FINAL DRAINAGE PLAN

FONTAINE BOULEVARD AND LAMPREY DRIVE

DECEMBER 20, 2017
REVISED FEBRUARY 28, 2018

Prepared for:

Lorson, LLC
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Project No. 100.041

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

Fontaine Boulevard and Lamprey Drive will serve as the main access points for Lorson Ranch East subdivision. 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.

Fontaine Boulevard will be constructed from Old Glory Drive east 3,500 feet to the 325' electrical line easement. Lamprey Drive will be constructed from Fontaine Boulevard north and east 2,100 feet. Both of these streets will include a trunk line storm sewer system that will serve Lorson Ranch East and the remaining development in Lorson Ranch East of the 325' electric line easement.

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 & PDR by Core Engineering Group

Core Engineering Group has submitted a MDDP for Lorson East which covers this drainage area and the East Tributary. This FDR conforms to the MDDP and PDR for Lorson East and is referenced in this report. The major infrastructure to be constructed in this FDR site includes the East Tributary reconstruction north of Fontaine Boulevard (Kiowa report), bridge over the East Tributary at Fontaine Blvd (Kiowa report), storm sewer in Fontaine Boulevard and Lamprey Drive, 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 as a separate submittal items. 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 is required for Lorson Ranch East. Detention ponds have been graded in the early grading plans for Lorson Ranch East including the overflows and outlet pipes. The first final plat in Lorson East will finalize the trickle channels, forebays, and outlet structures including construction drawings and final drainage calculations. Fontaine Boulevard will start construction of wet utilities and storm sewer prior to approval of the first final drainage report for Lorson Ranch East final plat. This scenario is okay since the pond functions as a sediment basin. The FDR with the final pond design should be approved before paving begins and the full spectrum outlet, trickle channels, and forebays are required.

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.

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.

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 drainage report to utilize some of the open space under the towers for detention of storm flows.

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.

<u>Basin EX-A1</u>
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.

<u>Overall Basin EX-C flows to Design Point 2</u>
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. The storm sewer infrastructure in Fontaine Boulevard and Lamprey Drive will serve this basin.

<u>Existing flow at Design Pt. 18</u>
This condition will occur after the 66” storm sewer from Pond C5 is constructed east to the future Wacissa Drive terminating in a temporary sediment basin and 84” RCP standpipe. This condition will exist until the adjacent residential areas are developed. The 66” storm sewer will accept existing runoff from the NE from Basin EX3 (158ac). The existing 100year flow is estimated to be 210cfs. The capacity of the 66” storm sewer is 230cfs in the future conditions. The headwater elevation of the 210cfs is calculated to be 2.0’ above the standpipe at an elevation of 5721 and the top of the sediment basin is at an elevation of 5722.

<u>Existing flow at Design Pt. 27</u>
This condition will occur after the 42” storm sewer from Fontaine Boulevard is constructed south to Design Point 27. The 42” storm sewer will collect runoff from a temporary swale at Design Point 27. This condition will exist until the adjacent residential areas are developed. The 42” storm sewer will accept existing runoff from the SE from Basin EX2 (80ac). The existing 100year flow is estimated to be 110cfs which does not exceed the capacity of the 42” storm sewer. The headwater depth of the culvert is at an elevation of 5732.68 and the existing ground is at elevation 5733.70.

<u>Existing flow at Design Pt. 3f</u>
This condition will occur after the 54” storm sewer in Fontaine Boulevard is constructed. The 54” storm sewer will collect runoff from a temporary swale at Design Point 3f. This condition will exist until development in Phase 2 of Lorson Ranch East constructs the ponds under the electric line. The 54” storm sewer will accept existing runoff from the SE from Basin EX1 (120ac). The existing 100year flow is estimated to be 178cfs which does not exceed the capacity of the 54” storm sewer which is 200cfs in the future conditions. The headwater depth of the culvert is at an elevation of 5748.55 and the existing ground is at elevation 5752.00

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.

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 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 for residential areas and final design for areas directly tributary to Fontaine Boulevard and Lamprey Drive. The tributary residential areas will be finalized when the final plats 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.

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.

<u>Basin C15.9</u>
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.

<u>Basin C15.10</u>
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.

<u>Basin C15.11</u>
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.

<u>Basin C15.12</u>
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.

<u>Basin C15.13</u>
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.

<u>Basin C15.14</u>
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.

<u>Basin C15.15</u>
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.

<u>Basin C16.1</u>
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.

<u>Basin C16.2</u>

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
Basin C16.14 consists of residential development located north of Shavers Drive and Lamprey Drive. Runoff is directed southwest in curb/gutter in Mumford Drive to Design Point 10 to a proposed Type “R” inlet at Clarion/Mumford Drive. See the appendix for detailed calculations.

Basin C16.15
text missing?
Basin C16.15 consists of residential develShavers Drive to Design Point 6a 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/Clarion/Mumford Drives to a proposed Type “R” inlet at the NE corner of Mumford/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 C16.24

Basins C16.24 consists of residential development located on Tarbell and Wacissa Drive. Runoff is directed south in curb/gutter in Wacissa Drive to Design Point 13 to a proposed Type “R” inlet in Wacissa 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.

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)

It is the intent of this report to construct inlets on Fontaine Boulevard located at the ultimate 4-lane curb location so reconstruction of inlets will not be necessary when Fontaine is widened. This condition occurs at Design Points 19c, 29, 42, and 47. See the respective design points for flows.

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

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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 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 DP10b, DP10c, then to 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: 20.2cfs **Total Street Flow:** 27.1cfs (20.2+ 6.9cfs)

Flow Intercepted: 6.9cfs **Flow Bypassed:** 20.2cfs to DP10c

Inlet Size: 5' type R, sump

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

This inlet capacity is limited by the capacity of the 18" storm sewer that connects to the inlet. The 100-year HGL is above the top of the pipe with a pipe capacity is 6.9cfs which is lower than the inlet capacity of a 5' type R inlet with a free flowing outlet. Therefore, we used the pipe capacity for the flow intercepted by the inlet. The remaining flow will flow downstream to Inlet DP-10c

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: 20.2cfs | **Total Street Flow:** 21.5cfs (20.2+ 1.3cfs)

Flow Intercepted: 1.3cfs | **Flow Bypassed:** 20.2cfs to DP16
Inlet Size: 5' type R, sump

Street Capacity: Street slope = 0.7%, capacity = 31.2cfs (half street) is okay
This inlet capacity is limited by the capacity of the downstream 24" storm sewer that connects to the inlet. The 100-year HGL is above the top of the pipe which translates to a pipe capacity of 8.2cfs which is lower than the inlet capacity of a 5' type R inlet with a free flowing outlet. The pipe capacity is determined by the HGL of the downstream 54" storm sewer at Design Point 11. Therefore, we used 1.3cfs for the flow intercepted by the inlet. The remaining flow will flow overland downstream to Inlet DP-16.

Design Point 11

Design Point 11 is located at the west 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 east 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: 3.2cfs **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.

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 is one permanent full spectrum pond (Pond C5) that serves Fontaine Boulevard and Lamprey Drive in Lorson Ranch East. Pond C5 incorporates storm water quality features and complies with the Lorson Ranch East MDDP and PDR. In the future several detention ponds are proposed under the electric transmission line easement to be constructed in Phase 2 of Lorson Ranch East. 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 Pond C5 are included in this report and are taken from the PDR for Lorson Ranch East. The pond was graded in the Early Grading for Phase 1 of Lorson Ranch East which also included construction of the emergency overflow and the outlet pipe into the East Tributary. Excerpts from the Early Grading plan are included in Appendix . The Pond C5 design of the trickle channel, forebays, and outlet structure will be finalized in the first plat for Lorson Ranch East.

- Watershed Ares: 171 acres
- Watershed Imperviousness: 63%
- 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
- 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			

Pond B1 was constructed in Pioneer Landing Filing No. 2 in July, 2016 and is located west of the East Tributary of JCC just north of Fontaine Boulevard. Pond B1 included detention and WQ provisions for Fontaine Boulevard construction from Old Glory Drive east to the high point at the bridge over the East Tributary. Construction of Fontaine Boulevard in area is contained in drainage basins C17.9 and C17.10. See Appendix I for the WQ and detention calculations for Pond B1 taken from the approved final drainage report for Pioneer Landing Filing No. 2.

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

This section will discuss Phase 2 detention ponds located at the midpoint of the "C" basin. Additional discussion of how Phase 2 ponds affect flow rates at three main design points (DP46) 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.

<u>Phase 2 Pond Construction Requirements</u>
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.

<u>Detention Pond C1</u>
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'

<u>Detention Pond C2.2</u>

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'

<u>Detention Pond C2.3</u>

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

<u>Detention Pond C3</u>

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

<u>Interim Flows at Design Point 46</u>

Design Point 46 is located downstream of Pond C5 next to the East Tributary. The future developed flows from Pond C5 is 126.0cfs/453.0cfs 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 interim 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.

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 200cfs which is the future rate determined by the MDDP for an emergency overflow event from Ponds C2.2 and C2.3. In the future 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 pond flows (200cfs) along Fontaine Boulevard resulting in a sewer sized for the on-site 100-year flows plus additional capacity for the emergency conveyance/pond outflows. The construction plans for the storm sewer on Fontaine Boulevard will include a HGL and flow rates for the overflow conveyance event (Q100+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. There are no drainage/bridge fees associated with this FDR because we are not platting land with this construction plan set.

8.0 FOUR STEP PROCESS

This FDR study area contains runoff from Fontaine Boulevard and Lamprey Drive and is the backbone of the storm sewer system for 171 acres of residential development known as Lorson Ranch East. Therefore, we incorporated the residential areas into the four step process discussion and implementation. The site has been developed to minimize wherever possible the rate of developed runoff that will leave the site and to provide water quality management for the runoff produced by the site as proposed on the development plan. The following four step process should be considered and incorporated into the storm water collection system and storage facilities where applicable.

<u>Step 1: Employ Runoff Reduction Practices</u>
Lorson Ranch East has employed several methods of reducing runoff.

- The street configuration was laid out to minimize the length of streets. Many streets are straight and perpendicular resulting in lots with less wasted space.
- East Tributary of Jimmy Camp Creek with a natural sand bottom and vegetated slopes has been preserved through this site

- Lots on the west side of the site discharge runoff westward over an open space buffer prior to discharge into the creek
- A buffer tract has been added along the SDS watermain easement which reduces impervious areas
- Construct Full Spectrum Detention Pond C5. The full spectrum detention mimics existing storm discharges

Step 3

Step 2: Implement BMP's that Slowly Release the Water Quality Capture Volume

Treatment and slow release of the water quality capture volume (WQCV) is required. Lorson Ranch East Filing will construct a full spectrum stormwater detention pond which includes Water Quality Volumes and a WQ outlet structure.

Step 2

Step 3: Stabilize Drainageways

East Tributary of Jimmy Camp Creek is a major drainageway located within this site. In 2014 the East Tributary of JCC was reconstructed and stabilized per county criteria. The design included a natural sand bottom and armored sides.

Step 4: Implement Site Specific & Source Control BMP's

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

Consider Need for Industrial and Commercial BMPs (this is not construction BMPs)

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:

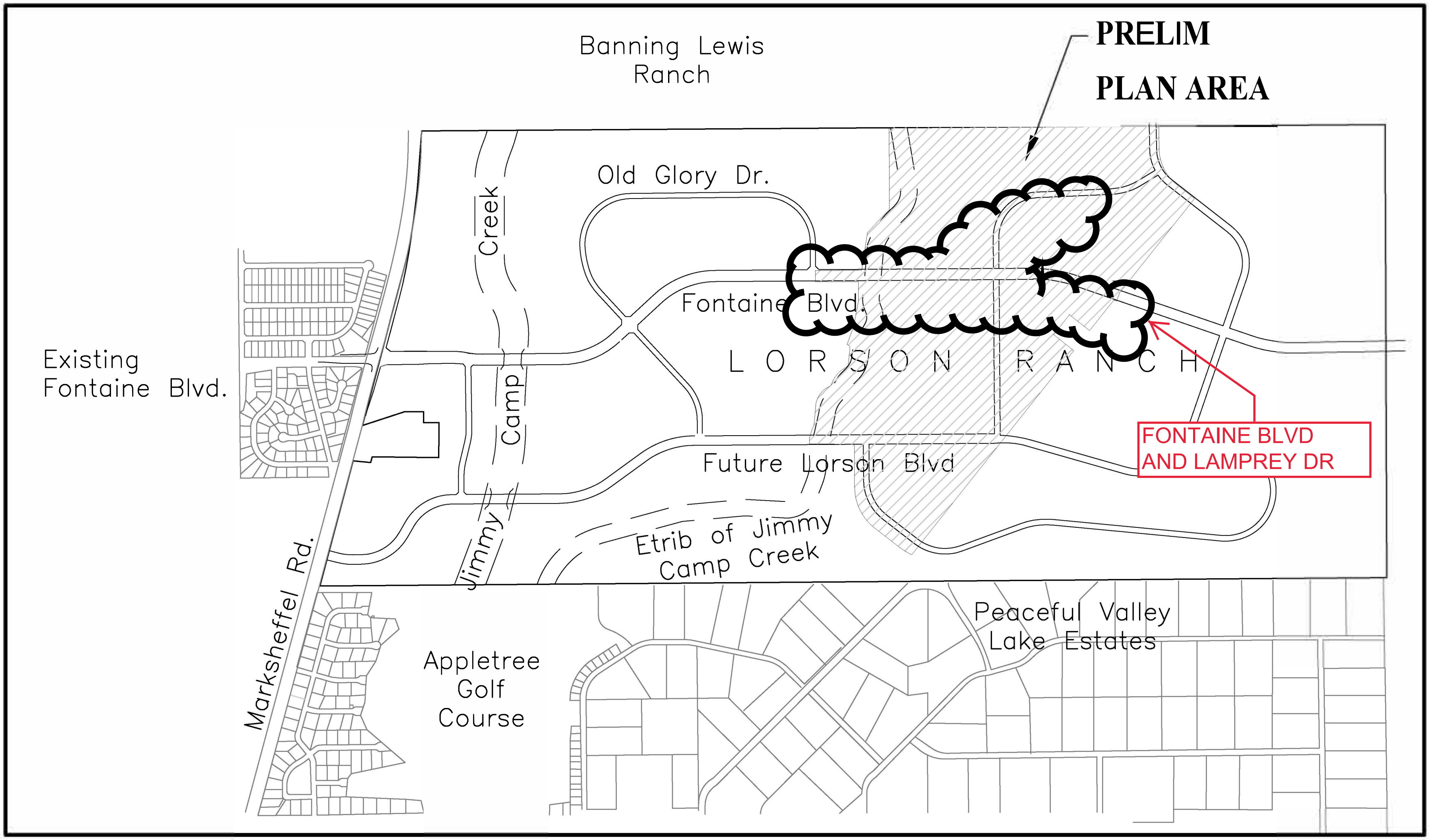
- Developed runoff will be conveyed via curb/gutter and storm sewer facilities
- The East Tributary of Jimmy Camp Creek will be reconstructed within this study area north of Fontaine Boulevard.
- A bridge over the East Tributary will be required at Fontaine Boulevard
- Detention and water quality for this study area will be provided in one permanent 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
11. Preliminary Drainage Report for Lorson Ranch East, PUDSP-16-003, Dated December 18,2017 prepared by Core Engineering Group

APPENDIX A – VICINTIY MAP, SOILS MAP, FEMA MAP



VICINITY MAP
NO SCALE

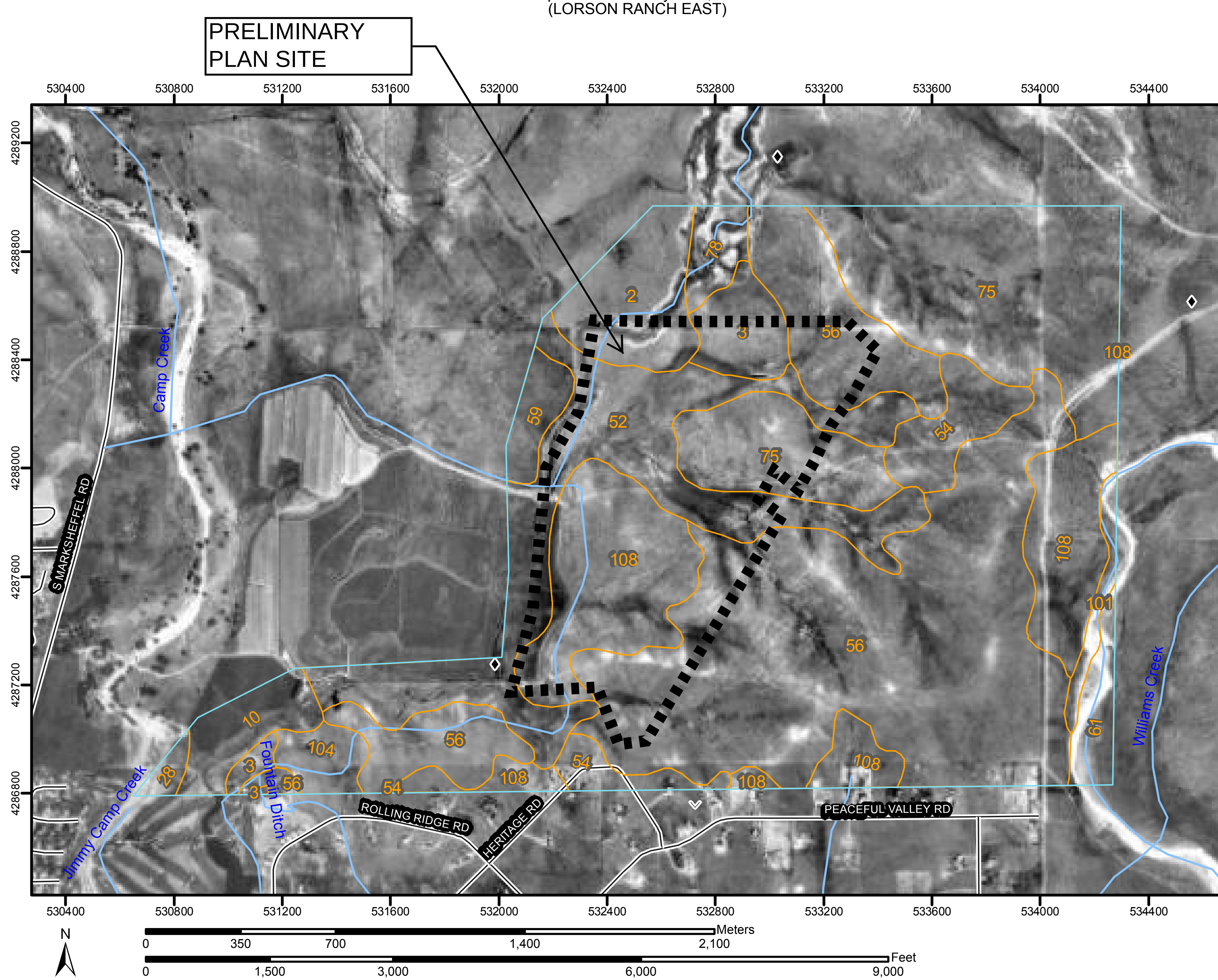
CORE
ENGINEERING GROUP

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

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

LORSON RANCH EAST
VICINITY MAP

SCALE:	DATE:	FIGURE NO.
NTS	JUNE 30, 2017	--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PLAN SITE
530400
530800
531200
531600
532000
532400
532800
533200
533600
534000
534400
4289200
4288800
4288400
4288000
4287600
4287200
4286800
Camp Creek
S MARKSHEFFEL RD
Jimmy Camp Creek
Fountain Ditch
ROLLING RIDGE RD
HERITAGE RD
PEACEFUL VALLEY RD
Williams Creek
2
3
78
56
75
108
59
52
54
101
61
10
28
104
N
Meters
0
350
700
1,400
2,100
Feet
0
1,500
3,000
6,000
9,000

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.

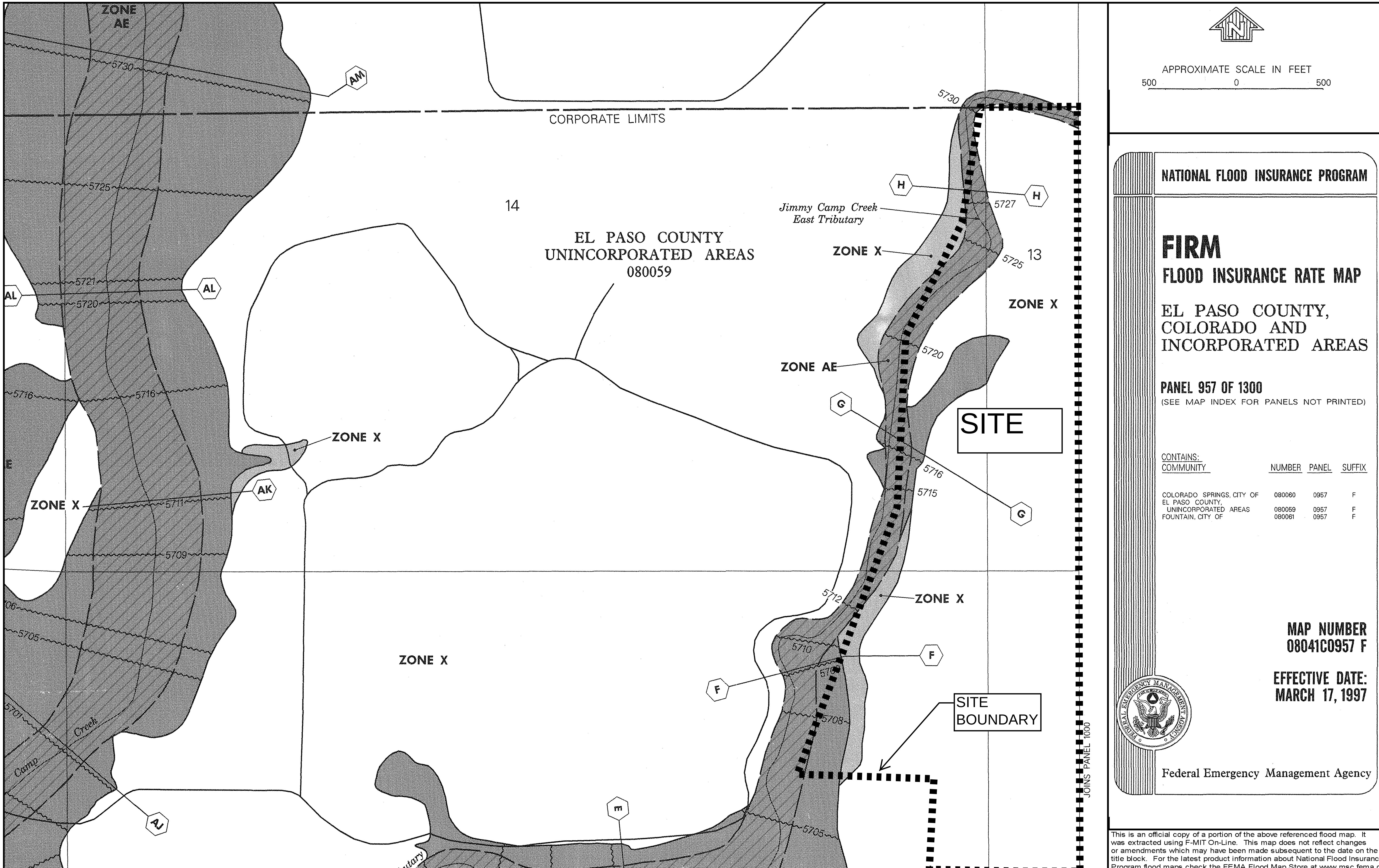
Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 5, Jan 15, 2008

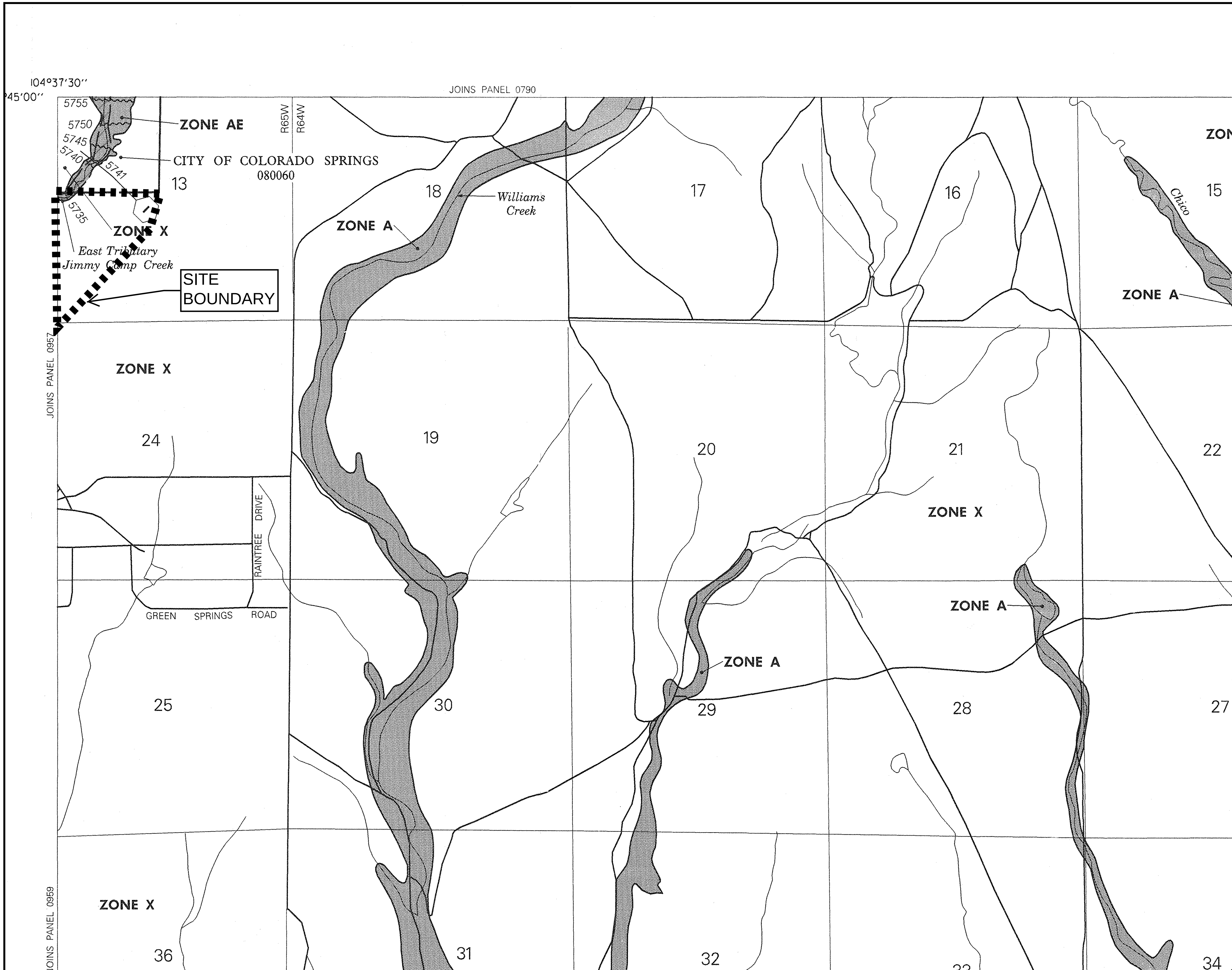
Date(s) aerial images were photographed: 1999

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%


ZONE AE
5730
AM
CORPORATE LIMITS
5725
14
EL PASO COUNTY
UNINCORPORATED AREAS
080059
AL
5721
5720
5716
ZONE X
AK
5711
5709
5706
5705
5701
Camp Creek
AJ
ZONE X
E
Tributary
H
5727
Jimmy Camp Creek
East Tributary
ZONE X
5725
13
ZONE X
5720
ZONE AE
G
5716
5715
SITE
ZONE X
5712
5710
F
5708
SITE
BOUNDARY
JOINS PANEL 1000
APPROXIMATE SCALE IN FEET
500 0 500
NATIONAL FLOOD INSURANCE PROGRAM
FIRM
FLOOD INSURANCE RATE MAP
EL PASO COUNTY,
COLORADO AND
INCORPORATED AREAS
PANEL 957 OF 1300
(SEE MAP INDEX FOR PANELS NOT PRINTED)
CONTAINS:
COMMUNITY NUMBER PANEL SUFFIX
COLORADO SPRINGS, CITY OF 080060 0957 F
EL PASO COUNTY, UNINCORPORATED AREAS 080059 0957 F
FOUNTAIN, CITY OF 080061 0957 F
MAP NUMBER
08041C0957 F
EFFECTIVE DATE:
MARCH 17, 1997
FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Emergency Management Agency
This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov



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:

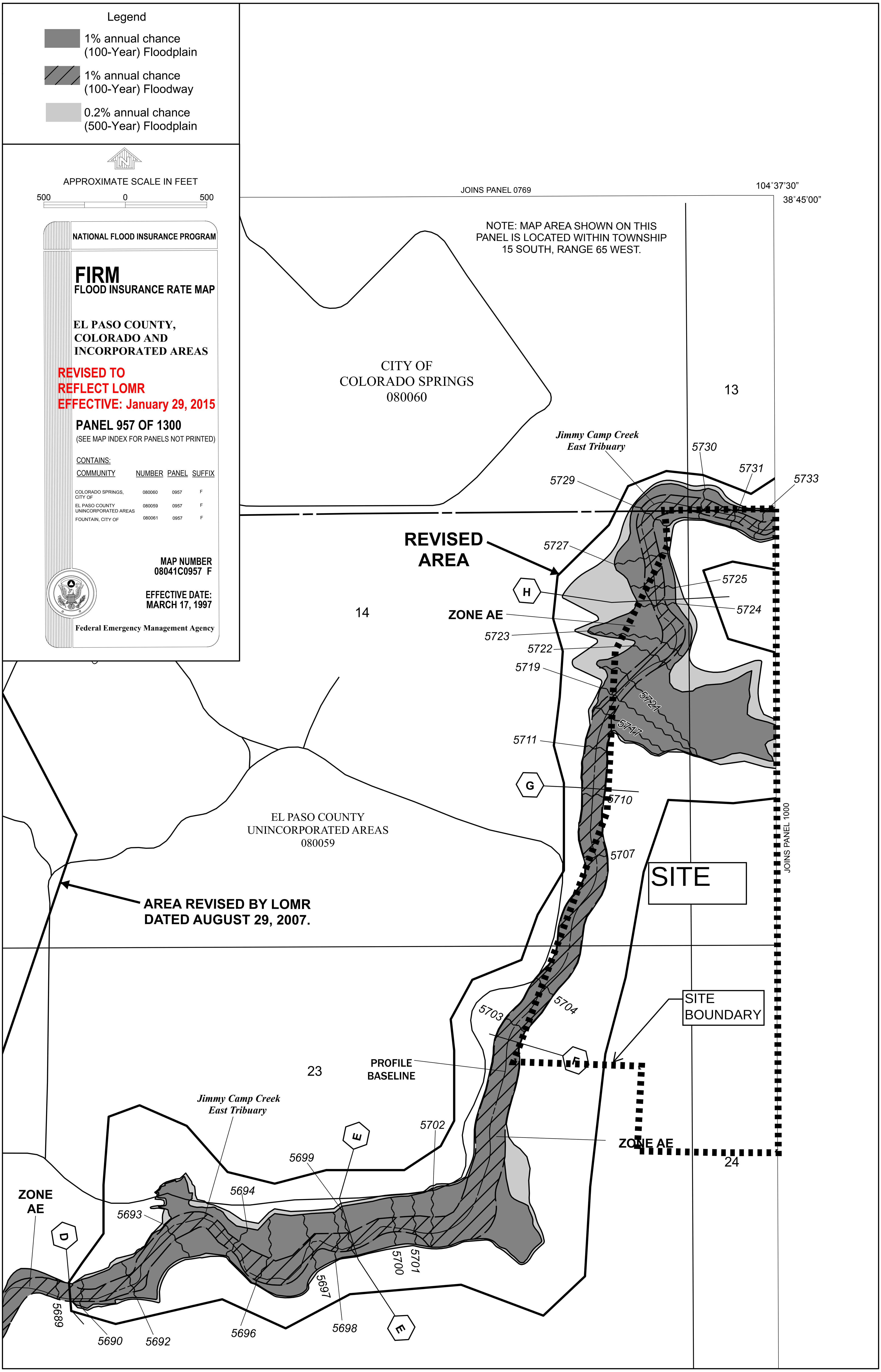
COMMUNITY	NUMBER	PANEL	SUFFIX
COLORADO SPRINGS, CITY OF	080060	1000	F
EL PASO COUNTY, UNINCORPORATED AREAS	080059	1000	F

MAP NUMBER 08041C1000 F

EFFECTIVE DATE: MARCH 17, 1997

Federal Emergency Management Agency

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


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

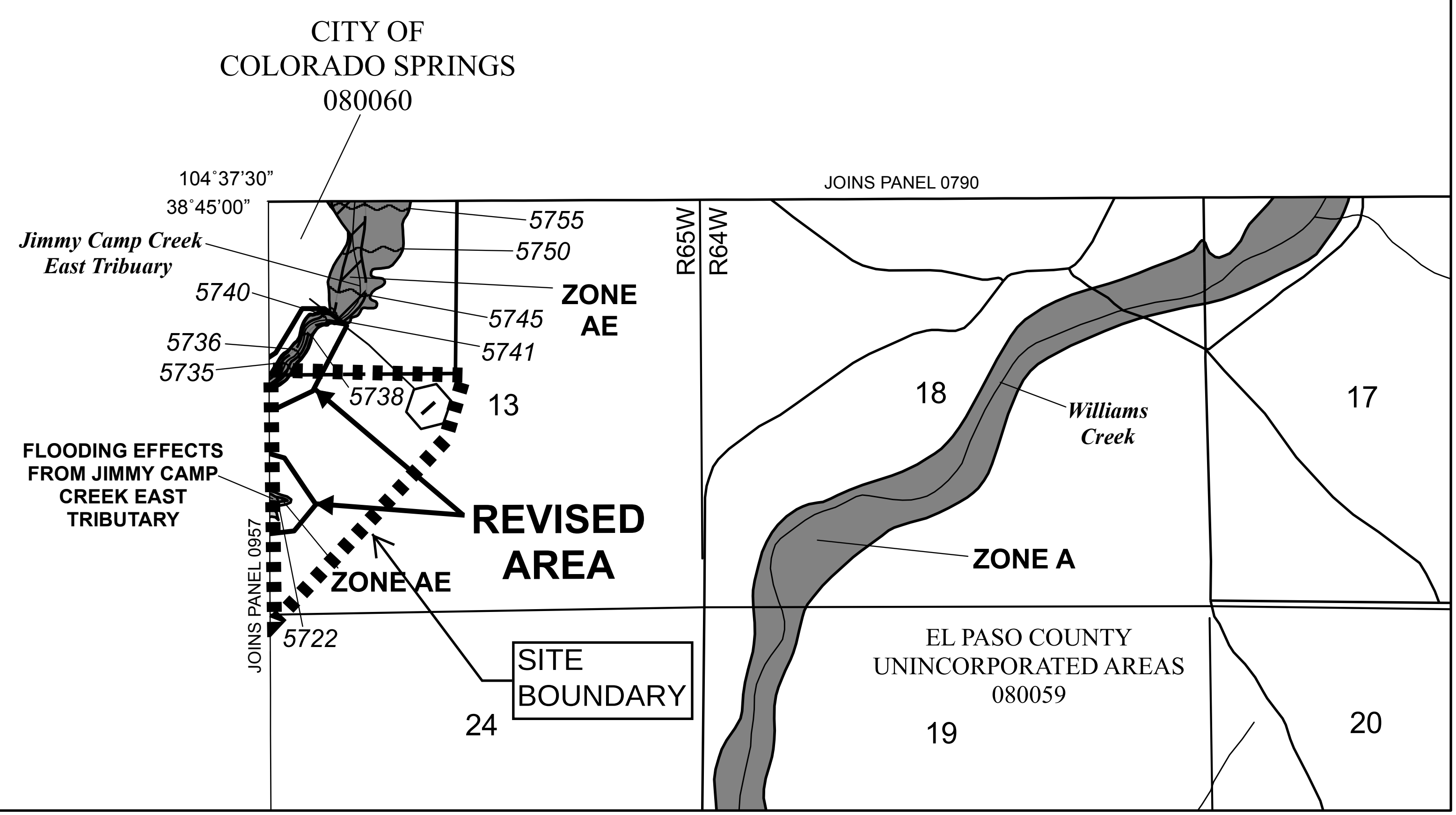
REVISED TO REFLECT LOMR EFFECTIVE: January 29, 2015

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.

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	SCS Runoff	458.13	6	384	2,456,980	----	------	------	EX-C
2	SCS Runoff	178.11	6	372	667,589	----	------	------	EX1
3	SCS Runoff	106.13	6	372	406,031	----	------	------	EX2
4	SCS Runoff	209.60	6	372	801,911	----	------	------	EX3

existing Flows.gpw	Return Period: 100 Year	Wednesday, Dec 20 2017, 9:45 AM

Hydrograph Plot

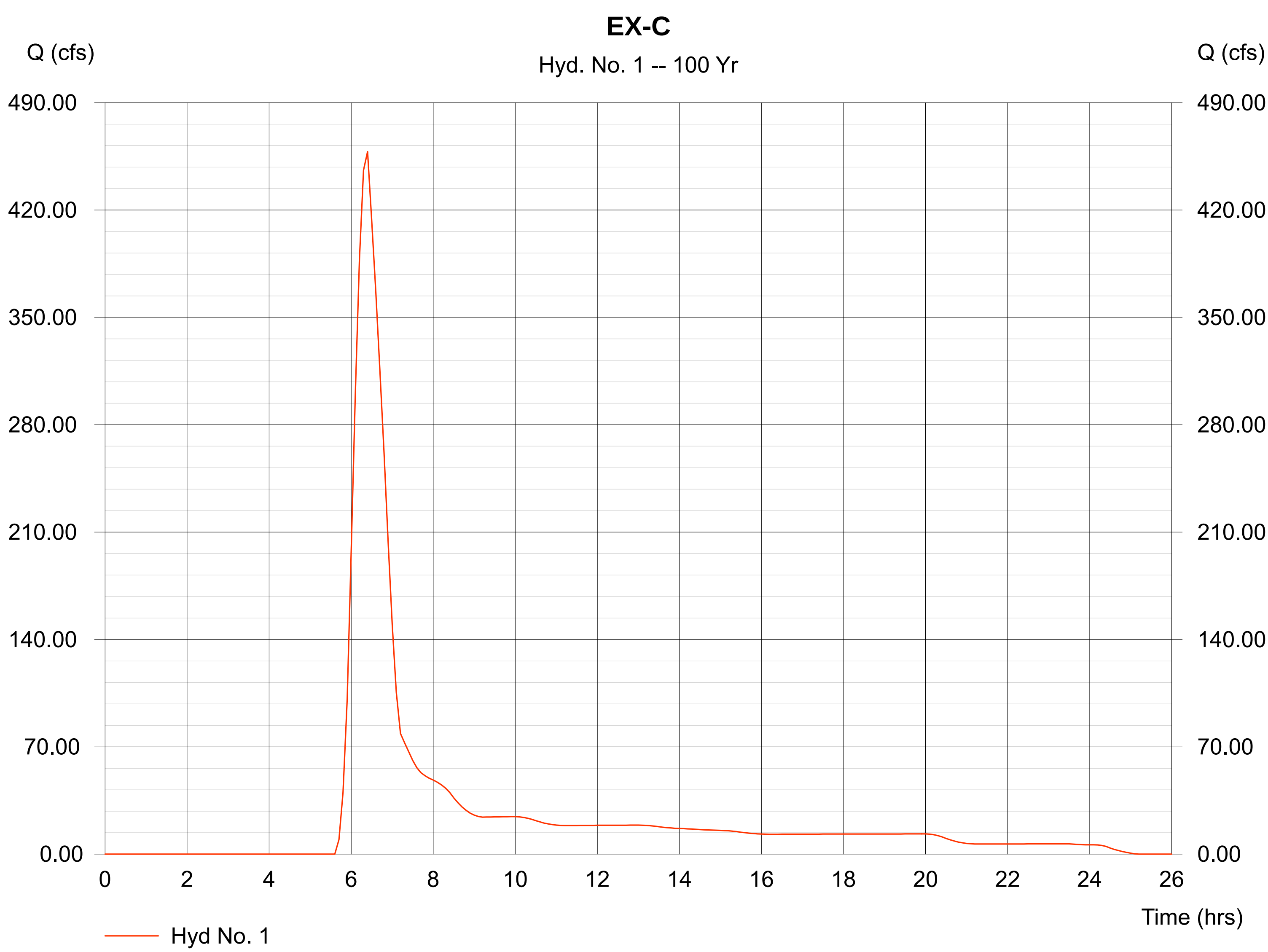
Hydraflow Hydrographs by Intelisolve | Wednesday, Dec 20 2017, 9:46 AM

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



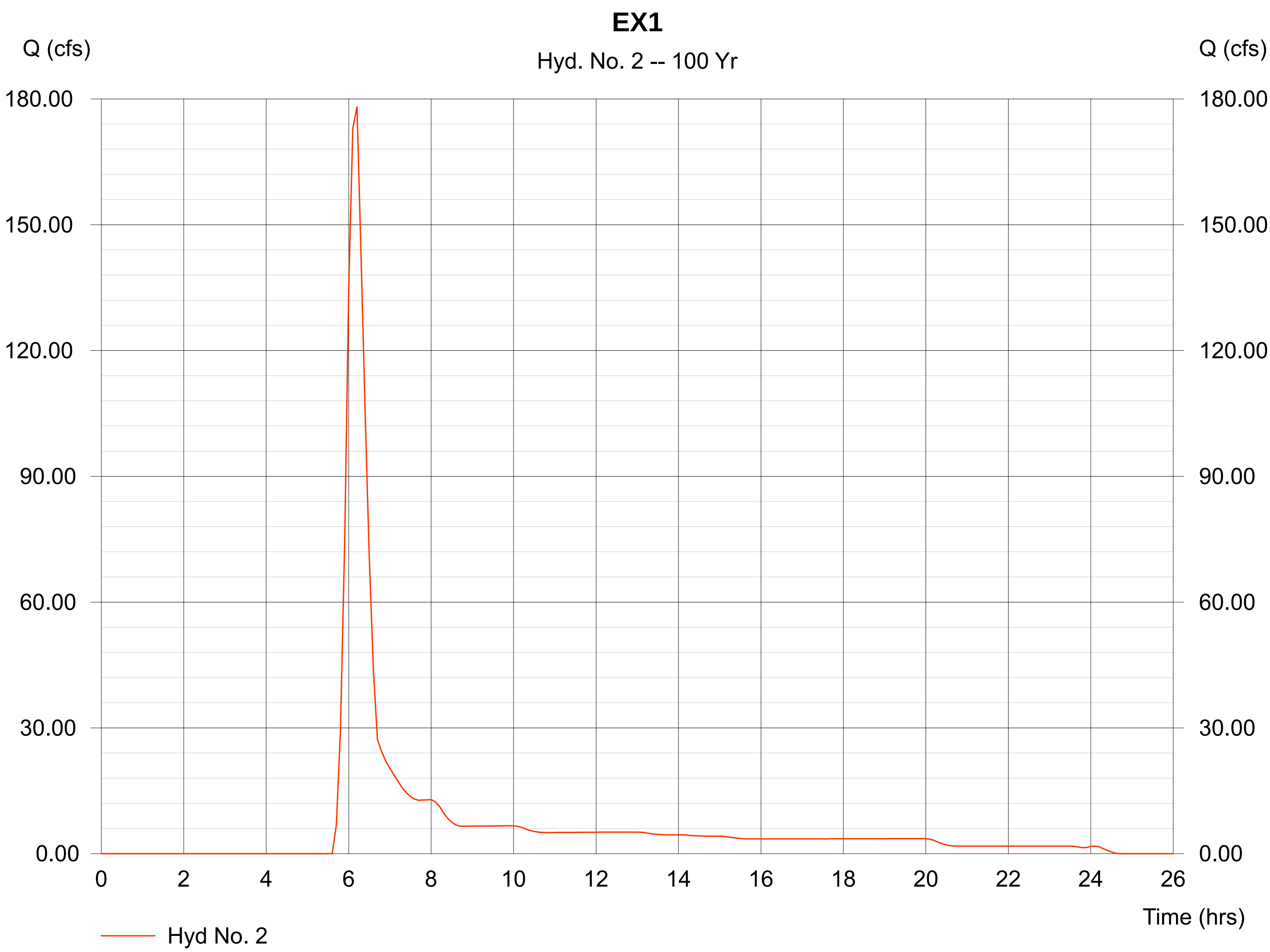
Hydrograph Plot

Hyd. No. 2

EX1

Hydrograph type	= SCS Runoff	Peak discharge	= 178.11 cfs
Storm frequency	= 100 yrs	Time interval	= 6 min
Drainage area	= 120.000 ac	Curve number	= 69
Basin Slope	= 3.0 %	Hydraulic length	= 3000 ft
Tc method	= USER	Time of conc. (Tc)	= 25.00 min
Total precip.	= 4.40 in	Distribution	= Custom
Storm duration	= CSpring_IIA-6min.cds	Shape factor	= 484

Hydrograph Volume = 667,589 cuft



Hydrograph Plot

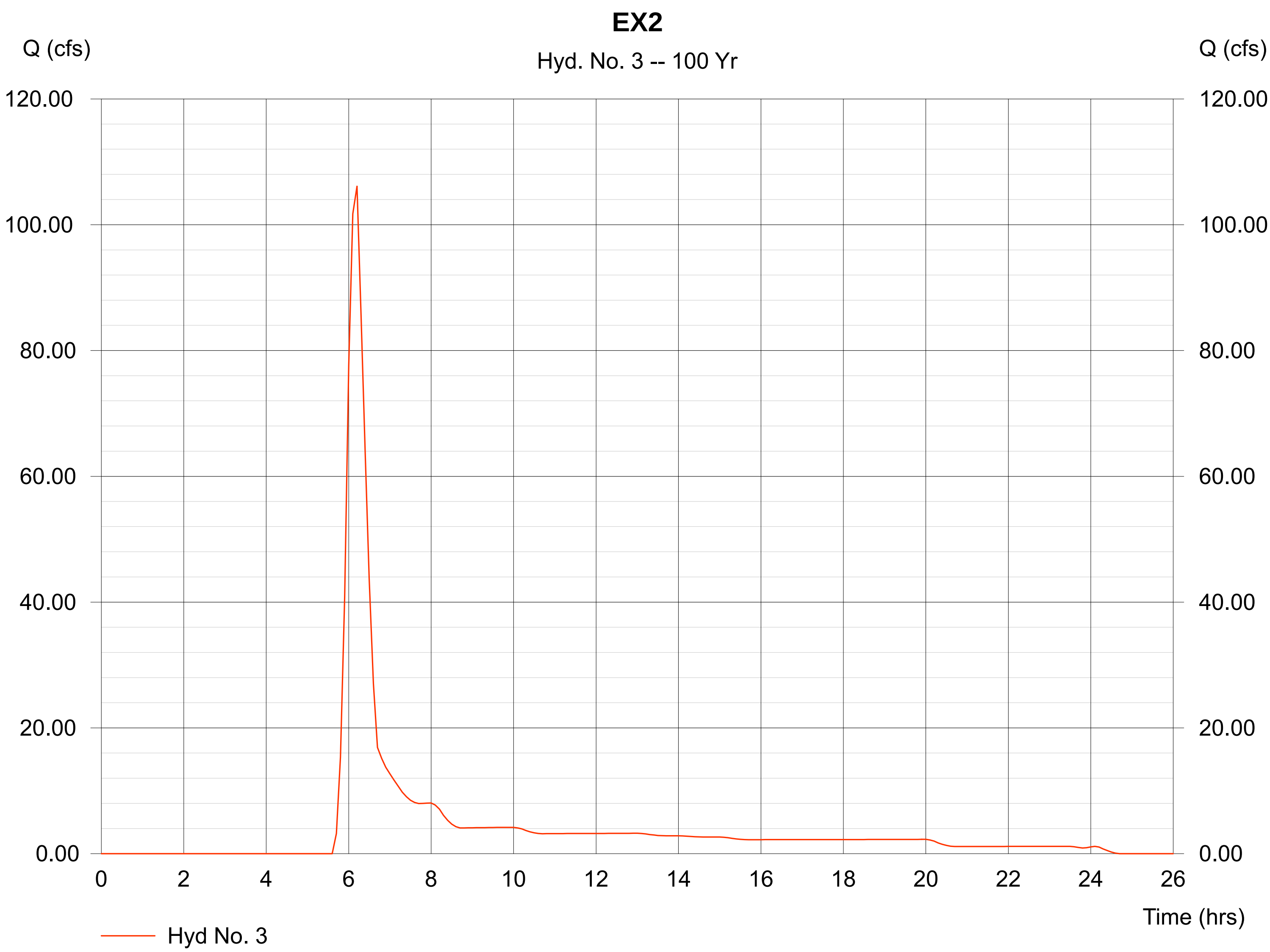
Hydraflow Hydrographs by Intelisolve | Wednesday, Dec 20 2017, 9:46 AM

Hyd. No. 3

EX2

Hydrograph type	= SCS Runoff	Peak discharge	= 106.13 cfs
Storm frequency	= 100 yrs	Time interval	= 6 min
Drainage area	= 80.000 ac	Curve number	= 67
Basin Slope	= 0.0 %	Hydraulic length	= 3000 ft
Tc method	= USER	Time of conc. (Tc)	= 25.00 min
Total precip.	= 4.40 in	Distribution	= Custom
Storm duration	= CSpring_IIA-6min.cds	Shape factor	= 484

Hydrograph Volume = 406,031 cuft



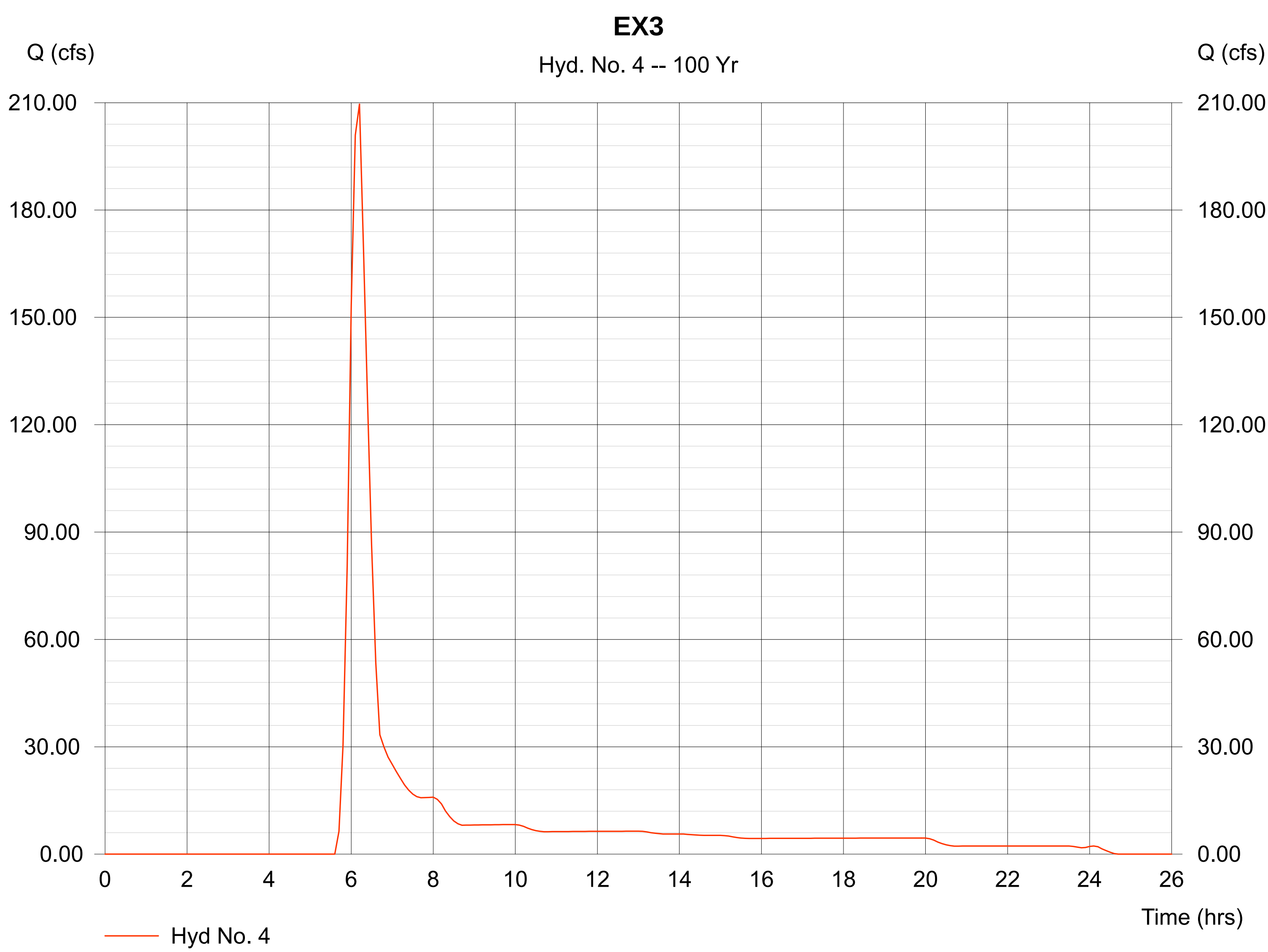
Hydrograph Plot

Hyd. No. 4

EX3

Hydrograph type	= SCS Runoff	Peak discharge	= 209.60 cfs
Storm frequency	= 100 yrs	Time interval	= 6 min
Drainage area	= 158.000 ac	Curve number	= 67
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 29.00 min
Total precip.	= 4.40 in	Distribution	= Custom
Storm duration	= CSpring_IIA-6min.cds	Shape factor	= 484

Hydrograph Volume = 801,911 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: Area Design	Area (A) ac.	Runoff Coeff. (C)	tc min.	CA	i in/hr	Q cfs	Total Runoff: tc min	Σ (CA)	i in/hr	Q cfs	Street: Slope %	Street Flow cfs	Pipe: Design Flow cfs	Slope %	Pipe Size in	Travel Time: Length ft	Velocity ft/sec	tt min	Remarks
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													

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

CORE ENGINEERING GROUP

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: Area Design	Direct Runoff: Area (A)	Direct Runoff: Runoff Coeff. (C)	Direct Runoff: tc	Direct Runoff: CA	Direct Runoff: i	Direct Runoff: Q	Total Runoff: tc	Total Runoff: Σ (CA)	Total Runoff: i	Total Runoff: Q	Street: Slope	Street: Street Flow	Pipe: Design Flow	Pipe: Slope	Pipe: Pipe Size	Travel Time: Length	Travel Time: Velocity	Travel Time: tt	Remarks
			ac.		min.		in/hr	cfs	min		in/hr	cfs	%	cfs	cfs	%	in	ft	ft/sec	min	
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													

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

CORE ENGINEERING GROUP

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	Area Design	Direct Runoff						Total Runoff				Street		Pipe			Travel Time			Remarks
			Area (A)	Runoff Coeff. (C)	tc	CA	i	Q	tc	Σ (CA)	i	Q	Slope	Street Flow	Design Flow	Slope	Pipe Size	Length	Velocity	tt	
			ac.		min.		in/hr	cfs	min		in/hr	cfs	%	cfs	cfs	%	in	ft	ft/sec	min	
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													

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	Area Design	Direct Runoff						Total Runoff				Street		Pipe			Travel Time			Remarks
			Area (A)	Runoff Coeff. (C)	tc	CA	i	Q	tc	Σ (CA)	i	Q	Slope	Street Flow	Design Flow	Slope	Pipe Size	Length	Velocity	tt	
			ac.		min.		in/hr	cfs	min		in/hr	cfs	%	cfs	cfs	%	in	ft	ft/sec	min	
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													

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

CORE ENGINEERING GROUP

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**

		Direct Runoff							Total Runoff				Street		Pipe			Travel Time			
Street or Basin	Design Point	Area Design	Area (A)	Runoff Coeff. (C)	tc	CA	i	Q	tc	Σ (CA)	i	Q	Slope	Street Flow	Design Flow	Slope	Pipe Size	Length	Velocity	tt	Remarks
			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													

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

CORE ENGINEERING GROUP

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	Area Design	Direct Runoff						Total Runoff				Street		Pipe			Travel Time			Remarks
			Area (A)	Runoff Coeff. (C)	tc	CA	i	Q	tc	Σ (CA)	i	Q	Slope	Street Flow	Design Flow	Slope	Pipe Size	Length	Velocity	tt	
			ac.		min.		in/hr	cfs	min		in/hr	cfs	%	cfs	cfs	%	in	ft	ft/sec	min	
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													

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)	tc	CA	i	Q	tc	Σ (CA)	i	Q	Slope	Street Flow	Design Flow	Slope	Pipe Size	Length	Velocity	tt	
			ac.		min.		in/hr	cfs	min		in/hr	cfs	%	cfs	cfs	%	in	ft	ft/sec	min	
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**

		Direct Runoff							Total Runoff				Street		Pipe			Travel Time			
Street or Basin	Design Point	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	Remarks
			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													

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

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)
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

Standard Form SF-1. Time of Concentration-Proposed

CORE ENGINEERING GROUP

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

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 t_c=(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

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)
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

Culvert Report

headwater at des. pt 27 (5732.68)

Invert Elev Dn (ft)	=	5724.37
Pipe Length (ft)	=	130.00
Slope (%)	=	1.40
Invert Elev Up (ft)	=	5726.19
Rise (in)	=	42.0
Shape	=	Cir
Span (in)	=	42.0
No. Barrels	=	1
n-Value	=	0.013
Inlet Edge	=	Beveled
Coeff. K,M,c,Y,k	=	0.0018, 2.5, 0.03, 0.74, 0.2

Embankment

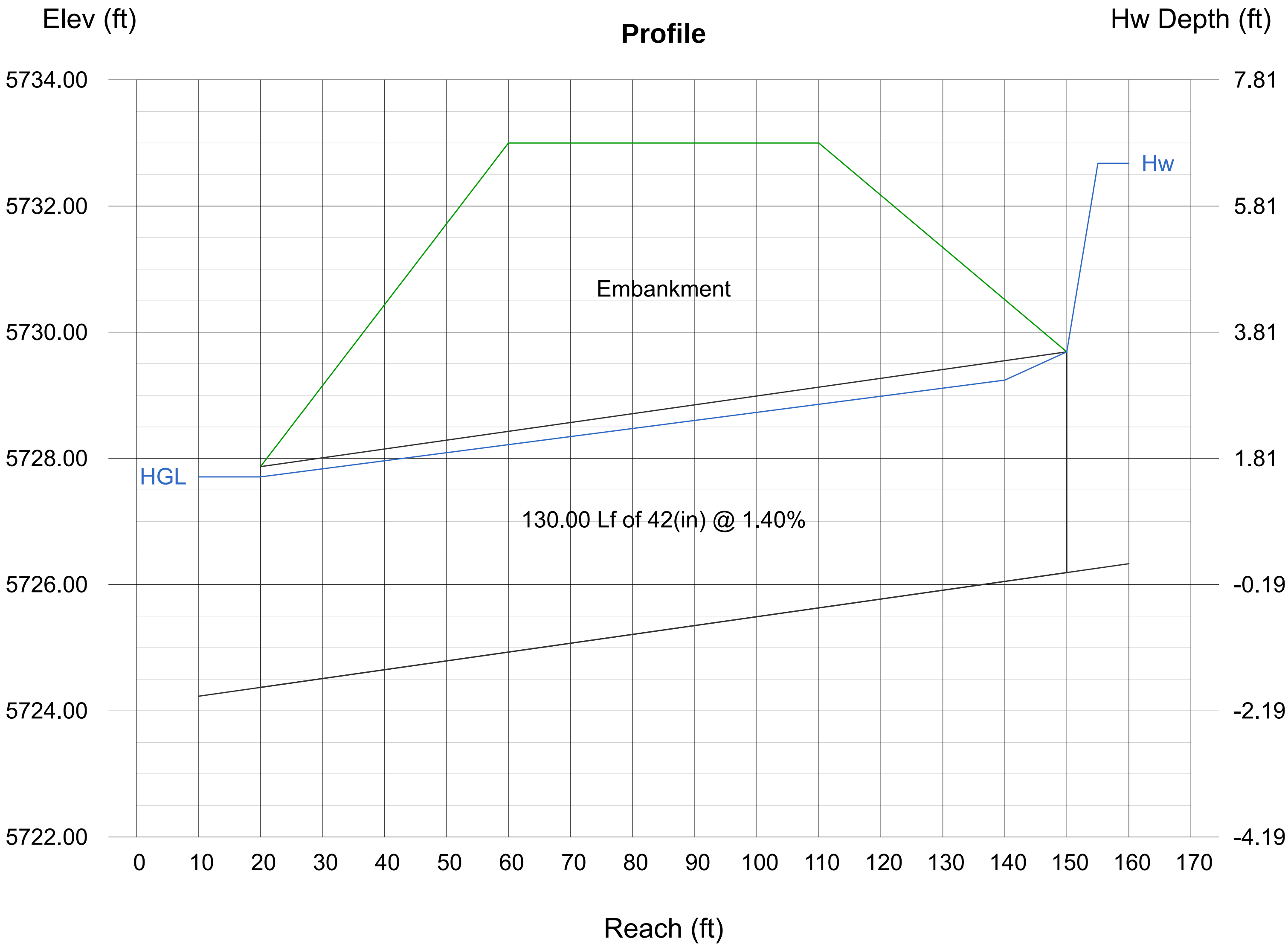
Top Elevation (ft)	=	5733.00
Top Width (ft)	=	50.00
Crest Width (ft)	=	500.00

Calculations

Qmin (cfs)	=	50.00
Qmax (cfs)	=	110.00
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	110.00
Qpipe (cfs)	=	110.00
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	11.63
Veloc Up (ft/s)	=	11.99
HGL Dn (ft)	=	5727.71
HGL Up (ft)	=	5729.37
Hw Elev (ft)	=	5732.68
Hw/D (ft)	=	1.85
Flow Regime	=	Inlet Control



Culvert Report

headwater at des. pt 3f (5748.55)

Invert Elev Dn (ft)	=	5737.77
Pipe Length (ft)	=	274.00
Slope (%)	=	1.33
Invert Elev Up (ft)	=	5741.41
Rise (in)	=	54.0
Shape	=	Cir
Span (in)	=	54.0
No. Barrels	=	1
n-Value	=	0.013
Inlet Edge	=	Beveled
Coeff. K,M,c,Y,k	=	0.0018, 2.5, 0.03, 0.74, 0.2

Embankment

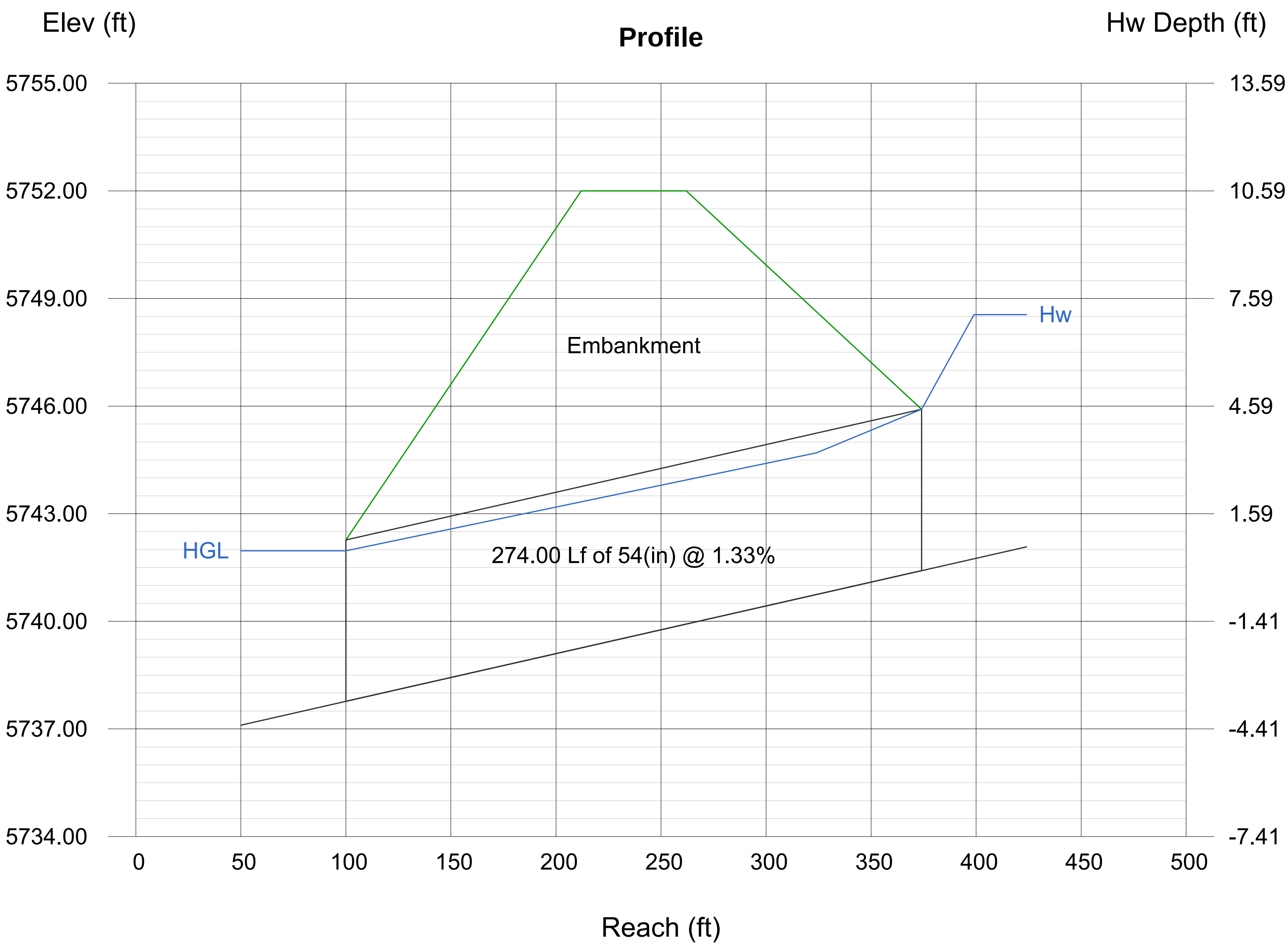
Top Elevation (ft)	=	5752.00
Top Width (ft)	=	50.00
Crest Width (ft)	=	200.00

Calculations

Qmin (cfs)	=	60.00
Qmax (cfs)	=	180.00
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	180.00
Qpipe (cfs)	=	180.00
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	11.66
Veloc Up (ft/s)	=	12.31
HGL Dn (ft)	=	5741.97
HGL Up (ft)	=	5745.30
Hw Elev (ft)	=	5748.55
Hw/D (ft)	=	1.59
Flow Regime	=	Inlet Control



Weir Report

Des. Pt 18 - 84-inch dia weir

Rectangular Weir

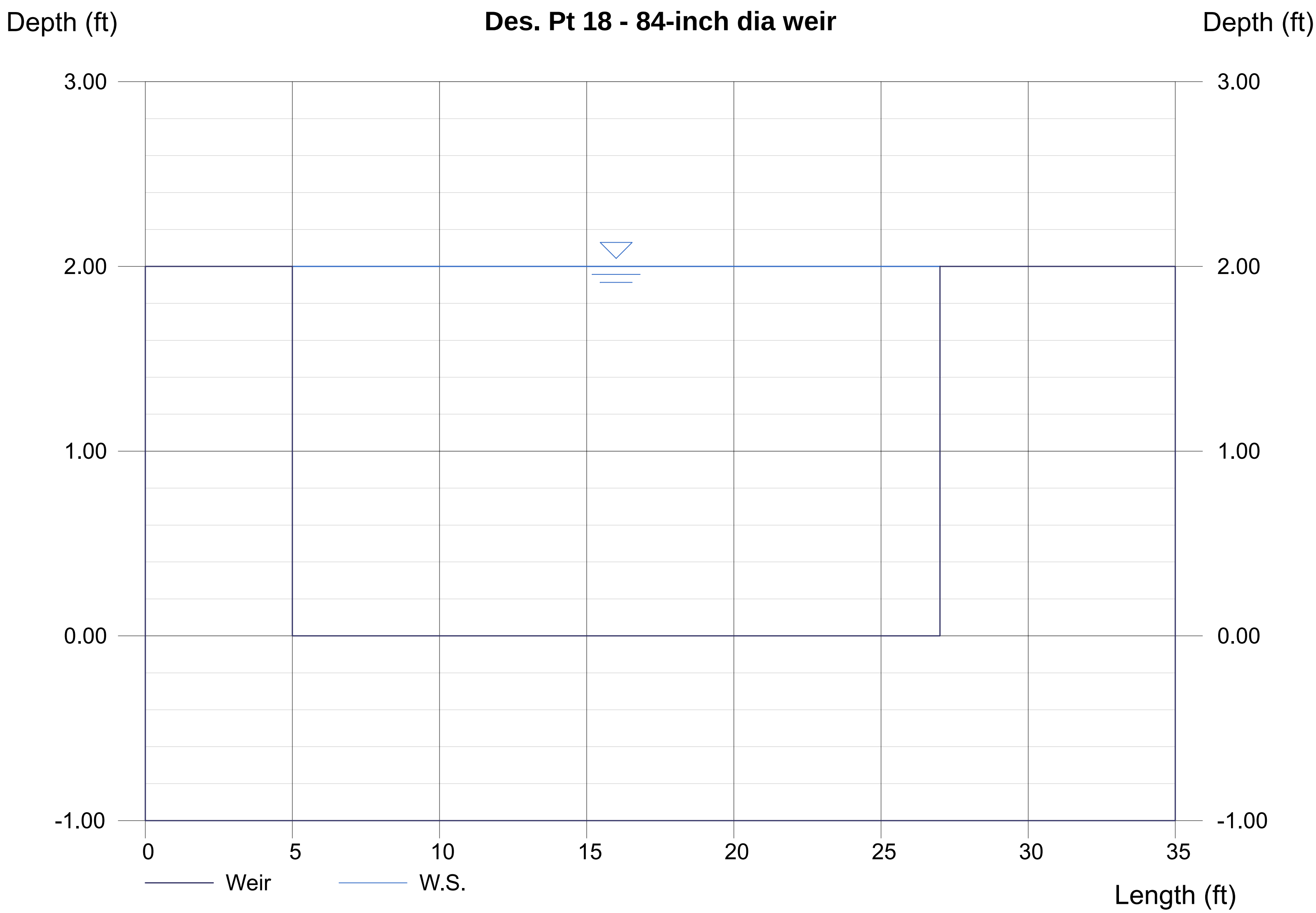
Crest	= Sharp
Bottom Length (ft)	= 22.00
Total Depth (ft)	= 2.00

Calculations

Weir Coeff. Cw	= 3.33
Compute by:	Q vs Depth
No. Increments	= 10

Highlighted

Depth (ft)	= 2.00
Q (cfs)	= 207.21
Area (sqft)	= 44.00
Velocity (ft/s)	= 4.71
Top Width (ft)	= 22.00



Channel Report

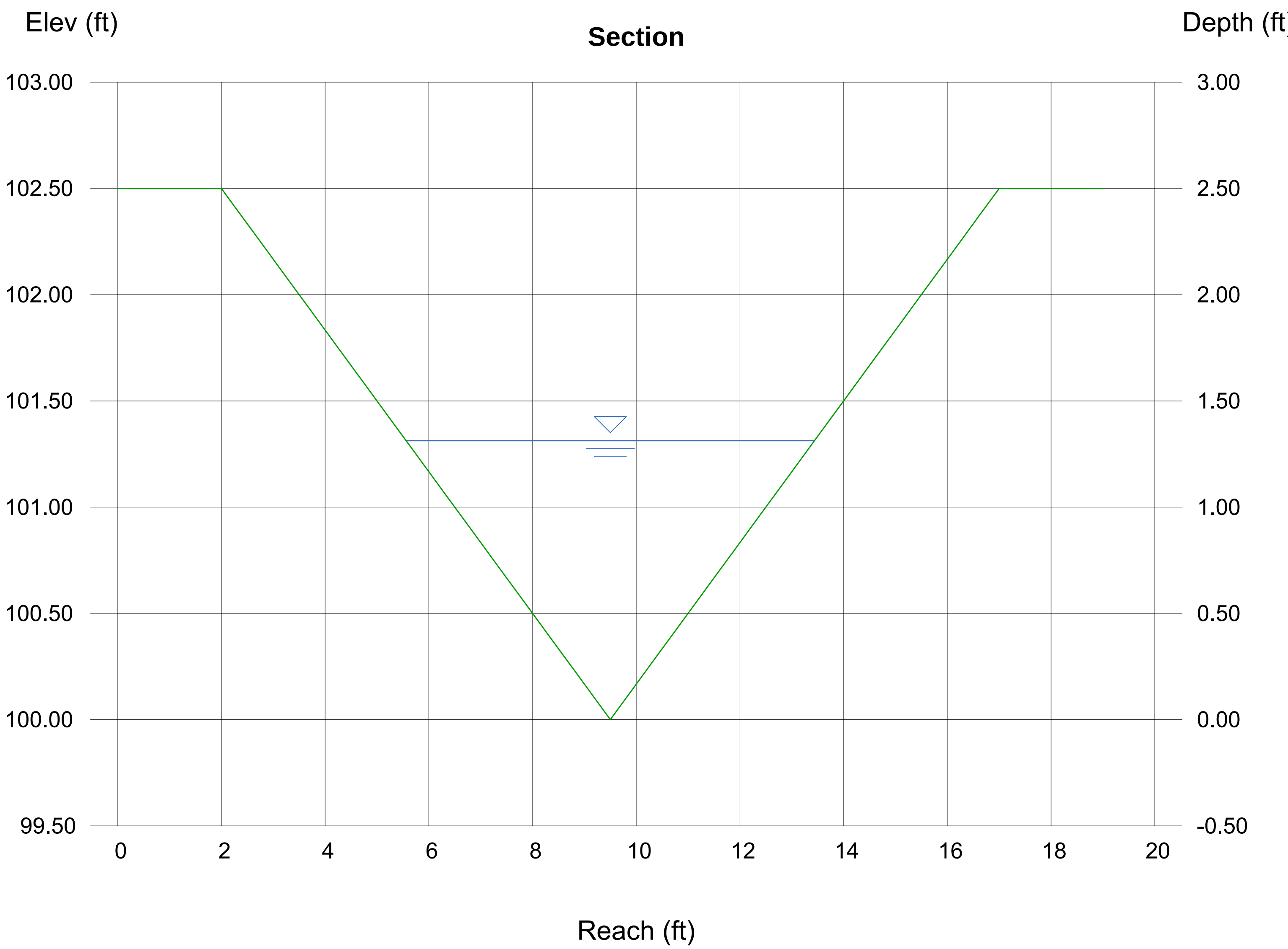
Basin OS-C11 Swale - North Diversion Swale

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

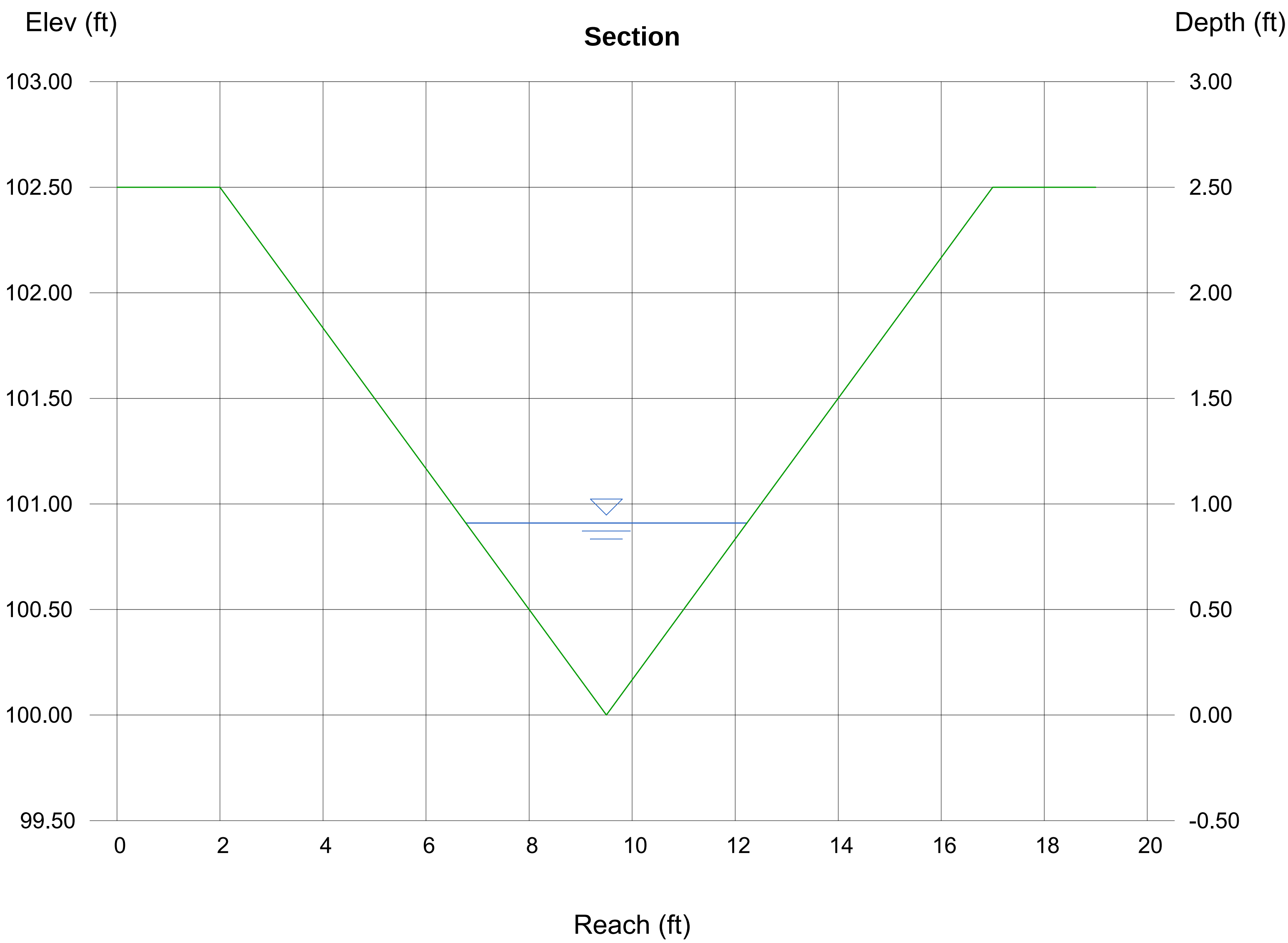
North Diversion Swale @ 7.0% slope

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 — Thursday, Sep 8 2016, 12:9 PM

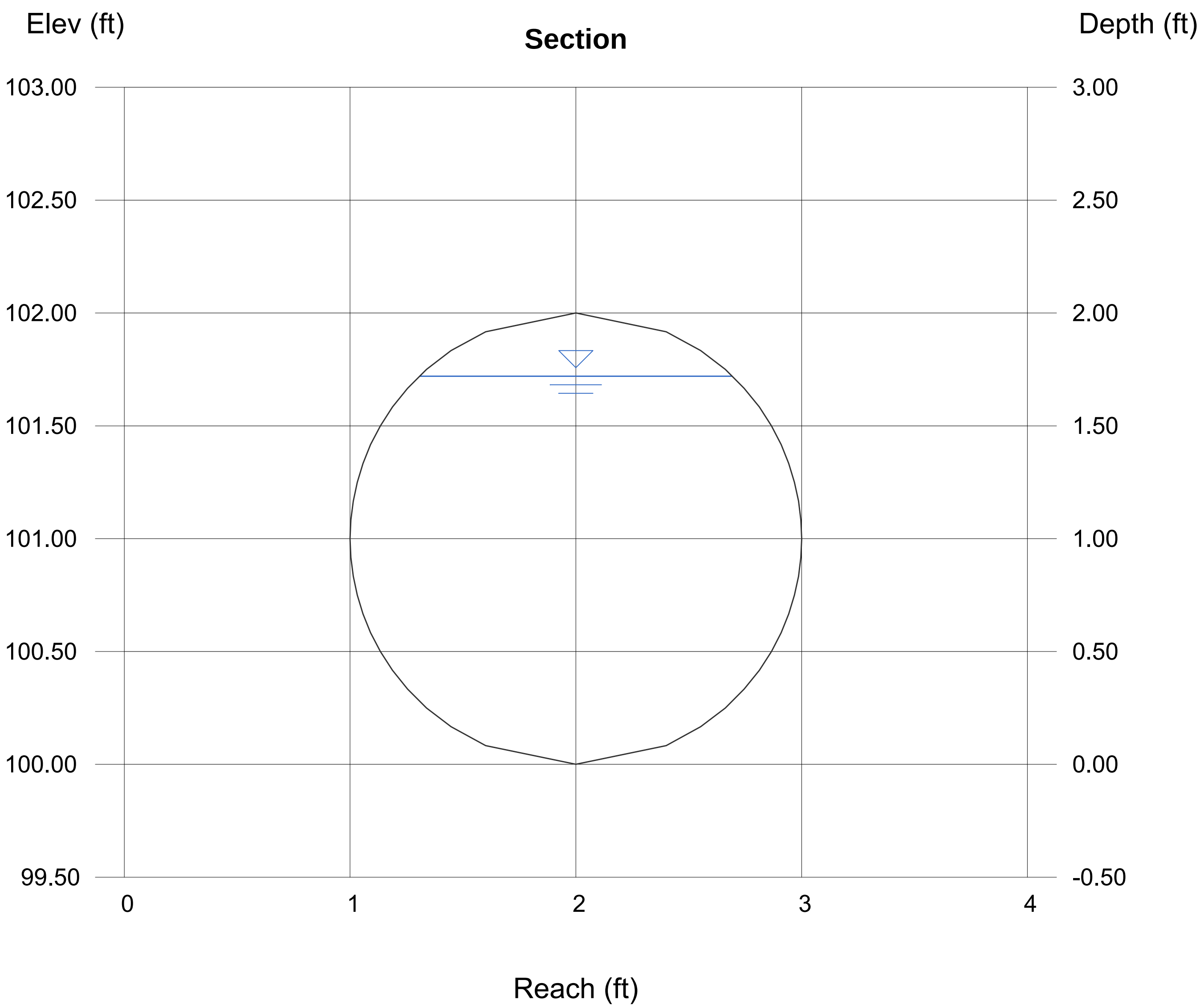
24-inch from Des.Pt 47 to Des.Pt.48

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

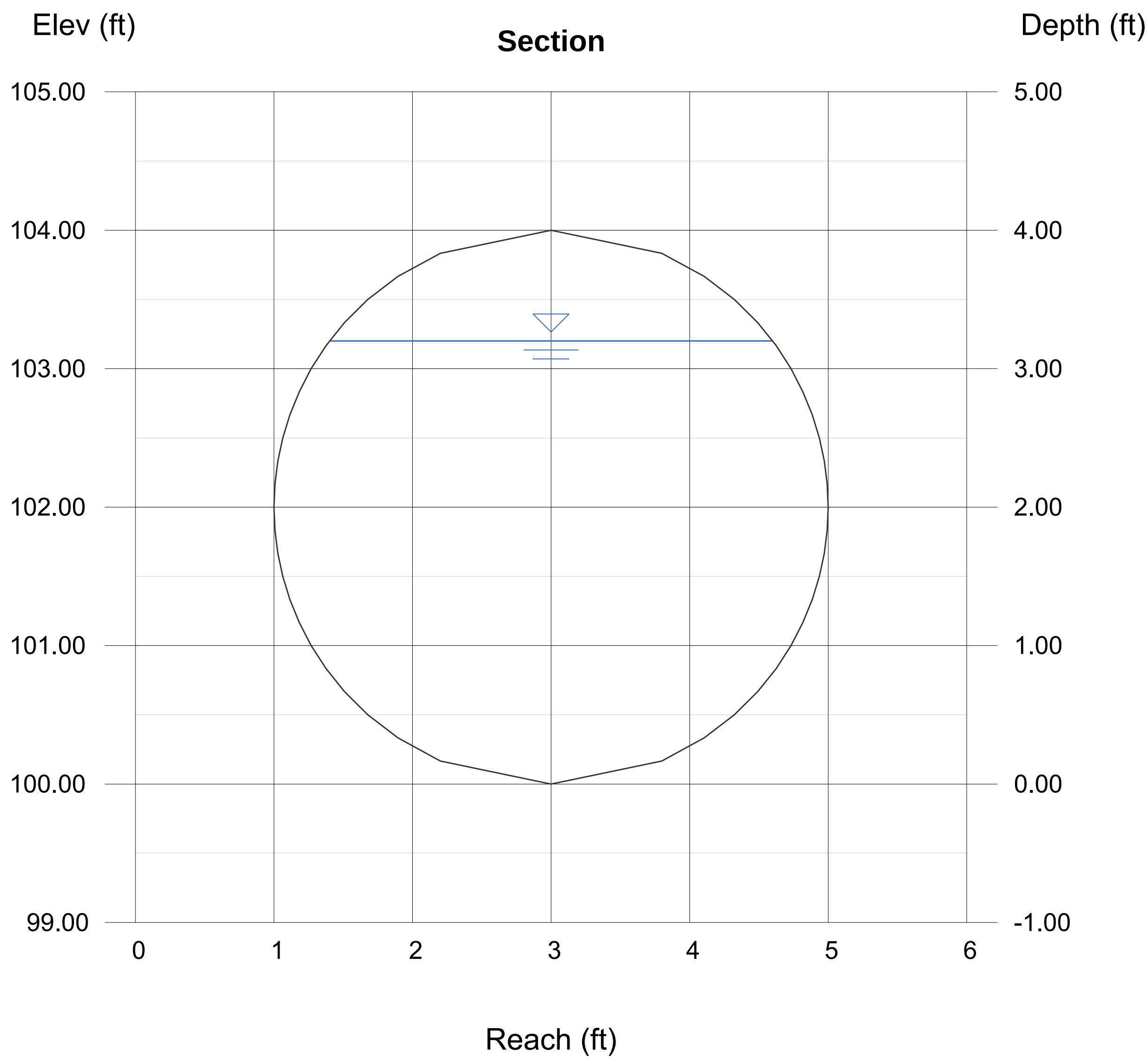
48-inch storm sewer at Des.Pt. 49 into Pond B1

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

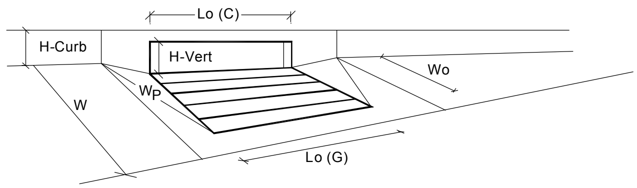
Highlighted
Depth (ft) = 3.20
Q (cfs) = 99.32
Area (sqft) = 10.78
Velocity (ft/s) = 9.21
Wetted Perim (ft) = 8.86
Crit Depth, Yc (ft) = 2.80
Top Width (ft) = 3.20
EGL (ft) = 4.52



INLET IN A SUMP OR SAG LOCATION

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

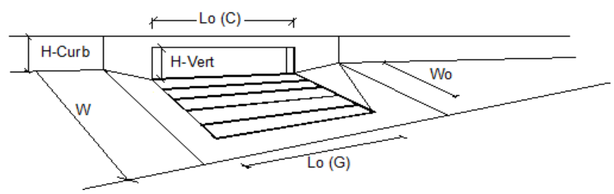
Inlet ID = **Inlet DP-3 (C16.1+C16.2)**



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Inlet Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.5	8.0	inches
				☑ Override Depths
Grate Information		MINOR	MAJOR	
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	15.00	15.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Grate Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	N/A	N/A	
Clogging Factor for Multiple Units	Clog =	N/A	N/A	
Grate Capacity as a Weir (based on UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	N/A	N/A	cfs
Interception with Clogging	Q_{wa} =	N/A	N/A	cfs
Grate Capacity as a Orifice (based on UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	N/A	N/A	cfs
Interception with Clogging	Q_{oa} =	N/A	N/A	cfs
Grate Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	N/A	N/A	cfs
Interception with Clogging	Q_{ma} =	N/A	N/A	cfs
Resulting Grate Capacity (assumes clogged condition)	Q_{Grate} =	**N/A**	**N/A**	**cfs**
Curb Opening Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	1.31	1.31	
Clogging Factor for Multiple Units	Clog =	0.04	0.04	
Curb Opening as a Weir (based on UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	12.45	21.18	cfs
Interception with Clogging	Q_{wa} =	11.90	20.25	cfs
Curb Opening as an Orifice (based on UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	30.33	33.57	cfs
Interception with Clogging	Q_{oa} =	29.00	32.11	cfs
Curb Opening Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	18.07	24.80	cfs
Interception with Clogging	Q_{ma} =	17.28	23.72	cfs
Resulting Curb Opening Capacity (assumes clogged condition)	Q_{Curb} =	**11.90**	**20.25**	**cfs**
Resultant Street Conditions		MINOR	MAJOR	
Total Inlet Length	L =	15.00	15.00	feet
Resultant Street Flow Spread (based on sheet *Q-Allow* geometry)	T =	39.3	52.1	ft.>T-Crown
Resultant Flow Depth at Street Crown	d_{CROWN} =	2.7	4.2	inches
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	Q_a =	**11.9**	**20.3**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	8.9	20.1	cfs

INLET ON A CONTINUOUS GRADE

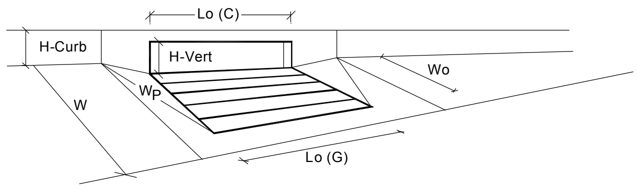
Project: **Lorson East Prelim Plan #100.040**
Inlet ID: **Inlet DP-4 (Basins C16.5-16.10)**



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	15.00	15.00	ft
Width of a Unit Grate (cannot be greater than W from Q-Allow)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	
Street Hydraulics: OK - Q < maximum allowable from sheet 'Q-Allow'		MINOR	MAJOR	
Design Discharge for Half of Street (from Sheet *Q-Peak*)	**Q_o =**	10.4	21.9	cfs
Water Spread Width	T =	15.3	17.0	ft
Water Depth at Flowline (outside of local depression)	d =	5.2	6.5	inches
Water Depth at Street Crown (or at T_{MAX})	d_{CROWN} =	0.0	0.9	inches
Ratio of Gutter Flow to Design Flow	E_o =	0.391	0.290	
Discharge outside the Gutter Section W, carried in Section T_x	Q_x =	6.4	15.5	cfs
Discharge within the Gutter Section W	Q_w =	4.1	6.4	cfs
Discharge Behind the Curb Face	Q_{BACK} =	0.0	0.0	cfs
Flow Area within the Gutter Section W	A_W =	2.45	4.25	sq ft
Velocity within the Gutter Section W	V_W =	4.3	5.2	fps
Water Depth for Design Condition	d_{LOCAL} =	8.2	9.5	inches
Grate Analysis (Calculated)		MINOR	MAJOR	
Total Length of Inlet Grate Opening	L =	N/A	N/A	ft
Ratio of Grate Flow to Design Flow	$E_{o\text{-}GRATE}$ =	N/A	N/A	
Under No-Clogging Condition		MINOR	MAJOR	
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Interception Capacity	Q_i =	N/A	N/A	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient for Multiple-unit Grate Inlet	GrateCoef =	N/A	N/A	
Clogging Factor for Multiple-unit Grate Inlet	GrateClog =	N/A	N/A	
Effective (unclogged) Length of Multiple-unit Grate Inlet	L_e =	N/A	N/A	ft
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Actual Interception Capacity	**Q_a =**	N/A	N/A	cfs
Carry-Over Flow = Q_o-Q_a (to be applied to curb opening or next d/s inlet)	**Q_b =**	N/A	N/A	cfs
Curb or Slotted Inlet Opening Analysis (Calculated)		MINOR	MAJOR	
Equivalent Slope S_e (based on grate carry-over)	S_e =	0.093	0.075	ft/ft
Required Length L_T to Have 100% Interception	L_T =	18.91	30.59	ft
Under No-Clogging Condition		MINOR	MAJOR	
Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T)	L =	15.00	15.00	ft
Interception Capacity	Q_i =	9.8	15.4	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient	CurbCoef =	1.31	1.31	
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet	CurbClog =	0.04	0.04	
Effective (Unclogged) Length	L_e =	13.03	13.03	ft
Actual Interception Capacity	**Q_a =**	9.7	15.0	cfs
Carry-Over Flow = $Q_{b(GRATE)}$-Q_a	**Q_b =**	0.8	6.9	cfs
Summary		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**9.67**	**14.98**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.8**	**6.9**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**93**	**68**	**%**

INLET IN A SUMP OR SAG LOCATION

Project = Lorson East Prelim Plan #100.040
Inlet ID = Inlet DP-5



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Inlet Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.5	8.0	inches
				☑ Override Depths
Grate Information		MINOR	MAJOR	
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	

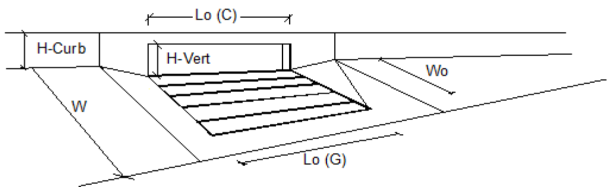
Grate Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	N/A	N/A	
Clogging Factor for Multiple Units	Clog =	N/A	N/A	
Grate Capacity as a Weir (based on UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	N/A	N/A	cfs
Interception with Clogging	Q_{wa} =	N/A	N/A	cfs
Grate Capacity as a Orifice (based on UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	N/A	N/A	cfs
Interception with Clogging	Q_{oa} =	N/A	N/A	cfs
Grate Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	N/A	N/A	cfs
Interception with Clogging	Q_{ma} =	N/A	N/A	cfs
Resulting Grate Capacity (assumes clogged condition)	Q_{Grate} =	**N/A**	**N/A**	**cfs**

Curb Opening Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	1.00	1.00	
Clogging Factor for Multiple Units	Clog =	0.10	0.10	
Curb Opening as a Weir (based on UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	7.06	10.97	cfs
Interception with Clogging	Q_{wa} =	6.35	9.87	cfs
Curb Opening as an Orifice (based on UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	10.11	11.19	cfs
Interception with Clogging	Q_{oa} =	9.10	10.07	cfs
Curb Opening Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	7.86	10.30	cfs
Interception with Clogging	Q_{ma} =	7.07	9.27	cfs
Resulting Curb Opening Capacity (assumes clogged condition)	Q_{Curb} =	**6.35**	**9.27**	**cfs**

Resultant Street Conditions		MINOR	MAJOR	
Total Inlet Length	L =	5.00	5.00	feet
Resultant Street Flow Spread (based on sheet *Q-Allow* geometry)	T =	20.7	27.0	ft.>T-Crown
Resultant Flow Depth at Street Crown	d_{CROWN} =	0.9	2.4	inches
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	Q_a =	**6.4**	**9.3**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	0.3	0.6	cfs

INLET ON A CONTINUOUS GRADE

Project: **Lorson East Prelim Plan #100.040**
Inlet ID: **Inlet DP-6 (Basins C16.10-16.13 + bypass from Inlet DP-4)**

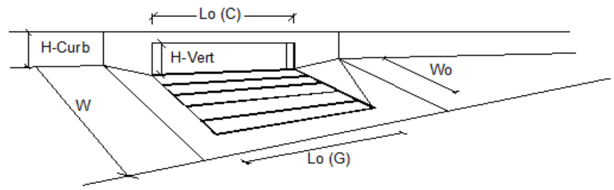


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	15.00	15.00	ft
Width of a Unit Grate (cannot be greater than W from Q-Allow)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	
Street Hydraulics: WARNING: Q > ALLOWABLE Q FOR MINOR & MAJOR STORM		MINOR	MAJOR	
Design Discharge for Half of Street (from Sheet *Q-Peak*)	Q_o =	12.9	32.6	cfs
Water Spread Width	T =	17.0	17.0	ft
Water Depth at Flowline (outside of local depression)	d =	6.1	8.2	inches
Water Depth at Street Crown (or at T_{MAX})	d_{CROWN} =	0.5	2.6	inches
Ratio of Gutter Flow to Design Flow	E_o =	0.312	0.229	
Discharge outside the Gutter Section W, carried in Section T_x	Q_x =	8.9	23.7	cfs
Discharge within the Gutter Section W	Q_w =	4.0	7.0	cfs
Discharge Behind the Curb Face	Q_{BACK} =	0.0	1.9	cfs
Flow Area within the Gutter Section W	A_W =	3.74	6.64	sq ft
Velocity within the Gutter Section W	V_W =	3.4	4.6	fps
Water Depth for Design Condition	d_{LOCAL} =	9.1	11.2	inches
Grate Analysis (Calculated)		MINOR	MAJOR	
Total Length of Inlet Grate Opening	L =	N/A	N/A	ft
Ratio of Grate Flow to Design Flow	$E_{o\text{-}GRATE}$ =	N/A	N/A	
Under No-Clogging Condition		MINOR	MAJOR	
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Interception Capacity	Q_i =	N/A	N/A	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient for Multiple-unit Grate Inlet	GrateCoef =	N/A	N/A	
Clogging Factor for Multiple-unit Grate Inlet	GrateClog =	N/A	N/A	
Effective (unclogged) Length of Multiple-unit Grate Inlet	L_e =	N/A	N/A	ft
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Actual Interception Capacity	Q_a =	N/A	N/A	cfs
Carry-Over Flow = Q_o-Q_a (to be applied to curb opening or next d/s inlet)	Q_b =	N/A	N/A	cfs
Curb or Slotted Inlet Opening Analysis (Calculated)		MINOR	MAJOR	
Equivalent Slope S_e (based on grate carry-over)	S_e =	0.079	0.063	ft/ft
Required Length L_T to Have 100% Interception	L_T =	21.89	37.78	ft
Under No-Clogging Condition		MINOR	MAJOR	
Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T)	L =	15.00	15.00	ft
Interception Capacity	Q_i =	11.3	18.4	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient	CurbCoef =	1.31	1.31	
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet	CurbClog =	0.04	0.04	
Effective (Unclogged) Length	L_e =	13.03	13.03	ft
Actual Interception Capacity	Q_a =	11.0	17.9	cfs
Carry-Over Flow = $Q_{b(GRATE)}$-Q_a	Q_b =	1.8	14.7	cfs
Summary		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**11.05**	**17.87**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**1.8**	**14.7**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**86**	**55**	**%**

INLET ON A CONTINUOUS GRADE

Project: Lorson East Prelim Plan #100.040

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

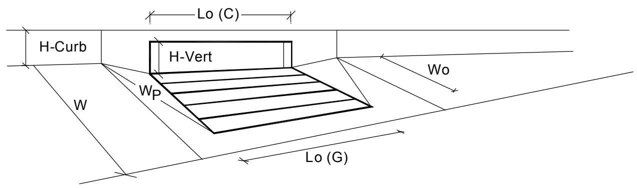


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	10.00	10.00	ft
Width of a Unit Grate (cannot be greater than W from Q-Allow)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	
Street Hydraulics: OK - Q < maximum allowable from sheet 'Q-Allow'		MINOR	MAJOR	
Design Discharge for Half of Street (from Sheet *Q-Peak*)	Q_o =	6.6	24.9	cfs
Water Spread Width	T =	14.6	17.0	ft
Water Depth at Flowline (outside of local depression)	d =	5.0	7.5	inches
Water Depth at Street Crown (or at T_{MAX})	d_{CROWN} =	0.0	1.9	inches
Ratio of Gutter Flow to Design Flow	E_o =	0.409	0.247	
Discharge outside the Gutter Section W, carried in Section T_x	Q_x =	3.9	18.2	cfs
Discharge within the Gutter Section W	Q_w =	2.7	6.0	cfs
Discharge Behind the Curb Face	Q_{BACK} =	0.0	0.7	cfs
Flow Area within the Gutter Section W	A_W =	2.25	5.70	sq ft
Velocity within the Gutter Section W	V_W =	2.9	4.2	fps
Water Depth for Design Condition	d_{LOCAL} =	8.0	10.5	inches
Grate Analysis (Calculated)		MINOR	MAJOR	
Total Length of Inlet Grate Opening	L =	N/A	N/A	ft
Ratio of Grate Flow to Design Flow	$E_{o\text{-}GRATE}$ =	N/A	N/A	
Under No-Clogging Condition		MINOR	MAJOR	
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Interception Capacity	Q_i =	N/A	N/A	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient for Multiple-unit Grate Inlet	GrateCoef =	N/A	N/A	
Clogging Factor for Multiple-unit Grate Inlet	GrateClog =	N/A	N/A	
Effective (unclogged) Length of Multiple-unit Grate Inlet	L_e =	N/A	N/A	ft
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Actual Interception Capacity	Q_a =	N/A	N/A	cfs
Carry-Over Flow = Q_o-Q_a (to be applied to curb opening or next d/s inlet)	Q_b =	N/A	N/A	cfs
Curb or Slotted Inlet Opening Analysis (Calculated)		MINOR	MAJOR	
Equivalent Slope S_e (based on grate carry-over)	S_e =	0.097	0.066	ft/ft
Required Length L_T to Have 100% Interception	L_T =	14.16	32.65	ft
Under No-Clogging Condition		MINOR	MAJOR	
Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T)	L =	10.00	10.00	ft
Interception Capacity	Q_i =	5.9	11.7	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient	CurbCoef =	1.25	1.25	
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet	CurbClog =	0.06	0.06	
Effective (Unclogged) Length	L_e =	8.75	8.75	ft
Actual Interception Capacity	Q_a =	5.7	11.2	cfs
Carry-Over Flow = $Q_{b(GRATE)}$-Q_a	Q_b =	0.9	13.7	cfs
Summary		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**5.71**	**11.17**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.9**	**13.7**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**86**	**45**	**%**

INLET IN A SUMP OR SAG LOCATION

Project = Lorson East Prelim Plan #100.040

Inlet ID = Inlet DP-6b (C13.1+ bypass from C12)



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Inlet Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.5	8.0	inches
				☑ Override Depths
Grate Information		MINOR	MAJOR	
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	15.00	15.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	

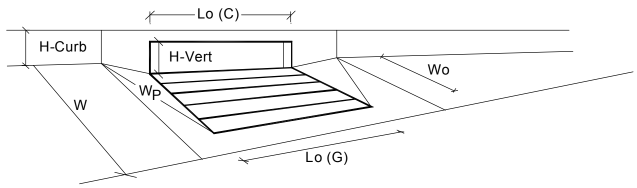
Grate Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	N/A	N/A	
Clogging Factor for Multiple Units	Clog =	N/A	N/A	
Grate Capacity as a Weir (based on UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	N/A	N/A	cfs
Interception with Clogging	Q_{wa} =	N/A	N/A	cfs
Grate Capacity as a Orifice (based on UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	N/A	N/A	cfs
Interception with Clogging	Q_{oa} =	N/A	N/A	cfs
Grate Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	N/A	N/A	cfs
Interception with Clogging	Q_{ma} =	N/A	N/A	cfs
Resulting Grate Capacity (assumes clogged condition)	Q_{Grate} =	**N/A**	**N/A**	**cfs**

Curb Opening Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	1.31	1.31	
Clogging Factor for Multiple Units	Clog =	0.04	0.04	
Curb Opening as a Weir (based on UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	12.45	21.18	cfs
Interception with Clogging	Q_{wa} =	11.90	20.25	cfs
Curb Opening as an Orifice (based on UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	30.33	33.57	cfs
Interception with Clogging	Q_{oa} =	29.00	32.11	cfs
Curb Opening Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	18.07	24.80	cfs
Interception with Clogging	Q_{ma} =	17.28	23.72	cfs
Resulting Curb Opening Capacity (assumes clogged condition)	Q_{Curb} =	**11.90**	**20.25**	**cfs**

Resultant Street Conditions		MINOR	MAJOR	
Total Inlet Length	L =	15.00	15.00	feet
Resultant Street Flow Spread (based on sheet *Q-Allow* geometry)	T =	20.7	27.0	ft.>T-Crown
Resultant Flow Depth at Street Crown	d_{CROWN} =	0.2	1.7	inches
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	Q_a =	**11.9**	**20.3**	**cfs**
WARNING: Inlet Capacity less than Q Peak for MAJOR Storm	$Q_{PEAK\ REQUIRED}$ =	6.8	40.5	cfs

INLET IN A SUMP OR SAG LOCATION

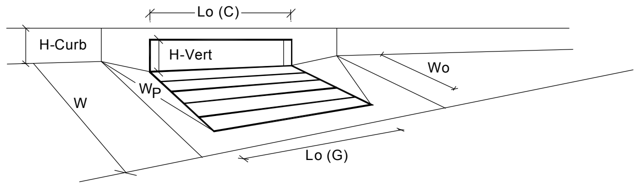
Project = **Lorson East Prelim Plan #100.040**
Inlet ID = **Inlet DP-7 (Basin C16.14)**



		MINOR	MAJOR	
Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Inlet Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.5	8.0	inches
			☑ Override Depths	
Grate Information		MINOR	MAJOR	
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Grate Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	N/A	N/A	
Clogging Factor for Multiple Units	Clog =	N/A	N/A	
Grate Capacity as a Weir (based on UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	N/A	N/A	cfs
Interception with Clogging	Q_{wa} =	N/A	N/A	cfs
Grate Capacity as a Orifice (based on UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	N/A	N/A	cfs
Interception with Clogging	Q_{oa} =	N/A	N/A	cfs
Grate Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	N/A	N/A	cfs
Interception with Clogging	Q_{ma} =	N/A	N/A	cfs
Resulting Grate Capacity (assumes clogged condition)	Q_{Grate} =	**N/A**	**N/A**	**cfs**
Curb Opening Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	1.00	1.00	
Clogging Factor for Multiple Units	Clog =	0.10	0.10	
Curb Opening as a Weir (based on UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	7.06	10.97	cfs
Interception with Clogging	Q_{wa} =	6.35	9.87	cfs
Curb Opening as an Orifice (based on UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	10.11	11.19	cfs
Interception with Clogging	Q_{oa} =	9.10	10.07	cfs
Curb Opening Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	7.86	10.30	cfs
Interception with Clogging	Q_{ma} =	7.07	9.27	cfs
Resulting Curb Opening Capacity (assumes clogged condition)	Q_{Curb} =	**6.35**	**9.27**	**cfs**
Resultant Street Conditions		MINOR	MAJOR	
Total Inlet Length	L =	5.00	5.00	feet
Resultant Street Flow Spread (based on sheet *Q-Allow* geometry)	T =	20.7	27.0	ft.>T-Crown
Resultant Flow Depth at Street Crown	d_{CROWN} =	0.9	2.4	inches
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	Q_a =	**6.4**	**9.3**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	0.3	0.6	cfs

INLET IN A SUMP OR SAG LOCATION

Project = Lorson East Prelim Plan #100.040
Inlet ID = Inlet DP-8 (Basins C16.3+C16.4+ bypass from DP-6a)

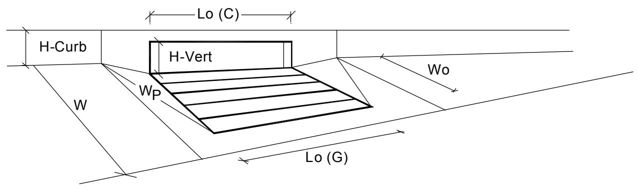


		MINOR	MAJOR	
Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Inlet Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.5	8.0	inches
				☑ Override Depths
Grate Information		MINOR	MAJOR	
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	10.00	10.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Grate Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	N/A	N/A	
Clogging Factor for Multiple Units	Clog =	N/A	N/A	
Grate Capacity as a Weir (based on UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	N/A	N/A	cfs
Interception with Clogging	Q_{wa} =	N/A	N/A	cfs
Grate Capacity as a Orifice (based on UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	N/A	N/A	cfs
Interception with Clogging	Q_{oa} =	N/A	N/A	cfs
Grate Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	N/A	N/A	cfs
Interception with Clogging	Q_{ma} =	N/A	N/A	cfs
Resulting Grate Capacity (assumes clogged condition)	Q_{Grate} =	**N/A**	**N/A**	**cfs**
Curb Opening Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	1.25	1.25	
Clogging Factor for Multiple Units	Clog =	0.06	0.06	
Curb Opening as a Weir (based on UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	10.72	17.34	cfs
Interception with Clogging	Q_{wa} =	10.05	16.26	cfs
Curb Opening as an Orifice (based on UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	20.22	22.38	cfs
Interception with Clogging	Q_{oa} =	18.96	20.98	cfs
Curb Opening Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	13.69	18.32	cfs
Interception with Clogging	Q_{ma} =	12.84	17.18	cfs
Resulting Curb Opening Capacity (assumes clogged condition)	Q_{Curb} =	**10.05**	**16.26**	**cfs**
Resultant Street Conditions		MINOR	MAJOR	
Total Inlet Length	L =	10.00	10.00	feet
Resultant Street Flow Spread (based on sheet *Q-Allow* geometry)	T =	20.7	27.0	ft.>T-Crown
Resultant Flow Depth at Street Crown	d_{CROWN} =	0.9	2.4	inches
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	Q_a =	**10.1**	**16.3**	**cfs**
WARNING: Inlet Capacity less than Q Peak for MAJOR Storm	$Q_{PEAK\ REQUIRED}$ =	6.2	25.2	cfs

INLET IN A SUMP OR SAG LOCATION

Project = Lorson East Prelim Plan #100.040

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



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Inlet Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.5	8.0	inches
				☑ Override Depths
Grate Information		MINOR	MAJOR	
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	10.00	10.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	

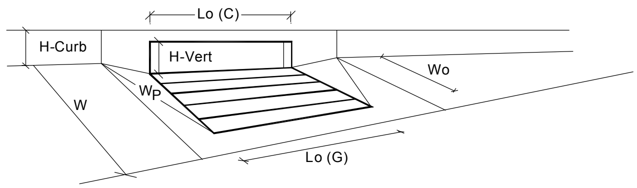
Grate Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	N/A	N/A	
Clogging Factor for Multiple Units	Clog =	N/A	N/A	
Grate Capacity as a Weir (based on UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	N/A	N/A	cfs
Interception with Clogging	Q_{wa} =	N/A	N/A	cfs
Grate Capacity as a Orifice (based on UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	N/A	N/A	cfs
Interception with Clogging	Q_{oa} =	N/A	N/A	cfs
Grate Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	N/A	N/A	cfs
Interception with Clogging	Q_{ma} =	N/A	N/A	cfs
Resulting Grate Capacity (assumes clogged condition)	Q_{Grate} =	**N/A**	**N/A**	**cfs**

Curb Opening Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	1.25	1.25	
Clogging Factor for Multiple Units	Clog =	0.06	0.06	
Curb Opening as a Weir (based on UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	10.72	17.34	cfs
Interception with Clogging	Q_{wa} =	10.05	16.26	cfs
Curb Opening as an Orifice (based on UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	20.22	22.38	cfs
Interception with Clogging	Q_{oa} =	18.96	20.98	cfs
Curb Opening Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	13.69	18.32	cfs
Interception with Clogging	Q_{ma} =	12.84	17.18	cfs
Resulting Curb Opening Capacity (assumes clogged condition)	Q_{Curb} =	**10.05**	**16.26**	**cfs**

Resultant Street Conditions		MINOR	MAJOR	
Total Inlet Length	L =	10.00	10.00	feet
Resultant Street Flow Spread (based on sheet *Q-Allow* geometry)	T =	39.3	52.1	ft.>T-Crown
Resultant Flow Depth at Street Crown	d_{CROWN} =	2.7	4.2	inches
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	Q_a =	**10.1**	**16.3**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	6.0	12.5	cfs

INLET IN A SUMP OR SAG LOCATION

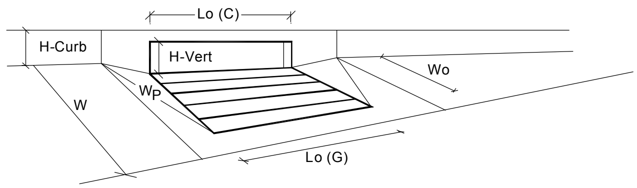
Project = **Lorson East Prelim Plan #100.040**
Inlet ID = **Inlet DP-10a (C16.18+bypass from Inlet DP-8)**



		MINOR	MAJOR	
Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Inlet Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.5	8.0	inches
			☑ Override Depths	
Grate Information		MINOR	MAJOR	
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	15.00	15.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Grate Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	N/A	N/A	
Clogging Factor for Multiple Units	Clog =	N/A	N/A	
Grate Capacity as a Weir (based on UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	N/A	N/A	cfs
Interception with Clogging	Q_{wa} =	N/A	N/A	cfs
Grate Capacity as a Orifice (based on UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	N/A	N/A	cfs
Interception with Clogging	Q_{oa} =	N/A	N/A	cfs
Grate Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	N/A	N/A	cfs
Interception with Clogging	Q_{ma} =	N/A	N/A	cfs
Resulting Grate Capacity (assumes clogged condition)	Q_{Grate} =	**N/A**	**N/A**	**cfs**
Curb Opening Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	1.31	1.31	
Clogging Factor for Multiple Units	Clog =	0.04	0.04	
Curb Opening as a Weir (based on UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	12.45	21.18	cfs
Interception with Clogging	Q_{wa} =	11.90	20.25	cfs
Curb Opening as an Orifice (based on UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	30.33	33.57	cfs
Interception with Clogging	Q_{oa} =	29.00	32.11	cfs
Curb Opening Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	18.07	24.80	cfs
Interception with Clogging	Q_{ma} =	17.28	23.72	cfs
Resulting Curb Opening Capacity (assumes clogged condition)	Q_{Curb} =	**11.90**	**20.25**	**cfs**
Resultant Street Conditions		MINOR	MAJOR	
Total Inlet Length	L =	15.00	15.00	feet
Resultant Street Flow Spread (based on sheet *Q-Allow* geometry)	T =	39.3	52.1	ft.>T-Crown
Resultant Flow Depth at Street Crown	d_{CROWN} =	2.7	4.2	inches
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	Q_a =	**11.9**	**20.3**	**cfs**
WARNING: Inlet Capacity less than Q Peak for MAJOR Storm	$Q_{PEAK\ REQUIRED}$ =	5.7	20.7	cfs

INLET IN A SUMP OR SAG LOCATION

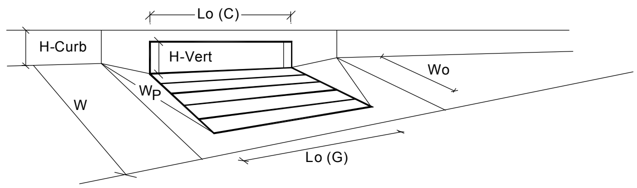
Project = **Lorson East Prelim Plan #100.040**
Inlet ID = **Inlet DP-10b (C16.26)**



		MINOR	MAJOR	
Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Inlet Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.5	8.0	inches
				☑ Override Depths
Grate Information		MINOR	MAJOR	
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Grate Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	N/A	N/A	
Clogging Factor for Multiple Units	Clog =	N/A	N/A	
Grate Capacity as a Weir (based on UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	N/A	N/A	cfs
Interception with Clogging	Q_{wa} =	N/A	N/A	cfs
Grate Capacity as a Orifice (based on UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	N/A	N/A	cfs
Interception with Clogging	Q_{oa} =	N/A	N/A	cfs
Grate Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	N/A	N/A	cfs
Interception with Clogging	Q_{ma} =	N/A	N/A	cfs
Resulting Grate Capacity (assumes clogged condition)	Q_{Grate} =	**N/A**	**N/A**	**cfs**
Curb Opening Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	1.00	1.00	
Clogging Factor for Multiple Units	Clog =	0.10	0.10	
Curb Opening as a Weir (based on UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	7.06	10.97	cfs
Interception with Clogging	Q_{wa} =	6.35	9.87	cfs
Curb Opening as an Orifice (based on UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	10.11	11.19	cfs
Interception with Clogging	Q_{oa} =	9.10	10.07	cfs
Curb Opening Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	7.86	10.30	cfs
Interception with Clogging	Q_{ma} =	7.07	9.27	cfs
Resulting Curb Opening Capacity (assumes clogged condition)	Q_{Curb} =	**6.35**	**9.27**	**cfs**
Resultant Street Conditions		MINOR	MAJOR	
Total Inlet Length	L =	5.00	5.00	feet
Resultant Street Flow Spread (based on sheet *Q-Allow* geometry)	T =	39.3	52.1	ft.>T-Crown
Resultant Flow Depth at Street Crown	d_{CROWN} =	2.7	4.2	inches
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	Q_a =	**6.4**	**9.3**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	3.2	6.9	cfs

INLET IN A SUMP OR SAG LOCATION

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

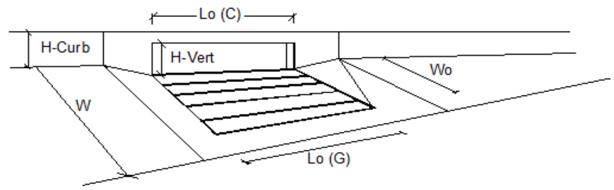


		MINOR	MAJOR	
Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Inlet Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.5	8.0	inches
			☑ Override Depths	
Grate Information		MINOR	MAJOR	
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Grate Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	N/A	N/A	
Clogging Factor for Multiple Units	Clog =	N/A	N/A	
Grate Capacity as a Weir (based on UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	N/A	N/A	cfs
Interception with Clogging	Q_{wa} =	N/A	N/A	cfs
Grate Capacity as a Orifice (based on UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	N/A	N/A	cfs
Interception with Clogging	Q_{oa} =	N/A	N/A	cfs
Grate Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	N/A	N/A	cfs
Interception with Clogging	Q_{ma} =	N/A	N/A	cfs
Resulting Grate Capacity (assumes clogged condition)	Q_{Grate} =	**N/A**	**N/A**	**cfs**
Curb Opening Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	1.00	1.00	
Clogging Factor for Multiple Units	Clog =	0.10	0.10	
Curb Opening as a Weir (based on UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	7.06	10.97	cfs
Interception with Clogging	Q_{wa} =	6.35	9.87	cfs
Curb Opening as an Orifice (based on UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	10.11	11.19	cfs
Interception with Clogging	Q_{oa} =	9.10	10.07	cfs
Curb Opening Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	7.86	10.30	cfs
Interception with Clogging	Q_{ma} =	7.07	9.27	cfs
Resulting Curb Opening Capacity (assumes clogged condition)	Q_{Curb} =	**6.35**	**9.27**	**cfs**
Resultant Street Conditions		MINOR	MAJOR	
Total Inlet Length	L =	5.00	5.00	feet
Resultant Street Flow Spread (based on sheet *Q-Allow* geometry)	T =	39.3	52.1	ft.>T-Crown
Resultant Flow Depth at Street Crown	d_{CROWN} =	2.7	4.2	inches
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	Q_a =	**6.4**	**9.3**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	0.6	1.3	cfs

INLET ON A CONTINUOUS GRADE

Project: Lorson East Prelim Plan #100.040

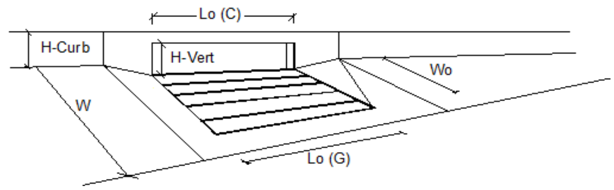
Inlet ID: Inlet DP-12 (Basins C16.22-C16.23)



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	10.00	10.00	ft
Width of a Unit Grate (cannot be greater than W from Q-Allow)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	
Street Hydraulics: OK - Q < maximum allowable from sheet 'Q-Allow'		MINOR	MAJOR	
Design Discharge for Half of Street (from Sheet *Q-Peak*)	Q_o =	8.0	16.6	cfs
Water Spread Width	T =	15.2	17.0	ft
Water Depth at Flowline (outside of local depression)	d =	5.2	6.4	inches
Water Depth at Street Crown (or at T_{MAX})	d_{CROWN} =	0.0	0.8	inches
Ratio of Gutter Flow to Design Flow	E_o =	0.392	0.293	
Discharge outside the Gutter Section W, carried in Section T_x	Q_x =	4.9	11.7	cfs
Discharge within the Gutter Section W	Q_w =	3.1	4.9	cfs
Discharge Behind the Curb Face	Q_{BACK} =	0.0	0.0	cfs
Flow Area within the Gutter Section W	A_W =	2.44	4.17	sq ft
Velocity within the Gutter Section W	V_W =	3.3	4.0	fps
Water Depth for Design Condition	d_{LOCAL} =	8.2	9.4	inches
Grate Analysis (Calculated)		MINOR	MAJOR	
Total Length of Inlet Grate Opening	L =	N/A	N/A	ft
Ratio of Grate Flow to Design Flow	$E_{o\text{-}GRATE}$ =	N/A	N/A	
Under No-Clogging Condition		MINOR	MAJOR	
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Interception Capacity	Q_i =	N/A	N/A	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient for Multiple-unit Grate Inlet	GrateCoef =	N/A	N/A	
Clogging Factor for Multiple-unit Grate Inlet	GrateClog =	N/A	N/A	
Effective (unclogged) Length of Multiple-unit Grate Inlet	L_e =	N/A	N/A	ft
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Actual Interception Capacity	Q_a =	N/A	N/A	cfs
Carry-Over Flow = Q_o-Q_a (to be applied to curb opening or next d/s inlet)	Q_b =	N/A	N/A	cfs
Curb or Slotted Inlet Opening Analysis (Calculated)		MINOR	MAJOR	
Equivalent Slope S_e (based on grate carry-over)	S_e =	0.094	0.075	ft/ft
Required Length L_T to Have 100% Interception	L_T =	16.05	25.73	ft
Under No-Clogging Condition		MINOR	MAJOR	
Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T)	L =	10.00	10.00	ft
Interception Capacity	Q_i =	6.6	9.7	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient	CurbCoef =	1.25	1.25	
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet	CurbClog =	0.06	0.06	
Effective (Unclogged) Length	L_e =	8.75	8.75	ft
Actual Interception Capacity	Q_a =	6.4	9.3	cfs
Carry-Over Flow = $Q_{b(GRATE)}$-Q_a	Q_b =	1.6	7.3	cfs
Summary		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**6.43**	**9.35**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**1.6**	**7.3**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**80**	**56**	**%**

INLET ON A CONTINUOUS GRADE

Project: Lorson East Prelim Plan #100.040
Inlet ID: Inlet DP-12a (Basins C16.20-16.21)

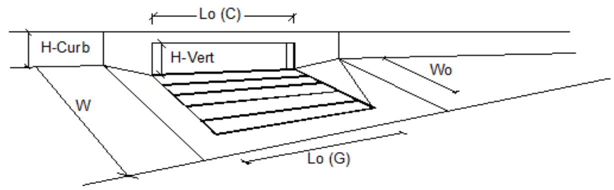


		MINOR	MAJOR	
Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	10.00	10.00	ft
Width of a Unit Grate (cannot be greater than W from Q-Allow)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	
Street Hydraulics: OK - Q < maximum allowable from sheet 'Q-Allow'		MINOR	MAJOR	
Design Discharge for Half of Street (from Sheet *Q-Peak*)	Q_o =	8.8	18.3	cfs
Water Spread Width	T =	15.8	17.0	ft
Water Depth at Flowline (outside of local depression)	d =	5.3	6.6	inches
Water Depth at Street Crown (or at T_{MAX})	d_{CROWN} =	0.0	1.0	inches
Ratio of Gutter Flow to Design Flow	E_o =	0.377	0.282	
Discharge outside the Gutter Section W, carried in Section T_x	Q_x =	5.5	13.1	cfs
Discharge within the Gutter Section W	Q_w =	3.3	5.2	cfs
Discharge Behind the Curb Face	Q_{BACK} =	0.0	0.1	cfs
Flow Area within the Gutter Section W	A_W =	2.62	4.46	sq ft
Velocity within the Gutter Section W	V_W =	3.4	4.1	fps
Water Depth for Design Condition	d_{LOCAL} =	8.3	9.6	inches
Grate Analysis (Calculated)		MINOR	MAJOR	
Total Length of Inlet Grate Opening	L =	N/A	N/A	ft
Ratio of Grate Flow to Design Flow	$E_{o\text{-}GRATE}$ =	N/A	N/A	
Under No-Clogging Condition		MINOR	MAJOR	
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Interception Capacity	Q_i =	N/A	N/A	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient for Multiple-unit Grate Inlet	GrateCoef =	N/A	N/A	
Clogging Factor for Multiple-unit Grate Inlet	GrateClog =	N/A	N/A	
Effective (unclogged) Length of Multiple-unit Grate Inlet	L_e =	N/A	N/A	ft
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Actual Interception Capacity	Q_a =	N/A	N/A	cfs
Carry-Over Flow = Q_o-Q_a (to be applied to curb opening or next d/s inlet)	Q_b =	N/A	N/A	cfs
Curb or Slotted Inlet Opening Analysis (Calculated)		MINOR	MAJOR	
Equivalent Slope S_e (based on grate carry-over)	S_e =	0.091	0.073	ft/ft
Required Length L_T to Have 100% Interception	L_T =	17.07	27.35	ft
Under No-Clogging Condition		MINOR	MAJOR	
Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T)	L =	10.00	10.00	ft
Interception Capacity	Q_i =	7.0	10.2	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient	CurbCoef =	1.25	1.25	
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet	CurbClog =	0.06	0.06	
Effective (Unclogged) Length	L_e =	8.75	8.75	ft
Actual Interception Capacity	Q_a =	6.8	9.8	cfs
Carry-Over Flow = $Q_{b(GRATE)}$-Q_a	Q_b =	2.0	8.5	cfs
Summary		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**6.78**	**9.78**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**2.0**	**8.5**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**77**	**53**	**%**

INLET ON A CONTINUOUS GRADE

Project: Lorson East Prelim Plan #100.040

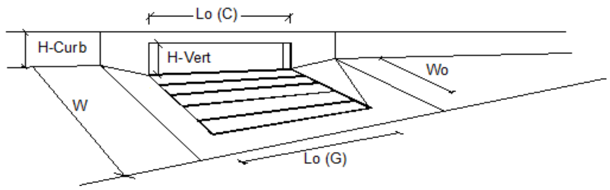
Inlet ID: Inlet DP-13 (Basins C16.24 + bypass from Inlet DP-12 & Inlet DP12a)



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	10.00	10.00	ft
Width of a Unit Grate (cannot be greater than W from Q-Allow)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	
Street Hydraulics: OK - Q < maximum allowable from sheet 'Q-Allow'		MINOR	MAJOR	
Design Discharge for Half of Street (from Sheet *Q-Peak*)	Q_o =	8.3	25.5	cfs
Water Spread Width	T =	16.0	17.0	ft
Water Depth at Flowline (outside of local depression)	d =	5.4	7.5	inches
Water Depth at Street Crown (or at T_{MAX})	d_{CROWN} =	0.0	1.9	inches
Ratio of Gutter Flow to Design Flow	E_o =	0.372	0.245	
Discharge outside the Gutter Section W, carried in Section T_x	Q_x =	5.2	18.7	cfs
Discharge within the Gutter Section W	Q_w =	3.1	6.1	cfs
Discharge Behind the Curb Face	Q_{BACK} =	0.0	0.8	cfs
Flow Area within the Gutter Section W	A_W =	2.69	5.78	sq ft
Velocity within the Gutter Section W	V_W =	3.1	4.3	fps
Water Depth for Design Condition	d_{LOCAL} =	8.4	10.5	inches
Grate Analysis (Calculated)		MINOR	MAJOR	
Total Length of Inlet Grate Opening	L =	N/A	N/A	ft
Ratio of Grate Flow to Design Flow	$E_{o\text{-}GRATE}$ =	N/A	N/A	
Under No-Clogging Condition		MINOR	MAJOR	
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Interception Capacity	Q_i =	N/A	N/A	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient for Multiple-unit Grate Inlet	GrateCoef =	N/A	N/A	
Clogging Factor for Multiple-unit Grate Inlet	GrateClog =	N/A	N/A	
Effective (unclogged) Length of Multiple-unit Grate Inlet	L_e =	N/A	N/A	ft
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Actual Interception Capacity	Q_a =	N/A	N/A	cfs
Carry-Over Flow = Q_o-Q_a (to be applied to curb opening or next d/s inlet)	Q_b =	N/A	N/A	cfs
Curb or Slotted Inlet Opening Analysis (Calculated)		MINOR	MAJOR	
Equivalent Slope S_e (based on grate carry-over)	S_e =	0.090	0.066	ft/ft
Required Length L_T to Have 100% Interception	L_T =	16.47	33.07	ft
Under No-Clogging Condition		MINOR	MAJOR	
Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T)	L =	10.00	10.00	ft
Interception Capacity	Q_i =	6.8	11.8	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient	CurbCoef =	1.25	1.25	
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet	CurbClog =	0.06	0.06	
Effective (Unclogged) Length	L_e =	8.75	8.75	ft
Actual Interception Capacity	Q_a =	6.5	11.3	cfs
Carry-Over Flow = $Q_{b(GRATE)}$-Q_a	Q_b =	1.8	14.2	cfs
Summary		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**6.55**	**11.28**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**1.8**	**14.2**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**79**	**44**	**%**

INLET ON A CONTINUOUS GRADE

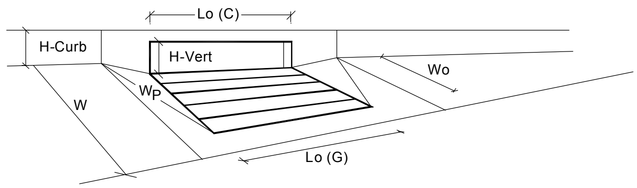
Project: Lorson East Prelim Plan #100.040
Inlet ID: Inlet DP-14 (Basin C16.30)



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	10.00	10.00	ft
Width of a Unit Grate (cannot be greater than W from Q-Allow)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	
Street Hydraulics: OK - Q < maximum allowable from sheet 'Q-Allow'		MINOR	MAJOR	
Design Discharge for Half of Street (from Sheet *Q-Peak*)	Q_o =	7.1	14.5	cfs
Water Spread Width	T =	15.0	17.0	ft
Water Depth at Flowline (outside of local depression)	d =	5.1	6.3	inches
Water Depth at Street Crown (or at T_{MAX})	d_{CROWN} =	0.0	0.7	inches
Ratio of Gutter Flow to Design Flow	E_o =	0.398	0.298	
Discharge outside the Gutter Section W, carried in Section T_x	Q_x =	4.3	10.2	cfs
Discharge within the Gutter Section W	Q_w =	2.8	4.3	cfs
Discharge Behind the Curb Face	Q_{BACK} =	0.0	0.0	cfs
Flow Area within the Gutter Section W	A_W =	2.36	4.05	sq ft
Velocity within the Gutter Section W	V_W =	3.0	3.6	fps
Water Depth for Design Condition	d_{LOCAL} =	8.1	9.3	inches
Grate Analysis (Calculated)		MINOR	MAJOR	
Total Length of Inlet Grate Opening	L =	N/A	N/A	ft
Ratio of Grate Flow to Design Flow	$E_{o\text{-}GRATE}$ =	N/A	N/A	
Under No-Clogging Condition		MINOR	MAJOR	
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Interception Capacity	Q_i =	N/A	N/A	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient for Multiple-unit Grate Inlet	GrateCoef =	N/A	N/A	
Clogging Factor for Multiple-unit Grate Inlet	GrateClog =	N/A	N/A	
Effective (unclogged) Length of Multiple-unit Grate Inlet	L_e =	N/A	N/A	ft
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Actual Interception Capacity	Q_a =	N/A	N/A	cfs
Carry-Over Flow = Q_o-Q_a (to be applied to curb opening or next d/s inlet)	Q_b =	N/A	N/A	cfs
Curb or Slotted Inlet Opening Analysis (Calculated)		MINOR	MAJOR	
Equivalent Slope S_e (based on grate carry-over)	S_e =	0.095	0.076	ft/ft
Required Length L_T to Have 100% Interception	L_T =	14.79	23.61	ft
Under No-Clogging Condition		MINOR	MAJOR	
Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T)	L =	10.00	10.00	ft
Interception Capacity	Q_i =	6.1	9.1	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient	CurbCoef =	1.25	1.25	
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet	CurbClog =	0.06	0.06	
Effective (Unclogged) Length	L_e =	8.75	8.75	ft
Actual Interception Capacity	Q_a =	6.0	8.7	cfs
Carry-Over Flow = $Q_{b(GRATE)}$-Q_a	Q_b =	1.1	5.7	cfs
Summary		MINOR	MAJOR	
Total Inlet Interception Capacity	Q =	**5.95**	**8.74**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	Q_b =	**1.1**	**5.7**	**cfs**
Capture Percentage = Q_a/Q_o =	C% =	**84**	**60**	**%**

INLET IN A SUMP OR SAG LOCATION

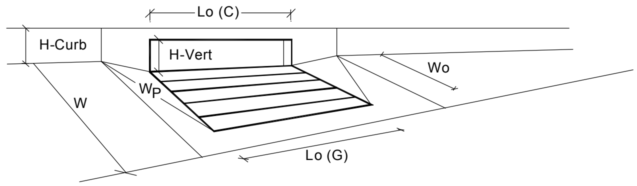
Project = Lorson East Prelim Plan #100.040
Inlet ID = Inlet DP-16 (Basin C16.19+Basin C16.28+Basin C16.29+bypass from Inlet DP-6b+bypass from Inlet 13)



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Inlet Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.5	8.0	inches
	☑ Override Depths			
Grate Information		MINOR	MAJOR	
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	30.00	30.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Grate Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	N/A	N/A	
Clogging Factor for Multiple Units	Clog =	N/A	N/A	
Grate Capacity as a Weir (based on UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	N/A	N/A	cfs
Interception with Clogging	Q_{wa} =	N/A	N/A	cfs
Grate Capacity as a Orifice (based on UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	N/A	N/A	cfs
Interception with Clogging	Q_{oa} =	N/A	N/A	cfs
Grate Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	N/A	N/A	cfs
Interception with Clogging	Q_{ma} =	N/A	N/A	cfs
Resulting Grate Capacity (assumes clogged condition)	Q_{Grate} =	**N/A**	**N/A**	**cfs**
Curb Opening Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	1.33	1.33	
Clogging Factor for Multiple Units	Clog =	0.02	0.02	
Curb Opening as a Weir (based on UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	22.48	38.26	cfs
Interception with Clogging	Q_{wa} =	21.98	37.41	cfs
Curb Opening as an Orifice (based on UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	60.66	67.15	cfs
Interception with Clogging	Q_{oa} =	59.31	65.66	cfs
Curb Opening Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	34.34	47.14	cfs
Interception with Clogging	Q_{ma} =	33.58	46.09	cfs
Resulting Curb Opening Capacity (assumes clogged condition)	Q_{Curb} =	**21.98**	**37.41**	**cfs**
Resultant Street Conditions		MINOR	MAJOR	
Total Inlet Length	L =	30.00	30.00	feet
Resultant Street Flow Spread (based on sheet *Q-Allow* geometry)	T =	39.3	52.1	ft.>T-Crown
Resultant Flow Depth at Street Crown	d_{CROWN} =	2.7	4.2	inches
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	Q_a =	**22.0**	**37.4**	**cfs**
WARNING: Inlet Capacity less than Q Peak for MAJOR Storm	$Q_{PEAK\ REQUIRED}$ =	12.8	57.3	cfs

INLET IN A SUMP OR SAG LOCATION

Project = Lorson East Prelim Plan #100.040
Inlet ID = Inlet DP-17 (Basin C16.25+Basin C16.32+bypass from Inlet DP-14+bypass from Inlet 16)

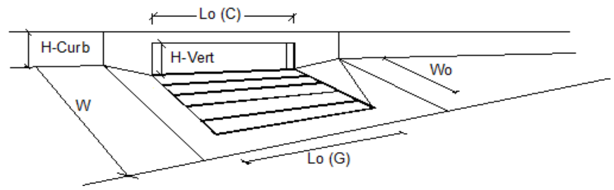


		MINOR	MAJOR	
Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Inlet Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.5	8.0	inches
	☑ Override Depths			
Grate Information		MINOR	MAJOR	
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	25.00	25.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Grate Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	N/A	N/A	
Clogging Factor for Multiple Units	Clog =	N/A	N/A	
Grate Capacity as a Weir (based on UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	N/A	N/A	cfs
Interception with Clogging	Q_{wa} =	N/A	N/A	cfs
Grate Capacity as a Orifice (based on UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	N/A	N/A	cfs
Interception with Clogging	Q_{oa} =	N/A	N/A	cfs
Grate Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	N/A	N/A	cfs
Interception with Clogging	Q_{ma} =	N/A	N/A	cfs
Resulting Grate Capacity (assumes clogged condition)	Q_{Grate} =	**N/A**	**N/A**	**cfs**
Curb Opening Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	1.33	1.33	
Clogging Factor for Multiple Units	Clog =	0.03	0.03	
Curb Opening as a Weir (based on UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	19.14	32.57	cfs
Interception with Clogging	Q_{wa} =	18.63	31.70	cfs
Curb Opening as an Orifice (based on UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	50.55	55.95	cfs
Interception with Clogging	Q_{oa} =	49.20	54.47	cfs
Curb Opening Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	28.92	39.70	cfs
Interception with Clogging	Q_{ma} =	28.16	38.64	cfs
Resulting Curb Opening Capacity (assumes clogged condition)	Q_{Curb} =	**18.63**	**31.70**	**cfs**
Resultant Street Conditions		MINOR	MAJOR	
Total Inlet Length	L =	25.00	25.00	feet
Resultant Street Flow Spread (based on sheet *Q-Allow* geometry)	T =	39.3	52.1	ft.>T-Crown
Resultant Flow Depth at Street Crown	d_{CROWN} =	2.7	4.2	inches
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	Q_a =	**18.6**	**31.7**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	3.9	31.6	cfs

INLET ON A CONTINUOUS GRADE

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

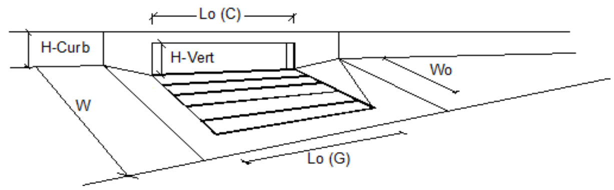
Inlet ID: **Inlet DP-19c (Basins C14.1+C14.2)**



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	10.00	10.00	ft
Width of a Unit Grate (cannot be greater than W from Q-Allow)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	
Street Hydraulics: OK - Q < maximum allowable from sheet 'Q-Allow'		MINOR	MAJOR	
Design Discharge for Half of Street (from Sheet *Q-Peak*)	Q_o =	6.5	22.1	cfs
Water Spread Width	T =	14.3	17.0	ft
Water Depth at Flowline (outside of local depression)	d =	5.0	7.2	inches
Water Depth at Street Crown (or at T_{MAX})	d_{CROWN} =	0.0	1.6	inches
Ratio of Gutter Flow to Design Flow	E_o =	0.416	0.259	
Discharge outside the Gutter Section W, carried in Section T_x	Q_x =	3.8	16.1	cfs
Discharge within the Gutter Section W	Q_w =	2.7	5.6	cfs
Discharge Behind the Curb Face	Q_{BACK} =	0.0	0.4	cfs
Flow Area within the Gutter Section W	A_W =	2.18	5.24	sq ft
Velocity within the Gutter Section W	V_W =	3.0	4.2	fps
Water Depth for Design Condition	d_{LOCAL} =	8.0	10.2	inches
Grate Analysis (Calculated)		MINOR	MAJOR	
Total Length of Inlet Grate Opening	L =	N/A	N/A	ft
Ratio of Grate Flow to Design Flow	$E_{o\text{-}GRATE}$ =	N/A	N/A	
Under No-Clogging Condition		MINOR	MAJOR	
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Interception Capacity	Q_i =	N/A	N/A	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient for Multiple-unit Grate Inlet	GrateCoef =	N/A	N/A	
Clogging Factor for Multiple-unit Grate Inlet	GrateClog =	N/A	N/A	
Effective (unclogged) Length of Multiple-unit Grate Inlet	L_e =	N/A	N/A	ft
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Actual Interception Capacity	Q_a =	N/A	N/A	cfs
Carry-Over Flow = Q_o-Q_a (to be applied to curb opening or next d/s inlet)	Q_b =	N/A	N/A	cfs
Curb or Slotted Inlet Opening Analysis (Calculated)		MINOR	MAJOR	
Equivalent Slope S_e (based on grate carry-over)	S_e =	0.098	0.069	ft/ft
Required Length L_T to Have 100% Interception	L_T =	14.00	30.53	ft
Under No-Clogging Condition		MINOR	MAJOR	
Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T)	L =	10.00	10.00	ft
Interception Capacity	Q_i =	5.8	11.1	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient	CurbCoef =	1.25	1.25	
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet	CurbClog =	0.06	0.06	
Effective (Unclogged) Length	L_e =	8.75	8.75	ft
Actual Interception Capacity	Q_a =	5.7	10.6	cfs
Carry-Over Flow = $Q_{b(GRATE)}$-Q_a	Q_b =	0.8	11.5	cfs
Summary		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**5.66**	**10.62**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.8**	**11.5**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**87**	**48**	**%**

INLET ON A CONTINUOUS GRADE

Project: **Lorson East Prelim Plan #100.040**
Inlet ID: **Inlet DP-20 (Basin C15.8)**

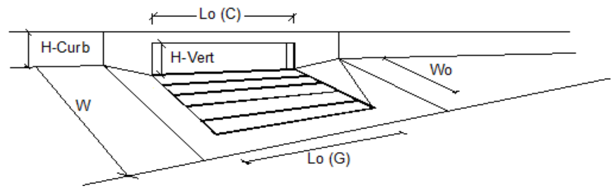


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	15.00	15.00	ft
Width of a Unit Grate (cannot be greater than W from Q-Allow)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	
Street Hydraulics: OK - Q < maximum allowable from sheet 'Q-Allow'		MINOR	MAJOR	
Design Discharge for Half of Street (from Sheet *Q-Peak*)	**Q_o =**	5.2	13.4	cfs
Water Spread Width	T =	12.9	17.0	ft
Water Depth at Flowline (outside of local depression)	d =	4.6	6.1	inches
Water Depth at Street Crown (or at T_{MAX})	d_{CROWN} =	0.0	0.5	inches
Ratio of Gutter Flow to Design Flow	E_o =	0.459	0.313	
Discharge outside the Gutter Section W, carried in Section T_x	Q_x =	2.8	9.2	cfs
Discharge within the Gutter Section W	Q_w =	2.4	4.2	cfs
Discharge Behind the Curb Face	Q_{BACK} =	0.0	0.0	cfs
Flow Area within the Gutter Section W	A_W =	1.79	3.71	sq ft
Velocity within the Gutter Section W	V_W =	2.9	3.6	fps
Water Depth for Design Condition	d_{LOCAL} =	7.6	9.1	inches
Grate Analysis (Calculated)		MINOR	MAJOR	
Total Length of Inlet Grate Opening	L =	N/A	N/A	ft
Ratio of Grate Flow to Design Flow	$E_{o\text{-}GRATE}$ =	N/A	N/A	
Under No-Clogging Condition		MINOR	MAJOR	
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Interception Capacity	Q_i =	N/A	N/A	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient for Multiple-unit Grate Inlet	GrateCoef =	N/A	N/A	
Clogging Factor for Multiple-unit Grate Inlet	GrateClog =	N/A	N/A	
Effective (unclogged) Length of Multiple-unit Grate Inlet	L_e =	N/A	N/A	ft
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Actual Interception Capacity	**Q_a =**	N/A	N/A	cfs
Carry-Over Flow = Q_o-Q_a (to be applied to curb opening or next d/s inlet)	**Q_b =**	N/A	N/A	cfs
Curb or Slotted Inlet Opening Analysis (Calculated)		MINOR	MAJOR	
Equivalent Slope S_e (based on grate carry-over)	S_e =	0.106	0.079	ft/ft
Required Length L_T to Have 100% Interception	L_T =	12.07	22.45	ft
Under No-Clogging Condition		MINOR	MAJOR	
Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T)	L =	12.07	15.00	ft
Interception Capacity	Q_i =	5.2	11.6	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient	CurbCoef =	1.31	1.31	
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet	CurbClog =	0.04	0.04	
Effective (Unclogged) Length	L_e =	13.03	13.03	ft
Actual Interception Capacity	**Q_a =**	5.2	11.3	cfs
Carry-Over Flow = $Q_{b(GRATE)}$-Q_a	**Q_b =**	0.0	2.1	cfs
Summary		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**5.20**	**11.33**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**2.1**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**85**	**%**

INLET ON A CONTINUOUS GRADE

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

Inlet ID: **Inlet DP-23 (Basins C15.3+C15.4)**

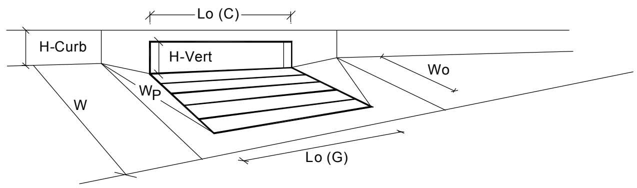


		MINOR	MAJOR	
Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	15.00	15.00	ft
Width of a Unit Grate (cannot be greater than W from Q-Allow)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	
Street Hydraulics: OK - Q < maximum allowable from sheet 'Q-Allow'		MINOR	MAJOR	
Design Discharge for Half of Street (from Sheet *Q-Peak*)	Q_o =	8.7	18.7	cfs
Water Spread Width	T =	16.0	17.0	ft
Water Depth at Flowline (outside of local depression)	d =	5.4	6.7	inches
Water Depth at Street Crown (or at T_{MAX})	d_{CROWN} =	0.0	1.1	inches
Ratio of Gutter Flow to Design Flow	E_o =	0.373	0.276	
Discharge outside the Gutter Section W, carried in Section T_x	Q_x =	5.5	13.5	cfs
Discharge within the Gutter Section W	Q_w =	3.2	5.1	cfs
Discharge Behind the Curb Face	Q_{BACK} =	0.0	0.1	cfs
Flow Area within the Gutter Section W	A_W =	2.68	4.64	sq ft
Velocity within the Gutter Section W	V_W =	3.2	4.0	fps
Water Depth for Design Condition	d_{LOCAL} =	8.4	9.7	inches
Grate Analysis (Calculated)		MINOR	MAJOR	
Total Length of Inlet Grate Opening	L =	N/A	N/A	ft
Ratio of Grate Flow to Design Flow	$E_{o-GRATE}$ =	N/A	N/A	
Under No-Clogging Condition		MINOR	MAJOR	
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Interception Capacity	Q_i =	N/A	N/A	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient for Multiple-unit Grate Inlet	GrateCoef =	N/A	N/A	
Clogging Factor for Multiple-unit Grate Inlet	GrateClog =	N/A	N/A	
Effective (unclogged) Length of Multiple-unit Grate Inlet	L_e =	N/A	N/A	ft
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Actual Interception Capacity	Q_a =	N/A	N/A	cfs
Carry-Over Flow = Q_o-Q_a (to be applied to curb opening or next d/s inlet)	Q_b =	N/A	N/A	cfs
Curb or Slotted Inlet Opening Analysis (Calculated)		MINOR	MAJOR	
Equivalent Slope S_e (based on grate carry-over)	S_e =	0.090	0.072	ft/ft
Required Length L_T to Have 100% Interception	L_T =	16.94	27.66	ft
Under No-Clogging Condition		MINOR	MAJOR	
Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T)	L =	15.00	15.00	ft
Interception Capacity	Q_i =	8.5	14.0	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient	CurbCoef =	1.31	1.31	
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet	CurbClog =	0.04	0.04	
Effective (Unclogged) Length	L_e =	13.03	13.03	ft
Actual Interception Capacity	Q_a =	8.4	13.7	cfs
Carry-Over Flow = $Q_{b(GRATE)}$-Q_a	Q_b =	0.3	5.0	cfs
Summary		MINOR	MAJOR	
Total Inlet Interception Capacity	Q =	**8.43**	**13.69**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	Q_b =	**0.3**	**5.0**	**cfs**
Capture Percentage = Q_a/Q_o =	C% =	**97**	**73**	**%**

INLET IN A SUMP OR SAG LOCATION

Project = Lorson East Prelim Plan #100.040

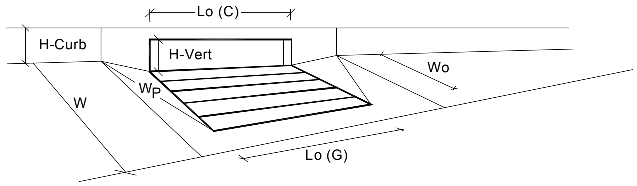
Inlet ID = Inlet DP-25 (Basin C15.5+C15.6+C15.11+C12+bypass from Inlet DP-23)



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Inlet Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.5	8.0	inches
				☑ Override Depths
Grate Information		MINOR	MAJOR	
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	25.00	25.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Grate Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	N/A	N/A	
Clogging Factor for Multiple Units	Clog =	N/A	N/A	
Grate Capacity as a Weir (based on UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	N/A	N/A	cfs
Interception with Clogging	Q_{wa} =	N/A	N/A	cfs
Grate Capacity as a Orifice (based on UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	N/A	N/A	cfs
Interception with Clogging	Q_{oa} =	N/A	N/A	cfs
Grate Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	N/A	N/A	cfs
Interception with Clogging	Q_{ma} =	N/A	N/A	cfs
Resulting Grate Capacity (assumes clogged condition)	Q_{Grate} =	**N/A**	**N/A**	**cfs**
Curb Opening Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	1.33	1.33	
Clogging Factor for Multiple Units	Clog =	0.03	0.03	
Curb Opening as a Weir (based on UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	19.14	32.57	cfs
Interception with Clogging	Q_{wa} =	18.63	31.70	cfs
Curb Opening as an Orifice (based on UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	50.55	55.95	cfs
Interception with Clogging	Q_{oa} =	49.20	54.47	cfs
Curb Opening Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	28.92	39.70	cfs
Interception with Clogging	Q_{ma} =	28.16	38.64	cfs
Resulting Curb Opening Capacity (assumes clogged condition)	Q_{Curb} =	**18.63**	**31.70**	**cfs**
Resultant Street Conditions		MINOR	MAJOR	
Total Inlet Length	L =	25.00	25.00	feet
Resultant Street Flow Spread (based on sheet *Q-Allow* geometry)	T =	39.3	52.1	ft.>T-Crown
Resultant Flow Depth at Street Crown	d_{CROWN} =	2.7	4.2	inches
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	Q_a =	**18.6**	**31.7**	**cfs**
WARNING: Inlet Capacity less than Q Peak for MAJOR Storm	$Q_{PEAK\ REQUIRED}$ =	16.0	38.9	cfs

INLET IN A SUMP OR SAG LOCATION

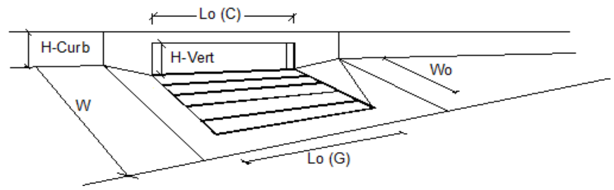
Project = Lorson East Prelim Plan #100.040
Inlet ID = Inlet DP-26 (Basin C15.7+C15.13+bypass from Inlet DP-25)



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Inlet Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.5	8.0	inches
	☑ Override Depths			
Grate Information		MINOR	MAJOR	
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	20.00	20.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Grate Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	N/A	N/A	
Clogging Factor for Multiple Units	Clog =	N/A	N/A	
Grate Capacity as a Weir (based on UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	N/A	N/A	cfs
Interception with Clogging	Q_{wa} =	N/A	N/A	cfs
Grate Capacity as a Orifice (based on UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	N/A	N/A	cfs
Interception with Clogging	Q_{oa} =	N/A	N/A	cfs
Grate Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	N/A	N/A	cfs
Interception with Clogging	Q_{ma} =	N/A	N/A	cfs
Resulting Grate Capacity (assumes clogged condition)	Q_{Grate} =	**N/A**	**N/A**	**cfs**
Curb Opening Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	1.33	1.33	
Clogging Factor for Multiple Units	Clog =	0.03	0.03	
Curb Opening as a Weir (based on UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	15.79	26.87	cfs
Interception with Clogging	Q_{wa} =	15.27	25.98	cfs
Curb Opening as an Orifice (based on UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	40.44	44.76	cfs
Interception with Clogging	Q_{oa} =	39.09	43.28	cfs
Curb Opening Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	23.50	32.26	cfs
Interception with Clogging	Q_{ma} =	22.72	31.18	cfs
Resulting Curb Opening Capacity (assumes clogged condition)	Q_{Curb} =	**15.27**	**25.98**	**cfs**
Resultant Street Conditions		MINOR	MAJOR	
Total Inlet Length	L =	20.00	20.00	feet
Resultant Street Flow Spread (based on sheet *Q-Allow* geometry)	T =	39.3	52.1	ft.>T-Crown
Resultant Flow Depth at Street Crown	d_{CROWN} =	2.7	4.2	inches
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	Q_a =	**15.3**	**26.0**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	8.4	26.0	cfs

INLET ON A CONTINUOUS GRADE

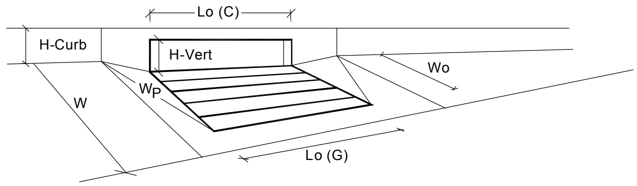
Project: Lorson East Prelim Plan #100.040
Inlet ID: Inlet DP-28 (Basin C17.1a)



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	15.00	15.00	ft
Width of a Unit Grate (cannot be greater than W from Q-Allow)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	
Street Hydraulics: OK - Q < maximum allowable from sheet 'Q-Allow'		MINOR	MAJOR	
Design Discharge for Half of Street (from Sheet *Q-Peak*)	Q_o =	5.3	11.5	cfs
Water Spread Width	T =	10.8	15.1	ft
Water Depth at Flowline (outside of local depression)	d =	4.1	5.1	inches
Water Depth at Street Crown (or at T_{MAX})	d_{CROWN} =	0.0	0.0	inches
Ratio of Gutter Flow to Design Flow	E_o =	0.541	0.396	
Discharge outside the Gutter Section W, carried in Section T_x	Q_x =	2.4	7.0	cfs
Discharge within the Gutter Section W	Q_w =	2.9	4.6	cfs
Discharge Behind the Curb Face	Q_{BACK} =	0.0	0.0	cfs
Flow Area within the Gutter Section W	A_W =	1.29	2.39	sq ft
Velocity within the Gutter Section W	V_W =	4.1	4.8	fps
Water Depth for Design Condition	d_{LOCAL} =	7.1	8.1	inches
Grate Analysis (Calculated)		MINOR	MAJOR	
Total Length of Inlet Grate Opening	L =	N/A	N/A	ft
Ratio of Grate Flow to Design Flow	$E_{o\text{-}GRATE}$ =	N/A	N/A	
Under No-Clogging Condition		MINOR	MAJOR	
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Interception Capacity	Q_i =	N/A	N/A	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient for Multiple-unit Grate Inlet	GrateCoef =	N/A	N/A	
Clogging Factor for Multiple-unit Grate Inlet	GrateClog =	N/A	N/A	
Effective (unclogged) Length of Multiple-unit Grate Inlet	L_e =	N/A	N/A	ft
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Actual Interception Capacity	Q_a =	N/A	N/A	cfs
Carry-Over Flow = Q_o-Q_a (to be applied to curb opening or next d/s inlet)	Q_b =	N/A	N/A	cfs
Curb or Slotted Inlet Opening Analysis (Calculated)		MINOR	MAJOR	
Equivalent Slope S_e (based on grate carry-over)	S_e =	0.122	0.094	ft/ft
Required Length L_T to Have 100% Interception	L_T =	12.04	20.09	ft
Under No-Clogging Condition		MINOR	MAJOR	
Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T)	L =	12.04	15.00	ft
Interception Capacity	Q_i =	5.3	10.5	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient	CurbCoef =	1.31	1.31	
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet	CurbClog =	0.04	0.04	
Effective (Unclogged) Length	L_e =	13.03	13.03	ft
Actual Interception Capacity	Q_a =	5.3	10.4	cfs
Carry-Over Flow = $Q_{b(GRATE)}$-Q_a	Q_b =	0.0	1.2	cfs
Summary		MINOR	MAJOR	
Total Inlet Interception Capacity	Q =	**5.30**	**10.36**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	Q_b =	**0.0**	**1.2**	**cfs**
Capture Percentage = Q_a/Q_o =	C% =	**100**	**90**	**%**

INLET IN A SUMP OR SAG LOCATION

Project = Lorson East Prelim Plan #100.040
Inlet ID = Inlet DP-29 (Basin C15.9+C15.10+C15.14+bypass from Inlet DP-20)



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Inlet Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.5	8.0	inches
			☑ Override Depths	
Grate Information		MINOR	MAJOR	
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	10.00	10.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	

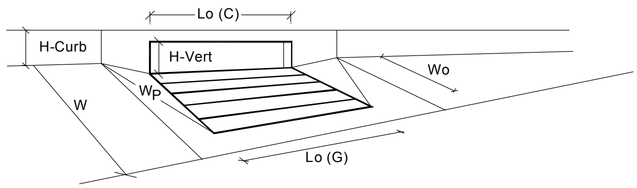
Grate Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	N/A	N/A	
Clogging Factor for Multiple Units	Clog =	N/A	N/A	
Grate Capacity as a Weir (based on UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	N/A	N/A	cfs
Interception with Clogging	Q_{wa} =	N/A	N/A	cfs
Grate Capacity as a Orifice (based on UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	N/A	N/A	cfs
Interception with Clogging	Q_{oa} =	N/A	N/A	cfs
Grate Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	N/A	N/A	cfs
Interception with Clogging	Q_{ma} =	N/A	N/A	cfs
Resulting Grate Capacity (assumes clogged condition)	Q_{Grate} =	**N/A**	**N/A**	**cfs**

Curb Opening Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	1.25	1.25	
Clogging Factor for Multiple Units	Clog =	0.06	0.06	
Curb Opening as a Weir (based on UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	10.72	17.34	cfs
Interception with Clogging	Q_{wa} =	10.05	16.26	cfs
Curb Opening as an Orifice (based on UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	20.22	22.38	cfs
Interception with Clogging	Q_{oa} =	18.96	20.98	cfs
Curb Opening Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	13.69	18.32	cfs
Interception with Clogging	Q_{ma} =	12.84	17.18	cfs
Resulting Curb Opening Capacity (assumes clogged condition)	Q_{Curb} =	**10.05**	**16.26**	**cfs**

Resultant Street Conditions		MINOR	MAJOR	
Total Inlet Length	L =	10.00	10.00	feet
Resultant Street Flow Spread (based on sheet *Q-Allow* geometry)	T =	39.3	52.1	ft.>T-Crown
Resultant Flow Depth at Street Crown	d_{CROWN} =	2.7	4.2	inches
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	Q_a =	**10.1**	**16.3**	**cfs**
WARNING: Inlet Capacity less than Q Peak for MAJOR Storm	$Q_{PEAK\ REQUIRED}$ =	8.6	20.8	cfs

INLET IN A SUMP OR SAG LOCATION

Project = Lorson East Prelim Plan #100.040
Inlet ID = Inlet DP-30 (Basin C15.15+bypass from Inlet DP-29 in 100-yr)

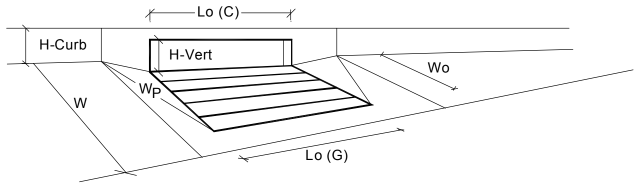


		MINOR	MAJOR	
Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Inlet Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.5	8.0	inches
			☑ Override Depths	
Grate Information		MINOR	MAJOR	
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	15.00	15.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Grate Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	N/A	N/A	
Clogging Factor for Multiple Units	Clog =	N/A	N/A	
Grate Capacity as a Weir (based on UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	N/A	N/A	cfs
Interception with Clogging	Q_{wa} =	N/A	N/A	cfs
Grate Capacity as a Orifice (based on UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	N/A	N/A	cfs
Interception with Clogging	Q_{oa} =	N/A	N/A	cfs
Grate Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	N/A	N/A	cfs
Interception with Clogging	Q_{ma} =	N/A	N/A	cfs
Resulting Grate Capacity (assumes clogged condition)	Q_{Grate} =	**N/A**	**N/A**	**cfs**
Curb Opening Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	1.31	1.31	
Clogging Factor for Multiple Units	Clog =	0.04	0.04	
Curb Opening as a Weir (based on UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	12.45	21.18	cfs
Interception with Clogging	Q_{wa} =	11.90	20.25	cfs
Curb Opening as an Orifice (based on UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	30.33	33.57	cfs
Interception with Clogging	Q_{oa} =	29.00	32.11	cfs
Curb Opening Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	18.07	24.80	cfs
Interception with Clogging	Q_{ma} =	17.28	23.72	cfs
Resulting Curb Opening Capacity (assumes clogged condition)	Q_{Curb} =	**11.90**	**20.25**	**cfs**
Resultant Street Conditions		MINOR	MAJOR	
Total Inlet Length	L =	15.00	15.00	feet
Resultant Street Flow Spread (based on sheet *Q-Allow* geometry)	T =	39.3	52.1	ft.>T-Crown
Resultant Flow Depth at Street Crown	d_{CROWN} =	2.7	4.2	inches
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	Q_a =	**11.9**	**20.3**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	7.2	20.1	cfs

INLET IN A SUMP OR SAG LOCATION

Project = Lorson East Prelim Plan #100.040

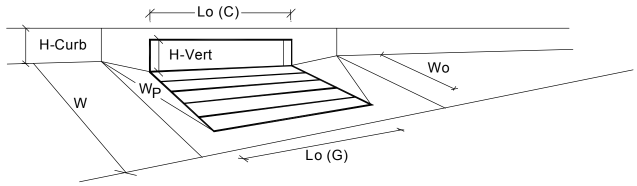
Inlet ID = Inlet DP-33 (Basin C14+C16.33+bypass from Inlet DP-19c)



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Inlet Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.5	8.0	inches
				☑ Override Depths
Grate Information		MINOR	MAJOR	
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	15.00	15.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Grate Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	N/A	N/A	
Clogging Factor for Multiple Units	Clog =	N/A	N/A	
Grate Capacity as a Weir (based on UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	N/A	N/A	cfs
Interception with Clogging	Q_{wa} =	N/A	N/A	cfs
Grate Capacity as a Orifice (based on UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	N/A	N/A	cfs
Interception with Clogging	Q_{oa} =	N/A	N/A	cfs
Grate Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	N/A	N/A	cfs
Interception with Clogging	Q_{ma} =	N/A	N/A	cfs
Resulting Grate Capacity (assumes clogged condition)	Q_{Grate} =	**N/A**	**N/A**	**cfs**
Curb Opening Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	1.31	1.31	
Clogging Factor for Multiple Units	Clog =	0.04	0.04	
Curb Opening as a Weir (based on UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	12.45	21.18	cfs
Interception with Clogging	Q_{wa} =	11.90	20.25	cfs
Curb Opening as an Orifice (based on UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	30.33	33.57	cfs
Interception with Clogging	Q_{oa} =	29.00	32.11	cfs
Curb Opening Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	18.07	24.80	cfs
Interception with Clogging	Q_{ma} =	17.28	23.72	cfs
Resulting Curb Opening Capacity (assumes clogged condition)	Q_{Curb} =	**11.90**	**20.25**	**cfs**
Resultant Street Conditions		MINOR	MAJOR	
Total Inlet Length	L =	15.00	15.00	feet
Resultant Street Flow Spread (based on sheet *Q-Allow* geometry)	T =	39.3	52.1	ft.>T-Crown
Resultant Flow Depth at Street Crown	d_{CROWN} =	2.7	4.2	inches
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	Q_a =	**11.9**	**20.3**	**cfs**
WARNING: Inlet Capacity less than Q Peak for MAJOR Storm	$Q_{PEAK\ REQUIRED}$ =	8.2	26.3	cfs

INLET IN A SUMP OR SAG LOCATION

Project = Lorson East Prelim Plan #100.040
Inlet ID = Inlet DP-34 (Basin C34+bypass from Inlet DP-33)



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Inlet Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.5	8.0	inches
				☑ Override Depths
Grate Information		MINOR	MAJOR	
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	

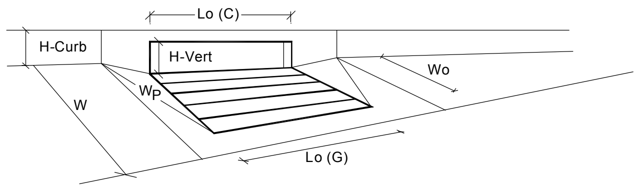
Grate Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	N/A	N/A	
Clogging Factor for Multiple Units	Clog =	N/A	N/A	
Grate Capacity as a Weir (based on UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	N/A	N/A	cfs
Interception with Clogging	Q_{wa} =	N/A	N/A	cfs
Grate Capacity as a Orifice (based on UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	N/A	N/A	cfs
Interception with Clogging	Q_{oa} =	N/A	N/A	cfs
Grate Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	N/A	N/A	cfs
Interception with Clogging	Q_{ma} =	N/A	N/A	cfs
Resulting Grate Capacity (assumes clogged condition)	Q_{Grate} =	**N/A**	**N/A**	**cfs**

Curb Opening Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	1.00	1.00	
Clogging Factor for Multiple Units	Clog =	0.10	0.10	
Curb Opening as a Weir (based on UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	7.06	10.97	cfs
Interception with Clogging	Q_{wa} =	6.35	9.87	cfs
Curb Opening as an Orifice (based on UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	10.11	11.19	cfs
Interception with Clogging	Q_{oa} =	9.10	10.07	cfs
Curb Opening Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	7.86	10.30	cfs
Interception with Clogging	Q_{ma} =	7.07	9.27	cfs
Resulting Curb Opening Capacity (assumes clogged condition)	Q_{Curb} =	**6.35**	**9.27**	**cfs**

Resultant Street Conditions		MINOR	MAJOR	
Total Inlet Length	L =	5.00	5.00	feet
Resultant Street Flow Spread (based on sheet *Q-Allow* geometry)	T =	39.3	52.1	ft.>T-Crown
Resultant Flow Depth at Street Crown	d_{CROWN} =	2.7	4.2	inches
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	Q_a =	**6.4**	**9.3**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	0.9	8.0	cfs

INLET IN A SUMP OR SAG LOCATION

Project = **Lorson East Prelim Plan #100.040**
Inlet ID = **Inlet DP-35 (Basin C16.35)**

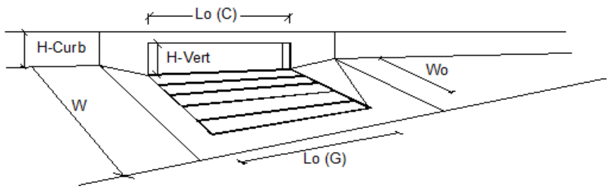


		MINOR	MAJOR	
Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Inlet Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.5	8.0	inches
			☑ Override Depths	
Grate Information		MINOR	MAJOR	
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Grate Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	N/A	N/A	
Clogging Factor for Multiple Units	Clog =	N/A	N/A	
Grate Capacity as a Weir (based on UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	N/A	N/A	cfs
Interception with Clogging	Q_{wa} =	N/A	N/A	cfs
Grate Capacity as a Orifice (based on UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	N/A	N/A	cfs
Interception with Clogging	Q_{oa} =	N/A	N/A	cfs
Grate Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	N/A	N/A	cfs
Interception with Clogging	Q_{ma} =	N/A	N/A	cfs
Resulting Grate Capacity (assumes clogged condition)	Q_{Grate} =	**N/A**	**N/A**	**cfs**
Curb Opening Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	1.00	1.00	
Clogging Factor for Multiple Units	Clog =	0.10	0.10	
Curb Opening as a Weir (based on UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	7.06	10.97	cfs
Interception with Clogging	Q_{wa} =	6.35	9.87	cfs
Curb Opening as an Orifice (based on UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	10.11	11.19	cfs
Interception with Clogging	Q_{oa} =	9.10	10.07	cfs
Curb Opening Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	7.86	10.30	cfs
Interception with Clogging	Q_{ma} =	7.07	9.27	cfs
Resulting Curb Opening Capacity (assumes clogged condition)	Q_{Curb} =	**6.35**	**9.27**	**cfs**
Resultant Street Conditions		MINOR	MAJOR	
Total Inlet Length	L =	5.00	5.00	feet
Resultant Street Flow Spread (based on sheet *Q-Allow* geometry)	T =	39.3	52.1	ft.>T-Crown
Resultant Flow Depth at Street Crown	d_{CROWN} =	2.7	4.2	inches
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	Q_a =	**6.4**	**9.3**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	2.8	6.1	cfs

INLET ON A CONTINUOUS GRADE

Project: Lorson East Prelim Plan #100.040

Inlet ID: Inlet DP-38 (Basin C17.1+bypass from Inlet DP-28)

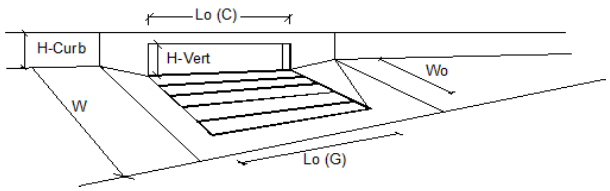


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	15.00	15.00	ft
Width of a Unit Grate (cannot be greater than W from Q-Allow)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	
Street Hydraulics: OK - Q < maximum allowable from sheet 'Q-Allow'		MINOR	MAJOR	
Design Discharge for Half of Street (from Sheet *Q-Peak*)	**Q_o =**	5.9	14.4	cfs
Water Spread Width	T =	13.6	17.0	ft
Water Depth at Flowline (outside of local depression)	d =	4.8	6.2	inches
Water Depth at Street Crown (or at T_{MAX})	d_{CROWN} =	0.0	0.6	inches
Ratio of Gutter Flow to Design Flow	E_o =	0.437	0.304	
Discharge outside the Gutter Section W, carried in Section T_x	Q_x =	3.3	10.0	cfs
Discharge within the Gutter Section W	Q_w =	2.6	4.4	cfs
Discharge Behind the Curb Face	Q_{BACK} =	0.0	0.0	cfs
Flow Area within the Gutter Section W	A_W =	1.98	3.91	sq ft
Velocity within the Gutter Section W	V_W =	3.0	3.7	fps
Water Depth for Design Condition	d_{LOCAL} =	7.8	9.2	inches
Grate Analysis (Calculated)		MINOR	MAJOR	
Total Length of Inlet Grate Opening	L =	N/A	N/A	ft
Ratio of Grate Flow to Design Flow	$E_{o\text{-}GRATE}$ =	N/A	N/A	
Under No-Clogging Condition		MINOR	MAJOR	
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Interception Capacity	Q_i =	N/A	N/A	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient for Multiple-unit Grate Inlet	GrateCoef =	N/A	N/A	
Clogging Factor for Multiple-unit Grate Inlet	GrateClog =	N/A	N/A	
Effective (unclogged) Length of Multiple-unit Grate Inlet	L_e =	N/A	N/A	ft
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Actual Interception Capacity	**Q_a =**	N/A	N/A	cfs
Carry-Over Flow = Q_o-Q_a (to be applied to curb opening or next d/s inlet)	**Q_b =**	N/A	N/A	cfs
Curb or Slotted Inlet Opening Analysis (Calculated)		MINOR	MAJOR	
Equivalent Slope S_e (based on grate carry-over)	S_e =	0.102	0.077	ft/ft
Required Length L_T to Have 100% Interception	L_T =	13.12	23.51	ft
Under No-Clogging Condition		MINOR	MAJOR	
Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T)	L =	13.12	15.00	ft
Interception Capacity	Q_i =	5.9	12.1	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient	CurbCoef =	1.31	1.31	
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet	CurbClog =	0.04	0.04	
Effective (Unclogged) Length	L_e =	13.03	13.03	ft
Actual Interception Capacity	**Q_a =**	5.9	11.8	cfs
Carry-Over Flow = $Q_{b(GRATE)}$-Q_a	**Q_b =**	0.0	2.6	cfs
Summary		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**5.90**	**11.83**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**2.6**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**82**	**%**

INLET ON A CONTINUOUS GRADE

Project: Lorson East Prelim Plan #100.040

Inlet ID: Inlet DP-39 (Basin C17.2+bypass from Inlet DP-38)

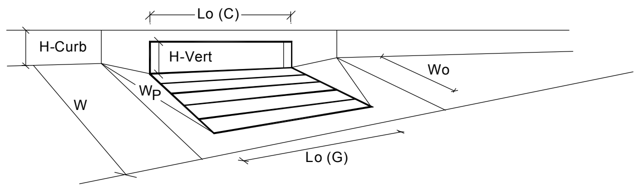


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	15.00	15.00	ft
Width of a Unit Grate (cannot be greater than W from Q-Allow)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	
Street Hydraulics: OK - Q < maximum allowable from sheet 'Q-Allow'		MINOR	MAJOR	
Design Discharge for Half of Street (from Sheet *Q-Peak*)	Q_o =	8.6	21.6	cfs
Water Spread Width	T =	12.5	17.0	ft
Water Depth at Flowline (outside of local depression)	d =	4.5	5.9	inches
Water Depth at Street Crown (or at T_{MAX})	d_{CROWN} =	0.0	0.3	inches
Ratio of Gutter Flow to Design Flow	E_o =	0.473	0.326	
Discharge outside the Gutter Section W, carried in Section T_x	Q_x =	4.5	14.5	cfs
Discharge within the Gutter Section W	Q_w =	4.1	7.0	cfs
Discharge Behind the Curb Face	Q_{BACK} =	0.0	0.0	cfs
Flow Area within the Gutter Section W	A_W =	1.69	3.45	sq ft
Velocity within the Gutter Section W	V_W =	5.1	6.2	fps
Water Depth for Design Condition	d_{LOCAL} =	7.5	8.9	inches
Grate Analysis (Calculated)		MINOR	MAJOR	
Total Length of Inlet Grate Opening	L =	N/A	N/A	ft
Ratio of Grate Flow to Design Flow	$E_{o\text{-}GRATE}$ =	N/A	N/A	
Under No-Clogging Condition		MINOR	MAJOR	
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Interception Capacity	Q_i =	N/A	N/A	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient for Multiple-unit Grate Inlet	GrateCoef =	N/A	N/A	
Clogging Factor for Multiple-unit Grate Inlet	GrateClog =	N/A	N/A	
Effective (unclogged) Length of Multiple-unit Grate Inlet	L_e =	N/A	N/A	ft
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Actual Interception Capacity	Q_a =	N/A	N/A	cfs
Carry-Over Flow = Q_o-Q_a (to be applied to curb opening or next d/s inlet)	Q_b =	N/A	N/A	cfs
Curb or Slotted Inlet Opening Analysis (Calculated)		MINOR	MAJOR	
Equivalent Slope S_e (based on grate carry-over)	S_e =	0.109	0.081	ft/ft
Required Length L_T to Have 100% Interception	L_T =	16.50	30.17	ft
Under No-Clogging Condition		MINOR	MAJOR	
Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T)	L =	15.00	15.00	ft
Interception Capacity	Q_i =	8.5	15.3	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient	CurbCoef =	1.31	1.31	
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet	CurbClog =	0.04	0.04	
Effective (Unclogged) Length	L_e =	13.03	13.03	ft
Actual Interception Capacity	Q_a =	8.4	14.9	cfs
Carry-Over Flow = $Q_{b(GRATE)}$-Q_a	Q_b =	0.2	6.6	cfs
Summary		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**8.41**	**14.93**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.2**	**6.6**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**98**	**69**	**%**

INLET IN A SUMP OR SAG LOCATION

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

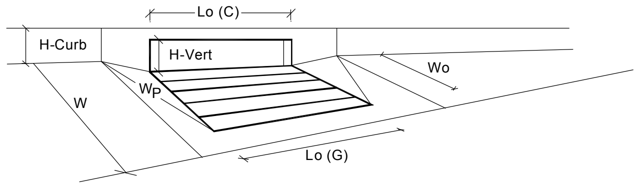
Inlet ID = **Inlet DP-40 (Basin C17.3+C17.4+C17.5+bypass from Inlet DP-39)**



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Inlet Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.5	8.0	inches
				☑ Override Depths
Grate Information		MINOR	MAJOR	
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	20.00	20.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Grate Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	N/A	N/A	
Clogging Factor for Multiple Units	Clog =	N/A	N/A	
Grate Capacity as a Weir (based on UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	N/A	N/A	cfs
Interception with Clogging	Q_{wa} =	N/A	N/A	cfs
Grate Capacity as a Orifice (based on UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	N/A	N/A	cfs
Interception with Clogging	Q_{oa} =	N/A	N/A	cfs
Grate Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	N/A	N/A	cfs
Interception with Clogging	Q_{ma} =	N/A	N/A	cfs
Resulting Grate Capacity (assumes clogged condition)	Q_{Grate} =	**N/A**	**N/A**	**cfs**
Curb Opening Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	1.33	1.33	
Clogging Factor for Multiple Units	Clog =	0.03	0.03	
Curb Opening as a Weir (based on UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	15.79	26.87	cfs
Interception with Clogging	Q_{wa} =	15.27	25.98	cfs
Curb Opening as an Orifice (based on UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	40.44	44.76	cfs
Interception with Clogging	Q_{oa} =	39.09	43.28	cfs
Curb Opening Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	23.50	32.26	cfs
Interception with Clogging	Q_{ma} =	22.72	31.18	cfs
Resulting Curb Opening Capacity (assumes clogged condition)	Q_{Curb} =	**15.27**	**25.98**	**cfs**
Resultant Street Conditions		MINOR	MAJOR	
Total Inlet Length	L =	20.00	20.00	feet
Resultant Street Flow Spread (based on sheet *Q-Allow* geometry)	T =	39.3	52.1	ft.>T-Crown
Resultant Flow Depth at Street Crown	d_{CROWN} =	2.7	4.2	inches
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	Q_a =	**15.3**	**26.0**	**cfs**
WARNING: Inlet Capacity less than Q Peak for MAJOR Storm	$Q_{PEAK\ REQUIRED}$ =	12.9	39.4	cfs

INLET IN A SUMP OR SAG LOCATION

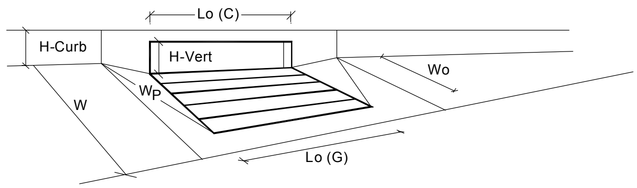
Project = **Lorson East Prelim Plan #100.040**
Inlet ID = **Inlet DP-41 (Basin C17.6+bypass from Inlet DP-40 in 100yr)**



		MINOR	MAJOR	
Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Inlet Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.5	8.0	inches
				☑ Override Depths
Grate Information		MINOR	MAJOR	
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	20.00	20.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Grate Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	N/A	N/A	
Clogging Factor for Multiple Units	Clog =	N/A	N/A	
Grate Capacity as a Weir (based on UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	N/A	N/A	cfs
Interception with Clogging	Q_{wa} =	N/A	N/A	cfs
Grate Capacity as a Orifice (based on UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	N/A	N/A	cfs
Interception with Clogging	Q_{oa} =	N/A	N/A	cfs
Grate Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	N/A	N/A	cfs
Interception with Clogging	Q_{ma} =	N/A	N/A	cfs
Resulting Grate Capacity (assumes clogged condition)	Q_{Grate} =	**N/A**	**N/A**	**cfs**
Curb Opening Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	1.33	1.33	
Clogging Factor for Multiple Units	Clog =	0.03	0.03	
Curb Opening as a Weir (based on UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	15.79	26.87	cfs
Interception with Clogging	Q_{wa} =	15.27	25.98	cfs
Curb Opening as an Orifice (based on UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	40.44	44.76	cfs
Interception with Clogging	Q_{oa} =	39.09	43.28	cfs
Curb Opening Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	23.50	32.26	cfs
Interception with Clogging	Q_{ma} =	22.72	31.18	cfs
Resulting Curb Opening Capacity (assumes clogged condition)	Q_{Curb} =	**15.27**	**25.98**	**cfs**
Resultant Street Conditions		MINOR	MAJOR	
Total Inlet Length	L =	20.00	20.00	feet
Resultant Street Flow Spread (based on sheet *Q-Allow* geometry)	T =	39.3	52.1	ft.>T-Crown
Resultant Flow Depth at Street Crown	d_{CROWN} =	2.7	4.2	inches
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	Q_a =	**15.3**	**26.0**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	1.9	19.3	cfs

INLET IN A SUMP OR SAG LOCATION

Project = **Lorson East Prelim Plan #100.040**
Inlet ID = **Inlet DP-42 (Basin C17.8)**

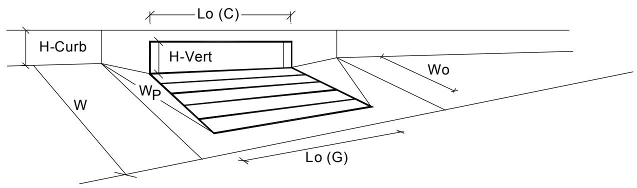


		MINOR	MAJOR	
Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Inlet Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.5	8.0	inches
				☑ Override Depths
Grate Information		MINOR	MAJOR	
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Grate Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	N/A	N/A	
Clogging Factor for Multiple Units	Clog =	N/A	N/A	
Grate Capacity as a Weir (based on UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	N/A	N/A	cfs
Interception with Clogging	Q_{wa} =	N/A	N/A	cfs
Grate Capacity as a Orifice (based on UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	N/A	N/A	cfs
Interception with Clogging	Q_{oa} =	N/A	N/A	cfs
Grate Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	N/A	N/A	cfs
Interception with Clogging	Q_{ma} =	N/A	N/A	cfs
Resulting Grate Capacity (assumes clogged condition)	Q_{Grate} =	**N/A**	**N/A**	**cfs**
Curb Opening Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	1.00	1.00	
Clogging Factor for Multiple Units	Clog =	0.10	0.10	
Curb Opening as a Weir (based on UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	7.06	10.97	cfs
Interception with Clogging	Q_{wa} =	6.35	9.87	cfs
Curb Opening as an Orifice (based on UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	10.11	11.19	cfs
Interception with Clogging	Q_{oa} =	9.10	10.07	cfs
Curb Opening Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	7.86	10.30	cfs
Interception with Clogging	Q_{ma} =	7.07	9.27	cfs
Resulting Curb Opening Capacity (assumes clogged condition)	Q_{Curb} =	**6.35**	**9.27**	**cfs**
Resultant Street Conditions		MINOR	MAJOR	
Total Inlet Length	L =	5.00	5.00	feet
Resultant Street Flow Spread (based on sheet *Q-Allow* geometry)	T =	39.3	52.1	ft.>T-Crown
Resultant Flow Depth at Street Crown	d_{CROWN} =	2.7	4.2	inches
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	Q_a =	**6.4**	**9.3**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	3.2	7.2	cfs

INLET IN A SUMP OR SAG LOCATION

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

Inlet ID = **Inlet DP-47 (Basin C17.9)**



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Inlet Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.5	8.0	inches
				☑ Override Depths
Grate Information		MINOR	MAJOR	
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	10.00	10.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	

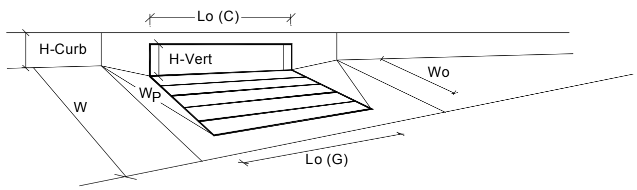
Grate Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	N/A	N/A	
Clogging Factor for Multiple Units	Clog =	N/A	N/A	
Grate Capacity as a Weir (based on UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	N/A	N/A	cfs
Interception with Clogging	Q_{wa} =	N/A	N/A	cfs
Grate Capacity as a Orifice (based on UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	N/A	N/A	cfs
Interception with Clogging	Q_{oa} =	N/A	N/A	cfs
Grate Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	N/A	N/A	cfs
Interception with Clogging	Q_{ma} =	N/A	N/A	cfs
Resulting Grate Capacity (assumes clogged condition)	Q_{Grate} =	**N/A**	**N/A**	**cfs**

Curb Opening Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	1.25	1.25	
Clogging Factor for Multiple Units	Clog =	0.06	0.06	
Curb Opening as a Weir (based on UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	10.72	17.34	cfs
Interception with Clogging	Q_{wa} =	10.05	16.26	cfs
Curb Opening as an Orifice (based on UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	20.22	22.38	cfs
Interception with Clogging	Q_{oa} =	18.96	20.98	cfs
Curb Opening Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	13.69	18.32	cfs
Interception with Clogging	Q_{ma} =	12.84	17.18	cfs
Resulting Curb Opening Capacity (assumes clogged condition)	Q_{Curb} =	**10.05**	**16.26**	**cfs**

Resultant Street Conditions		MINOR	MAJOR	
Total Inlet Length	L =	10.00	10.00	feet
Resultant Street Flow Spread (based on sheet *Q-Allow* geometry)	T =	39.3	52.1	ft.>T-Crown
Resultant Flow Depth at Street Crown	d_{CROWN} =	2.7	4.2	inches
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	Q_a =	**10.1**	**16.3**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	7.9	13.9	cfs

INLET IN A SUMP OR SAG LOCATION

Project = Lorson East Prelim Plan #100.040
Inlet ID = Inlet DP-48 (Basin C17.10)



		MINOR	MAJOR	
Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Inlet Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.5	8.0	inches
			☑ Override Depths	
Grate Information		MINOR	MAJOR	
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	10.00	10.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Grate Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	N/A	N/A	
Clogging Factor for Multiple Units	Clog =	N/A	N/A	
Grate Capacity as a Weir (based on UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	N/A	N/A	cfs
Interception with Clogging	Q_{wa} =	N/A	N/A	cfs
Grate Capacity as a Orifice (based on UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	N/A	N/A	cfs
Interception with Clogging	Q_{oa} =	N/A	N/A	cfs
Grate Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	N/A	N/A	cfs
Interception with Clogging	Q_{ma} =	N/A	N/A	cfs
Resulting Grate Capacity (assumes clogged condition)	Q_{Grate} =	**N/A**	**N/A**	**cfs**
Curb Opening Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	1.25	1.25	
Clogging Factor for Multiple Units	Clog =	0.06	0.06	
Curb Opening as a Weir (based on UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	10.72	17.34	cfs
Interception with Clogging	Q_{wa} =	10.05	16.26	cfs
Curb Opening as an Orifice (based on UDFCD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	20.22	22.38	cfs
Interception with Clogging	Q_{oa} =	18.96	20.98	cfs
Curb Opening Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	13.69	18.32	cfs
Interception with Clogging	Q_{ma} =	12.84	17.18	cfs
Resulting Curb Opening Capacity (assumes clogged condition)	Q_{Curb} =	**10.05**	**16.26**	**cfs**
Resultant Street Conditions		MINOR	MAJOR	
Total Inlet Length	L =	10.00	10.00	feet
Resultant Street Flow Spread (based on sheet *Q-Allow* geometry)	T =	39.3	52.1	ft.>T-Crown
Resultant Flow Depth at Street Crown	d_{CROWN} =	2.7	4.2	inches
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	Q_a =	**10.1**	**16.3**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	8.9	16.0	cfs

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
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**

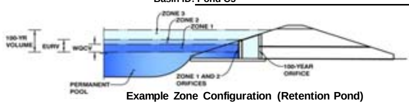
8. Initial Surcharge Volume			
A) Depth of Initial Surcharge Volume (Minimum recommended depth is 4 inches)	D_{IS} =	4	in
B) Minimum Initial Surcharge Volume (Minimum volume of 0.3% of the WQCV)	V_{IS} =	431.2	cu ft
C) Initial Surcharge Provided Above Micropool	V_s=	115.0	cu ft
9. Trash Rack			
A) Water 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

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

			Optional User Override 1-hr Precipitation	
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	1.16	inches
5-yr Runoff Volume (P1 = 1.44 in.) =	13.459	acre-feet	1.44	inches
10-yr Runoff Volume (P1 = 1.68 in.) =	16.659	acre-feet	1.68	inches
25-yr Runoff Volume (P1 = 1.92 in.) =	21.433	acre-feet	1.92	inches
50-yr Runoff Volume (P1 = 2.16 in.) =	25.205	acre-feet	2.16	inches
100-yr Runoff Volume (P1 = 2.42 in.) =	29.878	acre-feet	2.42	inches
500-yr Runoff Volume (P1 = 3.14 in.) =	41.092	acre-feet		inches
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		

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
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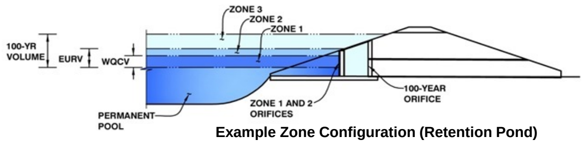
Detention Basin Outlet Structure Design

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 Diameter =	N/A	inches

Calculated Parameters for Underdrain

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

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

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

Calculated Parameters for Plate

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

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

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

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

User Input: Vertical Orifice (Circular or Rectangular)

	Zone 2 Rectangular	Not Selected	
Invert of Vertical Orifice =	4.01	N/A	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =	6.57	N/A	ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Height =	6.00	N/A	inches
Vertical Orifice Width =	18.68		inches

Calculated Parameters for Vertical Orifice

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

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

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

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

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

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

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

User Input: Emergency Spillway (Rectangular or Trapezoidal)

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

Calculated Parameters for Spillway

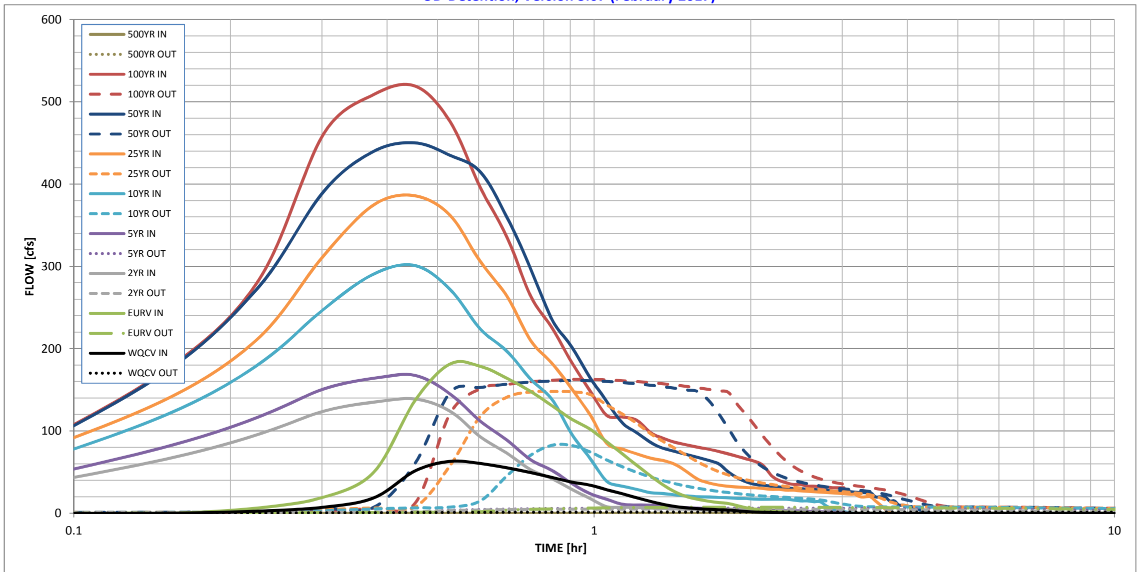
Spillway Design Flow Depth=		feet
Stage at Top of Freeboard =		feet
Basin Area at Top of Freeboard =		acres

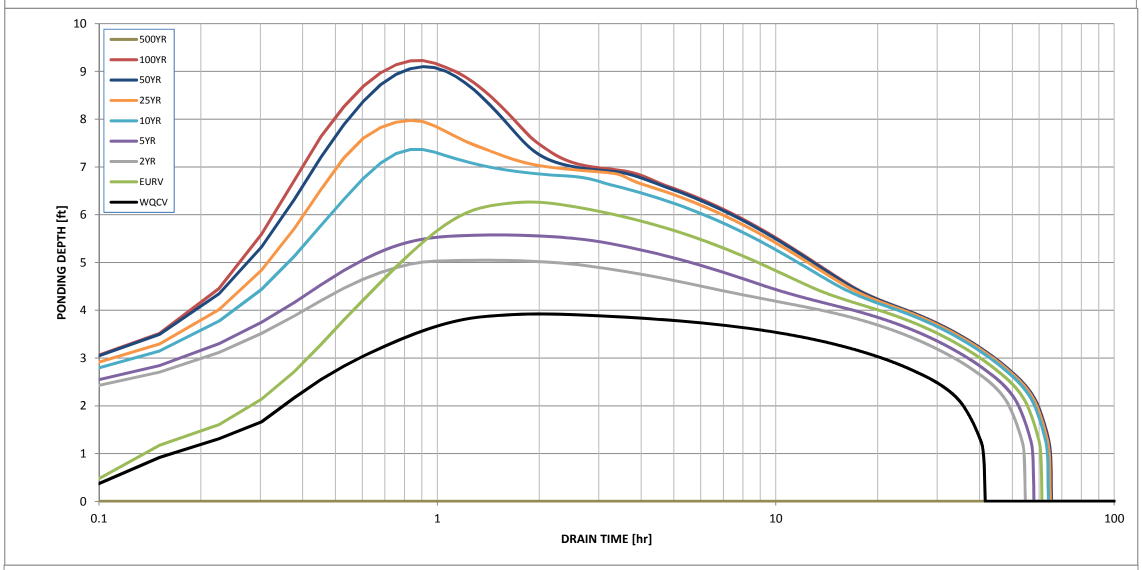
Routed Hydrograph Results

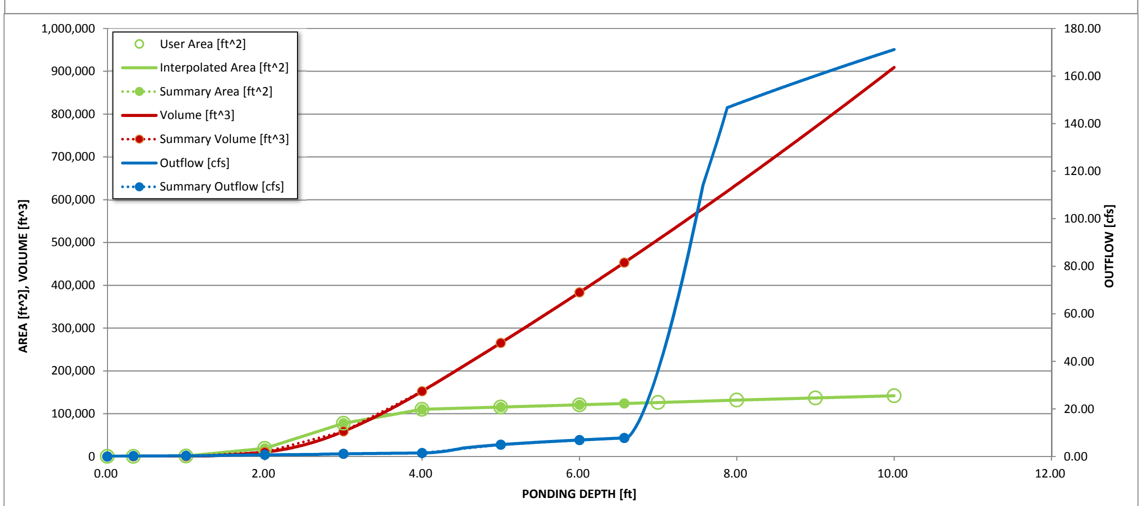
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	0.53	1.07	1.16	1.44	1.68	1.92	2.16	2.42	3.14
Calculated Runoff Volume (acre-ft) =	3.515	10.382	9.641	13.459	16.659	21.433	25.205	29.878	41.092
OPTIONAL Override Runoff Volume (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.

Time Interval	
4.53 min	
Hydrograph Constant	1.105

SOURCE	WORKBOOK	WORKBOOK	USER	USER	USER	USER	USER	USER	USER
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]
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
0:09:04	0.00	0.00	66.00	81.00	120.00	139.00	173.00	175.00	0.00
0:13:35	2.65	6.62	96.00	117.00	181.00	213.00	275.00	283.00	0.00
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

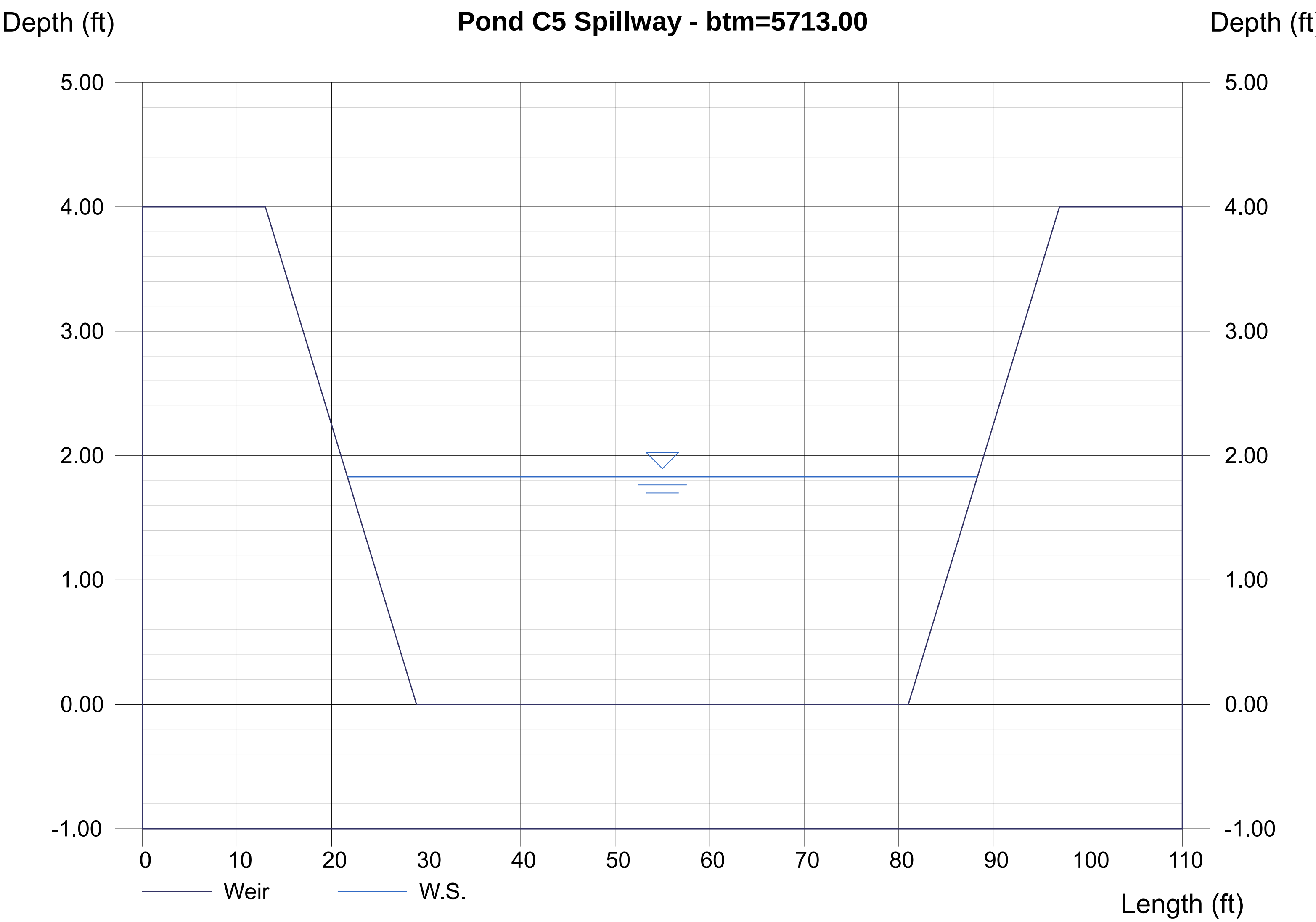
Crest	=	Sharp
Bottom Length (ft)	=	52.00
Total Depth (ft)	=	4.00
Side Slope (z:1)	=	4.00

Calculations

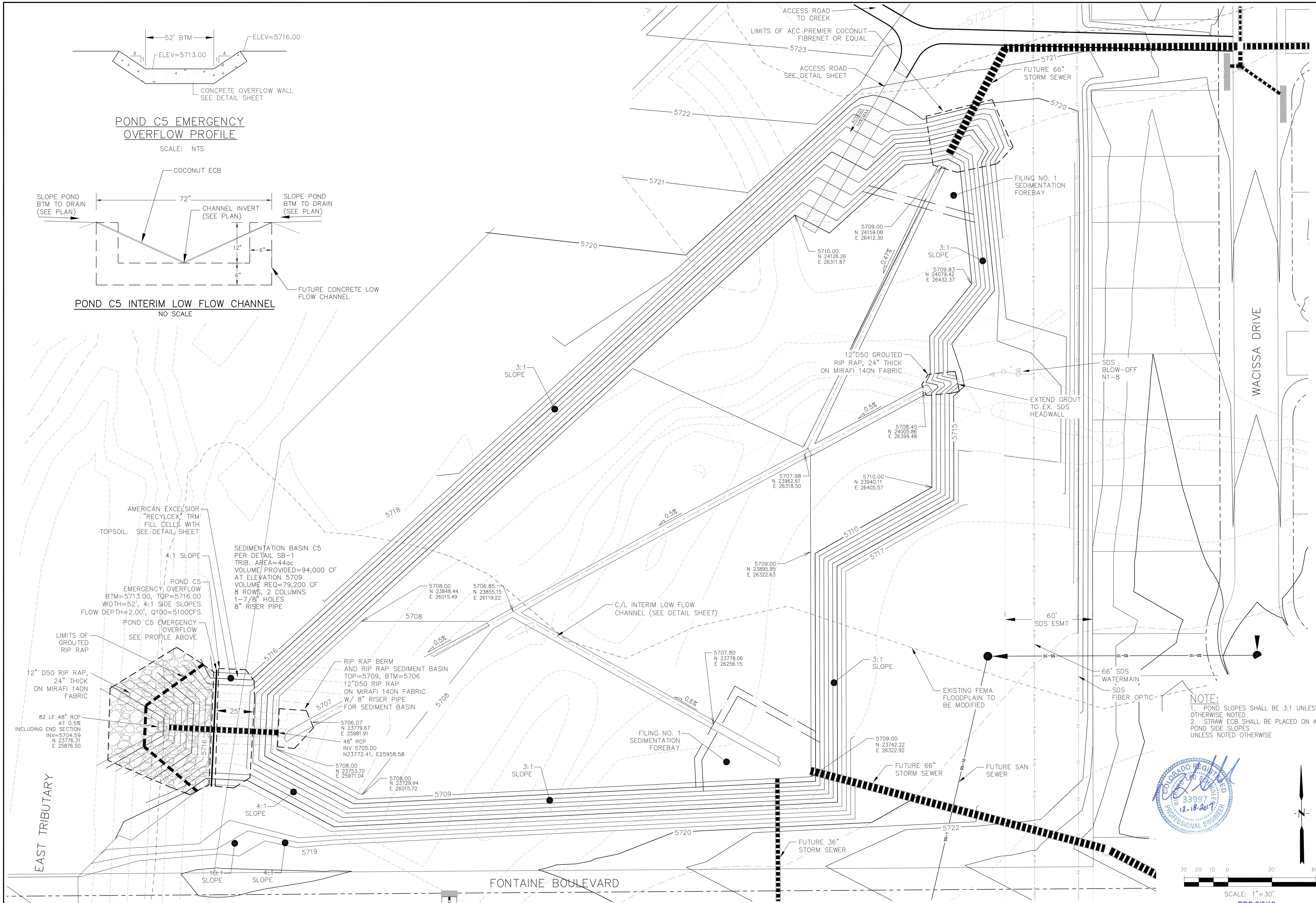
Weir Coeff. Cw	=	3.10
Compute by:		Known Q
Known Q (cfs)	=	443.00

Highlighted

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



APPENDIX D – LORSON RANCH EAST EARLY GRADING PLANS – POND C5 CONSTRUCTION



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EMAIL: Rich@ceg1.com

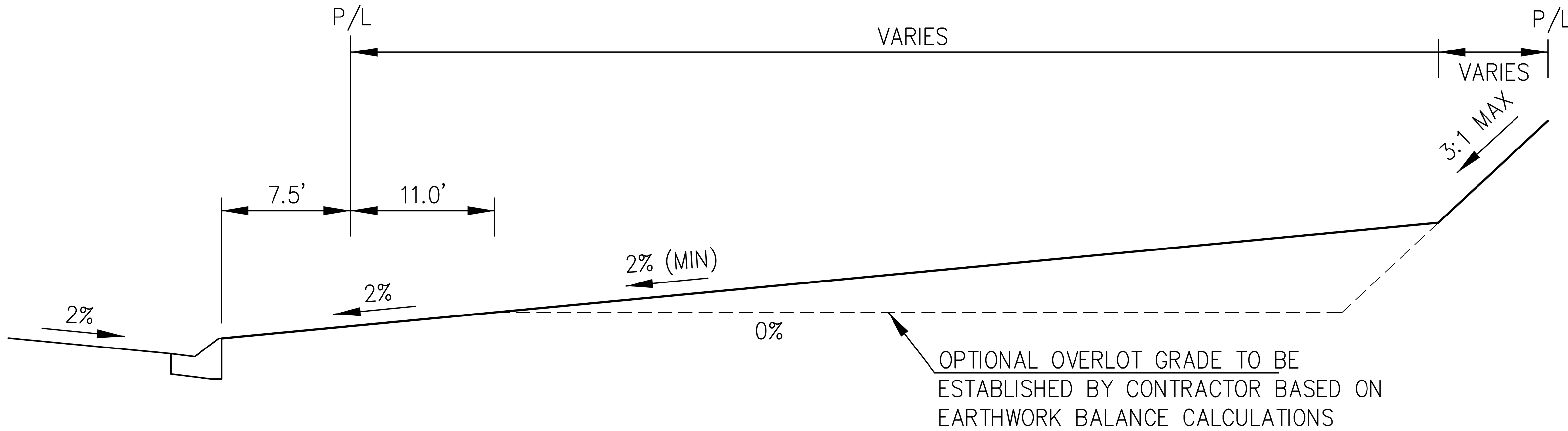
PREPARED FOR: LORSON, LLC
212 N. WAHSATCH AVE., SUITE 301
COLORADO SPRINGS, COLORADO 80903
(719) 635-3200
CONTACT: JEFF MARK

PROJECT: LORSON RANCH EAST
FONTAINE BLVD. – EAST TRIBUTARY
EL PASO COUNTY, COLORADO

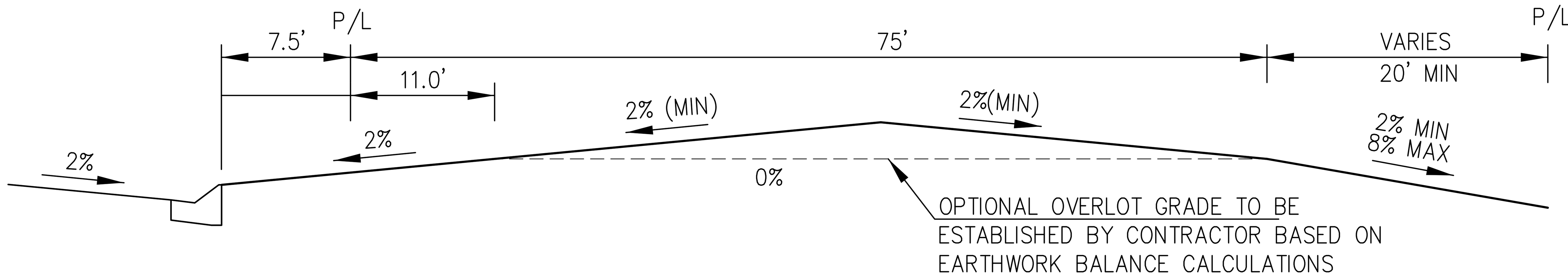
DRAWN: RLS
DESIGNED: RLS
CHECKED: RLS

FULL SPECTRUM DETENTION POND C5
PHASE 1 LORSON RANCH EAST

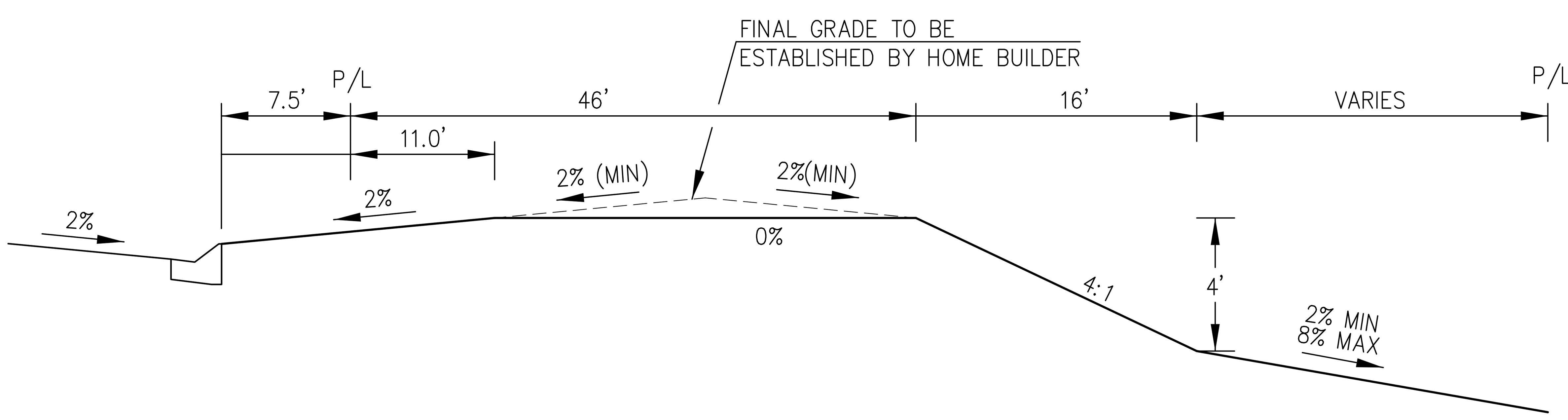
DATE: DECEMBER 18, 2017
PROJECT NO. 100.040
SHEET NUMBER C4.9
TOTAL SHEETS: 28



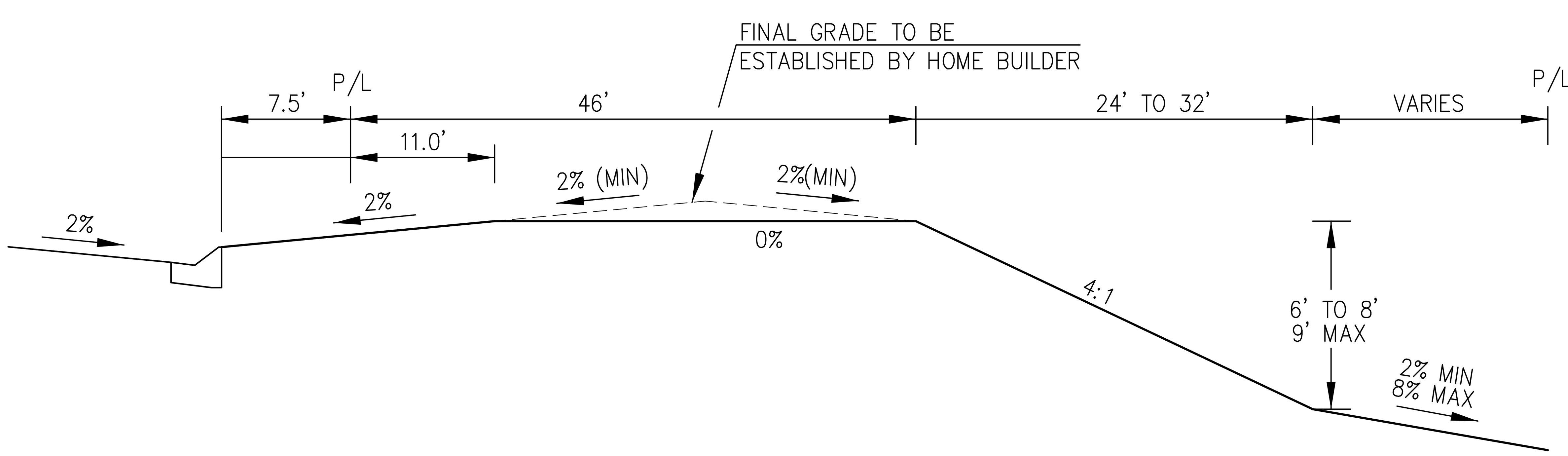
TYPICAL "A" LOT



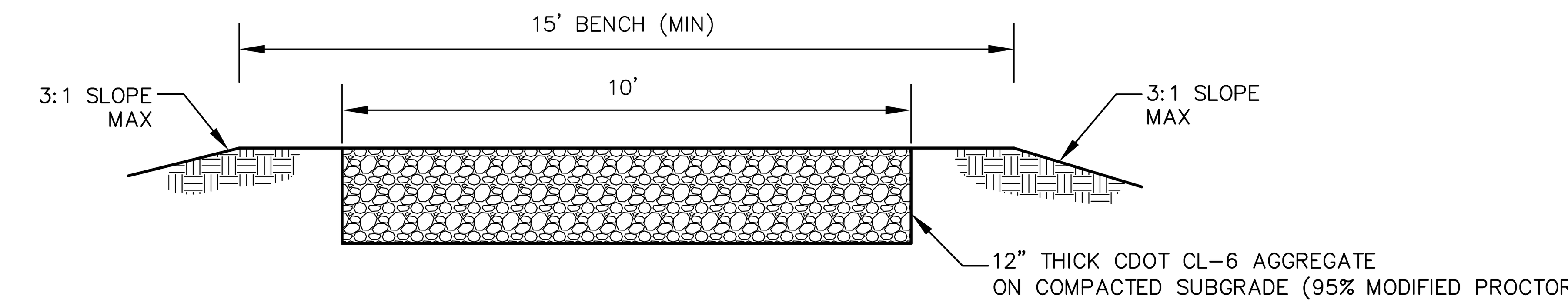
TYPICAL "B" LOT



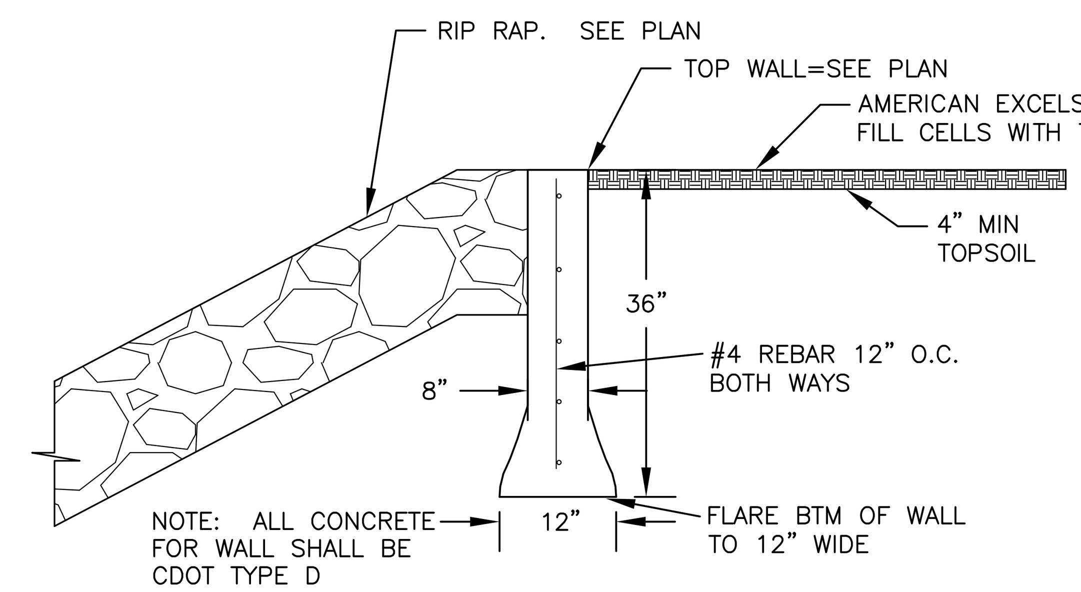
TYPICAL "GARDEN" LOT



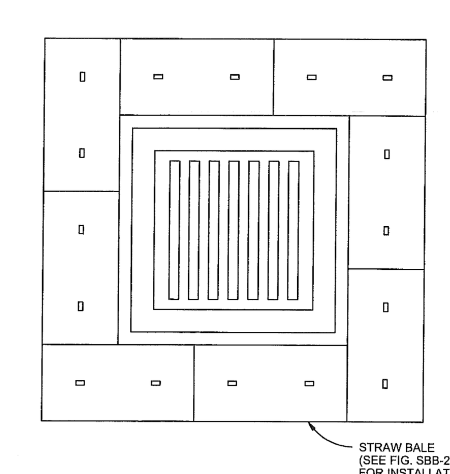
TYPICAL "WALKOUT" LOT



POND MAINTENANCE ACCESS ROAD
NO SCALE



POND OVERFLOW CONCRETE WALL
NO SCALE



STRAW BALE INLET PROTECTION
NTS

STRAW BALE INLET PROTECTION NOTES

INSTALLATION REQUIREMENTS

1. INLET PROTECTION SHALL BE INSTALLED IMMEDIATELY AFTER CONSTRUCTION OF INLET.

2. BALES ARE TO BE PLACED IN A SINGLE ROW AROUND THE INLET WITH THE END OF THE BALES TIGHTLY ABUTTING ONE ANOTHER.

3. SEE STRAW BALE BARRIER FIGURE SBB-2 FOR INSTALLATION REQUIREMENTS.

MAINTENANCE REQUIREMENTS

1. CONTRACTOR SHALL INSPECT STRAW BALE INLET PROTECTION IMMEDIATELY AFTER EACH RAINFALL, AT LEAST DAILY DURING PROLONGED RAINFALL, AND WEEKLY DURING PERIODS NO RAINFALL.

2. DAMAGED OR INEFFECTIVE INLET PROTECTION SHALL PROMPTLY BE REPAIRED, REPLACING BALES IF NECESSARY, AND UNENTRENCHED BALES NEED TO BE REPAIRED WITH COMPACTED BACKFILL MATERIAL.

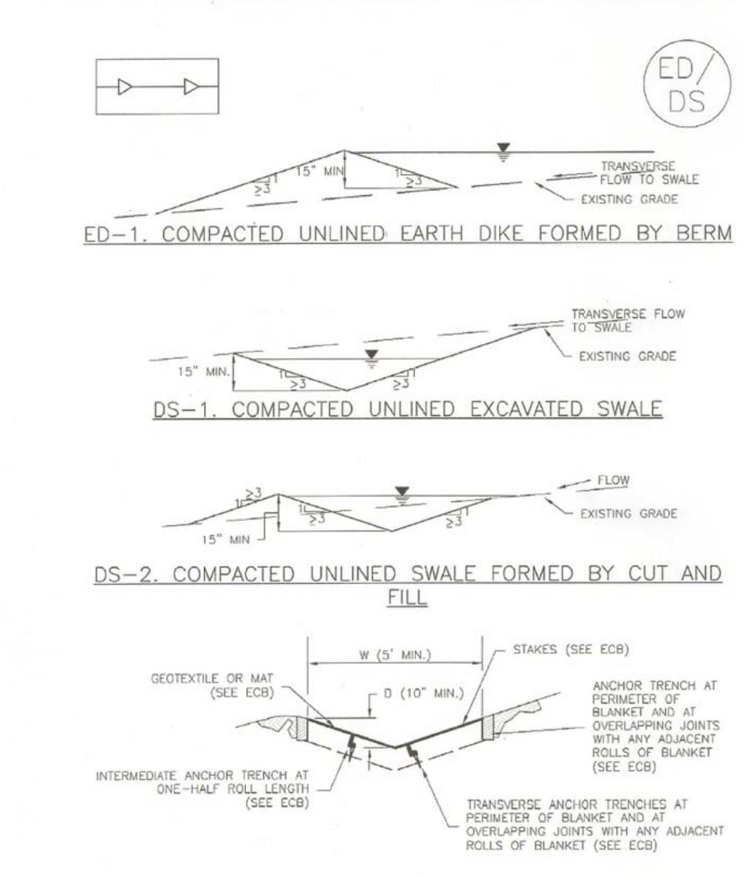
3. SEDIMENT SHALL BE REMOVED FROM BEHIND STRAW BALES WHEN IT ACCUMULATES TO APPROXIMATELY 1/3 THE HEIGHT OF THE BARRIER.

4. INLET PROTECTION SHALL BE REMOVED WHEN ADEQUATE VEGETATIVE COVER IS ATTAINED WITHIN THE DRAINAGE AREA AS APPROVED BY THE CITY.

City of Colorado Springs Stormwater Quality	Figure IP-2 Straw Bale Inlet Protection Construction Detail and Maintenance Requirements

3-26

Earth Dikes and Drainage Swales (ED/DS) **EC-10**



November 2010 — Urban Drainage and Flood Control District, Urban Storm Drainage Criteria Manual Volume 3 — ED/DS-3

EPC 2/5/18

COLORADO REGISTERED PROFESSIONAL ENGINEER 33997 12-18-2017

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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
FONTAINE BLVD. – EAST TRIBUTARY
EL PASO COUNTY, COLORADO

DRAWN: RLS
DESIGNED: RLS
CHECKED: RLS

GRADING AND EROSION CONTROL DETAILS

DATE
DECEMBER 18, 2017

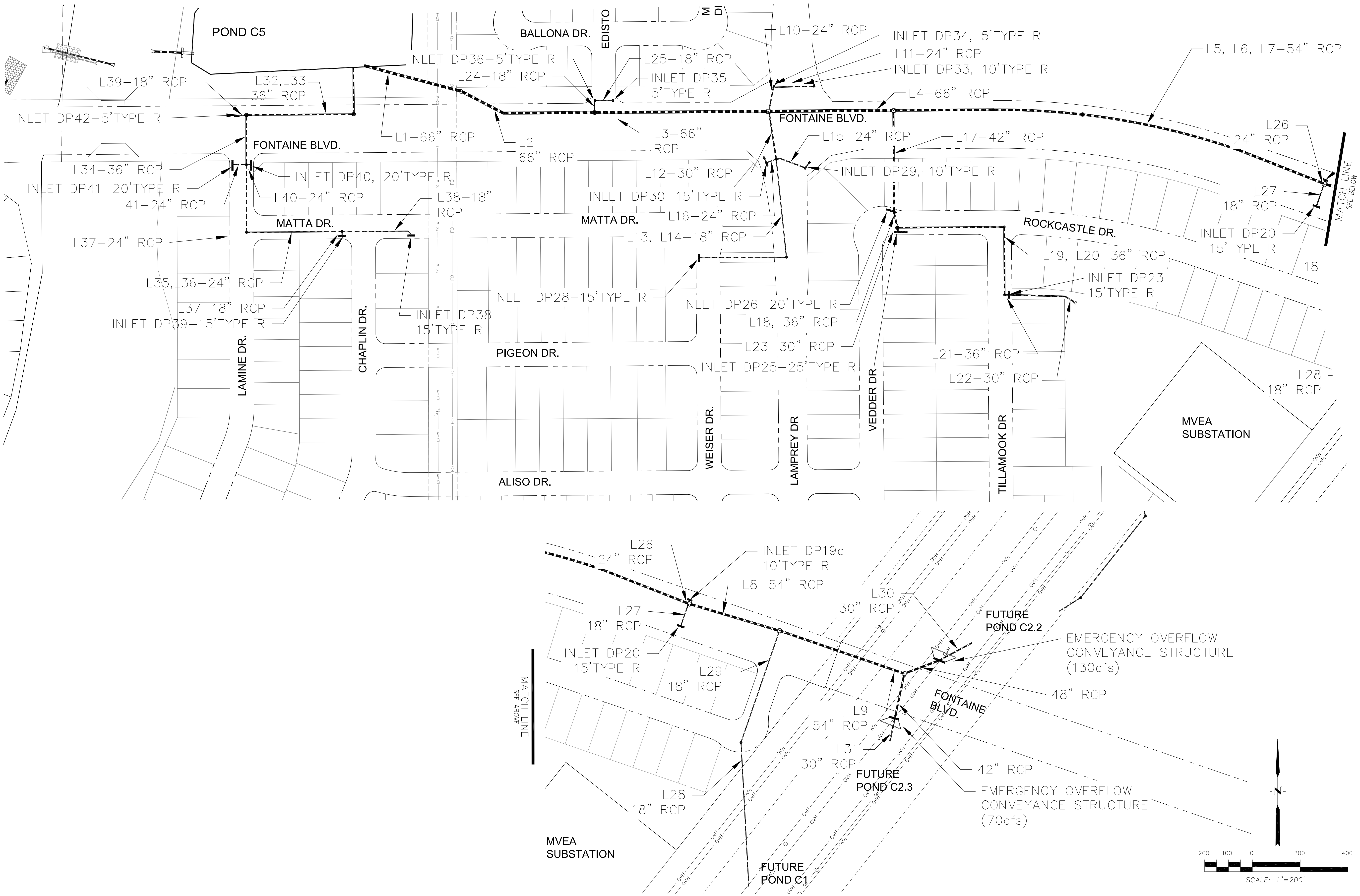
PROJECT NO.
100.040

SHEET NUMBER
C12.1

TOTAL SHEETS: 28

APPENDIX E– STORM SEWER SCHEMATIC AND HYDRAFLOW STORM SEWER CALCS

BASIN C15 - C17 STORM SCHEMATIC



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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 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 Ht (in)	Curb Inlet L (ft)	Grate Inlet area (sqft)	Grate Inlet L (ft)	Grate Inlet W (ft)	Gutter So (ft/ft)	Gutter W (ft)	Gutter Sw (ft/ft)	Gutter Sx (ft/ft)	Gutter n	Gutter Depth (ft)	Gutter Spread (ft)	Inlet Depth (ft)	Inlet Spread (ft)	Inlet Depr (in)	Byp line No
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	28.69	24 c	58.7	5723.20	5724.30	1.873	5726.06*	5727.01*	0.00	5727.01	3
11	L11	20.03	24 c	52.4	5724.40	5724.84	0.845	5727.67*	5728.08*	0.00	5728.08	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: 12-18-2017

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: 12-18-2017

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'	13.94*	11.12	21.06	4.00	Genr	6.0	5.00	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
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: 12-18-2017

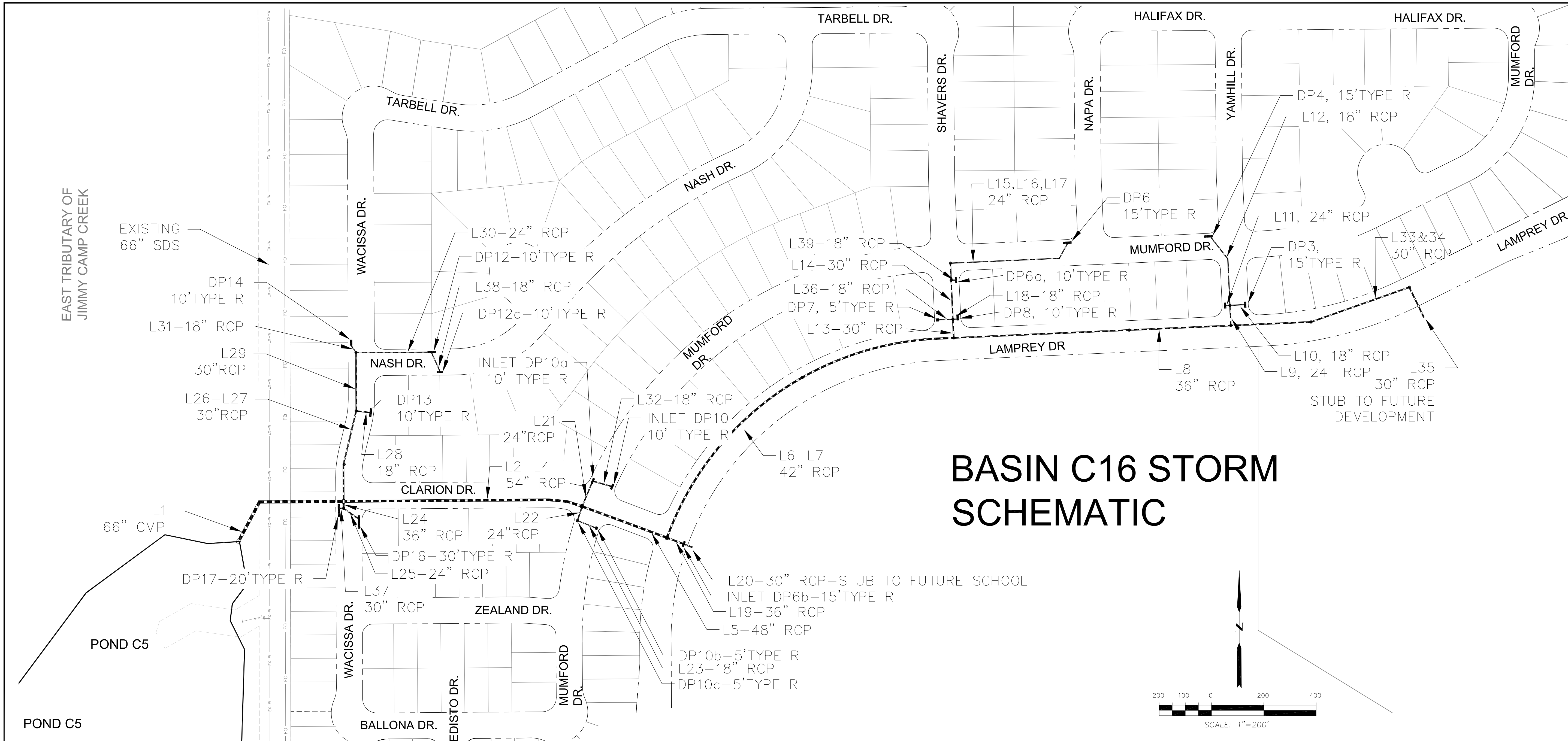
NOTES: Inlet N-Values = 0.016 ; Intensity = 58.48 / (Inlet time + 7.70) ^ 0.75; Return period = 100 Yrs. ; * Indicates Known Q added

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		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: 12-18-2017

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



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NO.	DESCRIPTION	DATE

PREPARED FOR: LORSON, LLC
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COLORADO SPRINGS, COLORADO 80903
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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 Ht (in)	Curb Inlet L (ft)	Grate Inlet area (sqft)	Grate Inlet L (ft)	Grate Inlet W (ft)	Gutter So (ft/ft)	Gutter W (ft)	Gutter Sw (ft/ft)	Gutter Sx (ft/ft)	Gutter n	Gutter Depth (ft)	Gutter Spread (ft)	Inlet Depth (ft)	Inlet Spread (ft)	Inlet Depr (in)	Byp line No
1	MH #19	29.20*	11.55	0.00	40.75	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*	16.17	0.00	25.17	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*	7.17	0.00	16.17	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*	-1.83	0.00	7.17	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*	-10.83	0.00	-1.83	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	-10.83	0.00	-10.83	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	-10.83	0.00	-10.83	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	-5.13	0.00	-5.13	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		-5.13	0.00	0.00	-5.13	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: 12-18-2017

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, 25'	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, 25'	31.86*	0.00	31.86	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	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

Lorson East PDR- C16 basins | Number of lines: 39 | Run Date: 12-18-2017

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

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
January 22, 2018

Page

List of Figures

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
Registered Engineer #19310
For and on Behalf of Kiowa Engineering Corporation

1/22/18
Date

Developer's Statement:

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

BY: ______________________ 1/23/18
Date

JEFF MARK
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.

Approved
By:Jennifer Irvine, County Engineer
Date:02/06/2018
El Paso County Department of Public Works

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. The location of the site is shown on Figure 1.

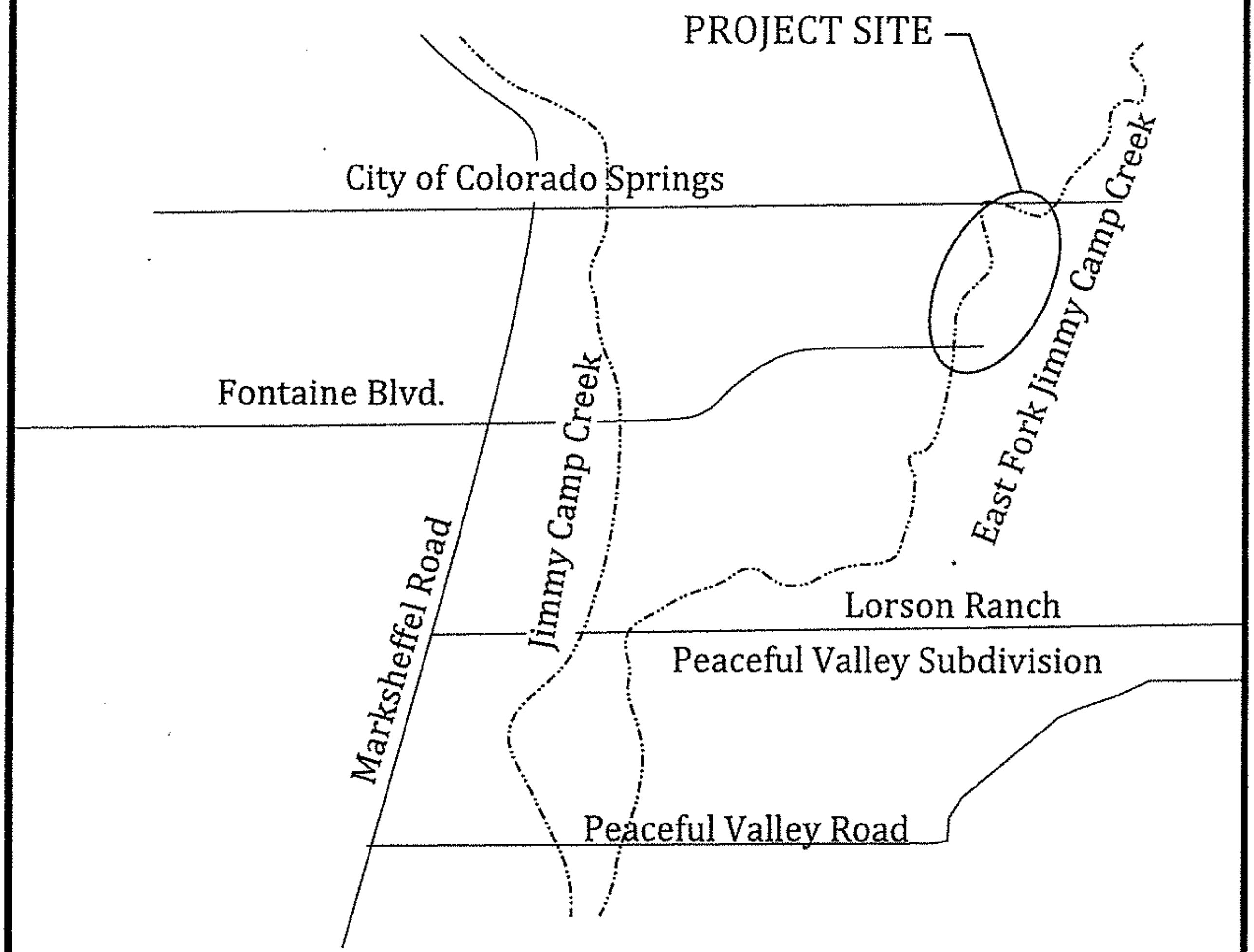
Upon the completion of the drainageway facilities and acceptance by El Paso County and Lorson Ranch Metropolitan District, easements and or tracts will be dedicated for the purposes of maintenance access. Tract E, a tract of land dedicated as an area for future development was created when Pioneer Landing at Lorson Ranch Filing 2B was platted. Most of the proposed drainageway facilities shown on the plans are confined to Tract E. There is a short length within the upper segment of drainageway will 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. Operation and maintenance of the drainageway will be the responsibility of the Lorson Ranch Metropolitan District. 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, El Paso County will assume maintenance responsibility for the structure and roadway.

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 the Lorson Ranch Metropolitan District.

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 regrading 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 show the effect of the bridge crossing at Fontaine Boulevard. Because the bridge structure and channel stabilization measures occur within the regulatory floodplain and floodway, a Conditional Letter of Map Revision (CLOMR) has been processed through FEMA as part of gaining the necessary construction approvals for the project. Reference 7 has been included in the Appendix. The approved CLOMR is contained within Appendix D.

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 Lorson 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 the vegetation 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:	3.8 feet
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 to be maintained by the Lorson Ranch Metropolitan District 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 Winter 2018 with substantial completion in Summer 2018.

Completion of the roadway will initially involve only the two lanes on an interim basis until such time that traffic warrants completing the full design section for Fontaine Boulevard. The full bridge length will be constructed as shown on the plans. The final configuration of the interim roadway section will be shown on the Fontaine Boulevard design plans being prepared by Core Engineering. Fine grading, paving, curb and gutter and sidewalks will be installed when the roadway is extended east from its present point of terminus.

Appendix A:
Hydrologic and Hydraulic Calculations

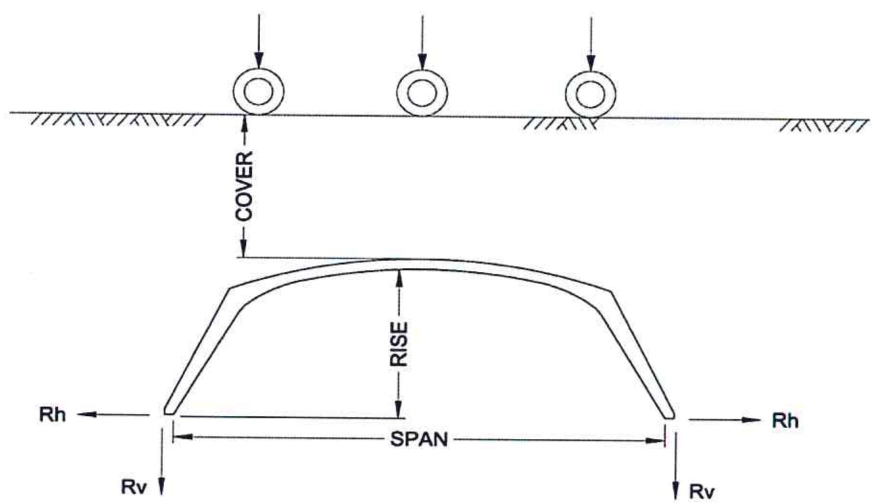
CON SPAN
-SERIES

BRIDGE REACTIONS

JOB #: 434050
NAME: Lorson Ranch
DATE: 22-Nov-16
BY: jal

LOADS:

Cover at structure center:	4		
Shape ID:	O848		
Bridge span:	48 ft	Vertical load, per leg, R_v (DL Only)	**28.3 k/f**
Bridge rise:	13.1 ft	Horizontal load, per leg, R_h (DL Only)	**15.1 k/f**
Design live load:	Piles, HL-93 Tandem	Vertical load, per leg, R_v (DL + LL)	**33.8 k/f**
		Horizontal load, per leg, R_h (DL+LL)	**18.0 k/f**



Notes:

1) Axle load positions are varied to produce critical reactions shown here.
2) Reactions are unfactored loads.
3) Impact is not included.
4) Units are kips/ft.
5) Soil Weight = 120 pcf.
6) reactions are based on pile foundations.

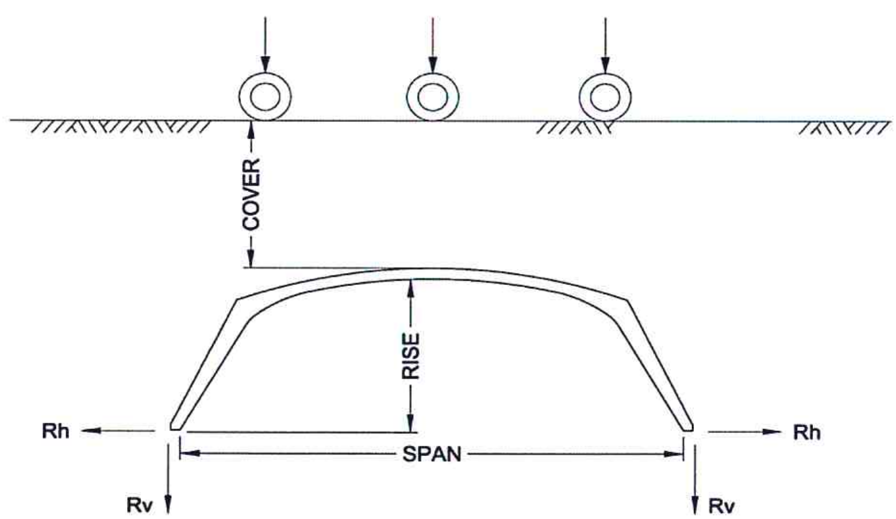
CON SPAN S-SERIES

BRIDGE REACTIONS

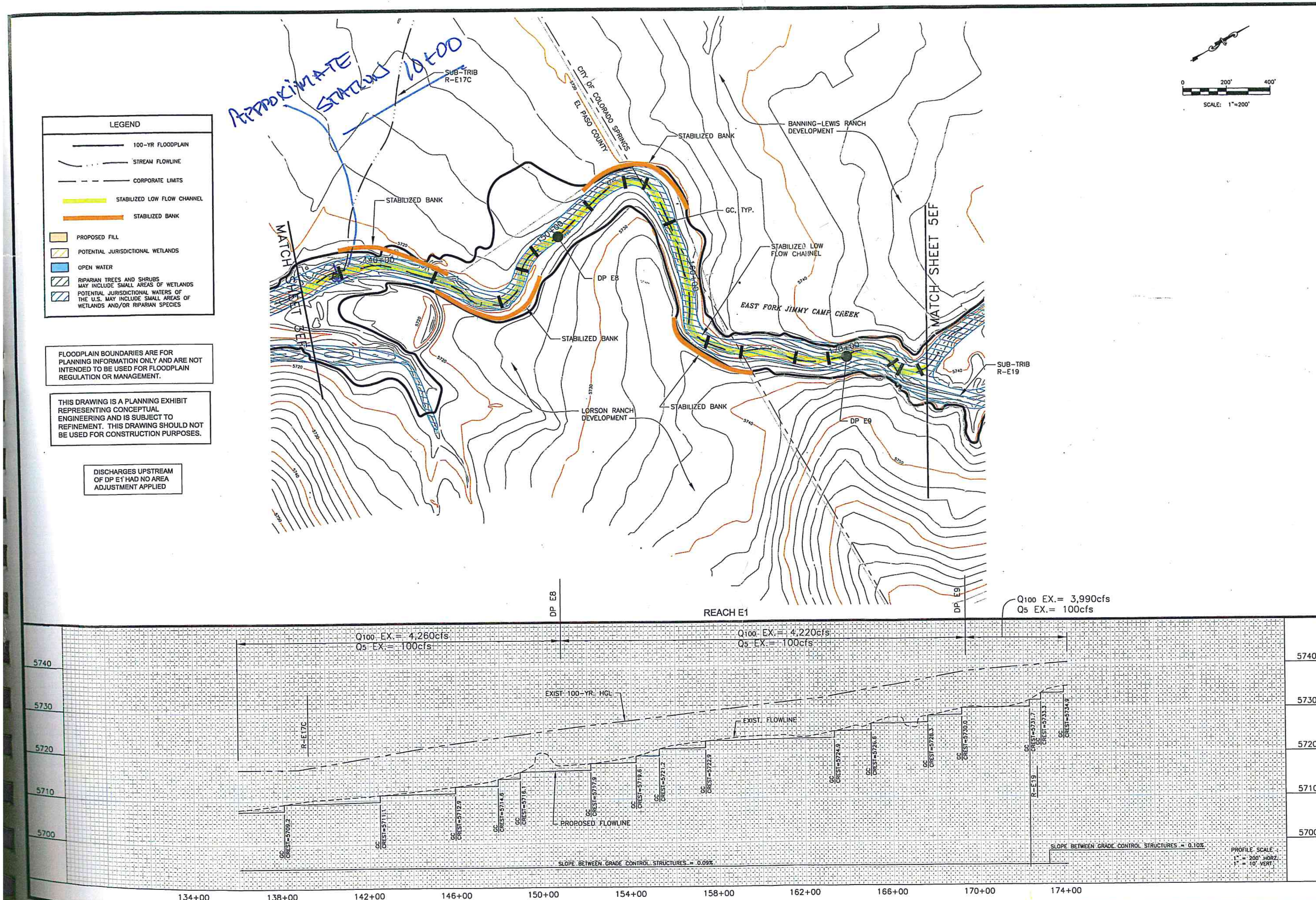
JOB #: 434050
NAME: Lorson Ranch
DATE: 22-Nov-16
BY: JAL

LOADS:

Cover at structure center:	2		
Shape ID:	O848		
Bridge span:	48 ft	Vertical load, per leg, R_v (DL Only)	**23.1 k/f**
Bridge rise:	13.1 ft	Horizontal load, per leg, R_h (DL Only)	**8.8 k/f**
Design live load:	Piles, HL-93 Tandem	Vertical load, per leg, R_v (DL + LL)	**28.6 k/f**
		Horizontal load, per leg, R_h (DL+LL)	**13.4 k/f**



Notes:
1) Axle load positions are varied to produce critical reactions shown here.
2) Reactions are unfactored loads.
3) Impact is not included.
4) Units are kips/ft.
5) Soil Weight = 120 pcf.
6) reactions are based on pile foundations.



Kiowa Engineering Corporation
1604 South 21st Street
Colorado Springs, Colorado 80904
(719) 630-7342

JIMMY CAMP CREEK DRAINAGE BASIN PLANNING STUDY
EAST FORK JIMMY CAMP CREEK
CONCEPTUAL DESIGN PLAN & PROFILE
CITY OF COLORADO SPRINGS, COLORADO

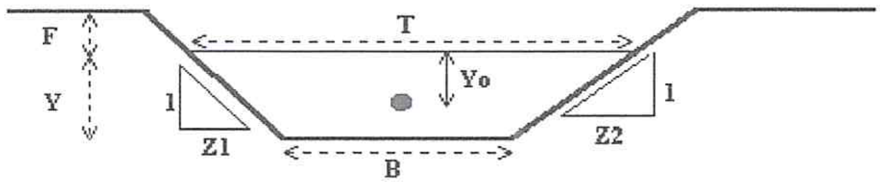
Project No.: 14008
Date: OCTOBER 2014
Design: RNW
Drawn: JLN
Check: RNW
Revisions:

4EF

14008-4EF-768cdpp.dwg/Aug 19, 2014

Normal Flow Analysis - Trapezoidal Channel

Project: 16031 East Fork Jimmy Camp Creek
Channel ID: Q10 Low Flow Channel

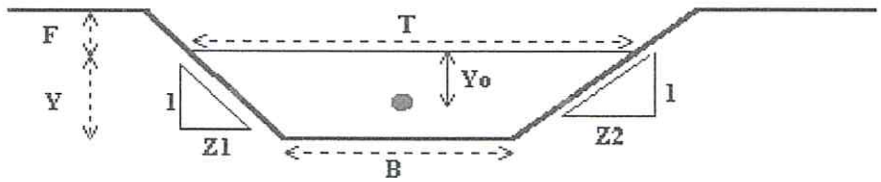


Design Information (Input)			
Channel Invert Slope	So =	0.0025	ft/ft
Manning's n	n =	0.030	
Bottom Width	B =	25.00	ft
Left Side Slope	Z1 =	3.00	ft/ft
Right Side Slope	Z2 =	3.00	ft/ft
Freeboard Height	F =	0.00	ft
Design Water Depth	Y =	**3.00**	ft

Normal Flow Condtion (Calculated)			
Discharge	**Q =**	**443.85**	cfs
Froude Number	**Fr =**	**0.50**	
Flow Velocity	**V =**	**4.35**	fps
Flow Area	A =	102.00	sq ft
Top Width	T =	43.00	ft
Wetted Perimeter	P =	43.97	ft
Hydraulic Radius	R =	2.32	ft
Hydraulic Depth	D =	2.37	ft
Specific Energy	Es =	3.29	ft
Centroid of Flow Area	Yo =	1.37	ft
Specific Force	Fs =	12.43	kip

Critical Flow Analysis - Trapezoidal Channel

Project: 16031 East Fork Jimmy Camp Creek
Channel ID: Q10 low flow channel at crests of drops



Design Information (Input)			
Bottom Width	B =	25.00	ft
Left Side Slope	Z1 =	3.00	ft/ft
Right Side Slope	Z2 =	3.00	ft/ft
Design Discharge	Q =	**475.00**	cfs
Critical Flow Condition (Calculated)			
Critical Flow Depth	**Y =**	**2.05**	ft
Critical Flow Area	A =	63.86	sq ft
Critical Top Width	T =	37.30	ft
Critical Hydraulic Depth	D =	1.71	ft
Critical Flow Velocity	V =	7.44	fps
Froude Number	**Fr =**	**1.00**	
Critical Wetted Perimeter	P =	37.97	ft
Critical Hydraulic Radius	R =	1.68	ft
Critical (min) Specific Energy	Esc =	2.91	ft
Centroid on the Critical Flow Area	Yoc =	0.89	ft
Critical (min) Specific Force	Fsc =	10.40	kip

τ stress $\tau = ds$ w $S = .25\%$

$d = 3'$

$\tau = .47$ psf.

τ_p for TRM = 1.55 psf

τ_p for Soil/Riprap = 3.2 psf

τ_p for Ret. class 'B' 2.1 psf (nat. floodplain veg.

4/4

SHEAR STRESS CALCULATIONS

PROJECT: **EAST FORK JIMMY CAMP CREEK**

PROJECT NO: **16031**

MAXIMUM DEPTH OVER INVERT

PROFILE STA	HEC-RAS RIVER STATION	CRITICAL DEPTH?	SLOPE (%)	10-YR DEPTH (FT)	SHEAR STRESS (PSF) 10-YR SHEAR STRESS (PSF)	100-YR DEPTH (PSF)	100-YR SHEAR STRESS (PSF)
16+05	12200	N	0.25	6.4	1.00	8.3	1.29
19+05	12500	N	0.25	5.5	1.51	6.9	1.08
22+55	12850	N	0.25	6.5	1.81	8.3	1.29
26+76	13272	N	0.25	6.1	1.83	7.7	1.20
29+79	13575	N	0.25	6.1	1.80	7.8	1.22
37+33	14330	N	0.25	6.0	1.80	7.8	1.22

DEPTH OVER BENCH

PROFILE STA	RIVER STA	CRITICAL DEPTH?	SLOPE (%)	10-YR DEPTH (FT)	SHEAR STRESS (PSF) 10-YR SHEAR STRESS (PSF)	100-YR DEPTH (PSF)	100-YR SHEAR STRESS (PSF)
16+05	12200	N	0.25	3.4	0.53	5.3	0.83
19+05	12500	N	0.25	2.5	0.39	3.9	0.61
22+55	12850	N	0.25	3.5	0.55	5.3	0.83
26+76	13272	N	0.25	3.1	0.48	4.7	0.73
29+79	13575	N	0.25	3.1	0.48	4.8	0.75
37+33	14330	N	0.25	3.0	0.47	4.8	0.75

HEC-15

- γ = unit weight of water (62.4 lb./ft.^{3} or 9810 N./m.^{2})
- d = maximum depth of flow (ft. or m.)
- S = channel slope (ft./ft. or m./m.)

Retardation Class for Lining Materials

Retardance Class	Cover	Condition
A	Weeping Lovegrass	Excellent stand, tall (average 30 in. or 760 mm)
	Yellow Bluestem Ischaemum	Excellent stand, tall (average 36 in. or 915 mm)
B	Kudzu	Very dense growth, uncut
	Bermuda grass	Good stand, tall (average 12 in. or 305 mm)
*	Native grass mixture little bluestem, bluestem, blue gamma, other short and long stem midwest grasses	Good stand, unmowed
	Weeping lovegrass	Good Stand, tall (average 24 in. or 610 mm)
	Lespedeza sericea	Good stand, not woody, tall (average 19 in. or 480 mm)
	Alfalfa	Good stand, uncut (average 11 in or 280 mm)
	Weeping lovegrass	Good stand, unmowed (average 13 in. or 330 mm)
	Kudzu	Dense growth, uncut
	Blue gamma	Good stand, uncut (average 13 in. or 330 mm)
C	Crabgrass	Fair stand, uncut (10-to-48 in. or 55-to-1220 mm)
	Bermuda grass	Good stand, mowed (average 6 in. or 150 mm)
	Common lespedeza	Good stand, uncut (average 11 in. or 280 mm)
	Grass-legume mixture: summer (orchard grass redtop, Italian ryegrass, and common lespedeza)	Good stand, uncut (6-8 in. or 150-200 mm)
	Centipedegrass	Very dense cover (average 6 in. or 150 mm)
	Kentucky bluegrass	

		Good stand, headed (6-12 in. or 150-305 mm)
D	Bermuda grass	Good stand, cut to 2.5 in. or 65 mm
	Common lespedeza	Excellent stand, uncut (average 4.5 in. or 115 mm)
	Buffalo grass	Good stand, uncut (3-6 in. or 75-150 mm)
	Grass-legume mixture: fall, spring (orchard grass Italian ryegrass, and common lespedeza	Good Stand, uncut (4-5 in. or 100-125 mm)
	Lespedeza sericea	After cutting to 2 in. or 50 mm (very good before cutting)
E	Bermuda grass	Good stand, cut to 1.5 in. or 40 mm
	Bermuda grass	Burned stubble

Permissible Shear Stresses for Various Linings

Protective Cover	(lb./sq.ft.)	t_p (N/m^2)
Retardance Class A Vegetation (See the "Retardation Class for Lining Materials" table above)	3.70	177
* Retardance Class B Vegetation (See the "Retardation Class for Lining Materials" table above)	2.10	101
Retardance Class C Vegetation (See the "Retardation Class for Lining Materials" table above)	1.00	48
Retardance Class D Vegetation (See the "Retardation Class for Lining Materials" table above)	0.60	29
Retardance Class E Vegetation (See the "Retardation Class for Lining Materials" table above)	0.35	17
Woven Paper	0.15	7
Jute Net	0.45	22
Single Fiberglass	0.60	29
Double Fiberglass	0.85	41

Straw W/Net	1.45	69
Curled Wood Mat	1.55	74
Synthetic Mat	2.00	96
Gravel, D_{50} = 1 in. or 25 mm	0.40	19
Gravel, D_{50} = 2 in. or 50 mm	0.80	38
Rock, D_{50} = 6 in. or 150 mm	2.50	120
Rock, D_{50} = 12 in. or 300 mm	5.00	239
6-in. or 50-mm Gabions	35.00	1675
4-in. or 100-mm Geoweb	10.00	479
Soil Cement (8% cement)	>45	>2154
Dycel w/out Grass	>7	>335
Petraflex w/out Grass	>32	>1532
Armorflex w/out Grass	12-20	574-957
Erikamat w/3-in or 75-mm Asphalt	13-16	622-766
Erikamat w/1-in. or 25 mm Asphalt	<5	<239
Armorflex Class 30 with longitudinal and lateral cables, no grass	>34	>1628
Dycel 100, longitudinal cables, cells filled with mortar	<12	<574
Concrete construction blocks, granular filter underlayer	>20	>957
Wedge-shaped blocks with drainage slot	>25	>1197

Trial Runs

To optimize the roadside channel system design, make several trial runs before a final design is achieved. Refer to HEC-15 for more information on channel design techniques and considerations.

KIOWA ENGINEERING CORPORATION

JOB Lower Ranch Fountain Bridge
SHEET NO. 1 OF 4
CALCULATED BY RAOW DATE 10/22/16
CHECKED BY DATE RBJ 7/10/17
SCALE Riprap Sizing

Riprap Sizing Through Bridge : Station 10+00

Bridge Velocity = 14.5 @ outlet RS 11523
per HEC RAS, Q_{100} = 4750 cfs
Slope = .25 % = .0025 ft

$$\frac{VS^{.17}}{(S_s-1)^{.66}}$$ Assume $S_s = 2.6$

$$\frac{(14.75)(.0025)^{.17}}{(2.6-1)^{.66}} = \frac{5.32}{1.36} = 3.92$$ upper end of L

Per Table 10-4 (EPCKCS DCM)

Required rock size Type M (cons.)

Riprap Sizing

Station 18+50 to 22+50

Per HEC Ras: Velocity Range 6.1 – 10.4 fps
Stream Slope.

@ fps : $\frac{10.4(.0025)^{.17}}{(2.6-1)} = \frac{3.75}{1.36} = 2.8$

upper end of VL; use next size up.
per Table 10-6 use Type VL

∴ 12" Thick

depth of flow ≈ 10'

Station 27+20 to 31+24

Per HEC RAS : Velocity Range 5.9 – 9.4

@ 9.4 fps : $\frac{9.4(.0025\%)^{.17}}{1.36} = 2.5$

per Table 10-6 Type VL

Kiowa Engineering Corporation

CLIENT Larson Ranch JOB NO. 16031 PAGE 3/4
PROJECT DATE CHECKED DATE 10/22/16
DETAIL Riprap Sizing CHECKED BY COMPUTED BY
Rev. 7-10-17

Sta 35+80 — 39+00

Per HEC RAS Velocity Range 8.0-10.0 fps

@ Velocity = 10.0 fps

$$\frac{10.0\,(.0025)^{.12}}{1.36} = 2.65$$

Per Table 10.6 use Type VL Soil Riprap

TABLE 10-6

RIPRAP REQUIREMENTS FOR CHANNEL LININGS **

$VS^{0.17}/(S_s-1)^{0.66}$* ($ft^{1}/2/sec$)	Rock Type ***
1.4 to 3.2	VL
3.3 to 3.9	L
4.0 to 4.5	M
4.6 to 5.5	H
5.6 to 6.4	VH

* where:

V = mean channel flow velocity, in fps;

S = longitudinal channel slope, in feet per foot (ft/ft); and

S_s = specific gravity of stone (minimum S_s = 2.50)

** Table valid only for Froude number of 0.8 or less and side slopes no steeper than 2h:1v.

*** Type VL and L riprap may be buried after placement to reduce vandalism.

KIOWA ENGINEERING CORPORATION

JOB Lawson Ranch EFICC
SHEET NO. 1/2 OF 2/14/17
CALCULATED BY RWW DATE Rev 7/18/17
CHECKED BY ______ DATE ______
SCALE Channel Hydraulics

Super Elevation

per DCM
Super Elevation
Height $H = \frac{CV^2W}{gR}$

C = .5 (subcritical Flow)

Station 28+00 to 31+00

Max 100 yr Velocity = 9.4 fps (max)
Min " " = 5.9 fps (min)
use Avg through segment 7.6 fps

℄ R 28+00 to 31+00 150 : ≈ 210' @ mid bank
Flood plain width (use @ Station 29+50) = 95'

$H = \frac{.5(7.6)^2(95)}{g(150)} = .60'$ use 1.0'

Sta 36+00 - 39+00

Velocity Range 8-10 fps use Avg = 9.0 fps
R = 200' @ Sta 37+00 W = 170'

$H = \frac{.5(9.0)^2(170)}{g(200)} = 1.06$ use 1.0'

D PRODUCT 207

KIOWA ENGINEERING CORPORATION

JOB Larson Ranch EFJCC

SHEET NO. 2 OF 2

CALCULATED BY RJW DATE 2/14/17

CHECKED BY DATE Rev 7-10-17

SCALE Channel Hydraulics

Station 18+50 to 22+00

Velocity Range 6.1 – 10.4 fps

Use Average = 9.4 fps

R = 195' to ℄ @ mid-bank

Floodplain width 230'

$$H = \frac{.5(10.4)^2(230)}{g(195)} = 1.98 \text{ use } 2'$$

KIOWA ENGINEERING CORPORATION

JOB Larsen Park EEJCC
SHEET NO. F
OF 2/14/17
CALCULATED BY RNW
DATE
CHECKED BY
DATE
SCALE Channel Hydraulics

Bank Heights outside bends w/ Soil Riprap

Sta	100yr WS	TOR w/ FB (1.0)
27+20	26.2	27.2 (use 28.0)
28+00	28.2	29.2
29+00	28.8	29.8
30+00	29.4	30.4
32+00	29.8	30.8
		w/ 1.0' = FB
36+00	32.0	33.0
37+00	32.2	33.2
38+00	33.3	34.3
		w/ FB = 2.0
19+50	20.5	22.5
21+00	22.4	24.4
22+00	22.8	24.8

D PRODUCT 207

KIOWA ENGINEERING CORPORATION

JOB Fountain Blvd Bridge / EFRC
SHEET NO. 1 OF 1
CALCULATED BY RWW DATE
CHECKED BY DATE
SCALE Hydraulics

Cutoff El. @ Crest and Sill

Sill Station	Downstream Control Elev / Sta	Sill Elev/BOR	Sill invert @ .0009%	
12+95	2.0 / 8+00	4.0/1.0	1.6 ✓	ok
18+00	7.0 / 13+30	8.5/5.5	6.6 ✓	ok
23+85	11.5 / 18+35	13.5/10.5	11.0 ✓	ok
26+85	16.5 / 24+20	17.5/14.5	16.3 ✓	ok
* 35+80	20.5 / 27+20	23.6/20.6	19.8	.8 above

Crest Station	Crest Elev	5' Cutoff Elev	d/s Elev @ .0009%	
13+30	7.0	2.0	1.6	.4 above
18+35	11.5	6.5	6.6	ok below
24+20	16.5	11.5	11.0	.5 above
27+20	20.5	14.5	16.3	ok
36+15	25.0	20.0	19.8	.2 above ok

* Bottom of rock @ 35+80 .8' above longterm crest. Crest cut-off wall is below long-term sill invert so sill is probably ok at .8' above.

Seepage Analysis (Lane's Weighted Creep Method Calculation)

10-YR FLOW COND

Location	C_w	Weep Drain System	C_w	H_s	Drop Height	L_a	L_f	L_s	L_H	Required $L_{v\text{-calc}}$	$L_{V\text{-Struct}}$	L_v Difference $L_{v\text{-calc}}$ and $L_{v\text{-Struct}}$	Additional Calculated Cut off Wall Depth	Additional Cut off Wall Depth
Sta. 24+20	6.0	No	6.0	**3.0 ft**	3.6 ft	10.0ft	36.0ft	0.0ft	**46.0 ft**	2.7 ft	**5.0 ft**	0.0 ft	0.0 ft	**0 ft**
			##											

Equations:

$C_w = [(L_H/3)+L_v] / H_s$ (USDCM Eqn 9-5)

C_w = Lane's Weighted Creep Ratio

Table 9-3: Lane's Weighted Creep Recommended Ratios (USDCM)

- C_w = 8.5 Very fine sand or silt
- C_w = 7.0 Fine Sand
- C_w = 6.0 Medium Sand
- C_w = 5.0 Coarse Sand
- C_w = 4.0 Fine Gravel
- C_w = 3.0 Coarse gravel including cobbles or Soft Clay
- C_w = 2.0 Medium Clay

Weep Drain System: 10% Reduction is C_w if weep drain system is used

H_s = Head Differential between analysis points -- Taken from HEC-Ras

Drop Height = Difference between Crest and Sill

L_H = Sum of the Horizontal Creep Distances (Less than 45 degrees)

$L_H = L_a + L_f$

- L_a = Approach Length
- L_s = Length of stilling basin (Toe to Sill)
- L_f = Drop Face Length (Crest to Toe)

L_v = Sum of the Vertical Creep Distances (Steeper than 45 degrees)

$L_{v\text{-Struct}}$ = Vertical creep distances of structure w/o cut off wall

Additional Calculated Cutoff Wall Depth = Half of L_v Difference if Sheet Pile

Seepage Analysis (Lane's Weighted Creep Method Calculation)

100-YR FLOW COND

Location	C_w	Weep Drain System	C_w	H_s	Drop Height	L_a	L_f	L_s	L_H	Required $L_{V\text{-calc}}$	$L_{V\text{-Struct}}$	L_v Difference $L_{V\text{-calc}}$ and $L_{V\text{-Struct}}$	Additional Calculated Cut off Wall Depth	Additional Cut off Wall Depth
Sta. 24+20	6.0	No	6.0	1.1 ft	3.6 ft	10.0ft	36.0ft	0.0ft	46.0 ft	-8.7 ft	12.0 ft	0.0 ft	0.0 ft	0 ft *
			##											

Equations:

$C_w = [(L_H/3)+L_v] / H_s$ (USDCM Eqn 9-5)

C_w = Lane's Weighted Creep Ratio

Table 9-3: Lane's Weighted Creep Recommended Ratios (USDCM)

- C_w = 8.5 Very fine sand or silt
- C_w = 7.0 Fine Sand
- C_w = 6.0 Medium Sand
- C_w = 5.0 Coarse Sand
- C_w = 4.0 Fine Gravel
- C_w = 3.0 Coarse gravel including cobbles or Soft Clay
- C_w = 2.0 Medium Clay

Weep Drain System: 10% Reduction is C_w if weep drain system is used

H_s = Head Differential between analysis points -- Taken from HEC-Ras

* CUT-OFF WALL NOT REQUIRED AT DROPS PER UDFCD 9.2.4

Drop Height = Difference between Crest and Sill

L_H = Sum of the Horizontal Creep Distances (Less than 45 degrees)

$L_H = L_a + L_f$

L_a = Approach Length

L_s = Length of stilling basin (Toe to Sill)

L_f = Drop Face Length (Crest to Toe)

L_v = Sum of the Vertical Creep Distances (Steeper than 45 degrees)

$L_{V\text{-Struct}}$ = Vertical creep distances of structure w/o cut off wall

Additional Calculated Cutoff Wall Depth = Half of L_v Difference if Sheet Pile

PROFILE
ETA

39+00
36+95
36+15
35+80
33+55
31+25
29+80
27+20
26+85

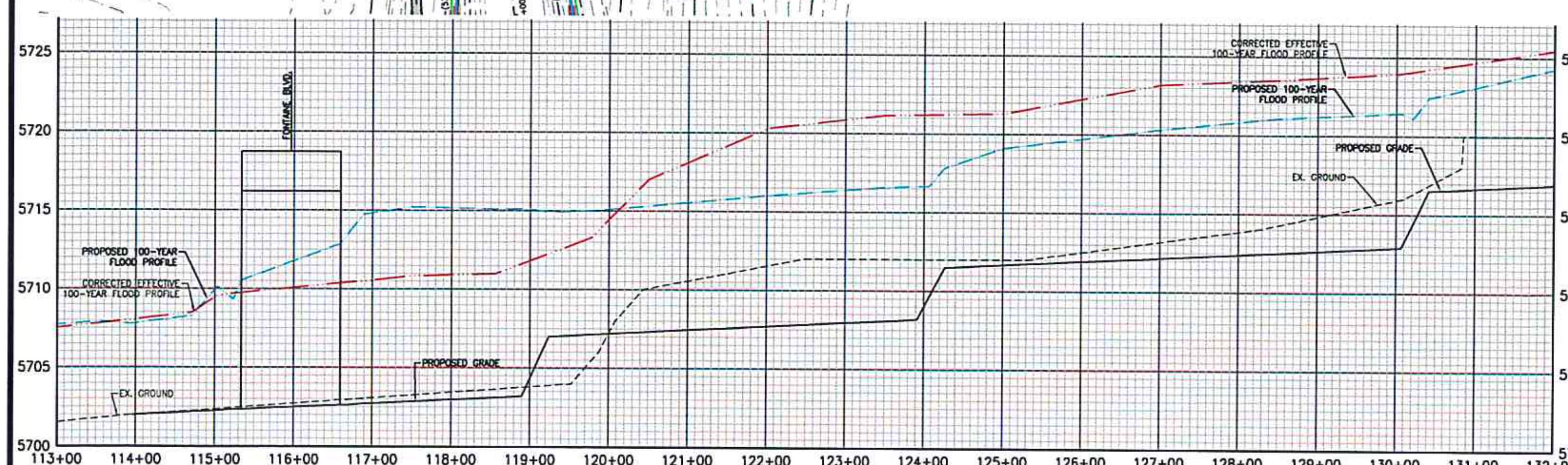
HEC-RAS Plan: Prop Cond River: East Tributary Reach: Main Reach

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Main Reach	14800	10yr	2200.00	5728.60	5733.67	5733.67	5735.14	0.011180	10.69	283.64	111.82	0.89
Main Reach	14800	50yr	3850.00	5728.60	5735.18	5735.18	5736.92	0.010002	12.26	483.65	152.71	0.88
Main Reach	14800	100yr	4400.00	5728.60	5735.56	5735.56	5737.39	0.009940	12.74	544.24	163.09	0.89
Main Reach	14800	500yr	5700.00	5728.60	5736.45	5736.40	5738.36	0.009308	13.43	699.12	187.01	0.88
Main Reach	14650	10yr	2200.00	5727.87	5733.45	5731.85	5733.97	0.003280	6.06	437.60	134.68	0.49
Main Reach	14650	50yr	3850.00	5727.87	5734.92	5733.23	5735.69	0.003631	7.61	658.38	167.85	0.53
Main Reach	14650	100yr	4400.00	5727.87	5735.33	5733.63	5736.17	0.003690	8.00	729.84	177.77	0.54
Main Reach	14650	500yr	5700.00	5727.87	5736.19	5734.41	5737.23	0.003956	8.98	894.14	225.01	0.58
Main Reach	14527	10yr	2200.00	5726.23	5732.43	5731.94	5733.35	0.007347	7.70	287.38	102.92	0.78
Main Reach	14527	50yr	3850.00	5726.23	5733.62	5733.19	5735.01	0.007627	9.52	424.14	126.82	0.82
Main Reach	14527	100yr	4400.00	5726.23	5733.93	5733.58	5735.47	0.007804	10.05	464.73	132.96	0.83
Main Reach	14527	500yr	5700.00	5726.23	5734.54	5734.34	5736.46	0.008455	11.31	550.38	149.33	0.88
Main Reach	14500	10yr	2200.00	5726.17	5732.33	5731.60	5733.14	0.005886	7.19	306.12	101.58	0.73
Main Reach	14500	50yr	3850.00	5726.17	5733.61	5732.93	5734.74	0.006086	8.54	450.58	125.23	0.79
Main Reach	14500	100yr	4400.00	5726.17	5733.96	5733.30	5735.18	0.006160	8.88	495.74	132.15	0.81
Main Reach	14500	500yr	5700.00	5726.17	5734.68	5734.04	5736.11	0.006336	9.66	597.24	157.47	0.81
Main Reach	14330	10yr	2200.00	5725.81	5731.68	5730.72	5732.24	0.004087	6.11	360.35	129.76	0.65
Main Reach	14330	50yr	3850.00	5725.81	5733.01	5731.94	5733.75	0.004419	6.90	558.30	164.10	0.66
Main Reach	14330	100yr	4400.00	5725.81	5733.39	5732.27	5734.16	0.004455	7.07	622.19	173.54	0.66
Main Reach	14330	500yr	5700.00	5725.81	5734.18	5732.93	5735.03	0.004472	7.43	768.53	201.43	0.65
Main Reach	14251	10yr	2200.00	5725.65	5730.57	5730.44	5731.62	0.017673	8.19	268.48	111.63	0.93
Main Reach	14251	50yr	3850.00	5725.65	5731.96	5731.58	5733.15	0.013284	8.74	440.40	137.11	0.86
Main Reach	14251	100yr	4400.00	5725.65	5732.34	5731.89	5733.57	0.012537	8.90	494.21	145.92	0.85
Main Reach	14251	500yr	5700.00	5725.65	5733.14	5732.59	5734.46	0.011347	9.21	618.97	165.50	0.84
Main Reach	14231	10yr	2200.00	5725.01	5730.53	5729.82	5731.26	0.009571	6.88	319.74	111.89	0.72
Main Reach	14231	50yr	3850.00	5725.01	5731.89	5731.06	5732.86	0.009075	7.89	488.08	134.67	0.73
Main Reach	14231	100yr	4400.00	5725.01	5732.26	5731.38	5733.29	0.008919	8.16	539.42	142.12	0.74
Main Reach	14231	500yr	5700.00	5725.01	5733.04	5732.09	5734.21	0.008640	8.69	658.30	159.01	0.75
Main Reach	14215	10yr	2200.00	5724.86	5730.37	5729.66	5731.11	0.009552	6.91	318.19	110.41	0.72
Main Reach	14215	50yr	3850.00	5724.86	5731.73	5730.91	5732.72	0.009189	7.96	483.87	132.73	0.73
Main Reach	14215	100yr	4400.00	5724.86	5732.10	5731.22	5733.16	0.009122	8.24	534.13	139.39	0.74
Main Reach	14215	500yr	5700.00	5724.86	5732.87	5731.95	5734.07	0.008946	8.79	648.30	156.94	0.76
Main Reach	14179	10yr	2200.00	5724.51	5730.00	5729.29	5730.77	0.009770	7.01	313.81	107.31	0.72
Main Reach	14179	50yr	3850.00	5724.51	5731.36	5730.57	5732.38	0.009714	8.11	474.97	131.03	0.75
Main Reach	14179	100yr	4400.00	5724.51	5731.73	5730.93	5732.82	0.009689	8.39	524.66	137.49	0.76
Main Reach	14179	500yr	5700.00	5724.51	5732.49	5731.66	5733.74	0.009580	8.96	636.07	153.87	0.78
Main Reach	13950	10yr	2200.00	5723.84	5728.70	5727.54	5729.28	0.004398	6.22	410.92	146.30	0.55
Main Reach	13950	50yr	3850.00	5723.84	5729.93	5728.77	5730.78	0.004929	7.88	612.55	181.68	0.61
Main Reach	13950	100yr	4400.00	5723.84	5730.25	5729.12	5731.20	0.005139	8.35	671.83	192.23	0.62
Main Reach	13950	500yr	5700.00	5723.84	5730.94	5729.88	5732.09	0.005428	9.29	814.50	216.04	0.65
Main Reach	13720.34	10yr	2200.00	5723.55	5727.26	5726.65	5727.97	0.007270	7.36	387.41	162.35	0.69
Main Reach	13720.34	50yr	3850.00	5723.55	5728.53	5727.75	5729.46	0.006771	8.71	626.37	215.38	0.70
Main Reach	13720.34	100yr	4400.00	5723.55	5728.90	5728.13	5729.87	0.006517	8.99	710.39	231.53	0.70
Main Reach	13720.34	500yr	5700.00	5723.55	5729.73	5728.83	5730.75	0.005906	9.44	917.12	267.15	0.68
Main Reach	13575	10yr	2200.00	5721.83	5726.33	5725.52	5726.99	0.006042	6.70	370.91	141.93	0.63
Main Reach	13575	50yr	3850.00	5721.83	5727.52	5726.69	5728.50	0.006389	8.36	558.89	175.39	0.68
Main Reach	13575	100yr	4400.00	5721.83	5727.83	5727.04	5728.91	0.006554	8.83	615.18	184.86	0.69
Main Reach	13575	500yr	5700.00	5721.83	5728.44	5727.75	5729.78	0.007123	9.94	735.29	208.30	0.74
Main Reach	13437.94	10yr	2200.00	5719.89	5725.39	5724.80	5726.16	0.005993	7.04	312.57	116.95	0.78
Main Reach	13437.94	50yr	3850.00	5719.89	5726.52	5726.02	5727.61	0.006560	8.36	460.26	145.54	0.83
Main Reach	13437.94	100yr	4400.00	5719.89	5726.82	5726.36	5728.00	0.006750	8.71	505.27	153.81	0.85
Main Reach	13437.94	500yr	5700.00	5719.89	5727.48	5727.06	5728.83	0.006970	9.30	612.80	171.95	0.87
Main Reach	13342	10yr	2200.00	5719.60	5723.99	5723.99	5725.13	0.021774	8.58	256.36	113.99	1.01
Main Reach	13342	50yr	3850.00	5719.60	5725.12	5725.12	5726.56	0.019808	9.62	400.15	141.42	1.01
Main Reach	13342	100yr	4400.00	5719.60	5725.44	5725.44	5726.95	0.019141	9.83	447.40	149.41	1.00
Main Reach	13342	500yr	5700.00	5719.60	5726.09	5726.09	5727.77	0.018437	10.37	549.56	164.87	1.00
Main Reach	13322	10yr	2200.00	5718.21	5723.26	5723.25	5724.48	0.020493	8.87	248.07	102.75	1.01
Main Reach	13322	50yr	3850.00	5718.21	5724.49	5724.49	5725.97	0.019012	9.76	394.33	134.11	1.00
Main Reach	13322	100yr	4400.00	5718.21	5724.96	5724.81	5726.38	0.016569	9.57	459.55	144.73	0.95
Main Reach	13322	500yr	5700.00	5718.21	5725.62	5725.50	5727.23	0.016359	10.16	581.05	159.84	0.96
Main Reach	13307	10yr	2200.00	5717.16	5723.56	5722.26	5724.12	0.008802	6.01	366.21	118.47	0.60
Main Reach	13307	50yr	3850.00	5717.16	5724.74	5723.68	5725.58	0.008353	7.37	522.69	145.51	0.68
Main Reach	13307	100yr	4400.00	5717.16	5725.17	5724.04	5726.04	0.008056	7.49	587.50	155.09	0.68
Main Reach	13307	500yr	5700.00	5717.16	5725.84	5724.78	5726.88	0.008661	8.19	695.92	169.04	0.71

SCALE: 1"=100'

LEGEND

- EFFECTIVE 100-YEAR FLOODPLAIN
- EFFECTIVE 500-YEAR FLOODPLAIN
- EFFECTIVE FLOODWAY
- CORRECTED EFFECTIVE 100-YEAR FLOODPLAIN
- CORRECTED EFFECTIVE 500-YEAR FLOODPLAIN
- PROPOSED 100-YEAR FLOODPLAIN
- PROPOSED 500-YEAR FLOODPLAIN
- PROPOSED FLOODWAY
- (6020) EXISTING CONTOURS
- 6020 PROPOSED CONTOURS



TOPOGRAPHIC MAPPING IS BASED UPON AERIAL TOPOGRAPHIC MAPPING PROVIDED BY CORE ENGINEERING INC., COLORADO STATE PLANE COORDINATES 1983, AND NATIONAL GEODETIC VERTICAL DATUM OF 1929.

THE TOPOGRAPHY WAS COMPILED IN ACCORDANCE WITH NATIONAL MAPPING STANDARDS FOR 1"=200' & 2' CONTOUR INTERVAL DETAIL.

SITE BENCHMARK: FIMS MONUMENT NO. F204

RICHARD N. WRAY
COLORADO LIC. 19310

DATED

Kiowa Engineering Corporation
Celebrating 30 years
1604 South 21st Street
Colorado Springs, Colorado 80904
(719) 630-7342

EAST TRIBUTARY JIMMY CAMP CREEK CLOMR

LORSON RANCH

PROPOSED CONDITIONS FLOODPLAIN MAP

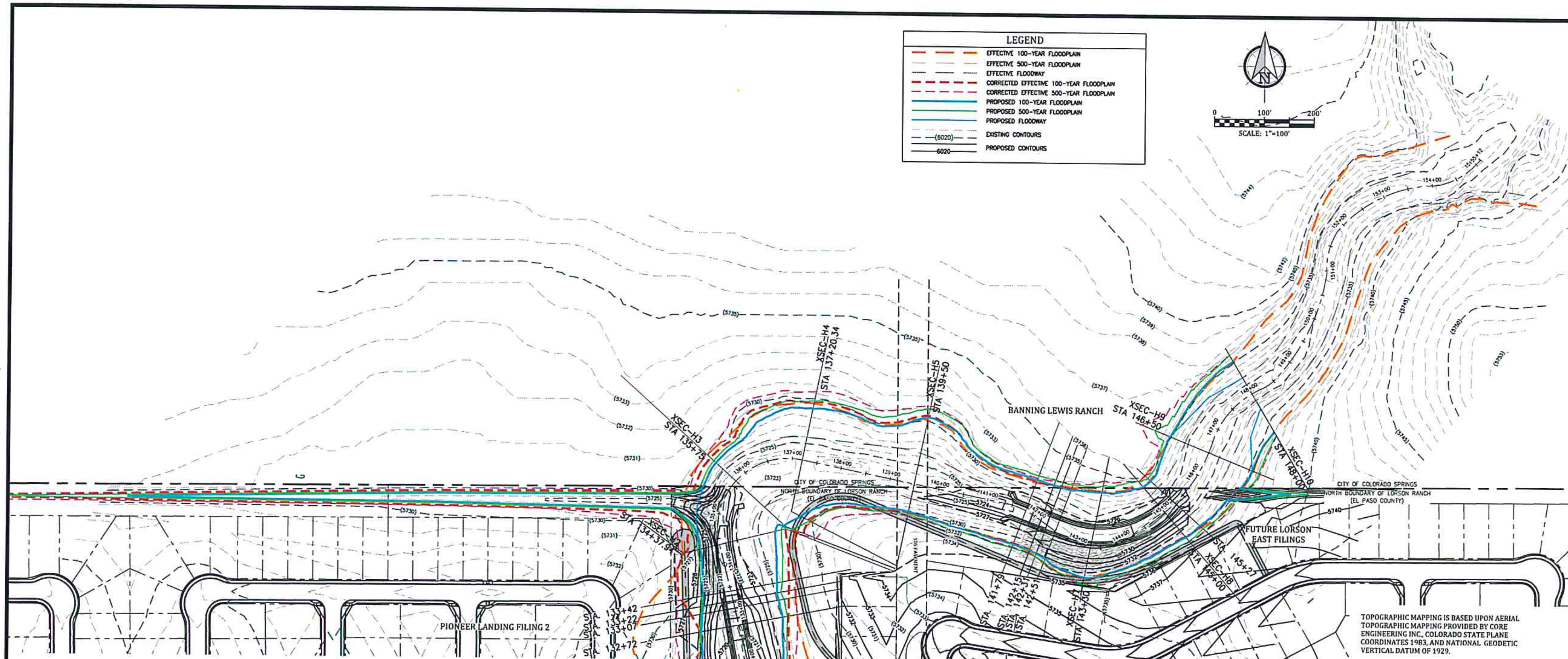
EL PASO COUNTY, COLORADO

Project No.:	16031
Date:	June 21, 2017
Design:	RNW
Drawn:	ELS
Check:	RNW
Revisions:	

SHEET

3

OF 4 SHEETS



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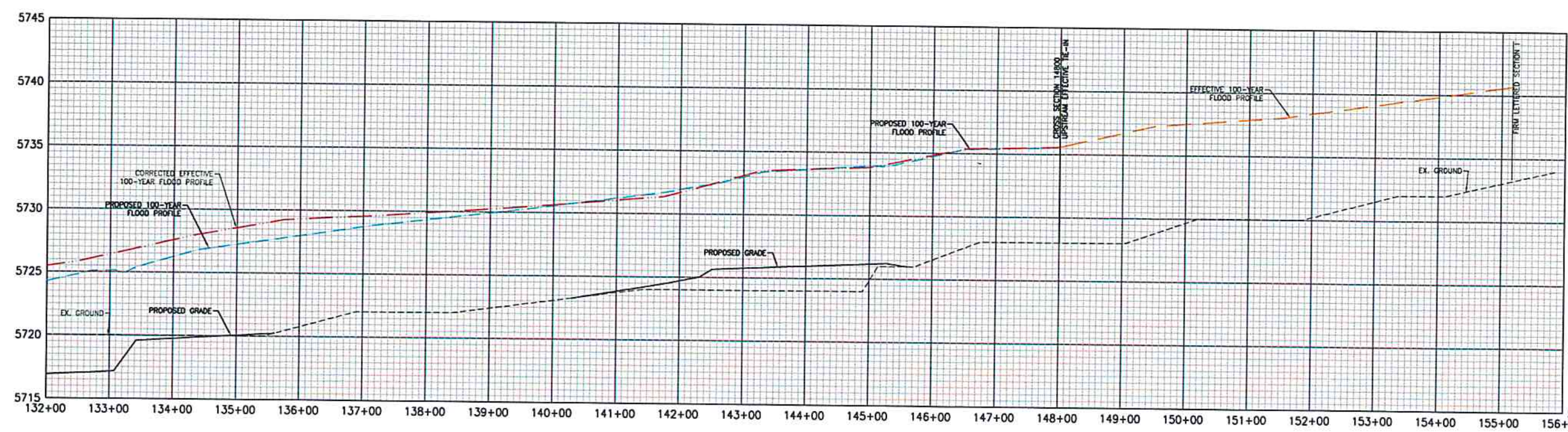

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EAST TRIBUTARY JIMMY CAMP CREEK CLOMR
LORSON RANCH
PROPOSED CONDITIONS FLOODPLAIN MAP
EL PASO COUNTY, COLORADO

Project No.: 16031
Date: June 21, 2017
Design: RNW
Drawn: ELS
Check: RNW
Revisions:

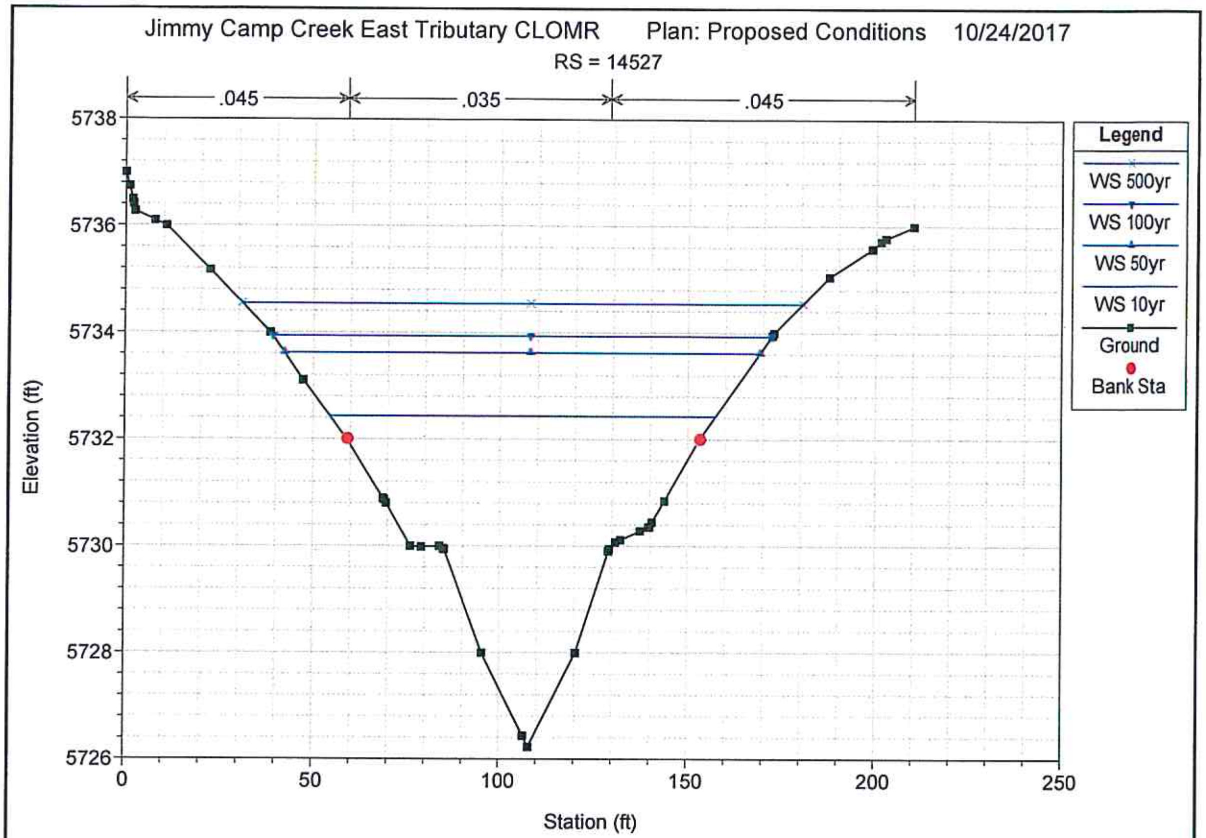
SHEET
4
OF 4 SHEETS

HEC-RAS Plan: Prop Cond River: East Tributary Reach: Main Reach (Continued)

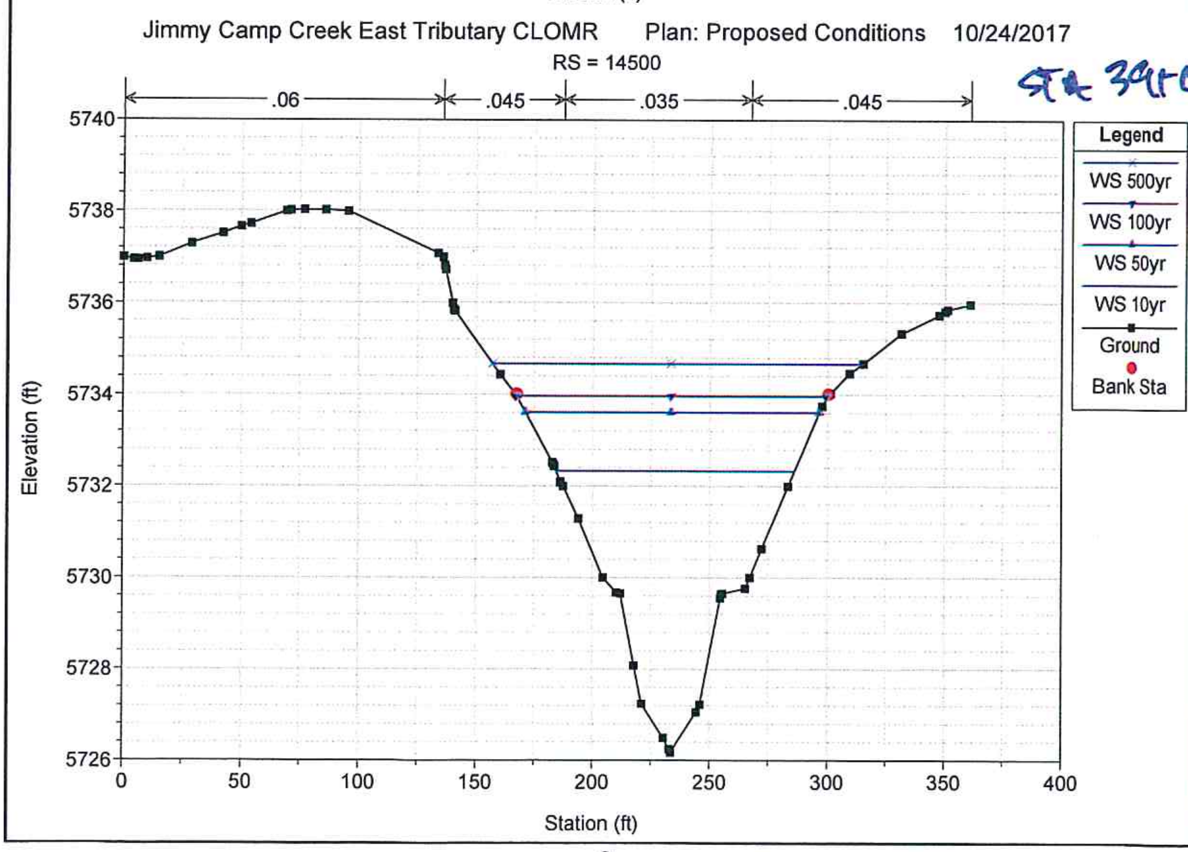
	Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
	Main Reach	13272	10yr	2200.00	5717.07	5723.50	5721.93	5723.91	0.003331	5.11	430.12	131.28	0.50
	Main Reach	13272	50yr	3850.00	5717.07	5724.68	5723.13	5725.32	0.004149	6.41	600.35	156.75	0.58
	Main Reach	13272	100yr	4400.00	5717.07	5725.12	5723.48	5725.79	0.004021	6.56	670.60	165.13	0.57
	Main Reach	13272	500yr	5700.00	5717.07	5725.78	5724.19	5726.60	0.004425	7.26	784.66	177.87	0.61
24+20	Main Reach	13041	10yr	2400.00	5716.50	5721.14	5721.14	5722.20	0.021307	8.28	290.00	137.15	1.00
	Main Reach	13041	50yr	4000.00	5716.50	5722.05	5722.05	5723.45	0.018536	9.50	421.23	150.70	1.00
	Main Reach	13041	100yr	4750.00	5716.50	5722.43	5722.43	5723.96	0.017653	9.91	479.25	157.51	1.00
	Main Reach	13041	500yr	6000.00	5716.50	5722.99	5722.99	5724.71	0.016649	10.51	570.91	167.85	1.00
	Main Reach	13021	10yr	2400.00	5714.43	5719.58	5719.58	5720.87	0.013799	9.11	263.44	105.04	1.01
	Main Reach	13021	50yr	4000.00	5714.43	5720.74	5720.74	5722.22	0.012745	9.78	408.84	138.04	1.00
	Main Reach	13021	100yr	4750.00	5714.43	5721.14	5721.14	5722.76	0.012681	10.22	464.96	143.68	1.00
	Main Reach	13021	500yr	6000.00	5714.43	5721.72	5721.72	5723.56	0.012622	10.87	551.89	152.06	1.01
23+85	Main Reach	13006	10yr	2400.00	5712.88	5719.61	5718.13	5720.15	0.004053	5.87	408.92	124.38	0.57
	Main Reach	13006	50yr	4000.00	5712.88	5720.95	5719.47	5721.66	0.004215	6.77	591.20	145.68	0.59
	Main Reach	13006	100yr	4750.00	5712.88	5721.45	5719.93	5722.24	0.004292	7.13	666.04	152.83	0.60
	Main Reach	13006	500yr	6000.00	5712.88	5722.18	5720.58	5723.10	0.004441	7.68	781.34	164.23	0.62
	Main Reach	12970	10yr	2400.00	5712.79	5719.51	5718.01	5719.99	0.003707	5.59	429.02	129.47	0.54
	Main Reach	12970	50yr	4000.00	5712.79	5720.85	5719.24	5721.50	0.003832	6.46	619.49	151.94	0.56
	Main Reach	12970	100yr	4750.00	5712.79	5721.36	5719.67	5722.08	0.003895	6.81	697.97	159.56	0.57
	Main Reach	12970	500yr	6000.00	5712.79	5722.09	5720.33	5722.92	0.004025	7.33	818.72	171.62	0.59
22+55	Main Reach	12850	10yr	2400.00	5712.50	5719.20	5717.60	5719.57	0.002839	4.90	489.54	152.19	0.48
	Main Reach	12850	50yr	4000.00	5712.50	5720.58	5718.66	5721.06	0.002801	5.57	718.71	182.94	0.49
	Main Reach	12850	100yr	4750.00	5712.50	5721.10	5719.06	5721.62	0.002805	5.81	817.33	195.22	0.50
	Main Reach	12850	500yr	6000.00	5712.50	5721.86	5719.66	5722.45	0.002796	6.18	971.49	211.38	0.51
21+05	Main Reach	12700	10yr	2400.00	5712.14	5718.63	5717.13	5719.10	0.003298	5.51	435.88	126.99	0.52
	Main Reach	12700	50yr	4000.00	5712.14	5719.88	5718.28	5720.55	0.003779	6.61	605.26	145.09	0.57
	Main Reach	12700	100yr	4750.00	5712.14	5720.33	5718.70	5721.11	0.003874	7.06	675.54	166.57	0.58
	Main Reach	12700	500yr	6000.00	5712.14	5721.00	5719.36	5721.92	0.003958	7.72	800.50	207.02	0.60
19+05	Main Reach	12500	10yr	2400.00	5711.68	5717.63	5716.73	5718.25	0.005420	6.36	377.62	129.03	0.65
	Main Reach	12500	50yr	4000.00	5711.68	5718.70	5717.83	5719.60	0.005940	7.59	526.85	147.71	0.71
	Main Reach	12500	100yr	4750.00	5711.68	5719.11	5718.25	5720.12	0.006110	8.07	588.73	153.89	0.73
	Main Reach	12500	500yr	6000.00	5711.68	5719.67	5718.87	5720.89	0.006579	8.87	676.14	161.95	0.77
18+35	Main Reach	12426	10yr	2400.00	5711.50	5716.44	5716.44	5717.57	0.015662	8.50	282.24	446.05	0.99
	Main Reach	12426	50yr	4000.00	5711.50	5717.45	5717.45	5718.89	0.014542	9.62	415.99	472.98	0.99
	Main Reach	12426	100yr	4750.00	5711.50	5717.85	5717.85	5719.41	0.014174	10.02	473.95	494.48	0.99
	Main Reach	12426	500yr	6000.00	5711.50	5718.47	5718.47	5720.17	0.012943	10.50	578.80	554.80	0.96
	Main Reach	12406	10yr	2400.00	5709.61	5714.91	5714.91	5716.28	0.014224	9.41	255.11	423.16	0.99
	Main Reach	12406	50yr	4000.00	5709.61	5716.20	5716.20	5717.82	0.012968	10.22	391.23	461.92	0.99
	Main Reach	12406	100yr	4750.00	5709.61	5716.66	5716.66	5718.41	0.012730	10.60	447.97	472.69	0.99
	Main Reach	12406	500yr	6000.00	5709.61	5717.65	5717.33	5719.31	0.010116	10.33	580.92	497.10	0.90
18+00	Main Reach	12391	10yr	2400.00	5708.18	5714.70	5713.48	5715.50	0.005789	7.18	334.16	440.49	0.67
	Main Reach	12391	50yr	4000.00	5708.18	5716.06	5715.07	5717.15	0.006445	8.39	476.83	475.55	0.73
	Main Reach	12391	100yr	4750.00	5708.18	5716.67	5715.63	5717.82	0.006195	8.62	551.01	488.23	0.72
	Main Reach	12391	500yr	6000.00	5708.18	5717.96	5716.36	5719.03	0.004754	8.29	724.08	514.73	0.65
17+60	Main Reach	12356	10yr	2400.00	5708.09	5714.66	5713.23	5715.27	0.004390	6.28	382.32	481.16	0.57
	Main Reach	12356	50yr	4000.00	5708.09	5716.00	5714.53	5716.89	0.004943	7.56	529.33	507.12	0.63
	Main Reach	12356	100yr	4750.00	5708.09	5716.61	5715.05	5717.57	0.004838	7.89	601.91	516.87	0.63
	Main Reach	12356	500yr	6000.00	5708.09	5717.89	5715.82	5718.84	0.003876	7.84	765.40	536.56	0.58
16+05	Main Reach	12200	10yr	2400.00	5707.70	5714.12	5712.73	5714.65	0.003380	5.84	410.63	523.86	0.54
	Main Reach	12200	50yr	4000.00	5707.70	5715.40	5713.84	5716.19	0.003791	7.15	559.11	542.90	0.59
	Main Reach	12200	100yr	4750.00	5707.70	5716.03	5714.29	5716.89	0.003643	7.45	637.97	552.35	0.58
	Main Reach	12200	500yr	6000.00	5707.70	5717.46	5715.00	5718.26	0.003045	7.17	837.40	589.38	0.54
14+55	Main Reach	12050	10yr	2400.00	5707.32	5713.40	5712.43	5714.04	0.004747	6.44	372.67	544.62	0.62
	Main Reach	12050	50yr	4000.00	5707.32	5714.54	5713.49	5715.51	0.005310	7.89	506.87	561.93	0.68
	Main Reach	12050	100yr	4750.00	5707.32	5715.33	5713.97	5716.28	0.004419	7.82	607.42	574.06	0.64
	Main Reach	12050	500yr	6000.00	5707.32	5717.07	5714.65	5717.84	0.002493	7.06	877.71	655.24	0.50
	Main Reach	11976.79	10yr	2400.00	5707.13	5712.75	5712.27	5713.59	0.007589	7.36	326.09	597.15	0.77
	Main Reach	11976.79	50yr	4000.00	5707.13	5713.77	5713.33	5715.00	0.008178	8.92	448.33	660.65	0.83
	Main Reach	11976.79	100yr	4750.00	5707.13	5715.01	5713.76	5715.95	0.004645	7.75	612.57	722.02	0.65
	Main Reach	11976.79	500yr	6000.00	5707.13	5717.29	5714.42	5717.58	0.001098	4.80	1565.82	920.75	0.33
13+70	Main Reach	11923	10yr	2400.00	5706.99	5711.81	5711.81	5712.91	0.022077	8.42	285.11	770.48	0.99
	Main Reach	11923	50yr	4000.00	5706.99	5713.45	5712.76	5714.42	0.010740	7.89	506.94	812.06	0.74
	Main Reach	11923	100yr	4750.00	5706.99	5714.95	5713.15	5715.60	0.005033	6.49	732.28	847.67	0.53
	Main Reach	11923	500yr	6000.00	5706.99	5717.42	5713.75	5717.49	0.000213	1.73	2975.57	983.52	0.12

HEC-RAS Plan: Prop Cond River: East Tributary Reach: Main Reach (Continued)

	Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
	Main Reach	11903	10yr	2400.00	5704.82	5710.43	5710.04	5711.41	0.016427	7.96	301.39	748.81	0.87
	Main Reach	11903	50yr	4000.00	5704.82	5713.71	5711.25	5714.16	0.003202	5.35	747.97	834.16	0.43
	Main Reach	11903	100yr	4750.00	5704.82	5715.08	5711.66	5715.48	0.002143	4.92	985.68	866.91	0.36
	Main Reach	11903	500yr	6000.00	5704.82	5717.43	5712.29	5717.48	0.000153	1.61	3303.05	991.82	0.10
12+95	Main Reach	11888	10yr	2400.00	5703.20	5710.78	5708.52	5711.13	0.003305	4.75	505.20	766.95	0.42
	Main Reach	11888	50yr	4000.00	5703.20	5713.79	5709.70	5714.08	0.001605	4.31	928.89	840.26	0.31
	Main Reach	11888	100yr	4750.00	5703.20	5715.14	5710.26	5715.40	0.001247	4.14	1147.26	872.67	0.28
	Main Reach	11888	500yr	6000.00	5703.20	5717.43	5710.92	5717.48	0.000127	1.56	3498.57	994.53	0.09
	Main Reach	11856	10yr	2400.00	5703.12	5710.73	5708.23	5711.02	0.002465	4.30	558.52	760.97	0.37
	Main Reach	11856	50yr	4000.00	5703.12	5713.77	5709.35	5714.02	0.001306	4.00	999.67	839.56	0.28
	Main Reach	11856	100yr	4750.00	5703.12	5715.12	5709.74	5715.35	0.001053	3.87	1226.42	874.40	0.26
	Main Reach	11856	500yr	6000.00	5703.12	5717.43	5710.48	5717.47	0.000120	1.53	3598.54	1034.46	0.09
11+55	Main Reach	11750	10yr	2400.00	5702.87	5710.71	5706.24	5710.83	0.000787	2.79	861.41	622.48	0.21
	Main Reach	11750	50yr	4000.00	5702.87	5713.78	5707.27	5713.90	0.000531	2.82	1421.29	791.32	0.19
	Main Reach	11750	100yr	4750.00	5702.87	5715.23	5707.77	5715.27	0.000121	1.49	3111.42	856.78	0.09
	Main Reach	11750	500yr	6000.00	5702.87	5717.45	5708.46	5717.46	0.000026	0.80	7472.73	1001.52	0.04
	Main Reach	11688	10yr	2400.00	5702.72	5710.24	5707.47	5710.71	0.003177	5.51	435.25	83.27	0.43
	Main Reach	11688	50yr	4000.00	5702.72	5713.33	5708.97	5713.80	0.002164	5.54	722.34	142.49	0.37
	Main Reach	11688	100yr	4750.00	5702.72	5714.76	5709.60	5715.21	0.002050	5.38	883.32	210.90	0.36
	Main Reach	11688	500yr	6000.00	5702.72	5717.04	5710.52	5717.42	0.001494	4.92	1234.33	432.44	0.31
10+73	Main Reach	11668	10yr	2400.00	5702.65	5709.58	5707.38	5710.50	0.004497	7.69	312.11	70.49	0.53
	Main Reach	11668	50yr	4000.00	5702.65	5712.21	5709.11	5713.50	0.004028	9.13	438.30	71.83	0.53
	Main Reach	11668	100yr	4750.00	5702.65	5713.45	5709.83	5714.86	0.003717	9.54	497.76	72.29	0.52
	Main Reach	11668	500yr	6000.00	5702.65	5715.41	5710.93	5717.01	0.003324	10.13	592.19	153.99	0.51
	Main Reach	11595		Bridge		FONTAINE BLVD							
9+28	Main Reach	11523	10yr	2400.00	5702.35	5707.34	5706.88	5709.09	0.013127	10.61	226.22	68.09	0.86
	Main Reach	11523	50yr	4000.00	5702.35	5708.67	5708.61	5711.62	0.015928	13.79	290.04	68.87	0.99
	Main Reach	11523	100yr	4750.00	5702.35	5709.34	5709.33	5712.71	0.015811	14.74	322.24	69.27	1.00
	Main Reach	11523	500yr	6000.00	5702.35	5710.47	5710.47	5714.41	0.015005	15.93	376.59	69.94	1.00
	Main Reach	11503	10yr	2400.00	5702.28	5707.53	5706.43	5708.47	0.008549	7.79	308.06	73.90	0.67
	Main Reach	11503	50yr	4000.00	5702.28	5709.30	5707.87	5710.55	0.008062	8.95	447.02	82.91	0.68
	Main Reach	11503	100yr	4750.00	5702.28	5710.16	5708.46	5711.46	0.007385	9.13	520.15	87.42	0.66
	Main Reach	11503	500yr	6000.00	5702.28	5710.97	5709.37	5712.56	0.008103	10.12	592.83	91.36	0.70
DS LIMIT													
	Main Reach	11471.55	10yr	2600.00	5702.19	5706.53	5706.23	5707.96	0.015821	9.61	270.41	75.38	0.89
	Main Reach	11471.55	50yr	4300.00	5702.19	5707.68	5707.68	5709.88	0.018562	11.90	361.43	82.25	1.00
	Main Reach	11471.55	100yr	5200.00	5702.19	5708.32	5708.32	5710.75	0.018245	12.52	415.32	86.31	1.01
	Main Reach	11471.55	500yr	6450.00	5702.19	5709.13	5709.13	5711.85	0.017620	13.24	487.18	90.49	1.01
	Main Reach	11395	10yr	2600.00	5702.00	5705.69	5705.29	5706.69	0.014053	8.01	324.46	110.15	0.82
	Main Reach	11395	50yr	4300.00	5702.00	5707.12	5706.40	5708.32	0.011044	8.77	490.30	121.00	0.77
	Main Reach	11395	100yr	5200.00	5702.00	5707.80	5706.90	5709.07	0.010193	9.07	573.17	126.45	0.75
	Main Reach	11395	500yr	6450.00	5702.00	5708.84	5707.54	5710.12	0.008598	9.07	710.93	137.97	0.70
	Main Reach	11355.87	10yr	2600.00	5700.80	5705.82	5704.32	5706.37	0.002358	5.95	436.76	116.13	0.54
	Main Reach	11355.87	50yr	4300.00	5700.80	5707.25	5705.49	5708.01	0.002460	7.00	614.13	131.66	0.57
	Main Reach	11355.87	100yr	5200.00	5700.80	5707.93	5706.04	5708.77	0.002442	7.37	706.02	139.38	0.58
	Main Reach	11355.87	500yr	6450.00	5700.80	5708.96	5706.71	5709.84	0.002209	7.53	856.47	151.28	0.56
	Main Reach	11125	10yr	2600.00	5700.60	5704.74	5704.08	5705.59	0.004704	7.40	351.34	113.28	0.74
	Main Reach	11125	50yr	4300.00	5700.60	5706.38	5705.23	5707.32	0.003520	7.78	552.73	132.85	0.67
	Main Reach	11125	100yr	5200.00	5700.60	5707.16	5705.73	5708.12	0.003136	7.88	659.70	142.35	0.65
	Main Reach	11125	500yr	6450.00	5700.60	5708.41	5706.39	5709.31	0.002429	7.60	848.27	160.00	0.58
	Main Reach	10890.13	10yr	2600.00	5698.80	5704.06	5702.85	5704.70	0.002744	6.39	407.20	114.34	0.60
	Main Reach	10890.13	50yr	4300.00	5698.80	5705.91	5704.03	5706.61	0.002146	6.73	639.17	137.15	0.55
	Main Reach	10890.13	100yr	5200.00	5698.80	5706.74	5704.58	5707.47	0.001972	6.86	757.91	147.44	0.53
	Main Reach	10890.13	500yr	6450.00	5698.80	5708.11	5705.27	5708.79	0.001558	6.65	970.43	164.47	0.48
	Main Reach	10600	10yr	2600.00	5698.40	5703.25	5702.06	5703.87	0.002932	6.31	411.73	176.61	0.60
	Main Reach	10600	50yr	4300.00	5698.40	5705.41	5703.24	5706.00	0.001862	6.18	696.06	222.57	0.50
	Main Reach	10600	100yr	5200.00	5698.40	5706.30	5703.77	5706.91	0.001675	6.25	831.51	243.12	0.48
	Main Reach	10600	500yr	6450.00	5698.40	5708.11	5704.42	5708.38	0.000682	4.46	1717.32	303.29	0.31
	Main Reach	10500	10yr	2600.00	5697.97	5703.05	5701.51	5703.59	0.002279	5.90	440.80	194.92	0.54
	Main Reach	10500	50yr	4300.00	5697.97	5705.28	5702.73	5705.81	0.001539	5.87	732.82	240.71	0.46
	Main Reach	10500	100yr	5200.00	5697.97	5706.18	5703.28	5706.74	0.001419	5.98	869.44	261.56	0.45
	Main Reach	10500	500yr	6450.00	5697.97	5708.11	5703.96	5708.30	0.000473	3.84	2009.95	322.67	0.26
	Main Reach	10350	10yr	2600.00	5697.80	5702.62	5701.34	5703.21	0.002697	6.17	421.09	193.79	0.58
	Main Reach	10350	50yr	4300.00	5697.80	5705.07	5702.52	5705.58	0.001496	5.75	748.43	244.07	0.45
	Main Reach	10350	100yr	5200.00	5697.80	5706.00	5703.04	5706.52	0.001354	5.83	892.69	263.16	0.44



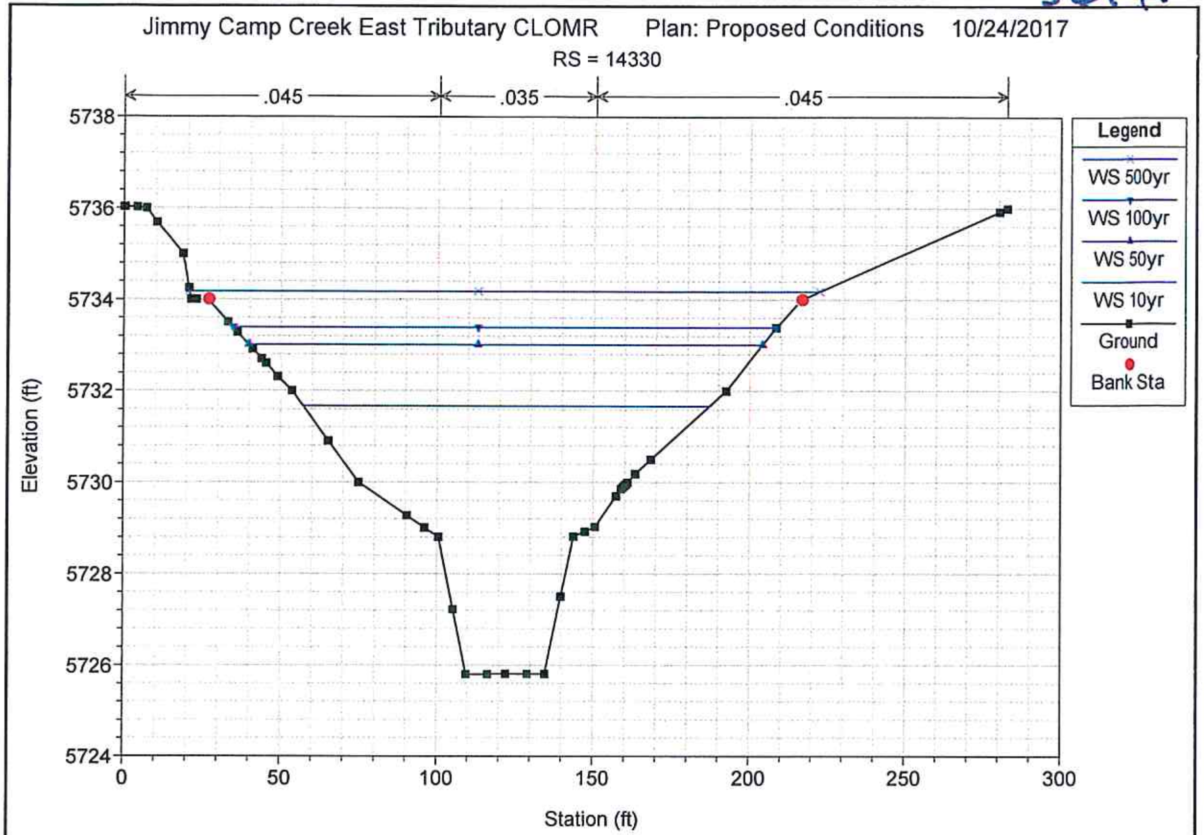
Jimmy Camp Creek East Tributary CLOMR Plan: Proposed Conditions 10/24/2017
RS = 14527
.045
.035
.045
Legend
WS 500yr
WS 100yr
WS 50yr
WS 10yr
Ground
Bank Sta
Elevation (ft)
Station (ft)



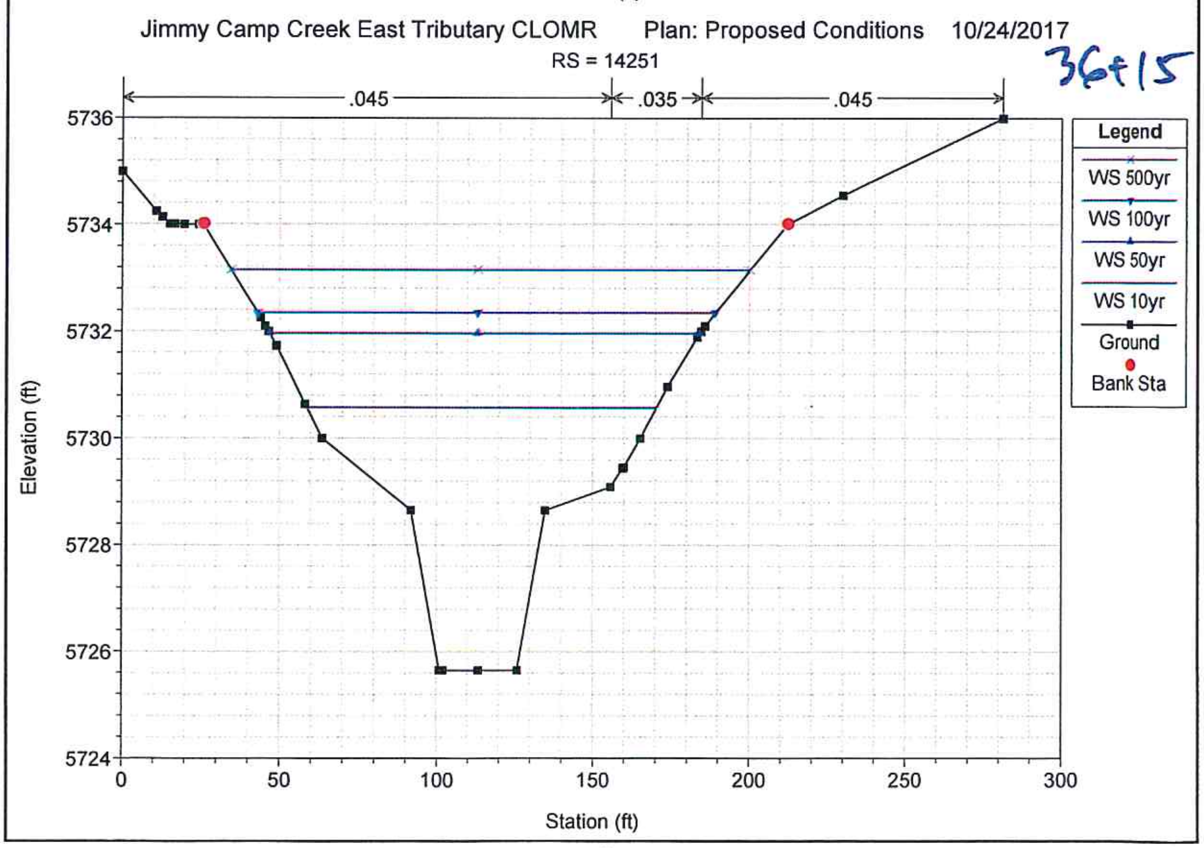
Jimmy Camp Creek East Tributary CLOMR Plan: Proposed Conditions 10/24/2017
RS = 14500
.06
.045
.035
.045
Legend
WS 500yr
WS 100yr
WS 50yr
WS 10yr
Ground
Bank Sta
Elevation (ft)
Station (ft)

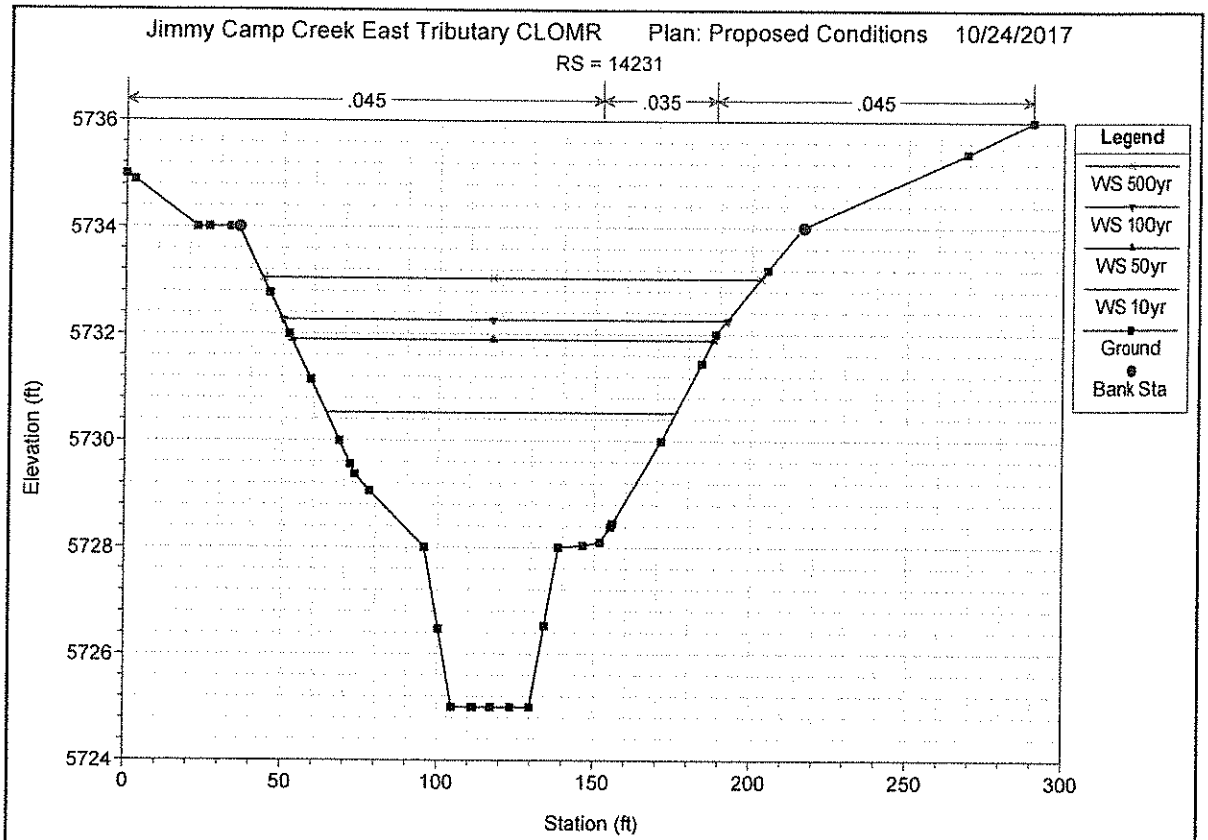
STA 39+00

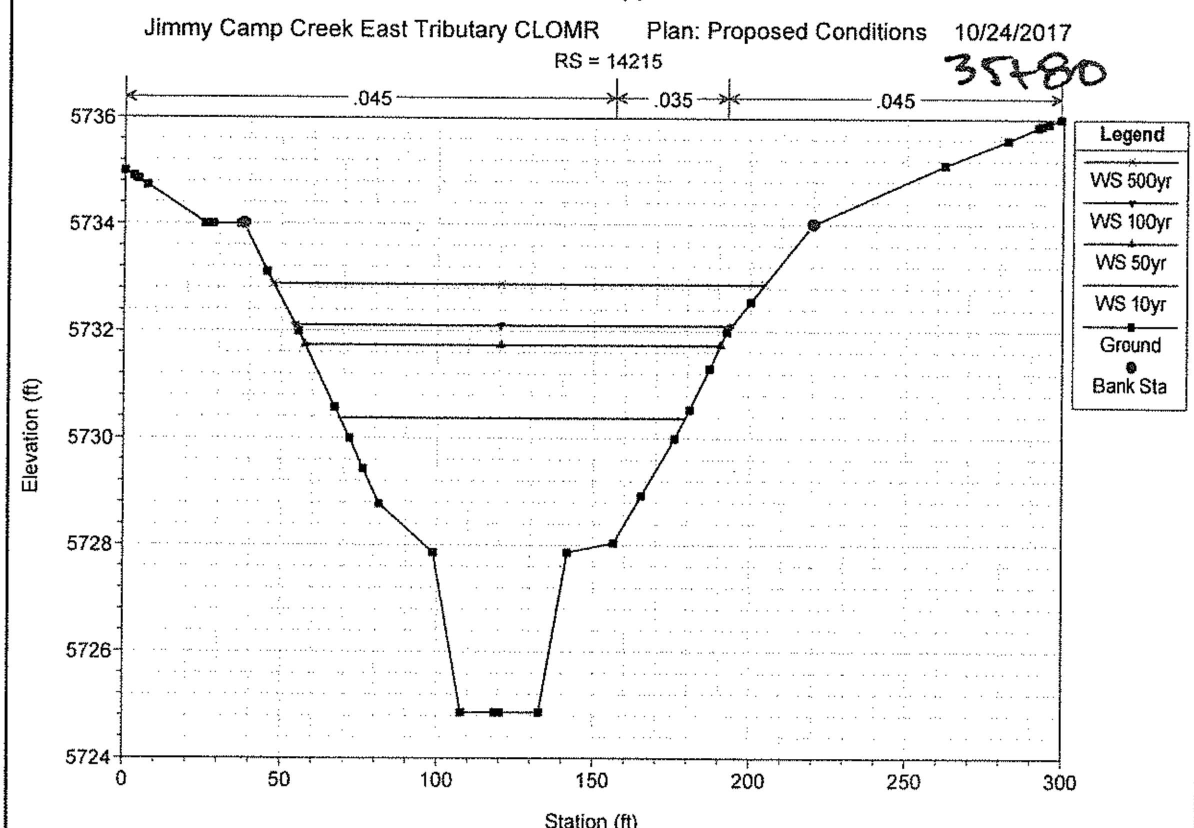
36+95

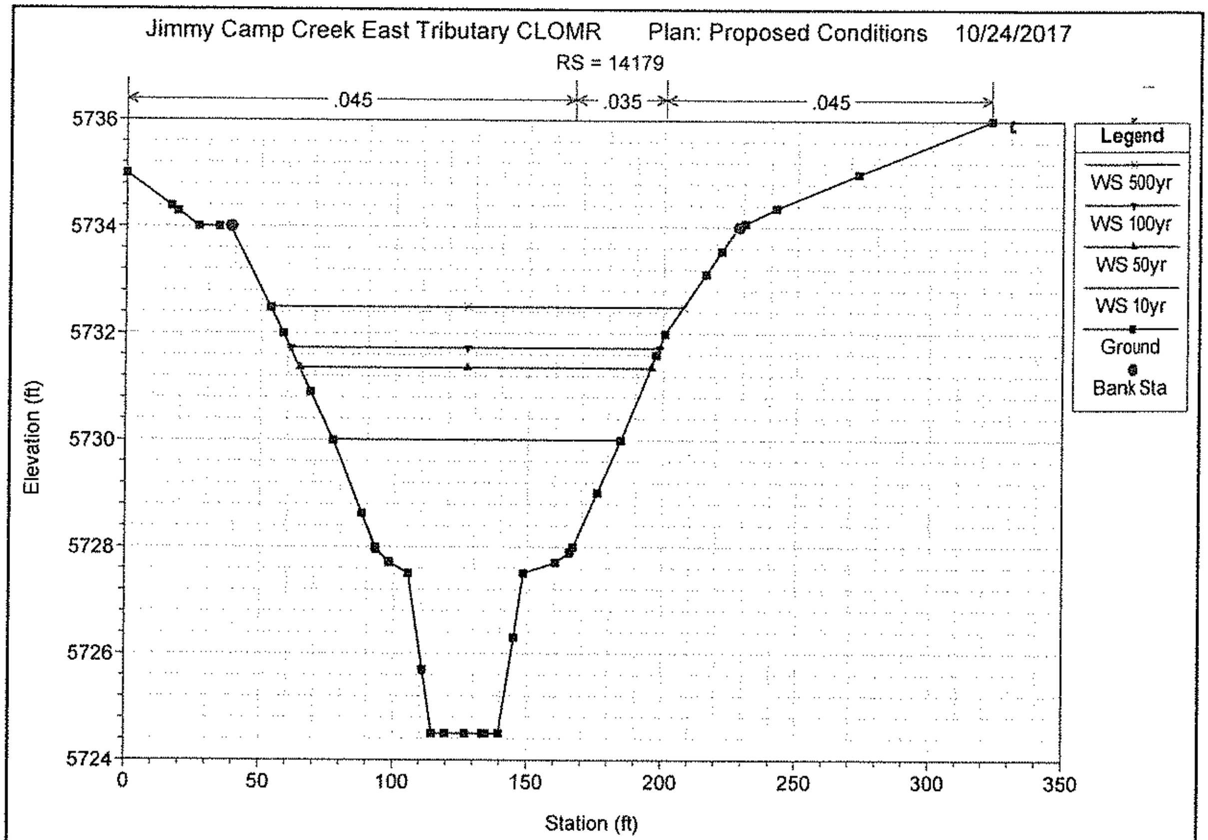

Jimmy Camp Creek East Tributary CLOMR Plan: Proposed Conditions 10/24/2017
RS = 14330
.045
.035
.045
Legend
WS 500yr
WS 100yr
WS 50yr
WS 10yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
5738
5736
5734
5732
5730
5728
5726
5724
0
50
100
150
200
250
300

36+15

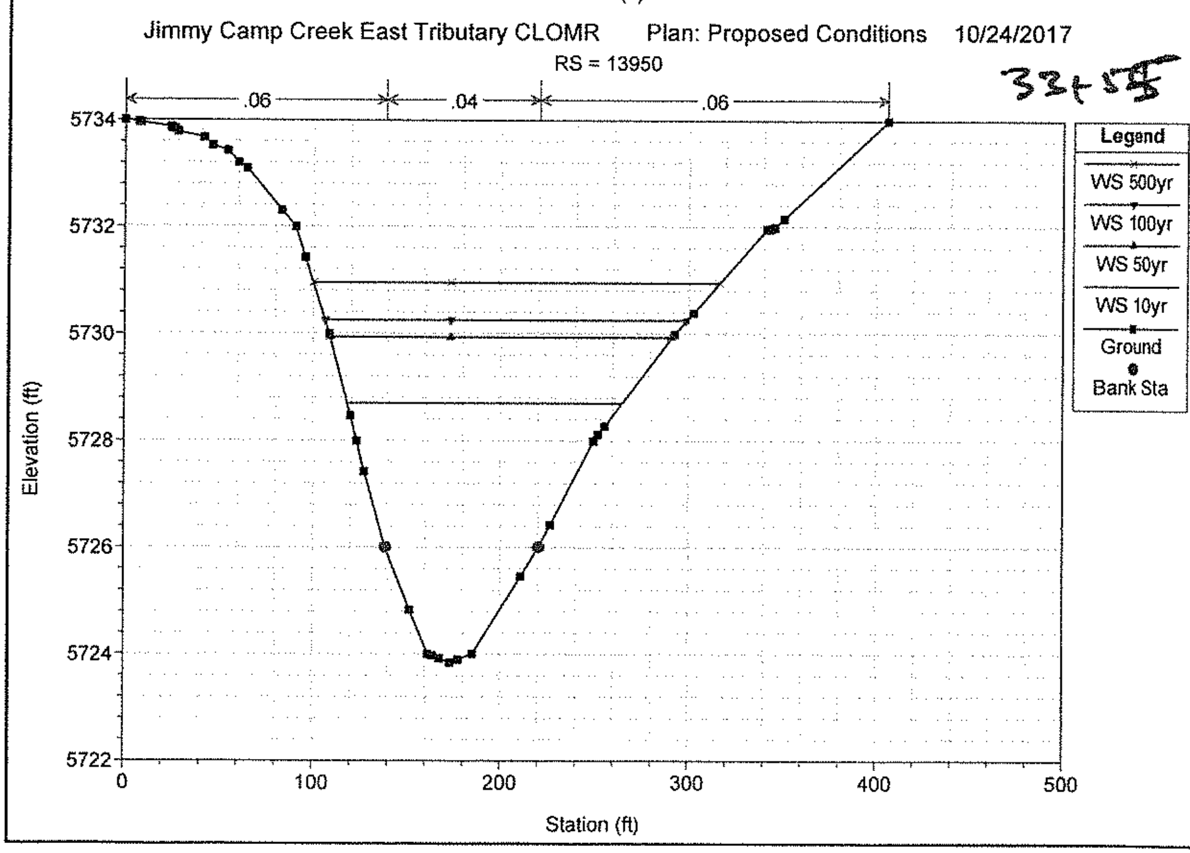

Jimmy Camp Creek East Tributary CLOMR Plan: Proposed Conditions 10/24/2017
RS = 14251
.045
.035
.045
Legend
WS 500yr
WS 100yr
WS 50yr
WS 10yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
5736
5734
5732
5730
5728
5726
5724
0
50
100
150
200
250
300


Jimmy Camp Creek East Tributary CLOMR Plan: Proposed Conditions 10/24/2017
RS = 14231
.045
.035
.045
Legend
WS 500yr
WS 100yr
WS 50yr
WS 10yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
5736
5734
5732
5730
5728
5726
5724
0
50
100
150
200
250
300

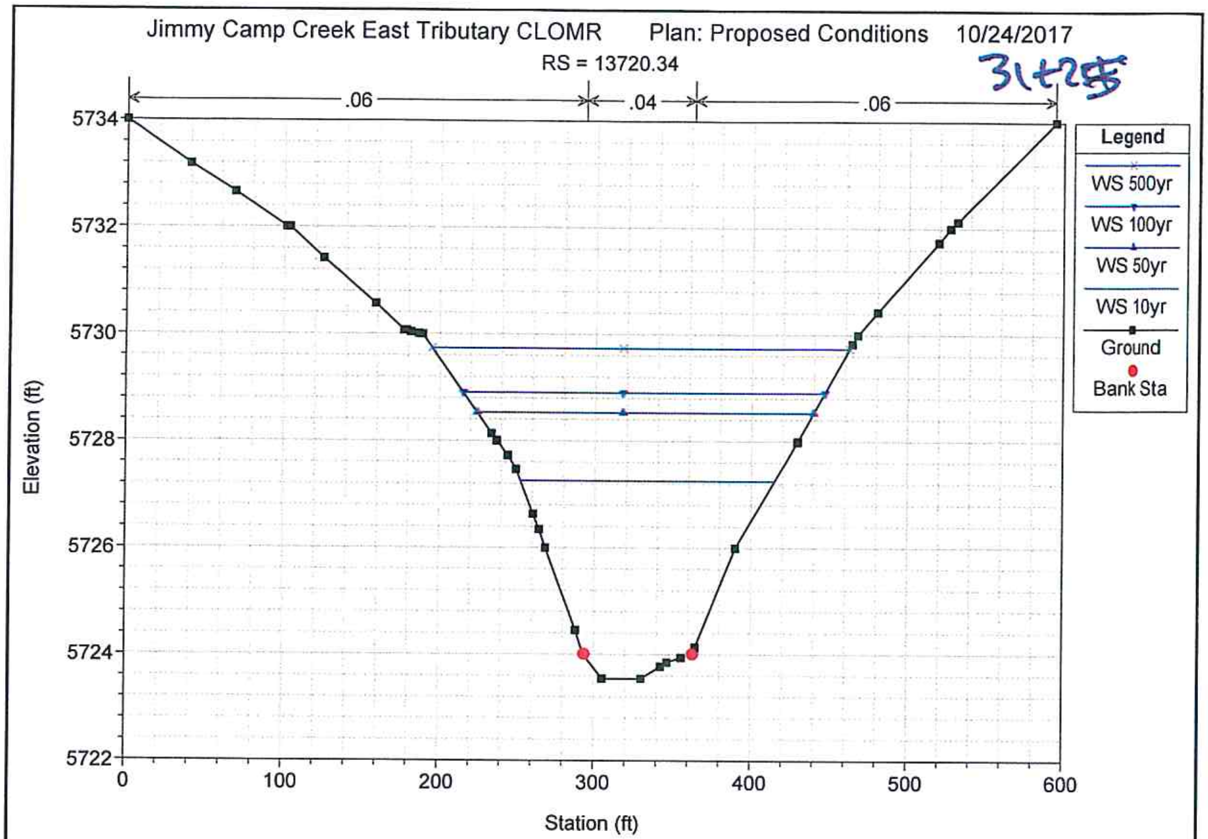

Jimmy Camp Creek East Tributary CLOMR Plan: Proposed Conditions 10/24/2017
RS = 14215
35+80
.045
.035
.045
Legend
WS 500yr
WS 100yr
WS 50yr
WS 10yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
5736
5734
5732
5730
5728
5726
5724
0
50
100
150
200
250
300

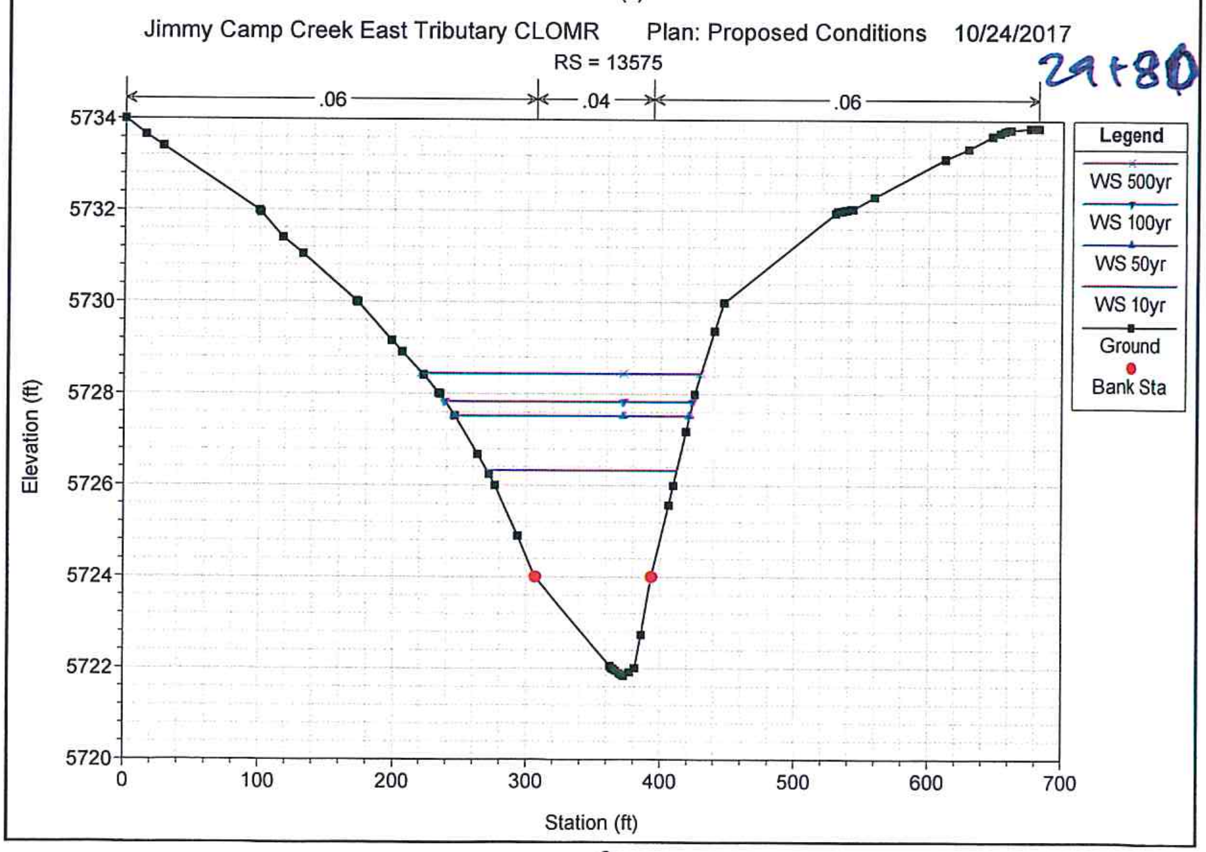


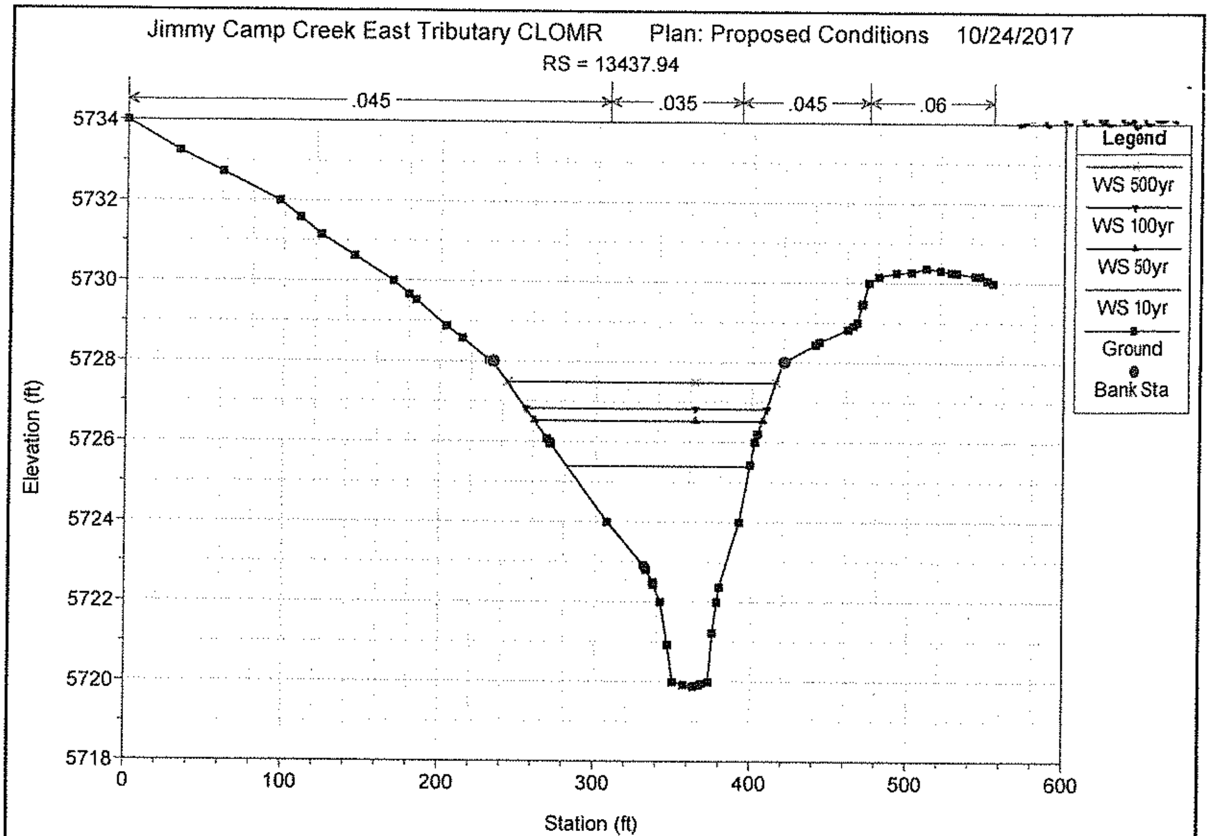
Jimmy Camp Creek East Tributary CLOMR Plan: Proposed Conditions 10/24/2017
RS = 14179
.045
.035
.045
Legend
WS 500yr
WS 100yr
WS 50yr
WS 10yr
Ground
Bank Sta
Elevation (ft)
Station (ft)

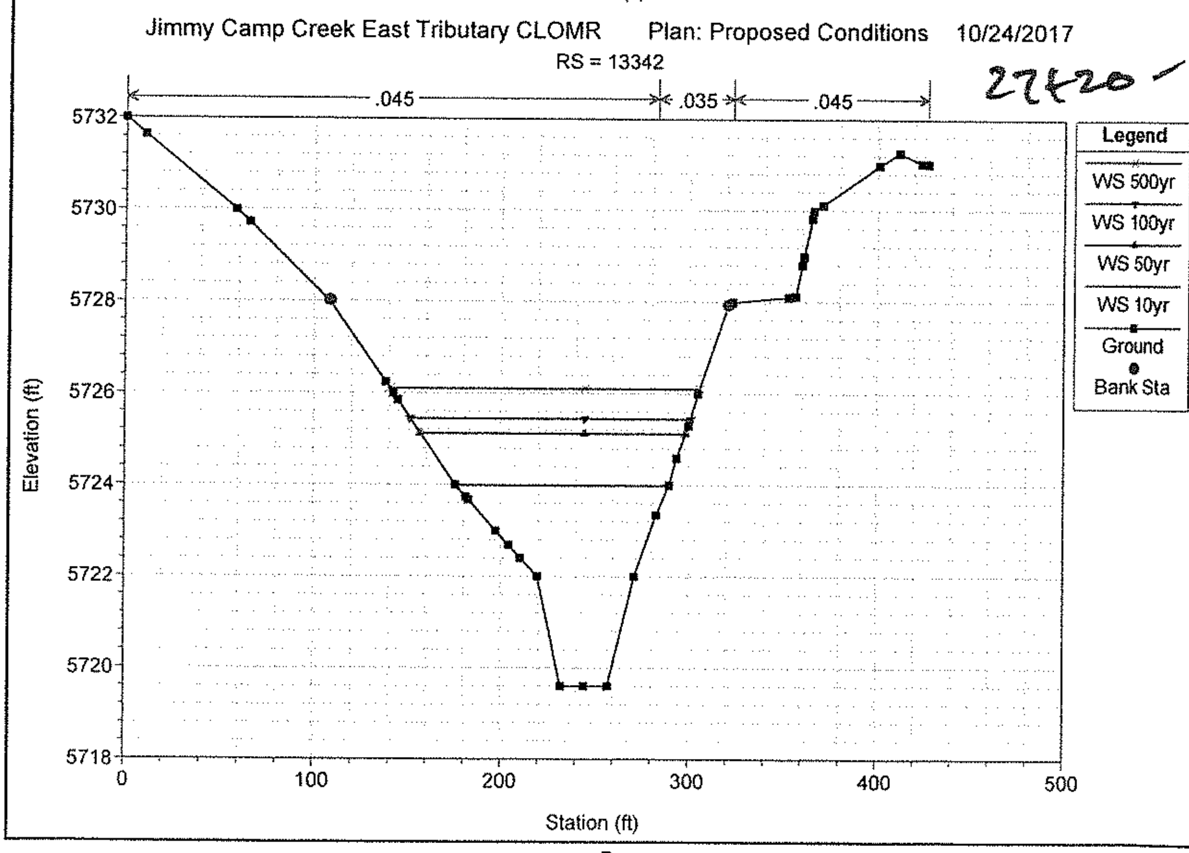


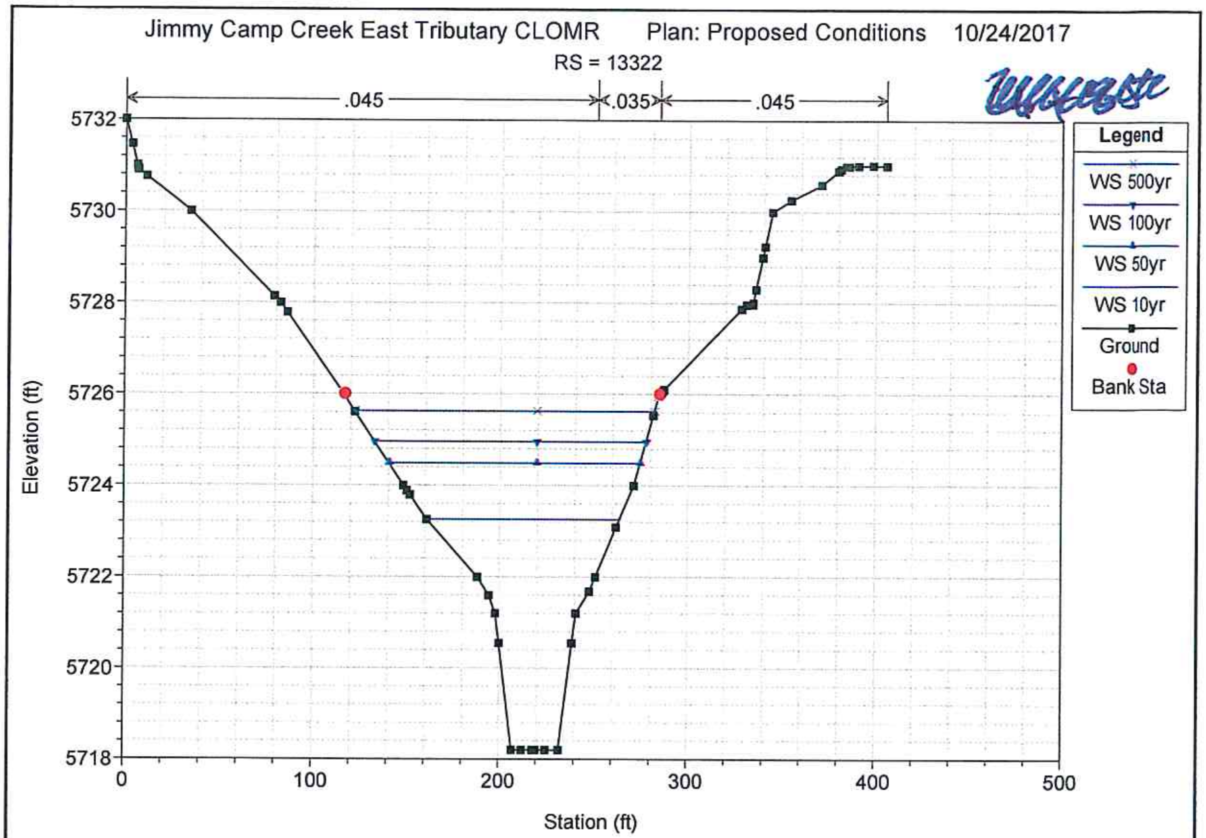
Jimmy Camp Creek East Tributary CLOMR Plan: Proposed Conditions 10/24/2017
RS = 13950
.06
.04
.06
Legend
WS 500yr
WS 100yr
WS 50yr
WS 10yr
Ground
Bank Sta
Elevation (ft)
Station (ft)

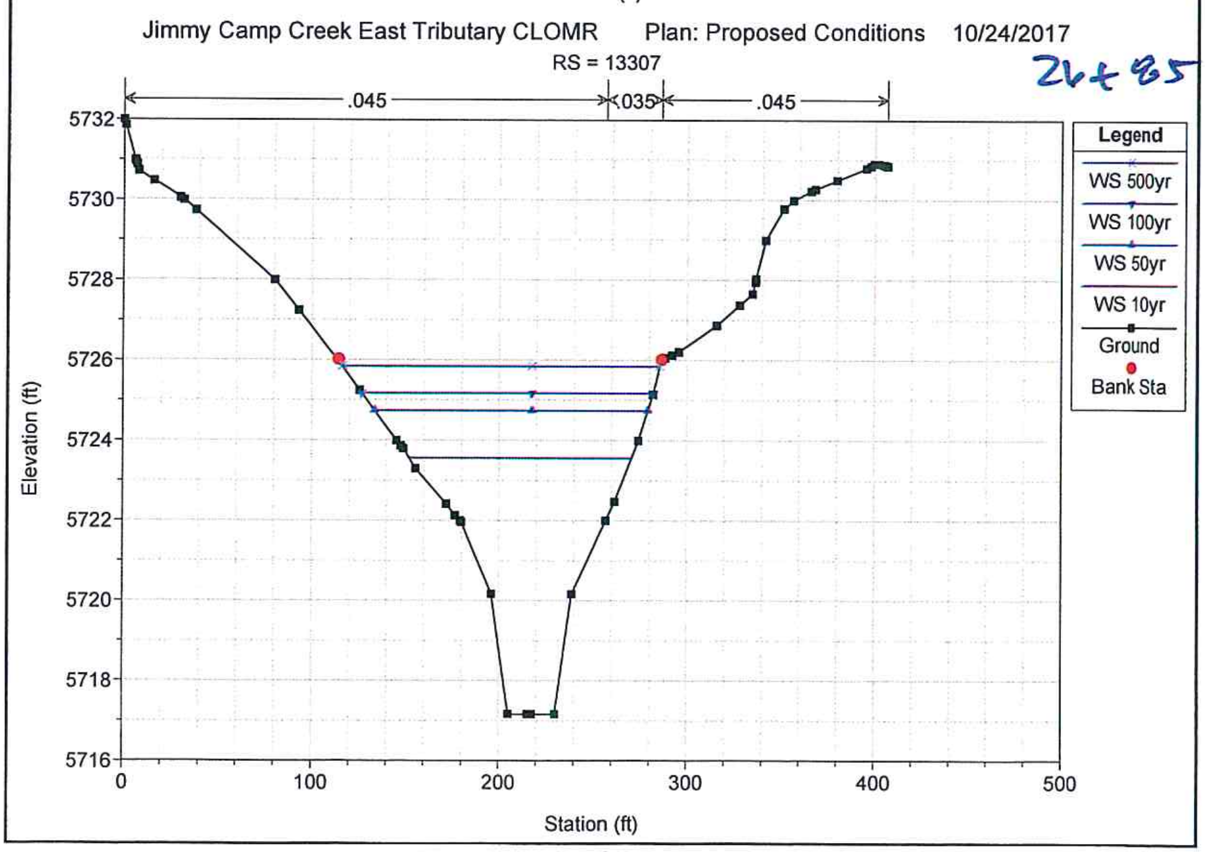

Jimmy Camp Creek East Tributary CLOMR Plan: Proposed Conditions 10/24/2017
RS = 13720.34
31+25
.06
.04
.06
Legend
WS 500yr
WS 100yr
WS 50yr
WS 10yr
Ground
Bank Sta
Elevation (ft)
Station (ft)

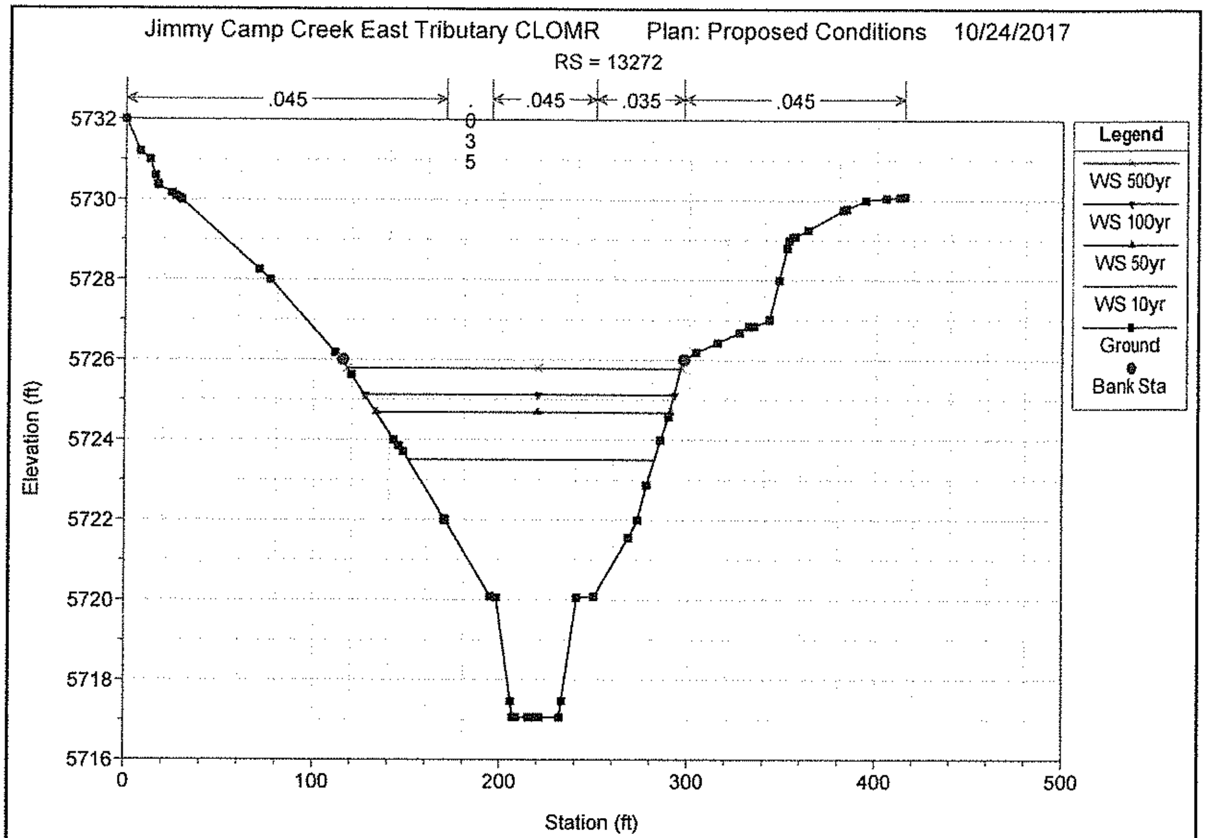

Jimmy Camp Creek East Tributary CLOMR Plan: Proposed Conditions 10/24/2017
RS = 13575
29+80
.06
.04
.06
Legend
WS 500yr
WS 100yr
WS 50yr
WS 10yr
Ground
Bank Sta
Elevation (ft)
Station (ft)

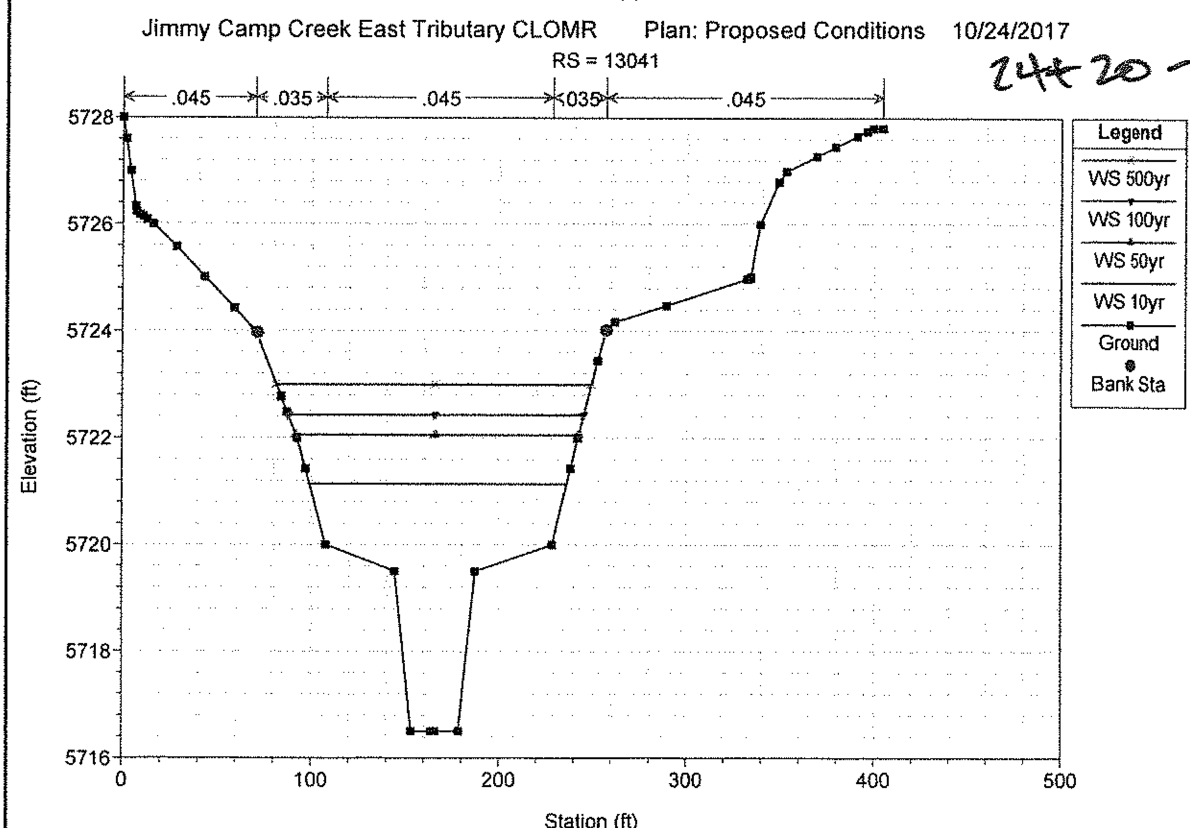

Jimmy Camp Creek East Tributary CLOMR Plan: Proposed Conditions 10/24/2017
RS = 13437.94
.045
.035
.045
.06
Legend
WS 500yr
WS 100yr
WS 50yr
WS 10yr
Ground
Bank Sta
Elevation (ft)
Station (ft)


Jimmy Camp Creek East Tributary CLOMR Plan: Proposed Conditions 10/24/2017
RS = 13342
.045
.035
.045
27+20
Legend
WS 500yr
WS 100yr
WS 50yr
WS 10yr
Ground
Bank Sta
Elevation (ft)
Station (ft)

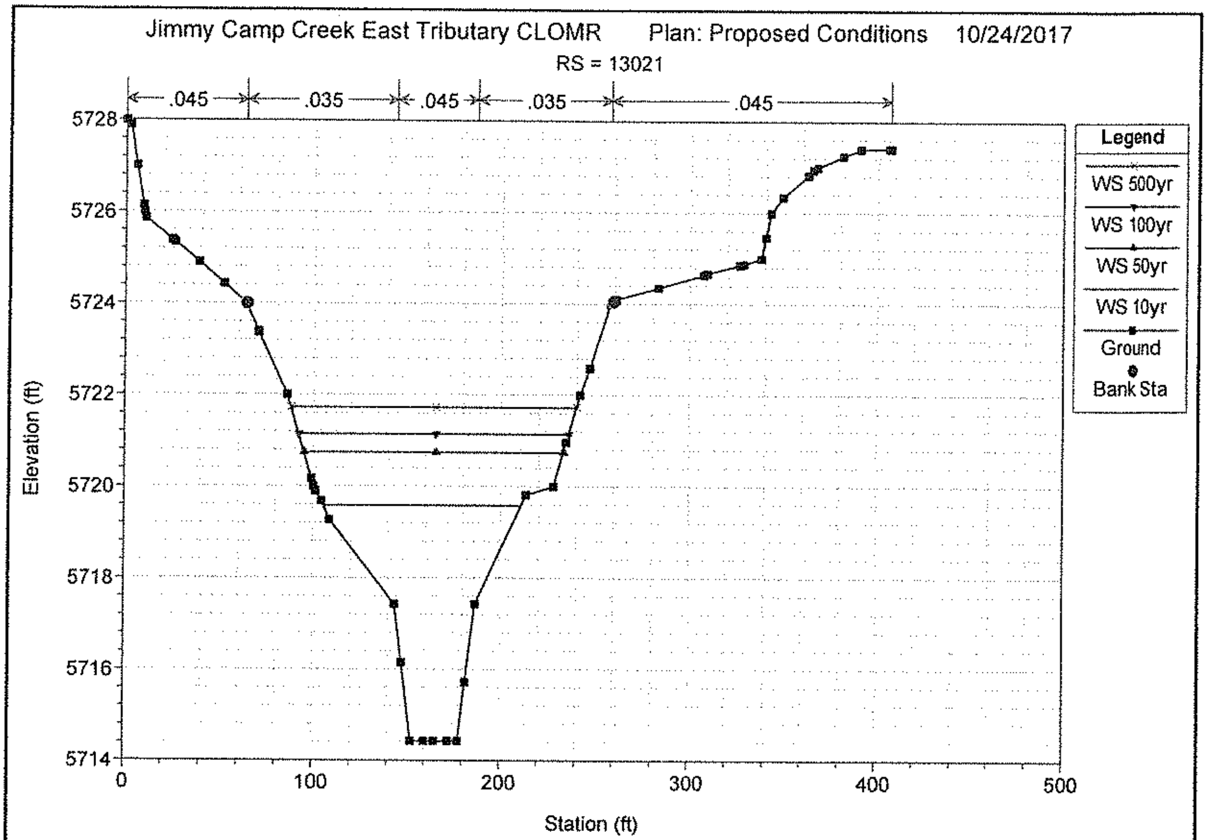

Jimmy Camp Creek East Tributary CLOMR
Plan: Proposed Conditions
10/24/2017
RS = 13322
.045
.035
.045
Legend
WS 500yr
WS 100yr
WS 50yr
WS 10yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
5732
5730
5728
5726
5724
5722
5720
5718
0
100
200
300
400
500

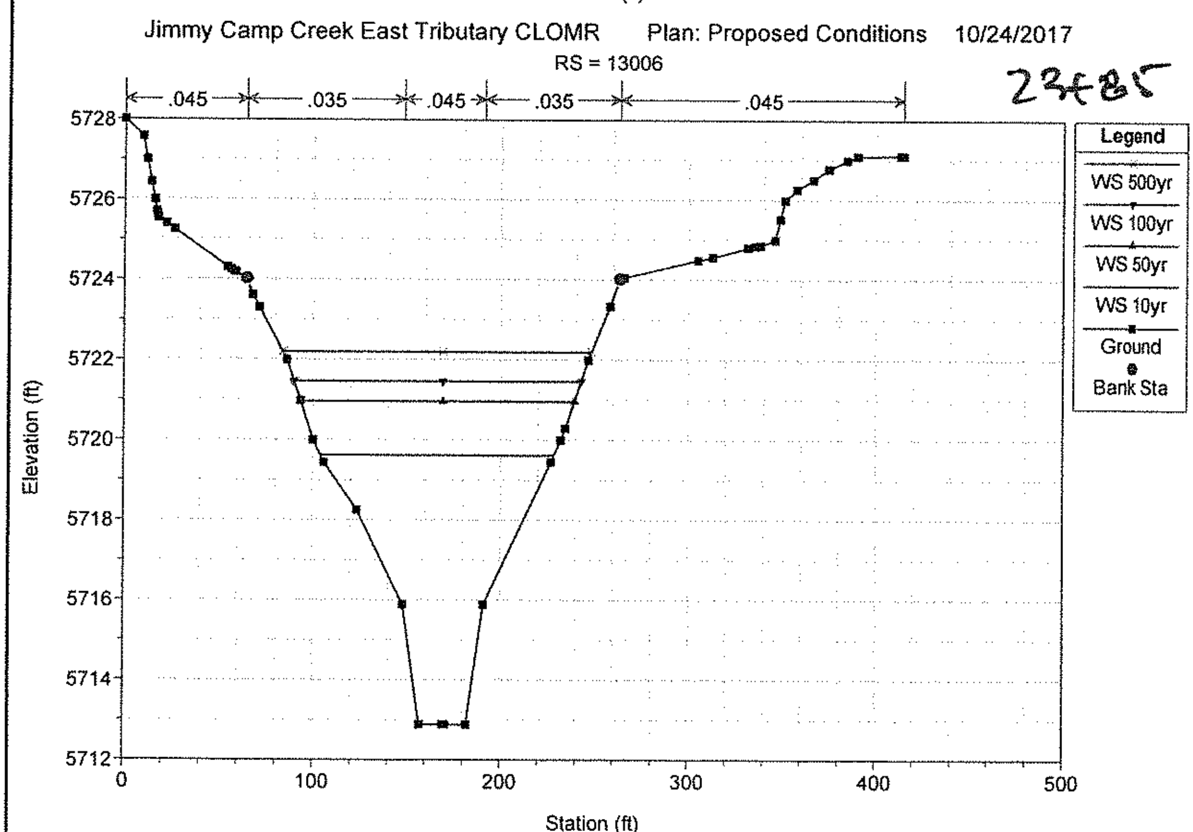

Jimmy Camp Creek East Tributary CLOMR
Plan: Proposed Conditions
10/24/2017
RS = 13307
26+85
.045
.035
.045
Legend
WS 500yr
WS 100yr
WS 50yr
WS 10yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
5732
5730
5728
5726
5724
5722
5720
5718
5716
0
100
200
300
400
500

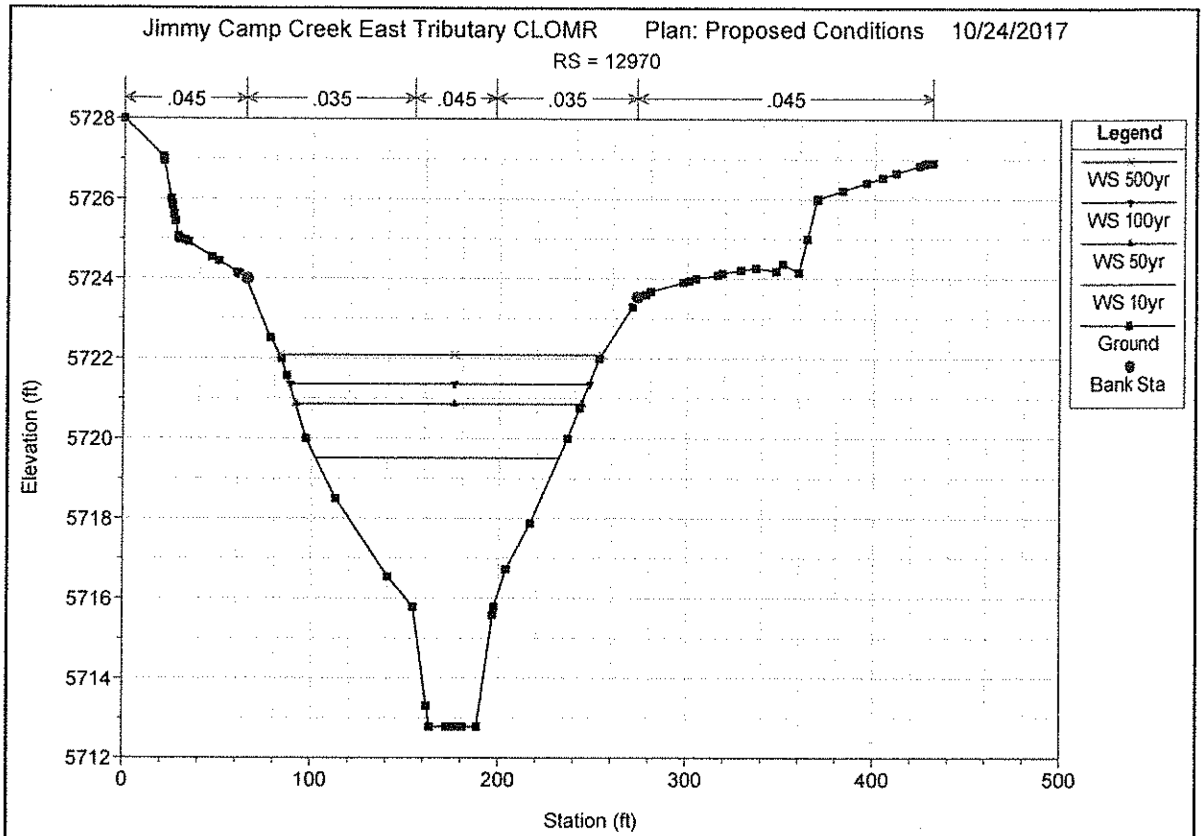

Jimmy Camp Creek East Tributary CLOMR Plan: Proposed Conditions 10/24/2017
RS = 13272
.045
.035
.045
.035
.045
Legend
WS 500yr
WS 100yr
WS 50yr
WS 10yr
Ground
Bank Sta
Elevation (ft)
Station (ft)

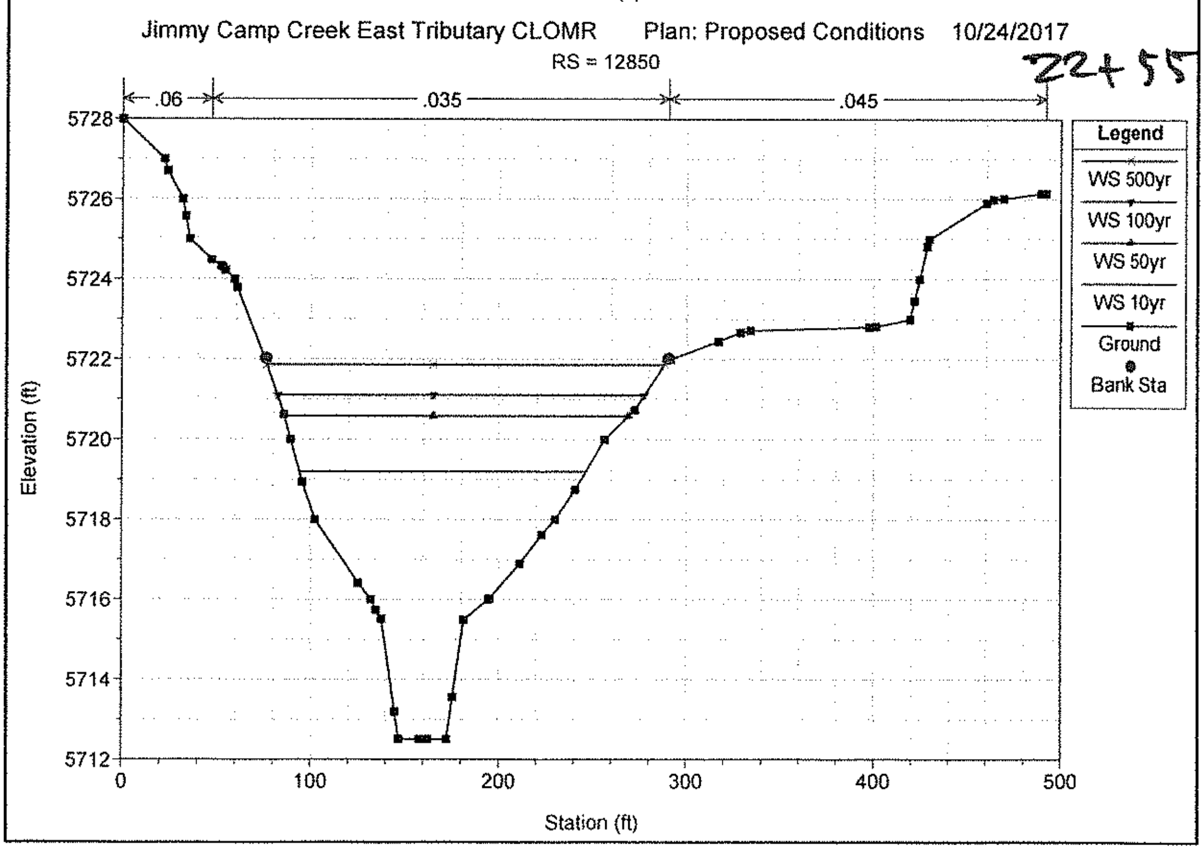

Jimmy Camp Creek East Tributary CLOMR Plan: Proposed Conditions 10/24/2017
RS = 13041
.045
.035
.045
.035
.045
Legend
WS 500yr
WS 100yr
WS 50yr
WS 10yr
Ground
Bank Sta
Elevation (ft)
Station (ft)

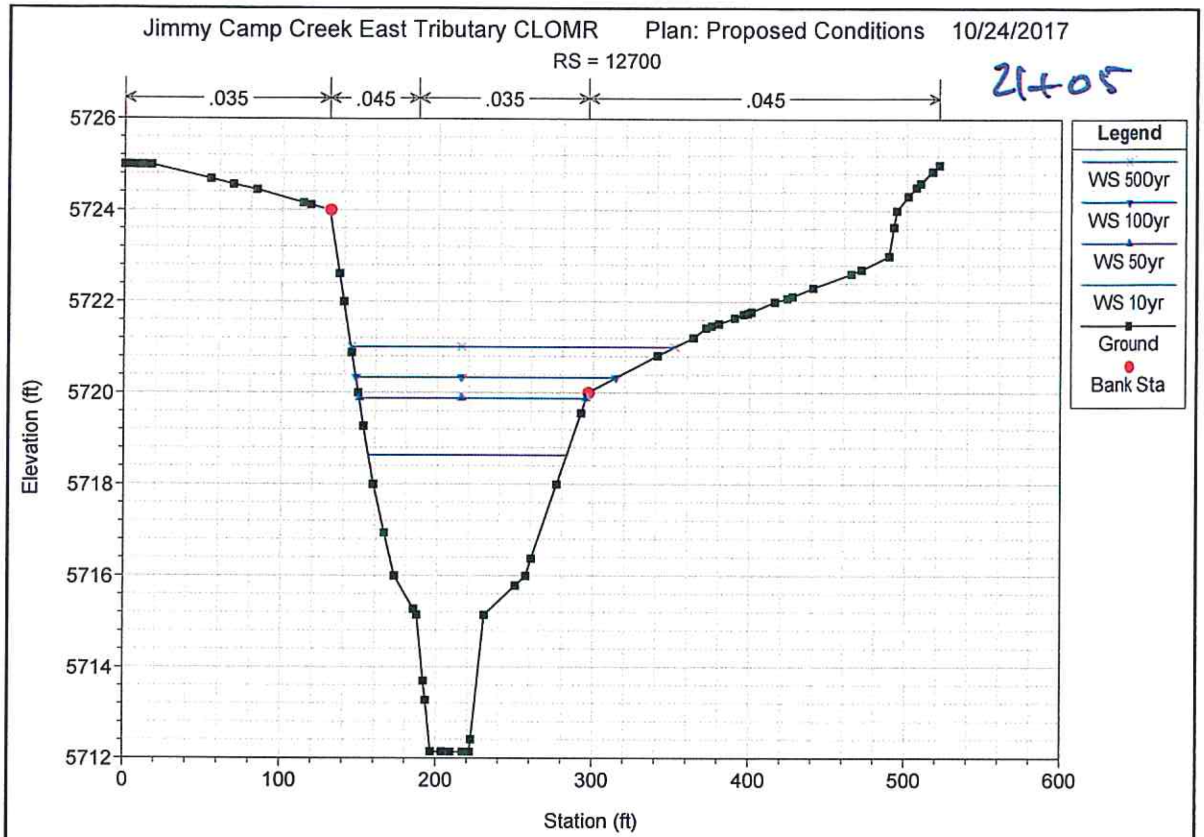
24+20 -

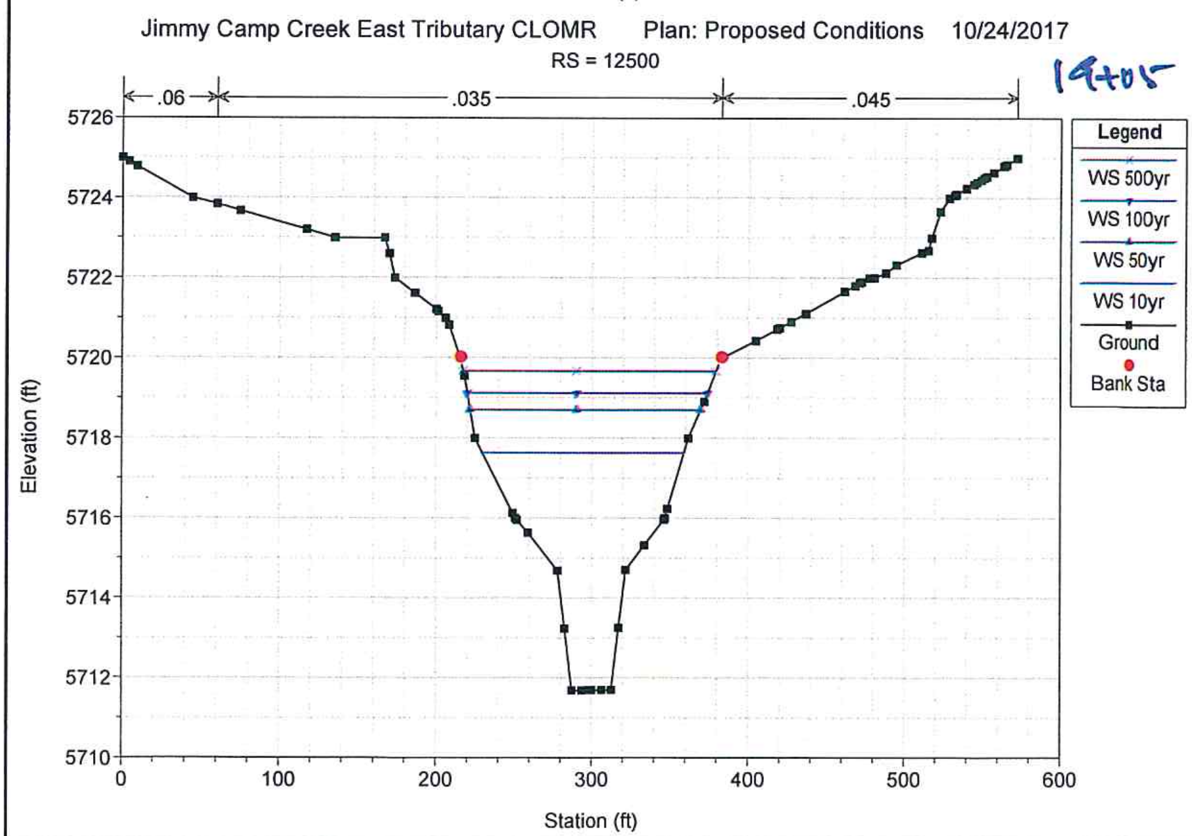

Jimmy Camp Creek East Tributary CLOMR Plan: Proposed Conditions 10/24/2017
RS = 13021
.045
.035
.045
.035
.045
Legend
WS 500yr
WS 100yr
WS 50yr
WS 10yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
5728
5726
5724
5722
5720
5718
5716
5714
0
100
200
300
400
500

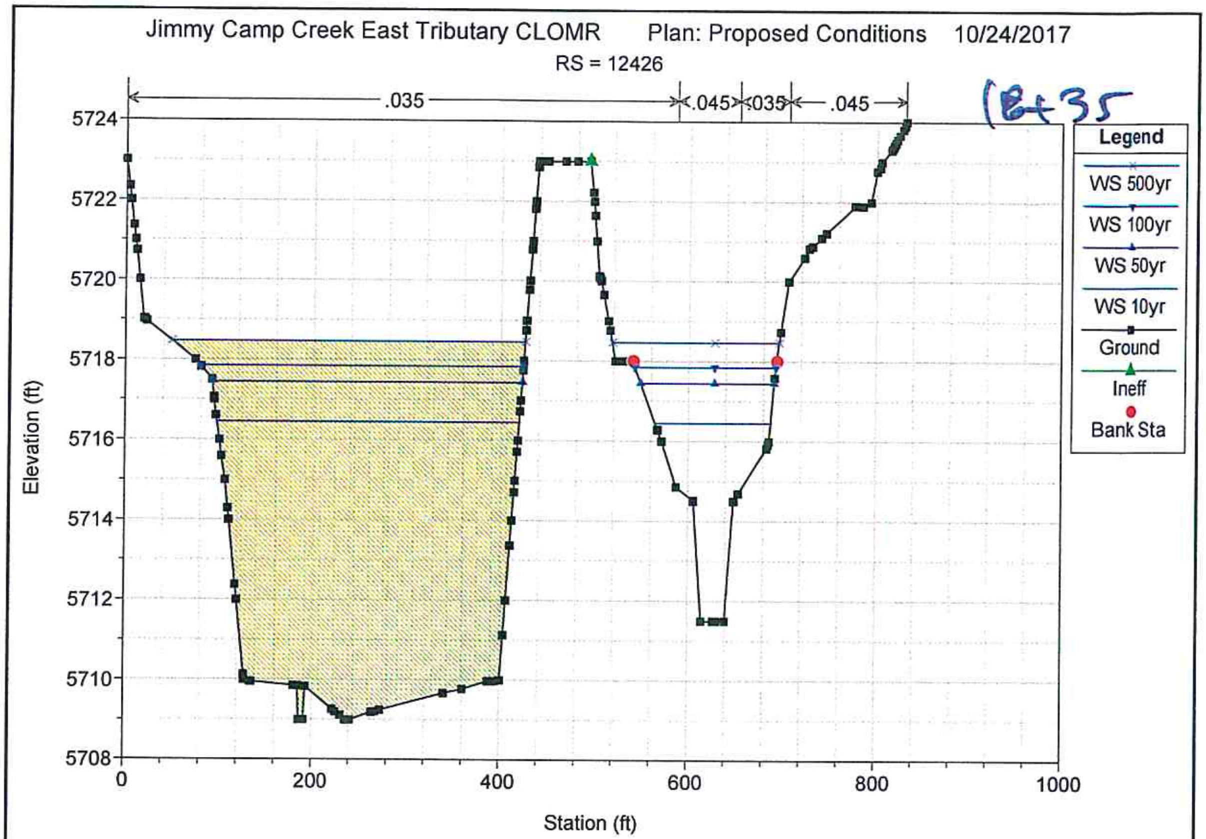

Jimmy Camp Creek East Tributary CLOMR Plan: Proposed Conditions 10/24/2017
RS = 13006
23+85
.045
.035
.045
.035
.045
Legend
WS 500yr
WS 100yr
WS 50yr
WS 10yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
5728
5726
5724
5722
5720
5718
5716
5714
5712
0
100
200
300
400
500

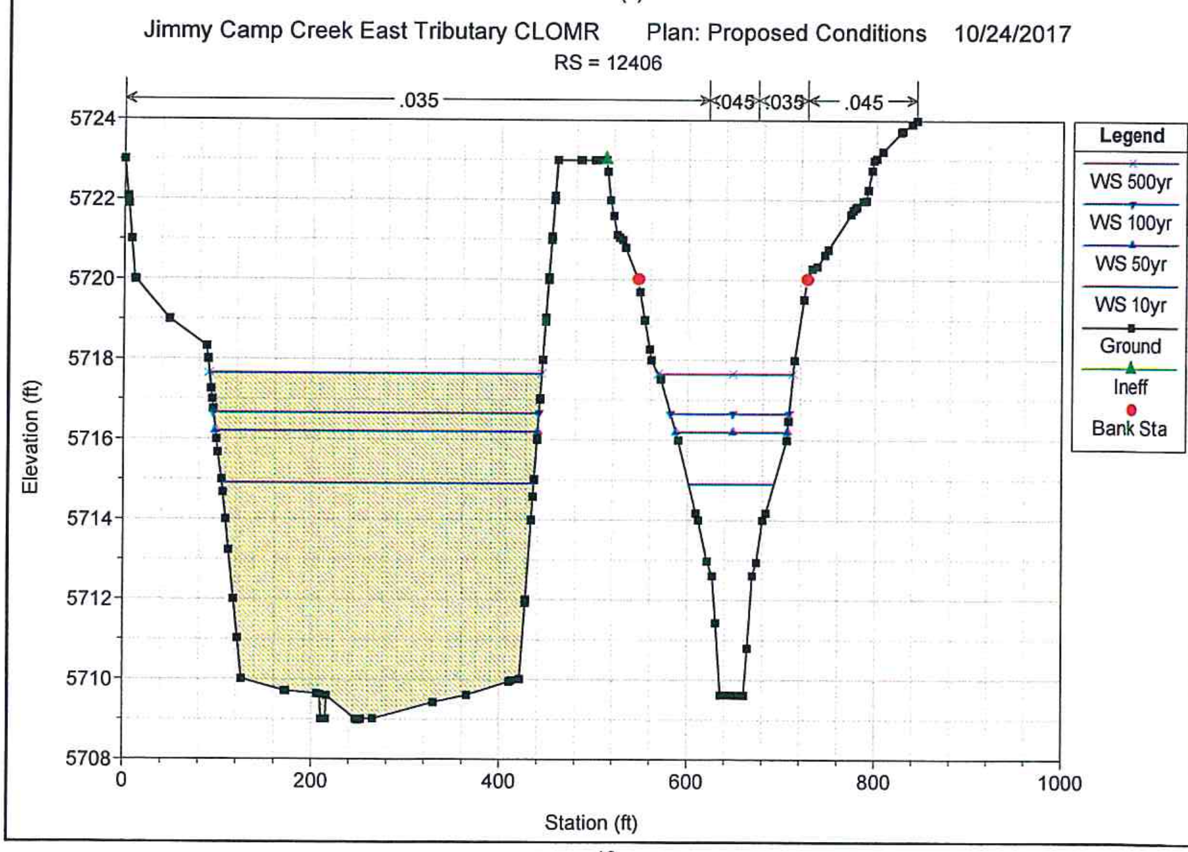

Jimmy Camp Creek East Tributary CLOMR Plan: Proposed Conditions 10/24/2017
RS = 12970
.045
.035
.045
.035
.045
5728
5726
5724
5722
5720
5718
5716
5714
5712
Elevation (ft)
0
100
200
300
400
500
Station (ft)
Legend
WS 500yr
WS 100yr
WS 50yr
WS 10yr
Ground
Bank Sta

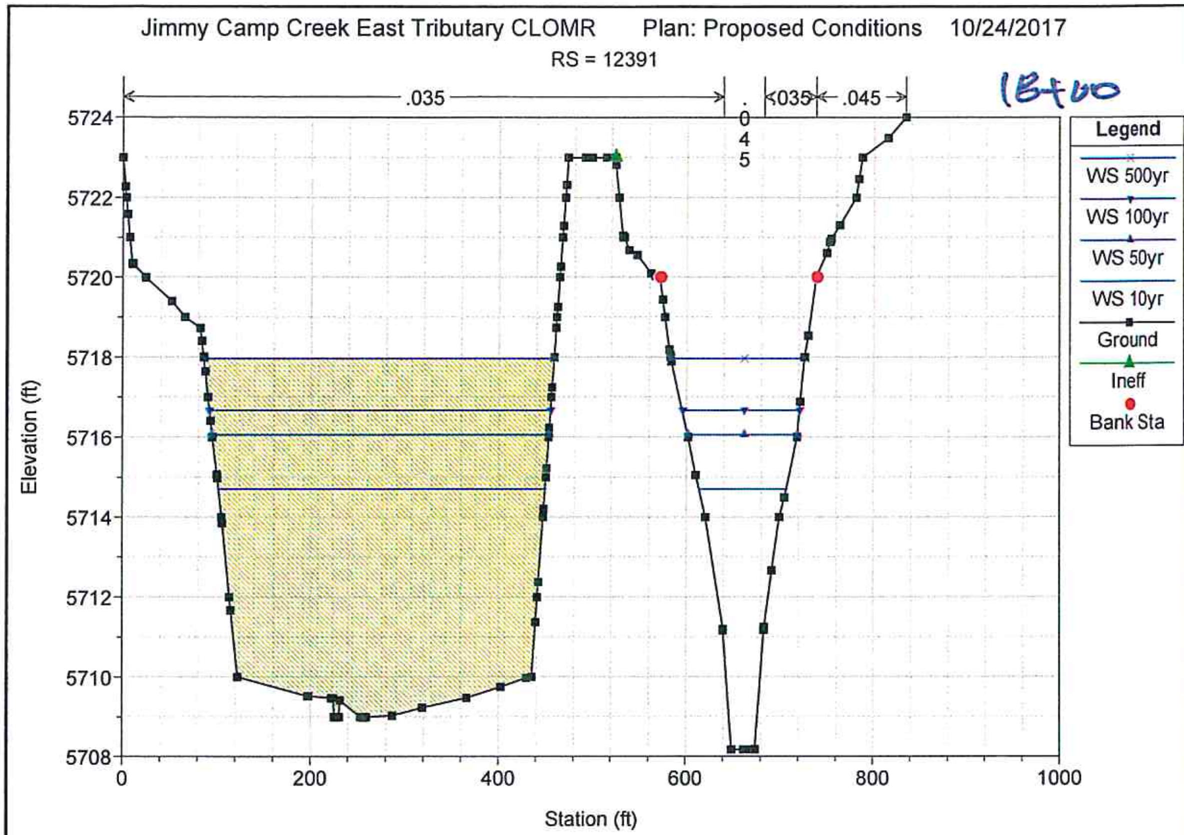

Jimmy Camp Creek East Tributary CLOMR Plan: Proposed Conditions 10/24/2017
RS = 12850
22+55
.06
.035
.045
5728
5726
5724
5722
5720
5718
5716
5714
5712
Elevation (ft)
0
100
200
300
400
500
Station (ft)
Legend
WS 500yr
WS 100yr
WS 50yr
WS 10yr
Ground
Bank Sta

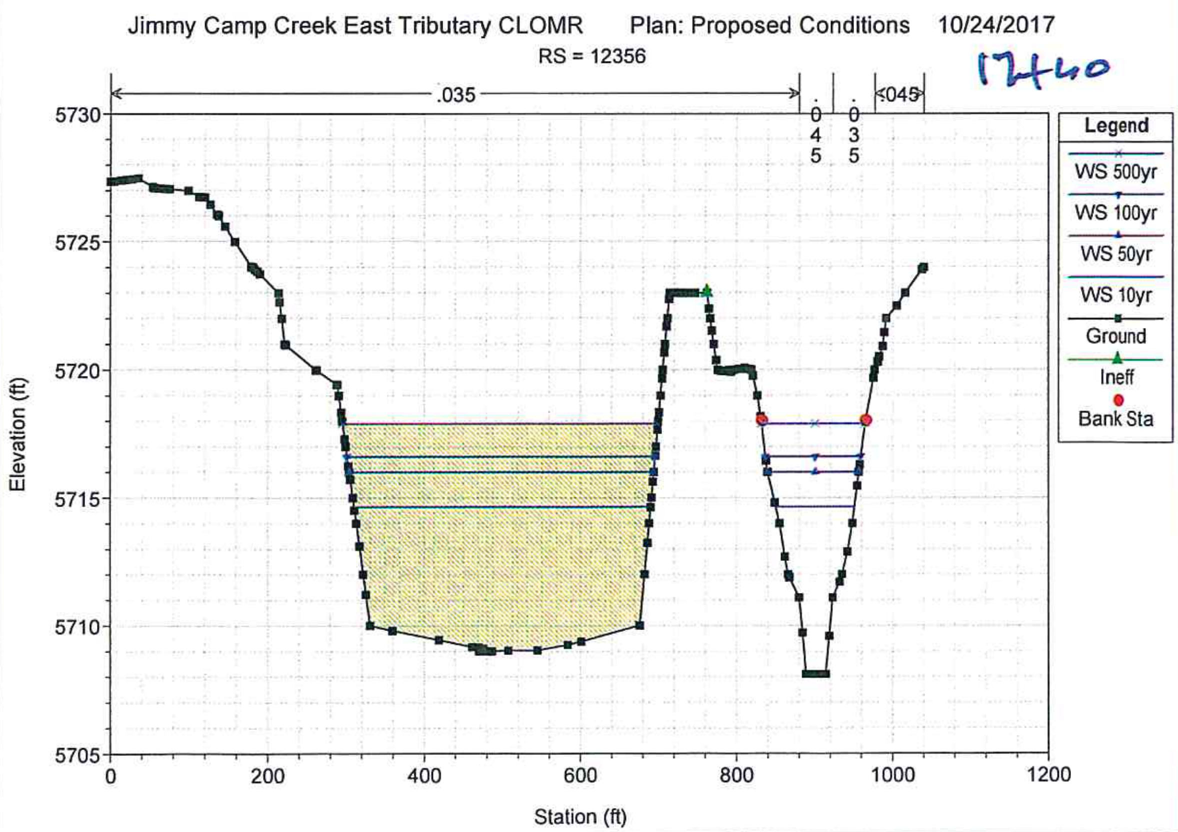

Jimmy Camp Creek East Tributary CLOMR Plan: Proposed Conditions 10/24/2017
RS = 12700
21+05
.035
.045
.035
.045
Legend
WS 500yr
WS 100yr
WS 50yr
WS 10yr
Ground
Bank Sta
Elevation (ft)
5726
5724
5722
5720
5718
5716
5714
5712
0
100
200
300
400
500
600
Station (ft)

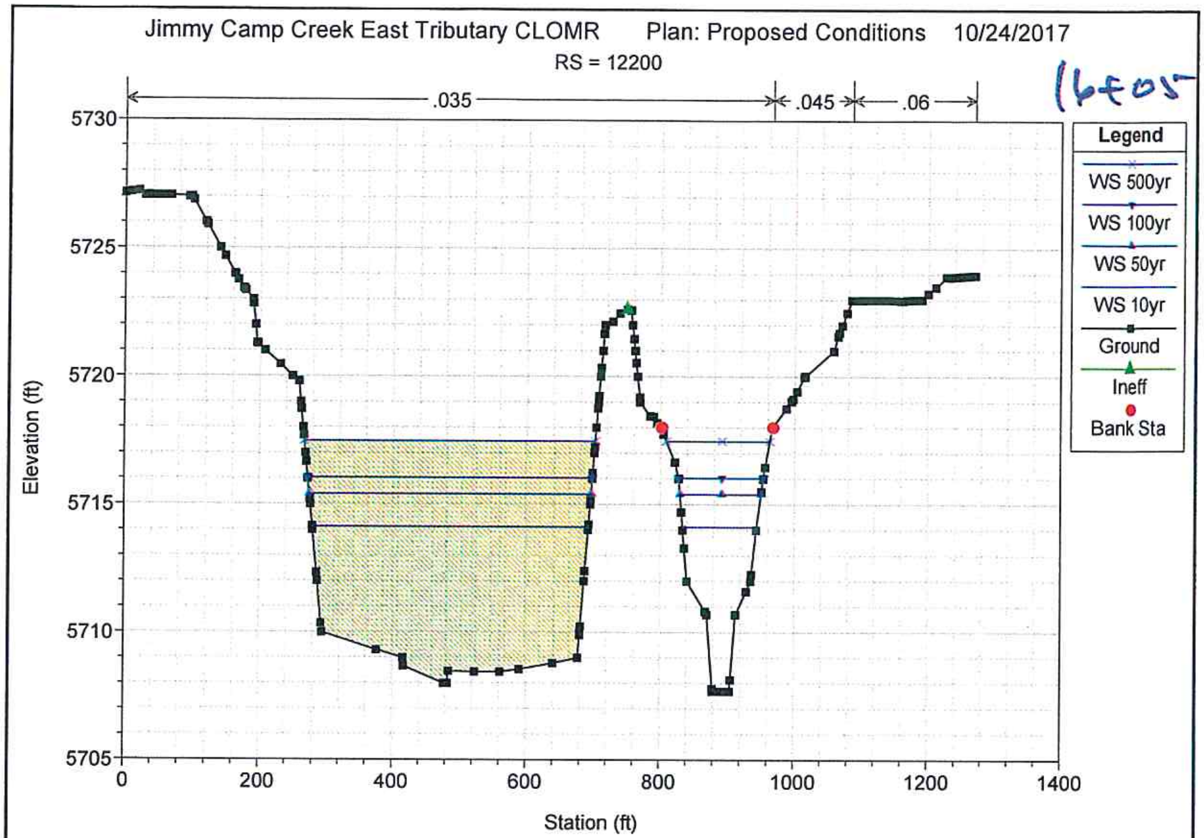

Jimmy Camp Creek East Tributary CLOMR Plan: Proposed Conditions 10/24/2017
RS = 12500
19+05
.06
.035
.045
Legend
WS 500yr
WS 100yr
WS 50yr
WS 10yr
Ground
Bank Sta
Elevation (ft)
5726
5724
5722
5720
5718
5716
5714
5712
5710
0
100
200
300
400
500
600
Station (ft)

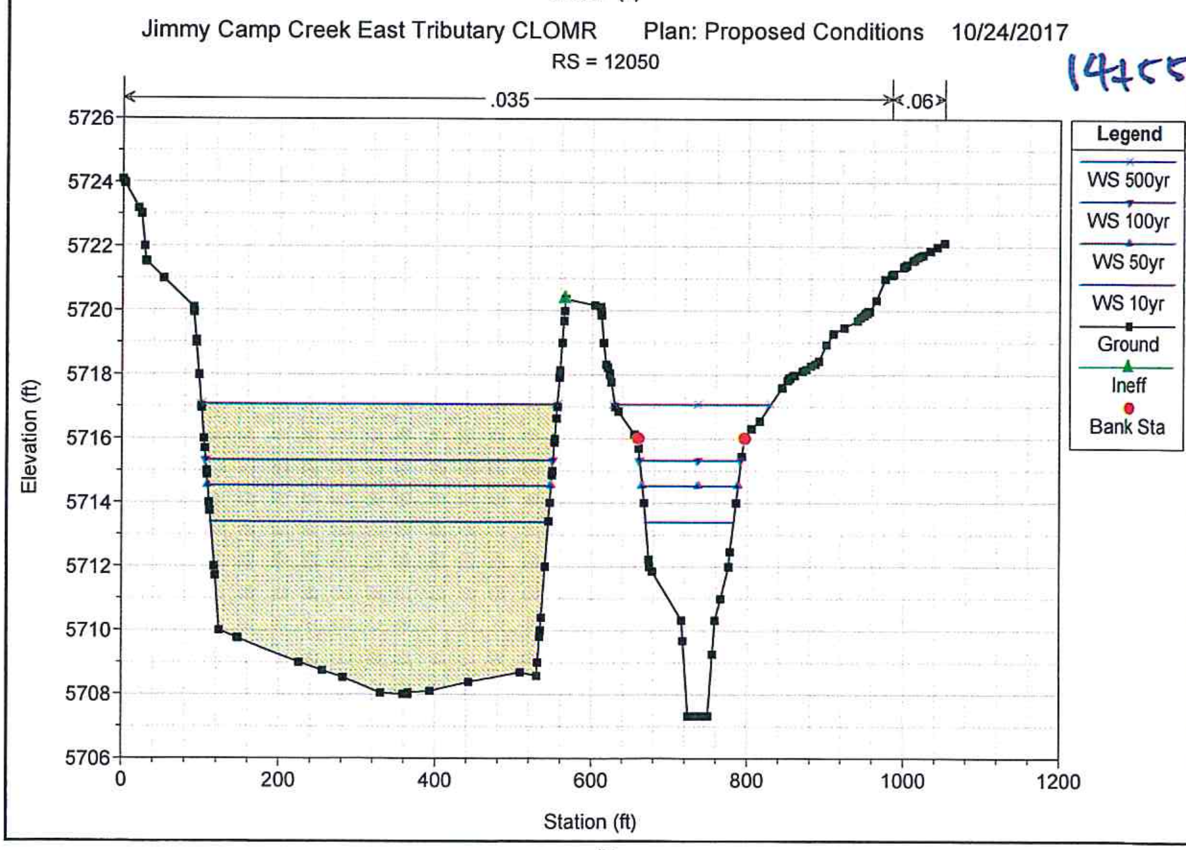

Jimmy Camp Creek East Tributary CLOMR Plan: Proposed Conditions 10/24/2017
RS = 12426
.035
.045
.035
.045
18+35
Legend
WS 500yr
WS 100yr
WS 50yr
WS 10yr
Ground
Ineff
Bank Sta
Elevation (ft)
5724
5722
5720
5718
5716
5714
5712
5710
5708
0
200
400
600
800
1000
Station (ft)

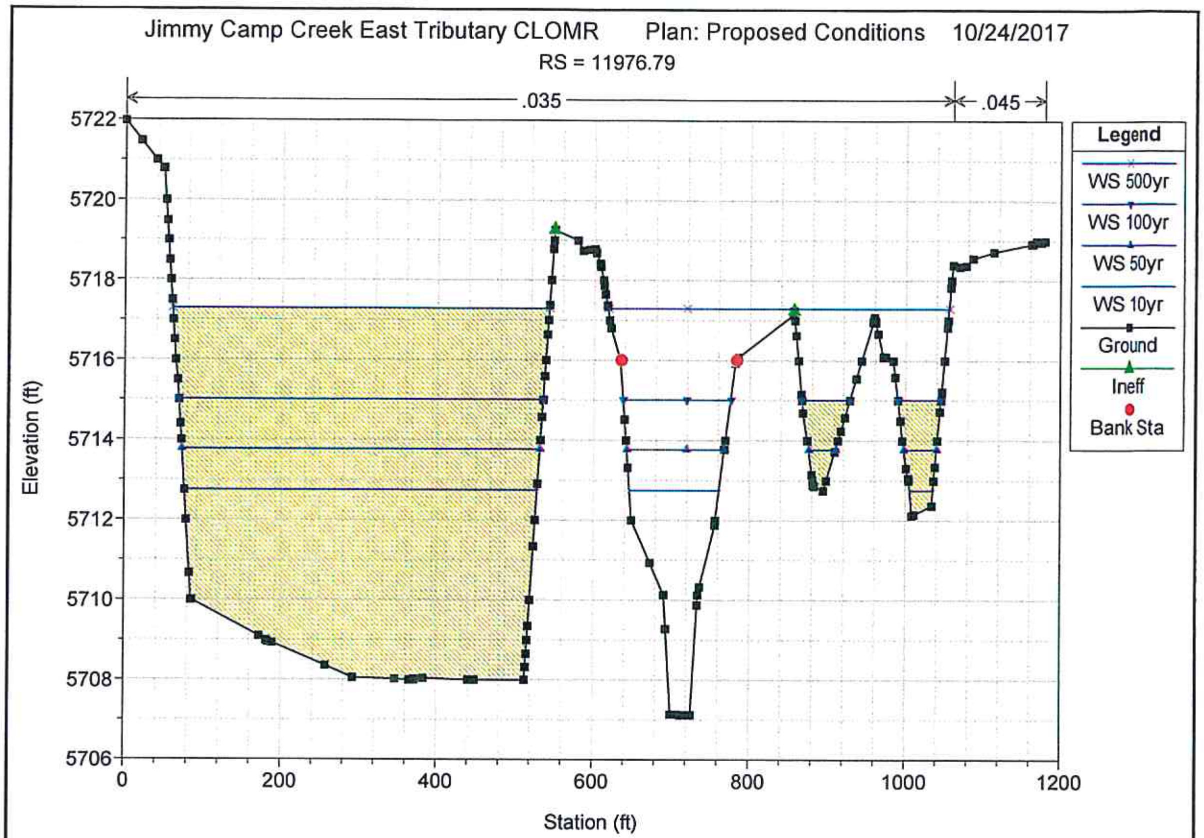

Jimmy Camp Creek East Tributary CLOMR Plan: Proposed Conditions 10/24/2017
RS = 12406
.035
.045
.035
.045
Legend
WS 500yr
WS 100yr
WS 50yr
WS 10yr
Ground
Ineff
Bank Sta
Elevation (ft)
5724
5722
5720
5718
5716
5714
5712
5710
5708
0
200
400
600
800
1000
Station (ft)


Jimmy Camp Creek East Tributary CLOMR Plan: Proposed Conditions 10/24/2017
RS = 12391
18+00
.035
.045
.035
.045
Legend
WS 500yr
WS 100yr
WS 50yr
WS 10yr
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)


Jimmy Camp Creek East Tributary CLOMR Plan: Proposed Conditions 10/24/2017
RS = 12356
17+40
.035
.045
.035
.045
Legend
WS 500yr
WS 100yr
WS 50yr
WS 10yr
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)


Jimmy Camp Creek East Tributary CLOMR Plan: Proposed Conditions 10/24/2017
RS = 12200
16+05
.035
.045
.06
Legend
WS 500yr
WS 100yr
WS 50yr
WS 10yr
Ground
Ineff
Bank Sta
Elevation (ft)
5730
5725
5720
5715
5710
5705
0
200
400
600
800
1000
1200
1400
Station (ft)


Jimmy Camp Creek East Tributary CLOMR Plan: Proposed Conditions 10/24/2017
RS = 12050
14+55
.035
.06
Legend
WS 500yr
WS 100yr
WS 50yr
WS 10yr
Ground
Ineff
Bank Sta
Elevation (ft)
5726
5724
5722
5720
5718
5716
5714
5712
5710
5708
5706
0
200
400
600
800
1000
1200
Station (ft)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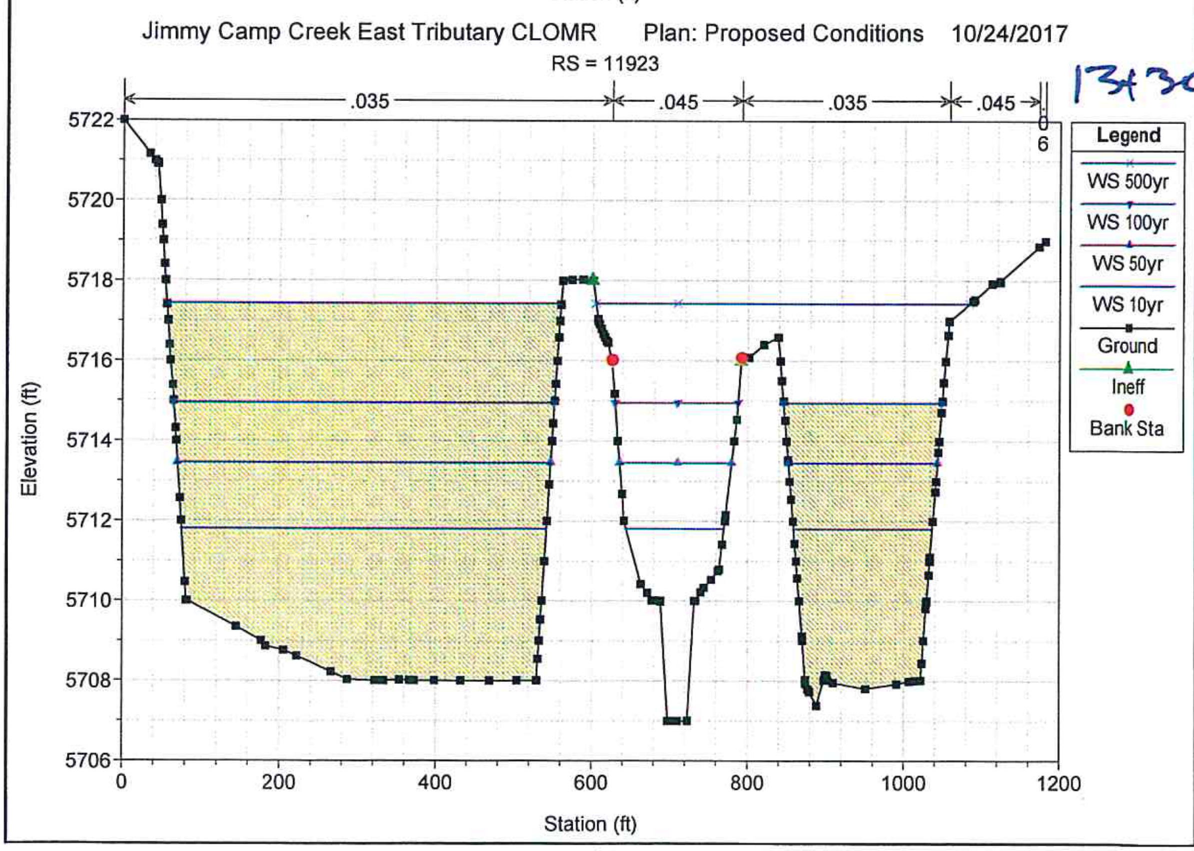
WS 50yr
WS 10yr
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)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.035
.045
.035
.045
0
6
Legend
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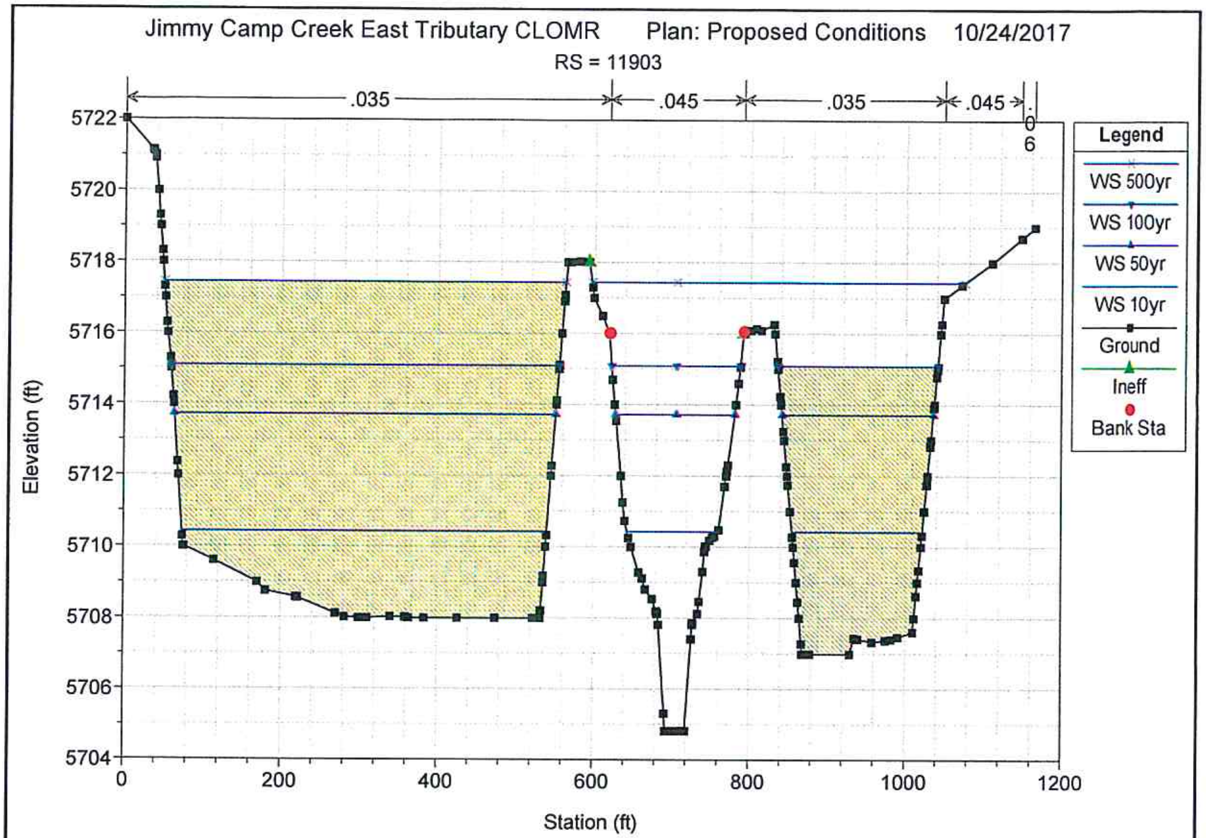
WS 100yr
WS 50yr
WS 10yr
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)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.045
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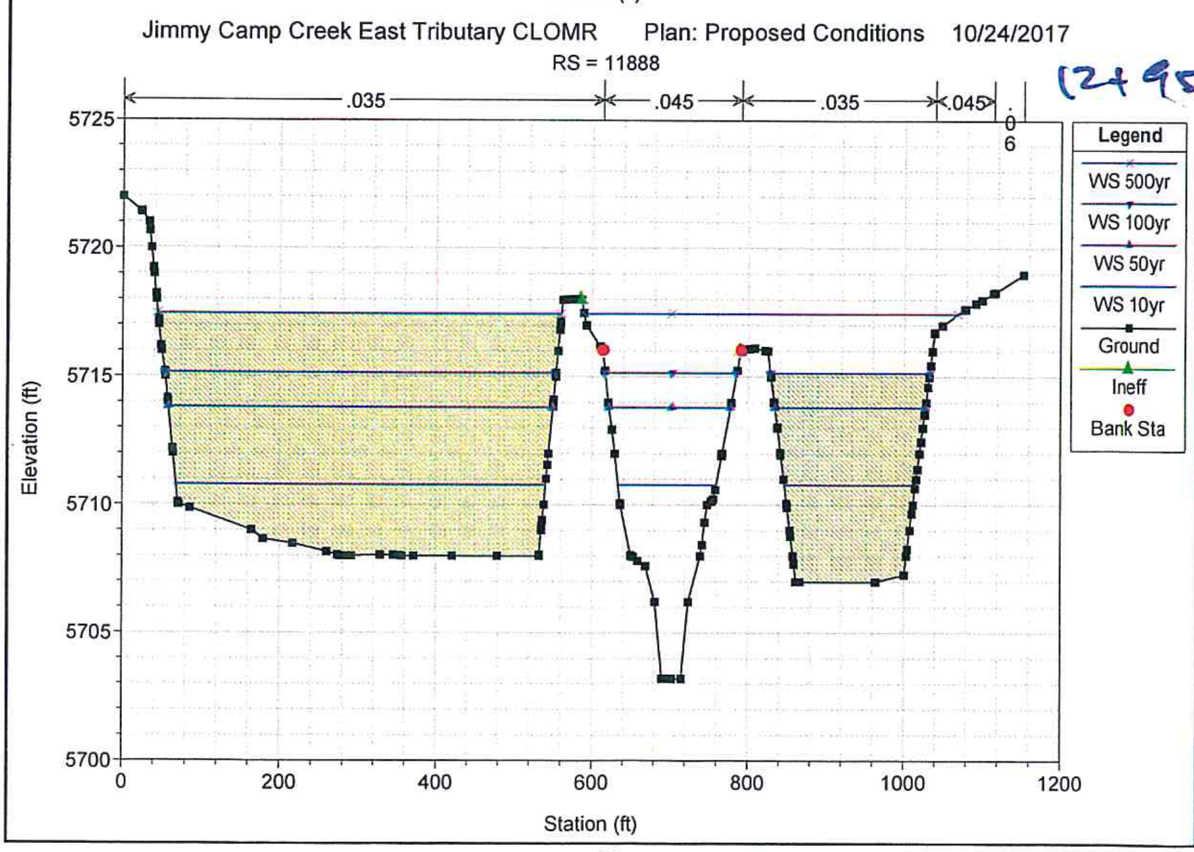
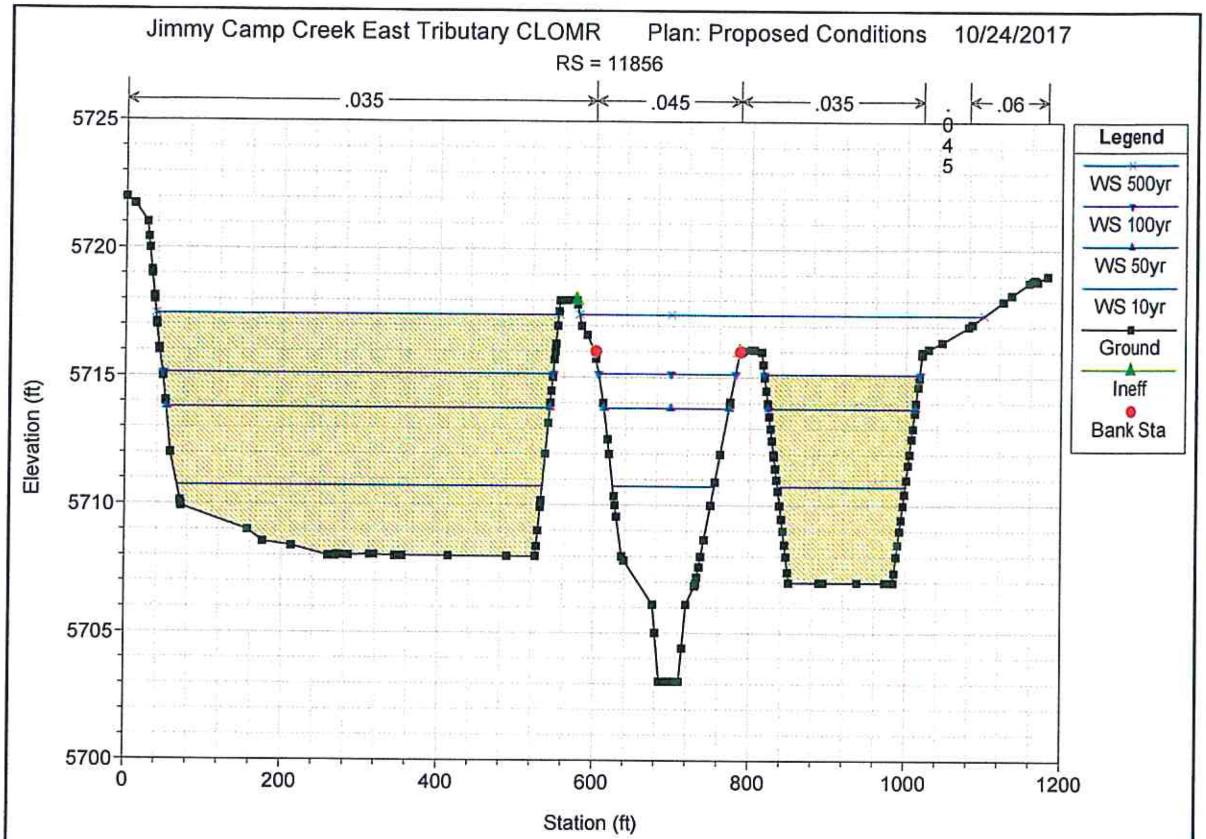
WS 100yr
WS 50yr
WS 10yr
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)


Jimmy Camp Creek East Tributary CLOMR Plan: Proposed Conditions 10/24/2017
RS = 11888
12+95
.035
.045
.035
.045
.06
Legend
WS 500yr
WS 100yr
WS 50yr
WS 10yr
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)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Legend
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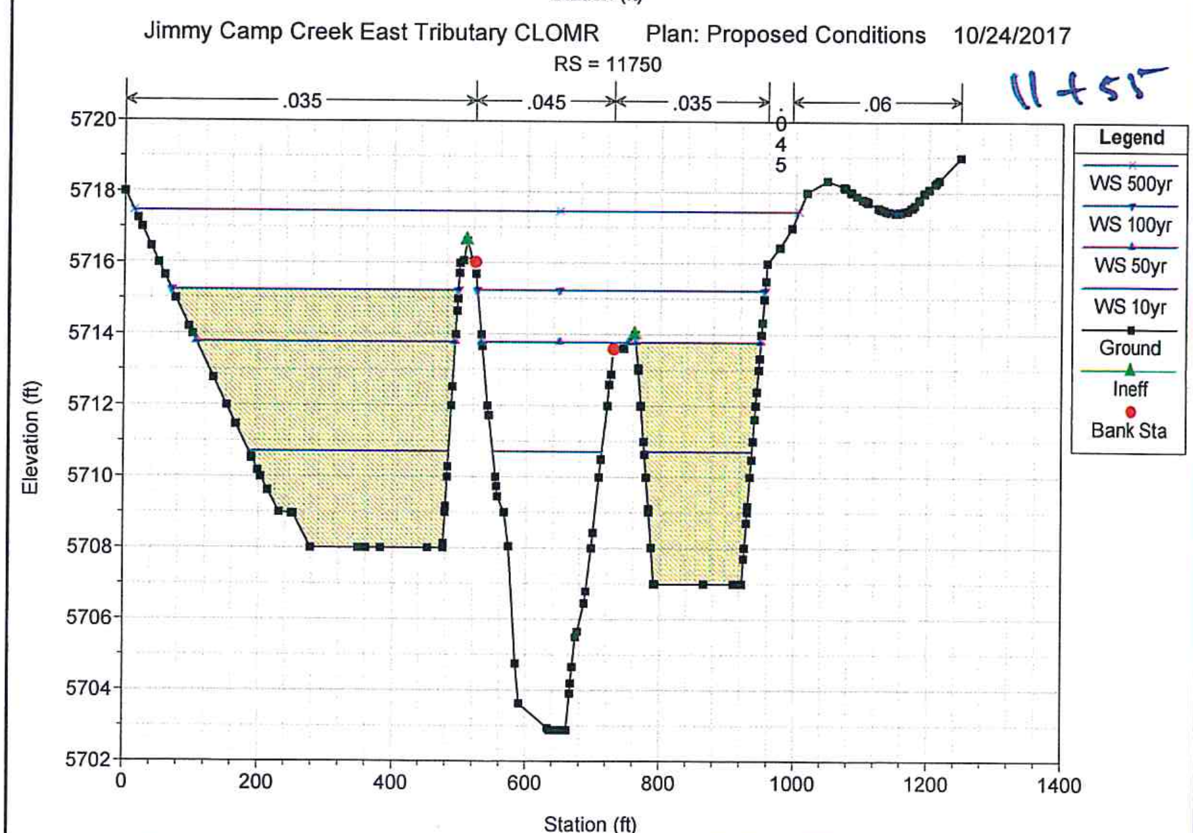
WS 100yr
WS 50yr
WS 10yr
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)


Jimmy Camp Creek East Tributary CLOMR Plan: Proposed Conditions 10/24/2017
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11+55
.035
.045
.035
.045
.06
Legend
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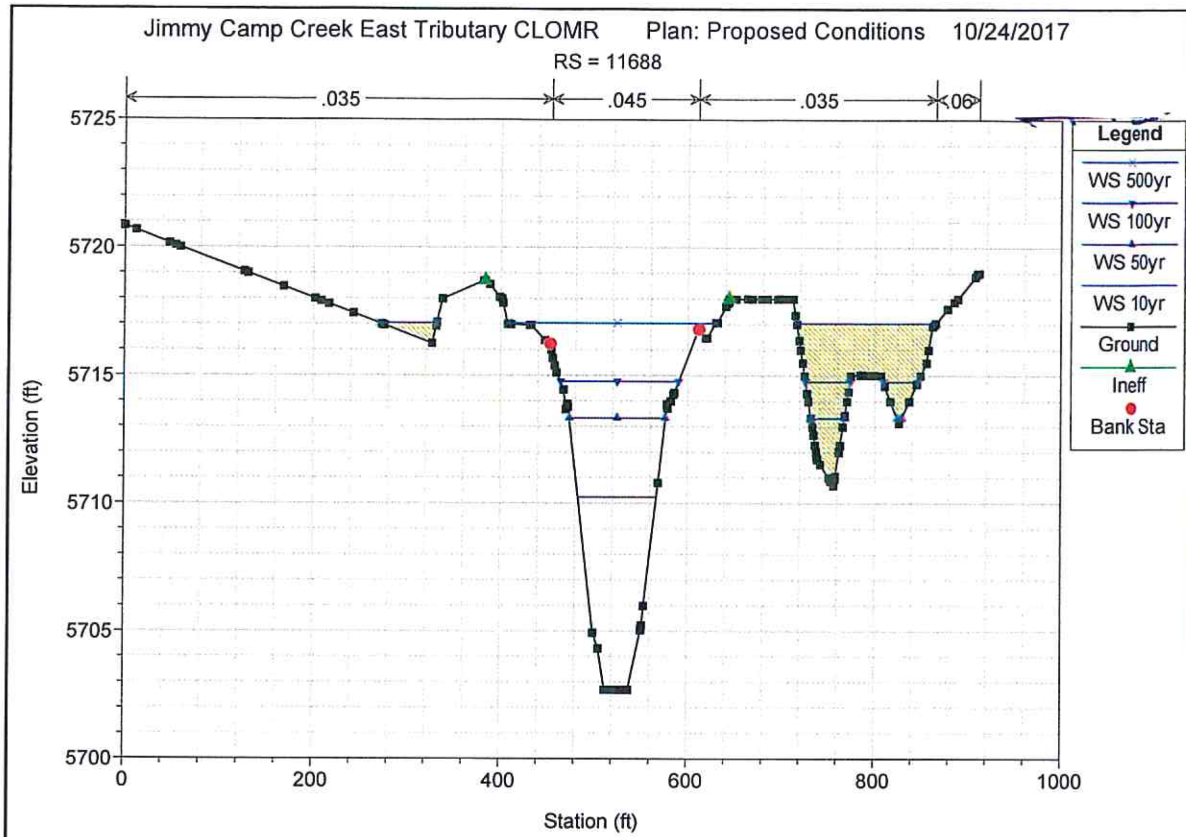
WS 100yr
WS 50yr
WS 10yr
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)


Jimmy Camp Creek East Tributary CLOMR
Plan: Proposed Conditions
10/24/2017
RS = 11688
.035
.045
.035
.06
Legend
WS 500yr
WS 100yr
WS 50yr
WS 10yr
Ground
Ineff
Bank Sta
Elevation (ft)
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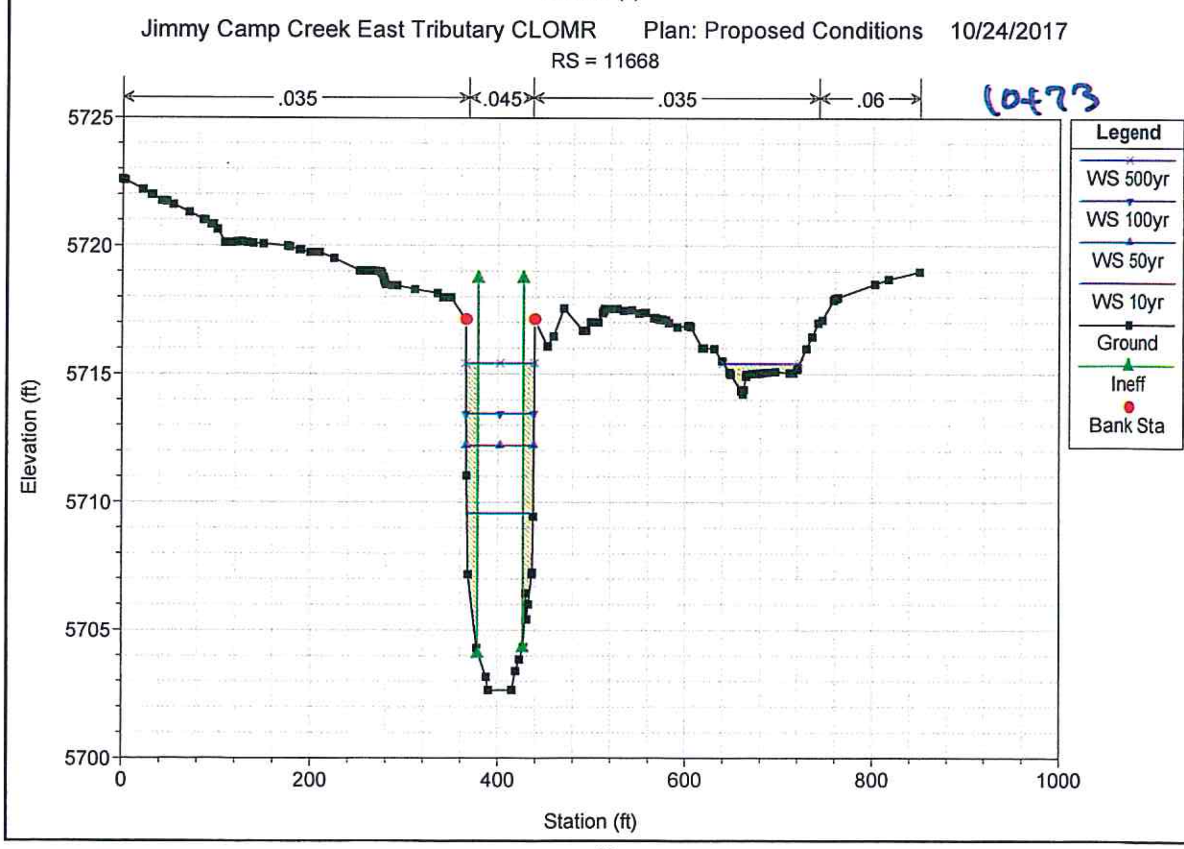
5720
5715
5710
5705
5700
0
200
400
600
800
1000
Station (ft)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Plan: Proposed Conditions
10/24/2017
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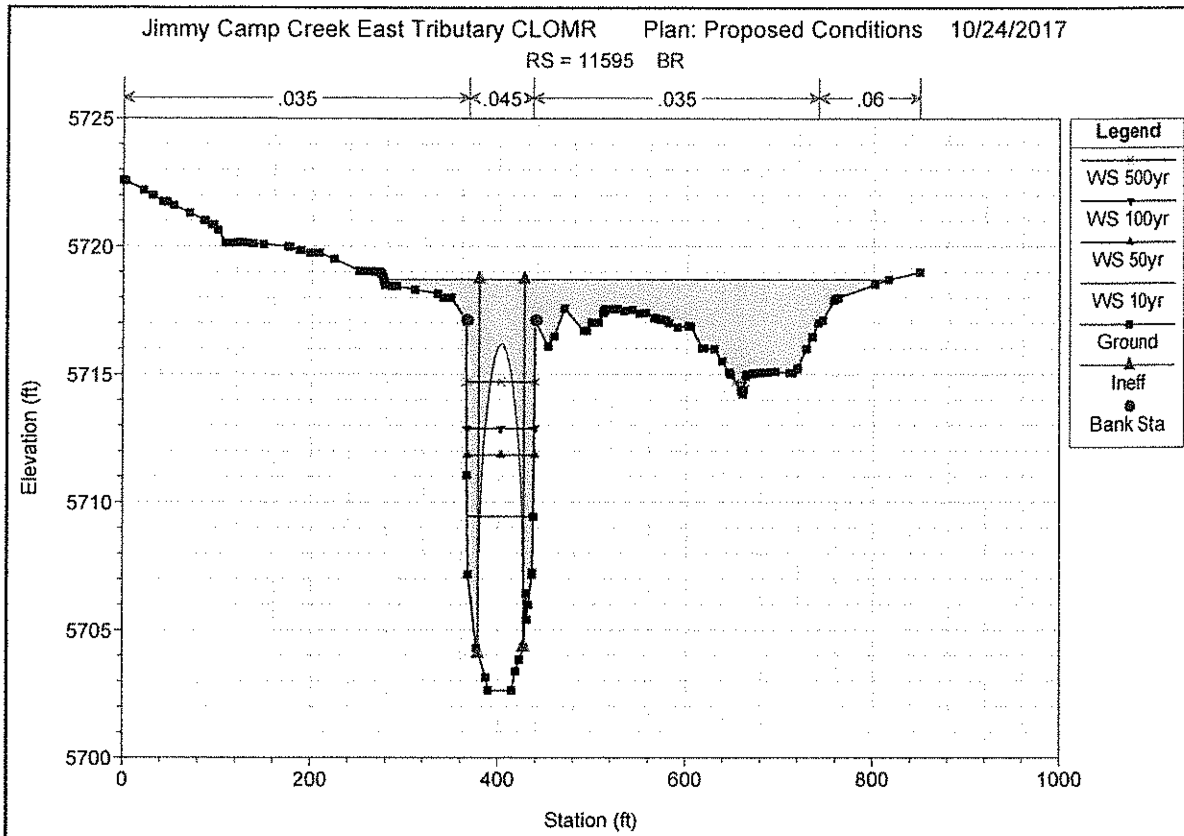
.045
.035
.06
10+73
Legend
WS 500yr
WS 100yr
WS 50yr
WS 10yr
Ground
Ineff
Bank Sta
Elevation (ft)
5725
5720
5715
5710
5705
5700
0
200
400
600
800
1000
Station (ft)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RS = 11595 BR
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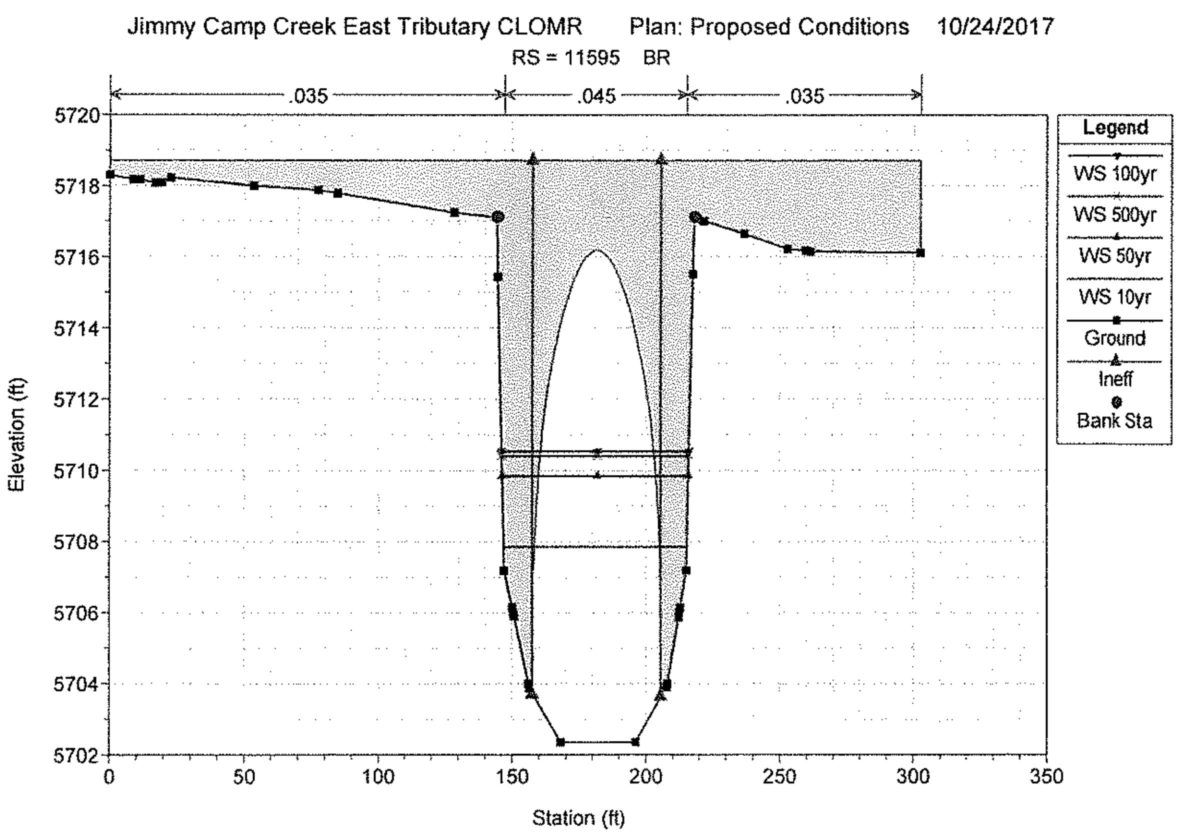
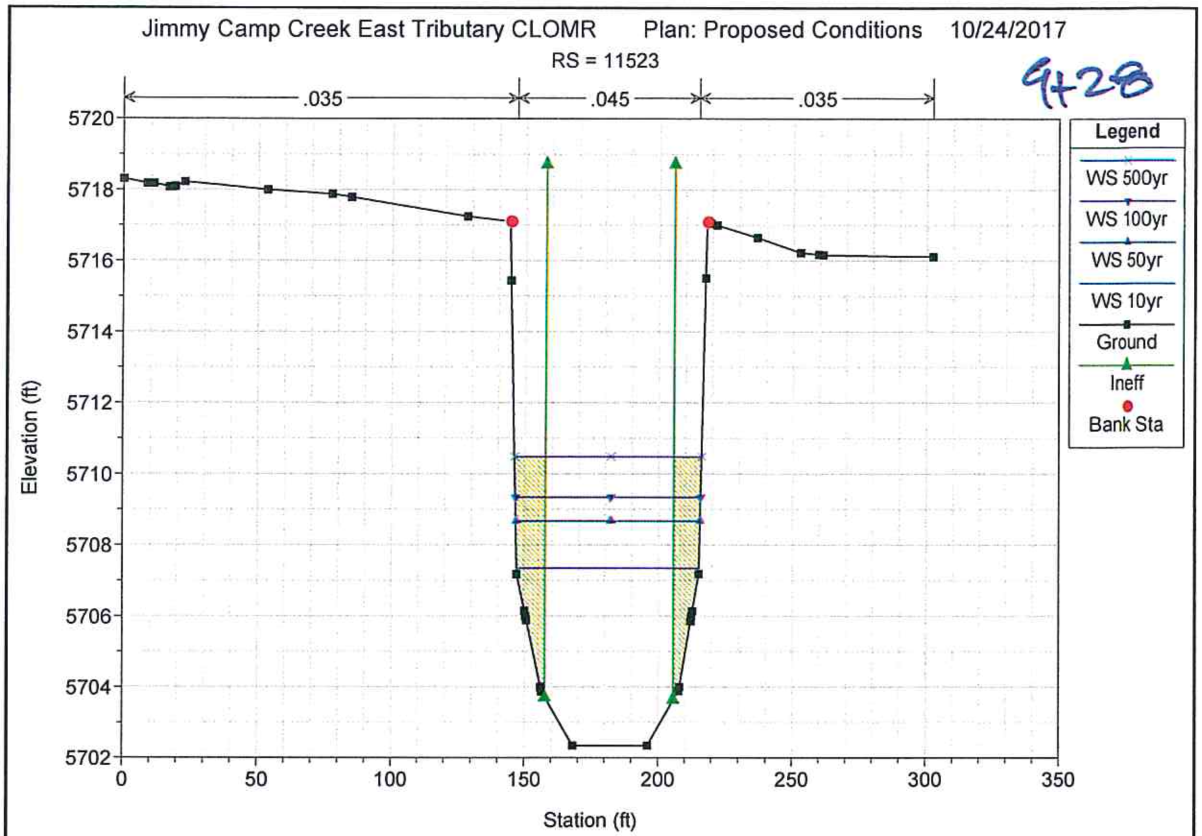
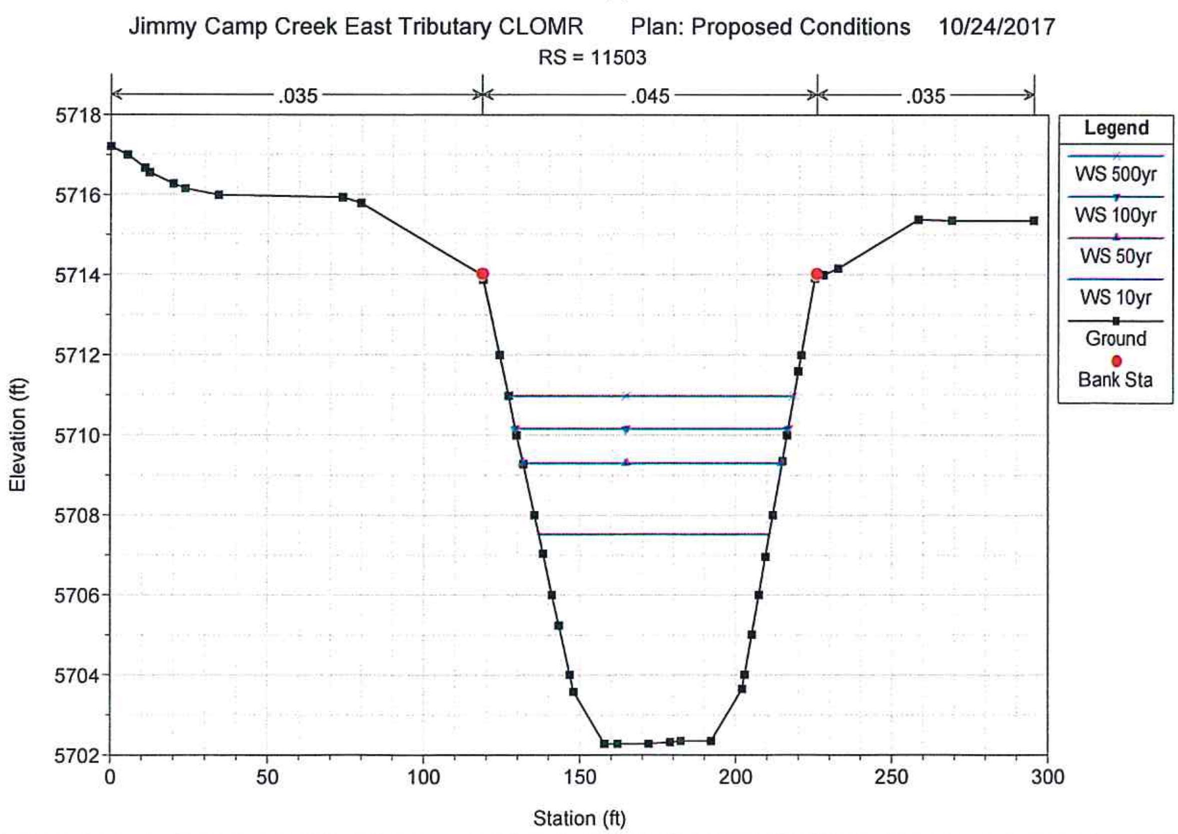
.045
.035
.06
Legend
WS 500yr
WS 100yr
WS 50yr
WS 10yr
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
5725
5720
5715
5710
5705
5700
0
200
400
600
800
1000


Jimmy Camp Creek East Tributary CLOMR Plan: Proposed Conditions 10/24/2017
RS = 11595 BR
.035
.045
.035
Legend
WS 100yr
WS 500yr
WS 50yr
WS 10yr
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
5720
5718
5716
5714
5712
5710
5708
5706
5704
5702
0
50
100
150
200
250
300
350


Jimmy Camp Creek East Tributary CLOMR Plan: Proposed Conditions 10/24/2017
RS = 11523
9+28
.035
.045
.035
Legend
WS 500yr
WS 100yr
WS 50yr
WS 10yr
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
5720
5718
5716
5714
5712
5710
5708
5706
5704
5702
0
50
100
150
200
250
300
350


Jimmy Camp Creek East Tributary CLOMR Plan: Proposed Conditions 10/24/2017
RS = 11503
.035
.045
.035
Legend
WS 500yr
WS 100yr
WS 50yr
WS 10yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
5718
5716
5714
5712
5710
5708
5706
5704
5702
0
50
100
150
200
250
300

Appendix B

LOMR Case Number 14-08-0534P

Lorson Ranch 404 Permit

EFJCC

Page 1 of 5	Issue Date: September 16, 2014	Effective Date: January 29, 2015	Case No.: 14-08-0534P	LOMR-APP

Follows Conditional Case No.: 06-08-B425R

Federal Emergency Management Agency

Washington, D.C. 20472

LETTER OF MAP REVISION DETERMINATION DOCUMENT

COMMUNITY AND REVISION INFORMATION		PROJECT DESCRIPTION	BASIS OF REQUEST
COMMUNITY	El Paso County Colorado (Unincorporated Areas) COMMUNITY NO.: 080059	CHANNELIZATION	HYDRAULIC ANALYSIS NEW TOPOGRAPHIC DATA
IDENTIFIER	Lorso Ranch Development, East Tributary of Jimmy Camp Creek	APPROXIMATE LATITUDE & LONGITUDE: 38.732, -104.631 SOURCE: Precision Mapping Streets DATUM: NAD 83	

ANNOTATED MAPPING ENCLOSURES	ANNOTATED STUDY ENCLOSURES
TYPE: FIRM* NO.: 08041C0957F DATE: March 17, 1997 TYPE: FIRM* NO.: 08041C1000F DATE: March 17, 1997	DATE OF EFFECTIVE FLOOD INSURANCE STUDY: August 23, 1999 PROFILE(S): 117P-119P FLOODWAY DATA TABLE: 5

Enclosures reflect changes to flooding sources affected by this revision.
* FIRM - Flood Insurance Rate Map; ** FBFM - Flood Boundary and Floodway Map; *** FHBM - Flood Hazard Boundary Map

FLOODING SOURCE(S) & REVISED REACH(ES)

Jimmy Camp Creek East Tributary - from approximately 4,260 feet upstream to approximately 14,470 feet upstream of Peaceful Valley Road

[redacted]

SUMMARY OF REVISIONS

Flooding Source	Effective Flooding	Revised Flooding	Increases	Decreases
Jimmy Camp Creek East Tributary	Zone AE	Zone AE	YES	YES
	BFEs	BFEs	YES	YES
	Zone X (shaded)	Zone X (shaded)	YES	YES
	Floodway	Floodway	YES	YES

* BFEs - Base Flood Elevations

DETERMINATION

This document provides the determination from the Department of Homeland Security's Federal Emergency Management Agency (FEMA) regarding a request for a Letter of Map Revision (LOMR) for the area described above. Using the information submitted, we have determined that a revision to the flood hazards depicted in the Flood Insurance Study (FIS) report and/or National Flood Insurance Program (NFIP) map is warranted. This document revises the effective NFIP map, as indicated in the attached documentation. Please use the enclosed annotated map panels revised by this LOMR for floodplain management purposes and for all flood insurance policies and renewals in your community.

This determination is based on the flood data presently available. The enclosed documents provide additional information regarding this determination. If you have any questions about this document, please contact the FEMA Map Information eXchange toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMC Clearinghouse, 847 South Pickett Street, Alexandria, VA 22304-4605. Additional Information about the NFIP is available on our website at http://www.fema.gov/nfip.

Luis Rodriguez, P.E., Chief
Engineering Management Branch
Federal Insurance and Mitigation Administration

142877 PT202.02.BKR.14080534P.BG 102-I-A-C

Federal Emergency Management Agency
Washington, D.C. 20472

LETTER OF MAP REVISION DETERMINATION DOCUMENT (CONTINUED)

OTHER COMMUNITIES AFFECTED BY THIS REVISION

CID Number: 080060 **Name:** City of Colorado Springs, Colorado

AFFECTED MAP PANELS	AFFECTED PORTIONS OF THE FLOOD INSURANCE STUDY REPORT
TYPE: FIRM* NO.: 08041C0957F DATE: March 17, 1997 TYPE: FIRM* NO.: 08041C1000F DATE: March 17, 1997	DATE OF EFFECTIVE FLOOD INSURANCE STUDY: August 23, 1999 PROFILE(S): 119P FLOODWAY DATA TABLE: 5

This determination is based on the flood data presently available. The enclosed documents provide additional information regarding this determination. If you have any questions about this document, please contact the FEMA Map Information eXchange toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMC Clearinghouse, 847 South Pickett Street, Alexandria, VA 22304-4605. Additional Information about the NFIP is available on our website at http://www.fema.gov/nfip.

Luis Rodriguez, P.E., Chief
Engineering Management Branch
Federal Insurance and Mitigation Administration

Federal Emergency Management Agency
Washington, D.C. 20472

LETTER OF MAP REVISION
DETERMINATION DOCUMENT (CONTINUED)

COMMUNITY INFORMATION

APPLICABLE NFIP REGULATIONS/COMMUNITY OBLIGATION

We have made this determination pursuant to Section 206 of the Flood Disaster Protection Act of 1973 (P.L. 93-234) and in accordance with the National Flood Insurance Act of 1968, as amended (Title XIII of the Housing and Urban Development Act of 1968, P.L. 90-448), 42 U.S.C. 4001-4128, and 44 CFR Part 65. Pursuant to Section 1361 of the National Flood Insurance Act of 1968, as amended, communities participating in the NFIP are required to adopt and enforce floodplain management regulations that meet or exceed NFIP criteria. These criteria, including adoption of the FIS report and FIRM, and the modifications made by this LOMR, are the minimum requirements for continued NFIP participation and do not supersede more stringent State/Commonwealth or local requirements to which the regulations apply.

We provide the floodway designation to your community as a tool to regulate floodplain development. Therefore, the floodway revision we have described in this letter, while acceptable to us, must also be acceptable to your community and adopted by appropriate community action, as specified in Paragraph 60.3(d) of the NFIP regulations.

NFIP regulations Subparagraph 60.3(b)(7) requires communities to ensure that the flood-carrying capacity within the altered or relocated portion of any watercourse is maintained. This provision is incorporated into your community's existing floodplain management ordinances; therefore, responsibility for maintenance of the altered or relocated watercourse, including any related appurtenances such as bridges, culverts, and other drainage structures, rests with your community. We may request that your community submit a description and schedule of maintenance activities necessary to ensure this requirement.

COMMUNITY REMINDERS

We based this determination on the base (1-percent-annual-chance) flood discharges computed in the FIS for your community without considering subsequent changes in watershed characteristics that could increase flood discharges. Future development of projects upstream could cause increased flood discharges, which could cause increased flood hazards. A comprehensive restudy of your community's flood hazards would consider the cumulative effects of development on flood discharges subsequent to the publication of the FIS report for your community and could, therefore, establish greater flood hazards in this area.

Your community must regulate all proposed floodplain development and ensure that permits required by Federal and/or State/Commonwealth law have been obtained. State/Commonwealth or community officials, based on knowledge of local conditions and in the interest of safety, may set higher standards for construction or may limit development in floodplain areas. If your State/Commonwealth or community has adopted more restrictive or comprehensive floodplain management criteria, those criteria take precedence over the minimum NFIP requirements.

We will not print and distribute this LOMR to primary users, such as local insurance agents or mortgage lenders; instead, the community will serve as a repository for the new data. We encourage you to disseminate the information in this LOMR by preparing a news release for publication in your community's newspaper that describes the revision and explains how your community will provide the data and help interpret the NFIP maps. In that way, interested persons, such as property owners, insurance agents, and mortgage lenders, can benefit from the information.

This determination is based on the flood data presently available. The enclosed documents provide additional information regarding this determination. If you have any questions about this document, please contact the FEMA Map Information eXchange toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMC Clearinghouse, 847 South Pickett Street, Alexandria, VA 22304-4605. Additional Information about the NFIP is available on our website at http://www.fema.gov/nfip.

Luis Rodriguez, P.E., Chief
Engineering Management Branch
Federal Insurance and Mitigation Administration

Federal Emergency Management Agency
Washington, D.C. 20472

LETTER OF MAP REVISION
DETERMINATION DOCUMENT (CONTINUED)

We have designated a Consultation Coordination Officer (CCO) to assist your community. The CCO will be the primary liaison between your community and FEMA. For information regarding your CCO, please contact:

Ms. Jeanine D. Petterson
Director, Mitigation Division
Federal Emergency Management Agency, Region VIII
Denver Federal Center, Building 710
P.O. Box 25267
Denver, CO 80225-0267
(303) 235-4830

STATUS OF THE COMMUNITY NFIP MAPS

We will not physically revise and republish the FIRM and FIS report for your community to reflect the modifications made by this LOMR at this time. When changes to the previously cited FIRM panels and FIS report warrant physical revision and republication in the future, we will incorporate the modifications made by this LOMR at that time.

This determination is based on the flood data presently available. The enclosed documents provide additional information regarding this determination. If you have any questions about this document, please contact the FEMA Map Information eXchange toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMC Clearinghouse, 847 South Pickett Street, Alexandria, VA 22304-4605. Additional Information about the NFIP is available on our website at http://www.fema.gov/nfip.

Luis Rodriguez, P.E., Chief
Engineering Management Branch
Federal Insurance and Mitigation Administration

Federal Emergency Management Agency

Washington, D.C. 20472

LETTER OF MAP REVISION DETERMINATION DOCUMENT (CONTINUED)

PUBLIC NOTIFICATION OF REVISION

A notice of changes will be published in the *Federal Register*. This information also will be published in your local newspaper on or about the dates listed below and through FEMA's Flood Hazard Mapping website at https://www.floodmaps.fema.gov/fhm/Scripts/bfe_main.asp.

LOCAL NEWSPAPER Name: *The Colorado Springs Gazette*
Dates: September 24, 2014 and October 1, 2014

Within 90 days of the second publication in the local newspaper, a citizen may request that we reconsider this determination. Any request for reconsideration must be based on scientific or technical data. Therefore, this letter will be effective only after the 90-day appeal period has elapsed and we have resolved any appeals that we receive during this appeal period. Until this LOMR is effective, the revised flood hazard determination information presented in this LOMR may be changed.

This determination is based on the flood data presently available. The enclosed documents provide additional information regarding this determination. If you have any questions about this document, please contact the FEMA Map Information eXchange toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMC Clearinghouse, 847 South Pickett Street, Alexandria, VA 22304-4605. Additional Information about the NFIP is available on our website at http://www.fema.gov/nfip.

Luis Rodriguez, P.E., Chief
Engineering Management Branch
Federal Insurance and Mitigation Administration

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY (FEET (NGVD))	WITH FLOODWAY (FEET (NGVD))	INCREASE
JIMMY CAMP CREEK EAST TRIBUTARY								
A	1,672	240	1,535	3.6	5,676.0	5,674.8[2]	5,675.6[2]	0.8
B	1,962	700	862	6.4	5,681.3	5,681.3	5,682.3	1.0
C	4,362	340	2,188	2.5	5,686.6	5,686.6	5,687.3	0.7
D	5,693	80	660	8.3	5,689.5	5,689.5	5,690.0	0.5
E	7,983	105	788	7.0	5,699.2	5,699.2	5,699.6	0.4
F	9,875	158	822	6.3	5,702.8	5,702.8	5,703.5	0.7
G	11,583	138	698	6.8	5,710.6	5,710.6	5,710.6	0.0
H	12,984	85	441	10.8	5,724.1	5,724.1	5,724.4	0.3
I	15,904	230	1,361	3.2	5,740.7	5,740.7	5,741.3	0.6
J	17,782	220	518	8.5	5,760.2	5,760.2	5,760.2	0.0
K	19,162	260	735	5.0	5,772.0	5,772.0	5,772.5	0.5
L	20,462	670	647	5.6	5,785.7	5,785.7	5,785.8	0.1
M	23,542	600	1,259	2.9	5,813.0	5,813.0	5,813.0	0.0
N	25,272	450	596	6.1	5,828.1	5,828.1	5,828.8	0.7
O	26,532	400	900	3.7	5,843.6	5,843.6	5,844.6	1.0
P	28,502	195	346	7.8	5,866.6	5,866.6	5,866.6	0.0
Q	30,442	190	550	4.9	5,882.8	5,882.8	5,883.1	0.3
R	30,662	200	613	4.4	5,884.7	5,884.7	5,884.7	0.0
S	30,704	200	580	4.7	5,887.2	5,887.2	5,887.2	0.0
T	30,804	280	996	2.7	5,887.2	5,887.2	5,887.2	0.0
U	32,164	230	435	5.5	5,898.3	5,898.3	5,899.0	0.7
V	33,244	350	518	4.6	5,910.4	5,910.4	5,910.6	0.2
W	34,324	150	318	7.6	5,921.7	5,921.7	5,921.7	0.0
X	36,344	130	255	7.9	5,954.3	5,954.3	5,954.3	0.0
Y	38,444	70	221	9.0	5,986.5	5,986.5	5,986.5	0.0
Z	40,934	110	187	7.2	6,025.3	6,025.3	6,025.4	0.1
AA	42,144	198	240	5.6	6,059.0	6,059.0	6,059.0	0.0
AB	43,064	100	178	7.6	6,080.9	6,080.9	6,080.9	0.0

REVISED DATA

[1] Feet Above Confluence With Jimmy Camp Creek
[2] Elevation Computerd Without Consideration of Backwater Effects From Jimmy Camp Creek

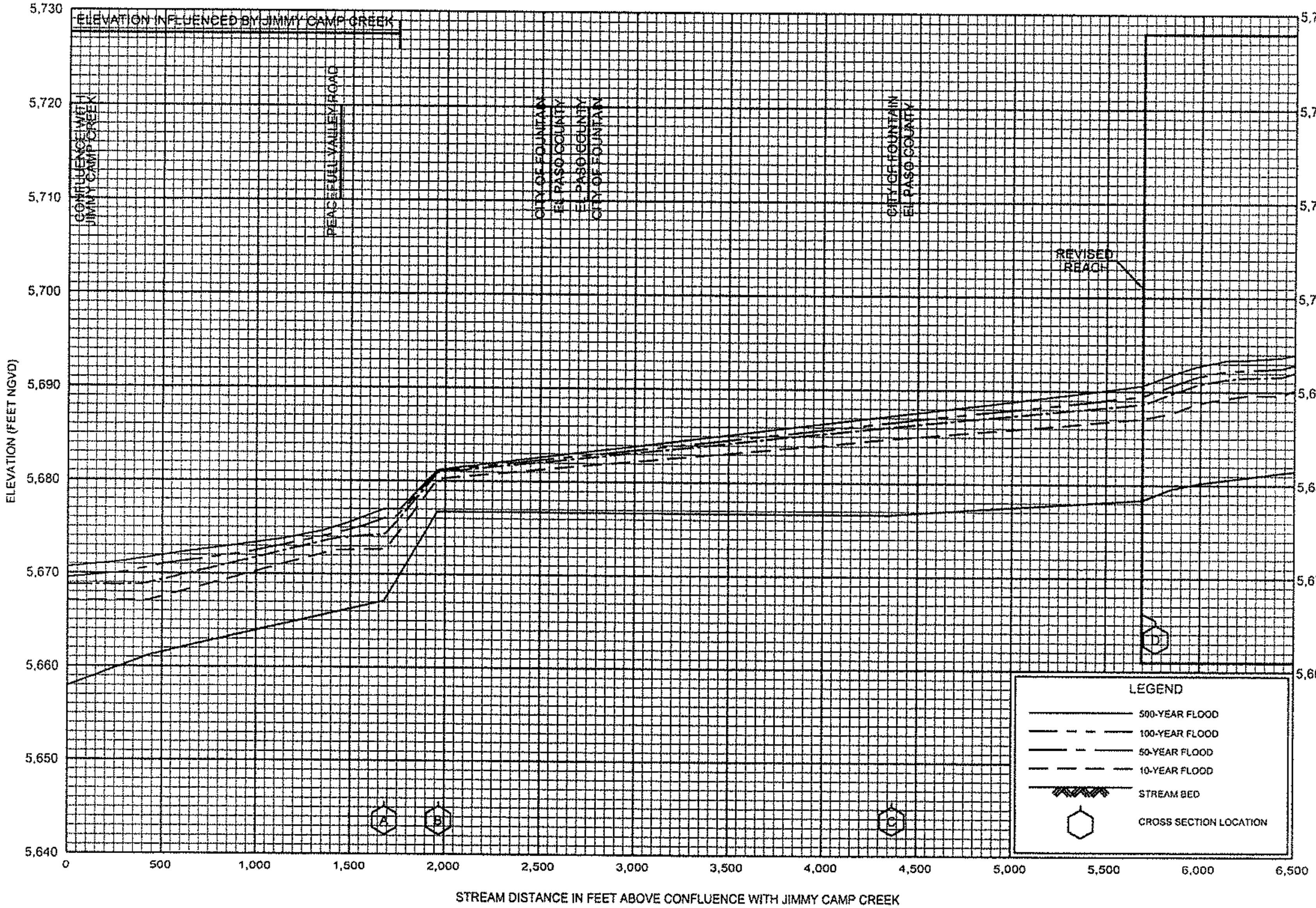
REVISED TO REFLECT LOMR EFFECTIVE: January 29, 2015

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY
EL PASO COUNTY, CO
AND INCORPORATED AREAS

FLOODWAY DATA

JIMMY CAMP CREEK EAST TRIBUTARY



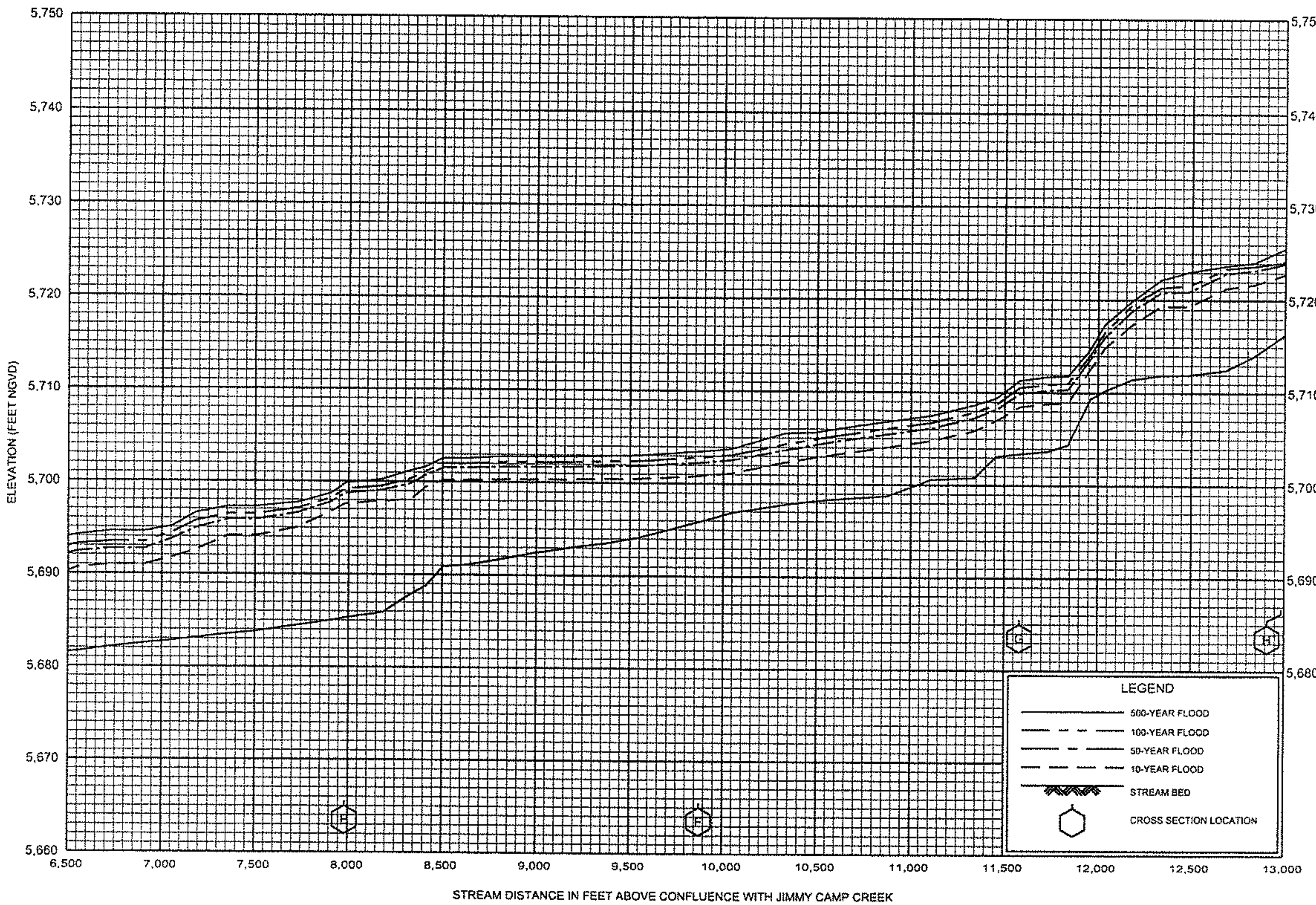
FLOOD PROFILES

JIMMY CAMP CREEK EAST TRIBUTARY

FEDERAL EMERGENCY MANAGEMENT AGENCY

EL PASO COUNTY, CO AND INCORPORATED AREAS

117P



REVISED TO
REFLECT LOMR
EFFECTIVE: January 29, 2015

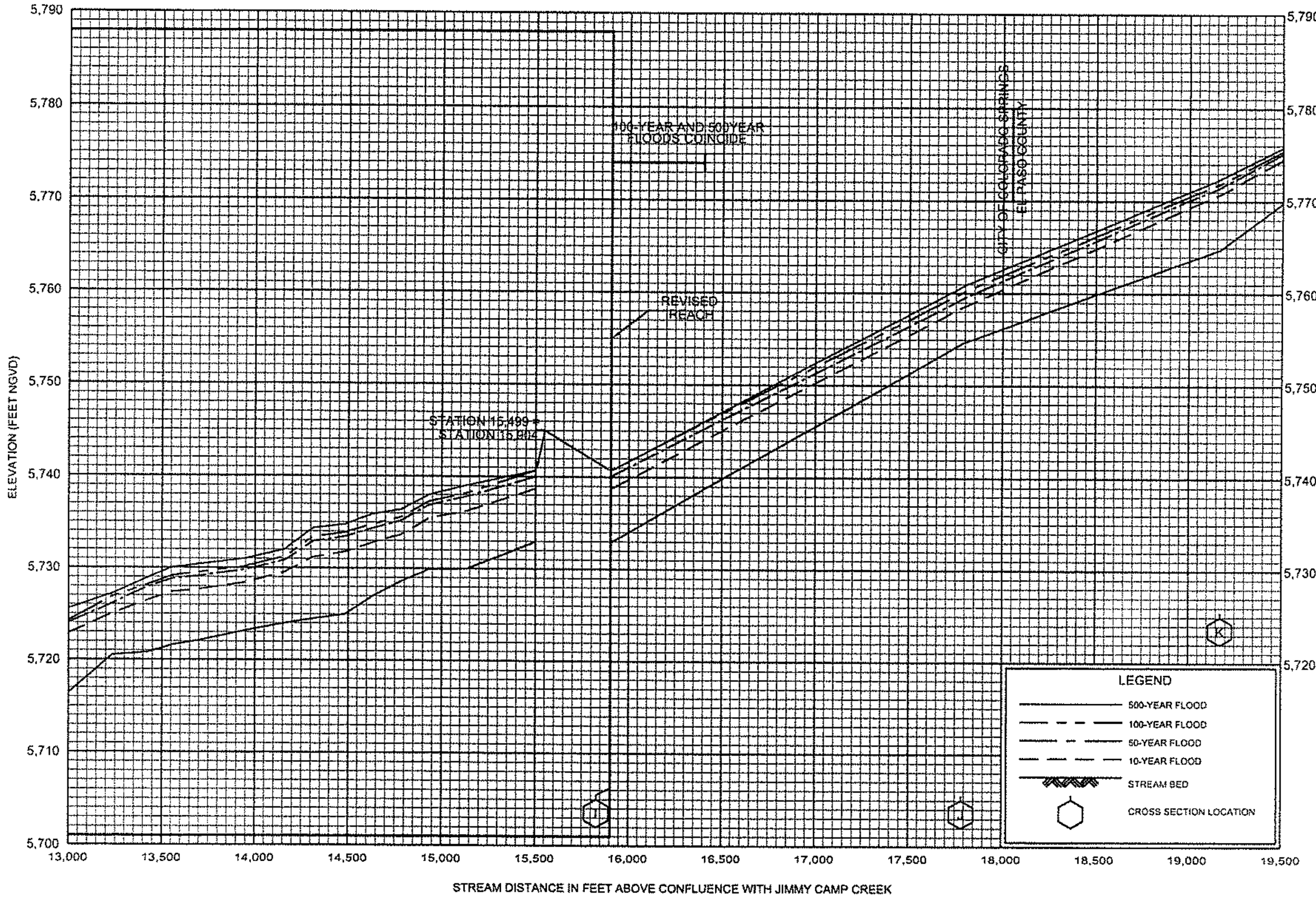
FLOOD PROFILES

JIMMY CAMP CREEK EAST TRIBUTARY

FEDERAL EMERGENCY MANAGEMENT AGENCY

EL PASO COUNTY, CO
AND INCORPORATED AREAS

118P



REVISED TO REFLECT LOMR EFFECTIVE: January 29, 2015

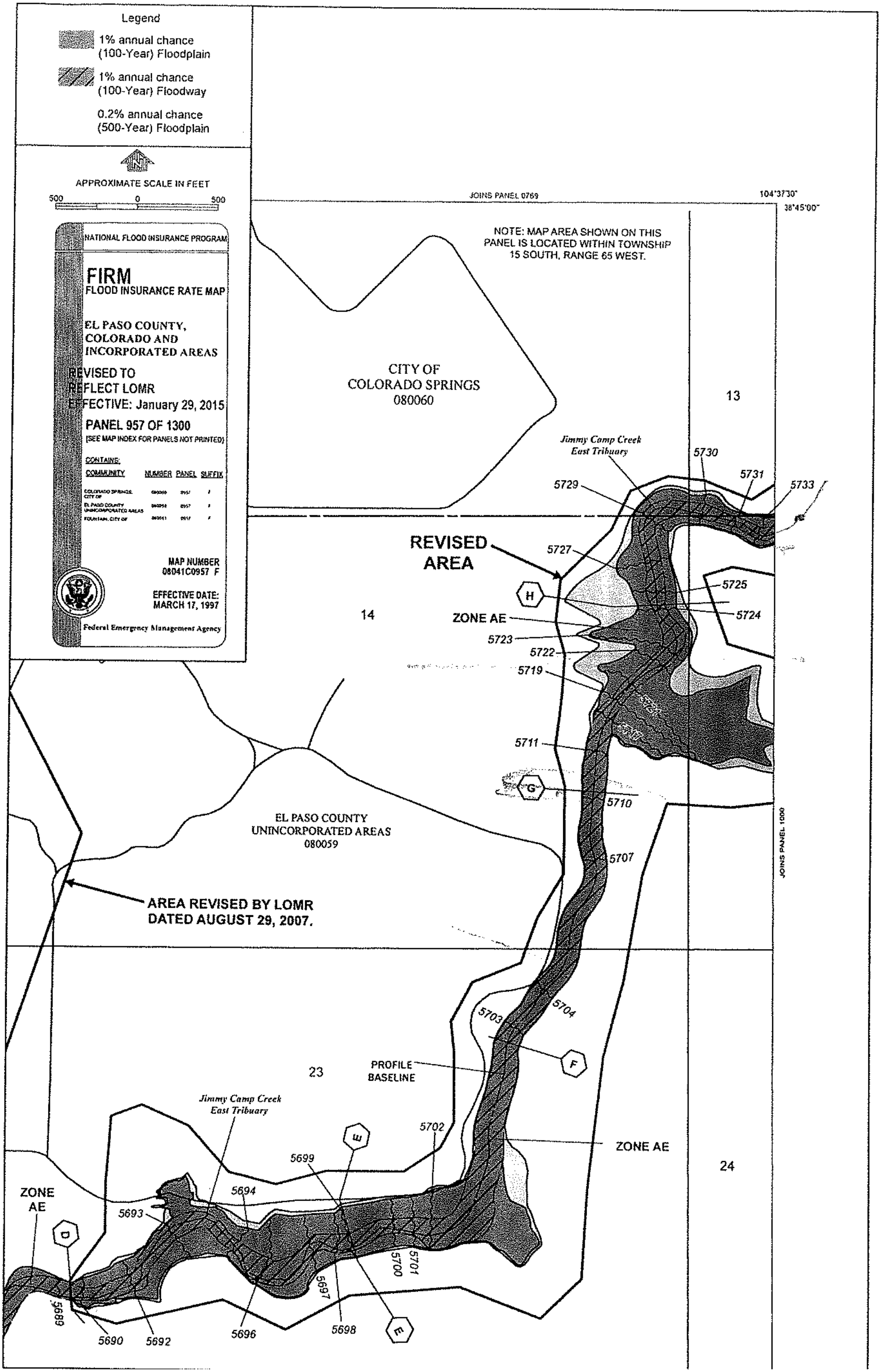
FLOOD PROFILES

JIMMY CAMP CREEK EAST TRIBUTARY

FEDERAL EMERGENCY MANAGEMENT AGENCY

EL PASO COUNTY, CO AND INCORPORATED AREAS

119P



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
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 Tributary
5730
5731
5733
5729
REVISED AREA
5727
H
5725
5724
14
ZONE AE
5723
5722
5719
5711
G
5710
JOINS PANEL 1000
EL PASO COUNTY UNINCORPORATED AREAS 080059
5707
AREA REVISED BY LOMR DATED AUGUST 29, 2007.
5704
5703
F
23
PROFILE BASELINE
Jimmy Camp Creek East Tributary
5702
ZONE AE
24
5699
E
ZONE AE
5694
5693
D
5701
5700
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

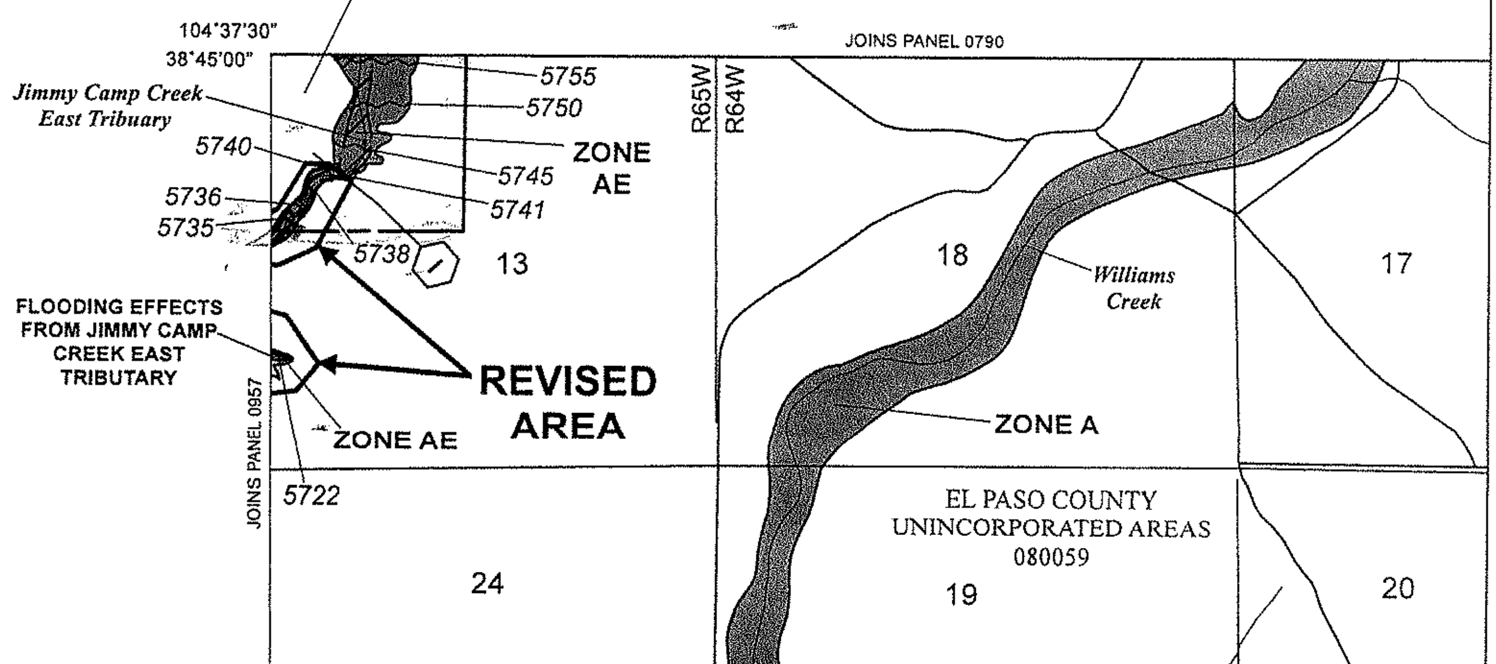
REVISED TO REFLECT LOMR EFFECTIVE: January 29, 2015

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.



REPLY TO
ATTENTION OF

DEPARTMENT OF THE ARMY
ALBUQUERQUE DISTRICT, U.S. ARMY CORPS OF ENGINEERS
SOUTHERN COLORADO REGULATORY OFFICE
200 S. SANTA FE AVENUE, SUITE 301
PUEBLO, COLORADO 81003

September 7, 2017

Regulatory Division

SUBJECT: Action No. SPA-2005-00757; Modification to the Lorson Ranch Permit in El Paso County, Colorado

Elizabeth Klein
Kiowa Engineering
1604 South 21st Street
Colorado Springs, CO 80904

Ms. Klein:

The U.S. Army Corps of Engineers (Corps) is in receipt of your letter dated August 3, 2017, requesting a modification to the Department of the Army permit for the discharge of dredged and fill material into waters of the United States associated with Lorson Ranch. This includes the bridge construction and stream configurations and updating delineation for upland swale in the Lorson ranch development, Fountain, El Paso County, Colorado.

We have reviewed and hereby approve your request. Action Number SPA-2005-00757 is modified as follows: This includes approval of the Special Condition 1 - Lorson Blvd. & Fontaine Blvd. bridge design and stream configuration, Special Condition 2 – no action required; and Upper Reach Item #2 Stabilization – No permit required.

Replace the project description on page one of your permit with: Insert the approved designs into the Permit as an attachment to the Special Condition 1.

The expiration date of your is still September 30, 2021.

This modification is effective immediately. All other terms and conditions of the original permit remain in full force and effect.

If you have any questions concerning this letter, please contact me at (719) 543-6915 or by e-mail at Van.A.Truan@usace.army.mil.

Sincerely,

TRUAN.VAN.ALLAN.1231422150 Digitally signed by TRUAN.VAN.ALLAN.1231422150 DN: c=US, o=U.S. Government, ou=DoD, ou=PKI, ou=USA, cn=TRUAN.VAN.ALLAN.1231422150 Date: 2017.09.07 09:15:45 -06'00'

Van Truan
Chief, Southern Colorado
Regulatory Branch

Josh
719-543-6914

Kiowa
Engineering Corporation

August 3, 2017

Mr. Van Truan
U. S. Army Corps of Engineers
200 South Santa Fe Avenue Suite 301
Pueblo, Colorado 81003

Re: SPA Action No. 2005 00757
Lorson Ranch East Fork Jimmy Camp Creek Permit Modification Amendment No.1
El Paso County, Colorado
(Kiowa Project No. 16031)

Dear Van:

Following our telephone conversation of last January, we are submitting a Permit Modification Amendment No. 1 for the above-mentioned project on behalf of Lorson Development and requesting your concurrence.

Action Number 2005 00757 Modification Amendment Request No. 1

Project impacts for the East Fork Jimmy Camp Creek on the Lorson Ranch were originally authorized under the above-mentioned Action Number by the Pueblo Regulatory Office on September 22, 2006 with an expiration date of December 31, 2009. The permit authorized channel bank linings, grade control structures and two roadway crossings for three segments for the entire length of the East Fork Jimmy Camp Creek on the Lorson Ranch. See Exhibit 1, Permit Modification Amendment 1 Map (attached) for location of existing, proposed, and future activities discussed here.

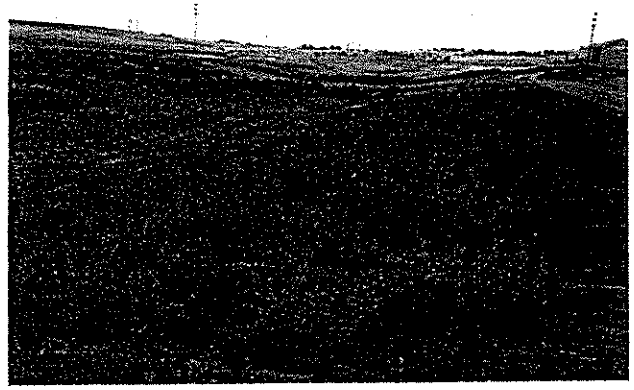
The central stream segment, designed as a reconfigured reach (Item#1 on Exhibit 1) was completed in about 2007 or 8. Subsequently, a construction standstill in 2009 occurred with no further activity. It appears that the permit has been extended twice, first to September 2001 and then to September 2021.

At that time, about 3,600 linear feet of reconfigured trapezoidal channel consisting of 100-Year riprap bank linings and grouted grade control structures were completed (*Photograph #1*). The bottom width was designed at about 60-feet wide and the top width was about 180-feet wide. Currently, the reconfigured channel is vegetated with upland vegetation with areas of exposed rock on the bank linings and grouted drops structures.

The purpose of this Modification Amendment is to address and clarify Special Conditions in the permit and summarize all future activities that were originally authorized in this permit. An additional Modification Amendment Request will be submitted in the future to address remaining authorized activities.

Special Condition 1

Per Special Condition 1, final design drawings for Fontaine Boulevard and Lorson Boulevard Bridges need to be submitted for review and approval 60 days prior to construction. At this time, we are transmitting final design drawings for the proposed Fontaine Boulevard and Lorson Bridges (see attachments.)



The proposed Fontaine Boulevard Bridge (Item #3) will be a 48-foot span, 130-foot long by 14-foot high arched Contech pre-cast bridge and pre-cast headwalls with an ungrouted rock invert. This bridge will be constructed over the north termination of the existing reconfigured trapezoidal channel reach (*Photograph #2*). Minor modifications to the reconfigured channel in the vicinity of the bridge will be necessary to link the existing improvements to the proposed bridge.

The proposed Lorson Boulevard Bridge (Item #4) is currently in final design and is expected to be constructed in the early spring of 2018. The location of Lorson Boulevard Bridge will be over the reconfigured channel at about the location of Photograph #1. The Lorson Boulevard Bridge will be a 48-foot span, 84-foot long by 13-foot high arched Contech pre-cast bridge and pre-cast headwalls with an ungrouted rock invert. Similar to Fontaine Boulevard Bridge, minor modifications to the reconfigured channel under the bridge will be required to match the existing condition.

Special Condition 2

This Special Condition refers to the lower stream preservation reach (Item #5 on Exhibit 1) that has not yet been designed. This reach will be about 3,900 linear feet of three-to-one riprap bank linings in select locations with possibly one to several grade control structures. We anticipate the bottom width of the channel will be less than 20-feet. The design concept for this reach is to retain the stream alignment, to avoid future channel incision and to lay back nearly vertical banks to three-to-one. Modifications to this channel segment are anticipated to be minimal.

The Lorson Ranch has been delineated twice during the permitting process. The original delineation by Savage and Savage in 2002 for the overall project delineated both the Mainstem Jimmy Camp Creek and the East Fork Jimmy Camp Creek. Subsequently, the Mainstem Jimmy Camp Creek was permitted and completed under Action No. 2002 00701. The East Fork Jimmy Camp Creek in the Lorson Ranch was again delineated in March 7, 2006 by AG Environmental Services, Inc. under Action No. 2005 00757. The existing delineations for this reach will be reviewed and verified for current conditions. The existing delineations for this reach will be reviewed and verified for current conditions. Improvements for this segment will be addressed in a future permit modification amendment.

Upper Reach Item#2 Stabilized Channel

The upper reach (Item#2 *Photograph# 3*) was originally a portion of the stream reconfiguration reach. This upper segment was not and currently is not wetland or a water of the U.S. This reach is a vegetated swale with upland vegetation and lacks a bed and bank configuration. The permit requests the channel design for this reach for clarity.

Prior to design, this reach was re-evaluated by Kiowa according to current criteria with the result being that channel reconfiguration is no longer required. A stabilized floodplain section can appropriately be applied here with three small sloping grouted boulder drop structures 6-foot long, 2,900 linear feet of low flow soil/rock and TRM lined channel and 1,020 linear feet buried rock/soil bank linings in select locations on outside bends. The bottom width of the low flow channel will be 25-feet and the top-width will be 43-feet. The stabilized floodplain section allows for the preservation of the stream alignment and prevents future channel incision. The overall design will provide an alternative with significantly less environmental impact than a reconfigured channel This portion of the work will be constructed in an upland swale and therefore is non-jurisdictional, but design plans are being submitted per permit request for review and approval by the COE 60 days prior to construction.

Please let us know if you need more information.

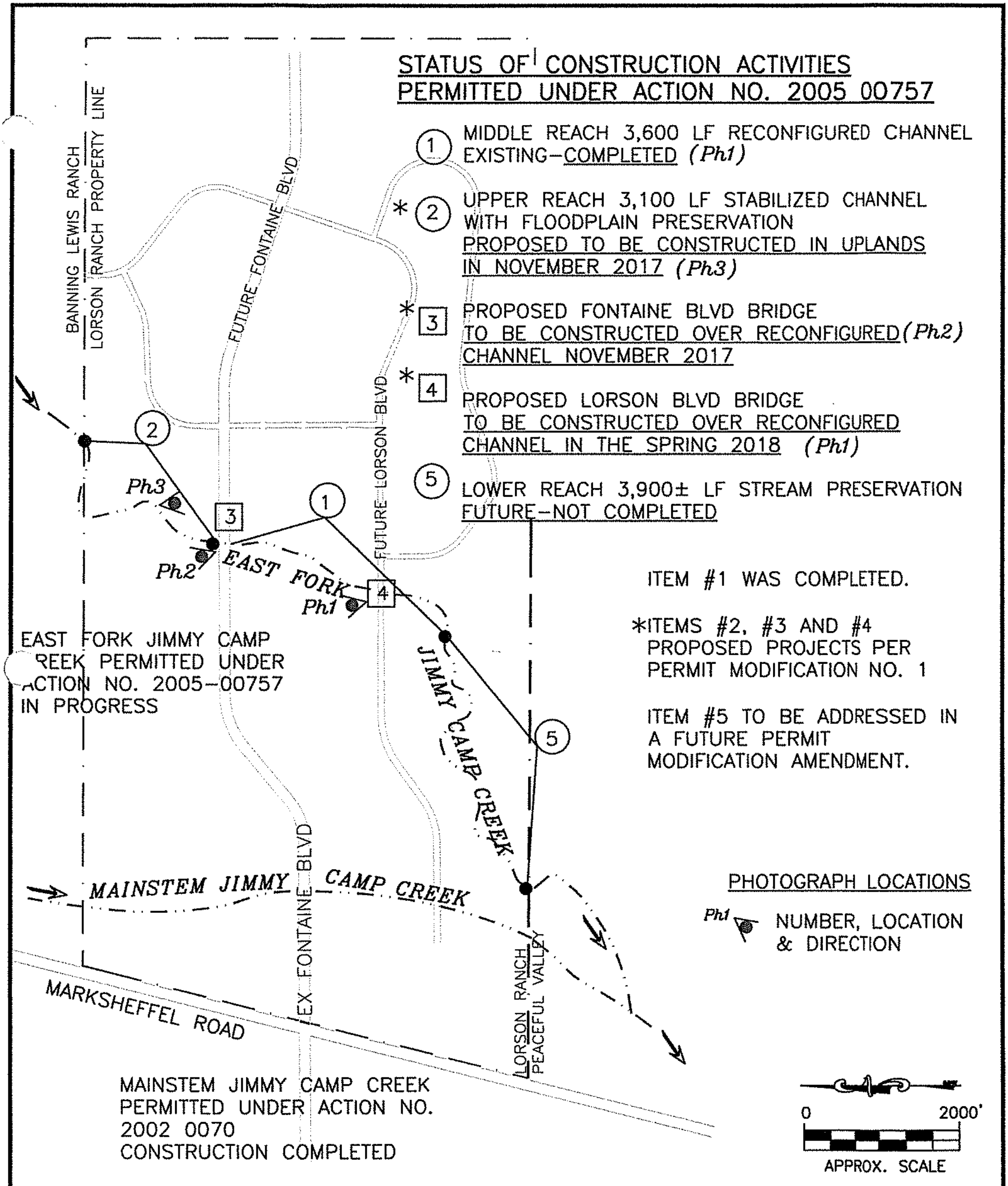
Sincerely,
KIOWA ENGINEERING CORPORATION

Elizabeth Klein

Elizabeth A. Klein
Certified Wetland Scientist

Encs. Exhibit 1
Fontaine Boulevard Bridge and East Fork Jimmy Camp Creek Channel Design Drawings
Lorson Boulevard Bridge

cc: Jeff Mark, Lorson Development
Richard Schindler, Core Engineering



LORSON RANCH
PERMIT MODIFICATION AMENDMENT NO. 1 MAP
ACTION NO. 2005 00757
EL PASO COUNTY, COLORADO

EXHIBIT 1

DATE: 08/03/17
PROJECT NO. 16031

Kiowa Engineering Corporation
1604 South 21st Street
Colorado Springs, Colorado 80904
(719) 630-7342

DEPARTMENT OF THE ARMY PERMIT

Permittee Lorson LLC nominee for Lorson Conservation Investment 1, LLLP

Permit No. 2005 00757

Issuing Office Albuquerque District Corps of Engineers

NOTE: The term "you" and its derivatives, as used in this permit, means the permittee or any future transferee. The term "this office" refers to the appropriate district or division office of the Corps of Engineers having jurisdiction over the permitted activity or the appropriate official of that office acting under the authority of the commanding officer.

You are authorized to perform work in accordance with the terms and conditions specified below.

Project Description: The work includes modifying the lower 3,110 linear feet of stream with bank protection while preserving the stream alignment (stream preservation reach), and reconfiguring the upper 5,825 linear feet of the stream (reconfiguration reach). Specifically:

In the lower stream preservation reach, about 3,110 linear feet will be treated on one or both banks by regrading the overbank to 3H:1V and treating with concrete or synthetic matting with seeded topsoil beneath the mat. About 350 linear feet will be treated with stone toe protection with soil coir lifts. One or two grade control structures may be built to provide protection from future channel incision.

In the upper reconfiguration reach, a breached stock pond dam will be removed. About 4,025 linear feet of the upper channel will be reconstructed with a bottom width of about 40 feet, side slopes no steeper than 6H:1V, and a natural channel bottom. The new channel side slopes will be protected with a mat material that will provide stability while allowing establishment of vegetation. Eleven boulder grade control structures will be built.

The upper 1,800 linear feet of the channel is actually an upland swale and is not a water of the U.S. However, it's channel design is included in the permit for clarity.

* Two road crossings will be built in the upper reach for Lorson Boulevard and Fontaine Boulevard. These structures will be two or three concrete arch, natural bottom spans. A temporary construction crossing may be built in the upper stream portion.

* The project will be constructed in accordance with the attached drawings, entitled, "Lorson Ranch channel modification in East Tributary of Jimmy Camp Creek near Fountain, El Paso County, Colorado, Application by: Lorson LLC, Application No. 2005 00757," sheets 1 through 16, dated May 17, 2006.

Project Location: In the East Tributary of Jimmy Camp Creek and adjacent wetlands in the east portion of the Lorson Ranch development located east of the intersection of Fountaine Boulevard and Marksheffel Road near Fountain, El Paso County, Colorado, Sections 13, 14 and 23, Township 15S, Range 65W (38° 44.1' N Latitude, 104° 37.9' W Longitude).

Permit Conditions:

General Conditions:

1. The time limit for completing the work authorized ends on December 31, 2009. If you find that you need more time to complete the authorized activity, submit your request for a time extension to this office for consideration at least one month before the above date is reached.

2. You must maintain the activity authorized by this permit in good condition and in conformance with the terms and conditions of this permit. You are not relieved of this requirement if you abandon the permitted activity, although you may make a good faith transfer to a third party in compliance with General Condition 4 below. Should you wish to cease to maintain the authorized activity or should you desire to abandon it without a good faith transfer, you must obtain a modification of this permit from this office, which may require restoration of the area.

3. If you discover any previously unknown historic or archeological remains while accomplishing the activity authorized by this permit, you must immediately notify this office of what you have found. We will initiate the Federal and state coordination required to determine if the remains warrant a recovery effort or if the site is eligible for listing in the National Register of Historic Places.

4. If you sell the property associated with this permit, you must obtain the signature of the new owner in the space provided and forward a copy of the permit to this office to validate the transfer of this authorization.

5. If a conditioned water quality certification has been issued for your project, you must comply with the conditions specified in the certification as special conditions to this permit. For your convenience, a copy of the certification is attached if it contains such conditions.

6. You must allow representatives from this office to inspect the authorized activity at any time deemed necessary to ensure that it is being or has been accomplished in accordance with the terms and conditions of your permit.

Special Conditions:

After a detailed and careful review of all of the conditions contained in this permit, the permittee acknowledges that, although said conditions were required by the Corps of Engineers, nonetheless the permittee agreed to those conditions voluntarily to facilitate issuance of the permit; the permittee will comply fully with all the terms of all the permit conditions.

1. Final bridge designs for Fontaine Boulevard and Lorson Boulevard will be submitted to the Corps of Engineers for review and approval 60 days prior to start of each bridge construction. Project construction of each structure may begin upon the Corps of Engineers' issuance of a start-of-work authorization.

2. The bank armoring for the stream preservation (lower) reach will be ungrouted stone toe with coir fabric lifts or similar materials. A final design for the stream preservation reach, including vegetation species list, will be submitted to the Corps of Engineers for review and

approval 60 days prior to start of bank armoring construction. Project construction may begin upon the Corps of Engineers' issuance of a start-of-work authorization.

3. The bank armoring for the reconfiguration (upper) reach will be armorflex, geogrid, or similar materials. The bank armoring will be covered with at least 6 inches of topsoil and seeded with grasses. The boulder grade control structures will be ungrouted. A final design for the reconfigured channel reach, including vegetation species list, will be submitted to the Corps of Engineers for review and approval 60 days prior to start of channel construction. Project construction may begin upon the Corps of Engineers' issuance of a start-of-work authorization.

4. Sloping boulder grade control structures will be ungrouted and designed to allow passage of small fish. For the stream preservation (lower) reach, the location of grade control structures and their design will be submitted to the Corps of Engineers for review and approval 60 days prior to the start of grade control structure construction.

5. Erosion control measures will be implemented to prevent upland erosion into the East Tributary of Jimmy Camp Creek. All upland areas disturbed by the permittee or their (sub)contractors located within 200 feet of the stream will be treated with erosion control measures including placing topsoil, seeding, and mulching within 21 calendar days after final grading or final earth disturbance or in accordance with the erosion control plan required by El Paso County. An erosion control plan or a summary of the County's approved plan will be provided to the Corps of Engineers within 60 days of permit issuance.

6. Noxious weeds will be controlled in all project-disturbed areas within 200 feet of the stream during the 5-year maintenance period. A plan for such control will be provided to the Corps of Engineers within 60 days of permit issuance, for review and approval.

7. A detailed mitigation plan will be provided to the Corps of Engineers within 60 days of permit issuance, for review and approval prior to start of project construction. Project construction may begin upon the Corps of Engineers' issuance of a start-of-work authorization. The plan will provide for the mitigation of the loss of 4.56 acres of wetland shrubs and the loss of riparian trees. The mitigation work will begin in the spring following winter construction (or in the fall following summer construction) and be completed within 6 months of project construction. The plan will include, but is not limited to, the following items:

- A typical cross section showing the area to be planted with shrubs and trees,
- Planting densities and number and species of trees,
- Methods and times of year for planting. (If willow stakes are used, they must be planted with no more than 6 inches of the stake exposed above the ground.) And,
- A plan for short and long term management and maintenance of the mitigation sites, including supplemental tree watering if needed,

replacement of failed plantings before the end of the 5-year monitoring period, and other contingency needs.

8. The mitigation efforts must be maintained for at least 5 years including 5 growing seasons or until the Corps of Engineers has determined that the mitigation efforts have been successful. Tree plantings will be deemed successful when 80% of the planted trees are alive at the end of the 5-year period. Willow shrub plantings will be deemed successful when 50% of the planted shrubs are alive at the end of the 5-year period.

9. An annual monitoring report of mitigation activities is required and will be sent to the Corps of Engineers by October 31 of each year. The monitoring report will include as a minimum:

- A drawing or sketch showing photographic monitoring points,
- Before and after photographs from fixed photographic location(s),
- A brief discussion of the overall success, any bare or problem areas, and a plan to remedy any problem areas.

10. A letter of intent from the local governing authority will be provided as financial assurances for construction, and for contingency and monitoring of the mitigation for the 5-year monitoring period. The assurances of the mitigation effort will be provided sufficient to hire an independent contractor to complete the proposed mitigation should the permittee default. The financial assurance for construction of the mitigation project will in an amount equal to 115 percent of the estimated cost of construction. The financial assurance for contingency and monitoring of the mitigation for the 5-year monitoring period will be in an amount equal to 25% of the construction costs and will be to assure the success of the mitigation. The letter of intent will be submitted to the Corps of Engineers, for approval, within 90 days of permit issuance.

11. Any changes to the project must be approved by the Corps of Engineers through a permit modification prior to the changes being implemented.

Further information:

1. Congressional Authorities: You have been authorized to undertake the activity described above pursuant to:

( ) Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. 403).

(XX) Section 404 of the Clean Water Act (33 U.S.C. 1344).

( ) Section 103 of the Marine Protection, Research and Sanctuaries Act of 1972 (33 U.S.C. 1413).

2. Limits of this authorization.

a. This permit does not obviate the need to obtain other Federal, state, or local authorizations required by law.

b. This permit does not grant any property rights or exclusive privileges.

c. This permit does not authorize any injury to the property or rights of others.

d. This permit does not authorize interference with any existing or proposed Federal project.

3. Limits of Federal Liability. In issuing this permit, the Federal Government does not assume any liability for the following:

a. Damages to the permitted project or uses thereof as a result of other permitted or unpermitted activities or from natural causes.

b. Damages to the permitted project or uses thereof as a result of current or future activities undertaken by or on behalf of the United States in the public interest.

c. Damages to persons, property, or to other permitted or unpermitted activities or structures caused by the activity authorized by this permit.

d. Design or construction deficiencies associated with the permitted work.

e. Damage claims associated with any future modification, suspension, or revocation of this permit.

4. Reliance on Applicant's Data: The determination of this office that issuance of this permit is not contrary to the public interest was made in reliance on the information you provided.

5. Reevaluation of Permit Decision. This office may reevaluate its decision on this permit at any time the circumstances warrant. Circumstances that could require a reevaluation include, but are not limited to, the following:

a. You fail to comply with the terms and conditions of this permit.

b. The information provided by you in support of your permit application proves to have been false, incomplete, or inaccurate (See 4 above).

c. Significant new information surfaces which this office did not consider in reaching the original public interest decision.

Such a reevaluation may result in a determination that it is appropriate to use the suspension, modification, and revocation procedures contained in 33 CFR 325.7 or enforcement procedures such as those contained in 33 CFR 326.4 and 326.5. The referenced enforcement procedures provide for the issuance of an administrative order requiring you to comply with the terms and conditions of your permit and for the initiation of legal action where appropriate. You will be required to pay for any corrective measures ordered by this office, and if you fail to comply with such directive, this office may in certain situations (such as those specified in 33 CFR 209.170) accomplish the corrective measures by contract or otherwise and bill you for the cost.

6. Extensions. General condition 1 establishes a time limit for the completion of the activity authorized by this permit. Unless there are circumstances requiring either a prompt completion of the authorized activity or a reevaluation of the public interest decision, the Corps will normally give favorable consideration to a request for an extension of this time limit.

Your signature below, as permittee, indicates that you accept and agree to comply with the terms and conditions of this permit.

(PERMITTEE)

(DATE)

This permit becomes effective when the Federal official, designated to act for the Secretary of the Army, has signed below.

Van A. Truan
Chief, Southern Colorado Regulatory Office
(for the DISTRICT ENGINEER)

22 September 2006
(DATE)

When the structures or work authorized by this permit are still in existence at the time the property is transferred, the terms and conditions of this permit will continue to be binding on the new owner(s) of the property. To validate the transfer of this permit and the associated liabilities associated with compliance with its terms and conditions, have the transferee sign and date below.

(TRANSFERREE)

(DATE)

Appendix C

Fontaine Boulevard Bridge Geotechnical Report

NCRS Soil Survey

ARCHITECTS RMG ENGINEERS

ROCKY MOUNTAIN GROUP

Geotechnical Report

Fontaine Boulevard Bridge over East Tributary of Jimmy Camp Creek Lorson Ranch El Paso County, Colorado

PREPARED FOR:

Lorson Ranch Metropolitan District No.1
212 N. Wahsatch Ave, Ste. 301
Colorado Springs, CO 80903

JOB NO. 152808

September 23, 2016

Respectfully Submitted,
RMG – Rocky Mountain Group

COLORADO LICENSED PROFESSIONAL ENGINEER NATHAN A. DOWDEN 31266 9-23-16

Nathan A. Dowden, P.E.
Sr. Geotechnical Engineer

Reviewed by

Tony Munger, P.E.
Sr. Geotechnical Engineer

TABLE OF CONTENTS

GENERAL SITE AND PROJECT DESCRIPTION

Purpose and Scope of Study

This report present the results of a geotechnical engineering study for the proposed Fontaine Boulevard Bridge over the East Tributary of Jimmy Camp Creek at Lorson Ranch in El Paso County, Colorado. The site is located in the central portion of Lorson Ranch in the east central portion of El Paso County. The location of the project site is shown on the Site Vicinity Map, Figure 1.

This report has been prepared to summarize the data obtained during this study and to present our conclusions and recommendations based on the proposed construction and the subsurface conditions encountered. Design parameters and a discussion of geotechnical engineering considerations related to the proposed structure are included in the report.

Proposed Construction

We understand a single-span bridge will be constructed to carry Fontaine Boulevard over the East Tributary of Jimmy Camp Creek. Based on the information provided by Kiowa Engineering, we understand the proposed structure is a Con-Span® Bridge with a 50-foot span. The Con-Span® Bridge will support approximately 6 feet of soil cover and vehicular traffic loads. Driven H-Piles or drilled caissons are being considered for support of the structure at the bridge abutments. Unfactored vertical loads at the abutments are anticipated to be on the order of 35-40 kips/ft.

If the proposed construction varies significantly from that described above or depicted herein, we should be notified to re-evaluate the recommendations provided herein.

Existing Site Conditions

The site is presently being developed as residential lots. West of the East Tributary of Jimmy Camp Creek, Lorson Ranch Master Planned Community is currently under construction. East of the East Tributary, the land is vacant and Lorson Ranch is preparing to develop additional residential lots. The ephemeral channel of the East Tributary trends, generally, north to south. The topography on the site generally slopes gently toward the East Tributary. At the time of drilling, the height of the creek banks was on the order of approximately 10 feet, and the creek was dry. Vegetation in the area primarily consists of occasional grass and weeds.

FIELD INVESTIGATION AND LABORATORY TESTING

Drilling

The subsurface conditions at the site were investigated by drilling two exploratory test borings. The approximate locations of the test borings are presented in the Test Boring Location Plan, Figure 2.

The test borings were advanced with a power-driven, continuous-flight auger drill rig to depths of about 44 to 24 feet below the existing ground surface at TB-1 and TB-2, respectively. Samples were obtained in general accordance with ASTM D-1586 utilizing a 2-inch OD split-barrel sampler or in general accordance with ASTM D-3550 utilizing a 2½-inch OD modified California sampler. An Explanation of Test Boring Logs is presented in Figure 3. The Test Boring Logs are presented in Figure 4.

Laboratory Testing

The moisture content for the recovered samples was obtained in the laboratory. Grain-size analysis and Atterberg Limits tests were performed on selected samples for purposes of classification and to develop pertinent engineering properties. Soil Classification Data is presented in Figure 5. A Summary of Laboratory Test Results are presented in Figure 6.

SUBSURFACE CONDITIONS

Subsurface Materials

The subsurface materials encountered in the test borings were classified using the Unified Soils Classification System (USCS) and the materials were grouped into the general categories of native silty to clayey sand, native sandy clay extending to depths of approximately 20 to 40 feet below the existing ground surface. The native sands and clays are underlaid by sandy claystone and shale bedrock with occasional seams of clayey sandstone. The claystone/shale bedrock extended to the maximum depth of drilling in each test boring.

Additional descriptions and the interpreted distribution (approximate depths) of the subsurface materials are presented on the Test Boring Logs. The classifications shown on the logs are based upon the engineer's classification of the samples at the depths indicated. Stratification lines shown on the logs represent the approximate boundaries between material types and the actual transitions may be gradual and vary with location.

Groundwater

Groundwater was observed in Test Boring 1 at a depth of 19 feet below the existing ground surface at the time of field exploration. Groundwater was not encountered in Test Boring 2 either at the time of drilling or subsequent water-level checks. Fluctuations in groundwater and subsurface moisture conditions may occur due to variations in rainfall and other factors not readily apparent at this time. Development of the site and adjacent properties may also affect groundwater levels.

CONCLUSIONS AND RECOMMENDATIONS

The following discussion is based on the subsurface conditions encountered in the test borings and on the project characteristics previously described. If conditions are different from those described in this report or the project characteristics change, RMG should be retained to review our recommendations and adjust them, if necessary.

Bridge Foundation Recommendations

We recommend the proposed bridge structure founded on driven H-piles and/or drilled pier caissons bearing in the bedrock. Both foundation systems will have the advantage that they will experience small total and differential settlements. Depending on the time of year the foundation system is constructed, we anticipate that caisson shafts may require casing during drilling and possibly dewatering because of the presence of granular soils and the possible presence of groundwater. The presence of groundwater above the bearing elevation will not impact construction of pile foundation systems. Individual piles are anticipated to have lower supporting capacities than individual caissons. Recommendations for design and construction of drilled caissons and driven H-Piles are presented below.

Driven H-Piles

The design and construction criteria presented below should be observed for design of drive H-piles.

1. H-piles should be driven to virtual refusal into the bedrock. H-piles driven to virtual refusal may be design to their structural capacity. Virtual refusal is defined in Section 502.05 of the Colorado Department of Transportation's (CDOT) "Standard Specifications for Roads and Bridge Construction" (2011). Assuming the AASHTO LRFD method is utilized for design, ultimate capacities of the piles should be calculated using an ultimate pile stress of 40 ksi for AASHTO M270 Grade 50 steel. The ultimate capacity assumes a weighted load factor of 1.6. We recommend a resistance factor of 0.5 be used for pile design.

   The AASHTO LRFD resistance factor may be increased to 0.65 if supported by site-specific Pile Driving Analyzer (PDA) testing is performed on production piles. The resistance factor may be increased to 0.75 if static load testing of production piles is performed. If dynamic load testing is conducted on a minimum of 2 percent of production piles (but no fewer than 2 piles), the resistance factor may be increased to 0.8.

2. Based on our field exploration, laboratory testing and experience with similar properly constructed driven pile foundations, we estimate individual pile settlement will be on the order of ½ inch or less when designed in accordance with the criteria presented herein. The settlement of closely spaced piles in groups may be greater and should be studied on a individual basis.

3. Assuming a computer program such as LPILE is to be used, we recommend the following parameters be used for the analysis of laterally loaded piles:

Table 1 - Soil Properties for Lateral Analysis of Piles

Material		k_s (psi/in)	k_c (psi/in)	ϕ (degrees)	c (psi)	ε_{50}	γ_m/γ_b (pci)
Granular embankment fill		90	90	32	-	-	0.075/-
Native granular soils	Above water level	90	90	30	-	-	0.070/-
	Below water level	60	60	30	-	-	-/0.035
Native cohesive soils	Above water level	750	300	-	400	0.010	0.065/-
	Below water level	500	200	-	100	0.020	-/0.033
Claystone Bedrock		2000	800	-	500	0.004	-/0.040

k_s = modulus of subgrade reaction for static loading
k_c = modulus of subgrade reaction for cyclic loading
ϕ = angle of internal friction
c = undrained shear strength
ε_{50} = strain at 50% of peak strength
γ_m = moist unit weight
γ_b = buoyant unit weight

4. Resistance to horizontal forces may be provided by battered piles. It is normal to assume a battered pile can resist the same axial load as a vertical pile of the same type and size driven to the same elevation. The vertical and horizontal components of the load will depend on the batter inclinations. Batters should not exceed 1 horizontal to 4 vertical.

5. Closely spaced piles will require appropriate reductions of the lateral and axial capacities. Reduction in lateral load capacity may be avoided by spacing piles a center-to-center distance in the direction parallel to loading of at least 6 times the pile section depth, and at least 2.5 times the section depth in the direction perpendicular to loading. For axial loading, the center-to-center pile spacing should be a minimum of three times the section depth. More closely spaced piles should be studied on an individual basis to determine the appropriate reduction in axial and lateral load design parameters.

6. In our opinion, pile tip protection will generally not be required to reduce potential damage during driving. However, the contractor should be prepared for its use if unexpected hard driving conditions are encountered.

7. The contractor should select a driving hammer according to the criteria presented in Sections 502.03 and 502.04 of the CDOT Standard Specifications.

8. We anticipate that the piles will penetrate approximately 2 to 4 feet into bedrock at the time the virtual refusal is met. Based on construction information from the previously constructed Fontaine Boulevard bridge over Jimmy Camp Creek (located approximately 0.8 mile west of the subject site), we expect penetration into the bedrock may exceed the above values. If the pile penetration into bedrock is excessive, a Pile Driving Analyzer (PDA) should be used to

evaluate the conditions and determine virtual refusal based on the pile loads and the efficiency of the hammer.

9. The pile hammer should be operated at the manufacturer's recommended stroke when measuring penetration resistance for virtual refusal.

10. The pile driving operations should be observed by a qualified representative from RMG on a full-time basis. Each pile should be observed and checked for buckling, crimping and alignment in addition to recording penetration resistance and general pile driving operations.

Drilled Caissons

The design and construction criteria presented below should be observed for design of drilled caisson foundation systems.

1. Recommended ultimate end bearing capacities and ultimate side resistance for the LRFD method are 120 and 9.0 ksf, respectively. For the LRFD method, the capacities assume a weighted load factor of 1.6 and resistance factors of 0.5 and 0.55 for end bearing and side resistance, respectively. Skin friction values are for the portion of the caisson in unweathered bedrock.

2. Caissons should penetrate at least three pier diameters or 10 feet, whichever is greater, into the bedrock.

3. Caissons should be designed to resist lateral loads using the soil parameters presented above under "Driven H-Piles."

4. Closely spaced caissons will require appropriate reductions of the lateral and axial capacities. Reduction in lateral load capacity may be avoided by spacing the caissons at a distance of at least 6 diameters from center to center in the direction parallel to loading and 2.5 diameters in the direction perpendicular to loading. For axial loading, the caissons should be spaced at a minimum 3 diameters center to center. More closely spaced piers should be studied on an individual basis to determine the appropriate reduction in axial and lateral load design parameters.

5. The pier length-to-diameter ratio should not exceed 30.

6. Based on the results of our field exploration, laboratory testing, analysis and our experience with similar, properly constructed drilled-caisson foundations, we estimate caisson settlement will be low. Generally, we estimate the settlement of caissons 4 feet or less in diameter will be approximately 1 inch or less when designed according to the criteria presented herein and the caissons are properly constructed. The settlement of closely spaced caissons will be larger and should be studied on an individual basis.

7. Caisson holes should be properly cleaned and dewatered prior to the placement of concrete.

8. The presence of water and granular soils in the exploratory borings indicates casing and/or dewatering equipment will likely be required for caissons at this site. In no case should

concrete be placed in more than 3 inches of water unless the tremie method is used. If water cannot be removed or prevented with the use of casing or dewatering equipment prior to placement of concrete, the tremie method should be used after the hole has been cleaned.

9. Casing procedures should be evaluated by the geotechnical engineer on piers which will be subjected to lateral loads. Oversizing the portion of the hole in the overburden to allow casing insertion can reduce the lateral pier capacity, particularly if the hole is processed with a dense, viscous mixture of water and soil which is not displaced from the annular space around the casing during concreting. Depending on loading conditions and construction practices, additional measures such as modification of the slurry with cementitious materials or densification of the materials around the pier top after construction may be required.
10. When water and/or a drilling slurry is present outside the casing, care should be taken that concrete of sufficiently high slump is placed to a sufficiently high elevation inside the casing to prevent intrusion of the water and/or slurry into the concrete when the casing is withdrawn.
11. The drilled shaft contractor should mobilize equipment of sufficient size and operating condition to achieve the required penetration in the very hard bedrock.
12. Concrete should be placed in caissons the same day they are drilled. The presence of water or caving soils may require that concrete be placed immediately after the caisson hole is completed. Failure to place concrete the day of drilling will normally result in a requirement for additional bedrock penetration.
13. Caisson drilling operations should be observed by a qualified representative of RMG on a full-time basis.

Bridge Abutments/Con-Span® Arches

We recommend backfill placed against the abutments/Con-Span® arches consist of granular soils meeting the requirements of a Class 1 structure backfill in Section 703.08 of the CDOT Standard Specifications. Assuming Class 1 backfill is used, we recommend earth retaining structures be designed for an equivalent fluid unit weight of 40 pcf for the active condition, 55 pcf for the at-rest condition and 45 pcf for the intermediate condition. The moisture content and compacted density of the backfill should be in accordance with Section 203.07 of the standard specifications.

Cantilevered Retaining Walls

It is our opinion cantilevered, cast-in-place (CIP) retaining walls, if utilized, may be founded on spread footings. The design and construction criteria presented below should be observed for a shallow foundation system.

1. Spread footing foundations bearing on native granular soils and/or new structural fill may be designed for an allowable bearing pressure of 1,500 psf.

2. We recommend the walls be designed for lateral earth pressure computed using the following parameters:

    Active Earth Pressure Coefficient: 0.38
    At-Rest Earth Pressure Coefficient: 0.55
    Passive Earth Pressure Coefficient: 2.66
    Moist Unit Weight: 120 pcf
    Buoyant Unit Weight: 60 pcf

    In addition to passive earth pressures, friction at the bottom of wall may be used to resist lateral loads. An allowable coefficient of friction of 0.3 may be used for foundations bearing on the native granular soils and/or new structural fill. All earth retaining walls should be designed for surcharge pressures, such as traffic, construction materials and equipment. The buildup of water behind an earth retaining structure will increase the lateral earth pressure imposed on the retaining structure.

3. The horizontal extent of the select backfill material should be equal to at least 60% of the backfill height for the active or at-rest conditions and 200% of the backfill height for the passive condition.

4. Material used for backfill of retaining earth structures should consist of a select granular material approved by the geotechnical engineer. Select granular material should have a maximum of 15% passing the No. 200 sieve and a maximum plasticity index of 10. Some of the on-site granular soils will be suitable for reuse as select granular backfill material. Backfill should be placed in uniform lifts and compacted to 95% of the maximum Modified Proctor density (AASHTO T-180) at a moisture content near optimum. Care should be taken not to overcompact the backfill since this could cause excessive lateral pressure on the walls.

5. Footings should be provided with adequate soil cover above their bearing elevation for frost protection. Placement of foundations at least 30 inches below the exterior grade is typically used in this area.

6. Structural fill placed for support of foundations should be compacted to a minimum 95% of the maximum Modified Proctor density (AASHTO T-180) at a moisture content near optimum. New fill should extend down from the edges of the footings at a minimum 1 horizontal to 1 vertical projection.

7. Structural fill should be a minus 2-inch material that has a maximum of 30% passing the No. 200 sieve, a maximum liquid limit of 30, and a maximum plasticity index of 10. Some of the tested samples of the on-site materials meet these criteria. The geotechnical engineer should approve any proposed fill material prior to placement.

8. Areas of loose material encountered within the foundation excavation should be removed and replaced with nonexpansive fill material compacted to 95% of the maximum Modified Proctor density (AASHTO T-180) near the optimum moisture content, or compacted $^{3}/_{4}$"

to 2" crushed rock. As an alternate to removal and replacement, the loose materials should be removed and the footings extended to adequate native bearing material.

9. Granular foundation soils should be densified with a smooth vibratory compactor prior to placement of concrete.

10. Depending on the ground water level and the construction depth of the proposed walls, dewatering of the excavation may be required during construction. Dewatering should be conducted by using sumps or drains well below footing elevations to avoid loss of supporting capacity of the soils.

11. The native soils at the base of the excavation may soften due to construction traffic and the presence of water. In order to reduce this problem, we recommend the contractor consider a lean concrete "mud mat." In lieu of the "mud mat," a thick layer of gravel may provide a stable working platform.

12. A qualified representative of RMG should observe all foundation excavations prior to concrete placement.

Embankments

All areas to receive fill should be stripped of topsoil and organic matter, and prepared in accordance with Section 203.06 of the CDOT Standard Specifications. Embankments placed on slopes steeper than 4:1 should be keyed into the slope in accordance with Section 203.07. After each bench is cut into the slope, the materials exposed in the bench should be inspected for any weak or disturbed materials. If encountered, such materials should be removed. Compaction of all fill should be in accordance with Section 203.07 of the CDOT Standard Specifications.

Water Soluble Sulfates

The concentration of water soluble sulfates measured in representative samples obtained from Lorson Ranch range from approximately 0.01% on a tested sample of granular soil to 0.20% to 0.23% for the tested samples of bedrock. These concentrations of water soluble sulfates represent a negligible to severe degree (at the lower range for "severe") of sulfate attack on concrete exposed to these materials. The degree of attack is based on a range of negligible, positive, severe and very severe as presented in Table 4.3.1 of ACI 318-05 (American Concrete Institute).

Based on this information, we believe special sulfate resistant cement will not be required for concrete exposed to the on-site soils. For concrete exposed to the bedrock, we recommend concrete contain ASTM C 150 Type V cement. Concrete should have a minimum cement content of 564 pounds (6 sacks) per cubic yard, have a maximum water-cement ratio (by weight) of 0.45, and have air entrainment.

The above recommendation conforms with the general guidance of the American Concrete Institute (ACI) and the Portland Cement Association (PCA). However, Type V cement may have limited local availability. When this is the case, PCA guidance suggests that project specifications should allow for equivalent alternatives provided that the equivalence can meet the requirements of Section 2.2.7 of ACI 201.2R-10.

CLOSING

This report has been prepared for the exclusive purpose of providing geotechnical engineering information and recommendations for development described in this report. RMG should be retained to review the final construction documents prior to construction to verify our findings, conclusions and recommendations have been appropriately implemented.

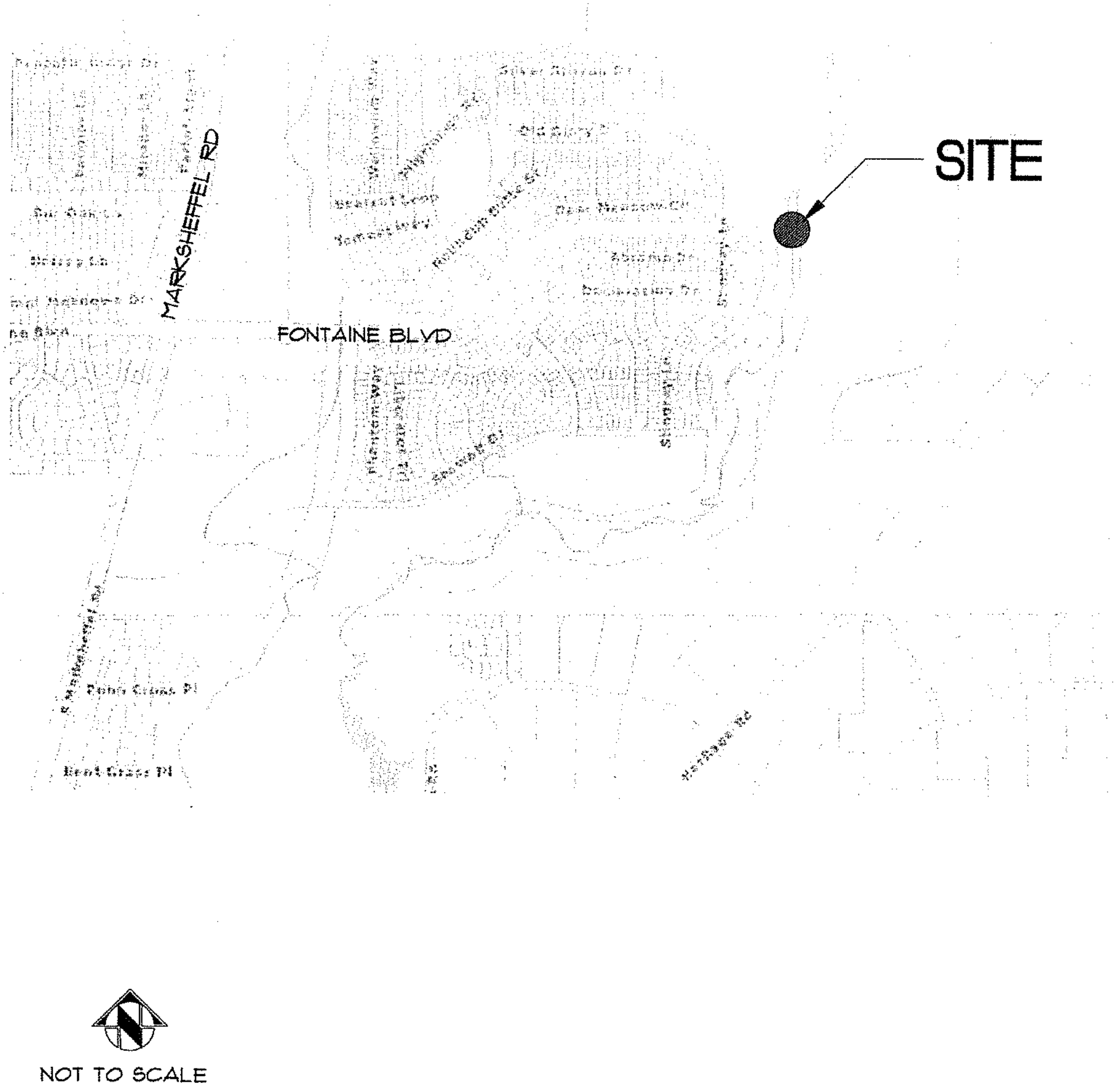
This report has been prepared for the exclusive use by **Lorson Ranch Metropolitan District No. 1** for application as an aid in the design and construction of the proposed structure in accordance with generally accepted geotechnical engineering practices. The analyses and recommendations in this report are based in part upon data obtained from test borings, site observations and the information presented herein. The nature and extent of variations in soil types and distributions, groundwater, and subsurface conditions may not become evident until construction. If variations then become evident, RMG should be retained immediately to review the recommendations presented in this report considering the varied condition, and either verify or modify them in writing.

Our professional services were performed using that degree of care and skill ordinarily exercised, under similar circumstances, by geotechnical engineers practicing in this or similar localities. RMG does not warrant the work of regulatory agencies or other third parties supplying information which may have been used during the preparation of this report. No warranty, express or implied is made by the preparation of this report. Third parties reviewing this report should draw their own conclusions regarding site conditions and specific construction techniques to be used on this project.

The scope of services for this project does not include, either specifically or by implication, environmental assessment of the site or identification of contaminated or hazardous materials or conditions. Development of recommendations for the mitigation of environmentally related conditions, including but not limited to biological or toxicological issues, are beyond the scope of this report. If the Client desires investigation into the potential for such contamination or conditions, other studies should be undertaken.

If we can be of further assistance in discussing the contents of this report or analysis of the proposed development, from a geotechnical engineering point-of-view, please feel free to contact us.

FIGURES



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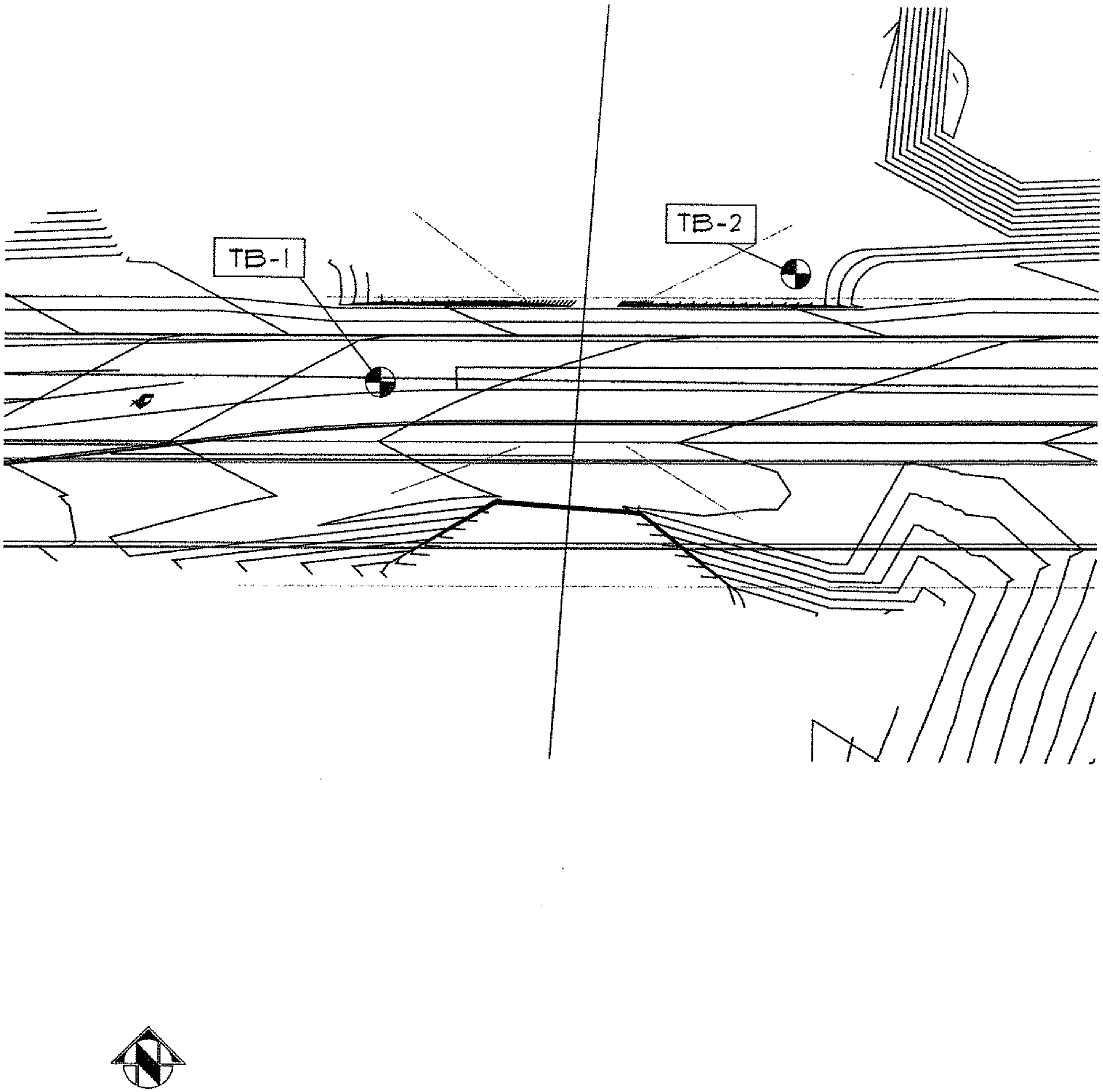
SITE VICINITY MAP

FONTAINE BOULEVARD
BRIDGE CROSSING
EL PASO COUNTY, COLORADO
LORSON RANCH METRO DISTRICT

JOB No. 152808

FIG No. 1

DATE 9-23-2016



NOT TO SCALE

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TEST BORING LOCATION PLAN

FONTAINE BOULEVARD
BRIDGE CROSSING
EL PASO COUNTY, COLORADO
LORSON RANCH METRO DISTRICT

JOB No. 152808

FIG No. 2

DATE 9-23-2016

SOILS DESCRIPTION

CLAYEY SAND

CLAYSTONE

SANDY CLAY

SHALE

SILTY SAND

SILTY TO CLAYEY SAND

SYMBOLS AND NOTES

XX STANDARD PENETRATION TEST - MADE BY DRIVING A SPLIT-BARREL SAMPLER INTO THE SOIL BY DROPPING A 140 LB. HAMMER 30", IN GENERAL ACCORDANCE WITH ASTM D-1586. NUMBER INDICATES NUMBER OF HAMMER BLOWS PER FOOT (UNLESS OTHERWISE INDICATED).

XX UNDISTURBED CALIFORNIA SAMPLE - MADE BY DRIVING A RING-LINED SAMPLER INTO THE SOIL BY DROPPING A 140 LB. HAMMER 30", IN GENERAL ACCORDANCE WITH ASTM D-3550. NUMBER INDICATES NUMBER OF HAMMER BLOWS PER FOOT (UNLESS OTHERWISE INDICATED).

FREE WATER TABLE

DEPTH AT WHICH BORING CAVED

BULK DISTURBED BULK SAMPLE

AUG AUGER "CUTTINGS"

4.5 WATER CONTENT (%)

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EXPLANATION OF TEST BORING LOGS

JOB No. 152808

FIGURE No. 3

DATE 9/23/16

TEST BORING: 1

DATE DRILLED: 9/23/16
TOB ELEV: 5733
GROUNDWATER @ 19.0' 9/23/16

	Blows per ft.	Water content %
SAND, SILTY TO CLAYEY, brown, loose to medium dense, moist	16	9.6
	15	7.8
	14	8.6
	5	13.3
CLAY, SANDY, brown, moist to wet		
SAND, SILTY, with gravel, tan, loose, moist to wet	18	15.1
CLAY, SANDY, brown, moist to wet		
CLAYSTONE, SANDY, brown to gray, moist to wet		
SHALE, SANDY, gray, very hard, moist to wet	50/3"	--

TEST BORING: 2

DATE DRILLED: 9/23/16
TOB ELEV: 5731
NO GROUNDWATER ON 9/23/16

	Blows per ft.	Water content %
CLAY, SANDY, brown, moist		
SAND, CLAYEY, brown, medium dense, moist	14	6.6
CLAY, SANDY, brown, stiff to very stiff, moist	16	11.6
	15	16.8
CLAYSTONE, SANDY, brown, medium hard, moist	50/12"	17.9
	50/8"	14.5
	50/9"	--

DEPTH (FT): 10, 20, 30, 40, 50

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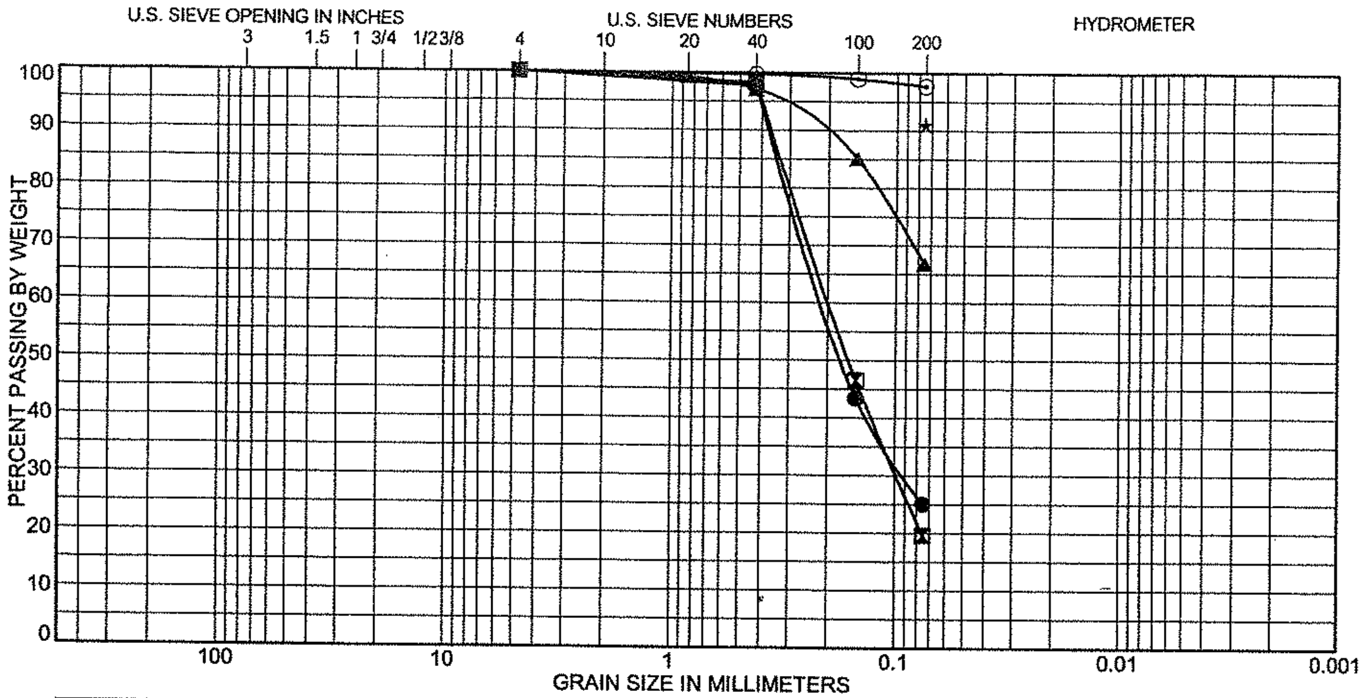
TEST BORING LOGS

JOB No. 152808

FIGURE No. 4

DATE 9/23/16



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Test Boring		Depth (ft)	Classification	LL	PL	PI
●	1	9.0	**CLAYEY SAND(SC)**	**30**	**15**	**15**
⊠	1	24.0	**SILTY SAND(SM)**	**NP**	**NP**	**NP**
▲	2	9.0	**SANDY LEAN CLAY(CL)**	**44**	**12**	**32**
★	2	14.0	**LEAN CLAY(CL)**	**39**	**13**	**26**
⊙	2	19.0	**FAT CLAY(CH)**	**56**	**15**	**41**

Test Boring		Depth (ft)	%Gravel	%Sand	%Silt	%Clay
●	1	9.0	0.0	75.0	25.0	
⊠	1	24.0	0.0	80.4	19.6	
▲	2	9.0	0.0	33.2	66.8	
★	2	14.0			91.0	
⊙	2	19.0	0.0	2.3	97.7	

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SOIL CLASSIFICATION DATA

JOB No. 152808

FIGURE No. 5

DATE 9/23/16

Test Boring No.	Depth	Water Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% Retained No.4 Sieve	% Passing No. 200 Sieve	% Swell/ Collapse	FHA Expansion Pressure (psf)
1	4.0	9.6							
1	9.0	7.8		30	15	0.0	25.0		
1	14.0	8.6							
1	19.0	13.3							
1	24.0	15.1		NP	NP	0.0	19.6		
2	4.0	6.6							
2	9.0	11.6		44	32	0.0	66.8		
2	14.0	16.8		39	26		91.0		
2	19.0	17.9		56	41	0.0	97.7		
2	24.0	14.5							

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SUMMARY OF LABORATORY TEST RESULTS

JOB No. 152808
FIGURE No. 6
PAGE 1 OF 1
DATE 9/23/16

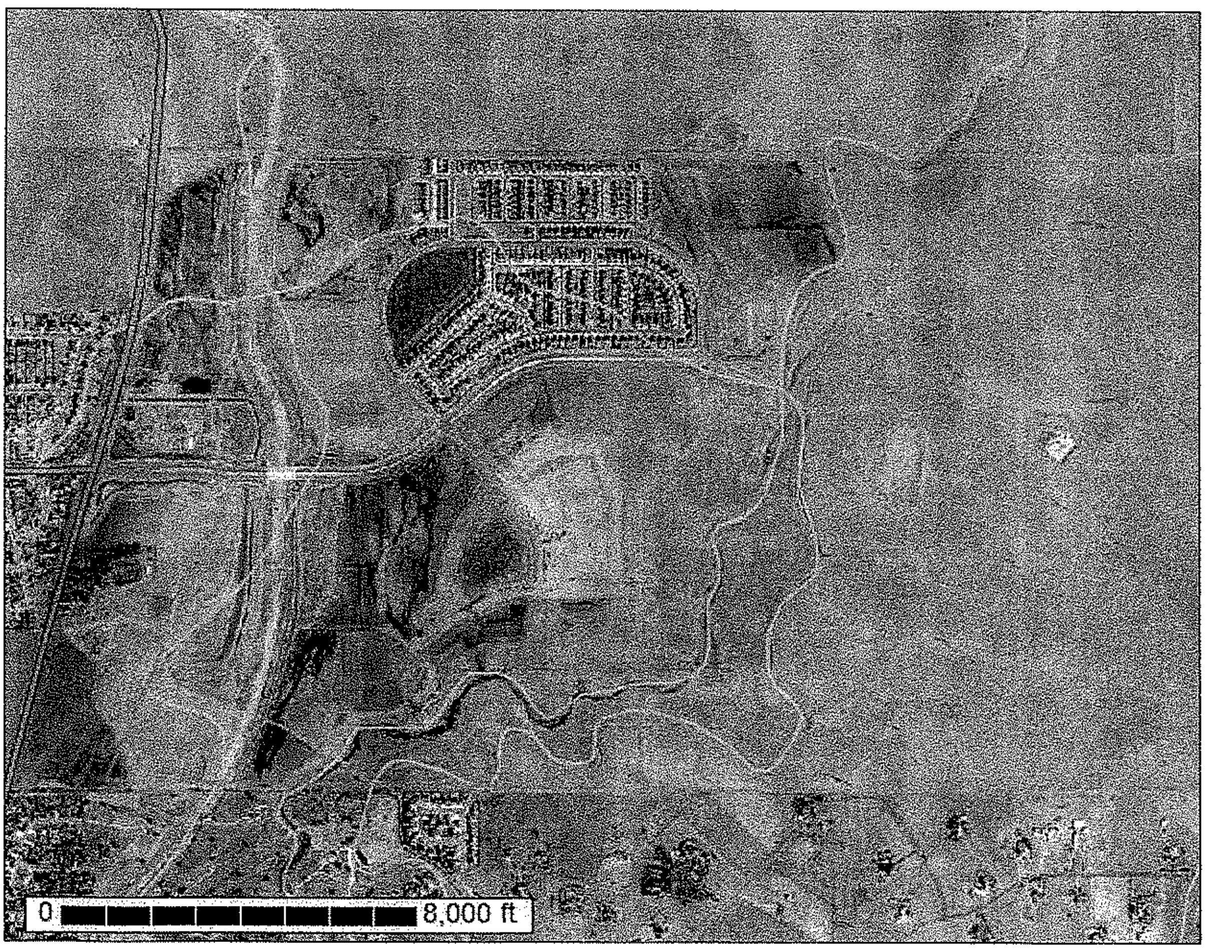
USDA United States Department of Agriculture

NRCS Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for
El Paso County Area, Colorado

Lorson Ranch



April 26, 2017

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

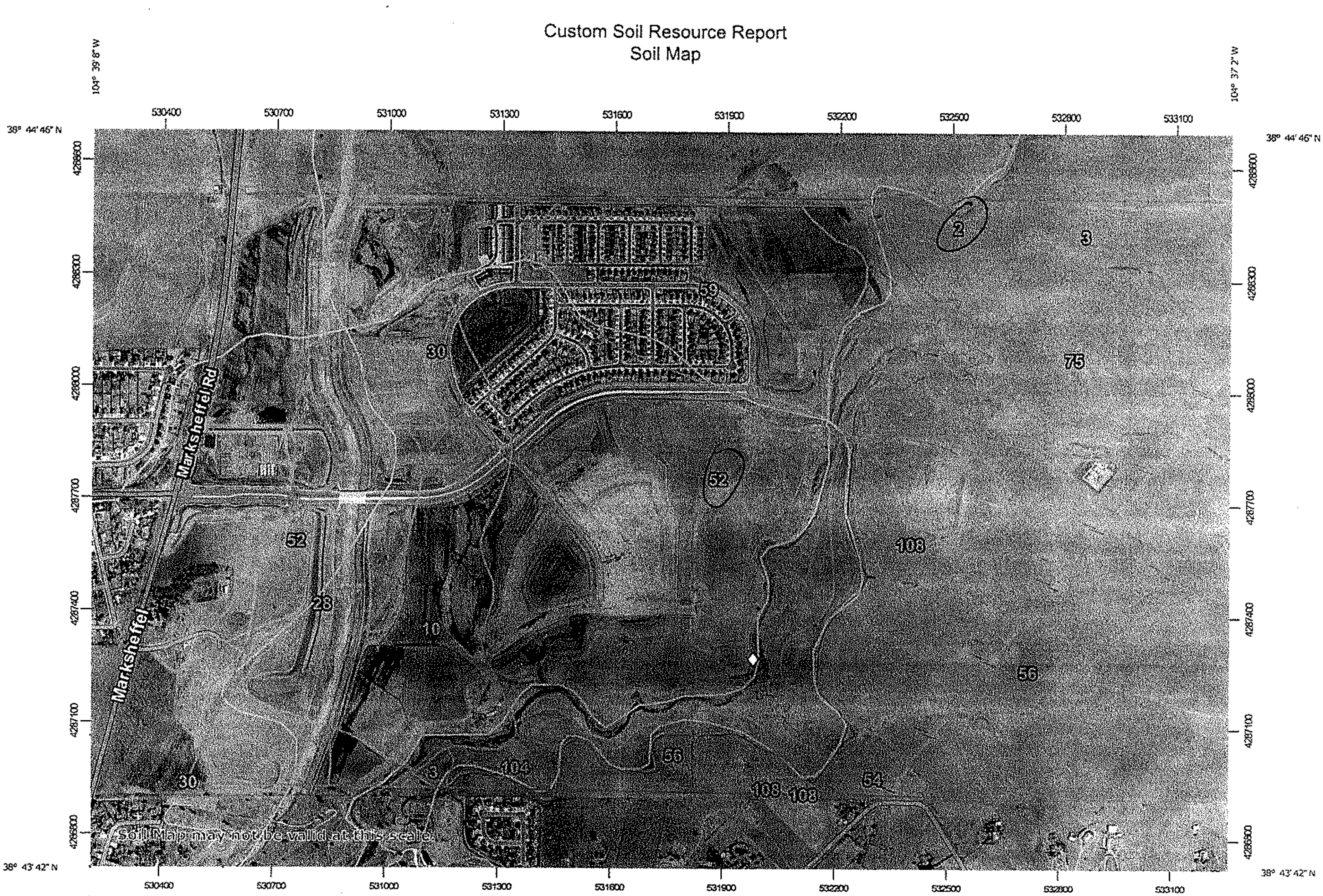
Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Soil Map



Map Scale: 1:13,900 if printed on A landscape (11" x 8.5") sheet.

0 200 400 800 1200 Meters

0 500 1000 2000 3000 Feet

N

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

MAP LEGEND

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

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

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

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 14, Sep 23, 2016

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Apr 15, 2011—Sep 22, 2011

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	12.5	1.5%
3	Ascalon sandy loam, 3 to 9 percent slopes	11.0	1.3%
10	Blendon sandy loam, 0 to 3 percent slopes	70.2	8.2%
28	Ellicott loamy coarse sand, 0 to 5 percent slopes	75.7	8.9%
30	Fort Collins loam, 0 to 3 percent slopes	24.8	2.9%
52	Manzanst clay loam, 0 to 3 percent slopes	315.6	37.0%
54	Midway clay loam, 3 to 25 percent slopes	3.7	0.4%
56	Nelson-Tassel fine sandy loams, 3 to 18 percent slopes	129.4	15.2%
59	Nunn clay loam, 0 to 3 percent slopes	85.4	10.0%
75	Razor-Midway complex	25.8	3.0%
104	Vona sandy loam, warm, 0 to 3 percent slopes	9.7	1.1%
108	Wiley silt loam, 3 to 9 percent slopes	89.2	10.5%
Totals for Area of Interest		**852.7**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

El Paso County Area, Colorado

2—Ascalon sandy loam, 1 to 3 percent slopes

Map Unit Setting

National map unit symbol: 367q
Elevation: 5,500 to 6,500 feet
Mean annual precipitation: 14 to 16 inches
Mean annual air temperature: 47 to 50 degrees F
Frost-free period: 130 to 150 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

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

Description of Ascalon

Setting

Landform: Flats
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Mixed alluvium and/or eolian deposits

Typical profile

A - 0 to 8 inches: sandy loam
Bt - 8 to 21 inches: sandy clay loam
BC - 21 to 27 inches: sandy loam
Ck1 - 27 to 48 inches: sandy loam
Ck2 - 48 to 60 inches: loamy sand

Properties and qualities

Slope: 1 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 10 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Moderate (about 7.1 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Ecological site: Sandy Plains LRU's A & B (R069XY026CO)
Other vegetative classification: SANDY PLAINS (069BY026CO)
Hydric soil rating: No

Minor Components

Other soils

Percent of map unit:
Hydric soil rating: No

Pleasant

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

3—Ascalon sandy loam, 3 to 9 percent slopes

Map Unit Setting

National map unit symbol: 2tlny
Elevation: 3,870 to 5,960 feet
Mean annual precipitation: 13 to 18 inches
Mean annual air temperature: 46 to 54 degrees F
Frost-free period: 95 to 155 days
Farmland classification: Not prime farmland

Map Unit Composition

Ascalon and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ascalon

Setting

Landform: Interfluves
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Wind-reworked alluvium and/or calcareous sandy eolian deposits

Typical profile

Ap - 0 to 6 inches: sandy loam
Bt1 - 6 to 12 inches: sandy clay loam
Bt2 - 12 to 19 inches: sandy clay loam
Bk1 - 19 to 35 inches: fine sandy loam
Bk2 - 35 to 80 inches: fine sandy loam

Properties and qualities

Slope: 3 to 9 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 5.98 in/hr)

Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 10 percent
Salinity, maximum in profile: Nonsaline (0.1 to 1.9 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 1.0
Available water storage in profile: Moderate (about 7.1 inches)

Interpretive groups

Land capability classification (irrigated): 6e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: B
Ecological site: Sandy Plains (R067BY024CO)
Hydric soil rating: No

Minor Components

Olnest

Percent of map unit: 10 percent
Landform: Interfluves
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Sandy Plains (R067BY024CO)
Hydric soil rating: No

Vona

Percent of map unit: 5 percent
Landform: Interfluves
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Sandy Plains (R067BY024CO)
Hydric soil rating: No

10—Blendon sandy loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 3671
Elevation: 6,000 to 6,800 feet
Mean annual precipitation: 14 to 16 inches
Mean annual air temperature: 46 to 48 degrees F
Frost-free period: 125 to 145 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Blendon

Setting

Landform: Alluvial fans, terraces
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Sandy alluvium derived from arkose

Typical profile

A - 0 to 10 inches: sandy loam
Bw - 10 to 36 inches: sandy loam
C - 36 to 60 inches: gravelly sandy loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 2 percent
Available water storage in profile: Moderate (about 6.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B
Ecological site: Sandy Foothill (R049BY210CO)
Hydric soil rating: No

Minor Components

Other soils

Percent of map unit:
Hydric soil rating: No

Pleasant

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

28—Ellicott loamy coarse sand, 0 to 5 percent slopes

Map Unit Setting

National map unit symbol: 3680
Elevation: 5,500 to 6,500 feet
Mean annual precipitation: 13 to 15 inches
Mean annual air temperature: 47 to 50 degrees F

Frost-free period: 125 to 145 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Ellicott

Setting

Landform: Flood plains, stream terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Sandy alluvium

Typical profile

A - 0 to 4 inches: loamy coarse sand
C - 4 to 60 inches: stratified coarse sand to sandy loam

Properties and qualities

Slope: 0 to 5 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Frequent
Frequency of ponding: None
Available water storage in profile: Low (about 4.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7w
Hydrologic Soil Group: A
Ecological site: Sandy Bottomland LRU's A & B (R069XY031CO)
Other vegetative classification: SANDY BOTTOMLAND (069AY031CO)
Hydric soil rating: No

Minor Components

Fluvaquentic haplaquoll

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

Other soils

Percent of map unit:
Hydric soil rating: No

Pleasant

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

30—Fort Collins loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 3683
Elevation: 5,200 to 6,500 feet
Mean annual precipitation: 14 to 16 inches
Mean annual air temperature: 48 to 52 degrees F
Frost-free period: 135 to 155 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

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

Description of Fort Collins

Setting

Landform: Flats
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy alluvium

Typical profile

A - 0 to 9 inches: loam
Bt - 9 to 16 inches: clay loam
Bk - 16 to 21 inches: clay loam
Ck - 21 to 60 inches: loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: High (about 10.1 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Ecological site: Loamy Plains (R067BY002CO)
Other vegetative classification: LOAMY PLAINS (069AY006CO)

Hydric soil rating: No

Minor Components

Pleasant

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

Other soils

Percent of map unit:
Hydric soil rating: No

52—Manzanst clay loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2w4nr
Elevation: 4,060 to 6,660 feet
Mean annual precipitation: 14 to 16 inches
Mean annual air temperature: 50 to 54 degrees F
Frost-free period: 130 to 170 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Manzanst and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Manzanst

Setting

Landform: Terraces, drainageways
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear, concave
Parent material: Clayey alluvium derived from shale

Typical profile

A - 0 to 3 inches: clay loam
Bt - 3 to 12 inches: clay
Btk - 12 to 37 inches: clay
Bk1 - 37 to 52 inches: clay
Bk2 - 52 to 79 inches: clay

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches

Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Gypsum, maximum in profile: 3 percent
Salinity, maximum in profile: Slightly saline (4.0 to 7.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 10.0
Available water storage in profile: High (about 9.0 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 4c
Hydrologic Soil Group: C
Ecological site: Saline Overflow (R067BY037CO)
Hydric soil rating: No

Minor Components

Ritoazul

Percent of map unit: 7 percent
Landform: Drainageways, interfluves
Landform position (three-dimensional): Rise
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Clayey Plains (R067BY042CO)
Hydric soil rating: No

Arvada

Percent of map unit: 6 percent
Landform: Drainageways, interfluves
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Salt Flat (R067XY033CO)
Hydric soil rating: No

Wiley

Percent of map unit: 2 percent
Landform: Interfluves
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Loamy Plains (R067BY002CO)
Hydric soil rating: No

54—Midway clay loam, 3 to 25 percent slopes

Map Unit Setting

National map unit symbol: 368y
Elevation: 5,200 to 6,200 feet
Mean annual precipitation: 12 to 14 inches
Mean annual air temperature: 48 to 52 degrees F
Frost-free period: 135 to 155 days
Farmland classification: Not prime farmland

Map Unit Composition

Midway and similar soils: 85 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Midway

Setting

Landform: Hills
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Slope alluvium over residuum weathered from shale

Typical profile

A - 0 to 4 inches: clay loam
C - 4 to 13 inches: clay
Cr - 13 to 17 inches: weathered bedrock

Properties and qualities

Slope: 3 to 25 percent
Depth to restrictive feature: 6 to 20 inches to paralithic bedrock
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Gypsum, maximum in profile: 15 percent
Salinity, maximum in profile: Very slightly saline to moderately saline (2.0 to 8.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 15.0
Available water storage in profile: Very low (about 2.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: D
Ecological site: Shaly Plains LRU's A & B (R069XY046CO)
Other vegetative classification: SHALY PLAINS (069AY046CO)
Hydric soil rating: No

Minor Components

Other soils

Percent of map unit:
Hydric soil rating: No

Pleasant

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

56—Nelson-Tassel fine sandy loams, 3 to 18 percent slopes

Map Unit Setting

National map unit symbol: 3690
Elevation: 5,600 to 6,400 feet
Mean annual precipitation: 12 to 14 inches
Mean annual air temperature: 48 to 52 degrees F
Frost-free period: 135 to 155 days
Farmland classification: Not prime farmland

Map Unit Composition

Nelson and similar soils: 45 percent
Tassel and similar soils: 30 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Nelson

Setting

Landform: Hills
Landform position (three-dimensional): Crest, side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Calcareous residuum weathered from interbedded sedimentary rock

Typical profile

A - 0 to 5 inches: fine sandy loam
Ck - 5 to 23 inches: fine sandy loam
Cr - 23 to 27 inches: weathered bedrock

Properties and qualities

Slope: 3 to 12 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.06 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 10 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Very low (about 2.8 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: B
Ecological site: Shaly Plains (R067BY045CO)

Other vegetative classification: SHALY PLAINS (069AY046CO)
Hydric soil rating: No

Description of Tassel

Setting

Landform: Hills
Landform position (three-dimensional): Crest, side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Calcareous slope alluvium over residuum weathered from sandstone

Typical profile

A - 0 to 4 inches: fine sandy loam
C - 4 to 10 inches: fine sandy loam
Cr - 10 to 14 inches: weathered bedrock

Properties and qualities

Slope: 3 to 18 percent
Depth to restrictive feature: 6 to 20 inches to paralithic bedrock
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 10 percent
Available water storage in profile: Very low (about 1.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: D
Ecological site: Shaly Plains (R067BY045CO)
Other vegetative classification: SHALY PLAINS (069AY046CO)
Hydric soil rating: No

Minor Components

Other soils

Percent of map unit:
Hydric soil rating: No

Pleasant

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

59—Nunn clay loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 3693
Elevation: 5,400 to 6,500 feet
Mean annual precipitation: 13 to 15 inches
Mean annual air temperature: 46 to 50 degrees F
Frost-free period: 135 to 155 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

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

Description of Nunn

Setting

Landform: Terraces, fans
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Mixed alluvium

Typical profile

A - 0 to 12 inches: clay loam
Bt - 12 to 26 inches: clay loam
BC - 26 to 30 inches: clay loam
Bk - 30 to 58 inches: sandy clay loam
C - 58 to 72 inches: clay

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Gypsum, maximum in profile: 2 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: High (about 9.8 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 3c
Hydrologic Soil Group: C

Ecological site: Clayey Plains LRU's A & B (R069XY042CO)
Other vegetative classification: CLAYEY PLAINS (069AY042CO)
Hydric soil rating: No

Minor Components

Other soils

Percent of map unit:
Hydric soil rating: No

Pleasant

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

75—Razor-Midway complex

Map Unit Setting

National map unit symbol: 369p
Elevation: 5,300 to 6,100 feet
Mean annual precipitation: 12 to 14 inches
Mean annual air temperature: 48 to 52 degrees F
Frost-free period: 135 to 155 days
Farmland classification: Not prime farmland

Map Unit Composition

Razor and similar soils: 50 percent
Midway and similar soils: 30 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Razor

Setting

Landform: Hills
Landform position (three-dimensional): Side slope
Down-slope shape: Concave, linear
Across-slope shape: Linear
Parent material: Clayey slope alluvium over residuum weathered from shale

Typical profile

A - 0 to 4 inches: stony clay loam
Bw - 4 to 22 inches: cobbly clay loam
Bk - 22 to 29 inches: cobbly clay
Cr - 29 to 33 inches: weathered bedrock

Properties and qualities

Slope: 3 to 15 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
Natural drainage class: Well drained
Runoff class: Medium

Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Gypsum, maximum in profile: 5 percent
Salinity, maximum in profile: Moderately saline to strongly saline (8.0 to 16.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 15.0
Available water storage in profile: Low (about 4.7 inches)

Interpretive groups

Land capability classification (irrigated): 6e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: D
Ecological site: Alkaline Plains LRU's A & B (R069XY047CO)
Other vegetative classification: ALKALINE PLAINS (069AY047CO)
Hydric soil rating: No

Description of Midway

Setting

Landform: Hills
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Slope alluvium over residuum weathered from shale

Typical profile

A - 0 to 4 inches: clay loam
C - 4 to 13 inches: clay
Cr - 13 to 17 inches: weathered bedrock

Properties and qualities

Slope: 3 to 25 percent
Depth to restrictive feature: 6 to 20 inches to paralithic bedrock
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Gypsum, maximum in profile: 15 percent
Salinity, maximum in profile: Very slightly saline to moderately saline (2.0 to 8.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 15.0
Available water storage in profile: Very low (about 2.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: D
Ecological site: Shaly Plains LRU's A & B (R069XY046CO)
Other vegetative classification: SHALY PLAINS (069AY045CO)

Hydric soil rating: No

Minor Components

Pleasant

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

Other soils

Percent of map unit:
Hydric soil rating: No

104—Vona sandy loam, warm, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2t516
Elevation: 3,590 to 6,000 feet
Mean annual precipitation: 14 to 16 inches
Mean annual air temperature: 50 to 54 degrees F
Frost-free period: 130 to 170 days
Farmland classification: Not prime farmland

Map Unit Composition

Vona, warm, and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Vona, Warm

Setting

Landform: Sand sheets
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Eolian sands

Typical profile

A - 0 to 5 inches: sandy loam
Bt1 - 5 to 12 inches: sandy loam
Bt2 - 12 to 17 inches: sandy loam
Bk - 17 to 41 inches: sandy loam
BCk - 41 to 79 inches: loamy sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat excessively drained

Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Gypsum, maximum in profile: 2 percent
Salinity, maximum in profile: Nonsaline to slightly saline (0.5 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 2.0
Available water storage in profile: Moderate (about 7.2 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: A
Ecological site: Sandy Plains (R067BY024CO)
Other vegetative classification: Loamy, Dry (G067BW019CO), Sandy Plains #24 (067XY024CO_2)
Hydric soil rating: No

Minor Components

Valent, warm

Percent of map unit: 5 percent
Landform: Sand sheets
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Crest, side slope
Down-slope shape: Convex
Across-slope shape: Convex
Ecological site: Deep Sand (R067BY015CO)
Other vegetative classification: Sandy, Dry (G067BW026CO), Deep Sands #15 (067XY015CO_3)
Hydric soil rating: No

Olnest, warm

Percent of map unit: 5 percent
Landform: Hillslopes
Landform position (two-dimensional): Summit, backslope
Landform position (three-dimensional): Crest, side slope
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Sandy Plains (R067BY024CO)
Other vegetative classification: Loamy, Dry (G067BW019CO)
Hydric soil rating: No

Otero

Percent of map unit: 5 percent
Landform: Hillslopes
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Side slope, head slope
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Sandy Plains (R067BY024CO)
Other vegetative classification: Loamy, Dry (G067BW019CO), SANDY PLAINS (067XY024CO_1)
Hydric soil rating: No

108—Wiley silt loam, 3 to 9 percent slopes

Map Unit Setting

National map unit symbol: 367b
Elevation: 5,200 to 6,200 feet
Mean annual precipitation: 12 to 14 inches
Mean annual air temperature: 48 to 52 degrees F
Frost-free period: 135 to 155 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Wiley

Setting

Landform: Hills
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Calcareous silty eolian deposits

Typical profile

A - 0 to 4 inches: silt loam
Bt - 4 to 16 inches: silt loam
Bk - 16 to 60 inches: silt loam

Properties and qualities

Slope: 3 to 9 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: High (about 11.5 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: B
Ecological site: Loamy Plains (R067BY002CO)
Other vegetative classification: LOAMY PLAINS (069AY006CO)
Hydric soil rating: No

Minor Components

Pleasant

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

Other soils

Percent of map unit:
Hydric soil rating: No

References

American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.

American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deep-water habitats of the United States. U.S. Fish and Wildlife Service FWS/OBS-79/31.

Federal Register. July 13, 1994. Changes in hydric soils of the United States.

Federal Register. September 18, 2002. Hydric soils of the United States.

Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.

National Research Council. 1995. Wetlands: Characteristics and boundaries.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_054262

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service, U.S. Department of Agriculture Handbook 436. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053577

Soil Survey Staff. 2010. Keys to soil taxonomy. 11th edition. U.S. Department of Agriculture, Natural Resources Conservation Service. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053580

Tiner, R.W., Jr. 1985. Wetlands of Delaware. U.S. Fish and Wildlife Service and Delaware Department of Natural Resources and Environmental Control, Wetlands Section.

United States Army Corps of Engineers, Environmental Laboratory. 1987. Corps of Engineers wetlands delineation manual. Waterways Experiment Station Technical Report Y-87-1.

United States Department of Agriculture, Natural Resources Conservation Service. National forestry manual. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/home/?cid=nrcs142p2_053374

United States Department of Agriculture, Natural Resources Conservation Service. National range and pasture handbook. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/landuse/rangepasture/?cid=stelprdb1043084

United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2_054242

United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053624

United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210. http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052290.pdf

Appendix D

East Fork Jimmy Camp Creek Conditional Letter of Map Revision

Case No. 17-08-1043R

Federal Emergency Management Agency
Washington, D.C. 20472
December 28, 2017

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

IN REPLY REFER TO:
Case No.: 17-08-1043R

The Honorable Darryl Glenn
President, El Paso County Board of County Commissioners
200 South Cascade Avenue, Suite 100
Colorado Springs, CO 80903

Community Name: El Paso County, CO
Community No.: 080059

104

Dear Mr. Glenn:

We are providing our comments with the enclosed Conditional Letter of Map Revision (CLOMR) on a proposed project within your community that, if constructed as proposed, could revise the effective Flood Insurance Study report and Flood Insurance Rate Map for your community.

If you have any questions regarding the floodplain management regulations for your community, the National Flood Insurance Program (NFIP) in general, or technical questions regarding this CLOMR, please contact the Director, Mitigation Division of the Federal Emergency Management Agency (FEMA) Regional Office in Denver, at (303) 235-4830, or the FEMA Map Information eXchange (FMIX) toll free at 1-877-336-2627 (1-877-FEMA MAP). Additional information about the NFIP is available on our website at https://www.fema.gov/national-flood-insurance-program.

Sincerely,

Patrick "Rick" F. Sacbibit, P.E., Branch Chief
Engineering Services Branch
Federal Insurance and Mitigation Administration

List of Enclosures:
Conditional Letter of Map Revision Comment Document

cc: The Honorable John Suthers
Mayor, City of Colorado Springs

Mr. Keith Curtis, P.E., CFM
Regional Floodplain Administrator
El Paso County and City of Colorado Springs

Mr. Richard N. Wray, P.E.
Principal
Kiowa Engineering Corporation

Federal Emergency Management Agency

Washington, D.C. 20472

CONDITIONAL LETTER OF MAP REVISION
COMMENT DOCUMENT

COMMUNITY INFORMATION		PROPOSED PROJECT DESCRIPTION	BASIS OF CONDITIONAL REQUEST
COMMUNITY	El Paso County Colorado (Unincorporated Areas) COMMUNITY NO.: 080059	BRIDGE CHANNELIZATION DETENTION BASIN	FLOODWAY HYDRAULIC ANALYSIS UPDATED TOPOGRAPHIC DATA
IDENTIFIER	East Tributary Jimmy Camp Creek CLOMR Lorson Ranch	APPROXIMATE LATITUDE & LONGITUDE: 38.738, -104.630 SOURCE: USGS QUADRANGLE DATUM: NAD 83	

AFFECTED MAP PANELS

TYPE: FIRM*	NO.: 08041C0957F	DATE: March 17, 1997
TYPE: FIRM	NO.: 08041C1000F	DATE: March 17, 1997

* FIRM - Flood Insurance Rate Map

FLOODING SOURCE AND REACH DESCRIPTION

Jimmy Camp Creek East Tributary - from approximately 5,260 feet upstream to approximately 13,350 feet upstream of Peaceful Valley Road

PROPOSED PROJECT DESCRIPTION

Flooding Source	Proposed Project	Location of Proposed Project
Jimmy Camp Creek East Tributary	2 New Bridges	Approximately 8,030 feet upstream and approximately 10,120 feet upstream of Peaceful Valley Road
	Channelization	From approximately 9,930 feet upstream to approximately 13,110 feet upstream of Peaceful Valley Road
	New Detention Basin	On the left bank from approximately 10,200 feet upstream to approximately 11,020 feet upstream of Peaceful Valley Road

SUMMARY OF IMPACTS TO FLOOD HAZARD DATA

Flooding Source	Effective Flooding	Proposed Flooding	Increases	Decreases
Jimmy Camp Creek East Tributary	Floodway	Floodway	Yes	Yes
	BFEs*	BFEs	Yes	Yes
	Zone AE	Zone AE	Yes	Yes
	Zone X (shaded)	Zone X (shaded)	Yes	Yes

* BFEs - Base (1-percent-annual-chance) Flood Elevations

COMMENT

This document provides the Federal Emergency Management Agency's (FEMA's) comment regarding a request for a CLOMR for the project described above. This document is not a final determination; it only provides our comment on the proposed project in relation to the flood hazard information shown on the effective National Flood Insurance Program (NFIP) map. We reviewed the submitted data and the data used to prepare the effective flood hazard information for your community and determined that the proposed project meets the minimum floodplain management criteria of the NFIP. Your community is responsible for approving all floodplain development and for ensuring that all permits required by Federal or State/Commonwealth law have been received. State/Commonwealth, county, and community officials, based on their knowledge of local conditions and in the interest of safety, may set higher standards for construction in the Special Flood Hazard Area (SFHA), the area subject to inundation by the base flood). If the State/Commonwealth, county, or community has adopted more restrictive or comprehensive floodplain management criteria, these criteria take precedence over the minimum NFIP criteria.

This comment is based on the flood data presently available. If you have any questions about this document, please contact the FEMA Map Information eXchange (FMIX) toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMC Clearinghouse, 3601 Eisenhower Avenue, Suite 500, Alexandria, VA 22304-6426. Additional information about the NFIP is available on the FEMA website at https://www.fema.gov/national-flood-insurance-program.

Patrick "Rick" F. Sacbibit, P.E., Branch Chief
Engineering Services Branch
Federal Insurance and Mitigation Administration

Federal Emergency Management Agency
Washington, D.C. 20472

CONDITIONAL LETTER OF MAP REVISION
COMMENT DOCUMENT (CONTINUED)

OTHER COMMUNITIES AFFECTED BY THIS CONDITIONAL REQUEST

CID Number: 080060 **Name:** City of Colorado Springs, CO

AFFECTED MAP PANELS

TYPE: FIRM	NO.: 08041C0957F	DATE: March 17, 1997
TYPE: FIRM	NO.: 08041C1000F	DATE: March 17, 1997

This comment is based on the flood data presently available. If you have any questions about this document, please contact the FEMA Map Information eXchange (FMIX) toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMC Clearinghouse, 3601 Eisenhower Avenue, Suite 500, Alexandria, VA 22304-6426. Additional information about the NFIP is available on the FEMA website at https://www.fema.gov/national-flood-insurance-program.

Patrick "Rick" F. Sacbibit, P.E., Branch Chief
Engineering Services Branch
Federal Insurance and Mitigation Administration

Federal Emergency Management Agency

Washington, D.C. 20472

CONDITIONAL LETTER OF MAP REVISION COMMENT DOCUMENT (CONTINUED)

COMMUNITY INFORMATION

To determine the changes in flood hazards that will be caused by the proposed project, we compared the hydraulic modeling reflecting the proposed project (referred to as the proposed conditions model) to the hydraulic modeling used to prepare the Flood Insurance Study (FIS) (referred to as the effective model). If the effective model does not provide enough detail to evaluate the effects of the proposed project, an existing conditions model must be developed to provide this detail. This existing conditions model is then compared to the effective model and the proposed conditions model to differentiate the increases or decreases in flood hazards caused by more detailed modeling from the increases or decreases in flood hazards that will be caused by the proposed project.

The table below shows the changes in the BFEs:

BFE Comparison Table

Flooding Source: Jimmy Camp Creek East Tributary		BFE Change (feet)	Location of maximum change
Existing vs. Effective	Maximum increase	0.7	Approximately 10,730 feet upstream of Peaceful Valley Road
	Maximum decrease	1.2	Approximately 11,820 feet upstream of Peaceful Valley Road
Proposed vs. Existing	Maximum increase	4.4	Approximately 10,280 feet upstream of Peaceful Valley Road
	Maximum decrease	4.5	Approximately 10,930 feet upstream of Peaceful Valley Road
Proposed vs. Effective	Maximum increase	4.3	Approximately 10,280 feet upstream of Peaceful Valley Road
	Maximum decrease	4.8	Approximately 10,930 feet upstream of Peaceful Valley Road

Increases due to the proposed project that exceed those permitted under Paragraphs (c)(10) or (d)(3) of Section 60.3 of the NFIP regulations must adhere to Section 65.12 of the NFIP regulations. With this request, your community has complied with all requirements of Paragraph 65.12(a) of the NFIP regulations. Compliance with Paragraph 65.12(b) also is necessary before FEMA can issue a Letter of Map Revision when a community proposes to permit encroachments into the effective regulatory floodway that will cause BFE increases in excess of those permitted under Paragraph 60.3(d)(3).

NFIP regulations Subparagraph 60.3(b)(7) requires communities to ensure that the flood-carrying capacity within the altered or relocated portion of any watercourse is maintained. This provision is incorporated into your community's existing floodplain management ordinances; therefore, responsibility for maintenance of the altered or relocated watercourse, including any related appurtenances such as bridges, culverts, and other drainage structures, rests with your community. We may request that your community submit a description and schedule of maintenance activities necessary to ensure this requirement.

This comment is based on the flood data presently available. If you have any questions about this document, please contact the FEMA Map Information eXchange (FMIX) toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMC Clearinghouse, 3601 Eisenhower Avenue, Suite 500, Alexandria, VA 22304-6426. Additional information about the NFIP is available on the FEMA website at https://www.fema.gov/national-flood-insurance-program.

Patrick "Rick" F. Sacbibit, P.E., Branch Chief
Engineering Services Branch
Federal Insurance and Mitigation Administration

Federal Emergency Management Agency

Washington, D.C. 20472

CONDITIONAL LETTER OF MAP REVISION COMMENT DOCUMENT (CONTINUED)

COMMUNITY INFORMATION (CONTINUED)

DATA REQUIRED FOR FOLLOW-UP LOMR

Upon completion of the project, your community must submit the data listed below and request that we make a final determination on revising the effective FIRM and FIS report. If the project is built as proposed and the data below are received, a revision to the FIRM and FIS report would be warranted.

• Detailed application and certification forms must be used for requesting final revisions to the maps. Therefore, when the map revision request for the area covered by this letter is submitted, Form 1, entitled "Overview and Concurrence Form," must be included. A copy of this form may be accessed at https://www.fema.gov/media-library/assets/documents/1343.

• The detailed application and certification forms listed below may be required if as-built conditions differ from the proposed plans. If required, please submit new forms, which may be accessed at https://www.fema.gov/media-library/assets/documents/1343, or annotated copies of the previously submitted forms showing the revised information.

Form 2, entitled "Riverine Hydrology and Hydraulics Form." Hydraulic analyses for as-built conditions of the base flood, the 10-percent, 2-percent, and 0.2-percent-annual-chance floods, and the regulatory floodway, must be submitted with Form 2.

Form 3, entitled "Riverine Structures Form."

• A certified topographic work map showing the revised and effective base and 0.2-percent-annual-chance floodplain and floodway boundaries. Please ensure that the revised information ties-in with the current effective information at the downstream and upstream ends of the revised reach.

• An annotated copy of the FIRM, at the scale of the effective FIRM, that shows the revised base and 0.2-percent-annual-chance floodplain and floodway boundary delineations shown on the submitted work map and how they tie-in to the base and 0.2-percent-annual-chance floodplain and floodway boundary delineations shown on the current effective FIRM at the downstream and upstream ends of the revised reach.

• As-built plans, certified by a registered Professional Engineer, of all proposed project elements.

• A copy of the public notice distributed by your community stating its intent to revise the regulatory floodway, or a signed statement by your community that it has notified all affected property owners and affected adjacent jurisdictions.

• Documentation of the individual legal notices sent to property owners who will be affected by any widening or shifting of the base floodplain and/or any BFE increases along Jimmy Camp Creek East Tributary.

This comment is based on the flood data presently available. If you have any questions about this document, please contact the FEMA Map Information eXchange (FMIX) toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMC Clearinghouse, 3601 Eisenhower Avenue, Suite 500, Alexandria, VA 22304-6426. Additional information about the NFIP is available on the FEMA website at https://www.fema.gov/national-flood-insurance-program.

Patrick "Rick" F. Sacbibit, P.E., Branch Chief
Engineering Services Branch
Federal Insurance and Mitigation Administration

Federal Emergency Management Agency

Washington, D.C. 20472

CONDITIONAL LETTER OF MAP REVISION COMMENT DOCUMENT (CONTINUED)

COMMUNITY INFORMATION (CONTINUED)

DATA REQUIRED FOR FOLLOW-UP LOMR (continued)

• FEMA's fee schedule for reviewing and processing requests for conditional and final modifications to published flood information and maps may be accessed at https://www.fema.gov/forms-documents-and-software/flood-map-related-fees. The fee at the time of the map revision submittal must be received before we can begin processing the request. Payment of this fee can be made through a check or money order, made payable in U.S. funds to the National Flood Insurance Program, or by credit card (Visa or MasterCard only). Please either forward the payment, along with the revision application, to the following address:

LOMC Clearinghouse
Attention: LOMR Manager
3601 Eisenhower Avenue, Suite 500
Alexandria, Virginia 22304-6426

or submit the LOMR using the Online LOMC portal at: https://hazards.fema.gov/femaportal/onlinelomc/signin

After receiving appropriate documentation to show that the project has been completed, FEMA will initiate a revision to the FIRM and FIS report. Because the flood hazard information (i.e., base flood elevations, base flood depths, SFHAs, zone designations, and/or regulatory floodways) will change as a result of the project, a 90-day appeal period will be initiated for the revision, during which community officials and interested persons may appeal the revised flood hazard information based on scientific or technical data.

This comment is based on the flood data presently available. If you have any questions about this document, please contact the FEMA Map Information eXchange (FMIX) toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMC Clearinghouse, 3601 Eisenhower Avenue, Suite 500, Alexandria, VA 22304-6426. Additional information about the NFIP is available on the FEMA website at https://www.fema.gov/national-flood-insurance-program.

Patrick "Rick" F. Sacbibit, P.E., Branch Chief
Engineering Services Branch
Federal Insurance and Mitigation Administration

Federal Emergency Management Agency

Washington, D.C. 20472

CONDITIONAL LETTER OF MAP REVISION COMMENT DOCUMENT (CONTINUED)

COMMUNITY INFORMATION (CONTINUED)

COMMUNITY REMINDERS

We have designated a Consultation Coordination Officer (CCO) to assist your community. The CCO will be the primary liaison between your community and FEMA. For information regarding your CCO, please contact:

Ms. Jeanine P. Petterson
Director, Mitigation Division
Federal Emergency Management Agency, Region VIII
Denver Federal Center, Building 710
P.O. Box 25267
Denver, CO 80225-0267
(303) 235-4830

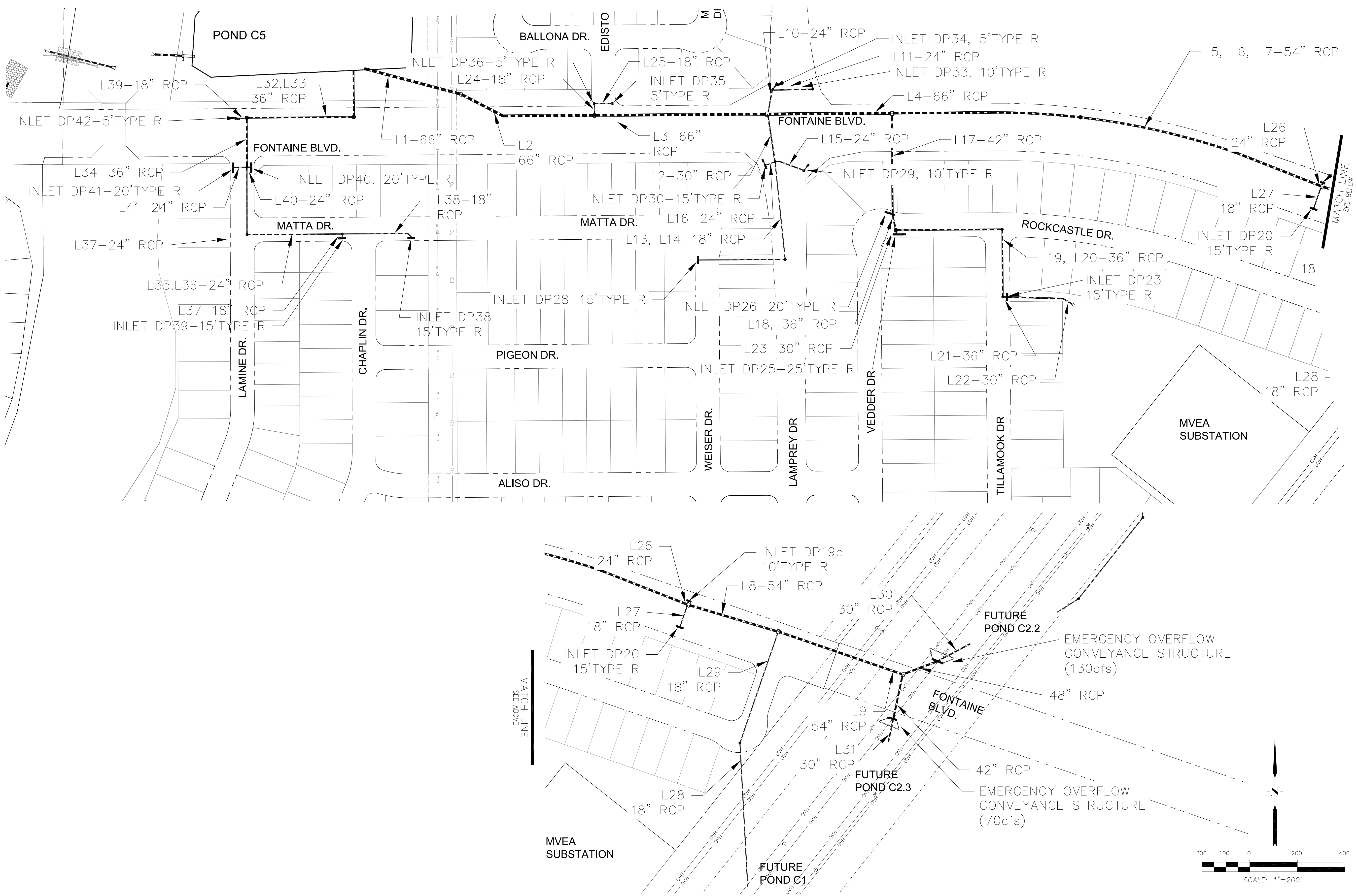
A preliminary study is being conducted for El Paso County, Colorado, and Incorporated Areas. Preliminary copies of the revised FIRM and FIS report were submitted to your community for review on July 29, 2015, and may become effective before the revision request following this CLOMR is submitted. Please ensure that the data submitted for the revision ties into the data effective at the time of the submittal.

This comment is based on the flood data presently available. If you have any questions about this document, please contact the FEMA Map Information eXchange (FMIX) toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMC Clearinghouse, 3601 Eisenhower Avenue, Suite 500, Alexandria, VA 22304-6426. Additional information about the NFIP is available on the FEMA website at https://www.fema.gov/national-flood-insurance-program.

Patrick "Rick" F. Sacbibit, P.E., Branch Chief
Engineering Services Branch
Federal Insurance and Mitigation Administration

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: 719.570.1100
CONTACT: RICHARD L. SCHINDLER, P.E.
EMAIL: Rich@ceg1.com

NO.	DESCRIPTION	DATE

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

PROJECT:
LORSON RANCH EAST
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

APPENDIX I – PIONEER LANDING 2 FINAL DRAINAGE REPORT EXCERPTS FOR POND B1

NEW DOC

FINAL DRAINAGE REPORT

PIONEER LANDING
FILING NO. 2

JUNE 30, 2016

Prepared for:

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

Prepared by:

Core Engineering Group, LLC
15004 1st Avenue S.
Burnsville, MN 55306
(719) 570-1100

Project No. 100.028

CORE
ENGINEERING GROUP

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

OWNER'S STATEMENT

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

Lorson, LLC 7/26/16

Business Name Date

By

Jeff Mark, Manager

Title

212 North Wahsatch Avenue, Suite 301

Address

Colorado Springs, Colorado 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, dated March 17, 1997. (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.

8 Aug 2016

(printed name) Date

County Engineer/ECM Administrator

Pioneer Landing Filing No.2 Final Plat contains 46.34 acres. Lots with the future Filing No. 3 (Tracts G, H, & K) totaling 1.84 acres have been removed from fee calculations and will be paid when Filing No. 3 is platted. The remaining 44.5 acres will be assessed Drainage, Bridge and Surety fees. This project has a percent impervious of 53%, this is based on 0.138 acre lots obtained from the "Addendum; Revised Drainage Basin Fees Based on Impervious Area". The 2015 drainage fees are $15,720, bridge fees are $735 and Drainage Surety fees are $7,000 per impervious acre. The fees are calculated as follows:

Table 1: Drainage/Bridge Fees

Type of Land Use	Total Area (ac)	Imperviousness	Drainage Fee	Bridge Fee	Surety Fee
Residential	44.5	53%	$370,756	$17,335	$165,095
		Total	$370,756	$17,335	$165,095

Construction costs of on-site storm sewer are not reimbursable.

8.0 DETENTION AND WATER QUALITY POND

According to the MDDP1 Lorson Ranch is required to limit developed discharge to near historic conditions for this study area and includes permanent detention facilities. The proposed Pond B1 meets the MDDP1 requirements and will discharge east to the East Tributary of Jimmy Camp Creek.

Pond B1 exists today but was constructed several years ago (with Ponderosa Filing No. 2) with a temporary outlet structure that discharged into the East Tributary. The existing pond and outlet structure have not been sized for the developed conditions of Pioneer Landing Filing No. 2 and the reconstructed conditions of the East Tributary. For example, the temporary outlet pipe was constructed to discharge at the existing elevation of the creek. The East Tributary is now reconstructed and the outlet pipe can be lowered thus increasing the volume of the pond. Both the volume for detention and for water quality must be increased to meet the developed conditions of Pioneer Landing Filing No. 2 thus requiring reconstruction of a small portion of Pond B1. New El Paso County regulations require that the 100-year volume of the pond must meet Full Spectrum Analysis size. The 100-year full spectrum size is 5.75ac-ft and the design volume is 6.15 ac-ft.

Pond B1 reconstruction includes a new access road to the bottom on the north side, lowering the bottom around 3 feet, new permanent outlet structure, new overflow wier, and new forebays at the two new storm sewer locations for water quality. The upper elevations of the pond will remain the same as well as the swale on the south side. The south swale will not be removed until Fontaine Boulevard is constructed over the East Tributary at which time new storm sewer will replace the swale.

The Pond B1 calculations have been included in the appendix of this report. Pond B1 is an extended detention basin and a dual stage outlet structure for detention (5/100yr) and includes a water quality plate. The outlet structure of the pond consists of a CDOT Type C inlet (riser) connecting to a 24" RCP outlet pipe.

<u>Water Quality</u>

In the appendix of this report is a map of the area to be treated for water quality. The design area includes a portion from Ponderosa Filing No. 1, a portion of Pioneer Landing Filing No. 1, nearly all of Pioneer Landing Filing No. 2, and the future Fontaine Boulevard over the East Tributary as shown on the map. Basin B5.1 flows north to an existing swale where the backyards and swale will remove sediment/pollutants from the runoff. Basin B5.2 consists of open space and backyards and drains overland to the East Tributary. The grass backyards and the buffer from the creek will remove sediment and pollutants from the runoff. All other areas will drain to Pond B1 for treatment of water quality.

Table 1: Water Quality Pond Summary (Pond B1)

Pond	Tributary Area	WQCV Req.	WQCV Provided	WSEL
Pond B1	51.24 ac	1.3 ac-ft	1.6 ac-ft	5708.50

Table 2: Detention Pond Data (Pond B1 – 5yr)

Pond (5 yr.)	Incoming Flow	Pond Discharge	WSEL	Storage (ac-ft)	Water Quality
Pond B1	99 cfs	4.0 cfs	5710.83	3.9	yes

Table 3: Detention Pond Data (Pond B1– 100yr)

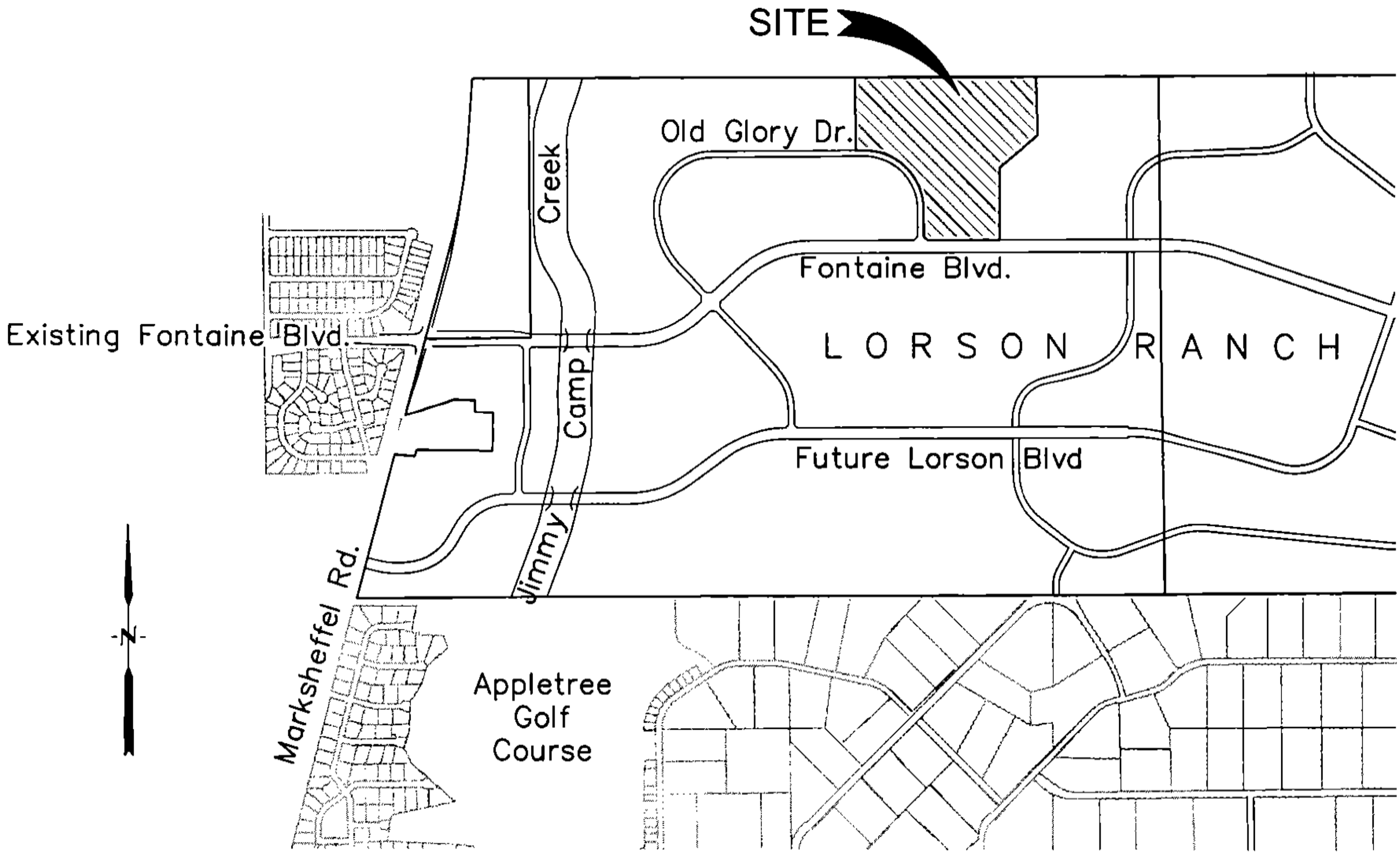
Pond (100 yr.)	Incoming Flow	Pond Discharge	WSEL	Storage (ac-ft)	Water Quality
Pond B1	201 cfs	9.0 cfs	5712.71	6.15	yes

Based on the above tables of design flows from Pond B1, the release rates are less than the amounts of 13cfs/65cfs in the 5/100yr storms per the approved MDDP1 for Lorson Ranch and meet full spectrum pond sizing.

9.0 FEMA 100-YEAR FLOODPLAIN

Core Engineering has submitted a LOMR to FEMA in June, 2013 which calculated and depicted the new 100-year floodplain. The LOMR is approved and is now effective. For the purposes of this drainage report, we are designing all houses and infrastructure to be above the calculated/FEMA 100-year floodplain. The revised floodplain elevations and limits will be shown on the drainage maps as well as the existing old floodplain limits as depicted on the old FIRM map.

Portions of this site do fall within the 100-year floodplain limits. Since final plats cannot include lots located within the floodplain, the plat will be split into two phases. The west side will be phase 1 and the east side (containing floodplain) will be in phase 2. This will allow the developer to plat phase 1 (contains no floodplain). In conjunction with phase 1, the developer will secure a regional floodplain permit, work within FEMA regulations, and grade both phase 1 and 2 via a Pre-Development Site Grading Plan. This will raise the ground elevations in Phase 2 above the 100-year flood elevations. After the Pre-Development Grading is complete, a LOMR-F will be submitted to FEMA for Phase 2



CORE
ENGINEERING GROUP

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

PIONEER LANDING FILING NO. 2
VICINITY MAP

SCALE:	DATE:	FIGURE NO.
NTS	AUGUST, 2014	--

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Design Procedure Form: Extended Detention Basin (EDB) - Sedimentation Facility

Designer:	**Richard Schindler**
Company:	**Core Engineering Group**
Date:	**March, 2015**
Project:	**Pioneer Landing 2 at Lorson Ranch**
Location:	**Pond B1**

1. Basin Storage Volume			
	I_a =	65.00	%
A) Tributary Area's Imperviousness Ratio ($i = I_a / 100$)	i =	0.65	
B) Contributing Watershed Area (Area)	Area =	51.24	acres
C) Water Quality Capture Volume (WQCV) ($WQCV = 1.0 * (0.91 * I^3 - 1.19 * I^2 + 0.78 * I)$)	WQCV =	0.25	watershed inches
D) Design Volume: Vol = (WQCV / 12) * Area * 1.2	Vol =	1.302	acre-feet
2. Outlet Works			
A) Outlet Type (Check One)	X	Orifice Plate	
		Perforated Riser Pipe	
		Other:	
B) Depth at Outlet Above Lowest Perforation (H)	H =	2.00	feet
C) Required Maximum Outlet Area per Row, (A_o)	A_o =	2.77	square inches
D) Perforation Dimensions **(enter one only)**:			
i) Circular Perforation Diameter **OR**	D =	1.7500	inches, **OR**
ii) 2" Height Rectangular Perforation Width	W =		inches
E) Number of Columns (nc, See Table 6a-1 For Maximum)	nc =	1	number
F) Actual Design Outlet Area per Row (A_o)	A_o =	2.41	square inches
G) Number of Rows (nr)	nr =	6	number
H) Total Outlet Area (A_{ot})	A_{ot} =	14.43	square inches
3. Trash Rack			
A) Needed Open Area: $A_t = 0.5 * (\text{Figure 7 Value}) * A_{ot}$	A_t =	447	square inches
B) Type of Outlet Opening (Check One)	X	≤ 2" Diameter **Round**	
		2" High **Rectangular**	
		Other:	
C) For 2", or Smaller, **Round Opening** (Ref.: Figure 6a):			
i) Width of Trash Rack and Concrete Opening (W_{conc}) from Table 6a-1	W_{conc} =	18	inches
ii) Height of Trash Rack Screen (H_{TR})	H_{TR} =	48	inches

Design Procedure Form: Extended Detention Basin (EDB) - Sedimentation Facility

Designer:	**Richard Schindler**
Company:	**Core Engineering Group**
Date:	**March, 2015**
Project:	**Pioneer Landing 2 at Lorson Ranch**
Location:	**Pond B1**

iii) Type of Screen (Based on Depth H), Describe if "Other"	**X** S.S. #93 VEE Wire (US Filter) Other:
iv) Screen Opening Slot Dimension, Describe if "Other"	**X** 0.139" (US Filter) Other:
v) Spacing of Support Rod (O.C.) Type and Size of Support Rod (Ref.: Table 6a-2)	1.00 inches **TE 0.074 in. x 0.50 in.**
vi) Type and Size of Holding Frame (Ref.: Table 6a-2)	**0.75 in. x 1.00 in. angle**
D) For 2" High **Rectangular Opening** (Refer to Figure 6b):	
I) Width of Rectangular Opening (W)	W = ______ inches
ii) Width of Perforated Plate Opening (W_{conc} = W + 12")	W_{conc} = ______ inches
iii) Width of Trashrack Opening ($W_{opening}$) from Table 6b-1	$W_{opening}$ = ______ inches
iv) Height of Trash Rack Screen (H_{TR})	H_{TR} = ______ inches
v) Type of Screen (based on depth H) (Describe if "Other")	______ Klemp™ KPP Series Aluminum ______ Other:
vi) Cross-bar Spacing (Based on Table 6b-1, Klemp™ KPP Grating). Describe if "Other"	______ inches ______ Other:
vii) Minimum Bearing Bar Size (Klemp™ Series, Table 6b-2) (Based on depth of WQCV surcharge)	
4. Detention Basin length to width ratio	2.00 (L/W)
5 Pre-sedimentation Forebay Basin - Enter design values	
A) Volume (5 to 10% of the Design Volume in 1D)	0.065 acre-feet
B) Surface Area	0.082 acres — 1 at 45'x45' 1 at 20'x20'
C) Connector Pipe Diameter (Size to drain this volume in 5-minutes under inlet control)	8 inches — (2 each)
D) Paved/Hard Bottom and Sides	**no** yes/no — rip rap

Design Procedure Form: Extended Detention Basin (EDB) - Sedimentation Facility

Designer:	**Richard Schindler**
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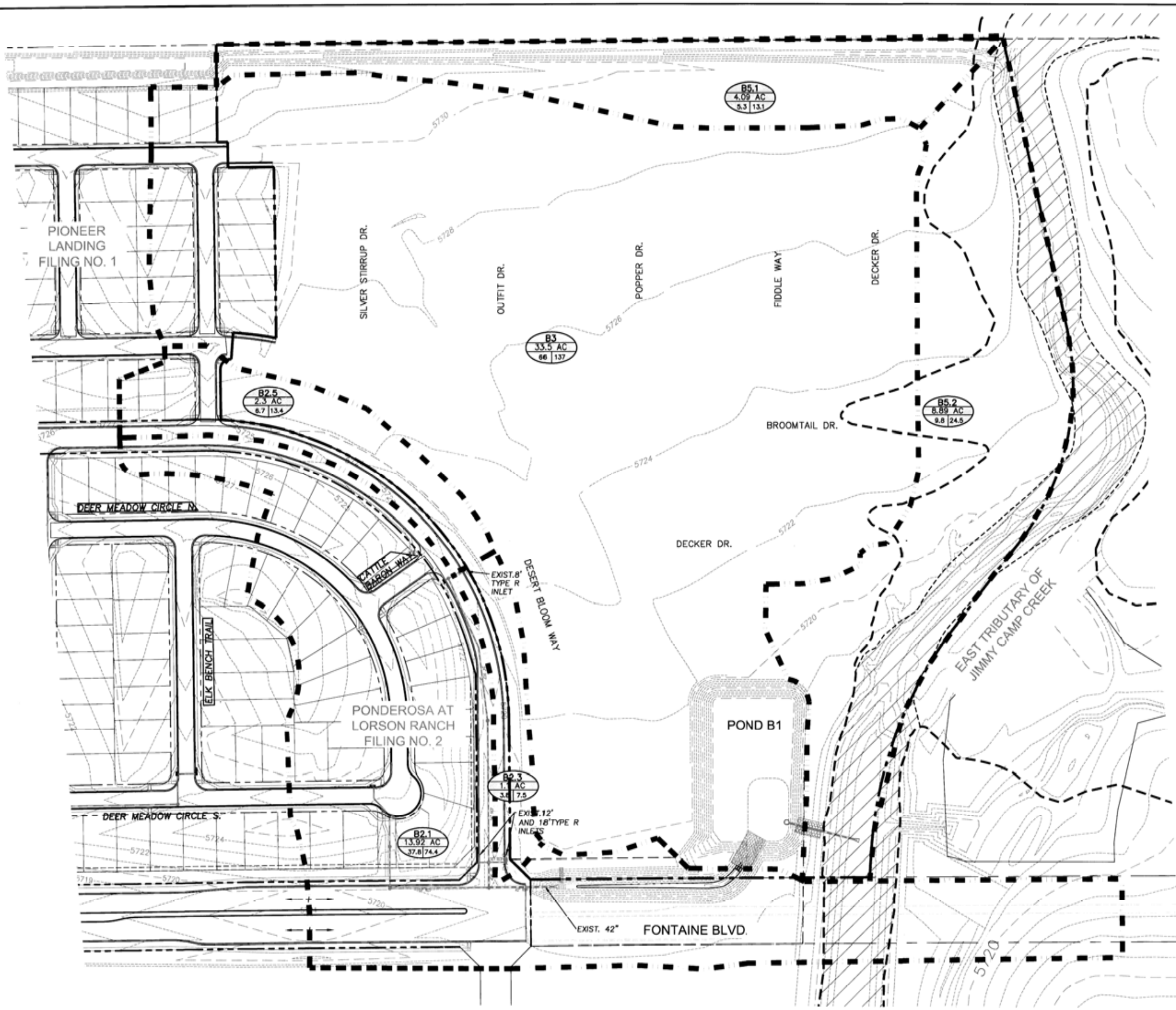
Date:	**March, 2015**
Project:	**Pioneer Landing 2 at Lorson Ranch**
Location:	**Pond B1**

6. Two-Stage Design	
A) Top Stage (D_{WQ} = 2' Minimum)	D_{WQ} = 2.00 feet Storage= 1.430 acre-feet
B) Bottom Stage (D_{BS} = D_{WQ} + 1.5' Minimum, D_{WQ} + 3.0' Maximum, Storage = 5% to 15% of Total WQCV)	D_{BS} = 3.50 feet Storage= 0.100 acre-feet Surf. Area= 0.029 acres
C) Micro Pool (Minimum Depth = the Larger of 0.5 * Top Stage Depth or 2.5 Feet)	Depth= 2.50 feet Storage= 0.001 acre-feet Surf. Area= 0.001 acres
D) Total Volume: Vol_{tot} = Storage from 5A + 6A + 6B Must be ≥ Design Volume in 1D	Vol_{tot} = 1.595 acre-feet
7. Basin Side Slopes (Z, horizontal distance per unit vertical) Minimum Z = 3, Flatter Preferred	Z = 4.00 (horizontal/vertical)
8. Dam Embankment Side Slopes (Z, horizontal distance) per unit vertical) Minimum Z = 3, Flatter Preferred	Z = 4.00 (horizontal/vertical)
9. Vegetation (Check the method or describe "Other")	X Native Grass __ Irrigated Turf Grass __ Other:

Notes:



NOTE:

1. PROPOSED DETENTION POND B1 PROVIDES WATER QUALITY FOR BASINS B2.1, B2.3, B2.5, B3, AND B4.

LEGEND

	SITE BOUNDARY
	DRAINAGE MAJOR BASIN BOUNDARY
BASIN XX AC XX X.X	BASIN I.D. ACREAGE 5 YR/100 YR CFS
	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
	CALCULATED 100-YR FLOODPLAIN
	CALCULATED 100-YR FLOODWAY

N

100 50 0 100 200

SCALE: 1"=100'

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NO. | DESCRIPTION | DATE

DRAWN: RLS
DESIGNED: RLS
CHECKED: RLS

PROJECT: PIONEER LANDING FILING 2
FONTAINE BLVD. - OLD GLORY DRIVE
EL PASO COUNTY, COLORADO

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

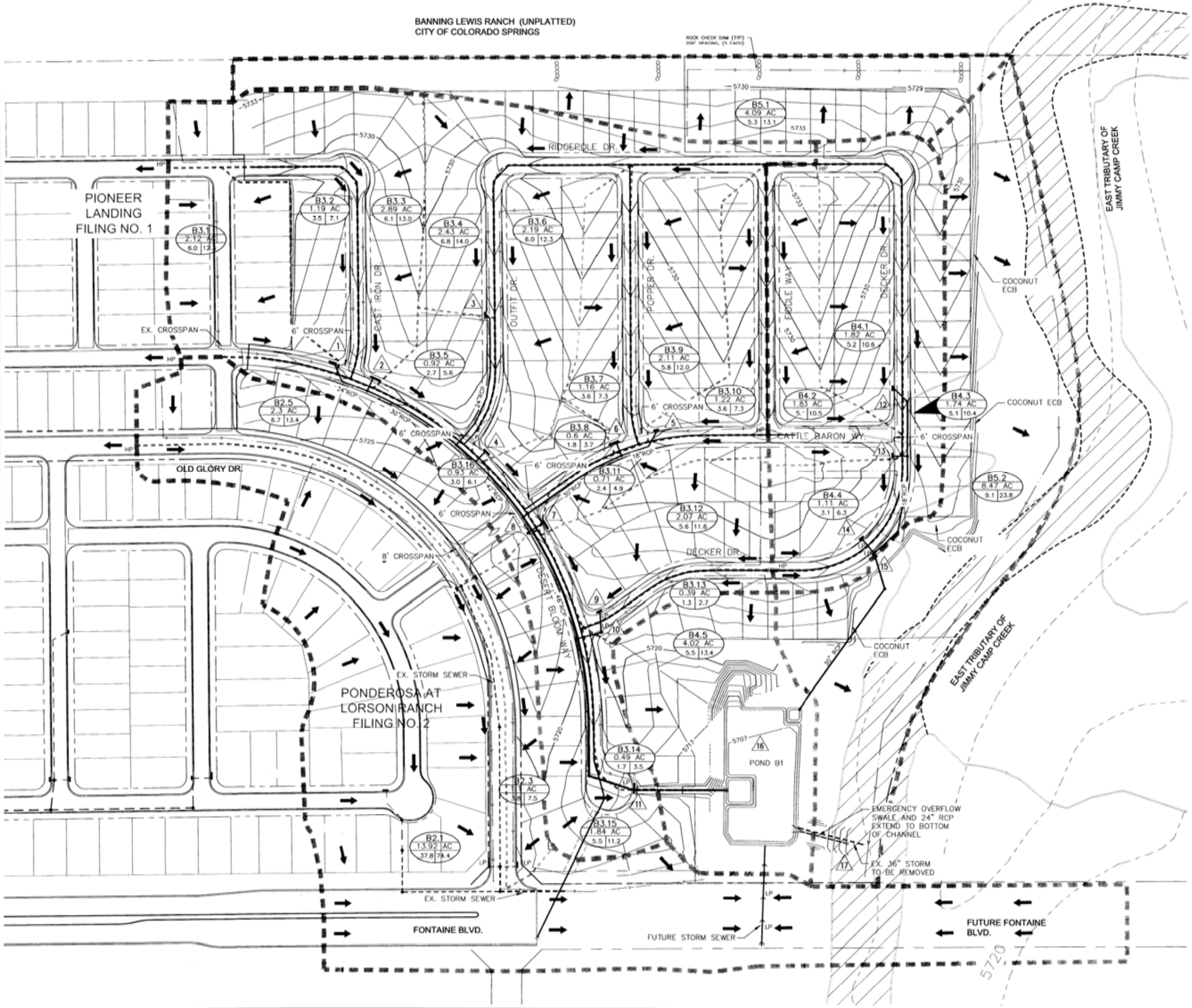
EXISTING CONDITIONS AND DETENTION/WQ AREA PIONEER LANDING FILING NO. 2

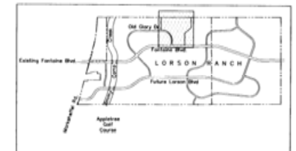
DATE
JUNE 30, 2016

PROJECT NO.
100.028

SHEET NUMBER
1

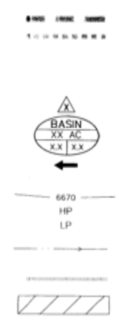
TOTAL SHEETS: 1





VICINITY MAP

DESIGN POINT SUMMARY TABLE				
DP	Q5	Q100	COMMENTS	INLET SIZE
1	6.0	12.3	BASIN FLOW	15' TYPE R
2	9.6	20.1	BASIN FLOW	20' TYPE R
3	6.8	14.0	BASIN FLOW	12' TYPE R
4	8.7	17.9	BASIN FLOW	15' TYPE R
5	3.6	7.3	BASIN FLOW	10' TYPE R
6	9.4	17.3	BASIN FLOW	20' TYPE R
7	4.2	8.6	BASIN FLOW	20' TYPE R
8	3.0	6.1	BASIN FLOW	5' TYPE R
9	5.6	11.6	BASIN FLOW	10' TYPE R
10	1.3	2.7	BASIN FLOW	5' TYPE R
11	7.2	14.7	BASIN FLOW	20' TYPE R
11	48	107	FLOW IN 48" RCP INTO POND	15' TYPE R
				15' TYPE R
12	5.2	10.6	BASIN FLOW	5' TYPE R
13	5.1	10.5	BASIN FLOW	10' TYPE R
14	3.1	6.3	BASIN FLOW	10' TYPE R
15	5.1	10.4	BASIN FLOW	10' TYPE R
15	17	36	FLOW IN 30" RCP INTO POND	10' TYPE R
16	99	201	TOTAL FLOW INTO POND B1 INCLUDING OLD GLORY/FONTAINE AND PONDEROSA FILING NO. 2	
17	4	9	OUTFLOW FROM POND INTO E. TRIB	



DRAINAGE MAJOR BASIN BOUNDARY
DRAINAGE MINOR BASIN BOUNDARY
DRAINAGE BASIN DESIGN POINT
BASIN I.D.
ACREAGE
5 YR/100 YR CFS
DIRECTION OF FLOW
EXISTING CONTOUR
6670 PROPOSED CONTOUR
HP HIGH POINT
LP LOW POINT
TIME OF CONCENTRATION
100-YR FEMA FLOODPLAIN
100-YR FEMA FLOODWAY
100-YR FEMA FLOODPLAIN

100 50 0 100 200
SCALE: 1"=100'

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NO.	DESCRIPTION	DATE

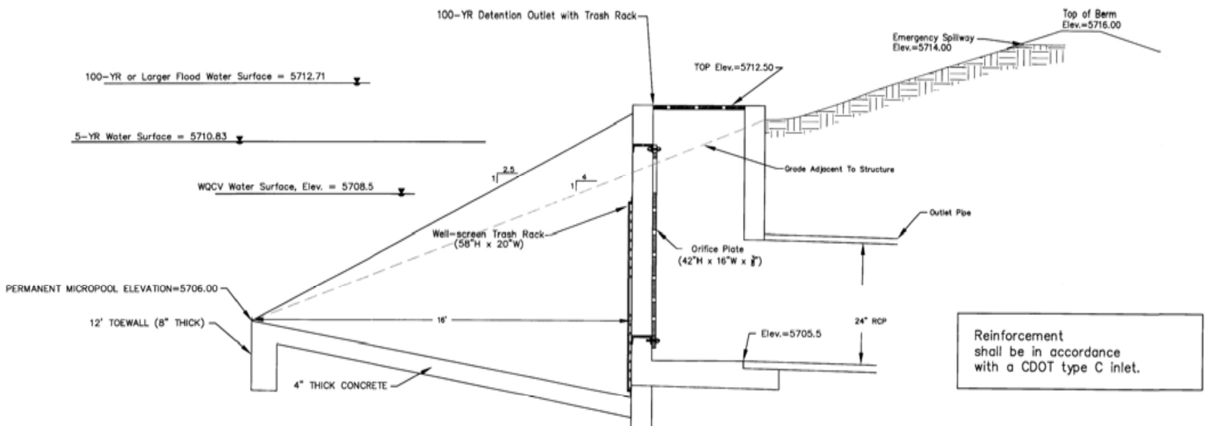
DRAWN: AZM
DESIGNED: LAB
CHECKED: LAB

PROJECT:
PIONEER LANDING FIL. 2
FONTAINE BLVD. - OLD GLORY RD.
EL PASO COUNTY, COLORADO

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

DEVELOPED CONDITIONS DRAINAGE PLAN PIONEER LANDING FILING NO. 2

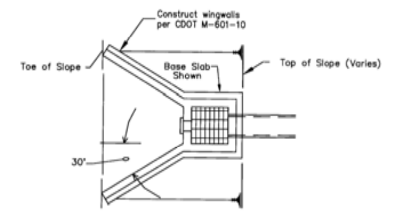
DATE
MARCH, 2015
PROJECT NO.
100.028
SHEET NUMBER
1
TOTAL SHEETS: 1



Overtopping Spillway

Figure 2
Typical WQCV Outlet Structure Profiles
Including 5-Year and 100-Year Detention

Reinforcement shall be in accordance with a CDOT type C inlet.



For either a Vertical or Adverse-Slope Trash Rack a handrail may be required.

Plan View-Flared Wingwall

Figure 3
Typical WQCV Outlet Structure
Wingwall Configurations

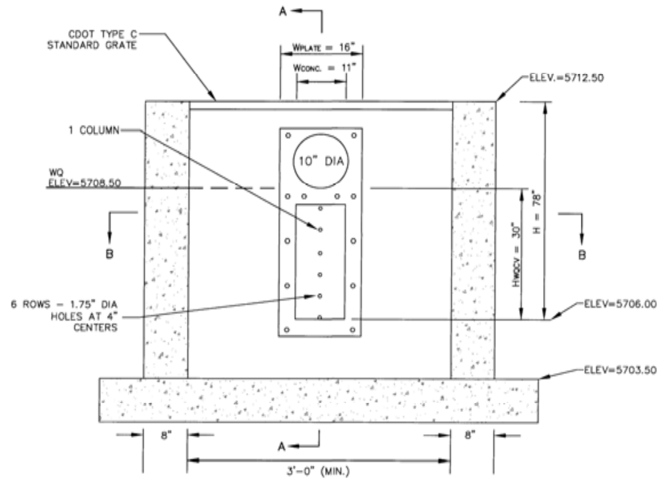
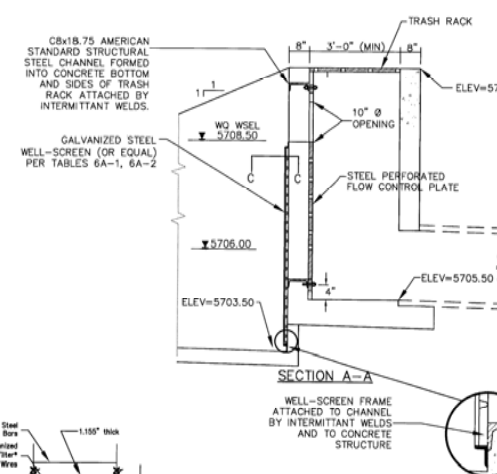
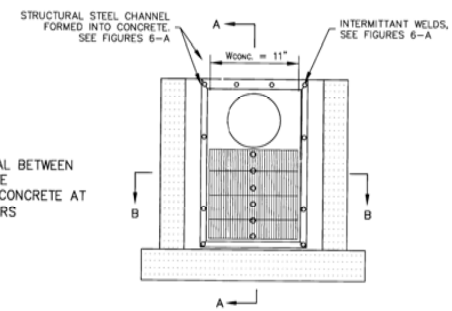


FIGURE 4:
ORIFICE PERFORATION DETAILS
SCALE: NTS

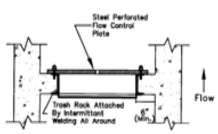


SECTION A-A

NOTES:
1. PROVIDE GASKET MATERIAL BETWEEN ORIFICE PLATE AND CONCRETE
2. BOLT ORIFICE PLATE TO CONCRETE AT 12" MAX. SPACING ON CENTERS



ELEVATION

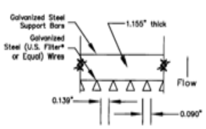


Section B-B - Plan View

From Figure 6, Circular Openings Only

Limits for this Standardized Design:
1. All outlet plate openings are circular.
2. Maximum diameter of opening = 2 inches.

*U.S. Filter, St. Paul, Minnesota, USA



Section C-C

From Figure 6, Circular Openings Only

R Value = (net open area)/(gross rack area) = 0.60

Figure 6-a
Standardized Trash Rack and Outlet Design For WQCV Outlets With Circular Openings

POND DATA TABLE

	INFLOW (CFS)	DISCHARGE (CFS)	WSEL	STORAGE (AC FT)
WQCV	--	--	5708.50	1.6
5-YR	99	4	5710.83	3.9
100-YR	201	9	5712.71	6.15

WQCV Trash Racks:
1. Well-screen trash racks shall be galvanized steel and shall be attached by intermittant welds along the edge of the mounting frame.
2. Bar grate trash racks shall be aluminum and shall be bolted using galvanized steel hardware.
3. Trash Rack widths are for specified trash rack material. Finer well-screen or mesh size than specified is acceptable, however, trash rack dimensions need to be adjusted for materials having a different open area/gross area ratio (R value)
4. Structural design of trash rack shall be based on full hydrostatic head with zero head downstream of the rack.

Overflow Trash Racks:
1. All trash racks shall be mounted using galvanized steel hardware and provided with hinged and lockable or boltable access panels.
2. Trash racks shall be galvanized steel, aluminum, or steel. Steel trash racks shall be hot dip galvanized and may be hot powder painted after galvanizing.
3. Trash Racks shall be designed such that the diagonal dimension of each opening is smaller than the diameter of the outlet pipe.
4. Structural design of trash rack shall be based on full hydrostatic head with zero head downstream of the rack.

Outlet Structure Details
Scale: NTS

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NO.	DESCRIPTION	DATE

DRAWN: RLS
DESIGNED: RLS
CHECKED: RLS

PROJECT: PIONEER LANDING FILING 2
FONTAINE BLVD. - OLD GLORY DRIVE
EL PASO COUNTY, COLORADO

PREPARED FOR: LORSON, LLC.
212 N. WAHSATCH AVE., SUITE 301
COLORADO SPRINGS, COLORADO 80903
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CONTACT: JEFF MARK

POND B1
OUTLET STRUCTURE DETAILS

DATE: JUNE 30, 2016
PROJECT NO. 100.028
SHEET NUMBER C7.6
TOTAL SHEETS: 24

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

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

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NO.	DESCRIPTION	DATE

PREPARED FOR:
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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

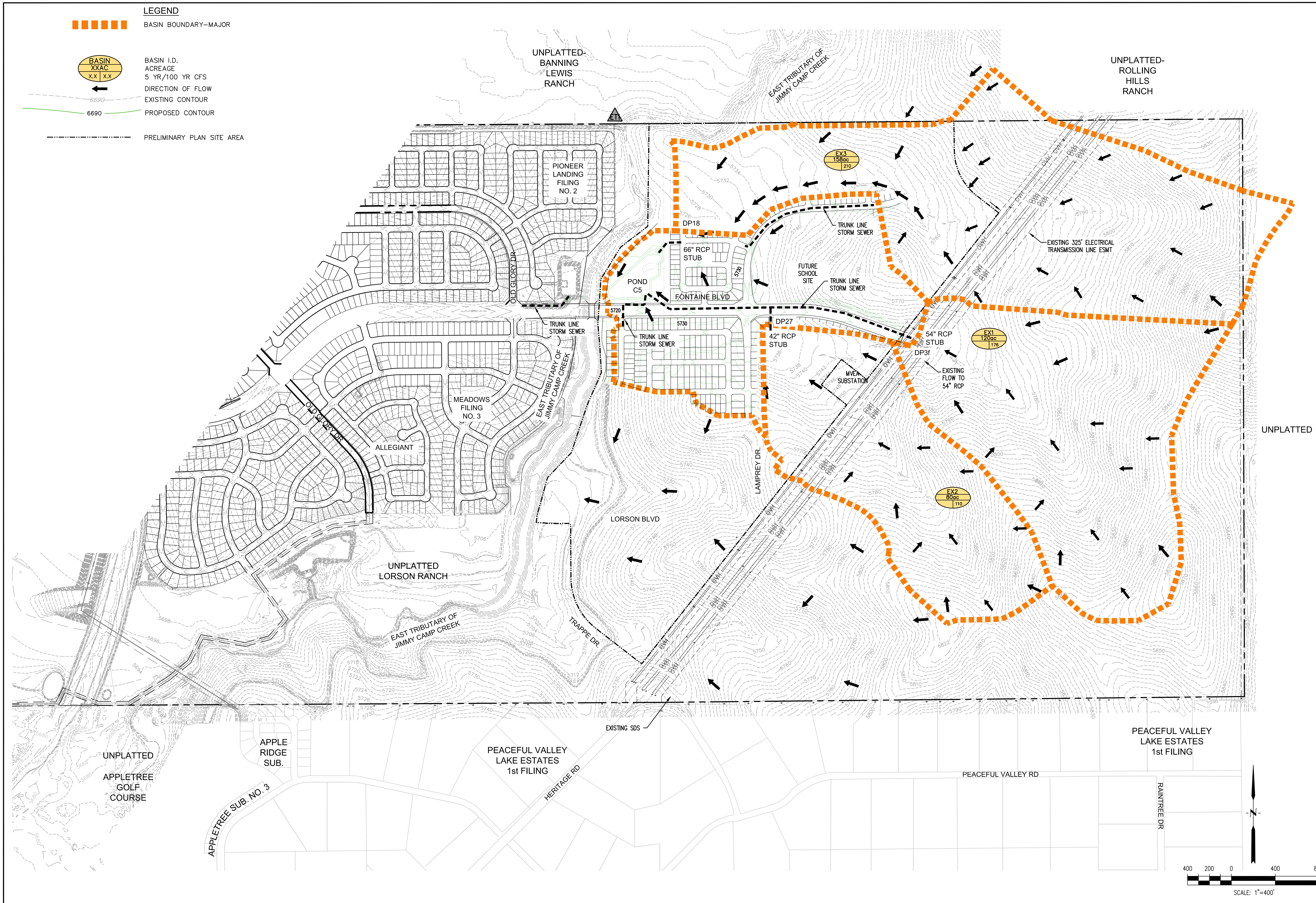
EXISTING CONDITIONS
FONTAINE BOULEVARD
EAST OF ETRIB OF JIMMY CAMP CREEK

DATE:
FEBRUARY 28, 2018

PROJECT NO.
100.041

SHEET NUMBER
1

TOTAL SHEETS: 1



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NO.	DESCRIPTION	DATE

PREPARED FOR:
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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 FLOWS AT FONTAINE BLVD & LAMPREY DRIVE IN PHASE 1 OF LORSON RANCH EAST

DATE:
FEBRUARY 28, 2018

PROJECT NO.
100.041

SHEET NUMBER
1

TOTAL SHEETS: 1

LEGEND

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

EXISTING VERSUSES DEVELOPED FLOW AT OUTFLOWS TO ETRIB				
DESIGN POINT	EXISTING RUNOFF 5 YR (CFS)	EXISTING RUNOFF 100 YR (CFS)	DEVELOPED RUNOFF 5 YR (CFS)	DEVELOPED RUNOFF 100 YR (CFS)
46	141	458	126	453

NOTE:

1. OVERALL BASIN "C" FLOWS TO FULL SPECTRUM DETENTION POND C5.

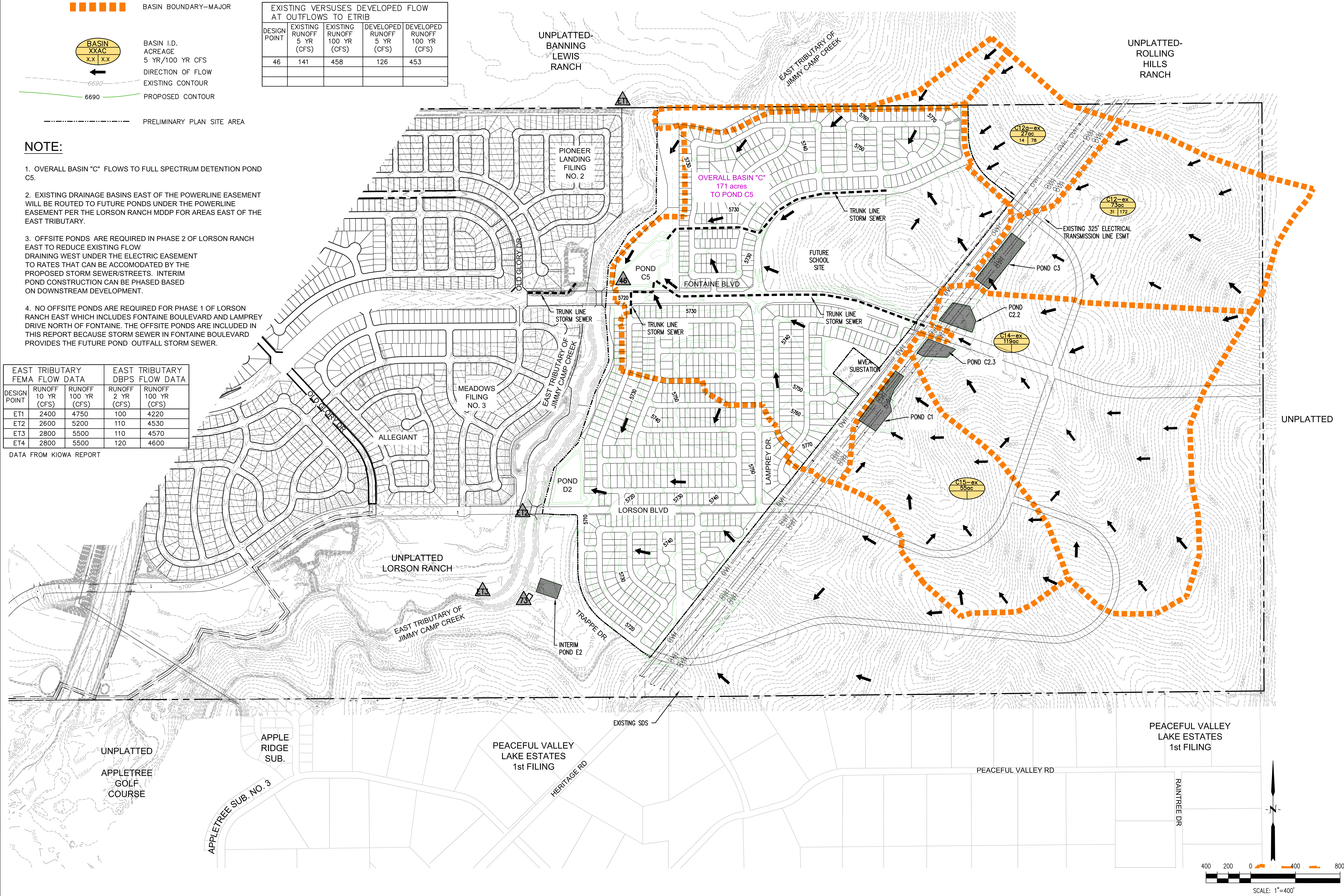
2. EXISTING DRAINAGE BASINS EAST OF THE POWERLINE EASEMENT WILL BE ROUTED TO FUTURE PONDS UNDER THE POWERLINE EASEMENT PER THE LORSON RANCH MDDP FOR AREAS EAST OF THE EAST TRIBUTARY.

3. OFFSITE PONDS ARE REQUIRED IN PHASE 2 OF LORSON RANCH EAST TO REDUCE EXISTING 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.

4. NO OFFSITE PONDS ARE REQUIRED FOR PHASE 1 OF LORSON RANCH EAST WHICH INCLUDES FONTAINE BOULEVARD AND LAMPREY DRIVE NORTH OF FONTAINE. THE OFFSITE PONDS ARE INCLUDED IN THIS REPORT BECAUSE STORM SEWER IN FONTAINE BOULEVARD PROVIDES THE FUTURE POND OUTFALL STORM SEWER.

	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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NO.	DESCRIPTION	DATE

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

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

DRAWN: LJA
DESIGNED: LAB
CHECKED: RLS

OVERALL DEVELOPED CONDITIONS
FONTAINE BLVD & LAMPREY DRIVE
EAST OF ETRIB OF JIMMY CAMP CREEK

DATE: FEBRUARY 28, 2018

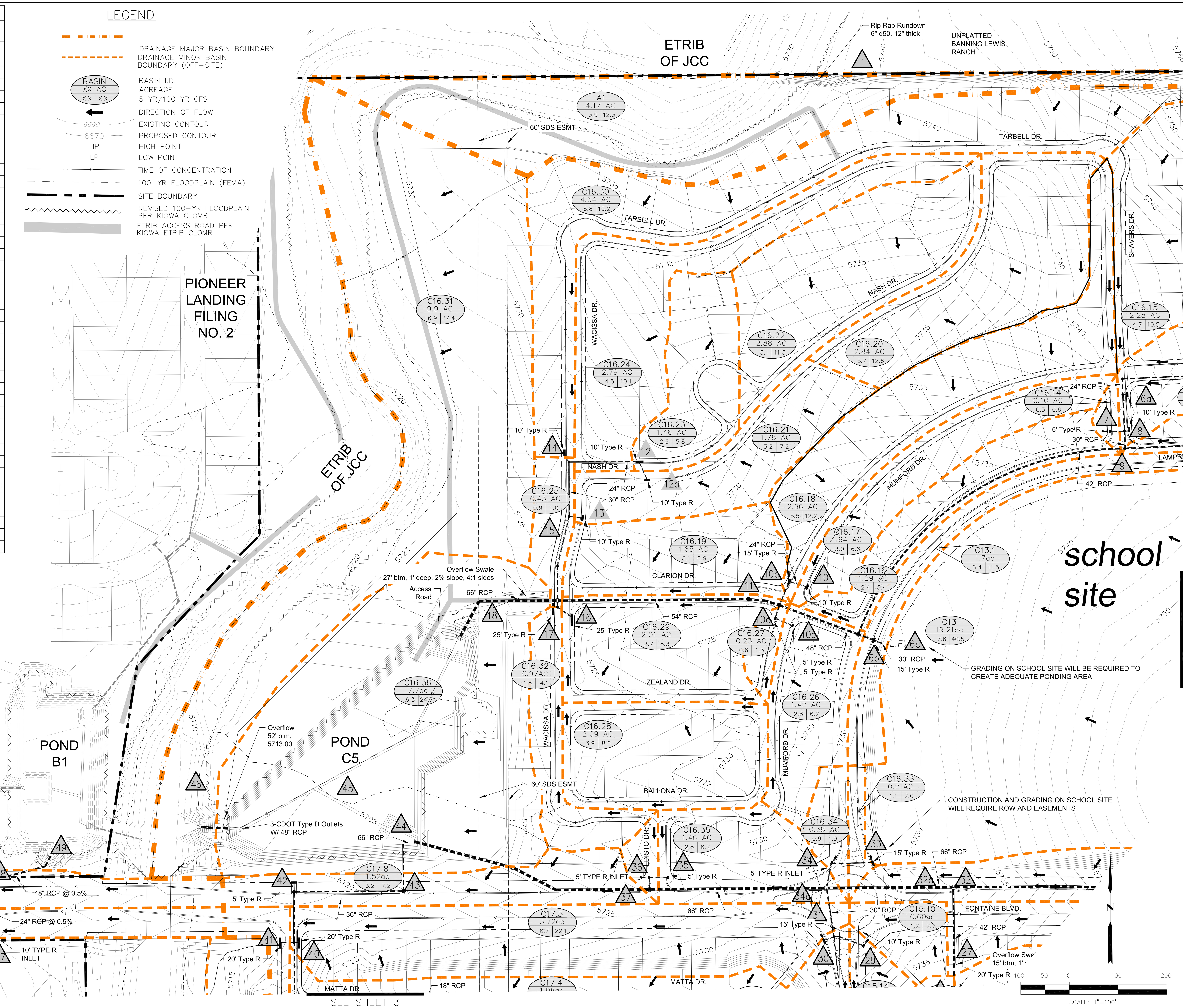
PROJECT NO. 100.041

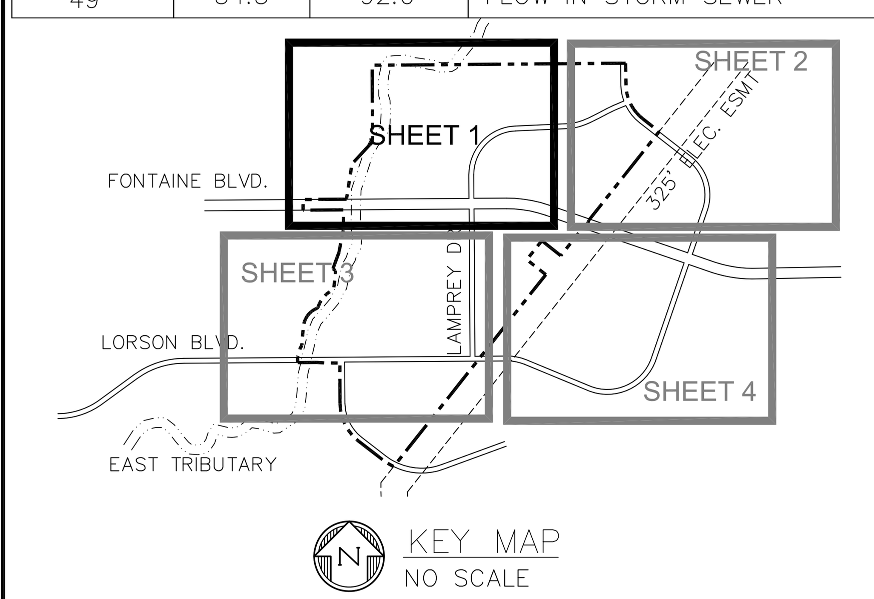
SHEET NUMBER 1

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	453	FLOW INTO EAST TRIBUTARY
47	7.8	13.9	STREET FLOW
48	8.9	16.0	STREET FLOW
49	54.3	92.0	FLOW IN STORM SEWER





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

PREPARED FOR:
LORSON, LLC
212 N. WAHSATCH AVE, SUITE 301
COLORADO SPRINGS, COLORADO 80903
(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 - NORTHWEST AREA FONTAINE BLVD/LAMPREY DRIVE

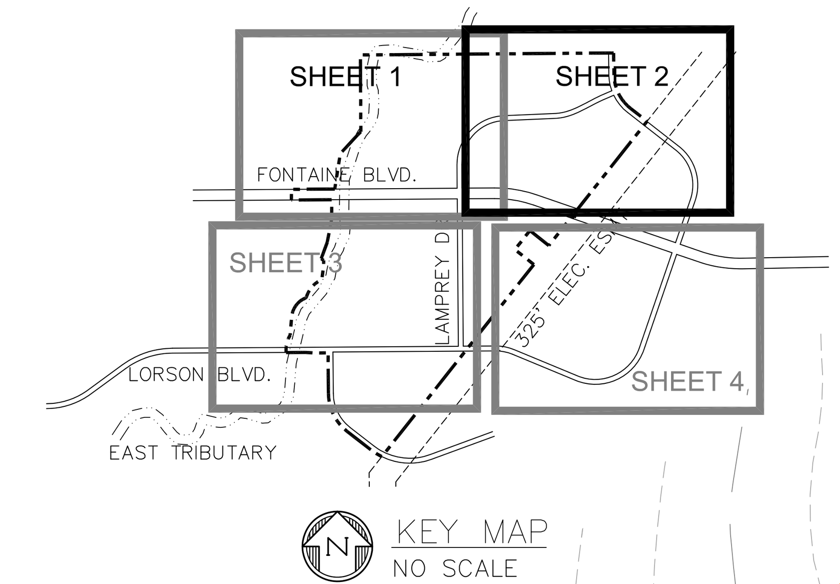
DATE: FEBRUARY 28, 2018
PROJECT NO. 100.040
SHEET NUMBER 1
TOTAL SHEETS: 4

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	21.88	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

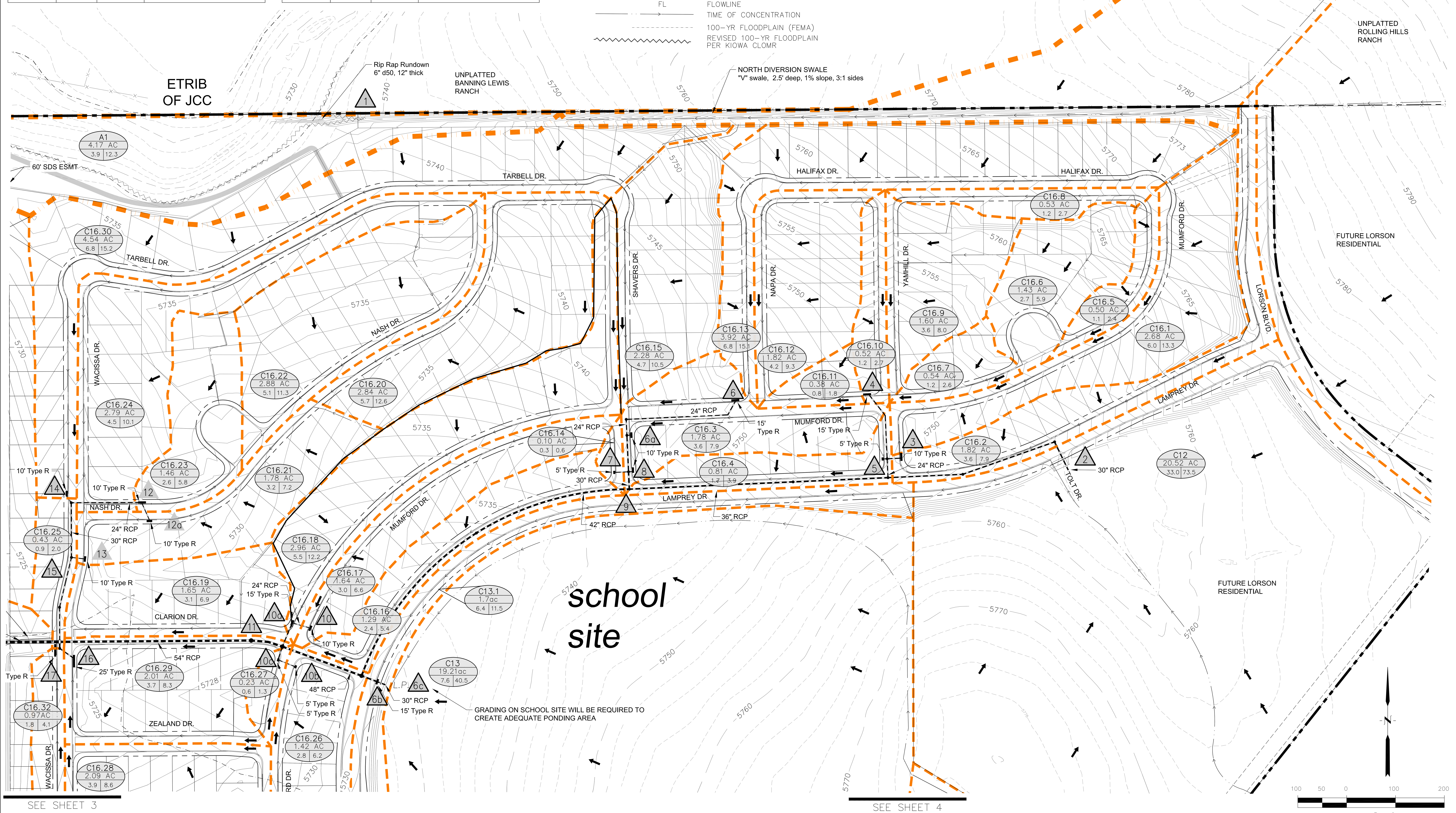
RUNOFF SUMMARY			
DESIGN POINT	5 YEAR	100 YEAR	NOTES
10	6.0	12.5	STREET FLOW
10a	5.7	20.7	STREET FLOW
10b	3.2	27.1	STREET FLOW
10c	0.6	21.5	STREET FLOW
11	105.5	154.8	FLOW IN STM SWR
12	8.0	16.65	STREET FLOW
12a	8.78	18.28	STREET FLOW
13	8.35	25.48	STREET FLOW
14	7.05	14.44	STREET FLOW
15	25.69	39.15	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
- EXISTING CONTOUR (6690)
- PROPOSED CONTOUR (6670)
- 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



KEY MAP
NO SCALE



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

NO.	DESCRIPTION	DATE

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

PROJECT:
LORSON RANCH EAST
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
FEBRUARY 28, 2018

PROJECT NO.
100.040

SHEET NUMBER
2

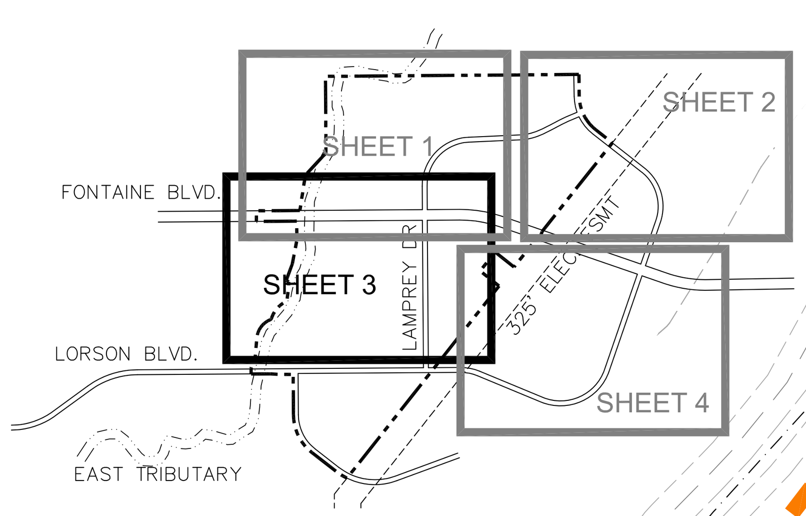
TOTAL SHEETS: 4

LEGEND

	DRAINAGE MAJOR BASIN BOUNDARY
	DRAINAGE MINOR BASIN BOUNDARY (OFF-SITE)
	SITE BOUNDARY
BASIN XX AC X.X X.X	BASIN I.D. ACREAGE 5 YR/100 YR CFS
	DIRECTION OF FLOW
6690	EXISTING CONTOUR
6670	PROPOSED CONTOUR
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



KEY MAP
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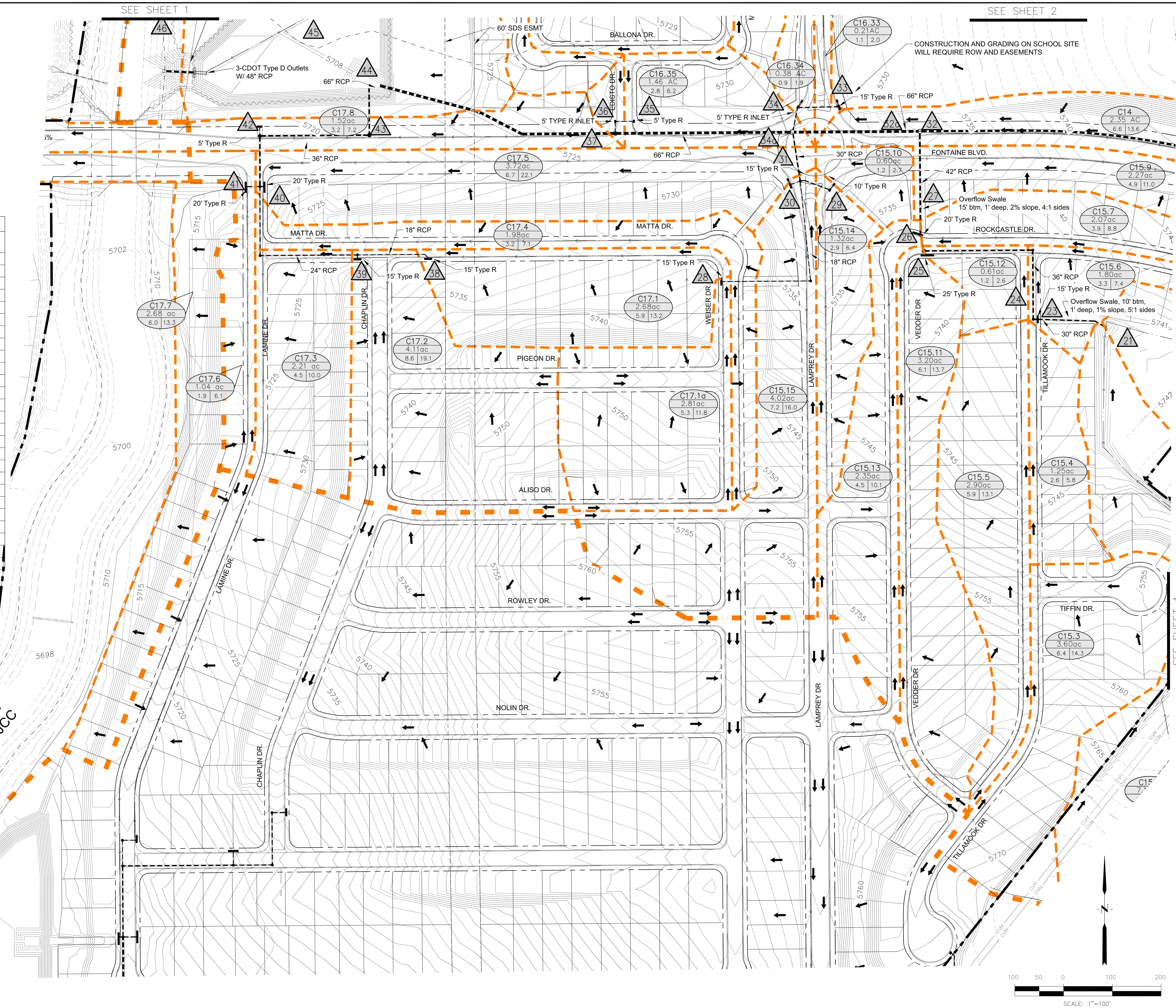

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NO.	DESCRIPTION	DATE

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

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

DRAWN: RLS
DESIGNED: LAB
CHECKED: LAB

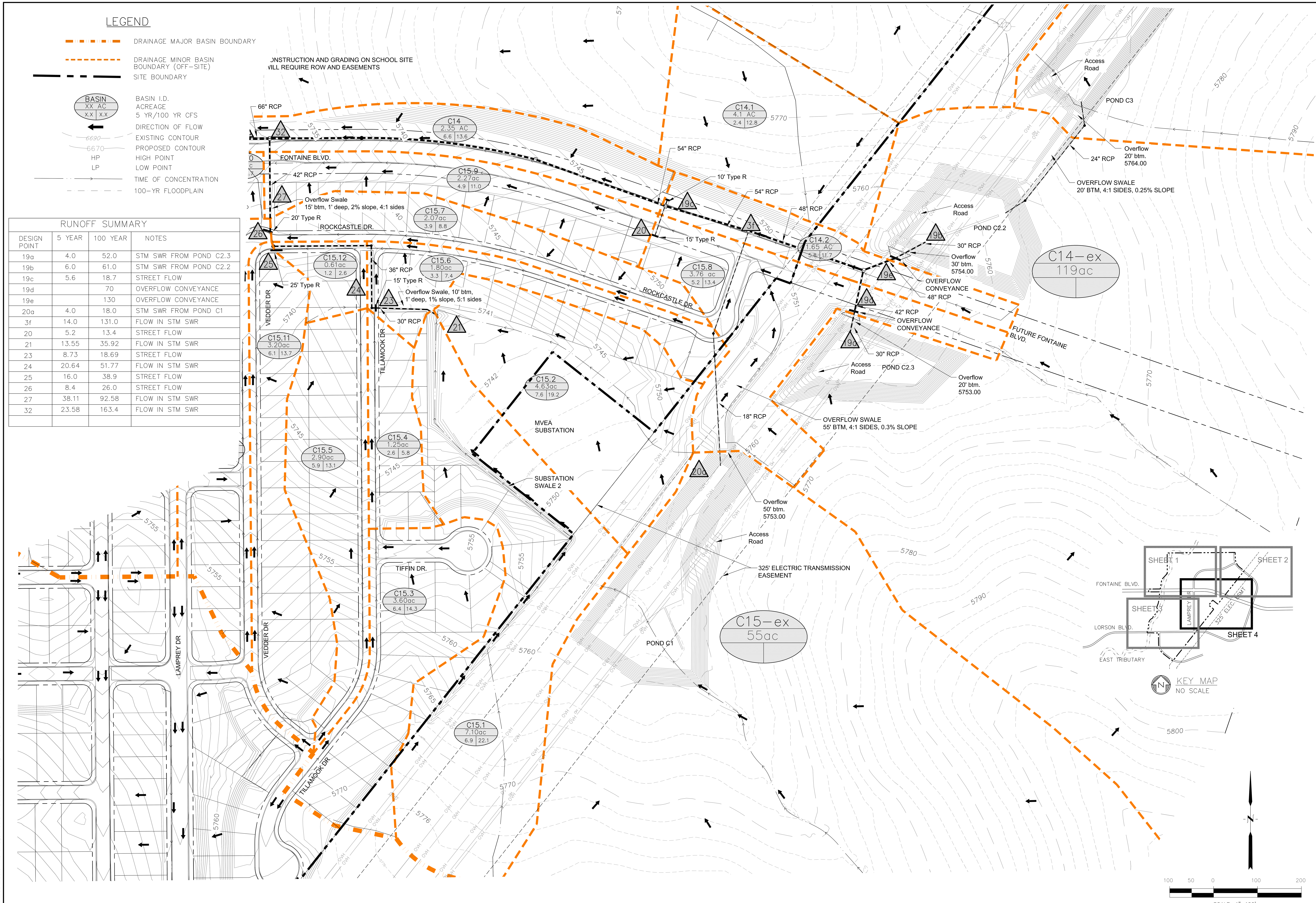
DEVELOPED CONDITIONS DRAINAGE PLAN - MIDDLE WEST AREA FONTAINE BLVD/LAMPREY DRIVE

DATE
FEBRUARY 28, 2018

PROJECT NO.
100.040

SHEET NUMBER
3

TOTAL SHEETS: 4



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

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PH: 719.570.1100
CONTACT: RICHARD L. SCHINDLER, P.E.
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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
FONTAINE BLVD. - EAST TRIBUTARY OF JCC
EL PASO COUNTY, COLORADO

DRAWN: RLS
DESIGNED: LAB
CHECKED: LAB

DEVELOPED CONDITIONS
DRAINAGE PLAN - EAST AREA
FONTAINE BLVD/LAMPREY DRIVE

DATE
FEBRUARY 28, 2018

PROJECT NO.
100.041

SHEET NUMBER
4

TOTAL SHEETS: 4

Markup Summary

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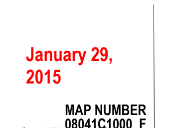

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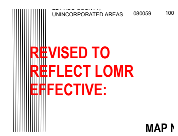
January 29, 2015



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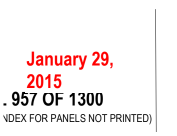
9/16/2014 1:47:49 PM (2)



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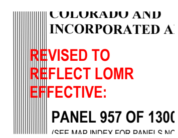

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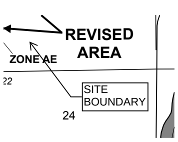

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SITE
BOUNDARY

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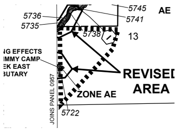

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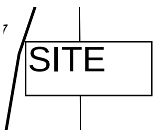

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SITE

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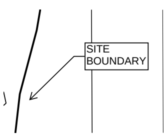

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SITE
BOUNDARY

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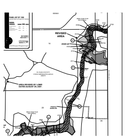

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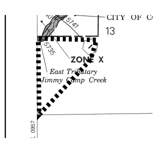

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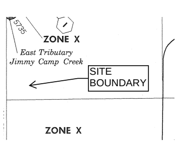

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SITE
BOUNDARY

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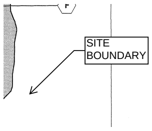

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SITE
BOUNDARY

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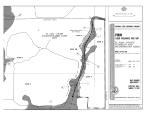

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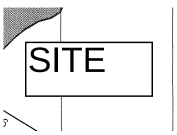

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SITE

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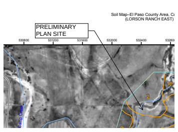

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PRELIMINARY PLAN SITE

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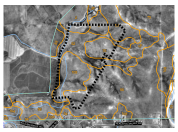

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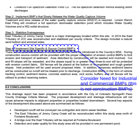

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Author: dsdrice
Date: 3/16/2018 3:25:10 PM
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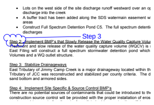
Consider Need for Industrial and Commercial BMPs (this is not construction BMPs)

3/16/2018 3:21:28 PM (1)



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Date: 3/16/2018 3:21:28 PM
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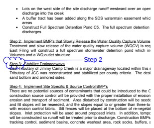
Step 3

3/16/2018 3:20:46 PM (1)



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Step 2

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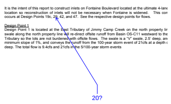

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20?

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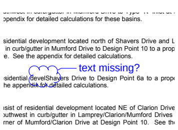

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text missing?

3/16/2018 1:28:47 PM (1)

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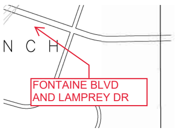

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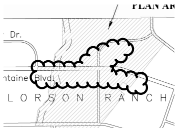
FONTAINE BLVD
AND LAMPREY DR

12/20/2017 9:00:24 AM (1)



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Date: 12/20/2017 9:00:24 AM
Color: ■