

PRELIMINARY DRAINAGE PLAN PUDSP 21-002

SKYLINE AT LORSON RANCH

**NOVEMBER, 2020
REV. MAY, 2021**

Prepared for:

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Project No. 100.063



CORE

ENGINEERING GROUP

TABLE OF CONTENTS

<i>ENGINEER'S STATEMENT</i>	<i>1</i>
<i>OWNER'S STATEMENT</i>	<i>1</i>
<i>FLOODPLAIN STATEMENT</i>	<i>1</i>
<i>1.0 LOCATION and DESCRIPTION</i>	<i>2</i>
<i>2.0 DRAINAGE CRITERIA</i>	<i>2</i>
<i>3.0 EXISTING HYDROLOGICAL CONDITIONS</i>	<i>3</i>
<i>4.0 DEVELOPED HYDROLOGICAL CONDITIONS</i>	<i>4</i>
<i>5.0 HYDRAULIC SUMMARY</i>	<i>5</i>
<i>6.0 DETENTION and WATER QUALITY PONDS</i>	<i>8</i>
<i>7.0 DRAINAGE and BRIDGE FEES</i>	<i>9</i>
<i>8.0 FOUR STEP PROCESS</i>	<i>10</i>
<i>9.0 CONCLUSIONS</i>	<i>11</i>
<i>10.0 REFERENCES</i>	<i>11</i>

APPENDIX A

VICINITY MAP, SCS SOILS INFORMATION, FEMA FIRM MAP

APPENDIX B

HYDROLOGY CALCULATIONS

APPENDIX C

HYDRAULIC CALCULATIONS

APPENDIX D

POND CALCULATIONS

APPENDIX E

STORM SEWER SCHEMATIC and HYDRAFLOW STORM SEWER CALCS

APPENDIX F – 2019 ANNUAL DRAINAGE/BRIDGE FEE CREDITS WORKSHEET

BACK POCKET

EXISTING CONDITIONS DRAINAGE MAP

DEVELOPED CONDITIONS DRAINAGE MAPS

FULL SPECTRUM OUTLET STRUCTURES

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

Skyline at Lorson Ranch is located east of the East Tributary of Jimmy Camp Creek. The site is located on approximately 13.195 acres of vacant land. This project will develop this site into single-family residential developments. The land for the residential lots is currently owned by Lorson LLC or its nominees for Lorson Ranch.

The site is located in the South ½ of Section 13, Township 15 South and Range 65 West of the 6th Principal Meridian. The site is bounded on the north by unplatted lands, on the west by Lorson Ranch East Filing No. 3 and The Hills at Lorson Ranch, on the east and 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 2021. 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 FDR conforms to the MDDP for Lorson East and the PDR for “The Hills at Lorson Ranch” and is referenced in this report. The major infrastructure to be constructed for “The Hills at Lorson Ranch” under PUD/SP 20-003 includes Detention/WQ Ponds C1, C2.1, C2.2, C2.3, C3 and C4. Pond C4 was graded as part of The Hills at Lorson Ranch but will require an interim outlet structure for this project. There are also two bridges over the East Tributary that was built in 2018 to provide access to this development across the East Tributary. The bridges are located at Fontaine Boulevard and Lorson Boulevard.

The Skyline 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 Skyline at Lorson Ranch property as Nelson-Tassel fine Sandy loam and Razor clay loam [3]. The sandy loams are considered hydrologic soil group A/B soils with moderate to moderately rapid permeability. The 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
56-Nelson – Tassel Fine Sandy Loam	B	Moderate	Moderately Rapid	Slow	Moderate
75-Razor Clay Loam	C	High	Slow	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 soils 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 east 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 C5.1-ex

This existing basin consists of existing flow from offsite undeveloped areas north of Lorson Ranch. Runoff flows overland to the south to the existing electric transmission lines and then drains south into

Existing Pond C3 excavated as part of Lorson Ranch East Filing No. 2 final grading. The existing runoff is 1.6cfs and 9.6cfs for the 5-year and 100-year events.

Basin C5.2-ex

This existing basin consists of existing flow from undeveloped areas within the PUD boundary. Runoff flows overland to the south to the existing electric transmission lines and then drains south into Existing Pond C3 excavated as part of Lorson Ranch East Filing No. 2 final grading. The existing runoff is 3.2cfs and 21.8cfs for the 5-year and 100-year events.

Design Point 5x

Design Point 5x is the existing flow at the electric transmission lines from Basins C5.1-ex and C5.2-ex. The existing runoff is 4.2cfs and 27.2cfs for the 5-year and 100-year events from these two basins. This flow is then routed south into Existing Pond C3.

4.0 DEVELOPED HYDROLOGICAL CONDITIONS

Hydrology for **Skyline 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 types A/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 C10.6

This offsite basin consists of runoff from the north side of Grayling Drive. Runoff will be directed west to Design Point 39 in curb/gutter where it will be collected by a 25' Type R inlet. The developed flow from this basin is 1.3cfs and 3.0cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin C10.7

This basin consists of runoff from residential development east of Grayling Drive and north of Garganey Lane. Runoff will be directed west to Grayling Drive, then southeasterly to Design Point 38 in curb/gutter and will continue flowing south in Grayling Drive to Design Point 39 where it will be collected by a 25' Type R inlet. The developed flow from this basin is 5.3cfs and 11.6cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin C10.8

This basin consists of runoff from residential development and an existing water pump station located northeast of Grayling Drive. Runoff will be directed southwesterly overland to Grayling Drive, then southeasterly within the curb/gutter and will continue flowing south in Grayling Drive to Design Point 39

where it will be collected by a 25' Type R inlet. The developed flow from this basin is 3.2cfs and 7.1cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin C10.9

This basin consists of runoff from residential development and open space under the electric transmission line located northeast of Grayling Drive. Runoff will be directed southwesterly overland to Grayling Drive and Design Point 39 where it will be collected by an existing 25' Type R inlet. The developed flow from this basin is 6.1cfs and 13.3cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin C10.10a

This basin consists of runoff from residential development, Garganey Drive, Sora Street and Lamprey Drive. Runoff will be directed to the aforementioned streets, and then routed to Design Point 38a within the curb/gutter where it will be collected by a 20' Type R inlet on the north side of Lamprey Dr. Flows from this basin will be directed southeasterly in storm sewer to Pond C4. The developed flow from this basin is 7.4cfs and 16.4cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin C10.10b

This basin consists of runoff from residential development, Lamprey Drive, and Sora Street. Runoff will be directed to Sora Street, and then routed to Design Point 38b within the curb/gutter where it will be collected by a 15' Type R inlet on the south side of Lamprey Drive. Flows from this basin will be directed southeasterly in storm sewer to Pond C4. The developed flow from this basin is 2.8cfs and 6.2cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin C10.10c

This basin consists of runoff from residential development, Lamprey Drive and Sora Street. Runoff will be directed to Sora Street, and then routed to Design Point 38c within the curb/gutter where it will be collected by a 10' Type R inlet on the east side of Sora Street. Flows from this basin will be directed southeasterly in storm sewer to Pond C4. The developed flow from this basin is 3.3cfs and 7.2cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin C10.10

This basin consists of runoff from residential development, Garganey Drive, Sora Street and Lamprey Drive. Runoff will be directed to the proposed street, and then routed to Design Point, 38a, 38b and 38c within the curb/gutter where it will be collected by the 3 previously discussed Type R inlets. Flows from this basin will be directed southeasterly in storm sewer to Pond C4. The total developed flow from this basin is 11.4cfs and 25.4cfs 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 was prepared by using the *StormSewers* 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)

Street Slope	Residential Local		Residential Collector		Principal Arterial	
	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	39.7
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 38

Design Point 38 is located at the NE corner of Grayling Drive and Lamprey Drive and accepts developed flows from Basin C10.7 and existing runoff from basin C5.1-ex. The runoff will be conveyed to Design Point 39 via curb/gutter. The total flow accepted is 6.8cfs/22.1cfs in the 5/100-year storm events. The street capacity of Grayling Drive (10.6/32.1 at 0.6% slope) is not exceeded.

Design Point 38a

Design Point 38a is located on the north side of Lamprey Dr, east of Grayling Drive.

(5-year storm)

Tributary Basins: C10.10a

Upstream flowby:

Inlet/MH Number: Inlet DP-38a

Total Street Flow: 7.4cfs

Flow Intercepted: 7.4cfs

Inlet Size: 20' type R, on-grade

Flow Bypassed: 0.0cfs

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

(100-year storm)

Tributary Basins: C10.10a

Upstream flowby:

Inlet/MH Number: Inlet DP-38a

Total Street Flow: 16.4cfs

Flow Intercepted: 15.2cfs

Inlet Size: 20' type R, on-grade

Flow Bypassed: 1.2cfs to DP- 40

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

The flowby from the 100yr storm is consistent with The Hills at Lorson Ranch PDR.

Design Point 38b

Design Point 38b is located on the south side of Lamprey Drive, east of Grayling Drive.

(5-year storm)

Tributary Basins: C10.10b

Upstream flowby:

Inlet/MH Number: Inlet DP-38b

Total Street Flow: 2.8cfs

Flow Intercepted: 2.8cfs

Flow Bypassed: 0.0cfs

Inlet Size: 15' type R, on-grade

Street Capacity: Street slope = 2.7%, capacity = 14.7cfs, okay

(100-year storm)

Tributary Basins: C10.10b

Upstream flowby:

Inlet/MH Number: Inlet DP-38b

Total Street Flow: 6.2cfs

Flow Intercepted: 6.2cfs

Flow Bypassed: 0.0cfs

Inlet Size: 15' type R, on-grade

Street Capacity: Street slope = 2.7%, capacity = 40.8cfs (half street) is okay

Design Point 38c

Design Point 38c is located on the east side of Sora Street, south of Lamprey Drive at a low point.

(5-year storm)

Tributary Basins: C10.10c

Upstream flowby:

Inlet/MH Number: Inlet DP-38c

Total Street Flow: 3.3cfs

Flow Intercepted: 3.3cfs

Flow Bypassed: 0.0cfs

Inlet Size: 10' type R, Sump

Street Capacity: Street slope = 2.7%, capacity = 14.7cfs, okay

(100-year storm)

Tributary Basins: C10.10c

Upstream flowby:

Inlet/MH Number: Inlet DP-38b

Total Street Flow: 7.2cfs

Flow Intercepted: 7.2cfs

Flow Bypassed: 0.0cfs

Inlet Size: 10' type R, sump

Street Capacity: Street slope = 2.7%, capacity = 40.8cfs (half street) is okay

Design Point 39 (street runoff from the west side of the inlet)

Design Point 39 is located on the east side of Grayling Drive south of Lamprey Drive and accepts developed flows from Basin C10.7, C10.8 and existing runoff from basin C5.1-ex. The runoff will be conveyed to Design Point 39 via curb/gutter on the easterly/northerly half of Grayling Drive. The total curb/gutter flow from the north side of the inlet is 8.5cfs/25.1cfs in the 5/100-year storm events. The

street capacity of Grayling Drive is 10.6cfs/32.1cfs in the 5/100-year storm events at a street slope of 0.6% is not exceeded

Design Point 40

Design Point 40 is located on the north side of Grayling Drive at a low point. Peak runoff at this design point from the drainage report and plan for the “Hills at Lorson Ranch” is 14.7cfs/38.5cfs in the 5/100-year storm events. Peak runoff for “Skyline at Lorson Ranch” is 14.7cfs/38.7cfs in the 5/100-year storm events. Based on this information there is no flow increase for the 5-year event and a 0.2cfs increase for the 100-event. This slight increase will have negligible impact on storm drain system

(5-year storm)

Tributary Basins: C10.6+C10.8+C10.9+Des.Pt.38

Upstream flowby: 0 cfs

Inlet/MH Number: Ex. Inlet DP40

Total Street Flow: 14.7cfs

Flow Intercepted: 14.7cfs

Inlet Size: 25' type R, sump

Flow Bypassed:

Street Capacity: Street slope = 0.6%, capacity = 10.6cfs, street capacity okay since Basin C10.9 (6.1cfs) flows directly to Inlet DP40

(100-year storm)

Tributary Basins: C10.6+C10.8+C10.9+Des.Pt.38

Upstream flowby: 0cfs

Inlet/MH Number: Ex. Inlet DP40

Total Street Flow: 38.7cfs

Flow Intercepted: 35.6cfs

Inlet Size: 25' type R, sump

Flow Bypassed: 3.1cfs to Des.Pt 40a

Street Capacity: Street slope = 0.6%, capacity = 32.1cfs (half street) street capacity okay since Basin C10.9 (13.3cfs) flows directly to Inlet DP40

6.0 DETENTION AND WATER QUALITY PONDS

Detention and Storm Water Quality for Skyline at Lorson Ranch will be provided for in Pond C4. Pond C4 is graded as part of PUD/SP 20-003 and is included as required per El Paso County criteria.

For additional information, see Drainage Report and Plan for “The Hills at Lorson Ranch, PUD/SP 20-03, CDR 20-007, revised dated 10/22/2020.

Detention Pond C4 (Interim Conditions with developed drainage from Skyline)

This is a permanent full spectrum detention pond that includes water quality and discharges downstream to Pond C3. Pond C4 is graded with The Hills at Lorson Ranch including a 24” pipe outlet, concrete low flow channel, and a concrete forebay on the east side of the pond. There is no full spectrum outlet structure or overflow wall for this pond. This project will construct an interim full spectrum outlet structure and additional concrete low flow channels and a new forebay for runoff from the C10.10 basins. Skyline at Lorson Ranch includes 6.96 acres of developed land that will flow directly to Pond C4 in a storm sewer system. This report includes full spectrum design for this developed area (6.96acres) calculated in the UDCF Full Spectrum spreadsheets for Water Quality and EURV volumes. The outlet structure is a standard full spectrum extended detention basin structure and has been designed with a detachable orifice plate that can be modified in the future when additional

developed areas from the east flow into Pond C4. The interim full spectrum print outs are in the appendix of this report.

- Watershed Area: 6.96 acres (from Skyline only)
- Watershed Imperviousness: 55%
- Hydrologic Soils Group B (100%)
- Zone 1 WQCV: 0.128ac-ft, WSEL: 5766.50
- Zone 2 EURV: 0.418ac-ft, WSEL: 5766.93, Top outlet structure set at 5770.50, 6'x6' outlet structure set for full buildout conditions of the pond
- (5-yr): 0.375ac-ft, WSEL: 5766.89, 1.5cfs (22" wide square orifice in orifice plate)
- Zone 3 (100-yr): 0.802ac-ft, WSEL: 5767.33, 4.5cfs (22" wide square orifice in orifice plate)
- Pipe Outlet: existing 24" RCP at 0.9%
- Overflow Spillway: 30' wide bottom, elevation=5775.00, 4:1 side slopes, flow depth=1.87' 1.13' freeboard
- Micropool Elevation: 5765.00

The remaining tributary areas to the east that are from undeveloped land will enter Pond C4 per improvements made as part of The Hills at Lorson Ranch and will exit the pond through the top of the full spectrum outlet structure at elevation 5770.50. Future development to the east will only have to modify the orifice plate to meet full spectrum detention requirements since this outlet structure has been designed for future conditions.

Detention Pond C4 ultimate conditions (from The Hills at Lorson Ranch PDR)

This is a permanent full spectrum detention pond that includes water quality and discharges downstream to Pond C3. Pond C4 is graded with The Hills at Lorson Ranch including a 24" pipe outlet. 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.

- Watershed Area: 81.00 acres (Future Area)
- 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

7.0 DRAINAGE AND BRIDGE FEES

The Hills 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. See Appendix F.

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

Item	Quantity	Unit	Unit Cost	Item Total
Rip Rap	5	CY	\$50/CY	\$250
Inlets/Manholes	2	EA	\$3000/EA	\$6,000
18" Storm	41	LF	\$35	\$1,435
24" Storm	58	LF	\$40	\$2,320
30" Storm	600	LF	\$45	\$27,000
			Subtotal	\$37,005
			Eng/Cont (10%)	\$3,700
			Total Est. Cost	\$40,705

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

Skyline 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 on the east side
- Construct one Full Spectrum Detention Outlet Structure. 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, 2018, and through 2021 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. Skyline at Lorson Ranch will construct one full spectrum stormwater extended detention basin outlet structure within existing Pond C4 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

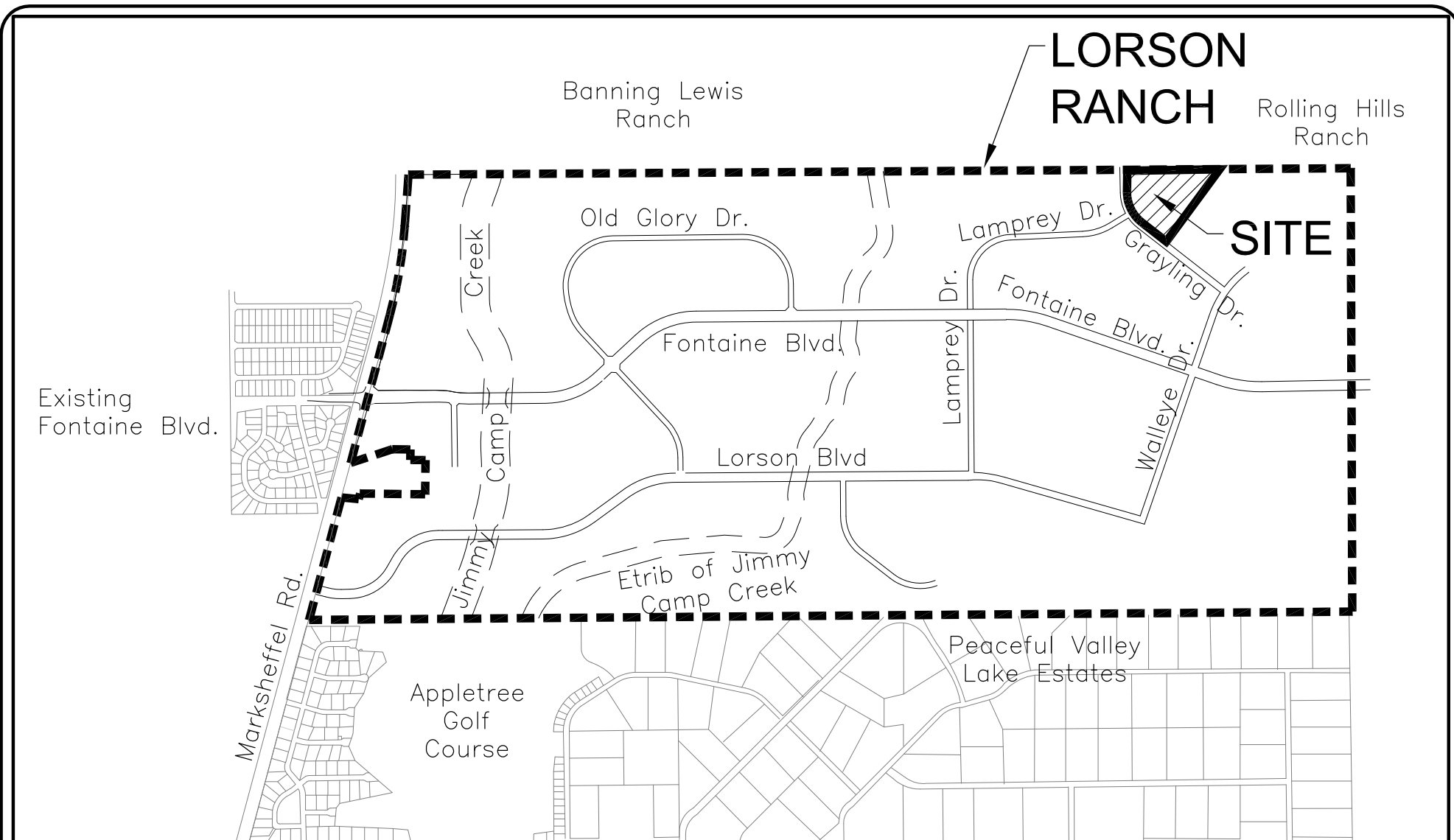
This drainage report has been prepared in accordance with the City of Colorado Springs/El Paso County Drainage Criteria Manual. The proposed development and drainage infrastructure will not cause adverse impacts to adjacent properties or properties located downstream. Several key aspects of the development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

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 Fontaine Boulevard prepared by Core Engineering Group, Reference CDR183, dated December 20, 2017
10. Final Drainage Report for Lorson Ranch East Filing No. 1 prepared by Core Engineering Group, Reference SF18-008, approved July 24, 2018
11. Final Drainage Report for Lorson Ranch East Filing No. 4 prepared by Core Engineering Group, Reference SF19-008, approved September 12, 2019
12. Final Drainage Report for The Hills at Lorson Ranch prepared by Core Engineering Group, Reference CDR20-007, approved in 2020

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

**SKYLINE AT LORSON RANCH
VICINITY MAP**

SCALE:
NTS

DATE:
NOV 5, 2020

FIGURE NO.
--



CORE
ENGINEERING GROUP

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

SCALE:
NTS

SKYLINE at LORSON RANCH
FEMA MAP
DATE:
November 2020

FIGURE NO.



Legend

SEE THIS REPORT FOR DETAILED LEGEND AND CHECK MAP FOR FINAL PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
Without Base Flood Elevation (BFE)
Zone A, V, X
With BFE or Depth: Zone AE, AO, AH, VE, ADF
Regulatory Floodway

0.2% Annual Chance Flood Hazard: Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile
Future Conditions 1% Annual Chance Flood Hazard: Zone X
Areas with Reduced Flood Risk due to Levee, Sea Wall, Dike, or Floodwall
Areas with Flood Risk due to Levee: Zone D

OTHER AREAS OF FLOOD HAZARD
No Scores: Areas of Minimal Flood Hazard: Zone X
Effective LOMR

OTHER AREAS
GENERAL STRUCTURES
Areas of Undetermined Flood Hazard: Zone I
Channel, Culvert, or Storm Sewer
Levee, Dike, or Floodwall

200 Cross Sections with 1% Annual Chance
1% Base Flood Elevation
1% Base Flood Elevation Line (BFE)
Limit of Study
Jurisdiction Boundary
Coastal Transact Baseline
Profile Baseline
Hydrographic Feature

MAP PANELS
Digital Data Available
No Digital Data Available
Unmapped

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

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

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 11/16/2020 at 8:00 PM, and does not represent a specific date. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, NFHL panel number, and NFHL effective date. Map images for unmapped and undetermined areas cannot be used for regulatory purposes.

NOT TO SCALE



CORE ENGINEERING GROUP

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

SKYLINE at LORSON RANCH SOILS MAP

SCALE:
NTS

DATE:
November 2020

FIGURE NO.
--



NOT TO SCALE

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
56	Nelson-Tassel fine sandy loams, 3 to 18 percent slopes	B	12.0	95.1%
75	Razor-Midway complex	D	0.6	4.9%
Totals for Area of Interest			12.6	100.0%

Description

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

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

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

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

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

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

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

Rating Options

Aggregation Method: Dominant Condition

APPENDIX B – HYDROLOGY CALCULATIONS



Calculated By: Leonard Beasley
Date: Oct. 31, 2020
Checked By: Leonard Beasley

Job No: 100.063
Project: Skyline at Lorson Ranch
Design Storm: **5 - Year Event (Proposed)**

11/19/2020



Job No: 100.063
Project: Skyline at Lorson Ranch
Design Storm: **100-Year Event (Current)**

P:\100\100.063\drainage\100.063 Flows



Standard Form SF-1. Time of Concentration-Current

Calculated By: Leonard Beasley
 Date: Oct. 31, 2019
 Checked By: Leonard Beasley

Job No: 100.063
 Project: Skyline at Lorson Ranch

Sub-Basin Data				Initial Overland Time (ti)				Travel Time (tt)					Final tc
BASIN or DESIGN	C ₅	AREA (A) acres	NRCS Convey.	LENGTH (L) feet	SLOPE (S) %	VELOCITY (V) ft/sec	ti minutes	LENGTH (L) feet	SLOPE (S) %	VELOCITY (V) ft/sec	tt minutes	Computed tc Minutes	USDCM Recommended tc=ti+tt (min)
C5.1-ex	0.11	4.81	7.0	300.00	4.80%	0.27	18.51	285.00	4.80%	1.53	3.10	21.60	21.60
C5.2-ex	0.09	13.32	7.0	300.00	4.80%	0.26	18.88	644.00	4.90%	1.55	6.93	25.81	25.81
(C5-ex) 5X	0.10	18.13	7.0	300.00	4.80%	0.27	18.69	285.00	4.80%	1.53	3.10		
			15.0					940.00	1.17%	1.62	9.66	31.45	31.45



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

Calculated By: Leonard Beasley

Date: Nov. 4, 2020

Checked By: Leonard Beasley

Job No: 100.063

Project: Skyline 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	
C5.1-ex			4.81	0.11	21.6	0.53	2.97	1.6													
C10.7			3.17	0.45	13.5	1.43	3.68	5.3													
C10.7 & C5.1-ex	38	7.98							15.6	1.96	3.46	6.8									
C10.8			1.89	0.45	12.5	0.85	3.80	3.2													
C10.7, C10.8 & C5.1-ex	39	9.87							20.6	2.81	3.05	8.5									
C10.9			3.82	0.46	15.7	1.76	3.45	6.1													
C10.6			0.56	0.49	6.1	0.27	4.88	1.3													
C10.6 - C10.9 & C5.1-ex	40	14.25							20.6	4.84	3.05	14.7									
C10.10a			3.75	0.45	8.3	1.69	4.41	7.4													
C10.10a	38a	3.75							8.3	1.69	4.41	7.4									
C10.10b			1.67	0.45	13.6	0.75	3.67	2.8													
C10.10a - C10.10b	38b	5.42							13.7	2.44	3.66	8.9									
C10.10c			1.54	0.45	6.9	0.69	4.70	3.3													
C10.10	38c	6.96							13.8	3.13	3.64	11.4									



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

Calculated By: Leonard Beasley
 Date: Nov. 4, 2019
 Checked By: Leonard Beasley

Job No: 100.063
 Project: Skyline 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	-	Q	t_c	Σ (CA)	-	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	
C5.1-ex			4.81	0.40	21.6	1.92	4.99	9.6													
C10.7			3.17	0.59	13.5	1.87	6.18	11.6													
C5.1-ex & C10.7	38	7.98							15.6	3.79	5.82	22.1									
C10.8			1.89	0.59	12.5	1.12	6.37	7.1													
C10.7-C10.8 & C5.1-ex	39	9.87							20.6	4.91	5.11	25.1									
C10.9			3.82	0.60	15.7	2.29	5.79	13.3													
C10.6			0.56	0.65	6.1	0.36	8.19	3.0													
C10.6-C10.9 & C5.1-ex	40	14.25							20.6	7.57	5.11	38.7									
C10.10a			3.75	0.59	8.3	2.21	7.40	16.4													
C10.10a	38a	3.75							8.3	2.21	7.40	16.4									
C10.10b			1.67	0.60	13.6	1.00	6.17	6.2													
C10.10a - C10.10b	38b	5.42							13.6	3.21	6.17	19.8									
C10.10c			1.54	0.59	6.9	0.91	7.89	7.2													
C10.10	38c	6.96							13.6	4.12	6.17	25.4									



CORE ENGINEERING GROUP

15004 1st Avenue South
Burnsville, MN 55306

PROJECT NAME: Skyline at Lorson Ranch

PROJECT NUMBER: 100.063

ENGINEER: LAB

DATE: Nov. 2, 2020

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
C5.1-ex	56	B	3.37	70.06%	0.09	0.06	0.36	0.25	2%	Historic / Offsite
	75	D	1.44	29.94%	0.16	0.05	0.51	0.15	2%	Historic / Offsite
			4.81	100.00%		0.11		0.40		
C10.7	56	B	3.04	95.90%	0.45	0.43	0.59	0.57	65%	1/8 ac. Single Family
	75	D	0.13	4.10%	0.49	0.02	0.65	0.03	65%	1/8 ac. Single Family
			3.17	100.00%		0.45		0.59		
C10.8	56	B	1.89		0.45		0.59		65%	1/8 ac. Single Family
C10.9	56	B	3.26	85.34%	0.45	0.38	0.59	0.50	65%	1/8 ac. Single Family
	52	C	0.56	14.66%	0.49	0.07	0.65	0.10	65%	1/8 ac. Single Family
			3.82	100.00%		0.46		0.60		
C10.6	52	C	0.56		0.49		0.65		65%	1/8 ac. Single Family
C10.10a	56	B	3.75		0.45		0.59		65%	1/8 ac. Single Family
C10.10b	56	B	1.50	89.82%	0.45	0.40	0.59	0.53	65%	1/8 ac. Single Family
	75	D	0.17	10.18%	0.49	0.05	0.65	0.07	65%	1/8 ac. Single Family
			1.67	100.00%		0.45		0.60		
C10.10c	56	B	1.76		0.45		0.59		65%	1/8 ac. Single Family
C10.10	56	B	6.79	97.56%	0.45	0.44	0.59	0.58	65%	1/8 ac. Single Family
	75	D	0.17	2.44%	0.49	0.01	0.65	0.02	65%	1/8 ac. Single Family
			6.96	100.00%		0.45		0.59		



Standard Form SF-1. Time of Concentration-Proposed

Calculated By: Leonard Beasley

Job No: 100.063

Date: Nov. 2, 2020

Project: Skyline at Lorson Ranch

Checked By: Leonard Beasley

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 t _c tc=(L/180)+10 minutes	USDCM Recommended Tc=Ti+Tt (min)
C5.1-ex	0.11	4.81	7.0	300.00	4.80%	0.27	18.51	285.00	4.80%	1.53	3.10	21.60	585.00	13.25	21.60
C10.7	0.45	3.17	7.0	100.00	5.30%	0.25	6.79	70.00	3.00%	1.21	0.96				
			20.0					917.00	3.78%	3.89	3.93				
			20.0					216.00	1.00%	2.00	1.80	13.48	1303.00	17.24	13.48
DP-38	0.25	7.98	7.0	100.00	5.30%	0.19	8.88	70.00	3.00%	1.21	0.96				
			20.0					917.00	3.78%	3.89	3.93				
			20.0					216.00	1.00%	2.00	1.80	15.57	1303.00	17.24	15.57
C10.8	0.45	1.89	20.0	78.00	5.12%	0.21	6.06	597.00	0.60%	1.55	6.42	12.49	675.00	13.75	12.49
DP-39	0.28	9.87	7.0	100.00	5.30%	0.19	8.56	70.00	3.00%	1.21	0.96				
			20.0					917.00	3.78%	3.89	3.93				
			20.0					216.00	1.00%	2.00	1.80				
			20.0					604.00	0.60%	1.55	6.50	21.75	1907.00	20.59	20.59
C10.9	0.46	3.82	7.0	100.00	5.00%	0.24	6.81	932.00	4.61%	1.50	10.34	17.15	1032.00	15.73	15.73
C10.10a	0.45	3.75	20.0	40.00	4.25%	0.14	4.62	860.00	3.77%	3.88	3.69	8.31	900.00	15.00	8.31
DP-38a	0.45	3.75	20.0	40.00	4.25%	0.14	4.62	860.00	3.77%	3.88	3.69	8.31	900.00	15.00	8.31
C10.10b	0.45	1.67	7.0	100.00	3.60%	0.22	7.72	120.00	2.89%	1.19	1.68				
			20.0					952.00	3.64%	3.82	4.16	13.55	1172.00	16.51	13.55



Standard Form SF-1. Time of Concentration-Proposed

Calculated By: Leonard Beasley

Job No: 100.063

Date: Nov. 2, 2020

Project: Skyline at Lorson Ranch

Checked By: Leonard Beasley

Sub-Basin Data				Initial Overland Time (t _i)				Travel Time (t _t)					t _c Check (urbanized Basins)		Final t _c
BASIN or DESIGN	C _s	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 t _c t _c =(L/180)+10 minutes	USDCM Recommended T _c =T _i +T _t (min)
DP-38b	0.45	5.42	7.0	100.00	3.60%	0.22	7.72	120.00	2.89%	1.19	1.68				
			20.0					952.00	3.64%	3.82	4.16				
			RCP					35.00	0.80%	5.32	0.11	13.66	1207.00	16.71	13.66
C10.10c	0.45	1.54	20.0	37.00	2.70%	0.12	5.16	423.00	4.35%	4.17	1.69	6.85	460.00	12.56	6.85
DP-38c	0.45	6.96	7.0	100.00	3.60%	0.22	7.72	120.00	2.89%	1.19	1.68				
			20.0					952.00	3.64%	3.82	4.16				
			RCP					35.00	0.80%	5.32	0.11				
			RCP					53.00	0.69%	5.98	0.15	13.81	1260.00	17.00	13.81
C10.10	0.45	6.96	7.0	100.00	3.60%	0.22	7.72	120.00	2.89%	1.19	1.68				
			20.0					952.00	3.64%	3.82	4.16				
			RCP					35.00	0.80%	5.32	0.11				
			RCP					53.00	0.69%	5.98	0.15	13.81	1260.00	17.00	13.81
C10.6	0.49	0.56	20.0	16.00	2.00%	0.08	3.50	490.00	2.51%	3.17	2.58	6.08	506.00	12.81	6.08
DP-40	0.28	14.25	7.0	100.00	5.30%	0.19	8.56	70.00	3.00%	1.21	0.96				
			20.0					917.00	3.78%	3.89	3.93				
			20.0					216.00	1.00%	2.00	1.80				
			20.0					604.00	0.60%	1.55	6.50	21.75	1907.00	20.59	20.59

APPENDIX C – HYDRAULIC CALCULATIONS

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

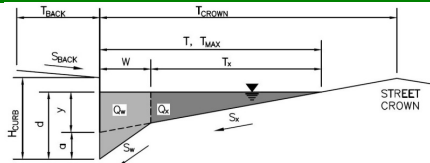
(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project:

Skyline at Lorson Ranch, 100.063

Inlet ID:

Inlet DP-38a

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

Maximum Allowable Width for Spread Behind Curb

 $T_{BACK} = 5.0$ 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

 $T_{CROWN} = 20.0$ 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)

 $n_{STREET} = 0.018$

Max. Allowable Spread for Minor & Major Storm

	Minor Storm	Major Storm	
$T_{MAX} =$	20.0	20.0	ft

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

	Minor Storm	Major Storm	
$d_{MAX} =$	6.0	7.0	inches

Allow Flow Depth at Street Crown (leave blank for no)

check = yes

Maximum Capacity for 1/2 Street based On Allowable Spread

Water Depth without Gutter Depression (Eq. ST-2)

	Minor Storm	Major Storm	
$y =$	4.80	4.80	inches

Vertical Depth between Gutter Lip and Gutter Flowline (usually 2")

	Minor Storm	Major Storm	
$d_C =$	2.0	2.0	inches

Gutter Depression ($d_C - (W * S_X * 12)$)

	Minor Storm	Major Storm	
$a =$	1.51	1.51	inches

Water Depth at Gutter Flowline

	Minor Storm	Major Storm	
$d =$	6.31	6.31	inches

Allowable Spread for Discharge outside the Gutter Section W (T - W)

	Minor Storm	Major Storm	
$T_X =$	18.0	18.0	ft

Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)

	Minor Storm	Major Storm	
$E_O =$	0.296	0.296	

Discharge outside the Gutter Section W, carried in Section T_X

	Minor Storm	Major Storm	
$Q_X =$	15.1	15.1	cfs

Discharge within the Gutter Section W ($Q_T - Q_X$)

	Minor Storm	Major Storm	
$Q_W =$	6.4	6.4	cfs

Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)

	Minor Storm	Major Storm	
$Q_{BACK} =$	0.0	0.0	cfs

Maximum Flow Based On Allowable Spread

	Minor Storm	Major Storm	
$Q_T =$	21.5	21.5	cfs

Flow Velocity within the Gutter Section

	Minor Storm	Major Storm	
$V =$	7.2	7.2	fps

 $V*d$ Product: Flow Velocity times Gutter Flowline Depth

	Minor Storm	Major Storm	
$V*d =$	3.8	3.8	

Maximum Capacity for 1/2 Street based on Allowable Depth

Theoretical Water Spread

	Minor Storm	Major Storm	
$T_{TH} =$	18.7	22.9	ft

Theoretical Spread for Discharge outside the Gutter Section W (T - W)

	Minor Storm	Major Storm	
$T_{XTH} =$	16.7	20.9	ft

Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)

	Minor Storm	Major Storm	
$E_O =$	0.318	0.258	

Theoretical Discharge outside the Gutter Section W, carried in Section T_{XTH}

	Minor Storm	Major Storm	
$Q_{XTH} =$	12.4	22.4	cfs

Actual Discharge outside the Gutter Section W, (limited by distance T_{CROWN})

	Minor Storm	Major Storm	
$Q_X =$	12.4	22.3	cfs

Discharge within the Gutter Section W ($Q_d - Q_X$)

	Minor Storm	Major Storm	
$Q_W =$	5.8	7.8	cfs

Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)

	Minor Storm	Major Storm	
$Q_{BACK} =$	0.0	0.4	cfs

Total Discharge for Major & Minor Storm (Pre-Safety Factor)

	Minor Storm	Major Storm	
$Q =$	18.2	30.5	cfs

Average Flow Velocity Within the Gutter Section

	Minor Storm	Major Storm	
$V =$	6.9	7.8	fps

 $V*d$ Product: Flow Velocity Times Gutter Flowline Depth

	Minor Storm	Major Storm	
$V*d =$	3.5	4.5	

Slope-Based Depth Safety Reduction Factor for Major & Minor ($d \geq 6"$) Storm

	Minor Storm	Major Storm	
$R =$	0.95	0.77	

Max Flow Based on Allowable Depth (Safety Factor Applied)

	Minor Storm	Major Storm	
$Q_d =$	17.3	23.6	cfs

Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)

	Minor Storm	Major Storm	
$d =$	5.92	6.49	inches

Resultant Flow Depth at Street Crown (Safety Factor Applied)

	Minor Storm	Major Storm	
$d_{CROWN} =$	0.00	0.18	inches

MINOR STORM Allowable Capacity is based on Depth Criterion

	Minor Storm	Major Storm	
$Q_{allow} =$	17.3	23.6	cfs

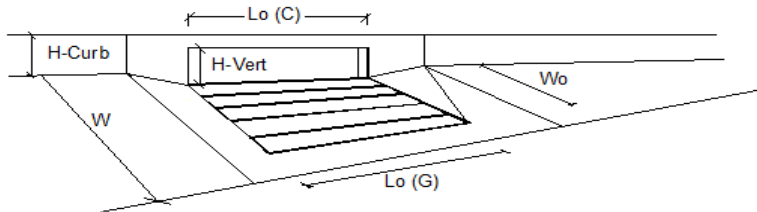
MAJOR STORM Allowable Capacity is based on Depth Criterion

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



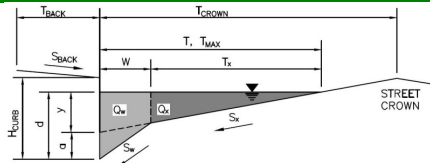
Design Information (Input)		MINOR	MAJOR	
Type of Inlet		Type =		CDOT Type R Curb Opening
Local Depression (additional to continuous gutter depression 'a')		a _{LOCAL} =	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		No =	1	
Length of a Single Unit Inlet (Grate or Curb Opening)		L _o =	20.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)		W _o =	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)		C _{T-G} =	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		C _{T-C} =	0.10	
Street Hydraulics: OK - Q < Allowable Street Capacity				
Design Discharge for Half of Street (from Sheet Inlet Management)		Q _o =	7.4	cfs
Water Spread Width		T =	13.0	ft
Water Depth at Flowline (outside of local depression)		d =	4.6	inches
Water Depth at Street Crown (or at T _{MAX})		d _{CROWN} =	0.0	inches
Ratio of Gutter Flow to Design Flow		E _o =	0.458	
Discharge outside the Gutter Section W, carried in Section T _x		Q _s =	4.0	cfs
Discharge within the Gutter Section W		Q _w =	3.4	cfs
Discharge Behind the Curb Face		Q _{BACK} =	0.0	cfs
Flow Area within the Gutter Section W		A _w =	0.60	sq ft
Velocity within the Gutter Section W		V _w =	5.6	fps
Water Depth for Design Condition		d _{LOCAL} =	7.6	inches
Grate Analysis (Calculated)				
Total Length of Inlet Grate Opening		L =	N/A	ft
Ratio of Grate Flow to Design Flow		E _{o-GRATE} =	N/A	
Under No-Clogging Condition				
Minimum Velocity Where Grate Splash-Over Begins		V _o =	N/A	fps
Interception Rate of Frontal Flow		R _f =	N/A	
Interception Rate of Side Flow		R _s =	N/A	
Interception Capacity		Q _i =	N/A	cfs
Under Clogging Condition				
Clogging Coefficient for Multiple-unit Grate Inlet		GrateCoef =	N/A	
Clogging Factor for Multiple-unit Grate Inlet		GrateClog =	N/A	
Effective (unclogged) Length of Multiple-unit Grate Inlet		L _e =	N/A	ft
Minimum Velocity Where Grate Splash-Over Begins		V _o =	N/A	fps
Interception Rate of Frontal Flow		R _f =	N/A	
Interception Rate of Side Flow		R _s =	N/A	
Actual Interception Capacity		Q _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	cfs
Curb or Slotted Inlet Opening Analysis (Calculated)				
Equivalent Slope S _e (based on grate carry-over)		S _e =	0.106	ft/ft
Required Length L _T to Have 100% Interception		L _T =	15.06	ft
Under No-Clogging Condition				
Effective Length of Curb Opening or Slotted Inlet (minimum of L, L _T)		L =	15.06	ft
Interception Capacity		Q _i =	7.4	cfs
Under Clogging Condition				
Clogging Coefficient		CurbCoef =	1.33	
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet		CurbClog =	0.03	
Effective (Unclogged) Length		L _e =	17.34	ft
Actual Interception Capacity		Q _a =	7.4	cfs
Carry-Over Flow = Q _{b(GRATE)} - Q _a		Q _b =	0.0	cfs
Summary				
Total Inlet Interception Capacity		Q =	7.4	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)		Q _b =	0.0	cfs
Capture Percentage = Q _a /Q _o =		C% =	100	%

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

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

Project: Skyline at Lorson Ranch, 100.063

Inlet ID: Inlet DP-38b

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

Maximum Allowable Width for Spread Behind Curb

 $T_{BACK} = 5.0$ 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

 $T_{CROWN} = 20.0$ 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)

 $n_{STREET} = 0.018$

Max. Allowable Spread for Minor & Major Storm

	Minor Storm	Major Storm	
T_{MAX}	20.0	20.0	ft
d_{MAX}	6.0	7.0	inches

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

Allow Flow Depth at Street Crown (leave blank for no)

check = yes

Maximum Capacity for 1/2 Street based On Allowable Spread

Water Depth without Gutter Depression (Eq. ST-2)

	Minor Storm	Major Storm	
y	4.80	4.80	inches
d_c	2.0	2.0	inches
a	1.51	1.51	inches
d	6.31	6.31	inches
T_x	18.0	18.0	ft
E_o	0.296	0.296	
Q_x	16.7	16.7	cfs
Q_w	7.0	7.0	cfs
Q_{BACK}	0.0	0.0	cfs
Q_T	23.8	23.8	cfs
V	7.9	7.9	fps
$V*d$	4.2	4.2	

Vertical Depth between Gutter Lip and Gutter Flowline (usually 2")

Gutter Depression ($d_c = (W * S_x * 12)$)

Water Depth at Gutter Flowline

Allowable Spread for Discharge outside the Gutter Section W ($T - W$)

Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)

Discharge outside the Gutter Section W , carried in Section T_x Discharge within the Gutter Section W ($Q_T - Q_x$)

Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)

Maximum Flow Based On Allowable Spread

Flow Velocity within the Gutter Section

 $V*d$ Product: Flow Velocity times Gutter Flowline Depth**Maximum Capacity for 1/2 Street based on Allowable Depth**

Theoretical Water Spread

Theoretical Spread for Discharge outside the Gutter Section W ($T - W$)

Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)

Theoretical Discharge outside the Gutter Section W , carried in Section T_{XTH} Actual Discharge outside the Gutter Section W , (limited by distance T_{CROWN})Discharge within the Gutter Section W , ($Q_T - Q_x$)

Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)

Total Discharge for Major & Minor Storm (Pre-Safety Factor)

Average Flow Velocity Within the Gutter Section

 $V*d$ Product: Flow Velocity Times Gutter Flowline DepthSlope-Based Depth Safety Reduction Factor for Major & Minor ($d \geq 6"$) Storm**Max Flow Based on Allowable Depth (Safety Factor Applied)**

Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)

Resultant Flow Depth at Street Crown (Safety Factor Applied)

	Minor Storm	Major Storm	
T_{TH}	18.7	22.9	ft
T_{XTH}	16.7	20.9	ft
E_o	0.318	0.258	
Q_{XTH}	13.7	24.8	cfs
Q_x	13.7	24.6	cfs
Q_w	6.4	8.6	cfs
Q_{BACK}	0.0	0.4	cfs
Q	20.0	33.7	cfs
V	7.6	8.6	fps
$V*d$	3.8	5.0	
R	0.81	0.66	
Q_d	16.3	22.2	cfs
d	5.65	6.19	inches
d_{CROWN}	0.00	0.00	inches

MINOR STORM Allowable Capacity is based on Depth Criterion

MAJOR STORM Allowable Capacity is based on Depth Criterion

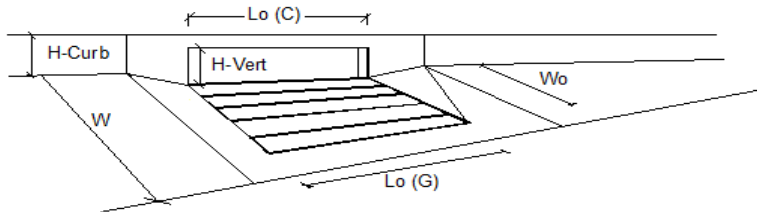
	Minor Storm	Major Storm	
Q_{allow}	16.3	22.2	cfs

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

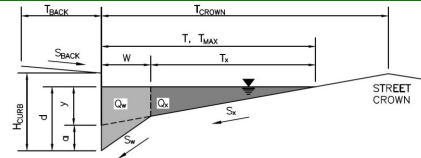


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	N_o =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	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_{T-G} =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_{T-C} =	0.10	0.10	
Street Hydraulics: OK - Q < Allowable Street Capacity				
Design Discharge for Half of Street (from Sheet Inlet Management)		MINOR	MAJOR	
Water Spread Width	Q_o =	2.8	6.2	cfs
Water Depth at Flowline (outside of local depression)	T =	7.9	11.5	ft
Water Depth at Street Crown (or at T_{MAX})	d =	3.4	4.3	inches
Ratio of Gutter Flow to Design Flow	d_{CROWN} =	0.0	0.0	inches
Discharge outside the Gutter Section W, carried in Section T_x	E_o =	0.694	0.511	
Discharge within the Gutter Section W	Q_s =	0.9	3.0	cfs
Discharge Behind the Curb Face	Q_w =	1.9	3.2	cfs
Flow Area within the Gutter Section W	Q_{BACK} =	0.0	0.0	cfs
Velocity within the Gutter Section W	A_w =	0.40	0.55	sq ft
Water Depth for Design Condition	V_w =	4.8	5.8	fps
	d_{LOCAL} =	6.4	7.3	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	$E_o-GRATE$ =	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_s =	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_s =	N/A	N/A	
Actual Interception Capacity	Q_s =	N/A	N/A	cfs
Carry-Over Flow = $Q_o - Q_s$ (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 =	0.150	0.116	ft/ft
Required Length L_T to Have 100% Interception	L_T =	7.91	13.35	ft
Under No-Clogging Condition		MINOR	MAJOR	
Effective Length of Curb Opening or Slotted Inlet (minimum of L , L_T)	L =	7.91	13.35	ft
Interception Capacity	Q_i =	2.8	6.2	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_s =	2.8	6.2	cfs
Carry-Over Flow = $Q_b(Grate) - Q_s$	Q_b =	0.0	0.0	cfs
Summary		MINOR	MAJOR	
Total Inlet Interception Capacity	Q =	2.8	6.2	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)	Q_b =	0.0	0.0	cfs
Capture Percentage = Q_s/Q_o =	$C\%$ =	100	100	%

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

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

Project: Skyline at Lorson Ranch, 100.063
 Inlet ID: Inlet DP-38c

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

Maximum Allowable Width for Spread Behind Curb
 Side Slope Behind Curb (leave blank for no conveyance credit behind curb)
 Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

$T_{BACK} = 5.0$ ft
 $S_{BACK} = 0.020$ ft/ft
 $n_{BACK} = 0.015$

Height of Curb at Gutter Flow Line
 Distance from Curb Face to Street Crown
 Gutter Width
 Street Transverse Slope
 Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)
 Street Longitudinal Slope - Enter 0 for sump condition
 Manning's Roughness for Street Section (typically between 0.012 and 0.020)

$H_{CURB} = 6.00$ inches
 $T_{CROWN} = 20.0$ ft
 $W = 2.00$ ft
 $S_X = 0.020$ ft/ft
 $S_W = 0.083$ ft/ft
 $S_D = 0.000$ ft/ft
 $n_{STREET} = 0.018$

Max. Allowable Spread for Minor & Major Storm
 Max. Allowable Depth at Gutter Flowline for Minor & Major Storm
 Check boxes are not applicable in SUMP conditions

	Minor Storm	Major Storm	
T_{MAX}	20.0	20.0	ft
d_{MAX}	6.0	7.0	inches
	<input type="checkbox"/>	<input type="checkbox"/>	

Maximum Capacity for 1/2 Street based On Allowable Spread

Water Depth without Gutter Depression (Eq. ST-2)
 Vertical Depth between Gutter Lip and Gutter Flowline (usually 2")
 Gutter Depression ($d_c - (W \cdot S_x \cdot 12)$)
 Water Depth at Gutter Flowline
 Allowable Spread for Discharge outside the Gutter Section W ($T - W$)
 Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)
 Discharge outside the Gutter Section W , carried in Section T_X
 Discharge within the Gutter Section W ($Q_T - Q_X$)
 Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)

	Minor Storm	Major Storm	
y	4.80	4.80	inches
d_c	2.0	2.0	inches
a	1.51	1.51	inches
d	6.31	6.31	inches
T_X	18.0	18.0	ft
E_o	0.296	0.296	
$Q_{X,T}$	0.0	0.0	cfs
$Q_{W,T}$	0.0	0.0	cfs
Q_{BACK}	0.0	0.0	cfs
Q_T	SUMP	SUMP	cfs
V	0.0	0.0	fps
$V \cdot d$	0.0	0.0	

Maximum Flow Based On Allowable Spread

Flow Velocity within the Gutter Section
 $V \cdot d$ Product: Flow Velocity times Gutter Flowline Depth

Maximum Capacity for 1/2 Street based on Allowable Depth

Theoretical Water Spread
 Theoretical Spread for Discharge outside the Gutter Section W ($T - W$)
 Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)
 Theoretical Discharge outside the Gutter Section W , carried in Section $T_{X,TH}$
 Actual Discharge outside the Gutter Section W , (limited by distance T_{CROWN})
 Discharge within the Gutter Section W ($Q_d - Q_X$)
 Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)
 Total Discharge for Major & Minor Storm (Pre-Safety Factor)
 Average Flow Velocity Within the Gutter Section
 $V \cdot d$ Product: Flow Velocity Times Gutter Flowline Depth
 Slope-Based Depth Safety Reduction Factor for Major & Minor ($d \geq 6"$) Storm
Max Flow Based on Allowable Depth (Safety Factor Applied)
 Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)
 Resultant Flow Depth at Street Crown (Safety Factor Applied)

	Minor Storm	Major Storm	
T_{TH}	18.7	22.9	ft
$T_{X,TH}$	16.7	20.9	ft
E_o	0.318	0.258	
$Q_{X,TH}$	0.0	0.0	cfs
Q_X	0.0	0.0	cfs
Q_W	0.0	0.0	cfs
Q_{BACK}	0.0	0.0	cfs
Q	0.0	0.0	cfs
V	0.0	0.0	fps
$V \cdot d$	0.0	0.0	
R	SUMP	SUMP	
Q_d	SUMP	SUMP	cfs
d			inches
d_{CROWN}			inches

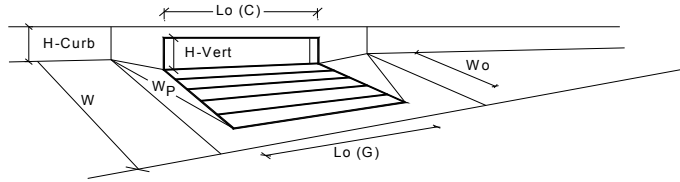
MINOR STORM Allowable Capacity is based on Depth Criterion

MAJOR STORM Allowable Capacity is based on Depth Criterion

	Minor Storm	Major Storm	
Q_{allow}	SUMP	SUMP	cfs

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017

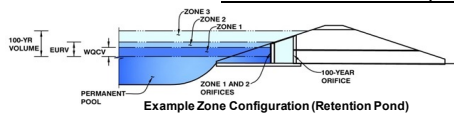


Design Information (Input)		MINOR		MAJOR	
Type of Inlet	CDOT Type R Curb Opening	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)		a _{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)		No =	1	1	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	4.4	5.7	inches
Grate Information		MINOR		MAJOR	
Length of a Unit Grate		L _g (G) =	N/A	N/A	feet
Width of a Unit Grate		W _g =	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 _l (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 _l (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	
Grate Flow Analysis (Calculated)		MINOR		MAJOR	
Clogging Coefficient for Multiple Units		Coef =	N/A	N/A	
Clogging Factor for Multiple Units		Clog =	N/A	N/A	
Grate Capacity as a Weir (based on Modified HEC22 Method)		MINOR		MAJOR	
Interception without Clogging		Q _{all} =	N/A	N/A	cfs
Interception with Clogging		Q _{we} =	N/A	N/A	cfs
Grate Capacity as a Orifice (based on Modified HEC22 Method)		MINOR		MAJOR	
Interception without Clogging		Q _{or} =	N/A	N/A	cfs
Interception with Clogging		Q _{os} =	N/A	N/A	cfs
Grate Capacity as Mixed Flow		MINOR		MAJOR	
Interception without Clogging		Q _{mi} =	N/A	N/A	cfs
Interception with Clogging		Q _{ma} =	N/A	N/A	cfs
Resulting Grate Capacity (assumes clogged condition)		MINOR		MAJOR	
		Q _{Grate} =	N/A	N/A	cfs
Curb Opening Flow Analysis (Calculated)		MINOR		MAJOR	
Clogging Coefficient for Multiple Units		Coef =	1.25	1.25	
Clogging Factor for Multiple Units		Clog =	0.06	0.06	
Curb Opening as a Weir (based on Modified HEC22 Method)		MINOR		MAJOR	
Interception without Clogging		Q _{all} =	3.5	7.7	cfs
Interception with Clogging		Q _{we} =	3.3	7.2	cfs
Curb Opening as an Orifice (based on Modified HEC22 Method)		MINOR		MAJOR	
Interception without Clogging		Q _{or} =	16.8	19.0	cfs
Interception with Clogging		Q _{os} =	15.8	17.8	cfs
Curb Opening Capacity as Mixed Flow		MINOR		MAJOR	
Interception without Clogging		Q _{mi} =	7.2	11.3	cfs
Interception with Clogging		Q _{ma} =	6.7	10.6	cfs
Resulting Curb Opening Capacity (assumes clogged condition)		MINOR		MAJOR	
		Q _{Curb} =	3.3	7.2	cfs
Resultant Street Conditions		MINOR		MAJOR	
Total Inlet Length		L =	10.00	10.00	feet
Resultant Street Flow Spread (based on street geometry from above)		T =	11.9	17.5	ft
Resultant Flow Depth at Street Crown		d _{CROWN} =	0.0	0.0	inches
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} =	0.20	0.31	ft
Combination Inlet Performance Reduction Factor for Long Inlets		RF _{Combination} =	0.41	0.54	
Curb Opening Performance Reduction Factor for Long Inlets		RF _{Curb} =	0.82	0.92	
Grated Inlet Performance Reduction Factor for Long Inlets		RF _{Grate} =	N/A	N/A	
Total Inlet Interception Capacity (assumes clogged condition)		MINOR		MAJOR	
		Q _s =	3.3	7.2	cfs
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)		MINOR		MAJOR	
		Q _{PEAK REQUIRED} =	3.3	7.2	cfs

APPENDIX D – POND AND ROUTING CALCULATIONS

MHFD-Detention, Version 4.02 (February 2020)

Basin ID: Pond C4- Interim Conditions with only developed C10.10 basins for WQ plate



Depth Increment =	0.20	ft
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[illegible]

Selected BMP Type =	EDB	
Watershed Area =	6.96	acres
Watershed Length =	900	ft
Watershed Length to Centroid =	700	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 =	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.

Water Quality Capture Volume (WQCV) =	0.128	acre-feet
Excess Urban Runoff Volume (EQRV) =	0.412	acre-feet
2-yr Runoff Volume ($P1 = 1.19$ in.) =	0.379	acre-feet
5-yr Runoff Volume ($P1 = 1.5$ in.) =	0.531	acre-feet
10-yr Runoff Volume ($P1 = 1.75$ in.) =	0.664	acre-feet
25-yr Runoff Volume ($P1 = 2.1$ in.) =	0.836	acre-feet
50-yr Runoff Volume ($P1 = 2.25$ in.) =	0.979	acre-feet
100-yr Runoff Volume ($P1 = 2.52$ in.) =	1.158	acre-feet
500-yr Runoff Volume ($P1 = 3.14$ in.) =	1.525	acre-feet
Approximate 2-yr Detention Volume =	0.314	acre-feet
Approximate 5-yr Detention Volume =	0.427	acre-feet
Approximate 10-yr Detention Volume =	0.558	acre-feet
Approximate 25-yr Detention Volume =	0.606	acre-feet
Approximate 50-yr Detention Volume =	0.633	acre-feet
Approximate 100-yr Detention Volume =	0.698	acre-feet

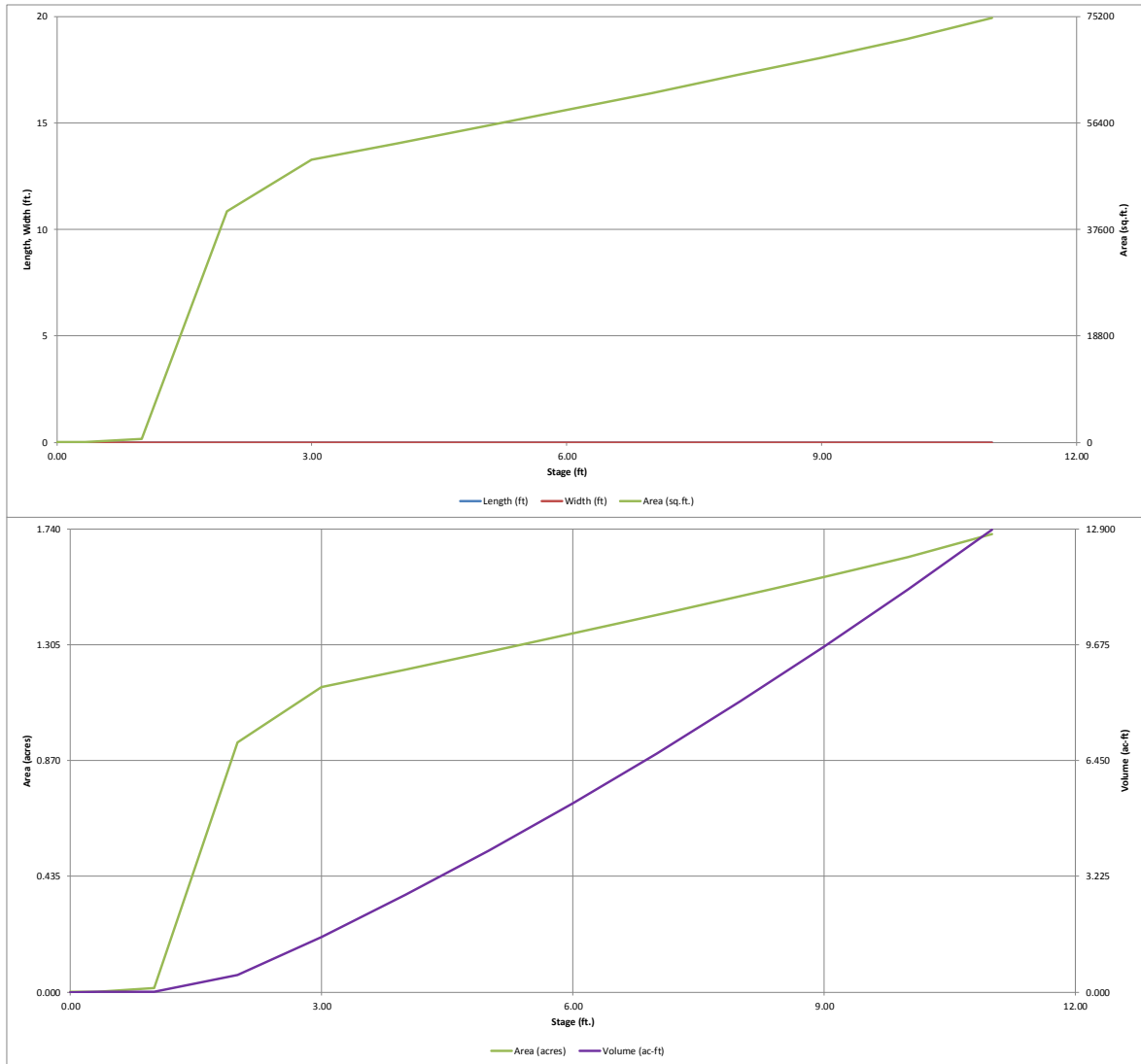
	acre-feet
	acre-feet
1.19	inches
1.50	inches
1.75	inches
2.00	inches
2.25	inches
2.52	inches
	inches

Zone 1 Volume (WQCV) =	0.128	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.285	acre-feet
Zone 3 (100yr + 1 / 2 WQCVr - Zones 1 & 2) =	0.350	acre-feet
Total Detention Basin Volume =	0.762	acre-feet
Initial Surge Volume (ISV) =	user	ft ³
Initial Surge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{Dmax}) =	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	Ht/V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	

Initial Surcharge Area (A_{SV})	=	user	ft ²
Surcharge Volume Length (L_{SV})	=	user	ft
Surcharge Volume Width (W_{SV})	=	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 STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.02 (February 2020)

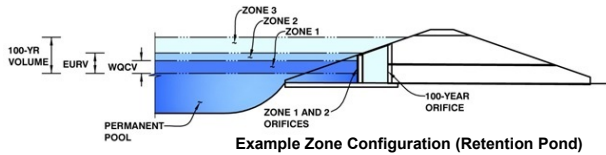


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.02 (February 2020)

Project: The Hills at Lorson Ranch

Basin ID: Pond C4- Interim Conditions with only developed C10.10 basins for WQ plate



	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	1.50	0.128	Orifice Plate
Zone 2 (EURV)	1.93	0.285	Rectangular Orifice
Zone 3 (100+1/2WQCV)	2.30	0.350	Rectangular Orifice
Total (all zones)		0.762	

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

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

Calculated Parameters for Underdrain

Underdrain Orifice Area = ft²
Underdrain Orifice Centroid = feet

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

Invert of Lowest Orifice = ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate = ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing = inches
Orifice Plate: Orifice Area per Row = sq. inches (diameter = 3/4 inch)

Calculated Parameters for Plate

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

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	0.50	1.00					
Orifice Area (sq. inches)	0.46	0.46	0.46					

	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)

Calculated Parameters for Vertical Orifice

	Zone 2 Rectangular	Zone 3 Rectangular			Zone 2 Rectangular	Zone 3 Rectangular
Invert of Vertical Orifice =	1.50	1.93	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	0.79	0.92
Depth at top of Zone using Vertical Orifice =	1.93	2.30	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	0.22	0.25
Vertical Orifice Height =	5.16	6.00	inches			
Vertical Orifice Width =	22.00	22.00	inches			

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

Calculated Parameters for Overflow Weir

	Not Selected	Not Selected			Not Selected	Not Selected
Overflow Weir Front Edge Height, H _o =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H _g =	N/A	N/A
Overflow Weir Front Edge Length =	N/A	N/A	feet	Overflow Weir Slope Length =	N/A	N/A
Overflow Weir Grate Slope =	N/A	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	N/A	N/A
Horiz. Length of Weir Sides =	N/A	N/A	feet	Overflow Grate Open Area w/o Debris =	N/A	N/A
Overflow Grate Open Area % =	N/A	N/A	%	Overflow Grate Open Area w/ Debris =	N/A	N/A
Debris Clogging % =	N/A	N/A	%			

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

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Not Selected	Not Selected			Not Selected	Not Selected
Depth to Invert of Outlet Pipe =	N/A	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	N/A	N/A
Circular Orifice Diameter =	N/A	N/A	inches	Outlet Orifice Centroid =	N/A	N/A
				Half-Central Angle of Restrictor Plate on Pipe =	N/A	N/A

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Calculated Parameters for Spillway

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		

micropool = 0 = 5765

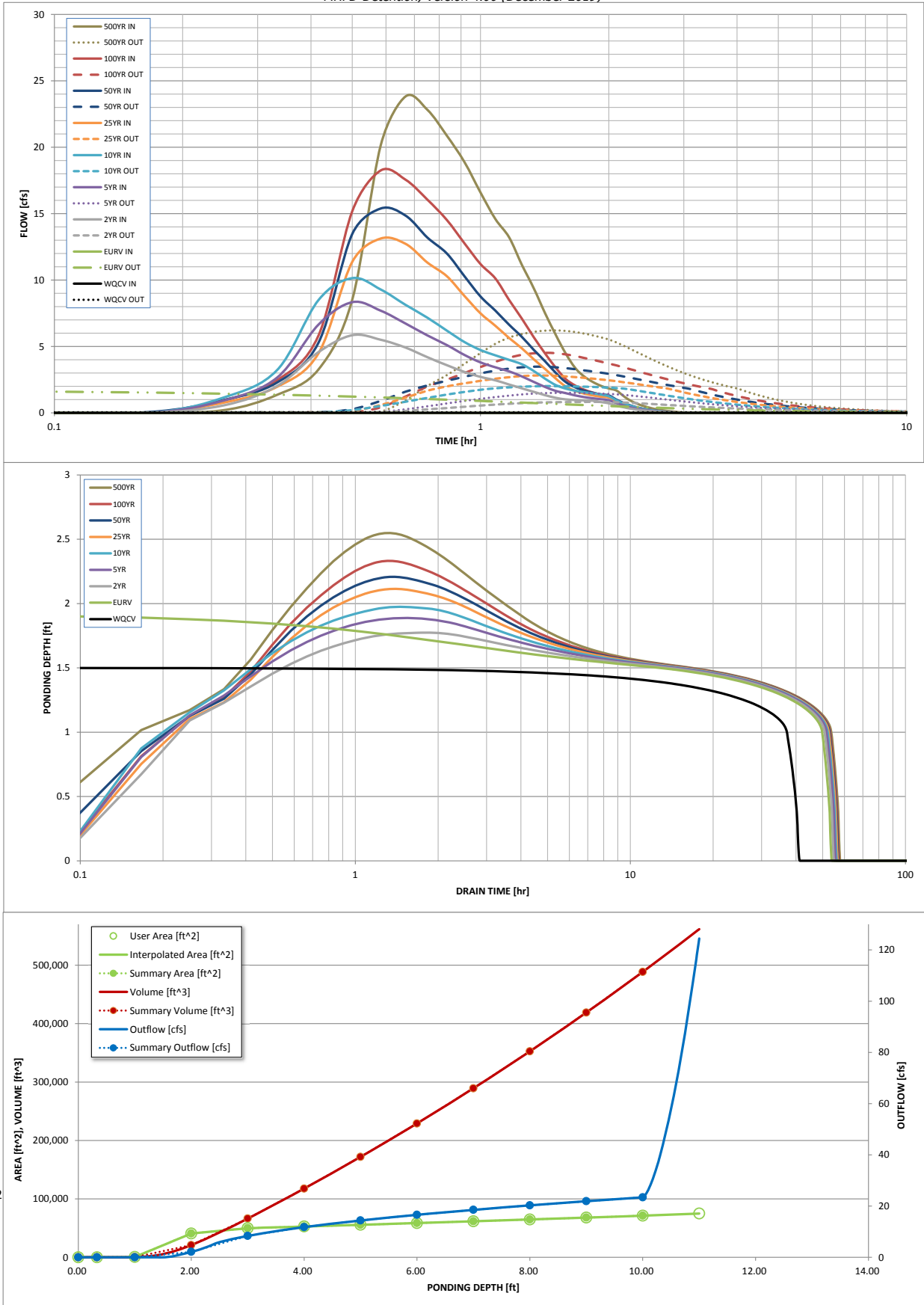
Routed Hydrograph Results

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

	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
Design Storm Return Period =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52
One-Hour Rainfall Depth (in) =	0.128	0.412	0.379	0.531	0.664	0.836	0.979	1.158
CUHP Runoff Volume (acre-ft) =	N/A	N/A	0.379	0.531	0.664	0.836	0.979	1.158
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.7	1.9	2.9	5.2	6.5	8.4
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A						
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	0.42	0.75	0.94	1.20
Peak Inflow Q (cfs) =	N/A	N/A	5.9	8.3	10.1	13.1	15.4	18.3
Peak Outflow Q (cfs) =	0.0	1.7	0.8	1.5	2.0	2.8	3.5	4.5
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.8	0.7	0.5	0.5	0.5
Structure Controlling Flow =	Vertical Orifice 1	Vertical Orifice 2	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 2	Vertical Orifice 2	Vertical Orifice 2	Vertical Orifice 2
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
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	47	49	48	47	46	45	43
Time to Drain 99% of Inflow Volume (hours) =	40	51	52	52	52	52	51	51
Maximum Ponding Depth (ft) =	1.50	1.93	1.77	1.89	1.97	2.11	2.21	2.33
Area at Maximum Ponding Depth (acres) =	0.48	0.87	0.72	0.83	0.91	0.96	0.98	1.01
Maximum Volume Stored (acre-ft) =	0.128	0.418	0.290	0.375	0.454	0.586	0.673	0.802

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			

Outflow Hydrograph Workbook Filename: .\\Outflow Hydrographs-pond C4.xlsx

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

[illegible]

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.

[illegible]

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).

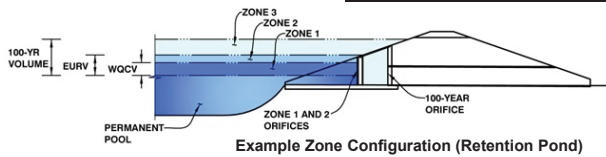
full buildout of Pond C4 from The Hills at Lorson Ranch PDR

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 Diameter = N/A inches

Calculated Parameters for Underdrain

Underdrain Orifice Area = N/A ft²
Underdrain Orifice Centroid = N/A feet

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

Calculated Parameters for Plate

Invert of Lowest Orifice = 0.00 ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate = 2.97 ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing = 11.90 inches
Orifice Plate: Orifice Area per Row = 4.68 sq. inches (use rectangular openings)

WQ Orifice Area per Row = 3.250E-02 ft²
Elliptical Half-Width = N/A feet
Elliptical Slot Centroid = N/A feet
Elliptical Slot Area = N/A ft²

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	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)

Calculated Parameters for Vertical Orif

	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			

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

Calculated Parameters for Overflow Weir

	Zone 3 Weir	Not Selected			Zone 3 Weir	Not Selected
Overflow Weir Front Edge Height, H _o =	5.50	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H _g =	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	%			

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

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	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

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Calculated Parameters for Spillway

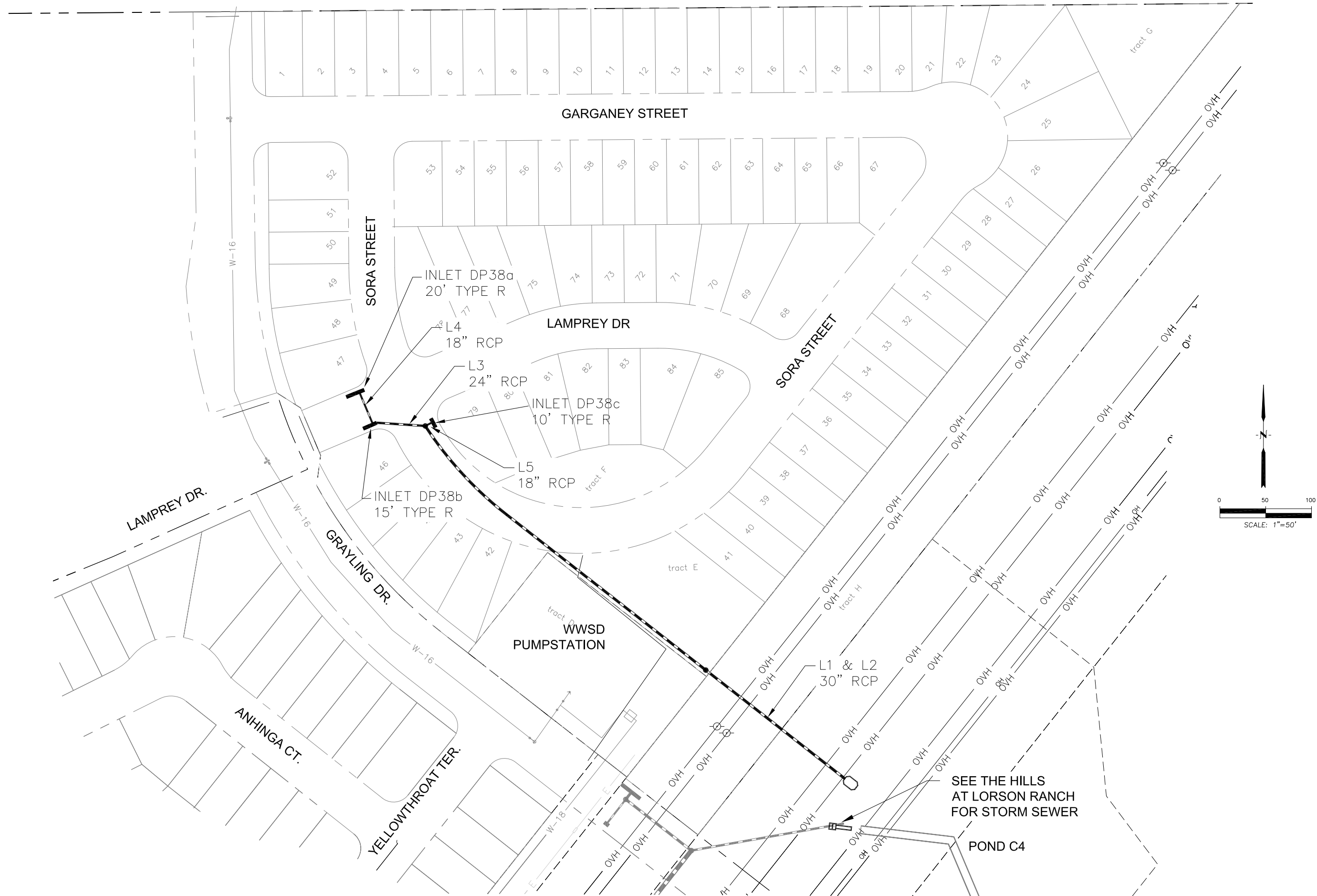
Spillway Invert Stage =	10.00	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth =	1.87	feet	
Spillway Crest Length =	30.00	feet	Stage at Top of Freeboard =	13.00	feet	
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	1.72	acres	
Freeboard above Max Water Surface =	1.13	feet	Basin Volume at Top of Freeboard =	12.89	acre-ft	

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)

	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
Design Storm Return Period =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52
One-Hour Rainfall Depth (in) =	1.488	4.468	4.607	6.475	8.109	10.045	11.748	13.830
CUHP Runoff Volume (acre-ft) =	N/A	N/A	4.607	6.475	8.109	10.045	11.748	13.830
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	17.5	39.6	56.8	90.6	111.9	138.5
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.22	0.49	0.70	1.12	1.38	1.71
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A	93.5	131.6	158.6	200.0	232.9	277.2
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	5.3	16.5	34.4	38.0	40.5	43.7
Peak Inflow Q (cfs) =	0.6	5.8	N/A	0.4	0.6	0.4	0.4	0.3
Peak Outflow Q (cfs) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
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



DATE	MAY 20, 2021
PROJECT NO.	100.063
SHEET NUMBER	1
TOTAL SHEETS:	1

DRAWN: RLS	PROJECT: THE HILLS AT LORSON RANCH FONTAINE BLVD WALLEYE DR EL PASO COUNTY, COLORADO	PREPARED FOR: LORSON, LLC 212 N. WAHSATCH AVE., SUITE 301 COLORADO SPRINGS, COLORADO 80903 719.544.1700	DATE
DESIGNED: LAB			
CHECKED: LAB			

 **CORE**
ENGINEERING GROUP

15004 1ST AVE. S.
BURNSVILLE, MN 55306
TEL: 763/793-5100
CONTACT: RICHARD L. SCHINDLER, P.E.
EMAIL: Rich@cegi.com

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	13.50	30 c	498.0	5766.90	5769.99	0.621	5768.13	5771.22	n/a	5771.22 j	End
2	2	13.50	30 c	108.2	5769.99	5770.66	0.618	5771.59	5771.89	n/a	5772.55 i	1
3	3	10.20	24 c	56.6	5771.16	5771.55	0.688	5772.55	5772.68	n/a	5773.37 i	2
4	4	7.40	18 c	36.1	5772.05	5772.34	0.803	5773.37	5773.43	n/a	5774.06 i	3
5	5	3.30	18 c	7.8	5771.66	5771.82	2.042	5772.55	5772.51	n/a	5772.86 i	2
100.063-5yr STM							Number of lines: 5			Run Date: 11-19-2020		
NOTES: c = cir; e = ellip; b = box; Return period = 5 Yrs. ; i - Inlet control. ; 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	28.60	30 c	498.0	5766.90	5769.99	0.621	5768.72	5771.83	0.17	5772.00	End
2	2	28.60	30 c	108.2	5769.99	5770.66	0.618	5772.32	5772.67	n/a	5773.51 i	1
3	3	21.40	24 c	56.6	5771.16	5771.55	0.688	5773.51*	5774.02*	n/a	5774.43 i	2
4	4	15.20	18 c	36.1	5772.05	5772.34	0.803	5774.43*	5775.18*	n/a	5776.08 i	3
5	5	7.20	18 c	7.8	5771.66	5771.82	2.042	5773.51*	5773.55*	0.26	5773.81	2
100.063-100yr STM							Number of lines: 5			Run Date: 11-19-2020		
NOTES: c = cir; e = ellip; b = box; Return period = 100 Yrs. ; *Surcharged (HGL above crown). ; i - Inlet control.												

APPENDIX F – 2019 Annual Report of Drainage/Bridge Fee Credits

2020 Lorson Ranch Drainage/Surety Fees and Drainage Fee Report						
	Subdivision Name	Drainage Fee	Surety	pay out	Credits	Credit balance
06-491	credit established				\$ 6,804,637.69	\$ 6,804,637.69
06-491	payout			\$ (403,041.97)		\$ 6,401,595.72
07-485	payout			\$ (223,130.33)		\$ 6,178,465.39
07-485	Ponderosa Filing No. 1	\$ (151,208.00)				\$ 6,027,257.39
10-255	payout			\$ (238,680.00)		\$ 5,788,577.39
12-117	payout			\$ (65,250.00)		\$ 5,723,327.39
12-117	Ponderosa Filing No. 2	\$ (192,765.00)				\$ 5,530,562.39
12-117	Pioneer Landing	\$ (219,500.00)				\$ 5,311,062.39
12-117	Townhomes at Lorson	\$ (68,512.50)				\$ 5,242,549.89
13-055	payout			\$ (187,200.00)		\$ 5,055,349.89
13-478	payout			\$ (146,790.00)		\$ 4,908,559.89
15-015	Ponderosa Filing No. 2		\$ (89,957.00)			\$ 4,818,602.89
15-015	Pioneer Landing		\$ (102,433.00)			\$ 4,716,169.89
15-015	Townhomes at Lorson		\$ (31,972.50)			\$ 4,684,197.39
15-015	Buffalo Crossing No. 2	\$ (182,228.00)	\$ (85,040.00)			\$ 4,416,929.39
15-239	payout			\$ (145,620.00)		\$ 4,271,309.39
15-473	payout	\$ (149,292.00)				\$ 4,122,017.39
16-091	credit established				\$ 745,604.28	\$ 4,867,621.67
	Meadows Filing No. 1	\$ (181,578.00)	\$ (84,736.00)			\$ 4,601,307.67
	Meadows Filing No. 2	\$ (224,587.00)	\$ (104,808.00)			\$ 4,271,912.67
	Allegiant at Lorson	\$ (162,021.00)	\$ (75,610.00)			\$ 4,034,281.67
	Buffalo Crossing No. 1	\$ (78,975.00)	\$ (36,855.00)			\$ 3,918,451.67
						\$ 3,918,451.67
	Meadows 3	\$ (287,820.00)	\$ (134,316.00)			\$ 3,496,315.67
	Meadows 4	\$ (464,200.00)	\$ (216,626.00)			\$ 2,815,489.67
	Pioneer Landing 2	\$ (370,756.00)	\$ (165,095.00)			\$ 2,279,638.67
	Carriage Meadows South	\$ (844,538.00)	\$ (376,066.00)			\$ 1,059,034.67
	Carriage Meadows North	\$ (296,184.00)	\$ (132,618.00)			\$ 630,232.67
	Pioneer Landing 3	\$ (15,832.00)	\$ (7,089.00)			\$ 607,311.67
	Lorson Ranch East Filing No. 1	\$ (899,058.00)	\$ (380,859.00)			\$ (672,605.33)
20-17	credit established				\$ 984,434.42	\$ 311,829.09

Drainage Fee Pre-Credit Analysis						
	Subdivision Name	Drainage Fee	Surety	pay out	Credits	Credit balance
	CDR 19-002 (CD's not approved yet)				\$ 2,074,670.20	\$ 2,074,670.20
	Lorson Ranch East Filing No. 2	\$ (322,236.00)	\$ (136,506.00)			\$ 1,615,928.20
	Lorson Ranch East Filing No. 3	\$ (177,213.00)	\$ (70,354.00)			\$ 1,368,361.20
	Creekside at Lorson filing 1	\$ (429,894.00)	\$ (170,669.00)			\$ 767,798.20
	Lorson Ranch East Filing No. 4	\$ (475,387.00)	\$ (188,729.00)			\$ 103,682.20
	totals	\$ (6,193,784.50)	\$ (2,590,338.50)	\$ (1,409,712.30)	\$ 10,609,346.59	

	confirmed with resolution
	current credit balance

MAP POCKET

LEGEND

--- PUD BOUNDARY
--- BASIN BOUNDARY

BASIN DESIGN POINT
BASIN I.D.
XX AC
X.X | X.X
5 YR/100 YR CFS

--- DENOTES OVERALL BASIN

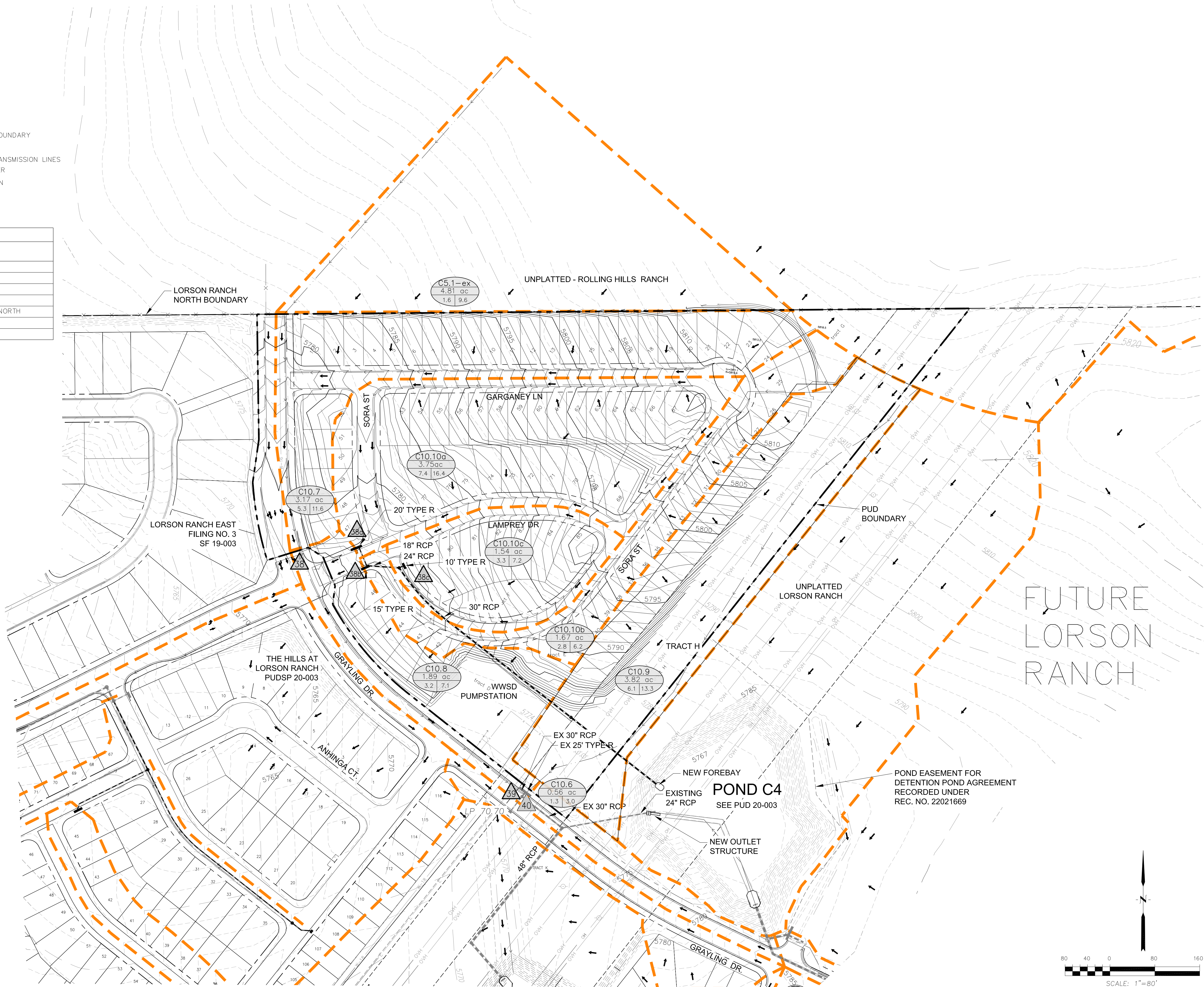
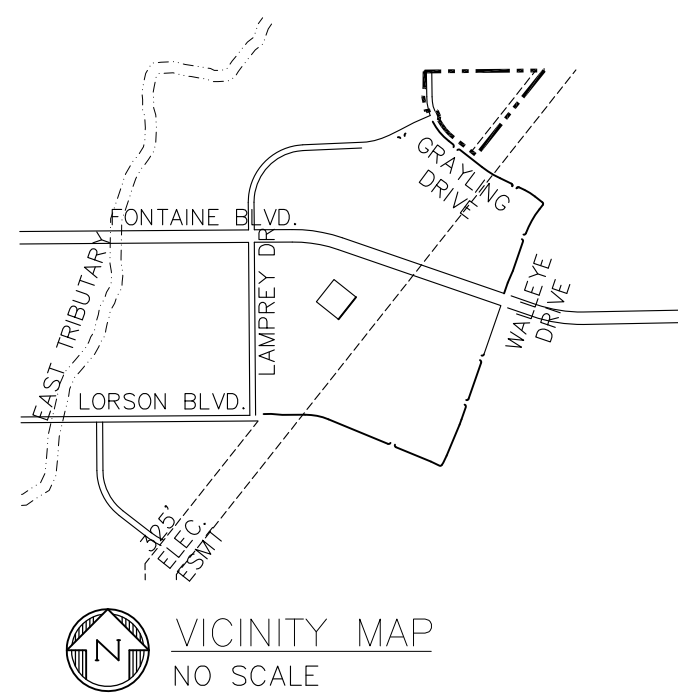
--- DIRECTION OF FLOW
--- EXISTING CONTOUR
--- PROPOSED CONTOUR

--- ROW/LORSON RANCH BOUNDARY
--- EXISTING STORM SEWER
--- EXISTING OVERHEAD TRANSMISSION LINES
--- PROPOSED STORM SEWER

--- TIME OF CONCENTRATION
HP
LP

--- HIGH POINT
--- LOW POINT

RUNOFF SUMMARY				
D.P.	AREA (acres)	5 YEAR cfs	100 YEAR cfs	NOTES
38	7.98 ac	6.8	22.1	STREET FLOW
38a	3.75 ac	7.4	16.4	STREET FLOW
38b	5.42 ac	2.8	6.2	STREET FLOW
38c	6.96 ac	3.3	7.2	STREET FLOW
39	9.87 ac	8.5	25.1	STREET FLOW FROM NORTH
40	14.25 ac	14.7	38.7	STREET FLOW



CORE ENGINEERING GROUP

15004 1ST AVE. S.
BURNSVILLE, MN 55306
PH: 763-257-0000
FAX: 763-257-0001
EMAIL: Rich@cegi.com

DATE: _____

DESCRIPTION: _____

NO: _____

DRAWN: RLS
DESIGNED: LAB
CHECKED: LAB

PROJECT: THE HILLS AT LORSON RANCH
FONTAINE BLVD. - WALLEYE DRIVE
EL PASO COUNTY, COLORADO

PREPARED FOR: LORSON, LLC
212 N. WASHBACH AVE. SUITE 301
COLORADO SPRINGS, COLORADO 80903
(719) 635-3200
CONTACT: JEFF MARK

DEVELOPED CONDITIONS
SKYLINE AT LORSON RANCH
C10 BASIN

DATE: MAY 20, 2021

PROJECT NO.: 100.063

SHEET NUMBER: 1

TOTAL SHEETS: 1