PRELIMINARY DRAINAGE PLAN

LORSON RANCH EAST

SEPTEMBER 15, 2017
REV. 11/28/2017

PUD SP-16-003

Prepared for:

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Project No. 100.040

CORE
ENGINEERING GROUP

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ENGINEER'S STATEMENT

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

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

OWNER'S STATEMENT

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

Lorson, LLC Date

By
Jeff Mark

Title
Manager

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

FLOODPLAIN STATEMENT

To the best of my knowledge and belief, this development is 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: _____

1.0 LOCATION and DESCRIPTION

Lorson Ranch East is located east of the East Tributary of Jimmy Camp Creek. The site is located on approximately 275 acres of vacant land. Future plans are to develop this site into single-family residential developments. Also included in this report and plan is the proposed layout for Lorson Ranch East which is located east of the East Tributary of Jimmy Camp Creek. The land is currently owned by Lorson LLC or its nominees for Lorson Ranch.

The site is located in the West 1/2 of Sections 14 & 23, South ½ of Section 13, and the North ½ of Section 24, Township 15 South and Range 65 West of the 6th Principal Meridian. The property is bounded on the north by un-platted land in Banning Lewis Ranch and Rolling Hills Ranch, on the east by unplatted land and a 325' electric easement in Lorson Ranch, the west by The East Tributary of Jimmy Camp Creek, and the south by unplatted land in Lorson Ranch. For reference, a vicinity map is included in Appendix A of this report.

Conformance with applicable Drainage Basin Planning Studies

There is an existing (unapproved) DBPS for Jimmy Camp Creek prepared by Wilson & Company in 1987, and is referenced in this report. The only major drainage improvements for this study area according to the 1987 Wilson study was the reconstruction of the East Tributary of Jimmy Camp Creek (East Tributary). In 2014 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. Per the Kiowa DBPS concept the preferred channel improvements include selective channel armoring on outer bends and a low flow channel for the East Tributary. Channel improvements in the East Tributary are potentially reimbursable against drainage fees for future development but need to go through the county process for reimbursement. The only major infrastructure not shown in the Kiowa DBPS is the future bridge for Fontaine Boulevard and Lorson Boulevard on the East Tributary. The Fontaine Boulevard bridge is considered to be potentially reimbursable but must go through the county process for reimbursement. The Lorson Boulevard bridge is not considered reimbursable.

Conformance with Lorson East MDDP by Core Engineering Group

Core Engineering Group has concurrently submitted a MDDP for Lorson East which covers this preliminary plan area and the East Tributary. This PDR conforms to the MDDP for Lorson East and is referenced in this report. The major infrastructure to be constructed in this PDR site includes the East Tributary reconstruction north of Fontaine Boulevard (Kiowa report), bridges over the East Tributary at Fontaine Blvd/Lorson Blvd (Kiowa report), Detention/WQ Ponds C5 and D2, and storm sewer oversizing for emergency overflow conveyance in Fontaine Boulevard.

Reconstruction of the East Tributary of Jimmy Camp Creek

The Kiowa DBPS shows the East Tributary to be protected using selective armoring (soil rip rap) at the outside stream bends (500' minimum radius) and a stabilized low flow channel. The East Tributary can be divided into three different sections, south, middle, and north. The first section (south) is from the south property line east and north to design point ET-3 (see drainage map) and is roughly 2,900 feet in length. The south section is not adjacent to this preliminary plan but it will be armored in accordance with the Kiowa DBPS in the future as development occurs. The 100-year flow rate for design is 5,500cfs for the south section. The middle section is from Design Point ET-3 north 2,800 feet to the future extension of Fontaine Boulevard. The channel for this section was reconstructed and stabilized in 2014 in accordance with the 1987 Wilson DBPS. The only infrastructure left to construct are the bridges over the creek at Fontaine Boulevard and Lorson Boulevard for the middle section. LOMR

Case No. 14-08-0534P was approved by FEMA for this middle section. The northern section is from Fontaine Boulevard and extends north to the north property line. The north section will be constructed in conformance with the Kiowa DBPS during the first phase of development east of the East Tributary. The channel consists of a stabilized low flow channel and soil rip rap armored outer bends. Kiowa Engineering has submitted construction plans to El Paso County for this section of creek including bridges for Lorson Boulevard and Fontaine Boulevard. A CLOMR for the creek and bridge construction is currently submitted to FEMA under Case No. 17-08-1043R. The 100-year flow rate for design is from FEMA FIS data and is from 4,400cfs to 4,750cfs for this section. The low flow channel is sized using 10% of the 100-yr FEMA flow rates and is from 440cfs to 475cfs.

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

2.0 DRAINAGE CRITERIA

The supporting drainage design and calculations were performed in accordance with the City of Colorado Springs and El Paso County "Drainage Criteria Manual (DCM)", dated November, 1991, the El Paso County "Engineering Criteria Manual", Chapter 6 and Section 3.2.1 Chapter 13 of the City of Colorado Springs Drainage Criteria Manual dated May 2014, and the UDFCD "Urban Storm Drainage Criteria Manual" Volumes 1, 2 and 3 for inlet sizing and full spectrum ponds. No deviations from these published criteria are requested for this site. The proposed improvements to the Lorson Ranch Development will be in substantial compliance with the "Jimmy Camp Creek Drainage Basin Planning Study", prepared by Kiowa Engineering Corp., Colorado Springs, CO.

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

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

3.0 EXISTING HYDROLOGICAL CONDITIONS

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

Since the majority of this site will consist of import material, soil type C/D has been assumed for the hydrologic conditions because mass grading will occur and soil types will be moved around. This approach will provide a more conservative approach to designing the storm sewer infrastructure. See Appendix A for SCS Soils Map.

The Soil Conservation Service (SCS) classifies the soils within the Lorson Ranch East property as Ascalon sandy loam (4%); Manzanola clay loam (17%); Midway clay loam (5%): Nelson-Tassel fine Sandy loam (50%); Razor clay loam (10%); and Wiley silt loam (13%) [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.

Move to Developed Conditions section.

Table 3.1: SCS Soils Survey

Soil	Hydro. Group	Shrink/Swell Potential	Permeability	Surface Runoff Potential	Erosion Hazard
2-Ascalon Sandy Loam - (4%)	B	Moderate	Moderate	Slow to Medium	Moderate
3-Ascalon Sandy Loam - (9%)	B	Moderate	Moderate	Slow to Medium	Moderate
52-Manzanola Clay Loam (17%)	C	High	Slow	Medium	Moderate
54-Midway Clay Loam (5%)	C	High	Slow	Medium to Rapid	Moderate to High
56-Nelson – Tassel Fine Sandy Loam (50%)	B	Moderate	Moderately Rapid	Slow	Moderate
75-Razor Clay Loam (10%)	C	High	Slow	Medium	Moderate
108-Wiley Silt Loam (13%)	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.

An existing electrical easement, within existing transmission towers, is adjacent to this site on the east side of this portion of the development and will be set aside as open space in the future. It is the intent of this master development drainage plan to utilize some of the open space under the towers for detention of storm flows.

PDR

The FMIC (irrigation canal) that runs parallel with the East Tributary through this site was decommissioned in 2006 and will be filled in during the early grading process. For the purpose of existing drainage calculations the canal was ignored and all flow was assumed to flow to the East Tributary.

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 from the current floodplain is currently submitted to 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. A map has been included in the appendix.

Basin EX-A1
This 4.28 acre basin is in the northwest corner of the site and includes part of the East Tributary. Under existing conditions, this area contributes 1.1 cfs and 8.0 cfs to the East Tributary for 5-year and 100-year events respectively. This basin comprises of the East Tributary and will not be developed in the future.

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.

Overall Basin EX-D flows to Design Point 3
Overall Basin EX-D is located adjacent to and southwest of Basin Ex-C and is 109.55 acres in size. This basin is an overall existing on-site basin. The existing runoff of 29.7cfs and 166.5cfs for the 5-year and 100-year events at Design Point 3 respectively and flows directly overland into the East Tributary.

Overall Basin EX-E flows to Design Point 4
Overall Basin EX-E is located adjacent to and southwest of Basin Ex-D and is 186.30 acres in size. Overall Basin EX-E is the second largest historic basin at 186.30 acres and includes on-site flow (Basins EX-E1 to EX-E3) and offsite flows (Basin OS-E1.1 and OS-E2.1) from the Peaceful Valley Estates subdivision to the south. Under existing conditions, this overall basin contributes 104.0 cfs and 286.0 cfs for the 5-year and 100-year events respectively at Design Point 4 and flows directly overland into the East Tributary.

4.0 DEVELOPED HYDROLOGICAL CONDITIONS

Hydrology for the **Lorson Ranch East** 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.

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 the City of Colorado Springs/El Paso County Drainage Criteria Manual.

The hydrology analysis necessary for sizing the storm sewer system is preliminary only and will be finalized when the construction documents are prepared.

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

Overall Basin C
Overall Basin C includes all of the "C" basins that drain to Pond C5. This basin was included to provide sizing data to design Pond C5 WQ and EURV in the full spectrum worksheets. The total size of this basin is 171 acres and comprises of residential development. There is runoff from a future school site which has been included for water quality in Pond C5. The future school site will be required to detain runoff to existing flow rates to several storm outfall points provided on Lamprey Drive and Fontaine Boulevard.

Overall Basin D
Overall Basin D includes all of the "D" basins that drain to Pond D2. This basin was included to provide sizing data to design Pond D2 in the full spectrum worksheets. The total size of this basin is 72 acres and comprises of residential development.

89 on plan

Overall Basin E
Overall Basin E is located south of Lorson Boulevard and comprises of residential development. According to the MDDP this basin drains to Pond E2 and will include more future development in Lorson Ranch. We are recommending that an interim pond be built at Pond E2 to detain runoff from development within the basin. This pond will treat runoff from Overall Basin E for water quality.

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. See the appendix for detailed calculations. See Section 6.0 for water quality discussions.

Basin C12
Basin C12 consists of future residential development located South of Tolt Drive and Lamprey Drive. Runoff will be directed north in the future curb/gutter to Design Point 2 in Tolt Drive. The future peak developed flow from this basin is 33.0cfs and 73.5cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin C13
Basin C13 consists of future school site NE of Lamprey Drive and Fontaine Boulevard. Runoff will be directed west internally to a 30" storm sewer stub from Lamprey Drive at Design Point 6c. The peak developed flow from this basin will be required to be detained to pre-development conditions on the school site with a release rate not to exceed 7.6cfs and 40.5cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin C13.1
Basin C13.1 consists of runoff from Lamprey Drive on the south side. Runoff will be directed west in the curb/gutter to Design Point 6b in Lamprey Drive where it will be collected by a Type R inlet. The developed flow from this basin is 6.4cfs and 11.5cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin C14
Basin C14 consists of runoff from Fontaine Bouevard on the north side. Runoff will be directed west in the curb/gutter to Design Point 33 in Lamprey Drive where it will be collected by a Type R inlet. The developed flow from this basin is 6.6cfs and 13.6cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin C14.1
Basin C14.1 consists of runoff from the future school site to Fontaine Bouevard on the north side. Runoff will be directed south internally to Design Point 19c in Fontaine Boulevard where it will be collected by a Type R inlet. The peak developed flow from this basin will be required to be detained to

pre-development conditions on the school site with a release rate not to exceed 2.4cfs and 12.8cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin C14.2
Basin C14.2 consists of runoff from Fontaine Bouevard on the north side. Runoff will be directed in the curb/gutter to Design Point 19c in Fontaine Boulevard where it will be collected by a Type R inlet. The developed flow from this basin is 5.8cfs and 11.7cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin C15.1
Basin C15.1 consists of runoff from areas under the electric easement and residential development. Runoff will be directed west to Design Point 21 in a swale where it will be collected by a storm sewer. The developed flow from this basin is 6.9cfs and 22.1cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin C15.2
Basin C15.2 consists of runoff from areas under the electric easement, MVEA substation, and residential development. Runoff will be directed west to Design Point 21 in a swale where it will be collected by a storm sewer. The developed flow from this basin is 7.6cfs and 19.2cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin C15.3-C15.4
These basins consist of runoff from residential development. Runoff will be directed north to Design Point 23 in curb/gutter where it will be collected by a Type R inlet on Tillamook Drive. The developed flow from these basins is 9.0cfs and 20.1cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin C15.5
This basin consists of runoff from residential development. Runoff will be directed north to Design Point 24 in curb/gutter. The developed flow from these basins is 5.9cfs and 13.1cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin C15.6
This basin consists of runoff from residential development and Rockcastle Drive. Runoff will be directed west in Rockcastle Drive. The developed flow from these basins is 3.3cfs and 7.4cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin C15.7
This basin consists of runoff from residential development and Rockcastle Drive. Runoff will be directed west in Rockcastle Drive. The developed flow from these basins is 3.9cfs and 8.8cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin C15.8
Basin C15.8 consists of runoff from Fontaine Boulevard on the south side, residential lots, Rockcastle Drive, and open space under the existing electric lines. Runoff will be directed north in the curb/gutter to Design Point 20 in Fontaine Boulevard where it will be collected by a Type R inlet. The developed flow from this basin is 5.2cfs and 13.4cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin C15.9
Basin C15.9 consists of runoff from Fontaine Boulevard on the south side. Runoff will be directed west in the curb/gutter. The developed flow from this basin is 4.9cfs and 11.0cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin C15.10
Basin C15.10 consists of runoff from Fontaine Boulevard on the south side, and residential lots. Runoff will be directed west in the curb/gutter to Design Point 29 at the SE corner of the Fontaine Boulevard/Lamprey Drive intersection where it will be collected by a Type R inlet. The developed flow from this basin is 1.2cfs and 2.7cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin C15.11
These basins consist of runoff from residential development and Vedder/Rockcastle Drive. Runoff will be directed north to Design Point 25 in curb/gutter where it will be collected by a Type R inlet on Rockcastle Drive. The developed flow from these basins is 6.1cfs and 13.7cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin C15.12
This basin consists of runoff from residential development and Rockcastle Drive. Runoff will be directed west in Rockcastle Drive to Design Point 25 where it will be collected by a Type R inlet. The developed flow from these basins is 1.2cfs and 2.6cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin C15.13
Basin C15.13 consists of runoff from residential development and Vedder/Rockcastle Drive. Runoff will be directed north to Design Point 26 in curb/gutter where it will be collected by a Type R inlet on Rockcastle 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.

Basin C15.14
These basins consist of runoff from residential development and Lamprey Drive. Runoff will be directed north to Design Point 29 in curb/gutter where it will be collected by a Type R inlet on Lamprey Drive. The developed flow from this basin is 2.9cfs and 6.4cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin C15.15
These basins consist of runoff from residential development and Lamprey Drive. Runoff will be directed north to Design Point 30 in curb/gutter where it will be collected by a Type R inlet on Lamprey Drive. The developed flow from this basin is 7.2cfs and 16.0cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin C16.1
Basin C16.1 consists of residential development located NE of Yamhill and Lamprey Drive. Runoff is directed southwest in curb/gutter in Mumford Drive and then south to Design Point 3 to a proposed Type “R” inlet in Yamhill Drive. The peak developed flow from this basin is 6.0cfs and 13.3cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin C16.2
Basin C16.2 consists of residential development and Lamprey Drive. Runoff is directed west in curb/gutter in Lamprey Drive and to Design Point 3 to a proposed Type “R” inlet in Yamhill 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.

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.

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 a proposed Type "R" inlet in Shavers Drive. The peak 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 C16.5, C16.6, C16.7, C16.8, C16.9, C16.10
Basin C16.5-C16.10 consists of residential development located NE of Yamhill Drive and Lamprey Drive. Runoff is directed southwest in curb/gutter in Mumford Drive to Design Point 4 in Mumford Drive. See the appendix for detailed calculations for these basins.

Basin C16.11, C16.12, C16.13
Basin C16.11-C16.13 consists of residential development located NE of Napa Drive and Lamprey Drive. Runoff is directed southwest in curb/gutter in Mumford Drive to Type "R" inlet at Design Point 6 in Mumford Drive. See the appendix for detailed calculations for these basins.

Basin C16.14 & C16.15
Basin C16.14 & C16.15 consist of residential development located north of Shavers Drive and Lamprey Drive. Runoff is directed southwest in curb/gutter in Mumford Drive to Design Point 6a and Design Point 7 to a proposed Type "R" inlet in Shavers Drive. See the appendix for detailed calculations.

Basin C16.16 & C16.17
Basin C16.16 & C16.17 consist 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 Clarion Drive at Design Point 10. 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 peak developed flow from this basin is 5.5cfs and 12.2cfs for the 5/100-year storm event. See the appendix for detailed calculations.

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 peak developed flow from this basin is 3.1cfs and 6.9cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin C16.20, C16.21
Basins C16.20 and C16.21 consist 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. See the appendix for detailed calculations

Basin C16.22 & C16.23
Basins C16.22 & C16.23 consist 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. See the appendix for detailed calculations

Basin C16.25
Basins 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. See the appendix for detailed calculations

Basin C16.26
Basins 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. See the appendix for detailed calculations

Basin C16.27
Basins 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. See the appendix for detailed calculations

Basin C16.28 & C16.29
Basins C16.28 & C16.29 consist of residential development located on Clarion, 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. See the appendix for detailed calculations

Basin C16.30
Basins 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. See the appendix for detailed calculations

Basin C16.31
Basins C16.31 consists of backyards of houses on Wacissa Drive, East Tributary, and open space. Runoff is directed overland to the East Tributary. See Section 6.0 for water quality discussions for backyards. See the appendix for detailed calculations

Basin C16.32
Basins 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. See the appendix for detailed calculations

Basin C16.33
Basins C16.33 consist of flow from Lamprey Drive and Fontaine Boulevard. Runoff is directed in curb/gutter in to a proposed Type “R” inlet in the NE corner of Fontaine Boulevard and Lamprey Drive at Design Point 33. See the appendix for detailed calculations

Basin C16.34
Basins C16.34 consists of flow from Lamprey Drive and the adjacent backyards. Runoff is directed south in curb/gutter in to a proposed Type “R” inlet in the NW corner of Fontaine Boulevard and Lamprey Drive at Design Point 34. See the appendix for detailed calculations

Basin C16.35
Basins 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. See the appendix for detailed calculations

Basin C16.36
Basins C16.36 consists of flow from residential development and Pond C5. Runoff is directly tributary to Pond C5. See the appendix for detailed calculations

Basin C17.1
Basin C17.1 consists of residential development located in Weiser and Matta Drives. Runoff is directed northwest in curb/gutter to Design Point 38 to a proposed Type “R” inlet in Matta Drive. The peak developed flow from this basin is 5.9cfs and 13.2cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin C17.1a
Basin C17.1a consists of residential development located in Weiser, Pigeon, and Aliso Drives. Runoff is directed north in curb/gutter to Design Point 28 to a proposed Type "R" inlet in Weiser Drive. The peak developed flow from this basin is 5.3cfs and 11.8cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin C17.2
Basin C17.2 consists of residential development located in Chaplin, Pigeon, Aliso, and Matta Drives. Runoff is directed north in curb/gutter to Design Point 39 to a proposed Type "R" inlet in Matta Drive. The peak developed flow from this basin is 8.6cfs and 19.1cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin C17.3
Basin C17.3 consists of residential development located in Lamine and Matta Drives. Runoff is directed north in curb/gutter to Design Point 40 to a proposed Type "R" inlet in Lamine Drive. The peak developed flow from this basin is 4.5cfs and 10.0cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin C17.4
Basin C17.4 consists of residential development located in Matta Drive. Runoff is directed west in curb/gutter to Design Point 40 to a proposed Type "R" inlet in Lamine Drive. The peak developed flow from this basin is 3.2cfs and 7.1cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin C17.5
Basin C17.5 consists of residential development and Fontaine Boulevard. Runoff is directed west in curb/gutter to Design Point 40 to a proposed Type "R" inlet in Lamine Drive. The peak developed flow from this basin is 6.7cfs and 22.1cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin C17.6
Basin C17.6 consists of residential development located in Lamine Drive. Runoff is directed north in curb/gutter to Design Point 41 to a proposed Type "R" inlet in Lamine Drive. The peak developed flow from this basin is 1.9cfs and 6.1cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin C17.7
Basin C17.7 consists of backyards of houses on Lamine Drive, East Tributary, and open space. Runoff is directed overland to the East Tributary. See Section 6.0 for water quality discussions for backyards. 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 proposed 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.

Basin C17.9
Basin C17.9 consists of existing residential development in Meadows 3 and Fontaine Boulevard. Runoff is directed in curb/gutter to Design Point 47 to a proposed Type "R" inlet in Fontaine Boulevard on the south side. The peak developed flow from this basin is 7.8cfs and 13.9cfs for the 5/100-year storm event. See the appendix for detailed calculations. This basin will flow north to existing Pond B1. Pond B1 has been sized for this flow per the Pioneer Landing Filing No. 2 Final drainage report.

Basin C17.10
Basin C17.10 consists of existing residential development in Pioneer Landing and Fontaine Boulevard. Runoff is directed in curb/gutter to Design Point 48 to a proposed Type "R" inlet in Fontaine Boulevard on the north side. The peak developed flow from this basin is 8.9cfs and 16.0cfs for the 5/100-year storm event. See the appendix for detailed calculations. This basin will flow north to existing Pond B1. Pond B1 has been sized for this flow per the Pioneer Landing Filing No. 2 final drainage report.

Basin D1.1 & D1.2
Basin D1.1 & D1.2 consists of residential development, Saco Drive, Weiser Drive, and Lamprey Drive. Runoff is directed south and west in curb/gutter to Design Point 50 to a proposed Type "R" inlet in Saco Drive on the south side. See the appendix for detailed calculations.

Basin D1.3
Basin D1.3 consists of residential development, Saco Drive, and Lamine Drive. Runoff is directed west and north in curb/gutter to Design Point 56 to a proposed Type "R" inlet in Lamine Drive. See the appendix for detailed calculations. The peak developed flow from this basin is 1.7cfs and 3.8cfs for the 5/100-year storm event.

Basin D1.4 & D1.5
Basin D1.4 & D1.5 consists of residential development. Runoff is directed south in curb/gutter to Design Point 52 in Chaplin Drive. See the appendix for detailed calculations.

Basin D1.6
Basin D1.6 consists of residential development, Yuba Drive, and Chaplin Drive. Runoff is directed south and west in curb/gutter to Design Point 53 to a proposed Type "R" inlet in Yuba Drive. See the appendix for detailed calculations. The peak developed flow from this basin is 8.4cfs and 18.7cfs for the 5/100-year storm event.

Basin D1.7
Basin D1.7 consists of residential development and Lamine Drive. Runoff is directed south in curb/gutter to Design Point 54 in Lamine Drive. See the appendix for detailed calculations. The peak developed flow from this basin is 7.0cfs and 15.5cfs for the 5/100-year storm event.

Basin D1.8
Basin D1.8 consists of residential development, Chaplin Drive, and Yuba Drive. Runoff is directed south and west in curb/gutter to Design Point 53 in Yuba Drive. See the appendix for detailed calculations. The peak developed flow from this basin is 3.2cfs and 7.1cfs for the 5/100-year storm event.

Basin D1.9 & D1.10
Basin D1.9 & D1.10 consists of residential development, Saco Drive, Lamine Drive, and Yuba Drive. Runoff is directed west in curb/gutter to Design Point 55 in Lamine Drive. See the appendix for detailed calculations.

Basin D1.11
Basin D1.11 consists of residential development and Lamine Drive. Runoff is directed south in curb/gutter to Design Point 56 to a proposed Type "R" inlet in Lamine Drive. See the appendix for detailed calculations. The peak developed flow from this basin is 2.6cfs and 5.8cfs for the 5/100-year storm event.

Basin D1.12
Basin D1.12 consists of residential development and Pond D2. Runoff is directly tributary to Pond D2. See the appendix for detailed calculations. The peak developed flow from this basin is 3.9 cfs and 15.4cfs for the 5/100-year storm event.

Basin D2.1 & D2.3
Basin D2.1 & D2.3 consists of residential development, open space under the electric easement, Vedder Drive, Lamprey Drive, and Lorson Boulevard. Runoff is directed south and west in curb/gutter to Design Point 59d in Lamprey Drive. See the appendix for detailed calculations.

Basin D2.2
Basin D2.2 consists of residential development and Tillamook Drive. Runoff is directed south in curb/gutter to Design Point 59a. See the appendix for detailed calculations. The peak developed flow from this basin is 2.1cfs and 4.7cfs for the 5/100-year storm event.

Basin D2.4
Basin D2.4 consists of residential development, Lorson Boulevard, and open space area under the electric easement. Runoff is directed west in curb/gutter in Lorson Boulevard to Design Point 59f. See the appendix for detailed calculations. The peak developed flow from this basin is 3.6cfs and 11.9cfs for the 5/100-year storm event.

Basin D2.5
Basin D2.5 consists of residential development, Skuna Drive, and Witcher Drive. Runoff is directed north in curb/gutter to Lorson Boulevard to Design Point 59f. See the appendix for detailed calculations. The peak developed flow from this basin is 8.8cfs and 19.6cfs for the 5/100-year storm event.

Basin D2.6 & D2.7
Basin D2.6 & D2.7 consists of residential development, Skuna Drive, Abita Drive, Witcher Drive, and Yocona Drive. Runoff is directed west in curb/gutter to Design Point 61 in Witcher Drive. See the appendix for detailed calculations.

Basin D2.8
Basin D2.8 consists of residential development, Volga Drive, and Witcher Drive. Runoff is directed west and south in curb/gutter to Design Point 62 in Volga Drive. The peak developed flow from this basin is 7.7cfs and 17.2cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin D2.9
Basin D2.9 consists of residential development, Volga Drive, Trappe Drive, and Witcher Drive. Runoff is directed west and north in curb/gutter to Design Point 60 in Trappe Drive. The peak developed flow from this basin is 5.5cfs and 12.2cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin D2.10
Basin D2.10 consists of Trappe Drive and adjacent areas. Runoff is directed north in curb/gutter in Trappe Drive to Design Point 64. See the appendix for detailed calculations. The peak developed flow from this basin is 1.9cfs and 5.0cfs for the 5/100-year storm event.

Basin D2.11
Basin D2.11 consists of runoff from Lorson Boulevard on the south side. Runoff is directed west in curb/gutter to Design Point 65a in Lorson Boulevard. The peak developed flow from this basin is 2.0cfs and 3.6cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin D2.12
Basin D2.12 consists of runoff from residential development and Lorson Boulevard on the south side. Runoff is directed west in curb/gutter to Design Point 60 in Trappe Drive. The peak developed flow from this basin is 5.4cfs and 12.0cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin D2.13
Basin D2.13 consists of runoff from Lorson Boulevard on the north side. Runoff is directed west in curb/gutter to Design Point 65b in Lorson Boulevard. The peak developed flow from this basin is 4.0cfs and 9.0cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin E1.1
Basin E1.1 consists of residential development and Skuna Drive. Runoff is directed south in curb/gutter in Skuna Drive to Design Point 66a. See the appendix for detailed calculations. The peak developed flow from this basin is 3.2cfs and 7.0cfs for the 5/100-year storm event.

Basin E1.2
Basin E1.2 consists of residential development, open space under the electric easement, Horton Drive, and Yocona Drive. Runoff is directed south in curb/gutter to Design Point 66d in Horton Drive. The peak developed flow from this basin is 7.3cfs and 16.1cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin E1.3
Basin E1.3 consists of residential development and open space under the electric easement. Runoff is directed south in a swale to Design Point 67b next to Trappe Drive. The peak developed flow from this basin is 4.7cfs and 21.7cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin E1.4
Basin E1.4 consists of residential development, Horton Drive, and Trappe Drive. Runoff is directed southwest in curb/gutter to Design Point 68 in Trappe Drive. The peak developed flow from this basin is 1.3cfs and 2.9cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin E1.5
Basin E1.5 consists of residential development, Horton Drive, Volga Drive, and Trappe Drive. Runoff is directed southwest in curb/gutter to Design Point 68 in Trappe Drive. The peak developed flow from this basin is 4.1cfs and 9.2cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin E1.6
Basin E1.6 consists of residential development and Trappe Drive. Runoff is directed north in curb/gutter to Design Point 69 in Trappe Drive. The peak developed flow from this basin is 4.5cfs and 10.1cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin E1.7
Basin E1.7 consists of residential development and Trappe Drive. Runoff is directed north in curb/gutter to Design Point 70 in Trappe Drive. See the appendix for detailed calculations. The peak developed flow from this basin is 4.7cfs and 13.3cfs for the 5/100-year storm event.

Basin E
Basin E is a 21-acre develop basin used to size Interim Pond E2. Per the full spectrum worksheets the peak developed flow is 28.0cfs and 62.0cfs.

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)

Design Point 1

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

Design Point 2
Design Point 2 is located at the south side of the intersection of Tolt Drive and Lamprey Drive.

This design point is sized to accommodate future flows from Basin C12 when it is developed as residential lots per the MDDP. A 30" RCP will be stubbed to this area to collect the flows. Future development will be required to construct storm sewer and inlets to collect runoff. Flow from upstream tributary areas (non-developed) are calculated in Basin C12-ex. Detention Pond C2 and Pond C3 will need to be partially constructed to reduce the runoff from Basin C12-ex to 24.9cfs and 41.8cfs in the 5 & 100-year storm events

(5-year storm)
Tributary Basins: C12 **Inlet/MH Number:** n/a
Upstream flowby: 0 **Total Street Flow:**

Flow Intercepted: 33.0 cfs **Flow Bypassed:**
Inlet Size: n/a – storm sewer installed in future development

Street Capacity:

(100-year storm)
Tributary Basins: C12 **Inlet/MH Number:** n/a
Upstream flowby: 0 **Total Street Flow:**

Flow Intercepted: 40.5 cfs **Flow Bypassed:** 33.0 cfs to Inlet 6b
Inlet Size: n/a – storm sewer installed in future development

Comments: Street slope = 0.9%, capacity = 39.3cfs (half street) is okay

Design Point 3
Design Point 3 is located at the SE corner of Yamhill Drive and Mumford Drive

(5-year storm)
Tributary Basins: C16.1 & C16.2 **Inlet/MH Number:** Inlet DP3
Upstream flowby: 0cfs **Total Street Flow:** 8.9cfs

Flow Intercepted: 8.9 cfs **Flow Bypassed:** 0
Inlet Size: 10' Type R Inlet, sump

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

(100-year storm)
Tributary Basins: C16.1 & C16.2 **Inlet/MH Number:** Inlet DP3
Upstream flowby: 0 **Total Street Flow:** 20.1cfs

Flow Intercepted: 20.1 cfs **Flow Bypassed:** 0
Inlet Size: 15' Type R Inlet, sump

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

Design Point 4
Design Point 4 is located at the NW corner of Yamhill and Mumford Drive

(5-year storm)
Tributary Basins: C16.5 - C16.10 **Inlet/MH Number:** Inlet DP4
Upstream flowby: 0 **Total Street Flow:** 10.47cfs

Flow Intercepted: 9.67 cfs **Flow Bypassed:** 0.8cfs to Inlet DP6
Inlet Size: 15' Type R Inlet, on-grade

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

(100-year storm)
Tributary Basins: C16.5 - C16.10 **Inlet/MH Number:** Inlet DP4
Upstream flowby: 0 **Total Street Flow:** 21.88cfs

Flow Intercepted: 14.98 cfs **Flow Bypassed:** 6.9cfs to Inlet DP6
Inlet Size: 15' Type R Inlet, on-grade

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

Design Point 5
Design Point 5 is located at the SW corner of Yamhill and Mumford Drives. This is a small drainage basin that needs a 5' Type R inlet to drain the curb. The total flow is 0.3cfs and 0.6cfs in the 5/100 year storm events. For this report the tributary basin wasn't calculated but will need to be verified in the final drainage report.

Design Point 6
Design Point 6 is located at the NW corner of Napa Drive and Mumford Drive

(5-year storm)
Tributary Basins: C16.10-C16.13 **Inlet/MH Number:** Inlet DP6a
Upstream flowby: 0.8cfs **Total Street Flow:** 12.82cfs

Flow Intercepted: 11.05cfs **Flow Bypassed:** 1.77cfs to Inlet DP6a
Inlet Size: 15' type R, on-grade

Street Capacity: Street slope = 2.5%, capacity = 14.1cfs, inlet needed

(100-year storm)
Tributary Basins: C16.10-C16.13 **Inlet/MH Number:** Inlet DP6a
Upstream flowby: 6.9cfs **Total Street Flow:** 32.62cfs

Flow Intercepted: 17.87cfs **Flow Bypassed:** 14.75cfs to Inlet DP6a
Inlet Size: 15' type R, on-grade

Street Capacity: Street slope = 2.5%, capacity = 40.7cfs (half street) is okay

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 6c
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 will be 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 on-site detention ponds to collect/detain runoff. Water quality for Basin C13 will be 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.

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.

(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 DP16
Inlet Size: 15' type R, sump

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

Design Point 7
Design Point 7 is a small drainage basin (C16.14) that needs a 5' Type R inlet 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
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

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

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

Design Point 9
Design Point 9 is located at the intersection of Shavers Drive and Lamprey Drive and is the flow in the storm sewer. The total flow in the storm sewer is 75.68cfs/105.3cfs in the 5/100 year storm events.

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:** 12.5cfs

Flow Intercepted: 12.5cfs **Flow Bypassed:** 8.5cfs 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: 8.5cfs **Total Street Flow:** 20.7cfs

Flow Intercepted: 20.7cfs **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: **Total Street Flow:** 6.9cfs

Flow Intercepted: 6.9cfs **Flow Bypassed:** 0
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: 0 **Total Street Flow:** 1.3cfs

Flow Intercepted: 1.3cfs **Flow Bypassed:**
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 105.5cfs/154.8cfs in the 5/100 year storm events.

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:** 8.0cfs

Flow Intercepted: 6.43cfs **Flow Bypassed:** 1.6cfs 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:** 16.65cfs

Flow Intercepted: 9.35cfs **Flow Bypassed:** 7.3cfs 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:** 8.78cfs

Flow Intercepted: 6.78cfs **Flow Bypassed:** 2.0cfs 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:** 18.28cfs

Flow Intercepted: 9.78cfs **Flow Bypassed:** 8.5cfs 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: 3.6cfs **Total Street Flow:** 8.35cfs

Flow Intercepted: 6.55cfs **Flow Bypassed:** 1.8cfs 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: 15.8cfs **Total Street Flow:** 25.48cfs

Flow Intercepted: 11.28cfs **Flow Bypassed:** 14.2cfs 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:** 7.05cfs

Flow Intercepted: 5.95cfs **Flow Bypassed:** 1.1cfs 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:** 14.44cfs

Flow Intercepted: 8.74cfs **Flow Bypassed:** 5.7cfs 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 25.69cfs/39.15cfs 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: 1.8cfs **Total Street Flow:** 12.8cfs

Flow Intercepted: 12.8cfs **Flow Bypassed:** 0
Inlet Size: 25' 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: 34.4cfs **Total Street Flow:** 57.3cfs

Flow Intercepted: 37.4cfs **Flow Bypassed:** 19.9cfs 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: 1.10cfs **Total Street Flow:** 3.9cfs

Flow Intercepted: 3.9cfs **Flow Bypassed:**
Inlet Size: 25' 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: 25.6cfs **Total Street Flow:** 31.6cfs

Flow Intercepted: 31.6cfs **Flow Bypassed:** 0
Inlet Size: 25' 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 147.9cfs 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 19a
Design Point 19a is located on the south side of Fontaine Boulevard east of Rockcastle Drive and is the outflow pipe for future pond C2.3 located under the electric line easement. This 30" RCP outflow pipe will also function as the outflow pipe for interim Pond C2.3. The total future pipe flow is 4.0cfs in the 5-year and 46.0cfs in the 100-year storm which conforms to the outflow rates in the Lorson Ranch East MDDP for Pond C2.3. Interim pipe flows are 17cfs in the 5-year and 57cfs in the 100-year storm. See section 6.1 for further discussion of interim pond C2.3

Design Point 19b
Design Point 19b is located on the north side of Fontaine Boulevard east of Rockcastle Drive and is the outflow pipe for future pond C2.2 located under the electric line easement. This 30" RCP outflow pipe will also function as the outflow pipe for interim Pond C2.2. The total allowed future pipe flow is 6.0cfs in the 5-year and 41.0cfs in the 100-year storm which conforms to the outflow rates in the Lorson Ranch East MDDP for Pond C2.2. Interim pipe flows are 17cfs in the 5-year and 44cfs in the 100-year storm. See section 6.1 for further discussion of interim pond C2.2

Design Point 19d
Design Point 19d is located at the SE of Fontaine Boulevard and Rockcastle Drive and is the emergency outflow conveyance pipe for future pond C2.3 as discussed in the MDDP. This 42" RCP outflow pipe will accept 70cfs in an emergency overflow event from Pond C2.3. The conveyance structure is a 20' CDOT Type R inlet with an 18" throat opening and 2' high concrete inflow apron from the spillway to the structure. The structure will be constructed/designed in Phase 2.

Design Point 19e
Design Point 19e is located at the NE of Fontaine Boulevard and Rockcastle Drive and is the emergency outflow conveyance pipe for future pond C2.2 as discussed in the MDDP. This 48" RCP outflow pipe will accept 130cfs in an emergency overflow event from Pond C2.2. The conveyance structure is a 25' CDOT Type R inlet with an 18" throat opening and 2' high concrete inflow apron from the spillway to the structure. The structure will be constructed/designed in Phase 2.

Design Point 20a
Design Point 20a is located on the south side of Fontaine Boulevard south of Rockcastle Drive and is the outflow pipe for future pond C1 located under the electric line easement. This 18" RCP outflow pipe will also function as the outflow pipe for interim Pond C1. The total allowed pipe flow is 4.0cfs in the 5-year and 18.0cfs in the 100-year which conforms to the outflow rates in the Lorson Ranch East MDDP for Pond C1

Design Point 3f
Design Point 3f is located on the north side of Fontaine Boulevard at Rockcastle Drive and is the outflow pipe for Ponds C2.2, Pond C2.3, and Pond C1. The total allowed pipe flow is 14.0cfs in the 5-year and 131.0cfs in the 100-year which conforms to the outflow rates in the Lorson Ranch East MDDP for the ponds. This section of storm sewer has been oversized to accept 200cfs in a 54" RCP to account for emergency overflow conveyances from the future ponds as detailed in the MDDP.

Design Point 19c
Design Point 19c is located north side of Fontaine Boulevard north of the electric substation.

(5-year storm)
Tributary Basins: C14.1, C14.2 **Inlet/MH Number:** Inlet DP19c
Upstream flowby: **Total Street Flow:** 5.6cfs

Flow Intercepted: 5.66cfs **Flow Bypassed:** 0.8cfs to Inlet DP33
Inlet Size: 10' type R**,** on-grade

Street Capacity: Street slope = 1.0%, capacity = 13.0cfs, okay

(100-year storm)
Tributary Basins: C14.1, C14.2 **Inlet/MH Number:** Inlet DP19c
Upstream flowby: **Total Street Flow:** 18.7 cfs

Flow Intercepted: 10.62cfs **Flow Bypassed:** 11.5cfs to Inlet DP33
Inlet Size: 10' type R, on-grade

Street Capacity: Street slope = 1.0%, capacity = 40cfs (half street) is okay

Design Point 20
Design Point 20 is located south side of Fontaine Boulevard north of the electric substation.

(5-year storm)
Tributary Basins: C15.8 **Inlet/MH Number:** Inlet DP20
Upstream flowby: **Total Street Flow:** 5.2cfs

Flow Intercepted: 5.2cfs **Flow Bypassed:**
Inlet Size: 15' type R, on-grade

Street Capacity: Street slope = 1.0%, capacity = 13.0cfs, okay

(100-year storm)
Tributary Basins: C15.8 **Inlet/MH Number:** Inlet DP20
Upstream flowby: **Total Street Flow:** 13.4cfs

Flow Intercepted: 11.3cfs **Flow Bypassed:** 2.1cfs to Inlet DP29
Inlet Size: 15' type R, on-grade

Street Capacity: Street slope = 1.0%, capacity = 40cfs (half street) is okay

Design Point 21
Design Point 21 is located west of the electric substation and is the surface runoff collected at a 30" end section (Line 22). The total flow in the storm sewer is from Basin C15.1+Basin C15.2 for a total flow of 13.55cfs/35.92cfs in the 5/100 year storm events in the storm sewer. The trapezoidal overflow swale between the lots is 1.0' deep, 5:1 side slopes, 10' wide bottom, 1% slope, velocity of 4.29cfs, and has a flow depth of 0.76 feet.

Design Point 23
Design Point 23 is located on Tillamook Drive north of Rockcastle Drive

(5-year storm)
Tributary Basins: C15.3&C15.4 **Inlet/MH Number:** Inlet DP23
Upstream flowby: **Total Street Flow:** 8.73cfs

Flow Intercepted: 8.43cfs **Flow Bypassed:** 0.3cfs to Inlet DP25
Inlet Size: 15' type R, on-grade

Street Capacity: Street slope = 1.1%, capacity = 9.2cfs, okay

(100-year storm)
Tributary Basins: C15.3&C15.4 **Inlet/MH Number:** Inlet DP23
Upstream flowby: **Total Street Flow:** 18.69cfs

Flow Intercepted: 13.69cfs **Flow Bypassed:** 5.0cfs to Inlet DP25
Inlet Size: 15' type R, on-grade

Street Capacity: Street slope = 1.1%, capacity = 38cfs (half street) is okay

Design Point 24
Design Point 24 is located in the south of Rockcastle Drive on Tillamook Drive and is the flow in the storm sewer. The total flow in the storm sewer is 20.64cfs/51.77cfs in the 5/100 year storm events.

Design Point 25
Design Point 25 is located on the south side of Rockcastle Drive east of Vedder Drive

(5-year storm)
Tributary Basins: C15.5,C15.6,C15.11, C15.12 **Inlet/MH Number:** Inlet DP25
Upstream flowby: 0.3cfs **Total Street Flow:** 16.0cfs

Flow Intercepted: 16.0cfs **Flow Bypassed:**
Inlet Size: 20' type R, sump

Street Capacity: Street slope = 1.0%, capacity = 9.0cfs, okay since half flow from each side

(100-year storm)
Tributary Basins: C15.5,C15.6,C15.11, C15.12 **Inlet/MH Number:** Inlet DP25
Upstream flowby: **Total Street Flow:** 38.9cfs

Flow Intercepted: 31.7cfs **Flow Bypassed:** 7.2cfs to Inlet DP26
Inlet Size: 20' type R, sump

Street Capacity: Street slope = 1.0%, capacity = 37.3cfs (half street) is okay since half flow from each side

Design Point 26
Design Point 26 is located on the north side of Rockcastle Drive east of Vedder Drive.

(5-year storm)
Tributary Basins: C15.7, C15.13 **Inlet/MH Number:** Inlet DP26
Upstream flowby: **Total Street Flow:** 8.4cfs

Flow Intercepted: 8.4cfs **Flow Bypassed:**
Inlet Size: 20' type R, sump

Street Capacity: Street slope = 1.0%, capacity = 9.0cfs, okay since half of flow is from each side.

(100-year storm)
Tributary Basins: C15.7, C15.13 **Inlet/MH Number:** Inlet DP26
Upstream flowby: 7.2cfs **Total Street Flow:** 26.0cfs

Flow Intercepted: 26.0cfs **Flow Bypassed:**
Inlet Size: 20' type R, sump

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

Design Point 27
Design Point 27 is located in the north of Design Point 26 and is the flow in the storm sewer. The total flow in the storm sewer is 38.11cfs/92.58cfs in the 5/100 year storm events. The trapezoidal overflow swale between the lots is 1.0' deep, 4:1 side slopes, 15' wide bottom, 1% slope, velocity of 5.41cfs, and has a flow depth of 1.0 feet.

Design Point 32
Design Point 32 is located north of Design Point 27 on Fontaine Boulevard and is the flow in the storm sewer. The total flow in the storm sewer is 23.2cfs/163.4cfs in the 5/100 year storm events.

Design Point 32a
Design Point 32a is located west of Design Point 32 on Fontaine Boulevard and is the flow in the storm sewer. The total flow in the storm sewer is 56.8cfs/252.9cfs in the 5/100 year storm events. This section of storm sewer has been oversized to 66" RCP to account for 200cfs from emergency overflow conveyances as detailed in the MDDP for future upstream ponds.

Design Point 28
Design Point 28 is located on Weiser Drive north of Pigeon Drive.

(5-year storm)
Tributary Basins: C17.1a **Inlet/MH Number:** Inlet DP28
Upstream flowby: **Total Street Flow:** 5.3cfs

Flow Intercepted: 5.3cfs **Flow Bypassed:**
Inlet Size: 15' type R, on-grade

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

(100-year storm)
Tributary Basins: C17.1a **Inlet/MH Number:** Inlet DP28
Upstream flowby: **Total Street Flow:** 11.56cfs

Flow Intercepted: 10.36cfs **Flow Bypassed:** 1.2cfs to Inlet DP38
Inlet Size: 15' type R, on-grade

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

Design Point 29
Design Point 29 is located SE corner of Fontaine Boulevard and Lamprey Drive.

(5-year storm)
Tributary Basins: C15.9, C15.10, C15.14 **Inlet/MH Number:** Inlet DP29
Upstream flowby: **Total Street Flow:** 8.6cfs

Flow Intercepted: 8.6cfs **Flow Bypassed:**
Inlet Size: 10' type R, sump

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

(100-year storm)
Tributary Basins: C15.9, C15.10, C15.14 **Inlet/MH Number:** Inlet DP29
Upstream flowby: 2.1cfs **Total Street Flow:** 20.8cfs

Flow Intercepted: 16.3cfs **Flow Bypassed:** 4.5cfs to Inlet DP30
Inlet Size: 10' type R, sump

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

Design Point 30
Design Point 30 is located on Lamprey Drive south of Fontaine Boulevard in the SW corner

(5-year storm)
Tributary Basins: C15.15 **Inlet/MH Number:** Inlet DP30
Upstream flowby: **Total Street Flow:** 7.2cfs

Flow Intercepted: 7.2cfs **Flow Bypassed:**
Inlet Size: 15' type R, sump

Street Capacity: Lamprey Drive Street slope = 1.8%, capacity = 18.4cfs, okay

(100-year storm)
Tributary Basins: C15.15 **Inlet/MH Number:** Inlet DP30
Upstream flowby: 4.5cfs **Total Street Flow:** 20.1cfs

Flow Intercepted: 20.1cfs **Flow Bypassed:**
Inlet Size: 15' type R, sump

Street Capacity: Lamprey Drive Street slope = 1.8%, capacity = 50.4cfs (half street) is okay

Design Point 31
Design Point 31 is located downstream of Design Point 30 in Fontaine Boulevard and is the flow in the storm sewer. The total flow in the storm sewer (Line 12) is a total flow of 19.36cfs/42.12cfs in the 5/100 year storm events in the storm sewer.

Design Point 33
Design Point 33 is located in the northeast corner of Lamprey Drive and Fontaine Boulevard.

(5-year storm)
Tributary Basins: C16.33, C14 **Inlet/MH Number:** Inlet DP33
Upstream flowby: 0.8cfs **Total Street Flow:** 8.2cfs

Flow Intercepted: 8.2cfs **Flow Bypassed:**
Inlet Size: 15' type R, sump

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

(100-year storm)
Tributary Basins: C16.33, C14 **Inlet/MH Number:** Inlet DP33
Upstream flowby: 11.5cfs **Total Street Flow:** 26.3cfs

Flow Intercepted: 20.3cfs **Flow Bypassed:** 6.0cfs to Inlet DP34
Inlet Size: 15' type R, sump

Street Capacity: Fontaine street slope = 1.0%, capacity = 40cfs (half street) is okay

Design Point 34
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 34a
Design Point 34a is located downstream of Design Point 34 in Fontaine Boulevard and is the flow in the storm sewer. The total flow in the storm sewer (Line 3) is a total flow of 74.7cfs/298.3cfs in the 5/100 year storm events in the storm sewer. This section of storm sewer has been oversized to 66" RCP to account for 200cfs from emergency overflow conveyances as detailed in the MDDP for future upstream ponds.

Design Point 35
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

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.

Design Point 37

Design Point 37 is located downstream of Design Point 36 in Fontaine Boulevard just west of Edisto Drive and is the flow in the storm sewer. The total flow in the storm sewer (Line 2) is 75cfs/300.0cfs in the 5/100 year storm events in the storm sewer. This section of storm sewer has been oversized to 66" RCP to account for 200cfs from emergency overflow conveyances as detailed in the MDDP for future upstream ponds.

Design Point 38

Design Point 38 is located in the SE corner of Chaplin Drive and Matta Drive.

(5-year storm)

Tributary Basins: C17.1 **Inlet/MH Number:** Inlet DP38
Upstream flowby: **Total Street Flow:** 5.9cfs

Flow Intercepted: 5.9cfs **Flow Bypassed:**
Inlet Size: 15' type R, on-grade

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

(100-year storm)

Tributary Basins: C17.1 **Inlet/MH Number:** Inlet DP39
Upstream flowby: 1.2cfs **Total Street Flow:** 14.43cfs

Flow Intercepted: 11.83cfs **Flow Bypassed:** 2.6cfs to Inlet DP39
Inlet Size: 15' type R, on-grade

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

Design Point 39
Design Point 39 is located in the SW corner of Chaplin Drive and Matta Drive.

(5-year storm)
Tributary Basins: C17.2 **Inlet/MH Number:** Inlet DP39
Upstream flowby: **Total Street Flow:** 8.61cfs

Flow Intercepted: 8.41cfs **Flow Bypassed:** 0.2cfs to Inlet DP40
Inlet Size: 15' type R, on-grade

Street Capacity: Street slope = 3.5%, capacity = 16.7cfs is okay

(100-year storm)
Tributary Basins: C17.2 **Inlet/MH Number:** Inlet DP39
Upstream flowby: 24.0cfs **Total Street Flow:** 21.53cfs

Flow Intercepted: 14.93cfs **Flow Bypassed:** 6.6cfs to Inlet DP40
Inlet Size: 15' type R, on-grade

Street Capacity: Street slope = 3.5%, capacity = 37.2cfs (half street) is okay

Design Point 40
Design Point 40 is located at a low point in the SE corner of Lamine Drive and Fontaine Boulevard.

(5-year storm)
Tributary Basins: C17.3-C17.5 **Inlet/MH Number:** Inlet DP40
Upstream flowby: 0.2cfs **Total Street Flow:** 12.9cfs

Flow Intercepted: 12.9cfs **Flow Bypassed:**
Inlet Size: 20' type R, sump

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

(100-year storm)
Tributary Basins: C17.3-C17.5 **Inlet/MH Number:** Inlet DP40
Upstream flowby: 6.6cfs **Total Street Flow:** 39.4cfs

Flow Intercepted: 26.0cfs **Flow Bypassed:** 13.4cfs to Inlet DP41
Inlet Size: 20' type R, sump

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

Design Point 41

Design Point 41 is located at a low point in the SW corner of Lamine Drive and Fontaine Boulevard.

(5-year storm)

Tributary Basins: C17.6 **Inlet/MH Number:** Inlet DP41
Upstream flowby: **Total Street Flow:** 2.0cfs

Flow Intercepted: 2.0cfs **Flow Bypassed:**
Inlet Size: 20' type R, sump

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

(100-year storm)

Tributary Basins: C17.6 **Inlet/MH Number:** Inlet DP41
Upstream flowby: 13.4cfs **Total Street Flow:** 19.3cfs

Flow Intercepted: 19.3cfs **Flow Bypassed:**
Inlet Size: 20' type R, sump

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

Design Point 42

Design Point 42 is located on the north side of Fontaine Boulevard just east of the East Tributary of JCC north of Lamine Drive.

(5-year storm)

Tributary Basins: C17.8 **Inlet/MH Number:** Inlet DP43
Upstream flowby: **Total Street Flow:** 3.2cfs

Flow Intercepted: 2.3cfs **Flow Bypassed:**
Inlet Size: 5' type R, sump

Street Capacity: Street slope = 1.0%, capacity = 13.0cfs, okay

(100-year storm)

Tributary Basins: C17.8 **Inlet/MH Number:** Inlet DP43
Upstream flowby: **Total Street Flow:** 7.2cfs

Flow Intercepted: 7.2cfs **Flow Bypassed:**
Inlet Size: 5' type R, sump

Street Capacity: Street slope = 1.0%, capacity = 40cfs (half street) is okay

Design Point 43

Design Point 43 is located downstream of Design Point 42 in Fontaine Boulevard just east of Lamine Drive and is the flow in the storm sewer. The total flow in the storm sewer (Line 33) is 27.33cfs/65.94cfs in the 5/100-year storm events in the storm sewer.

Design Point 44

Design Point 44 is located on the south side of Pond C5 and is the total storm sewer flow from the south into Pond C5. The flow into Pond C5 from the south is from (Line 1+Line 33) and is 102.5cfs/365.9cfs in the 5/100-year storm events in the storm sewer.

Design Point 45

Design Point 45 is the total developed flow into Pond C5. We did not use the flow rates from the storm sewer system as in other design points because the storm system flows used fixed release rates (no hydrographs used) from the upstream ponds which results in much larger flows than using the actual hydraulic model of the ponds/storm. Therefore, we used the flow amount from the Lorson Ranch East MDDP Hydraflow hydraulic model of the storm ponds and sewer system. The hydraflow model from the MDDP has not changed and is the best representation of the actual flow entering the Pond C5. The flow into Pond C5 is 167.5.0cfs/519.1cfs in the 5/100-year storm events in the storm sewer.

Design Point 46

Design Point 46 is the total developed flow from Pond C5 into the East Tributary. This flow rate was taken from the Lorson Ranch East MDDP Hydraflow hydraulic model of the storm ponds and sewer system. The hydraflow model from the MDDP has not changed and is the best representation of the actual flow from Pond C5. The outflow from Pond C5 is 126.3cfs/453.2.0cfs in the 5/100-year storm events in the storm sewer (Design Pt 7c in MDDP). The pre-developed flows entering the East Tributary at this design point are 141.0cfs/458.0cfs in the 5/100-year storm events (Design Pt 2 in MDDP). The developed discharge is slightly below pre-developed conditions which conforms to the design criteria (90% of pre-developed) set by El Paso County. The MDDP has modeled the entire “C” Basin and Pond C5 and shows the time to peak of Pond C5 to be 30 minutes which matches the existing conditions time of concentration closely as shown on the hydrograph of Pond C5. The Hydrograph of Pond C5 peaks at 420cfs around 30 minutes and then falls off sharply to around 100cfs at 60 minutes. At 60 minutes the upstream detention ponds enter Pond C5 and level the release rate off until around 2.5 hours where the flows are reduced to around 30cfs. The pond is nearly empty at around 6 hours. According to the Kiowa Engineering DBPS, the peak flows in the East Tributary at this outfall point occur at around 6 hours at which our outfall rates are minimal and will have little to no impact to the East Tributary flows. See Pond C5 for additional information and the Lorson East MDDP. See Section 6.1 for interim flows at this design point.

Design Point 47

Design Point 47 is located in a low point in Fontaine Boulevard west of the East Tributary on the south side of Fontaine. Flows from this basin have already been included in the pond modeling (including water quality) of Pond B1 which was constructed as part of Pioneer Landing 2.

(5-year storm)

Tributary Basins: C17.9 **Inlet/MH Number:** Inlet DP47
Upstream flowby: **Total Street Flow:** 7.8cfs

Flow Intercepted: 7.8cfs **Flow Bypassed:**
Inlet Size: 10' type R, sump

Street Capacity: Street slope = 0.6%, capacity = 10.4cfs, okay

(100-year storm)

Tributary Basins: C17.9 **Inlet/MH Number:** Inlet DP47
Upstream flowby: **Total Street Flow:** 13.9cfs

Flow Intercepted: 13.9cfs **Flow Bypassed:**
Inlet Size: 10' type R, sump

Street Capacity: Street slope = 0.6%, capacity = 31.2cfs (half street) is okay

Design Point 48

Design Point 48 is located in a low point in Fontaine Boulevard west of the East Tributary on the north side of Fontaine. Flows from this basin have already been included in the pond modeling (including water quality) of Pond B1 which was constructed as part of Pioneer Landing 2.

(5-year storm)

Tributary Basins: C17.10 **Inlet/MH Number:** Inlet DP48
Upstream flowby: **Total Street Flow:** 8.9cfs

Flow Intercepted: 8.9cfs **Flow Bypassed:**
Inlet Size: 10' type R, sump

Street Capacity: Street slope = 0.6%, capacity = 10.4cfs, okay

(100-year storm)

Tributary Basins: C17.10 **Inlet/MH Number:** Inlet DP48
Upstream flowby: **Total Street Flow:** 16.0cfs

Flow Intercepted: 16.0cfs **Flow Bypassed:**
Inlet Size: 10' type R, sump

Street Capacity: Street slope = 0.6%, capacity = 31.2cfs (half street) is okay

Design Point 49

Design Point 49 is located northeast of Design Point 48 in Fontaine Boulevard and is the total flow from the Fontaine Boulevard storm sewer system entering Pond B1. According to the final drainage report for Fontaine Boulevard prepared by Pentacor Engineering in 2006 the flow in the existing 42" storm sewer (P-40) is 37.6cfs in the 5-year and 62.1cfs in the 100 year storm events. The 42" has a constructed slope of 0.4%. When combined with the flow from the two new inlets the total pipe flow will be 54.3cfs in the 5-year and 92.0cfs in the 100-year storm events downstream to Pond B1. The proposed storm sewer into Pond B1 will be a 48" RCP at 0.5% slope with a capacity of 99cfs.

Design Point 50

Design Point 50 is located on the south side of Saco Drive just east of Willapa Drive.

(5-year storm)

Tributary Basins: D1.1 & D1.2 **Inlet/MH Number:** Inlet DP50
Upstream flowby: **Total Street Flow:** 10.01cfs

Flow Intercepted: 7.34cfs **Flow Bypassed:** 2.7cfs to DP56
Inlet Size: 10' type R, on-grade

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

(100-year storm)

Tributary Basins: D1.1 & D1.2 **Inlet/MH Number:** Inlet DP50
Upstream flowby: **Total Street Flow:** 22.27cfs

Flow Intercepted: 10.77cfs **Flow Bypassed:** 11.5cfs to DP56
Inlet Size: 10' type R, on-grade

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

Design Point 51

Design Point 51 is located downstream of Design Point 50 in Saco Drive just west of Willapa Drive and is the flow in the storm sewer. The total flow in the storm sewer (Line 3) is 14.68cfs/21.60cfs in the 5/100-year storm events in the storm sewer.

Design Point 52
Design Point 52 is located on the east side of Chaplin Drive north of Yuba Drive

(5-year storm)
Tributary Basins: D1.4+D1.5 **Inlet/MH Number:** Inlet DP52
Upstream flowby: **Total Street Flow:** 15.44cfs

Flow Intercepted: 12.44cfs **Flow Bypassed:** 3.0cfs to DP53
Inlet Size: 15' type R, on-grade

Street Capacity: Street slope = 3.8%, capacity = 16.9cfs is okay

(100-year storm)
Tributary Basins: D1.4+D1.5 **Inlet/MH Number:** Inlet DP52
Upstream flowby: **Total Street Flow:** 34.7cfs

Flow Intercepted: 18.8cfs **Flow Bypassed:** 15.9cfs to DP53
Inlet Size: 15' type R, on-grade

Street Capacity: Street slope = 3.8%, capacity = 36cfs (half street) is okay

Design Point 53
Design Point 53 is located at Chaplin Drive and Yuba Drive on the north side of the street.

(5-year storm)
Tributary Basins: D1.6, D1.8 **Inlet/MH Number:** Inlet DP53
Upstream flowby: 3.0cfs **Total Street Flow:** 14.65cfs

Flow Intercepted: 14.05cfs **Flow Bypassed:** 0.6cfs to DP-55
Inlet Size: 20' type R, on-grade

Street Capacity: Street slope = 3.5%, capacity = 16.7cfs, okay

(100-year storm)
Tributary Basins: D1.6, D1.8 **Inlet/MH Number:** Inlet DP53
Upstream flowby: 15.9cfs **Total Street Flow:** 41.47cfs

Flow Intercepted: 25.97cfs **Flow Bypassed:** 15.50cfs to DP55
Inlet Size: 20' type R, on-grade

Street Capacity: Street slope = 3.5%, capacity = 37.2cfs (half street) flow tops crown

Design Point 54
Design Point 54 is located at Lamine Drive and Yuba Drive on the northeast corner

(5-year storm)
Tributary Basins: D1.7 **Inlet/MH Number:** Inlet DP54
Upstream flowby: **Total Street Flow:** 7.0cfs

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

Street Capacity: Street slope = 1.2%, capacity = 10 cfs, okay

(100-year storm)
Tributary Basins: D1.7 **Inlet/MH Number:** Inlet DP54
Upstream flowby: **Total Street Flow:** 15.5cfs

Flow Intercepted: 12.6cfs **Flow Bypassed:** 3.0cfs to DP55
Inlet Size: 15' type R, on-grade

Street Capacity: Street slope = 1.2%, capacity = 37cfs (half street)

Design Point 55a
Design Point 55a is located on the north side of Saco Drive west of Willapa Drive

(5-year storm)
Tributary Basins: D1.10 **Inlet/MH Number:** Inlet DP55a
Upstream flowby: **Total Street Flow:** 10.18cfs

Flow Intercepted: 7.38cfs **Flow Bypassed:** 2.8cfs to DP55
Inlet Size: 10' type R, on-grade

Street Capacity: Street slope = 2.5%, capacity = 14.0cfs, okay

(100-year storm)
Tributary Basins: D1.10 **Inlet/MH Number:** Inlet DP55a
Upstream flowby: **Total Street Flow:** 22.63cfs

Flow Intercepted: 10.83cfs **Flow Bypassed:** 11.80cfs to DP55
Inlet Size: 10' type R, on-grade

Street Capacity: Street slope = 2.5%, capacity = 40.0cfs (half street) is okay

Design Point 55

Design Point 55 is located on the east side of Lamine Drive at a low point south of Yuba Drive.

(5-year storm)

Tributary Basins: D1.9 **Inlet/MH Number:** Inlet DP55
Upstream flowby: 6.4cfs **Total Street Flow:** 7.8cfs

Flow Intercepted: 7.5cfs **Flow Bypassed:**
Inlet Size: 25' type R, sump

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

(100-year storm)

Tributary Basins: D1.9 **Inlet/MH Number:** Inlet DP55
Upstream flowby: 30.3cfs **Total Street Flow:** 40.0cfs

Flow Intercepted: 31.7cfs **Flow Bypassed:** 8.3cfs to Inlet DP56
Inlet Size: 25' type R, sump

Street Capacity: Street slope = 1.9%, capacity = 45cfs (half street) is okay

Design Point 56

Design Point 56 is located on the west side of Lamine Drive at a low point south of Yuba Drive..

(5-year storm)

Tributary Basins: D1.11 **Inlet/MH Number:** Inlet DP56
Upstream flowby: 1.71cfs **Total Street Flow:** 7.2cfs

Flow Intercepted: 7.2cfs **Flow Bypassed:**
Inlet Size: 25' type R, sump

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

(100-year storm)

Tributary Basins: D1.11 **Inlet/MH Number:** Inlet DP56
Upstream flowby: 19.8cfs **Total Street Flow:** 29.7cfs

Flow Intercepted: 29.7cfs **Flow Bypassed:**
Inlet Size: 25' type R, sump

Street Capacity: Street slope = 1.9%, capacity = 45cfs (half street) is okay

The trapezoidal overflow swale between the lots is sized for 150cfs, 2.0' deep, 4:1 side slopes, 8' wide bottom, 2% slope, velocity of 8.38cfs, and has a flow depth of 1.34 feet.

Design Point 57

Design Point 57 is located in the SW corner of Lamine Drive and Saco Drive in the knuckle and is the flow in the pipe to Pond D2. The total pipe flow is 63.6cfs/121.1cfs in the 5/100 year storm events.

Design Point 58

Design Point 58 is the total flow into Pond D2. The total pond inflow is 118.2cfs/277.1cfs in the 5/100-year storm events taken from the full spectrum worksheets.

Design Point 58a
Design Point 58a flow is from Pond D2 which is modeled in the full spectrum excel worksheets. The release rates are directly from the spreadsheet and are less than the existing. There are no ponds in series for this basin. The total pond out flow is 12.5cfs/132.cfs in the 5/100-year storm events from the full spectrum excel worksheets and complies with discharge similar to existing conditions. See Pond D2 for more information.

Design Point 59a
Design Point 59a is located at the south end of Tillamook Drive in a cul-de-sac

(5-year storm)
Tributary Basins: D2.2 **Inlet/MH Number:** Inlet DP59a
Upstream flowby: **Total Street Flow:** 2.2cfs

Flow Intercepted: 2.2cfs **Flow Bypassed:**
Inlet Size: 5' type R, sump

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

(100-year storm)
Tributary Basins: D2.2 **Inlet/MH Number:** Inlet DP59a
Upstream flowby: **Total Street Flow:** 4.8cfs

Flow Intercepted: 4.8cfs **Flow Bypassed:**
Inlet Size: 5' type R, sump

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

Design Point 59b
Design Point 59b is located south of Lorson Boulevard under the electric easement and is the flow in the pipe from future Basin D1. The total future pipe flow (Line 27) is 23cfs/60cfs in the 5/100-year storm events.

Design Point 59c
Design Point 59c is located east of Lorson Boulevard and Lamprey Drive and is the flow in the pipe to Design Point 59e. The total pipe flow is 25.7cfs/75.4cfs in the 5/100 year storm events.

Design Point 59d
Design Point 59d is located in the northeast corner of Lorson Boulevard and Lamprey Drive.

(5-year storm)
Tributary Basins: D2.1 & D2.3 **Inlet/MH Number:** Inlet DP59d
Upstream flowby: **Total Street Flow:** 10.7cfs

Flow Intercepted: 10.7cfs **Flow Bypassed:**
Inlet Size: 15' type R, sump

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

(100-year storm)
Tributary Basins: D2.1 & D2.3 **Inlet/MH Number:** Inlet DP59d
Upstream flowby: **Total Street Flow:** 23.7cfs

Flow Intercepted: 20.3cfs **Flow Bypassed:** 3.7cfs to Inlet DP65b
Inlet Size: 15' type R, sump

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

Design Point 59e
Design Point 59e is located west of Lorson Boulevard and Lamprey Drive and is the flow in the pipe (Line 24) in Lorson Boulevard flowing west to Trappe Drive. The total pipe flow is 36.4cfs/93.2cfs in the 5/100 year storm events.

Design Point 59f
Design Point 59f is located at the SW corner of Lorson Boulevard and Skuna Drive.

(5-year storm)
Tributary Basins: D2.4 & D2.5 **Inlet/MH Number:** Inlet DP59f
Upstream flowby: **Total Street Flow:** 13.68cfs

Flow Intercepted: 8.58cfs **Flow Bypassed:** 5.1cfs to Inlet DP60
Inlet Size: 10' type R, on-grade

Street Capacity: Street slope = 1.9%, capacity Lorson Blvd.= 18.4cfs, okay

(100-year storm)
Tributary Basins: D2.4 & D2.5 **Inlet/MH Number:** Inlet DP59f
Upstream flowby: **Total Street Flow:** 30.47cfs

Flow Intercepted: 12.37cfs **Flow Bypassed:** 18.1cfs to Inlet DP60
Inlet Size: 10' type R, on-grade

Street Capacity: Street slope = 1.9%, capacity Lorson Blvd. = 50.4cfs (half street) is okay

Design Point 59g

Design Point 59g is located on Lorson Boulevard west of Skuna Drive and is the flow in the pipe (Line 23) in Lorson Boulevard flowing west to Trappe Drive. The total pipe flow is 45.0cfs/104.2cfs in the 5/100 year storm events.

Design Point 60

Design Point 60 is located in the SE corner of Lorson Boulevard and Trappe Drive

(5-year storm)

Tributary Basins: D2.9, D2.12 **Inlet/MH Number:** Inlet DP60
Upstream flowby: 6.1cfs **Total Street Flow:** 15.8cfs

Flow Intercepted: 15.8cfs **Flow Bypassed:**
Inlet Size: 25' type R, sump

Street Capacity: Street slope = 1.8%, capacity = 18.4cfs, okay

(100-year storm)

Tributary Basins: D2.9, D2.12 **Inlet/MH Number:** Inlet DP60
Upstream flowby: 32.1cfs **Total Street Flow:** 55.9cfs

Flow Intercepted: 31.7cfs **Flow Bypassed:** 24.2cfs to Design Point 64
Inlet Size: 25' type R, sump

Street Capacity: Street slope = 1.8%, capacity = 50.4cfs (half street) is okay since half is from Lorson Blvd and half is from Trappe Drive.

Design Point 61

Design Point 61 is located on Witcher Drive just west of Yocona Drive.

(5-year storm)

Tributary Basins: D2.6 & D2.7 **Inlet/MH Number:** Inlet DP61
Upstream flowby: **Total Street Flow:** 10.57cfs

Flow Intercepted: 7.57cfs **Flow Bypassed:** 3.0cfs to Design Point 62
Inlet Size: 10' type R, on-grade

Street Capacity: Street slope = 3.1%, capacity = 15.5cfs, okay

(100-year storm)

Tributary Basins: D2.6 & D2.7 **Inlet/MH Number:** Inlet DP61
Upstream flowby: **Total Street Flow:** 23.68cfs

Flow Intercepted: 11.07cfs **Flow Bypassed:** 12.6cfs to Design Point 62
Inlet Size: 10' type R, on-grade

Street Capacity: Street slope = 3.1%, capacity = 39.0cfs (half street) is okay

Design Point 62
Design Point 62 is located on the east side of Volga Drive at Magothy Drive.

(5-year storm)
Tributary Basins: D2.8 **Inlet/MH Number:** Inlet DP62
Upstream flowby: **Total Street Flow:** 10.1cfs

Flow Intercepted: 10.1cfs **Flow Bypassed:**
Inlet Size: 10' type R, sump

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

(100-year storm)
Tributary Basins: D2.8 **Inlet/MH Number:** Inlet DP62
Upstream flowby: **Total Street Flow:** 30.3cfs

Flow Intercepted: 16.3cfs **Flow Bypassed:** 14.0cfs to Design Point 60
Inlet Size: 10' type R, sump

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

Design Point 63
Design Point 63 is located in the SE corner of Magothy Drive and Volga Drive and is the flow in the pipe (Line 35) in Magothy Drive flowing west to Trappe Drive. The total pipe flow is 18.63cfs/27.38cfs in the 5/100 year storm events.

Design Point 64
Design Point 64 is located in the SW corner of Lorson Boulevard and Trappe Drive

(5-year storm)
Tributary Basins: D2.10 **Inlet/MH Number:** Inlet DP64
Upstream flowby: **Total Street Flow:** 3.2cfs

Flow Intercepted: 3.0cfs **Flow Bypassed:**
Inlet Size: 25' type R, sump

Street Capacity: Street slope = 1.8%, capacity = 18.4cfs, okay

(100-year storm)
Tributary Basins: D2.10 **Inlet/MH Number:** Inlet DP64
Upstream flowby: 24.2cfs **Total Street Flow:** 29.2cfs

Flow Intercepted: 29.2cfs **Flow Bypassed:**
Inlet Size: 25' type R, sump

Street Capacity: Street slope = 1.8%, capacity = 50.4cfs, okay

Design Point 65

Design Point 65 is located at the SW corner of Lorson Boulevard and Trappe Drive and is the flow in the pipe north (Line 30) to Design Point 65c. The total pipe flow is 37.54cfs/88.31cfs in the 5/100 year storm events.

Design Point 65a

Design Point 65a is located on the south side of Lorson Boulevard west of Trappe Drive

(5-year storm)

Tributary Basins: D2.11 **Inlet/MH Number:** Inlet DP65a
Upstream flowby: **Total Street Flow:** 2.0cfs

Flow Intercepted: 2.0cfs **Flow Bypassed:**
Inlet Size: 5' type R, sump

Street Capacity: Street slope = 0.66%, capacity = 10.6 cfs, okay

(100-year storm)

Tributary Basins: D2.11 **Inlet/MH Number:** Inlet DP65a
Upstream flowby: **Total Street Flow:** 4.0cfs

Flow Intercepted: 4.0cfs **Flow Bypassed:**
Inlet Size: 5' type R, sump

Street Capacity: Street slope = 0.66%, capacity = 32.1cfs (half street) is okay

Design Point 65b

Design Point 65b is located on the north side of Lorson Boulevard west of Trappe Drive

(5-year storm)

Tributary Basins: D2.13 **Inlet/MH Number:** Inlet DP65b
Upstream flowby: **Total Street Flow:** 4.2cfs

Flow Intercepted: 4.2cfs **Flow Bypassed:**
Inlet Size: 5' type R, sump

Street Capacity: Street slope = 0.66%, capacity = 10.6cfs, okay

(100-year storm)

Tributary Basins: D2.13 **Inlet/MH Number:** Inlet DP65b
Upstream flowby: 3.7cfs **Total Street Flow:** 12.7cfs

Flow Intercepted: 12.7cfs **Flow Bypassed:**
Inlet Size: 5' type R, sump

Street Capacity: Street slope = 0.66%, capacity = 32.1cfs (half street) is okay

Design Point 65c
Design Point 65c is located west of Lorson Boulevard and Trappe Drive and is the flow in the pipe (Line 17) north to Pond D2. The total pipe flow is 88.3cfs/174.2cfs in the 5/100 year storm events.

Design Point 66a
Design Point 66a is located at the south end of Skuna Drive in the cul-de-sac

(5-year storm)
Tributary Basins: E1.1 **Inlet/MH Number:** Inlet DP66a
Upstream flowby: **Total Street Flow:** 3.3cfs

Flow Intercepted: 3.3cfs **Flow Bypassed:**
Inlet Size: 5' type R, sump

Street Capacity: Street slope = 2.5%, capacity = 14cfs, okay

(100-year storm)
Tributary Basins: E1.1 **Inlet/MH Number:** Inlet DP66a
Upstream flowby: **Total Street Flow:** 7.3cfs

Flow Intercepted: 7.3cfs **Flow Bypassed:**
Inlet Size: 5' type R, sump

Street Capacity: Street slope = 2.5%, capacity = 40cfs (half street) is okay

Design Point 66b
Design Point 66b is located east of Horton Drive/Yocona Drive knuckle and is the flow in the pipe from future Pond E1. The total future pipe flow (Line 15) is allowed to be 12.8cfs in the 5-year and 36.3cfs in the 100-year storm events. The pipe flow is greater than the release rate of Pond E1 as detailed in the Lorson Ranch East MDDP so the pipes will be sized adequately for any possible future flows.

Design Point 66c
Design Point 66c is located east of the Horton Drive/Yocona Drive knuckle and is the flow in the pipe as it discharges into a swale flowing west to Trappe Drive. The total pipe flow (Line 14) is 16.11cfs/43.59cfs in the 5/100-year storm events.

Design Point 66d
Design Point 66d is located on the south side of the Horton Drive/Volga Drive intersection.

(5-year storm)
Tributary Basins: E1.2 **Inlet/MH Number:** Inlet DP66d
Upstream flowby: **Total Street Flow:** 7.57cfs

Flow Intercepted: 6.27fs **Flow Bypassed:** 1.3cfs to Design Pt. 68
Inlet Size: 10' type R, on-grade

Street Capacity: Street slope = 2.5%, capacity = 14.0cfs, okay

(100-year storm)
Tributary Basins: E1.2 **Inlet/MH Number:** Inlet DP66d
Upstream flowby: **Total Street Flow:** 16.78cfs

Flow Intercepted: 9.48cfs **Flow Bypassed:** 7.3cfs to Design Pt. 68
Inlet Size: 10' type R, on-grade

Street Capacity: Street slope = 2.5%, capacity = 40.7cfs (half street) is okay

Design Point 67a
Design Point 67a is located at the east end of Trappe Drive on the south side at the electric easement. Flow at this design point is from Basin E2-ex which includes offsite flows. A 30" storm sewer (Line 13) will extend to the ROW where the flow will be collected in double Type D inlets and swale. The total flow is 26.0cfs/92cfs in the 5/100-year storm events to the end section. The storm sewer system will collect 26.0cfs and 70.0cfs in the 5/100-year storm events and 22.0cfs in the 100-year storm event will flow to Trappe Drive and then west to Design Point 70 in the street. The diversion swale at this design point is 3.0' deep, 4:1 side slopes, 0' wide bottom, 2.0% slope, velocity of 8.08cfs, and has a flow depth of 1.88 feet.

Design Point 67b
Design Point 67b is located on the east end of Trappe Drive on the north side. Flow at this design point is from Basin E1.3 and Design Point 66c. A 30" storm (Line 8) will collect this area and convey it to Trappe Drive. The total flow at the end section is 20.0cfs/64.10cfs in the 5/100 year storm events. The storm sewer system will collect 20.0cfs and 42.0cfs in the 5/100-year storm events and 22.1cfs in the 100-year storm event will flow to Trappe Drive and then west to Design Point 68 in the street. The Basin E1.3 swale is sized for 210cfs which is the future emergency overflow from Pond E1. The swale is 3.0' deep, 4:1 side slopes, 0' wide bottom, 2.5% slope, velocity of 10.1cfs, and has a flow depth of 2.3 feet.

Design Point 68
Design Point 68 is located in the NE corner of Trappe Drive and Horton Drive.

(5-year storm)
Tributary Basins: E1.4 & E1.5 **Inlet/MH Number:** Inlet DP68
Upstream flowby: 1.3cfs **Total Street Flow:** 6.7cfs

Flow Intercepted: 6.7cfs **Flow Bypassed:**
Inlet Size: 15' type R, on-grade

Street Capacity: Street slope = 1.15%, capacity = 14.0cfs, okay

(100-year storm)
Tributary Basins: E1.4 & E1.5 **Inlet/MH Number:** Inlet DP68
Upstream flowby: 29.4cfs **Total Street Flow:** 41.7cfs

Flow Intercepted: 19.88cfs **Flow Bypassed:** 21.8cfs to Design Pt. 69
Inlet Size: 15' type R, on-grade

Street Capacity: Street slope = 1.15%, capacity = 43cfs (half street) is okay

Design Point 69
Design Point 69 is located on the east side of Trappe Drive south of Magothy Drive at a low point.

(5-year storm)
Tributary Basins: E1.6 **Inlet/MH Number:** Inlet DP69
Upstream flowby: **Total Street Flow:** 5.7cfs

Flow Intercepted: 5.7cfs **Flow Bypassed:**
Inlet Size: 30' type R, sump

Street Capacity: Street slope = 1.15%, capacity = 14.0cfs, okay

(100-year storm)
Tributary Basins: E1.6 **Inlet/MH Number:** Inlet DP69
Upstream flowby: 21.8cfs **Total Street Flow:** 32.2cfs

Flow Intercepted: 32.2cfs **Flow Bypassed:**
Inlet Size: 30' type R, sump

Street Capacity: Street slope = 1.15%, capacity = 43cfs (half street) is okay

Design Point 70

Design Point 70 is located on the west side of Trappe Drive south of Magothy Drive at a low point.

(5-year storm)

Tributary Basins: E1.7 **Inlet/MH Number:** Inlet DP70
Upstream flowby: **Total Street Flow:** 4.9cfs

Flow Intercepted: 4.9cfs **Flow Bypassed:**
Inlet Size: 30' type R, sump

Street Capacity: Street slope = 1.15%, capacity = 14.0cfs, okay

(100-year storm)

Tributary Basins: E1.7 **Inlet/MH Number:** Inlet DP70
Upstream flowby: 22.0cfs **Total Street Flow:** 35.7cfs

Flow Intercepted: 35.7cfs **Flow Bypassed:**
Inlet Size: 30' type R, sump

Street Capacity: Street slope = 1.15%, capacity = 43.0cfs (half street)

Design Point 71

Design Point 71 is located East of Trappe Drive and is the flow into Interim Pond E2. The total pipe flow (Line1) is 69.2cfs/209.3cfs in the 5/100 year storm events. Interim Pond E2 will need to be updated in the future as additional tributary areas are developed. This pond is only to treat developed runoff for water quality. Flows that exceed the water quality outlet capacity will flow over a trapezoid spillway to the south and enter existing swale that drain to the East Tributary. See Section 6.1 for interim flow rartes at the East Tributary for downstream flows entering the East Tributary at Design Point 73.

Design Point 72

Design Point 72 has been added so the ultimate storm sewer outfall for Future Pond E2 can be referenced. The size of the storm sewer is 48" and corresponds to Design Pt 14a in the MDDP

Design Point 73

Design Point 73 is located downstream of Interim Pond E2 next to the East Tributary on an existing natural swale draining to the East Tributary. The future ultimate developed flows at this design point are 97.0cfs/266.0cfs in the 5/100-year storm events (Design Pt 14a in MDDP) when all upstream areas are developed and future Pond E2 is built. However, we are in an interim condition since we are not constructing future Pond E2 yet and the interim flows are 120cfs/280cfs in the 5/100-year storm events based on upstream development and Phase 2 Pond E1. See Appendix F for additional calculations. The interim flows are near pre-development flows of (100cfs/280cfs) as calculated in the MDDP. The 5-year flows will be slightly less since we did not model the reduction in flow from the WQ elevation of Interim Pond E2 to the spillway from elevation 5696.20 to 5698.00. There are negligible negative impacts downstream due to the interim ponds in the "E" basins.

Add statement that the inlets in Fontaine Blvd. will be constructed at the ultimate 4-lane curb locations and elevations so that reconstruction of the inlets will not be necessary when Fontaine is widened.

6.0 DETENTION AND WATER QUALITY PONDS

Detention and Storm Water Quality for Lorson Ranch East is required per El Paso County criteria. We have implemented the Full Spectrum approach for detention for Lorson Ranch East per the Denver Urban Drainage Districts specifications. There are two permanent full spectrum ponds proposed for this development. The two full spectrum ponds (Pond C5 and Pond D2) and one interim pond (Interim Pond E2) incorporate storm water quality features and comply with the Lorson Ranch East MDDP. In addition several detention ponds proposed under the electric transmission line easement to be constructed in Phase 2. Phase 2 ponds are sized and built to handle future developed flows east of the electric easement but do not have full spectrum outlet structures or water quality features at this time. The Phase 2 ponds are to reduce the upstream existing runoff from large existing tributary basins flowing overland west onto this site. As development progresses east of the powerline easement Phase 2 ponds will require full spectrum outlet structures to be built. See Section 6.1 for Phase 2 Detention Pond Discussions and their impacts to the downstream flows entering the East Tributary.

Full Spectrum Pond Construction Requirements

Design calculations for full spectrum Ponds C5 and D2 are included in this report. However, only rough grading of the ponds are shown on the Early Grading plans for Lorson Ranch East at this time in the Preliminary Plan submittal. Final construction plans for full spectrum Ponds C5 and D2 will incorporate these design calculations within this report and will be included in the first filing of a final plat in Lorson Ranch East. The final design will include a 10' wide gravel access road on a 15' wide bench at a maximum 10% slope to the pond bottom. The final design of the full spectrum ponds consists of an outlet structure, storm sewer outfall to the East Tributary, concrete low flow channels, sediment forebays, and overflow weirs to the East Tributary. Soil borings, embankment, slope, and compaction requirements for detention ponds can be found in the geotechnical report for the Lorson Ranch East prepared by RMG.

Detention Pond C5 (Full Spectrum and Hydraflow Design)

This is an on-site 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. See MDDP (Table 6.2) for pre/post development release rates into the East Tributary at this location. Pond C5 is required to release runoff (5-yr/100-yr) so it closely mimics the pre-developed flow rates into the East Tributary. The outlet structure is a triple 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. The full spectrum print outs are in the appendix of this report as well as the MDDP hydraflow pond sheets. See map in appendix for watershed areas.

- Watershed Ares: 171 acres
- Watershed Imperviousness: 65%
- Hydrologic Soils Group C/D
- Forebay: 3.51ac-ft (see spreadsheet in appendix)
- 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

Calculation sheet says 63%

- 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:	3'x18' flat top outlet structure (cdot type d) with top at stage 6.60ft			

Detention Pond D2 (Full Spectrum Design)

This is an on-site permanent full spectrum detention pond that includes water quality and discharges directly into the East Tributary. Pond D2 is designed using only the UDCF Full Spectrum spreadsheets and does not include any upstream pond flows. The outlet structure is a standard 4'x24' full spectrum sloped outlet structure and the overflow spillway is a weir set above the outlet structure designed by the full spectrum spreadsheets to match pre-developed rates. The full spectrum print outs are in the appendix of this report. See map in appendix for watershed areas.

- Watershed Ares: 89 acres
- Watershed Imperviousness: 55%
- Hydrologic Soils Group C/D
- Forebay: 1.635ac-ft (see spreadsheet in appendix)
- Zone 1 WQCV: 1.53ac-ft, WSEL: 5697.52
- Zone 2 EURV: 3.95ac-ft, WSEL: 5699.14, Top EURV set at 5699.60, 4'x20' outlet with 10:1 slope, 8.9cfs
- (5-yr): 5.13ac-ft, WSEL: 5699.81, 12.5cfs
- Zone 3 (100-yr): 8.73ac-ft, WSEL: 5701.68, 132cfs
- Pipe Outlet: 54" RCP at 0.5% with no restrictor plate
- Overflow Spillway: 30' wide bottom, elevation=5702.00, 4:1 side slopes, flow depth=1.64' at 277.1cfs
- Pre-development release rate into creek compliance from full spectrum pond spreadsheets
- Pond Bottom Elevation: 5695.00
-

Design: Full Spectrum Excel Worksheets Only

	WQ	EURV	5-yr	100-yr
Peak Inflow	32.1cfs	90.1cfs	118.2cfs	277.1cfs
Peak Outflow	0.6cfs	8.9cfs	12.6cfs	132cfs
Ponding Depth	2.73ft	4.14ft	4.81ft	6.68ft
Stored Volume	1.53ac-ft	3.95ac-ft	5.13ac-ft	8.73ac-ft

Spillway Stage	7.00ft, 30' wide
Structure Type:	4'x20' outlet structure with 10:1 slopes. Top at stage 6.60ft

Interim Detention Pond E2

This is an interim water quality pond located south of Lorson Boulevard and west of Trappe Drive and treats runoff from the partially developed "E" basins which is 21acres. Interim Pond E2 is only a water quality pond. All developed upstream flows greater than the EURV will be allowed to flow undetained through this pond because Phase 2 Pond E1 detains existing upstream flows significantly lower than existing rates. See hydraflow model and Interim flow analysis at Design Point 73. Pond E2's water quality will outlet into a 48" pipe draining to the East Tributary which has been designed for future flows. All storm events above water quality flows will flow over an emergency overflow southward into existing swales flowing and then west to the East Tributary. This will result in interim developed flows entering the East Tributary near the pre-developed conditions. See Design Point 73 for interim flow discussion. Future development within the "E" basins will need match the pre-developed rates. The water quality features were modeled in the Exel spreadsheets for full spectrum for the "E" basin (21 acres) only.

- Watershed Ares: 21 acres
- Watershed Imperviousness: 55%
- Hydrologic Soils Group C/D
- Forebay: 0.012ac-ft (see spreadsheet in appendix)
- Zone 1 WQCV: 0.348ac-ft, WSEL: 5695.59
- Zone 2 EURV: 0.996ac-ft, WSEL: 5697.71, Top outlet structure set at 5698.00, 4'x5' outlet with 3:1 slope, 0.8cfs
- Pipe Outlet: 48" RCP at 0.5%,
- Outlet Structure: From full spectrum worksheets
- Pond Bottom – 5694.00
- Spillway set at 5698, Cipoleti Wier facing south, 15' wide, 4:1 side slopes, 5698.00 invert

Water Quality Design

Water quality will be provided by two permanent extended detention basins and one interim pond for 98.6% of the 275acre site. Approximately 1.4% of the total 275-acre preliminary plan area consists of backyards that drain directly to the East Tributary over a grass buffer. Final platting of these areas may need to include a deviation from county criteria or a grass buffer bmp which will be determined at the final drainage report stage. Water Quality for the "C" and "D" basins is provided by the two on-site full spectrum ponds Pond C5 and Pond D2. Pond E2 is an interim pond that will provide water quality treatment for the developed portions of the "E" basins.

6.1 PHASE 2 DETENTION PONDS and INTERIM FLOWS AT THE EAST TRIBUTARY

This section will discuss Phase 2 detention ponds located at the midpoints of the "C" and "E" basins. Additional discussion of how Phase 2 ponds affect flow rates at three main design points (DP46, DP58a, DP73) that convey all developed/interim runoff into the East Tributary is included in this section. The proposed Phase 2 ponds are located partially under an existing electric transmission line easement at the midpoint of the basin. Phase 2 ponds are sized and built to handle future developed flows east of the electric easement but do not have full spectrum outlet structures or water quality features at this time. These Phase 2 ponds are to reduce the upstream existing runoff from large existing tributary basins flowing west overland across the powerline easement onto this site. The detention ponds do not have full spectrum or water quality features and are strictly to reduce the upstream existing runoff from large tributary basins. The ponds drain via storm sewer pipe with a small rip rap berm in front of it to prevent sediment from entering the pipe. It is the intent to change these ponds to full spectrum ponds when areas east of the powerlines develop.

Phase 2 Pond Construction Requirements

Phase 2 pond construction is only for rough grading as detailed on the Early Grading plans for Lorson Ranch East included in the Preliminary Plan submittal. Phase 2 ponds include a 10' wide gravel access road on a 15' wide bench at a maximum 10% slope to the pond bottom. Phase 2 pond outlets consist of a storm sewer outfall and flared end section with a small rip rap berm to prevent sediment from entering the pipe and an emergency overflow weir all sized for future flows. Soil borings, embankment, slope, compaction requirements, and other Geotechnical requirements can be found in the geotechnical report for the Lorson Ranch East Detention ponds prepared by RMG.

Detention Pond C1

This is a detention pond located east of the electric substation and detains runoff from Basin C15-ex which is a large 55-acre existing basin. Pond C1 is needed in Phase 2 when lots east of Lamprey Drive, south of Fontaine Boulevard, near the substation and Rockcastle Drive are graded/developed. Timing the construction of Interim Pond C1 will be provided in the final drainage report for the adjacent lots. This pond was modeled in Hydraflow and does not include water quality features.

- Incoming flows: 24cfs/134cfs in the 5-year and 100-year storm event
- Detained flows: 4.0cfs/10.0cfs in the 5-year and 100-year storm event
- Pipe Outlet: 18" RCP at 0.5%
- 5-yr WSEL= 5746.90, 100-yr WSEL=5749.46
- Volume: 0.8 ac-ft storage in 5-year, 4.3 acre-ft storage in 100-year
- Spillway sized for future developed flow = 175cfs, Inv=5753.00, 28' wide, 3' deep, flow depth=1.44'deep
- Spillway swale to Fontaine: 175cfs, 50' btm, 0.3% slope, 2' deep, 4:1 sides, velocity=3.3cfs, flow depth=1.05'

Detention Pond C2.2

This is a detention pond located on the north side of Fontaine Boulevard at the electric easement and detains runoff from a portion of Basin C14-ex which is a large 119-acre existing basin and from Pond C3. Pond C2.2 reduces the size of storm sewer necessary to convey drainage east to the East Tributary of JCC in Fontaine Boulevard. The pond has a 30" outlet pipe that flows to Fontaine Boulevard from north of Fontaine. This pond was modeled in Hydraflow and does not include water quality features.

- Incoming flows: 32cfs/132cfs in the 5-year and 100-year storm event
- Detained flows: 17cfs/44cfs in the 5-year and 100-year storm event
- Pipe Outlet: 30" RCP at 0.5%
- 5-yr WSEL= 5747.12, 100-yr WSEL=5750.07
- Volume: 0.5ac-ft storage in 5-year, 2.9acre-ft storage in 100-year
- Pond C2.2 spillway sized for future developed flow = 138cfs, Inv=5754.00, 30' wide, 3' deep, flow depth=1.48'

Detention Pond C2.3

This is a detention pond located on the south side of Fontaine Boulevard at the electric easement and detains runoff from a portion of Basin C14-ex which is a large 119-acre existing basin. Pond C2.3 reduces the size of storm sewer necessary to convey drainage east to the East Tributary of JCC in Fontaine Boulevard from the south. The pond has a 30" outlet pipe that flows to Fontaine Boulevard. This pond was modeled in Hydraflow and does not include water quality features.

- Incoming flows: 37cfs/171cfs in the 5-year and 100-year storm event
- Detained flows: 17cfs/57cfs in the 5-year and 100-year storm event
- Pipe Outlet: 30" RCP at 0.5%
- 5-yr WSEL= 5748.02, 100-yr WSEL=5753.00
- Volume: 0.8ac-ft storage in 5-year, 4.3acre-ft storage in 100-year
- Pond C2.3 spillway sized for future developed flow = 111cfs, Inv=5753.00, 20' wide, 3.0' deep, flow depth=1.3', see MDDP

Detention Pond C3

This is a detention pond located north of Fontaine Boulevard and detains runoff from Basin C12-ex which is a large 100-acre existing basin. Pond C3 flows to Pond C2.2 and reduces the size of storm sewer necessary to convey drainage east to the East Tributary of JCC in Fontaine Boulevard. Pond C3 is connected by a 24" storm sewer to Pond C2.2. This pond was modeled in Hydraflow and does not include water quality features.

- Incoming flows: 45cfs/250cfs in the 5-year and 100-year storm event
- Detained flows: 13cfs/32cfs in the 5-year and 100-year storm event
- Pipe Outlet: 21" RCP draining to Pond C2.2
- 5-yr WSEL= 5759.72, 100-yr WSEL=5763.35
- Volume: 1.2ac-ft storage in 5-year, 5.5acre-ft storage in 100-year
- Spillway sized for future developed flow = 134cfs, Inv=5764.50, 20' wide, 3.5' deep, 1.46' flow depth

Detention Pond E1

This is a detention pond located south of Lorson Boulevard and detains runoff from Basin E1-ex which is a 57-acre existing basin. Pond E1 reduces the size of storm sewer necessary to convey drainage east to the East Tributary of JCC in Trappe Drive. Pond E1 has a 24" outlet pipe draining east to the East Tributary of JCC. This pond was modeled in Hydraflow and does not include water quality features.

- Incoming flows: 25cfs/142cfs in the 5-year and 100-year storm event
- Detained flows: 9.0cfs/20.0cfs in the 5-year and 100-year storm event
- Pipe Outlet: 24" RCP at 0.5%
- 5-yr WSEL= 5730.32, 100-yr WSEL=5732.89
- Volume: 0.5ac-ft storage in 5-year, 2.5acre-ft storage in 100-year
- Spillway sized for future developed flow = 210cfs, Inv=5738.00, 40' wide, 2' deep, flow depth=1.33', see MDDP

Interim Flows at Design Point 46

Design Point 46 is located downstream of Pond C5 next to the East Tributary. The future developed flows from Pond C5 is 121.0cfs/443.0cfs in the 5/100-year storm events (Design Pt 7c in MDDP). The interim flows are 151cfs/425cfs in the 5/100-year storm events which include upstream flows from Phase 2 ponds. These flows at the creek are slightly higher than developed flows but are still less than pre-development flows as calculated in the MDDP for the 100-year storm event. The pre-developed flows entering the East Tributary at this design point are 141.0cfs/458.0cfs in the 5/100-year storm events. (Design Pt 2 in MDDP). There are no negative impacts downstream due to the interim ponds in the "C" basins.

Interim Flows at Design Point 58a

Design Point 58a is located downstream of Pond D2 next to the East Tributary. There are no interim ponds or flows in the "D" basins. Pond D2 is a full spectrum pond which complies with pre-development discharges.

Interim Flows at Design Point 73

Design Point 73 is located downstream of Pond E2 next to the East Tributary. The future developed flows at this design point are 97.0cfs/266.0cfs in the 5/100-year storm events (Design Pt 14a in MDDP). The interim flows are 120cfs/280cfs in the 5/100-year storm events. The flows are slightly higher than future developed flows and are near pre-development flows (100cfs/280cfs) as calculated in the MDDP. The 5-year flows will be slightly less because we did not model the reduction in flow from the WQ

elevation of Pond E2 to the spillway (EURV elevation) from elevation 5696.20 to 5698.00. There are negligible negative impacts downstream due to the interim ponds in the "E" basins.

6.2 EMERGENCY OVERFLOW CONVEYANCE FOR PONDS C1, C2.2, C2.3, AND C3

The MDDP for Lorson East discussed an emergency overflow condition for detention ponds which have emergency overflow structures directed to Fontaine Bouelvard. The storm sewer system in Fontaine Boulevard must be oversized to handle an additional 200cfs which is the future rate determined by the MDDP for an emergency overflow event from Ponds C2.2 and C2.3. As part of this preliminary plan we propose to construct two emergency overflow structures, one at Pond C2.2 and one at Pond C2.3. The structures will incorporate a CDOT type R structure modified with an 18" throat opening and a concrete apron from the spillway concrete wall to the structure. Pond C2.2 consists of a 25' Type R structure with a 48" RCP outfall pipe to collect 114cfs from an emergency overflow event on the north side of Fontaine Boulevard from Pond C2.2 spillway. Pond C2.3 consists of a 20' Type R structure with a 42" RCP outfall pipe to collect 86cfs from an emergency overflow event on the south side of Fontaine Boulevard from Pond C2.3 spillway. Pond C1 does not require a special overflow structure and can be discharged over the spillway and channel to Fontaine Boulevard overland. An additional flow calculation has been provided for the C15-C17 storm sewer system in the hydraulic storm sewer modeling program in Appendix. The storm sewer was sized by adding the additional flow (200cfs) at each node along Fontaine Boulevard resulting in a sewer sized for the on-site 100-year flows plus additional capacity for the emergency conveyance.

7.0 DRAINAGE AND BRIDGE FEES

Lorson Ranch East 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 be constructing the major drainage infrastructure as part of the district improvements.

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 contains 274.585 acres. The 274.585 acres will be assessed Drainage, Bridge and Surety fees. The 2017 drainage fees are $15,720, bridge fees are $735 and Drainage Surety fees are $7,000 per impervious acre. The drainage and bridge fees are calculated when the final plat is submitted. The fees are due at plat recordation.

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

Item	Quantity	Unit	Unit Cost	Item Total
Rip Rap	200	CY	$50/CY	$10,000
Inlets/Manholes	103	EA	$3000/EA	$309,000
18" Storm	3492	LF	$35	$122,220
24" Storm	1940	LF	$40	$77,600
30" Storm	1740	LF	$45	$78,300
36" Storm	3385	LF	$55	$186,175
42" Storm	1020	LF	$65	$66,300
48" Storm	1670	LF	$85	$141,950
54" Storm	1875	LF	$100	$187,500

60” Storm	0	LF	$110	0
66” Storm	1800	LF	$230	$414,000
			Subtotal	$1,593,045
			Eng/Cont (15%)	$238,956
			Total Est. Cost	$1,832,001

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

Item	Quantity	Unit	Unit Cost	Item Total
Full Spectrum Ponds and Outlet	2	LS	$150,000	$300,000
Lorson Blvd. Bridge Over East Tributary	1	LS	$1,000,000	$1,000,000
			Subtotal	$1,300,000
			Eng/Cont (15%)	$195,000
			Total Est. Cost	$1,495,000

Table 7.3: Lorson Ranch Metro District Drainage Facility Costs (Potential Reimbursable)

Item	Quantity	Unit	Unit Cost	Item Total
E. Tributary Channel Improvements-Kiowa	1	LS	$1,000,000	$1,000,000
Fontaine Blvd. Bridge Over East Tributary-Kiowa	1	LS	$1,200,000	$1,200,000
			Subtotal	$2,200,000
			Eng/Cont (15%)	$330,000
			Total Est. Cost	$2,530,000

8.0 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 will be reconstructed within this study area north of Fontaine Boulevard.
- Bridges over the East Tributary will be required at Lorson Boulevard and Fontaine Boulevard
- Detention and water quality for this preliminary plan area will be provided in two permanent ponds and one interim pond.

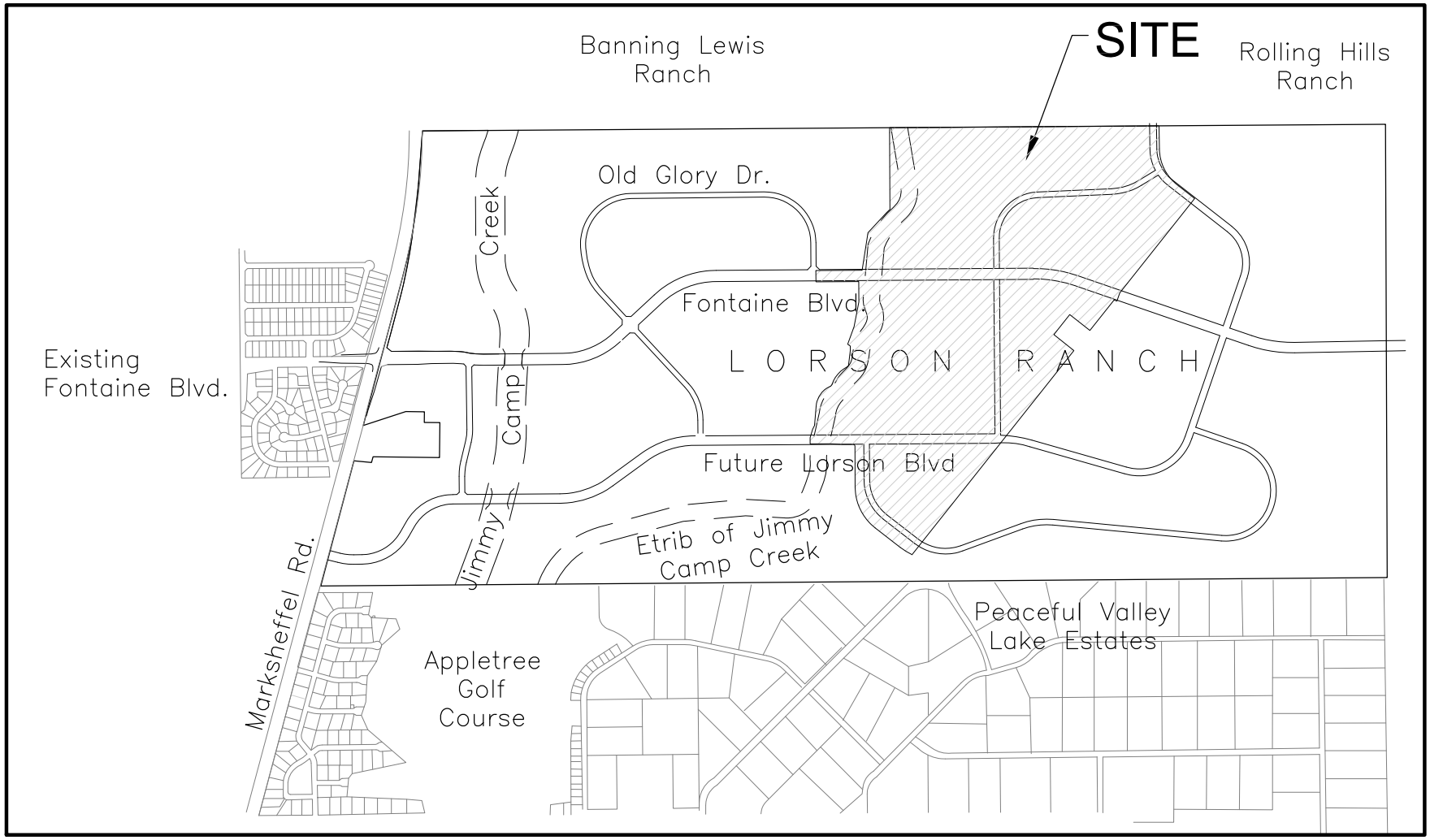
9.0 REFERENCES

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.
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

APPENDIX A – VICINTIY MAP, SOILS MAP, FEMA MAP



N

VICINITY MAP

NO SCALE

CORE ENGINEERING GROUP

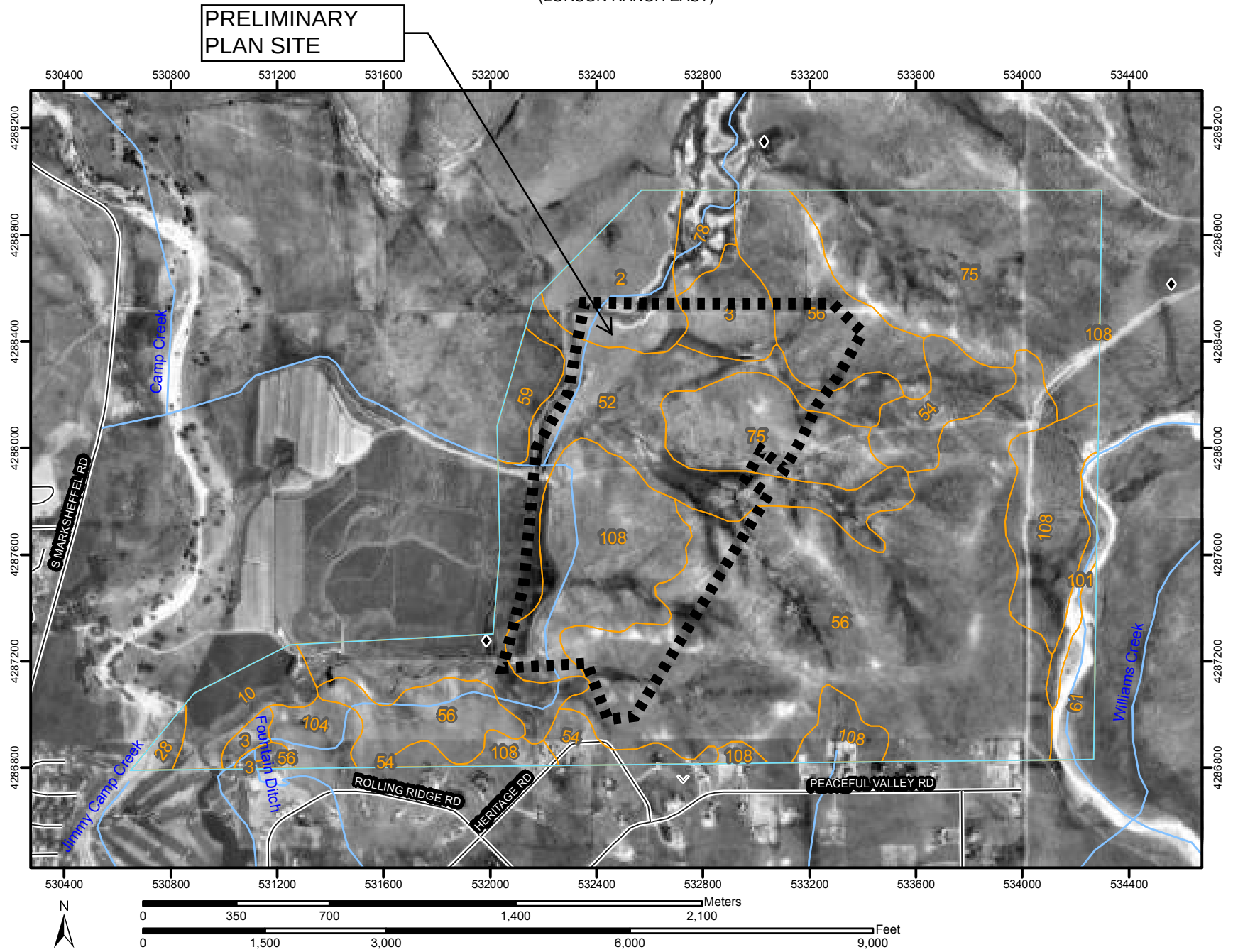
15004 1ST AVE. S.
BURNSVILLE, MN 55306
PH: 719.570.1100

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

LORSON RANCH EAST
VICINITY MAP

SCALE:	DATE:	FIGURE NO.
NTS	JUNE 30, 2017	--

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



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.

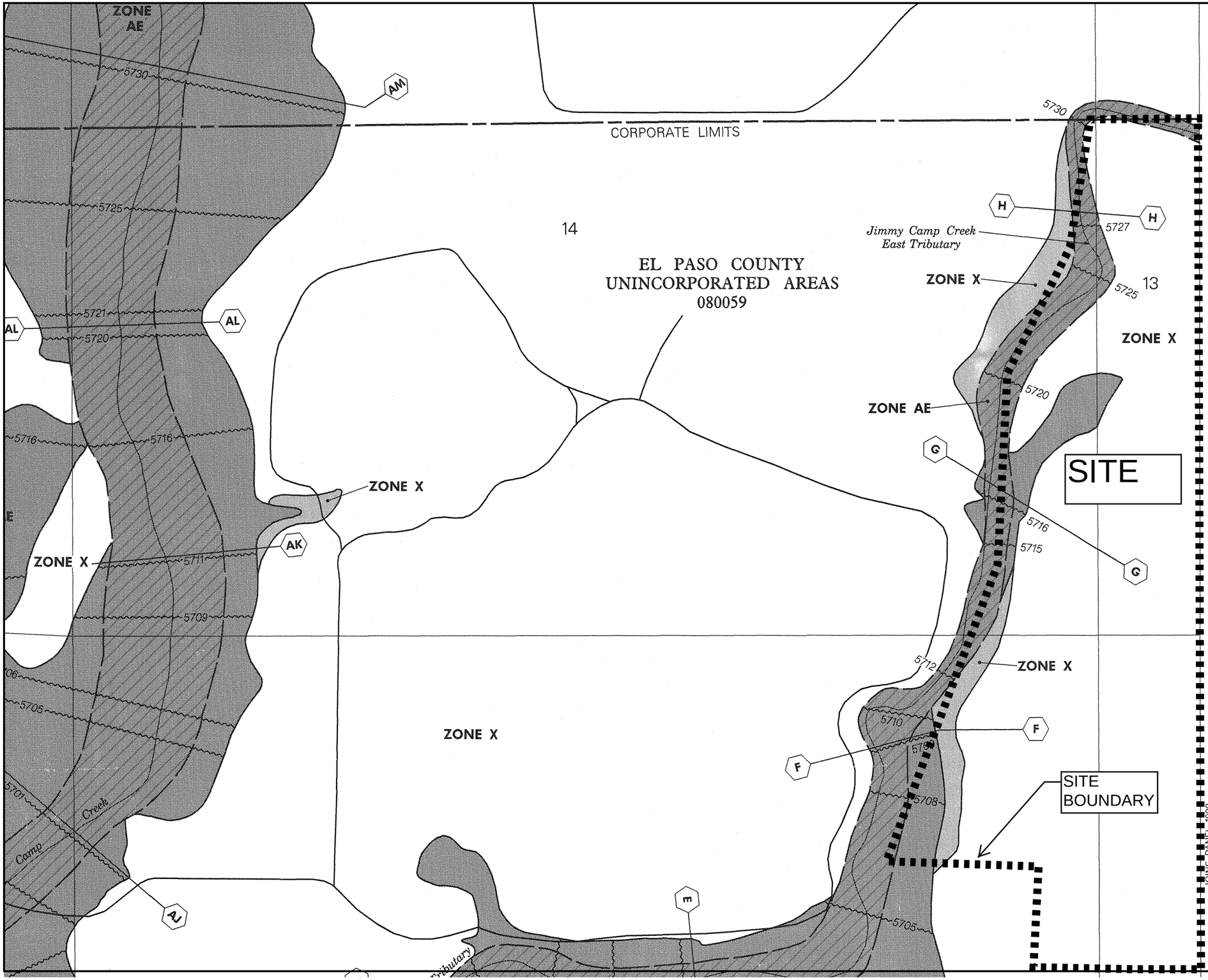
Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 5, Jan 15, 2008

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

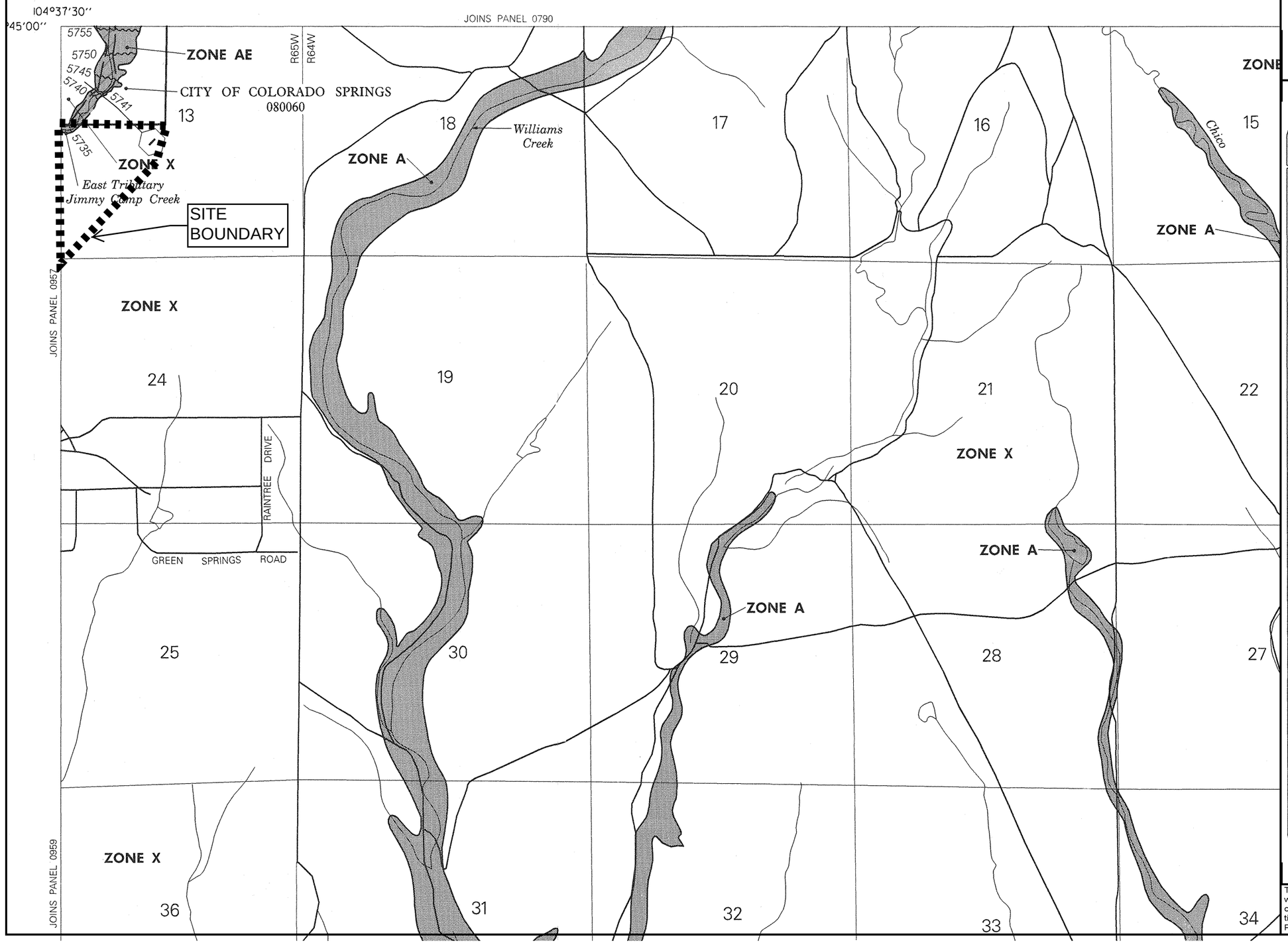
(SEE MAP INDEX FOR PANELS NOT PRINTED)

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



APPROXIMATE SCALE IN FEET

2000 0 2000

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

EL PASO COUNTY, COLORADO AND INCORPORATED AREAS

PANEL 1000 OF 1300

(SEE MAP INDEX FOR PANELS NOT PRINTED)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
COLORADO SPRINGS, CITY OF	080060	1000	F
EL PASO COUNTY, UNINCORPORATED AREAS	080059	1000	F

MAP NUMBER
08041C1000 F

EFFECTIVE DATE:
MARCH 17, 1997

Federal Emergency Management Agency

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.

CITY OF COLORADO SPRINGS 080060

13

Jimmy Camp Creek East Tribuary

5730

5731

5733

5729

REVISED AREA

5727

5725

H

5724

14

ZONE AE

5723

5722

5719

5721

5717

5711

G

5710

EL PASO COUNTY UNINCORPORATED AREAS 080059

5707

SITE

JOINS PANEL 1000

AREA REVISED BY LOMR DATED AUGUST 29, 2007.

SITE BOUNDARY

5703

5704

F

PROFILE BASELINE

23

Jimmy Camp Creek East Tribuary

5702

E

5699

ZONE AE

24

ZONE AE

5694

5693

D

5700

5701

5697

5689

5690

5692

5696

5698

E

Legend

1% annual chance (100-Year) Floodplain

1% annual chance (100-Year) Floodway

0.2% annual chance (500-Year) Floodplain

APPROXIMATE SCALE IN FEET

2,000 0 2,000

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

EL PASO COUNTY, COLORADO AND INCORPORATED AREAS

PANEL 1000 OF 1300

(SEE MAP INDEX FOR PANELS NOT PRINTED)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
COLORADO SPRINGS, CITY OF	080060	1000	F
EL PASO COUNTY, UNINCORPORATED AREAS	080059	1000	F

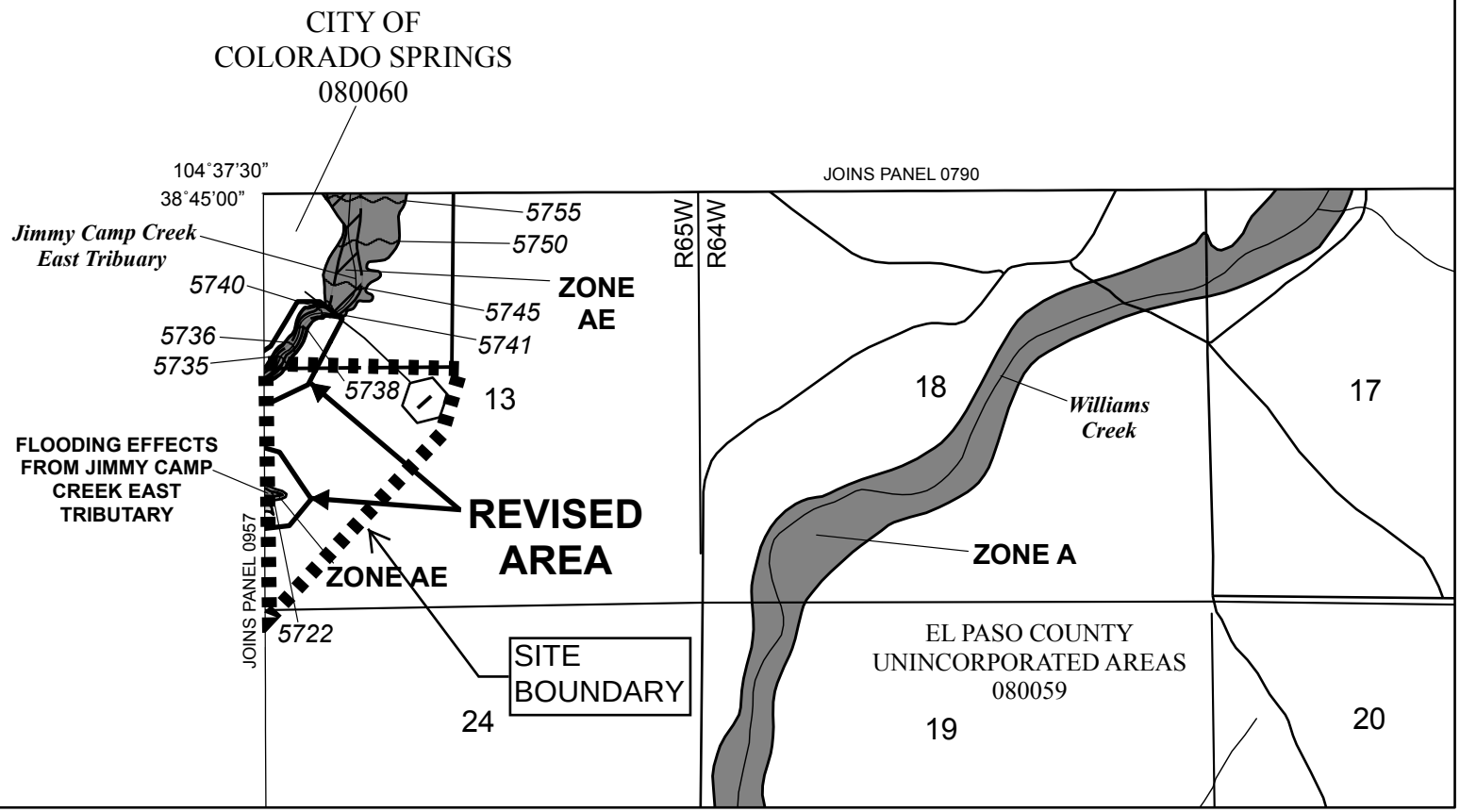
REVISED TO REFLECT LOMR EFFECTIVE: January 29, 2015

MAP NUMBER
08041C1000 F

EFFECTIVE DATE:
MARCH 17, 1997

Federal Emergency Management Agency

NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 15 SOUTH, RANGE 64 WEST AND TOWNSHIP 16 SOUTH, RANGE 65 WEST.



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)	t_c	CA	i	Q	t_c	Σ (CA)	i	Q	Slope	Street Flow	Design Flow	Slope	Pipe Size	Length	Velocity	t_t	
			ac.		min.		in/hr	cfs	min		in/hr	cfs	%	cfs	cfs	%	in	ft	ft/sec	min	
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)	t_c	CA	i	Q	t_c	$\sum$ (CA)	i	Q	Slope	Street Flow	Design Flow	Slope	Pipe Size	Length	Velocity	t_t	
			ac.		min.		in/hr	cfs	min		in/hr	cfs	%	cfs	cfs	%	in	ft	ft/sec	min	
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

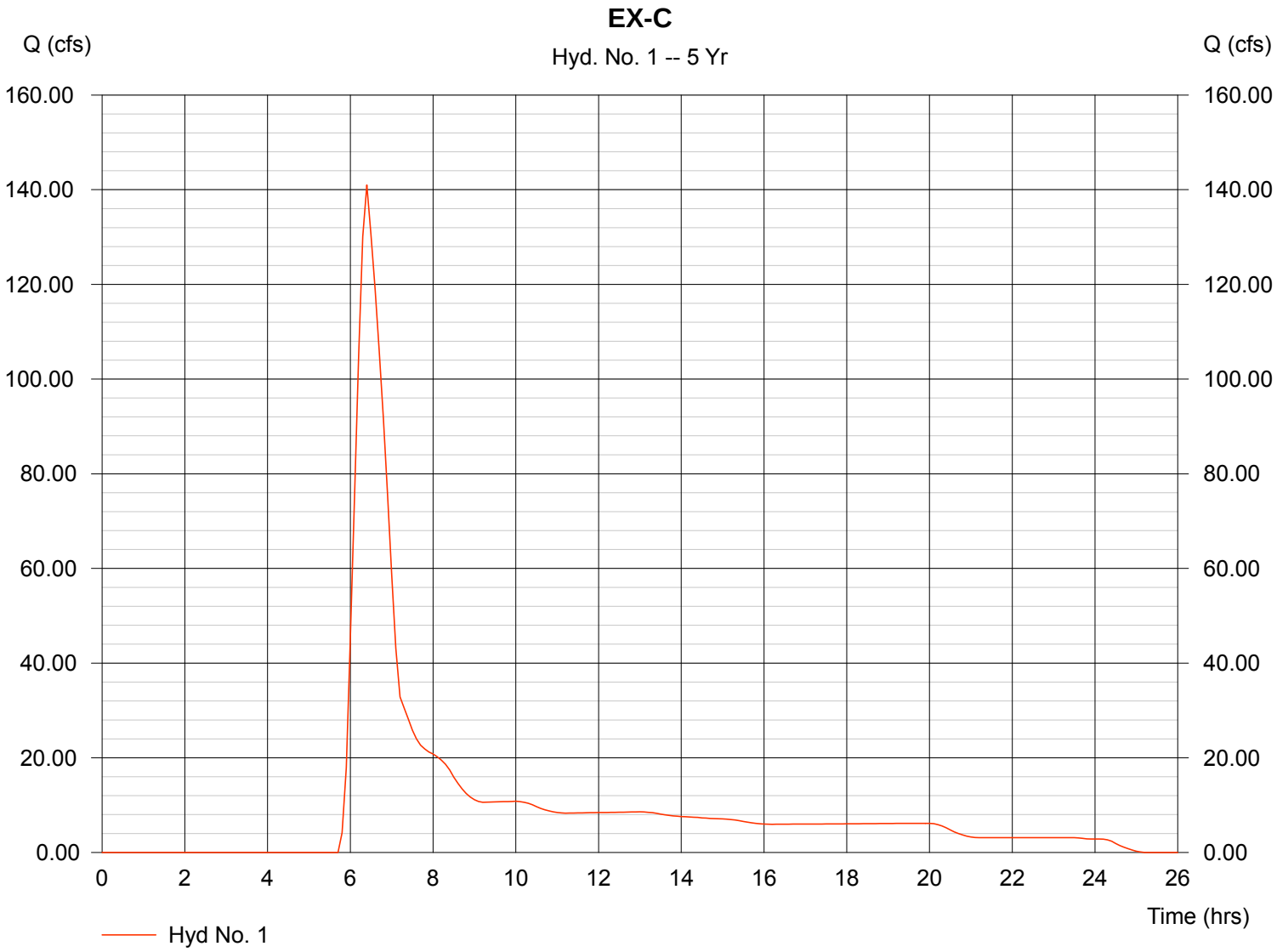
Hydraflow Hydrographs by Intelisolve | Monday, Jun 5 2017, 4:1 PM

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

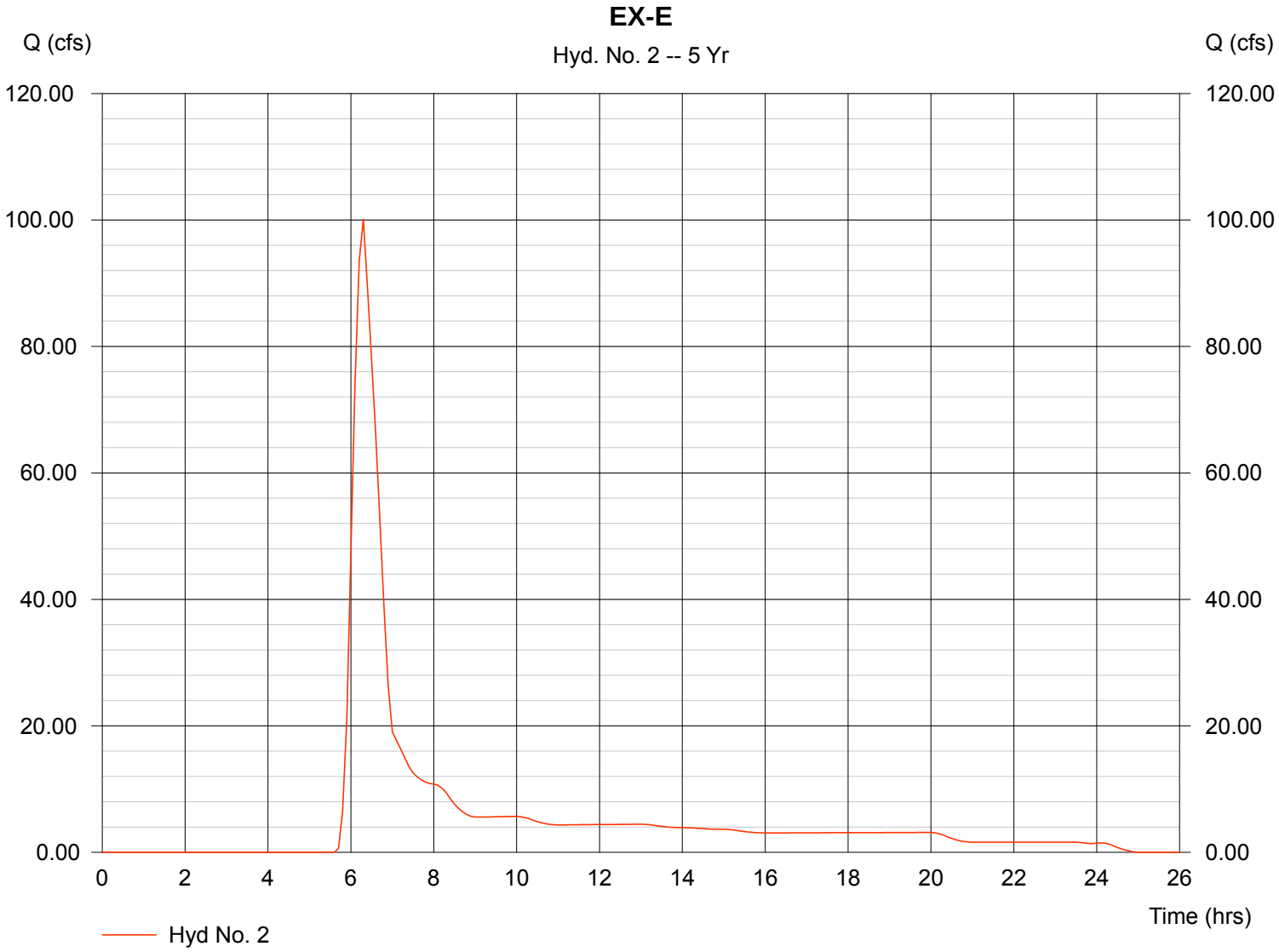
Hydraflow Hydrographs by Intelisolve | Monday, Jun 5 2017, 4:1 PM

Hyd. No. 2

EX-E

Hydrograph type	=	SCS Runoff	Peak discharge	=	100.11 cfs
Storm frequency	=	5 yrs	Time interval	=	6 min
Drainage area	=	187.300 ac	Curve number	=	73
Basin Slope	=	3.0 %	Hydraulic length	=	4150 ft
Tc method	=	USER	Time of conc. (Tc)	=	33.00 min
Total precip.	=	2.80 in	Distribution	=	Custom
Storm duration	=	CSpring_IIA-6min.cds	Shape factor	=	484

Hydrograph Volume = 513,793 cuft



Hydrograph Plot

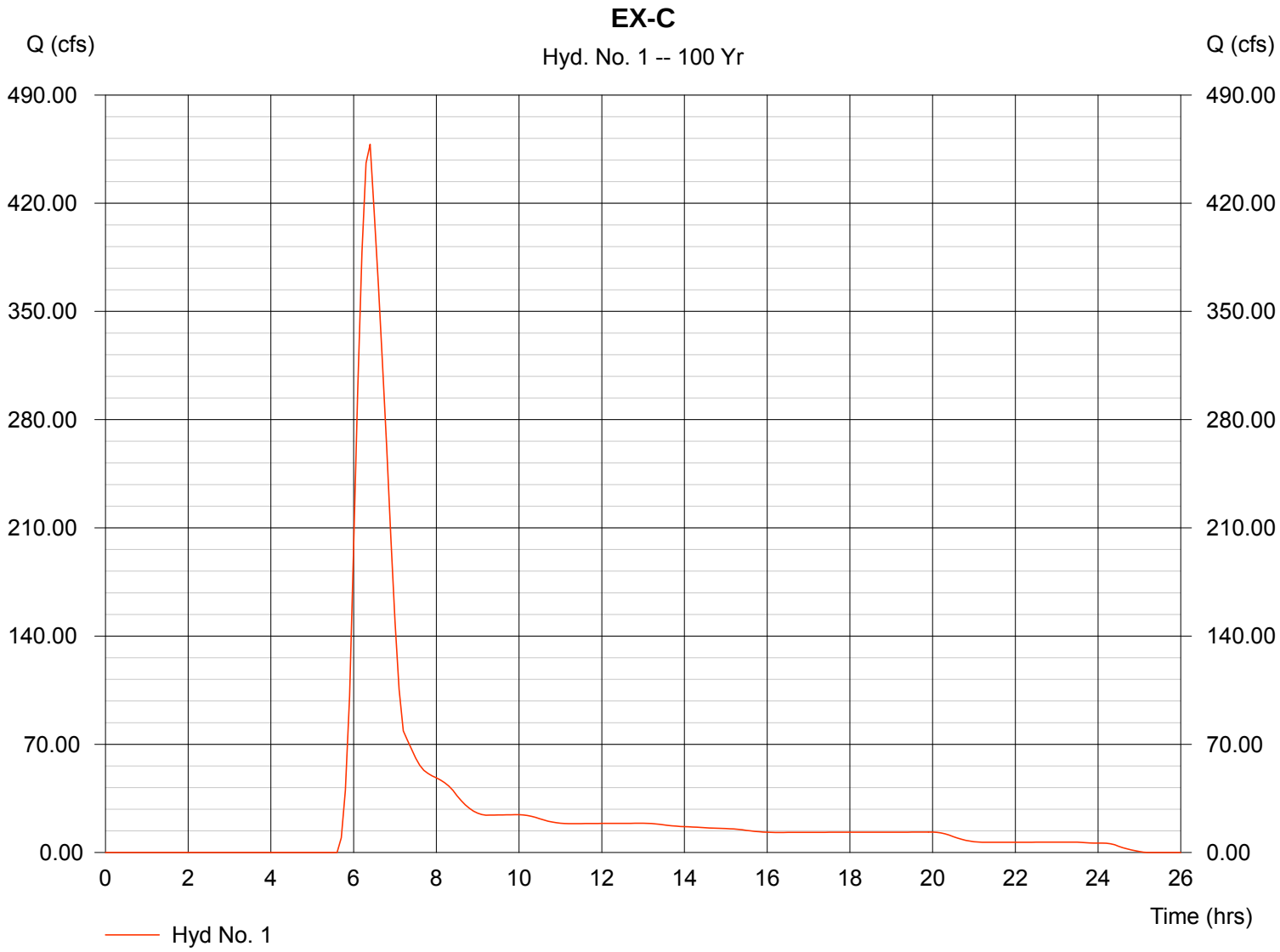
Hydraflow Hydrographs by Intelisolve | Monday, Jun 5 2017, 4:1 PM

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



Hydrograph Plot

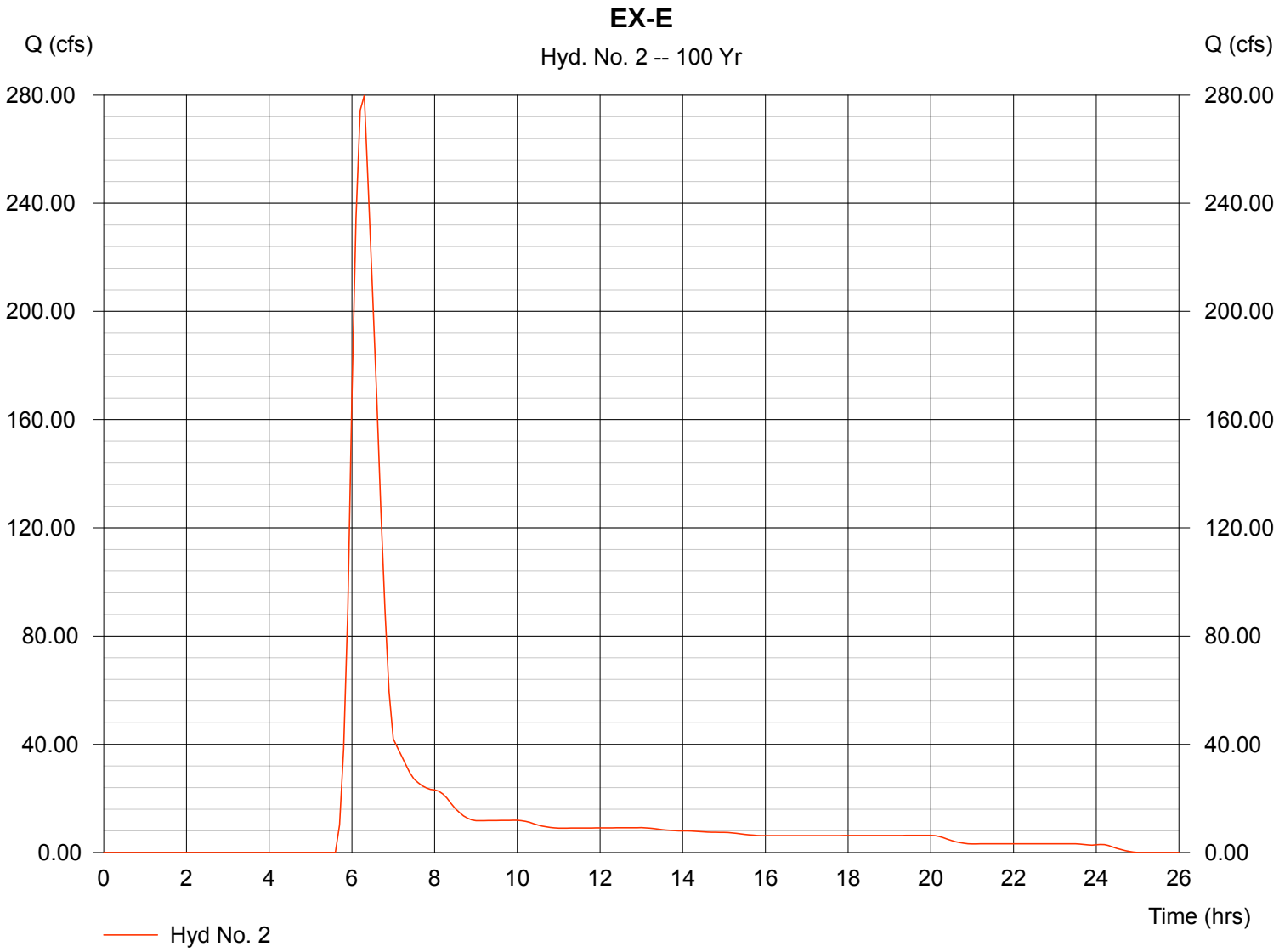
Hydraflow Hydrographs by Intelisolve | Monday, Jun 5 2017, 4:1 PM

Hyd. No. 2

EX-E

Hydrograph type	= SCS Runoff		Peak discharge	= 279.84 cfs	
Storm frequency	= 100 yrs		Time interval	= 6 min	
Drainage area	= 187.300 ac		Curve number	= 73	
Basin Slope	= 3.0 %		Hydraulic length	= 4150 ft	
Tc method	= USER		Time of conc. (Tc)	= 33.00 min	
Total precip.	= 4.40 in		Distribution	= Custom	
Storm duration	= CSpring_IIA-6min.cds		Shape factor	= 484	

Hydrograph Volume = 1,267,200 cuft



CORE ENGINEERING GROUP

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

Calculated By: Leonard Beasley
Date: August 16, 2016, June 30, 2017
Checked By: Leonard Beasley

Job No: 100.040
Project: Lorson Ranch East Preliminary Drainage
Design Storm: **5 - 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)	t_c	CA	i	Q	t_c	$\sum$ (CA)	i	Q	Slope	Street Flow	Design Flow	Slope	Pipe Size	Length	Velocity	t_t	
			ac.		min.		in/hr	cfs	min		in/hr	cfs	%	cfs	cfs	%	in	ft	ft/sec	min	
OS-C9			5.24	0.49	11.09	2.57	3.97	10.2													
C10			12.92	0.49	17.87	6.33	3.26	20.6													
OS-C11			6.48	0.49	21.69	3.18	2.97	9.4													
C12			20.52	0.49	17.56	10.05	3.28	33.0													
C13			19.21	0.16	30.35	3.07	2.46	7.6													
C13.1			1.63	0.90	8.57	1.47	4.36	6.4													
C14			2.36	0.66	9.25	1.56	4.25	6.6													
C14.1			4.10	0.16	13.89	0.66	3.64	2.4													
C14.2			1.65	0.68	5.12	1.12	5.13	5.8													
C16.1			2.68	0.49	7.55	1.31	4.55	6.0													
C16.2			1.82	0.49	10.97	0.89	3.99	3.6													
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													
C16.5			0.50	0.49	5.63	0.25	4.99	1.2													
C16.6			1.43	0.49	10.27	0.70	4.09	2.9													
C16.7			0.54	0.49	7.60	0.26	4.54	1.2													
C16.8			0.53	0.49	6.43	0.26	4.79	1.2													
C16.9			1.60	0.49	7.62	0.78	4.54	3.6													
C16.10			0.52	0.49	6.35	0.25	4.81	1.2													
C16.11			0.38	0.49	9.76	0.19	4.17	0.8													
C16.12			1.82	0.49	6.89	0.89	4.69	4.2													
C16.13			3.62	0.49	11.45	1.77	3.93	7.0													
C16.14			0.10	0.49	5.01	0.05	5.17	0.3													
C16.15			2.28	0.49	9.77	1.12	4.16	4.7													
C16.16			1.29	0.49	13.31	0.63	3.70	2.3													
C16.17			1.64	0.49	12.39	0.80	3.81	3.1													
C16.18			2.96	0.49	12.69	1.45	3.77	5.5													
C16.19			1.65	0.49	11.98	0.81	3.86	3.1													
C16.20			2.84	0.49	10.38	1.39	4.07	5.7													
C16.21			1.78	0.49	13.36	0.87	3.69	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													

CORE ENGINEERING GROUP

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

Calculated By: Leonard Beasley
Date: August 16, 2016, June 30, 2017
Checked By: Leonard Beasley

Job No: 100.040
Project: Lorson Ranch East Preliminary Drainage
Design Storm: **5 - 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)	t_c	CA	i	Q	t_c	$\sum$ (CA)	i	Q	Slope	Street Flow	Design Flow	Slope	Pipe Size	Length	Velocity	t_t	
			ac.		min.		in/hr	cfs	min		in/hr	cfs	%	cfs	cfs	%	in	ft	ft/sec	min	
C16.26			1.42	0.49	11.66	0.70	3.90	2.7													
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													
C16.33			0.21	0.90	5.00	0.19	5.17	1.0													
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													
C15.1			7.10	0.30	18.04	2.13	3.24	6.9													
C15.2			4.63	0.42	11.51	1.94	3.92	7.6													
C15.3			3.60	0.49	13.83	1.76	3.64	6.4													
C15.4			1.25	0.49	9.05	0.61	4.28	2.6													
C15.5			2.90	0.49	9.86	1.42	4.15	5.9													
C15.6			1.80	0.49	12.88	0.88	3.75	3.3													
C15.7			2.07	0.49	11.73	1.01	3.89	3.9													
C15.8			3.76	0.40	15.51	1.50	3.47	5.2													
C15.9			2.27	0.49	8.22	1.11	4.42	4.9													
C15.10			0.60	0.49	9.85	0.29	4.15	1.2													
C15.11			3.20	0.49	11.58	1.57	3.91	6.1													
C15.12			0.61	0.49	11.47	0.30	3.92	1.2													
C15.13			2.35	0.49	11.49	1.15	3.92	4.5													
C15.14			1.32	0.49	8.11	0.65	4.44	2.9													
C15.15			4.02	0.49	13.72	1.97	3.65	7.2													
C17.1a			2.81	0.49	12.11	1.38	3.84	5.3													
C17.1			2.68	0.49	7.69	1.31	4.52	5.9													
C17.2			4.11	0.49	9.19	2.01	4.26	8.6													
C17.3			2.21	0.49	9.78	1.08	4.16	4.5													
C17.4			1.98	0.49	17.58	0.97	3.28	3.2													
C17.5			3.72	0.49	13.41	1.82	3.69	6.7													

CORE ENGINEERING GROUP

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

Calculated By: Leonard Beasley
Date: August 16, 2016, June 30, 2017
Checked By: Leonard Beasley

Job No: 100.040
Project: Lorson Ranch East Preliminary Drainage
Design Storm: **5 - 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)	t_c	CA	i	Q	t_c	$\sum$ (CA)	i	Q	Slope	Street Flow	Design Flow	Slope	Pipe Size	Length	Velocity	t_t	
			ac.		min.		in/hr	cfs	min		in/hr	cfs	%	cfs	cfs	%	in	ft	ft/sec	min	
C17.6			1.04	0.49	13.89	0.51	3.64	1.9													
C17.7			2.68	0.49	7.62	1.31	4.54	6.0													
C17.8			1.52	0.55	12.41	0.84	3.81	3.2													
C17.9			1.73	0.90	5.65	1.56	4.99	7.8													
C17.10			2.34	0.90	9.34	2.11	4.23	8.9													
D1.1			5.09	0.49	18.38	2.49	3.22	8.0													
D1.2			1.10	0.49	6.86	0.54	4.69	2.5													
D1.3			0.86	0.49	10.65	0.42	4.03	1.7													
D1.4			2.80	0.49	12.39	1.37	3.81	5.2													
D1.5			5.15	0.49	9.43	2.52	4.22	10.6													
D1.6			5.10	0.49	16.74	2.50	3.36	8.4													
D1.7			3.50	0.49	10.40	1.72	4.07	7.0													
D1.8			1.70	0.49	12.37	0.83	3.81	3.2													
D1.9			2.20	0.49	12.70	1.08	3.77	4.1													
D1.10			5.50	0.49	13.39	2.70	3.69	9.9													
D1.11			1.40	0.49	12.38	0.69	3.81	2.6													
D1.12			4.45	0.24	14.08	1.07	3.62	3.9													
D2.1			3.14	0.49	14.87	1.54	3.53	5.4													
D2.2			1.11	0.49	11.93	0.54	3.86	2.1													
D2.3			2.80	0.27	14.09	0.76	3.61	2.7													
D2.4			3.33	0.29	13.48	0.97	3.68	3.6													
D2.5			3.93	0.49	7.40	1.93	4.58	8.8													
D2.6			2.13	0.49	10.37	1.04	4.07	4.3													
D2.7			2.98	0.49	7.22	1.46	4.62	6.7		5.11											
D2.8			3.70	0.49	9.24	1.81	4.25	7.7													
D2.9			3.15	0.49	14.83	1.54	3.54	5.5													
D2.10			0.80	0.49	6.24	0.39	4.84	1.9													
D2.11			0.40	0.90	3.68	0.36	5.63	2.0													
D2.12			2.78	0.49	11.27	1.36	3.95	5.4													
D2.13			2.51	0.49	17.67	1.23	3.28	4.0													
E1.1			1.41	0.49	7.40	0.69	4.58	3.2													

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

Calculated By: Leonard Beasley
Date: August 16, 2016, June 30, 2017
Checked By: Leonard Beasley

Job No: 100.040
Project: Lorson Ranch East Preliminary Drainage
Design Storm: **5 - 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)	t_c	CA	i	Q	t_c	Σ (CA)	i	Q	Slope	Street Flow	Design Flow	Slope	Pipe Size	Length	Velocity	t_t	
			ac.		min.		in/hr	cfs	min		in/hr	cfs	%	cfs	cfs	%	in	ft	ft/sec	min	
E1.2			3.61	0.49	10.20	1.77	4.10	7.3													
E1.3			6.81	0.20	15.70	1.36	3.45	4.7		0.25											
E1.4			0.65	0.49	9.92	0.32	4.14	1.3													
E1.5			1.95	0.49	8.86	0.96	4.31	4.1													
E1.6			2.32	0.49	10.94	1.14	3.99	4.5													
E1.7			3.50	0.38	14.72	1.33	3.55	4.7													
C12a-ex			27	0.15	15.69	4.05	3.45	14													
C12-ex			73	0.15	24.19	10.95	2.80	31													
C14-ex			119	0.15	29.17	17.85	2.52	45													
C15-ex			55	0.15	22.61	8.25	2.91	24													
D1-ex			17	0.15	17.78	2.55	3.27	8													
E1-ex			57	0.15	21.72	8.55	2.97	25													
E2-ex			30	0.26	16.78	7.67	3.35	26													

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

Calculated By: Leonard Beasley
Date: August 16, 2016, June 30, 2017
Checked By: Leonard Beasley

Job No: 100.040
Project: Lorson Ranch East Preliminary Drainage
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)	t_c	CA	i	Q	t_c	$\sum$ (CA)	i	Q	Slope	Street Flow	Design Flow	Slope	Pipe Size	Length	Velocity	t_t	
			ac.		min.		in/hr	cfs	min		in/hr	cfs	%	cfs	cfs	%	in	ft	ft/sec	min	
OS-C9			5.24	0.65	11.09	3.41	6.67	22.7													
C10			12.92	0.65	17.87	8.40	5.47	45.9													
OS-C11			6.48	0.65	21.69	4.21	4.98	21.0													
C12			20.52	0.65	17.56	13.34	5.51	73.5													
C13			19.21	0.51	30.35	9.80	4.13	40.5													
C13.1			1.63	0.96	8.57	1.56	7.32	11.5													
C14			2.36	0.81	9.25	1.91	7.13	13.6													
C14.1			4.10	0.51	13.89	2.09	6.10	12.8													
C14.2			1.65	0.82	5.12	1.35	8.62	11.7													
C16.1			2.68	0.65	7.55	1.74	7.64	13.3													
C16.2			1.82	0.65	10.97	1.18	6.70	7.9													
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													
C16.5			0.50	0.65	5.63	0.33	8.38	2.7													
C16.6			1.43	0.65	10.27	0.93	6.87	6.4													
C16.7			0.54	0.65	7.60	0.35	7.62	2.7													
C16.8			0.53	0.65	6.43	0.34	8.05	2.8													
C16.9			1.60	0.65	7.62	1.04	7.62	7.9													
C16.10			0.52	0.65	6.35	0.34	8.08	2.7													
C16.11			0.38	0.65	9.76	0.25	6.99	1.7													
C16.12			1.82	0.65	6.89	1.18	7.87	9.3													
C16.13			3.62	0.65	11.45	2.35	6.59	15.5													
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	10.4													
C16.16			1.29	0.65	13.31	0.84	6.21	5.2													
C16.17			1.64	0.65	12.39	1.07	6.39	6.8													
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	10.38	1.85	6.84	12.6													
C16.21			1.78	0.65	13.36	1.16	6.20	7.2													
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													

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

Calculated By: Leonard Beasley
Date: August 16, 2016, June 30, 2017
Checked By: Leonard Beasley

Job No: 100.040
Project: Lorson Ranch East Preliminary Drainage
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)	t_c	CA	i	Q	t_c	$\sum$ (CA)	i	Q	Slope	Street Flow	Design Flow	Slope	Pipe Size	Length	Velocity	t_t	
			ac.		min.		in/hr	cfs	min		in/hr	cfs	%	cfs	cfs	%	in	ft	ft/sec	min	
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	6.0													
C16.27			0.23	0.65	5.95	0.15	8.24	1.2													
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													
C16.33			0.21	0.96	5.00	0.20	8.68	1.7													
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													
C15.1			7.10	0.57	18.04	4.05	5.45	22.0													
C15.2			4.63	0.63	11.51	2.92	6.58	19.2													
C15.3			3.60	0.65	13.83	2.34	6.12	14.3													
C15.4			1.25	0.65	9.05	0.81	7.18	5.8													
C15.5			2.90	0.65	9.86	1.89	6.97	13.1													
C15.6			1.80	0.65	12.88	1.17	6.29	7.4													
C15.7			2.07	0.65	11.73	1.35	6.53	8.8													
C15.8			3.76	0.61	15.51	2.29	5.83	13.4													
C15.9			2.27	0.65	8.22	1.48	7.43	11.0													
C15.10			0.60	0.65	9.85	0.39	6.97	2.7													
C15.11			3.20	0.65	11.58	2.08	6.56	13.7													
C15.12			0.61	0.65	11.47	0.40	6.59	2.6													
C15.13			2.35	0.65	11.49	1.53	6.58	10.1													
C15.14			1.32	0.65	8.11	0.86	7.46	6.4													
C15.15			4.02	0.65	13.72	2.61	6.14	16.0													
C17.1a			2.81	0.65	12.11	1.83	6.45	11.8													
C17.1			2.68	0.65	7.69	1.74	7.59	13.2													
C17.2			4.11	0.65	9.19	2.67	7.15	19.1													
C17.3			2.21	0.65	9.78	1.44	6.99	10.0													

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

Calculated By: Leonard Beasley
Date: August 16, 2016, June 30, 2017
Checked By: Leonard Beasley

Job No: 100.040
Project: Lorson Ranch East Preliminary Drainage
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)	t_c	CA	i	Q	t_c	Σ (CA)	i	Q	Slope	Street Flow	Design Flow	Slope	Pipe Size	Length	Velocity	t_t	
			ac.		min.		in/hr	cfs	min		in/hr	cfs	%	cfs	cfs	%	in	ft	ft/sec	min	
C17.4			1.98	0.65	17.58	1.29	5.51	7.1													
C17.5			3.72	0.96	13.41	3.57	6.19	22.1													
C17.6			1.04	0.96	13.89	1.00	6.10	6.1													
C17.7			2.68	0.65	7.62	1.74	7.62	13.3													
C17.8			1.52	0.74	12.41	1.12	6.39	7.2													
C17.9			1.73	0.96	5.65	1.66	8.37	13.9													
C17.10			2.34	0.96	9.34	2.25	7.10	16.0													
D1.1			5.09	0.65	18.38	3.31	5.40	17.9													
D1.2			1.10	0.65	6.86	0.72	7.88	5.6													
D1.3			0.86	0.65	10.65	0.56	6.77	3.8													
D1.4			2.80	0.65	12.39	1.82	6.39	11.6			33.03										
D1.5			5.15	0.65	9.43	3.35	7.08	23.7													
D1.6			5.10	0.65	16.74	3.32	5.63	18.7			47.79										
D1.7			3.50	0.65	10.40	2.28	6.83	15.5													
D1.8			1.70	0.65	12.37	1.11	6.40	7.1													
D1.9			2.20	0.65	12.70	1.43	6.33	9.1													
D1.10			5.50	0.65	13.39	3.58	6.20	22.2													
D1.11			1.40	0.65	12.38	0.91	6.39	5.8													
D1.12			4.45	0.57	14.08	2.54	6.07	15.4													
D2.1			3.14	0.65	14.87	2.04	5.93	12.1													
D2.2			1.11	0.65	11.93	0.72	6.49	4.7													
D2.3			2.80	0.57	14.09	1.60	6.07	9.7													
D2.4			3.33	0.58	13.48	1.93	6.18	11.9													
D2.5			3.93	0.65	7.40	2.55	7.69	19.6													
D2.6			2.13	0.65	10.37	1.38	6.84	9.5													
D2.7			2.98	0.65	7.22	1.94	7.75	15.0													
D2.8			3.70	0.65	9.24	2.41	7.13	17.2													
D2.9			3.15	0.65	14.83	2.05	5.94	12.2													
D2.10			0.95	0.65	6.24	0.62	8.12	5.0													
D2.11			0.40	0.96	3.68	0.38	9.45	3.6													
D2.12			2.78	0.65	11.27	1.81	6.63	12.0													
D2.13			2.51	0.65	17.67	1.63	5.50	9.0													

CORE ENGINEERING GROUP

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

Calculated By: Leonard Beasley
Date: August 16, 2016, June 30, 2017
Checked By: Leonard Beasley

Job No: 100.040
Project: Lorson Ranch East Preliminary Drainage
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)	t_c	CA	i	Q	t_c	Σ (CA)	i	Q	Slope	Street Flow	Design Flow	Slope	Pipe Size	Length	Velocity	t_t	
			ac.		min.		in/hr	cfs	min		in/hr	cfs	%	cfs	cfs	%	in	ft	ft/sec	min	
E1.1			1.41	0.65	7.40	0.92	7.69	7.0													
E1.2			3.61	0.65	10.20	2.35	6.88	16.1													
E1.3			6.81	0.55	15.70	3.75	5.80	21.7		0.57											
E1.4			0.65	0.65	9.92	0.42	6.95	2.9													
E1.5			1.95	0.65	8.86	1.27	7.24	9.2													
E1.6			2.32	0.65	10.94	1.51	6.71	10.1													
E1.7			3.50	0.64	14.72	2.24	5.96	13.3													
C12a-ex			27	0.50	15.69	13.50	5.80	78													
C12-ex			73	0.50	24.19	36.50	4.71	172													
C14-ex			119	0.50	29.17	59.50	4.23	252													
C15-ex			55	0.50	22.61	27.50	4.88	134													
D1-ex			17	0.50	17.78	8.50	5.48	47													
E1-ex			57	0.50	21.72	28.50	4.98	142													
E2-ex			30	0.55	16.78	16.23	5.63	91													

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Standard Form SF-1. Time of Concentration-Proposed

Calculated By: Leonard Beasley
Date: August 16, 2016, June 30, 2017
Checked By: Leonard Beasley

Job No: 100.040
Project: Lorson Ranch East Preliminary Drainage

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)
OS-C9	0.49	5.24	15.0	100.00	4.18%	0.24	6.87	777.0	4.18%	3.07	4.22	11.09	877.00	14.87	11.09
C10	0.49	12.92	15.0	100.00	2.00%	0.19	8.76	904.0	4.98%	3.35	4.50				
			20.0					466.0	0.71%	1.69	4.61	17.87	1470.00	18.17	17.87
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
C12	0.49	20.52	15.0	100.00	3.00%	0.22	7.66	969.0	1.34%	1.74	9.30				
			20.0					292.0	0.60%	1.55	3.14	20.11	1361.00	17.56	17.56
C13	0.16	24.54	15.0	100.00	1.00%	0.10	16.97	1620.0	2.90%	2.55	10.57	27.54	1720.00	19.56	19.56
C13.1	0.90	1.70	20.0	55.00	15.04%	0.84	1.09	1232.0	1.65%	2.57	7.99	9.09	1287.00	17.15	9.09
C14	0.66	2.36	20.0	55.00	12.00%	0.35	2.59	1083.0	1.51%	2.46	7.34	9.94	1138.00	16.32	9.94
C14.1	0.16	4.10	15.0	100.00	1.00%	0.10	16.97	544.0	3.49%	2.80	3.24	20.21	644.00	13.58	13.58
C14.2	0.66	1.65	15.0	52.00	1.92%	0.19	4.62	807.0	1.80%	2.01	6.68	11.30	859.00	14.77	11.30
C16.1	0.49	2.68	15.0	30.00	18.33%	0.22	2.31	150.0	2.67%	2.45	1.02				
			20.0					850.0	2.82%	3.36	4.22	7.55	1030.00	15.72	7.55
C16.2	0.49	1.82	20.0	27.00	3.00%	0.11	3.98	1332.0	2.52%	3.17	6.99	10.97	1359.00	17.55	10.97
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
C16.5	0.49	0.50	20.0	30.00	3.33%	0.12	4.06	370.0	3.85%	3.92	1.57	5.63	400.00	12.22	5.63
C16.6	0.49	1.43	15.0	98.00	5.10%	0.26	6.37	238.0	3.78%	2.92	1.36				
			20.0					437.0	2.06%	2.87	2.54	10.27	773.00	14.29	10.27
C16.7	0.49	0.54	15.0	85.00	4.24%	0.22	6.30	110.0	3.18%	2.67	0.69				
			20.0					123.0	2.85%	3.38	0.61	7.60	318.00	11.77	7.60
C16.8	0.49	0.53	20.0	25.00	4.00%	0.12	3.49	488.0	1.91%	2.76	2.94	6.43	513.00	12.85	6.43
C16.9	0.49	1.60	15.0	59.00	4.24%	0.19	5.25	108.0	2.31%	2.28	0.79				
			20.0					330.0	3.03%	3.48	1.58	7.62	497.00	12.76	7.62
C16.10	0.49	0.52	20.0	28.00	2.14%	0.10	4.53	397.0	3.32%	3.64	1.82	6.35	425.00	12.36	6.35
C16.11	0.49	0.38	15.0	89.00	2.00%	0.18	8.27	75.0	2.80%	2.51	0.50				
			20.0					120.0	1.00%	2.00	1.00	9.76	284.00	11.58	9.76
C16.12	0.49	1.82	20.0	18.00	2.22%	0.08	3.59	603.0	2.32%	3.05	3.30	6.89	621.00	13.45	6.89
C16.13	0.49	3.62	15.0	30.00	18.33%	0.22	2.31	150.0	2.67%	2.45	1.02				
			20.0					1326.0	1.85%	2.72	8.12	11.45	1506.00	18.37	11.45
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

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Standard Form SF-1. Time of Concentration-Proposed

Calculated By: Leonard Beasley
Date: August 16, 2016, June 30, 2017
Checked By: Leonard Beasley

Job No: 100.040
Project: Lorson Ranch East Preliminary Drainage

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)
C16.18	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	1.68%	2.59	5.05	10.38	823.00	14.57	10.38
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	1.16%	2.15	4.80	13.36	769.00	14.27	13.36
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
C16.33	0.90	0.21	20.0	18.00	2.22%	0.25	1.18	194.0	0.92%	1.92	1.69	2.86	212.00	11.18	2.86
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
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
C15.1	0.30	7.10	15.0	100.00	4.50%	0.19	8.79	747.0	3.41%	1.41	8.83				
			15.0					600.0	1.92%	2.08	4.81	22.43	1447.00	18.04	18.04
C15.2	0.42	4.63	15.0	100.00	6.20%	0.25	6.72	604.0	1.97%	2.11	4.78	11.51	704.00	13.91	11.51
C15.3	0.49	3.60	15.0	100.00	2.05%	0.19	8.69	161.0	3.35%	1.41	1.90				
			20.0					658.0	2.87%	3.39	3.24	13.83	919.00	15.11	13.83

CORE ENGINEERING GROUP

Standard Form SF-1. Time of Concentration-Proposed

Calculated By: Leonard Beasley
Date: August 16, 2016, June 30, 2017
Checked By: Leonard Beasley

Job No: 100.040
Project: Lorson Ranch East Preliminary Drainage

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)
C15.4	0.49	1.25	15.0	91.00	7.14%	0.28	5.49	100.0	2.60%	1.41	1.18				
			20.0					406.0	2.02%	2.84	2.38	9.05	597.00	13.32	9.05
C15.5	0.49	2.90	20.0	35.00	2.00%	0.11	5.18	979.0	3.04%	3.49	4.68	9.86	1014.00	15.63	9.86
C15.6	0.49	1.80	15.0	59.00	1.36%	0.13	7.64	100.0	2.00%	2.12	0.79				
			20.0					731.0	1.87%	2.73	4.45	12.88	890.00	14.94	12.88
C15.7	0.49	2.07	20.0	39.00	2.05%	0.12	5.43	966.0	1.63%	2.55	6.31	11.73	1005.00	15.58	11.73
C15.8	0.40	3.76	15.0	100.00	7.00%	0.25	6.65	89.0	11.35%	5.05	0.29				
			15.0					463.0	0.60%	1.16	6.64				
			20.0					240.0	1.08%	2.08	1.92	15.51	892.00	14.96	15.51
C15.9	0.49	2.27	15.0	53.00	1.20%	0.12	7.55	96.0	3.02%	2.61	0.61				
			20.0					8.6	1.61%	2.54	0.06	8.22	157.55	10.88	8.22
C15.10	0.49	0.60	15.0	100.00	2.20%	0.20	8.49	37.0	2.20%	2.22	0.28				
			20.0					160.0	1.51%	2.46	1.09	9.85	297.00	11.65	9.85
C15.11	0.49	3.20	20.0	74.00	4.19%	0.21	5.90	1105.0	2.63%	3.24	5.68	11.58	1179.00	16.55	11.58
C15.12	0.49	0.61	15.0	100.00	2.16%	0.20	8.54	34.0	2.16%	2.20	0.26				
			20.0					321.0	1.00%	2.00	2.68	11.47	455.00	12.53	11.47
C15.13	0.49	2.35	20.0	52.00	2.12%	0.14	6.20	967.0	2.32%	3.05	5.29	11.49	1019.00	15.66	11.49
C15.14	0.49	1.32	20.0	33.00	1.82%	0.11	5.19	595.0	2.89%	3.40	2.92	8.11	628.00	13.49	8.11
C15.15	0.49	4.02	20.0	100.00	2.88%	0.21	7.77	1111.0	2.42%	3.11	5.95	13.72	1211.00	16.73	13.72
C17.1a	0.49	2.81	20.0	90.00	2.00%	0.18	8.31	733.0	2.58%	3.21	3.80	12.11	823.00	14.57	12.11
C17.1	0.49	2.68	15.0	28.00	18.57%	0.21	2.22	160.0	2.88%	2.55	1.05				
			20.0					530.0	1.00%	2.00	4.42	7.69	718.00	13.99	7.69
C17.2	0.49	4.11	20.0	33.00	2.00%	0.11	5.03	903.0	3.27%	3.62	4.16	9.19	936.00	15.20	9.19
C17.3	0.49	2.21	15.0	100.00	8.40%	0.31	5.46	152.0	4.47%	3.17	0.80				
			20.0					416.0	0.97%	1.97	3.52	9.78	668.00	13.71	9.78
C17.4	0.49	1.98	20.0	36.00	2.00%	0.11	5.26	1579.0	1.14%	2.14	12.32	17.58	1615.00	18.97	17.58
C17.5	0.49	3.72	15.0	66.00	7.73%	0.24	4.56	77.0	4.63%	3.23	0.40				
			20.0					1050.0	1.07%	2.07	8.46	13.41	1193.00	16.63	13.41
C17.6	0.49	1.04	20.0	94.00	1.06%	0.15	10.47	527.0	1.65%	2.57	3.42	13.89	621.00	13.45	13.89
C17.7	0.49	2.68	15.0	90.00	4.44%	0.23	6.39	107.0	0.93%	1.45	1.23	7.62	197.00	11.09	7.62
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
C17.9	0.90	1.73	20.0	31.00	2.00%	0.32	1.60	464.0	0.91%	1.91	4.05	5.65	495.00	12.75	5.65
C17.10	0.90	2.34	20.0	45.00	2.00%	0.39	1.93	723.0	0.66%	1.62	7.42	9.34	768.00	14.27	9.34
D1.1	0.49	5.09	20.0	100.00	1.50%	0.17	9.63	1484.0	2.00%	2.83	8.74	18.38	1584.00	18.80	18.38
D1.2	0.49	1.10	15.0	65.00	7.85%	0.24	4.50	81.0	2.72%	2.47	0.55				

CORE ENGINEERING GROUP

Standard Form SF-1. Time of Concentration-Proposed

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Checked By: Leonard Beasley

Job No: 100.040
Project: Lorson Ranch East Preliminary Drainage

Sub-Basin Data				Initial Overland Time (t_i)				Travel Time (t_t)					t_c Check (urbanized Basins)		Final t_c
BASIN or DESIGN	C_5	AREA (A) acres	NRCS Convey.	LENGTH (L) feet	SLOPE (S) %	VELOCITY (V) ft/sec	t_i minutes	LENGTH (L) feet	SLOPE (S) %	VELOCITY (V) ft/sec	t_t minutes	Computed t_c Minutes	TOTAL LENGTH (L) feet	Regional tc tc=(L/180)+10 minutes	USDCM Recommended t_c=t_i+t_t (min)
			20.0					309.0	2.01%	2.84	1.82	6.86	455.00	12.53	6.86
D1.3	0.49	0.86	20.0	100.00	2.60%	0.21	8.03	420.0	1.79%	2.68	2.62	10.65	520.00	12.89	10.65
D1.4	0.49	2.80	15.0	100.00	1.60%	0.18	9.43	33.0	2.42%	2.33	0.24				
			20.0					582.0	3.18%	3.57	2.72	12.39	715.00	13.97	12.39
D1.5	0.49	5.15	20.0	36.00	4.22%	0.15	4.11	1132.0	3.14%	3.54	5.32	9.43	1168.00	16.49	9.43
D1.6	0.49	5.10	20.0	90.00	1.44%	0.16	9.26	1421.0	2.51%	3.17	7.47	16.74	1511.00	18.39	16.74
D1.7	0.49	3.50	15.0	90.00	12.33%	0.33	4.56	107.0	3.74%	2.90	0.61				
			20.0					781.0	1.55%	2.49	5.23	10.40	978.00	15.43	10.40
D1.8	0.49	1.70	20.0	45.00	1.11%	0.11	7.14	1004.0	2.56%	3.20	5.23	12.37	1049.00	15.83	12.37
D1.9	0.49	2.20	20.0	50.00	2.00%	0.13	6.20	1265.0	2.63%	3.24	6.50	12.70	1315.00	17.31	12.70
D1.10	0.49	5.50	20.0	47.00	2.49%	0.14	5.59	1460.0	2.43%	3.12	7.80	13.39	1507.00	18.37	13.39
D1.11	0.49	1.40	20.0	50.00	2.00%	0.13	6.20	951.0	1.64%	2.56	6.19	12.38	1001.00	15.56	12.38
D1.12	0.24	4.45	15.0	95.00	7.16%	0.20	7.90	177.0	6.78%	3.91	0.76				
			15.0					463.0	0.50%	1.06	7.28	15.93	735.00	14.08	14.08
D2.1	0.49	3.14	15.0	100.00	2.32%	0.20	8.34	90.0	2.32%	2.28	0.66				
			20.0					897.0	1.62%	2.55	5.87	14.87	1087.00	16.04	14.87
D2.2	0.49	1.11	15.0	100.00	1.70%	0.18	9.24	167.0	3.47%	2.79	1.00				
			20.0					218.0	1.15%	2.14	1.69	11.93	485.00	12.69	11.93
D2.3	0.27	2.80	15.0	100.00	2.10%	0.14	11.73	344.0	4.77%	3.28	1.75				
			20.0					292.0	3.20%	3.58	1.36	14.84	736.00	14.09	14.09
D2.4	0.29	3.33	15.0	100.00	4.50%	0.19	8.90	386.0	6.30%	3.76	1.71				
			20.0					487.0	2.00%	2.83	2.87	13.48	973.00	15.41	13.48
D2.5	0.49	3.93	15.0	61.00	14.75%	0.29	3.54	219.0	2.19%	2.22	1.64				
			20.0					447.0	2.82%	3.36	2.22	7.40	727.00	14.04	7.40
D2.6	0.49	2.13	15.0	100.00	3.00%	0.22	7.66	20.0	2.50%	2.37	0.14				
			20.0					528.0	2.94%	3.43	2.57	10.37	648.00	13.60	10.37
D2.7	0.49	2.98	20.0	25.00	2.00%	0.10	4.38	631.0	3.44%	3.71	2.84	7.22	656.00	13.64	7.22
D2.8	0.49	3.70	15.0	35.00	15.71%	0.22	2.63	162.0	2.34%	2.29	1.18				
			20.0					665.0	1.04%	2.04	5.43	9.24	862.00	14.79	9.24
D2.9	0.49	3.15	20.0	75.00	1.87%	0.16	7.76	1342.0	2.50%	3.16	7.07	14.83	1417.00	17.87	14.83
D2.10	0.49	0.80	20.0	17.00	2.00%	0.08	3.61	392.0	1.54%	2.48	2.63	6.24	409.00	12.27	6.24
D2.11	0.90	0.40	20.0	10.00	2.00%	0.18	0.91	278.0	0.70%	1.67	2.77	3.68	288.00	11.60	3.68
D2.12	0.49	2.78	20.0	100.00	5.20%	0.26	6.39	1009.0	2.97%	3.45	4.88	11.27	1109.00	16.16	11.27
D2.13	0.49	2.51	20.0	20.00	2.00%	0.09	3.92	2334.0	2.00%	2.83	13.75	17.67	2354.00	23.08	17.67

CORE ENGINEERING GROUP

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Sub-Basin Data				Initial Overland Time (t_i)				Travel Time (t_t)					t_c Check (urbanized Basins)		Final t_c
BASIN or DESIGN	C_5	AREA (A) acres	NRCS Convey.	LENGTH (L) feet	SLOPE (S) %	VELOCITY (V) ft/sec	t_i minutes	LENGTH (L) feet	SLOPE (S) %	VELOCITY (V) ft/sec	t_t minutes	Computed t_c Minutes	TOTAL LENGTH (L) feet	Regional tc tc=(L/180)+10 minutes	USDCM Recommended $t_c=t_i+t_t$ (min)
E1.1	0.49	1.41	15.0	92.00	9.24%	0.30	5.07	145.0	2.75%	2.49	0.97				
			20.0					296.0	3.31%	3.64	1.36	7.40	533.00	12.96	7.40
E1.2	0.49	3.61	15.0	100.00	6.60%	0.28	5.91	203.0	5.22%	3.43	0.99				
			20.0					563.0	2.01%	2.84	3.31	10.20	866.00	14.81	10.20
E1.3	0.20	6.81	15.0	100.00	4.80%	0.17	9.68	763.0	5.22%	3.43	3.71				
			20.0					415.0	2.24%	2.99	2.31	15.70	1278.00	17.10	15.70
E1.4	0.49	0.65	15.0	100.00	2.00%	0.19	8.76	20.0	2.00%	2.12	0.16				
			20.0					165.0	1.87%	2.73	1.01	9.92	285.00	11.58	9.92
E1.5	0.49	1.95	20.0	30.00	2.00%	0.10	4.80	729.0	2.24%	2.99	4.06	8.86	759.00	14.22	8.86
E1.6	0.49	2.32	20.0	100.00	5.12%	0.26	6.42	566.0	1.09%	2.09	4.52	10.94	666.00	13.70	10.94
E1.7	0.38	3.50	15.0	100.00	4.50%	0.21	7.91	155.0	7.95%	4.23	0.61				
			20.0					769.0	1.07%	2.07	6.20	14.72	1024.00	15.69	14.72
C12a-ex	0.15	27	7.0	300.00	4.00%	0.27	18.80	725.0	4.97%	1.56	7.74	26.54	1025.00	15.69	15.69
C12-ex	0.15	73	7.0	300.00	5.33%	0.29	17.10	2250.0	4.53%	1.49	25.17	42.27	2550.00	24.17	24.17
C14-ex	0.15	119	7.0	300.00	3.00%	0.24	20.67	3150.0	3.37%	1.29	40.86	61.53	3450.00	29.17	29.17
D15-ex	0.15	55	7.0	300.00	3.83%	0.26	19.07	1970.0	2.61%	1.13	29.03	48.11	2270.00	22.61	22.61
D1-ex	0.15	17	7.0	300.00	2.67%	0.23	21.48	1100.0	4.55%	1.49	12.28	33.76	1400.00	17.78	17.78
E1-ex	0.15	57	7.0	300.00	4.67%	0.28	17.87	1810.0	3.73%	1.35	22.31	40.18	2110.00	21.72	21.72
E2-ex	0.26	29.50	15.0	100.00	2.70%	0.15	10.93	200.0	2.70%	1.41	2.36				
C17.2	0.49	4.11	20.0	33.00	2.00%	0.11	5.03	903.0	3.27%	3.62	4.16	9.19	936.00	15.20	9.19

APPENDIX C – HYDRAULIC CALCULATIONS

Channel Report

Hydraflow Express by Intelisolve

Wednesday, Aug 31 2016, 1:59 PM

Basin OS-C11 Swale - North Diversion Swale

Triangular

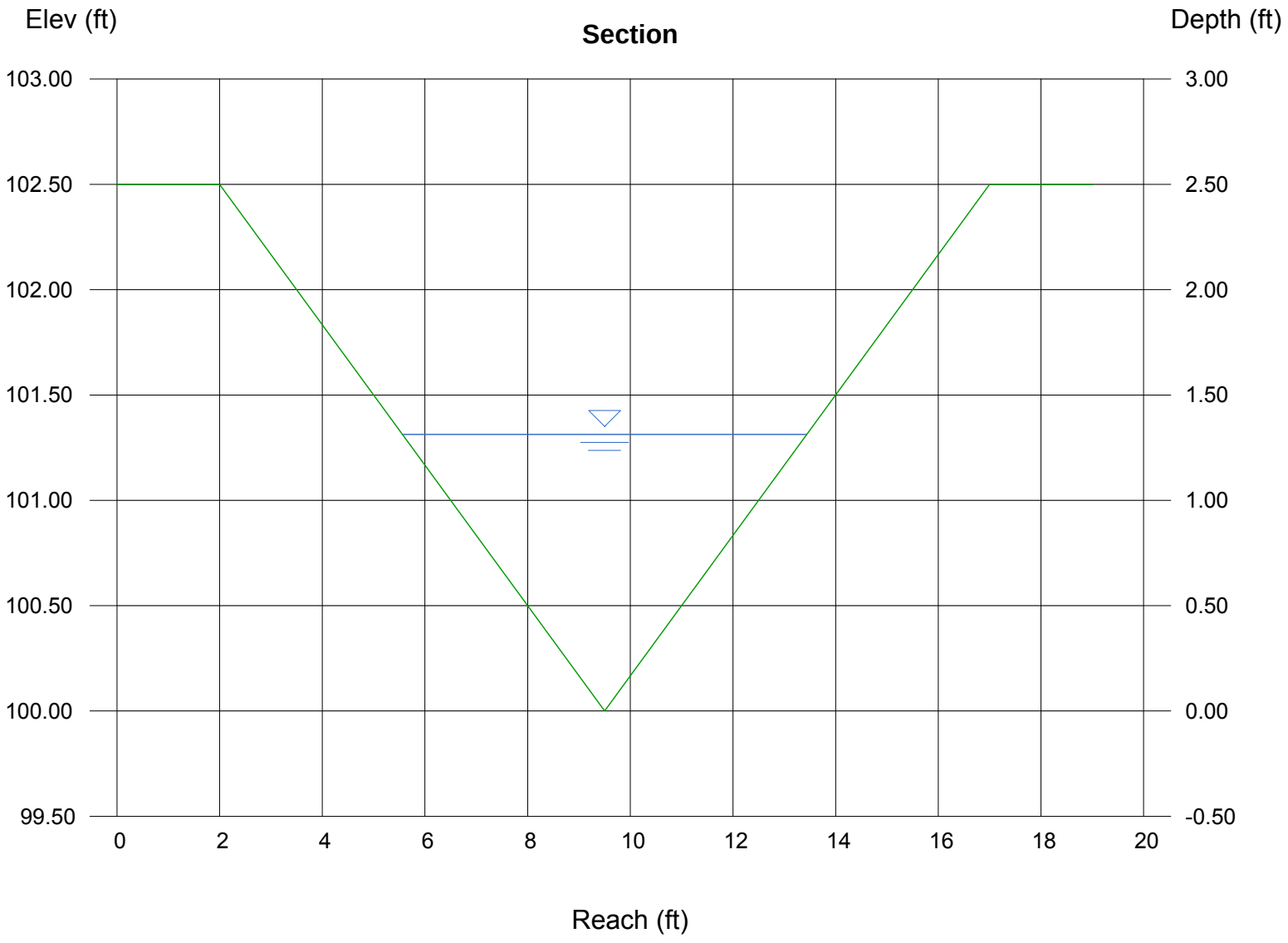
Side Slope (z:1)	= 3.00
Total Depth (ft)	= 2.50
Invert Elev (ft)	= 100.00
Slope (%)	= 1.00
N-Value	= 0.025

Calculations

Compute by:	Q vs Depth
No. Increments	= 40

Highlighted

Depth (ft)	= 1.31
Q (cfs)	= 22.39
Area (sqft)	= 5.17
Velocity (ft/s)	= 4.33
Wetted Perim (ft)	= 8.30
Crit Depth, Yc (ft)	= 1.22
Top Width (ft)	= 7.88
EGL (ft)	= 1.60



Channel Report

Hydraflow Express by Intelisolve | Wednesday, Jul 5 2017, 10:7 AM

North Diversion Swale @ 7.0% slope

Triangular

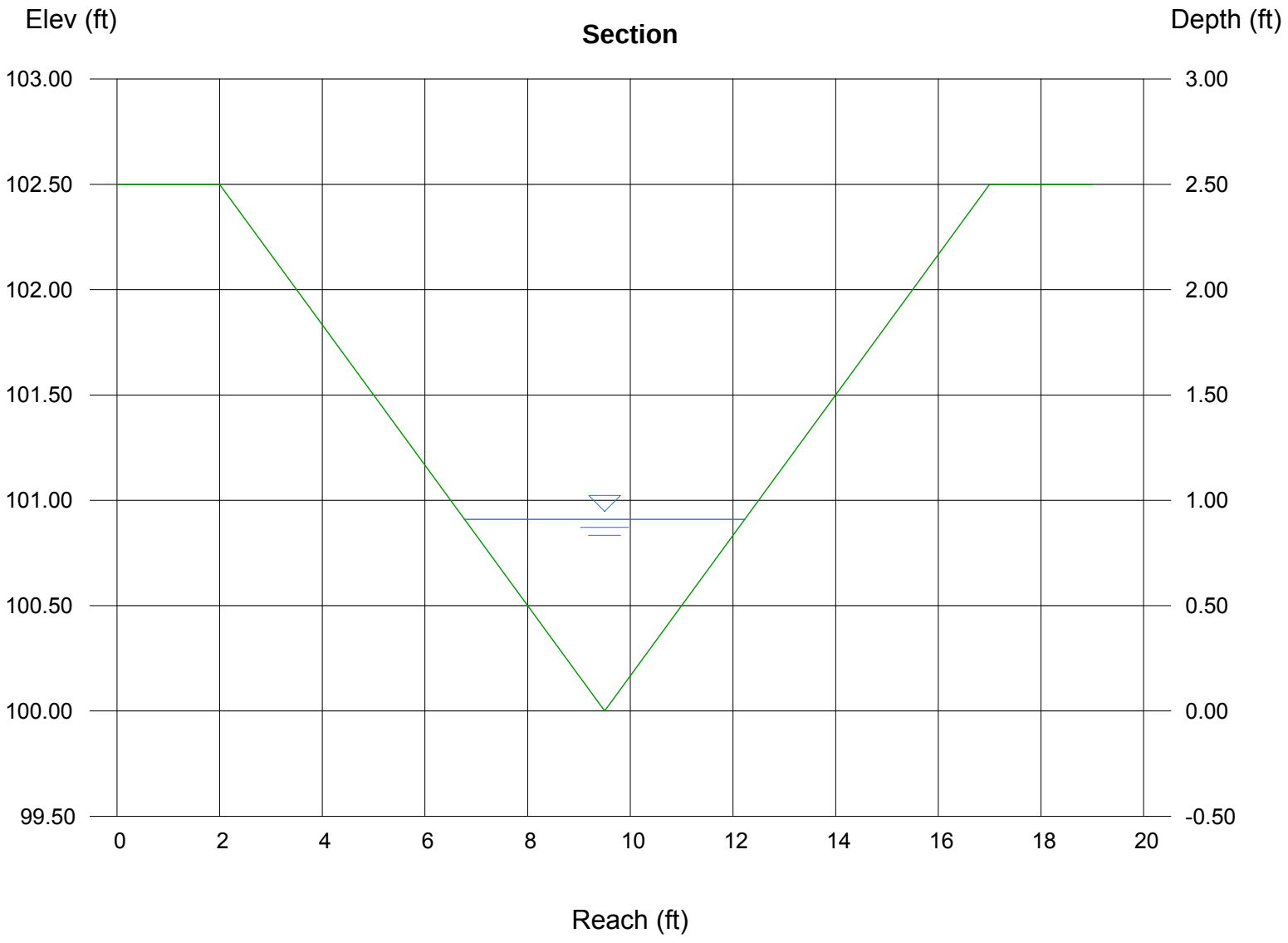
Side Slope (z:1)	= 3.00
Total Depth (ft)	= 2.50
Invert Elev (ft)	= 100.00
Slope (%)	= 7.00
N-Value	= 0.025

Calculations

Compute by:	Known Q
Known Q (cfs)	= 22.00

Highlighted

Depth (ft)	= 0.91
Q (cfs)	= 22.00
Area (sqft)	= 2.48
Velocity (ft/s)	= 8.86
Wetted Perim (ft)	= 5.76
Crit Depth, Yc (ft)	= 1.28
Top Width (ft)	= 5.46
EGL (ft)	= 2.13



Channel Report

Hydraflow Express by Intelisolve — Tuesday, Jun 27 2017, 6:8 AM

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

Trapezoidal

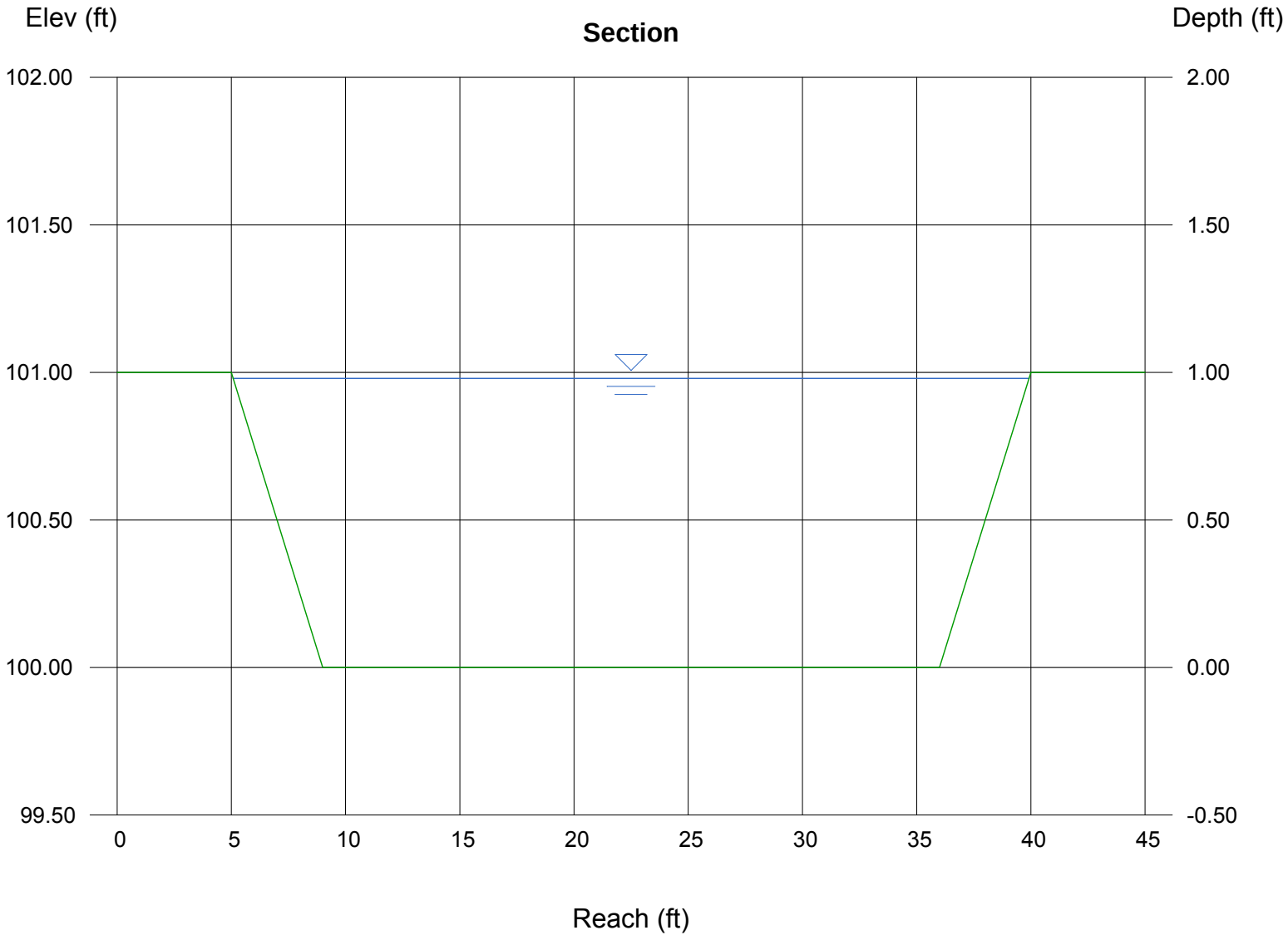
Botom Width (ft)	= 27.00
Side Slope (z:1)	= 4.00
Total Depth (ft)	= 1.00
Invert Elev (ft)	= 100.00
Slope (%)	= 2.00
N-Value	= 0.025

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



Channel Report

Hydraflow Express by Intelisolve — Friday, Sep 9 2016, 11:22 AM

Substation Swale 2 - Design Point 21

Triangular

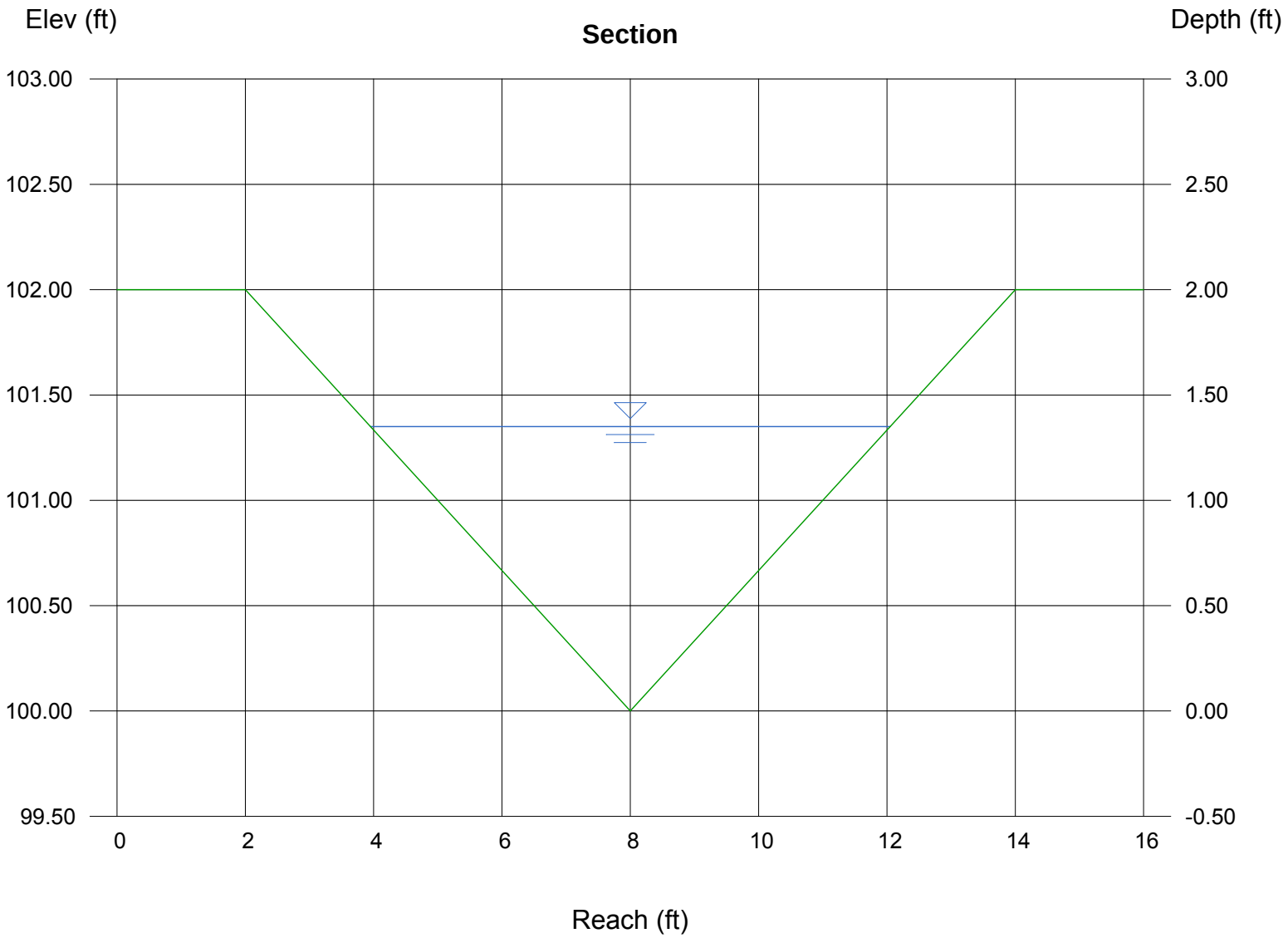
Side Slope (z:1)	= 3.00
Total Depth (ft)	= 2.00
Invert Elev (ft)	= 100.00
Slope (%)	= 1.00
N-Value	= 0.025

Calculations

Compute by:	Known Depth
Known Depth (ft)	= 1.35

Highlighted

Depth (ft)	= 1.35
Q (cfs)	= 24.14
Area (sqft)	= 5.47
Velocity (ft/s)	= 4.42
Wetted Perim (ft)	= 8.54
Crit Depth, Yc (ft)	= 1.33
Top Width (ft)	= 8.10
EGL (ft)	= 1.65



Channel Report

Hydraflow Express by Intelisolve — Sunday, Mar 5 2017, 10:50 AM

Overflow Swale Substation to Tilllamook - Design Point 21

Trapezoidal

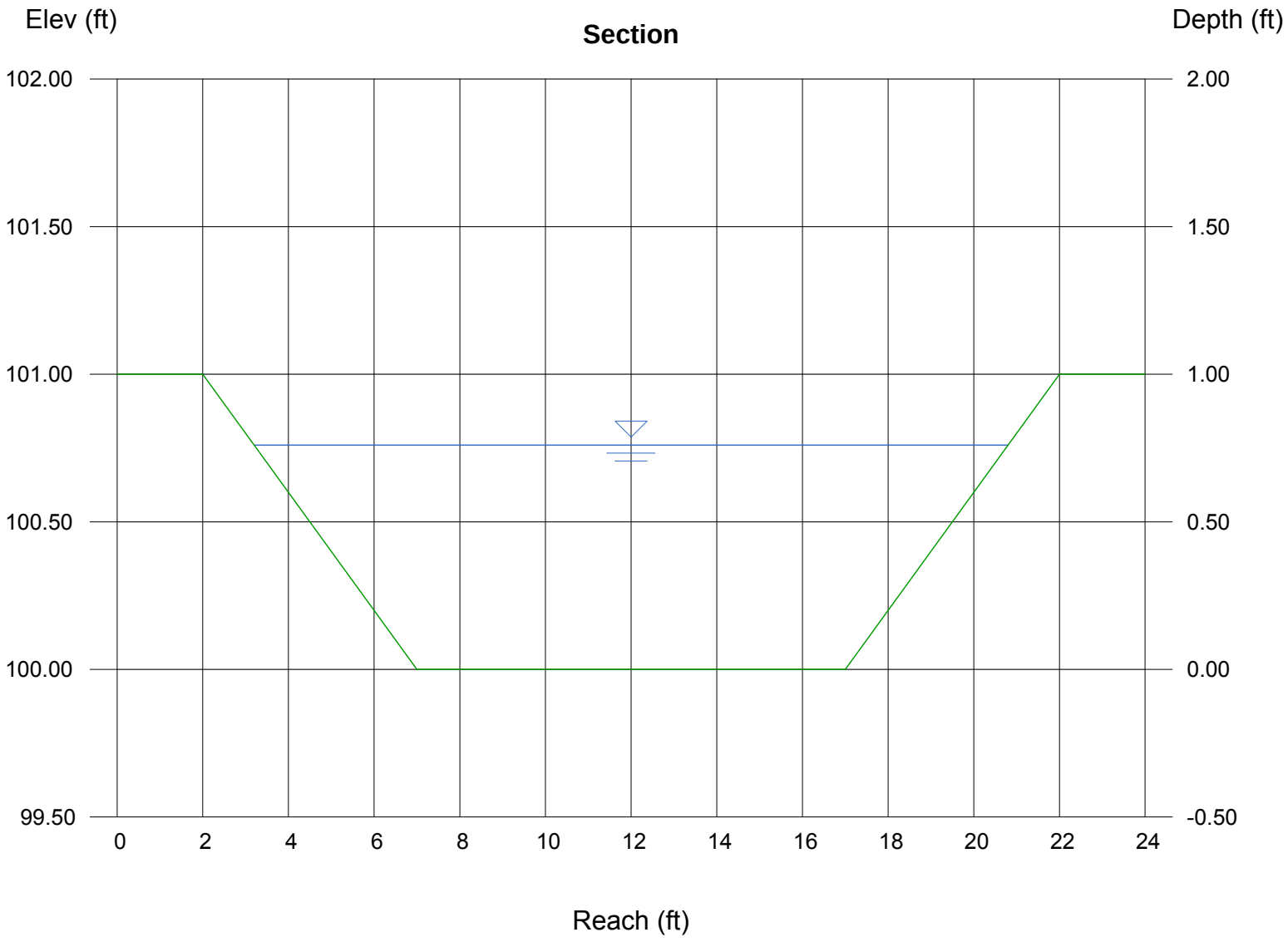
Botom Width (ft)	= 10.00
Side Slope (z:1)	= 5.00
Total Depth (ft)	= 1.00
Invert Elev (ft)	= 100.00
Slope (%)	= 1.00
N-Value	= 0.024

Calculations

Compute by:	Known Q
Known Q (cfs)	= 45.00

Highlighted

Depth (ft)	= 0.76
Q (cfs)	= 45.00
Area (sqft)	= 10.49
Velocity (ft/s)	= 4.29
Wetted Perim (ft)	= 17.75
Crit Depth, Yc (ft)	= 0.76
Top Width (ft)	= 17.60
EGL (ft)	= 1.05



Channel Report

Hydraflow Express by Intelisolve — Friday, Mar 3 2017, 7:22 AM

Overflow from Rockcastle to Fontaine - Design Point 27

Trapezoidal

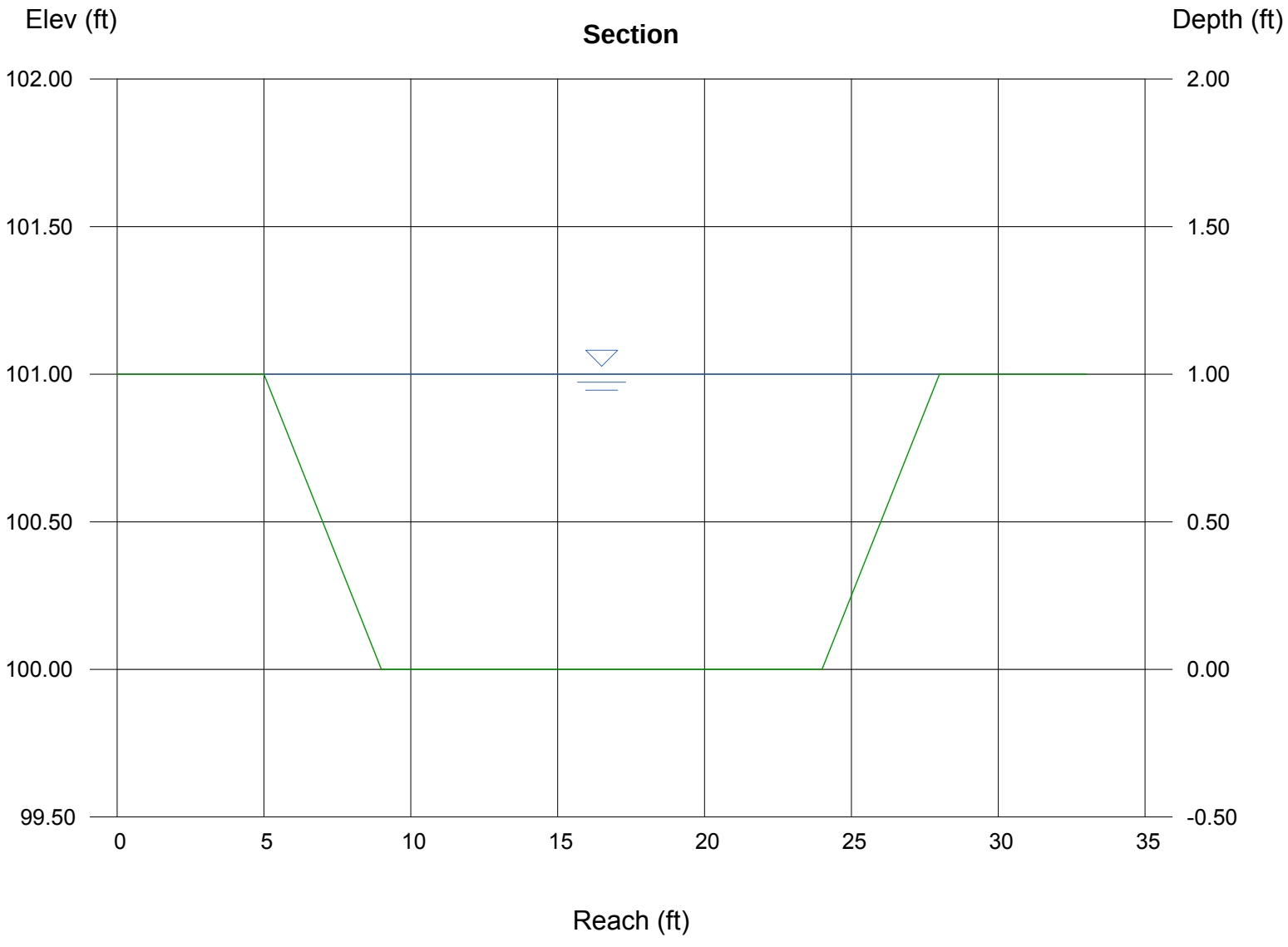
Botom Width (ft)	= 15.00
Side Slope (z:1)	= 4.00
Total Depth (ft)	= 1.00
Invert Elev (ft)	= 100.00
Slope (%)	= 1.00
N-Value	= 0.024

Calculations

Compute by:	Q vs Depth
No. Increments	= 1

Highlighted

Depth (ft)	= 1.00
Q (cfs)	= 102.83
Area (sqft)	= 19.00
Velocity (ft/s)	= 5.41
Wetted Perim (ft)	= 23.25
Crit Depth, Yc (ft)	= 0.01
Top Width (ft)	= 23.00
EGL (ft)	= 1.46



Channel Report

Hydraflow Express by Intelisolve | Thursday, Sep 8 2016, 12:9 PM

24-inch from Des.Pt 47 to Des.Pt.48

Circular

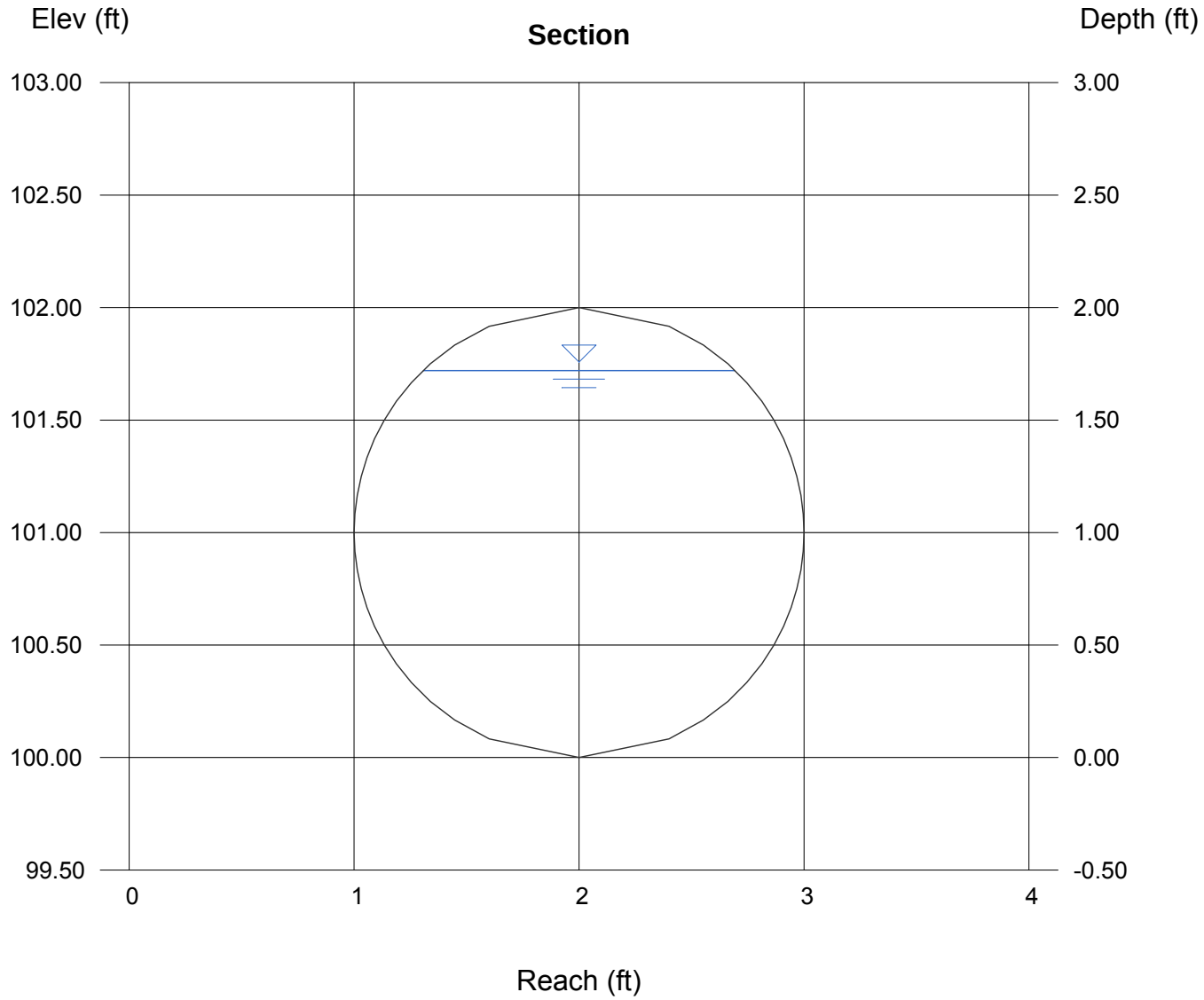
Diameter (ft)	= 2.00
Invert Elev (ft)	= 100.00
Slope (%)	= 0.50
N-Value	= 0.013

Calculations

Compute by:	Known Q
Known Q (cfs)	= 16.60

Highlighted

Depth (ft)	= 1.72
Q (cfs)	= 16.60
Area (sqft)	= 2.87
Velocity (ft/s)	= 5.77
Wetted Perim (ft)	= 4.75
Crit Depth, Yc (ft)	= 1.47
Top Width (ft)	= 1.39
EGL (ft)	= 2.24



Channel Report

48-inch storm sewer at Des.Pt. 49 into Pond B1

Circular

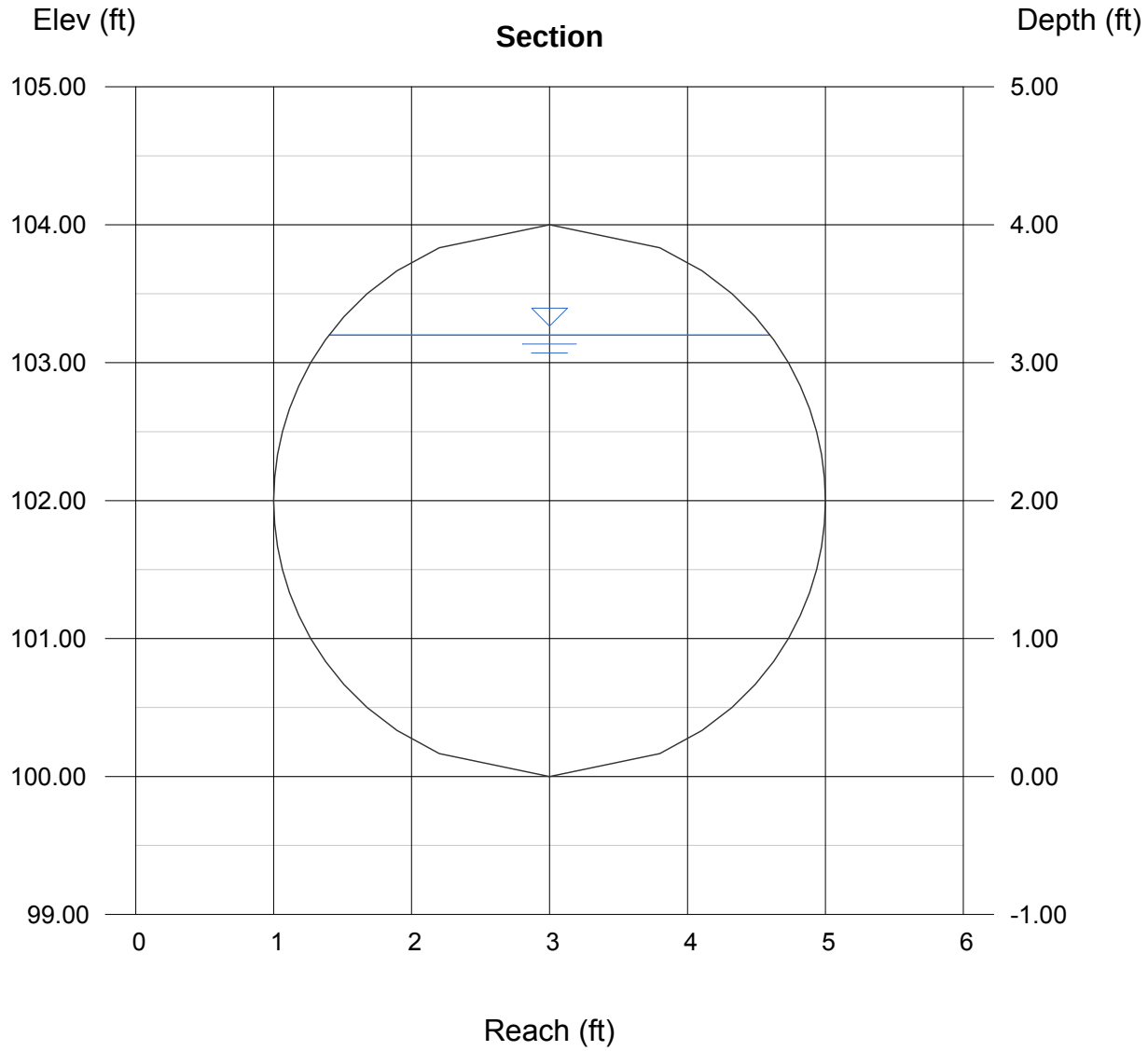
Diameter (ft)	= 4.00
Invert Elev (ft)	= 100.00
Slope (%)	= 0.50
N-Value	= 0.013

Calculations

Compute by:	Q vs Depth
No. Increments	= 10

Highlighted

Depth (ft)	= 3.20
Q (cfs)	= 99.32
Area (sqft)	= 10.78
Velocity (ft/s)	= 9.21
Wetted Perim (ft)	= 8.86
Crit Depth, Yc (ft)	= 2.80
Top Width (ft)	= 3.20
EGL (ft)	= 4.52



Channel Report

Hydraflow Express by Intelisolve | Wednesday, Mar 8 2017, 6:4 AM

Lamine low point to Pond D2 Overflow Swale - Design Point 56

Trapezoidal

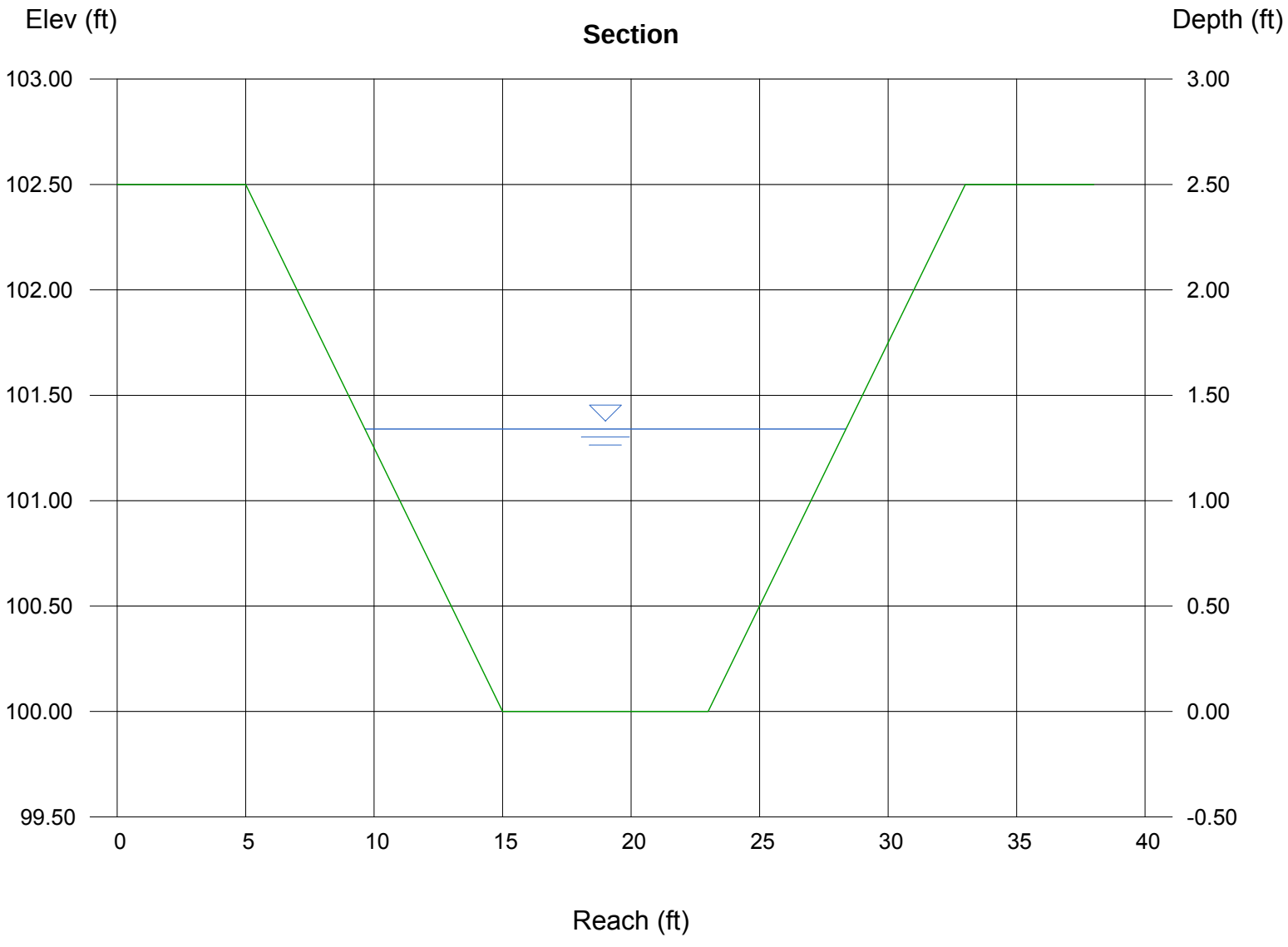
Botom Width (ft)	= 8.00
Side Slope (z:1)	= 4.00
Total Depth (ft)	= 2.50
Invert Elev (ft)	= 100.00
Slope (%)	= 2.00
N-Value	= 0.024

Calculations

Compute by:	Known Q
Known Q (cfs)	= 150.00

Highlighted

Depth (ft)	= 1.34
Q (cfs)	= 150.00
Area (sqft)	= 17.90
Velocity (ft/s)	= 8.38
Wetted Perim (ft)	= 19.05
Crit Depth, Yc (ft)	= 1.68
Top Width (ft)	= 18.72
EGL (ft)	= 2.43



Channel Report

Hydraflow Express by Intelisolve — Tuesday, Jun 27 2017, 6:53 AM

Basin E1.3 Swale at Design Pt. 67b

Triangular

Side Slope (z:1)	= 4.00
Total Depth (ft)	= 3.00
Invert Elev (ft)	= 100.00
Slope (%)	= 2.50
N-Value	= 0.025

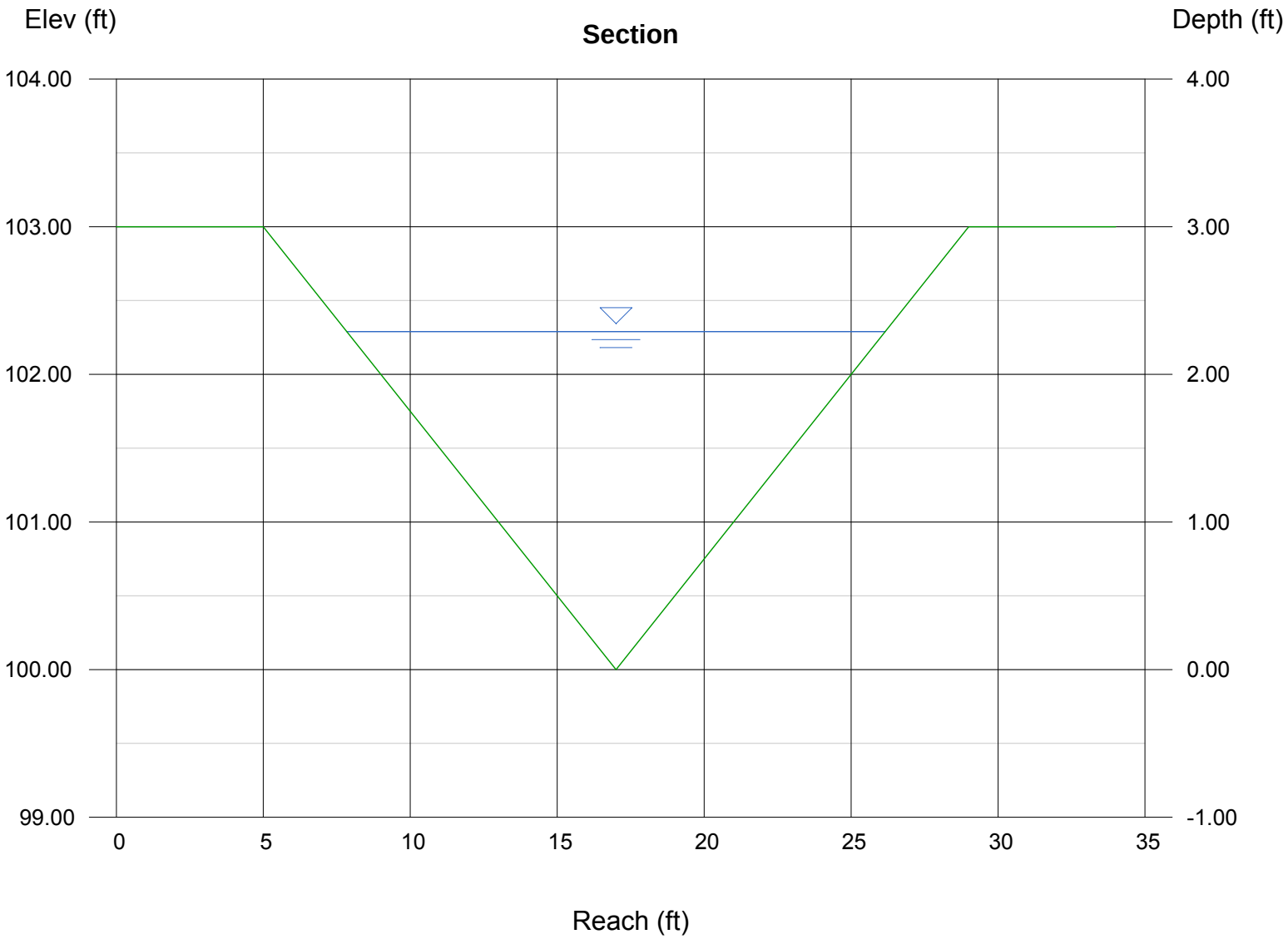
Highlighted

Depth (ft)	= 2.29
Q (cfs)	= 210.00
Area (sqft)	= 20.98
Velocity (ft/s)	= 10.01
Wetted Perim (ft)	= 18.88
Crit Depth, Yc (ft)	= 2.80
Top Width (ft)	= 18.32
EGL (ft)	= 3.85

Calculations

Compute by:	Known Q
Known Q (cfs)	= 210.00

Is this an overflow calculation?



Channel Report

Hydraflow Express by Intelisolve | Thursday, Jul 6 2017, 7:15 AM

Basin E1.3 Swale at Design Pt. 67b

Triangular

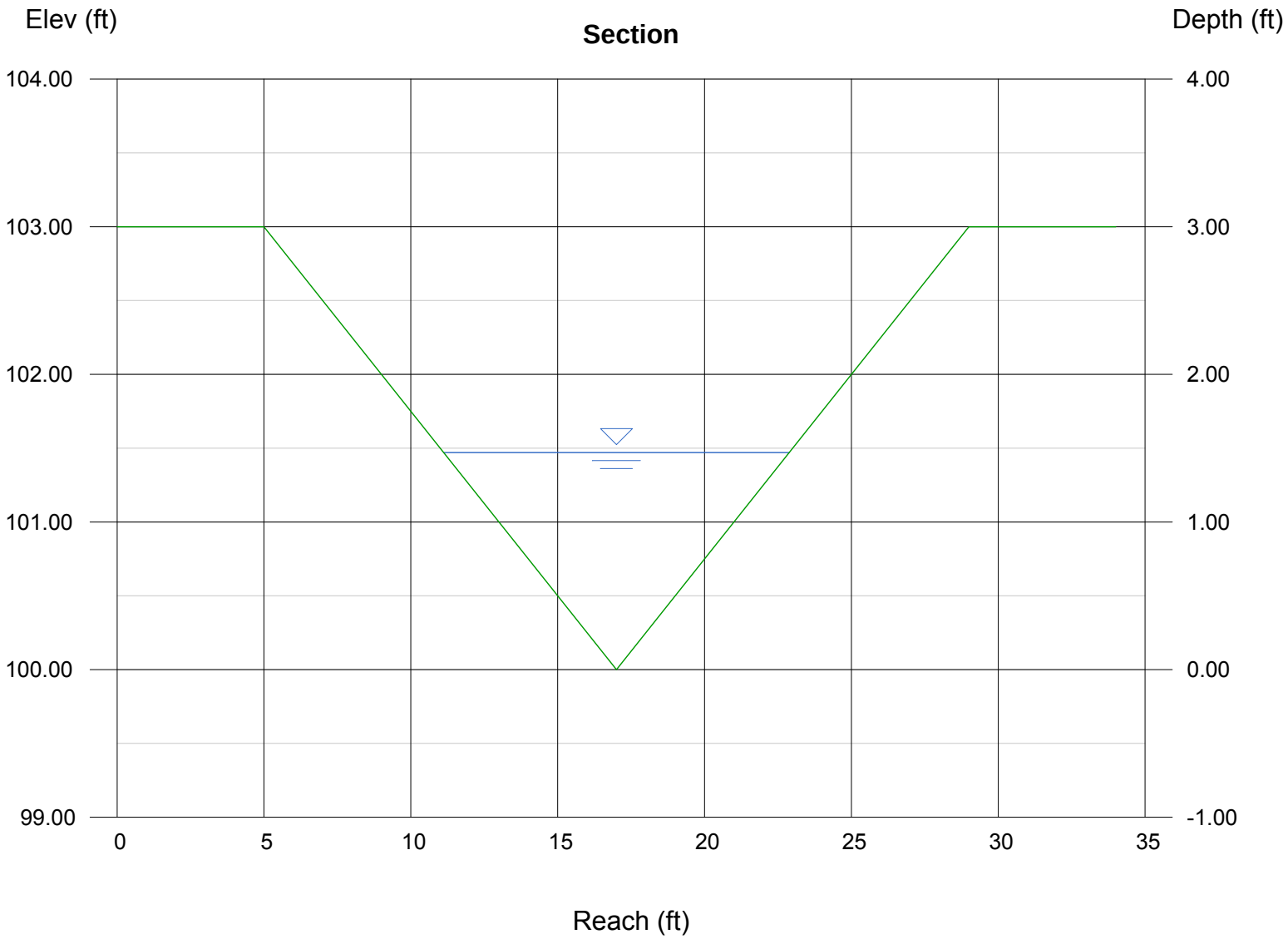
Side Slope (z:1)	= 4.00
Total Depth (ft)	= 3.00
Invert Elev (ft)	= 100.00
Slope (%)	= 2.50
N-Value	= 0.025

Calculations

Compute by:	Known Q
Known Q (cfs)	= 64.10

Highlighted

Depth (ft)	= 1.47
Q (cfs)	= 64.10
Area (sqft)	= 8.64
Velocity (ft/s)	= 7.42
Wetted Perim (ft)	= 12.12
Crit Depth, Yc (ft)	= 1.75
Top Width (ft)	= 11.76
EGL (ft)	= 2.33



Channel Report

Hydraflow Express by Intelisolve — Thursday, Mar 16 2017, 6:1 AM

Basin E2-ex Diversion Channel at Design Point 67a

Triangular

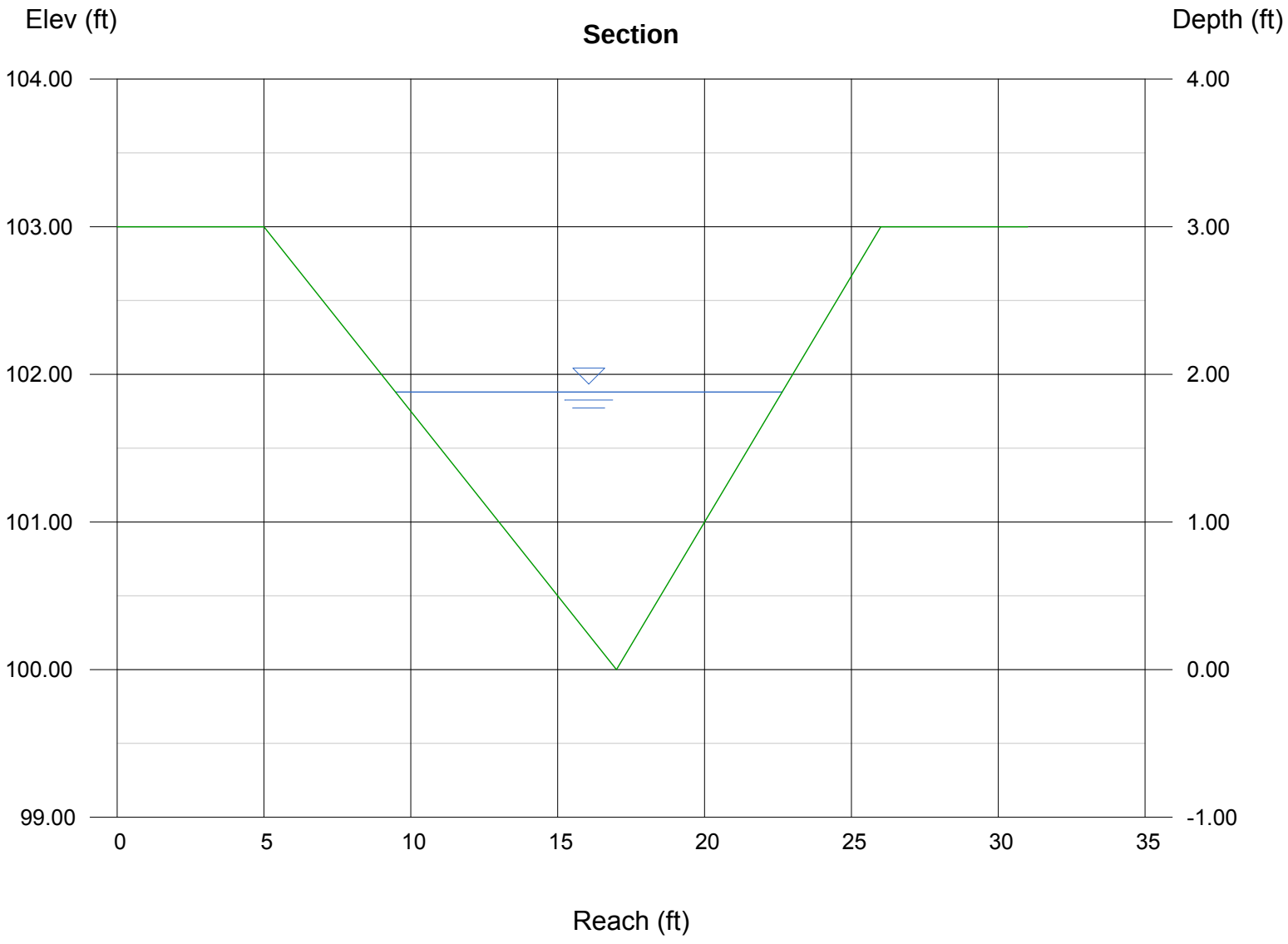
Side Slope (z:1)	= 4.00
Total Depth (ft)	= 3.00
Invert Elev (ft)	= 100.00
Slope (%)	= 2.00
N-Value	= 0.024

Calculations

Compute by:	Known Q
Known Q (cfs)	= 100.00

Highlighted

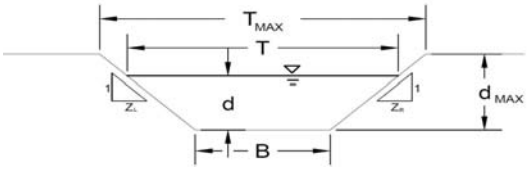
Depth (ft)	= 1.88
Q (cfs)	= 100.00
Area (sqft)	= 12.37
Velocity (ft/s)	= 8.08
Wetted Perim (ft)	= 13.70
Crit Depth, Yc (ft)	= 2.20
Top Width (ft)	= 13.16
EGL (ft)	= 2.90



AREA INLET IN A TRAPEZOIDAL GRASS-LINED CHANNEL

Lorson East Prelim Plan #100.040

Flow from Basin E2-ex into Type D inlet



Grass Type	Limiting Manning's n
A	0.06
B	0.04
C	0.033
D	0.03
E	0.024

Analysis of Trapezoidal Grass-Lined Channel Using SCS Method

	NRCS Vegetal Retardance (A, B, C, D, or E)	A, B, C, D or E	B	
	Manning's n (Leave cell D16 blank to manually enter an n value)	n =	see details below	
	Channel Invert Slope	S_O =	0.0280	ft/ft
	Bottom Width	B =	4.00	ft
Warning 01	Left Side Slope	Z1 =	0.33	ft/ft
Warning 01	Right Side Slope	Z2 =	0.33	ft/ft

Check one of the following soil types:

Soil Type:	Max. Velocity (V_{MAX})	Max Froude No. (F_{MAX})
Sandy	5.0 fps	0.50
Non-Sandy	7.0 fps	0.80

Choose One:
- ○ Sandy
- ◉ Non-Sandy

		Minor Storm	Major Storm	
	Max. Allowable Top Width of Channel for Minor & Major Storm	T_{MAX} =	18.00	18.00 feet
	Max. Allowable Water Depth in Channel for Minor & Major Storm	d_{MAX} =	3.00	3.00 feet

Allowable Channel Capacity Based On Channel Geometry

		Minor Storm	Major Storm	
	MINOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	97.37	97.37 cfs
	MAJOR STORM Allowable Capacity is based on Depth Criterion	d_{allow} =	3.00	3.00 ft

Water Depth in Channel Based On Design Peak Flow

	Design Peak Flow	Q_o =	26.65	92.02 cfs
	Water Depth	d =	1.70	2.92 feet

Minor storm max. allowable capacity GOOD - greater than flow given on sheet 'Q-Peak'

Major storm max. allowable capacity GOOD - greater than flow given on sheet 'Q-Peak'

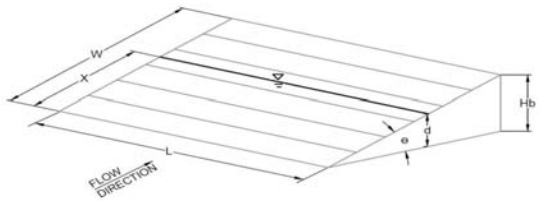
AREA INLET IN A TRAPEZOIDAL GRASS-LINED CHANNEL

Lorson East Prelim Plan #100.040

Flow from Basin E2-ex into Type D inlet

Inlet Design Information (Input)

Type of Inlet — Inlet Type = CDOT Type D (In Series & Depressed)



Angle of Inclined Grate (must be <= 30 degrees)	θ =	0.00	degrees
Width of Grate	W =	3.00	feet
Length of Grate	L =	6.00	feet
Open Area Ratio	A_{RATIO} =	0.70	
Height of Inclined Grate	H_B =	0.00	feet
Clogging Factor	C_f =	0.38	
Grate Discharge Coefficient	C_d =	0.72	
Orifice Coefficient	C_o =	0.48	
Weir Coefficient	C_w =	1.53	

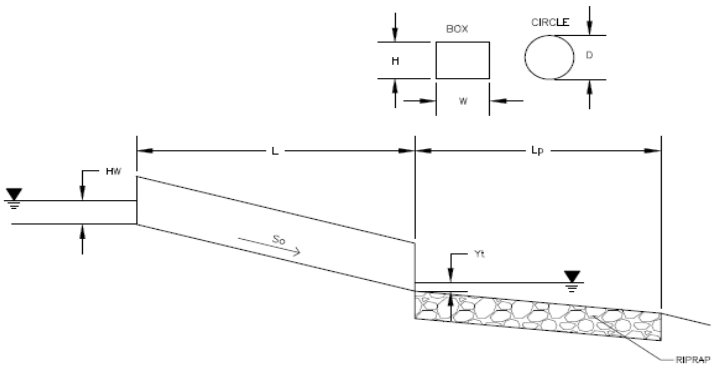
		MINOR	MAJOR	
Water Depth at Inlet (for depressed inlets, 1 foot is added for depression)	d =	2.70	3.92	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**49.56**	**59.71**	**cfs**
WARNING: Inlet Capacity is less than Q Peak for Major Storm	**Bypassed Flow, Q_b =**	**0.00**	**32.31**	**cfs**
	Capture Percentage = Q_a/Q_o = C%	**100**	**65**	**%**

Warning 01: Sideslope steepness exceeds USDCM Volume I recommendation.
Warning 02: Depth (d) exceeds USDCM Volume I recommendation.

Determination of Culvert Headwater and Outlet Protection

Project: Lorson Ranch East

Basin ID: Rip Rap sizing for outlet pipe from Pond C3 to Pond C2.2



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

Design Information (Input):

Design Discharge	Q =	18	cfs
Circular Culvert:			
Barrel Diameter in Inches	D =	18	inches
Inlet Edge Type (Choose from pull-down list)		Square End Projection	
Box Culvert:		**OR**	
Barrel Height (Rise) in Feet	Height (Rise) =		ft
Barrel Width (Span) in Feet	Width (Span) =		ft
Inlet Edge Type (Choose from pull-down list)			
Number of Barrels	No =	1	
Inlet Elevation	Elev IN =	102	ft
Outlet Elevation **OR** Slope	Elev OUT =	100	ft
Culvert Length	L =	100	ft
Manning's Roughness	n =	0.012	
Bend Loss Coefficient	k_b =	0	
Exit Loss Coefficient	k_x =	1	
Tailwater Surface Elevation	Elev Y_t =		ft
Max Allowable Channel Velocity	V =	5	ft/s

Required Protection (Output):

Tailwater Surface Height	Y_t =	0.60	ft
Flow Area at Max Channel Velocity	A_t =	3.60	ft^2
Culvert Cross Sectional Area Available	A =	1.77	ft^2
Entrance Loss Coefficient	k_e =	0.50	
Friction Loss Coefficient	k_f =	1.54	
Sum of All Losses Coefficients	k_s =	3.04	ft
Culvert Normal Depth	Y_n =	1.12	ft
Culvert Critical Depth	Y_c =	1.45	ft
Tailwater Depth for Design	d =	1.48	ft
Adjusted Diameter **OR** Adjusted Rise	D_a =	-	ft
Expansion Factor	1/(2*tan(Θ)) =	1.85	
Flow/Diameter$^{2.5}$ **OR** Flow/(Span * Rise$^{1.5}$)	Q/D^2.5 =	6.53	$ft^{0.5}/s$
Froude Number	Fr =	-	**Pressure flow!**
Tailwater/Adjusted Diameter **OR** Tailwater/Adjusted Rise	Yt/D =	0.40	
Inlet Control Headwater	HW_I =	5.23	ft
Outlet Control Headwater	HW_O =	4.38	
Design Headwater Elevation	**HW =**	**107.23**	**ft**
Headwater/Diameter OR Headwater/Rise Ratio	**HW/D =**	**3.48**	**HW/D > 1.5!**
Minimum Theoretical Riprap Size	d_{50} =	8	in
Nominal Riprap Size	d_{50} =	9	in
UDFCD Riprap Type	**Type =**	**L**	
Length of Protection	**L_p =**	**10**	**ft**
Width of Protection	**T =**	**7**	**ft**

APPENDIX D – POND AND ROUTING CALCULATIONS

Design Procedure Form: Extended Detention Basin (EDB)

UD-BMP (Version 3.06, November 2016)

Designer: Richard Schindler
Company: Core Engineering Group
Date: July 6, 2017
Project: Lorson Ranch East PDR - Pond c5 forebay design (south and north forebay same size)
Location: Tributary area =171ac, use 1/2 in north forebay and 1/2 in south forebay

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

65%?

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: July 6, 2017
Project: Lorson Ranch East PDR - Pond c5 forebay design (south and north forebay same size)
Location: Pond C5 forebay design (1/2 of total pond forebay)

5. Forebay	
A) Minimum Forebay Volume (V_{FMIN} = 3% of the WQCV)	V_{FMIN} = 0.050 ac-ft
B) Actual Forebay Volume	V_F = 0.050 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} = 242.00 cfs
ii) Forebay Discharge Design Flow ($Q_F = 0.02 * Q_{100}$)	Q_F = 4.84 cfs
E) Forebay Discharge Design	Choose One: (•) Berm With Pipe; ( ) Wall with Rect. Notch; ( ) Wall with V-Notch Weir — ROUND UP TO NEAREST PIPE SIZE
F) Discharge Pipe Size (minimum 8-inches)	Calculated D_P = 12 in
G) Rectangular Notch Width	Calculated W_N = 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 = 345 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: July 6, 2017
Project: Lorson Ranch East PDR - Pond c5 forebay design (south and north forebay same size)
Location: Tributary area =171ac, use 1/2 in north forebay and 1/2 in south forebay

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 = 115.0 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.)	*Aluminum Amico-Klemp SR Series with Cross Rods 2" O.C.*
Other (Y/N): N	
C) Ratio of Total Open Area to Total Area (only for type 'Other')	User Ratio =
D) Total Water Quality Screen Area (based on screen type)	A_{total} = 1123 sq. in.
E) Depth of Design Volume (EURV or WQCV) (Based on design concept chosen under 1E)	H= 2.12 feet
F) Height of Water Quality Screen (H_{TR})	H_{TR}= 53.44 inches
G) Width of Water Quality Screen Opening ($W_{opening}$) (Minimum of 12 inches is recommended)	$W_{opening}$ = 21.0 inches

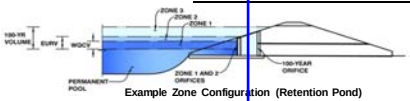
65%?

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 =	Denver - Capitol Building	
Water Quality Capture Volume (WQCV) =	3.515	acre-feet
Excess Urban Runoff Volume (EURV) =	10.382	acre-feet
2-yr Runoff Volume (P1 = 1.16 in.) =	9.641	acre-feet
5-yr Runoff Volume (P1 = 1.44 in.) =	13.459	acre-feet
10-yr Runoff Volume (P1 = 1.68 in.) =	16.659	acre-feet
25-yr Runoff Volume (P1 = 1.92 in.) =	21.433	acre-feet
50-yr Runoff Volume (P1 = 2.16 in.) =	25.205	acre-feet
100-yr Runoff Volume (P1 = 2.42 in.) =	29.878	acre-feet
500-yr Runoff Volume (P1 = 3.14 in.) =	41.092	acre-feet
Approximate 2-yr Detention Volume =	9.045	acre-feet
Approximate 5-yr Detention Volume =	12.678	acre-feet
Approximate 10-yr Detention Volume =	14.486	acre-feet
Approximate 25-yr Detention Volume =	15.477	acre-feet
Approximate 50-yr Detention Volume =	15.943	acre-feet
Approximate 100-yr Detention Volume =	17.508	acre-feet

Optional User Override 1-hr Precipitation

1.16	inches
1.44	inches
1.68	inches
1.92	inches
2.16	inches
2.42	inches
	inches

Stage-Storage Calculation

Zone 1 Volume (WQCV) =	3.515	acre-feet
Zone 2 Volume (EURV - Zone 1) =	6.868	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	7.126	acre-feet
Total Detention Basin Volume =	17.508	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	user	acre-feet

Depth Increment = 0.2 ft

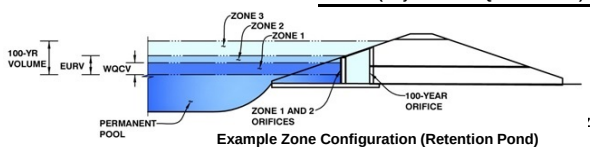
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	50	0.001		
5706.33	--	0.33	--	--	--	100	0.002	24	0.001
5707	--	1.00	--	--	--	1,000	0.023	383	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 (100-year)	8.95	7.126	Weir&Pipe (Restrict)
		17.508	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 Area =	N/A	ft^2
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

Calculated Parameters for Underdrain

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

Invert of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	6.396E-02	ft^2
Depth at top of Zone using Orifice Plate =	4.01	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	16.00	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	9.21	sq. inches (use rectangular openings)	Elliptical Slot Area =	N/A	ft^2

Calculated Parameters for Plate

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.34	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		Zone 2 Rectangular	Not Selected	
Invert of Vertical Orifice =	4.01	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	0.78	N/A	ft^2
Depth at top of Zone using Vertical Orifice =	6.57	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	0.25	N/A	feet
Vertical Orifice Height =	6.00	N/A	inches				
Vertical Orifice Width =	18.68		inches				

Calculated Parameters for Vertical Orifice

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

	Zone 3 Weir	Not Selected		Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	6.60	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	6.60	N/A	feet
Overflow Weir Front Edge Length =	18.00	N/A	feet	Over Flow Weir Slope Length =	3.00	N/A	feet
Overflow Weir Slope =	0.00	N/A	H:V (enter zero for flat grate)	Grate Open Area / 100-yr Orifice Area =	3.65	N/A	should be ≥ 4
Horiz. Length of Weir Sides =	3.00	N/A	feet	Overflow Grate Open Area w/o Debris =	45.90	N/A	ft^2
Overflow Grate Open Area % =	85%	N/A	%, grate open area/total area	Overflow Grate Open Area w/ Debris =	22.95	N/A	ft^2
Debris Clogging % =	50%	N/A	%				

Calculated Parameters for Overflow Weir

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

	Zone 3 Restrictor	Not Selected		Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	0.00	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	12.57	N/A	ft^2
Outlet Pipe Diameter =	48.00	N/A	inches	Outlet Orifice Centroid =	2.00	N/A	feet
Restrictor Plate Height Above Pipe Invert =	48.00		inches	Half-Central Angle of Restrictor Plate on Pipe =	3.14	N/A	radians

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=		ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=		feet
Spillway Crest Length =		feet	Stage at Top of Freeboard =		feet
Spillway End Slopes =		H:V	Basin Area at Top of Freeboard =		acres
Freeboard above Max Water Surface =		feet			

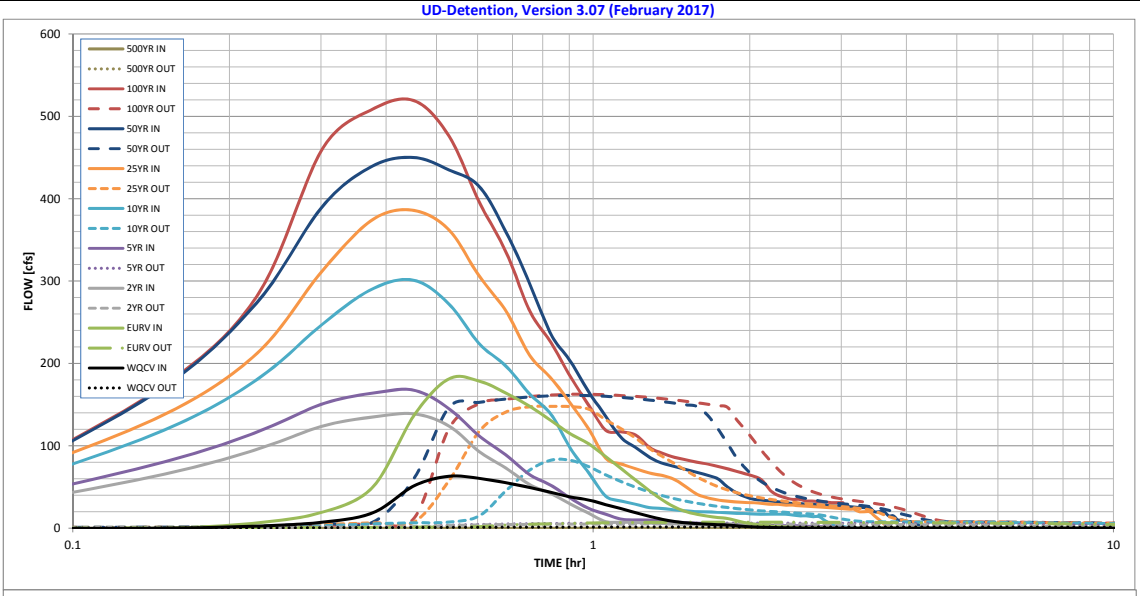
Calculated Parameters for Spillway

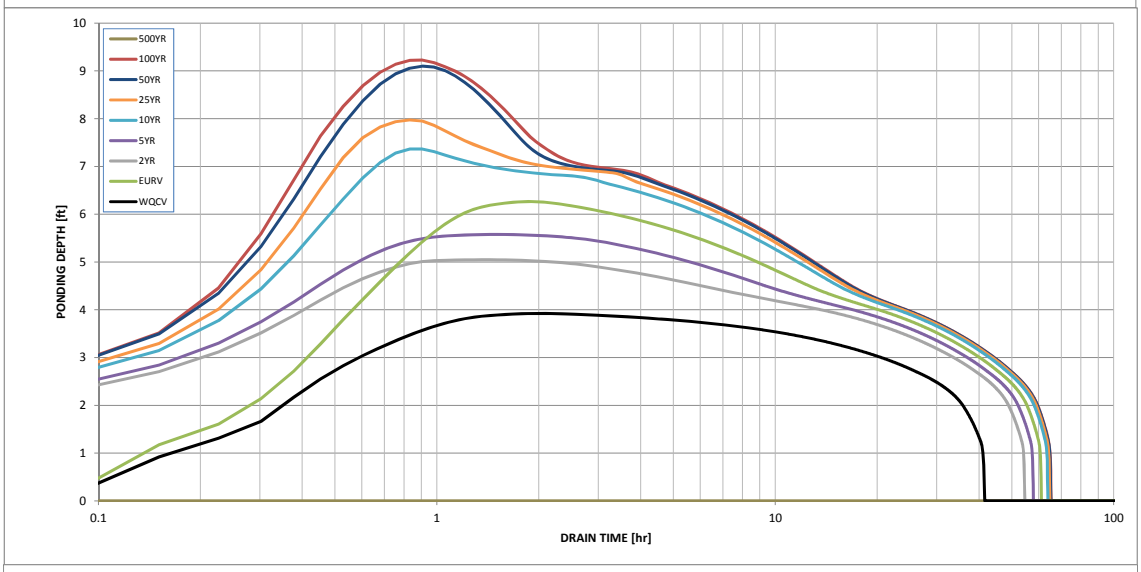
Routed Hydrograph Results

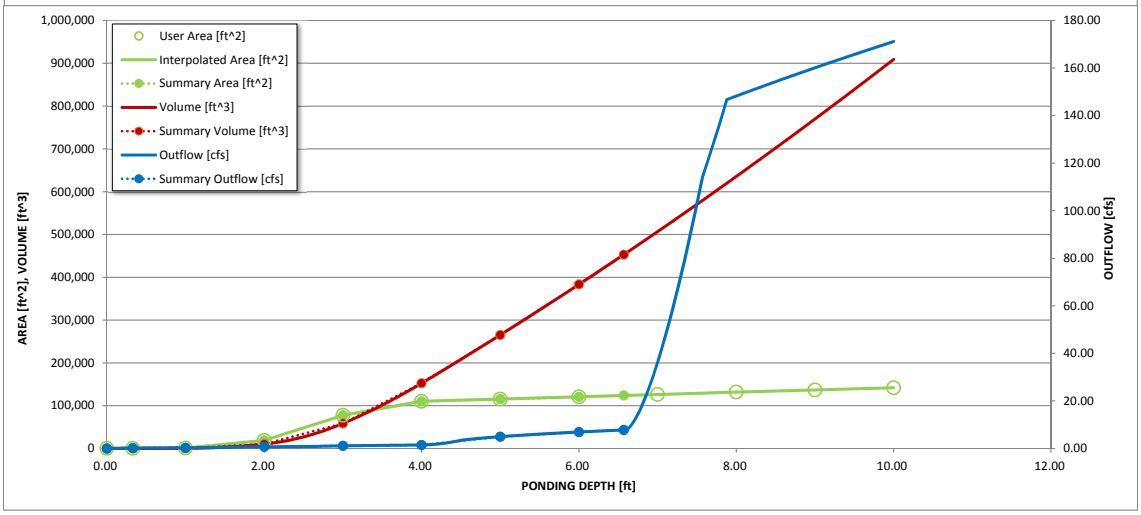
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	0.53	1.07	1.16	1.44	1.68	1.92	2.16	2.42	3.14
Calculated Runoff Volume (acre-ft) =	3.515	10.382	9.641	13.459	16.659	21.433	25.205	29.878	41.092
OPTIONAL Override Runoff Volume (acre-ft) =									
Inflow Hydrograph Volume (acre-ft) =	3.517	10.386	6.877	8.575	17.689	26.716	34.728	37.807	0.000
Predevelopment Unit Peak Flow, q (cfs/acre) =	0.00	0.00	0.02	0.14	0.37	0.85	1.12	1.46	2.19
Predevelopment Peak Q (cfs) =	0.0	0.0	2.8	23.2	63.2	145.3	191.8	249.0	374.8
Peak Inflow Q (cfs) =	63.1	181.4	138.8	167.5	301.0	385.7	450.0	519.1	0.0
Peak Outflow Q (cfs) =	1.4	7.3	5.1	6.2	82.7	147.9	161.2	162.7	
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.3	1.3	1.0	0.8	0.7	
Structure Controlling Flow =	Plate	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Overflow Grate 1	Outlet Plate 1	Outlet Plate 1	Outlet Plate 1	
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	1.6	3.0	3.3	3.3	
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
Time to Drain 97% of Inflow Volume (hours) =	38	54	50	52	54	50	48	47	
Time to Drain 99% of Inflow Volume (hours) =	**40**	58	52	55	59	59	58	57	
Maximum Ponding Depth (ft) =	3.92	6.27	5.05	5.58	7.37	7.98	9.10	9.23	
Area at Maximum Ponding Depth (acres) =	2.47	2.80	2.66	2.72	2.94	3.02	3.15	3.17	
Maximum Volume Stored (acre-ft) =	3.298	9.524	6.195	7.619	12.682	14.500	17.986	18.365	

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	USER
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
4.53 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:04:32	0.00	0.00	29.00	36.00	51.00	62.00	64.00	65.00	0.00
Hydrograph	0:09:04	0.00	0.00	66.00	81.00	120.00	139.00	173.00	175.00	0.00
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	0.00
	4:22:44	0.00	0.00					1.00	2.00	0.00
	4:27:16	0.00	0.00					0.00	1.00	0.00
	4:31:48	0.00	0.00					0.00	0.00	0.00
	4:36:20	0.00	0.00						0.00	0.00
	4:40:52	0.00	0.00						0.00	0.00
	4:45:23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:49:55	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:54:27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:58:59	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:03:31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:08:02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:12:34	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:17:06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:21:38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:26:10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)

Summary Stage-Area-Volume-Discharge Relationships

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

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

Stage - Storage Description	Stage [ft]	Area [ft^2]	Area [acres]	Volume [ft^3]	Volume [ac-ft]	Total Outflow [cfs]
	0.00	50	0.001	0	0.000	0.00
	0.33	98	0.002	24	0.001	0.17
	1.00	987	0.023	383	0.009	0.31
	2.00	18,719	0.430	10,154	0.233	0.68
	3.00	77,432	1.778	58,507	1.343	1.11
	4.00	110,270	2.531	152,358	3.498	1.47
	5.00	115,455	2.650	265,220	6.089	4.97
	6.00	120,720	2.771	383,308	8.800	6.92
	6.57	123,755	2.841	452,983	10.399	7.80

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

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

Weir Report

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

Pond C5 Spillway - btm=5713.00

Trapezoidal Weir

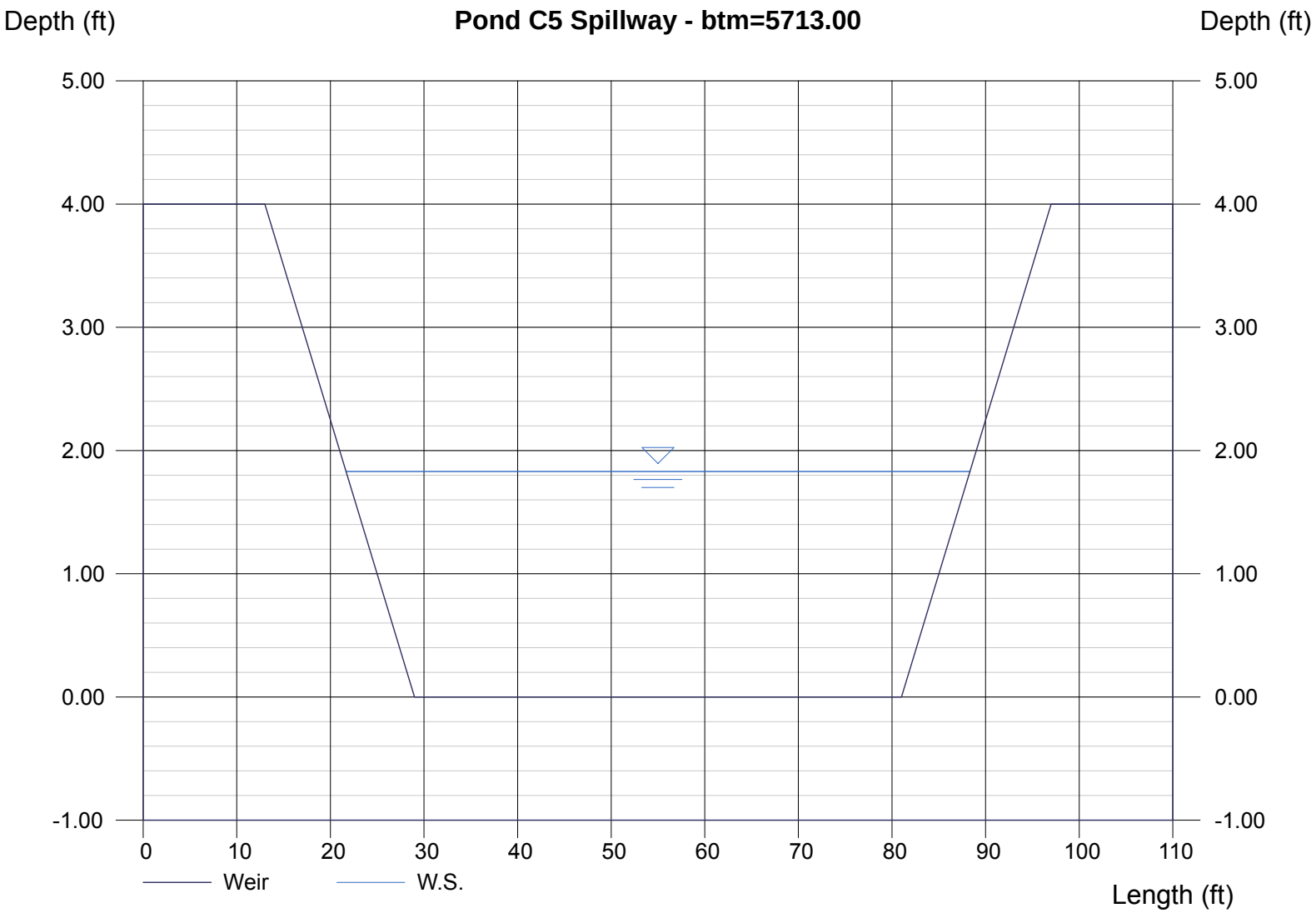
Crest	= Sharp
Bottom Length (ft)	= 52.00
Total Depth (ft)	= 4.00
Side Slope (z:1)	= 4.00

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

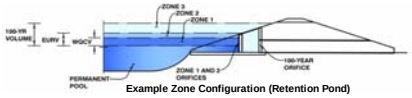


DETENTION BASIN STAGE-STORAGE TABLE BUILDER

UD-Detention, Version 3.07 (February 2017)

Project: Lorson East MDDP

Basin ID: Pond D2 - Lorson Blvd at East Tributary of JCC



Example Zone Configuration (Retention Pond)

Required Volume Calculation

Selected BMP Type =	EDB	
Watershed Area =	89.00	acres
Watershed Length =	2,200	ft
Watershed Slope =	0.025	ft/ft
Watershed Imperviousness =	55.00%	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) =	1.635	acre-feet
Excess Urban Runoff Volume (EURV) =	4.666	acre-feet
2-yr Runoff Volume (P1 = 1.16 in.) =	4.303	acre-feet
5-yr Runoff Volume (P1 = 1.44 in.) =	6.164	acre-feet
10-yr Runoff Volume (P1 = 1.68 in.) =	7.797	acre-feet
25-yr Runoff Volume (P1 = 1.92 in.) =	10.390	acre-feet
50-yr Runoff Volume (P1 = 2.16 in.) =	12.380	acre-feet
100-yr Runoff Volume (P1 = 2.42 in.) =	14.861	acre-feet
500-yr Runoff Volume (P1 = 0 in.) =	0.000	acre-feet
Approximate 2-yr Detention Volume =	4.036	acre-feet
Approximate 5-yr Detention Volume =	5.809	acre-feet
Approximate 10-yr Detention Volume =	6.624	acre-feet
Approximate 25-yr Detention Volume =	7.126	acre-feet
Approximate 50-yr Detention Volume =	7.365	acre-feet
Approximate 100-yr Detention Volume =	8.261	acre-feet

Optional User Override 1-hr Precipitation

1.16	inches
1.44	inches
1.68	inches
1.92	inches
2.16	inches
2.42	inches
	inches

Stage-Storage Calculation

Zone 1 Volume (WQCV) =	1.635	acre-feet
Zone 2 Volume (EURV - Zone 1) =	3.032	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	3.595	acre-feet
Total Detention Basin Volume =	8.261	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	user	acre-feet

Depth Increment = 0.2 ft

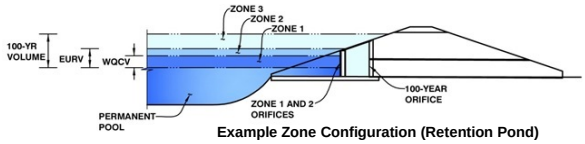
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	20	0.000		
5695.33	--	0.33	--	--	--	100	0.002	19	0.000
5696	--	1.00	--	--	--	1,074	0.025	402	0.009
5697	--	2.00	--	--	--	48,988	1.125	24,956	0.573
5698	--	3.00	--	--	--	72,821	1.672	86,348	1.982
5699	--	4.00	--	--	--	76,610	1.759	161,063	3.698
5700	--	5.00	--	--	--	80,493	1.848	239,615	5.501
5701	--	6.00	--	--	--	84,486	1.940	322,104	7.394
5702	--	7.00	--	--	--	88,582	2.034	408,638	9.381
5703	--	8.00	--	--	--	92,768	2.130	499,313	11.463
5704	--	9.00	--	--	--	97,074	2.229	594,234	13.642
5705	--	10.00	--	--	--	102,033	2.342	693,788	15.927
5706	--	11.00	--	--	--	106,000	2.433	797,804	18.315

Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)

Project: Lorson Ranch East MDDP

Basin ID: Pond D2 - Lorson Blvd at East Tributary of JCC



Example Zone Configuration (Retention Pond)

	Stage (ft)	Zone Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.79	1.635	Orifice Plate
Zone 2 (EURV)	4.55	3.032	Rectangular Orifice
Zone 3 (100-year)	6.45	3.595	Weir&Pipe (Restrict)
		8.261	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 =	2.80	ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing =	9.00	inches
Orifice Plate: Orifice Area per Row =	4.20	sq. inches (use rectangular openings)

Calculated Parameters for Plate

WQ Orifice Area per Row =	2.917E-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	0.60	1.20					
Orifice Area (sq. inches)	4.20	4.20	4.20					

	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 =	2.79	N/A	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =	4.55	N/A	ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Height =	10.00	N/A	inches
Vertical Orifice Width =	25.21		inches

Calculated Parameters for Vertical Orifice

	Zone 2 Rectangular	Not Selected	
Vertical Orifice Area =	1.75	N/A	ft^2
Vertical Orifice Centroid =	0.42	N/A	feet

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

	Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	4.60	N/A	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	4.00	N/A	feet
Overflow Weir Slope =	10.00	N/A	H:V (enter zero for flat grate)
Horiz. Length of Weir Sides =	20.00	N/A	feet
Overflow Grate Open Area % =	70%	N/A	%, grate open area/total area
Debris Clogging % =	50%	N/A	%

Calculated Parameters for Overflow Weir

	Zone 3 Weir	Not Selected	
Height of Grate Upper Edge, H_t =	6.60	N/A	feet
Over Flow Weir Slope Length =	20.10	N/A	feet
Grate Open Area / 100-yr Orifice Area =	3.54	N/A	should be ≥ 4
Overflow Grate Open Area w/o Debris =	56.28	N/A	ft^2
Overflow Grate Open Area w/ Debris =	28.14	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 =	54.00	N/A	inches
Restrictor Plate Height Above Pipe Invert =	54.00		inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 3 Restrictor	Not Selected	
Outlet Orifice Area =	15.90	N/A	ft^2
Outlet Orifice Centroid =	2.25	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 =	30.00	feet
Spillway End Slopes =	4.00	H:V
Freeboard above Max Water Surface =	3.00	feet

Calculated Parameters for Spillway

Spillway Design Flow Depth=	1.64	feet
Stage at Top of Freeboard =	11.64	feet
Basin Area at Top of Freeboard =	2.43	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	1.16	1.44	1.68	1.92	2.16	2.42	0.00
Calculated Runoff Volume (acre-ft) =	1.635	4.666	4.303	6.164	7.797	10.390	12.380	14.861	0.000
OPTIONAL Override Runoff Volume (acre-ft) =									
Inflow Hydrograph Volume (acre-ft) =	1.632	4.661	4.297	6.155	7.781	10.375	12.358	14.837	#N/A
Predevelopment Unit Peak Flow, q (cfs/acre) =	0.00	0.00	0.02	0.15	0.41	0.93	1.23	1.59	0.00
Predevelopment Peak Q (cfs) =	0.0	0.0	1.6	13.5	36.4	82.9	109.4	141.5	0.0
Peak Inflow Q (cfs) =	32.1	90.1	83.2	118.2	148.6	196.4	232.5	277.1	#N/A
Peak Outflow Q (cfs) =	0.6	8.9	8.2	12.5	26.2	60.9	91.6	131.5	#N/A
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.9	0.7	0.7	0.8	0.9	#N/A
Structure Controlling Flow =	Plate	Vertical Orifice 1	Vertical Orifice 1	Overflow Grate 1	Overflow Grate 1	Overflow Grate 1	Overflow Grate 1	Overflow Grate 1	#N/A
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	0.0	0.2	0.8	1.3	2.0	#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) =	39	49	49	49	48	46	44	42	#N/A
Time to Drain 99% of Inflow Volume (hours) =	**40**	52	52	53	53	52	52	51	#N/A
Maximum Ponding Depth (ft) =	2.73	4.14	3.98	4.81	5.37	5.99	6.33	6.68	#N/A
Area at Maximum Ponding Depth (acres) =	1.52	1.77	1.76	1.83	1.88	1.94	1.97	2.00	#N/A
Maximum Volume Stored (acre-ft) =	1.536	3.945	3.645	5.133	6.191	7.356	8.040	8.735	#N/A

Design Procedure Form: Extended Detention Basin (EDB)

UD-BMP (Version 3.06, November 2016)

Designer: Richard Schindler
Company: Core Engineering Group
Date: October 10, 2017
Project: Lorson Ranch East PDR - Pond D2 forebay design
Location:

1. Basin Storage Volume	
A) Effective Imperviousness of Tributary Area, I_a	I_a = 55.0 %
B) Tributary Area's Imperviousness Ratio ($i = I_a / 100$)	i = 0.550
C) Contributing Watershed Area	Area = 89.000 ac
D) For Watersheds Outside of the Denver Region, Depth of Average Runoff Producing Storm	d_6 = in
E) Design Concept (Select EURV when also designing for flood control)	Choose One: (•) Water Quality Capture Volume (WQCV); ( ) Excess Urban Runoff Volume (EURV)
F) Design Volume (WQCV) Based on 40-hour Drain Time ($V_{DESIGN} = (1.0 * (0.91 * i^3 - 1.19 * i^2 + 0.78 * i) / 12 * Area$)	V_{DESIGN}= 1.635 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)	$V_{DESIGN\ USER}$= 1.390 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: October 10, 2017
Project: Lorson Ranch East PDR - Pond D2 forebay design
Location:

5. Forebay	
A) Minimum Forebay Volume (V_{FMIN} = 3% of the WQCV)	V_{FMIN} = 0.042 ac-ft
B) Actual Forebay Volume	V_F = 0.045 ac-ft
C) Forebay Depth (D_F = 30 inch maximum)	D_F = 30.0 in
D) Forebay Discharge	
i) Undetained 100-year Peak Discharge	Q_{100} = 243.00 cfs
ii) Forebay Discharge Design Flow ($Q_F = 0.02 * Q_{100}$)	Q_F = 4.86 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 = 10.4 in
6. Trickle Channel	
A) Type of Trickle Channel	Choose One: ◉ Concrete ○ Soft Bottom
F) Slope of Trickle Channel	S = 0.0050 ft / ft
7. Micropool and Outlet Structure	
A) Depth of Micropool (2.5-feet minimum)	D_M = 2.5 ft
B) Surface Area of Micropool (10 ft^2 minimum)	A_M = 121 sq ft
C) Outlet Type	Choose One: ◉ Orifice Plate ○ Other (Describe):
D) Smallest Dimension of Orifice Opening Based on Hydrograph Routing (Use UD-Detention)	$D_{orifice}$ = 3.05 inches
E) Total Outlet Area	A_{ot} = 26.85 square inches

Design Procedure Form: Extended Detention Basin (EDB)

Designer: Richard Schindler
Company: Core Engineering Group
Date: October 10, 2017
Project: Lorson Ranch East PDR - Pond D2 forebay design
Location:

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} = 181.6 cu ft
C) Initial Surcharge Provided Above Micropool	V_s = 40.3 cu ft
9. Trash Rack	
A) Water Quality Screen Open Area: $A_t = A_{ot} * 38.5*(e^{-0.095D})$	A_t = 774 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.)	*Aluminum Amico-Klemp SR Series with Cross Rods 2" O.C.*
Other (Y/N): N	
C) Ratio of Total Open Area to Total Area (only for type 'Other')	User Ratio =
D) Total Water Quality Screen Area (based on screen type)	A_{total} = 1090 sq. in.
E) Depth of Design Volume (EURV or WQCV) (Based on design concept chosen under 1E)	H= 1 feet
F) Height of Water Quality Screen (H_{TR})	H_{TR}= 40 inches
G) Width of Water Quality Screen Opening ($W_{opening}$) (Minimum of 12 inches is recommended)	$W_{opening}$ = 27.2 inches

Weir Report

Hydraflow Express by Intelisolve | Friday, Oct 13 2017, 7:8 AM

Pond D2 Spillway - btm=5702.00

Trapezoidal Weir

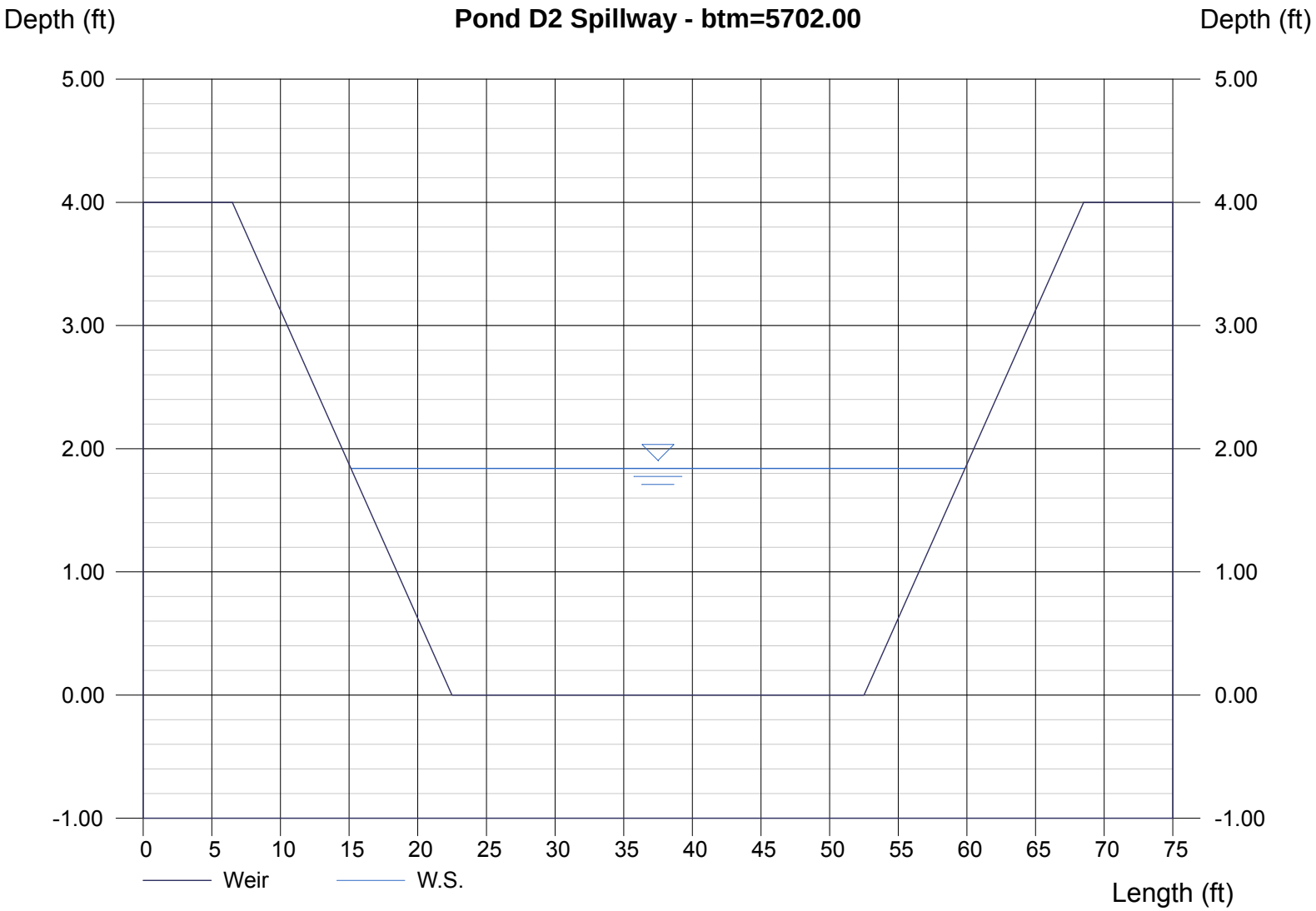
Crest	= Sharp
Bottom Length (ft)	= 30.00
Total Depth (ft)	= 4.00
Side Slope (z:1)	= 4.00

Calculations

Weir Coeff. Cw	= 3.10
Compute by:	Known Q
Known Q (cfs)	= 277.10

Highlighted

Depth (ft)	= 1.84
Q (cfs)	= 277.10
Area (sqft)	= 68.74
Velocity (ft/s)	= 4.03
Top Width (ft)	= 44.72



Weir Report

Hydraflow Express by Intelisolve | Thursday, Oct 12 2017, 8:46 PM

Future Pond C2.2 Overflow Conveyance

Rectangular Weir

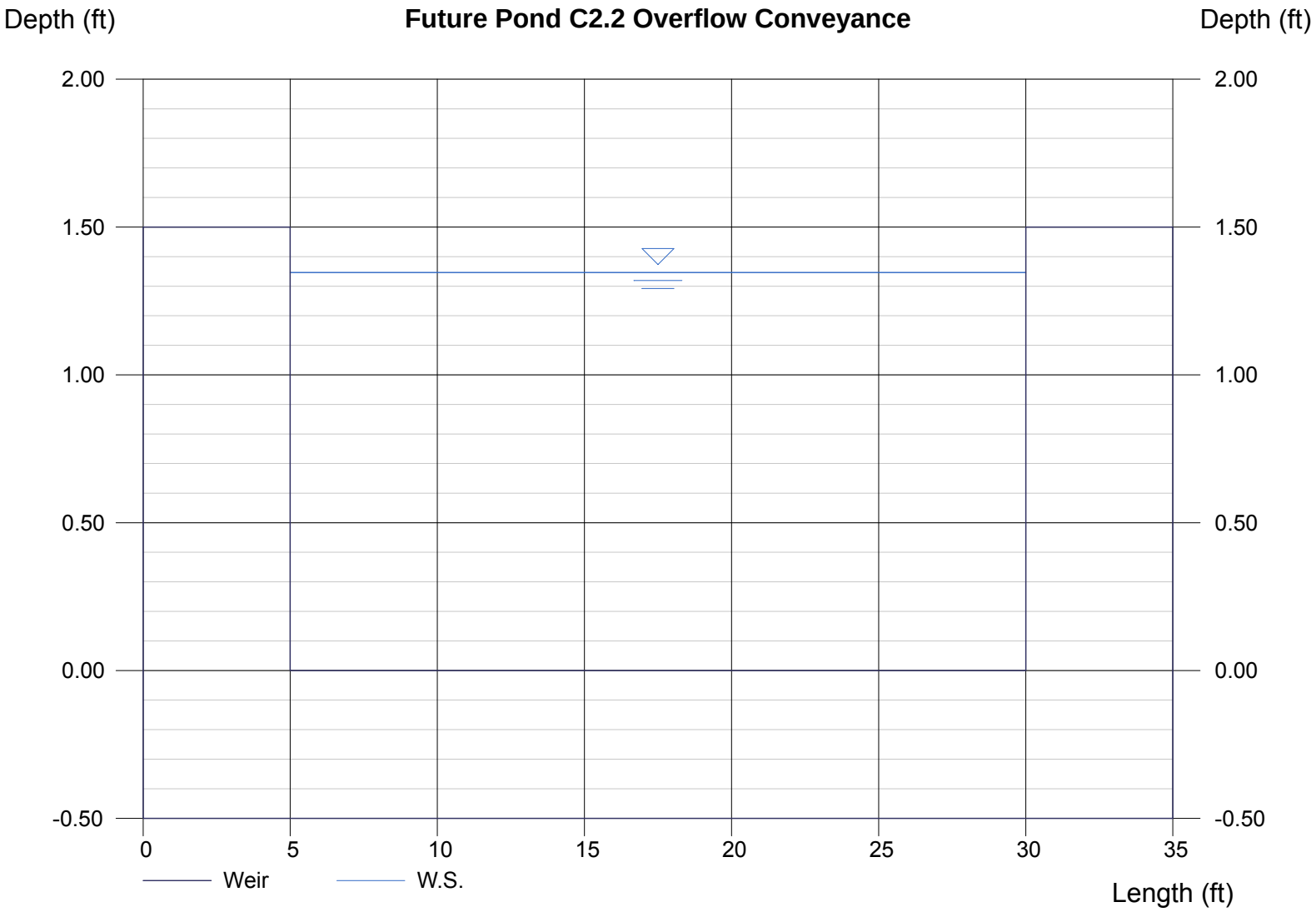
Crest	= Sharp
Bottom Length (ft)	= 25.00
Total Depth (ft)	= 1.50

Calculations

Weir Coeff. Cw	= 3.33
Compute by:	Known Q
Known Q (cfs)	= 130.00

Highlighted

Depth (ft)	= 1.35
Q (cfs)	= 130.00
Area (sqft)	= 33.65
Velocity (ft/s)	= 3.86
Top Width (ft)	= 25.00



Weir Report

Hydraflow Express by Intelisolve | Thursday, Oct 12 2017, 8:43 PM

Future Pond C2.3 Overflow Conveyance

Rectangular Weir

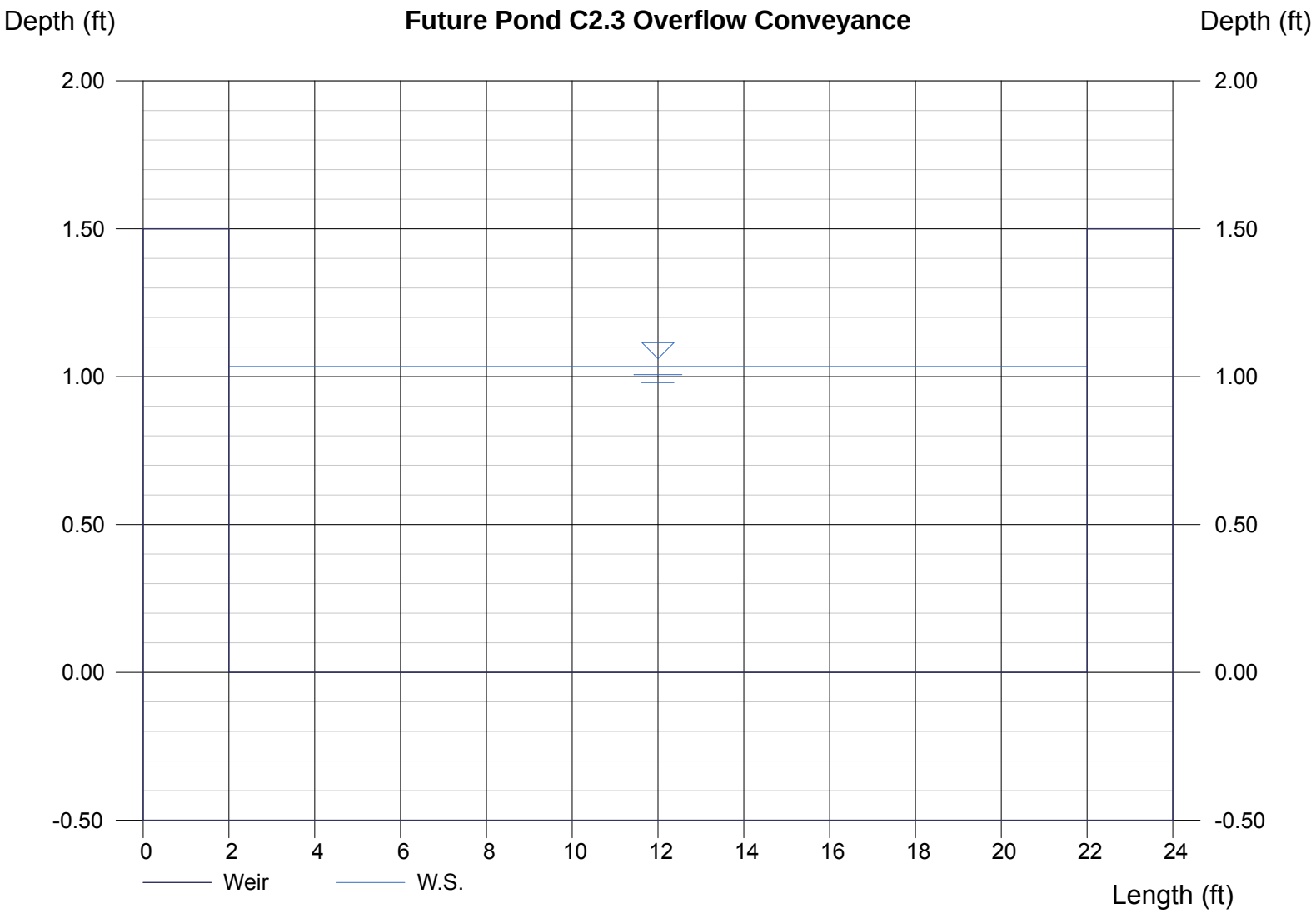
Crest	= Sharp
Bottom Length (ft)	= 20.00
Total Depth (ft)	= 1.50

Calculations

Weir Coeff. Cw	= 3.33
Compute by:	Known Q
Known Q (cfs)	= 70.00

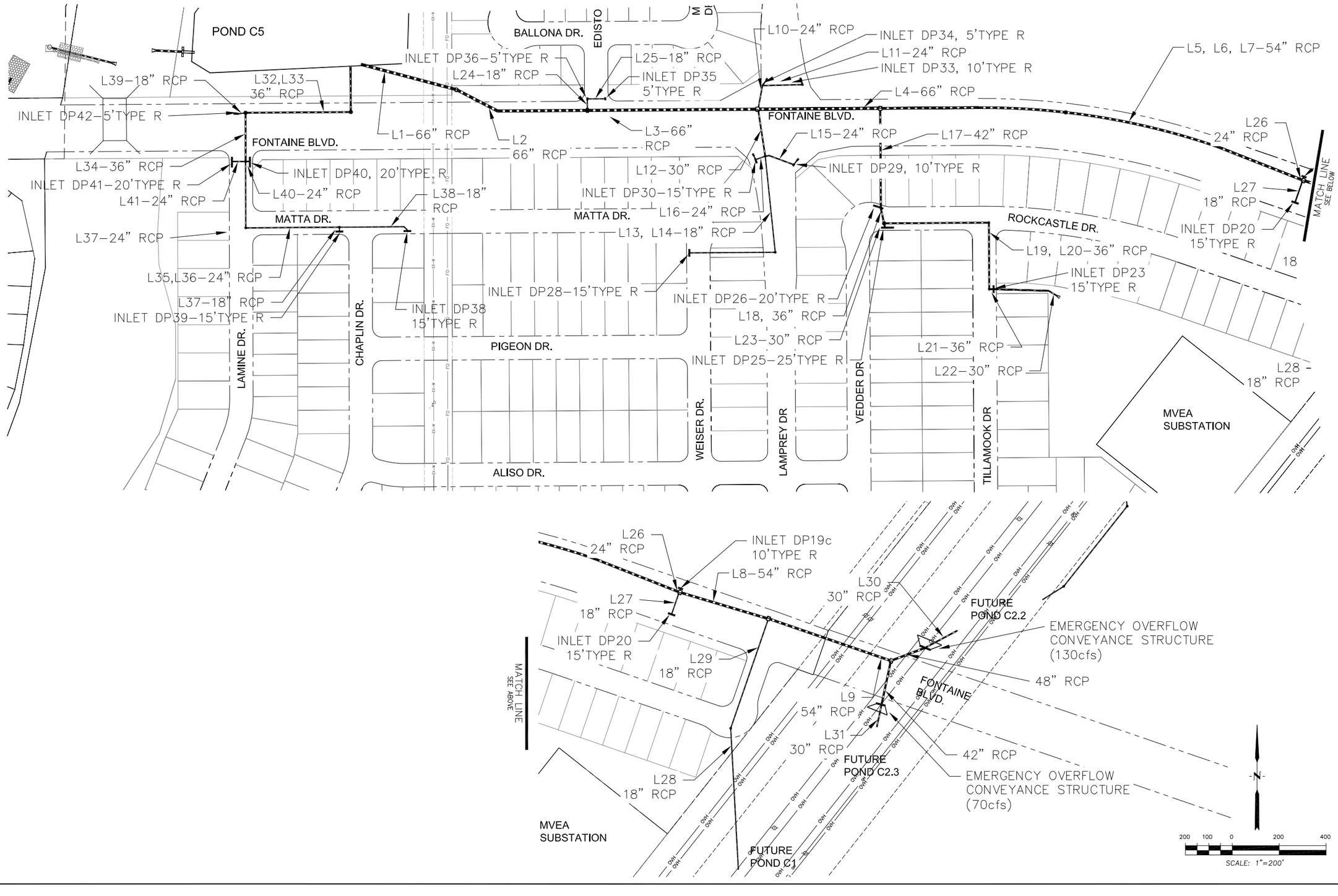
Highlighted

Depth (ft)	= 1.03
Q (cfs)	= 70.00
Area (sqft)	= 20.68
Velocity (ft/s)	= 3.39
Top Width (ft)	= 20.00



APPENDIX E– STORM SEWER SCHEMATIC AND HYDRAFLOW STORM SEWER CALCS

BASIN C15 - C17 STORM SCHEMATIC



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CONTACT: RICHARD L. SCHINDLER, P.E.
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NO. | DESCRIPTION | DATE

PREPARED FOR:
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COLORADO SPRINGS, COLORADO 80903
(719) 635-3200
CONTACT: JEFF MARK

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

DRAWN: RLS
DESIGNED: LAB
CHECKED: LAB

STORM SEWER SCHEMATIC
BASIN C15 - C17
LORSON RANCH EAST

DATE
OCTOBER 20, 2017

PROJECT NO.
100.040

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	L1	71.78	66 c	147.3	5709.00	5710.58	1.073	5713.23	5712.89	n/a	5712.89 j	End
2	L2	74.17	66 c	383.5	5711.05	5715.17	1.074	5713.63	5717.52	n/a	5717.52 j	1
3	L3	74.71	66 c	373.9	5715.17	5718.90	0.998	5718.28	5721.25	n/a	5721.25 j	2
4	L4	56.87	54 c	249.3	5719.80	5722.30	1.003	5721.98	5724.46	n/a	5724.46 j	3
5	L5	23.22	54 c	228.8	5722.70	5726.20	1.530	5725.31	5727.58	n/a	5727.58 j	4
6	L6	24.61	54 c	494.6	5726.50	5733.40	1.395	5728.03	5734.82	n/a	5734.82 j	5
7	L7	25.27	54 c	194.1	5733.50	5735.50	1.030	5735.29	5736.94	n/a	5736.94 j	6
8	L8	14.00	54 c	219.8	5735.50	5737.40	0.864	5737.44	5738.47	n/a	5738.47 j	7
9	L9	10.00	54 c	279.0	5737.40	5740.20	1.004	5738.83	5741.11	n/a	5741.11 j	8
10	L10	8.18	24 c	58.7	5721.70	5723.68	3.373	5722.30	5724.70	0.00	5724.70	3
11	L11	7.49	24 c	52.4	5724.38	5724.94	1.069	5725.16	5725.92	0.00	5725.92	10
12	L12	19.36	30 c	84.4	5721.30	5723.52	2.629	5722.22	5725.13	0.00	5725.13	3
13	L13	5.14	18 c	214.7	5724.72	5728.81	1.905	5725.52	5729.68	0.00	5729.68	12
14	L14	5.32	18 c	182.2	5729.11	5734.84	3.145	5729.90	5735.72	0.00	5735.72	13
15	L15	8.63	24 c	31.0	5725.08	5725.61	1.711	5725.82	5726.92	0.00	5726.92	12
16	L16	7.21	24 c	13.1	5724.61	5725.10	3.742	5725.57	5726.05	n/a	5726.05 j	12
17	L17	38.11	42 c	202.3	5723.10	5727.36	2.106	5725.10	5729.25	n/a	5729.25 j	4
18	L18	31.82	36 c	30.7	5728.15	5728.46	1.011	5729.74	5730.27	0.00	5730.27	17
19	L19	20.19	36 c	223.4	5728.50	5730.75	1.007	5730.94	5732.18	n/a	5732.18 j	18
20	L20	20.64	36 c	141.8	5730.95	5732.40	1.021	5732.62	5733.85	n/a	5733.85 j	19
21	L21	20.68	36 c	11.2	5732.70	5732.79	0.805	5734.29	5734.25	n/a	5734.25 j	20
22	L22	13.55	30 c	139.3	5733.40	5735.50	1.508	5734.70	5736.73	n/a	5736.73 j	21
23	L23	15.69	30 c	10.8	5729.21	5729.48	2.506	5730.90	5730.81	n/a	5730.81	18
24	L24	2.96	18 c	35.8	5719.93	5720.92	2.768	5720.35	5721.58	0.00	5721.58	2
25	L25	2.82	18 c	41.0	5721.22	5721.63	0.998	5721.78	5722.27	n/a	5722.27	24
26	L26	6.51	24 c	13.2	5741.12	5742.52	10.617	5741.52*	5745.41*	0.00	5745.41	7
27	L27	5.20	18 c	45.8	5742.58	5743.07	1.070	5743.31	5743.94	0.00	5743.94	7
28	L28	4.00	18 c	264.9	5740.45	5741.80	0.509	5741.23	5742.58	0.00	5742.58	8
29	L29	4.00	18 c	273.9	5741.90	5743.30	0.511	5742.79	5744.06	n/a	5744.06	28
30	L30	6.00	30 c	149.2	5743.71	5744.50	0.529	5744.47	5745.32	0.00	5745.32	9
31	L31	4.00	30 c	116.9	5743.49	5744.10	0.521	5744.11	5744.77	0.00	5744.77	9
32	L32	26.54	36 c	104.3	5709.00	5709.63	0.604	5711.10	5711.27	n/a	5711.27 j	End

Lorson East PDR - C15 basins | Number of lines: 41 | Run Date: 10-30-2017

NOTES: c = cir; e = ellip; b = box; Return period = 5 Yrs. ; *Surcharged (HGL above crown). ; 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.
33	L33	27.33	36 c	243.0	5709.83	5711.30	0.605	5711.74	5712.97	n/a	5712.97 j	32
34	L34	24.96	36 c	90.4	5711.80	5712.55	0.829	5713.49	5714.14	0.00	5714.14	33
35	L35	13.90	24 c	142.7	5713.55	5717.40	2.699	5714.51	5718.72	n/a	5718.72	34
36	L36	14.34	24 c	220.6	5717.70	5723.60	2.675	5719.02	5724.94	n/a	5724.94	35
37	L37	8.69	18 c	7.0	5724.10	5724.18	1.144	5725.20	5725.31	0.00	5725.31	36
38	L38	6.03	18 c	145.3	5724.10	5727.01	2.003	5725.40	5727.95	n/a	5727.95 j	36
39	L39	3.20	18 c	17.2	5714.35	5714.58	1.340	5714.88	5715.35	0.00	5715.35	33
40	L40	12.59	24 c	27.1	5713.55	5713.76	0.776	5714.70	5715.03	0.00	5715.03	34
41	L41	1.85	24 c	11.5	5713.55	5713.70	1.303	5714.79	5714.78	0.00	5714.78	34

Lorson East PDR - C15 basins | Number of lines: 41 | Run Date: 10-30-2017

NOTES: c = cir; e = ellip; b = box; Return period = 5 Yrs. ; *Surcharged (HGL above crown). ; j - Line contains hyd. jump.

Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q byp (cfs)	Junc type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp line No
							Ht (in)	L (ft)	area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
1		0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.00	Off
2		0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.00	Off
3		0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.00	Off
4		0.00	0.00	0.00	0.00	MH	6.0	6.00	0.00	0.00	0.00	Sag	2.00	0.080	0.050	0.013	0.00	0.00	0.00	0.00	0.00	Off
5		0.00	0.00	0.00	0.00	MH	6.0	6.00	0.00	0.00	0.00	Sag	2.00	0.080	0.050	0.013	0.00	0.00	0.00	0.00	0.00	Off
6		0.00	0.00	0.00	0.00	MH	6.0	6.00	0.00	0.00	0.00	Sag	2.00	0.080	0.050	0.013	0.00	0.00	0.00	0.00	0.00	5
7		0.00	0.00	0.00	0.00	MH	6.0	6.00	0.00	0.00	0.00	Sag	2.00	0.080	0.050	0.013	0.00	0.00	0.00	0.00	0.00	6
8		0.00	0.00	0.00	0.00	MH	6.0	6.00	0.00	0.00	0.00	Sag	2.00	0.080	0.050	0.013	0.00	0.00	0.00	0.00	0.00	7
9		0.00	0.00	0.00	0.00	MH	6.0	6.00	0.00	0.00	0.00	Sag	2.00	0.080	0.050	0.013	0.00	0.00	0.00	0.00	0.00	8
10	Inlet DP-34 - 5'	0.88	0.00	0.88	0.00	Curb	6.0	5.00	0.00	0.00	0.00	Sag	2.00	0.080	0.020	0.013	0.24	6.23	0.37	6.23	3.00	Off
11	Inlet DP-33 - 10'	7.49	0.81	8.30	0.00	Curb	6.0	6.00	0.00	0.00	0.00	Sag	2.00	0.080	0.050	0.013	0.58	10.38	0.69	10.38	2.00	Off
12		0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	2.00	0.080	0.050	0.013	0.00	0.00	0.00	0.00	0.00	Off
13		0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.00	Off
14	Inlet DP-28 - 15'	5.32	0.00	5.30	0.02	Genr	6.0	15.00	0.00	0.00	0.00	0.026	2.00	0.080	0.020	0.013	0.31	9.40	0.31	9.40	0.00	38
15	Inlet DP-29 - 10'	8.63	0.00	8.63	0.00	Curb	6.0	10.00	0.00	0.00	0.00	Sag	2.00	0.080	0.020	0.013	0.54	21.10	0.67	21.10	3.00	Off
16	Inlet DP-30 - 15'	7.21	0.00	7.21	0.00	Curb	6.0	10.00	0.00	0.00	0.00	Sag	2.00	0.080	0.020	0.013	0.49	18.70	0.62	18.70	3.00	Off
17	Inlet DP-26, 20'	8.49	0.00	8.49	0.00	Genr	6.0	15.00	0.00	0.00	0.00	Sag	2.00	0.080	0.050	0.013	0.30	4.80	0.30	4.80	0.00	Off
18		0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.00	Off
19		0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.00	Off
20		0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.00	Off
21	Inlet DP-23, 15'	8.68	0.00	8.43	0.25	Genr	6.0	15.00	0.00	0.00	0.00	0.011	2.00	0.080	0.020	0.013	0.40	14.05	0.40	14.05	0.00	23
22		13.55	0.00	13.55	0.00	Hdwl	0.0	0.00	15.00	6.00	3.00	Sag	2.00	0.080	0.050	0.013	0.00	0.00	0.00	0.00	0.00	Off

Lorson East PDR - C15 basins | Number of lines: 41 | Run Date: 10-30-2017

NOTES: Inlet N-Values = 0.016 ; Intensity = 68.28 / (Inlet time + 13.10) ^ 0.89; Return period = 5 Yrs. ; * Indicates Known Q added

Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q byp (cfs)	Junc type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp line No
							Ht (in)	L (ft)	area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
23	INLET DP-25- 25'	15.69	0.25	15.94	0.00	Genr	6.0	48.21	0.00	0.00	0.00	Sag	2.00	0.080	0.020	0.013	0.30	9.00	0.30	9.00	0.00	Off
24	Inlet DP-36, 5'	0.25	0.00	0.25	0.00	Curb	6.0	5.00	2.00	4.00	2.00	Sag	2.00	0.080	0.020	0.013	0.17	2.71	0.30	2.71	3.00	2
25	Inlet DP-35, 5'	2.82	0.00	2.82	0.00	Curb	6.0	5.00	2.00	4.00	2.00	Sag	2.00	0.080	0.020	0.013	0.39	13.55	0.52	13.55	3.00	24
26	Inlet DP-19c, 10'	6.51	0.00	5.70	0.81	Genr	6.0	15.00	2.00	4.00	2.00	0.010	2.00	0.080	0.020	0.013	0.37	12.70	0.37	12.70	0.00	11
27	Inlet DP-20, 15'	5.20	0.00	5.20	0.00	Genr	6.0	15.00	2.00	4.00	2.00	0.010	2.00	0.080	0.020	0.013	0.35	11.55	0.35	11.55	0.00	15
28		0.00	0.00	0.00	0.00	MH	6.0	6.00	2.00	4.00	2.00	Sag	2.00	0.080	0.050	0.013	0.00	0.00	0.00	0.00	0.00	8
29		4.00*	0.00	4.00	0.00	Grate	6.0	6.00	2.00	4.00	2.00	Sag	2.00	0.080	0.050	0.013	0.30	4.85	0.30	4.85	0.00	28
30		6.00*	0.00	6.00	0.00	Genr	6.0	6.00	2.00	4.00	2.00	Sag	2.00	0.080	0.050	0.013	0.30	4.80	0.30	4.80	0.00	9
31		4.00*	0.00	4.00	0.00	Genr	6.0	6.00	2.00	4.00	2.00	Sag	2.00	0.080	0.050	0.013	0.30	4.80	0.30	4.80	0.00	9
32		0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	2.00	0.080	0.020	0.013	0.00	0.00	0.00	0.00	0.00	Off
33		0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	2.00	0.080	0.020	0.013	0.00	0.00	0.00	0.00	0.00	32
34		0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.00	Off
35		0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.00	Off
36		0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.00	35
37	Inlet DP-39, 15'	8.69	0.00	8.41	0.28	Genr	6.0	15.00	2.00	4.00	2.00	0.038	2.00	0.080	0.020	0.013	0.34	10.80	0.34	10.80	0.00	40
38	Inlet DP-38, 15'	6.03	0.02	6.05	0.00	Genr	6.0	15.00	0.00	0.00	0.00	0.011	2.00	0.080	0.020	0.013	0.36	12.05	0.36	12.05	0.00	37
39	Inlet DP-42, 10'	3.20	0.00	3.20	0.00	Curb	6.0	6.00	2.00	4.00	2.00	Sag	2.00	0.080	0.050	0.013	0.33	5.48	0.44	5.48	2.00	33
40	Inlet DP-40, 20'	12.59	0.28	12.87	0.00	Curb	6.0	20.00	2.00	4.00	2.00	Sag	2.00	0.080	0.050	0.013	0.42	7.13	0.52	7.13	2.00	34
41	Inlet DP-41, 20'	1.85	0.00	1.85	0.00	Curb	6.0	20.00	2.00	4.00	2.00	Sag	2.00	0.080	0.050	0.013	0.16	1.97	0.26	1.98	2.00	34

Lorson East PDR - C15 basins | Number of lines: 41 | Run Date: 10-30-2017

NOTES: Inlet N-Values = 0.016 ; Intensity = 68.28 / (Inlet time + 13.10) ^ 0.89; Return period = 5 Yrs. ; * Indicates Known Q added

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	L1	298.5	66 c	147.3	5709.50	5711.15	1.122	5715.80*	5716.96*	0.00	5716.96	End
2	L2	300.9	66 c	383.5	5711.45	5715.70	1.106	5716.96	5720.47	n/a	5720.47	1
3	L3	298.3	66 c	373.9	5715.90	5719.70	1.017	5720.95	5724.47	0.00	5724.47	2
4	L4	252.9	66 c	249.3	5719.90	5722.40	1.003	5725.60	5726.73	n/a	5726.73	3
5	L5	163.4	54 c	228.8	5723.60	5728.00	1.923	5727.56	5731.67	n/a	5731.67	4
6	L6	164.2	54 c	494.6	5728.20	5733.16	1.003	5732.17	5736.84	0.00	5736.84	5
7	L7	164.6	54 c	194.1	5733.26	5735.20	1.000	5737.34	5738.88	n/a	5738.88	6
8	L8	131.0	54 c	219.8	5735.30	5737.50	1.001	5740.00	5740.79	0.00	5740.79	7
9	L9	87.00	54 c	279.0	5737.40	5741.20	1.363	5742.05	5743.88	0.00	5743.88	8
10	L10	24.69	24 c	58.7	5723.20	5724.30	1.862	5726.40*	5727.10*	0.00	5727.10	3
11	L11	20.03	24 c	52.4	5724.40	5724.84	0.845	5727.43*	5727.84*	0.00	5727.84	10
12	L12	42.12	30 c	84.4	5722.70	5723.52	0.976	5726.21*	5727.11*	0.00	5727.11	3
13	L13	11.36	18 c	214.7	5724.72	5728.81	1.905	5727.61	5730.10	n/a	5730.10 j	12
14	L14	11.56	18 c	182.2	5729.11	5734.84	3.145	5730.20	5736.14	n/a	5736.14	13
15	L15	18.67	24 c	31.0	5725.08	5725.61	1.711	5727.70*	5727.91*	0.00	5727.91	12
16	L16	15.39	24 c	13.1	5724.61	5725.10	3.742	5727.88*	5727.94*	0.00	5727.94	12
17	L17	92.58	42 c	202.3	5724.40	5727.36	1.465	5727.76	5730.31	n/a	5730.31	4
18	L18	78.29	36 c	30.7	5728.15	5728.46	1.011	5731.15*	5731.57*	0.00	5731.57	17
19	L19	51.29	36 c	223.4	5728.50	5730.75	1.007	5732.66*	5733.98*	0.00	5733.98	18
20	L20	51.77	36 c	141.8	5730.95	5732.40	1.022	5733.98	5734.69	0.00	5734.69	19
21	L21	51.81	36 c	11.2	5732.70	5732.79	0.805	5735.10	5735.11	0.00	5735.11	20
22	L22	35.92	30 c	139.3	5733.40	5735.50	1.508	5735.49	5737.50	n/a	5737.50 j	21
23	L23	33.74	30 c	10.8	5729.21	5729.48	2.506	5732.75*	5732.82*	0.00	5732.82	18
24	L24	6.37	18 c	35.8	5719.93	5720.92	2.768	5723.20*	5723.33*	0.00	5723.33	2
25	L25	6.01	18 c	41.0	5721.22	5721.63	0.998	5723.36*	5723.49*	0.00	5723.49	24
26	L26	22.01	24 c	13.2	5741.12	5742.52	10.617	5741.87*	5748.38*	0.00	5748.38	7
27	L27	13.06	18 c	45.8	5742.58	5743.07	1.070	5744.08*	5744.79*	0.00	5744.79	7
28	L28	18.00	18 c	268.7	5740.50	5741.84	0.498	5742.00*	5749.89*	0.00	5749.89	8
29	L29	18.00	18 c	271.6	5741.94	5743.30	0.500	5749.89*	5757.88*	0.00	5757.88	28
30	L30	61.00	48 c	149.2	5741.71	5742.50	0.529	5744.72	5744.81	0.00	5744.81	9
31	L31	52.00	42 c	116.9	5742.20	5742.90	0.597	5744.63	5745.11	n/a	5745.11 j	9
32	L32	65.12	36 c	104.3	5709.00	5709.63	0.604	5711.81*	5712.81*	0.00	5712.81	End

Lorson East PDR - C15 basins | Number of lines: 41 | Run Date: 10-30-2017

NOTES: c = cir; e = ellip; b = box; Return period = 100 Yrs. ; *Surcharged (HGL above crown). ; 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.
33	L33	65.94	36 c	243.0	5709.83	5711.30	0.605	5712.83*	5715.21*	0.00	5715.21	32
34	L34	60.45	36 c	90.4	5711.80	5712.55	0.829	5715.42*	5716.17*	0.00	5716.17	33
35	L35	31.08	24 c	142.7	5713.55	5717.40	2.699	5716.17	5719.28	n/a	5719.28 j	34
36	L36	31.58	24 c	220.6	5717.70	5723.60	2.675	5719.31	5725.49	n/a	5725.49	35
37	L37	19.13	18 c	7.0	5724.10	5724.18	1.144	5725.60*	5725.83*	0.00	5725.83	36
38	L38	13.06	18 c	145.3	5724.10	5727.01	2.003	5726.28	5728.51	0.00	5728.51	36
39	L39	7.04	18 c	17.2	5714.35	5714.58	1.340	5716.31*	5716.39*	0.00	5716.39	33
40	L40	32.43	24 c	27.1	5713.55	5713.76	0.776	5716.17*	5716.72*	0.00	5716.72	34
41	L41	5.88	24 c	11.5	5713.55	5713.67	1.049	5717.25*	5717.26*	0.00	5717.26	34

Lorson East PDR - C15 basins | Number of lines: 41 | Run Date: 10-30-2017

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

Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q byp (cfs)	Junc type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp line No
							Ht (in)	L (ft)	area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
1		131.00*	0.00	0.00	131.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.00	Off
2		131.00*	0.00	0.00	131.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.00	Off
3		131.00*	0.00	0.00	131.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.00	Off
4		131.00*	0.00	0.00	131.00	MH	6.0	6.00	0.00	0.00	0.00	Sag	2.00	0.080	0.050	0.013	0.00	0.00	0.00	0.00	0.00	Off
5		131.00*	629.00	0.00	760.00	MH	6.0	6.00	0.00	0.00	0.00	Sag	2.00	0.080	0.050	0.013	0.00	0.00	0.00	0.00	0.00	Off
6		131.00*	498.00	0.00	629.00	MH	6.0	6.00	0.00	0.00	0.00	Sag	2.00	0.080	0.050	0.013	0.00	0.00	0.00	0.00	0.00	5
7		131.00*	367.00	0.00	498.00	MH	6.0	6.00	0.00	0.00	0.00	Sag	2.00	0.080	0.050	0.013	0.00	0.00	0.00	0.00	0.00	6
8		131.00*	236.00	0.00	367.00	MH	6.0	6.00	0.00	0.00	0.00	Sag	2.00	0.080	0.050	0.013	0.00	0.00	0.00	0.00	0.00	7
9		87.00*	113.00	0.00	200.00	MH	6.0	6.00	0.00	0.00	0.00	Sag	2.00	0.080	0.050	0.013	0.00	0.00	0.00	0.00	0.00	8
10	Inlet DP-34 - 5'	9.94*	11.12	21.06	0.00	Curb	6.0	5.00	0.00	0.00	0.00	Sag	2.00	0.080	0.020	0.013	1.34	60.88	1.47	60.88	3.00	Off
11	Inlet DP-33 - 10'	20.03*	11.39	20.30	11.12	Genr	6.0	6.00	0.00	0.00	0.00	0.020	2.00	0.080	0.050	0.013	0.65	11.88	0.65	11.88	0.00	10
12		0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	2.00	0.080	0.050	0.013	0.00	0.00	0.00	0.00	0.00	Off
13		0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.00	Off
14	Inlet DP-28 - 15'	11.56	0.00	10.36	1.20	Genr	6.0	15.00	0.00	0.00	0.00	0.026	2.00	0.080	0.020	0.013	0.38	13.25	0.38	13.25	0.00	38
15	Inlet DP-29 - 10'	18.67	1.73	16.30	4.10	Genr	6.0	10.00	0.00	0.00	0.00	0.020	2.00	0.080	0.020	0.013	0.47	17.60	0.47	17.60	0.00	16
16	Inlet DP-30 - 15'	15.39	4.10	19.49	0.00	Genr	6.0	10.00	0.00	0.00	0.00	Sag	2.00	0.080	0.020	0.013	0.30	9.00	0.30	9.00	0.00	Off
17	Inlet DP-26, 20'	18.18	6.91	25.10	0.00	Genr	6.0	15.00	0.00	0.00	0.00	Sag	2.00	0.080	0.050	0.013	0.30	4.80	0.30	4.80	0.00	Off
18		0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.00	Off
19		0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.00	Off
20		0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.00	Off
21	Inlet DP-23, 15'	18.56	0.00	13.69	4.87	Genr	6.0	15.00	0.00	0.00	0.00	0.011	2.00	0.080	0.020	0.013	0.50	19.10	0.50	19.10	0.00	23
22		35.92	0.00	35.92	0.00	Hdwl	0.0	0.00	15.00	6.00	3.00	Sag	2.00	0.080	0.050	0.013	0.00	0.00	0.00	0.00	0.00	Off

Lorson East PDR - C15 basins | Number of lines: 41 | Run Date: 10-30-2017

NOTES: Inlet N-Values = 0.016 ; Intensity = 58.48 / (Inlet time + 7.70) ^ 0.75; Return period = 100 Yrs. ; * Indicates Known Q added

This seems excessive - what is ponding area?

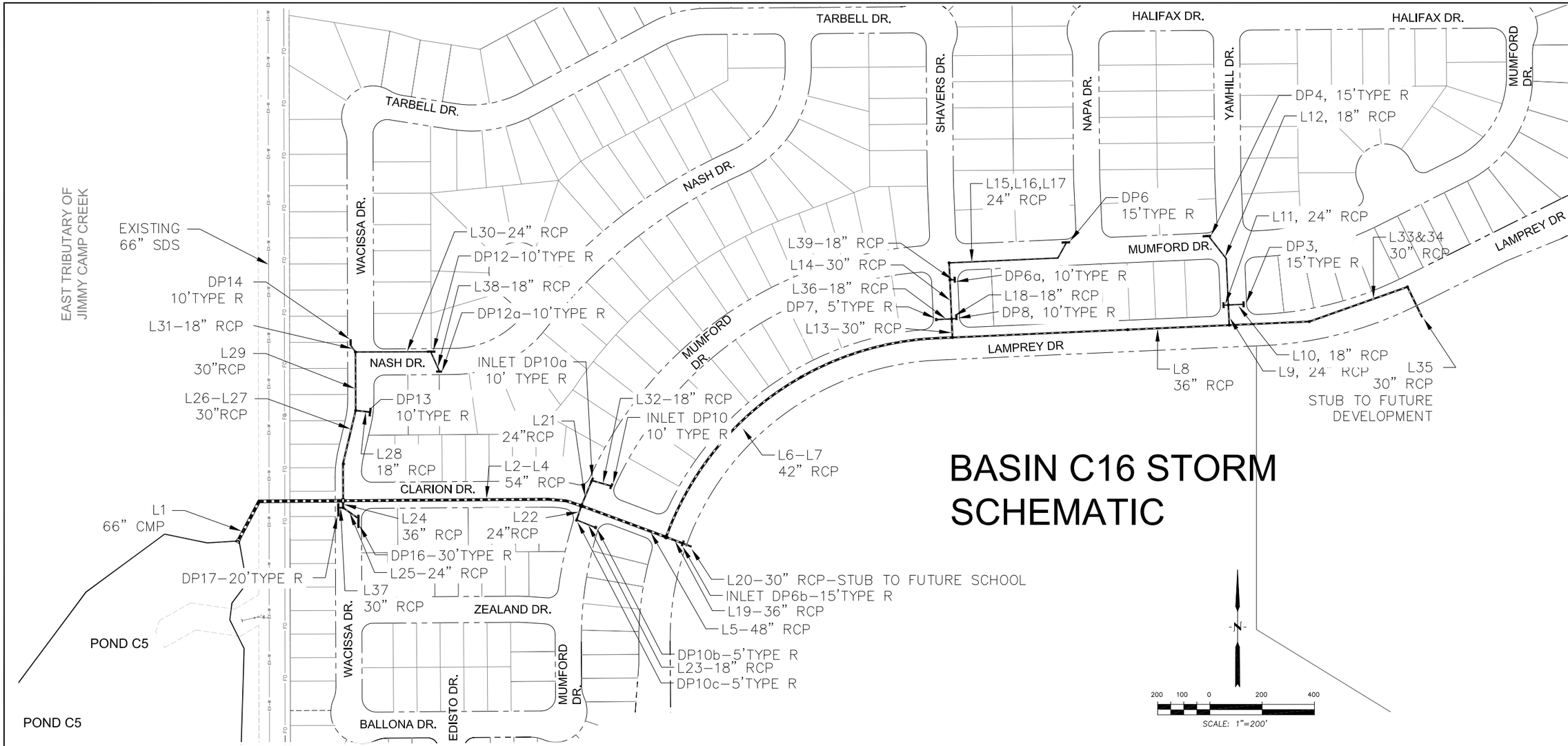
Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q byp (cfs)	Junc type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp line No
							Ht (in)	L (ft)	area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
23	INLET DP-25- 25'	33.74	4.87	31.70	6.91	Genr	6.0	48.21	0.00	0.00	0.00	0.020	2.00	0.080	0.020	0.013	0.57	22.65	0.57	22.65	0.00	17
24	Inlet DP-36, 5'	0.57	0.00	0.57	0.00	Curb	6.0	5.00	2.00	4.00	2.00	Sag	2.00	0.080	0.020	0.013	0.21	4.65	0.34	4.65	3.00	2
25	Inlet DP-35, 5'	6.01	0.00	6.01	0.00	Curb	6.0	5.00	2.00	4.00	2.00	Sag	2.00	0.080	0.020	0.013	0.57	22.50	0.70	22.50	3.00	24
26	Inlet DP-19c, 10'	22.01	0.00	10.62	11.39	Genr	6.0	15.00	2.00	4.00	2.00	0.010	2.00	0.080	0.020	0.013	0.54	20.80	0.54	20.80	0.00	11
27	Inlet DP-20, 15'	13.06	0.00	11.33	1.73	Genr	6.0	15.00	2.00	4.00	2.00	0.010	2.00	0.080	0.020	0.013	0.46	16.90	0.46	16.90	0.00	15
28		18.00*	18.00	0.00	36.00	None	6.0	6.00	2.00	4.00	2.00	Sag	2.00	0.080	0.050	0.013	0.00	0.00	0.00	0.00	0.00	8
29		18.00*	0.00	0.00	18.00	MH	6.0	6.00	2.00	4.00	2.00	Sag	2.00	0.080	0.050	0.013	0.00	0.00	0.00	0.00	0.00	28
30		61.00*	0.00	0.00	61.00	MH	6.0	6.00	2.00	4.00	2.00	Sag	2.00	0.080	0.050	0.013	0.00	0.00	0.00	0.00	0.00	9
31		52.00*	0.00	0.00	52.00	MH	6.0	6.00	2.00	4.00	2.00	Sag	2.00	0.080	0.050	0.013	0.00	0.00	0.00	0.00	0.00	9
32		0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	2.00	0.080	0.020	0.013	0.00	0.00	0.00	0.00	0.00	Off
33		0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	2.00	0.080	0.020	0.013	0.00	0.00	0.00	0.00	0.00	32
34		0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.00	Off
35		0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.00	Off
36		0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.00	35
37	Inlet DP-39, 15'	19.13	2.43	14.93	6.62	Genr	6.0	15.00	2.00	4.00	2.00	0.038	2.00	0.080	0.020	0.013	0.44	15.80	0.44	15.80	0.00	40
38	Inlet DP-38, 15'	13.06	1.20	11.83	2.43	Genr	6.0	15.00	0.00	0.00	0.00	0.011	2.00	0.080	0.020	0.013	0.46	17.20	0.46	17.20	0.00	37
39	Inlet DP-42, 10'	7.04	0.00	7.04	0.00	Curb	6.0	6.00	2.00	4.00	2.00	Sag	2.00	0.080	0.050	0.013	0.52	9.30	0.63	9.30	2.00	33
40	Inlet DP-40, 20'	32.43	6.62	26.00	13.06	Genr	6.0	20.00	2.00	4.00	2.00	0.020	2.00	0.080	0.050	0.013	0.71	12.92	0.71	12.92	0.00	41
41	Inlet DP-41, 20'	5.88	13.06	18.94	0.00	Curb	6.0	20.00	2.00	4.00	2.00	Sag	2.00	0.080	0.050	0.013	0.52	9.24	0.63	9.24	2.00	34

Lorson East PDR - C15 basins | Number of lines: 41 | Run Date: 10-30-2017

NOTES: Inlet N-Values = 0.016 ; Intensity = 58.48 / (Inlet time + 7.70) ^ 0.75; Return period = 100 Yrs. ; * Indicates Known Q added

BASIN C16 STORM SCHEMATIC



CORE ENGINEERING GROUP
15004 1ST AVE. S.
BURNSVILLE, MN 55306
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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
EAST OF EAST TRIBUTARY
EL PASO COUNTY, COLORADO

DRAWN: RLS
DESIGNED: LAB
CHECKED: LAB

STORM SEWER SCHEMATIC
BASIN C16
LORSON RANCH EAST

DATE
OCTOBER 20, 2017

PROJECT NO.
100.040

SHEET NUMBER
1

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	147.9	66 c	249.0	5710.00	5711.25	0.502	5715.50*	5717.15*	0.30	5717.45	End
2	2	105.5	54 c	380.6	5714.10	5717.91	1.001	5717.45	5720.86	n/a	5720.86	1
3	3	105.5	54 c	42.5	5717.91	5718.34	1.011	5721.59	5721.29	n/a	5721.29	2
4	4	105.5	54 c	37.8	5718.54	5718.92	1.005	5722.02	5721.87	n/a	5721.87	3
5	5	90.12	48 c	174.0	5720.30	5722.04	1.000	5722.60	5724.85	n/a	5724.85	4
6	6	75.68	42 c	397.2	5722.60	5727.37	1.201	5725.31	5730.03	0.29	5730.03	5
7	7	75.68	42 c	300.0	5727.67	5731.27	1.200	5730.51	5733.93	0.72	5733.93	6
8	8	52.52	36 c	531.0	5732.23	5739.66	1.399	5734.52	5741.97	0.50	5741.97	7
9	9	18.79	24 c	51.8	5740.66	5741.53	1.680	5742.67	5743.07	n/a	5743.07 j	8
10	10	8.87	18 c	26.3	5742.03	5742.29	0.990	5743.49	5743.60	0.23	5743.83	9
11	11	0.25	18 c	9.8	5742.23	5742.33	1.025	5743.89*	5743.89*	0.00	5743.89	9
12	12	9.67	18 c	124.3	5742.63	5743.23	0.483	5744.13*	5745.19*	0.23	5745.42	9
13	13	23.16	30 c	33.6	5732.73	5733.02	0.864	5734.63	5734.63	n/a	5734.63 j	7
14	14	16.76	30 c	65.0	5733.02	5733.41	0.600	5734.90	5734.89	0.05	5734.94	13
15	15	11.05	24 c	43.0	5733.91	5734.17	0.604	5735.22	5735.35	0.20	5735.56	14
16	16	11.05	24 c	210.8	5734.47	5738.22	1.779	5735.87	5739.40	n/a	5739.40 j	15
17	17	11.05	24 c	31.9	5738.25	5738.89	2.005	5739.72	5740.07	n/a	5740.07	16
18	18	6.15	24 c	7.0	5733.52	5733.59	0.997	5735.30	5735.30	0.04	5735.33	13
19	19	14.44	36 c	23.0	5723.04	5723.27	1.000	5726.19	5726.20	0.03	5726.23	5
20	20	7.62	30 c	20.0	5723.77	5723.97	1.001	5726.24	5726.25	0.02	5726.27	19
21	21	11.62	24 c	50.5	5721.42	5721.92	0.991	5723.08	5723.13	n/a	5723.13 j	4
22	22	3.79	24 c	29.2	5721.42	5721.71	0.992	5723.25	5723.25	0.02	5723.26	4
23	23	3.21	18 c	35.8	5722.21	5722.57	1.004	5723.26	5723.26	n/a	5723.39 j	22
24	24	16.68	36 c	15.3	5715.75	5716.21	3.006	5717.68	5717.51	0.20	5717.51	1
25	25	12.81	24 c	33.7	5717.21	5717.55	1.007	5718.29	5718.90	0.25	5719.15	24
26	26	25.69	30 c	69.5	5716.10	5716.80	1.007	5717.63	5718.49	n/a	5718.49	1
27	27	25.69	30 c	103.6	5717.00	5718.04	1.004	5718.89	5719.73	n/a	5719.73	26
28	28	6.55	18 c	25.1	5719.54	5719.79	0.995	5720.40	5720.77	0.22	5721.00	27
29	29	19.14	30 c	112.8	5718.04	5719.17	1.002	5720.32	5720.63	n/a	5720.63 j	27
30	30	13.19	24 c	135.3	5719.97	5721.19	0.901	5721.10	5722.48	n/a	5722.48	29
31	31	5.95	18 c	16.1	5720.88	5721.04	0.997	5721.69	5722.05	0.35	5722.39	29
32	32	5.97	18 c	36.2	5722.42	5722.75	0.911	5723.48	5723.68	n/a	5723.68 j	21

Lorson East PDR -C16 basins | Number of lines: 39 | Run Date: 10-13-2017

NOTES: c = cir; e = ellip; b = box; Return period = 5 Yrs. ; *Surcharged (HGL above crown). ; 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.
33	33	33.73	30 c	152.0	5740.16	5742.14	1.303	5742.49	5744.08	n/a	5744.08 j	8
34	34	33.73	30 c	197.6	5742.44	5745.01	1.301	5744.40	5746.95	n/a	5746.95 j	33
35	35	33.73	30 c	65.3	5745.31	5746.29	1.500	5747.27	5748.23	n/a	5748.23 j	34
36	36	0.25	18 c	26.6	5734.20	5734.34	0.525	5735.37	5735.37	0.00	5735.37	13
37	37	3.87	30 c	8.3	5717.21	5717.34	1.568	5718.00	5718.00	n/a	5718.00 j	24
38	38	6.76	18 c	31.4	5721.69	5722.00	0.989	5722.84	5722.99	n/a	5722.99	30
39	39	5.71	18 c	9.3	5734.41	5734.51	1.068	5735.25	5735.43	0.20	5735.62	14

Lorson East PDR -C16 basins | Number of lines: 39 | Run Date: 10-13-2017

NOTES: c = cir; e = ellip; b = box; Return period = 5 Yrs. ; *Surcharged (HGL above crown). ; j - Line contains hyd. jump.

Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q byp (cfs)	Junc type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp line No
							Ht (in)	L (ft)	area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
1	MH #19	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	Off
2		0.00	0.00	0.00	0.00	None	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	Off
3		0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	Off
4		0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	Off
5		0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	Off
6		0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	Off
7		0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	Off
8		0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	Off
9		0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	Off
10	Inlet DP-3, 15'	8.87	0.00	8.87	0.00	Curb	6.0	15.00	0.00	0.00	0.00	Sag	2.00	0.080	0.020	0.000	0.46	16.85	0.59	16.85	3.00	Off
11	Inlet DP-5 (5')	0.25	0.00	0.25	0.00	Curb	6.0	5.00	0.00	0.00	0.00	Sag	2.00	0.080	0.020	0.013	0.17	2.70	0.30	2.70	3.00	Off
12	Inlet DP-4 (15')	10.43	0.00	9.67	0.76	Genr	0.0	0.00	0.00	0.00	0.00	0.010	2.00	0.080	0.020	0.013	0.43	15.45	0.43	15.45	0.00	17
13		0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	Off
14		0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	Off
15		0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	Off
16		0.00	0.00	0.00	0.00	None	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	Off
17	Inlet DP-6 (15')	12.07	0.76	11.05	1.78	Genr	0.0	0.00	0.00	0.00	0.00	0.025	2.00	0.083	0.020	0.013	0.40	13.90	0.40	13.90	0.00	39
18	Inlet DP-8 (10')	5.28	0.87	6.15	0.00	Curb	6.0	10.00	0.00	0.00	0.00	Sag	2.00	0.080	0.020	0.000	0.46	16.81	0.50	16.81	2.00	Off
19	Inlet DP6b, 15'	6.81	0.00	6.81	0.00	Curb	6.0	15.00	0.00	0.00	0.00	Sag	2.00	0.080	0.020	0.013	0.40	14.11	0.53	14.11	3.00	Off
20	C13-DP6c	7.62	0.00	7.62	0.00	Curb	6.0	6.00	0.00	0.00	0.00	Sag	2.00	0.080	0.050	0.000	0.55	9.81	0.55	9.81	0.00	Off
21	Inlet DP-10a, 15'	5.65	0.00	5.65	0.00	Curb	6.0	10.00	0.00	0.00	0.00	Sag	2.00	0.080	0.020	0.013	0.44	15.89	0.57	15.89	3.00	Off
22	Inlet DP-10c, 5'	0.58	0.00	0.58	0.00	Curb	6.0	5.00	0.00	0.00	0.00	Sag	2.00	0.080	0.050	0.000	0.15	1.93	0.34	1.97	3.00	Off

Lorson East PDR -C16 basins | Number of lines: 39 | Run Date: 10-13-2017

NOTES: Inlet N-Values = 0.016 ; Intensity = 503.90 / (Inlet time + 28.20) ^ 1.31; Return period = 5 Yrs. ; * Indicates Known Q added

Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q byp (cfs)	Junc type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp line No
							Ht (in)	L (ft)	area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
23	Inlet DP-10b, 5'	3.21	0.00	3.21	0.00	Curb	6.0	5.00	0.00	0.00	0.00	Sag	2.00	0.080	0.020	0.000	0.42	14.79	0.55	14.79	3.00	Off
24		0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	Off
25	Inlet DP-16, 30'	10.98	1.83	12.81	0.00	Curb	6.0	30.00	0.00	0.00	0.00	Sag	2.00	0.080	0.020	0.013	0.39	13.54	0.52	13.54	3.00	Off
26		0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	Off
27		0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	Off
28	Inlet DP-13, 10'	4.72	3.66	6.55	1.83	Genr	6.0	6.00	0.00	0.00	0.00	0.010	2.00	0.080	0.020	0.013	0.40	14.10	0.40	14.10	0.00	25
29		0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	Off
30	Inlet DP-12, 10'	8.03	0.00	6.43	1.60	Genr	6.0	10.00	0.00	0.00	0.00	0.012	2.00	0.080	0.020	0.013	0.39	13.35	0.39	13.35	0.00	28
31	Inlet DP-14, 10'	7.06	0.00	5.95	1.11	Genr	6.0	10.00	0.00	0.00	0.00	0.010	2.00	0.080	0.020	0.013	0.38	13.15	0.38	13.15	0.00	37
32	Inlet DP10, 10'	5.97	0.00	5.97	0.00	Curb	6.0	10.00	0.00	0.00	0.00	Sag	2.00	0.080	0.050	0.000	0.39	6.59	0.58	6.59	3.00	Off
33		0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	Off
34		0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	Off
35	Inlet DP-2	33.73	0.00	33.73	0.00	Curb	6.0	20.00	0.00	0.00	0.00	Sag	2.00	0.080	0.020	0.000	0.80	33.99	0.85	33.99	2.00	Off
36	Inlet DP-7 (5')	0.25	0.00	0.25	0.00	Curb	6.0	5.00	0.00	0.00	0.00	Sag	2.00	0.080	0.050	0.013	0.11	1.42	0.22	1.65	2.00	Off
37	Inlet DP-17, 25'	2.76	1.11	3.87	0.00	Curb	6.0	25.00	0.00	0.00	0.00	Sag	2.00	0.080	0.020	0.013	0.26	6.86	0.39	6.86	3.00	Off
38	Inlet DP-12a, 10'	8.82	0.00	6.76	2.06	Genr	6.0	10.00	0.00	0.00	0.00	0.012	2.00	0.080	0.020	0.013	0.40	13.90	0.40	13.90	0.00	28
39	Inlet DP-6a (10')	4.81	1.78	5.71	0.87	Genr	0.0	0.00	0.00	0.00	0.00	0.010	2.00	0.080	0.020	0.013	0.37	12.75	0.37	12.75	0.00	18

Lorson East PDR -C16 basins | Number of lines: 39 | Run Date: 10-13-2017

NOTES: Inlet N-Values = 0.016 ; Intensity = 503.90 / (Inlet time + 28.20) ^ 1.31; Return period = 5 Yrs. ; * Indicates Known Q added

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	5710.00	5711.25	0.502	5714.95*	5718.89*	0.73	5719.62	End
2	2	154.4	54 c	380.6	5714.10	5717.91	1.001	5719.62	5721.48	0.30	5721.79	1
3	3	154.6	54 c	42.5	5717.91	5718.34	1.011	5722.34	5722.45	0.56	5723.01	2
4	4	154.8	54 c	37.8	5718.54	5718.92	1.005	5723.01	5723.15	0.62	5723.77	3
5	5	136.5	48 c	174.0	5720.30	5722.04	1.000	5723.77	5725.52	n/a	5725.52	4
6	6	103.9	42 c	397.2	5722.60	5727.37	1.201	5725.86	5730.49	0.41	5730.49	5
7	7	105.3	42 c	300.0	5727.67	5731.27	1.200	5730.67	5734.40	1.05	5734.40	6
8	8	71.50	36 c	531.0	5732.23	5739.66	1.399	5734.90	5742.34	0.71	5742.34	7
9	9	35.45	24 c	42.8	5740.66	5741.53	2.029	5742.66*	5743.71*	0.79	5744.51	8
10	10	20.05	18 c	26.3	5742.03	5742.29	0.990	5744.51*	5745.47*	1.00	5746.47	9
11	11	0.57	24 c	9.8	5741.73	5741.83	1.025	5746.48*	5746.48*	0.00	5746.48	9
12	12	14.98	18 c	131.6	5742.63	5743.33	0.532	5745.37*	5748.05*	0.56	5748.61	9
13	13	44.84	30 c	33.6	5732.73	5733.02	0.864	5735.23*	5735.63*	0.52	5736.15	7
14	14	34.17	30 c	65.0	5733.02	5733.41	0.600	5736.70*	5737.15*	0.08	5737.22	13
15	15	17.18	24 c	43.0	5733.91	5734.17	0.604	5737.51*	5737.76*	0.19	5737.94	14
16	16	17.78	24 c	210.8	5734.47	5738.22	1.779	5737.94	5739.71	n/a	5739.71 j	15
17	17	17.87	24 c	31.9	5738.15	5738.79	2.008	5739.99	5740.29	0.39	5740.29	16
18	18	16.30	24 c	7.0	5733.52	5733.59	0.997	5737.03*	5737.07*	0.21	5737.28	13
19	19	53.54	36 c	23.0	5723.04	5723.27	1.000	5726.78*	5726.93*	0.36	5727.28	5
20	20	38.21	30 c	20.0	5723.77	5723.97	1.001	5727.28*	5727.46*	0.47	5727.93	19
21	21	32.25	24 c	50.5	5721.42	5721.92	0.991	5723.77*	5724.79*	0.82	5725.61	4
22	22	7.98	24 c	29.2	5721.42	5721.71	0.992	5725.21*	5725.25*	0.05	5725.30	4
23	23	6.92	18 c	35.8	5722.21	5722.57	1.004	5725.30*	5725.46*	0.12	5725.58	22
24	24	54.37	36 c	15.3	5715.75	5716.21	3.006	5720.17*	5720.27*	0.37	5720.64	1
25	25	22.80	24 c	33.7	5717.31	5717.95	1.897	5720.74*	5721.08*	0.41	5721.49	24
26	26	38.85	30 c	69.5	5716.10	5716.80	1.007	5720.11*	5720.74*	0.19	5720.93	1
27	27	39.15	30 c	103.6	5717.00	5718.04	1.004	5720.93*	5721.88*	0.40	5722.27	26
28	28	9.70	18 c	25.1	5719.54	5719.79	0.995	5722.79*	5723.01*	0.23	5723.24	27
29	29	27.87	30 c	112.8	5718.04	5719.17	1.002	5722.76*	5723.28*	0.15	5723.43	27
30	30	19.15	24 c	135.3	5719.97	5721.19	0.901	5723.43*	5724.40*	0.87	5725.27	29
31	31	8.74	18 c	16.1	5720.88	5721.04	0.997	5723.55*	5723.66*	0.38	5724.04	29
32	32	12.53	18 c	36.2	5722.62	5723.05	1.186	5726.47*	5726.98*	0.39	5727.38	21

Lorson East PDR- C16 basins | Number of lines: 39 | Run Date: 10-13-2017

NOTES: c = cir; e = ellip; b = box; Return period = 100 Yrs. ; *Surcharged (HGL above crown). ; 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.
33	33	39.85	30 c	152.0	5740.16	5742.14	1.303	5743.10	5744.29	0.25	5744.53	8
34	34	40.32	30 c	197.6	5742.44	5745.01	1.301	5744.71	5747.13	n/a	5747.13 j	33
35	35	40.47	30 c	65.3	5745.31	5746.29	1.500	5747.36	5748.43	n/a	5748.43	34
36	36	0.57	18 c	26.6	5734.20	5734.34	0.525	5737.45*	5737.45*	0.00	5737.45	13
37	37	31.86	30 c	8.3	5717.21	5717.34	1.568	5720.90*	5720.95*	0.65	5721.61	24
38	38	9.82	18 c	31.4	5721.69	5722.10	1.308	5725.37*	5725.64*	0.48	5726.12	30
39	39	10.16	18 c	9.3	5734.41	5734.51	1.068	5737.46*	5737.55*	0.26	5737.81	14

Lorson East PDR- C16 basins | Number of lines: 39 | Run Date: 10-13-2017

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

Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q byp (cfs)	Junc type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp line No
							Ht (in)	L (ft)	area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
1	MH #19	29.20*	16.68	0.00	45.88	MH	6.0	6.00	2.00	4.00	2.00	Sag	2.00	0.080	0.050	0.013	0.00	0.00	0.00	0.00	0.00	Off
2	2	9.00*	21.30	0.00	30.30	None	6.0	6.00	2.00	4.00	2.00	Sag	2.00	0.080	0.050	0.013	0.00	0.00	0.00	0.00	0.00	1
3		9.00*	12.30	0.00	21.30	MH	6.0	6.00	2.00	4.00	2.00	Sag	2.00	0.080	0.050	0.013	0.00	0.00	0.00	0.00	0.00	2
4		9.00*	3.30	0.00	12.30	MH	6.0	6.00	2.00	4.00	2.00	Sag	2.00	0.080	0.050	0.013	0.00	0.00	0.00	0.00	0.00	3
5		9.00*	-5.70	0.00	3.30	MH	6.0	6.00	2.00	4.00	2.00	Sag	2.00	0.080	0.050	0.013	0.00	0.00	0.00	0.00	0.00	4
6		0.00	-5.70	0.00	-5.70	MH	6.0	6.00	2.00	4.00	2.00	Sag	2.00	0.080	0.050	0.013	0.00	0.00	0.00	0.00	0.00	5
7		0.00	-5.70	0.00	-5.70	MH	6.0	6.00	2.00	4.00	2.00	Sag	2.00	0.080	0.050	0.013	0.00	0.00	0.00	0.00	0.00	6
8		0.00	-5.70	0.00	-5.70	MH	6.0	6.00	2.00	4.00	2.00	Sag	2.00	0.080	0.050	0.013	0.00	0.00	0.00	0.00	0.00	7
9		-5.70	0.00	0.00	-5.70	MH	6.0	6.00	2.00	4.00	2.00	Sag	2.00	0.080	0.050	0.013	0.00	0.00	0.00	0.00	0.00	8
10	Inlet DP-3, 15'	20.05	0.00	20.05	0.00	Curb	6.0	15.00	2.00	4.00	2.00	Sag	2.00	0.080	0.020	0.016	0.70	29.09	0.83	29.09	3.00	19
11	Inlet DP-5, 5'	0.57	0.00	0.57	0.00	Curb	6.0	5.00	2.00	4.00	2.00	Sag	2.00	0.080	0.020	0.013	0.21	4.65	0.34	4.65	3.00	9
12	Inlet DP-4 , 15'	14.98	0.00	14.98	0.00	Genr	6.0	10.00	2.00	4.00	2.00	0.010	2.00	0.080	0.020	0.013	0.48	17.85	0.48	17.85	0.00	17
13		0.00	0.00	0.00	0.00	MH	6.0	6.00	2.00	4.00	2.00	Sag	2.00	0.080	0.050	0.013	0.00	0.00	0.00	0.00	0.00	7
14		0.00	0.00	0.00	0.00	MH	6.0	6.00	2.00	4.00	2.00	Sag	2.00	0.080	0.050	0.013	0.00	0.00	0.00	0.00	0.00	13
15		-7.84	-7.84	0.00	-15.68	MH	6.0	6.00	2.00	4.00	2.00	Sag	2.00	0.080	0.050	0.013	0.00	0.00	0.00	0.00	0.00	Off
16		-7.84	0.00	0.00	-7.84	None	6.0	6.00	2.00	4.00	2.00	Sag	2.00	0.080	0.050	0.013	0.00	0.00	0.00	0.00	0.00	15
17	Inlet DP-6, 15'	17.87	0.00	17.87	0.00	Genr	6.0	10.00	2.00	4.00	2.00	0.025	2.00	0.083	0.020	0.013	0.44	15.95	0.44	15.95	0.00	39
18	Inlet DP-8, 10'	16.30*	0.00	16.30	0.00	Genr	6.0	10.00	2.00	4.00	2.00	0.015	2.00	0.080	0.020	0.013	0.46	17.05	0.46	17.05	0.00	21
19	Inlet DP6b, 20'	20.68*	0.17	20.30	0.56	Genr	6.0	20.00	2.00	4.00	2.00	0.010	2.00	0.080	0.020	0.013	0.53	20.40	0.53	20.40	0.00	25
20	C13-DP6c	38.21	0.00	38.21	0.00	Curb	6.0	6.00	2.00	4.00	2.00	Sag	2.00	0.080	0.050	0.013	4.76	93.97	4.76	93.97	0.00	19
21	Inlet DP-10a, 10'	20.64*	0.00	20.64	0.00	Genr	6.0	15.00	2.00	4.00	2.00	Sag	2.00	0.080	0.020	0.013	0.30	9.00	0.30	9.00	0.00	28
22	Inlet DP-10c, 5'	1.31	0.00	1.31	0.00	Curb	6.0	5.00	2.00	4.00	2.00	Sag	2.00	0.080	0.050	0.013	0.22	3.25	0.41	3.25	3.00	4

Lorson East PDR- C16 basins | Number of lines: 39 | Run Date: 10-13-2017

NOTES: Inlet N-Values = 0.016 ; Intensity = 58.48 / (Inlet time + 7.70) ^ 0.75; Return period = 100 Yrs. ; * Indicates Known Q added

Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q byp (cfs)	Junc type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp line No
							Ht (in)	L (ft)	area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
23	Inlet DP-10b, 5'	6.92	0.00	6.92	0.00	Curb	6.0	5.00	2.00	4.00	2.00	Sag	2.00	0.080	0.020	0.013	0.61	24.74	0.74	24.74	3.00	24
24		26.10*	0.00	0.00	26.10	MH	6.0	6.00	2.00	4.00	2.00	Sag	2.00	0.080	0.050	0.013	0.00	0.00	0.00	0.00	0.00	1
25	Inlet DP-16, 30'	22.80	0.56	23.35	0.00	Genr	6.0	30.00	2.00	4.00	2.00	0.020	2.00	0.080	0.020	0.013	0.49	18.60	0.49	18.60	0.00	37
26		-12.29	-27.43	0.00	-39.72	MH	6.0	6.00	2.00	4.00	2.00	Sag	2.00	0.080	0.050	0.013	0.00	0.00	0.00	0.00	0.00	1
27		-12.29	-15.14	0.00	-27.43	MH	6.0	6.00	2.00	4.00	2.00	Sag	2.00	0.080	0.050	0.013	0.00	0.00	0.00	0.00	0.00	26
28	DP-13, 10'	9.70	0.04	9.73	0.00	Genr	6.0	6.00	2.00	4.00	2.00	0.010	2.00	0.080	0.020	0.013	0.42	15.00	0.42	15.00	0.00	25
29		-15.14	0.00	0.00	-15.14	MH	6.0	6.00	2.00	4.00	2.00	Sag	2.00	0.080	0.050	0.013	0.00	0.00	0.00	0.00	0.00	27
30	DP-12, 10'	1.46	0.00	1.46	0.00	Genr	6.0	10.00	2.00	4.00	2.00	0.012	2.00	0.080	0.020	0.013	0.24	5.90	0.24	5.90	0.00	28
31	Inlet DP-14, 10'	8.74	0.00	8.74	0.00	Genr	6.0	10.00	2.00	4.00	2.00	0.010	2.00	0.080	0.020	0.013	0.41	14.35	0.41	14.35	0.00	37
32	Inlet DP10, 10'	12.53	0.00	12.53	0.00	Curb	6.0	10.00	2.00	4.00	2.00	Sag	2.00	0.080	0.050	0.013	0.60	10.84	0.79	10.84	3.00	25
33		0.00	0.00	0.00	0.00	MH	6.0	6.00	2.00	4.00	2.00	Sag	2.00	0.080	0.050	0.013	0.00	0.00	0.00	0.00	0.00	8
34		0.00	0.00	0.00	0.00	MH	6.0	6.00	2.00	4.00	2.00	Sag	2.00	0.080	0.050	0.013	0.00	0.00	0.00	0.00	0.00	33
35	Inlet DP-2	40.47	0.00	40.30	0.17	Genr	6.0	6.00	2.00	4.00	2.00	0.015	2.00	0.080	0.050	0.013	0.75	13.84	0.75	13.84	0.00	19
36	Inlet DP-7, 5'	0.57	0.00	0.57	0.00	Curb	6.0	6.00	2.00	4.00	2.00	Sag	2.00	0.080	0.050	0.013	0.15	1.83	0.25	1.90	2.00	13
37	Inlet DP-17, 20'	31.86*	0.00	31.86	0.00	Curb	6.0	20.00	2.00	4.00	2.00	Sag	2.00	0.080	0.020	0.013	0.77	32.72	0.90	32.72	3.00	24
38	Inlet DP-12a, 10'	9.82	0.00	9.78	0.04	Genr	6.0	10.00	2.00	4.00	2.00	0.012	2.00	0.080	0.020	0.013	0.41	14.50	0.41	14.50	0.00	28
39	Inlet DP-6a, 10'	10.16	0.00	10.16	0.00	Genr	6.0	10.00	2.00	4.00	2.00	0.010	2.00	0.080	0.020	0.013	0.43	15.30	0.43	15.30	0.00	18

Won't this overtop to the overflow swale?

Lorson East PDR- C16 basins | Number of lines: 39 | Run Date: 10-13-2017

NOTES: Inlet N-Values = 0.016 ; Intensity = 58.48 / (Inlet time + 7.70) ^ 0.75; Return period = 100 Yrs. ; * Indicates Known Q added

BASIN D AND BASIN E STORM SCHEMATIC

INLET DP54–15'TYPE R
L16–18" RCP
LAMINE
INLET DP53
20'TYPE R
L9–L11,18" RCP
INLET DP52, 15'TYPE R
CHAPLIN DR.
L8–30" RCP
YUBA DR.
EAST TRIBUTARY OF JIMMY CAMP CREEK
L7–30" RCP
INLET DP56–25'TYPE R
INLET DP55, 25'TYPE R
WEISER DR.
LAMPREY DR
TILLAMOOK DR
INLET DP55a, 10'TYPE R
INLET DP59a
5'TYPE R
POND D2
L13–24" RCP
L12
24"
L14–18" RCP
L6–48" RCP
L4–L5, 18" RCP
SACO DR.
INLET DP59d–15'TYPE R
L1–48" RCP
L17–48" RCP
INLET DP50, 10'TYPE R
L28–L29
18" RCP
INLET DP65b–10'TYPE R
L19–18" RCP
L2–L3,
24" RCP
L25–18" RCP
LORSON BLVD.
LORSON BLVD.
L20–18" RCP
INLET DP65a–5'TYPE R
L18–18" RCP
L30–36" RCP
INLET DP64–25'TYPE R
L31–36" RCP
INLET DP60, 25'TYPE R
L32, 24" RCP
L21–L23
36" RCP
L38, 18" RCP
INLET DP59f
10'TYPE R
L24
36" RCP
L26
36" RCP
L27
30" RCP
WITCHER DR.
WITCHER DR.
FUTURE
BASIN D1
INLET DP61, 10'TYPE R
TRAPPE DR
YOCONA DR
ABITA DR
SKUNA DR
L36–L37
18" RCP
MAGOTHY DR
L33–L35
30" RCP
INLET DP62, 10'TYPE R
VOLGA DR
L39
18" RCP
INLET DP69–30'TYPE R
L10–24" RCP
L2–48" RCP
INLET DP70–30'TYPE R
L1–48" RCP
INLET DP66a, 5'TYPE R
YOCONA DR
L14–30" RCP
L16–L17, 18" RCP
INTERIM
POND E2
INLET DP66d
10'TYPE R
L15, 24" RCP
VOLGA DR
HORTON DR
TRAPPE DR
INTERIM
POND E1
L3–L5
48" RCP
INLET DP68–15 'TYPE R
L11–18" RCP
L9,L12
18" RCP
L6–48" RCP
L8
30" RCP
L7–48" RCP
L13
30" RCP

200 100 0 200 400
SCALE: 1"=200'

CORE ENGINEERING GROUP
15004 1ST AVE. S.
BURNSVILLE, MN 55306
PH: 763.479.4100
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
EAST OF EAST TRIBUTARY
EL PASO COUNTY, COLORADO

DRAWN: RLS
DESIGNED: LAB
CHECKED: LAB

STORM SEWER SCHEMATIC
BASIN D AND BASIN E
LORSON RANCH EAST

DATE
OCTOBER 20, 2017

PROJECT NO.
100.040

SHEET NUMBER
3

TOTAL SHEETS: 3

P:\100 100.040 Drainage 100.040-storm schematic.dwg Oct 13, 2017 - 7:28pm

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	L1	63.56	48 c	185.0	5697.00	5702.09	2.751	5699.36	5704.45	n/a	5704.45	End
2	L2	14.68	24 c	45.0	5704.99	5706.84	4.106	5705.77*	5709.07*	0.07	5709.14	1
3	L3	14.68	24 c	62.6	5706.84	5709.42	4.119	5709.14	5710.78	n/a	5710.78 j	2
4	L4	7.34	18 c	186.4	5710.17	5715.01	2.597	5711.16	5716.04	0.10	5716.04	3
5	L5	7.34	18 c	10.0	5715.11	5715.38	2.700	5716.27	5716.41	0.45	5716.41	4
6	L6	48.88	48 c	137.0	5702.59	5704.23	1.197	5705.27	5706.30	n/a	5706.30 j	1
7	L7	33.79	30 c	146.0	5705.83	5708.17	1.603	5707.30	5710.11	0.42	5710.11	6
8	L8	26.49	30 c	226.5	5708.37	5713.87	2.428	5710.72	5715.59	n/a	5715.59 j	7
9	L9	12.44	18 c	78.4	5714.92	5718.39	4.425	5715.73	5719.73	0.26	5719.73	8
10	L10	12.44	18 c	83.9	5718.68	5720.50	2.168	5719.83	5721.84	0.26	5721.84	9
11	L11	12.44	18 c	24.9	5720.70	5720.98	1.123	5722.20*	5722.55*	0.00	5722.55	10
12	L12	7.80	24 c	26.0	5706.33	5707.11	2.999	5707.07	5708.10	0.00	5708.10	6
13	L13	7.29	24 c	6.0	5707.13	5707.37	4.004	5707.67*	5709.45*	0.00	5709.45	6
14	L14	7.34	18 c	26.6	5710.44	5710.86	1.577	5711.24	5712.07	0.32	5712.39	3
15	L15	14.05	18 c	29.2	5715.08	5716.06	3.360	5716.03*	5718.00*	0.00	5718.00	8
16	L16	7.30	18 c	58.9	5709.75	5710.83	1.832	5710.91	5711.86	n/a	5711.86 j	7
17	L17	88.34	48 c	100.0	5697.00	5699.50	2.500	5699.78	5702.28	n/a	5702.28	End
18	L18	5.82	18 c	101.3	5701.90	5702.93	1.017	5703.51	5703.85	n/a	5703.85 j	17
19	L19	4.16	18 c	30.6	5703.13	5703.45	1.048	5704.17	5704.23	n/a	5704.23 j	18
20	L20	1.65	18 c	20.0	5703.33	5703.73	1.995	5704.24	5704.22	n/a	5704.22 j	18
21	L21	44.98	36 c	400.0	5700.75	5715.00	3.563	5703.05	5717.14	n/a	5717.14 j	17
22	L22	44.98	36 c	400.0	5715.30	5725.70	2.600	5717.59	5727.84	n/a	5727.84 j	21
23	L23	44.98	36 c	217.3	5726.00	5732.00	2.762	5728.29	5734.14	n/a	5734.14 j	22
24	L24	36.40	36 c	621.3	5732.00	5743.26	1.812	5734.81	5745.18	n/a	5745.18 j	23
25	L25	10.66	18 c	67.0	5745.16	5745.96	1.192	5746.31	5747.21	0.00	5747.21	24
26	L26	25.74	36 c	248.8	5743.86	5748.50	1.865	5745.88	5750.12	n/a	5750.12 j	24
27	L27	23.56	30 c	19.8	5749.50	5749.99	2.482	5750.55*	5752.75*	0.00	5752.75	26
28	L28	2.19	18 c	249.0	5752.72	5762.38	3.879	5753.05	5762.94	n/a	5762.94	26
29	L29	2.19	18 c	10.0	5762.38	5762.68	3.003	5763.12	5763.25	n/a	5763.25 j	28
30	L30	37.54	36 c	51.0	5700.50	5702.03	3.000	5703.24	5703.98	n/a	5703.98 j	17
31	L31	34.39	36 c	32.0	5702.33	5702.97	2.000	5704.54	5704.84	n/a	5704.84	30
32	L32	15.76	24 c	10.0	5703.97	5704.17	1.997	5705.31	5705.58	0.00	5705.58	31

Lorson East PDR - D Basins | Number of lines: 39 | Run Date: 10-13-2017

NOTES: c = cir; e = ellip; b = box; Return period = 5 Yrs. ; *Surcharged (HGL above crown). ; j - Line contains hyd. jump.

Per ECM 3.3.1.C, minor storm not to cause surcharge

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.
33	L33	18.63	24 c	274.1	5703.97	5707.51	1.291	5705.23	5709.04	0.33	5709.04	31
34	L34	18.63	24 c	143.3	5707.81	5710.70	2.017	5709.30	5712.23	0.33	5712.23	33
35	L35	18.63	24 c	19.4	5711.00	5711.30	1.548	5712.50	5712.83	0.33	5712.83	34
36	L36	7.57	18 c	120.7	5711.80	5713.30	1.242	5713.36	5714.35	n/a	5714.35 j	35
37	L37	7.57	18 c	219.8	5713.60	5719.23	2.562	5714.58	5720.28	0.00	5720.28	36
38	L38	8.58	18 c	13.6	5733.60	5733.93	2.430	5734.85	5735.05	0.00	5735.05	23
39	L39	11.06	18 c	28.3	5711.80	5712.09	1.023	5713.09	5713.38	0.00	5713.38	35

Lorson East PDR - D Basins | Number of lines: 39 | Run Date: 10-13-2017

NOTES: c = cir; e = ellip; b = box; Return period = 5 Yrs. ; *Surcharged (HGL above crown). ; j - Line contains hyd. jump.

Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q byp (cfs)	Junc type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp line No
							Ht (in)	L (ft)	area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
1		0.00	0.00	0.00	0.00	MH	6.0	10.00	2.00	4.00	2.00	Sag	2.00	0.080	0.020	0.013	0.00	0.00	0.00	0.00	0.00	Off
2		0.00	0.00	0.00	0.00	MH	6.0	10.00	2.00	4.00	2.00	Sag	2.00	0.080	0.020	0.013	0.00	0.00	0.00	0.00	0.00	1
3		0.00	0.00	0.00	0.00	MH	6.0	10.00	2.00	4.00	2.00	Sag	2.00	0.080	0.020	0.013	0.00	0.00	0.00	0.00	0.00	2
4		0.00	0.00	0.00	0.00	None	6.0	10.00	2.00	4.00	2.00	Sag	2.00	0.080	0.020	0.013	0.00	0.00	0.00	0.00	0.00	3
5	Inlet DP-50, 10'	10.18	0.00	7.34	2.84	Genr	6.0	10.00	2.00	4.00	2.00	0.026	2.00	0.080	0.020	0.013	0.37	12.55	0.37	12.55	0.00	13
6		0.00	0.00	0.00	0.00	MH	6.0	10.00	2.00	4.00	2.00	Sag	2.00	0.080	0.020	0.013	0.00	0.00	0.00	0.00	0.00	1
7		0.00	0.00	0.00	0.00	MH	6.0	10.00	2.00	4.00	2.00	Sag	2.00	0.080	0.020	0.013	0.00	0.00	0.00	0.00	0.00	6
8		0.00	0.00	0.00	0.00	MH	6.0	10.00	2.00	4.00	2.00	Sag	2.00	0.080	0.020	0.013	0.00	0.00	0.00	0.00	0.00	7
9		0.00	0.00	0.00	0.00	MH	6.0	6.00	2.00	4.00	2.00	Sag	2.00	0.080	0.050	0.013	0.00	0.00	0.00	0.00	0.00	8
10		0.00	0.00	0.00	0.00	MH	6.0	15.00	2.00	4.00	2.00	Sag	2.00	0.080	0.020	0.013	0.00	0.00	0.00	0.00	0.00	11
11	Inlet DP-52, 15'	15.67	0.00	12.44	3.23	Genr	6.0	15.00	2.00	4.00	2.00	0.030	2.00	0.080	0.020	0.013	0.41	14.60	0.41	14.60	0.00	15
12	Inlet DP-55, 25'	4.20	3.60	7.80	0.00	Genr	6.0	10.00	2.00	4.00	2.00	Sag	2.00	0.080	0.020	0.013	0.30	9.00	0.30	9.00	0.00	13
13	Inlet DP-56, 25'	4.46	2.84	7.29	0.00	Genr	6.0	10.00	2.00	4.00	2.00	Sag	2.00	0.080	0.020	0.013	0.30	9.00	0.30	9.00	0.00	Off
14	Inlet DP55a, 10'	10.18	0.00	7.34	2.84	Genr	6.0	10.00	2.00	4.00	2.00	0.021	2.00	0.080	0.020	0.013	0.38	13.10	0.38	13.10	0.00	12
15	Inlet DP-53, 20'	11.50	3.23	14.05	0.69	Genr	6.0	10.00	2.00	4.00	2.00	Sag	2.00	0.080	0.020	0.013	0.30	9.00	0.30	9.00	0.00	12
16	Inlet DP-54, 15'	7.38	0.00	7.30	0.08	Genr	6.0	10.00	2.00	4.00	2.00	0.013	2.00	0.080	0.020	0.013	0.37	12.65	0.37	12.65	0.00	12
17		0.00	0.00	0.00	0.00	MH	6.0	10.00	2.00	4.00	2.00	Sag	2.00	0.080	0.020	0.013	0.00	0.00	0.00	0.00	0.00	Off
18		0.00	0.00	0.00	0.00	MH	6.0	10.00	2.00	4.00	2.00	Sag	2.00	0.080	0.020	0.013	0.00	0.00	0.00	0.00	0.00	17
19	Inlet DP-65b, 10'	4.16	0.00	4.16	0.00	Curb	6.0	10.00	2.00	4.00	2.00	Sag	2.00	0.080	0.020	0.013	0.38	12.95	0.38	12.95	0.00	Off
20	Inlet DP-65a, 5'	1.65	0.00	1.65	0.00	Curb	6.0	5.00	2.00	4.00	2.00	Sag	2.00	0.080	0.020	0.013	0.31	9.48	0.31	9.48	0.00	18
21		0.00	0.00	0.00	0.00	MH	6.0	10.00	2.00	4.00	2.00	Sag	2.00	0.080	0.020	0.013	0.00	0.00	0.00	0.00	0.00	17
22		0.00	0.00	0.00	0.00	MH	6.0	10.00	2.00	4.00	2.00	Sag	2.00	0.080	0.020	0.013	0.00	0.00	0.00	0.00	0.00	21

Lorson East PDR - D Basins | Number of lines: 39 | Run Date: 10-13-2017

NOTES: Inlet N-Values = 0.016 ; Intensity = 501.75 / (Inlet time + 28.20) ^ 1.31; Return period = 5 Yrs. ; * Indicates Known Q added

Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q byp (cfs)	Junc type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp line No
							Ht (in)	L (ft)	area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
23		0.00	0.00	0.00	0.00	MH	6.0	10.00	2.00	4.00	2.00	Sag	2.00	0.080	0.020	0.013	0.00	0.00	0.00	0.00	0.00	22
24		0.00	0.00	0.00	0.00	MH	6.0	10.00	2.00	4.00	2.00	Sag	2.00	0.080	0.020	0.013	0.00	0.00	0.00	0.00	0.00	23
25	Inlet DP-59d, 10'	10.66	0.00	10.66	0.00	Genr	6.0	10.00	2.00	4.00	2.00	Sag	2.00	0.080	0.020	0.013	0.30	9.00	0.30	9.00	0.00	19
26		0.00	0.00	0.00	0.00	MH	6.0	10.00	2.00	4.00	2.00	Sag	2.00	0.080	0.020	0.013	0.00	0.00	0.00	0.00	0.00	24
27	From Basin D1	23.56	0.00	23.56	0.00	Curb	6.0	10.00	2.00	4.00	2.00	Sag	2.00	0.080	0.020	0.013	0.97	42.52	0.97	42.52	0.00	26
28		0.00	0.00	0.00	0.00	None	6.0	10.00	2.00	4.00	2.00	Sag	2.00	0.080	0.020	0.013	0.00	0.00	0.00	0.00	0.00	26
29	DP-59a	2.19	0.00	2.19	0.00	Curb	6.0	10.00	2.00	4.00	2.00	Sag	2.00	0.080	0.020	0.013	0.29	8.41	0.29	8.41	0.00	28
30	Inlet DP64, 25'	3.15	0.00	3.15	0.00	Genr	6.0	10.00	2.00	4.00	2.00	Sag	2.00	0.080	0.020	0.013	0.30	9.00	0.30	9.00	0.00	20
31		0.00	0.00	0.00	0.00	MH	6.0	10.00	2.00	4.00	2.00	Sag	2.00	0.080	0.020	0.013	0.00	0.00	0.00	0.00	0.00	30
32	Inlet DP60, 25'	10.70	5.06	15.76	0.00	Genr	6.0	20.00	2.00	4.00	2.00	Sag	2.00	0.080	0.020	0.013	0.30	9.00	0.30	9.00	0.00	30
33		0.00	0.00	0.00	0.00	MH	6.0	10.00	2.00	4.00	2.00	Sag	2.00	0.080	0.020	0.013	0.00	0.00	0.00	0.00	0.00	31
34		0.00	0.00	0.00	0.00	MH	6.0	10.00	2.00	4.00	2.00	Sag	2.00	0.080	0.020	0.013	0.00	0.00	0.00	0.00	0.00	33
35		0.00	0.00	0.00	0.00	MH	6.0	15.00	2.00	4.00	2.00	Sag	2.00	0.080	0.020	0.013	0.00	0.00	0.00	0.00	0.00	32
36		0.00	0.00	0.00	0.00	MH	6.0	15.00	2.00	4.00	2.00	Sag	2.00	0.080	0.020	0.013	0.00	0.00	0.00	0.00	0.00	35
37	Inlet DP61, 10'	10.62	0.00	7.57	3.05	Genr	6.0	10.00	2.00	4.00	2.00	0.026	2.00	0.080	0.020	0.013	0.37	12.75	0.37	12.75	0.00	39
38	Inlet DP- 59f, 10'	13.64	0.00	8.58	5.06	Genr	6.0	6.00	2.00	4.00	2.00	0.020	2.00	0.080	0.050	0.013	0.49	8.60	0.49	8.60	0.00	32
39	Inlet DP62, 10'	8.01	3.05	11.06	0.00	Genr	6.0	6.00	2.00	4.00	2.00	Sag	2.00	0.080	0.050	0.013	0.30	4.80	0.30	4.80	0.00	35

Lorson East PDR - D Basins | Number of lines: 39 | Run Date: 10-13-2017

NOTES: Inlet N-Values = 0.016 ; Intensity = 501.75 / (Inlet time + 28.20) ^ 1.31; Return period = 5 Yrs. ; * Indicates Known Q added

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	L1	121.1	48 c	185.0	5697.00	5702.09	2.751	5700.27	5705.35	0.76	5705.35	End
2	L2	21.57	24 c	45.0	5704.99	5706.84	4.108	5706.51	5708.49	0.19	5708.49	1
3	L3	21.60	24 c	62.6	5706.84	5709.42	4.119	5708.70	5711.07	n/a	5711.07 j	2
4	L4	10.76	18 c	186.4	5710.17	5715.01	2.597	5711.44	5716.26	n/a	5716.26 j	3
5	L5	10.77	18 c	10.0	5715.11	5715.38	2.700	5716.41	5716.63	0.65	5716.63	4
6	L6	118.4	48 c	137.0	5702.59	5704.23	1.197	5705.87	5707.45	0.74	5707.45	1
7	L7	57.12	30 c	146.0	5705.83	5708.17	1.603	5708.33*	5711.16*	0.84	5712.01	6
8	L8	44.77	30 c	226.5	5708.37	5713.87	2.428	5712.82	5716.10	n/a	5716.10	7
9	L9	18.80	18 c	78.4	5714.92	5718.39	4.425	5716.10	5719.85	0.54	5719.85	8
10	L10	18.80	18 c	83.9	5718.68	5720.50	2.168	5720.18*	5722.87*	0.53	5723.40	9
11	L11	18.80	18 c	24.9	5720.70	5720.98	1.123	5723.40*	5724.20*	0.00	5724.20	10
12	L12	31.70	24 c	26.0	5706.33	5707.11	2.999	5707.72*	5709.63*	0.00	5709.63	6
13	L13	29.70	24 c	6.0	5707.13	5707.37	4.004	5708.31*	5710.76*	0.00	5710.76	6
14	L14	10.83	18 c	26.6	5710.44	5710.86	1.577	5711.48	5712.28	0.55	5712.83	3
15	L15	25.53	18 c	29.2	5715.08	5716.06	3.360	5716.58*	5718.31*	0.00	5718.31	8
16	L16	12.63	18 c	58.9	5709.75	5710.83	1.832	5713.32*	5714.17*	0.00	5714.17	7
17	L17	174.3	48 c	100.0	5697.00	5699.50	2.500	5700.75	5703.25	n/a	5703.25	End
18	L18	15.99	18 c	101.3	5701.50	5702.63	1.115	5705.13*	5707.48*	0.51	5707.99	17
19	L19	12.70	18 c	30.6	5702.93	5703.25	1.046	5708.46*	5708.91*	0.00	5708.91	18
20	L20	3.29	18 c	20.0	5702.93	5703.33	2.000	5709.21*	5709.23*	0.00	5709.23	18
21	L21	103.6	36 c	400.0	5700.75	5715.00	3.563	5703.25	5717.91	n/a	5717.91	17
22	L22	104.2	36 c	400.0	5715.30	5725.70	2.600	5717.93	5728.61	0.00	5728.61	21
23	L23	104.5	36 c	217.3	5726.00	5732.00	2.762	5728.65	5734.91	1.04	5734.91	22
24	L24	93.23	36 c	621.3	5732.00	5743.26	1.812	5735.66*	5747.81*	1.08	5748.89	23
25	L25	20.30	18 c	67.0	5745.06	5745.96	1.343	5749.54*	5752.04*	0.00	5752.04	24
26	L26	75.38	36 c	251.2	5744.56	5749.20	1.847	5749.82*	5753.03*	0.53	5753.56	24
27	L27	60.85	30 c	27.3	5750.00	5750.49	1.793	5753.56*	5754.17*	0.00	5754.17	26
28	L28	4.84	18 c	249.0	5752.72	5762.38	3.879	5755.22	5763.22	n/a	5763.22 j	26
29	L29	4.85	18 c	10.0	5762.38	5762.68	3.003	5763.45	5763.52	n/a	5763.52 j	28
30	L30	88.31	36 c	51.0	5700.30	5701.83	3.001	5703.97	5704.80	0.97	5705.78	17
31	L31	58.94	36 c	32.0	5701.93	5702.57	1.999	5707.13*	5707.38*	0.43	5707.81	30
32	L32	31.70	24 c	10.0	5703.97	5704.17	1.997	5707.81*	5708.01*	0.00	5708.01	31

Lorson East PDR - D Basins | Number of lines: 39 | Run Date: 10-13-2017

NOTES: c = cir; e = ellip; b = box; Return period = 100 Yrs. ; *Surcharged (HGL above crown). ; 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.
33	L33	27.33	24 c	274.1	5703.87	5707.51	1.328	5707.81*	5711.82*	0.35	5712.17	31
34	L34	27.37	24 c	143.3	5707.81	5710.40	1.807	5712.17*	5714.27*	0.35	5714.62	33
35	L35	27.38	24 c	19.4	5710.70	5711.20	2.581	5714.62*	5714.91*	0.47	5715.38	34
36	L36	11.08	18 c	120.7	5711.70	5714.00	1.905	5715.95*	5717.29*	0.18	5717.48	35
37	L37	11.08	18 c	219.8	5714.20	5719.23	2.288	5717.48	5720.50	n/a	5720.50 j	36
38	L36	30.24	18 c	13.6	5733.60	5733.93	2.430	5735.10*	5736.23*	0.00	5736.23	23
39	L39	20.30	18 c	28.3	5711.80	5712.09	1.023	5715.38*	5716.44*	0.00	5716.44	35

Lorson East PDR - D Basins | Number of lines: 39 | Run Date: 10-13-2017

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

Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q byp (cfs)	Junc type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp line No
							Ht (in)	L (ft)	area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
1		0.00	-53.15	0.00	-53.15	MH	6.0	10.00	2.00	4.00	2.00	Sag	2.00	0.080	0.020	0.013	0.00	0.00	0.00	0.00	0.00	Off
2		-19.72	-31.38	0.00	-51.10	MH	6.0	10.00	2.00	4.00	2.00	Sag	2.00	0.080	0.020	0.013	0.00	0.00	0.00	0.00	0.00	1
3		-19.87	-11.51	0.00	-31.38	MH	6.0	10.00	2.00	4.00	2.00	Sag	2.00	0.080	0.020	0.013	0.00	0.00	0.00	0.00	0.00	2
4		-11.51	0.00	0.00	-11.51	None	6.0	10.00	2.00	4.00	2.00	Sag	2.00	0.080	0.020	0.013	0.00	0.00	0.00	0.00	0.00	3
5	Inlet DP-50, 10'	10.77	0.00	10.77	0.00	Genr	6.0	10.00	2.00	4.00	2.00	0.026	2.00	0.080	0.020	0.013	0.38	12.85	0.38	12.85	0.00	13
6		34.77*	-36.82	0.00	-2.05	MH	6.0	10.00	2.00	4.00	2.00	Sag	2.00	0.080	0.020	0.013	0.00	0.00	0.00	0.00	0.00	1
7		-10.54	-26.28	0.00	-36.82	MH	6.0	10.00	2.00	4.00	2.00	Sag	2.00	0.080	0.020	0.013	0.00	0.00	0.00	0.00	0.00	6
8		-10.56	-15.72	0.00	-26.28	MH	6.0	10.00	2.00	4.00	2.00	Sag	2.00	0.080	0.020	0.013	0.00	0.00	0.00	0.00	0.00	7
9		-15.72	0.00	0.00	-15.72	MH	6.0	6.00	2.00	4.00	2.00	Sag	2.00	0.080	0.050	0.013	0.00	0.00	0.00	0.00	0.00	8
10		-15.86	0.00	0.00	-15.86	MH	6.0	15.00	2.00	4.00	2.00	Sag	2.00	0.080	0.020	0.013	0.00	0.00	0.00	0.00	0.00	11
11	Inlet DP-52, 15'	18.80	-15.86	2.94	0.00	Genr	6.0	15.00	2.00	4.00	2.00	0.030	2.00	0.080	0.020	0.013	0.26	6.75	0.26	6.75	0.00	15
12	Inlet DP-55, 25'	31.70*	0.00	31.70	0.00	Genr	6.0	10.00	2.00	4.00	2.00	0.020	2.00	0.080	0.020	0.013	0.54	20.95	0.54	20.95	0.00	13
13	Inlet DP-56, 25'	29.70*	0.00	26.00	3.70	Genr	6.0	10.00	2.00	4.00	2.00	Sag	2.00	0.080	0.020	0.013	0.30	9.00	0.30	9.00	0.00	Off
14	Inlet DP55a, 10'	10.83	0.00	10.83	0.00	Genr	6.0	10.00	2.00	4.00	2.00	0.021	2.00	0.080	0.020	0.013	0.39	13.45	0.39	13.45	0.00	12
15	Inlet DP-53, 20'	25.53	0.00	25.53	0.00	Genr	6.0	10.00	2.00	4.00	2.00	0.020	2.00	0.080	0.020	0.013	0.50	19.25	0.50	19.25	0.00	12
16	Inlet DP-54, 15'	12.63	0.00	12.63	0.00	Genr	6.0	10.00	2.00	4.00	2.00	0.013	2.00	0.080	0.020	0.013	0.44	15.85	0.44	15.85	0.00	12
17		0.00	5.53	0.00	5.53	MH	6.0	10.00	2.00	4.00	2.00	Sag	2.00	0.080	0.020	0.013	0.00	0.00	0.00	0.00	0.00	Off
18		4.59*	0.00	0.00	4.59	MH	6.0	10.00	2.00	4.00	2.00	Sag	2.00	0.080	0.020	0.013	0.00	0.00	0.00	0.00	0.00	17
19	Inlet DP-65b, 10'	12.70*	0.00	12.70	0.00	Curb	6.0	10.00	2.00	4.00	2.00	Sag	2.00	0.080	0.020	0.013	0.67	27.33	0.67	27.33	0.00	Off
20	Inlet DP-65a, 5'	3.29	0.00	3.29	0.00	Curb	6.0	5.00	2.00	4.00	2.00	Sag	2.00	0.080	0.020	0.013	0.42	15.04	0.42	15.04	0.00	18
21		-5.20	6.14	0.00	0.94	MH	6.0	10.00	2.00	4.00	2.00	Sag	2.00	0.080	0.020	0.013	0.00	0.00	0.00	0.00	0.00	17
22		-6.23	12.37	0.00	6.14	MH	6.0	10.00	2.00	4.00	2.00	Sag	2.00	0.080	0.020	0.013	0.00	0.00	0.00	0.00	0.00	21

Lorson East PDR - D Basins | Number of lines: 39 | Run Date: 10-13-2017

NOTES: Inlet N-Values = 0.016 ; Intensity = 1020.33 / (Inlet time + 30.10) ^ 1.34; Return period = 100 Yrs. ; * Indicates Known Q added

Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q byp (cfs)	Junc type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp line No
							Ht (in)	L (ft)	area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
23		-6.79	19.16	0.00	12.37	MH	6.0	10.00	2.00	4.00	2.00	Sag	2.00	0.080	0.020	0.013	0.00	0.00	0.00	0.00	0.00	22
24		8.16*	11.00	0.00	19.16	MH	6.0	10.00	2.00	4.00	2.00	Sag	2.00	0.080	0.020	0.013	0.00	0.00	0.00	0.00	0.00	23
25	Inlet DP-59d, 15'	20.30	0.00	20.30	0.00	Genr	6.0	10.00	2.00	4.00	2.00	0.025	2.00	0.080	0.020	0.013	0.46	16.80	0.46	16.80	0.00	19
26		11.00*	0.00	0.00	11.00	MH	6.0	10.00	2.00	4.00	2.00	Sag	2.00	0.080	0.020	0.013	0.00	0.00	0.00	0.00	0.00	24
27	From Basin D1	60.85	0.00	60.85	0.00	Curb	6.0	10.00	2.00	4.00	2.00	Sag	2.00	0.080	0.020	0.013	3.65	176.30	3.65	176.30	0.00	26
28		0.00	0.00	0.00	0.00	None	6.0	10.00	2.00	4.00	2.00	Sag	2.00	0.080	0.020	0.013	0.00	0.00	0.00	0.00	0.00	26
29	Inlet DP-59a, 10'	4.85	0.00	4.85	0.00	Curb	6.0	10.00	2.00	4.00	2.00	Sag	2.00	0.080	0.020	0.013	0.41	14.33	0.41	14.33	0.00	28
30	Inlet DP64, 25'	30.96*	-23.46	7.50	0.00	Genr	6.0	10.00	2.00	4.00	2.00	Sag	2.00	0.080	0.020	0.013	0.30	9.00	0.30	9.00	0.00	20
31		0.00	-23.46	0.00	-23.46	MH	6.0	10.00	2.00	4.00	2.00	Sag	2.00	0.080	0.020	0.013	0.00	0.00	0.00	0.00	0.00	30
32	Inlet DP60, 25'	31.70*	-2.03	29.67	0.00	Genr	6.0	20.00	2.00	4.00	2.00	0.020	2.00	0.080	0.020	0.013	0.53	20.45	0.53	20.45	0.00	30
33		-11.57	-11.89	0.00	-23.46	MH	6.0	10.00	2.00	4.00	2.00	Sag	2.00	0.080	0.020	0.013	0.00	0.00	0.00	0.00	0.00	31
34		-11.89	0.00	0.00	-11.89	MH	6.0	10.00	2.00	4.00	2.00	Sag	2.00	0.080	0.020	0.013	0.00	0.00	0.00	0.00	0.00	33
35		-11.93	-11.97	0.00	-23.90	MH	6.0	15.00	2.00	4.00	2.00	Sag	2.00	0.080	0.020	0.013	0.00	0.00	0.00	0.00	0.00	32
36		-11.97	0.00	0.00	-11.97	MH	6.0	15.00	2.00	4.00	2.00	Sag	2.00	0.080	0.020	0.013	0.00	0.00	0.00	0.00	0.00	35
37	Inlet DP61, 10'	11.08	0.00	11.08	0.00	Genr	6.0	10.00	2.00	4.00	2.00	0.026	2.00	0.080	0.020	0.013	0.38	13.00	0.38	13.00	0.00	39
38	Inlet DP- 59f, 10'	30.24	0.00	12.37	17.87	Genr	6.0	6.00	2.00	4.00	2.00	0.020	2.00	0.080	0.050	0.013	0.65	11.72	0.65	11.72	0.00	32
39	Inlet DP62, 10'	20.30*	0.00	16.30	4.00	Genr	6.0	6.00	2.00	4.00	2.00	0.020	2.00	0.080	0.050	0.013	0.56	10.04	0.56	10.04	0.00	32

Lorson East PDR - D Basins | Number of lines: 39 | Run Date: 10-13-2017

NOTES: Inlet N-Values = 0.016 ; Intensity = 1020.33 / (Inlet time + 30.10) ^ 1.34; Return period = 100 Yrs. ; * Indicates Known Q added

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	L1	69.17	48 c	76.0	5700.00	5701.90	2.500	5702.64	5704.36	0.00	5704.36	End
2	L2	64.30	48 c	15.0	5702.20	5702.58	2.533	5705.08	5704.95	n/a	5704.95	1
3	L3	58.57	48 c	169.5	5702.68	5704.38	1.003	5705.68	5706.64	n/a	5706.64 j	2
4	L4	58.57	48 c	169.5	5704.58	5706.30	1.015	5707.30	5708.56	n/a	5708.56 j	3
5	L5	58.57	48 c	269.4	5706.50	5709.20	1.002	5709.22	5711.46	n/a	5711.46 j	4
6	L6	52.75	48 c	76.4	5709.30	5710.10	1.047	5712.18	5712.25	n/a	5712.25 j	5
7	L7	46.48	48 c	152.3	5710.30	5711.83	1.005	5712.95	5713.85	n/a	5713.85 j	6
8	L8	20.00	30 c	52.5	5713.89	5716.03	4.072	5714.73*	5718.59*	0.00	5718.59	7
9	L9	6.27	18 c	149.4	5712.40	5716.67	2.859	5713.02	5717.63	n/a	5717.63	6
10	L10	5.72	24 c	29.3	5705.76	5706.34	1.981	5706.33	5707.39	0.00	5707.39	2
11	L11	5.82	18 c	31.3	5712.00	5713.31	4.180	5712.53	5714.71	0.00	5714.71	5
12	L12	6.27	18 c	21.4	5716.75	5717.46	3.315	5717.86	5718.42	n/a	5718.42 j	9
13	L13	26.48	30 c	35.2	5713.30	5713.66	1.025	5714.75	5715.62	0.00	5715.62	7
14	L14	16.11	30 c	189.0	5724.00	5726.29	1.212	5725.42	5727.63	n/a	5727.63 j	End
15	L15	12.80	24 c	165.6	5726.90	5727.90	0.604	5728.17	5729.17	0.17	5729.34	14
16	L16	3.31	18 c	142.8	5727.30	5728.90	1.120	5728.14	5729.59	n/a	5729.59 j	14
17	L17	3.31	18 c	220.3	5728.90	5739.48	4.802	5729.81	5740.17	n/a	5740.17 j	16

Lorson East PDR - E Basins Number of lines: 17 Run Date: 10-13-2017

NOTES: c = cir; e = ellip; b = box; Return period = 5 Yrs. ; *Surcharged (HGL above crown). ; j - Line contains hyd. jump.

Per ECM 3.3.1.C, minor storm not to cause surcharge

Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q byp (cfs)	Junc type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp line No
							Ht (in)	L (ft)	area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
1	Inlet DP70, 30'	4.87	0.00	4.87	0.00	Genr	0.0	0.00	0.00	0.00	0.00	0.020	2.00	0.080	0.020	0.013	0.31	9.60	0.31	9.60	0.00	Off
2		0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	Off
3	Pipe Curve	0.00	0.00	0.00	0.00	None	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	Off
4		0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	Off
5		0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	Off
6		0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	Off
7		0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	Off
8	Basin E1.3 + Pond	20.00*	0.00	20.00	0.00	Hdwl	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	Off
9		1.00*	0.00	0.00	1.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	Off
10	Inlet DP-69, 30'	4.73	1.00	5.72	0.00	Curb	6.0	6.00	0.00	0.00	0.00	Sag	2.00	0.080	0.050	0.000	0.46	8.10	0.57	8.10	2.00	Off
11	Inlet DP68, 10'	5.48	1.34	5.82	1.00	Genr	0.0	0.00	0.00	0.00	0.00	0.012	2.00	0.080	0.050	0.013	0.42	7.22	0.42	7.22	0.00	10
12	Inlet DP66d, 10'	7.61	0.00	6.27	1.34	Genr	0.0	0.00	0.00	0.00	0.00	0.020	2.00	0.080	0.050	0.013	0.40	6.82	0.40	6.82	0.00	11
13	from Basin E2-ex	26.48	0.00	26.48	0.00	Hdwl	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	Off
14		0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	Off
15	from Pond E1	12.80*	0.00	12.80	0.00	Hdwl	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	Off
16		1.00*	0.00	0.00	1.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	Off
17	Inlet 66a, 5'	3.31	0.00	3.31	0.00	Curb	6.0	6.00	0.00	0.00	0.00	Sag	2.00	0.080	0.050	0.000	0.34	5.60	0.45	5.60	2.00	Off

Lorson East PDR - E Basins | Number of lines: 17 | Run Date: 10-13-2017

NOTES: Inlet N-Values = 0.016 ; Intensity = 501.75 / (Inlet time + 28.20) ^ 1.31; Return period = 5 Yrs. ; * Indicates Known Q added

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	L1	209.3	48 c	76.0	5700.00	5701.90	2.500	5703.88	5705.77	n/a	5705.77	End
2	L2	173.6	48 c	15.0	5702.20	5702.58	2.533	5707.20*	5707.42*	0.00	5707.42	1
3	L3	141.4	48 c	169.5	5702.78	5704.48	1.002	5708.42*	5710.06*	0.00	5710.06	2
4	L4	141.4	48 c	169.5	5704.48	5706.20	1.015	5710.06*	5711.71*	0.00	5711.71	3
5	L5	141.4	48 c	269.4	5706.40	5709.10	1.002	5711.71*	5714.32*	0.79	5715.10	4
6	L6	121.5	48 c	76.4	5709.30	5710.07	1.009	5715.62*	5716.16*	0.58	5716.74	5
7	L7	112.0	48 c	152.3	5710.30	5711.83	1.005	5716.96*	5717.89*	0.49	5718.38	6
8	L8	42.00	30 c	52.5	5714.93	5715.46	1.008	5718.48*	5719.03*	0.00	5719.03	7
9	L9	9.48	18 c	149.4	5712.40	5716.67	2.859	5717.75*	5718.97*	0.09	5719.06	6
10	L10	32.20	24 c	29.3	5705.76	5706.34	1.981	5708.75*	5709.35*	0.00	5709.35	2
11	L11	19.88	18 c	31.3	5712.00	5713.31	4.180	5715.10*	5716.23*	0.00	5716.23	5
12	L12	9.48	18 c	21.4	5716.75	5717.46	3.315	5719.06*	5719.23*	0.00	5719.23	9
13	L13	70.00	30 c	35.2	5713.33	5713.69	1.015	5718.38*	5719.41*	0.00	5719.41	7
14	L14	43.59	30 c	189.0	5724.00	5726.30	1.216	5726.21	5728.50	n/a	5728.50	End
15	L15	36.30	24 c	165.6	5726.90	5727.90	0.604	5728.90*	5733.17*	0.62	5733.79	14
16	L16	7.29	18 c	142.8	5727.30	5728.90	1.120	5729.65	5730.27	0.00	5730.27	14
17	L17	7.29	18 c	220.3	5728.90	5739.48	4.802	5730.29	5740.51	n/a	5740.51 j	16

Lorson East PDR - E Basins | Number of lines: 17 | Run Date: 10-13-2017

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

Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q byp (cfs)	Junc type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp line No
							Ht (in)	L (ft)	area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
1	Inlet DP70, 30'	13.72	22.02	35.74	0.00	Genr	0.0	0.00	0.00	0.00	0.00	0.020	2.00	0.080	0.020	0.013	0.56	21.95	0.56	21.95	0.00	Off
2		0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	Off
3	Pipe Curve	0.00	0.00	0.00	0.00	None	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	Off
4		0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	Off
5		0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	Off
6		0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	Off
7		0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	Off
8	Basin E1.3	64.16*	0.00	42.00	22.16	Genr	0.0	0.00	0.00	0.00	0.00	0.012	2.00	0.080	0.020	0.013	0.73	30.40	0.73	30.40	0.00	11
9		0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	Off
10	Inlet DP-69, 30'	10.46	21.74	32.20	0.00	Curb	6.0	6.00	0.00	0.00	0.00	Sag	2.00	0.080	0.050	0.000	2.47	48.22	2.58	48.22	2.00	Off
11	Inlet DP68, 10'	12.12	29.50	19.88	21.74	Genr	0.0	0.00	0.00	0.00	0.00	0.012	2.00	0.080	0.050	0.013	0.79	14.60	0.79	14.60	0.00	10
12	Inlet DP66d, 10'	16.82	0.00	9.48	7.34	Genr	0.0	0.00	0.00	0.00	0.00	0.020	2.00	0.080	0.050	0.013	0.53	9.34	0.53	9.34	0.00	11
13	From Basin E2-ex	92.02	0.00	70.00	22.02	Genr	0.0	0.00	0.00	0.00	0.00	0.010	2.00	0.080	0.050	0.013	1.08	20.42	1.08	20.42	0.00	1
14		0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	Off
15	from Pond E1	36.30*	0.00	36.30	0.00	Hdwl	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	Off
16		0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	Off
17	Inlet 66a, 5'	7.29	0.00	7.29	0.00	Curb	6.0	6.00	0.00	0.00	0.00	Sag	2.00	0.080	0.050	0.000	0.54	9.52	0.64	9.52	2.00	Off

Lorson East PDR - E Basins | Number of lines: 17 | Run Date: 10-13-2017

NOTES: Inlet N-Values = 0.016 ; Intensity = 1020.33 / (Inlet time + 30.10) ^ 1.34; Return period = 100 Yrs. ; * Indicates Known Q added

APPENDIX F –INTERIM POND CALCULATIONS BY HYDRAFLOW

Channel Report

Hydraflow Express by Intelisolve | Monday, Oct 23 2017, 1:32 PM

Pond C1 Overflow Swale at Wier

Trapezoidal

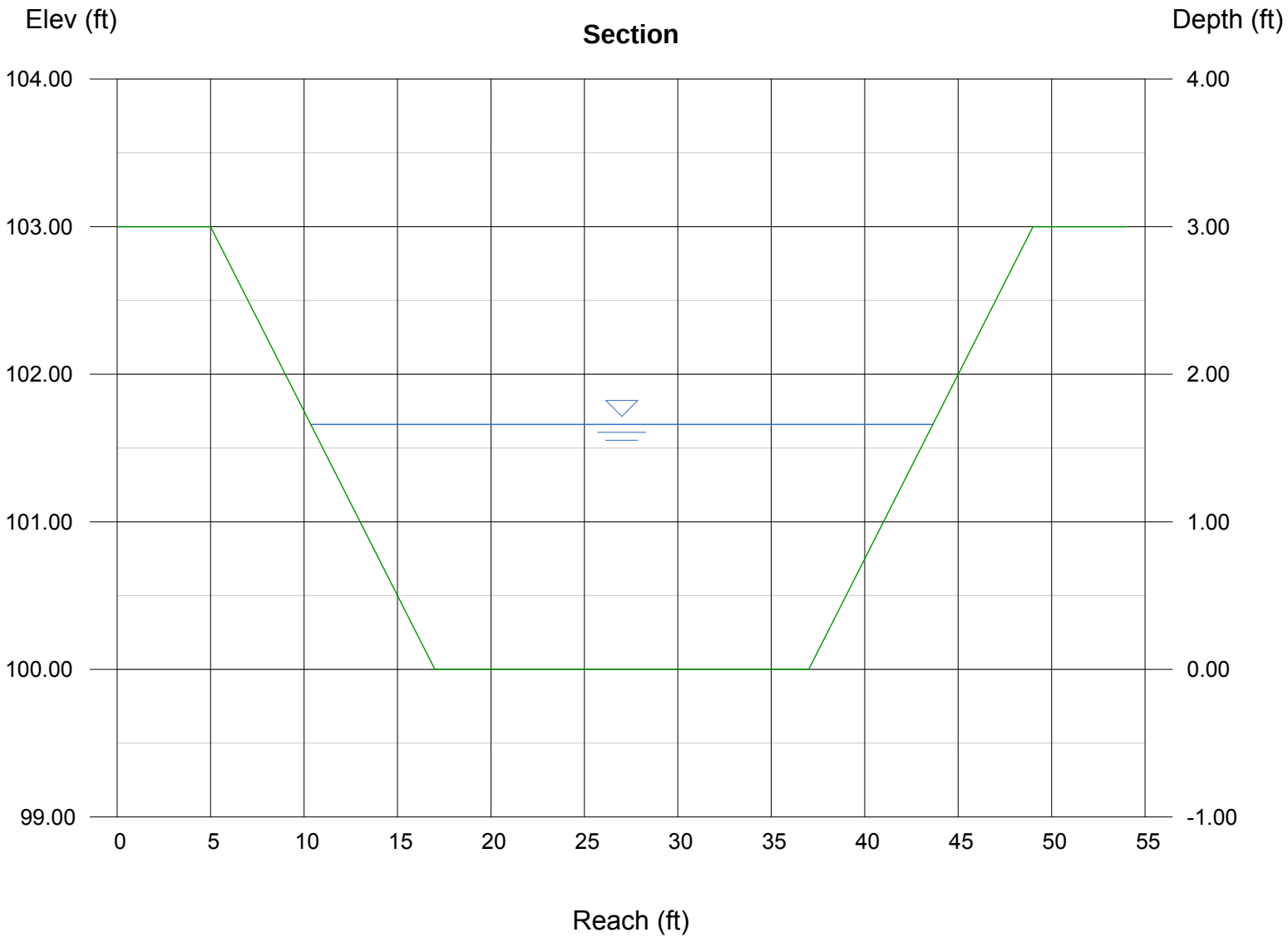
Botom Width (ft)	= 20.00
Side Slope (z:1)	= 4.00
Total Depth (ft)	= 3.00
Invert Elev (ft)	= 100.00
Slope (%)	= 0.30
N-Value	= 0.025

Calculations

Compute by:	Known Q
Known Q (cfs)	= 171.00

Highlighted

Depth (ft)	= 1.66
Q (cfs)	= 171.00
Area (sqft)	= 44.22
Velocity (ft/s)	= 3.87
Wetted Perim (ft)	= 33.69
Crit Depth, Yc (ft)	= 1.21
Top Width (ft)	= 33.28
EGL (ft)	= 1.89



Channel Report

Hydraflow Express by Intelisolve — Thursday, Oct 19 2017, 8:51 AM

POND C1 OVERFLOW SWALE TO FONTAINE

Trapezoidal

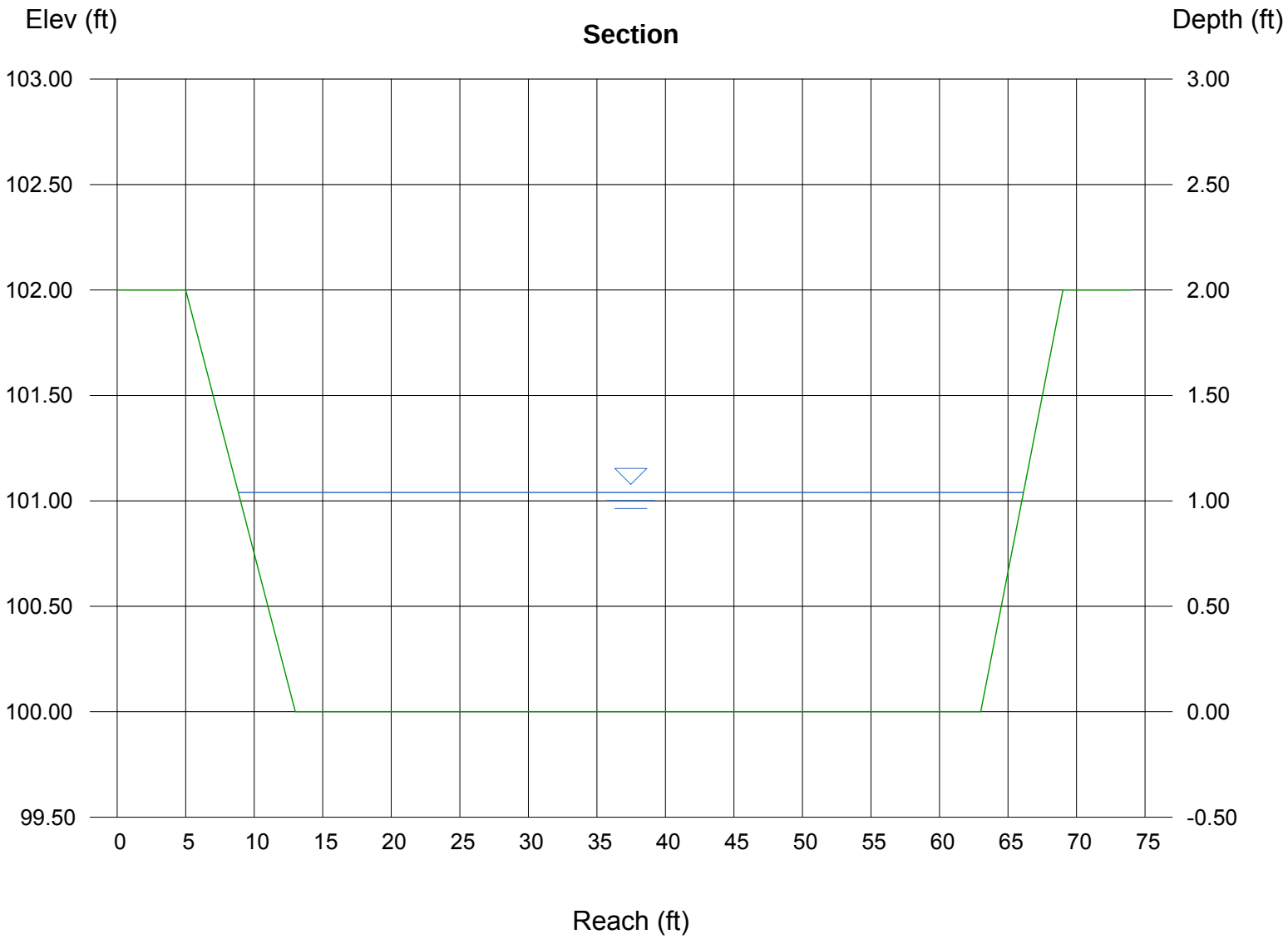
Botom Width (ft)	= 50.00
Side Slope (z:1)	= 4.00
Total Depth (ft)	= 2.00
Invert Elev (ft)	= 100.00
Slope (%)	= 0.30
N-Value	= 0.025

Calculations

Compute by:	Known Q
Known Q (cfs)	= 175.00

Highlighted

Depth (ft)	= 1.04
Q (cfs)	= 175.00
Area (sqft)	= 55.79
Velocity (ft/s)	= 3.14
Wetted Perim (ft)	= 57.58
Crit Depth, Yc (ft)	= 0.72
Top Width (ft)	= 57.28
EGL (ft)	= 1.19



Weir Report

Hydraflow Express by Intelisolve | Monday, Oct 23 2017, 1:41 PM

Pond C1 Overflow Weir

Trapezoidal Weir

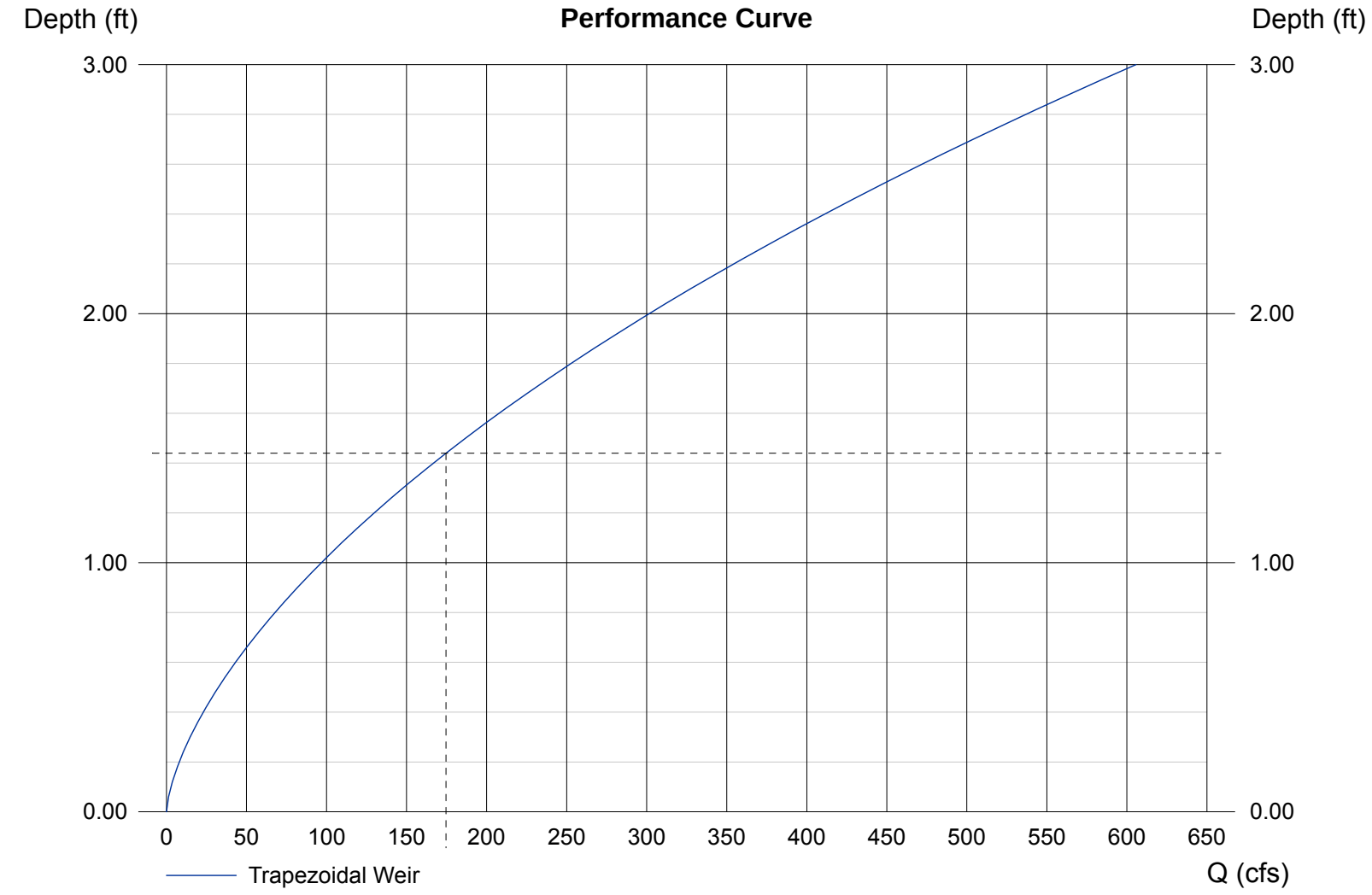
Crest	= Sharp
Bottom Length (ft)	= 28.00
Total Depth (ft)	= 3.00
Side Slope (z:1)	= 4.00

Calculations

Weir Coeff. Cw	= 3.10
Compute by:	Q vs Depth
No. Increments	= 50

Highlighted

Depth (ft)	= 1.44
Q (cfs)	= 174.67
Area (sqft)	= 48.61
Velocity (ft/s)	= 3.59
Top Width (ft)	= 39.52



Weir Report

Hydraflow Express by Intelisolve | Thursday, Oct 12 2017, 4:18 PM

Interim Pond C2.2 Spillway

Trapezoidal Weir

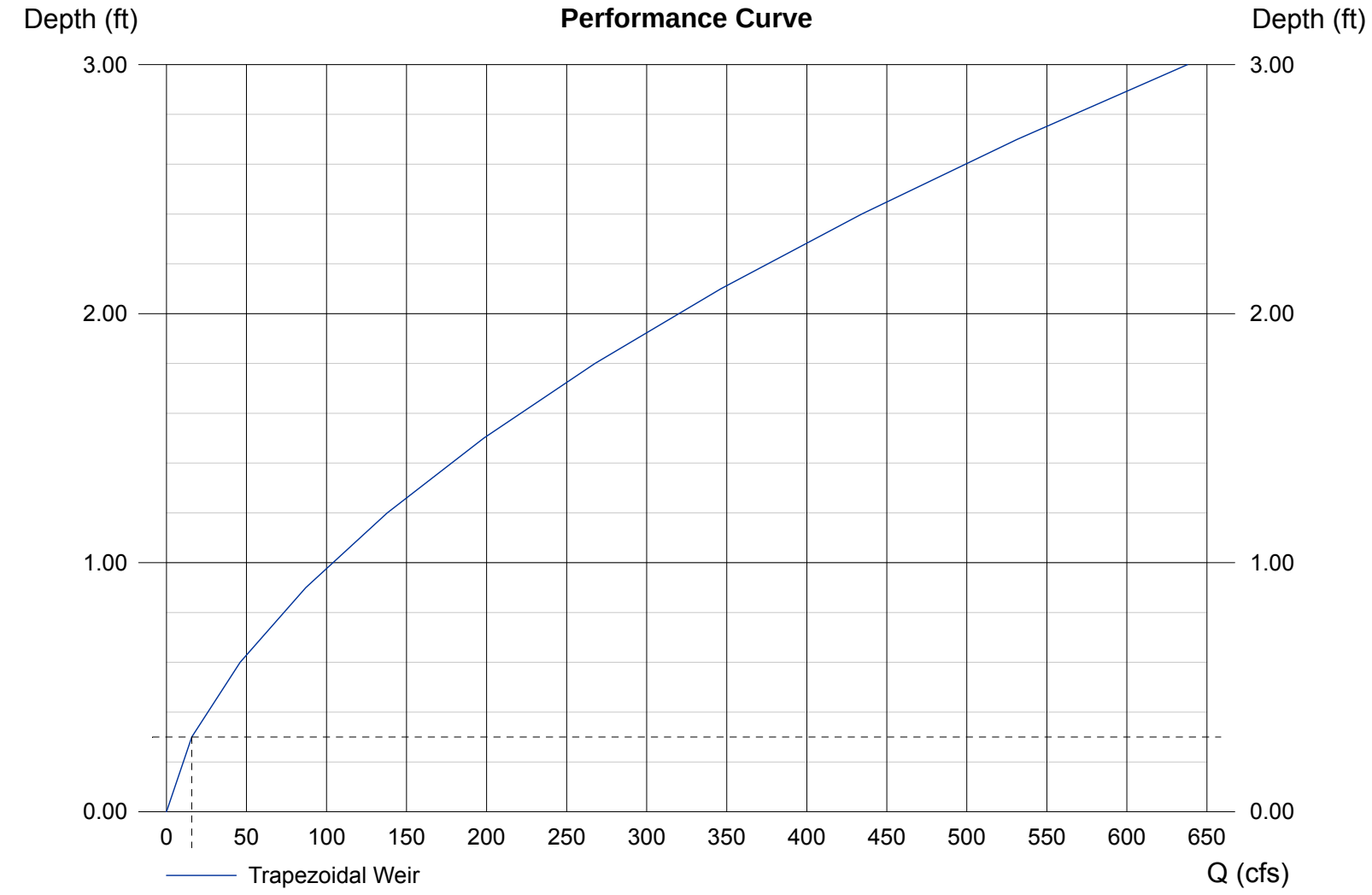
Crest	= Sharp
Bottom Length (ft)	= 30.00
Total Depth (ft)	= 3.00
Side Slope (z:1)	= 4.00

Calculations

Weir Coeff. Cw	= 3.10
Compute by:	Q vs Depth
No. Increments	= 10

Highlighted

Depth (ft)	= 0.30
Q (cfs)	= 15.77
Area (sqft)	= 9.36
Velocity (ft/s)	= 1.68
Top Width (ft)	= 32.40



Weir Report

Hydraflow Express by Intelisolve | Thursday, Oct 12 2017, 4:19 PM

Interim Pond C2.3 Spillway

Trapezoidal Weir

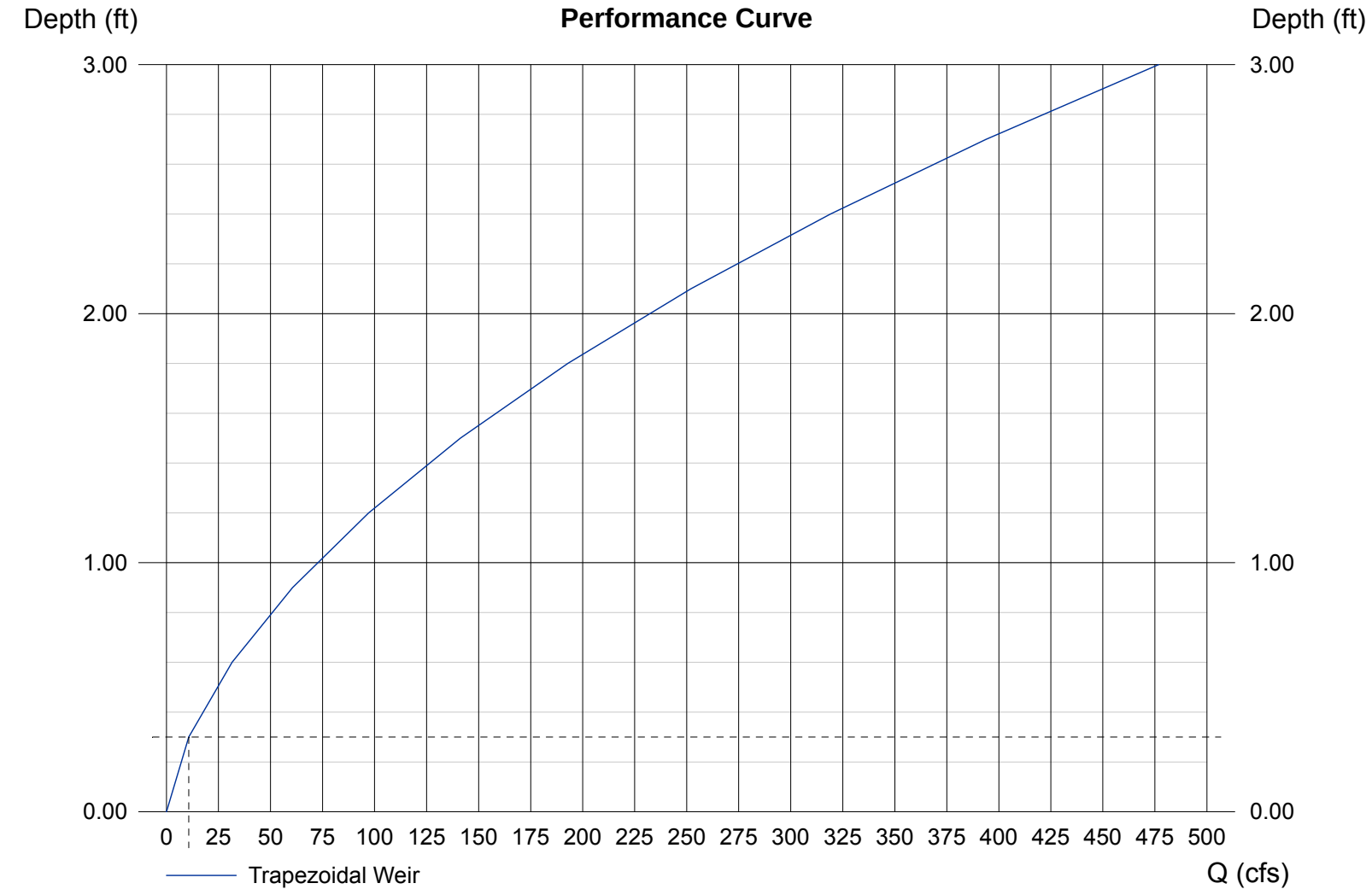
Crest	= Sharp
Bottom Length (ft)	= 20.00
Total Depth (ft)	= 3.00
Side Slope (z:1)	= 4.00

Calculations

Weir Coeff. Cw	= 3.10
Compute by:	Q vs Depth
No. Increments	= 10

Highlighted

Depth (ft)	= 0.30
Q (cfs)	= 10.68
Area (sqft)	= 6.36
Velocity (ft/s)	= 1.68
Top Width (ft)	= 22.40



Weir Report

Hydraflow Express by Intelisolve | Thursday, Oct 12 2017, 4:21 PM

Interim Pond C3 Spillway

Trapezoidal Weir

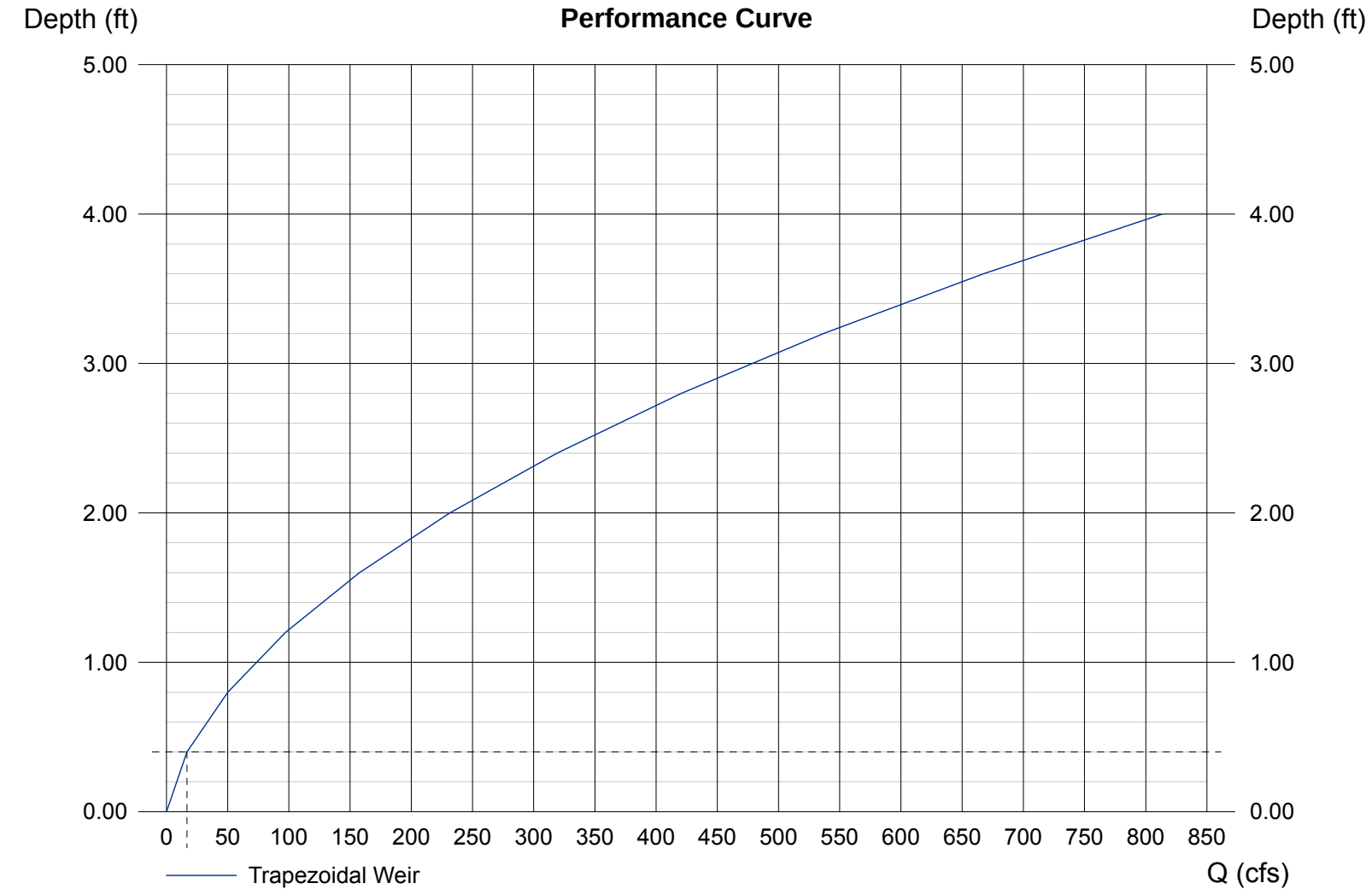
Crest	= Sharp
Bottom Length (ft)	= 20.00
Total Depth (ft)	= 4.00
Side Slope (z:1)	= 4.00

Calculations

Weir Coeff. Cw	= 3.10
Compute by:	Q vs Depth
No. Increments	= 10

Highlighted

Depth (ft)	= 0.40
Q (cfs)	= 16.69
Area (sqft)	= 8.64
Velocity (ft/s)	= 1.93
Top Width (ft)	= 23.20



Channel Report

Hydraflow Express by Intelisolve — Friday, Oct 20 2017, 10:39 AM

POND C3 OVERFLOW SWALE TO POND C2.2

Trapezoidal

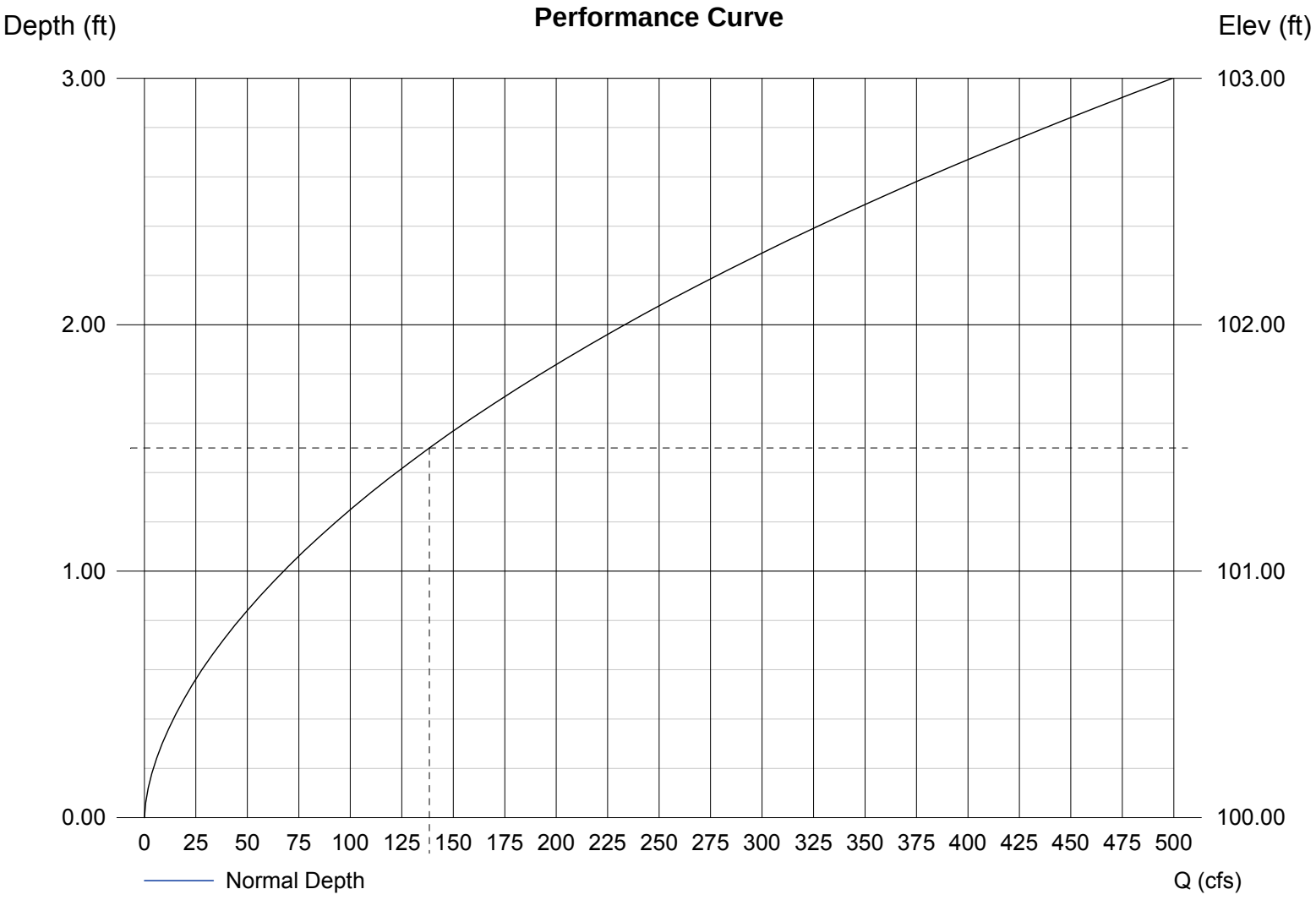
Botom Width (ft)	= 15.00
Side Slope (z:1)	= 3.00
Total Depth (ft)	= 3.00
Invert Elev (ft)	= 100.00
Slope (%)	= 0.50
N-Value	= 0.025

Calculations

Compute by:	Q vs Depth
No. Increments	= 50

Highlighted

Depth (ft)	= 1.50
Q (cfs)	= 138.41
Area (sqft)	= 29.25
Velocity (ft/s)	= 4.73
Wetted Perim (ft)	= 24.49
Crit Depth, Yc (ft)	= 1.22
Top Width (ft)	= 24.00
EGL (ft)	= 1.85



Channel Report

Hydraflow Express by Intelisolve — Friday, Oct 20 2017, 10:37 AM

POND C3 OVERFLOW SWALE TO POND C2.2

Trapezoidal

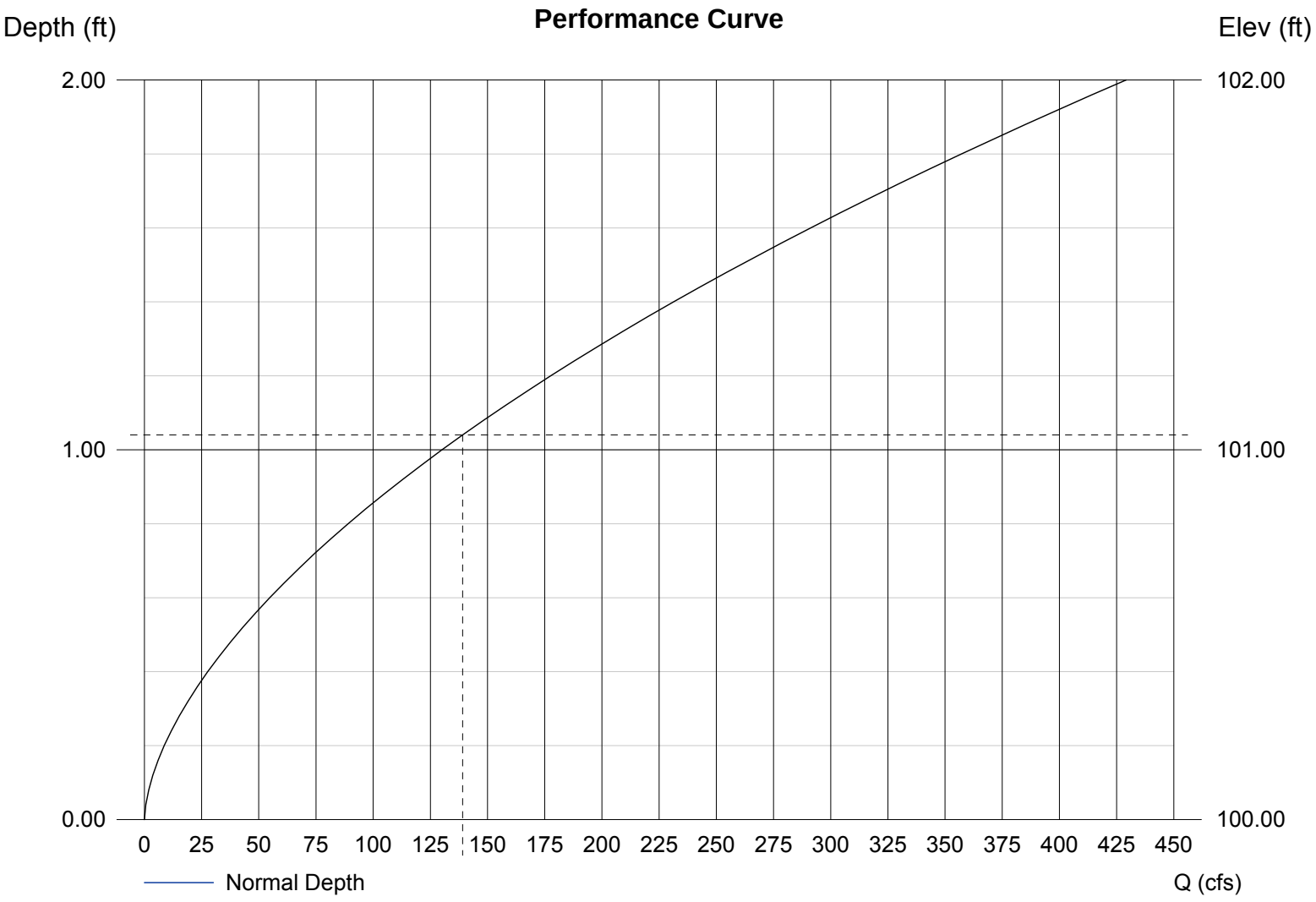
Botom Width (ft)	= 30.00
Side Slope (z:1)	= 3.00
Total Depth (ft)	= 2.00
Invert Elev (ft)	= 100.00
Slope (%)	= 0.50
N-Value	= 0.025

Calculations

Compute by:	Q vs Depth
No. Increments	= 50

Highlighted

Depth (ft)	= 1.04
Q (cfs)	= 139.09
Area (sqft)	= 34.44
Velocity (ft/s)	= 4.04
Wetted Perim (ft)	= 36.58
Crit Depth, Yc (ft)	= 0.82
Top Width (ft)	= 36.24
EGL (ft)	= 1.29



Weir Report

Hydraflow Express by Intelisolve | Thursday, Oct 19 2017, 7:13 AM

POND C5 EMERGENCY OVERFLOW - 510cfs

Trapezoidal Weir

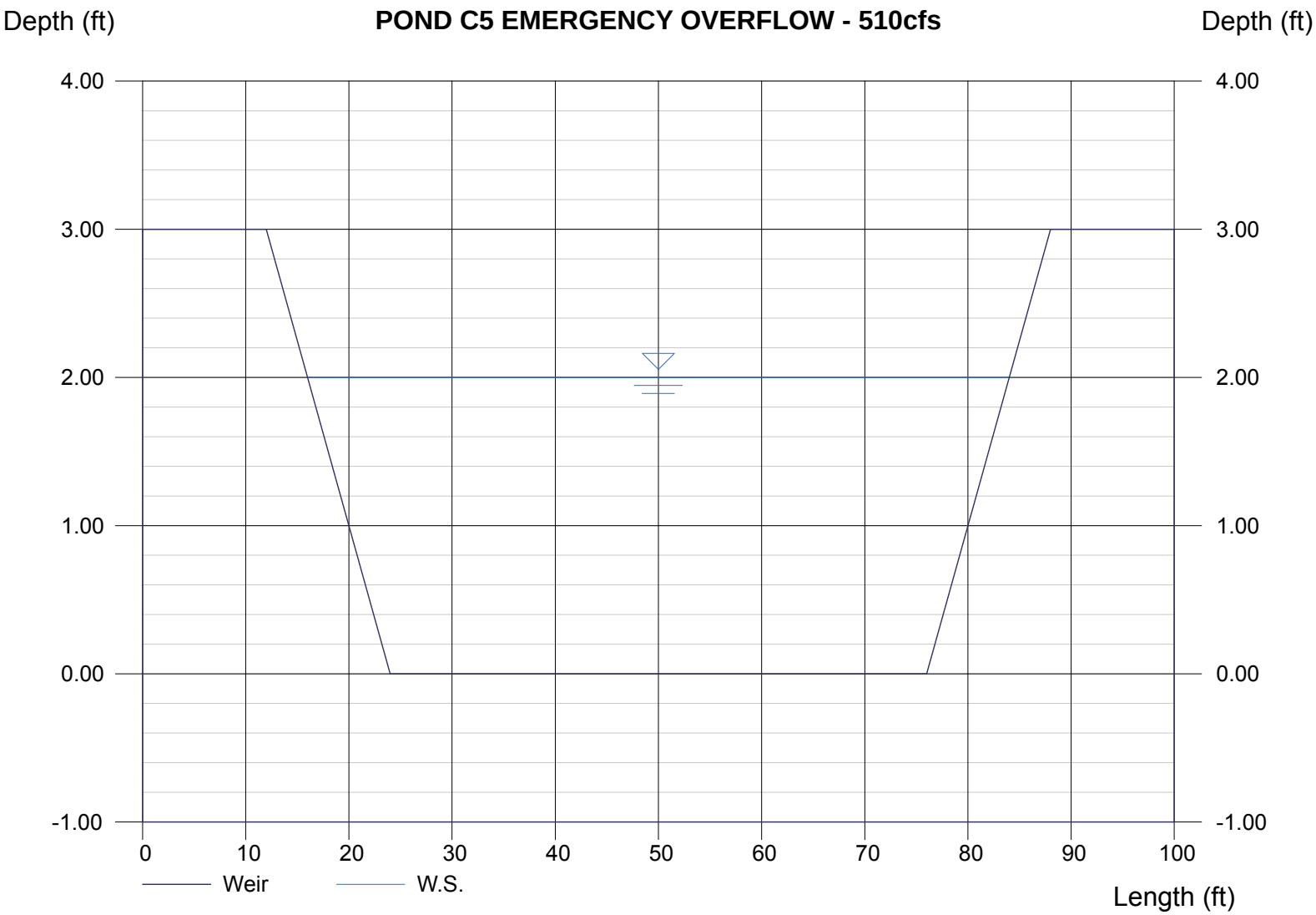
Crest	= Sharp
Bottom Length (ft)	= 52.00
Total Depth (ft)	= 3.00
Side Slope (z:1)	= 4.00

Calculations

Weir Coeff. Cw	= 3.10
Compute by:	Known Q
Known Q (cfs)	= 510.00

Highlighted

Depth (ft)	= 2.00
Q (cfs)	= 510.00
Area (sqft)	= 120.00
Velocity (ft/s)	= 4.25
Top Width (ft)	= 68.00



Weir Report

Hydraflow Express by Intelisolve | Tuesday, Jun 27 2017, 11:37 AM

Interim Pond E1 Spillway for future flow

Trapezoidal Weir

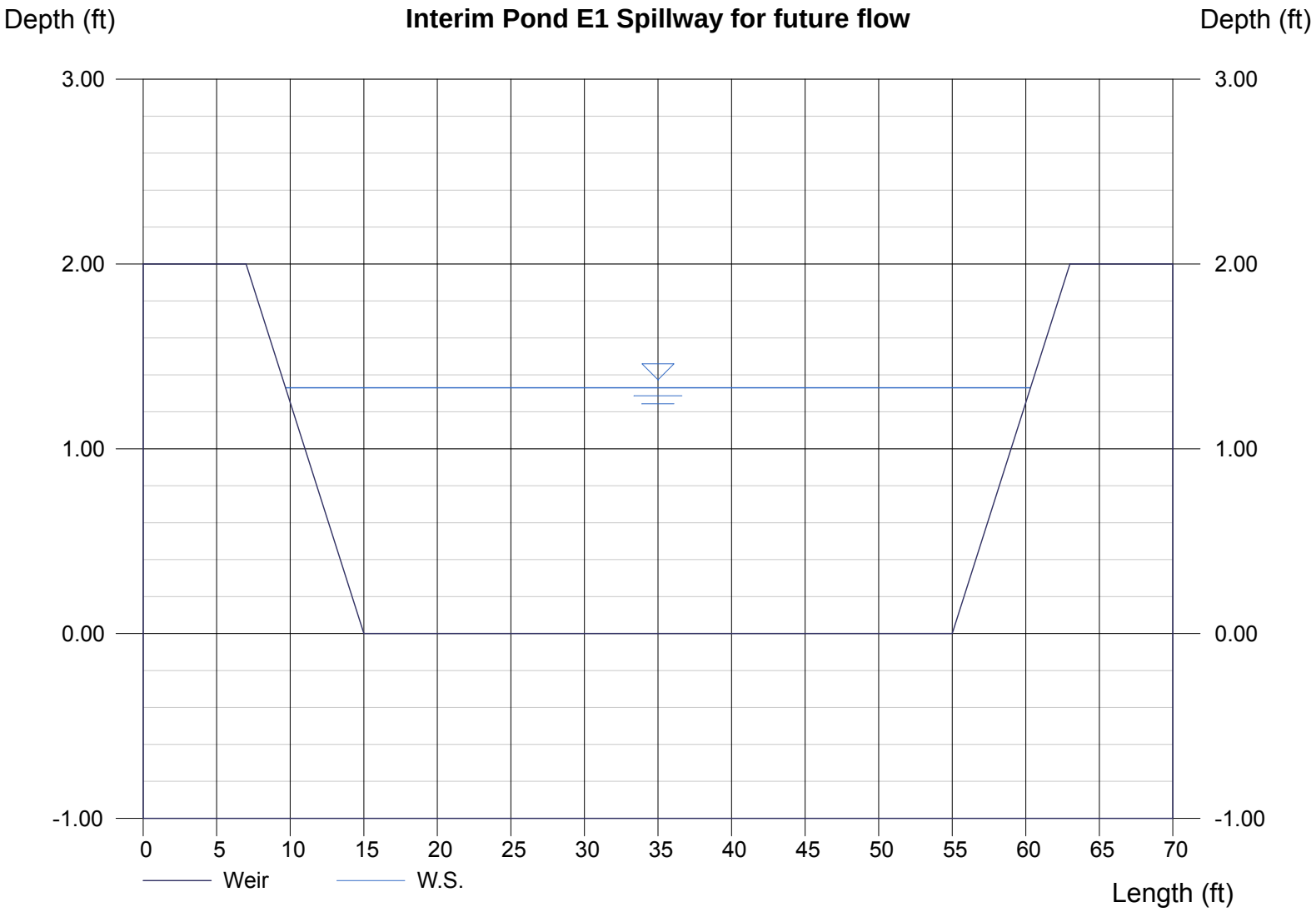
Crest	= Sharp
Bottom Length (ft)	= 40.00
Total Depth (ft)	= 2.00
Side Slope (z:1)	= 4.00

Calculations

Weir Coeff. Cw	= 3.10
Compute by:	Known Q
Known Q (cfs)	= 210.00

Highlighted

Depth (ft)	= 1.33
Q (cfs)	= 210.00
Area (sqft)	= 60.28
Velocity (ft/s)	= 3.48
Top Width (ft)	= 50.64



Weir Report

Hydraflow Express by Intelisolve | Thursday, Oct 12 2017, 9:19 AM

Interim Pond E2 Spillway to south

Trapezoidal Weir

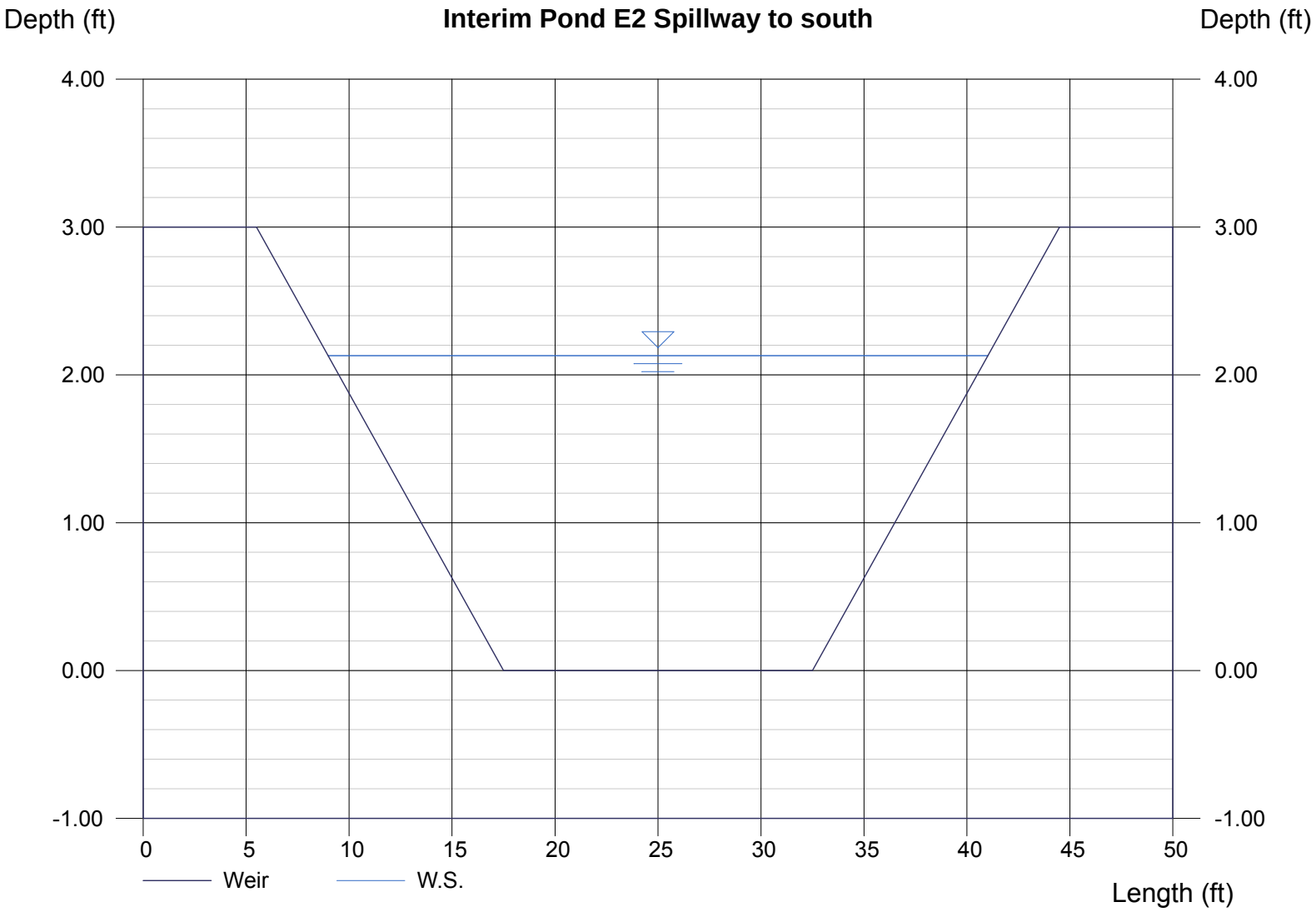
Crest	= Sharp
Bottom Length (ft)	= 15.00
Total Depth (ft)	= 3.00
Side Slope (z:1)	= 4.00

Calculations

Weir Coeff. Cw	= 3.10
Compute by:	Known Q
Known Q (cfs)	= 210.00

Highlighted

Depth (ft)	= 2.13
Q (cfs)	= 210.00
Area (sqft)	= 50.10
Velocity (ft/s)	= 4.19
Top Width (ft)	= 32.04

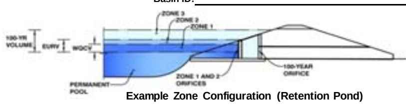


DETENTION BASIN STAGE-STORAGE TABLE BUILDER

UD-Detention, Version 3.07 (February 2017)

Project: Lorson Ranch East, Prelim Drainage Full Spectrum Design, #100.040

Basin ID: Interim Pond E2 !!!!! only use for WQ Design !!!!!!!!



Example Zone Configuration (Retention Pond)

Required Volume Calculation

Selected BMP Type =	**EDB**			
Watershed Area =	21.00	acres		
Watershed Length =	1,500	ft		
Watershed Slope =	0.035	ft/ft		
Watershed Imperviousness =	55.00%	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) =	0.386	acre-feet	Optional User Override 1-hr Precipitation	
Excess Urban Runoff Volume (EURV) =	1.101	acre-feet		
2-yr Runoff Volume (P1 = 1.16 in.) =	1.015	acre-feet	1.16	inches
5-yr Runoff Volume (P1 = 1.44 in.) =	1.455	acre-feet	1.44	inches
10-yr Runoff Volume (P1 = 1.68 in.) =	1.840	acre-feet	1.68	inches
25-yr Runoff Volume (P1 = 1.92 in.) =	2.451	acre-feet	1.92	inches
50-yr Runoff Volume (P1 = 2.16 in.) =	2.921	acre-feet	2.16	inches
100-yr Runoff Volume (P1 = 2.42 in.) =	3.507	acre-feet	2.42	inches
500-yr Runoff Volume (P1 = 0 in.) =	0.000	acre-feet		inches
Approximate 2-yr Detention Volume =	0.952	acre-feet		
Approximate 5-yr Detention Volume =	1.371	acre-feet		
Approximate 10-yr Detention Volume =	1.563	acre-feet		
Approximate 25-yr Detention Volume =	1.681	acre-feet		
Approximate 50-yr Detention Volume =	1.738	acre-feet		
Approximate 100-yr Detention Volume =	1.949	acre-feet		

Stage-Storage Calculation

Zone 1 Volume (WQCV) =	0.386	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.715	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.848	acre-feet
Total Detention Basin Volume =	1.949	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	

Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	**user**	acre-feet

Depth Increment = 0.2 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		
5694.33	--	0.33	--	--	--	10,245	0.235	1,597	0.037
5695	--	1.00	--	--	--	10,700	0.246	8,608	0.198
5696	--	2.00	--	--	--	12,222	0.281	20,053	0.460
5697	--	3.00	--	--	--	13,800	0.317	33,187	0.762
5698	--	4.00	--	--	--	15,441	0.354	47,807	1.097
5699	--	5.00	--	--	--	17,153	0.394	64,104	1.472
5700	--	6.00	--	--	--	18,960	0.435	82,161	1.886
5701	--	7.00	--	--	--	20,000	0.459	101,641	2.333
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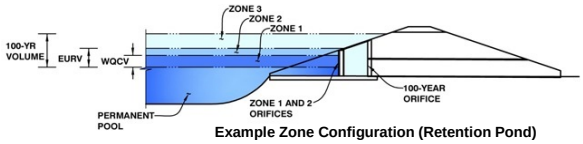
Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)

Project: Lorson Ranch East, Prelim. Full Spectrum Design, #100.040

Basin ID: Interim Pond E2 !!!! Only use for WQ Design !!!!!!!!



Example Zone Configuration (Retention Pond)

	Stage (ft)	Zone Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	1.72	0.386	Orifice Plate
Zone 2 (EURV)	4.02	0.715	Circular Orifice
Zone 3 (100-year)	6.15	0.848	Weir&Pipe (Restrict)
		1.949	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 Area =	N/A	ft²
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

Calculated Parameters for Underdrain

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

Invert of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	2.222E-02	ft²
Depth at top of Zone using Orifice Plate =	1.72	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	8.00	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	3.20	sq. inches (diameter = 2 inches)	Elliptical Slot Area =	N/A	ft²

Calculated Parameters for Plate

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	0.70	1.40					
Orifice Area (sq. inches)	3.20	3.20	3.20					

	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 Circular	Not Selected		Zone 2 Circular	Not Selected	
Invert of Vertical Orifice =	1.72	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	0.04	N/A	ft²
Depth at top of Zone using Vertical Orifice =	4.02	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	0.11	N/A	feet
Vertical Orifice Diameter =	2.73	N/A	inches				

Calculated Parameters for Vertical Orifice

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

	Zone 3 Weir	Not Selected		Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =		N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =		N/A	feet
Overflow Weir Front Edge Length =		N/A	feet	Over Flow Weir Slope Length =		N/A	feet
Overflow Weir Slope =		N/A	H:V (enter zero for flat grate)	Grate Open Area / 100-yr Orifice Area =		N/A	should be ≥ 4
Horiz. Length of Weir Sides =		N/A	feet	Overflow Grate Open Area w/o Debris =		N/A	ft²
Overflow Grate Open Area % =		N/A	%, grate open area/total area	Overflow Grate Open Area w/ Debris =		N/A	ft²
Debris Clogging % =		N/A	%				

Calculated Parameters for Overflow Weir

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

	Zone 3 Restrictor	Not Selected		Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =		N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =		N/A	ft²
Outlet Pipe Diameter =		N/A	inches	Outlet Orifice Centroid =		N/A	feet
Restrictor Plate Height Above Pipe Invert =			inches	Half-Central Angle of Restrictor Plate on Pipe =		N/A	radians

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=		ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	1.13	feet
Spillway Crest Length =		feet	Stage at Top of Freeboard =	8.13	feet
Spillway End Slopes =		H:V	Basin Area at Top of Freeboard =	0.46	acres
Freeboard above Max Water Surface =		feet			

Calculated Parameters for Spillway

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	1.16	1.44	1.68	1.92	2.16	2.42	0.00
Calculated Runoff Volume (acre-ft) =	0.386	1.101	1.015	1.455	1.840	2.451	2.921	3.507	0.000
OPTIONAL Override Runoff Volume (acre-ft) =									
Inflow Hydrograph Volume (acre-ft) =	0.385	1.100	1.014	1.453	1.838	2.449	2.918	3.503	#N/A
Predevelopment Unit Peak Flow, q (cfs/acre) =	0.00	0.00	0.01	0.12	0.33	0.77	1.02	1.33	0.00
Predevelopment Peak Q (cfs) =	0.0	0.0	0.3	2.5	7.0	16.2	21.4	27.9	0.0
Peak Inflow Q (cfs) =	6.6	18.5	17.1	24.4	30.8	40.8	48.5	58.1	#N/A
Peak Outflow Q (cfs) =	0.3	0.8	0.8	1.0	1.1	1.2	1.2	1.2	#N/A
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.4	0.2	0.1	0.1	0.0	#N/A
Structure Controlling Flow =	Plate	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	N/A	N/A	#N/A
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	#N/A
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	#N/A
Time to Drain 97% of Inflow Volume (hours) =	38	47	46	49	52	55	57	60	#N/A
Time to Drain 99% of Inflow Volume (hours) =	**40**	52	51	56	59	64	67	72	#N/A
Maximum Ponding Depth (ft) =	1.59	3.71	3.48	4.63	5.54	6.88	7.00	7.00	#N/A
Area at Maximum Ponding Depth (acres) =	0.27	0.34	0.33	0.38	0.42	0.46	0.46	0.46	#N/A
Maximum Volume Stored (acre-ft) =	0.348	0.996	0.915	1.325	1.690	2.274	2.333	2.333	#N/A

Design Procedure Form: Extended Detention Basin (EDB)

UD-BMP (Version 3.06, November 2016)

Designer: Richard Schindler
Company: Core Engineering Group
Date: October 12, 2017
Project: Lorson Ranch East PDR - Interim Pond E2 forebay design
Location:

1. Basin Storage Volume

A) Effective Imperviousness of Tributary Area, I_a — I_a = 55.0 %

B) Tributary Area's Imperviousness Ratio ($i = I_a / 100$) — i = 0.550

C) Contributing Watershed Area — Area = 21.000 ac

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

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

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

F) Design Volume (WQCV) Based on 40-hour Drain Time
($V_{DESIGN} = (1.0 * (0.91 * i^3 - 1.19 * i^2 + 0.78 * i) / 12 * Area$)
V_{DESIGN} = 0.386 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)
$V_{DESIGN\ USER}$ = 0.386 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: October 12, 2017
Project: Lorson Ranch East PDR - Interim Pond E2 forebay design
Location:

5. Forebay

A) Minimum Forebay Volume (V_{FMIN} = 3% of the WQCV) — V_{FMIN} = 0.012 ac-ft

B) Actual Forebay Volume — V_F = 0.018 ac-ft

C) Forebay Depth (D_F = 18 inch maximum) — D_F = 30.0 in **DF > DF MAXIMUM**

D) Forebay Discharge

i) Undetained 100-year Peak Discharge — Q_{100} = 209.00 cfs

ii) Forebay Discharge Design Flow ($Q_F = 0.02 * Q_{100}$) — Q_F = 4.18 cfs

E) Forebay Discharge Design

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

(flow too small for berm w/ pipe)

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

G) Rectangular Notch Width — Calculated W_N = 9.8 in

6. Trickle Channel

A) Type of Trickle Channel

Choose One
- ◉ Concrete
- ○ Soft Bottom

F) Slope of Trickle Channel — S = 0.0050 ft / ft

7. Micropool and Outlet Structure

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

B) Surface Area of Micropool (10 ft^2 minimum) — A_M = 40 sq ft

C) Outlet Type

Choose One
- ◉ Orifice Plate
- ○ Other (Describe):

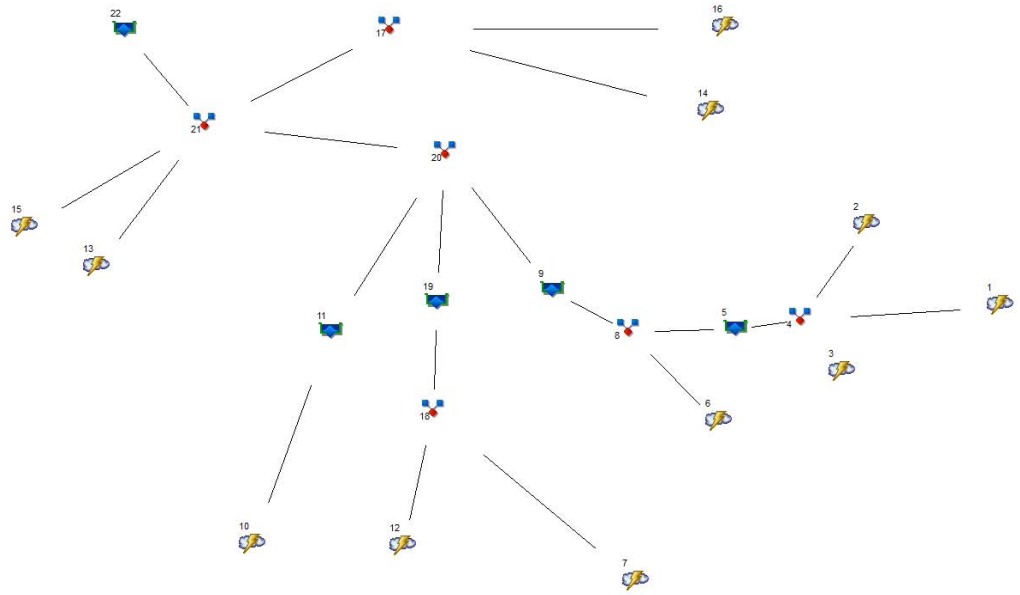
D) Smallest Dimension of Orifice Opening Based on Hydrograph Routing (Use UD-Detention) — $D_{orifice}$ = 2.00 inches

E) Total Outlet Area — A_{ot} = 9.60 square inches

Design Procedure Form: Extended Detention Basin (EDB)

Designer: Richard Schindler
Company: Core Engineering Group
Date: October 12, 2017
Project: Lorson Ranch East PDR - Interim Pond E2 forebay design
Location:

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} = 50.4 cu ft
C) Initial Surcharge Provided Above Micropool	V_s = 13.3 cu ft
9. Trash Rack	
A) Water Quality Screen Open Area: $A_t = A_{ot} * 38.5*(e^{-0.095D})$	A_t = 306 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.)	*Aluminum Amico-Klemp SR Series with Cross Rods 2" O.C.*
Other (Y/N): N	
C) Ratio of Total Open Area to Total Area (only for type 'Other')	User Ratio =
D) Total Water Quality Screen Area (based on screen type)	A_{total} = 430 sq. in.
E) Depth of Design Volume (EURV or WQCV) (Based on design concept chosen under 1E)	H= 1 feet
F) Height of Water Quality Screen (H_{TR})	H_{TR}= 40 inches
G) Width of Water Quality Screen Opening ($W_{opening}$) (Minimum of 12 inches is recommended)	$W_{opening}$ = 12.0 inches



Legend

Hyd.	Origin	Description
1	Rational	C8
2	Rational	Basins OS-C9 & C10
3	Rational	Basin C8a
4	Combine	Inflow Interim Pond C3
5	Reservoir	interimPond C3 outflow
6	Rational	Basins C5 & C7
7	Rational	Basin C3 & C4
8	Combine	Inflow Interim Pond C2.2
9	Reservoir	interPond C2.2 outflow
10	Rational	Basins C1 & C2
11	Reservoir	interimPond C1 outflow
12	Rational	Basin C6
13	Rational	Basin C14+C15
14	Rational	Basin C13
15	Rational	C17
16	Rational	Basins C16 & C12
17	Combine	Des.Pt.6c to Pond C5
18	Combine	inflow interim Pond C2.3
19	Reservoir	interim Pond C2.3 flow
20	Combine	Des. Pt 3f
21	Combine	Inflow Pond C5
22	Reservoir	Pond C5 outflow

Hydrograph Summary Report-Interim Pond Analysis

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	43.59	1	19	49,695	----	------	------	C8
2	Rational	11.92	1	15	10,730	----	------	------	Basins OS-C9 & C10
3	Rational	8.493	1	12	6,115	----	------	------	Basin C8a
4	Combine	55.87	1	19	66,540	1, 2, 3	------	------	Inflow Interim Pond C3
5	Reservoir	12.86	1	32	66,480	4	5759.72	52,312	Pond C3 outflow
6	Rational	19.97	1	25	29,954	----	------	------	Basins C5 & C7
7	Rational	33.95	1	25	50,922	----	------	------	Basin C3 & C4
8	Combine	31.68	1	25	96,434	5, 6,	------	------	Inflow Pond C2.2
9	Reservoir	16.95	1	43	96,431	8	5747.12	22,077	Pond C2.2 outflow
10	Rational	28.81	1	25	43,208	----	------	------	Basins C1 & C2- Pond C1 inflow
11	Reservoir	3.971	1	47	42,251	10	5746.96	38,377	Pond C1 outflow
12	Rational	12.66	1	14	10,633	----	------	------	Basin C6
13	Rational	65.81	1	23	90,814	----	------	------	Basin C14+C15
14	Rational	6.881	1	30	12,386	----	------	------	Basin C13
15	Rational	46.96	1	16	45,084	----	------	------	C17
16	Rational	79.61	1	31	148,075	----	------	------	Basins C16 & C12
17	Combine	86.26	1	31	160,462	14, 16	------	------	Des.Pt.6c to Pond C5
18	Combine	36.66	1	25	61,555	7, 12,	------	------	inflow interim Pond C2.3
19	Reservoir	16.39	1	38	61,539	18	5748.04	35,404	Pond C2.3 outflow
20	Combine	37.00	1	41	200,222	9, 11, 19	------	------	Des. Pt 3f
21	Combine	181.75	1	23	496,582	13, 15, 17, 20	------	------	Inflow Pond C5
22	Reservoir	151.19	1	33	484,171	21	5713.57	579,716	Pond C5 outflow

Hydrograph Summary Report Interim Pond Analysis

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	205.11	1	19	233,826	----	------	------	C8
2	Rational	55.89	1	15	50,299	----	------	------	Basins OS-C9 & C10
3	Rational	39.48	1	12	28,425	----	------	------	Basin C8a
4	Combine	246.10	1	19	284,126	1, 2,	------	------	Inflow Interim Pond C3
5	Reservoir	31.56	1	35	284,051	4	5763.35	241,540	interimPond C3 outflow
6	Rational	93.55	1	25	140,331	----	------	------	Basins C5 & C7
7	Rational	159.04	1	25	238,562	----	------	------	Basin C3 & C4
8	Combine	122.78	1	25	424,382	5, 6,	------	------	Inflow Interim Pond C2.2
9	Reservoir	44.38	1	46	424,377	8	5750.07	126,021	interPond C2.2 outflow
10	Rational	134.95	1	25	202,427	----	------	------	Basins C1 & C2
11	Reservoir	8.853	1	48	201,168	10	5749.46	185,680	interimPond C1 outflow
12	Rational	59.21	1	14	49,738	----	------	------	Basin C6
13	Rational	163.99	1	23	226,299	----	------	------	Basin C14+C15
14	Rational	40.73	1	30	73,322	----	------	------	Basin C13
15	Rational	108.00	1	16	103,681	----	------	------	C17
16	Rational	195.70	1	31	363,995	----	------	------	Basins C16 & C12
17	Combine	235.07	1	31	437,317	14, 16	------	------	Des.Pt.6c to Pond C5
18	Combine	171.73	1	25	288,300	7, 12,	------	------	inflow interim Pond C2.3
19	Reservoir	57.07	1	41	288,284	18	5753.08	189,006	interim Pond C2.3 flow
20	Combine	109.93	1	44	913,831	9, 11, 19	------	------	Des. Pt 3f
21	Combine	481.25	1	23	1,681,127	13, 15, 17, 20	------	------	Inflow Pond C5
22	Reservoir	425.63	1	32	1,583,382	21	5714.33	679,973	Pond C5 outflow

Interim Pond Report

Hydraflow Hydrographs by Intelisolve | Wednesday, Oct 11 2017, 9:1 AM

Pond No. 4 - Pond C1

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	5746.00	26,303	0	0
1.00	5747.00	53,900	40,102	40,102
2.00	5748.00	57,925	55,913	96,014
3.00	5749.00	62,019	59,972	155,986
4.00	5750.00	66,200	64,110	220,096
5.00	5751.00	70,500	68,350	288,446
6.00	5752.00	74,920	72,710	361,156
7.00	5753.00	78,760	76,840	437,996
8.00	5754.00	80,000	79,380	517,376
9.00	5755.00	82,000	81,000	598,376
10.00	5756.00	85,000	83,500	681,876

Culvert / Orifice Structures

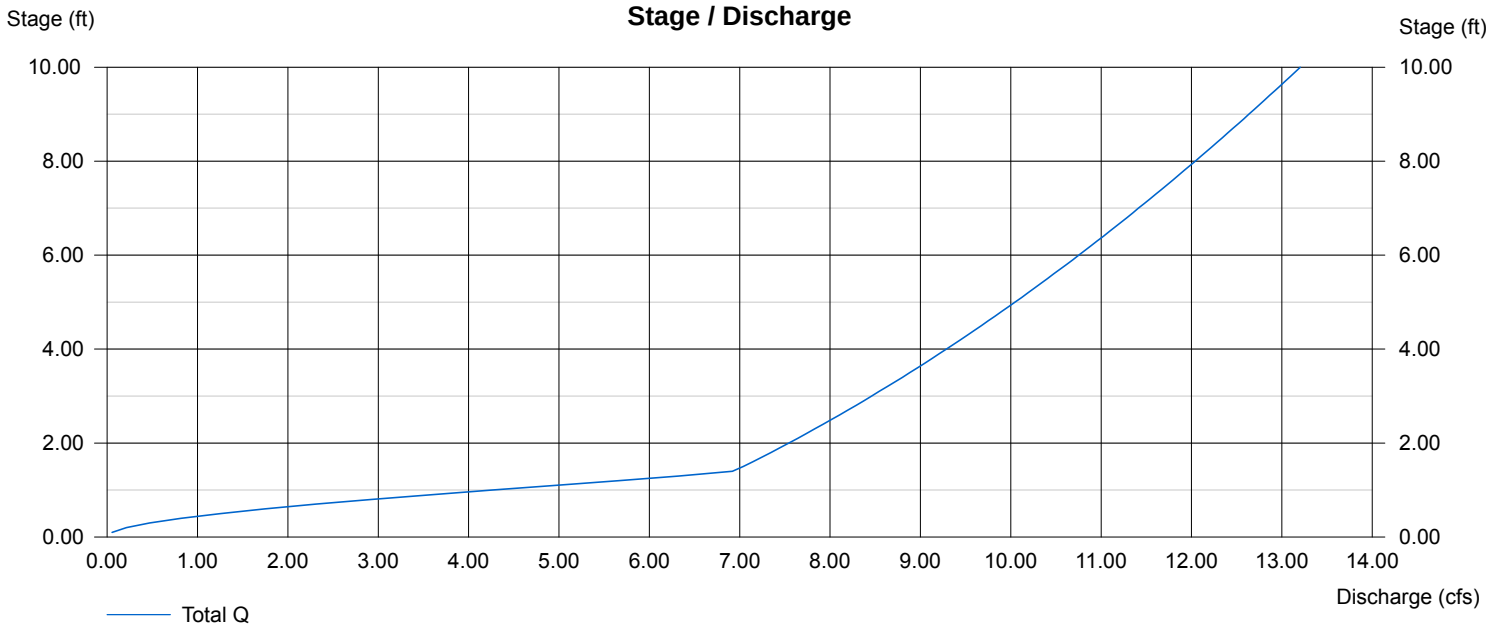
	[A]	[B]	[C]	[D]
Rise (in)	= 18.00	0.00	0.00	0.00
Span (in)	= 18.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 5746.00	0.00	0.00	0.00
Length (ft)	= 675.00	0.00	0.00	0.00
Slope (%)	= 0.50	0.00	0.00	0.00
N-Value	= .013	.013	.000	.000
Orif. Coeff.	= 0.60	0.60	0.00	0.00
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 0.00	0.00	0.00	0.00
Crest El. (ft)	= 0.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	0.00	0.00
Weir Type	= ---	---	---	---
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.



Interim Pond Report

Pond No. 3 - Pond C2.2

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	5745.00	10	0	0
1.00	5746.00	2,363	1,187	1,187
2.00	5747.00	31,533	16,948	18,135
3.00	5748.00	33,850	32,692	50,826
4.00	5749.00	36,237	35,044	85,870
5.00	5750.00	38,701	37,469	123,339
6.00	5751.00	41,268	39,985	163,323
7.00	5752.00	44,081	42,675	205,998
8.00	5753.00	47,000	45,541	251,538
9.00	5754.00	50,000	48,500	300,038
10.00	5755.00	53,000	51,500	351,538
11.00	5756.00	56,000	54,500	406,038

Culvert / Orifice Structures

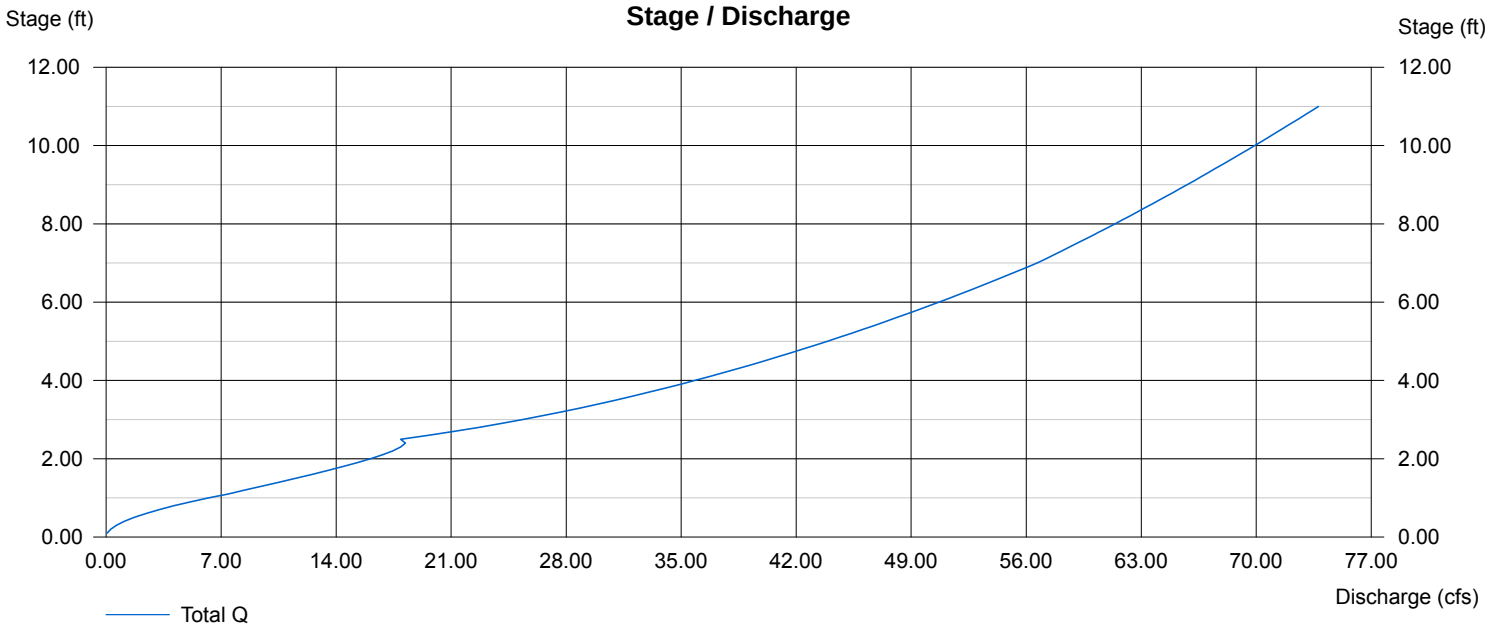
	[A]	[B]	[C]	[D]
Rise (in)	= 30.00	0.00	0.00	0.00
Span (in)	= 30.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 5745.00	0.00	0.00	0.00
Length (ft)	= 100.00	0.00	0.00	0.00
Slope (%)	= 0.50	0.00	0.00	0.00
N-Value	= .013	.013	.000	.000
Orif. Coeff.	= 0.60	0.60	0.00	0.00
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 0.00	0.00	0.00	0.00
Crest El. (ft)	= 0.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	0.00	0.00
Weir Type	= ---	---	---	---
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.



Interim Pond Report

Hydraflow Hydrographs by Intelisolve | Wednesday, Oct 11 2017, 9:1 AM

Pond No. 6 - Pond C2.3

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	5746.00	100	0	0
1.00	5747.00	22,141	11,121	11,121
2.00	5748.00	24,321	23,231	34,352
3.00	5749.00	26,601	25,461	59,813
4.00	5750.00	28,983	27,792	87,605
5.00	5751.00	31,466	30,225	117,829
6.00	5752.00	34,050	32,758	150,587
7.00	5753.00	36,742	35,396	185,983
8.00	5754.00	38,000	37,371	223,354

Culvert / Orifice Structures

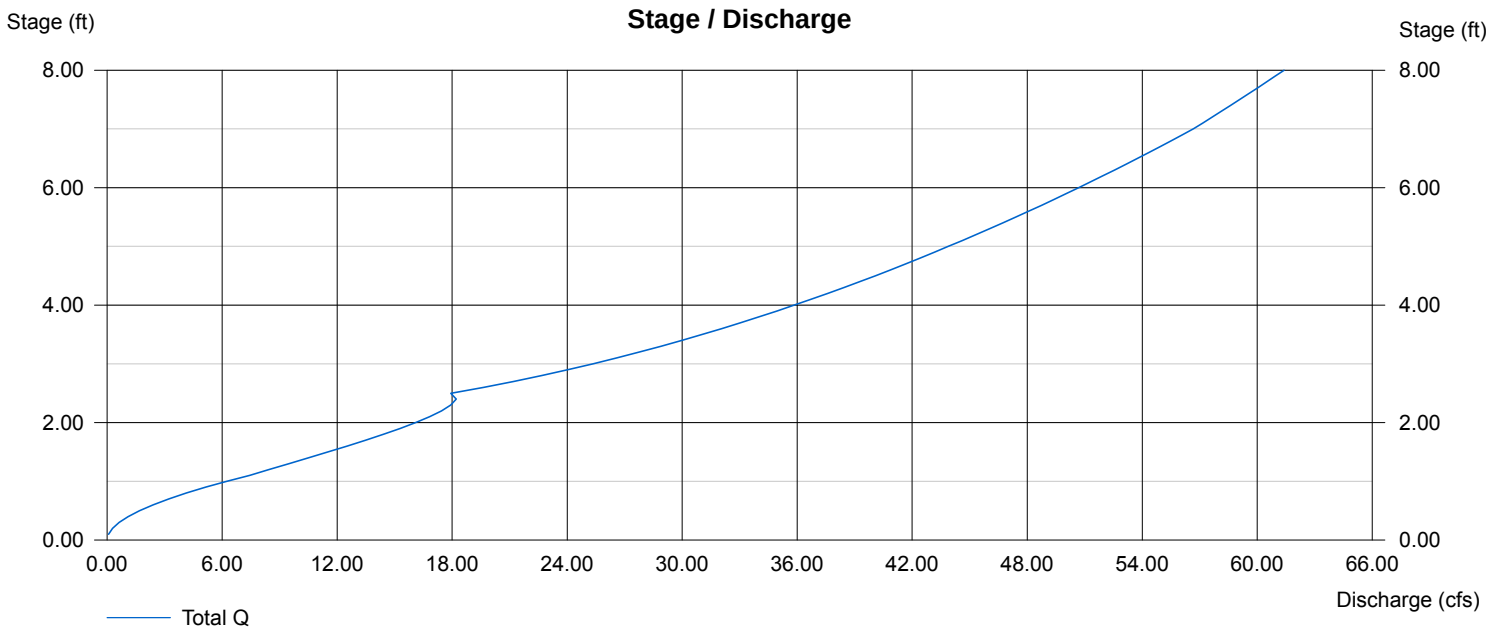
	[A]	[B]	[C]	[D]
Rise (in)	= 30.00	0.00	0.00	0.00
Span (in)	= 30.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 5746.00	0.00	0.00	0.00
Length (ft)	= 100.00	0.00	0.00	0.00
Slope (%)	= 0.50	0.00	0.00	0.00
N-Value	= .013	.000	.000	.000
Orif. Coeff.	= 0.60	0.00	0.00	0.00
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 0.00	0.00	0.00	0.00
Crest El. (ft)	= 0.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	0.00	0.00
Weir Type	= ---	---	---	---
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.



Interim Pond Report

Hydraflow Hydrographs by Intelisolve | Wednesday, Oct 11 2017, 9:1 AM

Pond No. 2 - Pond C3

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	5758.00	13,580	0	0
1.00	5759.00	33,254	23,417	23,417
2.00	5760.00	46,803	40,029	63,446
3.00	5761.00	50,425	48,614	112,060
4.00	5762.00	54,123	52,274	164,334
5.00	5763.00	57,909	56,016	220,350
6.00	5764.00	61,796	59,853	280,202
7.00	5765.00	70,319	66,058	346,260
8.00	5766.00	74,258	72,289	418,548
9.00	5767.00	78,270	76,264	494,812
10.00	5768.00	82,343	80,307	575,119

Culvert / Orifice Structures

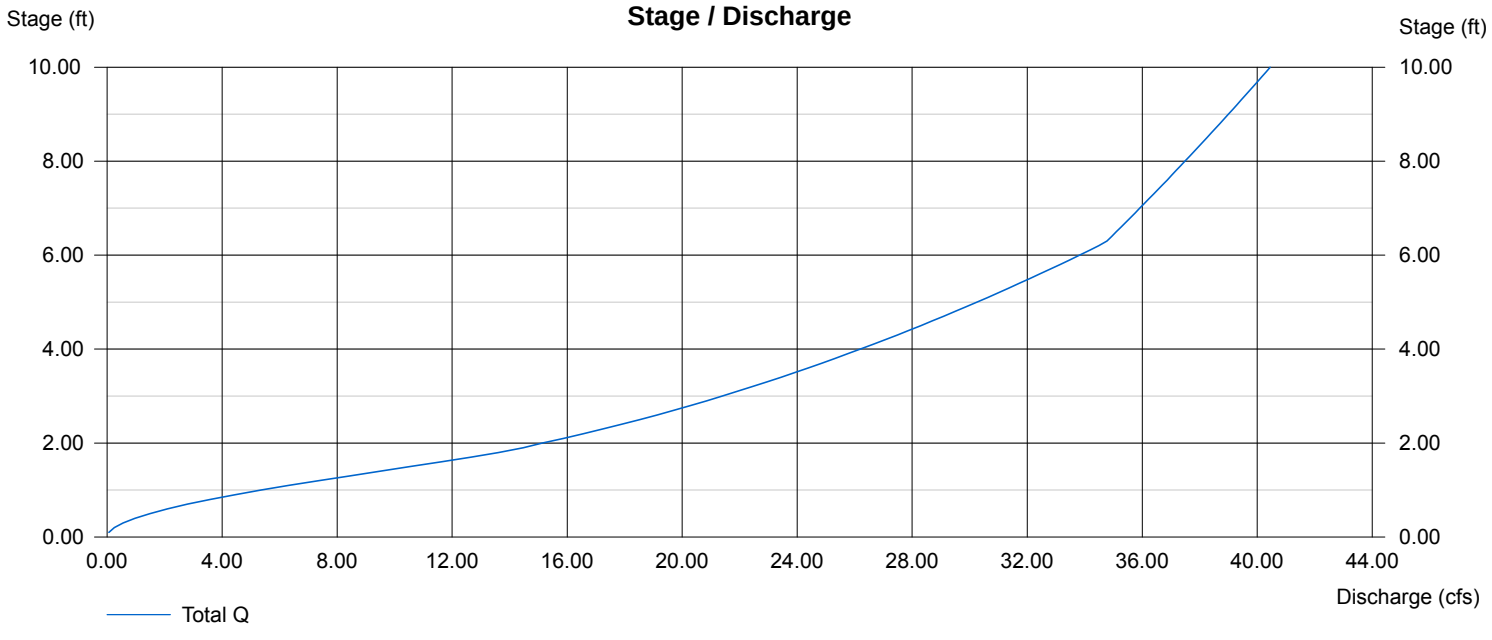
	[A]	[B]	[C]	[D]
Rise (in)	= 24.00	0.00	0.00	0.00
Span (in)	= 24.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 5758.00	0.00	0.00	0.00
Length (ft)	= 325.00	0.00	0.00	0.00
Slope (%)	= 1.90	0.00	0.00	0.00
N-Value	= .013	.013	.000	.000
Orif. Coeff.	= 0.60	0.60	0.00	0.00
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 0.00	0.00	0.00	0.00
Crest El. (ft)	= 0.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	0.00	0.00
Weir Type	= ---	---	---	---
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.



Interim Pond Report

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

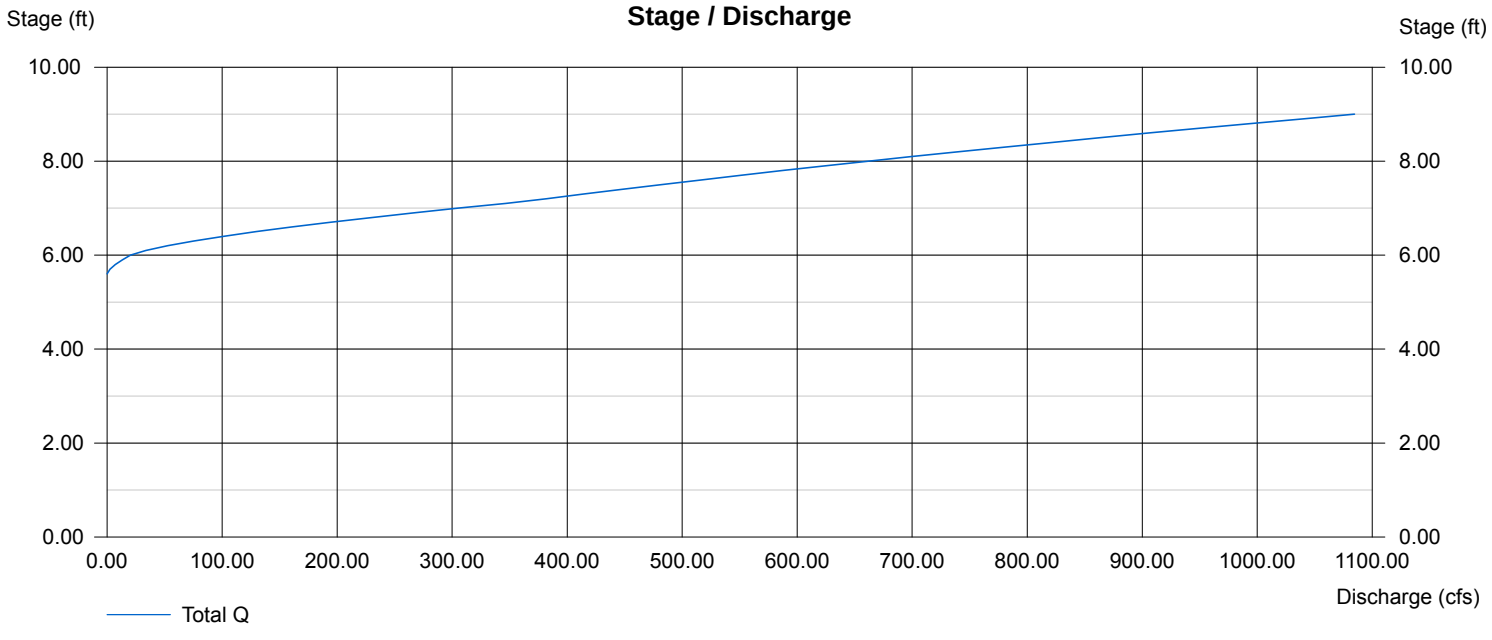
	[A]	[B]	[C]	[D]
Rise (in)	= 48.00	0.00	0.00	0.00
Span (in)	= 48.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 5704.50	0.00	0.00	0.00
Length (ft)	= 120.00	0.00	0.00	0.00
Slope (%)	= 0.50	0.00	0.00	0.00
N-Value	= .013	.013	.000	.000
Orif. Coeff.	= 0.60	0.60	0.00	0.00
Multi-Stage	= n/a	No	No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

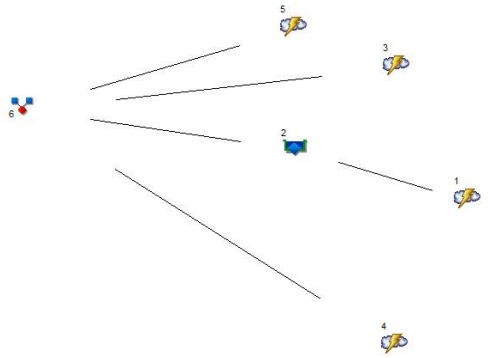
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 24.00	52.00	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.





Legend

Hyd.	Origin	Description
1	Rational	Pond E1 Inflow
2	Reservoir	Pond E1 Outflow
3	Rational	Basin E2-ex
4	Rational	Basin E3-ex
5	Rational	Basin E-developed
6	Combine	Interim Flow Des.Pt.73

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	25.50	1	22	33,653	----	------	------	Pond E1 Inflow
2	Reservoir	8.581	1	37	33,631	1	5730.32	23,285	Pond E1 Outflow
3	Rational	29.34	1	19	33,450	----	------	------	Basin E2-ex
4	Rational	62.18	1	22	82,079	----	------	------	Basin E3-ex
5	Rational	29.98	1	20	35,973	----	------	------	Basin E-developed
6	Combine	119.50	1	22	185,132	2, 3, 4, 5	------	------	Interim Flow Des.Pt.73

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	142.36	1	15	128,125	----	------	------	Pond E1 Inflow
2	Reservoir	19.62	1	28	128,103	1	5732.89	106,828	Pond E1 Outflow
3	Rational	92.88	1	18	100,308	----	------	------	Basin E2-ex
4	Rational	165.36	1	30	297,648	----	------	------	Basin E3-ex
5	Rational	68.92	1	22	90,979	----	------	------	Basin E-developed
6	Combine	281.30	1	22	617,036	2, 3, 4, 5	------	------	Interim Flow Des.Pt.73

Interim Pond Report

Hydraflow Hydrographs by Intelisolve | Tuesday, Oct 10 2017, 3:59 PM

Pond No. 3 - Pond E1

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	5729.00	2,550	0	0
1.00	5730.00	25,900	14,225	14,225
2.00	5731.00	31,341	28,621	42,846
3.00	5732.00	33,851	32,596	75,442
4.00	5733.00	36,442	35,147	110,588
5.00	5734.00	39,105	37,774	148,362
6.00	5735.00	41,838	40,472	188,833
7.00	5736.00	44,644	43,241	232,074
8.00	5737.00	47,527	46,086	278,160
9.00	5738.00	50,487	49,007	327,167
10.00	5739.00	52,120	51,304	378,470
11.00	5740.00	55,072	53,596	432,066

Culvert / Orifice Structures

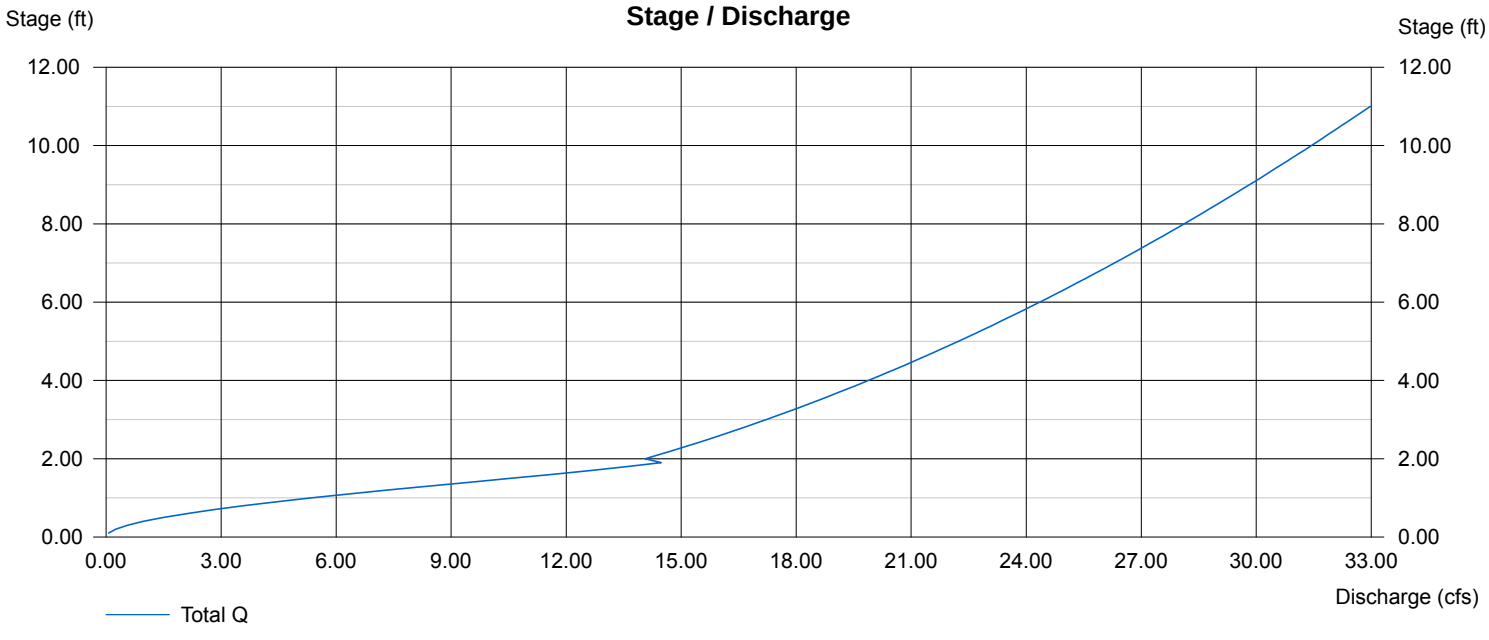
	[A]	[B]	[C]	[D]
Rise (in)	= 24.00	0.00	0.00	0.00
Span (in)	= 24.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 5729.00	0.00	0.00	0.00
Length (ft)	= 400.00	0.00	0.00	0.00
Slope (%)	= 0.50	0.00	0.00	0.00
N-Value	= .013	.013	.000	.000
Orif. Coeff.	= 0.60	0.60	0.00	0.00
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 0.00	0.00	0.00	0.00
Crest El. (ft)	= 0.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	0.00	0.00
Weir Type	= ---	---	---	---
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

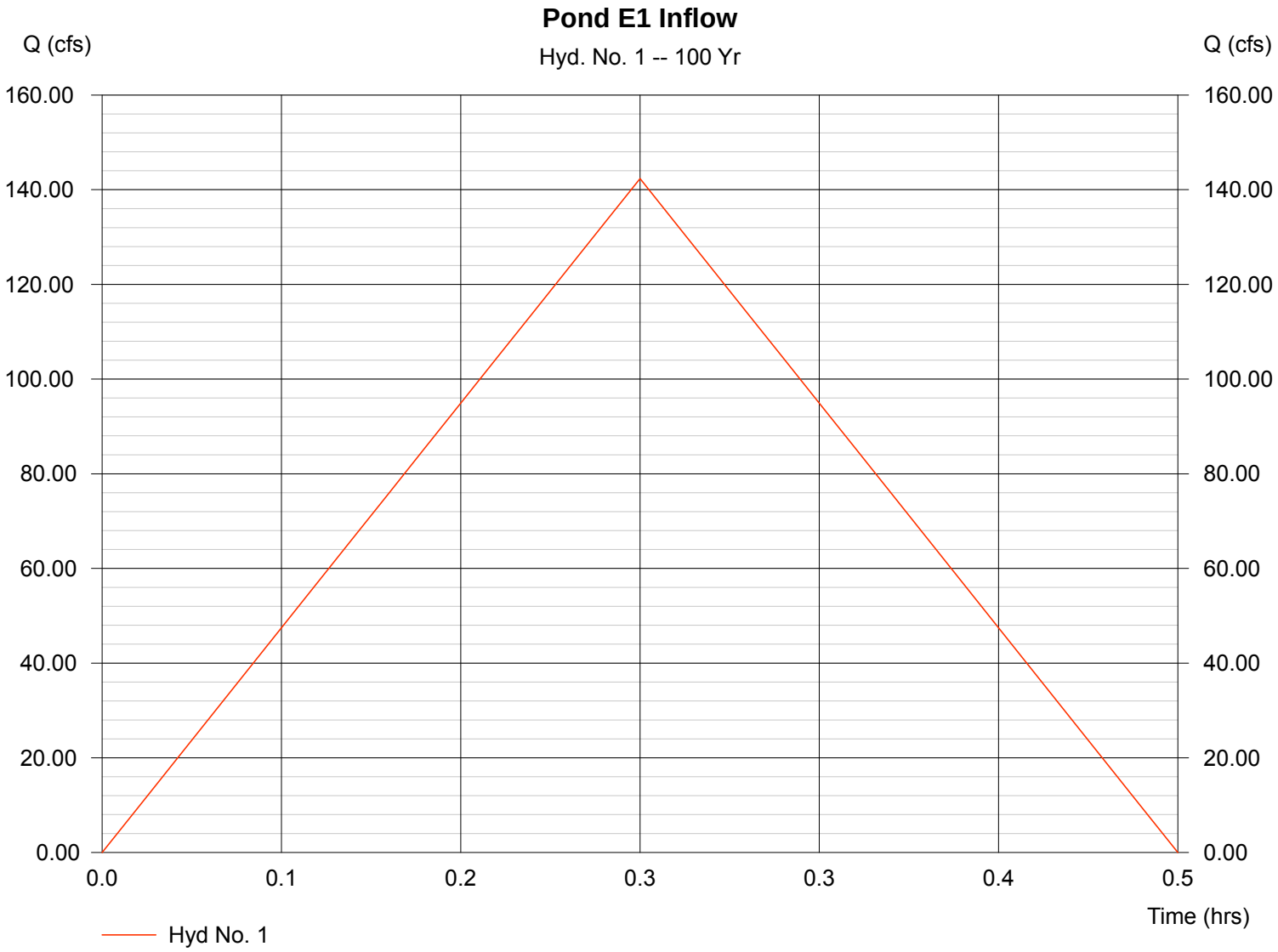
Hydraflow Hydrographs by Intelisolve | Tuesday, Oct 10 2017, 3:52 PM

Hyd. No. 1

Pond E1 Inflow

Hydrograph type	= Rational	Peak discharge	= 142.36 cfs
Storm frequency	= 100 yrs	Time interval	= 1 min
Drainage area	= 56.500 ac	Runoff coeff.	= 0.41
Intensity	= 6.146 in/hr	Tc by User	= 15.00 min
IDF Curve	= 2016-idf curves-rls.IDF	Asc/Rec limb fact	= 1/1

Hydrograph Volume = 128,125 cuft



Hydrograph Plot

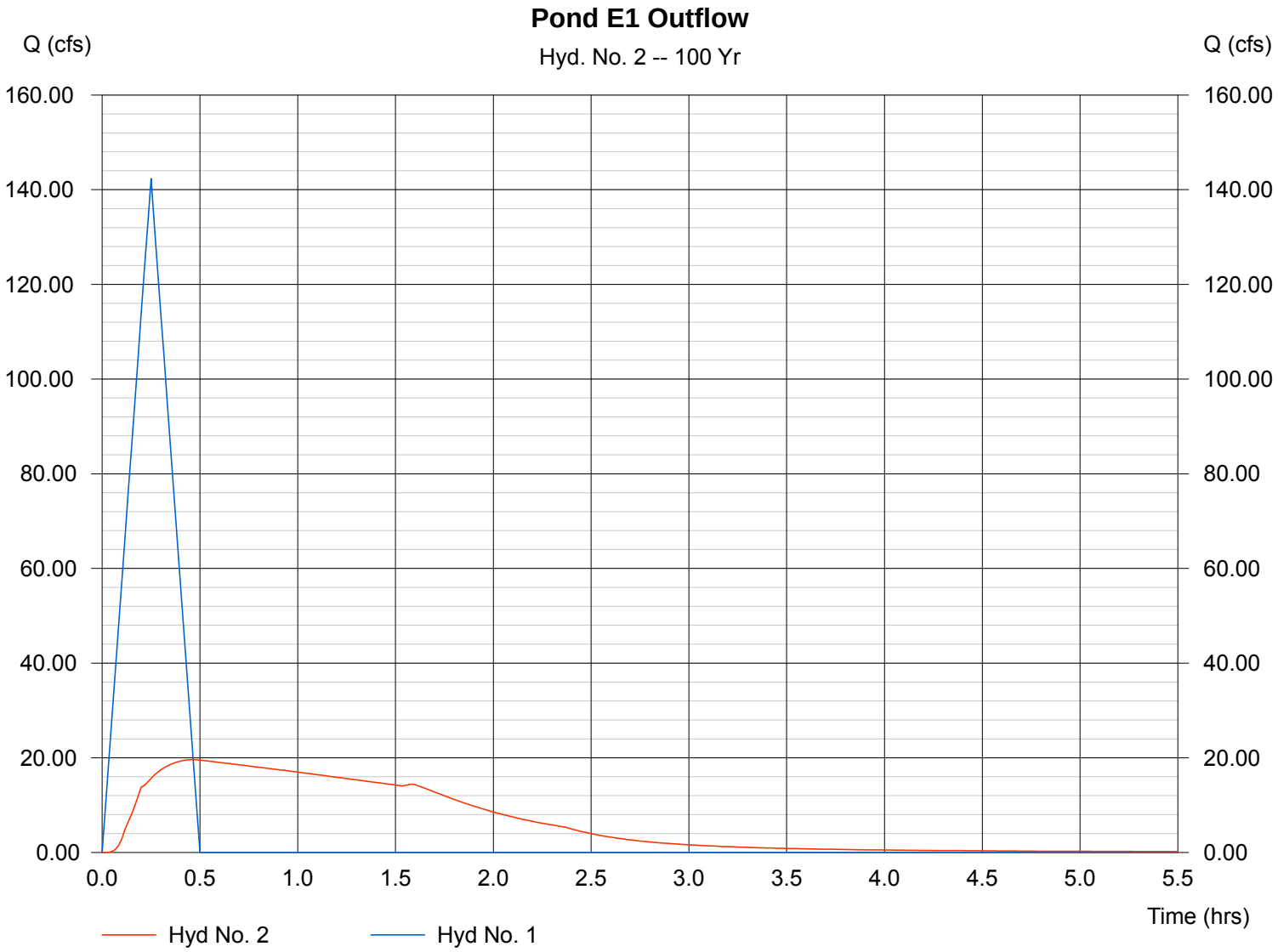
Hydraflow Hydrographs by Intelisolve | Tuesday, Oct 10 2017, 3:52 PM

Hyd. No. 2

Pond E1 Outflow

Hydrograph type	= Reservoir	Peak discharge	= 19.62 cfs
Storm frequency	= 100 yrs	Time interval	= 1 min
Inflow hyd. No.	= 1	Max. Elevation	= 5732.89 ft
Reservoir name	= Pond E1	Max. Storage	= 106,828 cuft

Storage Indication method used. | Hydrograph Volume = 128,103 cuft



Hydrograph Plot

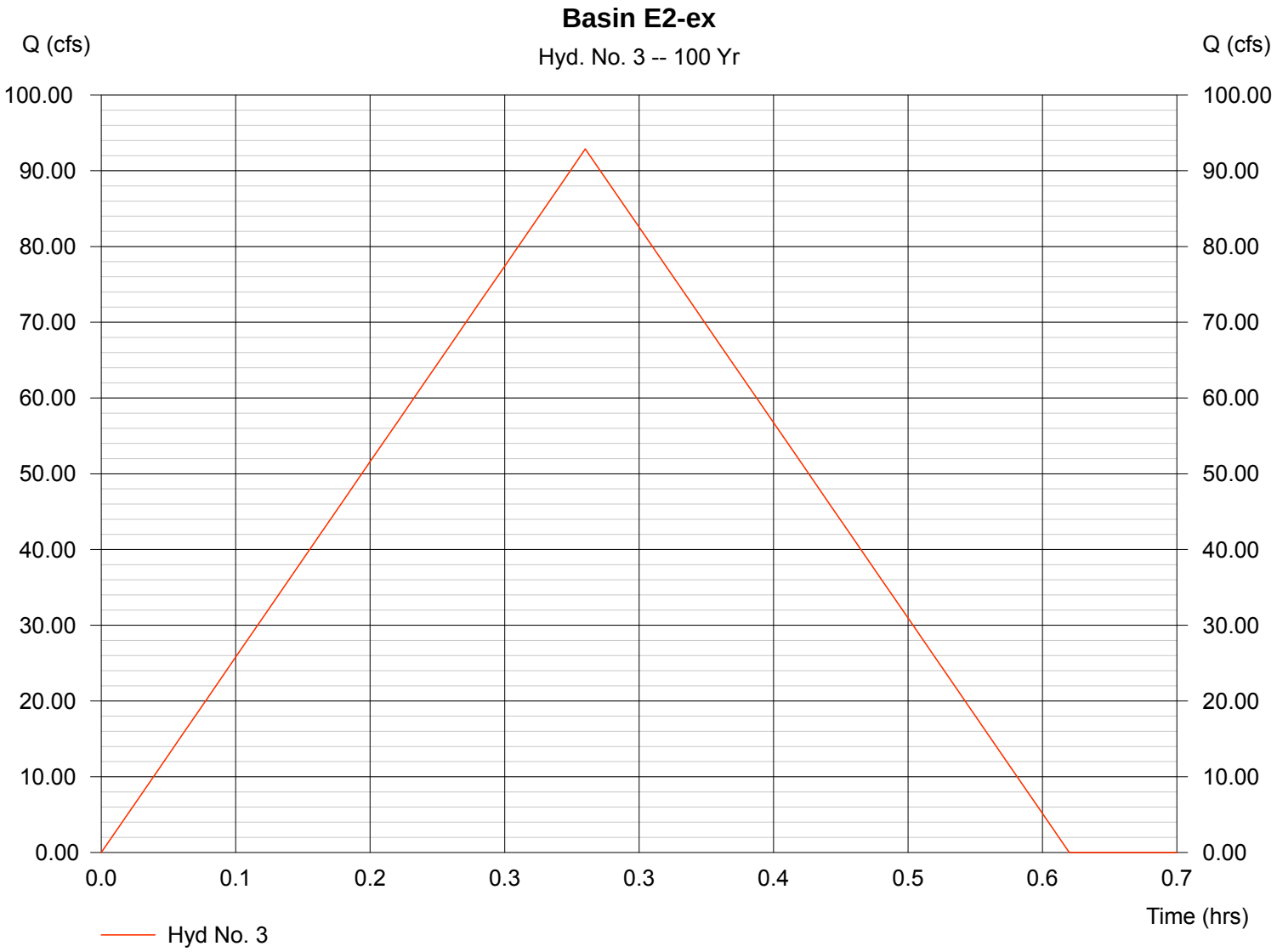
Hydraflow Hydrographs by Intelisolve | Tuesday, Oct 10 2017, 3:52 PM

Hyd. No. 3

Basin E2-ex

Hydrograph type	= Rational	Peak discharge	= 92.88 cfs
Storm frequency	= 100 yrs	Time interval	= 1 min
Drainage area	= 30.000 ac	Runoff coeff.	= 0.55
Intensity	= 5.629 in/hr	Tc by User	= 18.00 min
IDF Curve	= 2016-idf curves-rls.IDF	Asc/Rec limb fact	= 1/1

Hydrograph Volume = 100,308 cuft



Hydrograph Plot

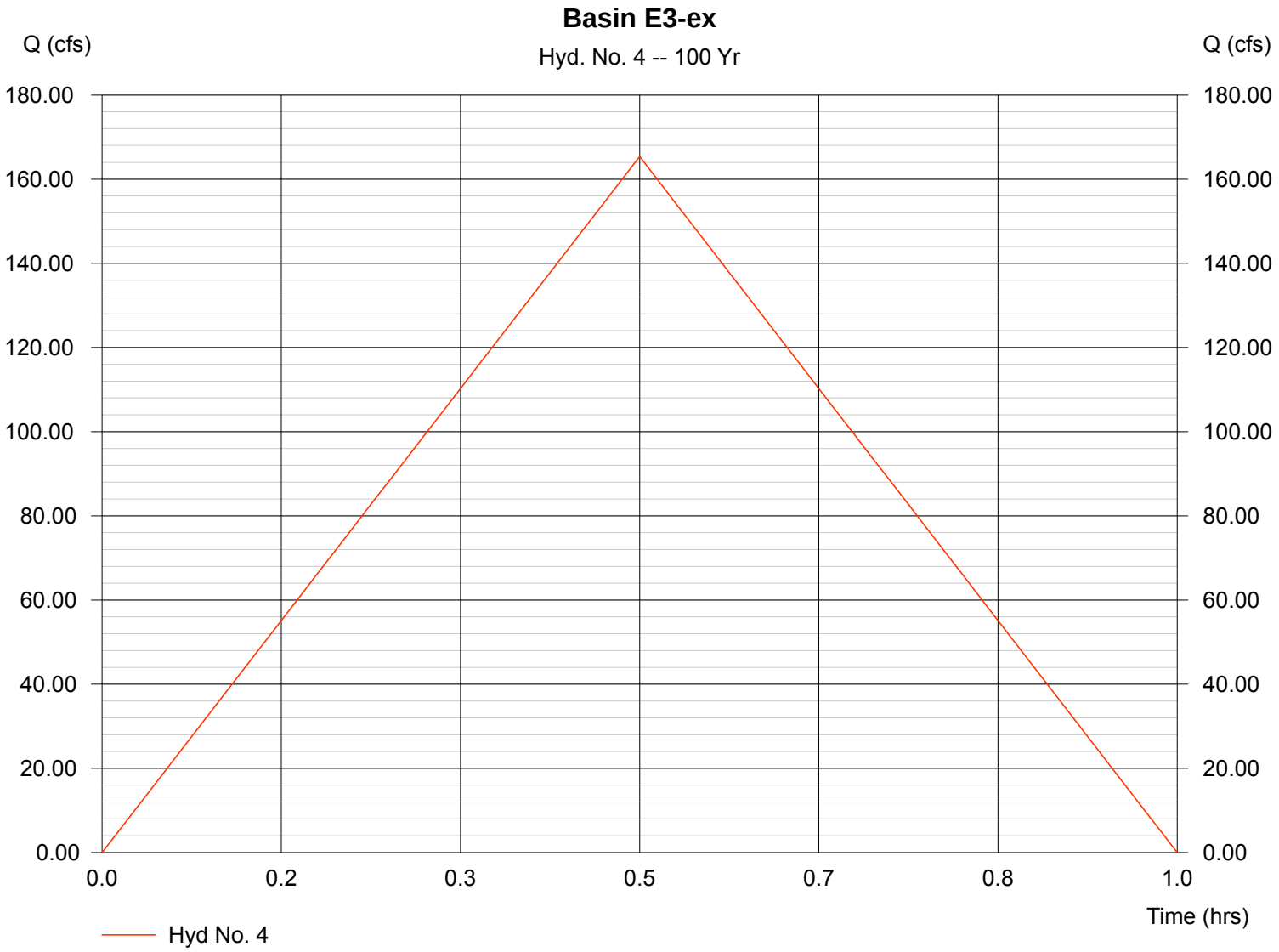
Hydraflow Hydrographs by Intelisolve | Tuesday, Oct 10 2017, 3:52 PM

Hyd. No. 4

Basin E3-ex

Hydrograph type	= Rational	Peak discharge	= 165.36 cfs
Storm frequency	= 100 yrs	Time interval	= 1 min
Drainage area	= 79.500 ac	Runoff coeff.	= 0.5
Intensity	= 4.160 in/hr	Tc by User	= 30.00 min
IDF Curve	= 2016-idf curves-rls.IDF	Asc/Rec limb fact	= 1/1

Hydrograph Volume = 297,648 cuft



Hydrograph Plot

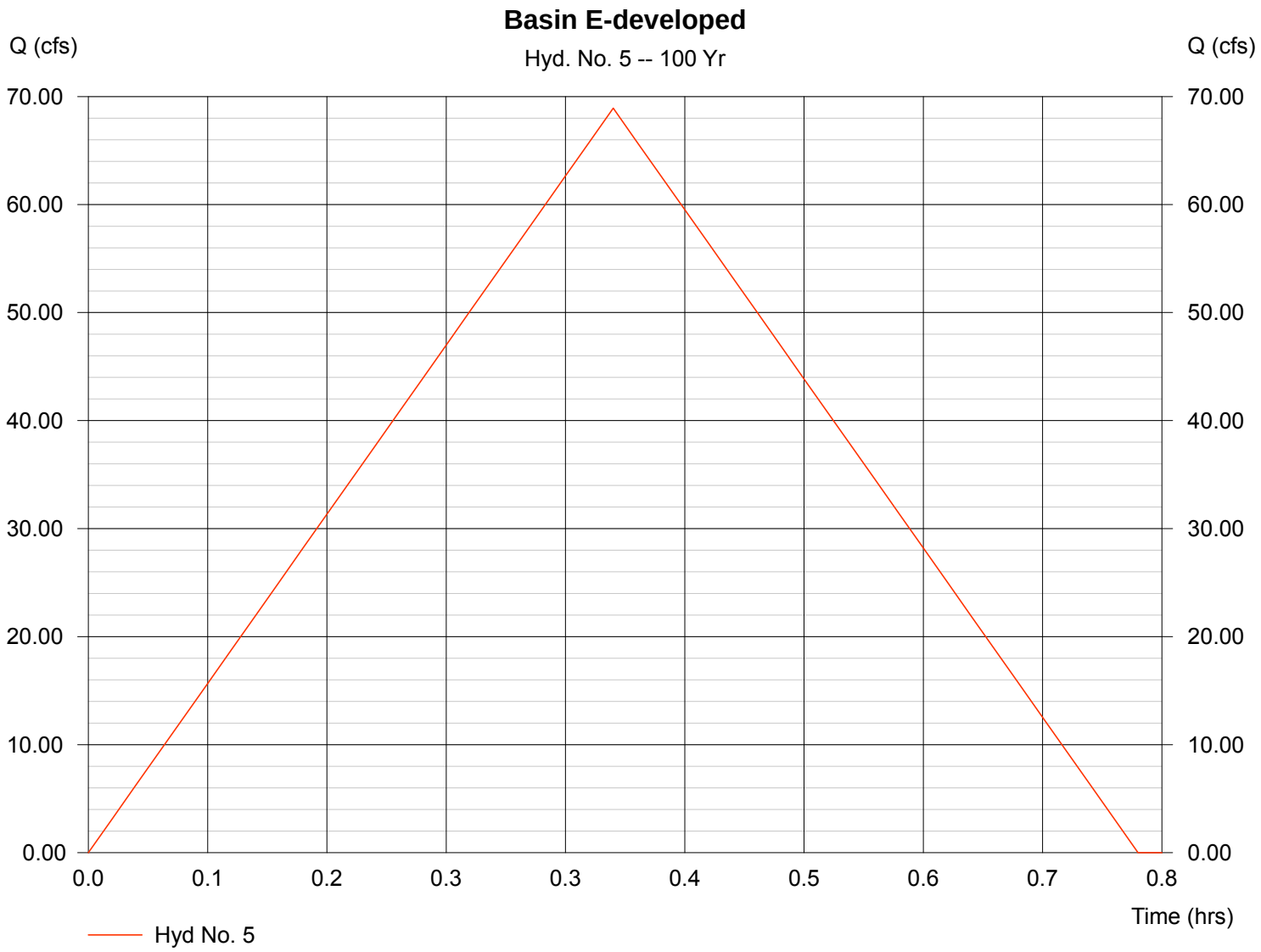
Hydraflow Hydrographs by Intelisolve | Tuesday, Oct 10 2017, 3:52 PM

Hyd. No. 5

Basin E-developed

Hydrograph type	= Rational	Peak discharge	= 68.92 cfs
Storm frequency	= 100 yrs	Time interval	= 1 min
Drainage area	= 21.000 ac	Runoff coeff.	= 0.65
Intensity	= 5.049 in/hr	Tc by User	= 22.00 min
IDF Curve	= 2016-idf curves-rls.IDF	Asc/Rec limb fact	= 1/1

Hydrograph Volume = 90,979 cuft



Hydrograph Plot

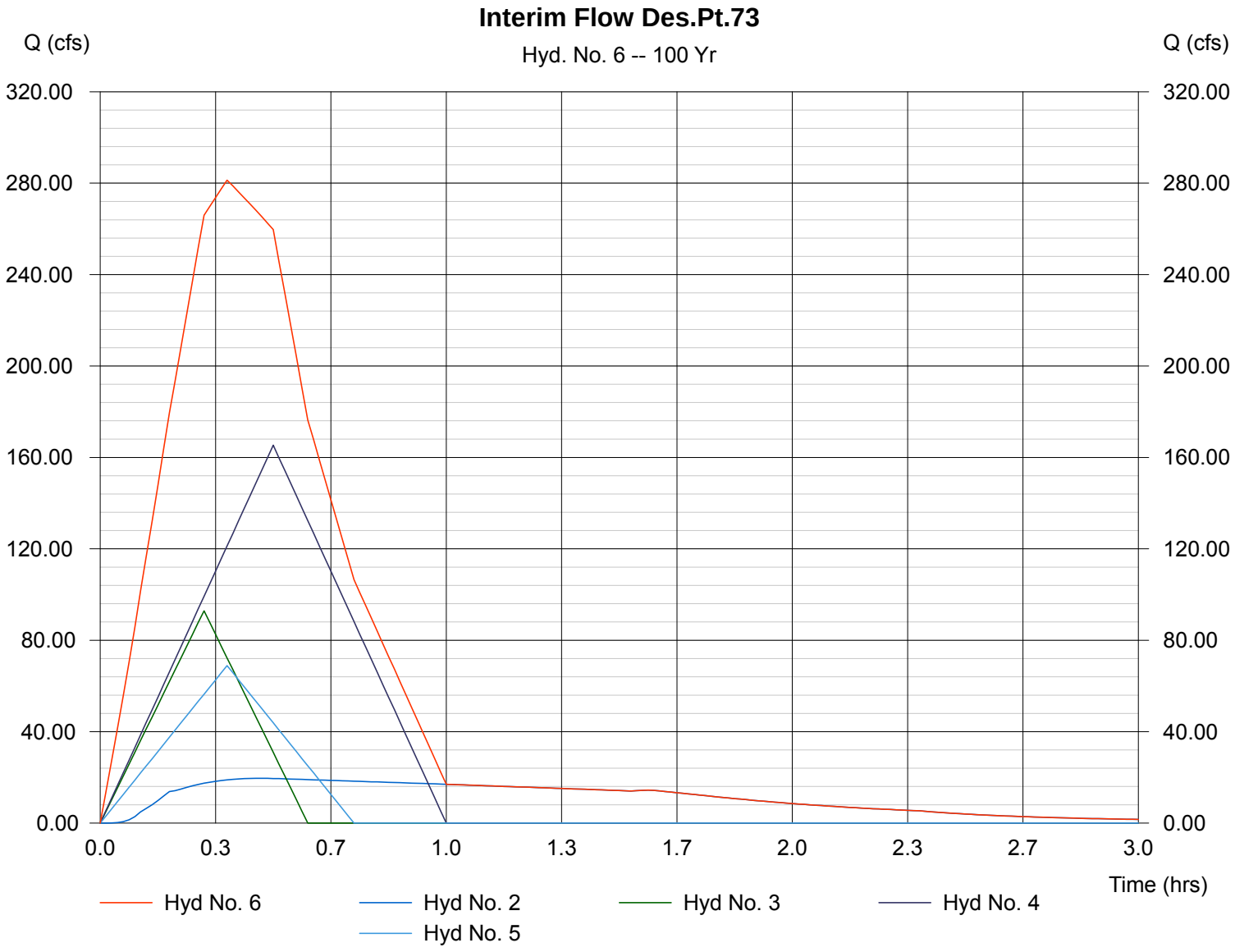
Hydraflow Hydrographs by Intelisolve | Tuesday, Oct 10 2017, 3:52 PM

Hyd. No. 6

Interim Flow Des.Pt.73

Hydrograph type	= Combine	Peak discharge	= 281.30 cfs
Storm frequency	= 100 yrs	Time interval	= 1 min
Inflow hyds.	= 2, 3, 4, 5		

Hydrograph Volume = 617,036 cuft



Hydrograph Plot

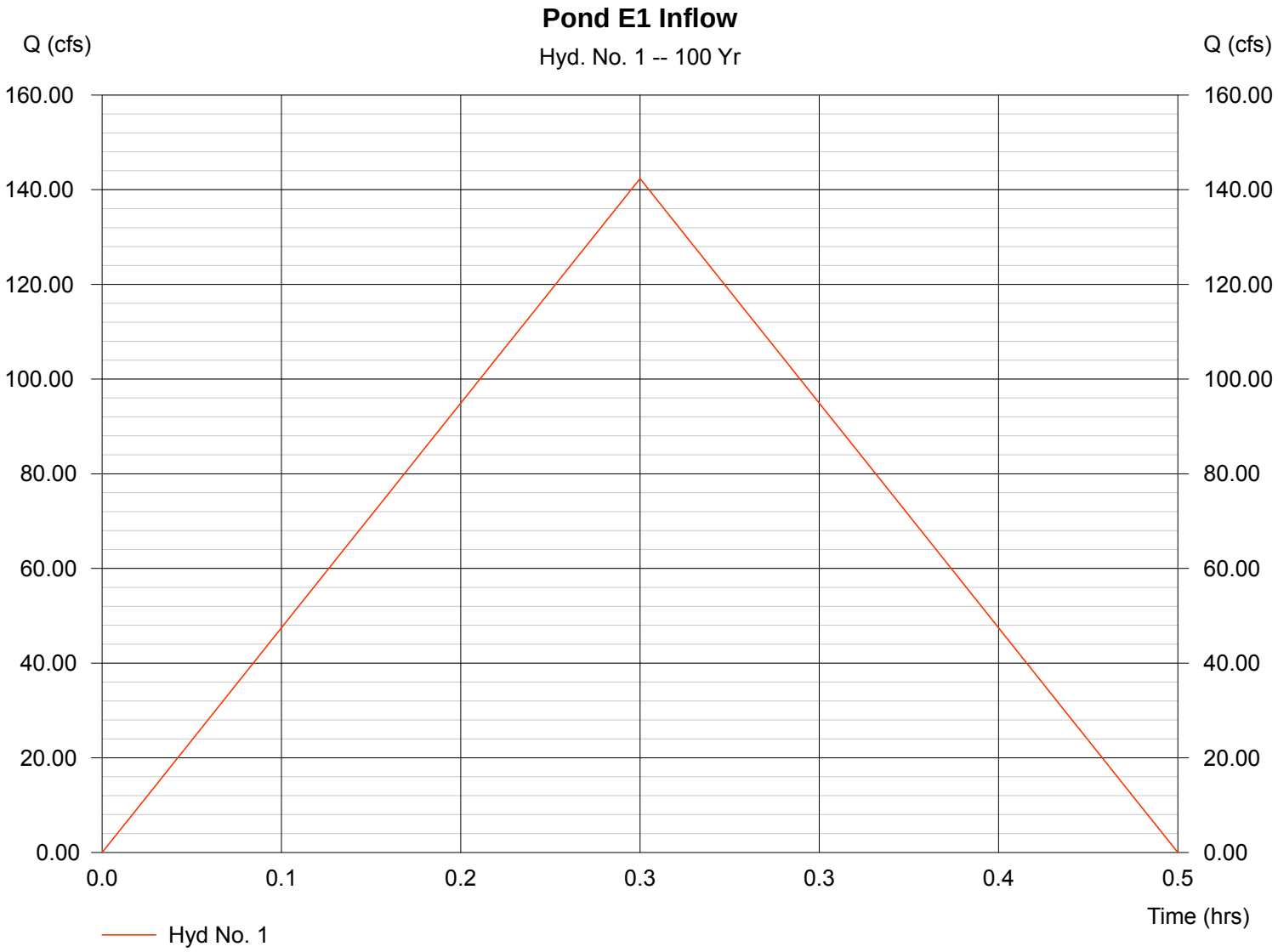
Hydraflow Hydrographs by Intelisolve | Tuesday, Oct 10 2017, 3:59 PM

Hyd. No. 1

Pond E1 Inflow

Hydrograph type	= Rational	Peak discharge	= 142.36 cfs
Storm frequency	= 100 yrs	Time interval	= 1 min
Drainage area	= 56.500 ac	Runoff coeff.	= 0.41
Intensity	= 6.146 in/hr	Tc by User	= 15.00 min
IDF Curve	= 2016-idf curves-rls.IDF	Asc/Rec limb fact	= 1/1

Hydrograph Volume = 128,125 cuft



Hydrograph Plot

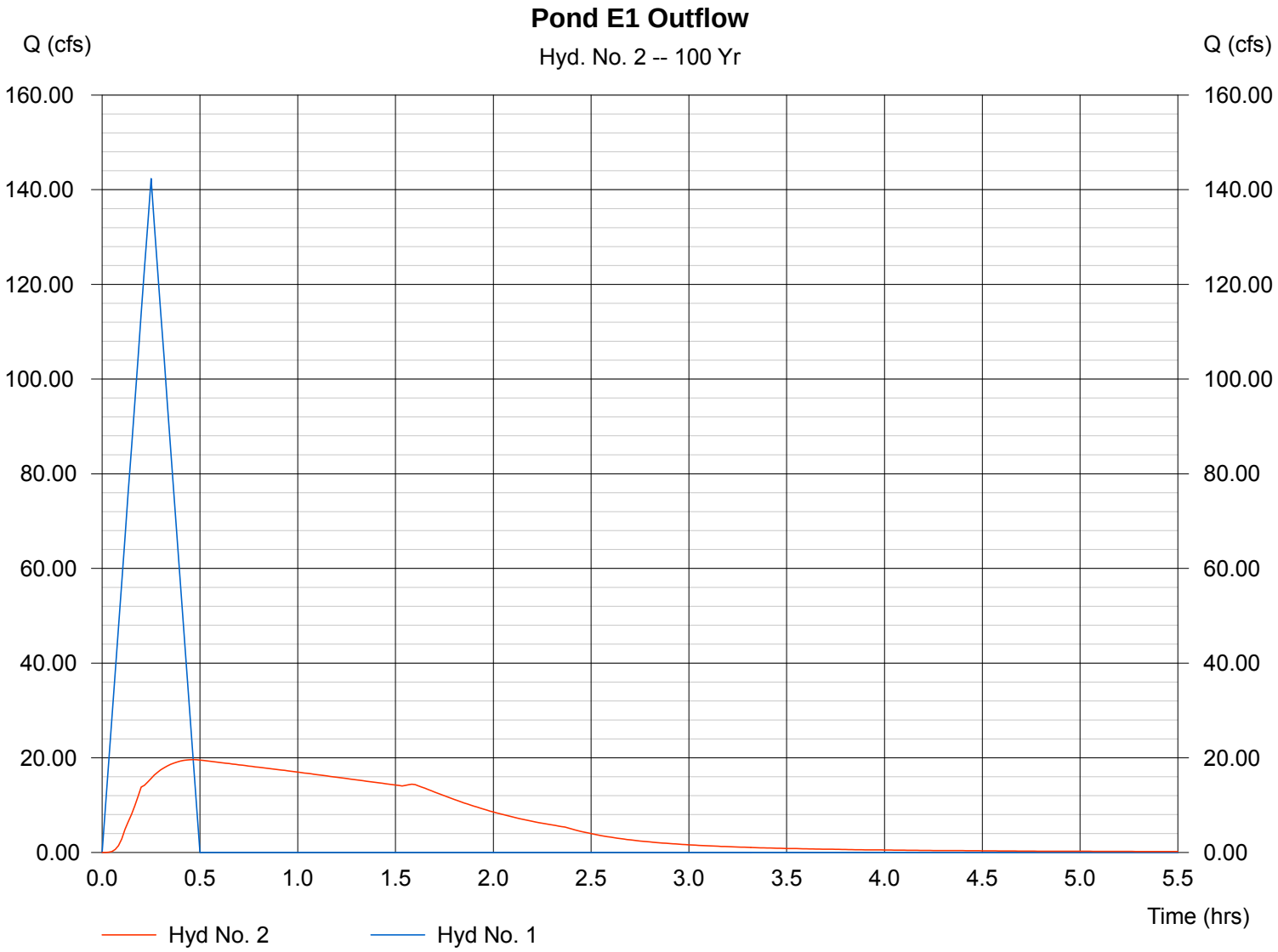
Hydraflow Hydrographs by Intelisolve | Tuesday, Oct 10 2017, 3:59 PM

Hyd. No. 2

Pond E1 Outflow

Hydrograph type	=	Reservoir	Peak discharge	=	19.62 cfs
Storm frequency	=	100 yrs	Time interval	=	1 min
Inflow hyd. No.	=	1	Max. Elevation	=	5732.89 ft
Reservoir name	=	Pond E1	Max. Storage	=	106,828 cuft

Storage Indication method used. | Hydrograph Volume = 128,103 cuft



Hydrograph Plot

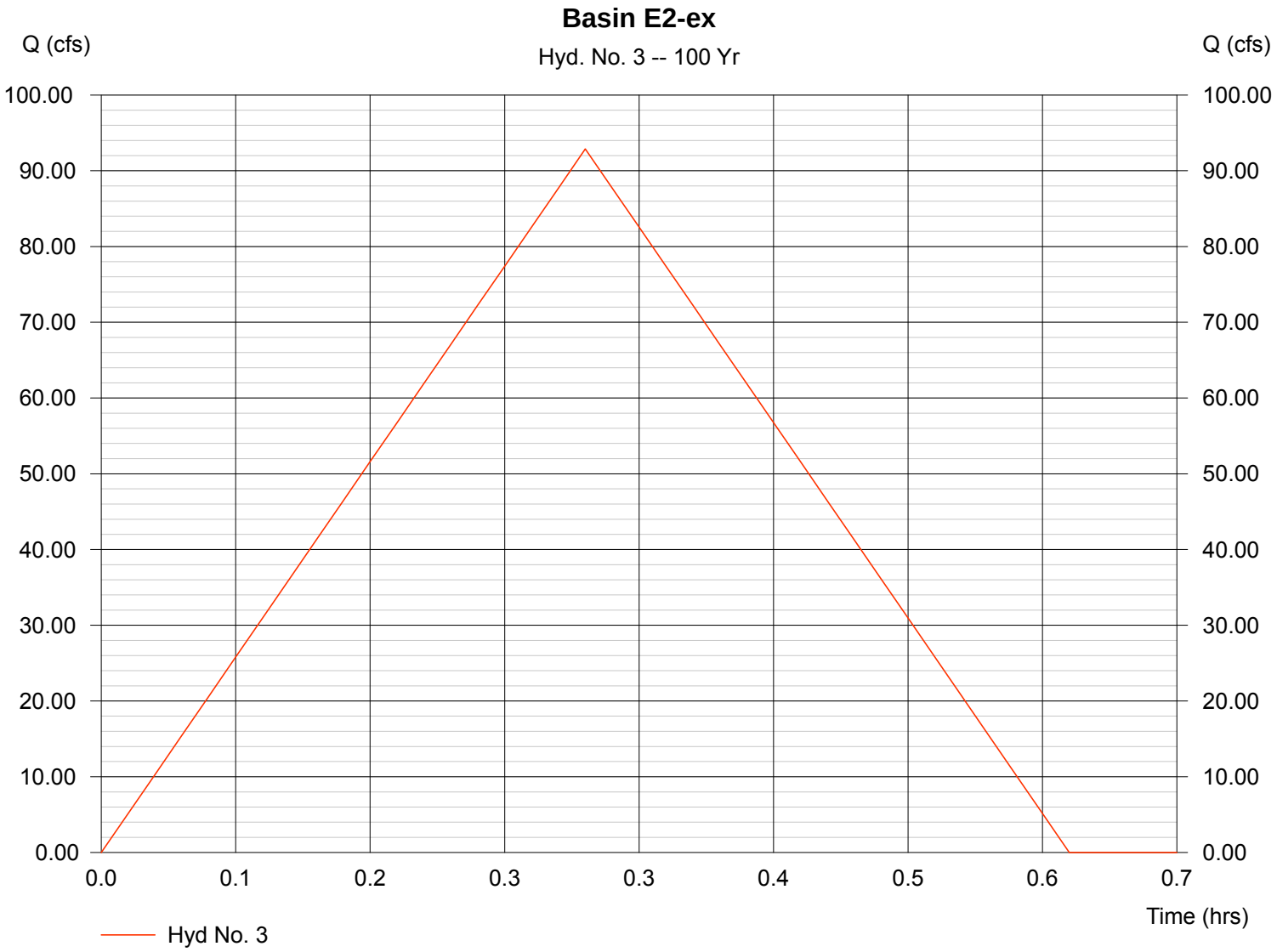
Hydraflow Hydrographs by Intelisolve | Tuesday, Oct 10 2017, 3:59 PM

Hyd. No. 3

Basin E2-ex

Hydrograph type	= Rational	Peak discharge	= 92.88 cfs
Storm frequency	= 100 yrs	Time interval	= 1 min
Drainage area	= 30.000 ac	Runoff coeff.	= 0.55
Intensity	= 5.629 in/hr	Tc by User	= 18.00 min
IDF Curve	= 2016-idf curves-rls.IDF	Asc/Rec limb fact	= 1/1

Hydrograph Volume = 100,308 cuft



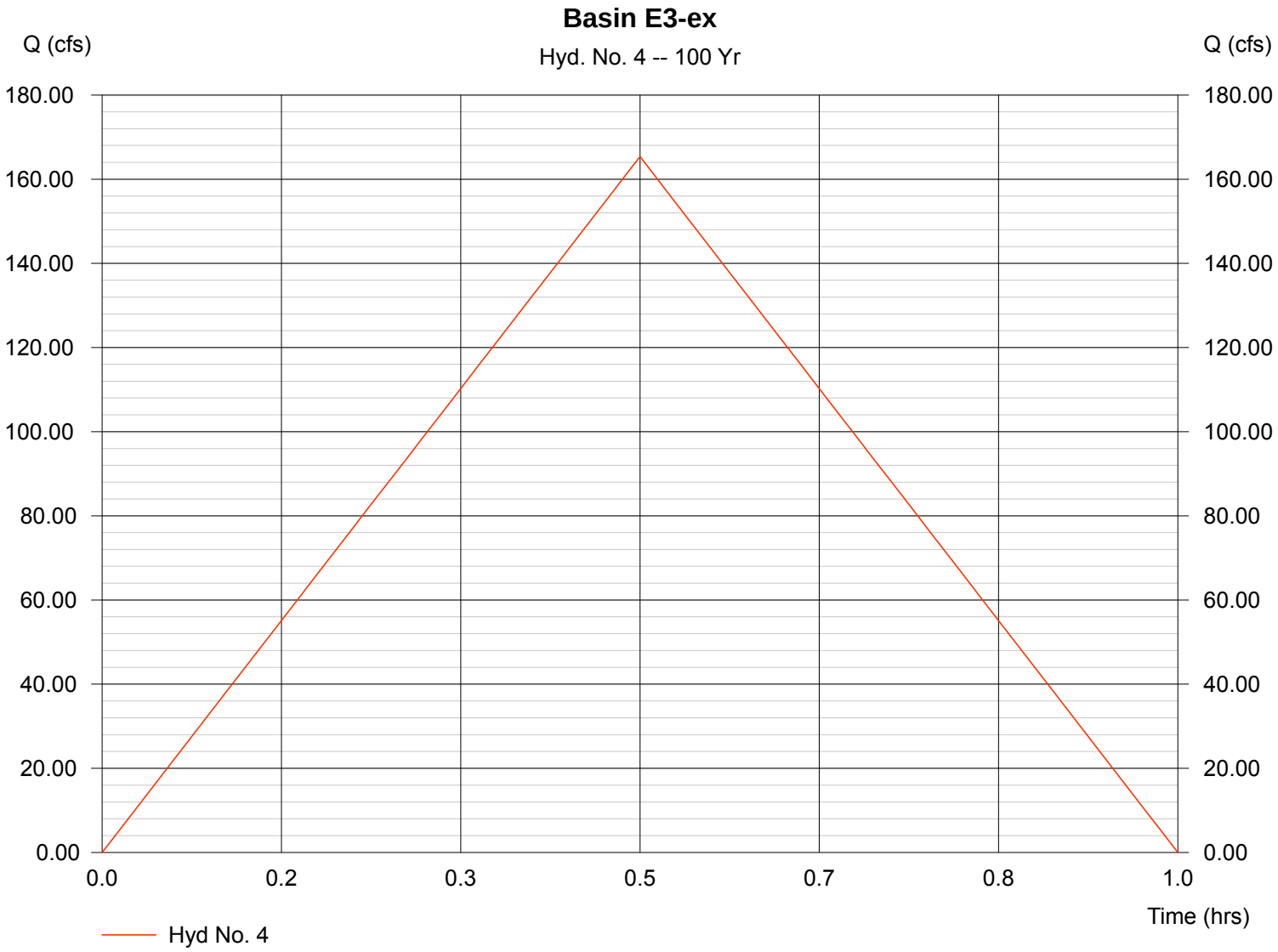
Hydrograph Plot

Hyd. No. 4

Basin E3-ex

Hydrograph type	= Rational	Peak discharge	= 165.36 cfs
Storm frequency	= 100 yrs	Time interval	= 1 min
Drainage area	= 79.500 ac	Runoff coeff.	= 0.5
Intensity	= 4.160 in/hr	Tc by User	= 30.00 min
IDF Curve	= 2016-idf curves-rls.IDF	Asc/Rec limb fact	= 1/1

Hydrograph Volume = 297,648 cuft



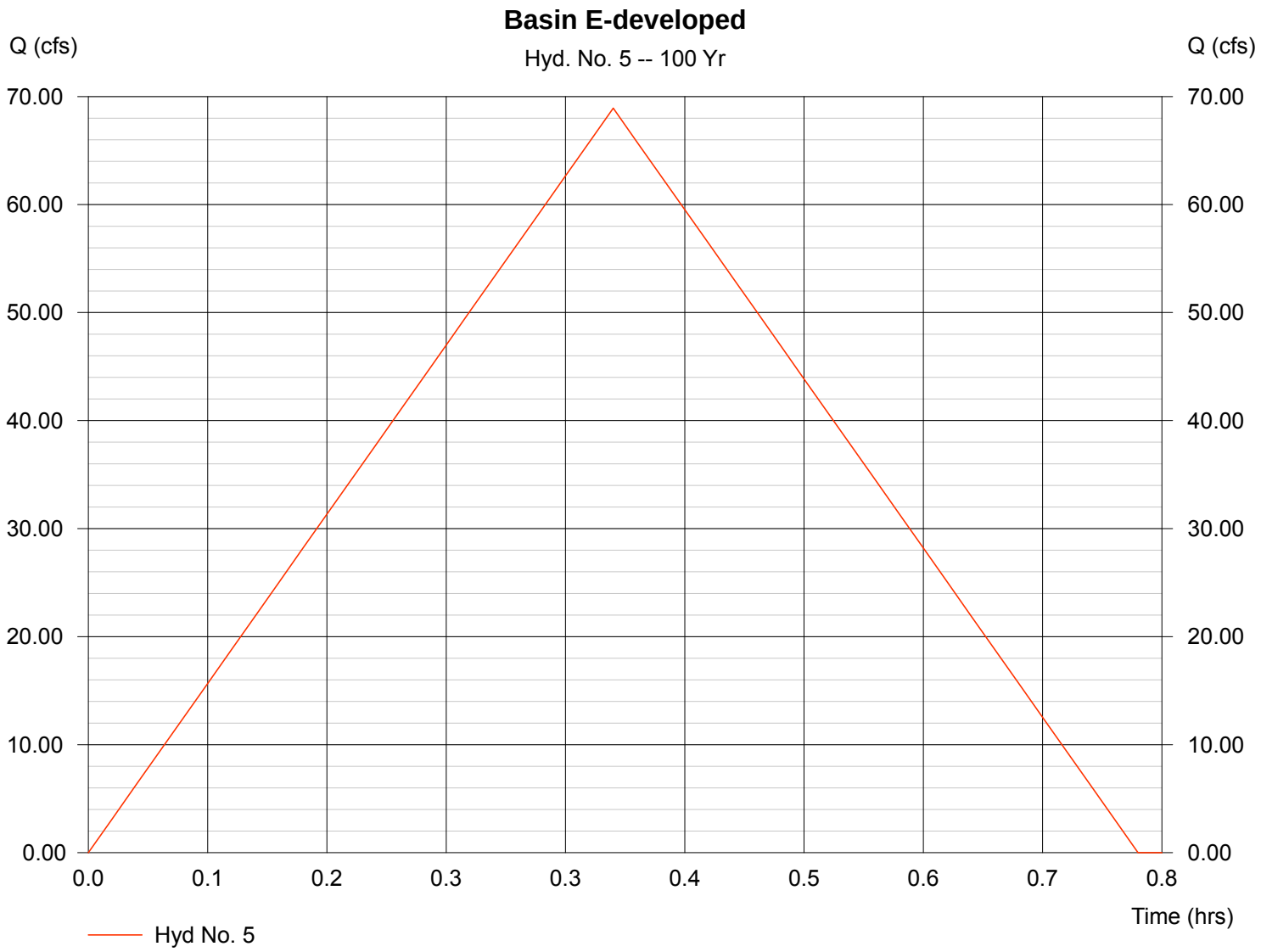
Hydrograph Plot

Hyd. No. 5

Basin E-developed

Hydrograph type	= Rational	Peak discharge	= 68.92 cfs
Storm frequency	= 100 yrs	Time interval	= 1 min
Drainage area	= 21.000 ac	Runoff coeff.	= 0.65
Intensity	= 5.049 in/hr	Tc by User	= 22.00 min
IDF Curve	= 2016-idf curves-rls.IDF	Asc/Rec limb fact	= 1/1

Hydrograph Volume = 90,979 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve | Tuesday, Oct 10 2017, 3:59 PM

Hyd. No. 6

Interim Flow Des.Pt.73

Hydrograph type	= Combine	Peak discharge	= 281.30 cfs
Storm frequency	= 100 yrs	Time interval	= 1 min
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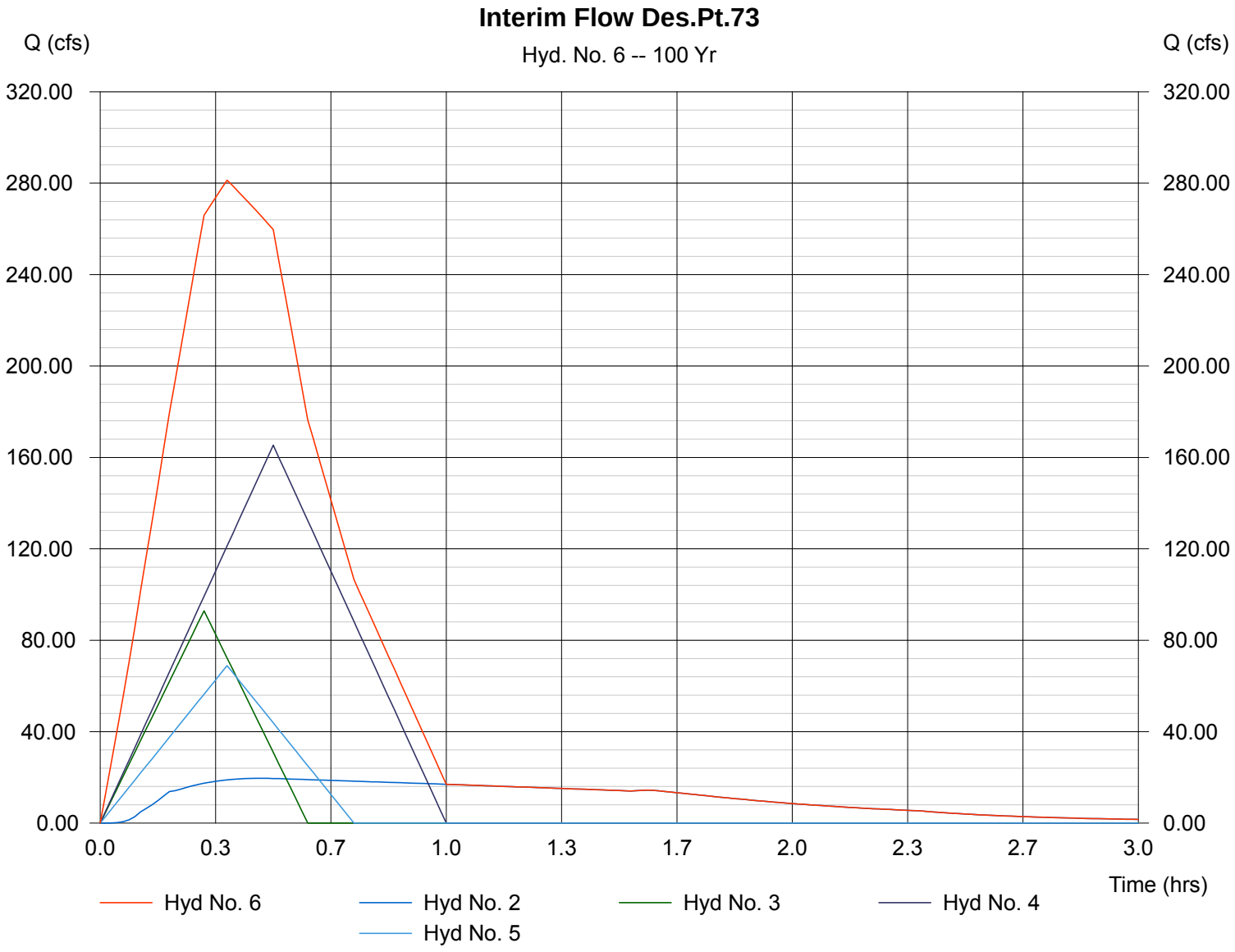
Hydrograph Volume = 617,036 cuft



APPENDIX G–KIOWA ENGINEERING ETRIB FINAL BRIDGE AND CHANNEL DESIGN REPORT

Final Bridge and Channel Design Report

East Fork Jimmy Camp Creek at Fontaine Boulevard
Lorson Ranch Development

CDR-16-009
El Paso County, Colorado

Prepared for:
Lorson Development
212 North Wahsatch Suite 301
Colorado Springs, Colorado 80903

Prepared by:

Kiowa
Engineering Corporation

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

Kiowa Project No. 16031
December 7, 2016
Revised February 13, 2017
Revised May 15, 2017
Revised July 24, 2017
Revised August 24, 2017

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Appendix B – LOMR Case Number 14-08-0534P and Lorson Ranch 404 Permit
Appendix C – Geotechnical Report-Fontaine Boulevard Bridge
NRCS Soil Survey

Map Pocket – Exhibit 1 Existing Drainage Plan
Exhibit 2 Proposed Drainage Plan and Facilities

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 the 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.

Kiowa Engineering Corporation, 1604 South 21st Street, Colorado Springs, Colorado 80904

_____ _____

Richard N. Wray Date
Registered Engineer #19310
For and on Behalf of Kiowa Engineering Corporation

Developer's Statement:

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

BY: _____ _____

Date

_____

Printed

ADDRESS: Lorson Development, LLC
212 North Wahsatch Suite 300
Colorado Springs, Colorado 80903

El Paso County:

Filed in accordance with the requirements of the Drainage Criteria Manual Volumes 1 and 2, El Paso County Engineering Criteria Manual and Land Development Code, as amended.

_____ _____

Jennifer Irvine, P.E. Date
County Engineer/ECM Administrator

I. General Location and Description

This report serves to summarize the design of the East Fork Jimmy Camp Creek (EFJCC), drainageway and for the bridge at Fontaine Boulevard within the Lorson Ranch Development. It is proposed to construct four low flow rock drops, low flow channels, a grouted rock check and soil riprap bank linings at selective locations along a 3,400-lineal foot segment of the EFJCC. The work along the drainageway will begin approximately 200 feet south of the centerline for future Fontaine Boulevard and extend upstream to the northern property line of the Lorson Ranch development. To provide for a continuous design, at the northern property line a short portion of the EFJCC drainageway that lies within the Banning-Lewis Ranch property has been included in the drawings. Banning Lewis-Ranch lies within in the City of Colorado Springs. Lorson Development does not intend to complete the work that is shown within Banning-Lewis Ranch as the need for drainageway improvements would not be required until such time that development proceeds within Banning-Lewis Ranch. The location of the site is shown on Figure 1.

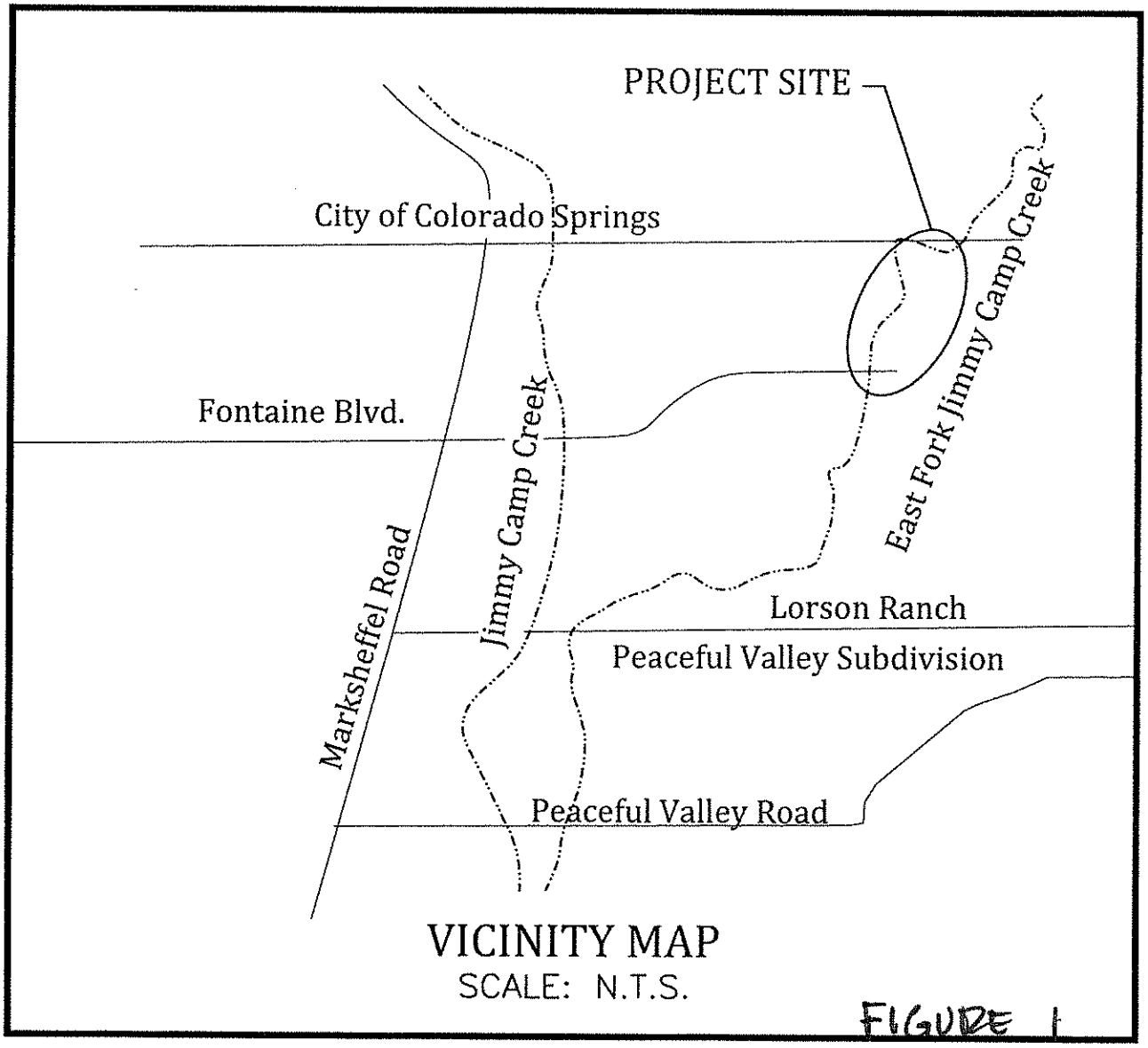
Upon the completion of the drainageway facilities and acceptance by El Paso County, easements and or tracts will be dedicated to the County for the purposes of maintenance access. Tract E, a tract of land dedicated as an area for future development was created when Pioneer Landing at Lorson Ranch Filing 2 was platted. Most of the proposed drainageway facilities shown on the plans are confined to Tract E with the exception of the portion of the drainageway that will abut a future Lorson East filing. With the platting of the first filing within Lorson East, Tract E will be re-platted and enlarged to contain the drainage facilities shown on the plans within a new tract dedicated for open space, floodplain preservation and drainage maintenance access. Upon completion of a LOMR that accounts for the channel and bridge structures subject to this design, there will be no residential lots within future Lorson East filings will be platted into the 100-year floodplain.

The bridge over EFJCC at Fontaine Boulevard is also included within the design plans. The bridge will be a clear-span precast structure that has the capacity to pass the 100-year discharge. The ultimate roadway right-of-way is proposed to be 130-feet. The structure will be 126 feet out-to-out. The roadway section shown on the design plans includes four lanes with a 16-foot median and 5-foot detached sidewalks. Protective guardrails as shown on the drawings have been designed in conformance with Colorado Department of Transportation M-standards. The use of a clear-span structure is consistent with the US Army Corps of Engineers 404 permit issued for the Lorson Ranch Development that requires that a natural invert be constructed. Once the bridge and roadway facilities are completed and accepted by El Paso County, the facilities will be owned, operated and maintained by El Paso County.

The developer intends to request reimbursement for the cost to construct the bridge and drainageway facilities, or request credit against future drainage and bridge fees. Reimbursement will be processed in accordance with sections 1.7 and 3.3 of the Drainage Criteria Manual (DCM). The drainageway facilities will be operated and maintained by El Paso County

II. Project Background

EFJCC is a natural drainageway that was shown to be stabilized in the Lorson Ranch Master Development Drainage Plan (MDDP). The MDDP as last updated showed the EFJCC drainageway to be reconfigured into a trapezoidal channel section capable of conveying the 100-year discharge as listed in the MDDP as derived from the Jimmy Camp Creek Drainage Basin Planning Study (DBPS), that was prepared in 1988. Between future Lorson Boulevard and the downstream limits of this project, the channel has been stabilized into a trapezoidal section with buried grouted rock checks



VICINITY MAP

SCALE: N.T.S.

FIGURE 1

across the invert, and soil/riprap bank lining. The segment below the project site is presently stable and functioning as intended in the design.

In April 2015, the City of Colorado Springs adopted an update to the 1987 Jimmy Camp Creek DBPS. The primary findings and recommendations summarized in the updated 2015 DBPS was in regards to hydrology and the recommendation for implementation of full spectrum detention (FSD) within the overall Jimmy Camp Creek watershed. The long-term stable sloped estimated in the 2015 DBPS was used as the basis for the hydraulic design for the facilities shown on the design drawings. The existing basin condition hydrology summarized in the DBPS was used in combination with the hydrology summarized in the El Paso County Flood Insurance Study in the hydraulic design of the bridge and EFJCC drainageway work shown on the drawings.

Another finding of the 2015 DBPS was that with the assumption of the maintenance of existing basin condition flow rates through the implementation of FSD, the low flow channel would still need of stabilization because of the anticipation of continuous low flow once the basin develops into an urban watershed. The 2015 DBPS also called for the 100-year floodplain to be preserved for many segments of the natural drainageways within the Jimmy Camp Creek watershed, including the EFJCC drainageway subject to this design. Low flow stabilization was called for in the 2015 DBPS for the EFJCC, along with selective bank lining and the preservation of the 100-year floodplain.

Though the 2015 DBPS was never adopted by El Paso County, the County is now requiring development to provide for FSD, as is the City of Colorado Springs. The implementation of FSD is being accomplished in the County through the adoption of Chapter 6 and Section 3.2.1 of Chapter 13 of the City of Colorado Springs Drainage Criteria Manual, Volume 1.

III. Previous Reports and Jurisdictional Requirements

The basis for the development of the design has been developed from referencing the following reports:

1. ***Lorson Ranch Master Development Drainage Plan (MDDP), prepared by Core Engineering, latest version (not approved by El Paso County).***
2. ***Jimmy Camp Creek Drainage Basin Planning Study (DBPS), prepared by Kiowa Engineering, 2015 (not approved by El Paso County).***
3. ***City of Colorado Springs and El Paso County Drainage Criteria Manual, 1987.***
4. ***El Paso County Engineering Criteria Manual, most current version.***
5. ***City of Colorado Springs Drainage Criteria Manual, Chapters 6 and 12, May 2014.***
6. ***The City of Colorado Springs and El Paso County Flood Insurance Study (FIS), prepared by the Federal Emergency Management Agency, effective 1997.***
7. ***East Fork Jimmy Camp Creek Letter of Map Revision, Case Number 14-08-0543P, Lorson Ranch Development, effective date January 2015.***

Reference 7 provides for the existing condition floodplain and floodway for the segment of EFJCC subject to this design. The existing condition floodplain has been shown on the design drawings, and has been modified to shown the effect of the bridge crossing at Fontaine Boulevard. Because the bridge structure and channel stabilization measures will occur within the regulatory floodplain and floodway, a Conditional Letter of Map Revision (CLOMR), will need to be processed through FEMA as part of gaining the necessary construction approvals for the project. Reference 7 has been included in the Appendix.

Chapter 6 and Section 3.2.1 of Chapter 13 of the City of Colorado Springs DCM was made part of Reference 3 by El Paso County Board of County Commissioners Resolution 15-042.

IV. Site Description

The EFJCC floodplain within the design reach is well vegetated with native grasses that are in fair to good condition that exists on the floodplain overbanks and within the greater valley in general. There is very little evidence of active invert degradation or bank sloughing. Current longitudinal slope along the project is ranges from .2 to .5 percent. There is presently no base flow in this segment. There is at some locations a small low flow channel that has formed and has a top width of approximately 20 feet. Topography used in the design was compiled at a one-foot contour interval and is dated 2015. The topography reflects the grading within Pioneer Landing Filing 2 that lies west of the drainageway and north of Fontaine Boulevard. There are presently no encroachments into the floodplain or channel thread associated with man-made structures. There is presently no existing water, wastewater, gas or electric utilities that impact the construction of the proposed drainageway facilities. A future wastewater and water line is proposed at Fontaine Boulevard. Each of these future utilities have been shown on the design plans. Approval of the water and wastewater design plans would ultimately come from Widefield Water and Sanitation District.

V. Hydrology

Hydrology for use in determining the typical channel sections shown on the plans were obtained from Reference 7. The 100-year discharges shown in Reference 7 (ranging from 4,400 to 4,750 cubic feet per second), have been used in the hydraulic design of the bridge at Fontaine and in determining the proposed condition floodplain shown on the design plans. The low flow channel was sized using ten percent of the peak flow rate for the 10-year recurrence interval (ranging 440 to 475 cubic feet per second), as listed in Reference 2 in accordance with Reference 3. Basin area at Fontaine Boulevard is approximately 9.6 square miles. The watershed above Fontaine Boulevard is presently undeveloped. Provided on Table 1 is a summary of the peak flows for existing watershed development conditions for References 2 and 7

The assumption that FSD will be required for all future development is reflected in the use of the FIS discharges in this design. There is a good correlation between the FIS and DBPS 100-year discharges for the segment of EFJCC subject to this design. Use of the existing basin condition flow rates is consistent with the requirements set forth in the annexation agreement between the owners of Banning-Lewis Ranch and the City of Colorado Springs. The future FSD's within Banning-Lewis Ranch will be publicly operated and maintained facilities. The plan and profile that summarize the peak discharges from Reference 2 are included in the Appendix.

VI. Hydraulics

The hydraulic design of the drainageway and bridge as presented on the plans was carried out using the US Army Corps of Engineers HEC-RAS modeling system. The HEC-RAS model was used to determine the 100-year hydraulic grade line shown on the plan and profiles. The 100-year profile for the FIS hydrology has been determined. The location for the proposed 100-year floodplain using FIS hydrology has been presented on the plan view of the design plans and on the grading plan. Contained within the Appendix of this report are floodplain maps that show the proposed (pre-project) and regulatory (FIS LOMR) 100-year floodplains using the FIS hydrology. The location for selected HEC-RAS cross-sections are shown on the design profile. The HEC-RAS cross-sections are presented on the floodplain work maps contained in Appendix A. The summary output and cross-section plots for the HEC-RAS models have been included in the Appendix of this memorandum.

The propose drainageway design concepts put forth on the plans are 100-year selective bank lining with low flow stabilization. As described in the DBPS, even with FSD implemented throughout the watershed the low flow area of the drainageway will continue to degrade to a flatter longitudinal

TABLE 1: SUMMARY OF DESIGN DISCHARGES
PROJECT: EAST FORK JIMMY CAMP CREEK
PROJECT NO: 16031

DESIGN POINT	LOCATION	EL PASO COUNTY FIS (1)		JIMMY CAMP CREEK DBPS	
		10-YEAR (CFS)	100-YEAR (CFS)	10-YEAR (CFS)	100-YEAR (CFS)
A	800 FT DOWNSTREAM OF FONTAINE BOULEVARD	2400	4750	1850	4260
B	PROFILE STATION 20+00	2200	4400	1830	4260
C	500-FEET UPSTREAM LORSON RANCH NORTH PROPERTY LINE	2200	4400	1830	4260

(1) FIS DISCHARGES USED FOR THE DESIGN OF BRIDGE AND DRAINAGEWAY FACILITIES
(2) ALL DISCHARGES LISTED IN TABLE 1 ARE FOR THE EXISTING WATERSHED CONDITIONS

slope. The effect of development within the watershed will be to increase the frequency and duration of base flows. Base flows will increase with the development because of discharges from future FSD's and irrigation return flows. Natural drainageway will eventually degrade along the invert in turn causing bank sloughing to occur if grade control is not implemented. The bank full capacity as estimated in the DBPS represents rate of runoff that would form the low flow channel over time. The bank full capacity for most natural watersheds represents a flow rate usually between the 2-year to and 5-year recurrence intervals. In order to comply with County DCM criteria, the low flow channel capacity for this design was set at 10 percent of the predominant 100-year FIS discharge (445 cubic feet per second) for the reach. While considerably higher than the bank full capacity estimated in Reference 2, (100 cubic feet per second), designing the low channel at the higher discharge will stabilize the low for over a wider range of runoff events. The crest of the drops has been sized to be able to convey 475 cubic feet per second. A buried grouted rock check has been added at the downstream terminus of the project that will extend into the toe of the soil riprap channel banks. The check will limit the possibility of a head cut from developing that could migrate upstream through the bridge and the drainageway above.

A qualitative channel stability analysis was carried as part of developing the design for EFJCC. The analysis consisted of a field inspection, historic topographic mapping comparisons and the determination of existing channel slopes. Field observations revealed no indication of invert degradation along the entire length of the design reach. There is presently no base flow in the drainageway which explains the relative lack if any significant head cutting or bank erosion. The long term stable slope for this segment the East Fork Jimmy Camp Creek was estimated at .09 percent. The current slope is approximately .76 percent through the project reach. This means that if the drainageway is left unchecked with increasing base flows, the invert could fall as much as 8-feet at the north property line. The grouted low check grade controls have been designed to prevent the possibility of long-term invert degradation. The longitudinal location of the grade controls as well as the depth of the upstream cut-off wall that is integral with the crest of each structure, were determined by projecting the long-term slope of .09 percent upstream such that if a head cut was to from and move upstream along the low flow, the invert of the head cut would not reach an elevation that is below the bottom of the grouted rock sill, and/or the bottom of the cut-off wall.

The design of the channel stabilization measures using .25 percent has been based upon guidance offered in section 3.1.2 of Reference 5. The development of the watershed upstream of Loson Ranch will occur over the next 30 to 40 years. As such the sediment supply to the reach of East Fork Jimmy Camp Creek as it passes through Lorson Ranch will remain the same as present conditions. Designing the low flow and stabilized channel section at the slope called for in the Jimmy Camp Creek DBPS (.09 percent) now could cause aggradation of sediment along the low flow and floodplain benches due to extremely low flow velocities (less than 3 feet per second). As pointed out in section 3.1.2, it is in some cases better to phase the construction of the channel drops, as a phased approach better recognizes the fact that the natural sediment supply will change as the basin moves from un-developed to developed. It is this guidance that the drops shown in this design have been determined.

Based upon the field observations regarding channel stability, the EFJCC low flow channel was designed to operate at normal depths of flow, thereby eliminating channel instability associated with super-critical flow conditions. The low flow channel lining is proposed to be a combination of soil/riprap bank and turf reinforcement mats depending upon velocity. The locations where selective 100-year soil/riprap lining is proposed was based upon the velocities returned by the HEC-RAS model. Velocities for the 100-year discharge range from 4.1 to 9.9 feet per second. Calculations related to the sizing of the soil/riprap bank and channel sections are contained within the Appendix of the report. The low flow is in normal conditions for most of the reach except at the crest of the grouted boulder drops. At the outside channel bends of the floodplain soil/riprap is proposed as the bank lining material. The top of the bank where selective linings have been proposed reflect the freeboard criteria per County DCM requirements. There was also an effort to realign portions of the

low flow channel away the toe of an outside bend of the drainageway. The intent of the positioning of the low flow was to minimize disturbance to the vegetation on the benches of the 100-year floodplain that could occur during construction. Finally, shear stress calculations were carried out for the 10- and 100-year flow conditions at each segment of the drainageway. Maximum 100-year shear stress on the bench was calculated at .83 pounds per square foot. Permissible shear stress for native vegetation with Class B retardance similar to what is present at the site is 2.1 pounds per square foot. Channel design calculations are included in the Appendix of this memorandum.

VII. Design Elements

Presented on the design plans associated with this design memorandum are the proposed drainageway conditions. The drops have been designed to raise the invert anywhere from two to three feet. Design criteria for the project are summarized as follows:

Channel design slope:	.25 percent
Maximum low flow drop height:	3.5feet
Outside bend slopes- riprap	2.5 to 1 maximum
Low flow channel side slopes- TRM lined	3 to 1 maximum
Low flow channel side slopes- riprap lined	3 to 1 maximum
Low flow channel depth	3 feet
Manning's n-values:	.025-.04
Froude number-(excluding crests of drops):	.25-.84
Minimum channel radius	150 feet
Maximum design velocity	
Grass-lined	5 feet per second
Reinforced turf (TRM)	7 feet per second
Permissible shear stress: low flow channel	
TRM (curled wood mat)	1.55 psf
Type VL riprap	2.5 psf
Permissible shear stress: floodplain benches and overbanks	
Class B retardance, native vegetation	2.1 psf
TRM (curled wood mat)	1.55 psf
Type M riprap	5.0 psf

The low flow drops will be constructed using grouted boulders. The selection of grouted boulders was chosen to address long-term durability of the drop knowing that they would be overtopped in a flood exceeding the low flow design discharge. Each grade control has an integral grouted boulder sill followed by a 25-foot soil/riprap transition to the low flow channel section. A concrete cut-off wall is proposed at the crest of each grade control that will extend into the adjacent floodplain section. The bottom depth of the cut-off walls and the grouted boulder sills have been determined so that the degradation to the ultimate channel slope of .09 percent would not cause the grade control to be undermined. Wherever soil riprap linings are proposed, rock sizing and freeboard criteria followed is in accordance with the DCM.

A geotechnical investigation was conducted to support the design of the foundation for the bridge at Fontaine. The geotechnical report is included within the Appendix. Two soil borings were drilled at near the location of the proposed footings for the bridge. Because of the depth to bedrock, deep foundations are proposed using driven H-piles. A precast bridge section has been chosen that has a 48-foot clear span and a 13-foot rise. The 100-year discharge can be passed through the bridge at a headwater to depth ratio of 1. Bridge velocity during a 100-year event is estimated at between 10.5 and 14.5 feet per second. The Geotechnical Report has been included in this report within Appendix C.

The construction of the improvements shown on the plans will result in a long-term stable drainageway corridor and prevent damages that could arise from bank sloughing related to the erosion of the drainageway's invert. Because the low flow channel will be stabilized both horizontally and vertically the potential for negative impacts upon the native vegetative habitat will be minimized. A stabilized floodplain corridor will result from the construction of the proposed drainageway structures and over the long–term, the environmental quality of the corridor will be enhanced and preserved.

Maintenance access to the proposed drops will be provided via platted tracts within Pioneer Land Filing 2 and from tracts or easements within the future Lorson East filings. The locations of the maintenance roads are shown on the design plans. The benches of the channel are relatively flat and will allow for access to the crest of each drop. Access to the floodplain bench will allow for maintenance of proposed storm sewer outfalls from the adjacent Pioneer Landing Filing 2B and future Lorson East filings. Access points to the 100-year floodplain will be identified in the Lorson East MDDP and subsequent subdivision plat(s). Access roadways will have an all-weather surface and be a minimum of 12-feet in width.

VIII. Construction Permitting

The following permits are anticipated to allow for the construction of the project as shown on the design plans. A copy of the Lorson Ranch 404 Permit is included within the Appendix.

Notification of project in conformance with 404 permit - USACOE

Floodplain Development Permit – Regional Building Department

Grading and Erosion Control Permit (ESQCP) – El Paso County

Construction Stormwater Discharge Permit – CDPHE

Construction Dewatering Permit - CDPHE

Conditional Letter of Map Revision - FEMA

IX. Drainage and Bridge Fees

The Lorson Ranch Development and specifically Lorson Ranch East lies wholly within the Jimmy Camp Creek drainage basin. Drainage and bridge fees have been established by the County for the Jimmy Camp Creek drainage basin for assessment against platted land within the watershed. The drainageway structures will be public and are considered reimbursable or creditable against drainage fees owed when land within Lorson East is platted pending approval through the DCM reimbursement process. Construction of the bridge at Fontaine Boulevard will be creditable against bridge fees owed pending approval through the DCM reimbursement process.

The current 2017 drainage and bridge fees for the Jimmy Camp Creek drainage basin are as follows:

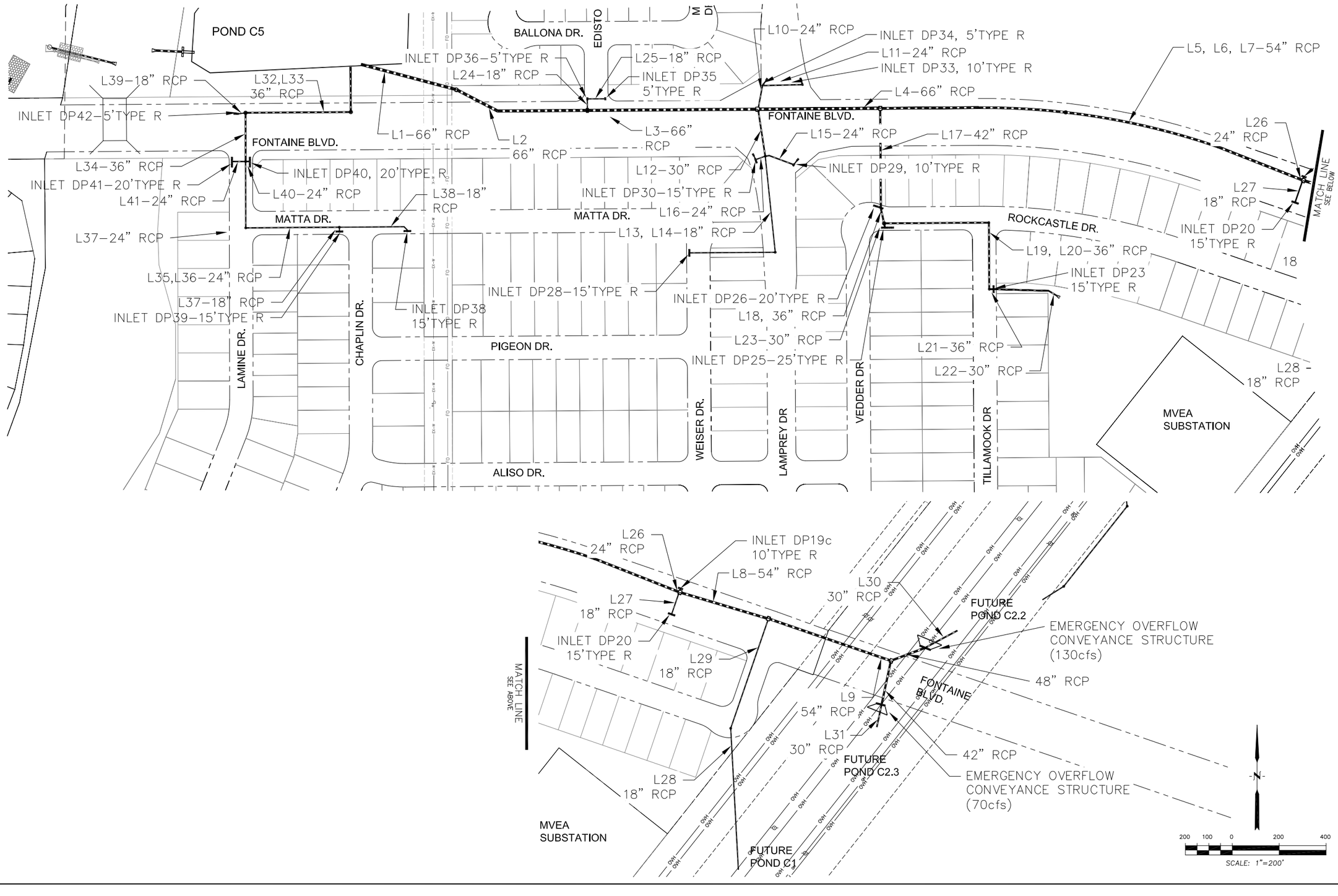
Drainage Fee:	$16,270 per all impervious acres
Drainage Fee Escrow (BOCC Reas.16-320)	$7,285 per acre
Total Drainage Fee	$23,555 per acre
Bridge Fee:	$735 per acre

X. Phasing

Construction of the drainage and bridge facilities shown on the plans is to be completed all at once and no phasing of the construction is proposed. The construction will commence prior to or concurrent with the development of the first filing within Lorson East. Plans are to commence with construction in Fall 2017 with a completion in Winter 2018. Completion of the roadway may initially involve only the two westbound lanes on an interim basis until such time that traffic warrants completing the entire future east bound lanes of Fontaine Boulevard. The full bridge length will be constructed.

APPENDIX H – EMERGENCY OVERFLOW STORM SEWER CALCULATIONS FOR C15-C17 BASINS BY HYDRAFLOW

BASIN C15 - C17 STORM SCHEMATIC



CORE ENGINEERING GROUP
15004 1ST AVE. S.
BURNSVILLE, MN 55306
PH: 763.252.6100
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
EAST OF EAST TRIBUTARY
EL PASO COUNTY, COLORADO

DRAWN: RLS
DESIGNED: LAB
CHECKED: LAB

STORM SEWER SCHEMATIC
BASIN C15 - C17
LORSON RANCH EAST

DATE
OCTOBER 20, 2017

PROJECT NO.
100.040

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	L1	368.8	66 c	147.3	5709.50	5711.15	1.120	5715.80*	5717.58*	0.00	5717.58	End
2	L2	370.7	66 c	383.5	5711.45	5715.70	1.108	5717.58*	5722.25*	0.00	5722.25	1
3	L3	367.7	66 c	373.9	5715.90	5719.70	1.016	5722.31*	5726.80*	0.00	5726.80	2
4	L4	321.9	66 c	249.3	5719.90	5722.40	1.003	5727.66*	5729.96*	0.00	5729.96	3
5	L5	232.8	54 c	228.8	5723.60	5728.00	1.923	5729.96*	5733.16*	0.00	5733.16	4
6	L6	233.3	54 c	494.6	5728.20	5733.16	1.003	5733.16*	5740.13*	0.00	5740.13	5
7	L7	233.6	54 c	194.1	5733.26	5735.20	1.000	5740.13*	5742.87*	0.00	5742.87	6
8	L8	200.0	54 c	219.8	5735.30	5737.50	1.001	5743.76*	5746.04*	0.00	5746.04	7
9	L9	200.0	54 c	279.0	5737.40	5741.20	1.362	5746.04*	5748.92*	0.00	5748.92	8
10	L10	24.69	24 c	58.7	5723.20	5724.30	1.862	5729.56*	5730.26*	0.00	5730.26	3
11	L11	20.03	24 c	52.4	5724.40	5724.84	0.845	5730.59*	5731.00*	0.00	5731.00	10
12	L12	42.12	30 c	84.4	5722.70	5723.52	0.976	5729.38*	5730.27*	0.00	5730.27	3
13	L13	11.36	18 c	214.7	5724.72	5728.81	1.905	5730.77*	5733.28*	0.00	5733.28	12
14	L14	11.56	18 c	182.2	5729.11	5734.84	3.145	5733.28	5736.14	n/a	5736.14 j	13
15	L15	18.67	24 c	31.0	5725.08	5725.61	1.711	5730.86*	5731.07*	0.00	5731.07	12
16	L16	15.39	24 c	13.1	5724.61	5725.10	3.742	5731.04*	5731.10*	0.00	5731.10	12
17	L17	92.58	42 c	202.3	5724.40	5727.36	1.465	5731.37*	5733.08*	0.00	5733.08	4
18	L18	78.29	36 c	30.7	5728.15	5728.46	1.011	5733.08*	5733.51*	0.00	5733.51	17
19	L19	51.29	36 c	223.4	5728.50	5730.75	1.007	5734.60*	5735.92*	0.00	5735.92	18
20	L20	51.77	36 c	141.8	5730.95	5732.40	1.022	5735.92*	5736.77*	0.00	5736.77	19
21	L21	51.81	36 c	11.2	5732.70	5732.79	0.805	5736.77*	5736.84*	0.00	5736.84	20
22	L22	35.92	30 c	139.3	5733.40	5735.50	1.508	5736.84	5737.76	0.00	5737.76	21
23	L23	33.74	30 c	10.8	5729.21	5729.48	2.506	5734.68*	5734.75*	0.00	5734.75	18
24	L24	6.37	18 c	35.8	5719.93	5720.92	2.768	5725.84*	5725.97*	0.00	5725.97	2
25	L25	6.01	18 c	41.0	5721.22	5721.63	0.998	5725.99*	5726.13*	0.00	5726.13	24
26	L26	22.01	24 c	13.2	5741.12	5742.52	10.617	5745.46*	5745.58*	0.00	5745.58	7
27	L27	13.06	18 c	45.8	5742.58	5743.07	1.070	5745.37*	5746.08*	0.00	5746.08	7
28	L28	18.00	18 c	268.7	5740.50	5741.84	0.498	5746.88*	5754.78*	0.00	5754.78	8
29	L29	18.00	18 c	271.6	5741.94	5743.30	0.500	5754.78*	5762.76*	0.00	5762.76	28
30	L30	130.0	48 c	149.2	5741.71	5742.50	0.529	5749.72*	5750.94*	0.00	5750.94	9
31	L31	70.00	42 c	116.9	5742.20	5742.90	0.598	5750.56*	5751.13*	0.00	5751.13	9
32	L32	65.12	36 c	104.3	5709.00	5709.63	0.604	5711.81*	5712.81*	0.00	5712.81	End

Lorson East PDR - C15 basins | Number of lines: 41 | Run Date: 10-30-2017

NOTES: c = cir; e = ellip; b = box; Return period = 100 Yrs. ; *Surcharged (HGL above crown). ; 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.
33	L33	65.94	36 c	243.0	5709.83	5711.30	0.605	5712.83*	5715.21*	0.00	5715.21	32
34	L34	60.45	36 c	90.4	5711.80	5712.55	0.829	5715.42*	5716.17*	0.00	5716.17	33
35	L35	31.08	24 c	142.7	5713.55	5717.40	2.699	5716.17	5719.28	n/a	5719.28 j	34
36	L36	31.58	24 c	220.6	5717.70	5723.60	2.675	5719.31	5725.49	n/a	5725.49	35
37	L37	19.13	18 c	7.0	5724.10	5724.18	1.144	5725.60*	5725.83*	0.00	5725.83	36
38	L38	13.06	18 c	145.3	5724.10	5727.01	2.003	5726.28	5728.51	0.00	5728.51	36
39	L39	7.04	18 c	17.2	5714.35	5714.58	1.340	5716.31*	5716.39*	0.00	5716.39	33
40	L40	32.43	24 c	27.1	5713.55	5713.76	0.776	5716.17*	5716.72*	0.00	5716.72	34
41	L41	5.88	24 c	11.5	5713.55	5713.67	1.049	5717.25*	5717.26*	0.00	5717.26	34

Lorson East PDR - C15 basins | Number of lines: 41 | Run Date: 10-30-2017

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

Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q byp (cfs)	Junc type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp line No
							Ht (in)	L (ft)	area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
1		200.00*	0.00	0.00	200.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.00	Off
2		200.00*	0.00	0.00	200.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.00	Off
3		200.00*	0.00	0.00	200.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.00	Off
4		200.00*	0.00	0.00	200.00	MH	6.0	6.00	0.00	0.00	0.00	Sag	2.00	0.080	0.050	0.013	0.00	0.00	0.00	0.00	0.00	Off
5		200.00*	1036.00	0.00	1236.00	MH	6.0	6.00	0.00	0.00	0.00	Sag	2.00	0.080	0.050	0.013	0.00	0.00	0.00	0.00	0.00	Off
6		200.00*	836.00	0.00	1036.00	MH	6.0	6.00	0.00	0.00	0.00	Sag	2.00	0.080	0.050	0.013	0.00	0.00	0.00	0.00	0.00	5
7		200.00*	636.00	0.00	836.00	MH	6.0	6.00	0.00	0.00	0.00	Sag	2.00	0.080	0.050	0.013	0.00	0.00	0.00	0.00	0.00	6
8		200.00*	436.00	0.00	636.00	MH	6.0	6.00	0.00	0.00	0.00	Sag	2.00	0.080	0.050	0.013	0.00	0.00	0.00	0.00	0.00	7
9		200.00*	200.00	0.00	400.00	MH	6.0	6.00	0.00	0.00	0.00	Sag	2.00	0.080	0.050	0.013	0.00	0.00	0.00	0.00	0.00	8
10	Inlet DP-34 - 5'	9.94*	11.12	21.06	0.00	Curb	6.0	5.00	0.00	0.00	0.00	Sag	2.00	0.080	0.020	0.013	1.34	60.88	1.47	60.88	3.00	Off
11	Inlet DP-33 - 10'	20.03*	11.39	20.30	11.12	Genr	6.0	6.00	0.00	0.00	0.00	0.020	2.00	0.080	0.050	0.013	0.65	11.88	0.65	11.88	0.00	10
12		0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	2.00	0.080	0.050	0.013	0.00	0.00	0.00	0.00	0.00	Off
13		0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.00	Off
14	Inlet DP-28 - 15'	11.56	0.00	10.36	1.20	Genr	6.0	15.00	0.00	0.00	0.00	0.026	2.00	0.080	0.020	0.013	0.38	13.25	0.38	13.25	0.00	38
15	Inlet DP-29 - 10'	18.67	1.73	16.30	4.10	Genr	6.0	10.00	0.00	0.00	0.00	0.020	2.00	0.080	0.020	0.013	0.47	17.60	0.47	17.60	0.00	16
16	Inlet DP-30 - 15'	15.39	4.10	19.49	0.00	Genr	6.0	10.00	0.00	0.00	0.00	Sag	2.00	0.080	0.020	0.013	0.30	9.00	0.30	9.00	0.00	Off
17	Inlet DP-26, 20'	18.18	6.91	25.10	0.00	Genr	6.0	15.00	0.00	0.00	0.00	Sag	2.00	0.080	0.050	0.013	0.30	4.80	0.30	4.80	0.00	Off
18		0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.00	Off
19		0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.00	Off
20		0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.00	Off
21	Inlet DP-23, 15'	18.56	0.00	13.69	4.87	Genr	6.0	15.00	0.00	0.00	0.00	0.011	2.00	0.080	0.020	0.013	0.50	19.10	0.50	19.10	0.00	23
22		35.92	0.00	35.92	0.00	Hdwl	0.0	0.00	15.00	6.00	3.00	Sag	2.00	0.080	0.050	0.013	0.00	0.00	0.00	0.00	0.00	Off

Lorson East PDR - C15 basins | Number of lines: 41 | Run Date: 10-30-2017

NOTES: Inlet N-Values = 0.016 ; Intensity = 58.48 / (Inlet time + 7.70) ^ 0.75; Return period = 100 Yrs. ; * Indicates Known Q added

Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q byp (cfs)	Junc type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp line No
							Ht (in)	L (ft)	area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
23	INLET DP-25- 25'	33.74	4.87	31.70	6.91	Genr	6.0	48.21	0.00	0.00	0.00	0.020	2.00	0.080	0.020	0.013	0.57	22.65	0.57	22.65	0.00	17
24	Inlet DP-36, 5'	0.57	0.00	0.57	0.00	Curb	6.0	5.00	2.00	4.00	2.00	Sag	2.00	0.080	0.020	0.013	0.21	4.65	0.34	4.65	3.00	2
25	Inlet DP-35, 5'	6.01	0.00	6.01	0.00	Curb	6.0	5.00	2.00	4.00	2.00	Sag	2.00	0.080	0.020	0.013	0.57	22.50	0.70	22.50	3.00	24
26	Inlet DP-19c, 10'	22.01	0.00	10.62	11.39	Genr	6.0	15.00	2.00	4.00	2.00	0.010	2.00	0.080	0.020	0.013	0.54	20.80	0.54	20.80	0.00	11
27	Inlet DP-20, 15'	13.06	0.00	11.33	1.73	Genr	6.0	15.00	2.00	4.00	2.00	0.010	2.00	0.080	0.020	0.013	0.46	16.90	0.46	16.90	0.00	15
28		18.00*	18.00	0.00	36.00	None	6.0	6.00	2.00	4.00	2.00	Sag	2.00	0.080	0.050	0.013	0.00	0.00	0.00	0.00	0.00	8
29		18.00*	0.00	0.00	18.00	MH	6.0	6.00	2.00	4.00	2.00	Sag	2.00	0.080	0.050	0.013	0.00	0.00	0.00	0.00	0.00	28
30		130.00*	0.00	0.00	130.00	MH	6.0	6.00	2.00	4.00	2.00	Sag	2.00	0.080	0.050	0.013	0.00	0.00	0.00	0.00	0.00	9
31		70.00*	0.00	0.00	70.00	MH	6.0	6.00	2.00	4.00	2.00	Sag	2.00	0.080	0.050	0.013	0.00	0.00	0.00	0.00	0.00	9
32		0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	2.00	0.080	0.020	0.013	0.00	0.00	0.00	0.00	0.00	Off
33		0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	2.00	0.080	0.020	0.013	0.00	0.00	0.00	0.00	0.00	32
34		0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.00	Off
35		0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.00	Off
36		0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.00	35
37	Inlet DP-39, 15'	19.13	2.43	14.93	6.62	Genr	6.0	15.00	2.00	4.00	2.00	0.038	2.00	0.080	0.020	0.013	0.44	15.80	0.44	15.80	0.00	40
38	Inlet DP-38, 15'	13.06	1.20	11.83	2.43	Genr	6.0	15.00	0.00	0.00	0.00	0.011	2.00	0.080	0.020	0.013	0.46	17.20	0.46	17.20	0.00	37
39	Inlet DP-42, 10'	7.04	0.00	7.04	0.00	Curb	6.0	6.00	2.00	4.00	2.00	Sag	2.00	0.080	0.050	0.013	0.52	9.30	0.63	9.30	2.00	33
40	Inlet DP-40, 20'	32.43	6.62	26.00	13.06	Genr	6.0	20.00	2.00	4.00	2.00	0.020	2.00	0.080	0.050	0.013	0.71	12.92	0.71	12.92	0.00	41
41	Inlet DP-41, 20'	5.88	13.06	18.94	0.00	Curb	6.0	20.00	2.00	4.00	2.00	Sag	2.00	0.080	0.050	0.013	0.52	9.24	0.63	9.24	2.00	34

Lorson East PDR - C15 basins | Number of lines: 41 | Run Date: 10-30-2017

NOTES: Inlet N-Values = 0.016 ; Intensity = 58.48 / (Inlet time + 7.70) ^ 0.75; Return period = 100 Yrs. ; * Indicates Known Q added

MAP POCKET

DESIGN POINT SUMMARY TABLE				
DESIGN POINT	BASIN	DRAINAGE AREA (AC)	RUNOFF 5 YR (CFS)	RUNOFF 100 YR (CFS)
2	EX-C	452.97	141	458
3	EX-D	109.55	29.7	166.5
4	EX-E	186.30	100	280

FROM LORSON EAST MDDP

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

LEGEND

- BASIN BOUNDARY–MAJOR
- BASIN DESIGN POINT
- BASIN I.D. / ACREAGE / 5 YR/100 YR CFS
- DIRECTION OF FLOW
- EXISTING CONTOUR
- TIME OF CONCENTRATION
- PRELIMINARY PLAN SITE AREA
- 100–YR FLOODPLAIN

UNPLATTED-
BANNING
LEWIS
RANCH

UNPLATTED-
ROLLING
HILLS
RANCH

EAST TRIBUTARY OF
JIMMY CAMP CREEK

EX–A1
4.28 AC
1.1 | 8.0

ET1

PIONEER
LANDING
FILING
NO. 2

OLD GLORY DR

FONTAINE BLVD

EX–C
452.97 AC
141.0|458.0

EXISTING 325' ELECTRICAL
TRANSMISSION LINE ESMT

MVEA
SUBSTATION
SITE

EAST TRIBUTARY OF
JIMMY CAMP CREEK

MEADOWS FILING
NO. 3

ALLEGIANT

EX–D
109.55 AC
29.7|166.5

UNPLATTED

MEADOWS FILING
NO. 4

EXISTING 100 YR
FLOOD PLAIN

ET2

ET3

ET4

ABANDONED
FMIC CHANNEL

EX–E
186.30 AC
100.0|280.0

EXISTING SDS

UNPLATTED

APPLE
RIDGE
SUB.

APPLETREE
GOLF
COURSE

APPLETREE SUB. NO. 3

PEACEFUL VALLEY
LAKE ESTATES
1st FILING

HERITAGE RD

PEACEFUL VALLEY RD

PEACEFUL VALLEY
LAKE ESTATES
1st FILING

RAINTREE DR

N

400 200 0 400 800

SCALE: 1"=400'

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

EXISTING 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

LEGEND

BASIN BOUNDARY–MAJOR

BASIN I.D.
ACREAGE
5 YR/100 YR CFS

DIRECTION OF FLOW

EXISTING CONTOUR

PROPOSED CONTOUR

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:

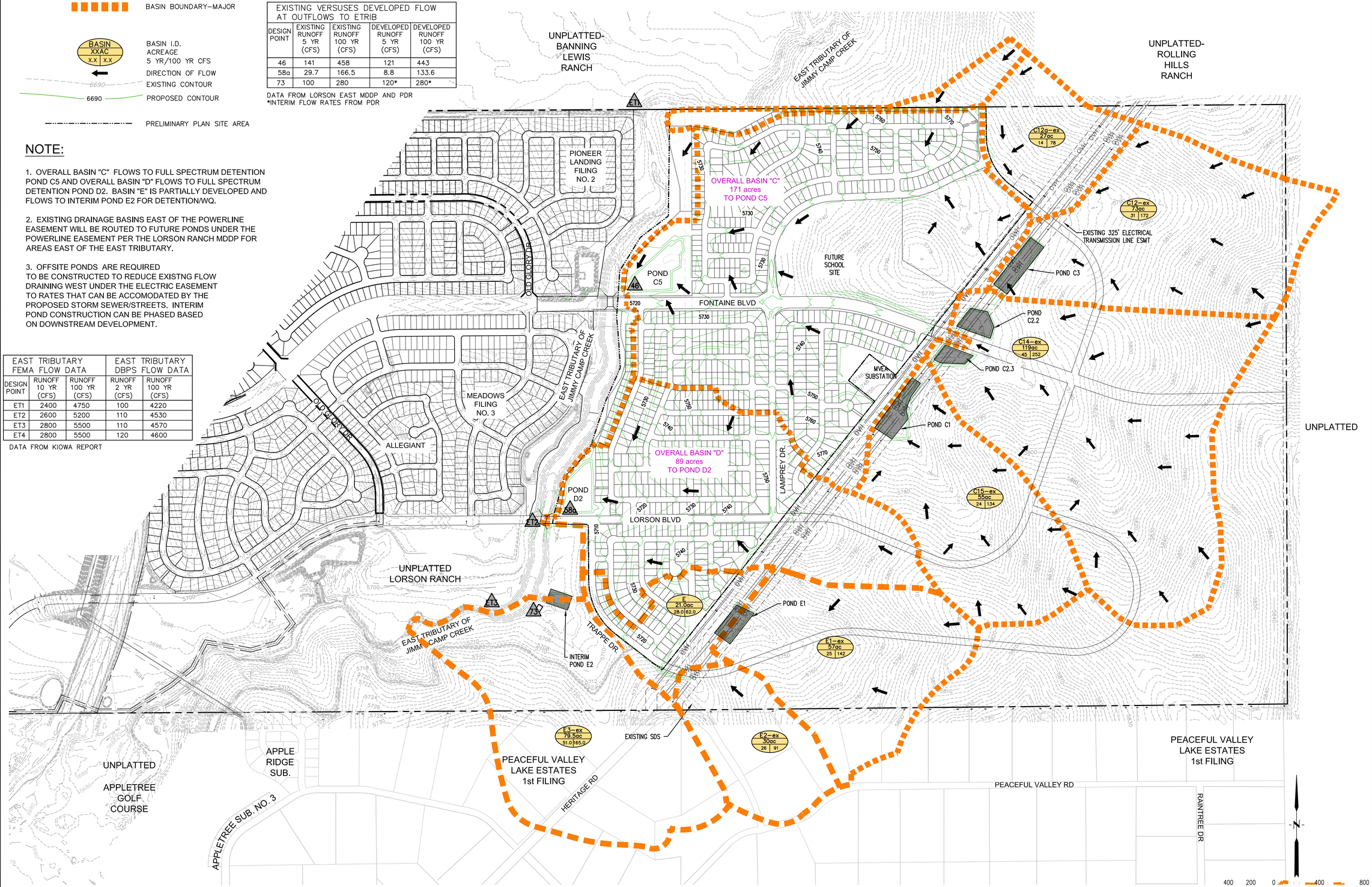
1. OVERALL BASIN "C" FLOWS TO FULL SPECTRUM DETENTION POND C5 AND OVERALL BASIN "D" FLOWS TO FULL SPECTRUM DETENTION POND D2. BASIN "E" IS PARTIALLY DEVELOPED AND FLOWS TO INTERIM POND E2 FOR DETENTION/WQ.

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



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DESCRIPTION | DATE | NO.

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

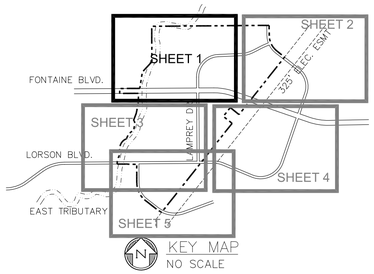
TOTAL SHEETS: 1

RUNOFF SUMMARY

DESIGN POINT	5 YEAR	100 YEAR	NOTES
1	9.4	21.0	FLOW IN SWALE
6a	6.61	24.87	STREET FLOW
6c	7.6	40.5	FLOW IN STM SWR TO SCHOOL
6b	6.8	20.2	STREET FLOW
7	0.3	0.6	STREET FLOW
8	6.2	25.2	STREET FLOW
9	75.68	105.3	FLOW IN STM SWR
10	6.0	12.5	STREET FLOW
10a	5.7	20.7	STREET FLOW
10b	3.2	6.9	STREET FLOW
10c	0.6	1.3	STREET FLOW
11	105.5	154.8	FLOW IN STM SWR
12	8.0	16.65	STREET FLOW
12a	8.78	18.28	STREET FLOW
13	8.35	25.48	STREET FLOW
14	1.1	14.44	STREET FLOW
15	25.69	39.15	FLOW IN STM SWR
16	12.8	57.3	STREET FLOW
17	3.9	31.6	STREET FLOW
18	147.9	230.8	STM SWR INTO POND C5
27	38.11	92.58	FLOW IN STM SWR
29	8.6	20.8	STREET FLOW
30	7.2	20.1	STREET FLOW
31	19.36	42.12	FLOW IN STM SWR
32	23.2	163.4	FLOW IN STM SWR
32a	56.8	252.9	FLOW IN STM SWR
33	8.2	26.3	STREET FLOW
34	0.9	8.0	STREET FLOW
34a	74.7	298.3	FLOW IN STM SWR
35	2.8	6.1	STREET FLOW
36	0.3	0.6	STREET FLOW
37	74.2	300.0	STM SWR INTO POND C5
40	12.9	39.4	STREET FLOW
41	2.0	19.3	STREET FLOW
42	3.2	7.2	STREET FLOW
43	27.33	65.94	STM SWR INTO POND C5
44	102.5	365.9	FLOW INTO POND C5 FROM SOUTH
45	167.5	519.1	TOTAL FLOW INTO POND C5
46	126.3	453.2	FLOW INTO EAST TRIBUTARY
47	7.8	13.9	STREET FLOW
48	8.9	16.0	STREET FLOW

LEGEND

- DRAINAGE MAJOR BASIN BOUNDARY
- DRAINAGE MINOR BASIN BOUNDARY (OFF-SITE)
- BASIN — BASIN I.D. / ACREAGE / 5 YR/100 YR CFS
- DIRECTION OF FLOW
- 6690 — EXISTING CONTOUR
- 6670 — PROPOSED CONTOUR
- HP — HIGH POINT
- LP — LOW POINT
- TIME OF CONCENTRATION
- 100-YR FLOODPLAIN (FEMA)
- SITE BOUNDARY
- REVISED 100-YR FLOODPLAIN PER KIOWA CLOMR
- ETRIB ACCESS ROAD PER KIOWA ETRIB CLOMR



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(719) 635-3200
CONTACT: JEFF MARK

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

NO. | DESCRIPTION | DATE

DRAWN: RLS
DESIGNED: LAB
CHECKED: LAB

DEVELOPED CONDITIONS DRAINAGE PLAN - NORTHWEST AREA LORSON RANCH EAST

DATE
OCTOBER 20, 2017

PROJECT NO.
100.040

SHEET NUMBER
1

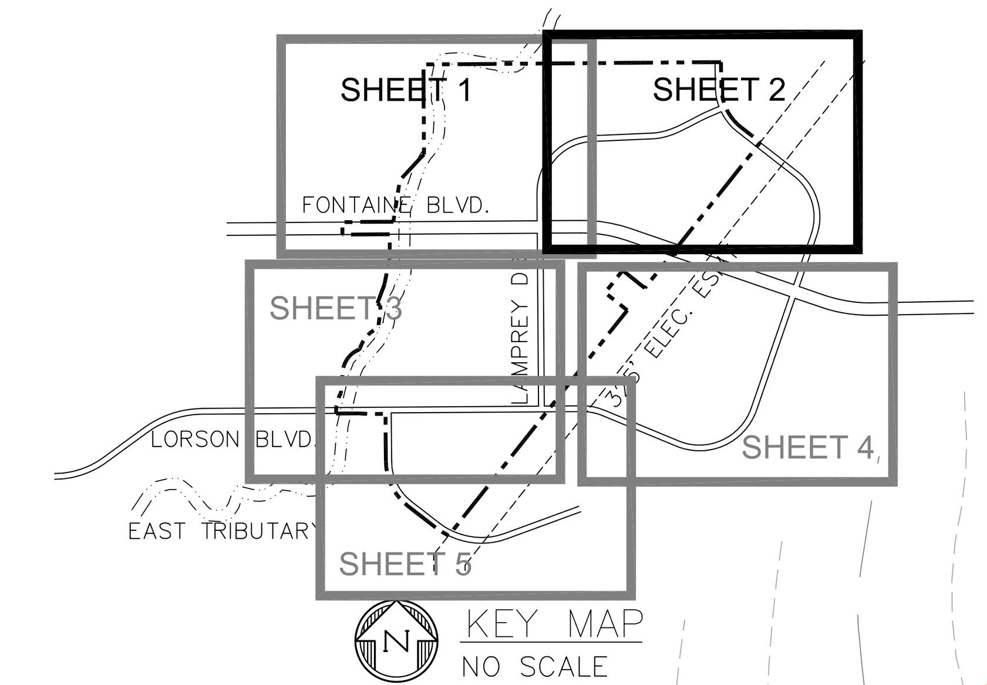
TOTAL SHEETS: 5

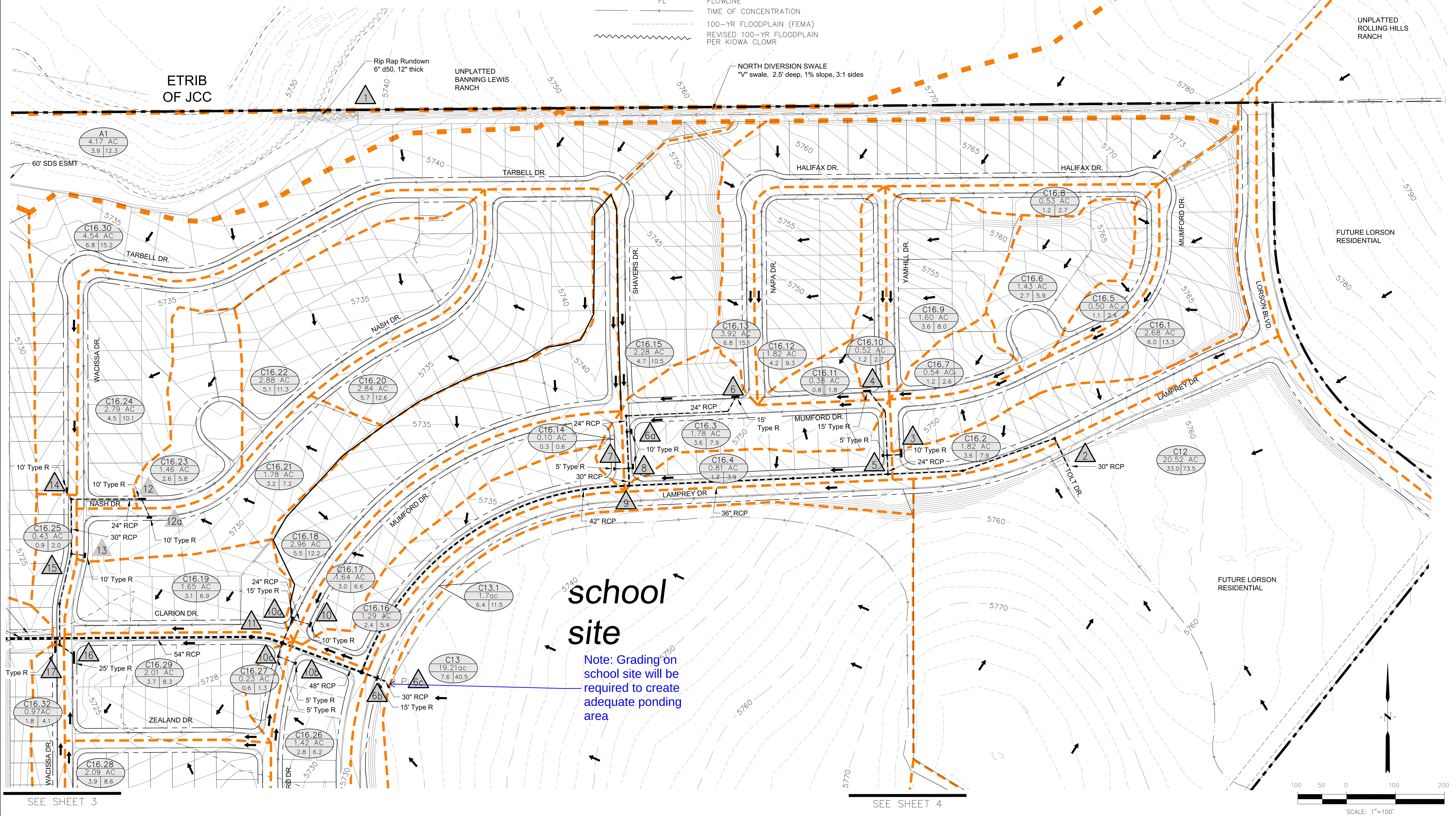
RUNOFF SUMMARY			
DESIGN POINT	5 YEAR	100 YEAR	NOTES
1	9.4	21.0	FLOW IN SWALE
2	33.0	40.5	FUTURE FLOW IN STM SWR
3	8.9	20.3	STREET FLOW
4	10.47	12.82	STREET FLOW
5	0.3	0.6	STREET FLOW
6	12.82	32.62	STREET FLOW
6a	6.61	24.87	STREET FLOW
6c	7.6	40.5	FLOW IN STM SWR TO SCHOOL
6b	6.8	20.2	STREET FLOW
7	0.3	0.6	STREET FLOW
8	6.2	25.2	STREET FLOW
9	75.68	105.3	FLOW IN STM SWR

RUNOFF SUMMARY			
DESIGN POINT	5 YEAR	100 YEAR	NOTES
10	6.0	12.5	STREET FLOW
10a	5.7	20.7	STREET FLOW
10b	3.2	6.9	STREET FLOW
10c	0.6	1.3	STREET FLOW
11	105.5	154.8	FLOW IN STM SWR
12	8.0	16.65	STREET FLOW
12a	8.78	18.28	STREET FLOW
13	8.35	25.48	STREET FLOW
14	1.1	14.44	STREET FLOW
15	25.69	39.15	FLOW IN STM SWR
16	12.8	57.3	STREET FLOW
17	3.9	31.6	STREET FLOW

LEGEND

- DRAINAGE MAJOR BASIN BOUNDARY
- DRAINAGE MINOR BASIN BOUNDARY (OFF-SITE)
- 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 PROPOSED CONTOUR
- HP HIGH POINT
- LP LOW POINT
- GB GRADE BREAK
- TC TOP BACK OF CURB
- FL FLOWLINE
- TIME OF CONCENTRATION
- 100-YR FLOODPLAIN (FEMA)
- REVISED 100-YR FLOODPLAIN PER KIOWA CLOMR





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CONTACT: JEFF MARK

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

DRAWN: RLS
DESIGNED: LAB
CHECKED: LAB

DEVELOPED CONDITIONS DRAINAGE PLAN - NORTHEAST AREA LORSON RANCH EAST

DATE: OCTOBER 20, 2017

PROJECT NO. 100.040

SHEET NUMBER 2

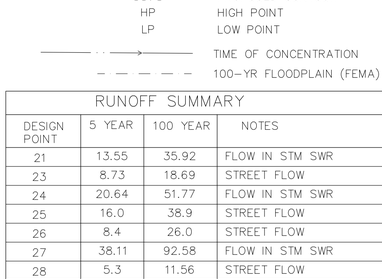
TOTAL SHEETS: 5

LEGEND

- DRAINAGE MAJOR BASIN BOUNDARY
- DRAINAGE MINOR BASIN BOUNDARY (OFF-SITE)
- SITE BOUNDARY
- BASIN I.D. / ACREAGE / 5 YR/100 YR CFS
- DIRECTION OF FLOW
- 6690 EXISTING CONTOUR
- 6670 PROPOSED CONTOUR
- HP HIGH POINT
- LP LOW POINT
- TIME OF CONCENTRATION
- 100-YR FLOODPLAIN (FEMA)

RUNOFF SUMMARY

DESIGN POINT	5 YEAR	100 YEAR	NOTES
21	13.55	35.92	FLOW IN STM SWR
23	8.73	18.69	STREET FLOW
24	20.64	51.77	FLOW IN STM SWR
25	16.0	38.9	STREET FLOW
26	8.4	26.0	STREET FLOW
27	38.11	92.58	FLOW IN STM SWR
28	5.3	11.56	STREET FLOW
29	8.6	20.8	STREET FLOW
30	7.2	20.1	STREET FLOW
31	19.36	42.12	FLOW IN STM SWR
32	23.2	163.4	FLOW IN STM SWR
32a	56.8	252.9	FLOW IN STM SWR
33	8.2	26.3	STREET FLOW
34	0.9	8.0	STREET FLOW
34a	74.7	298.3	FLOW IN STM SWR
35	2.8	6.1	STREET FLOW
36	0.3	0.6	STREET FLOW
37	74.2	300.0	STM SWR INTO POND C5
38	5.9	14.43	STREET FLOW
39	8.61	21.53	STREET FLOW
40	12.9	39.4	STREET FLOW
41	2.0	19.3	STREET FLOW
42	3.2	7.2	STREET FLOW
43	27.33	65.94	STM SWR INTO POND C5
44	102.5	365.9	FLOW INTO POND C5 FROM SOUTH
45	157.0	510.0	TOTAL FLOW INTO POND C5
52	15.44	34.7	STREET FLOW
53	14.65	41.47	STREET FLOW
54	7.0	15.5	STREET FLOW
55a	10.18	22.63	STREET FLOW
55	7.8	40.4	STREET FLOW
56	7.2	29.7	STREET FLOW
59a	2.2	4.8	STREET FLOW



SEE SHEET 1
SEE SHEET 2
SEE SHEET 4
SEE SHEET 5

Note: Construction and grading on school site will require right-of-way and easements.

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CONTACT: JEFF MARK

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

DRAWN: RLS
DESIGNED: LAB
CHECKED: LAB

DEVELOPED CONDITIONS DRAINAGE PLAN - MIDDLE WEST AREA LORSON RANCH EAST

DATE: OCTOBER 20, 2017
PROJECT NO.: 100.040
SHEET NUMBER: 3
TOTAL SHEETS: 5

SCALE: 1"=100'

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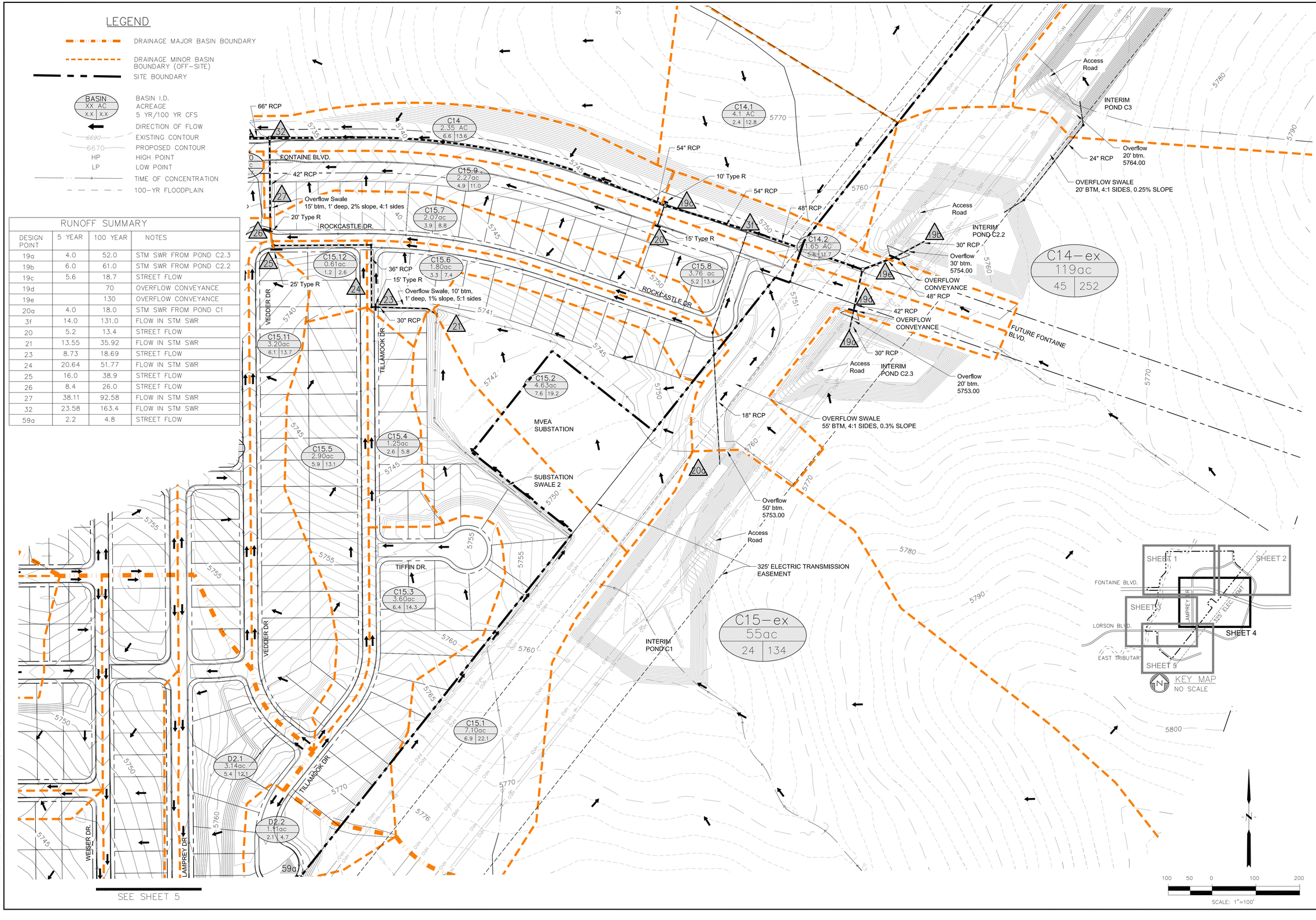
LEGEND

- DRAINAGE MAJOR BASIN BOUNDARY
- DRAINAGE MINOR BASIN BOUNDARY (OFF-SITE)
- SITE BOUNDARY
- BASIN I.D. / ACREAGE / 5 YR/100 YR CFS
- DIRECTION OF FLOW
- EXISTING CONTOUR
- PROPOSED CONTOUR
- HP HIGH POINT
- LP LOW POINT
- TIME OF CONCENTRATION
- 100-YR FLOODPLAIN

RUNOFF SUMMARY

DESIGN POINT	5 YEAR	100 YEAR	NOTES
19a	4.0	52.0	STM SWR FROM POND C2.3
19b	6.0	61.0	STM SWR FROM POND C2.2
19c	5.6	18.7	STREET FLOW
19d		70	OVERFLOW CONVEYANCE
19e		130	OVERFLOW CONVEYANCE
20a	4.0	18.0	STM SWR FROM POND C1
3f	14.0	131.0	FLOW IN STM SWR
20	5.2	13.4	STREET FLOW
21	13.55	35.92	FLOW IN STM SWR
23	8.73	18.69	STREET FLOW
24	20.64	51.77	FLOW IN STM SWR
25	16.0	38.9	STREET FLOW
26	8.4	26.0	STREET FLOW
27	38.11	92.58	FLOW IN STM SWR
32	23.58	163.4	FLOW IN STM SWR
59a	2.2	4.8	STREET FLOW



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212 N. WAHSATCH AVE., SUITE 301
COLORADO SPRINGS, COLORADO 80903
(719) 635-3200
CONTACT: JEFF MARK

NO.	DESCRIPTION	DATE

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

DRAWN: RLS
DESIGNED: LAB
CHECKED: LAB

DEVELOPED CONDITIONS DRAINAGE PLAN - EAST AREA LORSON RANCH EAST

DATE
OCTOBER 20, 2017

PROJECT NO.
100.040

SHEET NUMBER
4

TOTAL SHEETS: 5

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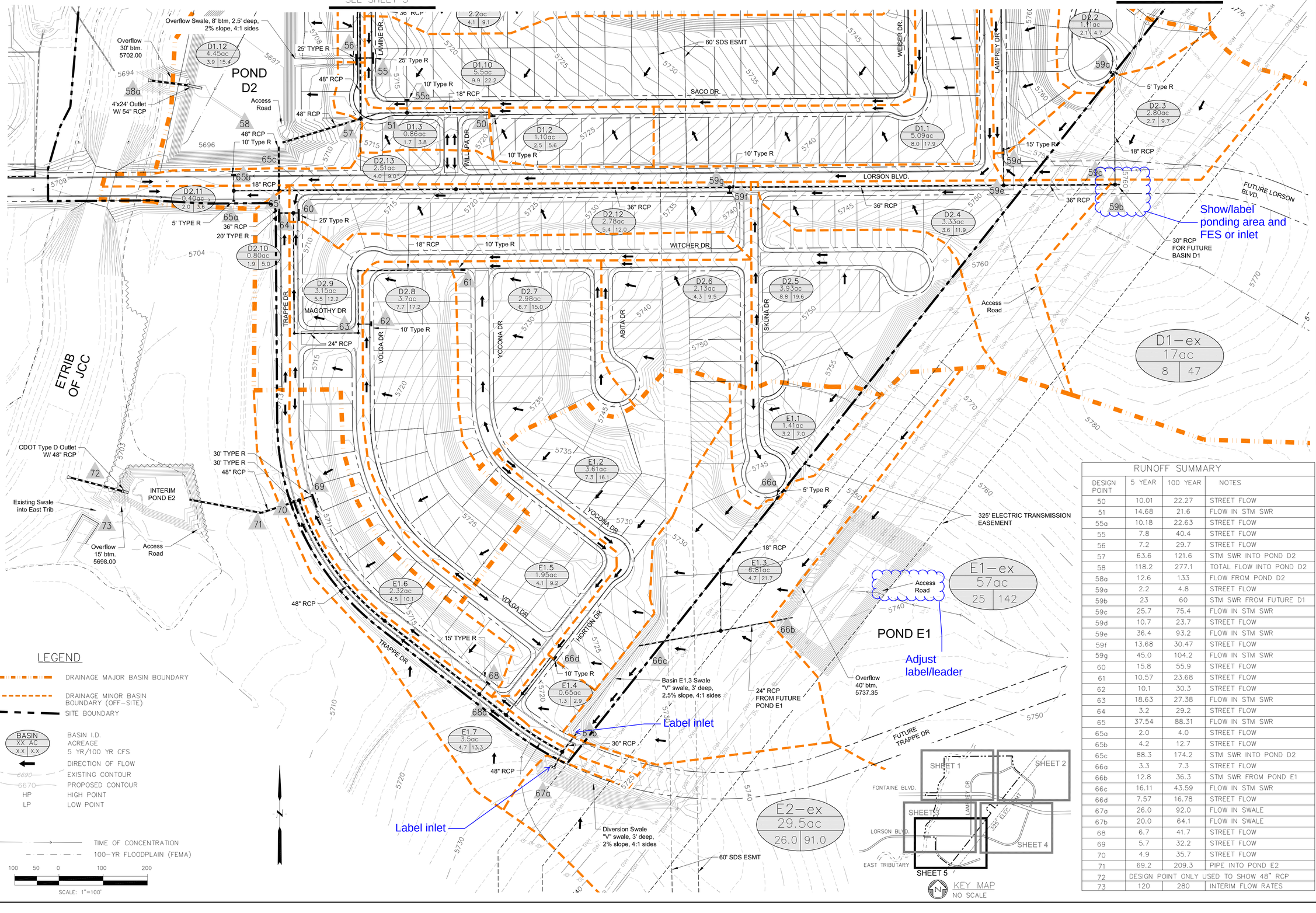

LEGEND

- DRAINAGE MAJOR BASIN BOUNDARY
- DRAINAGE MINOR BASIN BOUNDARY (OFF-SITE)
- SITE BOUNDARY
- BASIN I.D. / XX AC / X.X 5 YR/100 YR CFS
- DIRECTION OF FLOW
- 6690 EXISTING CONTOUR
- 6670 PROPOSED CONTOUR
- HP HIGH POINT
- LP LOW POINT
- TIME OF CONCENTRATION
- 100-YR FLOODPLAIN (FEMA)

100 50 0 100 200

SCALE: 1"=100'

RUNOFF SUMMARY

DESIGN POINT	5 YEAR	100 YEAR	NOTES
50	10.01	22.27	STREET FLOW
51	14.68	21.6	FLOW IN STM SWR
55a	10.18	22.63	STREET FLOW
55	7.8	40.4	STREET FLOW
56	7.2	29.7	STREET FLOW
57	63.6	121.6	STM SWR INTO POND D2
58	118.2	277.1	TOTAL FLOW INTO POND D2
58a	12.6	133	FLOW FROM POND D2
59a	2.2	4.8	STREET FLOW
59b	23	60	STM SWR FROM FUTURE D1
59c	25.7	75.4	FLOW IN STM SWR
59d	10.7	23.7	STREET FLOW
59e	36.4	93.2	FLOW IN STM SWR
59f	13.68	30.47	STREET FLOW
59g	45.0	104.2	FLOW IN STM SWR
60	15.8	55.9	STREET FLOW
61	10.57	23.68	STREET FLOW
62	10.1	30.3	STREET FLOW
63	18.63	27.38	FLOW IN STM SWR
64	3.2	29.2	STREET FLOW
65	37.54	88.31	FLOW IN STM SWR
65a	2.0	4.0	STREET FLOW
65b	4.2	12.7	STREET FLOW
65c	88.3	174.2	STM SWR INTO POND D2
66a	3.3	7.3	STREET FLOW
66b	12.8	36.3	STM SWR FROM POND E1
66c	16.11	43.59	FLOW IN STM SWR
66d	7.57	16.78	STREET FLOW
67a	26.0	92.0	FLOW IN SWALE
67b	20.0	64.1	FLOW IN SWALE
68	6.7	41.7	STREET FLOW
69	5.7	32.2	STREET FLOW
70	4.9	35.7	STREET FLOW
71	69.2	209.3	PIPE INTO POND E2
72	DESIGN POINT ONLY USED TO SHOW 48" RCP		
73	120	280	INTERIM FLOW RATES

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NO. | DESCRIPTION | DATE

PREPARED FOR:
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(719) 635-3200
CONTACT: JEFF MARK

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

DRAWN: RLS
DESIGNED: LAB
CHECKED: LAB

DEVELOPED CONDITIONS DRAINAGE PLAN - SOUTH AREA LORSON RANCH EAST

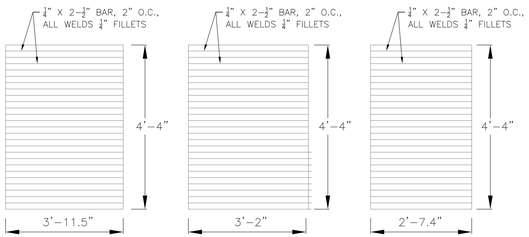
DATE
OCTOBER 20, 2017

PROJECT NO.
100.040

SHEET NUMBER
5

TOTAL SHEETS: 5

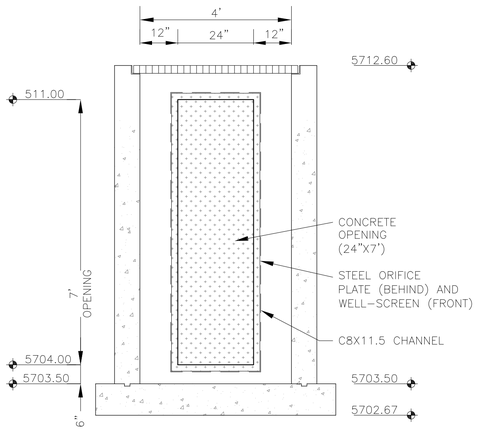
NOTE:
AFTER CONCRETE STRUCTURE HAS BEEN POURED
ALL GRATE DIMENSIONS SHALL BE FIELD VERIFIED
PRIOR TO GRATE CONSTRUCTION



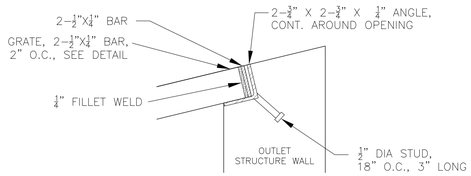
GRATE 1
NO SCALE

GRATES 2,3,4,5,6
NO SCALE

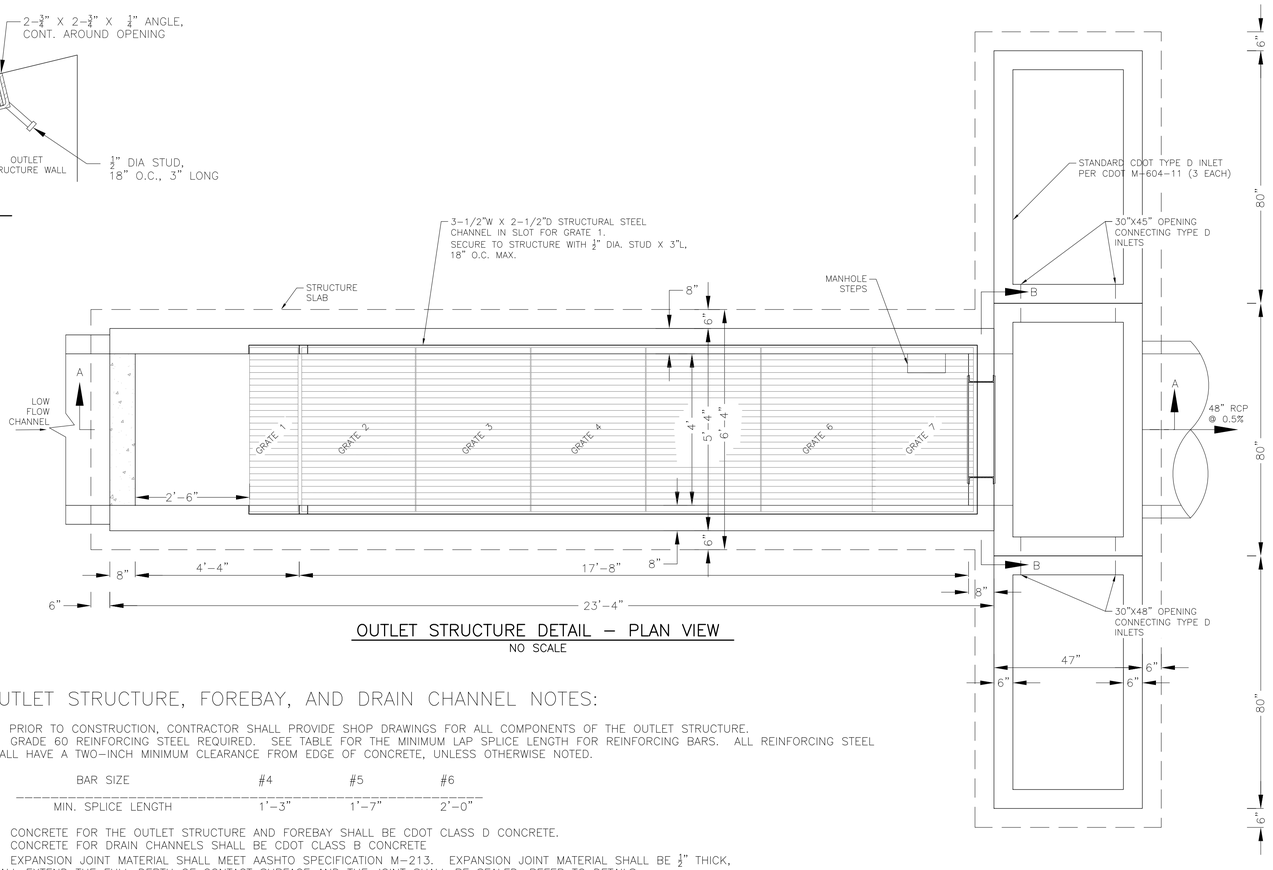
GRATE 7
NO SCALE



OUTLET STRUCTURE DETAIL – SECTION B–B
NO SCALE



DETAIL B
NO SCALE



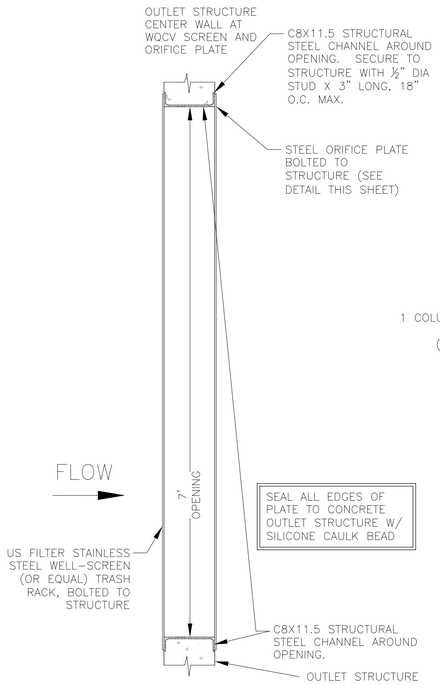
OUTLET STRUCTURE DETAIL – PLAN VIEW
NO SCALE

OUTLET STRUCTURE, FOREBAY, AND DRAIN CHANNEL NOTES:

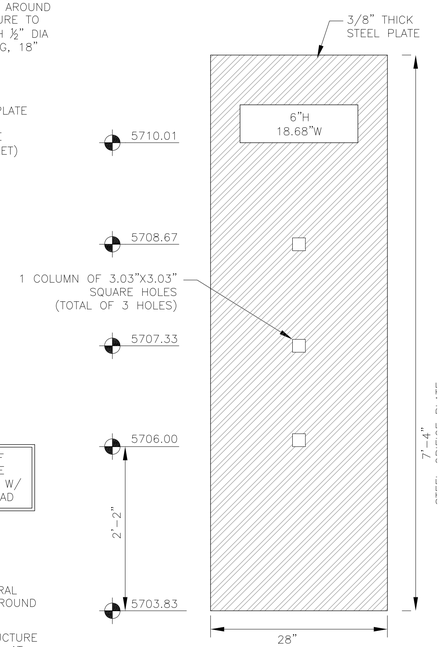
1. PRIOR TO CONSTRUCTION, CONTRACTOR SHALL PROVIDE SHOP DRAWINGS FOR ALL COMPONENTS OF THE OUTLET STRUCTURE.
2. GRADE 60 REINFORCING STEEL REQUIRED. SEE TABLE FOR THE MINIMUM LAP SPLICE LENGTH FOR REINFORCING BARS. ALL REINFORCING STEEL SHALL HAVE A TWO–INCH MINIMUM CLEARANCE FROM EDGE OF CONCRETE, UNLESS OTHERWISE NOTED.

BAR SIZE	#4	#5	#6
MIN. SPLICE LENGTH	1'–3"	1'–7"	2'–0"

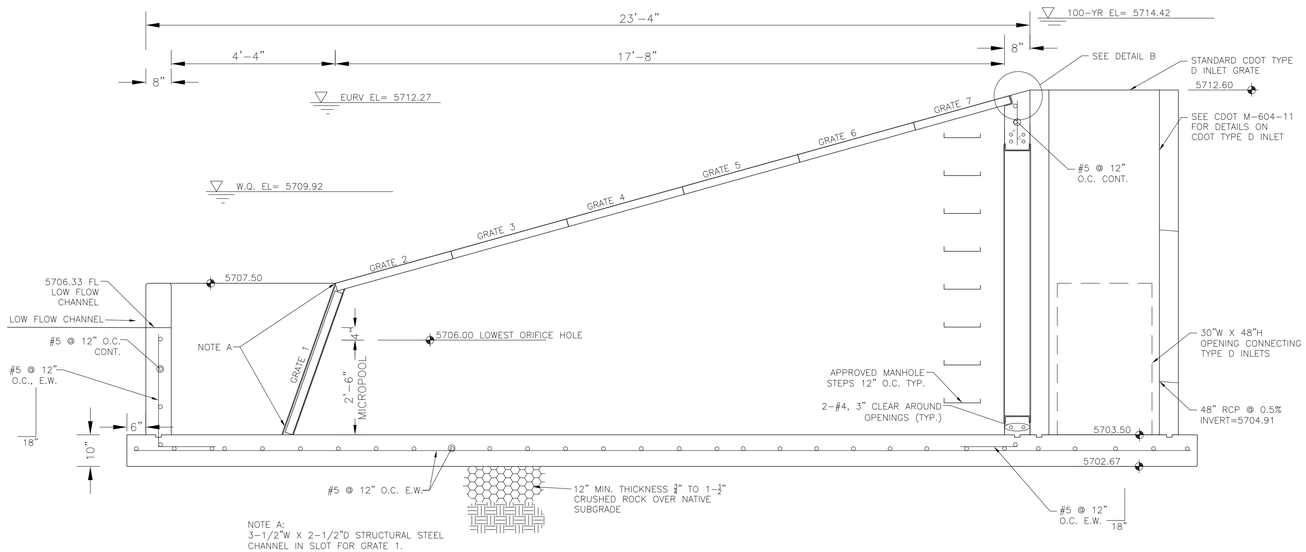
3. CONCRETE FOR THE OUTLET STRUCTURE AND FOREBAY SHALL BE CDOT CLASS D CONCRETE.
4. CONCRETE FOR DRAIN CHANNELS SHALL BE CDOT CLASS B CONCRETE
5. EXPANSION JOINT MATERIAL SHALL MEET AASHTO SPECIFICATION M–213. EXPANSION JOINT MATERIAL SHALL BE ½" THICK, SHALL EXTEND THE FULL DEPTH OF CONTACT SURFACE AND THE JOINT SHALL BE SEALED, REFER TO DETAILS.
6. ALL EXPOSED CONCRETE CORNERS SHALL HAVE A ¾" CHAMFER UNLESS OTHERWISE NOTED.
7. SUBGRADE TO BE 12" THICK CLEAN FILL COMPACTED TO 95% STANDARD PROCTOR DENSITY PER ASTM M698 UNDER STRUCTURE.
8. REFER TO SHEET XX FOR PRESEDIMENTATION/FOREBAY DESIGN.
9. ENGINEER SHALL BE NOTIFIED PRIOR TO BEGINNING CONSTRUCITON OF OUTLET STRUCTURE TO SCHEDULE OBSERVATION VISITS FOR STRUCTURES.



TRASH RACK DETAIL
NO SCALE



ORIFICE PLATE DETAIL
NO SCALE



NOTE A:
3–1/2"W X 2–1/2"D STRUCTURAL STEEL CHANNEL IN SLOT FOR GRATE 1. SECURE TO STRUCTURE WITH ½" DIA. STUD X 3"L, 18" O.C. MAX.

OUTLET STRUCTURE DETAIL – SECTION A–A
NO SCALE

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

NO.	DESCRIPTION	DATE

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

PROJECT:
LORSON RANCH EAST
LORSON BLVD – EAST TRIBUTARY
COLORADO SPRINGS, COLORADO

DRAWN: RLS
DESIGNED: RLS
CHECKED: RLS

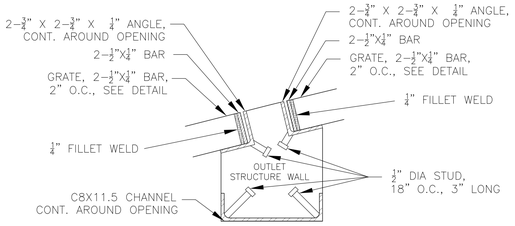
POND C5 (DISTRICT) FULL SPECTRUM OUTLET STRUCTURE DETAILS

DATE:
NOVEMBER, 2017

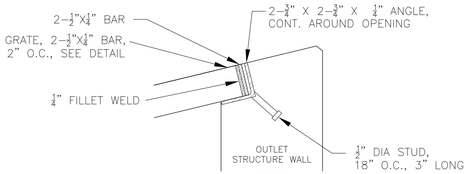
PROJECT NO.
100.002

SHEET NUMBER
X

TOTAL SHEETS: XX

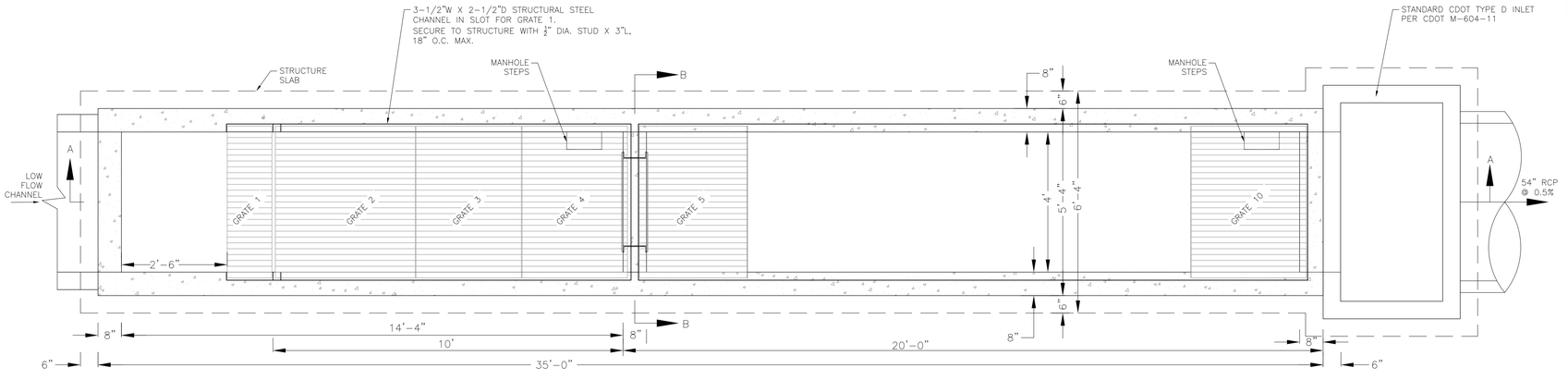


DETAIL A
NO SCALE

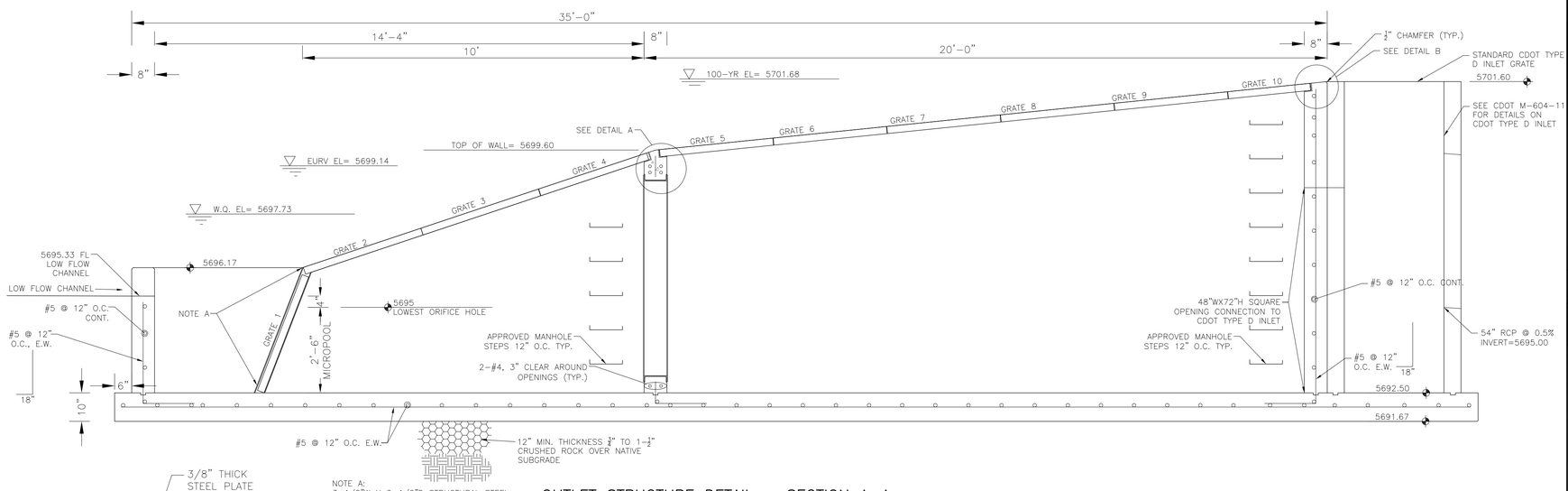


DETAIL B
NO SCALE

NOTE:
AFTER CONCRETE STRUCTURE HAS BEEN POURED
ALL GRATE DIMENSIONS SHALL BE FIELD VERIFIED
PRIOR TO GRATE CONSTRUCTION

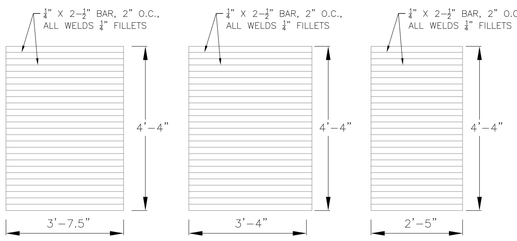


OUTLET STRUCTURE DETAIL – PLAN VIEW
NO SCALE



NOTE A:
3–1/2"W X 2–1/2"D STRUCTURAL STEEL CHANNEL IN SLOT FOR GRATE 1. SECURE TO STRUCTURE WITH ½" DIA. STUD X 3"L, 18" O.C. MAX.

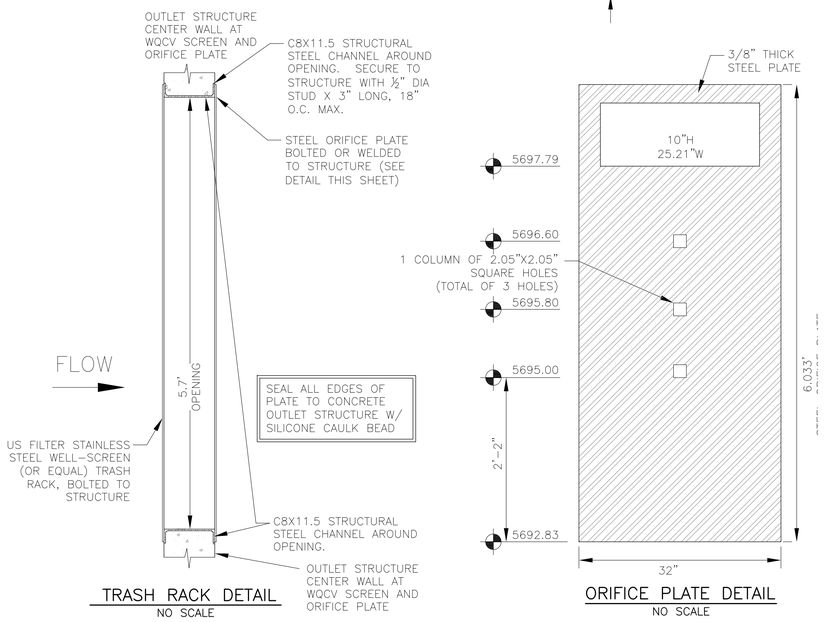
OUTLET STRUCTURE DETAIL – SECTION A–A
NO SCALE



GRATE 1,2,3
NO SCALE

GRATES 4,5,6,7,8,9
NO SCALE

GRATE 10
NO SCALE



TRASH RACK DETAIL
NO SCALE

ORIFICE PLATE DETAIL
NO SCALE

OUTLET STRUCTURE, FOREBAY, AND DRAIN CHANNEL NOTES:

1. PRIOR TO CONSTRUCTION, CONTRACTOR SHALL PROVIDE SHOP DRAWINGS FOR ALL COMPONENTS OF THE OUTLET STRUCTURE.

2. GRADE 60 REINFORCING STEEL REQUIRED. SEE TABLE FOR THE MINIMUM LAP SPLICE LENGTH FOR REINFORCING BARS. ALL REINFORCING STEEL SHALL HAVE A TWO–INCH MINIMUM CLEARANCE FROM EDGE OF CONCRETE, UNLESS OTHERWISE NOTED.

BAR SIZE	#4	#5	#6
MIN. SPLICE LENGTH	1'–3"	1'–7"	2'–0"

3. CONCRETE FOR THE OUTLET STRUCTURE AND FOREBAY SHALL BE CDOT CLASS D CONCRETE.

4. CONCRETE FOR DRAIN CHANNELS SHALL BE CDOT CLASS B CONCRETE

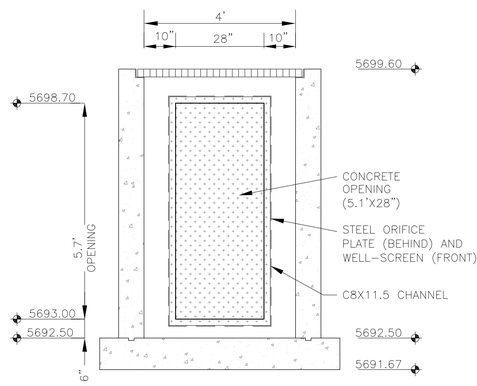
5. EXPANSION JOINT MATERIAL SHALL MEET AASHTO SPECIFICATION M–213. EXPANSION JOINT MATERIAL SHALL BE ½" THICK, SHALL EXTEND THE FULL DEPTH OF CONTACT SURFACE AND THE JOINT SHALL BE SEALED, REFER TO DETAILS.

6. ALL EXPOSED CONCRETE CORNERS SHALL HAVE A ¾" CHAMFER UNLESS OTHERWISE NOTED.

7. SUBGRADE TO BE 12" THICK CLEAN FILL COMPACTED TO 95% STANDARD PROCTOR DENSITY PER ASTM M698 UNDER STRUCTURE.

8. REFER TO SHEET XX FOR PRESEDIMENTATION/FOREBAY DESIGN.

9. ENGINEER SHALL BE NOTIFIED PRIOR TO BEGINNING CONSTRUCITON OF OUTLET STRUCTURE TO SCHEDULE OBSERVATION VISITS FOR STRUCTURES.



OUTLET STRUCTURE DETAIL – SECTION B–B
NO SCALE

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

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

NO.	DESCRIPTION	DATE

PROJECT:
LORSON RANCH EAST
LORSON BLVD – EAST TRIBUTARY
COLORADO SPRINGS, COLORADO

DRAWN: RLS
DESIGNED: RLS
CHECKED: RLS

POND D2 (DISTRICT)
FULL SPECTRUM
OUTLET STRUCTURE DETAILS

DATE:
NOVEMBER, 2017

PROJECT NO.
100.002

SHEET NUMBER
X

TOTAL SHEETS: XX

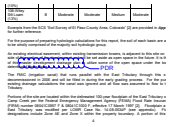
Markup Summary

12/14/2017 3:28:23 PM (1)

Subject: Cloud+
Page Label: 5
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 12/14/2017 3:28:23 PM
Color:

Move to Developed Conditions section.

12/14/2017 3:29:41 PM (1)



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Page Label: 6
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Author: dsdrice
Date: 12/14/2017 3:29:41 PM
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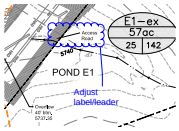
PDR

12/15/2017 11:25:33 AM (1)



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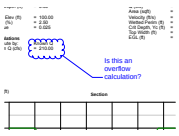
Author: dsdrice
Date: 12/15/2017 11:25:33 AM
Color:

Adjust label/leader

12/15/2017 11:29:00 AM (1)



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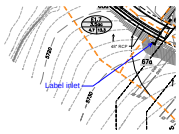
Checkmark: Unchecked
Author: dsdrice
Date: 12/15/2017 11:29:00 AM
Color:

Is this an overflow calculation?

12/15/2017 11:34:21 AM (1)



Subject: Callout
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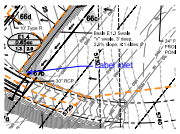
Author: dsdrice
Date: 12/15/2017 11:34:21 AM
Color:

Label inlet

12/15/2017 11:34:48 AM (1)



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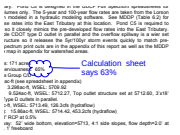
Author: dsdrice
Date: 12/15/2017 11:34:48 AM
Color:

Label inlet

12/15/2017 11:42:23 AM (1)



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Author: dsdrice
Date: 12/15/2017 11:42:23 AM
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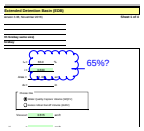
Calculation sheet says 63%

12/15/2017 11:49:24 AM (1)



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Page Label: 106
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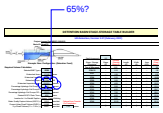
Author: dsdrice
Date: 12/15/2017 11:49:24 AM
Color:

65%?

12/15/2017 11:50:24 AM (1)



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Page Label: 109
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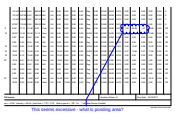
Author: dsdrice
Date: 12/15/2017 11:50:24 AM
Color:

65%?

12/15/2017 11:59:25 AM (1)



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Page Label: 131
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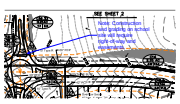
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 12/15/2017 11:59:25 AM
Color:

This seems excessive - what is ponding area?

12/15/2017 2:02:14 PM (1)



Subject: Callout
Page Label: 220
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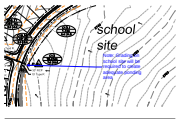
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 12/15/2017 2:02:14 PM
Color:

Note: Construction and grading on school site will require right-of-way and easements.

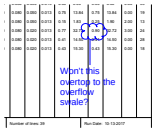
12/15/2017 2:21:14 PM (1)



Subject: Callout
Page Label: 219
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 12/15/2017 2:21:14 PM
Color:

Note: Grading on school site will be required to create adequate ponding area

12/15/2017 2:23:32 PM (1)



Subject: Cloud+
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Checkmark: Unchecked
Author: dsdrice
Date: 12/15/2017 2:23:32 PM
Color:

Won't this overtop to the overflow swale?

12/15/2017 2:24:07 PM (1)

Subject: Highlight
Page Label: 141
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 12/15/2017 2:24:07 PM
Color:

12/15/2017 2:24:40 PM (1)

Subject: Highlight
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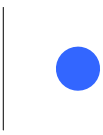
Author: dsdrice
Date: 12/15/2017 2:24:40 PM
Color:

12/15/2017 2:29:55 PM (1)

Subject: Cloud+
Page Label: 143
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 12/15/2017 2:29:55 PM
Color:

Per ECM 3.3.1.C, minor storm not to cause surcharge

12/15/2017 2:30:17 PM (1)



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Page Label: 143
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Author: dsdrice
Date: 12/15/2017 2:30:17 PM
Color:

12/15/2017 2:30:21 PM (1)

Subject: Highlight
Page Label: 143
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Date: 12/15/2017 2:30:21 PM
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12/15/2017 2:30:22 PM (1)

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Date: 12/15/2017 2:30:22 PM
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12/15/2017 2:30:24 PM (1)

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Date: 12/15/2017 2:30:24 PM
Color:

12/15/2017 2:30:28 PM (1)

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Date: 12/15/2017 2:30:28 PM
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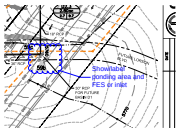
12/15/2017 2:41:24 PM (1)



Subject: Cloud+
Page Label: 222
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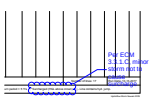
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 12/15/2017 2:41:24 PM
Color:

Show/label ponding area and FES or inlet

12/15/2017 2:42:23 PM (1)



Subject: Cloud+
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Author: dsdrice
Date: 12/15/2017 2:42:23 PM
Color:

Per ECM 3.3.1.C, minor storm not to cause surcharge

12/15/2017 2:42:33 PM (1)

Subject: Highlight
Page Label: 151
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Status:
Checkmark: Unchecked
Author: dsdrice
Date: 12/15/2017 2:42:33 PM
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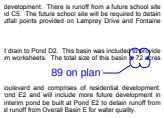
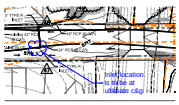
12/15/2017 8:50:40 AM (1)



Subject: Cloud+
Page Label: 8
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 12/15/2017 8:50:40 AM
Color:

89 on plan

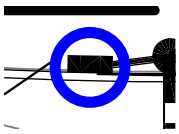
12/15/2017 9:37:39 AM (1)



Subject: Cloud+
Page Label: 218
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 12/15/2017 9:37:39 AM
Color:

Inlet location is to be at ultimate c&g

12/15/2017 9:39:01 AM (1)



Subject: Ellipse
Page Label: 218
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 12/15/2017 9:39:01 AM
Color:

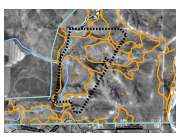
Move to ultimate curb location

12/15/2017 9:43:46 AM (1)

Subject: Text Box
Page Label: 50
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 12/15/2017 9:43:46 AM
Color:

Add statement that the inlets in Fontaine Blvd. will be constructed at the ultimate 4-lane curb locations and elevations so that reconstruction of the inlets will not be necessary when Fontaine is widened.

6/23/2017 9:14:23 AM (1)



Subject: Polygonal Line
Page Label: 61
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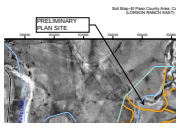
Checkmark: Unchecked
Author: RSchindler
Date: 6/23/2017 9:14:23 AM
Color:

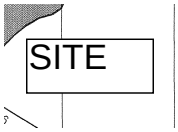
6/28/2017 8:47:40 AM (1)



Subject: Callout
Page Label: 61
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: RSchindler
Date: 6/28/2017 8:47:40 AM
Color:

PRELIMINARY PLAN SITE

6/28/2017 8:48:07 AM (1)



Subject: Text Box
Page Label: 64
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: RSchindler
Date: 6/28/2017 8:48:07 AM
Color:

SITE

6/28/2017 8:48:13 AM (1)

Subject: Polygonal Line
Page Label: 64
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: RSchindler
Date: 6/28/2017 8:48:13 AM
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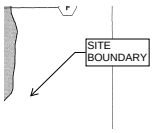

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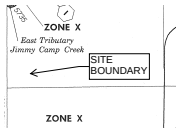

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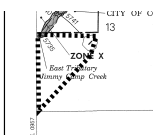

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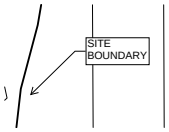

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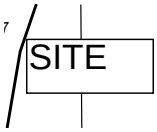

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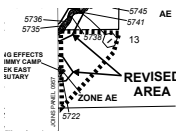

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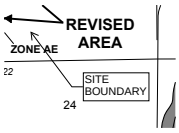

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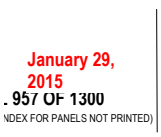
9/16/2014 1:47:49 PM (2)



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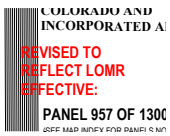
January 29, 2015



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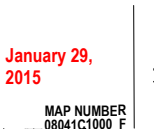

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