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

Prepared for:
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Job No. 1183.25

PCD Project No. SP235

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

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

COLORADO REGISTERED MARC ALAN WHORTON 37155 PROFESSIONAL ENGINEER

Marc A. Whorton Colorado P.E. #37155 — Date: 1/8/2024

**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: 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.

**By: Gilbert LaForce, P.E.**
**Engineering Manager**
**On behalf of the**
**ECM Administrator**
**Date: 01/18/2024 9:29:37 AM**
El Paso County Department of Public Works

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

Conditions:

CLASSIC CONSULTING ENGINEERS & SURVEYORS

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

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## PURPOSE

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

## GENERAL DESCRIPTION

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

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

## EXISTING DRAINAGE CONDITIONS

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

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-8, EX-9, EX-9A, EX-10 and EX-10A. These are referenced in the Appendix.

The following descriptions represent these pre-development basins for the property:
**Basin EX-8 ($Q_5$ = 5 cfs, $Q_{100}$ = 23 cfs)** consists of approximately 32.2 acres of property that sheet flows in a southerly direction. This basin is similar to the MDDP and the north portion of the west basin line defines the westerly edge of the East Fork basin. This basin incorporates the majority of MDDP basins EX-8. The flows seem to remain as sheet flows as they exit the property along the south boundary at **Design Point 5**. These flows seem consistent with the flows determined by the MDDP at DP-5 ($Q_5$ = 1.7 cfs, $Q_{100}$ = 20.5 cfs).

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

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

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

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

**PROPOSED DRAINAGE CONDITIONS**

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

Development of these urban lots proposed will consist of overlot grading and utility installation for the planned roadways and lots. Per the El Paso County ECM, Section I.7.1.B, all urban lots are required to provide Water Quality Capture Volume (WQCV). Thus, the proposed FSD facility within this development will provide WQCV along with an Excess Urban Runoff Volume (EURV)

in the lower portion of the facility storage volume with an outlet control device. Frequent and infrequent inflows are released at rates approximating undeveloped conditions. This concept provides some mitigation of increased runoff volume by releasing a portion of the increased runoff at a low rate over an extended period of time, up to 72 hours. This means that frequent storms, smaller than the 2-year event, will be reduced to very low flows near or below the sediment carrying threshold value for downstream drainage ways. Also, by incorporating an outlet structure that limits the 100-year runoff to the undeveloped condition rate, the discharge hydrograph for storms between the 2 year and the 100-year event will approximate the hydrograph for the undeveloped conditions and will help effectively mitigate the effects of development. As reasonably possible, WQCV will be provided for all new roads and urban lots.

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

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

**Off-site Basin P4-B ($Q_5$ = 58 cfs, $Q_{100}$ = 124 cfs)** represents the total developed flows from The Villages at Sterling Ranch East development contained within a planned 48" RCP public storm system.

**Design Point 1 ($Q_5$ = 6 cfs, $Q_{100}$ = 12 cfs)** represents developed flows along the east side of the Sterling Ranch Road corridor that are tributary to an existing 15' At-Grade Type R Inlet as designed and approved within the "Sterling Ranch Road & Briargate Parkway Segment 2 Street Plans", prepared by JR Engineering and the approved "Drainage Letter for Sterling Ranch Road and Briargate Pkwy. Interim Plan", also prepared by JR Engineering (both found under PCD No.

CDR-221). Within that report, this facility is at Design Point 7 ($Q_5$ = 5.2 cfs, $Q_{100}$ = 10.6 cfs)**.** This facility captures ($Q_5$ = 6.0 cfs, $Q_{100}$ = 10.4 cfs) with a flow-by of ($Q_5$ = 0.0 cfs, $Q_{100}$ = 1.6 cfs) which is consistent with the JR Engineering design. (See Appendix for inlet calculation)

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

**Design Point 3 ($Q_5$ = 4 cfs, $Q_{100}$ = 10 cfs)** represents developed flows from Basins OS-3, A and B that are completely captured by a proposed 10' Type R Sump Inlet with a 24" RCP outfall (Pipe Run 2). **Design Point 4 ($Q_5$ = 0.9 cfs, $Q_{100}$ = 2.1 cfs)** represents developed flows from Basin C that are completely captured by a proposed 5' Type R Sump Inlet with an 18" RCP outfall (Pipe Run 3). **Pipe Run 4 ($Q_5$ = 5 cfs, $Q_{100}$ = 12 cfs)** is a proposed 24" RCP that conveys the total collected developed flows from this sump condition. The emergency overflow path is a max. ponding of 12" for the major storm event and then around the corner down St. Louis St. **Pipe Run 1 ($Q_5$ = 58 cfs, $Q_{100}$ = 124 cfs)** is a proposed 48" RCP that conveys the total collected developed flows from the planned Villages at Sterling Ranch East development north of Oak Park Dr. **Pipe Run 5 ($Q_5$ = 62 cfs, $Q_{100}$ = 132 cfs)** is a proposed 48" RCP that conveys these developed flows further downstream.

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

**Design Point 6 ($Q_5$ = 5 cfs, $Q_{100}$ = 13 cfs)** represents developed flows from Basins E and F that are completely captured by a proposed 10' Type R Sump Inlet with a 24" RCP outfall (Pipe Run 7). **Design Point 7 ($Q_5$ = 1.4 cfs, $Q_{100}$ = 3.5 cfs)** represents developed flows from Basin G that are completely captured by a proposed 5' Type R Sump Inlet with a 24" RCP outfall (Pipe Run 8).

The emergency overflow path is a max. ponding of 12" for the major storm event and then south within the open space Tract D. **Pipe Run 9 ($Q_5$ = 11 cfs, $Q_{100}$ = 23 cfs)** is a proposed 30" RCP that conveys the total developed flows from this sump condition and Pipe Run 5 further downstream within Tract D.

**Design Point 8 ($Q_5$ = 5 cfs, $Q_{100}$ = 11 cfs)** represents developed flows from Basin H that are completely captured by a proposed 10' Type R Sump Inlet with a 24" RCP outfall (Pipe Run 10). **Design Point 9 ($Q_5$ = 2 cfs, $Q_{100}$ = 5 cfs)** represents developed flows from Basin I that are completely captured by a proposed 5' Type R Sump Inlet with a 24" RCP outfall (Pipe Run 11). The emergency overflow path is a max. ponding of 12" for the major storm event and then south within the open space Tract C. **Pipe Run 12 ($Q_5$ = 16 cfs, $Q_{100}$ = 37 cfs)** is a proposed 30" RCP that conveys the total developed flows from this sump condition and Pipe Run 9 further downstream within Tract C.

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

**Design Point 12 ($Q_5$ = 2 cfs, $Q_{100}$ = 6 cfs)** represents developed flows from Basin M that are completely captured by a proposed 5' Type R Sump Inlet with an 18" RCP outfall (Pipe Run 19). **Design Point 13 ($Q_5$ = 2 cfs, $Q_{100}$ = 4 cfs)** represents developed flows from Basin N that are completely captured by a proposed 5' Type R Sump Inlet with an 18" RCP outfall (Pipe Run 20). The emergency overflow path is a max. ponding of 12" for the major storm event and then west over the highpoint within Lake Tahoe Dr. **Pipe Run 21 ($Q_5$ = 4 cfs, $Q_{100}$ = 10 cfs)** is a proposed

24" RCP that conveys the total developed flows from this sump condition. **Pipe Run 22 ($Q_5$ = 19 cfs, $Q_{100}$ = 45 cfs)** is a proposed 36" RCP that conveys the total developed flows from Pipe Runs 12 and 18 further south within Tract B.

**Design Point 14 ($Q_5$ = 2 cfs, $Q_{100}$ = 11 cfs)** represents developed flows from Basin O and Flow-by from DP-5 that flow directly into Basin P via std. 6' crosspan. **Design Point 15 ($Q_5$ = 6 cfs, $Q_{100}$ = 19 cfs)** represents developed flows from Basin P and DP-14 that are completely captured by an existing 10' Type R Sump Inlet with a 24" RCP outfall (Pipe Run 13). **Design Point 16 ($Q_5$ = 2 cfs, $Q_{100}$ = 5 cfs)** represents developed flows from Basins OS-4 and R that are completely captured by an existing 5' Type R Sump Inlet with an 18" RCP outfall (Pipe Run 14). The emergency overflow path is a max. ponding of 12" for the major storm event and then south around the corner down Bentonville Way. **Pipe Run 15 ($Q_5$ = 7 cfs, $Q_{100}$ = 22 cfs)** is a proposed 30" RCP that conveys the total developed flows from this existing sump condition further downstream within Bentonville Way and the adjacent Sterling Ranch East Filing No. 3 subdivision. These developed flows are tributary to the planned Pond FSD 11-B and consistent with the "Sterling Ranch MDDP Amendment No. 2 & Preliminary Drainage Report for Sterling Ranch East Preliminary Plan No. 1", prepared by Classic Consulting, approved June 2023. The Sterling Ranch East Filing No. 3 subdivision including Pond FSD 11-B are anticipated to be constructed prior to this development. If phasing development phasing/timing changes, The Final Drainage Report will describe and include final design of this facility.

**Design Point 17 ($Q_5$ = 1.3 cfs, $Q_{100}$ = 3.3 cfs)** represents developed flows from Basin S that are completely captured by a proposed 5' Type R Sump Inlet with an 18" RCP outfall (Pipe Run 24). **Design Point 18 ($Q_5$ = 2 cfs, $Q_{100}$ = 4 cfs)** represents developed flows from Basin T that are completely captured by a proposed 5' Type R Sump Inlet with an 18" RCP outfall (Pipe Run 25). The emergency overflow path is a max. ponding of 12" for the major storm event and then south directly into the proposed Pond FSD 14-B. **Pipe Run 26 ($Q_5$ = 3 cfs, $Q_{100}$ = 7 cfs)** is a proposed 24" RCP that conveys the total developed flows from this sump condition. **Pipe Run 23 ($Q_5$ = 81 cfs, $Q_{100}$ = 178 cfs)** is a proposed 60" RCP that conveys the total developed flows

from Pipe Runs 18 and 22 further south within Tract B. **Pipe Run 27 ($Q_5$ = 83 cfs, $Q_{100}$ = 184 cfs)** is a proposed 60" RCP that conveys the total developed flows from Pipe Runs 23 and 26 directly into the proposed Pond FSD 14-B.

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

**Design Point 21 ($Q_5$ = 2 cfs, $Q_{100}$ = 5 cfs)** represents developed flows from Basin OS-5 that are tributary to the existing 10' Type R At-Grade Inlet as designed and approved within the "Sterling Ranch Road & Briargate Parkway Segment 2 Street Plans", prepared by JR Engineering and the approved "Drainage Letter for Sterling Ranch Road and Briargate Pkwy. Interim Plan", also prepared by JR Engineering (both found under PCD No. CDR-221). Within that report, this facility is at Design Point 10 ($Q_5$ = 3.3 cfs, $Q_{100}$ = 6.9 cfs). Thus, the planned downstream facilities have accounted for these flows. (See Appendix for inlet calculation)

**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 two Ponds (FSD 11-B and FSD 14-B), temporary sediment basin and runoff reduction RPA's (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.

The following represents the proposed **Pond FSD 14-B design**:
(See MHFD-Detention Design Sheets in Appendix)

**Total Tributary acreage: 74.65 Ac.**

**1.411 Ac.-ft. WQCV required**

**3.195 Ac.-ft. EURV required**

**3.098 Ac.-ft. 100-yr. Storage**

**7.704 Ac.-ft. Total**

**Total In-flow:** **$Q_5$ = 88 cfs, $Q_{100}$ = 203 cfs**

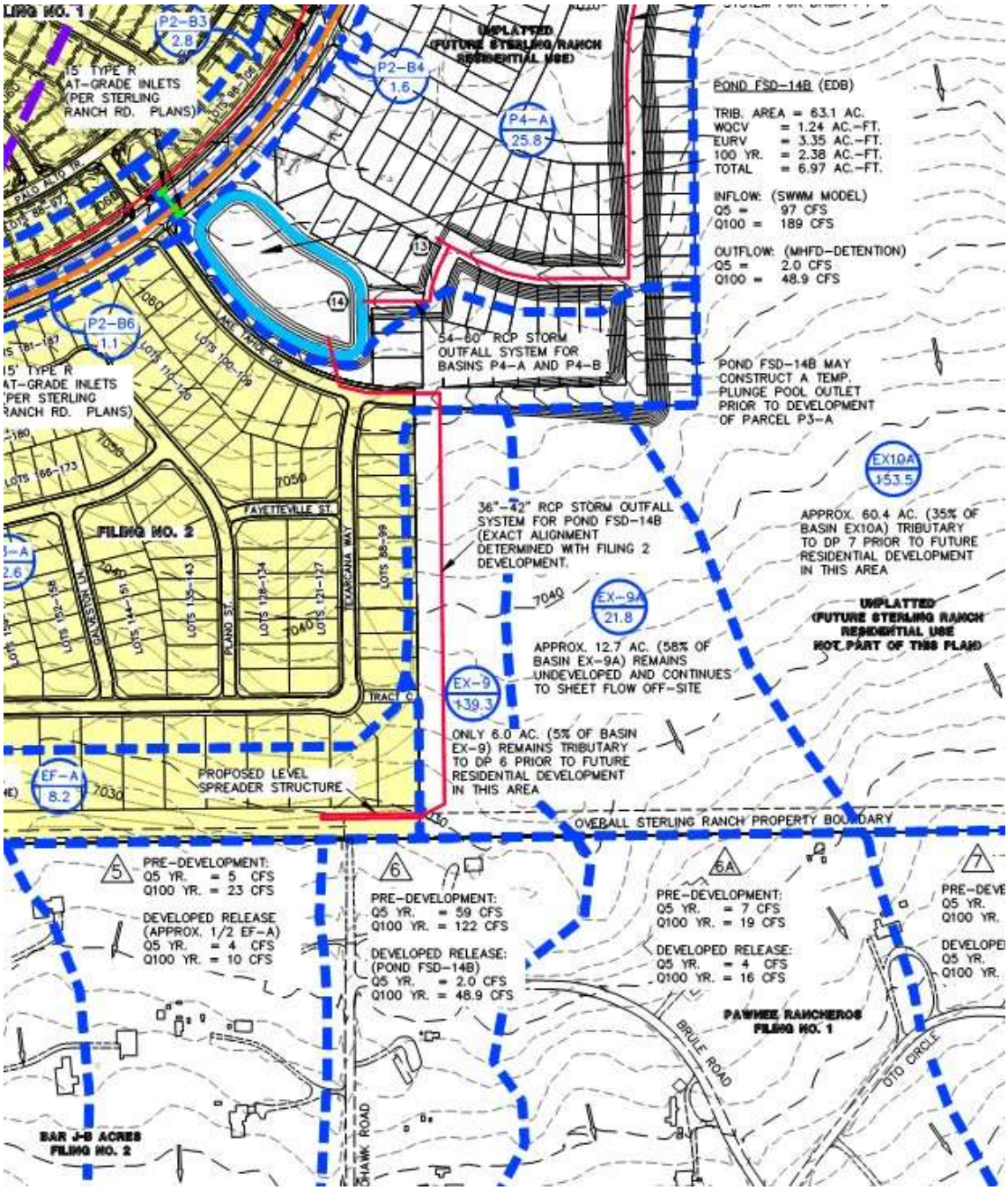
**Pond Design Release:** **$Q_5$ = 5.0 cfs, $Q_{100}$ = 54.3 cfs**

**(Ownership and maintenance by the Sterling Ranch Metro District)**

The location of this proposed facility differs from what was presented in the MDDP Amendment No. 2. Originally it was located on the northeast corner of the intersection of Sterling Ranch Road and Lake Tahoe Drive. The release from the facility in that location were shown to be routed via storm sewer towards the south boundary of the overall Sterling Ranch property and ultimately released through a level spreader at the existing conditions Design Point 6. (See Figure 1 below) This previous location was determined in the original MDDP as its outfall release was directly into the 48" RCP storm system in Sterling Ranch Road and ultimately into Sand Creek. There was concern from County Staff of this significant area within the East Fork being diverted into the main tributary of Sand Creek. To address this concern, the outfall routing was adjusted to head south and not to connect to the 48" RCP in Sterling Ranch Road. Then with the planning of Sterling Ranch East Filing 5 it was decided and made more sense to move the pond location to

the south boundary where it wanted to outfall anyway. With this planning change, additional area and lots are now tributary to this facility. Thus, the planned developed release amounts are more than anticipated in the MDDP Amendment No. 2, however, these planned release amounts are still well less than the pre-development flows at this location. See comparison below:

*Figure 1: Map taken from approved Sterling Ranch MDDP Amendment No. 2*



**Existing Design Point 6 along south boundary**

**Pre-development:** **$Q_5$ = 59 cfs, $Q_{100}$ = 122 cfs**

**FSD 14-B Developed Release (MDDP Amend. 2):** **$Q_5$ = 2.0 cfs, $Q_{100}$ = 48.9 cfs)**

**FSD 14-B Developed Release (Proposed):** **($Q_5$ = 5.0 cfs, $Q_{100}$ = 54.3 cfs)**

After development, **Design Point 6 along the south boundary ($Q_5$ = 5.0 cfs, $Q_{100}$ = 54.3 cfs)** consists of the developed flows release from FSD 14-B through the proposed level spreader and sheet flows from Basin Y1 in a southerly direction towards the existing Mohawk Road Right-of-Way. Further downstream analysis may be required with the Final Drainage Report to define any improvements required with this proposed release method and location. However, based on the flow comparison above, the proposed release will be well below the pre-development flows currently being experienced.

Also after development, **Design Point 6A along the south boundary ($Q_5$ = 2 cfs, $Q_{100}$ = 11 cfs)** consists of Basins OS-6 and Y2 that sheet flow in a southerly direction. Basin OS-6 is planned to have a Temporary Sediment Basin constructed just north of the south boundary to collect and treat the proposed rear yards of the development and Basin Y2 consisting of the back side of the proposed pond embankment. Based on the flow comparison above, these proposed minor sheets flows will be allowed to continue to exit the property as sheet flow with little effect downstream.

**DRAINAGE CRITERIA**

Hydrologic calculations were performed using the City of Colorado Springs/El Paso County Drainage Criteria Manual, as revised in November 1991 and October 1994 with County adopted Chapter 6 and Section 3.2.1 of Chapter 13 of the City of Colorado Springs/El Paso County Drainage Criteria Manual as revised in May 2014. Individual on-site developed basin design used for detention/SWQ basin sizing, inlet sizing and storm system routing was calculated using the Rational Method. Runoff Coefficients are based on the imperviousness of the particular land use

and the hydrologic soil type in accordance with Table 6-6. The average rainfall intensity, by recurrence interval found in the Intensity-Duration-Frequency (IDF) curves in Figure 6-5. (See Appendix)

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

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

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

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

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

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

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

**FLOODPLAIN STATEMENT**

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

**DRAINAGE AND BRIDGE FEES**

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

There is no final platting proposed at this time. However, the following are anticipated drainage and bridge fees using the following impervious acreage method approved by El Paso County.

**Sterling Ranch East Filing No. 5 has a total area of 47.17 acres** with the following different land uses proposed:

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

The percent imperviousness for this subdivision is calculated as follows:

**Fees for Park/Open Space/Trail Tracts**

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

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

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

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

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

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

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

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

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

**Bridge Fees**

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

**Drainage Fees**

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

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

**SUMMARY**

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

PREPARED BY:

**Classic Consulting Engineers & Surveyors, LLC**

Marc A. Whorton, P.E.
Project Manager

maw/118325/PDR.doc

**REFERENCES**


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

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

3. "Final Drainage Report for Forest Gate Subdivision" Law & Mariotti Consultants, Inc. dated October 2004.

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

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

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

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

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

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

# APPENDIX

# VICINITY MAP

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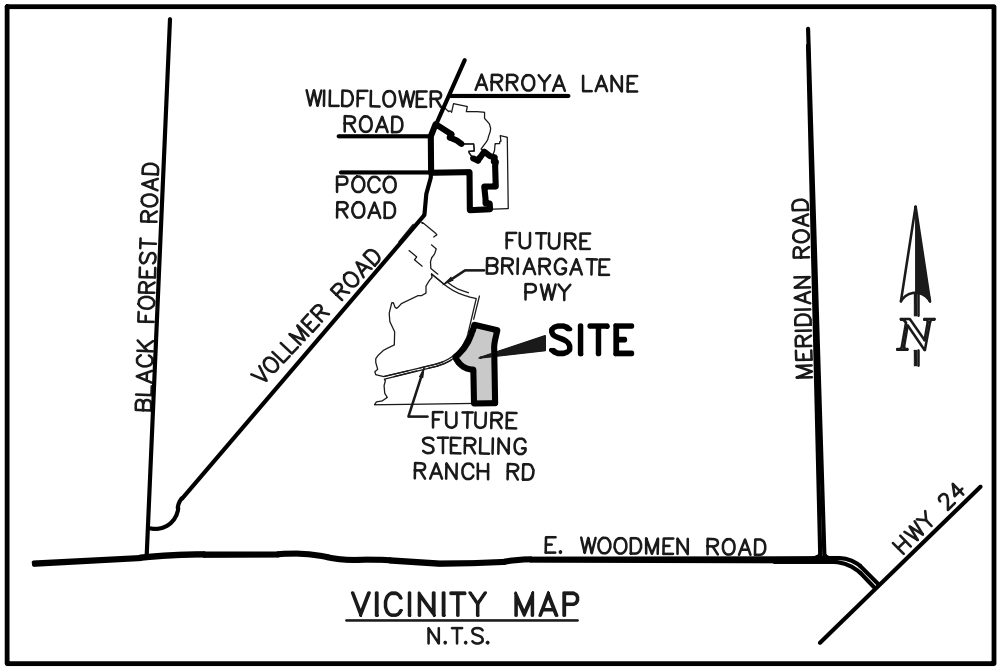


VICINITY MAP
N.T.S.

**SOILS MAP (S.C.S SURVEY)**

CLASSIC SM
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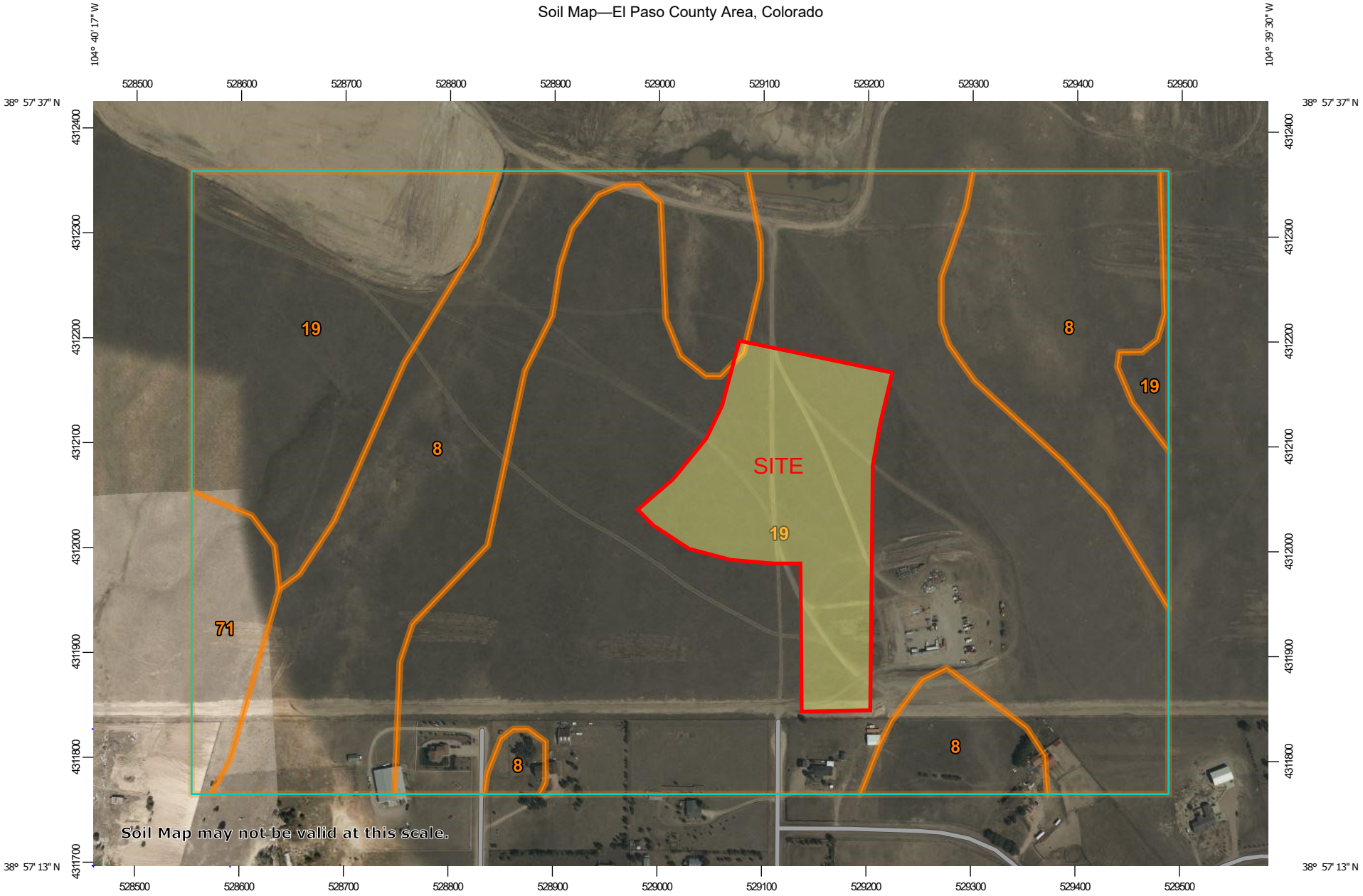
ENGINEERS & SURVEYORS




Map Scale: 1:5,140 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 50 100 200 300

Feet
0 200 400 800 1200

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

## MAP LEGEND

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

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

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

**Water Features**
- Streams and Canals

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

**Background**
- Aerial Photography

## MAP INFORMATION

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

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

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

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

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

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

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

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

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

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

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

# Map Unit Legend

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

# El Paso County Area, Colorado

## 8—Blakeland loamy sand, 1 to 9 percent slopes

### Map Unit Setting

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

### Map Unit Composition

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

### Description of Blakeland

#### Setting

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

#### Typical profile

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

#### Properties and qualities

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

#### Interpretive groups

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

**Minor Components**

**Other soils**

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

**Pleasant**

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

# Data Source Information

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

# El Paso County Area, Colorado

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

### Map Unit Setting

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

### Map Unit Composition

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

### Description of Columbine

#### Setting

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

#### Typical profile

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

#### Properties and qualities

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

#### Interpretive groups

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

### Minor Components

#### Fluvaquentic haplaquolls

*Percent of map unit:* 1 percent

*Landform:* Swales
*Hydric soil rating:* Yes

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

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

## Data Source Information

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

**F.E.M.A. MAP**

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## NOTES TO USERS

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

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

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

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

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

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

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

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

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

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

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

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

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

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

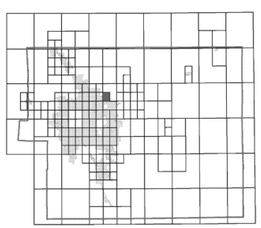
If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call **1-877-FEMA MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/business/nfip.

**El Paso County Vertical Datum Offset Table**

| Flooding Source | Vertical Datum Offset (ft) |
|---|---|

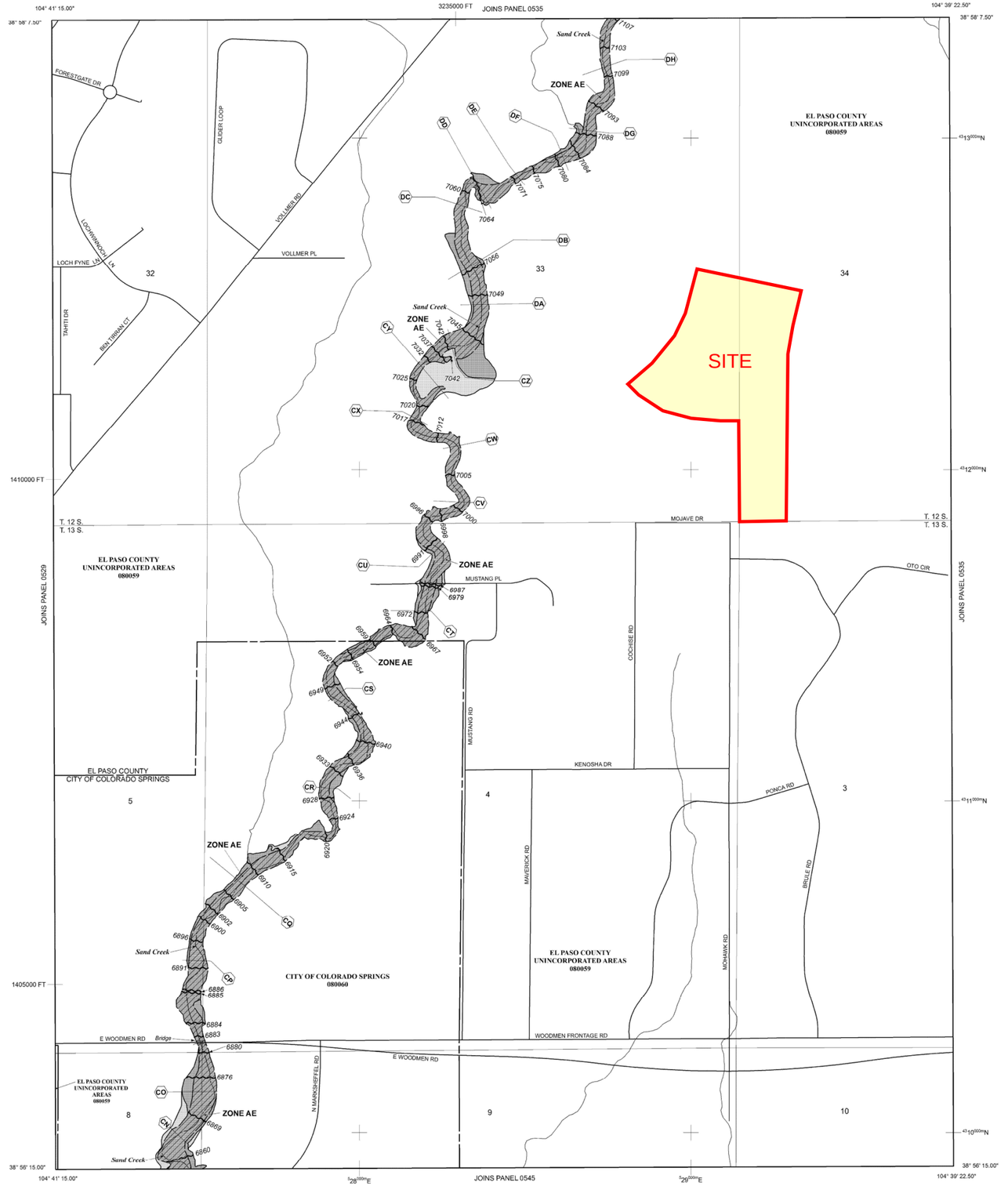
REFER TO SECTION 3.3 OF THE EL PASO COUNTY FLOOD INSURANCE STUDY FOR STREAM BY STREAM VERTICAL DATUM CONVERSION INFORMATION

**Panel Location Map**



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

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




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

## LEGEND

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

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

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

FLOODWAY AREAS IN ZONE AE

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

OTHER FLOOD AREAS

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

OTHER AREAS

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

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

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

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

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

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

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

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

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

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

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

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

NFIP

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

NATIONAL FLOOD INSURANCE PROGRAM

# 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

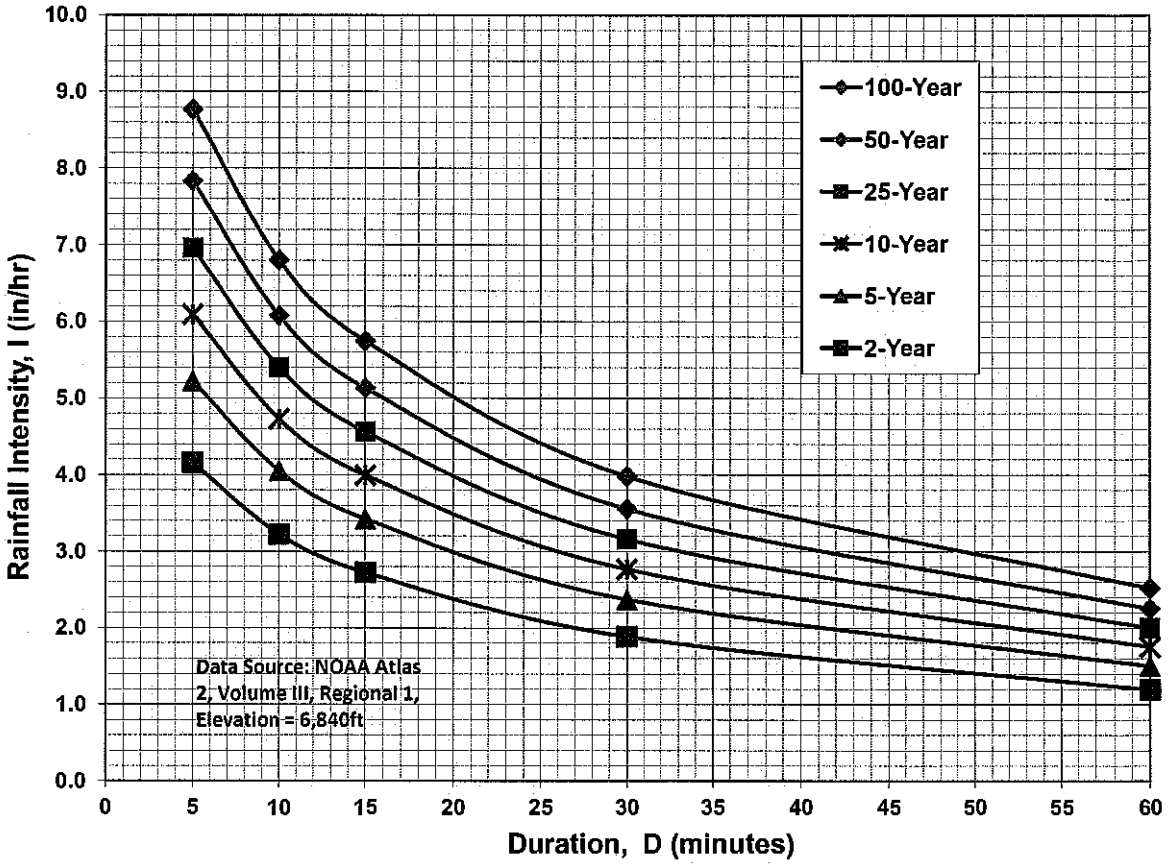
One of the basic assumptions underlying the Rational Method is that runoff is a function of the average rainfall rate during the time required for water to flow from the hydraulically most remote part of the drainage area under consideration to the design point. However, in practice, the time of concentration 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**

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

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

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

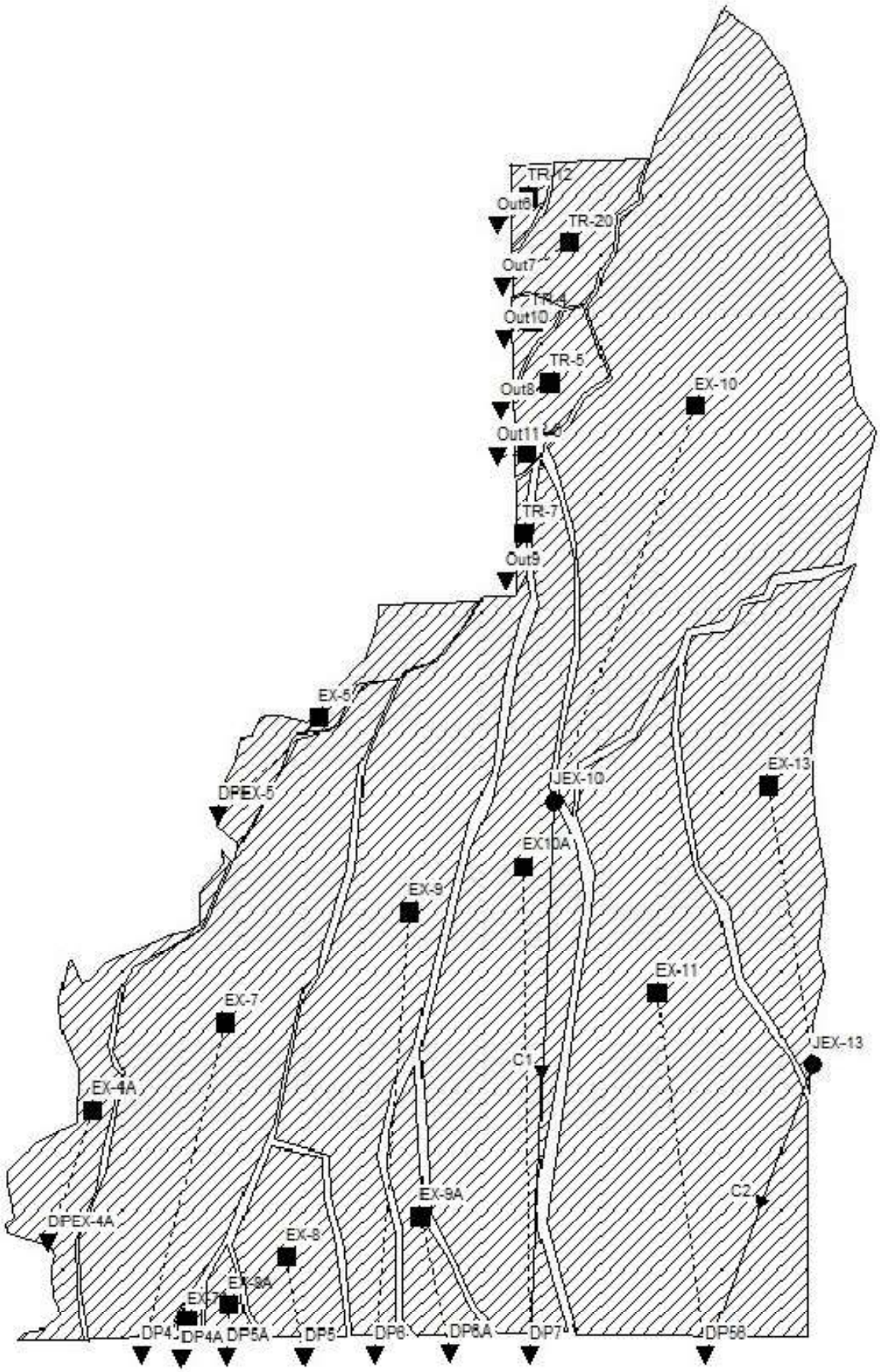
$I_{10} = -1.75 \ln(D) + 8.847$

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

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

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

# 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 |

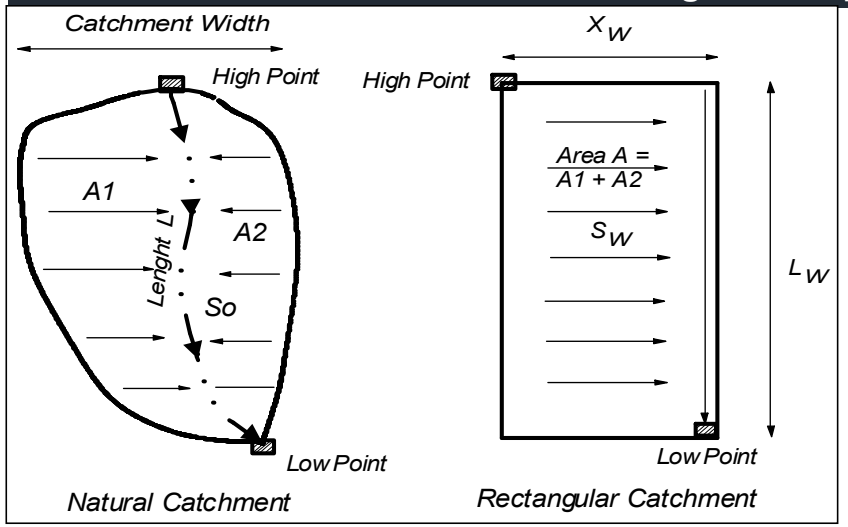
## STERLING RANCH EAST PRELIMINARY PLAN NO. 1
### Pre-Developed Subcatchment Runoff

| 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 |

JOB NAME: *STERLING RANCH EAST FILING NO. 5 - PRELIM. PLAN*
JOB NUMBER: *1183.25*
DATE: *11/22/23*
CALCULATED BY: *MAW*

## FINAL DRAINAGE REPORT ~ BASIN RUNOFF COEFFICIENT SUMMARY

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

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

JOB NAME: ***STERLING RANCH EAST FILING NO. 5 - PRELIM. PLAN***
JOB NUMBER: ***1183.25***
DATE: ***11/22/23***
CALC'D BY: ***MAW***

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

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

**Table 6-7. Conveyance Coefficient, $C_v$**

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

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

## FINAL DRAINAGE REPORT ~ BASIN RUNOFF SUMMARY

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

JOB NAME: ***STERLING RANCH EAST FILING NO. 5 - PRELIM. PLAN***
JOB NUMBER: ***1183.25***
DATE: ***11/22/23***
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 |

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

**Table 6-7. Conveyance Coefficient, $C_v$**

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

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

## FINAL DRAINAGE REPORT ~ BASIN RUNOFF SUMMARY

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

JOB NAME: ***STERLING RANCH EAST FILING NO. 5 - PRELIM. PLAN***
JOB NUMBER: ***1183.25***
DATE: ***11/22/23***
CALC'D BY: ***MAW***

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

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

**Table 6-7. Conveyance Coefficient, $C_v$**

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

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

## FINAL DRAINAGE REPORT ~ BASIN RUNOFF SUMMARY

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

JOB NAME: *STERLING RANCH EAST FILING NO. 5 - PRELIM. PLAN*
JOB NUMBER: *1183.25*
DATE: *11/22/23*
CALCULATED BY: *MAW*

*ALL STORM SEWER TO BE PRIVATE UNLESS OTHERWISE NOTED

## FINAL DRAINAGE REPORT ~ SURFACE ROUTING SUMMARY

| Design Point(s) | Contributing Basins / Design Point | Equivalent CA(5) | Equivalent CA(100) | Maximum Tc | Intensity | | Flow | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | I(5) | I(100) | Q(5) | Q(100) | Facility/ Inlet Size* |
| 1 | OS-1 | 1.76 | 2.02 | 14.0 | 3.62 | 6.08 | 6 | 12 | Exist. 15' Type R At-Grade Inlet |
| 2 | OS-2 and OS-1 Flow-By | 0.56 | 1.16 | 16.6 | 3.37 | 5.65 | 2 | 7 | |
| 3 | OS-3, A, B | 1.27 | 1.79 | 16.4 | 3.39 | 5.68 | 4 | 10 | Prop. 10' Type R Sump Inlet |
| 4 | C | 0.23 | 0.33 | 12.1 | 3.84 | 6.45 | 0.9 | 2.1 | Prop. 5' Type R Sump Inlet |
| 5 | D and DP-2 Flow On-Site | 1.94 | 3.18 | 20.2 | 3.07 | 5.16 | 6 | 16 | Prop. 10' Type R At-Grade Inlet |
| 6 | E, F | 1.45 | 2.31 | 15.9 | 3.43 | 5.76 | 5 | 13 | Prop. 10' Type R Sump Inlet |
| 7 | G | 0.36 | 0.53 | 11.8 | 3.88 | 6.52 | 1.4 | 3.5 | Prop. 5' Type R Sump Inlet |
| 8 | H | 1.38 | 2.04 | 17.1 | 3.32 | 5.57 | 5 | 11 | Prop. 10' Type R Sump Inlet |
| 9 | I | 0.51 | 0.75 | 13.4 | 3.69 | 6.19 | 2 | 5 | Prop. 5' Type R Sump Inlet |
| 10 | J | 0.86 | 1.25 | 13.2 | 3.72 | 6.24 | 3 | 8 | Prop. 10' Type R Sump Inlet |
| 11 | L | 0.41 | 0.60 | 18.1 | 3.24 | 5.44 | 1.3 | 3.3 | Prop. 5' Type R Sump Inlet |
| 12 | M | 0.63 | 0.95 | 15.4 | 3.48 | 5.84 | 2 | 6 | Prop. 5' Type R Sump Inlet |
| 13 | N | 0.45 | 0.69 | 15.4 | 3.48 | 5.84 | 2 | 4 | Prop. 5' Type R Sump Inlet |
| 14 | O and DP-5 Flow-By | 0.83 | 2.27 | 22.2 | 2.93 | 4.92 | 2 | 11 | Prop. 6' Crosspan |

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

*ALL STORM SEWER TO BE PRIVATE UNLESS OTHERWISE NOTED

## FINAL DRAINAGE REPORT ~ SURFACE ROUTING SUMMARY

| Design Point(s) | Contributing Basins / Design Point | Equivalent CA(5) | Equivalent CA(100) | Maximum Tc | Intensity | | Flow | | Facility/ Inlet Size* |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | I(5) | I(100) | Q(5) | Q(100) | |
| 15 | P and DP-14 | 2.07 | 4.07 | 24.2 | 2.80 | 4.70 | 6 | 19 | Exist. 10' Type R Sump Inlet |
| 16 | OS-4, R | 0.63 | 0.97 | 14.4 | 3.58 | 6.01 | 2 | 6 | Exist. 5' Type R Sump Inlet |
| 17 | S | 0.41 | 0.60 | 18.1 | 3.24 | 5.44 | 1.3 | 3.3 | Prop. 5' Type R Sump Inlet |
| 18 | T | 0.53 | 0.76 | 16.7 | 3.36 | 5.64 | 2 | 4 | Prop. 5' Type R Sump Inlet |
| 19 | U, V | 1.35 | 1.96 | 18.1 | 3.24 | 5.44 | 4 | 11 | Prop. 10' Type R Sump Inlet |
| 20 | W | 0.15 | 0.17 | 5.0 | 5.17 | 8.68 | 0.8 | 1.4 | Prop. 5' Type R Sump Inlet |
| 21 | OS-5 | 0.58 | 0.69 | 9.2 | 4.25 | 7.14 | 2 | 5 | Exist. 10' Type R At-Grade Inlet |
| | **TOTAL BASINS TRIBUTARY TO POND FSD-14B** | **30.70** | **41.99** | **23.1** | **2.88** | **4.83** | **88** | **203** | |
| | **TOTAL BASINS TRIBUTARY TO POND FSD-14B (VILLAGES NOT DEV.)** | **12.42** | **18.86** | **23.1** | **2.88** | **4.83** | **36** | **91** | |
| 6 (MDDP) SOUTH BNDY. | **POND FSD-14B RELEASE AND BASIN Y1** | **REF. MHFD-DETENTION SPREADSHEET FOR CALCULATIONS** | | | | | **5.0** | **54.3** | Sheet flow from Level Spreader & Basin Y1 |
| 6A (MDDP) SOUTH BNDY. | **BASINS Y2 AND OS-6** | **0.61** | **2.38** | **23.2** | **2.87** | **4.81** | **2** | **11** | Sheet flow |

JOB NAME: *STERLING RANCH EAST FILING NO. 5 - PRELIM. PLAN*
JOB NUMBER: *1183.25*
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CALCULATED BY: *MAW*

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

## FINAL DRAINAGE REPORT ~ PIPE ROUTING SUMMARY

| Pipe Run | Contributing Basin / Design Point / Pipe Run | Equivalent CA(5) | Equivalent CA(100) | Maximum Tc | Intensity | | Flow | | Pipe Size* |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | I(5) | I(100) | Q(5) | Q(100) | |
| **1** | **P4-B FUTURE VILLAGES AT STERLING RANCH PP** | **18.28** | **23.13** | **18.7** | **3.19** | **5.35** | **58** | **124** | **PROP. 48" RCP** |
| 2 | DP-3 | 1.27 | 1.79 | 16.4 | 3.39 | 5.68 | 4 | 10 | PROP. 24" RCP |
| 3 | DP-4 | 0.23 | 0.33 | 12.1 | 3.84 | 6.45 | 0.9 | 2.1 | PROP. 18" RCP |
| 4 | PR-2, PR-3 | 1.50 | 2.12 | 16.6 | 3.37 | 5.65 | 5 | 12 | PROP. 24" RCP |
| **5** | **PR-1, PR-4** | **19.78** | **25.25** | **19.5** | **3.12** | **5.25** | **62** | **132** | **PROP. 48" RCP** |
| 6 | DP-5 COLLECTION | 1.71 | 1.78 | 20.5 | 3.05 | 5.12 | 5.2 | 9.1 | PROP. 18" RCP |
| 7 | DP-6 | 1.45 | 2.31 | 15.9 | 3.43 | 5.76 | 5 | 13 | PROP. 24" RCP |
| 8 | PR-7, DP-7 | 1.81 | 2.84 | 15.9 | 3.43 | 5.76 | 6 | 16 | PROP. 24" RCP |
| 9 | PR-6, PR-8 | 3.52 | 4.62 | 20.9 | 3.02 | 5.07 | 11 | 23 | PROP. 30" RCP |
| 10 | DP-8 | 1.38 | 2.04 | 17.1 | 3.32 | 5.57 | 5 | 11 | PROP. 24" RCP |
| 11 | PR-10, DP-9 | 1.89 | 2.80 | 17.1 | 3.32 | 5.57 | 6 | 16 | PROP. 24" RCP |

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

## FINAL DRAINAGE REPORT ~ PIPE ROUTING SUMMARY

| Pipe Run | Contributing Basin / Design Point / Pipe Run | Equivalent CA(5) | Equivalent CA(100) | Maximum Tc | Intensity | | Flow | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | I(5) | I(100) | Q(5) | Q(100) | Pipe Size* |
| 12 | PR-9, PR-11 | 5.41 | 7.42 | 21.3 | 2.99 | 5.02 | 16 | 37 | PROP. 30" RCP |
| 13 | DP-15 | 2.07 | 4.07 | 24.2 | 2.80 | 4.70 | 6 | 19 | EXIST. 24" RCP |
| 14 | DP-16 | 0.63 | 0.97 | 14.4 | 3.58 | 6.01 | 2 | 6 | EXIST. 18" RCP |
| 15 | PR-13, PR-14 | 2.70 | 5.04 | 25.4 | 2.73 | 4.58 | 7 | 23 | EXIST. 30" RCP |
| 16 | DP-10 | 0.86 | 1.25 | 13.2 | 3.72 | 6.24 | 3 | 8 | PROP. 24" RCP |
| 17 | DP-11 | 0.41 | 0.60 | 18.1 | 3.24 | 5.44 | 1.3 | 3.3 | PROP. 18" RCP |
| **18** | **PR-5, PR-13, PR-14** | **21.05** | **27.10** | **19.7** | **3.11** | **5.22** | **65** | **141** | **PROP. 54" RCP** |
| 19 | DP-12 | 0.63 | 0.95 | 15.4 | 3.48 | 5.84 | 2 | 6 | PROP. 18" RCP |
| 20 | DP-13 | 0.45 | 0.69 | 15.4 | 3.48 | 5.84 | 2 | 4 | PROP. 18" RCP |
| 21 | PR-16, PR-17 | 1.08 | 1.64 | 15.5 | 3.47 | 5.82 | 4 | 10 | PROP. 24" RCP |
| 22 | PR-12, PR-18 | 6.49 | 9.06 | 21.7 | 2.96 | 4.98 | 19 | 45 | PROP. 36" RCP |
| **23** | **PR-15, PR-19** | **27.54** | **36.16** | **22.2** | **2.93** | **4.92** | **81** | **178** | **PROP. 60" RCP** |

JOB NAME: ***STERLING RANCH EAST FILING NO. 5 - PRELIM. PLAN***
JOB NUMBER: ***1183.25***
DATE: ***11/22/23***
CALCULATED BY: ***MAW***

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

## FINAL DRAINAGE REPORT ~ PIPE ROUTING SUMMARY

| Pipe Run | Contributing Basin / Design Point / Pipe Run | Equivalent CA(5) | Equivalent CA(100) | Maximum Tc | Intensity | | Flow | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | I(5) | I(100) | Q(5) | Q(100) | Pipe Size* |
| 24 | DP-17 | 0.41 | 0.60 | 18.1 | 3.24 | 5.44 | 1.3 | 3.3 | PROP. 18" RCP |
| 25 | DP-18 | 0.53 | 0.76 | 16.7 | 3.36 | 5.64 | 2 | 4 | PROP. 18" RCP |
| 26 | PR-21, PR-22 | 0.94 | 1.36 | 18.1 | 3.24 | 5.44 | 3 | 7 | PROP. 24" RCP |
| **27** | **PR-20, PR-23 (IN-FLOW ULTIMATE CONDITION)** | **28.48** | **37.52** | **22.3** | **2.92** | **4.91** | **83** | **184** | **PROP. 60" RCP** |
| **27** | **PR-20, PR-23 (IN-FLOW INTERIM CONDITION - VILLAGES NOT DEVELOPED)** | **10.20** | **14.39** | **20.3** | **3.06** | **5.14** | **31** | **74** | **PROP. 60" RCP** |
| 28 | DP-19 | 1.35 | 1.96 | 18.1 | 3.24 | 5.44 | 4 | 11 | PROP. 24" RCP |
| **29** | **DP-20, PR-25** | **1.50** | **2.13** | **18.2** | **3.23** | **5.43** | **5** | **12** | **PROP. 24" RCP** |

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

## POND FSD-14B TRIBUTARY BASINS

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

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

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

## POND FSD-14B TRIBUTARY BASINS - 24" OUTFALL

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

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

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

## POND FSD-14B TRIBUTARY BASINS - 60" OUTFALL

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

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

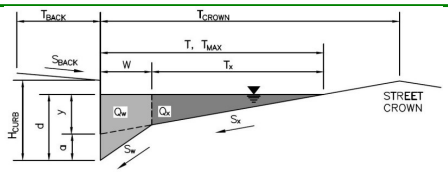
Version 4.05 Released March 2017

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

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

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

**Inlet ID:** DP-1




**Gutter Geometry (Enter data in the blue cells)**

| | | | |
|---|---|---|---|
| Maximum Allowable Width for Spread Behind Curb | $T_{BACK}$ = | 32.0 | ft |
| Side Slope Behind Curb (leave blank for no conveyance credit behind curb) | $S_{BACK}$ = | 0.020 | ft/ft |
| Manning's Roughness Behind Curb (typically between 0.012 and 0.020) | $n_{BACK}$ = | 0.016 | |
| Height of Curb at Gutter Flow Line | $H_{CURB}$ = | 6.00 | inches |
| Distance from Curb Face to Street Crown | $T_{CROWN}$ = | 32.0 | ft |
| Gutter Width | W = | 2.00 | ft |
| Street Transverse Slope | $S_X$ = | 0.020 | ft/ft |
| Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft) | $S_W$ = | 0.083 | ft/ft |
| Street Longitudinal Slope - Enter 0 for sump condition | $S_O$ = | 0.015 | ft/ft |
| Manning's Roughness for Street Section (typically between 0.012 and 0.020) | $n_{STREET}$ = | 0.016 | |

| | | Minor Storm | Major Storm | |
|---|---|---|---|---|
| Max. Allowable Spread for Minor & Major Storm | $T_{MAX}$ = | 12.0 | 24.0 | ft |
| Max. Allowable Depth at Gutter Flowline for Minor & Major Storm | $d_{MAX}$ = | 6.0 | 12.0 | inches |
| Allow Flow Depth at Street Crown (leave blank for no) | | ☐ | ☐ | check = yes |

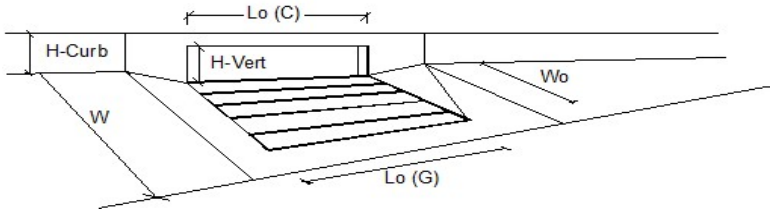
| | | Minor Storm | Major Storm | |
|---|---|---|---|---|
| **MINOR STORM Allowable Capacity is based on Spread Criterion** | | | | |
| **MAJOR STORM Allowable Capacity is based on Spread Criterion** | **$Q_{allow}$ =** | **5.8** | **32.7** | **cfs** |

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

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

# INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017




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

| Street Hydraulics: WARNING: Q > ALLOWABLE Q FOR MINOR STORM' | | MINOR | MAJOR | |
|---|---|---|---|---|
| **Total Inlet Interception Capacity** | **Q =** | **6.0** | **10.4** | **cfs** |
| **Total Inlet Carry-Over Flow (flow bypassing inlet)** | **$Q_b$ =** | **0.0** | **1.6** | **cfs** |
| **Capture Percentage = $Q_a/Q_o$ =** | **C% =** | **100** | **87** | **%** |

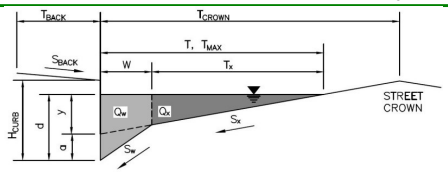
Version 4.05 Released March 2017

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

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

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

**Inlet ID:** DP-3




**Gutter Geometry (Enter data in the blue cells)**

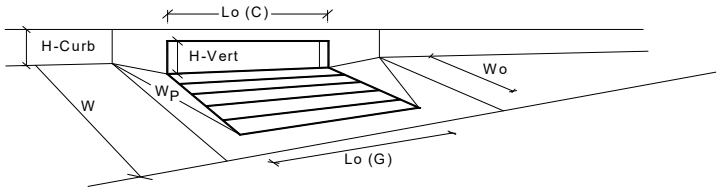
| | | | |
|---|---|---|---|
| Maximum Allowable Width for Spread Behind Curb | $T_{BACK}$ = | 7.5 | ft |
| Side Slope Behind Curb (leave blank for no conveyance credit behind curb) | $S_{BACK}$ = | 0.020 | ft/ft |
| Manning's Roughness Behind Curb (typically between 0.012 and 0.020) | $n_{BACK}$ = | 0.013 | |
| Height of Curb at Gutter Flow Line | $H_{CURB}$ = | 6.00 | inches |
| Distance from Curb Face to Street Crown | $T_{CROWN}$ = | 17.0 | ft |
| Gutter Width | W = | 2.00 | ft |
| Street Transverse Slope | $S_X$ = | 0.020 | ft/ft |
| Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft) | $S_W$ = | 0.083 | ft/ft |
| Street Longitudinal Slope - Enter 0 for sump condition | $S_O$ = | 0.000 | ft/ft |
| Manning's Roughness for Street Section (typically between 0.012 and 0.020) | $n_{STREET}$ = | 0.016 | |

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

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

# INLET IN A SUMP OR SAG LOCATION

**Version 4.05 Released March 2017**




| **Design Information (Input)** | CDOT Type R Curb Opening | | MINOR | MAJOR | |
|---|---|---|---|---|---|
| Type of Inlet | | Type = | CDOT Type R Curb Opening | | |
| Local Depression (additional to continuous gutter depression 'a' from above) | | $a_{local}$ = | 3.00 | 3.00 | inches |
| Number of Unit Inlets (Grate or Curb Opening) | | No = | 1 | 1 | |
| Water Depth at Flowline (outside of local depression) | | Ponding Depth = | 6.0 | 12.0 | inches |
| **Grate Information** | | | MINOR | MAJOR | ☑ Override Depths |
| Length of a Unit Grate | | $L_o$ (G) = | N/A | N/A | feet |
| Width of a Unit Grate | | $W_o$ = | N/A | N/A | feet |
| Area Opening Ratio for a Grate (typical values 0.15-0.90) | | $A_{ratio}$ = | N/A | N/A | |
| Clogging Factor for a Single Grate (typical value 0.50 - 0.70) | | $C_f$ (G) = | N/A | N/A | |
| Grate Weir Coefficient (typical value 2.15 - 3.60) | | $C_w$ (G) = | N/A | N/A | |
| Grate Orifice Coefficient (typical value 0.60 - 0.80) | | $C_o$ (G) = | N/A | N/A | |
| **Curb Opening Information** | | | MINOR | MAJOR | |
| Length of a Unit Curb Opening | | $L_o$ (C) = | 10.00 | 10.00 | feet |
| Height of Vertical Curb Opening in Inches | | $H_{vert}$ = | 6.00 | 6.00 | inches |
| Height of Curb Orifice Throat in Inches | | $H_{throat}$ = | 6.00 | 6.00 | inches |
| Angle of Throat (see USDCM Figure ST-5) | | Theta = | 63.40 | 63.40 | degrees |
| Side Width for Depression Pan (typically the gutter width of 2 feet) | | $W_p$ = | 2.00 | 2.00 | feet |
| Clogging Factor for a Single Curb Opening (typical value 0.10) | | $C_f$ (C) = | 0.10 | 0.10 | |
| Curb Opening Weir Coefficient (typical value 2.3-3.7) | | $C_w$ (C) = | 3.60 | 3.60 | |
| Curb Opening Orifice Coefficient (typical value 0.60 - 0.70) | | $C_o$ (C) = | 0.67 | 0.67 | |
| **Low Head Performance Reduction (Calculated)** | | | MINOR | MAJOR | |
| Depth for Grate Midwidth | | $d_{Grate}$ = | N/A | N/A | ft |
| Depth for Curb Opening Weir Equation | | $d_{Curb}$ = | 0.33 | 0.83 | ft |
| Combination Inlet Performance Reduction Factor for Long Inlets | | $RF_{Combination}$ = | 0.57 | 1.00 | |
| Curb Opening Performance Reduction Factor for Long Inlets | | $RF_{Curb}$ = | 0.93 | 1.00 | |
| Grated Inlet Performance Reduction Factor for Long Inlets | | $RF_{Grate}$ = | N/A | N/A | |
| | | | MINOR | MAJOR | |
| **Total Inlet Interception Capacity (assumes clogged condition)** | | **$Q_a$ =** | **8.3** | **25.5** | **cfs** |
| **Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)** | | $Q_{PEAK\ REQUIRED}$ = | 4.0 | 10.0 | cfs |

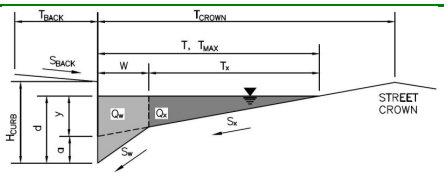
Version 4.05 Released March 2017

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

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

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

**Inlet ID:** DP-4




**Gutter Geometry (Enter data in the blue cells)**

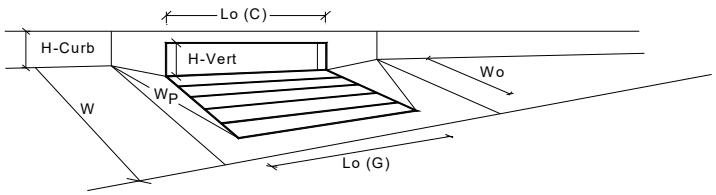
| | | | |
|---|---|---|---|
| Maximum Allowable Width for Spread Behind Curb | $T_{BACK}$ = | 7.5 | ft |
| Side Slope Behind Curb (leave blank for no conveyance credit behind curb) | $S_{BACK}$ = | 0.020 | ft/ft |
| Manning's Roughness Behind Curb (typically between 0.012 and 0.020) | $n_{BACK}$ = | 0.012 | |
| Height of Curb at Gutter Flow Line | $H_{CURB}$ = | 6.00 | inches |
| Distance from Curb Face to Street Crown | $T_{CROWN}$ = | 17.0 | ft |
| Gutter Width | W = | 2.00 | ft |
| Street Transverse Slope | $S_X$ = | 0.020 | ft/ft |
| Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft) | $S_W$ = | 0.083 | ft/ft |
| Street Longitudinal Slope - Enter 0 for sump condition | $S_O$ = | 0.000 | ft/ft |
| Manning's Roughness for Street Section (typically between 0.012 and 0.020) | $n_{STREET}$ = | 0.016 | |

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

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

# INLET IN A SUMP OR SAG LOCATION

**Version 4.05 Released March 2017**




| **Design Information (Input)** | CDOT Type R Curb Opening | | MINOR | MAJOR | |
|---|---|---|---|---|---|
| Type of Inlet | | Type = | CDOT Type R Curb Opening | | |
| Local Depression (additional to continuous gutter depression 'a' from above) | | $a_{local}$ = | 3.00 | 3.00 | inches |
| Number of Unit Inlets (Grate or Curb Opening) | | No = | 1 | 1 | |
| Water Depth at Flowline (outside of local depression) | | Ponding Depth = | 6.0 | 12.0 | inches |
| **Grate Information** | | | MINOR | MAJOR | ☑ Override Depths |
| Length of a Unit Grate | | $L_o$ (G) = | N/A | N/A | feet |
| Width of a Unit Grate | | $W_o$ = | N/A | N/A | feet |
| Area Opening Ratio for a Grate (typical values 0.15-0.90) | | $A_{ratio}$ = | N/A | N/A | |
| Clogging Factor for a Single Grate (typical value 0.50 - 0.70) | | $C_f$ (G) = | N/A | N/A | |
| Grate Weir Coefficient (typical value 2.15 - 3.60) | | $C_w$ (G) = | N/A | N/A | |
| Grate Orifice Coefficient (typical value 0.60 - 0.80) | | $C_o$ (G) = | N/A | N/A | |
| **Curb Opening Information** | | | MINOR | MAJOR | |
| Length of a Unit Curb Opening | | $L_o$ (C) = | 5.00 | 5.00 | feet |
| Height of Vertical Curb Opening in Inches | | $H_{vert}$ = | 6.00 | 6.00 | inches |
| Height of Curb Orifice Throat in Inches | | $H_{throat}$ = | 6.00 | 6.00 | inches |
| Angle of Throat (see USDCM Figure ST-5) | | Theta = | 63.40 | 63.40 | degrees |
| Side Width for Depression Pan (typically the gutter width of 2 feet) | | $W_p$ = | 2.00 | 2.00 | feet |
| Clogging Factor for a Single Curb Opening (typical value 0.10) | | $C_f$ (C) = | 0.10 | 0.10 | |
| Curb Opening Weir Coefficient (typical value 2.3-3.7) | | $C_w$ (C) = | 3.60 | 3.60 | |
| Curb Opening Orifice Coefficient (typical value 0.60 - 0.70) | | $C_o$ (C) = | 0.67 | 0.67 | |
| **Low Head Performance Reduction (Calculated)** | | | MINOR | MAJOR | |
| Depth for Grate Midwidth | | $d_{Grate}$ = | N/A | N/A | ft |
| Depth for Curb Opening Weir Equation | | $d_{Curb}$ = | 0.33 | 0.83 | ft |
| Combination Inlet Performance Reduction Factor for Long Inlets | | $RF_{Combination}$ = | 0.77 | 1.00 | |
| Curb Opening Performance Reduction Factor for Long Inlets | | $RF_{Curb}$ = | 1.00 | 1.00 | |
| Grated Inlet Performance Reduction Factor for Long Inlets | | $RF_{Grate}$ = | N/A | N/A | |
| | | | MINOR | MAJOR | |
| **Total Inlet Interception Capacity (assumes clogged condition)** | | **$Q_a$ =** | **5.4** | **12.3** | **cfs** |
| **Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)** | | $Q_{PEAK\ REQUIRED}$ = | 0.9 | 2.1 | cfs |

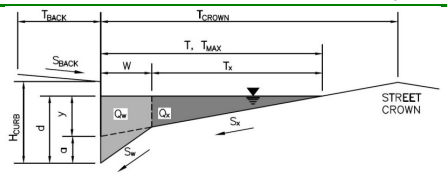
Version 4.05 Released March 2017

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

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

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

**Inlet ID:** DP-5




**Gutter Geometry (Enter data in the blue cells)**

| | | | |
|---|---|---|---|
| Maximum Allowable Width for Spread Behind Curb | $T_{BACK}$ = | 7.5 | ft |
| Side Slope Behind Curb (leave blank for no conveyance credit behind curb) | $S_{BACK}$ = | 0.020 | ft/ft |
| Manning's Roughness Behind Curb (typically between 0.012 and 0.020) | $n_{BACK}$ = | 0.012 | |
| Height of Curb at Gutter Flow Line | $H_{CURB}$ = | 6.00 | inches |
| Distance from Curb Face to Street Crown | $T_{CROWN}$ = | 17.0 | ft |
| Gutter Width | W = | 2.00 | ft |
| Street Transverse Slope | $S_X$ = | 0.020 | ft/ft |
| Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft) | $S_W$ = | 0.083 | ft/ft |
| Street Longitudinal Slope - Enter 0 for sump condition | $S_O$ = | 0.015 | ft/ft |
| Manning's Roughness for Street Section (typically between 0.012 and 0.020) | $n_{STREET}$ = | 0.016 | |

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

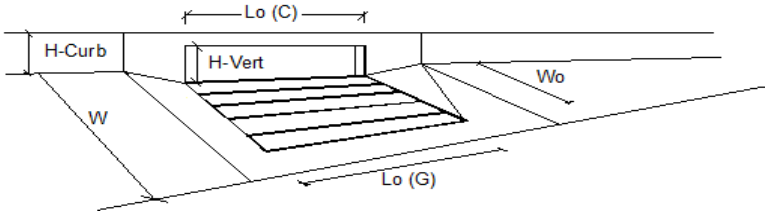
| | | Minor Storm | Major Storm | |
|---|---|---|---|---|
| **MINOR STORM Allowable Capacity is based on Spread Criterion** | | | | |
| **MAJOR STORM Allowable Capacity is based on Spread Criterion** | **$Q_{allow}$ =** | **13.3** | **13.3** | **cfs** |

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

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

# INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017




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

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

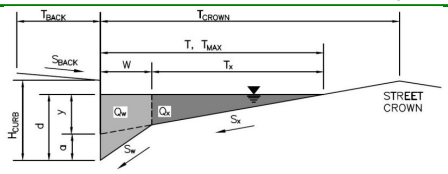
Version 4.05 Released March 2017

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

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

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

**Inlet ID:** DP-6




**Gutter Geometry (Enter data in the blue cells)**

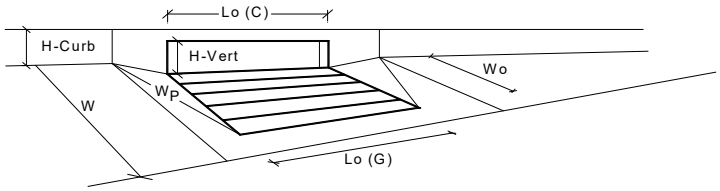
| | | | |
|---|---|---|---|
| Maximum Allowable Width for Spread Behind Curb | $T_{BACK}$ = | 7.5 | ft |
| Side Slope Behind Curb (leave blank for no conveyance credit behind curb) | $S_{BACK}$ = | 0.020 | ft/ft |
| Manning's Roughness Behind Curb (typically between 0.012 and 0.020) | $n_{BACK}$ = | 0.012 | |
| Height of Curb at Gutter Flow Line | $H_{CURB}$ = | 6.00 | inches |
| Distance from Curb Face to Street Crown | $T_{CROWN}$ = | 17.0 | ft |
| Gutter Width | W = | 2.00 | ft |
| Street Transverse Slope | $S_X$ = | 0.020 | ft/ft |
| Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft) | $S_W$ = | 0.083 | ft/ft |
| Street Longitudinal Slope - Enter 0 for sump condition | $S_O$ = | 0.000 | ft/ft |
| Manning's Roughness for Street Section (typically between 0.012 and 0.020) | $n_{STREET}$ = | 0.016 | |

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

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

# INLET IN A SUMP OR SAG LOCATION

**Version 4.05 Released March 2017**




| **Design Information (Input)** | CDOT Type R Curb Opening | | MINOR | MAJOR | |
|---|---|---|---|---|---|
| Type of Inlet | | Type = | CDOT Type R Curb Opening | | |
| Local Depression (additional to continuous gutter depression 'a' from above) | | $a_{local}$ = | 3.00 | 3.00 | inches |
| Number of Unit Inlets (Grate or Curb Opening) | | No = | 1 | 1 | |
| Water Depth at Flowline (outside of local depression) | | Ponding Depth = | 6.0 | 12.0 | inches |
| **Grate Information** | | | MINOR | MAJOR | ☑ Override Depths |
| Length of a Unit Grate | | $L_o$ (G) = | N/A | N/A | feet |
| Width of a Unit Grate | | $W_o$ = | N/A | N/A | feet |
| Area Opening Ratio for a Grate (typical values 0.15-0.90) | | $A_{ratio}$ = | N/A | N/A | |
| Clogging Factor for a Single Grate (typical value 0.50 - 0.70) | | $C_f$ (G) = | N/A | N/A | |
| Grate Weir Coefficient (typical value 2.15 - 3.60) | | $C_w$ (G) = | N/A | N/A | |
| Grate Orifice Coefficient (typical value 0.60 - 0.80) | | $C_o$ (G) = | N/A | N/A | |
| **Curb Opening Information** | | | MINOR | MAJOR | |
| Length of a Unit Curb Opening | | $L_o$ (C) = | 10.00 | 10.00 | feet |
| Height of Vertical Curb Opening in Inches | | $H_{vert}$ = | 6.00 | 6.00 | inches |
| Height of Curb Orifice Throat in Inches | | $H_{throat}$ = | 6.00 | 6.00 | inches |
| Angle of Throat (see USDCM Figure ST-5) | | Theta = | 63.40 | 63.40 | degrees |
| Side Width for Depression Pan (typically the gutter width of 2 feet) | | $W_p$ = | 2.00 | 2.00 | feet |
| Clogging Factor for a Single Curb Opening (typical value 0.10) | | $C_f$ (C) = | 0.10 | 0.10 | |
| Curb Opening Weir Coefficient (typical value 2.3-3.7) | | $C_w$ (C) = | 3.60 | 3.60 | |
| Curb Opening Orifice Coefficient (typical value 0.60 - 0.70) | | $C_o$ (C) = | 0.67 | 0.67 | |
| **Low Head Performance Reduction (Calculated)** | | | MINOR | MAJOR | |
| Depth for Grate Midwidth | | $d_{Grate}$ = | N/A | N/A | ft |
| Depth for Curb Opening Weir Equation | | $d_{Curb}$ = | 0.33 | 0.83 | ft |
| Combination Inlet Performance Reduction Factor for Long Inlets | | $RF_{Combination}$ = | 0.57 | 1.00 | |
| Curb Opening Performance Reduction Factor for Long Inlets | | $RF_{Curb}$ = | 0.93 | 1.00 | |
| Grated Inlet Performance Reduction Factor for Long Inlets | | $RF_{Grate}$ = | N/A | N/A | |
| | | | MINOR | MAJOR | |
| **Total Inlet Interception Capacity (assumes clogged condition)** | | **$Q_a$ =** | **8.3** | **25.5** | **cfs** |
| **Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)** | | $Q_{PEAK\ REQUIRED}$ = | 5.0 | 13.0 | cfs |

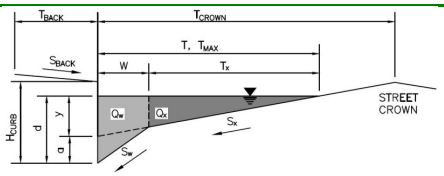
Version 4.05 Released March 2017

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

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

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

**Inlet ID:** DP-7




**Gutter Geometry (Enter data in the blue cells)**

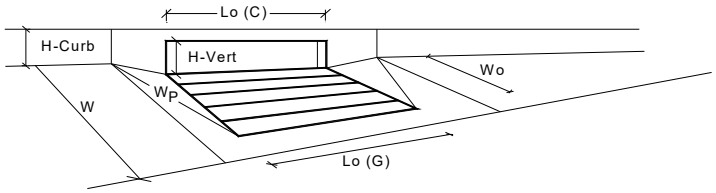
| | | | |
|---|---|---|---|
| Maximum Allowable Width for Spread Behind Curb | $T_{BACK}$ = | 7.5 | ft |
| Side Slope Behind Curb (leave blank for no conveyance credit behind curb) | $S_{BACK}$ = | 0.020 | ft/ft |
| Manning's Roughness Behind Curb (typically between 0.012 and 0.020) | $n_{BACK}$ = | 0.012 | |
| Height of Curb at Gutter Flow Line | $H_{CURB}$ = | 6.00 | inches |
| Distance from Curb Face to Street Crown | $T_{CROWN}$ = | 17.0 | ft |
| Gutter Width | W = | 2.00 | ft |
| Street Transverse Slope | $S_X$ = | 0.020 | ft/ft |
| Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft) | $S_W$ = | 0.083 | ft/ft |
| Street Longitudinal Slope - Enter 0 for sump condition | $S_O$ = | 0.000 | ft/ft |
| Manning's Roughness for Street Section (typically between 0.012 and 0.020) | $n_{STREET}$ = | 0.016 | |

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

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

# INLET IN A SUMP OR SAG LOCATION

**Version 4.05 Released March 2017**




| **Design Information (Input)** | CDOT Type R Curb Opening | | MINOR | MAJOR | |
|---|---|---|---|---|---|
| Type of Inlet | | Type = | CDOT Type R Curb Opening | | |
| Local Depression (additional to continuous gutter depression 'a' from above) | | $a_{local}$ = | 3.00 | 3.00 | inches |
| Number of Unit Inlets (Grate or Curb Opening) | | No = | 1 | 1 | |
| Water Depth at Flowline (outside of local depression) | | Ponding Depth = | 6.0 | 12.0 | inches |
| **Grate Information** | | | MINOR | MAJOR | ☑ Override Depths |
| Length of a Unit Grate | | $L_o$ (G) = | N/A | N/A | feet |
| Width of a Unit Grate | | $W_o$ = | N/A | N/A | feet |
| Area Opening Ratio for a Grate (typical values 0.15-0.90) | | $A_{ratio}$ = | N/A | N/A | |
| Clogging Factor for a Single Grate (typical value 0.50 - 0.70) | | $C_f$ (G) = | N/A | N/A | |
| Grate Weir Coefficient (typical value 2.15 - 3.60) | | $C_w$ (G) = | N/A | N/A | |
| Grate Orifice Coefficient (typical value 0.60 - 0.80) | | $C_o$ (G) = | N/A | N/A | |
| **Curb Opening Information** | | | MINOR | MAJOR | |
| Length of a Unit Curb Opening | | $L_o$ (C) = | 5.00 | 5.00 | feet |
| Height of Vertical Curb Opening in Inches | | $H_{vert}$ = | 6.00 | 6.00 | inches |
| Height of Curb Orifice Throat in Inches | | $H_{throat}$ = | 6.00 | 6.00 | inches |
| Angle of Throat (see USDCM Figure ST-5) | | Theta = | 63.40 | 63.40 | degrees |
| Side Width for Depression Pan (typically the gutter width of 2 feet) | | $W_p$ = | 2.00 | 2.00 | feet |
| Clogging Factor for a Single Curb Opening (typical value 0.10) | | $C_f$ (C) = | 0.10 | 0.10 | |
| Curb Opening Weir Coefficient (typical value 2.3-3.7) | | $C_w$ (C) = | 3.60 | 3.60 | |
| Curb Opening Orifice Coefficient (typical value 0.60 - 0.70) | | $C_o$ (C) = | 0.67 | 0.67 | |
| **Low Head Performance Reduction (Calculated)** | | | MINOR | MAJOR | |
| Depth for Grate Midwidth | | $d_{Grate}$ = | N/A | N/A | ft |
| Depth for Curb Opening Weir Equation | | $d_{Curb}$ = | 0.33 | 0.83 | ft |
| Combination Inlet Performance Reduction Factor for Long Inlets | | $RF_{Combination}$ = | 0.77 | 1.00 | |
| Curb Opening Performance Reduction Factor for Long Inlets | | $RF_{Curb}$ = | 1.00 | 1.00 | |
| Grated Inlet Performance Reduction Factor for Long Inlets | | $RF_{Grate}$ = | N/A | N/A | |
| | | | MINOR | MAJOR | |
| **Total Inlet Interception Capacity (assumes clogged condition)** | | **$Q_a$ =** | **5.4** | **12.3** | **cfs** |
| **Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)** | | $Q_{PEAK\ REQUIRED}$ = | 1.4 | 3.5 | cfs |

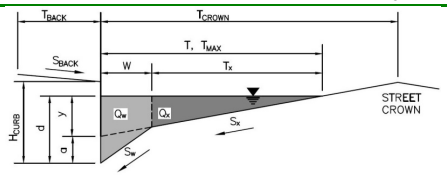
Version 4.05 Released March 2017

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

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

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

**Inlet ID:** DP-8




**Gutter Geometry (Enter data in the blue cells)**

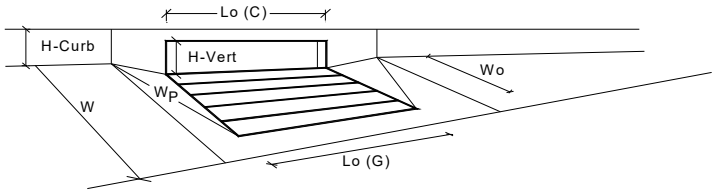
| | | | |
|---|---|---|---|
| Maximum Allowable Width for Spread Behind Curb | $T_{BACK}$ = | 7.5 | ft |
| Side Slope Behind Curb (leave blank for no conveyance credit behind curb) | $S_{BACK}$ = | 0.020 | ft/ft |
| Manning's Roughness Behind Curb (typically between 0.012 and 0.020) | $n_{BACK}$ = | 0.012 | |
| Height of Curb at Gutter Flow Line | $H_{CURB}$ = | 6.00 | inches |
| Distance from Curb Face to Street Crown | $T_{CROWN}$ = | 17.0 | ft |
| Gutter Width | W = | 2.00 | ft |
| Street Transverse Slope | $S_X$ = | 0.020 | ft/ft |
| Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft) | $S_W$ = | 0.083 | ft/ft |
| Street Longitudinal Slope - Enter 0 for sump condition | $S_O$ = | 0.000 | ft/ft |
| Manning's Roughness for Street Section (typically between 0.012 and 0.020) | $n_{STREET}$ = | 0.016 | |

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

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

# INLET IN A SUMP OR SAG LOCATION

**Version 4.05 Released March 2017**




| **Design Information (Input)** | CDOT Type R Curb Opening | | | |
|---|---|---|---|---|
| | | MINOR | MAJOR | |
| Type of Inlet | Type = | CDOT Type R Curb Opening | | |
| Local Depression (additional to continuous gutter depression 'a' from above) | $a_{local}$ = | 3.00 | 3.00 | inches |
| Number of Unit Inlets (Grate or Curb Opening) | No = | 1 | 1 | |
| Water Depth at Flowline (outside of local depression) | Ponding Depth = | 6.0 | 12.0 | inches |
| **Grate Information** | | MINOR | MAJOR | ☑ Override Depths |
| Length of a Unit Grate | $L_o$ (G) = | N/A | N/A | feet |
| Width of a Unit Grate | $W_o$ = | N/A | N/A | feet |
| Area Opening Ratio for a Grate (typical values 0.15-0.90) | $A_{ratio}$ = | N/A | N/A | |
| Clogging Factor for a Single Grate (typical value 0.50 - 0.70) | $C_f$ (G) = | N/A | N/A | |
| Grate Weir Coefficient (typical value 2.15 - 3.60) | $C_w$ (G) = | N/A | N/A | |
| Grate Orifice Coefficient (typical value 0.60 - 0.80) | $C_o$ (G) = | N/A | N/A | |
| **Curb Opening Information** | | MINOR | MAJOR | |
| Length of a Unit Curb Opening | $L_o$ (C) = | 10.00 | 10.00 | feet |
| Height of Vertical Curb Opening in Inches | $H_{vert}$ = | 6.00 | 6.00 | inches |
| Height of Curb Orifice Throat in Inches | $H_{throat}$ = | 6.00 | 6.00 | inches |
| Angle of Throat (see USDCM Figure ST-5) | Theta = | 63.40 | 63.40 | degrees |
| Side Width for Depression Pan (typically the gutter width of 2 feet) | $W_p$ = | 2.00 | 2.00 | feet |
| Clogging Factor for a Single Curb Opening (typical value 0.10) | $C_f$ (C) = | 0.10 | 0.10 | |
| Curb Opening Weir Coefficient (typical value 2.3-3.7) | $C_w$ (C) = | 3.60 | 3.60 | |
| Curb Opening Orifice Coefficient (typical value 0.60 - 0.70) | $C_o$ (C) = | 0.67 | 0.67 | |
| **Low Head Performance Reduction (Calculated)** | | MINOR | MAJOR | |
| Depth for Grate Midwidth | $d_{Grate}$ = | N/A | N/A | ft |
| Depth for Curb Opening Weir Equation | $d_{Curb}$ = | 0.33 | 0.83 | ft |
| Combination Inlet Performance Reduction Factor for Long Inlets | $RF_{Combination}$ = | 0.57 | 1.00 | |
| Curb Opening Performance Reduction Factor for Long Inlets | $RF_{Curb}$ = | 0.93 | 1.00 | |
| Grated Inlet Performance Reduction Factor for Long Inlets | $RF_{Grate}$ = | N/A | N/A | |
| | | MINOR | MAJOR | |
| **Total Inlet Interception Capacity (assumes clogged condition)** | **$Q_a$ =** | **8.3** | **25.5** | **cfs** |
| **Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)** | $Q_{PEAK\ REQUIRED}$ = | 5.0 | 11.0 | cfs |

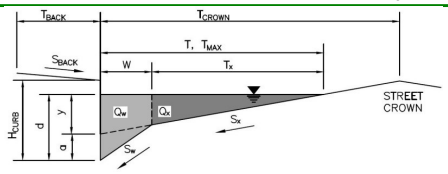
Version 4.05 Released March 2017

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

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

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

**Inlet ID:** DP-9




**Gutter Geometry (Enter data in the blue cells)**

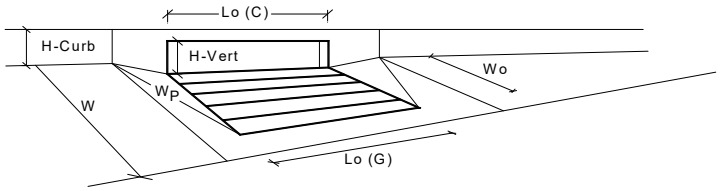
| | | | |
|---|---|---|---|
| Maximum Allowable Width for Spread Behind Curb | $T_{BACK}$ = | 7.5 | ft |
| Side Slope Behind Curb (leave blank for no conveyance credit behind curb) | $S_{BACK}$ = | 0.020 | ft/ft |
| Manning's Roughness Behind Curb (typically between 0.012 and 0.020) | $n_{BACK}$ = | 0.012 | |
| Height of Curb at Gutter Flow Line | $H_{CURB}$ = | 6.00 | inches |
| Distance from Curb Face to Street Crown | $T_{CROWN}$ = | 17.0 | ft |
| Gutter Width | W = | 2.00 | ft |
| Street Transverse Slope | $S_X$ = | 0.020 | ft/ft |
| Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft) | $S_W$ = | 0.083 | ft/ft |
| Street Longitudinal Slope - Enter 0 for sump condition | $S_O$ = | 0.000 | ft/ft |
| Manning's Roughness for Street Section (typically between 0.012 and 0.020) | $n_{STREET}$ = | 0.016 | |

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

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

# INLET IN A SUMP OR SAG LOCATION

**Version 4.05 Released March 2017**




| **Design Information (Input)** | | MINOR | MAJOR | |
|---|---|---|---|---|
| Type of Inlet | Type = | CDOT Type R Curb Opening | | |
| Local Depression (additional to continuous gutter depression 'a' from above) | $a_{local}$ = | 3.00 | 3.00 | inches |
| Number of Unit Inlets (Grate or Curb Opening) | No = | 1 | 1 | |
| Water Depth at Flowline (outside of local depression) | Ponding Depth = | 6.0 | 12.0 | inches |
| **Grate Information** | | MINOR | MAJOR | ☑ Override Depths |
| Length of a Unit Grate | $L_o$ (G) = | N/A | N/A | feet |
| Width of a Unit Grate | $W_o$ = | N/A | N/A | feet |
| Area Opening Ratio for a Grate (typical values 0.15-0.90) | $A_{ratio}$ = | N/A | N/A | |
| Clogging Factor for a Single Grate (typical value 0.50 - 0.70) | $C_f$ (G) = | N/A | N/A | |
| Grate Weir Coefficient (typical value 2.15 - 3.60) | $C_w$ (G) = | N/A | N/A | |
| Grate Orifice Coefficient (typical value 0.60 - 0.80) | $C_o$ (G) = | N/A | N/A | |
| **Curb Opening Information** | | MINOR | MAJOR | |
| Length of a Unit Curb Opening | $L_o$ (C) = | 5.00 | 5.00 | feet |
| Height of Vertical Curb Opening in Inches | $H_{vert}$ = | 6.00 | 6.00 | inches |
| Height of Curb Orifice Throat in Inches | $H_{throat}$ = | 6.00 | 6.00 | inches |
| Angle of Throat (see USDCM Figure ST-5) | Theta = | 63.40 | 63.40 | degrees |
| Side Width for Depression Pan (typically the gutter width of 2 feet) | $W_p$ = | 2.00 | 2.00 | feet |
| Clogging Factor for a Single Curb Opening (typical value 0.10) | $C_f$ (C) = | 0.10 | 0.10 | |
| Curb Opening Weir Coefficient (typical value 2.3-3.7) | $C_w$ (C) = | 3.60 | 3.60 | |
| Curb Opening Orifice Coefficient (typical value 0.60 - 0.70) | $C_o$ (C) = | 0.67 | 0.67 | |
| **Low Head Performance Reduction (Calculated)** | | MINOR | MAJOR | |
| Depth for Grate Midwidth | $d_{Grate}$ = | N/A | N/A | ft |
| Depth for Curb Opening Weir Equation | $d_{Curb}$ = | 0.33 | 0.83 | ft |
| Combination Inlet Performance Reduction Factor for Long Inlets | $RF_{Combination}$ = | 0.77 | 1.00 | |
| Curb Opening Performance Reduction Factor for Long Inlets | $RF_{Curb}$ = | 1.00 | 1.00 | |
| Grated Inlet Performance Reduction Factor for Long Inlets | $RF_{Grate}$ = | N/A | N/A | |
| | | MINOR | MAJOR | |
| **Total Inlet Interception Capacity (assumes clogged condition)** | **$Q_a$ =** | **5.4** | **12.3** | **cfs** |
| **Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)** | $Q_{PEAK\ REQUIRED}$ = | 2.0 | 5.0 | cfs |

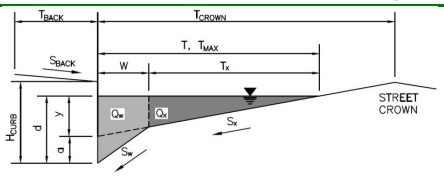
Version 4.05 Released March 2017

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

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

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

**Inlet ID:** DP-10




**Gutter Geometry (Enter data in the blue cells)**

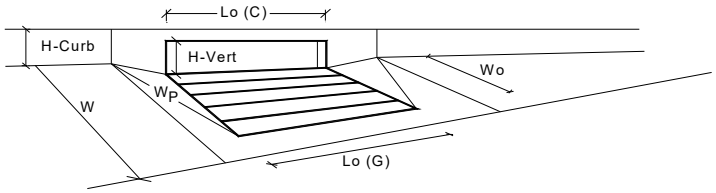
| | | | |
|---|---|---|---|
| Maximum Allowable Width for Spread Behind Curb | $T_{BACK}$ = | 7.5 | ft |
| Side Slope Behind Curb (leave blank for no conveyance credit behind curb) | $S_{BACK}$ = | 0.020 | ft/ft |
| Manning's Roughness Behind Curb (typically between 0.012 and 0.020) | $n_{BACK}$ = | 0.012 | |
| Height of Curb at Gutter Flow Line | $H_{CURB}$ = | 6.00 | inches |
| Distance from Curb Face to Street Crown | $T_{CROWN}$ = | 17.0 | ft |
| Gutter Width | W = | 2.00 | ft |
| Street Transverse Slope | $S_X$ = | 0.020 | ft/ft |
| Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft) | $S_W$ = | 0.083 | ft/ft |
| Street Longitudinal Slope - Enter 0 for sump condition | $S_O$ = | 0.000 | ft/ft |
| Manning's Roughness for Street Section (typically between 0.012 and 0.020) | $n_{STREET}$ = | 0.016 | |

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

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

# INLET IN A SUMP OR SAG LOCATION

**Version 4.05 Released March 2017**




| **Design Information (Input)** | CDOT Type R Curb Opening | | | |
|---|---|---|---|---|
| | | MINOR | MAJOR | |
| Type of Inlet | Type = | CDOT Type R Curb Opening | | |
| Local Depression (additional to continuous gutter depression 'a' from above) | $a_{local}$ = | 3.00 | 3.00 | inches |
| Number of Unit Inlets (Grate or Curb Opening) | No = | 1 | 1 | |
| Water Depth at Flowline (outside of local depression) | Ponding Depth = | 6.0 | 12.0 | inches |
| **Grate Information** | | MINOR | MAJOR | ☑ Override Depths |
| Length of a Unit Grate | $L_o$ (G) = | N/A | N/A | feet |
| Width of a Unit Grate | $W_o$ = | N/A | N/A | feet |
| Area Opening Ratio for a Grate (typical values 0.15-0.90) | $A_{ratio}$ = | N/A | N/A | |
| Clogging Factor for a Single Grate (typical value 0.50 - 0.70) | $C_f$ (G) = | N/A | N/A | |
| Grate Weir Coefficient (typical value 2.15 - 3.60) | $C_w$ (G) = | N/A | N/A | |
| Grate Orifice Coefficient (typical value 0.60 - 0.80) | $C_o$ (G) = | N/A | N/A | |
| **Curb Opening Information** | | MINOR | MAJOR | |
| Length of a Unit Curb Opening | $L_o$ (C) = | 10.00 | 10.00 | feet |
| Height of Vertical Curb Opening in Inches | $H_{vert}$ = | 6.00 | 6.00 | inches |
| Height of Curb Orifice Throat in Inches | $H_{throat}$ = | 6.00 | 6.00 | inches |
| Angle of Throat (see USDCM Figure ST-5) | Theta = | 63.40 | 63.40 | degrees |
| Side Width for Depression Pan (typically the gutter width of 2 feet) | $W_p$ = | 2.00 | 2.00 | feet |
| Clogging Factor for a Single Curb Opening (typical value 0.10) | $C_f$ (C) = | 0.10 | 0.10 | |
| Curb Opening Weir Coefficient (typical value 2.3-3.7) | $C_w$ (C) = | 3.60 | 3.60 | |
| Curb Opening Orifice Coefficient (typical value 0.60 - 0.70) | $C_o$ (C) = | 0.67 | 0.67 | |
| **Low Head Performance Reduction (Calculated)** | | MINOR | MAJOR | |
| Depth for Grate Midwidth | $d_{Grate}$ = | N/A | N/A | ft |
| Depth for Curb Opening Weir Equation | $d_{Curb}$ = | 0.33 | 0.83 | ft |
| Combination Inlet Performance Reduction Factor for Long Inlets | $RF_{Combination}$ = | 0.57 | 1.00 | |
| Curb Opening Performance Reduction Factor for Long Inlets | $RF_{Curb}$ = | 0.93 | 1.00 | |
| Grated Inlet Performance Reduction Factor for Long Inlets | $RF_{Grate}$ = | N/A | N/A | |
| | | MINOR | MAJOR | |
| **Total Inlet Interception Capacity (assumes clogged condition)** | **$Q_a$ =** | **8.3** | **25.5** | **cfs** |
| **Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)** | $Q_{PEAK\ REQUIRED}$ = | 3.0 | 8.0 | cfs |

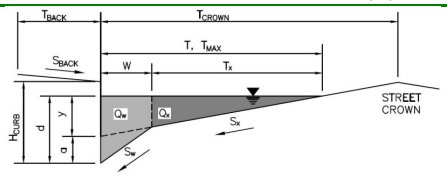
Version 4.05 Released March 2017

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

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

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

**Inlet ID:** DP-11 and DP-17




**Gutter Geometry (Enter data in the blue cells)**

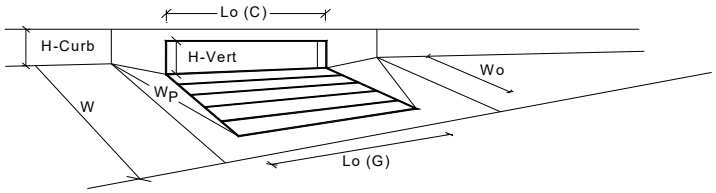
| | | | |
|---|---|---|---|
| Maximum Allowable Width for Spread Behind Curb | $T_{BACK}$ = | 7.5 | ft |
| Side Slope Behind Curb (leave blank for no conveyance credit behind curb) | $S_{BACK}$ = | 0.020 | ft/ft |
| Manning's Roughness Behind Curb (typically between 0.012 and 0.020) | $n_{BACK}$ = | 0.012 | |
| Height of Curb at Gutter Flow Line | $H_{CURB}$ = | 6.00 | inches |
| Distance from Curb Face to Street Crown | $T_{CROWN}$ = | 17.0 | ft |
| Gutter Width | W = | 2.00 | ft |
| Street Transverse Slope | $S_X$ = | 0.020 | ft/ft |
| Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft) | $S_W$ = | 0.083 | ft/ft |
| Street Longitudinal Slope - Enter 0 for sump condition | $S_O$ = | 0.000 | ft/ft |
| Manning's Roughness for Street Section (typically between 0.012 and 0.020) | $n_{STREET}$ = | 0.016 | |

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

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

# INLET IN A SUMP OR SAG LOCATION

**Version 4.05 Released March 2017**




| **Design Information (Input)** | CDOT Type R Curb Opening | | MINOR | MAJOR | |
|---|---|---|---|---|---|
| Type of Inlet | | Type = | CDOT Type R Curb Opening | | |
| Local Depression (additional to continuous gutter depression 'a' from above) | | $a_{local}$ = | 3.00 | 3.00 | inches |
| Number of Unit Inlets (Grate or Curb Opening) | | No = | 1 | 1 | |
| Water Depth at Flowline (outside of local depression) | | Ponding Depth = | 6.0 | 12.0 | inches |
| **Grate Information** | | | MINOR | MAJOR | ☑ Override Depths |
| Length of a Unit Grate | | $L_o$ (G) = | N/A | N/A | feet |
| Width of a Unit Grate | | $W_o$ = | N/A | N/A | feet |
| Area Opening Ratio for a Grate (typical values 0.15-0.90) | | $A_{ratio}$ = | N/A | N/A | |
| Clogging Factor for a Single Grate (typical value 0.50 - 0.70) | | $C_f$ (G) = | N/A | N/A | |
| Grate Weir Coefficient (typical value 2.15 - 3.60) | | $C_w$ (G) = | N/A | N/A | |
| Grate Orifice Coefficient (typical value 0.60 - 0.80) | | $C_o$ (G) = | N/A | N/A | |
| **Curb Opening Information** | | | MINOR | MAJOR | |
| Length of a Unit Curb Opening | | $L_o$ (C) = | 5.00 | 5.00 | feet |
| Height of Vertical Curb Opening in Inches | | $H_{vert}$ = | 6.00 | 6.00 | inches |
| Height of Curb Orifice Throat in Inches | | $H_{throat}$ = | 6.00 | 6.00 | inches |
| Angle of Throat (see USDCM Figure ST-5) | | Theta = | 63.40 | 63.40 | degrees |
| Side Width for Depression Pan (typically the gutter width of 2 feet) | | $W_p$ = | 2.00 | 2.00 | feet |
| Clogging Factor for a Single Curb Opening (typical value 0.10) | | $C_f$ (C) = | 0.10 | 0.10 | |
| Curb Opening Weir Coefficient (typical value 2.3-3.7) | | $C_w$ (C) = | 3.60 | 3.60 | |
| Curb Opening Orifice Coefficient (typical value 0.60 - 0.70) | | $C_o$ (C) = | 0.67 | 0.67 | |
| **Low Head Performance Reduction (Calculated)** | | | MINOR | MAJOR | |
| Depth for Grate Midwidth | | $d_{Grate}$ = | N/A | N/A | ft |
| Depth for Curb Opening Weir Equation | | $d_{Curb}$ = | 0.33 | 0.83 | ft |
| Combination Inlet Performance Reduction Factor for Long Inlets | | $RF_{Combination}$ = | 0.77 | 1.00 | |
| Curb Opening Performance Reduction Factor for Long Inlets | | $RF_{Curb}$ = | 1.00 | 1.00 | |
| Grated Inlet Performance Reduction Factor for Long Inlets | | $RF_{Grate}$ = | N/A | N/A | |
| | | | MINOR | MAJOR | |
| **Total Inlet Interception Capacity (assumes clogged condition)** | | **$Q_a$ =** | **5.4** | **12.3** | **cfs** |
| **Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)** | | $Q_{PEAK\ REQUIRED}$ = | 1.3 | 3.3 | cfs |

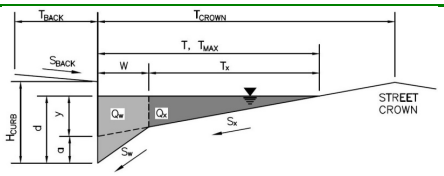
Version 4.05 Released March 2017

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

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

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

**Inlet ID:** DP-12




**Gutter Geometry (Enter data in the blue cells)**

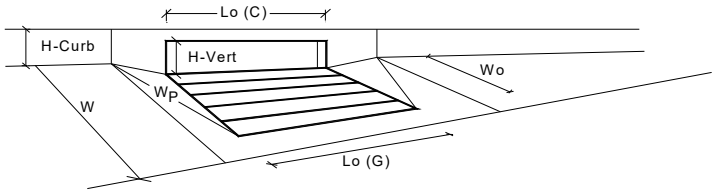
| | | | |
|---|---|---|---|
| Maximum Allowable Width for Spread Behind Curb | $T_{BACK}$ = | 7.5 | ft |
| Side Slope Behind Curb (leave blank for no conveyance credit behind curb) | $S_{BACK}$ = | 0.020 | ft/ft |
| Manning's Roughness Behind Curb (typically between 0.012 and 0.020) | $n_{BACK}$ = | 0.012 | |
| Height of Curb at Gutter Flow Line | $H_{CURB}$ = | 6.00 | inches |
| Distance from Curb Face to Street Crown | $T_{CROWN}$ = | 17.0 | ft |
| Gutter Width | W = | 2.00 | ft |
| Street Transverse Slope | $S_X$ = | 0.020 | ft/ft |
| Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft) | $S_W$ = | 0.083 | ft/ft |
| Street Longitudinal Slope - Enter 0 for sump condition | $S_O$ = | 0.000 | ft/ft |
| Manning's Roughness for Street Section (typically between 0.012 and 0.020) | $n_{STREET}$ = | 0.016 | |

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

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

# INLET IN A SUMP OR SAG LOCATION

**Version 4.05 Released March 2017**




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

| **Low Head Performance Reduction (Calculated)** | | MINOR | MAJOR | |
|---|---|---|---|---|
| Depth for Grate Midwidth | $d_{Grate}$ = | N/A | N/A | ft |
| Depth for Curb Opening Weir Equation | $d_{Curb}$ = | 0.33 | 0.83 | ft |
| Combination Inlet Performance Reduction Factor for Long Inlets | $RF_{Combination}$ = | 0.77 | 1.00 | |
| Curb Opening Performance Reduction Factor for Long Inlets | $RF_{Curb}$ = | 1.00 | 1.00 | |
| Grated Inlet Performance Reduction Factor for Long Inlets | $RF_{Grate}$ = | N/A | N/A | |

| | | MINOR | MAJOR | |
|---|---|---|---|---|
| **Total Inlet Interception Capacity (assumes clogged condition)** | **$Q_a$ =** | **5.4** | **12.3** | **cfs** |
| **Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)** | $Q_{PEAK\ REQUIRED}$ = | 2.0 | 6.0 | cfs |

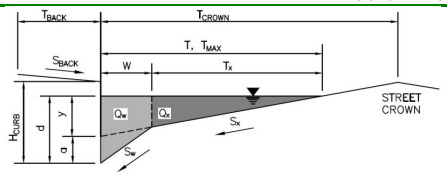
Version 4.05 Released March 2017

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

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

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

**Inlet ID:** DP-13 and DP-18




**Gutter Geometry (Enter data in the blue cells)**

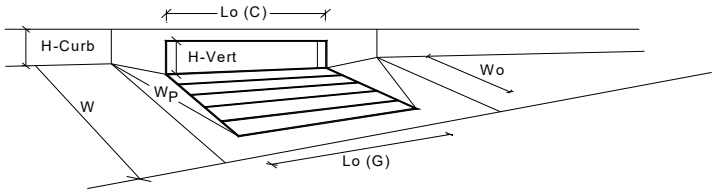
| | | | |
|---|---|---|---|
| Maximum Allowable Width for Spread Behind Curb | $T_{BACK}$ = | 7.5 | ft |
| Side Slope Behind Curb (leave blank for no conveyance credit behind curb) | $S_{BACK}$ = | 0.020 | ft/ft |
| Manning's Roughness Behind Curb (typically between 0.012 and 0.020) | $n_{BACK}$ = | 0.012 | |
| Height of Curb at Gutter Flow Line | $H_{CURB}$ = | 6.00 | inches |
| Distance from Curb Face to Street Crown | $T_{CROWN}$ = | 17.0 | ft |
| Gutter Width | W = | 2.00 | ft |
| Street Transverse Slope | $S_X$ = | 0.020 | ft/ft |
| Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft) | $S_W$ = | 0.083 | ft/ft |
| Street Longitudinal Slope - Enter 0 for sump condition | $S_O$ = | 0.000 | ft/ft |
| Manning's Roughness for Street Section (typically between 0.012 and 0.020) | $n_{STREET}$ = | 0.016 | |

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

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

# INLET IN A SUMP OR SAG LOCATION

**Version 4.05 Released March 2017**




| **Design Information (Input)** | CDOT Type R Curb Opening | | MINOR | MAJOR | |
|---|---|---|---|---|---|
| Type of Inlet | | Type = | CDOT Type R Curb Opening | | |
| Local Depression (additional to continuous gutter depression 'a' from above) | | $a_{local}$ = | 3.00 | 3.00 | inches |
| Number of Unit Inlets (Grate or Curb Opening) | | No = | 1 | 1 | |
| Water Depth at Flowline (outside of local depression) | | Ponding Depth = | 6.0 | 12.0 | inches |
| **Grate Information** | | | MINOR | MAJOR | ☑ Override Depths |
| Length of a Unit Grate | | $L_o$ (G) = | N/A | N/A | feet |
| Width of a Unit Grate | | $W_o$ = | N/A | N/A | feet |
| Area Opening Ratio for a Grate (typical values 0.15-0.90) | | $A_{ratio}$ = | N/A | N/A | |
| Clogging Factor for a Single Grate (typical value 0.50 - 0.70) | | $C_f$ (G) = | N/A | N/A | |
| Grate Weir Coefficient (typical value 2.15 - 3.60) | | $C_w$ (G) = | N/A | N/A | |
| Grate Orifice Coefficient (typical value 0.60 - 0.80) | | $C_o$ (G) = | N/A | N/A | |
| **Curb Opening Information** | | | MINOR | MAJOR | |
| Length of a Unit Curb Opening | | $L_o$ (C) = | 5.00 | 5.00 | feet |
| Height of Vertical Curb Opening in Inches | | $H_{vert}$ = | 6.00 | 6.00 | inches |
| Height of Curb Orifice Throat in Inches | | $H_{throat}$ = | 6.00 | 6.00 | inches |
| Angle of Throat (see USDCM Figure ST-5) | | Theta = | 63.40 | 63.40 | degrees |
| Side Width for Depression Pan (typically the gutter width of 2 feet) | | $W_p$ = | 2.00 | 2.00 | feet |
| Clogging Factor for a Single Curb Opening (typical value 0.10) | | $C_f$ (C) = | 0.10 | 0.10 | |
| Curb Opening Weir Coefficient (typical value 2.3-3.7) | | $C_w$ (C) = | 3.60 | 3.60 | |
| Curb Opening Orifice Coefficient (typical value 0.60 - 0.70) | | $C_o$ (C) = | 0.67 | 0.67 | |
| **Low Head Performance Reduction (Calculated)** | | | MINOR | MAJOR | |
| Depth for Grate Midwidth | | $d_{Grate}$ = | N/A | N/A | ft |
| Depth for Curb Opening Weir Equation | | $d_{Curb}$ = | 0.33 | 0.83 | ft |
| Combination Inlet Performance Reduction Factor for Long Inlets | | $RF_{Combination}$ = | 0.77 | 1.00 | |
| Curb Opening Performance Reduction Factor for Long Inlets | | $RF_{Curb}$ = | 1.00 | 1.00 | |
| Grated Inlet Performance Reduction Factor for Long Inlets | | $RF_{Grate}$ = | N/A | N/A | |
| | | | MINOR | MAJOR | |
| **Total Inlet Interception Capacity (assumes clogged condition)** | | **$Q_a$ =** | **5.4** | **12.3** | **cfs** |
| **Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)** | | $Q_{PEAK\ REQUIRED}$ = | 2.0 | 4.0 | cfs |

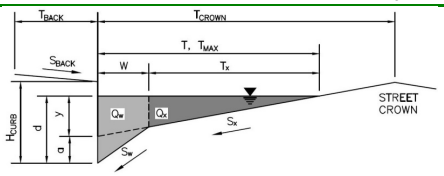
Version 4.05 Released March 2017

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

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

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

**Inlet ID:** DP-15




**Gutter Geometry (Enter data in the blue cells)**

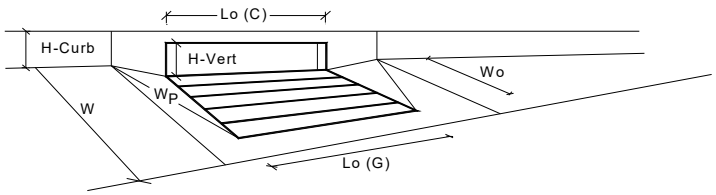
| | | | |
|---|---|---|---|
| Maximum Allowable Width for Spread Behind Curb | $T_{BACK}$ = | 7.5 | ft |
| Side Slope Behind Curb (leave blank for no conveyance credit behind curb) | $S_{BACK}$ = | 0.020 | ft/ft |
| Manning's Roughness Behind Curb (typically between 0.012 and 0.020) | $n_{BACK}$ = | 0.012 | |
| Height of Curb at Gutter Flow Line | $H_{CURB}$ = | 6.00 | inches |
| Distance from Curb Face to Street Crown | $T_{CROWN}$ = | 17.0 | ft |
| Gutter Width | W = | 2.00 | ft |
| Street Transverse Slope | $S_X$ = | 0.020 | ft/ft |
| Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft) | $S_W$ = | 0.083 | ft/ft |
| Street Longitudinal Slope - Enter 0 for sump condition | $S_O$ = | 0.000 | ft/ft |
| Manning's Roughness for Street Section (typically between 0.012 and 0.020) | $n_{STREET}$ = | 0.016 | |

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

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

# INLET IN A SUMP OR SAG LOCATION

**Version 4.05 Released March 2017**




| **Design Information (Input)** | CDOT Type R Curb Opening | | MINOR | MAJOR | |
|---|---|---|---|---|---|
| Type of Inlet | | Type = | CDOT Type R Curb Opening | | |
| Local Depression (additional to continuous gutter depression 'a' from above) | | $a_{local}$ = | 3.00 | 3.00 | inches |
| Number of Unit Inlets (Grate or Curb Opening) | | No = | 1 | 1 | |
| Water Depth at Flowline (outside of local depression) | | Ponding Depth = | 6.0 | 12.0 | inches |
| **Grate Information** | | | MINOR | MAJOR | ☑ Override Depths |
| Length of a Unit Grate | | $L_o$ (G) = | N/A | N/A | feet |
| Width of a Unit Grate | | $W_o$ = | N/A | N/A | feet |
| Area Opening Ratio for a Grate (typical values 0.15-0.90) | | $A_{ratio}$ = | N/A | N/A | |
| Clogging Factor for a Single Grate (typical value 0.50 - 0.70) | | $C_f$ (G) = | N/A | N/A | |
| Grate Weir Coefficient (typical value 2.15 - 3.60) | | $C_w$ (G) = | N/A | N/A | |
| Grate Orifice Coefficient (typical value 0.60 - 0.80) | | $C_o$ (G) = | N/A | N/A | |
| **Curb Opening Information** | | | MINOR | MAJOR | |
| Length of a Unit Curb Opening | | $L_o$ (C) = | 10.00 | 10.00 | feet |
| Height of Vertical Curb Opening in Inches | | $H_{vert}$ = | 6.00 | 6.00 | inches |
| Height of Curb Orifice Throat in Inches | | $H_{throat}$ = | 6.00 | 6.00 | inches |
| Angle of Throat (see USDCM Figure ST-5) | | Theta = | 63.40 | 63.40 | degrees |
| Side Width for Depression Pan (typically the gutter width of 2 feet) | | $W_p$ = | 2.00 | 2.00 | feet |
| Clogging Factor for a Single Curb Opening (typical value 0.10) | | $C_f$ (C) = | 0.10 | 0.10 | |
| Curb Opening Weir Coefficient (typical value 2.3-3.7) | | $C_w$ (C) = | 3.60 | 3.60 | |
| Curb Opening Orifice Coefficient (typical value 0.60 - 0.70) | | $C_o$ (C) = | 0.67 | 0.67 | |
| **Low Head Performance Reduction (Calculated)** | | | MINOR | MAJOR | |
| Depth for Grate Midwidth | | $d_{Grate}$ = | N/A | N/A | ft |
| Depth for Curb Opening Weir Equation | | $d_{Curb}$ = | 0.33 | 0.83 | ft |
| Combination Inlet Performance Reduction Factor for Long Inlets | | $RF_{Combination}$ = | 0.57 | 1.00 | |
| Curb Opening Performance Reduction Factor for Long Inlets | | $RF_{Curb}$ = | 0.93 | 1.00 | |
| Grated Inlet Performance Reduction Factor for Long Inlets | | $RF_{Grate}$ = | N/A | N/A | |
| | | | MINOR | MAJOR | |
| **Total Inlet Interception Capacity (assumes clogged condition)** | | **$Q_a$ =** | **8.3** | **25.5** | **cfs** |
| **Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)** | | $Q_{PEAK\ REQUIRED}$ = | 6.0 | 19.0 | cfs |

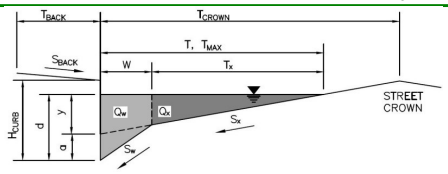
Version 4.05 Released March 2017

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

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

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

**Inlet ID:** DP-16




**Gutter Geometry (Enter data in the blue cells)**

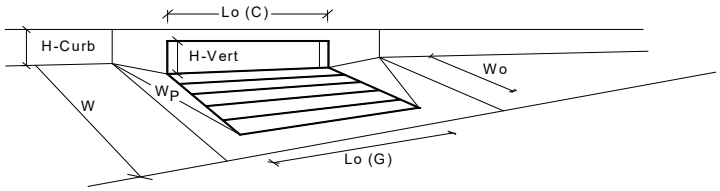
| | | | |
|---|---|---|---|
| Maximum Allowable Width for Spread Behind Curb | $T_{BACK}$ = | 7.5 | ft |
| Side Slope Behind Curb (leave blank for no conveyance credit behind curb) | $S_{BACK}$ = | 0.020 | ft/ft |
| Manning's Roughness Behind Curb (typically between 0.012 and 0.020) | $n_{BACK}$ = | 0.012 | |
| Height of Curb at Gutter Flow Line | $H_{CURB}$ = | 6.00 | inches |
| Distance from Curb Face to Street Crown | $T_{CROWN}$ = | 17.0 | ft |
| Gutter Width | W = | 2.00 | ft |
| Street Transverse Slope | $S_X$ = | 0.020 | ft/ft |
| Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft) | $S_W$ = | 0.083 | ft/ft |
| Street Longitudinal Slope - Enter 0 for sump condition | $S_O$ = | 0.000 | ft/ft |
| Manning's Roughness for Street Section (typically between 0.012 and 0.020) | $n_{STREET}$ = | 0.016 | |

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

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

# INLET IN A SUMP OR SAG LOCATION

**Version 4.05 Released March 2017**




| **Design Information (Input)** | | MINOR | MAJOR | |
|---|---|---|---|---|
| Type of Inlet | Type = | CDOT Type R Curb Opening | | |
| Local Depression (additional to continuous gutter depression 'a' from above) | $a_{local}$ = | 3.00 | 3.00 | inches |
| Number of Unit Inlets (Grate or Curb Opening) | No = | 1 | 1 | |
| Water Depth at Flowline (outside of local depression) | Ponding Depth = | 6.0 | 12.0 | inches |
| **Grate Information** | | MINOR | MAJOR | ☑ Override Depths |
| Length of a Unit Grate | $L_o$ (G) = | N/A | N/A | feet |
| Width of a Unit Grate | $W_o$ = | N/A | N/A | feet |
| Area Opening Ratio for a Grate (typical values 0.15-0.90) | $A_{ratio}$ = | N/A | N/A | |
| Clogging Factor for a Single Grate (typical value 0.50 - 0.70) | $C_f$ (G) = | N/A | N/A | |
| Grate Weir Coefficient (typical value 2.15 - 3.60) | $C_w$ (G) = | N/A | N/A | |
| Grate Orifice Coefficient (typical value 0.60 - 0.80) | $C_o$ (G) = | N/A | N/A | |
| **Curb Opening Information** | | MINOR | MAJOR | |
| Length of a Unit Curb Opening | $L_o$ (C) = | 5.00 | 5.00 | feet |
| Height of Vertical Curb Opening in Inches | $H_{vert}$ = | 6.00 | 6.00 | inches |
| Height of Curb Orifice Throat in Inches | $H_{throat}$ = | 6.00 | 6.00 | inches |
| Angle of Throat (see USDCM Figure ST-5) | Theta = | 63.40 | 63.40 | degrees |
| Side Width for Depression Pan (typically the gutter width of 2 feet) | $W_p$ = | 2.00 | 2.00 | feet |
| Clogging Factor for a Single Curb Opening (typical value 0.10) | $C_f$ (C) = | 0.10 | 0.10 | |
| Curb Opening Weir Coefficient (typical value 2.3-3.7) | $C_w$ (C) = | 3.60 | 3.60 | |
| Curb Opening Orifice Coefficient (typical value 0.60 - 0.70) | $C_o$ (C) = | 0.67 | 0.67 | |
| **Low Head Performance Reduction (Calculated)** | | MINOR | MAJOR | |
| Depth for Grate Midwidth | $d_{Grate}$ = | N/A | N/A | ft |
| Depth for Curb Opening Weir Equation | $d_{Curb}$ = | 0.33 | 0.83 | ft |
| Combination Inlet Performance Reduction Factor for Long Inlets | $RF_{Combination}$ = | 0.77 | 1.00 | |
| Curb Opening Performance Reduction Factor for Long Inlets | $RF_{Curb}$ = | 1.00 | 1.00 | |
| Grated Inlet Performance Reduction Factor for Long Inlets | $RF_{Grate}$ = | N/A | N/A | |
| | | MINOR | MAJOR | |
| **Total Inlet Interception Capacity (assumes clogged condition)** | **$Q_a$ =** | **5.4** | **12.3** | **cfs** |
| **Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)** | $Q_{PEAK\ REQUIRED}$ = | 2.0 | 6.0 | cfs |

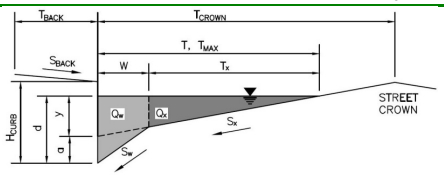
Version 4.05 Released March 2017

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

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

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

**Inlet ID:** DP-19




**Gutter Geometry (Enter data in the blue cells)**

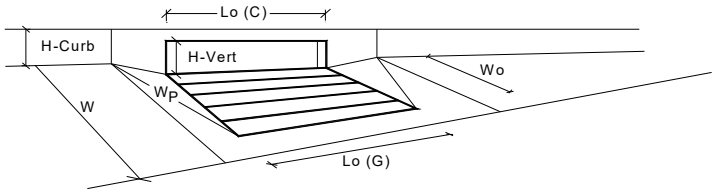
| | | | |
|---|---|---|---|
| Maximum Allowable Width for Spread Behind Curb | $T_{BACK}$ = | 7.5 | ft |
| Side Slope Behind Curb (leave blank for no conveyance credit behind curb) | $S_{BACK}$ = | 0.020 | ft/ft |
| Manning's Roughness Behind Curb (typically between 0.012 and 0.020) | $n_{BACK}$ = | 0.012 | |
| Height of Curb at Gutter Flow Line | $H_{CURB}$ = | 6.00 | inches |
| Distance from Curb Face to Street Crown | $T_{CROWN}$ = | 17.0 | ft |
| Gutter Width | W = | 2.00 | ft |
| Street Transverse Slope | $S_X$ = | 0.020 | ft/ft |
| Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft) | $S_W$ = | 0.083 | ft/ft |
| Street Longitudinal Slope - Enter 0 for sump condition | $S_O$ = | 0.000 | ft/ft |
| Manning's Roughness for Street Section (typically between 0.012 and 0.020) | $n_{STREET}$ = | 0.016 | |

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

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

# INLET IN A SUMP OR SAG LOCATION

**Version 4.05 Released March 2017**




| **Design Information (Input)** | CDOT Type R Curb Opening | | MINOR | MAJOR | |
|---|---|---|---|---|---|
| Type of Inlet | | Type = | CDOT Type R Curb Opening | | |
| Local Depression (additional to continuous gutter depression 'a' from above) | | $a_{local}$ = | 3.00 | 3.00 | inches |
| Number of Unit Inlets (Grate or Curb Opening) | | No = | 1 | 1 | |
| Water Depth at Flowline (outside of local depression) | | Ponding Depth = | 6.0 | 12.0 | inches |
| **Grate Information** | | | MINOR | MAJOR | ☑ Override Depths |
| Length of a Unit Grate | | $L_o$ (G) = | N/A | N/A | feet |
| Width of a Unit Grate | | $W_o$ = | N/A | N/A | feet |
| Area Opening Ratio for a Grate (typical values 0.15-0.90) | | $A_{ratio}$ = | N/A | N/A | |
| Clogging Factor for a Single Grate (typical value 0.50 - 0.70) | | $C_f$ (G) = | N/A | N/A | |
| Grate Weir Coefficient (typical value 2.15 - 3.60) | | $C_w$ (G) = | N/A | N/A | |
| Grate Orifice Coefficient (typical value 0.60 - 0.80) | | $C_o$ (G) = | N/A | N/A | |
| **Curb Opening Information** | | | MINOR | MAJOR | |
| Length of a Unit Curb Opening | | $L_o$ (C) = | 10.00 | 10.00 | feet |
| Height of Vertical Curb Opening in Inches | | $H_{vert}$ = | 6.00 | 6.00 | inches |
| Height of Curb Orifice Throat in Inches | | $H_{throat}$ = | 6.00 | 6.00 | inches |
| Angle of Throat (see USDCM Figure ST-5) | | Theta = | 63.40 | 63.40 | degrees |
| Side Width for Depression Pan (typically the gutter width of 2 feet) | | $W_p$ = | 2.00 | 2.00 | feet |
| Clogging Factor for a Single Curb Opening (typical value 0.10) | | $C_f$ (C) = | 0.10 | 0.10 | |
| Curb Opening Weir Coefficient (typical value 2.3-3.7) | | $C_w$ (C) = | 3.60 | 3.60 | |
| Curb Opening Orifice Coefficient (typical value 0.60 - 0.70) | | $C_o$ (C) = | 0.67 | 0.67 | |
| **Low Head Performance Reduction (Calculated)** | | | MINOR | MAJOR | |
| Depth for Grate Midwidth | | $d_{Grate}$ = | N/A | N/A | ft |
| Depth for Curb Opening Weir Equation | | $d_{Curb}$ = | 0.33 | 0.83 | ft |
| Combination Inlet Performance Reduction Factor for Long Inlets | | $RF_{Combination}$ = | 0.57 | 1.00 | |
| Curb Opening Performance Reduction Factor for Long Inlets | | $RF_{Curb}$ = | 0.93 | 1.00 | |
| Grated Inlet Performance Reduction Factor for Long Inlets | | $RF_{Grate}$ = | N/A | N/A | |
| | | | MINOR | MAJOR | |
| **Total Inlet Interception Capacity (assumes clogged condition)** | | **$Q_a$ =** | **8.3** | **25.5** | **cfs** |
| **Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)** | | $Q_{PEAK\ REQUIRED}$ = | 4.0 | 11.0 | cfs |

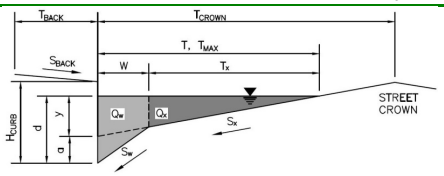
Version 4.05 Released March 2017

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

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

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

**Inlet ID:** DP-20




**Gutter Geometry (Enter data in the blue cells)**

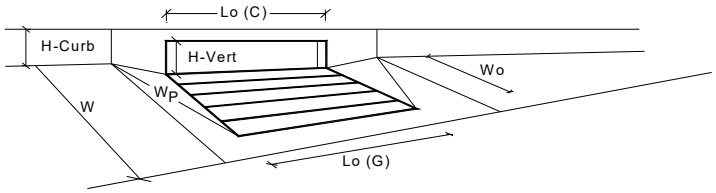
| | | | |
|---|---|---|---|
| Maximum Allowable Width for Spread Behind Curb | $T_{BACK}$ = | 7.5 | ft |
| Side Slope Behind Curb (leave blank for no conveyance credit behind curb) | $S_{BACK}$ = | 0.020 | ft/ft |
| Manning's Roughness Behind Curb (typically between 0.012 and 0.020) | $n_{BACK}$ = | 0.012 | |
| Height of Curb at Gutter Flow Line | $H_{CURB}$ = | 6.00 | inches |
| Distance from Curb Face to Street Crown | $T_{CROWN}$ = | 17.0 | ft |
| Gutter Width | W = | 2.00 | ft |
| Street Transverse Slope | $S_X$ = | 0.020 | ft/ft |
| Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft) | $S_W$ = | 0.083 | ft/ft |
| Street Longitudinal Slope - Enter 0 for sump condition | $S_O$ = | 0.000 | ft/ft |
| Manning's Roughness for Street Section (typically between 0.012 and 0.020) | $n_{STREET}$ = | 0.016 | |

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

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

# INLET IN A SUMP OR SAG LOCATION

**Version 4.05 Released March 2017**




| **Design Information (Input)** | CDOT Type R Curb Opening | | MINOR | MAJOR | |
|---|---|---|---|---|---|
| Type of Inlet | | Type = | CDOT Type R Curb Opening | | |
| Local Depression (additional to continuous gutter depression 'a' from above) | | $a_{local}$ = | 3.00 | 3.00 | inches |
| Number of Unit Inlets (Grate or Curb Opening) | | No = | 1 | 1 | |
| Water Depth at Flowline (outside of local depression) | | Ponding Depth = | 6.0 | 12.0 | inches |
| **Grate Information** | | | MINOR | MAJOR | ☑ Override Depths |
| Length of a Unit Grate | | $L_o$ (G) = | N/A | N/A | feet |
| Width of a Unit Grate | | $W_o$ = | N/A | N/A | feet |
| Area Opening Ratio for a Grate (typical values 0.15-0.90) | | $A_{ratio}$ = | N/A | N/A | |
| Clogging Factor for a Single Grate (typical value 0.50 - 0.70) | | $C_f$ (G) = | N/A | N/A | |
| Grate Weir Coefficient (typical value 2.15 - 3.60) | | $C_w$ (G) = | N/A | N/A | |
| Grate Orifice Coefficient (typical value 0.60 - 0.80) | | $C_o$ (G) = | N/A | N/A | |
| **Curb Opening Information** | | | MINOR | MAJOR | |
| Length of a Unit Curb Opening | | $L_o$ (C) = | 5.00 | 5.00 | feet |
| Height of Vertical Curb Opening in Inches | | $H_{vert}$ = | 6.00 | 6.00 | inches |
| Height of Curb Orifice Throat in Inches | | $H_{throat}$ = | 6.00 | 6.00 | inches |
| Angle of Throat (see USDCM Figure ST-5) | | Theta = | 63.40 | 63.40 | degrees |
| Side Width for Depression Pan (typically the gutter width of 2 feet) | | $W_p$ = | 2.00 | 2.00 | feet |
| Clogging Factor for a Single Curb Opening (typical value 0.10) | | $C_f$ (C) = | 0.10 | 0.10 | |
| Curb Opening Weir Coefficient (typical value 2.3-3.7) | | $C_w$ (C) = | 3.60 | 3.60 | |
| Curb Opening Orifice Coefficient (typical value 0.60 - 0.70) | | $C_o$ (C) = | 0.67 | 0.67 | |
| **Low Head Performance Reduction (Calculated)** | | | MINOR | MAJOR | |
| Depth for Grate Midwidth | | $d_{Grate}$ = | N/A | N/A | ft |
| Depth for Curb Opening Weir Equation | | $d_{Curb}$ = | 0.33 | 0.83 | ft |
| Combination Inlet Performance Reduction Factor for Long Inlets | | $RF_{Combination}$ = | 0.77 | 1.00 | |
| Curb Opening Performance Reduction Factor for Long Inlets | | $RF_{Curb}$ = | 1.00 | 1.00 | |
| Grated Inlet Performance Reduction Factor for Long Inlets | | $RF_{Grate}$ = | N/A | N/A | |
| | | | MINOR | MAJOR | |
| **Total Inlet Interception Capacity (assumes clogged condition)** | | **$Q_a$ =** | **5.4** | **12.3** | **cfs** |
| **Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)** | | $Q_{PEAK\ REQUIRED}$ = | 0.8 | 1.4 | cfs |

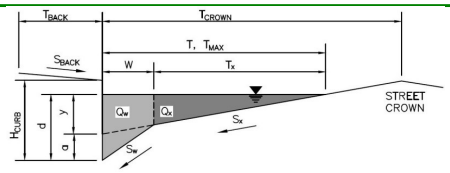
Version 4.05 Released March 2017

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

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

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

**Inlet ID:** DP-21




**Gutter Geometry (Enter data in the blue cells)**

| | | | |
|---|---|---|---|
| Maximum Allowable Width for Spread Behind Curb | $T_{BACK}$ = | 38.5 | ft |
| Side Slope Behind Curb (leave blank for no conveyance credit behind curb) | $S_{BACK}$ = | 0.020 | ft/ft |
| Manning's Roughness Behind Curb (typically between 0.012 and 0.020) | $n_{BACK}$ = | 0.012 | |
| Height of Curb at Gutter Flow Line | $H_{CURB}$ = | 6.00 | inches |
| Distance from Curb Face to Street Crown | $T_{CROWN}$ = | 24.0 | ft |
| Gutter Width | W = | 2.00 | ft |
| Street Transverse Slope | $S_X$ = | 0.020 | ft/ft |
| Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft) | $S_W$ = | 0.083 | ft/ft |
| Street Longitudinal Slope - Enter 0 for sump condition | $S_O$ = | 0.015 | ft/ft |
| Manning's Roughness for Street Section (typically between 0.012 and 0.020) | $n_{STREET}$ = | 0.016 | |

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

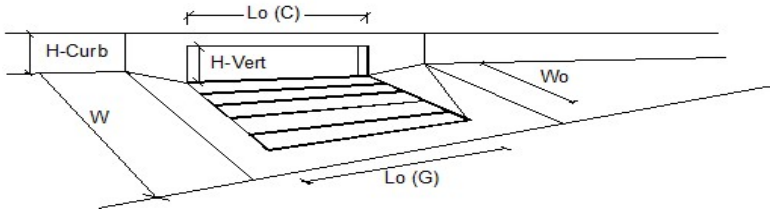
| | | Minor Storm | Major Storm | |
|---|---|---|---|---|
| **MINOR STORM Allowable Capacity is based on Spread Criterion** | | | | |
| **MAJOR STORM Allowable Capacity is based on Spread Criterion** | **$Q_{allow}$ =** | **13.4** | **13.4** | **cfs** |

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

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

# INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017




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

| Street Hydraulics: OK - Q < Allowable Street Capacity' | | MINOR | MAJOR | |
|---|---|---|---|---|
| **Total Inlet Interception Capacity** | **Q =** | **2.0** | **4.7** | **cfs** |
| **Total Inlet Carry-Over Flow (flow bypassing inlet)** | **$Q_b$ =** | **0.0** | **0.3** | **cfs** |
| **Capture Percentage = $Q_a/Q_o$ =** | **C% =** | **100** | **94** | **%** |

# STORMWATER QUALITY CALCULATIONS

CLASSIC SM
CONSULTING
ENGINEERS & SURVEYORS

# WATER QUALITY TREATMENT PLAN MAP

FILING 5 BOUNDARY LINE

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

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

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

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

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

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

BRIARGATE PKWY. (130' ROW)

STERLING RANCH ROAD (80' ROW)

VILLAGES AT STERLING RANCH EAST PRELIMINARY PLAN

KANSAS CITY ROAD (80' ROW)

OAK PARK DRIVE (60' ROW)

ST. LOUIS ROAD (80' ROW)

SHOREWOOD DR. (60' ROW)

CEDAR RAPIDS DR. (60' ROW)

NASHVILLE LANE

CHATTANOOGA DRIVE

MEMPHIS TERRACE

NEWPORT BEACH DRIVE

BILOXI PLACE

GULFPORT TRAIL

LAKE TAHOE DRIVE

OCEAN SPRINGS PATH

HUNTSVILLE LANE

TOPAZ LOOP TERRACE

OPEN SPACE TRACT C 9500 SF

OPEN SPACE TRACT D 9700 SF

TRACT E 40983 SF

TRACT F 4116 SF

TRACT G 4116 SF

TRACT I 4116 SF

TRACT J 4116 SF

TRACT A 4.56 AC

TRACT B 3.68 AC

PARK TRACT E 40983 SF

PARK TRACT B 3.68 AC

POND FSD-14B TRACT A 4.56 AC

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

EXIST. 42" RCP STORM SYSTEM

EXIST. 15" TYPE R AT-GRADE INLETS

EXIST. 18" RCP STORM

EXIST. 60" RCP STORM SYSTEM

EXIST. 36" RCP STORM SYSTEM

EXIST. 10' TYPE R SUMP INLETS

EXIST. 30" RCP STORM SYSTEM

EXIST. 10' TYPE R AT-GRADE INLETS

STERLING RANCH EAST FILING NO. 1

STERLING RANCH EAST FILING NO. 1 TRACT J (MIDDLE SCHOOL SITE)

STERLING RANCH EAST FILING NO. 3

FUTURE STERLING RANCH EAST DEVELOPMENT UNPLATTED

PROP. TEMP. SEDIMENT BASIN OFF-SITE ESMT. TO BE GRANTED PRIOR TO CONST.

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

PROP. 10' TYPE R SUMP INLET

PROP. 5' TYPE R SUMP INLET

PROP. 10' TYPE R AT-GRADE INLET

PROP. 18" PUBLIC RCP

PROP. 24" PUBLIC RCP

PROP. 30" PUBLIC RCP

PROP. 36" PUBLIC RCP

PROP. 48" PUBLIC RCP

PROP. 54" PUBLIC RCP

PROP. 60" PUBLIC RCP

4:1 SLOPE

PAWNEE RANCHEROS FILING NO. 1 LOT 21

PAWNEE RANCHEROS FILING NO. 1 LOT 20

PAWNEE RANCHEROS FILING NO. 1 LOT 19

PAWNEE RANCHEROS FILING NO. 1 LOT 7

BAR J-B ACRES FILING NO. 2 LOT 6

MOHAWK ROAD (60' ROW)

BRULE ROAD (60' ROW)

OTO CIRCLE

PLAMO STREET

SEXTONVILLE WAY

FAYETTEVILLE ST.

BIXBY COURT

TRACT C

TRACT D

LAKE LANCE DRIVE (60' ROW)

NEWPORT BEACH DRIVE (60' ROW)

M:\2021\21900015\Engineering\Drainage\Reports\FDR\21900015_FDR_Figures.dwg, 11/22/2022 12:52:20 PM, Jeff Kuhn

# Design Procedure Form: Runoff Reduction

UD-BMP (Version 3.07, March 2018)



**Designer:** Marc A. Whorton, P.E.
**Company:** Classic Consulting
**Date:** January 8, 2024
**Project:** Sterling Ranch East Filing No. 5 Preliminary Plan
**Location:** Sand Creek East Fork Basin

## SITE INFORMATION (User Input in Blue Cells)

WQCV Rainfall Depth = 0.53 inches
Depth of Average Runoff Producing Storm, $d_6$ = 0.42 inches (for Watersheds Outside of the Denver Region, Figure 3-1 in USDCM Vol. 3)

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Area Type | UIA:RPA | UIA:RPA | | | | | | | | | | |
| Area ID | Basin Y1 | Basin Y2 | | | | | | | | | | |
| Downstream Design Point ID | SC | SC | | | | | | | | | | |
| Downstream BMP Type | None | None | | | | | | | | | | |
| DCIA ($ft^2$) | -- | -- | | | | | | | | | | |
| UIA ($ft^2$) | 13,068 | 1,743 | | | | | | | | | | |
| RPA ($ft^2$) | 56,696 | 23,522 | | | | | | | | | | |
| SPA ($ft^2$) | -- | -- | | | | | | | | | | |
| HSG A (%) | 0% | 0% | | | | | | | | | | |
| HSG B (%) | 100% | 100% | | | | | | | | | | |
| HSG C/D (%) | 0% | 0% | | | | | | | | | | |
| Average Slope of RPA (ft/ft) | 0.030 | 0.050 | | | | | | | | | | |
| UIA:RPA Interface Width (ft) | 450.00 | 265.00 | | | | | | | | | | |

## CALCULATED RUNOFF RESULTS

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Area ID | Basin Y1 | Basin Y2 | | | | | | | | | | |
| UIA:RPA Area ($ft^2$) | 69,764 | 25,265 | | | | | | | | | | |
| L / W Ratio | 0.34 | 0.36 | | | | | | | | | | |
| UIA / Area | 0.1873 | 0.0690 | | | | | | | | | | |
| Runoff (in) | 0.00 | 0.00 | | | | | | | | | | |
| Runoff ($ft^3$) | 0 | 0 | | | | | | | | | | |
| Runoff Reduction ($ft^3$) | 468 | 62 | | | | | | | | | | |

## CALCULATED WQCV RESULTS

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Area ID | Basin Y1 | Basin Y2 | | | | | | | | | | |
| WQCV ($ft^3$) | 532 | 71 | | | | | | | | | | |
| WQCV Reduction ($ft^3$) | 532 | 71 | | | | | | | | | | |
| WQCV Reduction (%) | 100% | 100% | | | | | | | | | | |
| Untreated WQCV ($ft^3$) | 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 ($ft^2$) | 14,811 | | | | | | | | | | | |
| RPA ($ft^2$) | 80,218 | | | | | | | | | | | |
| SPA ($ft^2$) | 0 | | | | | | | | | | | |
| Total Area ($ft^2$) | 95,029 | | | | | | | | | | | |
| Total Impervious Area ($ft^2$) | 14,811 | | | | | | | | | | | |
| WQCV ($ft^3$) | 603 | | | | | | | | | | | |
| WQCV Reduction ($ft^3$) | 603 | | | | | | | | | | | |
| WQCV Reduction (%) | 100% | | | | | | | | | | | |
| Untreated WQCV ($ft^3$) | 0 | | | | | | | | | | | |

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

| | |
|---|---|
| Total Area ($ft^2$) | 95,029 |
| Total Impervious Area ($ft^2$) | 14,811 |
| WQCV ($ft^3$) | 603 |
| WQCV Reduction ($ft^3$) | 603 |
| WQCV Reduction (%) | 100% |
| Untreated WQCV ($ft^3$) | 0 |

# Design Procedure Form: Extended Detention Basin (EDB)

UD-BMP (Version 3.07, March 2018)



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

1. Basin Storage Volume

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

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

C) Contributing Watershed Area — Area = 74.650 ac

D) For Watersheds Outside of the Denver Region, Depth of Average Runoff Producing Storm — $d_6$ = 0.42 in

E) Design Concept (Select EURV when also designing for flood control)

Choose One
- ○ Water Quality Capture Volume (WQCV)
- ◉ Excess Urban Runoff Volume (EURV)

F) Design Volume (WQCV) Based on 40-hour Drain Time
($V_{DESIGN} = (1.0 * (0.91 * i^3 - 1.19 * i^2 + 0.78 * i) / 12 * Area$)
$V_{DESIGN}$ = ac-ft

G) For Watersheds Outside of the Denver Region, Water Quality Capture Volume (WQCV) Design Volume
($V_{WQCV\ OTHER} = (d_6 * (V_{DESIGN}/0.43))$
$V_{DESIGN\ OTHER}$ = 1.378 ac-ft

H) User Input of Water Quality Capture Volume (WQCV) Design Volume (Only if a different WQCV Design Volume is desired)
$V_{DESIGN\ USER}$ = ac-ft

I) NRCS Hydrologic Soil Groups of Tributary Watershed
- i) Percentage of Watershed consisting of Type A Soils — $HSG_A$ = 0 %
- ii) Percentage of Watershed consisting of Type B Soils — $HSG_B$ = 100 %
- iii) Percentage of Watershed consisting of Type C/D Soils — $HSG_{C/D}$ = 0 %

J) Excess Urban Runoff Volume (EURV) Design Volume
For HSG A: $EURV_A = 1.68 * i^{1.28}$
For HSG B: $EURV_B = 1.36 * i^{1.08}$
For HSG C/D: $EURV_{C/D} = 1.20 * i^{1.08}$
$EURV_{DESIGN}$ = 4.619 ac-f t

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

2. Basin Shape: Length to Width Ratio (A basin length to width ratio of at least 2:1 will improve TSS reduction.)
L : W = 2.0 : 1

3. Basin Side Slopes

A) Basin Maximum Side Slopes (Horizontal distance per unit vertical, 4:1 or flatter preferred)
Z = 4.00 ft / ft

4. Inlet

A) Describe means of providing energy dissipation at concentrated inflow locations:

5. Forebay

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

B) Actual Forebay Volume
$V_F$ = 0.041 ac-ft

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

D) Forebay Discharge

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

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

E) Forebay Discharge Design

Choose One
- ○ Berm With Pipe
- ◉ Wall with Rect. Notch
- ○ Wall with V-Notch Weir

F) Discharge Pipe Size (minimum 8-inches)
Calculated $D_P$ = in

G) Rectangular Notch Width
Calculated $W_N$ = 9.3 in

# Design Procedure Form: Extended Detention Basin (EDB)



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

| | |
|---|---|
| 6. Trickle Channel | |
| A) Type of Trickle Channel | Choose One: (•) Concrete ( ) Soft Bottom |
| F) Slope of Trickle Channel | S = 0.0100 ft / ft |
| 7. Micropool and Outlet Structure | |
| A) Depth of Micropool (2.5-feet minimum) | $D_M$ = 2.5 ft |
| B) Surface Area of Micropool (10 $ft^2$ minimum) | $A_M$ = 372 sq ft |
| C) Outlet Type | Choose One: (•) Orifice Plate ( ) Other (Describe): |
| D) Smallest Dimension of Orifice Opening Based on Hydrograph Routing (Use UD-Detention) | $D_{orifice}$ = 2.68 inches |
| E) Total Outlet Area | $A_{ot}$ = 26.30 square inches |
| 8. Initial Surcharge Volume | |
| A) Depth of Initial Surcharge Volume (Minimum recommended depth is 4 inches) | $D_{IS}$ = 6 in |
| B) Minimum Initial Surcharge Volume (Minimum volume of 0.3% of the WQCV) | $V_{IS}$ = 180 cu ft |
| C) Initial Surcharge Provided Above Micropool | $V_s$ = 186.0 cu ft |
| 9. Trash Rack | |
| A) Water Quality Screen Open Area: $A_t = A_{ot} * 38.5*(e^{-0.095D})$ | $A_t$ = 785 square inches |
| B) Type of Screen (If specifying an alternative to the materials recommended in the USDCM, indicate "other" and enter the ratio of the total open are to the total screen are for the material specified.) | *Aluminum Amico-Klemp SR Series with Cross Rods 2" O.C.* |
| Other (Y/N): N | |
| C) Ratio of Total Open Area to Total Area (only for type 'Other') | User Ratio = |
| D) Total Water Quality Screen Area (based on screen type) | $A_{total}$ = 1106 sq. in. |
| E) Depth of Design Volume (EURV or WQCV) (Based on design concept chosen under 1E) | H= 6.25 feet |
| F) Height of Water Quality Screen ($H_{TR}$) | $H_{TR}$= 103 inches |
| G) Width of Water Quality Screen Opening ($W_{opening}$) (Minimum of 12 inches is recommended) | $W_{opening}$ = 12.0 inches VALUE LESS THAN RECOMMENDED MIN. WIDTH. WIDTH HAS BEEN SET TO 12 INCHES. |

## Design Procedure Form: Extended Detention Basin (EDB)



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

10. Overflow Embankment

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

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

Ze = 4.00 ft / ft

11. Vegetation

Choose One
- ◯ Irrigated
- ◯ Not Irrigated

12. Access

A) Describe Sediment Removal Procedures

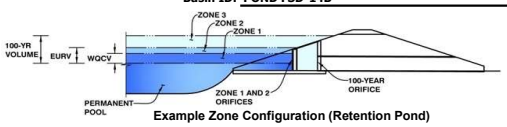
Notes:

# DETENTION BASIN STAGE-STORAGE TABLE BUILDER

*MHFD-Detention, Version 4.06 (July 2022)*

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

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




**Example Zone Configuration (Retention Pond)**

## Watershed Information

| | | |
|---|---|---|
| Selected BMP Type = | **EDB** | |
| Watershed Area = | 74.65 | acres |
| Watershed Length = | 3,200 | ft |
| Watershed Length to Centroid = | 1,600 | ft |
| Watershed Slope = | 0.030 | ft/ft |
| Watershed Imperviousness = | 57.10% | percent |
| Percentage Hydrologic Soil Group A = | 0.0% | percent |
| Percentage Hydrologic Soil Group B = | 100.0% | percent |
| Percentage Hydrologic Soil Groups C/D = | 0.0% | percent |
| Target WQCV Drain Time = | 40.0 | hours |
| Location for 1-hr Rainfall Depths = | User Input | |

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

| | | | Optional User Overrides | |
|---|---|---|---|---|
| Water Quality Capture Volume (WQCV) = | 1.411 | acre-feet | | acre-feet |
| Excess Urban Runoff Volume (EURV) = | 4.605 | acre-feet | | acre-feet |
| 2-yr Runoff Volume (P1 = 1.19 in.) = | 4.311 | acre-feet | 1.19 | inches |
| 5-yr Runoff Volume (P1 = 1.5 in.) = | 6.010 | acre-feet | 1.50 | inches |
| 10-yr Runoff Volume (P1 = 1.75 in.) = | 7.479 | acre-feet | 1.75 | inches |
| 25-yr Runoff Volume (P1 = 2 in.) = | 9.370 | acre-feet | 2.00 | inches |
| 50-yr Runoff Volume (P1 = 2.25 in.) = | 10.947 | acre-feet | 2.25 | inches |
| 100-yr Runoff Volume (P1 = 2.52 in.) = | 12.909 | acre-feet | 2.52 | inches |
| 500-yr Runoff Volume (P1 = 3.48 in.) = | 19.199 | acre-feet | 3.48 | inches |
| Approximate 2-yr Detention Volume = | 3.523 | acre-feet | | |
| Approximate 5-yr Detention Volume = | 4.776 | acre-feet | | |
| Approximate 10-yr Detention Volume = | 6.199 | acre-feet | | |
| Approximate 25-yr Detention Volume = | 6.723 | acre-feet | | |
| Approximate 50-yr Detention Volume = | 7.014 | acre-feet | | |
| Approximate 100-yr Detention Volume = | 7.704 | acre-feet | | |

## Define Zones and Basin Geometry

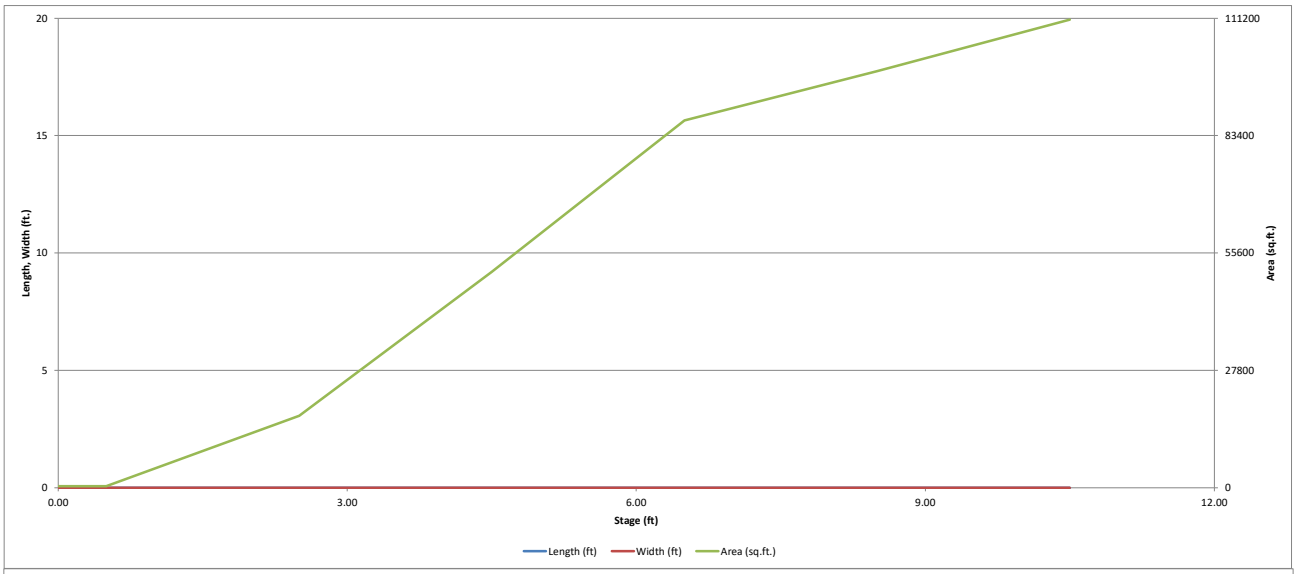
| | | |
|---|---|---|
| Zone 1 Volume (WQCV) = | 1.411 | acre-feet |
| Zone 2 Volume (EURV - Zone 1) = | 3.195 | acre-feet |
| Zone 3 Volume (100-year - Zones 1 & 2) = | 3.098 | acre-feet |
| Total Detention Basin Volume = | 7.704 | acre-feet |
| Initial Surcharge Volume (ISV) = | user | $ft^3$ |
| Initial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

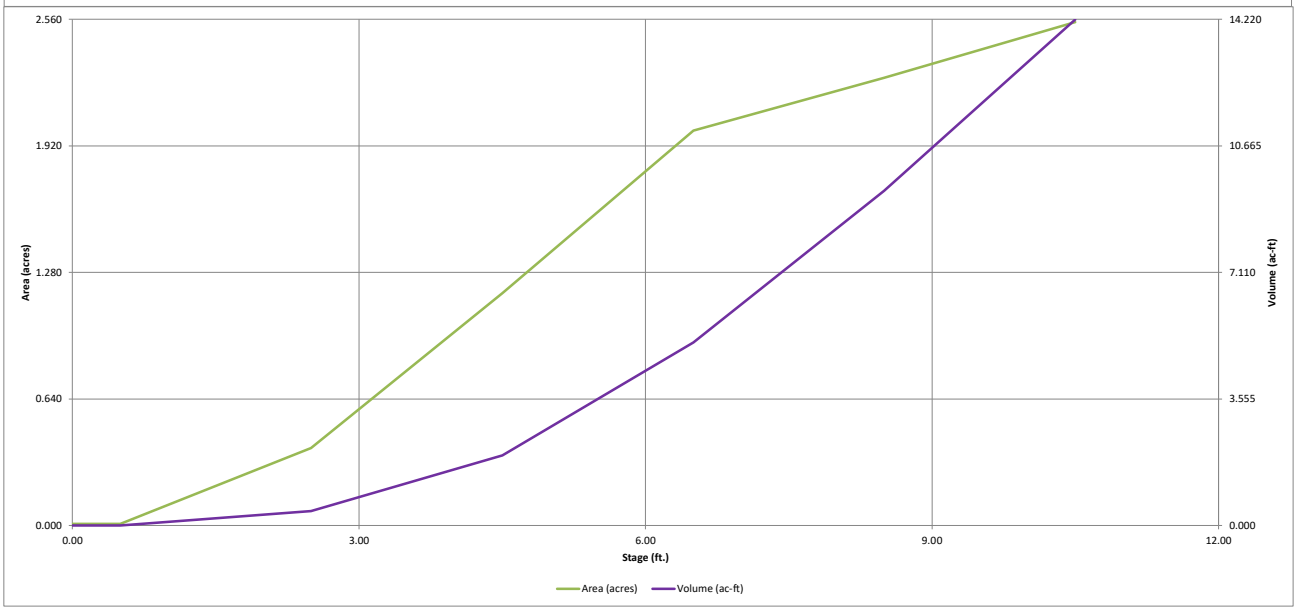
Depth Increment = 1.00 ft

| Stage - Storage Description | Stage (ft) | Optional Override Stage (ft) | Length (ft) | Width (ft) | Area ($ft^2$) | Optional Override Area ($ft^2$) | Area (acre) | Volume ($ft^3$) | Volume (ac-ft) |
|---|---|---|---|---|---|---|---|---|---|
| **Top of Micropool** | -- | 0.00 | -- | -- | -- | 372 | 0.009 | | |
| **7032** | -- | 0.50 | -- | -- | -- | 372 | 0.009 | 186 | 0.004 |
| **7034** | -- | 2.50 | -- | -- | -- | 17,098 | 0.393 | 17,656 | 0.405 |
| **7036** | -- | 4.50 | -- | -- | -- | 51,180 | 1.175 | 85,934 | 1.973 |
| **7038** | -- | 6.50 | -- | -- | -- | 87,013 | 1.998 | 224,127 | 5.145 |
| **7040** | -- | 8.50 | -- | -- | -- | 98,661 | 2.265 | 409,801 | 9.408 |
| **7042** | -- | 10.50 | -- | -- | -- | 110,900 | 2.546 | 619,362 | 14.219 |

# DETENTION BASIN STAGE-STORAGE TABLE BUILDER

*MHFD-Detention, Version 4.06 (July 2022)*



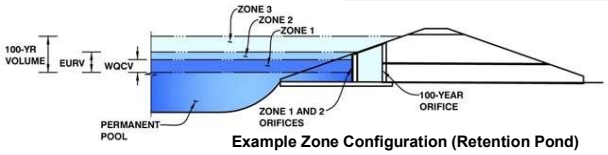



# DETENTION BASIN OUTLET STRUCTURE DESIGN

*MHFD-Detention, Version 4.06 (July 2022)*

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

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




**Example Zone Configuration (Retention Pond)**

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

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

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

Underdrain Orifice Diameter = [ ] inches

Calculated Parameters for Underdrain

Underdrain Orifice Area = [ ] $ft^2$

Underdrain Orifice Centroid = [ ] feet

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

Centroid of Lowest Orifice = 0.00 ft (relative to basin bottom at Stage = 0 ft)

Depth at top of Zone using Orifice Plate = 6.25 ft (relative to basin bottom at Stage = 0 ft)

Orifice Plate: Orifice Vertical Spacing = 25.00 inches

Orifice Plate: Orifice Area per Row = N/A sq. inches

Calculated Parameters for Plate

WQ Orifice Area per Row = N/A $ft^2$

Elliptical Half-Width = N/A feet

Elliptical Slot Centroid = N/A feet

Elliptical Slot Area = N/A $ft^2$

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

| | Row 1 (required) | Row 2 (optional) | Row 3 (optional) | Row 4 (optional) | Row 5 (optional) | Row 6 (optional) | Row 7 (optional) | Row 8 (optional) |
|---|---|---|---|---|---|---|---|---|
| Stage of Orifice Centroid (ft) | 0.00 | 2.10 | 4.20 | | | | | |
| Orifice Area (sq. inches) | 5.65 | 5.65 | 15.00 | | | | | |

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

User Input: Vertical Orifice (Circular or Rectangular)

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

Calculated Parameters for Vertical Orifice

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

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

| | Zone 3 Weir | Not Selected | |
|---|---|---|---|
| Overflow Weir Front Edge Height, Ho = | 6.25 | N/A | ft (relative to basin bottom at Stage = 0 ft) |
| Overflow Weir Front Edge Length = | 8.00 | N/A | feet |
| Overflow Weir Grate Slope = | 4.00 | N/A | H:V |
| Horiz. Length of Weir Sides = | 4.00 | N/A | feet |
| Overflow Grate Type = | Close Mesh Grate | N/A | |
| Debris Clogging % = | 50% | N/A | % |

Calculated Parameters for Overflow Weir

| | Zone 3 Weir | Not Selected | |
|---|---|---|---|
| Height of Grate Upper Edge, $H_t$ = | 7.25 | N/A | feet |
| Overflow Weir Slope Length = | 4.12 | N/A | feet |
| Grate Open Area / 100-yr Orifice Area = | 5.32 | N/A | |
| Overflow Grate Open Area w/o Debris = | 26.09 | N/A | $ft^2$ |
| Overflow Grate Open Area w/ Debris = | 13.05 | N/A | $ft^2$ |

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

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

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

| | Zone 3 Restrictor | Not Selected | |
|---|---|---|---|
| Outlet Orifice Area = | 4.91 | N/A | $ft^2$ |
| Outlet Orifice Centroid = | 1.25 | N/A | feet |
| Half-Central Angle of Restrictor Plate on Pipe = | 3.14 | N/A | radians |

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage= 8.50 ft (relative to basin bottom at Stage = 0 ft)

Spillway Crest Length = 60.00 feet

Spillway End Slopes = 3.00 H:V

Freeboard above Max Water Surface = 1.00 feet

Calculated Parameters for Spillway

Spillway Design Flow Depth= 0.98 feet

Stage at Top of Freeboard = 10.48 feet

Basin Area at Top of Freeboard = 2.54 acres

Basin Volume at Top of Freeboard = 14.17 acre-ft

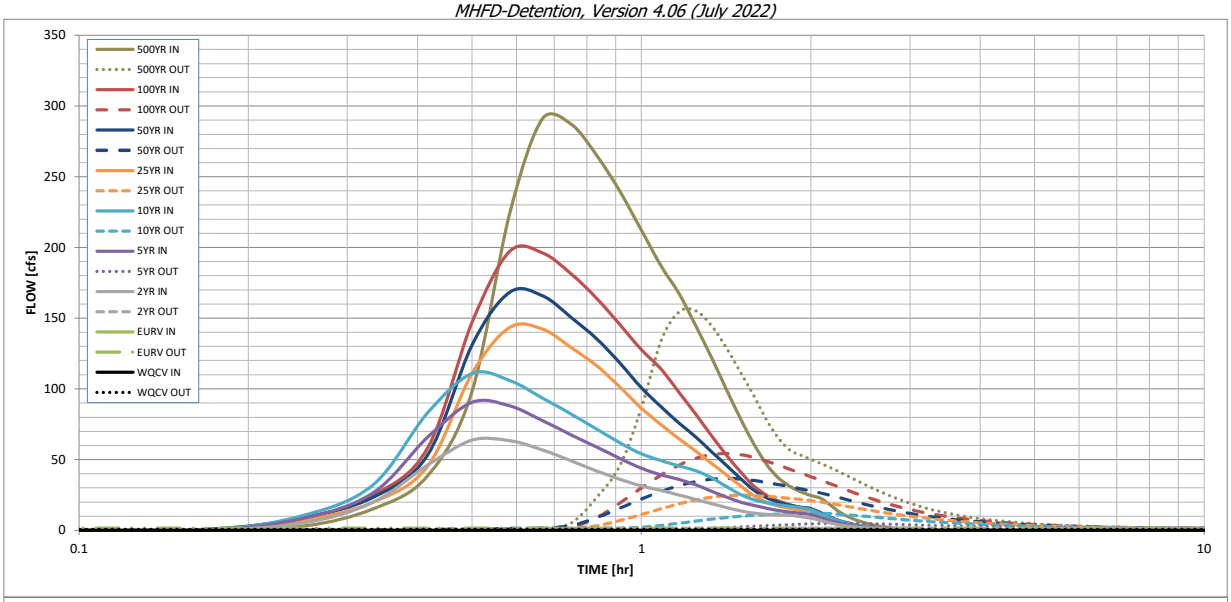
Routed Hydrograph Results

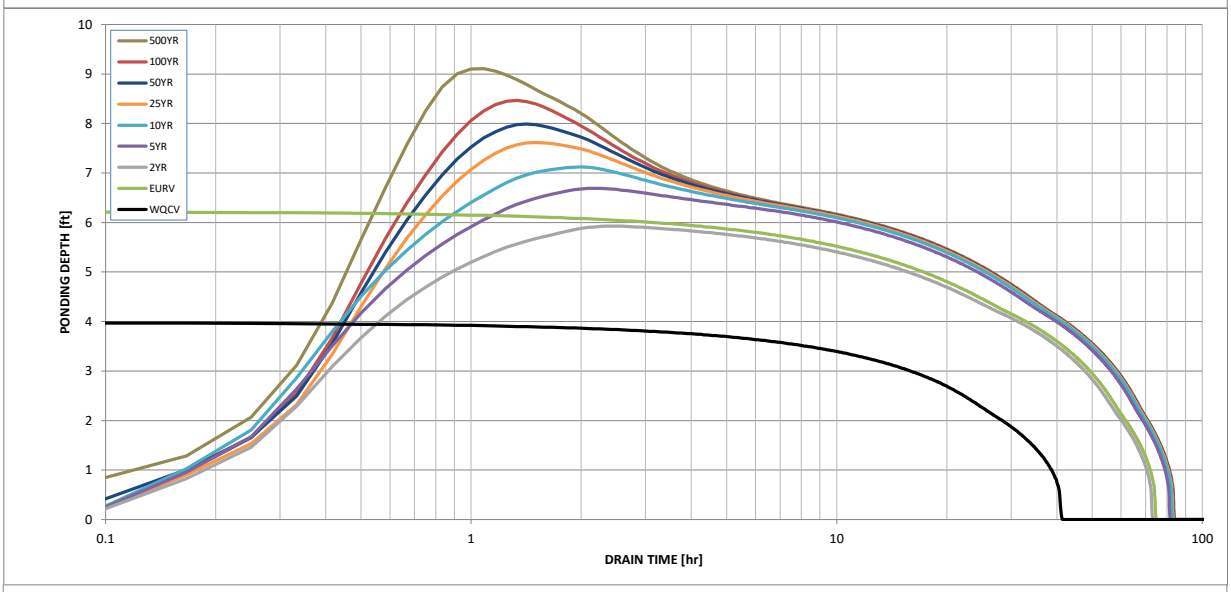
*The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).*

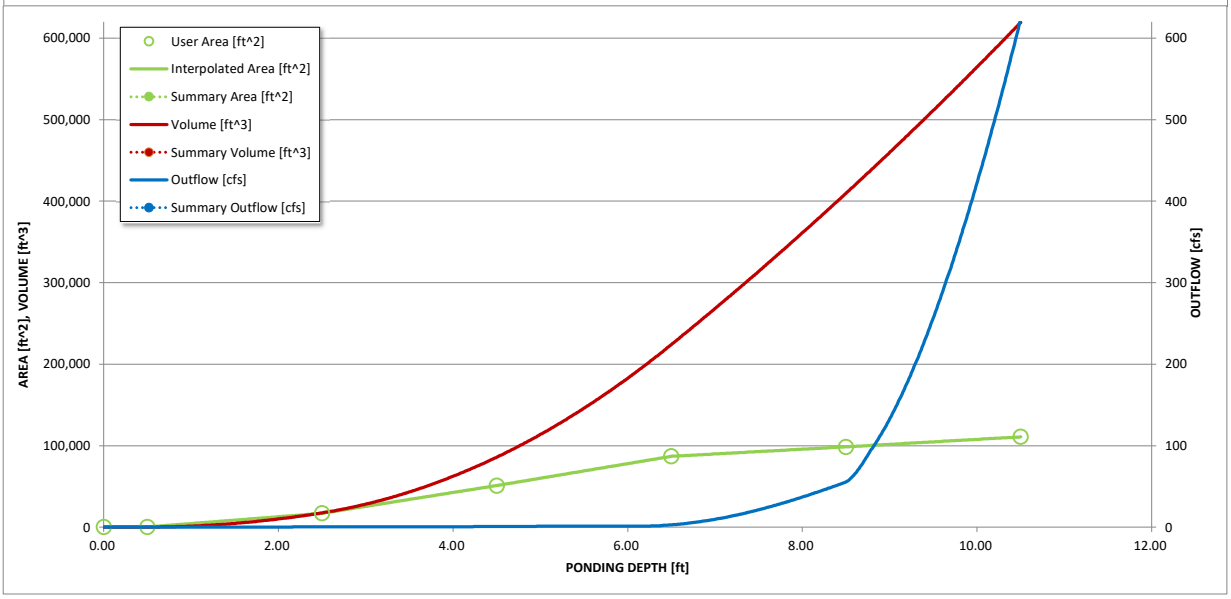
| Design Storm Return Period = | WQCV | EURV | 2 Year | 5 Year | 10 Year | 25 Year | 50 Year | 100 Year | 500 Year |
|---|---|---|---|---|---|---|---|---|---|
| One-Hour Rainfall Depth (in) = | N/A | N/A | 1.19 | 1.50 | 1.75 | 2.00 | 2.25 | 2.52 | 3.48 |
| CUHP Runoff Volume (acre-ft) = | 1.411 | 4.605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

# DETENTION BASIN OUTLET STRUCTURE DESIGN

*MHFD-Detention, Version 4.06 (July 2022)*




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

# DETENTION BASIN OUTLET STRUCTURE DESIGN

*Outflow Hydrograph Workbook Filename:*

Inflow Hydrographs

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

| | SOURCE | CUHP | CUHP | CUHP | CUHP | CUHP | CUHP | CUHP | CUHP | CUHP |
|---|---|---|---|---|---|---|---|---|---|---|
| Time Interval | TIME | WQCV [cfs] | EURV [cfs] | 2 Year [cfs] | 5 Year [cfs] | 10 Year [cfs] | 25 Year [cfs] | 50 Year [cfs] | 100 Year [cfs] | 500 Year [cfs] |
| 5.00 min | 0:00:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0:05:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0:10:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.58 | 0.06 | 2.88 |
| | 0:15:00 | 0.00 | 0.00 | 5.14 | 8.40 | 10.41 | 6.99 | 8.90 | 8.54 | 15.14 |
| | 0:20:00 | 0.00 | 0.00 | 19.81 | 26.57 | 32.14 | 19.91 | 23.35 | 24.79 | 38.44 |
| | 0:25:00 | 0.00 | 0.00 | 46.16 | 65.73 | 83.04 | 45.24 | 53.12 | 58.25 | 98.14 |
| | 0:30:00 | 0.00 | 0.00 | 63.73 | 90.49 | 110.83 | 110.89 | 130.95 | 146.96 | 224.28 |
| | 0:35:00 | 0.00 | 0.00 | 63.26 | 87.96 | 105.92 | 143.52 | 168.29 | 197.18 | 290.85 |
| | 0:40:00 | 0.00 | 0.00 | 56.88 | 77.61 | 93.54 | 142.29 | 165.91 | 196.15 | 287.14 |
| | 0:45:00 | 0.00 | 0.00 | 49.07 | 67.41 | 82.21 | 129.21 | 150.45 | 181.33 | 264.85 |
| | 0:50:00 | 0.00 | 0.00 | 41.92 | 58.87 | 71.42 | 116.22 | 135.33 | 163.89 | 239.45 |
| | 0:55:00 | 0.00 | 0.00 | 36.05 | 50.76 | 61.73 | 101.21 | 117.99 | 145.14 | 212.09 |
| | 1:00:00 | 0.00 | 0.00 | 31.36 | 43.79 | 54.04 | 86.29 | 100.76 | 127.71 | 186.84 |
| | 1:05:00 | 0.00 | 0.00 | 28.21 | 39.24 | 49.23 | 74.66 | 87.37 | 113.95 | 167.41 |
| | 1:10:00 | 0.00 | 0.00 | 24.96 | 35.89 | 45.58 | 64.72 | 75.90 | 97.60 | 144.29 |
| | 1:15:00 | 0.00 | 0.00 | 21.74 | 32.04 | 42.10 | 55.96 | 65.74 | 81.84 | 121.90 |
| | 1:20:00 | 0.00 | 0.00 | 18.83 | 27.63 | 37.11 | 47.28 | 55.51 | 66.82 | 99.58 |
| | 1:25:00 | 0.00 | 0.00 | 16.10 | 23.47 | 30.92 | 39.15 | 45.89 | 53.18 | 79.01 |
| | 1:30:00 | 0.00 | 0.00 | 13.76 | 19.98 | 25.38 | 31.42 | 36.68 | 41.44 | 61.36 |
| | 1:35:00 | 0.00 | 0.00 | 12.14 | 17.63 | 21.66 | 24.57 | 28.53 | 31.48 | 46.77 |
| | 1:40:00 | 0.00 | 0.00 | 11.30 | 15.61 | 19.50 | 19.99 | 23.14 | 24.81 | 37.17 |
| | 1:45:00 | 0.00 | 0.00 | 10.92 | 14.01 | 18.07 | 17.26 | 19.91 | 20.84 | 31.33 |
| | 1:50:00 | 0.00 | 0.00 | 10.69 | 12.89 | 17.06 | 15.51 | 17.80 | 18.16 | 27.34 |
| | 1:55:00 | 0.00 | 0.00 | 9.68 | 12.05 | 16.08 | 14.32 | 16.36 | 16.30 | 24.55 |
| | 2:00:00 | 0.00 | 0.00 | 8.54 | 11.18 | 14.70 | 13.52 | 15.39 | 14.97 | 22.54 |
| | 2:05:00 | 0.00 | 0.00 | 6.84 | 9.00 | 11.75 | 10.94 | 12.42 | 11.81 | 17.77 |
| | 2:10:00 | 0.00 | 0.00 | 5.17 | 6.76 | 8.80 | 8.14 | 9.21 | 8.60 | 12.92 |
| | 2:15:00 | 0.00 | 0.00 | 3.92 | 5.09 | 6.57 | 6.09 | 6.87 | 6.39 | 9.57 |
| | 2:20:00 | 0.00 | 0.00 | 2.94 | 3.80 | 4.85 | 4.53 | 5.11 | 4.78 | 7.12 |
| | 2:25:00 | 0.00 | 0.00 | 2.19 | 2.80 | 3.56 | 3.35 | 3.76 | 3.55 | 5.29 |
| | 2:30:00 | 0.00 | 0.00 | 1.61 | 2.01 | 2.60 | 2.43 | 2.73 | 2.60 | 3.86 |
| | 2:35:00 | 0.00 | 0.00 | 1.15 | 1.43 | 1.88 | 1.76 | 1.97 | 1.89 | 2.81 |
| | 2:40:00 | 0.00 | 0.00 | 0.81 | 1.02 | 1.35 | 1.28 | 1.44 | 1.38 | 2.04 |
| | 2:45:00 | 0.00 | 0.00 | 0.53 | 0.69 | 0.91 | 0.88 | 0.99 | 0.94 | 1.39 |
| | 2:50:00 | 0.00 | 0.00 | 0.31 | 0.43 | 0.55 | 0.56 | 0.62 | 0.59 | 0.87 |
| | 2:55:00 | 0.00 | 0.00 | 0.16 | 0.24 | 0.29 | 0.31 | 0.34 | 0.32 | 0.47 |
| | 3:00:00 | 0.00 | 0.00 | 0.06 | 0.10 | 0.11 | 0.13 | 0.14 | 0.13 | 0.19 |
| | 3:05:00 | 0.00 | 0.00 | 0.02 | 0.02 | 0.02 | 0.03 | 0.03 | 0.03 | 0.03 |
| | 3:10:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 3:15:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 3:20:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 3:25:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 3:30:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 3:35:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 3:40:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 3:45:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 3:50:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 3:55:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 4:00:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 4:05:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 4:10:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 4:15:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 4:20:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 4:25:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 4:30:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 4:35:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 4:40:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 4:45:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 4:50:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 4:55:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 5:00:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 5:05:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 5:10:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 5:15:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 5:20:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 5:25:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 5:30:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 5:35:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 5:40:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 5:45:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 5:50:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 5:55:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 6:00:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

# DETENTION BASIN OUTLET STRUCTURE DESIGN

*MHFD-Detention, Version 4.06 (July 2022)*

Summary Stage-Area-Volume-Discharge Relationships

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

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

**DRAINAGE MAPS**

CLASSIC SM
CONSULTING
ENGINEERS & SURVEYORS

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 |

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

SEE SHEET 3

N

200 100 0 200 400

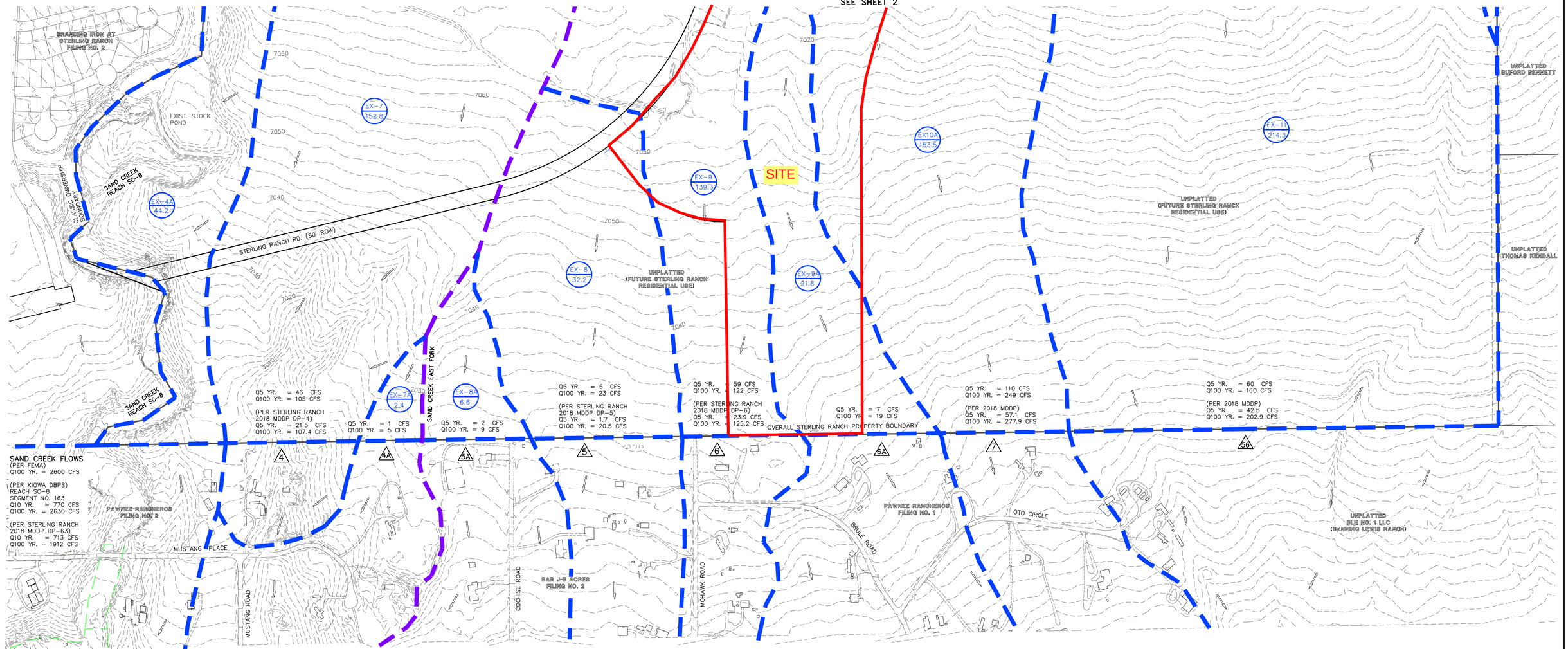
SCALE: 1" = 200'

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

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

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

N:\1183.2\Reports\Prelim Drainage Report\1183.2PRDR rdm rev.dwg, 11/11/2022 10:06:43 AM, 1:1




NOTE:

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

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

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

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

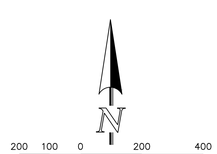
* Basins with no change upon developed condition

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

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

**LEGEND**

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

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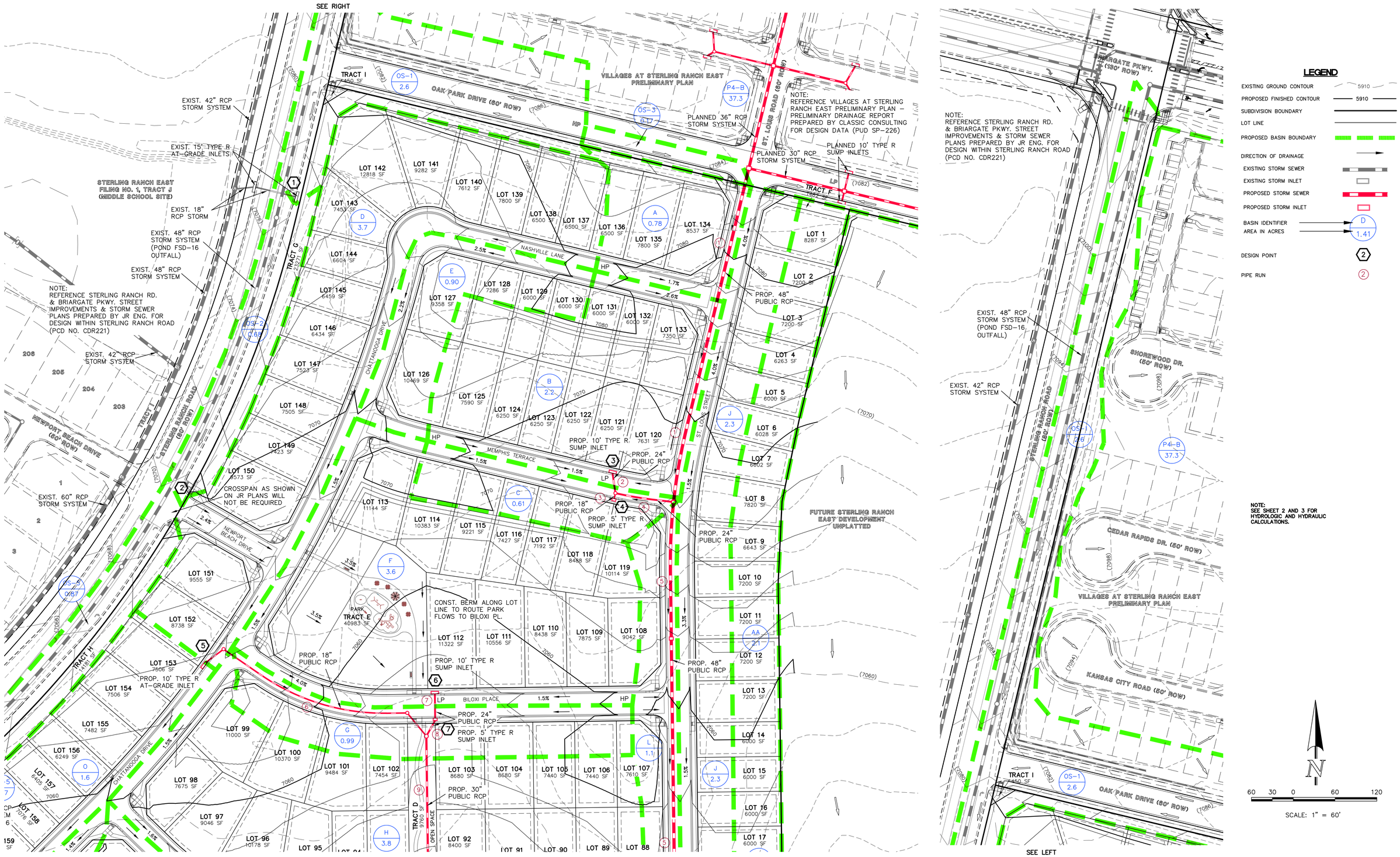
619 N. Cascade Avenue, Suite 200 (719)785-0790
Colorado Springs, Colorado 80903 (719)785-0799 (Fax)

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

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

N:\1183\2\REPORTS\PRELIM DRAINAGE REPORT\1183\2PDR.MDW mw.dwg, 11/1/2022 10:05:54 AM, 1:1




48 HOURS BEFORE YOU DIG, CALL UTILITY LOCATORS
**811**
UTILITY NOTIFICATION CENTER OF COLORADO
IT'S THE LAW

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

| NO. | REVISION | DATE |
|---|---|---|
| 1 | REVISED PER COUNTY COMMENTS | 11/22/23 |

REVIEW:

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

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

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

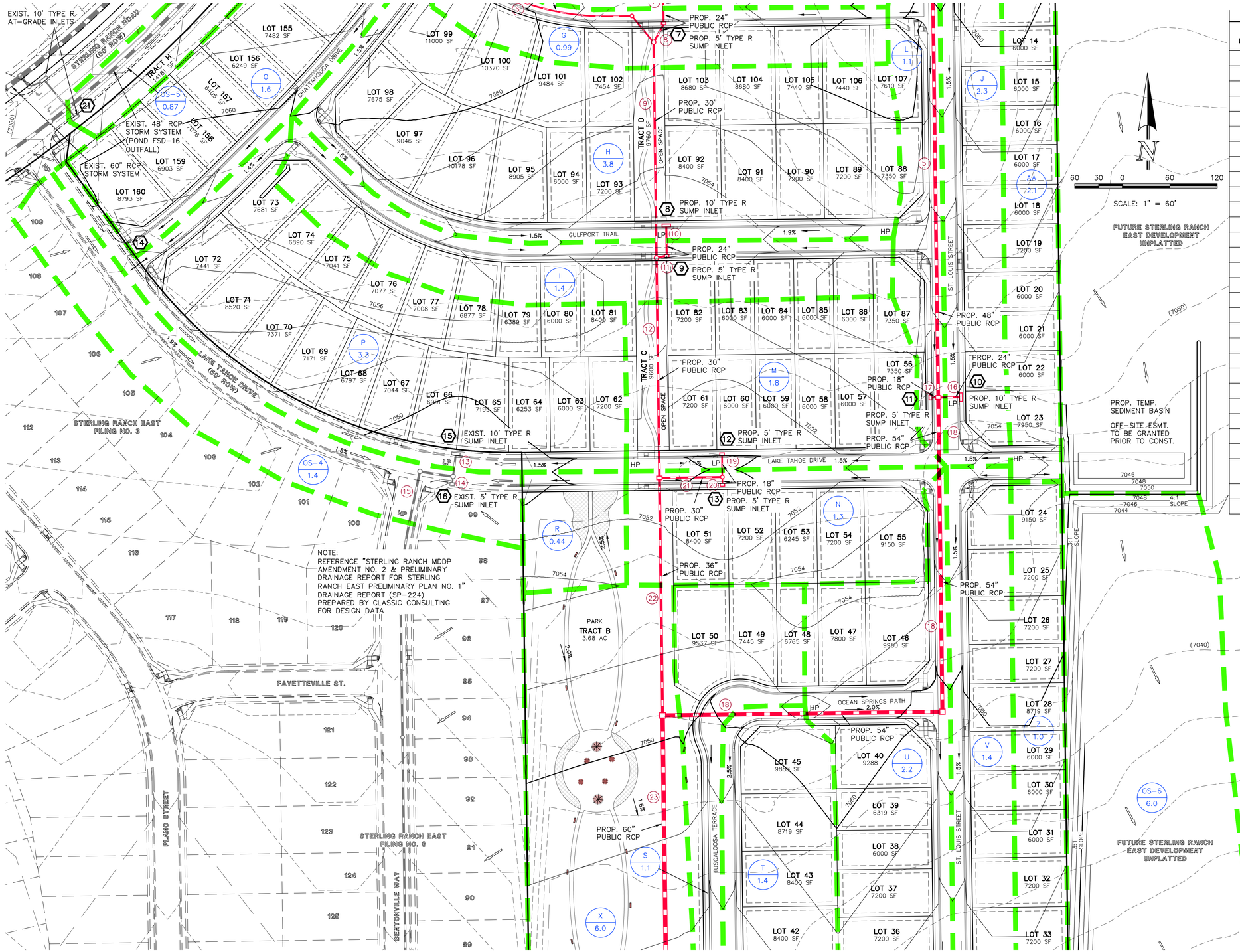
# STERLING RANCH EAST FILING NO. 5 PRELIMINARY PLAN

PRELIMINARY DRAINAGE REPORT

DEVELOPED DRAINAGE MAP

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

N:\1183\25\REPORTS\PRELIMINARY DRAINAGE REPORT\1183\25PRM.dwg, 11/22/2023 12:55:07 PM, 1:1




**FINAL DRAINAGE REPORT ~ PIPE ROUTING SUMMARY**

| Pipe Run | Contributing Basin / Design Point / Pipe Run | Equivalent CA(5) | Equivalent CA(100) | Maximum Tc | Intensity I(5) | Intensity I(100) | Flow Q(5) | Flow Q(100) | Pipe Size* |
|---|---|---|---|---|---|---|---|---|---|
| 1 | **P4-B FUTURE VILLAGES AT STERLING RANCH PP** | **18.28** | **23.13** | **18.7** | **3.19** | **5.35** | **58** | **124** | **PROP. 48" RCP** |
| 2 | DP-3 | 1.27 | 1.79 | 16.4 | 3.39 | 5.68 | 4 | 10 | PROP. 24" RCP |
| 3 | DP-4 | 0.23 | 0.33 | 12.1 | 3.84 | 6.45 | 0.9 | 2.1 | PROP. 18" RCP |
| 4 | PR-2, PR-3 | 1.50 | 2.12 | 16.6 | 3.37 | 5.65 | 5 | 12 | PROP. 24" RCP |
| 5 | **PR-1, PR-4** | **19.78** | **25.25** | **19.5** | **3.12** | **5.25** | **62** | **132** | **PROP. 48" RCP** |
| 6 | DP-5 COLLECTION | 1.71 | 1.78 | 20.5 | 3.05 | 5.12 | 5.2 | 9.1 | PROP. 18" RCP |
| 7 | DP-6 | 1.45 | 2.31 | 15.9 | 3.43 | 5.76 | 5 | 13 | PROP. 24" RCP |
| 8 | PR-7, DP-7 | 1.81 | 2.84 | 15.9 | 3.43 | 5.76 | 6 | 16 | PROP. 24" RCP |
| 9 | PR-6, PR-8 | 3.52 | 4.62 | 20.9 | 3.02 | 5.07 | 11 | 23 | PROP. 30" RCP |
| 10 | DP-8 | 1.38 | 2.04 | 17.1 | 3.32 | 5.57 | 5 | 11 | PROP. 24" RCP |
| 11 | PR-10, DP-9 | 1.89 | 2.80 | 17.1 | 3.32 | 5.57 | 6 | 16 | PROP. 24" RCP |
| 12 | PR-9, PR-11 | 5.41 | 7.42 | 21.3 | 2.99 | 5.02 | 16 | 37 | PROP. 30" RCP |
| 13 | DP-15 | 2.07 | 4.07 | 24.2 | 2.80 | 4.70 | 6 | 19 | EXIST. 24" RCP |
| 14 | DP-16 | 0.63 | 0.97 | 14.4 | 3.58 | 6.01 | 2 | 6 | EXIST. 18" RCP |
| 15 | PR-13, PR-14 | 2.70 | 5.04 | 25.4 | 2.73 | 4.58 | 7 | 23 | EXIST. 30" RCP |
| 16 | DP-10 | 0.86 | 1.25 | 13.2 | 3.72 | 6.24 | 3 | 8 | PROP. 24" RCP |
| 17 | DP-11 | 0.41 | 0.60 | 18.1 | 3.24 | 5.44 | 1.3 | 3.3 | PROP. 18" RCP |
| **18** | **PR-5, PR-13, PR-14** | **21.05** | **27.10** | **19.7** | **3.11** | **5.22** | **65** | **141** | **PROP. 54" RCP** |
| 19 | DP-12 | 0.63 | 0.95 | 15.4 | 3.48 | 5.84 | 2 | 6 | PROP. 18" RCP |
| 20 | DP-13 | 0.45 | 0.69 | 15.4 | 3.48 | 5.84 | 2 | 4 | PROP. 18" RCP |
| 21 | PR-16, PR-17 | 1.08 | 1.64 | 15.5 | 3.47 | 5.82 | 4 | 10 | PROP. 24" RCP |
| 22 | PR-12, PR-18 | 6.49 | 9.06 | 21.7 | 2.96 | 4.98 | 19 | 45 | PROP. 36" RCP |
| **23** | **PR-15, PR-19** | **27.54** | **36.16** | **22.2** | **2.93** | **4.92** | **81** | **178** | **PROP. 60" RCP** |
| 24 | DP-17 | 0.41 | 0.60 | 18.1 | 3.24 | 5.44 | 1.3 | 3.3 | PROP. 18" RCP |
| 25 | DP-18 | 0.53 | 0.76 | 16.7 | 3.36 | 5.64 | 2 | 4 | PROP. 18" RCP |
| 26 | PR-21, PR-22 | 0.94 | 1.36 | 18.1 | 3.24 | 5.44 | 3 | 7 | PROP. 24" RCP |
| **27** | **PR-20, PR-23 (IN-FLOW ULTIMATE CONDITION)** | **28.48** | **37.52** | **22.3** | **2.92** | **4.91** | **83** | **184** | **PROP. 60" RCP** |
| **27** | **PR-20, PR-23 (IN-FLOW INTERIM CONDITION - VILLAGES NOT DEVELOPED)** | **10.20** | **14.39** | **20.3** | **3.06** | **5.14** | **31** | **74** | **PROP. 60" RCP** |
| 28 | DP-19 | 1.35 | 1.96 | 18.1 | 3.24 | 5.44 | 4 | 11 | PROP. 24" RCP |
| **29** | **DP-20, PR-25** | **1.50** | **2.13** | **18.2** | **3.23** | **5.43** | **5** | **12** | **PROP. 24" RCP** |

**FINAL DRAINAGE REPORT ~ SURFACE ROUTING SUMMARY**

| Design Point(s) | Contributing Basins / Design Point | Equivalent CA(5) | Equivalent CA(100) | Maximum Tc | Intensity I(5) | Intensity I(100) | Flow Q(5) | Flow Q(100) | Facility/ Inlet Size* |
|---|---|---|---|---|---|---|---|---|---|
| 1 | OS-1 | 1.76 | 2.02 | 14.0 | 3.62 | 6.08 | 6 | 12 | Exist. 15" Type R At-Grade Inlet |
| 2 | OS-2 and OS-1 Flow-By | 0.56 | 1.16 | 16.6 | 3.37 | 5.65 | 2 | 7 | |
| 3 | OS-3, A, B | 1.27 | 1.79 | 16.4 | 3.39 | 5.68 | 4 | 10 | Prop. 10' Type R Sump Inlet |
| 4 | C | 0.23 | 0.33 | 12.1 | 3.84 | 6.45 | 0.9 | 2.1 | Prop. 5' Type R Sump Inlet |
| 5 | D and DP-2 Flow On-Site | 1.94 | 3.18 | 20.2 | 3.07 | 5.16 | 6 | 16 | Prop. 10' Type R At-Grade Inlet |
| 6 | E, F | 1.45 | 2.31 | 15.9 | 3.43 | 5.76 | 5 | 13 | Prop. 10' Type R Sump Inlet |
| 7 | G | 0.36 | 0.53 | 11.8 | 3.88 | 6.52 | 1.4 | 3.5 | Prop. 5' Type R Sump Inlet |
| 8 | H | 1.38 | 2.04 | 17.1 | 3.32 | 5.57 | 5 | 11 | Prop. 10' Type R Sump Inlet |
| 9 | I | 0.51 | 0.75 | 13.4 | 3.69 | 6.19 | 2 | 5 | Prop. 5' Type R Sump Inlet |
| 10 | J | 0.86 | 1.25 | 13.2 | 3.72 | 6.24 | 3 | 8 | Prop. 10' Type R Sump Inlet |
| 11 | L | 0.41 | 0.60 | 18.1 | 3.24 | 5.44 | 1.3 | 3.3 | Prop. 5' Type R Sump Inlet |
| 12 | M | 0.63 | 0.95 | 15.4 | 3.48 | 5.84 | 2 | 6 | Prop. 5' Type R Sump Inlet |
| 13 | N | 0.45 | 0.69 | 15.4 | 3.48 | 5.84 | 2 | 4 | Prop. 5' Type R Sump Inlet |
| 14 | O and DP-5 Flow-By | 0.83 | 2.27 | 22.2 | 2.93 | 4.92 | 2 | 11 | Prop. 6' Crosspan |
| 15 | P and DP-14 | 2.07 | 4.07 | 24.2 | 2.80 | 4.70 | 6 | 19 | Exist. 10' Type R Sump Inlet |
| 16 | OS-4, R | 0.63 | 0.97 | 14.4 | 3.58 | 6.01 | 2 | 6 | Exist. 5' Type R Sump Inlet |
| 17 | S | 0.41 | 0.60 | 18.1 | 3.24 | 5.44 | 1.3 | 3.3 | Prop. 5' Type R Sump Inlet |
| 18 | T | 0.53 | 0.76 | 16.7 | 3.36 | 5.64 | 2 | 4 | Prop. 5' Type R Sump Inlet |
| 19 | U, V | 1.35 | 1.96 | 18.1 | 3.24 | 5.44 | 4 | 11 | Prop. 10' Type R Sump Inlet |
| 20 | W | 0.15 | 0.17 | 5.0 | 5.17 | 8.68 | 0.8 | 1.4 | Prop. 5' Type R Sump Inlet |
| 21 | OS-5 | 0.58 | 0.69 | 9.2 | 4.25 | 7.14 | 2 | 5 | Exist. 10' Type R At-Grade Inlet |
| | **TOTAL BASINS TRIBUTARY TO POND FSD-14B** | **30.70** | **41.99** | **23.1** | **2.88** | **4.83** | **88** | **203** | |
| | **TOTAL BASINS TRIBUTARY TO POND FSD-14B (VILLAGES NOT DEV.)** | **12.42** | **18.86** | **23.1** | **2.88** | **4.83** | **36** | **91** | |
| 6 (MDDP) SOUTH BNDY. | **POND FSD-14B RELEASE AND BASIN Y1** | **REF. MHFD-DETENTION SPREADSHEET FOR CALCULATIONS** | | | | | **5.0** | **52.2** | Sheet flow from Level Spreader |
| 6A (MDDP) SOUTH BNDY. | **BASINS Y2 AND OS-6** | **0.61** | **2.38** | **23.2** | **2.87** | **4.81** | **2** | **11** | Sheet flow |

**LEGEND**

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

48 HOURS BEFORE YOU DIG, CALL UTILITY LOCATORS
**811**
UTILITY NOTIFICATION CENTER OF COLORADO
IT'S THE LAW

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| NO. | REVISION | DATE |
|---|---|---|
| 1 | REVISED PER COUNTY COMMENTS | 11/22/23 |

REVIEW:

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

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

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

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

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

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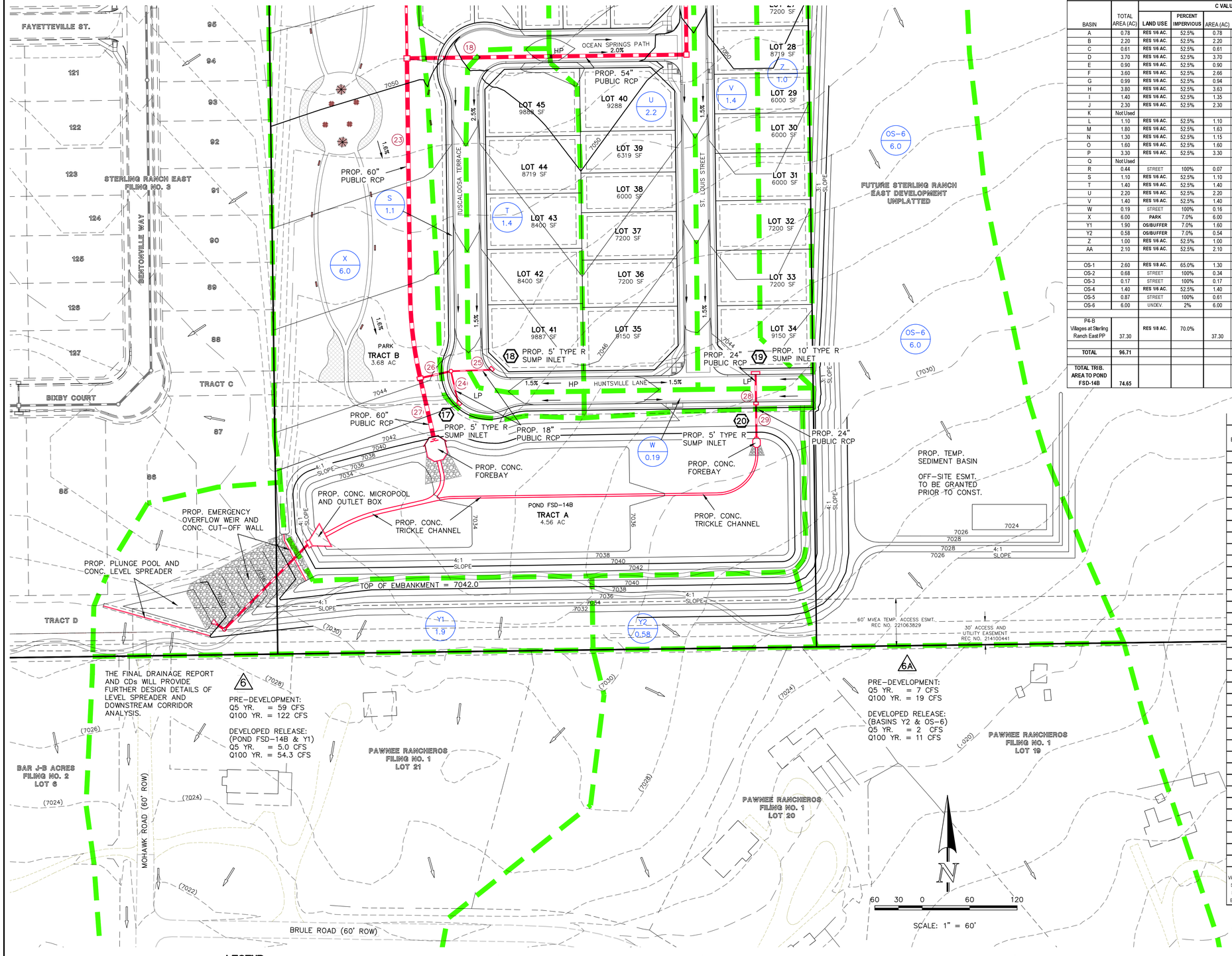


## FINAL DRAINAGE REPORT ~ BASIN RUNOFF COEFFICIENT SUMMARY

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

## FINAL DRAINAGE REPORT ~ BASIN RUNOFF SUMMARY

| BASIN | WEIGHTED 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 | 0.25 | 0.29 | 0.43 | 0.08 | 100 | 2 | 14.7 | 135 | 2.0% | 2.8 | 0.8 | 15.4 | 2.78 | 3.48 | 5.84 | 0.7 | **1.0** | **2.5** |
| B | 0.70 | 0.83 | 1.20 | 0.08 | 100 | 2 | 14.7 | 260 | 1.5% | 2.4 | 1.8 | 16.4 | 2.70 | 3.39 | 5.68 | 2 | **3** | **7** |
| C | 0.20 | 0.23 | 0.33 | 0.08 | 50 | 1 | 10.4 | 260 | 1.5% | 2.4 | 1.8 | 12.1 | 3.07 | 3.84 | 6.45 | 0.6 | **0.9** | **2.1** |
| D | 1.18 | 1.39 | 2.02 | 0.08 | 100 | 2 | 14.7 | 900 | 1.8% | 2.7 | 5.6 | 20.2 | 2.46 | 3.07 | 5.16 | 3 | **4** | **10** |
| E | 0.29 | 0.34 | 0.49 | 0.08 | 50 | 1 | 10.4 | 470 | 2.5% | 3.2 | 2.5 | 12.8 | 3.00 | 3.75 | 6.30 | 0.9 | **1.3** | **3.1** |
| F | 0.90 | 1.11 | 1.82 | 0.12 | 100 | 2 | 14.1 | 270 | 1.5% | 2.4 | 1.8 | 15.9 | 2.74 | 3.43 | 5.76 | 2 | **4** | **10** |
| G | 0.30 | 0.36 | 0.53 | 0.12 | 50 | 1 | 10.0 | 270 | 1.5% | 2.4 | 1.8 | 11.8 | 3.10 | 3.88 | 6.52 | 0.9 | **1.4** | **3.5** |
| H | 1.17 | 1.38 | 2.04 | 0.12 | 100 | 2 | 14.1 | 450 | 1.5% | 2.4 | 3.1 | 17.1 | 2.65 | 3.32 | 5.57 | 3 | **5** | **11** |
| I | 0.43 | 0.51 | 0.75 | 0.08 | 50 | 1 | 10.4 | 450 | 1.5% | 2.4 | 3.1 | 13.4 | 2.94 | 3.69 | 6.19 | 1 | **2** | **5** |
| J | 0.74 | 0.86 | 1.25 | 0.08 | 50 | 1 | 10.4 | 630 | 3.5% | 3.7 | 2.8 | 13.2 | 2.97 | 3.72 | 6.24 | 2 | **3** | **8** |
| K | Not Used | | | | | | | | | | | | | | | | | |
| L | 0.35 | 0.41 | 0.60 | 0.08 | 100 | 2 | 14.7 | 500 | 1.5% | 2.4 | 3.4 | 18.1 | 2.59 | 3.24 | 5.44 | 0.9 | **1.3** | **3.3** |
| M | 0.53 | 0.63 | 0.95 | 0.12 | 100 | 2 | 14.1 | 200 | 1.5% | 2.4 | 1.4 | 15.4 | 2.78 | 3.48 | 5.84 | 1 | **2** | **6** |
| N | 0.38 | 0.45 | 0.69 | 0.12 | 100 | 2 | 14.1 | 200 | 1.5% | 2.4 | 1.4 | 15.4 | 2.78 | 3.48 | 5.84 | 1 | **2** | **4** |
| O | 0.51 | 0.60 | 0.87 | 0.08 | 100 | 2 | 14.7 | 300 | 1.5% | 2.4 | 2.0 | 16.7 | 2.69 | 3.36 | 5.64 | 1 | **2** | **5** |
| P | 1.06 | 1.24 | 1.80 | 0.08 | 100 | 2 | 14.7 | 420 | 1.5% | 2.4 | 2.9 | 17.5 | 2.63 | 3.29 | 5.52 | 3 | **4** | **10** |
| Q | Not Used | | | | | | | | | | | | | | | | | |
| R | 0.08 | 0.11 | 0.21 | 0.12 | 100 | 2 | 14.1 | 50 | 1.5% | 2.4 | 0.3 | 14.4 | 2.86 | 3.56 | 6.01 | 0.2 | **0.4** | **1.3** |
| S | 0.35 | 0.41 | 0.60 | 0.08 | 100 | 2 | 14.7 | 500 | 1.5% | 2.4 | 3.4 | 18.1 | 2.59 | 3.24 | 5.44 | 0.9 | **1.3** | **3.3** |
| T | 0.45 | 0.53 | 0.76 | 0.08 | 100 | 2 | 14.7 | 300 | 1.5% | 2.4 | 2.0 | 16.7 | 2.69 | 3.36 | 5.64 | 1 | **2** | **4** |
| U | 0.70 | 0.83 | 1.20 | 0.08 | 100 | 2 | 14.7 | 500 | 1.5% | 2.4 | 3.4 | 18.1 | 2.59 | 3.24 | 5.44 | 2 | **3** | **7** |
| V | 0.45 | 0.53 | 0.76 | 0.08 | 50 | 1 | 10.4 | 650 | 1.5% | 2.4 | 4.4 | 14.8 | 2.83 | 3.54 | 5.95 | 1 | **2** | **5** |
| W | 0.14 | 0.15 | 0.17 | | | | | | | | | 5.0 | 4.12 | 5.17 | 8.68 | 0.6 | **0.8** | **1.4** |
| X | 0.30 | 0.72 | 2.34 | 0.08 | 100 | 2 | 14.7 | 500 | 2.0% | 1.0 | 8.4 | 23.1 | 2.30 | 2.88 | 4.83 | 1 | **2** | **11** |
| Y1 | 0.35 | 0.46 | 0.91 | 0.90 | 250 | 10 | 3.6 | | | | | 5.0 | 4.12 | 5.17 | 8.68 | 1.4 | **2** | **8** |
| Y2 | 0.03 | 0.07 | 0.22 | 0.08 | 90 | 14 | 7.1 | | | | | 7.1 | 3.71 | 4.65 | 7.81 | 0.1 | **0.3** | **1.8** |
| Z | 0.32 | 0.38 | 0.55 | 0.08 | 65 | 2 | 10.2 | | | | | 10.2 | 3.27 | 4.09 | 6.87 | 1 | **2** | **4** |
| AA | 0.67 | 0.79 | 1.14 | 0.08 | 65 | 2 | 10.2 | | | | | 10.2 | 3.27 | 4.09 | 6.87 | 2 | **3** | **8** |
| OS-1 | 1.69 | 1.76 | 2.02 | 0.08 | 40 | 0.8 | 9.3 | 900 | 2.5% | 3.2 | 4.7 | 14.0 | 2.89 | 3.62 | 6.08 | 5 | **6** | **12** |
| OS-2 | 0.32 | 0.35 | 0.46 | 0.12 | 50 | 1 | 10.0 | 400 | 1.6% | 2.5 | 2.6 | 12.6 | 3.02 | 3.78 | 6.35 | 1.0 | **1.3** | **2.9** |
| OS-3 | 0.15 | 0.15 | 0.16 | | | | | | | | | 5.0 | 4.12 | 5.17 | 8.68 | 0.6 | **0.8** | **1.4** |
| OS-4 | 0.45 | 0.53 | 0.76 | 0.08 | 50 | 1 | 10.4 | 500 | 1.5% | 2.4 | 3.4 | 13.8 | 2.91 | 3.65 | 6.13 | 1 | **2** | **5** |
| OS-5 | 0.56 | 0.58 | 0.69 | 0.12 | 25 | 0.75 | 6.2 | 450 | 1.5% | 2.4 | 3.1 | 9.2 | 3.39 | 4.25 | 7.14 | 2 | **2** | **5** |
| OS-6 | 0.18 | 0.54 | 2.16 | 0.12 | 300 | 7 | 23.2 | | | | | 23.2 | 2.29 | 2.87 | 4.81 | 0.4 | **1.5** | **10** |
| P4-B Villages at Sterling Ranch East PP | 16.79 | 18.28 | 23.13 | 0.08 | 100 | 2 | 14.7 | 600 | 1.5% | 2.4 | 4.1 | 18.7 | 2.55 | 3.19 | 5.35 | 43 | **58** | **124** |

**LEGEND**

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

48 HOURS BEFORE YOU DIG, CALL UTILITY LOCATORS
**811**
UTILITY NOTIFICATION CENTER OF COLORADO
IT'S THE LAW

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

| NO. | REVISION | DATE |
|---|---|---|
| 1 | REVISED PER COUNTY COMMENTS | 11/22/23 |

REVIEW:

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

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


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


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

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

CLASSIC CONSULTING


N:\1183.25\REPORTS\PRELIMINARY DRAINAGE REPORT\1183.25PDM.dwg, 11/22/2023 11:14:08 PM, 1:1