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FINAL DRAINAGE REPORT
FOR
STERLING RANCH EAST FILING NO. 2
&
FOURSQUARE AT STERLING RANCH EAST FILING NO. 1

December 2022

Prepared for:
CLASSIC SRJ LAND, LLC
2138 Flying Horse Club Dr.
COLORADO SPRINGS CO 80921
(719) 592-9333

Prepared by:
CLASSIC CONSULTING ENGINEERS & SURVEYORS
619 N. CASCADE AVENUE, SUITE 200
COLORADO SPRINGS CO 80903
(719) 785-0790

SF2237

& SF2236

Job no. 2183.23
PCD File # SF

CLASSIC CONSULTING

ENGINEER'S STATEMENT:

The attached drainage plan and report were prepared under my direction and supervision and are correct to the best of my knowledge and belief. Said drainage report has been prepared according to the criteria established by the 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.

____________________________________ ____________________

David L Gibson, Colorado P.E. #46477 Date

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: Classic SRJ Land, LLC

By: ____________________________________

Title: ____________________________________

Address: 2138 Flying Horse Club Dr.
Colorado Springs, CO 80921

EL PASO COUNTY ONLY:

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

____________________________________ ____________________

For County Engineer / ECM Administrator Date

Conditions:

TABLE OF CONTENTS:

If nothing on the pond is being updated specifically with this SF2237 (no pond updates shown on CDs), calcs can be removed or label each sheet clearly as "for information only." And then if needed, the drainage report(s) with those calcs can be referenced in the text of this report.

PURPOSE

This document is the Final Drainage Report for Sterling Ranch East Filing No. 2 and Foursquare at Sterling Ranch East Filing No. 1. The purpose of this report is to identify onsite and offsite drainage patterns, define areas tributary to the proposed full spectrum detention and water quality facility (Pond 16), and to safely route developed storm water runoff via a proposed storm sewer system. The proposed Sterling Ranch East Filing No. 2 and Foursquare at Sterling Ranch East Filing No. 1 developments shall be in adherence to the El Paso County approved Master Development Drainage Plan and MDDP Amendment for Sterling Ranch as well as current County Drainage Criteria.

PROJECT DESCRIPTION

The Sterling Ranch East Filing No. 2 development is 16.841 acres and Foursquare at Sterling Ranch East Filing No. 1 is 36.647 acres of the 321.37 total acres of Sterling Ranch East, a phased master planned community located in northern El Paso County, Colorado. These developments consist of public residential roadways and single-family home lots. The site is located in portion of Section 33 & 34, Township 12 South, Range 65 west of the 6th p.m. in El Paso County, Colorado. The site is located on the east side of Sand Creek. The site is bounded on the north, east and west by proposed and future Sterling Ranch East residential development, west and south by the proposed extension of Briargate Pkwy. The site is in the upper portion of both the Sand Creek and Sand Creek East Fork Drainage Basins.

PREVIOUS REPORTS

The latest and most applicable previously approved drainage studies are the following:

1. "Sterling Ranch MDDP Amendment No. 2 & Preliminary Drainage Report for Sterling Ranch East Preliminary Plan No. 1," by Classic Consulting Engineers & Surveyors, LLC approval pending.
2. "Master Development Drainage Plan Amendment for Sterling Ranch," by JR Engineering, LLC, dated September 2022.
3. "2018 Sterling Ranch MDDP," by M&S Civil Consultants, Inc. June 2018.
4. "Drainage Letter for Sterling Ranch Road and Briargate Pkwy. Interim Plan," by JR Engineering, LLC dated September 2022.

5. "Final Drainage Report for Sand Creek Restoration," by JR Engineering, LLC, dated September 2022.

SOILS AND GEOLOGY

The soils within the Sterling Ranch East Filing No. 2 and Foursquare at Sterling Ranch East Filing No .1 site and tributary area are Hydrologic Soil Group A, Blakeland loamy sand and Columbine gravelly sandy loam (See Appendix for Soil Map). Per the El Paso County DCM, Chapter 6, Section 4.3, to recognize that soils within a development project are usually disturbed and covered with top soil, sod or landscaping and irrigated, Type A soils must be represented as Type B soils for post development runoff coefficients. Therefore, Type B soils are used in sizing the proposed storm sewer infrastructure and full spectrum detention/water quality facility (Pond 16).

developed runoff calculations

Remove portionof statement regarding the full spectrum pond, Type B soils are not being used in design of pond facility.

DRAINAGE CRITERIA

Hydrologic calculations were performed using the City of Colorado Springs/El Paso County Drainage Criteria Manual, as revised in November 1991 and October 1994 with County adopted Chapter 6 and Section 3.2.1 of Chapter 13 of the DCM as revised in May 2014. Full Spectrum Detention and Stormwater quality analysis, Extended Detention Basin (EDB) design, are per the Mile High Flood District Manual and MHFD-Detention version 4.05 and UD-BMP version 3.06 spreadsheet. The Rational Method was used to estimate stormwater runoff from the developed project and tributary to the proposed full spectrum detention/water quality pond. The UDFCD UD-Inlet excel workbook was used to verify street capacities, size sump inlets, and calculate interception and flow-by rates of at-grade inlets. The UD-Sewer computer program was used to calculate the hydraulic grade line (HGL) within the storm sewer system. An overall tributary area exhibit is included to show the various types of pervious and impervious areas established to determine the overall imperviousness of the 220.90 ultimate acres tributary to the proposed full spectrum detention/water quality facility (Pond 16) and 42.51 interim acres are tributary with development of Sterling Ranch East Filing No. 2 and Foursquare at Sterling Ranch East Filing No. 1 only.

Use newer version of spreadsheet

FLOODPLAIN STATEMENT

No portions of the Sterling Ranch East Filing No. 2 and Foursquare at Sterling Ranch East Filing No. 1 are located within a floodplain as determined by the Flood Insurance Rate Maps (F.I.R.M.) Map Numbers 08041C 0533G, effective date, December 7, 2018.

EXISTING DRAINAGE CONDITIONS

The "Sterling Ranch MDDP Amendment No. 2 & Preliminary Drainage Report for Sterling Ranch East Preliminary Plan No. 1," by Classic Consulting Engineers & Surveyors, LLC is currently under review and approval process with El Paso County Development Services and in full detail describes the Existing Conditions of the proposed development area. Please see this report for the full descriptions. The Pre-Developed (Existing) Conditions Maps are included in the Appendix of this Report and include the Sterling Ranch East Filing No. 2 and Foursquare at Sterling Ranch East Filing No. 1 boundary's.

The proposed site is located within Basins EX-5, EX-7, EX-9 & EX10A of the Preliminary Drainage Report study and drains north to south. The site has been previously disturbed with mass grading operations and vegetation is sparse and of natural grassland consistency (no trees or shrubs). See previous reports for additional details on the Existing Conditions.

The adjacent Briargate Parkway and Sterling Ranch Road drainage and roadway design was completed by JR Engineering, "Drainage Letter for Sterling Ranch Road and Briargate Parkway Interim Plan," May 2022. These roadways and storm system will be constructed prior to and in conjunction with the proposed Filing No. 1 development. Therefore, the storm system described within this JR Engineering Letter and Construction Drawings is shown as 'Existing' with proposed storm sewer extensions into the storm system for Sterling Ranch East Filing No. 2 and Foursquare at Sterling Ranch East Filing No. 1.

PROPOSED DRAINAGE CONDITIONS

Developed runoff from Sterling Ranch East Filing No. 2 and Foursquare at Sterling Ranch East Filing No. 1 will be collected in a public-private storm system and piped into the Privately owned and maintained full spectrum detention/water quality facility (Pond 16) that will detain and treat the developed runoff prior to releasing at or below historic rates to the downstream channel (Sand Creek Reach SC-9). As previously mentioned, the rational method was used to estimate developed runoff values. All storm sewer inlets and pipes collecting runoff within the County right-of-way will be 'Public'. All storm sewer outside of right-of-way, including the pond outfall pipe, is 'Private' as is the proposed full spectrum detention facility. Private facilities will be owned and maintained by the Sterling Ranch Metropolitan District. HGL grade line calculations are included in the Appendix in support of the construction drawings for the proposed Public and Private storm systems.

Per the current El Paso County Drainage Criteria for stormwater capacity within street sections, the following summaries of Figures 7-7 applies: all proposed roads are Residential.

Street Type	***Allowable – Initial Storm (5 yr)***	***Allowable–Major Storm (100 yr)***
Residential w/Ramp Curb	1.5% street slope = 10 cfs 2% street slope = 12 cfs 4% street slope = 16.5 cfs 6% street slope = 19.5 cfs 8% street slope = 17.8 cfs 10% street slope = 16.5 cfs No curb overtopping.	1.5% street slope = 46 cfs 2% street slope = 44 cfs 4% street slope = 36 cfs 6% street slope = 32 cfs 8% street slope = 29 cfs 10% street slope = 27.5 cfs 12" maximum depth at flowline.
Residential w/Vertical Curb (6" Vertical Curb)	1.5% street slope = 13 cfs 2% street slope = 15 cfs 4% street slope = 20.5 cfs 6% street slope = 18 cfs 8% street slope = 16.8 cfs 10% street slope = 15.7 cfs No curb overtopping.	1.5% street slope = 45 cfs 2% street slope = 43 cfs 4% street slope = 35 cfs 6% street slope = 31 cfs 8% street slope = 28 cfs 10% street slope = 26.5 cfs 12" maximum depth at flowline.

State that homes near sump inlets shall be constructed at least 1 foot above the 100-year water surface ponding elevation

At-grade inlets and sump (low-points) were designed in a way that street capacity is not an issue anywhere within the proposed Filings. Street capacity has also been verified at each design point by using the UD-Inlet Excel workbook (located in Appendix) from Urban Drainage Flood Control District (UDFCD). Inlet sizing is also per the UD-Inlet Excel workbook. Drainage from individual lots are assumed to travel in side-lot swales to the street. One Site-Level Low Impact Development form (IRF form) is

change to "shall"

included in the Appendix of this report, for the basins that discharge to the proposed full spectrum detention and water quality Pond 16. A detailed description of the developed flows for Sterling Ranch East Filing No. 2 and Foursquare at Sterling Ranch East Filing No. 1 is as follows:

Design Point 1 (Q_5 = 6.1 cfs, Q_{100} = 16.1 cfs) consists of developed flows from Basin B. Basin B is 4.9 acres of proposed residential development with associated streets, landscaping, and homes. Flows travel south in the east curbline of Boise Court and west curbline of Boulder City Place to Design Point 1 where a proposed public 10' Type R sump inlet will intercept flows. Flow will be conveyed by a proposed 24" RCP public storm sewer (Pipe 1). The emergency overflow route for this inlet will be south to Design Point 2.

Design Point 2 (Q_5 = 3.5 cfs, Q_{100} = 9.9 cfs) consists of developed flows from Basin A. Basin A is 3.35 acres of proposed residential development with associated streets, landscaping, and homes. Flows travel south in the west curbline of Boise Court and to the south curbline of Catalina Road to Design Point 2 where a proposed public 5' Type R sump inlet will intercept flows. Flow will be conveyed by a proposed 18" RCP public storm sewer (Pipe 2). The emergency overflow route for this inlet will overtop the southeast curb return at the at the intersection of Catalina Road and Boulder City Place and continue south along Boulder City Place.

Area does not match hydrology spreadsheet

Design Point 3 (Q_5 = 5.7 cfs, Q_{100} = 14.0 cfs) consists of developed flows from Basin J. Basin J is 2.60 acres of proposed residential development with associated streets, landscaping, and homes. Flows travel south in the curbline of Salt Lake Drive and to the north curbline of Catalina Road to Design Point 3 where a proposed public 10' Type R sump inlet will intercept flows. Flow will be conveyed by a proposed 24" RCP public storm sewer (Pipe 4). The emergency overflow route for this inlet will be south to Design Point 4.

Design Point 4 (Q_5 = 2.2 cfs, Q_{100} = 6.1 cfs) consists of developed flows from Basin K. Basin K is 1.83 acres of proposed residential development with associated streets, landscaping, and homes. Flows travel south in the south curbline of Catalina Road to Design Point 4 where a proposed public 5' Type R sump inlet will intercept flows. Flow will be conveyed by a proposed 18" RCP public storm sewer (Pipe 5). The emergency overflow route for this inlet will overtop curb behind Design Point 4 to Tract A and then to Briargate Parkway.

This design point should also include flows from Basin D.

Design Point 5 (Q_5 = 2.3 cfs, Q_{100} = 5.8 cfs) consists of developed flows from Basin F and Basin OS-1. Basin F is 0.49 acres of proposed Idaho Falls Drive. Basin OS-1 is 2.60 acres of future residential development north of Idaho Falls Drive. Flows travel east in the north curbline of Idaho Falls Drive to Design Point 5 where a proposed public 5' Type R sump inlet will intercept flows. Flow will be conveyed by a proposed 18" RCP public storm sewer (Pipe 7). The emergency overflow route for this inlet will be south to Design Point 6.

Hydrology spreadsheet and drainage map have different areas for this basin. Revise so all 3 locations show the same area

Design Point 6 (Q_5 = 0.7 cfs, Q_{100} = 1.3 cfs) consists of developed flows from Basin G. Basin G is 0.16 acres of proposed Idaho Falls Drive. Flows travel south in the south curbline of Idaho Falls Drive to Design Point 6 where a proposed public 5' Type R sump inlet will intercept flows. Flow will be conveyed by a proposed 18" RCP public storm sewer (Pipe 8). The emergency overflow route for this inlet will overtop the southeast curb return at the at the intersection of Idaho Falls Drive and Pagosa Springs Drive and continue south along Pagosa Springs Drive to Design Point 8.

Design Point 7 (Q_5 = 5.5 cfs, Q_{100} = 14.1 cfs) consists of developed flows from Basin H. Basin H is 4.01 acres of proposed residential development with associated streets, landscaping, and homes. Flows travel south in the west curbline of Pagosa Springs Drive to Design Point 7 where a proposed public 10' Type R sump inlet will intercept flows. Flow will be conveyed by a proposed 24" RCP public storm sewer (Pipe 10). The emergency overflow route for this inlet will overtop the highpoint in Pagosa Springs Drive to Design Point 3.

Design Point 8 (Q_5 = 1.1 cfs, Q_{100} = 4.6 cfs) consists of developed flows from Basin I. Basin I is 1.68 acres of proposed residential development with associated streets, landscaping, open space and homes. Flows travel south in the east curbline of Pagosa Springs Drive to Design Point 8 where a proposed public 5' Type R sump inlet will intercept flows. Flow will be conveyed by a proposed 18" RCP public storm sewer (Pipe 11). The emergency overflow route for this inlet will overtop the crown in the road to Design Point 7.

Design Point 9 (Q_5 = 7.6 cfs, Q_{100} = 21.9 cfs) consists of developed flows from Basin M and Basin N. Basin M is 4.10 acres and Basin N is 3.00 acres of proposed residential development with associated streets, landscaping, and homes. Developed flows travel east in the north curbline of Catalina Road to a proposed public 15' Type R at-grade inlet at Design Point 9. This at-grade inlet will intercept (Q_5= 7.1 cfs, Q_{100}= 13.2 cfs) with a flow-by of (Q_5= 0.5 cfs, Q_{100}= 8.7 cfs) that will travel in the north curb line of Catalina Road to Design Point 10. Intercepted flows will be conveyed by a proposed 24" RCP public storm sewer (Pipe 14).

10

Design Point 10 (Q_5 = 3.6 cfs, Q_{100} = 15.7 cfs) consists of developed flows from Basin L and Flow-by Design Point 9. Basin L is 2.20 acres of proposed residential development with associated streets, landscaping, open space and homes. Flows travel south in the south curbline of Catalina Road to Design Point 9 where a proposed public 15' Type R sump inlet will intercept flows. Flow will be conveyed by a proposed 24" RCP public storm sewer (Pipe 16). The emergency overflow route for this inlet will overtop the curb and into Tract A and then to Sterling Ranch Road.

Design Point 11 (Q_5 = 39 cfs, Q_{100} = 117 cfs) consists of Basin T and Pipe 17 and represents to the total flows into the proposed private Full Spectrum Detention Facility from Sterling Ranch East Filing No. 2 and Foursquare at Sterling Ranch East Filing No. 1. Basin T is 11.19 acres of landscape slope and pond. Pipe 17 **(Q_5 = 35.8 cfs, Q_{100} = 95 cfs)** is a public 42" RCP storm.

Basin C (Q_5 = 0.9 cfs, Q_{100} = 4.8 cfs) is 1.92 acres of open space tract and residential back yards that will discharge directly Briargate Parkway. Flows will be intercepted by an existing 20' Type R inlet in Briargate Parkway installed with Sterling Ranch East Filing No. 1. This is shown as a portion of Basin P1-A2 in the Sterling Ranch East Filing No. 1 Final Drainage Report.

Flows from this basin should be combined with Basins R & S, as they all release into Briargate Parkway. Indicate if the drainage report for Briargate Pkwy accounted for these flows and the inlet still functions properly with these flows.

Basin E (Q_5 = 2.2 cfs, Q_{100} = 16.3 cfs) is 6.63 acres of open space tract and adjacent Sand Creek (Reach SC-9) channel improvements that are within the boundary of Sterling Ranch East Filing No. 2. No development is located within this basin as its only open space and existing channel work. All channel work is completed per the "Final Drainage Report for Sand Creek Restoration," by JR Engineering LLC, dated September 2022.

Basin Q (Q_5 = 0.6 cfs, Q_{100} = 2.0 cfs) is 0.50 acres of open space tract that will discharge directly Briargate Parkway. Flows will be intercepted by an existing 20' Type R inlet in Briargate Parkway installed with Sterling Ranch East Filing No. 1. This is shown as a portion of Basin P1-A2 in the Sterling Ranch East Filing No. 1 Final Drainage Report.

Indicate if the drainage report for Briargate Pkwy accounted for these flows and the inlet still functions properly with these flows.

Basin O (Q_5 = 6.2 cfs, Q_{100} = 12.0 cfs) is 2.16 acres Sterling Ranch Road that will discharge directly Briargate Parkway. Flows will be intercepted by an existing 20' Type R inlet in Briargate Parkway installed with Sterling Ranch East Filing No. 1. This is shown as a portion of Basin P1-C2 in the Sterling Ranch East Filing No. 1 Final Drainage Report.

Indicate if the drainage report for Briargate Pkwy accounted for these flows and the inlet still functions properly with these flows.

Basin P (Q_5 = 0.7 cfs, Q_{100} = 2.4 cfs) is 0.63 acres of open space tract that will discharge directly Briargate Parkway. Flows will be intercepted by an existing 20' Type R inlet in Briargate Parkway installed with Sterling Ranch East Filing No. 1. This is shown as a portion of Basin P1-A3 in the Sterling Ranch East Filing No. 1 Final Drainage Report.

Indicate if the drainage report for Briargate Pkwy accounted for these flows and the inlet still functions properly with these flows.

Missing Basins D, R & S in discussion

STORM WATER QUALITY/DETENTION

As required, storm water quality measures will be utilized in order to reduce the amount of sediment, debris and pollutants that are allowed to enter Sand Creek. Developed flows from Sterling Ranch East Filing No. 2 and Foursquare at Sterling Ranch East Filing No. 1 along with future flows from the Sterling Ranch East Preliminary Plan No. 1 will be routed to a private Full Spectrum Detention facility, FSD Pond 16 to be located in Tract H of Foursquare at Sterling Ranch East Filing No. 1. The facilities will release treated developed flows to an existing 48" RCP storm within future Briargate Parkway. Reference the "Drainage Letter for Sterling Ranch Road and Briargate Pkwy. Interim Plan", prepared by JR Engineering, LLC, dated December 2021 and the "Sterling Ranch Road and Briargate Pkwy. Storm Plans", prepared by JR Engineering, LLC, dated September 2022. These referenced design plans provide a 48" RCP outfall pipe at this location with an allowable release rate of (Q_{100} = 156.6 cfs)

Private FSD POND-16

The outlet structure will be designed in an interim condition until future tributary storm systems from developments north of Foursquare at Sterling Ranch East Filing No . 1 are developed. As systems are designed and plans submitted for review Final Drainage Reports will be submitted updated the outlet plate until the ultimate condition is reached. This report will detail the interim condition as well as estimated ultimate conditions based on tributary areas shown in the Preliminary Drainage Report for Foursquare at Sterling Ranch Preliminary Plan/PUD as well as the Sterling Ranch MDDP amendment No. 2.

Clarify if anything on the pond (like the orifice plate) will be updated with this specific proposed project (SF2237). Because no orifice plate details were included with the CDs. Will this project be constructed at the same time as Four Square? So the orifice plate will being installed with Four Square will also account for the development of SF2237? Just add some more explanation to clarify these uncertainties.

The UD-BMP spreadsheet along with the UD-Detention spreadsheet were used to calculate the required volume for the EURV and 100-year release. User input 1-hour precipitation values in the UD-Detention spreadsheet were taken from Table 6-2 Volume 1 Colorado Springs El Paso County Drainage Criteria Manual. The UD-BMP IRF spreadsheet (see appendix) was used to calculate the overall total site imperviousness Sterling Ranch East Filing No. 2 and Foursquare at Sterling Ranch East Filing No. 1 to the EDB (Interim) and these subdivisions including the future tributary area (Ultimate). This total interim area is 42.51 acres. Per the spread sheet a 100 Year Event 42.3% imperviousness will be used in the interim condition. This total ultimate area is estimated at 220.90 acres. Per the spread sheet a 100 Year Event 48.9% imperviousness will be used in the ultimate condition.

Include a table, for interim & ultimate conditions, showing tributary basins with area and % impervious, coming to an overall % impervious.

Interim Condition (Sterling Ranch East Filing No. 2 & Foursquare at Sterling Ranch East Filing No. 1)

Per UD-Detention spreadsheet a 0.659 ac-ft. WQVC, 1.320ac-ft. EURV, and a 3.296 ac-ft. 100-year flow volume is provided. The outlet structure will have a 4-hole configuration with 4 individual rectangular holes spaced 30 inches apart each hole with have an area of 3.50, 8.0, 18.0 and 18.0 square inches. The outlet box will be an 20'x4' grated inlet box 10.0' tall with a 48" RCP storm sewer outlet with a plate 26" from invert will connect to the existing 48" RCP storm sewer in Briargate Parkway. A 165' wide 2' deep emergency overflow weir will be installed in the pond berm with Type L rip-rap (see appendix for calculation). Flows will overtop the pond in the provided weir and travel directly to the adjacent Briargate Parkway. Maintenance and ownership of the Private detention/water quality facility and the entire proposed storm sewer is by the Sterling Ranch East Metropolitan District. An El Paso County Detention Pond Maintenance Agreement will be required indicating these Facilities to be ultimately owned and maintained by the Metro District

Planned release per the UD-Detention spreadsheet from the Full Spectrum EDB will be **Q_5= 0.60 cfs, Q_{100}= 1.40 cfs**. Allowable release into the existing 48" RCP outfall pipe at this location is anticipated to release rate of (Q_{100} = 156.6 cfs). This facility restricts the release to below pre-development (historic levels) per the MHFD-Detention spreadsheet and is in conformance with the Preliminary Drainage Report and MDDP Amendment.

Similar to my comment on the previous page, clarify that this ultimate build-out will not occur with this project (SF2237), but rather with some future development.

Ultimate Condition (Sterling Ranch East Filing No. 2, Foursquare at Sterling Ranch East Filing No. 1 & Future Sterling Ranch East Development)

Per UD-Detention spreadsheet a 3.742 ac-ft. WQVC, 8.423ac-ft. EURV, and a 19.927 ac-ft. 100-year flow volume is provided. The outlet structure will have a 4-hole configuration with 4 individual rectangular holes spaced 30 inches apart each hole with have an area of 10.0, 14.0, 18.0 and 18.0 square inches. The outlet box will be an 20'x4' grated inlet box 10.0' tall with a 48" RCP storm sewer outlet with a plate 26" from invert will connect to the existing 48" RCP storm sewer in Briargate Parkway. A 165' wide 2' deep emergency overflow weir will be installed in the pond berm with Type L rip-rap (see appendix for calculation). Flows will overtop the pond in the provided weir and travel directly to the adjacent Briargate Parkway. Maintenance and ownership of the Private detention/water quality facility and the entire proposed storm sewer is by the Sterling Ranch East Metropolitan District. An El Paso County Detention Pond Maintenance Agreement will be required indicating these Facilities to be ultimately owned and maintained by the Metro District

Planned release per the UD-Detention spreadsheet from the Full Spectrum EDB will be **Q_5= 4.3 cfs, Q_{100}= 120.4 cfs**. Allowable release into the existing 48" RCP outfall pipe at this location is anticipated to release rate of (Q_{100} = 156.6 cfs). This facility restricts the release to below pre-development (historic levels) per the MHFD-Detention spreadsheet and is in conformance with the Preliminary Drainage Report and MDDP Amendment.

STORMWATER QUALITY (FOUR STEP PROCESS)

El Paso County requires the Four Step Process for receiving water protection that focuses on reducing runoff volumes, treating the water quality capture volume (WQCV), stabilizing drainage ways, and implementing long-term source controls. The Four Step Process pertains to management of smaller, frequently occurring storm events, as opposed to larger storms for which drainage and flood control infrastructure are sized. Implementation of these four steps to achieve stormwater permit requirements is required. The site adheres to this Four Step Process as follows:

1. Individual home roof downspouts will be directed onto pervious landscape areas. The additional grass buffer BMP provides the following: 1) Minimize directly connected impervious areas. 2) Provides initial pollutant and sediment removal before entering the storm system. Rear yard flows of those proposed lots adjacent to public streets will be directed over a grass buffer area (both landscaped and native grasses) to provide treatment of these small rear year areas.

2. The proposed Pond 16 provides Detention and Stormwater Quality Treatment for the entirety of the proposed development and surrounding arterial and collector roadways. The facility in conjunction with Step 1 implementation above will address all required Water Quality Capture Volume and Slow Release Requirements.

except for the area of disturbance on the western boundary of this site? Discuss applicable exclusion(s).

3. The recipient of the drainage flows from the site is Sand Creek (Reach SC-8), with an estimated 100-year storm runoff rate along Filing No. 1 between 1,487 cfs to 1,904 cfs. This portion of the creek contains 100-year FEMA floodplain, but no jurisdictional wetlands or Preble's Jumping Mouse habitat. As such the downstream corridor is very well established and as the detained developed release rate is far less than historic, theoretically no additional erosion will occur. The adjacent Sand Creek Channel Improvements accounted for the restricted runoff from Pond 16.

4. Does not apply to this Residential subdivision as this step is to 'consider the need for Industrial and Commercial BMPs'. Temporary construction BMPs will be installed per the approved grading and erosion control plans.

Update to 2023 fees

DRAINAGE AND BRIDGE FEES

Sterling Ranch East Filing No. 2 and Foursquare at Sterling Ranch East Filing No. 1 are within the Sand Creek Drainage Basin and is a total of 16.841 acres and 36.647. Per the year 2022 El Paso County Basin Fees, the Sand Creek Drainage Fee is $21,814 per impervious acre of development and the Bridge Fee is $8,923 per impervious acre. Sterling Ranch East Filing 2 consists of 7.320 acres of typical home lots, 2.453 acres of public right-of-way (roads), and 7.068 acres of open space/undeveloped area. Using Table 6-6 of the DCM, specifically 65% imperviousness for typical home lots, 100% imperviousness for pavement/right-of-way, and 0% imperviousness for open space/undeveloped area; an overall Filing No. 2 impervious area is calculated at 7.211 acres.

STERLING RANCH EAST FILING No. 2 (7.211 Impervious acres)

Please show the math in a table or line by line

DRAINAGE FEE:

$21,814/acre x 7.211 acres $ 157,300.75

BRIDGE FEE:

$8,923/acre x 7.211 acres $ 64,343.75

This site lies entirely within the Sand Creek Drainage Basin boundaries.

Foursquare at Sterling Ranch East Filing 1 consists of 13.581 acres of typical home lots, 6.702 acres of public right-of-way (roads), and 16.364 acres of open space/undeveloped area. Using Table 6-6 of the DCM, specifically 65% imperviousness for typical home lots, 100% imperviousness for pavement/right-of-way, and 0% imperviousness for open space/undeveloped area; an overall Filing No. 1 impervious area is calculated at 7.211 acres.

Please show the math in a table or line by line

Update to match area shown below in fee calculation

FOURSQUARE AT STERLING RANCH EAST FILING No. 1 (15.529 Impervious acres)

DRAINAGE FEE:

$21,814/acre x 15.929 acres $ 347,475.21

BRIDGE FEE:

$8,923/acre x 15.529 acres $ 138,565.27

This site lies entirely within the Sand Creek Drainage Basin boundaries.

Basin fees will be required to be paid prior to plat recordation.

CONSTRUCTION COST OPINION

The following is a construction cost opinion for the public facilities, located within the public right-of-way and accepting runoff from the public roadways, and the private facilities, intercepting the runoff from the adjacent school and park sites, and routing to the downstream natural channel:

Table will be reviewed with next submittal

Public Drainage Facilities Non-reimbursable (STERLING RANCH EAST FILING NO. 2)

ITEM	DESCRIPTION	QUANTITY	UNIT COST	COST
1.	10’ Type-R Inlet	2 EACH	$8,447/EA	$ 16,894.00
2.	18” RCP Storm Drain	8 LF	$70/LF	$ 560.00
3.	24” RCP Storm Drain	32 LF	$83/LF	$ 2,656.00
4.	30” RCP Storm Drain	104 LF	$104/LF	$ 10,816.00
5.	Type II Storm MH	1 EACH	$7,082/EA	$ 7,082.00
SUB-TOTAL				$ 38,008.00
10% ENGINEERING				$ 3,800.80
5% CONTINGENCIES				$ 1,900.40
TOTAL				**$ 43,709.20**

Public Drainage Facilities Non-reimbursable (FOURSQUARE AT STERLING RANCH EAST FILING NO. 1)

ITEM	DESCRIPTION	QUANTITY	UNIT COST	COST
1.	Riprap (spillway)	1,075 TONS	$89/TON	$ 95,675.00
2.	Geotextile (under riprap)	1,062 SY	$7/SY	$ 7,434.00
3.	18” RCP Storm Drain	586 LF	$70/LF	$ 41,020.00
4.	24” RCP Storm Drain	363 LF	$83/LF	$ 30,129.00
5.	30” RCP Storm Drain	487 LF	$104/LF	$ 50,648.00
6.	36” RCP Storm Drain	647 LF	$128/LF	$ 82,816.00
7.	42” RCP Storm Drain	267 LF	$171/LF	$ 45,657.00
8.	5’ Type R Inlets	4 EA	$6,138/EA	$ 24,552.00
9.	10’ Type R Inlets	2 EA	$8,447/EA	$ 16,894.00

10.	15’ Type R Inlets	2 EA	$11,775/EA	$ 23,550.00
11.	Type II Storm MH	2 EA	$7,082/EA	$ 14,164.00
12.	Type I Storm MH	7 EA	$12,876/EA	$ 90,132.00
13.	Permanent Pond 16*	1 EA	$200,000/EA	$ 200,000.00
SUB-TOTAL				$ 722,671.00
10% ENGINEERING				$ 72,267.10
5% CONTINGENCIES				$ 36,133.55
TOTAL				**$ 831,071.65**

*Includes cost of impact structures, forebays, trickle channel, road, and outlet box.

SUMMARY

Developed runoff from the proposed Sterling Ranch East Filing No. 2 and Foursquare at Sterling Ranch East Filing No. 1 development is proposed to outfall to one proposed private Full Spectrum Detention (EDB) and Storm Water Quality Facility (owned and maintained by the Sterling Ranch East Metropolitan District) prior to discharging to downstream facilities. The proposed Full Spectrum detention & water quality pond was sized using the current and applicable drainage criteria and provides release rates below existing allowable release rates. Therefore, the developed site runoff and proposed storm sewer facilities will not adversely affect the downstream facilities or surrounding developments.

delete East

PREPARED BY:

David L Gibson P.E.
Project Manager

dlg/118323/FDR-SRE FILING 1ª FSQ SER FILING 1.docx

REFERENCES

1. City of Colorado Springs/County of El Paso Drainage Criteria Manual Volume 1, as revised in November 1991 and October 1994 with County adopted Chapter 6 and Section 3.2.1 of Chapter 13 of the City of Colorado Springs/El Paso County Drainage Criteria Manual as revised in May 2014.

2. "Urban Storm Drainage Criteria Manual Volume 1, 2 & 3," Urban Drainage and Flood Control District, dated January 2016.

3. "Sand Creek Drainage Basin Planning Study," by Kiowa Engineering Corporation, dated March 1996.

4. "2018 Sterling Ranch MDDP," by M&S Consultants, Inc., June 2018.

5. "Final Drainage Report for Retreat at TimberRidge Filing No. 1", Classic Consulting, approved November, 2020.

6. "Final Drainage Report for Retreat at TimberRidge Filing No. 2", Classic Consulting, dated March, 2022

Update to latest version

7. "Final Design Report for Sand Creek Restoration", JR Engineering, LLC, dated September 2022

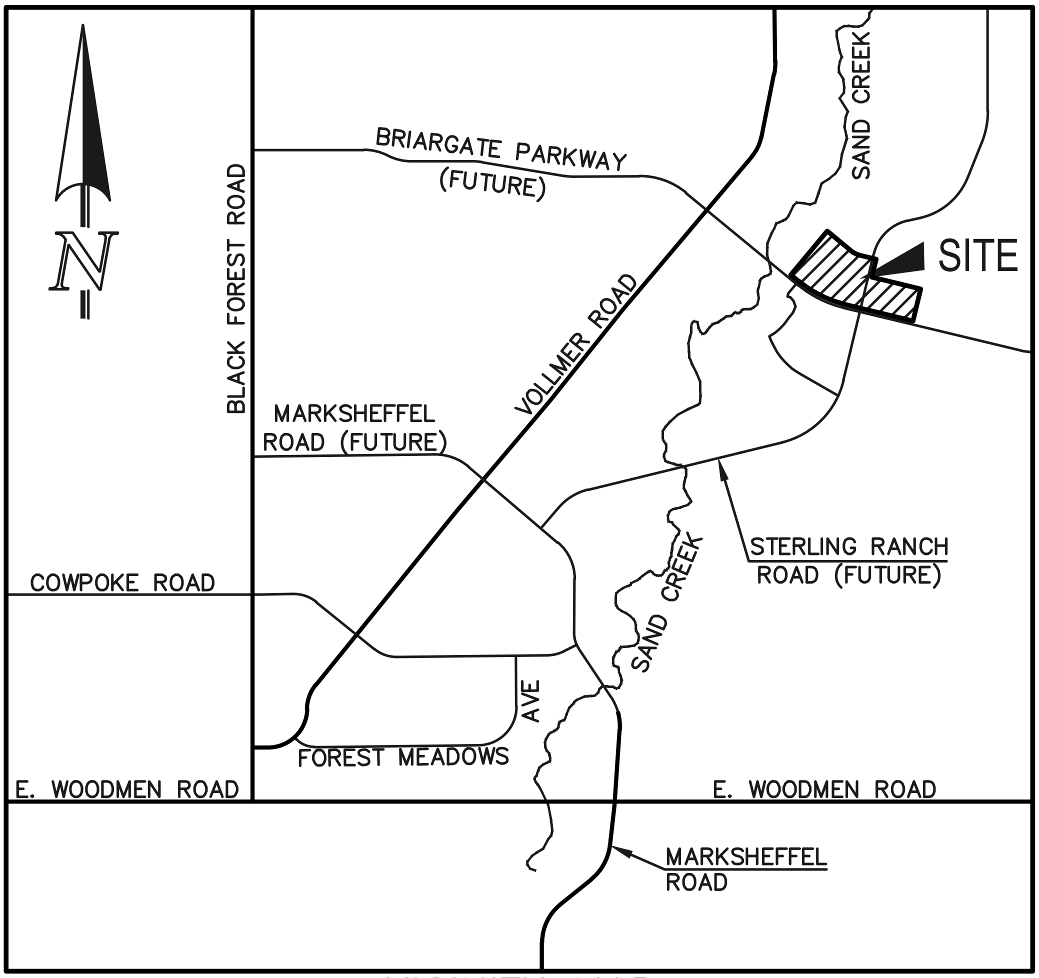
8. "Drainage Letter for Sterling Ranch Road and Briargate Pkwy. Interim Plan", prepared by JR Engineering, LLC, dated September 2022

9. "Master Development Drainage Plan Amendment for Sterling Ranch", prepared by JR Engineering, LLC, dated September 2022

Update to final version

APPENDIX

VICINITY MAP



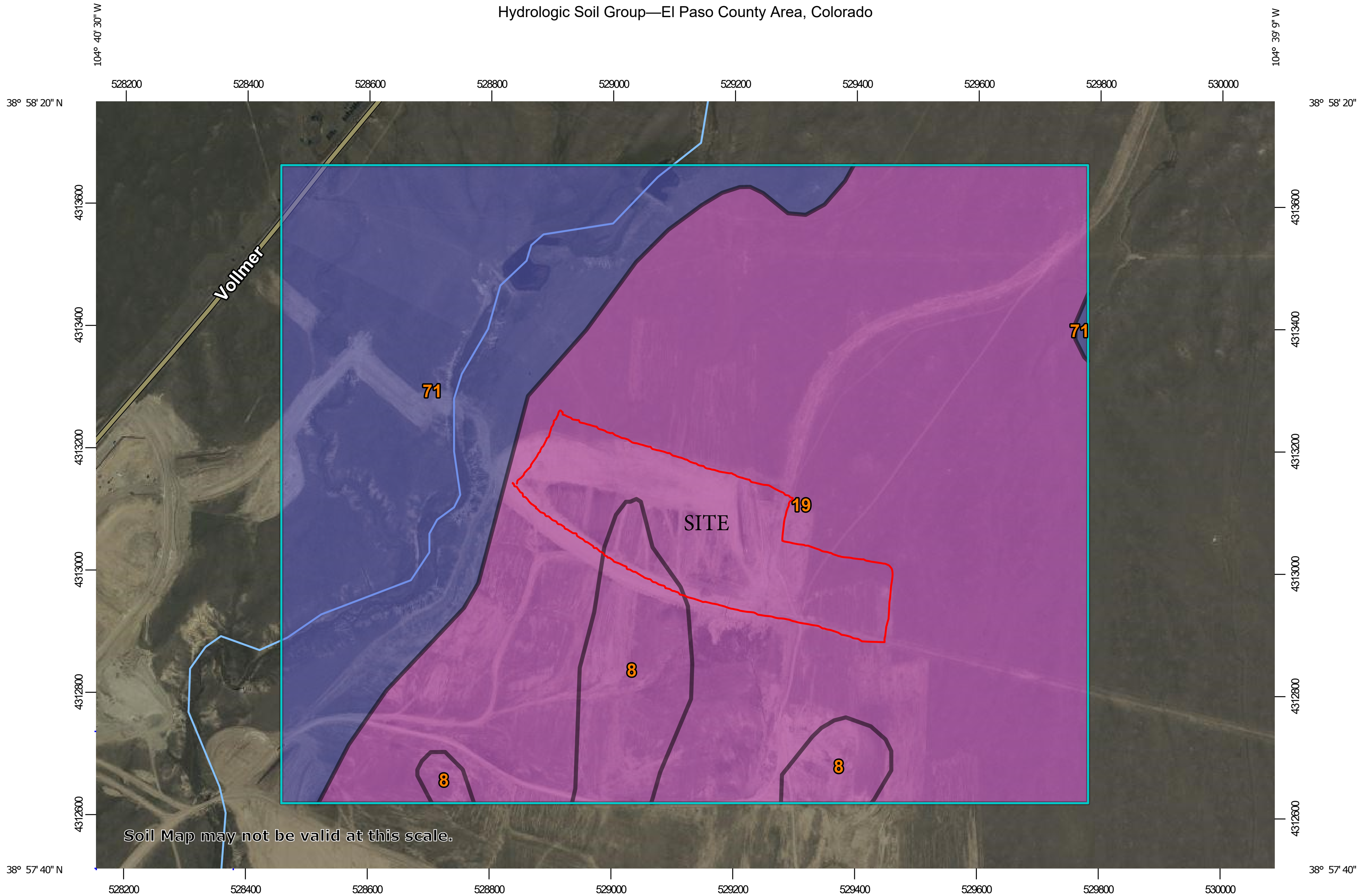
VICINITY MAP

NOT TO SCALE

SOILS MAP (S.C.S. SURVEY)

CLASSIC CONSULTING ENGINEERS & SURVEYORS

Hydrologic Soil Group—El Paso County Area, Colorado



Map Scale: 1:8,850 if printed on A landscape (11" x 8.5") sheet.

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 20, Sep 2, 2022

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

Date(s) aerial images were photographed: Sep 11, 2018—Oct 20, 2018

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	23.0	6.7%
19	Columbine gravelly sandy loam, 0 to 3 percent slopes	A	219.5	64.0%
71	Pring coarse sandy loam, 3 to 8 percent slopes	B	100.4	29.3%
Totals for Area of Interest			**342.9**	**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

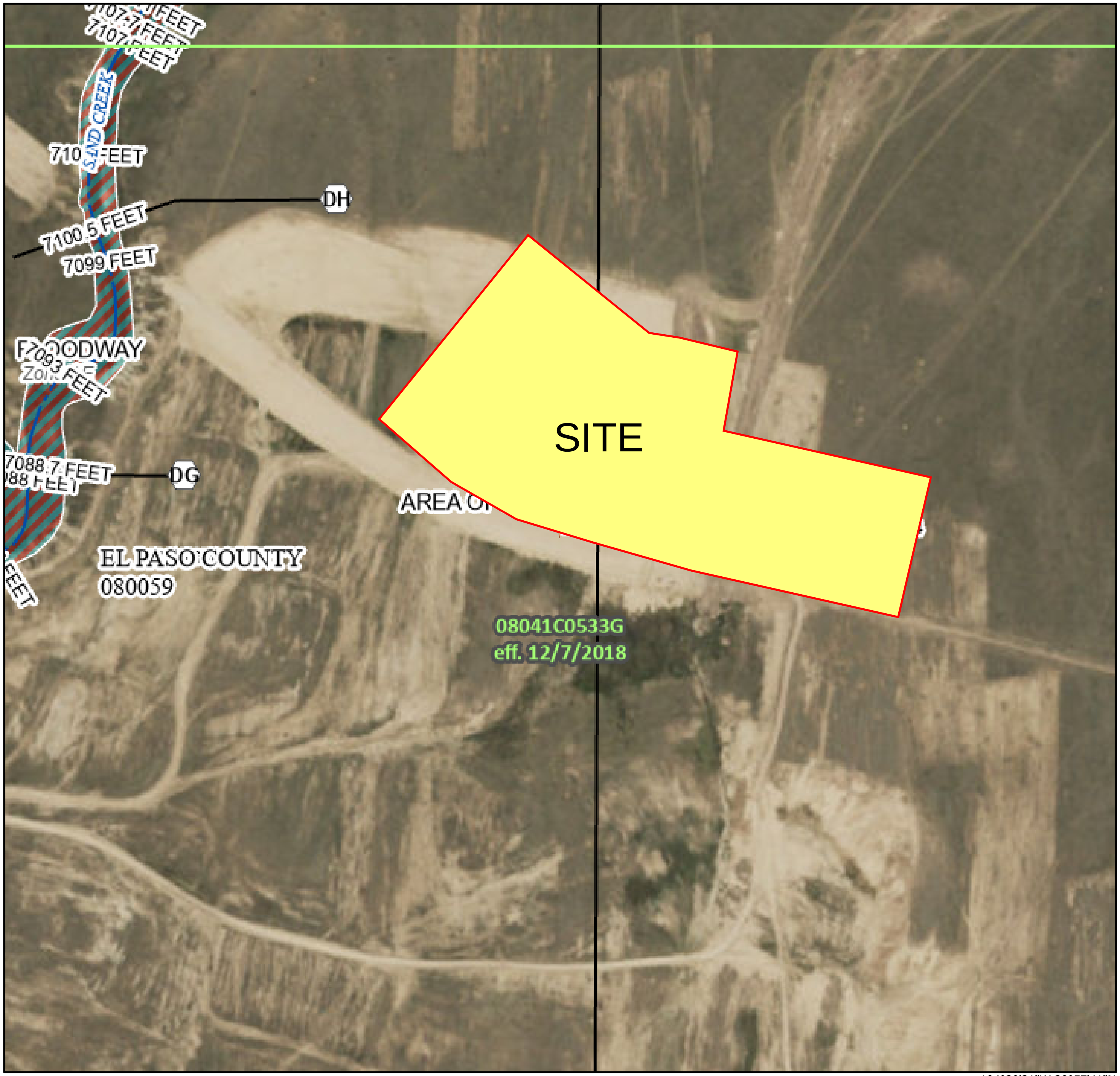
F.E.M.A. MAP

CLASSIC CONSULTING ENGINEERS & SURVEYORS

National Flood Hazard Layer FIRMette

FEMA

104°40'9"W 38°58'9"N



104°39'31"W 38°57'41"N

Feet

0 250 500 1,000 1,500 2,000

1:6,000

Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 / 17.5 Cross Sections with 1% Annual Chance Water Surface Elevation
- 8 Coastal Transect
- 513 Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

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

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

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 11/22/2022 at 4:39 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

DEVELOPED CONDITIONS CALCULATIONS

JOB NAME: ***STERLING RANCH EAST FIL NO. 2 & FOURSQUARE AT STERLING RANCH EAST FIL NO. 1***
JOB NUMBER: ***1183.23***
DATE: ***12/07/22***
CALCULATED BY: ***DLG***

FINAL DRAINAGE REPORT ~ BASIN RUNOFF COEFFICIENT SUMMARY

BASIN	TOTAL AREA (AC)	DEVELOPED AREA/IMPERVIOUS AREA				LANDSCAPE/UNDEVELOPED AREAS				WEIGHTED			WEIGHTED CA		
		AREA (AC)	C(2)	C(5)	C(100)	AREA (AC)	C(2)	C(5)	C(100)	C(2)	C(5)	C(100)	**CA(2)**	**CA(5)**	**CA(100)**
A	3.35	0.92	0.89	0.90	0.96	2.43	0.02	0.08	0.35	0.26	0.31	0.52	**0.87**	**1.02**	**1.73**
B	4.99	1.66	0.89	0.90	0.96	3.33	0.02	0.08	0.35	0.31	0.35	0.55	**1.54**	**1.76**	**2.76**
C	1.92	0.10	0.89	0.90	0.96	1.82	0.02	0.08	0.35	0.07	0.12	0.38	**0.13**	**0.24**	**0.73**
D	0.20	0.20	0.89	0.90	0.96	0.00	0.02	0.08	0.35	0.89	0.90	0.96	**0.18**	**0.18**	**0.19**
E	6.63	0.00	0.89	0.90	0.96	6.63	0.02	0.08	0.35	0.02	0.08	0.35	**0.13**	**0.53**	**2.32**
F	0.49	0.49	0.89	0.90	0.96	0.00	0.02	0.08	0.35	0.89	0.90	0.96	**0.44**	**0.44**	**0.47**
G	0.16	0.16	0.89	0.90	0.96	0.00	0.02	0.08	0.35	0.89	0.90	0.96	**0.14**	**0.14**	**0.15**
H	4.01	1.44	0.89	0.90	0.96	2.57	0.02	0.08	0.35	0.33	0.37	0.57	**1.33**	**1.50**	**2.28**
I	1.68	0.20	0.89	0.90	0.96	1.48	0.02	0.08	0.35	0.12	0.18	0.42	**0.21**	**0.30**	**0.71**
J	3.87	1.50	0.89	0.90	0.96	2.37	0.02	0.08	0.35	0.36	0.40	0.59	**1.38**	**1.54**	**2.27**
K	1.83	0.56	0.89	0.90	0.96	1.27	0.02	0.08	0.35	0.29	0.33	0.54	**0.52**	**0.61**	**0.98**
L	2.20	0.74	0.89	0.90	0.96	1.46	0.02	0.08	0.35	0.31	0.36	0.56	**0.69**	**0.78**	**1.22**
M	4.10	1.43	0.89	0.90	0.96	2.67	0.02	0.08	0.35	0.32	0.37	0.56	**1.33**	**1.50**	**2.31**
N	3.00	0.50	0.89	0.90	0.96	2.50	0.02	0.08	0.35	0.17	0.22	0.45	**0.50**	**0.65**	**1.36**
O	2.16	1.67	0.89	0.90	0.96	0.49	0.02	0.08	0.35	0.69	0.71	0.82	**1.50**	**1.54**	**1.77**
P	0.63	0.10	0.89	0.90	0.96	0.53	0.02	0.08	0.35	0.16	0.21	0.45	**0.10**	**0.13**	**0.28**
Q	0.50	0.10	0.89	0.90	0.96	0.40	0.02	0.08	0.35	0.19	0.24	0.47	**0.10**	**0.12**	**0.24**
R	0.33	0.04	0.89	0.90	0.96	0.29	0.02	0.08	0.35	0.13	0.18	0.42	**0.04**	**0.06**	**0.14**
S	0.54	0.10	0.89	0.90	0.96	0.44	0.02	0.08	0.35	0.18	0.23	0.46	**0.10**	**0.13**	**0.25**
T	11.19	0.00	0.89	0.90	0.96	11.19	0.02	0.08	0.35	0.02	0.08	0.35	**0.22**	**0.90**	**3.92**
OS-1	1.18	0.15	0.89	0.90	0.96	1.03	0.02	0.08	0.35	0.13	0.18	0.43	**0.15**	**0.22**	**0.50**

Need to have C-values representative of developed lots, not undisturbed areas. These values are for open areas, parks, tracts, etc

JOB NAME:	*STERLING RANCH EAST FIL NO. 2 & FOURSQUARE AT STERLING RANCH EAST FIL NO. 1*
JOB NUMBER:	*1183.23*
DATE:	*03/28/03*
CALC'D BY:	*DLG*

Return Period	1-Hour Depth
2	1.19
5	1.50
10	1.75
25	2.00
50	2.25
100	2.52

$0.395(1.1-C_5)\sqrt{L}$

$V = C_v S_w^{0.5}$

Tc=L/V

Table will be reviewed on next submittal after C-values have been revised

Table 6-7. Conveyance Coefficient, C_v

Type of Land Surface	C_v
Heavy meadow	2.5
Tillage/field	5
Riprap (not buried)*	6.5
Short pasture and lawns	7
Nearly bare ground	10
Grassed waterway	15
Paved areas and shallow paved swales	20

$t_c = \frac{L}{180} + 10$

* For buried riprap, select C_v value based on type of vegetative cover.

FINAL DRAINAGE REPORT ~ BASIN RUNOFF SUMMARY

	WEIGHTED			OVERLAND				STREET / CHANNEL FLOW				Tc	INTENSITY			TOTAL FLOWS		
BASIN	CA(2)	CA(5)	CA(100)	C(5)	Length (ft)	Height (ft)	Tc (min)	Length (ft)	Slope (%)	Velocity (fps)	Tc (min)	TOTAL (min)	I(2) (in/hr)	I(5) (in/hr)	I(100) (in/hr)	Q(2) (cfs)	Q(5) (cfs)	Q(100) (cfs)
A	0.87	1.02	1.73	0.08	100	2	14.7	300	2.0%	2.8	1.8	16.4	2.70	3.39	5.68	2.3	**3.5**	**9.9**
B	1.54	1.76	2.76	0.08	100	2.5	13.6	300	2.0%	2.8	1.8	15.4	2.78	3.48	5.85	4.3	**6.1**	**16.1**
C	0.13	0.24	0.73	0.08	75	2	11.5	0	0.0%	0.0	0.0	11.5	3.12	3.91	6.57	0.4	**0.9**	**4.8**
D	0.18	0.18	0.19	0.08	5	0.2	2.6	300	2.0%	2.8	1.8	5.0	4.12	5.17	8.68	0.7	**0.9**	**1.7**
E	0.13	0.53	2.32	0.08	100	7	9.7	0	0.0%	0.0	0.0	9.7	3.33	4.18	7.01	0.4	**2.2**	**16.3**
F	0.44	0.44	0.47	0.08	5	0.2	2.6	300	2.0%	2.8	1.8	5.0	4.12	5.17	8.68	1.8	**2.3**	**4.1**
G	0.14	0.14	0.15	0.08	5	0.2	2.6	100	2.0%	2.8	0.6	5.0	4.12	5.17	8.68	0.6	**0.7**	**1.3**
H	1.33	1.50	2.28	0.08	100	4	11.7	300	2.0%	2.8	1.8	13.4	2.94	3.69	6.19	3.9	**5.5**	**14.1**
I	0.21	0.30	0.71	0.08	100	4	11.7	100	2.0%	2.8	0.6	12.2	3.05	3.83	6.42	0.6	**1.1**	**4.6**
J	1.38	1.54	2.27	0.08	100	4	11.7	300	2.0%	2.8	1.8	13.4	2.94	3.69	6.19	4.1	**5.7**	**14.0**
K	0.52	0.61	0.98	0.08	100	4	11.7	300	2.0%	2.8	1.8	13.4	2.94	3.69	6.19	1.5	**2.2**	**6.1**
L	0.69	0.78	1.22	0.08	100	4	11.7	300	2.0%	2.8	1.8	13.4	2.94	3.69	6.19	2.0	**2.9**	**7.6**
M	1.33	1.50	2.31	0.08	100	4	11.7	300	2.0%	2.8	1.8	13.4	2.94	3.69	6.19	3.9	**5.5**	**14.3**
N	0.50	0.65	1.36	0.08	100	2	14.7	0	0.0%	0.0	0.0	14.7	2.84	3.56	5.97	1.4	**2.3**	**8.1**
O	1.50	1.54	1.77	0.08	80	5	9.0	300	2.0%	2.8	1.8	10.8	3.21	4.02	6.75	4.8	**6.2**	**12.0**
P	0.10	0.13	0.28	0.08	5	0.2	2.6	0	0.0%	0.0	0.0	5.0	4.12	5.17	8.68	0.4	**0.7**	**2.4**

JOB NAME: *STERLING RANCH EAST FIL NO. 2 & FOURSQUARE AT STERLING RANCH EAST FIL NO. 1*

JOB NUMBER: *1183.23*

DATE: *03/28/03*

CALC'D BY: *DLG*

Return Period	1-Hour Depth
2	1.19
5	1.50
10	1.75
25	2.00
50	2.25
100	2.52

$$t_i = \frac{0.395(1.1 - C_5)\sqrt{L}}{S^{0.33}}$$

$$V = C_v S_w^{0.5}$$

Tc=L/V

Table 6-7. Conveyance Coefficient, C_v

Type of Land Surface	C_v
Heavy meadow	2.5
Tillage/field	5
Riprap (not buried)*	6.5
Short pasture and lawns	7
Nearly bare ground	10
Grassed waterway	15
Paved areas and shallow paved swales	20

$$t_c = \frac{L}{180} + 10$$

* For buried riprap, select C_v value based on type of vegetative cover.

FINAL DRAINAGE REPORT ~ BASIN RUNOFF SUMMARY

BASIN	WEIGHTED CA(2)	CA(5)	CA(100)	OVERLAND C(5)	Length (ft)	Height (ft)	Tc (min)	STREET / CHANNEL FLOW Length (ft)	Slope (%)	Velocity (fps)	Tc (min)	Tc TOTAL (min)	INTENSITY I(2) (in/hr)	I(5) (in/hr)	I(100) (in/hr)	TOTAL FLOWS Q(2) (cfs)	Q(5) (cfs)	Q(100) (cfs)
Q	0.10	0.12	0.24	0.08	5	0.5	1.9	0	0.0%	0.0	0.0	5.0	4.12	5.17	8.68	0.4	**0.6**	**2.0**
R	0.04	0.06	0.14	0.08	100	4	11.7	50	2.0%	2.8	0.3	11.9	3.08	3.86	6.48	0.1	**0.2**	**0.9**
S	0.10	0.13	0.25	0.08	100	4	11.7	50	2.0%	2.8	0.3	11.9	3.08	3.86	6.48	0.3	**0.5**	**1.6**
T	0.22	0.90	3.92	0.08	100	4	11.7	0	2.0%	0.0	0.0	11.7	3.11	3.90	6.55	0.7	**3.5**	**25.6**
OS-1	0.15	0.22	0.50	0.08	100	2	14.7	0	0.0%	0.0	0.0	14.7	2.84	3.56	5.97	0.4	**0.8**	**3.0**

JOB NAME:	*STERLING RANCH EAST FIL NO. 2 & FOURSQUARE AT STERLING RANCH EAST FIL NO. 1*
JOB NUMBER:	*1183.23*
DATE:	*12/07/22*
CALCULATED BY:	*DLG*

Table will be reviewed on next submittal after C-values have been revised & flow rates updated

FINAL DRAINAGE REPORT ~ SURFACE ROUTING SUMMARY

Design Point(s)	Contributing Basins	Equivalent CA(5)	Equivalent CA(100)	Maximum Tc	Intensity I(5)	Intensity I(100)	Flow Q(5)	Flow Q(100)	Inlet Size
1	BASIN B	1.76	2.76	15.4	3.48	5.85	6.1	16.1	10' TYPE R PUBLIC
2	BASIN A	1.02	1.73	16.4	3.39	5.68	3.5	9.9	10' TYPE R PUBLIC
3	BASIN J	[illegible]	2.27	13.4	3.69	6.19	5.7	14.0	10' TYPE R PUBLIC
4	BASIN K	0.61	0.98	13.4	3.69	6.19	2.2	6.1	5' TYPE R PUBLIC
5	BASIN F & BASIN OS-3	0.66	0.97	14.7	3.56	5.97	2.3	5.8	5' TYPE R PUBLIC
6	BASIN G	0.14	0.15	5.0	5.17	8.68	0.7	1.3	5' TYPE R PUBLIC
7	BASIN H	1.50	2.28	13.4	3.69	6.19	5.5	14.1	10' TYPE R PUBLIC
8	BASIN I	0.30	0.71	12.2	3.83	6.42	1.1	4.6	5' TYPE R PUBLIC
9	BASIN M & BASIN N	2.15	3.66	14.7	3.56	5.97	7.6	21.9	15' TYPE R PUBLIC
10	BASIN L & FLOWBY DP 9	1.00	2.62	14.7	3.56	5.97	3.6	15.7	15' TYPE R PUBLIC
11	BASIN T & PIPE 17	11.48	20.64	16.4	3.39	5.68	39	117	POND IN

OS-1? & needs to include Basin D

Need to have DP that combines Basins C, R & S, as they exit the project area into Briargate Parkway.

Include if inlets are sump or at-grade

Per ECM Section 3.2.8.G, ensure design points are provided at all appropriate locations

Use newer MHFD spreadsheet dated August 2022

Inlet calculation spreadsheets will be reviewed with next submittal when flows have been revised.

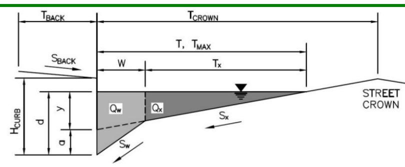
MHFD-Inlet, Version 5.01 (April 2021)

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

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

Project: STERLING RANCH EAST FILING NO. 2 & FOURSQUARE AT STERLING RANCH EAST FILING NO. 1

Inlet ID: INLET DP 1



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5	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 =	0.042	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	

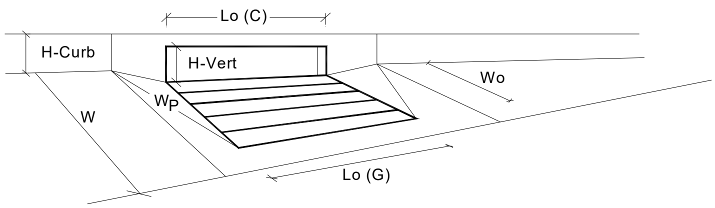
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	7.8	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

MINOR STORM Allowable Capacity is based on Depth Criterion
MAJOR STORM Allowable Capacity is based on Depth Criterion

	Minor Storm	Major Storm	
Q_{allow} =	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)



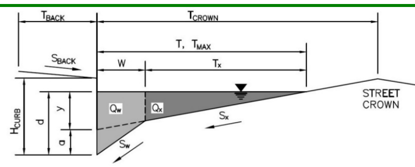
Design Information (Input)	CDOT Type R Curb Opening	MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	7.8	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) =	10.00	10.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
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} =	0.42	0.57	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.57	0.74	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.93	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 =**	**11.5**	**18.7**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	6.1	16.1	cfs

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

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

Project: STERLING RANCH EAST FILING NO. 2 & FOURSQUARE AT STERLING RANCH EAST FILING NO. 1

Inlet ID: INLET DP 2



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5	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 =	0.042	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	

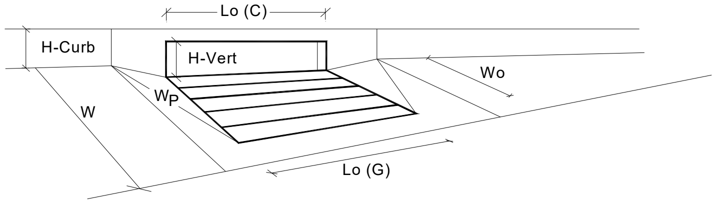
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	7.8	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

MINOR STORM Allowable Capacity is based on Depth Criterion
MAJOR STORM Allowable Capacity is based on Depth Criterion

		Minor Storm	Major Storm	
	Q_{allow} =	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)



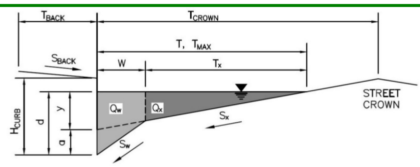
		MINOR	MAJOR	
Design Information (Input)				
Type of Inlet (CDOT Type R Curb Opening)	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	7.8	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) =	10.00	10.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
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} =	0.42	0.57	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.57	0.74	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.93	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 =	**11.5**	**18.7**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	3.5	9.9	cfs

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

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

Project: **STERLING RANCH EAST FILING NO. 2 & FOURSQUARE AT STERLING RANCH EAST FILING NO. 1**

Inlet ID: **INLET DP 3**



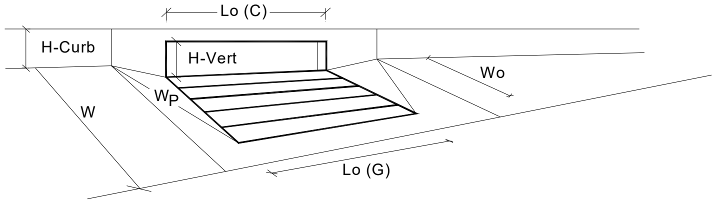
Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5		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 =	0.042		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} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	7.8	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)



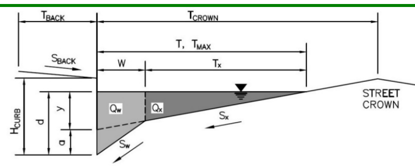
		MINOR	MAJOR	
Design Information (Input) — CDOT Type R Curb Opening		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	7.8	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) =	10.00	10.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
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} =	0.42	0.57	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.57	0.74	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.93	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 =**	**11.5**	**18.7**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	5.7	14.0	cfs

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

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

Project: STERLING RANCH EAST FILING NO. 2 & FOURSQUARE AT STERLING RANCH EAST FILING NO. 1

Inlet ID: INLET DP 4



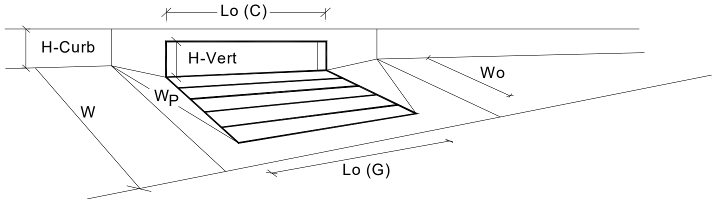
Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5		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 =	0.042		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} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	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

MHFD-Inlet, Version 5.01 (April 2021)



		MINOR	MAJOR	
Design Information (Input)				
Type of Inlet (CDOT Type R Curb Opening)	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	7.8	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) =	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	

		MINOR	MAJOR	
Low Head Performance Reduction (Calculated)				
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.42	0.57	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.77	1.00	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	

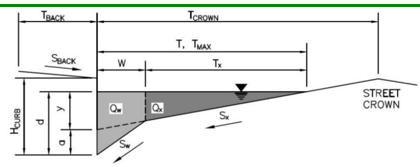
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	$\mathbf{Q_a}$ =	**7.5**	**9.9**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	2.2	6.1	cfs

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

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

Project: STERLING RANCH EAST FILING NO. 2 & FOURSQUARE AT STERLING RANCH EAST FILING NO. 1

Inlet ID: INLET DP 5



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	6.5	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 =	0.042	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	

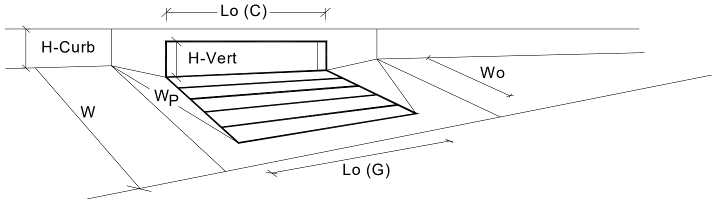
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	7.8	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

MINOR STORM Allowable Capacity is based on Depth Criterion
MAJOR STORM Allowable Capacity is based on Depth Criterion

	Minor Storm	Major Storm	
Q_{allow} =	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)



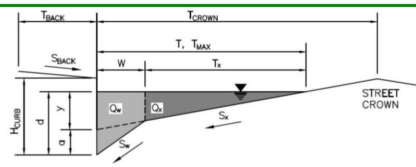
Design Information (Input)	CDOT Type R Curb Opening		MINOR	MAJOR	
Type of Inlet		Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)		a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)		No =	1	1	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	6.0	7.8	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) =	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} =	0.42	0.57	ft
Combination Inlet Performance Reduction Factor for Long Inlets		$RF_{Combination}$ =	0.77	1.00	
Curb Opening Performance Reduction Factor for Long Inlets		RF_{Curb} =	1.00	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 =**	**7.5**	**9.9**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)		$Q_{PEAK\ REQUIRED}$ =	2.3	5.8	cfs

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

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

Project: STERLING RANCH EAST FILING NO. 2 & FOURSQUARE AT STERLING RANCH EAST FILING NO. 1

Inlet ID: INLET DP 6



Gutter Geometry:

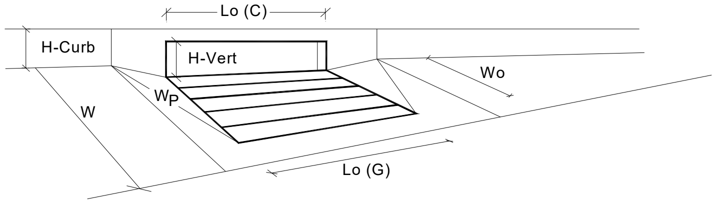
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5		ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013		
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00		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 =	0.042		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} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	7.8	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

MINOR STORM Allowable Capacity is based on Depth Criterion
MAJOR STORM Allowable Capacity is based on Depth Criterion

	Minor Storm	Major Storm	
Q_{allow} =	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)



Design Information (Input)	CDOT Type R Curb Opening		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	7.8	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) =	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} =	0.42	0.57	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.77	1.00	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	1.00	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 =**	**7.5**	**9.9**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	0.7	1.3	cfs

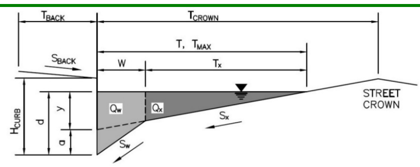
MHFD-Inlet, Version 5.01 (April 2021)

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

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

Project: STERLING RANCH EAST FILING NO. 2 & FOURSQUARE AT STERLING RANCH EAST FILING NO. 1

Inlet ID: INLET DP 7

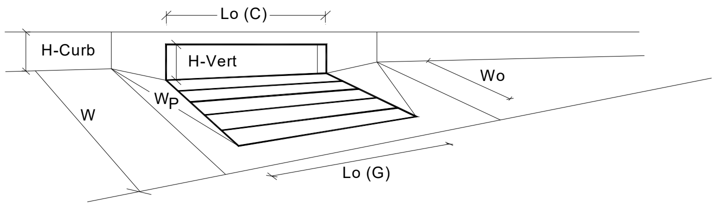


Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5		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 =	0.042		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} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	7.8	inches
Check boxes are not applicable in SUMP conditions		☐	☐	
MINOR STORM Allowable Capacity is based on Depth Criterion		Minor Storm	Major Storm	
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)



			MINOR	MAJOR	
Design Information (Input)	CDOT Type R Curb Opening		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	7.8	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) =	10.00	10.00	feet
Height of Vertical Curb Opening in Inches		H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches		H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)		Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)		C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)		C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)		C_o (C) =	0.67	0.67	

		MINOR	MAJOR	
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} =	0.42	0.57	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.57	0.74	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.93	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	

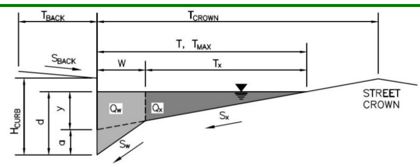
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**11.5**	**18.7**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	5.5	14.1	cfs

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

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

Project: STERLING RANCH EAST FILING NO. 2 & FOURSQUARE AT STERLING RANCH EAST FILING NO. 1

Inlet ID: INLET DP 8

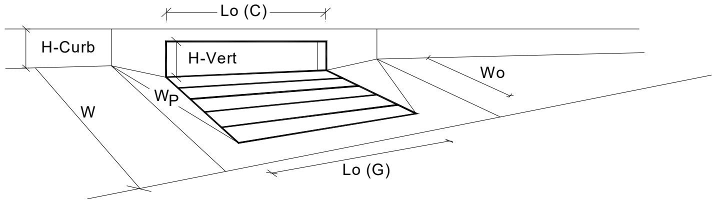


Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5		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 =	0.042		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} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	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**

INLEET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)



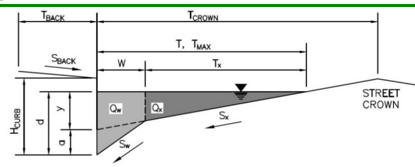
Design Information (Input)	CDOT Type R Curb Opening		MINOR	MAJOR	
Type of Inlet		Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)		a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)		No =	1	1	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	6.0	7.8	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) =	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} =	0.42	0.57	ft
Combination Inlet Performance Reduction Factor for Long Inlets		$RF_{Combination}$ =	0.77	1.00	
Curb Opening Performance Reduction Factor for Long Inlets		RF_{Curb} =	1.00	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 =**	**7.5**	**9.9**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)		$Q_{PEAK\ REQUIRED}$ =	1.1	4.6	cfs

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

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

Project: STERLING RANCH EAST FILING NO. 2 & FOURSQUARE AT STERLING RANCH EAST FILING NO. 1

Inlet ID: AT GRADE INLET DP 9



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5	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 =	0.042	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.020	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 (check box for yes, leave blank for no)		☐	☑	

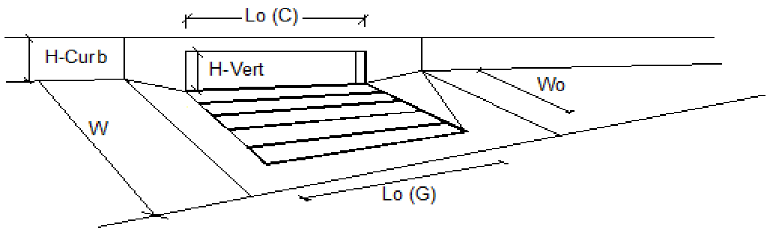
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**14.4**	**50.4**	**cfs**

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

MHFD-Inlet, Version 5.01 (April 2021)



Design Information (Input)	CDOT Type R Curb Opening		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	

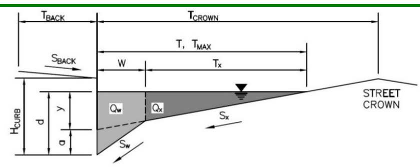
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**7.1**	**13.2**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.5**	**8.7**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**93**	**60**	**%**

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

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

Project: STERLING RANCH EAST FILING NO. 2 & FOURSQUARE AT STERLING RANCH EAST FILING NO. 1

Inlet ID: INLET DP 10

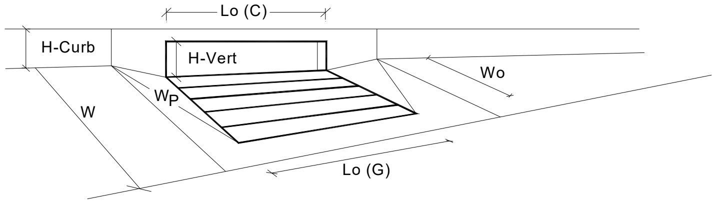


Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5		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 =	0.042		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} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	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**

INLEET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)



Design Information (Input)	CDOT Type R Curb Opening		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	7.8	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 =	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} =	0.42	0.57	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.57	0.74	
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 =**	**13.5**	**24.1**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	3.6	15.7	cfs

JOB NAME: *STERLING RANCH EAST FIL NO. 2 & FOURSQUARE AT STERLING RANCH EAST FIL NO. 1*
JOB NUMBER: *1183.23*
DATE: *12/07/22*
CALCULATED BY: *DLG*

Table will be reviewed on next submittal when flows have been revised

* PIPES ARE LISTED AT MAXIMUM SIZE REQUIRED TO ACCOMMODATE Q100 FLOWS AT MINIMUM GRADE
REFER TO INDIVIDUAL PIPE SHEETS FOR HYDRAULIC INFORMATION.

FINAL DRAINAGE REPORT ~ PIPE ROUTING SUMMARY

Pipe Run	Contributing Basins	Equivalent CA(5)	Equivalent CA(100)	Maximum Tc	Intensity		Flow		
					I(5)	I(100)	Q(5)	Q(100)	Pipe Size*
1	DP 1	1.76	2.76	15.38	3.48	5.85	6.1	16.1	24" PUBLIC RCP STORM
2	DP 2	1.02	1.73	16.42	3.39	5.68	3.5	9.9	18" PUBLIC RCP STORM
3	PIPE 1 & PIPE 2	2.78	4.49	16.42	3.39	5.68	9.4	25.5	30" PUBLIC RCP STORM
4	DP 3	1.54	2.27	13.4	3.69	6.19	5.7	14.0	24" PUBLIC RCP STORM
5	DP 4	0.61	0.98	13.4	3.69	6.19	2.2	6.1	18" PUBLIC RCP STORM
6	PIPE 3, PIPE 4 & PIPE 5	4.93	7.74	16.4	3.39	5.68	16.7	44.0	30" PUBLIC RCP STORM
7	DP 5	0.66	0.97	14.7	3.56	5.97	2.3	5.8	18" PUBLIC RCP STORM
8	DP 6	0.14	0.15	5.0	5.17	8.68	0.7	1.3	18" PUBLIC RCP STORM
9	PIPE 7 & PIPE 8	0.80	1.13	14.7	3.56	5.97	2.9	6.7	18" PUBLIC RCP STORM
10	DP 7	1.50	2.28	13.4	3.69	6.19	5.5	14.1	24" PUBLIC RCP STORM
11	DP 8	0.30	0.71	12.2	3.83	6.42	1.1	4.6	18" PUBLIC RCP STORM
12	PIPE 9, PIPE 10, PIPE 11	2.60	4.12	14.7	3.56	5.97	9.3	24.6	24" PUBLIC RCP STORM
13	PIPE 6 & PIPE 12	7.53	11.86	16.4	3.39	5.68	25.5	67.4	36" PUBLIC RCP STORM
14	DP 9 INTERCEPTED	2.05	2.23	14.7	3.56	5.97	7.3	13.3	24" PUBLIC RCP STORM

JOB NAME: *STERLING RANCH EAST FIL NO. 2 & FOURSQUARE AT STERLING RANCH EAST FIL NO. 1*
JOB NUMBER: *1183.23*
DATE: *12/07/22*
CALCULATED BY: *DLG*

* PIPES ARE LISTED AT MAXIMUM SIZE REQUIRED TO ACCOMMODATE Q100 FLOWS AT MINIMUM GRADE
REFER TO INDIVIDUAL PIPE SHEETS FOR HYDRAULIC INFORMATION.

FINAL DRAINAGE REPORT ~ PIPE ROUTING SUMMARY

Pipe Run	Contributing Basins	Equivalent CA(5)	Equivalent CA(100)	Maximum Tc	Intensity		Flow		
					I(5)	I(100)	Q(5)	Q(100)	Pipe Size*
15	PIPE 13 & PIPE 14	9.58	14.10	16.4	3.39	5.68	32.4	80.1	42" PUBLIC RCP STORM
16	DP 10	1.00	2.62	14.7	3.56	5.97	3.6	15.7	24" PUBLIC RCP STORM
17	PIPE 15 & PIPE 16	10.58	16.72	16.4	3.39	5.68	35.8	95.0	42" PUBLIC RCP STORM

Flow master worksheets are not necessary for pipe design as full storm system design with HGL calculations are provided later in the appendix.

Worksheet for Pipe Run - 1

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.013
Channel Slope	0.010 ft/ft
Diameter	24.0 in
Discharge	16.10 cfs

Results	
Normal Depth	15.0 in
Flow Area	2.1 ft²
Wetted Perimeter	3.6 ft
Hydraulic Radius	6.8 in
Top Width	1.94 ft
Critical Depth	17.4 in
Percent Full	62.3 %
Critical Slope	0.007 ft/ft
Velocity	7.82 ft/s
Velocity Head	0.95 ft
Specific Energy	2.20 ft
Froude Number	1.338
Maximum Discharge	24.33 cfs
Discharge Full	22.62 cfs
Slope Full	0.005 ft/ft
Flow Type	Supercritical

GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	62.3 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	15.0 in
Critical Depth	17.4 in
Channel Slope	0.010 ft/ft
Critical Slope	0.007 ft/ft

Worksheet for Pipe Run - 2

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	0.010 ft/ft
Diameter	18.0 in
Discharge	9.90 cfs

Results

Normal Depth	13.9 in
Flow Area	1.5 ft²
Wetted Perimeter	3.2 ft
Hydraulic Radius	5.5 in
Top Width	1.26 ft
Critical Depth	14.6 in
Percent Full	77.2 %
Critical Slope	0.009 ft/ft
Velocity	6.76 ft/s
Velocity Head	0.71 ft
Specific Energy	1.87 ft
Froude Number	1.104
Maximum Discharge	11.30 cfs
Discharge Full	10.50 cfs
Slope Full	0.009 ft/ft
Flow Type	Supercritical

GVF Input Data

Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data

Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	77.2 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	13.9 in
Critical Depth	14.6 in
Channel Slope	0.010 ft/ft
Critical Slope	0.009 ft/ft

Worksheet for Pipe Run - 3

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	0.005 ft/ft
Diameter	30.0 in
Discharge	25.50 cfs

Results

Normal Depth	21.8 in
Flow Area	3.8 ft²
Wetted Perimeter	5.1 ft
Hydraulic Radius	9.0 in
Top Width	2.23 ft
Critical Depth	20.7 in
Percent Full	72.8 %
Critical Slope	0.006 ft/ft
Velocity	6.67 ft/s
Velocity Head	0.69 ft
Specific Energy	2.51 ft
Froude Number	0.896
Maximum Discharge	31.20 cfs
Discharge Full	29.00 cfs
Slope Full	0.004 ft/ft
Flow Type	Subcritical

GVF Input Data

Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data

Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	57.1 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	21.8 in
Critical Depth	20.7 in
Channel Slope	0.005 ft/ft
Critical Slope	0.006 ft/ft

Worksheet for Pipe Run - 4

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	0.005 ft/ft
Diameter	24.0 in
Discharge	14.00 cfs

Results

Normal Depth	17.4 in
Flow Area	2.4 ft²
Wetted Perimeter	4.1 ft
Hydraulic Radius	7.2 in
Top Width	1.79 ft
Critical Depth	16.2 in
Percent Full	72.5 %
Critical Slope	0.006 ft/ft
Velocity	5.74 ft/s
Velocity Head	0.51 ft
Specific Energy	1.96 ft
Froude Number	0.866
Maximum Discharge	17.21 cfs
Discharge Full	16.00 cfs
Slope Full	0.004 ft/ft
Flow Type	Subcritical

GVF Input Data

Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data

Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	49.0 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	17.4 in
Critical Depth	16.2 in
Channel Slope	0.005 ft/ft
Critical Slope	0.006 ft/ft

Worksheet for Pipe Run - 5

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	0.005 ft/ft
Diameter	18.0 in
Discharge	6.10 cfs

Results

Normal Depth	12.4 in
Flow Area	1.3 ft²
Wetted Perimeter	2.9 ft
Hydraulic Radius	5.3 in
Top Width	1.39 ft
Critical Depth	11.5 in
Percent Full	69.0 %
Critical Slope	0.006 ft/ft
Velocity	4.69 ft/s
Velocity Head	0.34 ft
Specific Energy	1.38 ft
Froude Number	0.854
Maximum Discharge	7.99 cfs
Discharge Full	7.43 cfs
Slope Full	0.003 ft/ft
Flow Type	Subcritical

GVF Input Data

Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data

Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	42.8 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	12.4 in
Critical Depth	11.5 in
Channel Slope	0.005 ft/ft
Critical Slope	0.006 ft/ft

Worksheet for Pipe Run - 6

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	0.010 ft/ft
Diameter	30.0 in
Discharge	44.00 cfs

Results

Normal Depth	27.5 in
Flow Area	4.7 ft²
Wetted Perimeter	6.4 ft
Hydraulic Radius	8.8 in
Top Width	1.37 ft
Critical Depth	26.5 in
Percent Full	91.8 %
Critical Slope	0.010 ft/ft
Velocity	9.33 ft/s
Velocity Head	1.35 ft
Specific Energy	3.65 ft
Froude Number	0.886
Maximum Discharge	44.12 cfs
Discharge Full	41.01 cfs
Slope Full	0.012 ft/ft
Flow Type	Subcritical

GVF Input Data

Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data

Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	42.8 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	27.5 in
Critical Depth	26.5 in
Channel Slope	0.010 ft/ft
Critical Slope	0.010 ft/ft

Worksheet for Pipe Run - 7

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	0.010 ft/ft
Diameter	18.0 in
Discharge	5.80 cfs

Results

Normal Depth	9.5 in
Flow Area	1.0 ft²
Wetted Perimeter	2.4 ft
Hydraulic Radius	4.7 in
Top Width	1.50 ft
Critical Depth	11.2 in
Percent Full	53.0 %
Critical Slope	0.006 ft/ft
Velocity	6.09 ft/s
Velocity Head	0.58 ft
Specific Energy	1.37 ft
Froude Number	1.347
Maximum Discharge	11.30 cfs
Discharge Full	10.50 cfs
Slope Full	0.003 ft/ft
Flow Type	Supercritical

GVF Input Data

Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data

Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	53.0 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	9.5 in
Critical Depth	11.2 in
Channel Slope	0.010 ft/ft
Critical Slope	0.006 ft/ft

Worksheet for Pipe Run - 8

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	0.010 ft/ft
Diameter	18.0 in
Discharge	1.30 cfs

Results

Normal Depth	4.3 in
Flow Area	0.3 ft²
Wetted Perimeter	1.5 ft
Hydraulic Radius	2.5 in
Top Width	1.28 ft
Critical Depth	5.1 in
Percent Full	23.8 %
Critical Slope	0.005 ft/ft
Velocity	4.04 ft/s
Velocity Head	0.25 ft
Specific Energy	0.61 ft
Froude Number	1.420
Maximum Discharge	11.30 cfs
Discharge Full	10.50 cfs
Slope Full	0.000 ft/ft
Flow Type	Supercritical

GVF Input Data

Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data

Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	23.8 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	4.3 in
Critical Depth	5.1 in
Channel Slope	0.010 ft/ft
Critical Slope	0.005 ft/ft

Worksheet for Pipe Run - 9

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	0.010 ft/ft
Diameter	18.0 in
Discharge	6.70 cfs

Results

Normal Depth	10.4 in
Flow Area	1.1 ft²
Wetted Perimeter	2.6 ft
Hydraulic Radius	4.9 in
Top Width	1.48 ft
Critical Depth	12.0 in
Percent Full	58.0 %
Critical Slope	0.007 ft/ft
Velocity	6.30 ft/s
Velocity Head	0.62 ft
Specific Energy	1.49 ft
Froude Number	1.311
Maximum Discharge	11.30 cfs
Discharge Full	10.50 cfs
Slope Full	0.004 ft/ft
Flow Type	Supercritical

GVF Input Data

Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data

Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	58.0 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	10.4 in
Critical Depth	12.0 in
Channel Slope	0.010 ft/ft
Critical Slope	0.007 ft/ft

Worksheet for Pipe Run - 10

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.010	ft/ft
Diameter	24.0	in
Discharge	14.10	cfs

Results

Normal Depth	13.7	in
Flow Area	1.9	ft²
Wetted Perimeter	3.4	ft
Hydraulic Radius	6.5	in
Top Width	1.98	ft
Critical Depth	16.2	in
Percent Full	57.2	%
Critical Slope	0.006	ft/ft
Velocity	7.59	ft/s
Velocity Head	0.90	ft
Specific Energy	2.04	ft
Froude Number	1.382	
Maximum Discharge	24.33	cfs
Discharge Full	22.62	cfs
Slope Full	0.004	ft/ft
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.0	in
Length	0.0	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.0	in
Profile Description	N/A	
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.0	%
Normal Depth Over Rise	57.2	%
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	13.7	in
Critical Depth	16.2	in
Channel Slope	0.010	ft/ft
Critical Slope	0.006	ft/ft

Worksheet for Pipe Run - 11

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.013
Channel Slope	0.010 ft/ft
Diameter	18.0 in
Discharge	4.60 cfs

Results	
Normal Depth	8.3 in
Flow Area	0.8 ft²
Wetted Perimeter	2.2 ft
Hydraulic Radius	4.3 in
Top Width	1.50 ft
Critical Depth	9.9 in
Percent Full	46.3 %
Critical Slope	0.006 ft/ft
Velocity	5.75 ft/s
Velocity Head	0.51 ft
Specific Energy	1.21 ft
Froude Number	1.386
Maximum Discharge	11.30 cfs
Discharge Full	10.50 cfs
Slope Full	0.002 ft/ft
Flow Type	Supercritical

GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	46.3 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	8.3 in
Critical Depth	9.9 in
Channel Slope	0.010 ft/ft
Critical Slope	0.006 ft/ft

Worksheet for Pipe Run - 12

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	0.020 ft/ft
Diameter	24.0 in
Discharge	24.60 cfs

Results

Normal Depth	15.8 in
Flow Area	2.2 ft²
Wetted Perimeter	3.8 ft
Hydraulic Radius	6.9 in
Top Width	1.90 ft
Critical Depth	21.0 in
Percent Full	65.8 %
Critical Slope	0.011 ft/ft
Velocity	11.23 ft/s
Velocity Head	1.96 ft
Specific Energy	3.27 ft
Froude Number	1.843
Maximum Discharge	34.41 cfs
Discharge Full	31.99 cfs
Slope Full	0.012 ft/ft
Flow Type	Supercritical

GVF Input Data

Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data

Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	65.8 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	15.8 in
Critical Depth	21.0 in
Channel Slope	0.020 ft/ft
Critical Slope	0.011 ft/ft

Worksheet for Pipe Run - 13

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.013
Channel Slope	0.010 ft/ft
Diameter	36.0 in
Discharge	67.40 cfs

Results	
Normal Depth	29.9 in
Flow Area	6.3 ft²
Wetted Perimeter	6.9 ft
Hydraulic Radius	10.9 in
Top Width	2.26 ft
Critical Depth	31.5 in
Percent Full	83.0 %
Critical Slope	0.009 ft/ft
Velocity	10.75 ft/s
Velocity Head	1.80 ft
Specific Energy	4.29 ft
Froude Number	1.137
Maximum Discharge	71.74 cfs
Discharge Full	66.69 cfs
Slope Full	0.010 ft/ft
Flow Type	Supercritical

GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	83.0 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	29.9 in
Critical Depth	31.5 in
Channel Slope	0.010 ft/ft
Critical Slope	0.009 ft/ft

Worksheet for Pipe Run - 14

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	0.010 ft/ft
Diameter	24.0 in
Discharge	13.30 cfs

Results

Normal Depth	13.2 in
Flow Area	1.8 ft²
Wetted Perimeter	3.3 ft
Hydraulic Radius	6.4 in
Top Width	1.99 ft
Critical Depth	15.8 in
Percent Full	55.1 %
Critical Slope	0.006 ft/ft
Velocity	7.49 ft/s
Velocity Head	0.87 ft
Specific Energy	1.97 ft
Froude Number	1.398
Maximum Discharge	24.33 cfs
Discharge Full	22.62 cfs
Slope Full	0.003 ft/ft
Flow Type	Supercritical

GVF Input Data

Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data

Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	55.1 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	13.2 in
Critical Depth	15.8 in
Channel Slope	0.010 ft/ft
Critical Slope	0.006 ft/ft

Worksheet for Pipe Run - 15

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	0.010 ft/ft
Diameter	42.0 in
Discharge	80.10 cfs

Results

Normal Depth	28.3 in
Flow Area	6.9 ft^2
Wetted Perimeter	6.7 ft
Hydraulic Radius	12.3 in
Top Width	3.28 ft
Critical Depth	33.6 in
Percent Full	67.4 %
Critical Slope	0.007 ft/ft
Velocity	11.61 ft/s
Velocity Head	2.09 ft
Specific Energy	4.45 ft
Froude Number	1.411
Maximum Discharge	108.22 cfs
Discharge Full	100.60 cfs
Slope Full	0.006 ft/ft
Flow Type	Supercritical

GVF Input Data

Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data

Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	67.4 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	28.3 in
Critical Depth	33.6 in
Channel Slope	0.010 ft/ft
Critical Slope	0.007 ft/ft

Worksheet for Pipe Run - 16

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.013
Channel Slope	0.010 ft/ft
Diameter	24.0 in
Discharge	15.70 cfs

Results	
Normal Depth	14.7 in
Flow Area	2.0 ft²
Wetted Perimeter	3.6 ft
Hydraulic Radius	6.7 in
Top Width	1.95 ft
Critical Depth	17.1 in
Percent Full	61.3 %
Critical Slope	0.007 ft/ft
Velocity	7.78 ft/s
Velocity Head	0.94 ft
Specific Energy	2.17 ft
Froude Number	1.347
Maximum Discharge	24.33 cfs
Discharge Full	22.62 cfs
Slope Full	0.005 ft/ft
Flow Type	Supercritical

GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	61.3 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	14.7 in
Critical Depth	17.1 in
Channel Slope	0.010 ft/ft
Critical Slope	0.007 ft/ft

Worksheet for Pipe Run - 17

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	0.008 ft/ft
Diameter	42.0 in
Discharge	95.00 cfs

Results

Normal Depth	38.1 in
Flow Area	9.2 ft²
Wetted Perimeter	8.8 ft
Hydraulic Radius	12.5 in
Top Width	2.03 ft
Critical Depth	36.1 in
Percent Full	90.8 %
Critical Slope	0.008 ft/ft
Velocity	10.35 ft/s
Velocity Head	1.67 ft
Specific Energy	4.84 ft
Froude Number	0.858
Maximum Discharge	95.58 cfs
Discharge Full	88.85 cfs
Slope Full	0.009 ft/ft
Flow Type	Subcritical

GVF Input Data

Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data

Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	39.3 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	38.1 in
Critical Depth	36.1 in
Channel Slope	0.008 ft/ft
Critical Slope	0.008 ft/ft

If nothing on the pond is being updated specifically with this SF2237 (no pond updates shown on CDs), calcs can be removed or label each sheet clearly as "for information only." And then if needed, the drainage report(s) with those calcs can be referenced in the text of this report.

Pond calculations need to remain in report, as it covers 2 projects SF2236 & SF2237 - Include note that Pond is built as part of Project SF2236

DETENTION & STORMWATER QUALITY POND

Include summary table of all basins tributary to pond along with areas and % impervious to get a total overall % impervious for both design scenarios.

Spreadsheets will be reviewed with next submittal when % impervious has been updated.

Include design of trickle channel

CLASSIC CONSULTING ENGINEERS & SURVEYORS

Worksheet Protected

Site-Level Low Impact Development (LID) Design Effective Impervious Calculator
LID Credit by Impervious Reduction Factor (IRF) Method

UD-BMP (Version 3.06, November 2016)

User Input

Calculated cells

***Design Storm: 1-Hour Rain Depth	WQCV Event	0.53	inches
***Minor Storm: 1-Hour Rain Depth	5-Year Event	1.50	inches
***Major Storm: 1-Hour Rain Depth	100-Year Event	2.52	inches
Optional User Defined Storm	CUHP		
(CUHP) NOAA 1 Hour Rainfall Depth and Frequency for User Defined Storm	100-Year Event	2.52	
Max Intensity for Optional User Defined Storm	2.51496		

Designer: dlg
Company: Classic Consulting
Date: August 17, 2020
Project: Foursquare at Sterling Ranch East Filing No. 1 & Sterling Ranch East Filing No. 2
Location: Pond 16 INTERIM

SITE INFORMATION (USER-INPUT)

Sub-basin Identifier	**FIL 1A**	**FSQ**												
Receiving Pervious Area Soil Type	Sand	Sand												
Total Area (ac., Sum of DCIA, UIA, RPA, & SPA)	7.470	35.040												
Directly Connected Impervious Area (DCIA, acres)	2.480	8.140												
Unconnected Impervious Area (UIA, acres)	2.760	5.700												
Receiving Pervious Area (RPA, acres)	2.230	6.730												
Separate Pervious Area (SPA, acres)	0.000	14.470												
RPA Treatment Type: Conveyance (C), Volume (V), or Permeable Pavement (PP)	C	C												

CALCULATED RESULTS (OUTPUT)

Total Calculated Area (ac, check against input)	7.470	35.040												
Directly Connected Impervious Area (DCIA, %)	33.2%	23.2%												
Unconnected Impervious Area (UIA, %)	36.9%	16.3%												
Receiving Pervious Area (RPA, %)	29.9%	19.2%												
Separate Pervious Area (SPA, %)	0.0%	41.3%												
A_R (RPA / UIA)	0.808	1.181												
I_a Check	0.550	0.460												
f / I for WQCV Event:	11.0	11.0												
f / I for 5-Year Event:	0.6	0.6												
f / I for 100-Year Event:	0.6	0.6												
f / I for Optional User Defined Storm CUHP:	0.57	0.57												
IRF for WQCV Event:	0.63	0.58												
IRF for 5-Year Event:	0.87	0.85												
IRF for 100-Year Event:	0.88	0.86												
IRF for Optional User Defined Storm CUHP:	0.88	0.86												
Total Site Imperviousness: I_{total}	70.1%	39.5%												
Effective Imperviousness for WQCV Event:	56.6%	32.7%												
Effective Imperviousness for 5-Year Event:	65.3%	37.1%												
Effective Imperviousness for 100-Year Event:	65.7%	37.3%												
Effective Imperviousness for Optional User Defined Storm CUHP:	65.7%	37.3%												

LID / EFFECTIVE IMPERVIOUSNESS CREDITS

WQCV Event CREDIT: Reduce Detention By:	18.3%	10.5%	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
This line only for 10-Year Event	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
100-Year Event CREDIT**: Reduce Detention By:	6.0%	5.7%	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
User Defined CUHP CREDIT: Reduce Detention By:	8.0%	4.4%												

Total Site Imperviousness:	**44.9%**
Total Site Effective Imperviousness for WQCV Event:	**36.9%**
Total Site Effective Imperviousness for 5-Year Event:	**42.0%**
Total Site Effective Imperviousness for 100-Year Event:	**42.3%**
Total Site Effective Imperviousness for Optional User Defined Storm CUHP:	**42.3%**

Notes:

* Use Green-Ampt average infiltration rate values from Table 3-3.

** Flood control detention volume credits based on empirical equations from Storage Chapter of USDCM.

*** Method assumes that 1-hour rainfall depth is equivalent to 1-hour intensity for calculation purposed

Design Procedure Form: Extended Detention Basin (EDB)

UD-BMP (Version 3.06, November 2016)

Designer: DLG
Company: CLASSIC CONSULTING ENGINEERS
Date: December 7, 2022
Project: STERLING RANCH EAST FILING NO. 2 & FOURSQUARE AT STERLING RANCH EAST FILING NO. 1
Location: POND 16

INTERIM

1. Basin Storage Volume	
A) Effective Imperviousness of Tributary Area, I_a	I_a = 42.3 %
B) Tributary Area's Imperviousness Ratio ($i = I_a / 100$)	i = 0.423
C) Contributing Watershed Area	Area = 42.510 ac
D) For Watersheds Outside of the Denver Region, Depth of Average Runoff Producing Storm	d_6 = 0.42 in
E) Design Concept (Select EURV when also designing for flood control)	Choose One: ○ Water Quality Capture Volume (WQCV) ◉ Excess Urban Runoff Volume (EURV)
F) Design Volume (WQCV) Based on 40-hour Drain Time ($V_{DESIGN} = (1.0 * (0.91 * i^3 - 1.19 * i^2 + 0.78 * i) / 12 * Area)$)	V_{DESIGN}= 0.659 ac-ft
G) For Watersheds Outside of the Denver Region, Water Quality Capture Volume (WQCV) Design Volume ($V_{WQCV\ OTHER} = (d_6*(V_{DESIGN}/0.43))$)	$V_{DESIGN\ OTHER}$= 0.643 ac-ft
H) User Input of Water Quality Capture Volume (WQCV) Design Volume (Only if a different WQCV Design Volume is desired)	$V_{DESIGN\ USER}$= ac-ft
I) Predominant Watershed NRCS Soil Group	Choose One: ◉ A ○ B ○ C / D
J) Excess Urban Runoff Volume (EURV) Design Volume For HSG A: $EURV_A = 1.68 * i^{1.28}$ For HSG B: $EURV_B = 1.36 * i^{1.08}$ For HSG C/D: $EURV_{C/D} = 1.20 * i^{1.08}$	EURV = 1.978 ac-f t
2. Basin Shape: Length to Width Ratio (A basin length to width ratio of at least 2:1 will improve TSS reduction.)	L : W = 2.0 : 1
3. Basin Side Slopes	
A) Basin Maximum Side Slopes (Horizontal distance per unit vertical, 4:1 or flatter preferred)	Z = 4.00 ft / ft
4. Inlet	
A) Describe means of providing energy dissipation at concentrated inflow locations:	

Design Procedure Form: Extended Detention Basin (EDB)

Designer:	**DLG**
Company:	**CLASSIC CONSULTING ENGINEERS**
Date:	**December 7, 2022**
Project:	**STERLING RANCH EAST FILING NO. 2 & FOURSQUARE AT STERLING RANCH EAST FILING NO. 1**
Location:	**POND 16**

5. Forebay

A) Minimum Forebay Volume (V_{FMIN} = 3% of the WQCV)	V_{FMIN} =	0.019	ac-ft
B) Actual Forebay Volume	V_F =	0.190	ac-ft
C) Forebay Depth (D_F = 18 inch maximum)	D_F =	12.0	in
D) Forebay Discharge			
i) Undetained 100-year Peak Discharge	Q_{100} =	92.70	cfs
ii) Forebay Discharge Design Flow ($Q_F = 0.02 * Q_{100}$)	Q_F =	1.85	cfs
E) Forebay Discharge Design	Choose One: ○ Berm With Pipe; ● Wall with Rect. Notch; ○ Wall with V-Notch Weir		**(flow too small for berm w/ pipe)**
F) Discharge Pipe Size (minimum 8-inches)	Calculated D_P =		in
G) Rectangular Notch Width	Calculated W_N =	9.1	in

6. Trickle Channel

A) Type of Trickle Channel	Choose One: ○ Concrete; ○ Soft Bottom		
F) Slope of Trickle Channel	S =	0.0050	ft / ft

7. Micropool and Outlet Structure

A) Depth of Micropool (2.5-feet minimum)	D_M =	2.5	ft
B) Surface Area of Micropool (10 ft^2 minimum)	A_M =	650	sq ft
C) Outlet Type	Choose One: ● Orifice Plate; ○ Other (Describe):		
D) Smallest Dimension of Orifice Opening Based on Hydrograph Routing (Use UD-Detention)	$D_{orifice}$ =	3.47	inches
E) Total Outlet Area	A_{ot} =	42.47	square inches

Design Procedure Form: Extended Detention Basin (EDB)

Designer:	**DLG**
Company:	**CLASSIC CONSULTING ENGINEERS**
Date:	**December 7, 2022**
Project:	**STERLING RANCH EAST FILING NO. 2 & FOURSQUARE AT STERLING RANCH EAST FILING NO. 1**
Location:	**POND 16**

8. Initial Surcharge Volume	
A) Depth of Initial Surcharge Volume (Minimum recommended depth is 4 inches)	D_{IS} = 6 in
B) Minimum Initial Surcharge Volume (Minimum volume of 0.3% of the WQCV)	V_{IS} = 84.1 cu ft
C) Initial Surcharge Provided Above Micropool	V_s= 325.0 cu ft
9. Trash Rack	
A) Water Quality Screen Open Area: $A_t = A_{ot} * 38.5*(e^{-0.095D})$	A_t = 1,176 square inches
B) Type of Screen (If specifying an alternative to the materials recommended in the USDCM, indicate "other" and enter the ratio of the total open are to the total screen are for the material specified.) Other (Y/N): N	*Aluminum Amico-Klemp SR Series with Cross Rods 2" O.C.*
C) Ratio of Total Open Area to Total Area (only for type 'Other')	User Ratio =
D) Total Water Quality Screen Area (based on screen type)	A_{total} = 1656 sq. in.
E) Depth of Design Volume (EURV or WQCV) (Based on design concept chosen under 1E)	H= 10 feet
F) Height of Water Quality Screen (H_{TR})	H_{TR}= 148 inches
G) Width of Water Quality Screen Opening ($W_{opening}$) (Minimum of 12 inches is recommended)	$W_{opening}$ = 12.0 inches

Design Procedure Form: Extended Detention Basin (EDB)

Designer: DLG
Company: CLASSIC CONSULTING ENGINEERS
Date: December 7, 2022
Project: STERLING RANCH EAST FILING NO. 2 & FOURSQUARE AT STERLING RANCH EAST FILING NO. 1
Location: POND 16

10. Overflow Embankment

A) Describe embankment protection for 100-year and greater overtopping:

B) Slope of Overflow Embankment
(Horizontal distance per unit vertical, 4:1 or flatter preferred)

11. Vegetation

Choose One
- (●) Irrigated
- ( ) Not Irrigated

AVOID PLACING IRRIGATION HEADS IN THE BOTTOM OF THE BASIN

12. Access

A) Describe Sediment Removal Procedures

Notes:

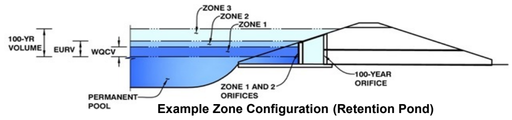
DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.05 (January 2022)

Use newer version of spreadsheet dated August 2022

Project: **STERLING RANCH EAST FILING NO. 2 & FOURSQUARE AT STERLING RANCH EAST FILING NO. 1**

Basin ID: **POND FSD-16 INTERIM**



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	**EDB**			
Watershed Area =	42.51	acres		
Watershed Length =	1,800	ft		
Watershed Length to Centroid =	900	ft		
Watershed Slope =	0.040	ft/ft		
Watershed Imperviousness =	42.30%	percent		
Percentage Hydrologic Soil Group A =	100.0%	percent		
Percentage Hydrologic Soil Group B =	0.0%	percent		
Percentage Hydrologic Soil Groups C/D =	0.0%	percent		
Target WQCV Drain Time =	40.0	hours		
Location for 1-hr Rainfall Depths = User Input				

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	0.659	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	1.978	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	1.490	acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	1.999	acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	2.405	acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	3.135	acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	3.848	acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	4.774	acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 3.48 in.) =	7.951	acre-feet	3.48	inches
Approximate 2-yr Detention Volume =	1.263	acre-feet		
Approximate 5-yr Detention Volume =	1.670	acre-feet		
Approximate 10-yr Detention Volume =	2.054	acre-feet		
Approximate 25-yr Detention Volume =	2.539	acre-feet		
Approximate 50-yr Detention Volume =	2.862	acre-feet		
Approximate 100-yr Detention Volume =	3.296	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.659	acre-feet
Zone 2 Volume (EURV - Zone 1) =	1.320	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	1.318	acre-feet
Total Detention Basin Volume =	3.296	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	**user**	acre-feet

Depth Increement = ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	1,027	0.024		
7092	--	0.50	--	--	--	1,027	0.024	514	0.012
7094	--	2.50	--	--	--	18,288	0.420	19,828	0.455
7096	--	4.50	--	--	--	54,450	1.250	92,566	2.125
7098	--	6.50	--	--	--	89,516	2.055	236,532	5.430
7100	--	8.50	--	--	--	106,783	2.451	432,831	9.936
7102	--	10.50	--	--	--	185,108	4.249	724,722	16.637
7104	--	12.50	--	--	--	263,928	6.059	1,173,758	26.946
7106	--	14.50	--	--	--	343,298	7.881	1,780,984	40.886
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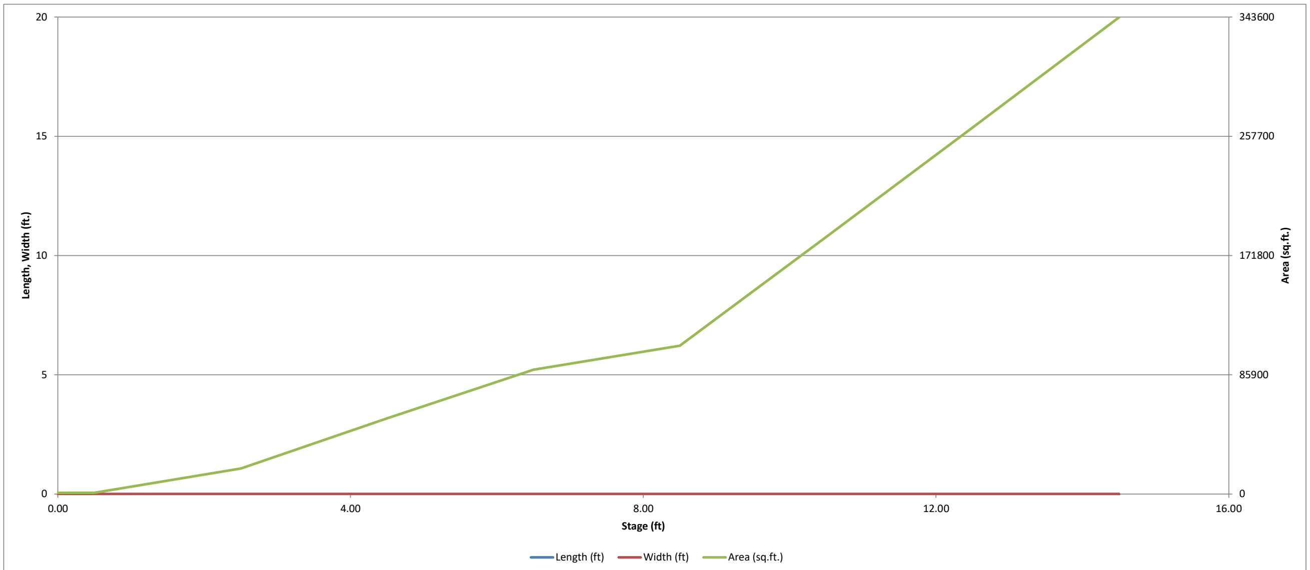
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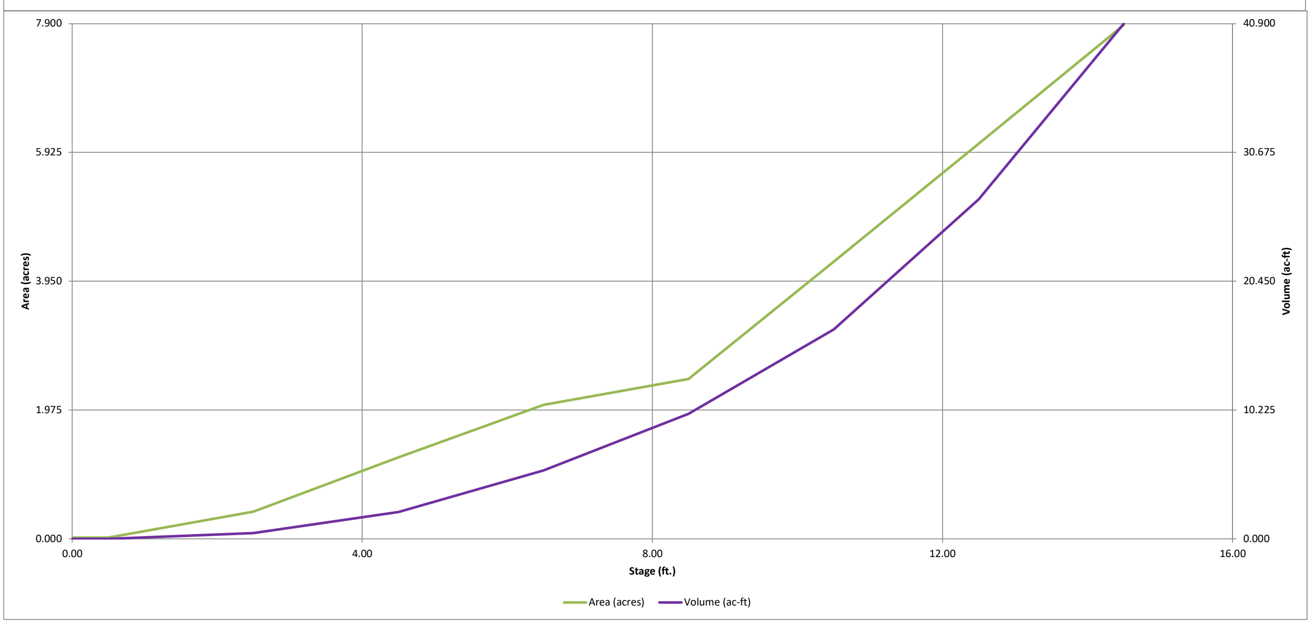
15
10
5
0
Length, Width (ft.)
343600
257700
171800
85900
0
Area (sq.ft.)
0.00
4.00
8.00
12.00
16.00
Stage (ft)
Length (ft)
Width (ft)
Area (sq.ft.)


7.900
5.925
3.950
1.975
0.000
Area (acres)
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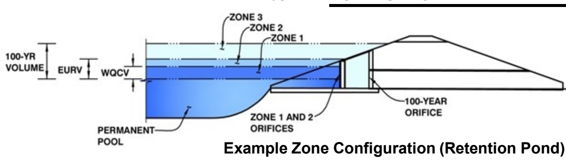
30.675
20.450
10.225
0.000
Volume (ac-ft)
0.00
4.00
8.00
12.00
16.00
Stage (ft.)
Area (acres)
Volume (ac-ft)

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.05 (January 2022)

Project: STERLING RANCH EAST FILING NO. 2 & FOURSQUARE AT STERLING RANCH EAST FILING NO. 1

Basin ID: POND FSD-16 INTERIM



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.91	0.659	Orifice Plate
Zone 2 (EURV)	4.39	1.320	Orifice Plate
Zone 3 (100-year)	5.33	1.318	Weir&Pipe (Restrict)
Total (all zones)		3.296	

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

				Calculated Parameters for Underdrain		
Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)		Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Diameter =	N/A	inches		Underdrain Orifice Centroid =	N/A	feet

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

				Calculated Parameters for Plate		
Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)		WQ Orifice Area per Row =	N/A	ft^2
Depth at top of Zone using Orifice Plate =	10.00	ft (relative to basin bottom at Stage = 0 ft)		Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	30.00	inches		Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	N/A	sq. inches		Elliptical Slot Area =	N/A	ft^2

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	2.50	5.00	7.50				
Orifice Area (sq. inches)	3.50	8.00	18.00	18.00				

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

User Input: Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected		Calculated Parameters for Vertical Orifice	Not Selected	Not Selected	
Invert of Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	N/A	N/A	ft^2
Depth at top of Zone using Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	N/A	N/A	feet
Vertical Orifice Diameter =	N/A	N/A	inches				

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

	Zone 3 Weir	Not Selected		Calculated Parameters for Overflow Weir	Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	10.00	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	10.00	N/A	feet
Overflow Weir Front Edge Length =	20.00	N/A	feet	Overflow Weir Slope Length =	4.00	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	8.01	N/A	
Horiz. Length of Weir Sides =	4.00	N/A	feet	Overflow Grate Open Area w/o Debris =	55.68	N/A	ft^2
Overflow Grate Type =	Type C Grate	N/A		Overflow Grate Open Area w/ Debris =	27.84	N/A	ft^2
Debris Clogging % =	50%	N/A	%				

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

	Zone 3 Restrictor	Not Selected		Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate	Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	2.50	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	6.95	N/A	ft^2
Outlet Pipe Diameter =	48.00	N/A	inches	Outlet Orifice Centroid =	1.24	N/A	feet
Restrictor Plate Height Above Pipe Invert =	26.00		inches	Half-Central Angle of Restrictor Plate on Pipe =	1.65	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

			Calculated Parameters for Spillway		
Spillway Invert Stage=	12.00	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.99	feet
Spillway Crest Length =	165.00	feet	Stage at Top of Freeboard =	13.99	feet
Spillway End Slopes =	6.00	H:V	Basin Area at Top of Freeboard =	7.42	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	36.98	acre-ft

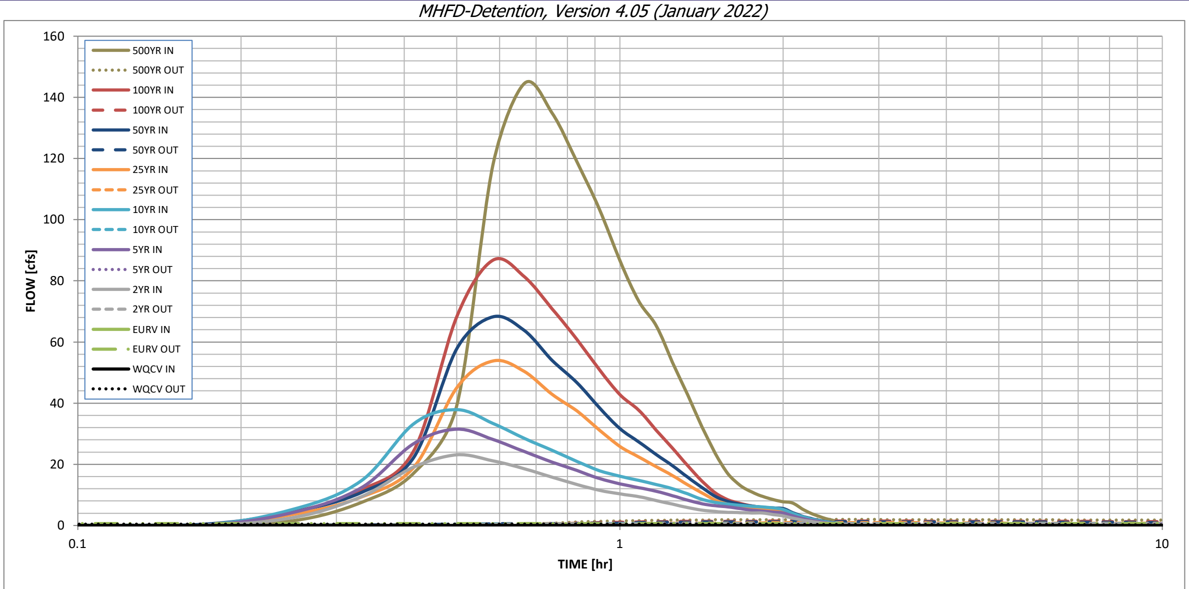
Routed Hydrograph Results

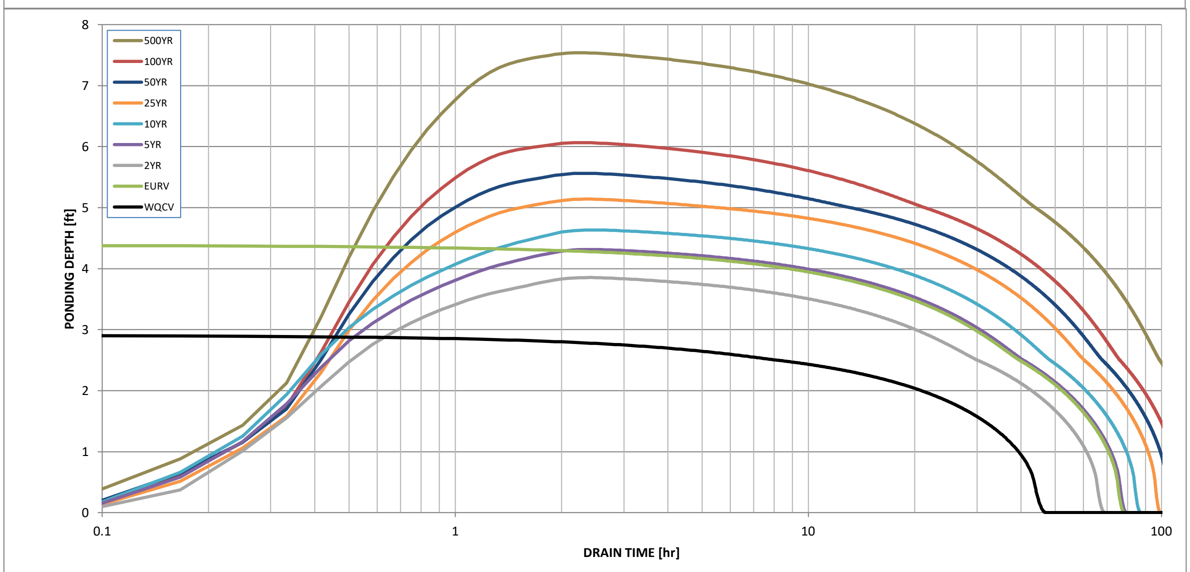
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

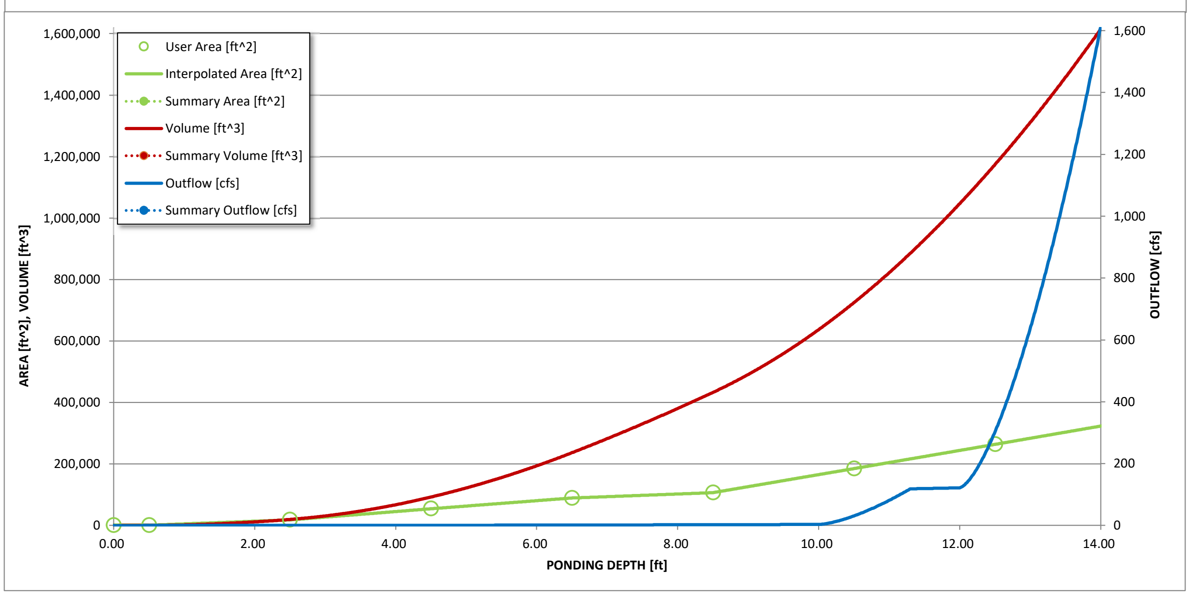
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.48
CUHP Runoff Volume (acre-ft) =	0.659	1.978	1.490	1.999	2.405	3.135	3.848	4.774	7.951
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	1.490	1.999	2.405	3.135	3.848	4.774	7.951
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.4	0.7	1.0	9.4	18.8	30.7	69.3
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.02	0.02	0.22	0.44	0.72	1.63
Peak Inflow Q (cfs) =	N/A	N/A	23.1	31.5	37.9	53.8	68.2	86.8	144.6
Peak Outflow Q (cfs) =	0.4	0.6	0.5	0.6	0.6	0.9	1.2	1.4	2.0
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.8	0.6	0.1	0.1	0.0	0.0
Structure Controlling Flow =	Plate	Plate	Plate	Plate	Plate	Plate	Plate	Plate	Plate
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	43	70	62	71	77	87	93	99	114
Time to Drain 99% of Inflow Volume (hours) =	**45**	74	65	75	82	94	100	108	>120
Maximum Ponding Depth (ft) =	2.91	4.38	3.85	4.31	4.63	5.14	5.56	6.06	7.54
Area at Maximum Ponding Depth (acres) =	0.59	1.20	0.98	1.17	1.30	1.50	1.68	1.88	2.26
Maximum Volume Stored (acre-ft) =	0.662	1.978	1.400	1.895	2.291	2.992	3.676	4.565	7.652

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.05 (January 2022)







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

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename:

Inflow Hydrographs

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

	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.30	0.03	1.50
	0:15:00	0.00	0.00	2.63	4.28	5.34	3.60	4.52	4.43	7.48
	0:20:00	0.00	0.00	9.41	12.34	14.59	9.25	10.81	11.61	17.13
	0:25:00	0.00	0.00	19.09	26.79	33.24	19.04	22.31	24.50	39.16
	0:30:00	0.00	0.00	23.07	31.46	37.88	45.01	57.73	68.23	117.81
	0:35:00	0.00	0.00	21.11	28.10	33.40	53.82	68.23	86.78	144.59
	0:40:00	0.00	0.00	18.55	24.12	28.48	50.28	63.68	81.27	134.88
	0:45:00	0.00	0.00	15.76	20.74	24.58	42.86	53.94	70.85	118.91
	0:50:00	0.00	0.00	13.39	17.95	20.95	37.41	46.71	60.78	103.43
	0:55:00	0.00	0.00	11.52	15.31	17.92	31.19	38.53	50.94	86.65
	1:00:00	0.00	0.00	10.30	13.61	16.10	25.87	31.65	42.81	73.33
	1:05:00	0.00	0.00	9.42	12.37	14.72	22.40	27.30	37.66	65.36
	1:10:00	0.00	0.00	8.15	11.20	13.38	19.20	23.19	31.16	53.40
	1:15:00	0.00	0.00	6.94	9.75	12.01	16.32	19.52	25.29	42.64
	1:20:00	0.00	0.00	5.86	8.25	10.32	13.30	15.74	19.54	32.35
	1:25:00	0.00	0.00	5.03	7.07	8.53	10.68	12.43	14.55	23.52
	1:30:00	0.00	0.00	4.54	6.42	7.52	8.27	9.47	10.61	16.86
	1:35:00	0.00	0.00	4.31	6.09	6.95	6.89	7.84	8.38	13.10
	1:40:00	0.00	0.00	4.18	5.50	6.53	6.11	6.91	7.18	10.93
	1:45:00	0.00	0.00	4.10	5.02	6.23	5.62	6.34	6.39	9.45
	1:50:00	0.00	0.00	4.04	4.67	6.02	5.28	5.95	5.87	8.46
	1:55:00	0.00	0.00	3.56	4.40	5.74	5.06	5.70	5.49	7.76
	2:00:00	0.00	0.00	3.13	4.09	5.23	4.90	5.51	5.24	7.28
	2:05:00	0.00	0.00	2.38	3.11	3.97	3.74	4.20	3.94	5.44
	2:10:00	0.00	0.00	1.76	2.29	2.89	2.73	3.05	2.87	3.94
	2:15:00	0.00	0.00	1.30	1.68	2.11	1.99	2.23	2.10	2.87
	2:20:00	0.00	0.00	0.94	1.22	1.53	1.45	1.62	1.54	2.10
	2:25:00	0.00	0.00	0.68	0.86	1.10	1.03	1.15	1.09	1.48
	2:30:00	0.00	0.00	0.47	0.60	0.77	0.72	0.81	0.77	1.04
	2:35:00	0.00	0.00	0.32	0.42	0.54	0.51	0.57	0.54	0.73
	2:40:00	0.00	0.00	0.20	0.28	0.35	0.34	0.38	0.36	0.47
	2:45:00	0.00	0.00	0.11	0.17	0.20	0.20	0.22	0.21	0.27
	2:50:00	0.00	0.00	0.05	0.09	0.09	0.10	0.11	0.10	0.13
	2:55:00	0.00	0.00	0.02	0.03	0.03	0.03	0.03	0.03	0.04
	3:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Worksheet Protected

Site-Level Low Impact Development (LID) Design Effective Impervious Calculator

LID Credit by Impervious Reduction Factor (IRF) Method

UD-BMP (Version 3.06, November 2016)

User Input

Calculated cells

***Design Storm: 1-Hour Rain Depth	WQCV Event	0.53	inches
***Minor Storm: 1-Hour Rain Depth	5-Year Event	1.50	inches
***Major Storm: 1-Hour Rain Depth	100-Year Event	2.52	inches
Optional User Defined Storm	CUHP		
(CUHP) NOAA 1 Hour Rainfall Depth and Frequency for User Defined Storm	100-Year Event	2.52	
Max Intensity for Optional User Defined Storm	2.51496		

Designer: dlg
Company: Classic Consulting
Date: August 17, 2020
Project: Foursquare at Sterling Ranch East Filing No. 1 & Sterling Ranch East Filing No. 2
Location: Pond 16 ULTIMATE

SITE INFORMATION (USER-INPUT)

Sub-basin Identifier	FIL 1A	FSQ	FUTURE										
Receiving Pervious Area Soil Type	Sand	Sand	Sand										
Total Area (ac., Sum of DCIA, UIA, RPA, & SPA)	7.470	35.040	178.390										
Directly Connected Impervious Area (DCIA, acres)	2.480	8.140	25.950										
Unconnected Impervious Area (UIA, acres)	2.760	5.700	72.810										
Receiving Pervious Area (RPA, acres)	2.230	6.730	58.630										
Separate Pervious Area (SPA, acres)	0.000	14.470	21.000										
RPA Treatment Type: Conveyance (C), Volume (V), or Permeable Pavement (PP)	C	C	C										

CALCULATED RESULTS (OUTPUT)

Total Calculated Area (ac, check against input)	7.470	35.040	178.390										
Directly Connected Impervious Area (DCIA, %)	33.2%	23.2%	14.5%										
Unconnected Impervious Area (UIA, %)	36.9%	16.3%	40.8%										
Receiving Pervious Area (RPA, %)	29.9%	19.2%	32.9%										
Separate Pervious Area (SPA, %)	0.0%	41.3%	11.8%										
A_R (RPA / UIA)	0.808	1.181	0.805										
I_a Check	0.550	0.460	0.550										
f / I for WQCV Event:	11.0	11.0	11.0										
f / I for 5-Year Event:	0.6	0.6	0.6										
f / I for 100-Year Event:	0.6	0.6	0.6										
f / I for Optional User Defined Storm CUHP:	0.57	0.57	0.57										
IRF for WQCV Event:	0.63	0.58	0.63										
IRF for 5-Year Event:	0.87	0.85	0.87										
IRF for 100-Year Event:	0.88	0.86	0.88										
IRF for Optional User Defined Storm CUHP:	0.88	0.86	0.88										
Total Site Imperviousness: I_{total}	70.1%	39.5%	55.4%										
Effective Imperviousness for WQCV Event:	56.6%	32.7%	40.4%										
Effective Imperviousness for 5-Year Event:	65.3%	37.1%	50.0%										
Effective Imperviousness for 100-Year Event:	65.7%	37.3%	50.5%										
Effective Imperviousness for Optional User Defined Storm CUHP:	65.7%	37.3%	50.5%										

LID / EFFECTIVE IMPERVIOUSNESS CREDITS

WQCV Event CREDIT: Reduce Detention By:	18.3%	10.5%	18.3%	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
This line only for 10-Year Event	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
100-Year Event CREDIT**: Reduce Detention By:	6.0%	5.7%	8.6%	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
User Defined CUHP CREDIT: Reduce Detention By:	8.0%	4.4%	8.6%											

Total Site Imperviousness:	**53.3%**
Total Site Effective Imperviousness for WQCV Event:	**39.8%**
Total Site Effective Imperviousness for 5-Year Event:	**48.4%**
Total Site Effective Imperviousness for 100-Year Event:	**48.9%**
Total Site Effective Imperviousness for Optional User Defined Storm CUHP:	**48.9%**

Notes:

* Use Green-Ampt average infiltration rate values from Table 3-3.

** Flood control detention volume credits based on empirical equations from Storage Chapter of USDCM.

*** Method assumes that 1-hour rainfall depth is equivalent to 1-hour intensity for calculation purposed

Design Procedure Form: Extended Detention Basin (EDB)

UD-BMP (Version 3.06, November 2016)

Designer:	**DLG**
Company:	**CLASSIC CONSULTING**
Date:	**December 7, 2022**
Project:	**STERLING RANCH EAST FILING NO. 2 & FOURSQUARE AT STERLING RANCH EAST FILING NO. 1**
Location:	**POND 16 ULTIMATE**

1. Basin Storage Volume	
A) Effective Imperviousness of Tributary Area, I_a	I_a = 48.9 %
B) Tributary Area's Imperviousness Ratio (i = I_a / 100)	i = 0.489
C) Contributing Watershed Area	Area = 220.900 ac
D) For Watersheds Outside of the Denver Region, Depth of Average Runoff Producing Storm	d_6 = 0.42 in
E) Design Concept (Select EURV when also designing for flood control)	Choose One ○ Water Quality Capture Volume (WQCV) ◉ Excess Urban Runoff Volume (EURV)
F) Design Volume (WQCV) Based on 40-hour Drain Time ($V_{DESIGN} = (1.0 * (0.91 * i^3 - 1.19 * i^2 + 0.78 * i) / 12 * Area$)	V_{DESIGN}= 3.742 ac-ft
G) For Watersheds Outside of the Denver Region, Water Quality Capture Volume (WQCV) Design Volume ($V_{WQCV\ OTHER} = (d_6*(V_{DESIGN}/0.43))$	$V_{DESIGN\ OTHER}$= 3.655 ac-ft
H) User Input of Water Quality Capture Volume (WQCV) Design Volume (Only if a different WQCV Design Volume is desired)	$V_{DESIGN\ USER}$= ac-ft
I) Predominant Watershed NRCS Soil Group	Choose One ◉ A ○ B ○ C / D
J) Excess Urban Runoff Volume (EURV) Design Volume For HSG A: $EURV_A = 1.68 * i^{1.28}$ For HSG B: $EURV_B = 1.36 * i^{1.08}$ For HSG C/D: $EURV_{C/D} = 1.20 * i^{1.08}$	EURV = 12.378 ac-f t
2. Basin Shape: Length to Width Ratio (A basin length to width ratio of at least 2:1 will improve TSS reduction.)	L : W = 2.0 : 1
3. Basin Side Slopes	
A) Basin Maximum Side Slopes (Horizontal distance per unit vertical, 4:1 or flatter preferred)	Z = 4.00 ft / ft
4. Inlet	
A) Describe means of providing energy dissipation at concentrated inflow locations:	

Design Procedure Form: Extended Detention Basin (EDB)

Designer:	**DLG**
Company:	**CLASSIC CONSULTING**
Date:	**December 7, 2022**
Project:	**STERLING RANCH EAST FILING NO. 2 & FOURSQUARE AT STERLING RANCH EAST FILING NO. 1**
Location:	**POND 16 ULTIMATE**

5. Forebay	
A) Minimum Forebay Volume (V_{FMIN} = 3% of the WQCV)	V_{FMIN} = 0.110 ac-ft
B) Actual Forebay Volume	V_F = 0.110 ac-ft
C) Forebay Depth (D_F = 30 inch maximum)	D_F = 12.0 in
D) Forebay Discharge	
i) Undetained 100-year Peak Discharge	Q_{100} = 499.00 cfs
ii) Forebay Discharge Design Flow ($Q_F = 0.02 * Q_{100}$)	Q_F = 9.98 cfs
E) Forebay Discharge Design	Choose One: ○ Berm With Pipe; ● Wall with Rect. Notch; ○ Wall with V-Notch Weir
F) Discharge Pipe Size (minimum 8-inches)	Calculated D_P = ___ in
G) Rectangular Notch Width	Calculated W_N = 38.4 in
6. Trickle Channel	Choose One: ● Concrete; ○ Soft Bottom
A) Type of Trickle Channel	
F) Slope of Trickle Channel	S = 0.0050 ft / ft
7. Micropool and Outlet Structure	
A) Depth of Micropool (2.5-feet minimum)	D_M = 2.5 ft
B) Surface Area of Micropool (10 ft^2 minimum)	A_M = 1000 sq ft
C) Outlet Type	Choose One: ● Orifice Plate; ○ Other (Describe):
D) Smallest Dimension of Orifice Opening Based on Hydrograph Routing (Use UD-Detention)	$D_{orifice}$ = 10.00 inches
E) Total Outlet Area	A_{ot} = 54.00 square inches

Design Procedure Form: Extended Detention Basin (EDB)

Designer: DLG
Company: CLASSIC CONSULTING
Date: December 7, 2022
Project: STERLING RANCH EAST FILING NO. 2 & FOURSQUARE AT STERLING RANCH EAST FILING NO. 1
Location: POND 16 ULTIMATE

8. Initial Surcharge Volume

A) Depth of Initial Surcharge Volume
(Minimum recommended depth is 4 inches)
D_{IS} = 6 in

B) Minimum Initial Surcharge Volume
(Minimum volume of 0.3% of the WQCV)
V_{IS} = 477.6 cu ft

C) Initial Surcharge Provided Above Micropool
V_s= 500.0 cu ft

9. Trash Rack

A) Water Quality Screen Open Area: $A_t = A_{ot} * 38.5*(e^{-0.095D})$
A_t = 804 square inches

B) Type of Screen (If specifying an alternative to the materials recommended in the USDCM, indicate "other" and enter the ratio of the total open are to the total screen are for the material specified.)
Aluminum Amico-Klemp SR Series with Cross Rods 4" O.C.

Other (Y/N): N

C) Ratio of Total Open Area to Total Area (only for type 'Other')
User Ratio =

D) Total Water Quality Screen Area (based on screen type)
A_{total} = 1044 sq. in.

E) Depth of Design Volume (EURV or WQCV)
(Based on design concept chosen under 1E)
H= 10 feet

F) Height of Water Quality Screen (H_{TR})
H_{TR}= 148 inches

G) Width of Water Quality Screen Opening ($W_{opening}$)
(Minimum of 12 inches is recommended)
$W_{opening}$ = 12.0 inches

Design Procedure Form: Extended Detention Basin (EDB)

Designer:	**DLG**
Company:	**CLASSIC CONSULTING**
Date:	**December 7, 2022**
Project:	**STERLING RANCH EAST FILING NO. 2 & FOURSQUARE AT STERLING RANCH EAST FILING NO. 1**
Location:	**POND 16 ULTIMATE**

10. Overflow Embankment A) Describe embankment protection for 100-year and greater overtopping: B) Slope of Overflow Embankment (Horizontal distance per unit vertical, 4:1 or flatter preferred)	
11. Vegetation	Choose One ○ Irrigated ○ Not Irrigated
12. Access A) Describe Sediment Removal Procedures	

Notes:

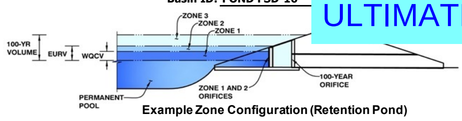
DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.05 (January 2022)

Project: STERLING RANCH EAST FILING NO. 2 & FOURSQUARE AT STERLING RANCH EAST FILING NO. 1

Basin ID: POND FSD-16

ULTIMATE



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	**EDB**	
Watershed Area =	220.90	acres
Watershed Length =	4,000	ft
Watershed Length to Centroid =	2,000	ft
Watershed Slope =	0.040	ft/ft
Watershed Imperviousness =	48.90%	percent
Percentage Hydrologic Soil Group A =	75.0%	percent
Percentage Hydrologic Soil Group B =	25.0%	percent
Percentage Hydrologic Soil Groups C/D =	0.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	3.742	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	12.165	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	9.612	acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	12.723	acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	15.734	acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	20.864	acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	24.964	acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	30.507	acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 3.48 in.) =	48.117	acre-feet	3.48	inches
Approximate 2-yr Detention Volume =	8.133	acre-feet		
Approximate 5-yr Detention Volume =	10.834	acre-feet		
Approximate 10-yr Detention Volume =	13.557	acre-feet		
Approximate 25-yr Detention Volume =	16.099	acre-feet		
Approximate 50-yr Detention Volume =	17.679	acre-feet		
Approximate 100-yr Detention Volume =	19.927	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	3.742	acre-feet
Zone 2 Volume (EURV - Zone 1) =	8.423	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	7.762	acre-feet
Total Detention Basin Volume =	19.927	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	**user**	acre-feet

Depth Increement = ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	1,027	0.024		
7092	--	0.50	--	--	--	1,027	0.024	514	0.012
7094	--	2.50	--	--	--	18,288	0.420	19,828	0.455
7096	--	4.50	--	--	--	54,450	1.250	92,566	2.125
7098	--	6.50	--	--	--	89,516	2.055	236,532	5.430
7100	--	8.50	--	--	--	106,783	2.451	432,831	9.936
7102	--	10.50	--	--	--	185,108	4.249	724,722	16.637
7104	--	12.50	--	--	--	263,928	6.059	1,173,758	26.946
7106	--	14.50	--	--	--	343,298	7.881	1,780,984	40.886
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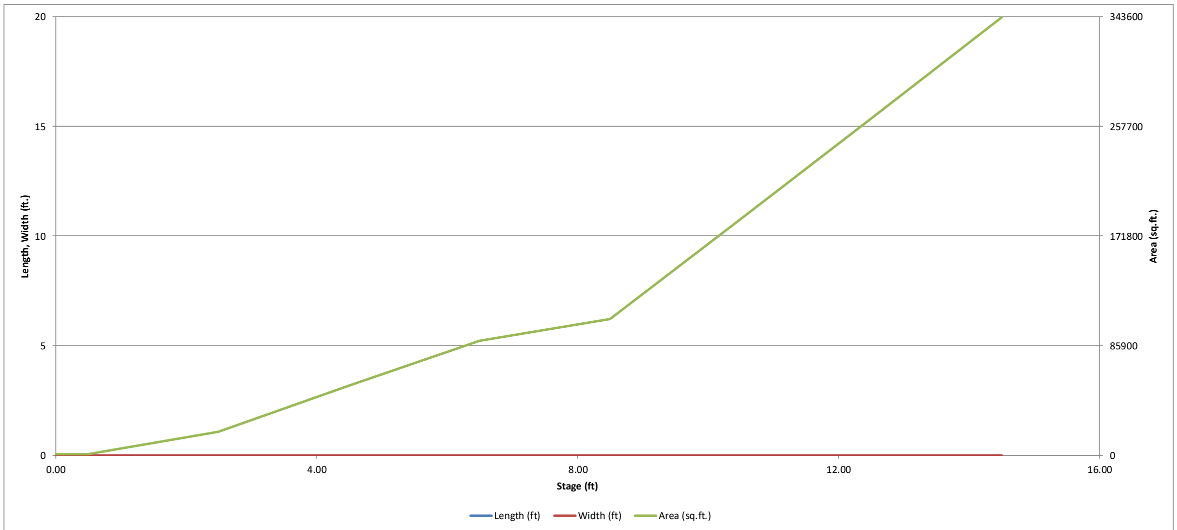
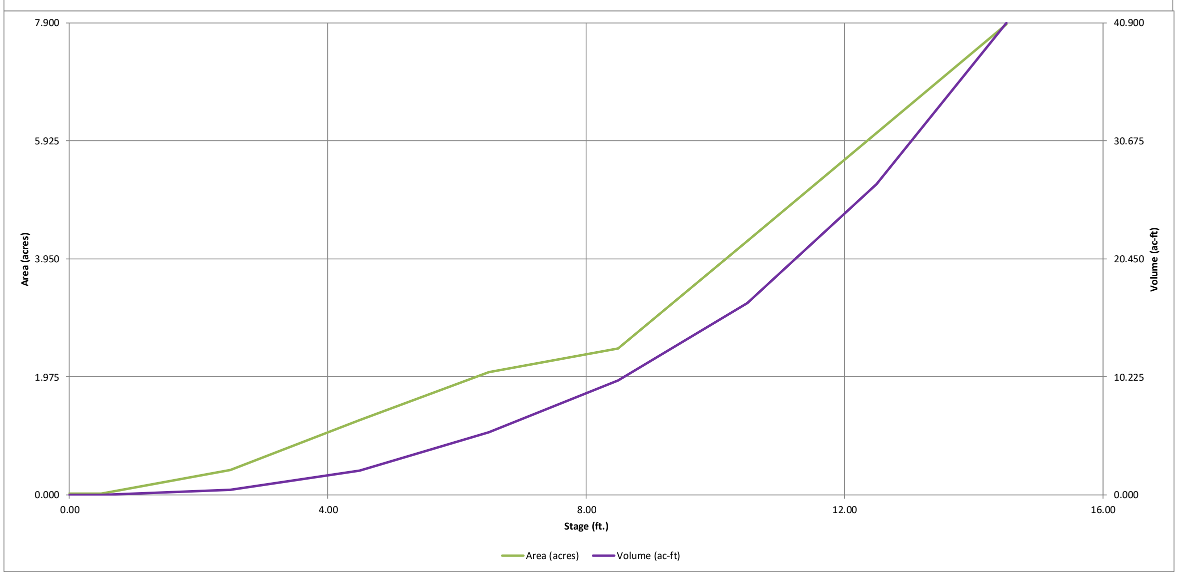
DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.05 (January 2022)



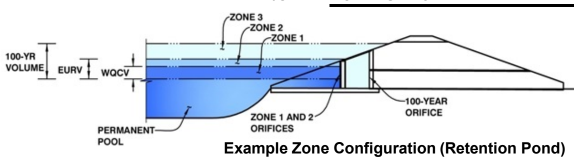


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.05 (January 2022)

Project: STERLING RANCH EAST FILING NO. 2 & FOURSQUARE AT STERLING RANCH EAST FILING NO. 1

Basin ID: POND FSD-16



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	5.60	3.742	Orifice Plate
Zone 2 (EURV)	9.30	8.423	Orifice Plate
Zone 3 (100-year)	11.22	7.762	Weir&Pipe (Restrict)
Total (all zones)		19.927	

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

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

Calculated Parameters for Underdrain

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

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

Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate =	10.00	ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing =	30.00	inches
Orifice Plate: Orifice Area per Row =	N/A	sq. inches

Calculated Parameters for Plate

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

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	2.50	5.00	7.50				
Orifice Area (sq. inches)	10.00	14.00	18.00	18.00				

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

User Input: Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected	
Invert of Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter =	N/A	N/A	inches

Calculated Parameters for Vertical Orifice

	Not Selected	Not Selected	
Vertical Orifice Area =	N/A	N/A	ft^2
Vertical Orifice Centroid =	N/A	N/A	feet

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

	Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	10.00	N/A	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	20.00	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V
Horiz. Length of Weir Sides =	4.00	N/A	feet
Overflow Grate Type =	Type C Grate	N/A	
Debris Clogging % =	50%	N/A	%

Calculated Parameters for Overflow Weir

	Zone 3 Weir	Not Selected	
Height of Grate Upper Edge, H_t =	10.00	N/A	feet
Overflow Weir Slope Length =	4.00	N/A	feet
Grate Open Area / 100-yr Orifice Area =	8.01	N/A	
Overflow Grate Open Area w/o Debris =	55.68	N/A	ft^2
Overflow Grate Open Area w/ Debris =	27.84	N/A	ft^2

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

	Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	2.50	N/A	ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter =	48.00	N/A	inches
Restrictor Plate Height Above Pipe Invert =	26.00		inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 3 Restrictor	Not Selected	
Outlet Orifice Area =	6.95	N/A	ft^2
Outlet Orifice Centroid =	1.24	N/A	feet
Half-Central Angle of Restrictor Plate on Pipe =	1.65	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	12.50	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	165.00	feet
Spillway End Slopes =	6.00	H:V
Freeboard above Max Water Surface =	1.00	feet

Calculated Parameters for Spillway

Spillway Design Flow Depth=	0.99	feet
Stage at Top of Freeboard =	14.49	feet
Basin Area at Top of Freeboard =	7.87	acres
Basin Volume at Top of Freeboard =	40.81	acre-ft

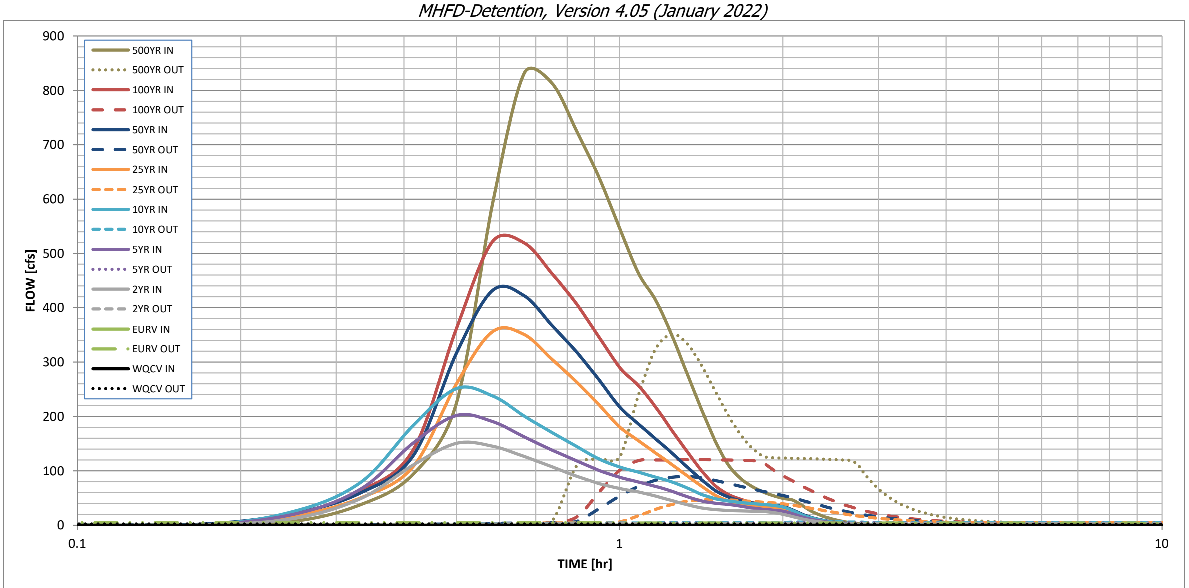
Routed Hydrograph Results

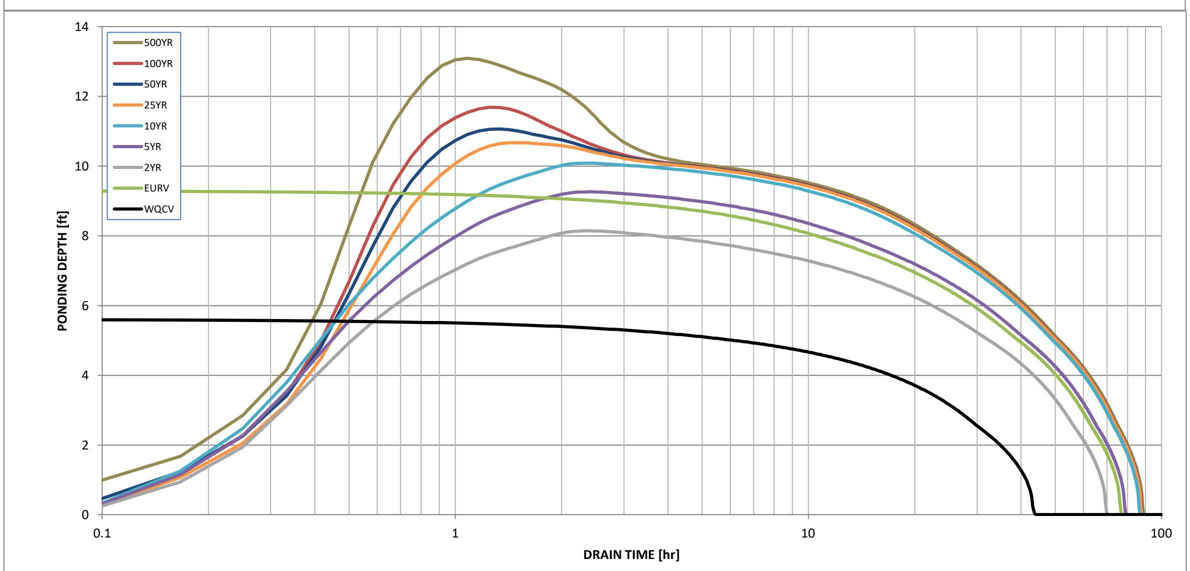
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

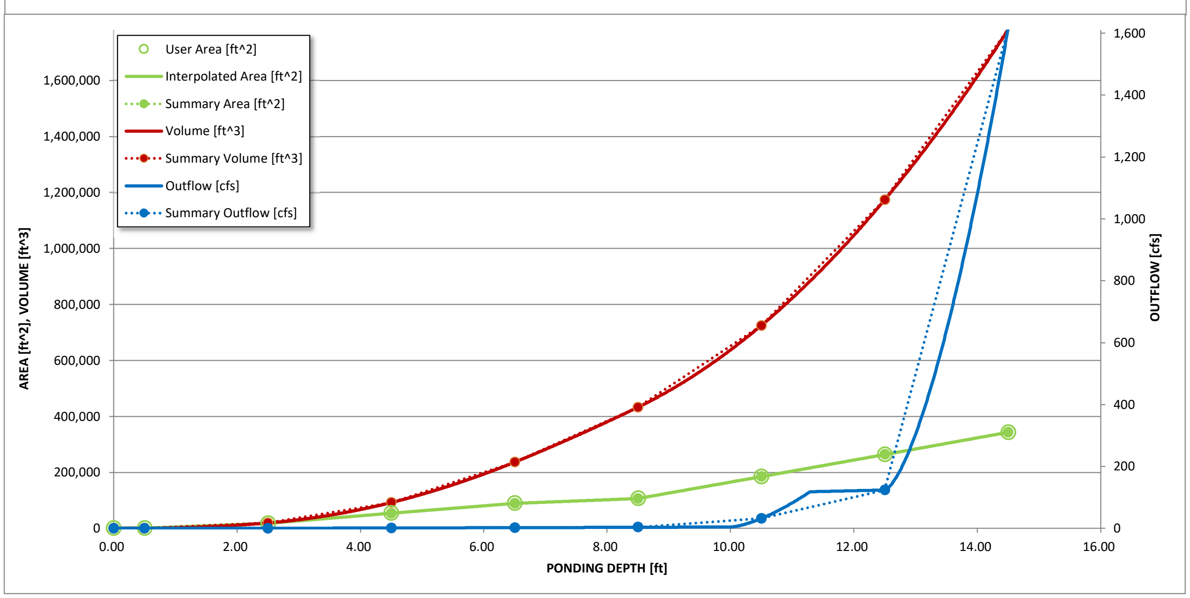
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.48
CUHP Runoff Volume (acre-ft) =	3.742	12.165	9.612	12.723	15.734	20.864	24.964	30.507	48.117
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	9.612	12.723	15.734	20.864	24.964	30.507	48.117
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	2.7	4.5	23.4	95.7	140.7	204.0	401.9
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.02	0.11	0.43	0.64	0.92	1.82
Peak Inflow Q (cfs) =	N/A	N/A	150.6	202.0	251.4	356.3	431.8	522.1	831.8
Peak Outflow Q (cfs) =	2.1	4.3	3.6	4.3	6.4	47.1	89.5	120.4	351.0
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.9	0.3	0.5	0.6	0.6	0.9
Structure Controlling Flow =	Plate	Plate	Plate	Plate	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	0.0	0.8	1.5	2.1	2.2
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	39	66	61	68	73	72	70	69	64
Time to Drain 99% of Inflow Volume (hours) =	**42**	72	66	74	81	81	80	79	75
Maximum Ponding Depth (ft) =	5.60	9.30	8.14	9.26	10.08	10.67	11.06	11.68	13.08
Area at Maximum Ponding Depth (acres) =	1.69	3.17	2.38	3.13	3.86	4.39	4.75	5.32	6.59
Maximum Volume Stored (acre-ft) =	3.744	12.185	9.043	12.028	14.893	17.329	19.111	22.282	30.613

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.05 (January 2022)







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

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename:

Inflow Hydrographs

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

	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	1.41	0.14	6.99
	0:15:00	0.00	0.00	12.21	20.07	24.98	16.83	21.70	20.67	37.86
	0:20:00	0.00	0.00	49.11	66.72	79.33	50.64	59.60	63.19	94.42
	0:25:00	0.00	0.00	111.20	151.82	184.04	108.46	128.80	139.80	224.58
	0:30:00	0.00	0.00	150.58	201.95	251.41	259.91	316.40	362.03	592.28
	0:35:00	0.00	0.00	145.26	190.30	237.77	356.29	431.75	522.15	831.79
	0:40:00	0.00	0.00	126.21	162.37	200.87	350.63	422.14	519.41	813.28
	0:45:00	0.00	0.00	107.35	138.30	170.70	305.16	367.71	463.17	724.72
	0:50:00	0.00	0.00	90.18	118.39	144.43	262.80	318.16	406.47	639.02
	0:55:00	0.00	0.00	76.60	100.58	121.54	220.91	267.11	345.70	546.49
	1:00:00	0.00	0.00	67.44	88.14	107.09	180.79	217.40	290.26	463.21
	1:05:00	0.00	0.00	61.04	79.31	97.31	155.18	186.12	256.61	413.13
	1:10:00	0.00	0.00	53.26	71.33	88.27	132.49	158.30	216.52	348.07
	1:15:00	0.00	0.00	44.89	62.10	79.24	111.15	132.30	173.45	277.16
	1:20:00	0.00	0.00	37.56	52.35	68.40	90.25	106.66	134.49	212.48
	1:25:00	0.00	0.00	31.86	44.41	56.53	71.39	83.51	100.06	155.43
	1:30:00	0.00	0.00	28.64	40.34	48.93	55.02	63.82	72.90	112.14
	1:35:00	0.00	0.00	27.11	38.32	44.73	45.13	52.04	56.99	86.82
	1:40:00	0.00	0.00	26.29	35.19	41.78	39.43	45.14	48.00	71.90
	1:45:00	0.00	0.00	25.79	31.89	39.63	35.92	40.84	41.87	61.48
	1:50:00	0.00	0.00	25.41	29.52	38.17	33.49	37.92	37.83	54.46
	1:55:00	0.00	0.00	23.08	27.78	36.48	31.93	36.06	35.00	49.47
	2:00:00	0.00	0.00	20.13	25.91	33.55	30.83	34.76	33.03	46.07
	2:05:00	0.00	0.00	15.98	20.83	26.66	25.16	28.31	26.61	36.85
	2:10:00	0.00	0.00	11.72	15.13	19.21	18.14	20.36	19.15	26.37
	2:15:00	0.00	0.00	8.55	10.99	13.86	13.11	14.68	13.86	19.02
	2:20:00	0.00	0.00	6.18	7.93	10.00	9.50	10.63	10.10	13.83
	2:25:00	0.00	0.00	4.42	5.54	7.09	6.70	7.49	7.15	9.76
	2:30:00	0.00	0.00	3.05	3.78	4.93	4.66	5.19	4.95	6.75
	2:35:00	0.00	0.00	2.07	2.60	3.42	3.29	3.67	3.50	4.74
	2:40:00	0.00	0.00	1.30	1.72	2.21	2.18	2.42	2.30	3.09
	2:45:00	0.00	0.00	0.72	1.02	1.26	1.29	1.43	1.35	1.79
	2:50:00	0.00	0.00	0.32	0.50	0.58	0.63	0.69	0.65	0.84
	2:55:00	0.00	0.00	0.11	0.16	0.17	0.20	0.22	0.20	0.25
	3:00:00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
	3:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Figure 13-12c. Emergency Spillway Protection

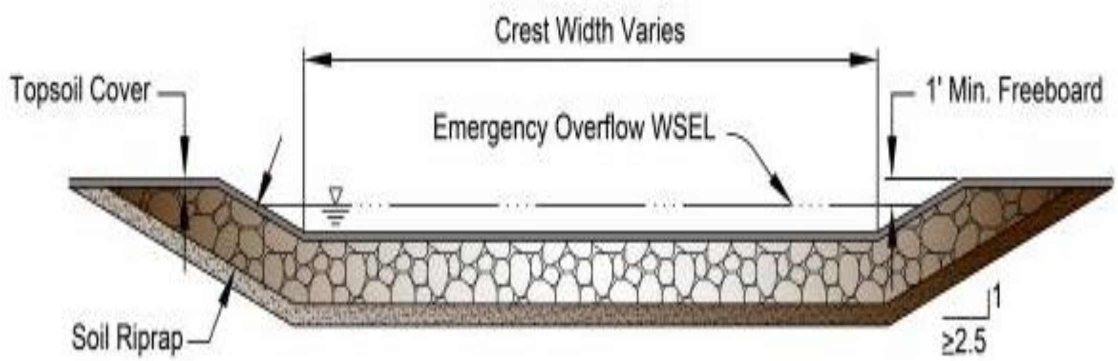
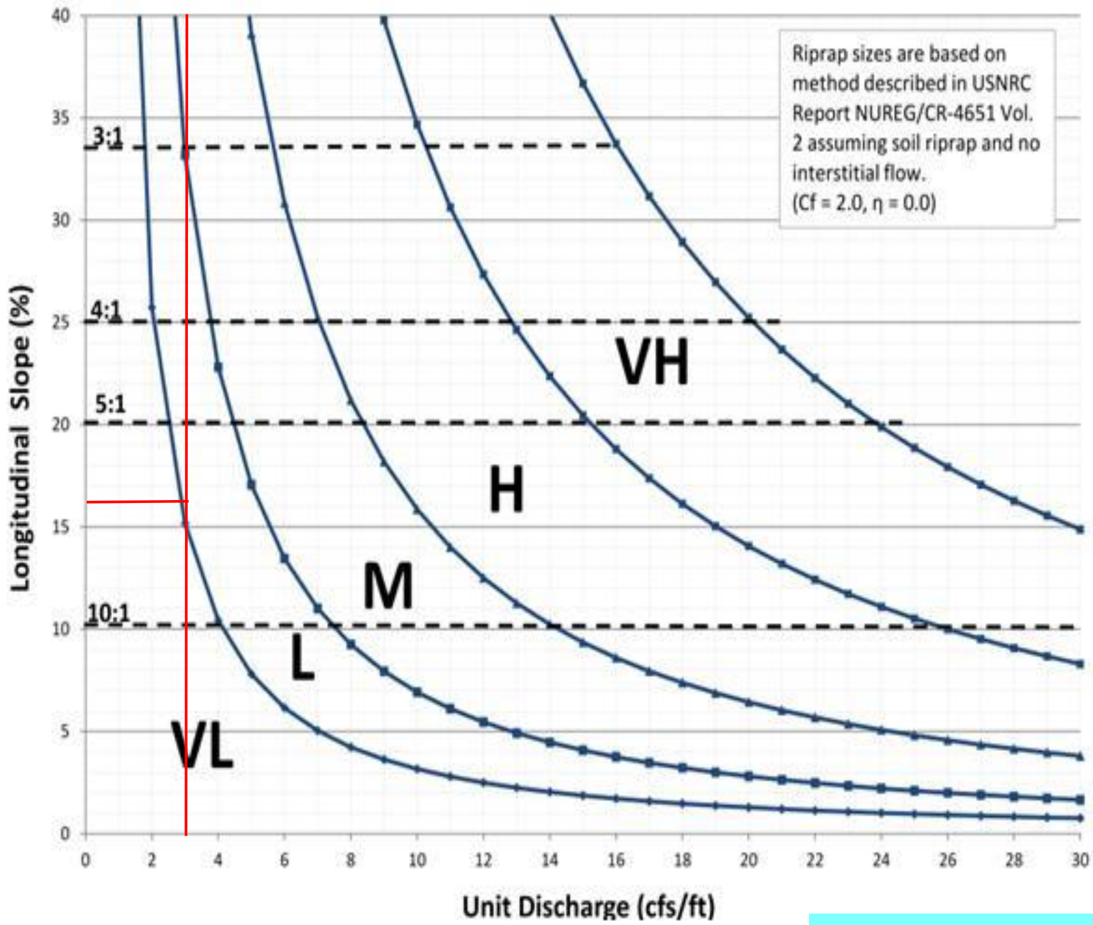


Figure 13-12d. Riprap Types for Emergency Spillway Protection



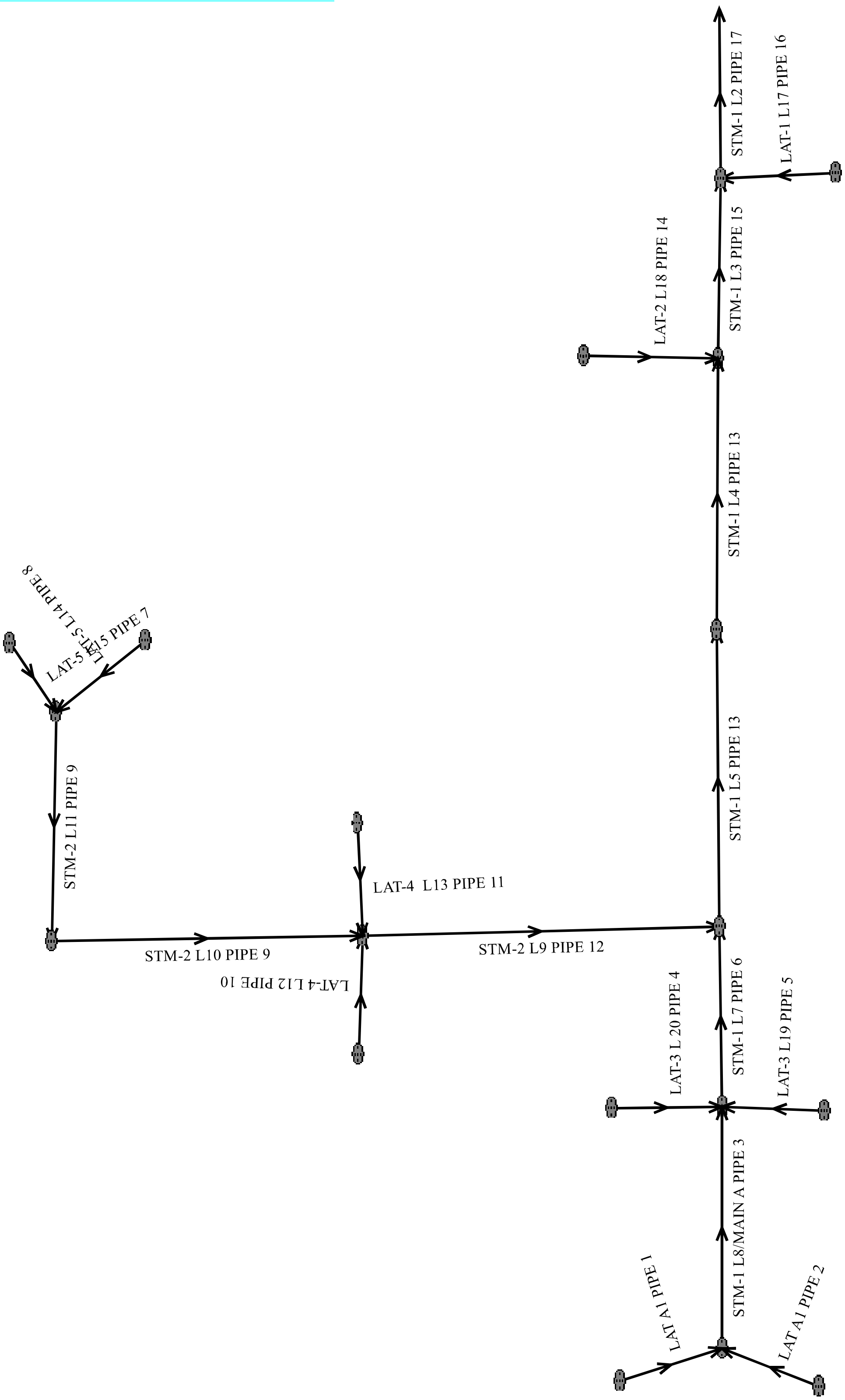
Indicate if this is for interim or ultimate design stage of pond.

HYDRAULIC GRADE LINE (HGL)

CALCULATIONS

CLASSIC
CONSULTING
ENGINEERS & SURVEYORS

System will be reviewed with next submittal when flows have been updated due to revised C-values.



System Input Summary 100 year

Backwater Calculations:

Tailwater Elevation (ft): 7097.55

Manhole Input Summary:

		Given Flow		Sub Basin Information						
Element Name	Ground Elevation (ft)	Total Known Flow (cfs)	Local Contribution (cfs)	Drainage Area (Ac.)	Runoff Coefficient	5yr Coefficient	Overland Length (ft)	Overland Slope (%)	Gutter Length (ft)	Gutter Velocity (fps)
OUTFALL 1	7102.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
STM-1 L1 PIPE 17	7107.04	92.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
STM-1 L2 PIPE 17	7111.17	92.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
STM-1 L3 PIPE 15	7112.39	77.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LAT-2 L18 PIPE 14	7112.63	13.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
STM-1 L4 PIPE 13	7117.81	65.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
STM-1 L5 PIPE 13	7117.57	65.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
STM-1 L7 PIPE 6	7116.79	44.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LAT-3 L19 PIPE 5	7116.90	6.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

STM-1 L8/MAIN A PIPE 3	7117.53	25.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LAT A1 PIPE 2	7117.80	9.90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LAT A1 PIPE 1	7118.07	16.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LAT-3 L 20 PIPE 4	7116.90	14.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
STM-2 L9 PIPE 12	7119.40	22.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
STM-2 L10 PIPE 9	7126.37	6.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
STM-2 L11 PIPE 9	7125.97	6.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LAT-5 L15 PIPE 7	7126.07	5.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LAT-5 L14 PIPE 8	7126.07	1.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LAT-4 L13 PIPE 11	7119.57	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LAT-4 L12 PIPE 10	7119.57	14.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LAT-1 L17 PIPE 16	7111.06	15.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Manhole Output Summary:

	Local Contribution					Total Design Flow				
Element Name	**Overland Time (min)**	**Gutter Time (min)**	**Basin Tc (min)**	**Intensity (in/hr)**	**Local Contrib (cfs)**	**Coeff. Area**	**Intensity (in/hr)**	**Manhole Tc (min)**	**Peak Flow (cfs)**	**Comment**
OUTFALL 1	0.00	0.00	0.00	0.00	0.00	7.97	11.63	0.14	92.70	
STM-1 L1 PIPE 17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	92.70	
STM-1 L2 PIPE 17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	92.70	
STM-1 L3 PIPE 15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	77.80	
LAT-2 L18 PIPE 14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	13.30	
STM-1 L4 PIPE 13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	65.20	
STM-1 L5 PIPE 13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	65.20	
STM-1 L7 PIPE 6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	44.00	
LAT-3 L19 PIPE 5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.10	
STM-1 L8/MAIN A PIPE 3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	25.50	
LAT A1 PIPE 2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.90	
LAT A1 PIPE 1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	16.10	
LAT-3 L 20 PIPE 4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	14.00	

STM-2 L9 PIPE 12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	22.20	
STM-2 L10 PIPE 9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.70	
STM-2 L11 PIPE 9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.70	
LAT-5 L15 PIPE 7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.80	
LAT-5 L14 PIPE 8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.30	
LAT-4 L13 PIPE 11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00	
LAT-4 L12 PIPE 10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	14.10	
LAT-1 L17 PIPE 16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	15.70	

Sewer Input Summary:

		Elevation			Loss Coefficients			Given Dimensions		
Element Name	**Sewer Length (ft)**	**Downstream Invert (ft)**	**Slope (%)**	**Upstream Invert (ft)**	**Mannings n**	**Bend Loss**	**Lateral Loss**	**Cross Section**	**Rise (ft or in)**	**Span (ft or in)**
STM-1 L1 PIPE 17	79.03	7094.50	0.8	7095.13	0.013	0.05	1.00	CIRCULAR	42.00 in	42.00 in
STM-1 L2 PIPE 17	119.33	7095.24	0.8	7096.19	0.013	0.10	1.00	CIRCULAR	42.00 in	42.00 in
STM-1 L3 PIPE 15	68.60	7097.20	2.2	7098.71	0.013	0.05	0.25	CIRCULAR	42.00 in	42.00 in
LAT-2 L18 PIPE 14	24.67	7101.69	3.6	7102.58	0.013	1.00	0.00	CIRCULAR	24.00 in	24.00 in

STM-1 L4 PIPE 13	368.17	7099.21	1.0	7102.89	0.013	0.05	0.25	CIRCULAR	36.00 in	36.00 in
STM-1 L5 PIPE 13	278.55	7102.99	1.0	7105.78	0.013	0.10	1.00	CIRCULAR	36.00 in	36.00 in
STM-1 L7 PIPE 6	84.52	7106.24	4.4	7109.96	0.013	0.05	0.25	CIRCULAR	30.00 in	30.00 in
LAT-3 L19 PIPE 5	5.67	7113.06	1.9	7113.17	0.013	1.00	0.00	CIRCULAR	18.00 in	18.00 in
STM-1 L8/MAIN A PIPE 3	500.69	7110.46	0.5	7112.96	0.013	0.05	0.25	CIRCULAR	30.00 in	30.00 in
LAT A1 PIPE 2	5.68	7113.96	0.5	7113.99	0.013	1.01	0.00	CIRCULAR	18.00 in	18.00 in
LAT A1 PIPE 1	26.95	7113.46	0.5	7113.59	0.013	0.48	0.00	CIRCULAR	24.00 in	24.00 in
LAT-3 L 20 PIPE 4	24.67	7112.55	1.0	7112.80	0.013	1.00	0.00	CIRCULAR	24.00 in	24.00 in
STM-2 L9 PIPE 12	249.88	7106.86	3.1	7114.61	0.013	1.00	0.00	CIRCULAR	24.00 in	24.00 in
STM-2 L10 PIPE 9	490.62	7115.44	1.0	7120.35	0.013	0.05	1.00	CIRCULAR	18.00 in	18.00 in
STM-2 L11 PIPE 9	48.37	7120.65	1.0	7121.13	0.013	1.00	1.00	CIRCULAR	18.00 in	18.00 in
LAT-5 L15 PIPE 7	26.43	7121.64	1.0	7121.90	0.013	0.29	0.00	CIRCULAR	18.00 in	18.00 in
LAT-5 L14 PIPE 8	9.55	7121.63	1.0	7121.73	0.013	0.29	0.00	CIRCULAR	18.00 in	18.00 in
LAT-4 L13 PIPE 11	5.67	7115.61	1.1	7115.67	0.013	1.00	0.00	CIRCULAR	18.00 in	18.00 in
LAT-4 L12 PIPE 10	24.67	7115.11	1.0	7115.36	0.013	1.00	0.00	CIRCULAR	24.00 in	24.00 in
LAT-1 L17 PIPE 16	38.87	7100.03	7.8	7103.06	0.013	1.00	0.00	CIRCULAR	24.00 in	24.00 in

Sewer Flow Summary:

	Full Flow Capacity		Critical Flow		Normal Flow						
Element Name	**Flow (cfs)**	**Velocity (fps)**	**Depth (in)**	**Velocity (fps)**	**Depth (in)**	**Velocity (fps)**	**Froude Number**	**Flow Condition**	**Flow (cfs)**	**Surcharged Length (ft)**	**Comment**
STM-1 L1 PIPE 17	90.23	9.38	42.00	9.64	42.00	9.64	0.00	Pressurized	92.70	79.03	
STM-1 L2 PIPE 17	90.23	9.38	42.00	9.64	42.00	9.64	0.00	Pressurized	92.70	119.33	
STM-1 L3 PIPE 15	149.63	15.55	33.10	9.57	21.49	15.70	2.33	Supercritical Jump	77.80	48.64	
LAT-2 L18 PIPE 14	43.04	13.70	15.75	6.09	9.16	12.07	2.83	Supercritical	13.30	0.00	
STM-1 L4 PIPE 13	66.88	9.46	31.06	10.06	28.72	10.78	1.20	Supercritical Jump	65.20	224.20	
STM-1 L5 PIPE 13	66.88	9.46	31.06	10.06	28.72	10.78	1.20	Supercritical	65.20	0.00	
STM-1 L7 PIPE 6	86.27	17.57	26.49	9.59	15.18	17.66	3.12	Supercritical Jump	44.00	31.37	
LAT-3 L19 PIPE 5	14.52	8.22	11.45	5.14	8.14	7.86	1.92	Supercritical	6.10	0.00	
STM-1 L8/MAIN A PIPE 3	29.08	5.92	20.65	7.08	21.78	6.68	0.90	Pressurized	25.50	500.69	
LAT A1 PIPE 2	7.45	4.21	18.00	5.60	18.00	5.60	0.00	Pressurized	9.90	5.68	
LAT A1 PIPE 1	16.04	5.11	24.00	5.12	24.00	5.12	0.00	Pressurized	16.10	26.95	

LAT-3 L 20 PIPE 4	22.68	7.22	16.17	6.22	13.64	7.60	1.39	Supercritical	14.00	0.00	
STM-2 L9 PIPE 12	39.94	12.71	20.18	7.87	12.78	13.05	2.49	Supercritical Jump	22.20	50.16	
STM-2 L10 PIPE 9	10.53	5.96	12.02	5.34	10.43	6.31	1.31	Supercritical Jump	6.70	109.28	
STM-2 L11 PIPE 9	10.53	5.96	12.02	5.34	10.43	6.31	1.31	Supercritical	6.70	0.00	
LAT-5 L15 PIPE 7	10.53	5.96	11.15	5.04	9.53	6.10	1.35	Supercritical	5.80	0.00	
LAT-5 L14 PIPE 8	10.53	5.96	5.12	3.14	4.27	4.05	1.42	Supercritical	1.30	0.00	
LAT-4 L13 PIPE 11	11.05	6.25	6.40	3.55	5.19	4.74	1.50	Pressurized	2.00	5.67	
LAT-4 L12 PIPE 10	22.68	7.22	16.23	6.24	13.70	7.61	1.39	Supercritical Jump	14.10	22.98	
LAT-1 L17 PIPE 16	63.35	20.17	17.14	6.54	8.14	16.72	4.19	Supercritical	15.70	0.00	

- A Froude number of 0 indicates that pressured flow occurs (adverse slope or undersized pipe).
- If the sewer is not pressurized, full flow represents the maximum gravity flow in the sewer.
- If the sewer is pressurized, full flow represents the pressurized flow conditions.

Sewer Sizing Summary:

			Existing		Calculated		Used			
Element Name	**Peak Flow (cfs)**	**Cross Section**	**Rise**	**Span**	**Rise**	**Span**	**Rise**	**Span**	**Area (ft^2)**	**Comment**
STM-1 L1 PIPE 17	92.70	CIRCULAR	42.00 in	42.00 in	48.00 in	48.00 in	42.00 in	42.00 in	9.62	Existing height is smaller than the suggested height. Existing width is smaller than the suggested width. Exceeds max. Depth/Rise
STM-1 L2 PIPE 17	92.70	CIRCULAR	42.00 in	42.00 in	48.00 in	48.00 in	42.00 in	42.00 in	9.62	Existing height is smaller than the suggested height. Existing width is smaller than the suggested width. Exceeds max. Depth/Rise
STM-1 L3 PIPE 15	77.80	CIRCULAR	42.00 in	42.00 in	33.00 in	33.00 in	42.00 in	42.00 in	9.62	
LAT-2 L18 PIPE 14	13.30	CIRCULAR	24.00 in	24.00 in	18.00 in	18.00 in	24.00 in	24.00 in	3.14	
STM-1 L4 PIPE 13	65.20	CIRCULAR	36.00 in	36.00 in	36.00 in	36.00 in	36.00 in	36.00 in	7.07	
STM-1 L5 PIPE 13	65.20	CIRCULAR	36.00 in	36.00 in	36.00 in	36.00 in	36.00 in	36.00 in	7.07	
STM-1 L7 PIPE 6	44.00	CIRCULAR	30.00 in	30.00 in	24.00 in	24.00 in	30.00 in	30.00 in	4.91	
LAT-3 L19 PIPE 5	6.10	CIRCULAR	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	1.77	
STM-1 L8/MAIN A PIPE 3	25.50	CIRCULAR	30.00 in	30.00 in	30.00 in	30.00 in	30.00 in	30.00 in	4.91	

LAT A1 PIPE 2	9.90	CIRCULAR	18.00 in	18.00 in	21.00 in	21.00 in	18.00 in	18.00 in	1.77	Existing height is smaller than the suggested height. Existing width is smaller than the suggested width. Exceeds max. Depth/Rise
LAT A1 PIPE 1	16.10	CIRCULAR	24.00 in	24.00 in	27.00 in	27.00 in	24.00 in	24.00 in	3.14	Existing height is smaller than the suggested height. Existing width is smaller than the suggested width. Exceeds max. Depth/Rise
LAT-3 L 20 PIPE 4	14.00	CIRCULAR	24.00 in	24.00 in	21.00 in	21.00 in	24.00 in	24.00 in	3.14	
STM-2 L9 PIPE 12	22.20	CIRCULAR	24.00 in	24.00 in	21.00 in	21.00 in	24.00 in	24.00 in	3.14	
STM-2 L10 PIPE 9	6.70	CIRCULAR	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	1.77	
STM-2 L11 PIPE 9	6.70	CIRCULAR	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	1.77	
LAT-5 L15 PIPE 7	5.80	CIRCULAR	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	1.77	
LAT-5 L14 PIPE 8	1.30	CIRCULAR	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	1.77	
LAT-4 L13 PIPE 11	2.00	CIRCULAR	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	1.77	
LAT-4 L12 PIPE 10	14.10	CIRCULAR	24.00 in	24.00 in	21.00 in	21.00 in	24.00 in	24.00 in	3.14	
LAT-1 L17 PIPE 16	15.70	CIRCULAR	24.00 in	24.00 in	18.00 in	18.00 in	24.00 in	24.00 in	3.14	

- Calculated diameter was determined by sewer hydraulic capacity rounded up to the nearest commercially available size.
- Sewer sizes should not decrease downstream.

- All hydraulics where calculated using the 'Used' parameters.

Grade Line Summary:

Tailwater Elevation (ft): 7097.55

	Invert Elev.		Downstream Manhole Losses		HGL		EGL		
Element Name	**Downstream (ft)**	**Upstream (ft)**	**Bend Loss (ft)**	**Lateral Loss (ft)**	**Downstream (ft)**	**Upstream (ft)**	**Downstream (ft)**	**Friction Loss (ft)**	**Upstream (ft)**
STM-1 L1 PIPE 17	7094.50	7095.13	0.00	0.00	7098.00	7098.67	7099.44	0.67	7100.11
STM-1 L2 PIPE 17	7095.24	7096.19	0.14	0.00	7098.81	7099.82	7100.25	1.01	7101.26
STM-1 L3 PIPE 15	7097.20	7098.71	0.05	1.19	7101.48	7101.48	7102.50	0.39	7102.89
LAT-2 L18 PIPE 14	7101.69	7102.58	0.28	0.00	7102.58	7103.89	7104.10	0.37	7104.47
STM-1 L4 PIPE 13	7099.21	7102.89	0.07	0.69	7102.32	7105.48	7103.64	3.41	7107.05
STM-1 L5 PIPE 13	7102.99	7105.78	0.13	0.00	7105.61	7108.37	7107.19	2.74	7109.94
STM-1 L7 PIPE 6	7106.24	7109.96	0.06	1.01	7109.76	7112.17	7111.01	2.59	7113.60
LAT-3 L19 PIPE 5	7113.06	7113.17	0.19	0.00	7113.87	7114.12	7114.48	0.05	7114.53
STM-1 L8/MAIN A PIPE 3	7110.46	7112.96	0.02	1.14	7114.34	7116.27	7114.76	1.92	7116.68
LAT A1 PIPE 2	7113.96	7113.99	0.49	0.00	7116.76	7116.81	7117.25	0.05	7117.30

LAT A1 PIPE 1	7113.46	7113.59	0.20	0.00	7116.47	7116.61	7116.88	0.14	7117.02
LAT-3 L 20 PIPE 4	7112.55	7112.80	0.31	0.00	7113.69	7114.15	7114.59	0.16	7114.75
STM-2 L9 PIPE 12	7106.86	7114.61	0.78	0.00	7109.94	7116.29	7110.71	6.54	7117.25
STM-2 L10 PIPE 9	7115.44	7120.35	0.01	0.55	7117.59	7121.35	7117.82	3.98	7121.80
STM-2 L11 PIPE 9	7120.65	7121.13	0.22	0.00	7121.57	7122.13	7122.13	0.44	7122.58
LAT-5 L15 PIPE 7	7121.64	7121.90	0.05	0.00	7122.43	7122.83	7123.01	0.22	7123.22
LAT-5 L14 PIPE 8	7121.63	7121.73	0.00	0.00	7122.56	7122.56	7122.58	0.01	7122.58
LAT-4 L13 PIPE 11	7115.61	7115.67	0.02	0.00	7117.25	7117.26	7117.27	0.00	7117.28
LAT-4 L12 PIPE 10	7115.11	7115.36	0.31	0.00	7117.25	7117.34	7117.57	0.09	7117.66
LAT-1 L17 PIPE 16	7100.03	7103.06	0.39	0.00	7100.71	7104.49	7105.05	0.10	7105.15

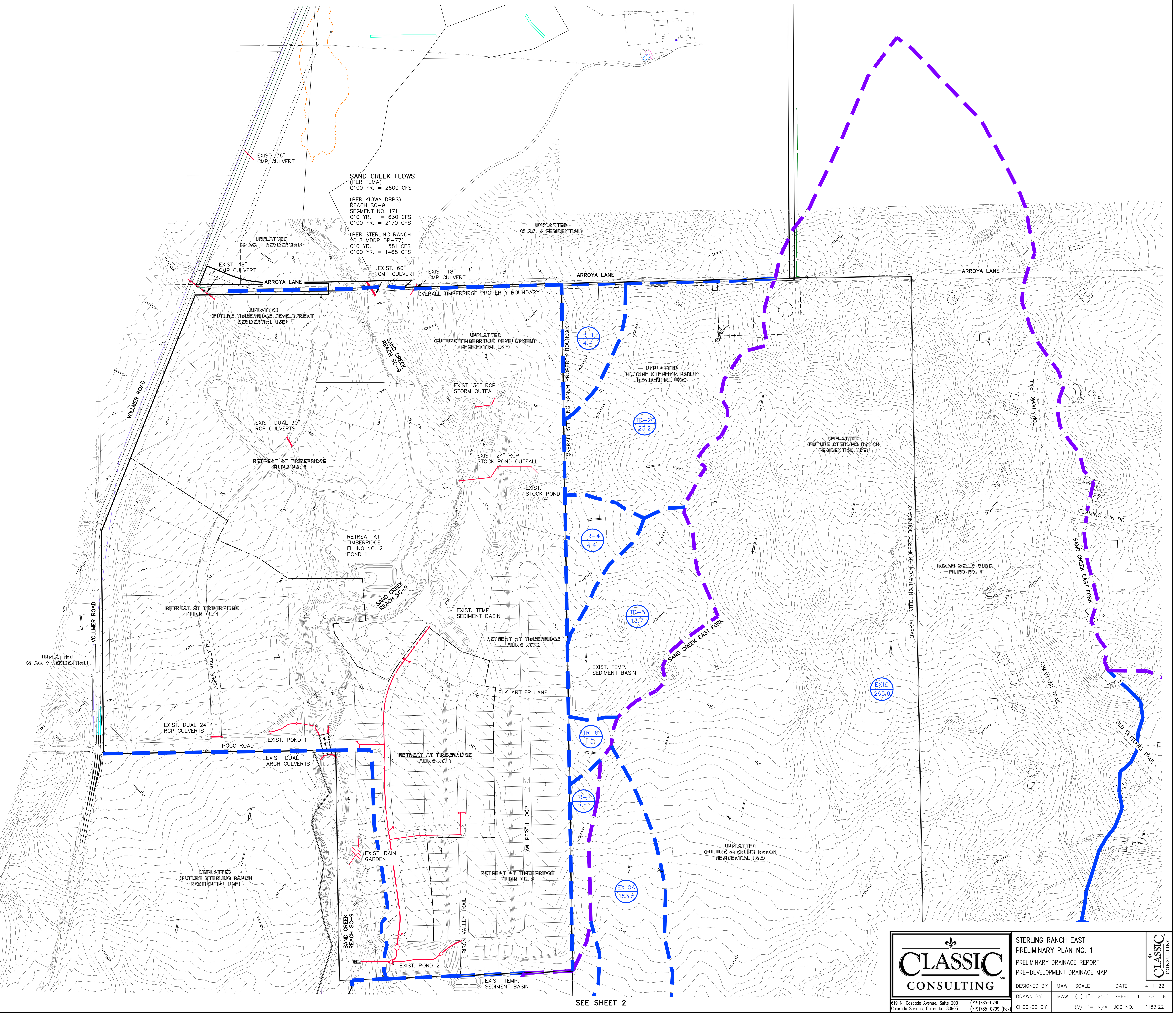
- Bend and Lateral losses only apply when there is an outgoing sewer. The system outfall, sewer #0, is not considered a sewer.
- Bend loss = Bend K * V_fi ^ 2/(2*g)
- Lateral loss = V_fo ^ 2/(2*g)- Junction Loss K * V_fi ^ 2/(2*g).
- Friction loss is always Upstream EGL - Downstream EGL.

DRAINAGE MAPS

Provide copy of hydrology calculations that go with this drainage map and mark as "Reference Material from Previous Reports"

STERLING RANCH EAST PRELIMINARY PLAN NO. 1
Pre-Developed Subcatchment Runoff

Subcatchment	Area (Ac.)	SWMM Imperv. (%)	Peak Runoff 5 yr. (CFS)	Peak Runoff 100 yr. (CFS)
EX-10	265.9	7%	105	222
EX10A	153.5	5%	46	103
EX-11	214.3	4%	54	129
EX-13	94.8	6%	36	85
EX-4A	44.2	8%	19	50
EX-5	26.2	8%	12	32
EX-7	152.8	5%	46	105
EX-7A	2.4	2%	1	5
EX-8	32.2	2%	5	23
EX-8A	6.6	2%	2	9
EX-9	139.3	8%	59	122
EX-9A	21.8	5%	7	19
TR-12	4.7	5%	2	9
TR-20	23.2	7%	10	32
TR-4	4.4	5%	2	9
TR-5	13.7	5%	5	17
TR-6	1.5	5%	1	4
TR-7	2.6	5%	1	5



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

LEGEND

DESCRIPTION	SYMBOL
EXISTING GROUND CONTOUR	6910
PROPOSED FINISHED CONTOUR	6910
SUB-BASIN BOUNDARY	
SAND CREEK EAST FORK BASIN LINE	
DESIGN POINT	4
BASIN IDENTIFIER / AREA IN ACRES	BB 10.0
EXISTING DIRECTION OF FLOW	
EXISTING STORM SEWER	

CLASSIC CONSULTING
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Colorado Springs, Colorado 80903
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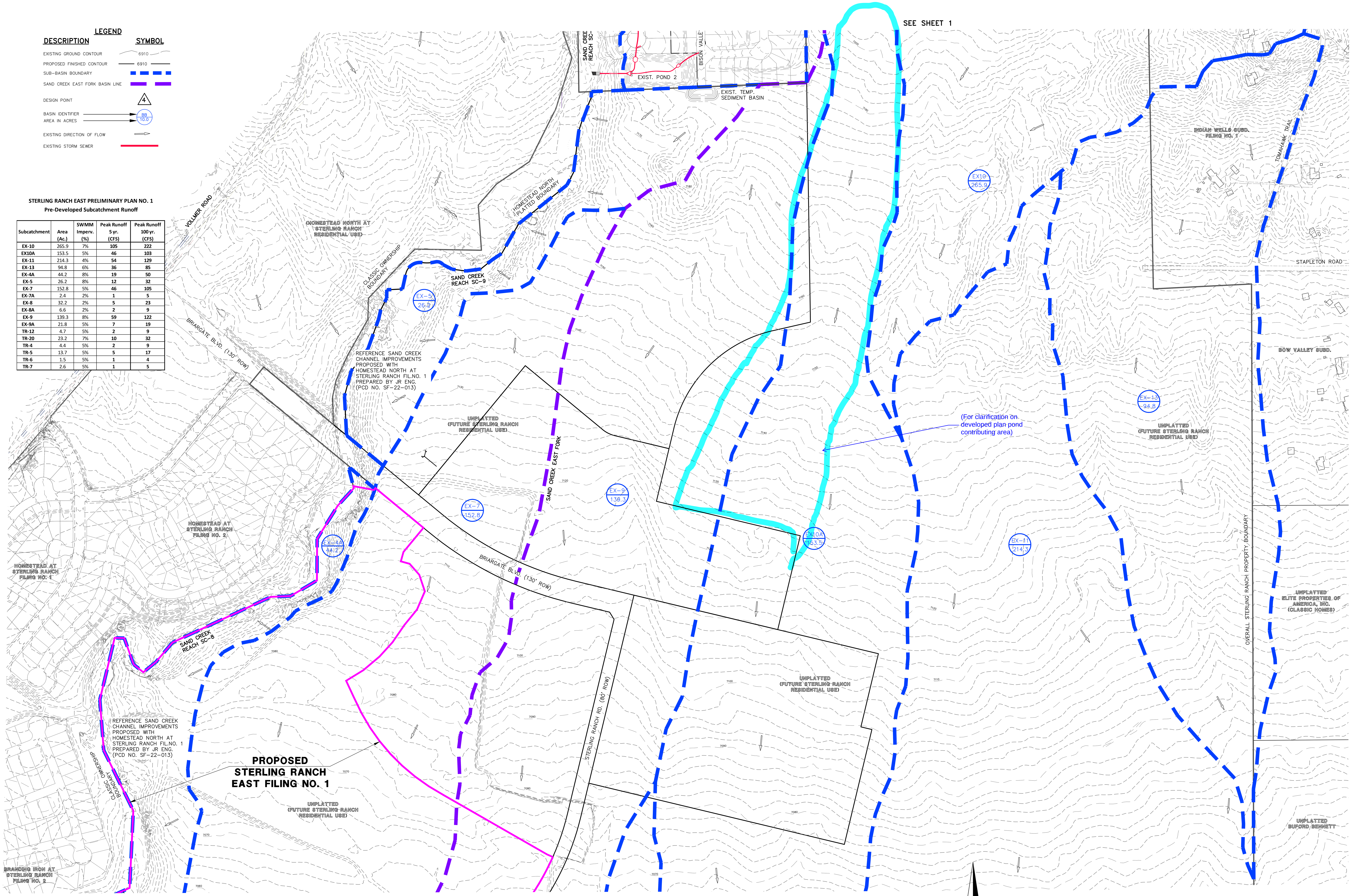
(719)785-0799 (Fax)

STERLING RANCH EAST
PRELIMINARY PLAN NO. 1
PRELIMINARY DRAINAGE REPORT
PRE-DEVELOPMENT DRAINAGE MAP

DESIGNED BY	MAW	SCALE	DATE 4-1-22
DRAWN BY	MAW	(H) 1"= 200'	SHEET 1 OF 6
CHECKED BY		(V) 1"= N/A	JOB NO. 1183.22



STERLING RANCH EAST PRELIMINARY PLAN NO. 1
Pre-Developed Subcatchment Runoff

Subcatchment	Area (Ac.)	SWMM Imperv. (%)	Peak Runoff 5 yr. (CFS)	Peak Runoff 100 yr. (CFS)
EX-10	265.9	7%	105	222
EX10A	153.5	5%	46	103
EX-11	214.3	4%	54	129
EX-13	94.8	6%	36	85
EX-4A	44.2	8%	19	50
EX-5	26.2	8%	12	32
EX-7	152.8	5%	46	105
EX-7A	2.4	2%	1	5
EX-8	32.2	2%	5	23
EX-8A	6.6	2%	2	9
EX-9	139.3	8%	59	122
EX-9A	21.8	5%	7	19
TR-12	4.7	5%	2	9
TR-20	23.2	7%	10	32
TR-4	4.4	5%	2	9
TR-5	13.7	5%	5	17
TR-6	1.5	5%	1	4
TR-7	2.6	5%	1	5

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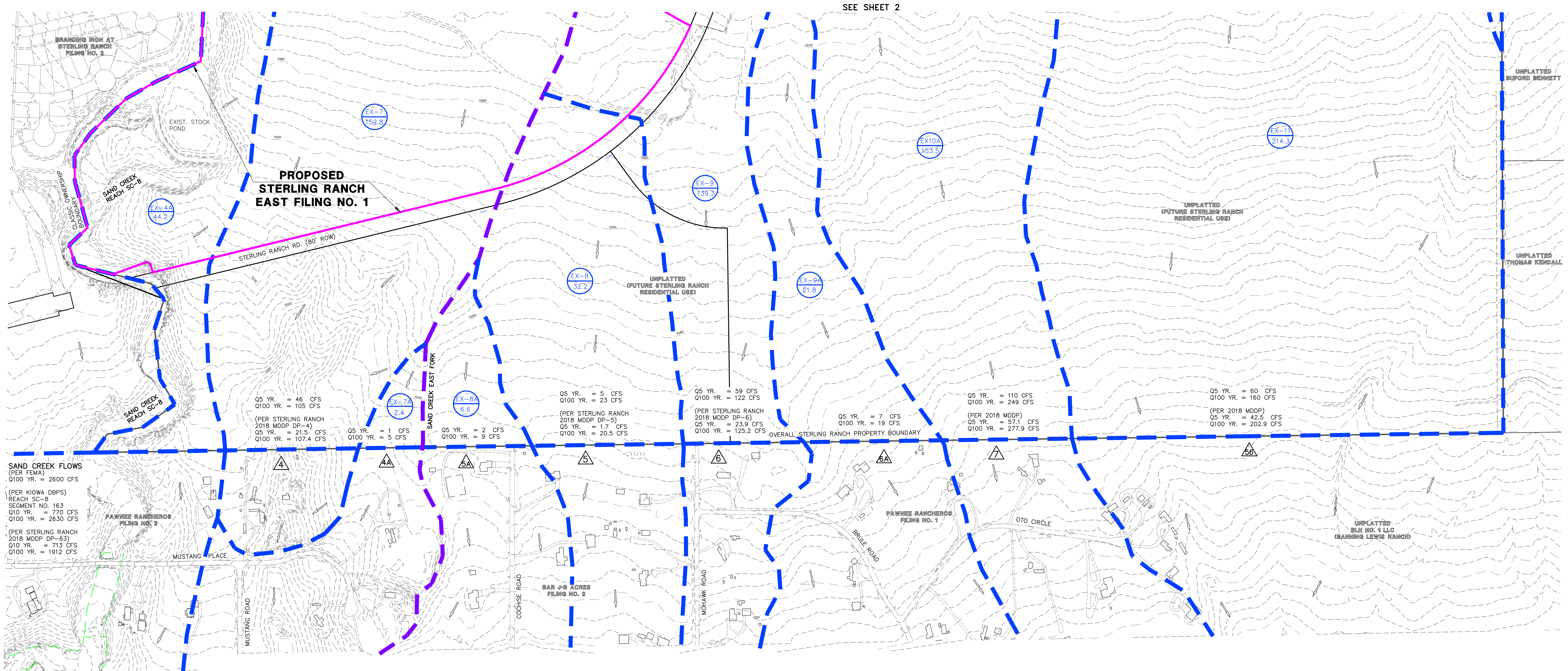
STERLING RANCH EAST
PRELIMINARY PLAN NO. 1
PRELIMINARY DRAINAGE REPORT
PRE-DEVELOPMENT DRAINAGE MAP

DESIGNED BY MAW	SCALE	DATE 4-1-22
DRAWN BY MAW	(H) 1"= 200'	SHEET 2 OF 6
CHECKED BY	(V) 1"= N/A	JOB NO. 1183.22



STERLING RANCH EAST PRELIMINARY PLAN NO. 1
Pre-Developed Subcatchment Runoff

Subcatchment	Area (Ac.)	SWMM Imperv. (%)	Peak Runoff 5 yr. (CFS)	Peak Runoff 100 yr. (CFS)
EX-10	265.9	7%	105	222
EX10A	153.5	5%	46	103
EX-11	214.3	4%	54	129
EX-13	94.8	6%	36	85
EX-4A	44.2	8%	19	50
EX-5	26.2	8%	12	32
EX-7	152.8	5%	46	105
EX-7A	2.4	2%	1	5
EX-8	32.2	2%	5	23
EX-8A	6.6	2%	2	9
EX-9	139.3	8%	59	122
EX-9A	21.8	5%	7	19
TR-12	4.7	5%	2	9
TR-20	23.2	7%	10	32
TR-4	4.4	5%	2	9
TR-5	13.7	5%	5	17
TR-6	1.5	5%	1	4
TR-7	2.6	5%	1	5

STERLING RANCH EAST PRELIMINARY PLAN NO. 1
Pre-Developed Surface Routing

Design Point	Peak Runoff 5 yr. (CFS)	Peak Runoff 100 yr. (CFS)
DP4	46	105
DP4A	1	5
DP5	5	23
DP5A	2	9
DP6	59	122
DP6A	7	19
DP7	110	249
DP56	60	160
DPEX-4A	19	50
DPEX-5	12	32

LEGEND

DESCRIPTION	SYMBOL
EXISTING GROUND CONTOUR	6910
PROPOSED FINISHED CONTOUR	6910
SUB-BASIN BOUNDARY	
SAND CREEK EAST FORK BASIN LINE	
DESIGN POINT	4
BASIN IDENTIFIER / AREA IN ACRES	BB 10.0
EXISTING DIRECTION OF FLOW	
EXISTING STORM SEWER	

N

200 100 0 200 400

SCALE: 1" = 200'

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(719)785-0799 (Fax)

STERLING RANCH EAST
PRELIMINARY PLAN NO. 1
PRELIMINARY DRAINAGE REPORT
PRE-DEVELOPMENT DRAINAGE MAP

DESIGNED BY MAW	SCALE	DATE 4-1-22	
DRAWN BY MAW	(H) 1"= 200'	SHEET 3 OF 6	
CHECKED BY	(V) 1"= N/A	JOB NO. 1183.22	

STERLING RANCH EAST PRELIMINARY PLAN NO. 1
Developed Subcatchment Runoff

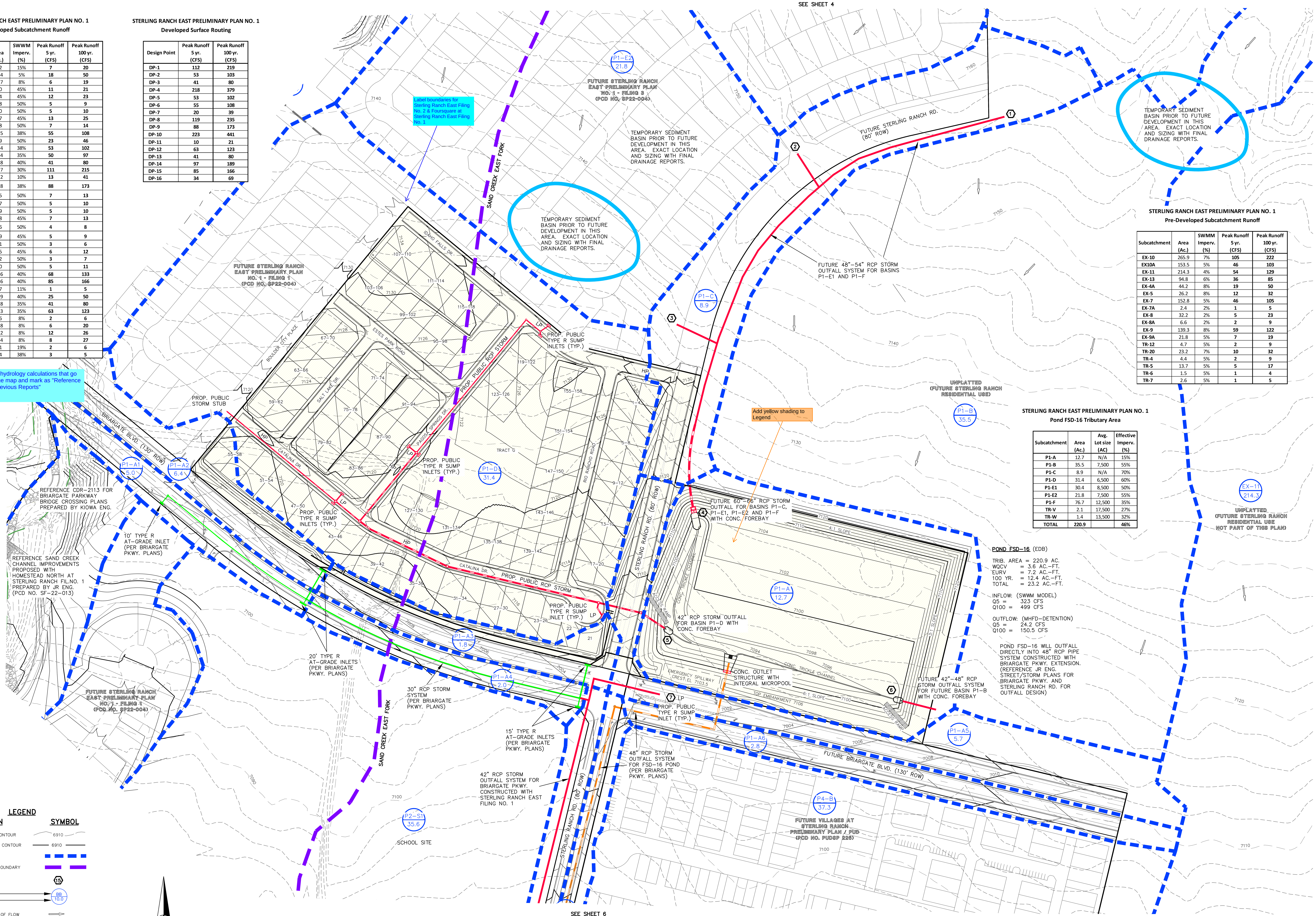
Subcatchment	Area (Ac.)	SWWM Imperv. (%)	Peak Runoff 5 yr. (CFS)	Peak Runoff 100 yr. (CFS)
EF-A	8.2	15%	7	20
EX10A	60.4	5%	18	50
P1-A	12.7	8%	6	19
P1-A1	5.0	45%	11	21
P1-A2	6.4	45%	12	23
P1-A3	1.8	50%	5	9
P1-A4	2.0	50%	5	10
P1-A5	5.7	45%	13	25
P1-A6	2.8	50%	7	14
P1-B	35.5	38%	55	108
P1-C	8.9	50%	23	46
P1-D	31.4	38%	53	102
P1-E1	30.4	35%	50	97
P1-E2	21.8	40%	41	80
P1-F	76.7	30%	111	215
P2-A	22.2	10%	13	41
P2-B	57.8	38%	88	173
P2-B1	2.5	50%	7	13
P2-B10	1.7	50%	5	10
P2-B2	1.9	50%	5	10
P2-B3	2.8	45%	7	13
P2-B4	1.6	50%	4	8
P2-B5	1.9	45%	5	9
P2-B6	1.1	50%	3	6
P2-B7	2.5	45%	6	12
P2-B8	1.2	50%	3	7
P2-B9	2.0	50%	5	11
P2-S1	35.6	40%	68	133
P3-A	52.6	40%	85	166
P3-C	1.7	11%	1	5
P3-S2	11.9	40%	25	50
P4-A	25.8	35%	41	80
P4-B	37.3	35%	63	123
SC-1	3.6	8%	2	6
SC-2	10.8	8%	6	20
SC-3	27.2	8%	12	26
SC-4	16.4	8%	8	27
TR-V	2.1	19%	2	6
TR-W	1.4	38%	3	5

Provide copy of hydrology calculations that go with this drainage map and mark as "Reference Material from Previous Reports"

STERLING RANCH EAST PRELIMINARY PLAN NO. 1
Developed Surface Routing

Design Point	Peak Runoff 5 yr. (CFS)	Peak Runoff 100 yr. (CFS)
DP-1	112	219
DP-2	53	103
DP-3	41	80
DP-4	218	379
DP-5	53	102
DP-6	55	108
DP-7	20	39
DP-8	119	235
DP-9	88	173
DP-10	223	441
DP-11	10	21
DP-12	63	123
DP-13	41	80
DP-14	97	189
DP-15	85	166
DP-16	34	69

SEE SHEET 4



STERLING RANCH EAST PRELIMINARY PLAN NO. 1
Pre-Developed Subcatchment Runoff

Subcatchment	Area (Ac.)	SWMM Imperv. (%)	Peak Runoff 5 yr. (CFS)	Peak Runoff 100 yr. (CFS)
EX-10	265.9	7%	105	222
EX10A	153.5	5%	46	103
EX-11	214.3	4%	54	129
EX-13	94.8	6%	36	85
EX-4A	44.2	8%	19	50
EX-5	26.2	8%	12	32
EX-7	152.8	5%	46	105
EX-7A	2.4	2%	1	5
EX-8	32.2	2%	5	23
EX-8A	6.6	2%	2	9
EX-9	139.3	8%	59	122
EX-9A	21.8	5%	7	19
TR-12	4.7	5%	2	9
TR-20	23.2	7%	10	32
TR-4	4.4	5%	2	9
TR-5	13.7	5%	5	17
TR-6	1.5	5%	1	4
TR-7	2.6	5%	1	5

STERLING RANCH EAST PRELIMINARY PLAN NO. 1
Pond FSD-16 Tributary Area

Subcatchment	Area (Ac.)	Avg. Lot size (AC)	Effective Imperv. (%)
P1-A	12.7	N/A	15%
P1-B	35.5	7,500	55%
P1-C	8.9	N/A	70%
P1-D	31.4	6,500	60%
P1-E1	30.4	8,500	50%
P1-E2	21.8	7,500	55%
P1-F	76.7	12,500	35%
TR-V	2.1	17,500	27%
TR-W	1.4	13,500	32%
TOTAL	220.9		46%

POND FSD-16 (EDB)

TRIB. AREA = 220.9 AC.
WQCV = 3.6 AC.-FT.
EURV = 7.2 AC.-FT.
100 YR. = 12.4 AC.-FT.
TOTAL = 23.2 AC.-FT.

INFLOW: (SWMM MODEL)
Q5 = 323 CFS
Q100 = 499 CFS

OUTFLOW: (MHFD-DETENTION)
Q5 = 24.2 CFS
Q100 = 150.5 CFS

POND FSD-16 WILL OUTFALL DIRECTLY INTO 48" RCP PIPE SYSTEM CONSTRUCTED WITH BRIARGATE PKWY. EXTENSION. (REFERENCE JR ENG. STREET/STORM PLANS FOR BRIARGATE PKWY. AND STERLING RANCH RD. FOR OUTFALL DESIGN)

LEGEND

DESCRIPTION	SYMBOL
EXISTING GROUND CONTOUR	6910
PROPOSED FINISHED CONTOUR	6910
BASIN BOUNDARY	
EAST FORK BASIN BOUNDARY	
DESIGN POINT	15
BASIN IDENTIFIER / AREA IN ACRES	BB / 10.0
EXISTING DIRECTION OF FLOW	
PROPOSED DIRECTION OF FLOW	
PROPOSED STORM SEWER	
PROPOSED STORM SEWER PER JR ENG. PLANS	
PROPOSED POND OUTFALL PER JR ENG. PLANS	

N

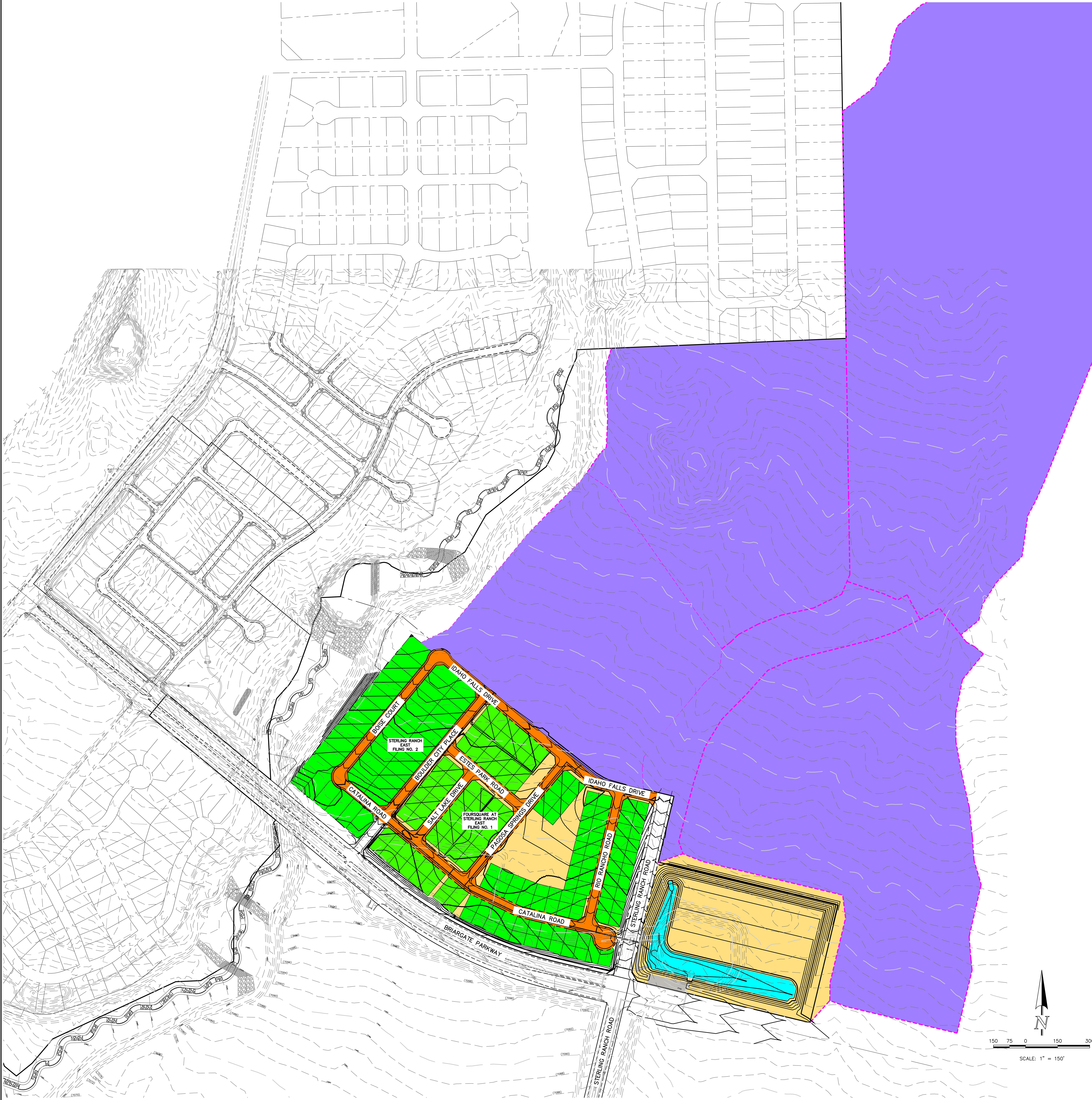
100 50 0 100 200
SCALE: 1" = 100'

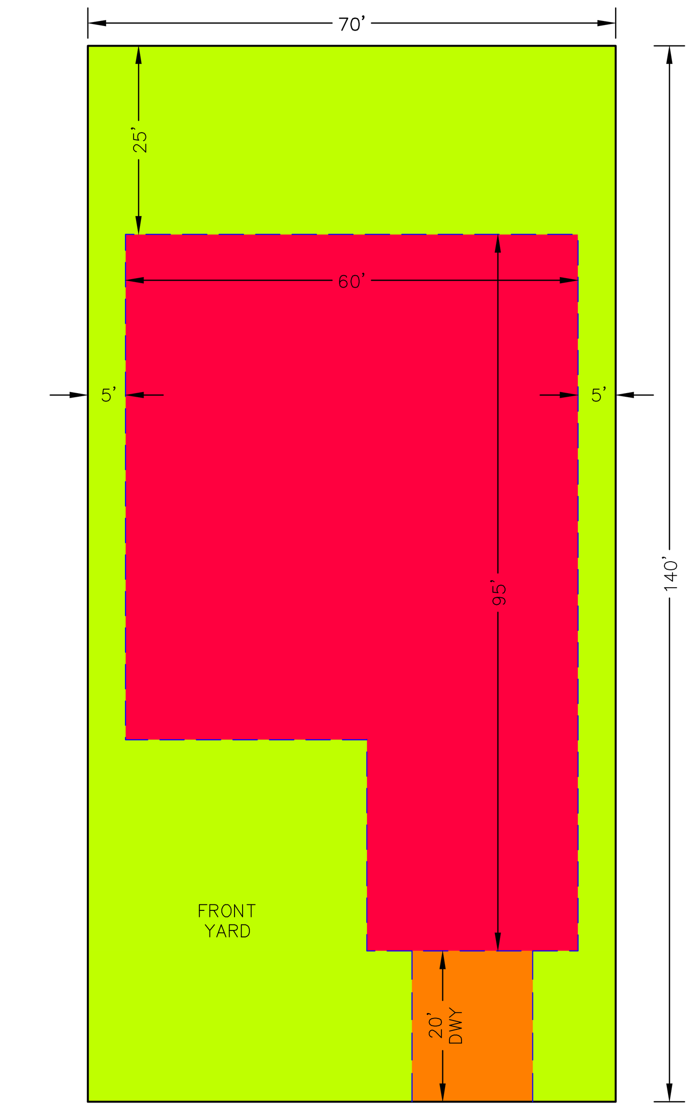
SEE SHEET 6

CLASSIC CONSULTING ENGINEERS & SURVEYORS
619 N. Cascade Avenue, Suite 200 Colorado Springs, Colorado 80903 (719)785-0790 (719)785-0799 (Fax)

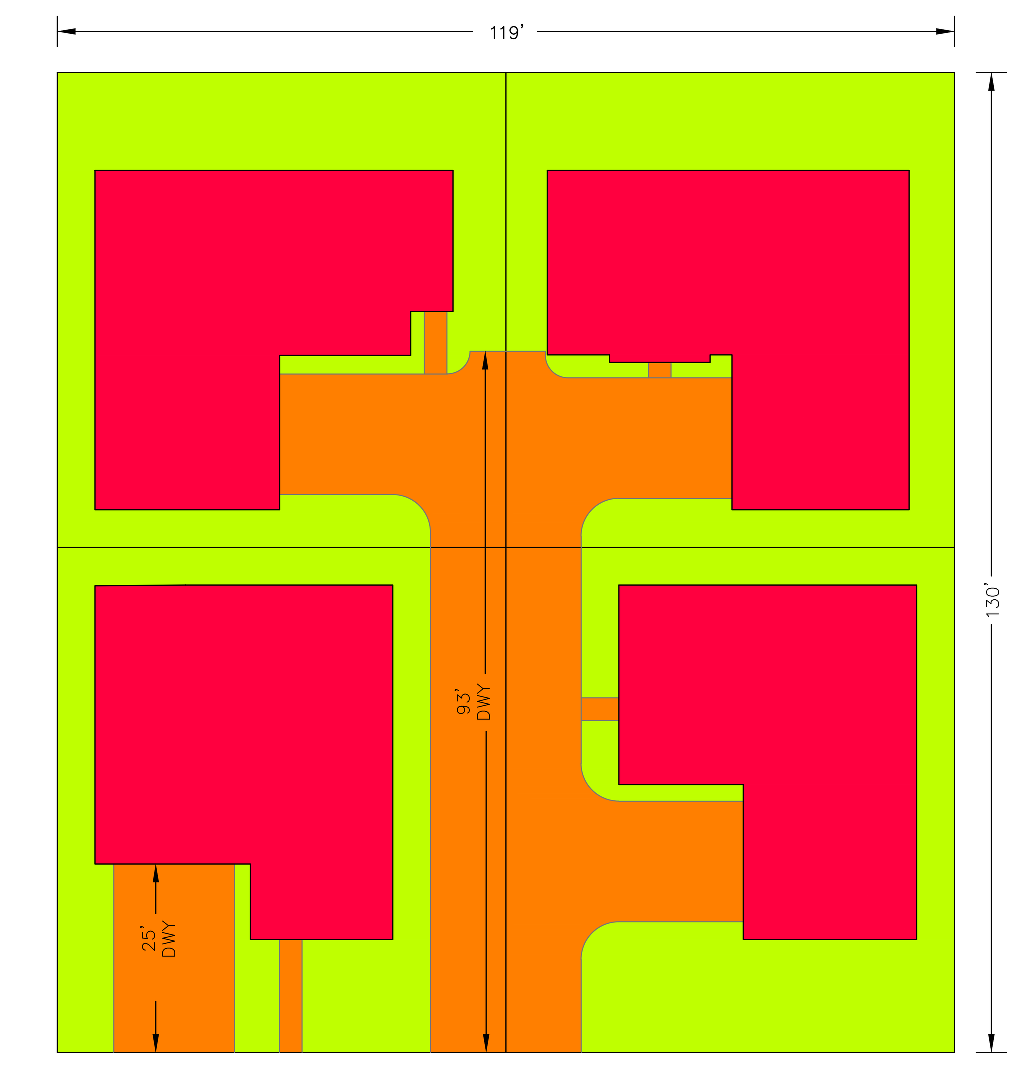
FOURSQUARE AT STERLING RANCH
PRELIMINARY PLAN / PUD
PRELIMINARY DRAINAGE REPORT
DEVELOPED DRAINAGE MAP

DESIGNED BY	MAW	SCALE	DATE 9-30-22
DRAWN BY	MAW	(H) 1"= 100'	SHEET 7 OF 7
CHECKED BY		(V) 1"= N/A	JOB NO. 1183.20





TYPICAL HOME LOT
UIA = 55% OF LOT AREA
DCIA = 0.72% OF LOT AREA
RPA = 44.28% OF LOT AREA



TYPICAL HOME LOT
UIA = 42% OF LOT AREA
DCIA = 22% OF LOT AREA
RPA = 36% OF LOT AREA

Please also include the "Water Quality Treatment Plan Map" that was included with the Drainage Report on SP224.

FUTURE SCHOOL SITE – ESTIMATED 13.94 AC. DCIA, 1.51 AC. UIA, 3.46 AC. RPA, 17.68 AC. SPA
HOME LOTS (SEE BREAKDOWN ABOVE)
SPA – SEPARATE PERVIOUS AREA
UIA – UNCONNECTED IMPERVIOUS AREA
DCIA – DIRECTLY CONNECTED IMPERVIOUS AREA
RPA – RECEIVING PERVIOUS AREA

TRIBUTARY AREA
STERLING RANCH EAST FIL NO. 1A
FOURSQUARE AT STERLING RANCH EAST FIL 1
12–05–22

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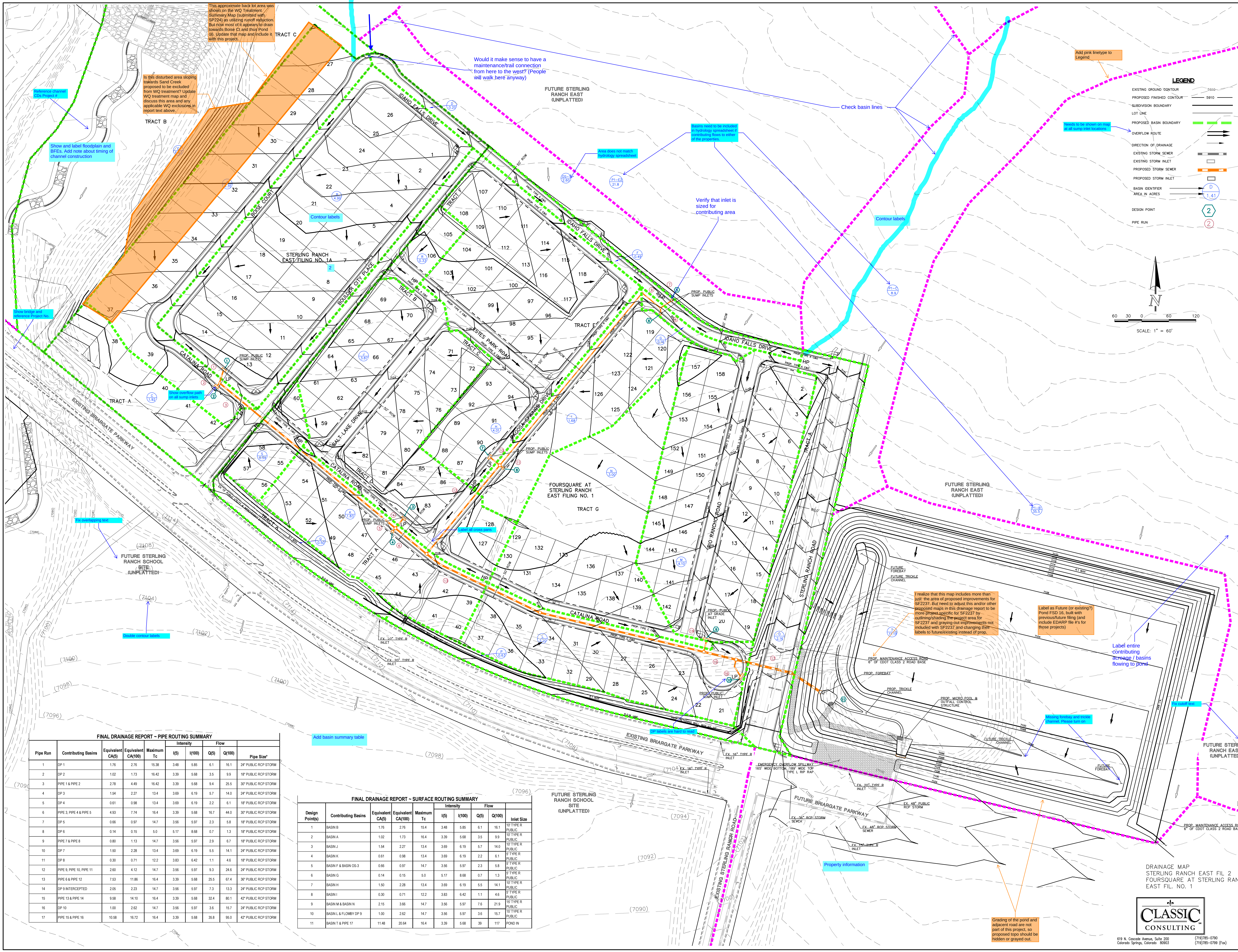

FINAL DRAINAGE REPORT ~ PIPE ROUTING SUMMARY

Pipe Run	Contributing Basins	Equivalent CA(5)	Equivalent CA(100)	Maximum Tc	Intensity I(5)	Intensity I(100)	Flow Q(5)	Flow Q(100)	Pipe Size*
1	DP 1	1.76	2.76	15.38	3.48	5.85	6.1	16.1	24" PUBLIC RCP STORM
2	DP 2	1.02	1.73	16.42	3.39	5.68	3.5	9.9	18" PUBLIC RCP STORM
3	PIPE 1 & PIPE 2	2.78	4.49	16.42	3.39	5.68	9.4	25.5	30" PUBLIC RCP STORM
4	DP 3	1.54	2.27	13.4	3.69	6.19	5.7	14.0	24" PUBLIC RCP STORM
5	DP 4	0.61	0.98	13.4	3.69	6.19	2.2	6.1	18" PUBLIC RCP STORM
6	PIPE 3, PIPE 4 & PIPE 5	4.93	7.74	16.4	3.39	5.68	16.7	44.0	30" PUBLIC RCP STORM
7	DP 5	0.66	0.97	14.7	3.56	5.97	2.3	5.8	18" PUBLIC RCP STORM
8	DP 6	0.14	0.15	5.0	5.17	8.68	0.7	1.3	18" PUBLIC RCP STORM
9	PIPE 7 & PIPE 8	0.80	1.13	14.7	3.56	5.97	2.9	6.7	18" PUBLIC RCP STORM
10	DP 7	1.50	2.28	13.4	3.69	6.19	5.5	14.1	24" PUBLIC RCP STORM
11	DP 8	0.30	0.71	12.2	3.83	6.42	1.1	4.6	18" PUBLIC RCP STORM
12	PIPE 9, PIPE 10, PIPE 11	2.60	4.12	14.7	3.56	5.97	9.3	24.6	24" PUBLIC RCP STORM
13	PIPE 6 & PIPE 12	7.53	11.86	16.4	3.39	5.68	25.5	67.4	36" PUBLIC RCP STORM
14	DP 9 INTERCEPTED	2.05	2.23	14.7	3.56	5.97	7.3	13.3	24" PUBLIC RCP STORM
15	PIPE 13 & PIPE 14	9.58	14.10	16.4	3.39	5.68	32.4	80.1	42" PUBLIC RCP STORM
16	DP 10	1.00	2.62	14.7	3.56	5.97	3.6	15.7	24" PUBLIC RCP STORM
17	PIPE 15 & PIPE 16	10.58	16.72	16.4	3.39	5.68	35.8	95.0	42" PUBLIC RCP STORM

FINAL DRAINAGE REPORT ~ SURFACE ROUTING SUMMARY

Design Point(s)	Contributing Basins	Equivalent CA(5)	Equivalent CA(100)	Maximum Tc	Intensity I(5)	Intensity I(100)	Flow Q(5)	Flow Q(100)	Inlet Size
1	BASIN B	1.76	2.76	15.4	3.48	5.85	6.1	16.1	10' TYPE R PUBLIC
2	BASIN A	1.02	1.73	16.4	3.39	5.68	3.5	9.9	10' TYPE R PUBLIC
3	BASIN J	1.54	2.27	13.4	3.69	6.19	5.7	14.0	10' TYPE R PUBLIC
4	BASIN K	0.61	0.98	13.4	3.69	6.19	2.2	6.1	5' TYPE R PUBLIC
5	BASIN F & BASIN OS-3	0.66	0.97	14.7	3.56	5.97	2.3	5.8	5' TYPE R PUBLIC
6	BASIN G	0.14	0.15	5.0	5.17	8.68	0.7	1.3	5' TYPE R PUBLIC
7	BASIN H	1.50	2.28	13.4	3.69	6.19	5.5	14.1	10' TYPE R PUBLIC
8	BASIN I	0.30	0.71	12.2	3.83	6.42	1.1	4.6	5' TYPE R PUBLIC
9	BASIN M & BASIN N	2.15	3.66	14.7	3.56	5.97	7.6	21.9	15' TYPE R PUBLIC
10	BASIN L & FLOWBY DP 9	1.00	2.62	14.7	3.56	5.97	3.6	15.7	15' TYPE R PUBLIC
11	BASIN T & PIPE 17	11.48	20.64	16.4	3.39	5.68	39	117	POND IN