FINAL DRAINAGE PLAN

LORSON RANCH EAST FILING NO. 2

JUNE 22, 2018

SF-18-00X

019/EGP-18-002

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. 100.044

CORE ENGINEERING GROUP

TABLE OF CONTENTS

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 located within a designated floodplain as shown on Flood Insurance Rate Map Panel No. 08041C0957 F and 08041C1000 F, dated March 17, 1997 and modified by modified per LOMR Case No. 14-08-0534P. (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: ____

Revise

1.0 LOCATION and DESCRIPTION

Lorson Ranch East Filing No. 2 is located east of the East Tributary of Jimmy Camp Creek and north of Fontaine Boulevard. The site is located on approximately 53.87acres 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 West 1/2 of Sections 14 and the South ½ of Section 13, Township 15 South and Range 65 West of the 6^{th} Principal Meridian. The property is bounded on the south by Fontaine Boulevard, on the east by unplatted land in Lorson Ranch, on the west by The East Tributary of Jimmy Camp Creek, and the north by unplatted land in Banning Lewis Ranch and Rolling Hills Ranch. For reference, a vicinity map is included in Appendix A of this report.

<u>Conformance with applicable Drainage Basin Planning Studies</u>
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 a portion of the East Tributary was reconstructed from Fontaine Boulevard south 2,800 feet in accordance with the 1987 study. This section of the East Tributary included a trapezoidal channel section with 6:1 side slopes and a sand bottom. 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. Channel improvements in the East Tributary north of Fontaine Boulevard were designed by Kiowa Engineering and are currently under construction and must be completed before this final plat is recorded. Channel improvements south of Fontaine Boulevard within this final plat limits were constructed in 2014.

Doesn't make sense.

<u>Conformance with Lorson East MDDP and PDR by Core Engineering Group</u>
Core Engineering Group has an approved MDDP for Lorson East and PDR for Lorson Ranch East which covers this final plat area and the East Tributary. This PDR conforms to the MDDP and PDR for Lorson East and is referenced in this report. The major infrastructure to be constructed in this final plat site includes Detention/WQ Ponds C5 and D2 which have been constructed as part of Lorson Ranch East Filing No. 1. There are also two bridges over the East Tributary that are required to be built for this plat. The bridges are located at Fontaine Boulevard and Lorson Boulevard. Both bridge construction plans were prepared by Kiowa Engineering and have been approved. Construction is currently underway for both bridges and must be complete prior to recordation of this plat.

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

Add bridge over main stem JCC

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. 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. Pond C5 is currently under construction as part of Lorson Ranch East Filing No. 1 and will be complete prior to recordation of this plat.

3.0 EXISTING HYDROLOGICAL CONDITIONS

Prior to the early grading of Lorson Ranch East the site was 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 Lorson Ranch East property as Ascalon Loam, 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 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 will 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
2-Ascalon Sandy Loam	B	Moderate	Moderate	Slow to Medium	Moderate
3-Ascalon Sandy Loam	B	Moderate	Moderate	Slow to Medium	Moderate
52-Manzanola Clay Loam	C	High	Slow	Medium	Moderate
54-Midway Clay Loam	C	High	Slow	Medium to Rapid	Moderate to High
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" [2] 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. The majority of this site is to be filled by material from the school site which is Razor Clay Loam which is Hydrologic Group C therefore the hydrologic conditions are assumed to be Group C.

Address LOMR approval necessary prior to recording final plat.

An existing electrical easement, with existing transmission towers, is located east side of this site and will be set aside as open space in the future.

Portions of the site are 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 08041C0957 F & 08041C1000 F, effective 17 March 1997 [2]. Floodplain along the East Tributary was modified per LOMR Case No. 14-08-0534P (see appendix). Floodplain designations include Zone AE and Zone X within the property boundary. A portion of this map is provided in ***Appendix A*** for reference. A CLOMR for the creek and bridge construction which includes grading to remove some areas north of Fontaine Boulevard from the current floodplain has been submitted to and approved by FEMA under Case No. 17-08-1043R.

The existing basins for this large site were taken from the Lorson Ranch East MDDP East of the East Tributary and depict conditions prior to any grading in Lorson Ranch East. A map from the MDDP has been included in the appendix.

Overall Basin EX-C flows to Design Point 2

This is the largest existing basin at 452.97 acres which includes approximately the northern half of the site. This basin is an overall existing basin including Basins EX-C1 to EX-C10. There are two offsite basins (OS-C6.1 and OS-C5.1) which flow onto the site from the north and east and are included in the flow at Design Point 2. Under existing conditions, this basin contributes 141.0 cfs and 458.0 cfs for the 5-year and 100-year events respectively at Design Point 2. Design Point 2 is located at the East Tributary and all flow is routed to the East Tributary in an existing swale that is eroded and is not armored.

3.1 INTERIM HYDROLOGICAL CONDITIONS

Interim hydrological conditions have been calculated based on grading that has been completed in accordance with Phase 1 of the Early Grading for Lorson Ranch East (PUDSP 16-003), Fontaine Boulevard/Lamprey Drive construction (CDR 183), and the school site improvements currently under construction. Interim condition existing flows have been calculated to determine interim drainage impacts to this final plat which is located downstream and to make sure runoff is accommodated by the street/storm sewer system constructed as part of this plat and CDR 183. These interim condition calculations are also used to perform hydraulic modeling of Pond C5 to see what effect the existing upstream flows have on the downstream pond outflow rates when compared to pre-developed conditions at the East Tributary. The interim conditions hydraulic modeling will be done by a computer program called Hydraflow (Intellisolve) and is discussed in Interim Conditions for Pond C5 (Section 6.0) of this report.

Interim conditions consist of Fontaine Boulevard construction from Old Glory Drive eastward 3,500 feet to the existing electric transmission lines, Lamprey Drive construction from Fontaine Boulevard northeast 1,800 feet to Yamhill Drive per CDR 183. CDR 183 includes street, storm sewer, sanitary sewer, and watermain construction which provides access to this plat. Interim conditions also include all the interior streets/infrastructure for this final plat and construction of the school site by the school district.

Interim Basin EX3

This interim basin consists of existing flow from undeveloped areas east of Lamprey Drive and the School Site. Runoff flows west overland and in natural drainageways to Design Point 2. The existing runoff is 43cfs and 193cfs for the 5-year and 100-year events. The downstream storm sewer at Design Point 5 is designed for the future flows of 52.5cfs/71.5cfs in the 5-year and 100-year events per the Fontaine/Lamprey construction (CDR 183). Interim Detention Pond EX-3 will be constructed at Design Point 2 to detain existing runoff less than downstream storm sewer capacities. See Interim Pond EX-3 and Design Point 2 for more information.

Address overflow path and conveyance capacity.

Interim Basin EX3.1

This interim basin consists of existing flow from undeveloped residential areas east of Lorson Ranch East Filing No. 2. The contours shown for this basin are taken from the Lorson Ranch East Early Grading Plans and the School Site grading plans. The school site has a large volume of dirt export generated by grading the school site and the material will be used to raise the grade in this basin. The existing flows are calculated based on vacant land that has been revegetated since development in this basin may not occur for several years. Future development will have to design storm sewer extensions and street capacities to handle developed flow when the future final plat is prepared. The existing flow is directed overland to a proposed 24" storm sewer constructed with this final plat. The existing runoff is 5.0cfs and 31.0cfs for the 5-year and 100-year events. See Design Point 6 for analysis of the 24" storm sewer and the temporary sediment basin at this location.

Interim Basin EX3.2

This interim basin consists of existing flow from undeveloped areas east of Lorson Ranch East Filing No. 2 and the future Lamprey Drive and Lorson Boulevard extension. The contours shown for this basin are taken from the Lorson Ranch East Early Grading Plans. The school site has a large volume of dirt export generated by grading the school site and the material will be used to raise the grade in this basin. Lamprey Drive and Lorson Boulevard have been graded as part of the Phase 1 grading in the Lorson Ranch East Early Grading plans. The existing flows are calculated based on vacant land that has been revegetated since development in this basin may not occur for several years. Future development will have to design storm sewer extensions and street capacities to handle developed flow when the future final plat is prepared. The existing flow is directed overland to an existing 24" storm sewer constructed as part of the Fontaine/Lamprey construction (CDR 183) at Design Point 4. The existing runoff is 2.0cfs and 13.0cfs for the 5-year and 100-year events. See Design Point 4 for analysis of the existing 24" storm sewer and the proposed temporary sediment basin at this location.

Basin C13

This basin consists of developed flow from the proposed school site. Runoff flows west in curb/storm sewer constructed by the school to a proposed detention pond at Design Point 9 located on the school site. The school will construct and own/maintain the detention pond. Water Quality for this basin has been provided by Lorson Ranch as part of Pond C5 constructed in Lorson Ranch East Filing No. 1. The developed runoff is 31.5cfs and 70.2cfs for the 5-year and 100-year events entering the school pond. See Design Point 9 for analysis of the proposed School Pond.

4.0 DEVELOPED HYDROLOGICAL CONDITIONS

Hydrology for the **Lorson Ranch East Filing No. 2** final 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 C/D has been assumed for the hydrologic conditions because most of the site requires fill and the majority of the fill will be from the school site which is Razor Clay Loam (75), Hydrologic Group C. This approach will provide a more conservative approach to designing the storm sewer infrastructure. 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 A1

Basins A1 consists of flow from backyards and the East Tributary of Jimmy Camp Creek. Runoff is directed north to the East Tributary of Jimmy Camp Creek. The peak developed flow from this basin is 4.6cfs and 16.9cfs for the 5/100-year storm event See the appendix for detailed calculations. See Section 6.0 for water quality discussions.

Provide deviation request for WQCV

Basin C16.3

Basin C16.3 consists of residential development located NE of Shavers Drive and Lamprey Drive. Runoff is directed southwest in curb/gutter in Mumford Drive and then south to Design Point 6a to a proposed Type “R” inlet in Shavers Drive. The peak developed flow from this basin is 3.6cfs and 7.9cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Address interim and ultimate conditions.

Basin C16.4

Basin C16.4 consists of residential development located east of Shavers Drive on Lamprey Drive. Runoff is directed west in curb/gutter in Lamprey Drive and to Design Point 8 to an existing Type “R” inlet in Shavers Drive. The developed flow from this basin is 1.7cfs and 3.9cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin C16.14

Basin C16.14 consists of residential development located north of Lamprey Drive on the east side of Shavers Drive. Runoff is directed south in curb/gutter to Design Point 7 to existing 5’ Type “R” inlet in Shavers Drive constructed per CDR183. The developed flow from this basin is 0.3cfs and 0.6cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin C16.15

Basin C16.15 consists of residential development located north of Mumford Drive on the east side of Shavers Drive. Runoff is directed south in curb/gutter to Design Point 6a to a proposed Type “R” inlet. The developed flow from this basin is 4.8cfs and 10.1cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin C16.16

Basin C16.16 consists of residential development located NE of Clarion Drive and Lamprey Drive. Runoff is directed southwest in curb/gutter in Lamprey Drive to a proposed Type “R” inlet in Mumford Drive at Design Point 10. The developed flow from this basin is 2.9cfs and 5.4cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin C16.17

Basin C16.17 consist of residential development located NE of Clarion Drive and Lamprey Drive. Runoff is directed southwest in curb/gutter in Mumford Drive to a proposed Type “R” inlet in Mumford Drive at Design Point 10. The developed flow from these basin is 3.0cfs and 6.6cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin C16.18

Basin C16.18 consists of residential development located North of Clarion Drive and Mumford Drive. Runoff is directed south in curb/gutter in Mumford Drive to Design Point 10a to a proposed Type “R” inlet in Mumford Drive. The developed flow from this basin is 5.7cfs and 12.2cfs for the 5/100-year storm event. See the appendix for detailed calculations.

10-foot

Basin C16.19
Basin C16.19 consists of residential development located on Clarion Drive. Runoff is directed southwest in curb/gutter in Clarion Drive to Design Point 16 to a proposed Type “R” inlet in Wacissa Drive. The developed flow from this basin is 3.1cfs and 6.9cfs for the 5/100-year storm event. See the appendix for detailed calculations.

south of Clarion Dr.

Basin C16.20
Basin C16.20 consists of residential development located on Nash and Wacissa Drive. Runoff is directed southwest in curb/gutter in Nash and Wacissa Drive to Design Point 12a to a proposed Type “R” inlet in Nash Drive. The developed flow from this basin is 5.4cfs and 12.0cfs for the 5/100-year storm event. See the appendix for detailed calculations

Tarbell?

Basin C16.21
Basin C16.21 consists of residential development located on Nash and Wacissa Drive. Runoff is directed southwest in curb/gutter in Nash and Wacissa Drive to Design Point 12a to a proposed Type “R” inlet in Nash Drive. 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

and DP13?

Basin C16.22
Basin C16.22 consists of residential development located on Nash Drive. Runoff is directed southwest in curb/gutter in Nash Drive to Design Point 12 to a proposed Type “R” inlet in Nash Drive. The developed flow from this basin is 5.1cfs and 11.3cfs for the 5/100-year storm event. See the appendix for detailed calculations

10-foot

Basin C16.23
Basin C16.23 consists of residential development located on Nash Drive. Runoff is directed southwest in curb/gutter in Nash Drive to Design Point 12 to a proposed Type “R” inlet in Nash Drive. The developed flow from this basin is 2.6cfs and 5.8cfs for the 5/100-year storm event. See the appendix for detailed calculations

Basin C16.24
Basin C16.24 consists of residential development located on Wacissa and Tarbell Drive. Runoff is directed southwest in curb/gutter in Wacissa Drive to Design Point 13 to a proposed Type “R” inlet in Wacissa Drive. The developed flow from this basin is 4.5cfs and 10.1cfs for the 5/100-year storm event. See the appendix for detailed calculations

south of Nash Dr.

Basin C16.25
Basin C16.25 consists of residential development located on Wacissa Drive. Runoff is directed south in curb/gutter in Wacissa Drive to Design Point 17 to a proposed Type “R” inlet in Wacissa Drive. The developed flow from this basin is 0.8cfs and 1.9cfs for the 5/100-year storm event. See the appendix for detailed calculations

Basin C16.26
Basin C16.26 consists of residential development located on Mumford Drive. Runoff is directed north in curb/gutter in Mumford Drive to Design Point 10b to a proposed Type “R” inlet at Mumford/Clarion Drive. The developed flow from this basin is 3.2cfs and 6.9cfs for the 5/100-year storm event. See the appendix for detailed calculations

Basin C16.27
Basin C16.27 consists of residential development located on Mumford Drive. Runoff is directed north in curb/gutter in Mumford Drive to Design Point 10c to a proposed Type “R” inlet at Mumford/Clarion Drive. The developed flow from this basin is 0.6cfs and 1.3cfs for the 5/100-year storm event See the appendix for detailed calculations

west in Ballona and Zealand then north
30-foot

Basin C16.28

Basin C16.28 consists of residential development located on Wacissa, Zealand, Ballona Drive. Runoff is directed northwest in curb/gutter in Wacissa Drive to Design Point 16 to a proposed Type "R" inlet in Wacissa Drive. The developed flow from this basin is 3.9cfs and 8.6cfs for the 5/100-year storm event See the appendix for detailed calculations

west in Clarion and Zealand then north

Basin C16.29

Basin C16.29 consists of residential development located on Wacissa, Zealand, Clarion Drive. Runoff is directed northwest in curb/gutter in Wacissa Drive to Design Point 16 to a proposed Type "R" inlet in Wacissa Drive. 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 C16.30

Basin C16.30 consists of residential development located on Wacissa and Tarbell Drive. Runoff is directed south in curb/gutter in Wacissa Drive to Design Point 14 to a proposed Type "R" inlet in Wacissa Drive. The developed flow from this basin is 6.8cfs and 15.2cfs for the 5/100-year storm event. See the appendix for detailed calculations

Basin C16.31

Basin C16.31 consists of backyards of houses on Wacissa Drive, East Tributary, and open space. Runoff is directed overland to the East Tributary. The developed flow from this basin is 6.9cfs and 27.4cfs for the 5/100-year storm event. See Section 6.0 for water quality discussions for backyards. See the appendix for detailed calculations

Ballona

Basin C16.32

Basin C16.32 consists of residential development located on Wacissa and Mumford Drive. Runoff is directed north in curb/gutter in Wacissa Drive to Design Point 17 to a proposed Type "R" inlet. The developed flow from this basin is 1.8cfs and 4.1cfs for the 5/100-year storm event. See the appendix for detailed calculations

30-foot

Basin C16.34

Basin C16.34 consists of flow from Lamprey Drive and the adjacent backyards. Runoff is directed south in curb/gutter in to a Type "R" inlet in the NW corner of Fontaine Boulevard and Lamprey Drive at Design Point 34. The developed flow from this basin is 0.9cfs and 1.9cfs for the 5/100-year storm event. See the appendix for detailed calculations

Basin C16.35

Basin C16.35 consists of flow from residential development and Fontaine Boulevard. Runoff is directed south and west in curb/gutter in to a proposed Type "R" inlet in the NE corner of Fontaine Boulevard and Edisto Drive at Design Point 35. 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 C16.36

Basin C16.36 consists of flow from residential development and Pond C5. Runoff is directly tributary to Pond C5. The developed flow from this basin is 6.3cfs and 24.7cfs for the 5/100-year storm event. See the appendix for detailed calculations

Basin C17.8

Basin C17.8 consists of residential development and Fontaine Boulevard on the north side. Runoff is directed west in curb/gutter to Design Point 42 to a Type "R" inlet in Fontaine Boulevard. The peak developed flow from this basin is 3.2cfs and 7.2cfs 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 *StormSewers* 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)

typo?

<u>Design Point 1</u>

Design Point 1 is located at the East Tributary of Jimmy Camp Creek on the north property line. A swale along the north property line will re-direct offsite runoff from Basin OS-C11 westward to the East Tributary so the lots are not burdened with offsite flows. The swale is a "V" swale, 2.5' deep, and at a minimum slope of 1%, and conveys the runoff from the 100-year storm event of 21cfs at a depth of 1.3' deep. The total flow is 9.4cfs and 21cfs in the 5/100-year storm events

<u>Design Point 2</u>

Design Point 2 is located at the south side of the future Lamprey Drive west of the school site where a natural drainageway is located. This design point accepts flow from an existing undeveloped Basin EX-3. In the future, upstream runoff will be diverted south into Pond C3 (see Lorson Ranch East MDDP, approved) resulting in reduced flow rates to this design point. For interim existing flows the downstream storm sewer does not have capacity to handle the flow so an interim detention pond is proposed at this location. Interim Detention Pond EX-3 consists of a 30" pipe outlet structure and is only to reduce runoff to amounts lower than the downstream storm sewer system. The outflow from Pond EX-3 is

describe outfall protection

34cfs and 67cfs in the 5/100-year storm events. The flow is directed north in a 30" temporary CMP pipe under the future Lamprey Drive to Design Point 3. When development in this area (south of Lamprey) is started Pond EX-3 will be removed and Pond C3 will need to be constructed per the Lorson Ranch East MDDP. See Section 6.0 for pond calculations.

<u>Design Point 3</u>
Design Point 3 is located in the NE corner of Lamprey Drive and Yamhill Drive. Flow at this design point is from Pond EX-3 outflow. A temporary 36" CMP will be constructed southwest to an existing manhole in Lamprey Drive at Yamhill Drive constructed as part of the Fontaine improvements (CDR 183). When Lamprey Drive is extended the temporary pipes will be removed. The total flow at this design point is 34cfs and 67cfs in the 5/100-year storm events. The temporary swale from Pond EX-3 is a trapezoid swale, 4' wide bottom, 3' deep, flow depth of 1.59' at 67cfs, velocity of 4fps at flow rate of 67cfs.

<u>Design Point 4</u>
Design Point 4 is located in the north of Lamprey Drive and Yamhill Drive. Flow at this design point is from Basin EX-3.2. A 24" RCP storm sewer was constructed in Yamhill Drive which connects to a manhole in Lamprey Drive at Yamhill Drive constructed as part of the Fontaine improvements (CDR 183). Temporary Sediment Basin EX-3.2 will be constructed over the 24" storm sewer including a 36" standpipe and perforated pipe. The existing interim runoff is 2.0cfs and 13.0cfs for the 5-year and 100-year events. The existing 24" storm sewer in Yamhill Drive is designed for future flows of 18.8cfs and 35.5cfs for the 5-year and 100-year events (see Fontaine CDR 183) and has capacity for the interim flows. Temporary Sediment Basin EX-3.2 is designed as follows: top=5748.00, btm=5746, top 36" standpipe=5747.00, 100-yr WSEL=5747.56, 8" perforated pipe, volume=466cuft, bottom is 5'x5', sideslopes are 4:1. When Yamhill Drive is extended the sediment basin will be removed.

<u>Design Point 5</u>
Design Point 5 is located at Lamprey Drive and Yamhill Drive at an existing manhole in the intersection. Flow at this design point is from Design Point 3 and 4. The total interim flows at this design point are 36cfs and 80cfs in the 5/100-year storm events. The existing 36" storm sewer in Lamprey Drive is designed for future flows of 52.5cfs and 71.5cfs for the 5-year and 100-year events (see Fontaine CDR 183). The interim 100year flow is slightly more than the future flows but the HGL is only slightly above the top of the pipe and the additional flow can be accommodated by the pipe. In the event the pipe does not have capacity the overflow will drain overland in Lamprey Drive west to Shavers Drive where existing inlets will capture the flow at Design Point 8. Design Point 8 will have excess capacity since a large portion of the tributary drainage area isn't developed at this time.

<u>Design Point 6</u>
Design Point 6 is located on Mumford Drive west of Shavers Drive just west of where the street construction for this plat will end. Flow at this design point is from Basin EX-3.1. A 24" RCP storm sewer will be constructed in Mumford Drive to collect this flow. Temporary Sediment Basin EX-3.1 will be constructed over the 24" storm sewer including a 36" standpipe and perforated pipe. The existing interim existing runoff is 5.0cfs and 31.0cfs for the 5-year and 100-year events. The 24" storm sewer in Mumford Drive is designed for future flows of 11.05cfs and 17.9cfs for the 5-year and 100-year events (see Lorson Ranch East PDR). Per the Lorson Ranch East PDR (Design Point 6), 14.75cfs is allowed to flow overland in the street to Design Point 6a which results in capacity for the interim existing runoff. Temporary Sediment Basin EX-3.1 is designed as follows: top=5743.00, btm=5741, top 36" standpipe=5742.00, 100-yr WSEL=5742.69 for 18cfs, 8" perforated pipe, volume=1162cuft, bottom is 10'x10', sideslopes are 4:1. When Mumford Drive is extended the sediment basin will be removed.

SE?

Design Point 6a

Design Point 6a is located at the SW corner of Shavers Drive and Mumford Drive

(5-year storm)

Tributary Basins: C16.15 **Inlet/MH Number:** Inlet DP6a

Upstream flowby: 1.77cfs **Total Street Flow:** 6.61cfs

Flow Intercepted: 5.71cfs **Flow Bypassed:** 0.9 cfs to Inlet DP8

Inlet Size: 10' type R, on-grade

Street Capacity: Street slope = 1.0%, capacity = 9.0cfs, inlet needed

(100-year storm)

Tributary Basins: C16.15 **Inlet/MH Number:** Inlet DP6a

Upstream flowby: 14.75cfs **Total Street Flow:** 24.87cfs

Flow Intercepted: 11.17cfs **Flow Bypassed:** 13.7cfs to Inlet DP8

Inlet Size: 10' type R, on-grade

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

Design Point 6b

Design Point 6b is located at the east side of the intersection of Clarion Drive and Lamprey Drive at a low point in Lamprey Drive. This Design Point was taken from the Fontaine FDR (CDR183)

(5-year storm)

Tributary Basins: C13.1 **Inlet/MH Number:** Inlet DP6b

Upstream flowby: 0 cfs **Total Street Flow:** 6.8cfs

Flow Intercepted: 6.8cfs **Flow Bypassed:**

Inlet Size: 15' type R, sump

Street Capacity: Street slope = 1.5%, capacity = 11cfs

(100-year storm)

Tributary Basins: C13.1 **Inlet/MH Number:** Inlet DP6b

Upstream flowby: 33.0cfs **Total Street Flow:** 40.5cfs

Flow Intercepted: 20.3cfs **Flow Bypassed:** 20.2cfs to Inlet DP10b

Inlet Size: 15' type R, sump

Street Capacity: Street slope = 1.5%, capacity = 44.1cfs (half street) is okay

Design Point 6c

This Design Point was taken from the Fontaine FDR (CDR183). Design Point 6c is located at the east side of the intersection of Clarion Drive and Lamprey Drive at a low point. A 30" RCP constructed in the Fontaine construction plans (CDR183) is stubbed to the school site to collect the flows from Basin C13 (school site). The school site will be required to construct on-site storm sewer/inlets and an on-site detention pond to collect/detain runoff. Water quality for Basin C13 is provided in Pond C5. Runoff rates from this basin are required to be reduced to pre-developed flows of 7.6cfs in the 5-year and 40.5cfs in the 100-year storm events to the 30" RCP stub according to the Fontaine FDR (CDR183).

The flow at this design point in the 30" storm sewer from Design Point 9 (school pond outflow) is 0.8cfs in the 5-year and 29cfs in the 100-year storm events which is less than the allowable flow based on hydraulic modeling of the school pond in Hydraflow. See School Pond in Section 6.0.

Design Point 7

This Design Point was taken from the Fontaine FDR (CDR183). Design Point 7 is a small drainage basin (C16.14) that includes a 5' Type R inlet (constructed as part of Fontaine CDR 183) to drain the curb in the NW corner of Shavers Drive and Lamprey Drive. The total flow is 0.3cfs and 0.6cfs in the 5/100 year storm events. There are no bypass flows for this inlet.

Design Point 8

This Design Point was taken from the Fontaine FDR (CDR183). This inlet was constructed as part of the Fontaine CDR183 project. Design Point 8 is located at the NE corner of Shavers Drive and Lamprey Drive

(5-year storm)

Tributary Basins: C16.3-C16.4 **Inlet/MH Number:** Inlet DP8

Upstream flowby: 0.9cfs **Total Street Flow:** 6.2cfs

Flow Intercepted: 6.20cfs **Flow Bypassed:** 0

Inlet Size: 10' type R, sump (existing)

Street Capacity: Street slope = 1.0%, capacity = 9.0cfs, inlet needed

(100-year storm)

Tributary Basins: C16.3-C16.4 **Inlet/MH Number:** Inlet DP8

Upstream flowby: 13.7cfs **Total Street Flow:** 25.2cfs

Flow Intercepted: 16.3cfs **Flow Bypassed:** 8.9cfs to Inlet DP10

Inlet Size: 10' type R, sump, (existing)

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

Design Point 9

Design Point 9 is located on the school site and is the detention pond the school will be constructing. The tributary basin for the Pond is Basin C13 and the total inflow is 31.5cfs and 71.2cfs in the 5/100 year storm events. The outflow from the School Pond is 0.8cfs and 29cfs in the 5/100 year storm events and is conveyed to Design Point 6c in a 24" storm sewer. See School Pond in Section 6.0 for more information. A full hydraulic analysis for this pond will be completed by the school.

Design Point 10

Design Point 10 is located at the NE corner of Clarion Drive and Mumford Drive

(5-year storm)
Tributary Basins: C16.16-C16.17 **Inlet/MH Number:** Inlet DP10
Upstream flowby: 0 cfs **Total Street Flow:** 6.0cfs

Flow Intercepted: 6.0cfs **Flow Bypassed:** 0 cfs
Inlet Size: 10' type R, sump

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

(100-year storm)
Tributary Basins: C16.16-C16.17 **Inlet/MH Number:** Inlet DP10
Upstream flowby: 8.9cfs **Total Street Flow:** 20.9cfs

Flow Intercepted: 16.3cfs **Flow Bypassed:** 4.6cfs to Inlet DP10a
Inlet Size: 10' type R, sump

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

Design Point 10a

Design Point 10a is located at the NW corner of Clarion Drive and Mumford Drive

(5-year storm)
Tributary Basins: C16.18 **Inlet/MH Number:** Inlet DP10a
Upstream flowby: **Total Street Flow:** 5.7cfs

Flow Intercepted: 5.7cfs **Flow Bypassed:** 0 cfs
Inlet Size: 15' type R, sump

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

(100-year storm)
Tributary Basins: C16.18 **Inlet/MH Number:** Inlet DP10a
Upstream flowby: 4.6cfs **Total Street Flow:** 16.8cfs

Flow Intercepted: 16.8cfs **Flow Bypassed:** 0cfs
Inlet Size: 15' type R, sump

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

Design Point 10b

Design Point 10b is located at the SE corner of Clarion Drive and Mumford Drive

(5-year storm)

Tributary Basins: C16.26 **Inlet/MH Number:** Inlet DP10b
Upstream flowby: **Total Street Flow:** 3.2cfs

Flow Intercepted: 3.2cfs **Flow Bypassed:**
Inlet Size: 5' type R, sump

Street Capacity: Street slope = 0.7%, capacity = 7.5cfs

(100-year storm)

Tributary Basins: C16.26 **Inlet/MH Number:** Inlet DP10b
Upstream flowby: 20.2cfs from Lamprey (Des.Pt 6b) **Total Street Flow:** 27.1cfs (6.9+20.2)

Flow Intercepted: 5.4cfs **Flow Bypassed:** 21.7cfs to Des. Pt 10c
Inlet Size: 5' type R, sump

Street Capacity: Street slope = 0.7%, capacity = 31.2cfs (half street) is okay

Design Point 10c

Design Point 10c is located at the SW corner of Clarion Drive and Mumford Drive

(5-year storm)

Tributary Basins: C16.27 **Inlet/MH Number:** Inlet DP10c
Upstream flowby: **Total Street Flow:** 0.6cfs

Flow Intercepted: 0.6cfs **Flow Bypassed:**
Inlet Size: 5' type R, sump

Street Capacity: Street slope = 0.7%, capacity = 7.5cfs

(100-year storm)

Tributary Basins: C16.27 **Inlet/MH Number:** Inlet DP10c
Upstream flowby: 21.7cfs **Total Street Flow:** 23.0cfs

Flow Intercepted: 2.2cfs **Flow Bypassed:** 20.8cfs to DesPt. 16
Inlet Size: 5' type R, sump

Street Capacity: Street slope = 0.7%, capacity = 31.2cfs (half street) is okay

Design Point 11

Design Point 11 is located at the east side of Clarion Drive and Mumford Drive and is the flow in the storm sewer. The total flow in the storm sewer is 105.6cfs/154.8cfs in the 5/100 year storm events.

west?

Design Point 12

Design Point 12 is located east of Wacissa Drive on the north side of Nash Drive.

(5-year storm)

Tributary Basins: C16.22-C16.23 **Inlet/MH Number:** Inlet DP12

Upstream flowby: **Total Street Flow:** 7.7cfs

Flow Intercepted: 6.28cfs **Flow Bypassed:** 1.4cfs to Inlet DP13

Inlet Size: 10' type R, on-grade

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

(100-year storm)

Tributary Basins: C16.22-C16.23 **Inlet/MH Number:** Inlet DP12

Upstream flowby: **Total Street Flow:** 17.1cfs

Flow Intercepted: 9.48cfs **Flow Bypassed:** 7.6cfs to Inlet DP13

Inlet Size: 10' type R, on-grade

Street Capacity: Street slope = 1.0%, capacity = 35.4cfs (half street) is okay

Design Point 12a

Design Point 12a is located east of Wacissa Drive on the south side of Nash Drive.

(5-year storm)

Tributary Basins: C16.20-C16.21 **Inlet/MH Number:** Inlet DP12a

Upstream flowby: **Total Street Flow:** 8.6cfs

Flow Intercepted: 6.68cfs **Flow Bypassed:** 1.9cfs to Inlet DP13

Inlet Size: 10' type R, on-grade

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

(100-year storm)

Tributary Basins: C16.20-C16.21 **Inlet/MH Number:** Inlet DP12a

Upstream flowby: **Total Street Flow:** 19.1cfs

Flow Intercepted: 9.97cfs **Flow Bypassed:** 9.1cfs to Inlet DP13

Inlet Size: 10' type R, on-grade

Street Capacity: Street slope = 1.0%, capacity = 35.4cfs (half street) is okay

Design Point 13

Design Point 13 is located in the SE corner of Wacissa Drive and Nash Drive.

(5-year storm)

Tributary Basins: C16.24 | **Inlet/MH Number:** Inlet DP13
Upstream flowby: 3.3cfs | **Total Street Flow:** 7.8cfs

Flow Intercepted: 6.31cfs | **Flow Bypassed:** 1.5cfs to Inlet DP16
Inlet Size: 10' type R, on-grade

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

(100-year storm)

Tributary Basins: C16.24 | **Inlet/MH Number:** Inlet DP13
Upstream flowby: 16.7cfs | **Total Street Flow:** 26.8cfs

Flow Intercepted: 11.52cfs | **Flow Bypassed:** 15.3cfs to Inlet DP16
Inlet Size: 10' type R, on-grade

Street Capacity: Street slope = 1.0%, capacity = 35.4cfs (half street) is okay

Design Point 14

Design Point 14 is located in the NW of Wacissa Drive and Nash Drive.

(5-year storm)

Tributary Basins: C16.30 | **Inlet/MH Number:** Inlet DP14
Upstream flowby: 0cfs | **Total Street Flow:** 6.8cfs

Flow Intercepted: 5.82cfs | **Flow Bypassed:** 1.0cfs to Inlet DP17
Inlet Size: 10' type R, on-grade

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

(100-year storm)

Tributary Basins: C16.30 | **Inlet/MH Number:** Inlet DP14
Upstream flowby: 0cfs | **Total Street Flow:** 15.2cfs

Flow Intercepted: 8.95cfs | **Flow Bypassed:** 6.3cfs to Inlet DP17
Inlet Size: 10' type R, on-grade

Street Capacity: Street slope = 1.0%, capacity = 35.4cfs (half street) is okay

Design Point 15

Design Point 15 is located in the SW of Wacissa Drive and Nash Drive and is the flow in the storm sewer. The total flow in the storm sewer is 25.09cfs/39.92cfs in the 5/100 year storm events.

Design Point 16
Design Point 16 is located in the SE corner of Wacissa Drive and Clarion Drive.

(5-year storm)
Tributary Basins: C16.19, C16.28, C16.29 **Inlet/MH Number:** Inlet DP16
Upstream flowby: 1.5cfs **Total Street Flow:** 12.2cfs

Flow Intercepted: 12.2cfs **Flow Bypassed:** 0
Inlet Size: 30' type R, sump

Street Capacity: Street slope = 1.0%, capacity = 9.0cfs, almost half of street flow is from the south. Capacity okay.

(100-year storm)
Tributary Basins: C16.19, C16.28, C16.29 **Inlet/MH Number:** Inlet DP16
Upstream flowby: 36.1cfs **Total Street Flow:** 59.8cfs

Flow Intercepted: 37.4cfs **Flow Bypassed:** 22.4cfs to Inlet DP17
Inlet Size: 25' type R, sump

Street Capacity: Street slope = 1.0%, capacity = 35.4cfs (half street)

Design Point 17
Design Point 17 is located in the SW corner of Wacissa Drive and Clarion Drive.

(5-year storm)
Tributary Basins: C16.25+C16.32 **Inlet/MH Number:** Inlet DP17
Upstream flowby: 1.0cfs **Total Street Flow:** 3.6cfs

Flow Intercepted: 3.6cfs **Flow Bypassed:**
Inlet Size: 30' type R, sump

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

(100-year storm)
Tributary Basins: C16.25+C16.32 **Inlet/MH Number:** Inlet DP17
Upstream flowby: 28.7cfs **Total Street Flow:** 34.7cfs

Flow Intercepted: 34.7cfs **Flow Bypassed:** 0
Inlet Size: 30' type R, sump

Street Capacity: Street slope = 1.0%, capacity = 35.4cfs (half street) is okay

Design Point 18
Design Point 18 is located west of Clarion Drive and Wacissa Drive and is the total flow in the pipe into Pond C5. The total pipe flow is 146.5cfs in the 5-year and 230.8cfs in the 100-year. The trapezoidal emergency overflow swale from Wacissa Drive to Pond C5 is 1.0' deep, 27' wide bottom, 4:1 side slopes, 2% slope, velocity of 7.59cfs, and has a flow depth of 0.98 feet, Q100=230cfs.

Design Point 34

This design point is copied from the Fontaine final drainage report for CDR 183. Design Point 34 is located northwest corner of Lamprey Drive and Fontaine Boulevard.

(5-year storm)
Tributary Basins: C16.34 **Inlet/MH Number:** Inlet DP34
Upstream flowby: **Total Street Flow:** 0.9cfs

Flow Intercepted: 0.9cfs **Flow Bypassed:**
Inlet Size: 5' type R, sump

Street Capacity: Lamprey Drive street slope = 0.8%, capacity = 12.0cfs, okay

(100-year storm)
Tributary Basins: C16.34 **Inlet/MH Number:** Inlet DP34
Upstream flowby: 6.0cfs **Total Street Flow:** 8.0cfs

Flow Intercepted: 8.0cfs **Flow Bypassed:**
Inlet Size: 5' type R, sump

Street Capacity: Lamprey Drive street slope = 0.8%, capacity = 37.0cfs (half street) is okay

Design Point 35

This design point is copied from the Fontaine final drainage report for CDR 183. Design Point 35 is located in the NE corner of Edisto Drive and Fontaine Boulevard.

(5-year storm)
Tributary Basins: C16.35 **Inlet/MH Number:** Inlet DP35
Upstream flowby: **Total Street Flow:** 2.8cfs

Flow Intercepted: 2.8cfs **Flow Bypassed:**
Inlet Size: 5' type R, sump

Street Capacity: Fontaine Boulevard street slope = 1.0 %, capacity = 13.5cfs, okay

(100-year storm)
Tributary Basins: C16.35 **Inlet/MH Number:** Inlet DP35
Upstream flowby: **Total Street Flow:** 6.1cfs

Flow Intercepted: 6.1cfs **Flow Bypassed:**
Inlet Size: 5' type R, sump

Street Capacity: Fontaine Boulevard street slope = 1.0%, capacity = 40.0cfs (half street) is okay

Design Point 36

This design point is copied from the Fontaine final drainage report for CDR 183. Design Point 36 is a small drainage basin that needs a 5' Type R inlet to drain the curb in the NW corner of Edisto Drive and Fontaine Boulevard. The total flow is 0.3cfs and 0.6cfs in the 5/100 year storm events. There are no bypass flows for this inlet.

constructed?

6.0 DETENTION AND WATER QUALITY PONDS & INTERIM DETENTION POND CALCULATIONS

Detention and Storm Water Quality for Lorson Ranch East Filing No. 2 is required per El Paso County criteria. We have implemented the Full Spectrum approach for detention per the Denver Urban Drainage Districts specifications. Pond C5 is a permanent full spectrum pond to serve this filing and incorporates storm water quality features and complies with the Lorson Ranch East MDDP. Pond C5 has been sized, graded, access roads, outlet pipes, overflow structures are provided with the Lorson Ranch East Filing No. 1 development. This final drainage report provides design information on the ultimate inflow/outflow from Pond C5 and also includes an analysis of interim condition inflows and the resultant flows from Pond C5. This data will be used to compare interim flow rates from Pond C5 to pre-development flow rates. See Appendix F for interim hydraulic calculations.

Detention Pond C5 (Ultimate Conditions, from Fontaine FDR, CDR183)
This is a permanent full spectrum detention pond that includes water quality and discharges directly into the East Tributary. Pond C5 is designed in the UDCF Full Spectrum spreadsheets for Water Quality and EURV volumes only. The 5-year and 100-year flow rates are taken from the Lorson East MDDP and have been modeled in a hydraulic modeling software. The outlet structure is a five cell CDOT type D outlet in parallel and the overflow spillway is a wier set slightly above the outlet structure so it releases the 5yr/100yr storm events quickly to match pre-developed rates.

- Watershed Ares: 171 acres (Ultimate Area)
- Watershed Imperviousness: 63%
- Hydrologic Soils Group C/D
- Forebay: 3.51ac-ft (see spreadsheet in appendix) divided between two forebays
- Zone 1 WQCV: 3.298ac-ft, WSEL: 5709.92
- Zone 2 EURV: 9.524ac-ft, WSEL: 5712.27, Top outlet structure set at 5712.60, 3'x18' triple CDOT Type D outlets in parallel.
- (5-yr): 13.06ac-ft, WSEL: 5713.49, 126.3cfs (hydraflow)
- Zone 3 (100-yr): 15.86ac-ft, WSEL: 5714.42, 453.2cfs (hydraflow)
- Pipe Outlet: 48" RCP at 0.5%
- Overflow Spillway: 52' wide bottom, elevation=5713, 4:1 side slopes, flow depth=2.0' at 519cfs inflow, 1' freeboard
- Pre-development release rate into East Tributary=141cfs/458cfs in the 5yr/100 yr storm at this pond outfall (Design Pt. 2, Table 6.2 in MDDP). See Design Point 46 for discussion on flows in creek from this pond
- Pond Bottom Elevation: 5706.00

Design: Composite, WQ/EURV by Full Spectrum Excel Worksheets, 5/100yr by Hydraflow

	WQ	EURV	5-yr	100-yr
Peak Inflow	63.1cfs	181.4cfs	167.5cfs	519.1cfs
Peak Outflow	1.4cfs	7.3cfs	126.3cfs	453.2cfs
Ponding Depth	3.92ft	6.27ft	7.49ft	8.42ft
Stored Volume	3.29ac-ft	9.52ac-ft	13.01ac-ft	15.86ac-ft
Spillway Stage	7.00ft, 52' wide			
Structure Type:	5'x18' flat top outlet structure (cdot type d) with top at stage 6.60ft			

Interim Pond EX-3

Interim Pond EX-3 is located south of Lamprey Drive at Design Point 2. This pond is designed to reduce existing runoff so the capacity of the downstream storm sewer is not exceeded. Interim Detention Pond EX-3 consists of a 30" pipe outlet, 4:1 pond slopes, and an emergency overflow. The outflow is directed north in a 30" temporary CMP pipe under the future Lamprey Drive to Design Point 3. When development in this area (south of Lamprey) is started Pond EX-3 will be removed and future Pond C3 will need to be constructed per the Lorson Ranch East MDDP.

- Inflow is 43cfs and 193cfs in the 5/100-year storm events.
- Outflow is 34cfs and 67cfs in the 5/100-year storm events.
- 5-year WSEL=5752.67, 100-year WSEL=5758.21
- Emergency Overflow: 30' btm width, weir btm= 5758.21, wier top=5760, 4:1 side slopes, flow depth of 1.48' at 193cfs flow

School Pond (for analysis only)

The School Pond is located on the school site east of Design Point 6c and is only included in this report to see what impact the pond has on the downstream storm sewer and the inflow rates to Pond C5. This pond is required by the Lorson Ranch East MDDP to be built on the school site to reduce downstream runoff so the storm system has capacity. Final drainage calculations and design will be provided by the school when the school site is designed. This report assumed a generic outlet structure (CDOT Type C outlet) with a 4"x4" vertical orifice for the 5-year storm and the 100-year storm controlled by stormwater flowing into the top of a Type C outlet structure. A 24" RCP is shown to connect the outlet structure to storm sewer stubbed out at Design Point 6c. The allowable outflow rates are 7.6cfs in the 5-year and 40.5cfs in the 100-year storm events according to the Fontaine FDR (CDR183) and Lorson Ranch East MDDP.

- Inflow is 31.5cfs and 71.2cfs in the 5/100-year storm events.
- Outflow is 0.8cfs and 29cfs in the 5/100-year storm events per Hydraflow.
- 5-year WSEL=5738.44, 100-year WSEL=5739.91
- Top of pond = 5742.00, btm pond =5735.00

Pond C5 for Interim Flow Conditions (for analysis only)

This analysis is only for an interim condition for Pond C5 when a portion of the upstream tributary area has been developed. The upstream developed areas include Lorson Ranch East Filing No. 1, Lorson Ranch East Filing No. 2, Fontaine Boulevard, and Lamprey Drive north of Fontaine Boulevard to Yamhill Drive. All other tributary areas have been assumed to be vacant land. The only interim detention pond modeled is Interim Pond EX-3 which will be constructed as part of this plat. The remaining existing flows have been modeled as undetained flows.

These interim calculations for this pond include routing the interim existing/developed flows to Pond C5 in Hydraflow modeling software (See Appendix F). Pond C5 has been constructed to the ultimate buildout design as shown in the FDR for Lorson Ranch East Filing No. 1 including the forebays, trickle channels, and the outlet structure. The following is a discussion on the inflow hydrographs used for the analysis:

Hydrograph 1 – school site basin to school pond, fully developed
Hydrograph 2 – existing flow to east end of Fontaine. See Fontaine FDR, CDR183 for basin limits
Hydrograph 3– C17 basins from Lorson Ranch East, fully developed
Hydrograph 4 – basin tributary to Interim Detention Pond EX-3, vacant land
Hydrograph 5 – school pond outflow hydrograph
Hydrograph 6 – school site basin flowing to Fontaine Bouelvard, fully developed
Hydrograph 7 – C16 Basins from Lorson Ranch East Filing No. 2, fully developed
Hydrograph 8 – Existing Basin EX-3.1, vacant land
Hydrograph 9 – Outflow from Interim Detention Pond EX-3

Hydrograph 10 – Interim inflow at Design Point 18 to Pond C5
Hydrograph 11 – Total interim inflow to Pond C5
Hydrograph 12 – Total interim outflow from Pond C5

The interim conditions outflow for Pond C5 is 115cfs and 374cfs for the 5/100 year storm events at Design Point 46. The pre-developed flow conditions at Design Point 46 (Etrib) are 141cfs and 458cfs for the 5/100 year storm events. The interim flows are lower than pre-developed conditions and will not cause negative downstream impacts. The outlet structure does not need modification at this time to accommodate interim flows.

Water Quality Design

Water quality for this final plat will be provided by Pond C5 for 96.8% of the 53.87acre site. Approximately 1.75acres (3.2%) of the total 53.87-acre final plat area consists of backyards that drain directly to the East Tributary over a grass buffer constructed and maintained in accordance with DCM Volume 2. Final platting of these areas includes a deviation from county criteria for a grass buffer bmp. Water Quality for the "C" is provided by full spectrum pond Pond C5.

7.0 DRAINAGE AND BRIDGE FEES

Lorson Ranch East Filing No. 2 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.

Lorson East Filing No. 2 contains 53.87 acres. The 53.87 acres will be assessed Drainage, Bridge and Surety fees. The 2018 drainage fees are $17,197, bridge fees are $804 and Drainage Surety fees are $7,285 per impervious acre per Resolution 17-348. The drainage and bridge fees are calculated when the final plat is submitted. The fees are due at plat recordation. The following table details the drainage fees for the platted area.

Table 1: Drainage/Bridge Fees

Type of Land Use	Total Area (ac)	Imperviousness	Drainage Fee	Bridge Fee	Surety Fee
Residential Area	35.79	52%	$320,049	$14,963	$135,579
Open Space, Landscape Tracts, Detention Ponds, E. Trib Jimmy Camp Creek	18.08	2%	$6,218	$290	$2,634
		Total	$326,267	$15,253	$138,213

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

Item	Quantity	Unit	Unit Cost	Item Total
Rip Rap	100	CY	$50/CY	$5,000
Inlets/Manholes	23	EA	$3000/EA	$69,000
18" Storm	160	LF	$35	$5,600
24" Storm	385	LF	$40	$15,400
30" Storm	400	LF	$45	$18,000
36" Storm	42	LF	$55	$2,310
48" Storm	175	LF	$85	$14,875
54" Storm	460	LF	$115	$52,900
			Subtotal	$183,085
			Eng/Cont (15%)	$27,462
			Total Est. Cost	$210,547

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

Item	Quantity	Unit	Unit Cost	Item Total
Interim Pond and Outlet	1	LS	$10,000	$10,000
			Subtotal	$220,547
			Eng/Cont (15%)	$31,582
			Total Est. Cost	$242,129

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

Lorson Ranch East Filing No. 2 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.
- East Tributary of Jimmy Camp Creek with a natural sand bottom and vegetated slopes has been preserved through this site
- Lots on the west side of the site discharge runoff westward over an open space buffer prior to discharge into the creek
- A buffer tract has been added along the SDS watermain easement which reduces impervious areas
- Full Spectrum Detention Pond C5 has been constructed. The full spectrum detention mimics existing storm discharges

Are there any covenants regarding lot maintenance, impervious coverage limits...?

Step 2: Implement BMP's that Slowly Release the Water Quality Capture Volume
Treatment and slow release of the water quality capture volume (WQCV) is required. Lorson Ranch East Filing No. 2 will utilize Pond C5, a fullspectrum stormwater detention pond which includes Water Quality Volumes and WQ outlet structures.

Step 3: Stabilize Drainageways
East Tributary of Jimmy Camp Creek is a major drainageway located within this site. In 2018 the East Tributary of JCC was reconstructed and stabilized per county criteria. The design included a low flow channel bottom and selectively armored sides.

Step 4: Implement Site Specific & Source Control BMP's
There are no potential sources of contaminants that could be introduced to the County's MS4. During construction source control will be provided with the proper installation of erosion control BMPs to limit erosion and transport of sediment. Area disturbed by construction will be seeded and mulched. Cut and fill slopes will be reseeded, and the slopes equal to or greater than three-to-one will be protected with erosion control fabric. Silt fences will be placed at the bottom of re-vegetated and rough graded slopes. Inlet protection will be used around proposed inlets. In addition, temporary sediment basins will be constructed so runoff will be treated prior to discharge. Construction BMPs in the form of vehicle tracking control, sediment basins, concrete washout area, rock socks, buffers, and silt fences will be utilized to protect receiving waters.

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 within this study area
- Bridges over the East Tributary will be required at Lorson Boulevard and Fontaine Boulevard and have been previously designed by Kiowa Engineering providing access to this site.
- Detention and water quality for this site area will be provided in a permanent pond
- Access to existing maintenance trails for the East Tributary of Jimmy Camp Creek will be provided on the west side from Tract E and from Fontaine Boulevard.
- Access to existing maintenance trails for the East Tributary of Jimmy Camp Creek will be provided on the east side from Fontaine Boulevard and from Wacissa Drive.

10.0 REFERENCES

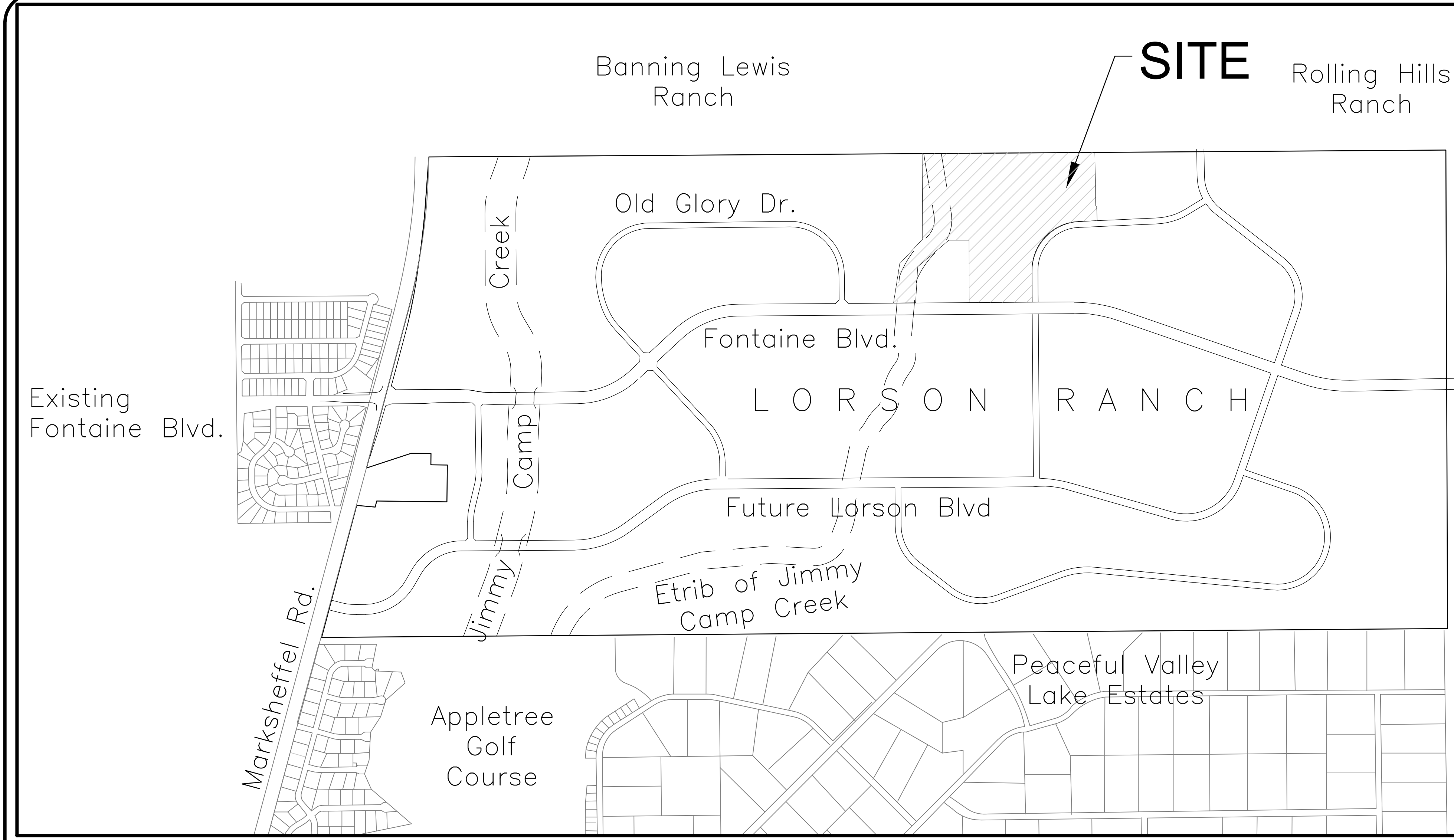
1. City of Colorado Springs/El Paso County Drainage Criteria Manual DCM, dated November, 1991
2. Soil Survey of El Paso County Area, Colorado by USDA, SCS
3. Jimmy Camp Creek Drainage Basin Planning Study, Dated March 9, 2015, by Kiowa Engineering Corporation
4. City of Colorado Springs "Drainage Criteria Manual, Volume 2
5. El Paso County "Engineering Criteria Manual"
6. Lorson Ranch East MDDP, June 30, 2017 by Core Engineering.

7. Final Drainage Report for Fontaine Boulevard, Old Glory Drive, and Marksheffel Road Phase 1 Improvements, Dated February 6, 2006, Revised September 7, 2006, by Pentacor Engineering.

Address maintenance of channels and ponds by the metro district

8. Final construction plans "Fontaine Boulevard and East Fork Jimmy Camp Creek Channel Design", Dated March 10, 2017, by Kiowa Engineering Corporation
9. 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.
10. Kiowa Engineering Corporation "Final Bridge and Channel Design Report, CDR 16-009" revised August 24, 2017
11. Lorson Ranch East MDDP prepared by Core Engineering Group, dated November 27, 2017
12. Lorson Ranch East PDR prepared by Core Engineering Group, dated December 18, 2017
13. Final Drainage Report for Fontaine Boulevard prepared by Core Engineering Group, Reference CDR183, dated December 20, 2017

APPENDIX A – VICINTIY MAP, SOILS MAP, FEMA MAP



VICINITY MAP

NO SCALE

CORE ENGINEERING GROUP

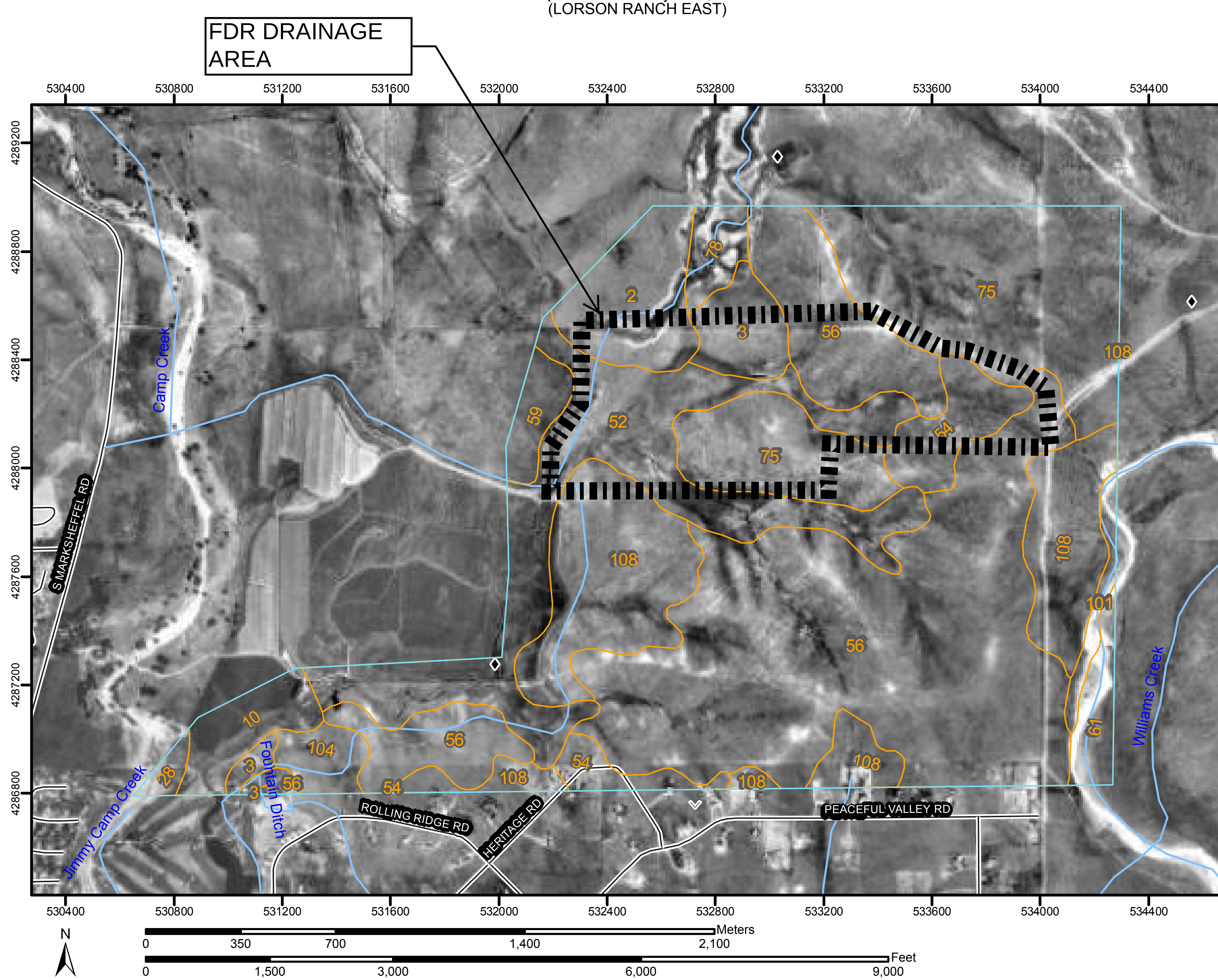
15004 1ST AVE. S.
BURNSVILLE, MN 55306
PH: 719.570.1100

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

LORSON RANCH EAST FILING NO. 2
VICINITY MAP

SCALE:	DATE:	FIGURE NO.
NTS	JUNE 15, 2018	--

Soil Map–El Paso County Area, Colorado
(LORSON RANCH EAST)



USDA Natural Resources Conservation Service

Web Soil Survey 2.0
National Cooperative Soil Survey

2/27/2008

MAP LEGEND

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

Soils
- Soil Map Units

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

Special Line Features
- Gully
- Short Steep Slope
- Other

Political Features

Municipalities
- Cities
- Urban Areas

Water Features
- Oceans
- Streams and Canals

Transportation
- Rails

Roads
- Interstate Highways
- US Routes
- State Highways
- Local Roads
- Other Roads

MAP INFORMATION

Original soil survey map sheets were prepared at publication scale. Viewing scale and printing scale, however, may vary from the original. Please rely on the bar scale on each map sheet for proper map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 13N

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

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 5, Jan 15, 2008

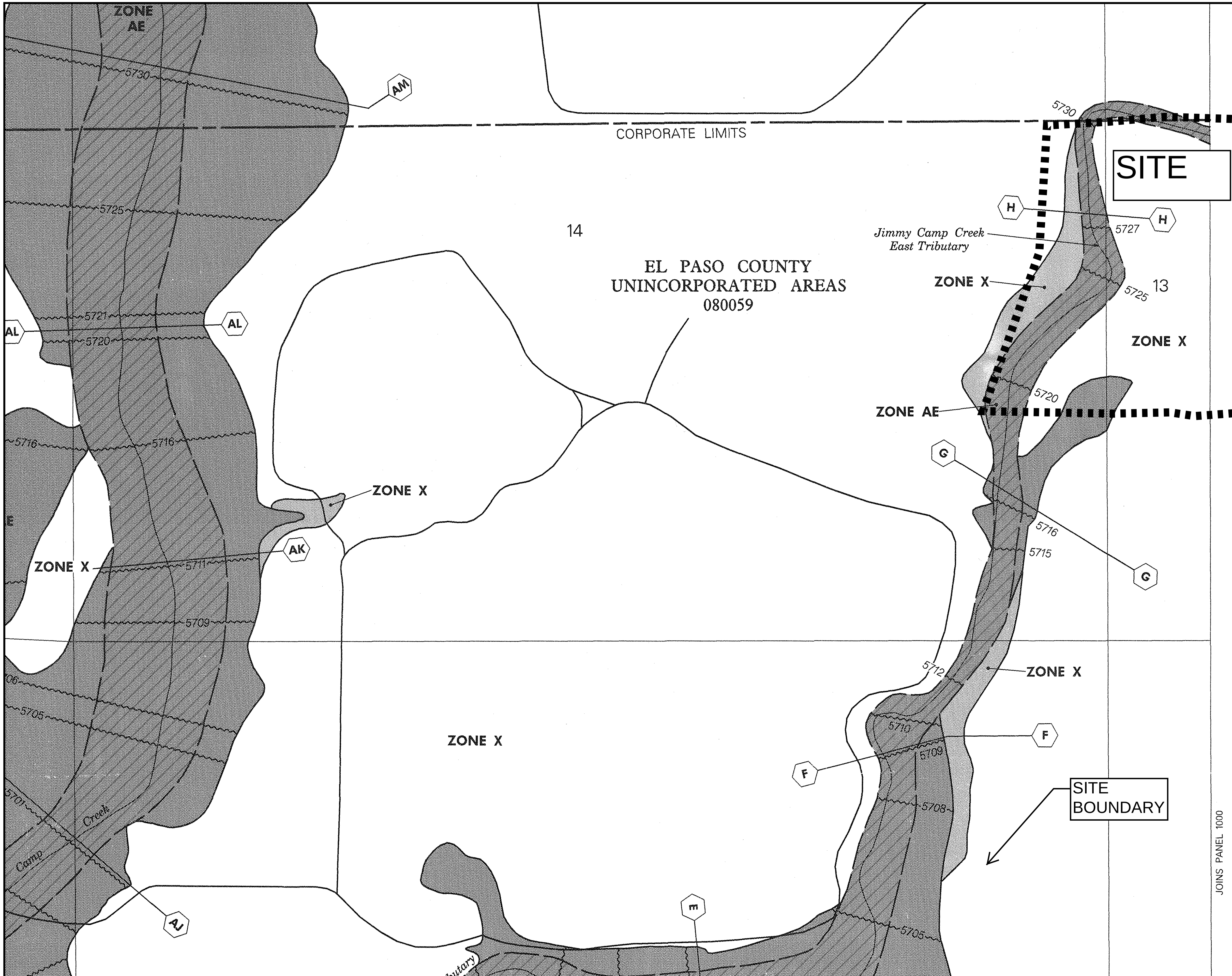
Date(s) aerial images were photographed: 1999

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

Map Unit Legend

El Paso County Area, Colorado (CO625)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
2	Ascalon sandy loam, 1 to 3 percent slopes	54.4	4.2%
3	Ascalon sandy loam, 3 to 9 percent slopes	32.6	2.5%
10	Blendon sandy loam, 0 to 3 percent slopes	29.0	2.2%
28	Ellicott loamy coarse sand, 0 to 5 percent slopes	5.5	0.4%
52	Manzanola clay loam, 1 to 3 percent slopes	180.3	14.0%
54	Midway clay loam, 3 to 25 percent slopes	46.2	3.6%
56	Nelson-Tassel fine sandy loams, 3 to 18 percent slopes	476.6	37.0%
59	Nunn clay loam, 0 to 3 percent slopes	16.8	1.3%
61	Olney sandy loam, 3 to 5 percent slopes	18.8	1.5%
75	Razor-Midway complex	213.9	16.6%
78	Sampson loam, 0 to 3 percent slopes	16.4	1.3%
101	Ustic Torrifluvents, loamy	11.3	0.9%
104	Vona sandy loam, 1 to 3 percent slopes	17.4	1.4%
108	Wiley silt loam, 3 to 9 percent slopes	170.2	13.2%

Totals for Area of Interest (AOI)	1,289.3	100.0%



APPROXIMATE SCALE IN FEET

500 0 500

NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

EL PASO COUNTY, COLORADO AND INCORPORATED AREAS

PANEL 957 OF 1300

(SEE MAP INDEX FOR PANELS NOT PRINTED)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
COLORADO SPRINGS, CITY OF	080060	0957	F
EL PASO COUNTY, UNINCORPORATED AREAS	080059	0957	F
FOUNTAIN, CITY OF	080061	0957	F

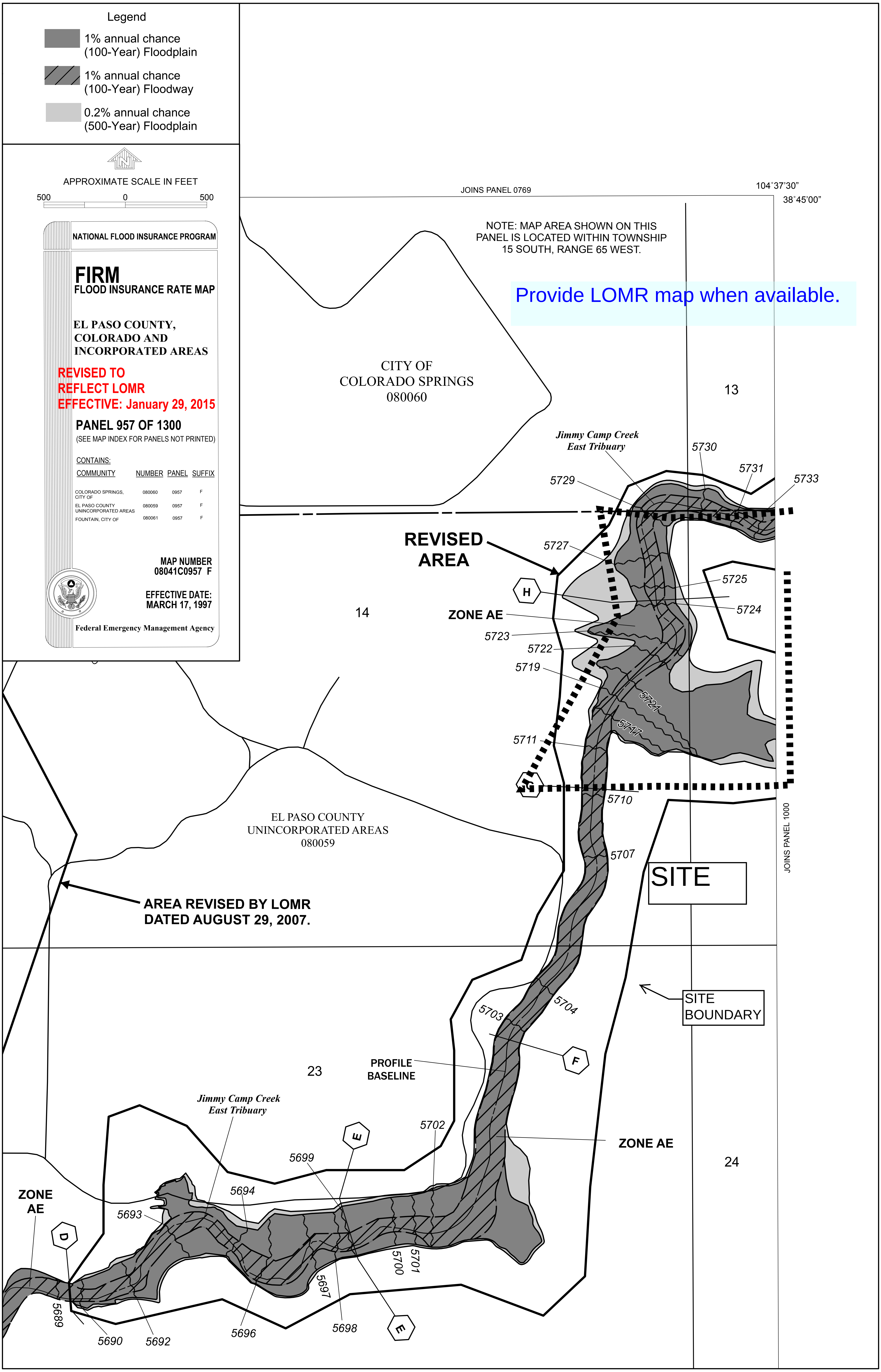
MAP NUMBER 08041C0957 F

EFFECTIVE DATE: MARCH 17, 1997

FEDERAL EMERGENCY MANAGEMENT AGENCY

Federal Emergency Management Agency

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov



Legend
1% annual chance (100-Year) Floodplain
1% annual chance (100-Year) Floodway
0.2% annual chance (500-Year) Floodplain
APPROXIMATE SCALE IN FEET
500 0 500
NATIONAL FLOOD INSURANCE PROGRAM
FIRM
FLOOD INSURANCE RATE MAP
EL PASO COUNTY, COLORADO AND INCORPORATED AREAS
REVISED TO REFLECT LOMR EFFECTIVE: January 29, 2015
PANEL 957 OF 1300
(SEE MAP INDEX FOR PANELS NOT PRINTED)
CONTAINS:
COMMUNITY NUMBER PANEL SUFFIX
COLORADO SPRINGS, CITY OF 080060 0957 F
EL PASO COUNTY UNINCORPORATED AREAS 080059 0957 F
FOUNTAIN, CITY OF 080061 0957 F
MAP NUMBER 08041C0957 F
EFFECTIVE DATE: MARCH 17, 1997
Federal Emergency Management Agency
JOINS PANEL 0769
104°37'30"
38°45'00"
NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 15 SOUTH, RANGE 65 WEST.
Provide LOMR map when available.
CITY OF COLORADO SPRINGS 080060
13
Jimmy Camp Creek East Tribuary
5730
5731
5733
5729
REVISED AREA
5727
5725
5724
H
ZONE AE
14
5723
5722
5719
5721
5717
5711
G
5710
5707
SITE
JOINS PANEL 1000
EL PASO COUNTY UNINCORPORATED AREAS 080059
AREA REVISED BY LOMR DATED AUGUST 29, 2007.
5703
5704
F
SITE BOUNDARY
23
PROFILE BASELINE
Jimmy Camp Creek East Tribuary
E
5702
ZONE AE
24
5699
5694
ZONE AE
5693
D
5700
5701
5697
5689
5690
5692
5696
5698
E

APPENDIX B – HYDROLOGY CALCULATIONS

Table 6-6. Runoff Coefficients for Rational Method

(Source: UDFCD 2001)

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

3.2 Time of Concentration

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

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

CORE
ENGINEERING GROUP

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

Calculated By: Leonard Beasley
Date: June, 2017
Checked By: Leonard Beasley

Job No: 100.013
Project: Lorson Ranch East MDDP
Design Storm: **5 - Year Event, Existing Conditions**

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-A1			4.28	0.08	18.6	0.34	3.20	1.1													
EX-C	**DP-2**		452.97	CN = 67							SCS =	141.0									
EX-D	**DP-3**		109.55	0.12	34.7	13.15	2.26	29.7													
EX-E	**DP-4**		187.30	CN =73							SCS =	100.0									

CORE ENGINEERING GROUP

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

Calculated By: Leonard Beasley
Date: April 28, 2016
Checked By: Leonard Beasley

Job No: 100.013
Project: Lorson Ranch East MDDP
Design Storm: **100 - Year Event, Existing Conditions**

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-A1			4.28	0.35	18.6	1.50	5.37	8.0													
EX-C	**DP-2**		452.97	CN = 67						SCS =		458.0									
EX-D	**DP-3**		109.55	0.40	34.7	43.82	3.80	166.5													
EX-E	**DP-4**		187.30	CN = 73						SCS =		280.0									

Hydrograph Plot

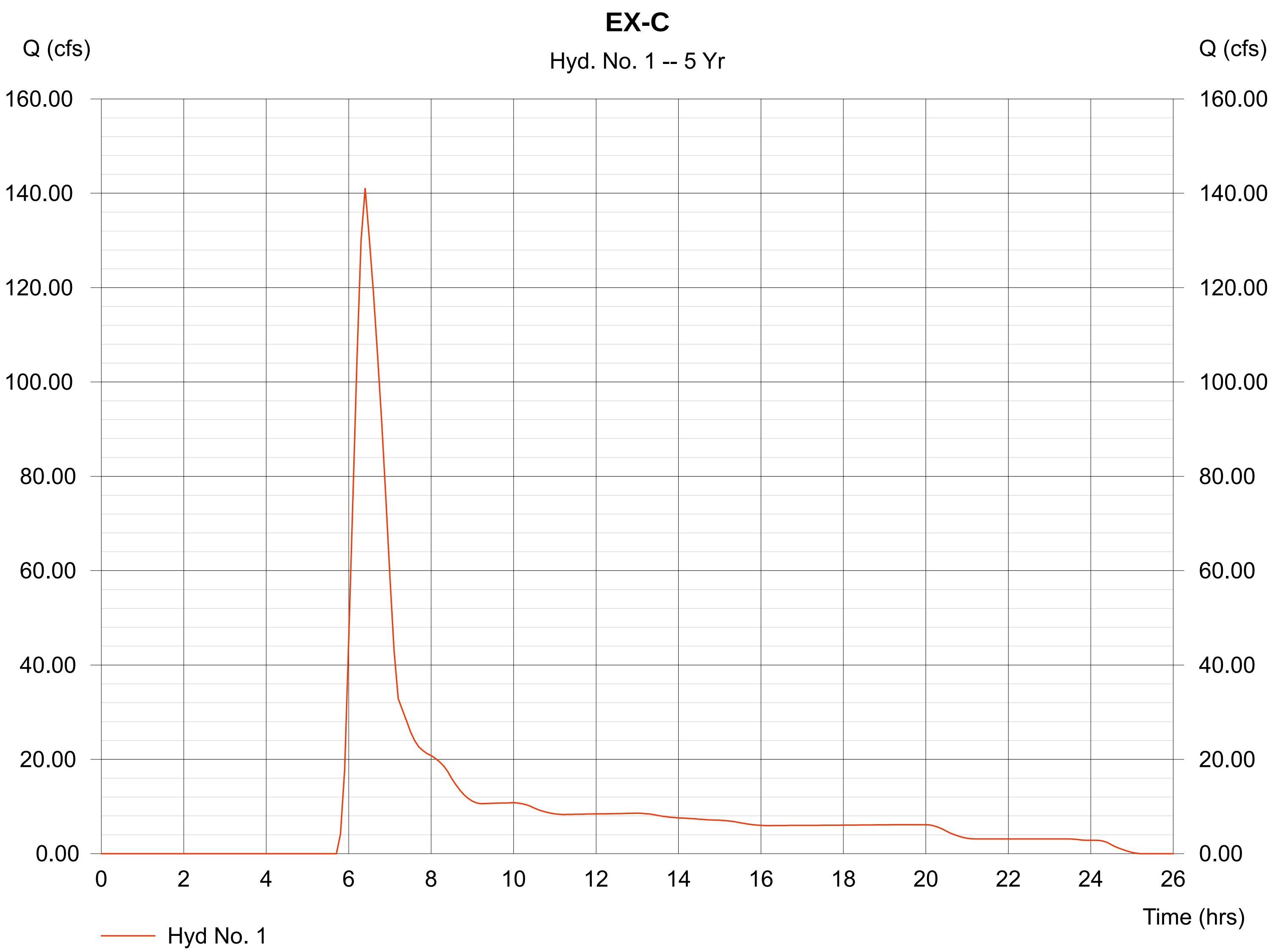
Hydraflow Hydrographs by Intelisolve — Monday, Jun 5 2017, 4:1 PM

Hyd. No. 1

EX-C

Hydrograph type	= SCS Runoff	Peak discharge	= 140.99 cfs
Storm frequency	= 5 yrs	Time interval	= 6 min
Drainage area	= 452.970 ac	Curve number	= 69
Basin Slope	= 0.0 %	Hydraulic length	= 7400 ft
Tc method	= USER	Time of conc. (Tc)	= 49.50 min
Total precip.	= 2.80 in	Distribution	= Custom
Storm duration	= CSpring_IIA-6min.cds	Shape factor	= 484

Hydrograph Volume = 905,484 cuft



Hydrograph Plot

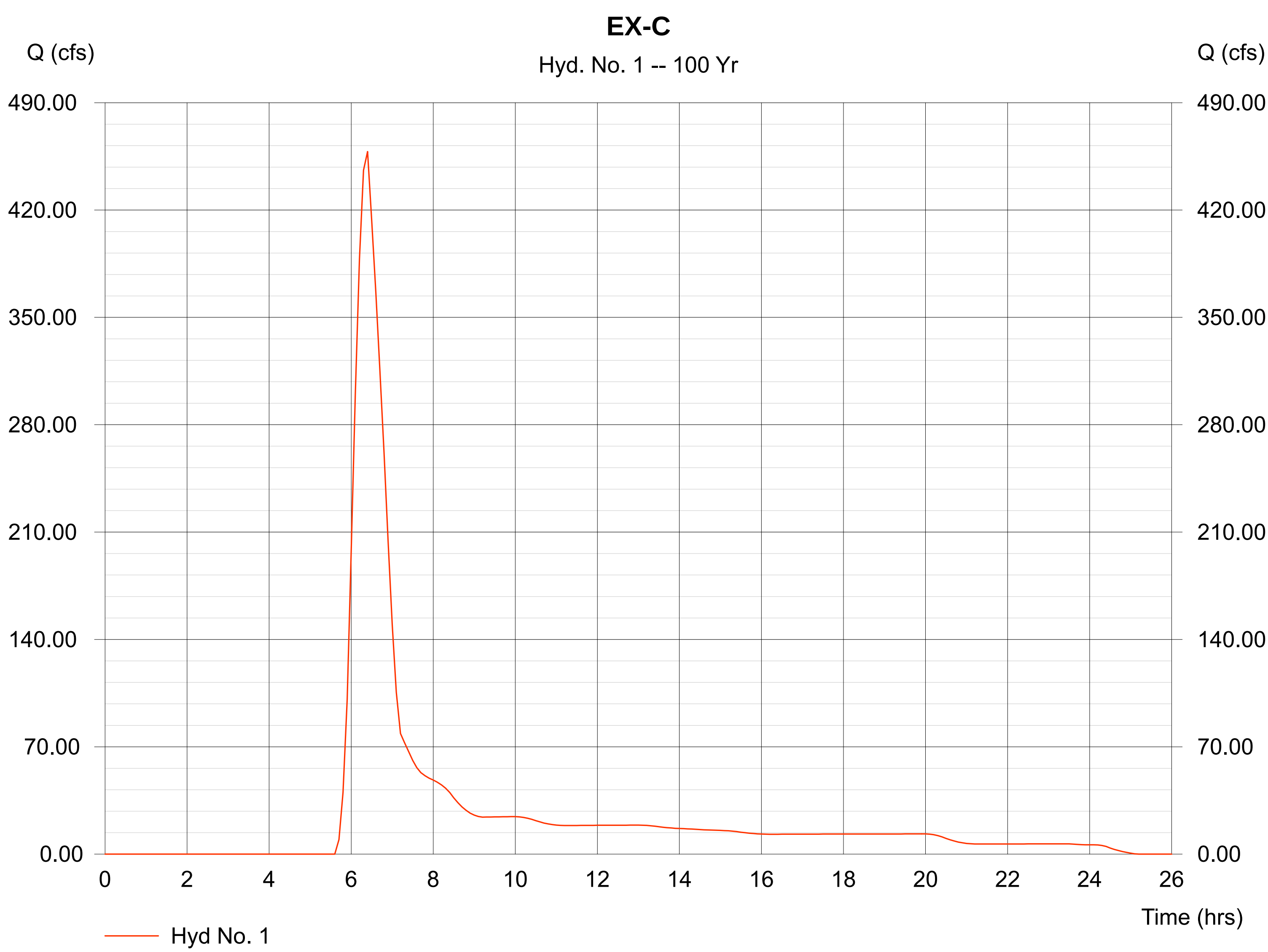
Hydraflow Hydrographs by Intelisolve | Monday, Jun 5 2017, 4:1 PM

Hyd. No. 1

EX-C

Hydrograph type	= SCS Runoff	Peak discharge	= 458.13 cfs
Storm frequency	= 100 yrs	Time interval	= 6 min
Drainage area	= 452.970 ac	Curve number	= 69
Basin Slope	= 0.0 %	Hydraulic length	= 7400 ft
Tc method	= USER	Time of conc. (Tc)	= 49.50 min
Total precip.	= 4.40 in	Distribution	= Custom
Storm duration	= CSpring_IIA-6min.cds	Shape factor	= 484

Hydrograph Volume = 2,456,980 cuft



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

CORE ENGINEERING GROUP

Calculated By: Leonard Beasley
Date: June 22, 2018
Checked By: Richard Schindler

Job No: 100.044
Project: Lorson Ranch East Filing 2 FDR
Design Storm: **5 - Year Event, Proposed Conditions**

Street or Basin	Design Point	Area Design	Direct Runoff: Area (A)	Direct Runoff: Runoff Coeff. (C)	Direct Runoff: tc	Direct Runoff: CA	Direct Runoff: i	Direct Runoff: Q	Total Runoff: tc	Total Runoff: Σ (CA)	Total Runoff: i	Total Runoff: Q	Street: Slope	Street: Street Flow	Pipe: Design Flow	Pipe: Slope	Pipe: Pipe Size	Travel Time: Length	Travel Time: Velocity	Travel Time: tt	Remarks
			ac.		min.		in/hr	cfs	min		in/hr	cfs	%	cfs	cfs	%	in	ft	ft/sec	min	
A1			4.17	0.30	13.17	1.25	3.72	4.6													
OS-C11			6.48	0.49	21.69	3.18	2.97	9.4													
C13			17.20	0.49	12.94	8.43	3.74	31.5													
C16.3			1.78	0.49	10.35	0.87	4.08	3.6													
C16.4			0.81	0.49	8.40	0.40	4.39	1.7													
C16.14			0.10	0.49	5.01	0.05	5.17	0.3													
C16.15			2.36	0.49	9.77	1.16	4.16	4.8													
C16.16			1.30	0.49	13.31	0.64	3.70	2.9													
C16.17			1.64	0.49	12.39	0.80	3.81	3.0													
C16.18			2.96	0.49	12.69	1.45	3.77	5.7													
C16.19			1.65	0.49	11.98	0.81	3.86	3.1													
C16.20			2.84	0.49	11.88	1.39	3.87	5.4													
C16.21			1.78	0.49	13.73	0.87	3.65	3.2													
C16.22			2.88	0.49	14.17	1.41	3.61	5.1													
C16.23			1.46	0.49	14.05	0.72	3.62	2.6													
C16.24			2.79	0.49	17.10	1.37	3.32	4.5													
C16.25			0.43	0.49	11.04	0.21	3.98	0.8													
C16.26			1.42	0.49	11.66	0.70	3.90	3.2													
C16.27			0.23	0.49	5.95	0.11	4.91	0.6													
C16.28			2.09	0.49	12.65	1.02	3.78	3.9													
C16.29			2.01	0.49	12.98	0.98	3.74	3.7													
C16.30			4.54	0.49	20.36	2.22	3.06	6.8													
C16.31			9.90	0.23	20.56	2.28	3.05	6.9													
C16.32			0.97	0.49	12.20	0.48	3.83	1.8													
C16.34			0.38	0.49	6.95	0.19	4.67	0.9													
C16.35			1.46	0.49	11.60	0.72	3.91	2.8													
C16.36			7.70	0.23	14.79	1.77	3.54	6.3													
C17.8			1.52	0.55	12.41	0.84	3.81	3.2													
EX-3			116	0.15	29.70	17.42	2.50	43													
EX-3.1			11	0.15	17.30	1.65	3.31	5													
EX-3.2			5	0.15	16.10	0.68	3.41	2													

CORE ENGINEERING GROUP

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

Calculated By: Leonard Beasley
Date: June 22, 2018
Checked By: Richard Schindler

Job No: 100.044
Project: Lorson Ranch East No 2 FDR
Design Storm: **100 - Year Event, Proposed Conditions**

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	
A1			4.17	0.65	13.17	2.71	6.24	16.9													
OS-C11			6.48	0.65	21.69	4.21	4.98	21.0													
C13			17.20	0.65	12.94	11.18	6.28	70.2													
C16.3			1.78	0.65	10.35	1.16	6.85	7.9													
C16.4			0.81	0.65	8.40	0.53	7.37	3.9													
C16.14			0.10	0.65	5.01	0.07	8.67	0.6													
C16.15			2.28	0.65	9.77	1.48	6.99	10.1													
C16.16			1.30	0.65	13.31	0.85	6.21	5.2													
C16.17			1.64	0.65	12.39	1.07	6.39	6.6													
C16.18			2.96	0.65	12.69	1.92	6.33	12.2													
C16.19			1.65	0.65	11.98	1.07	6.48	6.9													
C16.20			2.84	0.65	11.88	1.85	6.50	12.0													
C16.21			1.78	0.65	13.73	1.16	6.13	7.1													
C16.22			2.88	0.65	14.17	1.87	6.05	11.3													
C16.23			1.46	0.65	14.05	0.95	6.08	5.8													
C16.24			2.79	0.65	17.10	1.81	5.58	10.1													
C16.25			0.43	0.65	11.04	0.28	6.68	1.9													
C16.26			1.42	0.65	11.66	0.92	6.55	6.9													
C16.27			0.23	0.65	5.95	0.15	8.24	1.3													
C16.28			2.09	0.65	12.65	1.36	6.34	8.6													
C16.29			2.01	0.65	12.98	1.31	6.28	8.2													
C16.30			4.54	0.65	20.36	2.95	5.14	15.2													
C16.31			9.90	0.54	20.56	5.35	5.12	27.4													
C16.32			0.97	0.65	12.20	0.63	6.43	4.1													
C16.34			0.38	0.65	6.95	0.25	7.85	1.9													
C16.35			1.46	0.65	11.60	0.95	6.56	6.2													
C16.36			7.70	0.54	14.79	4.16	5.95	24.7													
C17.8			1.52	0.74	12.41	1.12	6.39	7.2													
EX-3			116.1	0.40	29.80	46.09	4.18	193													
EX-3.1			11.0	0.50	17.30	5.50	5.55	31													
EX-3.2			4.5	0.50	16.10	2.25	5.73	13													

CORE ENGINEERING GROUP

Standard Form SF-1. Time of Concentration-Proposed

Calculated By: Leonard Beasley
Date: June 22, 2018
Checked By: Richard Schindler

Job No: 100.044
Project: Lorson Ranch East No. 2 FDR

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 $t_c=(L/180)+10$ minutes	USDCM Recommended $t_c=t_i+t_t$ (min)
EX-A1	0.30	4.17	15.0	70.00	2.50%	0.13	8.93	500.0	1.00%	1.50	5.56	14.49	570.00	13.17	13.17
OS-C11	0.49	6.48	15.0	100.00	3.00%	0.22	7.66	2005.0	2.51%	2.38	14.06	21.73	2105.00	21.69	21.69
C13	0.49	17.20	20.0	100.00	25.00%	0.44	3.81	1550.0	2.00%	2.83	9.13	12.94	1650.00	19.17	12.94
C16.3	0.49	1.78	20.0	89.00	3.37%	0.21	6.96	530.0	1.70%	2.61	3.39	10.35	619.00	13.44	10.35
C16.4	0.49	0.81	20.0	45.00	3.33%	0.15	4.97	563.0	1.87%	2.73	3.43	8.40	608.00	13.38	8.40
C16.14	0.49	0.10	20.0	33.00	2.84%	0.12	4.48	71.0	1.28%	2.26	0.52	5.01	104.00	10.58	5.01
C16.15	0.49	2.28	15.0	100.00	7.30%	0.29	5.72	183.0	4.48%	3.17	0.96				
			20.0					443.0	1.42%	2.38	3.10	9.77	726.00	14.03	9.77
C16.16	0.49	1.29	20.0	90.00	2.22%	0.19	8.03	731.0	1.33%	2.31	5.28	13.31	821.00	14.56	13.31
C16.17	0.49	1.64	20.0	84.00	2.50%	0.19	7.46	703.0	1.41%	2.37	4.93	12.39	787.00	14.37	12.39
C16.18	0.49	2.96	15.0	70.00	2.71%	0.18	6.63	112.0	2.14%	2.19	0.85				
			20.0					724.0	1.34%	2.32	5.21	12.69	906.00	15.03	12.69
C16.19	0.49	1.65	15.0	100.00	2.37%	0.20	8.28	98.0	2.37%	2.31	0.71				
			20.0					358.0	1.00%	2.00	2.98	11.98	556.00	13.09	11.98
C16.20	0.49	2.84	20.0	37.00	2.00%	0.12	5.33	786.0	1.00%	2.00	6.55	11.88	823.00	14.57	11.88
C16.21	0.49	1.78	15.0	100.00	2.43%	0.20	8.22	48.0	2.43%	2.34	0.34				
			20.0					621.0	1.00%	2.00	5.18	13.73	769.00	14.27	13.73
C16.22	0.49	2.88	15.0	100.00	2.50%	0.20	8.14	138.0	2.55%	1.41	1.63				
			20.0					512.0	0.88%	1.88	4.55	14.32	750.00	14.17	14.17
C16.23	0.49	1.46	15.0	91.00	2.09%	0.18	8.24	153.0	1.76%	1.41	1.81				
			20.0					526.0	1.20%	2.19	4.00	14.05	770.00	14.28	14.05
C16.24	0.49	2.79	20.0	89.00	2.00%	0.18	8.27	1189.0	1.14%	2.14	9.28	17.55	1278.00	17.10	17.10
C16.25	0.49	0.43	20.0	100.00	2.00%	0.19	8.76	269.0	0.97%	1.97	2.28	11.04	369.00	12.05	11.04
C16.26	0.49	1.42	20.0	84.00	2.00%	0.17	8.03	380.0	0.76%	1.74	3.63	11.66	464.00	12.58	11.66
C16.27	0.49	0.23	20.0	28.00	2.00%	0.10	4.64	132.0	0.70%	1.67	1.31	5.95	160.00	10.89	5.95
C16.28	0.49	2.09	20.0	100.00	2.30%	0.20	8.37	485.0	0.89%	1.89	4.28	12.65	585.00	13.25	12.65
C16.29	0.49	2.01	20.0	100.00	2.00%	0.19	8.76	480.0	0.90%	1.90	4.22	12.98	580.00	13.22	12.98
C16.30	0.49	4.54	15.0	100.00	8.00%	0.30	5.55	168.0	2.86%	1.41	1.99				
			20.0					1658.0	1.16%	2.15	12.83	20.36	1926.00	20.70	20.36
C16.31	0.23	9.90	10.0	100.00	3.30%	0.16	10.59	334.0	3.80%	1.41	3.95				
			15.0					1467.0	1.16%	1.62	15.13	29.67	1901.00	20.56	20.56
C16.32	0.49	0.97	20.0	60.00	2.00%	0.15	6.79	570.0	0.77%	1.75	5.41	12.20	630.00	13.50	12.20
C16.34	0.49	0.38	20.0	32.00	2.00%	0.11	4.96	200.0	0.70%	1.67	1.99	6.95	232.00	11.29	6.95

CORE ENGINEERING GROUP

Standard Form SF-1. Time of Concentration-Proposed

Calculated By: Leonard Beasley
Date: June 22, 2018
Checked By: Richard Schindler

Job No: 100.044
Project: Lorson Ranch East No. 2 FDR

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)
C16.35	0.49	1.46	15.0	100.00	2.00%	0.19	8.76	30.0	2.00%	2.12	0.24				
			20.0					337.0	1.16%	2.15	2.61	11.60	467.00	12.59	11.60
C16.36	0.23	7.70	10.0	100.00	2.30%	0.14	11.93	111.0	0.72%	0.85	2.18				
			10.0					34.0	32.35%	5.69	0.10				
			15.0					617.0	0.50%	1.06	9.70	23.91	862.00	14.79	14.79
C17.8	0.55	1.52	20.0	100.00	3.00%	0.24	6.91	643.0	0.95%	1.95	5.50	12.41	743.00	14.13	12.41
EX-3	0.15	116.1	7.0	300.00	4.00%	0.27	18.80	3250.0	3.30%	1.27	42.60	61.40	3550.00	29.72	29.72
EX-3.1	0.15	11	7.0	120.00	2.00%	0.13	14.95	1200.0	3.00%	1.21	16.50	31.44	1320.00	17.33	17.33
EX-3.2	0.15	5	7.0	120.00	2.00%	0.13	14.95	980.0	3.00%	1.21	13.47	28.42	1100.00	16.11	16.11

APPENDIX C – HYDRAULIC CALCULATIONS

Channel Report

Overflow on Wacissa Drive to Pond C5 at Design Pt. 18

Trapezoidal

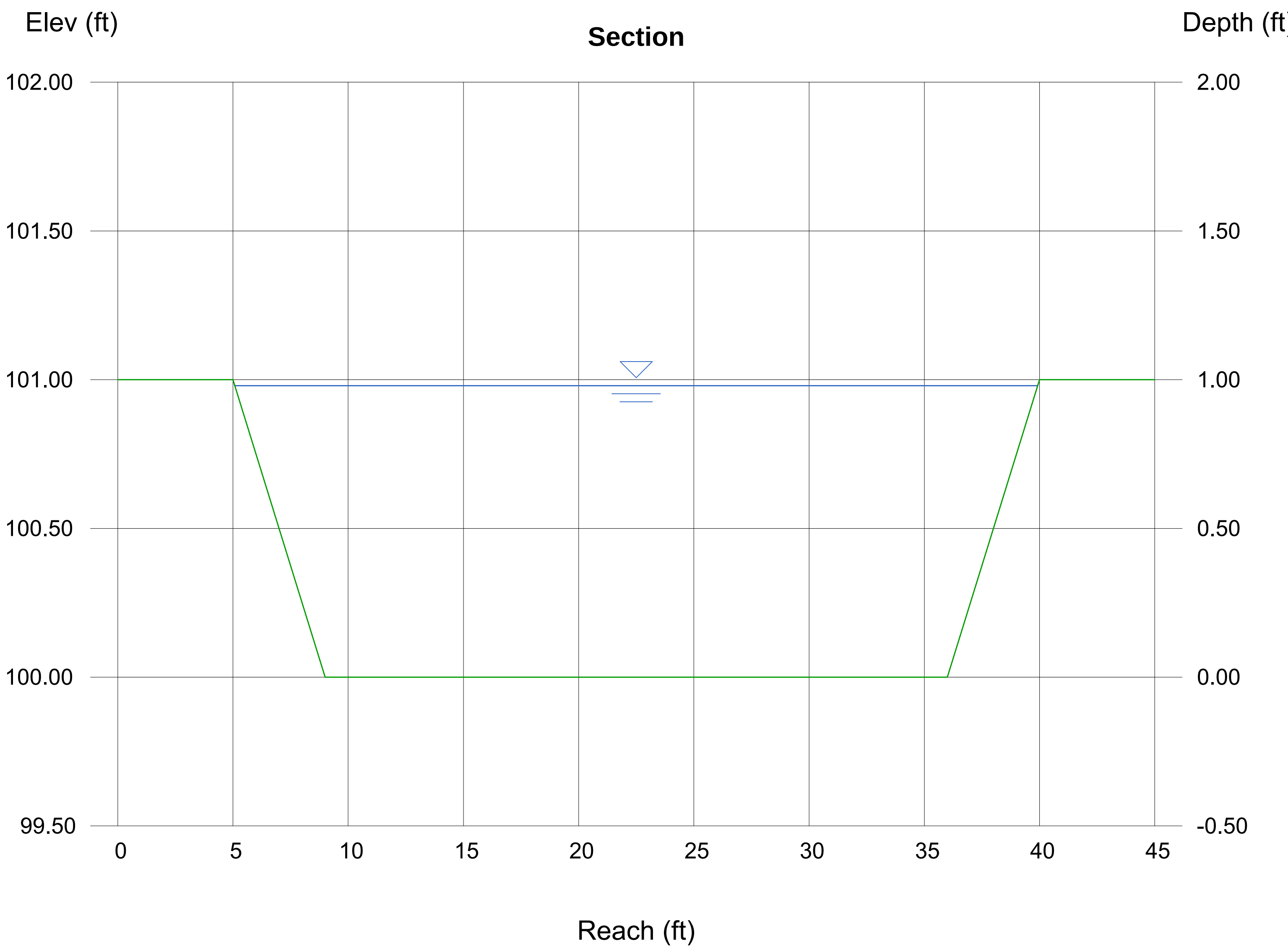
Botom Width (ft)	=	27.00
Side Slope (z:1)	=	4.00
Total Depth (ft)	=	1.00
Invert Elev (ft)	=	100.00
Slope (%)	=	2.00
N-Value	=	0.025

Calculations

Compute by:		Known Q
Known Q (cfs)	=	230.00

Highlighted

Depth (ft)	=	0.98
Q (cfs)	=	230.00
Area (sqft)	=	30.30
Velocity (ft/s)	=	7.59
Wetted Perim (ft)	=	35.08
Crit Depth, Yc (ft)	=	1.00
Top Width (ft)	=	34.84
EGL (ft)	=	1.88



Weir Report

Interim Pond Ex-3 Overflow

Trapezoidal Weir

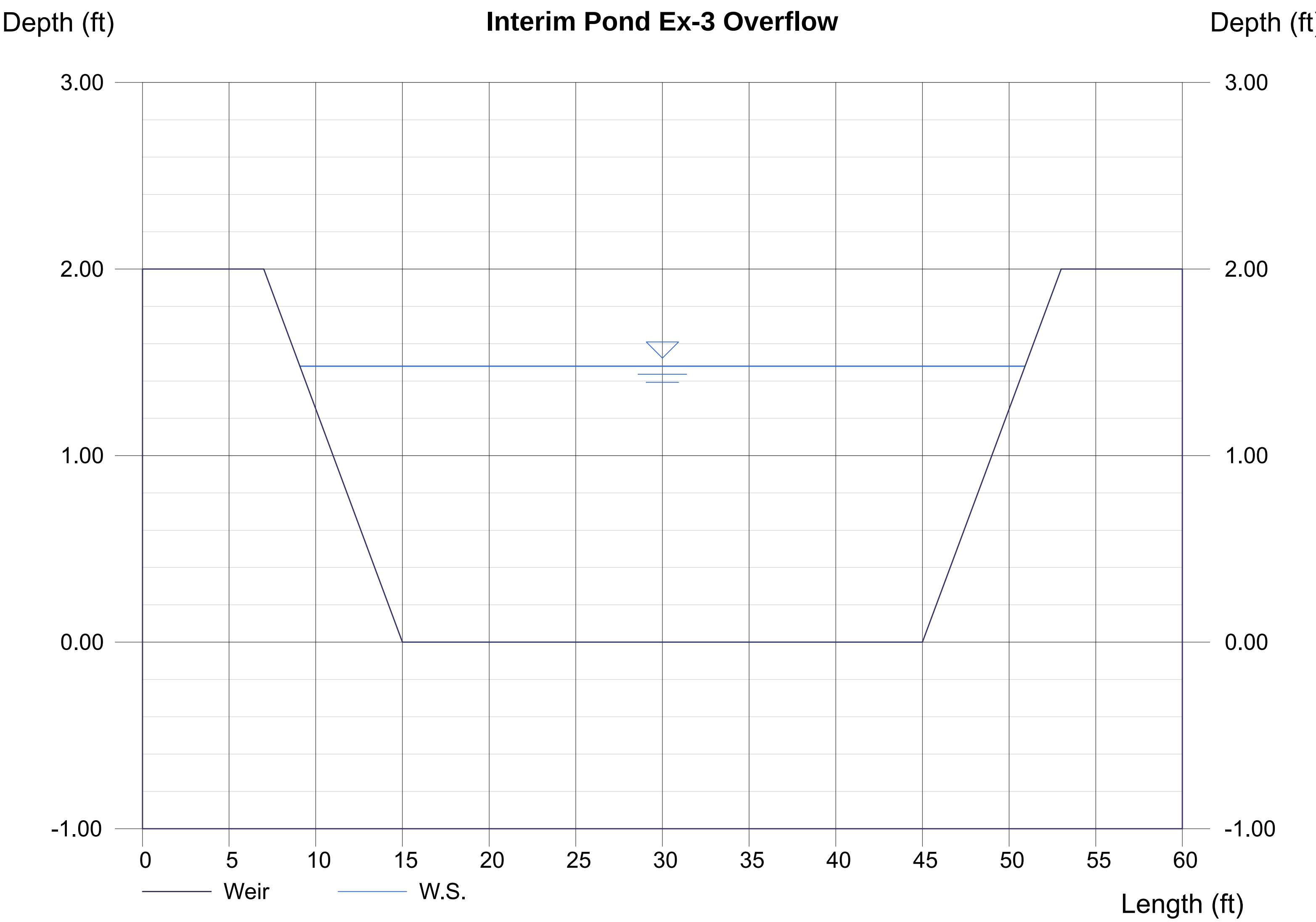
Crest	= Sharp
Bottom Length (ft)	= 30.00
Total Depth (ft)	= 2.00
Side Slope (z:1)	= 4.00

Calculations

Weir Coeff. Cw	= 3.10
Compute by:	Known Q
Known Q (cfs)	= 193.00

Highlighted

Depth (ft)	= 1.48
Q (cfs)	= 193.00
Area (sqft)	= 53.16
Velocity (ft/s)	= 3.63
Top Width (ft)	= 41.84



Channel Report

Hydraflow Express by Intelisolve Friday, Jun 8 2018, 11:39 AM

Interim Pond EX-3 outflow swale

Trapezoidal

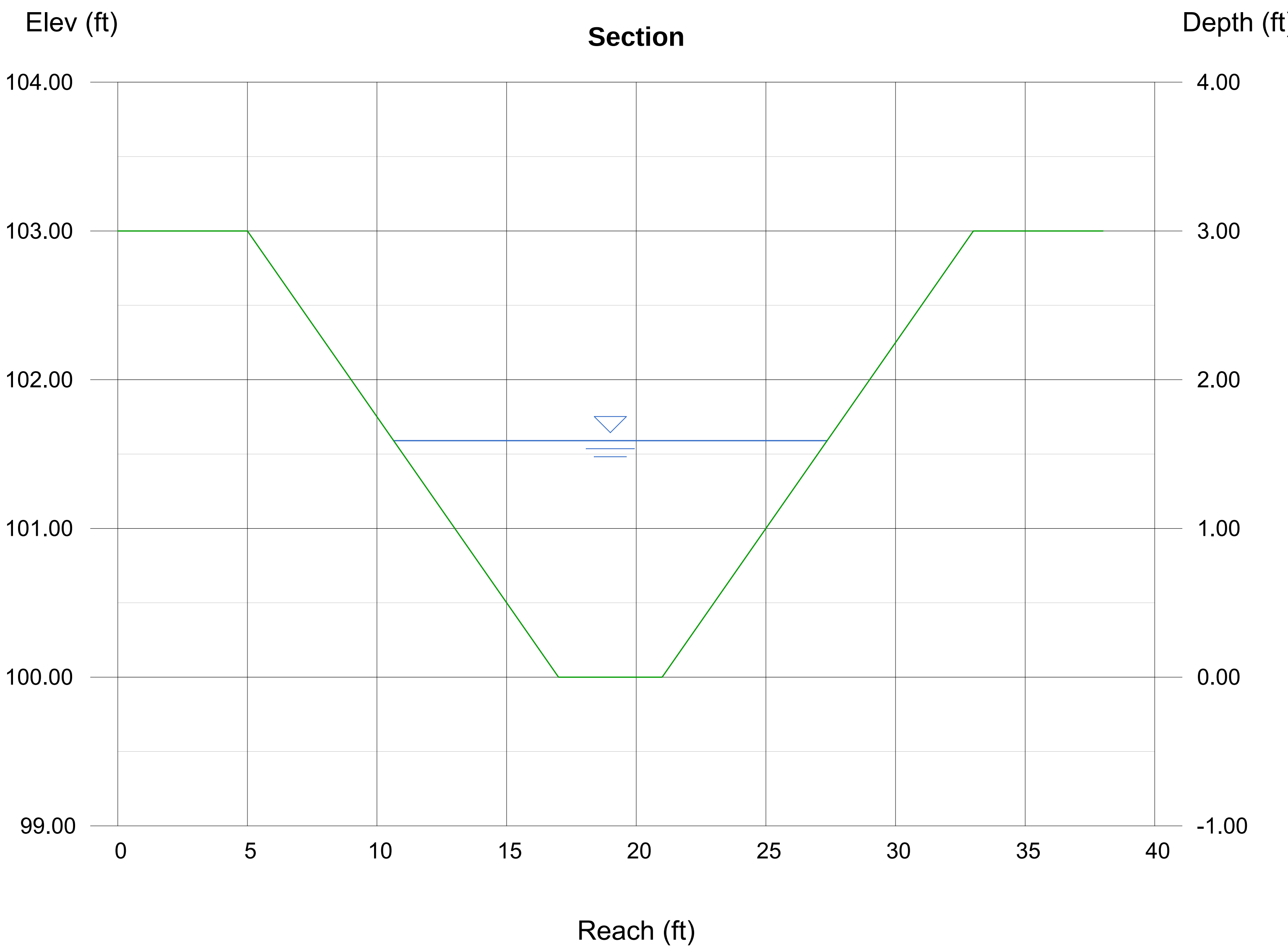
Botom Width (ft)	=	4.00
Side Slope (z:1)	=	4.00
Total Depth (ft)	=	3.00
Invert Elev (ft)	=	100.00
Slope (%)	=	0.50
N-Value	=	0.025

Calculations

Compute by:		Known Q
Known Q (cfs)	=	67.00

Highlighted

Depth (ft)	=	1.59
Q (cfs)	=	67.00
Area (sqft)	=	16.47
Velocity (ft/s)	=	4.07
Wetted Perim (ft)	=	17.11
Crit Depth, Yc (ft)	=	1.36
Top Width (ft)	=	16.72
EGL (ft)	=	1.85



Weir Report

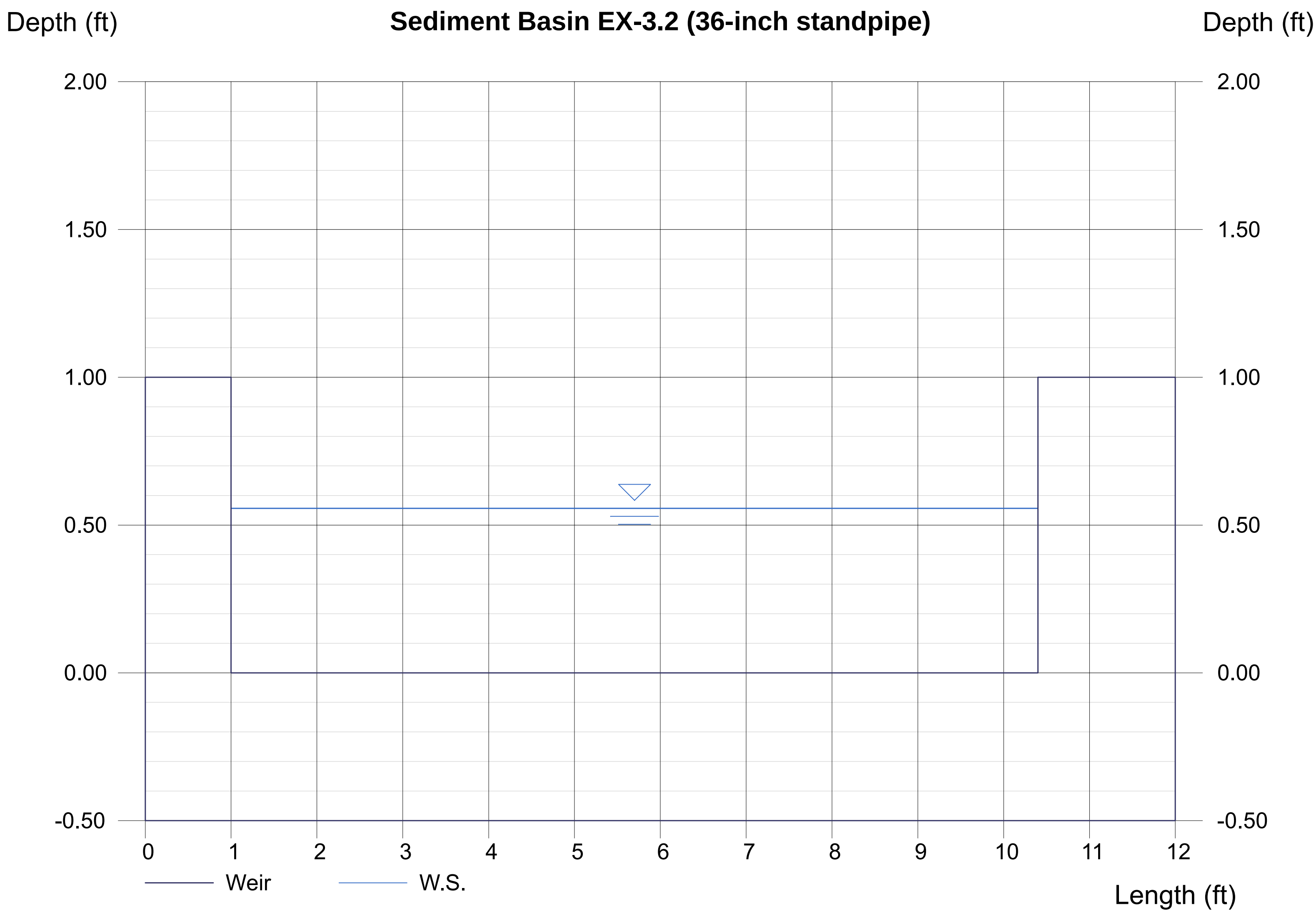
Hydraflow Express by Intelisolve | Thursday, Jun 14 2018, 8:34 AM

Sediment Basin EX-3.2 (36-inch standpipe)

Rectangular Weir
Crest = Sharp
Bottom Length (ft) = 9.40
Total Depth (ft) = 1.00

Calculations
Weir Coeff. Cw = 3.33
Compute by: Known Q
Known Q (cfs) = 13.00

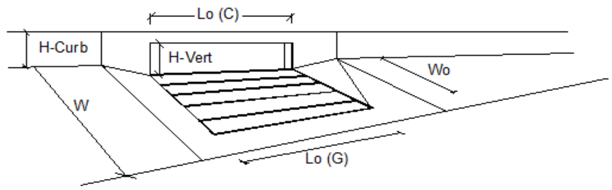
Highlighted
Depth (ft) = 0.56
Q (cfs) = 13.00
Area (sqft) = 5.23
Velocity (ft/s) = 2.49
Top Width (ft) = 9.40



INLET ON A CONTINUOUS GRADE

Project: Lorson East Prelim Plan #100.040

Inlet ID: Inlet DP-6a (Basins C16.15+ bypass from DP-6)

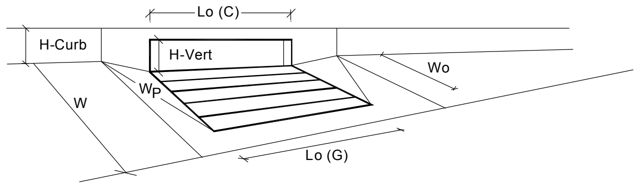


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	10.00	10.00	ft
Width of a Unit Grate (cannot be greater than W from Q-Allow)	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 < maximum allowable from sheet 'Q-Allow'		MINOR	MAJOR	
Design Discharge for Half of Street (from Sheet *Q-Peak*)	**Q_o =**	6.6	24.9	cfs
Water Spread Width	T =	14.6	17.0	ft
Water Depth at Flowline (outside of local depression)	d =	5.0	7.5	inches
Water Depth at Street Crown (or at T_{MAX})	d_{CROWN} =	0.0	1.9	inches
Ratio of Gutter Flow to Design Flow	E_o =	0.409	0.247	
Discharge outside the Gutter Section W, carried in Section T_x	Q_x =	3.9	18.2	cfs
Discharge within the Gutter Section W	Q_w =	2.7	6.0	cfs
Discharge Behind the Curb Face	Q_{BACK} =	0.0	0.7	cfs
Flow Area within the Gutter Section W	A_W =	2.25	5.70	sq ft
Velocity within the Gutter Section W	V_W =	2.9	4.2	fps
Water Depth for Design Condition	d_{LOCAL} =	8.0	10.5	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 =	0.097	0.066	ft/ft
Required Length L_T to Have 100% Interception	L_T =	14.16	32.65	ft
Under No-Clogging Condition		MINOR	MAJOR	
Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T)	L =	10.00	10.00	ft
Interception Capacity	Q_i =	5.9	11.7	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient	CurbCoef =	1.25	1.25	
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet	CurbClog =	0.06	0.06	
Effective (Unclogged) Length	L_e =	8.75	8.75	ft
Actual Interception Capacity	**Q_a =**	5.7	11.2	cfs
Carry-Over Flow = $Q_{b(GRATE)}$-Q_a	**Q_b =**	0.9	13.7	cfs
Summary		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**5.71**	**11.17**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.9**	**13.7**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**86**	**45**	**%**

INLET IN A SUMP OR SAG LOCATION

Project = **Lorson East Prelim Plan #100.040**

Inlet ID = **Inlet DP-10 (C16.16+C16.17+bypass from Inlet DP-8)**



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Inlet Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.5	8.0	inches
				☑ Override Depths
Grate Information		MINOR	MAJOR	
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	

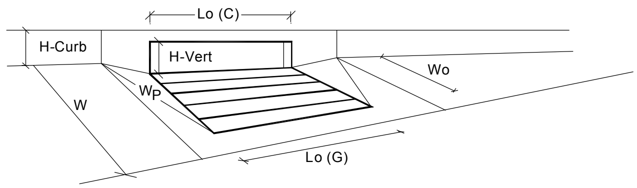
Grate Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	N/A	N/A	
Clogging Factor for Multiple Units	Clog =	N/A	N/A	
Grate Capacity as a Weir (based on UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	N/A	N/A	cfs
Interception with Clogging	Q_{wa} =	N/A	N/A	cfs
Grate Capacity as a Orifice (based on UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	N/A	N/A	cfs
Interception with Clogging	Q_{oa} =	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)	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 UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	10.72	17.34	cfs
Interception with Clogging	Q_{wa} =	10.05	16.26	cfs
Curb Opening as an Orifice (based on UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	20.22	22.38	cfs
Interception with Clogging	Q_{oa} =	18.96	20.98	cfs
Curb Opening Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	13.69	18.32	cfs
Interception with Clogging	Q_{ma} =	12.84	17.18	cfs
Resulting Curb Opening Capacity (assumes clogged condition)	Q_{Curb} =	**10.05**	**16.26**	**cfs**

Resultant Street Conditions		MINOR	MAJOR	
Total Inlet Length	L =	10.00	10.00	feet
Resultant Street Flow Spread (based on sheet *Q-Allow* geometry)	T =	39.3	52.1	ft.>T-Crown
Resultant Flow Depth at Street Crown	d_{CROWN} =	2.7	4.2	inches
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	Q_a =	**10.1**	**16.3**	**cfs**
WARNING: Inlet Capacity less than Q Peak for MAJOR Storm	$Q_{PEAK\ REQUIRED}$ =	6.0	20.9	cfs

INLET IN A SUMP OR SAG LOCATION

Project = Lorson East Prelim Plan #100.040
Inlet ID = Inlet DP-10a (C16.18+bypass from Inlet DP-8)

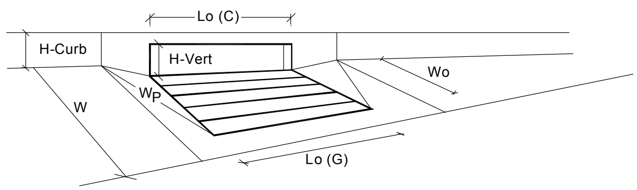


		MINOR	MAJOR	
Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Inlet Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.5	8.0	inches
			☑ Override Depths	
Grate Information		MINOR	MAJOR	
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	15.00	15.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
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 UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	N/A	N/A	cfs
Interception with Clogging	Q_{wa} =	N/A	N/A	cfs
Grate Capacity as a Orifice (based on UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	N/A	N/A	cfs
Interception with Clogging	Q_{oa} =	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)	Q_{Grate} =	**N/A**	**N/A**	**cfs**
Curb Opening Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	1.31	1.31	
Clogging Factor for Multiple Units	Clog =	0.04	0.04	
Curb Opening as a Weir (based on UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	12.45	21.18	cfs
Interception with Clogging	Q_{wa} =	11.90	20.25	cfs
Curb Opening as an Orifice (based on UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	30.33	33.57	cfs
Interception with Clogging	Q_{oa} =	29.00	32.11	cfs
Curb Opening Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	18.07	24.80	cfs
Interception with Clogging	Q_{ma} =	17.28	23.72	cfs
Resulting Curb Opening Capacity (assumes clogged condition)	Q_{Curb} =	**11.90**	**20.25**	**cfs**
Resultant Street Conditions		MINOR	MAJOR	
Total Inlet Length	L =	15.00	15.00	feet
Resultant Street Flow Spread (based on sheet *Q-Allow* geometry)	T =	39.3	52.1	ft.>T-Crown
Resultant Flow Depth at Street Crown	d_{CROWN} =	2.7	4.2	inches
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	Q_a =	**11.9**	**20.3**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	5.7	16.8	cfs

INLET IN A SUMP OR SAG LOCATION

Project = **Lorson East Prelim Plan #100.040**

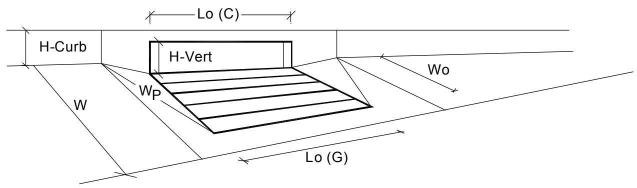
Inlet ID = **Inlet DP-10b (C16.26)**



		MINOR	MAJOR	
Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Inlet Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	6.0	inches
				☑ Override Depths
Grate Information		MINOR	MAJOR	
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	
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 UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	N/A	N/A	cfs
Interception with Clogging	Q_{wa} =	N/A	N/A	cfs
Grate Capacity as a Orifice (based on UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	N/A	N/A	cfs
Interception with Clogging	Q_{oa} =	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)	Q_{Grate} =	**N/A**	**N/A**	**cfs**
Curb Opening Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	1.00	1.00	
Clogging Factor for Multiple Units	Clog =	0.10	0.10	
Curb Opening as a Weir (based on UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	5.98	5.98	cfs
Interception with Clogging	Q_{wa} =	5.38	5.38	cfs
Curb Opening as an Orifice (based on UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	9.75	9.75	cfs
Interception with Clogging	Q_{oa} =	8.78	8.78	cfs
Curb Opening Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	7.10	7.10	cfs
Interception with Clogging	Q_{ma} =	6.39	6.39	cfs
Resulting Curb Opening Capacity (assumes clogged condition)	Q_{Curb} =	**5.38**	**5.38**	**cfs**
Resultant Street Conditions		MINOR	MAJOR	
Total Inlet Length	L =	5.00	5.00	feet
Resultant Street Flow Spread (based on sheet *Q-Allow* geometry)	T =	35.4	35.4	ft.>T-Crown
Resultant Flow Depth at Street Crown	d_{CROWN} =	2.2	2.2	inches
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	Q_a =	**5.4**	**5.4**	**cfs**
WARNING: Inlet Capacity less than Q Peak for MAJOR Storm	$Q_{PEAK\ REQUIRED}$ =	3.2	27.1	cfs

INLEET IN A SUMP OR SAG LOCATION

Project = Lorson East Prelim Plan #100.040
Inlet ID = Inlet DP-10c (C16.27)

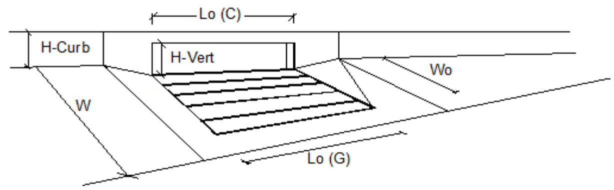


		MINOR	MAJOR	
Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Inlet Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	4.2	4.2	inches
				☐ Override Depths
Grate Information		MINOR	MAJOR	
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	
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 UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	N/A	N/A	cfs
Interception with Clogging	Q_{wa} =	N/A	N/A	cfs
Grate Capacity as a Orifice (based on UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	N/A	N/A	cfs
Interception with Clogging	Q_{oa} =	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)	Q_{Grate} =	**N/A**	**N/A**	**cfs**
Curb Opening Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	1.00	1.00	
Clogging Factor for Multiple Units	Clog =	0.10	0.10	
Curb Opening as a Weir (based on UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	2.44	2.44	cfs
Interception with Clogging	Q_{wa} =	2.20	2.20	cfs
Curb Opening as an Orifice (based on UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	8.25	8.25	cfs
Interception with Clogging	Q_{oa} =	7.42	7.42	cfs
Curb Opening Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	4.17	4.17	cfs
Interception with Clogging	Q_{ma} =	3.76	3.76	cfs
Resulting Curb Opening Capacity (assumes clogged condition)	Q_{Curb} =	**2.20**	**2.20**	**cfs**
Resultant Street Conditions		MINOR	MAJOR	
Total Inlet Length	L =	5.00	5.00	feet
Resultant Street Flow Spread (based on sheet *Q-Allow* geometry)	T =	20.4	20.4	ft.>T-Crown
Resultant Flow Depth at Street Crown	d_{CROWN} =	0.4	0.4	inches
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	Q_a =	**2.2**	**2.2**	**cfs**
WARNING: Inlet Capacity less than Q Peak for MAJOR Storm	$Q_{PEAK\ REQUIRED}$ =	0.6	23.0	cfs

INLET ON A CONTINUOUS GRADE

Project: Lorson East Prelim Plan #100.040

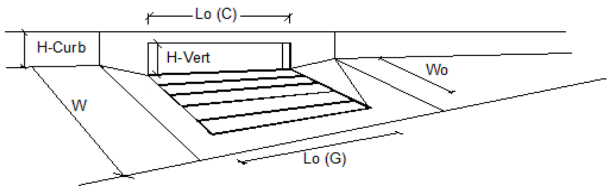
Inlet ID: Inlet DP-12a (Basins C16.20-16.21)



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	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 from Q-Allow)	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 < maximum allowable from sheet 'Q-Allow'		MINOR	MAJOR	
Design Discharge for Half of Street (from Sheet *Q-Peak*)	**Q_o =**	8.6	19.1	cfs
Water Spread Width	T =	15.6	17.0	ft
Water Depth at Flowline (outside of local depression)	d =	5.3	6.7	inches
Water Depth at Street Crown (or at T_{MAX})	d_{CROWN} =	0.0	1.1	inches
Ratio of Gutter Flow to Design Flow	E_o =	0.381	0.278	
Discharge outside the Gutter Section W, carried in Section T_x	Q_x =	5.3	13.7	cfs
Discharge within the Gutter Section W	Q_w =	3.3	5.3	cfs
Discharge Behind the Curb Face	Q_{BACK} =	0.0	0.1	cfs
Flow Area within the Gutter Section W	A_W =	2.57	4.59	sq ft
Velocity within the Gutter Section W	V_W =	3.3	4.1	fps
Water Depth for Design Condition	d_{LOCAL} =	8.3	9.7	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_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 =	0.092	0.072	ft/ft
Required Length L_T to Have 100% Interception	L_T =	16.79	28.05	ft
Under No-Clogging Condition		MINOR	MAJOR	
Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T)	L =	10.00	10.00	ft
Interception Capacity	Q_i =	6.9	10.4	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient	CurbCoef =	1.25	1.25	
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet	CurbClog =	0.06	0.06	
Effective (Unclogged) Length	L_e =	8.75	8.75	ft
Actual Interception Capacity	**Q_a =**	6.7	10.0	cfs
Carry-Over Flow = $Q_{b(GRATE)}$-Q_a	**Q_b =**	1.9	9.1	cfs
Summary		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**6.68**	**9.97**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**1.9**	**9.1**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**78**	**52**	**%**

INLET ON A CONTINUOUS GRADE

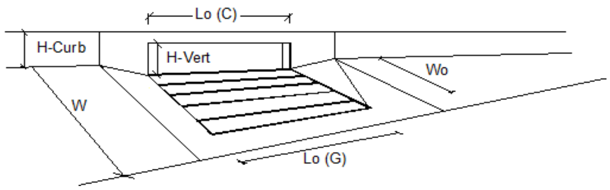
Project: Lorson East Prelim Plan #100.040
Inlet ID: Inlet DP-12 (Basins C16.22-C16.23)



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	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 from Q-Allow)	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 < maximum allowable from sheet 'Q-Allow'		MINOR	MAJOR	
Design Discharge for Half of Street (from Sheet *Q-Peak*)	Q_o =	7.7	17.1	cfs
Water Spread Width	T =	15.0	17.0	ft
Water Depth at Flowline (outside of local depression)	d =	5.1	6.5	inches
Water Depth at Street Crown (or at T_{MAX})	d_{CROWN} =	0.0	0.9	inches
Ratio of Gutter Flow to Design Flow	E_o =	0.399	0.289	
Discharge outside the Gutter Section W, carried in Section T_x	Q_x =	4.6	12.1	cfs
Discharge within the Gutter Section W	Q_w =	3.1	4.9	cfs
Discharge Behind the Curb Face	Q_{BACK} =	0.0	0.0	cfs
Flow Area within the Gutter Section W	A_W =	2.36	4.26	sq ft
Velocity within the Gutter Section W	V_W =	3.3	4.0	fps
Water Depth for Design Condition	d_{LOCAL} =	8.1	9.5	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 =	0.095	0.074	ft/ft
Required Length L_T to Have 100% Interception	L_T =	15.61	26.20	ft
Under No-Clogging Condition		MINOR	MAJOR	
Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T)	L =	10.00	10.00	ft
Interception Capacity	Q_i =	6.5	9.9	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient	CurbCoef =	1.25	1.25	
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet	CurbClog =	0.06	0.06	
Effective (Unclogged) Length	L_e =	8.75	8.75	ft
Actual Interception Capacity	Q_a =	6.3	9.5	cfs
Carry-Over Flow = $Q_{b(GRATE)}$-Q_a	Q_b =	1.4	7.6	cfs
Summary		MINOR	MAJOR	
Total Inlet Interception Capacity	Q =	**6.28**	**9.48**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	Q_b =	**1.4**	**7.6**	**cfs**
Capture Percentage = Q_a/Q_o =	C% =	**82**	**55**	**%**

INLET ON A CONTINUOUS GRADE

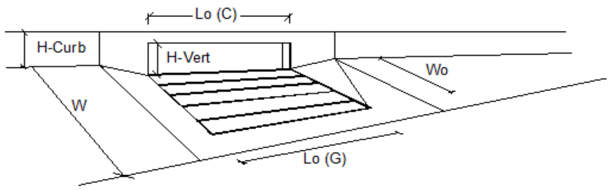
Project: **Lorson East Prelim Plan #100.040**
Inlet ID: **Inlet DP-13 (Basins C16.24 + bypass from Inlet DP-12 & Inlet DP12a)**



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	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 from Q-Allow)	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 < maximum allowable from sheet 'Q-Allow'		MINOR	MAJOR	
Design Discharge for Half of Street (from Sheet *Q-Peak*)	Q_o =	7.8	26.8	cfs
Water Spread Width	T =	15.6	17.0	ft
Water Depth at Flowline (outside of local depression)	d =	5.3	7.7	inches
Water Depth at Street Crown (or at T_{MAX})	d_{CROWN} =	0.0	2.1	inches
Ratio of Gutter Flow to Design Flow	E_o =	0.382	0.242	
Discharge outside the Gutter Section W, carried in Section T_x	Q_x =	4.8	19.6	cfs
Discharge within the Gutter Section W	Q_w =	3.0	6.2	cfs
Discharge Behind the Curb Face	Q_{BACK} =	0.0	1.0	cfs
Flow Area within the Gutter Section W	A_W =	2.56	5.95	sq ft
Velocity within the Gutter Section W	V_W =	3.1	4.3	fps
Water Depth for Design Condition	d_{LOCAL} =	8.3	10.7	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 =	0.092	0.065	ft/ft
Required Length L_T to Have 100% Interception	L_T =	15.79	33.99	ft
Under No-Clogging Condition		MINOR	MAJOR	
Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T)	L =	10.00	10.00	ft
Interception Capacity	Q_i =	6.5	12.0	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient	CurbCoef =	1.25	1.25	
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet	CurbClog =	0.06	0.06	
Effective (Unclogged) Length	L_e =	8.75	8.75	ft
Actual Interception Capacity	Q_a =	6.3	11.5	cfs
Carry-Over Flow = $Q_{b(GRATE)}$-Q_a	Q_b =	1.5	15.3	cfs
Summary		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**6.31**	**11.52**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**1.5**	**15.3**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**81**	**43**	**%**

INLET ON A CONTINUOUS GRADE

Project: Lorson East Prelim Plan #100.040
Inlet ID: Inlet DP-14 (Basin C16.30)

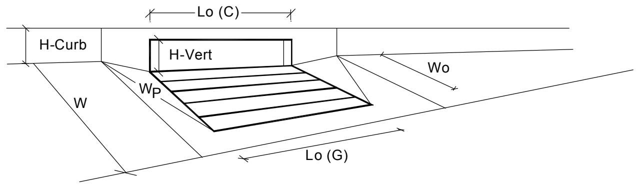


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	10.00	10.00	ft
Width of a Unit Grate (cannot be greater than W from Q-Allow)	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 < maximum allowable from sheet 'Q-Allow'		MINOR	MAJOR	
Design Discharge for Half of Street (from Sheet *Q-Peak*)	Q_o =	6.8	15.2	cfs
Water Spread Width	T =	14.8	17.0	ft
Water Depth at Flowline (outside of local depression)	d =	5.1	6.4	inches
Water Depth at Street Crown (or at T_{MAX})	d_{CROWN} =	0.0	0.8	inches
Ratio of Gutter Flow to Design Flow	E_o =	0.404	0.292	
Discharge outside the Gutter Section W, carried in Section T_x	Q_x =	4.1	10.7	cfs
Discharge within the Gutter Section W	Q_w =	2.7	4.4	cfs
Discharge Behind the Curb Face	Q_{BACK} =	0.0	0.0	cfs
Flow Area within the Gutter Section W	A_W =	2.30	4.19	sq ft
Velocity within the Gutter Section W	V_W =	3.0	3.6	fps
Water Depth for Design Condition	d_{LOCAL} =	8.1	9.4	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 =	0.096	0.075	ft/ft
Required Length L_T to Have 100% Interception	L_T =	14.43	24.34	ft
Under No-Clogging Condition		MINOR	MAJOR	
Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T)	L =	10.00	10.00	ft
Interception Capacity	Q_i =	6.0	9.3	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient	CurbCoef =	1.25	1.25	
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet	CurbClog =	0.06	0.06	
Effective (Unclogged) Length	L_e =	8.75	8.75	ft
Actual Interception Capacity	Q_a =	5.8	8.9	cfs
Carry-Over Flow = $Q_{b(GRATE)}$-Q_a	Q_b =	1.0	6.3	cfs
Summary		MINOR	MAJOR	
Total Inlet Interception Capacity	Q =	**5.82**	**8.95**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	Q_b =	**1.0**	**6.3**	**cfs**
Capture Percentage = Q_a/Q_o =	C% =	**86**	**59**	**%**

INLET IN A SUMP OR SAG LOCATION

Project = Lorson East Prelim Plan #100.040

Inlet ID = Inlet DP-16 (Basin C16.19+Basin C16.28+Basin C16.29+bypass from Inlet DP-6b+bypass from Inlet 13)

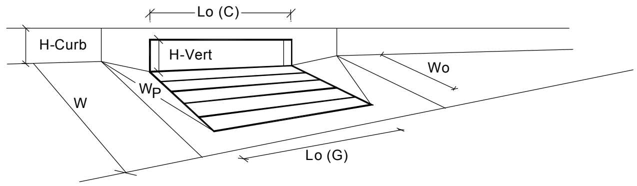


		MINOR	MAJOR	
Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Inlet Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.5	8.0	inches
			☑ Override Depths	
Grate Information		MINOR	MAJOR	
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	
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 UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	N/A	N/A	cfs
Interception with Clogging	Q_{wa} =	N/A	N/A	cfs
Grate Capacity as a Orifice (based on UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	N/A	N/A	cfs
Interception with Clogging	Q_{oa} =	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)	Q_{Grate} =	**N/A**	**N/A**	**cfs**
Curb Opening Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	1.33	1.33	
Clogging Factor for Multiple Units	Clog =	0.02	0.02	
Curb Opening as a Weir (based on UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	22.48	38.26	cfs
Interception with Clogging	Q_{wa} =	21.98	37.41	cfs
Curb Opening as an Orifice (based on UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	60.66	67.15	cfs
Interception with Clogging	Q_{oa} =	59.31	65.66	cfs
Curb Opening Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	34.34	47.14	cfs
Interception with Clogging	Q_{ma} =	33.58	46.09	cfs
Resulting Curb Opening Capacity (assumes clogged condition)	Q_{Curb} =	**21.98**	**37.41**	**cfs**
Resultant Street Conditions		MINOR	MAJOR	
Total Inlet Length	L =	30.00	30.00	feet
Resultant Street Flow Spread (based on sheet *Q-Allow* geometry)	T =	39.3	52.1	ft.>T-Crown
Resultant Flow Depth at Street Crown	d_{CROWN} =	2.7	4.2	inches
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	Q_a =	**22.0**	**37.4**	**cfs**
WARNING: Inlet Capacity less than Q Peak for MAJOR Storm	$Q_{PEAK\ REQUIRED}$ =	12.2	59.8	cfs

INLET IN A SUMP OR SAG LOCATION

Project = Lorson East Prelim Plan #100.040

Inlet ID = Inlet DP-17 (Basin C16.25+Basin C16.32+bypass from Inlet DP-14+bypass from Inlet 16)



		MINOR	MAJOR	
Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Inlet Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.5	8.0	inches
				☑ Override Depths
Grate Information		MINOR	MAJOR	
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	
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 UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	N/A	N/A	cfs
Interception with Clogging	Q_{wa} =	N/A	N/A	cfs
Grate Capacity as a Orifice (based on UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	N/A	N/A	cfs
Interception with Clogging	Q_{oa} =	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)	Q_{Grate} =	**N/A**	**N/A**	**cfs**
Curb Opening Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	1.33	1.33	
Clogging Factor for Multiple Units	Clog =	0.02	0.02	
Curb Opening as a Weir (based on UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	22.48	38.26	cfs
Interception with Clogging	Q_{wa} =	21.98	37.41	cfs
Curb Opening as an Orifice (based on UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	60.66	67.15	cfs
Interception with Clogging	Q_{oa} =	59.31	65.66	cfs
Curb Opening Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	34.34	47.14	cfs
Interception with Clogging	Q_{ma} =	33.58	46.09	cfs
Resulting Curb Opening Capacity (assumes clogged condition)	Q_{Curb} =	**21.98**	**37.41**	**cfs**
Resultant Street Conditions		MINOR	MAJOR	
Total Inlet Length	L =	30.00	30.00	feet
Resultant Street Flow Spread (based on sheet *Q-Allow* geometry)	T =	39.3	52.1	ft.>T-Crown
Resultant Flow Depth at Street Crown	d_{CROWN} =	2.7	4.2	inches
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	Q_a =	**22.0**	**37.4**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	3.6	34.7	cfs

APPENDIX D – POND AND ROUTING CALCULATIONS

Design Procedure Form: Grass Buffer (GB)

UD-BMP (Version 3.06, November 2016)

Designer:
Company: Core Engineering Group
Date: June 15, 2018
Project: Lorson Ranch East Filing No. 2
Location: Lorson Ranch

1. Design Discharge A) 2-Year Peak Flow Rate of the Area Draining to the Grass Buffer	Q_2 = 1.3 cfs
2. Minimum Width of Grass Buffer	W_G = 26 ft
3. Length of Grass Buffer (14' or greater recommended)	L_G = 60 ft
4. Buffer Slope (in the direction of flow, not to exceed 0.1 ft / ft)	S_G = 0.020 ft / ft
5. Flow Characteristics (sheet or concentrated) A) Does runoff flow into the grass buffer across the entire width of the buffer?	Choose One: (●) Yes ( ) No
B) Watershed Flow Length	F_L= 60 ft
C) Interface Slope (normal to flow)	S_I= 0.010 ft / ft
D) Type of Flow Sheet Flow: $F_L * S_I \leq 1$ Concentrated Flow: $F_L * S_I > 1$	SHEET FLOW
6. Flow Distribution for Concentrated Flows	Choose One: ( ) None (sheet flow) ( ) Slotted Curbing ( ) Level Spreader ( ) Other (Explain):
7 Soil Preparation (Describe soil amendment)	4" topsoil
8 Vegetation (Check the type used or describe "Other")	Choose One: (●) Existing Xeric Turf Grass ( ) Irrigated Turf Grass ( ) Other (Explain):
9. Irrigation (*Select None if existing buffer area has 80% vegetation AND will not be disturbed during construction.)	Choose One: ( ) Temporary ( ) Permanent (●) None*
10. Outflow Collection (Check the type used or describe "Other")	Choose One: ( ) Grass Swale ( ) Street Gutter ( ) Storm Sewer Inlet (●) Other (Explain): Etrib of Jimmy Camp Creek

Notes:

Design Procedure Form: Extended Detention Basin (EDB)

UD-BMP (Version 3.06, November 2016)

Designer: Richard Schindler
Company: Core Engineering Group
Date: February 13, 2018
Project: Lorson Ranch East PDR - Pond c5 forebay design
Location: Pond C5 forebay design (split forebay in two parts)

1. Basin Storage Volume	
A) Effective Imperviousness of Tributary Area, I_a	I_a = 63.0 %
B) Tributary Area's Imperviousness Ratio ($i = I_a / 100$)	i = 0.630
C) Contributing Watershed Area	Area = 171.000 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}= 3.515 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)	$V_{DESIGN\ USER}$= 3.300 ac-ft
I) Predominant Watershed NRCS Soil Group	Choose One: ( ) A ( ) B ( ) C / D — WQCV selected. Soil group not required.
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 = ______ 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 = 0.33 ft / ft **TOO STEEP (< 3)**
4. Inlet	
A) Describe means of providing energy dissipation at concentrated inflow locations:	______

Design Procedure Form: Extended Detention Basin (EDB)

Designer:	**Richard Schindler**
Company:	**Core Engineering Group**
Date:	**February 13, 2018**
Project:	**Lorson Ranch East PDR - Pond c5 forebay design**
Location:	**Pond C5 forebay design (split forebay in two parts)**

5. Forebay	
A) Minimum Forebay Volume (V_{FMIN} = 3% of the WQCV)	V_{FMIN} = 0.099 ac-ft
B) Actual Forebay Volume	V_F = 0.150 ac-ft
C) Forebay Depth (D_F = 30 inch maximum)	D_F = 30.0 in
D) Forebay Discharge	
i) Undetained 100-year Peak Discharge	Q_{100} = 484.00 cfs
ii) Forebay Discharge Design Flow ($Q_F = 0.02 * Q_{100}$)	Q_F = 9.68 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 = 14.8 in
6. Trickle Channel	
A) Type of Trickle Channel	Choose One: ◉ Concrete; ○ Soft Bottom
F) Slope of Trickle Channel	S = 0.0040 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 = 88 sq ft
C) Outlet Type	Choose One: ◉ Orifice Plate; ○ Other (Describe):
D) Smallest Dimension of Orifice Opening Based on Hydrograph Routing (Use UD-Detention)	$D_{orifice}$ = 3.03 inches
E) Total Outlet Area	A_{ot} = 27.63 square inches

Design Procedure Form: Extended Detention Basin (EDB)

Designer: Richard Schindler
Company: Core Engineering Group
Date: February 13, 2018
Project: Lorson Ranch East PDR - Pond c5 forebay design
Location: Pond C5 forebay design (split forebay in two parts)

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} = 431.2 cu ft

C) Initial Surcharge Provided Above Micropool

V_s= 29.3 cu ft

9. Trash Rack

A) Water Quality Screen Open Area: $A_t = A_{ot} * 38.5*(e^{-0.095D})$

A_t = 798 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)

stainless steel wellscreen

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} = 1329 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 feet

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

H_{TR}= 64 inches

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

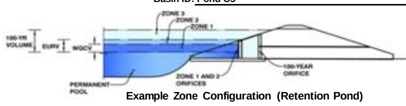
$W_{opening}$ = 20.8 inches

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

UD-Detention, Version 3.07 (February 2017)

Project: Lorson East MDDP (100.013)

Basin ID: Pond C5



Example Zone Configuration (Retention Pond)

Required Volume Calculation

Selected BMP Type =	**EDB**			
Watershed Area =	171.00	acres		
Watershed Length =	3,200	ft		
Watershed Slope =	0.018	ft/ft		
Watershed Imperviousness =	63.00%	percent		
Percentage Hydrologic Soil Group A =	0.0%	percent		
Percentage Hydrologic Soil Group B =	0.0%	percent		
Percentage Hydrologic Soil Groups C/D =	100.0%	percent		
Desired WQCV Drain Time =	40.0	hours		
Location for 1-hr Rainfall Depths =	User Input			
Water Quality Capture Volume (WQCV) =	3.515	acre-feet	Optional User Override 1-hr Precipitation	
Excess Urban Runoff Volume (EURV) =	10.382	acre-feet		
2-yr Runoff Volume (P1 = 1.19 in.) =	9.890	acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	14.020	acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	17.354	acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	22.326	acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	26.255	acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	31.112	acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 0 in.) =	0.000	acre-feet		inches
Approximate 2-yr Detention Volume =	9.279	acre-feet		
Approximate 5-yr Detention Volume =	13.206	acre-feet		
Approximate 10-yr Detention Volume =	15.090	acre-feet		
Approximate 25-yr Detention Volume =	16.122	acre-feet		
Approximate 50-yr Detention Volume =	16.607	acre-feet		
Approximate 100-yr Detention Volume =	18.232	acre-feet		

Stage-Storage Calculation

Zone 1 Volume (WQCV) =	3.515	acre-feet
Zone 2 Volume (EURV - Zone 1) =	6.868	acre-feet
Zone 3 Volume (User Defined - Zones 1 & 2) =	0.100	acre-feet
Total Detention Basin Volume =	10.482	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

Total detention volume is less than 100-year volume.

Depth Increment = 0.2 ft

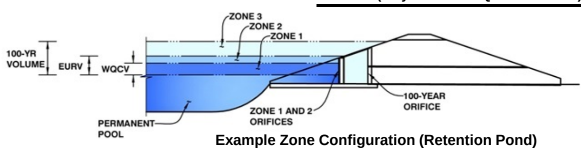
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	50	0.001		
5706.33	--	0.33	--	--	--	100	0.002	24	0.001
5707	--	1.00	--	--	--	1,000	0.023	383	0.009
5708	--	2.00	--	--	--	18,898	0.434	10,154	0.233
5709	--	3.00	--	--	--	77,432	1.778	58,507	1.343
5710	--	4.00	--	--	--	110,270	2.531	152,358	3.498
5711	--	5.00	--	--	--	115,455	2.650	265,220	6.089
5712	--	6.00	--	--	--	120,720	2.771	383,308	8.800
5713	--	7.00	--	--	--	126,045	2.894	506,690	11.632
5714	--	8.00	--	--	--	131,696	3.023	635,561	14.590
5715	--	9.00	--	--	--	136,745	3.139	769,781	17.672
5716	--	10.00	--	--	--	141,857	3.257	909,082	20.870
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				

Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)

Project: Lorson East MDDP (100.013)

Basin ID: Pond C5 (only used for WQCV and EURV) Do not use for 2-100-yr Storm Event!!!!!!



Example Zone Configuration (Retention Pond)

	Stage (ft)	Zone Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	4.01	3.515	Orifice Plate
Zone 2 (EURV)	6.57	6.868	Rectangular Orifice
Zone 3 (User)	6.60	0.100	Weir&Pipe (Restrict)
		10.482	Total

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

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

Calculated Parameters for Underdrain

Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Centroid =	N/A	feet

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

Invert of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate =	4.01	ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing =	16.00	inches
Orifice Plate: Orifice Area per Row =	9.21	sq. inches (use rectangular openings)

Calculated Parameters for Plate

WQ Orifice Area per Row =	6.396E-02	ft^2
Elliptical Half-Width =	N/A	feet
Elliptical Slot Centroid =	N/A	feet
Elliptical Slot Area =	N/A	ft^2

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.34	2.67					
Orifice Area (sq. inches)	9.21	9.21	9.21					

	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	
Invert of Vertical Orifice =	4.01	N/A	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =	6.57	N/A	ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Height =	6.00	N/A	inches
Vertical Orifice Width =	18.68		inches

Calculated Parameters for Vertical Orifice

	Zone 2 Rectangular	Not Selected	
Vertical Orifice Area =	0.78	N/A	ft^2
Vertical Orifice Centroid =	0.25	N/A	feet

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

	Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	6.60	N/A	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	3.00	N/A	feet
Overflow Weir Slope =	0.00	N/A	H:V (enter zero for flat grate)
Horiz. Length of Weir Sides =	30.00	N/A	feet
Overflow Grate Open Area % =	80%	N/A	%, grate open area/total area
Debris Clogging % =	50%	N/A	%

Calculated Parameters for Overflow Weir

	Zone 3 Weir	Not Selected	
Height of Grate Upper Edge, H_t =	6.60	N/A	feet
Over Flow Weir Slope Length =	30.00	N/A	feet
Grate Open Area / 100-yr Orifice Area =	5.73	N/A	should be $\geq$ 4
Overflow Grate Open Area w/o Debris =	72.00	N/A	ft^2
Overflow Grate Open Area w/ Debris =	36.00	N/A	ft^2

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

	Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	0.00	N/A	ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter =	48.00	N/A	inches
Restrictor Plate Height Above Pipe Invert =	48.00		inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

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

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	7.00	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	52.00	feet
Spillway End Slopes =	4.00	H:V
Freeboard above Max Water Surface =	3.00	feet

Calculated Parameters for Spillway

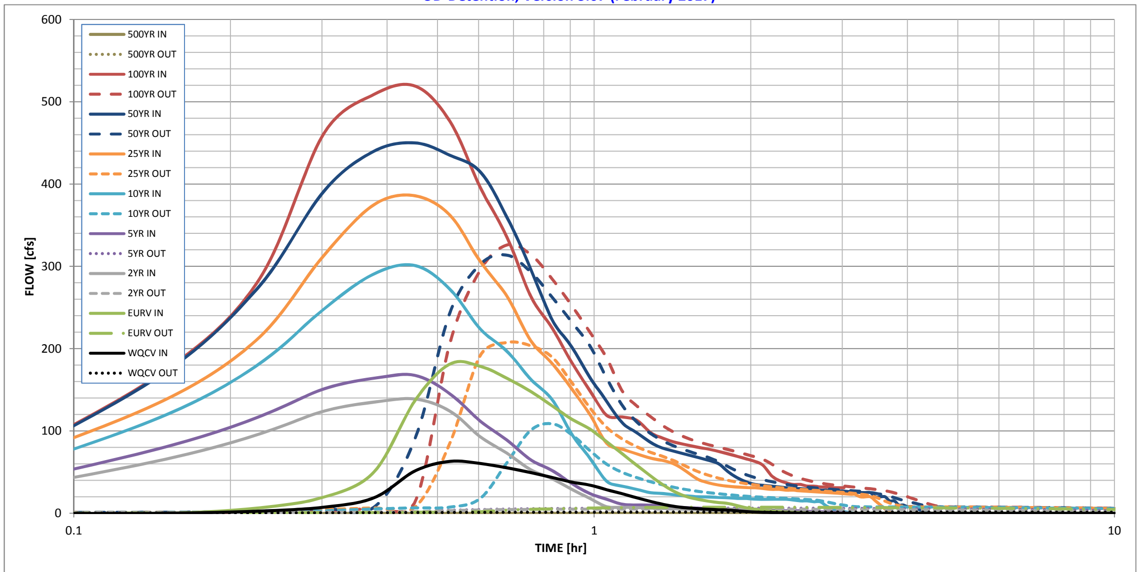
Spillway Design Flow Depth=	2.05	feet
Stage at Top of Freeboard =	12.05	feet
Basin Area at Top of Freeboard =	3.26	acres

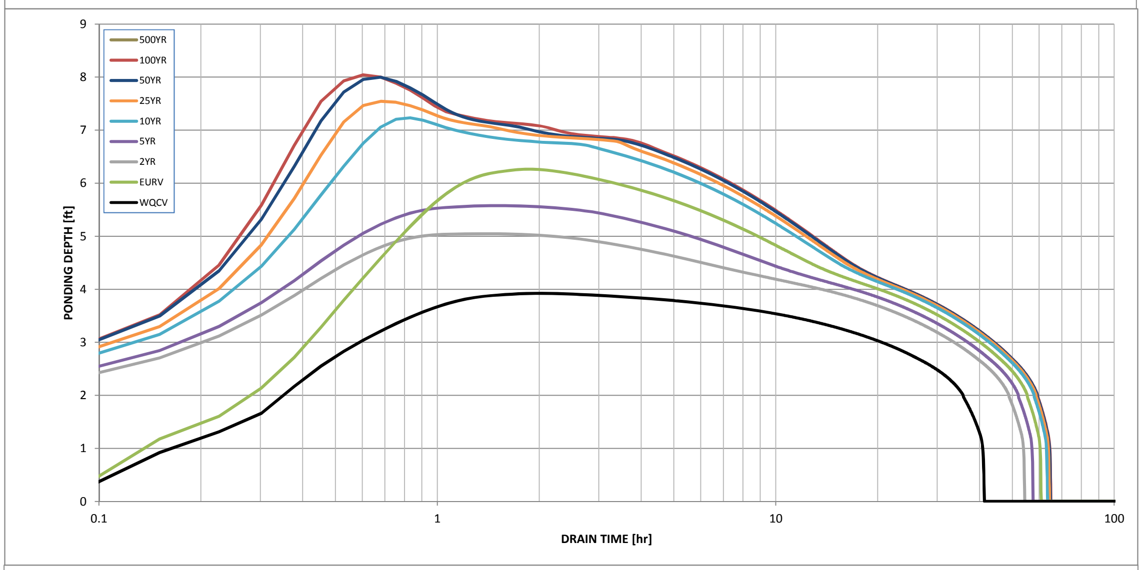
Routed Hydrograph Results

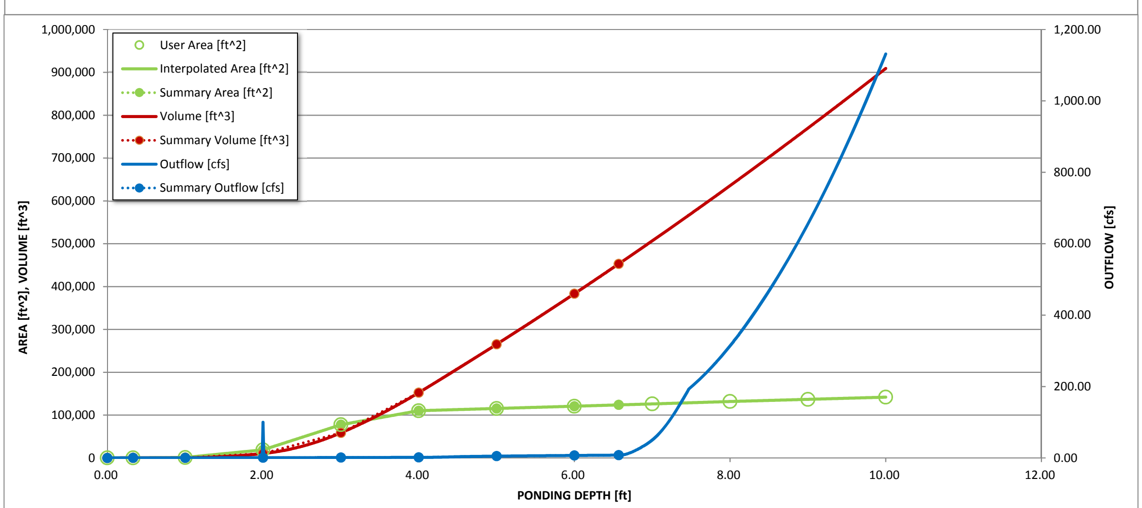
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	0.53	1.07	1.19	1.50	1.75	2.00	2.25	2.52	0.00
Calculated Runoff Volume (acre-ft) =	3.515	10.382	9.890	14.020	17.354	22.326	26.255	31.112	0.000
OPTIONAL Override Runoff Volume (acre-ft) =									
Inflow Hydrograph Volume (acre-ft) =	3.517	10.386	6.877	8.575	17.689	26.716	34.728	37.807	#N/A
Predevelopment Unit Peak Flow, q (cfs/acre) =	0.00	0.00	0.02	0.14	0.39	0.89	1.17	1.52	0.00
Predevelopment Peak Q (cfs) =	0.0	0.0	2.9	24.2	65.9	151.4	199.8	259.3	0.0
Peak Inflow Q (cfs) =	63.1	181.4	138.8	167.5	301.0	385.7	450.0	519.1	#N/A
Peak Outflow Q (cfs) =	2.5	7.3	5.1	6.2	108.7	207.6	313.7	326.0	#N/A
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.3	1.7	1.4	1.6	1.3	#N/A
Structure Controlling Flow =	User Defined	User Defined	User Defined	User Defined	User Defined	User Defined	User Defined	User Defined	#N/A
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	1.1	1.9	1.9	1.9	#N/A
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	#N/A
Time to Drain 97% of Inflow Volume (hours) =	38	54	49	52	53	50	48	47	#N/A
Time to Drain 99% of Inflow Volume (hours) =	40	58	52	55	59	58	58	57	#N/A
Maximum Ponding Depth (ft) =	3.92	6.27	5.05	5.58	7.23	7.55	8.00	8.04	#N/A
Area at Maximum Ponding Depth (acres) =	2.47	2.80	2.66	2.72	2.92	2.96	3.02	3.03	#N/A
Maximum Volume Stored (acre-ft) =	3.298	9.524	6.195	7.619	12.301	13.213	14.560	14.711	#N/A

Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)







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

Detention Basin Outlet Structure Design

Outflow Hydrograph Workbook Filename:

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

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

	SOURCE	WORKBOOK	WORKBOOK	USER	USER	USER	USER	USER	USER	#N/A
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]
4.53 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	#N/A
	0:04:32	0.00	0.00	29.00	36.00	51.00	62.00	64.00	65.00	#N/A
Hydrograph	0:09:04	0.00	0.00	66.00	81.00	120.00	139.00	173.00	175.00	#N/A
Constant	0:13:35	2.65	6.62	96.00	117.00	181.00	213.00	275.00	283.00	0.00
1.105	0:18:07	7.32	19.57	124.00	151.00	248.00	313.00	391.00	461.00	0.00
	0:22:39	18.80	50.29	135.00	164.00	291.00	375.00	440.00	509.00	0.00
	0:27:11	51.57	137.40	138.80	167.50	301.00	385.70	450.00	519.10	0.00
	0:31:43	63.09	181.40	124.00	145.00	272.00	362.00	435.00	476.00	0.00
	0:36:14	60.59	178.56	93.00	112.00	224.00	306.00	415.00	396.00	0.00
	0:40:46	55.14	164.07	73.00	89.00	197.00	264.00	360.00	336.00	0.00
	0:45:18	49.64	148.07	53.00	65.00	163.00	210.00	297.00	264.00	0.00
	0:49:50	43.37	130.43	42.00	52.00	138.00	182.00	235.00	225.00	0.00
	0:54:22	37.83	114.23	29.00	36.00	96.00	151.00	202.00	183.00	0.00
	0:58:53	34.19	102.31	18.00	24.00	67.00	120.00	165.00	149.00	0.00
	1:03:25	28.61	86.89	8.00	17.00	39.00	85.00	136.00	119.00	0.00
	1:07:57	23.68	72.31	7.40	11.00	33.00	78.00	109.80	117.00	0.00
	1:12:29	18.72	58.12	6.90	10.00	29.00	72.00	98.00	113.00	0.00
	1:17:01	14.42	45.40	6.30	10.00	25.00	67.00	86.00	98.00	0.00
	1:21:32	10.74	34.41	5.70	8.40	24.00	64.00	79.00	91.00	0.00
	1:26:04	8.07	25.42	5.40	7.50	22.00	59.00	75.00	86.00	0.00
	1:30:36	6.51	20.14	4.70	6.80	21.00	50.00	71.00	83.00	0.00
	1:35:08	5.48	16.87	4.50	6.10	20.00	41.00	68.00	80.00	0.00
	1:39:40	4.77	14.58	4.00	5.60	20.00	37.00	64.00	78.00	0.00
	1:44:11	4.27	12.98	3.60	5.20	19.00	34.00	60.00	75.00	0.00
	1:48:43	3.92	11.84	3.10	4.80	19.00	33.00	50.00	72.00	0.00
	1:53:15	2.91	9.12	3.00	4.40	18.00	32.00	42.90	69.00	0.00
	1:57:47	2.11	6.57	2.50	4.10	18.00	31.00	38.00	66.00	0.00
	2:02:19	1.56	4.88	2.40	3.80	17.00	31.00	35.00	63.00	0.00
	2:06:50	1.16	3.62	2.30	3.50	17.00	30.00	34.00	58.00	0.00
	2:11:22	0.85	2.68	2.20	3.20	17.00	29.00	33.00	46.00	0.00
	2:15:54	0.61	1.94	1.90	3.00	17.00	29.00	32.00	40.00	0.00
	2:20:26	0.44	1.40	1.70	3.00	17.00	28.00	31.00	37.00	0.00
	2:24:58	0.31	1.00	1.50	3.00	16.00	28.00	30.00	35.00	0.00
	2:29:29	0.20	0.66	1.30	3.00	15.00	27.00	30.00	35.00	0.00
	2:34:01	0.11	0.40	1.00	2.30	15.00	27.00	29.00	33.00	0.00
	2:38:33	0.05	0.20	0.90	2.00	14.00	26.00	29.00	33.00	0.00
	2:43:05	0.01	0.06	0.80	1.80	14.00	26.00	28.00	32.00	0.00
	2:47:37	0.00	0.00	0.20	1.70	9.00	25.00	28.00	32.00	0.00
	2:52:08	0.00	0.00	0.00	1.60	5.00	25.00	27.00	31.00	0.00
	2:56:40	0.00	0.00	0.00	1.00	3.00	24.00	27.00	31.00	0.00
	3:01:12	0.00	0.00		0.90	2.00	24.00	27.00	31.00	0.00
	3:05:44	0.00	0.00		0.00	1.00	23.00	26.00	30.00	0.00
	3:10:16	0.00	0.00		0.00	0.00	23.00	26.00	30.00	0.00
	3:14:47	0.00	0.00		0.00	0.00	20.00	25.00	28.00	0.00
	3:19:19	0.00	0.00			0.00	20.00	25.00	28.00	0.00
	3:23:51	0.00	0.00			0.00	20.00	25.00	28.00	0.00
	3:28:23	0.00	0.00			0.00	15.00	20.00	25.00	0.00
	3:32:55	0.00	0.00				10.00	20.00	25.00	0.00
	3:37:26	0.00	0.00				5.00	20.00	25.00	0.00
	3:41:58	0.00	0.00				1.00	15.00	20.00	0.00
	3:46:30	0.00	0.00				0.00	15.00	20.00	0.00
	3:51:02	0.00	0.00				0.00	10.00	16.00	0.00
	3:55:34	0.00	0.00					10.00	16.00	0.00
	4:00:05	0.00	0.00					8.00	11.00	0.00
	4:04:37	0.00	0.00					8.00	11.00	0.00
	4:09:09	0.00	0.00					6.00	8.00	0.00
	4:13:41	0.00	0.00					4.00	6.00	0.00
	4:18:13	0.00	0.00					2.00	4.00	#N/A
	4:22:44	0.00	0.00					1.00	2.00	#N/A
	4:27:16	0.00	0.00					0.00	1.00	#N/A
	4:31:48	0.00	0.00					0.00	0.00	#N/A
	4:36:20	0.00	0.00						0.00	#N/A
	4:40:52	0.00	0.00						0.00	#N/A
	4:45:23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	#N/A
	4:49:55	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	#N/A
	4:54:27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	#N/A
	4:58:59	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	#N/A
	5:03:31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	#N/A
	5:08:02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	#N/A
	5:12:34	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	#N/A
	5:17:06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	#N/A
	5:21:38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	#N/A
	5:26:10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	#N/A

Weir Report

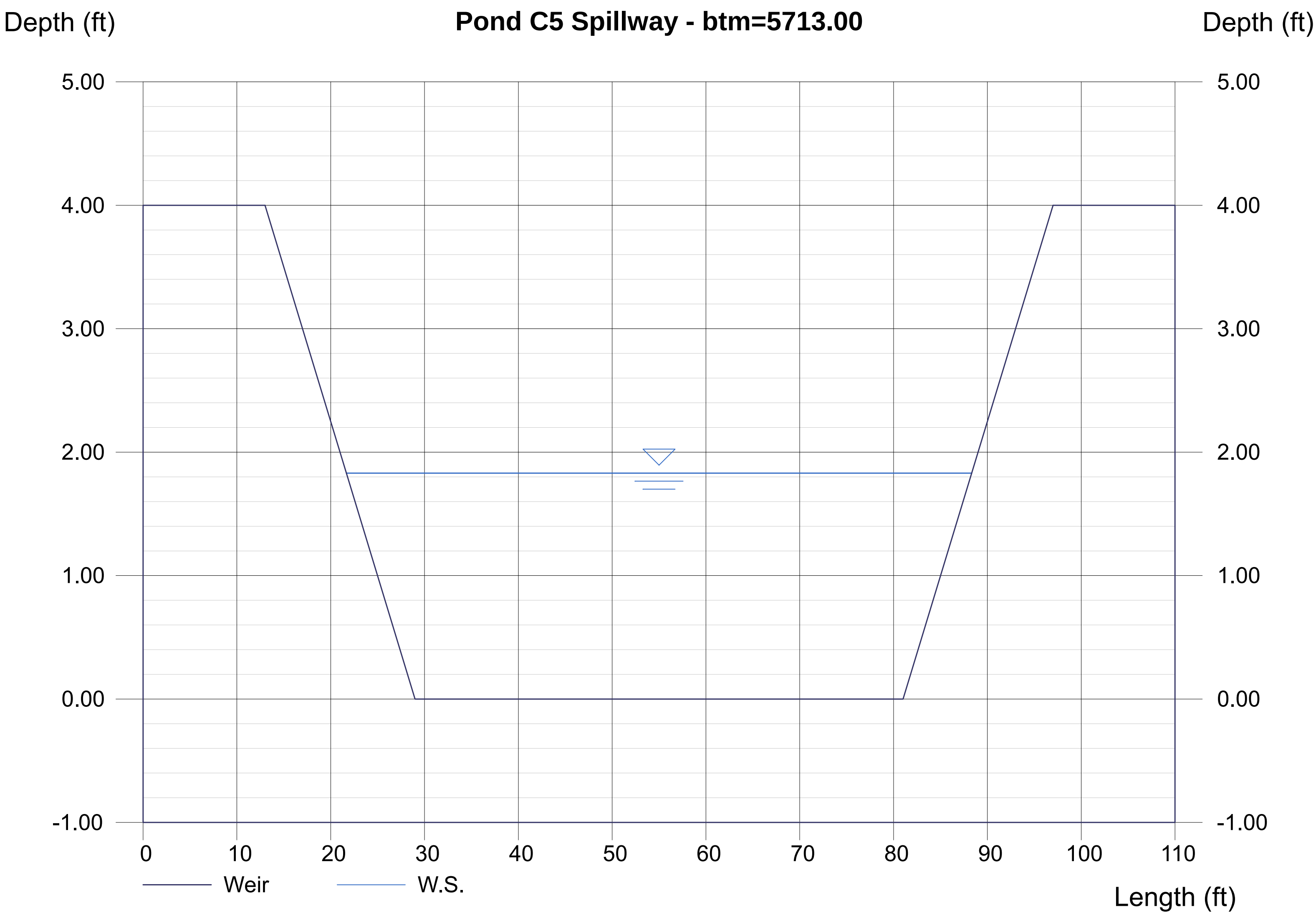
Hydraflow Express by Intelisolve | Friday, Oct 13 2017, 6:28 AM

Pond C5 Spillway - btm=5713.00

Trapezoidal Weir
Crest = Sharp
Bottom Length (ft) = 52.00
Total Depth (ft) = 4.00
Side Slope (z:1) = 4.00

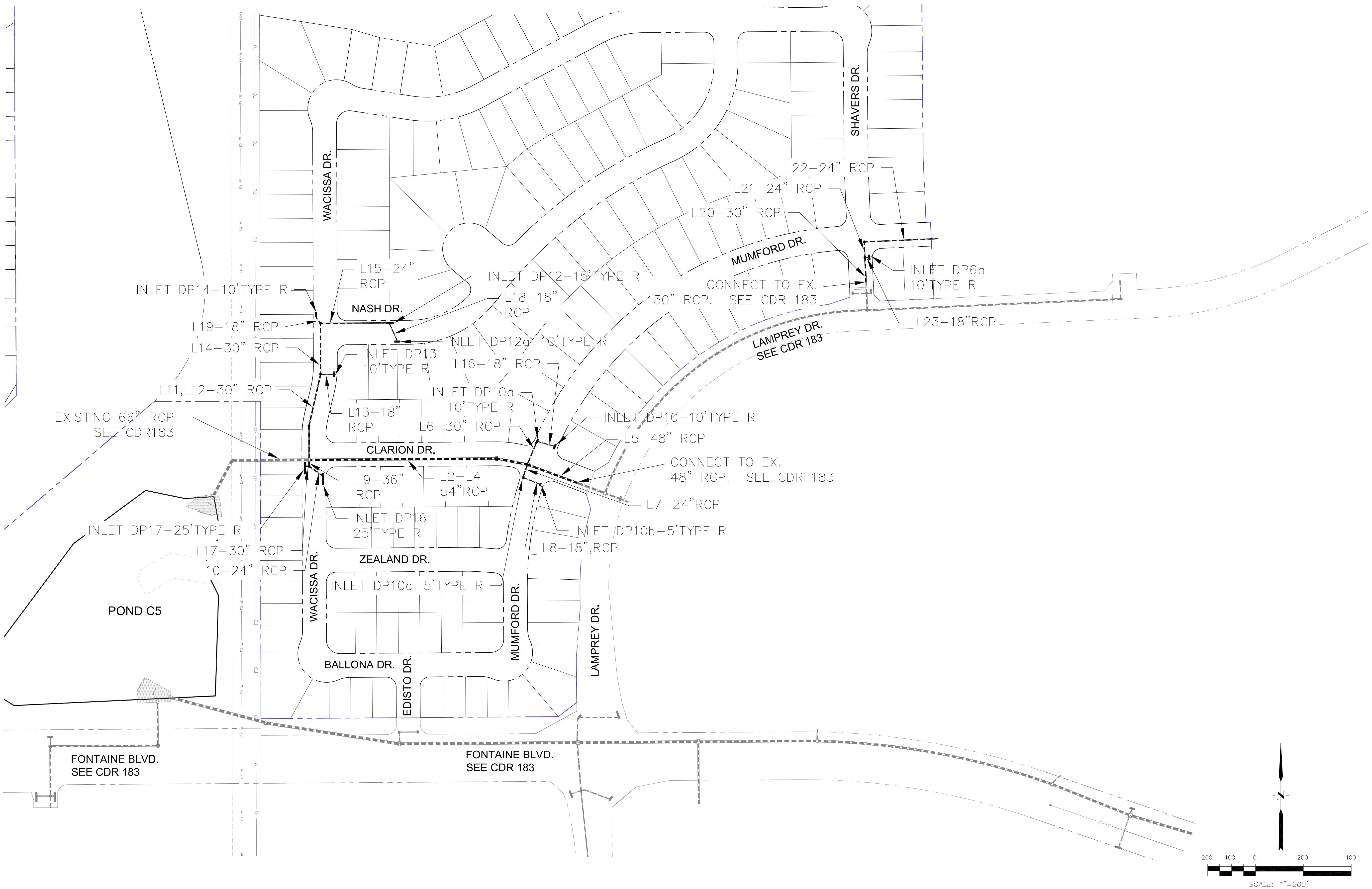
Calculations
Weir Coeff. Cw = 3.10
Compute by: Known Q
Known Q (cfs) = 443.00

Highlighted
Depth (ft) = 1.83
Q (cfs) = 443.00
Area (sqft) = 108.56
Velocity (ft/s) = 4.08
Top Width (ft) = 66.64



APPENDIX E– STORM SEWER SCHEMATIC AND HYDRAFLOW STORM SEWER CALCS

BASIN C16 STORM SCHEMATIC



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:
LORSON RANCH EAST FIL 2
EAST OF EAST TRIBUTARY
EL PASO COUNTY, COLORADO

DRAWN: RLS
DESIGNED: LAB
CHECKED: LAB

STORM SEWER SCHEMATIC
BASIN C16
LORSON RANCH EAST FILING NO. 2

DATE
JUNE 22, 2018
PROJECT NO.
100.044
SHEET NUMBER
2
TOTAL SHEETS: 3

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	146.5	66 c	249.0	5710.51	5713.01	1.004	5715.50	5716.94	0.50	5717.45	End
2	2	105.6	54 c	380.6	5714.10	5717.91	1.001	5717.77	5720.86	0.21	5720.86	1
3	3	105.6	54 c	42.5	5717.91	5718.34	1.011	5721.60	5721.29	0.50	5721.29	2
4	4	105.6	54 c	37.8	5718.54	5718.92	1.005	5722.02	5721.87	0.57	5721.87	3
5	5	90.12	48 c	172.0	5720.30	5722.04	1.012	5722.59	5724.86	0.71	5725.56	4
6	6	11.70	30 c	50.5	5720.92	5721.42	0.991	5723.11	5723.09	0.09	5723.17	4
7	7	3.80	24 c	29.2	5721.42	5721.71	0.992	5723.25	5723.25	0.02	5723.27	4
8	8	3.21	18 c	35.8	5722.21	5722.57	1.004	5723.27	5723.26	n/a	5723.39 j	7
9	9	15.80	36 c	15.3	5715.75	5716.21	3.013	5718.31	5718.27	0.06	5718.33	1
10	10	12.20	24 c	33.7	5717.21	5717.55	1.007	5718.33	5718.79	0.28	5718.79	9
11	11	25.09	30 c	69.5	5716.10	5716.80	1.007	5718.05	5718.47	0.16	5718.47	1
12	12	25.09	30 c	103.6	5717.00	5718.04	1.004	5718.87	5719.71	0.32	5719.71	11
13	13	6.31	18 c	25.1	5719.54	5719.79	0.995	5720.38	5720.76	0.21	5720.97	12
14	14	18.78	30 c	112.8	5718.04	5719.17	1.002	5720.29	5720.62	n/a	5720.62 j	12
15	15	12.96	24 c	135.3	5719.97	5721.19	0.901	5721.09	5722.47	n/a	5722.47	14
16	16	6.00	18 c	36.2	5722.42	5722.75	0.911	5723.26	5723.69	0.21	5723.90	6
17	17	3.60	30 c	8.3	5717.21	5717.34	1.568	5718.42	5718.40	0.05	5718.45	9
18	18	6.68	18 c	31.4	5721.69	5722.00	0.989	5722.83	5722.99	n/a	5722.99	15
19	19	5.82	18 c	20.9	5720.88	5721.09	1.003	5721.68	5722.05	0.11	5722.16	14
20	20	16.76	30 c	51.0	5733.47	5733.88	0.803	5735.45	5735.38	0.00	5735.38	End
21	21	11.05	24 c	32.0	5734.38	5734.64	0.813	5735.65	5735.82	n/a	5735.82	20
22	22	11.05	24 c	155.0	5734.74	5737.53	1.800	5736.14	5738.71	n/a	5738.71 j	21
23	23	5.71	18 c	8.0	5734.88	5734.96	1.001	5735.68	5735.98	0.00	5735.98	20

Lorson East 2 FDR -5yr | Number of lines: 23 | Run Date: 06-15-2018

NOTES: c = cir; e = ellip; b = box; Return period = 5 Yrs. ; j - Line contains hyd. jump.

Storm Sewer Summary Report

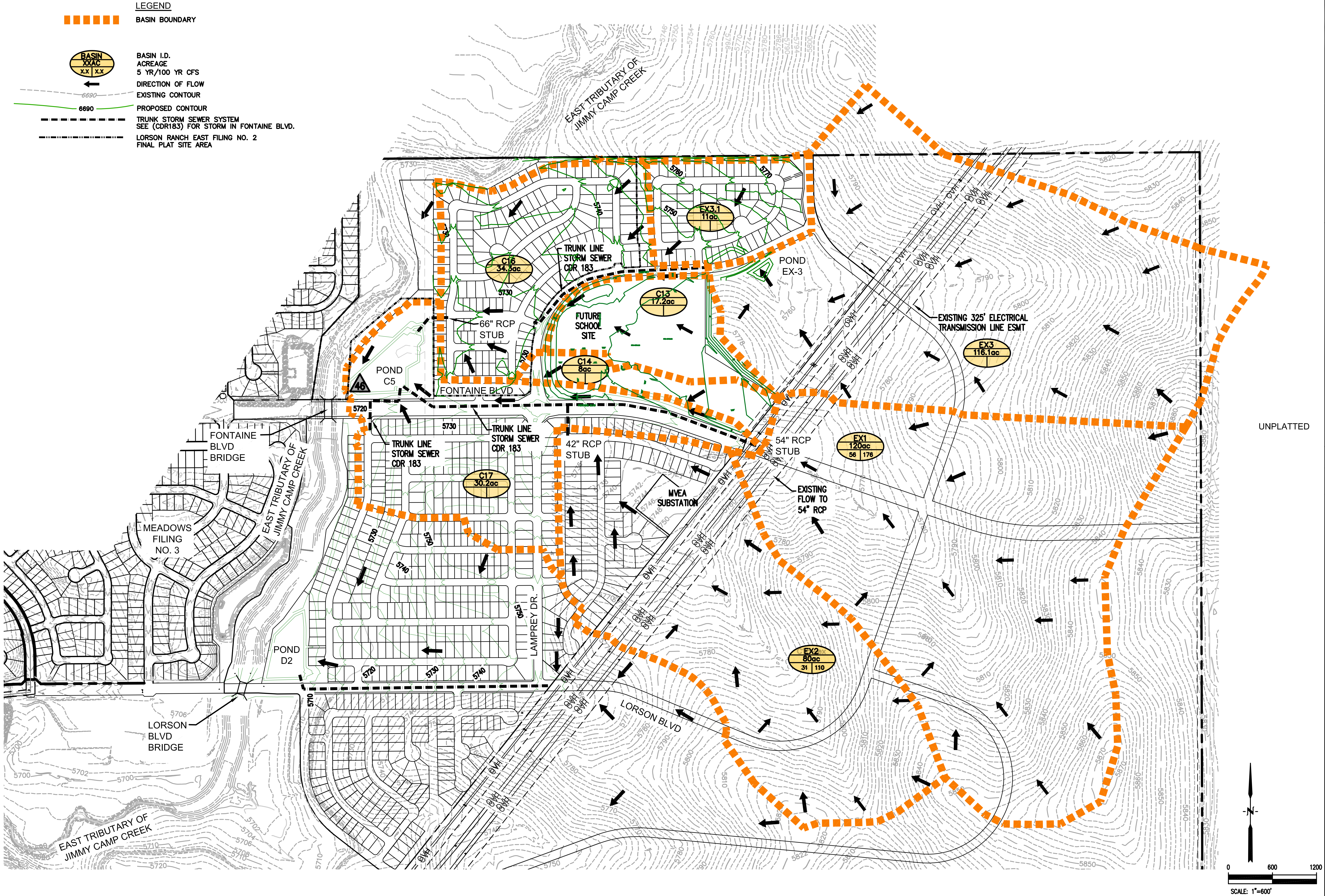
Line No.	Line ID	Flow rate (cfs)	Line size (in)	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line slope (%)	HGL down (ft)	HGL up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns line No.
1	1	230.8	66 c	249.0	5710.51	5713.00	1.000	5714.95*	5719.51*	0.73	5720.24	End
2	2	154.8	54 c	380.6	5714.10	5717.91	1.001	5720.24*	5722.60*	0.22	5722.82	1
3	3	154.8	54 c	42.5	5717.91	5718.34	1.011	5722.82*	5723.09*	0.52	5723.60	2
4	4	154.8	54 c	37.8	5718.54	5718.92	1.005	5723.60*	5723.84*	0.59	5724.42	3
5	5	136.5	48 c	174.0	5720.30	5722.04	1.000	5724.42	5725.79	0.97	5726.76	4
6	6	33.10	30 c	50.5	5720.92	5721.42	0.991	5725.19*	5725.52*	0.35	5725.87	4
7	7	7.60	24 c	29.2	5721.42	5721.71	0.992	5725.81*	5725.84*	0.05	5725.88	4
8	8	5.40	18 c	35.8	5722.21	5722.57	1.004	5725.88*	5725.98*	0.07	5726.05	7
9	9	72.10	36 c	15.3	5715.75	5716.21	3.013	5720.24*	5720.42*	0.65	5721.07	1
10	10	37.40	24 c	33.7	5717.31	5717.95	1.897	5721.07*	5721.99*	1.10	5723.09	9
11	11	39.93	30 c	69.5	5716.10	5716.80	1.007	5720.68*	5721.34*	0.21	5721.55	1
12	12	39.92	30 c	103.6	5717.00	5718.04	1.004	5721.55*	5722.53*	0.41	5722.94	11
13	13	11.52	18 c	25.1	5719.54	5719.79	0.995	5723.31*	5723.61*	0.33	5723.94	12
14	14	28.40	30 c	112.8	5718.04	5719.17	1.002	5723.45*	5723.99*	0.16	5724.15	12
15	15	19.45	24 c	135.3	5719.68	5721.19	1.116	5724.15*	5725.15*	0.89	5726.04	14
16	16	16.30	18 c	36.2	5722.62	5723.05	1.186	5725.87*	5726.75*	0.66	5727.41	6
17	17	34.70	30 c	8.3	5717.21	5717.34	1.568	5721.91*	5721.97*	0.78	5722.75	9
18	18	9.97	18 c	31.4	5721.69	5722.10	1.308	5726.14*	5726.42*	0.49	5726.92	15
19	19	8.95	18 c	16.0	5720.18	5720.34	0.998	5724.27*	5724.38*	0.12	5724.50	14
20	20	34.17	30 c	51.0	5733.47	5733.88	0.803	5736.50*	5736.85*	0.23	5737.08	End
21	21	17.87	24 c	32.0	5734.38	5734.64	0.813	5737.33*	5737.53*	0.15	5737.68	20
22	22	17.87	24 c	155.0	5734.74	5737.53	1.800	5737.68	5739.03	n/a	5739.03 j	21
23	23	11.17	18 c	8.0	5734.88	5734.96	1.001	5737.21*	5737.30*	0.19	5737.49	20

Lorson East 2 FDR- 100yr	Number of lines: 23	Run Date: 06-15-2018

NOTES: c = cir; e = ellip; b = box; Return period = 100 Yrs. ; *Surcharged (HGL above crown). ; j - Line contains hyd. jump.

APPENDIX F –INTERIM POND CALCULATIONS

Provide Pond EX-3 calculations.
Provide headwater/capacity modeling calculations for DP3.



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

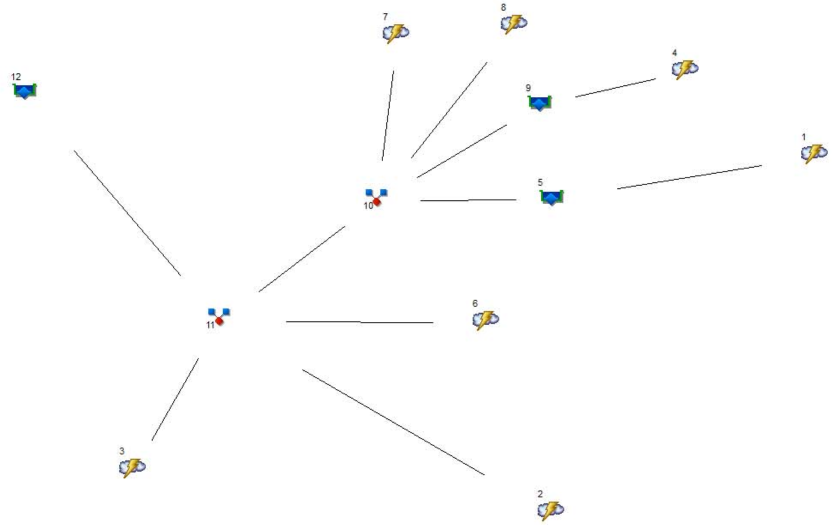
PREPARED FOR:
LORSON LLC
212 NORTH WAHSATCH AVE, SUITE 301
COLORADO SPRINGS, COLORADO 80903 (719) 635-3200
CONTACT: JEFF MARK

PROJECT:
LORSON RANCH EAST
EAST OF THE EAST TRIBUTARY
EL PASO COUNTY, COLORADO

DRAWN: RLS
DESIGNED: RLS
CHECKED: RLS

INTERIM HYDROLOGICAL CONDITIONS LORSON RANCH EAST FILING NO. 2 BASIN "C"

DATE: JUNE 22 2018
PROJECT NO. 100.044
SHEET NUMBER 1
TOTAL SHEETS: 1



Legend

Hyd.	Origin	Description
1	Rational	School to School Pond
2	Rational	Basin Ex-1&2
3	Rational	C17
4	Rational	Basins Ex-3
5	Reservoir	flow from school pond
6	Rational	School Site to Fontaine
7	Rational	Bason C16
8	Rational	Basin Ex3.1
9	Reservoir	Pond Ex-3
10	Combine	Des.Pt.6c to Pond C5
11	Combine	Inflow Pond C5
12	Reservoir	Pond C5 outflow

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	Rational	32.84	1	13	25,612	----	------	------	School to School Pond
2	Rational	99.20	1	30	178,560	----	------	------	Basin Ex-1&2
3	Rational	64.40	1	16	61,822	----	------	------	C17
4	Rational	43.19	1	30	77,741	----	------	------	Basins Ex-3
5	Reservoir	0.761	1	26	25,600	1	5738.44	24,803	flow from school pond
6	Rational	10.32	1	10	6,193	----	------	------	School Site to Lamprey
7	Rational	81.64	1	15	73,479	----	------	------	Bason C16
8	Rational	5.695	1	17	5,809	----	------	------	Basin Ex3.1
9	Reservoir	33.52	1	37	77,737	4	5752.67	20,652	Pond Ex-3
10	Combine	97.48	1	15	182,625	5, 7, 8, 9	------	------	Des.Pt.6c to Pond C5
11	Combine	214.73	1	16	429,201	2, 3, 6, 10	------	------	Inflow Pond C5
12	Reservoir	114.95	1	36	331,553	11	5713.52	573,261	Pond C5 outflow

5yr ponds C5 interim.100.044.gpw	Return Period: 5 Year	Friday, Jun 15 2018, 5:42 AM

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	Rational	73.06	1	13	56,987	----	------	------	School to School Pond
2	Rational	291.20	1	30	524,160	----	------	------	Basin Ex-1&2
3	Rational	108.00	1	16	103,681	----	------	------	C17
4	Rational	193.36	1	30	348,042	----	------	------	Basins Ex-3
5	Reservoir	29.12	1	21	56,974	1	5739.91	43,203	flow from school pond
6	Rational	37.52	1	10	22,512	----	------	------	School Site to Fontaine
7	Rational	136.93	1	15	123,234	----	------	------	Bason C16
8	Rational	30.40	1	15	27,361	----	------	------	Basin Ex3.1
9	Reservoir	66.95	1	50	348,038	4	5758.21	186,380	Pond Ex-3
10	Combine	218.92	1	15	555,606	5, 7, 8, 9	------	------	Des.Pt.6c to Pond C5
11	Combine	496.47	1	16	1,205,963	2, 3, 6, 10	------	------	Inflow Pond C5
12	Reservoir	374.29	1	30	1,108,314	11	5714.48	699,059	Pond C5 outflow

100yr ponds C5 interim.100.044.gpw	Return Period: 100 Year	Friday, Jun 15 2018, 5:39 AM

Pond Report

Hydraflow Hydrographs by Intelisolve | Friday, Jun 15 2018, 5:40 AM

Pond No. 5 - Pond C5

Pond Data

Pond storage is based on known contour areas. Average end area method used.

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	5707.00	1,000	0	0
1.00	5708.00	18,898	9,949	9,949
2.00	5709.00	77,432	48,165	58,114
3.00	5710.00	110,270	93,851	151,965
4.00	5711.00	115,455	112,863	264,828
5.00	5712.00	120,720	118,088	382,915
6.00	5713.00	126,045	123,383	506,298
7.00	5714.00	131,696	128,871	635,168
8.00	5715.00	136,745	134,221	769,389
9.00	5716.00	141,857	139,301	908,690

Culvert / Orifice Structures

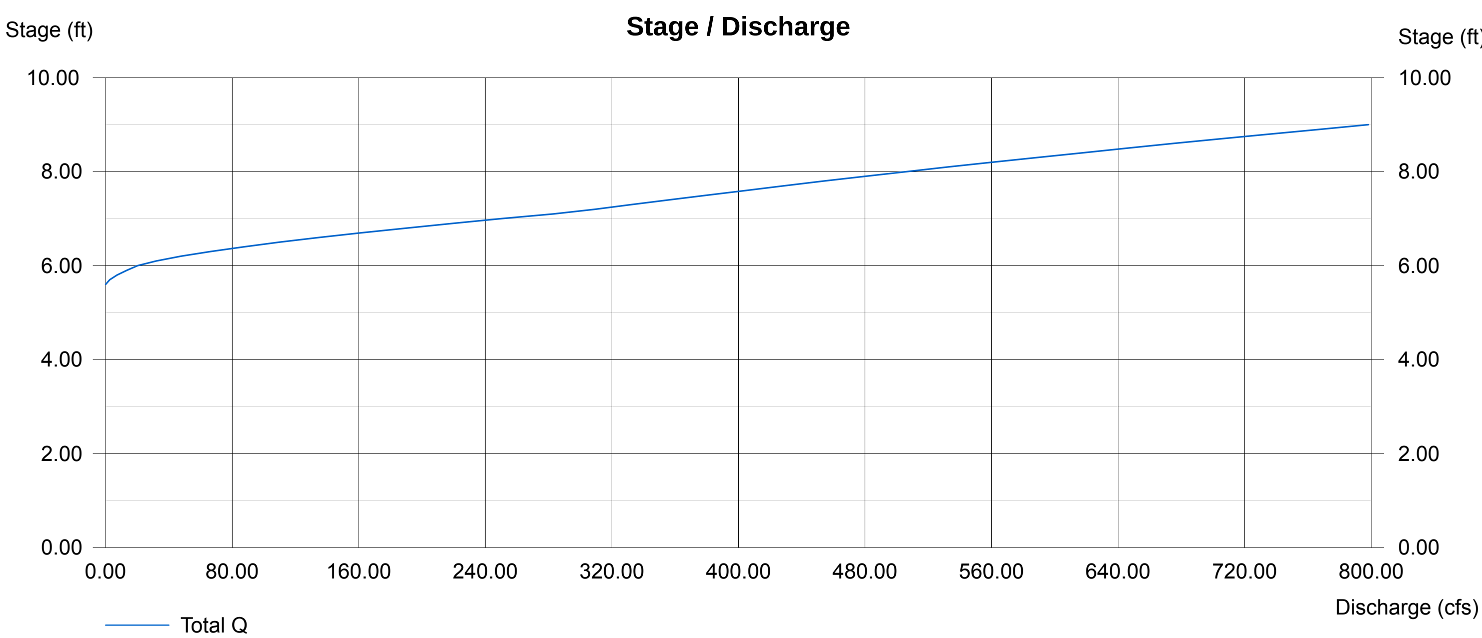
	[A]	[B]	[C]	[D]
Rise (in)	= 48.00	0.00	0.00	0.00
Span (in)	= 48.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 5704.50	0.00	0.00	0.00
Length (ft)	= 120.00	0.00	0.00	0.00
Slope (%)	= 0.50	0.00	0.00	0.00
N-Value	= .013	.013	.000	.000
Orif. Coeff.	= 0.60	0.60	0.00	0.00
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 24.00	35.45	0.00	0.00
Crest El. (ft)	= 5712.60	5713.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	0.00	0.00
Weir Type	= Riser	Ciplti	---	---
Multi-Stage	= Yes	No	No	No

Exfiltration = 0.000 in/hr (Contour) Tailwater Elev. = 0.00 ft

Note: Culvert/Orifice outflows have been analyzed under inlet and outlet control.



Pond Report

Hydraflow Hydrographs by Intelisolve | Friday, Jun 15 2018, 5:39 AM

Pond No. 1 - School Pond

Pond Data

Pond storage is based on known contour areas. Average end area method used.

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	5735.00	00	0	0
1.00	5736.00	6,000	3,000	3,000
2.00	5737.00	8,561	7,281	10,281
3.00	5738.00	10,390	9,476	19,756
4.00	5739.00	12,319	11,355	31,111
5.00	5740.00	14,348	13,334	44,444
6.00	5741.00	16,478	15,413	59,857
7.00	5742.00	18,708	17,593	77,450

Culvert / Orifice Structures

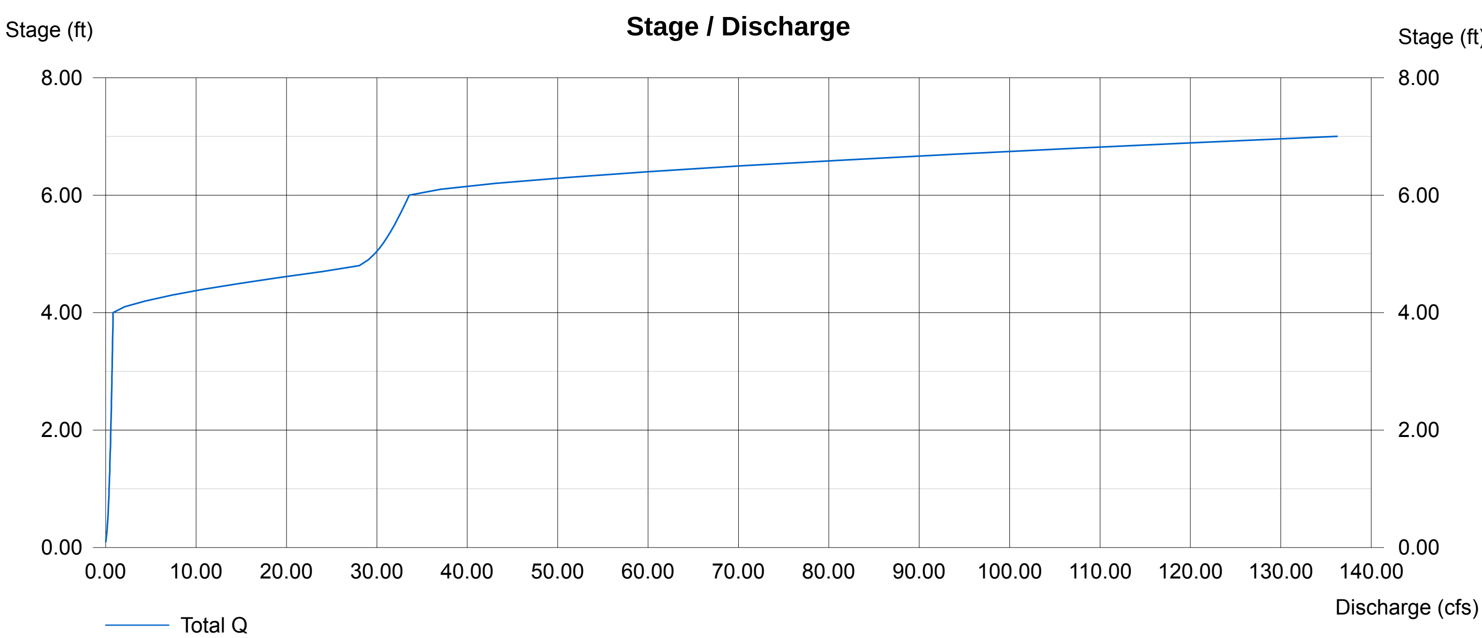
		[A]	[B]	[C]	[D]
Rise (in)	=	24.00	4.00	0.00	0.00
Span (in)	=	24.00	4.00	0.00	0.00
No. Barrels	=	1	1	0	0
Invert El. (ft)	=	5734.50	5735.00	0.00	0.00
Length (ft)	=	150.00	0.00	0.00	0.00
Slope (%)	=	1.00	0.00	0.00	0.00
N-Value	=	.013	.013	.000	.000
Orif. Coeff.	=	0.60	0.60	0.00	0.00
Multi-Stage	=	n/a	Yes	No	No

Weir Structures

		[A]	[B]	[C]	[D]
Crest Len (ft)	=	12.00	30.00	0.00	0.00
Crest El. (ft)	=	5739.00	5741.00	0.00	0.00
Weir Coeff.	=	3.33	3.33	0.00	0.00
Weir Type	=	Ciplti	Ciplti	---	---
Multi-Stage	=	Yes	No	No	No

Exfiltration = 0.000 in/hr (Contour) Tailwater Elev. = 0.00 ft

Note: Culvert/Orifice outflows have been analyzed under inlet and outlet control.



Pond Report

Hydraflow Hydrographs by Intelisolve — Friday, Jun 15 2018, 5:39 AM

Pond No. 2 - Basin Ex-3 Pond

Pond Data

Pond storage is based on known contour areas. Average end area method used.

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	5749.00	00	0	0
1.00	5750.00	4,868	2,434	2,434
2.00	5751.00	6,223	5,546	7,980
3.00	5752.00	7,718	6,971	14,950
4.00	5753.00	9,353	8,536	23,486
5.00	5754.00	11,129	10,241	33,727
6.00	5755.00	13,049	12,089	45,816
7.00	5756.00	21,184	17,117	62,932
8.00	5757.00	61,171	41,178	104,110
9.00	5758.00	72,114	66,643	170,752
10.00	5759.00	74,861	73,488	244,240

Culvert / Orifice Structures

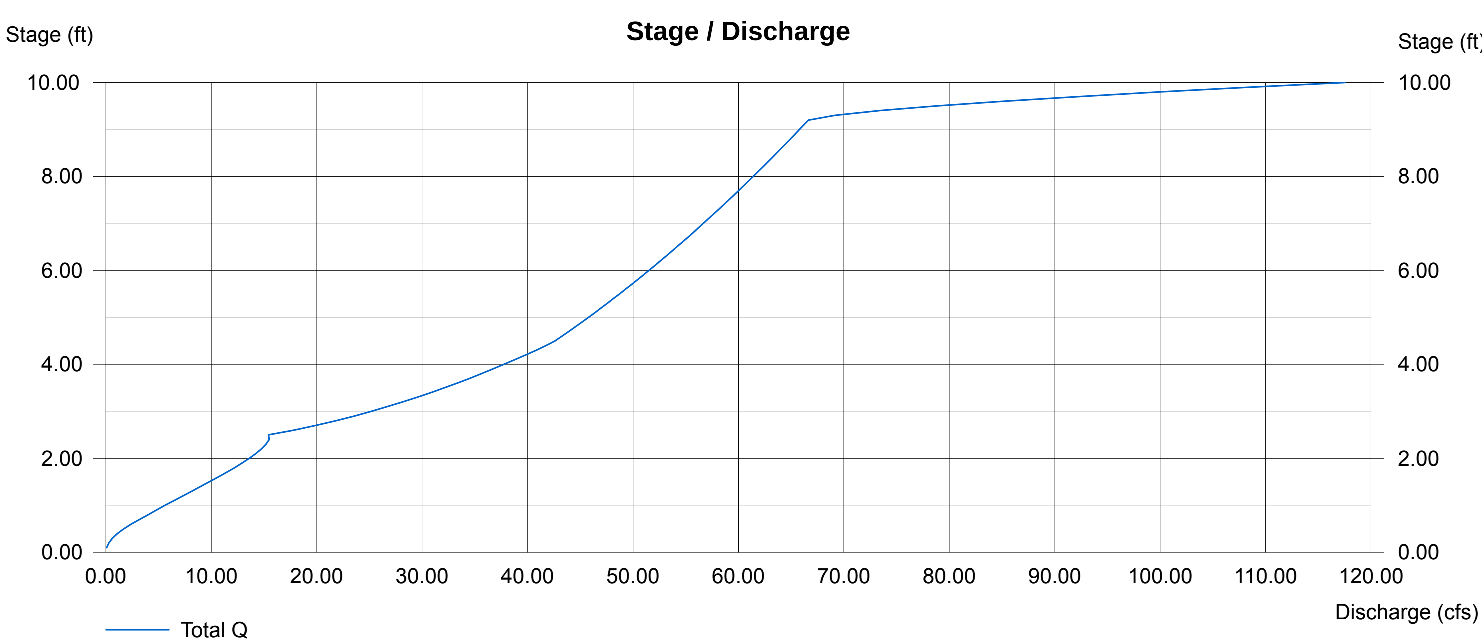
	[A]	[B]	[C]	[D]
Rise (in)	= 30.00	0.00	0.00	0.00
Span (in)	= 30.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 5749.00	0.00	0.00	0.00
Length (ft)	= 50.00	0.00	0.00	0.00
Slope (%)	= 0.60	0.00	0.00	0.00
N-Value	= .013	.000	.000	.000
Orif. Coeff.	= 0.60	0.00	0.00	0.00
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 20.00	0.00	0.00	0.00
Crest El. (ft)	= 5758.20	0.00	0.00	0.00
Weir Coeff.	= 3.33	0.00	0.00	0.00
Weir Type	= Ciplti	---	---	---
Multi-Stage	= No	No	No	No

Exfiltration = 0.000 in/hr (Contour) Tailwater Elev. = 0.00 ft

Note: Culvert/Orifice outflows have been analyzed under inlet and outlet control.



Hydrograph Plot

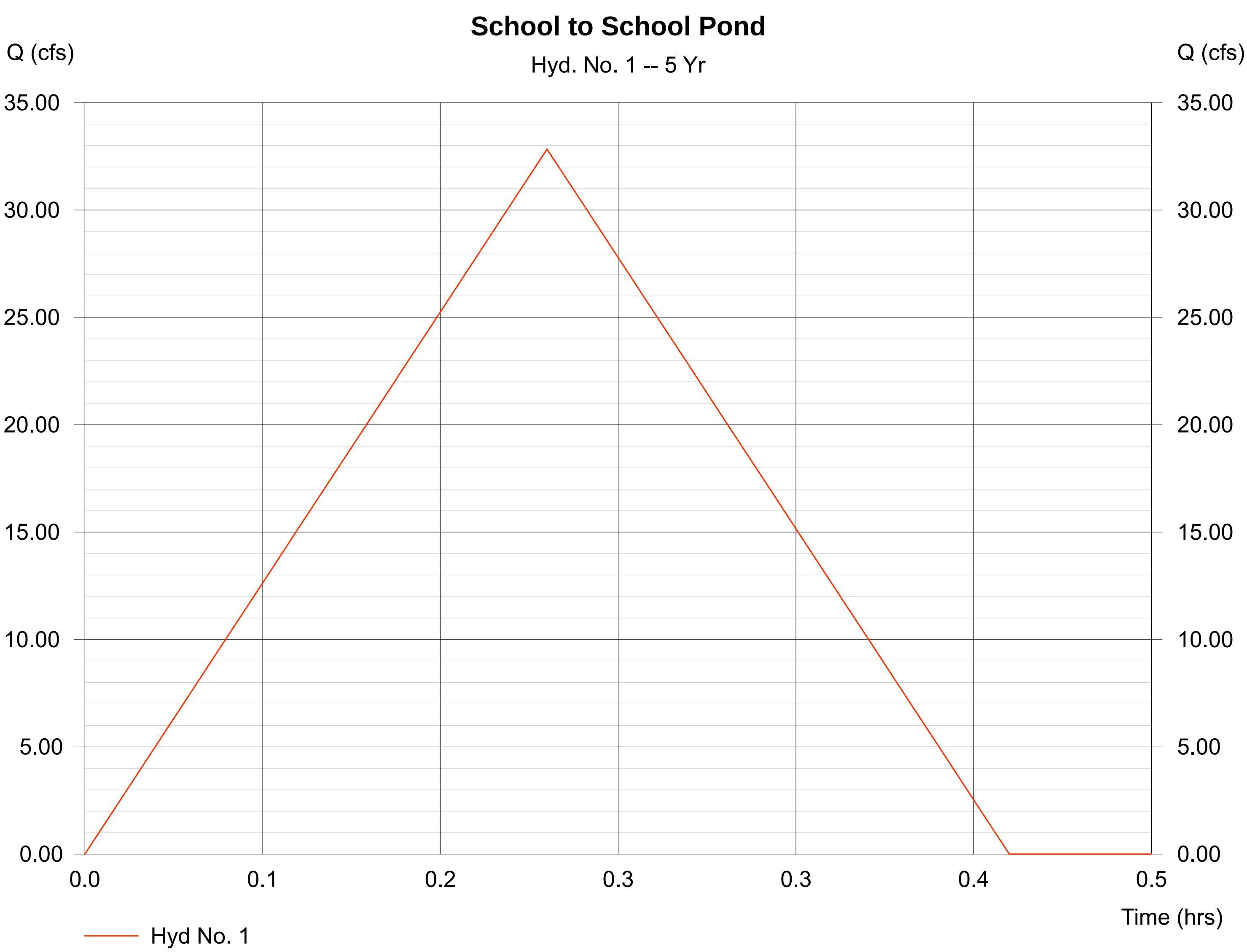
Hydraflow Hydrographs by Intelisolve — Friday, Jun 15 2018, 5:42 AM

Hyd. No. 1

School to School Pond

Hydrograph type	= Rational	Peak discharge	= 32.84 cfs
Storm frequency	= 5 yrs	Time interval	= 1 min
Drainage area	= 17.200 ac	Runoff coeff.	= 0.49
Intensity	= 3.896 in/hr	Tc by User	= 13.00 min
IDF Curve	= El Paso County-Table.IDF	Asc/Rec limb fact	= 1/1

Hydrograph Volume = 25,612 cuft



Hydrograph Plot

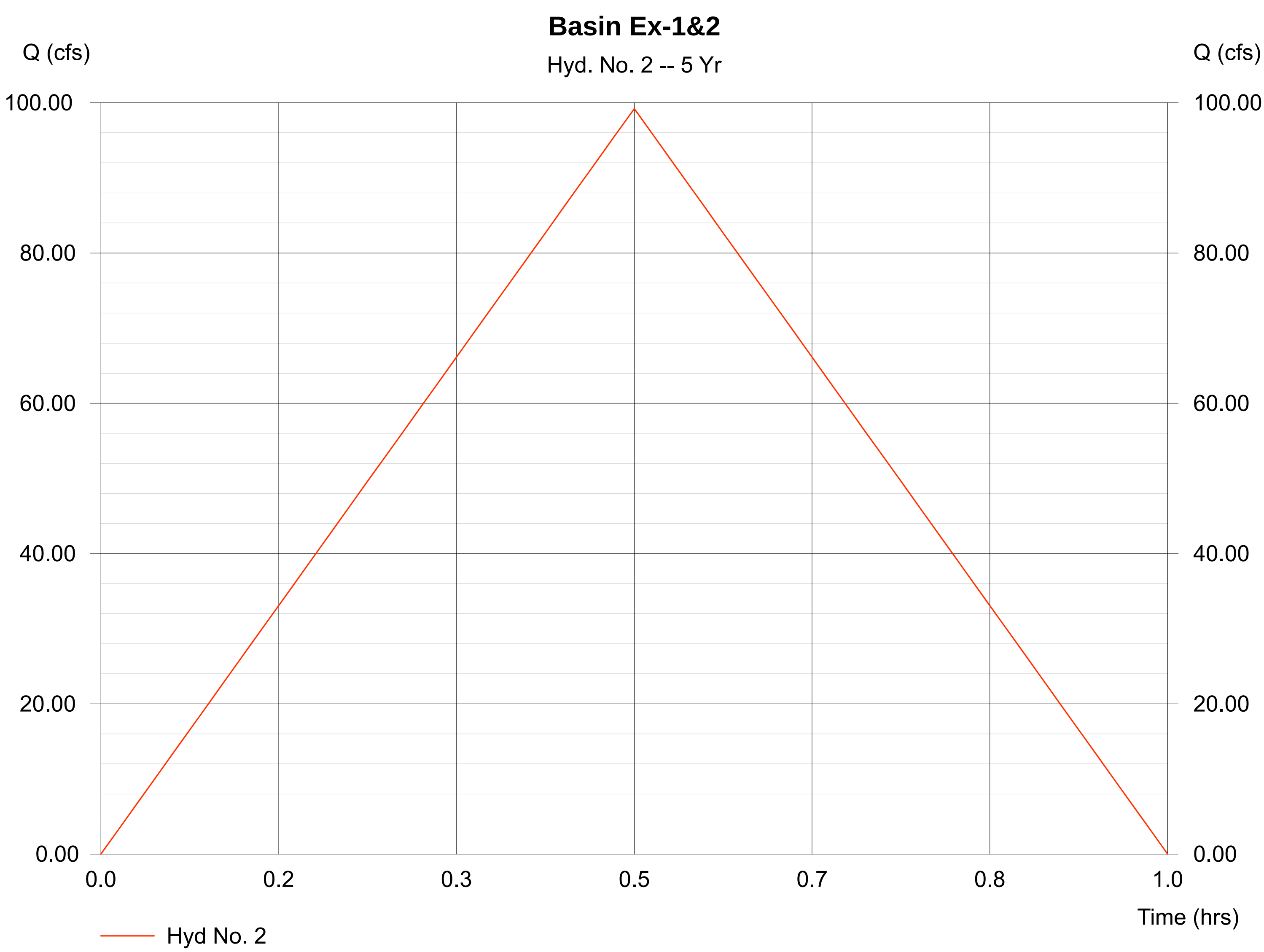
Hydraflow Hydrographs by Intelisolve Friday, Jun 15 2018, 5:42 AM

Hyd. No. 2

Basin Ex-1&2

Hydrograph type	= Rational	Peak discharge	= 99.20 cfs
Storm frequency	= 5 yrs	Time interval	= 1 min
Drainage area	= 200.000 ac	Runoff coeff.	= 0.2
Intensity	= 2.480 in/hr	Tc by User	= 30.00 min
IDF Curve	= El Paso County-Table.IDF	Asc/Rec limb fact	= 1/1

Hydrograph Volume = 178,560 cuft



Hydrograph Plot

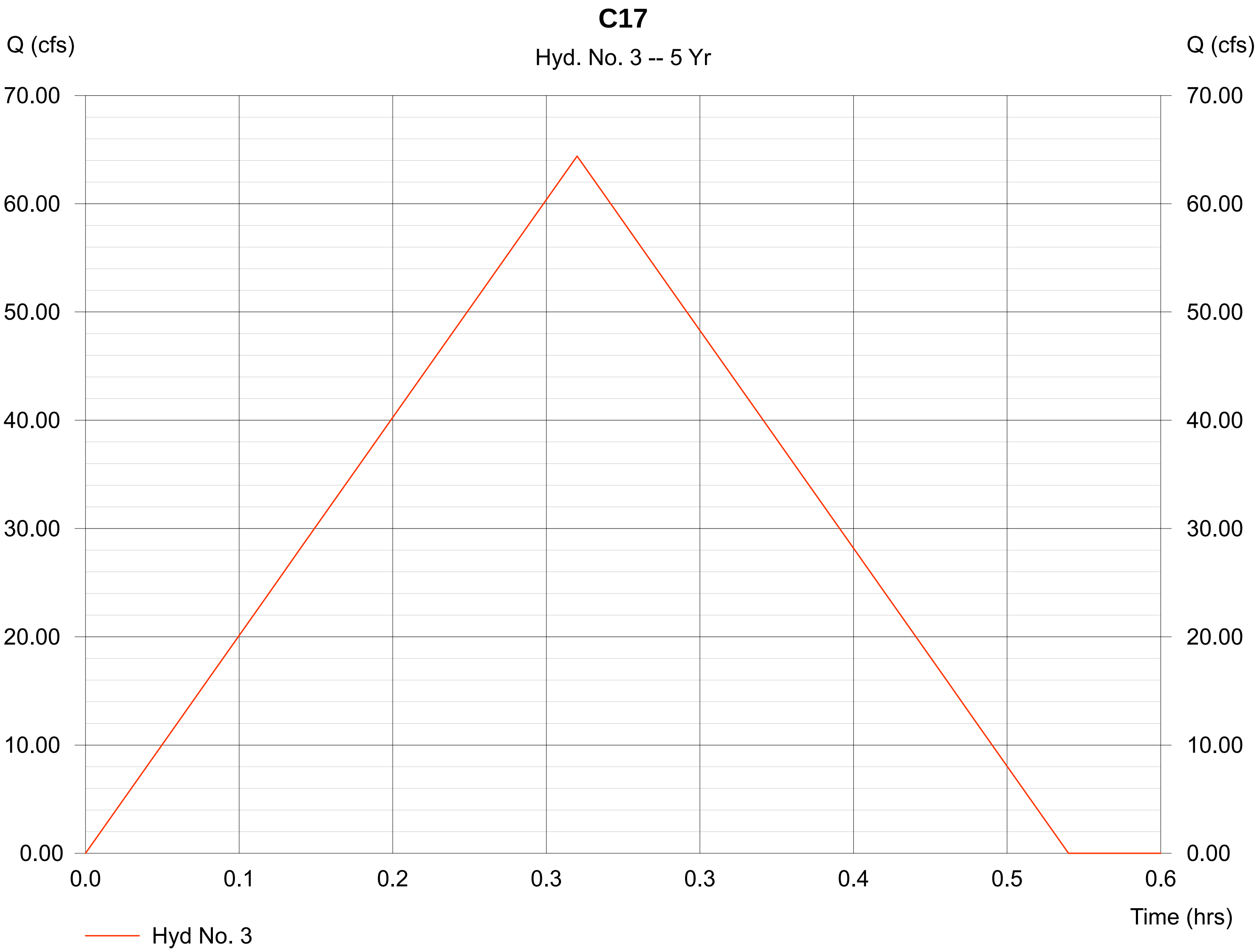
Hydraflow Hydrographs by Intelisolve | Friday, Jun 15 2018, 5:42 AM

Hyd. No. 3

C17

Hydrograph type	=	Rational	Peak discharge	=	64.40 cfs
Storm frequency	=	5 yrs	Time interval	=	1 min
Drainage area	=	30.200 ac	Runoff coeff.	=	0.6
Intensity	=	3.554 in/hr	Tc by User	=	16.00 min
IDF Curve	=	El Paso County-Table.IDF	Asc/Rec limb fact	=	1/1

Hydrograph Volume = 61,822 cuft



Hydrograph Plot

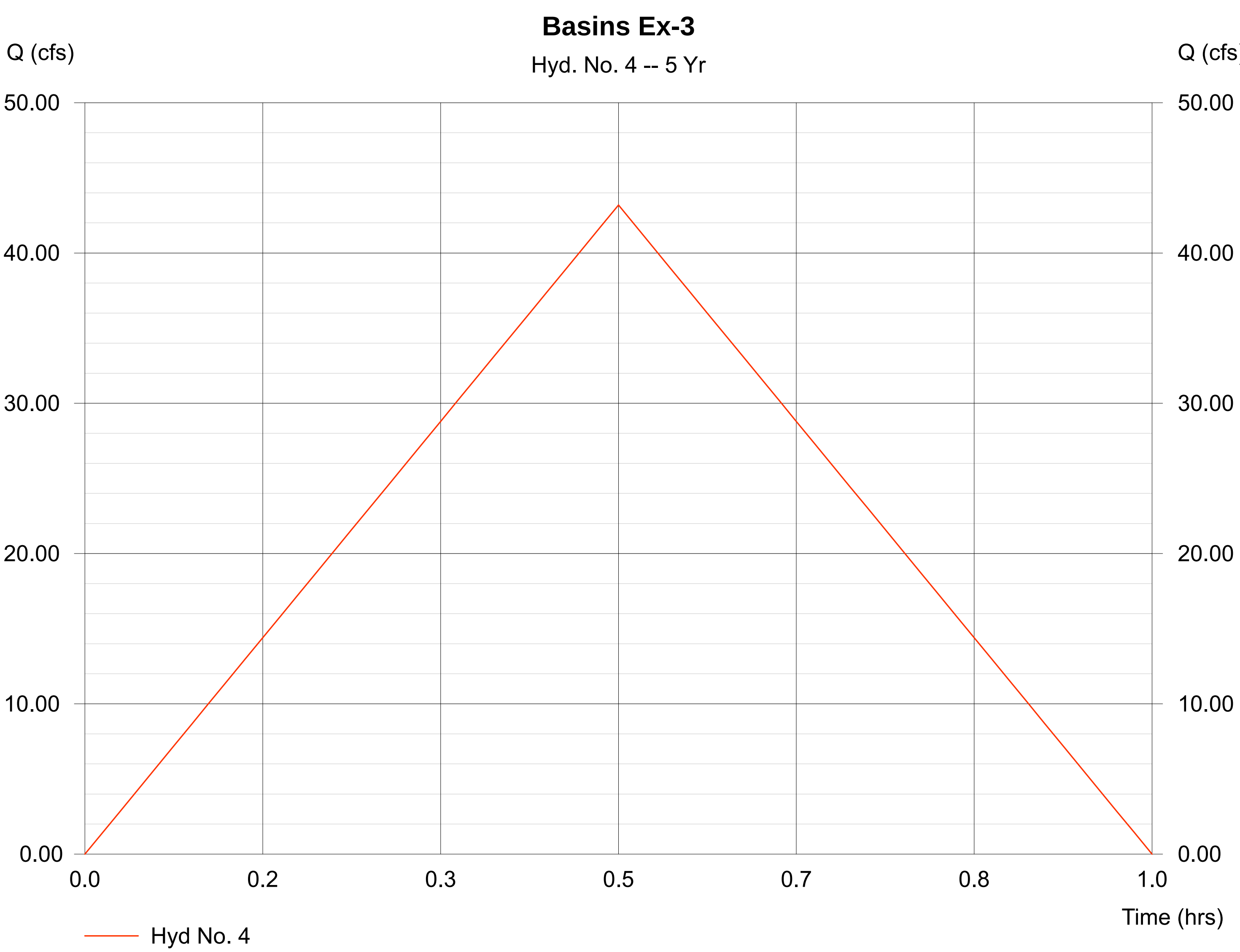
Hydraflow Hydrographs by Intelisolve — Friday, Jun 15 2018, 5:42 AM

Hyd. No. 4

Basins Ex-3

Hydrograph type	= Rational	Peak discharge	= 43.19 cfs
Storm frequency	= 5 yrs	Time interval	= 1 min
Drainage area	= 116.100 ac	Runoff coeff.	= 0.15
Intensity	= 2.480 in/hr	Tc by User	= 30.00 min
IDF Curve	= El Paso County-Table.IDF	Asc/Rec limb fact	= 1/1

Hydrograph Volume = 77,741 cuft



Hydrograph Plot

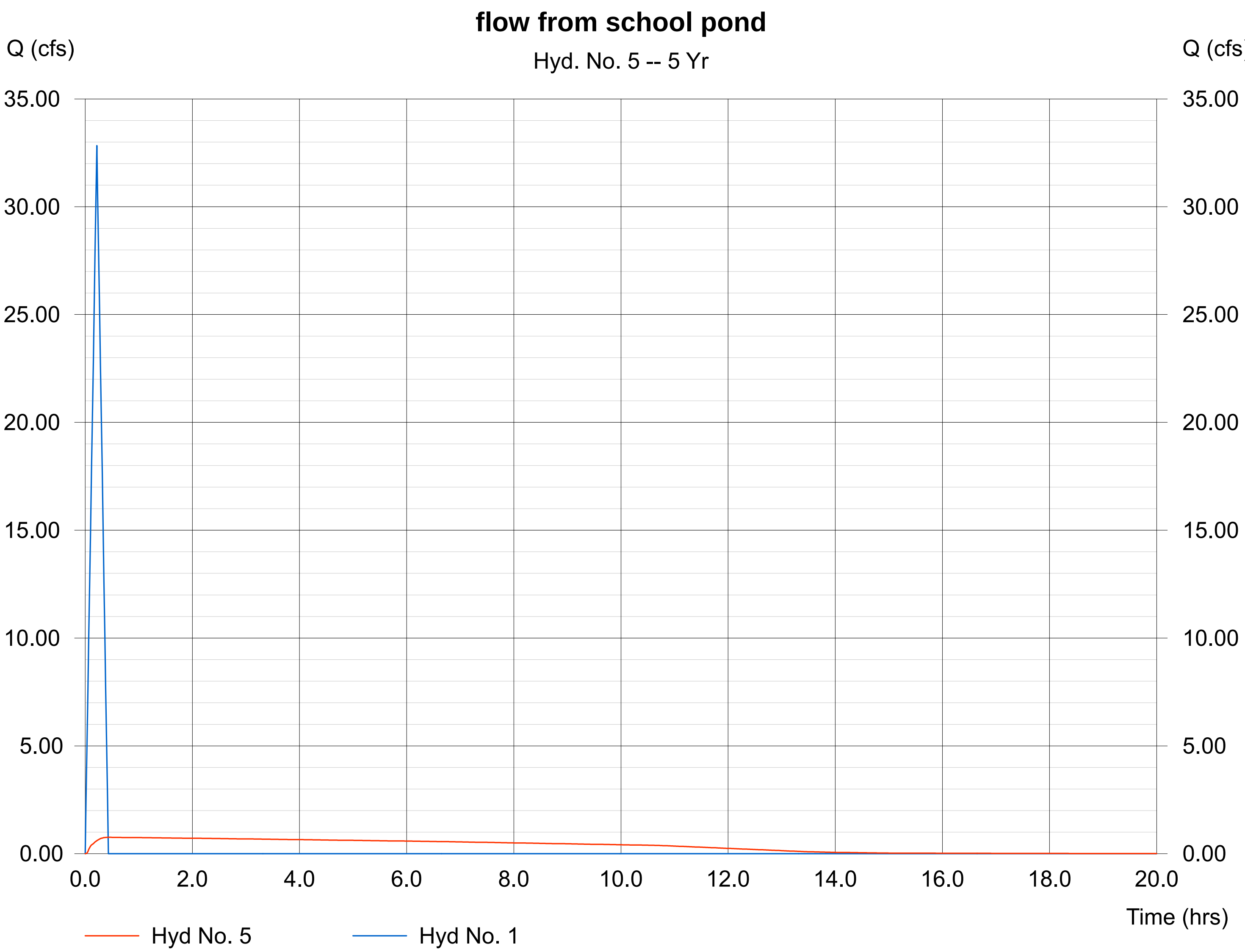
Hydraflow Hydrographs by Intelisolve — Friday, Jun 15 2018, 5:42 AM

Hyd. No. 5

flow from school pond

Hydrograph type	= Reservoir	Peak discharge	= 0.761 cfs
Storm frequency	= 5 yrs	Time interval	= 1 min
Inflow hyd. No.	= 1	Max. Elevation	= 5738.44 ft
Reservoir name	= School Pond	Max. Storage	= 24,803 cuft

Storage Indication method used. — Hydrograph Volume = 25,600 cuft



Hydrograph Plot

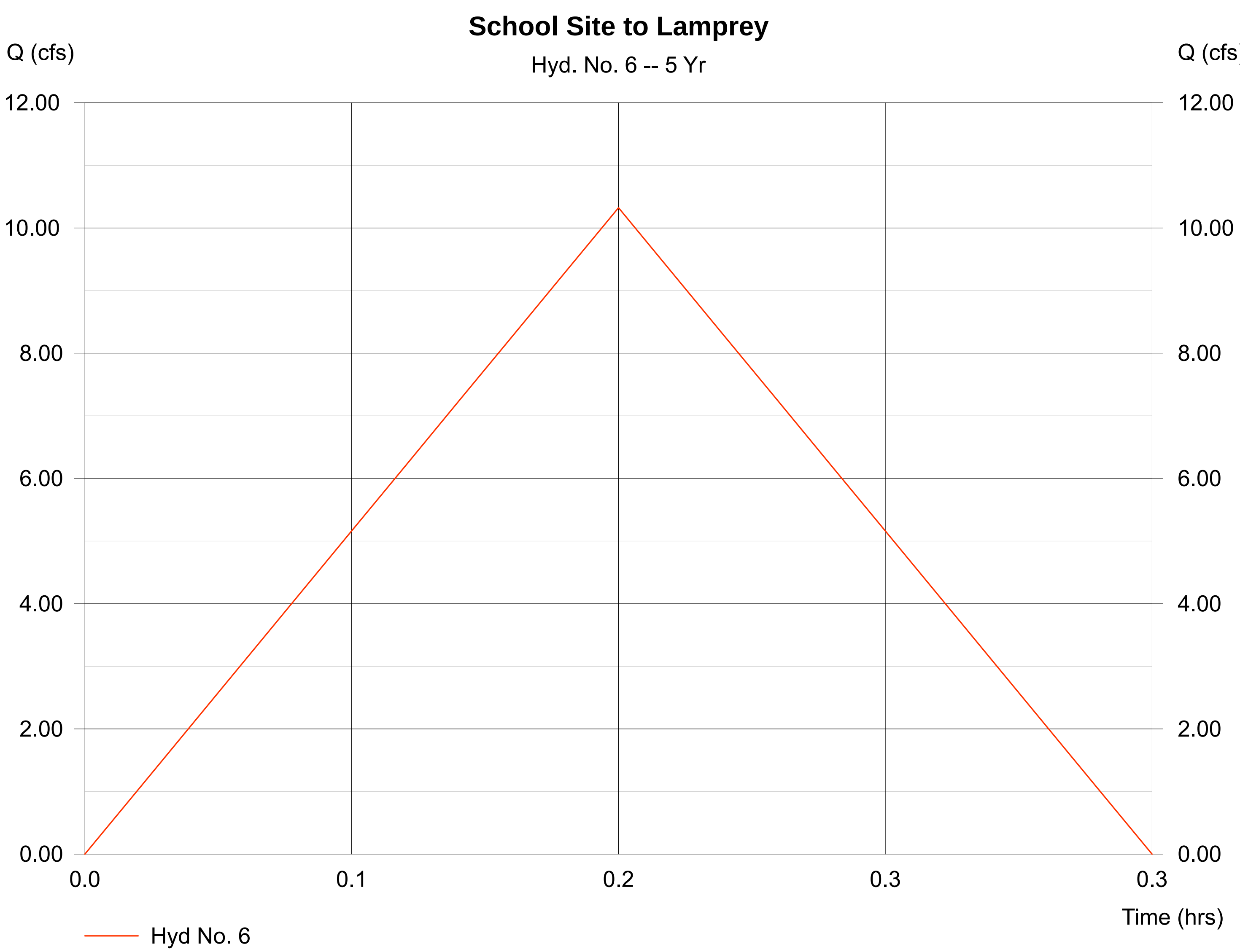
Hydraflow Hydrographs by Intelisolve — Friday, Jun 15 2018, 5:42 AM

Hyd. No. 6

School Site to Lamprey

Hydrograph type	= Rational	Peak discharge	= 10.32 cfs
Storm frequency	= 5 yrs	Time interval	= 1 min
Drainage area	= 8.000 ac	Runoff coeff.	= 0.3
Intensity	= 4.301 in/hr	Tc by User	= 10.00 min
IDF Curve	= El Paso County-Table.IDF	Asc/Rec limb fact	= 1/1

Hydrograph Volume = 6,193 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

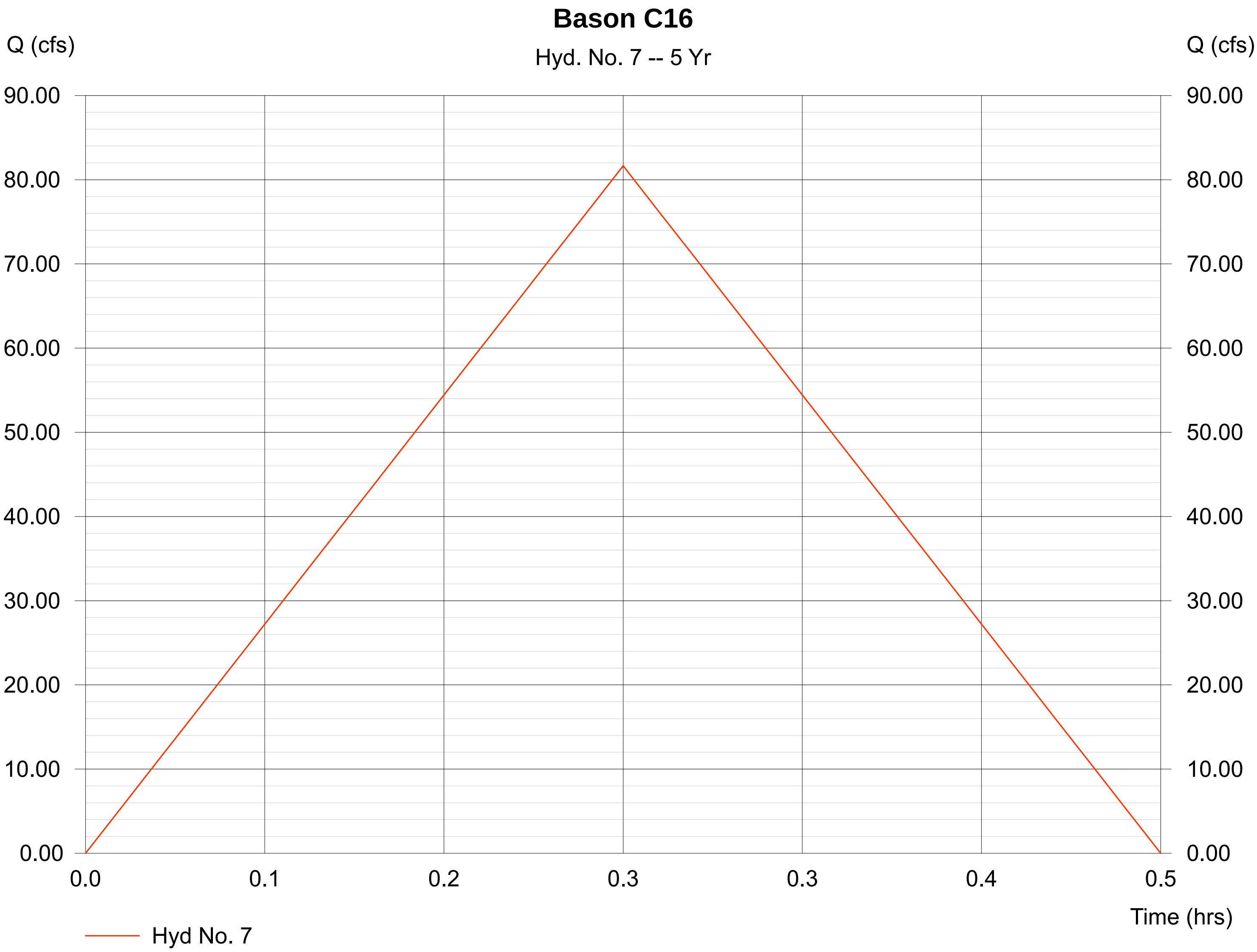
Friday, Jun 15 2018, 5:42 AM

Hyd. No. 7

Bason C16

Hydrograph type	=	Rational	Peak discharge	=	81.64 cfs
Storm frequency	=	5 yrs	Time interval	=	1 min
Drainage area	=	34.300 ac	Runoff coeff.	=	0.65
Intensity	=	3.662 in/hr	Tc by User	=	15.00 min
IDF Curve	=	El Paso County-Table.IDF	Asc/Rec limb fact	=	1/1

Hydrograph Volume = 73,479 cuft



Hydrograph Plot

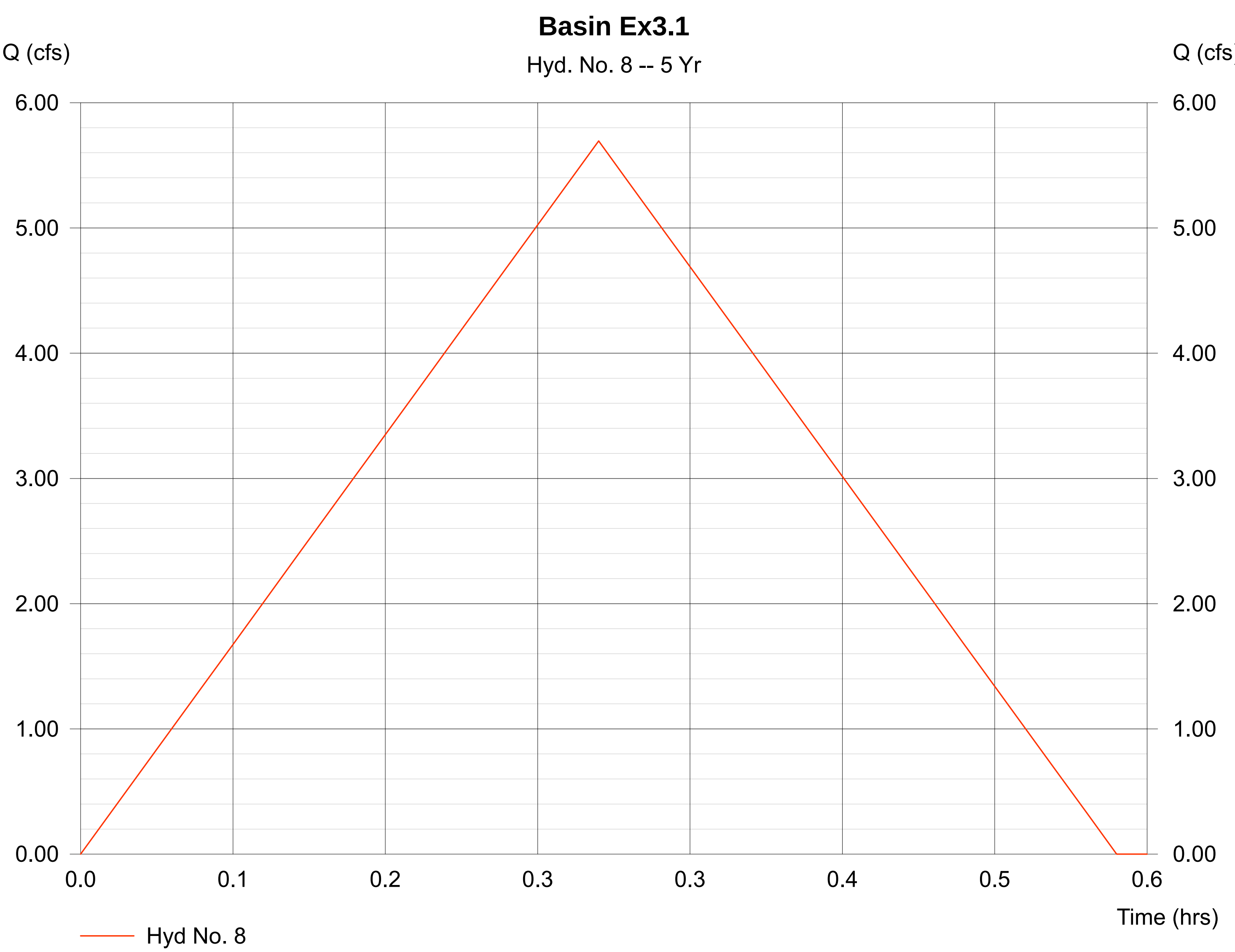
Hydraflow Hydrographs by Intelisolve | Friday, Jun 15 2018, 5:42 AM

Hyd. No. 8

Basin Ex3.1

Hydrograph type	= Rational	Peak discharge	= 5.695 cfs
Storm frequency	= 5 yrs	Time interval	= 1 min
Drainage area	= 11.000 ac	Runoff coeff.	= 0.15
Intensity	= 3.452 in/hr	Tc by User	= 17.00 min
IDF Curve	= El Paso County-Table.IDF	Asc/Rec limb fact	= 1/1

Hydrograph Volume = 5,809 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

Friday, Jun 15 2018, 5:42 AM

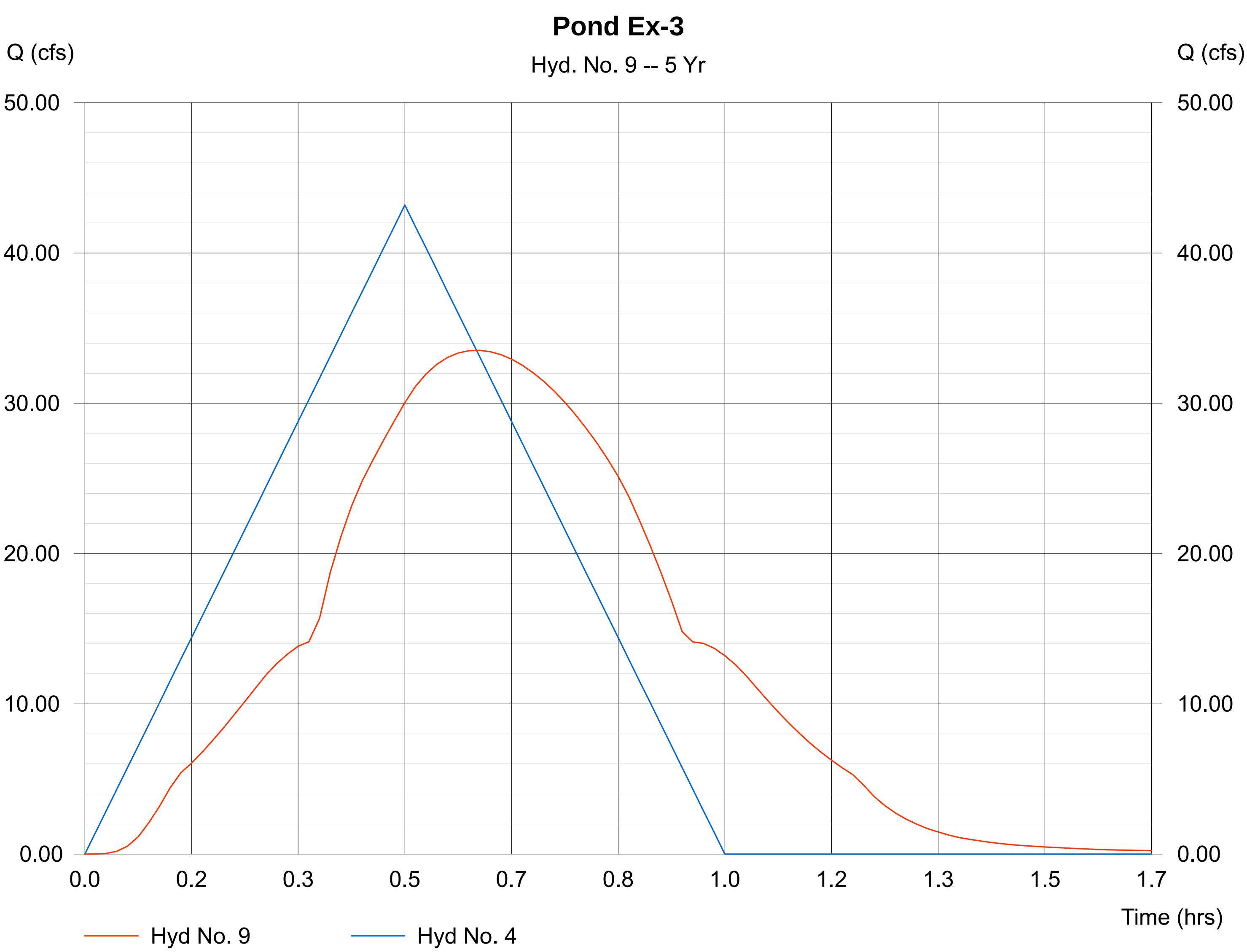
Hyd. No. 9

Pond Ex-3

Hydrograph type	= Reservoir	Peak discharge	= 33.52 cfs
Storm frequency	= 5 yrs	Time interval	= 1 min
Inflow hyd. No.	= 4	Max. Elevation	= 5752.67 ft
Reservoir name	= Basin Ex-3 Pond	Max. Storage	= 20,652 cuft

Storage Indication method used.

Hydrograph Volume = 77,737 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

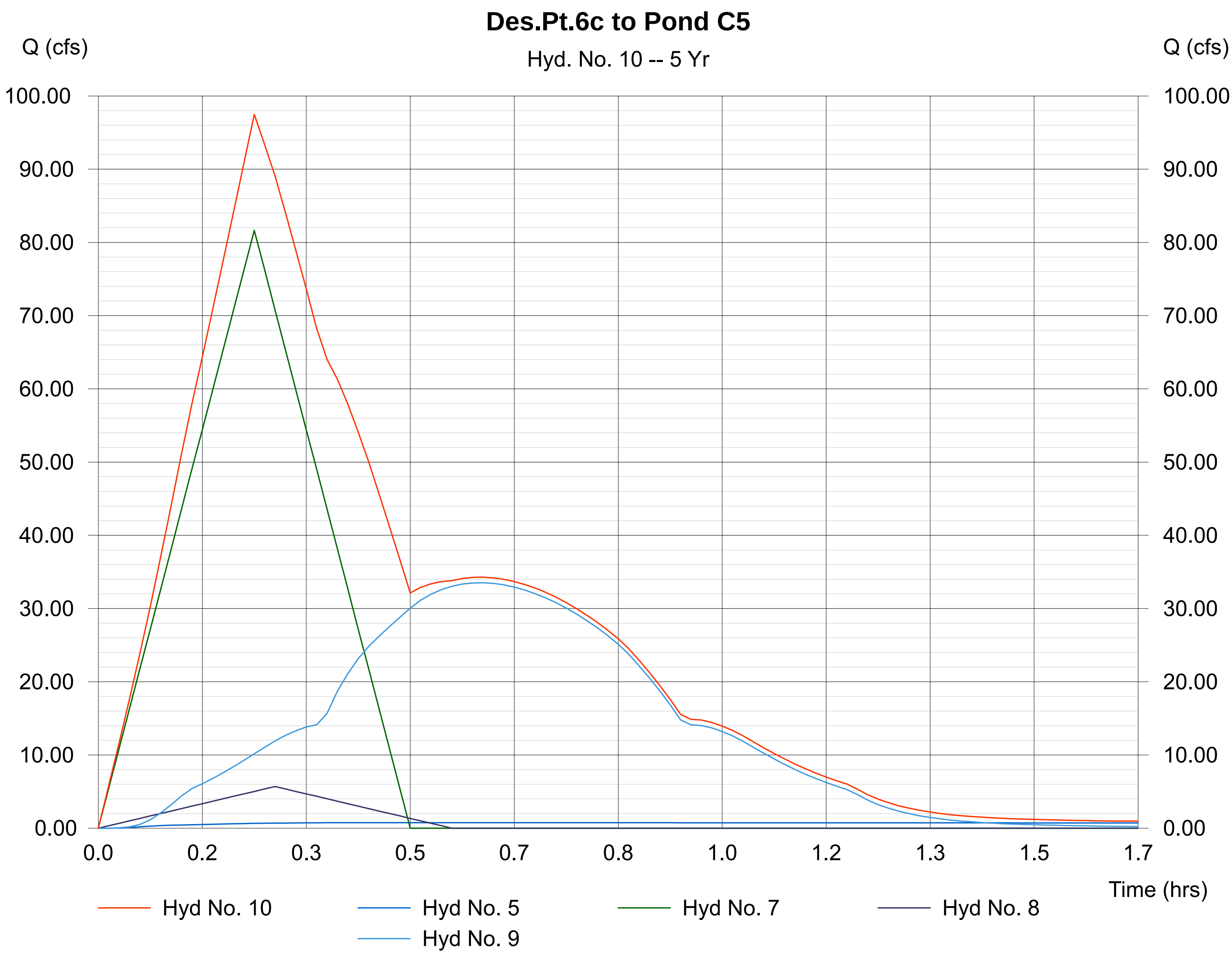
Friday, Jun 15 2018, 5:42 AM

Hyd. No. 10

Des.Pt.6c to Pond C5

Hydrograph type	= Combine	Peak discharge	= 97.48 cfs
Storm frequency	= 5 yrs	Time interval	= 1 min
Inflow hyds.	= 5, 7, 8, 9		

Hydrograph Volume = 182,625 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

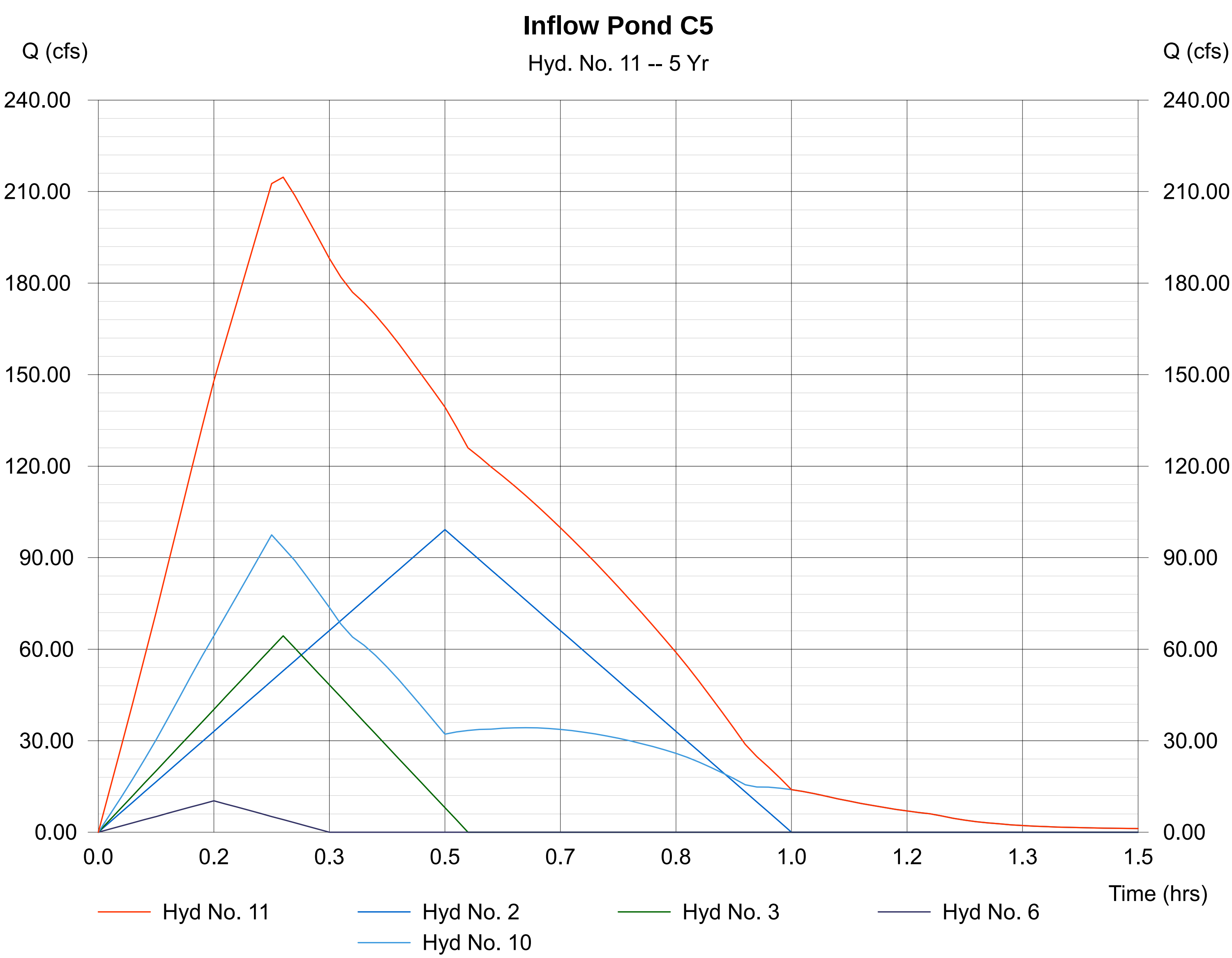
Friday, Jun 15 2018, 5:42 AM

Hyd. No. 11

Inflow Pond C5

Hydrograph type	= Combine	Peak discharge	= 214.73 cfs
Storm frequency	= 5 yrs	Time interval	= 1 min
Inflow hyds.	= 2, 3, 6, 10		

Hydrograph Volume = 429,201 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve — Friday, Jun 15 2018, 5:42 AM

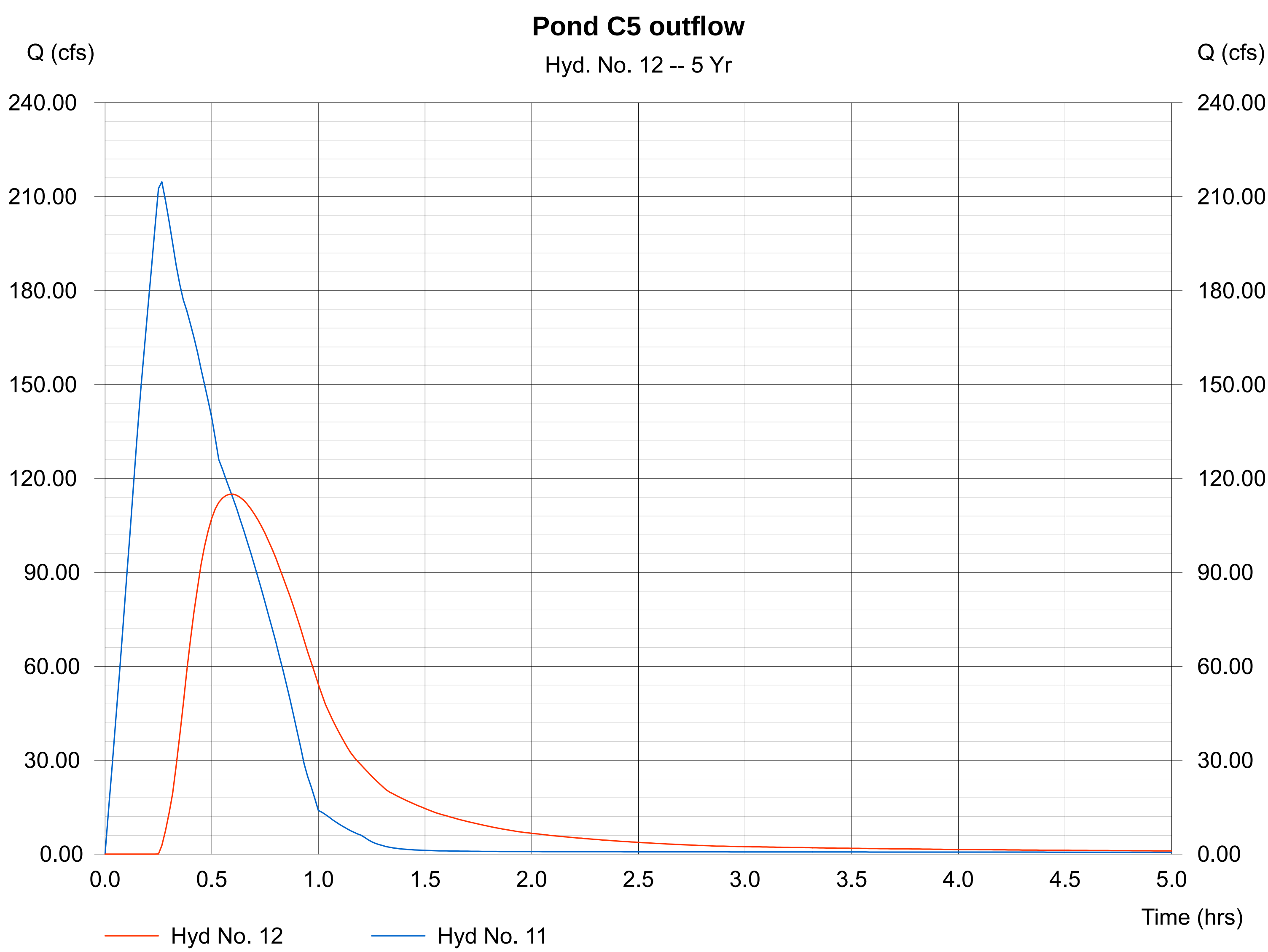
Hyd. No. 12

Pond C5 outflow

Hydrograph type	= Reservoir	Peak discharge	= 114.95 cfs
Storm frequency	= 5 yrs	Time interval	= 1 min
Inflow hyd. No.	= 11	Max. Elevation	= 5713.52 ft
Reservoir name	= Pond C5	Max. Storage	= 573,261 cuft

Storage Indication method used. Wet pond routing start elevation = 5711.80 ft.

Hydrograph Volume = 331,553 cuft



Hydrograph Plot

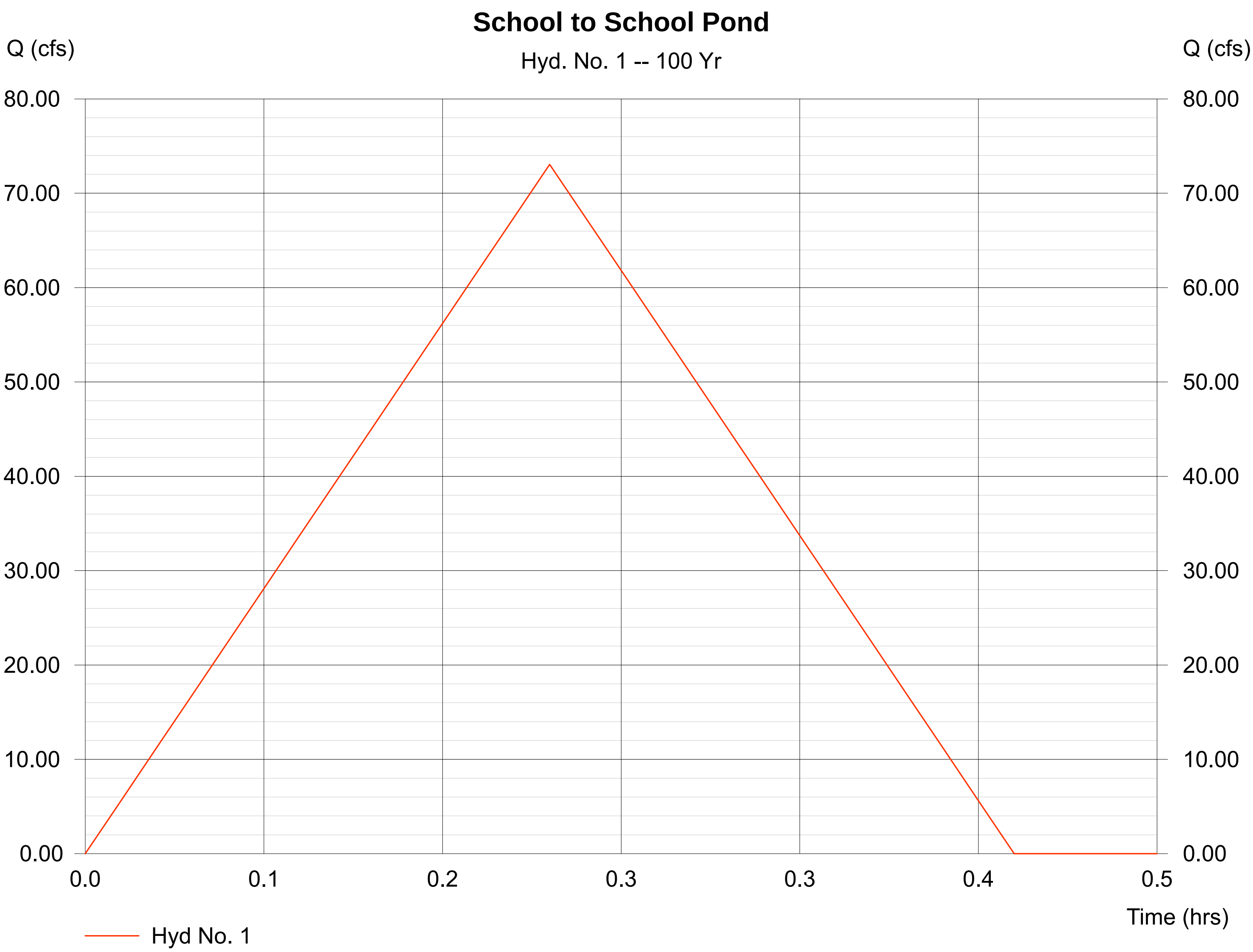
Hydraflow Hydrographs by Intelisolve — Friday, Jun 15 2018, 5:39 AM

Hyd. No. 1

School to School Pond

Hydrograph type	=	Rational	Peak discharge	=	73.06 cfs
Storm frequency	=	100 yrs	Time interval	=	1 min
Drainage area	=	17.200 ac	Runoff coeff.	=	0.65
Intensity	=	6.535 in/hr	Tc by User	=	13.00 min
IDF Curve	=	El Paso County-Table.IDF	Asc/Rec limb fact	=	1/1

Hydrograph Volume = 56,987 cuft



Hydrograph Plot

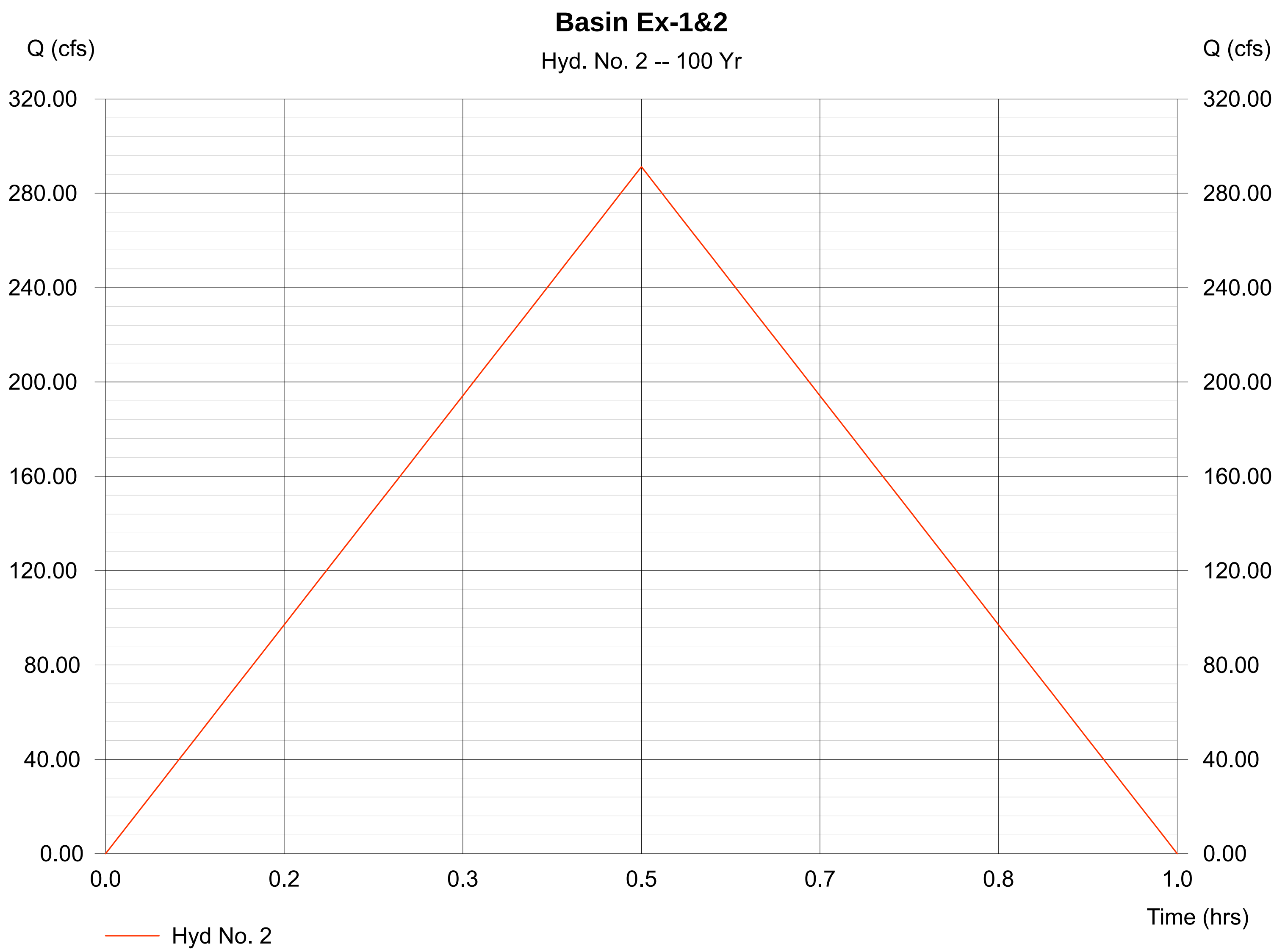
Hydraflow Hydrographs by Intelisolve — Friday, Jun 15 2018, 5:39 AM

Hyd. No. 2

Basin Ex-1&2

Hydrograph type	= Rational	Peak discharge	= 291.20 cfs
Storm frequency	= 100 yrs	Time interval	= 1 min
Drainage area	= 200.000 ac	Runoff coeff.	= 0.35
Intensity	= 4.160 in/hr	Tc by User	= 30.00 min
IDF Curve	= El Paso County-Table.IDF	Asc/Rec limb fact	= 1/1

Hydrograph Volume = 524,160 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

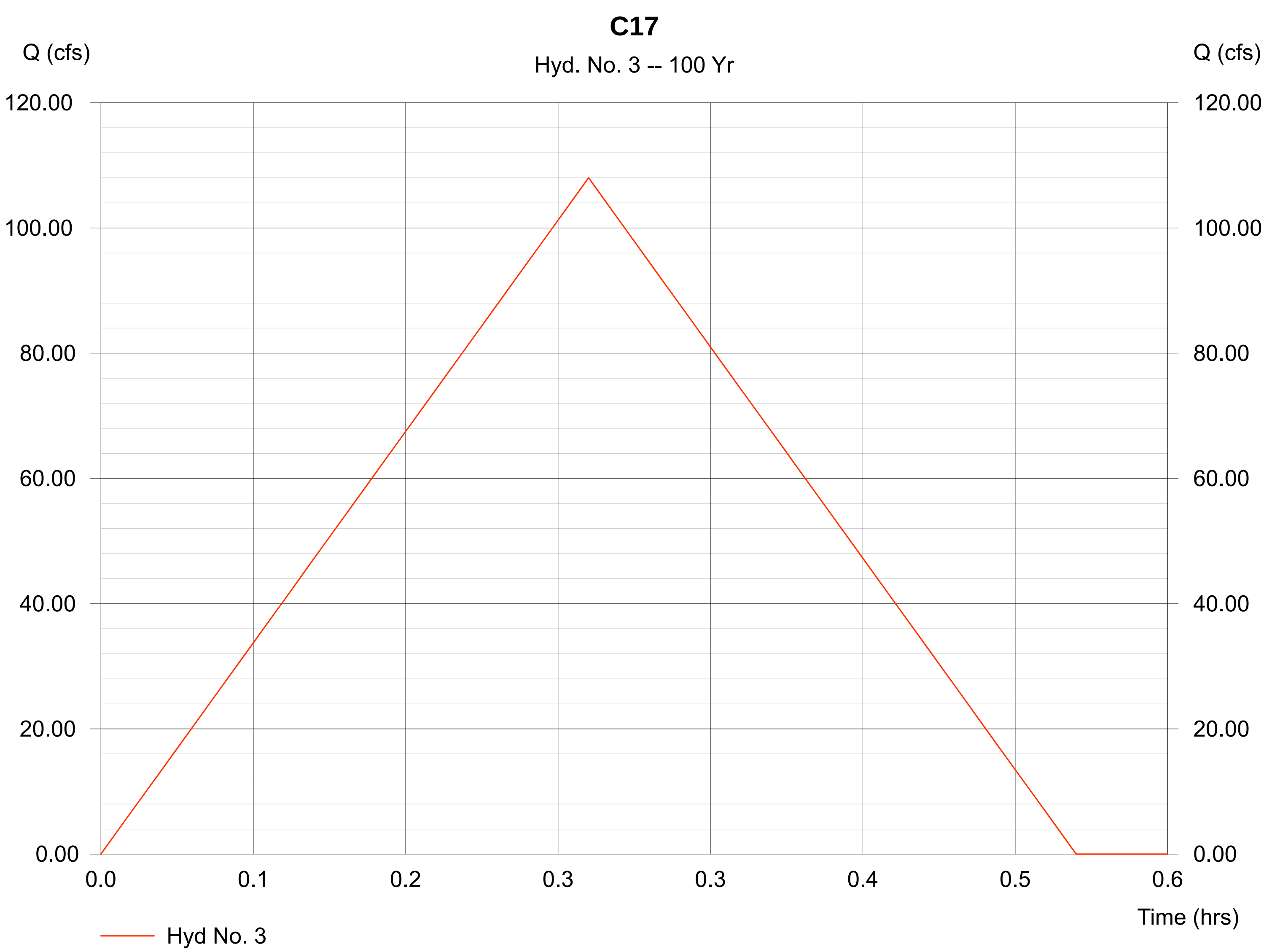
Friday, Jun 15 2018, 5:39 AM

Hyd. No. 3

C17

Hydrograph type	= Rational	Peak discharge	= 108.00 cfs
Storm frequency	= 100 yrs	Time interval	= 1 min
Drainage area	= 30.200 ac	Runoff coeff.	= 0.6
Intensity	= 5.960 in/hr	Tc by User	= 16.00 min
IDF Curve	= El Paso County-Table.IDF	Asc/Rec limb fact	= 1/1

Hydrograph Volume = 103,681 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

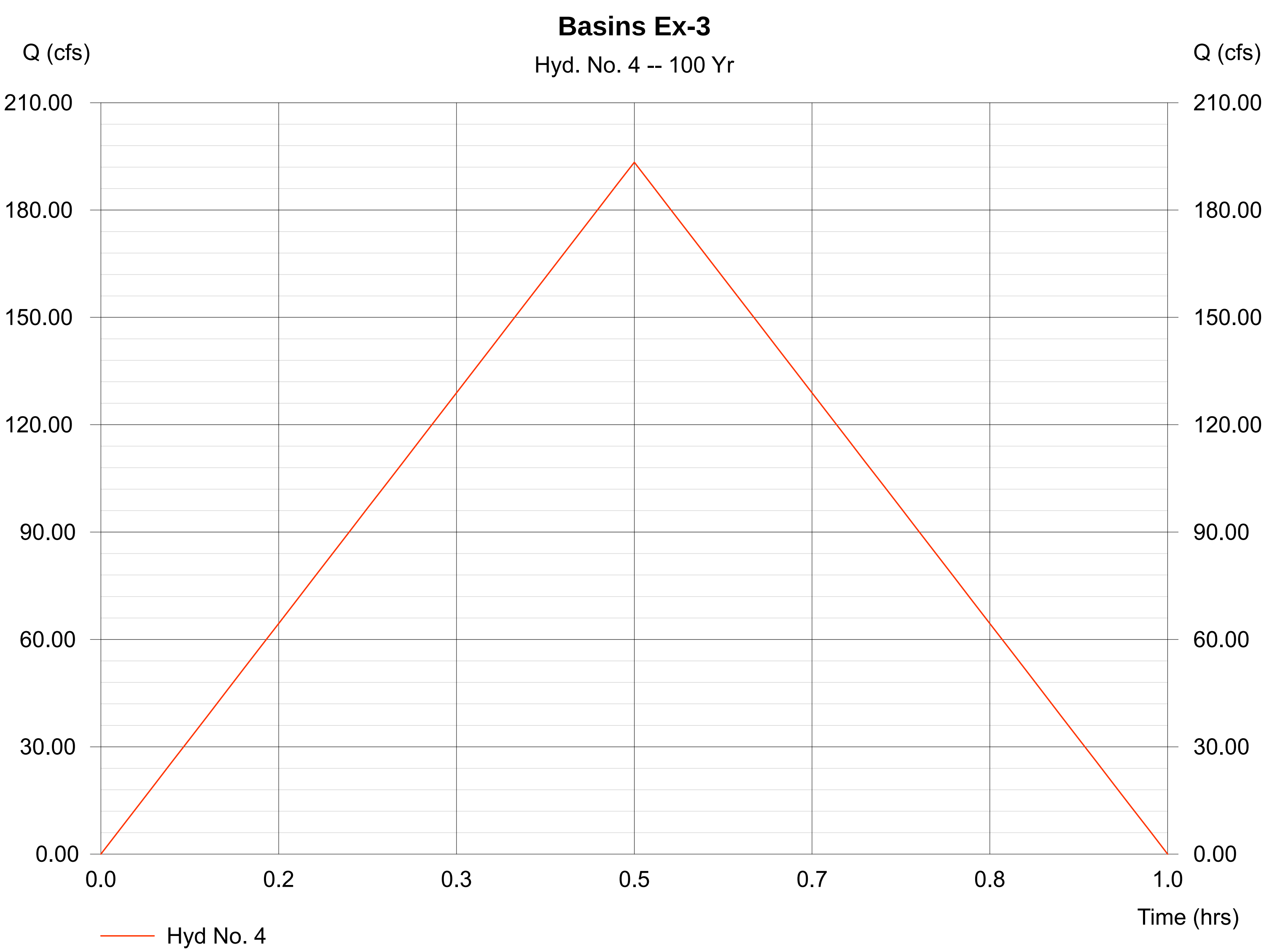
Friday, Jun 15 2018, 5:39 AM

Hyd. No. 4

Basins Ex-3

Hydrograph type	= Rational	Peak discharge	= 193.36 cfs
Storm frequency	= 100 yrs	Time interval	= 1 min
Drainage area	= 116.200 ac	Runoff coeff.	= 0.4
Intensity	= 4.160 in/hr	Tc by User	= 30.00 min
IDF Curve	= El Paso County-Table.IDF	Asc/Rec limb fact	= 1/1

Hydrograph Volume = 348,042 cuft



Hydrograph Plot

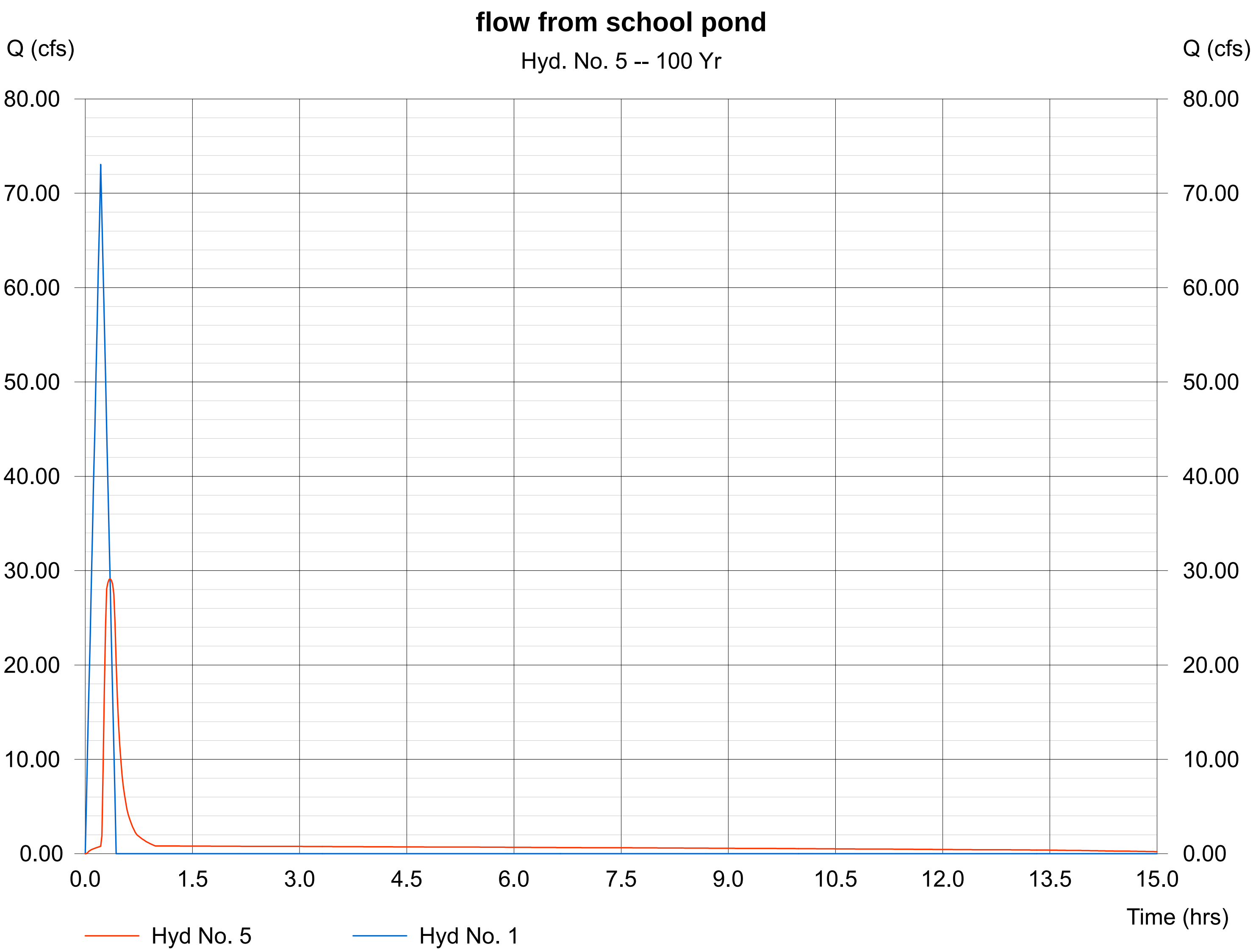
Hydraflow Hydrographs by Intelisolve — Friday, Jun 15 2018, 5:39 AM

Hyd. No. 5

flow from school pond

Hydrograph type	= Reservoir	Peak discharge	= 29.12 cfs
Storm frequency	= 100 yrs	Time interval	= 1 min
Inflow hyd. No.	= 1	Max. Elevation	= 5739.91 ft
Reservoir name	= School Pond	Max. Storage	= 43,203 cuft

Storage Indication method used. — Hydrograph Volume = 56,974 cuft



Hydrograph Plot

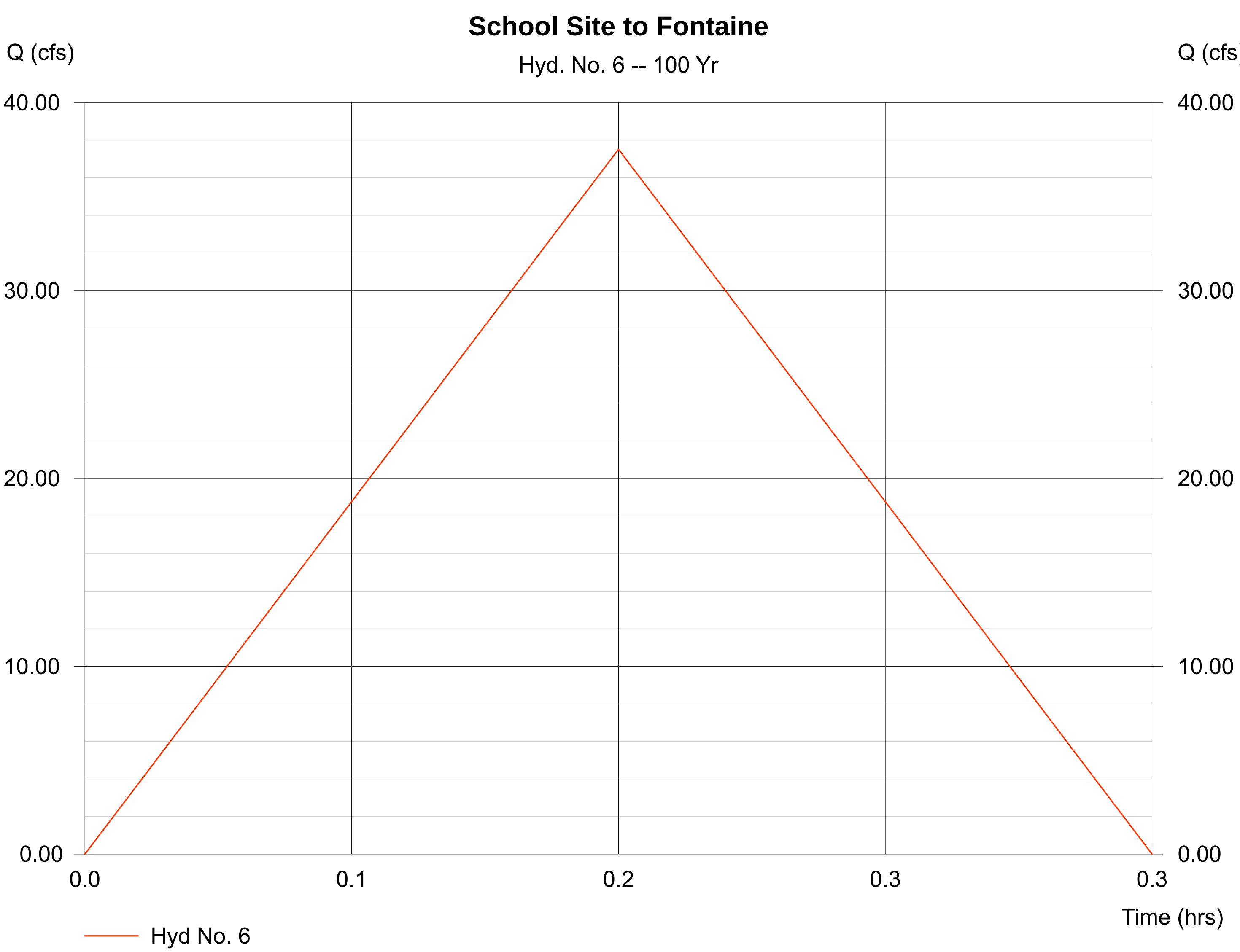
Hydraflow Hydrographs by Intelisolve — Friday, Jun 15 2018, 5:39 AM

Hyd. No. 6

School Site to Fontaine

Hydrograph type	= Rational	Peak discharge	= 37.52 cfs
Storm frequency	= 100 yrs	Time interval	= 1 min
Drainage area	= 8.000 ac	Runoff coeff.	= 0.65
Intensity	= 7.216 in/hr	Tc by User	= 10.00 min
IDF Curve	= El Paso County-Table.IDF	Asc/Rec limb fact	= 1/1

Hydrograph Volume = 22,512 cuft



Hydrograph Plot

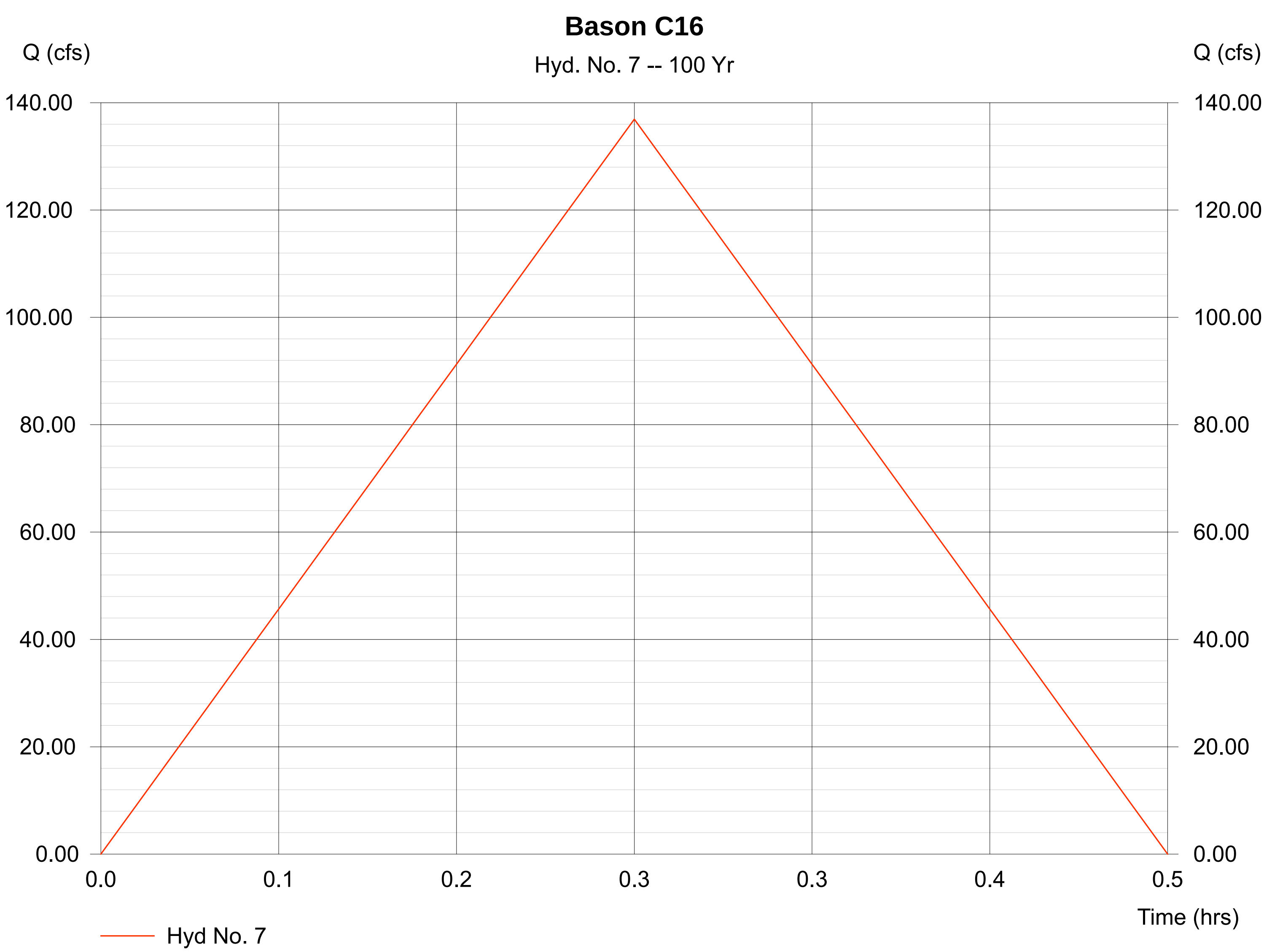
Hydraflow Hydrographs by Intelisolve | Friday, Jun 15 2018, 5:39 AM

Hyd. No. 7

Bason C16

Hydrograph type	= Rational	Peak discharge	= 136.93 cfs
Storm frequency	= 100 yrs	Time interval	= 1 min
Drainage area	= 34.300 ac	Runoff coeff.	= 0.65
Intensity	= 6.142 in/hr	Tc by User	= 15.00 min
IDF Curve	= El Paso County-Table.IDF	Asc/Rec limb fact	= 1/1

Hydrograph Volume = 123,234 cuft



Hydrograph Plot

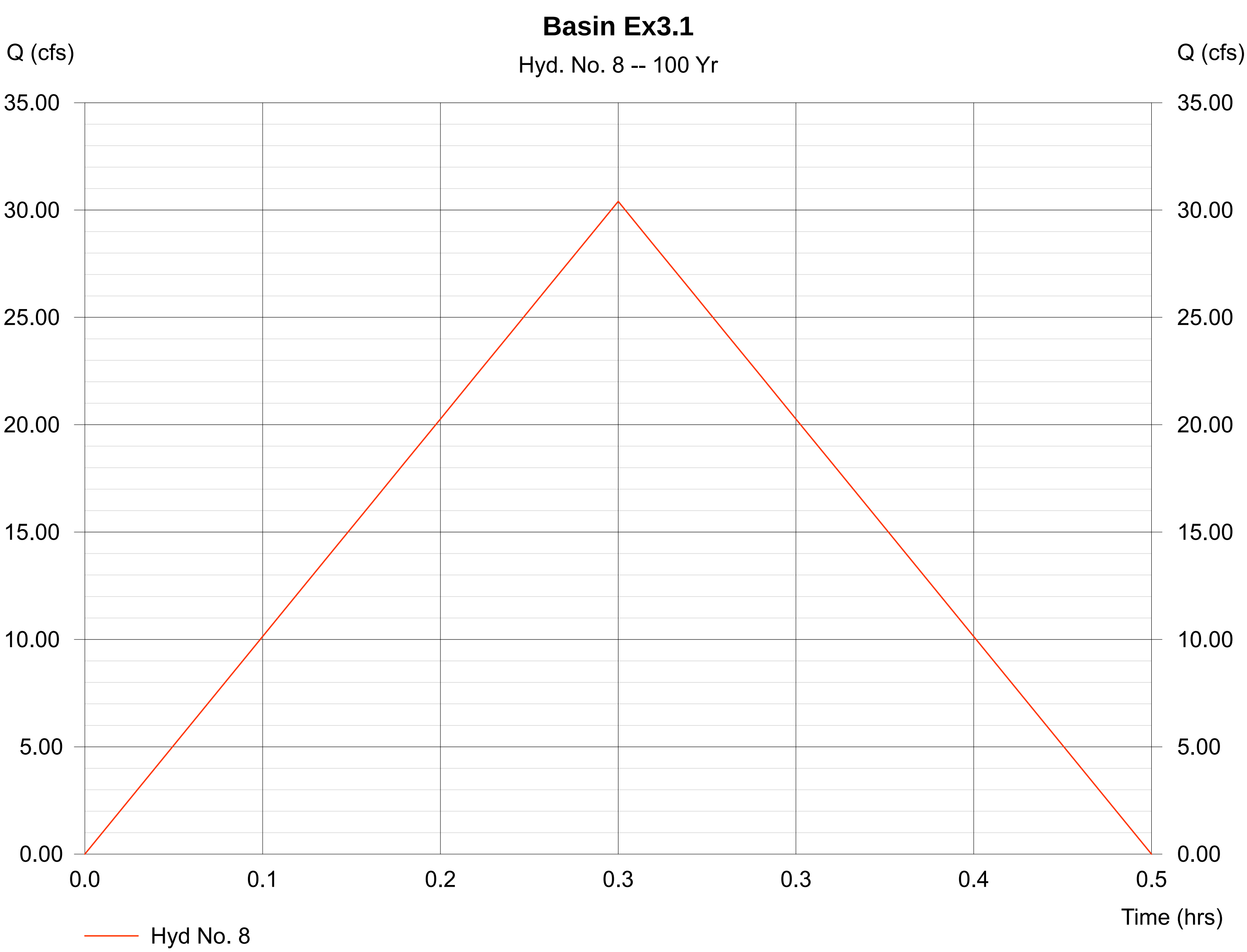
Hydraflow Hydrographs by Intelisolve — Friday, Jun 15 2018, 5:39 AM

Hyd. No. 8

Basin Ex3.1

Hydrograph type	= Rational	Peak discharge	= 30.40 cfs
Storm frequency	= 100 yrs	Time interval	= 1 min
Drainage area	= 11.000 ac	Runoff coeff.	= 0.45
Intensity	= 6.142 in/hr	Tc by User	= 15.00 min
IDF Curve	= El Paso County-Table.IDF	Asc/Rec limb fact	= 1/1

Hydrograph Volume = 27,361 cuft



Hydrograph Plot

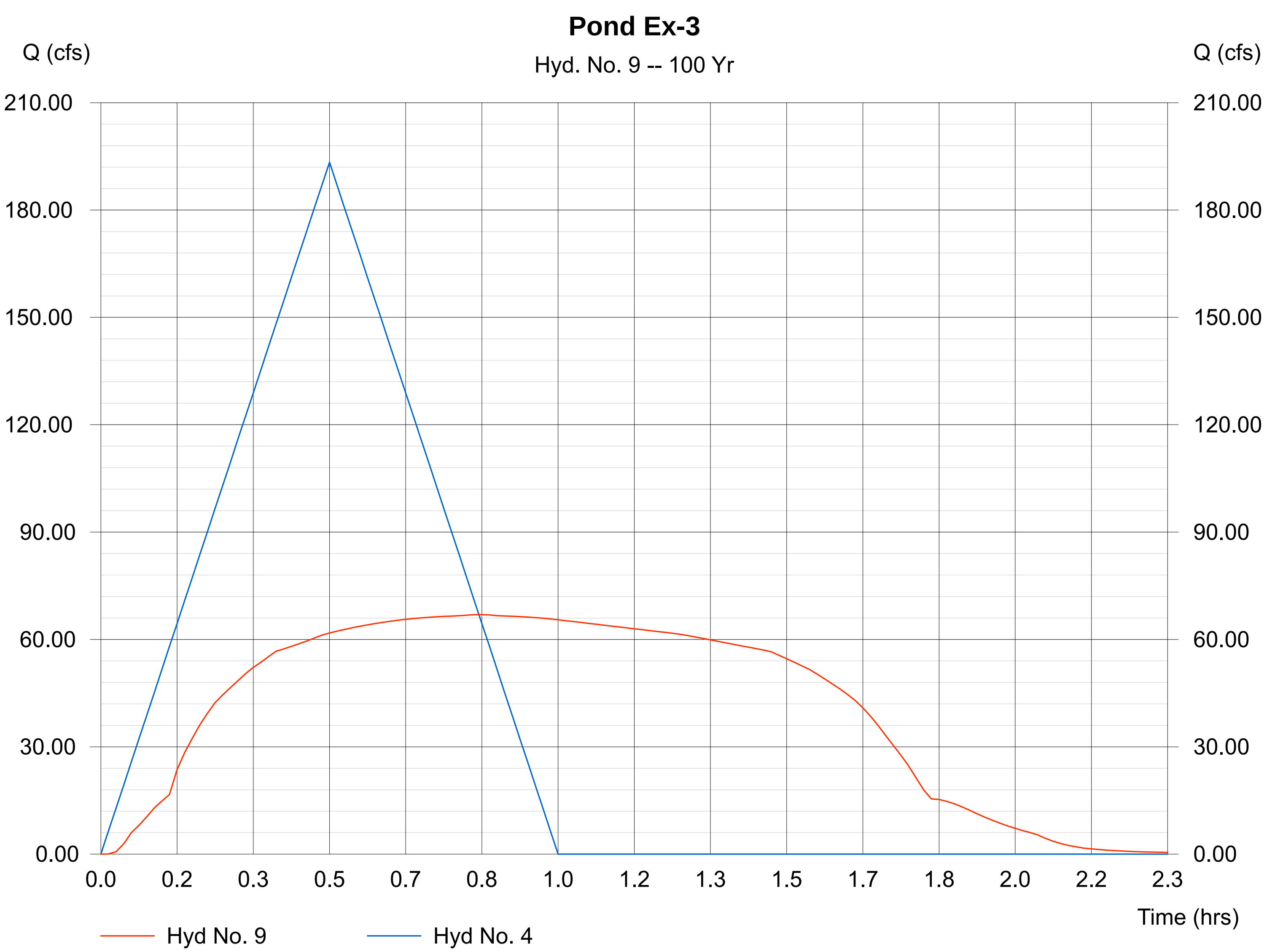
Hydraflow Hydrographs by Intelisolve | Friday, Jun 15 2018, 5:39 AM

Hyd. No. 9

Pond Ex-3

Hydrograph type	= Reservoir	Peak discharge	= 66.95 cfs
Storm frequency	= 100 yrs	Time interval	= 1 min
Inflow hyd. No.	= 4	Max. Elevation	= 5758.21 ft
Reservoir name	= Basin Ex-3 Pond	Max. Storage	= 186,380 cuft

Storage Indication method used. | Hydrograph Volume = 348,038 cuft



Hydrograph Plot

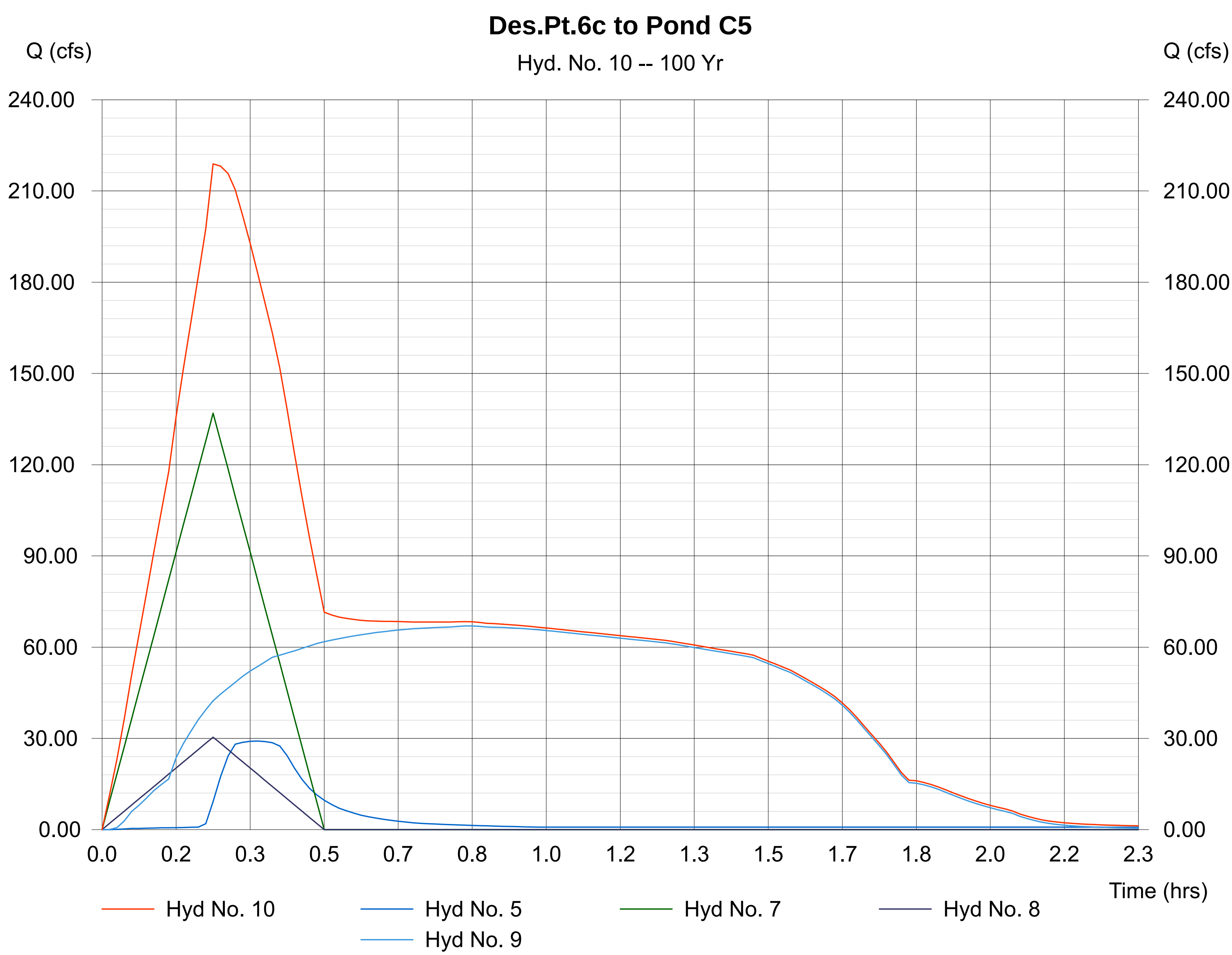
Hydraflow Hydrographs by Intelisolve — Friday, Jun 15 2018, 5:39 AM

Hyd. No. 10

Des.Pt.6c to Pond C5

Hydrograph type	= Combine	Peak discharge	= 218.92 cfs
Storm frequency	= 100 yrs	Time interval	= 1 min
Inflow hyds.	= 5, 7, 8, 9		

Hydrograph Volume = 555,606 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

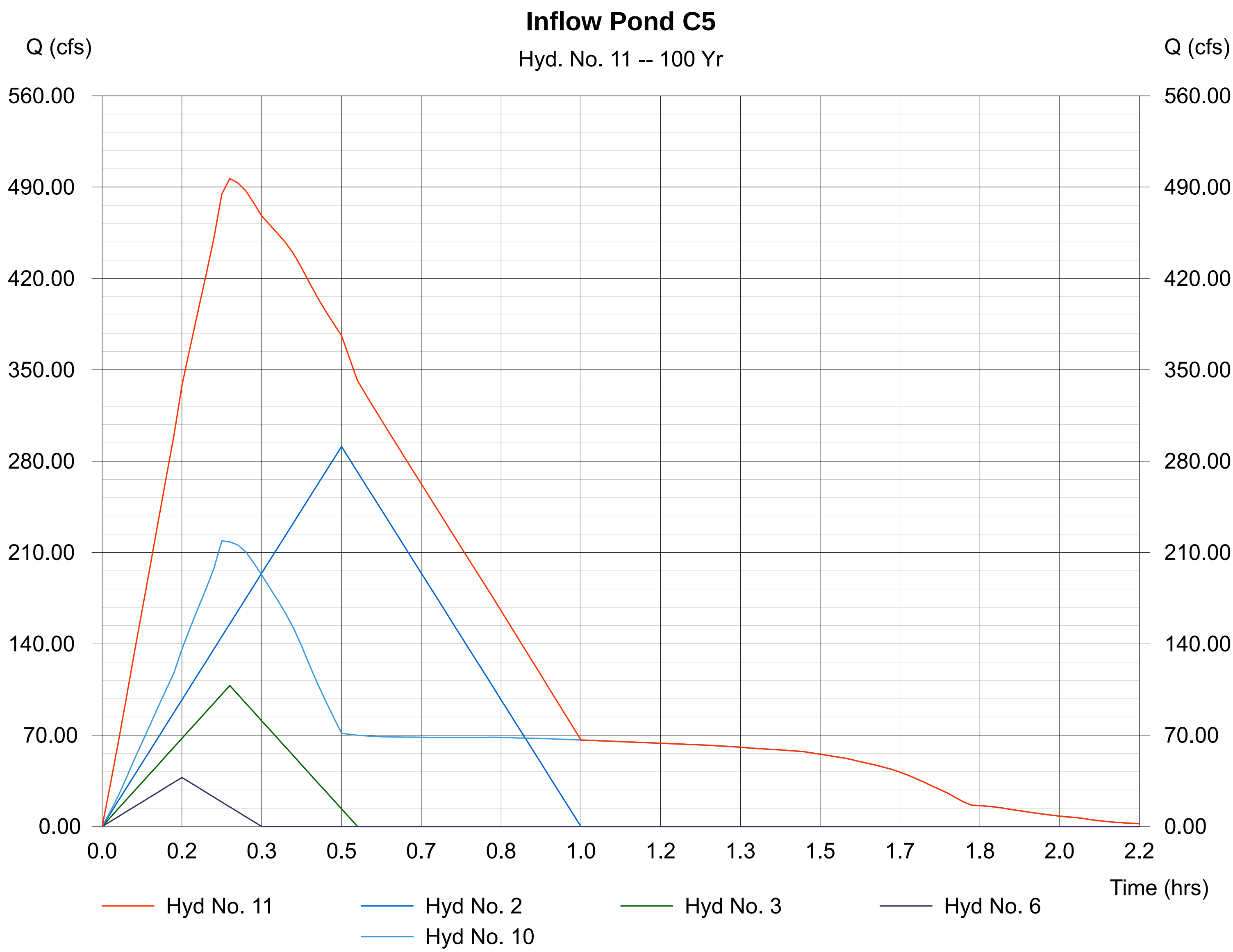
Friday, Jun 15 2018, 5:40 AM

Hyd. No. 11

Inflow Pond C5

Hydrograph type	= Combine	Peak discharge	= 496.47 cfs
Storm frequency	= 100 yrs	Time interval	= 1 min
Inflow hyds.	= 2, 3, 6, 10		

Hydrograph Volume = 1,205,963 cuft



Hydrograph Plot

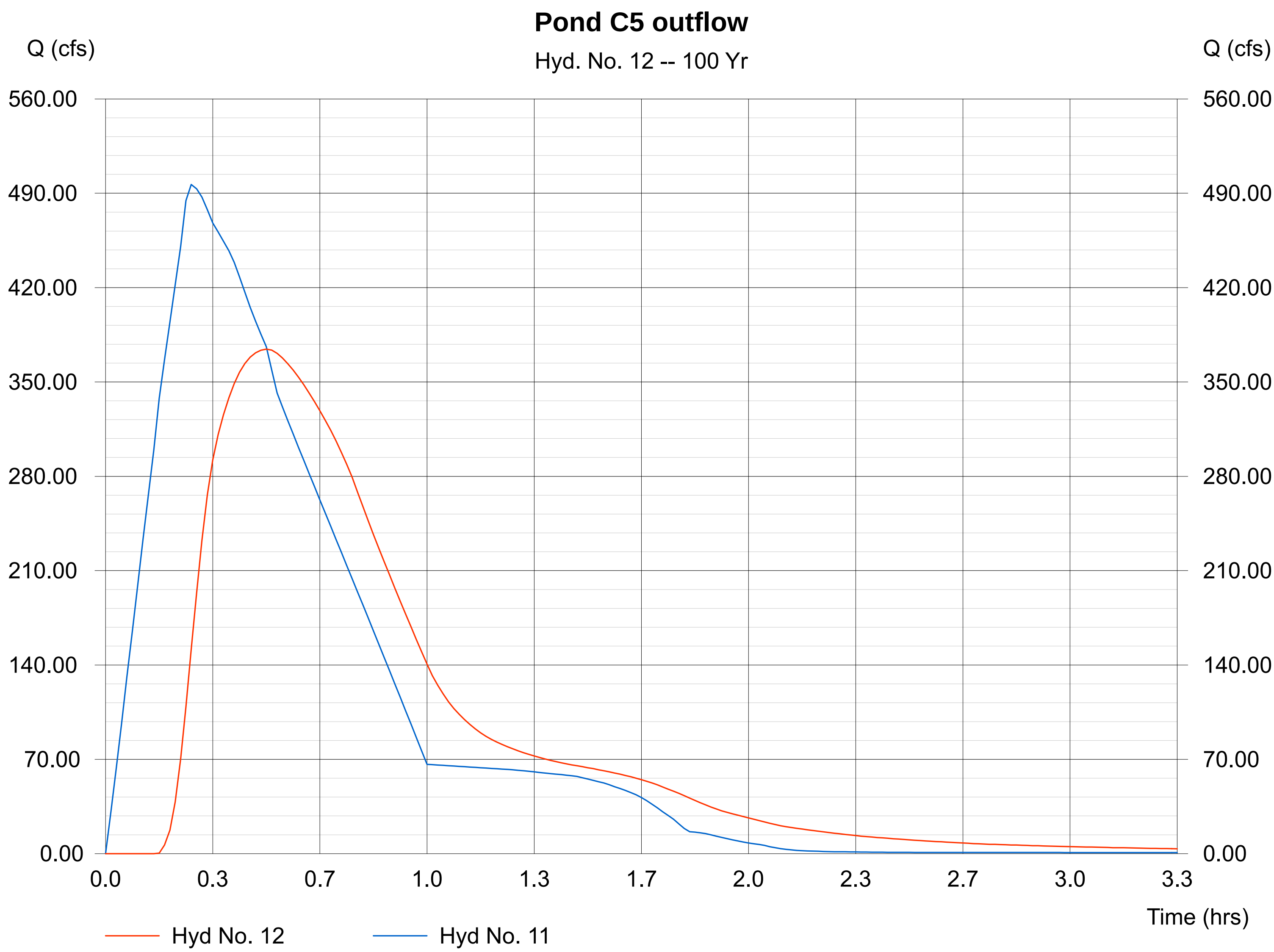
Hydraflow Hydrographs by Intelisolve — Friday, Jun 15 2018, 5:40 AM

Hyd. No. 12

Pond C5 outflow

Hydrograph type	= Reservoir	Peak discharge	= 374.29 cfs
Storm frequency	= 100 yrs	Time interval	= 1 min
Inflow hyd. No.	= 11	Max. Elevation	= 5714.48 ft
Reservoir name	= Pond C5	Max. Storage	= 699,059 cuft

Storage Indication method used. Wet pond routing start elevation = 5711.80 ft. — Hydrograph Volume = 1,108,314 cuft

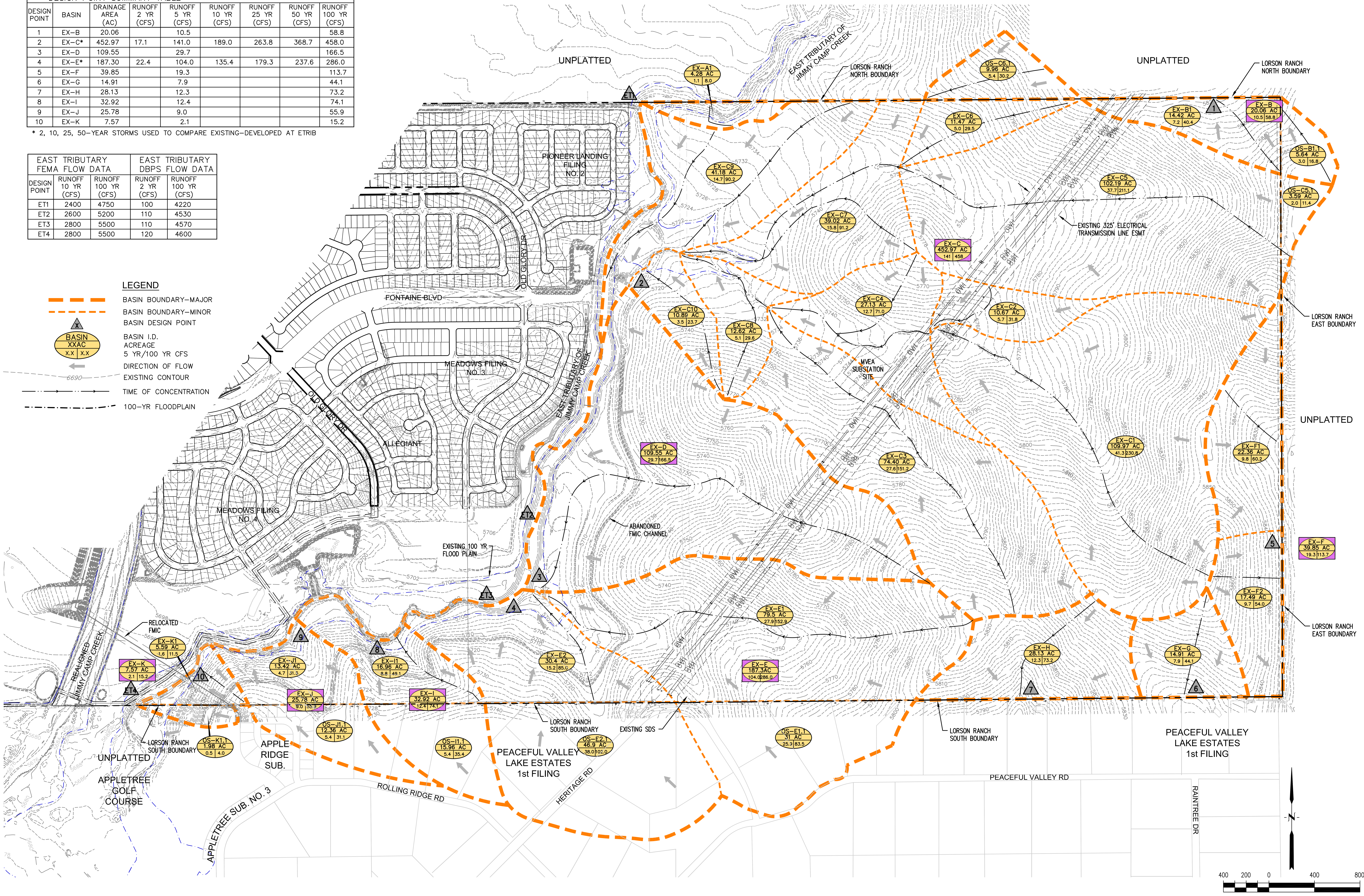


MAP POCKET

DESIGN POINT SUMMARY TABLE								
DESIGN POINT	BASIN	DRAINAGE AREA (AC)	RUNOFF 2 YR (CFS)	RUNOFF 5 YR (CFS)	RUNOFF 10 YR (CFS)	RUNOFF 25 YR (CFS)	RUNOFF 50 YR (CFS)	RUNOFF 100 YR (CFS)
1	EX–B	20.06		10.5				58.8
2	EX–C*	452.97	17.1	141.0	189.0	263.8	368.7	458.0
3	EX–D	109.55		29.7				166.5
4	EX–E*	187.30	22.4	104.0	135.4	179.3	237.6	286.0
5	EX–F	39.85		19.3				113.7
6	EX–G	14.91		7.9				44.1
7	EX–H	28.13		12.3				73.2
8	EX–I	32.92		12.4				74.1
9	EX–J	25.78		9.0				55.9
10	EX–K	7.57		2.1				15.2

* 2, 10, 25, 50–YEAR STORMS USED TO COMPARE EXISTING–DEVELOPED AT ETRIB

	EAST TRIBUTARY FEMA FLOW DATA		EAST TRIBUTARY DBPS FLOW DATA	
DESIGN POINT	RUNOFF 10 YR (CFS)	RUNOFF 100 YR (CFS)	RUNOFF 2 YR (CFS)	RUNOFF 100 YR (CFS)
ET1	2400	4750	100	4220
ET2	2600	5200	110	4530
ET3	2800	5500	110	4570
ET4	2800	5500	120	4600



EXISTING CONDITIONS

LORSON RANCH EAST MDDP

EAST OF ETRIB OF JIMMY CAMP CREEK

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

PROJECT: LORSON RANCH EAST MDDP
EAST OF THE EAST TRIBUTARY
EL PASO COUNTY, COLORADO

PREPARED FOR: LORSON LLC
212 NORTH WAHSATCH AVE, SUITE 301
COLORADO SPRINGS, COLORADO 80903 (719) 635–3200
CONTACT: JEFF MARK

DRAWN: LJA
DESIGNED: LAB
CHECKED: RLS

DATE: NOV, 2017

PROJECT NO. 100.013

SHEET NUMBER 1

TOTAL SHEETS: 1

LEGEND

- BASIN BOUNDARY–MAJOR
- BASIN I.D. / ACREAGE / 5 YR/100 YR CFS (BASIN XXAC X.X X.X)
- DIRECTION OF FLOW
- EXISTING CONTOUR (6690)
- PROPOSED CONTOUR (6690)
- PRELIMINARY PLAN SITE AREA

EXISTING VERSUSES DEVELOPED FLOW AT OUTFLOWS TO ETRIB				
DESIGN POINT	EXISTING RUNOFF 5 YR (CFS)	EXISTING RUNOFF 100 YR (CFS)	DEVELOPED RUNOFF 5 YR (CFS)	DEVELOPED RUNOFF 100 YR (CFS)
46	141	458	121	443
58a	29.7	166.5	8.8	133.6
73	100	280	120*	280*

DATA FROM LORSON EAST MDDP AND PDR
*INTERIM FLOW RATES FROM PDR

NOTE:

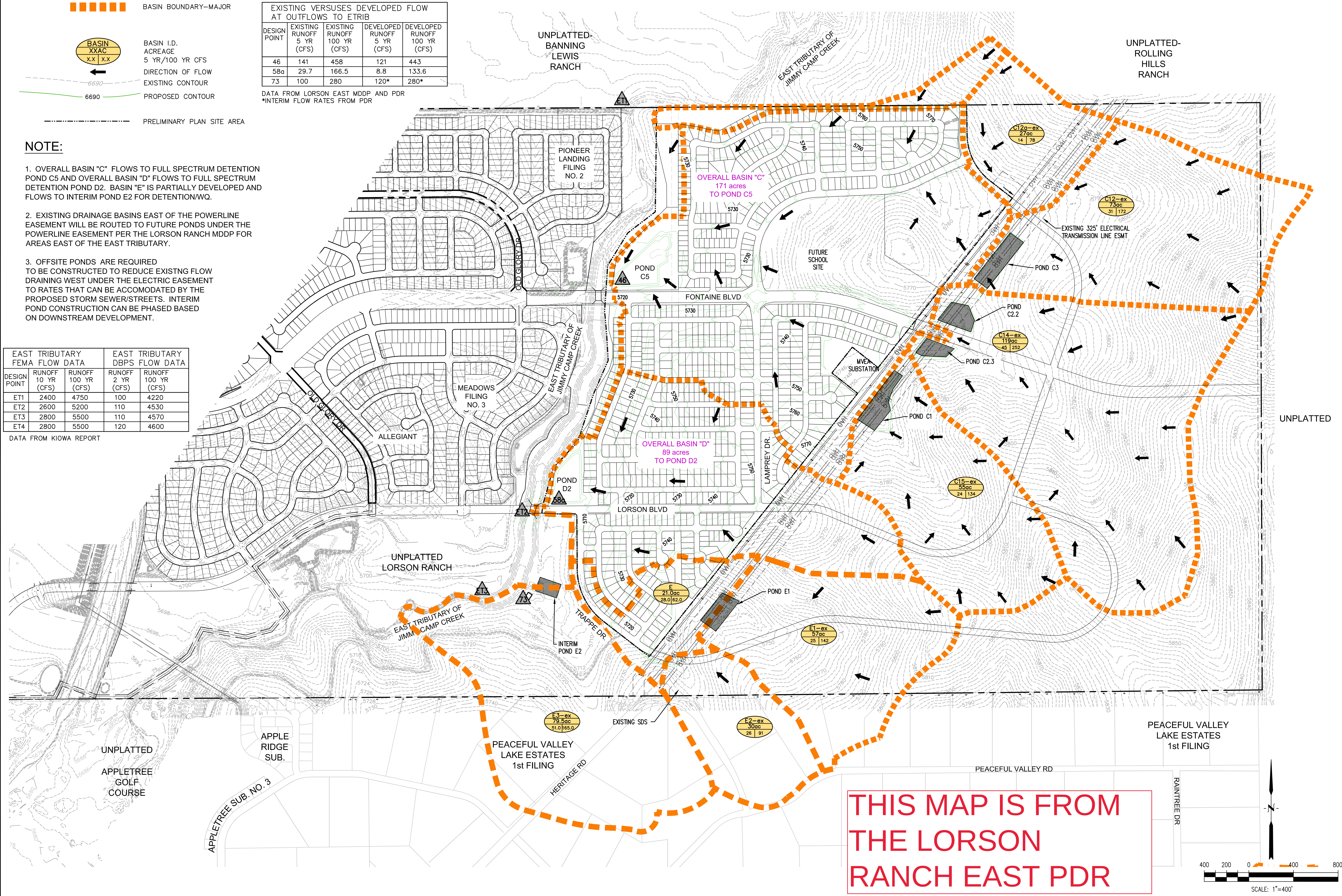
1. OVERALL BASIN "C" FLOWS TO FULL SPECTRUM DETENTION POND C5 AND OVERALL BASIN "D" FLOWS TO FULL SPECTRUM DETENTION POND D2. BASIN "E" IS PARTIALLY DEVELOPED AND FLOWS TO INTERIM POND E2 FOR DETENTION/WQ.

2. EXISTING DRAINAGE BASINS EAST OF THE POWERLINE EASEMENT WILL BE ROUTED TO FUTURE PONDS UNDER THE POWERLINE EASEMENT PER THE LORSON RANCH MDDP FOR AREAS EAST OF THE EAST TRIBUTARY.

3. OFFSITE PONDS ARE REQUIRED TO BE CONSTRUCTED TO REDUCE EXISTNG FLOW DRAINING WEST UNDER THE ELECTRIC EASEMENT TO RATES THAT CAN BE ACCOMODATED BY THE PROPOSED STORM SEWER/STREETS. INTERIM POND CONSTRUCTION CAN BE PHASED BASED ON DOWNSTREAM DEVELOPMENT.

	EAST TRIBUTARY FEMA FLOW DATA		EAST TRIBUTARY DBPS FLOW DATA	
DESIGN POINT	RUNOFF 10 YR (CFS)	RUNOFF 100 YR (CFS)	RUNOFF 2 YR (CFS)	RUNOFF 100 YR (CFS)
ET1	2400	4750	100	4220
ET2	2600	5200	110	4530
ET3	2800	5500	110	4570
ET4	2800	5500	120	4600

DATA FROM KIOWA REPORT



THIS MAP IS FROM THE LORSON RANCH EAST PDR

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:
LORSON RANCH EAST
EAST OF THE EAST TRIBUTARY
EL PASO COUNTY, COLORADO

DRAWN: LJA
DESIGNED: LAB
CHECKED: RLS

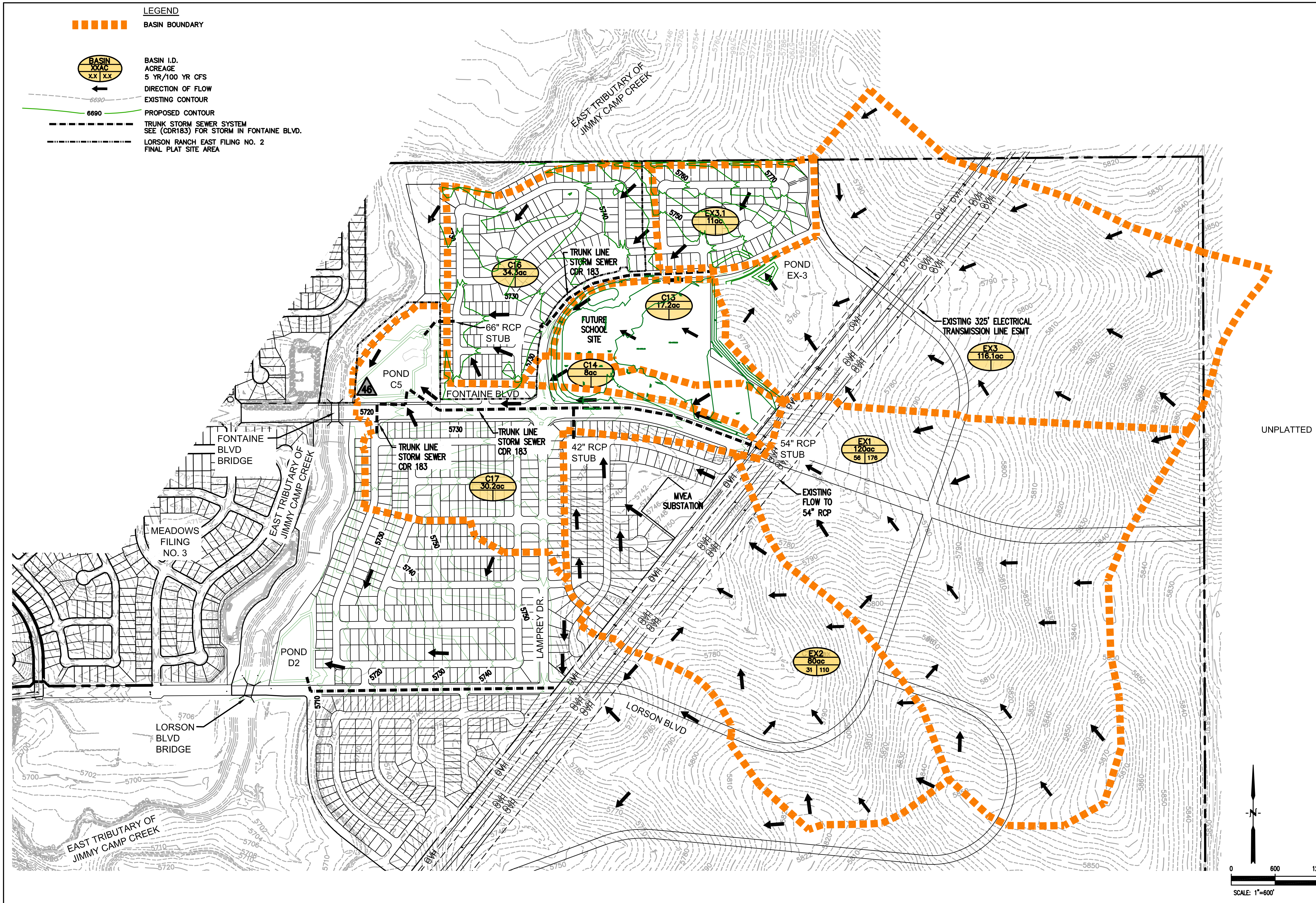
OVERALL DEVELOPED CONDITIONS
LORSON RANCH EAST
EAST OF ETRIB OF JIMMY CAMP CREEK

DATE: OCTOBER 20, 2017

PROJECT NO. 100.040

SHEET NUMBER 1

TOTAL SHEETS: 1



CORE ENGINEERING GROUP
15004 1ST AVENUE S.
BURNSVILLE, MN 55306
PH: 719.570.1100
CONTACT: RICHARD L. SCHINDLER, P.E.
EMAIL: Rich@cegl.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:
LORSON RANCH EAST
EAST OF THE EAST TRIBUTARY
EL PASO COUNTY, COLORADO

DRAWN: RLS
DESIGNED: RLS
CHECKED: RLS

INTERIM HYDROLOGICAL CONDITIONS
LORSON RANCH EAST FILING NO. 2
BASIN "C"

DATE:
JUNE 22 2018

PROJECT NO.
100.044

SHEET NUMBER
1

TOTAL SHEETS: 1

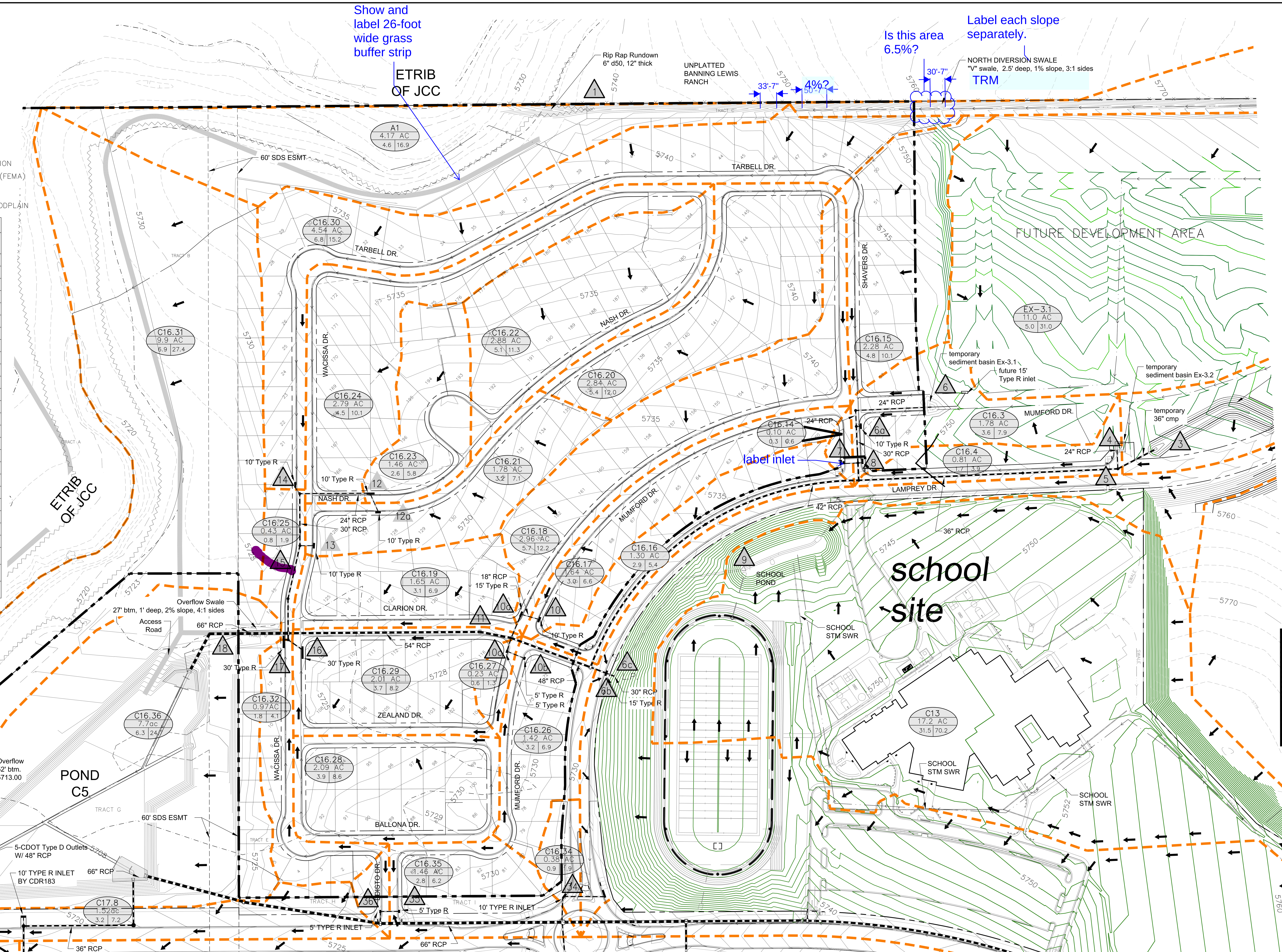
LEGEND

- DRAINAGE BASIN BOUNDARY
- SITE BOUNDARY
- BASIN I.D. / ACREAGE / 5 YR/100 YR CFS (BASIN, XX AC, X.X | X.X)
- DIRECTION OF FLOW
- 6690 EXISTING CONTOUR
- 6670 SCHOOL GRADING
- 6670 PROPOSED CONTOUR
- HP HIGH POINT
- LP LOW POINT
- TIME OF CONCENTRATION
- 100–YR FLOODPLAIN (FEMA)
- ETRIB ACCESS ROAD
- REVISED 100–YR FLOODPLAIN PER KIOWA CLOMR

RUNOFF SUMMARY

DESIGN POINT	5 YEAR	100 YEAR	NOTES
1	9.4	21.0	SWALE FLOW
3	34.0	67.0	SWALE FLOW
4	2.0	13.0	INTERIM FLOW
5	36.0	80.0	INTERIM FLOW
6	5.0	31.0	INTERIM FLOW
6a	6.61	24.87	STREET FLOW
6b	6.8	40.5	STREET FLOW
6c	0.8	29.0	FLOW IN STM
7	0.3	0.6	STREET FLOW
8	6.2	25.2	STREET FLOW
9	0.8	29.0	POND OUTFLOW
10	6.0	20.9	STREET FLOW
10a	5.7	16.8	STREET FLOW
10b	3.2	27.1	STREET FLOW
10c	0.6	23.0	STREET FLOW
11	105.6	154.8	FLOW IN STM SWR
12a	8.6	19.1	STREET FLOW
12	7.7	17.1	STREET FLOW
13	7.8	26.8	STREET FLOW
14	6.8	15.2	STREET FLOW
15	25.09	39.92	FLOW IN STM SWR
16	12.2	59.8	STREET FLOW
17	3.6	34.7	STREET FLOW
18	146.5	230.8	FLOW IN STM SWR
34	0.9	8.0	STREET FLOW SEE FONTAINE FDR
35	2.8	6.1	STREET FLOW SEE FONTAINE FDR
36	0.3	0.6	STREET FLOW SEE FONTAINE FDR

0 100 200
SCALE: 1"=100'



SEE FONTAINE FDR FOR ALL BASINS AND STORM SEWER ON FONTAINE BOULEVARD & LAMPREY DR, REF: CDR183

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:
LORSON RANCH EAST FIL. 2
FONTAINE BLVD. – LAMPREY DRIVE
EL PASO COUNTY, COLORADO

DRAWN: RLS
DESIGNED: LAB
CHECKED: LAB

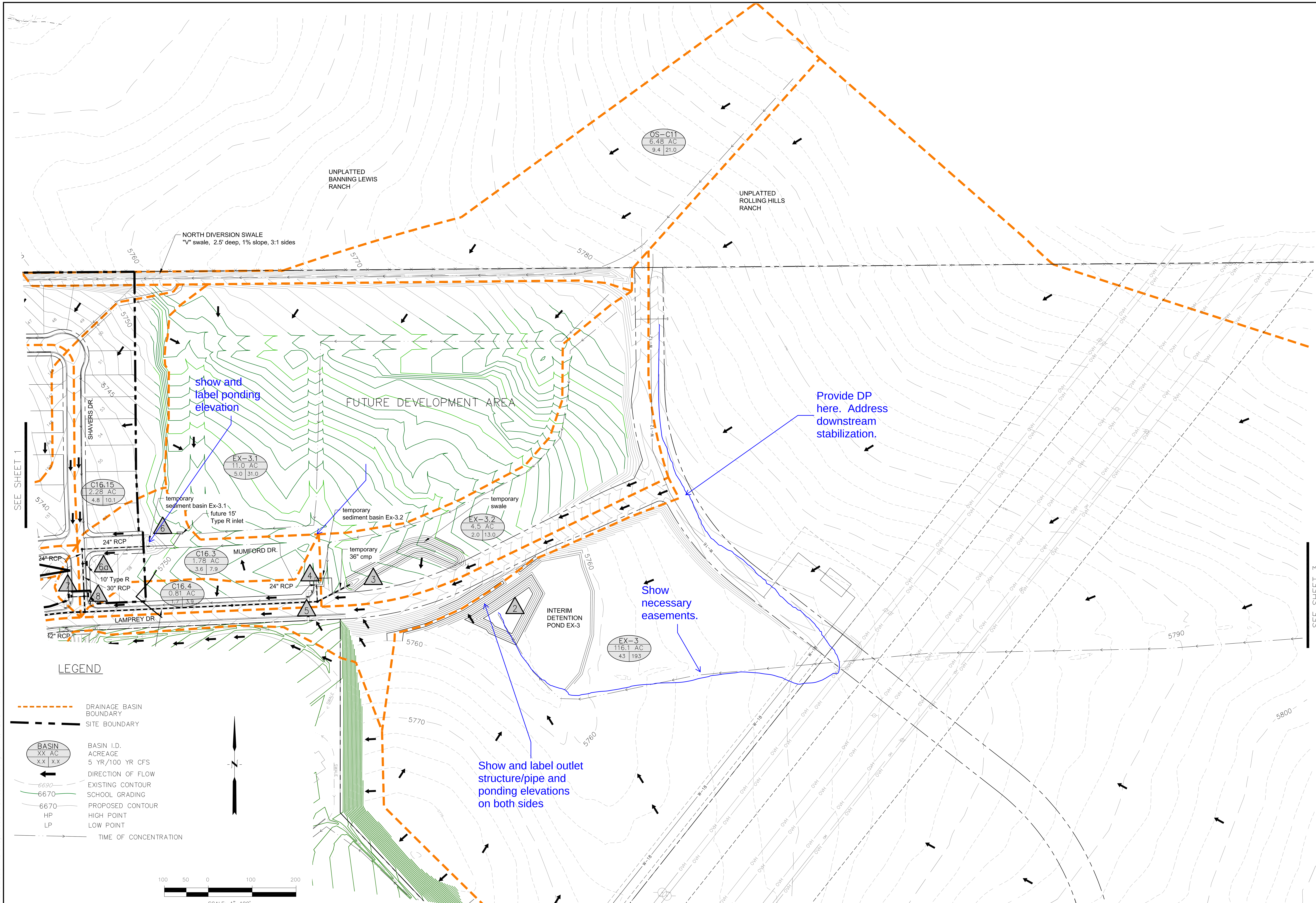
DEVELOPED CONDITIONS
LORSON RANCH EAST FILING NO. 2

DATE
JUNE 22, 2018

PROJECT NO.
100.044

SHEET NUMBER
1

TOTAL SHEETS: 3



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:
LORSON RANCH EAST FIL 2
FONTAINE BLVD. - EAST TRIBUTARY OF JCC
EL PASO COUNTY, COLORADO

DRAWN: RLS
DESIGNED: LAB
CHECKED: LAB

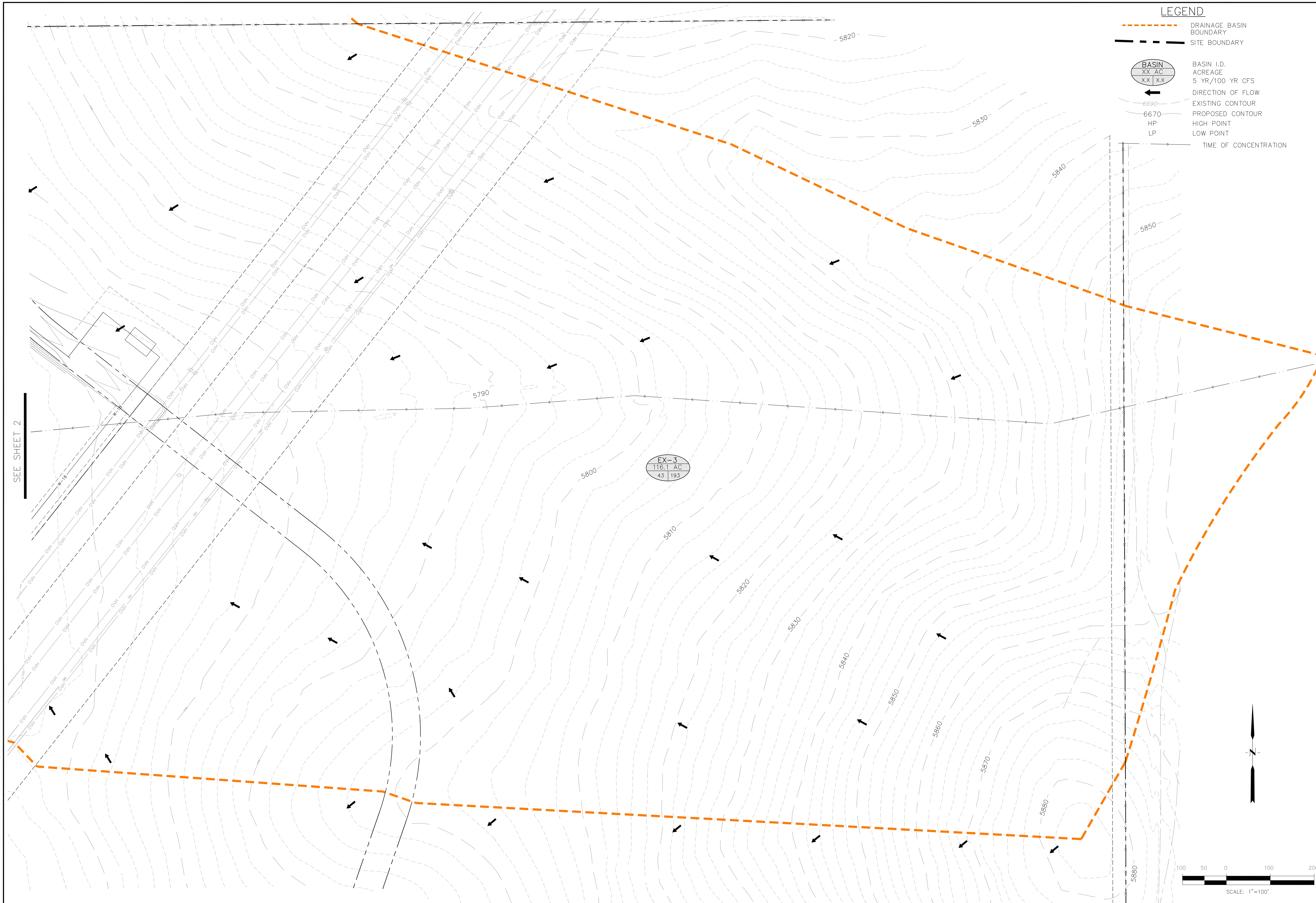
DEVELOPED CONDITIONS DRAINAGE PLAN
LORSON RANCH EAST FILING NO. 2

DATE
JUNE 22, 2018

PROJECT NO.
100.044

SHEET NUMBER
2

TOTAL SHEETS: 3



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:
LORSON RANCH EAST FIL 2
FONTAINE BLVD. - EAST TRIBUTARY OF JCC
EL PASO COUNTY, COLORADO

DRAWN: RLS
DESIGNED: LAB
CHECKED: LAB

DEVELOPED CONDITIONS DRAINAGE PLAN
LORSON RANCH EAST FILING NO. 2

DATE
JUNE 22, 2018

PROJECT NO.
100.044

SHEET NUMBER
3

TOTAL SHEETS: 3