	1.79	6.06	29.69	950.00	15.28	15.28
C1.1-ex	0.09	12.49	7.0	300.00	5.40%	0.28	18.16	434.00	5.50%	1.64	4.41				
			15.0					225.00	4.44%	3.16	1.19	23.75	959.00	15.33	23.75
C2.1-ex	0.10	26.56	7.0	300.00	5.33%	0.28	18.06	1347.00	5.72%	1.67	13.41				
			15.0					266.00	1.88%	2.06	2.16	33.62	1913.00	20.63	33.62
C2.2-ex	0.09	60.28	7.0	140.00	3.57%	0.16	14.22	1216.00	4.28%	1.45	13.99				
			15.0					1123.00	3.29%	2.72	6.88	35.10	2479.00	23.77	35.10
C3.1-ex	0.12	8.36	7.0	300.00	6.00%	0.29	17.01	1052.00	6.10%	1.73	10.14				
			15.0					152.00	1.32%	1.72	1.47	28.63	1504.00	18.36	28.63
OS-C4.1	0.10	4.39	7.0	300.00	4.50%	0.26	19.10	143.00	4.60%	1.50	1.59	20.68	443.00	12.46	20.68
C4.2-ex	0.13	47.93	7.0	300.00	5.25%	0.28	17.60	500.00	5.25%	1.60	5.20				
			15.0					1307.00	2.75%	2.49	8.76	31.55	2107.00	21.71	31.55

CORE ENGINEERING GROUP

Standard Form SF-1. Time of Concentration-Current

Calculated By: Leonard Beasley
Date: Feb. 17, 2021
Checked By: Leonard Beasley

Job No: 100.064
Project: The Ridge at Lorson Ranch

Sub-Basin Data				Initial Overland Time (t_i)				Travel Time (t_t)					t_c Check (urbanized Basins)		Final t_c
BASIN or DESIGN	C_5	AREA (A) acres	NRCS Convey.	LENGTH (L) feet	SLOPE (S) %	VELOCITY (V) ft/sec	τ_i minutes	LENGTH (L) feet	SLOPE (S) %	VELOCITY (V) ft/sec	τ_t minutes	Computed t_c Minutes	TOTAL LENGTH (L) feet	Regional tc tc=(L/180)+10 minutes	USDCM Recommended $\tau_c=\tau_i+\tau_t$ (min)
(C4-ex) **4X**	0.13	52.32	7.0	300.00	4.50%	0.27	18.52	143.00	4.60%	1.50	1.59				
			7.0					500.00	5.25%	1.60	5.20				
			15.0					1307.00	2.75%	2.49	8.76	34.06	2250.00	22.50	34.06
EX-F1	0.12	22.36	7.0	300.00	3.30%	0.24	20.67	390.00	3.30%	1.27	5.11	25.78	690.00	13.83	25.78
EX-F2	0.15	17.49	15.0	221.00	6.80%	0.27	13.55	406.00	5.90%	3.64	1.86	15.40	627.00	13.48	15.40
(EX-F) **2X**	0.13	39.85	7.0	300.00	3.30%	0.24	20.46	390.00	3.30%	1.27	5.11	25.57	690.00	13.83	25.57

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CORE ENGINEERING GROUP

15004 1st Avenue South
Burnsville, MN 55306

PROJECT NAME: *The Ridge at Lorson Ranch*
PROJECT NUMBER: *100.064*
ENGINEER: *LAB*
DATE: *Feb. 19, 2021*

Preliminary Drainage Plan
PROPOSED CONDITIONS COEFFICIENT "C" CALCULATIONS

BASIN	Soil No.	Hydro Group	Area	Cover (%)	C5	Wtd. C5	C100	Wtd. C100	Impervious	Type of Cover
C1.1	56	B	3.18		0.45		0.59		65%	1/8 ac. Single Family
C1.2	56	B	1.52		0.45		0.59		65%	1/8 ac. Single Family
C1.3	56	B	13.47		0.45		0.59		65%	1/8 ac. Single Family
C1.4	56	B	5.19		0.45		0.59		65%	1/8 ac. Single Family
C1.5	56	B	0.70		0.45		0.59		65%	1/8 ac. Single Family
C1.6	56/108	B	9.35		0.45		0.59		65%	1/8 ac. Single Family
C3.1	56	B	6.20		0.45		0.59		65%	1/8 ac. Single Family
C3.2	56	B	5.01		0.45		0.59		65%	1/8 ac. Single Family
C3.3	56	B	4.75		0.45		0.59		65%	1/8 ac. Single Family
C3.4	56	B	3.77		0.45		0.59		65%	1/8 ac. Single Family
C3.5	56	B	6.32		0.45		0.59		65%	1/8 ac. Single Family
C3.6a	56	B	3.15		0.45		0.59		65%	1/8 ac. Single Family
C3.6b	56	B	4.80		0.45		0.59		65%	1/8 ac. Single Family
C3.7	56	B	4.58		0.45		0.59		65%	1/8 ac. Single Family
C3.8	56	B	6.51		0.45		0.59		65%	1/8 ac. Single Family
C3.9	56	B	4.55		0.45		0.59		65%	1/8 ac. Single Family
C3.10	56	B	6.01		0.45		0.59		65%	1/8 ac. Single Family
C4.1	56	B	4.61		0.45		0.59		65%	1/8 ac. Single Family
C4.2	56	B	3.08		0.45		0.59		65%	1/8 ac. Single Family
C4.3	56	B	2.46	80.13%	0.45	0.36	0.59	0.47	65%	1/8 ac. Single Family
	52	C	0.61	19.87%	0.49	0.10	0.65	0.13	65%	1/8 ac. Single Family
			3.07	100.00%		0.46		0.60		
C4.1	56	B	4.61		0.45		0.59		65%	1/8 ac. Single Family
C4.2	56	B	3.08		0.45		0.59		65%	1/8 ac. Single Family
C4.3	56	B	2.46	80.13%	0.45	0.36	0.59	0.47	65%	1/8 ac. Single Family
	52	C	0.61	19.87%	0.49	0.10	0.65	0.13	65%	1/8 ac. Single Family
			3.07	100.00%		0.46		0.60		

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Preliminary Drainage Plan
PROPOSED CONDITIONS COEFFICIENT "C" CALCULATIONS

C4.4	56	B	2.56	77.81%	0.45	0.35	0.59	0.46	65%	1/8 ac. Single Family
	52	C	0.73	22.19%	0.49	0.11	0.65	0.14	65%	1/8 ac. Single Family
			3.29	100.00%		0.46		0.60		
C4.5	56	B	0.26	41.27%	0.90	0.37	0.96	0.40	100%	Roadway
	52	C	0.37	58.73%	0.90	0.53	0.96	0.56	100%	Roadway
			0.63	100.00%		0.90		0.96		
C5.1a	56	B	1.34	57.51%	0.45	0.26	0.59	0.34	65%	1/8 ac. Single Family
	54/52	D/C	0.99	42.49%	0.49	0.21	0.65	0.28	65%	1/8 ac. Single Family
			2.33	100.00%		0.47		0.62		
C5.1b	56	B	5.96	94.30%	0.45	0.42	0.59	0.56	65%	1/8 ac. Single Family
	52	C	0.36	5.70%	0.49	0.03	0.65	0.04	65%	1/8 ac. Single Family
			6.32	100.00%		0.45		0.59		
C5.1c	56	B	3.54	93.65%	0.45	0.42	0.59	0.55	65%	1/8 ac. Single Family
	52	C	0.24	6.35%	0.49	0.03	0.65	0.04	65%	1/8 ac. Single Family
			3.78	100.00%		0.45		0.59		
C5.1d	56	B	4.98	87.83%	0.45	0.40	0.59	0.52	65%	1/8 ac. Single Family
	52	C	0.69	12.17%	0.49	0.06	0.65	0.08	65%	1/8 ac. Single Family
			5.67	100.00%		0.45		0.60		
C5.1e	56	B	5.44	84.47%	0.45	0.38	0.59	0.50	65%	1/8 ac. Single Family
	52	C	1.00	15.53%	0.49	0.08	0.65	0.10	65%	1/8 ac. Single Family
			6.44	100.00%		0.46		0.60		
C5.2	52	C	1.71		0.49		0.65		65%	1/8 ac. Single Family
C5.3	56	B	1.50	66.37%	0.45	0.30	0.59	0.39	65%	1/8 ac. Single Family
	52	C	0.76	33.63%	0.49	0.16	0.65	0.22	65%	1/8 ac. Single Family
			2.26	100.00%		0.46		0.61		

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Preliminary Drainage Plan
PROPOSED CONDITIONS COEFFICIENT "C" CALCULATIONS

C8.1a	56	B	3.81	92.48%	0.45	0.42	0.59	0.55	65%	1/8 ac. Single Family
	54	D	0.31	7.52%	0.49	0.04	0.65	0.05	65%	1/8 ac. Single Family
			4.12	100.00%		0.45		0.59		
C8.1b	56	B	1.36	36.86%	0.45	0.17	0.59	0.22	65%	1/8 ac. Single Family
	54	D	2.33	63.14%	0.49	0.31	0.65	0.41	65%	1/8 ac. Single Family
			3.69	100.00%		0.48		0.63		
C8.1c	56	B	1.31	69.68%	0.45	0.31	0.59	0.41	65%	1/8 ac. Single Family
	54	D	0.57	30.32%	0.49	0.15	0.65	0.20	65%	1/8 ac. Single Family
			1.88	100.00%		0.46		0.61		
C8.2	52	C	2.12		0.49		0.65		65%	1/8 ac. Single Family
OS-C4a	56	B	2.29		0.09		0.36		10%	Undeveloped
C8.3a	56	B	4.88	82.99%	0.45	0.37	0.59	0.49	65%	1/8 ac. Single Family
	54	C/D	1.00	17.01%	0.49	0.08	0.65	0.11	65%	1/8 ac. Single Family
			5.88	100.00%		0.46		0.60		
OS-C4b	56	B	1.36	64.76%	0.09	0.06	0.36	0.23	10%	Undeveloped
	75	D	0.74	35.24%	0.16	0.06	0.51	0.18	10%	Undeveloped
			2.10	100.00%		0.11		0.41		
C8.3b	56	B	1.09	31.50%	0.45	0.14	0.59	0.19	65%	1/8 ac. Single Family
	54	D	2.37	68.50%	0.49	0.34	0.65	0.45	65%	1/8 ac. Single Family
			3.46	100.00%		0.48		0.63		
C8.3c	56	B	0.87	37.34%	0.45	0.17	0.59	0.22	65%	1/8 ac. Single Family
	54	D	1.46	62.66%	0.49	0.31	0.65	0.41	65%	1/8 ac. Single Family
			2.33	100.00%		0.48		0.63		
DP-54	56	B	6.84	58.61%	0.45	0.26	0.59	0.35	65%	1/8 ac. Single Family

CORE
ENGINEERING GROUP
15004 1st Avenue South
Burnsville, MN 55306

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Preliminary Drainage Plan
PROPOSED CONDITIONS COEFFICIENT "C" CALCULATIONS

	54	D	4.83	41.39%	0.49	0.20	0.65	0.27	65%	1/8 ac. Single Family
			11.67	100.00%		0.47		0.61		
C8.3d	56	B	0.81	15.40%	0.45	0.07	0.59	0.09	65%	1/8 ac. Single Family
	54	D	4.45	84.60%	0.49	0.41	0.65	0.55	65%	1/8 ac. Single Family
			5.26	100.00%		0.48		0.64		
C8.4	56	B	5.25	78.36%	0.45	0.35	0.59	0.46	65%	1/8 ac. Single Family
	54	D	1.45	21.64%	0.49	0.11	0.65	0.14	65%	1/8 ac. Single Family
			6.70	100.00%		0.46		0.60		
C8.5	54/75	D	3.84		0.49		0.65		100%	1/8 ac. Single Family
C8.6	54	D	0.79		0.90		0.96		100%	Street
C8.7a	75	D	6.29		0.49		0.65		100%	1/8 ac. Single Family
C8.7b	54/75	D	4.94		0.49		0.65		100%	1/8 ac. Single Family
C8.7c	75	D	4.94		0.49		0.65		100%	1/8 ac. Single Family
C8.7d	56	B	0.17	62.96%	0.45	0.28	0.59	0.37	65%	1/8 ac. Single Family
	54	D	0.10	37.04%	0.49	0.18	0.65	0.24	65%	1/8 ac. Single Family
			0.27	100.00%		0.46		0.61		
C8.7e	56	B	2.56	42.04%	0.45	0.19	0.59	0.25	65%	1/8 ac. Single Family
	52/54	C/D	3.53	57.96%	0.49	0.28	0.65	0.38	65%	1/8 ac. Single Family
			6.09	100.00%		0.47		0.62		
OS-B1	56	B	0.75	14.68%	0.09	0.01	0.36	0.05	10%	Undeveloped
	75	D	4.36	85.32%	0.16	0.14	0.51	0.44	10%	Undeveloped
			5.11	100.00%		0.15		0.49		
C8.8a	56	B	0.70	12.39%	0.45	0.06	0.59	0.07	65%	1/8 ac. Single Family
	52/54/75	C/D	4.95	87.61%	0.49	0.43	0.65	0.57	65%	1/8 ac. Single Family
			5.65	100.00%		0.49		0.64		
C8.8	56	B	3.85	49.36%	0.16	0.08	0.41	0.20	13%	Pond / Open Space
	52	C	3.08	39.49%	0.23	0.09	0.54	0.21	13%	Pond / Open Space

CORE
ENGINEERING GROUP

15004 1st Avenue South
Burnsville, MN 55306

PROJECT NAME: *The Ridge at Lorson Ranch*
PROJECT NUMBER: *100.064*
ENGINEER: *LAB*
DATE: *Feb. 19, 2021*

Preliminary Drainage Plan
PROPOSED CONDITIONS COEFFICIENT "C" CALCULATIONS

	56	B	0.63	8.08%	0.45	0.04	0.59	0.05	65%	1/8 ac. Single Family
	52	C	0.24	3.08%	0.49	0.02	0.65	0.02	65%	1/8 ac. Single Family
			7.80	100.00%		0.22		0.48		
C8.4	56	B	4.89	72.99%	0.45	0.33	0.59	0.43	65%	1/8 ac. Single Family
	54	C	1.81	27.01%	0.49	0.13	0.65	0.18	65%	1/8 ac. Single Family
			6.70	100.00%		0.46		0.61		
C8.5	75	D	3.49		0.49		0.65		100%	1/8 ac. Single Family
C8.6	54	D	0.79		0.90		0.96		100%	Street
C8.7	56	B	3.68	15.59%	0.45	0.07	0.59	0.09	65%	1/8 ac. Single Family
	52/54/75	C/D	19.93	84.41%	0.49	0.41	0.65	0.55	65%	1/8 ac. Single Family
			23.61	100.00%		0.48		0.64		
C8.8	56	B	3.85	49.36%	0.16	0.08	0.41	0.20	13%	Pond / Open Space
	52	C	3.08	39.49%	0.23	0.09	0.54	0.21	13%	Pond / Open Space
	56	B	0.63	8.08%	0.45	0.04	0.59	0.05	65%	1/8 ac. Single Family
	52	C	0.24	3.08%	0.49	0.02	0.65	0.02	65%	1/8 ac. Single Family
			7.80	100.00%		0.22		0.48		
	52/75	C/D	0.93	10.65%	0.49	0.05	0.65	0.07	65%	1/8 ac. Single Family
			8.73	110.65%		0.27		0.55		

Standard Form SF-1. Time of Concentration-Proposed

CORE ENGINEERING GROUP

Calculated By: Leonard Beasley
Date: Feb. 19, 2021
Checked By: Leonard Beasley

Job No: 100.064
Project: The Ridge at Lorson Ranch

Sub-Basin Data				Initial Overland Time (t_i)				Travel Time (t_t)					t_c Check (urbanized Basins)		Final t_c
BASIN or DESIGN	C_5	AREA (A) acres	NRCS Convey.	LENGTH (L) feet	SLOPE (S) %	VELOCITY (V) ft/sec	t_i minutes	LENGTH (L) feet	SLOPE (S) %	VELOCITY (V) ft/sec	t_t minutes	Computed t_c Minutes	TOTAL LENGTH (L) feet	Regional tc tc=(L/180)+10 minutes	USDCM Recommended $t_c=t_i+t_t$ (min)
C1.1	0.45	3.18	7.0	100.00	3.00%	0.20	8.20	90.00	2.60%	1.13	1.33				
			20.0					350.00	1.71%	2.62	2.23	11.76	540.00	13.00	11.76
C1.2	0.45	1.52	20.0	67.00	2.00%	0.15	7.67	417.00	0.83%	1.82	3.81	11.49	484.00	12.69	11.49
DP-3	0.45	4.70	7.0	100.00	3.00%	0.20	8.20	90.00	2.60%	1.13	1.33				
			20.0					350.00	1.71%	2.62	2.23	11.76	540.00	13.00	11.76
C1.3	0.45	11.61	7.0	100.00	2.00%	0.18	9.37	87.00	1.40%	0.83	1.75				
			20.0					2158.00	1.39%	2.36	15.25				
			20.0					552.00	5.25%	4.58	2.01	28.38	2897.00	26.09	26.09
DP-5	0.45	16.31	7.0	100.00	2.00%	0.18	9.37	87.00	1.40%	0.83	1.75				
			20.0					2158.00	1.39%	2.36	15.25				
			20.0					552.00	5.25%	4.58	2.01	28.38	2897.00	26.09	26.09
C1.4	0.45	2.51	20.0	51.00	2.00%	0.13	6.69	685.00	2.10%	2.90	3.94				
			20.0					302.00	1.00%	2.00	2.52	13.15	1038.00	15.77	13.15
C1.5	0.45	1.61	20.0	23.00	2.00%	0.09	4.50	1220.00	3.52%	3.75	5.42	9.91	1243.00	16.91	9.91
C1.6	0.45	9.35	20.0	81.00	2.90%	0.18	7.46	2102.00	1.80%	2.68	13.06	20.52	2183.00	22.13	20.52
C3.1	0.45	6.20	7.0	100.00	2.00%	0.18	9.37	20.00	2.10%	1.01	0.33				
			20.0					395.00	3.92%	3.96	1.66				
			20.0					440.00	1.82%	2.70	2.72				
			20.0					150.00	3.67%	3.83	0.65	14.73	1105.00	16.14	14.73
C3.2	0.45	5.01	7.0	100.00	2.00%	0.18	9.37	120.00	2.20%	1.04	1.93				
			20.0					940.00	3.80%	3.90	4.02	15.32	1160.00	16.44	15.32
DP-14	0.45	11.21	7.0	100.00	2.00%	0.18	9.37	2.00	2.10%	1.01	0.03				
			20.0					395.00	3.92%	3.96	1.66				
			20.0					440.00	1.82%	2.70	2.72				
			20.0					150.00	3.67%	3.83	0.65				
			20.0					255.00	1.57%	2.51	1.70	16.13	1342.00	17.46	16.13
C3.3	0.45	4.75	7.0	55.00	7.82%	0.21	4.43	165.00	2.79%	1.17	2.35				
			20.0					631.00	4.90%	4.43	2.38				
			20.0					286.00	1.40%	2.37	2.01	11.17	1137.00	16.32	11.17
DP-16	0.45	15.96	7.0	100.00	2.00%	0.18	9.37	20.00	2.10%	1.01	0.33				
			20.0					395.00	3.92%	3.96	1.66				
			20.0					440.00	1.82%	2.70	2.72				

Standard Form SF-1. Time of Concentration-Proposed

CORE ENGINEERING GROUP

Calculated By: Leonard Beasley
Date: Feb. 19, 2021
Checked By: Leonard Beasley

Job No: 100.064
Project: The Ridge at Lorson Ranch

Sub-Basin Data				Initial Overland Time (t_i)				Travel Time (t_t)					t_c Check (urbanized Basins)		Final t_c
BASIN or DESIGN	C_5	AREA (A) acres	NRCS Convey.	LENGTH (L) feet	SLOPE (S) %	VELOCITY (V) ft/sec	t_i minutes	LENGTH (L) feet	SLOPE (S) %	VELOCITY (V) ft/sec	t_t minutes	Computed t_c Minutes	TOTAL LENGTH (L) feet	Regional tc tc=(L/180)+10 minutes	USDCM Recommended $t_c=t_i+t_t$ (min)
			20.0					150.00	3.67%	3.83	0.65				
			20.0					255.00	1.57%	2.51	1.70				
			20.0					247.00	1.62%	2.55	1.62	18.05	1607.00	18.93	18.05
C3.4	0.45	3.77	7.0	45.00	9.33%	0.20	3.78	130.00	2.31%	1.06	2.04				
			20.0					601.00	4.74%	4.35	2.30				
			20.0					225.00	2.22%	2.98	1.26	9.37	1001.00	15.56	9.37
DP-18	0.45	19.73	7.0	100.00	2.00%	0.18	9.37	20.00	2.10%	1.01	0.33				
			20.0					395.00	3.92%	3.96	1.66				
			20.0					440.00	1.82%	2.70	2.72				
			20.0					150.00	3.67%	3.83	0.65				
			20.0					255.00	1.57%	2.51	1.70				
			20.0					247.00	1.62%	2.55	1.62				
			20.0					166.00	2.41%	3.10	0.89	18.94	1773.00	19.85	18.94
C3.5	0.45	6.32	7.0	82.00	6.22%	0.23	5.83	100.00	2.80%	1.17	1.42				
			20.0					535.00	1.16%	2.15	4.14				
			20.0					559.00	5.01%	4.48	2.08				
			20.0					114.00	2.63%	3.24	0.59	14.06	1390.00	17.72	14.06
DP-20	0.45	26.05	7.0	100.00	2.00%	0.18	9.37	20.00	2.10%	1.01	0.33				
			20.0					395.00	3.92%	3.96	1.66				
			20.0					440.00	1.82%	2.70	2.72				
			20.0					150.00	3.67%	3.83	0.65				
			20.0					255.00	1.57%	2.51	1.70				
			20.0					247.00	1.62%	2.55	1.62				
			20.0					166.00	2.41%	3.10	0.89				
			20.0					162.00	2.16%	2.94	0.92	19.86	1935.00	20.75	19.86
C3.6a	0.45	3.15	20.0	63.00	2.00%	0.14	7.44	915.00	4.07%	4.03	3.78	11.22	978.00	15.43	11.22
C3.6b	0.45	4.80	7.0	100.00	2.00%	0.18	9.37	65.00	2.00%	0.99	1.09				
			20.0					301.00	0.90%	1.90	2.64				
			20.0					515.00	5.24%	4.58	1.87				
			20.0					318.00	2.20%	2.97	1.79	16.77	1299.00	17.22	16.77
C3.7	0.45	4.58	20.0	30.00	2.33%	0.10	4.88	364.00	1.73%	2.63	2.31				
			20.0					386.00	5.96%	4.88	1.32				
			20.0					154.00	1.95%	2.79	0.92	9.42	934.00	15.19	9.42
DP-24	0.45	38.58	7.0	100.00	2.00%	0.18	9.37	20.00	2.10%	1.01	0.33				
			20.0					395.00	3.92%	3.96	1.66				
			20.0					440.00	1.82%	2.70	2.72				

Standard Form SF-1. Time of Concentration-Proposed

CORE ENGINEERING GROUP

Calculated By: Leonard Beasley
Date: Feb. 19, 2021
Checked By: Leonard Beasley

Job No: 100.064
Project: The Ridge at Lorson Ranch

Sub-Basin Data				Initial Overland Time (t_i)				Travel Time (t_t)					t_c Check (urbanized Basins)		Final t_c
BASIN or DESIGN	C_5	AREA (A) acres	NRCS Convey.	LENGTH (L) feet	SLOPE (S) %	VELOCITY (V) ft/sec	t_i minutes	LENGTH (L) feet	SLOPE (S) %	VELOCITY (V) ft/sec	t_t minutes	Computed t_c Minutes	TOTAL LENGTH (L) feet	Regional tc tc=(L/180)+10 minutes	USDCM Recommended $t_c=t_i+t_t$ (min)
			20.0					150.00	3.67%	3.83	0.65				
			20.0					255.00	1.57%	2.51	1.70				
			20.0					247.00	1.62%	2.55	1.62				
			20.0					166.00	2.41%	3.10	0.89				
			20.0					162.00	2.16%	2.94	0.92				
			20.0					236.00	2.97%	3.45	1.14	21.00	2171.00	22.06	21.00
C3.8	0.45	6.51	20.0	39.00	2.00%	0.11	5.85	569.00	1.28%	2.26	4.19				
			20.0					600.00	4.83%	4.40	2.28				
			20.0					539.00	1.39%	2.36	3.81	16.13	1747.00	19.71	16.13
C3.9	0.45	4.55	20.0	54.00	2.78%	0.15	6.18	1063.00	3.20%	3.58	4.95	11.13	1117.00	16.21	11.13
DP-28	0.45	45.09	7.0	100.00	2.00%	0.18	9.37	20.00	2.10%	1.01	0.33				
			20.0					395.00	3.92%	3.96	1.66				
			20.0					440.00	1.82%	2.70	2.72				
			20.0					150.00	3.67%	3.83	0.65				
			20.0					255.00	1.57%	2.51	1.70				
			20.0					247.00	1.62%	2.55	1.62				
			20.0					166.00	2.41%	3.10	0.89				
			20.0					162.00	2.16%	2.94	0.92				
			20.0					236.00	2.97%	3.45	1.14				
			20.0					246.00	2.64%	3.25	1.26	22.26	2417.00	23.43	22.26
C3.10	0.45	6.01	7.0	66.00	3.79%	0.18	6.16	118.00	2.37%	1.08	1.82				
			20.0					1076.00	2.39%	3.09	5.80				
			20.0					343.00	3.79%	3.89	1.47				
			20.0					146.00	1.23%	2.22	1.10	16.35	1749.00	19.72	16.35
DP-30	0.45	51.10	7.0	100.00	2.00%	0.18	9.37	20.00	2.10%	1.01	0.33				
			20.0					395.00	3.92%	3.96	1.66				
			20.0					440.00	1.82%	2.70	2.72				
			20.0					150.00	3.67%	3.83	0.65				
			20.0					255.00	1.57%	2.51	1.70				
			20.0					247.00	1.62%	2.55	1.62				
			20.0					166.00	2.41%	3.10	0.89				
			20.0					162.00	2.16%	2.94	0.92				
			20.0					236.00	2.97%	3.45	1.14				

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Sub-Basin Data				Initial Overland Time (t_i)				Travel Time (t_t)					t_c Check (urbanized Basins)		Final t_c
BASIN or DESIGN	C_5	AREA (A) acres	NRCS Convey.	LENGTH (L) feet	SLOPE (S) %	VELOCITY (V) ft/sec	t_i minutes	LENGTH (L) feet	SLOPE (S) %	VELOCITY (V) ft/sec	t_t minutes	Computed t_c Minutes	TOTAL LENGTH (L) feet	Regional tc tc=(L/180)+10 minutes	USDCM Recommended $t_c=t_i+t_t$ (min)
			20.0					246.00	2.64%	3.25	1.26				
			20.0					245.00	0.94%	1.94	2.11	24.37	2662.00	24.79	24.37
C4.1	0.45	4.61	7.0	45.00	10.00%	0.20	3.69	128.00	2.58%	1.12	1.90				
			20.0					1680.00	1.45%	1.36	20.59	26.18	1853.00	20.29	20.29
C4.2	0.45	3.08	20.0	43.00	2.80%	0.13	5.50	124.00	2.72%	3.30	0.63				
			20.0					865.00	4.44%	1.36	10.60	16.73	1032.00	15.73	15.73
DP-31	0.45	7.69	7.0	45.00	10.00%	0.20	3.69	128.00	2.58%	1.12	1.90				
			20.0					1680.00	1.45%	2.41	11.63				
			20.0					865.00	4.44%	4.21	3.42	20.64	2718.00	25.10	20.64
C4.3	0.46	3.07	7.0	100.00	2.00%	0.18	9.23	85.00	2.00%	0.99	1.43				
			20.0					5.07	1.12%	1.36	0.06	10.72	190.07	11.06	10.72
C4.4	0.46	3.29	20.0	34.00	3.82%	0.13	4.34	900.00	3.08%	3.51	4.27				
			20.0					144.00	1.32%	1.36	1.76	10.38	1078.00	15.99	10.38
DP-33	0.45	14.05	7.0	45.00	10.00%	0.20	3.66	128.00	2.58%	1.12	1.90				
			20.0					1680.00	1.45%	2.41	11.63				
			20.0					1170.00	4.27%	4.13	4.72				
			20.0					84.00	1.07%	2.07	0.68	22.58	3107.00	27.26	22.58
C4.5	0.90	0.63	20.0	56.00	3.93%	0.54	1.73	384.00	2.86%	3.38	1.89	3.62	440.00	12.44	3.62
F1.1	0.45	4.23	15.0	88.00	11.59%	0.30	4.92	1912.00	0.72%	1.27	25.04	29.95	2000.00	21.11	21.11
F1.2	0.08	12.12	7.0	37.00	19.19%	0.15	4.23	990.00	2.47%	1.10	15.00	19.23	1027.00	15.71	15.71
DP-35	0.18	16.35	15.0	88.00	11.59%	0.21	6.99	1912.00	0.72%	1.27	25.04				
			20.0					421.00	2.71%	1.36	5.16	37.19	2421.00	23.45	23.45
C5.1a & I-39	0.47	2.33	7.0	87.00	12.76%	0.32	4.59	141.00	2.13%	1.02	2.30				
			20.0					1159.00	5.13%	4.53	4.26				
			20.0					296.00	3.14%	3.54	1.39	12.54	1683.00	19.35	12.54
C5.1b & I-36	0.45	6.32	7.0	45.00	24.44%	0.27	2.75	255.00	3.53%	1.32	3.23				
			20.0					1212.00	5.07%	4.50	4.49				
			20.0					62.00	3.23%	3.59	0.29	10.75	1574.00	18.74	10.75
C5.1c & I-37	0.45	3.78	7.0	44.00	20.45%	0.25	2.88	47.00	2.55%	1.12	0.70				
			20.0					1335.00	4.85%	4.40	5.05	8.63	1426.00	17.92	8.63
C5.1d & I-41	0.45	5.67	7.0	83.00	15.30%	0.32	4.32	228.00	2.68%	1.15	3.32				
			20.0					1356.00	4.23%	4.11	5.49				
			20.0					115.00	1.13%	2.13	0.90	14.03	1782.00	19.90	14.03
DP-42	0.46	12.43	7.0	87.00	12.76%	0.31	4.66	141.00	2.13%	1.02	2.30				

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Project: The Ridge at Lorson Ranch

Sub-Basin Data				Initial Overland Time (t_i)				Travel Time (t_t)					t_c Check (urbanized Basins)		Final t_c
BASIN or DESIGN	C_5	AREA (A) acres	NRCS Convey.	LENGTH (L) feet	SLOPE (S) %	VELOCITY (V) ft/sec	t_i minutes	LENGTH (L) feet	SLOPE (S) %	VELOCITY (V) ft/sec	t_t minutes	Computed t_c Minutes	TOTAL LENGTH (L) feet	Regional tc tc=(L/180)+10 minutes	USDCM Recommended $t_c=t_i+t_t$ (min)
			20.0					1159.00	5.13%	4.53	4.26				
			20.0					375.00	2.61%	3.23	1.93				
			20.0					123.00	0.65%	1.61	1.27	14.43	1885.00	20.47	14.43
C5.1e & **DP-44**	0.46	6.44	7.0	100.00	7.00%	0.27	6.13	191.00	6.00%	1.71	1.86				
			20.0					742.00	1.62%	2.55	4.86				
			20.0					786.00	4.58%	4.28	3.06				
			20.0					104.00	2.40%	3.10	0.56	16.47	1923.00	20.68	16.47
C5.2	0.49	1.71	20.0	38.00	2.63%	0.13	4.95	677.00	2.48%	3.15	3.58	8.53	715.00	13.97	8.53
C5.3	0.46	2.26	20.0	42.00	2.00%	0.12	5.98	1115.00	4.68%	4.33	4.30	10.28	1157.00	16.43	10.28
C8.1a	0.45	4.12	7.0	60.00	7.67%	0.21	4.65	163.00	2.45%	1.10	2.48				
			20.0					966.00	5.12%	4.53	3.56	10.69	1189.00	16.61	10.69
C8.1b	0.48	3.69	20.0	73.00	2.00%	0.16	7.64	929.00	5.30%	4.60	3.36				
			20.0					465.00	1.08%	2.08	3.73	14.73	1467.00	18.15	14.73
C8.1c	0.46	1.88	20.0	63.00	2.00%	0.14	7.30	1119.00	5.36%	4.63	4.03	11.32	1182.00	16.57	11.32
C8.1	0.45	9.68	7.0	57.00	8.07%	0.21	4.43	163.00	2.45%	1.10	2.48				
			20.0					1018.00	4.93%	4.44	3.82				
			20.0					363.00	1.29%	2.27	2.66	13.39	1601.00	18.89	13.39
C8.2	0.49	2.12	20.0	50.00	4.20%	0.17	4.87	385.00	0.64%	1.60	4.01	8.88	435.00	12.42	8.88
OS-C4a	0.09	2.29	7.0	100.00	4.30%	0.15	11.30	227.00	4.40%	1.47	2.58	13.88	327.00	11.82	11.82
C8.3a	0.46	5.88	7.0	61.00	18.85%	0.30	3.43	123.00	2.60%	1.13	1.82				
			20.0					1390.00	3.17%	3.56	6.51	11.75	1574.00	18.74	11.75
DP-53	0.38	8.17	7.0	100.00	4.30%	0.21	8.06	377.00	5.60%	1.66	3.79				
			20.0					548.00	4.50%	4.24	2.15	14.00	1025.00	15.69	14.00
OS-C4b	0.11	2.10	7.0	100.00	4.00%	0.15	11.35	378.00	5.00%	1.57	4.02	15.37	478.00	12.66	12.66
C8.3b	0.48	3.46	7.0	100.00	4.50%	0.24	6.84	28.00	16.00%	2.80	0.17				
			7.0					108.00	2.00%	0.99	1.82				
			20.0					672.00	2.40%	3.10	3.61	12.44	908.00	15.04	12.44
C8.3c	0.48	2.33	7.0	60.00	11.17%	0.26	3.92	148.00	2.36%	1.08	2.29				
			20.0					900.00	3.50%	3.74	4.01				
			20.0					93.00	2.69%	3.28	0.47	10.69	1201.00	16.67	10.69
DP-54	0.36	16.06	7.0	100.00	4.00%	0.20	8.48	616.00	4.91%	1.55	6.62				
			20.0					1085.00	3.24%	3.60	5.02	20.13	1801.00	20.01	20.01
C8.3d	0.48	5.26	20.0	76.00	2.00%	0.16	7.79	700.00	5.19%	4.56	2.56				
			20.0					664.00	1.36%	2.33	4.74	15.10	1440.00	18.00	15.10

Standard Form SF-1. Time of Concentration-Proposed

CORE ENGINEERING GROUP

Calculated By: Leonard Beasley
Date: Feb. 19, 2021
Checked By: Leonard Beasley

Job No: 100.064
Project: The Ridge at Lorson Ranch

Sub-Basin Data				Initial Overland Time (t_i)				Travel Time (t_t)					t_c Check (urbanized Basins)		Final t_c
BASIN or DESIGN	C_5	AREA (A) acres	NRCS Convey.	LENGTH (L) feet	SLOPE (S) %	VELOCITY (V) ft/sec	t_i minutes	LENGTH (L) feet	SLOPE (S) %	VELOCITY (V) ft/sec	t_t minutes	Computed t_c Minutes	TOTAL LENGTH (L) feet	Regional tc tc=(L/180)+10 minutes	USDCM Recommended $t_c=t_i+t_t$ (min)
DP-56	0.44	21.32	7.0	100.00	4.00%	0.22	7.57	616.00	4.91%	1.55	6.62				
			20.0					1310.00	2.92%	3.42	6.39	20.57	2026.00	21.26	20.57
C8.4	0.46	6.70	7.0	42.00	1.19%	0.10	7.16	157.00	4.14%	1.42	1.84				
			20.0					89.00	3.37%	3.67	0.40				
			20.0					697.00	5.16%	4.54	2.56				
			20.0					374.00	1.48%	2.43	2.56	14.52	1359.00	17.55	14.52
DP-51	0.46	39.82	7.0	100.00	4.00%	0.23	7.34	616.00	4.91%	1.55	6.62				
			20.0					1310.00	2.92%	3.42	6.39				
			20.0					391.00	1.20%	9.15	0.71	21.06	2417.00	23.43	21.06
C8.5	0.49	3.84	7.0	45.00	2.20%	0.13	5.72	160.00	1.88%	0.96	2.78				
			20.0					683.00	4.25%	4.12	2.76				
			20.0					320.00	1.60%	2.53	2.11	13.36	1208.00	16.71	13.36
C8.6	0.90	0.79	20.0	25.00	2.00%	0.29	1.44	342.00	1.67%	2.58	2.21				
			20.0					400.00	2.98%	3.45	1.93	5.58	767.00	14.26	5.58
C8.7a	0.49	4.52	7.0	75.00	6.67%	0.24	5.11	108.00	2.50%	1.11	1.63				
			20.0					857.00	1.05%	2.05	6.97	13.71	1040.00	15.78	13.71
C8.7b	0.49	1.77	20.0	33.00	2.00%	0.11	5.05	1040.00	1.92%	2.77	6.25	11.31	1073.00	15.96	11.31
DP-63	0.49	6.29	7.0	75.00	6.67%	0.24	5.11	108.00	2.50%	1.11	1.63				
			20.0					885.00	1.05%	2.05	7.20	13.94	1068.00	15.93	13.94
C8.7c	0.49	4.94	20.0	60.00	2.10%	0.15	6.70	817.00	3.11%	3.53	3.86				
			20.0					172.00	1.74%	2.64	1.09	11.65	1049.00	15.83	11.65
DP-64	0.49	11.23	7.0	75.00	6.67%	0.24	5.11	108.00	2.50%	1.11	1.63				
			20.0					885.00	1.05%	2.05	7.20				
			RCP					270.00	1.00%	10.63	0.42	14.36	1338.00	17.43	14.36
C8.7d	0.46	0.27	7.0	20.00	16.50%	0.16	2.05	166.00	3.31%	1.27	2.17	4.23	186.00	11.03	4.23
C8.7e	0.47	6.09	7.0	40.00	20.00%	0.25	2.68	290.00	2.83%	1.18	4.10				
			20.0					293.00	1.06%	2.06	2.37				
			20.0					577.00	3.14%	3.54	2.71	11.87	1200.00	16.67	11.87
DP-62 C3.7a-e	0.48	17.59	7.0	75.00	6.67%	0.24	5.20	108.00	2.50%	1.11	1.63				
			20.0					885.00	1.05%	2.05	7.20				
			RCP					270.00	1.00%	10.63	0.42				
			RCP					777.00	3.40%	13.28	0.98	15.42	2115.00	21.75	15.42
DP-62 C3.5-C3.7	0.50	22.22	7.0	45.00	2.20%	0.13	5.62	160.00	1.88%	0.96	2.78				

Standard Form SF-1. Time of Concentration-Proposed

CORE ENGINEERING GROUP

Calculated By: Leonard Beasley
Date: Feb. 19, 2021
Checked By: Leonard Beasley

Job No: 100.064
Project: The Ridge at Lorson Ranch

Sub-Basin Data				Initial Overland Time (t_i)				Travel Time (t_t)					t_c Check (urbanized Basins)		Final t_c
BASIN or DESIGN	C_5	AREA (A) acres	NRCS Convey.	LENGTH (L) feet	SLOPE (S) %	VELOCITY (V) ft/sec	t_i minutes	LENGTH (L) feet	SLOPE (S) %	VELOCITY (V) ft/sec	t_t minutes	Computed t_c Minutes	TOTAL LENGTH (L) feet	Regional tc tc=(L/180)+10 minutes	USDCM Recommended t_c=t_i+t_t (min)
			20.0					683.00	4.25%	4.12	2.76				
			20.0					320.00	1.60%	2.53	2.11				
			20.0					342.00	1.67%	2.58	2.21				
			20.0					400.00	2.98%	3.45	1.93	17.41	1950.00	20.83	17.41
OS-B1	0.15	5.11	7.0	100.00	4.40%	0.16	10.55	388.00	4.30%	1.45	4.46	15.01	488.00	12.71	12.71
C8.8a	0.49	5.65	7.0	100.00	4.60%	0.25	6.68	133.00	4.36%	1.46	1.52				
			20.0					1457.00	1.41%	2.37	10.23				
			20.0					427.00	3.75%	3.87	1.84				
			20.0					650.00	3.06%	3.50	3.10	23.35	2767.00	25.37	23.35
DP-68	0.33	10.76	7.0	100.00	4.50%	0.20	8.49	488.00	2.42%	1.09	7.47				
			20.0					1457.00	1.41%	2.37	10.23				
			20.0					427.00	3.75%	3.87	1.84				
			20.0					650.00	0.60%	1.55	6.99	35.01	3122.00	27.34	27.34
C8.8	0.22	7.80	7.0	100.00	2.00%	0.13	12.69	611.00	5.48%	1.64	6.21				
			7.0					53.00	33.00%	4.02	0.22				
			7.0					245.00	0.60%	0.54	7.53	26.65	1009.00	15.61	15.61
C8	0.43	73.39	7.0	20.00	18.50%	0.16	2.07	99.00	2.42%	1.09	1.52				
			20.0					2654.00	2.15%	2.93	15.08				
			RCP					566.00	5.30%	21.72	0.43				
			7.0					272.00	0.60%	0.54	8.36	27.46	3611.00	30.06	27.46

APPENDIX C – HYDRAULIC CALCULATIONS

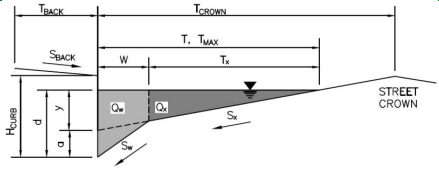
Version 4.05 Released March 2017

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

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

Project: **The Ridge at Lorson Ranch, #100.064**

Inlet ID: **Inlet DP-1**



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	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} =	0.015	
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} =	0.017	

		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} =	5.6	7.9	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

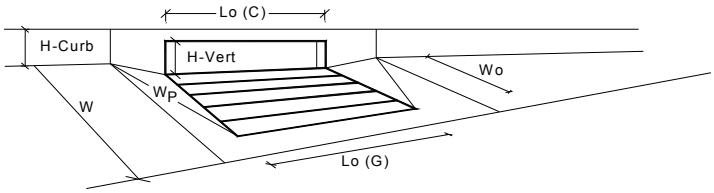
Maximum Capacity for 1/2 Street based On Allowable Spread		Minor Storm	Major Storm	
Water Depth without Gutter Depression (Eq. ST-2)	y =	4.08	4.08	inches
Vertical Depth between Gutter Lip and Gutter Flowline (usually 2")	d_C =	2.0	2.0	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	1.51	1.51	inches
Water Depth at Gutter Flowline	d =	5.59	5.59	inches
Allowable Spread for Discharge outside the Gutter Section W (T - W)	T_X =	15.0	15.0	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	E_O =	0.350	0.350	
Discharge outside the Gutter Section W, carried in Section T_X	Q_X =	0.0	0.0	cfs
Discharge within the Gutter Section W (Q_T - Q_X)	Q_W =	0.0	0.0	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	0.0	cfs
Maximum Flow Based On Allowable Spread	**Q_T =**	**SUMP**	**SUMP**	**cfs**
Flow Velocity within the Gutter Section	V =	0.0	0.0	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	0.0	0.0	

Maximum Capacity for 1/2 Street based on Allowable Depth		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	17.0	26.7	ft
Theoretical Spread for Discharge outside the Gutter Section W (T - W)	$T_{X\,TH}$ =	15.0	24.7	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	E_O =	0.349	0.219	
Theoretical Discharge outside the Gutter Section W, carried in Section $T_{X\,TH}$	$Q_{X\,TH}$ =	0.0	0.0	cfs
Actual Discharge outside the Gutter Section W, (limited by distance T_{CROWN})	Q_X =	0.0	0.0	cfs
Discharge within the Gutter Section W (Q_d - Q_X)	Q_W =	0.0	0.0	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	0.0	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	0.0	0.0	cfs
Average Flow Velocity Within the Gutter Section	V =	0.0	0.0	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	0.0	0.0	
Slope-Based Depth Safety Reduction Factor for Major & Minor (d $\geq$ 6") Storm	R =	SUMP	SUMP	
Max Flow Based on Allowable Depth (Safety Factor Applied)	**Q_d =**	**SUMP**	**SUMP**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =			inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =			inches

		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



		MINOR	MAJOR	
Design Information (Input) CDOT Type R Curb Opening				
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	5.2	7.0	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} =	0.27	0.42	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.49	0.66	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.88	0.99	
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 =**	**5.6**	**12.2**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	5.6	12.2	cfs

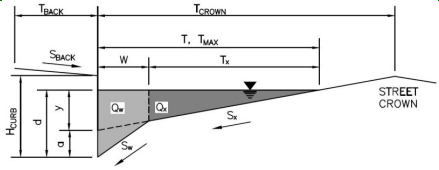
Version 4.05 Released March 2017

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

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

Project: **The Ridge at Lorson Ranch, #100.064**

Inlet ID: **Inlet DP-2**



Gutter Geometry (Enter data in the blue cells)

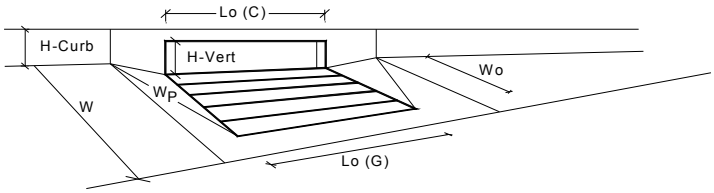
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.015	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
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} =	0.017	

		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} =	5.6	7.9	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



		MINOR	MAJOR	
Design Information (Input) CDOT Type R Curb Opening				
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	4.6	6.3	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} =	0.21	0.36	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.58	0.80	
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 =**	**2.7**	**5.9**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	2.7	5.9	cfs

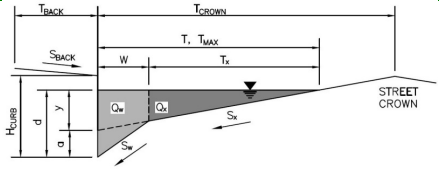
Version 4.05 Released March 2017

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

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

Project: **The Ridge at Lorson Ranch, #100.064**

Inlet ID: **Inlet DP-4**



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	10.0	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} =	0.015	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	22.0	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 =	0.026	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.017	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	22.0	22.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	8.4	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

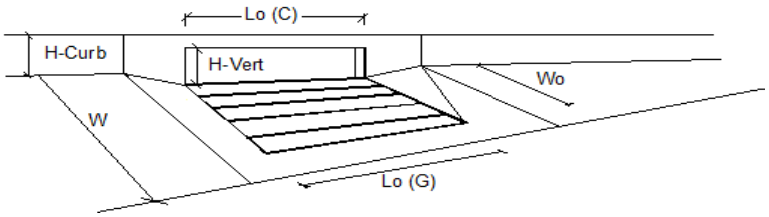
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**17.5**	**44.5**	**cfs**

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 =	20.00	20.00	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	
Design Discharge for Half of Street (from Sheet *Inlet Management*)	**Q_o =**	**14.1**	**30.9**	cfs
Water Spread Width	T =	16.0	21.9	ft
Water Depth at Flowline (outside of local depression)	d =	5.4	6.8	inches
Water Depth at Street Crown (or at T_{MAX})	d_{CROWN} =	0.0	0.0	inches
Ratio of Gutter Flow to Design Flow	E_o =	0.372	0.270	
Discharge outside the Gutter Section W, carried in Section T_x	Q_x =	8.9	22.4	cfs
Discharge within the Gutter Section W	Q_w =	5.2	8.3	cfs
Discharge Behind the Curb Face	Q_{BACK} =	0.0	0.2	cfs
Flow Area within the Gutter Section W	A_W =	0.73	0.96	sq ft
Velocity within the Gutter Section W	V_W =	7.2	8.6	fps
Water Depth for Design Condition	d_{LOCAL} =	8.4	9.8	inches
Grate Analysis (Calculated)		MINOR	MAJOR	
Total Length of Inlet Grate Opening	L =	N/A	N/A	ft
Ratio of Grate Flow to Design Flow	$E_{o\text{-}GRATE}$ =	N/A	N/A	
Under No-Clogging Condition		MINOR	MAJOR	
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Interception Capacity	Q_i =	N/A	N/A	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient for Multiple-unit Grate Inlet	GrateCoef =	N/A	N/A	
Clogging Factor for Multiple-unit Grate Inlet	GrateClog =	N/A	N/A	
Effective (unclogged) Length of Multiple-unit Grate Inlet	L_e =	N/A	N/A	ft
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Actual Interception Capacity	**Q_a =**	**N/A**	**N/A**	cfs
Carry-Over Flow = Q_o-Q_a (to be applied to curb opening or next d/s inlet)	**Q_b =**	**N/A**	**N/A**	cfs
Curb or Slotted Inlet Opening Analysis (Calculated)		MINOR	MAJOR	
Equivalent Slope S_e (based on grate carry-over)	S_e =	0.090	0.071	ft/ft
Required Length L_T to Have 100% Interception	L_T =	23.38	38.80	ft
Under No-Clogging Condition		MINOR	MAJOR	
Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T)	L =	20.00	20.00	ft
Interception Capacity	Q_i =	13.7	22.4	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient	CurbCoef =	1.33	1.33	
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet	CurbClog =	0.03	0.03	
Effective (Unclogged) Length	L_e =	17.34	17.34	ft
Actual Interception Capacity	**Q_a =**	**13.5**	**22.0**	cfs
Carry-Over Flow = $Q_{b(GRATE)}$-Q_a	**Q_b =**	**0.6**	**8.9**	cfs
Summary		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**13.5**	**22.0**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.6**	**8.9**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**96**	**71**	**%**

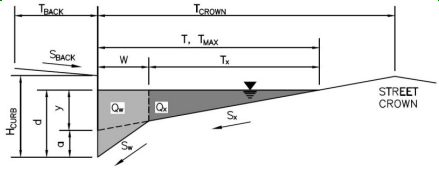
Version 4.05 Released March 2017

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

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

Project: **The Ridge at Lorson Ranch, #100.064**

Inlet ID: **Inlet DP-6**



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	10.0	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} =	0.015	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	22.0	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 =	0.025	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.017	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	18.5	22.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	8.4	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

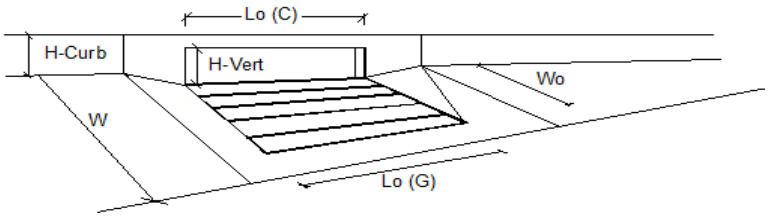
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**17.7**	**44.8**	**cfs**

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**	**5.7**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.9**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**86**	**%**

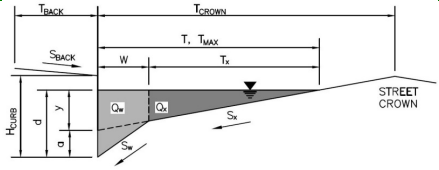
Version 4.05 Released March 2017

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

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

Project: **The Ridge at Lorson Ranch, #100.064**

Inlet ID: **Inlet DP-12**



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	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} =	0.015	
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 =	0.026	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.017	

		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} =	5.6	7.9	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

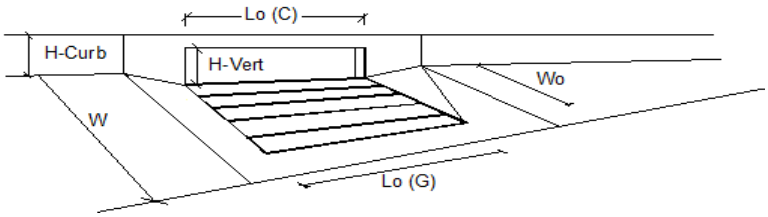
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**16.3**	**34.6**	**cfs**

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 =	15.00	15.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**9.3**	**14.8**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.6**	**7.0**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**94**	**68**	**%**

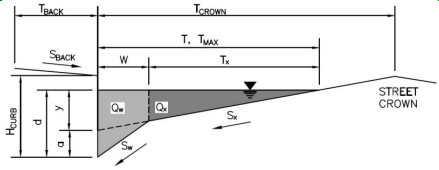
Version 4.05 Released March 2017

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

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

Project: **The Ridge at Lorson Ranch, #100.064**

Inlet ID: **Inlet DP-13**



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	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} =	0.015	
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 =	0.022	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.017	

		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} =	5.6	7.9	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

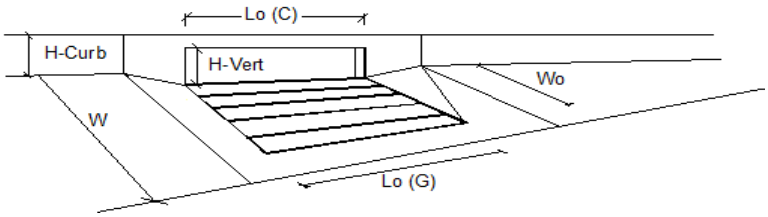
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**15.2**	**36.0**	**cfs**

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

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

INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet (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 =	15.00	15.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**8.3**	**15.6**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.2**	**8.7**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**97**	**64**	**%**

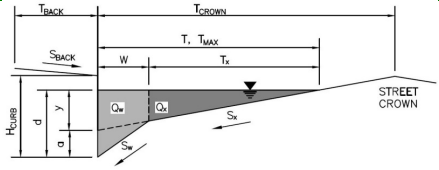
Version 4.05 Released March 2017

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

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

Project: **The Ridge at Lorson Ranch, #100.064**

Inlet ID: **Inlet DP-15**



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	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} =	0.015	
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 =	0.019	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.017	

		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} =	5.6	7.9	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

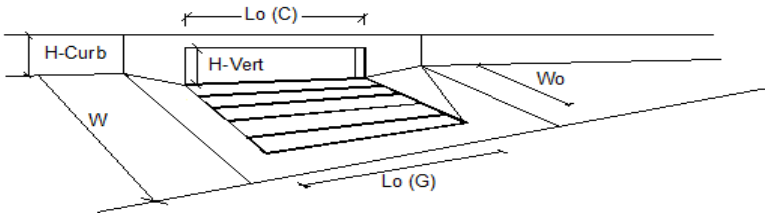
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**14.1**	**37.8**	**cfs**

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 =	15.00	15.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**8.4**	**16.5**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.3**	**10.8**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**97**	**60**	**%**

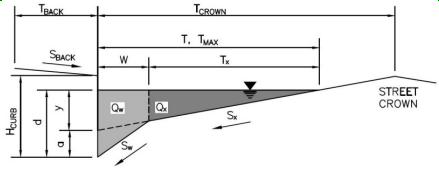
Version 4.05 Released March 2017

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

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

Project: **The Ridge at Lorson Ranch, #100.064**

Inlet ID: **Inlet DP-17**



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	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} =	0.015	
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 =	0.034	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.017	

		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} =	5.6	7.9	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

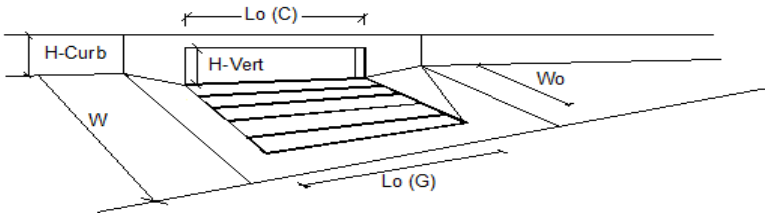
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**16.0**	**31.6**	**cfs**

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 =	20.00	20.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**7.5**	**20.4**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**6.3**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**77**	**%**

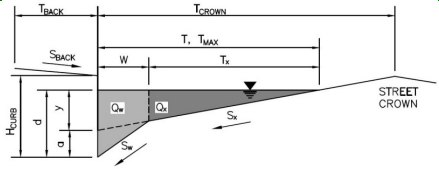
Version 4.05 Released March 2017

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

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

Project: **The Ridge at Lorson Ranch, #100.064**

Inlet ID: **Inlet DP-19**



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	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} =	0.015	
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 =	0.026	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.017	

		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} =	5.6	7.9	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

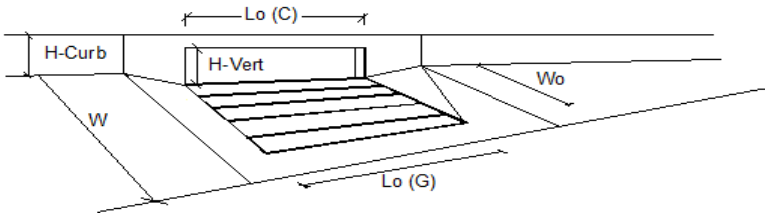
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	**16.4**	**34.5**	**cfs**

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 =	20.00	20.00	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 =**	**10.3**	**21.2**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**7.6**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**74**	**%**

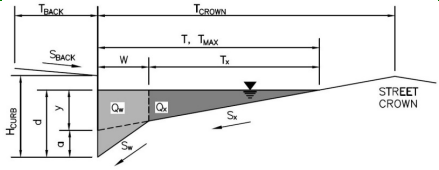
Version 4.05 Released March 2017

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

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

Project: **The Ridge at Lorson Ranch, #100.064**

Inlet ID: **Inlet DP-20a**



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	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} =	0.015	
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 =	0.030	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.017	

		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} =	5.6	7.9	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

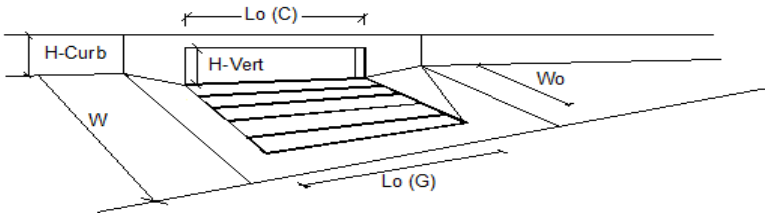
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**16.7**	**32.9**	**cfs**

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 (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 =	15.00	15.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**5.6**	**10.7**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**1.6**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**87**	**%**

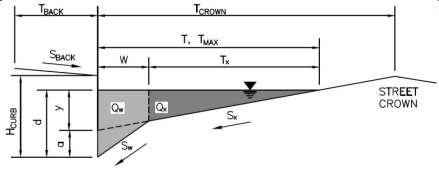
Version 4.05 Released March 2017

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

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

Project: **The Ridge at Lorson Ranch, #100.064**

Inlet ID: **Inlet DP-21**



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	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} =	0.015	
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 =	0.021	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.017	

		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} =	5.6	7.9	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

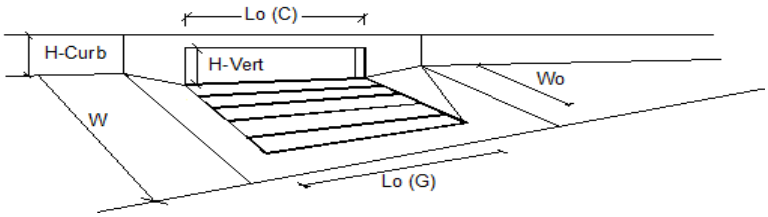
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	**14.8**	**36.6**	**cfs**

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 =	15.00	15.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**7.2**	**13.1**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**4.4**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**75**	**%**

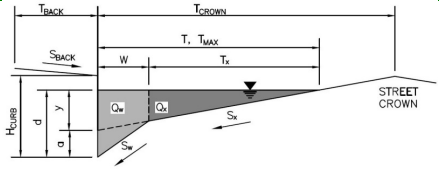
Version 4.05 Released March 2017

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

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

Project: **The Ridge at Lorson Ranch, #100.064**

Inlet ID: **Inlet DP-23**



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	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} =	0.015	
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} =	0.017	

		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} =	5.6	7.9	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

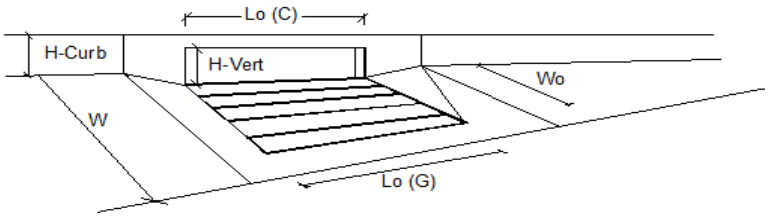
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**14.5**	**37.1**	**cfs**

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 =	15.00	15.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**8.4**	**16.3**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.3**	**10.4**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**97**	**61**	**%**

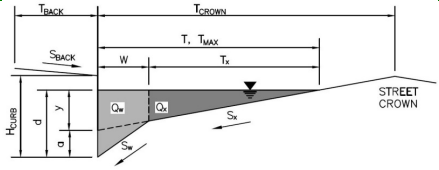
Version 4.05 Released March 2017

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

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

Project: **The Ridge at Lorson Ranch, #100.064**

Inlet ID: **Inlet DP-25**



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	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} =	0.015	
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 =	0.011	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.017	

		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} =	5.6	7.9	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

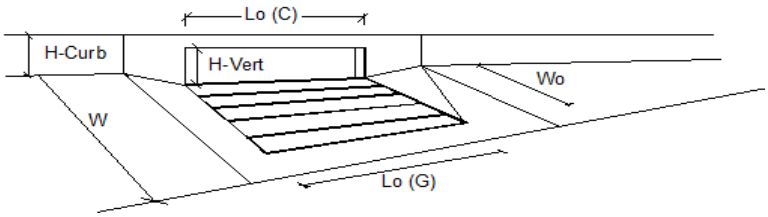
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**10.7**	**33.0**	**cfs**

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

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

INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet (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 =**	**7.2**	**11.3**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**2.9**	**15.1**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**71**	**43**	**%**

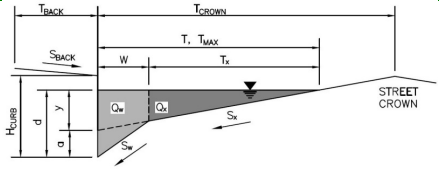
Version 4.05 Released March 2017

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

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

Project: **The Ridge at Lorson Ranch, #100.064**

Inlet ID: **Inlet DP-27**



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	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} =	0.015	
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 =	0.011	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.017	

		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} =	5.6	7.9	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

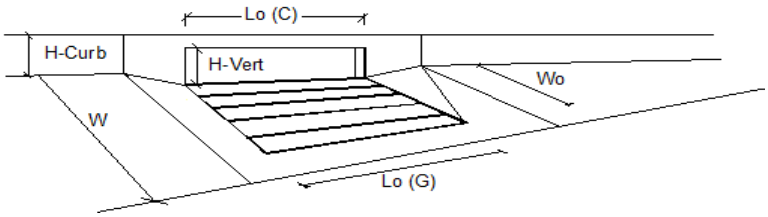
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**10.7**	**33.0**	**cfs**

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

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

INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet (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 =	20.00	20.00	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 =**	**8.4**	**20.7**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**7.6**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**73**	**%**

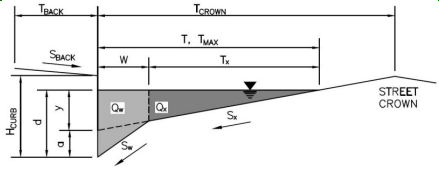
Version 4.05 Released March 2017

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

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

Project: **The Ridge at Lorson Ranch, #100.064**

Inlet ID: **Inlet DP-29**



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	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} =	0.015	
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} =	0.017	

		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} =	5.6	7.9	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

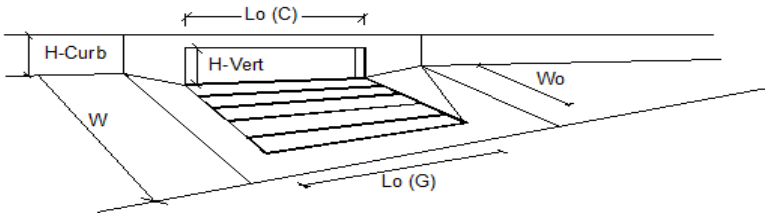
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**10.2**	**31.8**	**cfs**

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 =	20.00	20.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**9.2**	**20.5**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**7.3**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**74**	**%**

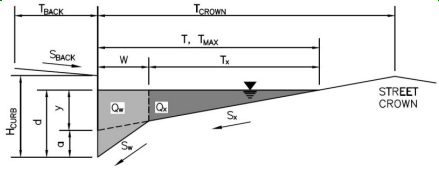
Version 4.05 Released March 2017

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

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

Project: **The Ridge at Lorson Ranch, #100.064**

Inlet ID: **Inlet DP-31**



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	24.0	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} =	0.015	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	26.0	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 =	0.048	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.017	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	26.0	26.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	11.8	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

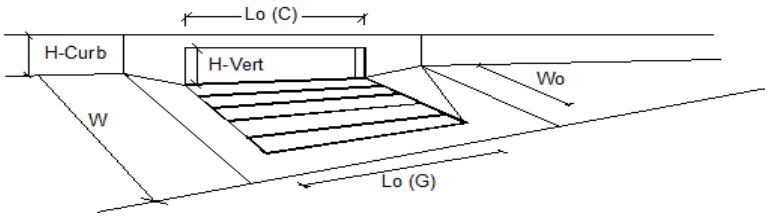
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**14.5**	**115.2**	**cfs**

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	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	15.00	15.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Design Discharge for Half of Street (from Sheet *Inlet Management*)	**Q_o =**	**10.5**	**23.2**	cfs
Water Spread Width	T =	12.4	17.2	ft
Water Depth at Flowline (outside of local depression)	d =	4.5	5.6	inches
Water Depth at Street Crown (or at T_{MAX})	d_{CROWN} =	0.0	0.0	inches
Ratio of Gutter Flow to Design Flow	E_o =	0.477	0.346	
Discharge outside the Gutter Section W, carried in Section T_x	Q_x =	5.5	15.2	cfs
Discharge within the Gutter Section W	Q_w =	5.0	8.0	cfs
Discharge Behind the Curb Face	Q_{BACK} =	0.0	0.0	cfs
Flow Area within the Gutter Section W	A_W =	0.58	0.77	sq ft
Velocity within the Gutter Section W	V_W =	8.6	10.4	fps
Water Depth for Design Condition	d_{LOCAL} =	7.5	8.6	inches
Grate Analysis (Calculated)		MINOR	MAJOR	
Total Length of Inlet Grate Opening	L =	N/A	N/A	ft
Ratio of Grate Flow to Design Flow	$E_{o\text{-}GRATE}$ =	N/A	N/A	
Under No-Clogging Condition		MINOR	MAJOR	
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Interception Capacity	Q_i =	N/A	N/A	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient for Multiple-unit Grate Inlet	GrateCoef =	N/A	N/A	
Clogging Factor for Multiple-unit Grate Inlet	GrateClog =	N/A	N/A	
Effective (unclogged) Length of Multiple-unit Grate Inlet	L_e =	N/A	N/A	ft
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Actual Interception Capacity	**Q_a =**	**N/A**	**N/A**	cfs
Carry-Over Flow = Q_o-Q_a (to be applied to curb opening or next d/s inlet)	**Q_b =**	**N/A**	**N/A**	cfs
Curb or Slotted Inlet Opening Analysis (Calculated)		MINOR	MAJOR	
Equivalent Slope S_e (based on grate carry-over)	S_e =	0.110	0.085	ft/ft
Required Length L_T to Have 100% Interception	L_T =	19.05	32.09	ft
Under No-Clogging Condition		MINOR	MAJOR	
Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T)	L =	15.00	15.00	ft
Interception Capacity	Q_i =	9.9	15.7	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient	CurbCoef =	1.31	1.31	
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet	CurbClog =	0.04	0.04	
Effective (Unclogged) Length	L_e =	13.03	13.03	ft
Actual Interception Capacity	**Q_a =**	**9.7**	**15.3**	cfs
Carry-Over Flow = $Q_{b(GRATE)}$-Q_a	**Q_b =**	**0.8**	**7.9**	cfs
Summary		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**9.7**	**15.3**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.8**	**7.9**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**92**	**66**	**%**

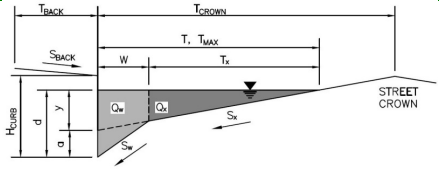
Version 4.05 Released March 2017

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

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

Project: **The Ridge at Lorson Ranch, #100.064**

Inlet ID: **Inlet DP-32**



Gutter Geometry (Enter data in the blue cells)

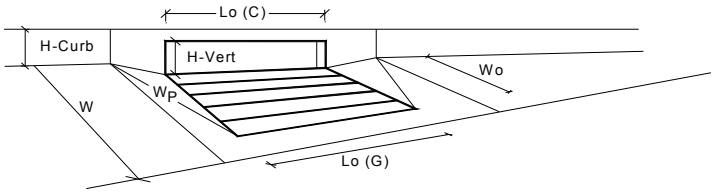
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.015	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
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} =	0.017	

		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} =	5.6	7.9	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)	CDOT Type R Curb Opening		MINOR	MAJOR	
Type of Inlet		Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)		a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)		No =	1	1	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	5.6	8.4	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) =	20.00	20.00	feet
Height of Vertical Curb Opening in Inches		H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches		H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)		Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)		C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)		C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)		C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)			MINOR	MAJOR	
Depth for Grate Midwidth		d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation		d_{Curb} =	0.30	0.53	ft
Combination Inlet Performance Reduction Factor for Long Inlets		$RF_{Combination}$ =	0.53	0.79	
Curb Opening Performance Reduction Factor for Long Inlets		RF_{Curb} =	0.76	0.91	
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 =**	**10.3**	**29.2**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)		$Q_{PEAK\ REQUIRED}$ =	8.6	27.5	cfs

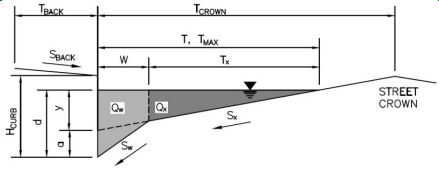
Version 4.05 Released March 2017

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

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

Project: **The Ridge at Lorson Ranch, #100.064**

Inlet ID: **Inlet DP-33 (Exist. 25' Type "R")**



Gutter Geometry (Enter data in the blue cells)

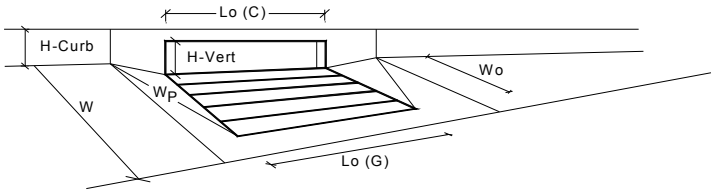
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.015	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
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} =	0.017	

		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} =	5.6	7.9	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



		MINOR	MAJOR	
Design Information (Input) CDOT Type R Curb Opening				
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	4.6	7.7	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) =	25.00	25.00	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} =	0.22	0.47	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.43	0.72	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.69	0.88	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**7.0**	**28.7**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	7.0	28.7	cfs

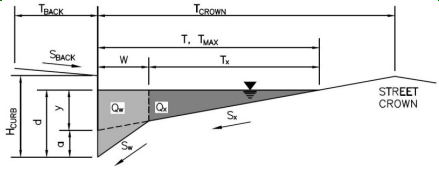
Version 4.05 Released March 2017

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

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

Project: **The Ridge at Lorson Ranch, #100.064**

Inlet ID: **Inlet DP-36**



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	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} =	0.015	
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 =	0.027	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.017	

		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} =	5.6	7.9	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

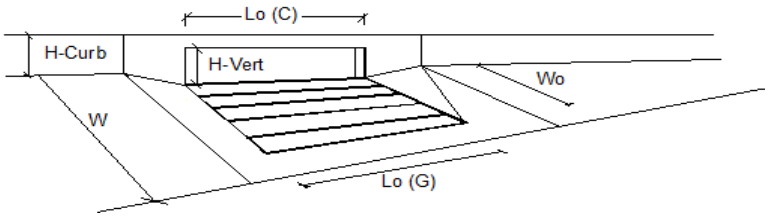
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**16.8**	**34.0**	**cfs**

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

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

INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet (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 =**	**4.1**	**5.7**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**7.3**	**19.5**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**36**	**22**	**%**

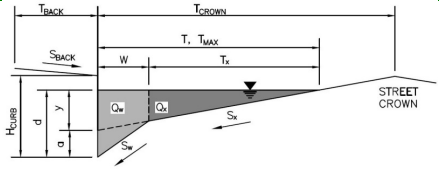
Version 4.05 Released March 2017

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

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

Project: **The Ridge at Lorson Ranch, #100.064**

Inlet ID: **Inlet DP-37**



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	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} =	0.015	
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} =	0.017	

		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} =	5.6	7.9	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

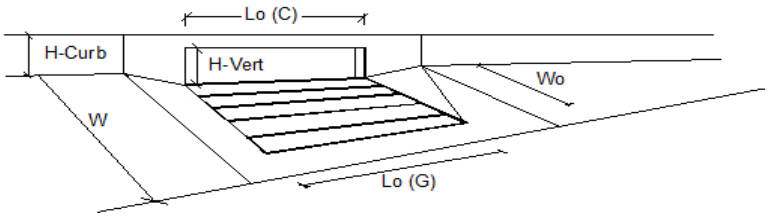
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**14.5**	**37.2**	**cfs**

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 =	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 =**	**3.4**	**4.8**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**4.0**	**11.5**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**46**	**29**	**%**

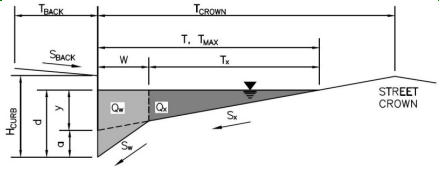
Version 4.05 Released March 2017

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

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

Project: **The Ridge at Lorson Ranch, #100.064**

Inlet ID: **Inlet DP-39**



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	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} =	0.015	
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} =	0.017	

		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} =	5.6	7.9	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

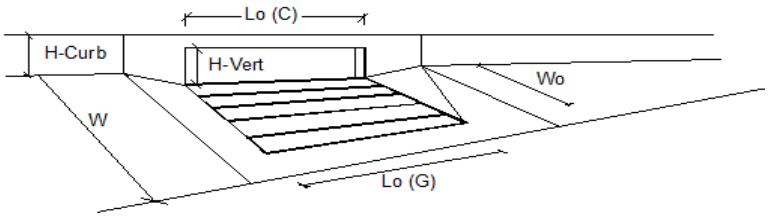
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	**10.3**	**31.8**	**cfs**

WARNING: MINOR STORM max. allowable capacity is less 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)		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 =	25.00	25.00	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 MINOR & MAJOR STORM		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**12.7**	**26.5**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**7.5**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**78**	**%**

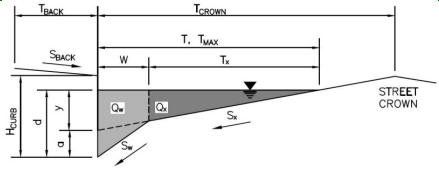
Version 4.05 Released March 2017

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

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

Project: **The Ridge at Lorson Ranch, #100.064**

Inlet ID: **Inlet DP-41**



Gutter Geometry (Enter data in the blue cells)

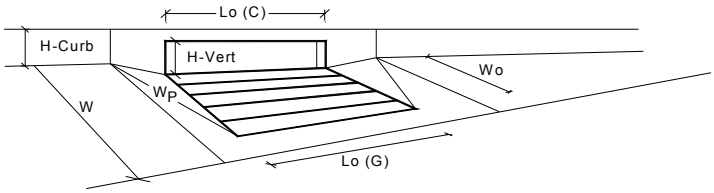
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.015	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
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} =	0.017	

		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} =	5.6	7.9	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)	CDOT Type R Curb Opening		MINOR	MAJOR	
Type of Inlet		Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)		a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)		No =	1	1	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	5.6	7.9	inches
Grate Information			MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate		L_o (G) =	N/A	N/A	feet
Width of a Unit Grate		W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)		A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)		C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)		C_o (G) =	N/A	N/A	
Curb Opening Information			MINOR	MAJOR	
Length of a Unit Curb Opening		L_o (C) =	20.00	20.00	feet
Height of Vertical Curb Opening in Inches		H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches		H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)		Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)		C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)		C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)		C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)			MINOR	MAJOR	
Depth for Grate Midwidth		d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation		d_{Curb} =	0.30	0.49	ft
Combination Inlet Performance Reduction Factor for Long Inlets		$RF_{Combination}$ =	0.53	0.74	
Curb Opening Performance Reduction Factor for Long Inlets		RF_{Curb} =	0.76	0.89	
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 =**	**10.3**	**25.1**	**cfs**
WARNING: Inlet Capacity less than Q Peak for Major Storm		$Q_{PEAK\ REQUIRED}$ =	9.3	28.2	cfs

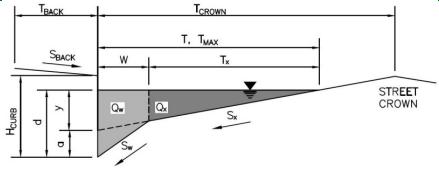
Version 4.05 Released March 2017

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

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

Project: **The Ridge at Lorson Ranch, #100.064**

Inlet ID: **Inlet DP-43**



Gutter Geometry (Enter data in the blue cells)

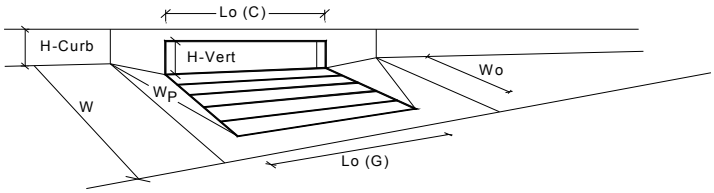
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.015	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	35.0	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} =	0.017	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	35.0	35.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	7.9	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



		MINOR	MAJOR	
Design Information (Input) CDOT Type R Curb Opening				
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	5.6	7.9	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	20.00	20.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.30	0.49	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.53	0.74	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.76	0.89	
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 =**	**10.3**	**25.0**	**cfs**
WARNING: Inlet Capacity less than Q Peak for Major Storm	$Q_{PEAK\ REQUIRED}$ =	10.0	25.0	cfs

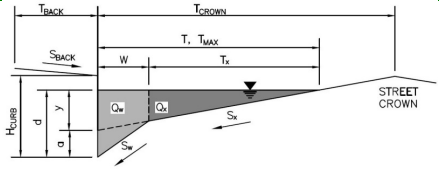
Version 4.05 Released March 2017

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

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

Project: **The Ridge at Lorson Ranch, #100.064**

Inlet ID: **Inlet DP-47**



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	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} =	0.015	
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} =	0.017	

		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} =	5.6	7.9	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

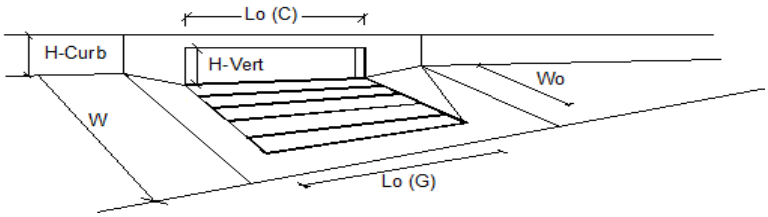
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**10.2**	**31.5**	**cfs**

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 =	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 =**	**6.1**	**9.1**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**1.4**	**7.3**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**81**	**56**	**%**

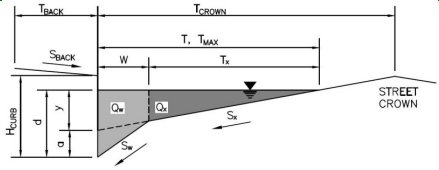
Version 4.05 Released March 2017

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

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

Project: **The Ridge at Lorson Ranch, #100.064**

Inlet ID: **Inlet DP-48**



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	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} =	0.015	
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} =	0.017	

		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} =	5.6	7.9	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

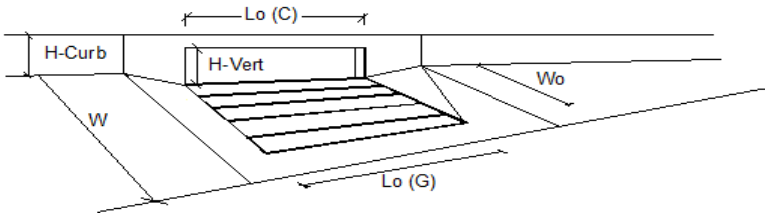
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	**12.6**	**38.8**	**cfs**

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 =**	**3.4**	**6.2**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**1.4**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**81**	**%**

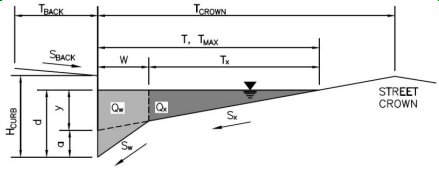
Version 4.05 Released March 2017

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

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

Project: **The Ridge at Lorson Ranch, #100.064**

Inlet ID: **Inlet DP-49**



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	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} =	0.015	
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} =	0.017	

		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} =	5.6	7.9	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

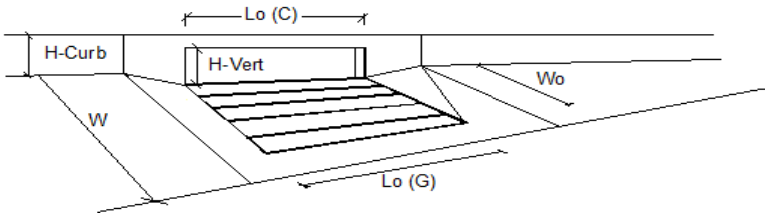
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	**17.0**	**33.6**	**cfs**

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 =	20.00	20.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**7.7**	**20.8**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**6.9**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**75**	**%**

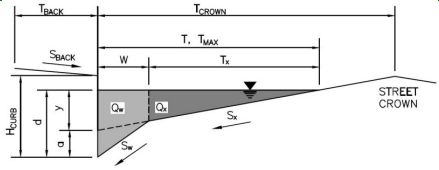
Version 4.05 Released March 2017

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

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

Project: **The Ridge at Lorson Ranch, #100.064**

Inlet ID: **Inlet DP-51**



Gutter Geometry (Enter data in the blue cells)

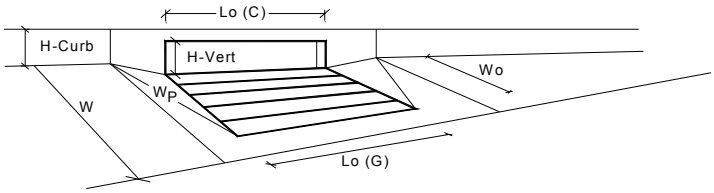
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.015	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
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} =	0.017	

		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} =	5.6	7.9	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



		MINOR	MAJOR	
Design Information (Input) CDOT Type R Curb Opening				
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	4.0	7.1	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	25.00	25.00	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} =	0.17	0.43	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.38	0.67	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.64	0.85	
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 =**	**4.5**	**24.0**	**cfs**
WARNING: Inlet Capacity less than Q Peak for Major Storm	$Q_{PEAK\ REQUIRED}$ =	4.5	26.0	cfs

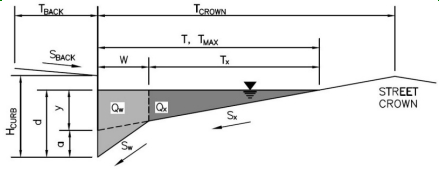
Version 4.05 Released March 2017

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

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

Project: **The Ridge at Lorson Ranch, #100.064**

Inlet ID: **Inlet DP-53**



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	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} =	0.015	
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 =	0.014	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.017	

		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} =	5.6	7.9	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

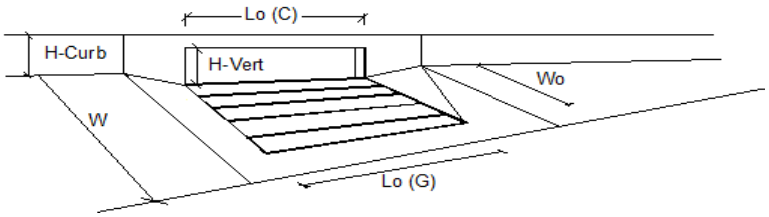
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**12.3**	**37.8**	**cfs**

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 =	15.00	15.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**9.7**	**16.2**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.9**	**10.3**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**91**	**61**	**%**

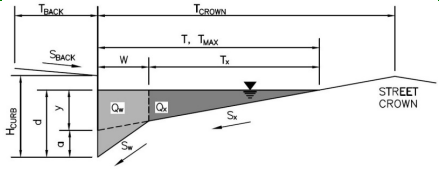
Version 4.05 Released March 2017

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

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

Project: **The Ridge at Lorson Ranch, #100.064**

Inlet ID: **Inlet DP-54**



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	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} =	0.015	
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} =	0.017	

		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} =	5.6	7.9	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

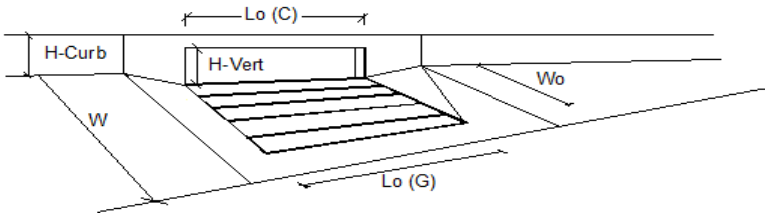
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	**12.5**	**38.6**	**cfs**

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 =	20.00	20.00	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 =**	**11.7**	**24.0**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.1**	**13.6**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**99**	**64**	**%**

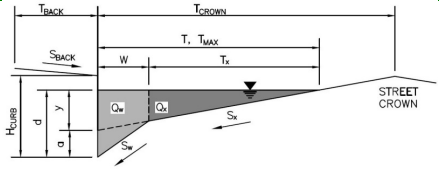
Version 4.05 Released March 2017

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

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

Project: **The Ridge at Lorson Ranch, #100.064**

Inlet ID: **Inlet DP-56**



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	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} =	0.015	
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 =	1.210	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.017	

		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} =	5.6	7.9	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

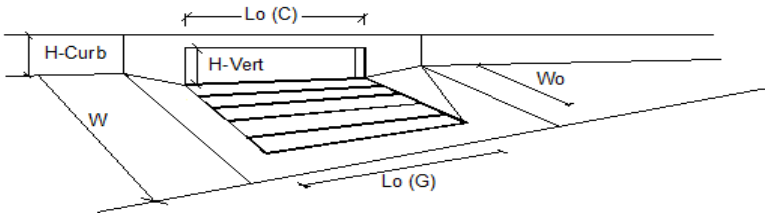
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	**5.5**	**10.9**	**cfs**

WARNING: MINOR STORM max. allowable capacity is less 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)		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 =	20.00	20.00	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 MINOR & MAJOR STORM		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**9.0**	**23.7**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**9.1**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**72**	**%**

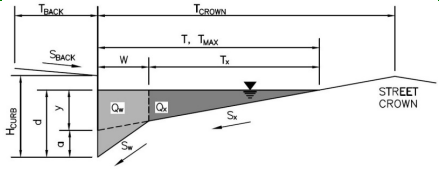
Version 4.05 Released March 2017

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

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

Project: **The Ridge at Lorson Ranch, #100.064**

Inlet ID: **Inlet DP-57**



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	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} =	0.015	
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} =	0.017	

		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} =	5.6	7.9	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

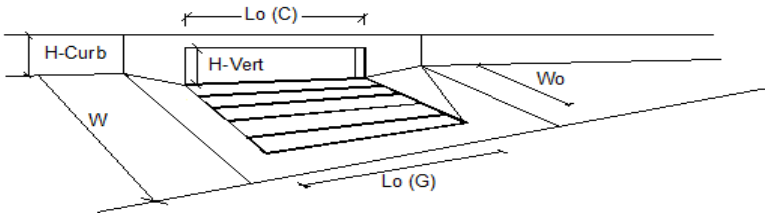
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**10.2**	**31.5**	**cfs**

WARNING: MINOR STORM max. allowable capacity is less 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 =	20.00	20.00	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 MINOR STORM'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**11.0**	**19.0**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**5.1**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**79**	**%**

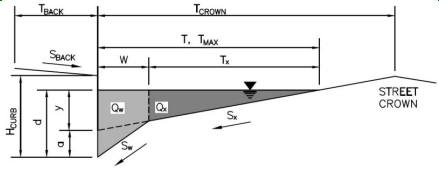
Version 4.05 Released March 2017

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

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

Project: **The Ridge at Lorson Ranch, #100.064**

Inlet ID: **Inlet DP-62**



Gutter Geometry (Enter data in the blue cells)

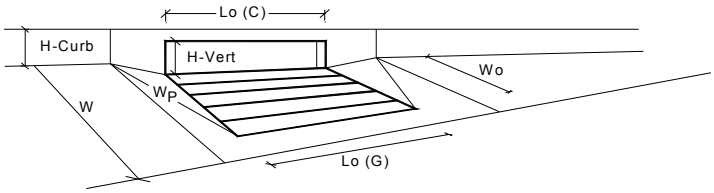
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.015	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
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} =	0.017	

		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} =	5.6	7.9	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)	CDOT Type R Curb Opening		MINOR	MAJOR	
Type of Inlet		Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)		a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)		No =	1	1	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	5.6	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) =	30.00	30.00	feet
Height of Vertical Curb Opening in Inches		H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches		H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)		Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)		C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)		C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)		C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)			MINOR	MAJOR	
Depth for Grate Midwidth		d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation		d_{Curb} =	0.30	0.50	ft
Combination Inlet Performance Reduction Factor for Long Inlets		$RF_{Combination}$ =	0.53	0.75	
Curb Opening Performance Reduction Factor for Long Inlets		RF_{Curb} =	0.76	0.89	
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 =**	**14.9**	**37.4**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)		$Q_{PEAK\ REQUIRED}$ =	14.3	37.4	cfs

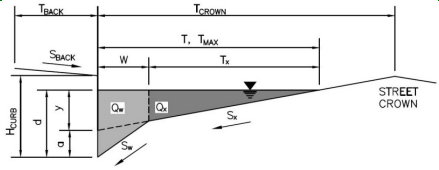
Version 4.05 Released March 2017

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

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

Project: **The Ridge at Lorson Ranch, #100.064**

Inlet ID: **Inlet DP-63**



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	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} =	0.015	
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 =	0.016	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.017	

		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} =	5.6	7.9	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

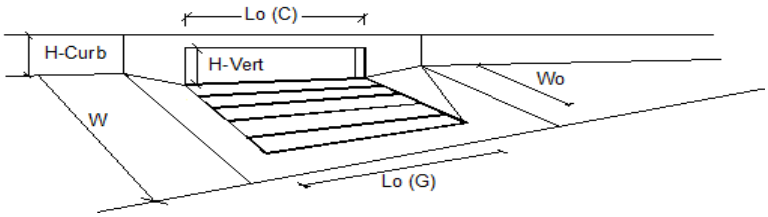
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**13.1**	**39.4**	**cfs**

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 =	15.00	15.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**10.2**	**15.9**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**1.3**	**9.7**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**89**	**62**	**%**

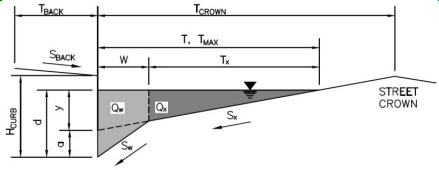
Version 4.05 Released March 2017

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

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

Project: **The Ridge at Lorson Ranch, #100.064**

Inlet ID: **Inlet DP-64**



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	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} =	0.015	
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} =	0.017	

		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} =	5.6	7.9	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

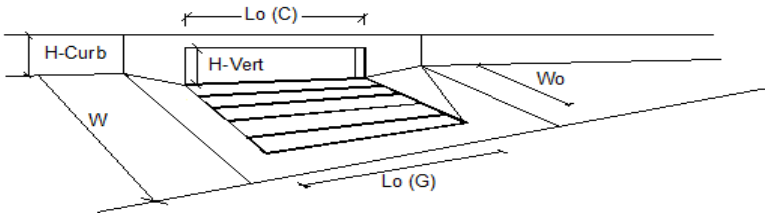
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	**15.3**	**30.2**	**cfs**

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)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	15.00	15.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	
Street Hydraulics: WARNING: Q > ALLOWABLE Q FOR MAJOR STORM		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**9.8**	**17.5**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.9**	**13.1**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**92**	**57**	**%**

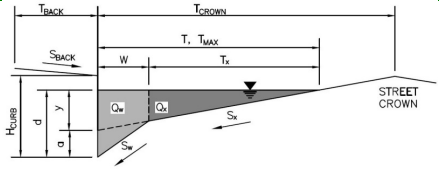
Version 4.05 Released March 2017

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

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

Project: **The Ridge at Lorson Ranch, #100.064**

Inlet ID: **Inlet DP-66**



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	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} =	0.015	
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} =	0.017	

		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} =	5.6	7.9	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

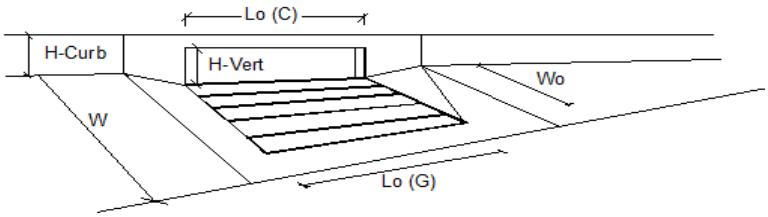
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**14.5**	**37.2**	**cfs**

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 =	15.00	15.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**1.5**	**11.8**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**2.7**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**81**	**%**

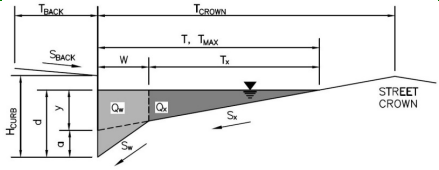
Version 4.05 Released March 2017

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

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

Project: **The Ridge at Lorson Ranch, #100.064**

Inlet ID: **Inlet DP-69**



Gutter Geometry (Enter data in the blue cells)

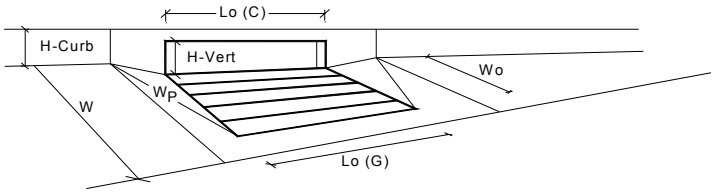
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.015	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
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} =	0.017	

		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} =	5.6	7.9	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

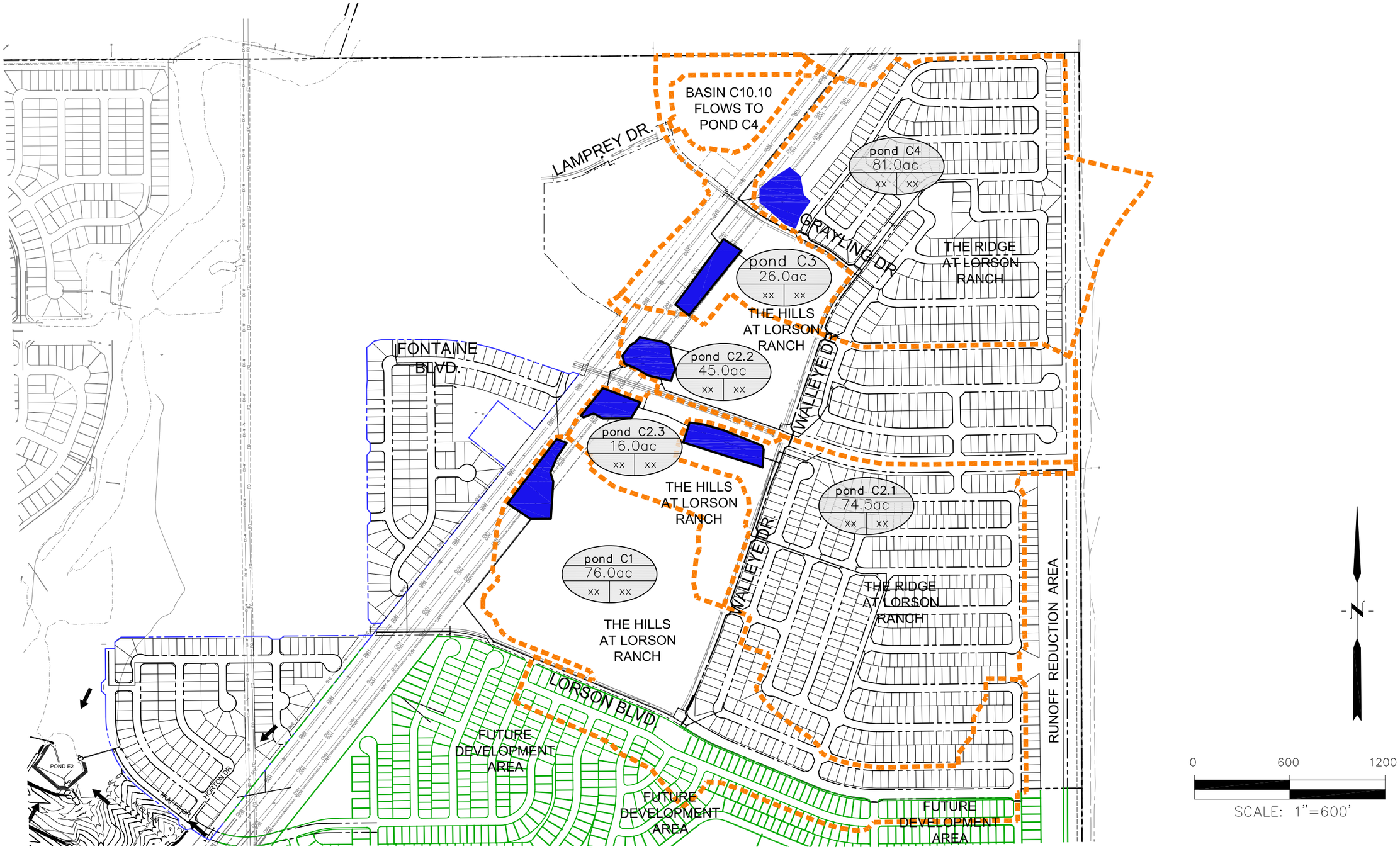
INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)	CDOT Type R Curb Opening		MINOR	MAJOR	
Type of Inlet		Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)		a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)		No =	1	1	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	5.5	7.8	inches
Grate Information			MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate		L_o (G) =	N/A	N/A	feet
Width of a Unit Grate		W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)		A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)		C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)		C_o (G) =	N/A	N/A	
Curb Opening Information			MINOR	MAJOR	
Length of a Unit Curb Opening		L_o (C) =	25.00	25.00	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} =	0.29	0.48	ft
Combination Inlet Performance Reduction Factor for Long Inlets		$RF_{Combination}$ =	0.52	0.74	
Curb Opening Performance Reduction Factor for Long Inlets		RF_{Curb} =	0.75	0.88	
Grated Inlet Performance Reduction Factor for Long Inlets		RF_{Grate} =	N/A	N/A	
			MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)		**Q_a =**	**12.0**	**29.8**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)		$Q_{PEAK\ REQUIRED}$ =	9.3	26.9	cfs

APPENDIX D – POND AND ROUTING CALCULATIONS



CORE
ENGINEERING GROUP
15004 1ST AVENUE S.
BURNSVILLE, MN 55306
PH: 719.570.1100
CONTACT: RICHARD L. SCHINDLER, P.E.
EMAIL: Rich@ceg1.com

THE RIDGE AT LORSON RANCH
WATER QUALITY & POND TRIBUTARY AREAS

SCALE:	DATE:	FIGURE NO.
NTS	MARCH, 2021	1

Design Procedure Form: Runoff Reduction

UD-BMP (Version 3.07, March 2018)

Designer:	**Richard Schindler**
Company:	**Core Engineering Group**
Date:	**March 18, 2021**
Project:	**The Ridge at Lorson Ranch**
Location:	**Basin F1**

SITE INFORMATION (User Input in Blue Cells)

WQCV Rainfall Depth	0.60	inches
Depth of Average Runoff Producing Storm, d_6 =	0.43	inches (for Watersheds Outside of the Denver Region, Figure 3-1 in USDCM Vol. 3)

Area Type	UIA:RPA											
Area ID	res. Lot											
Downstream Design Point ID	1											
Downstream BMP Type	None											
DCIA (ft^2)	--											
UIA (ft^2)	4,500											
RPA (ft^2)	7,250											
SPA (ft^2)	--											
HSG A (%)	0%											
HSG B (%)	100%											
HSG C/D (%)	0%											
Average Slope of RPA (ft/ft)	0.060											
UIA:RPA Interface Width (ft)	145.00											

CALCULATED RUNOFF RESULTS

Area ID	res. Lot											
UIA:RPA Area (ft^2)	11,750											
L / W Ratio	0.56											
UIA / Area	0.3830											
Runoff (in)	0.00											
Runoff (ft^3)	0											
Runoff Reduction (ft^3)	188											

CALCULATED WQCV RESULTS

Area ID	res. Lot											
WQCV (ft^3)	188											
WQCV Reduction (ft^3)	188											
WQCV Reduction (%)	100%											
Untreated WQCV (ft^3)	0											

CALCULATED DESIGN POINT RESULTS (sums results from all columns with the same Downstream Design Point ID)

Downstream Design Point ID	1											
DCIA (ft^2)	0											
UIA (ft^2)	4,500											
RPA (ft^2)	7,250											
SPA (ft^2)	0											
Total Area (ft^2)	11,750											
Total Impervious Area (ft^2)	4,500											
WQCV (ft^3)	188											
WQCV Reduction (ft^3)	188											
WQCV Reduction (%)	100%											
Untreated WQCV (ft^3)	0											

CALCULATED SITE RESULTS (sums results from all columns in worksheet)

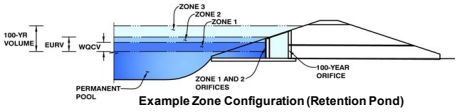
Total Area (ft^2)	11,750
Total Impervious Area (ft^2)	4,500
WQCV (ft^3)	188
WQCV Reduction (ft^3)	188
WQCV Reduction (%)	100%
Untreated WQCV (ft^3)	0

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.02 (February 2020)

Project: **The Hills at Lorson Ranch**

Basin ID: **Pond C1**



Example Zone Configuration (Retention Pond)

pond bottom=5743.40

Depth Increment = 0.20 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	--	--	--	40	0.001		
5743.73	--	0.33	--	--	--	52	0.001	15	0.000
5744	--	0.60	--	--	--	300	0.007	63	0.001
5745	--	1.60	--	--	--	4,017	0.092	2,221	0.051
5746	--	2.60	--	--	--	26,320	0.604	17,389	0.399
5747	--	3.60	--	--	--	56,078	1.287	58,588	1.345
5748	--	4.60	--	--	--	62,238	1.429	117,746	2.703
5749	--	5.60	--	--	--	66,563	1.528	182,147	4.182
5750	--	6.60	--	--	--	70,969	1.629	250,913	5.760
5751	--	7.60	--	--	--	75,495	1.733	324,145	7.441
5752	--	8.60	--	--	--	80,136	1.840	401,960	9.228
5753	--	9.60	--	--	--	85,057	1.953	484,557	11.124
5754	--	10.60	--	--	--	90,000	2.066	572,085	13.133
5755	--	11.60	--	--	--	95,000	2.181	664,585	15.257
5756	--	12.60	--	--	--	100,000	2.296	762,085	17.495

Watershed Information

Selected BMP Type =	**EDB**	
Watershed Area =	76.00	acres
Watershed Length =	4,800	ft
Watershed Length to Centroid =	2,100	ft
Watershed Slope =	0.040	ft/ft
Watershed Imperviousness =	55.00%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	100.0%	percent
Percentage Hydrologic Soil Groups C/D =	0.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

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

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	1.396	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	4.503	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	4.251	acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	5.966	acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	7.456	acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	9.398	acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	11.003	acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	13.015	acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 3.14 in.) =	17.139	acre-feet		inches
Approximate 2-yr Detention Volume =	3.431	acre-feet		
Approximate 5-yr Detention Volume =	4.666	acre-feet		
Approximate 10-yr Detention Volume =	6.090	acre-feet		
Approximate 25-yr Detention Volume =	6.620	acre-feet		
Approximate 50-yr Detention Volume =	6.911	acre-feet		
Approximate 100-yr Detention Volume =	7.625	acre-feet		

Define Zones and Basin Geometry

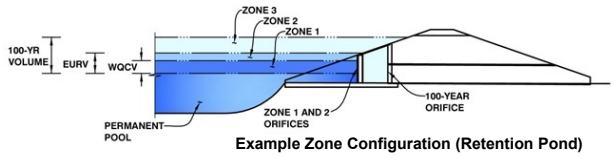
Zone 1 Volume (WQCV) =	1.396	acre-feet
Zone 2 Volume (EURV - Zone 1) =	3.107	acre-feet
Zone 3 (100yr + 1 / 2 WQCV - Zones 1 & 2) =	3.820	acre-feet
Total Detention Basin Volume =	8.323	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention 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

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.02 (February 2020)

Project: **The Hills at Lorson Ranch**

Basin ID: **Pond C1**



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.64	1.396	Orifice Plate
Zone 2 (EURV)	5.81	3.107	Rectangular Orifice
Zone 3 (100+1/2WQCV)	8.11	3.820	Weir&Pipe (Restrict)
Total (all zones)		8.323	

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

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

Calculated Parameters for Underdrain

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

Invert of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	2.597E-02	ft^2
Depth at top of Zone using Orifice Plate =	3.64	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	14.60	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	3.74	sq. inches (use rectangular openings)	Elliptical Slot Area =	N/A	ft^2

Calculated Parameters for Plate

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.21	2.43					
Orifice Area (sq. inches)	3.74	3.74	3.74					

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

User Input: Vertical Orifice (Circular or Rectangular)

	Zone 2 Rectangular	Not Selected			Zone 2 Rectangular	Not Selected
Invert of Vertical Orifice =	3.64	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	0.82	N/A
Depth at top of Zone using Vertical Orifice =	5.81	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	0.25	N/A
Vertical Orifice Height =	6.00	N/A	inches			
Vertical Orifice Width =	19.74		inches			

Calculated Parameters for Vertical Orifi

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

	Zone 3 Weir	Not Selected			Zone 3 Weir	Not Selected
Overflow Weir Front Edge Height, Ho =	6.10	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	6.10	N/A
Overflow Weir Front Edge Length =	5.66	N/A	feet	Overflow Weir Slope Length =	3.00	N/A
Overflow Weir Grate Slope =	0.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	9.41	N/A
Horiz. Length of Weir Sides =	3.00	N/A	feet	Overflow Grate Open Area w/o Debris =	11.89	N/A
Overflow Grate Open Area % =	70%	N/A	%, grate open area/total area	Overflow Grate Open Area w/ Debris =	5.94	N/A
Debris Clogging % =	50%	N/A	%			

Calculated Parameters for Overflow We

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

	Zone 3 Restrictor	Not Selected			Zone 3 Restrictor	Not Selected
Depth to Invert of Outlet Pipe =	0.00	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	1.26	N/A
Outlet Pipe Diameter =	18.00	N/A	inches	Outlet Orifice Centroid =	0.57	N/A
Restrictor Plate Height Above Pipe Invert =	12.10		inches	Half-Central Angle of Restrictor Plate on Pipe =	1.92	N/A

Calculated Parameters for Outlet Pipe w/ Flow Restriction Pla

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	10.00	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	1.44	feet
Spillway Crest Length =	28.00	feet	Stage at Top of Freeboard =	12.60	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	2.30	acres
Freeboard above Max Water Surface =	1.16	feet	Basin Volume at Top of Freeboard =	17.50	acre-ft

Calculated Parameters for Spillway

pond bottom = 0 = 5743.40

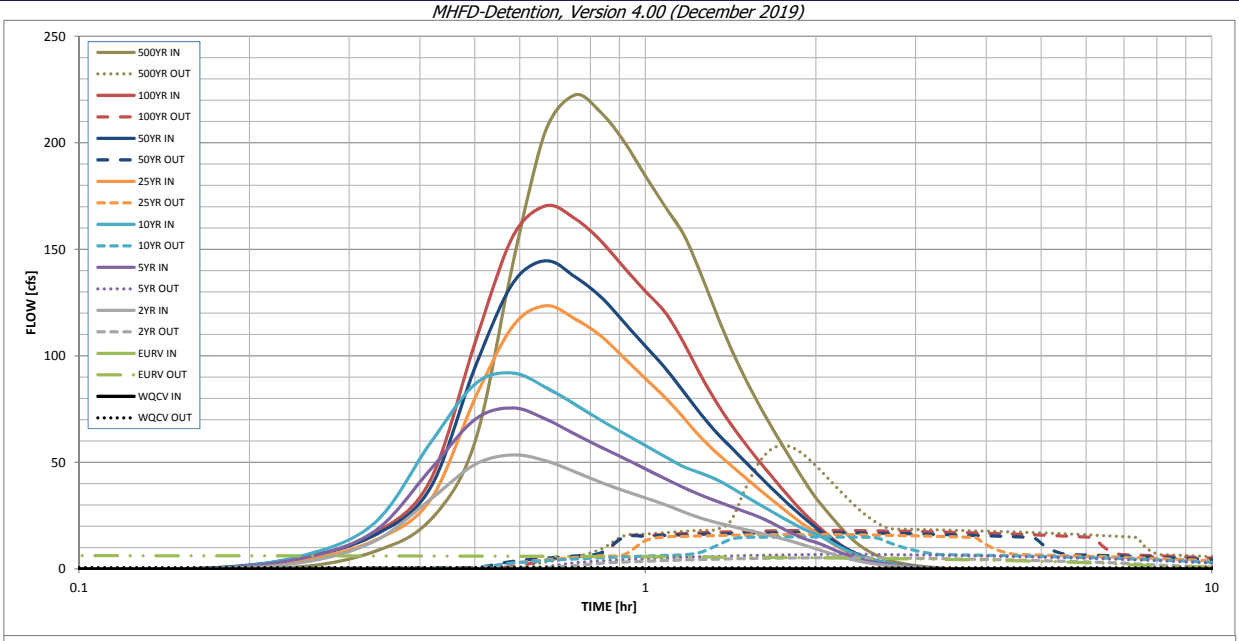
Routed Hydrograph Results

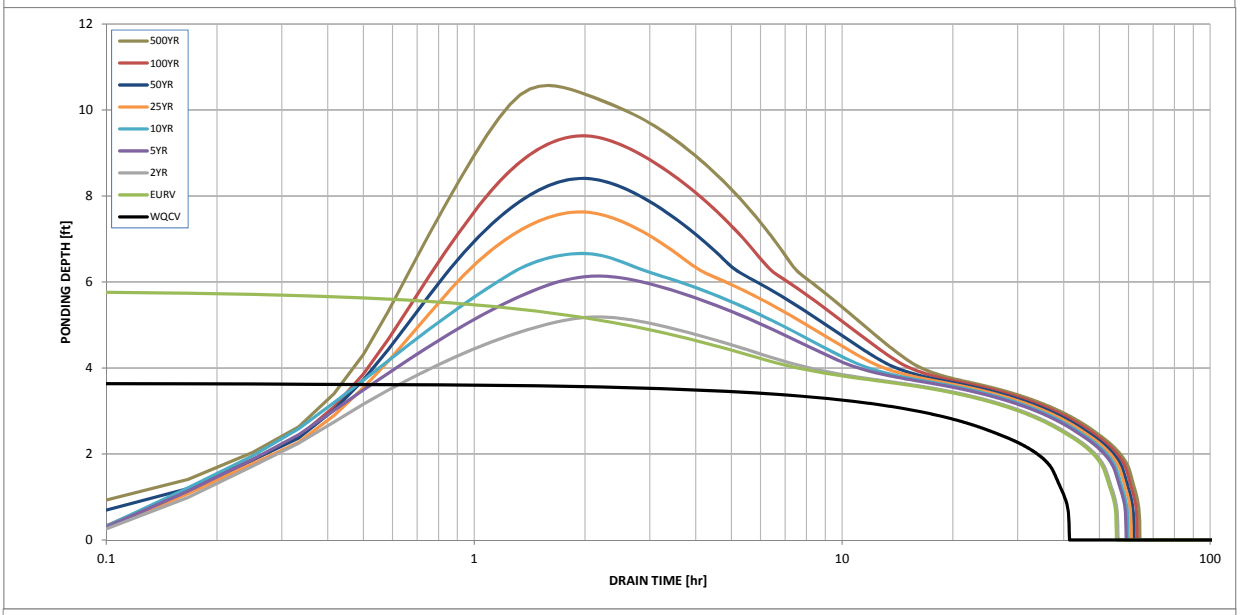
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

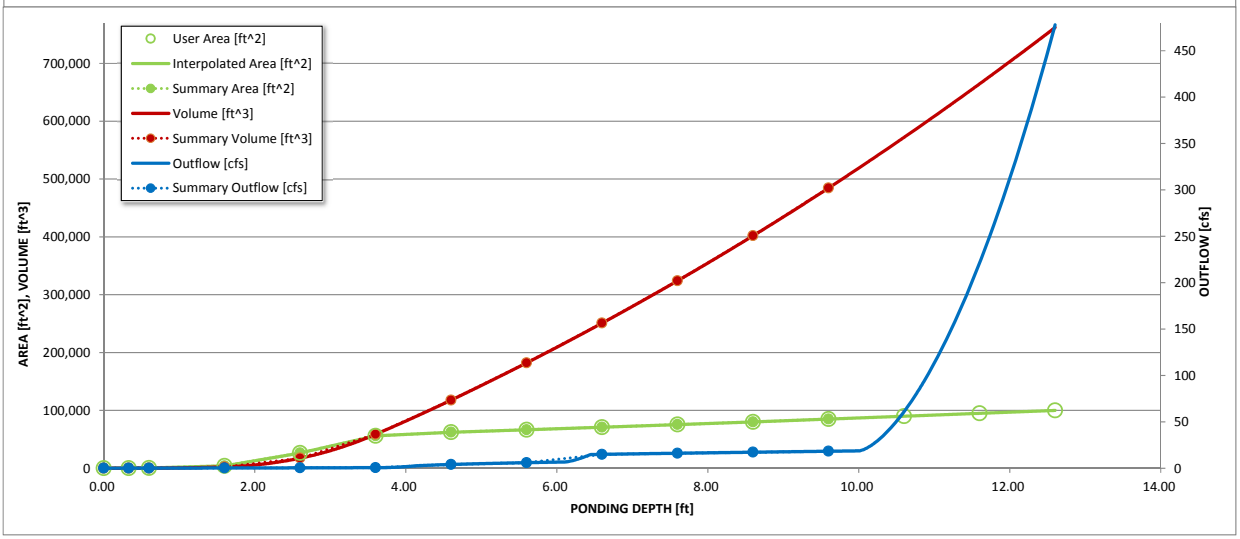
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52
CUHP Runoff Volume (acre-ft) =	1.396	4.503	4.251	5.966	7.456	9.398	11.003	13.015
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	4.251	5.966	7.456	9.398	11.003	13.015
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	5.7	16.2	25.0	45.9	57.7	74.5
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A						
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.08	0.21	0.33	0.60	0.76	0.98
Peak Inflow Q (cfs) =	N/A	N/A	53.5	75.6	91.9	123.5	144.7	170.4
Peak Outflow Q (cfs) =	0.6	6.3	5.3	7.1	15.0	16.2	17.0	18.1
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.4	0.6	0.4	0.3	0.2
Structure Controlling Flow =	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Overflow Weir 1	Outlet Plate 1	Outlet Plate 1	Outlet Plate 1	Outlet Plate 1
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	0.0	0.6	0.6	0.6	0.6
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	48	49	50	49	48	47	46
Time to Drain 99% of Inflow Volume (hours) =	**40**	52	53	55	55	55	55	56
Maximum Ponding Depth (ft) =	3.64	5.81	5.19	6.14	6.66	7.63	8.41	9.40
Area at Maximum Ponding Depth (acres) =	1.29	1.55	1.49	1.58	1.64	1.74	1.82	1.93
Maximum Volume Stored (acre-ft) =	1.397	4.505	3.548	5.006	5.858	7.493	8.862	10.736

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.00 (December 2019)







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

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename: _____

Inflow Hydrographs

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

	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.36	0.04	1.17
	0:15:00	0.00	0.00	3.21	5.25	6.50	4.37	5.65	5.35	8.30
	0:20:00	0.00	0.00	13.15	17.89	21.81	13.53	16.01	16.83	22.90
	0:25:00	0.00	0.00	32.51	46.49	58.89	32.12	37.80	41.36	59.51
	0:30:00	0.00	0.00	49.01	70.15	86.70	79.84	94.50	105.98	143.35
	0:35:00	0.00	0.00	53.50	75.56	91.94	113.93	134.11	156.12	205.77
	0:40:00	0.00	0.00	50.76	70.34	85.18	123.53	144.65	170.44	222.50
	0:45:00	0.00	0.00	45.62	63.33	77.42	117.46	137.22	164.57	214.42
	0:50:00	0.00	0.00	40.68	57.25	69.85	109.47	127.83	154.14	200.67
	0:55:00	0.00	0.00	36.68	51.94	63.56	99.08	115.78	141.50	184.45
	1:00:00	0.00	0.00	33.32	46.99	57.93	89.35	104.59	130.33	170.05
	1:05:00	0.00	0.00	30.16	42.30	52.71	80.48	94.37	120.48	157.26
	1:10:00	0.00	0.00	26.80	38.16	48.05	71.14	83.50	106.47	139.23
	1:15:00	0.00	0.00	23.93	34.81	45.03	62.00	72.87	91.26	120.06
	1:20:00	0.00	0.00	21.79	31.93	42.03	54.66	64.30	78.39	103.47
	1:25:00	0.00	0.00	20.06	29.26	38.18	48.56	57.10	67.84	89.53
	1:30:00	0.00	0.00	18.49	26.81	34.21	42.90	50.35	58.80	77.50
	1:35:00	0.00	0.00	16.99	24.50	30.55	37.64	44.04	50.99	67.10
	1:40:00	0.00	0.00	15.50	21.77	27.14	32.80	38.24	43.80	57.54
	1:45:00	0.00	0.00	14.01	18.85	23.90	28.26	32.83	37.08	48.66
	1:50:00	0.00	0.00	12.61	16.16	20.96	24.03	27.80	30.90	40.50
	1:55:00	0.00	0.00	10.93	13.95	18.31	20.21	23.27	25.43	33.31
	2:00:00	0.00	0.00	9.49	12.47	16.37	17.03	19.54	20.89	27.55
	2:05:00	0.00	0.00	7.95	10.63	13.90	13.96	16.01	16.79	22.24
	2:10:00	0.00	0.00	6.45	8.62	11.29	10.99	12.60	13.04	17.30
	2:15:00	0.00	0.00	5.19	6.89	9.06	8.59	9.84	9.97	13.24
	2:20:00	0.00	0.00	4.19	5.52	7.27	6.74	7.71	7.64	10.15
	2:25:00	0.00	0.00	3.35	4.42	5.78	5.30	6.05	5.81	7.73
	2:30:00	0.00	0.00	2.67	3.51	4.56	4.15	4.71	4.40	5.85
	2:35:00	0.00	0.00	2.11	2.75	3.53	3.21	3.63	3.33	4.41
	2:40:00	0.00	0.00	1.67	2.12	2.71	2.47	2.78	2.57	3.39
	2:45:00	0.00	0.00	1.31	1.63	2.07	1.90	2.13	1.99	2.62
	2:50:00	0.00	0.00	1.02	1.26	1.62	1.49	1.67	1.58	2.08
	2:55:00	0.00	0.00	0.77	0.95	1.24	1.14	1.28	1.22	1.61
	3:00:00	0.00	0.00	0.56	0.69	0.91	0.86	0.96	0.91	1.20
	3:05:00	0.00	0.00	0.38	0.48	0.64	0.61	0.68	0.65	0.85
	3:10:00	0.00	0.00	0.24	0.32	0.41	0.40	0.45	0.43	0.56
	3:15:00	0.00	0.00	0.13	0.19	0.24	0.24	0.27	0.25	0.33
	3:20:00	0.00	0.00	0.06	0.09	0.11	0.12	0.13	0.12	0.16
	3:25:00	0.00	0.00	0.02	0.03	0.03	0.04	0.04	0.04	0.05
	3:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.02 (February 2020)

Summary Stage-Area-Volume-Discharge Relationships

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

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

Stage - Storage Description	Stage [ft]	Area [ft^2]	Area [acres]	Volume [ft^3]	Volume [ac-ft]	Total Outflow [cfs]
micropool	0.00	40	0.001	0	0.000	0.00
surcharge	0.33	52	0.001	15	0.000	0.07
5744	0.60	300	0.007	63	0.001	0.10
5745	1.60	4,017	0.092	2,221	0.051	0.24
5746	2.60	26,320	0.604	17,389	0.399	0.40
5747	3.60	56,078	1.287	58,588	1.345	0.57
5748	4.60	62,238	1.429	117,746	2.703	4.02
5749	5.60	66,563	1.528	182,147	4.182	5.96
5750	6.60	70,969	1.629	250,913	5.760	14.94
5751	7.60	75,495	1.733	324,145	7.441	16.13
5752	8.60	80,136	1.840	401,960	9.228	17.24
5753	9.60	85,057	1.953	484,557	11.124	18.28

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).

Design Procedure Form: Extended Detention Basin (EDB)

UD-BMP (Version 3.07, March 2018)

Designer:	**Richard Schindler**
Company:	**Core Engineering Group**
Date:	**April 30, 2020**
Project:	**The Hills at Lorson Ranch**
Location:	**Pond C1**

1. Basin Storage Volume

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

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

C) Contributing Watershed Area — Area = 76.000 ac

D) For Watersheds Outside of the Denver Region, Depth of Average Runoff Producing Storm — d_6 = 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}= 1.396 ac-ft

G) For Watersheds Outside of the Denver Region, Water Quality Capture Volume (WQCV) Design Volume ($V_{WQCV\ OTHER} = (d_6*(V_{DESIGN}/0.43))$) — $V_{DESIGN\ OTHER}$= 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 = %
- ii) Percentage of Watershed consisting of Type B Soils — HSG_B = %
- iii) Percentage of Watershed consisting of Type C/D Soils — $HSG_{C/D}$ = %

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

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 = 3.00 ft / ft

DIFFICULT TO MAINTAIN, INCREASE WHERE POSSIBLE

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} = 0.042 ac-ft

B) Actual Forebay Volume — V_F = 0.045 ac-ft

C) Forebay Depth (D_F = 30 inch maximum) — D_F = 24.0 in

D) Forebay Discharge

i) Undetained 100-year Peak Discharge — Q_{100} = 170.00 cfs

ii) Forebay Discharge Design Flow ($Q_F = 0.02 * Q_{100}$) — Q_F = 3.40 cfs

E) Forebay Discharge Design

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

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

G) Rectangular Notch Width — Calculated W_N = 9.1 in

Design Procedure Form: Extended Detention Basin (EDB)

Designer:	**Richard Schindler**
Company:	**Core Engineering Group**
Date:	**April 30, 2020**
Project:	**The Hills at Lorson Ranch**
Location:	**Pond C1**

6. Trickle Channel	
A) Type of Trickle Channel	Choose One: (●) Concrete ( ) Soft Bottom
F) Slope of Trickle Channel	S = 0.0050 ft / ft
7. Micropool and Outlet Structure	
A) Depth of Micropool (2.5-feet minimum)	D_M = 2.5 ft
B) Surface Area of Micropool (10 ft^2 minimum)	A_M = 50 sq ft
C) Outlet Type	Choose One: (●) Orifice Plate ( ) Other (Describe):
D) Smallest Dimension of Orifice Opening Based on Hydrograph Routing (Use UD-Detention)	$D_{orifice}$ = 1.93 inches
E) Total Outlet Area	A_{ot} = 6.45 square inches
8. Initial Surcharge Volume	
A) Depth of Initial Surcharge Volume (Minimum recommended depth is 4 inches)	D_{IS} = 4 in
B) Minimum Initial Surcharge Volume (Minimum volume of 0.3% of the WQCV)	V_{IS} = 182 cu ft
C) Initial Surcharge Provided Above Micropool	V_s= 16.7 cu ft
9. Trash Rack	
A) Water Quality Screen Open Area: $A_t = A_{ot} * 38.5*(e^{-0.095D})$	A_t = 207 square inches
B) Type of Screen (If specifying an alternative to the materials recommended in the USDCM, indicate "other" and enter the ratio of the total open are to the total screen are for the material specified.)	*Other (Please describe below)* wellscreen stainless
Other (Y/N): y	
C) Ratio of Total Open Area to Total Area (only for type 'Other')	User Ratio = 0.6
D) Total Water Quality Screen Area (based on screen type)	A_{total} = 345 sq. in. **Based on type 'Other' screen ratio**
E) Depth of Design Volume (EURV or WQCV) (Based on design concept chosen under 1E)	H= 3.64 feet
F) Height of Water Quality Screen (H_{TR})	H_{TR}= 71.68 inches
G) Width of Water Quality Screen Opening ($W_{opening}$) (Minimum of 12 inches is recommended)	$W_{opening}$ = 12.0 inches **VALUE LESS THAN RECOMMENDED MIN. WIDTH. WIDTH HAS BEEN SET TO 12 INCHES.**

Weir Report

Hydraflow Express by Intelisolve | Friday, May 1 2020, 8:58 AM

Pond C1 forebay overflow

Rectangular Weir

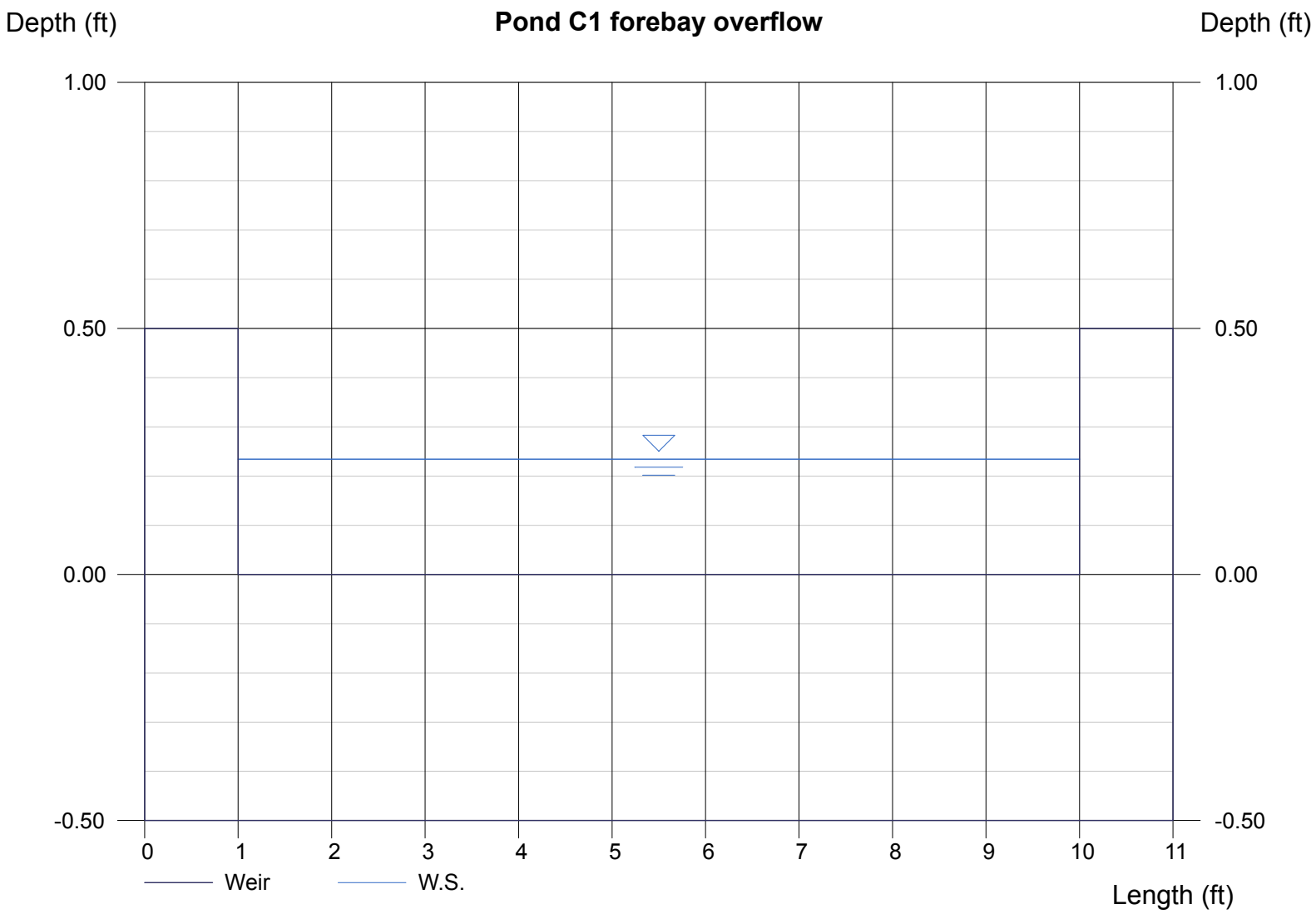
Crest	=	Sharp
Bottom Length (ft)	=	9.00
Total Depth (ft)	=	0.50

Calculations

Weir Coeff. Cw	=	3.33
Compute by:		Known Q
Known Q (cfs)	=	3.40

Highlighted

Depth (ft)	=	0.23
Q (cfs)	=	3.400
Area (sqft)	=	2.11
Velocity (ft/s)	=	1.61
Top Width (ft)	=	9.00



Channel Report

Hydraflow Express by Intelisolve

Friday, May 1 2020, 6:2 AM

pond C1 low flow channel (2 x forebay release = 6.8cfs)

Rectangular

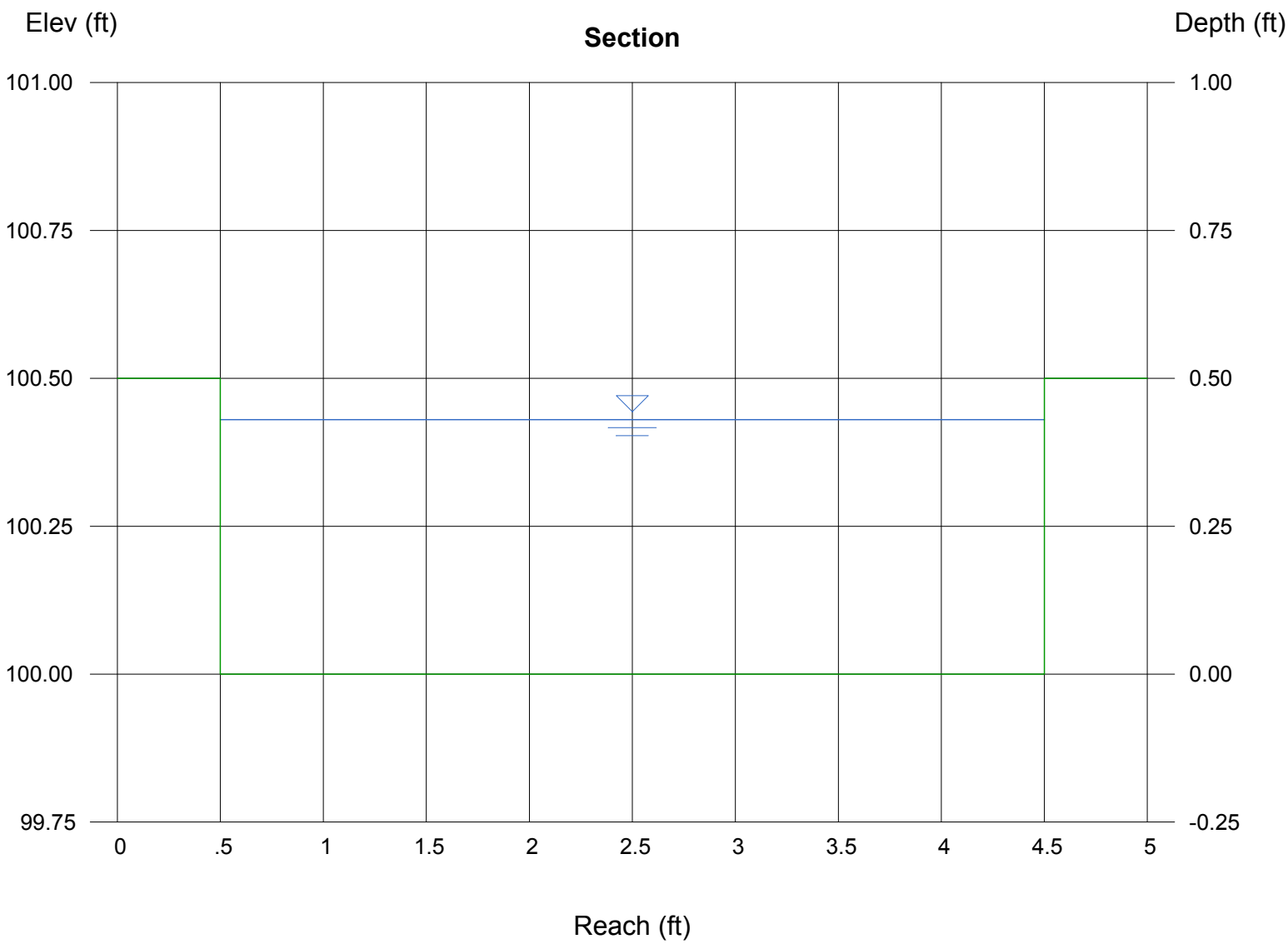
Botom Width (ft)	=	4.00
Total Depth (ft)	=	0.50
Invert Elev (ft)	=	100.00
Slope (%)	=	0.50
N-Value	=	0.013

Calculations

Compute by:		Known Q
Known Q (cfs)	=	6.80

Highlighted

Depth (ft)	=	0.43
Q (cfs)	=	6.800
Area (sqft)	=	1.72
Velocity (ft/s)	=	3.95
Wetted Perim (ft)	=	4.86
Crit Depth, Yc (ft)	=	0.45
Top Width (ft)	=	4.00
EGL (ft)	=	0.67

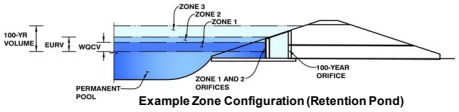


DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.02 (February 2020)

Project: **The Hills at Lorson Ranch**

Basin ID: **Pond C2.1**



Example Zone Configuration (Retention Pond)

top micropool-5760.00

Watershed Information

Selected BMP Type =	**EDB**	
Watershed Area =	74.50	acres
Watershed Length =	2,500	ft
Watershed Length to Centroid =	2,000	ft
Watershed Slope =	0.038	ft/ft
Watershed Imperviousness =	55.00%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	100.0%	percent
Percentage Hydrologic Soil Groups C/D =	0.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

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

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	1.368	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	4.414	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	4.152	acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	5.828	acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	7.285	acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	9.182	acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	10.750	acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	12.716	acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 3.14 in.) =	16.746	acre-feet		inches
Approximate 2-yr Detention Volume =	3.363	acre-feet		
Approximate 5-yr Detention Volume =	4.574	acre-feet		
Approximate 10-yr Detention Volume =	5.970	acre-feet		
Approximate 25-yr Detention Volume =	6.490	acre-feet		
Approximate 50-yr Detention Volume =	6.774	acre-feet		
Approximate 100-yr Detention Volume =	7.475	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	1.368	acre-feet
Zone 2 Volume (EURV - Zone 1) =	3.045	acre-feet
Zone 3 (100yr + 1 / 2 WQCV - Zones 1 & 2) =	3.745	acre-feet
Total Detention Basin Volume =	8.159	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	

Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	**user**	acre-feet

Depth Increment = 0.20 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	--	--	--	42	0.001		
5760.33	--	0.33	--	--	--	50	0.001	15	0.000
5761	--	1.00	--	--	--	1,264	0.029	455	0.010
5762	--	2.00	--	--	--	20,478	0.470	11,326	0.260
5763	--	3.00	--	--	--	41,417	0.951	42,274	0.970
5764	--	4.00	--	--	--	44,796	1.028	85,380	1.960
5765	--	5.00	--	--	--	48,239	1.107	131,898	3.028
5766	--	6.00	--	--	--	51,758	1.188	181,896	4.176
5767	--	7.00	--	--	--	55,348	1.271	235,449	5.405
5768	--	8.00	--	--	--	59,010	1.355	292,628	6.718
5769	--	9.00	--	--	--	62,743	1.440	353,505	8.115
5770	--	10.00	--	--	--	66,548	1.528	418,150	9.599
5771	--	11.00	--	--	--	70,423	1.617	486,636	11.172
5772	--	12.00	--	--	--	74,434	1.709	559,064	12.834
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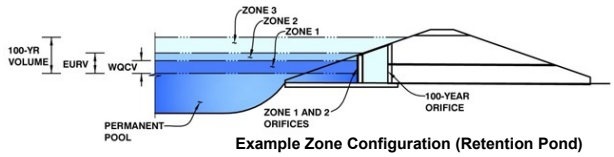
DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.02 (February 2020)

Project: **The Hills at Lorson Ranch**

Basin ID: **Pond C2.1**



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.42	1.368	Orifice Plate
Zone 2 (EURV)	6.20	3.045	Rectangular Orifice
Zone 3 (100+1/2WQCV)	9.04	3.745	Weir&Pipe (Restrict)
Total (all zones)		8.159	

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

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

Calculated Parameters for Underdrain

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

Invert of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	2.819E-02	ft^2
Depth at top of Zone using Orifice Plate =	3.42	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	13.70	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	4.06	sq. inches (use rectangular openings)	Elliptical Slot Area =	N/A	ft^2

Calculated Parameters for Plate

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.14	2.28					
Orifice Area (sq. inches)	4.06	4.06	4.06					

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

User Input: Vertical Orifice (Circular or Rectangular)

	Zone 2 Rectangular	Not Selected			Zone 2 Rectangular	Not Selected
Invert of Vertical Orifice =	3.42	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	0.61	N/A
Depth at top of Zone using Vertical Orifice =	6.20	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	0.25	N/A
Vertical Orifice Height =	6.00	N/A	inches			
Vertical Orifice Width =	14.59		inches			

Calculated Parameters for Vertical Orifi

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

	Zone 3 Weir	Not Selected			Zone 3 Weir	Not Selected
Overflow Weir Front Edge Height, Ho =	6.20	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	6.20	N/A
Overflow Weir Front Edge Length =	8.00	N/A	feet	Overflow Weir Slope Length =	6.00	N/A
Overflow Weir Grate Slope =	0.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	6.84	N/A
Horiz. Length of Weir Sides =	6.00	N/A	feet	Overflow Grate Open Area w/o Debris =	33.60	N/A
Overflow Grate Open Area % =	70%	N/A	%, grate open area/total area	Overflow Grate Open Area w/ Debris =	16.80	N/A
Debris Clogging % =	50%	N/A	%			

Calculated Parameters for Overflow We

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

	Zone 3 Restrictor	Not Selected			Zone 3 Restrictor	Not Selected
Depth to Invert of Outlet Pipe =	0.00	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	4.91	N/A
Outlet Pipe Diameter =	30.00	N/A	inches	Outlet Orifice Centroid =	1.25	N/A
Restrictor Plate Height Above Pipe Invert =	30.00		inches	Half-Central Angle of Restrictor Plate on Pipe =	3.14	N/A

Calculated Parameters for Outlet Pipe w/ Flow Restriction Pla

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	9.30	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	1.69	feet
Spillway Crest Length =	25.00	feet	Stage at Top of Freeboard =	12.00	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	1.71	acres
Freeboard above Max Water Surface =	1.01	feet	Basin Volume at Top of Freeboard =	12.83	acre-ft

top micropool = 5761= stage 0

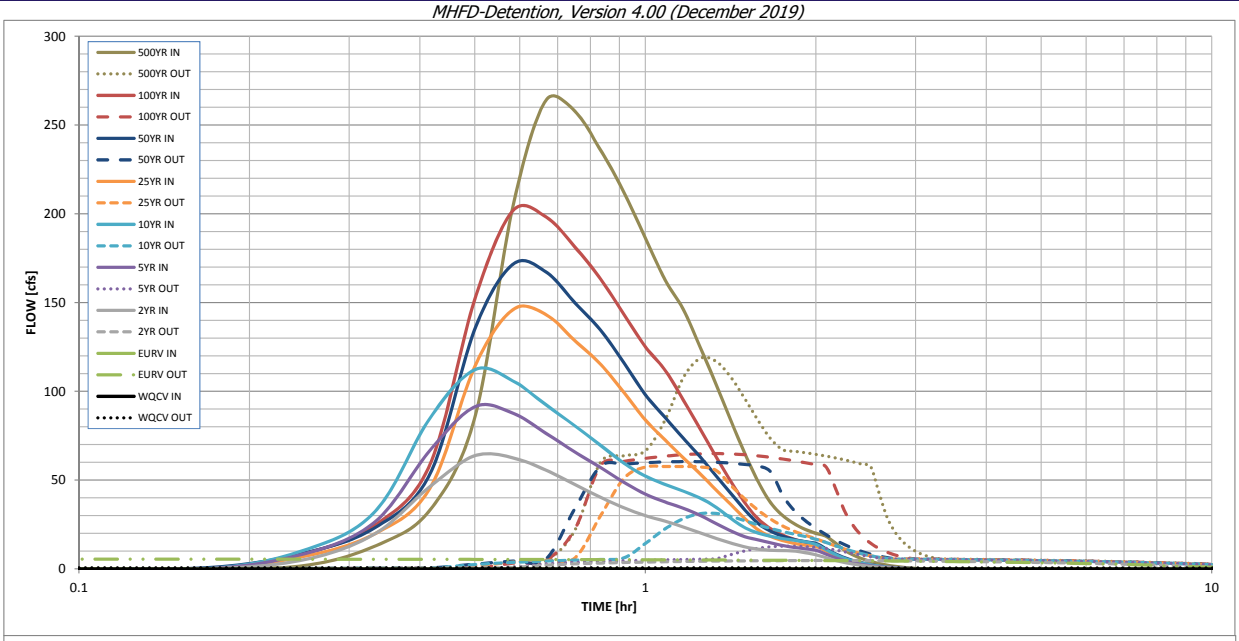
Routed Hydrograph Results

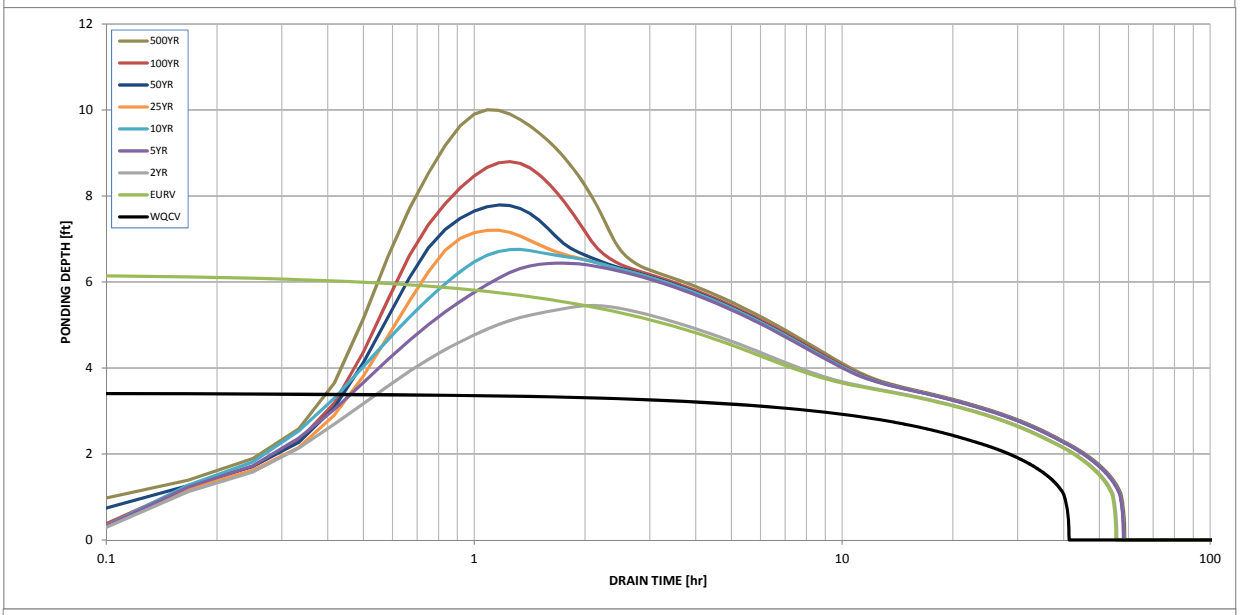
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

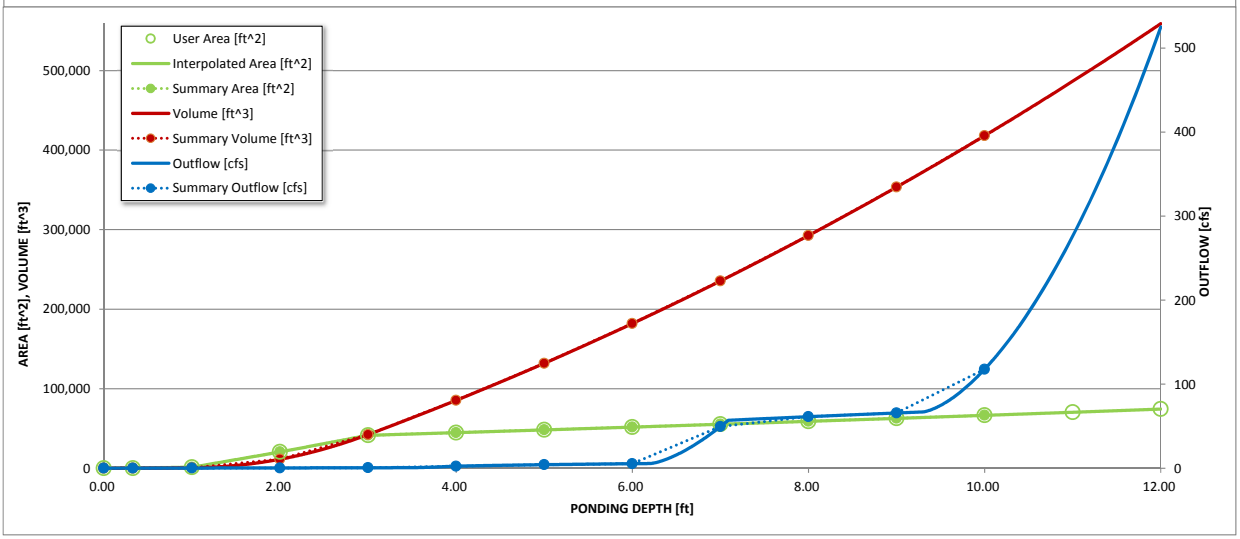
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52
CUHP Runoff Volume (acre-ft) =	1.368	4.414	4.152	5.828	7.285	9.182	10.750	12.716
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	4.152	5.828	7.285	9.182	10.750	12.716
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	7.5	21.2	32.2	57.6	72.4	92.1
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A						
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.10	0.28	0.43	0.77	0.97	1.24
Peak Inflow Q (cfs) =	N/A	N/A	63.8	91.4	112.2	146.0	171.6	201.7
Peak Outflow Q (cfs) =	0.6	5.6	4.8	12.8	31.2	57.7	60.5	65.0
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.6	1.0	1.0	0.8	0.7
Structure Controlling Flow =	Vertical Orifice 1	Overflow Weir 1	Vertical Orifice 1	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Outlet Plate 1	Outlet Plate 1
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	0.2	0.8	1.5	1.6	1.7
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	48	48	49	47	45	43	41
Time to Drain 99% of Inflow Volume (hours) =	**40**	52	53	54	53	52	52	51
Maximum Ponding Depth (ft) =	3.42	6.20	5.45	6.44	6.76	7.20	7.79	8.80
Area at Maximum Ponding Depth (acres) =	0.98	1.20	1.14	1.22	1.25	1.29	1.34	1.42
Maximum Volume Stored (acre-ft) =	1.377	4.415	3.534	4.694	5.090	5.661	6.435	7.829

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.00 (December 2019)







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

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename: .\xxxxxxx.xlsx

Inflow Hydrographs

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

	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.59	0.06	1.91
	0:15:00	0.00	0.00	5.22	8.54	10.59	7.11	9.03	8.69	12.94
	0:20:00	0.00	0.00	19.89	26.61	32.39	19.92	23.33	24.81	33.21
	0:25:00	0.00	0.00	46.47	66.84	85.05	45.56	53.57	58.95	85.49
	0:30:00	0.00	0.00	63.77	91.36	112.23	114.18	135.21	152.14	203.98
	0:35:00	0.00	0.00	62.57	87.72	105.94	146.00	171.56	201.73	263.77
	0:40:00	0.00	0.00	55.70	76.50	92.49	143.34	167.40	198.39	257.96
	0:45:00	0.00	0.00	47.59	65.90	80.77	128.66	150.06	181.55	235.82
	0:50:00	0.00	0.00	40.32	57.13	69.55	115.30	134.50	163.30	212.14
	0:55:00	0.00	0.00	34.42	48.76	59.53	99.33	116.01	143.36	186.25
	1:00:00	0.00	0.00	29.96	42.11	52.29	83.84	98.09	125.09	162.81
	1:05:00	0.00	0.00	26.93	37.69	47.58	72.69	85.28	111.97	146.17
	1:10:00	0.00	0.00	23.58	34.19	43.72	62.57	73.59	95.11	124.77
	1:15:00	0.00	0.00	20.26	30.12	39.98	53.50	63.03	78.69	103.88
	1:20:00	0.00	0.00	17.23	25.50	34.67	44.42	52.30	63.05	83.27
	1:25:00	0.00	0.00	14.49	21.34	28.37	36.12	42.44	49.07	64.63
	1:30:00	0.00	0.00	12.33	18.09	23.14	28.26	33.06	37.14	48.88
	1:35:00	0.00	0.00	11.11	16.33	20.17	21.86	25.47	27.88	36.96
	1:40:00	0.00	0.00	10.58	14.63	18.35	18.19	21.12	22.45	29.88
	1:45:00	0.00	0.00	10.28	13.15	17.06	15.89	18.35	19.04	25.36
	1:50:00	0.00	0.00	10.11	12.11	16.15	14.38	16.52	16.67	22.22
	1:55:00	0.00	0.00	9.09	11.32	15.20	13.33	15.24	15.02	20.01
	2:00:00	0.00	0.00	8.00	10.49	13.83	12.66	14.40	13.84	18.42
	2:05:00	0.00	0.00	6.32	8.33	10.89	10.10	11.46	10.78	14.34
	2:10:00	0.00	0.00	4.73	6.18	8.03	7.42	8.39	7.80	10.35
	2:15:00	0.00	0.00	3.55	4.59	5.92	5.50	6.20	5.78	7.65
	2:20:00	0.00	0.00	2.63	3.40	4.33	4.06	4.57	4.29	5.66
	2:25:00	0.00	0.00	1.93	2.46	3.15	2.96	3.32	3.16	4.16
	2:30:00	0.00	0.00	1.39	1.74	2.27	2.12	2.37	2.27	2.99
	2:35:00	0.00	0.00	0.98	1.22	1.62	1.53	1.71	1.64	2.15
	2:40:00	0.00	0.00	0.66	0.84	1.12	1.08	1.21	1.15	1.52
	2:45:00	0.00	0.00	0.41	0.55	0.72	0.71	0.79	0.76	0.99
	2:50:00	0.00	0.00	0.22	0.32	0.40	0.42	0.46	0.44	0.58
	2:55:00	0.00	0.00	0.09	0.15	0.18	0.20	0.22	0.21	0.27
	3:00:00	0.00	0.00	0.03	0.05	0.05	0.06	0.07	0.06	0.08
	3:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.02 (February 2020)

Summary Stage-Area-Volume-Discharge Relationships

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

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

Stage - Storage Description	Stage [ft]	Area [ft^2]	Area [acres]	Volume [ft^3]	Volume [ac-ft]	Total Outflow [cfs]
top micropool	0.00	42	0.001	0	0.000	0.00
surcharge	0.33	50	0.001	15	0.000	0.08
5761	1.00	1,264	0.029	455	0.010	0.14
5762	2.00	20,478	0.470	11,326	0.260	0.32
5763	3.00	41,417	0.951	42,274	0.970	0.54
5764	4.00	44,796	1.028	85,380	1.960	2.36
5765	5.00	48,239	1.107	131,898	3.028	4.17
5766	6.00	51,758	1.188	181,896	4.176	5.36
5767	7.00	55,348	1.271	235,449	5.405	49.52
5768	8.00	59,010	1.355	292,628	6.718	61.41
5769	9.00	62,743	1.440	353,505	8.115	65.80
5770	10.00	66,548	1.528	418,150	9.599	117.77

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).

Design Procedure Form: Extended Detention Basin (EDB)

UD-BMP (Version 3.07, March 2018)

Designer:	**Richard Schindler**
Company:	**Core Engineering Group**
Date:	**May 2, 2020**
Project:	**The Hills at Lorson Ranch**
Location:	**Pond C2.1**

1. Basin Storage Volume

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

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

C) Contributing Watershed Area — Area = 74.500 ac

D) For Watersheds Outside of the Denver Region, Depth of Average Runoff Producing Storm — d_6 = 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}= 1.368 ac-ft

G) For Watersheds Outside of the Denver Region, Water Quality Capture Volume (WQCV) Design Volume
($V_{WQCV\ OTHER} = (d_6*(V_{DESIGN}/0.43))$) — $V_{DESIGN\ OTHER}$= 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 = %
- ii) Percentage of Watershed consisting of Type B Soils — HSG_B = %
- iii) Percentage of Watershed consisting of Type C/D Soils — $HSG_{C/D}$ = %

J) Excess Urban Runoff Volume (EURV) Design Volume
For HSG A: $EURV_A = 1.68 * i^{1.28}$
For HSG B: $EURV_B = 1.36 * i^{1.08}$
For HSG C/D: $EURV_{C/D} = 1.20 * i^{1.08}$ — $EURV_{DESIGN}$ = 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 = 3.00 ft / ft
DIFFICULT TO MAINTAIN, INCREASE WHERE POSSIBLE

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} = 0.041 ac-ft

B) Actual Forebay Volume — V_F = 0.045 ac-ft

C) Forebay Depth
(D_F = 30 inch maximum) — D_F = 24.0 in

D) Forebay Discharge

i) Undetained 100-year Peak Discharge — Q_{100} = 202.00 cfs

ii) Forebay Discharge Design Flow
($Q_F = 0.02 * Q_{100}$) — Q_F = 4.04 cfs

E) Forebay Discharge Design

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

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

G) Rectangular Notch Width — Calculated W_N = 9.9 in

Design Procedure Form: Extended Detention Basin (EDB)

Designer: Richard Schindler
Company: Core Engineering Group
Date: May 2, 2020
Project: The Hills at Lorson Ranch
Location: Pond C2.1

6. Trickle Channel	
A) Type of Trickle Channel	Choose One: (●) Concrete ( ) Soft Bottom
F) Slope of Trickle Channel	S = 0.0050 ft / ft
7. Micropool and Outlet Structure	
A) Depth of Micropool (2.5-feet minimum)	D_M = 2.5 ft
B) Surface Area of Micropool (10 ft^2 minimum)	A_M = 50 sq ft
C) Outlet Type	Choose One: (●) Orifice Plate ( ) Other (Describe):
D) Smallest Dimension of Orifice Opening Based on Hydrograph Routing (Use UD-Detention)	$D_{orifice}$ = 2.01 inches
E) Total Outlet Area	A_{ot} = 12.60 square inches
8. Initial Surcharge Volume	
A) Depth of Initial Surcharge Volume (Minimum recommended depth is 4 inches)	D_{IS} = 4 in
B) Minimum Initial Surcharge Volume (Minimum volume of 0.3% of the WQCV)	V_{IS} = 179 cu ft
C) Initial Surcharge Provided Above Micropool	V_s= 16.7 cu ft
9. Trash Rack	
A) Water Quality Screen Open Area: $A_t = A_{ot} * 38.5*(e^{-0.095D})$	A_t = 401 square inches
B) Type of Screen (If specifying an alternative to the materials recommended in the USDCM, indicate "other" and enter the ratio of the total open are to the total screen are for the material specified.)	*Other (Please describe below)* wellscreen stainless
Other (Y/N): y	
C) Ratio of Total Open Area to Total Area (only for type 'Other')	User Ratio = 0.6
D) Total Water Quality Screen Area (based on screen type)	A_{total} = 668 sq. in. **Based on type 'Other' screen ratio**
E) Depth of Design Volume (EURV or WQCV) (Based on design concept chosen under 1E)	H= 3.42 feet
F) Height of Water Quality Screen (H_{TR})	H_{TR}= 69.04 inches
G) Width of Water Quality Screen Opening ($W_{opening}$) (Minimum of 12 inches is recommended)	$W_{opening}$ = 12.0 inches **VALUE LESS THAN RECOMMENDED MIN. WIDTH. WIDTH HAS BEEN SET TO 12 INCHES.**

Design Procedure Form: Extended Detention Basin (EDB)

Designer:	**Richard Schindler**
Company:	**Core Engineering Group**
Date:	**May 2, 2020**
Project:	**The Hills at Lorson Ranch**
Location:	**Pond C2.1**

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

Notes:

Channel Report

Hydraflow Express by Intelisolve | Saturday, May 2 2020, 7:49 AM

pond C2.1 low flow channel (2 x forebay release = 8.08cfs)

Rectangular

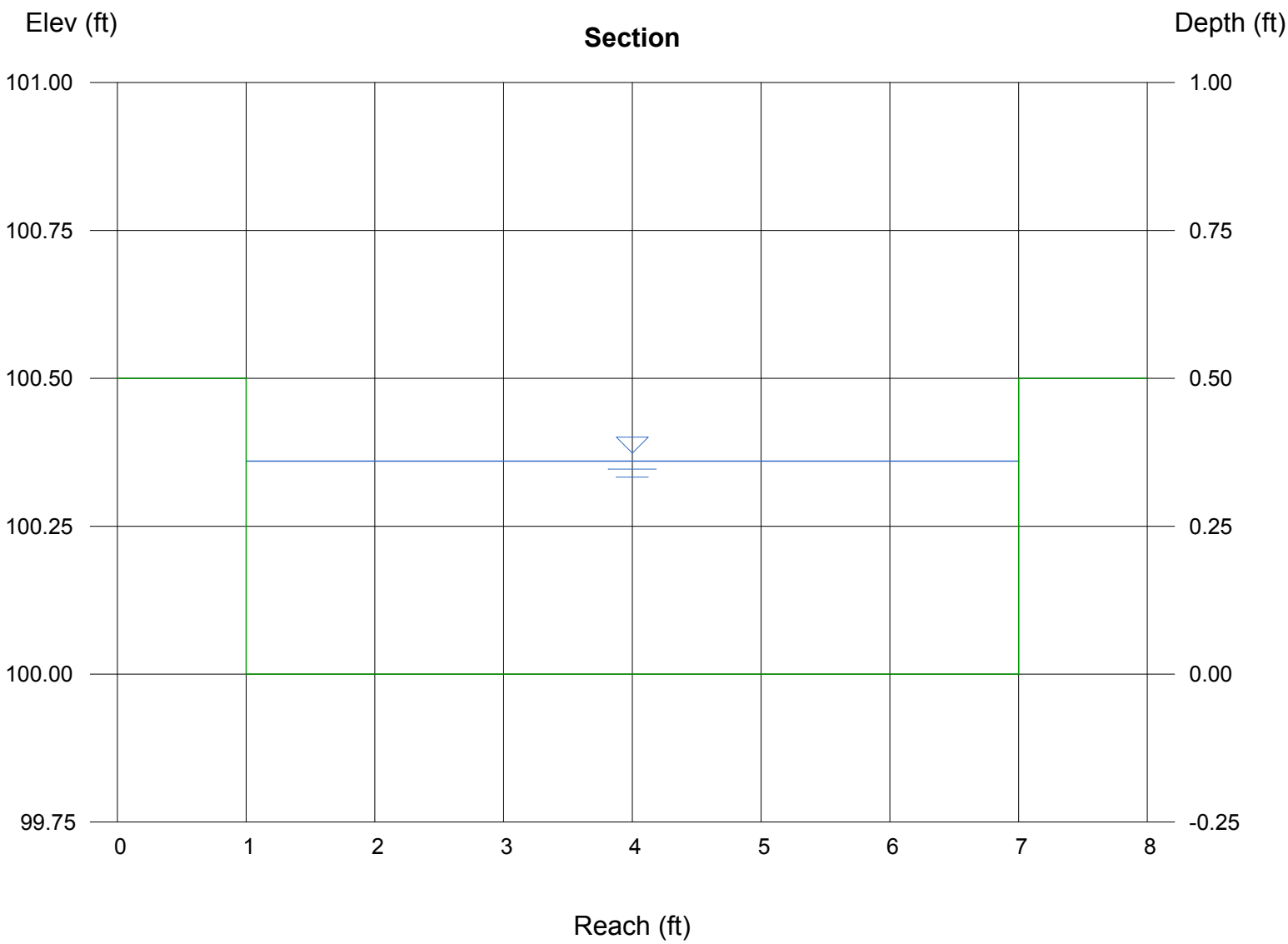
Botom Width (ft)	=	6.00
Total Depth (ft)	=	0.50
Invert Elev (ft)	=	100.00
Slope (%)	=	0.50
N-Value	=	0.013

Calculations

Compute by:		Known Q
Known Q (cfs)	=	8.08

Highlighted

Depth (ft)	=	0.36
Q (cfs)	=	8.080
Area (sqft)	=	2.16
Velocity (ft/s)	=	3.74
Wetted Perim (ft)	=	6.72
Crit Depth, Yc (ft)	=	0.39
Top Width (ft)	=	6.00
EGL (ft)	=	0.58



Weir Report

Hydraflow Express by Intelisolve | Saturday, May 2 2020, 7:52 AM

Pond C2.1 forebay overflow

Rectangular Weir

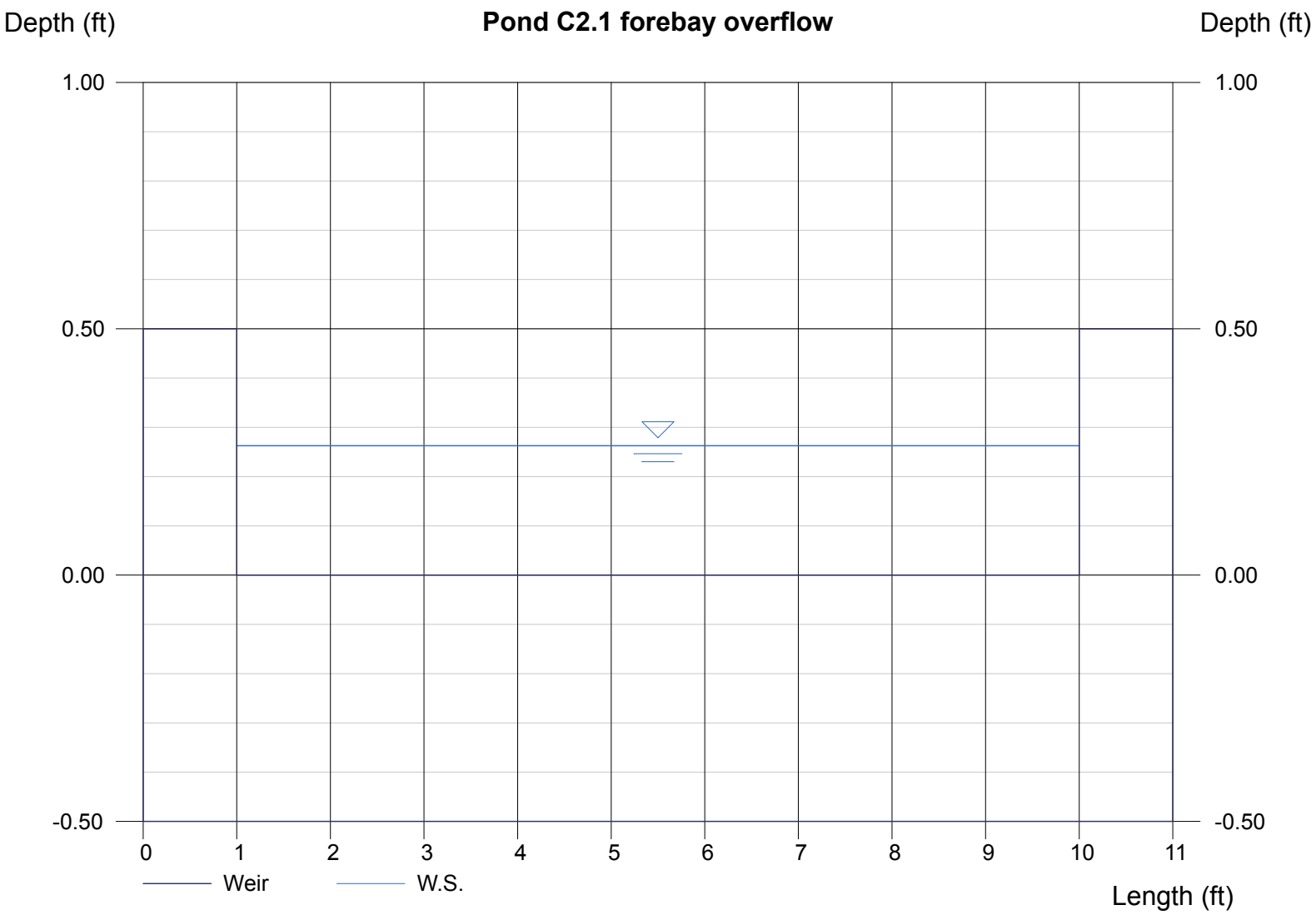
Crest	=	Sharp
Bottom Length (ft)	=	9.00
Total Depth (ft)	=	0.50

Calculations

Weir Coeff. Cw	=	3.33
Compute by:		Known Q
Known Q (cfs)	=	4.04

Highlighted

Depth (ft)	=	0.26
Q (cfs)	=	4.040
Area (sqft)	=	2.36
Velocity (ft/s)	=	1.71
Top Width (ft)	=	9.00

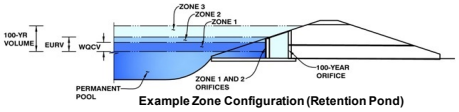


DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.02 (February 2020)

Project: **The Hills at Lorson Ranch**

Basin ID: **Pond C2.2**



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	**EDB**	
Watershed Area =	45.00	acres
Watershed Length =	2,500	ft
Watershed Length to Centroid =	1,200	ft
Watershed Slope =	0.045	ft/ft
Watershed Imperviousness =	55.00%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	95.0%	percent
Percentage Hydrologic Soil Groups C/D =	5.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

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

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	0.827	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	2.651	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	2.510	acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	3.521	acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	4.403	acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	5.541	acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	6.487	acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	7.671	acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 3.14 in.) =	10.104	acre-feet		inches
Approximate 2-yr Detention Volume =	2.035	acre-feet		
Approximate 5-yr Detention Volume =	2.778	acre-feet		
Approximate 10-yr Detention Volume =	3.600	acre-feet		
Approximate 25-yr Detention Volume =	3.912	acre-feet		
Approximate 50-yr Detention Volume =	4.081	acre-feet		
Approximate 100-yr Detention Volume =	4.507	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.827	acre-feet
Zone 2 Volume (EURV - Zone 1) =	1.824	acre-feet
Zone 3 (100yr + 1 / 2 WQCV - Zones 1 & 2) =	2.269	acre-feet
Total Detention Basin Volume =	4.920	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

micropool = 0 = 5744.00

Depth Increment = 0.20 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	--	--	--	40	0.001		
5744.33	--	0.33	--	--	--	50	0.001	15	0.000
5745	--	1.00	--	--	--	255	0.006	117	0.003
5746	--	2.00	--	--	--	6,998	0.161	3,743	0.086
5747	--	3.00	--	--	--	38,392	0.881	26,438	0.607
5748	--	4.00	--	--	--	40,927	0.940	66,098	1.517
5749	--	5.00	--	--	--	43,534	0.999	108,328	2.487
5750	--	6.00	--	--	--	46,212	1.061	153,201	3.517
5751	--	7.00	--	--	--	48,991	1.125	200,803	4.610
5752	--	8.00	--	--	--	51,837	1.190	251,217	5.767
5753	--	9.00	--	--	--	54,731	1.256	304,501	6.990
5754	--	10.00	--	--	--	58,033	1.332	360,883	8.285

Pond C2.2 Developed Inflow Hydrograph---- Pond C3 outflow + C5 Basin + C7 Basin

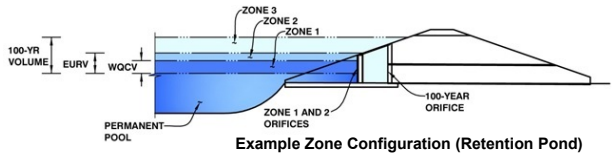
				2yr			5yr			10yr			25yr			50yr			100yr			500yr
		2 Year	CUHP	Combined	5 Year	CUHP	Combined	10 Year	CUHP	Combined	25 Year	CUHP	Combined	50 Year	CUHP	Combined	100 Year	CUHP	Combined	500 Year	CUHP	Combined
Time [hr]	Time [min]	Pond C3 Outflow2 - [cfs]	2 Year [cfs]	Hydrograph	Pond C3 Outflow2 - [cfs]	5 Year [cfs]	Hydrograph	Ponc C3 Outflow2 - [cfs]	10 Year [cfs]	Hydrograph	Pond C3 Outflow2 - [cfs]	25 Year [cfs]	Hydrograph	Pond C3 Outflow2 - [cfs]	50 Year [cfs]	Hydrograph	Pond C3 Outflow2 - [cfs]	100 Year [cfs]	Hydrograph	Pond C3 Outflow2 - [cfs]	500 Year [cfs]	Hydrograph
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.03	0.02	0.00	0.02	0.03	0.00	0.03
0.08	5.00	0.03	0.00	0.03	0.03	0.00	0.03	0.03	0.00	0.03	0.03	0.00	0.03	0.04	0.00	0.04	0.03	0.00	0.03	0.04	0.00	0.04
0.17	10.00	0.06	0.00	0.06	0.07	0.00	0.07	0.08	0.00	0.08	0.07	0.00	0.07	0.08	0.42	0.50	0.07	0.04	0.11	0.09	1.36	1.45
0.25	15.00	0.10	3.74	3.84	0.11	6.11	6.22	0.11	7.57	7.68	0.10	5.09	5.19	0.10	6.38	6.48	0.10	6.20	6.30	0.12	9.01	9.13
0.33	20.00	0.14	13.60	13.74	0.16	18.00	18.16	0.17	21.92	22.09	0.14	13.38	13.52	0.15	15.61	15.76	0.16	16.68	16.84	0.17	22.29	22.46
0.42	25.00	0.17	31.11	31.28	0.20	45.07	45.27	0.52	57.54	58.06	0.19	30.50	30.69	0.24	35.87	36.11	0.39	39.63	40.02	1.63	57.77	59.40
0.50	30.00	0.24	40.82	41.06	1.21	58.25	59.46	1.95	71.19	73.14	1.68	76.90	78.58	2.14	91.05	93.19	2.56	102.55	105.11	3.27	136.67	139.94
0.58	35.00	0.87	38.60	39.47	2.10	53.89	55.99	2.57	65.04	67.61	2.72	92.11	94.83	3.16	108.06	111.22	3.60	127.72	131.32	4.27	166.67	170.94
0.67	40.00	1.66	33.84	35.50	2.52	46.24	48.76	2.99	55.88	58.87	3.44	88.47	91.91	3.89	103.22	107.11	4.32	122.26	126.58	4.98	158.77	163.75
0.75	45.00	2.01	28.43	30.44	2.81	39.40	42.21	3.35	48.41	51.76	3.99	77.76	81.75	4.43	90.67	95.10	4.86	110.23	115.09	5.54	143.17	148.71
0.83	50.00	2.25	23.82	26.07	3.03	33.85	36.88	3.70	41.10	44.80	4.43	69.49	73.92	4.85	81.04	85.89	5.29	98.35	103.64	20.24	127.67	147.91
0.92	55.00	2.44	20.11	22.55	3.21	28.41	31.62	4.03	34.74	38.77	4.78	58.63	63.41	5.19	68.45	73.64	5.65	85.07	90.72	30.72	110.43	141.15
1.00	60.00	2.59	17.63	20.22	3.38	24.74	28.12	4.33	30.90	35.23	5.08	48.90	53.98	5.49	57.23	62.72	15.15	73.51	88.66	31.92	95.81	127.73
1.08	65.00	2.70	15.89	18.59	3.55	22.20	25.75	4.58	28.16	32.74	5.33	42.78	48.11	6.30	50.23	56.53	29.72	66.37	96.09	34.49	86.66	121.15
1.17	70.00	2.79	13.63	16.42	3.70	19.91	23.61	4.81	25.58	30.39	5.55	36.41	41.96	14.94	42.84	57.78	30.21	55.34	85.55	53.73	72.60	126.33
1.25	75.00	2.87	11.46	14.33	3.84	17.10	20.94	5.01	23.01	28.02	6.25	30.66	36.91	24.32	36.16	60.48	30.53	44.97	75.50	68.71	59.42	128.13
1.33	80.00	2.93	9.51	12.44	3.97	14.14	18.11	5.18	19.48	24.66	12.33	24.76	37.09	29.87	29.17	59.04	30.79	34.93	65.72	73.88	46.13	120.01
1.42	85.00	2.99	7.93	10.92	4.09	11.69	15.78	5.32	15.58	20.90	19.28	19.60	38.88	30.07	23.03	53.10	31.01	26.23	57.24	72.67	34.55	107.22
1.50	90.00	3.05	6.97	10.02	4.20	10.29	14.49	5.44	13.16	18.60	25.17	14.82	39.99	30.25	17.32	47.57	31.20	19.11	50.31	68.71	25.36	94.07
1.58	95.00	3.10	6.50	9.60	4.30	9.58	13.88	5.55	11.74	17.29	29.61	11.96	41.57	30.41	13.95	44.36	31.37	14.90	46.27	64.29	19.87	84.16
1.67	100.00	3.15	6.27	9.42	4.40	8.56	12.96	5.64	10.76	16.40	29.92	10.21	40.13	30.56	11.85	42.41	31.53	12.39	43.92	60.59	16.55	77.14
1.75	105.00	3.20	6.14	9.34	4.48	7.72	12.20	6.07	10.05	16.12	30.03	9.08	39.11	30.69	10.48	41.17	31.67	10.63	42.30	57.81	14.20	72.01
1.83	110.00	3.24	6.04	9.28	4.55	7.11	11.66	8.15	9.57	17.72	30.13	8.29	38.42	30.82	9.52	40.34	31.81	9.43	41.24	55.69	12.60	68.29
1.92	115.00	3.28	5.34	8.62	4.62	6.67	11.29	10.36	8.98	19.34	30.22	7.79	38.01	30.93	8.90	39.83	31.94	8.58	40.52	54.06	11.45	65.51
2.00	120.00	3.32	4.68	8.00	4.67	6.16	10.83	12.00	8.10	20.10	30.31	7.44	37.75	31.04	8.45	39.49	32.05	7.98	40.03	52.58	10.64	63.22
2.08	125.00	3.35	3.59	6.94	4.71	4.72	9.43	12.85	6.16	19.01	30.35	5.71	36.06	31.13	6.47	37.60	32.15	6.02	38.17	51.05	8.02	59.07
2.17	130.00	3.37	2.65	6.02	4.75	3.44	8.19	13.03	4.45	17.48	30.34	4.14	34.48	31.20	4.68	35.88	32.24	4.36	36.60	49.59	5.80	55.39
2.25	135.00	3.39	1.95	5.34	4.77	2.52	7.29	12.75	3.22	15.97	30.26	3.01	33.27	31.26	3.40	34.66	32.32	3.19	35.51	48.23	4.22	52.45
2.33	140.00	3.41	1.42	4.83	4.79	1.83	6.62	12.18	2.34	14.52	30.12	2.20	32.32	31.31	2.48	33.79	32.38	2.35	34.73	46.99	3.11	50.10
2.42	145.00	3.43	1.02	4.45	4.80	1.28	6.08	11.47	1.67	13.14	29.95	1.56	31.51	31.35	1.75	33.10	32.44	1.68	34.12	45.87	2.22	48.09
2.50	150.00	3.44	0.71	4.15	4.81	0.88	5.69	10.72	1.17	11.89	28.62	1.10	29.72	31.39	1.23	32.62	32.49	1.18	33.67	44.86	1.56	46.42
2.58	155.00	3.46	0.49	3.95	4.81	0.61	5.42	10.00	0.82	10.82	23.64	0.79	24.43	31.37	0.88	32.25	32.54	0.84	33.38	43.95	1.11	45.06
2.67	160.00	3.47	0.31	3.78	4.82	0.41	5.23	9.36	0.53	9.89	19.85	0.52	20.37	31.27	0.59	31.86	32.58	0.56	33.14	43.11	0.74	43.85
2.75	165.00	3.48	0.17	3.65	4.82	0.24	5.06	8.83	0.31	9.14	16.93	0.32	17.25	31.13	0.35	31.48	32.61	0.34	32.95	42.34	0.44	42.78
2.83	170.00	3.50	0.08	3.58	4.83	0.12	4.95	8.39	0.15	8.54	14.67	0.16	14.83	30.96	0.18	31.14	32.64	0.17	32.81	41.64	0.22	41.86
2.92	175.00	3.51	0.03	3.54	4.83	0.04	4.87	8.03	0.05	8.08	12.93	0.05	12.98	30.76	0.06	30.82	32.66	0.06	32.72	40.98	0.07	41.05
3.00	180.00	3.52	0.00	3.52	4.84	0.00	4.84	7.72	0.00	7.72	11.61	0.00	11.61	30.54	0.00	30.54	32.67	0.00	32.67	40.37	0.00	40.37
3.08	185.00	3.53		3.53	4.84	0.00	4.84	7.47	0.00	7.47	10.59	0.00	10.59	30.31	0.00	30.31	32.62	0.00	32.62	39.78	0.00	39.78
3.17	190.00	3.54		3.54	4.85		4.85	7.25		7.25	9.79	0.00	9.79	30.07	0.00	30.07	32.51	0.00	32.51	39.21	0.00	39.21
3.25	195.00	3.55		3.55	4.85		4.85	7.06		7.06	9.15	0.00	9.15	29.82	0.00	29.82	32.37		32.37	38.66	0.00	38.66
3.33	200.00	3.56		3.56	4.86		4.86	6.90		6.90	8.63	0.00	8.63	23.98	0.00	23.98	32.19		32.19	38.13	0.00	38.13
3.42	205.00	3.57		3.57	4.86		4.86	6.76		6.76	8.21	0.00	8.21	19.59	0.00	19.59	31.99		31.99	37.60	0.00	37.60
3.50	210.00	3.58		3.58	4.86		4.86	6.63		6.63	7.86		7.86	16.49	0.00	16.49	31.78		31.78	37.04	0.00	37.04
3.58	215.00	3.59		3.59	4.87		4.87	6.52		6.52	7.57		7.57	14.25		14.25	31.55		31.55	35.80	0.00	35.80
3.67	220.00	3.59		3.59	4.87		4.87	6.42		6.42	7.32		7.32	12.58		12.58	31.31		31.31	33.93	0.00	33.93
3.75	225.00	3.60		3.60	4.87		4.87	6.32		6.32	7.11		7.11	11.31		11.31	31.07		31.07	32.74	0.00	32.74
3.83	230.00	3.61		3.61	4.88		4.88	6.24		6.24	6.92		6.92	10.33		10.33	30.82		30.82	32.57	0.00	32.57
3.92	235.00	3.61		3.61	4.88		4.88	6.17		6.17	6.76		6.76	9.56		9.56	30.57		30.57	32.38	0.00	32.38
4.00	240.00	3.62		3.62	4.88		4.88	6.10		6.10	6.62		6.62	8.94		8.94	30.32		30.32	32.17		32.17
4.08	245.00	3.63		3.63	4.88		4.88	6.04		6.04	6.50		6.50	8.44		8.44	30.07		30.07	31.94		31.94
4.17	250.00	3.63		3.63	4.88		4.88	5.98		5.98	6.39		6.39	8.03		8.03	29.77		29.77	31.71		31.71
4.25	255.00	3.64		3.64	4.88		4.88	5.93		5.93	6.29		6.29	7.69		7.69	23.75		23.75	31.47		31.47
4.33	260.00	3.64		3.64	4.89		4.89	5.88		5.88	6.21		6.21	7.41		7.41	19.39		19.39	31.22		31.22
4.42	265.00	3.65		3.65	4.89		4.89	5.84		5.84	6.13		6.13	7.17		7.17	16.31		16.31	30.98		30.98
4.50	270.00	3.65		3.65	4.89		4.89	5.80		5.80	6.05		6.05	6.96		6.96	14.07		14.07	30.73		30.73
4.58	275.00	3.65		3.65	4.89		4.89	5.76		5.76	5.99		5.99	6.78		6.78	12.41		12.41	30.48		30.48
4.67	280.00	3.66		3.66	4.89		4.89	5.74		5.74	5.93		5.93	6.63		6.63	11.14		11.14	30.22		30.22
4.75	285.00	3.66		3.66	4.89		4.89	5.71		5.71	5.88		5.88	6.49		6.49	10.17		10.17	29.97		29.97
4.83	290.00	3.66		3.66	4.89		4.89	5.70		5.70	5.83		5.83	6.37		6.37	9.40		9.40	27.51		27.51
4.92	295.00	3.67		3.67	4.89		4.89	5.69		5.69	5.79		5.79	6.27		6.27	8.78		8.78	21.96		21.96
5.00	300.00	3.67		3.67	4.89		4.89	5.69		5.69	5.75		5.75	6.17		6.17	8.29		8.29	18.12		18.12
5.08	305.00	3.67		3.67	4.89		4.89	5.69		5.69	5.73		5.73	6.09		6.09	7.88		7.88	15.38		15.38
5.17	310.00	3.67		3.67	4.89		4.89	5.68		5.68	5.70		5.70	6.01		6.01	7.54		7.54	13.38		13.38
5.25	315.00	3.67		3.67	4.89		4.89	5.68		5.68	5.69		5.69	5.94		5.94	7.26		7.26	11.87		11.87
5.33	320.00	3.67		3.67	4.89		4.89	5.68		5.68	5.69		5.69	5.88		5.88	7.02		7.02	10.72		10.72
5.42	325.00	3.67		3.67	4.88		4.88	5.67		5.67	5.69		5.69	5.83		5.83	6.81		6.81	9.83		9.83
5.50	330.00	3.67		3.67	4.88		4.88	5.67		5.67	5.68		5.68	5.78		5.78	6.64		6.64	9.12		9.12
5.58	335.00	3.67		3.67	4.88		4.88	5.66		5.66	5.68		5.68	5.75		5.75	6.48		6.48	8.55		8.55
5.67	340.00	3.67		3.67	4.88		4.88	5.66		5.66	5.68		5.68	5.72		5.72	6.35		6.35	8.09		8.09
5.75	345.00	3.67		3.67	4.88		4.88	5.65		5.65	5.67		5.67	5.70		5.70	6.23		6.23	7.71		7.71

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.02 (February 2020)

Project: **The Hills at Lorson Ranch**

Basin ID: **Pond C2.2**



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.25	0.827	Orifice Plate
Zone 2 (EURV)	5.17	1.824	Rectangular Orifice
Zone 3 (100+1/2WQCV)	7.28	2.269	Weir&Pipe (Restrict)
Total (all zones)		4.920	

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

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

Calculated Parameters for Underdrain

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

Invert of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	1.535E-02	ft^2
Depth at top of Zone using Orifice Plate =	3.25	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	13.00	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	2.21	sq. inches (diameter = 1-11/16 inches)	Elliptical Slot Area =	N/A	ft^2

Calculated Parameters for Plate

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.08	2.17					
Orifice Area (sq. inches)	2.21	2.21	2.21					

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

User Input: Vertical Orifice (Circular or Rectangular)

	Zone 2 Rectangular	Not Selected			Zone 2 Rectangular	Not Selected
Invert of Vertical Orifice =	3.25	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	0.25	N/A
Depth at top of Zone using Vertical Orifice =	5.17	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	0.25	N/A
Vertical Orifice Height =	6.00	N/A	inches			
Vertical Orifice Width =	6.00		inches			

Calculated Parameters for Vertical Orifi

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

	Zone 3 Weir	Not Selected			Zone 3 Weir	Not Selected
Overflow Weir Front Edge Height, Ho =	7.00	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	7.00	N/A
Overflow Weir Front Edge Length =	8.00	N/A	feet	Overflow Weir Slope Length =	6.00	N/A
Overflow Weir Grate Slope =	0.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	10.58	N/A
Horiz. Length of Weir Sides =	6.00	N/A	feet	Overflow Grate Open Area w/o Debris =	33.60	N/A
Overflow Grate Open Area % =	70%	N/A	%, grate open area/total area	Overflow Grate Open Area w/ Debris =	16.80	N/A
Debris Clogging % =	50%	N/A	%			

Calculated Parameters for Overflow We

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

	Zone 3 Restrictor	Not Selected			Zone 3 Restrictor	Not Selected
Depth to Invert of Outlet Pipe =	0.00	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	3.18	N/A
Outlet Pipe Diameter =	30.00	N/A	inches	Outlet Orifice Centroid =	0.87	N/A
Restrictor Plate Height Above Pipe Invert =	18.50		inches	Half-Central Angle of Restrictor Plate on Pipe =	1.81	N/A

Calculated Parameters for Outlet Pipe w/ Flow Restriction Pla

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	10.00	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	1.51	feet
Spillway Crest Length =	20.00	feet	Stage at Top of Freeboard =	13.00	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	1.33	acres
Freeboard above Max Water Surface =	1.49	feet	Basin Volume at Top of Freeboard =	8.28	acre-ft

Calculated Parameters for Spillway

micropool = 0 = 5744.00

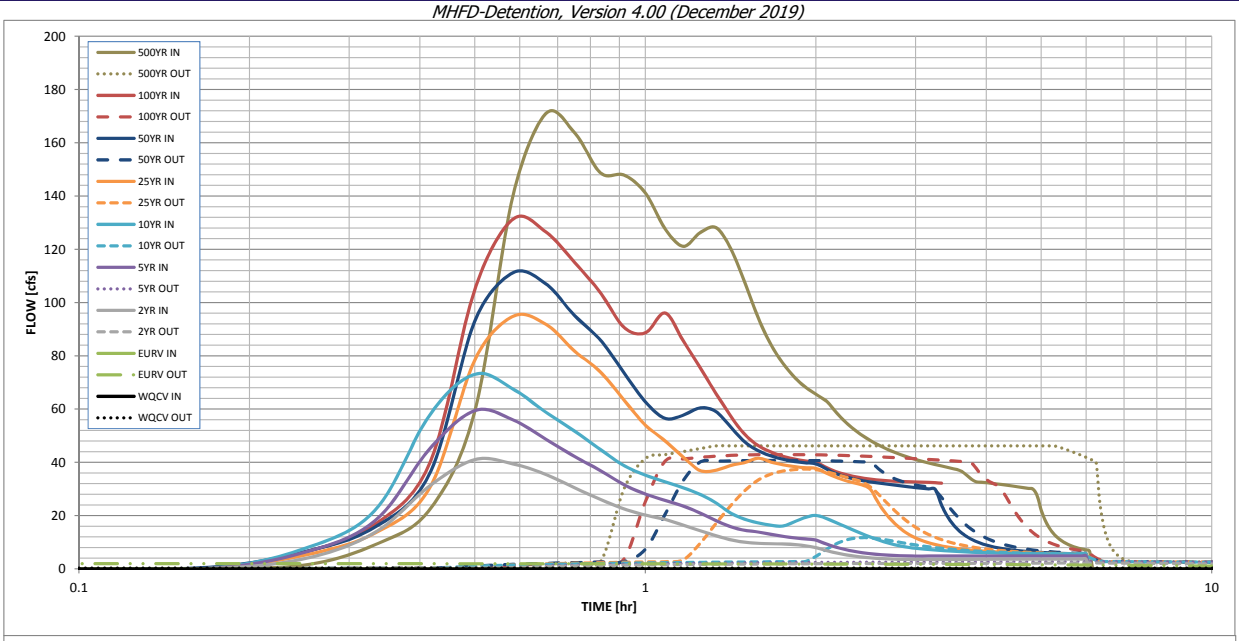
Routed Hydrograph Results

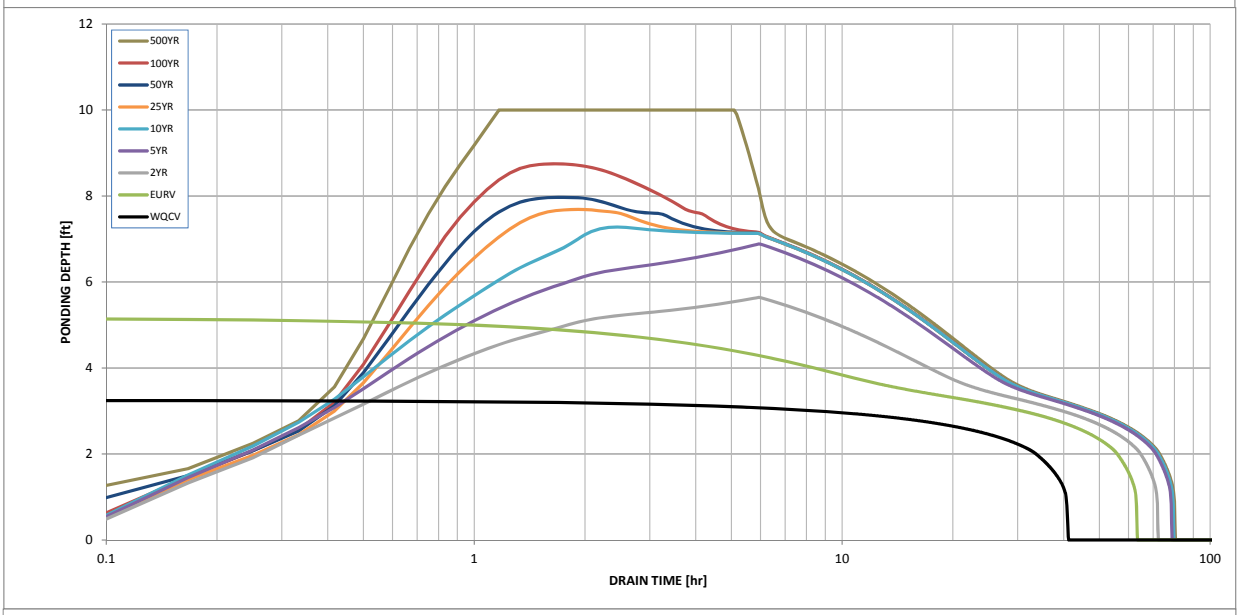
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

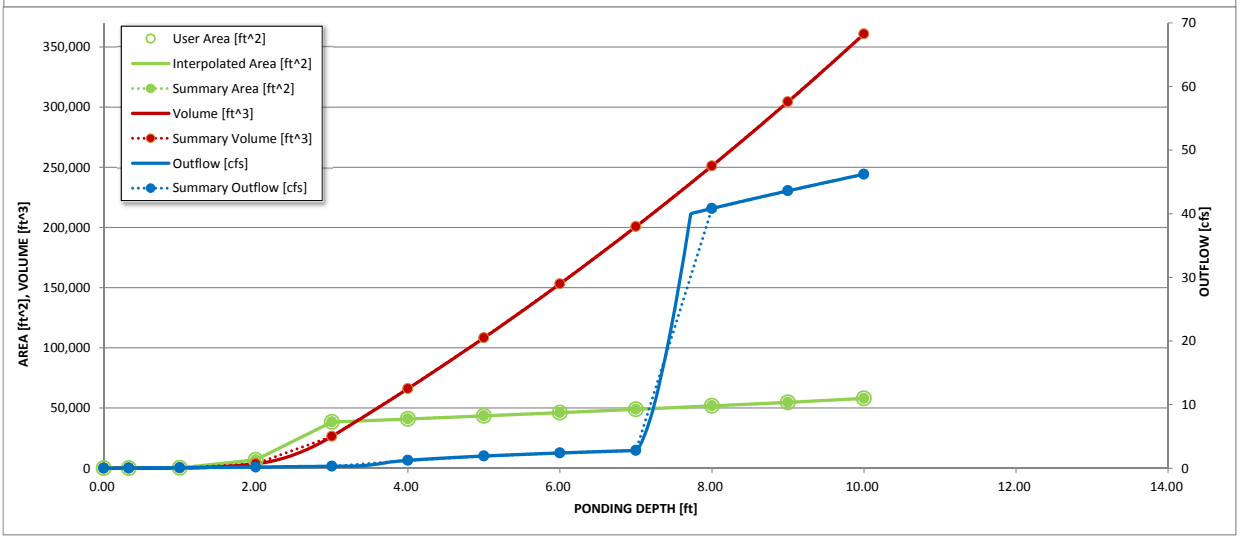
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52
CUHP Runoff Volume (acre-ft) =	0.827	2.651	2.510	3.521	4.403	5.541	6.487	7.671
User Override Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	4.034	5.603	7.467	11.034	14.029	17.717
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	5.0	13.5	20.5	36.5	45.7	58.2
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A						
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.11	0.30	0.46	0.81	1.02	1.29
Peak Inflow Q (cfs) =	N/A	N/A	41.1	59.5	73.1	94.8	111.2	131.3
Peak Outflow Q (cfs) =	0.3	2.0	2.2	2.7	11.7	37.5	40.7	42.9
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.2	0.6	1.0	0.9	0.7
Structure Controlling Flow =	Plate	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Outlet Plate 1
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	0.3	1.0	1.1	1.2
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	56	62	66	64	59	55	50
Time to Drain 99% of Inflow Volume (hours) =	**40**	61	68	73	73	71	69	67
Maximum Ponding Depth (ft) =	3.25	5.17	5.64	6.88	7.28	7.69	7.97	8.75
Area at Maximum Ponding Depth (acres) =	0.90	1.01	1.04	1.12	1.14	1.17	1.19	1.24
Maximum Volume Stored (acre-ft) =	0.829	2.658	3.139	4.475	4.916	5.390	5.720	6.666

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.00 (December 2019)







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

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename:

Inflow Hydrographs

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

	SOURCE	CUHP	CUHP	USER	USER	USER	USER	USER	USER	USER
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.02	0.03
	0:05:00	0.00	0.00	0.03	0.03	0.03	0.03	0.04	0.03	0.04
	0:10:00	0.00	0.00	0.06	0.07	0.08	0.07	0.50	0.11	1.45
	0:15:00	0.00	0.00	3.84	6.22	7.68	5.19	6.48	6.30	9.13
	0:20:00	0.00	0.00	13.74	18.16	22.09	13.52	15.76	16.84	22.46
	0:25:00	0.00	0.00	31.28	45.27	58.06	30.69	36.11	40.02	59.40
	0:30:00	0.00	0.00	41.06	59.46	73.14	78.58	93.19	105.11	139.94
	0:35:00	0.00	0.00	39.47	55.99	67.61	94.83	111.22	131.32	170.94
	0:40:00	0.00	0.00	35.50	48.76	58.87	91.91	107.11	126.58	163.75
	0:45:00	0.00	0.00	30.44	42.21	51.76	81.75	95.10	115.09	148.71
	0:50:00	0.00	0.00	26.07	36.88	44.80	73.92	85.89	103.64	147.91
	0:55:00	0.00	0.00	22.55	31.62	38.77	63.41	73.64	90.72	141.15
	1:00:00	0.00	0.00	20.22	28.12	35.23	53.98	62.72	88.66	127.73
	1:05:00	0.00	0.00	18.59	25.75	32.74	48.11	56.53	96.09	121.15
	1:10:00	0.00	0.00	16.42	23.61	30.39	41.96	57.78	85.55	126.33
	1:15:00	0.00	0.00	14.33	20.94	28.02	36.91	60.48	75.50	128.13
	1:20:00	0.00	0.00	12.44	18.11	24.66	37.09	59.04	65.72	120.01
	1:25:00	0.00	0.00	10.92	15.78	20.90	38.88	53.10	57.24	107.22
	1:30:00	0.00	0.00	10.02	14.49	18.60	39.99	47.57	50.31	94.07
	1:35:00	0.00	0.00	9.60	13.88	17.29	41.57	44.36	46.27	84.16
	1:40:00	0.00	0.00	9.42	12.96	16.40	40.13	42.41	43.92	77.14
	1:45:00	0.00	0.00	9.34	12.20	16.12	39.11	41.17	42.30	72.01
	1:50:00	0.00	0.00	9.28	11.66	17.72	38.42	40.34	41.24	68.29
	1:55:00	0.00	0.00	8.62	11.29	19.34	38.01	39.83	40.52	65.51
	2:00:00	0.00	0.00	8.00	10.83	20.10	37.75	39.49	40.03	63.22
	2:05:00	0.00	0.00	6.94	9.43	19.01	36.06	37.60	38.17	59.07
	2:10:00	0.00	0.00	6.02	8.19	17.48	34.48	35.88	36.60	55.39
	2:15:00	0.00	0.00	5.34	7.29	15.97	33.27	34.66	35.51	52.45
	2:20:00	0.00	0.00	4.83	6.62	14.52	32.32	33.79	34.73	50.10
	2:25:00	0.00	0.00	4.45	6.08	13.14	31.51	33.10	34.12	48.09
	2:30:00	0.00	0.00	4.15	5.69	11.89	29.72	32.62	33.67	46.42
	2:35:00	0.00	0.00	3.95	5.42	10.82	24.43	32.25	33.38	45.06
	2:40:00	0.00	0.00	3.78	5.23	9.89	20.37	31.86	33.14	43.85
	2:45:00	0.00	0.00	3.65	5.06	9.14	17.25	31.48	32.95	42.78
	2:50:00	0.00	0.00	3.58	4.95	8.54	14.83	31.14	32.81	41.86
	2:55:00	0.00	0.00	3.54	4.87	8.08	12.98	30.82	32.72	41.05
	3:00:00	0.00	0.00	3.52	4.84	7.72	11.61	30.54	32.67	40.37
	3:05:00	0.00	0.00	3.53	4.84	7.47	10.59	30.31	32.62	39.78
	3:10:00	0.00	0.00	3.54	4.85	7.25	9.79	30.07	32.51	39.21
	3:15:00	0.00	0.00	3.55	4.85	7.06	9.15	29.82	32.37	38.66
	3:20:00	0.00	0.00	3.56	4.86	6.90	8.63	23.98	32.19	38.13
	3:25:00	0.00	0.00	3.57	4.86	6.76	8.21	19.59	31.99	37.60
	3:30:00	0.00	0.00	3.58	4.86	6.63	7.86	16.49	31.78	37.04
	3:35:00	0.00	0.00	3.59	4.87	6.52	7.57	14.25	31.55	35.80
	3:40:00	0.00	0.00	3.59	4.87	6.42	7.32	12.58	31.31	33.93
	3:45:00	0.00	0.00	3.60	4.87	6.32	7.11	11.31	31.07	32.74
	3:50:00	0.00	0.00	3.61	4.88	6.24	6.92	10.33	30.82	32.57
	3:55:00	0.00	0.00	3.61	4.88	6.17	6.76	9.56	30.57	32.38
	4:00:00	0.00	0.00	3.62	4.88	6.10	6.62	8.94	30.32	32.17
	4:05:00	0.00	0.00	3.63	4.88	6.04	6.50	8.44	30.07	31.94
	4:10:00	0.00	0.00	3.63	4.88	5.98	6.39	8.03	29.77	31.71
	4:15:00	0.00	0.00	3.64	4.88	5.93	6.29	7.69	23.75	31.47
	4:20:00	0.00	0.00	3.64	4.89	5.88	6.21	7.41	19.39	31.22
	4:25:00	0.00	0.00	3.65	4.89	5.84	6.13	7.17	16.31	30.98
	4:30:00	0.00	0.00	3.65	4.89	5.80	6.05	6.96	14.07	30.73
	4:35:00	0.00	0.00	3.65	4.89	5.76	5.99	6.78	12.41	30.48
	4:40:00	0.00	0.00	3.66	4.89	5.74	5.93	6.63	11.14	30.22
	4:45:00	0.00	0.00	3.66	4.89	5.71	5.88	6.49	10.17	29.97
	4:50:00	0.00	0.00	3.66	4.89	5.70	5.83	6.37	9.40	27.51
	4:55:00	0.00	0.00	3.67	4.89	5.69	5.79	6.27	8.78	21.96
	5:00:00	0.00	0.00	3.67	4.89	5.69	5.75	6.17	8.29	18.12
	5:05:00	0.00	0.00	3.67	4.89	5.69	5.73	6.09	7.88	15.38
	5:10:00	0.00	0.00	3.67	4.89	5.68	5.70	6.01	7.54	13.38
	5:15:00	0.00	0.00	3.67	4.89	5.68	5.69	5.94	7.26	11.87
	5:20:00	0.00	0.00	3.67	4.89	5.68	5.69	5.88	7.02	10.72
	5:25:00	0.00	0.00	3.67	4.88	5.67	5.69	5.83	6.81	9.83
	5:30:00	0.00	0.00	3.67	4.88	5.67	5.68	5.78	6.64	9.12
	5:35:00	0.00	0.00	3.67	4.88	5.66	5.68	5.75	6.48	8.55
	5:40:00	0.00	0.00	3.67	4.88	5.66	5.68	5.72	6.35	8.09
	5:45:00	0.00	0.00	3.67	4.88	5.65	5.67	5.70	6.23	7.71
	5:50:00	0.00	0.00	3.67	4.87	5.65	5.67	5.69	6.13	7.39
	5:55:00	0.00	0.00	3.67	4.87	5.64	5.66	5.69	6.04	7.13
	6:00:00	0.00	0.00	3.65	4.86	5.63	5.65	5.68	5.81	6.62

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.02 (February 2020)

Summary Stage-Area-Volume-Discharge Relationships

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

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

Stage - Storage Description	Stage [ft]	Area [ft^2]	Area [acres]	Volume [ft^3]	Volume [ac-ft]	Total Outflow [cfs]
micropool	0.00	40	0.001	0	0.000	0.00
surcharge	0.33	50	0.001	15	0.000	0.04
5745	1.00	255	0.006	117	0.003	0.07
5746	2.00	6,998	0.161	3,743	0.086	0.18
5747	3.00	38,392	0.881	26,438	0.607	0.30
5748	4.00	40,927	0.940	66,098	1.517	1.23
5749	5.00	43,534	0.999	108,328	2.487	1.91
5750	6.00	46,212	1.061	153,201	3.517	2.39
5751	7.00	48,991	1.125	200,803	4.610	2.79
5752	8.00	51,837	1.190	251,217	5.767	40.84
5753	9.00	54,731	1.256	304,501	6.990	43.61
5754	10.00	58,033	1.332	360,883	8.285	46.21

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).

Design Procedure Form: Extended Detention Basin (EDB)

UD-BMP (Version 3.07, March 2018)

Designer:	**Richard Schindler**
Company:	**Core Engineering Group**
Date:	**May 2, 2020**
Project:	**The Hills at Lorson Ranch**
Location:	**Pond C2.2**

1. Basin Storage Volume

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

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

C) Contributing Watershed Area — Area = 45.000 ac

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

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

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

F) Design Volume (WQCV) Based on 40-hour Drain Time ($V_{DESIGN} = (1.0 * (0.91 * i^3 - 1.19 * i^2 + 0.78 * i) / 12 * Area)$) — V_{DESIGN}= 0.827 ac-ft

G) For Watersheds Outside of the Denver Region, Water Quality Capture Volume (WQCV) Design Volume ($V_{WQCV\ OTHER} = (d_6*(V_{DESIGN}/0.43))$) — $V_{DESIGN\ OTHER}$= 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 = %
- ii) Percentage of Watershed consisting of Type B Soils — HSG_B = %
- iii) Percentage of Watershed consisting of Type C/D Soils — $HSG_{C/D}$ = %

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

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 = 3.00 ft / ft

DIFFICULT TO MAINTAIN, INCREASE WHERE POSSIBLE

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} = 0.025 ac-ft

B) Actual Forebay Volume — V_F = 0.028 ac-ft

C) Forebay Depth (D_F = 30 inch maximum) — D_F = 24.0 in

D) Forebay Discharge

i) Undetained 100-year Peak Discharge — Q_{100} = 131.00 cfs

ii) Forebay Discharge Design Flow ($Q_F = 0.02 * Q_{100}$) — Q_F = 2.62 cfs

E) Forebay Discharge Design

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

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

G) Rectangular Notch Width — Calculated W_N = 8.1 in

Design Procedure Form: Extended Detention Basin (EDB)

Designer:	**Richard Schindler**
Company:	**Core Engineering Group**
Date:	**May 2, 2020**
Project:	**The Hills at Lorson Ranch**
Location:	**Pond C2.2**

6. Trickle Channel	
A) Type of Trickle Channel	Choose One: (●) Concrete ( ) Soft Bottom
F) Slope of Trickle Channel	S = 0.0050 ft / ft
7. Micropool and Outlet Structure	
A) Depth of Micropool (2.5-feet minimum)	D_M = 2.5 ft
B) Surface Area of Micropool (10 ft^2 minimum)	A_M = 50 sq ft
C) Outlet Type	Choose One: (●) Orifice Plate ( ) Other (Describe):
D) Smallest Dimension of Orifice Opening Based on Hydrograph Routing (Use UD-Detention)	$D_{orifice}$ = 1.48 inches
E) Total Outlet Area	A_{ot} = 6.63 square inches
8. Initial Surcharge Volume	
A) Depth of Initial Surcharge Volume (Minimum recommended depth is 4 inches)	D_{IS} = 4 in
B) Minimum Initial Surcharge Volume (Minimum volume of 0.3% of the WQCV)	V_{IS} = 108 cu ft
C) Initial Surcharge Provided Above Micropool	V_s= 16.7 cu ft
9. Trash Rack	
A) Water Quality Screen Open Area: $A_t = A_{ot} * 38.5*(e^{-0.095D})$	A_t = 222 square inches
B) Type of Screen (If specifying an alternative to the materials recommended in the USDCM, indicate "other" and enter the ratio of the total open are to the total screen are for the material specified.)	*Other (Please describe below)* wellscreen stainless
Other (Y/N): y	
C) Ratio of Total Open Area to Total Area (only for type 'Other')	User Ratio = 0.6
D) Total Water Quality Screen Area (based on screen type)	A_{total} = 370 sq. in. **Based on type 'Other' screen ratio**
E) Depth of Design Volume (EURV or WQCV) (Based on design concept chosen under 1E)	H= 3.25 feet
F) Height of Water Quality Screen (H_{TR})	H_{TR}= 67 inches
G) Width of Water Quality Screen Opening ($W_{opening}$) (Minimum of 12 inches is recommended)	$W_{opening}$ = 12.0 inches **VALUE LESS THAN RECOMMENDED MIN. WIDTH. WIDTH HAS BEEN SET TO 12 INCHES.**

Channel Report

Hydraflow Express by Intelisolve

Saturday, May 2 2020, 9:18 AM

pond C2.2 low flow channel (2 x forebay release = 5.24cfs)

Rectangular

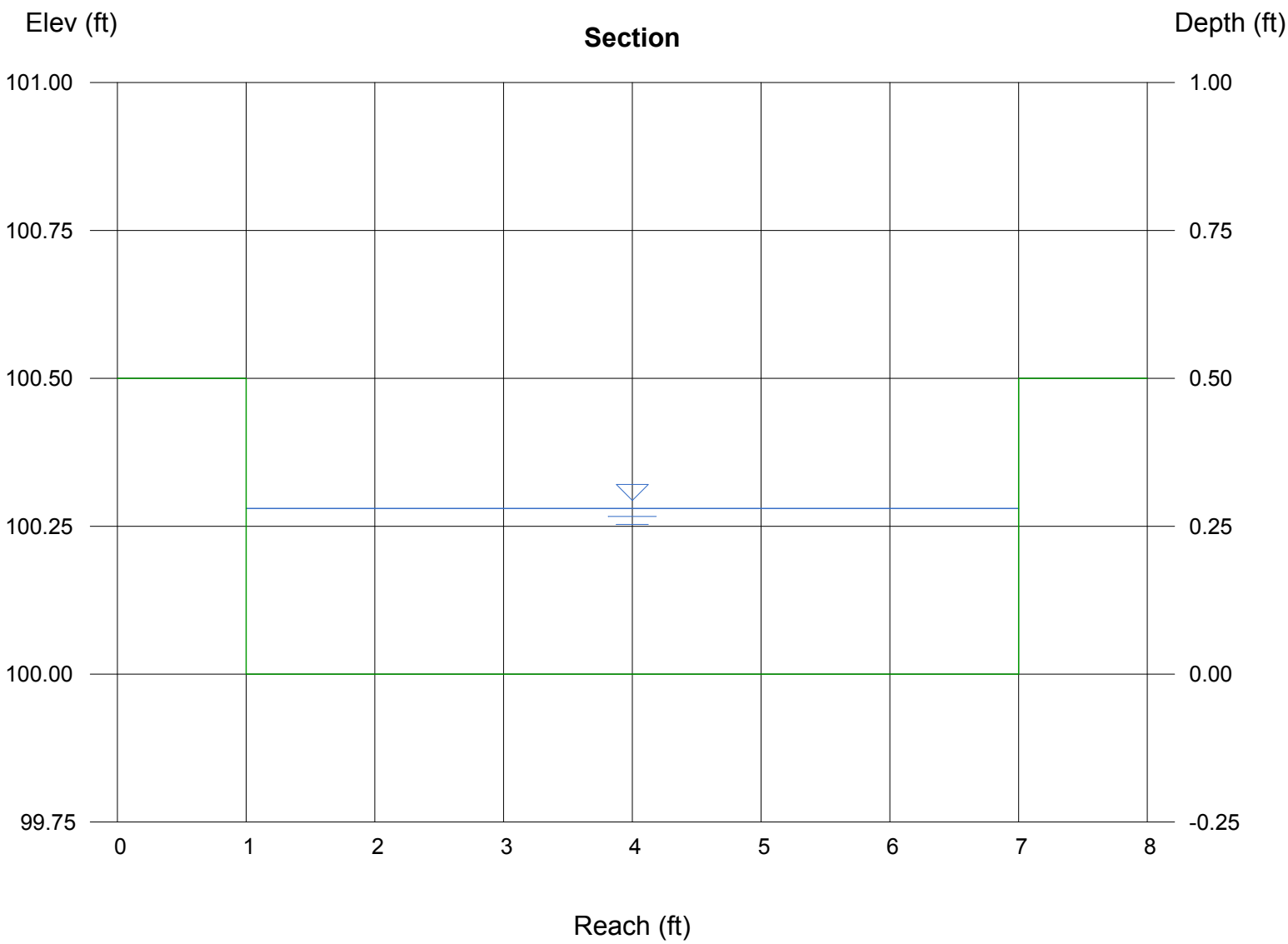
Botom Width (ft)	=	6.00
Total Depth (ft)	=	0.50
Invert Elev (ft)	=	100.00
Slope (%)	=	0.50
N-Value	=	0.013

Calculations

Compute by:		Known Q
Known Q (cfs)	=	5.24

Highlighted

Depth (ft)	=	0.28
Q (cfs)	=	5.240
Area (sqft)	=	1.68
Velocity (ft/s)	=	3.12
Wetted Perim (ft)	=	6.56
Crit Depth, Yc (ft)	=	0.29
Top Width (ft)	=	6.00
EGL (ft)	=	0.43



Weir Report

Hydraflow Express by Intelisolve | Saturday, May 2 2020, 9:19 AM

Pond C2.2 forebay overflow

Rectangular Weir

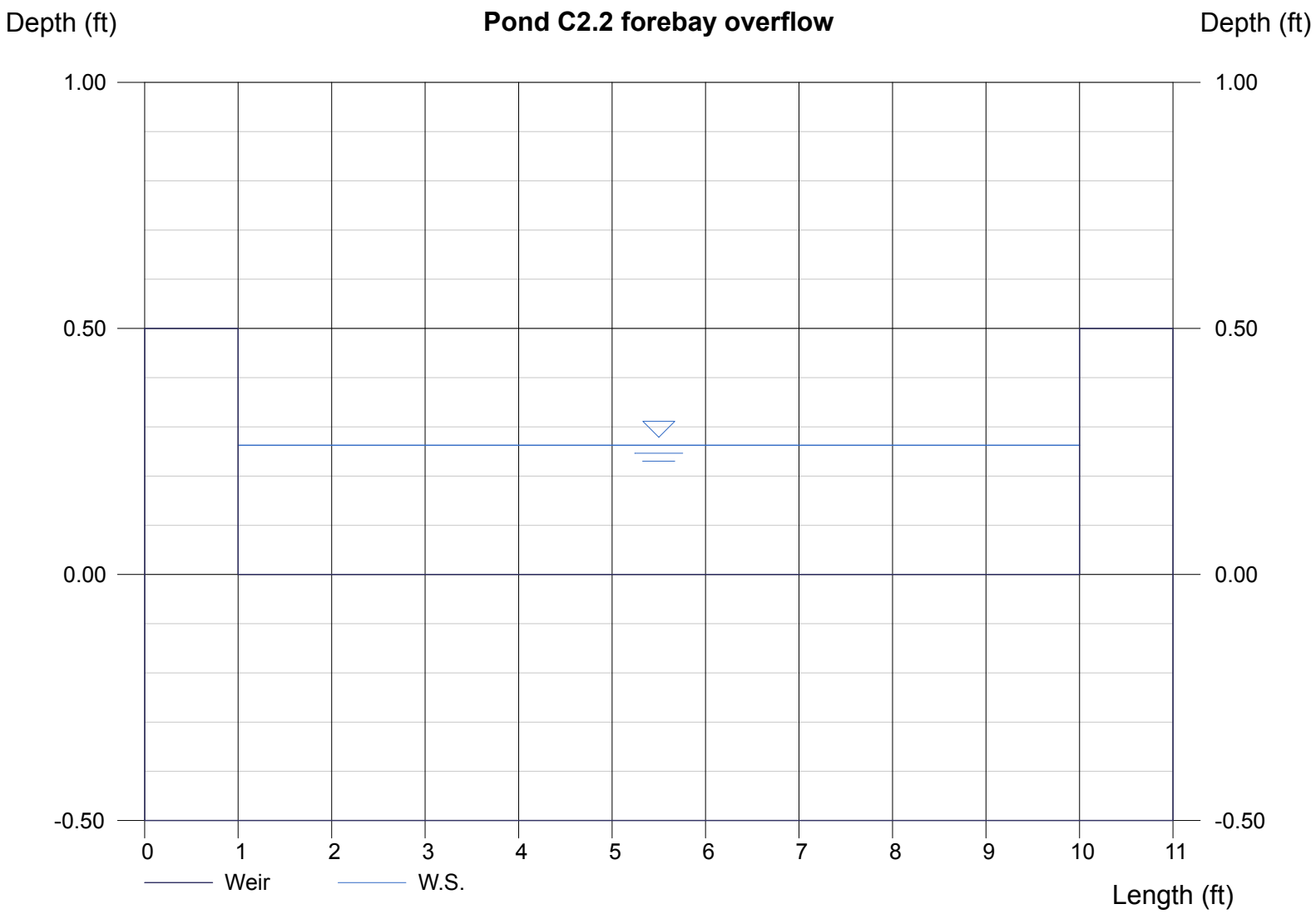
Crest	=	Sharp
Bottom Length (ft)	=	9.00
Total Depth (ft)	=	0.50

Calculations

Weir Coeff. Cw	=	3.33
Compute by:		Known Q
Known Q (cfs)	=	4.04

Highlighted

Depth (ft)	=	0.26
Q (cfs)	=	4.040
Area (sqft)	=	2.36
Velocity (ft/s)	=	1.71
Top Width (ft)	=	9.00

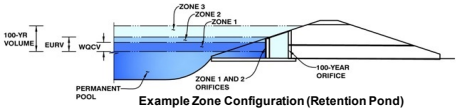


DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.02 (February 2020)

Project: **The Hills at Lorson Ranch**

Basin ID: **Pond C4**



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	**EDB**	
Watershed Area =	81.00	acres
Watershed Length =	2,300	ft
Watershed Length to Centroid =	1,200	ft
Watershed Slope =	0.050	ft/ft
Watershed Imperviousness =	55.00%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	40.0%	percent
Percentage Hydrologic Soil Groups C/D =	60.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

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

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	1.488	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	4.468	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	4.607	acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	6.475	acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	8.109	acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	10.045	acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	11.748	acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	13.830	acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 3.14 in.) =	18.178	acre-feet		inches
Approximate 2-yr Detention Volume =	3.723	acre-feet		
Approximate 5-yr Detention Volume =	5.293	acre-feet		
Approximate 10-yr Detention Volume =	6.364	acre-feet		
Approximate 25-yr Detention Volume =	6.876	acre-feet		
Approximate 50-yr Detention Volume =	7.136	acre-feet		
Approximate 100-yr Detention Volume =	7.948	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	1.488	acre-feet
Zone 2 Volume (EURV - Zone 1) =	2.980	acre-feet
Zone 3 (100yr + 1 / 2 WQCV - Zones 1 & 2) =	4.225	acre-feet
Total Detention Basin Volume =	8.692	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

micropool = 0 = 5765

Depth Increment = 0.20 ft

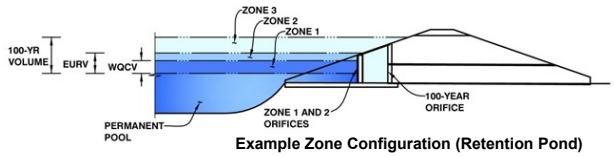
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	40	0.001		
5765.33	--	0.33	--	--	--	50	0.001	15	0.000
5766	--	1.00	--	--	--	630	0.014	243	0.006
5767	--	2.00	--	--	--	40,811	0.937	20,962	0.481
5768	--	3.00	--	--	--	49,929	1.146	66,332	1.523
5769	--	4.00	--	--	--	52,779	1.212	117,686	2.702
5770	--	5.00	--	--	--	55,690	1.278	171,921	3.947
5771	--	6.00	--	--	--	58,660	1.347	229,096	5.259
5772	--	7.00	--	--	--	61,704	1.417	289,278	6.641
5773	--	8.00	--	--	--	64,811	1.488	352,535	8.093
5774	--	9.00	--	--	--	67,980	1.561	418,931	9.617
5775	--	10.00	--	--	--	71,215	1.635	488,528	11.215
5776	--	11.00	--	--	--	75,000	1.722	561,636	12.893

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.02 (February 2020)

Project: **The Hills at Lorson Ranch**

Basin ID: **Pond C4**



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.97	1.488	Orifice Plate
Zone 2 (EURV)	5.41	2.980	Rectangular Orifice
Zone 3 (100+1/2WQCV)	8.40	4.225	Weir&Pipe (Restrict)
Total (all zones)		8.692	

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

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

Calculated Parameters for Underdrain

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

Invert of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	3.250E-02	ft^2
Depth at top of Zone using Orifice Plate =	2.97	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	11.90	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	4.68	sq. inches (use rectangular openings)	Elliptical Slot Area =	N/A	ft^2

Calculated Parameters for Plate

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	0.99	1.98					
Orifice Area (sq. inches)	4.68	4.68	4.68					

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

User Input: Vertical Orifice (Circular or Rectangular)

	Zone 2 Rectangular	Not Selected			Zone 2 Rectangular	Not Selected
Invert of Vertical Orifice =	2.97	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	0.68	N/A
Depth at top of Zone using Vertical Orifice =	5.41	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	0.25	N/A
Vertical Orifice Height =	6.00	N/A	inches			
Vertical Orifice Width =	16.39		inches			

Calculated Parameters for Vertical Orifi

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

	Zone 3 Weir	Not Selected			Zone 3 Weir	Not Selected
Overflow Weir Front Edge Height, Ho =	5.50	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	5.50	N/A
Overflow Weir Front Edge Length =	6.00	N/A	feet	Overflow Weir Slope Length =	6.00	N/A
Overflow Weir Grate Slope =	0.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	8.02	N/A
Horiz. Length of Weir Sides =	6.00	N/A	feet	Overflow Grate Open Area w/o Debris =	25.20	N/A
Overflow Grate Open Area % =	70%	N/A	%, grate open area/total area	Overflow Grate Open Area w/ Debris =	12.60	N/A
Debris Clogging % =	50%	N/A	%			

Calculated Parameters for Overflow We

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

	Zone 3 Restrictor	Not Selected			Zone 3 Restrictor	Not Selected
Depth to Invert of Outlet Pipe =	0.00	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	3.14	N/A
Outlet Pipe Diameter =	24.00	N/A	inches	Outlet Orifice Centroid =	1.00	N/A
Restrictor Plate Height Above Pipe Invert =	24.00		inches	Half-Central Angle of Restrictor Plate on Pipe =	3.14	N/A

Calculated Parameters for Outlet Pipe w/ Flow Restriction Pla

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	10.00	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	1.87	feet
Spillway Crest Length =	30.00	feet	Stage at Top of Freeboard =	13.00	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	1.72	acres
Freeboard above Max Water Surface =	1.13	feet	Basin Volume at Top of Freeboard =	12.89	acre-ft

Calculated Parameters for Spillway

micropool = 0 = 5765

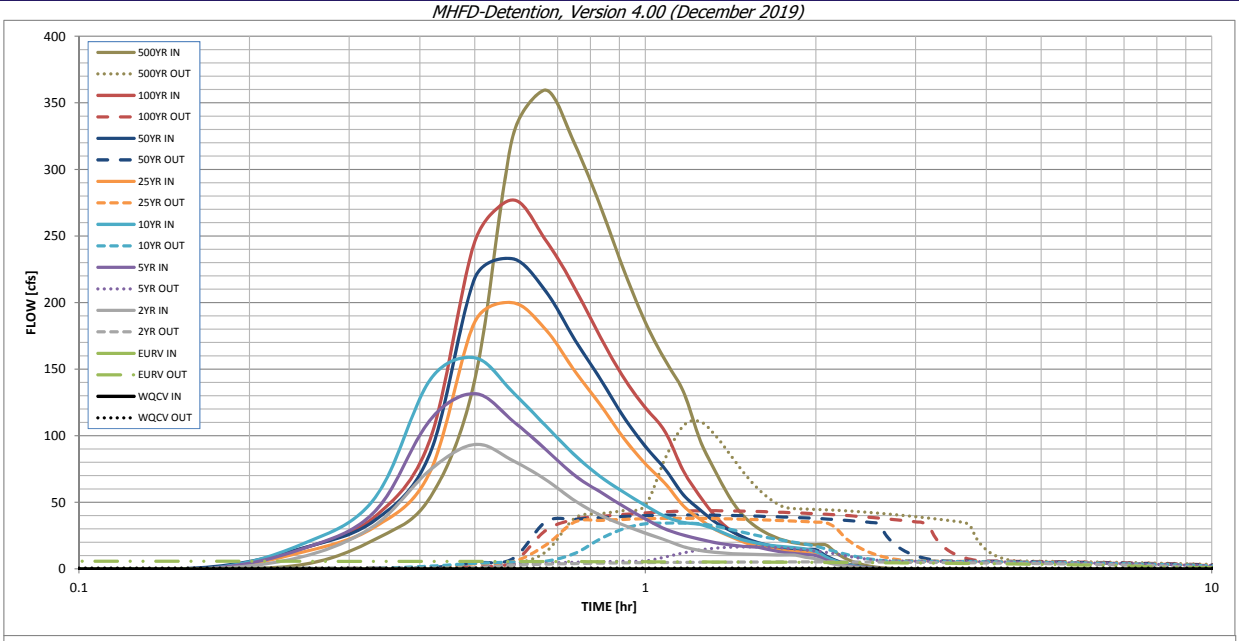
Routed Hydrograph Results

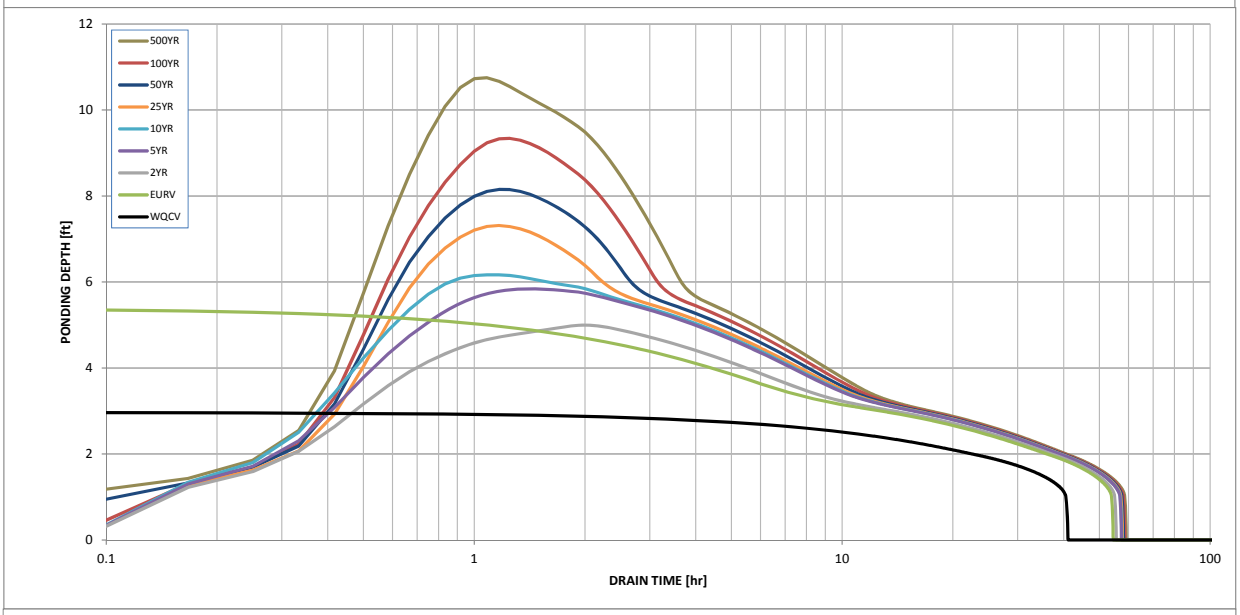
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

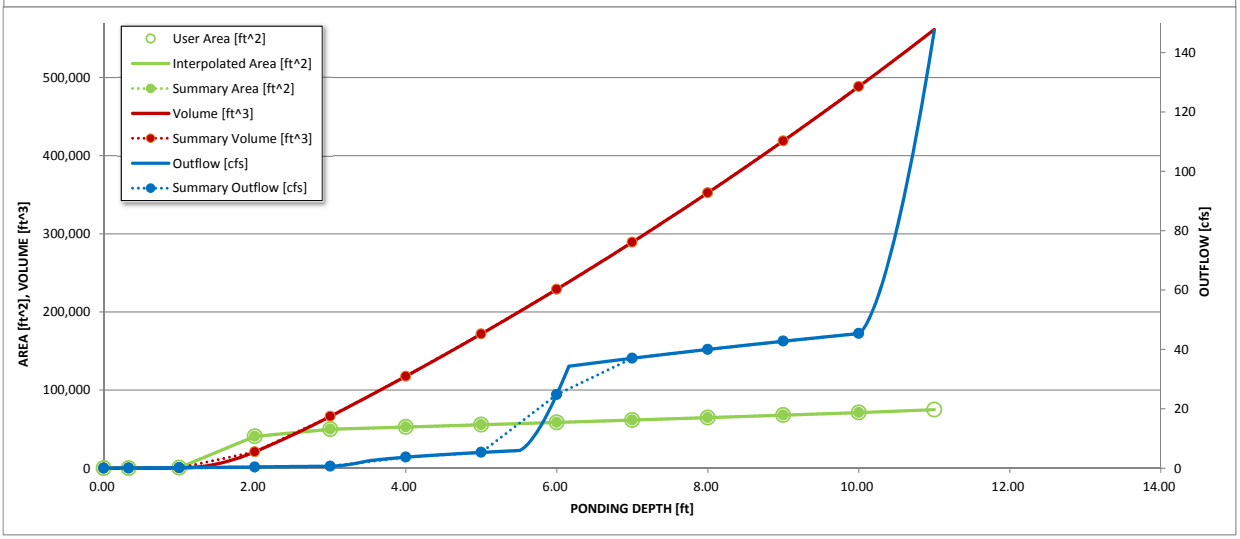
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52
CUHP Runoff Volume (acre-ft) =	1.488	4.468	4.607	6.475	8.109	10.045	11.748	13.830
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	4.607	6.475	8.109	10.045	11.748	13.830
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	17.5	39.6	56.8	90.6	111.9	138.5
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A						
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.22	0.49	0.70	1.12	1.38	1.71
Peak Inflow Q (cfs) =	N/A	N/A	93.5	131.6	158.6	200.0	232.9	277.2
Peak Outflow Q (cfs) =	0.6	5.8	5.3	16.5	34.4	38.0	40.5	43.7
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.4	0.6	0.4	0.4	0.3
Structure Controlling Flow =	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Overflow Weir 1	Outlet Plate 1	Outlet Plate 1	Outlet Plate 1	Outlet Plate 1
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	0.4	1.1	1.2	1.3	1.4
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	39	48	49	49	47	45	44	42
Time to Drain 99% of Inflow Volume (hours) =	**40**	52	53	54	53	53	53	52
Maximum Ponding Depth (ft) =	2.97	5.41	5.00	5.84	6.17	7.31	8.15	9.34
Area at Maximum Ponding Depth (acres) =	1.14	1.31	1.28	1.34	1.36	1.44	1.50	1.59
Maximum Volume Stored (acre-ft) =	1.488	4.477	3.934	5.031	5.476	7.083	8.317	10.152

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.00 (December 2019)







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

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename: .\Outflow Hydrographs-pond C4.xlsx

Inflow Hydrographs

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

	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	1.08	0.11	3.48
	0:15:00	0.00	0.00	9.55	15.60	19.32	12.98	16.07	15.80	22.32
	0:20:00	0.00	0.00	32.92	43.38	53.47	31.67	36.70	39.53	53.64
	0:25:00	0.00	0.00	74.34	111.85	142.03	72.79	86.79	97.17	142.25
	0:30:00	0.00	0.00	93.50	131.62	158.60	185.73	218.67	246.14	324.95
	0:35:00	0.00	0.00	81.33	111.11	132.69	199.96	232.94	277.21	359.64
	0:40:00	0.00	0.00	67.06	89.76	107.50	179.81	208.60	246.90	319.22
	0:45:00	0.00	0.00	51.28	70.23	85.54	148.69	172.31	211.27	272.12
	0:50:00	0.00	0.00	40.21	57.70	69.19	122.99	142.40	173.74	224.11
	0:55:00	0.00	0.00	32.87	46.75	57.49	97.93	113.76	143.17	185.13
	1:00:00	0.00	0.00	26.74	37.48	47.65	78.91	91.95	121.14	156.73
	1:05:00	0.00	0.00	21.83	29.98	39.43	64.22	74.98	103.05	133.25
	1:10:00	0.00	0.00	16.70	25.41	34.92	47.41	55.74	73.66	96.29
	1:15:00	0.00	0.00	13.82	22.23	33.34	37.17	44.19	54.17	72.10
	1:20:00	0.00	0.00	12.38	19.62	29.44	29.18	34.65	38.85	51.95
	1:25:00	0.00	0.00	11.55	17.93	24.66	24.13	28.54	28.70	38.45
	1:30:00	0.00	0.00	11.12	16.83	21.38	19.70	23.24	22.76	30.51
	1:35:00	0.00	0.00	10.79	16.17	19.14	16.72	19.67	18.74	25.11
	1:40:00	0.00	0.00	10.57	14.11	17.68	14.89	17.48	16.17	21.68
	1:45:00	0.00	0.00	10.43	12.53	16.70	13.64	15.97	14.54	19.48
	1:50:00	0.00	0.00	10.39	11.49	15.99	12.96	15.14	13.84	18.51
	1:55:00	0.00	0.00	8.80	10.81	14.89	12.55	14.64	13.56	18.10
	2:00:00	0.00	0.00	7.56	10.02	13.19	12.34	14.40	13.50	18.01
	2:05:00	0.00	0.00	5.14	6.81	8.96	8.46	9.87	9.31	12.40
	2:10:00	0.00	0.00	3.31	4.38	5.83	5.51	6.42	6.07	8.07
	2:15:00	0.00	0.00	2.13	2.77	3.73	3.57	4.15	3.92	5.21
	2:20:00	0.00	0.00	1.28	1.69	2.28	2.18	2.54	2.39	3.17
	2:25:00	0.00	0.00	0.73	1.04	1.36	1.35	1.57	1.48	1.96
	2:30:00	0.00	0.00	0.36	0.56	0.70	0.74	0.85	0.80	1.06
	2:35:00	0.00	0.00	0.14	0.23	0.27	0.31	0.35	0.33	0.43
	2:40:00	0.00	0.00	0.03	0.05	0.05	0.06	0.07	0.06	0.08
	2:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.02 (February 2020)

Summary Stage-Area-Volume-Discharge Relationships

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

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

Stage - Storage Description	Stage [ft]	Area [ft^2]	Area [acres]	Volume [ft^3]	Volume [ac-ft]	Total Outflow [cfs]
micropool	0.00	40	0.001	0	0.000	0.00
surcharge	0.33	50	0.001	15	0.000	0.09
5766	1.00	630	0.014	243	0.006	0.17
5767	2.00	40,811	0.937	20,962	0.481	0.40
5768	3.00	49,929	1.146	66,332	1.523	0.66
5769	4.00	52,779	1.212	117,686	2.702	3.71
5770	5.00	55,690	1.278	171,921	3.947	5.32
5771	6.00	58,660	1.347	229,096	5.259	24.83
5772	7.00	61,704	1.417	289,278	6.641	37.05
5773	8.00	64,811	1.488	352,535	8.093	40.02
5774	9.00	67,980	1.561	418,931	9.617	42.78
5775	10.00	71,215	1.635	488,528	11.215	45.38

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).

Design Procedure Form: Extended Detention Basin (EDB)

UD-BMP (Version 3.07, March 2018)

Designer:	**Richard Schindler**
Company:	**Core Engineering Group**
Date:	**May 4, 2020**
Project:	**The Hills at Lorson Ranch**
Location:	**Pond C4**

1. Basin Storage Volume

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

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

C) Contributing Watershed Area — Area = 81.000 ac

D) For Watersheds Outside of the Denver Region, Depth of Average Runoff Producing Storm — d_6 = 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}= 1.488 ac-ft

G) For Watersheds Outside of the Denver Region, Water Quality Capture Volume (WQCV) Design Volume ($V_{WQCV\ OTHER} = (d_6*(V_{DESIGN}/0.43))$) — $V_{DESIGN\ OTHER}$= 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 = %
- ii) Percentage of Watershed consisting of Type B Soils — HSG_B = %
- iii) Percentage of Watershed consisting of Type C/D Soils — $HSG_{C/D}$ = %

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

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 = 3.00 ft / ft

DIFFICULT TO MAINTAIN, INCREASE WHERE POSSIBLE

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} = 0.045 ac-ft

B) Actual Forebay Volume — V_F = 0.050 ac-ft

C) Forebay Depth (D_F = 30 inch maximum) — D_F = 24.0 in

D) Forebay Discharge

i) Undetained 100-year Peak Discharge — Q_{100} = 277.00 cfs

ii) Forebay Discharge Design Flow ($Q_F = 0.02 * Q_{100}$) — Q_F = 5.54 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 = 11.9 in

Design Procedure Form: Extended Detention Basin (EDB)

Designer:	**Richard Schindler**
Company:	**Core Engineering Group**
Date:	**May 4, 2020**
Project:	**The Hills at Lorson Ranch**
Location:	**Pond C4**

6. Trickle Channel	
A) Type of Trickle Channel	Choose One: (●) Concrete ( ) Soft Bottom
F) Slope of Trickle Channel	S = 0.0050 ft / ft
7. Micropool and Outlet Structure	
A) Depth of Micropool (2.5-feet minimum)	D_M = 2.5 ft
B) Surface Area of Micropool (10 ft^2 minimum)	A_M = 50 sq ft
C) Outlet Type	Choose One: (●) Orifice Plate ( ) Other (Describe):
D) Smallest Dimension of Orifice Opening Based on Hydrograph Routing (Use UD-Detention)	$D_{orifice}$ = 2.16 inches
E) Total Outlet Area	A_{ot} = 14.04 square inches
8. Initial Surcharge Volume	
A) Depth of Initial Surcharge Volume (Minimum recommended depth is 4 inches)	D_{IS} = 4 in
B) Minimum Initial Surcharge Volume (Minimum volume of 0.3% of the WQCV)	V_{IS} = 194 cu ft
C) Initial Surcharge Provided Above Micropool	V_s= 16.7 cu ft
9. Trash Rack	
A) Water Quality Screen Open Area: $A_t = A_{ot} * 38.5*(e^{-0.095D})$	A_t = 440 square inches
B) Type of Screen (If specifying an alternative to the materials recommended in the USDCM, indicate "other" and enter the ratio of the total open are to the total screen are for the material specified.)	*Other (Please describe below)* wellscreen stainless
Other (Y/N): y	
C) Ratio of Total Open Area to Total Area (only for type 'Other')	User Ratio = 0.6
D) Total Water Quality Screen Area (based on screen type)	A_{total} = 734 sq. in. **Based on type 'Other' screen ratio**
E) Depth of Design Volume (EURV or WQCV) (Based on design concept chosen under 1E)	H= 2.97 feet
F) Height of Water Quality Screen (H_{TR})	H_{TR}= 63.64 inches
G) Width of Water Quality Screen Opening ($W_{opening}$) (Minimum of 12 inches is recommended)	$W_{opening}$ = 12.0 inches **VALUE LESS THAN RECOMMENDED MIN. WIDTH. WIDTH HAS BEEN SET TO 12 INCHES.**

Channel Report

Hydraflow Express by Intelisolve | Monday, May 4 2020, 6:54 AM

pond C4 low flow channel (2 x forebay release = 11.08cfs)

Rectangular

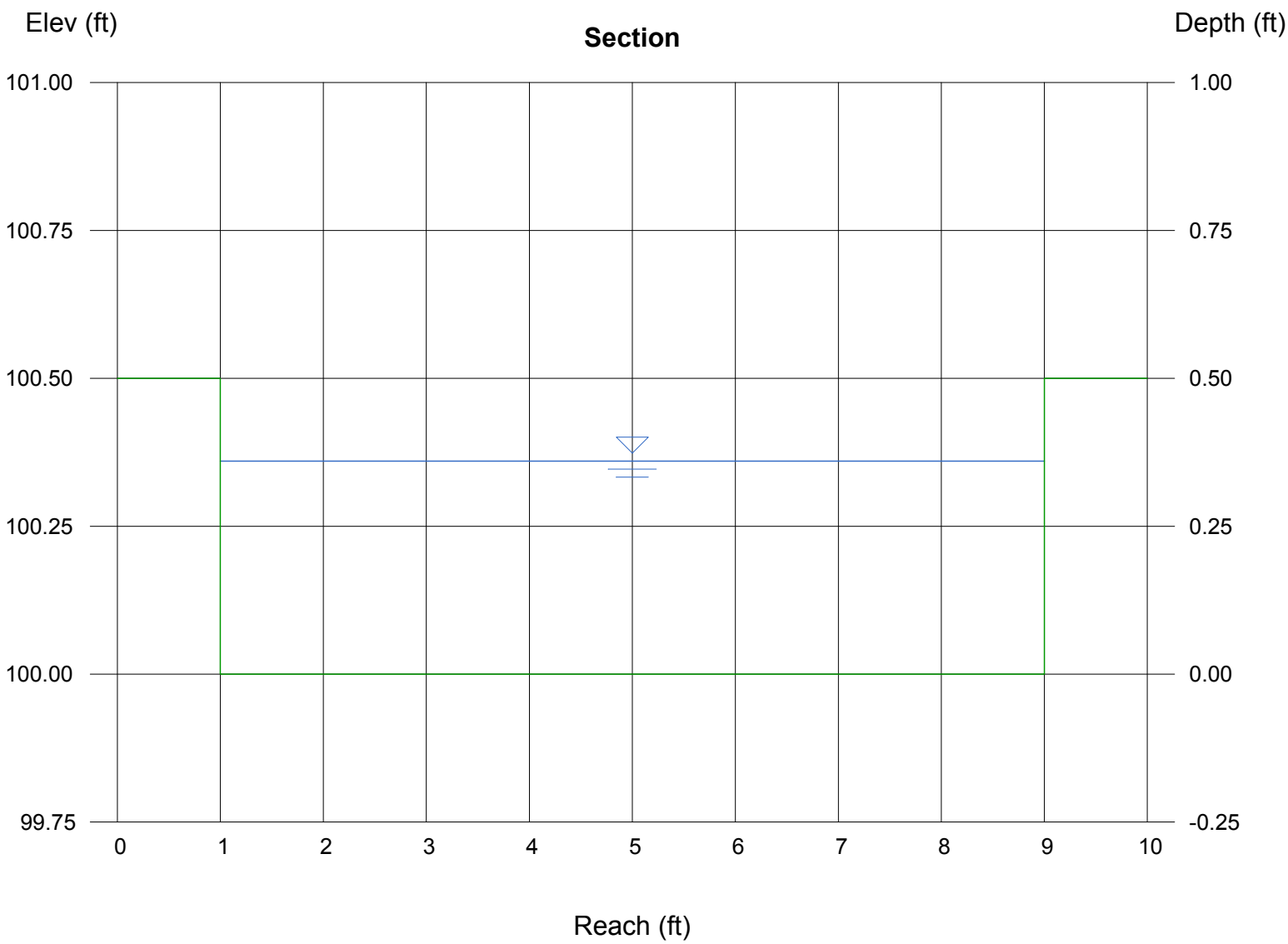
Botom Width (ft)	=	8.00
Total Depth (ft)	=	0.50
Invert Elev (ft)	=	100.00
Slope (%)	=	0.50
N-Value	=	0.013

Calculations

Compute by:		Known Q
Known Q (cfs)	=	11.08

Highlighted

Depth (ft)	=	0.36
Q (cfs)	=	11.08
Area (sqft)	=	2.88
Velocity (ft/s)	=	3.85
Wetted Perim (ft)	=	8.72
Crit Depth, Yc (ft)	=	0.40
Top Width (ft)	=	8.00
EGL (ft)	=	0.59



Weir Report

Hydraflow Express by Intelisolve | Monday, May 4 2020, 6:49 AM

Pond C4 forebay overflow

Rectangular Weir

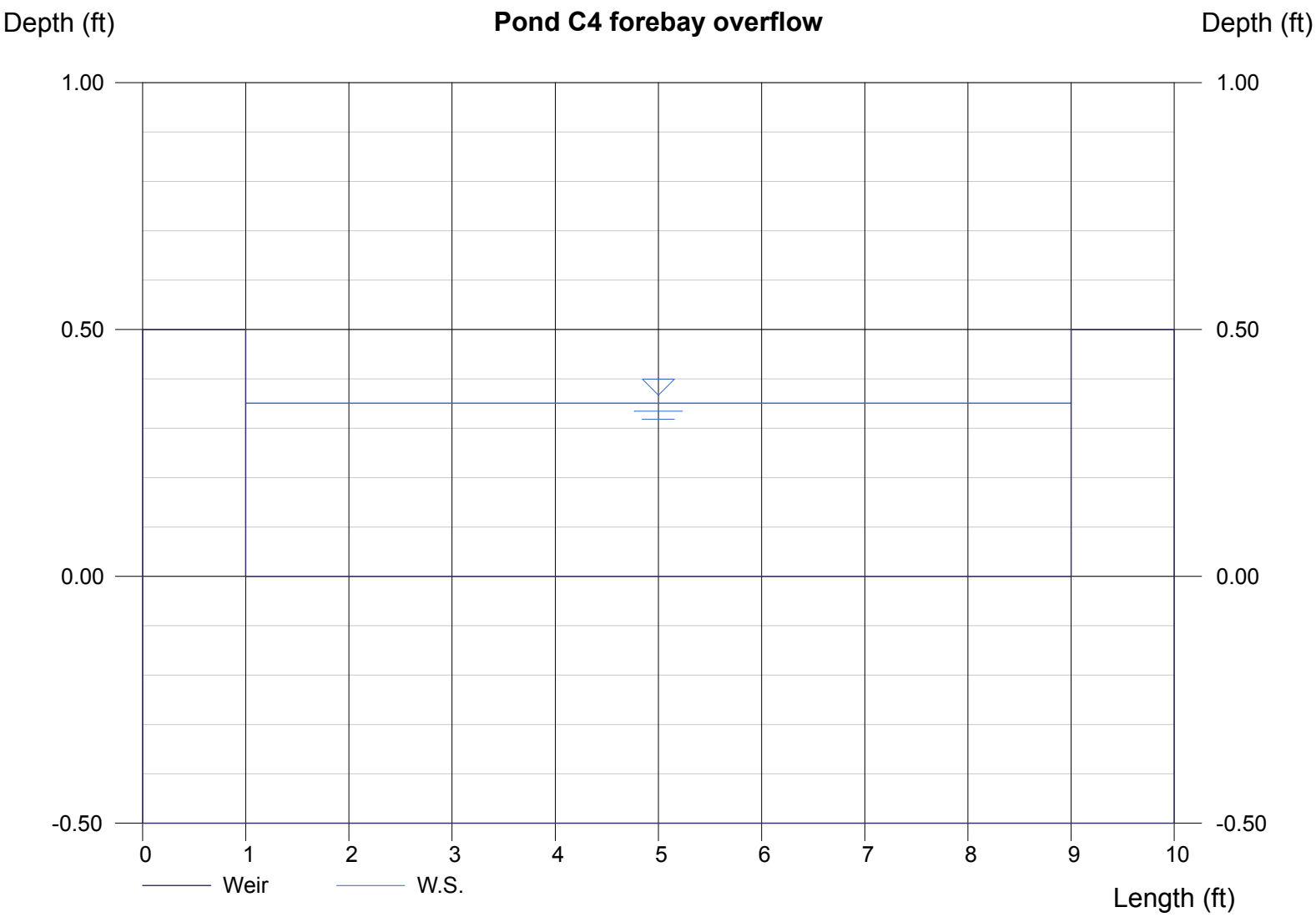
Crest	=	Sharp
Bottom Length (ft)	=	8.00
Total Depth (ft)	=	0.50

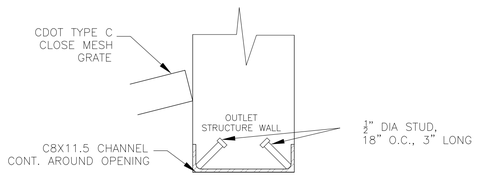
Calculations

Weir Coeff. Cw	=	3.33
Compute by:		Known Q
Known Q (cfs)	=	5.54

Highlighted

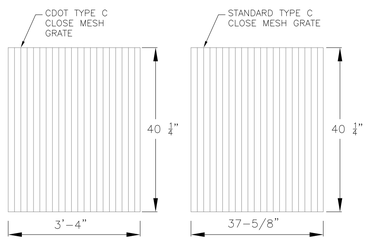
Depth (ft)	=	0.35
Q (cfs)	=	5.540
Area (sqft)	=	2.81
Velocity (ft/s)	=	1.97
Top Width (ft)	=	8.00





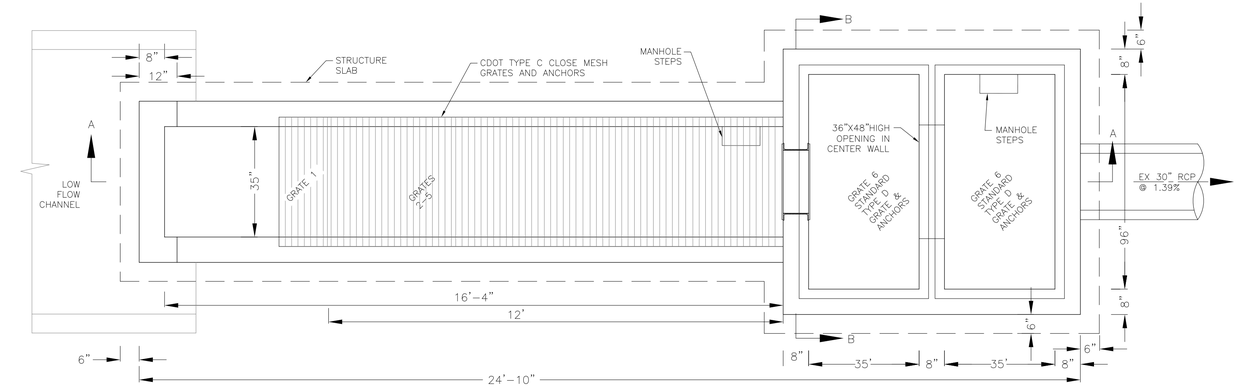
DETAIL A
NO SCALE

NOTE:
AFTER CONCRETE STRUCTURE HAS BEEN POURED ALL GRATE DIMENSIONS SHALL BE FIELD VERIFIED PRIOR TO GRATE CONSTRUCTION

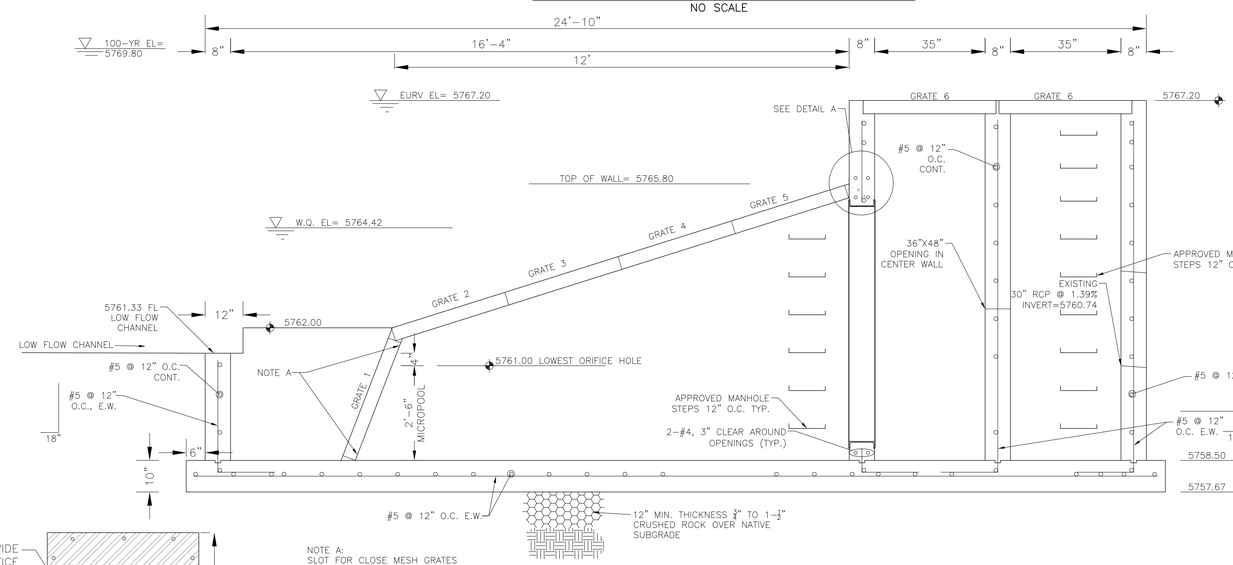


GRATE 1
NO SCALE

GRATES 2,3,4,5
NO SCALE

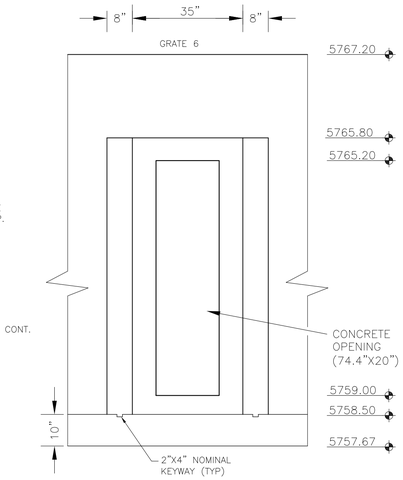


OUTLET STRUCTURE DETAIL – PLAN VIEW
NO SCALE

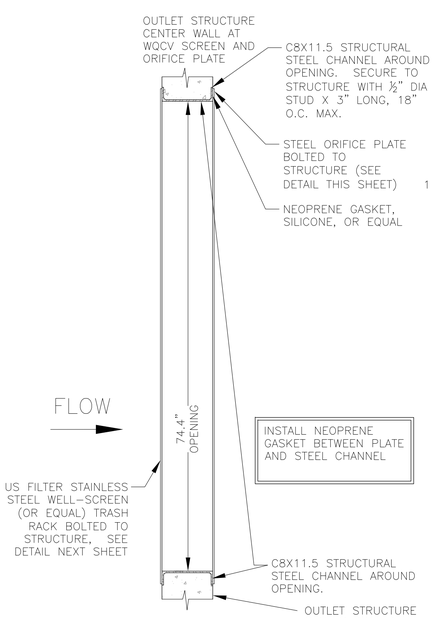


NOTE A:
SLOT FOR CLOSE MESH GRATES

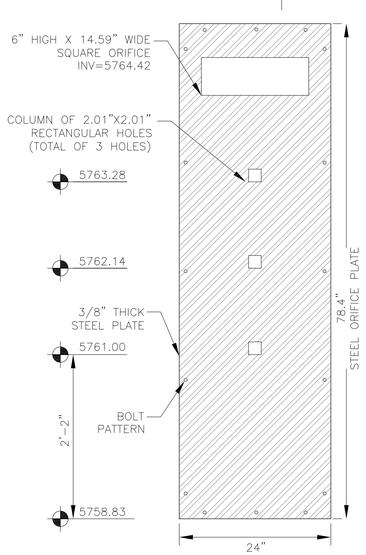
OUTLET STRUCTURE DETAIL – SECTION A–A
NO SCALE



OUTLET STRUCTURE DETAIL – SECTION B–B
NO SCALE



TRASH RACK DETAIL
NO SCALE



ORIFICE PLATE DETAIL
NO SCALE

OUTLET STRUCTURE, FOREBAY, AND DRAIN CHANNEL NOTES:

1. PRIOR TO CONSTRUCTION, CONTRACTOR SHALL PROVIDE SHOP DRAWINGS FOR ALL COMPONENTS OF THE OUTLET STRUCTURE.
2. GRADE 60 REINFORCING STEEL REQUIRED. SEE TABLE FOR THE MINIMUM LAP SPLICE LENGTH FOR REINFORCING BARS. ALL REINFORCING STEEL SHALL HAVE A TWO-INCH MINIMUM CLEARANCE FROM EDGE OF CONCRETE, UNLESS OTHERWISE NOTED.

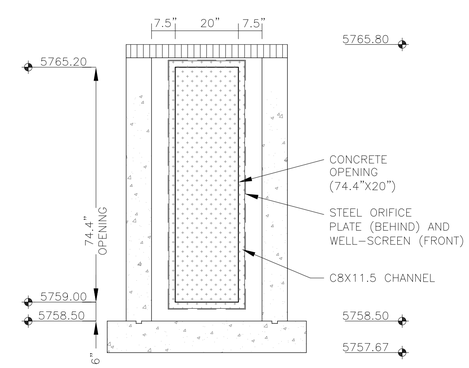
BAR SIZE	#4	#5	#6
MIN. SPLICE LENGTH	1'-3"	1'-7"	2'-0"

3. CONCRETE FOR THE OUTLET STRUCTURE AND FOREBAY SHALL BE CDOT CLASS D CONCRETE.
4. CONCRETE FOR DRAIN CHANNELS SHALL BE CDOT CLASS B CONCRETE
5. EXPANSION JOINT MATERIAL SHALL MEET AASHTO SPECIFICATION M-213. EXPANSION JOINT MATERIAL SHALL BE ½" THICK, SHALL EXTEND THE FULL DEPTH OF CONTACT SURFACE AND THE JOINT SHALL BE SEALED, REFER TO DETAILS.
6. ALL EXPOSED CONCRETE CORNERS SHALL HAVE A 3/8"x3/8" CHAMFER UNLESS OTHERWISE NOTED.
7. SUBGRADE TO BE 12" THICK CLEAN FILL COMPACTED TO 95% STANDARD PROCTOR DENSITY PER ASTM M698 UNDER STRUCTURE.
8. REFER TO POND DETAILS FOR PRESEDIMENTATION/FOREBAY DESIGN.
9. ENGINEER SHALL BE NOTIFIED PRIOR TO BEGINNING CONSTRUCITON OF OUTLET STRUCTURE TO SCHEDULE OBSERVATION VISITS FOR STRUCTURES.

WQCV WELL-SCREEN NOTES:

1. Well-Screen shall be stainless steel and attached by stainless steel bolts along edge of the mounting frame.

2. WQCV Well Screen
- Type of Screen: Stainless steel #93 Vee Wire (Johnson Vee Wire (tm) Stainless Steel Screen or equivalent with 60% open area)
- Screen slot opening dimension: 0.139" (Screen #93 Vee Wire Slot Opening)
- Type and Size of Support Rod: TE 0.074"X0.50"
- Spacing of Support Rod (O.C.): 1.0 Inch
- Total Screen Thickness: 0.655"
- Carbon Steel Holding Frame Type: 3/4" x 1.0" angle



OUTLET STRUCTURE DETAIL – SECTION B–B
NO SCALE

CORE ENGINEERING GROUP
15004 1ST AVENUE S.
BURNSVILLE, MN 55306
PH: 719.570.1100
CONTACT: RICHARD L. SCHINDLER, P.E.
EMAIL: Rich@ceg1.com

NO.	DESCRIPTION	DATE

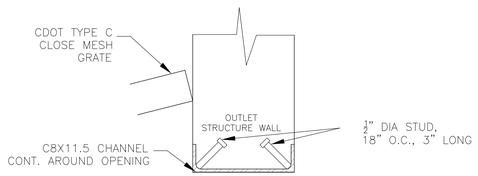
PREPARED FOR:
LORSON, LLC
212 N. WAHSATCH AVE, SUITE 301
COLORADO SPRINGS, COLORADO 80903
(719) 635-3200
CONTACT: JEFF MARK

PROJECT:
THE RIDGE AT LORSON RANCH
FONTAINE BLVD – WALLEYE DR
COLORADO SPRINGS, COLORADO

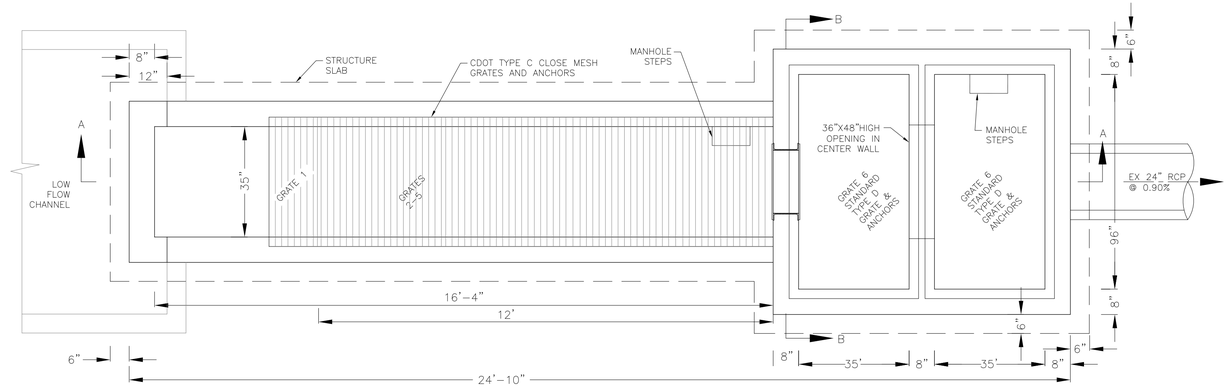
DRAWN: RLS
DESIGNED: RLS
CHECKED: RLS

POND C2.1
FULL SPECTRUM
OUTLET STRUCTURE DETAILS

DATE: MARCH 26, 2021
PROJECT NO. 100.064
SHEET NUMBER C9.2
TOTAL SHEETS: X



DETAIL A
NO SCALE



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NO SCALE

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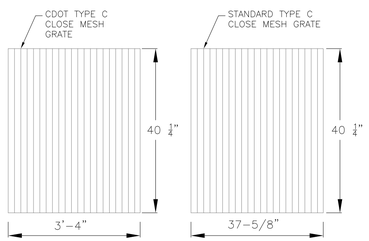

GRATE 1
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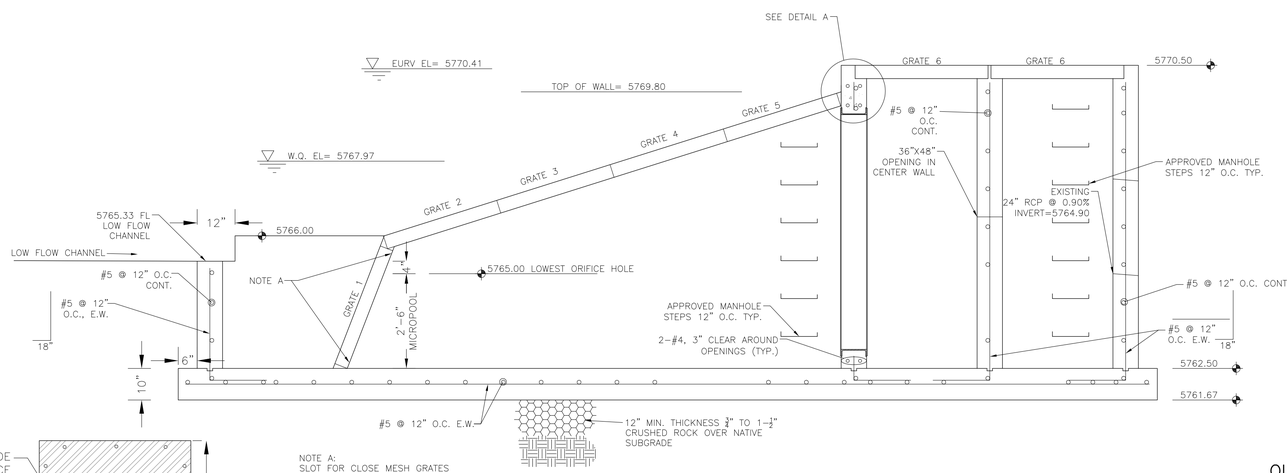
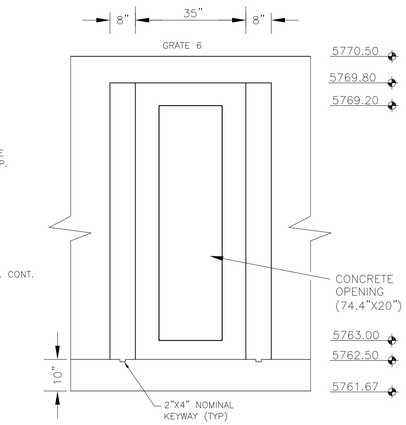
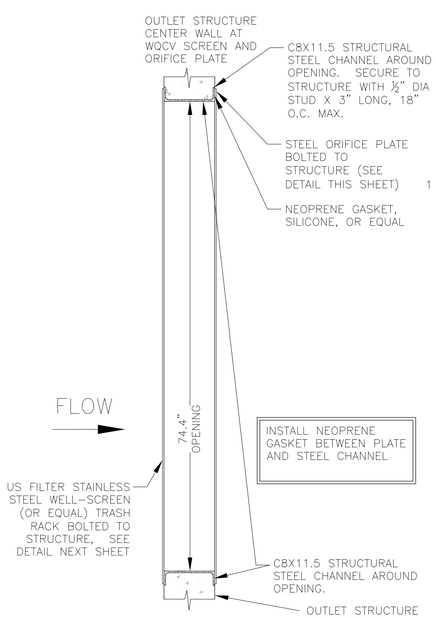


NOTE A:
SLOT FOR CLOSE MESH GRATES

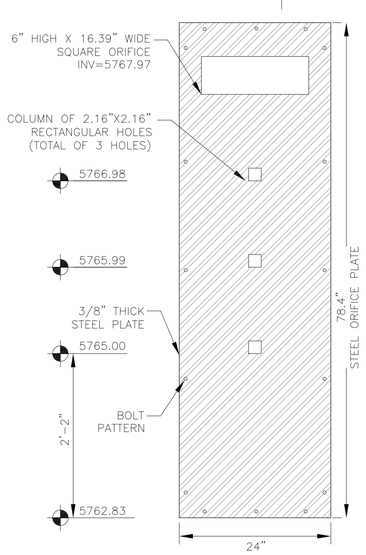
OUTLET STRUCTURE DETAIL – SECTION A–A
NO SCALE



OUTLET STRUCTURE DETAIL – SECTION B–B
NO SCALE



TRASH RACK DETAIL
NO SCALE



ORIFICE PLATE DETAIL
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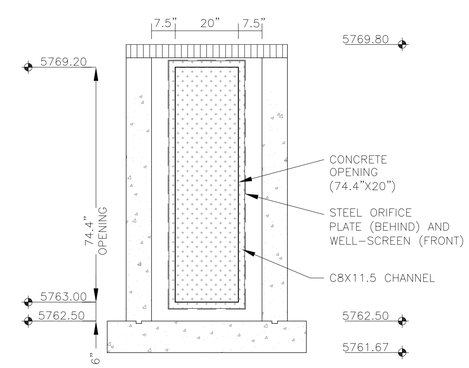
- Spacing of Support Rod (O.C.): 1.0 Inch
- Total Screen Thickness: 0.655"
- Carbon Steel Holding Frame Type: 3/4" x 1.0" angle



OUTLET STRUCTURE DETAIL – SECTION B–B
NO SCALE

CORE ENGINEERING GROUP
15004 1ST AVENUE S.
BURNSVILLE, MN 55306
PH: 719.570.1100
CONTACT: RICHARD L. SCHINDLER, P.E.
EMAIL: Rich@ceg1.com

NO.	DESCRIPTION	DATE

PREPARED FOR:
LORSON, LLC
212 N. WAHSATCH AVE, SUITE 301
COLORADO SPRINGS, COLORADO 80903
(719) 635-3200
CONTACT: JEFF MARK

PROJECT:
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FONTAINE BLVD – WALLEYE DR
COLORADO SPRINGS, COLORADO

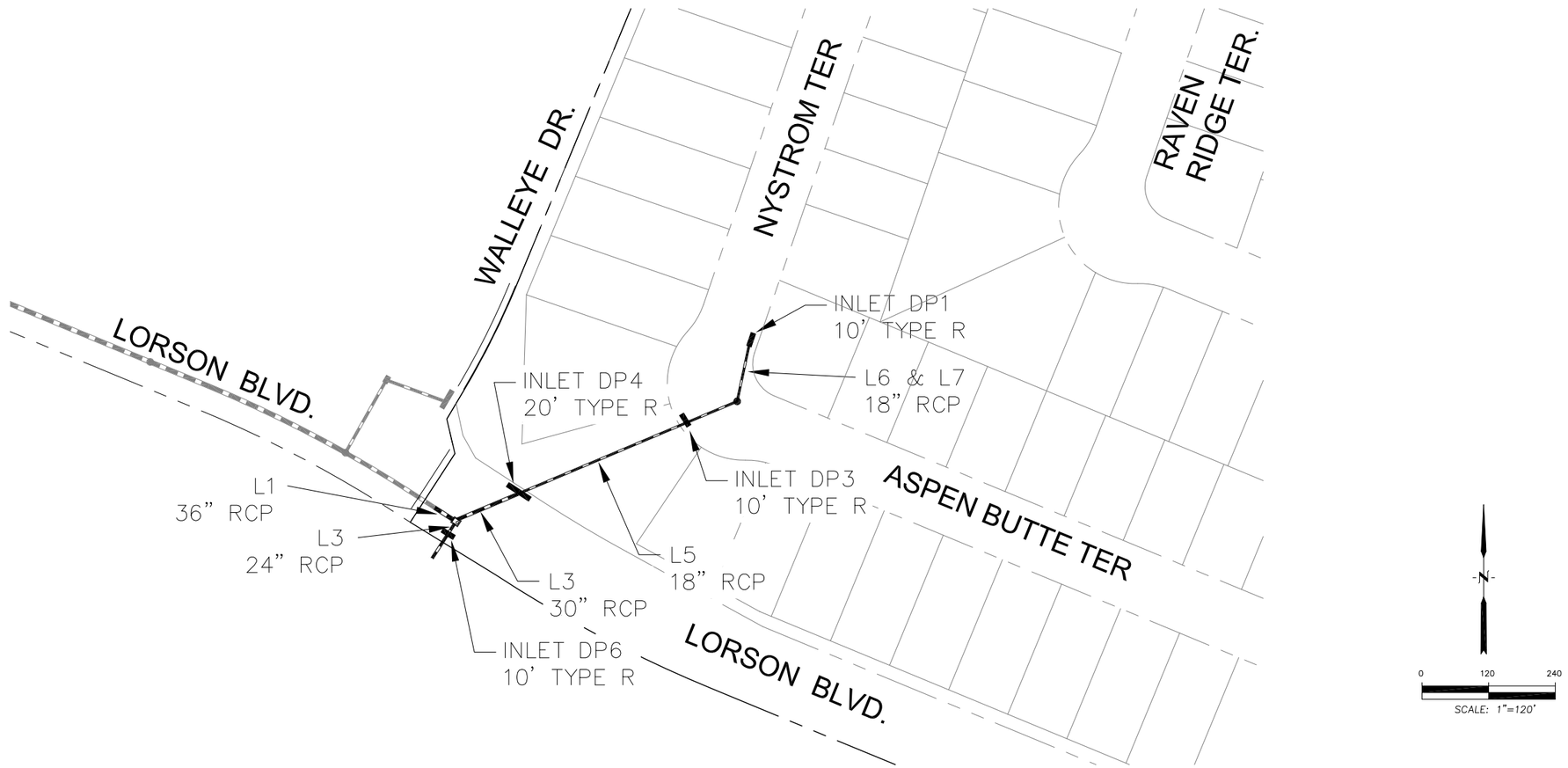
DRAWN: RLS
DESIGNED: RLS
CHECKED: RLS

POND C4
FULL SPECTRUM
OUTLET STRUCTURE DETAILS

DATE: MARCH 26, 2021
PROJECT NO. 100.064
SHEET NUMBER C9.3
TOTAL SHEETS: X

APPENDIX E– STORM SEWER SCHEMATIC AND HYDRAFLOW STORM SEWER CALCS

BASINS C1 STORM SCHEMATIC



CORE ENGINEERING GROUP
15004 1ST AVE. S.
BURNSVILLE, MN 55306
PH: 763.231.1100
CONTACT: RICHARD L. SCHINDLER, P.E.
EMAIL: Rich@ceg1.com

NO.	DESCRIPTION	DATE

PREPARED FOR:
LORSON, LLC
212 N. WAHSATCH AVE., SUITE 301
COLORADO SPRINGS, COLORADO 80903
(719) 635-3200
CONTACT: JEFF MARK

PROJECT:
THE RIDGE AT LORSON RANCH
FONTAINE BLVD – WALLEYE DR
EL PASO COUNTY, COLORADO

DRAWN: RLS
DESIGNED: LAB
CHECKED: LAB

STORM SEWER SCHEMATIC
BASINS C1
THE RIDGE AT LORSON RANCH

DATE
MARCH, 2021

PROJECT NO.
100.064

SHEET NUMBER
1

TOTAL SHEETS: 1

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line size (in)	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line slope (%)	HGL down (ft)	HGL up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns line No.
1	1	36.80	36 c	20.5	5798.38	5798.69	1.509	5800.33	5800.62	0.91	5800.62	End
2	2	15.00	24 c	8.0	5799.69	5799.81	1.525	5801.18	5801.18	n/a	5801.18	1
3	3	12.00	24 c	25.2	5799.91	5800.16	0.992	5801.62	5801.58	0.39	5801.97	2
4	4	21.80	30 c	51.4	5799.19	5799.70	0.993	5801.23	5801.26	n/a	5801.26 j	1
5	5	8.30	18 c	149.1	5800.70	5811.21	7.049	5801.63	5812.31	n/a	5812.31	4
6	6	5.60	18 c	39.8	5811.71	5812.09	0.953	5812.71	5812.99	n/a	5812.99 j	5
7	7	5.60	18 c	46.3	5812.49	5812.95	0.993	5813.27	5813.86	0.39	5814.25	6

C1 basins 5yr storm | Number of lines: 7 | Run Date: 03-18-2021

NOTES: c = cir; e = ellip; b = box; Return period = 5 Yrs. ; j - Line contains hyd. jump.

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line size (in)	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line slope (%)	HGL down (ft)	HGL up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns line No.
1	1	65.80	36 c	20.5	5798.38	5798.69	1.509	5801.00	5801.29	1.59	5801.29	End
2	2	25.70	24 c	8.0	5799.69	5799.81	1.512	5801.84*	5801.94*	0.52	5802.46	1
3	3	20.00	24 c	25.2	5800.00	5800.25	0.992	5802.87*	5803.07*	0.63	5803.70	2
4	4	40.10	30 c	51.4	5799.19	5799.70	0.993	5801.84*	5802.33*	0.52	5802.85	1
5	5	18.10	18 c	149.1	5801.20	5811.71	7.049	5802.85	5813.16	n/a	5813.16 j	4
6	6	12.20	18 c	39.8	5811.71	5812.11	1.001	5814.08*	5814.62*	0.64	5815.26	5
7	7	12.20	18 c	46.3	5812.49	5812.96	1.014	5815.26*	5815.89*	0.74	5816.63	6

C1 basins 100yr storm | Number of lines: 7 | Run Date: 03-18-2021

NOTES: c = cir; e = ellip; b = box; Return period = 100 Yrs. ; *Surcharged (HGL above crown). ; j - Line contains hyd. jump.

BASINS C3 STORM SCHEMATIC

CORE
ENGINEERING GROUP
15004 1ST AVE. S.
BURNSVILLE, MN
PH: 763.477.3100 55306
CONTACT: RICHARD L. SCHINDLER, P.E.
EMAIL: Rich@ceg1.com

NO.	DESCRIPTION	DATE

PREPARED FOR:
LORSON, LLC
212 N. WAHSATCH AVE., SUITE 301
COLORADO SPRINGS, COLORADO 80903
(719) 635-3200
CONTACT: JEFF MARK

PROJECT:
THE RIDGE AT LORSON RANCH
FONTAINE BLVD – WALLEYE DR
EL PASO COUNTY, COLORADO

DRAWN: RLS
DESIGNED: LAB
CHECKED: LAB

STORM SEWER SCHEMATIC
BASINS C3
THE RIDGE AT LORSON RANCH

DATE
MARCH, 2021

PROJECT NO.
100.064

SHEET NUMBER
1

TOTAL SHEETS: 1

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line size (in)	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line slope (%)	HGL down (ft)	HGL up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns line No.
1	1	115.0	54 c	38.4	5775.60	5776.70	2.869	5779.89	5779.78	1.53	5779.78	End
2	2	89.80	48 c	183.5	5777.70	5780.82	1.700	5780.51	5783.62	n/a	5783.62	1
3	3	89.80	48 c	307.6	5781.12	5790.01	2.890	5784.25	5792.81	n/a	5792.81	2
4	4	89.80	48 c	110.3	5790.30	5791.62	1.197	5793.44	5794.42	n/a	5794.42	3
5	5	80.60	48 c	102.4	5791.82	5793.05	1.201	5795.20	5795.71	n/a	5795.71	4
6	6	73.40	48 c	142.7	5793.05	5794.76	1.198	5796.46	5797.29	0.12	5797.29	5
7	7	65.00	42 c	104.4	5795.36	5796.61	1.197	5797.77	5799.08	n/a	5799.08	6
8	8	57.80	42 c	141.7	5796.92	5801.92	3.530	5799.77	5804.25	0.22	5804.25	7
9	9	49.40	36 c	135.8	5802.38	5805.38	2.209	5804.61	5807.62	n/a	5807.62	8
10	10	43.80	36 c	98.2	5805.58	5809.02	3.502	5808.21	5811.13	n/a	5811.13 j	9
11	11	33.50	36 c	57.5	5809.32	5810.48	2.016	5811.84	5812.33	n/a	5812.33 j	10
12	12	33.50	36 c	66.7	5810.69	5812.02	1.996	5812.82	5813.87	n/a	5813.87 j	11
13	13	33.50	36 c	35.9	5812.02	5812.74	2.005	5814.36	5814.59	n/a	5814.59 j	12
14	14	26.00	30 c	165.8	5813.24	5817.72	2.702	5814.99	5819.42	n/a	5819.42 j	13
15	15	17.60	24 c	245.7	5818.20	5822.14	1.604	5819.76	5823.63	n/a	5823.63 j	14
16	16	9.30	18 c	245.6	5822.64	5830.50	3.201	5823.96	5831.66	n/a	5831.66 j	15
17	17	9.20	18 c	7.9	5794.12	5794.44	4.057	5795.42	5795.60	n/a	5795.60	4
18	18	7.20	18 c	27.3	5795.76	5796.03	0.990	5796.73	5797.05	0.20	5797.05	5
19	19	8.40	18 c	8.0	5797.26	5797.58	4.003	5798.13	5798.69	0.56	5798.69	6
20	20	7.20	18 c	27.3	5798.78	5799.05	0.991	5800.07	5800.08	n/a	5800.27 j	7
21	21	8.40	18 c	8.0	5803.88	5804.20	4.020	5805.02	5805.31	0.00	5805.31	8
22	22	10.30	18 c	7.4	5810.82	5811.52	9.416	5811.66	5812.75	0.34	5813.09	10
23	23	7.50	18 c	7.5	5814.24	5814.54	4.004	5815.14	5815.59	0.51	5815.59	13
24	24	8.40	18 c	7.6	5818.70	5818.78	1.046	5819.90	5819.89	0.56	5820.45	14
25	25	8.30	18 c	10.1	5822.64	5822.74	0.996	5823.84	5823.84	0.55	5824.40	15
26	26	5.60	18 c	28.0	5807.28	5807.54	0.933	5808.65	5808.65	0.02	5808.68	9
27	27	7.00	24 c	17.8	5779.20	5779.94	4.149	5781.08	5780.88	0.14	5781.03	1
28	28	18.20	30 c	64.4	5778.80	5779.44	0.994	5781.10	5781.02	0.10	5781.12	1
29	29	18.20	30 c	172.1	5780.00	5786.88	3.997	5781.38	5788.31	n/a	5788.31	28
30	30	9.70	18 c	123.9	5787.88	5791.52	2.939	5788.66	5792.71	0.26	5792.71	29
31	31	8.50	24 c	15.9	5787.98	5788.30	2.005	5788.81	5789.33	0.17	5789.33	29

C3 basins 5yr storm | Number of lines: 31 | Run Date: 03-18-2021

NOTES: c = cir; e = ellip; b = box; Return period = 5 Yrs. ; j - Line contains hyd. jump.

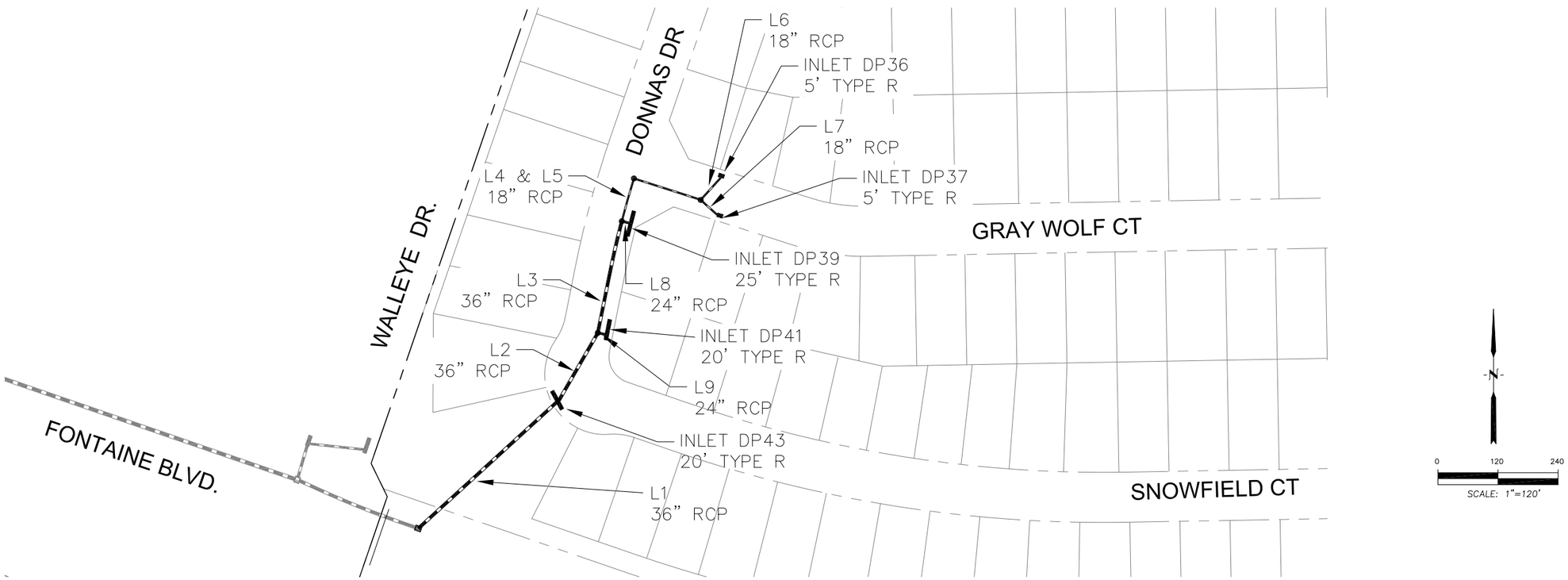
Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line size (in)	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line slope (%)	HGL down (ft)	HGL up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns line No.
1	1	225.4	54 c	38.4	5775.60	5776.70	2.869	5779.89	5780.88	n/a	5780.88	End
2	2	153.9	48 c	183.5	5777.70	5780.82	1.700	5781.88	5784.45	0.38	5784.45	1
3	3	153.9	48 c	307.6	5781.12	5790.01	2.890	5784.68	5793.64	1.28	5793.64	2
4	4	153.9	48 c	110.3	5790.30	5791.62	1.197	5793.87	5795.25	0.26	5795.25	3
5	5	133.4	48 c	102.4	5791.82	5793.05	1.201	5796.06	5796.78	0.19	5796.97	4
6	6	132.7	48 c	142.7	5793.05	5794.76	1.198	5797.09	5798.21	n/a	5798.21	5
7	7	118.6	42 c	104.4	5795.36	5796.61	1.197	5798.86*	5800.31*	0.24	5800.55	6
8	8	115.5	42 c	141.7	5796.92	5801.92	3.530	5800.67	5805.14	n/a	5805.14	7
9	9	99.20	36 c	135.8	5802.38	5805.38	2.209	5805.14	5808.28	0.63	5808.28	8
10	10	88.50	36 c	98.2	5805.58	5809.02	3.502	5808.97	5811.86	0.76	5811.86	9
11	11	67.30	36 c	57.5	5809.32	5810.48	2.016	5812.99*	5813.58*	1.41	5814.99	10
12	12	67.30	36 c	66.7	5810.69	5812.02	1.996	5814.99*	5815.67*	0.21	5815.88	11
13	13	67.30	36 c	35.9	5812.02	5812.74	2.005	5815.88*	5816.24*	0.70	5816.95	12
14	14	46.90	30 c	165.8	5813.24	5817.72	2.702	5816.95	5819.98	n/a	5819.98	13
15	15	30.40	24 c	245.7	5818.20	5822.14	1.604	5820.09	5824.12	0.73	5824.85	14
16	16	14.80	18 c	245.6	5822.64	5830.50	3.201	5825.22	5831.90	n/a	5831.90 j	15
17	17	20.50	18 c	7.9	5794.12	5794.44	4.057	5795.72*	5796.02*	2.09	5798.12	4
18	18	11.30	18 c	27.3	5795.76	5796.03	0.990	5798.19*	5798.51*	0.25	5798.76	5
19	19	20.70	18 c	8.0	5797.26	5797.58	4.003	5798.47*	5799.51*	2.13	5801.64	6
20	20	13.10	18 c	27.3	5798.78	5799.05	0.991	5802.06*	5802.48*	0.34	5802.82	7
21	21	16.30	18 c	8.0	5803.88	5804.20	4.020	5806.24*	5806.43*	0.00	5806.43	8
22	22	21.20	18 c	7.4	5810.82	5811.12	4.033	5812.16*	5812.72*	2.24	5814.96	10
23	23	20.40	18 c	7.5	5814.24	5814.54	4.004	5816.95*	5817.23*	2.07	5819.30	13
24	24	16.50	18 c	7.6	5818.70	5818.78	1.046	5820.20*	5820.39*	1.36	5821.74	14
25	25	15.60	18 c	10.1	5822.64	5822.74	0.996	5825.10*	5825.32*	1.21	5826.53	15
26	26	10.70	18 c	28.0	5806.88	5807.14	0.929	5810.84*	5811.13*	0.06	5811.18	9
27	27	28.70	24 c	17.8	5779.20	5779.94	4.149	5782.91*	5783.20*	0.52	5783.72	1
28	28	42.80	30 c	64.4	5778.80	5779.44	0.994	5783.03*	5783.73*	0.24	5783.97	1
29	29	42.80	30 c	172.1	5780.00	5786.88	3.997	5783.97	5789.07	0.14	5789.07	28
30	30	15.30	18 c	123.9	5787.88	5791.52	2.939	5789.27	5792.93	0.49	5792.93	29
31	31	27.50	24 c	15.9	5787.98	5788.30	2.005	5789.41*	5790.54*	0.48	5791.01	29

C3 basins 100yr storm | Number of lines: 31 | Run Date: 03-18-2021

NOTES: c = cir; e = ellip; b = box; Return period = 100 Yrs. ; *Surcharged (HGL above crown). ; j - Line contains hyd. jump.

BASINS C5 STORM SCHEMATIC



CORE ENGINEERING GROUP
15004 1ST AVE. S.
BURNSVILLE, MN 55306
PH: 763.231.1100
CONTACT: RICHARD L. SCHINDLER, P.E.
EMAIL: Rich@ceg1.com

NO.	DESCRIPTION	DATE

PREPARED FOR:
LORSON, LLC
212 N. WAHSATCH AVE., SUITE 301
COLORADO SPRINGS, COLORADO 80903
(719) 635-3200
CONTACT: JEFF MARK

PROJECT:
THE RIDGE AT LORSON RANCH
FONTAINE BLVD – WALLEYE DR
EL PASO COUNTY, COLORADO

DRAWN: RLS
DESIGNED: LAB
CHECKED: LAB

STORM SEWER SCHEMATIC
BASINS C5
THE RIDGE AT LORSON RANCH

DATE
MARCH, 2021

PROJECT NO.
100.064

SHEET NUMBER
1

TOTAL SHEETS: 1

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line size (in)	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line slope (%)	HGL down (ft)	HGL up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns line No.
1		42.30	36 c	190.8	5782.00	5788.40	3.354	5784.83	5790.47	n/a	5790.47 j	End
2		32.30	36 c	77.0	5789.50	5790.37	1.130	5791.17	5792.18	0.80	5792.18	1
3		23.00	36 c	121.5	5790.47	5791.49	0.839	5792.83	5793.02	n/a	5793.02 j	2
4		7.50	18 c	38.1	5793.00	5793.38	0.998	5793.94	5794.43	0.50	5794.93	3
5		7.50	18 c	70.0	5793.58	5794.28	1.000	5795.15	5795.39	0.41	5795.80	4
6		4.10	18 c	30.4	5794.48	5794.82	1.119	5796.14	5796.17	0.09	5796.27	5
7		3.40	18 c	23.5	5794.48	5794.81	1.406	5796.17	5796.19	0.06	5796.25	5
8		15.50	24 c	10.8	5792.50	5792.62	1.109	5793.68	5794.30	0.47	5794.77	3
9		9.30	24 c	14.0	5791.37	5791.65	2.002	5792.86	5792.73	n/a	5792.73 j	2

C5 basins 5yr storm | Number of lines: 9 | Run Date: 03-18-2021

NOTES: c = cir; e = ellip; b = box; Return period = 5 Yrs. ; j - Line contains hyd. jump.

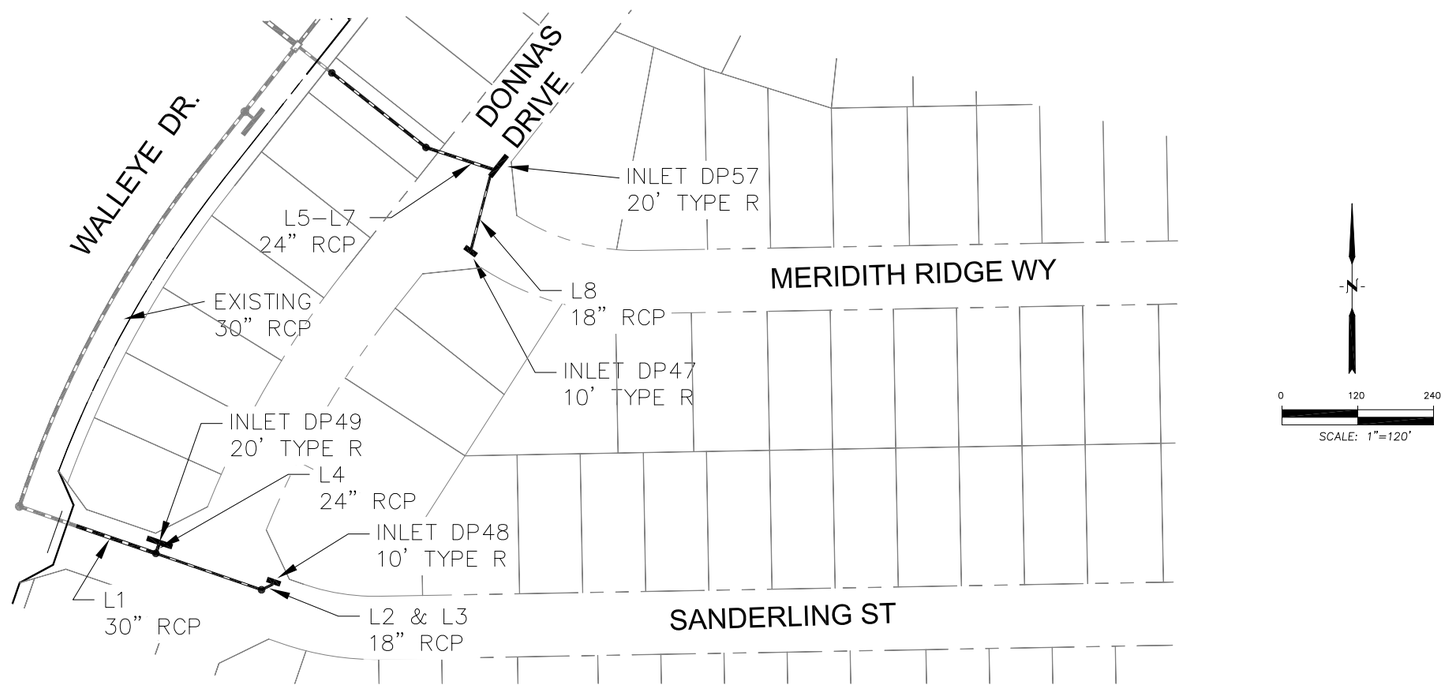
Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line size (in)	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line slope (%)	HGL down (ft)	HGL up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns line No.
1		87.10	36 c	190.8	5782.00	5787.80	3.039	5784.83	5790.63	1.38	5790.63	End
2		62.10	36 c	77.0	5788.70	5790.37	2.169	5791.90	5792.88	n/a	5792.88	1
3		37.00	36 c	121.5	5790.47	5791.44	0.797	5793.75	5794.03	0.50	5794.54	2
4		10.50	18 c	38.1	5793.00	5793.38	0.998	5794.54	5794.87	0.55	5795.42	3
5		10.50	18 c	70.0	5793.58	5794.28	1.000	5795.42*	5796.12*	0.50	5796.63	4
6		5.70	18 c	30.4	5794.48	5794.82	1.119	5797.02*	5797.10*	0.16	5797.27	5
7		4.80	18 c	23.5	5794.48	5794.81	1.406	5797.06*	5797.11*	0.11	5797.23	5
8		26.50	24 c	10.8	5792.50	5792.72	2.034	5794.54	5794.65	1.13	5795.78	3
9		25.10	24 c	14.0	5791.37	5791.65	2.002	5793.39	5793.42	1.13	5794.55	2

C5 basins 100yr storm | Number of lines: 9 | Run Date: 03-18-2021

NOTES: c = cir; e = ellip; b = box; Return period = 100 Yrs. ; *Surcharged (HGL above crown).

BASINS C8.1 & C8.4 STORM SCHEMATIC



CORE ENGINEERING GROUP
15004 1ST AVE. S.
BURNSVILLE, MN 55306
PH: 763.231.1100
CONTACT: RICHARD L. SCHINDLER, P.E.
EMAIL: Rich@ceg1.com

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212 N. WAHSATCH AVE., SUITE 301
COLORADO SPRINGS, COLORADO 80903
(719) 635-3200
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PROJECT:
THE RIDGE AT LORSON RANCH
FONTAINE BLVD – WALLEYE DR
EL PASO COUNTY, COLORADO

DRAWN: RLS
DESIGNED: LAB
CHECKED: LAB

STORM SEWER SCHEMATIC
BASINS C8.1 & C8.4
THE RIDGE AT LORSON RANCH

DATE
MARCH, 2021

PROJECT NO.
100.064

SHEET NUMBER
1

TOTAL SHEETS: 1

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line size (in)	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line slope (%)	HGL down (ft)	HGL up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns line No.
1		11.10	30 c	67.8	5796.22	5796.92	1.032	5798.38	5798.33	0.24	5798.56	End
2		3.40	18 c	70.9	5798.90	5800.32	2.003	5799.39	5801.02	n/a	5801.02	1
3		3.40	18 c	14.9	5800.52	5800.82	2.012	5801.24	5801.52	n/a	5801.52 j	2
4		7.70	24 c	9.5	5798.10	5798.48	3.987	5798.71	5800.16	0.12	5800.27	1
5		17.10	24 c	36.5	5792.52	5793.43	2.492	5794.44	5794.90	n/a	5794.90 j	End
6		17.10	24 c	94.9	5793.88	5801.00	7.504	5795.18	5802.47	0.31	5802.47	5
7		17.10	24 c	55.5	5801.30	5802.13	1.496	5802.75	5803.60	1.12	5803.60	6
8		6.10	18 c	68.5	5803.23	5803.92	1.007	5804.16	5804.86	0.42	5804.86	7

C8.1 basins 5yr storm | Number of lines: 8 | Run Date: 03-18-2021

NOTES: c = cir; e = ellip; b = box; Return period = 5 Yrs. ; j - Line contains hyd. jump.

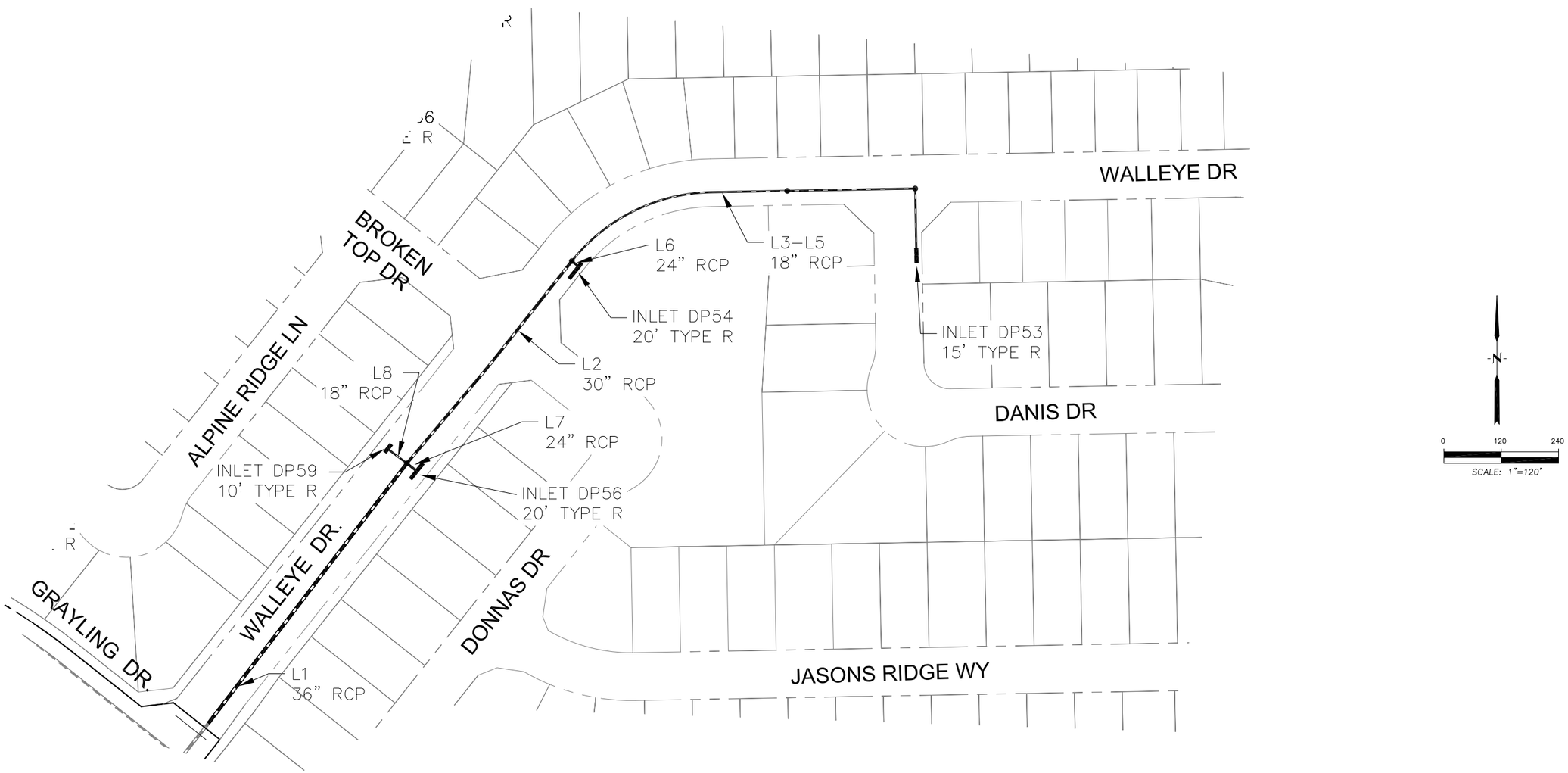
Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line size (in)	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line slope (%)	HGL down (ft)	HGL up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns line No.
1		27.00	30 c	67.8	5796.22	5796.92	1.032	5798.38	5798.66	n/a	5798.66 j	End
2		6.20	18 c	70.9	5798.90	5800.32	2.003	5799.58	5801.27	n/a	5801.27	1
3		6.20	18 c	14.9	5800.52	5800.82	2.012	5801.51	5801.77	n/a	5801.77 j	2
4		20.80	24 c	9.5	5798.40	5798.78	3.997	5799.35*	5801.99*	0.68	5802.67	1
5		28.10	24 c	36.5	5792.52	5793.43	2.492	5794.44	5795.26	n/a	5795.26 j	End
6		28.10	24 c	94.9	5793.88	5801.00	7.504	5795.37	5802.83	0.57	5802.83	5
7		28.10	24 c	55.5	5801.30	5802.13	1.496	5802.97	5804.02	1.95	5805.97	6
8		9.10	18 c	68.5	5803.23	5803.92	1.007	5806.86*	5807.37*	0.41	5807.79	7

C8.1 basins 100yr storm | Number of lines: 8 | Run Date: 03-18-2021

NOTES: c = cir; e = ellip; b = box; Return period = 100 Yrs. ; *Surcharged (HGL above crown). ; j - Line contains hyd. jump.

BASINS C8.3 STORM SCHEMATIC



CORE ENGINEERING GROUP
15004 1ST AVE. S.
BURNSVILLE, MN 55306
PH: 763.231.1100
CONTACT: RICHARD L. SCHINDLER, P.E.
EMAIL: Rich@ceg1.com

NO.	DESCRIPTION	DATE

PREPARED FOR:
LORSON, LLC
212 N. WAHSATCH AVE., SUITE 301
COLORADO SPRINGS, COLORADO 80903
(719) 635-3200
CONTACT: JEFF MARK

PROJECT:
THE RIDGE AT LORSON RANCH
FONTAINE BLVD – WALLEYE DR
EL PASO COUNTY, COLORADO

DRAWN: RLS
DESIGNED: LAB
CHECKED: LAB

STORM SEWER SCHEMATIC
BASINS C8.3
THE RIDGE AT LORSON RANCH

DATE
MARCH, 2021

PROJECT NO.
100.064

SHEET NUMBER
1

TOTAL SHEETS: 1

P:\100\100.064\drainage\100.064-storm schematic.dwg Mar 22, 2021 - 11:12am

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line size (in)	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line slope (%)	HGL down (ft)	HGL up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns line No.
1		32.70	36 c	388.3	5792.00	5797.44	1.401	5794.98	5799.26	n/a	5799.26 j	End
2		21.40	30 c	218.5	5797.94	5800.62	1.227	5799.79	5802.17	n/a	5802.17 j	1
3		9.70	18 c	212.9	5801.62	5809.62	3.758	5802.40	5810.81	0.38	5810.81	2
4		9.70	18 c	213.7	5809.82	5817.64	3.660	5810.99	5818.83	0.65	5818.83	3
5		9.70	18 c	61.5	5817.95	5818.86	1.480	5819.01	5820.05	0.65	5820.05	4
6		11.70	24 c	8.0	5801.50	5801.74	3.003	5802.65	5802.95	n/a	5802.95	2
7		9.00	24 c	9.9	5798.44	5798.64	2.028	5799.96	5799.87	0.31	5800.18	1
8		5.90	18 c	25.1	5798.94	5799.19	0.997	5799.91	5800.12	0.41	5800.12	1

C8.3 basins 5yr storm | Number of lines: 8 | Run Date: 03-18-2021

NOTES: c = cir; e = ellip; b = box; Return period = 5 Yrs. ; j - Line contains hyd. jump.

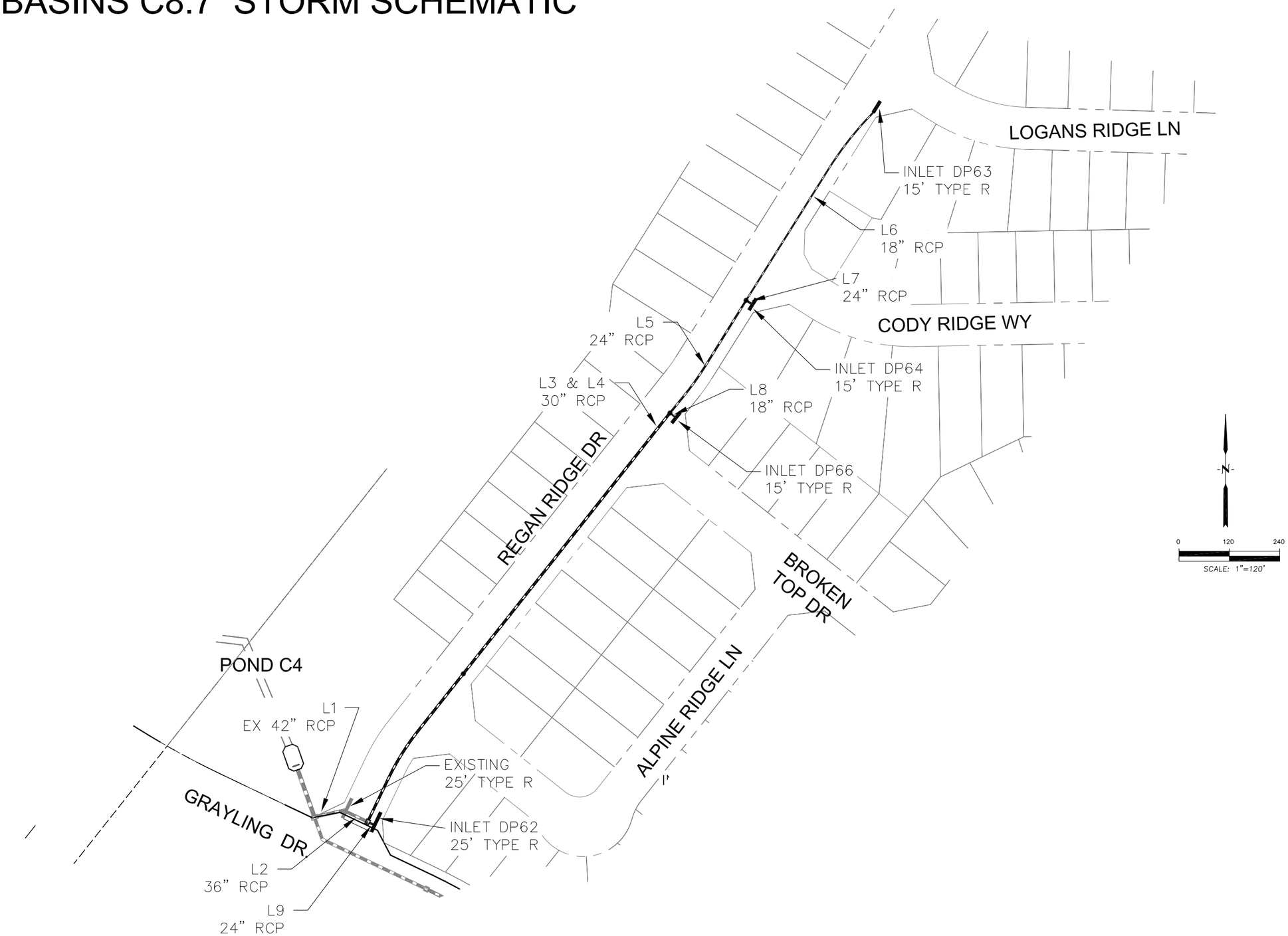
Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line size (in)	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line slope (%)	HGL down (ft)	HGL up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns line No.
1		73.30	36 c	388.3	5792.00	5797.44	1.401	5794.98	5800.15	n/a	5800.15	End
2		40.20	30 c	218.5	5797.94	5800.62	1.227	5800.96	5802.78	1.24	5804.02	1
3		16.20	18 c	212.9	5801.62	5809.62	3.758	5804.02	5811.05	n/a	5811.05 j	2
4		16.20	18 c	213.7	5809.82	5817.64	3.660	5811.10	5819.07	1.35	5819.07	3
5		16.20	18 c	61.5	5817.95	5818.86	1.480	5819.45*	5820.91*	1.31	5822.22	4
6		24.00	24 c	8.0	5801.50	5801.74	3.003	5804.35*	5804.44*	0.91	5805.34	2
7		32.80	24 c	9.9	5798.44	5798.64	2.028	5800.31	5800.55	1.75	5802.30	1
8		8.90	18 c	25.1	5798.94	5799.19	0.997	5801.61*	5801.79*	0.39	5802.18	1

C8.3 basins 100yr storm | Number of lines: 8 | Run Date: 03-18-2021

NOTES: c = cir; e = ellip; b = box; Return period = 100 Yrs. ; *Surcharged (HGL above crown). ; j - Line contains hyd. jump.

BASINS C8.7 STORM SCHEMATIC



CORE ENGINEERING GROUP
15004 1ST AVE. S.
BURNSVILLE, MN 55306
PH: 763.231.1100
CONTACT: RICHARD L. SCHINDLER, P.E.
EMAIL: Rich@ceg1.com

NO.	DESCRIPTION	DATE

PREPARED FOR:
LORSON, LLC
212 N. WAHSATCH AVE., SUITE 301
COLORADO SPRINGS, COLORADO 80903
(719) 635-3200
CONTACT: JEFF MARK

PROJECT:
THE RIDGE AT LORSON RANCH
FONTAINE BLVD - WALLEYE DR
EL PASO COUNTY, COLORADO

DRAWN: RLS
DESIGNED: LAB
CHECKED: LAB

STORM SEWER SCHEMATIC
BASINS C8.7
THE RIDGE AT LORSON RANCH

DATE
MARCH, 2021

PROJECT NO.
100.064

SHEET NUMBER
1

TOTAL SHEETS: 1

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line size (in)	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line slope (%)	HGL down (ft)	HGL up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns line No.
1		34.50	42 c	36.0	5778.08	5779.02	2.611	5781.58	5781.47	0.28	5781.75	End
2		33.00	36 c	31.0	5779.52	5779.89	1.194	5781.77	5781.72	0.33	5781.72	1
3		21.50	30 c	211.2	5780.39	5784.82	2.098	5782.25	5786.37	n/a	5786.37 j	2
4		21.50	30 c	394.6	5785.15	5798.76	3.449	5786.78	5800.31	n/a	5800.31 j	3
5		20.00	24 c	168.5	5799.30	5806.04	3.999	5800.38	5807.62	0.87	5807.62	4
6		10.20	18 c	269.2	5807.50	5816.38	3.298	5808.28	5817.60	0.68	5817.60	5
7		9.80	24 c	11.2	5807.10	5807.32	1.968	5808.35	5808.43	0.47	5808.43	5
8		1.50	18 c	10.7	5799.80	5800.01	1.956	5800.98	5800.97	0.02	5801.00	4
9		14.30	24 c	7.3	5780.39	5780.46	0.955	5782.14	5782.14	0.40	5782.54	2

C8.7 basins 5yr storm | Number of lines: 9 | Run Date: 03-18-2021

NOTES: c = cir; e = ellip; b = box; Return period = 5 Yrs. ; j - Line contains hyd. jump.

Storm Sewer Summary Report

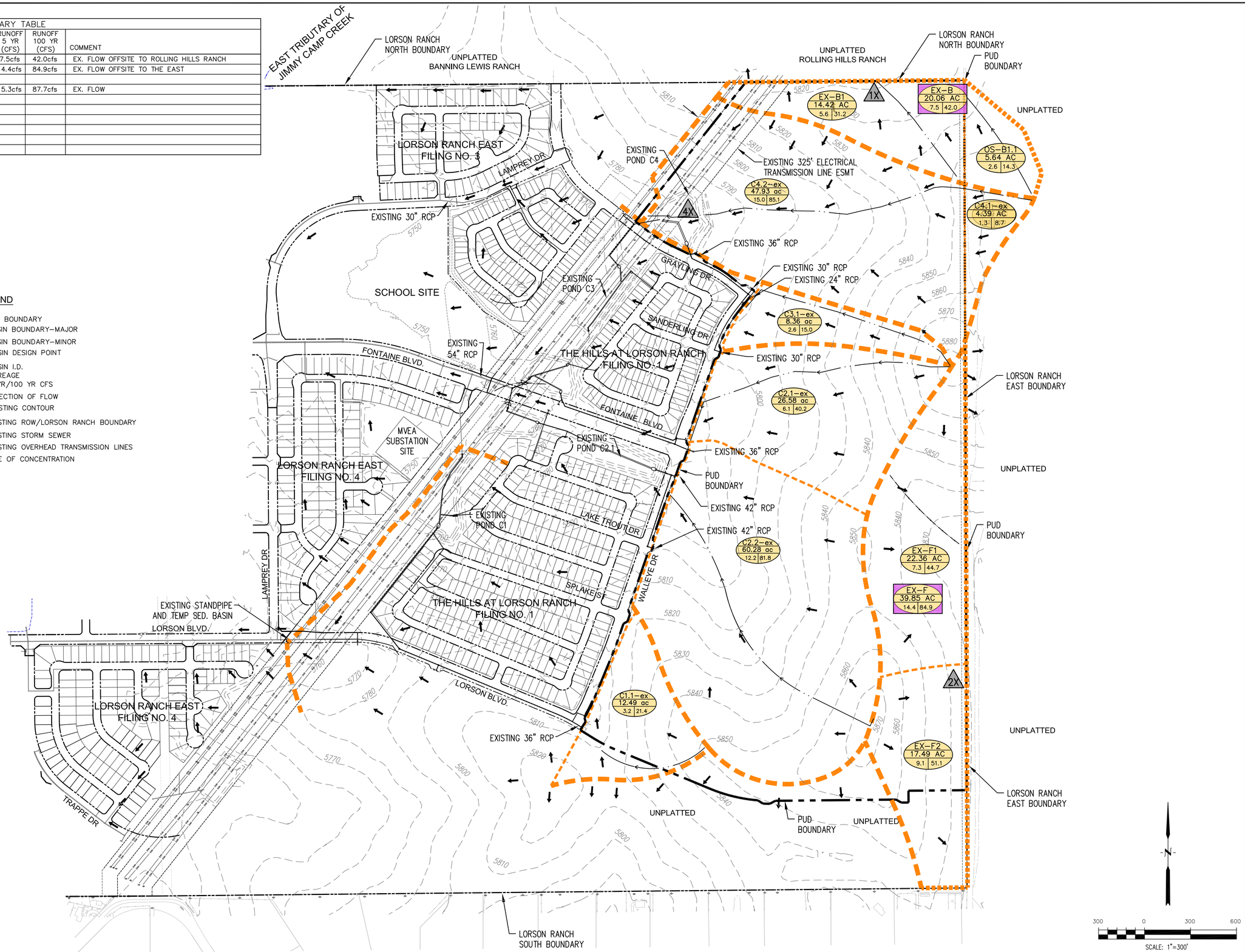
Line No.	Line ID	Flow rate (cfs)	Line size (in)	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line slope (%)	HGL down (ft)	HGL up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns line No.
1		86.30	42 c	36.0	5778.08	5779.02	2.611	5781.58	5781.87	1.30	5781.87	End
2		76.50	36 c	31.0	5779.52	5779.89	1.194	5782.14	5782.70	0.77	5783.47	1
3		45.20	30 c	211.2	5780.39	5784.82	2.098	5784.07	5787.05	n/a	5787.05	2
4		45.20	30 c	394.6	5785.15	5798.76	3.449	5787.22	5800.99	n/a	5800.99	3
5		33.40	24 c	168.5	5799.30	5806.04	3.999	5800.99	5807.95	n/a	5807.95	4
6		15.90	18 c	269.2	5807.50	5816.38	3.298	5808.55	5817.81	n/a	5817.81	5
7		17.50	24 c	11.2	5807.10	5807.32	1.968	5809.27	5809.32	0.48	5809.80	5
8		11.80	18 c	10.7	5799.80	5800.01	1.956	5801.78*	5801.92*	0.69	5802.61	4
9		37.40	24 c	7.3	5780.39	5780.46	0.955	5783.47*	5783.67*	2.20	5785.87	2

C8.7 basins 100yr storm | Number of lines: 9 | Run Date: 03-18-2021

NOTES: c = cir; e = ellip; b = box; Return period = 100 Yrs. ; *Surcharged (HGL above crown).

MAP POCKET

DESIGN POINT SUMMARY TABLE					
DESIGN POINT	BASIN	DRAINAGE AREA (AC)	RUNOFF 5 YR (CFS)	RUNOFF 100 YR (CFS)	COMMENT
1X	EX–B	20.06	7.5cfs	42.0cfs	EX. FLOW OFFSITE TO ROLLING HILLS RANCH
2X	EX–F	39.85	14.4cfs	84.9cfs	EX. FLOW OFFSITE TO THE EAST
4X	C4–ex	52.32	15.3cfs	87.7cfs	EX. FLOW



LEGEND

- PUD BOUNDARY
- BASIN BOUNDARY–MAJOR
- BASIN BOUNDARY–MINOR
- BASIN DESIGN POINT
- BASIN I.D. / ACREAGE / 5 YR/100 YR CFS (BASIN XXAC X.X X.X)
- DIRECTION OF FLOW
- EXISTING CONTOUR (6690)
- EXISTING ROW/LORSON RANCH BOUNDARY
- EXISTING STORM SEWER
- EXISTING OVERHEAD TRANSMISSION LINES (OVH)
- TIME OF CONCENTRATION

CORE ENGINEERING GROUP
15004 1ST AVENUE S.
BURNSVILLE, MN 55306
PH: 719.570.1100
CONTACT: RICHARD L. SCHINDLER, P.E.
EMAIL: rich@ceg1.com

NO.	DESCRIPTION	DATE

PREPARED FOR:
LORSON LLC
212 NORTH WAHSATCH AVE, SUITE 301
COLORADO SPRINGS, COLORADO 80903 (719) 635-3200
CONTACT: JEFF MARK

PROJECT:
THE RIDGE AT LORSON RANCH
EAST OF WALLEYE DRIVE
EL PASO COUNTY, COLORADO

DRAWN: RLS
DESIGNED:
CHECKED: RLS

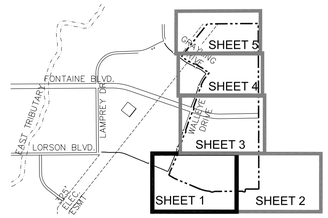
EXISTING CONDITIONS PUD / PRELIMINARY PLAN THE RIDGE AT LORSON RANCH

DATE: APRIL, 2021

PROJECT NO. 100.064

SHEET NUMBER 1

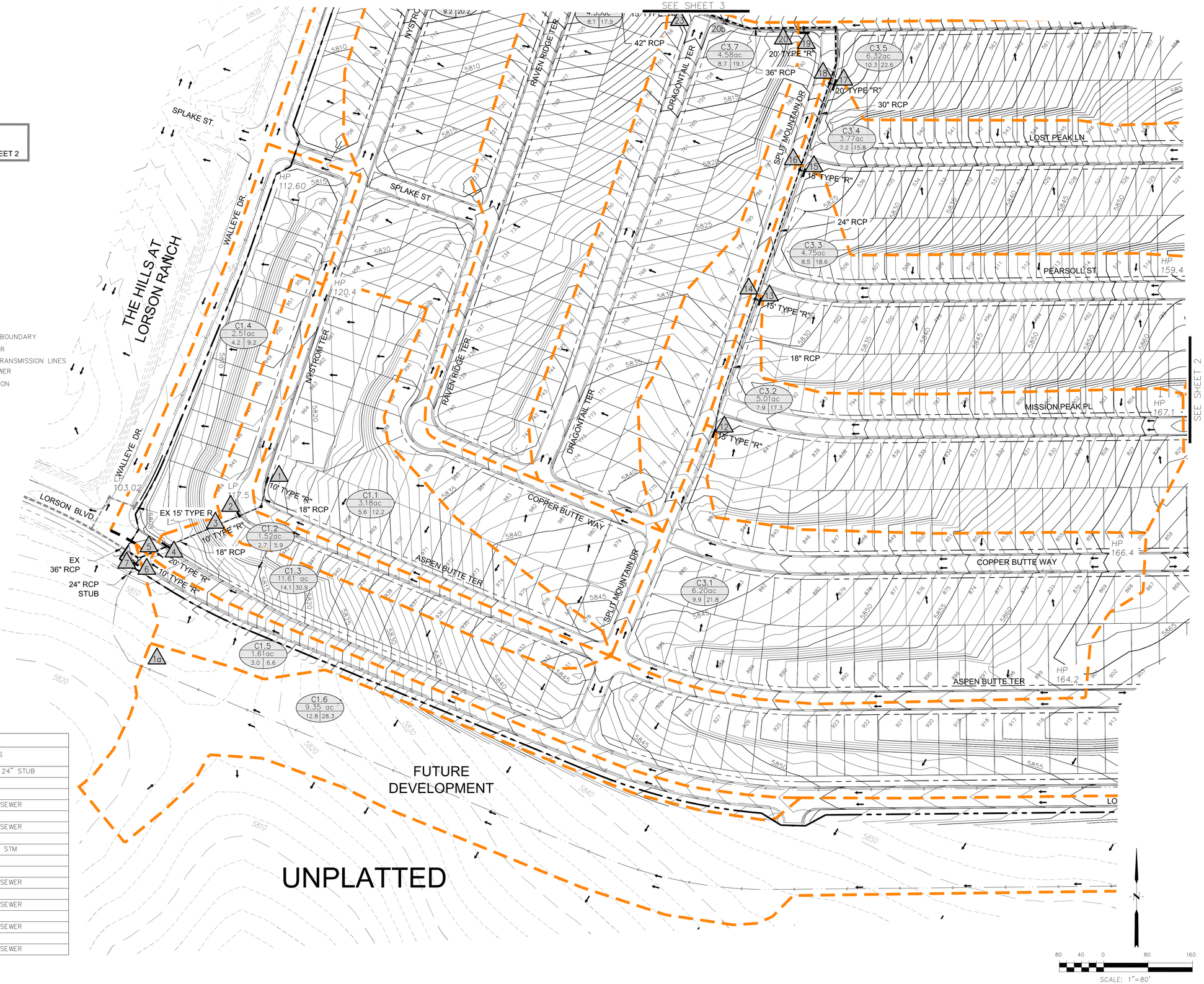
TOTAL SHEETS: 1



KEY MAP
NO SCALE

LEGEND

- PUD BOUNDARY
- BASIN BOUNDARY
- BASIN DESIGN POINT
- BASIN I.D. / ACREAGE / 5 YR/100 YR CFS (DENOTES OVERALL BASIN)
- DIRECTION OF FLOW
- EXISTING CONTOUR
- PROPOSED CONTOUR
- ROW/LORSON RANCH BOUNDARY
- EXISTING STORM SEWER
- EXISTING OVERHEAD TRANSMISSION LINES
- PROPOSED STORM SEWER
- TIME OF CONCENTRATION
- HP HIGH POINT
- LP LOW POINT



RUNOFF SUMMARY				
D.P.		5 YEAR cfs	100 YEAR cfs	NOTES
1a		12.8	28.3	FUTURE FLOW IN 24" STUB
1		5.6	12.2	STREET FLOW
2		2.7	5.9	STREET FLOW
3		8.3	18.1	FLOW IN STORM SEWER
4		14.1	30.9	STREET FLOW
5		21.8	40.1	FLOW IN STORM SEWER
6		3.0	6.6	STREET FLOW
7		36.8	65.8	FLOW IN EX. 36" STM
12		9.9	21.8	STREET FLOW
13		8.5	24.3	STREET FLOW
14		17.6	30.4	FLOW IN STORM SEWER
15		8.7	27.3	STREET FLOW
16		26.0	46.9	FLOW IN STORM SEWER
17		7.5	26.7	STREET FLOW
18		33.5	67.3	FLOW IN STORM SEWER
19		10.3	28.8	STREET FLOW
20		43.8	88.5	FLOW IN STORM SEWER

CORE ENGINEERING GROUP
15004 1ST AVE. S
BURNSVILLE, MN 55306
PH: 719.570.1100
CONTACT: RICHARD L. SCHINDLER, P.E.
EMAIL: Rich@ceg1.com

NO.	DESCRIPTION	DATE

PROJECT: THE RIDGE AT LORSON RANCH
FONTAINE BLVD. WALLEYE DRIVE
EL PASO COUNTY, COLORADO

PREPARED FOR: LORSON, LLC
212 N. WAHSATCH AVE., SUITE 301
COLORADO SPRINGS, COLORADO 80903
(719) 635-3200
CONTACT: JEFF MARK

DRAWN: RLS
DESIGNED: LAB
CHECKED: LAB

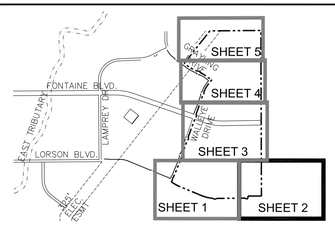
DEVELOPED CONDITIONS
THE RIDGE AT LORSON RANCH
X

DATE
MAY, 2021

PROJECT NO.
100.064

SHEET NUMBER
1

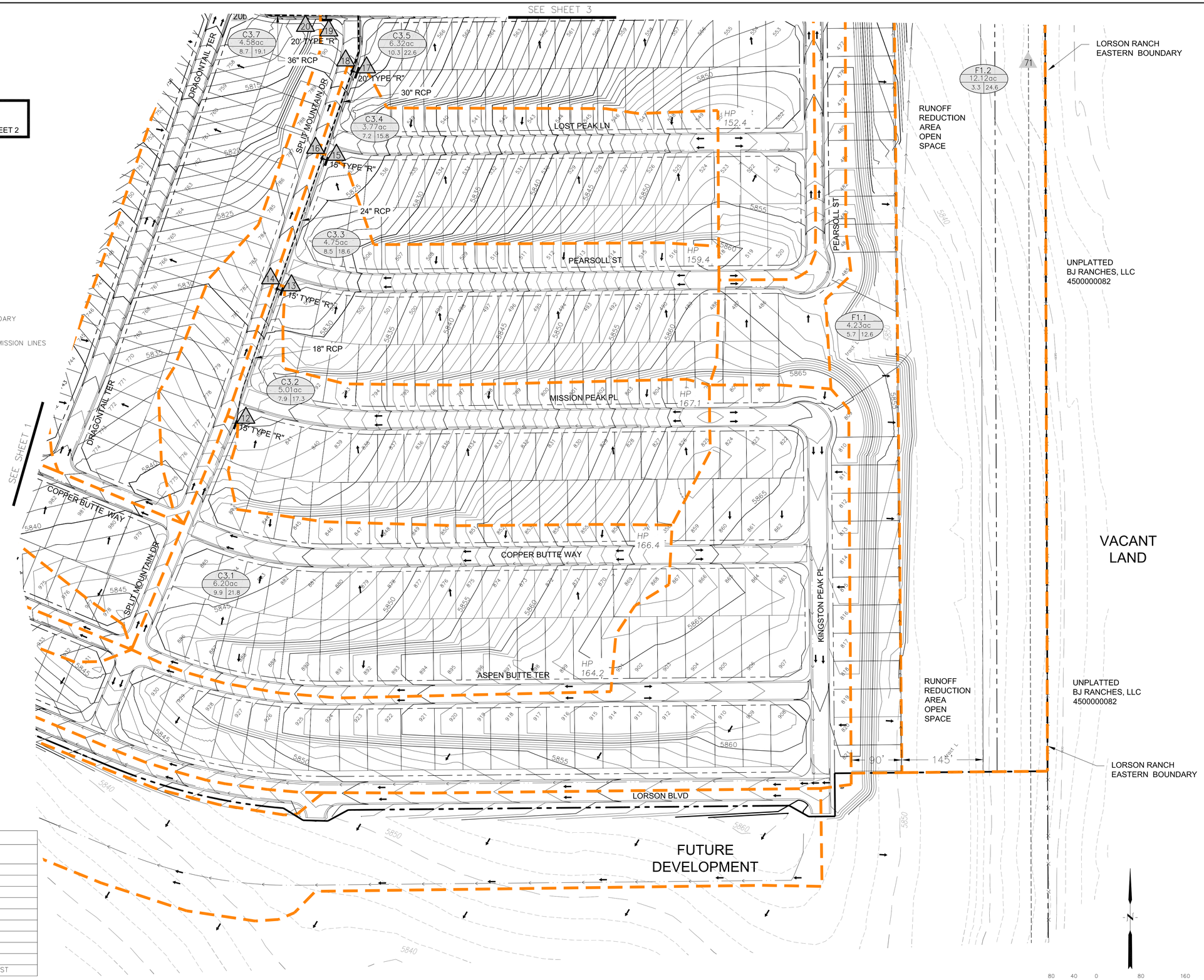
TOTAL SHEETS: 5



KEY MAP
NO SCALE

LEGEND

- PUD BOUNDARY
- BASIN BOUNDARY
- BASIN DESIGN POINT
- BASIN I.D. / ACREAGE / 5 YR/100 YR CFS (DENOTES OVERALL BASIN)
- DIRECTION OF FLOW
- EXISTING CONTOUR
- PROPOSED CONTOUR
- ROW/LORSON RANCH BOUNDARY
- EXISTING STORM SEWER
- EXISTING OVERHEAD TRANSMISSION LINES
- PROPOSED STORM SEWER
- TIME OF CONCENTRATION
- HP HIGH POINT
- LP LOW POINT



RUNOFF SUMMARY				
D.P.		5 YEAR cfs	100 YEAR cfs	NOTES
12		9.9	21.8	STREET FLOW
13		8.5	24.3	STREET FLOW
14		17.6	30.4	FLOW IN STORM SEWER
15		8.7	27.3	STREET FLOW
16		26.0	46.9	FLOW IN STORM SEWER
17		7.5	26.7	STREET FLOW
18		33.5	67.3	FLOW IN STORM SEWER
19		10.3	28.8	STREET FLOW
20		43.8	88.5	FLOW IN STORM SEWER
71		8.2	32.2	FLOW OFFSITE TO THE EAST

CORE ENGINEERING GROUP
15004 1ST AVE. S
BURNSVILLE, MN 55306
PH: 719.570.1100
CONTACT: RICHARD L. SCHINDLER, P.E.
EMAIL: Rich@ceg1.com

NO.	DESCRIPTION	DATE

PREPARED FOR:
LORSON, LLC
212 N. WAHSATCH AVE., SUITE 301
COLORADO SPRINGS, COLORADO 80903
(719) 635-3200
CONTACT: JEFF MARK

PROJECT:
THE RIDGE AT LORSON RANCH
FONTAINE BLVD.
WALLETE DRIVE
EL PASO COUNTY, COLORADO

DRAWN: RLS
DESIGNED: LAB
CHECKED: LAB

DEVELOPED CONDITIONS
THE RIDGE AT LORSON RANCH

DATE
MAY, 2021

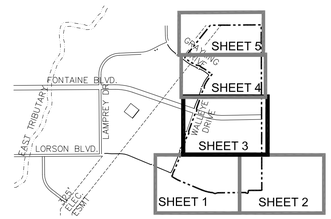
PROJECT NO.
100.064

SHEET NUMBER
2

TOTAL SHEETS: 5

RUNOFF SUMMARY				
D.P.		5 YEAR cfs	100 YEAR cfs	NOTES
17		7.5	26.7	STREET FLOW
18		33.5	67.3	FLOW IN STORM SEWER
19		10.3	28.8	STREET FLOW
20		43.8	88.5	FLOW IN STORM SEWER
20a		5.6	12.3	STREET FLOW
20b		49.4	99.2	FLOW IN STORM SEWER
21		7.2	17.5	STREET FLOW
23		8.7	26.7	STREET FLOW
24		57.8	115.5	FLOW IN STORM SEWER
24a		65.0	118.6	FLOW IN STORM SEWER
25		10.0	26.4	STREET FLOW
27		8.4	28.3	STREET FLOW
28		73.4	132.7	FLOW IN STORM SEWER
28a		80.6	133.4	FLOW IN STORM SEWER
29		9.2	27.8	STREET FLOW
30		89.8	153.9	FLOW IN STORM SEWER

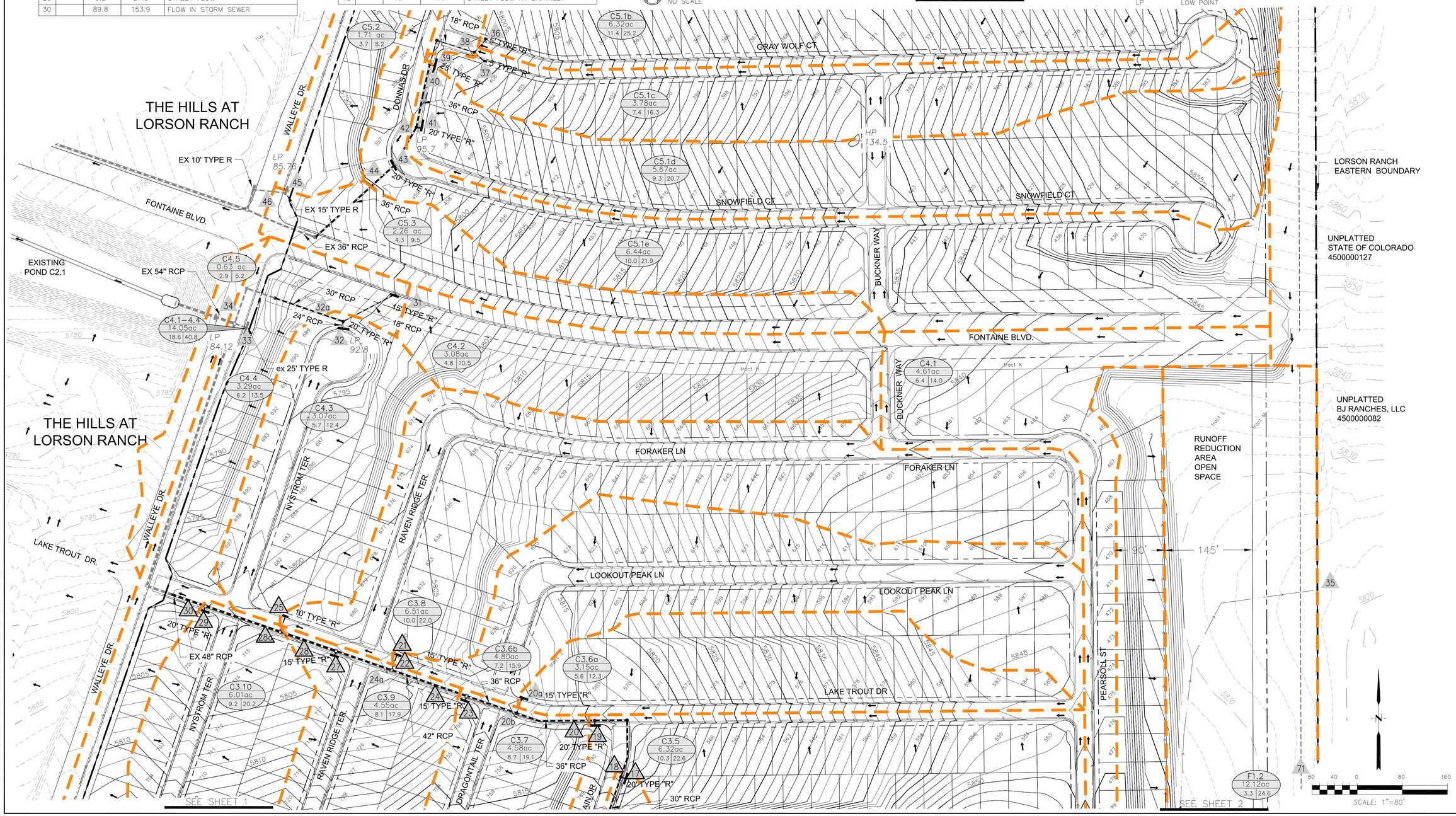
RUNOFF SUMMARY				
D.P.		5 YEAR cfs	100 YEAR cfs	NOTES
31		10.5	23.2	STREET FLOW
32		10.3	27.5	STREET FLOW
32a		18.2	42.8	FLOW IN STORM SEWER
33		7.0	28.7	STREET FLOW AT EX. INLET
34		115.0	225.4	FLOW IN EX. 54" STM
36		11.4	25.2	STREET FLOW
37		7.4	16.3	STREET FLOW
38		7.5	10.5	FLOW IN STORM SEWER
39		15.5	40.2	STREET FLOW
40		23.0	37.0	FLOW IN STORM SEWER
41		9.3	28.2	STREET FLOW
42		32.3	62.1	FLOW IN STORM SEWER
43		10.0	25.0	STREET FLOW
44		42.3	87.1	FLOW INTO EX. STORM SEWER
45		7.7	17.1	STREET FLOW AT EX. INLET



KEY MAP
NO SCALE

LEGEND

- PUD BOUNDARY
- BASIN BOUNDARY
- BASIN DESIGN POINT
- BASIN I.D. / ACREAGE / 5 YR/100 YR CFS (DENOTES OVERALL BASIN)
- DIRECTION OF FLOW
- EXISTING CONTOUR
- PROPOSED CONTOUR
- ROW/LORSON RANCH BOUNDARY
- EXISTING STORM SEWER
- EXISTING OVERHEAD TRANSMISSION LINES
- PROPOSED STORM SEWER
- TIME OF CONCENTRATION
- HP HIGH POINT
- LP LOW POINT



CORE ENGINEERING GROUP
15004 1ST AVE. S
BURNSVILLE, MN 55306
PH: 719.570.1100
CONTACT: RICHARD L. SCHINDLER, P.E.
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NO.	DESCRIPTION	DATE

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LORSON, LLC
212 N. WAHSATCH AVE., SUITE 301
COLORADO SPRINGS, COLORADO 80903
(719) 635-3200
CONTACT: JEFF MARK

PROJECT:
THE RIDGE AT LORSON RANCH
FONTAINE BLVD. & WALLEYE DRIVE
EL PASO COUNTY, COLORADO

DRAWN: RLS
DESIGNED: LAB
CHECKED: LAB

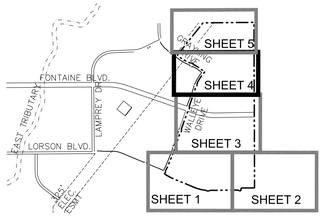
DEVELOPED CONDITIONS
THE RIDGE AT LORSON RANCH
X

DATE
MAY, 2021

PROJECT NO.
100.064

SHEET NUMBER
3

TOTAL SHEETS: 5



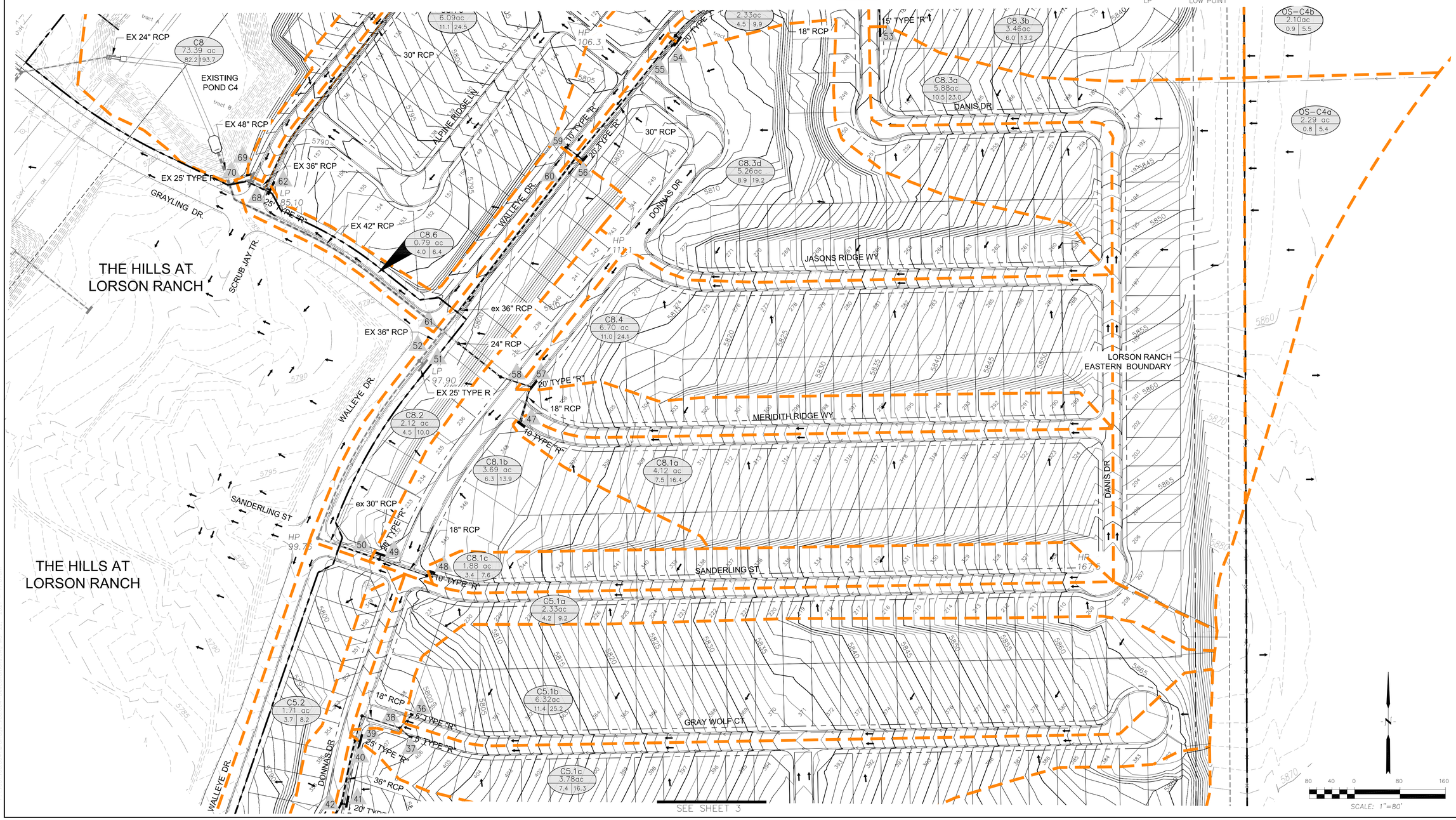
KEY MAP
NO SCALE

RUNOFF SUMMARY				
D.P.		5 YEAR cfs	100 YEAR cfs	NOTES
36		11.4	25.2	STREET FLOW
37		7.4	16.3	STREET FLOW
38		7.5	10.5	FLOW IN STORM SEWER
39		15.5	40.2	STREET FLOW
40		23.0	37.0	FLOW IN STORM SEWER
41		9.3	28.2	STREET FLOW
42		32.3	62.1	FLOW IN STORM SEWER
43		10.0	25.0	STREET FLOW
44		42.3	87.1	FLOW INTO EX. STORM SEWER
45		7.7	17.1	STREET FLOW AT EX. INLET
47		7.5	16.4	STREET FLOW
48		3.4	7.6	STREET FLOW

RUNOFF SUMMARY				
D.P.		5 YEAR cfs	100 YEAR cfs	NOTES
49		7.7	27.7	STREET FLOW
50		11.1	27.0	FLOW INTO EX. STORM SEWER
51		4.5	26.0	STREET FLOW AT EX. INLET
52		15.6	53.0	FLOW IN EX. STORM SEWER
53		10.6	26.5	STREET FLOW
54		11.8	37.6	STREET FLOW
55		21.4	40.2	FLOW IN STORM SEWER
56		9.0	32.8	STREET FLOW
57		11.0	24.1	STREET FLOW
58		17.1	28.1	FLOW IN STORM SEWER
59		7.0	15.5	STREET FLOW
60		32.7	73.3	FLOW IN STORM SEWER

LEGEND

- PUD BOUNDARY
- BASIN BOUNDARY
- BASIN DESIGN POINT
- BASIN I.D. / ACREAGE / 5 YR/100 YR CFS (DENOTES OVERALL BASIN)
- DIRECTION OF FLOW
- EXISTING CONTOUR
- PROPOSED CONTOUR
- ROW/LORSON RANCH BOUNDARY
- EXISTING STORM SEWER
- EXISTING OVERHEAD TRANSMISSION LINES
- PROPOSED STORM SEWER
- TIME OF CONCENTRATION
- HP HIGH POINT
- LP LOW POINT



CORE ENGINEERING GROUP
15004 1ST AVE. S
BURNSVILLE, MN 55306
PH: 719.570.1100
CONTACT: RICHARD L. SCHINDLER, P.E.
EMAIL: Rich@ceg1.com

NO.	DESCRIPTION	DATE

PREPARED FOR:
LORSON, LLC
212 N. WAHSATCH AVE., SUITE 301
COLORADO SPRINGS, COLORADO 80903
(719) 635-3200
CONTACT: JEFF MARK

PROJECT:
THE RIDGE AT LORSON RANCH
FONTAINE BLVD.
WALLTE DRIVE
EL PASO COUNTY, COLORADO

DRAWN: RLS
DESIGNED: LAB
CHECKED: LAB

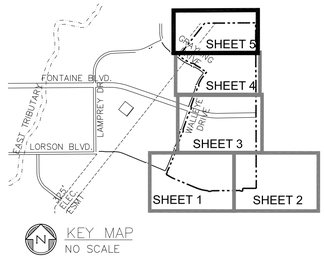
DEVELOPED CONDITIONS
THE RIDGE AT LORSON RANCH
X

DATE
MAY, 2021

PROJECT NO.
100.064

SHEET NUMBER
4

TOTAL SHEETS: 5

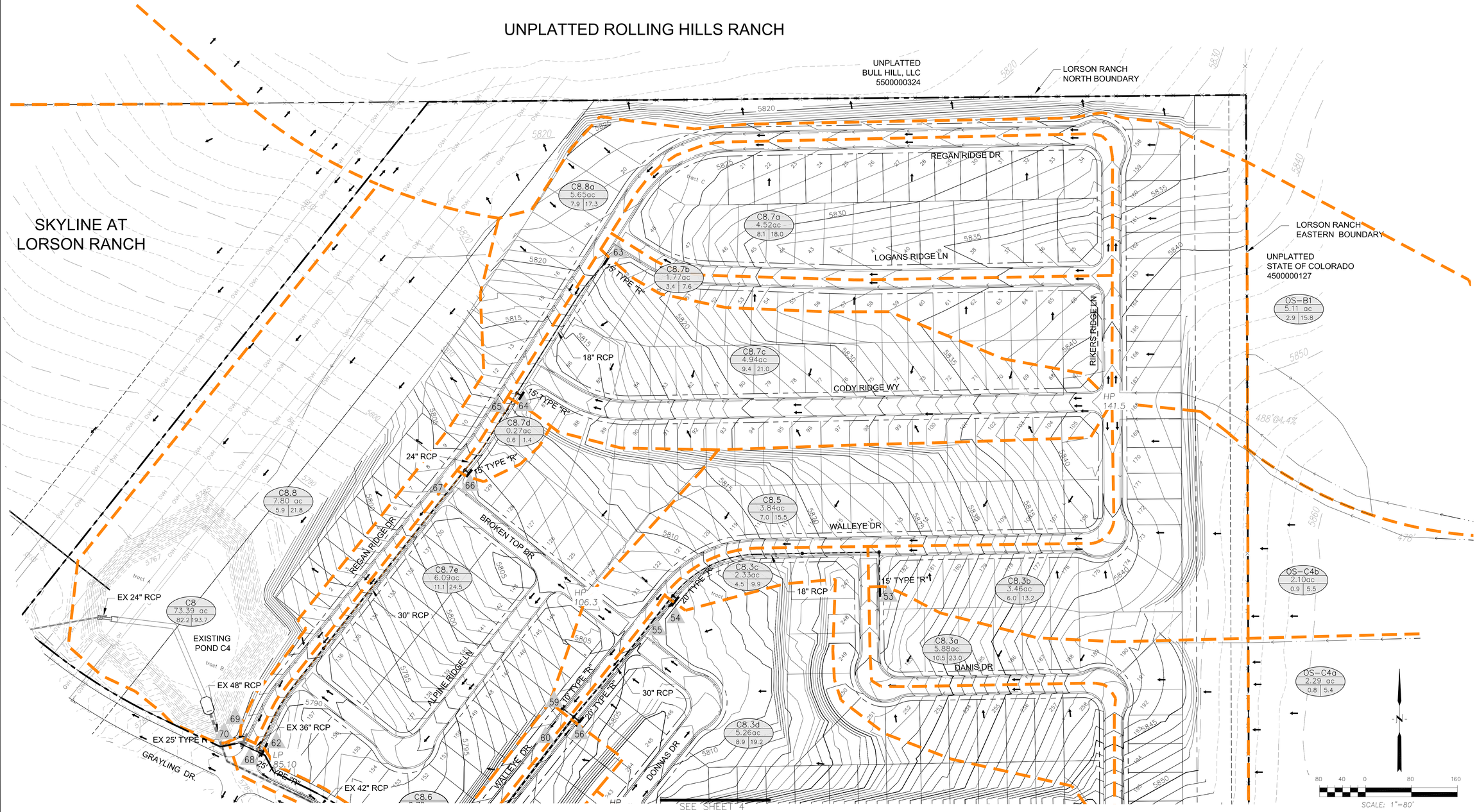


KEY MAP
NO SCALE

RUNOFF SUMMARY				
D.P.		5 YEAR cfs	100 YEAR cfs	NOTES
62		14.3	37.4	STREET FLOW
63		11.5	25.6	STREET FLOW
64		10.7	30.6	STREET FLOW
65		20.0	33.4	FLOW IN STORM SEWER
66		1.5	14.5	STREET FLOW
67		21.5	45.2	FLOW IN STORM SEWER
68		33.0	76.5	FLOW INTO EX. STORM SEWER
69		9.3	26.9	STREET FLOW AT EX. INLET
70		34.5	86.3	FLOW IN EX. 42" STORM SEWER

LEGEND

- PUD BOUNDARY
- BASIN BOUNDARY
- BASIN DESIGN POINT
- DENOTES OVERALL BASIN — BASIN / XX AC / X.X | X.X — BASIN I.D. / ACREAGE / 5 YR/100 YR CFS
- DIRECTION OF FLOW
- 6690 EXISTING CONTOUR
- 6670 PROPOSED CONTOUR
- ROW/LORSON RANCH BOUNDARY
- EXISTING STORM SEWER
- OVH EXISTING OVERHEAD TRANSMISSION LINES
- PROPOSED STORM SEWER
- TIME OF CONCENTRATION
- HP HIGH POINT
- LP LOW POINT



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