PRELIMINARY DRAINAGE REPORT
FOR
STERLING RANCH EAST FILING NO. 6
PRELIMINARY PLAN

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PCD Project No. SP24__

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

CLASSIC CONSULTING ENGINEERS & SURVEYORS

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TABLE OF CONTENTS:

PURPOSE	Page 4
GENERAL DESCRIPTION	Page 4
EXISTING DRAINAGE CONDITIONS	Page 5
PROPOSED DRAINAGE CONDITIONS	Page 6
DETENTION/SWQ FACILITIES	Page 14
DRAINAGE CRITERIA	Page 18
FLOODPLAIN STATEMENT	Page 19
DRAINAGE AND BRIDGE FEES	Page 20
SUMMARY	Page 20
REFERENCES	Page 21

APPENDICES

VICINITY MAP

SOILS MAP (WEB SOIL SURVEY)

F.E.M.A. MAP

HYDROLOGIC CALCULATIONS

STORMWATER QUALITY / BMP CALCULATIONS

DRAINAGE MAPS

PRELIMINARY DRAINAGE REPORT FOR STERLING RANCH EAST FILING NO. 6 PRELIMINARY PLAN

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. 6 Preliminary Plan is 56.13-acre site located in portions sections 27 and 34, township 12 south, range 65 west of the sixth principal meridian. 198 urban residential lots are planned. The site is bounded on the north and east by unplatted, future Sterling Ranch residential development, to the south by planned Briargate Parkway ROW extension and to the west by existing planned 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 latest approved Sterling Ranch Sketch Plan Amendment.

The overall area for this property includes Tract I of the adjacent Foursquare at Sterling Ranch East Filing No. 1 development, which is proposed to be Pond FSD-16. The original design for this detention/stormwater quality facility was to have a large useable park area (multiple ball fields) as a component in the upper section of the 100-yr ponding area. After discussions with County Parks staff, it was determined that this type of park use within a pond area would not get credit for urban park fees. Thus, with the proposed Sterling Ranch East Filing No. 6 development, Pond FSD-16 is still planned to be a detention/stormwater quality to handle all the previously anticipated developed flows but now designed without the large ball field area. This allows for the reconfiguration of the northeast portion of the original pond area to be used for proposed lots. Also, Tract I was re-zoned to PUD along with the Foursquare at Sterling Ranch Filing No. 1 approval. However, with Sterling Ranch East Filing No. 6 development, we are proposing to change the zoning of the original Tract I to RS-5000 to be consistent with the surrounding land use east of Sterling Ranch Road.

The average soil condition reflects Hydrologic Group "A" (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, a mix a both Type A and Type B soils are utilized for developed site conditions as some import is anticipated for this development.

EXISTING DRAINAGE CONDITIONS

The Sterling Ranch East Filing No. 6 property is located in the upper portion of the Sand Creek East Fork Drainage Basin. The south western portion of the site along with a gravel access road traversing the site are the areas of the property that are currently disturbed. The rest of the site is covered with native grasses with no trees or other vegetation.

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-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 travel towards the proposed Pond FSD-16 (designed under Foursquare at Sterling Ranch Filing No. 1 development due west of this project) and Briargate Parkway (currently under construction).

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, again towards the proposed Pond FSD-16 and Briargate Parkway

PROPOSED DRAINAGE CONDITIONS

As described in the General Description of the report, this proposed Preliminary Plan development contains 56.13 acres of urban residential lots. The Final Plat for (*Foursquare at Sterling Ranch East Filing No. 1 - PCD No. SF2236)* was recently approved with Tract I containing Pond FSD-16. This report describes how this facility will be reconfigured yet still designed to handle all the anticipated developed flows as previously planned. Thus, this report 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-16 facility within this development will continue to 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.

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 based on adjacent construction phasing and the ultimate buildout scenario. This report will also include the adjusted Pond FSD-16 final design.

Design Point 1 (Q_5 = 12 cfs, Q_{100} = 30 cfs) represents developed flows from Basins A1 (5.7 ac.) and A2 (3.6 ac.) that are tributary to the proposed sump condition at Design Point 1. At this location, Type R sump inlets will be sized to completely collect both the 5-yr. and 100-yr. developed flows. A public storm system within the ROW will convey these developed flows further downstream. Sizing of these facilities will be provided in the future FDR.

Design Point 2 (Q_5 = 6 cfs, Q_{100} = 13 cfs) represents developed flows from Basin B (4.6 ac.) that are tributary to the proposed sump condition at Design Point 2. At this location, Type R sump inlets will be sized to completely collect both the 5-yr. and 100-yr. developed flows. A public storm system within the ROW will convey these developed flows further downstream. Sizing of these facilities will be provided in the future FDR.

Design Point 3 (Q_5 = 2 cfs, Q_{100} = 5 cfs) represents developed flows from Basin C (1.6 ac.) that are tributary to Design Point 3. It is planned that at this location a Type R at-grade inlet will be sized to completely collect the 5-yr. developed flows with some minimal flow-by of the 100-yr.

flows. A public storm system within the ROW will convey the collected flows further downstream. Sizing of this facility will be provided in the future FDR.

Design Point 4 (Q_5 = 10 cfs, Q_{100} = 26 cfs) represents developed flows from Basin D (8.7 ac.) that are tributary to the proposed sump condition at Design Point 4. At this location, Type R sump inlets will be sized to completely collect both the 5-yr. and 100-yr. developed flows. A storm system within the ROW and tract will convey these developed flows further downstream towards the proposed large diameter storm system within Sterling Ranch Road. Sizing of these facilities will be provided in the future FDR.

Design Point 5 (Q_5 = 3 cfs, Q_{100} = 8 cfs) represents developed flows from Basin E (2.6 ac.) that are tributary to the proposed sump condition at Design Point 5. At this location, Type R sump inlets will be sized to completely collect both the 5-yr. and 100-yr. developed flows. A public storm system within the ROW will convey these developed flows further downstream. Sizing of these facilities will be provided in the future FDR.

Design Point 6 (Q_5 = 3 cfs, Q_{100} = 6 cfs) represents developed flows from Basin F (2.0 ac.) that are tributary to the proposed sump condition at Design Point 6. At this location, Type R sump inlets will be sized to completely collect both the 5-yr. and 100-yr. developed flows. A public storm system within the ROW will convey these developed flows further downstream. Sizing of these facilities will be provided in the future FDR.

Design Point 7 (Q_5 = 3 cfs, Q_{100} = 8 cfs) represents developed flows from Basin G (2.8 ac.) that are tributary to the proposed sump condition at Design Point 7. At this location, Type R sump inlets will be sized to completely collect both the 5-yr. and 100-yr. developed flows. A public storm system within the ROW will convey these developed flows further downstream. Sizing of these facilities will be provided in the future FDR.

Design Point 8 (Q_5 = 3 cfs, Q_{100} = 7 cfs) represents developed flows from Basin H (2.2 ac.) that are tributary to the proposed sump condition at Design Point 8. At this location, Type R sump inlets will be sized to completely collect both the 5-yr. and 100-yr. developed flows. A public storm system within the ROW will convey these developed flows further downstream. Sizing of these facilities will be provided in the future FDR.

Design Point 9 (Q_5 = 3 cfs, Q_{100} = 9 cfs) represents developed flows from Basin I (2.7 ac.) and the anticipated minimal 100-yr. flow-by from Design Point 3 that are tributary to Design Point 9. It is planned that at this location a Type R at-grade inlet will be sized to completely collect the 5-yr. developed flows with some minimal flow-by of the 100-yr. flows. A public storm system within the ROW will convey the collected flows further downstream. Sizing of this facility will be provided in the future FDR.

Design Point 10 (Q_5 = 5 cfs, Q_{100} = 13 cfs) represents developed flows from Basin J (4.2 ac.) that are tributary to the proposed sump condition at Design Point 10. At this location, Type R sump inlets will be sized to completely collect both the 5-yr. and 100-yr. developed flows. A storm system within the ROW and drainage esmt. will convey these developed flows and the collected flows from the Design Points mentioned above directly into Pond FSD-16. Sizing of these facilities will be provided in the future FDR.

Design Point 11 (Q_5 = 44 cfs, Q_{100} = 110 cfs) represents the total developed flows from this development that are tributary to this storm outfall into Pond FSD-16. Sizing of this storm outfall and the proposed concrete forebay structure will be provided in the future FDR.

The following Design Points are proposed to collect anticipated future or already planned residential development to the north and west of Sterling Ranch Road that are tributary to Pond FSD-16. The P1-F1 and P1-F2 basins are anticipated areas for future development within Sterling Ranch to the north and the F4 basins represent the Sterling Ranch East Filing No. 4

areas as planned and consistent with the approved "Sterling Ranch East Phase 1 Preliminary Plan - Filings 1-4" (SP224).

Design Point 12 (Q_5 = 12 cfs, Q_{100} = 32 cfs) represents the anticipated developed flows from future residential use within Basin P1-F2 (11.5 ac.) that are tributary to the proposed sump condition at Design Point 12 within Sterling Ranch Road. At this location, Type R sump inlets will be sized to completely collect both the 5-yr. and 100-yr. developed flows. A public storm system within the ROW will convey these developed flows further downstream. Sizing of these facilities and future storm stubs to the north will be provided in the future FDR.

Design Point 13 (Q_5 = 10 cfs, Q_{100} = 23 cfs) represents the anticipated developed flows from the planned Sterling Ranch East Filing No. 4 residential use within Basin F4-1 (7.8 ac.) that are tributary to the proposed sump condition at Design Point 13. At this location, Type R sump inlets will be sized to completely collect both the 5-yr. and 100-yr. developed flows. A public storm system within the ROW will convey these developed flows further downstream. Sizing of these facilities will be provided in a future FDR.

Design Point 14 (Q_5 = 3 cfs, Q_{100} = 7 cfs) represents the anticipated developed flows from the planned Sterling Ranch East Filing No. 4 residential use within Basin F4-2 (2.3 ac.) that are tributary to the proposed sump condition at Design Point 14. At this location, a Type R sump inlet will be sized to completely collect both the 5-yr. and 100-yr. developed flows. A storm system within a drainage esmt. and tract will convey these developed flows further downstream. Sizing of this facility will be provided in a future FDR.

Design Point 15 (Q_5 = 9 cfs, Q_{100} = 26 cfs) represents the anticipated developed flows from the planned Sterling Ranch East Filing No. 4 residential use within Basin F4-3 (9.8 ac.) that are tributary to the proposed sump condition at Design Point 15. At this location, Type R sump inlets will be sized to completely collect both the 5-yr. and 100-yr. developed flows. A public storm system within the ROW will convey these developed flows along with some collected

flows from an anticipated upstream Type R at-grade inlet further downstream. Sizing of these facilities will be provided in a future FDR.

Design Point 16 (Q_5 = 2 cfs, Q_{100} = 6 cfs) represents the anticipated developed flows from the planned Sterling Ranch East Filing No. 4 residential use within Basin F4-4 (1.7 ac.) that are tributary to the proposed sump condition at Design Point 16. At this location, Type R sump inlets will be sized to completely collect both the 5-yr. and 100-yr. developed flows. A public storm system within the ROW will convey these developed flows along with the collected flows from the Design Points described above further downstream towards the large diameter storm system within Sterling Ranch Road. Sizing of these facilities and the storm system outfall will be provided in a future FDR.

Design Point 17 (Q_5 = 7 cfs, Q_{100} = 17 cfs) represents the anticipated developed flows from the planned Sterling Ranch East Filing No. 4 residential use within Basin F4-5 (6.9 ac.) along with some flow-by from the anticipated upstream Type R at-grade inlet that are tributary to the proposed sump condition at Design Point 17. At this location, Type R sump inlets will be sized to completely collect both the 5-yr. and 100-yr. developed flows. A public storm system within the ROW will convey these developed flows further downstream. Sizing of these facilities will be provided in a future FDR.

Design Point 18 (Q_5 = 16 cfs, Q_{100} = 38 cfs) represents the anticipated developed flows from the planned Sterling Ranch East Filing No. 4 residential use within Basin F4-6 (13.3 ac.) that are tributary to the proposed sump condition at Design Point 13. It is anticipated that upstream at-grade inlets will be required within this basin. At this location, Type R sump inlets will be sized to completely collect both the 5-yr. and 100-yr. developed flows. A public storm system within the ROW will convey these developed flows further downstream. Sizing of these facilities along with the anticipated at-grade inlets will be provided in a future FDR.

Design Point 19 (Q_5 = 9 cfs, Q_{100} = 22 cfs) represents the anticipated developed flows from the planned Sterling Ranch East Filing No. 4 residential use within Basin F4-7 (7.8 ac.) that are tributary to the proposed sump condition at Design Point 19. At this location, Type R sump inlets will be sized to completely collect both the 5-yr. and 100-yr. developed flows. A storm system within a tract will convey these developed flows along with the collected flows from the Design Points described above further downstream towards the large diameter storm system within Sterling Ranch Road. Sizing of these facilities and the storm system outfall will be provided in a future FDR.

Design Point 20 (Q_5 = 4 cfs, Q_{100} = 10 cfs) represents the developed flows from the designed Foursquare at Sterling Ranch East Filing No. 1 development within Basin OS-3 (3.5 ac.) that are tributary to the designed sump condition at Design Point 20. At this location, a designed 10' Type R sump inlet will completely collect both the 5-yr. and 100-yr. developed flows. This remains consistent with *Design Point 5 (Q_5 = 4.5 cfs, Q_{100} = 10.5 cfs)* as described in the approved FDR for *Foursquare at Sterling Ranch East Filing No. 1 (SF2236).* A designed public storm system conveys these developed flows further downstream within the Foursquare development.

Design Point 21 (Q_5 = 4 cfs, Q_{100} = 9 cfs) represents anticipated developed flows from Basin OS-1 (2.0 ac.) along the north side of Sterling Ranch Road that are tributary to Design Point 21. A Type R at-grade inlet is proposed at this location that will be sized to completely collect the 5-yr. developed flows with some minimal flow-by of the 100-yr. flows. A public storm system within the ROW will convey the collected flows towards the public storm system within Sterling Ranch Road. Sizing of this facility will be provided in the future FDR. This remains consistent with *Design Point 13 (Q_5 = 5.4 cfs, Q_{100} = 15.1 cfs)* as described in the approved FDR for *Foursquare at Sterling Ranch East Filing No. 1 (SF2236).*

Design Point 22 (Q_5 = 5 cfs, Q_{100} = 9 cfs) represents anticipated developed flows from Basin OS-2 (2.0 ac.) along the south side of Sterling Ranch Road that are tributary to Design Point 22. A

Type R at-grade inlet is proposed at this location that will be sized to completely collect the 5-yr. developed flows with some minimal flow-by of the 100-yr. flows. A public storm system within the ROW will convey the collected flows towards the public storm system within Sterling Ranch Road. Sizing of this facility will be provided in the future FDR. This remains consistent with *Design Point 14 (Q_5 = 4.0 cfs, Q_{100} = 11.2 cfs)* as described in the approved FDR for *Foursquare at Sterling Ranch East Filing No. 1 (SF2236).*

Design Point 23 (Q_5 = 125 cfs, Q_{100} = 308 cfs) represents the total developed flows from all the planned and anticipated future residential development upstream as described above that are tributary to this storm outfall into Pond FSD-16. Sizing of this storm outfall and the proposed concrete forebay/impact structure will be provided in the future FDR. This remains fairly consistent with *Design Point 4 (Q_5 = 218 cfs, Q_{100} = 379 cfs)* as described in the approved *Sterling Ranch MDDP Amendment No. 2 and PDR for Sterling Ranch East Preliminary Plan No.1 (SP224).* The hydrologic calculation method difference between this report using rational method and the MDDP/PDR using SWWM 5.1 proves challenging for exact flow comparison. However, the future final drainage report(s) for these various proposed developments will provide the final determination of the interim and ultimate developed flow conditions.

Design Point 24 (Q_5 = 52 cfs, Q_{100} = 124 cfs) represents the total developed flows from all the designed residential development tributary to this storm outfall into Pond FSD-16 from Foursquare at Sterling Ranch East Filing No. 1 and Sterling Ranch East Filing No. 2 as designed and approved in the FDR for *Foursquare at Sterling Ranch East Filing No. 1 (SF2236)*

Basin N (Q_5 = 0.2 cfs, Q_{100} = 0.9 cfs) represents developed flows from rear yards of lots and the open space tract adjacent to Sterling Ranch Road. These flows sheet flow into the easterly curb line of Sterling Ranch Road and travel as curb and gutter flow in a southerly direction towards the downstream 15' Type R at-grade inlet planned with Foursquare at Sterling Ranch Filing 1. This basin was previously accounted for as Basin OS-4 in the Foursquare FDR.

Basin L (Q_5 = 3 cfs, Q_{100} = 9 cfs) represents developed flows from rear lots and Tract H that sheet flow directly into Pons FSD-16. **Basin O (Q_5 = 3 cfs, Q_{100} = 14 cfs)** represents developed flows from the actual pond area itself, which sheet flow into the proposed concrete trickle channels and then routed towards the outlet structure.

Basin K (Q_5 = 2 cfs, Q_{100} = 6 cfs) represents developed flows from rear yards of lots 1-6 that are not able to be captured and routed to Pond FSD-16. However, these developed flows will enter the proposed north curb line of Briargate Parkway and travel as curb and gutter flow in a westerly direction towards the planned Type R sump inlet just east of Sterling Ranch Road. This condition is consistent with the approved *Sterling Ranch MDDP Amendment No. 2 and PDR for Sterling Ranch East Preliminary Plan No.1 (SP224)* as previously planned Basin P1-A5. These developed flows within this basin are completely captured and routed downstream within the public storm system within Sterling Ranch Road and ultimately enter Pond FSD-14A as planned in the *Sterling Ranch East Filing No. 1 FDR (SF2235).*

Basin M (Q_5 = 2 cfs, Q_{100} = 4 cfs) represents developed flows from the north half of the proposed Appleton Dr. public roadway. These developed flows travel as curb and gutter flows in a southeasterly direction towards an off-site temporary sediment basin. These flows will ultimately be treated in a future downstream SWQ facility.

DETENTION / STORMWATER QUALITY FACILITES

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 Pond FSD-16 and temporary sediment basins (All owned and maintained by Sterling Ranch Metro District). All of these permanent BMPs will have final design data provided with the future FDR. 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 the public Right-of-Way will be owned and maintained by El Paso County.

There are two scenarios planned for in this report:

Interim Condition: Assumes development of Sterling Ranch East Filing No. 2, Foursquare at Sterling Ranch Filing No. 1 and the proposed Sterling Ranch East Filing No. 6 only.

POND FSD-16 TRIBUTARY BASINS (Interim)

TRIBUTARY BASIN	BASIN AREA (AC)	WEIGHTED % IMPERVIOUS
A1	5.70	47.7%
A2	3.60	52.5%
A3	1.50	52.5%
B	4.60	52.5%
C	1.60	52.5%
D	8.70	48.5%
E	2.60	52.5%
F	2.00	52.5%
G	2.80	46.0%
H	2.20	52.5%
I	2.70	52.5%
J	4.20	52.5%
L	2.60	42.3%
N	0.30	20.0%
O	6.20	7.0%
OS-1	2.00	66.8%
OS-2	2.00	76.3%
P INT	25.80	3.3%
Ref Sterling Ranch East Fil. 2 & Foursquare approved FDR	34.16	57.5%
TOTAL	115.26	40.2%
POND FSD-16 (Interim) EFF. IMPERVIOUS %		40.2%

Ultimate Condition: Assumes full build-out of all surrounding residential land use tributary to Pond FSD-16.

POND FSD-16 TRIBUTARY BASINS (Ultimate)

TRIBUTARY BASIN	BASIN AREA (AC)	WEIGHTED % IMPERVIOUS
A1	5.70	47.7%
A2	3.60	52.5%
A3	1.50	52.5%
B	4.60	52.5%
C	1.60	52.5%
D	9.70	48.5%
E	2.60	52.5%
F	2.00	52.5%
G	2.80	48.0%
H	2.20	52.5%
I	2.70	52.5%
J	4.20	52.5%
L	2.60	42.3%
N	0.30	20.0%
O	6.20	7.0%
F4-1	7.80	52.5%
F4-2	2.30	52.5%
F4-3	9.80	35.3%
F4-4	1.70	52.5%
F4-5	6.90	52.5%
F4-6	13.30	52.5%
F4-7	7.80	52.5%
OS-1	2.00	66.8%
OS-2	2.00	76.3%
P1-F1	60.60	52.5%
P1-F2	11.50	42.8%
Sterling Ranch East Fil. 2 & Foursquare per approved FDR	34.16	57.5%
TOTAL	211.16	50.4%
POND FSD-16 (Ultimate) EFF. IMPERVIOUS %		**50.4%**

This condition compares to the approved *Sterling Ranch MDDP Amendment No. 2 and PDR for Sterling Ranch East Preliminary Plan No.1 (SP224)* that presented and ultimate condition as follows: 220.9 ac. with 46.0% Imp.

The following represents the proposed **Pond FSD-16 design** incorporating the grading revisions within the pond and the removal of the play field area as presented in the original design:
(See MHFD-Detention Design Sheets in Appendix)

Interim Condition:

Total Tributary acreage: 115.26 Ac.

1.732 Ac.-ft. WQCV required

3.254 Ac.-ft. EURV required

3.703 Ac.-ft. 100-yr. Storage

8.690 Ac.-ft. Total

Total In-flow: **Q_5 = 62 cfs, Q_{100} = 189 cfs**

Pond Design Release: **Q_5 = 1.7 cfs, Q_{100} = 3.3 cfs**

(Ownership and maintenance by the Sterling Ranch Metro District)

Ultimate Condition:

Total Tributary acreage: 211.16 Ac.

3.649 Ac.-ft. WQCV required

8.421 Ac.-ft. EURV required

7.526 Ac.-ft. 100-yr. Storage

19.596 Ac.-ft. Total

Total In-flow: **Q_5 = 206 cfs, Q_{100} = 513 cfs**

Pond Design Release: **Q_5 = 4.0 cfs, Q_{100} = 119.1 cfs**

(Ownership and maintenance by the Sterling Ranch Metro District)

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 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. Final Drainage Report will provide further detail on basins that will be providing Runoff Reduction.

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. Final Drainage Report will provide further detail on basins that will be providing Runoff Reduction.

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 any area that is not able to be captured and routed to a permanent EDB, Runoff Reduction practices are required and will be provided in the rear setbacks of the lots or within the open space tract within these specific basins. Final Drainage Report will provide further detail on basins that will be providing Runoff Reduction.

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

No portion of this site is located within a floodplain as determined by the Flood Insurance Rate Maps (F.I.R.M.) Map Number 08041C0533G and 08041C535G with effective date of December 7, 2018 (See Appendix).

DRAINAGE AND BRIDGE FEES

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

There is no final platting proposed at this time. These fees using the impervious acreage method approved by El Paso County will be defined in the future Final Drainage Report.

SUMMARY

The proposed Sterling Ranch East Filing No. 6 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/118360/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. "2018 Sterling Ranch MDDP", M&S Civil Consultants, Inc., June 2018

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

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

8. "Sterling Ranch MDDP Amendment No. 2 & Preliminary Drainage Report for Sterling Ranch East Preliminary Plan No. 1", Classic Consulting, approved January, 2023.

9. "Final Drainage Report for Sterling Ranch East Filing No. 2 and Foursquare at Sterling Ranch East Filing No. 1", Classic Consulting, dated August, 2024.

APPENDIX

VICINITY MAP

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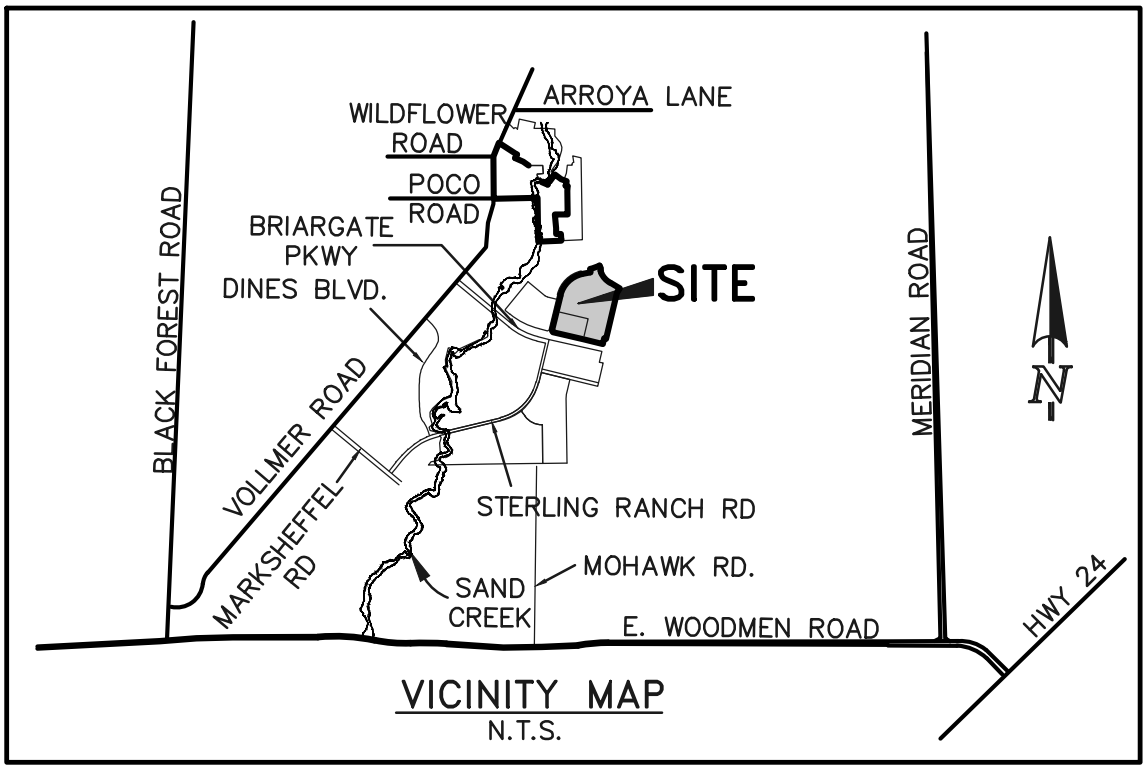
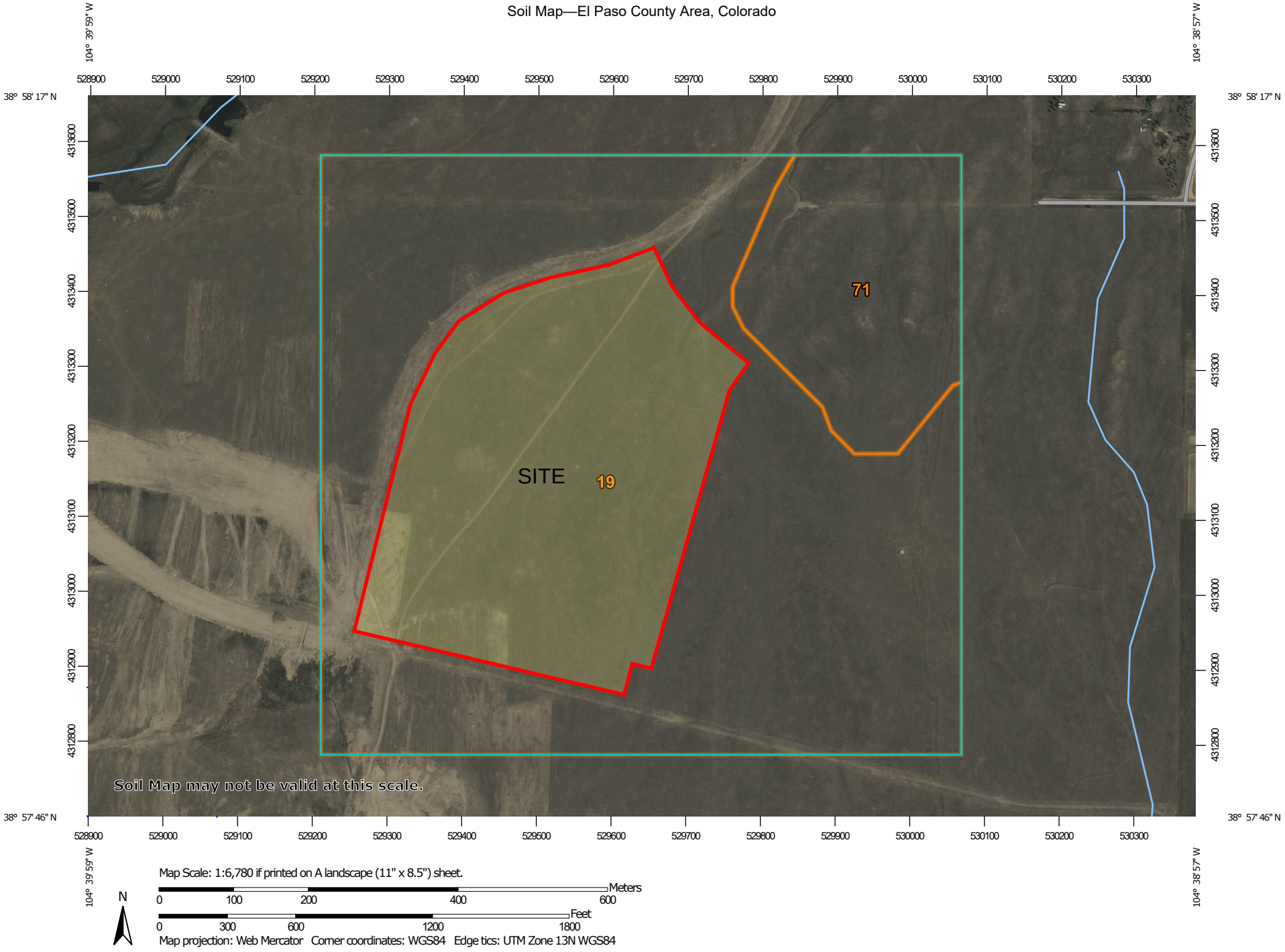


VICINITY MAP

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 21, Aug 24, 2023

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

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

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
19	Columbine gravelly sandy loam, 0 to 3 percent slopes	146.7	86.2%
71	Pring coarse sandy loam, 3 to 8 percent slopes	23.5	13.8%
Totals for Area of Interest		**170.2**	**100.0%**

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: Flood plains, fan terraces, fans
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 21, Aug 24, 2023

El Paso County Area, Colorado

71—Pring coarse sandy loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 369k
Elevation: 6,800 to 7,600 feet
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Pring

Setting

Landform: Hills
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Arkosic alluvium derived from sedimentary rock

Typical profile

A - 0 to 14 inches: coarse sandy loam
C - 14 to 60 inches: gravelly sandy loam

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 6.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B
Ecological site: R048AY222CO - Loamy Park
Hydric soil rating: No

Minor Components

Pleasant

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

Other soils

Percent of map unit:
Hydric soil rating: No

Data Source Information

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 21, Aug 24, 2023

F.E.M.A. MAP

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/.

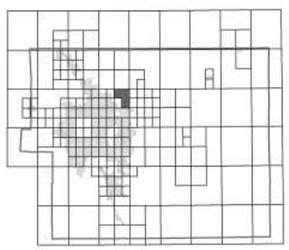
If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call **1-877-FEMA MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/business/nfip.

El Paso County Vertical Datum Offset Table

Flooding Source	Vertical Datum Offset (ft)

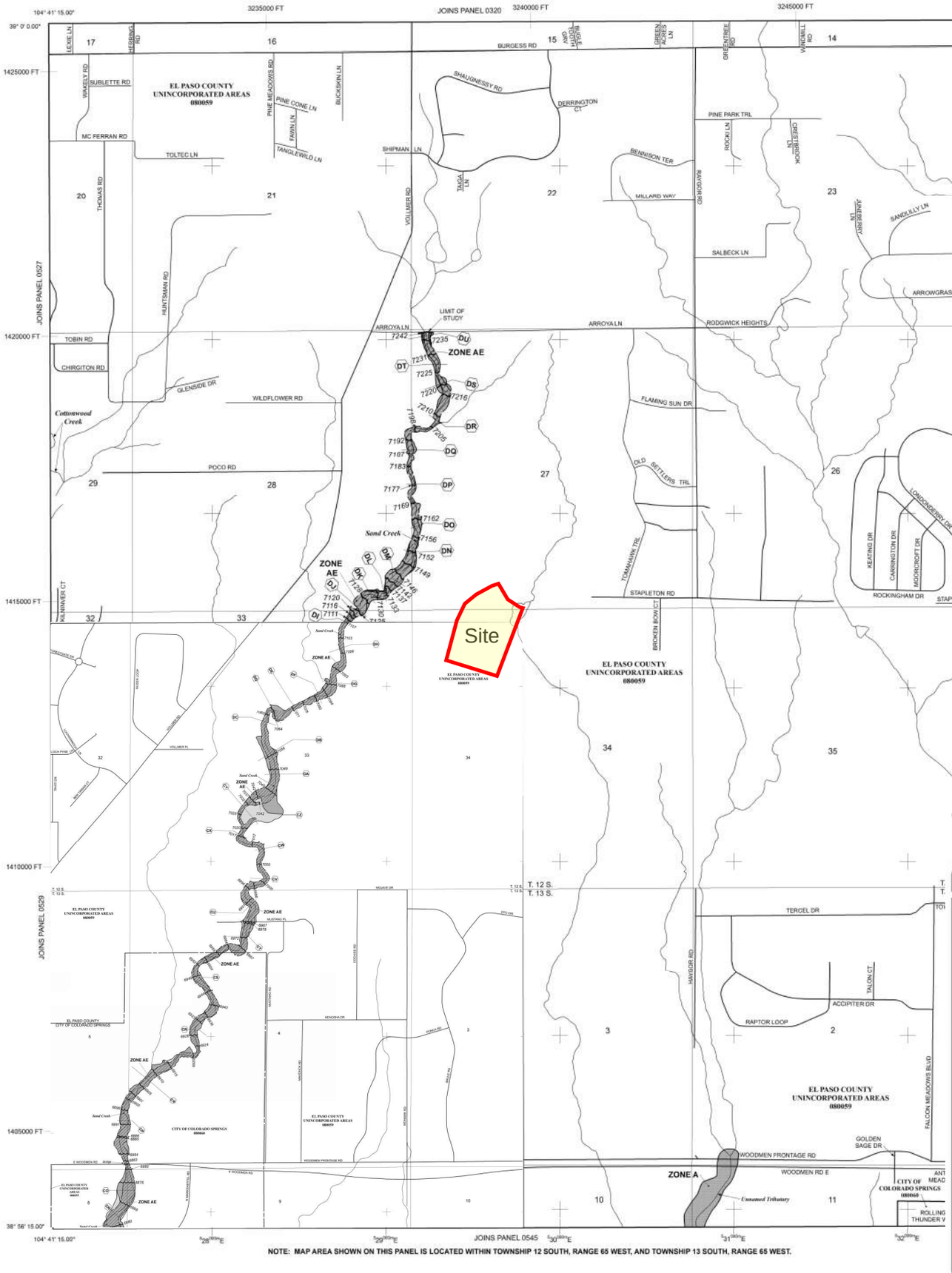
REFER TO SECTION 3.3 OF THE EL PASO COUNTY FLOOD INSURANCE STUDY FOR STREAM BY STREAM VERTICAL DATUM CONVERSION INFORMATION

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.



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)
- 4375000 FT — 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" = 1000'
500 0 1000 2000 FEET
300 0 300 600 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

NFIP
NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0535G

FIRM
FLOOD INSURANCE RATE MAP
EL PASO COUNTY, COLORADO AND INCORPORATED AREAS

PANEL 535 OF 1300

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
COLORADO SPRINGS, CITY OF	080060	0535	G
EL PASO COUNTY	080059	0535	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 08041C0535G

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

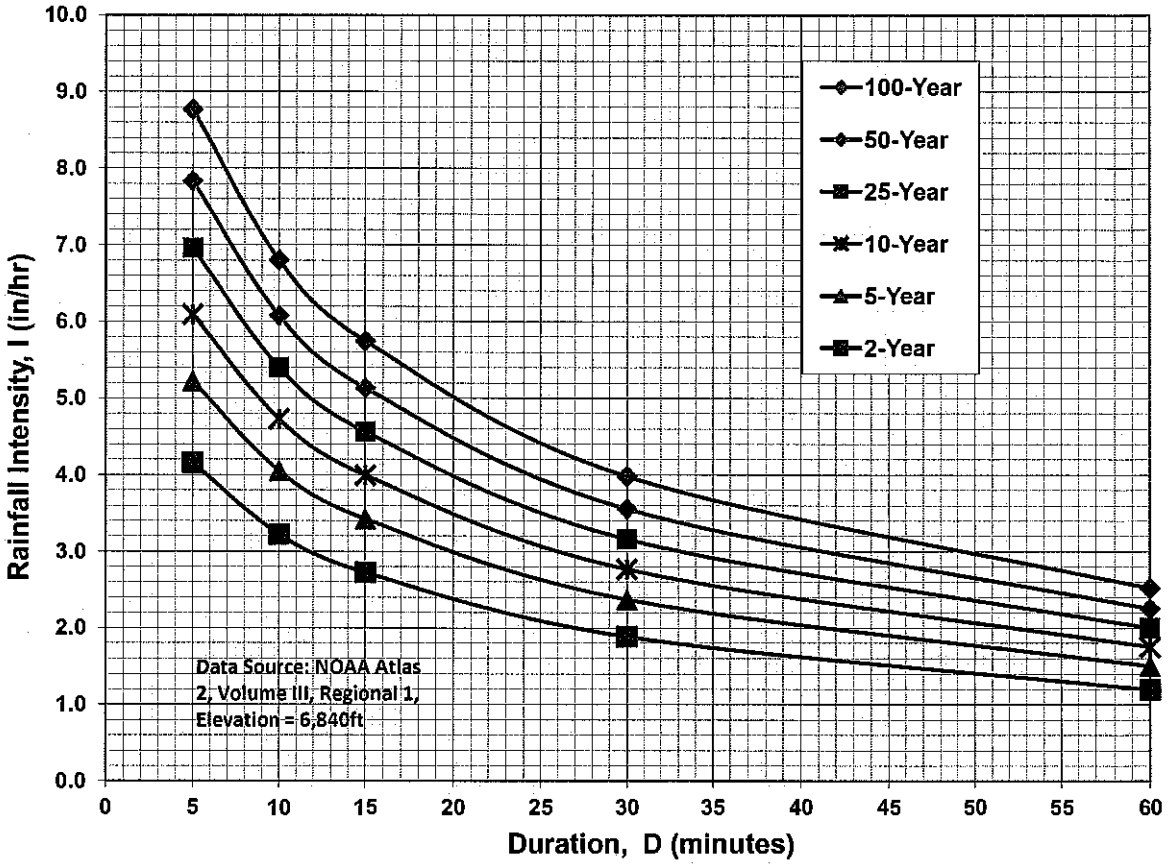
One of the basic assumptions underlying the Rational Method is that runoff is a function of the average rainfall rate during the time required for water to flow from the hydraulically most remote part of the drainage area under consideration to the design point. However, in practice, the time of concentration 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. 6 - PRELIM. PLAN*
JOB NUMBER: *1183.60*
DATE: *10/01/24*
CALCULATED BY: *MAW*

PRELIMINARY 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
A1	5.70	RES 1/6 AC.	52.5%	5.10	0.32	0.38	0.55	OPEN SPACE	7.0%	0.60	0.05	0.12	0.39	0.29	0.35	0.53	1.66	1.98	3.01	47.7%
A2	3.60	RES 1/6 AC.	52.5%	3.60	0.32	0.38	0.55			0.00	0.02	0.08	0.35	0.32	0.38	0.55	1.15	1.35	1.96	52.5%
A3	1.50	RES 1/6 AC.	52.5%	1.50	0.32	0.38	0.55			0.00	0.89	0.90	0.96	0.32	0.38	0.55	0.48	0.56	0.82	52.5%
B	4.60	RES 1/6 AC.	52.5%	4.60	0.32	0.38	0.55			0.00	0.02	0.08	0.35	0.32	0.38	0.55	1.47	1.73	2.51	52.5%
C	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%
D	8.70	RES 1/6 AC.	52.5%	7.93	0.32	0.38	0.55	POCKET PARK	7.0%	0.77	0.05	0.12	0.39	0.30	0.35	0.53	2.58	3.07	4.62	48.5%
E	2.60	RES 1/6 AC.	52.5%	2.60	0.32	0.38	0.55			0.00	0.02	0.08	0.35	0.32	0.38	0.55	0.83	0.98	1.42	52.5%
F	2.00	RES 1/6 AC.	52.5%	2.00	0.32	0.38	0.55			0.00	0.89	0.90	0.96	0.32	0.38	0.55	0.64	0.75	1.09	52.5%
G	2.80	RES 1/5 AC.	46.0%	2.80	0.28	0.34	0.52			0.00	0.02	0.08	0.35	0.28	0.34	0.52	0.78	0.95	1.46	46.0%
H	2.20	RES 1/6 AC.	52.5%	2.20	0.32	0.38	0.55			0.00	0.89	0.90	0.96	0.32	0.38	0.55	0.70	0.83	1.20	52.5%
I	2.70	RES 1/6 AC.	52.5%	2.70	0.32	0.38	0.55			0.00	0.02	0.08	0.35	0.32	0.38	0.55	0.86	1.01	1.47	52.5%
J	4.20	RES 1/6 AC.	52.5%	4.20	0.32	0.38	0.55			0.00	0.89	0.90	0.96	0.32	0.38	0.55	1.34	1.58	2.29	52.5%
K	1.70	RES 1/6 AC.	52.5%	1.37	0.32	0.38	0.55	OPEN SPACE		0.33	0.05	0.12	0.39	0.27	0.33	0.51	0.45	0.55	0.88	42.3%
L	2.60	RES 1/5 AC.	46.0%	2.35	0.28	0.34	0.52	OPEN SPACE	7.0%	0.25	0.05	0.12	0.39	0.26	0.32	0.51	0.67	0.83	1.32	42.3%
M	0.62	RES 1/5 AC.	46.0%	0.12	0.28	0.34	0.52	STREET	100.0%	0.50	0.89	0.90	0.96	0.77	0.79	0.87	0.48	0.49	0.54	89.5%
N	0.30	RES 1/5 AC.	46.0%	0.10	0.28	0.34	0.52	OPEN SPACE	7.0%	0.20	0.05	0.12	0.39	0.13	0.19	0.43	0.04	0.06	0.13	20.0%
O	6.20	RES 1/5 AC.	46.0%	0.00	0.28	0.34	0.52	POND TRACT	7.0%	6.20	0.05	0.12	0.39	0.05	0.12	0.39	0.31	0.74	2.42	7.0%
F4-1	7.80	RES 1/6 AC.	52.5%	7.80	0.32	0.38	0.55			0.00	0.02	0.08	0.35	0.32	0.38	0.55	2.50	2.93	4.25	52.5%
F4-2	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%
F4-3	9.80	RES 1/6 AC.	52.5%	6.10	0.32	0.38	0.55	OPEN SPACE	7.0%	3.70	0.05	0.12	0.39	0.22	0.28	0.49	2.14	2.73	4.77	35.3%
F4-4	1.70	RES 1/6 AC.	52.5%	1.70	0.32	0.38	0.55			0.00	0.89	0.90	0.96	0.32	0.38	0.55	0.54	0.64	0.93	52.5%
F4-5	6.90	RES 1/6 AC.	52.5%	6.90	0.32	0.38	0.55			0.00	0.02	0.08	0.35	0.32	0.38	0.55	2.21	2.59	3.76	52.5%
F4-6	13.30	RES 1/6 AC.	52.5%	13.30	0.32	0.38	0.55			0.00	0.89	0.90	0.96	0.32	0.38	0.55	4.26	4.99	7.25	52.5%
F4-7	7.80	RES 1/6 AC.	52.5%	7.80	0.32	0.38	0.55			0.00	0.02	0.08	0.35	0.32	0.38	0.55	2.50	2.93	4.25	52.5%
OS-1	2.00	RES 1/6 AC.	52.5%	1.40	0.32	0.38	0.55	STREET	100.0%	0.60	0.89	0.90	0.96	0.49	0.54	0.67	0.98	1.07	1.35	66.8%
OS-2	2.00	RES 1/6 AC.	52.5%	1.00	0.32	0.38	0.55	STREET	100.0%	1.00	0.89	0.90	0.96	0.61	0.64	0.76	1.21	1.28	1.51	76.3%
OS-3	3.50	RES 1/5 AC.	46.0%	3.50	0.28	0.34	0.52			0.00	0.57	0.59	0.70	0.28	0.34	0.52	0.98	1.19	1.80	46.0%
P1-F1	60.60	RES 1/6 AC.	52.5%	60.60	0.32	0.38	0.55			0.00	0.57	0.59	0.70	0.32	0.38	0.55	19.39	22.73	33.03	52.5%
P1-F2	11.50	RES 1/6 AC.	52.5%	9.00	0.32	0.38	0.55	OPEN SPACE	7.0%	2.50	0.05	0.12	0.39	0.26	0.32	0.51	3.01	3.68	5.88	42.6%
P INT	25.80	UNDEVELOPED	0.0%	24.95	0.02	0.08	0.35	STREET	100.0%	0.85	0.89	0.90	0.96	0.05	0.11	0.37	1.26	2.76	9.55	3.3%
TOTAL AREA TRIBUTARY TO POND FSD-16	**212.70**	**51.4%**																		
Tributary Area to NWesterly Outfall	**134.40**	**51.6%**																		
Tributary Area to Easterly Outfall	**33.50**	**51.1%**																		
***Tributary Area to SWesterly Outfall**	**35.70**	**58.4%**																		
Basins tributary to Pond FSD-14A	**1.70**	**42.3%**																		
Basin tributary to future SWQ pond	**0.62**	**89.5%**																		

***** REFERENCE FDR FOR SRE2 & FOURSQUARE AT STERLING RANCH EAST FILING NO. 1

JOB NAME: ***STERLING RANCH EAST FILING NO. 6 - PRELIM. PLAN***
JOB NUMBER: ***1183.60***
DATE: ***10/01/24***
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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.

PRELIMINARY 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)
A1	1.66	1.98	3.01	0.12	100	2	14.1	775	2.5%	3.2	4.1	18.2	2.58	3.23	5.43	4	**6**	**16**
A2	1.15	1.35	1.96	0.12	100	2	14.1	900	1.5%	2.4	6.1	20.2	2.46	3.07	5.16	3	**4**	**10**
A3	0.48	0.56	0.82	0.12	50	1	10.0	650	1.5%	2.4	4.4	14.4	2.86	3.58	6.02	1	**2**	**5**
B	1.47	1.73	2.51	0.12	100	2	14.1	650	1.5%	2.4	4.4	18.5	2.56	3.21	5.38	4	**6**	**13**
C	0.51	0.60	0.87	0.12	100	2	14.1	380	2.0%	2.8	2.2	16.3	2.71	3.39	5.70	1	**2**	**5**
D	2.58	3.07	4.62	0.12	100	2	14.1	640	4.0%	4.0	2.7	16.7	2.68	3.36	5.63	7	**10**	**26**
E	0.83	0.98	1.42	0.12	100	2	14.1	240	1.5%	2.4	1.6	15.7	2.76	3.45	5.79	2	**3**	**8**
F	0.64	0.75	1.09	0.12	100	2	14.1	210	1.5%	2.4	1.4	15.5	2.77	3.47	5.83	2	**3**	**6**
G	0.78	0.95	1.46	0.12	100	2	14.1	230	1.5%	2.4	1.6	15.6	2.76	3.46	5.81	2	**3**	**8**
H	0.70	0.83	1.20	0.12	100	2	14.1	175	1.5%	2.4	1.2	15.3	2.79	3.49	5.87	2	**3**	**7**
I	0.86	1.01	1.47	0.12	100	2	14.1	665	3.5%	3.7	3.0	17.0	2.66	3.33	5.59	2	**3**	**8**
J	1.34	1.58	2.29	0.12	100	2	14.1	675	3.0%	3.5	3.2	17.3	2.64	3.30	5.55	4	**5**	**13**
K	0.45	0.55	0.88	0.12	80	3	10.2					10.2	3.27	4.09	6.87	1	**2**	**6**
L	0.67	0.83	1.32	0.12	90	3	11.3					11.3	3.15	3.95	6.63	2	**3**	**9**

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JOB NUMBER: ***1183.60***
DATE: ***10/01/24***
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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.

PRELIMINARY 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)
M	0.48	0.49	0.54	0.12	10	0.2	4.5	650	3.5%	3.7	2.9	7.3	3.66	4.59	7.71	2	**2**	**4**
N	0.04	0.06	0.13	0.12	70	2	10.5					10.5	3.24	4.06	6.82	0.1	**0.2**	**0.9**
O	0.31	0.74	2.42	0.12	100	2	14.1	300	1.0%	2.0	2.5	16.6	2.69	3.37	5.66	0.8	**3**	**14**
F4-1	2.50	2.93	4.25	0.12	100	2	14.1	670	2.5%	3.2	3.5	17.6	2.62	3.28	5.51	7	**10**	**23**
F4-2	0.74	0.86	1.25	0.12	100	2	14.1	350	2.5%	3.2	1.8	15.9	2.74	3.43	5.76	2	**3**	**7**
F4-3	2.14	2.73	4.77	0.12	100	2	14.1	730	2.5%	3.2	3.8	17.9	2.60	3.25	5.46	6	**9**	**26**
F4-4	0.54	0.64	0.93	0.12	50	1	10.0	770	2.5%	3.2	4.1	14.0	2.89	3.62	6.08	2	**2**	**6**
F4-5	2.21	2.59	3.76	0.12	100	2	14.1	2100	2.5%	3.2	11.1	25.1	2.20	2.75	4.61	5	**7**	**17**
F4-6	4.26	4.99	7.25	0.12	100	2	14.1	870	2.0%	2.8	5.1	19.2	2.52	3.15	5.29	11	**16**	**38**
F4-7	2.50	2.93	4.25	0.12	100	2	14.1	1070	2.7%	3.3	5.4	19.5	2.50	3.13	5.25	6	**9**	**22**
OS-1	0.98	1.07	1.35	0.12	80	5	8.6	900	3.5%	3.7	4.0	12.7	3.01	3.78	6.34	3	**4**	**9**
OS-2	1.21	1.28	1.51	0.12	80	3	10.2	900	3.5%	3.7	4.0	14.2	2.87	3.60	6.04	3	**5**	**9**
OS-3	0.98	1.19	1.80	0.12	75	2	11.1	700	1.5%	2.4	4.8	15.8	2.75	3.44	5.77	2.7	**4**	**10**

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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)*	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.

PRELIMINARY 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)
P1-F1	19.39	22.73	33.03	0.12	100	2	14.1	2000	1.5%	2.4	13.6	27.7	2.08	2.60	4.37	40	**59**	**144**
P1-F2	3.01	3.68	5.88	0.12	100	2	14.1	850	2.5%	3.2	4.5	18.6	2.56	3.20	5.37	8	**12**	**32**
P INT	1.26	2.76	9.55	0.12	300	8	22.2	100	1.5%	2.4	0.7	22.9	2.31	2.89	4.85	3	**8**	**46**

JOB NAME: *STERLING RANCH EAST FILING NO. 6 - PRELIM. PLAN*
JOB NUMBER: *1183.60*
DATE: *10/01/24*
CALCULATED BY: *MAW*

*ALL STORM SEWER TO BE PRIVATE UNLESS OTHERWISE NOTED

PRELIMINARY 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)	
1	A1, A2, A3	3.90	5.79	20.2	3.07	5.16	12	30	Prop. Type R Sump Inlets
2	B	1.73	2.51	18.5	3.21	5.38	6	13	Prop. Type R Sump Inlets
3	C	0.60	0.87	16.3	3.39	5.70	2	5	Prop. Type R At - Grade Inlet
4	D	3.07	4.62	16.7	3.36	5.63	10	26	Prop. Type R Sump Inlets
5	E	0.98	1.42	15.7	3.45	5.79	3	8	Prop. Type R Sump Inlets
6	F	0.75	1.09	15.5	3.47	5.83	3	6	Prop. Type R Sump Inlets
7	G	0.95	1.46	15.6	3.46	5.81	3	8	Prop. Type R Sump Inlets
8	H	0.83	1.20	15.3	3.49	5.87	3	7	Prop. Type R Sump Inlets
9	I, 100-yr Flow-by from DP-3	1.01	1.65	17.0	3.33	5.59	3	9	Prop. Type R At - Grade Inlet
10	J	1.58	2.29	17.3	3.30	5.55	5	13	Prop. Type R Sump Inlets
11	**POND FSD-16 INFLOW (EASTERLY FOREBAY)**	**15.38**	**22.89**	**23.2**	**2.87**	**4.81**	**44**	**110**	**Prop. Concrete Forebay**
12	P1-F2	3.68	5.88	18.6	3.20	5.37	12	32	Prop. Type R Sump Inlets
13	F4-1	2.93	4.25	17.6	3.28	5.51	10	23	Prop. Type R Sump Inlets
14	F4-2	0.86	1.25	15.9	3.43	5.76	3	7	Prop. Type R Sump Inlet

JOB NAME: *STERLING RANCH EAST FILING NO. 6 - PRELIM. PLAN*
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DATE: *10/01/24*
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*ALL STORM SEWER TO BE PRIVATE UNLESS OTHERWISE NOTED

PRELIMINARY 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	F4-3	2.73	4.77	17.9	3.25	5.46	9	26	Prop. Type R Sump Inlets
16	F4-4	0.64	0.93	14.0	3.62	6.08	2	6	Prop. Type R Sump Inlets
17	F4-5	2.59	3.76	25.1	2.75	4.61	7	17	Prop. Type R Sump Inlets
18	F4-6	4.99	7.25	19.2	3.15	5.29	16	38	Prop. Type R Sump Inlets
19	F4-7	2.93	4.25	19.5	3.13	5.25	9	22	Prop. Type R Sump Inlets
20	OS-3	1.19	1.80	15.8	3.44	5.77	4	10	Prop. 10' At-Grade Type R Inlet
21	OS-1	1.07	1.35	12.7	3.78	6.34	4	9	Prop. Type R At - Grade Inlet
22	OS-2	1.28	1.51	14.2	3.60	6.04	5	9	Prop. Type R At - Grade Inlet
23	**POND FSD-16 INFLOW (NWESTERLY FOREBAY)**	**46.41**	**68.22**	**26.1**	**2.69**	**4.51**	**125**	**308**	**Prop. Concrete Forebay and Impact Stucture**
24	**POND FSD-16 INFLOW (SWESTERLY FOREBAY) Taken from Foursquare FDR**	**14.97**	**21.26**	**15.4**	**3.48**	**5.84**	**52**	**124**	**Prop. Concrete Forebay**
	POND FSD-16 TOTALINFLOW	**78.33**	**116.11**	**27.1**	**2.63**	**4.42**	**206**	**513**	**Prop. Concrete Forebay**

JOB NAME:	***STERLING RANCH EAST FILING NO. 6 - PRELIM. PLAN***
JOB NUMBER:	***1183.60***
DATE:	***10/01/24***
CALCULATED BY:	***MAW***

POND FSD-16 TRIBUTARY BASINS (Interim)

TRIBUTARY BASIN	BASIN AREA (AC)	WEIGHTED % IMPERVIOUS
A1	5.70	47.7%
A2	3.60	52.5%
A3	1.50	52.5%
B	4.60	52.5%
C	1.60	52.5%
D	8.70	48.5%
E	2.60	52.5%
F	2.00	52.5%
G	2.80	46.0%
H	2.20	52.5%
I	2.70	52.5%
J	4.20	52.5%
L	2.60	42.3%
N	0.30	20.0%
O	6.20	7.0%
OS-1	2.00	66.8%
OS-2	2.00	76.3%
P INT	25.80	3.3%
Ref: Sterling Ranch East Fil. 2 & Foursquare approved FDR	34.16	57.5%
TOTAL	115.26	**40.2%**

POND FSD-16 (Interim) EFF. IMPERVIOUS % **40.2%**

JOB NAME:	***STERLING RANCH EAST FILING NO. 6 - PRELIM. PLAN***
JOB NUMBER:	***1183.60***
DATE:	***10/01/24***
CALCULATED BY:	***MAW***

POND FSD-16 TRIBUTARY BASINS (Ultimate)

TRIBUTARY BASIN	BASIN AREA (AC)	WEIGHTED % IMPERVIOUS
A1	5.70	47.7%
A2	3.60	52.5%
A3	1.50	52.5%
B	4.60	52.5%
C	1.60	52.5%
D	8.70	48.5%
E	2.60	52.5%
F	2.00	52.5%
G	2.80	46.0%
H	2.20	52.5%
I	2.70	52.5%
J	4.20	52.5%
L	2.60	42.3%
N	0.30	20.0%
O	6.20	7.0%
F4-1	7.80	52.5%
F4-2	2.30	52.5%
F4-3	9.80	35.3%
F4-4	1.70	52.5%
F4-5	6.90	52.5%
F4-6	13.30	52.5%
F4-7	7.80	52.5%
OS-1	2.00	66.8%
OS-2	2.00	76.3%
P1-F1	60.60	52.5%
P1-F2	11.50	42.6%
Sterling Ranch East Fil. 2 & Foursquare per approved FDR	34.16	57.5%
TOTAL	211.16	**50.4%**

POND FSD-16 (Ultimate) EFF. IMPERVIOUS % **50.4%**

STORMWATER QUALITY CALCULATIONS

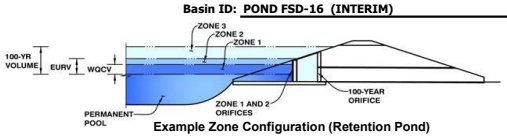
CLASSIC SM
CONSULTING
ENGINEERS & SURVEYORS

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: **STERLING RANCH EAST FILING NO. 6 - PRELIMINARY PLAN**

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



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	**EDB**	
Watershed Area =	115.26	acres
Watershed Length =	4,000	ft
Watershed Length to Centroid =	2,000	ft
Watershed Slope =	0.025	ft/ft
Watershed Imperviousness =	40.20%	percent
Percentage Hydrologic Soil Group A =	75.0%	percent
Percentage Hydrologic Soil Group B =	25.0%	percent
Percentage Hydrologic Soil Groups C/D =	0.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

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

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	1.732	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	4.986	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	3.996	acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	5.337	acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	6.736	acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	9.412	acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	11.477	acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	14.381	acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 3 in.) =	18.904	acre-feet	3.00	inches
Approximate 2-yr Detention Volume =	3.298	acre-feet		
Approximate 5-yr Detention Volume =	4.431	acre-feet		
Approximate 10-yr Detention Volume =	5.642	acre-feet		
Approximate 25-yr Detention Volume =	6.786	acre-feet		
Approximate 50-yr Detention Volume =	7.516	acre-feet		
Approximate 100-yr Detention Volume =	8.690	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	1.732	acre-feet
Zone 2 Volume (EURV - Zone 1) =	3.254	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	3.703	acre-feet
Total Detention Basin Volume =	8.690	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	

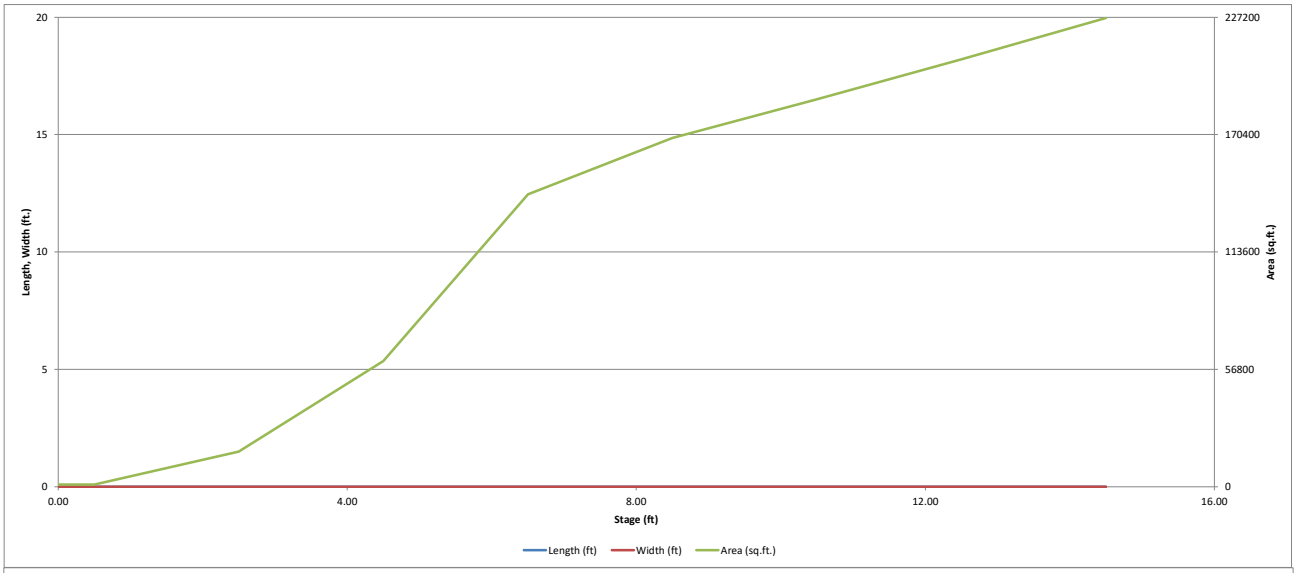
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	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

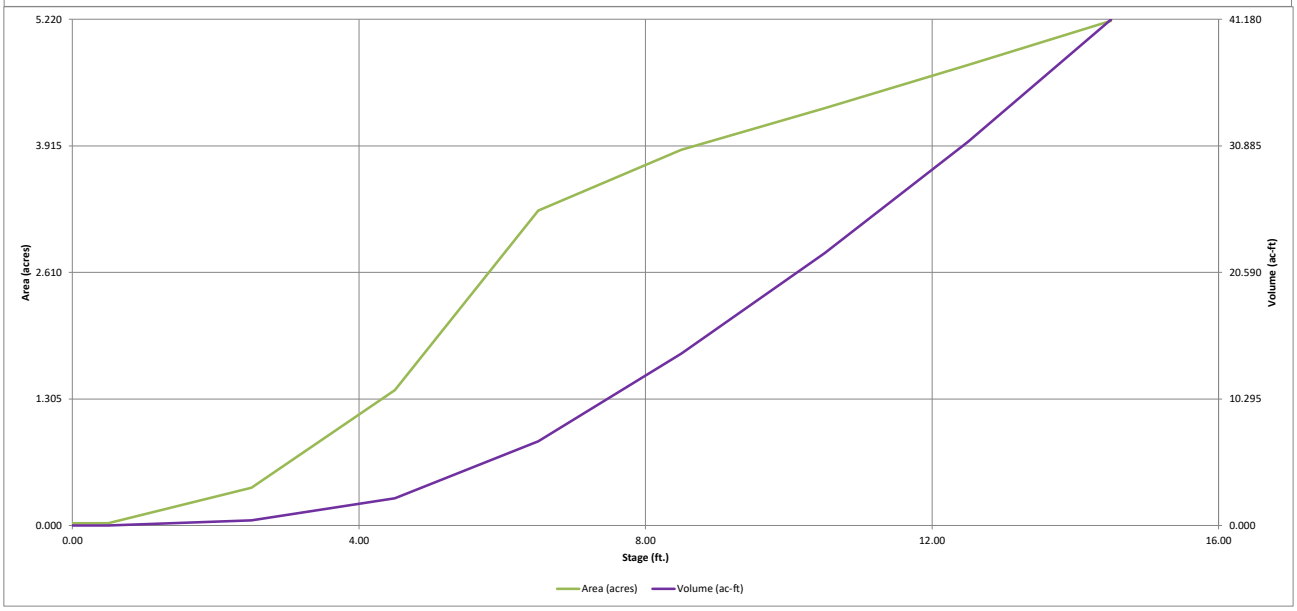
Depth Increment = ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	1,027	0.024		
7092	--	0.50	--	--	--	1,027	0.024	514	0.012
7094	--	2.50	--	--	--	17,010	0.390	18,550	0.426
7096	--	4.50	--	--	--	60,913	1.398	96,473	2.215
7098	--	6.50	--	--	--	141,508	3.249	298,894	6.862
7100	--	8.50	--	--	--	168,799	3.875	609,201	13.985
7102	--	10.50	--	--	--	187,503	4.304	965,503	22.165
7104	--	12.50	--	--	--	206,914	4.750	1,359,920	31.219
7106	--	14.50	--	--	--	226,802	5.207	1,793,636	41.176

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)



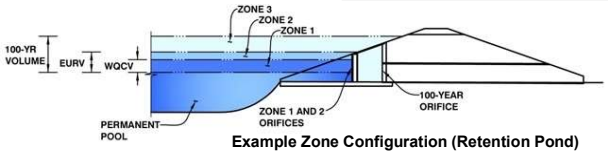


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: STERLING RANCH EAST FILING NO. 6 - PRELIMINARY PLAN

Basin ID: POND FSD-16 (INTERIM)



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	4.14	1.732	Orifice Plate
Zone 2 (EURV)	5.87	3.254	Orifice Plate
Zone 3 (100-year)	7.05	3.703	Weir&Pipe (Restrict)
Total (all zones)		8.690	

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

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

Calculated Parameters for Underdrain

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

Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	N/A	ft^2
Depth at top of Zone using Orifice Plate =	8.50	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	20.40	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	N/A	sq. inches	Elliptical Slot Area =	N/A	ft^2

Calculated Parameters for Plate

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.70	3.40	5.10	6.80			
Orifice Area (sq. inches)	5.00	5.00	10.00	16.00	16.00			

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

Calculated Parameters for Vertical Orifice

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			Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	8.50	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	8.50	N/A	feet
Overflow Weir Front Edge Length =	20.00	N/A	feet	Overflow Weir Slope Length =	4.00	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	4.43	N/A	
Horiz. Length of Weir Sides =	4.00	N/A	feet	Overflow Grate Open Area w/o Debris =	55.68	N/A	ft^2
Overflow Grate Type =	Type C Grate	N/A		Overflow Grate Open Area w/ Debris =	27.84	N/A	ft^2
Debris Clogging % =	50%	N/A	%				

Calculated Parameters for Overflow Weir

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

	Zone 3 Restrictor	Not Selected			Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	2.50	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	12.57	N/A	ft^2
Outlet Pipe Diameter =	48.00	N/A	inches	Outlet Orifice Centroid =	2.00	N/A	feet
Restrictor Plate Height Above Pipe Invert =	48.00		inches	Half-Central Angle of Restrictor Plate on Pipe =	3.14	N/A	radians

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	12.50	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	1.00	feet
Spillway Crest Length =	170.00	feet	Stage at Top of Freeboard =	14.50	feet
Spillway End Slopes =	6.00	H:V	Basin Area at Top of Freeboard =	5.21	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	41.18	acre-ft

Calculated Parameters for Spillway

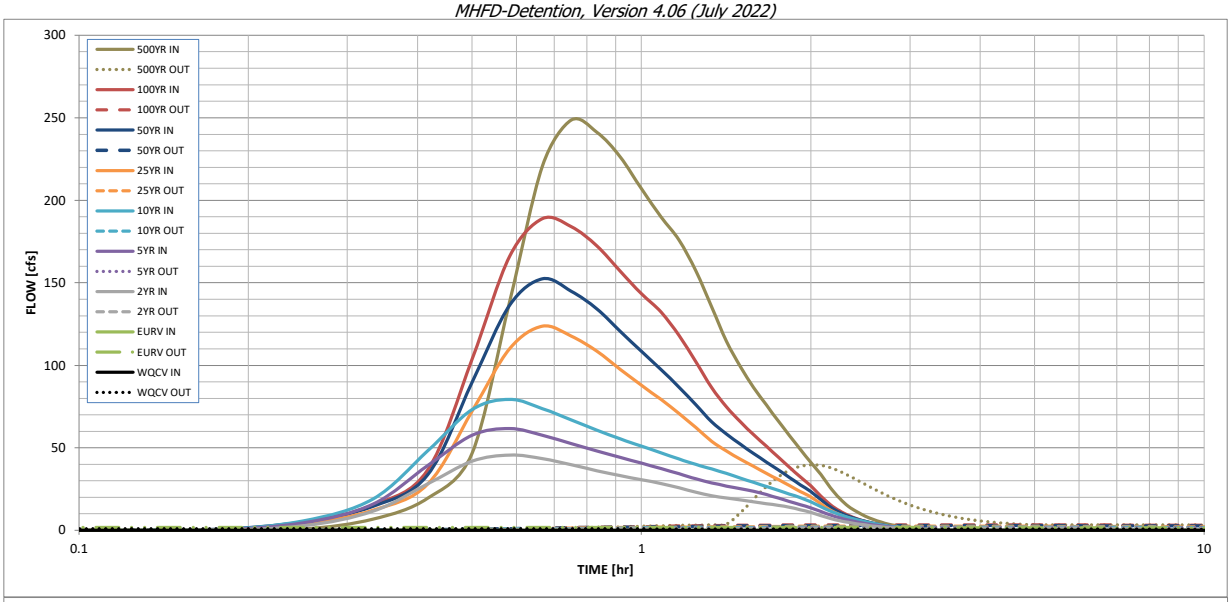
Routed Hydrograph Results

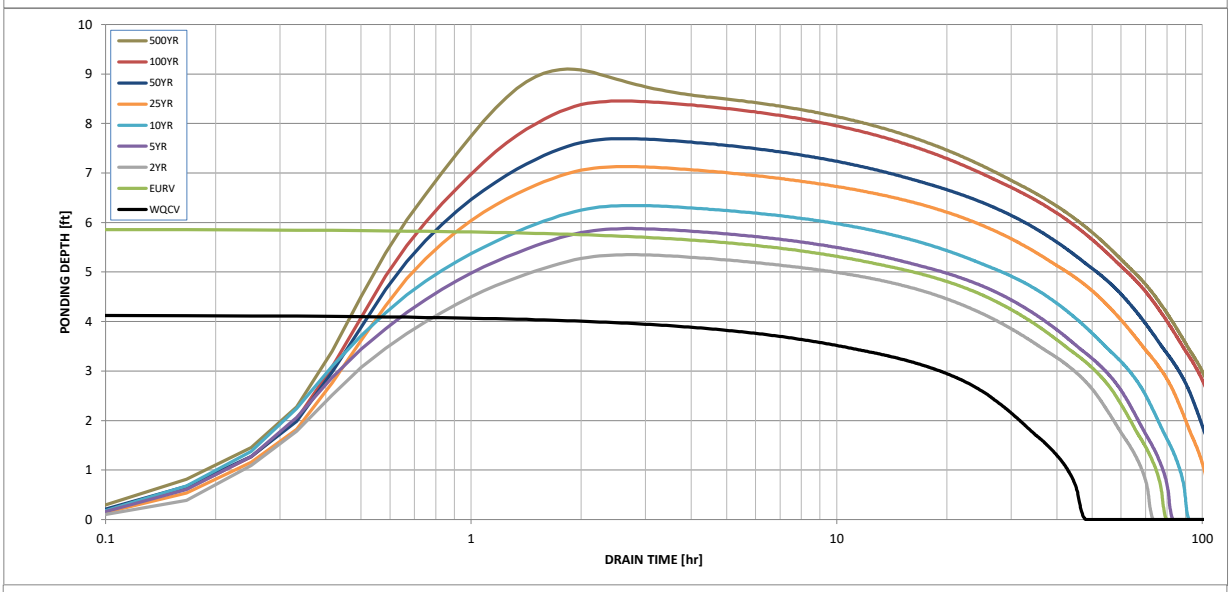
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

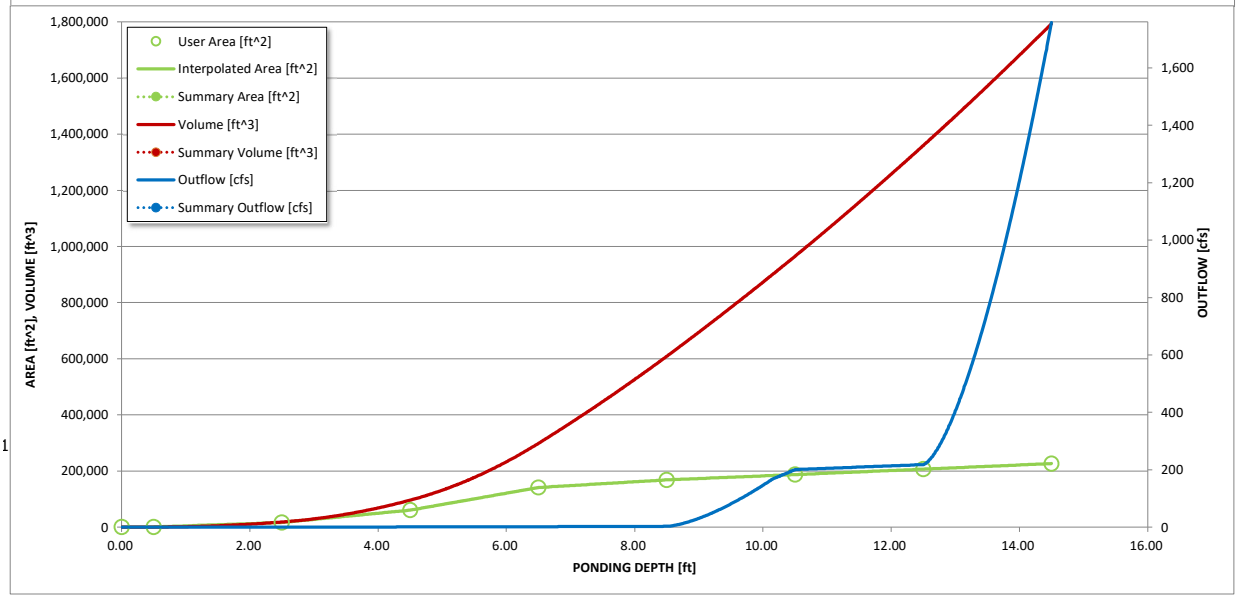
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.00
CUHP Runoff Volume (acre-ft) =	1.732	4.986	3.996	5.337	6.736	9.412	11.477	14.381	18.904
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	3.996	5.337	6.736	9.412	11.477	14.381	18.904
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	1.1	1.8	9.1	37.6	55.9	83.0	124.3
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.02	0.08	0.33	0.49	0.72	1.08
Peak Inflow Q (cfs) =	N/A	N/A	45.7	61.7	79.3	123.7	152.4	188.8	248.6
Peak Outflow Q (cfs) =	0.9	1.7	1.4	1.7	2.0	2.6	2.9	3.3	39.7
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	1.0	0.2	0.1	0.1	0.0	0.3
Structure Controlling Flow =	Plate	Plate	Plate	Plate	Plate	Plate	Plate	Plate	Overflow Weir 1
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.6
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	43	68	64	71	78	89	96	104	103
Time to Drain 99% of Inflow Volume (hours) =	**45**	75	69	78	86	98	106	115	115
Maximum Ponding Depth (ft) =	4.14	5.87	5.35	5.88	6.34	7.13	7.70	8.46	9.10
Area at Maximum Ponding Depth (acres) =	1.22	2.67	2.18	2.67	3.10	3.45	3.62	3.86	4.00
Maximum Volume Stored (acre-ft) =	1.744	4.999	3.738	4.999	6.354	8.970	10.949	13.792	16.349

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	0.32	0.03	0.81
	0:15:00	0.00	0.00	2.75	4.54	5.67	3.83	5.00	4.72	6.83
	0:20:00	0.00	0.00	11.56	15.95	19.06	12.23	14.56	15.29	19.42
	0:25:00	0.00	0.00	28.04	39.25	48.07	27.83	33.49	36.39	46.60
	0:30:00	0.00	0.00	41.89	57.58	73.21	72.17	89.67	103.64	138.83
	0:35:00	0.00	0.00	45.66	61.69	79.35	110.19	136.45	166.16	220.74
	0:40:00	0.00	0.00	43.52	57.62	73.76	123.70	152.36	188.84	248.57
	0:45:00	0.00	0.00	39.76	52.55	66.94	117.73	144.92	183.99	241.28
	0:50:00	0.00	0.00	36.13	48.08	60.70	108.55	134.14	172.34	226.41
	0:55:00	0.00	0.00	33.10	44.18	55.37	97.62	120.66	157.03	206.93
	1:00:00	0.00	0.00	30.66	40.73	51.02	87.81	108.32	143.34	189.91
	1:05:00	0.00	0.00	28.37	37.38	46.96	79.23	97.42	132.24	175.94
	1:10:00	0.00	0.00	25.70	34.23	43.16	70.78	86.77	118.02	157.08
	1:15:00	0.00	0.00	23.05	31.18	39.86	62.23	76.03	101.96	135.42
	1:20:00	0.00	0.00	21.00	28.76	37.15	53.99	65.80	86.45	114.61
	1:25:00	0.00	0.00	19.56	26.85	34.42	48.06	58.38	74.87	99.08
	1:30:00	0.00	0.00	18.36	25.17	31.62	43.07	52.09	65.67	86.53
	1:35:00	0.00	0.00	17.25	23.60	29.02	38.69	46.56	57.91	75.93
	1:40:00	0.00	0.00	16.18	21.67	26.60	34.57	41.38	50.91	66.35
	1:45:00	0.00	0.00	15.11	19.55	24.28	30.78	36.64	44.40	57.45
	1:50:00	0.00	0.00	14.04	17.46	22.01	27.09	32.03	38.16	48.99
	1:55:00	0.00	0.00	12.50	15.50	19.69	23.55	27.62	32.30	41.10
	2:00:00	0.00	0.00	10.80	13.65	17.28	20.26	23.51	26.94	33.88
	2:05:00	0.00	0.00	8.87	11.36	14.33	16.16	18.55	20.83	25.86
	2:10:00	0.00	0.00	7.17	9.25	11.67	12.29	14.07	15.53	19.32
	2:15:00	0.00	0.00	5.84	7.54	9.55	9.50	10.85	11.76	14.63
	2:20:00	0.00	0.00	4.80	6.18	7.85	7.55	8.59	9.07	11.22
	2:25:00	0.00	0.00	3.94	5.05	6.42	6.03	6.82	6.99	8.58
	2:30:00	0.00	0.00	3.21	4.12	5.22	4.82	5.44	5.41	6.56
	2:35:00	0.00	0.00	2.60	3.34	4.19	3.84	4.31	4.14	4.95
	2:40:00	0.00	0.00	2.09	2.66	3.32	3.02	3.38	3.15	3.72
	2:45:00	0.00	0.00	1.68	2.10	2.61	2.36	2.64	2.44	2.87
	2:50:00	0.00	0.00	1.35	1.65	2.05	1.86	2.07	1.92	2.26
	2:55:00	0.00	0.00	1.08	1.31	1.62	1.48	1.65	1.54	1.81
	3:00:00	0.00	0.00	0.85	1.01	1.27	1.16	1.29	1.21	1.42
	3:05:00	0.00	0.00	0.64	0.76	0.96	0.89	0.98	0.92	1.08
	3:10:00	0.00	0.00	0.47	0.55	0.70	0.65	0.72	0.67	0.78
	3:15:00	0.00	0.00	0.32	0.38	0.48	0.45	0.50	0.46	0.53
	3:20:00	0.00	0.00	0.20	0.25	0.30	0.29	0.32	0.29	0.33
	3:25:00	0.00	0.00	0.11	0.14	0.17	0.16	0.18	0.16	0.18
	3:30:00	0.00	0.00	0.05	0.07	0.07	0.07	0.08	0.07	0.07
	3:35:00	0.00	0.00	0.02	0.02	0.02	0.02	0.02	0.01	0.01
	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
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	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.

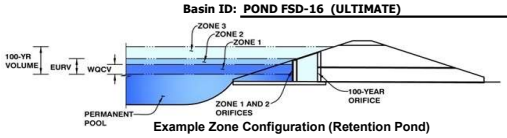
Stage - Storage Description	Stage [ft]	Area [ft^2]	Area [acres]	Volume [ft^3]	Volume [ac-ft]	Total Outflow [cfs]

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: STERLING RANCH EAST FILING NO. 6 - PRELIMINARY PLAN

Basin ID: POND FSD-16 (ULTIMATE)



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	211.16	acres
Watershed Length =	4,000	ft
Watershed Length to Centroid =	2,000	ft
Watershed Slope =	0.040	ft/ft
Watershed Imperviousness =	50.40%	percent
Percentage Hydrologic Soil Group A =	75.0%	percent
Percentage Hydrologic Soil Group B =	25.0%	percent
Percentage Hydrologic Soil Groups C/D =	0.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

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

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	3.649	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	12.070	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	9.525	acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	12.584	acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	15.518	acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	20.431	acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	24.383	acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	29.685	acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 3 in.) =	38.102	acre-feet	3.00	inches
Approximate 2-yr Detention Volume =	8.083	acre-feet		
Approximate 5-yr Detention Volume =	10.753	acre-feet		
Approximate 10-yr Detention Volume =	13.421	acre-feet		
Approximate 25-yr Detention Volume =	15.909	acre-feet		
Approximate 50-yr Detention Volume =	17.449	acre-feet		
Approximate 100-yr Detention Volume =	19.596	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	3.649	acre-feet
Zone 2 Volume (EURV - Zone 1) =	8.421	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	7.526	acre-feet
Total Detention Basin Volume =	19.596	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	

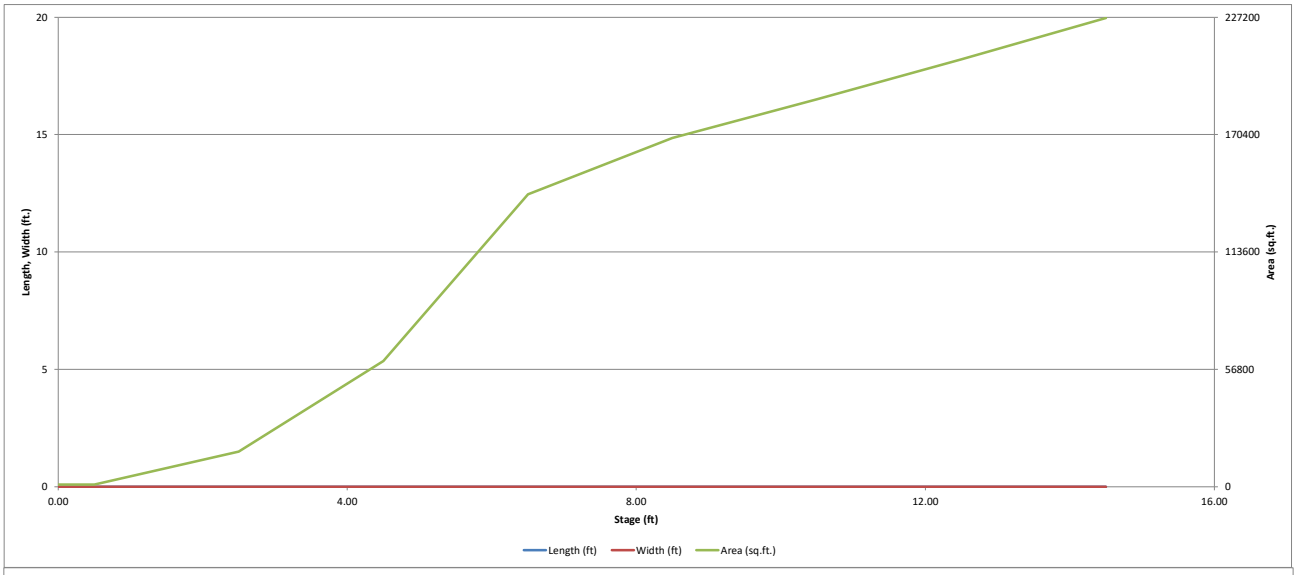
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	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

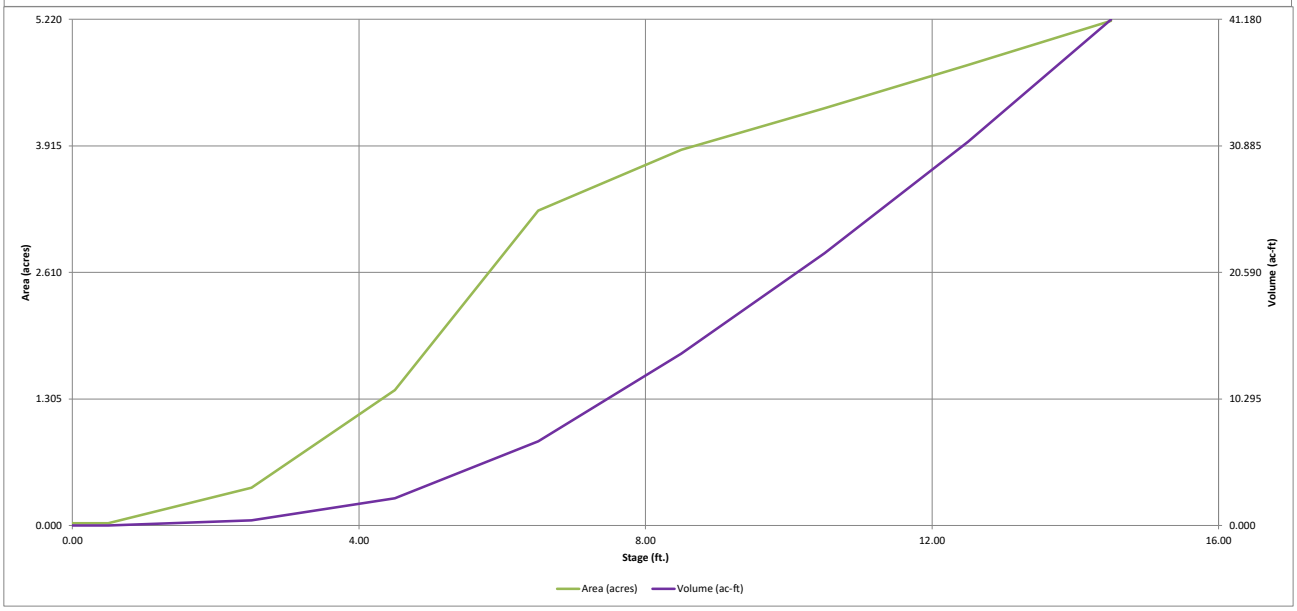
Depth Increment = ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	1,027	0.024		
7092	--	0.50	--	--	--	1,027	0.024	514	0.012
7094	--	2.50	--	--	--	17,010	0.390	18,550	0.426
7096	--	4.50	--	--	--	60,913	1.398	96,473	2.215
7098	--	6.50	--	--	--	141,508	3.249	298,894	6.862
7100	--	8.50	--	--	--	168,799	3.875	609,201	13.985
7102	--	10.50	--	--	--	187,503	4.304	965,503	22.165
7104	--	12.50	--	--	--	206,914	4.750	1,359,920	31.219
7106	--	14.50	--	--	--	226,802	5.207	1,793,636	41.176

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)



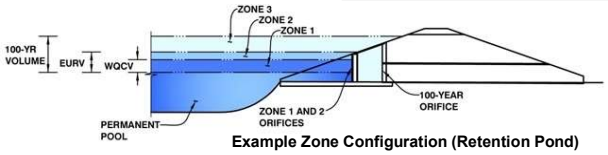


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: STERLING RANCH EAST FILING NO. 6 - PRELIMINARY PLAN

Basin ID: POND FSD-16 (ULTIMATE)



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	5.31	3.649	Orifice Plate
Zone 2 (EURV)	8.00	8.421	Orifice Plate
Zone 3 (100-year)	9.90	7.526	Weir&Pipe (Restrict)
Total (all zones)		19.596	

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

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

Calculated Parameters for Underdrain

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

Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	N/A	ft^2
Depth at top of Zone using Orifice Plate =	8.50	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	20.40	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	N/A	sq. inches	Elliptical Slot Area =	N/A	ft^2

Calculated Parameters for Plate

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.70	3.40	5.10	6.80			
Orifice Area (sq. inches)	7.00	9.00	16.00	16.00	16.00			

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

Calculated Parameters for Vertical Orifice

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			Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	8.50	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	8.50	N/A	feet
Overflow Weir Front Edge Length =	20.00	N/A	feet	Overflow Weir Slope Length =	4.00	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	7.65	N/A	
Horiz. Length of Weir Sides =	4.00	N/A	feet	Overflow Grate Open Area w/o Debris =	55.68	N/A	ft^2
Overflow Grate Type =	Type C Grate	N/A		Overflow Grate Open Area w/ Debris =	27.84	N/A	ft^2
Debris Clogging % =	50%	N/A	%				

Calculated Parameters for Overflow Weir

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

	Zone 3 Restrictor	Not Selected			Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	2.50	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	7.28	N/A	ft^2
Outlet Pipe Diameter =	48.00	N/A	inches	Outlet Orifice Centroid =	1.28	N/A	feet
Restrictor Plate Height Above Pipe Invert =	27.00		inches	Half-Central Angle of Restrictor Plate on Pipe =	1.70	N/A	radians

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	12.50	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	1.00	feet
Spillway Crest Length =	170.00	feet	Stage at Top of Freeboard =	14.50	feet
Spillway End Slopes =	6.00	H:V	Basin Area at Top of Freeboard =	5.21	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	41.18	acre-ft

Calculated Parameters for Spillway

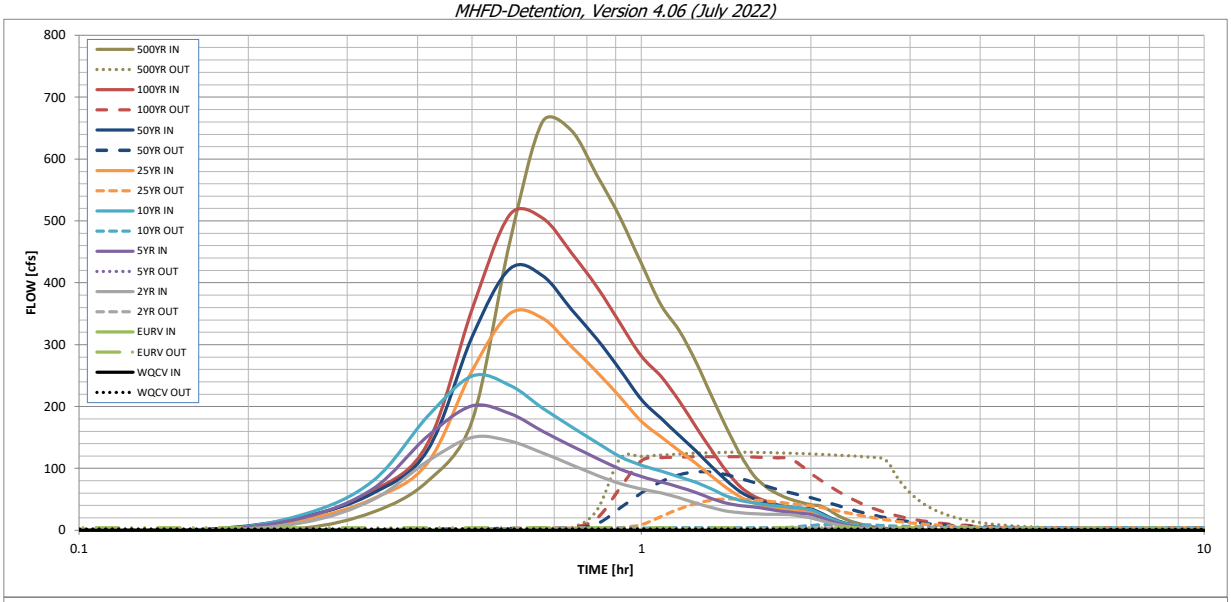
Routed Hydrograph Results

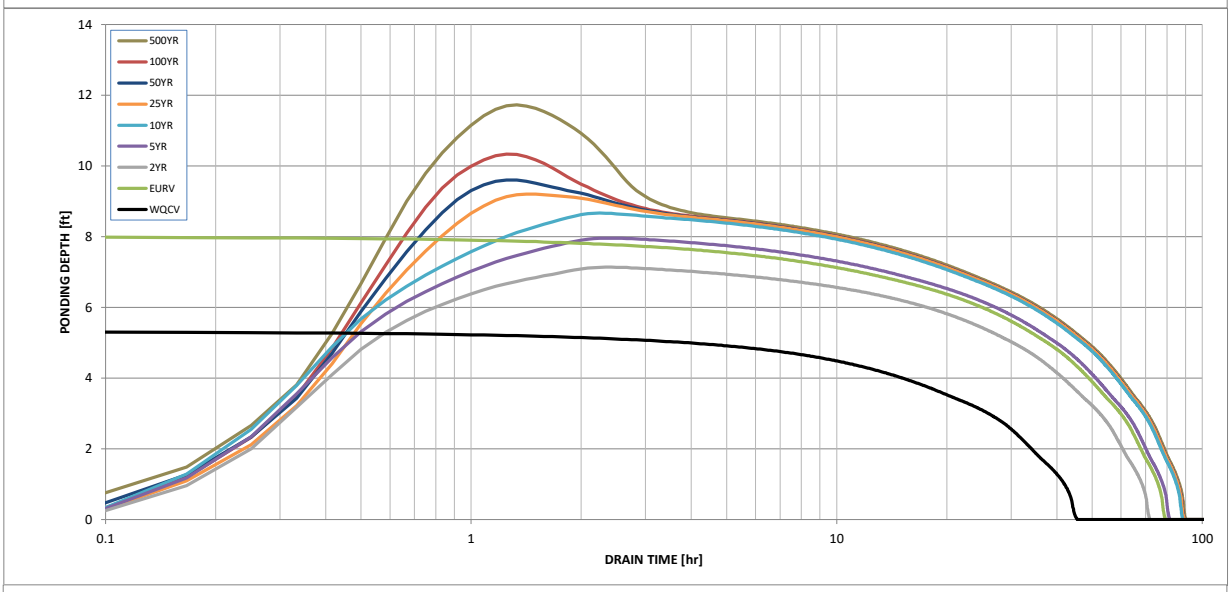
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

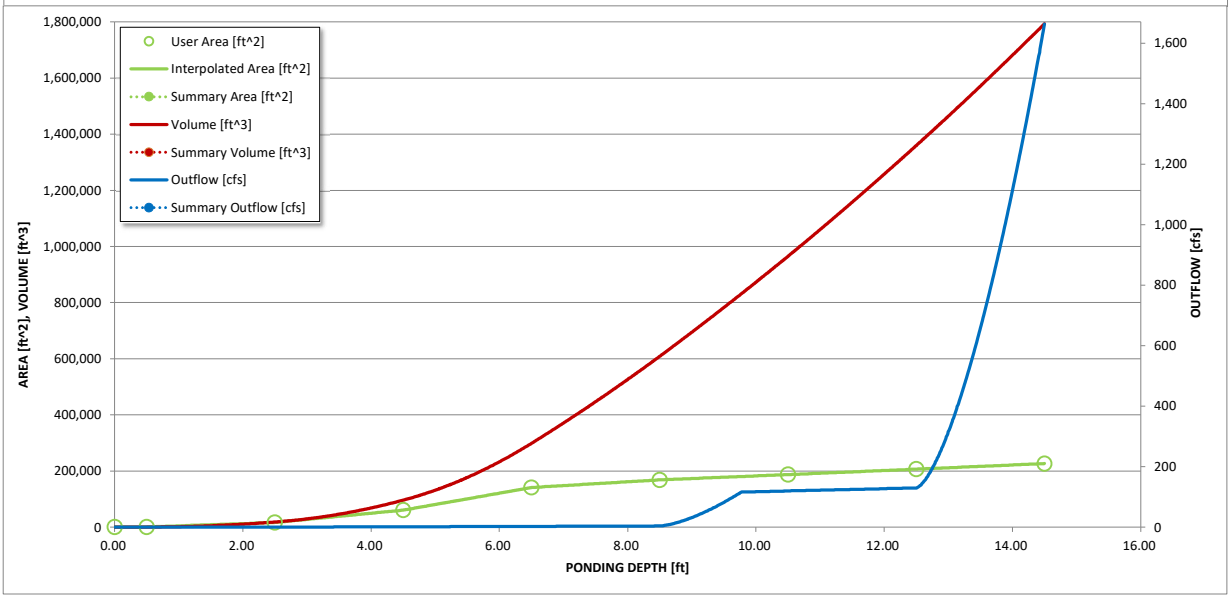
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.00
CUHP Runoff Volume (acre-ft) =	3.649	12.070	9.525	12.584	15.518	20.431	24.383	29.685	38.102
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	9.525	12.584	15.518	20.431	24.383	29.685	38.102
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	2.5	4.3	22.0	90.4	132.9	192.7	287.5
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.02	0.10	0.43	0.63	0.91	1.36
Peak Inflow Q (cfs) =	N/A	N/A	150.0	201.0	249.2	349.9	422.7	509.9	659.8
Peak Outflow Q (cfs) =	2.1	4.1	3.4	4.0	9.6	50.6	94.5	119.1	126.1
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.9	0.4	0.6	0.7	0.6	0.4
Structure Controlling Flow =	Plate	Plate	Plate	Plate	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Outlet Plate 1
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	0.1	0.8	1.6	2.0	2.2
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	39	66	60	67	73	71	69	67	64
Time to Drain 99% of Inflow Volume (hours) =	**43**	72	66	74	80	79	78	77	76
Maximum Ponding Depth (ft) =	5.31	8.00	7.13	7.96	8.67	9.21	9.60	10.33	11.73
Area at Maximum Ponding Depth (acres) =	2.15	3.72	3.45	3.70	3.91	4.03	4.11	4.27	4.58
Maximum Volume Stored (acre-ft) =	3.651	12.087	8.970	11.901	14.608	16.750	18.378	21.436	27.582

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	1.42	0.14	3.58
	0:15:00	0.00	0.00	12.35	20.29	25.24	17.00	21.90	20.87	29.49
	0:20:00	0.00	0.00	49.49	67.25	79.92	50.99	59.98	63.60	79.26
	0:25:00	0.00	0.00	111.46	151.98	183.94	108.83	129.02	139.92	176.35
	0:30:00	0.00	0.00	150.01	200.97	249.17	257.47	312.34	356.57	465.52
	0:35:00	0.00	0.00	144.21	188.61	234.49	349.94	422.66	509.88	659.80
	0:40:00	0.00	0.00	125.08	160.46	197.56	342.75	411.41	504.90	646.50
	0:45:00	0.00	0.00	106.20	136.43	167.65	297.45	357.37	448.93	574.29
	0:50:00	0.00	0.00	89.06	116.55	141.62	256.11	309.10	393.62	505.06
	0:55:00	0.00	0.00	75.55	98.82	119.02	214.93	259.13	334.40	430.57
	1:00:00	0.00	0.00	66.64	86.77	105.10	175.92	211.23	281.24	363.83
	1:05:00	0.00	0.00	60.33	78.08	95.50	151.17	180.92	248.74	323.46
	1:10:00	0.00	0.00	52.50	70.03	86.39	128.92	153.66	209.37	272.09
	1:15:00	0.00	0.00	44.08	60.80	77.43	107.91	128.06	167.18	216.56
	1:20:00	0.00	0.00	36.76	51.19	66.82	87.33	102.91	129.04	166.09
	1:25:00	0.00	0.00	31.20	43.69	55.56	68.96	80.43	95.60	121.83
	1:30:00	0.00	0.00	28.22	39.90	48.32	53.64	62.09	70.25	88.90
	1:35:00	0.00	0.00	26.85	37.97	44.22	44.30	50.99	55.43	69.70
	1:40:00	0.00	0.00	26.08	34.85	41.33	38.87	44.44	46.90	58.38
	1:45:00	0.00	0.00	25.60	31.57	39.23	35.47	40.30	41.08	50.56
	1:50:00	0.00	0.00	25.22	29.22	37.82	33.15	37.52	37.23	45.32
	1:55:00	0.00	0.00	22.88	27.51	36.15	31.63	35.72	34.53	41.61
	2:00:00	0.00	0.00	19.93	25.65	33.22	30.57	34.46	32.68	39.11
	2:05:00	0.00	0.00	15.78	20.56	26.31	24.89	28.01	26.34	31.40
	2:10:00	0.00	0.00	11.55	14.86	18.88	17.86	20.06	18.88	22.44
	2:15:00	0.00	0.00	8.39	10.75	13.57	12.86	14.42	13.64	16.17
	2:20:00	0.00	0.00	6.04	7.72	9.77	9.30	10.41	9.91	11.74
	2:25:00	0.00	0.00	4.30	5.36	6.89	6.53	7.31	6.98	8.26
	2:30:00	0.00	0.00	2.95	3.64	4.77	4.52	5.05	4.82	5.70
	2:35:00	0.00	0.00	1.99	2.51	3.30	3.18	3.55	3.38	3.98
	2:40:00	0.00	0.00	1.23	1.64	2.10	2.08	2.31	2.20	2.58
	2:45:00	0.00	0.00	0.66	0.96	1.18	1.21	1.34	1.26	1.47
	2:50:00	0.00	0.00	0.28	0.46	0.53	0.57	0.63	0.59	0.68
	2:55:00	0.00	0.00	0.09	0.14	0.15	0.17	0.18	0.17	0.19
	3:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
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	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
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	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]

REFERENCE MATERIALS

STERLING RANCH MDDP AMENDMENT NO. 2 & PRELIMINARY DRAINAGE REPORT FOR STERLING RANCH EAST PRELIMINARY PLAN NO. 1

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. 1183.22

PCD Project No.
SKP-22-004 / SP-22-004

STERLING RANCH MDDP AMENDMENT NO. 2 & PRELIM. DRAINAGE REPORT FOR STERLING RANCH EAST PRELIMINARY PLAN NO. 1

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: 11/11/2022

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: COREN J. MCRELAND

Title: VICE PRESIDENT

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.

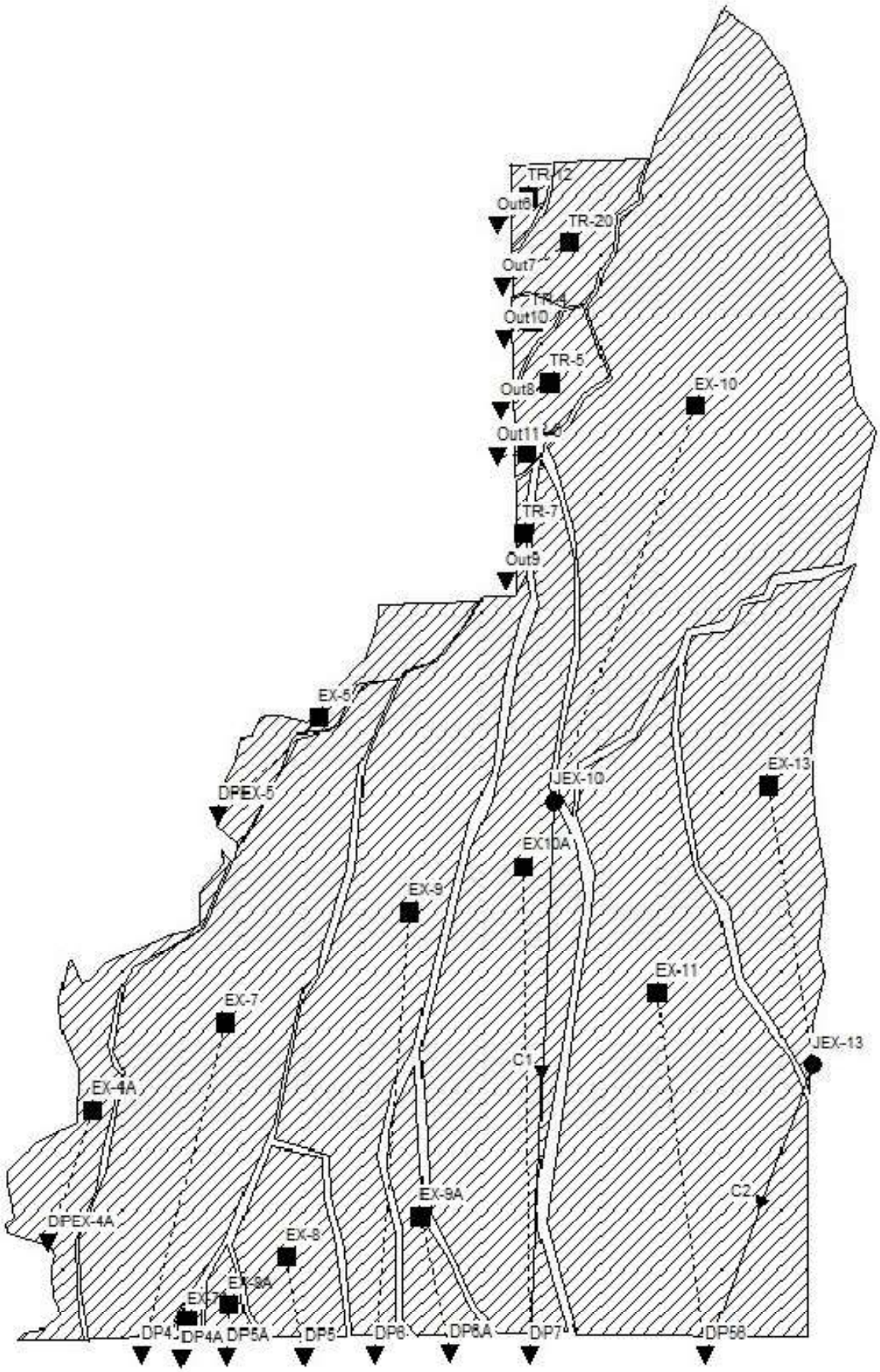
APPROVED
Engineering Department
01/19/2023 5:04:07 PM
dsdnijkamp
EPC Department of Public Works

For County Engineer, / ECM Administrator

Conditions:

Note: This report is acceptable until the version under review with SP-22-004 is approved, which will supersede this version.

EXISTING CONDITIONS SWMM MODEL MAP



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

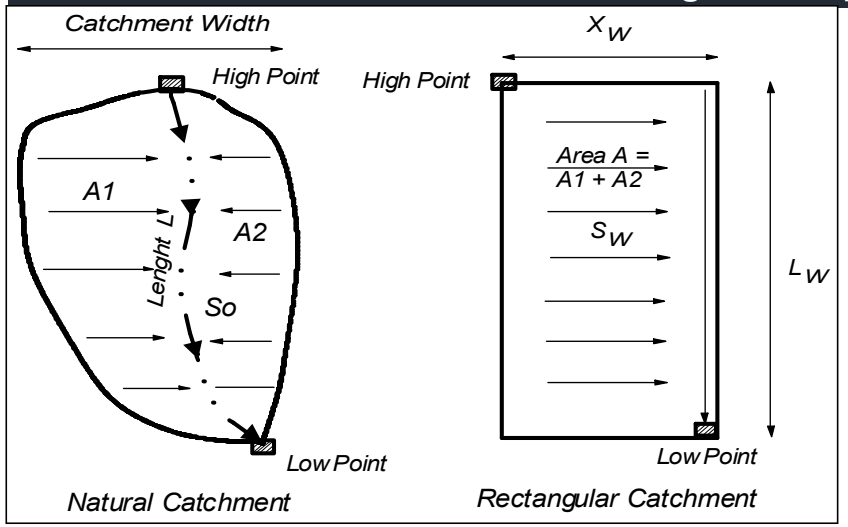
STERLING RANCH EAST PRELIMINARY PLAN NO. 1
Pre-Developed Subcatchment Runoff

Subcatchment	Area (Ac.)	SWMM Imperv. (%)	*SWMM Width (Lw) (ft.)	*SWMM Slope (Sw) (%)	Peak Runoff 5 yr. (CFS)	Peak Runoff 100 yr. (CFS)
EX-10	265.9	7%	3365	3.41%	105	222
EX10A	153.5	5%	1857	4.05%	46	103
EX-11 +	214.3	4%	3255	3.01%	54	129
EX-13 +	94.8	6%	1877	3.97%	36	85
EX-4A	44.2	8%	3355	1.09%	19	50
EX-5	26.2	8%	1959	1.65%	12	32
EX-7	152.8	5%	2234	3.13%	46	105
EX-7A	2.4	2%	416	2.70%	1	5
EX-8	32.2	2%	1679	1.47%	5	23
EX-8A	6.6	2%	698	1.80%	2	9
EX-9	139.3	8%	1837	3.19%	59	122
EX-9A	21.8	5%	786	3.01%	7	19
TR-12 +	4.7	5%	544	4.13%	2	9
TR-20 +	23.2	7%	1388	3.21%	10	32
TR-4 +	4.4	5%	645	2.76%	2	9
TR-5 +	13.7	5%	990	2.70%	5	17
TR-6 +	1.5	5%	519	1.55%	1	4
TR-7 +	2.6	5%	233	5.84%	1	5

* Reference SWMM Catchment Shape Parameter Finder for calculations

CATCHMENT SHAPE PARAMETER FINDER

Convert Natural Catchment to a Rectangular Shape



Subcatchment Center	Z=0.5
Side Collector	Z=1
Skewed Location	0.5<Z<1

Dimensionless Variables

$$Y = \frac{L}{L_w}; \qquad X = \frac{A}{L^2}$$

$$Y = (1.5 - Z)(2.286X - 0.286X^2)$$

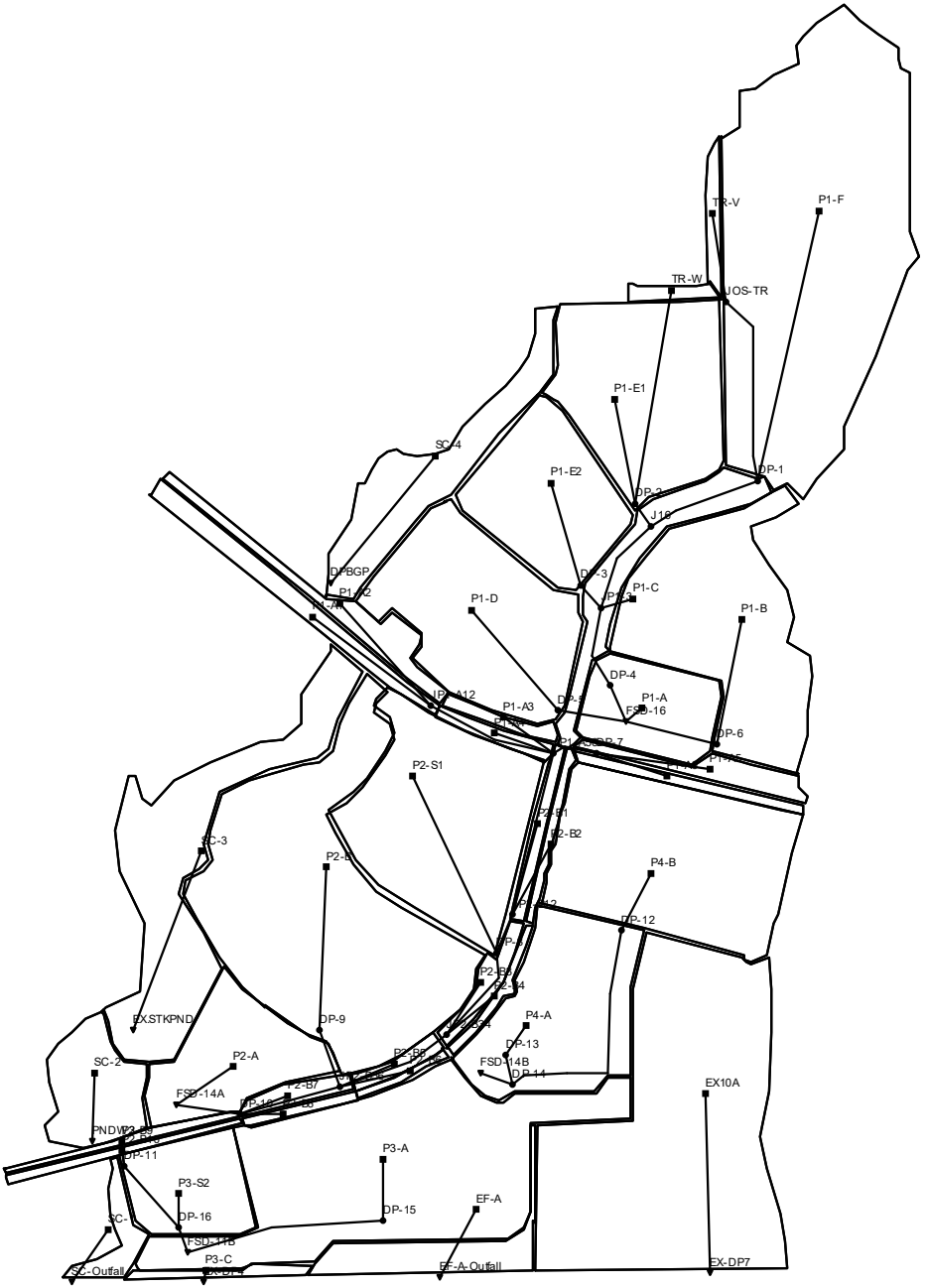
$$\frac{Lw}{L} = (1.5 - Z)[2.286(\frac{A}{L^2}) - 0.286(\frac{A}{L^2})^2]$$

$$S_o/S_w = A/(LL_w) + L_w/L$$

$$X_w = A/L_w$$

Subarea ID	Area acre	A1 acre	A2 acre	L ft	High Pt Elev. ft	Low Pt Elev. ft	Z=Am/A	X=A/L²	Y=Lw/L	Lw ft	Xw ft	So %	So/Sw	Sw %
EX-7	152.80	82.00	70.80	6,430	7160.0	6997.0	0.54	0.16	0.35	2,234	2,980	2.53	0.81	3.13
EX-9	139.30	65.00	74.30	7,190	7190.0	7026.0	0.53	0.12	0.26	1,837	3,302	2.28	0.71	3.19
EX10A	153.50	75.00	78.50	8,030	7,236	7,015	0.51	0.10	0.23	1,857	3,600	2.75	0.68	4.05
EX10	265.90	120.00	145.90	7,280	7,380	7,148	0.55	0.22	0.46	3,365	3,442	3.19	0.94	3.41
EX-11	214.30	100.00	114.30	6,140	7,192	7,008	0.53	0.25	0.53	3,255	2,867	3.00	1.00	3.01
EX-13	94.80	47.00	47.80	4,900	7,232	7,070	0.50	0.17	0.38	1,877	2,200	3.31	0.83	3.97
TR-4	4.40	2.20	2.20	640	7,270	7,244	0.50	0.47	1.01	645	297	4.06	1.47	2.76
TR-5	13.70	7.50	6.20	1,250	7,273	7,230	0.55	0.38	0.79	990	603	3.44	1.27	2.70
TR-6	1.50	0.75	0.75	250	7,238	7,228	0.50	1.05	2.08	519	126	4.00	2.58	1.55
TR-7	2.60	1.30	1.30	1,100	7,234	7,192	0.50	0.09	0.21	233	487	3.82	0.65	5.84
TR-12	4.70	2.50	2.20	800	7,300	7,262	0.53	0.32	0.68	544	377	4.75	1.15	4.13
TR-20	23.20	12.00	11.20	1,550	7,314	7,246	0.52	0.42	0.90	1,388	728	4.39	1.37	3.21
EX-4A	44.20	22.10	22.10	750	7,044	7,001	0.50	3.42	4.47	3,355	574	5.73	5.24	1.09
EX-5	26.20	13.10	13.10	1,200	7,186	7,144	0.50	0.79	1.63	1,959	583	3.50	2.12	1.65
EX-7A	2.40	1.20	1.20	550	7,039	7,021	0.50	0.35	0.76	416	251	3.27	1.21	2.70
EX-8A	6.60	3.30	3.30	900	7,045	7,025	0.50	0.35	0.78	698	412	2.22	1.23	1.80
EX-8A	32.20	17.00	15.20	1,750	7,062	7,025	0.53	0.46	0.96	1,679	835	2.11	1.44	1.47
EX-9A	21.80	11.80	10.00	2,600	7,082	7,022	0.54	0.14	0.30	786	1,208	2.31	0.77	3.01

DEVELOPED CONDITIONS SWMM MODEL MAP



STERLING RANCH EAST PRELIMINARY PLAN NO. 1
Developed Subcatchment Runoff

Subcatchment	Area (Ac.)	SWWM Imperv. (%)	*SWMM Width (Lw) (ft.)	*SWMM Slope (Sw) (%)	Peak Runoff 5 yr. (CFS)	Peak Runoff 100 yr. (CFS)
EF-A	8.2	15%	1064	1.57%	7	20
EX10A +	60.4	5%	2452	1.79%	18	50
EX-9 +	6.0	5%	578	1.70%	2	8
EX-9A +	12.7	5%	1080	1.94%	4	16
P1-A	12.7	8%	1276	1.29%	6	19
P1-A1	5.0	45%	258	1.66%	11	21
P1-A2	6.4	45%	258	0.77%	12	23
P1-A3	1.8	50%	196	1.17%	5	9
P1-A4	2.0	50%	208	1.12%	5	10
P1-A5	5.7	45%	417	1.38%	13	25
P1-A6	2.8	50%	205	1.75%	7	14
P1-B (Dev.)	35.5	38%	873	1.36%	55	108
P1-B (Un-dev.)	35.5	5%	873	1.36%	10	23
P1-C	8.9	50%	581	3.69%	23	46
P1-D	31.4	38%	1033	1.27%	53	102
P1-E1	30.4	35%	1148	1.56%	50	97
P1-E2	21.8	40%	1048	1.23%	41	80
P1-F (Dev.)	76.7	30%	2322	2.18%	111	215
P1-F (Un-dev.)	76.7	5%	2322	2.18%	22	59
P2-A	24.4	10%	2164	2.11%	15	43
P2-B	57.8	38%	1215	1.64%	88	173
P2-B1	2.5	50%	201	3.37%	7	13
P2-B10	1.7	50%	187	3.43%	5	10
P2-B2	1.9	50%	148	3.54%	5	10
P2-B3	2.8	45%	245	2.15%	7	13
P2-B4	1.6	50%	138	2.49%	4	8
P2-B5	1.9	45%	230	1.86%	5	9
P2-B6	1.1	50%	141	2.28%	3	6
P2-B7	2.5	45%	272	1.78%	6	12
P2-B8	1.2	50%	141	2.34%	3	7
P2-B9	2.0	50%	226	3.27%	5	11
P2-S1	35.6	40%	1756	1.44%	68	133
P3-A	52.6	40%	1290	1.37%	85	166
P3-C	1.7	11%	446	1.31%	1	5
P3-S2	11.9	40%	1103	1.27%	25	50
P4-A	25.8	35%	920	1.21%	41	80
P4-B	37.3	35%	1773	1.34%	63	123
SC-1 +	3.6	8%	306	2.20%	2	6
SC-2 +	10.8	8%	1211	2.44%	6	20
SC-3 +	27.2	8%	616	2.68%	12	26
SC-4 +	16.4	8%	1918	1.48%	8	27
TR-V	2.1	19%	162	4.13%	2	6
TR-W	1.4	38%	90	1.30%	3	5

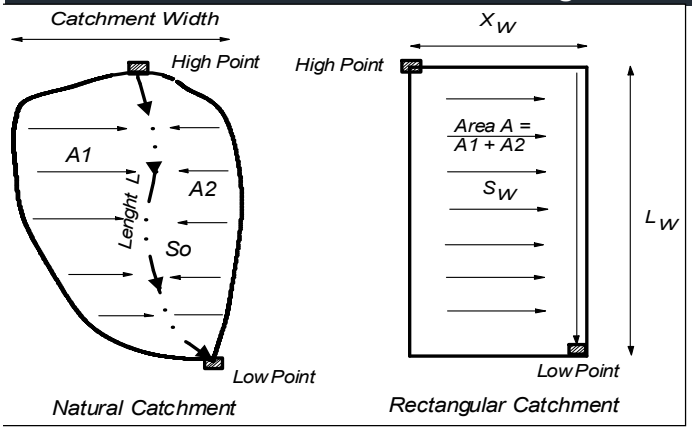
*** Reference SWMM Catchment Shape Parameter Finder for calculations**

+ Basin not changed from pre-development conditions

STERLING RANCH EAST PRELIMINARY PLAN NO. 1
Developed Surface Routing

Design Point (On-Site)	Peak Runoff 5 yr. (CFS)	Peak Runoff 100 yr. (CFS)
DP-1	112	219
DP-2	53	103
DP-3	41	80
DP-4	218	379
DP-5	53	102
DP-6	55	108
DP-7	20	39
DP-8	68	133
DP-9	88	173
DP-10	223	441
DP-11	10	21
DP-12	63	123
DP-13	41	80
DP-14	97	189
DP-15	85	166
DP-16	34	69
Pond FSD-11B	115	227
Pond FSD-14A	234	486
Pond FSD-14B	97	189
Pond FSD-16 (Ultimate)	323	499
Pond FSD-16 (Interim)	197	410
Design Point (South Bndy.)	Peak Runoff 5 yr. (CFS)	Peak Runoff 100 yr. (CFS)
4	0.5	3.5
4A	0.5	3.5
5	4	10
5A	2	7
6	2.0	48.9
6A	4	16
7	18	50

Convert Natural Catchment to a Rectangular Shape



Subcatchment Center	Z=0.5
Side Collector	Z=1
Skewed Location	0.5<Z<1

Dimensionless Variables

$$Y = \frac{L}{L_w}; \qquad X = \frac{A}{L^2}$$

$$Y = (1.5 - Z)(2.286X - 0.286X^2)$$

$$\frac{Lw}{L} = (1.5 - Z)[2.286(\frac{A}{L^2}) - 0.286(\frac{A}{L^2})^2]$$

$$S_o/S_w = A/(LL_w) + L_w/L$$

$$X_w = A/L_w$$

Subarea ID	Area acre	A1 acre	A2 acre	L ft	High Pt Elev. ft	Low Pt Elev. ft	Z=Am/A	X=A/L²	Y=Lw/L	Lw ft	Xw ft	So %	So/Sw	Sw %
EF-A	8.20	4.10	4.10	260	7050.0	7028.0	0.50	5.28	4.09	1,064	336	8.46	5.38	1.57
P3-C	1.70	0.50	1.20	260	7027.0	7019.0	0.71	1.10	1.72	446	166	3.08	2.35	1.31
P1-A	12.70	7.00	5.70	850	7,124	7,102	0.55	0.77	1.50	1,276	433	2.59	2.01	1.29
P1-B	35.50	10.00	25.50	3,100	7,160	7,124	0.72	0.16	0.28	873	1,770	1.16	0.85	1.36
P1-C	8.90	4.50	4.40	1,700	7,158	7,122	0.51	0.13	0.30	510	761	2.12	0.75	2.83
P1-D	31.40	14.00	17.40	2,800	7,136	7,106	0.55	0.17	0.37	1,033	1,324	1.07	0.84	1.27
P1-E1	30.40	16.00	14.40	2,500	7,188	7,152	0.53	0.21	0.46	1,148	1,154	1.44	0.92	1.56
P1-E2	21.80	11.00	10.80	2,000	7,158	7,134	0.50	0.24	0.52	1,048	906	1.20	0.98	1.23
P1-F	76.70	35.00	41.70	3,000	7,240	7,158	0.54	0.37	0.77	2,322	1,439	2.73	1.25	2.18
TR-W	1.40	0.70	0.70	90	7,192	7,182	0.50	7.53	1.00	90	678	11.11	8.53	1.30
TR-V	2.10	1.50	0.60	1,000	7,220	7,190	0.71	0.09	0.16	162	563	3.00	0.73	4.13
P1-A1	5.00	3.10	1.90	2,400	7,134	7,112	0.62	0.04	0.08	182	1,199	0.92	0.58	1.59
P1-A2	6.40	3.20	3.20	2,400	7,134	7,110	0.50	0.05	0.11	264	1,056	1.00	0.55	1.82
P1-A3	1.80	0.70	1.10	800	7,110	7,103	0.61	0.12	0.25	196	400	0.88	0.74	1.17
P1-A4	2.00	1.30	0.70	800	7,112	7,105	0.65	0.14	0.26	208	419	0.88	0.78	1.12
P1-A5	5.70	3.00	2.70	1,300	7,114	7,100	0.53	0.15	0.32	417	595	1.08	0.78	1.38
P1-A6	2.80	1.30	1.50	1,300	7,114	7,100	0.54	0.07	0.16	205	595	1.08	0.62	1.75
P2-A	24.40	13.20	11.20	900	7,056	7,000	0.54	1.31	2.40	2,164	491	6.22	2.95	2.11
P2-B	57.80	18.50	39.30	3,800	7,106	7,052	0.68	0.17	0.32	1,215	2,072	1.42	0.87	1.64
P2-S1	35.60	18.00	17.60	1,900	7,110	7,072	0.51	0.43	0.92	1,756	883	2.00	1.39	1.44
P2-B1	2.50	1.50	1.00	1,100	7,102	7,077	0.60	0.09	0.18	201	541	2.27	0.67	3.37
P2-B2	1.90	1.20	0.70	1,100	7,102	7,077	0.63	0.07	0.13	148	559	2.27	0.64	3.54
P2-B3	2.80	1.70	1.10	1,000	7,077	7,061	0.61	0.12	0.25	245	498	1.60	0.74	2.15
P2-B4	1.60	1.00	0.60	1,000	7,077	7,061	0.63	0.07	0.14	138	504	1.60	0.64	2.49
P2-B5	1.90	1.20	0.70	700	7,061	7,050	0.63	0.17	0.33	230	360	1.57	0.84	1.86
P2-B6	1.10	0.65	0.45	700	7,061	7,050	0.59	0.10	0.20	141	341	1.57	0.69	2.28
P2-B7	2.50	1.60	0.90	770	7,050	7,038	0.64	0.18	0.35	272	401	1.56	0.87	1.78
P2-B8	1.20	0.70	0.50	770	7,050	7,038	0.58	0.09	0.18	141	372	1.56	0.67	2.34
P2-B9	2.00	1.00	1.00	870	7,038	7,018	0.50	0.12	0.26	226	386	2.30	0.70	3.27
P2-B10	1.70	0.90	0.80	870	7,038	7,018	0.53	0.10	0.21	187	397	2.30	0.67	3.43
P3-A	1.70	0.90	0.80	870	7,038	7,018	0.53	0.10	0.21	187	397	2.30	0.67	3.43
P3-S2	11.90	6.00	5.90	1,000	7,036	7,016	0.50	0.52	1.10	1,103	470	2.00	1.57	1.27
P4-A	25.80	20.00	5.80	1,950	7,078	7,052	0.78	0.30	0.47	920	1,222	1.33	1.10	1.21
P4-B	37.30	25.00	12.30	1,600	7,116	7,080	0.67	0.63	1.11	1,773	916	2.25	1.68	1.34
SC-1	3.60	1.80	1.80	150	7,014	6,996	0.50	6.97	2.04	306	512	12.00	5.46	2.20
SC-2	10.80	5.00	5.80	770	7040.0	7001.0	0.54	0.79	1.57	1,211	388	5.06	2.08	2.44
SC-3	27.20	14.00	13.20	4,300	7100.0	7032.0	0.51	0.06	0.14	616	1,925	1.58	0.59	2.68
SC-4	16.40	8.20	8.20	420	7,136	7,102	0.50	4.05	4.57	1,918	372	8.10	5.45	1.48
EX-9	6.00	3.00	3.00	1,000	7,050	7,030	0.50	0.26	0.58	578	452	2.00	1.03	1.94
EX-9A	12.70	6.30	6.40	1,100	7,049	7,022	0.50	0.46	0.98	1,080	512	2.45	1.45	1.70

PROPOSED PONDS
EFFECTIVE IMPERVIOUS AREA CALCULATIONS

STERLING RANCH EAST PRELIMINARY PLAN NO. 1

Pond FSD-16 Tributary Area

(Full Build Out)

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

STERLING RANCH EAST PRELIMINARY PLAN NO. 1

Pond FSD-16 Tributary Area

(Prelim. Plan 1 & Foursquare PUD Only)

Subcatchment	Area (Ac.)	Avg. Lot size (AC)	Effective Imperv. (%)
P1-A	12.7	N/A	15%
P1-B	35.5	Un dev.	2%
P1-C	8.9	N/A	70%
P1-D	31.4	6,500	60%
P1-E1	30.4	8,500	50%
P1-E2	21.8	7,500	55%
P1-F	76.7	Un dev.	2%
TR-V	2.1	17,500	27%
TR-W	1.4	13,500	32%
TOTAL	**220.9**		**26%**

STERLING RANCH EAST PRELIMINARY PLAN NO. 1

Pond FSD-14A Tributary Area

Subcatchment	Area (Ac.)	Avg. Lot size (AC)	Effective Imperv. (%)
P1-A1	5.0	N/A	70%
P1-A2	6.4	N/A	70%
P1-A3	1.8	N/A	70%
P1-A4	2.0	N/A	70%
P1-A5	5.7	N/A	70%
P1-A6	2.8	N/A	70%
P2-S1	35.6	School	50%
P2-A	24.4	Park	7%
P2-B	57.8	7,000	57%
P2-B1	2.5	N/A	50%
P2-B2	1.9	N/A	70%
P2-B3	2.8	N/A	50%
P2-B4	1.6	N/A	70%
P2-B5	1.9	N/A	50%
P2-B6	1.1	N/A	70%
P2-B7	2.5	N/A	25%
P2-B8	1.2	N/A	70%
TOTAL	**157.0**		**49%**

STERLING RANCH EAST PRELIMINARY PLAN NO. 1

Pond FSD-14B Tributary Area

Subcatchment	Area (Ac.)	Avg. Lot size (AC)	Effective Imperv. (%)
P4-A	25.8	6,500	60%
P4-B	37.3	6,500	60%
TOTAL	**63.1**		**60%**

STERLING RANCH EAST PRELIMINARY PLAN NO. 1

Pond FSD-11B Tributary Area

Subcatchment	Area (Ac.)	Avg. Lot size (AC)	Effective Imperv. (%)
P2-B9	2.0	N/A	70%
P2-B10	1.7	N/A	70%
P3-S2	11.9	School	65%
P3-A	52.6	7,000	57%
TOTAL	**68.2**		**59%**

STERLING RANCH EAST PRELIMINARY PLAN NO. 1

Flow Comparison along South Boundary

	This Report (SWMM 5.1) Pre-Dev. Conditions		This Report (SWMM 5.1) Developed Conditions		2018 SR MDDP (HEC-HMS) Pre-Dev. Conditions	
Design Point (South Bndy.)	**Peak Runoff 5 yr. (CFS)**	**Peak Runoff 100 yr. (CFS)**	**Peak Runoff 5 yr. (CFS)**	**Peak Runoff 100 yr. (CFS)**	**Peak Runoff 5 yr. (CFS)**	**Peak Runoff 100 yr. (CFS)**
4	**46**	**105**	**0.5**	**3.5**	**21.5**	**107.4**
4A	**1**	**5**	**0.5**	**3.5**		
5	**5**	**23**	**4**	**10**	**1.7**	**20.5**
5A	**2**	**9**	**2**	**7**		
6	**59**	**122**	**2.0**	**48.9**	**23.9**	**125.2**
6A	**7**	**19**	**4**	**11**		
7	**110**	**249**	**18**	**50**	**57.1**	**277.9**
56	**60**	**160**	**60**	**160**	**42.5**	**202.9**

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: May 31, 2022
Project: Sterling Ranch East Preliminary Plan No. 1
Location: BASINS NOT TRIBUTARY TO PERMANENT SWQ FACILITY

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	UIA:RPA	UIA:RPA							
Area ID	EF-A	SC-3-1	SC-3-2	SC-4-1	SC-4-2							
Downstream Design Point ID	SC	SC	SC	SC	SC							
Downstream BMP Type	None	None	None	None	None							
DCIA (ft^2)	--	--	--	--	--							
UIA (ft^2)	40,000	26,790	19,924	30,053	48,697							
RPA (ft^2)	37,188	17,918	12,924	21,985	28,692							
SPA (ft^2)	--	--	--	--	--							
HSG A (%)	0%	0%	0%	0%	0%							
HSG B (%)	100%	100%	100%	100%	100%							
HSG C/D (%)	0%	0%	0%	0%	0%							
Average Slope of RPA (ft/ft)	0.020	0.040	0.030	0.040	0.040							
UIA:RPA Interface Width (ft)	800.00	700.00	400.00	800.00	1000.00							

CALCULATED RUNOFF RESULTS

Area ID	EF-A	SC-3-1	SC-3-2	SC-4-1	SC-4-2							
UIA:RPA Area (ft^2)	77,188	44,708	32,848	52,038	77,389							
L / W Ratio	0.12	0.09	0.21	0.08	0.08							
UIA / Area	0.5182	0.5992	0.6066	0.5775	0.6292							
Runoff (in)	0.00	0.00	0.00	0.00	0.00							
Runoff (ft^3)	0	0	0	0	0							
Runoff Reduction (ft^3)	1433	960	714	1077	1745							

CALCULATED WQCV RESULTS

Area ID	EF-A	SC-3-1	SC-3-2	SC-4-1	SC-4-2							
WQCV (ft^3)	1628	1090	811	1223	1982							
WQCV Reduction (ft^3)	1628	1090	811	1223	1982							
WQCV Reduction (%)	100%	100%	100%	100%	100%							
Untreated WQCV (ft^3)	0	0	0	0	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)	0											
UIA (ft^2)	165,464											
RPA (ft^2)	118,707											
SPA (ft^2)	0											
Total Area (ft^2)	284,171											
Total Impervious Area (ft^2)	165,464											
WQCV (ft^3)	6,734											
WQCV Reduction (ft^3)	6,734											
WQCV Reduction (%)	100%											
Untreated WQCV (ft^3)	0											

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

Total Area (ft^2)	284,171
Total Impervious Area (ft^2)	165,464
WQCV (ft^3)	6,734
WQCV Reduction (ft^3)	6,734
WQCV Reduction (%)	100%
Untreated WQCV (ft^3)	0

SEE SHEET 4

STERLING RANCH EAST PRELIMINARY PLAN NO. 1
Developed Subcatchment Runoff

Subcatchment	Area (Ac.)	SWWM Imperv. (%)	Peak Runoff 5 yr. (CFS)	Peak Runoff 100 yr. (CFS)
EF-A	8.2	15%	7	20
EX10A ++	60.4	5%	18	50
EX-9 ++	6.0	5%	2	8
EX-9A ++	12.7	5%	4	16
P1-A	12.7	8%	6	19
P1-A1	5.0	70%	15	29
P1-A2	6.4	70%	16	32
P1-A3	1.8	70%	6	12
P1-A4	2.0	70%	7	13
P1-A5	5.7	70%	18	35
P1-A6	2.8	70%	9	18
P1-B (Dev.)	35.5	55%	71	140
P1-B (Un-dev.)	35.5	5%	10	23
P1-C	8.9	70%	31	59
P1-D	31.4	60%	72	142
P1-E1	30.4	50%	66	128
P1-E2	21.8	55%	53	102
P1-F (Dev.)	76.7	35%	125	243
P1-F (Un-dev.)	76.7	5%	22	59
P2-A	24.4	7%	11	37
P2-B	57.8	57%	114	229
P2-B1	2.5	50%	7	13
P2-B10	1.7	70%	6	12
P2-B2	1.9	70%	7	13
P2-B3	2.8	50%	7	14
P2-B4	1.6	70%	6	11
P2-B5	1.9	50%	5	10
P2-B6	1.1	70%	4	8
P2-B7	2.5	25%	3	8
P2-B8	1.2	70%	4	8
P2-B9	2.0	70%	7	14
P2-S1	35.6	50%	82	158
P3-A	52.6	57%	107	213
P3-C	1.7	11%	1	5
P3-S2	11.9	50%	30	59
P4-A	25.8	57%	59	115
P4-B	37.3	60%	97	188
SC-1 +	3.6	8%	2	6
SC-2 +	10.8	8%	6	20
SC-3 +	27.2	8%	12	26
SC-4 +	16.4	8%	8	27
TR-V	2.1	27%	3	7
TR-W	1.4	32%	2	5

+ Basin not changed from pre-development conditions
++ Remaining undeveloped portion of the pre-development Basin

STERLING RANCH EAST PRELIMINARY PLAN NO. 1
Developed Surface Routing

Design Point (On-Site)	Peak Runoff 5 yr. (CFS)	Peak Runoff 100 yr. (CFS)
DP-1	127	248
DP-2	69	133
DP-3	53	102
DP-4	167	376
DP-5	72	142
DP-6	71	140
DP-7	28	53
DP-8	82	158
DP-9	114	229
DP-10	282	456
DP-11	14	26
DP-12	97	188
DP-13	59	115
DP-14	101	193
DP-15	107	213
DP-16	43	84

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

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

STERLING RANCH EAST PRELIMINARY PLAN NO. 1
Pond FSD-16 Tributary Area
(Prelim. Plan 1 & Foursquare PUD Only)

Subcatchment	Area (Ac.)	Avg. Lot size (AC)	Effective Imperv. (%)
P1-A	12.7	N/A	8%
P1-B	35.5	Un dev.	2%
P1-C	8.9	N/A	70%
P1-D	31.4	6,500	60%
P1-E1	30.4	8,500	50%
P1-E2	21.8	7,500	55%
P1-F	76.7	Un dev.	2%
TR-V	2.1	17,500	27%
TR-W	1.4	13,500	32%
TOTAL	220.9		26%

STERLING RANCH EAST PRELIMINARY PLAN NO. 1
Pond FSD-16 Tributary Area
(Full Build Out)

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

POND FSD-16 (EDB)
(FULL BUILD-OUT)

TRIB. AREA = 220.9 AC.
WQCV = 3.60 AC.-FT.
EURV = 7.70 AC.-FT.
100 YR. = 10.26 AC.-FT.
TOTAL = 21.56 AC.-FT.

INFLOW: (SWWM MODEL)
Q5 = 307 CFS
Q100 = 496 CFS

OUTFLOW: (MHFD-DETENTION)
Q5 = 3.6 CFS
Q100 = 117.4 CFS

POND FSD-16 (EDB)
(PRELIM. PLAN 1 & FOURSQUARE PUD)

TRIB. AREA = 220.9 AC.
WQCV = 2.55 AC.-FT.
EURV = 3.04 AC.-FT.
100 YR. = 5.92 AC.-FT.
TOTAL = 11.51 AC.-FT.

INFLOW: (SWWM MODEL)
Q5 = 197 CFS
Q100 = 410 CFS

OUTFLOW: (MHFD-DETENTION)
Q5 = 2.5 CFS
Q100 = 66.0 CFS

FOURSQUARE AT STERLING RANCH PRELIMINARY PLAN AREA

LEGEND

DESCRIPTION	SYMBOL
EXISTING GROUND CONTOUR	6910
PROPOSED FINISHED CONTOUR	6910
BASIN BOUNDARY	
HISTORIC EAST FORK BASIN BOUNDARY (NOT USED IN BASIN SIZING)	
DESIGN POINT	15
BASIN IDENTIFIER / AREA IN ACRES	BB 10.0
EXISTING DIRECTION OF FLOW	
PROPOSED DIRECTION OF FLOW	
PROPOSED STORM SEWER	
PROPOSED STORM SEWER PER JR ENG. PLANS	
PROPOSED POND OUTFALL PER JR ENG. PLANS	

SCALE: 1" = 100'

SEE SHEET 6

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

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

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

N:\1183\07\REPORTS\PRELIMINARY DRAINAGE REPORT\1820 FOR DM SITE.dwg, 3/9/2023 5:06:30 PM, 1:1

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

August 2024

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

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

Job no. 2183.23
PCD File # SF2236 & SF2237

ENGINEER'S STATEMENT:

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

COLORADO LICENSED DAVID LEE GIBSON 46477 PROFESSIONAL ENGINEER

David L Gibson, Colorado P.E. #46477 — Date: 08-23-2024

DEVELOPER'S STATEMENT:

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

Business Name: Classic SRJ Land, LLC

By:

Title: VICE PRESIDENT

Address: 2138 Flying Horse Club Dr.

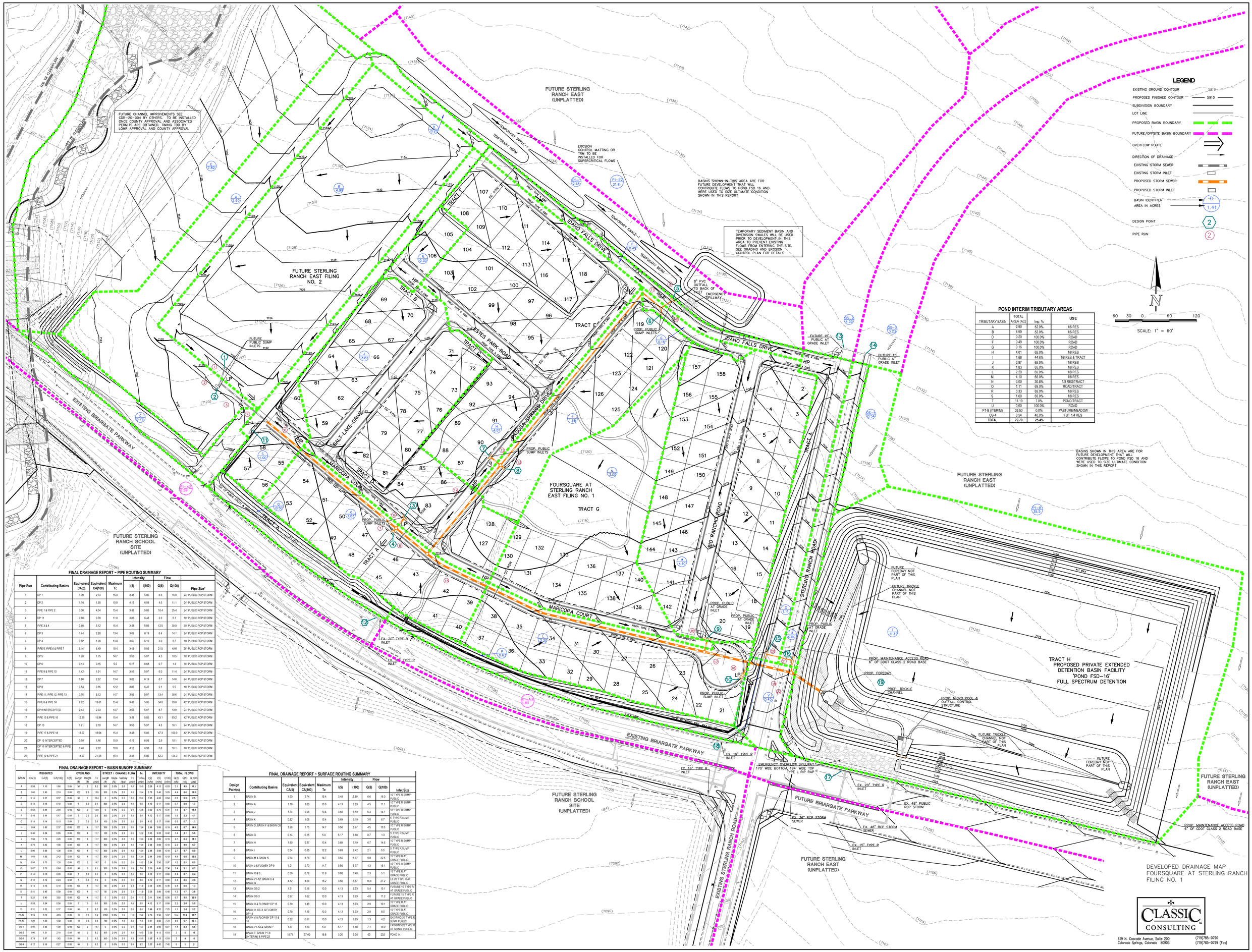
Colorado Springs, CO 80921

EL PASO COUNTY ONLY:

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

For County Engineer / ECM Administrator — Date

Conditions:



POND INTERIM TRIBUTARY AREAS

TRIBUTARY BASIN	TOTAL AREA (AC)	Imp. %	USE
A	2.90	52.0%	1/6 RES
B	4.99	52.0%	1/6 RES
D	0.20	100.0%	ROAD
F	0.49	100.0%	ROAD
G	0.16	100.0%	ROAD
H	4.01	65.0%	1/8 RES
I	1.68	44.6%	1/8 RES & TRACT
J	3.87	65.0%	1/8 RES
K	1.83	65.0%	1/8 RES
L	2.20	65.0%	1/8 RES
M	4.10	65.0%	1/8 RES
N	3.00	30.8%	1/8 RES/TRACT
O	1.11	69.0%	ROAD/TRACT
R	0.33	65.0%	1/8 RES
S	1.00	65.0%	1/8 RES
T	11.19	7.0%	POND/TRACT
U	0.60	100.0%	ROAD
P1-8 (ITERIM)	35.50	0.0%	PASTURE/MEADOW
OS-4	0.54	40.0%	FUT 1/4 RES
TOTAL	**79.70**	**25.4%**	

FINAL DRAINAGE REPORT - PIPE ROUTING SUMMARY

Pipe Run	Contributing Basins	Equivalent CA(5)	Equivalent CA(100)	Maximum Tc	Intensity I(5)	Intensity I(100)	Flow Q(5)	Flow Q(100)	Pipe Size*
1	DP 1	1.90	2.74	15.4	3.48	5.85	6.6	16.0	24" PUBLIC RCP STORM
2	DP 2	1.10	1.60	10.0	4.13	6.93	4.5	11.1	24" PUBLIC RCP STORM
3	PIPE 1 & PIPE 2	3.00	4.34	15.4	3.48	5.85	10.4	25.4	24" PUBLIC RCP STORM
4	DP 11	0.60	0.78	11.9	3.86	6.48	2.3	5.1	18" PUBLIC RCP STORM
5	PIPE 3 & 4	3.60	5.12	15.4	3.48	5.85	12.5	30.0	30" PUBLIC RCP STORM
6	DP 3	1.74	2.28	13.4	3.69	6.19	6.4	14.1	24" PUBLIC RCP STORM
7	DP 4	0.82	1.08	13.4	3.69	6.19	3.0	6.7	18" PUBLIC RCP STORM
8	PIPE 5, PIPE 6 & PIPE 7	6.16	8.49	15.4	3.48	5.85	21.5	49.6	36" PUBLIC RCP STORM
9	DP 5	1.28	1.75	14.7	3.56	5.97	4.5	10.5	18" PUBLIC RCP STORM
10	DP 6	0.14	0.15	5.0	5.17	8.68	0.7	1.3	18" PUBLIC RCP STORM
11	PIPE 9 & PIPE 10	1.42	1.91	14.7	3.56	5.97	5.0	11.4	24" PUBLIC RCP STORM
12	DP 7	1.80	2.37	13.4	3.69	6.19	6.7	14.6	24" PUBLIC RCP STORM
13	DP 8	0.54	0.85	12.2	3.83	6.42	2.1	5.5	18" PUBLIC RCP STORM
14	PIPE 11, PIPE 12, PIPE 13	3.76	5.12	14.7	3.56	5.97	13.4	30.6	24" PUBLIC RCP STORM
15	PIPE 8 & PIPE 14	9.92	13.61	15.4	3.48	5.85	34.6	79.6	42" PUBLIC RCP STORM
16	DP 9 INTERCEPTED	2.44	2.33	14.7	3.56	5.97	8.7	13.9	24" PUBLIC RCP STORM
17	PIPE 15 & PIPE 16	12.36	15.94	15.4	3.48	5.85	43.1	93.2	42" PUBLIC RCP STORM
18	DP 10	1.21	2.70	14.7	3.56	5.97	4.3	16.1	24" PUBLIC RCP STORM
19	PIPE 17 & PIPE 18	13.57	18.64	15.4	3.48	5.85	47.3	109.0	42" PUBLIC RCP STORM
20	DP 15 INTERCEPTED	0.70	1.46	10.0	4.13	6.93	2.9	10.1	18" PUBLIC RCP STORM
21	DP 16 INTERCEPTED & PIPE 20	1.40	2.62	10.0	4.13	6.93	5.8	18.1	18" PUBLIC RCP STORM
22	PIPE 19 & PIPE 21	14.97	21.26	15.4	3.48	5.85	52.2	124.3	48" PUBLIC RCP STORM

FINAL DRAINAGE REPORT - BASIN RUNOFF SUMMARY

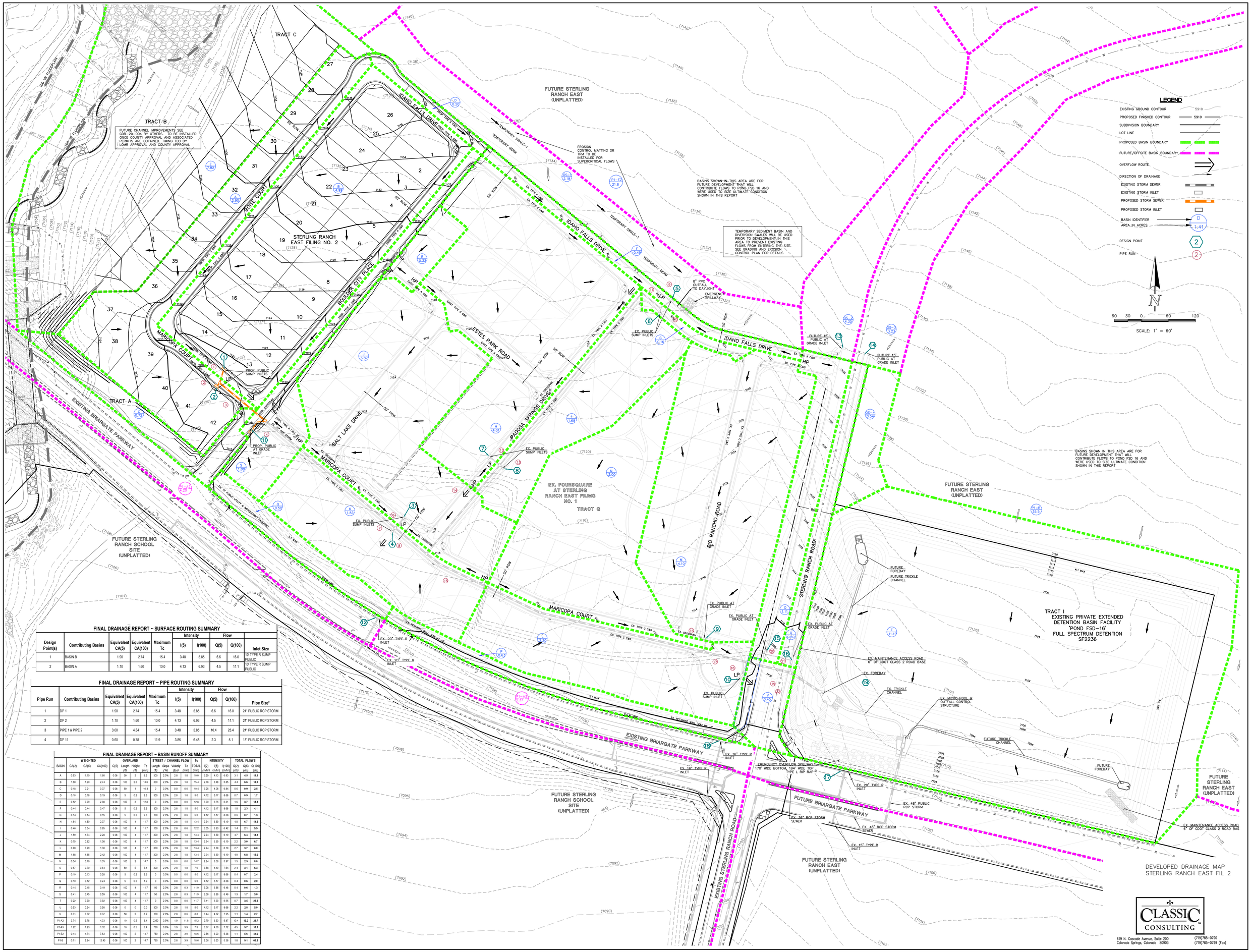
BASIN	WEIGHTED CA(5)	WEIGHTED CA(100)	OVERLAND C(5)	OVERLAND Length (ft)	OVERLAND Height (ft)	OVERLAND Tc (min)	STREET / CHANNEL FLOW Length (ft)	STREET / CHANNEL FLOW Slope (%)	STREET / CHANNEL FLOW Velocity (fps)	STREET / CHANNEL FLOW Tc (min)	Tc TOTAL (min)	INTENSITY I(5) (in/hr)	INTENSITY I(100) (in/hr)	TOTAL FLOWS Q(5) (cfs)	TOTAL FLOWS Q(10) (cfs)	TOTAL FLOWS Q(100) (cfs)
A	0.63	1.16	1.00	0.08	50	2	8.2	300	3.0%	2.8	1.8	10.3	3.29	4.13	5.65	11.7
B	1.90	1.90	2.74	0.08	50	2.5	13.6	300	2.0%	2.8	1.8	15.4	2.79	3.48	5.45	4.4	16.0
C	0.18	0.21	0.37	0.08	50	1	10.4	0	0.0%	0.0	0.0	10.4	3.25	4.06	6.54	0.6	0.9	2.5
D	0.18	0.18	0.19	0.08	5	0.2	2.6	300	2.0%	2.8	1.8	5.5	4.12	5.17	8.68	0.7	0.9	1.7
E	0.52	0.99	2.98	0.08	100	3	12.8	0	0.0%	0.0	0.0	12.8	3.00	3.76	6.31	1.6	3.7	10.8
F	0.44	0.44	0.47	0.08	5	0.2	2.6	300	2.0%	2.8	1.8	5.0	4.12	5.17	8.68	1.8	2.3	4.1
G	0.14	0.14	0.15	0.08	5	0.2	2.6	100	2.0%	2.8	0.6	5.0	4.12	5.17	8.68	0.6	0.7	1.3
H	1.64	1.80	2.37	0.08	100	4	11.7	300	2.0%	2.8	1.8	13.4	2.94	3.69	6.19	4.8	6.7	14.8
I	0.46	0.54	0.65	0.08	100	4	11.7	100	2.0%	2.8	0.6	12.2	3.05	3.83	6.42	1.4	2.1	5.5
J	1.59	1.74	2.28	0.08	100	4	11.7	300	2.0%	2.8	1.8	13.4	2.94	3.69	6.19	4.7	6.4	14.1
K	0.75	0.82	1.08	0.08	100	4	11.7	300	2.0%	2.8	1.8	13.4	2.94	3.69	6.19	2.2	3.0	6.7
L	0.90	0.99	1.30	0.08	100	4	11.7	300	2.0%	2.8	1.8	13.4	2.94	3.69	6.19	2.7	3.7	8.0
M	1.66	1.85	2.42	0.08	100	4	11.7	300	2.0%	2.8	1.8	13.4	2.94	3.69	6.19	4.9	6.8	15.0
N	0.54	0.70	1.35	0.08	100	2	14.7	0	0.0%	0.0	0.0	14.7	2.84	3.56	5.97	1.5	2.5	8.0
O	0.67	0.70	0.84	0.08	50	5	6.1	300	2.0%	2.8	1.8	7.9	3.58	4.48	7.54	2.4	3.1	6.3
P	0.10	0.13	0.28	0.08	5	0.2	2.6	0	0.0%	0.0	0.0	5.0	4.12	5.17	8.68	0.4	0.7	2.4
Q	0.10	0.12	0.24	0.08	5	0.5	1.9	0	0.0%	0.0	0.0	5.0	4.12	5.17	8.68	0.4	0.6	2.0
R	0.14	0.15	0.19	0.08	100	4	11.7	50	2.0%	2.8	0.3	11.9	3.08	3.86	6.48	0.4	0.6	1.3
S	0.22	0.40	0.53	0.08	100	4	11.7	50	2.0%	2.8	0.3	11.9	3.08	3.86	6.48	0.8	1.3	3.4
T	0.22	0.90	3.92	0.08	100	4	11.7	0	2.0%	0.0	0.0	11.7	3.11	3.90	6.55	0.7	3.5	25.6
U	0.53	0.54	0.58	0.08	0	0	0.0	300	2.0%	2.8	1.8	5.0	4.12	5.17	8.68	2.2	2.8	5.0
V	0.31	0.32	0.37	0.08	50	2	8.2	100	2.0%	2.8	0.6	8.8	3.44	4.32	7.25	1.1	1.4	2.7
P1-A2	3.74	3.78	4.03	0.08	10	0.5	3.4	2350	0.9%	1.9	11.8	15.2	2.79	3.50	5.87	10.4	13.2	23.7
P1-A3	1.22	1.23	1.32	0.08	10	0.5	3.4	760	0.9%	1.9	3.9	7.3	3.67	4.60	7.72	4.5	5.7	10.5
OS-1	0.50	0.85	1.09	0.08	100	2	14.7	0	0.0%	0.0	0.0	14.7	2.84	3.56	5.97	1.4	2.3	6.5
OS-2	1.00	1.31	2.19	0.08	50	2	8.2	300	2.0%	2.8	1.8	10.0	3.29	4.13	6.93	3	5	15
OS-3	0.74	0.97	1.62	0.08	50	2	8.2	300	2.0%	2.8	1.8	10.0	3.29	4.13	6.93	2	4	11
OS-4	0.12	0.16	0.27	0.08	50	2	8.2	0	0.0%	0.0	0.0	8.2	3.53	4.42	7.42	0	1	2

FINAL DRAINAGE REPORT - SURFACE ROUTING SUMMARY

Design Point(s)	Contributing Basins	Equivalent CA(5)	Equivalent CA(100)	Maximum Tc	Intensity I(5)	Intensity I(100)	Flow Q(5)	Flow Q(100)	Inlet Size
1	BASIN B	1.90	2.74	15.4	3.48	5.85	6.6	16.0	10' TYPE R SUMP PUBLIC
2	BASIN A	1.10	1.60	10.0	4.13	6.93	4.5	11.1	10' TYPE R SUMP PUBLIC
3	BASIN J	1.74	2.28	13.4	3.69	6.19	6.4	14.1	10' TYPE R SUMP PUBLIC
4	BASIN K	0.82	1.08	13.4	3.69	6.19	3.0	6.7	2' TYPE R SUMP PUBLIC
5	BASIN C, BASIN F & BASIN OS	1.28	1.75	14.7	3.56	5.97	4.5	10.5	10' TYPE R SUMP PUBLIC
6	BASIN G	0.14	0.15	5.0	5.17	8.68	0.7	1.3	5' TYPE R SUMP PUBLIC
7	BASIN H	1.80	2.37	13.4	3.69	6.19	6.7	14.6	10' TYPE R SUMP PUBLIC
8	BASIN I	0.54	0.85	12.2	3.83	6.42	2.1	5.5	5' TYPE R SUMP PUBLIC
9	BASIN M & BASIN N	2.54	3.76	14.7	3.56	5.97	9.0	22.5	15' TYPE R AT GRADE PUBLIC
10	BASIN L & FLOWBY DP 9	1.21	2.70	14.7	3.56	5.97	4.3	16.1	10' TYPE R SUMP PUBLIC
11	BASIN R & S	0.60	0.78	11.9	3.86	6.48	2.3	5.1	10' TYPE R AT GRADE PUBLIC
12	BASIN P1-A2, BASIN C & BASIN Q	4.12	4.64	15.2	3.50	5.87	14.4	27.2	EX 20' TYPE R AT GRADE PUBLIC
13	BASIN OS-2	1.31	2.18	10.0	4.13	6.93	5.4	15.1	FUTURE 10' TYPE R AT GRADE PUBLIC
14	BASIN OS-3	0.97	1.62	10.0	4.13	6.93	4.0	11.2	FUTURE 15' TYPE R AT GRADE PUBLIC
15	BASIN O & FLOWBY DP 13	0.70	1.46	10.0	4.13	6.93	2.9	10.1	15' TYPE R AT GRADE PUBLIC
16	BASIN U, OS-4, & FLOWBY DP 14	0.70	1.16	10.0	4.13	6.93	2.9	8.0	15' TYPE R AT GRADE PUBLIC
17	BASIN V & FLOWBY DP 15 & 16	0.32	0.61	10.0	4.13	6.93	1.3	4.2	EXISTING 20' TYPE R SUMP PUBLIC
18	BASIN P1-A3 & BASIN P	1.37	1.60	5.0	5.17	8.68	7.1	13.9	EXISTING 20' TYPE R AT GRADE PUBLIC
19	BASIN T, BASIN P1-B (INTERIM) & PIPE 22	18.71	37.60	18.6	3.20	5.38	60	202	POND IN

DEVELOPED DRAINAGE MAP
FOURSQUARE AT STERLING RANCH
FILING NO. 1

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



FINAL DRAINAGE REPORT ~ SURFACE ROUTING SUMMARY

Design Point(s)	Contributing Basins	Equivalent CA(5)	Equivalent CA(100)	Maximum Tc	Intensity I(5)	Intensity I(100)	Flow Q(5)	Flow Q(100)	Inlet Size
1	BASIN B	1.90	2.74	15.4	3.48	5.85	6.6	16.0	10' TYPE R SUMP PUBLIC
2	BASIN A	1.10	1.60	10.0	4.13	6.93	4.5	11.1	10' TYPE R SUMP PUBLIC

FINAL DRAINAGE REPORT ~ PIPE ROUTING SUMMARY

Pipe Run	Contributing Basins	Equivalent CA(5)	Equivalent CA(100)	Maximum Tc	Intensity I(5)	Intensity I(100)	Flow Q(5)	Flow Q(100)	Pipe Size*
1	DP 1	1.90	2.74	15.4	3.48	5.85	6.6	16.0	24" PUBLIC RCP STORM
2	DP 2	1.10	1.60	10.0	4.13	6.93	4.5	11.1	24" PUBLIC RCP STORM
3	PIPE 1 & PIPE 2	3.00	4.34	15.4	3.48	5.85	10.4	25.4	24" PUBLIC RCP STORM
4	DP 11	0.60	0.78	11.9	3.86	6.48	2.3	5.1	18" PUBLIC RCP STORM

FINAL DRAINAGE REPORT ~ BASIN RUNOFF SUMMARY

BASIN	WEIGHTED CA(2)	WEIGHTED CA(5)	WEIGHTED CA(100)	OVERLAND C(5)	OVERLAND Length (ft)	OVERLAND Height (ft)	OVERLAND Tc (min)	STREET / CHANNEL FLOW Length (ft)	STREET / CHANNEL FLOW Slope (%)	STREET / CHANNEL FLOW Velocity (fps)	STREET / CHANNEL FLOW Tc (min)	Tc TOTAL (min)	INTENSITY I(2) (in/hr)	INTENSITY I(5) (in/hr)	INTENSITY I(100) (in/hr)	TOTAL FLOWS Q(2) (cfs)	TOTAL FLOWS Q(5) (cfs)	TOTAL FLOWS Q(100) (cfs)
A	0.93	1.10	1.60	0.08	50	2	8.2	300	2.0%	2.8	1.8	10.0	3.29	4.13	6.93	3.1	**4.5**	**11.1**
B	1.60	1.90	2.74	0.08	100	2.5	13.6	300	2.0%	2.8	1.8	15.4	2.78	3.48	5.85	4.4	**6.6**	**16.0**
C	0.18	0.21	0.37	0.08	50	1	10.4	0	0.0%	0.0	0.0	10.4	3.25	4.08	6.84	0.6	**0.9**	**2.5**
D	0.18	0.18	0.19	0.08	5	0.2	2.6	300	2.0%	2.8	1.8	5.0	4.12	5.17	8.68	0.7	**0.9**	**1.7**
E	0.52	0.99	2.98	0.08	100	3	12.8	0	0.0%	0.0	0.0	12.8	3.00	3.76	6.31	1.6	**3.7**	**18.8**
F	0.44	0.44	0.47	0.08	5	0.2	2.6	300	2.0%	2.8	1.8	5.0	4.12	5.17	8.68	1.8	**2.3**	**4.1**
G	0.14	0.14	0.15	0.08	5	0.2	2.6	100	2.0%	2.8	0.6	5.0	4.12	5.17	8.68	0.6	**0.7**	**1.3**
H	1.64	1.80	2.37	0.08	100	4	11.7	300	2.0%	2.8	1.8	13.4	2.94	3.69	6.19	4.8	**6.7**	**14.6**
I	0.46	0.54	0.85	0.08	100	4	11.7	100	2.0%	2.8	0.6	12.2	3.05	3.83	6.42	1.4	**2.1**	**5.5**
J	1.59	1.74	2.28	0.08	100	4	11.7	300	2.0%	2.8	1.8	13.4	2.94	3.69	6.19	4.7	**6.4**	**14.1**
K	0.75	0.82	1.08	0.08	100	4	11.7	300	2.0%	2.8	1.8	13.4	2.94	3.69	6.19	2.2	**3.0**	**6.7**
L	0.90	0.99	1.30	0.08	100	4	11.7	300	2.0%	2.8	1.8	13.4	2.94	3.69	6.19	2.7	**3.7**	**8.0**
M	1.68	1.85	2.42	0.08	100	4	11.7	300	2.0%	2.8	1.8	13.4	2.94	3.69	6.19	4.9	**6.8**	**15.0**
N	0.54	0.70	1.35	0.08	100	2	14.7	0	0.0%	0.0	0.0	14.7	2.84	3.56	5.97	1.5	**2.5**	**8.0**
O	0.67	0.70	0.84	0.08	50	5	6.1	300	2.0%	2.8	1.8	7.9	3.58	4.49	7.54	2.4	**3.1**	**6.3**
P	0.10	0.13	0.28	0.08	5	0.2	2.6	0	0.0%	0.0	0.0	5.0	4.12	5.17	8.68	0.4	**0.7**	**2.4**
Q	0.10	0.12	0.24	0.08	5	0.5	1.9	0	0.0%	0.0	0.0	5.0	4.12	5.17	8.68	0.4	**0.6**	**2.0**
R	0.14	0.15	0.19	0.08	100	4	11.7	50	2.0%	2.8	0.3	11.9	3.08	3.86	6.48	0.4	**0.6**	**1.3**
S	0.41	0.45	0.59	0.08	100	4	11.7	50	2.0%	2.8	0.3	11.9	3.08	3.86	6.48	1.3	**1.7**	**3.8**
T	0.22	0.90	3.92	0.08	100	4	11.7	0	2.0%	0.0	0.0	11.7	3.11	3.90	6.55	0.7	**3.5**	**25.6**
U	0.53	0.54	0.56	0.08	0	0	0.0	300	2.0%	2.8	1.8	5.0	4.12	5.17	8.68	2.2	**2.8**	**5.0**
V	0.31	0.32	0.37	0.08	50	2	8.2	100	2.0%	2.8	0.6	8.8	3.44	4.32	7.25	1.1	**1.4**	**2.7**
P1-A2	3.74	3.78	4.03	0.08	10	0.5	3.4	2260	0.9%	1.9	11.8	15.2	2.79	3.50	5.87	10.4	**13.2**	**23.7**
P1-A3	1.22	1.23	1.32	0.08	10	0.5	3.4	780	0.9%	1.9	3.9	7.3	3.67	4.60	7.72	4.5	**5.7**	**10.1**
P1-E2	0.44	1.74	7.63	0.08	100	2	14.7	780	2.0%	2.8	3.9	18.6	2.56	3.20	5.38	1.1	**5.6**	**41.0**
P1-B	0.71	2.84	12.43	0.08	100	2	14.7	780	2.0%	2.8	3.9	18.6	2.56	3.20	5.38	1.8	**9.1**	**66.8**

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DRAINAGE MAPS

CLASSIC SM
CONSULTING
ENGINEERS & SURVEYORS

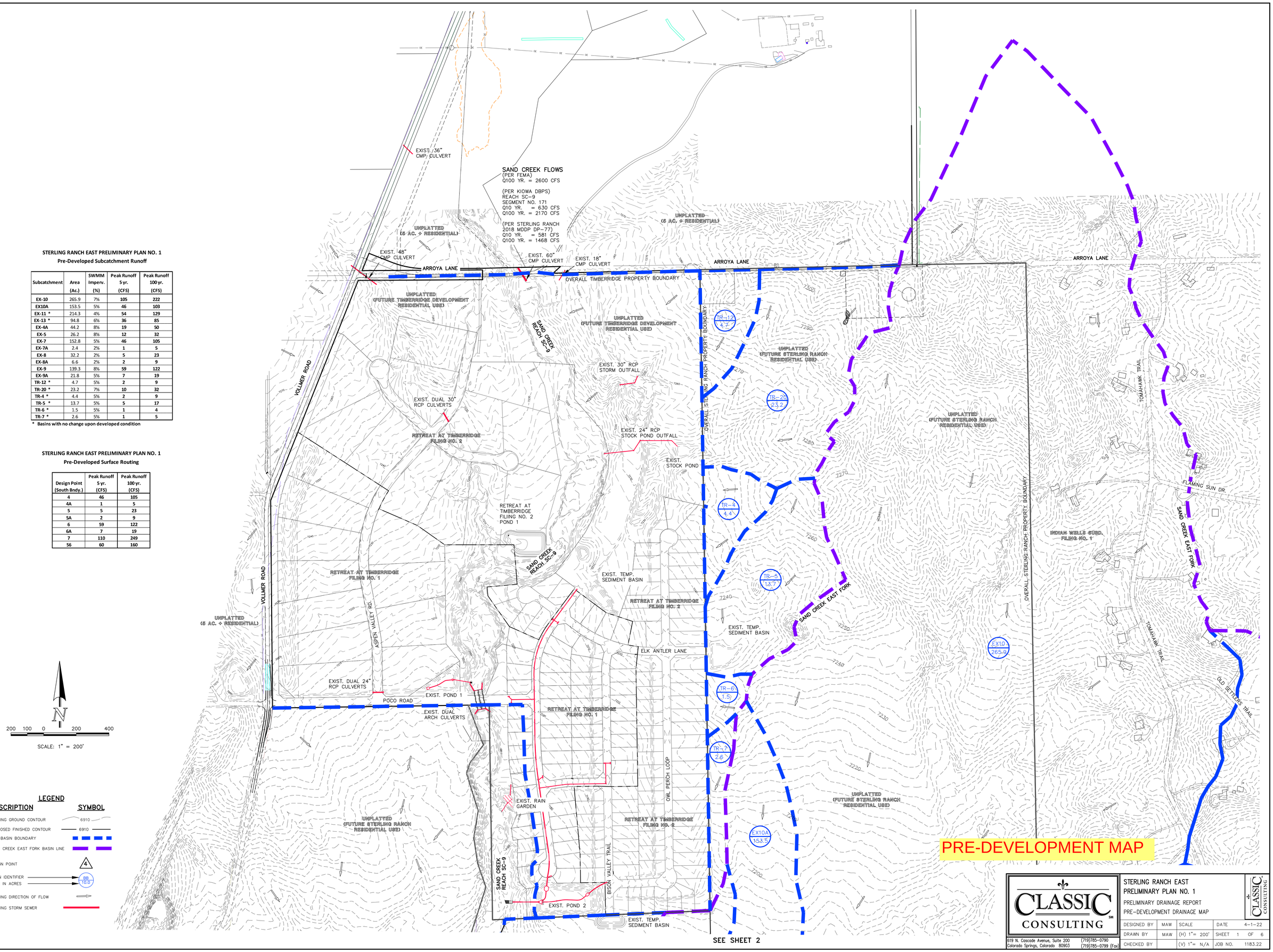
STERLING RANCH EAST PRELIMINARY PLAN NO. 1
Pre-Developed Subcatchment Runoff

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



200 100 0 200 400

SCALE: 1" = 200'

LEGEND

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

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

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

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SEE SHEET 1

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

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

SAND CREEK REACH SC-10
BISON VALLEY
EXIST. POND 2
EXIST. TEMP. SEDIMENT BASIN
HOMESTEAD NORTH PLATTED BOUNDARY
(HOMESTEAD NORTH AT STERLING RANCH RESIDENTIAL USE)
VOLLMER ROAD
CLASSIC OWNERSHIP BOUNDARY
SAND CREEK REACH SC-9
EX-5 26.2
BRIARGATE BLVD. (130' ROW)
REFERENCE SAND CREEK CHANNEL IMPROVEMENTS PROPOSED WITH HOMESTEAD NORTH AT STERLING RANCH FIL.NO. 1 PREPARED BY JR ENG. (PCD NO. SF-22-013)
UNPLATTED (FUTURE STERLING RANCH RESIDENTIAL USE)
SAND CREEK EAST FORK
EX-7 152.8
EX-9 139.3
EX-4A 44.2
HOMESTEAD AT STERLING RANCH FILING NO. 2
HOMESTEAD AT STERLING RANCH FILING NO. 1
SAND CREEK REACH SC-8
CLASSIC OWNERSHIP BOUNDARY
REFERENCE SAND CREEK CHANNEL IMPROVEMENTS PROPOSED WITH HOMESTEAD NORTH AT STERLING RANCH FIL.NO. 1 PREPARED BY JR ENG. (PCD NO. SF-22-013)
UNPLATTED (FUTURE STERLING RANCH RESIDENTIAL USE)
BRANDING IRON AT STERLING RANCH FILING NO. 2
STERLING RANCH RD. (80' ROW)
SITE
EX10A 153.5
EX-11 214.3
EX10 265.9
EX-13 94.8
INDIAN WELLS SUBD. FILING NO. 1
TOMAHAWK TRAIL
STAPLETON ROAD
BOW VALLEY SUBD.
UNPLATTED (FUTURE STERLING RANCH RESIDENTIAL USE)
OVERALL STERLING RANCH PROPERTY BOUNDARY
UNPLATTED ELITE PROPERTIES OF AMERICA, INC. (CLASSIC HOMES)
UNPLATTED BUFORD/BENNETT
UNPLATTED (FUTURE STERLING RANCH RESIDENTIAL USE)

PRE-DEVELOPMENT MAP

SEE SHEET 3

N

200 100 0 200 400

SCALE: 1" = 200'

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

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

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MATCH LINE SEE SHEET 3

PRELIMINARY DRAINAGE REPORT ~ SURFACE ROUTING SUMMARY

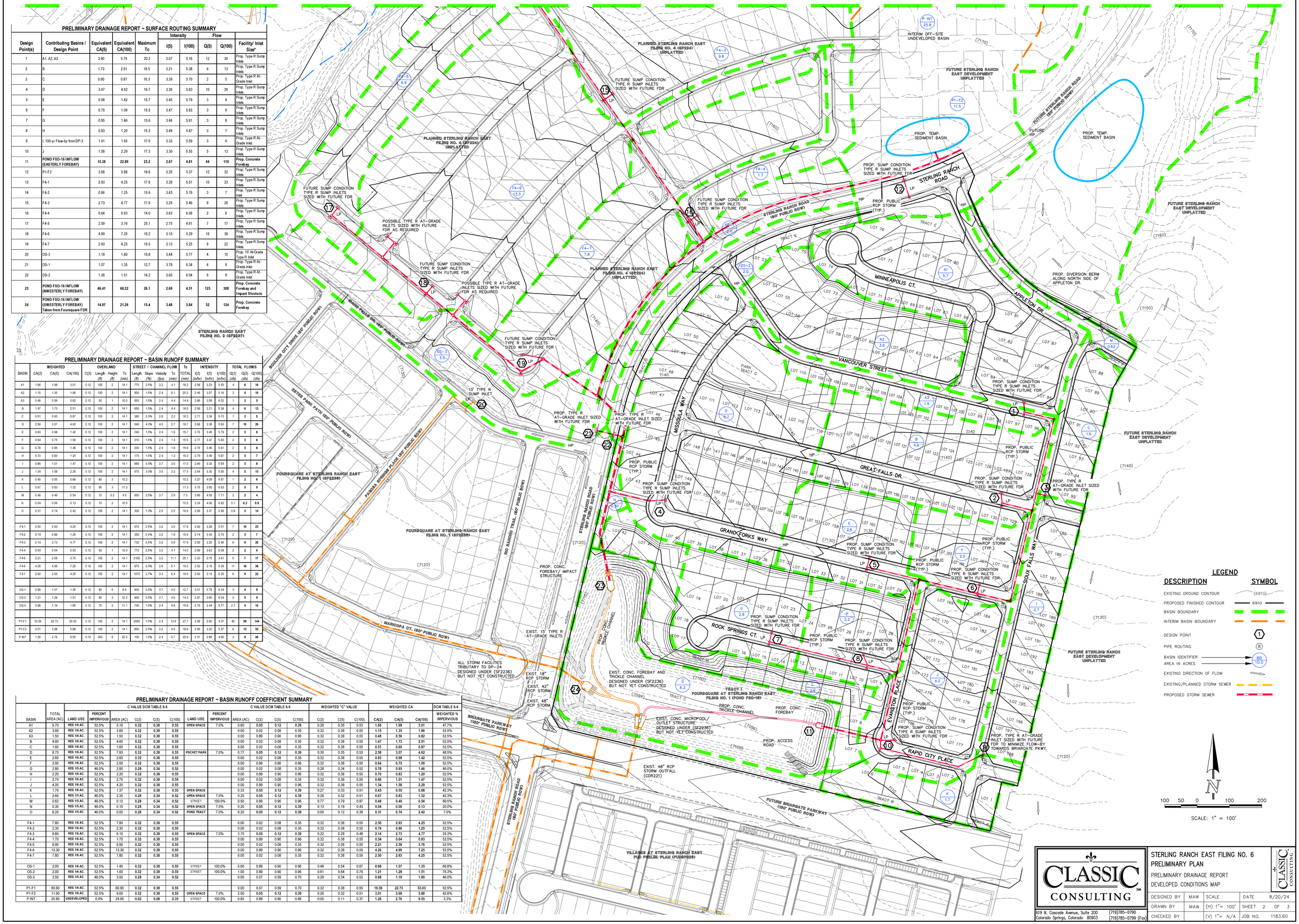
Design Point(s)	Contributing Basins / Design Point	Equivalent CA(5)	Equivalent CA(100)	Maximum Tc	Intensity I(5)	Intensity I(100)	Flow Q(5)	Flow Q(100)	Facility/ Inlet Size*
1	A1, A2, A3	3.90	5.79	20.2	3.07	5.16	12	30	Prop. Type R Sump Inlets
2	B	1.73	2.51	18.5	3.21	5.38	6	13	Prop. Type R Sump Inlets
3	C	0.60	0.87	16.3	3.39	5.70	2	5	Prop. Type R At-Grade Inlet
4	D	3.07	4.62	16.7	3.36	5.63	10	26	Prop. Type R Sump Inlets
5	E	0.98	1.42	15.7	3.45	5.79	3	8	Prop. Type R Sump Inlets
6	F	0.75	1.09	15.5	3.47	5.83	3	6	Prop. Type R Sump Inlets
7	G	0.95	1.46	15.6	3.46	5.81	3	8	Prop. Type R Sump Inlets
8	H	0.83	1.20	15.3	3.49	5.87	3	7	Prop. Type R Sump Inlets
9	I, 100-yr Flow-by from DP-3	1.01	1.65	17.0	3.33	5.59	3	9	Prop. Type R At-Grade Inlet
10	J	1.58	2.29	17.3	3.30	5.55	5	13	Prop. Type R Sump Inlets
11	POND FSD-16 INFLOW (EASTERLY FOREBAY)	**15.38**	**22.89**	**23.2**	**2.87**	**4.81**	**44**	**110**	**Prop. Concrete Forebay**
12	P1-F2	3.68	5.88	18.6	3.20	5.37	12	32	Prop. Type R Sump Inlets
13	F4-1	2.93	4.25	17.6	3.28	5.51	10	23	Prop. Type R Sump Inlets
14	F4-2	0.86	1.25	15.9	3.43	5.76	3	7	Prop. Type R Sump Inlet
15	F4-3	2.73	4.77	17.9	3.25	5.46	9	26	Prop. Type R Sump Inlets
16	F4-4	0.64	0.93	14.0	3.62	6.08	2	6	Prop. Type R Sump Inlets
17	F4-5	2.59	3.76	25.1	2.75	4.61	7	17	Prop. Type R Sump Inlets
18	F4-6	4.99	7.25	19.2	3.15	5.29	16	38	Prop. Type R Sump Inlets
19	F4-7	2.93	4.25	19.5	3.13	5.25	9	22	Prop. Type R Sump Inlets
20	OS-3	1.19	1.80	15.8	3.44	5.77	4	10	Prop. 10' At-Grade Type R Inlet
21	OS-1	1.07	1.35	12.7	3.78	6.34	4	9	Prop. Type R At-Grade Inlet
22	OS-2	1.28	1.51	14.2	3.60	6.04	5	9	Prop. Type R At-Grade Inlet
23	**POND FSD-16 INFLOW (NWESTERLY FOREBAY)**	**46.41**	**68.22**	**26.1**	**2.69**	**4.51**	**125**	**308**	**Prop. Concrete Forebay and Impact Stucture**
24	**POND FSD-16 INFLOW (SWESTERLY FOREBAY) Taken from Foursquare FDR**	**14.97**	**21.26**	**15.4**	**3.48**	**5.84**	**52**	**124**	**Prop. Concrete Forebay**

PRELIMINARY DRAINAGE REPORT ~ BASIN RUNOFF SUMMARY

BASIN	WEIGHTED CA(2)	WEIGHTED CA(5)	WEIGHTED CA(100)	OVERLAND C(5)	OVERLAND Length (ft)	OVERLAND Height (ft)	OVERLAND Tc (min)	STREET / CHANNEL FLOW Length (ft)	STREET / CHANNEL FLOW Slope (%)	STREET / CHANNEL FLOW Velocity (fps)	STREET / CHANNEL FLOW Tc (min)	Tc TOTAL (min)	INTENSITY I(2) (in/hr)	INTENSITY I(5) (in/hr)	INTENSITY I(100) (in/hr)	TOTAL FLOWS Q(2) (cfs)	TOTAL FLOWS Q(5) (cfs)	TOTAL FLOWS Q(100) (cfs)
A1	1.66	1.98	3.01	0.12	100	2	14.1	775	2.5%	3.2	4.1	18.2	2.56	3.23	5.43	4	**6**	**16**
A2	1.15	1.35	1.96	0.12	100	2	14.1	900	1.5%	2.4	6.1	20.2	2.46	3.07	5.16	3	**4**	**10**
A3	0.48	0.56	0.82	0.12	50	1	10.0	650	1.5%	2.4	4.4	14.4	2.86	3.58	6.02	1	**2**	**5**
B	1.47	1.73	2.51	0.12	100	2	14.1	650	1.5%	2.4	4.4	18.5	2.56	3.21	5.38	4	**6**	**13**
C	0.51	0.60	0.87	0.12	100	2	14.1	380	2.0%	2.8	2.2	16.3	2.71	3.39	5.70	1	**2**	**5**
D	2.58	3.07	4.62	0.12	100	2	14.1	640	4.0%	4.0	2.7	16.7	2.68	3.36	5.63	7	**10**	**26**
E	0.83	0.98	1.42	0.12	100	2	14.1	240	1.5%	2.4	1.6	15.7	2.76	3.45	5.79	2	**3**	**8**
F	0.64	0.75	1.09	0.12	100	2	14.1	210	1.5%	2.4	1.4	15.5	2.77	3.47	5.83	2	**3**	**6**
G	0.78	0.95	1.46	0.12	100	2	14.1	230	1.5%	2.4	1.6	15.6	2.76	3.46	5.81	2	**3**	**8**
H	0.70	0.83	1.20	0.12	100	2	14.1	175	1.5%	2.4	1.2	15.3	2.78	3.49	5.87	2	**3**	**7**
I	0.86	1.01	1.47	0.12	100	2	14.1	665	3.5%	3.7	3.0	17.0	2.66	3.33	5.59	2	**3**	**8**
J	1.34	1.58	2.29	0.12	100	2	14.1	675	3.0%	3.5	3.2	17.3	2.64	3.30	5.55	4	**5**	**13**
K	0.45	0.55	0.88	0.12	80	3	10.2					10.2	3.27	4.09	6.87	1	**2**	**6**
L	0.67	0.83	1.32	0.12	90	3	11.3					11.3	3.15	3.95	6.63	2	**3**	**9**
M	0.48	0.49	0.54	0.12	10	0.2	4.5	650	3.5%	3.7	2.9	7.3	3.66	4.59	7.71	2	**2**	**4**
N	0.04	0.06	0.13	0.12	70	2	10.5					10.5	3.24	4.06	6.82	0.1	**0.2**	**0.9**
O	0.31	0.74	2.42	0.12	100	2	14.1	300	1.0%	2.0	2.5	16.6	2.69	3.37	5.66	0.8	**3**	**14**
F4-1	2.50	2.93	4.25	0.12	100	2	14.1	670	2.5%	3.2	3.5	17.6	2.62	3.28	5.51	7	**10**	**23**
F4-2	0.74	0.86	1.25	0.12	100	2	14.1	350	2.5%	3.2	1.8	15.9	2.74	3.43	5.76	2	**3**	**7**
F4-3	2.14	2.73	4.77	0.12	100	2	14.1	730	2.5%	3.2	3.8	17.9	2.60	3.25	5.46	6	**9**	**26**
F4-4	0.54	0.64	0.93	0.12	50	1	10.0	770	2.5%	3.2	4.1	14.0	2.89	3.62	6.08	2	**2**	**6**
F4-5	2.21	2.59	3.76	0.12	100	2	14.1	2100	2.5%	3.2	11.1	25.1	2.20	2.75	4.61	5	**7**	**17**
F4-6	4.26	4.99	7.25	0.12	100	2	14.1	870	2.0%	2.8	5.1	19.2	2.52	3.15	5.29	11	**16**	**38**
F4-7	2.50	2.93	4.25	0.12	100	2	14.1	1070	2.7%	3.3	5.4	19.5	2.50	3.13	5.25	6	**9**	**22**
OS-1	0.98	1.07	1.35	0.12	80	5	8.6	900	3.5%	3.7	4.0	12.7	3.01	3.78	6.34	3	**4**	**9**
OS-2	1.21	1.28	1.51	0.12	80	3	10.2	900	3.5%	3.7	4.0	14.2	2.87	3.60	6.04	3	**5**	**9**
OS-3	0.98	1.19	1.80	0.12	75	2	11.1	700	1.5%	2.4	4.8	15.8	2.75	3.44	5.77	2.7	**4**	**10**
P1-F1	19.39	22.73	33.03	0.12	100	2	14.1	2000	1.5%	2.4	13.6	27.7	2.08	2.60	4.37	40	**59**	**144**
P1-F2	3.01	3.68	5.88	0.12	100	2	14.1	850	2.5%	3.2	4.5	18.6	2.56	3.20	5.37	8	**12**	**32**
P INT	1.26	2.76	9.55	0.12	300	8	22.2	100	1.5%	2.4	0.7	22.9	2.31	2.89	4.85	3	**8**	**46**

PRELIMINARY DRAINAGE REPORT ~ BASIN RUNOFF COEFFICIENT SUMMARY

BASIN	TOTAL AREA (AC)	C VALUE DCM TABLE 6-6 LAND USE	C VALUE DCM TABLE 6-6 PERCENT IMPERVIOUS	C VALUE DCM TABLE 6-6 AREA (AC)	C VALUE DCM TABLE 6-6 C(2)	C VALUE DCM TABLE 6-6 C(5)	C VALUE DCM TABLE 6-6 C(100)	C VALUE DCM TABLE 6-6 LAND USE	C VALUE DCM TABLE 6-6 PERCENT IMPERVIOUS	C VALUE DCM TABLE 6-6 AREA (AC)	C VALUE DCM TABLE 6-6 C(2)	C VALUE DCM TABLE 6-6 C(5)	C VALUE DCM TABLE 6-6 C(100)	WEIGHTED "C" VALUE C(2)	WEIGHTED "C" VALUE C(5)	WEIGHTED "C" VALUE C(100)	WEIGHTED CA CA(2)	WEIGHTED CA CA(5)	WEIGHTED CA CA(100)	DCM TABLE 6-6 WEIGHTED % IMPERVIOUS
A1	5.70	RES 1/8 AC.	52.5%	5.10	**0.32**	**0.38**	**0.55**	OPEN SPACE	7.0%	0.60	0.05	0.12	0.39	0.29	0.35	0.53	**1.66**	**1.98**	**3.01**	47.7%
A2	3.60	RES 1/8 AC.	52.5%	3.60	**0.32**	**0.38**	**0.55**			0.00	0.02	0.08	0.35	0.32	0.38	0.55	**1.15**	**1.35**	**1.96**	52.5%
A3	1.50	RES 1/8 AC.	52.5%	1.50	**0.32**	**0.38**	**0.55**			0.00	0.89	0.90	0.96	0.32	0.38	0.55	**0.48**	**0.56**	**0.82**	52.5%
B	4.60	RES 1/8 AC.	52.5%	4.60	**0.32**	**0.38**	**0.55**			0.00	0.02	0.08	0.35	0.32	0.38	0.55	**1.47**	**1.73**	**2.51**	52.5%
C	1.60	RES 1/8 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%
D	8.70	RES 1/8 AC.	52.5%	7.93	**0.32**	**0.38**	**0.55**	POCKET PARK	7.0%	0.77	0.05	0.12	0.39	0.30	0.35	0.53	**2.58**	**3.07**	**4.62**	48.5%
E	2.60	RES 1/8 AC.	52.5%	2.60	**0.32**	**0.38**	**0.55**			0.00	0.02	0.08	0.35	0.32	0.38	0.55	**0.83**	**0.98**	**1.42**	52.5%
F	2.00	RES 1/8 AC.	52.5%	2.00	**0.32**	**0.38**	**0.55**			0.00	0.89	0.90	0.96	0.32	0.38	0.55	**0.64**	**0.75**	**1.09**	52.5%
G	2.80	RES 1/5 AC.	46.0%	2.80	**0.28**	**0.34**	**0.52**			0.00	0.02	0.08	0.35	0.28	0.34	0.52	**0.78**	**0.95**	**1.46**	46.0%
H	2.20	RES 1/8 AC.	52.5%	2.20	**0.32**	**0.38**	**0.55**			0.00	0.89	0.90	0.96	0.32	0.38	0.55	**0.70**	**0.83**	**1.20**	52.5%
I	2.70	RES 1/8 AC.	52.5%	2.70	**0.32**	**0.38**	**0.55**			0.00	0.02	0.08	0.35	0.32	0.38	0.55	**0.86**	**1.01**	**1.47**	52.5%
J	4.20	RES 1/8 AC.	52.5%	4.20	**0.32**	**0.38**	**0.55**			0.00	0.89	0.90	0.96	0.32	0.38	0.55	**1.34**	**1.58**	**2.29**	52.5%
K	1.70	RES 1/8 AC.	52.5%	1.37	**0.32**	**0.38**	**0.55**	OPEN SPACE		0.33	0.05	0.12	0.39	0.27	0.33	0.51	**0.45**	**0.55**	**0.88**	42.3%
L	2.60	RES 1/5 AC.	46.0%	2.35	**0.28**	**0.34**	**0.52**	OPEN SPACE	7.0%	0.25	0.05	0.12	0.39	0.26	0.32	0.51	**0.67**	**0.83**	**1.32**	42.3%
M	0.62	RES 1/5 AC.	46.0%	0.12	**0.28**	**0.34**	**0.52**	STREET	100.0%	0.50	0.89	0.90	0.96	0.77	0.79	0.87	**0.48**	**0.49**	**0.54**	89.5%
N	0.30	RES 1/5 AC.	46.0%	0.10	**0.28**	**0.34**	**0.52**	OPEN SPACE	7.0%	0.20	0.05	0.12	0.39	0.13	0.19	0.43	**0.04**	**0.06**	**0.13**	20.0%
O	6.20	RES 1/5 AC.	46.0%	0.00	**0.28**	**0.34**	**0.52**	POND TRACT	7.0%	6.20	0.05	0.12	0.39	0.05	0.12	0.39	**0.31**	**0.74**	**2.42**	7.0%
F4-1	7.80	RES 1/8 AC.	52.5%	7.80	**0.32**	**0.38**	**0.55**			0.00	0.02	0.08	0.35	0.32	0.38	0.55	**2.50**	**2.93**	**4.25**	52.5%
F4-2	2.30	RES 1/8 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%
F4-3	9.80	RES 1/8 AC.	52.5%	6.10	**0.32**	**0.38**	**0.55**	OPEN SPACE	7.0%	3.70	0.05	0.12	0.39	0.22	0.28	0.49	**2.14**	**2.73**	**4.77**	35.3%
F4-4	1.70	RES 1/8 AC.	52.5%	1.70	**0.32**	**0.38**	**0.55**			0.00	0.89	0.90	0.96	0.32	0.38	0.55	**0.54**	**0.64**	**0.93**	52.5%
F4-5	6.90	RES 1/8 AC.	52.5%	6.90	**0.32**	**0.38**	**0.55**			0.00	0.02	0.08	0.35	0.32	0.38	0.55	**2.21**	**2.59**	**3.76**	52.5%
F4-6	13.30	RES 1/8 AC.	52.5%	13.30	**0.32**	**0.38**	**0.55**			0.00	0.89	0.90	0.96	0.32	0.38	0.55	**4.26**	**4.99**	**7.25**	52.5%
F4-7	7.80	RES 1/8 AC.	52.5%	7.80	**0.32**	**0.38**	**0.55**			0.00	0.02	0.08	0.35	0.32	0.38	0.55	**2.50**	**2.93**	**4.25**	52.5%
OS-1	2.00	RES 1/8 AC.	52.5%	1.40	**0.32**	**0.38**	**0.55**	STREET	100.0%	0.60	0.89	0.90	0.96	0.49	0.54	0.67	**0.98**	**1.07**	**1.35**	66.8%
OS-2	2.00	RES 1/8 AC.	52.5%	1.00	**0.32**	**0.38**	**0.55**	STREET	100.0%	1.00	0.89	0.90	0.96	0.61	0.64	0.76	**1.21**	**1.28**	**1.51**	76.3%
OS-3	3.50	RES 1/5 AC.	46.0%	3.50	**0.28**	**0.34**	**0.52**			0.00	0.57	0.59	0.70	0.28	0.34	0.52	**0.98**	**1.19**	**1.80**	46.0%
P1-F1	60.60	RES 1/8 AC.	52.5%	60.60	**0.32**	**0.38**	**0.55**			0.00	0.57	0.59	0.70	0.32	0.38	0.55	**19.39**	**22.73**	**33.03**	52.5%
P1-F2	11.50	RES 1/8 AC.	52.5%	9.00	**0.32**	**0.38**	**0.55**	OPEN SPACE	7.0%	2.50	0.05	0.12	0.39	0.26	0.32	0.51	**3.01**	**3.68**	**5.88**	42.6%
P INT	25.80	UNDEVELOPED	0.0%	24.95	**0.02**	**0.08**	**0.35**	STREET	100.0%	0.85	0.89	0.90	0.96	0.05	0.11	0.37	**1.26**	**2.76**	**9.55**	3.3%


P INT 25.8
INTERIM OFF-SITE UNDEVELOPED BASIN
FUTURE STERLING RANCH EAST DEVELOPMENT UNPLATTED
PLANNED STERLING RANCH EAST FILING NO. 4 (SF224) UNPLATTED
FUTURE STERLING RANCH ROAD (80' PUBLIC ROW)
PROP. TEMP. SEDIMENT BASIN
FUTURE HP
STERLING RANCH ROAD
PROP. PUBLIC RCP STORM (TYP.)
PROP. SUMP CONDITION TYPE R SUMP INLETS SIZED WITH FUTURE FDR
PROP. DIVERSION BERM ALONG NORTH SIDE OF APPLETON DR.
MINNEAPOLIS CT.
APPLETON DR.
VANCOUVER STREET
PARK TRACT G
MISSOULA WAY
GREAT FALLS DR.
GRAND FORKS WAY
SIOUX FALLS WAY
ROCK SPRINGS CT.
EVANSTON PLACE
RAPID CITY PLACE
PROP. TYPE R AT-GRADE INLET SIZED WITH FUTURE FDR
PROP. TYPE R AT-GRADE INLET SIZED WITH FUTURE FDR TO MINIMIZE FLOW-BY TOWARDS BRIARGATE PKWY.
FUTURE SUMP CONDITION TYPE R SUMP INLETS SIZED WITH FUTURE FDR
POSSIBLE TYPE R AT-GRADE INLETS SIZED WITH FUTURE FDR AS REQUIRED
STERLING RANCH EAST FILING NO. 2 (SF237)
BOULDER CITY DRIVE (60' PUBLIC ROW)
SISTER PARK PATH (60' PUBLIC ROW)
FOURSQUARE AT STERLING RANCH EAST FILING NO. 1 (SF238)
PASADA SPRINGS PLACE (60' PUBLIC ROW)
FOURSQUARE AT STERLING RANCH EAST FILING NO. 7 (SF239)
RIO RANCHO TRAIL (60' PUBLIC ROW)
STERLING RANCH ROAD (80' PUBLIC ROW)
MARICOPA CT. (60' PUBLIC ROW)
10' TYPE R SUMP INLET
PROP. CONC. FOREBAY/ IMPACT STRUCTURE
EXIST. 15' TYPE R AT-GRADE INLETS
PROP. CONC. TRICKLE CHANNEL
ALL STORM FACILITIES TRIBUTARY TO DP-24 DESIGNED UNDER (SF2236) BUT NOT YET CONSTRUCTED
EXIST. 18" RCP STORM
EXIST. 42" RCP STORM
EXIST. 48" RCP STORM
EXIST. CONC. FOREBAY AND TRICKLE CHANNEL DESIGNED UNDER (SF2236) BUT NOT YET CONSTRUCTED
TRACT I FOURSQUARE AT STERLING RANCH EAST FILING NO. 1 (POND FSD-16)
PROP. CONC. TRICKLE CHANNEL
PROP. CONC. FOREBAY
EXIST. CONC. MICROPOOL/ OUTLET STRUCTURE DESIGNED UNDER (SF2236) BUT NOT YET CONSTRUCTED
PROP. ACCESS ROAD
EXIST. 48" RCP STORM OUTFALL (CDR221)
BRIARGATE PARKWAY (130' PUBLIC ROW)
FUTURE BRIARGATE PARKWAY (130' PUBLIC ROW)
STERLING RANCH ROAD (80' PUBLIC ROW)
VILLAGES AT STERLING RANCH EAST PUD PRELIM. PLAN (PUDSP226)
FUTURE STERLING RANCH EAST DEVELOPMENT UNPLATTED
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TRACT B
TRACT C
TRACT E
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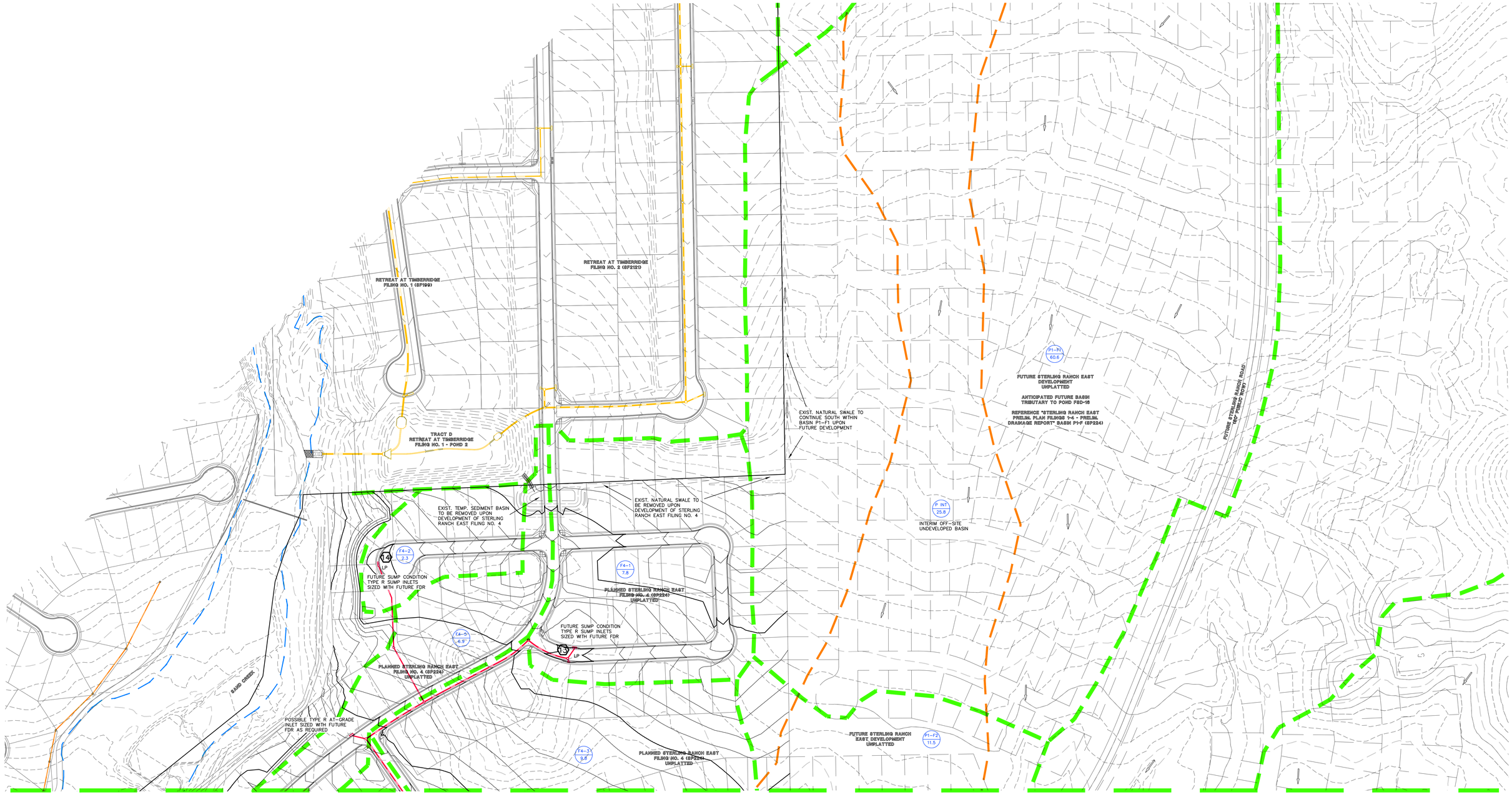

MATCH LINE SEE SHEET 2

LEGEND

DESCRIPTION	SYMBOL
EXISTING GROUND CONTOUR	(6910)
PROPOSED FINISHED CONTOUR	6910
BASIN BOUNDARY	
INTERIM BASIN BOUNDARY	
DESIGN POINT	1
PIPE ROUTING	8
BASIN IDENTIFIER / AREA IN ACRES	BB 10.0
EXISTING DIRECTION OF FLOW	
EXISTING/PLANNED STORM SEWER	
PROPOSED STORM SEWER	

N

100 50 0 100 200

SCALE: 1" = 100'

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

STERLING RANCH EAST FILING NO. 6
PRELIMINARY PLAN
PRELIMINARY DRAINAGE REPORT
OFF-SITE DEVELOPED CONDITIONS MAP

DESIGNED BY	MAW	SCALE		DATE	8/20/24
DRAWN BY	MAW	(H) 1"= 100'		SHEET	3 OF 3
CHECKED BY		(V) 1"= N/A		JOB NO.	1183.60

N:\1183\P\REPORTS\PDR\1183P0 DM.dwg, 10/1/2024 7:42:28 AM, 1:1