PRELIMINARY DRAINAGE REPORT
FOR
STERLING RANCH EAST FILING NO. 5
PRELIMINARY PLAN

CCES RESPONSES

Prepared for:
CLASSIC SRJ LAND, LLC
2138 FLYING HORSE CLUB DRIVE
COLORADO SPRINGS CO 80921
(719) 592-9333

Prepared by:
CLASSIC CONSULTING
619 N. CASCADE AVE SUITE 200
COLORADO SPRINGS CO 80903
(719) 785-0790

Job No. 1183.25

ADDED

PCD Project No. SP235

PRELIMINARY DRAINAGE REPORT FOR
STERLING RANCH EAST FILING NO. 5

ENGINEER'S STATEMENT:
The attached drainage plan and report were prepared under my direction and supervision and are correct to the best of my knowledge and belief. Said drainage report has been prepared according to the criteria established by the County for drainage reports and said report is in conformity with the applicable 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.

_____ _____

Marc A. Whorton Colorado P.E. #37155 Date

OWNER'S/DEVELOPER'S STATEMENT:
I, the owner/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 Drive

Colorado Springs, CO 80921

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

_____ _____

Joshua Palmer, P.E. Date
County Engineer, / ECM Administrator

Conditions:

PRELIMINARY DRAINAGE REPORT FOR
STERLING RANCH EAST FILING NO. 5

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PRELIMINARY DRAINAGE REPORT FOR STERLING RANCH EAST FILING NO. 5

PURPOSE

The purpose of this Preliminary Drainage Report is to address on-site and off-site drainage patterns and identify specific drainage improvements and facilities required to minimize impacts to the adjacent properties.

GENERAL DESCRIPTION

The Sterling ranch East Filing No. 5 Preliminary Plan is 47.168-acre site located in portions sections 33 and 34, township 12 south, range 65 west of the sixth principal meridian. 160 urban residential lots are planned. The site is bounded on the north by planned public ROW (Oak Park Drive) but still unplatted, to the south by existing platted 5-ac. residential lots (Pawnee Rancheros Filing No. 1), to the east by Sterling Ranch East property (zoned for future urban development), and to the west by existing platted public ROW (Sterling Ranch Road). The site is in the upper portion of the Sand Creek East Fork Drainage Basin. Urban single family residential is proposed in this Filing that is consistent with the approved Sterling Ranch Sketch Plan.

The average soil condition reflects Hydrologic Group "A" (Blakeland loamy sand and Columbine gravelly sandy loam) as determined by the "Web Soil Survey of El Paso County Area," prepared by the Natural Resources Conservation Service (see map in Appendix). Type A soils were used to determine the pre-development conditions however, Type B soils are utilized for developed site conditions as significant import is anticipated for this development.

EXISTING DRAINAGE CONDITIONS

The Sterling Ranch East Filing No. 5 property is located in the upper portion of the Sand Creek East Fork Drainage Basin. Nearly the entire site, other than the areas disturbed by equipment storage, gravel access roads and small stock ponds for grazing cattle, is covered with native grasses with no trees or other vegetation.

ADDED

Please include pre-development basin EX-8 in this section as the site includes a portion of this basin.

CLASSIC CONSULTING ENGINEERS & SURVEYORS

This site has been previously studied in the "2018 Sterling Ranch MDDP", prepared by M&S Civil Consultants, Inc., June 2018 and most recently by "MDDP Amendment for Sterling Ranch", prepared by JR Engineering, LLC, dated September 2022 and "Sterling Ranch MDDP Amendment No. 2 & Preliminary Drainage Report for Sterling Ranch East Preliminary Plan 1", prepared by Classic Consulting, dated January 2023. The latter report analyzed the pre-development conditions for the flows off-site to the south. The entire site currently drains as sheet flow in a southerly direction within the previously studied pre-development basins EX-9, EX-9A, EX-10 and EX-10A. These are referenced in the Appendix.

The following descriptions represent these pre-development basins for the property:
Basin EX-9 (Q_5 = 59 cfs, Q_{100} = 122 cfs) consists of approximately 139.3 acres of property that sheet flows in a southerly direction. This basin is similar to the original MDDP with the northern portion of the west basin line defining the westerly edge of the East Fork basin. The flows seem to remain as sheet flows as they exit the property along the south boundary at **Design Point 6**.

Basin EX-9A (Q_5 = 7 cfs, Q_{100} = 19 cfs) consists of a smaller basin of 21.8 ac. that sheet flows in a southerly direction. The original MDDP included this basin as a part of Basin EX-10A. However, a more detailed look at this area finds that the larger basin EX-10A seems to be tributary to Oto Circle east of the high point in the road while Basin EX-9A appears to sheet flow off-site along the south boundary at **Design Point 6A** west of the high point, towards the intersection of Brule Road and Oto Circle. These sheet flows seem to ultimately combine with the pre-developed flows from Basin Ex-10A further south and east of Brule Road.

Basin EX-10 (Q_5 = 105 cfs, Q_{100} = 222 cfs) consists of approximately 265.9 acres of property at the extreme top of the Sand Creek East Fork Basin. The off-site northern portion of this basin is within the Black Forest, heavily treed area. The off-site eastern portion of the basin contains existing 5 ac. lot development (Indian Wells Subd. Filing 1). The flows from this large basin sheet flow in a southerly direction across the northern portion of the Sterling Ranch property and enter Basin EX-10A.

Basin EX-10A (Q_5 = 46 cfs, Q_{100} = 103 cfs) consists of approximately 153.5 acres of property that sheet flows in a southerly direction through the Sterling Ranch property. The combined flows from both basins EX-10 and EX-10A seem to remain as sheet flow traveling in a southerly direction towards **Design Point 7 (Q_5 = 110 cfs, Q_{100} = 249 cfs)** At this location the flows exit the property along the south boundary. Again, these flows are fairly consistent with the flows determined by the original MDDP at DP-7 (Q_5 = 57.1 cfs, Q_{100} = 277.9 cfs).

PROPOSED DRAINAGE CONDITIONS

As described in the General Description of the report, this proposed Preliminary Plan development contains 47.168 acres of urban residential lots. The recent PUD development (*Villages at Sterling Ranch East PUDSP - PCD No. PUDSP226)* currently under review, is due north of the proposed development and is anticipated to be directly tributary to the drainage facilities designed herein. Thus, this report accounts for that development and remains consistent with the recently approved MDDP and Preliminary Drainage Report for Sterling Ranch East Preliminary Plan No. 1.

Development of these urban lots proposed will consist of overlot grading and utility installation for the planned roadways and lots. Per the El Paso County ECM, Section I.7.1.B, all urban lots are required to provide Water Quality Capture Volume (WQCV). Thus, the proposed FSD facility within this development will provide WQCV along with an Excess Urban Runoff Volume (EURV) in the lower portion of the facility storage volume with an outlet control device. Frequent and infrequent inflows are released at rates approximating undeveloped conditions. This concept provides some mitigation of increased runoff volume by releasing a portion of the increased runoff at a low rate over an extended period of time, up to 72 hours. This means that frequent storms, smaller than the 2-year event, will be reduced to very low flows near or below the sediment carrying threshold value for downstream drainage ways. Also, by incorporating an outlet structure that limits the 100-year runoff to the undeveloped condition rate, the discharge

hydrograph for storms between the 2 year and the 100-year event will approximate the hydrograph for the undeveloped conditions and will help effectively mitigate the effects of development. As reasonably possible, WQCV will be provided for all new roads and urban lots.

This report will describe each developed basin tributary to the proposed FSD facility. This preliminary design will include sizing of all inlets, storm systems and FSD facilities including all required appurtenances.

The following developed basin descriptions will start at the north end of the project and move south and describe how this development proposes to handle both the off-site and on-site drainage conditions both from an interim standpoint uction phasing and the ultimate buildout scenario:

Flows do not match information from Villages PDR for Basin P4-B. Verify and revise as needed.

Off-site Basin P4-B (Q_5 = 58 cfs, Q_{100} = 124 cfs) repres The Villages at Sterling Ranch East development containe orm system.

BOTH OF THESE REPORTS ARE PRELIMINARY DRAINAGE REPORTS AND THE VILLAGES SITE/REPORT ARE CURRENTLY BEING UPDATED FOR RESUBMITTAL. THESE FLOWS REPRESENT THE BEST PRELIM. DESIGN DATA AT THIS POINT AND WILL BE CONFIRMED TO ALL MATCH WITH THE FDR'S.

Design Point 1 (Q_5 = 6 cfs, Q_{100} = 12 cfs) represents d f the Sterling Ranch Road corridor that are tributary to an e designed and approved within the "Sterling Ranch Ro treet Plans", prepared by JR Engineering. (CDR-221) This fa 8 cfs) with a flow-by of (Q_5 = 0.7 cfs, Q_{100} = 4.2 cfs) which is consistent with the JR Engineering design.

Design Point 2 (Q_5 = 2 cfs, Q_{100} = 7 cfs) represents developed flows along the east side of the Sterling Ranch Road corridor along with the flow-by from DP-1 that then enter the site into Basin D at Newport Beach Dr.

Design Point 3 (Q_5 = 4 cf REMOVED CROSSPAN presents developed flows from Basins OS-3, A and B that are completely captured by a proposed 10' Type R Sump Inlet with a 24" RCP outfall (Pipe

Per drainage plan, it appears that OS-3 would drain through the cross pan on St Louis Rd and continue east, not turn the corner and head south.

Run 2). **Design Point 4 (Q_5 = 0.9 cfs, Q_{100} = 2.1 cfs)** represents developed flows from Basin C that are completely captured by a proposed 5' Type R Sump Inlet with an 18" RCP outfall (Pipe Run 3). **Pipe Run 4 (Q_5 = 5 cfs, Q_{100} = 12 cfs)** is a proposed 24" RCP that conveys the total collected developed flows from this sump condition. The emergency overflow path is a max. ponding of 12" and then around the corner down St. Louis St. **Pipe Run 1 (Q_5 = 58 cfs, Q_{100} = 124 cfs)** is a proposed 48" RCP that conveys the total collected developed flows from the planned Villages at Sterling Ranch East development north of Oak Park Dr. **Pipe Run 5 (Q_5 = 62 cfs, Q_{100} = 132 cfs)** is a proposed 48" RCP that conveys these developed flows further downstream.

Design Point 5 (Q_5 = 6 cfs, Q_{100} = 16 cfs) represents developed flows from DP-2 and Basin D that are tributary to a proposed 10' At-Grade Type R Inlet. This facility captures (Q_5 = 5.3 cfs, Q_{100} = 8.9 cfs) with a flow-by of (Q_5 = 0.7 cfs, Q_{100} = 7.1 cfs). The flow-by enters Basin O. The captured developed flows are conveyed via a proposed 18" RCP (Pipe Run 6) east down Biloxi Place.

Design Point 6 (Q_5 = 4 cfs, Q_{100} = 10 cfs) represents developed flows from Basin F that are completely captured by a proposed 10' Type R Sump Inlet with a 24" RCP outfall (Pipe Run 7) **Design Point 7 (Q_5 = 1.4 cfs, Q_{100} = 3.5 cfs)** represents developed flows from Basin G that are completely captured by a proposed 5' Type R Sump Inlet with a 24" RCP outfall (Pipe Run 8) The emergency overflow path is a max. ponding of 12" and then south within th Tract D. **Pipe Run 9 (Q_5 = 10 cfs, Q_{100} = 21 cfs)** is a proposed 30" RCP that conve developed flows from this sump condition and Pipe Run 5 further downstream

From drainage plan, it appears Basin E would also contribute to DP 6

GOOD COMMENT. YES IT WOULD. CALCS. HAVE BEEN UPDATED. THANKS!

Design Point 8 (Q_5 = 5 cfs, Q_{100} = 11 cfs) represents developed flows from Basin H that are completely captured by a proposed 10' Type R Sump Inlet with a 24" RCP outfall (Pipe Run 10). **Design Point 9 (Q_5 = 2 cfs, Q_{100} = 5 cfs)** represents developed flows from Basin I that are completely captured by a proposed 5' Type R Sump Inlet with a 24" RCP outfall (Pipe Run 11). The emergency overflow path is a max. ponding of 12" and then south within the open space

Tract C. **Pipe Run 12 (Q_5 = 15 cfs, Q_{100} = 35 cfs)** is a proposed 30" RCP that conveys the total developed flows from this sump condition and Pipe Run 9 further downstream within Tract C.

Design Point 10 (Q_5 = 3 cfs, Q_{100} = 8 cfs) represents developed flows from Basin J that are completely captured by a proposed 10' Type R Sump Inlet with a 24" RCP outfall (Pipe Run 16). **Design Point 11 (Q_5 = 1.3 cfs, Q_{100} = 3.3 cfs)** represents developed flows from Basin L that are completely captured by a proposed 5' Type R Sump Inlet with an 18" RCP outfall (Pipe Run 17). The emergency overflow path is a max. ponding of 12" and then south around the corner within Lake Tahoe Dr. **Pipe Run 18 (Q_5 = 65 cfs, Q_{100} = 141 cfs)** is a proposed 54" RCP that conveys the total developed flows from this sump condition and Pipe Run 5 further downstream within St. Louis St.

Design Point 12 (Q_5 = 2 cfs, Q_{100} = 6 cfs) represents developed flows from Basin M that are completely captured by a proposed 5' Type R Sump Inlet with an 18" RCP outfall (Pipe Run 19). **Design Point 13 (Q_5 = 2 cfs, Q_{100} = 4 cfs)** represents developed flows from Basin N that are completely captured by a proposed 5' Type R Sump Inlet with an 18" RCP outfall (Pipe Run 20). The emergency overflow path is a max. ponding of 12" and then west over the highpoint within Lake Tahoe Dr. **Pipe Run 21 (Q_5 = 4 cfs, Q_{100} = 10 cfs)** is a proposed 24" RCP that conveys the total developed flows from this sump condition. **Pipe Run 22 (Q_5 = 18 cfs, Q_{100} = 43 cfs)** is a proposed 36" RCP that conveys the total developed flows from Pipe Runs 12 and 18 further south within Tract B.

Design Point 14 (Q_5 = 2 cfs, Q_{100} = 11 cfs) represents developed flows from Basin O and Flow-by from DP-5 that flow directly into Basin P via std. 6' crosspan. **Design Point 15 (Q_5 = 6 cfs, Q_{100} = 19 cfs)** represents developed flows from Basin P and DP-14 that are completely captured by an existing 10' Type R Sump Inlet with a 24" RCP outfall (Pipe Run 13). **Design Point 16 (Q_5 = 2 cfs, Q_{100} = 5 cfs)** represents developed flows from Basins OS-4 and R that are completely captured by an existing 5' Type R Sump Inlet with an 18" RCP outfall (Pipe Run 14). The emergency overflow path is a max. ponding of 12" and then south around the corner down Bentonville

Way. **Pipe Run 15 (Q_5 = 7 cfs, Q_{100} = 22 cfs)** is a proposed 30" RCP that conveys the total developed flows from this existing sump condition further downstream within Bentonville Way and the adjacent Sterling Ranch East Filing No. 3 subdivision. These developed flows are tributary to the planned Pond FSD 11-B and consistent with the "Sterling Ranch MDDP Amendment No. 2 & Preliminary Drainage Report for Sterling Ranch East Preliminary Plan No. 1", prepared by Classic Consulting, approved June 2023.

Design Point 17 (Q_5 = 1.3 cfs, Q_{100} = 3.3 cfs) represents developed flows from Basin S that are completely captured by a proposed 5' Type R Sump Inlet with an 18" RCP outfall (Pipe Run 24). **Design Point 18 (Q_5 = 2 cfs, Q_{100} = 4 cfs)** represents developed flows from Basin T that are completely captured by a proposed 5' Type R Sump Inlet with an 18" RCP outfall (Pipe Run 25). The emergency overflow path is a max. ponding of 12" and then south directly into the proposed Pond FSD 14-B. **Pipe Run 26 (Q_5 = 3 cfs, Q_{100} = 7 cfs)** is a proposed 24" RCP that conveys the total developed flows from this sump condition. **Pipe Run 23 (Q_5 = 80 cfs, Q_{100} = 175 cfs)** is a proposed 60" RCP that conveys the total developed flows from Pipe Runs 18 and 22 further south within Tract B. **Pipe Run 27 (Q_5 = 82 cfs, Q_{100} = 182 cfs)** is a proposed 60" RCP that conveys the total developed flows from Pipe Runs 23 and 26 directly into the proposed Pond FSD 14-B.

Design Point 19 (Q_5 = 4 cfs, Q_{100} = 11 cfs) represents developed flows from Basins U and V that are completely captured by a proposed 10' Type R Sump Inlet with a 24" RCP outfall (Pipe Run 28). **Design Point 20 (Q_5 = 0.8 cfs, Q_{100} = 1.4 cfs)** represents developed flows from Basin W that are completely captured by a proposed 5' Type R Sump Inlet with a 24" RCP outfall (Pipe Run 29). The emergency overflow path is a max. ponding of 12" and then south directly into the proposed Pond FSD 14-B. **Pipe Run 29 (Q_5 = 5 cfs, Q_{100} = 12 cfs)** is a prop
conveys the total developed flows from this sump condition directly into
FSD 14-B.

YES IT IS. ADDED ADDITIONAL LANGUAGE GETTING A LITTLE DETAILED FOR A PDR??

Clarify ponding is for major storm events. Per DCM Vol.1 Section 3 Chapter 6 Table 6-1 cross flow on local streets is only allowed for major storms.

Provide reference from the report discussing inlet at DP21, and provide confirmation that the inlet was designed to account for new flows.

ADDED REFERENCE INFO. FOR JR'S PLANS/REPORT.

Design Point 21 (Q_5 = 2 cfs, Q_{100} = 5 cfs s from Basin OS-5 that are tributary to the existing 15' Type R At-G pproved within the "Sterling Ranch Road & Briargate Parkway Segment 2 Street Plans", prepared by JR Engineering. (CDR-221) This facility completely captures the developed flows with no flow-by which is consistent with the JR Engineering design.

Include discussion of DP 6 & DP6A

INCLUDED IN DISCUSSION IN BASINS EX-9 AND EX-9A PARAGRAPHS UNDER EXISTING CONDITIONS.

insert text:
"(Pond's FSD14B and FSD11B)"

DETENTION / STORMWATER QUALITY I

ADDED

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. These features include but are not limited to two FSD's, temporary sediment basin and runoff reduction RPA's. All urban areas require detention and will provide a Water Quality Capture Volume (WQCV) and Excess Urban Runoff Volume (EURV) in the lower portion of the facility storage volume that will release the more frequent storms at a slower rate to help minimize the effects of development of the property. The proposed facilities are to be private facilities with ownership and maintenance by the Sterling Ranch Metropolitan District. After completion of construction and upon the Board of County Commissioners acceptance, all the drainage facilities within will be owned and maintained by El Paso County.

ADDED FURTHER INFO. TO NARRATIVE IN THE DP-14 PARAGRAPH ABOVE.

The following represents the proposed **Pond FSD 14-B design**:

Also provide details for the other PBMPs:
- state which project FSD11B will be built under (and thus why calcs aren't provided here like they are for 14B)
- discuss design of the TSB (reference MHFD/County details is fine)
- discuss runoff reduction (reference MHFD calc sheets is fine)

(See MHFD-Detention Design Sheets in Appendix)

Total Tributary acreage: 74.65 Ac.

1.411 Ac.-ft. WQCV r

3.195 Ac.-ft. EURV re

3.098 Ac.-ft. 100-yr.

THESE ARE FDR FINAL DESIGN ITEMS AND WILL BE INCLUDED IN FDR.

7.704 Ac.-ft. Total

Total In-flow: **Q_5 = 87 cfs, Q_{100} = 200 cfs**

Pond Design Release: **Q_5 = 5.0 cfs, Q_{100} = 54.3 cfs**

naintenance by the Sterling Ranch Metro District)

ADDED TO PARAGRAPH ABOVE.

Have this statement for RR and TSB or make this a blank statement for all PBMPs for this site.

Discuss differences in release rates from the approved MDDP and calculations. Discuss the change in location of Pond FSD 14-B.

ADDED DISCUSSION

CONSULTING ENGINEERS & SURVEYORS

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 City of Colorado Springs/El Paso County Drainage Criteria Manual as revised in May 2014. Individual on-site developed basin design used for detention/SWQ basin sizing, inlet sizing and storm system routing was calculated using the Rational Method. Runoff Coefficients are based on the imperviousness of the particular land use and the hydrologic soil type in accordance with Table 6-6. The average rainfall intensity, by recurrence interval found in the Intensity-Duration-Frequency (IDF) curves in Figure 6-5. (See Appendix)

The City of Colorado Springs/El Paso County DCM 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 helps to achieve storm water permit requirements.

This site adheres to this **Four Step Process** as follows:

1. **Employ Runoff Reduction Practices:** All proposed lot impervious area (roof tops, patios, etc.) will sheet flow across landscaped portions of front and rear yards and through open space areas to slow runoff and increase time of concentration prior to being conveyed to the proposed public streets or detention facilities. This will minimize directly connected impervious areas within the project site.

Reference the Water Quality Treatment Plan Map in the Appendix for the following calculations:

Area treated in proposed permanent Pond FSD-14B (Area includes 37.3 ac. from anticipated Villages site)	74.65 ac.
Area treated in proposed permanent Pond FSD-11B	7.61 ac.
Area treated in temporary sediment basin (Basin AA – Rear yards)	2.10 ac.
Area of runoff reduction water quality treatment (Basins Y1 - Buffer, Y2 - Buffer and Z – Rear yards Reference Runoff Reduction Calculations in Appendix for these areas)	3.48 ac.
Filing No. 5 anticipated total platted area	**47.17 ac.**

2. **Stabilize Drainageways:** After developed flows utilize the runoff reduction practices through the front and rear yards, developed flows will travel via curb and gutter within the public streets and eventually public storm systems. These collected flows are then routed directly to the proposed extended detention basins (full-spectrum facilities). Where developed flows are not able to be routed to public street, sheet flows will travel across landscaped rear yards and then through undeveloped property prior to being released off-site.

3. **Provide Water Quality Capture Volume (WQCV):** Runoff from this development will be treated through capture and slow release of the WQCV and excess urban runoff volume (EURV) in the proposed Full-Spectrum permanent Extended Detention Basins designed per current El Paso County drainage criteria. For the 4.5 ac. that is not able to be captured and routed to one of the permanent EDB's, Runoff Reduction practices are required and provided in the rear setbacks of the lots or within the open space tract within these specific basins. Reference Runoff Reduction Calculations in Appendix for these areas that show a 100% WQCV Reduction and meets El Paso County standards.

4. **Consider need for Industrial and Commercial BMPs**: No industrial or commercial uses are proposed within this development. However, a site-specific storm water quality and erosion control plan and narrative along with the grading and erosion control plan will be submitted with the future Final Plat submittal. Details such as site-specific sediment and erosion control construction BMP's as well as temporary and permanent BMP's will be detailed in this plan and narrative to protect receiving waters. BMP's will be constructed and maintained as the development has been graded and erosion control methods employed.

FLOODPLAIN STATEMENT

Np portion of this site are located within a floodplain as determined by the Flood Insurance Rate Maps (F.I.R.M.) Map Number 08041C0533G with effective date of December 7, 2018 (See Appendix).

DRAINAGE AND BRIDGE FEES Fees will be reviewed at time of Final Plat with Final Drainage Report OK

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

There is no final platting proposed at this time. However, the following are anticipated drainage and bridge fees using the following impervious acreage method approved by El Paso County. **Sterling Ranch East Filing No. 5 has a total area of 47.17 acres** with the following different land uses proposed:

10.53 Ac.	Park/Open Space/Trail Tracts (Tracts A-I)
36.64 Ac.	Urban Lots (Avg. Lot Size = 7,533 SF)
47.17 Ac.	**Total**

The percent imperviousness for this subdivision is calculated as follows:

Fees for Park/Open Space/Trail Tracts

(Per El Paso County Percent Impervious Chart: 7**%**)

10.53 Ac. x 7% = **0.74 Impervious Ac.**

Fees for 0.17 Ac. lots (Avg. Lot Size of 7,533 SF)

(Per El Paso County Percent Impervious Chart: 48**%**)

36.64 Ac. x 48% = **17.59 Impervious Ac.**

Total Impervious Acreage: **18.33 Imp. Ac.** (Drainage Fees)

Total Impervious Acreage: **18.33 Imp. Ac.** (Bridge Fees)

The following calculations are based on the 2023 Sand Creek drainage/bridge fees:

ESTIMATED FEE TOTALS: (to be formalized in the Final Drainage Report)

Bridge Fees

$ 9,743.00 x 18.33 Impervious Ac. = **$ 178,589.19**

Drainage Fees

$ 23,821.00 x 18.33 Impervious Ac. = **$ 436,638.93**

However, per the ECM 3.10.4.a, this development requests a reduction of drainage fees based on proposed construction of an on-site full-spectrum detention/stormwater quality facility (Pond FSD-14B) as shown in the MDDP. This reduction will be formally requested in the Final Drainage Report.

SUMMARY

The proposed Sterling Ranch East Filing No. 5 is within the Sand Creek Drainage Basin. Recommendations are made within this report concerning necessary improvements that will be required as a result of development of this property. The points of storm water release from the proposed site are required to be at or below the calculated historic flow quantities. The development of the proposed site does not significantly impact any downstream facility or property to an extent greater than that which currently exists in the pre-development conditions. All drainage facilities within this report were sized according to the Drainage Criteria Manuals and the full-spectrum storm water quality requirements.

PREPARED BY:

Classic Consulting Engineers & Surveyors, LLC

Marc A. Whorton, P.E.
Project Manager

maw/118325/PDR.doc

REFERENCES

1. City of Colorado Springs/County of El Paso 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 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. "Final Drainage Report for Forest Gate Subdivision" Law & Mariotti Consultants, Inc. dated October 2004.

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

5. "Master Development Drainage Plan for The Retreat at TimberRidge", Classic Consulting, approved March 2018.

6. "Preliminary Drainage Report for The Retreat at TimberRidge Preliminary Plan – South of Arroya Lane", Classic Consulting, approved October 2018.

7. "2018 Sterling Ranch MDDP", M&S Civil Consultants, Inc., June 2018

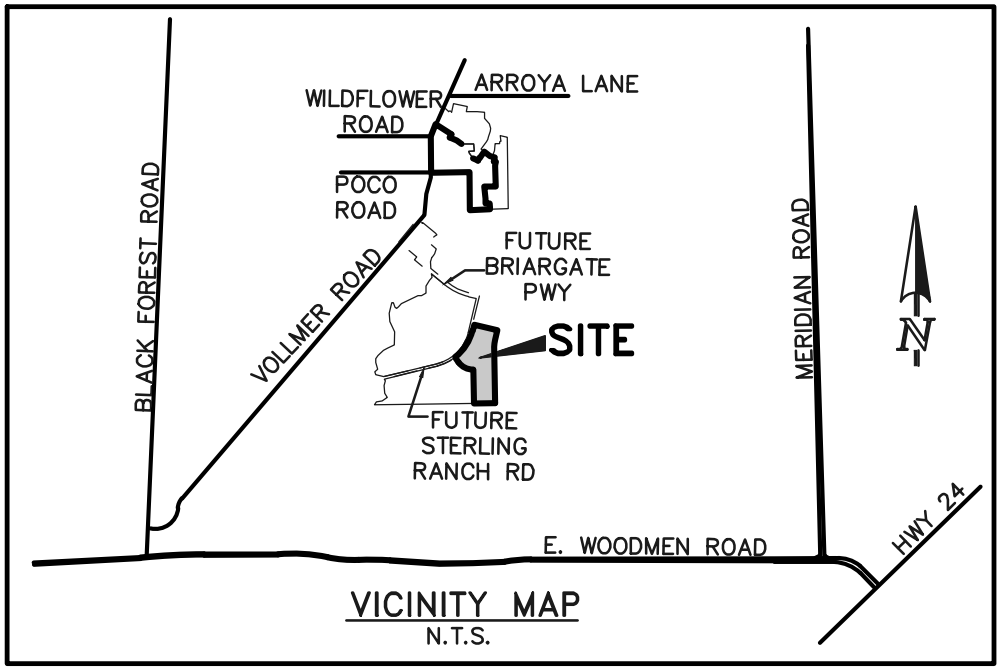
8. "Final Drainage Report for Retreat at TimberRidge Filing No. 1", Classic Consulting, approved November, 2020.

9. "Final Drainage Report for Retreat at TimberRidge Filing No. 2", Classic Consulting, approved September, 2022.

APPENDIX

VICINITY MAP

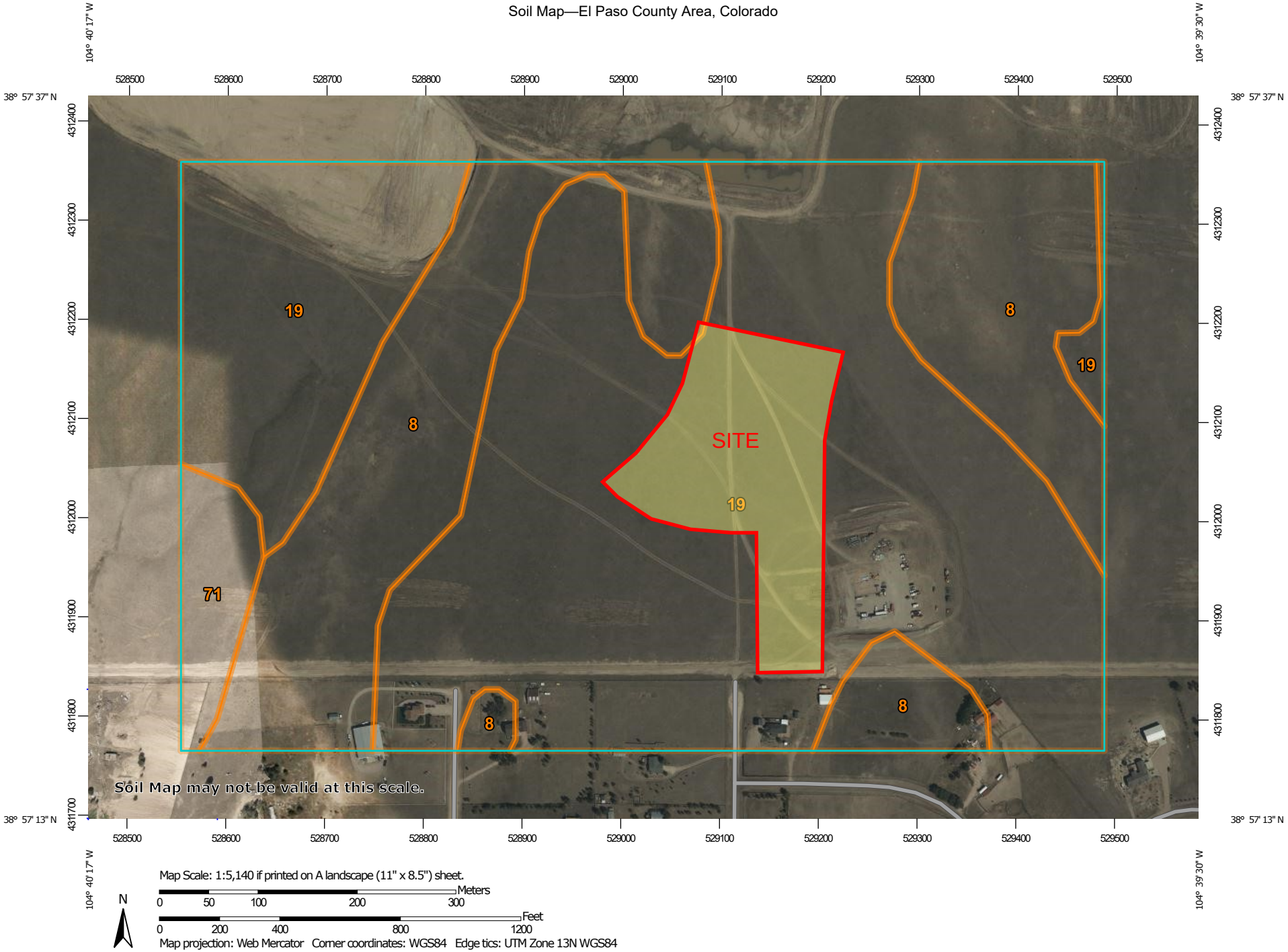
CLASSIC SM
CONSULTING
ENGINEERS & SURVEYORS



VICINITY MAP
N.T.S.

SOILS MAP (S.C.S SURVEY)

Soil Map—El Paso County Area, Colorado



MAP LEGEND

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

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

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

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 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: Aug 19, 2018—May 26, 2019

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
8	Blakeland loamy sand, 1 to 9 percent slopes	41.3	30.0%
19	Columbine gravelly sandy loam, 0 to 3 percent slopes	92.3	67.0%
71	Pring coarse sandy loam, 3 to 8 percent slopes	4.2	3.0%
Totals for Area of Interest		**137.8**	**100.0%**

El Paso County Area, Colorado

8—Blakeland loamy sand, 1 to 9 percent slopes

Map Unit Setting

National map unit symbol: 369v
Elevation: 4,600 to 5,800 feet
Mean annual precipitation: 14 to 16 inches
Mean annual air temperature: 46 to 48 degrees F
Frost-free period: 125 to 145 days
Farmland classification: Not prime farmland

Map Unit Composition

Blakeland and similar soils: 98 percent
Minor components: 2 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Blakeland

Setting

Landform: Flats, hills
Landform position (three-dimensional): Side slope, talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from sedimentary rock and/or eolian deposits derived from sedimentary rock

Typical profile

A - 0 to 11 inches: loamy sand
AC - 11 to 27 inches: loamy sand
C - 27 to 60 inches: sand

Properties and qualities

Slope: 1 to 9 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Available water supply, 0 to 60 inches: Low (about 4.5 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: A
Ecological site: R049XB210CO - Sandy Foothill
Hydric soil rating: No

Minor Components

Other soils

Percent of map unit: 1 percent
Hydric soil rating: No

Pleasant

Percent of map unit: 1 percent
Landform: Depressions
Hydric soil rating: Yes

Data Source Information

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 20, Sep 2, 2022

El Paso County Area, Colorado

19—Columbine gravelly sandy loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 367p
Elevation: 6,500 to 7,300 feet
Mean annual precipitation: 14 to 16 inches
Mean annual air temperature: 46 to 50 degrees F
Frost-free period: 125 to 145 days
Farmland classification: Not prime farmland

Map Unit Composition

Columbine and similar soils: 97 percent
Minor components: 3 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Columbine

Setting

Landform: Fans, fan terraces, flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium

Typical profile

A - 0 to 14 inches: gravelly sandy loam
C - 14 to 60 inches: very gravelly loamy sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 2.5 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: A
Ecological site: R049XY214CO - Gravelly Foothill
Hydric soil rating: No

Minor Components

Fluvaquentic haplaquolls

Percent of map unit: 1 percent

Landform: Swales
Hydric soil rating: Yes

Other soils
Percent of map unit: 1 percent
Hydric soil rating: No

Pleasant
Percent of map unit: 1 percent
Landform: Depressions
Hydric soil rating: Yes

Data Source Information

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 20, Sep 2, 2022

F.E.M.A. MAP

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NOTES TO USERS

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

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

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

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

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

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

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

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

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

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

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

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

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

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

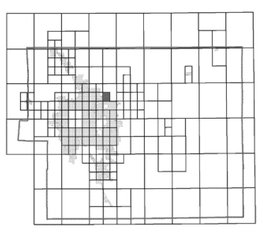
If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call **1-877-FEMA MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/business/nfip.

El Paso County Vertical Datum Offset Table

Flooding Source	Vertical Datum Offset (ft)

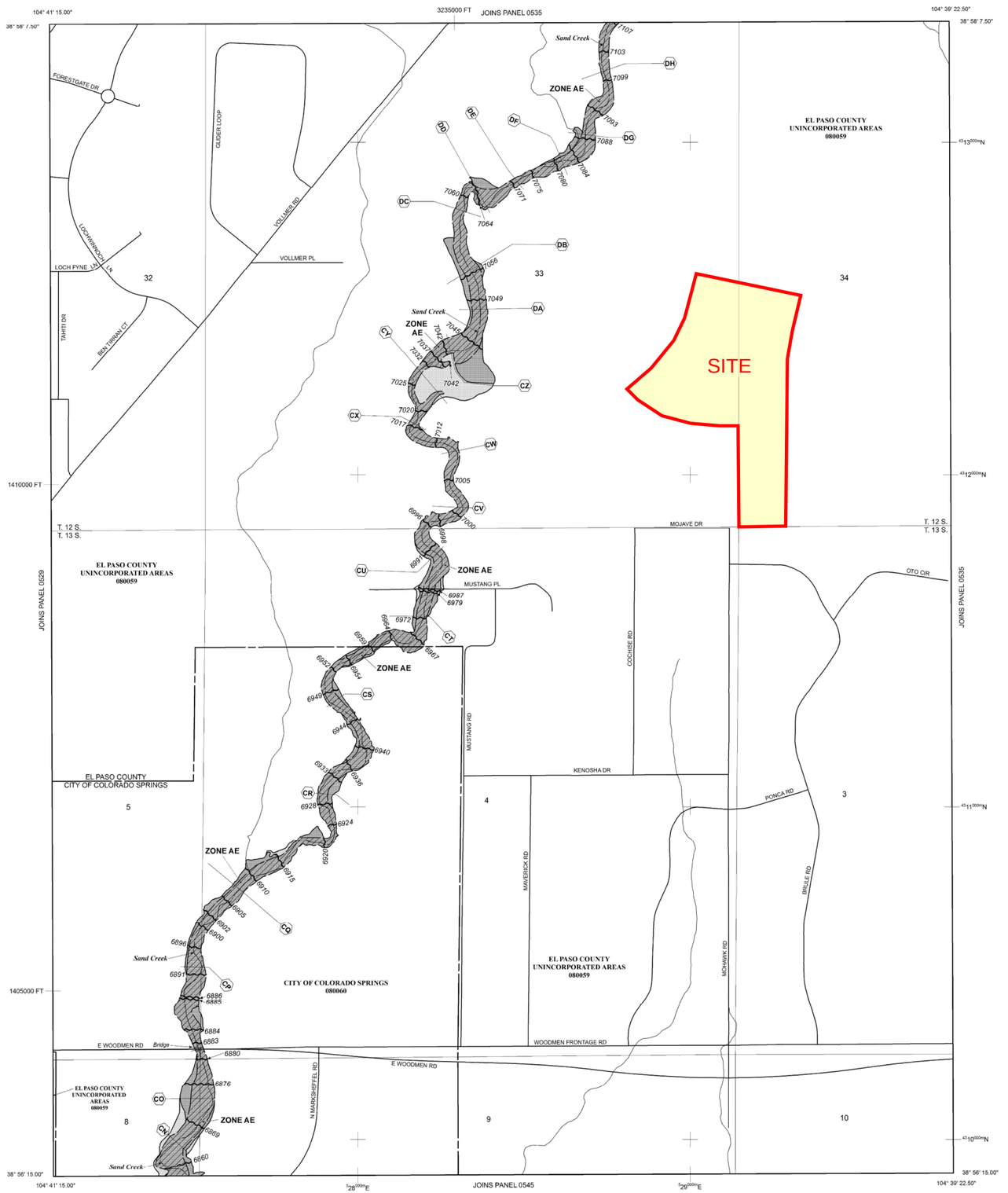
REFER TO SECTION 3.3 OF THE EL PASO COUNTY FLOOD INSURANCE STUDY FOR STREAM BY STREAM VERTICAL DATUM CONVERSION INFORMATION

Panel Location Map



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

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



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

LEGEND

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

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

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

FLOODWAY AREAS IN ZONE AE

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

OTHER FLOOD AREAS

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

OTHER AREAS

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

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

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

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

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

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

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

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

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

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

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

MAP SCALE 1" = 500'

250 0 500 1000 FEET
150 0 150 300 METERS

NFIP — NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0533G

FIRM

FLOOD INSURANCE RATE MAP

EL PASO COUNTY, COLORADO AND INCORPORATED AREAS

PANEL 533 OF 1300

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

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

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

MAP NUMBER
08041C0533G

MAP REVISED
DECEMBER 7, 2018

Federal Emergency Management Agency

HYDROLOGIC CALCULATIONS

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For Colorado Springs and much of the Fountain Creek watershed, the 1-hour depths are fairly uniform and are summarized in Table 6-2. Depending on the location of the project, rainfall depths may be calculated using the described method and the NOAA Atlas maps shown in Figures 6-6 through 6-17.

Table 6-2. Rainfall Depths for Colorado Springs

Return Period	1-Hour Depth	6-Hour Depth	24-Hour Depth
2	1.19	1.70	2.10
5	1.50	2.10	2.70
10	1.75	2.40	3.20
25	2.00	2.90	3.60
50	2.25	3.20	4.20
100	2.52	3.50	4.60

Where Z= 6,840 ft/100

These depths can be applied to the design storms or converted to intensities (inches/hour) for the Rational Method as described below. However, as the basin area increases, it is unlikely that the reported point rainfalls will occur uniformly over the entire basin. To account for this characteristic of rain storms an adjustment factor, the Depth Area Reduction Factor (DARF) is applied. This adjustment to rainfall depth and its effect on design storms is also described below. The UDFCD UD-Rain spreadsheet, available on UDFCD's website, also provides tools to calculate point rainfall depths and Intensity-Duration-Frequency curves[2] and should produce similar depth calculation results.

2.2 Design Storms

Design storms are used as input into rainfall/runoff models and provide a representation of the typical temporal distribution of rainfall events when the creation or routing of runoff hydrographs is required. It has long been observed that rainstorms in the Front Range of Colorado tend to occur as either short-duration, high-intensity, localized, convective thunderstorms (cloud bursts) or longer-duration, lower-intensity, broader, frontal (general) storms. The significance of these two types of events is primarily determined by the size of the drainage basin being studied. Thunderstorms can create high rates of runoff within a relatively small area, quickly, but their influence may not be significant very far downstream. Frontal storms may not create high rates of runoff within smaller drainage basins due to their lower intensity, but tend to produce larger flood flows that can be hazardous over a broader area and extend further downstream.

- **Thunderstorms**: Based on the extensive evaluation of rain storms completed in the Carlton study (Carlton 2011), it was determined that typical thunderstorms have a duration of about 2 hours. The study evaluated over 300,000 storm cells using gage-adjusted NEXRAD data, collected over a 14-year period (1994 to 2008). Storms lasting longer than 3 hours were rarely found. Therefore, the results of the Carlton study have been used to define the shorter duration design storms.

  To determine the temporal distribution of thunderstorms, 22 gage-adjusted NEXRAD storm cells were studied in detail. Through a process described in a technical memorandum prepared by the City of Colorado Springs (City of Colorado Springs 2012), the results of this analysis were interpreted and normalized to the 1-hour rainfall depth to create the distribution shown in Table 6-3 with a 5 minute time interval for drainage basins up to 1 square mile in size. This distribution represents the rainfall

Table 6-6. Runoff Coefficients for Rational Method
(Source: UDFCD 2001)

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

3.2 Time of Concentration

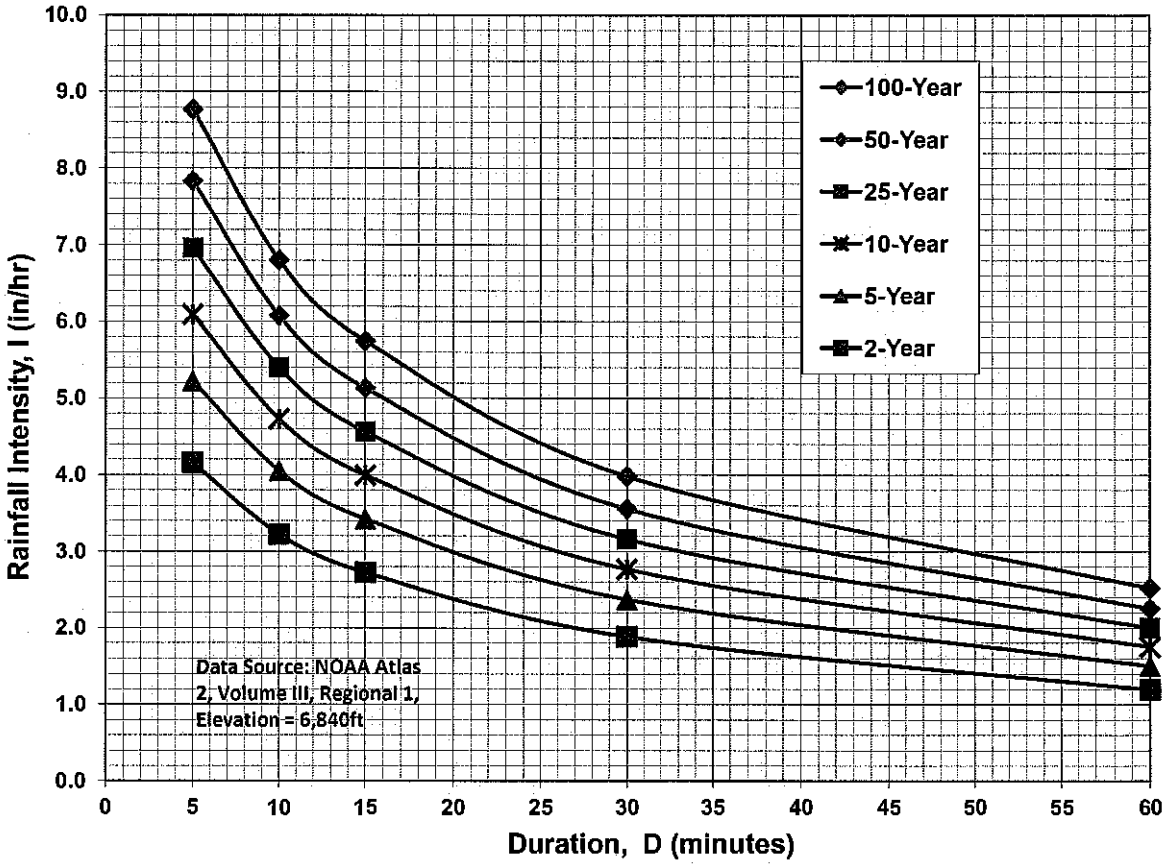
One of the basic assumptions underlying the Rational Method is that runoff is a function of the average rainfall rate during the time required for water to flow from the hydraulically most remote part of the drainage area under consideration to the design point. However, in practice, the time of concentration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

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

Table 6-10. NRCS Curve Numbers for Frontal Storms & Thunderstorms for Developed Conditions (ARCII)

Fully Developed Urban Areas (vegetation established)[1]	Treatment	Hydrologic Condition	% I	Pre-Development CN			
				HSG A	HSG B	HSG C	HSG D
Open space (lawns, parks, golf courses, cemeteries, etc.):							
Poor condition (grass cover < 50%)	-----	-----	---	68	79	86	89
Fair condition (grass cover 50% to 75%)	-----	-----	---	49	69	79	84
Good condition (grass cover > 75%)	-----	-----	---	39	61	74	80
Impervious areas:							
Paved parking lots, roofs, driveways, etc. (excluding right-of-way	-----	-----	---	98	98	98	98
Streets and roads:							
Paved; curbs and storm sewers (excluding right-of-way)	-----	-----	---	98	98	98	98
Paved; open ditches (including right-of-way)	-----	-----	---	83	89	92	93
Gravel (including right-of-way)	-----	-----	---	76	85	89	91
Dirt (including right-of-way)	-----	-----	---	72	82	87	89
Western desert urban areas:							
Natural desert landscaping (pervious areas only)	-----	-----	---	63	77	85	88
Artificial desert landscaping (impervious weed barrier, desert shrub with 1- to 2-inch sand or gravel mulch and basin borders)	-----	-----	---	96	96	96	96
Urban districts:							
Commercial and business	-----	-----	85	89	92	94	95
Industrial	-----	-----	72	81	88	91	93
Residential districts by average lot size:							
1/8 acre or less (town houses)	-----	-----	65	77	85	90	92
1/4 acre	-----	-----	38	61	75	83	87
1/3 acre	-----	-----	30	57	72	81	86
1/2 acre	-----	-----	25	54	70	80	85
1 acre	-----	-----	20	51	68	79	84
2 acres	-----	-----	12	46	65	77	82
Developing Urban Areas[1]	**Treatment[2]**	**Hydrologic Condition[3]**	**% I**	**HSG A**	**HSG B**	**HSG C**	**HSG D**
Newly graded areas (pervious areas only, no vegetation)	-----	-----	---	77	86	91	94
Cultivated Agricultural Lands[1]	**Treatment**	**Hydrologic Condition**	**% I**	**HSG A**	**HSG B**	**HSG C**	**HSG D**
Fallow	Bare soil	-----	---	77	86	91	94
	Crop residue cover (CR)	Poor	---	76	85	90	93
		Good	---	74	83	88	90
Row crops	Straight row (SR)	Poor	---	72	81	88	91
		Good	---	67	78	85	89
	SR + CR	Poor	---	71	80	87	90
		Good	---	64	75	82	85
	Contoured (C)	Poor	---	70	79	84	88
		Good	---	65	75	82	86
	C + CR	Poor	---	69	78	83	87
		Good	---	64	74	81	85
	Contoured & terraced (C&T)	Poor	---	66	74	80	82
		Good	---	62	71	78	81
	C&T+ CR	Poor	---	65	73	79	81
		Good	---	61	70	77	80
Small grain	SR	Poor	---	65	76	84	88
		Good	---	63	75	83	87
	SR + CR	Poor	---	64	75	83	86
		Good	---	60	72	80	84
	C	Poor	---	63	74	82	85
		Good	---	61	73	81	84
	C + CR Poor	Poor	---	62	73	81	84
		Good	---	60	72	80	83
	C&T	Poor	---	61	72	79	82
		Good	---	59	70	78	81
	C&T+ CR	Poor	---	60	71	78	81
		Good	---	58	69	77	80

Figure 6-5. Colorado Springs Rainfall Intensity Duration Frequency



IDF Equations

$I_{100} = -2.52 \ln(D) + 12.735$

$I_{50} = -2.25 \ln(D) + 11.375$

$I_{25} = -2.00 \ln(D) + 10.111$

$I_{10} = -1.75 \ln(D) + 8.847$

$I_{5} = -1.50 \ln(D) + 7.583$

$I_{2} = -1.19 \ln(D) + 6.035$

Note: Values calculated by equations may not precisely duplicate values read from figure.

JOB NAME: *STERLING RANCH EAST FILING NO. 5 - PRELIM. PLAN*
JOB NUMBER: *1183.25*
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FINAL DRAINAGE REPORT ~ BASIN RUNOFF COEFFICIENT SUMMARY

		C VALUE DCM TABLE 6-6						C VALUE DCM TABLE 6-6						WEIGHTED "C" VALUE			WEIGHTED CA			DCM TABLE 6-6
BASIN	TOTAL AREA (AC)	LAND USE	PERCENT IMPERVIOUS	AREA (AC)	C(2)	C(5)	C(100)	LAND USE	PERCENT IMPERVIOUS	AREA (AC)	C(2)	C(5)	C(100)	C(2)	C(5)	C(100)	CA(2)	CA(5)	CA(100)	WEIGHTED % IMPERVIOUS
A	0.78	RES 1/6 AC.	52.5%	0.78	0.32	0.38	0.55			0.00	0.02	0.08	0.35	0.32	0.38	0.55	0.25	0.29	0.43	52.5%
B	2.20	RES 1/6 AC.	52.5%	2.20	0.32	0.38	0.55			0.00	0.02	0.08	0.35	0.32	0.38	0.55	0.70	0.83	1.20	52.5%
C	0.61	RES 1/6 AC.	52.5%	0.61	0.32	0.38	0.55			0.00	0.02	0.08	0.35	0.32	0.38	0.55	0.20	0.23	0.33	52.5%
D	3.70	RES 1/6 AC.	52.5%	3.70	0.32	0.38	0.55			0.00	0.02	0.08	0.35	0.32	0.38	0.55	1.18	1.39	2.02	52.5%
E	0.90	RES 1/6 AC.	52.5%	0.90	0.32	0.38	0.55			0.00	0.02	0.08	0.35	0.32	0.38	0.55	0.29	0.34	0.49	52.5%
F	3.60	RES 1/6 AC.	52.5%	2.66	0.32	0.38	0.55	PARK	7.0%	0.94	0.05	0.12	0.39	0.25	0.31	0.50	0.90	1.11	1.82	40.6%
G	0.99	RES 1/6 AC.	52.5%	0.94	0.32	0.38	0.55	OPEN SPACE	7.0%	0.05	0.05	0.12	0.39	0.31	0.36	0.54	0.30	0.36	0.53	50.2%
H	3.80	RES 1/6 AC.	52.5%	3.63	0.32	0.38	0.55	OPEN SPACE	7.0%	0.17	0.05	0.12	0.39	0.31	0.36	0.54	1.17	1.38	2.04	50.5%
I	1.40	RES 1/6 AC.	52.5%	1.35	0.32	0.38	0.55	OPEN SPACE	7.0%	0.05	0.02	0.08	0.35	0.31	0.36	0.54	0.43	0.51	0.75	50.9%
J	2.30	RES 1/6 AC.	52.5%	2.30	0.32	0.38	0.55			0.00	0.02	0.08	0.35	0.32	0.38	0.55	0.74	0.86	1.25	52.5%
K	Not Used																			
L	1.10	RES 1/6 AC.	52.5%	1.10	0.32	0.38	0.55			0.00	0.02	0.08	0.35	0.32	0.38	0.55	0.35	0.41	0.60	52.5%
M	1.80	RES 1/6 AC.	52.5%	1.63	0.32	0.38	0.55	OPEN SPACE	7.0%	0.17	0.05	0.12	0.39	0.29	0.35	0.53	0.53	0.63	0.95	48.2%
N	1.30	RES 1/6 AC.	52.5%	1.15	0.32	0.38	0.55	PARK	7.0%	0.15	0.05	0.12	0.39	0.29	0.35	0.53	0.38	0.45	0.69	47.3%
O	1.60	RES 1/6 AC.	52.5%	1.60	0.32	0.38	0.55			0.00	0.02	0.08	0.35	0.32	0.38	0.55	0.51	0.60	0.87	52.5%
P	3.30	RES 1/6 AC.	52.5%	3.30	0.32	0.38	0.55			0.00	0.02	0.08	0.35	0.32	0.38	0.55	1.06	1.24	1.80	52.5%
Q	Not Used																			
R	0.44	STREET	100%	0.07	0.89	0.90	0.96	PARK	7.0%	0.37	0.05	0.12	0.39	0.18	0.24	0.48	0.08	0.11	0.21	21.8%
S	1.10	RES 1/6 AC.	52.5%	1.10	0.32	0.38	0.55			0.00	0.02	0.08	0.35	0.32	0.38	0.55	0.35	0.41	0.60	52.5%
T	1.40	RES 1/6 AC.	52.5%	1.40	0.32	0.38	0.55			0.00	0.02	0.08	0.35	0.32	0.38	0.55	0.45	0.53	0.76	52.5%
U	2.20	RES 1/6 AC.	52.5%	2.20	0.32	0.38	0.55			0.00	0.02	0.08	0.35	0.32	0.38	0.55	0.70	0.83	1.20	52.5%
V	1.40	RES 1/6 AC.	52.5%	1.40	0.32	0.38	0.55			0.00	0.02	0.08	0.35	0.32	0.38	0.55	0.45	0.53	0.76	52.5%
W	0.19	STREET	100%	0.16	0.89	0.90	0.96	OPEN SPACE	7.0%	0.03	0.05	0.12	0.39	0.76	0.78	0.87	0.14	0.15	0.17	85.3%
X	6.00	PARK	7.0%	6.00	0.05	0.12	0.39			0.00	0.02	0.08	0.35	0.05	0.12	0.39	0.30	0.72	2.34	7.0%
Y1	1.90	OS/BUFFER	7.0%	1.60	0.05	0.12	0.39	SIDEWALK	100.0%	0.30	0.89	0.90	0.96	0.18	0.24	0.48	0.35	0.46	0.91	21.7%
Y2	0.58	OS/BUFFER	7.0%	0.54	0.05	0.12	0.39	SIDEWALK	100.0%	0.04	0.02	0.08	0.35	0.05	0.12	0.39	0.03	0.07	0.22	13.4%
Z	1.00	RES 1/6 AC.	52.5%	1.00	0.32	0.38	0.55			0.00	0.02	0.08	0.35	0.32	0.38	0.55	0.32	0.38	0.55	52.5%
AA	2.10	RES 1/6 AC.	52.5%	2.10	0.32	0.38	0.55			0.00	0.02	0.08	0.35	0.32	0.38	0.55	0.67	0.79	1.14	52.5%
OS-1	2.60	RES 1/8 AC.	65.0%	1.30	0.41	0.45	0.59	STREET	100%	1.30	0.89	0.90	0.96	0.65	0.68	0.78	1.69	1.76	2.02	82.5%
OS-2	0.68	STREET	100%	0.34	0.89	0.90	0.96	OPEN SPACE	7.0%	0.34	0.05	0.12	0.39	0.47	0.51	0.68	0.32	0.35	0.46	53.5%
OS-3	0.17	STREET	100%	0.17	0.89	0.90	0.96			0.00	0.02	0.08	0.35	0.89	0.90	0.96	0.15	0.15	0.16	100.0%
OS-4	1.40	RES 1/6 AC.	52.5%	1.40	0.32	0.38	0.55			0.00	0.02	0.08	0.35	0.32	0.38	0.55	0.45	0.53	0.76	52.5%
OS-5	0.87	STREET	100%	0.61	0.89	0.90	0.96	OPEN SPACE	7.0%	0.26	0.05	0.12	0.39	0.64	0.67	0.79	0.56	0.58	0.69	72.2%
OS-6	6.00	UNDEV.	2%	6.00	0.03	0.09	0.36			0.00	0.05	0.12	0.39	0.03	0.09	0.36	0.18	0.54	2.16	2.0%
P4-B Villages at Sterling Ranch East PP	37.30	RES 1/8 AC.	70.0%	37.30	0.45	0.49	0.62			0.00	0.02	0.08	0.35	0.45	0.49	0.62	16.79	18.28	23.13	70.0%
TOTAL	**96.71**																			
TOTAL TRIB. AREA TO POND FSD-14B	**74.65**																			

Basins tributaty to Pond FSD-14B
Basins tributaty to Pond FSD-11B
Basin w/ Runoff Reduction Treatment
Basins treated in Temp. Sediment Pond

ADDED

Provide copy of existing drainage calculations

Identify if these are existing conditions.

JOB NAME: *STERLING RANCH EAST FILING NO. 5 - PRELIM. PLAN*
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EXISTING CONDITIONS CALCS. NOW INCLUDED. THESE ARE DEVELOPED BASINS AND CONDITIONS.

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

$$t_i = \frac{0.395(1.1 - C_5)\sqrt{L}}{S^{0.33}} \qquad V = C_v S_w^{0.5} \qquad Tc = L/V$$

nveyance Coefficient, C_v

d Surface	C_v
	2.5
$t_c = \frac{L}{180} + 10$	5
	6.5
Short pasture and lawns	7
Nearly bare ground	10
Grassed waterway	15
Paved areas and shallow paved swales	20

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

FINAL DRAINAGE REPORT ~ BASIN RUNOFF SUMMARY

BASIN	WEIGHTED			OVERLAND				STREET / CHANNEL FLOW				Tc	INTENSITY			TOTAL FLOWS		
	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	0.25	0.29	0.43	0.08	100	2	14.7	135	2.0%	2.8	0.8	15.4	2.78	3.48	5.84	0.7	1.0	2.5
B	0.70	0.83	1.20	0.08	100	2	14.7	260	1.5%	2.4	1.8	16.4	2.70	3.39	5.68	2	3	7
C	0.20	0.23	0.33	0.08	50	1	10.4	260	1.5%	2.4	1.8	12.1	3.07	3.84	6.45	0.6	0.9	2.1
D	1.18	1.39	2.02	0.08	100	2	14.7	900	1.8%	2.7	5.6	20.2	2.46	3.07	5.16	3	4	10
E	0.29	0.34	0.49	0.08	50	1	10.4	470	2.5%	3.2	2.5	12.8	3.00	3.75	6.30	0.9	1.3	3.1
F	0.90	1.11	1.82	0.12	100	2	14.1	270	1.5%	2.4	1.8	15.9	2.74	3.43	5.76	2	4	10
G	0.30	0.36	0.53	0.12	50	1	10.0	270	1.5%	2.4	1.8	11.8	3.10	3.88	6.52	0.9	1.4	3.5
H	1.17	1.38	2.04	0.12	100	2	14.1	450	1.5%	2.4	3.1	17.1	2.65	3.32	5.57	3	5	11
I	0.43	0.51	0.75	0.08	50	1	10.4	450	1.5%	2.4	3.1	13.4	2.94	3.69	6.19	1	2	5
J	0.74	0.86	1.25	0.08	50	1	10.4	630	3.5%	3.7	2.8	13.2	2.97	3.72	6.24	2	3	8
K	Not Used																	
L	0.35	0.41	0.60	0.08	100	2	14.7	500	1.5%	2.4	3.4	18.1	2.59	3.24	5.44	0.9	1.3	3.3
M	0.53	0.63	0.95	0.12	100	2	14.1	200	1.5%	2.4	1.4	15.4	2.78	3.48	5.84	1	2	6
N	0.38	0.45	0.69	0.12	100	2	14.1	200	1.5%	2.4	1.4	15.4	2.78	3.48	5.84	1	2	4
O	0.51	0.60	0.87	0.08	100	2	14.7	300	1.5%	2.4	2.0	16.7	2.69	3.36	5.64	1	2	5
P	1.06	1.24	1.80	0.08	100	2	14.7	420	1.5%	2.4	2.9	17.5	2.63	3.29	5.52	3	4	10

JOB NAME: ***STERLING RANCH EAST FILING NO. 5 - PRELIM. PLAN***
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CALC'D BY: ***MAW***

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

$$t_i = \frac{0.395(1.1 - C_5)\sqrt{L}}{S^{0.33}} \qquad V = C_v S_w^{0.5} \qquad \text{Tc=L/V}$$

Table 6-7. Conveyance Coefficient, C_v

Type of Land Surface	C_v
Heavy meadow	2.5
Tillage/field	5
Riprap (not buried)* $t_c = \frac{L}{180} + 10$	6.5
Short pasture and lawns	7
Nearly bare ground	10
Grassed waterway	15
Paved areas and shallow paved swales	20

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

FINAL DRAINAGE REPORT ~ BASIN RUNOFF SUMMARY

BASIN	WEIGHTED			OVERLAND				STREET / CHANNEL FLOW				Tc	INTENSITY			TOTAL FLOWS		
	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)
Q	Not Used																	
R	0.08	0.11	0.21	0.12	100	2	14.1	50	1.5%	2.4	0.3	14.4	2.86	3.58	6.01	0.2	**0.4**	**1.3**
S	0.35	0.41	0.60	0.08	100	2	14.7	500	1.5%	2.4	3.4	18.1	2.59	3.24	5.44	0.9	**1.3**	**3.3**
T	0.45	0.53	0.76	0.08	100	2	14.7	300	1.5%	2.4	2.0	16.7	2.69	3.36	5.64	1	**2**	**4**
U	0.70	0.83	1.20	0.08	100	2	14.7	500	1.5%	2.4	3.4	18.1	2.59	3.24	5.44	2	**3**	**7**
V	0.45	0.53	0.76	0.08	50	1	10.4	650	1.5%	2.4	4.4	14.8	2.83	3.54	5.95	1	**2**	**5**
W	0.14	0.15	0.17									5.0	4.12	5.17	8.68	0.6	**0.8**	**1.4**
X	0.30	0.72	2.34	0.08	100	2	14.7	500	2.0%	1.0	8.4	23.1	2.30	2.88	4.83	1	**2**	**11**
Y1	0.35	0.46	0.91	0.90	250	10	3.6					5.0	4.12	5.17	8.68	1.4	**2**	**8**
Y2	0.03	0.07	0.22	0.08	90	14	7.1					7.1	3.71	4.65	7.81	0.1	**0.3**	**1.8**
Z	0.32	0.38	0.55	0.08	65	2	10.2					10.2	3.27	4.09	6.87	1	**2**	**4**
AA	0.67	0.79	1.14	0.08	65	2	10.2					10.2	3.27	4.09	6.87	2	**3**	**8**
OS-1	1.69	1.76	2.02	0.08	40	0.8	9.3	900	2.5%	3.2	4.7	14.0	2.89	3.62	6.08	5	**6**	**12**
OS-2	0.32	0.35	0.46	0.12	50	1	10.0	400	1.6%	2.5	2.6	12.6	3.02	3.78	6.35	1.0	**1.3**	**2.9**
OS-3	0.15	0.15	0.16									5.0	4.12	5.17	8.68	0.6	**0.8**	**1.4**

JOB NAME: ***STERLING RANCH EAST FILING NO. 5 - PRELIM. PLAN***
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Return Period	1-Hour Depth
2	1.19
5	1.50
10	1.75
25	2.00
50	2.25
100	2.52

$$t_i = \frac{0.395(1.1 - C_5)\sqrt{L}}{S^{0.33}} \qquad V = C_v S_w^{0.5} \qquad \text{Tc=L/V}$$

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			OVERLAND				STREET / CHANNEL FLOW				Tc	INTENSITY			TOTAL FLOWS		
	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)
OS-4	0.45	0.53	0.76	0.08	50	1	10.4	500	1.5%	2.4	3.4	13.8	2.91	3.65	6.13	1	**2**	**5**
OS-5	0.56	0.58	0.69	0.12	25	0.75	6.2	450	1.5%	2.4	3.1	9.2	3.39	4.25	7.14	2	**2**	**5**
OS-6	0.18	0.54	2.16	0.12	300	7	23.2					23.2	2.29	2.87	4.81	0.4	**1.5**	**10**
P4-B Villages at Sterling Ranch East PP	16.79	18.28	23.13	0.08	100	2	14.7	600	1.5%	2.4	4.1	18.7	2.55	3.19	5.35	43	**58**	**124**

SEE RESPONSE ABOVE TO SAME COMMENT

Flows do not match information from Villages PDR for Basin P4-B. Verify and revise as needed.

JOB NAME: *STERLING RANCH EAST FILING NO. 5 - PRELIM. PLAN*
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*ALL STORM SEWER TO BE PRIVATE UNLESS OTHERWISE NOTED

FINAL DRAINAGE REPORT ~ SURFACE ROUTING SUMMARY

Design Point	Contributing Basins / Design Point	Equivalent CA(5)	Equivalent CA(100)	Maximum Tc	Intensity I(5)	Intensity I(100)	Flow Q(5)	Flow Q(100)	Facility/ Inlet Size*
		1.76	2.02	14.0	3.62	6.08	6	12	Exist. 10' Type R At-Grade Inlet
2	OS-2 and OS-1 Flow-By	0.56	1.16	16.6	3.37	5.65	2	7	
	OS-3, A, B	1.27	1.79	16.4	3.39	5.68	4	10	Prop. 10' Type R Sump Inlet
	C	0.23	0.33	12.1	3.84	6.45	0.9	2.1	Prop. 5' Type R Sump Inlet
	D and DP-2 Flow On-Site	1.94	3.18	20.2	3.07	5.16	6	16	Prop. 10' Type R At-Grade Inlet
6	F Basin E	1.11	1.82	15.9	3.43	5.76	4	10	Prop. 10' Type R Sump Inlet
7	G ADDED	0.36	0.53	11.8	3.88	6.52	1.4	3.5	Prop. 5' Type R Sump Inlet
8	H	1.38	2.04	17.1	3.32	5.57	5	11	Prop. 10' Type R Sump Inlet
9	I	0.51	0.75	13.4	3.69	6.19	2	5	Prop. 5' Type R Sump Inlet
10	J	0.86	1.25	13.2	3.72	6.24	3	8	Prop. 10' Type R Sump Inlet
11	L	0.41	0.60	18.1	3.24	5.44	1.3	3.3	Prop. 5' Type R Sump Inlet
12	M	0.63	0.95	15.4	3.48	5.84	2	6	Prop. 5' Type R Sump Inlet
13	N	0.45	0.69	15.4	3.48	5.84	2	4	Prop. 5' Type R Sump Inlet
14	O and DP-5 Flow-By	0.83	2.27	22.2	2.93	4.92	2	11	Prop. 6' Crosspan

SEE RESPONSE ABOVE TO SAME COMMENT REVISED

er drainage plan, it ppears that OS-3 would ain through the cross pan n St Louis Rd and ntinue east, not turn the rner and head south.

JOB NAME: *STERLING RANCH EAST FILING NO. 5 - PRELIM. PLAN*
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CALCULATED BY: *MAW*

*ALL STORM SEWER TO BE PRIVATE UNLESS OTHERWISE NOTED

FINAL DRAINAGE REPORT ~ SURFACE ROUTING SUMMARY

Design Point(s)	Contributing Basins / Design Point	Equivalent CA(5)	Equivalent CA(100)	Maximum Tc	Intensity		Flow		Facility/ Inlet Size*
					I(5)	I(100)	Q(5)	Q(100)	
15	P and DP-14	2.07	4.07	24.2	2.80	4.70	6	19	Exist. 10' Type R Sump Inlet
16	OS-4 Basin R ADDED	0.53	0.76	13.8	3.65	6.13	2	5	Exist. 5' Type R Sump Inlet
17	S	0.41	0.60	18.1	3.24	5.44	1.3	3.3	Prop. 5' Type R Sump Inlet
18	T	0.53	0.76	16.7	3.36	5.64	2	4	Prop. 5' Type R Sump Inlet
19	U, V	1.35	1.96	18.1	3.24	5.44	4	11	Prop. 10' Type R Sump Inlet
20	W	0.15	0.17	5.0	5.17	8.68	0.8	1.4	Prop. 5' Type R Sump Inlet
21	OS-5	0.58	0.69	9.2	4.25	7.14	2	5	Exist. 15' Type R At-Grade Inlet
	TOTAL BASINS TRIBUTARY TO POND FSD-14B	**30.36**	**41.50**	**23.1**	**2.88**	**4.83**	**87**	**200**	
	TOTAL BASINS TRIBUTARY TO POND FSD-14B (VILLAGES NOT DEV.)	**12.08**	**18.37**	**23.1**	**2.88**	**4.83**	**35**	**89**	
6 (MDDP) SOUTH BNDY.	**POND FSD-14B RELEASE AND BASIN Y1**	**REF. MHFD-DETENTION SPREADSHEET FOR CALCULATIONS**					**5.0**	**52.2**	Sheet flow from Level Spreader
6A (MDDP) SOUTH BNDY.	**BASINS Y2 AND OS-6** Include Basin Z and runoff from temporary sed pond in Basin AA	**0.61**	**2.38**	**23.2**	**2.87**	**4.81**	**2**	**11**	Sheet flow

JOB NAME: *STERLING RANCH EAST FILING NO. 5 - PRELIM. PLAN*
JOB NUMBER: *1183.25*
DATE: *07/31/23*
CALCULATED BY: *MAW*

Pipe routing will be reviewed at time of Final Plat with Final Drainage Report

OK

* PIPES ARE LISTED AT MAXIMUM SIZE REQUIRED TO ACCOMMODATE Q100 FLOWS AT MINIMUM SLOPE.
REFER TO INDIVIDUAL PIPE SHEETS FOR HYDRAULIC INFORMATION.
PIPES ARE TO BE PRIVATE UNLESS OTHERWISE NOTED.
PRIVATE STORM MATERIALS TO BE RCP OR DOUBLE WALL POLYPROPYLENE (DWPP) TO BE SELECTED BY CONTRACTOR

FINAL DRAINAGE REPORT ~ PIPE ROUTING SUMMARY

Pipe Run	Contributing Basin / Design Point / Pipe Run	Equivalent CA(5)	Equivalent CA(100)	Maximum Tc	Intensity		Flow		
					I(5)	I(100)	Q(5)	Q(100)	Pipe Size*
1	**P4-B FUTURE VILLAGES AT STERLING RANCH PP**	**18.28**	**23.13**	**18.7**	**3.19**	**5.35**	**58**	**124**	**PROP. 48" RCP**
2	DP-3	1.27	1.79	16.4	3.39	5.68	4	10	PROP. 24" RCP
3	DP-4	0.23	0.33	12.1	3.84	6.45	0.9	2.1	PROP. 18" RCP
4	PR-2, PR-3	1.50	2.12	16.6	3.37	5.65	5	12	PROP. 24" RCP
5	**PR-1, PR-4**	**19.78**	**25.25**	**19.5**	**3.12**	**5.25**	**62**	**132**	**PROP. 48" RCP**
6	DP-5 COLLECTION	1.71	1.78	20.5	3.05	5.12	5.2	9.1	PROP. 18" RCP
7	DP-6	1.11	1.82	15.9	3.43	5.76	4	10	PROP. 24" RCP
8	PR-7, DP-7	1.47	2.35	15.9	3.43	5.76	5	14	PROP. 24" RCP
9	PR-6, PR-8	3.18	4.13	20.9	3.02	5.07	10	21	PROP. 30" RCP
10	DP-8	1.38	2.04	17.1	3.32	5.57	5	11	PROP. 24" RCP
11	PR-10, DP-9	1.89	2.80	17.1	3.32	5.57	6	16	PROP. 24" RCP

JOB NAME: ***STERLING RANCH EAST FILING NO. 5 - PRELIM. PLAN***
JOB NUMBER: ***1183.25***
DATE: ***07/31/23***
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* PIPES ARE LISTED AT MAXIMUM SIZE REQUIRED TO ACCOMMODATE Q100 FLOWS AT MINIMUM SLOPE.
REFER TO INDIVIDUAL PIPE SHEETS FOR HYDRAULIC INFORMATION.
PIPES ARE TO BE PRIVATE UNLESS OTHERWISE NOTED.
PRIVATE STORM MATERIALS TO BE RCP OR DOUBLE WALL POLYPROPYLENE (DWPP) TO BE SELECTED BY CONTRACTOR

FINAL DRAINAGE REPORT ~ PIPE ROUTING SUMMARY

Pipe Run	Contributing Basin / Design Point / Pipe Run	Equivalent CA(5)	Equivalent CA(100)	Maximum Tc	Intensity		Flow		
					I(5)	I(100)	Q(5)	Q(100)	Pipe Size*
12	PR-9, PR-11	5.07	6.93	21.3	2.99	5.02	15	35	PROP. 30" RCP
13	DP-15	2.07	4.07	24.2	2.80	4.70	6	19	EXIST. 24" RCP
14	DP-16	0.53	0.76	13.8	3.65	6.13	2	5	EXIST. 18" RCP
15	PR-13, PR-14	2.60	4.83	25.4	2.73	4.58	7	22	EXIST. 30" RCP
16	DP-10	0.86	1.25	13.2	3.72	6.24	3	8	PROP. 24" RCP
17	DP-11	0.41	0.60	18.1	3.24	5.44	1.3	3.3	PROP. 18" RCP
18	**PR-5, PR-13, PR-14**	**21.05**	**27.10**	**19.7**	**3.11**	**5.22**	**65**	**141**	**PROP. 54" RCP**
19	DP-12	0.63	0.95	15.4	3.48	5.84	2	6	PROP. 18" RCP
20	DP-13	0.45	0.69	15.4	3.48	5.84	2	4	PROP. 18" RCP
21	PR-16, PR-17	1.08	1.64	15.5	3.47	5.82	4	10	PROP. 24" RCP
22	PR-12, PR-18	6.15	8.57	21.7	2.96	4.98	18	43	PROP. 36" RCP
23	**PR-15, PR-19**	**27.20**	**35.67**	**22.2**	**2.93**	**4.92**	**80**	**175**	**PROP. 60" RCP**

JOB NAME: *STERLING RANCH EAST FILING NO. 5 - PRELIM. PLAN*
JOB NUMBER: *1183.25*
DATE: *07/31/23*
CALCULATED BY: *MAW*

* PIPES ARE LISTED AT MAXIMUM SIZE REQUIRED TO ACCOMMODATE Q100 FLOWS AT MINIMUM SLOPE.
REFER TO INDIVIDUAL PIPE SHEETS FOR HYDRAULIC INFORMATION.
PIPES ARE TO BE PRIVATE UNLESS OTHERWISE NOTED.
PRIVATE STORM MATERIALS TO BE RCP OR DOUBLE WALL POLYPROPYLENE (DWPP) TO BE SELECTED BY CONTRACTOR

FINAL DRAINAGE REPORT ~ PIPE ROUTING SUMMARY

Pipe Run	Contributing Basin / Design Point / Pipe Run	Equivalent CA(5)	Equivalent CA(100)	Maximum Tc	Intensity		Flow		
					I(5)	I(100)	Q(5)	Q(100)	Pipe Size*
24	DP-17	0.41	0.60	18.1	3.24	5.44	1.3	3.3	PROP. 18" RCP
25	DP-18	0.53	0.76	16.7	3.36	5.64	2	4	PROP. 18" RCP
26	PR-21, PR-22	0.94	1.36	18.1	3.24	5.44	3	7	PROP. 24" RCP
27	**PR-20, PR-23 (IN-FLOW ULTIMATE CONDITION)**	**28.14**	**37.03**	**22.3**	**2.92**	**4.91**	**82**	**182**	**PROP. 60" RCP**
27	**PR-20, PR-23 (IN-FLOW INTERIM CONDITION - VILLAGES NOT DEVELOPED)**	**9.86**	**13.90**	**20.3**	**3.06**	**5.14**	**30**	**72**	**PROP. 60" RCP**
28	DP-19	1.35	1.96	18.1	3.24	5.44	4	11	PROP. 24" RCP
29	**DP-20, PR-25**	**1.50**	**2.13**	**18.2**	**3.23**	**5.43**	**5**	**12**	**PROP. 24" RCP**

JOB NAME:	***STERLING RANCH EAST FILING NO. 5 - PRELIM. PLAN***
JOB NUMBER:	***1183.25***
DATE:	***06/30/23***
CALCULATED BY:	***MAW***

POND FSD-14B TRIBUTARY BASINS

TRIBUTARY BASIN	BASIN AREA (AC)	WEIGHTED % IMPERVIOUS
A	0.78	52.5%
B	2.20	52.5%
C	0.61	52.5%
75% OF D	2.78	52.5%
E	0.90	52.5%
F	3.60	40.6%
G	0.99	50.2%
H	3.80	50.5%
I	1.40	50.9%
J	2.30	52.5%
L	1.10	52.5%
M	1.80	48.2%
N	1.30	47.3%
S	1.10	52.5%
T	1.40	52.5%
U	2.20	52.5%
V	1.40	52.5%
W	0.19	85.3%
X	6.00	7.0%
25% OF OS-1	0.65	82.5%
OS-2	0.68	53.5%
OS-3	0.17	100.0%
P4-B Villages at Sterling Ranch East PP	37.30	70.0%
TOTAL	74.65	**57.1%**

POND FSD-14B TOTAL EFF. IMPERVIOUS % **57.1%**

JOB NAME:	***STERLING RANCH EAST FILING NO. 5 - PRELIM. PLAN***
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POND FSD-14B TRIBUTARY BASINS - 24" OUTFALL

TRIBUTARY BASIN	BASIN AREA (AC)	WEIGHTED % IMPERVIOUS
U	2.20	52.5%
V	1.40	52.5%
W	0.19	85.3%
TOTAL	3.79	**54.1%**

POND FSD-14B 24" OUFTALL EFF. IMP. % **54.1%**

JOB NAME:	***STERLING RANCH EAST FILING NO. 5 - PRELIM. PLAN***
JOB NUMBER:	***1183.25***
DATE:	***06/30/23***
CALCULATED BY:	***MAW***

POND FSD-14B TRIBUTARY BASINS - 60" OUTFALL

TRIBUTARY BASIN	BASIN AREA (AC)	WEIGHTED % IMPERVIOUS
A	0.78	52.5%
B	2.20	52.5%
C	0.61	52.5%
E	0.90	52.5%
F	3.60	40.6%
G	0.99	50.2%
H	3.80	50.5%
I	1.40	50.9%
J	2.30	52.5%
L	1.10	52.5%
M	1.80	48.2%
N	1.30	47.3%
S	1.10	52.5%
T	1.40	52.5%
X	6.00	7.0%
OS-3	0.17	100.0%
P4-B Villages at Sterling Ranch East PP	37.30	70.0%
TOTAL	66.75	**57.3%**

POND FSD-14B 60" OUFTALL EFF. IMP. % **57.3%**

OK

Inlet calculations will be reviewed at time of Final Plat with Final Drainage Report

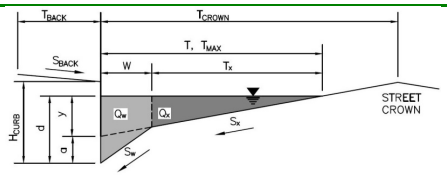
Version 4.05 Released March 2017

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

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

Project: STERLING RANCH EAST FILING NO. 5 - PRELIMINARY PLAN

Inlet ID: DP-1



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	32.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	32.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.017	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} =	12.0	24.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☐	check = yes

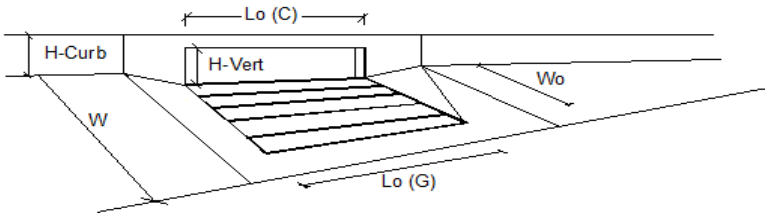
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	**Q_{allow} =**	**6.1**	**34.4**	**cfs**

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

Version 4.05 Released March 2017



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

Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**5.3**	**7.8**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.7**	**4.2**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**88**	**65**	**%**

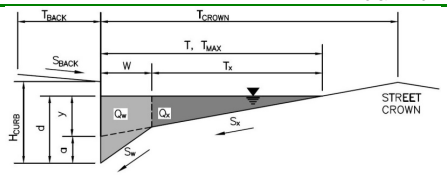
Version 4.05 Released March 2017

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

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

Project: STERLING RANCH EAST FILING NO. 5 - PRELIMINARY PLAN

Inlet ID: DP-3 & DP-6



Gutter Geometry (Enter data in the blue cells)

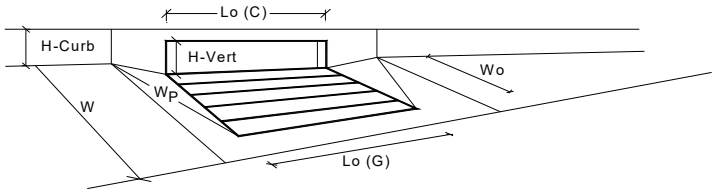
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
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 =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	12.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)	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	12.0	inches
Grate Information			MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate		L_o (G) =	N/A	N/A	feet
Width of a Unit Grate		W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)		A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)		C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)		C_o (G) =	N/A	N/A	
Curb Opening Information			MINOR	MAJOR	
Length of a Unit Curb Opening		L_o (C) =	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} =	0.33	0.83	ft
Combination Inlet Performance Reduction Factor for Long Inlets		$RF_{Combination}$ =	0.57	1.00	
Curb Opening Performance Reduction Factor for Long Inlets		RF_{Curb} =	0.93	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 =**	**8.3**	**25.5**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)		$Q_{PEAK\ REQUIRED}$ =	4.0	10.0	cfs

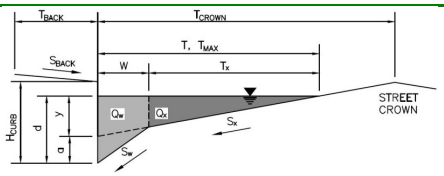
Version 4.05 Released March 2017

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

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

Project: STERLING RANCH EAST FILING NO. 5 - PRELIMINARY PLAN

Inlet ID: DP-4



Gutter Geometry (Enter data in the blue cells)

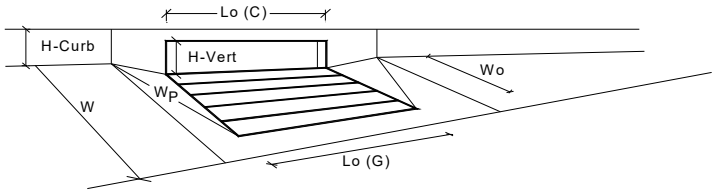
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.012	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	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	12.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	12.0	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	

Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.33	0.83	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 =**	**5.4**	**12.3**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	0.9	2.1	cfs

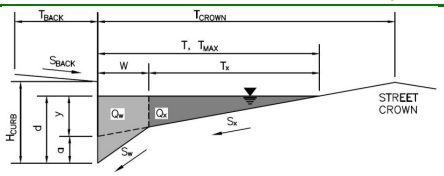
Version 4.05 Released March 2017

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

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

Project: STERLING RANCH EAST FILING NO. 5 - PRELIMINARY PLAN

Inlet ID: DP-5



Gutter Geometry (Enter data in the blue cells)

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} =	0.012	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.015	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☐	check = yes

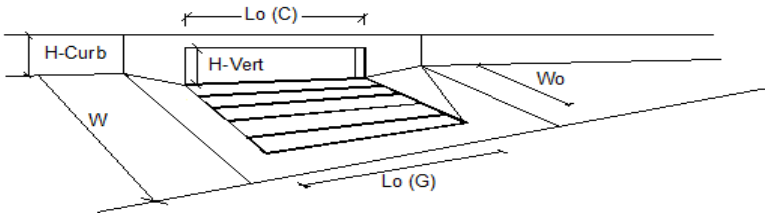
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	**Q_{allow} =**	**13.3**	**13.3**	**cfs**

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

WARNING: MAJOR STORM max. allowable capacity is less than the design flow given on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



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

Street Hydraulics: WARNING: Q > ALLOWABLE Q FOR MAJOR STORM		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**5.3**	**8.9**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.7**	**7.1**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**88**	**56**	**%**

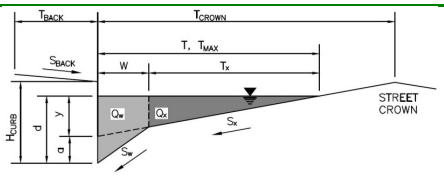
Version 4.05 Released March 2017

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

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

Project: STERLING RANCH EAST FILING NO. 5 - PRELIMINARY PLAN

Inlet ID: DP-7



Gutter Geometry (Enter data in the blue cells)

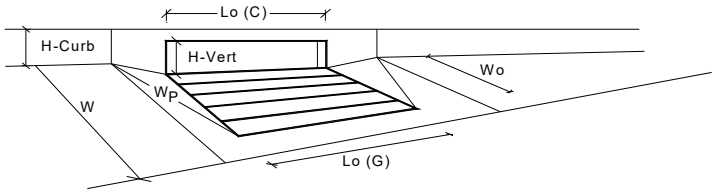
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.012	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	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	12.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)	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	12.0	inches
Grate Information			MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate		L_o (G) =	N/A	N/A	feet
Width of a Unit Grate		W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)		A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)		C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)		C_o (G) =	N/A	N/A	
Curb Opening Information			MINOR	MAJOR	
Length of a Unit Curb Opening		L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches		H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches		H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)		Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)		C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)		C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)		C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)			MINOR	MAJOR	
Depth for Grate Midwidth		d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation		d_{Curb} =	0.33	0.83	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 =**	**5.4**	**12.3**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)		$Q_{PEAK\ REQUIRED}$ =	1.4	3.5	cfs

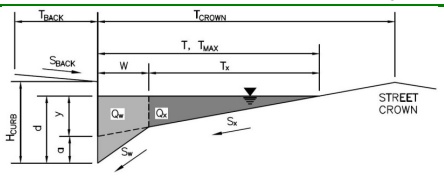
Version 4.05 Released March 2017

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

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

Project: STERLING RANCH EAST FILING NO. 5 - PRELIMINARY PLAN

Inlet ID: DP-8



Gutter Geometry (Enter data in the blue cells)

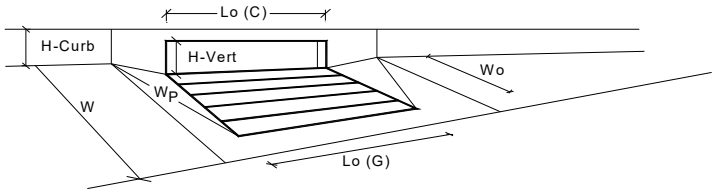
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.012	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	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	12.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	12.0	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	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} =	0.33	0.83	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.57	1.00	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.93	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 =**	**8.3**	**25.5**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	5.0	11.0	cfs

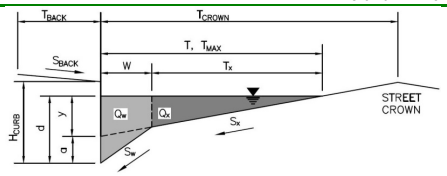
Version 4.05 Released March 2017

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

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

Project: STERLING RANCH EAST FILING NO. 5 - PRELIMINARY PLAN

Inlet ID: DP-9 and DP-16



Gutter Geometry (Enter data in the blue cells)

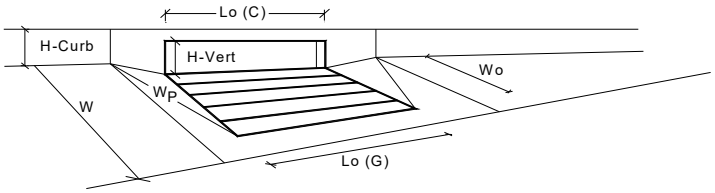
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.012	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	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	12.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)	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	12.0	inches
Grate Information			MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate		L_o (G) =	N/A	N/A	feet
Width of a Unit Grate		W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)		A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)		C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)		C_o (G) =	N/A	N/A	
Curb Opening Information			MINOR	MAJOR	
Length of a Unit Curb Opening		L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches		H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches		H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)		Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)		C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)		C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)		C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)			MINOR	MAJOR	
Depth for Grate Midwidth		d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation		d_{Curb} =	0.33	0.83	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 =**	**5.4**	**12.3**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)		$Q_{PEAK\ REQUIRED}$ =	2.0	5.0	cfs

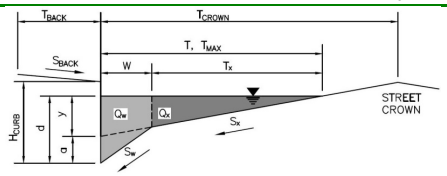
Version 4.05 Released March 2017

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

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

Project: STERLING RANCH EAST FILING NO. 5 - PRELIMINARY PLAN

Inlet ID: DP-10



Gutter Geometry (Enter data in the blue cells)

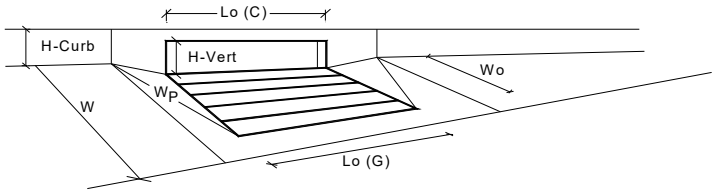
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.012	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	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	12.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)	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	12.0	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	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} =	0.33	0.83	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.57	1.00	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.93	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 =**	**8.3**	**25.5**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	3.0	8.0	cfs

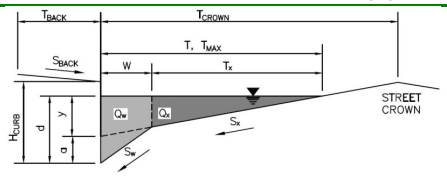
Version 4.05 Released March 2017

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

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

Project: STERLING RANCH EAST FILING NO. 5 - PRELIMINARY PLAN

Inlet ID: DP-11 and DP-17



Gutter Geometry (Enter data in the blue cells)

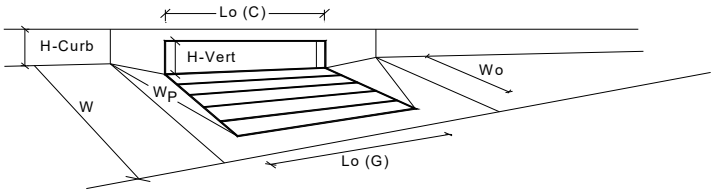
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.012	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	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	12.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)	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	12.0	inches
Grate Information			MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate		L_o (G) =	N/A	N/A	feet
Width of a Unit Grate		W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)		A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)		C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)		C_o (G) =	N/A	N/A	
Curb Opening Information			MINOR	MAJOR	
Length of a Unit Curb Opening		L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches		H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches		H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)		Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)		C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)		C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)		C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)			MINOR	MAJOR	
Depth for Grate Midwidth		d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation		d_{Curb} =	0.33	0.83	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 =**	**5.4**	**12.3**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)		$Q_{PEAK\ REQUIRED}$ =	1.3	3.3	cfs

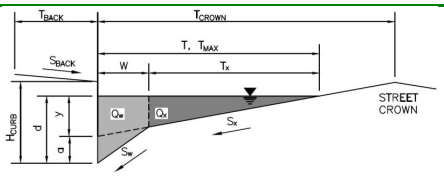
Version 4.05 Released March 2017

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

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

Project: STERLING RANCH EAST FILING NO. 5 - PRELIMINARY PLAN

Inlet ID: DP-12



Gutter Geometry (Enter data in the blue cells)

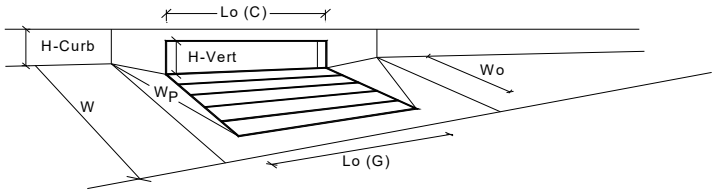
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.012	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	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	12.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)	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	12.0	inches
Grate Information			MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate		L_o (G) =	N/A	N/A	feet
Width of a Unit Grate		W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)		A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)		C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)		C_o (G) =	N/A	N/A	
Curb Opening Information			MINOR	MAJOR	
Length of a Unit Curb Opening		L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches		H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches		H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)		Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)		C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)		C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)		C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)			MINOR	MAJOR	
Depth for Grate Midwidth		d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation		d_{Curb} =	0.33	0.83	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 =**	**5.4**	**12.3**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)		$Q_{PEAK\ REQUIRED}$ =	2.0	6.0	cfs

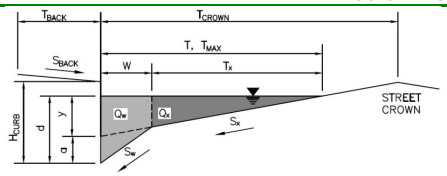
Version 4.05 Released March 2017

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

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

Project: STERLING RANCH EAST FILING NO. 5 - PRELIMINARY PLAN

Inlet ID: DP-13 and DP-18



Gutter Geometry (Enter data in the blue cells)

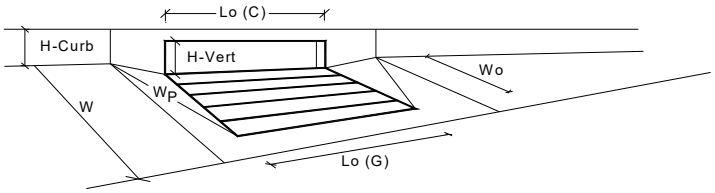
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.012	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	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	12.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)	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	12.0	inches
Grate Information			MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate		L_o (G) =	N/A	N/A	feet
Width of a Unit Grate		W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)		A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)		C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)		C_o (G) =	N/A	N/A	
Curb Opening Information			MINOR	MAJOR	
Length of a Unit Curb Opening		L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches		H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches		H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)		Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)		C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)		C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)		C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)			MINOR	MAJOR	
Depth for Grate Midwidth		d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation		d_{Curb} =	0.33	0.83	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 =**	**5.4**	**12.3**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)		$Q_{PEAK\ REQUIRED}$ =	2.0	4.0	cfs

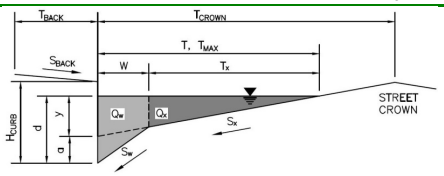
Version 4.05 Released March 2017

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

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

Project: STERLING RANCH EAST FILING NO. 5 - PRELIMINARY PLAN

Inlet ID: DP-15



Gutter Geometry (Enter data in the blue cells)

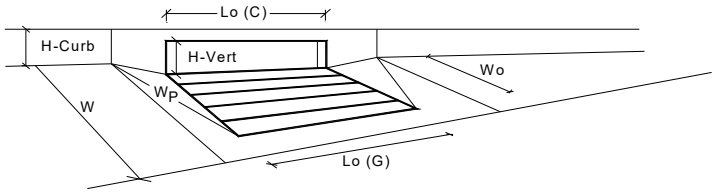
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.012	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	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	12.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)	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	12.0	inches
Grate Information			MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate		L_o (G) =	N/A	N/A	feet
Width of a Unit Grate		W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)		A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)		C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)		C_o (G) =	N/A	N/A	
Curb Opening Information			MINOR	MAJOR	
Length of a Unit Curb Opening		L_o (C) =	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} =	0.33	0.83	ft
Combination Inlet Performance Reduction Factor for Long Inlets		$RF_{Combination}$ =	0.57	1.00	
Curb Opening Performance Reduction Factor for Long Inlets		RF_{Curb} =	0.93	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 =**	**8.3**	**25.5**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)		$Q_{PEAK\ REQUIRED}$ =	6.0	19.0	cfs

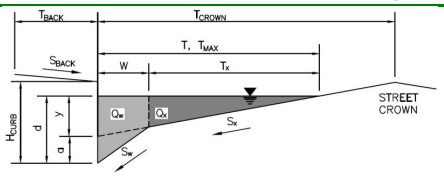
Version 4.05 Released March 2017

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

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

Project: STERLING RANCH EAST FILING NO. 5 - PRELIMINARY PLAN

Inlet ID: DP-19



Gutter Geometry (Enter data in the blue cells)

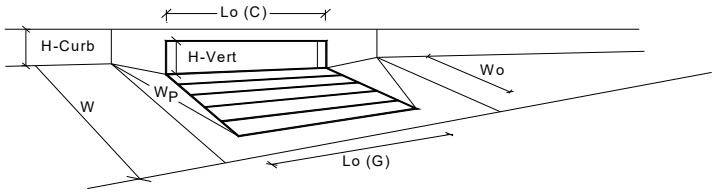
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.012	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	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	12.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)	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	12.0	inches
Grate Information			MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate		L_o (G) =	N/A	N/A	feet
Width of a Unit Grate		W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)		A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)		C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)		C_o (G) =	N/A	N/A	
Curb Opening Information			MINOR	MAJOR	
Length of a Unit Curb Opening		L_o (C) =	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} =	0.33	0.83	ft
Combination Inlet Performance Reduction Factor for Long Inlets		$RF_{Combination}$ =	0.57	1.00	
Curb Opening Performance Reduction Factor for Long Inlets		RF_{Curb} =	0.93	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 =**	**8.3**	**25.5**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)		$Q_{PEAK\ REQUIRED}$ =	4.0	11.0	cfs

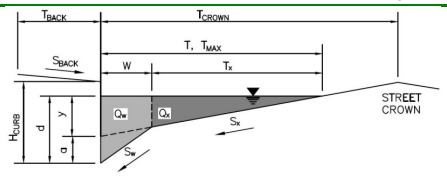
Version 4.05 Released March 2017

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

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

Project: STERLING RANCH EAST FILING NO. 5 - PRELIMINARY PLAN

Inlet ID: DP-20



Gutter Geometry (Enter data in the blue cells)

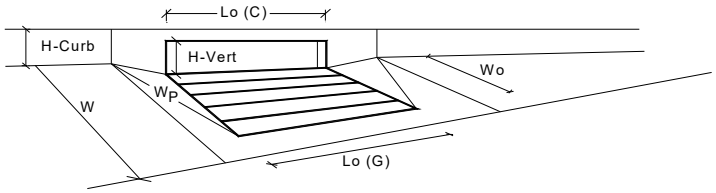
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.012	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	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	12.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)	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	12.0	inches
Grate Information			MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate		L_o (G) =	N/A	N/A	feet
Width of a Unit Grate		W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)		A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)		C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)		C_o (G) =	N/A	N/A	
Curb Opening Information			MINOR	MAJOR	
Length of a Unit Curb Opening		L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches		H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches		H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)		Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)		C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)		C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)		C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)			MINOR	MAJOR	
Depth for Grate Midwidth		d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation		d_{Curb} =	0.33	0.83	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 =**	**5.4**	**12.3**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)		$Q_{PEAK\ REQUIRED}$ =	0.8	1.4	cfs

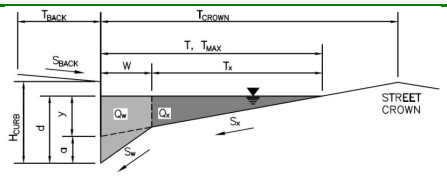
Version 4.05 Released March 2017

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

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

Project: STERLING RANCH EAST FILING NO. 5 - PRELIMINARY PLAN

Inlet ID: DP-21



Gutter Geometry (Enter data in the blue cells)

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} =	0.012	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.015	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☐	check = yes

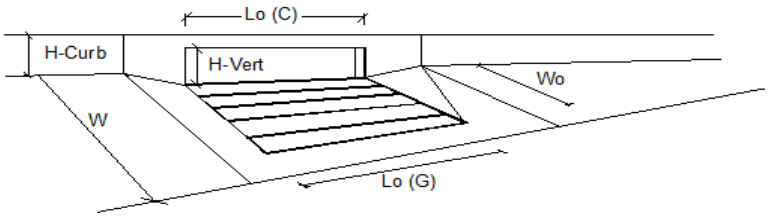
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	**Q_{allow} =**	**13.5**	**13.5**	**cfs**

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

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

INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



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

Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**2.0**	**5.0**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.0**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**100**	**%**

STORMWATER QUALITY CALCULATIONS

CLASSIC SM
CONSULTING
ENGINEERS & SURVEYORS

WATER QUALITY TREATMENT PLAN MAP

FILING 5 BOUNDARY LINE

10.49 AC. (BASINS OS-4, OS-5, O, P, R, 75% OS-1 & 25% D) — AREA TREATED IN OFF-SITE PERMANENT POND FSD-11B

74.65 AC. (BASINS OS-2, OS-3, A-N, S-X, 25% OS-1 & 75% D) — AREA TREATED IN PROPOSED PERMANENT POND FSD-14B

3.48 AC. (BASINS Y1, Y2, Z) — AREA OF RUNOFF REDUCTION WATER QUALITY TREATMENT

2.1 AC. (BASIN AA) — AREAS TREATED IN TEMPORARY SEDIMENT BASIN NOW AND FUTURE PERMANENT FSD POND FACILITY ULTIMATELY

What about AA1 and AA2 that are shown in the RR calcs on the next page?

REVISED. BASIN AA HAS BOTH A DCIA COMPONENT (THE SMALL STRETCH OF ROADWAY) AND UIA:RPA (REAR YARDS)

Account for WQ treatment of all areas of proposed grading in this map (ie: via hatching)

ADDED ANOTHER TSB

NOTE: REFERENCE STERLING RANCH RD. & BRIARGATE PKWY. STREET IMPROVEMENTS & STORM SEWER PLANS PREPARED BY JR ENG. FOR DESIGN WITHIN STERLING RANCH ROAD

NOTE: REFERENCE VILLAGES AT STERLING RANCH EAST PRELIMINARY PLAN — PRELIMINARY DRAINAGE REPORT PREPARED BY CLASSIC CONSULTING FOR PRELIMINARY DESIGN

VILLAGES AT STERLING RANCH EAST PRELIMINARY PLAN

STERLING RANCH EAST FILING NO. 1

STERLING RANCH EAST FILING NO. 3

STERLING RANCH EAST FILING NO. 2 (MIDDLE SCHOOL SITE)

FUTURE STERLING RANCH EAST DEVELOPMENT UNPLATTED

BAR J-3 ACRES FILING NO. 2

PAWNEE RANCHEROS FILING NO. 1

BRIARGATE PKWY. (150' ROW)

STERLING RANCH ROAD (80' ROW)

KANSAS CITY ROAD (80' ROW)

OAK PARK DRIVE (60' ROW)

CEDAR RAPIDS DR. (60' ROW)

SHOREWOOD DR. (60' ROW)

NEWPORT BEACH DRIVE (60' ROW)

LAKE TAHOE DRIVE (60' ROW)

FAYETTEVILLE ST.

BIXBY COURT

BENTONVILLE WAY

MOHAWK ROAD (60' ROW)

BRULE ROAD (60' ROW)

OTO CIRCLE

ST. LOUIS STREET

PLANO STREET

TRACT A 4.56 AC

TRACT B 3.68 AC

TRACT C 0.19 AC

TRACT D 0.44 AC

TRACT E 0.57 AC

TRACT F 0.87 AC

TRACT G 0.58 AC

TRACT H 0.87 AC

TRACT I 0.87 AC

POND FSD-14B

EXIST. 48" RCP STORM SYSTEM (POND FSD-16 OUTFALL)

EXIST. 42" RCP STORM SYSTEM

EXIST. 60" RCP STORM SYSTEM

EXIST. 36" RCP STORM SYSTEM

EXIST. 10' TYPE R AT-GRADE INLETS

EXIST. 18" RCP STORM

EXIST. 15' TYPE R AT-GRADE INLETS

EXIST. 10' TYPE R SUMP INLETS

PROP. 10' TYPE R SUMP INLET

PROP. 5' TYPE R SUMP INLET

PROP. 10' TYPE R AT-GRADE INLET

PROP. 18" PUBLIC RCP

PROP. 24" PUBLIC RCP

PROP. 30" PUBLIC RCP

PROP. 48" PUBLIC RCP

PROP. 54" PUBLIC RCP

PROP. 60" PUBLIC RCP

PROP. TEMP. SEDIMENT BASIN

OFF-SITE ESMT. TO BE GRANTED PRIOR TO CONST.

PROP. TEMP. EARTH DIKES & SWALES USED FOR EROSION AND SEDIMENT CONTROL

CONST. BERM ALONG LOT LINE TO ROUTE PARK FLOWS TO BILOXI PL.

J:\STERLING RANCH\WATER QUALITY\WQ TREATMENT PLAN MAP.dwg 7/31/2023 9:40:15 AM, MWeinheimer

Cannot review RR calcs in detail without CDs.
Will review completely with SF submittal.

Design Procedure Form: Runoff Reduction

UD-BMP (Version 3.07, March 2018) — Sheet 1 of 1

Designer:	**Marc A. Whorton, P.E.**
Company:	**Classic Consulting**
Date:	**July 31, 2023**
Project:	**Sterling Ranch East Filing No. 5 Preliminary Plan**
Location:	**Sand Creek Basin**

SITE INFORMATION (User Input in Blue Cells)

WQCV Rainfall Depth = 0.53 inches

Depth of Average Runoff Producing Storm, d_6 = 0.42 inches (for Watersheds Outside of the Denver Region, Figure 3-1 in USDCM Vol. 3)

Area Type	UIA:RPA	UIA:RPA	UIA:RPA	DCIA	UIA:RPA							
Area ID	Basin Y1	Basin Y2	Basin Z	Basin AA1	Basin AA2							
Downstream Design Point ID	SC	SC	SC	SC	SC							
Downstream BMP Type	None	None	None	None	None							
DCIA (ft^2)	--	--	--	1,625	--							
UIA (ft^2)	13,068	1,743	27,200	--	50,000							
RPA (ft^2)	56,696	23,522	17,000	--	30,000							
SPA (ft^2)	--	--	--	--	--							
HSG A (%)	0%	0%	0%	--	0%							
HSG B (%)	100%	100%	100%	--	100%							
HSG C/D (%)	0%	0%	0%	--	0%							
Average Slope of RPA (ft/ft)	0.030	0.050	0.050	--	0.050							
UIA:RPA Interface Width (ft)	450.00	265.00	25.00	--	25.00							

CALCULATED RUNOFF RESULTS

Area ID	Basin Y1	Basin Y2	Basin Z	Basin AA1	Basin AA2							
UIA:RPA Area (ft^2)	69,764	25,265	44,200	--	80,000							
L / W Ratio	0.34	0.36	16.00	--	16.00							
UIA / Area	0.1873	0.0690	0.6154	--	0.6250							
Runoff (in)	0.00	0.00	0.00	0.43	0.00							
Runoff (ft^3)	0	0	0	58	0							
Runoff Reduction (ft^3)	468	62	975	0	1792							

CALCULATED WQCV RESULTS

Area ID	Basin Y1	Basin Y2	Basin Z	Basin AA1	Basin AA2							
WQCV (ft^3)	532	71	1107	66	2035							
WQCV Reduction (ft^3)	532	71	1107	8	2035							
WQCV Reduction (%)	100%	100%	100%	12%	100%							
Untreated WQCV (ft^3)	0	0	0	58	0							

CALCULATED DESIGN POINT RESULTS (sums results from all columns with the same Downstream Design Point ID)

Downstream Design Point ID	SC											
DCIA (ft^2)	1,625											
UIA (ft^2)	92,011											
RPA (ft^2)	127,218											
SPA (ft^2)	0											
Total Area (ft^2)	220,854											
Total Impervious Area (ft^2)	93,636											
WQCV (ft^3)	3,811											
WQCV Reduction (ft^3)	3,753											
WQCV Reduction (%)	98%											
Untreated WQCV (ft^3)	58											

CALCULATED SITE RESULTS (sums results from all columns in worksheet)

Total Area (ft^2)	220,854
Total Impervious Area (ft^2)	93,636
WQCV (ft^3)	3,811
WQCV Reduction (ft^3)	3,753
WQCV Reduction (%)	98%
Untreated WQCV (ft^3)	58

Cannot review this EDB info in detail without CDs. Will review completely with SF submittal.

Design Procedure Form: Extended Detention Basin (EDB)

UD-BMP (Version 3.07, March 2018)

Designer: Marc A. Whorton, P.E.
Company: Classic Consulting
Date: July 25, 2023
Project: STERLING RANCH EAST FILING NO. 5 - PRELIMINARY PLAN
Location: POND FSD-14B

1. Basin Storage Volume

A) Effective Imperviousness of Tributary Area, I_a — I_a = 57.1 %

B) Tributary Area's Imperviousness Ratio ($i = I_a / 100$) — i = 0.571

C) Contributing Watershed Area — Area = 74.650 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} = ac-ft

G) For Watersheds Outside of the Denver Region, Water Quality Capture Volume (WQCV) Design Volume
($V_{WQCV\ OTHER} = (d_6 * (V_{DESIGN} / 0.43))$
$V_{DESIGN\ OTHER}$ = 1.378 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) NRCS Hydrologic Soil Groups of Tributary Watershed
i) Percentage of Watershed consisting of Type A Soils — HSG_A = 0 %
ii) Percentage of Watershed consisting of Type B Soils — HSG_B = 100 %
iii) Percentage of Watershed consisting of Type C/D Soils — $HSG_{C/D}$ = 0 %

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: $EURV_{C/D} = 1.20 * i^{1.08}$
$EURV_{DESIGN}$ = 4.619 ac-f t

K) User Input of Excess Urban Runoff Volume (EURV) Design Volume (Only if a different EURV Design Volume is desired)
$EURV_{DESIGN\ USER}$ = 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:

5. Forebay

A) Minimum Forebay Volume (V_{FMIN} = 3% of the WQCV)
V_{FMIN} = 0.041 ac-ft

B) Actual Forebay Volume
V_F = 0.041 ac-ft

C) Forebay Depth (D_F = 30 inch maximum)
D_F = 30.0 in

D) Forebay Discharge

i) Undetained 100-year Peak Discharge
Q_{100} = 182.00 cfs

ii) Forebay Discharge Design Flow ($Q_F = 0.02 * Q_{100}$)
Q_F = 3.64 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 = 9.3 in

Design Procedure Form: Extended Detention Basin (EDB)

Designer: Marc A. Whorton, P.E.
Company: Classic Consulting
Date: July 25, 2023
Project: STERLING RANCH EAST FILING NO. 5 - PRELIMINARY PLAN
Location: POND FSD-14B

6. Trickle Channel	
A) Type of Trickle Channel	Choose One: (•) Concrete ( ) Soft Bottom
F) Slope of Trickle Channel	S = 0.0100 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 = 372 sq ft
C) Outlet Type	Choose One: (•) Orifice Plate ( ) Other (Describe):
D) Smallest Dimension of Orifice Opening Based on Hydrograph Routing (Use UD-Detention)	$D_{orifice}$ = 2.68 inches
E) Total Outlet Area	A_{ot} = 26.30 square inches
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} = 180 cu ft
C) Initial Surcharge Provided Above Micropool	V_s = 186.0 cu ft
9. Trash Rack	
A) Water Quality Screen Open Area: $A_t = A_{ot} * 38.5*(e^{-0.095D})$	A_t = 785 square inches
B) Type of Screen (If specifying an alternative to the materials recommended in the USDCM, indicate "other" and enter the ratio of the total open are to the total screen are for the material specified.)	*Aluminum Amico-Klemp SR Series with Cross Rods 2" O.C.*
Other (Y/N): N	
C) Ratio of Total Open Area to Total Area (only for type 'Other')	User Ratio =
D) Total Water Quality Screen Area (based on screen type)	A_{total} = 1106 sq. in.
E) Depth of Design Volume (EURV or WQCV) (Based on design concept chosen under 1E)	H= 6.25 feet
F) Height of Water Quality Screen (H_{TR})	H_{TR}= 103 inches
G) Width of Water Quality Screen Opening ($W_{opening}$) (Minimum of 12 inches is recommended)	$W_{opening}$ = 12.0 inches **VALUE LESS THAN RECOMMENDED MIN. WIDTH. WIDTH HAS BEEN SET TO 12 INCHES.**

Design Procedure Form: Extended Detention Basin (EDB)

Designer: Marc A. Whorton, P.E.
Company: Classic Consulting
Date: July 25, 2023
Project: STERLING RANCH EAST FILING NO. 5 - PRELIMINARY PLAN
Location: POND FSD-14B

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)

Ze = 4.00 ft / ft

11. Vegetation

Choose One
- ◯ Irrigated
- ◯ Not Irrigated

12. Access

A) Describe Sediment Removal Procedures

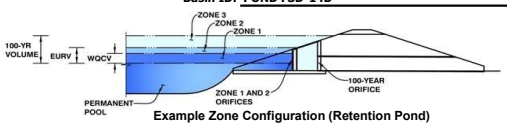
Notes:

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: **STERLING RANCH EAST FILING NO. 5 - PRELIMINARY PLAN**

Basin ID: **POND FSD-14B**



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	**EDB**	
Watershed Area =	74.65	acres
Watershed Length =	3,200	ft
Watershed Length to Centroid =	1,600	ft
Watershed Slope =	0.030	ft/ft
Watershed Imperviousness =	57.10%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	100.0%	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) =	1.411	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	4.605	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	4.311	acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	6.010	acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	7.479	acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	9.370	acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	10.947	acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	12.909	acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 3.48 in.) =	19.199	acre-feet	3.48	inches
Approximate 2-yr Detention Volume =	3.523	acre-feet		
Approximate 5-yr Detention Volume =	4.776	acre-feet		
Approximate 10-yr Detention Volume =	6.199	acre-feet		
Approximate 25-yr Detention Volume =	6.723	acre-feet		
Approximate 50-yr Detention Volume =	7.014	acre-feet		
Approximate 100-yr Detention Volume =	7.704	acre-feet		

Define Zones and Basin Geometry

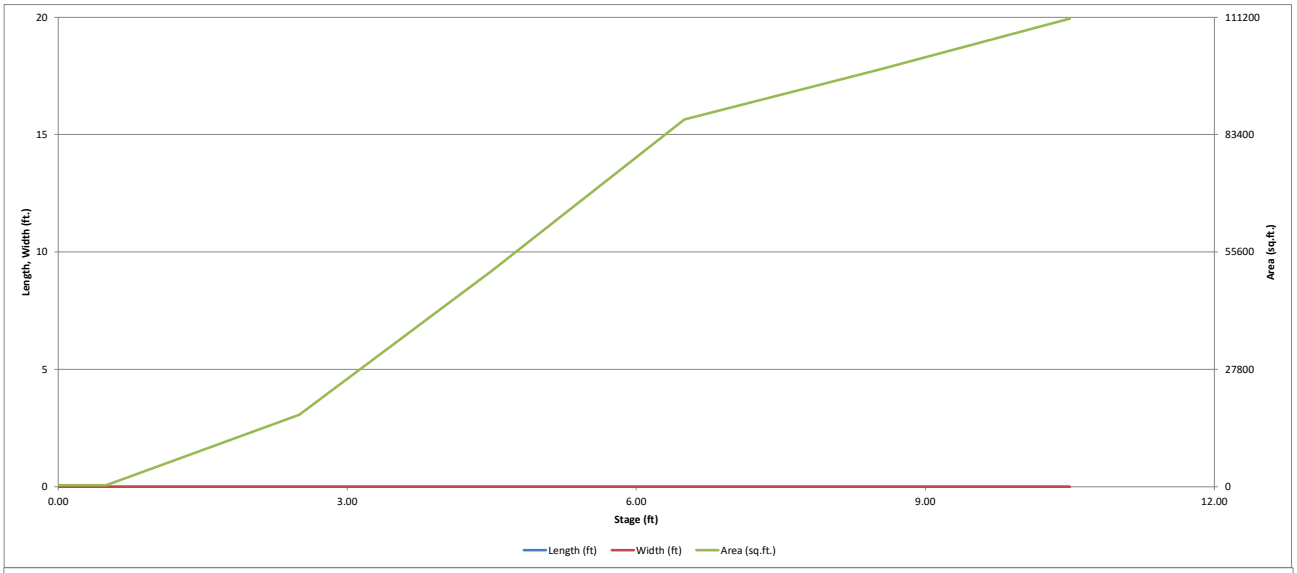
Zone 1 Volume (WQCV) =	1.411	acre-feet
Zone 2 Volume (EURV - Zone 1) =	3.195	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	3.098	acre-feet
Total Detention Basin Volume =	7.704	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	**user**	acre-feet

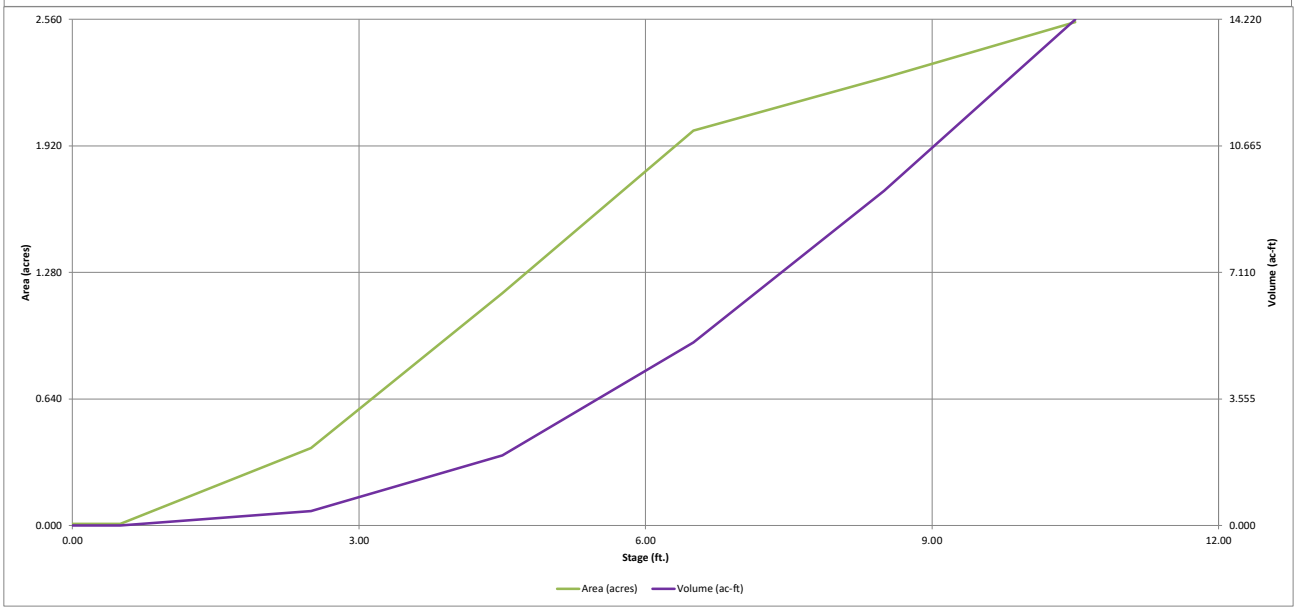
Depth Increment = 1.00 ft

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	--	--	--	372	0.009		
7032	--	0.50	--	--	--	372	0.009	186	0.004
7034	--	2.50	--	--	--	17,098	0.393	17,656	0.405
7036	--	4.50	--	--	--	51,180	1.175	85,934	1.973
7038	--	6.50	--	--	--	87,013	1.998	224,127	5.145
7040	--	8.50	--	--	--	98,661	2.265	409,801	9.408
7042	--	10.50	--	--	--	110,900	2.546	619,362	14.219

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)





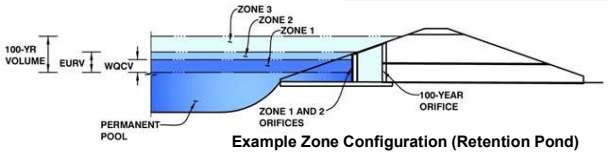
Cannot review pond calcs in detail without CDs.
Will review completely with SF submittal.

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: STERLING RANCH EAST FILING NO. 5 - PRELIMINARY PLAN

Basin ID: POND FSD-14B



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.98	1.411	Orifice Plate
Zone 2 (EURV)	6.23	3.195	Orifice Plate
Zone 3 (100-year)	7.74	3.098	Weir&Pipe (Restrict)
Total (all zones)		7.704	

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

Underdrain Orifice Invert Depth = [ ] ft (distance below the filtration media surface)
Underdrain Orifice Diameter = [ ] inches

Calculated Parameters for Underdrain

Underdrain Orifice Area = [ ] ft²
Underdrain Orifice Centroid = [ ] 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 = 6.25 ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing = 25.00 inches
Orifice Plate: Orifice Area per Row = N/A sq. inches

Calculated Parameters for Plate

WQ Orifice Area per Row = N/A ft²
Elliptical Half-Width = N/A feet
Elliptical Slot Centroid = N/A feet
Elliptical Slot Area = N/A ft²

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	2.10	4.20					
Orifice Area (sq. inches)	5.65	5.65	15.00					

	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	ft²
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 =	6.25	N/A	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	8.00	N/A	feet
Overflow Weir Grate Slope =	4.00	N/A	H:V
Horiz. Length of Weir Sides =	4.00	N/A	feet
Overflow Grate Type =	Close Mesh 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 =	7.25	N/A	feet
Overflow Weir Slope Length =	4.12	N/A	feet
Grate Open Area / 100-yr Orifice Area =	5.32	N/A	
Overflow Grate Open Area w/o Debris =	26.09	N/A	ft²
Overflow Grate Open Area w/ Debris =	13.05	N/A	ft²

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

	Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	0.50	N/A	ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter =	30.00	N/A	inches
Restrictor Plate Height Above Pipe Invert =	30.00		inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 3 Restrictor	Not Selected	
Outlet Orifice Area =	4.91	N/A	ft²
Outlet Orifice Centroid =	1.25	N/A	feet
Half-Central Angle of Restrictor Plate on Pipe =	3.14	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage= 8.50 ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length = 60.00 feet
Spillway End Slopes = 3.00 H:V
Freeboard above Max Water Surface = 1.00 feet

Calculated Parameters for Spillway

Spillway Design Flow Depth= 0.98 feet
Stage at Top of Freeboard = 10.48 feet
Basin Area at Top of Freeboard = 2.54 acres
Basin Volume at Top of Freeboard = 14.17 acre-ft

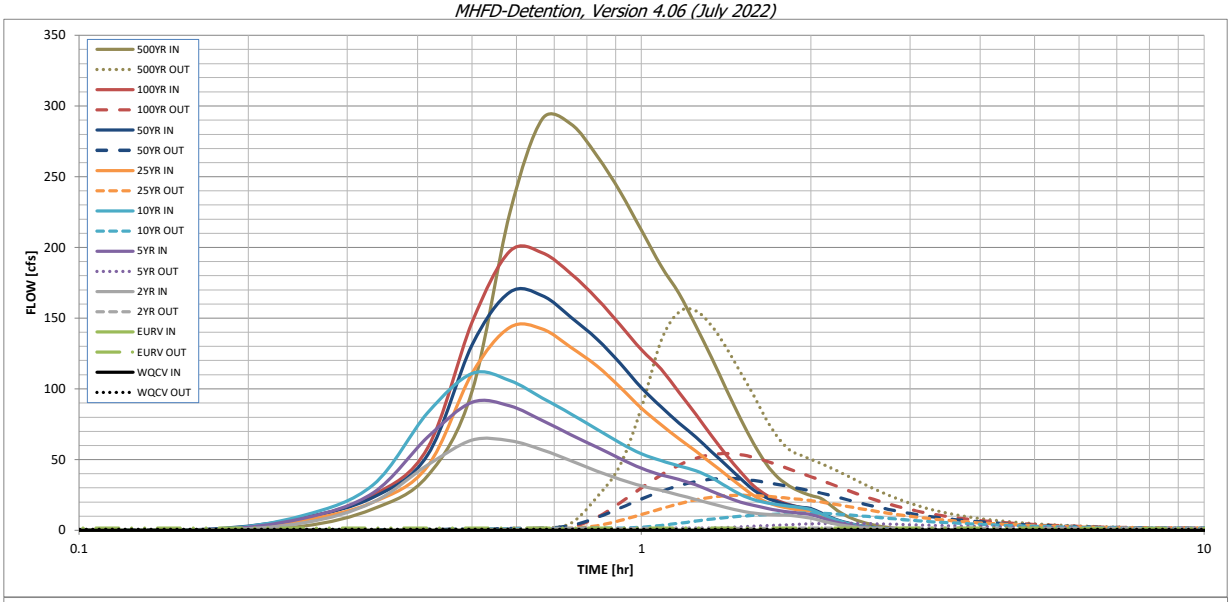
Routed Hydrograph Results

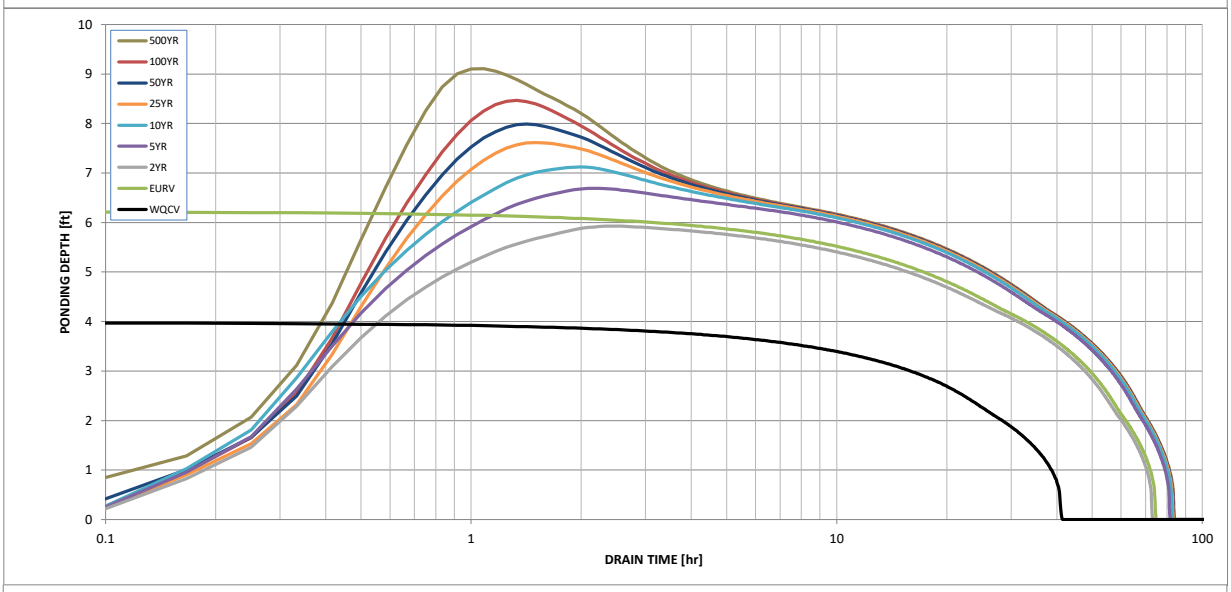
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

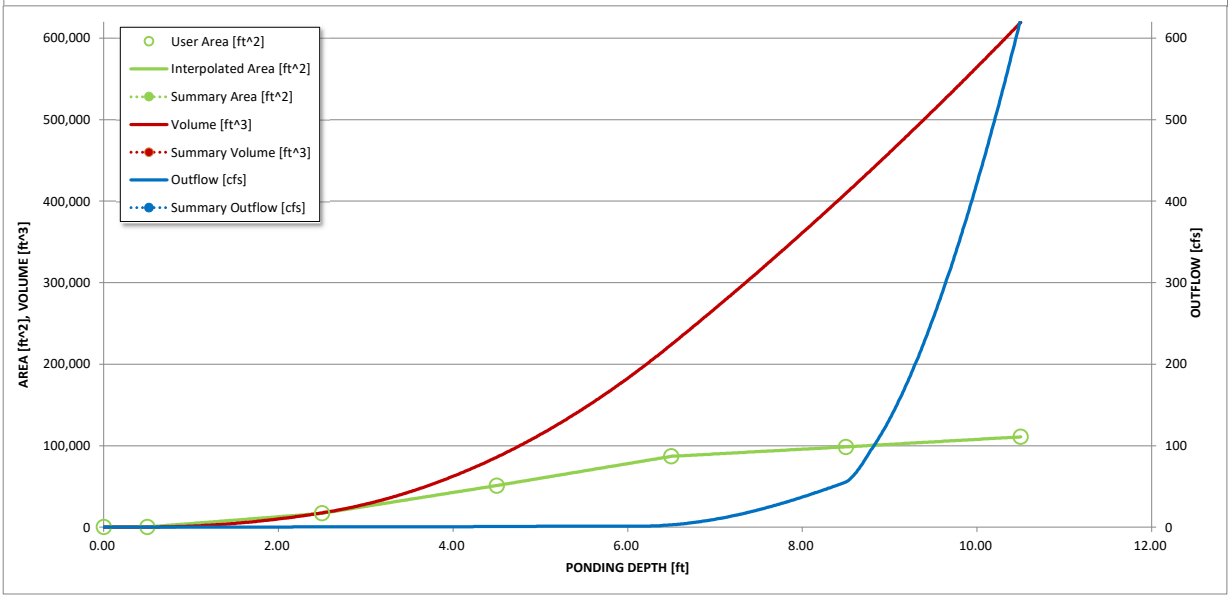
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.48
CUHP Runoff Volume (acre-ft) =	1.411	4.605	4.311	6.010	7.479	9.370	10.947	12.909	19.199
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	4.311	6.010	7.479	9.370	10.947	12.909	19.199
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	7.0	20.0	30.4	55.0	68.9	88.3	143.0
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.09	0.27	0.41	0.74	0.92	1.18	1.92
Peak Inflow Q (cfs) =	N/A	N/A	63.7	90.5	110.8	143.5	168.3	197.2	290.8
Peak Outflow Q (cfs) =	0.6	1.6	1.5	5.0	12.2	24.8	36.7	54.3	155.1
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.2	0.4	0.5	0.5	0.6	1.1
Structure Controlling Flow =	Plate	Plate	Plate	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	0.1	0.4	0.9	1.3	2.0	2.5
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	66	65	71	70	68	67	65	60
Time to Drain 99% of Inflow Volume (hours) =	**40**	71	70	77	78	77	77	76	73
Maximum Ponding Depth (ft) =	3.98	6.23	5.93	6.69	7.12	7.62	7.99	8.47	9.11
Area at Maximum Ponding Depth (acres) =	0.97	1.89	1.76	2.02	2.08	2.15	2.20	2.26	2.35
Maximum Volume Stored (acre-ft) =	1.415	4.621	4.056	5.527	6.409	7.445	8.248	9.317	10.792

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 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	0.58	0.06	2.88
	0:15:00	0.00	0.00	5.14	8.40	10.41	6.99	8.90	8.54	15.14
	0:20:00	0.00	0.00	19.81	26.57	32.14	19.91	23.35	24.79	38.44
	0:25:00	0.00	0.00	46.16	65.73	83.04	45.24	53.12	58.25	98.14
	0:30:00	0.00	0.00	63.73	90.49	110.83	110.89	130.95	146.96	224.28
	0:35:00	0.00	0.00	63.26	87.96	105.92	143.52	168.29	197.18	290.85
	0:40:00	0.00	0.00	56.88	77.61	93.54	142.29	165.91	196.15	287.14
	0:45:00	0.00	0.00	49.07	67.41	82.21	129.21	150.45	181.33	264.85
	0:50:00	0.00	0.00	41.92	58.87	71.42	116.22	135.33	163.89	239.45
	0:55:00	0.00	0.00	36.05	50.76	61.73	101.21	117.99	145.14	212.09
	1:00:00	0.00	0.00	31.36	43.79	54.04	86.29	100.76	127.71	186.84
	1:05:00	0.00	0.00	28.21	39.24	49.23	74.66	87.37	113.95	167.41
	1:10:00	0.00	0.00	24.96	35.89	45.58	64.72	75.90	97.60	144.29
	1:15:00	0.00	0.00	21.74	32.04	42.10	55.96	65.74	81.84	121.90
	1:20:00	0.00	0.00	18.83	27.63	37.11	47.28	55.51	66.82	99.58
	1:25:00	0.00	0.00	16.10	23.47	30.92	39.15	45.89	53.18	79.01
	1:30:00	0.00	0.00	13.76	19.98	25.38	31.42	36.68	41.44	61.36
	1:35:00	0.00	0.00	12.14	17.63	21.66	24.57	28.53	31.48	46.77
	1:40:00	0.00	0.00	11.30	15.61	19.50	19.99	23.14	24.81	37.17
	1:45:00	0.00	0.00	10.92	14.01	18.07	17.26	19.91	20.84	31.33
	1:50:00	0.00	0.00	10.69	12.89	17.06	15.51	17.80	18.16	27.34
	1:55:00	0.00	0.00	9.68	12.05	16.08	14.32	16.36	16.30	24.55
	2:00:00	0.00	0.00	8.54	11.18	14.70	13.52	15.39	14.97	22.54
	2:05:00	0.00	0.00	6.84	9.00	11.75	10.94	12.42	11.81	17.77
	2:10:00	0.00	0.00	5.17	6.76	8.80	8.14	9.21	8.60	12.92
	2:15:00	0.00	0.00	3.92	5.09	6.57	6.09	6.87	6.39	9.57
	2:20:00	0.00	0.00	2.94	3.80	4.85	4.53	5.11	4.78	7.12
	2:25:00	0.00	0.00	2.19	2.80	3.56	3.35	3.76	3.55	5.29
	2:30:00	0.00	0.00	1.61	2.01	2.60	2.43	2.73	2.60	3.86
	2:35:00	0.00	0.00	1.15	1.43	1.88	1.76	1.97	1.89	2.81
	2:40:00	0.00	0.00	0.81	1.02	1.35	1.28	1.44	1.38	2.04
	2:45:00	0.00	0.00	0.53	0.69	0.91	0.88	0.99	0.94	1.39
	2:50:00	0.00	0.00	0.31	0.43	0.55	0.56	0.62	0.59	0.87
	2:55:00	0.00	0.00	0.16	0.24	0.29	0.31	0.34	0.32	0.47
	3:00:00	0.00	0.00	0.06	0.10	0.11	0.13	0.14	0.13	0.19
	3:05:00	0.00	0.00	0.02	0.02	0.02	0.03	0.03	0.03	0.03
	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

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Summary Stage-Area-Volume-Discharge Relationships

The user can create a summary S-A-V-D by entering the desired stage increments and the remainder of the table will populate automatically.
The user should graphically compare the summary S-A-V-D table to the full S-A-V-D table in the chart to confirm it captures all key transition points.

Stage - Storage Description	Stage [ft]	Area [ft^2]	Area [acres]	Volume [ft^3]	Volume [ac-ft]	Total Outflow [cfs]

DRAINAGE MAPS

CLASSIC SM
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ENGINEERS & SURVEYORS

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	

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

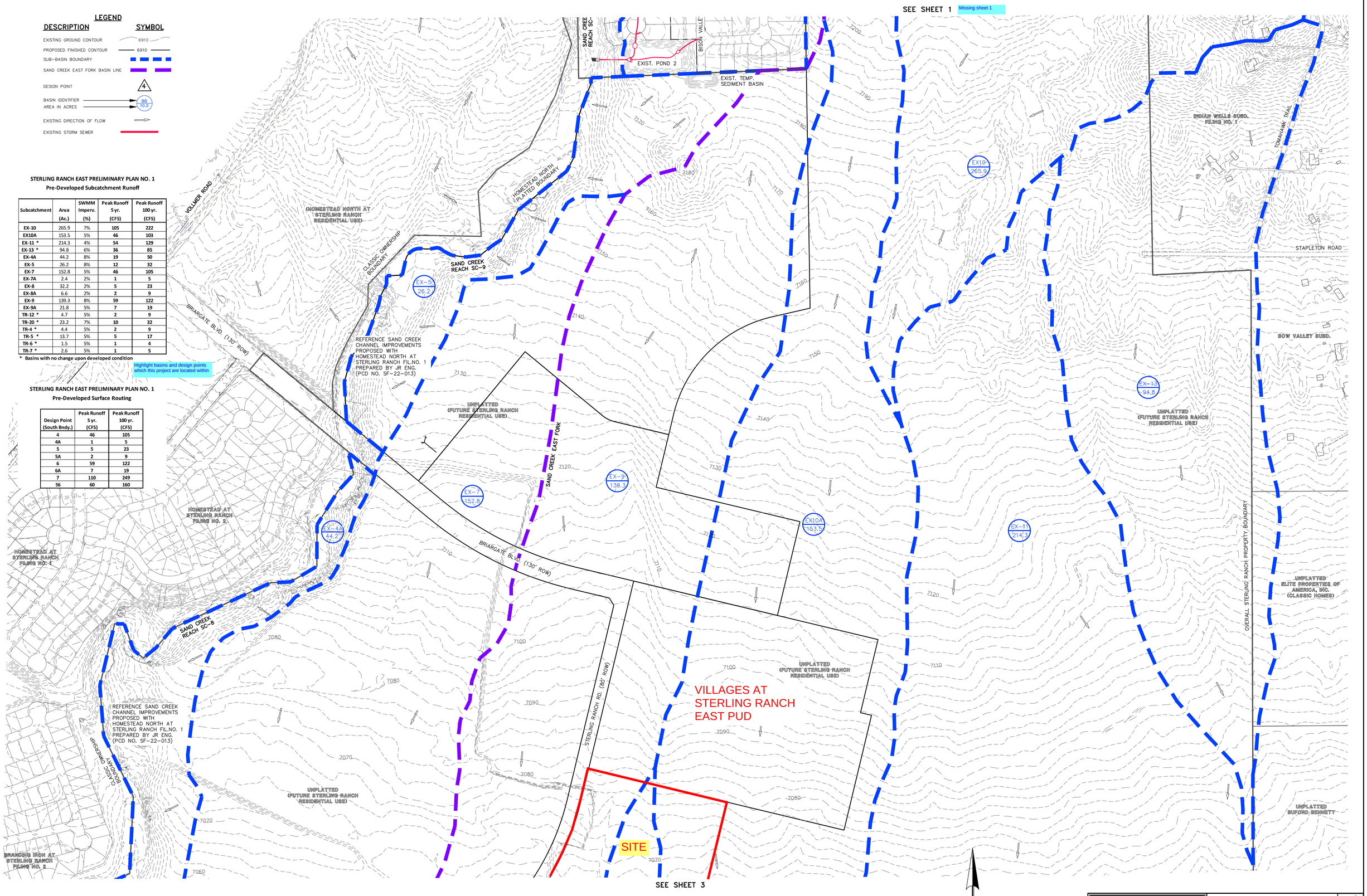
Subcatchment	Area (Ac.)	SWMM Imperv. (%)	Peak Runoff 5 yr. (CFS)	Peak Runoff 100 yr. (CFS)
EX-10	265.9	7%	105	222
EX10A	153.5	5%	46	103
EX-11 *	214.3	4%	54	129
EX-13 *	94.8	6%	36	85
EX-4A	44.2	8%	19	50
EX-5	26.2	8%	12	32
EX-7	152.8	5%	46	105
EX-7A	2.4	2%	1	5
EX-8	32.2	2%	5	23
EX-8A	6.6	2%	2	9
EX-9	139.3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

* Basins with no change upon developed condition

Highlight basins and design points which this project are located within

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

Design Point (South Bndy.)	Peak Runoff 5 yr. (CFS)	Peak Runoff 100 yr. (CFS)
4	46	105
4A	1	5
5	5	23
5A	2	9
6	59	122
6A	7	19
7	110	249
56	60	160

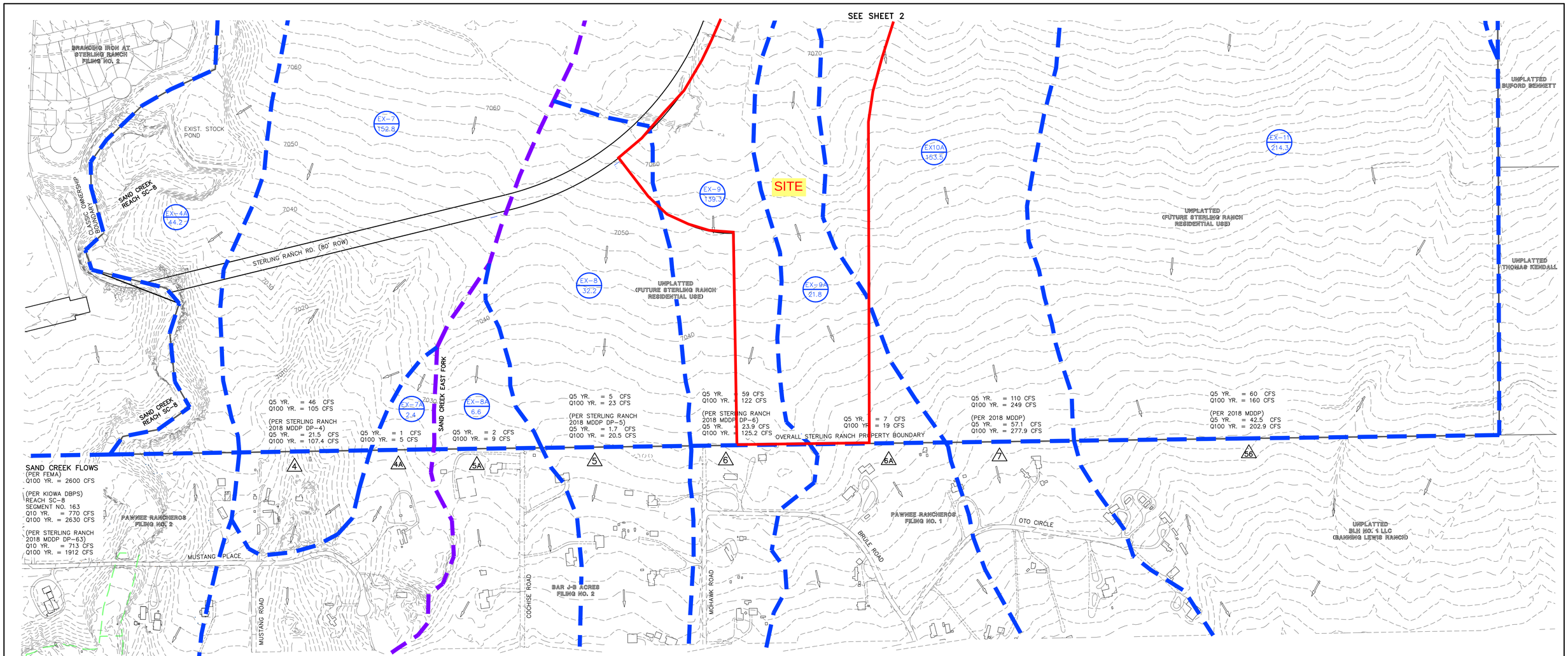


CLASSIC CONSULTING

619 N. Cascade Avenue, Suite 200
Colorado Springs, Colorado 80903
(719)785-0790
(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	2 OF 6
CHECKED BY		(V) 1"= N/A	JOB NO.	1183.22



NOTE:

THE FOLLOWING LABELS AS SHOWN ALONG THE SOUTH BOUNDARY REPRESENT PRE-DEVELOPED FLOWS AS PRESENTED IN THE 2018 STERLING RANCH MDDP. SEE REFERENCE MATERIAL IN APPENDIX FOR ORIGINAL MAP.

(PER STERLING RANCH 2018 MDDP DP-5)
Q5 YR. = 1.7 CFS
Q100 YR. = 20.5 CFS

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

* Basins with no change upon developed condition

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

Design Point (South Bndy.)	Peak Runoff 5 yr. (CFS)	Peak Runoff 100 yr. (CFS)
4	46	105
4A	1	5
5	5	23
5A	2	9
6	59	122
6A	7	19
7	110	249
56	60	160

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	

200 100 0 200 400

SCALE: 1" = 200'

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619 N. Cascade Avenue, Suite 200 (719)785-0790
Colorado Springs, Colorado 80903 (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

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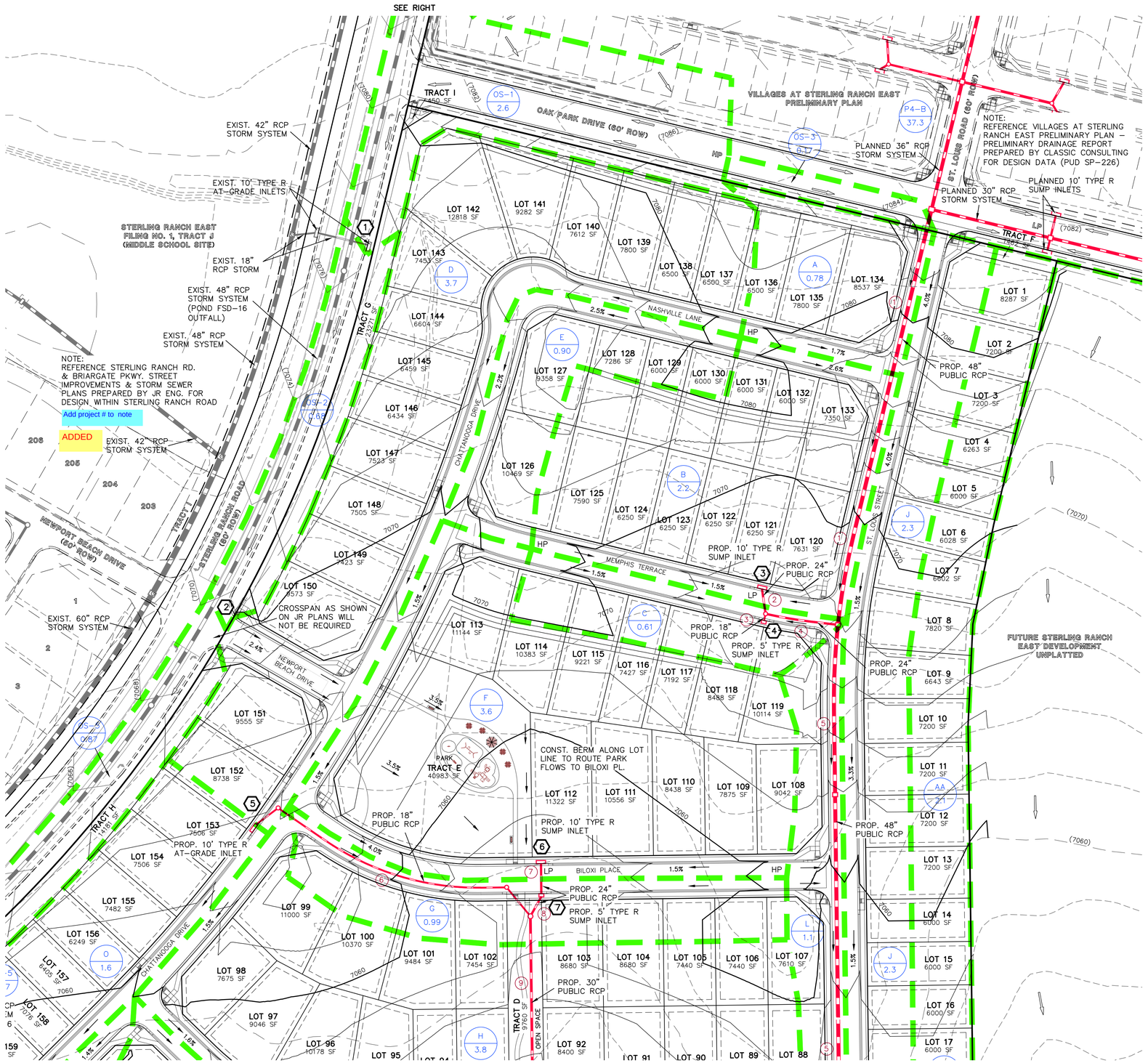

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IT'S THE LAW

THE LOCATIONS OF EXISTING UNDERGROUND UTILITIES ARE SHOWN IN AN APPROXIMATE WAY ONLY. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION OF ALL EXISTING UTILITIES BEFORE COMMENCING WORK. THE CONTRACTOR SHALL BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGES WHICH MIGHT BE CAUSED BY HIS FAILURE TO EXACTLY LOCATE AND PRESERVE ANY AND ALL UNDERGROUND UTILITIES.

NO.	REVISION	DATE

REVIEW:

PREPARED UNDER MY DIRECT SUPERVISION FOR AND ON BEHALF OF CLASSIC CONSULTING ENGINEERS AND SURVEYORS, LLC

MARC A. WHORTON, COLORADO P.E. #37155 DATE

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

STERLING RANCH EAST FILING NO. 5 PRELIMINARY PLAN

PRELIMINARY DRAINAGE REPORT
DEVELOPED DRAINAGE MAP

DESIGNED BY	MAW	SCALE	DATE
DRAWN BY	MAW	(H) 1"= 60'	SHEET 1 OF 3
CHECKED BY		(V) 1"= N/A	JOB NO. 1183.25

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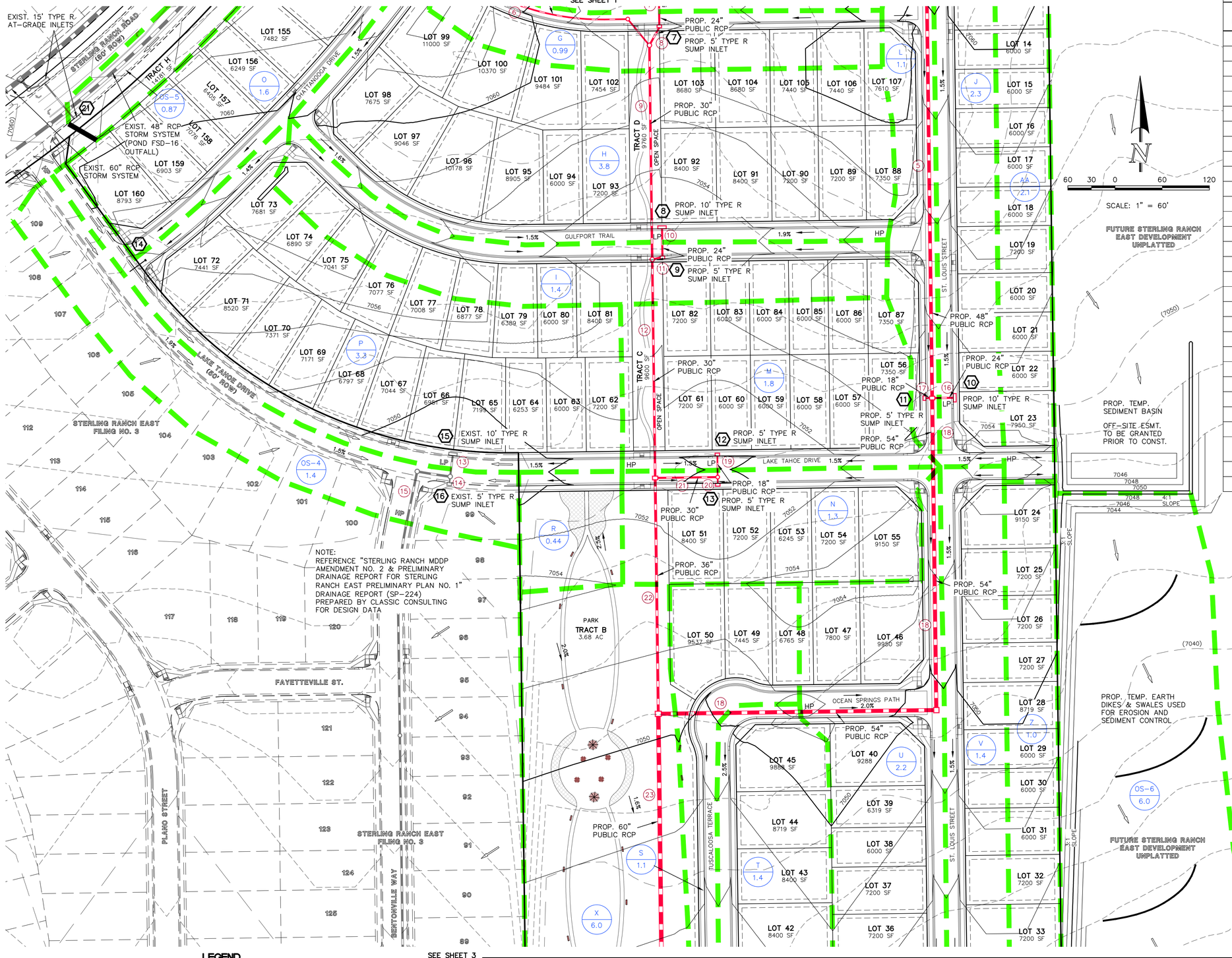

FINAL DRAINAGE REPORT ~ PIPE ROUTING SUMMARY

Pipe Run	Contributing Basin / Design Point / Pipe Run	Equivalent CA(5)	Equivalent CA(100)	Maximum Tc	Intensity I(5)	Intensity I(100)	Flow Q(5)	Flow Q(100)	Pipe Size*
1	P4-B FUTURE VILLAGES AT STERLING RANCH PP	18.28	23.13	18.7	3.19	5.35	58	124	PROP. 48" RCP
2	DP-3	1.27	1.79	16.4	3.39	5.68	4	10	PROP. 24" RCP
3	DP-4	0.23	0.33	12.1	3.84	6.45	0.9	2.1	PROP. 18" RCP
4	PR-2, PR-3	1.50	2.12	16.6	3.37	5.65	5	12	PROP. 24" RCP
5	PR-1, PR-4	19.78	25.25	19.5	3.12	5.25	62	132	PROP. 48" RCP
6	DP-5 COLLECTION	1.71	1.78	20.5	3.05	5.12	5.2	9.1	PROP. 18" RCP
7	DP-6	1.11	1.82	15.9	3.43	5.76	4	10	PROP. 24" RCP
8	PR-7, DP-7	1.47	2.35	15.9	3.43	5.76	5	14	PROP. 24" RCP
9	PR-6, PR-8	3.18	4.13	20.9	3.02	5.07	10	21	PROP. 30" RCP
10	DP-8	1.38	2.04	17.1	3.32	5.57	5	11	PROP. 24" RCP
11	PR-10, DP-9	1.89	2.80	17.1	3.32	5.57	6	16	PROP. 24" RCP
12	PR-9, PR-11	5.07	6.93	21.3	2.99	5.02	15	35	PROP. 30" RCP
13	DP-15	2.07	4.07	24.2	2.80	4.70	6	19	EXIST. 24" RCP
14	DP-16	0.53	0.76	13.8	3.65	6.13	2	5	EXIST. 18" RCP
15	PR-13, PR-14	2.60	4.83	25.4	2.73	4.58	7	22	EXIST. 30" RCP
16	DP-10	0.86	1.25	13.2	3.72	6.24	3	8	PROP. 24" RCP
17	DP-11	0.41	0.60	18.1	3.24	5.44	1.3	3.3	PROP. 18" RCP
18	PR-5, PR-13, PR-14	21.05	27.10	19.7	3.11	5.22	65	141	PROP. 54" RCP
19	DP-12	0.63	0.95	15.4	3.48	5.84	2	6	PROP. 18" RCP
20	DP-13	0.45	0.69	15.4	3.48	5.84	2	4	PROP. 18" RCP
21	PR-16, PR-17	1.08	1.64	15.5	3.47	5.82	4	10	PROP. 24" RCP
22	PR-12, PR-18	6.15	8.57	21.7	2.96	4.98	18	43	PROP. 36" RCP
23	PR-15, PR-19	27.20	35.67	22.2	2.93	4.92	80	175	PROP. 60" RCP
24	DP-17	0.41	0.60	18.1	3.24	5.44	1.3	3.3	PROP. 18" RCP
25	DP-18	0.53	0.76	16.7	3.36	5.64	2	4	PROP. 18" RCP
26	PR-21, PR-22	0.94	1.36	18.1	3.24	5.44	3	7	PROP. 24" RCP
27	PR-20, PR-23 (IN-FLOW ULTIMATE CONDITION)	28.14	37.03	22.3	2.92	4.91	82	182	PROP. 60" RCP
27	PR-20, PR-23 (IN-FLOW INTERIM CONDITION - VILLAGES NOT DEVELOPED)	9.86	13.90	20.3	3.06	5.14	30	72	PROP. 60" RCP
28	DP-19	1.35	1.96	18.1	3.24	5.44	4	11	PROP. 24" RCP
29	DP-20, PR-25	1.50	2.13	18.2	3.23	5.43	5	12	PROP. 24" RCP

FINAL DRAINAGE REPORT ~ SURFACE ROUTING SUMMARY

Design Point(s)	Contributing Basins / Design Point	Equivalent CA(5)	Equivalent CA(100)	Maximum Tc	Intensity I(5)	Intensity I(100)	Flow Q(5)	Flow Q(100)	Facility/ Inlet Size*
1	OS-1	1.76	2.02	14.0	3.62	6.08	6	12	Exist. 10' Type R At-Grade Inlet
2	OS-2 and OS-1 Flow-By	0.56	1.16	16.6	3.37	5.65	2	7	
3	OS-3, A, B	1.27	1.79	16.4	3.39	5.68	4	10	Prop. 10' Type R Sump Inlet
4	C	0.23	0.33	12.1	3.84	6.45	0.9	2.1	Prop. 5' Type R Sump Inlet
5	D and DP-2 Flow On-Site	1.94	3.18	20.2	3.07	5.16	6	16	Prop. 10' Type R At-Grade Inlet
6	F	1.11	1.82	15.9	3.43	5.76	4	10	Prop. 10' Type R Sump Inlet
7	G	0.36	0.53	11.8	3.88	6.52	1.4	3.5	Prop. 5' Type R Sump Inlet
8	H	1.38	2.04	17.1	3.32	5.57	5	11	Prop. 10' Type R Sump Inlet
9	I	0.51	0.75	13.4	3.69	6.19	2	5	Prop. 5' Type R Sump Inlet
10	J	0.86	1.25	13.2	3.72	6.24	3	8	Prop. 10' Type R Sump Inlet
11	L	0.41	0.60	18.1	3.24	5.44	1.3	3.3	Prop. 5' Type R Sump Inlet
12	M	0.63	0.95	15.4	3.48	5.84	2	6	Prop. 5' Type R Sump Inlet
13	N	0.45	0.69	15.4	3.48	5.84	2	4	Prop. 5' Type R Sump Inlet
14	O and DP-5 Flow-By	0.83	2.27	22.2	2.93	4.92	2	11	Prop. 6' Crosspan
15	P and DP-14	2.07	4.07	24.2	2.80	4.70	6	19	Exist. 10' Type R Sump Inlet
16	OS-4	0.53	0.76	13.8	3.65	6.13	2	5	Exist. 5' Type R Sump Inlet
17	S	0.41	0.60	18.1	3.24	5.44	1.3	3.3	Prop. 5' Type R Sump Inlet
18	T	0.53	0.76	16.7	3.36	5.64	2	4	Prop. 5' Type R Sump Inlet
19	U, V	1.35	1.96	18.1	3.24	5.44	4	11	Prop. 10' Type R Sump Inlet
20	W	0.15	0.17	5.0	5.17	8.68	0.8	1.4	Prop. 5' Type R Sump Inlet
21	OS-5	0.58	0.69	9.2	4.25	7.14	2	5	Exist. 15' Type R At-Grade Inlet
	TOTAL BASINS TRIBUTARY TO POND FSD-14B	30.36	41.50	23.1	2.88	4.83	87	200	
	TOTAL BASINS TRIBUTARY TO POND FSD-14B (VILLAGES NOT DEV.)	12.08	18.37	23.1	2.88	4.83	35	89	
6 (MDDP) SOUTH BNDY.	POND FSD-14B RELEASE AND BASIN Y1	REF. MHFD-DETENTION SPREADSHEET FOR CALCULATIONS					5.0	52.2	Sheet flow from Level Spreader
6A (MDDP) SOUTH BNDY.	BASINS Y2 AND OS-6	0.61	2.38	23.2	2.87	4.81	2	11	Sheet flow

LEGEND

- EXISTING GROUND CONTOUR — 5910
- PROPOSED FINISHED CONTOUR — 5910
- SUBDIVISION BOUNDARY
- LOT LINE
- PROPOSED BASIN BOUNDARY
- DIRECTION OF DRAINAGE
- EXISTING STORM SEWER
- EXISTING STORM INLET
- PROPOSED STORM SEWER
- PROPOSED STORM INLET
- BASIN IDENTIFIER / AREA IN ACRES — D / 1.41
- DESIGN POINT — 2
- PIPE RUN — 2

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NO.	REVISION	DATE

REVIEW:

PREPARED UNDER MY DIRECT SUPERVISION FOR AND ON BEHALF OF CLASSIC CONSULTING ENGINEERS AND SURVEYORS, LLC

MARC A. WHORTON, COLORADO P.E. #37155 DATE

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

STERLING RANCH EAST FILING NO. 5
PRELIMINARY PLAN
PRELIMINARY DRAINAGE REPORT
DEVELOPED DRAINAGE MAP

CLASSIC CONSULTING

DESIGNED BY	MAW	SCALE		DATE	
DRAWN BY	MAW	(H) 1"= 60'		SHEET	2 OF 3
CHECKED BY		(V) 1"= N/A		JOB NO.	1183.25

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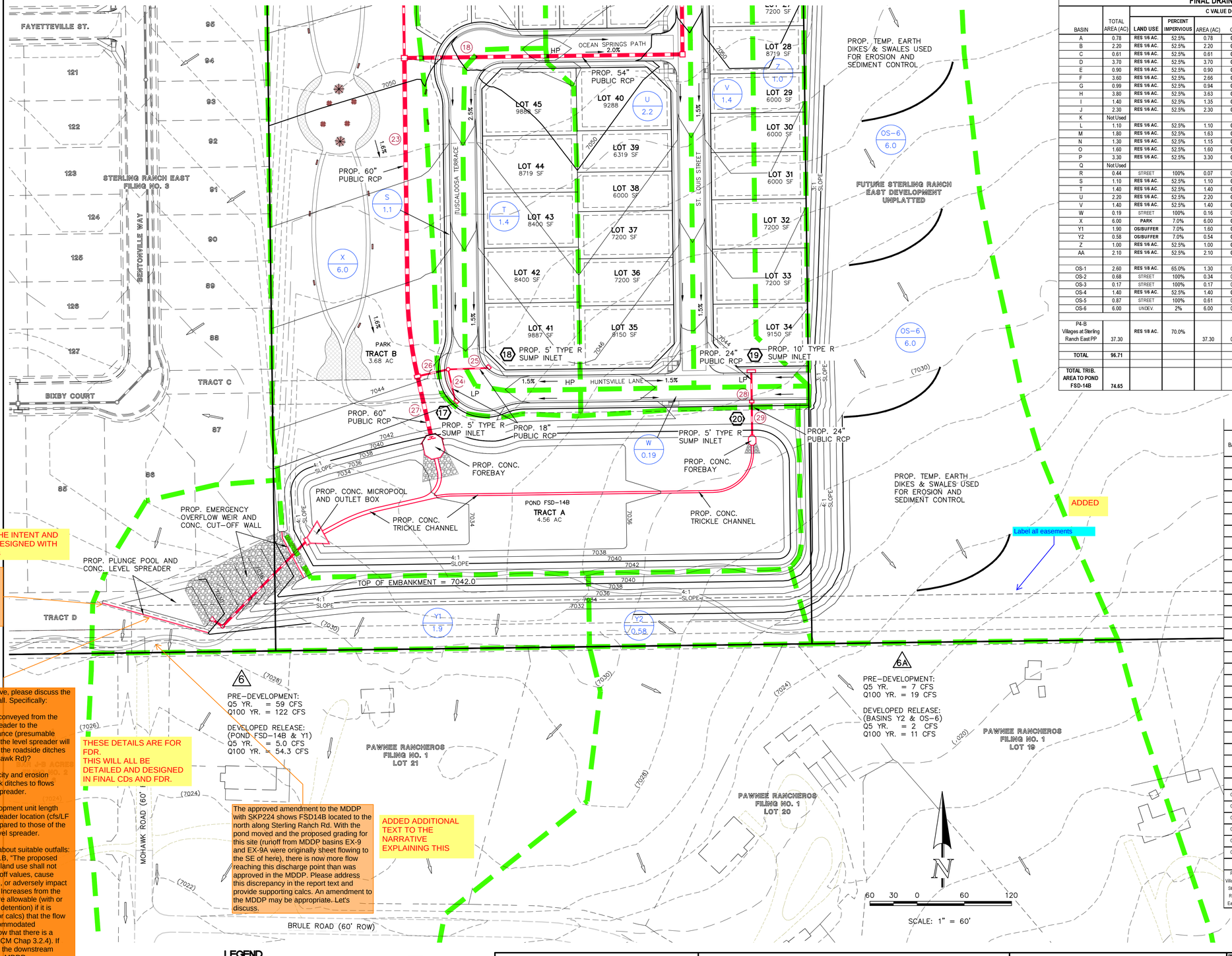


THAT IS THE INTENT AND WILL BE DESIGNED WITH FINAL CDs

Note: to match historic conditions and be a suitable outfall, the level spreader will need to be along an existing contour.

In the report text above, please discuss the suitability of this outfall. Specifically:

1) How will flows be conveyed from the ~120ft wide level spreader to the downstream conveyance (presumable almost all flows from the level spreader will eventually make it to the roadside ditches on either side of Mohawk Rd)?

2) And discuss capacity and erosion resistance of Mohawk ditches to flows released from level spreader.

3) Discuss pre-development unit length flows at this level spreader location (cfs/LF over the ~120ft) compared to those of the post-development level spreader.

4) Typical comment about suitable outfalls: Per ECM Chap 3.2.8.B, "The proposed project or developed land use shall not change historical runoff values, cause downstream damage, or adversely impact adjacent properties." Increases from the historical flowrates are allowable (with or without full spectrum detention) if it is shown (via text and/or calcs) that the flow increase can be accommodated downstream (i.e., show that there is a suitable outfall, per ECM Chap 3.2.4). If applicable, reference the downstream facilities in a DBPS or MDDP.

THESE DETAILS ARE FOR FDR.
THIS WILL ALL BE DETAILED AND DESIGNED IN FINAL CDs AND FDR.

The approved amendment to the MDDP with SKP224 shows FSD14B located to the north along Sterling Ranch Rd. With the pond moved and the proposed grading for this site (runoff from MDDP basins EX-9 and EX-9A were originally sheet flowing to the SE of here), there is now more flow reaching this discharge point than was approved in the MDDP. Please address this discrepancy in the report text and provide supporting calcs. An amendment to the MDDP may be appropriate. Let's discuss.

ADDED ADDITIONAL TEXT TO THE NARRATIVE EXPLAINING THIS

LEGEND

- EXISTING GROUND CONTOUR (5910)
- PROPOSED FINISHED CONTOUR (5910)
- SUBDIVISION BOUNDARY
- LOT LINE
- PROPOSED BASIN BOUNDARY
- DIRECTION OF DRAINAGE
- EXISTING STORM SEWER
- EXISTING STORM INLET
- PROPOSED STORM SEWER
- PROPOSED STORM INLET
- BASIN IDENTIFIER / AREA IN ACRES (D / 1.41)
- DESIGN POINT (2)
- PIPE RUN (2)

FINAL DRAINAGE REPORT ~ BASIN RUNOFF COEFFICIENT SUMMARY

BASIN	TOTAL AREA (AC)	C VALUE DCM TABLE 6-6					C VALUE DCM TABLE 6-6						WEIGHTED "C" VALUE		WEIGHTED CA		DCM TABLE 6-6
		LAND USE	PERCENT IMPERVIOUS	AREA (AC)	C(5)	C(100)	LAND USE	PERCENT IMPERVIOUS	AREA (AC)	C(5)	C(100)		C(5)	C(100)	CA(5)	CA(100)	WEIGHTED % IMPERVIOUS
A	0.78	RES 1/6 AC.	52.5%	0.78	**0.38**	**0.55**			0.00	0.08	0.35		0.38	0.55	**0.29**	**0.43**	52.5%
B	2.20	RES 1/6 AC.	52.5%	2.20	**0.38**	**0.55**			0.00	0.08	0.35		0.38	0.55	**0.83**	**1.20**	52.5%
C	0.61	RES 1/6 AC.	52.5%	0.61	**0.38**	**0.55**			0.00	0.08	0.35		0.38	0.55	**0.23**	**0.33**	52.5%
D	3.70	RES 1/6 AC.	52.5%	3.70	**0.38**	**0.55**			0.00	0.08	0.35		0.38	0.55	**1.39**	**2.02**	52.5%
E	0.90	RES 1/6 AC.	52.5%	0.90	**0.38**	**0.55**			0.00	0.08	0.35		0.38	0.55	**0.34**	**0.49**	52.5%
F	3.60	RES 1/6 AC.	52.5%	2.66	**0.38**	**0.55**	PARK	7.0%	0.94	**0.12**	**0.39**		0.31	0.50	**1.11**	**1.82**	40.6%
G	0.99	RES 1/6 AC.	52.5%	0.94	**0.38**	**0.55**	OPEN SPACE	7.0%	0.05	**0.12**	**0.39**		0.36	0.54	**0.36**	**0.53**	50.2%
H	3.80	RES 1/6 AC.	52.5%	3.63	**0.38**	**0.55**	OPEN SPACE	7.0%	0.17	**0.12**	**0.39**		0.36	0.54	**1.38**	**2.04**	50.5%
I	1.40	RES 1/6 AC.	52.5%	1.35	**0.38**	**0.55**	OPEN SPACE	7.0%	0.05	0.08	0.35		0.36	0.54	**0.51**	**0.75**	50.9%
J	2.30	RES 1/6 AC.	52.5%	2.30	**0.38**	**0.55**			0.00	0.08	0.35		0.38	0.55	**0.86**	**1.25**	52.5%
K	Not Used																
L	1.10	RES 1/6 AC.	52.5%	1.10	**0.38**	**0.55**			0.00	0.08	0.35		0.38	0.55	**0.41**	**0.60**	52.5%
M	1.80	RES 1/6 AC.	52.5%	1.63	**0.38**	**0.55**	OPEN SPACE	7.0%	0.17	**0.12**	**0.39**		0.35	0.53	**0.63**	**0.95**	48.2%
N	1.30	RES 1/6 AC.	52.5%	1.15	**0.38**	**0.55**	PARK	7.0%	0.15	**0.12**	**0.39**		0.35	0.53	**0.45**	**0.69**	47.3%
O	1.60	RES 1/6 AC.	52.5%	1.60	**0.38**	**0.55**			0.00	0.08	0.35		0.38	0.55	**0.60**	**0.87**	52.5%
P	3.30	RES 1/6 AC.	52.5%	3.30	**0.38**	**0.55**			0.00	0.08	0.35		0.38	0.55	**1.24**	**1.80**	52.5%
Q	Not Used																
R	0.44	STREET	100%	0.07	0.90	0.96	PARK	7.0%	0.37	**0.12**	**0.39**		0.24	0.48	**0.11**	**0.21**	21.8%
S	1.10	RES 1/6 AC.	52.5%	1.10	**0.38**	**0.55**			0.00	0.08	0.35		0.38	0.55	**0.41**	**0.60**	52.5%
T	1.40	RES 1/6 AC.	52.5%	1.40	**0.38**	**0.55**			0.00	0.08	0.35		0.38	0.55	**0.53**	**0.76**	52.5%
U	2.20	RES 1/6 AC.	52.5%	2.20	**0.38**	**0.55**			0.00	0.08	0.35		0.38	0.55	**0.83**	**1.20**	52.5%
V	1.40	RES 1/6 AC.	52.5%	1.40	**0.38**	**0.55**			0.00	0.08	0.35		0.38	0.55	**0.53**	**0.76**	52.5%
W	0.19	STREET	100%	0.16	0.90	0.96	OPEN SPACE	7.0%	0.03	**0.12**	**0.39**		0.78	0.87	**0.15**	**0.17**	85.3%
X	6.00	PARK	7.0%	6.00	**0.12**	**0.39**			0.00	0.08	0.35		0.12	0.39	**0.72**	**2.34**	7.0%
Y1	1.90	OS/BUFFER	7.0%	1.60	**0.12**	**0.39**	SIDEWALK	100.0%	0.30	0.90	0.96		0.24	0.48	**0.46**	**0.91**	21.7%
Y2	0.58	OS/BUFFER	7.0%	0.54	**0.12**	**0.39**	SIDEWALK	100.0%	0.04	0.08	0.35		0.12	0.39	**0.07**	**0.22**	13.4%
Z	1.00	RES 1/6 AC.	52.5%	1.00	**0.38**	**0.55**			0.00	0.08	0.35		0.38	0.55	**0.38**	**0.55**	52.5%
AA	2.10	RES 1/6 AC.	52.5%	2.10	**0.38**	**0.55**			0.00	0.08	0.35		0.38	0.55	**0.79**	**1.14**	52.5%
OS-1	2.60	RES 1/6 AC.	65.0%	1.30	0.45	0.59	STREET	100%	1.30	0.90	0.96		0.68	0.78	**1.76**	**2.02**	82.5%
OS-2	0.68	STREET	100%	0.34	0.90	0.96	OPEN SPACE	7.0%	0.34	**0.12**	**0.39**		0.51	0.68	**0.35**	**0.46**	53.5%
OS-3	0.17	STREET	100%	0.17	0.90	0.96			0.00	0.08	0.35		0.90	0.96	**0.15**	**0.16**	100.0%
OS-4	1.40	RES 1/6 AC.	52.5%	1.40	**0.38**	**0.55**			0.00	0.08	0.35		0.38	0.55	**0.53**	**0.76**	52.5%
OS-5	0.87	STREET	100%	0.61	0.90	0.96	OPEN SPACE	7.0%	0.26	**0.12**	**0.39**		0.67	0.79	**0.58**	**0.69**	72.2%
OS-6	6.00	UNDEV.	2%	6.00	0.09	0.36			0.00	**0.12**	**0.39**		0.09	0.38	**0.54**	**2.16**	2.0%
P4-B Villages at Sterling Ranch East PP	37.30	RES 1/6 AC.	70.0%	37.30	0.49	0.62			0.00	0.08	0.35		0.49	0.62	**18.28**	**23.13**	70.0%
TOTAL	96.71																
TOTAL TRIB. AREA TO POND FSD-14B	74.65																

FINAL DRAINAGE REPORT ~ BASIN RUNOFF SUMMARY

BASIN	WEIGHTED			OVERLAND				STREET / CHANNEL FLOW				Tc	INTENSITY			TOTAL FLOWS		
	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	0.25	0.29	0.43	0.08	100	2	14.7	135	2.0%	2.8	0.8	15.4	2.78	3.48	5.84	0.7	**1.0**	**2.5**
B	0.70	0.83	1.20	0.08	100	2	14.7	260	1.5%	2.4	1.8	16.4	2.70	3.39	5.68	2	**3**	**7**
C	0.20	0.23	0.33	0.08	50	1	10.4	260	1.5%	2.4	1.8	12.1	3.07	3.84	6.45	0.6	**0.9**	**2.1**
D	1.18	1.39	2.02	0.08	100	2	14.7	900	1.8%	2.7	5.6	20.2	2.46	3.07	5.16	3	**4**	**10**
E	0.29	0.34	0.49	0.08	50	1	10.4	470	2.5%	3.2	2.5	12.8	3.00	3.75	6.30	0.9	**1.3**	**3.1**
F	0.90	1.11	1.82	0.12	100	2	14.1	270	1.5%	2.4	1.8	15.9	2.74	3.43	5.76	2	**4**	**10**
G	0.30	0.36	0.53	0.12	50	1	10.0	270	1.5%	2.4	1.8	11.8	3.10	3.88	6.52	0.9	**1.4**	**3.5**
H	1.17	1.38	2.04	0.12	100	2	14.1	450	1.5%	2.4	3.1	17.1	2.65	3.32	5.57	3	**5**	**11**
I	0.43	0.51	0.75	0.08	50	1	10.4	450	1.5%	2.4	3.1	13.4	2.94	3.69	6.19	1	**2**	**5**
J	0.74	0.86	1.25	0.08	50	1	10.4	630	3.5%	3.7	2.8	13.2	2.97	3.72	6.24	2	**3**	**8**
K	Not Used																	
L	0.35	0.41	0.60	0.08	100	2	14.7	500	1.5%	2.4	3.4	18.1	2.59	3.24	5.44	0.9	**1.3**	**3.3**
M	0.53	0.63	0.95	0.12	100	2	14.1	200	1.5%	2.4	1.4	15.4	2.78	3.48	5.84	1	**2**	**6**
N	0.38	0.45	0.69	0.12	100	2	14.1	200	1.5%	2.4	1.4	15.4	2.78	3.48	5.84	1	**2**	**4**
O	0.51	0.60	0.87	0.08	100	2	14.7	300	1.5%	2.4	2.0	16.7	2.69	3.36	5.64	1	**2**	**5**
P	1.06	1.24	1.80	0.08	100	2	14.7	420	1.5%	2.4	2.9	17.5	2.63	3.29	5.52	3	**4**	**10**
Q	Not Used																	
R	0.08	0.11	0.21	0.12	100	2	14.1	50	1.5%	2.4	0.3	14.4	2.86	3.58	6.01	0.2	**0.4**	**1.3**
S	0.35	0.41	0.60	0.08	100	2	14.7	500	1.5%	2.4	3.4	18.1	2.59	3.24	5.44	0.9	**1.3**	**3.3**
T	0.45	0.53	0.76	0.08	100	2	14.7	300	1.5%	2.4	2.0	16.7	2.69	3.36	5.64	1	**2**	**4**
U	0.70	0.83	1.20	0.08	100	2	14.7	500	1.5%	2.4	3.4	18.1	2.59	3.24	5.44	2	**3**	**7**
V	0.45	0.53	0.76	0.08	50	1	10.4	650	1.5%	2.4	4.4	14.8	2.83	3.54	5.95	1	**2**	**5**
W	0.14	0.15	0.17									5.0	4.12	5.17	8.68	0.6	**0.8**	**1.4**
X	0.30	0.72	2.34	0.08	100	2	14.7	500	2.0%	1.0	8.4	23.1	2.30	2.88	4.83	1	**2**	**11**
Y1	0.35	0.46	0.91	0.90	250	10	3.6					5.0	4.12	5.17	8.68	1.4	**2**	**8**
Y2	0.03	0.07	0.22	0.08	90	14	7.1					7.1	3.71	4.65	7.81	0.1	**0.3**	**1.8**
Z	0.32	0.38	0.55	0.08	65	2	10.2					10.2	3.27	4.09	6.87	1	**2**	**4**
AA	0.67	0.79	1.14	0.08	65	2	10.2					10.2	3.27	4.09	6.87	2	**3**	**8**
OS-1	1.69	1.76	2.02	0.08	40	0.8	9.3	900	2.5%	3.2	4.7	14.0	2.89	3.62	6.08	5	**6**	**12**
OS-2	0.32	0.35	0.46	0.12	50	1	10.0	400	1.6%	2.5	2.6	12.6	3.02	3.78	6.35	1.0	**1.3**	**2.9**
OS-3	0.15	0.15	0.16									5.0	4.12	5.17	8.68	0.6	**0.8**	**1.4**
OS-4	0.45	0.53	0.76	0.08	50	1	10.4	500	1.5%	2.4	3.4	13.8	2.91	3.65	6.13	1	**2**	**5**
OS-5	0.56	0.58	0.69	0.12	25	0.75	6.2	450	1.5%	2.4	3.1	9.2	3.39	4.25	7.14	2	**2**	**5**
OS-6	0.18	0.54	2.16	0.12	300	7	23.2					23.2	2.29	2.87	4.81	0.4	**1.5**	**10**
P4-B Villages at Sterling Ranch East PP	16.79	18.28	23.13	0.08	100	2	14.7	600	1.5%	2.4	4.1	18.7	2.55	3.19	5.35	43	**58**	**124**

48 HOURS BEFORE YOU DIG, CALL UTILITY LOCATORS
811
UTILITY NOTIFICATION CENTER OF COLORADO
IT'S THE LAW
THE LOCATIONS OF EXISTING UNDERGROUND UTILITIES ARE SHOWN IN AN APPROXIMATE WAY ONLY. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION OF ALL EXISTING UTILITIES BEFORE COMMENCING WORK. THE CONTRACTOR SHALL BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGES WHICH MIGHT BE CAUSED BY HIS FAILURE TO EXACTLY LOCATE AND PRESERVE ANY AND ALL UNDERGROUND UTILITIES.

NO.	REVISION	DATE

REVIEW:
PREPARED UNDER MY DIRECT SUPERVISION FOR AND ON BEHALF OF CLASSIC CONSULTING ENGINEERS AND SURVEYORS, LLC

MARC A. WHORTON, COLORADO P.E. #37155 DATE

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

STERLING RANCH EAST FILING NO. 5
PRELIMINARY PLAN
PRELIMINARY DRAINAGE REPORT
DEVELOPED DRAINAGE MAP

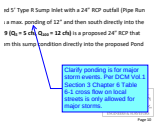
CLASSIC CONSULTING

DESIGNED BY	MAW	SCALE	DATE
DRAWN BY	MAW	(H) 1"= 60'	SHEET 3 OF 3
CHECKED BY		(V) 1"= N/A	JOB NO. 1183.25

N:\1183\25\REPORTS\PRELIMINARY

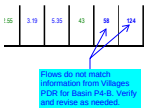
V1_Drainage REPORT.pdf Markup Summary

Callout (5)



Subject: Callout
Page Label: 10
Author: Carlos
Date: 9/25/2023 10:01:27 AM
Status:
Color:
Layer:
Space:

Clarify ponding is for major storm events. Per DCM Vol.1 Section 3 Chapter 6 Table 6-1 cross flow on local streets is only allowed for major storms.



Subject: Callout
Page Label: 22
Author: CDurham
Date: 9/26/2023 1:31:26 PM
Status:
Color:
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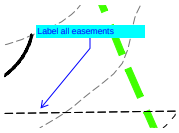
Space:

Flows do not match information from Villages PDR for Basin P4-B. Verify and revise as needed.



Subject: Callout
Page Label: [1] SHEET 3
Author: CDurham
Date: 9/26/2023 12:59:12 PM
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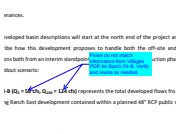
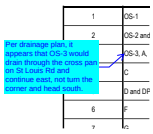
Color:
Layer:
Space:

Label all easements



Subject: Callout
Page Label: 7
Author: CDurham
Date: 9/26/2023 1:32:08 PM
Status:
Color:
Layer:
Space:

Flows do not match information from Villages PDR for Basin P4-B. Verify and revise as needed.



Subject: Callout
Page Label: 23
Author: CDurham
Date: 9/26/2023 1:41:14 PM
Status:
Color:
Layer:
Space:

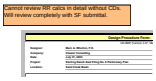
Per drainage plan, it appears that OS-3 would drain through the cross pan on St Louis Rd and continue east, not turn the corner and head south.

SW - Textbox (4)

. SP235

Subject: SW - Textbox
Page Label: 1
Author: Mikayla Hartford
Date: 9/21/2023 2:47:05 PM
Status:
Color:
Layer:
Space:

SP235

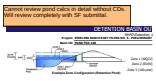


Subject: SW - Textbox
Page Label: 80
Author: Glenn Reese - EPC Stormwater
Date: 9/25/2023 8:07:55 AM
Status:
Color:
Layer:
Space:

Cannot review RR calcs in detail without CDs. Will review completely with SF submittal.

Subject: SW - Textbox
Page Label: 80
Author: Glenn Reese - EPC Stormwater
Date: 9/25/2023 8:08:00 AM
Status:
Color:
Layer:
Space:

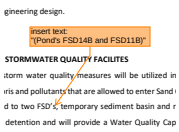
Cannot review this EDB info in detail without CDs. Will review completely with SF submittal.



Subject: SW - Textbox
Page Label: 85
Author: Glenn Reese - EPC Stormwater
Date: 9/25/2023 8:08:07 AM
Status:
Color:
Layer:
Space:

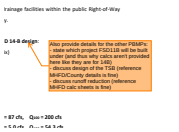
Cannot review pond calcs in detail without CDs. Will review completely with SF submittal.

SW - Textbox with Arrow (8)



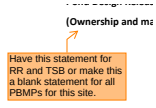
Subject: SW - Textbox with Arrow
Page Label: 11
Author: Glenn Reese - EPC Stormwater
Date: 9/25/2023 8:07:28 AM
Status:
Color:
Layer:
Space:

insert text:
"(Pond's FSD14B and FSD11B)"



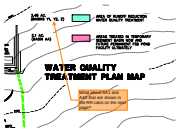
Subject: SW - Textbox with Arrow
Page Label: 11
Author: Glenn Reese - EPC Stormwater
Date: 9/25/2023 8:07:28 AM
Status:
Color:
Layer:
Space:

Also provide details for the other PBMPs:
- state which project FSD11B will be built under (and thus why calcs aren't provided here like they are for 14B)
- discuss design of the TSB (reference MHFD/County details is fine)
- discuss runoff reduction (reference MHFD calc sheets is fine)



Subject: SW - Textbox with Arrow
Page Label: 11
Author: Glenn Reese - EPC Stormwater
Date: 9/25/2023 8:07:28 AM
Status:
Color:
Layer:
Space:

Have this statement for RR and TSB or make this a blank statement for all PBMPs for this site.



Subject: SW - Textbox with Arrow
Page Label: [1] Model
Author: Glenn Reese - EPC Stormwater
Date: 9/25/2023 8:07:37 AM
Status:
Color:
Layer:
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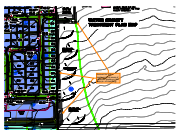
What about AA1 and AA2 that are shown in the RR calcs on the next page?



Subject: SW - Textbox with Arrow
Page Label: [1] Model
Author: Glenn Reese - EPC Stormwater
Date: 9/25/2023 8:07:37 AM
Status:
Color:
Layer:
Space:

Account for WQ treatment of all areas of proposed grading in this map (ie: via hatching)

Subject: SW - Textbox with Arrow
Page Label: [1] SHEET 3
Author: Glenn Reese - EPC Stormwater
Date: 9/25/2023 8:09:19 AM
Status:
Color:
Layer:
Space:

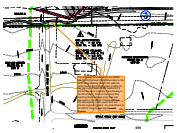
In the report text above, please discuss the suitability of this outfall. Specifically:

1) How will flows be conveyed from the ~120ft wide level spreader to the downstream conveyance (presumable almost all flows from the level spreader will eventually make it to the roadside ditches on either side of Mohawk Rd)?

2) And discuss capacity and erosion resistance of Mohawk ditches to flows released from level spreader.

3) Discuss pre-development unit length flows at this level spreader location (cfs/LF over the ~120ft) compared to those of the post-development level spreader.

4) Typical comment about suitable outfalls:
Per ECM Chap 3.2.8.B, “The proposed project or developed land use shall not change historical runoff values, cause downstream damage, or adversely impact adjacent properties.” Increases from the historical flowrates are allowable (with or without full spectrum detention) if it is shown (via text and/or calcs) that the flow increase can be accommodated downstream (i.e., show that there is a suitable outfall, per ECM Chap 3.2.4). If applicable, reference the downstream facilities in a DBPS or MDDP.



Subject: SW - Textbox with Arrow
Page Label: [1] SHEET 3
Author: Glenn Reese - EPC Stormwater
Date: 9/25/2023 8:09:19 AM
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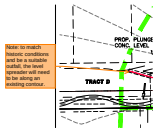
The approved amendment to the MDDP with SKP224 shows FSD14B located to the north along Sterling Ranch Rd. With the pond moved and the proposed grading for this site (runoff from MDDP basins EX-9 and EX-9A were originally sheet flowing to the SE of here), there is now more flow reaching this discharge point than was approved in the MDDP. Please address this discrepancy in the report text and provide supporting calcs. An amendment to the MDDP may be appropriate. Let's discuss.



Subject: SW - Textbox with Arrow
Page Label: [1] SHEET 3
Author: Glenn Reese - EPC Stormwater
Date: 9/25/2023 8:09:19 AM
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Note: to match historic conditions and be a suitable outfall, the level spreader will need to be along an existing contour.

Text Box (18)

Subject: Text Box
Page Label: 11
Author: Carlos
Date: 9/25/2023 9:57:41 AM
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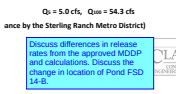
Provide reference from the report discussing inlet at DP21, and provide confirmation that the inlet was designed to account for new flows.



Subject: Text Box
Page Label: 11
Author: Carlos
Date: 9/25/2023 11:03:43 AM
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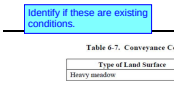
Discuss differences in release rates from the approved MDDP and calculations. Discuss the change in location of Pond FSD 14-B.



Subject: Text Box
Page Label: 20
Author: Carlos
Date: 9/25/2023 10:56:07 AM
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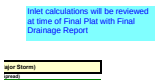
Identify if these are existing conditions.



Subject: Text Box
Page Label: 31
Author: CDurham
Date: 9/26/2023 10:47:00 AM
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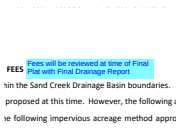
Inlet calculations will be reviewed at time of Final Plat with Final Drainage Report



Subject: Text Box
Page Label: 14
Author: CDurham
Date: 9/26/2023 10:48:39 AM
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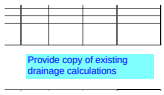
Fees will be reviewed at time of Final Plat with Final Drainage Report



Subject: Text Box
Page Label: 19
Author: CDurham
Date: 9/26/2023 10:49:56 AM
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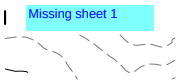
Provide copy of existing drainage calculations



Subject: Text Box
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Author: CDurham
Date: 9/26/2023 10:59:26 AM
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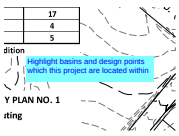
Missing sheet 1



Subject: Text Box
Page Label: [1] SHEET 2
Author: CDurham
Date: 9/26/2023 11:01:22 AM
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Highlight basins and design points which this project are located within

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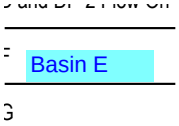

Subject: Text Box
Page Label: 23
Author: CDurham
Date: 9/26/2023 12:45:53 PM
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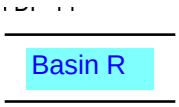
Basin E



Subject: Text Box
Page Label: 24
Author: CDurham
Date: 9/26/2023 12:46:14 PM
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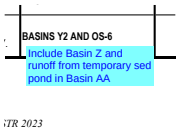
Basin R



Subject: Text Box
Page Label: 24
Author: CDurham
Date: 9/26/2023 12:46:39 PM
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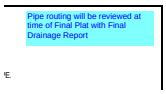
Include Basin Z and runoff from temporary sed pond in Basin AA



Subject: Text Box
Page Label: 25
Author: CDurham
Date: 9/26/2023 12:47:30 PM
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Pipe routing will be reviewed at time of Final Plat with Final Drainage Report

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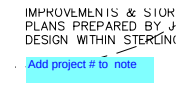

Subject: Text Box
Page Label: [1] SHEET 1
Author: CDurham
Date: 9/26/2023 12:58:21 PM
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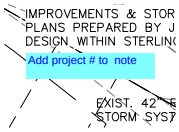
Add project # to note



Subject: Text Box
Page Label: [1] SHEET 1
Author: CDurham
Date: 9/26/2023 12:58:31 PM
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Add project # to note

Subject: Text Box
Page Label: 4
Author: Carlos
Date: 9/26/2023 1:31:33 PM
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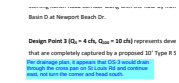
Please include pre-development basin EX-8 in this section as the site includes a portion of this basin.



Subject: Text Box
Page Label: 7
Author: CDurham
Date: 9/26/2023 1:41:44 PM
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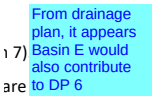
Per drainage plan, it appears that OS-3 would drain through the cross pan on St Louis Rd and continue east, not turn the corner and head south.



Subject: Text Box
Page Label: 8
Author: CDurham
Date: 9/26/2023 1:42:49 PM
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From drainage plan, it appears Basin E would also contribute to DP 6

' Type R At-Grade Inlet as designed and appr
rkway Segment 2 Street Plans", prepared by
ly captures the developed flows with no flow
sign. Include discussion of DP 6 & DP6A

'ER QUALITY FACILITES

Subject: Text Box
Page Label: 11
Author: CDurham
Date: 9/26/2023 1:48:19 PM
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Include discussion of DP 6 & DP6A