FINAL DRAINAGE REPORT
FOR
STERLING RANCH FILING NO. 4

Prepared For:

SR Land, LLC
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May 6th 2022
Project No. 25188.11

Prepared By:

JR Engineering, LLC
5475 Tech Center Drive, Suite 235
Colorado Springs, CO 80919
719-593-2593

PCD Filing No.:
XX-XX-XXX

J·R ENGINEERING

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.

_____

Mike Bramlett, Colorado P.E. 32314
For and On Behalf of JR Engineering, LLC

DEVELOPER'S STATEMENT:

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

Business Name: SR Land, LLC

By: _____

Title: _____

Address: 20 Boulder Crescent, Suite 200
Colorado Springs, CO 80903

El Paso County:

Filed in accordance with the requirements of the El Paso County Land Development Code, Drainage Criteria Manual, Volumes 1 and 2 and Engineering Criteria Manual, as amended.

osh Palmer, P.E.

_____ _____

Jennifer Irvine, P.E. Date
County Engineer/ ECM Administrator

Conditions:

APPENDIX

PURPOSE

This document is the Final Drainage Report for Sterling Ranch Filing Number 4. The purpose of this report is to identify on-site and off-site drainage patterns, storm sewer, culvert, inlet locations, areas tributary to the site, and to safely route developed storm water to adequate outfall facilities. The proposed use is a permissible use within the residential service zoning criteria.

GENERAL SITE DESCRIPTION

GENERAL LOCATION

Sterling Filing Number 4 (hereby referred to as the "site") is a proposed development within the Sterling Ranch master planned community with a total area of approximately 55 acres and includes a replat of tracts B and J of Sterling Ranch Filing No. 2 and the regional detention pond W-5 built during Sterling Ranch Filing No. 2. The site is currently being designed to accommodate approximately 146 single-family residential lots. West of the site adjacent to the pond W-5 Marksheffel road will be extended to a planned residential subdivision.

157 lots per plat

The site is located in portion a Portion of the Southwest Quarter Of Section 33, Township 12 South, Range 65 West Of The 6th Principal Meridian & A Portion Of The Northwest Quarter Of The Northwest Quarter Of Section 4, Township 13S South, Range 65 West Of The 6th Principal Meridian County Of El Paso, State Of Colorado. The site is separated by Sterling Ranch Road into a north and south region. Barbarick Subdivision borders the northern portion of the site to the north, to the west by Sterling Ranch Filing No. 2, and to the east, the site is bounded by unplatted vacant land that is currently undeveloped. The southern portion of the site is bounded by Sterling Ranch road to the north, Sterling Ranch Filing No. 3, and Pawnee Rancheros border the site directly to the east. To the west, the southern portion of the site borders the proposed extension of Marksheffel Road, and to the south, the site borders unplatted and undeveloped land that is planned for residential use.

DESCRIPTION OF PROPERTY

The property will be primarily be single-family residential development (approximately 55 acres), Open space and drainage tracts. The site is comprised of variable sloping grasslands that generally slope(s) downward to the southeast at 3 to 8% towards the Sand Creek tributary basin.

Soil characteristics are comprised of Type A and B hydrologic Soil groups. Refer to the soil survey map in Appendix A for additional information.

There are no major drainage ways running through the site, although a tributary to the Sand Creek basin is immediately to the east of the site. Currently, JR Engineering, LLC is performing studies and plans to address Sand Creek stabilization.

Include project # for creek work and if it's in review.

There are no known irrigation facilities located on the project site.

FLOODPLAIN STATEMENT

Based on the FEMA FIRM Maps number 08041C0533G, dated December 7, 2018, the proposed development lies within Zone X. Zone X is defined as area outside the Special Flood Hazard Area (SFHA) and higher than the elevation of the 0.2-percent-annual-chance (or 500-year) flood. FIRM Map is presented in Appendix A.

EXISTING DRAINAGE CONDITIONS

MAJOR BASIN DESCRIPTIONS

The site lies within the Sand Creek Drainage Basin based **o**n the "Sand Creek Drainage Basin Planning Study" (DBPS) completed by Kiowa Engineering Corporation in January 1993, revised March 1996. The Sand Creek Drainage Basin covers approximately 54 square miles and is divided into major sub-basins. The site is within the respective sub-basin is shown in Appendix E.

Revise statement to include which Sand Creek Sub-basin. Information from Sand Creek DBPS is included in Appendix D, not E.

The Sand Creek DBPS assumed the Sterling Ranch Filing No. 4 property to residential" use for the majority of the site. The Sterling Ranch MDDP assumed a mix of commercial and single family residential lots ranging in size from 0.2 to 0.3 acres for the Sterling Ranch Filing No. 4 site. The proposed Sterling Ranch master plan is a mix of; school, multi-family, single-family, and commercial land uses, resulting in higher runoff. Any additional runoff will be provided for with the extended detention basin located at the southern edge of the site. The site generally drains from north to south consisting of rolling hills. The site currently has an existing channel that was built in the Sterling Ranch Filing No. 3 that conveys the Sterling Ranch Filing 3 runoff to drainage infrastructure on the southern portion of the site that was built in Homestead Filing No. 2; this infrastructure consists of pond W-5 and Existing storm pipe. Currently, the site is used as pastureland for cattle. Sand Creek is located east of the site running north to south. This reach of drainage conveyance is not currently improved. There are a few stock ponds within the creek channel used for cattle watering. Currently, JR engineering is performing studies and plans to address Sand Creek stabilization adjacent to the site.

The proposed drainage on the site closely follows the approved "Master Development Drainage Plan for Sterling Ranch"; (MDDP) prepared by M&S Civil Consultants, Inc., dated October 24, 2018. The site is tributary to Pond W5 and full-spectrum detention for the site was previously analyzed and can be found in the Final Drainage Report for Sterling Ranch Filing 2 as shown in Appendix D.

There are no "B" basins. Please revise statement

EXISTING SUB-BASIN DRAINAGE

The existing / predeveloped condition of the site was broken into two major basins: Basin A (western portion) and Basin B (Eastern Portion), as well as several offsite basins. The basin and sub-basin delineation is shown in the existing drainage map in Appendix E and is described as follows:

2% per hydrology spreadsheet

Sub-basin A-1 (Q_5= 1.1cfs, Q_{100}=8.0cfs) is 5.17 acres and 0 percent impervious consists of the eastern portion of the proposed Sterling Filing No. 4 site. Runoff from this basin drains to the south west into the assumed existing storm sewer built with Filing 2 just east of Marksheffel Road located at design point 1. Collected runoff is piped south to the existing detention pond built with Filing 2 and outfalls to Sand Creek.

Sub-basin A-2 (Q_5= 3.9cfs, Q_{100}=28.6cfs) is 19.12 acres and 0 percent impervious and consists the central portion of Sterling Ranch Filing No. 4. Runoff from this basin drains south onsite into the assumed existing storm sewer built with Filing 2 located at design point 2. Collected runoff is piped south to the existing detention pond built with Filing 2 and outfalls to Sand Creek.

, Pond W-5,

Sub-basin A-3 (Q_5= 5.1cfs, Q_{100}=33.3cfs) is 17.62 acres and 2 percent impervious and is located onsite in the northern part of Sterling Ranch Filing No. 4. Runoff from this basin drains to the assumed existing storm sewer built with Filing 2 just north of Sterling Ranch Road located at design point 5. Design Point 5.1 is a confluence of flows from basins A3, OS6 and OS7. Collected runoff is piped south to the existing detention pond built with Filing 2 and outfalls to Sand Creek.

Basin E-1 (Q_5= 1.3 cfs, Q_{100}=9.5 cfs) is 5.15 acres and 0 percent impervious and is located on south west portion of the site. Runoff from this basin drains to design point O1. Improvements to this basin will be part of the proposed Marksheffel Road improveme

State if there is anything currently on/in this basin

Sub-basin OS1(Q_5= 10.5cfs, Q_{100}=24.4 cfs) is 9.27 acres is 37 percent impervious and is located to the east of the site. Runoff from this basin drains into the Sterling Ranch Filing 2 detention Pond in confluence with upstream flows from the eastern portion of Sub-basin A2. Collected runoff is piped south to the existing detention pond built with Filing 2 and outfalls to Sand Creek.

Indicate the design point this basin flows to and then joins with.

Sub-basin OS2 (Q_5= 3.9cfs, Q_{100}=7.0cfs) is 2.48 acres and 56 percent impervious ar the southern half street of Sterling Ranch Road. Runoff from this basin drains into the assumed existing storm sewer built with Filing 2 located at design point 7. Collected runoff is piped south to the existing detention pond built with Filing 2 and outfalls to Sand Creek.

Sub-basin OS3 (Q_5= 5.0cfs, Q_{100}=12.1cfs) is 3.50 acres and 42 percent impervious and is comprised of the northern half street of Sterling Ranch Road. Runoff from this basin drains into the assumed existing storm sewer built with Filing 2 located at design point 8. Collected runoff is piped south to the existing detention pond built with Filing 2 and outfalls to Sand Creek.

Sub-basin OS4 (Q_5= 1.6cfs, Q_{100}=7.9cfs) is 5.10 acres and 8 percent impervious and is located immediately north of Sterling Ranch Road and the eastern portion of the site. Runoff from this basin drains south into assumed existing storm sewer built with Filing 2 located at design point 9. Collected runoff is piped south to the existing detention pond built with Filing 2 and outfalls to Sand Creek.

Sub-basin OS5 (Q_5= 0.7cfs, Q_{100}=5.0cfs) is 3.46 acres and 0 percent impervious and is located to the east of the northern portion of the site. Runoff from this basin drains to a low point just north of Sterling Ranch Road located at Design Point 4 and will be collected in the assumed existing storm sewer built with Filing 2 and piped to the Filing 2 detention pond located south of the site and outfalls to Sand Creek.

Sub-basin OS6 (Q_5= 35.4cfs, Q_{100}=71.9cfs) is 18.18 acres and 11 percent impervious as is located northwest of the site in the Barbarick subdivision. Historic runoff from this basins drains south onto the site at design point 10. Detained flow from this basin will be piped through the site to the detention pond and will outfall to Sand Creek.

Sub-basin OS7(Q_5= 20.6cfs, Q_{100}=60.4cfs) is 33.07 Acres and 19 percent impervious and is located directly north of the site in the Barbarick subdivision. Historic runoff from this site drains south onto the site at design point 11. Detained flow from this basin will be piped through the site to the detention pond and will outfall to Sand Creek.

Include a description of what will be done if the assumed Filing No. 2 storm sewers are not yet built when this project begins.

PROPOSED DRAINAGE CONDITIONS

PROPOSED SUB-BASIN DRAINAGE

The proposed site was broken into three major basins: Basin A (lower-portion), Basin B (mid and eastern –portion), Basin C (upper-portion) of the site and Basin, which consists of the proposed improvements to Marksheffel Road. The proposed basin (and sub-basin) delineation is shown on the drainage basin map within Appendix E and is described as follows.

Basin A2 (Q_5= 1.7cfs, Q_{100}=4.8 cfs) is 1.38 acres and 32 percent impervious is comprised of single-family residential lots, open space, several trails, and a local road Hazlett Drive. Runoff from this basin drains to design point 17, a 10’ type R on grade inlet on the southwest corner of the basin, in confluence with upstream by-pass flows from the Filing 3 development 0.2 cfs in the 5 year event and 5.2 cfs in the 100 year event.

Include what total flows at DP 17 or inlet would be with Basin A2 and flow by from Filing 3. Be sure to include this with all inlets that will be accepting by pass flows from on grade inlets

Basin A3 (Q_5= 7.0cfs, Q_{100}=14.9cfs) is 3.68 acres and 65 percent impervious is comprised of single-family residential lots and a local road Pennydale Drive. Runoff from this basin drains to a 15' on grade type R inlet located at design point 20.

Indicate that inlet is not capturing any by pass flows

Include what by pass flows are and total flow reaching DP 22

Hazlett Dr

cfs, Q_{100}=15.1cfs) is 4.53 acres and 48 percent impervious is comprised of single-family residential lots, open space a local road Moore Drive, Pennydale Drive and two urban knuckles. Runoff from this basin drains to a sump 15' type R inlet located at design point 22 in confluence with upstream by-pass flows from basins A1, A2, and A3. The emergency overflow for this basins drains directly to pond W-5 south of the inlet. The runoff from this basin is piped to DP 23 where the runoff confluence with the entire southern portion of the Sterling Ranch Filing No. 4 site. From here on, the runoff is then piped into an existing 42" RCP and Structure associated with design point 23. In the event the inlet at design point 22 clogs there is an overflow path to pond W-5 south west of the inlet.

Basin A5 (Q_5= 1.4cfs, Q_{100}=2.9cfs) is 0.45 acres and 79 percent impervious is comprised of single-family residential lots and a local road Hazelett Drive. Runoff from this basin drains to a 10' type R on grade inlet at design point 16.

Include how much flow is intercepted and by passed. Indicate where each of the flows is directed. Add this information to each on grade inlet.

Basin A6.1 (Q_5= 10cfs, Q_{100}=20.5cfs) is 4.73 acres and 72 percent impervious is comprised of single-family residential lots, local roads Pennydale Drive, Trago Drive, and Hazelett.Drive. Runoff from this basin drains to an on grade 15' type R inlet at design point 12. Runoff the on-grade inlet at design point 12 is by-passed further down to the inlet at design point 19 (Q_5= 1.0 cfs, Q_{100}=6.9cfs)

Basin A6.2 (Q_5= 5.6cfs, Q_{100}=11.3cfs) is 2.56 acres and 74 percent impervious is comprised of single-family residential lots, local roads Pennydale Drive, Pendroy Street, and Hazelett.Drive. Runoff from this basin drains to an on grade 20' type R inlet at design point 19. In the 100 year event runoff is bypassed further down stream to design point 21 (Q5= 0 cfs, Q100=3.2 cfs).

5 yr flow does not match spreadsheet

Basin A7 (Q_5= 4.5 cfs, Q_{100}=8.5 cfs) is 1.76 acres and 73 percent impervious is comprised of single family residential lots and local roads Pennydale Drive, Moore Drive, and Hazelett Drive. The runoff from this basin drains to a 15' sump type R inlet located at design point 21, which receives up stream, by pass flow from the on grade 15' type R inlet at design point 19.

Basin A8 (Q_5= 2.2cfs, Q_{100}=9.2cfs) 4.23 acres and 13 percent impervious is comprised of a single family residential lots and open space. The runoff from this basin drains to a swale on western side of the site and into a type C inlet located at design point 24.

Basin A9 (Q_5= 1.0cfs, Q_{100}=4.8cfs) 2.02 acres and 8 percent impervious is comprised of a single family residential lots and open space. The runoff from this basin drains to a swale on the western side of the site and into a flared end section and pipe located at design point 25. From there on, the flow enters and existing structure at design point 26.

From map, it appears this may be an existing feature. Please state if it is existing or new and label on map.

Basin A10 (Q_5= 2.9cfs, Q_{100}=8.8cfs) 2.67 acres and 26 percent impervious is comprised of a single family residential lots and open space. The runoff from this basin sheet flows to the south and into existing pond W5 at design point 27.

Basin B3 (Q_5= 3.6cfs, Q_{100}=7.5cfs) is 2.38 acres and 63 percent impervious is comprised of open space, Sterling Ranch road and sidewalk. Runoff from basin B3 drains to a 15' type R on grade inlet located at design point 9 in existing Sterling Ranch Road. All of the runoff is captured in the 100 year event. Runoff from this on grade inlet and is piped and outfalls into pond W-5.

Basin C1 (Q_5= 6.1 cfs, Q_{100}=12.7 cfs) is 2.59 acres and 69 percent impervious is comprised of single family residential lots, local roads Clancy Drive, School House Drive, Ennis Drive and an urban knuckle Runoff from basin C1 drains to 15' a sump type R inlet located at design point 6. The combined runoff at DP 6.1 drains to the existing drainage structure DP 7.2.

Basin C2 (Q_5= 12.0cfs, Q_{100}=25.9cfs) is 6.75 acres and 63 percent impervious is comprised of local roads, Clancy Drive, School House Drive, Ennis Drive, single-family residential lots, an urban knuckle, open space, and paved walks. Runoff from basin C2 drains to a 15' type R sump inlet located at design point 5. State what DP 5 connects with

Basin C3 (Q_5= 3.5cfs, Q_{100}=12.8cfs) is 4.18 acres and 19 percent impervious is comprised of single family residential lots, open space, and paved walks. Runoff from basin C3 drains to a swale on the western side of the site and into a type C area inlet located at design point 7. State where DP 7 connects/goes

Basin C4 (Q_5= 5.0cfs, Q_{100}=11.5 cfs) is 4.52 acres and 49 percent impervious is comprised of open space, roads and rear yards of single family residential lots. Runoff from basin B3 drains to an on-grade 15' type R inlet located at design point 8 in existing Sterling Ranch Road. In the 100 year event, 0.8 cfs is by-passed to a sump inlet adjacent to the intersection of Sterling Ranch Road and Marksheffel Road. From there on the runoff is piped out falls into pond W-5.

Basin OS6 (Q_5= 35.4cfs, Q_{100}=72.2cfs) is 18.38 acres, and 54 percent impervious is located near the northwest border of the site in the Barbarick subdivision. Runoff from the Barbarick, a portion of lots 3 and 4 for 3.13 acres site, is treated in this area with a sand filter. The other portion of the site is piped with two existing 24" HDPE. In the event, the sand filter clogs in the 100-year event, the emergency overflow from the sand filter will sheet flow across an open area of land i.e. tract B at 11.6 CFS, to sheet flow onto Ennis Drive. The total runoff from basin OS6 will be piped to throughout the Sterling Ranch Filing No. 4 site at design point 4 and will outfall in detention pond W5 and will ultimately outfall to Sand Creek.

Basin OS7 (Q_5= 20.6cfs, Q_{100}=60.4cfs) is 33.07 Acres and 23 percent impervious and is located directly north of the site in the Barbarick subdivision. Runoff from the eastern portion of the basin travels overland towards design point 1. Historic runoff from this site drains south onto the site at design point 1. Detained flow from this basin will be piped through the site to the detention pond and will outfall to Sand Creek. Emergency overflow from this basin will be routed around the lots and into the open space east of the site to vacant land.

which pond?

Basin I1 (Q_5= 1.8 cfs, Q_{100}=9.7 cfs) is 5.88 Acres and 7 percent imperious is located directly east of the upper half of Homestead Filing Four. Runoff from this basin drains into an existing draw. The runoff is then picked up by an interim swale and conveyed away from the Filing 4 lots adjacent to Greenough Drive. The undeveloped lot that makes up basin I1 will be developed into a residential development. The runoff is conveyed in the swale and then goes to the downstream design point 2.1i, where it is ultimately conveyed into pond W-5 built-in Homestead Filing No. 2, as shown in Appendix D.

Sterling Ranch Filing No. 3?

Currently this design accounts for I basins as being undeveloped. Has the storm sewer been designed/checked to ensure it can handle the fully developed flows from I Basins?

Basin I2 (Q_5= 0.7 cfs, Q_{100}=5.3 cfs) is 2.90 Acres and 0 percent imperious is located directly east of the upper half of Homestead Filing Four. Runoff from this basin sheet drains across existing native grass. The runoff is picked up by an interim swale, where it is collected by an interim 36" FES at design point 2.1i. The runoff is ultimately conveyed into pond W-5 built-in Homestead Filing No. 2, as shown within Appendix D.

Sterling Ranch Filing No. 3?

Flows don't match hydrology spreadsheet

Basin I3 (Q_5= 0.7 cfs, Q_{100}=5.3 cfs) is 2.11 Acres and 0 percent imperious is located north of Sterling Ranch Road in the unplatted parcel of land directly east of the northern portion of the site. Runoff from this basin drains into an interim swale at design point 3.1i and then ultimately drains to the interim 36" FES at design point 2.1i. The runoff is ultimately conveyed into pond W-5 built in Homestead Filing No. 2, as shown within Appendix D.

Sterling Ranch Filing No. 3?

Basin E1 (Q_5= 3.4 cfs, Q_{100}=6.3 cfs) is 0.88 Acres and 86 percent imperious is located directly west of Sterling Ranch Filing No. 4. Basin E1 is composed of the southwest portion of the proposed extension of Marksheffel Road. Runoff from basin E1 drains via curb and gutter in confluence with existing bypass runoff from the existing portion of Marksheffel Road. The runoff from this basin is capture into the 15' type R inlet on grade at design point 1e and is then piped to pond W-5 and the remaining runoff is then by passed to design point 3e downstream of 1e.

E2

Basin E2 (Q_5= 3.4 cfs, Q_{100}=6.4 cfs) is 0.91 Acres and 83 percent imperious is located directly west of Sterling Ranch Filing No. 4. Basin E1 is composed of the northwest portion of the proposed extension of Marksheffel Road. Runoff from basin E2 drains via curb and gutter in confluence with existing bypass runoff from the existing portion of Marksheffel Road. The runoff from this basin is captured by a 15' on grade type R inlet at design point 2e. The runoff from the on grade inlet is bypassed down stream to design point 4e. The captured runoff is piped to pond W-5 built in Filing No. 2 along with upstream runoff from the Western portion of Marksheffel Road.

Please show and label sedimentation pond on drainage map

Basin E3 (Q_5= 1.4 cfs, Q_{100}=2.7 cfs) is 0.35 acres and 89 percent impervious is located directly west of Sterling Ranch Filing No. 4. Basin E3 is composed the southwest portion of the proposed extension of Marksheffel road. Runoff from basin E3 will drain via curb and gutter and drain into an interim sediment pond. The runoff will ultimately be treated in a downstream water quality pond that is being built with the Aspen Meadows subdivision to the south and will by conveyed by corresponding improvements to Marksheffel road that will be built the Aspen Meadows subdivision developed. Refer to Appendix D for excerpts from the Aspen Meadows drainage report.

Basin E4 (Q_5= 1.3 cfs, Q_{100}=3.1 cfs) is 0.61 acres and 47 percent impervious is located directly west of Sterling Ranch Filing No. 4. Basin E4 is composed the northwest portion of the proposed extension of Marksheffel road. Runoff from basin E4 will drain to an interim sediment pond. The runoff will ultimately be treated in a downstream water quality pond that is being built with the Aspen Meadows subdivision to the south and will by conveyed by corresponding improvements to Marksheffel road that will be built the Aspen Meadows subdivision developed. Refer to Appendix D for excerpts from the Aspen Meadows drainage report.

DRAINAGE DESIGN CRITERIA

DEVELOPMENT CRITERIA REFERENCE

Storm drainage analysis and design criteria for this project were taken from the "*City of Colorado Springs/El Paso County Drainage Criteria Manual*" Volumes 1 and 2 (EPCDCM), dated October 12, 1994, the "*Urban Storm Drainage Criteria Manual*" Volumes 1 to 3 (USDCM) and Chapter 6 and Section 3.2.1 of Chapter 13 of the "*Colorado Springs Drainage Criteria Manual*" (CSDCM), dated May 2014, as adopted by El Paso County.

HYDROLOGIC CRITERIA

All hydrologic data was obtained from the "*El Paso Drainage Criteria Manual*" Volumes 1 and 2, and the "*Urban Drainage and Flood Control District Urban Storm Drainage Criteria Manual*" Volumes 1, 2, and 3. Onsite drainage improvements were designed based on the 5 year (minor) storm event and the 100-year (major) storm event. Runoff was calculated using the Rational Method, and rainfall intensities for the 5-year and the 100-year storm return frequencies were obtained from Table 6-2 of the CSDCM. One hour point rainfall data for the storm events is identified in the chart below. Runoff coefficients were determined based on proposed land use and from data in Table 6-6 from the CSDCM. Time of concentrations were developed using equations from CSDCM. All runoff calculations and applicable charts and graphs are included in the Appendices.

Table 2 - 1-hr Point Rainfall Data

Storm	Rainfall (in.)
5-year	1.50
100-year	2.52

HYDRAULIC CRITERIA

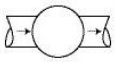
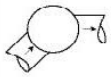
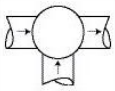
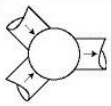
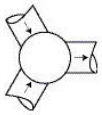
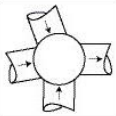
The Rational Method and USDCM's SF-2 and SF-3 forms were used to determine the runoff from the minor and major storms on the site. Sump and on-grade inlets were sized using UDFCD UD-Inlet v4.05. StormCAD was used to model the proposed storm sewer system within the interim area and to analyze the proposed HGL calculations for the Construction Drawings. Autodesk Hydraflow express was used to size the overflow channel and an interim swale. Manhole and pipe losses for the model were obtained from the *Modeling Hydraulic and Energy Gradients in Storm Sewers: A Comparison of Computation Methods*, by AMEC Earth & Environmental, Inc. The manhole loss coefficients used in the model can be seen in Table 3 (below) This method is accurate for pipes 42" and smaller for larger pipes the Standard head-loss coefficients as recommended by Bentley were used as shown in table 4. StormCAD, Autodesk Hydraflow results, along with street and inlet capacities, are presented in Appendix C.

Include discussion of design criteria used for design of swales.

Table 3 Storm Head-loss Coefficients

StormCAD Conversion Table			
Bend Loss	Bend Angle	K coefficient Conversion	
	0	0.05	
	22.5	0.1	
	45	0.4	
	60	0.64	
	90	1.32	
Lateral Loss	1 Lateral K coefficient Conversion		
	Bend Angle	Non Surcharged	Surcharged
	45	0.27	0.47
	60	0.52	0.9
	90	1.02	1.77
	2 Laterals K coefficient Conversion		
	45	0.96	
	60	1.16	
	90	1.52	

Table 4 Storm Head-loss Coefficients

Type of Manhole	Diagram	Headloss Coefficient
Trunkline only with no bend at the junction		0.5
Trunkline only with 45° bend at the junction		0.6
Trunkline only with 90° bend at the junction		0.8
Trunkline with one lateral		Small 0.6 Large 0.7
Two roughly equivalent entrance lines with angle < 90° between lines		0.8
Two roughly equivalent entrance lines with angle > 90° between lines		0.9
Three or more entrance lines		1.0

DRAINAGE FACILITY DESIGN

Filing 3?

Include discussion of storm sewer systems & swales

GENERAL CONCEPT

The proposed stormwater conveyance system was designed to convey the developed Sterling Ranch Filing No. 4 runoff to an existing (Filing 2) full spectrum water quality and detention pond via storm sewer. The proposed pond was designed to release at less than historic rates to minimize adverse impacts downstream. Treated water will outfall directly into the Sand Creek Drainage way, where it will eventually outfall into Fountain Creek. A proposed drainage map is presented in Appendix E showing locations of the pond.

FOUR STEP PROCESS TO MINIMIZE ADVERSE IMPACTS OF URBANIZATION

In accordance with the El Paso County Drainage Criteria Manual Volume 2, this site has implemented the four-step process to minimize adverse impacts of urbanization. The four-step process includes reducing runoff volumes, treating the water quality capture volume (WQCV), stabilizing drainage ways, and implementing long-term source controls.

Step 1 – Reducing Runoff Volumes: The Sterling Ranch Filing No. 4 development project consists of single-family homes with open spaces and lawn areas interspersed within the development which helps disconnect impervious areas and reduce runoff volumes. Roof drains from the structures will discharge to lawn areas, where feasible, to allow for infiltration and runoff volume reduction.

Step 2 – Stabilize Drainageways: The site lies within the Sand Creek Drainage Basin. Basin and bridge fees will be due at time of platting. These funds will be used for the channel stabilization being designed by JR Engineering adjacent to the site and on future projects within the basin to stabilize drainageways. The site does not discharge directly into the open drainageway of Sand Creek, therefore no downstream stabilization will be accomplished with this project.

Step 3 – Treat the WQCV: Water Quality treatment for this site is provided in an existing full spectrum water quality detention pond (W5). The runoff from this site will be collected within inlets and conveyed to the proposed ponds via storm sewer. Upon entrance to the ponds, flows will be captured in a forebay designed to promote settlement of suspended solids. A trickle channel is also incorporated into the ponds to minimize the amount of standing water. The outlet structure has been designed to detain the water quality capture volume (WQCV) for 40 hours, and the extended urban runoff volume (EURV) for 72 hours. All flows released from the ponds will be reduced to less than historic rates.

Step 4 –BMPs will be utilized to minimize off-site contaminants and to protect the downstream receiving waters. The Filing No. 4 site is residential. There is no proposed commercial or industrial use for the site. The permanent erosion control BMPs include asphalt drives, storm inlets and storm pipe, the full spectrum detention pond W-5 and permanent vegetation. Maintenance responsibilities and plans will be defined at the time of final platting.

WATER QUALITY

In accordance with Section 13.3.2.1 of the CCS/EPCDCM, full spectrum water quality and detention are provided for all developed basins. This site will drain into an existing Full Spectrum Drainage Pond W5 developed during the Sterling Ranch Filing No. 2 Project. Further details as well as all pond volume, water quality, and outfall calculations are included in the Sterling Ranch Filing 2 Final Drainage Report. Pond W5 corresponds to pond FSD6 from the Master Development Drainage Plan for Sterling Ranch", (MMDP) prepared by M&S Civil Consultants, Inc., dated October 24, 2018 and is releasing less than the MDDP values in the proposed design. A summary of Pond W-5 has been included below for reference.

Using Existing Pond: Engineer must confirm in the Drainage Report that the existing pond (W5) is functioning as intended.

Table 3. Pond Volumes & Release Rates

	REQUIRED VOLUME (AC-FT)	VOLUME PROVIDED (AC-FT)	WQCV (AC-FT)	EURV (AC-FT)	5-YEAR RELEASE (CFS)	100-YEAR RELEASE (CFS)
POND W5	18.217	18.441	3.29	11.71	2.7	137.1

EROSION CONTROL PLAN

It is the policy of the El Paso County, that a grading and erosion control plan be submitted with the drainage report. Proposed silt fence, vehicles traffic control, temporary sediment basins, seeding and mulching are proposed as erosion control measure.

Revise statement. This is construction document submittal. Please provide copy of O & M manual with next submittal

OPERATION & MAINTENANCE

In order to ensure the function and effectiveness of the stormwater infrastructure, maintenance activities such as inspection, routine maintenance, restorative maintenance, rehabilitation and repair, are required. The district shall be responsible for the inspection, maintenance, rehabilitation and repair of stormwater and erosion control facilities located on the property unless another party accepts such responsibility in writing and responsibility is properly assigned through legal documentation. Access is provided from onsite facilities and easements for proposed infrastructure located offsite. We respectfully request that the Operation & Maintenance Manual be submitted in conjunction with the construction documents, prior to obtaining a grading permit. A maintenance road was provided for the existing pond W5 and information on the road can be found in the Final Drainage Report for Sterling Ranch Filing No. 2. The maintenance road access is off Marksheffel Road and wraps around the top of the pond providing access to the inflow pipe wingwalls and outlet structure for the pond.

Revise statement as this is plat submittal

DRAINAGE AND BRIDGE FEES

The site lies within the Sand Creek Drainage Basin. Anticipated drainage and bridge fees are presented below and will be due at time of platting (depending on date of plat submittal):

date to 2022 fees

2021 DRAINAGE AND BRIDGE FEES – STERLING RANCH FILING No. 4				
Impervious Acres (ac)	Drainage Fee (Per Imp. Acre)	Bridge Fee (Per Imp. Acre)	Sterling Ranch Drainage Fee	Sterling Ranch Bridge Fee
21.0	$20,387	$8,339	$428,127	$175,119

Provide calculations and address the existing lots being replatted from Filing 2.

CONSTRUCTION COST OPINION

A construction cost opinion for the public storm drainage infrastructure has been provided below. The below cost opinion is only an estimate of facility and drainage infrastructure cost and may vary.

ADD

SUMMARY

The proposed Sterling Ranch Filing No. 4 drainage improvements were designed to meet or exceed the El Paso County Drainage Criteria. The proposed development will not adversely affect the offsite drainage-ways or surrounding development. The existing pond W-5 is to release less than 90% of the predeveloped runoff study associated with the subject site. The site is in continuity with the Sterling Ranch Filing No. 2 Drainage Report. This report is in conformance and meets the latest El Paso County Storm Drainage Criteria requirements for this site.

REFERENCES

1. "El Paso County and City of Colorado Springs Drainage Criteria Manual, Vol I & II".

2. Sand Creek Channel Design Report, prepared by JR Engineering, May 19, 2021 (not yet approved)

3. "Master Development Drainage Plan for Sterling Ranch", (MMDP) prepared by M&S Civil Consultants, Inc., dated October 24, 2018.

4. Sand Creek Drainage Basin Planning Study, prepared Kiowa Engineering Corporation, January 1993, revised March 1996.

5. "Sterling Ranch Filing 2 Final Drainage Report", prepared by JR Engineering, dated May 2021

6. Urban Storm Drainage Criteria Manual (Volumes 1, 2, and 3), Urban Drainage and Flood Control District, June 2001.

7. Sand Creek Stabilization at Aspen Meadows Subdivision Filing No. 1 – 100% Design Plans, April 2020

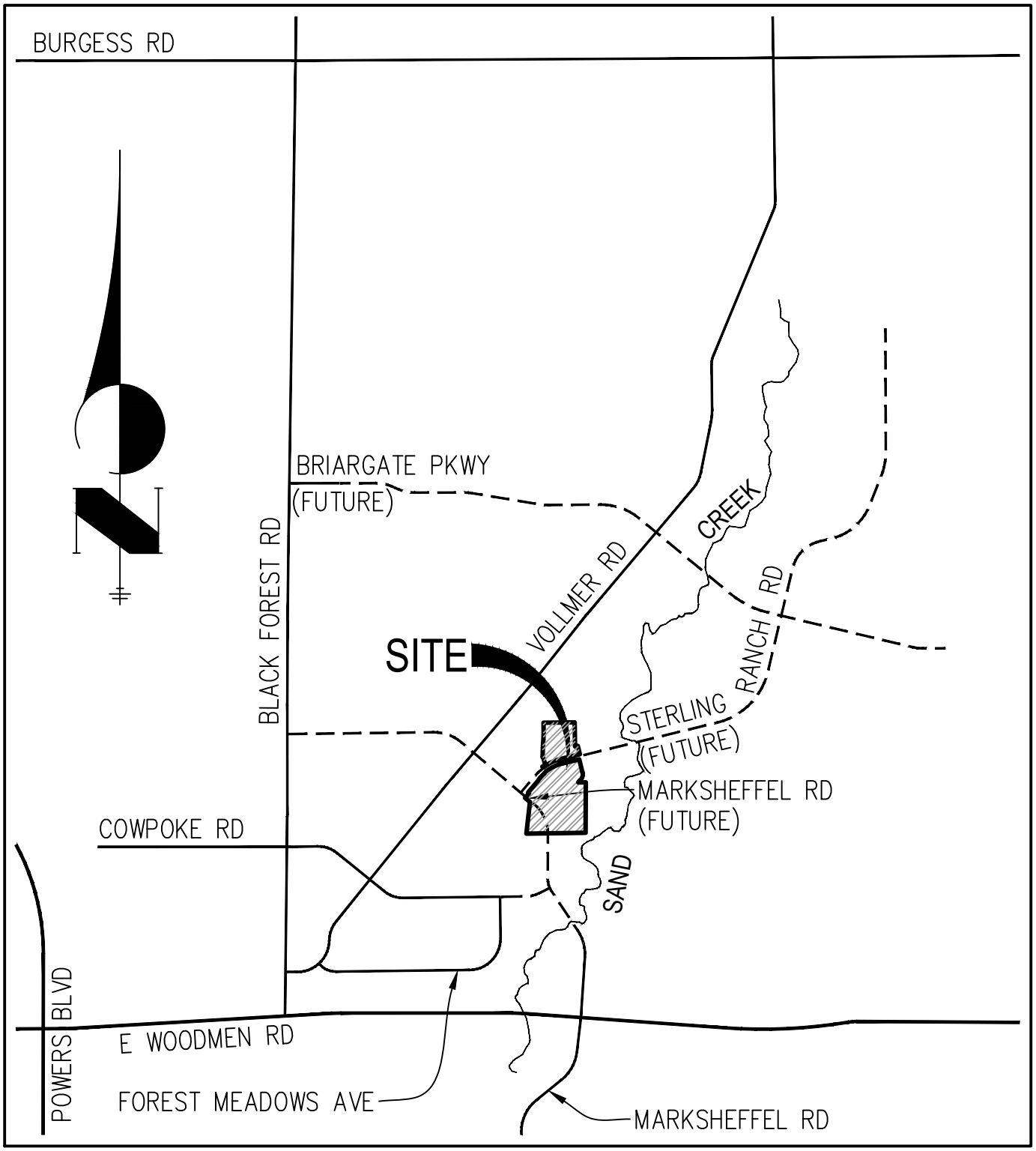
8. Final Drainage Report For Barbarick Subdivision Portion Of Lots 1,2 And Lots 3 and 4, Prepared by Matrix Design Group, June 2016

9. Preliminary Drainage Report And MDDP Addendum For Homestead North At Sterling Ranch Preliminary Plan", prepared by JR Engineering, dated January 2022

10. Sand Creek Drainage Basin Planning Study, Stantec, January 2021

12. Final Drainage Report for Aspen Meadows, Matrix Design, January 2019* pending approval

Appendix A
Vicinity Map, Soil Descriptions, FEMA Floodplain Map



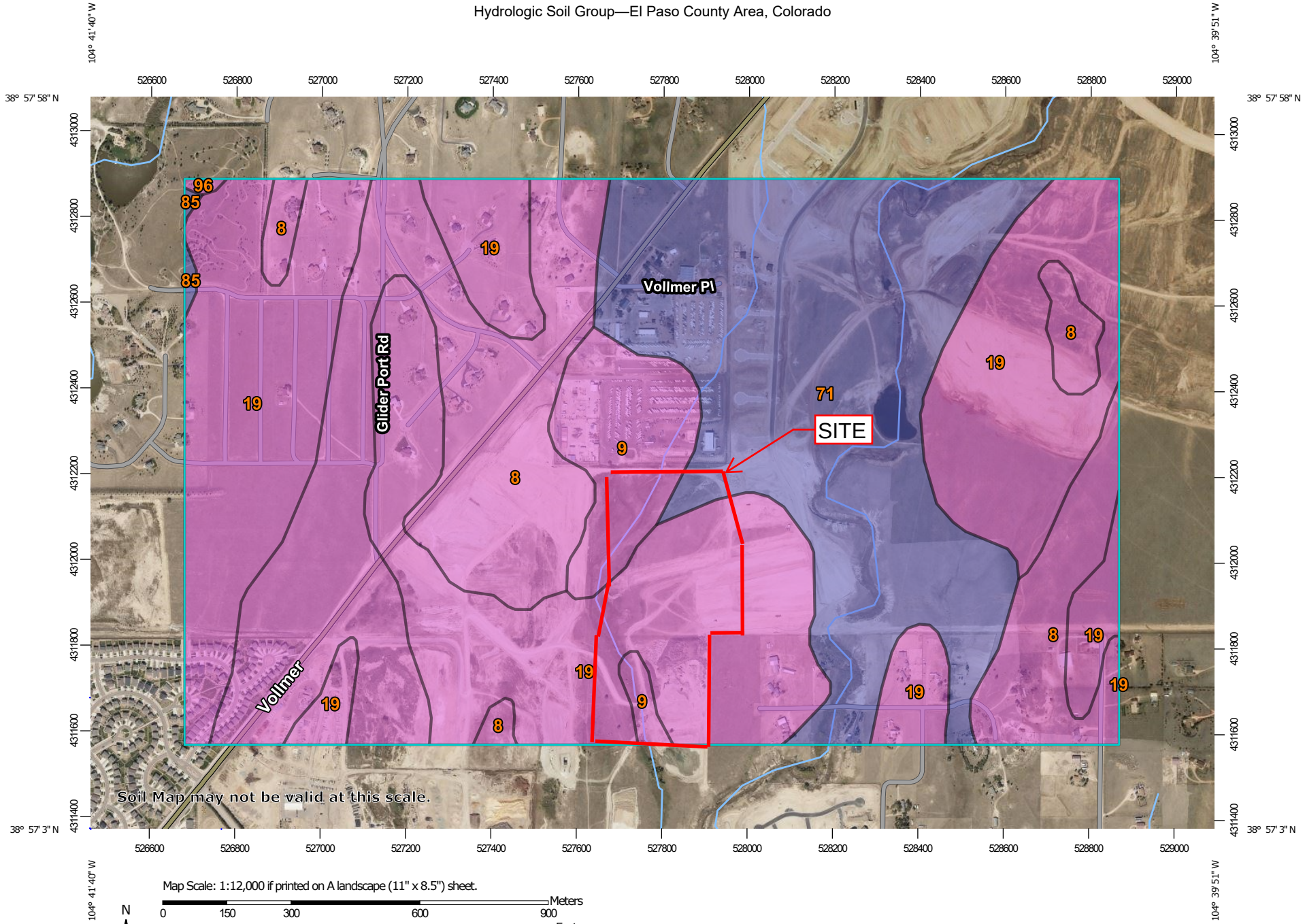
VICINITY MAP

N.T.S.

VICINITY MAP
STERLING RANCH FILING NO. 4
JOB NO. 25188.11
4/27/22
SHEET 1 OF 1

J·R ENGINEERING
A Westrian Company

Centennial 303-740-9393 • Colorado Springs 719-593-2593
Fort Collins 970-491-9888 • www.jrengineering.com



Map Scale: 1:12,000 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 150 300 600 900

Feet: 0 500 1000 2000 3000

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 Rating Polygons

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

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 17, Sep 13, 2019

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

Date(s) aerial images were photographed: Aug 19, 2018—May 26, 2019

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.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
8	Blakeland loamy sand, 1 to 9 percent slopes	A	182.3	25.4%
9	Blakeland-Fluvaquentic Haplaquolls	A	36.8	5.1%
19	Columbine gravelly sandy loam, 0 to 3 percent slopes	A	307.5	42.9%
71	Pring coarse sandy loam, 3 to 8 percent slopes	B	188.4	26.3%
85	Stapleton-Bernal sandy loams, 3 to 20 percent slopes	B	1.2	0.2%
96	Truckton sandy loam, 0 to 3 percent slopes	A	0.6	0.1%
Totals for Area of Interest			**716.9**	**100.0%**

Description

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

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

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

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

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

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

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

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) zone 13. The **horizontal datum** was NAD83, GRS80 spheroid. Differences in datum, spheroid, projection or UTM zones zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the **North American Vertical Datum of 1988 (NAVD88)**. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov/ or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, MD 20910-3282

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at (301) 713-3242 or visit its website at http://www.ngs.noaa.gov/.

Base Map information shown on this FIRM was provided in digital format by El Paso County, Colorado Springs Utilities, and Anderson Consulting Engineers, Inc. These data are current as of 2008.

This map reflects more detailed and up-to-date **stream channel configurations and floodplain delineations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables in the Flood Insurance Study Report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map. The profile baselines depicted on this map represent the hydraulic modeling baselines that match the flood profiles and Floodway Data Tables if applicable, in the FIS report. As a result, the profile baselines may deviate significantly from the new base map channel representation and may appear outside of the floodplain.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

Contact **FEMA Map Service Center** (MSC) via the FEMA Map Information eXchange (FMIX) 1-877-336-2627 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. The MSC may also be reached by Fax at 1-800-358-9620 and its website at http://www.msc.fema.gov/.

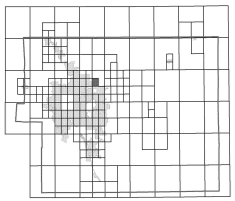
If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call **1-877-FEMA MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/business/nfip.

El Paso County Vertical Datum Offset Table

Flooding Source	Vertical Datum Offset (ft)

REFER TO SECTION 3.3 OF THE EL PASO COUNTY FLOOD INSURANCE STUDY FOR STREAM BY STREAM VERTICAL DATUM CONVERSION INFORMATION

Panel Location Map



This Digital Flood Insurance Rate Map (DFIRM) was produced through a Cooperating Technical Partner (CTP) agreement between the State of Colorado Water Conservation Board (CWCB) and the Federal Emergency Management Agency (FEMA).

Additional Flood Hazard information and resources are available from local communities and the Colorado Water Conservation Board.

NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 12 SOUTH, RANGE 65 WEST, AND TOWNSHIP 13 SOUTH, RANGE 65 WEST.

LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAS) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A No Base Flood Elevations determined.
ZONE AE Base Flood Elevations determined.
ZONE AH Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR Special Flood Hazard Area Formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99 Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

Floodplain boundary
Floodway boundary
Zone D Boundary
CBRS and OPA boundary
Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
513 — Base Flood Elevation line and value; elevation in feet*
(EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988 (NAVD 88)

A — A — Cross section line
23 — 23 — Transect line
97° 07' 30.00" / 32° 22' 30.00" — Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
4275000 N — 1000-meter Universal Transverse Mercator grid ticks, zone 13
6000000 FT — 5000-foot grid ticks: Colorado State Plane coordinate system, central zone (FIPSZONE 0502), Lambert Conformal Conic Projection
DX5510 — Bench mark (see explanation in Notes to Users section of this FIRM panel)
M1.5 — River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
MARCH 17, 1997

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
DECEMBER 7, 2018 - to update corporate limits, to change Base Flood Elevations and Special Flood Hazard Areas, to update map format, to add roads and road names, and to incorporate previously issued Letters of Map Revision.

For community map revision history prior to countywide mapping, refer to the Community Map History Table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 500'
250 0 500 1000 FEET
150 0 150 300 METERS

NFIP

PANEL 0533G

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

EL PASO COUNTY, COLORADO AND INCORPORATED AREAS

PANEL 533 OF 1300

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
COLORADO SPRINGS, CITY OF	080060	0533	G
EL PASO COUNTY	080059	0533	G

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER 08041C0533G

MAP REVISED DECEMBER 7, 2018

Federal Emergency Management Agency

Appendix B
Hydrologic Calculations

COMPOSITE % IMPERVIOUS & COMPOSITE EXISTING RUNOFF COEFFICIENT CALCULATIONS

Subdivision: Sterling Ranch Subdivision- Existing
Location: El Paso County

Project Name: Sterling Ranch Phase 2
Project No.: 25188.02
Calculated By: CJD
Checked By:
Date: 4/26/22

Need one land type per column

How is this basin 2% impervious if entire basin is Lawns (0%)?

Basin ID	Total Area (ac)	Streets (100% Impervious)				Residential (65% Impervious) Neighborhood Area (70% Impervious)				1 Acre lot Rersidential (20% Impervious) Light Commercial (80% Impervious)				Lawns (0% Impervious) School (55% Impervious)				Basins Total Weighted C Values		Basins Total Weighted % Imp.
		C_5	C_{100}	Area (ac)	Weighted % Imp.	C_5	C_{100}	Area (ac)	Weighted % Imp.	C_5	C_{100}	Area (ac)	Weighted % Imp.	C_5	C_{100}	Area (ac)	Weighted % Imp	C_5	C_{100}	
A-1	5.17	0.90	0.96	0.00	0.0%	0.45	0.59	0.00	0.0%	0.59	0.70	0.00	0.0%	0.08	0.35	5.17	2.0%	0.08	0.35	2.0%
A-2	19.12	0.90	0.96	0.00	0.0%	0.45	0.59	0.00	0.0%	0.59	0.70	0.00	0.0%	0.08	0.35	19.12	0.0%	0.08	0.35	0.0%
A-3	17.62	0.90	0.96	0.00	0.0%	0.45	0.59	0.62	2.3%	0.59	0.70	0.00	0.0%	0.08	0.35	17.00	0.0%	0.09	0.36	2.3%
OS1	9.27	0.90	0.96	2.85	30.7%	0.45	0.59	0.00	0.0%	0.30	0.40	2.85	6.1%	0.08	0.35	3.57	0.0%	0.40	0.55	36.9%
OS2	2.48	0.90	0.96	1.40	56.5%	0.45	0.59	0.00	0.0%	0.59	0.70	0.00	0.0%	0.08	0.35	0.00	0.0%	0.51	0.54	56.5%
OS3	3.50	0.90	0.96	1.46	41.7%	0.45	0.59	0.00	0.0%	0.59	0.70	0.00	0.0%	0.08	0.35	2.04	0.0%	0.42	0.60	41.7%
OS4	5.10	0.90	0.96	0.00	0.0%	0.45	0.59	0.65	8.3%	0.59	0.70	0.00	0.0%	0.08	0.35	4.45	0.0%	0.13	0.38	8.3%
OS5	3.46	0.90	0.96	0.00	0.0%	0.45	0.59	0.00	0.0%	0.59	0.70	0.00	0.0%	0.08	0.35	3.46	0.0%	0.08	0.35	0.0%
OS6	18.18	0.90	0.96	0.00	0.0%	0.45	0.59	0.00	0.0%	0.90	0.90	10.40	11.4%	0.08	0.35	7.78	0.0%	0.55	0.66	11.4%
OS7	33.07	0.90	0.96	0.00	0.0%	0.45	0.59	0.00	0.0%	0.90	0.90	7.91	19.1%	0.08	0.35	25.16	0.0%	0.28	0.48	19.1%
E-1	5.15	0.90	0.96	0.00	0.0%	0.45	0.59	0.00	0.0%	0.90	0.90	0.00	0.0%	0.08	0.35	5.15	0.0%	0.08	0.35	0.0%
TOTAL (A1-B1)	41.91																			1.2%
TOTAL (OS1-OS7)	75.06																			20.1%
TOTAL	116.97																			13.4%

There is no B1 basin. Please update label

What land type is the remaining 1.08 acres?

Why are these C-values different than others in this column? 100-yr values should be different than 5-yr values.

EXISTING
STANDARD FORM SF-2
TIME OF CONCENTRATION

Subdivision: Sterling Ranch Subdivision- Existing
Location: El Paso County

Project Name: Sterling Ranch Phase 2
Project No.: 25188.02
Calculated By: CJD
Checked By:
Date: 4/26/22

SUB-BASIN DATA						INITIAL/OVERLAND (T_i)			TRAVEL TIME (T_t)					*tc* CHECK (URBANIZED BASINS)			FINAL
BASIN ID	D.A. (ac)	Hydrologic Soils Group	Impervious (%)	C_5	C_{100}	L (ft)	S_o (%)	t_i (min)	L_t (ft)	S_t (%)	K	VEL. (ft/s)	t_t (min)	COMP. t_c (min)	TOTAL LENGTH (ft)	Urbanized t_c (min)	t_c (min)
A-1	5.17	A	2%	0.08	0.35	212	2.0%	21.4	517	2.1%	10.0	1.4	6.0	27.4	729.0	32.1	27.4
A-2	19.12	A	0%	0.08	0.35	297	2.5%	23.4	500	2.4%	10.0	1.6	5.3	28.7	797.0	31.9	28.7
A-3	17.62	A	2%	0.09	0.36	121	5.4%	11.4	784	2.7%	10.0	1.7	7.9	19.4	905.0	34.1	19.4
OS1	9.27	A	37%	0.40	0.55	298	2.7%	15.7	737	2.4%	10.0	1.5	8.0	23.7	1035.0	25.4	23.7
OS2	2.48	A	56%	0.51	0.54	117	3.1%	8.0	1745	1.6%	20.0	2.5	11.5	19.5	1862.0	30.0	19.5
OS3	3.50	A	42%	0.42	0.60	41	2.5%	5.8	1681	1.8%	20.0	2.7	10.5	16.2	1722.0	33.0	16.2
OS4	5.10	A	8%	0.13	0.38	491	1.4%	35.0	940	5.6%	10.0	2.4	6.6	41.6	1431.0	31.1	31.1
OS5	3.46	A	0%	0.08	0.35	298	3.0%	22.1	784	2.4%	10.0	1.6	8.4	30.4	1082.0	35.3	30.4
OS6	18.18	A	11%	0.55	0.66	165	3.4%	8.5	612	2.7%	10.0	1.6	6.2	14.7	777.0	29.9	14.7
OS7	33.07	A	19%	0.28	0.48	298	3.0%	17.9	1664	2.7%	10.0	1.6	16.9	34.7	1962.0	37.2	34.7
E-1	5.15	A	0%	0.08	0.35	60	3.0%	9.9	865	2.3%	10.0	1.5	9.5	19.4	925.0	36.5	19.4

NOTES:

$$t_c = t_i + t_t$$ Equation 6-2

Where:

t_c = computed time of concentration (minutes)

t_i = overland (initial) flow time (minutes)

t_t = channelized flow time (minutes).

$$t_i = \frac{0.395(1.1 - C_5)\sqrt{L_i}}{S_o^{0.33}}$$ Equation 6-3

Where:

t_i = overland (initial) flow time (minutes)
C_5 = runoff coefficient for 5-year frequency (from Table 6-4)
L_i = length of overland flow (ft)
S_o = average slope along the overland flow path (ft/ft).

Use a minimum t_c value of 5 minutes for urbanized areas and a minimum t_c value of 10 minutes for areas that are not considered urban. Use minimum values even when calculations result in a lesser time of concentration.

$$t_t = \frac{L_t}{60K\sqrt{S_o}} = \frac{L_t}{60V_t}$$ Equation 6-4

Where:

t_t = channelized flow time (travel time, min)
L_t = waterway length (ft)
S_o = waterway slope (ft/ft)
V_t = travel time velocity (ft/sec) = $K\sqrt{S_o}$
K = NRCS conveyance factor (see Table 6-2).

$$t_c = (26 - 17i) + \frac{L_t}{60(14i + 9)\sqrt{S_t}}$$ Equation 6-5

Where:

t_c = minimum time of concentration for first design point when less than t_c from Equation 6-1.
L_t = length of channelized flow path (ft)
i = imperviousness (expressed as a decimal)
S_t = slope of the channelized flow path (ft/ft).

Table 6-2. NRCS Conveyance factors, K

Type of Land Surface	Conveyance Factor, K
Heavy meadow	2.5
Tillage/field	5
Short pasture and lawns	7
Nearly bare ground	10
Grassed waterway	15
Paved areas and shallow paved swales	20

EXISTING
STANDARD FORM SF-2
TIME OF CONCENTRATION

Subdivision: Sterling Ranch Subdivision- Existing
Location: El Paso County

Project Name: Sterling Ranch Phase 2
Project No.: 25188.02
Calculated By: CJD
Checked By:
Date: 4/26/22

SUB-BASIN DATA						INITIAL/OVERLAND (T_i)			TRAVEL TIME (T_t)					*tc* CHECK (URBANIZED BASINS)			FINAL
BASIN	D.A.	Hydrologic	Impervious	C_5	C_{100}	L	S_o	t_i	L_t	S_t	K	VEL.	t_t	COMP. t_c	TOTAL	Urbanized t_c	t_c

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STANDARD FORM SF-3 - EXISTING
STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)

Subdivision: Sterling Ranch Subdivision- Existing
Location: El Paso County
Design Storm: 5-Year

Project Name: Sterling Ranch Phase 2
Project No.: 25188.02
Calculated By: CJD
Checked By:
Date: 4/26/22

STREET	Design Point	DIRECT RUNOFF							TOTAL RUNOFF				STREET/SWALE			PIPE				TRAVEL TIME			REMARKS
		Basin ID	Area (Ac)	Runoff Coeff.	t_c (min)	C*A (Ac)	I (in/hr)	Q (cfs)	tc (min)	C*A (ac)	I (in/hr)	Q (cfs)	$Q_{street/swale}$ (cfs)	C*A (ac)	Slope (%)	Q_{pipe} (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t_t (min)	
	1	A-1	5.17	0.08	27.4	0.41	2.62	1.1															
	16.2								19.8	6.99	3.10	21.7											Runoff from Sterling Ranch Filing no. 3 see attached report in appendix D
	2	A-2	19.12	0.08	28.7	1.53	2.55	3.9	28.7	8.52	2.55	21.7											Basin A2 + runoff from Sterling Ranch Filing No. 3
	3	OS1	9.27	0.40	23.7	3.71	2.83	10.5															Basin A1
	4	OS5	3.46	0.08	30.4	0.28	2.46	0.7															Basin A4
	7	OS2	2.48	0.51	19.5	1.26	3.13	3.9															Basin OS2
	8	OS3	3.50	0.42	16.2	1.48	3.40	5.0															Basin OS3
	9	OS4	5.10	0.13	31.1	0.65	2.43	1.6															Basin OS4
	10	OS6	18.18	0.55	14.7	9.98	3.55	35.4						10.0	3.4					998	1.8	9.1	Basin OS6 travel to design point 5.1
	11	OS7	33.07	0.28	34.7	9.13	2.26	20.6						9.13	3.2					936	1.8	8.7	Basin OS7 travel to design point 5.1
	5	A-3	17.62	0.09	19.4	1.64	3.14	5.1															Basin A3
	5.1								34.7	19.11	2.26	43.2											Design point 5.1 fed by basins A3, OS6, and OS7
	O1	E-1	5.15	0.08	19.4	0.41	3.13	1.3															Basin E-1

Basin OS1

Could not verify this flow as Filing 3 information was not in Appendix D. Please provide with next submittal

Notes:
Street and Pipe C*A values are determined by Q/i using the catchment's intensity value.
All pipes are private and RCP unless otherwise noted. Pipe size shown in table column.

Is this a correct statement?

STANDARD FORM SF-3 - EXISTING
STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)

Subdivision: Sterling Ranch Subdivision- Existing
Location: El Paso County
Design Storm: 100-Year

Project Name: Sterling Ranch Phase 2
Project No.: 25188.02
Calculated By: CJD
Checked By:
Date: 4/26/22

Description	Design Point	DIRECT RUNOFF							TOTAL RUNOFF				STREET/SWALE			PIPE				TRAVEL TIME			REMARKS
		Basin ID	Area (ac)	Runoff Coeff.	t_c (min)	C*A (ac)	I (in/hr)	Q (cfs)	tc (min)	C*A (ac)	I (in/hr)	Q (cfs)	$Q_{street/swale}$ (cfs)	C*A (ac)	Slope (%)	Q_{pipe} (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t_t (min)	
	1	A-1	5.17	0.35	27.4	1.81	4.39	8.0															
	16.2								19.4	9.33	5.26	49.1											Runoff from Sterling Ranch Filing no. 3 see attached report in appendix D
	2	A-2	19.12	0.35	28.7	6.69	4.27	28.6	28.7	16.02	4.27	68.5											Basin A2 + runoff from Sterling Ranch Filing No. 3
	3	OS1	9.27	0.55	23.7	5.13	4.76	24.4															Basin A1
	4	OS5	3.46	0.35	30.4	1.21	4.13	5.0															Basin A4
	7	OS2	2.48	0.54	19.5	1.34	5.25	7.0															Basin OS2
	8	OS3	3.50	0.60	16.2	2.12	5.71	12.1															Basin OS3
	9	OS4	5.10	0.38	31.1	1.94	4.07	7.9															Basin OS4
	10	OS6	18.18	0.66	14.7	12.08	5.95	71.9						12.1	3.4					998	1.8	9.1	Basin OS6 travel to design point 5.1
	11	OS7	33.07	0.48	34.7	15.93	3.79	60.4						15.93	3.2					936	1.8	8.7	Basin OS7 travel to design point 5.1
	5	A-3	17.62	0.36	19.4	6.32	5.27	33.3															Basin A3
	5.1								34.7	28.01	3.79	106.3											Design point 5.1 fed by basins A3, OS6, and OS7
	O1	E-1	5.15	0.35	19.4	1.80	5.26	9.5															Basin E-1

Notes:
Street and Pipe C*A values are determined by Q/i using the catchment's intensity value.
All pipes are private and RCP unless otherwise noted. Pipe size shown in table column.

See comments from previous page

STANDARD FORM SF-3 - EXISTING

STORM DRAINAGE SYSTEM DESIGN

(RATIONAL METHOD PROCEDURE)

Subdivision: Sterling Ranch Subdivision- Existing
Location: El Paso County
Design Storm: 100-Year

Project Name: Sterling Ranch Phase 2
Project No.: 25188.02
Calculated By: CJD
Checked By:
Date: 4/26/22

Description	Design Point	DIRECT RUNOFF							TOTAL RUNOFF				STREET/SWALE			PIPE				TRAVEL TIME			REMARKS
		Basin ID	Area (ac)	Runoff Coeff.	t_c (min)	C*A (ac)	I (in/hr)	Q (cfs)	tc (min)	C*A (ac)	I (in/hr)	Q (cfs)	$Q_{street/swale}$ (cfs)	C*A (ac)	Slope (%)	Q_{pipe} (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t_t (min)	

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COMPOSITE % IMPERVIOUS & COMPOSITE PROPOSED RUNOFF COEFFICIENT CALCULATIONS

Subdivision: Sterling Ranch Subdivision -Proposed
Location: El Paso County

Project Name: Sterling Ranch Filing No. 4
Project No.: 25188.11
Calculated By: ARJ
Checked By:
Date: 4/20/22

Seems like a low acreage for lot area. Please verify area of this and lawns.

Need one land type per column

Basin ID	Total Area (ac)	Paved/Streets (100% Impervious)				Residential (65% Impervious)				Light Industrial (80% Impervious) Commercial (95% Impervious)				Lawns (0% Impervious) School (55% Impervious)				Basins Total Weighted C Values		Basins Total Weighted % Imp.
		C_5	C_{100}	Area (ac)	Weighted % Imp.	C_5	C_{100}	Area (ac)	Weighted % Imp.	C_5	C_{100}	Area (ac)	Weighted % Imp.	C_5	C_{100}	Area (ac)	Weighted % Imp.	C_5	C_{100}	
A2	1.38	0.90	0.96	0.22	15.9%	0.45	0.59	0.34	16.0%	0.59	0.70	0.00	0.0%	0.08	0.35	0.82	0.0%	0.30	0.51	32.0%
A3	3.68	0.90	0.96	0.71	19.3%	0.45	0.59	2.59	45.7%	0.59	0.70	0.00	0.0%	0.08	0.35	0.38	0.0%	0.50	0.64	65.0%
A4	4.53	0.90	0.96	0.67	14.8%	0.45	0.59	2.35	33.7%	0.59	0.70	0.00	0.0%	0.08	0.35	1.51	0.0%	0.39	0.56	48.5%
A5	0.45	0.90	0.96	0.17	38.1%	0.45	0.59	0.28	40.8%	0.59	0.70	0.00	0.0%	0.08	0.35	0.00	0.0%	0.63	0.73	79.0%
A6.1	4.73	0.90	0.96	1.02	21.6%	0.45	0.59	3.70	50.9%	0.59	0.70	0.00	0.0%	0.08	0.35	0.01	0.0%	0.55	0.67	72.5%
A6.2	2.56	0.90	0.96	0.66	25.7%	0.45	0.59	1.90	48.2%	0.59	0.70	0.00	0.0%	0.08	0.35	0.00	0.0%	0.56	0.68	73.9%
A7	1.76	0.90	0.96	0.43	24.5%	0.45	0.59	1.32	48.8%	0.59	0.70	0.00	0.0%	0.08	0.35	0.01	0.0%	0.56	0.68	73.3%
A8	4.23	0.90	0.96	0.12	2.8%	0.45	0.59	0.68	10.5%	0.59	0.70	0.00	0.0%	0.08	0.35	3.42	0.0%	0.16	0.41	13.4%
C1	2.59	0.90	0.96	0.72	27.8%	0.45	0.59	1.66	41.7%	0.59	0.70	0.00	0.0%	0.08	0.35	0.21	0.0%	0.55	0.67	69.5%
C2	6.75	0.90	0.96	1.49	22.0%	0.45	0.59	4.21	40.5%	0.59	0.70	0.00	0.0%	0.08	0.35	1.06	0.0%	0.49	0.63	62.5%
C3	4.18	0.90	0.96	0.14	3.4%	0.45	0.59	1.00	15.5%	0.59	0.70	0.00	0.0%	0.08	0.35	3.04	0.0%	0.20	0.43	18.9%
A9	2.02	0.90	0.96	0.06	3.0%	0.45	0.59	0.15	4.8%	0.59	0.70	0.00	0.0%	0.08	0.35	1.81	0.0%	0.13	0.39	7.8%
A10	2.67	0.90	0.96	0.44	16.4%	0.45	0.59	0.40	9.8%	0.59	0.70	0.00	0.0%	0.08	0.35	1.83	0.0%	0.27	0.49	26.2%
B3	2.38	0.90	0.96	1.41	59.3%	0.45	0.59	0.12	3.3%	0.59	0.70	0.00	0.0%	0.08	0.35	0.85	0.0%	0.58	0.72	62.6%
C4	4.52	0.90	0.96	1.68	37.2%	0.45	0.59	0.80	11.5%	0.59	0.70	0.00	0.0%	0.08	0.35	2.04	0.0%	0.45	0.62	48.7%
OS6	18.38	0.90	0.96	0.00	0.0%	0.45	0.59	0.00	0.0%	0.90	0.90	10.40	53.8%	0.08	0.35	7.98	0.0%	0.54	0.66	53.8%
OS7	33.07	0.90	0.96	0.00	0.0%	0.45	0.59	0.00	0.0%	0.90	0.90	7.91	22.7%	0.08	0.35	25.16	0.0%	0.28	0.48	22.7%
I1	5.88	0.90	0.96	0.00	0.0%	0.45	0.59	0.62	6.9%	0.90	0.90	0.00	0.0%	0.08	0.35	5.26	0.0%	0.12	0.38	6.9%
I2	2.89	0.90	0.96	0.00	0.0%	0.45	0.59	0.00	0.0%	0.90	0.90	0.00	0.0%	0.08	0.35	2.89	0.0%	0.08	0.35	0.0%
I3	2.11	0.90	0.96	0.00	0.0%	0.45	0.59	0.00	0.0%	0.90	0.90	0.00	0.0%	0.08	0.35	2.11	0.0%	0.08	0.35	0.0%
E1	0.88	0.90	0.96	0.75	85.6%	0.45	0.59	0.00	0.0%	0.90	0.90	0.00	0.0%	0.08	0.35	0.13	0.0%	0.78	0.87	85.6%
E2	0.91	0.90	0.96	0.76	83.1%	0.45	0.59	0.00	0.0%	0.90	0.90	0.00	0.0%	0.08	0.35	0.15	0.0%	0.76	0.86	83.1%
E3	0.35	0.90	0.96	0.31	88.9%	0.45	0.59	0.00	0.0%	0.90	0.90	0.00	0.0%	0.08	0.35	0.04	0.0%	0.81	0.89	88.9%
E4	0.61	0.90	0.96	0.29	46.9%	0.45	0.59	0.00	0.0%	0.90	0.90	0.00	0.0%	0.08	0.35	0.32	0.0%	0.46	0.64	46.9%
TOTAL (A1-C4)	48.42																			49.4%
TOTAL (OS4 -OS7)	51.45																			33.8%
TOTAL (E1-E4)	2.75																			76.6%
TOTAL	99.87																			41.4%

100-yr values should be different from 5-yr vallues

Seems like a large area of lawn for a basin covering half of Sterling Ranch Road. Please check acreage.

Basin ID	Total Area (ac)	Paved/Streets (100% Impervious)				Res
		C_5	C_{100}	Area (ac)	Weighted % Imp.	C_5

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Basin ID	Total Area (ac)	Paved/Streets (100% Impervious)				Res
		C_5	C_{100}	Area (ac)	Weighted % Imp.	C_5

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PROPOSED
STANDARD FORM SF-2
TIME OF CONCENTRATION

Subdivision: Sterling Ranch Subdivision -Proposed
Location: El Paso County

Project Name: Sterling Ranch Filing No. 4
Project No.: 25188.11
Calculated By: ARJ
Checked By:
Date: 4/20/22

SUB-BASIN DATA						INITIAL/OVERLAND (T_i)			TRAVEL TIME (T_t)					*tc* CHECK (URBANIZED BASINS)			FINAL
BASIN ID	D.A. (ac)	Hydrologic Soils Group	Impervious (%)	C_5	C_{100}	L (ft)	S_o (%)	t_i (min)	L_t (ft)	S_t (%)	K	VEL. (ft/s)	t_t (min)	COMP. t_c (min)	TOTAL LENGTH (ft)	Urbanized t_c (min)	t_c (min)
A2	1.38	A	32%	0.30	0.51	100	3.7%	9.4	141	1.5%	20.0	2.4	1.0	10.3	241.0	22.0	10.3
A3	3.68	A	65%	0.50	0.64	100	3.7%	7.0	1008	2.4%	20.0	3.1	5.5	12.5	1108.2	21.0	12.5
A4	4.53	A	48%	0.39	0.56	100	2.1%	10.1	814	1.9%	20.0	2.8	4.9	15.0	914.0	24.0	15.0
A5	0.45	A	79%	0.63	0.73	54	3.7%	4.1	217	3.9%	20.0	4.0	0.9	5.0	271.0	13.5	5.0
A6.1	4.73	A	72%	0.55	0.67	100	2.0%	8.0	841	2.9%	20.0	3.4	4.1	12.1	941.0	18.0	12.1
A6.2	2.56	A	74%	0.56	0.68	100	2.0%	7.7	685	1.6%	20.0	2.6	4.5	12.1	785.0	18.1	12.1
A7	1.76	A	73%	0.56	0.68	100	3.4%	6.5	367	1.2%	20.0	2.2	2.8	9.4	467.0	16.5	9.4
A8	4.23	A	13%	0.16	0.41	233	4.9%	15.3	307	0.9%	15.0	1.4	3.6	18.9	540.0	28.7	18.9
C1	2.59	A	69%	0.55	0.67	100	4.3%	6.2	393	1.8%	20.0	2.7	2.5	8.7	493.0	16.8	8.7
C2	6.75					99	1.8%	9.1	796	1.7%	20.0	2.6	5.1	14.2	895.0	21.1	14.2
C3	4.18					100	9.6%	7.7	255	3.5%	15.0	2.8	1.5	9.3	355.0	24.7	9.3
A9	2.02					100	2.4%	13.1	108	2.6%	20.0	3.2	0.6	13.6	208.0	25.8	13.6
A10	2.67	A	26%	0.27	0.49	100	2.8%	10.7	0	1.0%	20.0	2.0	0.0	10.7	100.0	21.5	10.7
B3	2.38	A	63%	0.58	0.72	165	3.4%	8.0	1595	1.5%	10.0	1.2	21.7	29.7	1760.0	27.6	27.6
C4	4.52	A	49%	0.45	0.62	100	3.0%	8.2	1664	1.5%	10.0	1.2	22.6	30.8	1764.0	32.0	30.8
OS6	18.38	A	54%	0.54	0.66	165	3.4%	8.6	612	2.7%	10.0	1.6	6.2	14.8	777.0	20.6	14.8
OS7	33.07	A	23%	0.28	0.48	298	3.0%	17.9	1664	2.7%	10.0	1.6	16.9	34.7	1962.0	36.0	34.7
I1	5.88	A	7%	0.12	0.38	180	1.4%	21.3	497	1.6%	10.0	1.3	6.5	27.8	677.0	31.4	27.8
I2	2.89	A	0%	0.08	0.35	125	1.6%	17.7	385	5.2%	10.0	2.3	2.8	20.5	510.0	29.1	20.5
I3	2.11	A	0%	0.08	0.35	80	1.7%	13.8	385	2.5%	10.0	1.6	4.1	17.9	465.0	30.6	17.9
E1	0.88	A	86%	0.78	0.87	30	2.0%	2.5	730	2.9%	20.0	3.4	3.6	6.1	760.0	14.9	6.1
E2	0.91	A	83%	0.76	0.86	30	2.0%	2.7	675	2.9%	20.0	3.4	3.3	6.0	705.0	15.1	6.0
E3	0.35	A	89%	0.81	0.89	30	2.0%	2.3	280	1.9%	20.0	2.8	1.7	4.0	310.0	12.5	5.0
E4	0.61	A	47%	0.46	0.64	30	2.0%	5.0	260	1.9%	20.0	2.8	1.6	6.6	290.0	20.1	6.6

Length seems long based on basin configuration. Please verify.

NOTES:

PROPOSED
STANDARD FORM SF-2
TIME OF CONCENTRATION

Subdivision: Sterling Ranch Subdivision -Proposed
Location: El Paso County

Project Name: Sterling Ranch Filing No. 4
Project No.: 25188.11
Calculated By: ARJ
Checked By:
Date: 4/20/22

SUB-BASIN						INITIAL/OVERLAND			TRAVEL TIME					tc CHECK			FINAL
DATA						(T_i)			(T_t)					(URBANIZED BASINS)			
BASIN	D.A.	Hydrologic	Impervious	C_5	C_{100}	L	S_o	t_i	L_t	S_t	K	VEL.	t_t	COMP. t_c	TOTAL	Urbanized t_c	t_c

$$t_c = t_i + t_t$$ Equation 6-2

Where:

t_c = computed time of concentration (minutes)

t_i = overland (initial) flow time (minutes)

t_t = channelized flow time (minutes).

$$t_t = \frac{L_t}{60K\sqrt{S_o}} = \frac{L_t}{60V_t}$$ Equation 6-4

Where:

t_t = channelized flow time (travel time, min)
L_t = waterway length (ft)
S_o = waterway slope (ft/ft)
V_t = travel time velocity (ft/sec) = $K\sqrt{S_o}$
K = NRCS conveyance factor (see Table 6-2).

Use a minimum t_c value of 5 minutes for urbanized areas and a minimum t_c value of 10 minutes for areas that are not considered urban. Use minimum values even when calculations result in a lesser time of concentration.

$$t_i = \frac{0.395(1.1 - C_5)\sqrt{L_i}}{S_o^{0.33}}$$ Equation 6-3

Where:

t_i = overland (initial) flow time (minutes)
C_5 = runoff coefficient for 5-year frequency (from Table 6-4)
L_i = length of overland flow (ft)
S_o = average slope along the overland flow path (ft/ft).

Table 6-2. NRCS Conveyance factors, K

Type of Land Surface	Conveyance Factor, K
Heavy meadow	2.5
Tillage/field	5
Short pasture and lawns	7
Nearly bare ground	10
Grassed waterway	15
Paved areas and shallow paved swales	20

$$t_c = (26 - 17i) + \frac{L_t}{60(14i + 9)\sqrt{S_t}}$$ Equation 6-5

Where:

t_c = minimum time of concentration for first design point when less than t_c from Equation 6-1.
L_t = length of channelized flow path (ft)
i = imperviousness (expressed as a decimal)
S_t = slope of the channelized flow path (ft/ft).

STANDARD FORM SF-3 - PROPOSED
STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)

Subdivision: Sterling Ranch Subdivision -Proposed
Location: El Paso County
Design Storm: 5-Year

Project Name: Sterling Ranch Filing No. 4
Project No.: 25188.11
Calculated By: ARJ
Checked By:
Date: 4/20/22

Do design points account include by-pass flows from upstream on-grade inlets? It's hard to tell if that had been included in the flows here or on the inlet spreadsheets.

		DIRECT RUNOFF							TOTAL RUNOFF				STREET/SWALE			PIPE				TRAVEL TIME			
STREET	Design Point	Basin ID	Area (Ac)	Runoff Coeff.	t_c (min)	C*A (Ac)	I (in/hr)	Q (cfs)	tc (min)	C*A (ac)	I (in/hr)	Q (cfs)	$Q_{street/swale}$ (cfs)	C*A (ac)	Slope (%)	Q_{pipe} (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t_t (min)	REMARKS
	1	OS7	33.07	0.28	34.7	9.13	2.26	20.6								20.6	9.13	1.0	36	430	8.3	0.9	Offsite Barbarick Subdivision pond release Piped to DP 4.1
	4	OS6	18.38	0.54	14.8	10.00	3.54	35.4															Offsite subdivision pond release Confluenced at DP 4.1
	4.1								35.6	19.13	2.22	42.5				35.6	19.13	1.0	48	775	9.5	1.4	Offsite flow confluenced from basins OS7 and OS4 Piped to DP 7.1
	5	C2	6.75	0.49	14.2	3.32	3.61	12.0								12.0	3.32	1.0	24	63	7.3	0.1	Sump Inlet Piped to DP 6.1
	6	C1	2.59	0.55	8.7	1.41	4.34	6.1															Sump Inlet Piped to DP 6.1
	6.1								14.3	4.73	3.59	17.0				17.0	4.73	1.0	36	245	7.8	0.5	Piped to DP 7.2
	7	C3	4.18	0.20	9.3	0.82	4.24	3.5															Area Inlet Piped to DP 7.1
	7.1								37.0	19.95	2.17	43.2				43.2	19.95	1.0	36	40	10.0	0.1	Structure piped to 7.2
	7.2								37.0	24.68	2.16	53.4											Piped to existing storm sewer in Sterling Ranch Road
																							Runoff drains directly onto Sterling Ranch Road
	8	C4	4.52	0.45	30.8	2.04	2.44	5.0	30.8	2.04	2.44	5.0											Offsite flow to existing inlet in Sterling Ranch Road Piped to existing storm sewer in Sterling Ranch Road
	9	B3	2.38	0.58	27.6	1.39	2.61	3.6															Offsite flow to existing inlet in Sterling Ranch Road Piped to existing storm sewer in Sterling Ranch Road
	15							8.2					0.4	0.11	1.6	7.8							Include summary of where this flow is from & where it goes
	15.1								19.5	6.71	3.13	21.0				21.0	6.71	1.0	24	45	8.2	0.1	Include summary of where this flow is from & where it goes
	16	A5	0.45	0.63	5.0	0.28	5.17	1.4					0.0	0	2.9	1.4							On-grade Inlet Captured Flows piped to DP 16.1
	16.1								19.6	6.88	3.12	21.5				21.5	6.88	1.0	24	280	8.2	0.6	Piped to DP 18.1
	17	A2	1.38	0.30	10.3	0.42	4.08	1.7	20.2	0.53	3.08	1.6	0.0	0		1.6	0.42	1.0	24	27	4.1	0.1	On-grade Inlet Piped to DP 18.1
	17.1															1.6							Captured runoff from on Grade inlet at DP 17
	18.1								20.3	7.41	3.07	22.7				22.7	0.00	1.0	30	600	8.6	1.2	Piped to DP20.1
	12	A6.1	4.73	0.55	12.1	2.59	3.85	10.0					1.0	0.26	1.0	9.0	2.33	1.0	24	100	6.7	0.2	On-grade Inlet Captured Flows piped to DP 18.2, Bypass flow to DP 19
	12.1															9.0							Captured flow into on grade inlet at DP12.1
	18.2								21.4	9.74	2.99	29.1											
	19	A6.2	2.56	0.56	12.1	1.45	3.84	5.6	12.3	1.71	3.81	6.5	0.0	0	1.0	6.5	1.70	1.0	18	30	6.2	0.1	On-grade Inlet Captured Flows piped to DP 20.1, Bypass flow to DP 21
	19.1															6.5							Captured flow from on grade inlet from DP 19

No OS4 basin, is it OS6?

Where does captured flow pipe to?

Verify all pipe sizes on drainage map. Some discrepancies between map and spreadsheet

STANDARD FORM SF-3 - PROPOSED
STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)

Subdivision: Sterling Ranch Subdivision -Proposed
Location: El Paso County
Design Storm: 5-Year

Project Name: Sterling Ranch Filing No. 4
Project No.: 25188.11
Calculated By: ARJ
Checked By:
Date: 4/20/22

		DIRECT RUNOFF							TOTAL RUNOFF				STREET/SWALE			PIPE				TRAVEL TIME			
STREET	Design Point	Basin ID	Area (Ac)	Runoff Coeff.	t_c (min)	C*A (Ac)	I (in/hr)	Q (cfs)	tc (min)	C*A (ac)	I (in/hr)	Q (cfs)	$Q_{street/swale}$ (cfs)	C*A (ac)	Slope (%)	Q_{pipe} (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t_t (min)	REMARKS
	20	A3	3.68	0.50	12.5	1.84	3.79	7.0					0.0	0	1.0	7.0	1.84	1.0	18	4	6.3	0.0	On-grade Inlet Captured Flows piped to DP 20.1
	20.1															7.0							Captured flow from on grade inlet from DP 20
	20.2								21.4	13.28	2.99	39.6				39.6	13.28	1.0	36	220	9.8	0.4	Piped to DP23
	21	A7	1.76	0.56	9.4	0.99	4.23	4.2	12.2	0.99	3.83	3.8				3.8	0.99	1.0	18	60	5.4	0.2	Sump Inlet Piped to DP21.1
	21.1								21.4	14.27	2.99	42.6				42.6	14.27	1.0	42	90	10.0	0.1	MH Piped to DP23
	22	A4	4.53	0.39	15.0	1.78	3.52	6.3	15.0	1.78	3.52	6.3											Sump Inlet Piped to DP22.1
	22.1								15.0	1.78	3.52	6.3				6.3	1.78	1.0	24	10	6.2	0.0	Piped to DP23
	23								21.8	16.05	2.96	47.5				47.5	16.05	1.0	42	145	10.3	0.2	Piped to DP26
	24	A8	4.23	0.16	18.9	0.69	3.17	2.2															Area Inlet Piped to EX 84" Storm Line Built w/ SR Filing 2 First Phase
	25	A9	2.02	0.13	13.6	0.27	3.66	1.0								1.0	0.27	1.0	18	30	3.6	0.1	EX FES Piped to EX 84" Storm Line Built w/ SR Filing 2 First Phase
	27	A10	2.67	0.27	10.7	0.72	4.03	2.9															Pervious area sheet flows into EX Pond W5
	1.i	I1	5.88	0.12	27.8	0.70	2.60	1.8															Runoff drains into into swale
	3.i	I3	2.11	0.08	17.9	0.17	3.26	0.6															Runoff drains into swale
	2.i	I2	2.89	0.08	20.5	0.23	3.05	0.7	27.8	1.10	2.60	2.9											
	e11												0.6										By pass runoff from upstream existing 15' type R inlet built in Sterling Ranch Filing No. 2

STANDARD FORM SF-3 - PROPOSED
STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)

Subdivision: Sterling Ranch Subdivision -Proposed
Location: El Paso County
Design Storm: 5-Year

Project Name: Sterling Ranch Filing No. 4
Project No.: 25188.11
Calculated By: ARJ
Checked By:
Date: 4/20/22

		DIRECT RUNOFF							TOTAL RUNOFF				STREET/SWALE			PIPE				TRAVEL TIME			
STREET	Design Point	Basin ID	Area (Ac)	Runoff Coeff.	t_c (min)	C*A (Ac)	I (in/hr)	Q (cfs)	tc (min)	C*A (ac)	I (in/hr)	Q (cfs)	$Q_{street/swale}$ (cfs)	C*A (ac)	Slope (%)	Q_{pipe} (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t_t (min)	REMARKS
	1e	E1	0.88	0.78	6.1	0.69	4.87	3.4				4.0	0.0										Runoff from up stream + runoff from by pass flow
	1.1e															4.0							Captured and Piped runoff from 15 ' type R inlet
	e10												0.6										By pass runoff from up stream existing 15' type R inlet built in Sterling Ranch Filing No. 2
	2e	E2	0.91	0.76	6.0	0.70	4.90	3.4				4.0											Total Runoff from up stream + runoff from by pass flow
	2.1e															8.0							Total runoff piped from basin E1 + upstream bypass and runoff from basin E2 + runoff from upstream bypass
	3e	E3	0.35	0.81	5.0	0.28	5.17	1.4	6.1	0.28	4.87	1.4	0.0										Total runoff from basin E3 and bypass runoff from basin E1
	4e	E4	0.61	0.46	6.6	0.28	4.76	1.3	6.6	0.28	4.76	1.3											Total runoff from basin E4 and bypass runoff from basin E2

STANDARD FORM SF-3 - PROPOSED

STORM DRAINAGE SYSTEM DESIGN

(RATIONAL METHOD PROCEDURE)

Subdivision: Sterling Ranch Subdivision -Proposed
Location: El Paso County
Design Storm: 5-Year

Project Name: Sterling Ranch Filing No. 4
Project No.: 25188.11
Calculated By: ARJ
Checked By:
Date: 4/20/22

		DIRECT RUNOFF							TOTAL RUNOFF				STREET/SWALE			PIPE				TRAVEL TIME			
STREET	Design Point	Basin ID	Area (Ac)	Runoff Coeff.	t_c (min)	C*A (Ac)	I (in/hr)	Q (cfs)	tc (min)	C*A (ac)	I (in/hr)	Q (cfs)	$Q_{street/swale}$ (cfs)	C*A (ac)	Slope (%)	Q_{pipe} (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t_t (min)	REMARKS

Notes:
Street and Pipe C*A values are determined by Q/i using the catchment's intensity value.
All pipes are private and RCP unless otherwise noted. Pipe size shown in table column.

Is this a correct statement?

STANDARD FORM SF-3 - PROPOSED

STORM DRAINAGE SYSTEM DESIGN

(RATIONAL METHOD PROCEDURE)

Subdivision: Sterling Ranch Subdivision -Proposed
Location: El Paso County
Design Storm: 100-Year

Project Name: Sterling Ranch Filing No. 4
Project No.: 25188.11
Calculated By: ARJ
Checked By:
Date: 4/20/22

		DIRECT RUNOFF							TOTAL RUNOFF				STREET/SWALE			PIPE				TRAVEL TIME			
Description	Design Point	Basin ID	Area (ac)	Runoff Coeff.	t_c (min)	C* A (ac)	I (in/hr)	Q (cfs)	tc (min)	C* A (ac)	I (in/hr)	Q (cfs)	$Q_{street/swale}$ (cfs)	C* A (ac)	Slope (%)	Q_{pipe} (cfs)	C* A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t_t (min)	REMARKS
	1	OS7	33.07	0.48	34.7	15.93	3.79	60.4								60.4	15.93	1.0	36	725	10.7	1.1	Offsite Barbarick Subdivision pond release Piped to DP 4.1
	4	OS6	18.38	0.66	14.8	12.15	5.94	72.2								72.2	12.15	1.0	48	800	11.4	1.2	Offsite subdivision pond release Piped to DP 7.1
	4.1								35.9	28.08	3.71	104.3											Offsite subdivision pond release Confluenced at DP 4.1
	5	C2	6.75	0.63	14.2	4.28	6.06	25.9								25.9	4.28	1.0	24	63	8.3	0.1	Sump Inlet Piped to DP 6.1
	6	C1	2.59	0.67	8.7	1.74	7.29	12.7															Sump Inlet Piped to DP 6.1
	6.1								14.3	6.02	6.03	36.3				36.3	6.02	1.0	36	245	9.6	0.4	Piped to DP 7.1
	7	C3	4.18	0.43	9.3	1.79	7.12	12.8															Area Inlet Piped to DP 7.1
	7.1								35.9	29.87	3.71	110.9				110.9	29.87	1.0	36	40	15.7	0.0	Structure piped to 7.2
	7.2								35.9	35.89	3.71	133.2											Piped to existing storm sewer in Sterling Ranch Road
																							Runoff drains directly onto Sterling Ranch Road
	8	C4	4.52	0.62	30.8	2.80	4.10	11.5	30.8	2.80	4.10	11.5											Offsite flow to existing inlet in Sterling Ranch Road Piped to existing storm sewer in Sterling Ranch Road
	9	B3	2.38	0.72	27.6	1.72	4.38	7.5															Offsite flow to existing inlet in Sterling Ranch Road Piped to existing storm sewer in Sterling Ranch Road
	15							17.7					5.2	0.817	1.5	12.5							Existing runoff from Sterling Ranch Filing 3 by-passed to DP 17
	15.1								19.2	8.18	5.28	43.2				43.2	8.18	1.0	24	45	13.8	0.1	On-grade Inlet. See attached SR Filing 3 SF-3 Sheet and drainage map in Appendix D Captured Flows piped to DP 16.1

STANDARD FORM SF-3 - PROPOSED

STORM DRAINAGE SYSTEM DESIGN

(RATIONAL METHOD PROCEDURE)

Subdivision: Sterling Ranch Subdivision -Proposed
Location: El Paso County
Design Storm: 100-Year

Project Name: Sterling Ranch Filing No. 4
Project No.: 25188.11
Calculated By: ARJ
Checked By:
Date: 4/20/22

Description	Design Point	DIRECT RUNOFF							TOTAL RUNOFF				STREET/SWALE			PIPE				TRAVEL TIME			REMARKS
		Basin ID	Area (ac)	Runoff Coeff.	t_c (min)	C* A (ac)	I (in/hr)	Q (cfs)	tc (min)	C* A (ac)	I (in/hr)	Q (cfs)	$Q_{street/swale}$ (cfs)	C* A (ac)	Slope (%)	Q_{pipe} (cfs)	C* A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t_t (min)	
	16	A5	0.45	0.73	5.0	0.33	8.68	2.9					0.0	0	2.9	2.9							On-grade Inlet Captured Flows piped to DP 16.1
	16.1								19.3	8.51	5.28	44.9				44.9	8.51	1.0	24	280	14.3	0.3	Piped to DP 18.1
	17	A2	1.38	0.51	10.3	0.70	6.85	4.8	19.6	1.52	5.23	7.9	0.7	0.102	1.5	7.2	1.41	1.0	24	27	6.4	0.1	On-grade Inlet Piped to DP 18.1
	17.1															7.2							Captured runoff from on Grade inlet at DP 17
	18.1								19.7	10.03	5.23	52.4				52.4	10.03	1.0	30	600	10.7	0.9	Piped to DP18.2
	12	A6.1	4.73	0.67	12.1	3.17	6.46	20.5					6.9	1.069	1.0	13.6	2.10	1.0	24	100	7.5	0.2	On-grade Inlet Captured Flows piped to DP 18.2, Bypass flow to DP 19
	12.1															13.6							Captured flow into on grade inlet at DP12.1
	18.2								20.6	12.13	5.11	62.0				62.0	12.13	1.0	24	50	19.7	0.0	
	19	A6.2	2.56	0.68	12.1	1.75	6.44	11.3	12.3	2.82	6.41	18.1	3.3	0.512	1.0	14.8	2.29	1.0	18	30	8.4	0.1	On-grade Inlet Captured Flows piped to DP 20.1, Bypass flow to DP 21
	19.1															14.8							Captured flow from on grade inlet from DP 19
	20	A3	3.68	0.64	12.5	2.34	6.37	14.9					3.2	0.502	1.0	11.7	1.84	1.0	18	4	6.6	0.0	On-grade Inlet Captured Flows piped to DP 20.1, Bypass flow to DP 22
	20.1															11.7							Captured flow from on grade inlet from DP 20
	20.2								20.7	16.26	5.10	83.0				83.0	16.26	1.0	36	220	11.7	0.3	Piped to DP23
	21	A7	1.76	0.68	9.4	1.20	7.10	8.5	12.2	1.71	6.43	11.0				11.0	1.71	1.0	18	60	6.7	0.1	Sump Inlet Piped to DP21.1
	21.1								20.7	17.97	5.10	91.7				91.7	17.97	1.0	42	90	11.9	0.1	MH Piped to DP23
	22	A4	4.53	0.56	15.0	2.56	5.91	15.1	15.0	3.16	5.91	18.7											Piped to Piped to DP22.1
	22.1								15.0	3.16	5.91	18.7				18.7	3.16	1.0	24	10	8.0	0.0	Piped to DP23
	23								21.0	21.14	5.07	107.1				107.1	21.14	1.0	42	145	11.8	0.2	Piped to DP26
	24	A8	4.23	0.41	18.9	1.72	5.32	9.2															Area Inlet Piped to EX 84" Storm Line Built w/ SR Filing 2 First Phase
	25	A9	2.02	0.39	13.6	0.78	6.15	4.8								4.8	0.78	1.0	18	30	5.7	0.1	EX FES Piped to EX 84" Storm Line Built w/ SR Filing 2 First Phase
	27	A10	2.67	0.49	10.7	1.30	6.77	8.8															Pervious area sheet flows into EX Pond W5
	1.i	I1	5.88	0.38	27.8	2.21	4.36	9.6															Runoff drains into into swale and is conveyed away from lots on Grenbough DR
	3.i	I3	2.11	0.35	17.9	0.74	5.47	4.0															Runoff drains into swale
	2.i	I2	2.89	0.35	20.5	1.01	5.13	5.2	27.8	3.96	4.36	17.3											Runoff drains into Ex. 36" FES
													4.5										By pass runoff from upstream existing 15' type R inlet built in Sterling Ranch Filing No. 2

Print this line with the next sheet

STANDARD FORM SF-3 - PROPOSED

STORM DRAINAGE SYSTEM DESIGN

(RATIONAL METHOD PROCEDURE)

Subdivision: Sterling Ranch Subdivision -Proposed
Location: El Paso County
Design Storm: 100-Year

Project Name: Sterling Ranch Filing No. 4
Project No.: 25188.11
Calculated By: ARJ
Checked By:
Date: 4/20/22

Description	Design Point	DIRECT RUNOFF							TOTAL RUNOFF				STREET/SWALE			PIPE				TRAVEL TIME			REMARKS
		Basin ID	Area (ac)	Runoff Coeff.	t_c (min)	C*A (ac)	I (in/hr)	Q (cfs)	tc (min)	C*A (ac)	I (in/hr)	Q (cfs)	$Q_{street/swale}$ (cfs)	C*A (ac)	Slope (%)	Q_{pipe} (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t_t (min)	
	e11																						
	1e	E1	0.88	0.87	6.1	0.77	8.18	6.3				10.8	0.5	0.061	2.8	10.3							Runoff from up stream + runoff from by pass flow
	1.1e															10.3							Captured and Piped runoff from 15 ' type R inlet
	e10												6.1										By pass runoff from up stream existing 15' type R inlet built in Sterling Ranch Filing No. 2
	2e	E2	0.91	0.86	6.0	0.78	8.22	6.4				12.5	1.8	0.219	2.8	10.7							Total Runoff from up stream + runoff from by pass flow
	2.1e															21.0							Total runoff piped from basin E1 + upstream bypass and runoff from basin E2 + runoff from upstream bypass. Runoff is then piped into pond W-5
	3e	E3	0.35	0.89	5.0	0.31	8.68	2.7	6.1	0.37	8.18	3.0											Total runoff from basin E3 and bypass runoff from basin E1
	4e	E4	0.61	0.64	6.6	0.39	7.99	3.1	6.6	0.61	7.99	4.9											Total runoff from basin E4 and bypass runoff from basin E2

Notes:
Street and Pipe C*A values are determined by Q/i using the catchment's intensity value.
All pipes are private and RCP unless otherwise noted. Pipe size shown in table column.

Is this a correct statement?

Appendix C
Hydraulic Calculations

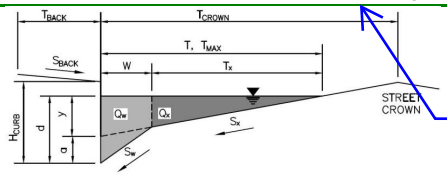
Version 4.05 Released March 2017

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

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

Project: Sterling Ranch Phase 2

Inlet ID: A1 - DP15



There is no A1 in hydrology spreadsheet or on proposed map. Please ensure labels correspond to basins and/or design points used. Indicate that this is an existing inlet.

Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	5.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.033	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.013	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	7.8	inches
Allow Flow Depth at Street Crown (leave blank for no)				check = yes

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	**Q_{allow} =**	**21.2**	**24.3**	**cfs**

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

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

Please update to new inlet sizing spreadsheet - MHFD-Inlet V5.02 dated Sept 2022

Include analysis of existing inlets at 3e & 4e to ensure they are still functioning properly

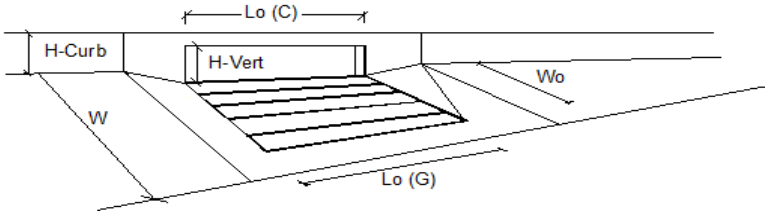
Include "Inlet Management" print out for quick summary of inlet design

Include design of area inlets

Full review of inlet design will be completed next submittal once routing of by-pass flows has been determined.

INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	15.00	15.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**7.8**	**12.5**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.4**	**5.2**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**95**	**71**	**%**

Existing by-pass runoff from 15' Type R inlet at DP 15

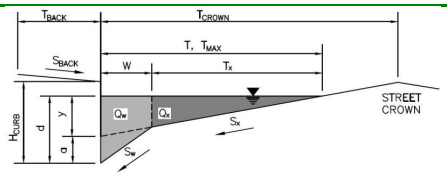
Version 4.05 Released March 2017

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

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

Project: Sterling Ranch Phase Fil. 4

Inlet ID: A2 - DP17



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.8	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	1.17	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.042	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.026	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	15.8	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.6	7.8	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☐	check = yes

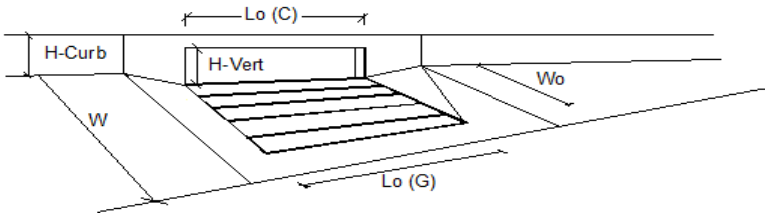
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	**Q_{allow} =**	**13.3**	**16.1**	**cfs**

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

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

INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	10.00	10.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	

Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**1.6**	**5.6**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**2.3**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**70**	**%**

Has by pass flow from DP 15 been accounted for at this inlet?

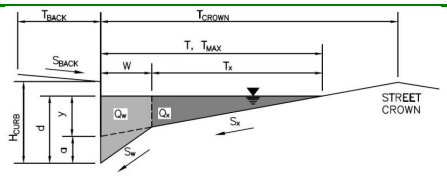
Version 4.05 Released March 2017

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

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

Project: Sterling Ranch Phase Fil. 4

Inlet ID: A4 - DP22



Gutter Geometry (Enter data in the blue cells)

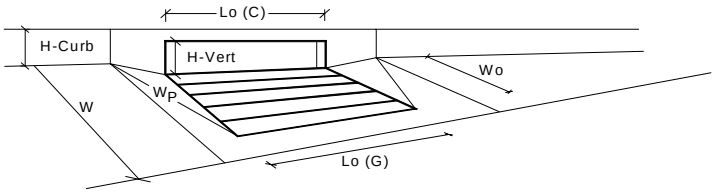
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	1.17	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	15.8	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.6	7.8	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	4.6	8.0	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	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 =	1.17	1.17	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.29	0.57	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.43	0.75	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.69	0.89	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**6.2**	**22.6**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	5.5	15.9	cfs

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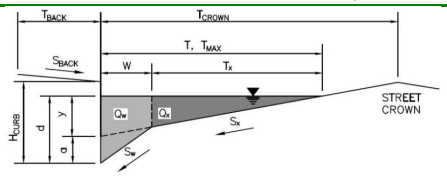
ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

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

Project: Sterling Ranch Phase Fil. 4

Inlet ID: A6.1 - DP12



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	17.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	1.17	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.010	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	7.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

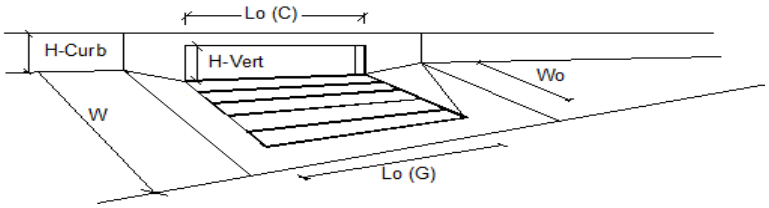
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**10.2**	**28.1**	**cfs**

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

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

INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	3	3	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**9.0**	**13.6**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**1.0**	**6.9**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**90**	**66**	**%**

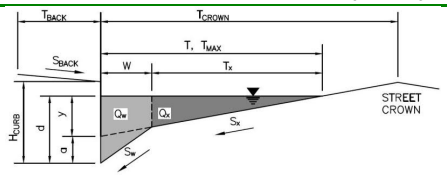
Version 4.05 Released March 2017

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

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

Project: Sterling Ranch Phase Fil. 4

Inlet ID: A6.2 - DP19



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.8	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.042	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.010	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	7.8	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

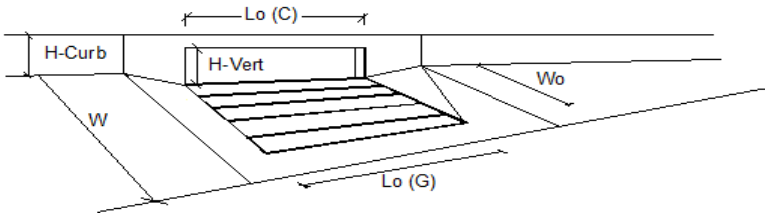
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**10.2**	**42.6**	**cfs**

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

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

INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	20.00	20.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	

Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**6.5**	**14.8**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**3.3**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**82**	**%**

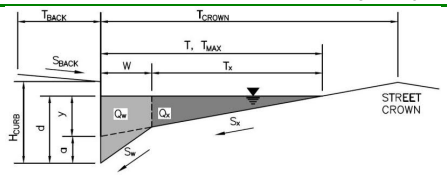
Version 4.05 Released March 2017

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

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

Project: Sterling Ranch Phase Fil. 4

Inlet ID: A5 - DP16



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	1.17	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.029	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	15.8	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.6	7.8	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

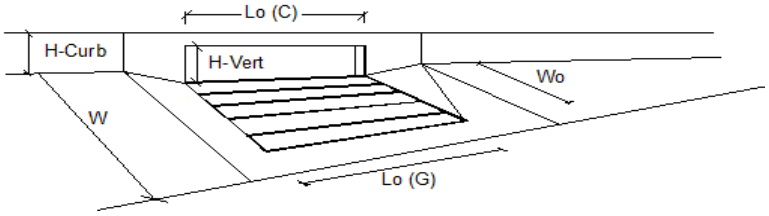
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**13.6**	**40.2**	**cfs**

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

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

INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	10.00	10.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**1.4**	**2.9**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.0**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**100**	**%**

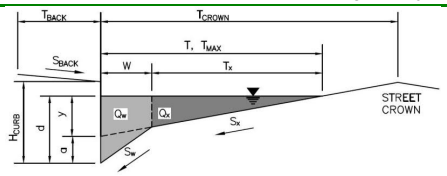
Version 4.05 Released March 2017

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

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

Project: Sterling Ranch Phase Fil. 4

Inlet ID: A3 - DP 20



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	26.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.007	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	19.3	26.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	7.7	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☐	check = yes

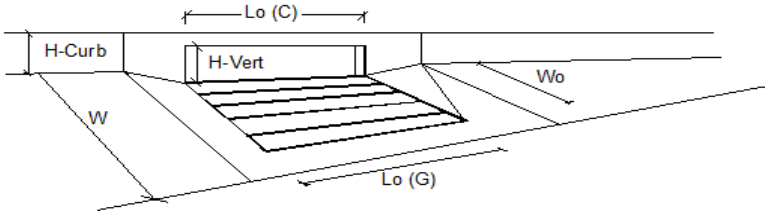
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**11.5**	**26.7**	**cfs**

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

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

INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	15.00	15.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**7.0**	**11.7**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**3.2**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**99**	**79**	**%**

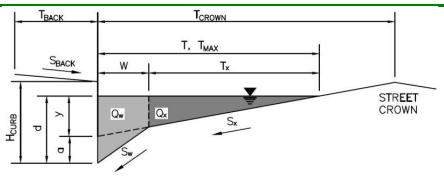
Version 4.05 Released March 2017

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

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

Project: Sterling Ranch Phase Fil. 4

Inlet ID: A7 - DP21



Gutter Geometry (Enter data in the blue cells)

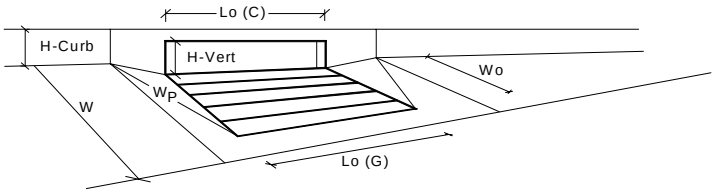
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	15.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	1.17	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	15.8	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.6	12.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	12.0	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	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 =	1.17	1.17	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	

Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.40	0.90	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.57	1.00	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.79	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	

		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**11.9**	**39.1**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	7.5	21.7	cfs

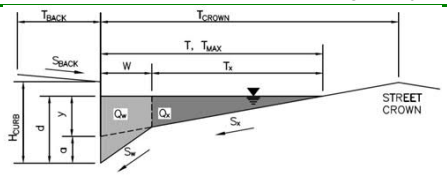
Version 4.05 Released March 2017

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

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

Project: Sterling Ranch Phase 2

Inlet ID: C1 - DP 6



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	26.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

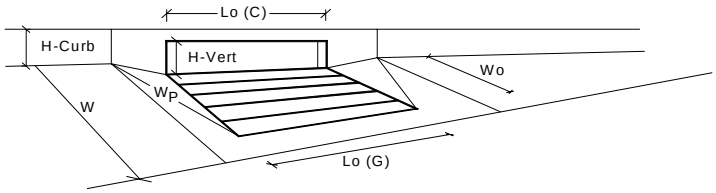
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	19.3	26.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	7.7	inches

Check boxes are not applicable in SUMP conditions

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

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	7.7	inches
Grate Information		MINOR	MAJOR	Override
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	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.33	0.48	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.57	0.73	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.79	0.88	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**9.7**	**18.5**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	5.4	12.3	cfs

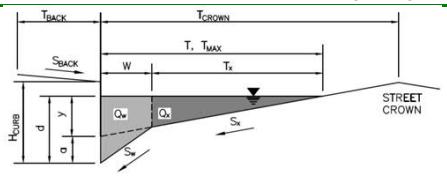
Version 4.05 Released March 2017

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

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

Project: Sterling Ranch Phase 2

Inlet ID: C2 - DP5



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	9.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	26.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

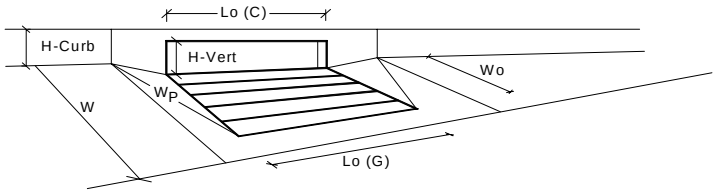
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	19.3	26.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	7.7	inches

Check boxes are not applicable in SUMP conditions

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

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	3	3	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	8.0	inches
Grate Information		MINOR	MAJOR	☑ Override
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.33	0.50	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.57	0.75	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.79	0.89	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**13.5**	**27.9**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	12.0	25.9	cfs

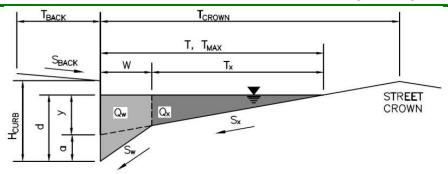
Version 4.05 Released March 2017

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

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

Project: Sterling Ranch Phase Fil. 4

Inlet ID: C4 - DP8



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	5.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	30.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.015	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	15.0	30.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☐	check = yes

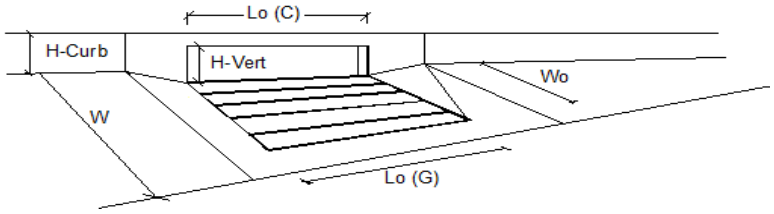
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**9.8**	**16.9**	**cfs**

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

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

INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	3	3	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	

Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**5.0**	**10.2**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**1.3**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**89**	**%**

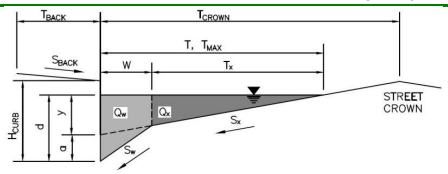
Version 4.05 Released March 2017

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

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

Project: Sterling Ranch Phase Fil. 4

Inlet ID: B3 - DP9



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	5.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	30.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.015	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	15.0	30.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☐	check = yes

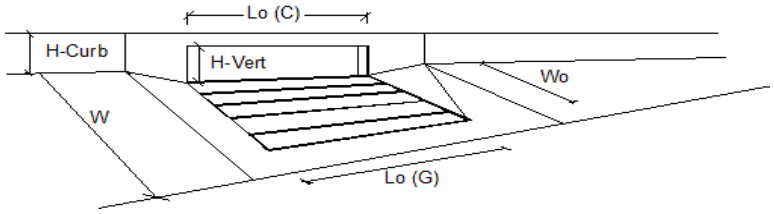
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**9.8**	**16.9**	**cfs**

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

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

INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	3	3	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	

Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**3.5**	**7.3**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.0**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**100**	**%**

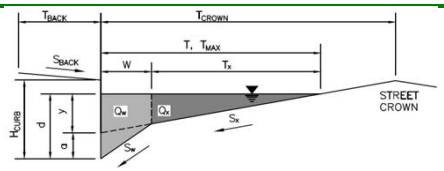
Version 4.05 Released March 2017

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

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

Project: Sterling Ranch Filing No. 2

Inlet ID: A11



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	15.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	38.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.012	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	33.0	38.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	9.1	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☐	check = yes

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**15.1**	**63.3**	**cfs**

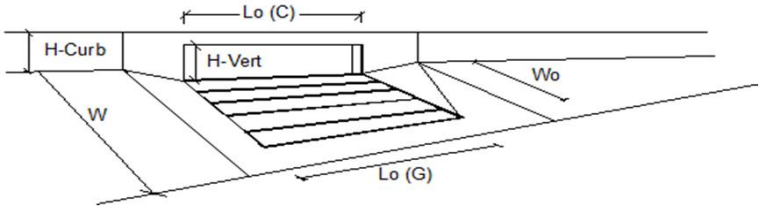
Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

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

No A11 on hydrology spreadsheets or labeled on map. Please include there if needed or remove this and next sheet if not needed.

INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet (CDOT Type R Curb Opening)	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	15.00	15.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**8.9**	**13.8**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.6**	**6.1**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**93**	**69**	**%**

By pass runoff from inlet built in sterling Ranch Filing No. 2 to proposed inlet at design point 2e

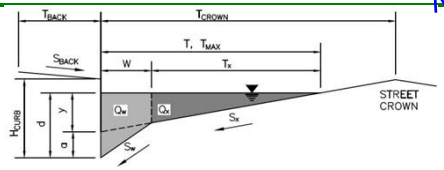
Version 4.05 Released March 2017

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

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

Project: Sterling Ranch Filing No. 2

Inlet ID: A10



Indicate that this is an existing inlet and update Inlet ID, as very misleading as this filing has a basin A10.

Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	15.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	38.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.012	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	33.0	38.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	9.1	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☐	check = yes

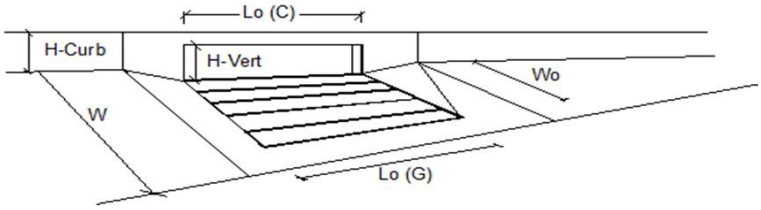
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**15.2**	**63.8**	**cfs**

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

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

INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	15.00	15.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	

Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**8.7**	**12.8**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.5**	**4.5**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**94**	**74**	**%**

By pass runoff from inlet built in sterling Ranch Filing No. 2 to proposed inlet at design point 1e

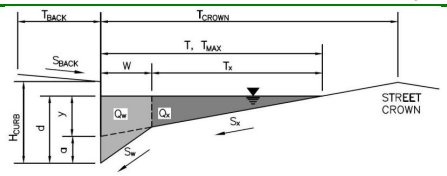
Version 4.05 Released March 2017

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

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

Project: Sterling Ranch Phase Fil. 4

Inlet ID: E1 - DP 1e



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	16.8	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	36.0	ft
Gutter Width	W =	5.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.029	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	16.8	32.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☐	check = yes

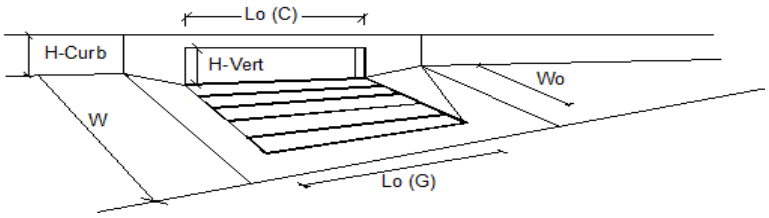
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**8.9**	**106.2**	**cfs**

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

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

INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	15.00	15.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	

Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**3.9**	**10.3**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.5**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**95**	**%**

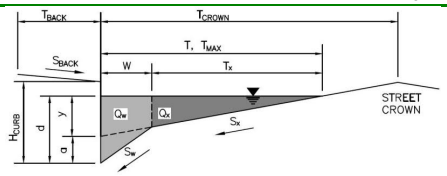
Version 4.05 Released March 2017

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

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

Project: Sterling Ranch Phase Fil. 4

Inlet ID: E2 - DP 2e



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	16.8	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	36.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.029	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	16.8	32.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☐	check = yes

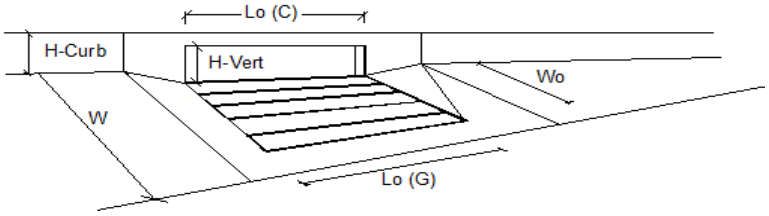
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	**Q_{allow} =**	**17.8**	**101.0**	**cfs**

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

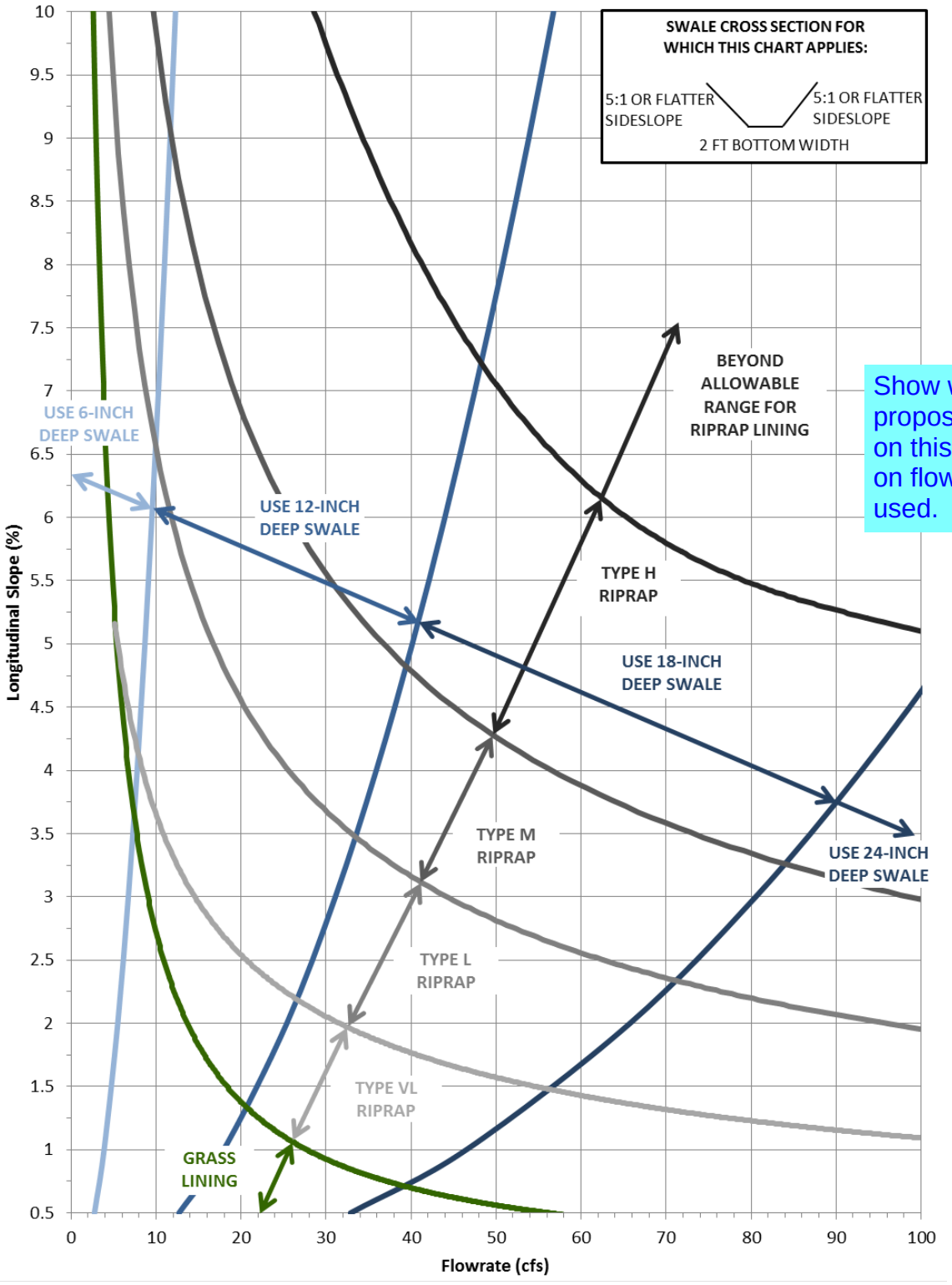
Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	15.00	15.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**4.0**	**10.7**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**1.8**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**86**	**%**



Show where proposed swale fits on this chart, based on flow and slope used.

Figure 8-22. Swale stability chart; 2- to 4-foot bottom width and side slopes between 5:1 and 10:1 (Note: Riprap classifications refer to gradation for riprap used in soil riprap or void-filled riprap. See Figure 8-34 for gradations.) (Source: Muller Engineering Company)

Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, Apr 22 2022

Barbrarick FSD Overflow Channel

Where did this flow come from? Flow does not match what is shown for Basin OS7 in hydrology spreadsheet

Trapezoidal

Bottom Width (ft)	= 3.00
Side Slopes (z:1)	= 3.00, 3.00
Total Depth (ft)	= 2.00
Invert Elev (ft)	= 7018.00
Slope (%)	= 0.50
N-Value	= 0.013

Highlighted

Depth (ft)	= 1.50
Q (cfs)	= 84.40
Area (sqft)	= 11.25
Velocity (ft/s)	= 7.50
Wetted Perim (ft)	= 12.49
Crit Depth, Yc (ft)	= 1.75
Top Width (ft)	= 12.00
EGL (ft)	= 2.38

Calculations

Compute by:	Known Q
Known Q (cfs)	= 84.40

Show and label this channel on drainage map

Section

Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, Apr 22 2022

Swale Sesign Point 2.i -Section BB

Trapezoidal

Bottom Width (ft)	= 4.00
Side Slopes (z:1)	= 5.00, 5.00
Total Depth (ft)	= 1.00
Invert Elev (ft)	= 7005.00
Slope (%)	= 2.00
N-Value	= 0.035

Calculations

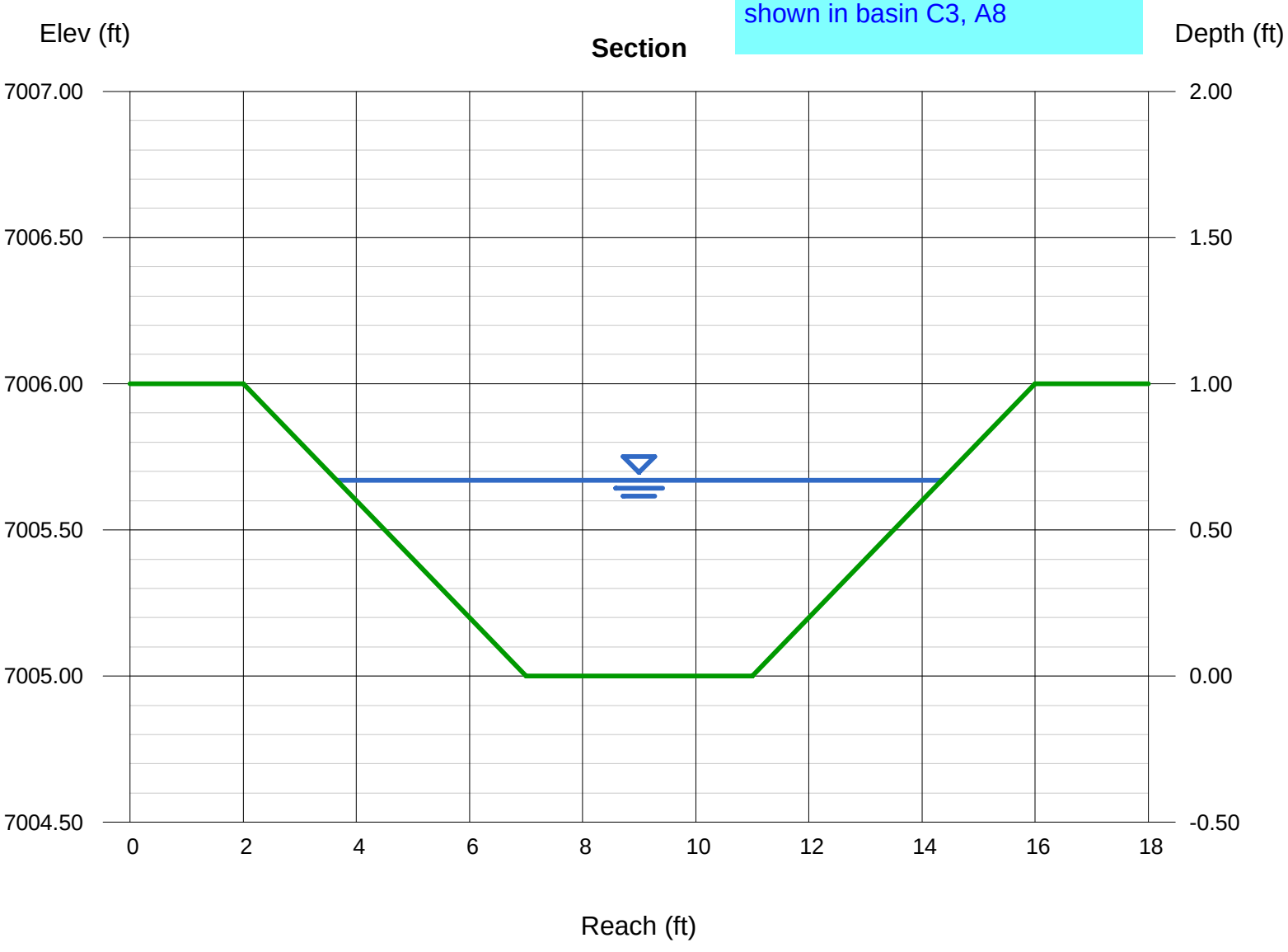
Compute by:	Known Q
Known Q (cfs)	= 17.30

Highlighted

Depth (ft)	= 0.67
Q (cfs)	= 17.30
Area (sqft)	= 4.92
Velocity (ft/s)	= 3.51
Wetted Perim (ft)	= 10.83
Crit Depth, Yc (ft)	= 0.64
Top Width (ft)	= 10.70
EGL (ft)	= 0.86

Include FR number for design. If you are using this to design the swale, remove MHFD chart showed earlier in appendix.

Include swale design for swales shown in basin C3, A8



PIPE OUTFALL RIPRAP SIZING CALCULATIONS

Subdivision: Sterling Ranch Subdivision -Proposed
Location: El Paso County

Project Name: Sterling Ranch Filing No. 4
Project No.: 25188.11
Calculated By: ARJ
Checked By:
Date: 4/20/22

As this design point releases into a pond, it should be designed as a forebay, not a riprap outfall

	STORM DRAIN SYSTEM			
	DESIGN POINT 2.1e	DESIGN POINT	DESIGN POINT	Notes
Q_{100} (cfs):	21.0			Flows are the greater of proposed vs. future
Conduit	Pipe			
D_c, Pipe Diameter (in):	24	N/A		
W, Box Width (ft):	N/A			
H, Box Height (ft):	N/A	N/A		
Y_t, Tailwater Depth (ft):	0.80			If unknown, use Y_t/D_c (or H)=0.4
Y_t/Dc or Y_t/H	0.40			
$Q/D^{2.5}$ or $Q/(WH^{3/2})$	3.71			
Supercritical?	No			
Y_n, Normal Depth (ft) [Supercritical]:	1.00			
D_a, H_a (in) [Supercritical]:	N/A			$D_a=(D_c+Y_n)/2$
Riprap d_{50} (in) [Supercritical]:	N/A			
Riprap d_{50} (in) [Subcritical]:	6.16			
Required Riprap Size:	L			Fig. 9-38 or Fig. 9-36
d_{50} (in):	9			
Expansion Factor, $1/(2\tan\theta)$:	6.00			Read from Fig. 9-35 or 9-36
θ:	0.08			
Erosive Soils?	No			
Area of Flow, A_t (ft^2):	3.00			$A_t=Q/V$
Length of Protection, L_p (ft):	10.5			L=(1/(2 tan θ))(At/Yt - D)
Min Length (ft)	6.0			Min L=3D or 3H
Max Length (ft)	20.0			Max L=10D or 10H
Min Bottom Width, T (ft):	3.7			$T=2*(L_p*\tan\theta)+W$
Design Length (ft)	11.0			
Design Width (ft)	3.7			
Riprap Depth (in)	18			Depth=2(d_{50})
Type II Bedding Depth (in)*	6			*Not used if Soil Riprap
Cutoff Wall	No			
Cutoff Wall Depth (ft)				Depth of Riprap and Base
Cutoff Wall Width (ft)				

Note: No Type II Base to be used if Soil Riprap is specified within the plans

* For use when the flow in the culvert is supercritical (and less than full).

Include design RR protection shown at end of Barbarick Overflow channel

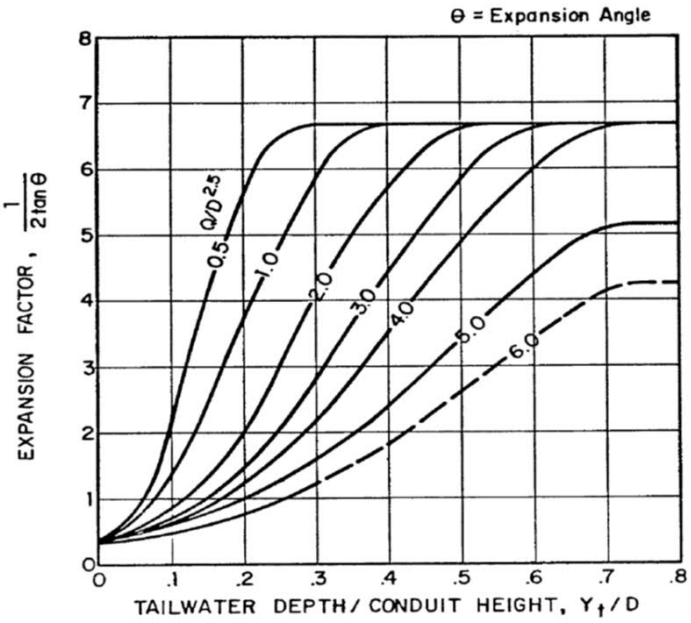


Figure 9-35. Expansion factor for circular conduits

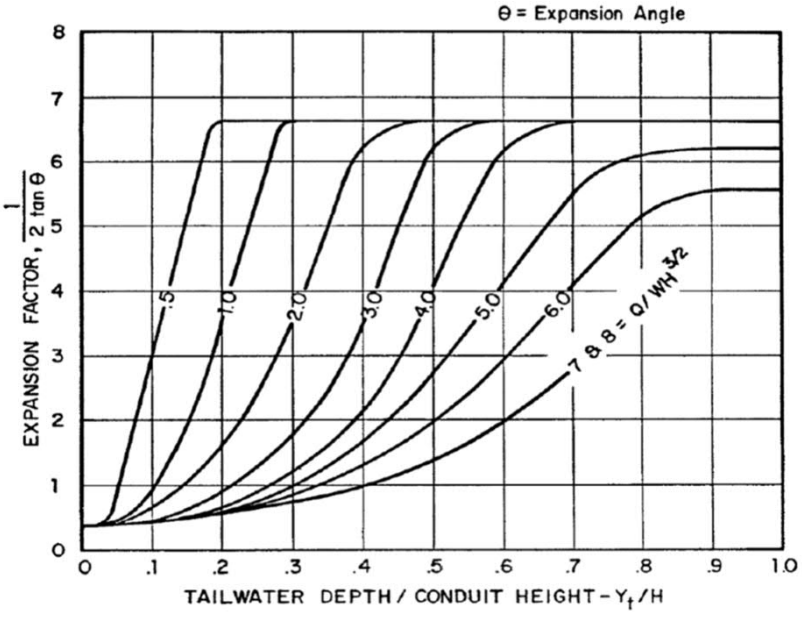
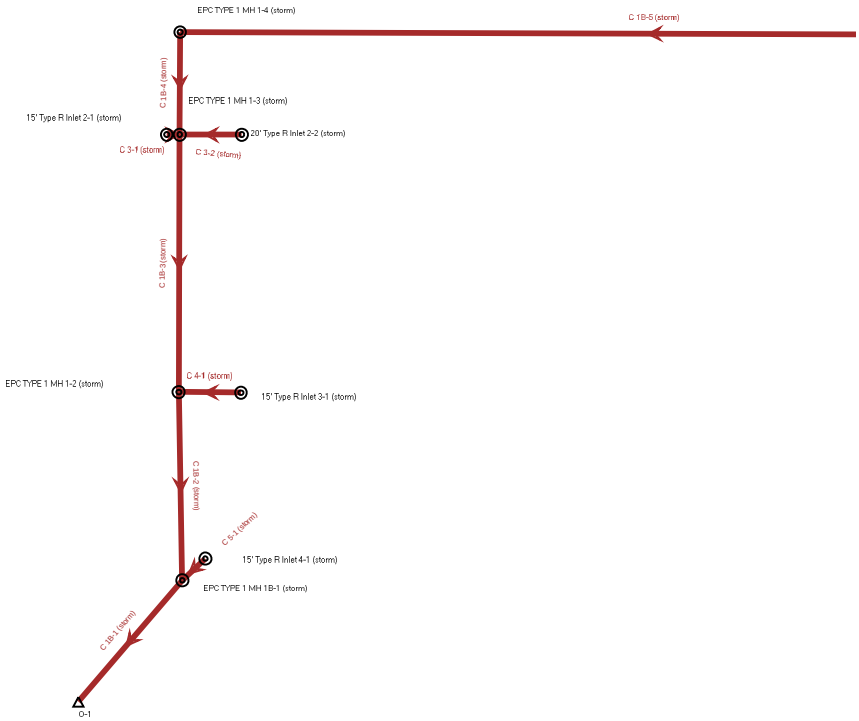
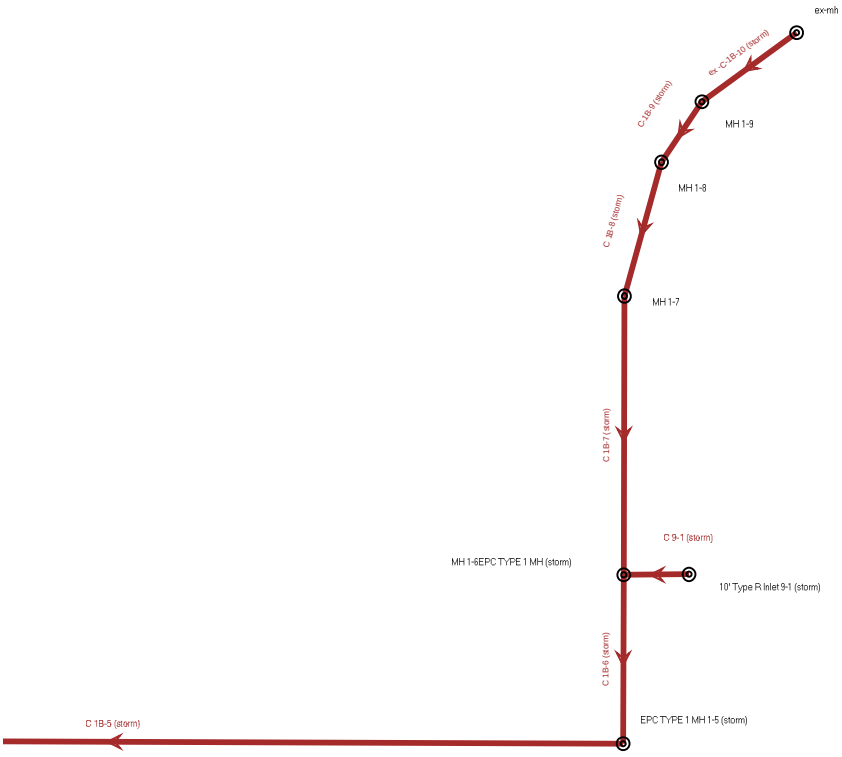


Figure 9-36. Expansion factor for rectangular conduits

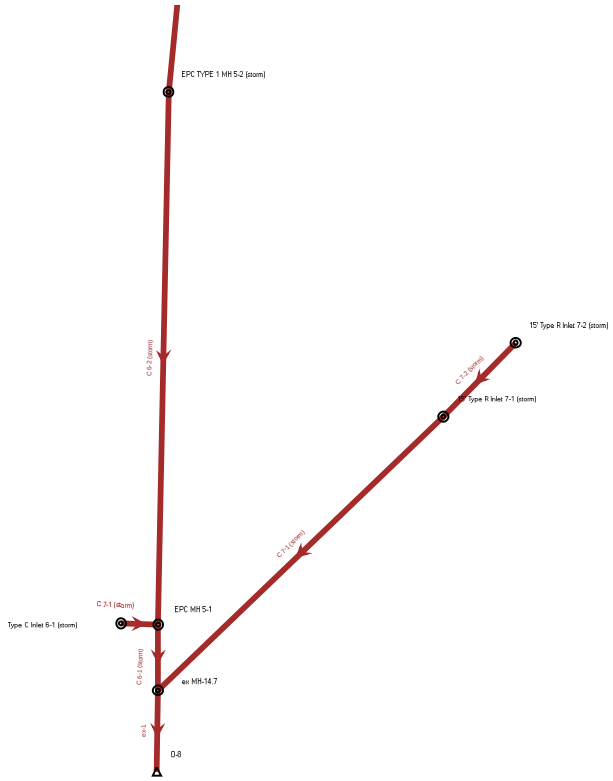
Scenario: 100 Year



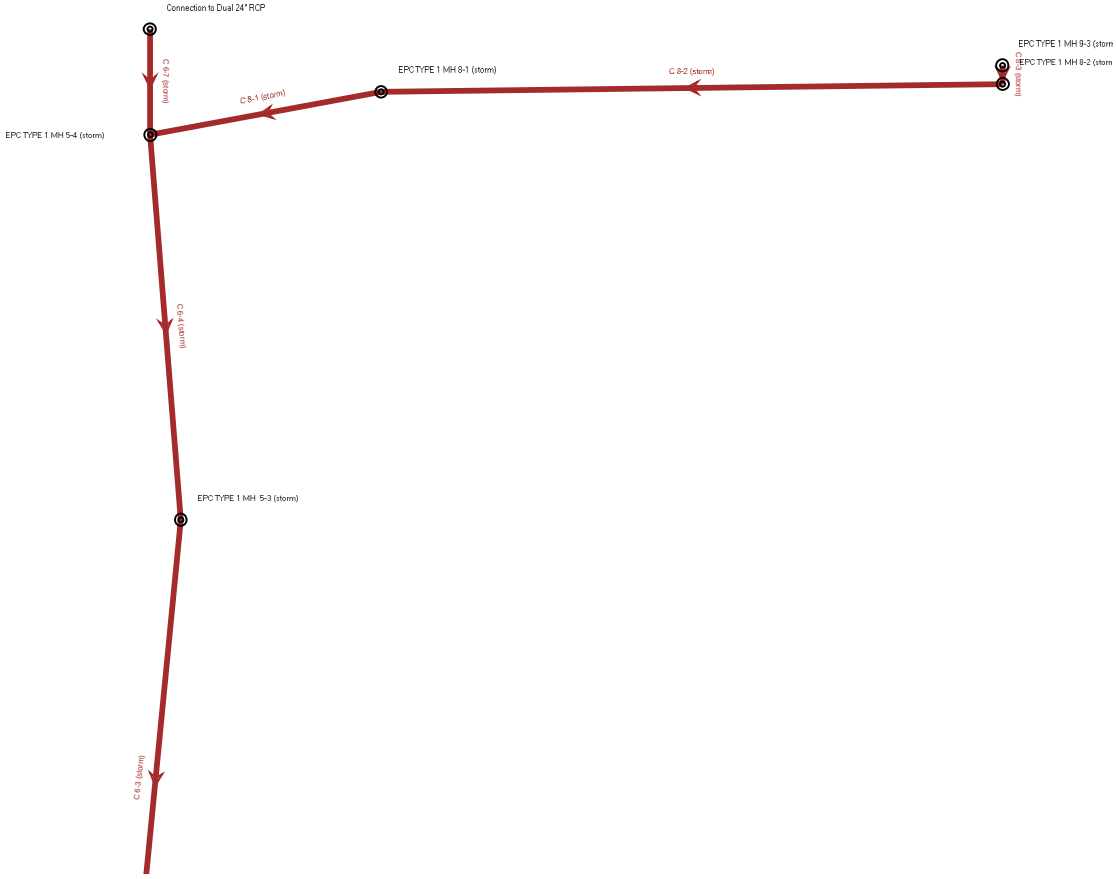
Scenario: Sterling Ranch Fil. No. 4 -5 Year



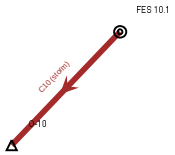
Scenario: Sterling Ranch Fil. No. 4 -100 Year



Scenario: 100 Year

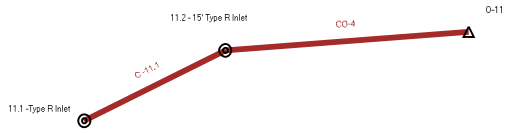


Scenario: 100 Year



Scenario: Sterling Ranch Fil. No. 4 -100 Year

Scenario: Sterling Ranch Fil. No. 4 -100 Year



Scenario: Sterling Ranch Fil. No. 4 -100 Year
Current Time Step: 0.000 h
FlexTable: Conduit Table

These elevations need to be switched between start & stop locations

Label	Flow (cfs)	Capacity (Full Flow) (cfs)	Velocity (ft/s)	Manning's n	Diameter (in)	Slope (Calculated) (ft/ft)	Invert (Start) (ft)	Invert (Stop) (ft)	Elevation Ground (Start) (ft)	Elevation Ground (Stop) (ft)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Energy Grade Line (In) (ft)	Energy Grade Line (Out) (ft)	Number of Barrels
C -11.1	10.30	17.41	5.77	0.013	24.0	0.006	6,968.75	6,968.29	6,971.57	6,971.72	6,970.08	6,970.03	6,970.42	6,970.23	1
C 1B-1 (storm)	101.70	64.87	10.57	0.013	42.0	0.004	6,970.28	6,969.57	6,979.57	6,973.84	6,974.04	6,973.06	6,975.78	6,975.05	1
C 1B-2 (storm)	86.30	100.60	8.97	0.013	42.0	0.010	6,971.51	6,970.58	6,979.46	6,979.57	6,975.54	6,974.86	6,976.79	6,976.11	1
C 1B-3 (storm)	77.60	100.60	8.07	0.013	42.0	0.010	6,973.02	6,971.77	6,980.54	6,979.46	6,977.55	6,976.81	6,978.56	6,977.83	1
C 1B-4 (storm)	62.00	100.60	6.44	0.013	42.0	0.010	6,973.78	6,973.31	6,981.10	6,980.54	6,979.27	6,979.09	6,979.91	6,979.74	1
C 1B-5 (storm)	52.40	84.69	12.61	0.013	36.0	0.016	6,981.88	6,974.26	6,988.70	6,981.10	6,984.24	6,980.12	6,985.44	6,980.97	1
C 1B-6 (storm)	18.10	94.05	10.28	0.013	36.0	0.020	6,983.60	6,982.08	6,989.81	6,988.70	6,985.83	6,985.83	6,985.99	6,985.93	1
C 1B-7 (storm)	44.90	66.69	10.12	0.013	36.0	0.010	6,985.17	6,983.89	6,991.56	6,989.81	6,987.35	6,985.71	6,988.38	6,987.27	1
C 1B-8 (storm)	44.90	66.69	10.12	0.013	36.0	0.010	6,986.11	6,985.46	6,992.41	6,991.56	6,988.29	6,987.76	6,989.32	6,988.69	1
C 3-1 (storm)	11.70	35.12	6.62	0.013	18.0	0.112	6,976.89	6,976.61	6,980.54	6,980.90	6,979.12	6,979.09	6,979.80	6,979.77	1
C 3-2 (storm)	14.80	36.81	4.71	0.013	24.0	0.026	6,977.18	6,976.46	6,980.82	6,980.54	6,979.21	6,979.09	6,979.55	6,979.44	1
C 4-1 (storm)	11.00	14.31	8.93	0.013	18.0	0.019	6,975.94	6,975.44	6,979.81	6,979.46	6,977.21	6,976.81	6,977.94	6,977.47	1
C 5-1 (storm)	18.70	22.16	14.06	0.013	18.0	0.045	6,975.24	6,974.83	6,979.58	6,979.57	6,976.70	6,976.12	6,978.47	6,978.21	1
C 6-1 (storm)	110.40	212.95	17.10	0.013	48.0	0.022	6,988.34	6,987.47	6,996.65	6,997.00	6,992.12	6,991.94	6,993.37	6,993.14	1
C 6-2 (storm)	104.30	235.90	18.19	0.013	48.0	0.027	6,998.76	6,990.09	7,008.21	6,996.65	7,001.85	6,991.96	7,003.41	6,997.06	1
C 6-3 (storm)	104.30	217.68	17.14	0.013	48.0	0.023	7,006.01	7,000.16	7,015.59	7,008.21	7,009.11	7,002.15	7,010.66	7,006.50	1
C 6-4 (storm)	104.30	196.89	15.89	0.013	48.0	0.019	7,011.28	7,007.73	7,020.02	7,015.59	7,014.38	7,009.88	7,015.93	7,013.45	1
C 6-7 (storm)	72.20	72.10	13.08	0.013	24.0	0.025	7,019.12	7,017.85	7,021.50	7,020.02	7,021.05	7,019.58	7,023.15	7,022.01	2
C 7-1 (storm)	36.30	101.50	13.16	0.013	36.0	0.023	6,993.10	6,987.47	7,003.30	6,997.00	6,995.06	6,991.94	6,995.92	6,992.35	1
C 7-1 (storm)	11.70	19.29	6.62	0.013	18.0	0.034	6,990.65	6,990.01	6,993.40	6,996.65	6,993.10	6,992.87	6,993.79	6,993.55	1
C 7-2 (storm)	25.90	31.99	11.34	0.013	24.0	0.020	6,995.31	6,994.10	7,001.62	7,003.30	6,997.10	6,995.53	6,998.29	6,997.34	1
C 8-1 (storm)	60.40	67.02	10.73	0.013	36.0	0.010	7,013.38	7,012.27	7,021.12	7,020.02	7,016.36	7,015.47	7,017.50	7,016.60	1
C 8-2 (storm)	60.40	66.73	10.69	0.013	36.0	0.010	7,016.65	7,013.63	7,021.99	7,021.12	7,019.16	7,016.93	7,020.58	7,018.07	1
C 8-3 (storm)	48.90	41.80	9.96	0.013	30.0	0.010	7,017.29	7,017.19	7,020.00	7,021.99	7,021.17	7,021.04	7,022.72	7,022.58	1
C 9-1 (storm)	7.20	17.85	9.56	0.013	18.0	0.029	6,986.21	6,985.45	6,990.17	6,989.81	6,987.25	6,986.18	6,987.72	6,987.30	1
C 12-1 (storm)	13.60	22.63	4.33	0.013	24.0	0.010	6,977.50	6,976.76	6,981.92	6,981.10	6,980.39	6,980.12	6,980.68	6,980.41	1
C 12-2 (storm)	13.60	26.30	4.33	0.013	24.0	0.014	6,978.00	6,977.60	6,982.28	6,981.92	6,980.79	6,980.68	6,981.08	6,980.98	1
C 13-1)Storm)	9.10	6.21	5.15	0.013	18.0	0.003	6,973.72	6,973.50	6,976.64	6,973.50	6,975.29	6,974.67	6,975.70	6,975.26	1
C- 11.2	21.00	18.38	6.68	0.013	24.0	0.007	6,967.79	6,967.00	6,971.72	6,967.00	6,969.75	6,968.64	6,970.45	6,969.54	1
C-1B-9 (storm)	44.90	111.47	14.92	0.013	36.0	0.028	6,987.55	6,986.61	6,992.82	6,992.41	6,989.74	6,988.19	6,990.77	6,990.38	1
C10 (storm)	14.20	133.38	12.29	0.013	36.0	0.040	7,004.63	7,001.50	7,007.97	7,010.00	7,005.83	7,002.18	7,006.28	7,004.37	1
ex -C-1B-10 (storm)	44.90	37.62	6.35	0.013	36.0	0.003	6,988.02	6,987.85	6,994.20	6,992.82	6,990.56	6,990.15	6,991.33	6,991.08	1
ex-1	132.60	204.52	17.32	0.013	48.0	0.020	6,987.47	6,986.46	6,997.00	6,990.00	6,990.91	6,989.21	6,992.98	6,992.44	1

Please provide different labels for these 2 pipes

Did not see these pipes on any of the stormcad layouts

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Include pipe lengths in table

Scenario: Sterling Ranch Fil. No. 4 -100 Year
Current Time Step: 0.000 h
FlexTable: Manhole Table

Label	Elevation (Ground) (ft)	Elevation (Invert) (ft)	Flow (Total Out) (cfs)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Energy Grade Line (In) (ft)	Energy Grade Line (Out) (ft)	Headloss Coefficient (Standard)
10' Type R Inlet 9-1 (storm)	6,990.17	6,986.21	7.20	6,987.27	6,987.25	6,987.75	6,987.72	0.050
11.1 -Type R Inlet	6,971.57	6,968.75	10.30	6,970.10	6,970.08	6,970.43	6,970.42	0.050
11.2 - 15' Type R Inlet	6,971.72	6,967.79	21.00	6,970.03	6,969.75	6,970.23	6,970.45	0.400
12-2 15' TYPE R INLET	6,982.28	6,978.00	13.60	6,981.09	6,980.79	6,981.38	6,981.08	1.020
15' Type R Inlet 2-1 (storm)	6,980.90	6,976.89	11.70	6,979.16	6,979.12	6,979.84	6,979.80	0.050
15' Type R Inlet 3-1 (storm)	6,979.81	6,975.94	11.00	6,977.24	6,977.21	6,977.98	6,977.94	0.050
15' Type R Inlet 4-1 (storm)	6,979.58	6,974.17	18.70	6,976.79	6,976.70	6,978.55	6,978.47	0.050
15' Type R Inlet 7-1 (storm)	7,003.30	6,993.10	36.30	6,995.10	6,995.06	6,996.91	6,995.92	0.050
15' Type R Inlet 7-2 (storm)	7,001.62	6,995.31	25.90	6,997.16	6,997.10	6,998.35	6,998.29	0.050
20' Type R Inlet 2-2 (storm)	6,980.82	6,977.18	14.80	6,979.22	6,979.21	6,979.57	6,979.55	0.050
Connection to Dual 24" RCP	7,021.50	7,019.12	72.20	7,022.10	7,021.05	7,024.20	7,023.15	0.500
EPC MH 5-1	6,996.65	6,988.34	110.40	6,992.87	6,992.12	6,997.98	6,993.37	0.600
EPC TYPE 1 MH 5-3 (storm)	7,015.59	7,006.01	104.30	7,009.88	7,009.11	7,013.46	7,010.66	0.500
EPC TYPE 1 MH 1-2 (storm)	6,979.46	6,971.51	86.30	6,976.81	6,975.54	6,977.83	6,976.79	1.020
EPC TYPE 1 MH 1-3 (storm)	6,980.54	6,973.02	77.60	6,979.09	6,977.55	6,979.74	6,978.56	1.520
EPC TYPE 1 MH 1-4 (storm)	6,981.10	6,973.78	62.00	6,980.12	6,979.27	6,980.97	6,979.91	1.320
EPC TYPE 1 MH 1-5 (storm)	6,988.70	6,981.88	52.40	6,985.83	6,984.24	6,985.93	6,985.44	1.320
EPC TYPE 1 MH 1B-1 (storm)	6,979.57	6,970.28	101.70	6,974.86	6,974.04	6,976.11	6,975.78	0.470
EPC TYPE 1 MH 5-2 (storm)	7,008.21	6,998.76	104.30	7,002.63	7,001.85	7,006.98	7,003.41	0.500
EPC TYPE 1 MH 5-4 (storm)	7,020.02	7,011.28	104.30	7,015.47	7,014.38	7,016.60	7,015.93	0.700
EPC TYPE 1 MH 8-1 (storm)	7,021.12	7,013.38	60.40	7,016.93	7,016.36	7,018.07	7,017.50	0.500
EPC TYPE 1 MH 8-2 (storm)	7,021.99	7,016.65	60.40	7,021.04	7,019.16	7,022.58	7,020.58	1.320
EPC TYPE 1 MH 9-3 (storm)	7,020.00	7,017.29	48.90	7,020.77	7,020.00	7,022.31	7,021.54	0.500
FES 10.1	7,007.97	7,004.63	14.20	7,005.85	7,005.83	7,006.30	7,006.28	0.050
MH 1-6EPC TYPE 1 MH (storm)	6,989.81	6,983.60	18.10	6,985.99	6,985.83	6,987.55	6,985.99	1.020
MH 1-7	6,991.56	6,985.17	44.90	6,987.76	6,987.35	6,988.69	6,988.38	0.400
MH 1-8	6,992.41	6,986.11	44.90	6,988.70	6,988.29	6,990.89	6,989.32	0.400
MH 1-9	6,992.82	6,987.55	44.90	6,990.15	6,989.74	6,991.08	6,990.77	0.400
MH 12-1	6,981.92	6,977.50	13.60	6,980.68	6,980.39	6,980.98	6,980.68	1.020
Type C Inlet 6-1 (storm)	6,993.40	6,990.65	11.70	6,993.44	6,993.10	6,994.13	6,993.79	0.500
Type C-13-2	6,976.64	6,973.72	9.10	6,975.31	6,975.29	6,975.72	6,975.70	0.050
ex MH-14.7	6,997.00	6,987.47	132.60	6,991.94	6,990.91	6,992.35	6,992.98	0.500
ex-mh	6,994.20	6,988.02	44.90	6,990.87	6,990.56	6,991.64	6,991.33	0.400

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Scenario: Sterling Ranch Fil. No. 4 -5 Year
Current Time Step: 0.000 h
FlexTable: Conduit Table

Label	Flow (cfs)	Capacity (Full Flow) (cfs)	Velocity (ft/s)	Manning's n	Diameter (in)	Slope (Calculated) (ft/ft)	Invert (Start) (ft)	Invert (Stop) (ft)	Elevation Ground (Start) (ft)	Elevation Ground (Stop) (ft)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Energy Grade Line (In) (ft)	Energy Grade Line (Out) (ft)	Number of Barrels
C -11.1	3.90	17.41	4.47	0.013	24.0	0.006	6,968.75	6,968.29	6,971.57	6,971.72	6,969.44	6,968.93	6,969.70	6,969.24	1
C 1B-1 (storm)	47.50	64.87	7.36	0.013	42.0	0.004	6,970.28	6,969.97	6,979.57	6,973.84	6,972.50	6,972.12	6,973.35	6,973.03	1
C 1B-2 (storm)	42.60	100.60	10.02	0.013	42.0	0.010	6,971.51	6,970.58	6,979.46	6,979.57	6,973.54	6,972.90	6,974.38	6,973.52	1
C 1B-3 (storm)	39.60	100.60	9.83	0.013	42.0	0.010	6,973.02	6,971.77	6,980.54	6,979.46	6,974.97	6,974.40	6,975.77	6,974.80	1
C 1B-4 (storm)	21.40	100.60	8.31	0.013	42.0	0.010	6,973.78	6,973.31	6,981.10	6,980.54	6,976.16	6,976.18	6,976.31	6,976.28	1
C 1B-5 (storm)	22.70	84.69	10.15	0.013	36.0	0.016	6,981.88	6,974.26	6,988.70	6,981.10	6,983.42	6,976.36	6,984.02	6,976.64	1
C 1B-6 (storm)	22.70	94.05	10.95	0.013	36.0	0.020	6,983.60	6,982.08	6,989.81	6,988.70	6,985.13	6,984.22	6,985.74	6,984.50	1
C 1B-7 (storm)	21.50	66.69	8.41	0.013	36.0	0.010	6,985.17	6,983.89	6,991.56	6,989.81	6,986.66	6,985.75	6,987.24	6,986.09	1
C 1B-8 (storm)	21.50	66.69	8.41	0.013	36.0	0.010	6,986.11	6,985.46	6,992.41	6,991.56	6,987.60	6,986.67	6,988.18	6,987.69	1
C 3-1 (storm)	7.00	35.12	3.96	0.013	18.0	0.112	6,976.89	6,976.61	6,980.54	6,980.90	6,978.14	6,977.91	6,978.38	6,978.37	1
C 3-2 (storm)	6.50	36.81	8.83	0.013	24.0	0.026	6,977.18	6,976.46	6,980.82	6,980.54	6,978.08	6,977.08	6,978.43	6,978.05	1
C 4-1 (storm)	3.80	14.31	6.84	0.013	18.0	0.019	6,975.94	6,975.44	6,979.81	6,979.46	6,976.68	6,975.99	6,976.97	6,976.64	1
C 5-1 (storm)	6.30	22.16	10.80	0.013	18.0	0.045	6,975.24	6,974.83	6,979.58	6,979.57	6,976.21	6,975.52	6,976.63	6,976.50	1
C 6-1 (storm)	43.20	212.95	13.28	0.013	48.0	0.022	6,988.34	6,987.47	6,996.65	6,997.00	6,990.31	6,990.11	6,991.08	6,990.48	1
C 6-2 (storm)	42.50	235.90	14.23	0.013	48.0	0.027	6,998.76	6,990.09	7,008.21	6,996.65	7,000.71	6,991.24	7,001.47	6,994.38	1
C 6-3 (storm)	42.50	217.68	13.43	0.013	48.0	0.023	7,006.01	7,000.16	7,015.59	7,008.21	7,007.96	7,001.36	7,008.72	7,004.16	1
C 6-4 (storm)	42.50	196.89	12.50	0.013	48.0	0.019	7,011.28	7,007.73	7,020.02	7,015.59	7,013.23	7,009.00	7,013.99	7,011.39	1
C 6-7 (storm)	35.40	72.10	11.42	0.013	24.0	0.025	7,019.12	7,017.85	7,021.50	7,020.02	7,020.64	7,018.91	7,021.38	7,020.61	2
C 7-1 (storm)	17.00	101.50	10.66	0.013	36.0	0.023	6,993.10	6,987.47	7,003.30	6,997.00	6,994.42	6,990.11	6,994.92	6,990.21	1
C 7-1 (storm)	3.40	19.29	8.23	0.013	18.0	0.034	6,990.65	6,990.01	6,993.40	6,996.65	6,991.35	6,990.77	6,991.62	6,991.00	1
C 7-2 (storm)	12.00	31.99	9.46	0.013	24.0	0.020	6,995.31	6,994.10	7,001.62	7,003.30	6,996.56	6,994.98	6,997.09	6,996.25	1
C 8-1 (storm)	20.60	67.02	8.34	0.013	36.0	0.010	7,013.38	7,012.27	7,021.12	7,020.02	7,014.84	7,013.76	7,015.41	7,014.30	1
C 8-2 (storm)	20.60	66.73	8.32	0.013	36.0	0.010	7,016.65	7,013.63	7,021.99	7,021.12	7,018.11	7,015.12	7,018.68	7,015.66	1
C 8-3 (storm)	20.60	41.80	8.48	0.013	30.0	0.010	7,017.29	7,017.19	7,020.00	7,021.99	7,018.83	7,018.86	7,019.48	7,019.40	1
C 9-1 (storm)	1.60	17.85	6.26	0.013	18.0	0.029	6,986.21	6,985.45	6,990.17	6,989.81	6,986.69	6,985.76	6,986.86	6,986.34	1
C 12-1 (storm)	9.00	22.63	6.79	0.013	24.0	0.010	6,977.50	6,976.76	6,981.92	6,981.10	6,978.57	6,977.64	6,979.00	6,978.35	1
C 12-2 (storm)	9.00	26.30	7.58	0.013	24.0	0.014	6,978.00	6,977.60	6,982.28	6,981.92	6,979.07	6,979.01	6,979.50	6,979.23	1
C 13-1)Storm)	2.20	6.21	3.21	0.013	18.0	0.003	6,973.72	6,973.50	6,976.64	6,973.50	6,974.34	6,974.06	6,974.50	6,974.27	1
C- 11.2	8.00	18.38	5.64	0.013	24.0	0.007	6,967.79	6,967.00	6,971.72	6,967.00	6,968.80	6,967.92	6,969.19	6,968.42	1
C-1B-9 (storm)	21.50	111.47	12.19	0.013	36.0	0.028	6,987.55	6,986.61	6,992.82	6,992.41	6,989.04	6,987.63	6,989.63	6,989.23	1
C10 (storm)	2.40	133.38	7.24	0.013	36.0	0.040	7,004.63	7,001.50	7,007.97	7,010.00	7,005.11	7,001.78	7,005.28	7,002.59	1
ex -C-1B-10 (storm)	21.50	37.62	5.50	0.013	36.0	0.003	6,988.02	6,987.85	6,994.20	6,992.82	6,989.63	6,989.34	6,990.11	6,989.93	1
ex-1	53.40	204.52	13.69	0.013	48.0	0.020	6,987.47	6,986.46	6,997.00	6,990.00	6,989.67	6,988.05	6,990.55	6,990.09	1

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See comments on 100-year table

Scenario: Sterling Ranch Fil. No. 4 -5 Year
Current Time Step: 0.000 h
FlexTable: Manhole Table

Label	Elevation (Ground) (ft)	Elevation (Invert) (ft)	Flow (Total Out) (cfs)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Energy Grade Line (In) (ft)	Energy Grade Line (Out) (ft)	Headloss Coefficient (Standard)
10' Type R Inlet 9-1 (storm)	6,990.17	6,986.21	1.60	6,986.70	6,986.69	6,986.87	6,986.86	0.050
11.1 -Type R Inlet	6,971.57	6,968.75	3.90	6,969.46	6,969.44	6,969.71	6,969.70	0.050
11.2 - 15' Type R Inlet	6,971.72	6,967.79	8.00	6,968.96	6,968.80	6,969.27	6,969.19	0.400
12-2 15' TYPE R INLET	6,982.28	6,978.00	9.00	6,979.51	6,979.07	6,979.94	6,979.50	1.020
15' Type R Inlet 2-1 (storm)	6,980.90	6,976.89	7.00	6,978.15	6,978.14	6,978.40	6,978.38	0.050
15' Type R Inlet 3-1 (storm)	6,979.81	6,975.94	3.80	6,976.70	6,976.68	6,976.99	6,976.97	0.050
15' Type R Inlet 4-1 (storm)	6,979.58	6,974.17	6.30	6,976.23	6,976.21	6,976.65	6,976.63	0.050
15' Type R Inlet 7-1 (storm)	7,003.30	6,993.10	17.00	6,994.44	6,994.42	6,995.71	6,994.92	0.050
15' Type R Inlet 7-2 (storm)	7,001.62	6,995.31	12.00	6,996.58	6,996.56	6,997.11	6,997.09	0.050
20' Type R Inlet 2-2 (storm)	6,980.82	6,977.18	6.50	6,978.10	6,978.08	6,978.44	6,978.43	0.050
Connection to Dual 24" RCP	7,021.50	7,019.12	35.40	7,021.01	7,020.64	7,021.75	7,021.38	0.500
EPC MH 5-1	6,996.65	6,988.34	43.20	6,990.77	6,990.31	6,991.00	6,991.08	0.600
EPC TYPE 1 MH 5-3 (storm)	7,015.59	7,006.01	42.50	7,008.34	7,007.96	7,010.74	7,008.72	0.500
EPC TYPE 1 MH 1-2 (storm)	6,979.46	6,971.51	42.60	6,974.40	6,973.54	6,974.80	6,974.38	1.020
EPC TYPE 1 MH 1-3 (storm)	6,980.54	6,973.02	39.60	6,976.18	6,974.97	6,976.28	6,975.77	1.520
EPC TYPE 1 MH 1-4 (storm)	6,981.10	6,973.78	21.40	6,976.36	6,976.16	6,976.64	6,976.31	1.320
EPC TYPE 1 MH 1-5 (storm)	6,988.70	6,981.88	22.70	6,984.22	6,983.42	6,984.50	6,984.02	1.320
EPC TYPE 1 MH 1B-1 (storm)	6,979.57	6,970.28	47.50	6,972.90	6,972.50	6,973.52	6,973.35	0.470
EPC TYPE 1 MH 5-2 (storm)	7,008.21	6,998.76	42.50	7,001.09	7,000.71	7,003.89	7,001.47	0.500
EPC TYPE 1 MH 5-4 (storm)	7,020.02	7,011.28	42.50	7,013.76	7,013.23	7,014.30	7,013.99	0.700
EPC TYPE 1 MH 8-1 (storm)	7,021.12	7,013.38	20.60	7,015.12	7,014.84	7,015.66	7,015.41	0.500
EPC TYPE 1 MH 8-2 (storm)	7,021.99	7,016.65	20.60	7,018.86	7,018.11	7,019.40	7,018.68	1.320
EPC TYPE 1 MH 9-3 (storm)	7,020.00	7,017.29	20.60	7,019.16	7,018.83	7,019.81	7,019.49	0.500
FES 10.1	7,007.97	7,004.63	2.40	7,005.12	7,005.11	7,005.29	7,005.28	0.050
MH 1-6EPC TYPE 1 MH (storm)	6,989.81	6,983.60	22.70	6,985.75	6,985.13	6,986.09	6,985.74	1.020
MH 1-7	6,991.56	6,985.17	21.50	6,986.89	6,986.66	6,987.91	6,987.24	0.400
MH 1-8	6,992.41	6,986.11	21.50	6,987.83	6,987.60	6,989.43	6,988.18	0.400
MH 1-9	6,992.82	6,987.55	21.50	6,989.28	6,989.04	6,989.86	6,989.63	0.400
MH 12-1	6,981.92	6,977.50	9.00	6,979.01	6,978.57	6,979.23	6,979.00	1.020
Type C Inlet 6-1 (storm)	6,993.40	6,990.65	3.40	6,991.49	6,991.35	6,991.76	6,991.62	0.500
Type C-13-2	6,976.64	6,973.72	2.20	6,974.34	6,974.34	6,974.51	6,974.50	0.050
ex MH-14.7	6,997.00	6,987.47	53.40	6,990.11	6,989.67	6,990.21	6,990.55	0.500
ex-mh	6,994.20	6,988.02	21.50	6,989.83	6,989.63	6,990.31	6,990.11	0.400

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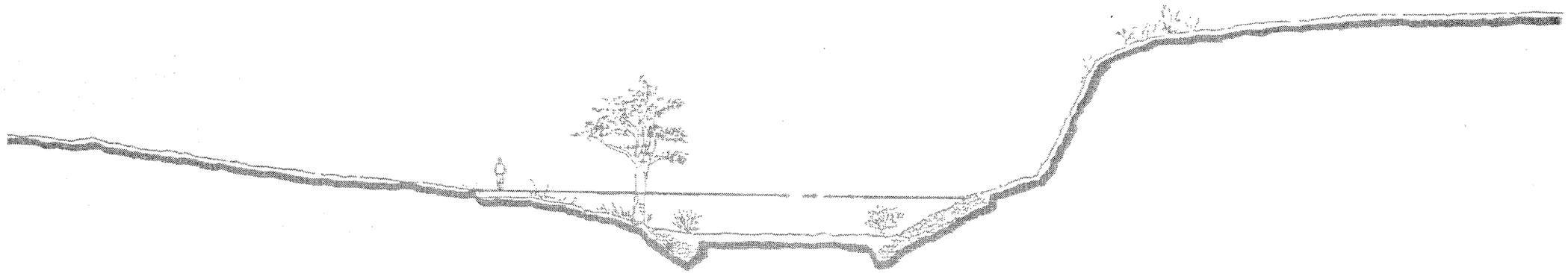
Appendix D
Reference Material

SAND CREEK DRAINAGE BASIN PLANNING STUDY

PRELIMINARY DESIGN REPORT

CITY OF COLORADO SPRINGS, EL PASO COUNTY, COLORADO



PREPARED FOR:

City of Colorado Springs
Department of Comprehensive Planning, Development and Finance
Engineering Division
30 S. Nevada
Colorado Springs, Colorado 80903

PREPARED BY:

Kiowa Engineering Corporation
1011 North Weber
Colorado Springs, CO 80903

II. STUDY AREA DESCRIPTION

The Sand Creek drainage basin is a left-bank tributary to the Fountain Creek lying in the west-central portions of El Paso County. Sand Creek's drainage area at Fountain Creek is approximately 54 square miles of which approximately 18.8 square miles are inside the City of Colorado Springs corporate limits. The basin is divided into five major sub-basins, the Sand Creek mainstem, the East Fork Sand Creek, the Central Tributary to East Fork, the West Fork, and the East Fork Subtributary. Figure II-1 shows the location of the Sand Creek basin.

Basin Description

The Sand Creek basin covers a total of 54 square miles in unincorporated El Paso County and Colorado Springs, Colorado. Of this total, approximately 28 square miles is encompassed by the Sand Creek basin, and 26 square miles for the East Fork Sand Creek basin. The basin trends in generally a south to southwesterly direction, entering the Fountain Creek approximately two miles upstream of the Academy Boulevard bridge over Fountain Creek. Two main tributaries drain the basin, those being the mainstem of Sand Creek and East Fork Sand Creek. Development presence in most evident along the mainstream. At this time, approximately 25 percent of the basin is developed. This alternative evaluation focuses upon the Sand Creek basin only.

The maximum basin elevation is approximately 7,620 feet above mean sea level, and falls to approximately 5,790 feet at the confluence with Fountain Creek. The headwaters of the basin originate in the conifer covered areas of The Black Forest. The middle eastern portions of the basin are typified by rolling range land with fair to good vegetative cover associated with semi-arid climates.

Climate

This area of El Paso County can be described, in general as high plains, with total precipitation amounts typical of a semi-arid region. Winters are generally cold and dry. Precipitation ranges from 14 to 16 inches per year, with the majority of this precipitation occurring in spring and summer in the form of rainfall. Thunderstorms are common during the summer months, and are typified by quick-moving low pressure cells which draw moisture from the Gulf of Mexico into the region. Average temperatures range from about 30^{O}F in the winter to 75^{O} in the summer. The relative humidity ranges from about 25 percent in the summer to 45 percent in the winter.

Soils and Geology

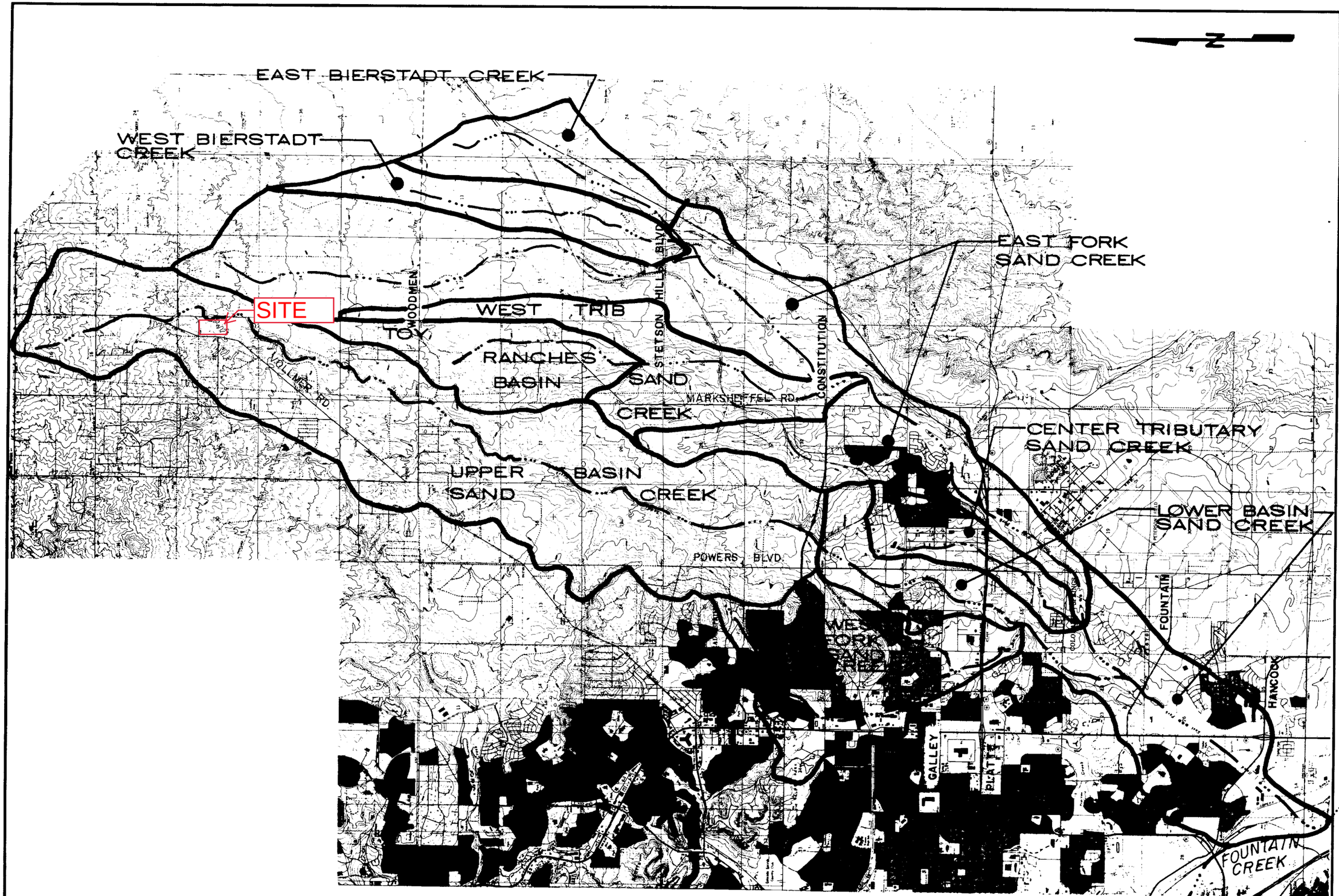
Soils within the Sand Creek basin vary between soil types A through D, as identified by the U. S. Department of Agriculture, Soil Conservation Service. The predominant soil groupings are in the Truckton and Bresser soil associations. The soils consist of deep, well drained soils that formed in alluvium and residium, derived from sedimentary rock. The soils have high to moderate infiltration rates, and are extremely susceptible to wind and water erosion where poor vegetation cover exists. In undeveloped areas, the predominance of Type A and B soils give this basin a lower runoff per unit area as compared to basins with soils dominated by Types C and D. Presented on Figure II-2 is the Hydrologic Soil distribution map for the Sand Creek basin.

Property Ownership and Impervious Land Densities

Property ownership along the major drainageway within the Sand Creek basin vary from public to private. Along the developed reaches, drainage right-of-ways and greenbelts have been dedicated during the development of the adjacent residential and commercial land. Where development has not occurred, the drainageways remain under private ownership with no delineated drainage right-of-way or easements. There are several public parks which abut the mainstem of Sand Creek. Roadway and utility easements abutting or crossing the major drainageways occur most frequently in the developed portions of the basin.

Land use information for the existing and future conditions were reviewed as part of the planning effort. This information is used in the hydrologic analysis to predict runoff rates and volumes for the purposes of facility evaluation. The identification of land uses abutting the drainageways is also useful in the identification of feasible plans for stabilization and aesthetic treatment of the creek. Presented on Figure II-3 is the proposed land use map used in the evaluation of impervious land densities discussed in the hydrologic section of this report. Figure II-3 is not intended to reflect the future zoning or land use policies of the City or the County.

The land use information within the Banning-Lewis Ranch property was obtained from Aries Properties during the time the draft East Fork Sand Creek Drainage Basin Planning Study was being prepared. The land use information was again reviewed with the City of Colorado Springs Department of Planning and was found to be appropriate for use in the estimation of hydrology for the East Fork Basin. The location of future arterial streets and roadways within



Kiowa Engineering Corporation
419 W. Bijou Street
Colorado Springs, Colorado
80905-1308

SAND CREEK DRAINAGE BASIN PLANNING STUDY

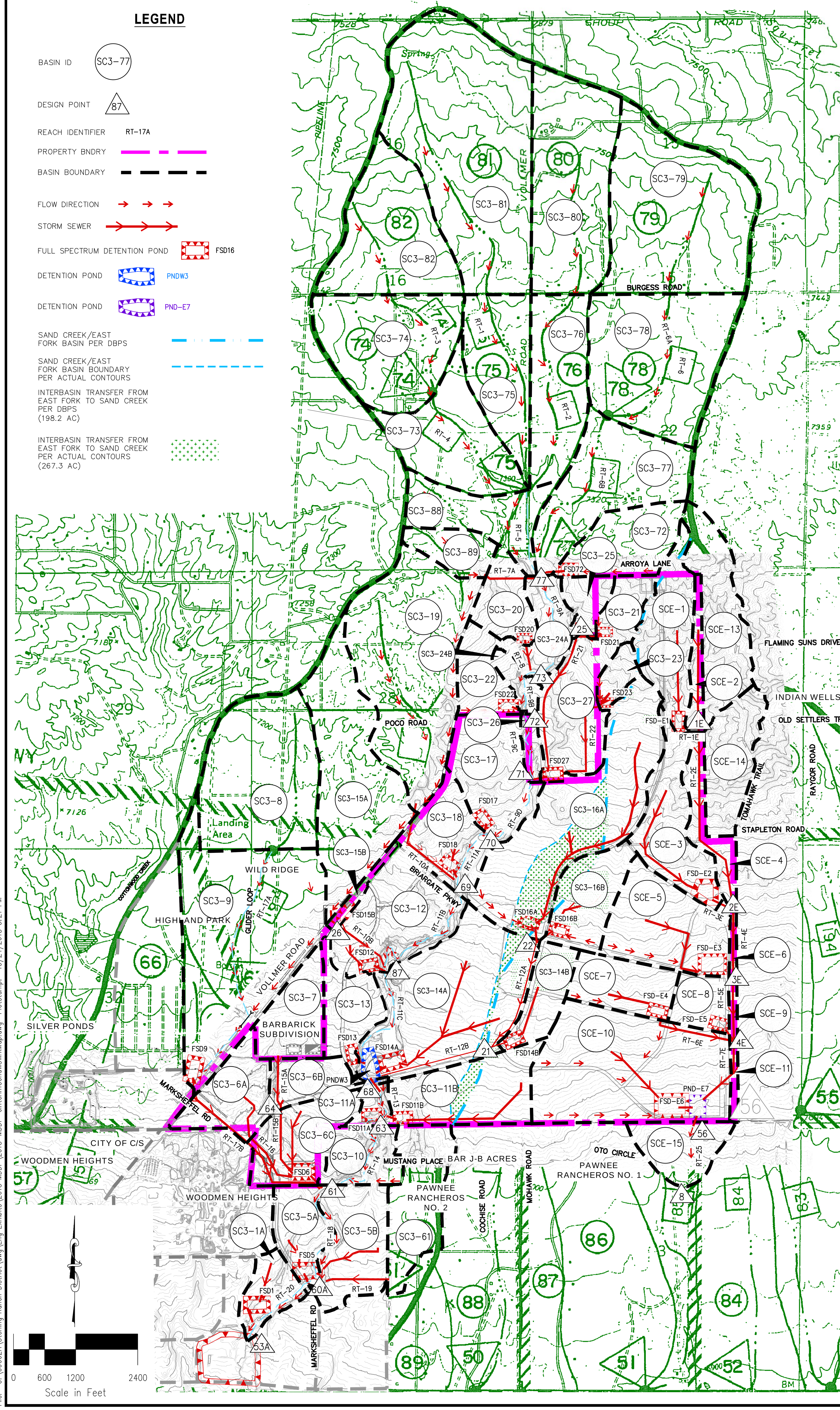
REGIONAL SUB-BASINS

Project No	90-04-09
Date:	11/90
Design:	
Drawn:	EAK
Check:	
Revisions:	

11

FIG. III-1

File: O:\09002A\Sterling Ranch District\dwg\Eng Exhibits\2018 MDDP\2018-MDDP-eInterimCondWSWrkMap.dwg Plotstamp: 10/24/2018 3:21 PM



BASIN SUMMARY

BASIN	CN	AREA (ACRES)	AREA (SQ MI)	Q_2 (CFS)	Q_5 (CFS)	Q_{10} (CFS)	Q_{25} (CFS)	Q_{50} (CFS)	Q_{100} (CFS)
SC3-1A	73	27.8	0.044	16.3	23.3	33.0	45.8	57.1	68.9
SC3-5A	84	39.1	0.061	40.6	53.7	71.0	92.4	110.6	129.1
SC3-5B	81	63.0	0.098	53.8	73.0	98.5	130.8	158.6	187.0
SC3-6A	88	49.3	0.077	61.4	79.3	102.2	130.1	153.6	177.1
SC3-6B	85	30.9	0.048	32.9	43.4	57.0	73.9	88.2	102.7
SC3-6C	82	58.0	0.091	53.9	72.5	97.1	128.0	154.5	181.5
SC3-7	88	45.7	0.071	54.0	69.9	90.3	115.2	136.2	157.2
SC3-8	62	143.4	0.224	25.4	42.1	66.7	100.7	132.3	166.2
SC3-9	66	217.4	0.340	45.8	71.5	108.6	158.9	204.9	254.0
SC3-10	63	36.0	0.056	7.6	12.3	19.4	29.1	38.0	47.7
SC3-11A	70	10.7	0.017	5.3	7.8	11.3	15.9	20.0	24.3
SC3-11B	80	76.6	0.120	59.4	81.3	110.8	148.1	180.5	213.7
SC3-12	81	88.2	0.138	77.8	105.6	142.5	189.1	229.1	270.0
SC3-13	85	41.0	0.064	43.9	57.8	76.0	98.5	117.6	136.9
SC3-14A	79	164.9	0.258	127.6	175.4	239.8	321.9	393.2	466.3
SC3-14B	77	34.7	0.054	24.6	34.3	47.4	64.2	79.0	94.1
SC3-15A	62	139.7	0.218	21.3	35.5	56.3	85.3	112.1	141.0
SC3-15B	87	7.9	0.012	10.8	14.0	18.2	23.3	27.6	31.9
SC3-16A	74	168.1	0.263	84.4	120.4	170.0	234.8	292.2	351.8
SC3-16B	78	50.7	0.079	39.0	53.7	73.6	99.0	121.1	143.8
SC3-17	73	70.6	0.110	41.8	59.6	85.2	119.0	149.1	180.6
SC3-18	81	53.8	0.084	49.3	67.1	91.0	121.2	147.3	174.0
SC3-19	62	184.0	0.287	28.8	47.7	75.7	114.4	150.2	188.8
SC3-20	65	34.2	0.053	9.9	15.5	23.8	35.1	45.5	56.6
SC3-21	66	23.3	0.036	7.0	10.8	16.3	23.7	30.4	37.5
SC3-22	65	33.9	0.053	9.4	14.8	22.5	32.9	42.5	52.6
SC3-23	67	14.5	0.023	5.5	8.3	12.4	18.0	23.0	28.4
SC3-24A	65	35.7	0.056	13.0	20.4	31.1	45.7	59.0	73.2
SC3-24B	65	12.2	0.019	3.4	5.3	8.1	11.8	15.2	18.9
SC3-25	66	19.0	0.030	5.8	8.9	13.4	19.5	25.1	31.0
SC3-26	63	10.0	0.016	2.5	4.0	6.2	9.2	12.1	15.1
SC3-27	71	70.0	0.109	35.1	51.2	73.8	103.7	130.3	158.3
SC3-61	63	65.5	0.102	13.7	22.0	34.4	51.6	67.6	84.8
SC3-72	64	56.2	0.088	12.8	20.2	31.4	46.7	60.9	76.0
SC3-73	63	90.0	0.141	16.4	26.4	41.3	62.1	81.3	102.0
SC3-74	63	119.7	0.187	22.3	36.5	57.3	85.9	112.3	140.7
SC3-75	63	79.3	0.124	13.1	21.5	33.7	50.5	66.1	82.8
SC3-76	63	86.4	0.135	14.2	23.1	36.4	54.6	71.4	89.6
SC3-77	62	106.9	0.167	16.6	27.6	43.8	66.2	87.0	109.4
SC3-78	63	155.6	0.243	28.1	45.3	70.6	106.2	139.1	174.5
SC3-79	63	189.0	0.295	34.9	57.0	89.5	134.3	175.6	220.1
SC3-80	63	147.7	0.231	27.3	44.3	69.6	104.5	136.8	171.4
SC3-81	62	262.9	0.411	42.6	70.2	111.0	167.4	219.6	275.7
SC3-82	62	117.8	0.184	20.0	33.2	52.8	80.0	105.1	132.3
SC3-88	62	60.2	0.094	10.5	17.4	27.6	41.8	54.9	69.0
SC3-89	62	27.5	0.043	6.1	10	15.7	23.6	30.8	38.6
SCE-1	65	64.4	0.101	23.3	35.9	53.8	79.1	102.4	127.4
SCE-2	64	15.0	0.023	4.4	7.0	10.8	15.9	20.7	25.7
SCE-3	70	67.5	0.105	30.6	45.2	65.9	93.3	118.0	143.9
SCE-4	70	29.5	0.046	13.3	19.6	28.6	40.6	257.8	62.6
SCE-5	87	85.5	0.134	100.4	130.6	169.6	217.4	257.8	298.4
SCE-6	64	3.8	0.006	1.6	2.5	3.7	5.4	7.0	8.6
SCE-7	89	44.9	0.070	58.9	75.5	96.6	122.2	143.7	165.2
SCE-8	92	25.5	0.040	38.6	48.4	60.7	75.4	87.7	99.9
SCE-9	64	4.0	0.006	1.5	2.4	3.6	5.3	6.8	8.5
SCE-10	83	174.3	0.272	7.6	189.4	19.4	29.1	398.9	467.5
SCE-11	64	5.8	0.009	2.3	3.6	5.5	8.0	10.3	12.8
SCE-13	63	78.6	0.123	19.6	31.3	48.7	73.1	95.7	120.0
SCE-14	63	52.5	0.082	13.2	21.2	33.3	49.9	65.2	81.7
SCE-15	51	39.7	0.062	2.2	5.1	10.1	17.7	25.1	33.4

DESIGN POINT SUMMARY

DESIGN POINT	AREA (SQ MI)	Q_2 (CFS)	Q_5 (CFS)	Q_{10} (CFS)	Q_{25} (CFS)	Q_{50} (CFS)	Q_{100} (CFS)	LOCATION
DP-74	0.371	39.3	65.3	104.8	158.9	209.1	262.8	
DP-75	1.413	141.2	235.1	376.6	566.6	750.9	950.5	
DP-77	2.343	209.9	351.9	580.6	886.6	1168.4	1467.7	ARROYA LANE X-ING
DP-78	0.538	59.7	98.4	154.0	232.6	306.2	385.3	
DP-73	2.471	207.5	354.3	588.5	897.1	1187.2	1506.7	
DP-72	2.543	206.2	352.5	586.7	897.2	1195.3	1518.6	POCO ROAD X-ING
DP-71	2.757	205.9	349.3	610.5	932.4	1226.9	1612.2	STERLING RANCH NORTHERN BNDRY
DP-70	2.867	205.3	349.8	614.0	940.1	1260.6	1636.7	
DP-69	3.238	212.7	366.6	653.7	1010.6	1364.1	1775.7	BRIARGATE PARKWAY X-ING
DP-87	3.594	216.9	374.6	681.9	1072.1	1471.5	1905.9	
DP-68	4.312	214.6	374.5	714.9	1187.6	1674.9	2204.1	UPSTREAM OF POND W3
DP-64	0.119	85.9	112.1	145.9	187.5	222.6	258.0	
DP-63	4.449	154.4	201.0	375.7	815.9	1112.1	1385.1	STERLING RANCH SOUTHERN BNDRY
DP-61	5.356	156.6	223.9	428.0	928.2	1287.3	1620.1	COLORADO SPRINGS/EL PASO BNDRY
DP-60A	5.617	161.6	224.8	439.1	950.4	1320.5	1661.8	MARKSHEFFEL X-ING
DP-53A	5.661	161.6	225.7	441.8	951.1	1326.0	1668.9	SAND CREEK AND POND 3
DP-1E	0.247	23.9	38.3	70.1	132.8	173.0	220.9	
DP-2E	0.486	48.9	76.8	123.0	228.7	319.7	419.4	
DP-3E	0.626	48.5	75.7	122.2	271.1	387.1	500.1	
DP-4E	0.745	48.1	76.2	122.4	286.9	407.3	534.8	
DP-56	1.017	23.1	35.3	71.5	108.3	152.1	196.4	NEAR SE PROP CORNER
DP-8	1.079	24.1	37.2	73.5	111.3	155.4	200.7	BELOW SE PROP CORNER
DP-21	0.396	0.6	8.8	17.8	57.1	116.8	174.9	
DP-22	0.342	0.6	8.8	17.6	56.8	105.1	156.4	
DP-25	0.066	5.9	9.1	16.3	35.1	46.4	58.2	
DP-26	0.012	0.1	1.1	3.2	7.3	9.5	12.0	

DESIGN POINT SUMMARY (VOLUME)

DESIGN POINT	AREA (SQ MI)	V_2 (AC-FT)	V_5 (AC-FT)	V_{10} (AC-FT)	V_{25} (AC-FT)	V_{50} (AC-FT)	V_{100} (AC-FT)	LOCATION
DP-74	0.371	5.9	9.0	13.6	19.8	25.5	31.6	
DP-75	1.413	22.7	34.5	51.7	75.4	97.1	120.5	
DP-77	2.343	37.7	57.4	85.9	125.1	161.1	199.9	ARROYA LANE X-ING
DP-78	0.538	8.9	13.5	20.1	29.3	37.7	46.7	
DP-73	2.471	40.0	60.8	91.0	132.5	170.7	211.7	
DP-72	2.543	41.3	62.9	94.0	136.8	176.2	218.5	POCO ROAD X-ING
DP-71	2.757	46.3	70.0	104.3	151.3	194.5	240.8	STERLING RANCH NORTHERN BNDRY
DP-70	2.867	49.5	74.5	110.6	160.1	205.4	254.0	
DP-69	3.238	57.5	86.1	127.4	183.8	235.3	290.6	BRIARGATE PARKWAY X-ING
DP-87	3.594	66.5	98.9	145.6	209.1	267.1	329.1	
DP-68	4.312	81.8	123.7	183.9	264.9	338.0	415.8	UPSTREAM OF POND W3
DP-64	0.119	7.0	9.1	11.8	15.2	18.1	21.1	
DP-63	4.449	85.6	129.5	192.3	276.7	352.8	433.5	STERLING RANCH SOUTHERN BNDRY
DP-61	5.356	103.7	157.8	235.1	338.4	431.3	529.8	COLORADO SPRINGS/EL PASO BNDRY
DP-60A	5.617	111.0	168.6	250.4	359.5	457.7	561.5	MARKSHEFFEL X-ING
DP-53A	5.661	112.0	170.0	252.6	362.6	461.7	566.5	SAND CREEK AND POND 3
DP-1E	0.247	3.1	5.2	8.4	12.7	16.6	20.9	
DP-2E	0.480	6.1	10.4	16.9	25.7	33.7	42.2	
DP-3E	0.620	7.0	13.7	23.4	36.1	47.4	59.3	
DP-4E	0.736	7.6	15.6	27.2	43.0	57.2	72.0	
DP-56	1.017	7.7	16.1	28.6	51.3	71.7	92.9	NEAR SE PROP CORNER
DP-8	1.079	8.0	16.7	26.6	53.0	74.0	95.9	BELOW SE PROP CORNER
DP-21	0.396	6.3	11.3	18.3	27.5	35.6	44.0	
DP-22	0.736	6.3	10.7	16.7	24.6	31.5	38.7	
DP-25	1.017	1.3	1.9	2.8	4.1	5.2	6.4	
DP-26	1.079	0.7	0.9	1.2	1.5	1.8	2.1	

WATER QUALITY & DETENTION POND SUMMARY

FSD1						
STORM EVENT (YR)	2	5	10	25	50	100
PEAK INFLOW (CFS)	16.3	23.3	33.0	45.8	57.1	68.9
ALLOWABLE RELEASE (CFS)	0.1	1.7	3.3	10.9	17.5	25.5
MODELED RELEASE (CFS)	0.1	1.6	3.2	10.9	17.4	25.4
STORED VOLUME (AC-FT)	2.4	2.6	3.0	3.6	1.9	2.2

FSD5						
STORM EVENT (YR)	2	5	10	25	50	100
PEAK INFLOW (CFS)	40.6	53.7	71.0	92.4	110.6	129.1
ALLOWABLE RELEASE (CFS)	0.1	1.4	2.6	11.3	19.8	30.2
MODELED RELEASE (CFS)	0.1	1.4	2.6	11.2	19.7	30.1
STORED VOLUME (AC-FT)	3.0	3.2	3.8	4.1	4.7	5.2

FSD6						
STORM EVENT (YR)	2	5	10	25	50	100
PEAK INFLOW (CFS)	196.5	258.5	339.1	438.7	523.3	608.6
ALLOWABLE RELEASE (CFS)	0.5	7.6	14.6	58.4	99.6	149.7
MODELED RELEASE (CFS)	0.5	7.5	14.5	58.2	99.6	149.6
STORED VOLUME (AC-FT)	15.5	16.4	18.7	20.8	23.3	26.0

FSD9						
STORM EVENT (YR)	2	5	10	25	50	100
PEAK INFLOW (CFS)	64.6	105.6	169.5	252.3	327.1	410.1
ALLOWABLE RELEASE (CFS)	1.7	24.9	49.8	141.1	207.2	290.0
MODELED RELEASE (CFS)	1.7	24.9	49.8	141.1	207.0	289.9
STORED VOLUME (AC-FT)	8.7	8.7	9.6	10.8	12.3	13.8

FSD11A						
STORM EVENT (YR)	2	5	10	25	50	100
PEAK INFLOW (CFS)	5.3	7.8	11.3	15.9	20.0	24.3
ALLOWABLE RELEASE (CFS)	0.1	1.6	3.2	7.5	9.7	12.4
MODELED RELEASE (CFS)	0.2	0.9	3.0	7.5	9.7	12.3
STORED VOLUME (AC-FT)	0.3	0.3	0.4	0.4	0.5	0.6

FSD11B						
STORM EVENT (YR)	2	5	10	25	50	100
PEAK INFLOW (CFS)	59.4	81.3	110.8	148.1	180.5	213.7
ALLOWABLE RELEASE (CFS)	0.3	4.5	8.7	29.6	47.7	69.6
MODELED RELEASE (CFS)	0.3	4.5	8.6	29.5	47.7	69.5
STORED VOLUME (AC-FT)	4.8	4.9	5.5	6.4	7.3	8.2

FSD12						
STORM EVENT (YR)	2	5	10	25	50	100
PEAK INFLOW (CFS)	77.8	105.6	142.5	189.1	229.1	270.0
ALLOWABLE RELEASE (CFS)	0.9	13.2	26.7	62.0	80.2	103.2
MODELED RELEASE (CFS)	0.9	9.0	26.7	61.9	80.1	103.1
STORED VOLUME (AC-FT)	5.2	5.5	5.8	6.7	7.8	8.9

FSD13						
STORM EVENT (YR)	2	5	10	25	50	100
PEAK INFLOW (CFS)	43.9	57.8	76.0	98.5	117.6	136.9
ALLOWABLE RELEASE (CFS)	0.4	6.1	12.3	28.6	37.0	47.6
MODELED RELEASE (CFS)	0.4	4.2	12.3	28.6	36.9	47.2
STORED VOLUME (AC-FT)	3.1	3.1	3.3	3.8	4.4	5.0

FSD14A						
STORM EVENT (YR)	2	5	10	25	50	100
PEAK INFLOW (CFS)	127.6	175.4	239.8	321.9	393.2	466.3
ALLOWABLE RELEASE (CFS)	0.5	7.5	14.4	56.2	95.2	142.4
MODELED RELEASE (CFS)	0.5	7.5	14.4	56.2	95.1	142.2
STORED VOLUME (AC-FT)	9.9	10.6	11.9	13.5	15.3	17.3

FSD14B						
STORM EVENT (YR)	2	5	10	25	50	100
PEAK INFLOW (CFS)	24.6	34.3	47.4	64.2	79.0	94.1
ALLOWABLE RELEASE (CFS)	0.0	0.3	0.5	5.7	11.8	19.3
MODELED RELEASE (CFS)	0.0	0.3	0.5	4.5	11.8	19.3
STORED VOLUME (AC-FT)	1.9	2.5	3.3	3.5	3.5	3.8

FSD15B						
STORM EVENT (YR)	2	5	10	25	50	100
PEAK INFLOW (CFS)	10.8	14.0	18.2	23.3	27.6	31.9
ALLOWABLE RELEASE (CFS)	0.1	1.6	3.2	7.3	9.5	12.0
MODELED RELEASE (CFS)	0.1	1.1	3.2	7.3	9.5	12.0
STORED VOLUME (AC-FT)	0.6	0.6	0.7	0.8	0.9	1.0

FSD16A						
STORM EVENT (YR)	2	5	10	25	50	100
PEAK INFLOW (CFS)	84.4	120.4	170.0	234.8	292.2	351.8
ALLOWABLE RELEASE (CFS)	0.6	8.8	17.3	56.2	88.4	128.3
MODELED RELEASE (CFS)	0.6	8.8	17.3	56.2	88.3	128.3
STORED VOLUME (AC-FT)	7.6	7.7	8.9	10.4	12.1	13.8

SAND CREEK FLOW COMPARISON CHART

DESIGN POINT	AREA (SQ MI)	Q_{100} (CFS)	DESCRIPTION
DP-77	2.343	1468	PROPOSED CONDITION
	2.91	2262	SAND CREEK DBPS
		2600	FEMA
DP-71	2.757	1612	PROPOSED CONDITION
		2260	SAND CREEK DBPS
DP-63	4.449	1385	PROPOSED CONDITION
	4.33	2630	SAND CREEK DBPS
		2600	FEMA
DP-60A	5.661	1662	PROPOSED CONDITION
	5.38	3295	SAND CREEK DBPS

EFSC DBPS DESIGN POINT SUMMARY (PEAK FLOW)

DBPS DESIGN POINT	AREA (SQ MI)	Q_{10} (CFS) (EXIST)	Q_{100} (CFS) (EXIST)	AREA (SQ MI)	Q_{10} (CFS) (PROP)	Q_{100} (CFS) (PROP)
DP-50	0.32	47.0	195.7	0.32	146.7	370.3
DP-51 (BASIN 86)	0.33	17.7	74.1	0.33	110.0	233.5
DP-52	1.67	80.5	456.5	1.67	1207.9	2123.0
DP-56	0.79	63.6	265.0	0.79	513.0	908.2

Values reported from SCDBPS, (DP 50, 51, 52 Not analyzed as a part of this study)
DBPS Reach 85(Basin91)=Q10=28.8cfs Q100=115.2cfs (EXISTING) / Q10=345.7cfs Q100=588.9cfs (PROPOSED)

WATER QUALITY & DETENTION POND SUMMARY

FSD16B						
STORM EVENT (YR)	2	5	10	25	50	100
PEAK INFLOW (CFS)	39.0	53.7	73.6	99.0	121.1	143.8
ALLOWABLE RELEASE (CFS)	0.0	0.4	0.7	8.3	17.2	28.2
MODELED RELEASE (CFS)	0.0	0.4	0.7	7.9	17.2	28.1
STORED VOLUME (AC-FT)	3.0	3.9	5.1	5.1	5.3	5.8

FSD17						
STORM EVENT (YR)	2	5	10	25	50	100
PEAK INFLOW (CFS)	41.8	59.6	85.2	119.0	149.1	180.6
ALLOWABLE RELEASE (CFS)	0.7	11.1	22.5	52.0	67.2	86.3
MODELED RELEASE (CFS)	0.7	8.4	22.4	52.0	67.2	86.1
STORED VOLUME (AC-FT)	2.6	2.6	2.8	3.4	4.0	4.7

FSD18						
STORM EVENT (YR)	2	5	10	25	50	100
PEAK INFLOW (CFS)	49.3	67.1	91.0	121.2	147.3	174.0
ALLOWABLE RELEASE (CFS)	0.6	9.2	18.4	42.2	54.6	69.9
MODELED RELEASE (CFS)	0.6	6.3	18.4	42.2	54.6	69.6
STORED VOLUME (AC-FT)	3.2	3.2	3.4	4.0	4.7	5.3

FSD20						
STORM EVENT (YR)	2	5	10	25	50	100
PEAK INFLOW (CFS)	9.9	15.5	23.8	35.1	45.5	56.6
ALLOWABLE RELEASE (CFS)	0.4	5.5	11.1	25.7	33.2	42.5
MODELED RELEASE (CFS)	0.4	2.8	10.9	25.7	33.0	42.4
STORED VOLUME (AC-FT)	0.7	0.8	0.8	0.9	1.0	1.2

FSD21						
STORM EVENT (YR)	2	5	10	25	50	100
PEAK INFLOW (CFS)	7.0	10.8	16.3	23.7	30.4	37.5
ALLOWABLE RELEASE (CFS)	0.3	4.0	8.0	18.3	23.7	30.3
MODELED RELEASE (CFS)	0.3	3.3	8.0	18.3	23.7	30.1
STORED VOLUME (AC-FT)	0.5	0.5	0.5	0.6	0.7	0.8

FSD22						
STORM EVENT (YR)	2	5	10	25	50	100
PEAK INFLOW (CFS)	9.4	14.8	22.5	32.9	42.5	52.6
ALLOWABLE RELEASE (CFS)	0.4	5.8	11.5	26.5	34.3	43.9
MODELED RELEASE (CFS)	0.4	5.8	11.4	26.5	34.3	43.8
STORED VOLUME (AC-FT)	0.6	0.6	0.7	0.8	0.9	1.0

FSD23						
STORM EVENT (YR)	2	5	10	25	50	100
PEAK INFLOW (CFS)	5.5	8.3	12.4	18.0	23.0	28.4
ALLOWABLE RELEASE (CFS)	0.2	2.4	4.9	11.2	14.5	18.6
MODELED RELEASE (CFS)	0.2	2.0	4.9	11.2	14.5	18.6
STORED VOLUME (AC-FT)	0.3	0.3	0.4	0.4	0.5	0.6

FSD27						
STORM EVENT (YR)	2	5	10	25	50	100
PEAK INFLOW (CFS)	38.8	57.6	84.1	119.7	159.2	206.3
ALLOWABLE RELEASE (CFS)	1.4	21.1	42.4	97.8	126.4	161.9
MODELED RELEASE (CFS)	1.4	18.4	42.3	97.7	126.2	161.9
STORED VOLUME (AC-FT)	2.7	2.8	2.9	3.2	3.7	4.2

FSD72						
STORM EVENT (YR)	2	5	10	25	50	100
PEAK INFLOW (CFS)	12.8	20.2	31.4	46.7	60.9	76.0
ALLOWABLE RELEASE (CFS)	0.6	9.6	19.3	44.4	57.4	73.4
MODELED RELEASE (CFS)	0.6	9.3	19.2	44.4	57.4	73.4
STORED VOLUME (AC-FT)	1.0	1.0	1.1	1.1	1.2	1.3

PNDW3						
STORM EVENT (YR)	2	5	10	25	50	100
PEAK INFLOW (CFS)	214.6	374.5	714.9	1187.6	1674.9	2204.1
MODELED RELEASE (CFS)	154.3	200.3	366.8	799.9	1085.6	1350.6
STORED VOLUME (AC-FT)	2.8	9.5	26.3	41.2	57.2	78.2

FSD-E1						
STORM EVENT (YR)	2	5	10	25	50	100
PEAK INFLOW (CFS)	23.3	35.9	53.8	79.1	102.4	127.4
ALLOWABLE RELEASE (CFS)	0.7	11.0	22.1	50.9	65.7	84.1
MODELED RELEASE (CFS)	0.7	5.4	19.9	48.9	62.8	84.0
STORED VOLUME (AC-FT)	1.3	1.3	1.5	1.8	2.1	2.5

FSD-E2						
STORM EVENT (YR)	2	5	10	25	50	100
PEAK INFLOW (CFS)	30.6	45.2	65.9	93.3	118.0	143.9
ALLOWABLE RELEASE (CFS)	0.6	9.5	19.2	45.5	59.8	77.6
MODELED RELEASE (CFS)	0.6	3.2	18.5	41.3	58.5	74.7
STORED VOLUME (AC-FT)	2.1	2.3	2.4	2.8	3.3	3.8

FSD-E3						
STORM EVENT (YR)	2	5	10	25	50	100
PEAK INFLOW (CFS)	100.4	130.6	169.6	217.4	257.8	298.4
ALLOWABLE RELEASE (CFS)	0.9	13.2	26.5	61.6	79.8	102.6
MODELED RELEASE (CFS)	1.0	6.8	25.7	56.0	79.8	101.3
STORED VOLUME (AC-FT)	7.0	7.2	7.7	8.9	10.1	11.4

FSD-E4						
STORM EVENT (YR)	2	5	10	25	50	100
PEAK INFLOW (CFS)	58.9	75.5	96.6	122.2	143.7	165.2
ALLOWABLE RELEASE (CFS)	0.3	4.4	8.8	23.0	32.2	43.7
MODELED RELEASE (CFS)	0.9	2.8	8.7	21.9	32.2	43.6
STORED VOLUME (AC-FT)	4.2	4.3	4.7	5.4	6.2	6.9

FSD-E5						
STORM EVENT (YR)	2	5	10	25	50	100
PEAK INFLOW (CFS)	38.6	48.4	60.7	75.4	87.7	99.9
ALLOWABLE RELEASE (CFS)	0.0	0.2	0.4	4.2	8.7	14.3
MODELED RELEASE (CFS)	0.0	0.2	0.5	2.2	5.1	10.0
STORED VOLUME (AC-FT)	3.0	3.7	4.4	4.8	5.0	5.3

FSD-E6						
STORM EVENT (YR)	2	5	10	25	50	100
PEAK INFLOW (CFS)	141.6	189.4	252.5	331.4	398.9	467.5
ALLOWABLE RELEASE (CFS)	0.2	1.9	3.2	37.4	77.3	125.6
MODELED RELEASE (CFS)	0.2	0.9	3.2	18.3	64.1	123.3
STORED VOLUME (AC-FT)	13.0	17.0	21.9	22.2	22.6	23.7

PND-E7						
STORM EVENT (YR)	2	5	10	25	50	100
PEAK INFLOW (CFS)	46.5	75.4	121.2	285.2	402.4	548.0
MODELED RELEASE (CFS)	23.1	35.3	71.5	108.3	152.1	196.4
STORED VOLUME (AC-FT)	1.0	1.8	4.6	10.5	17.9	28.0

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2018 STERLING RANCH MDDP

DEVELOPED HYDROLOGIC CONDITIONS MAP

PROJECT NO. 09-002
FILE: \dwg\Eng Exhibits\2018-MDDP-PROPCOND.dwg
DESIGNED BY: JD
DRAWN BY: JD
CHECKED BY: VAS
SCALE HORIZ: 1"=2400' VERT: 1"=2400'
DATE: 10-21-2018
DM2

Pond FDS - Barbarack Subdivision Restrictor plate

Worksheet for FSD Outlet Orifice Plate

Project Description

Solve For	Diameter

Input Data

Discharge	45.90	ft³/s (16.5 Ha + 29.4 Pac)
Headwater Elevation	4.70	ft
Centroid Elevation	0.00	ft
Tailwater Elevation	0.00	ft
Discharge Coefficient	0.60	

Results

Diameter	2.37	ft
Headwater Height Above Centroid	4.70	ft
Tailwater Height Above Centroid	0.00	ft
Flow Area	4.40	ft²
Velocity	10.43	ft/s

Pond FDS - Barbarack Subdivision Restrictor plate

Worksheet for FSD Overflow - Pass

Project Description

Solve For	Discharge

Input Data

Headwater Elevation	0.90	ft
Crest Elevation	0.00	ft
Tailwater Elevation	0.00	ft
Crest Surface Type	Gravel	
Crest Breadth	12.00	ft
Crest Length	36.00	ft

Results

Discharge	86.22	ft³/s
Headwater Height Above Crest	0.90	ft
Tailwater Height Above Crest	0.00	ft
Weir Coefficient	2.80	US
Submergence Factor	1.00	
Adjusted Weir Coefficient	2.80	US
Flow Area	32.40	ft²
Velocity	2.66	ft/s
Wetted Perimeter	37.80	ft
Top Width	36.00	ft

(55 DU + 29.4 pass = 84.4 cfs)

Pond FDS Barbarack Subdivision Overflow Weir

Worksheet for FSD Overflow - Pass

Project Description

Solve For	Discharge

Input Data

Headwater Elevation	0.90	ft
Crest Elevation	0.00	ft
Tailwater Elevation	0.00	ft
Crest Surface Type	Gravel	
Crest Breadth	12.00	ft
Crest Length	36.00	ft

Results

Discharge	86.22	ft³/s
Headwater Height Above Crest	0.90	ft
Tailwater Height Above Crest	0.00	ft
Weir Coefficient	2.80	US
Submergence Factor	1.00	
Adjusted Weir Coefficient	2.80	US
Flow Area	32.40	ft²
Velocity	2.66	ft/s
Wetted Perimeter	37.80	ft
Top Width	36.00	ft

(55DVI + 29.4 pass = 44.4 L/s)

Pond SFB Barbarack Subdivision Overflow Weir

Worksheet for SFB Overflow Developed

Project Description

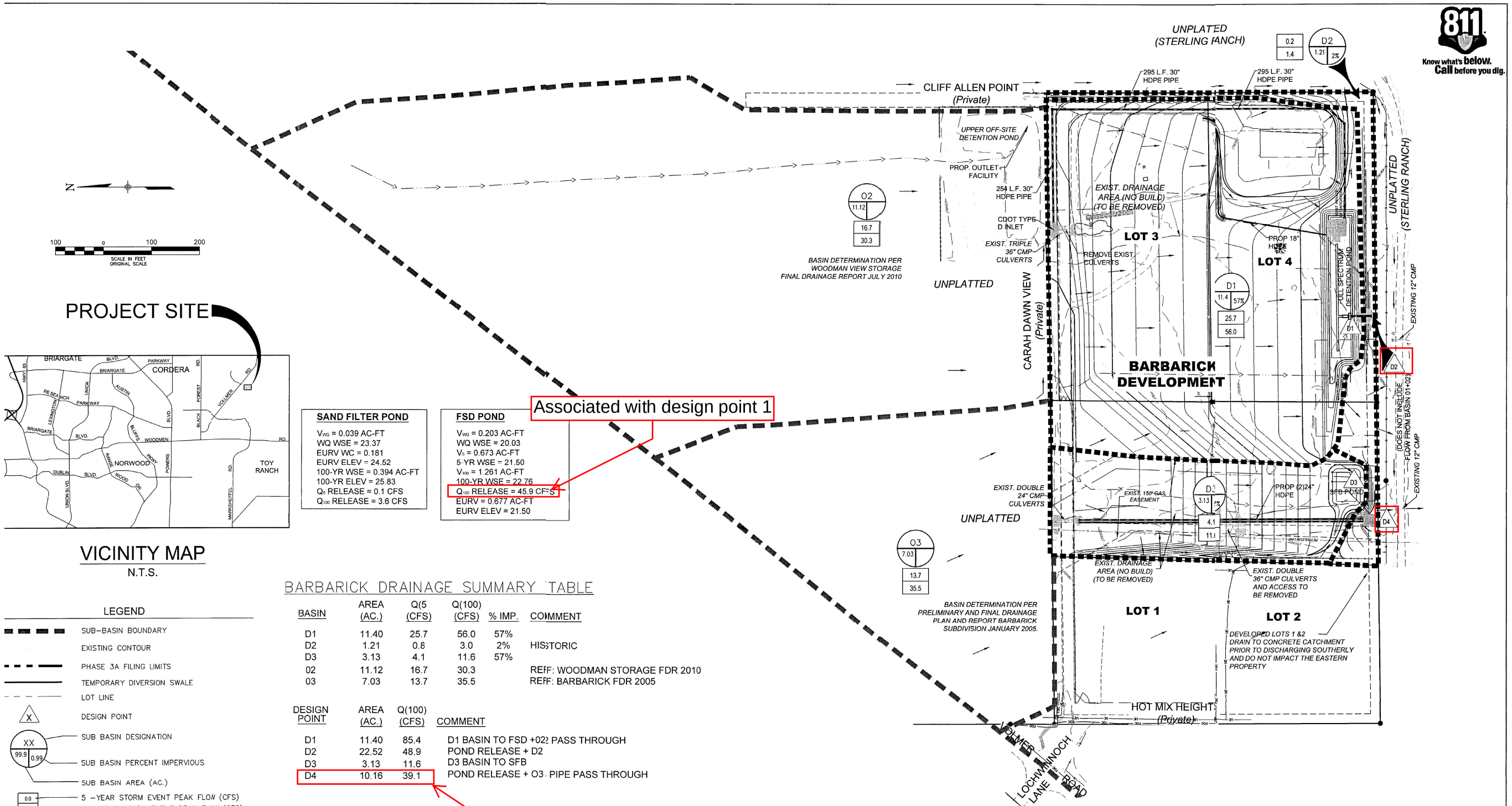
Solve For	Discharge

Input Data

Headwater Elevation		0.45	ft
Crest Elevation		0.00	ft
Tailwater Elevation		0.00	ft
Crest Surface Type	Gravel		
Crest Breadth		6.00	ft
Crest Length		10.00	ft

Results

Discharge	8.08	ft^3/s
Headwater Height Above Crest	0.45	ft
Tailwater Height Above Crest	0.00	ft
Weir Coefficient	2.68	US
Submergence Factor	1.00	
Adjusted Weir Coefficient	2.68	US
Flow Area	4.50	ft^2
Velocity	1.80	ft/s
Wetted Perimeter	10.90	ft
Top Width	10.00	ft



PROJECT SITE

VICINITY MAP

N.T.S.

SAND FILTER POND

V_{WQ} = 0.039 AC-FT
WQ WSE = 23.37
EURV WC = 0.181
EURV ELEV = 24.52
100-YR WSE = 0.394 AC-FT
100-YR ELEV = 25.83
Q_5 RELEASE = 0.1 CFS
Q_{100} RELEASE = 3.6 CFS

FSD POND

V_{WQ} = 0.203 AC-FT
WQ WSE = 20.03
V_5 = 0.673 AC-FT
5-YR WSE = 21.50
V_{100} = 1.261 AC-FT
100-YR WSE = 22.76
Q_{100} RELEASE = 45.9 CFS
EURV = 0.677 AC-FT
EURV ELEV = 21.50

Associated with design point 1

BARBARICK DRAINAGE SUMMARY TABLE

BASIN	AREA (AC.)	Q(5 (CFS)	Q(100) (CFS)	% IMP.	COMMENT
D1	11.40	25.7	56.0	57%	
D2	1.21	0.8	3.0	2%	HISTORIC
D3	3.13	4.1	11.6	57%	
02	11.12	16.7	30.3		REFF: WOODMAN STORAGE FDR 2010
03	7.03	13.7	35.5		REFF: BARBARICK FDR 2005

DESIGN POINT	AREA (AC.)	Q(100) (CFS)	COMMENT
D1	11.40	85.4	D1 BASIN TO FSD +02? PASS THROUGH
D2	22.52	48.9	POND RELEASE + D2
D3	3.13	11.6	D3 BASIN TO SFB
D4	10.16	39.1	POND RELEASE + O3 PIPE PASS THROUGH

Associated with design point 4

LEGEND

- SUB-BASIN BOUNDARY
- EXISTING CONTOUR
- PHASE 3A FILING LIMITS
- TEMPORARY DIVERSION SWALE
- LOT LINE
- X — DESIGN POINT
- XX / 99.9 / 0.99 — SUB BASIN DESIGNATION, SUB BASIN PERCENT IMPERVIOUS, SUB BASIN AREA (AC.)
- 0.0 / 0.0 — 5-YEAR STORM EVENT PEAK FLOW (CFS), 100-YEAR STORM EVENT PEAK FLOW (CFS)
- PROPOSED FLOW DIRECTION
- EXISTING FLOW DIRECTION

NO.	DATE	DESCRIPTION	BY
		REVISIONS	

NAME: S:\15.789.001 Tri Lakes\Dwg\CD\Drainage\20160605-DP01.dwg
PCP: Matrix.ctb
PLOT DATE: Tue Jun 07, 2016 12:49pm

BENCHMARK DATA(ELEV.)
(DATUM)
(DESCRIPTION/LOCATION)

VERTICAL BENCHMARK:

THE VERTICAL INFORMATION ON THIS MAP IS BASED ON THE NATIONAL GEODETIC VERTICAL DATUM OF 1929 AND THE 1960 SUPPLEMENTARY ADJUSTMENT BEING A FOUND 3.25" ALUMINUM CAP IN A ROAD BOX DESIGNATED AS FACILITIES INFORMATION MANAGEMENT SYSTEM (FIMS) MONUMENT "F_69" AND HAVING PUBLISHED ELEVATION OF 6975.62 FEET WAS USED TO REFERENCE THIS VERTICAL DATUM. THE BENCHMARK IS LOCATED ON THE WEST SIDE OF BLACK FOREST ROAD, ABOUT 1.95 MILES SOUTH OF OLD RANCH ROAD, JUST SOUTH OF THE SCHMIDT CONSTRUCTION COMPANY DRIVEWAY. A CORNER FENCE POST IS 28.1 FEET TO THE SOUTHWEST, AND THE MOST SOUTHERLY GUARD RAIL POST IS 25.7 FEET TO THE NORTH.

BASIS OF BEARING:

THE BASIS OF BEARINGS FOR THIS MAP IS THE NORTH LINE OF BARBARICK SUBDIVISION ACCORDING TO THE OFFICIAL MAP THEREOF RECORDED FEBRUARY 12, 2008 IN THE OFFICE OF THE EL PASO COUNTY CLERK AND RECORDER UNDER RECEPTION NUMBER 208712754, SAID LINE MONUMENTED ON THE WEST END BY A FOUND 5/8" REBAR AND ON THE EAST BY A FOUND 4/8" REBAR WITH 1" ALUMINUM CAP STAMPED "LS 2154" BEING A POINT ON THE NORTH LINE BEARING NORTH 89°12'41 EAST 1287.35 FEET FROM THE WEST END THEREOF

PREPARED UNDER MY DIRECT SUPERVISION, FOR AND ON BEHALF OF MATRIX DESIGN GROUP, INC.

Matrix DESIGN GROUP
2435 Research Parkway, Suite
300 Colorado Springs, CO 80920
Phone 719-575-0100
Fax 719-575-0208

BARBARICK SUBDIVISION LOTS 1-4

PROPOSED DRAINAGE PLAN

DESIGNED BY	BJH	SCALE		DATE ISSUED:	April 2016
DRAWN BY:	BJH	HORIZ:	1"=100'		
CHECKED BY	ES	VERT:	N/A	SHEET NO. 1 OF 2 SHEETS	DP02

DESIGN POINT		
DP	Q5 Total	Q100 Total
1	4.4	9.4
2	1.9	3.9
3	11.1	24.7
4	3.7	7.4
5	4.1	19.6
6	3.3	6.7
6A	2.2	4.1
7	27.5	60.6
8	3.0	12.5
9	1.9	4.8
10	9.2	17.3
11	9.5	19.9
12	1.9	9.5
13	15.7	34.6
14	16.0	37.9
15	5.4	11.7
16	4.4	9.6
17	1.4	4.7
18	4.3	14.0
19	38.8	85.4
20	7.1	13.4
21	7.4	15.2
22	2.7	15.4
23	8.8	15.8
24	11.5	20.6
25	61.0	310.0
26	4.3	22.4
27	6.3	11.7
28	6.9	14.4
29	3.1	16.3
30	0.9	6.4
31	2.0	15.0
32	1.4	10.0
1.0	6.0	10.3
1.1	12.6	19.7
1.2	17.6	28.2
1.3	25.9	46.9
1.3A	5.0	8.7
1.4	52.5	105.9
1.5	55.1	103.9
1.6	56.4	107.7
1.7	17.3	25.3
1.8	68.8	125.0
2.0	23.2	74.5
2.1	38.1	106.6
2.2	56.9	138.7
2.3	9.6	17.2
2.4	63.7	151.9
2.5	96.6	250.7
2.6	97.8	250.4
2.7	162.0	336.8
2.8	189.8	424.4
2.9	14.2	22.5
3.0	189.8	424.4
3.1	14.2	22.5
3.2	187.5	428.2
4.0	18.4	26.1
4.1	56.2	264.7
4.2	12.7	26.0
4.3	49.1	291.2
4.4	3.1	3.1
4.5	51.1	51.1
4.6	56.5	245.8
4.7	58.4	248.6
4.8	59.8	320.3
OS2	13.8	39.1
OS3	17.6	48.9
OS4	2.6	8.5
D1	3.31	8.20
D2	1.63	2.97

BASIN SUMMARY TABLE

Tributary Sub-basin	Area (acres)	Percent Impervious	C_5	C_{100}	t_c (min)	Q_5 (cfs)	Q_{100} (cfs)
A1	2.06	66%	0.51	0.65	9.7	4.4	9.4
A2	0.82	69%	0.53	0.66	9.1	1.9	3.9
A3	6.76	60%	0.47	0.62	15.0	11.1	24.7
A4	1.51	77%	0.60	0.71	10.2	3.7	7.4
A5	1.70	76%	0.59	0.70	9.9	4.1	8.3
A6	1.37	75%	0.58	0.70	10.0	3.3	6.6
A6A	0.53	95%	0.81	0.88	5.0	2.2	4.1
A7	19.00	65%	0.45	0.59	18.3	27.5	60.6
A8	1.48	63%	0.56	0.70	13.9	3.0	6.3
A9	0.61	79%	0.73	0.83	8.7	1.9	3.7
A10	2.61	86%	0.79	0.88	7.9	9.2	17.3
A11	2.89	83%	0.76	0.86	8.7	9.5	18.1
A12	3.87	8%	0.13	0.38	11.9	1.9	9.5
A13	9.65	65%	0.45	0.59	14.0	15.7	34.6
A14	11.76	55%	0.39	0.55	15.3	16.0	37.9
A15	2.91	54%	0.52	0.68	14.9	5.4	11.7
A16	2.34	56%	0.54	0.69	14.7	4.4	9.6
A17	1.76	24%	0.21	0.44	13.7	1.4	4.7
A18	5.27	21%	0.24	0.47	16.4	4.3	14.0
A19	31.85	67%	0.45	0.59	25.8	38.8	85.4
A20	1.83	89%	0.81	0.89	8.0	6.6	12.2
A21	1.93	90%	0.82	0.90	8.7	6.8	12.6
A22	8.68	5%	0.11	0.37	23.3	2.7	15.4
B1	2.98	100%	0.90	0.96	17.6	8.8	15.8
B2	3.89	100%	0.90	0.96	17.6	11.5	20.6
B3	1.53	100%	0.90	0.96	9.4	5.8	10.4
B4	1.50	100%	0.90	0.96	9.4	5.7	10.2
B5	2.91	0%	0.08	0.35	13.1	0.9	6.4
C1	8.01	95%	0.81	0.88	9.9	2.0	15.0
C2	5.06	95%	0.81	0.88	7.9	1.4	10.0
OS20	308.00	6%	0.13	0.40	68.9	61.0	310.0
OS21A	20.26	14%	0.13	0.40	52.3	4.3	22.4
OS21B	8.71	9%	0.13	0.40	24.5	3.1	16.3
OS2	17.00	70%	0.49	0.62	36.0	13.8	39.1
OS3	28.70	70%	0.49	0.62	52.6	17.6	48.9
OS4	5.08	15%	0.20	0.40	29.5	2.6	8.5
D1	0.45	95%	0.81	0.88	7.0	1.7	3.1
D2	0.43	95%	0.81	0.88	7.0	1.6	3.0

NOTE

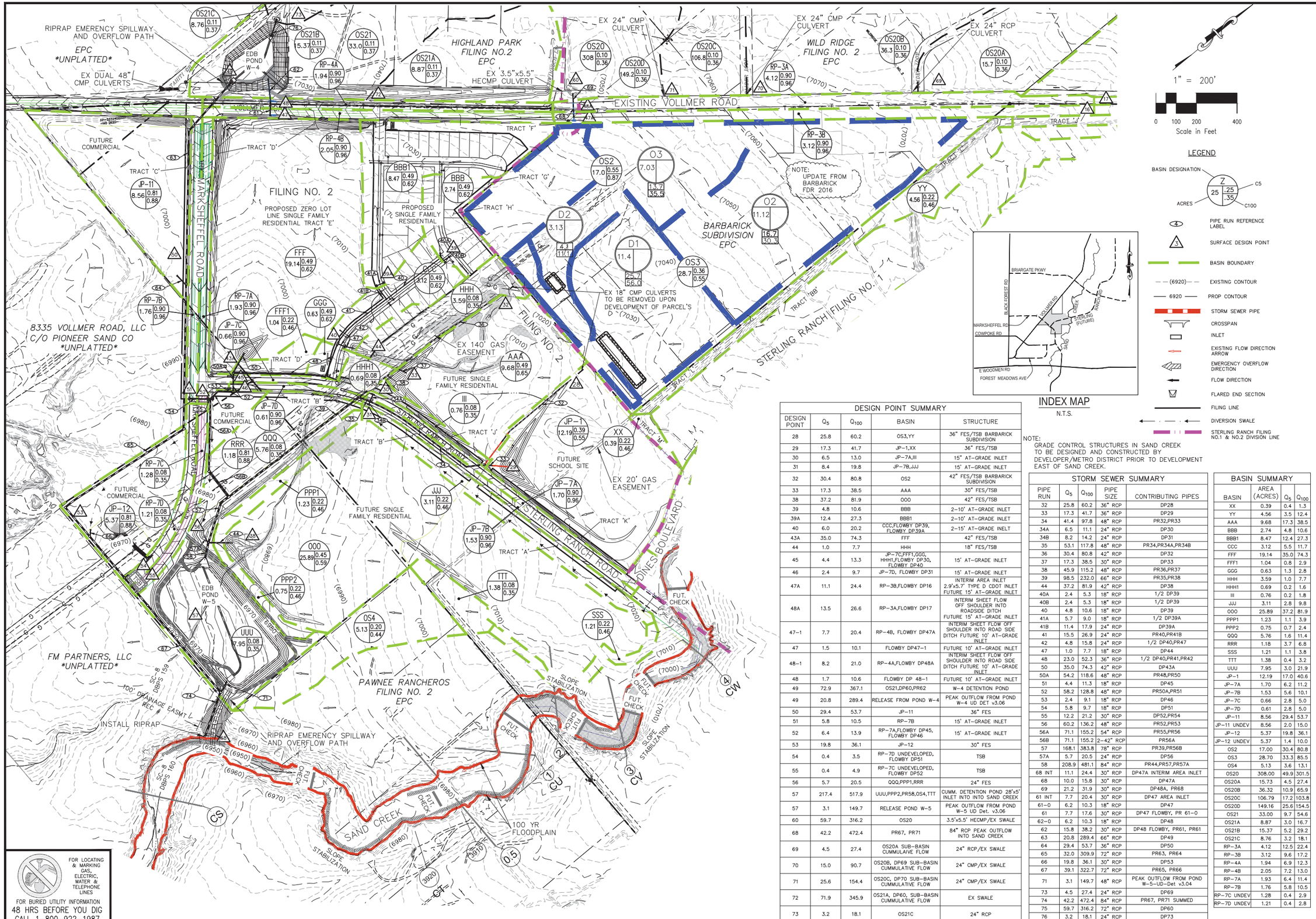
SEDIMENT CONTROL TO BE PROVIDED AT THE STUBS UNTIL THE TIME THOSE PARCELS DEVELOP

LEGEND:

- PROPOSED STORM SEWER
- 5000 FUTURE RD MAJOR CONTOUR
- FUTURE RD MINOR CONTOUR
- 5000 PROPOSED MAJOR CONTOUR
- PROPOSED MINOR CONTOUR
- 5000 EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- DRAINAGE BASIN
- A = BASIN DESIGNATION; B = AREA IN ACRES; C = 5-YR RUNOFF COEFFICIENT; D = 100-YR RUNOFF COEFFICIENT
- DESIGN POINT
- HP HIGH POINT
- LP LOW POINT
- DRAINAGE ARROW
- EXISTING DRAINAGE ARROW
- PROPOSED DRAINAGE SWALE

DRAINAGE MAP
STERLING RANCH FILING 2
JOB NO. 25188.01
8/18/21
SHEET 1 OF 7

J·R ENGINEERING
A Westrian Company
Centennial 303-740-9393 • Colorado Springs 719-593-2593
Fort Collins 970-491-9888 • www.jrengineering.com



INDEX MAP
N.T.S.

1" = 200'
0 100 200 400
Scale in Feet

LEGEND
BASIN DESIGNATION
Z 25 .25 .35 C5 C100
ACRES
4 PIPE RUN REFERENCE LABEL
3 SURFACE DESIGN POINT
BASIN BOUNDARY
(6920) EXISTING CONTOUR
6920 PROP CONTOUR
STORM SEWER PIPE
CROSSPAN
INLET
EXISTING FLOW DIRECTION ARROW
EMERGENCY OVERFLOW DIRECTION
FLOW DIRECTION
FLARED END SECTION
FILING LINE
DIVERSION SWALE
STERLING RANCH FILING NO.1 & NO.2 DIVISION LINE

NOTE:
GRADE CONTROL STRUCTURES IN SAND CREEK TO BE DESIGNED AND CONSTRUCTED BY DEVELOPER/METRO DISTRICT PRIOR TO DEVELOPMENT EAST OF SAND CREEK.

DESIGN POINT SUMMARY

DESIGN POINT	Q_5	Q_{100}	BASIN	STRUCTURE
28	25.8	60.2	OS3,YY	36" FES/TSB BARBARICK SUBDIVISION
29	17.3	41.7	JP-1,XX	36" FES/TSB
30	6.5	13.0	JP-7A,III	15" AT-GRADE INLET
31	8.4	19.8	JP-7B,JJJ	15' AT-GRADE INLET
32	30.4	80.8	OS2	42" FES/TSB BARBARICK SUBDIVISION
33	17.3	38.5	AAA	30" FES/TSB
38	37.2	81.9	OOO	42" FES/TSB
39	4.8	10.6	BBB	2-10' AT-GRADE INLET
39A	12.4	27.3	BBB1	2-10' AT-GRADE INLET
40	6.0	20.2	CCC,FLOWBY DP39, FLOWBY DP39A	2-15' AT-GRADE INELT
43A	35.0	74.3	FFF	42" FES/TSB
44	1.0	7.7	HHH	18" FES/TSB
45	4.4	13.3	JP-7C,FFF1,GGG, HHH1,FLOWBY DP30, FLOWBY DP40	15' AT-GRADE INLET
46	2.4	9.7	JP-7D, FLOWBY DP31	15' AT-GRADE INLET
47A	11.1	24.4	RP-3B,FLOWBY DP16	INTERIM AREA INLET 2.9'x5.7' TYPE D CDOT INLET FUTURE 15' AT-GRADE INLET
48A	13.5	26.6	RP-3A,FLOWBY DP17	INTERIM SHEET FLOW OFF SHOULDER INTO ROADSIDE DITCH FUTURE 15' AT-GRADE INLET
47-1	7.7	20.4	RP-4B, FLOWBY DP47A	INTERIM SHEET FLOW OFF SHOULDER INTO ROAD SIDE DITCH FUTURE 10' AT-GRADE INLET
47	1.5	10.1	FLOWBY DP47-1	FUTURE 10' AT-GRADE INLET
48-1	8.2	21.0	RP-4A,FLOWBY DP48A	INTERIM SHEET FLOW OFF SHOULDER INTO ROAD SIDE DITCH FUTURE 10' AT-GRADE INLET
48	1.7	10.6	FLOWBY DP 48-1	FUTURE 10' AT-GRADE INLET
49	72.9	367.1	OS21,DP60,PR62	W-4 DETENTION POND
49	20.8	289.4	RELEASE FROM POND W-4	PEAK OUTFLOW FROM POND W-4 UD DET v3.06
50	29.4	53.7	JP-11	36" FES
51	5.8	10.5	RP-7B	15' AT-GRADE INLET
52	6.4	13.9	RP-7A,FLOWBY DP45, FLOWBY DP46	15' AT-GRADE INLET
53	19.8	36.1	JP-12	30" FES
54	0.4	3.5	RP-7D UNDEVELOPED, FLOWBY DP51	TSB
55	0.4	4.9	RP-7C UNDEVELOPED, FLOWBY DP52	TSB
56	5.7	20.5	QQQ,PPP1,RRR	24" FES
57	217.4	517.9	UUU,PPP2,PR58,OS4,TTT	CUMM. DETENTION POND 28'x5' INLET INTO INTO SAND CREEK
57	3.1	149.7	RELEASE POND W-5	PEAK OUTFLOW FROM POND W-5 UD Det. v3.06
60	59.7	316.2	OS20	3.5'x5.5' HECMP/EX SWALE
68	42.2	472.4	PR67, PR71	84" RCP PEAK OUTFLOW INTO SAND CREEK
69	4.5	27.4	OS20A SUB-BASIN CUMMULAIVE FLOW	24" RCP/EX SWALE
70	15.0	90.7	OS20B, DP69 SUB-BASIN CUMMULATIVE FLOW	24" CMP/EX SWALE
71	25.6	154.4	OS20C, DP70 SUB-BASIN CUMMULATIVE FLOW	24" CMP/EX SWALE
72	71.9	345.9	OS21A, DP60, SUB-BASIN CUMMULATIVE FLOW	EX SWALE
73	3.2	18.1	OS21C	24" RCP

STORM SEWER SUMMARY

PIPE RUN	Q_5	Q_{100}	PIPE SIZE	CONTRIBUTING PIPES
32	25.8	60.2	36" RCP	DP28
33	17.3	41.7	36" RCP	DP29
34	41.4	97.8	48" RCP	PR32,PR33
34A	6.5	11.1	24" RCP	DP30
34B	8.2	14.2	24" RCP	DP31
35	53.1	117.8	48" RCP	PR34,PR34A,PR34B
36	30.4	80.8	42" RCP	DP32
37	17.3	38.5	30" RCP	DP33
38	45.9	115.2	48" RCP	PR36,PR37
39	98.5	232.0	66" RCP	PR35,PR38
44	37.2	81.9	42" RCP	DP38
40A	2.4	5.3	18" RCP	1/2 DP39
40B	2.4	5.3	18" RCP	1/2 DP39
40	4.8	10.6	18" RCP	DP39
41A	5.7	9.0	18" RCP	1/2 DP39A
41B	11.4	17.9	24" RCP	DP39A
41	15.5	26.9	24" RCP	PR40,PR41B
42	4.8	15.8	24" RCP	1/2 DP40,PR47
47	1.0	7.7	18" RCP	DP44
48	23.0	52.3	36" RCP	1/2 DP40,PR41,PR42
50	35.0	74.3	42" RCP	DP43A
50A	54.2	118.6	48" RCP	PR48,PR50
51	4.4	11.3	18" RCP	DP45
52	58.2	128.8	48" RCP	PR50A,PR51
53	2.4	9.1	18" RCP	DP46
54	5.8	9.7	18" RCP	DP51
55	12.2	21.2	30" RCP	DP52,PR54
56	60.2	136.2	48" RCP	PR52,PR53
56A	71.1	155.2	54" RCP	PR55,PR56
56B	71.1	155.2	2-42" RCP	PR56A
57	168.1	383.8	78" RCP	PR39,PR56B
57A	5.7	20.5	24" RCP	DP56
58	208.9	481.1	84" RCP	PR44,PR57,PR57A
68 INT	11.1	24.4	30" RCP	DP47A INTERIM AREA INLET
68	10.0	15.8	30" RCP	DP47A
69	21.2	31.9	30" RCP	DP48A, PR68
61 INT	7.7	20.4	30" RCP	DP47 AREA INLET
61-0	6.2	10.3	18" RCP	DP47
61	7.7	17.6	30" RCP	DP47 FLOWBY, PR 61-0
62-0	6.2	10.3	18" RCP	DP48
62	15.8	38.2	30" RCP	DP48 FLOWBY, PR61, PR61
63	20.8	289.4	66" RCP	DP49
64	29.4	53.7	36" RCP	DP50
65	32.0	309.9	72" RCP	PR63, PR64
66	19.8	36.1	30" RCP	DP53
67	39.1	322.7	72" RCP	PR65, PR66
71	3.1	149.7	48" RCP	PEAK OUTFLOW FROM POND W-5-UD-Det v3.04
73	4.5	27.4	24" RCP	DP69
74	42.2	472.4	84" RCP	PR67, PR71 SUMMED
75	59.7	316.2	72" RCP	DP60
76	3.2	18.1	24" RCP	DP73

BASIN SUMMARY

BASIN	AREA (ACRES)	Q_5	Q_{100}
XX	0.39	0.4	1.3
YY	4.56	3.5	12.4
AAA	9.68	17.3	38.5
BBB	2.74	4.8	10.6
BBB1	8.47	12.4	27.3
CCC	3.12	5.5	11.7
FFF	19.14	35.0	74.3
FFF1	1.04	0.8	2.9
GGG	0.63	1.3	2.8
HHH	3.59	1.0	7.7
HHH1	0.69	0.2	1.6
III	0.76	0.2	1.8
JJJ	3.11	2.8	9.8
OOO	25.89	37.2	81.9
PPP1	1.23	1.1	3.9
PPP2	0.75	0.7	2.4
QQQ	5.76	1.6	11.4
RRR	1.18	3.7	6.8
SSS	1.21	1.1	3.8
TTT	1.38	0.4	3.2
UUU	7.95	3.0	21.9
JP-1	12.19	17.0	40.6
JP-7A	1.70	6.2	11.2
JP-7B	1.53	5.6	10.1
JP-7C	0.66	2.8	5.0
JP-7D	0.61	2.8	5.0
JP-11	8.56	29.4	53.7
JP-11 UNDEV	8.56	2.0	15.0
JP-12	5.37	19.8	36.1
JP-12 UNDEV	5.37	1.4	10.0
OS2	17.00	30.4	80.8
OS3	28.70	33.3	85.5
OS4	5.13	3.6	13.1
OS20	308.00	49.9	301.5
OS20A	15.73	4.5	27.4
OS20B	36.32	10.9	65.9
OS20C	106.79	17.2	103.8
OS20D	149.16	25.6	154.5
OS21	33.00	9.7	54.6
OS21A	8.87	3.0	16.7
OS21B	15.37	5.2	29.2
OS21C	8.76	3.2	18.1
RP-3A	4.12	12.5	22.4
RP-3B	3.12	9.6	17.2
RP-4A	1.94	6.9	12.3
RP-4B	2.05	7.2	13.0
RP-7A	1.93	6.4	11.4
RP-7B	1.76	5.8	10.5
RP-7C UNDEV	1.28	0.4	2.9
RP-7D UNDEV	1.21	0.4	2.8

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FOR BURIED UTILITY INFORMATION
48 HRS BEFORE YOU DIG
CALL 1-800-922-1987

STERLING RANCH FILING NO. 2
PROPOSED DRAINAGE MAP

PROJECT NO. 09-002 | SCALE: HORIZONTAL: 1"=200' VERTICAL: N/A | DATE: 12/20/2017 | SHEET 1 OF 1 | SHEET 1
DESIGNED BY: GT
DRAWN BY: BB
CHECKED BY: GT

20 BOULDER CRESCENT, SUITE 110
COLORADO SPRINGS, CO 80903
PHONE: 719.955.5485
CIVIL CONSULTANTS, INC.

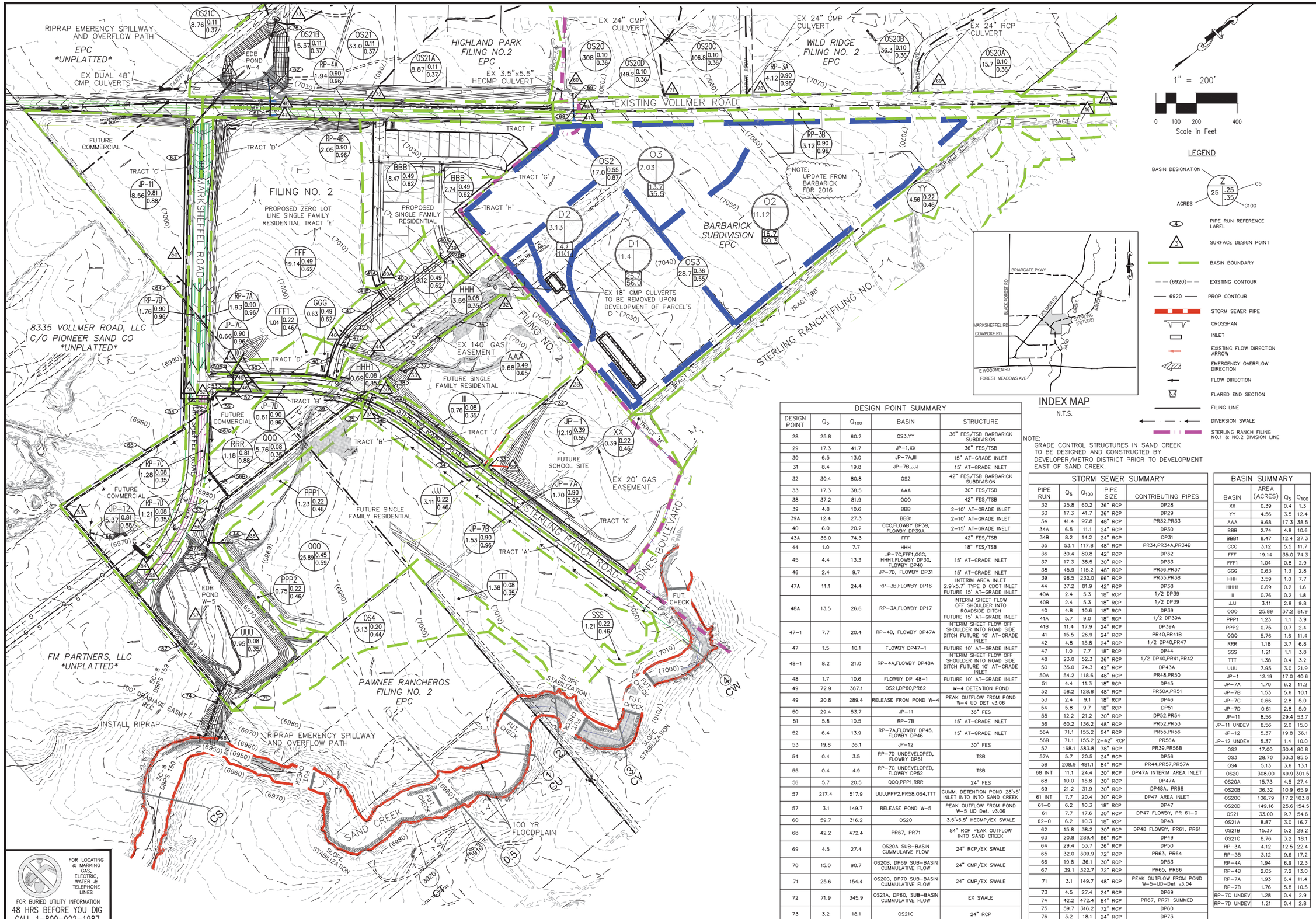
FOR AND ON BEHALF OF M&S CIVIL CONSULTANTS, INC.
VIRGIL A. SANCHEZ, COLORADO P.E. NO. 37160

REVISIONS:
NO. | DATE: | BY: | DESCRIPTION: | APPR'D. BY: | DATE:

THE ENGINEER PREPARING THESE PLANS WILL NOT BE RESPONSIBLE, OR LIABLE FOR, UNAUTHORIZED CHANGES TO OR USES OF THESE PLANS. ALL CHANGES TO THE PLANS MUST BE IN WRITING AND MUST BE APPROVED BY THE PREPARER OF THESE PLANS.

CAUTION

File: G:\09002A\Sterling Ranch District - Filing 2\dwg\Eng Exhibits\FDP\SR Filing 2-Proposed Drainage Map Filing 2.dwg Plotstamp: 1/24/2018 3:27 PM



INDEX MAP
N.T.S.

1" = 200'
0 100 200 400
Scale in Feet

LEGEND
BASIN DESIGNATION
Z 25 .25 .35 C5 C100
ACRES
4 PIPE RUN REFERENCE LABEL
3 SURFACE DESIGN POINT
BASIN BOUNDARY
(6920) EXISTING CONTOUR
6920 PROP CONTOUR
STORM SEWER PIPE
CROSSPAN
INLET
EXISTING FLOW DIRECTION ARROW
EMERGENCY OVERFLOW DIRECTION
FLOW DIRECTION
FLARED END SECTION
FILING LINE
DIVERSION SWALE
STERLING RANCH FILING NO.1 & NO.2 DIVISION LINE

NOTE:
GRADE CONTROL STRUCTURES IN SAND CREEK TO BE DESIGNED AND CONSTRUCTED BY DEVELOPER/METRO DISTRICT PRIOR TO DEVELOPMENT EAST OF SAND CREEK.

DESIGN POINT SUMMARY

DESIGN POINT	Q_5	Q_{100}	BASIN	STRUCTURE
28	25.8	60.2	OS3,YY	36" FES/TSB BARBARICK SUBDIVISION
29	17.3	41.7	JP-1,XX	36" FES/TSB
30	6.5	13.0	JP-7A,III	15" AT-GRADE INLET
31	8.4	19.8	JP-7B,JJJ	15' AT-GRADE INLET
32	30.4	80.8	OS2	42" FES/TSB BARBARICK SUBDIVISION
33	17.3	38.5	AAA	30" FES/TSB
38	37.2	81.9	OOO	42" FES/TSB
39	4.8	10.6	BBB	2-10' AT-GRADE INLET
39A	12.4	27.3	BBB1	2-10' AT-GRADE INLET
40	6.0	20.2	CCC,FLOWBY DP39, FLOWBY DP39A	2-15' AT-GRADE INELT
43A	35.0	74.3	FFF	42" FES/TSB
44	1.0	7.7	HHH	18" FES/TSB
45	4.4	13.3	JP-7C,FFF1,GGG, HHH1,FLOWBY DP30, FLOWBY DP40	15' AT-GRADE INLET
46	2.4	9.7	JP-7D, FLOWBY DP31	15' AT-GRADE INLET
47A	11.1	24.4	RP-3B,FLOWBY DP16	INTERIM AREA INLET 2.9'x5.7' TYPE D CDOT INLET FUTURE 15' AT-GRADE INLET
48A	13.5	26.6	RP-3A,FLOWBY DP17	INTERIM SHEET FLOW OFF SHOULDER INTO ROADSIDE DITCH FUTURE 15' AT-GRADE INLET
47-1	7.7	20.4	RP-4B, FLOWBY DP47A	INTERIM SHEET FLOW OFF SHOULDER INTO ROAD SIDE DITCH FUTURE 10' AT-GRADE INLET
47	1.5	10.1	FLOWBY DP47-1	FUTURE 10' AT-GRADE INLET
48-1	8.2	21.0	RP-4A,FLOWBY DP48A	INTERIM SHEET FLOW OFF SHOULDER INTO ROAD SIDE DITCH FUTURE 10' AT-GRADE INLET
48	1.7	10.6	FLOWBY DP 48-1	FUTURE 10' AT-GRADE INLET
49	72.9	367.1	OS21,DP60,PR62	W-4 DETENTION POND
49	20.8	289.4	RELEASE FROM POND W-4	PEAK OUTFLOW FROM POND W-4 UD DET v3.06
50	29.4	53.7	JP-11	36" FES
51	5.8	10.5	RP-7B	15' AT-GRADE INLET
52	6.4	13.9	RP-7A,FLOWBY DP45, FLOWBY DP46	15' AT-GRADE INLET
53	19.8	36.1	JP-12	30" FES
54	0.4	3.5	RP-7D UNDEVELOPED, FLOWBY DP51	TSB
55	0.4	4.9	RP-7C UNDEVELOPED, FLOWBY DP52	TSB
56	5.7	20.5	QQQ,PPP1,RRR	24" FES
57	217.4	517.9	UUU,PPP2,PR58,OS4,TTT	CUMM. DETENTION POND 28'x5' INLET INTO INTO SAND CREEK
57	3.1	149.7	RELEASE POND W-5	PEAK OUTFLOW FROM POND W-5 UD Det. v3.06
60	59.7	316.2	OS20	3.5'x5.5' HECMP/EX SWALE
68	42.2	472.4	PR67, PR71	84" RCP PEAK OUTFLOW INTO SAND CREEK
69	4.5	27.4	OS20A SUB-BASIN CUMMULAIVE FLOW	24" RCP/EX SWALE
70	15.0	90.7	OS20B, DP69 SUB-BASIN CUMMULATIVE FLOW	24" CMP/EX SWALE
71	25.6	154.4	OS20C, DP70 SUB-BASIN CUMMULATIVE FLOW	24" CMP/EX SWALE
72	71.9	345.9	OS21A, DP60, SUB-BASIN CUMMULATIVE FLOW	EX SWALE
73	3.2	18.1	OS21C	24" RCP

STORM SEWER SUMMARY

PIPE RUN	Q_5	Q_{100}	PIPE SIZE	CONTRIBUTING PIPES
32	25.8	60.2	36" RCP	DP28
33	17.3	41.7	36" RCP	DP29
34	41.4	97.8	48" RCP	PR32,PR33
34A	6.5	11.1	24" RCP	DP30
34B	8.2	14.2	24" RCP	DP31
35	53.1	117.8	48" RCP	PR34,PR34A,PR34B
36	30.4	80.8	42" RCP	DP32
37	17.3	38.5	30" RCP	DP33
38	45.9	115.2	48" RCP	PR36,PR37
39	98.5	232.0	66" RCP	PR35,PR38
44	37.2	81.9	42" RCP	DP38
40A	2.4	5.3	18" RCP	1/2 DP39
40B	2.4	5.3	18" RCP	1/2 DP39
40	4.8	10.6	18" RCP	DP39
41A	5.7	9.0	18" RCP	1/2 DP39A
41B	11.4	17.9	24" RCP	DP39A
41	15.5	26.9	24" RCP	PR40,PR41B
42	4.8	15.8	24" RCP	1/2 DP40,PR47
47	1.0	7.7	18" RCP	DP44
48	23.0	52.3	36" RCP	1/2 DP40,PR41,PR42
50	35.0	74.3	42" RCP	DP43A
50A	54.2	118.6	48" RCP	PR48,PR50
51	4.4	11.3	18" RCP	DP45
52	58.2	128.8	48" RCP	PR50A,PR51
53	2.4	9.1	18" RCP	DP46
54	5.8	9.7	18" RCP	DP51
55	12.2	21.2	30" RCP	DP52,PR54
56	60.2	136.2	48" RCP	PR52,PR53
56A	71.1	155.2	54" RCP	PR55,PR56
56B	71.1	155.2	2-42" RCP	PR56A
57	168.1	383.8	78" RCP	PR39,PR56B
57A	5.7	20.5	24" RCP	DP56
58	208.9	481.1	84" RCP	PR44,PR57,PR57A
68 INT	11.1	24.4	30" RCP	DP47A INTERIM AREA INLET
68	10.0	15.8	30" RCP	DP47A
69	21.2	31.9	30" RCP	DP48A, PR68
61 INT	7.7	20.4	30" RCP	DP47 AREA INLET
61-0	6.2	10.3	18" RCP	DP47
61	7.7	17.6	30" RCP	DP47 FLOWBY, PR 61-0
62-0	6.2	10.3	18" RCP	DP48
62	15.8	38.2	30" RCP	DP48 FLOWBY, PR61, PR61
63	20.8	289.4	66" RCP	DP49
64	29.4	53.7	36" RCP	DP50
65	32.0	309.9	72" RCP	PR63, PR64
66	19.8	36.1	30" RCP	DP53
67	39.1	322.7	72" RCP	PR65, PR66
71	3.1	149.7	48" RCP	PEAK OUTFLOW FROM POND W-5-UD-Det v3.04
73	4.5	27.4	24" RCP	DP69
74	42.2	472.4	84" RCP	PR67, PR71 SUMMED
75	59.7	316.2	72" RCP	DP60
76	3.2	18.1	24" RCP	DP73

BASIN SUMMARY

BASIN	AREA (ACRES)	Q_5	Q_{100}
XX	0.39	0.4	1.3
YY	4.56	3.5	12.4
AAA	9.68	17.3	38.5
BBB	2.74	4.8	10.6
BBB1	8.47	12.4	27.3
CCC	3.12	5.5	11.7
FFF	19.14	35.0	74.3
FFF1	1.04	0.8	2.9
GGG	0.63	1.3	2.8
HHH	3.59	1.0	7.7
HHH1	0.69	0.2	1.6
III	0.76	0.2	1.8
JJJ	3.11	2.8	9.8
OOO	25.89	37.2	81.9
PPP1	1.23	1.1	3.9
PPP2	0.75	0.7	2.4
QQQ	5.76	1.6	11.4
RRR	1.18	3.7	6.8
SSS	1.21	1.1	3.8
TTT	1.38	0.4	3.2
UUU	7.95	3.0	21.9
JP-1	12.19	17.0	40.6
JP-7A	1.70	6.2	11.2
JP-7B	1.53	5.6	10.1
JP-7C	0.66	2.8	5.0
JP-7D	0.61	2.8	5.0
JP-11	8.56	29.4	53.7
JP-11 UNDEV	8.56	2.0	15.0
JP-12	5.37	19.8	36.1
JP-12 UNDEV	5.37	1.4	10.0
OS2	17.00	30.4	80.8
OS3	28.70	33.3	85.5
OS4	5.13	3.6	13.1
OS20	308.00	49.9	301.5
OS20A	15.73	4.5	27.4
OS20B	36.32	10.9	65.9
OS20C	106.79	17.2	103.8
OS20D	149.16	25.6	154.5
OS21	33.00	9.7	54.6
OS21A	8.87	3.0	16.7
OS21B	15.37	5.2	29.2
OS21C	8.76	3.2	18.1
RP-3A	4.12	12.5	22.4
RP-3B	3.12	9.6	17.2
RP-4A	1.94	6.9	12.3
RP-4B	2.05	7.2	13.0
RP-7A	1.93	6.4	11.4
RP-7B	1.76	5.8	10.5
RP-7C UNDEV	1.28	0.4	2.9
RP-7D UNDEV	1.21	0.4	2.8

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FOR BURIED UTILITY INFORMATION
48 HRS BEFORE YOU DIG
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STERLING RANCH FILING NO. 2
PROPOSED DRAINAGE MAP

PROJECT NO. 09-002 | SCALE: HORIZONTAL: 1"=200' VERTICAL: N/A | DATE: 12/20/2017 | SHEET 1 OF 1 | SHEET 1
DESIGNED BY: GT
DRAWN BY: BB
CHECKED BY: GT

20 BOULDER CRESCENT, SUITE 110
COLORADO SPRINGS, CO 80903
PHONE: 719.955.5485
CIVIL CONSULTANTS, INC.

FOR AND ON BEHALF OF M&S CIVIL CONSULTANTS, INC.
VIRGIL A. SANCHEZ, COLORADO P.E. NO. 37160

REVISIONS:
NO. | DATE: | BY: | DESCRIPTION: | APPR'D. BY: | DATE:

THE ENGINEER PREPARING THESE PLANS WILL NOT BE RESPONSIBLE, OR LIABLE FOR, UNAUTHORIZED CHANGES TO OR USES OF THESE PLANS. ALL CHANGES TO THE PLANS MUST BE IN WRITING AND MUST BE APPROVED BY THE PREPARER OF THESE PLANS.

CAUTION

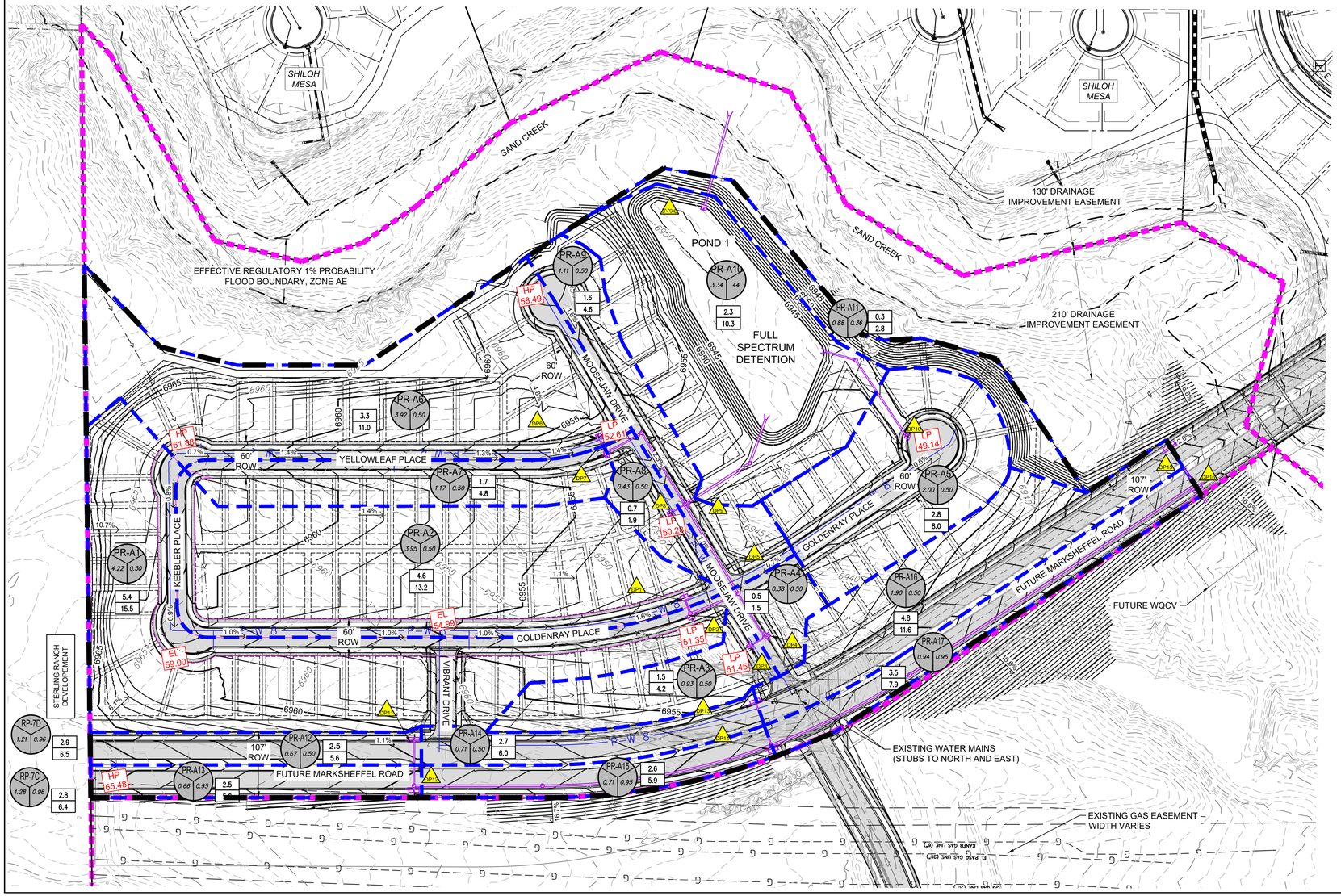
File: G:\09002A\Sterling Ranch District - Filing 2\dwg\Eng Exhibits\FDP\SR Filing 2-Proposed Drainage Map Filing 2.dwg Plotstamp: 1/24/2018 3:27 PM

Design Point Summary Table									
Design Point	Upstream Area (Acres)	Upstream Q5 (cfs)	Upstream Q100 (cfs)	Subbasins Included	Inlet Name	Inlet Type	Inlet Size (ft)	Outlet Pipe Size/Type	Downstream Design Point
DP1	4.22	4.6	13.2	A2	A2	D 10 R	8	24" RCP/HP	D2
DP2	8.17	10.0	28.7	A1,A2	A1	D 10 R	8	30" RCP/HP	D5
DP3	0.93	1.5	4.2	A3	A3	D 10 R	6	18" RCP/HP	D4
DP4	1.31	2.0	5.7	A3,A4	A4	D 10 R	6	18" RCP/HP	D5
DP5	9.48	12.0	34.4	A1,A2,A3,A4	D5	MH	6	30" RCP/HP	D9
DP6	3.92	3.3	11.0	A6	A6	D 10 R	8	24" RCP/HP	D7
DP7	5.08	5.0	15.9	A6,A7	A5	D 10 R	6	24" RCP/HP	D9
DP8	0.43	0.7	1.9	A8	A7	D 10 R	6	18" RCP/HP	D9
DP9	16.10	19.3	56.8	A1,A2,A3,A4,A6, A7,A8,A9	A8	D 10 R	8	36" RCP/HP	D10
DP10	2.00	2.8	8.0	A5	A5	D 10 R	0	0	0
DP Pond	21.45	24.4	75.1	A1,A2,A3,A4,A5, A6,A7,A8,A9,A10	A9	Detention Outlet Structure	Orifice Plate: 1.02 Sq. In. (Stage 0', .9' & 1.06') Overflow Weir/Grate: L=2', W=2' w/ slope: 0 Overflow Weir/Grate: (Stage: .4' to 6') Structure Outlet Pipe: 18" RCP/HP (10.5" Orifice Plate.		-
Detention Discharge	-	0.4	3.7						Sand Creek
DP11	1.88	5.4	12.1	A12	A12	D 10 R	16	18" RCP/HP	D12
DP12	3.82	10.7	24.0	A12,A13	A13	D 10 R	16	24" RCP/HP	D14
DP13	0.71	2.7	6.0	A14	A14	D 10 R	16	18" RCP/HP	D14
DP14	5.24	16.0	36.0	A12,A13, A14,A15	A15	D 10 R	16	30" RCP/HP	D16
DP15	1.90	4.8	11.6	A16	A16	D 10 R	20	18" RCP/HP	D16
DP16	8.09	24.3	55.4	A12,A13, A14, A15,A16,A17	A17	D 10 R	16	30" RCP/HP	Sand Creek

ASPEN MEADOWS

COLORADO SPRINGS, CO

PROPOSED CONDITIONS MAP



Basin Summary Table			
Aspen Meadows			
Area ID	Area (Acres)	Q5 (cfs)	Q100 (cfs)
RP-7C	1.28	2.8	6.4
RP-7D	1.21	2.9	6.5
A1	4.22	5.4	15.5
A2	3.95	4.6	13.2
A3	0.93	1.5	4.2
A4	0.38	0.5	1.5
A5	2.00	2.8	8.0
A6	3.92	3.3	11.0
A7	1.17	1.7	4.8
A8	0.43	0.7	1.9
A9	1.11	1.6	4.6
A10	3.34	2.3	10.3
A11	0.88	0.3	2.8
A12	0.67	2.5	5.6
A13	0.66	2.5	5.6
A14	0.71	2.7	6.0
A15	0.71	2.6	5.9
A16	1.90	4.8	11.6
A17	0.94	3.5	7.9

NOTES:
1. Spot elevations subject to change with final grading design and construction.

LEGEND

- SUB-BASIN BOUNDARY
- EXISTING CONTOUR (4900)
- PROPOSED CONTOUR (6970)
- FLOW DIRECTION (XXX)
- LOW POINT AND ELEVATION (LP XX)
- HIGH POINT AND ELEVATION (HP XX)
- SPOT ELEVATION (95.71)
- SWALE
- DESIGN POINT (x)
- SUB BASIN DESIGNATION (XX)
- SUB BASIN RUNOFF COEFFICIENT (XX)
- SUB BASIN AREA (AC.) (X.XX)
- 5-YEAR STORM EVENT PEAK FLOW (CFS) (0.0)
- 100-YEAR STORM EVENT PEAK FLOW (CFS) (0.0)
- PROPERTY LINE
- STORM PIPE

GRAPHIC SCALE

100' 0' 100' 200'

(IN FEET)
1 inch = 100 ft.

Know what's below. Call before you dig.

CONSULTANT:

CIVIL ENGINEER:

Matrix DESIGN GROUP
2435 Research Parkway, Suite 300
Colorado Springs, CO 80920
Phone 719-575-0100
Fax 719-575-0208

LANDSCAPE ARCHITECT:

Thomas & Thomas Planning-Urban
614 N. Tejon Street
Colorado Springs, CO 80903
Phone (719)578-8777

PROJECT:

ASPEN MEADOWS
FILING NO.1
DEVELOPMENT PLAN
CITY OF COLORADO SPRINGS
JANUARY 2019

OWNER:

COLA, LLC
555 MIDDLE PARKWAY
COLORADO SPRINGS, CO 80921
(719)459-0807

DEVELOPER:

COLA, LLC
555 MIDDLE PARKWAY
COLORADO SPRINGS, CO 80921
(719)459-0807

CITY PLANNING FILE NO: AR DP XXXXXXXXX

ISSUE: JANUARY, 2019

DRAWING INFORMATION:	
PROJECT NO:	17.886.004.000
DRAWN BY:	CRAIG DOLD
CHECKED BY:	JEFF ODOR
APPROVED BY:	JEFF ODOR
SHEET TITLE:	

DRAINAGE REPORT MAP

DR02

SHEET 2 OF 3

Project Name:	Aspen Meadows
Project Location:	NE Colorado Springs
Designer	JTS
Notes:	Proposed Conditions

Average Channel Velocity 5 ft/s (If specific channel vel is used, this will be ignored)
Average Slope for Initial Flow 0.04 ft/ft (If Elevations are used, this will be ignored)

	Area		Rational 'C' Values														Flow Lengths				Initial Flow				Channel Flow					Tc	Rainfall Intensity & Rational Flow Rate													
Basin			Surface Type 1 (Meadow)			Surface Type 2 (Pavement)			Surface Type 3 Acre Lots)		(1/4 Area	Surface Type 4 (0.147 Acre Lots) (Interpolated between 1/8 & 1/4 Acre lots)			Composite		Initial	True Initial	Channel	rue Chann	High Point	Low Point	Average	Initial	High Point	Low Point	Average	Velocity	Channel	Total	i2	Q2	i5	Q5	i10	Q10	i25	Q25	i50	Q50	i100	Q100
	sf	acres	C5	C100	Area (SF)	C5	C100	Area (SF)	C5	C100	Area	C10	C100	Area	C5	C100	ft	Length ft	ft	Length ft	Elevation	Elevation	Slope	Tc (min)	Elevation	Elevation	Slope	(ft/s)	Tc (min)	(min)	in/hr	cfs	in/hr	cfs	in/hr	cfs	in/hr	cfs	in/hr	cfs	in/hr	cfs
RP-7C	55757	1.28	0.08	0.36	0	0.90	0.96	55,757	0.30	0.50		0.42	0.57		0.90	0.96	25	25	2111	2111			0.040	1.2	0		0.000		7.0	8.2	1.9	**2.2**	2.5	**2.8**	3.0	**3.5**	3.8	**4.7**	4.4	**5.5**	5.2	**6.4**
RP-7D	52707	1.21	0.08	0.36	0	0.90	0.96	52,707	0.30	0.50		0.42	0.57		0.90	0.96	25	25	1927	1927			0.040	1.2	0		0.000		6.4	7.6	2.0	**2.2**	2.6	**2.9**	3.2	**3.5**	4.0	**4.7**	4.7	**5.5**	5.5	**6.5**
A1	183953	4.22	0.08	0.36	0	0.90	0.96	0	0.30	0.50	0	0.42	0.57	183953	0.42	0.57	129	129	1165	1165	6968	6962	0.047	8.7	6962	6951	0.010		3.9	12.5	2.3	**4.2**	3.0	**5.4**	3.7	**6.6**	4.6	**11.3**	5.5	**13.3**	6.4	**15.5**
A2	171980	3.95	0.08	0.36		0.90	0.96		0.30	0.50		0.42	0.57	171980	0.42	0.57	155	155	785	785	6962	6959	0.019	12.7	6959	6951	0.010		2.6	15.3	2.1	**3.6**	2.8	**4.6**	3.4	**5.6**	4.3	**9.6**	5.0	**11.4**	5.8	**13.2**
A3	40333	0.93	0.08	0.36		0.90	0.96		0.30	0.50		0.42	0.57	40333	0.42	0.57	60	60	429	429	6958	6955	0.050	5.8	6955	6951	0.010		1.4	7.2	2.9	**1.1**	3.7	**1.5**	4.5	**1.8**	5.7	**3.0**	6.7	**3.6**	7.8	**4.2**
A4	16521	0.38	0.08	0.36		0.90	0.96		0.30	0.50		0.42	0.57	16521	0.42	0.57	84	84	168	168	6954	6952	0.020	9.2	6952	6951	0.006		0.6	9.8	2.6	**0.4**	3.3	**0.5**	4.1	**0.7**	5.1	**1.1**	6.0	**1.3**	7.0	**1.5**
A5	87091	2.00	0.08	0.36		0.90	0.96		0.30	0.50		0.42	0.57	87091	0.42	0.57	84	84	281	281	6954	6952	0.020	9.2	6952	6949	0.010		0.9	10.2	2.5	**2.1**	3.3	**2.8**	4.0	**3.4**	5.1	**5.8**	6.0	**6.8**	6.9	**8.0**
A6	170648	3.92	0.08	0.36	46,932	0.90	0.96		0.30	0.50		0.42	0.57	123716	0.33	0.52	331	300	672	703	6975	6962	0.039	15.8	6962	6953	0.014		2.3	18.2	2.0	**2.6**	2.6	**3.3**	3.1	**4.0**	3.9	**8.1**	4.6	**9.5**	5.4	**11.0**
A7	50796	1.17	0.08	0.36		0.90	0.96		0.30	0.50		0.42	0.57	50796	0.42	0.57	60	60	624	624	6963	6961	0.027	7.0	6961	6953	0.013		2.1	9.1	2.6	**1.3**	3.4	**1.7**	4.2	**2.1**	5.3	**3.5**	6.2	**4.2**	7.2	**4.8**
A8	18695	0.43	0.08	0.36		0.90	0.96		0.30	0.50		0.42	0.57	18695	0.42	0.57	50	50	130	130	6953	6951	0.023	6.8	6951	6950	0.008		0.4	7.2	2.9	**0.5**	3.7	**0.7**	4.5	**0.8**	5.7	**1.4**	6.7	**1.7**	7.8	**1.9**
A9	48530	1.11	0.08	0.36		0.90	0.96		0.30	0.50		0.42	0.57	48530	0.42	0.57	66	66	400	400	6959	6958	0.023	7.8	6958	6950	0.019		1.3	9.1	2.6	**1.2**	3.4	**1.6**	4.2	**2.0**	5.3	**3.4**	6.2	**4.0**	7.2	**4.6**
A10	145660	3.34	0.08	0.36	91,851	0.90	0.96		0.30	0.50		0.42	0.57	53809	0.21	0.44	133	133	409	409	6959	6945	0.105	8.8	6945	6942	0.007		1.4	10.1	2.5	**1.8**	3.3	**2.3**	4.0	**2.8**	5.1	**7.5**	6.0	**8.8**	6.9	**10.3**
A11	38513	0.88	0.08	0.36	38,513	0.90	0.96		0.30	0.50		0.42	0.57		0.08	0.36	15	15	74	74	6950	6949	0.067	3.9	6949	6940	0.122		0.2	5.0	3.2	**0.2**	4.1	**0.3**	5.0	**0.4**	6.3	**2.0**	7.5	**2.4**	8.7	**2.8**
A12	29078	0.67	0.08	0.36		0.90	0.96	29,078	0.30	0.50		0.42	0.57		0.90	0.96	13	13	512	512	6965	6964	0.077	0.7	6964	6959	0.009		1.7	5.0	3.2	**1.9**	4.1	**2.5**	5.0	**3.0**	6.3	**4.1**	7.5	**4.8**	8.7	**5.6**
A13	28956	0.66	0.08	0.36		0.90	0.96	28,956	0.30	0.50		0.42	0.57		0.90	0.96	13	13	512	512	6964	6964	0.020	1.1	6964	6959	0.009		1.7	5.0	3.2	**1.9**	4.1	**2.5**	5.0	**3.0**	6.3	**4.1**	7.5	**4.8**	8.7	**5.6**
A14	31058	0.71	0.08	0.36		0.90	0.96	31,058	0.30	0.50		0.42	0.57		0.90	0.96	96	96	547	547	6956	6954	0.021	2.9	6954	6953	0.002		1.8	5.0	3.2	**2.0**	4.1	**2.7**	5.0	**3.2**	6.3	**4.4**	7.5	**5.1**	8.7	**6.0**
A15	30826	0.71	0.08	0.36		0.90	0.96	30,826	0.30	0.50		0.42	0.57		0.90	0.96	13	13	547	547	6958	6958	0.020	1.1	6958	6953	0.009		1.8	5.0	3.2	**2.0**	4.1	**2.6**	5.0	**3.2**	6.3	**4.3**	7.5	**5.1**	8.7	**5.9**
A16	82931	1.90	0.08	0.36		0.90	0.96	43,788	0.30	0.50		0.42	0.57	39143	0.68	0.78	100	100	553	553	6954	6951	0.027	5.6	6951	6940	0.019		1.8	7.5	2.8	**3.7**	3.7	**4.8**	4.5	**5.8**	5.6	**8.4**	6.6	**9.9**	7.7	**11.6**
A17	40961	0.94	0.08	0.36		0.90	0.96	40,961	0.30	0.50		0.42	0.57		0.90	0.96	13	13	553	553	6954	6953	0.077	0.7	6953	6940	0.023		1.8	5.0	3.2	**2.7**	4.1	**3.5**	5.0	**4.3**	6.3	**5.8**	7.5	**6.8**	8.7	**7.9**
Total Onsite Area =	**1216531**	**27.93**																																								
DP1 (A2)		3.95																														**4.6**										**13.2**
DP2 (A1+A2)		8.17																														**10.0**										**28.7**
DP3 (A3)		0.93																														**1.5**										**4.2**
DP4 (A3+A4)		1.31																														**2.0**										**5.7**
DP5 (D2+D4)		9.48																														**12.0**										**34.4**
DP6 (A6)		3.92																														**3.3**										**11.0**
DP7 (A6+A7)		5.08																														**5.0**										**15.9**
DP8 (A8)		0.43																														**0.7**										**1.9**
DP9 (DP5+DP7+DP8+A9)		16.10																														**19.3**										**56.8**
DP 10 (A5)		2.00																														**2.8**										**8.0**
DP Pond (A1-A10)		21.45																														**24.4**										**75.1**
DP Pond (Discharge)		21.45																														**0.4**										**3.7**
DP11 (RP-7D+A12)		1.88																														**5.4**										**12.1**
DP12 (DP11+RP-7C+A13)		3.82																														**10.7**										**24.0**
DP13 (A14)		0.71																														**2.7**										**6.0**
DP14 (DP12+DP13+A15)		5.24																														**16.0**										**36.0**
DP15 (A16)		1.90																														**4.8**										**11.6**
DP16 (DP14+DP15+A17)		8.09																														**24.3**										**55.4**
Total Area =	**1324995**	**30.42**																																								

Runoff captured in offsite runoff from basins RP-7D and RP-7C

NOTES:
1. Spot elevations subject to change with final grading design and construction.

ASPEN MEADOWS

COLORADO SPRINGS, CO

PROPOSED STORM SEWER EXHIBIT MAP

Know what's below. Call before you dig.

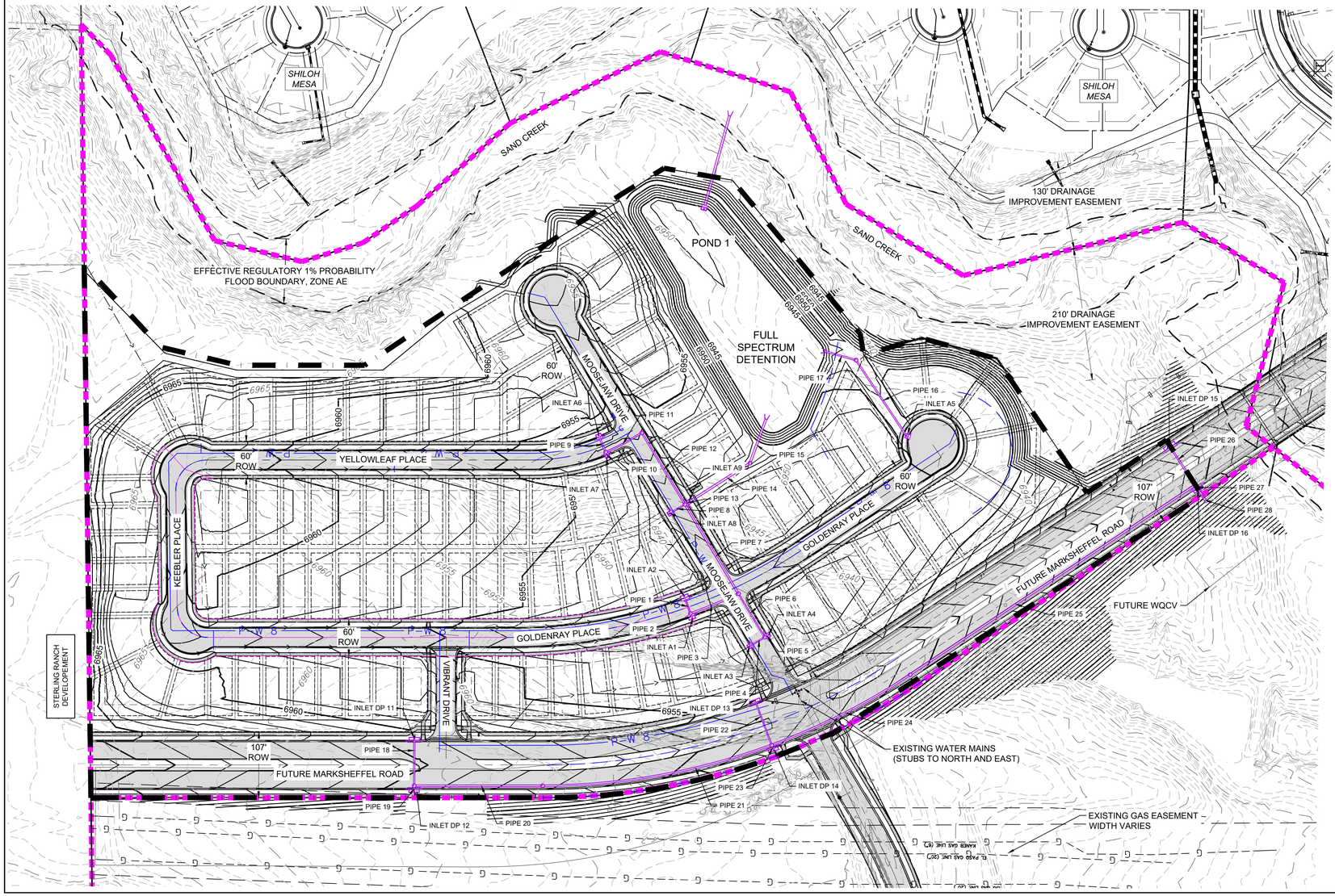
LEGEND

- SUB-BASIN BOUNDARY
- EXISTING CONTOUR (4900)
- PROPOSED CONTOUR (6970)
- FLOW DIRECTION (XXX)
- LOW POINT AND ELEVATION (LP XX)
- HIGH POINT AND ELEVATION (HP XX)
- SPOT ELEVATION (95.71)
- SWALE
- DESIGN POINT
- SUB BASIN DESIGNATION (XX)
- SUB BASIN RUNOFF COEFFICIENT (xx)
- SUB BASIN AREA (AC.) (x.xx)
- 5-YEAR STORM EVENT PEAK FLOW (CFS) (0.0)
- 100-YEAR STORM EVENT PEAK FLOW (CFS) (0.0)
- PROPERTY LINE
- STORM PIPE

GRAPHIC SCALE

100' 0' 100' 200'

(IN FEET)
1 inch = 100 ft.



STORM PIPE SUMMARY TABLE

PIPE LABEL	PIPE DIAMETER (IN)	PIPE LENGTH (FT)	PIPE FLOW (cfs)
PIPE 1	24"	28	13.2
PIPE 2	24"	6	15.5
PIPE 3	30"	88	28.7
PIPE 4	18"	28	4.2
PIPE 5	18"	6	1.5
PIPE 6	18"	83	5.7
PIPE 7	30"	170	34.4
PIPE 8	18"	28	1.9
PIPE 9	24"	28	11.6
PIPE 10	18"	6	4.8
PIPE 11	24"	68	16.4
PIPE 12	24"	137	16.4
PIPE 13	36"	6	52.7
PIPE 14	36"	117	57.3
PIPE 15	36"	77	57.3
PIPE 16	24"	148	7.9
PIPE 17	24"	52	7.9
PIPE 18	24"	75	10.5
PIPE 19	24"	7	10.4
PIPE 20	30"	210	20.9
PIPE 21	30"	382	20.9
PIPE 22	18"	75	7.5
PIPE 23	18"	7	7.3
PIPE 24	30"	255	35.7
PIPE 25	30"	560	35.7
PIPE 26	24"	75	11.4
PIPE 27	36"	7	47.1
PIPE 28	36"	24	54.9

STORM SUMMARY TABLE

INLET LABEL	INLET OPENING (FT)	FLOW TO INLET (CFS)	FLOW CAPTURED (CFS)
INLET A1 (D10R)	12'	15.5	15.5
INLET A2 (D10R)	10'	13.2	13.2
INLET A3 (D10R)	6'	4.2	4.2
INLET A4 (D10R)	6'	1.5	1.5
INLET A5 (D10R)	6'	8.0	8.0
INLET A6 (D10R)	8'	11.0	11.0
INLET A7 (D10R)	6'	4.8	4.8
INLET A8 (D10R)	6'	1.9	1.9
INLET A9 (D10R)	6'	4.6	4.6
INLET DP11 (D10R)	16'	12.1	10.5
INLET DP12 (D10R)	16'	12.0	10.4
INLET DP13 (D10R)	16'	7.6	7.5
INLET DP14 (D10R)	16'	7.4	7.3
INLET DP15 (D10R)	20'	11.7	11.4
INLET DP16 (D10R)	16'	8.0	7.8

ASPEN MEADOWS
FILING NO. 1
COLORADO SPRINGS, CO
DEVELOPMENT PLAN

CONSULTANT:

CIVIL ENGINEER:

Matrix DESIGN GROUP

2435 Research Parkway, Suite 300
Colorado Springs, CO 80920
Phone 719-575-0100
Fax 719-575-0208

LANDSCAPE ARCHITECT:

Thomas & Thomas Planning-Urban
614 N. Tejon Street
Colorado Springs, CO 80903
Phone (719)578-8777

PROJECT:

ASPEN MEADOWS
FILING NO.1
DEVELOPMENT PLAN
CITY OF COLORADO SPRINGS
JANUARY 2019

OWNER:

COLA, LLC
555 MIDDLE PARKWAY
COLORADO SPRINGS, CO 80921
(719)459-0807

DEVELOPER:

COLA, LLC
555 MIDDLE PARKWAY
COLORADO SPRINGS, CO 80921
(719)459-0807

CITY PLANNING FILE NO: AR DP XXXXXXXXX

ISSUE: JANUARY, 2019

DRAWING INFORMATION:	
PROJECT NO:	17.886.004.000
DRAWN BY:	CRAIG DOLD
CHECKED BY:	JEFF ODOR
APPROVED BY:	JEFF ODOR
SHEET TITLE:	

DRAINAGE REPORT EXHIBIT

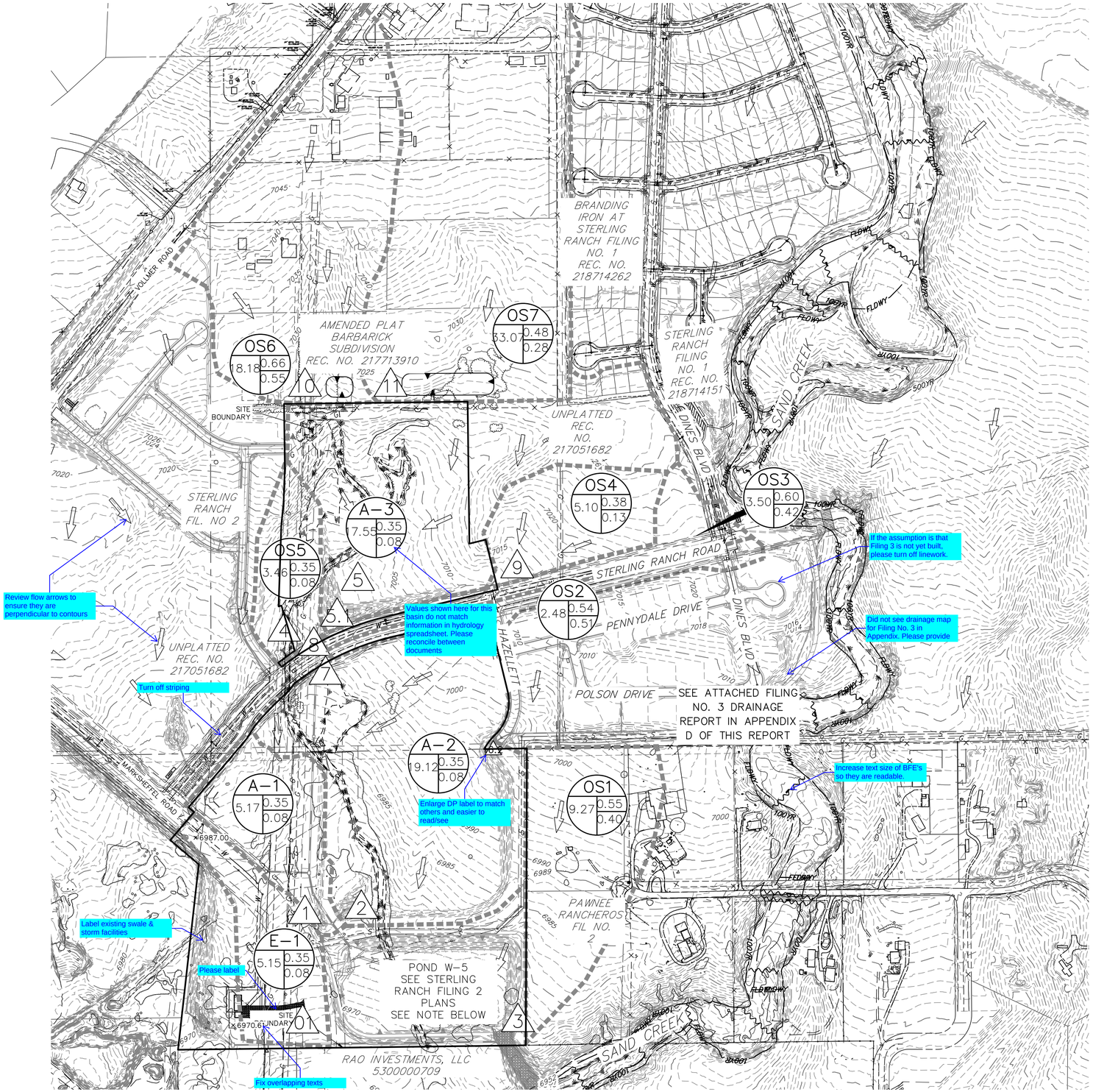
DR03

SHEET 3 OF 3

Appendix E
Drainage Maps

STERLING RANCH FILING NO. 4

EXISTING DRAINAGE MAP



Please outline the limits of Sterling Ranch F4 on this existing conditions map and the subsequent 2 sheets of proposed conditions.

-Show and label all existing storm & indicate public vs. private

-Some basin lines are hard to follow and see. Could they be made color or stand out a little better?

LEGEND

BASIN ID
A: BASIN LABEL
B: AREA
C: C –100 YR
D: C–5 YR

DESIGN POINT

EXISTING FLOW DIRECTION

BASIN DRAINAGE AREA

EXISTING STORM SEWER

SITE BOUNDARY
EXISTING PROPERTY LINE
ROW EXISTING
FL EXISTING
SIDEWALK EXISTING

DRAINAGE ACCESS & MAINTENANCE EASEMENT

EXISTING
6100

DESIGN POINT		
DP	Q5 Total	Q100 Total
1	1.1	8.0
16.2	21.7	49.1
2	21.7	68.5
3	10.5	24.4
4	0.7	5.0
7	3.9	7.0
8	5.0	12.1
9	1.6	7.9
10	35.4	71.9
11	20.6	60.4
5	5.1	33.3
5.1	43.2	106.3
O1	1.3	9.5

BASIN SUMMARY TABLE							
Tributary Sub-basin	Area (acres)	Percent Impervious	C_5	C_{100}	t_c (min)	Q_5 (cfs)	Q_{100} (cfs)
A-1	5.17	2%	0.08	0.35	27.4	1.1	8.0
A-2	19.12	0%	0.08	0.35	28.7	3.9	28.6
A-3	17.62	2%	0.09	0.36	19.4	5.1	33.3
OS1	9.27	37%	0.40	0.55	23.7	10.5	24.4
OS2	2.48	56%	0.51	0.54	19.5	3.9	7.0
OS3	3.50	42%	0.42	0.60	16.2	5.0	12.1
OS4	5.10	8%	0.13	0.38	31.1	1.6	7.9
OS5	3.46	0%	0.08	0.35	30.4	0.7	5.0
OS6	18.18	11%	0.55	0.66	14.7	35.4	71.9
OS7	33.07	19%	0.28	0.48	34.7	20.6	60.4
E-1	5.15	0%	0.08	0.35	19.4	1.3	9.5

Flow does not match hydrology spreadsheet

TITLE Change to "NOTE"

EXISTING GRADING ASSUMES FILING 2, STERLING RANCH ROAD, & MARKSHEFFEL ROAD ARE BUILT.

300 150 0 300 600
ORIGINAL SCALE: 1" = 300'

STERLING RANCH FILING NO. 4
EXISTING DRAINAGE MAP
JOB NO. 25188.11
04/20/22
SHEET 1 OF 1

J·R ENGINEERING
A Westrian Company

Centennial 303–740–9393 • Colorado Springs 719–593–2593
Fort Collins 970–491–9888 • www.jrengineering.com

STERLING RANCH FILING NO. 4
PROPOSED DRAINAGE MAP

If overflows from the north could flow this way, the low spot should not be this lot.

Label Ponds

Doesn't match GEC Plan

Label Barbarick FSD Overflow channel. Are cutoff walls needed at beginning and/or end?

Include design calcs for riprap protection (size, length, width, etc)

Enlarge BFE's so they are readable

Provide design calculations for swale

Text not readable

Enlarge text size and include leader with text

Provide design calculations for swale

Include copies of inlet design spreadsheets for existing inlets in appendix D or provide analysis of them in the Appendix B inlet section and indicate they are existing structures

Turn off striping

Provide design calculations for swale

Label

Delete this DP as not shown in hydrology spreadsheet

-Label all proposed and existing storm facilities. Indicate if public or private. Label inlets as sump or on-grade

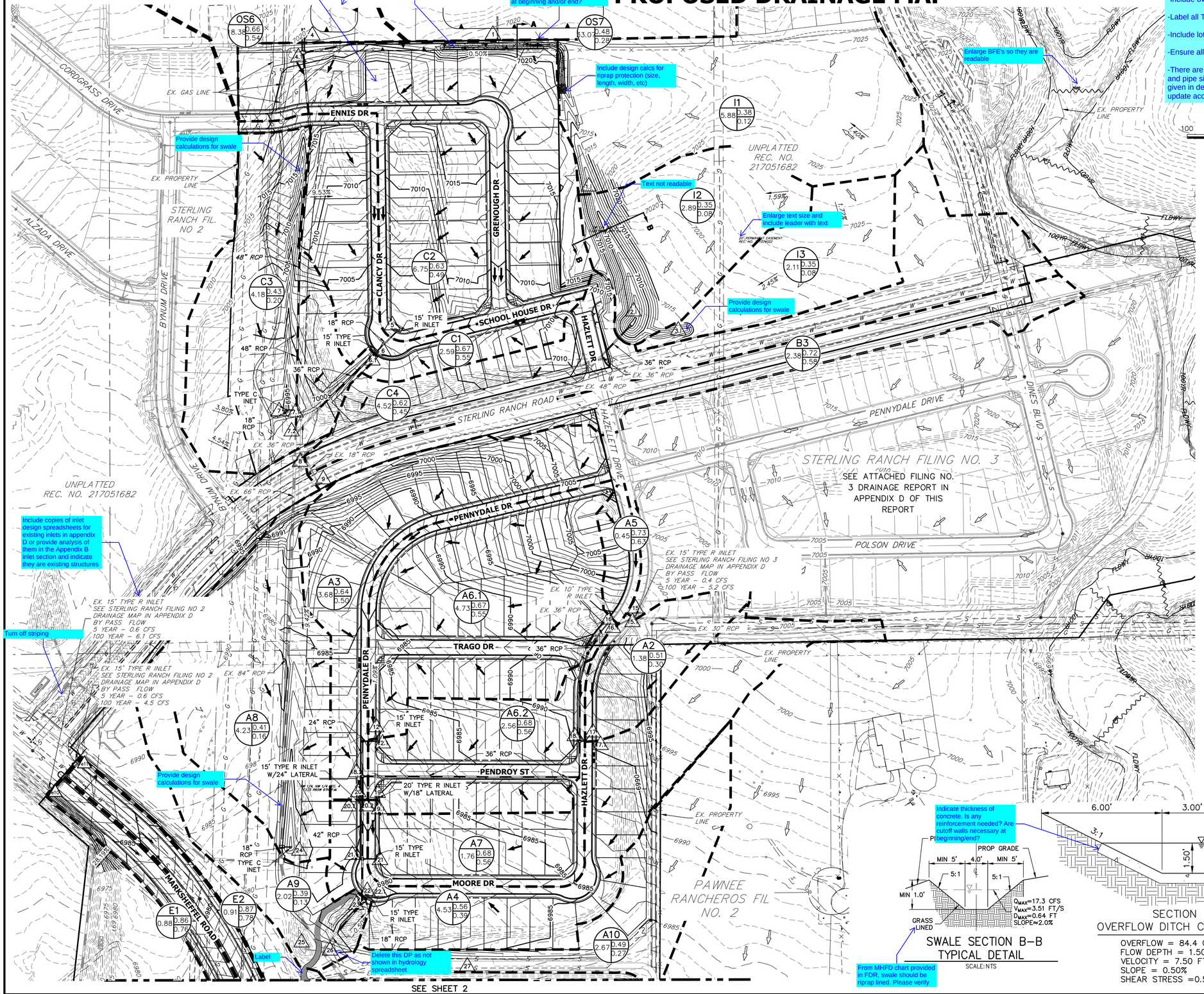
-Include overflow path for all sump inlets.

-Label all Tracts.

-Include lot numbers.

-Ensure all easements are labeled.

-There are discrepancies between inlet and pipe sizes shown on plans to what is given in design appendices. Please update accordingly.



LEGEND

BASIN ID
A: BASIN LABEL
B: AREA
C: C –100 YR
D: C–5 YR

DESIGN POINT

PROPOSED FLOW DIRECTION

EXISTING FLOW DIRECTION

BASIN DRAINAGE AREA

EXISTING STORM SEWER

STORM SEWER PROPOSED

PROPOSED R.O.W

PROPOSED PROPERTY LINES

PROPOSED SIDEWALK

EXISTING PROPERTY LINE

ROW EXISTING

FL EXISTING

SIDEWALK EXISTING

DRAINAGE ACCESS & MAINTENANCE EASEMENT

EXISTING 6100 PROPOSED 6100

100 50 0 100 200

ORIGINAL SCALE: 1" = 100'

DESIGN POINT

DP	Q5 Total	Q100 Total
1	20.6	60.4
4	35.4	72.2
4.1	42.5	104.3
5	12.0	25.9
6	6.1	12.7
6.1	17.0	36.3
7	3.5	12.8
7.1	43.2	110.9
7.2	53.4	133.2
8	5.0	11.5
9	3.6	7.5
15	8.2	17.7
15.1	21.0	43.2
16	1.4	2.9
16.1	21.5	44.9
17	1.6	7.9
17.1	1.6	7.2
18.1	22.7	52.4
12	10.0	20.5
12.1	9.0	13.6
18.2	29.1	62.0
19	6.5	18.1
19.1	6.5	14.8
20	7.0	14.9
20.1	7.0	11.7
20.2	39.6	83.0
21	3.8	11.0
21.1	42.6	91.7
22	6.3	18.7
22.1	6.3	18.7
23	47.5	107.1
24	2.2	9.2
25	1.0	4.8
27	2.9	8.8
1.i	1.8	9.6
3.i	0.6	4.0
2.i	2.9	17.3
e11	0.6	4.5
1e	4.0	10.8
1.1e	4.0	10.3
e10	0.6	6.1
2e	4.0	4.5
2.1e	8.0	21.0
3e	1.4	3.0
4e	1.3	4.9

BASIN SUMMARY TABLE

Tributary Sub-basin	Area (acres)	Percent Impervious	C_5	C_{100}	t_c (min)	Q_5 (cfs)	Q_{100} (cfs)
A2	1.38	32%	0.30	0.51	10.3	1.7	4.8
A3	3.68	65%	0.50	0.64	12.5	7.0	14.9
A4	4.53	48%	0.39	0.56	15.0	6.3	15.1
A5	0.45	79%	0.63	0.73	5.0	1.4	2.9
A6.1	4.73	72%	0.55	0.67	12.1	10.0	20.5
A6.2	2.56	74%	0.56	0.68	12.1	5.6	11.3
A7	1.76	73%	0.56	0.68	9.4	4.2	8.5
A8	4.23	13%	0.16	0.41	18.9	2.2	9.2
C1	2.59	69%	0.55	0.67	8.7	6.1	12.7
C2	6.75	63%	0.49	0.63	14.2	12.0	25.9
C3	4.18	19%	0.20	0.43	9.3	3.5	12.8
A9	2.02	8%	0.13	0.39	13.6	1.0	4.8
A10	2.67	26%	0.27	0.49	10.7	2.9	8.8
B3	2.38	63%	0.58	0.72	27.6	3.6	7.5
C4	4.52	49%	0.45	0.62	30.8	5.0	11.5
OS6	18.38	54%	0.54	0.66	14.8	35.4	72.2
OS7	33.07	23%	0.28	0.48	34.7	20.6	60.4
I1	5.88	7%	0.12	0.38	27.8	1.8	9.6
I2	2.89	0%	0.08	0.35	20.5	0.7	5.2
I3	2.11	0%	0.08	0.35	17.9	0.6	4.0
E1	0.88	86%	0.78	0.87	6.1	3.4	6.3
E2	0.91	83%	0.76	0.86	6.0	3.4	6.4
E3	0.35	89%	0.81	0.89	5.0	1.4	2.7
E4	0.61	47%	0.46	0.64	6.6	1.3	3.1

Please create a basic overview map (or modify an existing drainage map) with color shading/hatching that shows areas tributary to each PBMP (Pond W-54, runoff reduction, etc) and those areas that are not treated by a PBMP, with the applicable exclusion labeled (ex: 20% up to 1ac of development can be excluded per ECM App I.7.1.C.1 and exclusions listed in ECM App I.7.1.B.#). A summary table on the current map would also be acceptable (example provided):

PBMP SUMMARY TABLE

BASINS	PBMP TRIBUTARY AREA (AC)	PBMP
A1.1	1.43	RG–A1.1
A3.1	1.87	RG–A3.1
B1,B2	8.60	EDB–B
OA2_A2	0.95	EXCLUDED*

* EXCLUDED BASED ON < 1–ACRE OF DEVELOPED ROADWAY AREA PER ECM APP. 17.C.1.a

Indicate thickness of concrete. Is any reinforcement needed? Are cutoff walls necessary at beginning/end?

SWALE SECTION B–B
TYPICAL DETAIL
SCALE: NTS

From MHFD chart provided in FDR, swale should be riprap lined. Please verify

SECTION AA
OVERFLOW DITCH CROSS SECTION

OVERFLOW = 84.4 CFS
FLOW DEPTH = 1.50 FT
VELOCITY = 7.50 FT/S
SLOPE = 0.50%
SHEAR STRESS =0.546 LB/FT^2

Please label as Barbarick FSD Overflow, if that is what it's for.

STERLING RANCH FILING NO.4
PROPOSED DRAINAGE MAP
JOB NO. 25188.11
4/26/2022
SHEET 1 OF 2

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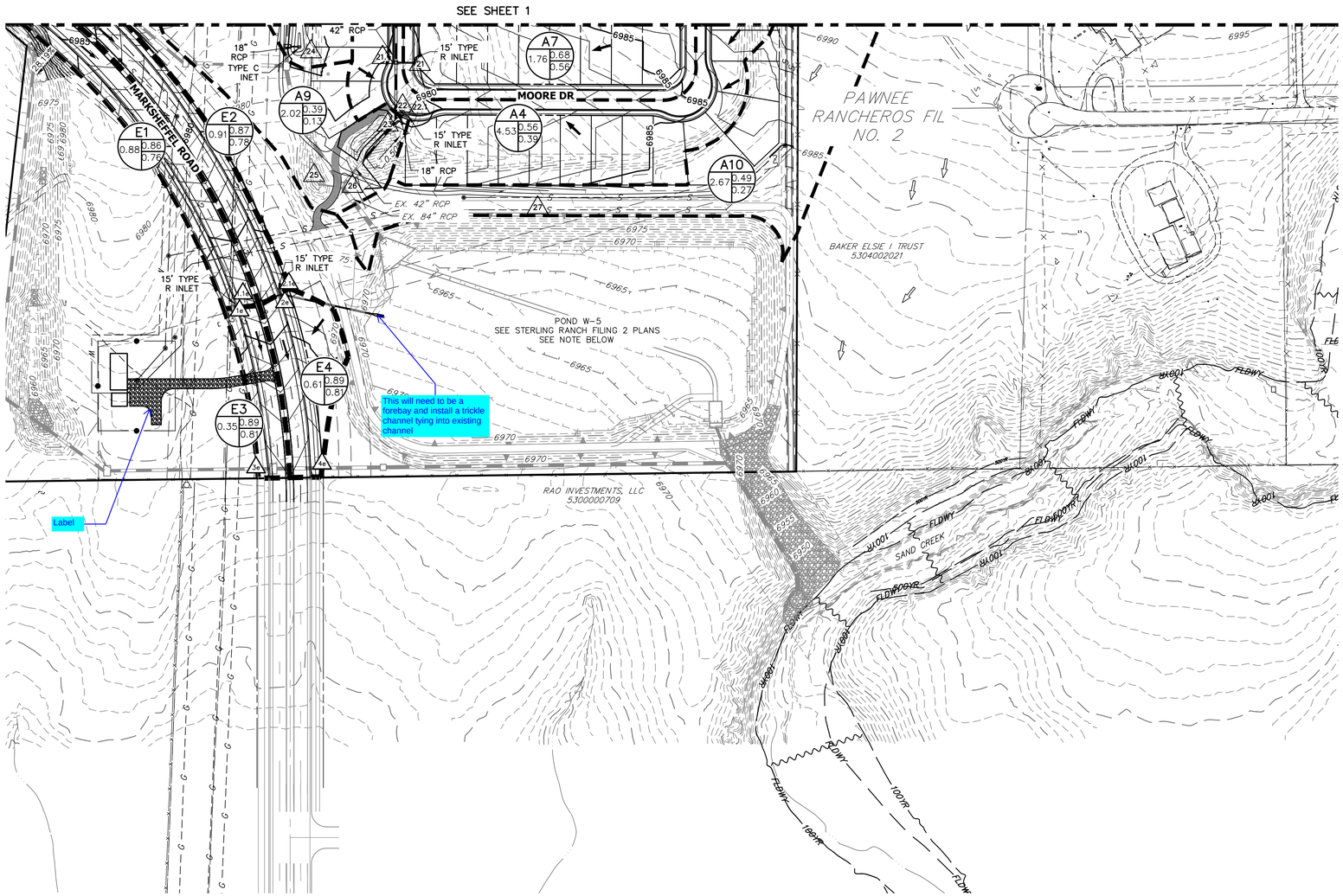
STERLING RANCH FILING NO. 4
PROPOSED DRAINAGE MAP



LEGEND

BASIN ID
A: BASIN LABEL
B: AREA
C: C –100 YR
D: C–5 YR

DESIGN POINT

PROPOSED FLOW DIRECTION

EXISTING FLOW DIRECTION

BASIN DRAINAGE AREA

EXISTING STORM SEWER

STORM SEWER PROPOSED

PROPOSED R.O.W

PROPOSED PROPERTY LINES

PROPOSED SIDEWALK

EXISTING PROPERTY LINE

ROW EXISTING

FL EXISTING

SIDEWALK EXISTING

DRAINAGE ACCESS & MAINTENANCE EASEMENT

EXISTING 6100 PROPOSED 6100

DESIGN POINT		
DP	Q5 Total	Q100 Total
1	20.6	60.4
4	35.4	72.2
4.1	42.5	104.3
5	12.0	25.9
6	6.1	12.7
6.1	17.0	36.3
7	3.5	12.8
7.1	43.2	110.9
7.2	53.4	133.2
8	5.0	11.5
9	3.6	7.5
15	8.2	17.7
15.1	21.0	43.2
16	1.4	2.9
16.1	21.5	44.9
17	1.6	7.9
17.1	1.6	7.2
18.1	22.7	52.4
12	10.0	20.5
12.1	9.0	13.6
18.2	29.1	62.0
19	6.5	18.1
19.1	6.5	14.8
20	7.0	14.9
20.1	7.0	11.7
20.2	39.6	83.0
21	3.8	11.0
21.1	42.6	91.7
22	6.3	18.7
22.1	6.3	18.7
23	47.5	107.1
24	2.2	9.2
25	1.0	4.8
27	2.9	8.8
1.i	1.8	9.6
3.i	0.6	4.0
2.i	2.9	17.3
e11	0.6	4.5
1e	4.0	10.8
1.1e	4.0	10.3
e10	0.6	6.1
2e	4.0	4.5
2.1e	8.0	21.0
3e	1.4	3.0
4e	1.3	4.9

BASIN SUMMARY TABLE

Tributary Sub-basin	Area (acres)	Percent Impervious	C_5	C_{100}	t_c (min)	Q_5 (cfs)	Q_{100} (cfs)
A2	1.38	32%	0.30	0.51	10.3	1.7	4.8
A3	3.68	65%	0.50	0.64	12.5	7.0	14.9
A4	4.53	48%	0.39	0.56	15.0	6.3	15.1
A5	0.45	79%	0.63	0.73	5.0	1.4	2.9
A6.1	4.73	72%	0.55	0.67	12.1	10.0	20.5
A6.2	2.56	74%	0.56	0.68	12.1	5.6	11.3
A7	1.76	73%	0.56	0.68	9.4	4.2	8.5
A8	4.23	13%	0.16	0.41	18.9	2.2	9.2
C1	2.59	69%	0.55	0.67	8.7	6.1	12.7
C2	6.75	63%	0.49	0.63	14.2	12.0	25.9
C3	4.18	19%	0.20	0.43	9.3	3.5	12.8
A9	2.02	8%	0.13	0.39	13.6	1.0	4.8
A10	2.67	26%	0.27	0.49	10.7	2.9	8.8
B3	2.38	63%	0.58	0.72	27.6	3.6	7.5
C4	4.52	49%	0.45	0.62	30.8	5.0	11.5
OS6	18.38	54%	0.54	0.66	14.8	35.4	72.2
OS7	33.07	23%	0.28	0.48	34.7	20.6	60.4
I1	5.88	7%	0.12	0.38	27.8	1.8	9.6
I2	2.89	0%	0.08	0.35	20.5	0.7	5.2
I3	2.11	0%	0.08	0.35	17.9	0.6	4.0
E1	0.88	86%	0.78	0.87	6.1	3.4	6.3
E2	0.91	83%	0.76	0.86	6.0	3.4	6.4
E3	0.35	89%	0.81	0.89	5.0	1.4	2.7
E4	0.61	47%	0.46	0.64	6.6	1.3	3.1

N

100 50 0 100 200

ORIGINAL SCALE: 1" = 100'

NOTE:
FOR ADDITIONAL INFORMATION REGARDING DESIGN POINTS, ROUTING, AND RUNOFF VALUES ASSOCIATED WITH POND W-5. REFER TO THE FILING 2 DRAINAGE MAP, AS SHOWN IN APPENDIX D OF THIS REPORT.

STERLING RANCH FILING NO. 4
PROPOSED DRAINAGE MAP
JOB NO. 25188.11
4/26/2022
SHEET 2 OF 2

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