PRELIMINARY DRAINAGE REPORT AND MDDP ADDENDUM
FOR
HOMESTEAD NORTH AT STERLING RANCH PRELIMINARY PLAN

Engineering Review
01/05/2021 6:22:39 PM
dsdrice
JeffRice@elpasoco.com
(719) 520-7877
EPC Planning & Community Development Department

Cursory comments - see comment letter also.

PCD-ENGINEERING REVIEW COMMENTS IN BLUE BOXES WITH BLUE TEXT

Prepared For:

SR Land, LLC
20 Boulder Crescent, Suite 200
Colorado Springs, CO 80903
(719) 491-3024

June 26, 2020
Project No. 25188.00

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

PCD Filing No.:
SP-20-008

J·R ENGINEERING

ENGINEER'S STATEMENT:

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

_____

Mike Bramlett, Colorado P.E. 38861
For and On Behalf of JR Engineering, LLC

DEVELOPER'S STATEMENT:

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

Business Name: SR Land, LLC

By: _____

Title: _____

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

El Paso County:

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

_____ _____

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

Conditions:

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APPENDIX

PURPOSE

This document is the Preliminary Drainage Report and MDDP Addendum for Homestead North at Sterling Ranch. The purpose of this report is to identify on-site and off-site drainage patterns, storm sewer, culvert and inlet locations, areas tributary to the site, and to safely route developed storm water to adequate outfall facilities. It is important to note that Homestead North at Sterling Ranch is intended to be constructed in two phases with both phases being evaluated in this report. Assumptions have been made with regards to Phase 2 in order to size and evaluate the site drainage infrastructure. This report will be confirmed or amended in the event that the phase 2 lot configuration has significant changes.

GENERAL SITE DESCRIPTION

GENERAL LOCATION

Homestead North at Sterling Ranch and the undeveloped land to the north(hereby referred to as the "site") is a proposed development with a total area of approximately 88 acres.

33 and southeast quarter of Section 28?

The site is located in the northeast quarter of Section 28, Township 12 South, Range 65 West of the Sixth Principal Meridian in the County of El Paso, State of Colorado. The site is located immediately east of Vollmer Road. The site is bounded by Briargate Parkway to the south, an unplatted vacant residential parcel to the north, and Sand Creek borders the site to east. The parcels are planned to be platted after approval of the Preliminary Plan. Refer to the vicinity map in Appendix A for additional information.

224?

DESCRIPTION OF PROPERTY

The site is currently being designed to accommodate approximately 264 single-family residential lots and development is to be completed in two phases (totaling approximately 88 acres). The site is comprised of variable sloping grasslands that generally slope(s) downward to the east at 3 to 7% towards the Sand Creek tributary basin.

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

There are no major drainageways on the site, although a tributary to the Sand Creek basin is immediately to the east of the site. Currently, Kiowa Engineering Corp. is performing studies and plans to address Sand Creek stabilization.

Should be reworded to state Sand Creek is within the east portion of the site.

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

FLOODPLAIN STATEMENT

Based on the FEMA Firm Maps Number 08041C0533G and 08041C0535G revised December 7, 2018, the vast majority of the development is located within Zone X, or areas area outside the Special Flood Hazard Area (SFHA) and higher than the elevation of the 0.2-percent-annual-chance (or 500-year) flood. The eastern property boundary will be platted to the center of Sand creek placing a portion of the site within Zone AE. The area of disturbance for site grading is located outside of the delineated floodway within Zone X. The FEMA map containing the site has been presented in Appendix A.

EXISTING DRAINAGE CONDITIONS

MAJOR BASIN DESCRIPTIONS

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

The Sand Creek DBPS assumed the Homestead North at Sterling Ranch property to have a "large lot residential" use for the majority of the site. However, the proposed Sterling Ranch master plan is a mix of; school, multi-family, single-family, and commercial land uses, resulting in higher runoff. The site generally drains from north to south consisting of rolling hills. Currently, the site is used as pasture land for cattle. Sand Creek is located east of the site running north to south. This reach of drainage conveyance is not currently improved. There are a few stock ponds within the creek channel used for cattle watering. Currently, Kiowa is performing studies and plans to address Sand Creek stabilization adjacent to the site.

The proposed drainage on the site closely follows the approved "Master Development Drainage Plan for Sterling Ranch", (MMDP) prepared by M&S Civil Consultants, Inc., dated October 24, 2018. The MMDP "Developed Hydrologic Conditions Map" as shown within Appendix E, shows the estimated detention for the site. The site is tributary to basins SC3-18, SC3-17, and a portion of basin SC-322. Full-spectrum detention in the MMDP was previously analyzed and corresponds to ponds FSD18 and FSD17 for the site. Pond FSD17 is associated with ponds A and B within this report. Pond FSD18 is associated with ponds B and C within this report. The total estimated/projected detention and estimated outflows from the MDDP are shown in Table 1 below.

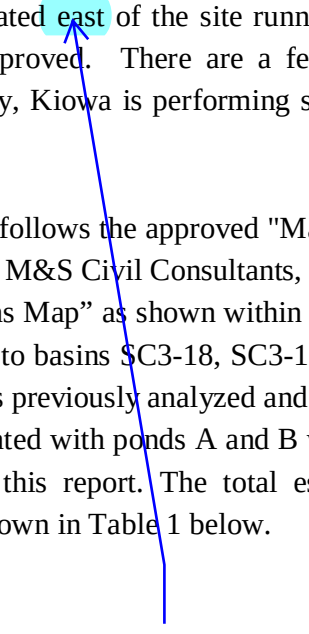


Table 1.

FSD17						
STORM EVENT (YR)	2	5	10	25	50	100
PEAK INFLOW (CFS)	41.8	59.6	85.2	119.0	149.1	180.6
ALLOWABLE RELEASE (CFS)	0.7	11.1	22.5	52	67.2	86.3
MODELED RELEASE (CFS)	0.7	8.4	22.4	52	67.2	86.1
STORED VOLUME (AC-FT)	2.6	2.6	2.8	3.4	4.0	4.7

FSD18						
STORM EVENT (YR)	2	5	10	25	50	100
PEAK INFLOW (CFS)	49.3	67.1	91.0	121.2	147.3	174
ALLOWABLE RELEASE (CFS)	0.6	9.2	18.4	42.2	54.6	69.9
MODELED RELEASE (CFS)	0.6	6.3	18.4	42.2	54.6	69.6
STORED VOLUME (AC-FT)	3.2	3.2	3.4	4.0	4.7	5.3

please describe a little more here.

The MMDP plans for additional detention to the north of the site as shown in appendix E. No future offsite detention is necessary for the site.

Add a summary sentence stating what is changing from the approved MDDP.

EXISTING SUB-BASIN DRAINAGE

The existing / predeveloped condition of the site was analyzed in the MMDP conducted by M&S the existing site corresponds to basin EX-5 as shown in the 2018 Sterling Ranch MMDP, Existing Hydrologic Conditions Map in Appendix E.

Provide detailed analysis of existing conditions

PROPOSED DRAINAGE CONDITIONS

PROPOSED SUB-BASIN DRAINAGE

The proposed site was broken up and delineated into three major basins: Basin A (upper-portion), Basin B (mid –portion), and Basin C (lower-portion) of the site. It should be noted that Basin A will be constructed as part of phase 2 of this development and Basins B and C will be constructed as part of Phase 1. Basin A is tributary to Pond A, Basin B is Tributary to Pond B and Basin C is tributary to Pond C. The proposed basin (and sub-basin) delineation is shown on the drainage basin map within Appendix D and is described as follows.

Basin A1 3.51 acres and 56% percent impervious is comprised of single-family residential lots, a local road, and a Cul de Sac. Runoff (Q_5=7.1 cfs, Q_{100}=14.8 cfs)from this basin drains to design point 1A.

Basin A2 3.18 acres and 57% percent impervious is comprised of single-family residential lots, a local road, and a Cul de Sac. Runoff (Q_5=6.4 cfs, Q_{100}=13.2 cfs)from this basin drains to design point 2A.

Basin A3 4.58 acres and 53% percent impervious is comprised of single-family residential lots, a local road, and a Cul de Sac. Runoff (Q_5=8.7 cfs, Q_{100}=18.3 cfs)from this basin drains to design point 3A in confluence with upstream flow from basin A1.

Basin A4 3.82 acres and 54% percent impervious is comprised of single-family residential lots, a local road, and a Cul de Sac. Runoff (Q_5=7.3 cfs, Q_{100}=15.2 cfs)from this basin drains to design point 4A in confluence with upstream flow from basin A2.

Basin A5 5.46 acres and 51% percent impervious is comprised of single-family residential lots, a local road, and a Cul de Sac. Runoff (Q_5=10.8 cfs, Q_{100}=23.1 cfs)from this basin drains to design point 5A in confluence with upstream flow from basin A3 and A1.

Basin A6 3.91 acres and 54% percent impervious is comprised of single-family residential lots, a local road, and an urban knuckle. Runoff (Q_5=7.6 cfs, Q_{100}=16.0 cfs)from this basin drains to design point 6A in confluence with upstream flow from basin A4 and A2.

Basin A7 1.87 acres and 14% percent impervious is comprised of open grass area, and a portion of a collector road. The runoff (Q_5=1.1 cfs, Q_{100}=4.5 cfs)from this basin drains to design point 7A a 20' type R sump inlet. The runoff from the sump inlet collects tributary runoff basins A7, A5, A3, and A1.

Basin A8 0.42 acres and 62% percent impervious is comprised of a portion of a collector road. The runoff (Q_5=1.2 cfs, Q_{100}=2.6 cfs)from this basin drains to design point 8A a 15' type R sump inlet. From here on runoff is piped for basin A1-A8 to detention pond A and detained for the water-quality event and up to the 100-year event.

Basin A9 2.97 acres and 17% percent impervious is comprised of pond A, grass and walk-out lots facing the detention area. Runoff (Q_5=2.3 cfs, Q_{100}=7.9 cfs) generated in Basin A9 sheet flows into Pond A where it is treated for water-quality and is detained up until the 100 year-event.

Basin B1.1 2.71 acres and 52% percent impervious is comprised of single-family residential lots, a local road and an urban knuckle. The runoff (Q_5=5.3 cfs, Q_{100}=11.1 cfs) from basin B1.1 drains to design point 1.1B.

Basin B1.2 1.87 acres and 53% percent impervious is comprised of single-family residential lots, a local road and an urban knuckle. The runoff (Q_5=3.6 cfs, Q_{100}=7.6 cfs) from basin B1.2 drains to design point 1.2B.

Basin B1.3 0.43 acres and 46% percent impervious is comprised of single-family residential lots and a local road. The runoff (Q_5=0.8 cfs, Q_{100}=2.0 cfs)from basin B1.3 drains to design point 1.3B.

Basin B2 0.83 acres and 62% percent impervious is comprised of the northern portion of a local collector road adjacent to the intersecting at Vollmer road. Runoff (Q_5=2.5 cfs, Q_{100}=5.1 cfs)from basin B2 drains to design point 2B and confluences with runoff from basin 1B.

Basin B3 0.26 acres and 100% percent impervious is comprised of the southern portion of a local collector road adjacent to the intersection of Vollmer road. Runoff (Q_5=1.2 cfs, Q_{100}=2.2 cfs)from basin B3 drains to design point 3B.

Basin B4 3.98 acres and 40% percent impervious is comprised of single-family residential lots, a collector road and a Cul de Sac. Runoff (Q_5=6.8 cfs, Q_{100}=16.0 cfs) from this basin drains to design point 4B.

Basin B5 1.75 acres and 58% percent impervious is comprised of single-family residential lots, a collector road, and a Cul de Sac. Runoff (Q_5=4.4 cfs, Q_{100}=9.0 cfs)from basin B5 drains to design point 5B.

Basin B6 3.60 acres and 60% percent impervious is comprised of single-family residential lots and a collector road. Runoff (Q_5=9.8 cfs, Q_{100}=20.2 cfs) from basin 6B drains to design point 6B. In total, the flow at design point 6B collects flow from basins B1, B2, B3, B4, and B6.

Basin B7 1.13 acres and 62% percent impervious is comprised of single-family lots, local roads and a Cul de Sac. Runoff (Q_5=2.9 cfs, Q_{100}=5.8 cfs) from basin B7 drains to design point B7 in confluence with runoff from B5.

Basin B8 1.76 acres and 59% percent impervious is comprised of single-family lots, local road and a Cul de Sac. Runoff (Q_5=4.2 cfs, Q_{100}=8.6 cfs) from basin B8 drains to design point B8 in confluence with runoff from basins B8, B7 and B5.

Basin B9 3.79 acres and 64% percent impervious is comprised of single-family lots, local road, collector road and an urban knuckle. Runoff (Q_5=7.0 cfs, Q_{100}=15.0 cfs)from Basin B9 drains to design point B9 in a 15’ type R sump inlet. In total the runoff from the sump inlet collects runoff from basins B1, B2, B3, B4, B6 and B9.

Basin B10 0.22 acres and 100% percent impervious is comprised of the southeastern side of the collector road. The runoff from this basin drains to design point B10. The total runoff (Q_5=1.0 cfs, Q_{100}=1.8 cfs) is collected at this site is from basins B7, B8, and B10.

Basin B11 1.75 acres and 2.0% percent impervious is comprised of pond B. Runoff (Q_5=0.5 cfs, Q_{100}=3.4 cfs) generated in Basin B11 sheet flows into Pond B where it is treated for water-quality and is detained up until the 100 year-event.

Basin C1 2.82 acres and 70% percent impervious is comprised of local roads, single-family lots, and the northwestern side of the collector road. Runoff (Q_5=5.5 cfs, Q_{100}=11.5 cfs) from basin C1 drains to design point 1C.

Basin C2.1 0.20 acres and 89% percent impervious is comprised of local roads, single-family lots, and the north western side of the collector road. Runoff (Q_5=0.8 cfs, Q_{100}=1.6 cfs) from basin C2.1 drains to design point 2.1C in confluence with runoff from basin C1.

Basin C2.2 4.69 acres and 73% percent impervious is comprised of local roads, single-family lots, and the north western side of the collector road. Runoff (Q_5=9.9 cfs, Q_{100}=20.3 cfs) from basin C2.2 drains to design point 2.2C in confluence with bypass runoff from basin C2.3.

Basin C2.3 0.83 acres and 70% percent impervious is comprised of local roads, single-family lots, and the north western side of the collector road. Runoff (Q_5=2.0 cfs, Q_{100}=4.1 cfs) from basin C2.3 drains to design point 2C in confluence with runoff from basin C1.

Basin C3.1 0.35 acres and 82% percent impervious is comprised of local roads, single-family lots, and the southeastern side of a collector road. Runoff (Q_5=1.3 cfs, Q_{100}=2.6 cfs) from basin C3.1 drains to design point 3.1C.

Basin C3.2 1.46 acres and 72% percent impervious is comprised of local roads, single-family lots, and the southeastern side of a collector road. Runoff (Q_5=3.6 cfs, Q_{100}=7.4 cfs) from basin C3.2 drains to design point 3.2C.

Basin C4.1 5.81 acres and 70% percent impervious is comprised of local roads, single-family lots, and the northwestern side of a collector road. Runoff (Q_5=11.5 cfs, Q_{100}=23.9 cfs) from basin C4.1 drains to design point 4.1C a 20' type R sump inlet. The total runoff from basins C1, C2.1, C2.2, C2.3 and C4.1 is collected within the sump inlet.

DP not shown on pdf page 28 or 30.
Typo? Supposed to be DP 4c?

Basin C4.2 2.58 acres and 69% percent impervious is comprised of local roads and single-family lots and. Runoff (Q_5=4.4 cfs, Q_{100}=9.3 cfs) from basin C4.2 drains to design point 4.2C a 15' type R inlet.

Basin C5 0.16 acres and 100% percent impervious is comprised of the northwestern side of a collector road. Runoff (Q_5=0.7 cfs, Q_{100}=1.3 cfs) from basin C5 drains to design point 5C, a 5' type R sump inlet. Basin C5 collects runoff from basin C3.2 and C5. The runoff from basin C ultimately outfalls into pond C.

Basin C6 2.43 acres and 10% percent impervious is comprised of pond C and some single-family residential area. Runoff (Q_5=1.6 cfs, Q_{100}=8.1 cfs) generated in Basin B11 sheet flows into Pond Cwhere it is treated for water-quality and is detained up until the 100 year-event.

Include discussion of design points combined flows, overflow paths and pond release rates and volumes above or add.

DRAINAGE DESIGN CRITERIA

DEVELOPMENT CRITERIA REFERENCE

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

HYDROLOGIC CRITERIA

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

Table 2 - 1-hr Point Rainfall Data

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

HYDRAULIC CRITERIA

The Rational Method and USDCM's SF-2 and SF-3 forms were used to determine the runoff from the minor and major storms on the site, and the UDFCD MHFD-Detention v4 03 spreadsheet was

utilized for evaluating proposed detention and water quality pond. Sump and on-grade inlets were sized using UDFCD UD-Inlet v2.07. Manning's equation was used to size the proposed pipes in this report and StormCAD will be used to model the proposed storm sewer system and to analyze the proposed HGL calculations for Construction Drawings.

DRAINAGE FACILITY DESIGN

FOUR STEP PROCESS TO MINIMIZE ADVERSE IMPACTS OF URBANIZATION

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

Step 1 – Reducing Runoff Volumes: The Homestead North at Sterling Ranch development project consists single -family homes with open spaces and lawn areas interspersed within the development which helps disconnect impervious areas and reduce runoff volumes. Roof drains from the structures will discharge to lawn areas, where feasible, to allow for infiltration and runoff volume reduction.

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

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

Revise Step 4. This should be n/a since this is not an industrial or commercial site.

Step 4 – Consider Need for Industrial and Commercial BMPs: BMPs will be utilized to minimize off-site contaminants and to protect the downstream receiving waters. Site specific temporary source control BMPs that will be implemented include, but are not limited to, silt fencing placed around downstream areas of disturbance, construction vehicle tracking pads at the entrances, designated concrete truck washout basin, designated vehicle fueling areas, covered storage areas, spill containment and control, (parking, storm inlets and s permanent vegetation.

Step 4: Consider Need for Industrial and Commercial BMPs

If a new development or significant redevelopment activity is planned for an industrial or commercial site, the need for specialized BMPs must be considered. Two approaches are described in the New Development BMP Factsheets:

- Covering of Storage/Handling Areas
- Spill Containment and Control

Other Specialized BMPs may also be required

WATER QUALITY

The site is split into three major basins A, B, and C. Each major basin is serviced by an extended full spectrum water quality / detention pond. All the ponds have been designed per Section 13.3.2.1 of Resolution 15-042 of the El Paso County Drainage Criteria Manual. For additional information on pond storage and outlet characteristics see the MHFD sheets within appendix C.

EROSION CONTROL PLAN

We respectfully request that the Erosion Control Plan and Cost Estimate be submitted in conjunction with the grading and erosion control plan and construction assurances posted prior to obtaining a grading permit.

OPERATION & MAINTENANCE

In order to ensure the function and effectiveness of the stormwater infrastructure, maintenance activities such as inspection, routine maintenance, restorative maintenance, rehabilitation and repair, are required. The property owner shall be responsible for the inspection, maintenance, rehabilitation and repair of stormwater and erosion control facilities located on the property unless another party accepts such responsibility in writing and responsibility is properly assigned through legal documentation. Access is provided from onsite facilities and easements for proposed infrastructure located offsite. We respectfully request that the Operation & Maintenance Manual be submitted in conjunction with the construction documents, prior to obtaining a grading permit.

Show all access roads on the plans.

DRAINAGE AND BRIDGE FEES

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

2020 DRAINAGE AND BRIDGE FEES – STERLING RANCH HOMESTEAD NORTH				
Impervious Acres (ac)	Drainage Fee (Per Imp. Acre)	Bridge Fee (Per Imp. Acre)	Sterling Ranch Drainage Fee	Sterling Ranch Bridge Fee
	$19,698	$8,057		

This table is not needed in a PDR

SUMMARY

The proposed Homestead North at Sterling Ranch drainage improvements were designed to meet or exceed the El Paso County Drainage Criteria. The proposed development ponds are designed to release less than MDDP study associated with the subject site. The proposed development will not adversely affect the offsite drainageways or surrounding development. This report is in conformance and meets the latest El Paso County Storm Drainage Criteria requirements for this site.

REFERENCES

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

El Paso County ECM, 2019

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

El Paso County DCM Vol. 1 Update, 2015

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

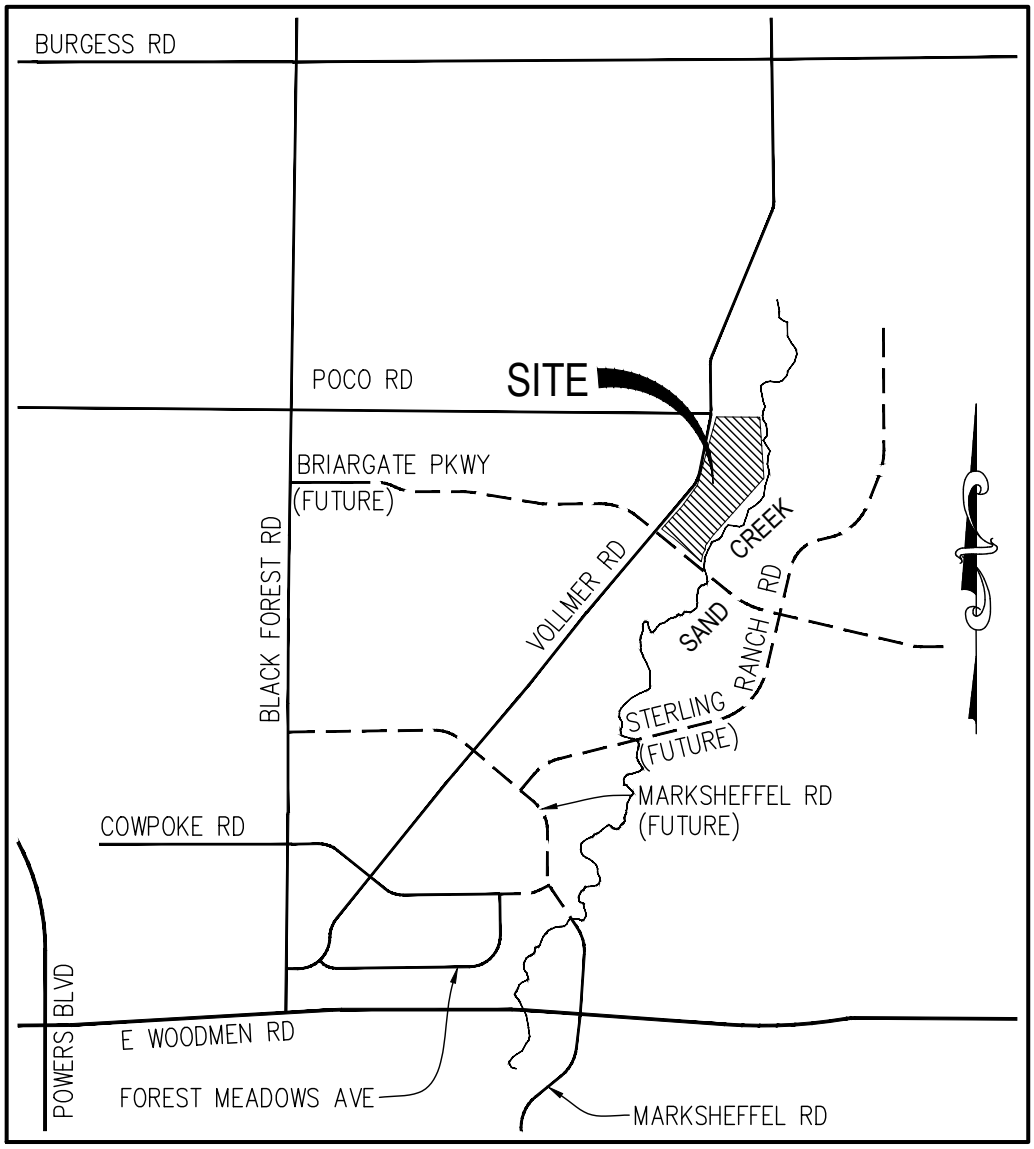
Upper Sand Creek Basin Detention Evaluation Study... (Wilson) ?

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

TimberRidge PDR/FDR?

Sand Creek Channel Design report and plans (Kiowa, 2021)

Appendix A
Vicinity Map, Soil Descriptions, FEMA Floodplain Map



VICINITY MAP

N.T.S.

VICINITY MAP
HOMESTEAD FIL. 3
JOB NO. 25188.00
04/20/20
SHEET 1 OF 1

J·R ENGINEERING
A Westrian Company

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

Map Scale: 1:5,730 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 50 100 200 300

Feet
0 250 500 1000 1500

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

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

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

Soil Rating Lines

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

Soil Rating Points

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

Water Features

- Streams and Canals

Transportation

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

Background

- Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 17, Sep 13, 2019

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

Date(s) aerial images were photographed: Sep 8, 2018—May 26, 2019

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
71	Pring coarse sandy loam, 3 to 8 percent slopes	B	90.2	100.0%
Totals for Area of Interest			**90.2**	**100.0%**

Description

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

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

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

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

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

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

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

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

NOTES TO USERS

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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.

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

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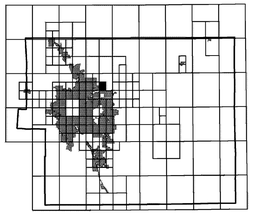
El Paso County Vertical Datum Offset Table

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



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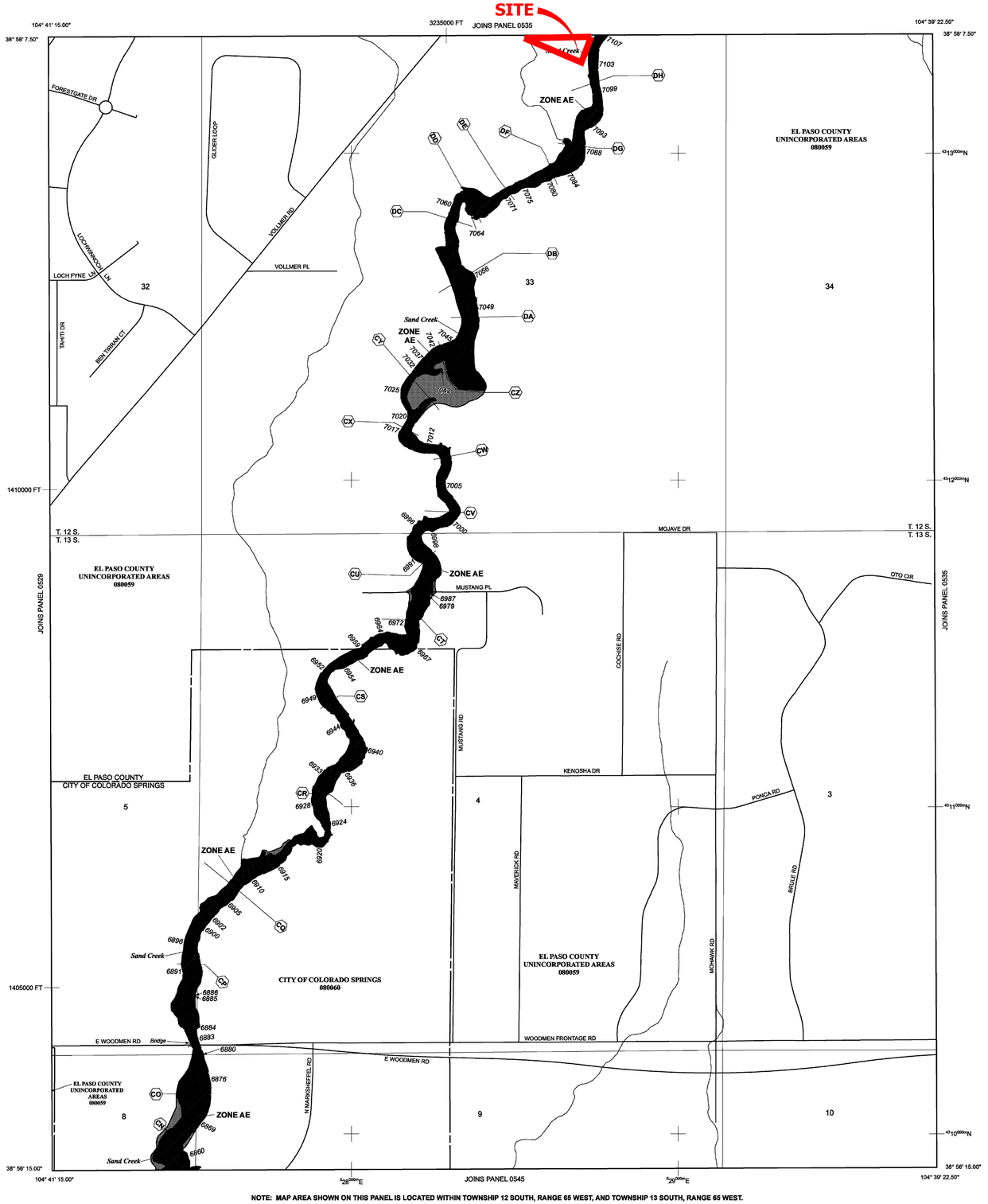

NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 12 SOUTH, RANGE 65 WEST, AND TOWNSHIP 13 SOUTH, RANGE 65 WEST.

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*

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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.

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

NFIP

PANEL 0533G

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

EL PASO COUNTY, COLORADO AND INCORPORATED AREAS

PANEL 533 OF 1300

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

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

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

MAP NUMBER
08041C0533G

MAP REVISED
DECEMBER 7, 2018

Federal Emergency Management Agency

NOTES TO USERS

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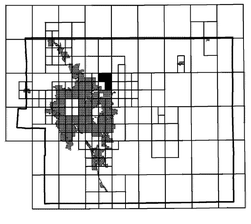

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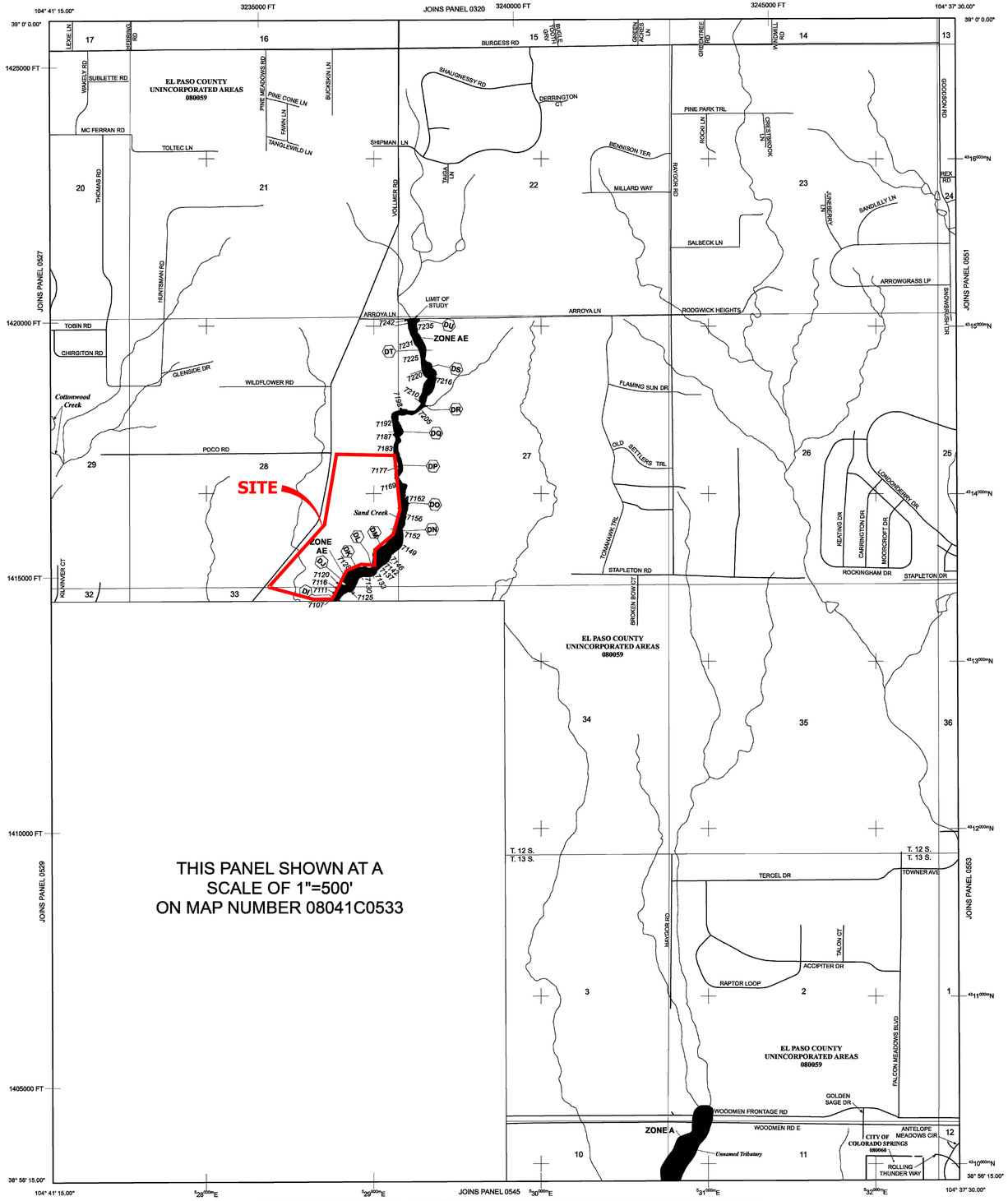

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LEGEND

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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

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OTHERWISE PROTECTED AREAS (OPAs)

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- 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.
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- (EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*

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

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- 23 — 23 — Transect line
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- DX5510 — Bench mark (see explanation in Notes to Users section of this FIRM panel)
- M1.5 — River Mile

MAP REPOSITORIES
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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.

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MAP SCALE 1" = 1000'
500 0 1000 2000 FEET
300 0 300 600 METERS

NFIP

PANEL 0535G

FIRM

FLOOD INSURANCE RATE MAP

EL PASO COUNTY, COLORADO AND INCORPORATED AREAS

PANEL 535 OF 1300

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

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

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MAP NUMBER 08041C0535G

MAP REVISED DECEMBER 7, 2018

Federal Emergency Management Agency

Appendix B
Hydrologic Calculations

Provide existing conditions calculations.

COMPOSITE % IMPERVIOUS & COMPOSITE RUNOFF COEFFICIENT CALCULATIONS

Subdivision: Homestead Fil. 3
Location: El Paso County

Project Name: Homestead North
Project No.: 25188.00
Calculated By: ARJ
Checked By:
Date: 6/25/20

Basin ID	Total Area (ac)	Streets/Paved (100% Impervious)				Residential (45%-65% Impervious)				Lawns (2% Impervious)				Basins Total Weighted C Values		Basins Total Weighted % Imp.
		C_5	C_{100}	Area (ac)	Weighted % Imp.	C_5	C_{100}	Area (ac)	Weighted % Imp.	C_5	C_{100}	Area (ac)	Weighted % Imp.	C_5	C_{100}	
A1	3.51	0.90	0.96	0.84	24.0%	0.45	0.59	2.48	31.8%	0.08	0.35	0.18	0.1%	0.54	0.67	55.9%
A2	3.18	0.90	0.96	0.84	26.5%	0.45	0.59	2.12	29.9%	0.08	0.35	0.22	0.1%	0.54	0.67	56.6%
A3	4.58	0.90	0.96	0.79	17.2%	0.45	0.59	3.66	35.9%	0.08	0.35	0.14	0.1%	0.52	0.65	53.2%
A4	3.82	0.90	0.96	0.78	20.3%	0.45	0.59	2.89	34.1%	0.08	0.35	0.15	0.1%	0.53	0.66	54.5%
A5	5.46	0.90	0.96	0.66	12.0%	0.45	0.59	4.70	38.7%	0.08	0.35	0.11	0.0%	0.50	0.63	50.7%
A6	3.91	0.90	0.96	0.66	17.0%	0.45	0.59	3.11	35.7%	0.08	0.35	0.14	0.1%	0.51	0.64	52.8%
A7	1.87	0.90	0.96	0.24	12.7%	0.45	0.59	0.00	0.0%	0.08	0.35	1.63	1.7%	0.18	0.43	14.5%
A8	0.42	0.90	0.96	0.24	58.0%	0.45	0.59	0.03	3.0%	0.08	0.35	0.15	0.7%	0.58	0.72	61.7%
A9	2.97	0.90	0.96	0.00	0.0%	0.45	0.59	1.00	15.2%	0.08	0.35	1.97	1.3%	0.21	0.43	16.5%
Pond A	29.72															47.6%
B1.1	2.71	0.90	0.96	0.39	14.4%	0.45	0.59	2.29	38.0%	0.08	0.35	0.03	0.0%	0.51	0.64	52.4%
B1.2	1.87	0.90	0.96	0.32	17.3%	0.45	0.59	1.48	35.5%	0.08	0.35	0.07	0.1%	0.51	0.65	52.9%
B1.3	0.43	0.90	0.96	0.19	45.0%	0.45	0.59	0.00	0.0%	0.08	0.35	0.24	1.1%	0.45	0.62	46.1%
B2	0.83	0.90	0.96	0.37	44.1%	0.45	0.59	0.32	17.1%	0.08	0.35	0.15	0.4%	0.58	0.71	61.6%
B3	0.26	0.90	0.96	0.26	100.0%	0.45	0.59	0.00	0.0%	0.08	0.35	0.00	0.0%	0.90	0.96	100.0%
B4	3.98	0.90	0.96	0.50	12.7%	0.45	0.59	2.39	27.0%	0.08	0.35	1.09	0.5%	0.41	0.57	40.2%
B5	1.75	0.90	0.96	0.48	27.7%	0.45	0.59	1.19	30.6%	0.08	0.35	0.08	0.1%	0.56	0.68	58.3%
B6	3.60	0.90	0.96	1.33	37.0%	0.45	0.59	1.82	22.8%	0.08	0.35	0.44	0.2%	0.57	0.70	60.0%
B7	1.13	0.90	0.96	0.38	34.1%	0.45	0.59	0.69	27.6%	0.08	0.35	0.05	0.1%	0.59	0.71	61.8%
B8	1.76	0.90	0.96	0.55	31.1%	0.45	0.59	1.07	27.4%	0.08	0.35	0.14	0.2%	0.56	0.69	58.7%
B9	3.79	0.90	0.96	0.82	21.6%	0.45	0.59	2.45	42.0%	0.08	0.35	0.53	0.3%	0.50	0.64	63.8%
B10	0.22	0.90	0.96	0.22	100.0%	0.45	0.59	0.00	0.0%	0.08	0.35	0.00	0.0%	0.90	0.96	100.0%
B11	1.75	0.90	0.96	0.00	0.0%	0.45	0.59	0.00	0.0%	0.08	0.35	1.75	2.0%	0.08	0.35	2.0%
Pond B	24.08															52.2%
C1	2.82	0.90	0.96	0.49	17.4%	0.45	0.59	2.27	52.3%	0.08	0.35	0.06	0.0%	0.52	0.65	69.8%
C2.1	0.20	0.90	0.96	0.18	89.2%	0.45	0.59	0.00	0.0%	0.08	0.35	0.02	0.2%	0.81	0.89	89.4%
C2.2	4.69	0.90	0.96	1.26	26.9%	0.45	0.59	3.33	46.1%	0.08	0.35	0.10	0.0%	0.56	0.68	73.0%
C2.3	0.83	0.90	0.96	0.31	36.8%	0.45	0.59	0.41	32.5%	0.08	0.35	0.11	0.3%	0.57	0.69	69.6%
C3.1	0.35	0.90	0.96	0.29	82.0%	0.45	0.59	0.00	0.0%	0.08	0.35	0.06	0.4%	0.75	0.85	82.3%
C3.2	1.46	0.90	0.96	0.42	28.5%	0.45	0.59	0.96	42.9%	0.08	0.35	0.08	0.1%	0.56	0.68	71.5%
C4.1	5.81	0.90	0.96	0.99	17.0%	0.45	0.59	4.76	53.3%	0.08	0.35	0.06	0.0%	0.52	0.65	70.3%
C4.2	2.58	0.90	0.96	0.34	13.3%	0.45	0.59	2.20	55.4%	0.08	0.35	0.04	0.0%	0.50	0.64	68.8%
C5	0.16	0.90	0.96	0.16	100.0%	0.45	0.59	0.00	0.0%	0.08	0.35	0.00	0.0%	0.90	0.96	100.0%
C6	2.43	0.90	0.96	0.00	0.0%	0.45	0.59	0.32	8.5%	0.08	0.35	2.11	1.7%	0.13	0.38	10.3%
Pond C	21.33															64.5%

STANDARD FORM SF-2
TIME OF CONCENTRATION

Subdivision: Homestead Fil. 3
Location: El Paso County

Project Name: Homestead North
Project No.: 25188.00
Calculated By: ARJ
Checked By:
Date: 6/25/20

SUB-BASIN DATA						INITIAL/OVERLAND (T_i)			TRAVEL TIME (T_t)					*tc* CHECK (URBANIZED BASINS)			FINAL
BASIN ID	D.A. (ac)	Hydrologic Soils Group	Impervious (%)	C_5	C_{100}	L (ft)	S_o (%)	t_i (min)	L_t (ft)	S_t (%)	K	VEL. (ft/s)	t_t (min)	COMP. t_c (min)	TOTAL LENGTH (ft)	Urbanized t_c (min)	t_c (min)
A1	3.51	B	56%	0.54	0.67	150	2.0%	9.9	612	3.0%	20.0	3.5	2.9	12.8	762.0	20.0	12.8
A2	3.18	B	57%	0.54	0.67	150	2.0%	9.8	577	1.7%	20.0	2.6	3.7	13.5	727.0	20.8	13.5
A3	4.58	B	53%	0.52	0.65	150	2.0%	10.3	645	2.9%	20.0	3.4	3.1	13.4	795.0	20.8	13.4
A4	3.82	B	54%	0.53	0.66	150	2.0%	10.1	653	1.9%	20.0	2.8	3.9	14.0	803.0	21.5	14.0
A5	5.46	B	51%	0.50	0.63	187	7.0%	7.9	531	2.1%	20.0	2.9	3.1	10.9	718.0	21.2	10.9
A6	3.91	B	53%	0.51	0.64	230	4.5%	9.8	435	1.6%	20.0	2.6	2.8	12.6	665.0	20.5	12.6
A7	1.87	B	14%	0.18	0.43	240	4.9%	15.2	125	0.6%	20.0	1.5	1.4	16.6	365.0	26.1	16.6
A8	0.42	B	62%	0.58	0.72	9.5	2.0%	2.3	230	1.9%	20.0	2.8	1.4	3.7	239.5	17.1	5.0
A9	2.97	B	17%	0.21	0.43	30	2.0%	7.0	535	0.5%	20.0	1.4	6.3	13.3	565.0	34.3	13.3
B1.1	2.71	B	52%	0.51	0.64	125	2.0%	9.5	610	3.1%	20.0	3.5	2.9	12.4	735.0	20.6	12.4
B1.2	1.87	B	53%	0.51	0.65	150	2.0%	10.3	577	3.4%	20.0	3.7	2.6	12.9	727.0	20.2	12.9
B1.3	0.43	B	46%	0.45	0.62	50	2.0%	6.6	270	2.0%	20.0	2.8	1.6	8.2	320.0	20.2	8.2
B2	0.83	B	62%	0.58	0.71	9.5	2.0%	2.3	368	3.4%	20.0	3.7	1.7	4.0	377.5	17.4	5.0
B3	0.26	B	100%	0.90	0.96	9.5	2.0%	0.9	360	3.7%	20.0	3.9	1.6	2.4	369.5	10.4	5.0
B4	3.98	B	40%	0.41	0.57	25	2.0%	5.0	680	1.6%	20.0	2.5	4.5	9.5	705.0	25.3	9.5
B5	1.75	B	58%	0.56	0.68	25	2.0%	3.9	590	1.6%	20.0	2.6	3.8	7.7	615.0	20.6	7.7
B6	3.60	B	60%	0.57	0.70	9.5	2.0%	2.3	855	3.0%	20.0	3.5	4.1	6.5	864.5	20.5	6.5
B7	1.13	B	62%	0.59	0.71	50	1.0%	6.6	315	1.5%	20.0	2.4	2.1	8.7	365.0	17.9	8.7
B8	1.76	B	59%	0.56	0.69	50	1.0%	6.9	280	1.0%	20.0	2.0	2.4	9.2	330.0	18.8	9.2
B9	3.79	B	64%	0.50	0.64	140	2.0%	10.3	600	2.9%	20.0	3.4	2.9	13.2	740.0	18.4	13.2
B10	0.22	B	100%	0.90	0.96	9.5	2.0%	0.9	200	0.5%	20.0	1.4	2.4	3.3	209.5	11.1	5.0
B11	1.75	B	2%	0.08	0.35	30	2.0%	8.0	250	0.1%	20.0	0.4	9.3	17.3	280.0	45.7	17.3
C1	2.82	B	70%	0.52	0.65	130	2.0%	9.5	690	2.6%	20.0	3.2	3.6	13.0	820.0	17.9	13.0
C2.1	0.20	B	89%	0.81	0.89	7.5	2.0%	1.1	300	1.0%	20.0	2.0	2.5	3.7	307.5	13.2	5.0
C2.2	4.69	B	73%	0.56	0.68	150	2.0%	9.5	630	2.5%	20.0	3.2	3.3	12.8	780.0	17.0	12.8
C2.3	0.83	B	70%	0.57	0.69	100	2.0%	7.7	462	3.3%	20.0	3.6	2.1	9.8	562.0	16.4	9.8
C3.1	0.35	B	82%	0.75	0.85	9.5	2.0%	1.5	460	2.6%	20.0	3.2	2.4	3.9	469.5	14.3	5.0

STANDARD FORM SF-2
TIME OF CONCENTRATION

Subdivision: Homestead Fil. 3
Location: El Paso County

Project Name: Homestead North
Project No.: 25188.00
Calculated By: ARJ
Checked By:
Date: 6/25/20

SUB-BASIN DATA						INITIAL/OVERLAND (T_i)			TRAVEL TIME (T_t)					*tc* CHECK (URBANIZED BASINS)			FINAL
BASIN ID	D.A. (ac)	Hydrologic Soils Group	Impervious (%)	C_5	C_{100}	L (ft)	S_o (%)	t_i (min)	L_t (ft)	S_t (%)	K	VEL. (ft/s)	t_t (min)	COMP. t_c (min)	TOTAL LENGTH (ft)	Urbanized t_c (min)	t_c (min)
C3.2	1.46	B	72%	0.56	0.68	50	2.0%	5.5	365	1.1%	20.0	2.1	2.9	8.4	415.0	16.9	8.4
C4.1	5.81	B	70%	0.52	0.65	150	2.0%	9.5	633	2.8%	20.0	3.3	3.2	12.7	783.0	17.2	12.7
C4.2	2.58	B	69%	0.50	0.64	150	2.0%	10.2	1010	1.7%	20.0	2.6	6.5	16.7	1160.0	20.9	16.7
C5	0.16	B	100%	0.90	0.96	9.5	2.0%	2.6	200	0.6%	20.0	1.5	2.2	4.8	209.5	16.4	5.0
C6	2.43	B	10%	0.13	0.38	15	2.0%	1.1	160	0.5%	20.0	1.4	1.9	3.0	175.0	10.6	5.0

NOTES:

$$t_c = t_i + t_t$$

Where:

t_c = computed time of concentration (minutes)

t_i = overland (initial) flow time (minutes)

t_t = channelized flow time (minutes).

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

Where:

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

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

Equation 6-2

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

Where:

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

Equation 6-3

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

Where:

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

Table 6-2. NRCS Conveyance factors, K

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

STANDARD FORM SF-3

STORM DRAINAGE SYSTEM DESIGN

(RATIONAL METHOD PROCEDURE)

Subdivision: Homestead Fil. 3
Location: El Paso County
Design Storm: 5-Year

Project Name: Homestead North
Project No.: 25188.00
Calculated By: ARJ
Checked By:
Date: 6/25/20

STREET	Design Point	DIRECT RUNOFF							TOTAL RUNOFF				STREET/SWALE			PIPE				TRAVEL TIME			REMARKS
		Basin ID	Area (Ac)	Runoff Coeff.	t_c (min)	C*A (Ac)	I (in/hr)	Q (cfs)	tc (min)	C*A (ac)	I (in/hr)	Q (cfs)	$Q_{street/swale}$ (cfs)	C*A (ac)	Slope (%)	Q_{pipe} (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t_t (min)	
	1a	A1	3.51	0.54	12.8	1.89	3.76	7.1					0.00	0	2.84					335	3.4	1.7	On-grade Type R Inlet, Bypass to DP 3a
	3a	A3	4.58	0.52	13.4	2.36	3.69	8.7	14.5	2.36	3.58	8.4	0.20	0.06	2.8					110	3.3	0.5	On-grade Type R Inlet, Bypass to DP 5a
	5a	A5	5.46	0.50	10.9	2.71	3.99	10.8	14.5	2.77	3.58	9.9											Street Flow
	7a	A7	1.87	0.18	16.6	0.34	3.37	1.1	16.6	3.11	3.37	10.5											Flow Confluences at sump inlet
	2a	A2	3.18	0.54	13.5	1.73	3.68	6.4					0.00	0	2.84					335	3.4	1.7	On-grade Type R Inlet, Bypass to DP 4a
	4a	A4	3.82	0.53	14.0	2.01	3.62	7.3	15.2	2.01	3.50	7.0	3.60	1.03	2.8					110	3.3	0.5	On-grade Type R Inlet, Bypass to DP 6a
	6a	A6	3.91	0.51	12.6	2.01	3.78	7.6	15.2	3.04	3.50	10.6											Street Flow
	8a	A8	0.42	0.58	5.0	0.24	5.17	1.2	15.7	3.28	3.45	11.3											Flow Confluences at sump inlet
	9A	A9	2.97	0.21	13.3	0.61	3.70	2.3	16.6	6.38	3.37	21.5											Flows into Pond A. All of Pond A.
	1.1b	B1.1	2.71	0.51	12.4	1.38	3.81	5.3					0.00	0	2.6					210	3.2	1.1	On-grade Type R Inlet, Bypass to DP 2B
	1.2b	B1.2	1.87	0.51	12.9	0.96	3.74	3.6					0.00	0	2.6					235	3.2	1.2	On-grade Type R Inlet, Bypass to DP 2B
	1.3b	B1.3	0.43	0.45	8.2	0.19	4.42	0.8															Street flow
	2b	B2	0.83	0.58	5.0	0.48	5.17	2.5	14.1	0.67	3.61	2.42											Street flow
	3b	B3	0.26	0.90	5.0	0.23	5.17	1.2															Street flow
	4b	B4	3.98	0.41	9.5	1.62	4.21	6.8					0.1	0.02	2.5					340	3.2	1.8	Type R Inlet, Bypass to DP 6B
	6b	B6	3.60	0.57	6.5	2.05	4.79	9.8	14.1	2.97	3.61	10.73											Recives by-pass flows from Basins (B1.1, B1.2 and B4), Direct Runoff from B1.3,B2,B3, and B6
	9b	B9	3.79	0.50	13.2	1.88	3.71	7.0	14.1	3.47	3.61	12.52											Sump inlet Recives by-pass flows from (B1.1, B1.2 and B4) Direct Runoff from B1.3,B2,B3, B6 and B9
	5b	B5	1.75	0.56	7.7	0.98	4.51	4.4															Street flow
	7b	B7	1.13	0.59	8.7	0.66	4.34	2.9	8.7	1.64	4.34	7.1	0.1	0.06	1.6					340	2.5	2.2	On-grade Type R Inlet, Bypass to DP 8B
	8b	B8	1.76	0.56	9.2	0.99	4.25	4.2	10.9	1.05	3.99	4.2											Street Flow, Recives bypass flow from DP 7B
	10b	B10	0.22	0.90	5.0	0.20	5.17	1.0	10.9	1.25	3.99	5.0											Sump inlet revices by-pass flow from 7b and runoff from 5b,8b, and 10b

STANDARD FORM SF-3

STORM DRAINAGE SYSTEM DESIGN

(RATIONAL METHOD PROCEDURE)

Subdivision: Homestead Fil. 3
Location: El Paso County
Design Storm: 5-Year

Project Name: Homestead North
Project No.: 25188.00
Calculated By: ARJ
Checked By:
Date: 6/25/20

STREET	Design Point	DIRECT RUNOFF							TOTAL RUNOFF				STREET/SWALE			PIPE				TRAVEL TIME			REMARKS
		Basin ID	Area (Ac)	Runoff Coeff.	t_c (min)	C*A (Ac)	I (in/hr)	Q (cfs)	tc (min)	C*A (ac)	I (in/hr)	Q (cfs)	$Q_{street/swale}$ (cfs)	C*A (ac)	Slope (%)	Q_{pipe} (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t_t (min)	
	11b	B11	1.75	0.08	17.3	0.14	3.30	0.5	14.1	4.86	3.61	17.5											Flow confluences into Pond B. All of Basin B
	1c	C1	2.82	0.52	13.0	1.47	3.73	5.5															
	2.3c	C2.3	0.83	0.57	9.8	0.47	4.16	2.0	13.0	1.94	3.73	7.2	0.1	0.03	1.6					185	2.5	1.2	On-Grade Type R Inlet, Street runoff from basin C1 and basin C2.3
	2.1C	C2.1	0.20	0.81	5.0	0.16	5.17	0.8					0.0	0	2.83					630	3.4	3.1	On-Grade Type R Inlet
	2.2C	C2.2	4.69	0.56	12.8	2.64	3.76	9.9	13.0	2.64	3.73	9.8											Runoff from basins 1c, 2.3c, 2.1c and 2.2c
	4.2c	C4.2	2.58	0.50	16.7	1.30	3.36	4.4					0.00	0	2.84					1010	3.4	5.0	On-Grade Type R Inlet, by pass to 4.2c
	4C	C4.1	5.81	0.52	12.7	3.04	3.77	11.5	21.7	5.68	2.97	16.9											Sump Inlet
	3.1c	C3.1	0.35	0.75	5.0	0.26	5.17	1.3					0.00	0	2.84					200	3.4	1.0	On-Grade Type R inlet, By pass flow to DP 3.2c
	3.2c	C3.2	1.46	0.56	8.4	0.81	4.39	3.6	8.4	0.81	4.39	3.6											Recives by-pass flow from DP 3.1c
	5C	C5	0.16	0.90	5.0	0.14	5.17	0.7	8.4	0.95	4.39	4.2											Sump Inlet
	6C	C6	2.43	0.13	5.0	0.31	5.17	1.6	21.7	6.94	2.97	20.6											Conluenced flow for Pond C

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

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

Subdivision: Homestead Fil. 3
Location: El Paso County
Design Storm: 100-Year

Project Name: Homestead North
Project No.: 25188.00
Calculated By: ARJ
Checked By:
Date: 6/25/20

Description	Design Point	DIRECT RUNOFF							TOTAL RUNOFF				STREET/SWALE			PIPE				TRAVEL TIME			REMARKS
		Basin ID	Area (ac)	Runoff Coeff.	t_c (min)	C*A (ac)	I (in/hr)	Q (cfs)	t_c (min)	C*A (ac)	I (in/hr)	Q (cfs)	$Q_{street/swale}$ (cfs)	C*A (ac)	Slope (%)	Q_{pipe} (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t_t (min)	
	1a	A1	3.51	0.67	12.8	2.34	6.31	14.8					2.80	0.44	2.84					335	3.4	1.7	On-grade Type R Inlet, Bypass to DP 3a
	3a	A3	4.58	0.65	13.4	2.96	6.19	18.3	14.5	3.40	6.00	20.4	6.10	1.02	2.8					110	3.3	0.5	On-grade Type R Inlet, Bypass to DP 5a
	5a	A5	5.46	0.63	10.9	3.44	6.71	23.1	14.5	4.46	6.00	26.7											Street Flow
	7a	A7	1.87	0.43	16.6	0.80	5.65	4.5	16.6	5.26	5.65	29.7											Flow Confluences at sump inlet
	2a	A2	3.18	0.67	13.5	2.13	6.17	13.2					1.60	0.26	2.84					335	3.4	1.7	On-grade Type R Inlet, Bypass to DP 4a
	4a	A4	3.82	0.66	14.0	2.50	6.08	15.2	15.2	2.76	5.88	16.2	3.60	0.61	2.8					110	3.3	0.5	On-grade Type R Inlet, Bypass to DP 6a
	6a	A6	3.91	0.64	12.6	2.52	6.35	16.0	15.2	3.13	5.88	18.4											Street Flow
	8a	A8	0.42	0.72	5.0	0.30	8.68	2.6	15.7	3.43	5.79	19.9											Flow Confluences at sump inlet
	9A	A9	2.97	0.43	13.3	1.28	6.21	7.9	16.6	8.69	5.65	49.1											Flows into Pond A. All of Pond A.
	1.1b	B1.1	2.71	0.64	12.4	1.74	6.40	11.1					1.50	0.23	2.6					210	3.2	1.1	On-grade Type R Inlet, Bypass to DP 2B
	1.2b	B1.2	1.87	0.65	12.9	1.21	6.29	7.6					0.20	0.03	2.6					235	3.2	1.2	On-grade Type R Inlet, Bypass to DP 2B
	1.3b	B1.3	0.43	0.62	8.2	0.27	7.43	2.0															Street flow
	2b	B2	0.83	0.71	5.0	0.59	8.68	5.1	14.1	1.13	6.06	6.82											Street flow, Recives bypass flow from 1.1b,1.2b and direct runoff from basin 1.3b
	3b	B3	0.26	0.96	5.0	0.25	8.68	2.2															Street flow
	4b	B4	3.98	0.57	9.5	2.27	7.06	16.0					4.1	0.58	2.5					340	3.2	1.8	Type R Inlet, Bypass to DP 6B
	6b	B6	3.60	0.70	6.5	2.51	8.04	20.2	14.1	4.47	6.06	27.1											Recives by-pass flows from Basins (B1.1, B1.2 and B4), Direct Runoff from B1.3,B2,B3, and B6
	9b	B9	3.79	0.64	13.2	2.41	6.23	15.0	14.1	5.10	6.06	30.9											Sump inlet Recives by-pass flows from (B1.1, B1.2 and B4) Direct Runoff from B1.3,B2,B3, B6 and B9
	5b	B5	1.75	0.68	7.7	1.19	7.58	9.0															Street flow

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

Subdivision: Homestead Fil. 3
Location: El Paso County
Design Storm: 100-Year

Project Name: Homestead North
Project No.: 25188.00
Calculated By: ARJ
Checked By:
Date: 6/25/20

Description	Design Point	DIRECT RUNOFF							TOTAL RUNOFF				STREET/SWALE			PIPE				TRAVEL TIME			REMARKS
		Basin ID	Area (ac)	Runoff Coeff.	t_c (min)	C*A (ac)	I (in/hr)	Q (cfs)	t_c (min)	C*A (ac)	I (in/hr)	Q (cfs)	$Q_{street/swale}$ (cfs)	C*A (ac)	Slope (%)	Q_{pipe} (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t_t (min)	
	7b	B7	1.13	0.71	8.7	0.80	7.28	5.8	8.7	1.99	7.28	14.5	3.2	0.44	1.6					340	2.5	2.2	On-grade Type R Inlet, Bypass to DP 8B
	8b	B8	1.76	0.69	9.2	1.21	7.13	8.6	10.9	1.65	6.71	11.1											Street Flow, Recives bypass flow from DP 7B
	10b	B10	0.22	0.96	5.0	0.21	8.68	1.8	10.9	1.86	6.71	12.5											Sump inlet revices by-pass flow from 7b and runoff from 5b,8b, and 10b
	11b	B11	1.75	0.35	17.3	0.61	5.55	3.4	14.1	7.57	6.06	45.9											Flow confluences into Pond B. All of Basin B
	1c	C1	2.82	0.65	13.0	1.83	6.26	11.5															
	2.3c	C2.3	0.83	0.69	9.8	0.58	6.99	4.1	13.0	2.41	6.26	15.1	3.6	0.57	1.6					185	2.5	1.2	On-Grade Type R Inlet, Street runoff from basin C1 and basin C2.3
	2.1C	C2.1	0.20	0.89	5.0	0.18	8.68	1.6					0.1	0.01	2.83					630	3.4	3.1	On-Grade Type R Inlet
	2.2C	C2.2	4.69	0.68	12.8	3.21	6.32	20.3	13.0	3.22	6.26	20.2											Runoff from basins 1c, 2.3c, 2.1c and 2.2c
	4.2c	C4.2	2.58	0.64	16.7	1.64	5.65	9.3					0.70	0.12	2.84					1010	3.4	5.0	On-Grade Type R Inlet, by pass to 4.2c
	4C	C4.1	5.81	0.65	12.7	3.78	6.33	23.9	21.7	7.13	4.99	35.5											Sump Inlet
	3.1c	C3.1	0.35	0.85	5.0	0.30	8.68	2.6					0.60	0.07	2.84					200	3.4	1.0	On-Grade Type R inlet, By pass flow to DP 3.2c
	3.2c	C3.2	1.46	0.68	8.4	1.00	7.37	7.4	8.4	1.07	7.37	7.9											Recives by-pass flow from DP 3.1c
	5C	C5	0.16	0.96	5.0	0.15	8.68	1.3	8.4	1.22	7.37	9.0											Sump Inlet
	6C	C6	2.43	0.38	5.0	0.93	8.68	8.1	21.7	9.27	4.99	46.2											Conluenced flow for Pond C

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

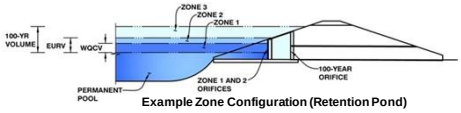
Appendix C
Hydraulic Calculations

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.03 (May 2020)

Project: Homestead North at Sterling Ranch

Basin ID: Pond A



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	29.72	acres
Watershed Length =	1,963	ft
Watershed Length to Centroid =	1,178	ft
Watershed Slope =	0.030	ft/ft
Watershed Imperviousness =	47.60%	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) =	0.495 acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	1.506 acre-feet		acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	1.441 acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	2.078 acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	2.640 acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	3.407 acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	4.023 acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	4.809 acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 4 in.) =	8.642 acre-feet	4.00	inches
Approximate 2-yr Detention Volume =	1.131 acre-feet		
Approximate 5-yr Detention Volume =	1.556 acre-feet		
Approximate 10-yr Detention Volume =	2.078 acre-feet		
Approximate 25-yr Detention Volume =	2.284 acre-feet		
Approximate 50-yr Detention Volume =	2.390 acre-feet		
Approximate 100-yr Detention Volume =	2.683 acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.495	acre-feet
Zone 2 Volume (EURV - Zone 1) =	1.012	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	1.177	acre-feet
Total Detention Basin Volume =	2.683	acre-feet
Initial Surcharge Volume (ISV) =	65	ft^3
Initial Surcharge Depth (ISD) =	0.50	ft
Total Available Detention Depth (H_{total}) =	5.00	ft
Depth of Trickle Channel (H_{TC}) =	0.50	ft
Slope of Trickle Channel (S_{TC}) =	0.005	ft/ft
Slopes of Main Basin Sides (S_{main}) =	4	H:V
Basin Length-to-Width Ratio (R_{LW}) =	2	
Initial Surcharge Area (A_{ISV}) =	129	ft^2
Surcharge Volume Length (L_{ISV}) =	11.4	ft
Surcharge Volume Width (W_{ISV}) =	11.4	ft
Depth of Basin Floor (H_{FLOOR}) =	1.17	ft
Length of Basin Floor (L_{FLOOR}) =	250.1	ft
Width of Basin Floor (W_{FLOOR}) =	128.4	ft
Area of Basin Floor (A_{FLOOR}) =	32,100	ft^2
Volume of Basin Floor (V_{FLOOR}) =	13,364	ft^3
Depth of Main Basin (H_{MAIN}) =	2.83	ft
Length of Main Basin (L_{MAIN}) =	272.7	ft
Width of Main Basin (W_{MAIN}) =	151.0	ft
Area of Main Basin (A_{MAIN}) =	41,180	ft^2
Volume of Main Basin (V_{MAIN}) =	103,424	ft^3
Calculated Total Basin Volume (V_{total}) =	2.684	acre-feet

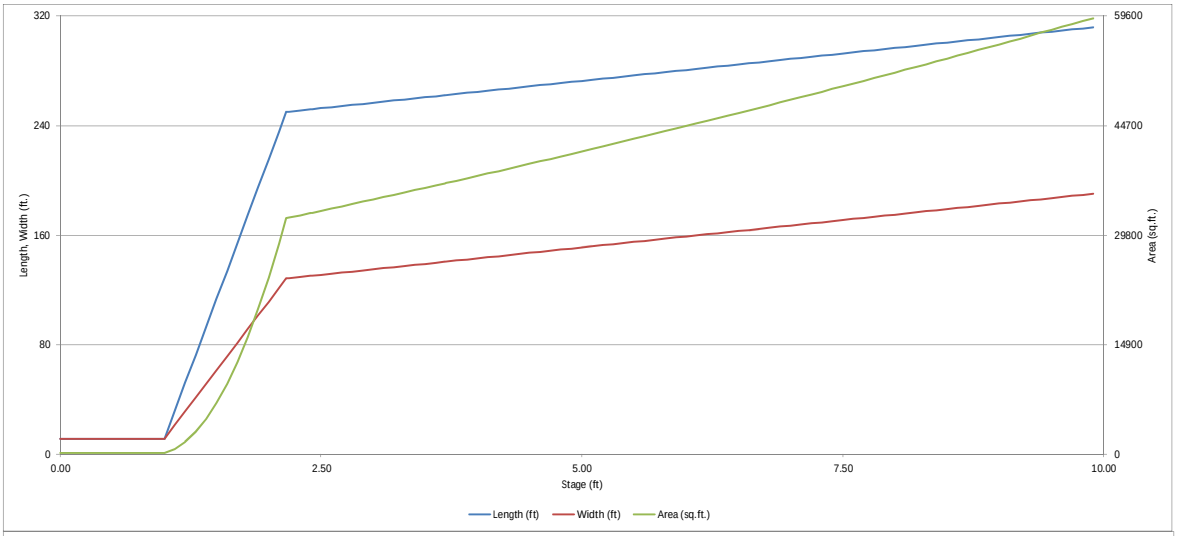
Depth Increment = 0.10 ft

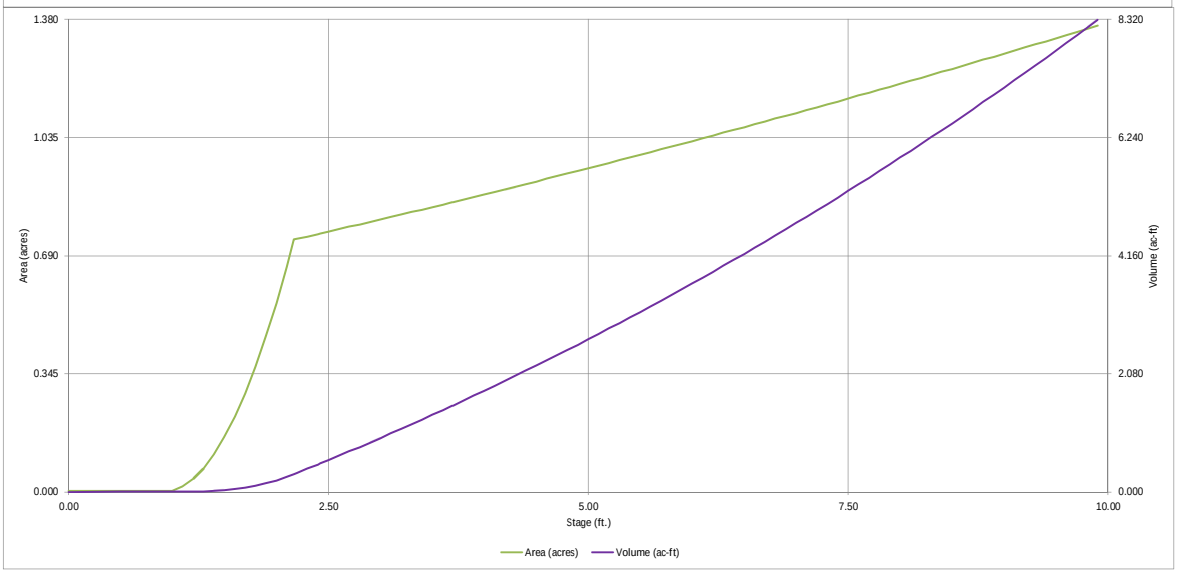
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	0.00		11.4	11.4	129		0.003		
ISV	0.50		11.4	11.4	129		0.003	65	0.001
	0.60		11.4	11.4	129		0.003	78	0.002
	0.70		11.4	11.4	129		0.003	91	0.002
	0.80		11.4	11.4	129		0.003	103	0.002
	0.90		11.4	11.4	129		0.003	116	0.003
	1.00		11.4	11.4	129		0.003	129	0.003
	1.10		31.8	21.4	679		0.016	166	0.004
	1.20		52.2	31.4	1,637		0.038	279	0.006
	1.30		72.6	41.4	3,002		0.069	507	0.012
	1.40		93.0	51.4	4,776		0.110	893	0.020
	1.50		113.4	61.4	6,958		0.160	1,476	0.034
	1.60		133.8	71.4	9,548		0.219	2,298	0.053
	1.70		154.2	81.4	12,545		0.288	3,399	0.078
	1.80		174.6	91.4	15,951		0.366	4,821	0.111
	1.90		195.0	101.4	19,765		0.454	6,603	0.152
	2.00		215.4	111.4	23,987		0.551	8,787	0.202
	2.10		235.8	121.4	28,616		0.657	11,414	0.262
Floor	2.17		250.1	128.4	32,100		0.737	13,538	0.311
	2.20		250.3	128.6	32,191		0.739	14,502	0.333
	2.30		251.1	129.4	32,494		0.746	17,736	0.407
	2.40		251.9	130.2	32,799		0.753	21,001	0.482
Zone 1 (WQCV)	2.42		252.1	130.4	32,861		0.754	21,658	0.497
	2.50		252.7	131.0	33,106		0.760	24,296	0.558
	2.60		253.5	131.8	33,413		0.767	27,622	0.634
	2.70		254.3	132.6	33,722		0.774	30,979	0.711
	2.80		255.1	133.4	34,032		0.781	34,367	0.789
	2.90		255.9	134.2	34,344		0.788	37,786	0.867
	3.00		256.7	135.0	34,657		0.796	41,236	0.947
	3.10		257.5	135.8	34,971		0.803	44,717	1.027
	3.20		258.3	136.6	35,286		0.810	48,230	1.107
	3.30		259.1	137.4	35,602		0.817	51,774	1.189
	3.40		259.9	138.2	35,920		0.825	55,350	1.271
	3.50		260.7	139.0	36,239		0.832	58,958	1.353
	3.60		261.5	139.8	36,560		0.839	62,598	1.437
Zone 2 (EURV)	3.69		262.2	140.5	36,849		0.846	65,902	1.513
	3.70		262.3	140.6	36,882		0.847	66,270	1.521
	3.80		263.1	141.4	37,204		0.854	69,975	1.606
	3.90		263.9	142.2	37,529		0.862	73,711	1.692
	4.00		264.7	143.0	37,854		0.869	77,480	1.779
	4.10		265.5	143.8	38,181		0.877	81,282	1.866
	4.20		266.3	144.6	38,509		0.884	85,117	1.954
	4.30		267.1	145.4	38,839		0.892	88,984	2.043
	4.40		267.9	146.2	39,169		0.899	92,884	2.132
	4.50		268.7	147.0	39,501		0.907	96,818	2.223
	4.60		269.5	147.8	39,834		0.914	100,785	2.314
	4.70		270.3	148.6	40,169		0.922	104,785	2.406
	4.80		271.1	149.4	40,505		0.930	108,819	2.498
	4.90		271.9	150.2	40,842		0.938	112,886	2.592
Zone 3 (100-year)	5.00		272.7	151.0	41,180		0.945	116,987	2.686
	5.10		273.5	151.8	41,520		0.953	121,122	2.781
	5.20		274.3	152.6	41,860		0.961	125,291	2.876
	5.30		275.1	153.4	42,203		0.969	129,494	2.973
	5.40		275.9	154.2	42,546		0.977	133,731	3.070
	5.50		276.7	155.0	42,891		0.985	138,003	3.168
	5.60		277.5	155.8	43,237		0.993	142,310	3.267
	5.70		278.3	156.6	43,584		1.001	146,651	3.367
	5.80		279.1	157.4	43,933		1.009	151,026	3.467
	5.90		279.9	158.2	44,282		1.017	155,437	3.568
	6.00		280.7	159.0	44,634		1.025	159,883	3.670
	6.10		281.5	159.8	44,986		1.033	164,364	3.773
	6.20		282.3	160.6	45,340		1.041	168,880	3.877
	6.30		283.1	161.4	45,695		1.049	173,432	3.981
	6.40		283.9	162.2	46,051		1.057	178,019	4.087
	6.50		284.7	163.0	46,408		1.065	182,642	4.193
	6.60		285.5	163.8	46,767		1.074	187,301	4.300
	6.70		286.3	164.6	47,127		1.082	191,996	4.408
	6.80		287.1	165.4	47,489		1.090	196,726	4.516
	6.90		287.9	166.2	47,851		1.099	201,493	4.626
	7.00		288.7	167.0	48,215		1.107	206,297	4.736
	7.10		289.5	167.8	48,580		1.115	211,136	4.847
	7.20		290.3	168.6	48,947		1.124	216,013	4.959
	7.30		291.1	169.4	49,315		1.132	220,926	5.072
	7.40		291.9	170.2	49,684		1.141	225,876	5.185
	7.50		292.7	171.0	50,054		1.149	230,863	5.300
	7.60		293.5	171.8	50,426		1.158	235,887	5.415
	7.70		294.3	172.6	50,798		1.166	240,948	5.531
	7.80		295.1	173.4	51,173		1.175	246,046	5.648
	7.90		295.9	174.2	51,548		1.183	251,182	5.766
	8.00		296.7	175.0	51,925		1.192	256,356	5.885
	8.10		297.5	175.8	52,303		1.201	261,567	6.005
	8.20		298.3	176.6	52,682		1.209	266,817	6.125
	8.30		299.1	177.4	53,063		1.218	272,104	6.247
	8.40		299.9	178.2	53,445		1.227	277,429	6.369
	8.50		300.7	179.0	53,828		1.236	282,793	6.492
	8.60		301.5	179.8	54,212		1.245	288,195	6.616
	8.70		302.3	180.6	54,598		1.253	293,635	6.741
	8.80		303.1	181.4	54,985		1.262	299,114	6.867
	8.90		303.9	182.2	55,373		1.271	304,632	6.993
	9.00		304.7	183.0	55,762		1.280	310,189	7.121
	9.10		305.5	183.8	56,153		1.289	315,785	7.249
	9.20		306.3	184.6	56,545		1.298	321,420	7.379
	9.30		307.1	185.4	56,939		1.307	327,094	7.509
	9.40		307.9	186.2	57,333		1.316	332,807	7.640
	9.50		308.7	187.0	57,729		1.325	338,561	7.772
	9.60		309.5	187.8	58,126		1.334	344,353	7.905
	9.70		310.3	188.6	58,525		1.344	350,186	8.039
	9.80		311.1	189.4	58,925		1.353	356,058	8.174
	9.90		311.9	190.2	59,326		1.362	361,971	8.310

Provide the FSD summary tables

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.03 (May 2020)



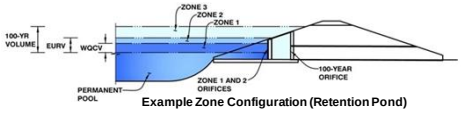


DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.03 (May 2020)

Project: Homestead North at Sterling Ranch

Basin ID: Pond B



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	24.08	acres
Watershed Length =	1,290	ft
Watershed Length to Centroid =	775	ft
Watershed Slope =	0.020	ft/ft
Watershed Imperviousness =	52.20%	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 =	Denver - Capitol Building	

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

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	0.426	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	1.348	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	1.265	acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	1.793	acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	2.255	acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	2.868	acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	3.368	acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	4.000	acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 4 in.) =	7.103	acre-feet	4.00	inches
Approximate 2-yr Detention Volume =	1.022	acre-feet		
Approximate 5-yr Detention Volume =	1.396	acre-feet		
Approximate 10-yr Detention Volume =	1.836	acre-feet		
Approximate 25-yr Detention Volume =	2.004	acre-feet		
Approximate 50-yr Detention Volume =	2.093	acre-feet		
Approximate 100-yr Detention Volume =	2.324	acre-feet		

Define Zones and Basin Geometry

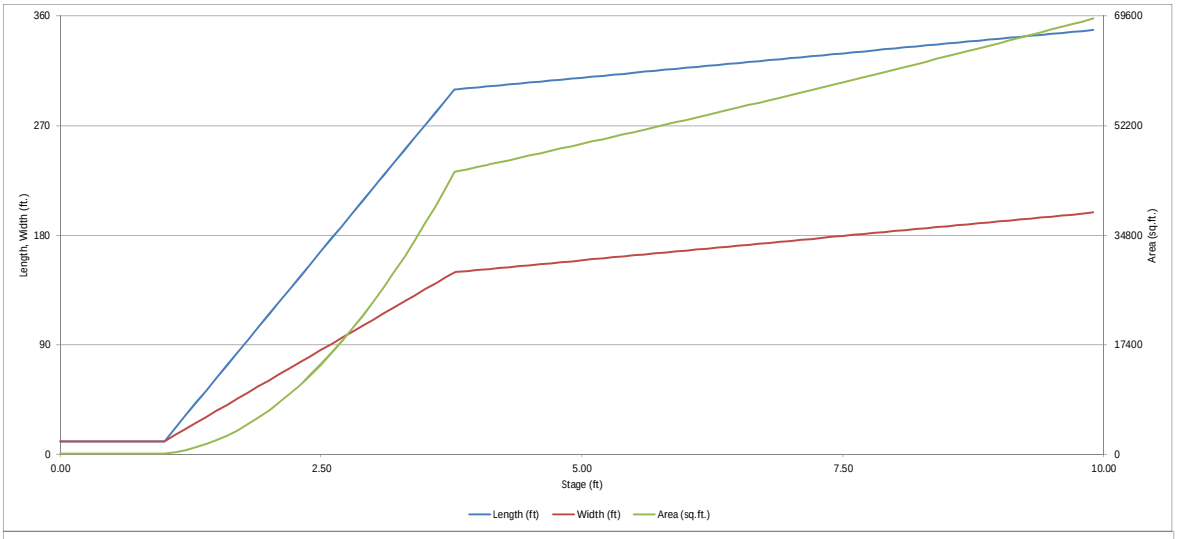
Zone 1 Volume (WQCV) =	0.426	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.922	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.976	acre-feet
Total Detention Basin Volume =	2.324	acre-feet
Initial Surcharge Volume (ISV) =	56	ft^3
Initial Surcharge Depth (ISD) =	0.50	ft
Total Available Detention Depth (H_{total}) =	5.00	ft
Depth of Trickle Channel (H_{TC}) =	0.50	ft
Slope of Trickle Channel (S_{TC}) =	0.010	ft/ft
Slopes of Main Basin Sides (S_{main}) =	4	H:V
Basin Length-to-Width Ratio (R_{LW}) =	2	
Initial Surcharge Area (A_{ISV}) =	111	ft^2
Surcharge Volume Length (L_{ISV}) =	10.6	ft
Surcharge Volume Width (W_{ISV}) =	10.6	ft
Depth of Basin Floor (H_{FLOOR}) =	2.78	ft
Length of Basin Floor (L_{FLOOR}) =	299.7	ft
Width of Basin Floor (W_{FLOOR}) =	149.6	ft
Area of Basin Floor (A_{FLOOR}) =	44,817	ft^2
Volume of Basin Floor (V_{FLOOR}) =	43,704	ft^3
Depth of Main Basin (H_{MAIN}) =	1.22	ft
Length of Main Basin (L_{MAIN}) =	309.4	ft
Width of Main Basin (W_{MAIN}) =	159.3	ft
Area of Main Basin (A_{MAIN}) =	49,297	ft^2
Volume of Main Basin (V_{MAIN}) =	57,388	ft^3
Calculated Total Basin Volume (V_{total}) =	2.323	acre-feet

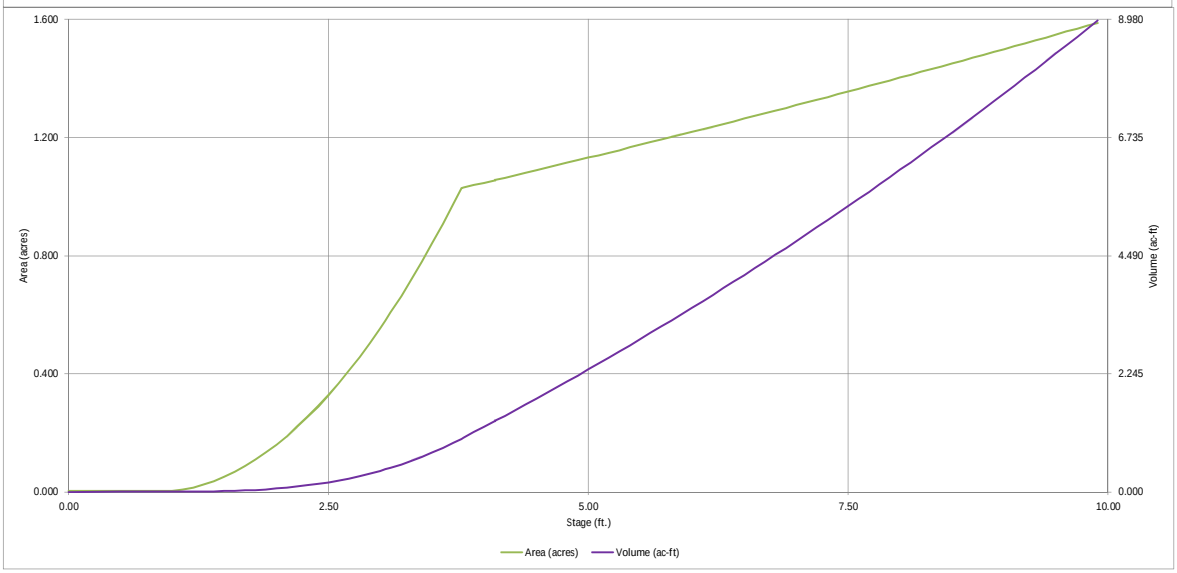
Depth Increment = 0.10 ft

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		10.6	10.6	111		0.003		
ISV	0.50		10.6	10.6	111		0.003	56	0.001
	0.60		10.6	10.6	111		0.003	67	0.002
	0.70		10.6	10.6	111		0.003	78	0.002
	0.80		10.6	10.6	111		0.003	89	0.002
	0.90		10.6	10.6	111		0.003	100	0.002
	1.00		10.6	10.6	111		0.003	111	0.003
	1.10		21.0	15.6	326		0.007	132	0.003
	1.20		31.4	20.6	644		0.015	180	0.004
	1.30		41.8	25.6	1,067		0.024	265	0.006
	1.40		52.2	30.6	1,593		0.037	397	0.009
	1.50		62.6	35.6	2,224		0.051	587	0.013
	1.60		73.0	40.6	2,958		0.068	845	0.019
	1.70		83.4	45.6	3,797		0.087	1,182	0.027
	1.80		93.8	50.6	4,739		0.109	1,608	0.037
	1.90		104.2	55.6	5,786		0.133	2,133	0.049
	2.00		114.6	60.6	6,937		0.159	2,769	0.064
	2.10		125.0	65.6	8,191		0.188	3,524	0.081
	2.20		135.4	70.6	9,550		0.219	4,410	0.101
	2.30		145.8	75.6	11,012		0.253	5,438	0.125
	2.40		156.2	80.6	12,579		0.289	6,616	0.152
	2.50		166.6	85.6	14,249		0.327	7,957	0.183
	2.60		177.0	90.6	16,024		0.368	9,469	0.217
	2.70		187.4	95.6	17,902		0.411	11,165	0.256
	2.80		197.8	100.6	19,885		0.456	13,053	0.300
	2.90		208.2	105.6	21,971		0.504	15,145	0.348
	3.00		218.6	110.6	24,162		0.555	17,451	0.401
Zone 1 (WQCV)	3.05		223.8	113.1	25,296		0.581	18,687	0.429
	3.10		229.0	115.6	26,456		0.607	19,981	0.459
	3.20		239.4	120.6	28,855		0.662	22,746	0.522
	3.30		249.8	125.6	31,357		0.720	25,755	0.591
	3.40		260.2	130.6	33,964		0.780	29,021	0.666
	3.50		270.6	135.6	36,674		0.842	32,552	0.747
	3.60		281.0	140.6	39,489		0.907	36,359	0.835
	3.70		291.4	145.6	42,407		0.974	40,453	0.929
Floor	3.78		299.7	149.6	44,817		1.029	43,941	1.009
	3.80		299.8	149.7	44,889		1.031	44,838	1.029
	3.90		300.6	150.5	45,249		1.039	49,345	1.133
	4.00		301.4	151.3	45,611		1.047	53,888	1.237
	4.10		302.2	152.1	45,974		1.055	58,468	1.342
Zone 2 (EURV)	4.11		302.3	152.2	46,010		1.056	58,927	1.353
	4.20		303.0	152.9	46,338		1.064	63,083	1.448
	4.30		303.8	153.7	46,703		1.072	67,735	1.555
	4.40		304.6	154.5	47,070		1.081	72,424	1.663
	4.50		305.4	155.3	47,438		1.089	77,149	1.771
	4.60		306.2	156.1	47,807		1.097	81,911	1.880
	4.70		307.0	156.9	48,177		1.106	86,711	1.991
	4.80		307.8	157.7	48,549		1.115	91,547	2.102
	4.90		308.6	158.5	48,922		1.123	96,420	2.214
Zone 3 (100-year)	5.00		309.4	159.3	49,297		1.132	101,331	2.326
	5.10		310.2	160.1	49,672		1.140	106,280	2.440
	5.20		311.0	160.9	50,049		1.149	111,266	2.554
	5.30		311.8	161.7	50,427		1.158	116,290	2.670
	5.40		312.6	162.5	50,807		1.166	121,351	2.786
	5.50		313.4	163.3	51,188		1.175	126,451	2.903
	5.60		314.2	164.1	51,570		1.184	131,589	3.021
	5.70		315.0	164.9	51,953		1.193	136,765	3.140
	5.80		315.8	165.7	52,338		1.202	141,980	3.259
	5.90		316.6	166.5	52,723		1.210	147,233	3.380
	6.00		317.4	167.3	53,111		1.219	152,524	3.501
	6.10		318.2	168.1	53,499		1.228	157,855	3.624
	6.20		319.0	168.9	53,889		1.237	163,224	3.747
	6.30		319.8	169.7	54,280		1.246	168,633	3.871
	6.40		320.6	170.5	54,672		1.255	174,080	3.996
	6.50		321.4	171.3	55,066		1.264	179,567	4.122
	6.60		322.2	172.1	55,460		1.273	185,093	4.249
	6.70		323.0	172.9	55,857		1.282	190,659	4.377
	6.80		323.8	173.7	56,254		1.291	196,265	4.506
	6.90		324.6	174.5	56,653		1.301	201,910	4.635
	7.00		325.4	175.3	57,053		1.310	207,595	4.766
	7.10		326.2	176.1	57,454		1.319	213,321	4.897
	7.20		327.0	176.9	57,856		1.328	219,086	5.030
	7.30		327.8	177.7	58,260		1.337	224,892	5.163
	7.40		328.6	178.5	58,665		1.347	230,738	5.297
	7.50		329.4	179.3	59,072		1.356	236,625	5.432
	7.60		330.2	180.1	59,479		1.365	242,553	5.568
	7.70		331.0	180.9	59,888		1.375	248,521	5.705
	7.80		331.8	181.7	60,298		1.384	254,530	5.843
	7.90		332.6	182.5	60,710		1.394	260,581	5.982
	8.00		333.4	183.3	61,123		1.403	266,672	6.122
	8.10		334.2	184.1	61,537		1.413	272,805	6.263
	8.20		335.0	184.9	61,952		1.422	278,980	6.404
	8.30		335.8	185.7	62,369		1.432	285,196	6.547
	8.40		336.6	186.5	62,786		1.441	291,453	6.691
	8.50		337.4	187.3	63,206		1.451	297,753	6.835
	8.60		338.2	188.1	63,626		1.461	304,094	6.981
	8.70		339.0	188.9	64,048		1.470	310,478	7.128
	8.80		339.8	189.7	64,471		1.480	316,904	7.275
	8.90		340.6	190.5	64,895		1.490	323,372	7.424
	9.00		341.4	191.3	65,321		1.500	329,883	7.573
	9.10		342.2	192.1	65,747		1.509	336,436	7.724
	9.20		343.0	192.9	66,175		1.519	343,033	7.875
	9.30		343.8	193.7	66,605		1.529	349,672	8.027
	9.40		344.6	194.5	67,036		1.539	356,354	8.181
	9.50		345.4	195.3	67,468		1.549	363,079	8.335
	9.60		346.2	196.1	67,901		1.559	369,847	8.491
	9.70		347.0	196.9	68,335		1.569	376,659	8.647
	9.80		347.8	197.7	68,771		1.579	383,514	8.804
	9.90		348.6	198.5	69,208		1.589	390,413	8.963

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.03 (May 2020)



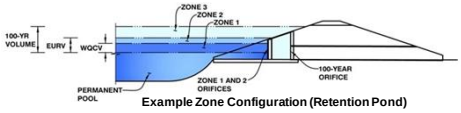


DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.03 (May 2020)

Project: Homestead North at Sterling Ranch

Basin ID: Pond C



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	21.33	acres
Watershed Length =	1,580	ft
Watershed Length to Centroid =	948	ft
Watershed Slope =	0.021	ft/ft
Watershed Imperviousness =	64.50%	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) =	0.448 acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	1.501 acre-feet		acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	1.382 acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	1.886 acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	2.317 acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	2.844 acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	3.299 acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	3.851 acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 4 in.) =	6.639 acre-feet	4.00	inches
Approximate 2-yr Detention Volume =	1.163 acre-feet		
Approximate 5-yr Detention Volume =	1.560 acre-feet		
Approximate 10-yr Detention Volume =	1.991 acre-feet		
Approximate 25-yr Detention Volume =	2.146 acre-feet		
Approximate 50-yr Detention Volume =	2.234 acre-feet		
Approximate 100-yr Detention Volume =	2.418 acre-feet		

Define Zones and Basin Geometry

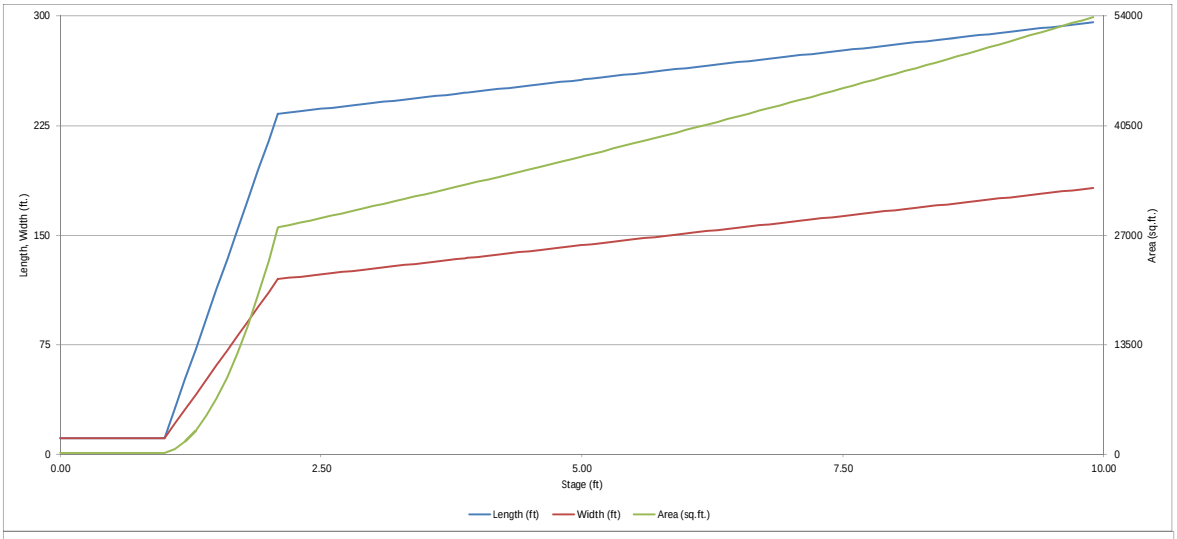
Zone 1 Volume (WQCV) =	0.448	acre-feet
Zone 2 Volume (EURV - Zone 1) =	1.053	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.917	acre-feet
Total Detention Basin Volume =	2.418	acre-feet
Initial Surcharge Volume (ISV) =	59	ft^3
Initial Surcharge Depth (ISD) =	0.50	ft
Total Available Detention Depth (H_{total}) =	5.00	ft
Depth of Trickle Channel (H_{TC}) =	0.50	ft
Slope of Trickle Channel (S_{TC}) =	0.005	ft/ft
Slopes of Main Basin Sides (S_{main}) =	4	H:V
Basin Length-to-Width Ratio (R_{LW}) =	2	
Initial Surcharge Area (A_{ISV}) =	117	ft^2
Surcharge Volume Length (L_{ISV}) =	10.8	ft
Surcharge Volume Width (W_{ISV}) =	10.8	ft
Depth of Basin Floor (H_{FLOOR}) =	1.09	ft
Length of Basin Floor (L_{FLOOR}) =	233.2	ft
Width of Basin Floor (W_{FLOOR}) =	119.8	ft
Area of Basin Floor (A_{FLOOR}) =	27,941	ft^2
Volume of Basin Floor (V_{FLOOR}) =	10,852	ft^3
Depth of Main Basin (H_{MAIN}) =	2.91	ft
Length of Main Basin (L_{MAIN}) =	256.5	ft
Width of Main Basin (W_{MAIN}) =	143.1	ft
Area of Main Basin (A_{MAIN}) =	36,701	ft^2
Volume of Main Basin (V_{MAIN}) =	93,766	ft^3
Calculated Total Basin Volume (V_{total}) =	2.404	acre-feet

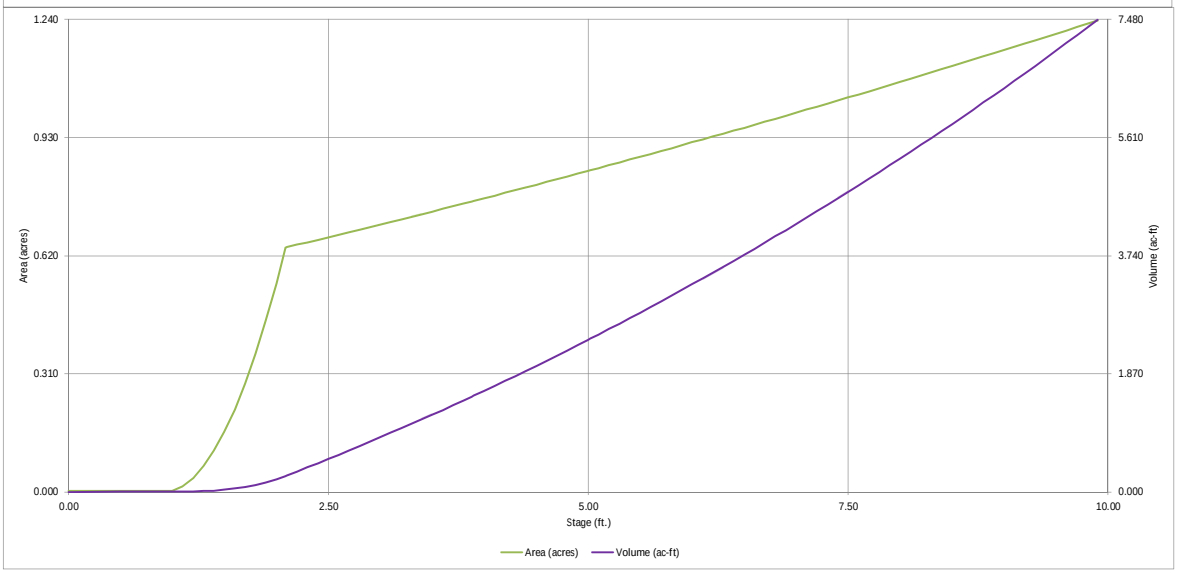
Depth Increment = 0.10 ft

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		10.8	10.8	117		0.003		
ISV	0.50		10.8	10.8	117		0.003	59	0.001
	0.60		10.8	10.8	117		0.003	70	0.002
	0.70		10.8	10.8	117		0.003	82	0.002
	0.80		10.8	10.8	117		0.003	94	0.002
	0.90		10.8	10.8	117		0.003	105	0.002
	1.00		10.8	10.8	117		0.003	117	0.003
	1.10		31.2	20.8	650		0.015	152	0.003
	1.20		51.6	30.8	1,591		0.037	261	0.006
	1.30		72.0	40.8	2,940		0.068	484	0.011
	1.40		92.4	50.8	4,697		0.108	862	0.020
	1.50		112.8	60.8	6,863		0.158	1,437	0.033
	1.60		133.2	70.8	9,436		0.217	2,249	0.052
	1.70		153.6	80.8	12,417		0.285	3,338	0.077
	1.80		174.0	90.8	15,806		0.363	4,746	0.109
	1.90		194.4	100.8	19,603		0.450	6,513	0.150
	2.00		214.8	110.8	23,808		0.547	8,680	0.199
Floor	2.09		233.2	119.8	27,941		0.641	11,006	0.253
	2.10		233.3	119.9	27,969		0.642	11,285	0.259
	2.20		234.1	120.7	28,253		0.649	14,097	0.324
	2.30		234.9	121.5	28,537		0.655	16,936	0.389
Zone 1 (WQCV)	2.40		235.7	122.3	28,823		0.662	19,804	0.455
	2.50		236.5	123.1	29,110		0.668	22,701	0.521
	2.60		237.3	123.9	29,398		0.675	25,626	0.588
	2.70		238.1	124.7	29,688		0.682	28,580	0.656
	2.80		238.9	125.5	29,979		0.688	31,564	0.725
	2.90		239.7	126.3	30,271		0.695	34,576	0.794
	3.00		240.5	127.1	30,564		0.702	37,618	0.864
	3.10		241.3	127.9	30,859		0.708	40,689	0.934
	3.20		242.1	128.7	31,155		0.715	43,790	1.005
	3.30		242.9	129.5	31,452		0.722	46,920	1.077
	3.40		243.7	130.3	31,751		0.729	50,080	1.150
	3.50		244.5	131.1	32,050		0.736	53,270	1.223
	3.60		245.3	131.9	32,352		0.743	56,490	1.297
	3.70		246.1	132.7	32,654		0.750	59,740	1.371
	3.80		246.9	133.5	32,958		0.757	63,021	1.447
Zone 2 (EURV)	3.88		247.5	134.1	33,201		0.762	65,667	1.508
	3.90		247.7	134.3	33,262		0.764	66,332	1.523
	4.00		248.5	135.1	33,569		0.771	69,674	1.599
	4.10		249.3	135.9	33,876		0.778	73,046	1.677
	4.20		250.1	136.7	34,185		0.785	76,449	1.755
	4.30		250.9	137.5	34,495		0.792	79,883	1.834
	4.40		251.7	138.3	34,806		0.799	83,348	1.913
	4.50		252.5	139.1	35,119		0.806	86,844	1.994
	4.60		253.3	139.9	35,433		0.813	90,372	2.075
	4.70		254.1	140.7	35,748		0.821	93,931	2.156
	4.80		254.9	141.5	36,065		0.828	97,521	2.239
	4.90		255.7	142.3	36,382		0.835	101,144	2.322
	5.00		256.5	143.1	36,701		0.843	104,798	2.406
Zone 3 (100-year)	5.02		256.6	143.3	36,765		0.844	105,533	2.423
	5.10		257.3	143.9	37,022		0.850	108,484	2.490
	5.20		258.1	144.7	37,343		0.857	112,202	2.576
	5.30		258.9	145.5	37,666		0.865	115,953	2.662
	5.40		259.7	146.3	37,990		0.872	119,735	2.749
	5.50		260.5	147.1	38,316		0.880	123,551	2.836
	5.60		261.3	147.9	38,642		0.887	127,399	2.925
	5.70		262.1	148.7	38,970		0.895	131,279	3.014
	5.80		262.9	149.5	39,299		0.902	135,193	3.104
	5.90		263.7	150.3	39,630		0.910	139,139	3.194
	6.00		264.5	151.1	39,962		0.917	143,119	3.286
	6.10		265.3	151.9	40,295		0.925	147,132	3.378
	6.20		266.1	152.7	40,629		0.933	151,178	3.471
	6.30		266.9	153.5	40,965		0.940	155,257	3.564
	6.40		267.7	154.3	41,302		0.948	159,371	3.659
	6.50		268.5	155.1	41,640		0.956	163,518	3.754
	6.60		269.3	155.9	41,980		0.964	167,699	3.850
	6.70		270.1	156.7	42,320		0.972	171,914	3.947
	6.80		270.9	157.5	42,662		0.979	176,163	4.044
	6.90		271.7	158.3	43,006		0.987	180,446	4.142
	7.00		272.5	159.1	43,350		0.995	184,764	4.242
	7.10		273.3	159.9	43,696		1.003	189,116	4.342
	7.20		274.1	160.7	44,043		1.011	193,503	4.442
	7.30		274.9	161.5	44,392		1.019	197,925	4.544
	7.40		275.7	162.3	44,742		1.027	202,382	4.646
	7.50		276.5	163.1	45,093		1.035	206,874	4.749
	7.60		277.3	163.9	45,445		1.043	211,400	4.853
	7.70		278.1	164.7	45,799		1.051	215,963	4.958
	7.80		278.9	165.5	46,153		1.060	220,560	5.063
	7.90		279.7	166.3	46,509		1.068	225,193	5.170
	8.00		280.5	167.1	46,867		1.076	229,862	5.277
	8.10		281.3	167.9	47,226		1.084	234,567	5.385
	8.20		282.1	168.7	47,586		1.092	239,307	5.494
	8.30		282.9	169.5	47,947		1.101	244,084	5.603
	8.40		283.7	170.3	48,309		1.109	248,897	5.714
	8.50		284.5	171.1	48,673		1.117	253,746	5.825
	8.60		285.3	171.9	49,038		1.126	258,631	5.937
	8.70		286.1	172.7	49,405		1.134	263,554	6.050
	8.80		286.9	173.5	49,772		1.143	268,512	6.164
	8.90		287.7	174.3	50,141		1.151	273,508	6.279
	9.00		288.5	175.1	50,511		1.160	278,541	6.394
	9.10		289.3	175.9	50,883		1.168	283,610	6.511
	9.20		290.1	176.7	51,256		1.177	288,717	6.628
	9.30		290.9	177.5	51,630		1.185	293,862	6.746
	9.40		291.7	178.3	52,005		1.194	299,043	6.865
	9.50		292.5	179.1	52,382		1.203	304,263	6.985
	9.60		293.3	179.9	52,760		1.211	309,520	7.106
	9.70		294.1	180.7	53,139		1.220	314,815	7.227
	9.80		294.9	181.5	53,519		1.229	320,147	7.350
	9.90		295.7	182.3	53,901		1.237	325,518	7.473

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.03 (May 2020)





Inlet calculations not checked

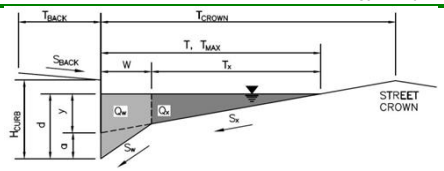
Version 4.05 Released March 2017

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

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

Project: Homestead North

Inlet ID: Inlet DP 4b



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	9.5	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} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	18.0	ft
Gutter Width	W =	1.17	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.016	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} =	18.0	18.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	8.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

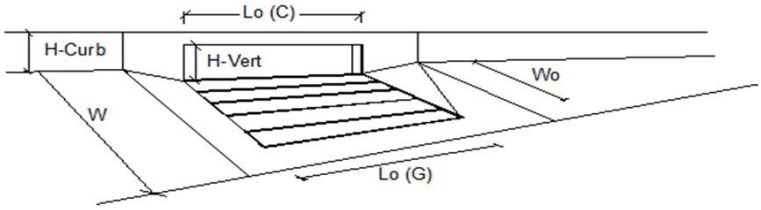
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**15.0**	**52.4**	**cfs**

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

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

INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet (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 =	3	3	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	

Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**6.7**	**11.9**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.1**	**4.1**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**99**	**74**	**%**

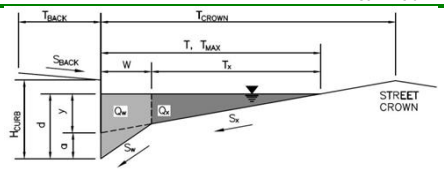
Version 4.05 Released March 2017

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

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

Project: Homestead North

Inlet ID: Inlet DP 9b



Gutter Geometry (Enter data in the blue cells)

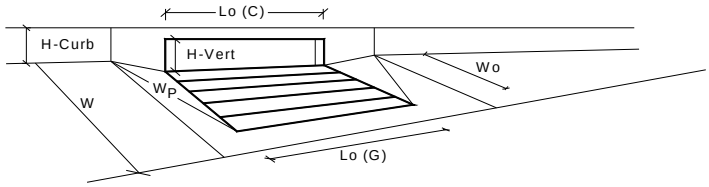
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	9.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	18.0	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} =	18.0	18.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	8.0	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 =	3	3	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	5.8	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} =	0.32	0.83	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.55	1.00	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.78	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 =**	**12.5**	**39.1**	**cfs**
WARNING: Inlet Capacity less than Q Peak for Minor Storm	$Q_{PEAK\ REQUIRED}$ =	12.5	30.9	cfs

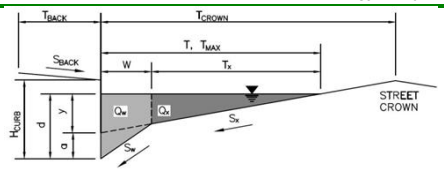
Version 4.05 Released March 2017

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

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

Project: Homestead North

Inlet ID: Inlet DP 7b



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	9.5	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} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	18.0	ft
Gutter Width	W =	1.17	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.016	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} =	18.0	18.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	8.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

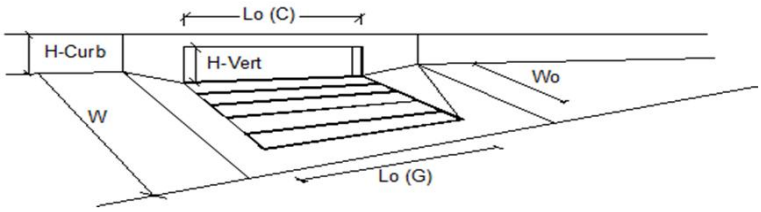
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**15.0**	**52.3**	**cfs**

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

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

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 =	3	3	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	

Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**7.0**	**11.3**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.1**	**3.2**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**98**	**78**	**%**

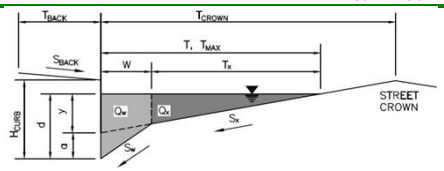
Version 4.05 Released March 2017

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

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

Project: Homestead North

Inlet ID: Inlet DP 10b



Gutter Geometry (Enter data in the blue cells)

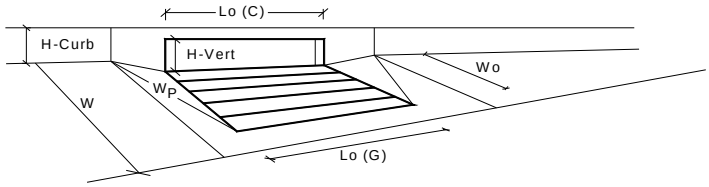
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	9.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	18.0	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} =	18.0	18.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	8.0	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 =	3	3	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	5.8	8.0	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	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} =	0.32	0.50	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.55	0.75	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.78	0.89	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**12.5**	**27.9**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	5.0	12.5	cfs

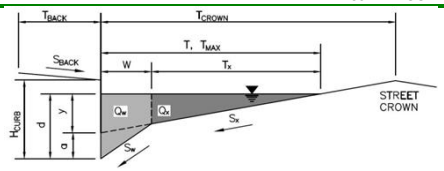
Version 4.05 Released March 2017

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

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

Project: Homestead North

Inlet ID: Inlet DP 2.3C



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	9.5	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} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	18.0	ft
Gutter Width	W =	1.17	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.027	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} =	18.0	18.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	8.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☑	☑	check = yes

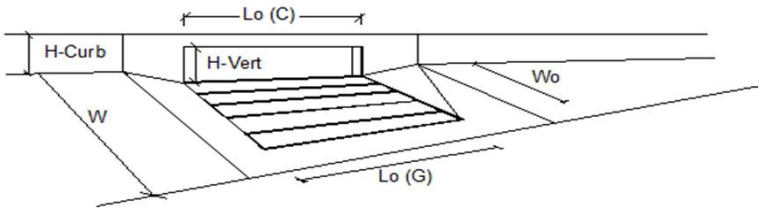
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**24.2**	**44.5**	**cfs**

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

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

INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



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

Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**7.2**	**11.6**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.1**	**3.6**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**98**	**76**	**%**

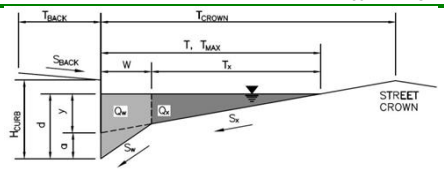
Version 4.05 Released March 2017

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

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

Project: Homestead North

Inlet ID: Inlet DP 2.1C



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} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	18.0	ft
Gutter Width	W =	1.17	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.020	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	18.0	18.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	8.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☐	check = yes

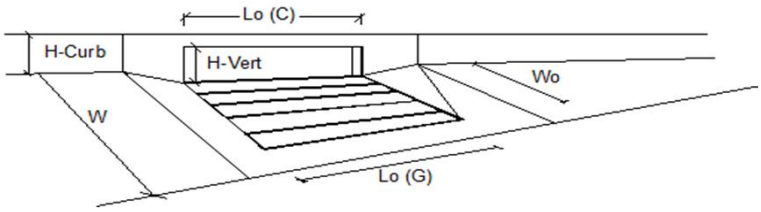
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	**Q_{allow} =**	**16.7**	**16.7**	**cfs**

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

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

INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**0.8**	**1.5**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.1**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**91**	**%**

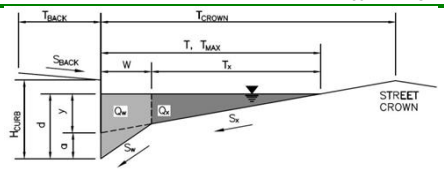
Version 4.05 Released March 2017

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

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

Project: Homestead North

Inlet ID: Inlet DP 4.2C



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} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	18.0	ft
Gutter Width	W =	1.17	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.020	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	18.0	18.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	8.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☐	check = yes

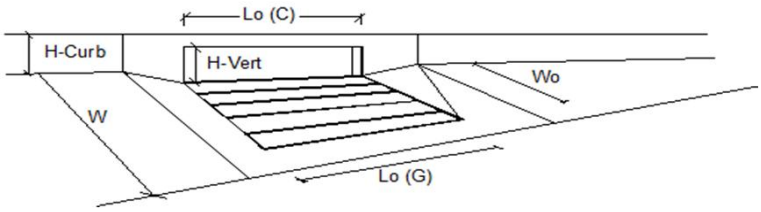
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	**Q_{allow} =**	**16.7**	**16.7**	**cfs**

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

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

INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet (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 =	3	3	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	

Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**4.4**	**8.6**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.7**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**92**	**%**

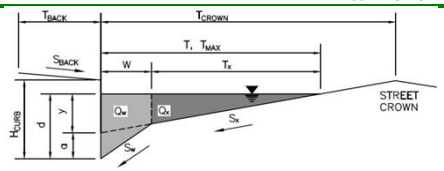
Version 4.05 Released March 2017

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

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

Project: Homestead North

Inlet ID: Inlet DP 3.1C



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	9.5	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} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	18.0	ft
Gutter Width	W =	1.17	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	2.000	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} =	18.0	18.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	8.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☐	check = yes

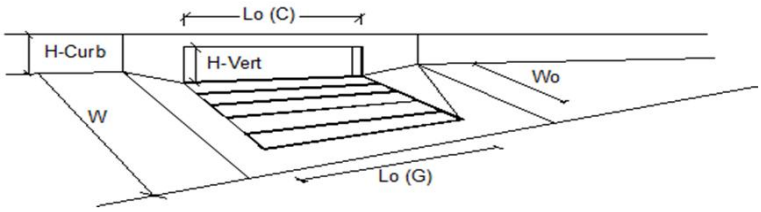
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**6.7**	**12.3**	**cfs**

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

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

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 =	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	

Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**1.3**	**2.0**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.6**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**97**	**79**	**%**

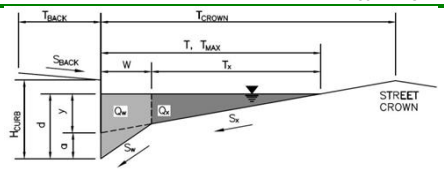
Version 4.05 Released March 2017

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

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

Project: Homestead North

Inlet ID: Inlet DP 4C



Gutter Geometry (Enter data in the blue cells)

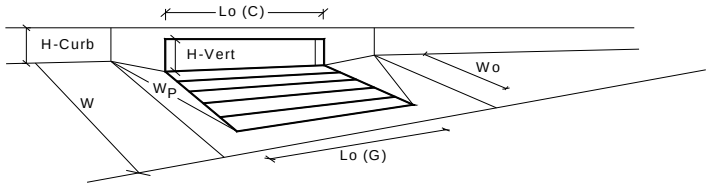
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	9.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	18.0	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} =	18.0	18.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	8.3	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 =	4	4	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	8.3	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	0.53	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.57	0.78	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.79	0.91	
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 =**	**18.2**	**39.7**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	16.9	35.5	cfs

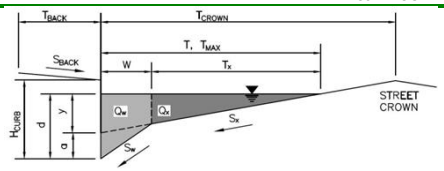
Version 4.05 Released March 2017

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

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

Project: Homestead North

Inlet ID: Inlet DP 5C



Gutter Geometry (Enter data in the blue cells)

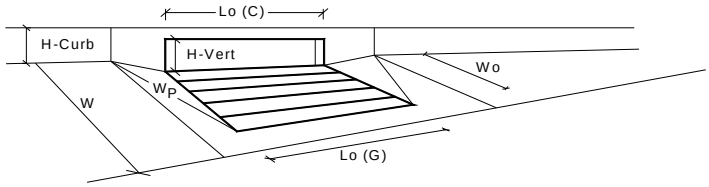
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	9.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	18.0	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} =	18.0	18.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	8.3	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



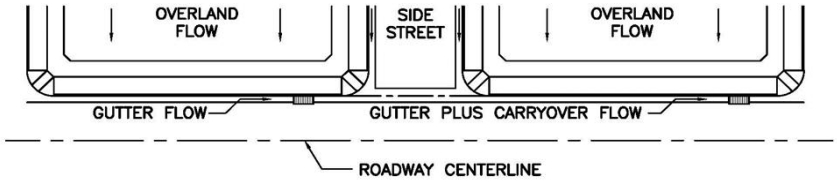
Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	2	2	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	5.8	5.8	inches
Grate Information		MINOR	MAJOR	☐ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.32	0.32	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.55	0.55	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.92	0.92	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**9.7**	**9.7**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	4.2	9.0	cfs

Version 4.05 Released March 2017

Worksheet Protected

DESIGN PEAK FLOW FOR SWALE OR ONE-HALF OF STREET BY THE RATIONAL METHOD

Project: Homestead North



Show Details

Design Flow: ONLY if already determined through other methods:

(local peak flow for 1/2 of street OR grass-lined channel):

	Minor Storm	Major Storm	
*Q_{Known} =			cfs

* If you enter flows in Row 14, select "Street Inlet" or "Area Inlet" button and then skip the rest of this sheet and click "Add New Inlet" at bottom of sheet.

<--- FILL IN THIS SECTION OR...

FILL IN THE SECTIONS BELOW. <---

Geographic Information: (Enter data in the blue cells):

Subcatchment Area =		Acres
Percent Imperviousness =		%
NRCS Soil Type =		A, B, C, or D

Site Type:
- (●) Site is Urban
- ( ) Site is Rural

Flows Developed For:
- (●) Street Inlet
- ( ) Area Inlet in a Swale

	Slope (ft/ft)	Length (ft)
Overland Flow =		
Gutter Flow =		

Rainfall Information: Intensity I (inch/hr) = $C_1 * P_1 / (C_2 + T_c) ^ C_3$

	Minor Storm	Major Storm	
Design Storm Return Period, T_r =			years
Return Period One-Hour Precipitation, P_1 =			inches
C_1 =			
C_2 =			
C_3 =			
User-Defined Storm Runoff Coefficient (leave this blank to accept a calculated value), C =			
User-Defined 5-yr. Runoff Coefficient (leave this blank to accept a calculated value), C_5 =			
Bypass (Carry-Over) Flow from upstream Subcatchments, Q_b =			**cfs**
Total Design Peak Flow, Q =			**cfs**

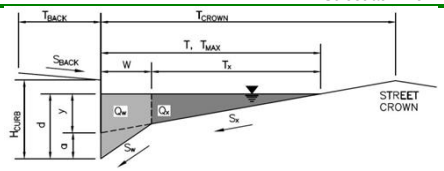
Version 4.05 Released March 2017

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

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

Project: Homestead North

Inlet ID: Street at DP 5A



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	9.5	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} =	18.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.002	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 =	0.028	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} =	18.0	18.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	8.3	inches
Allow Flow Depth at Street Crown (leave blank for no)		☑	☑	check = yes

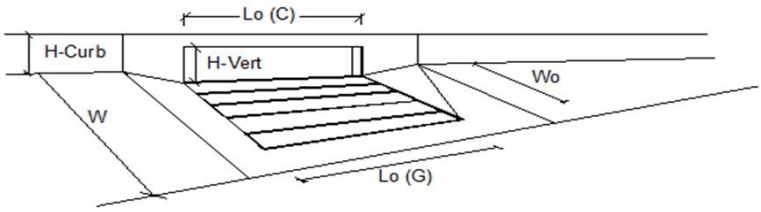
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**34.9**	**63.3**	**cfs**

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

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

INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



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

		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**			**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**			**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**			**%**

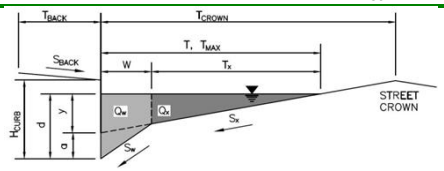
Version 4.05 Released March 2017

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

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

Project: Homestead North

Inlet ID: Inlet 1A



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	9.5	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} =	18.0	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 =	0.028	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} =	18.0	18.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	8.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☐	check = yes

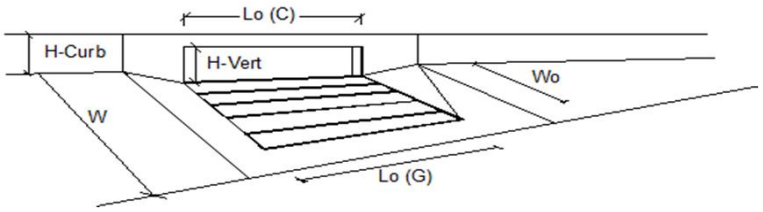
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	**Q_{allow} =**	**18.1**	**21.1**	**cfs**

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

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

INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet (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 =	3	3	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	

Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**7.1**	**12.0**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**2.8**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**81**	**%**

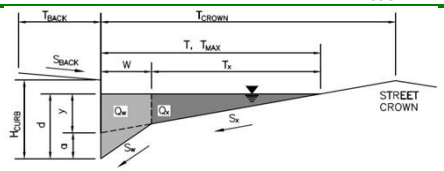
Version 4.05 Released March 2017

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

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

Project: Homestead North

Inlet ID: Inlet 3A



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	9.5	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} =	18.0	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 =	0.028	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} =	18.0	18.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	8.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☐	check = yes

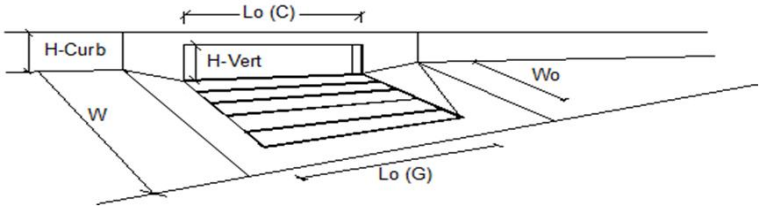
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	**Q_{allow} =**	**18.1**	**21.1**	**cfs**

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

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

INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	3	3	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**8.2**	**14.3**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.2**	**6.1**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**98**	**70**	**%**

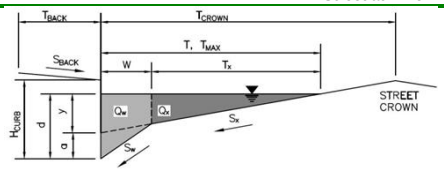
Version 4.05 Released March 2017

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

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

Project: Homestead North

Inlet ID: Street at DP 5A



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	9.5	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} =	18.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.002	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 =	0.028	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} =	18.0	18.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	8.3	inches
Allow Flow Depth at Street Crown (leave blank for no)		☑	☑	check = yes

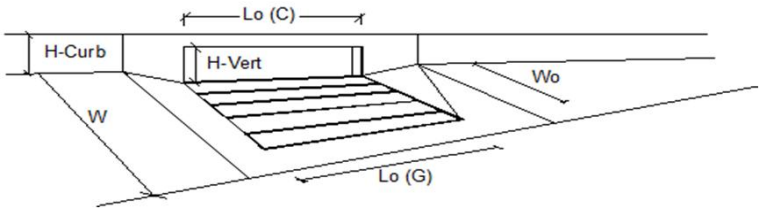
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**34.9**	**63.3**	**cfs**

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

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

INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



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

		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**			**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**			**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**			**%**

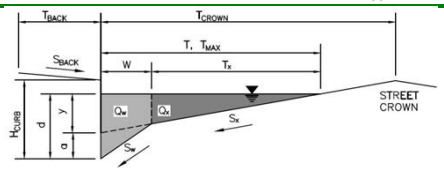
Version 4.05 Released March 2017

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

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

Project: Homestead North

Inlet ID: Inlet 7A



Gutter Geometry (Enter data in the blue cells)

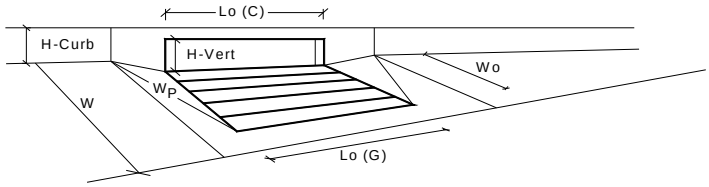
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	9.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	18.0	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} =	18.0	18.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	8.0	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 =	4	4	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	8.3	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	0.53	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.57	0.78	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.79	0.91	
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 =**	**18.2**	**39.7**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	10.5	29.7	cfs

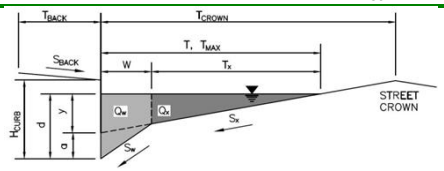
Version 4.05 Released March 2017

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

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

Project: Homestead North

Inlet ID: Inlet 2A



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	9.5	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} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	18.0	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 =	0.284	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} =	18.0	18.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	8.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☐	check = yes

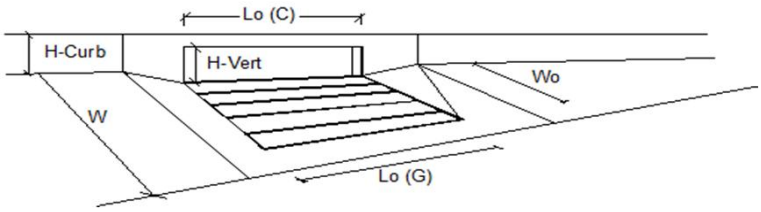
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**9.0**	**18.6**	**cfs**

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

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

INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet (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 =	3	3	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	

Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**6.4**	**11.5**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**1.7**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**87**	**%**

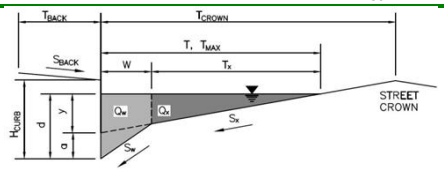
Version 4.05 Released March 2017

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

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

Project: Homestead North

Inlet ID: Inlet 4A



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	9.5	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} =	18.0	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 =	0.028	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} =	18.0	18.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	8.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☐	check = yes

MINOR STORM Allowable Capacity is based on Depth Criterion

MAJOR STORM Allowable Capacity is based on Spread Criterion

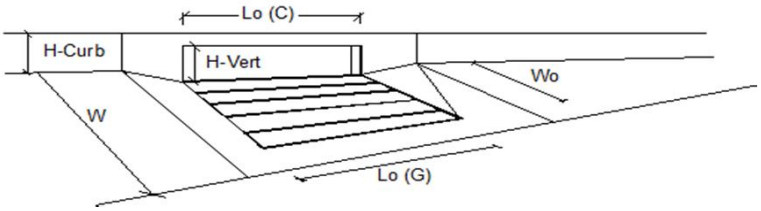
	Minor Storm	Major Storm	
Q_{allow} =	**18.1**	**21.0**	**cfs**

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

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

INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet (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 =	3	3	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	

Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**7.0**	**12.6**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**3.6**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**78**	**%**

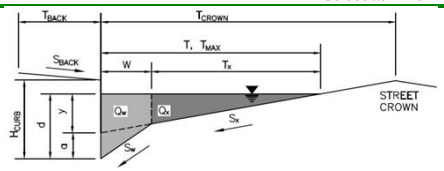
Version 4.05 Released March 2017

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

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

Project: Homestead North

Inlet ID: Street at DP 6A



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	9.5	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} =	18.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.002	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 =	0.028	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} =	18.0	18.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	8.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☑	☑	check = yes

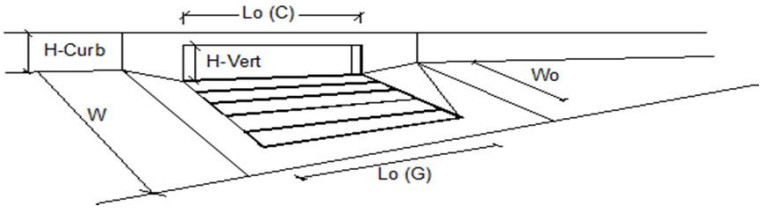
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**34.9**	**57.7**	**cfs**

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

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

INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



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

		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**			**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**			**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**			**%**

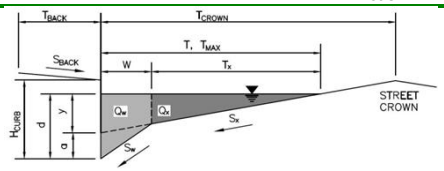
Version 4.05 Released March 2017

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

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

Project: Homestead North

Inlet ID: Inlet 8A



Gutter Geometry (Enter data in the blue cells)

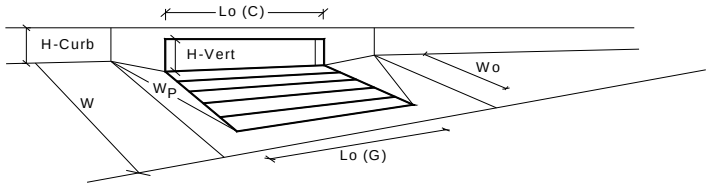
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	9.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	18.0	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} =	18.0	18.0	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 =	3	3	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	5.8	8.3	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} =	0.32	0.53	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.55	0.78	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.78	0.91	
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 =**	**12.5**	**29.4**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	11.3	19.9	cfs

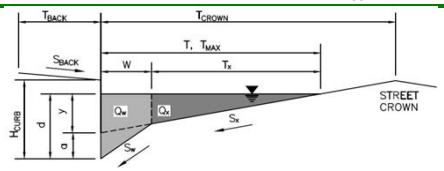
Version 4.05 Released March 2017

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

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

Project: Homestead North

Inlet ID: Inlet DP 1.1B



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	9.5	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} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	18.0	ft
Gutter Width	W =	1.17	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.026	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	18.0	18.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	8.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☐	check = yes

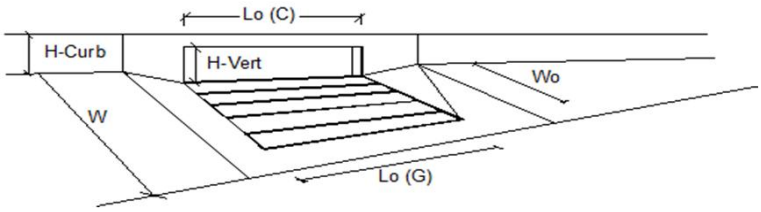
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	**Q_{allow} =**	**19.1**	**19.1**	**cfs**

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

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

INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



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

Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**5.3**	**9.6**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**1.5**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**87**	**%**

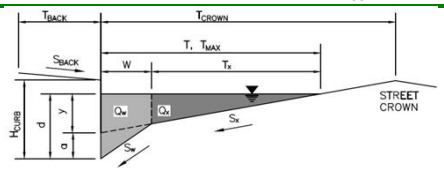
Version 4.05 Released March 2017

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

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

Project: Homestead North

Inlet ID: Inlet DP 1.2B



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	9.5	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} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	18.0	ft
Gutter Width	W =	1.17	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.026	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	9.5	18.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	8.3	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☐	check = yes

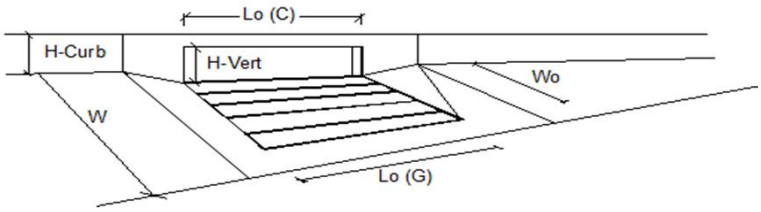
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	**Q_{allow} =**	**3.7**	**19.1**	**cfs**

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

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

INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



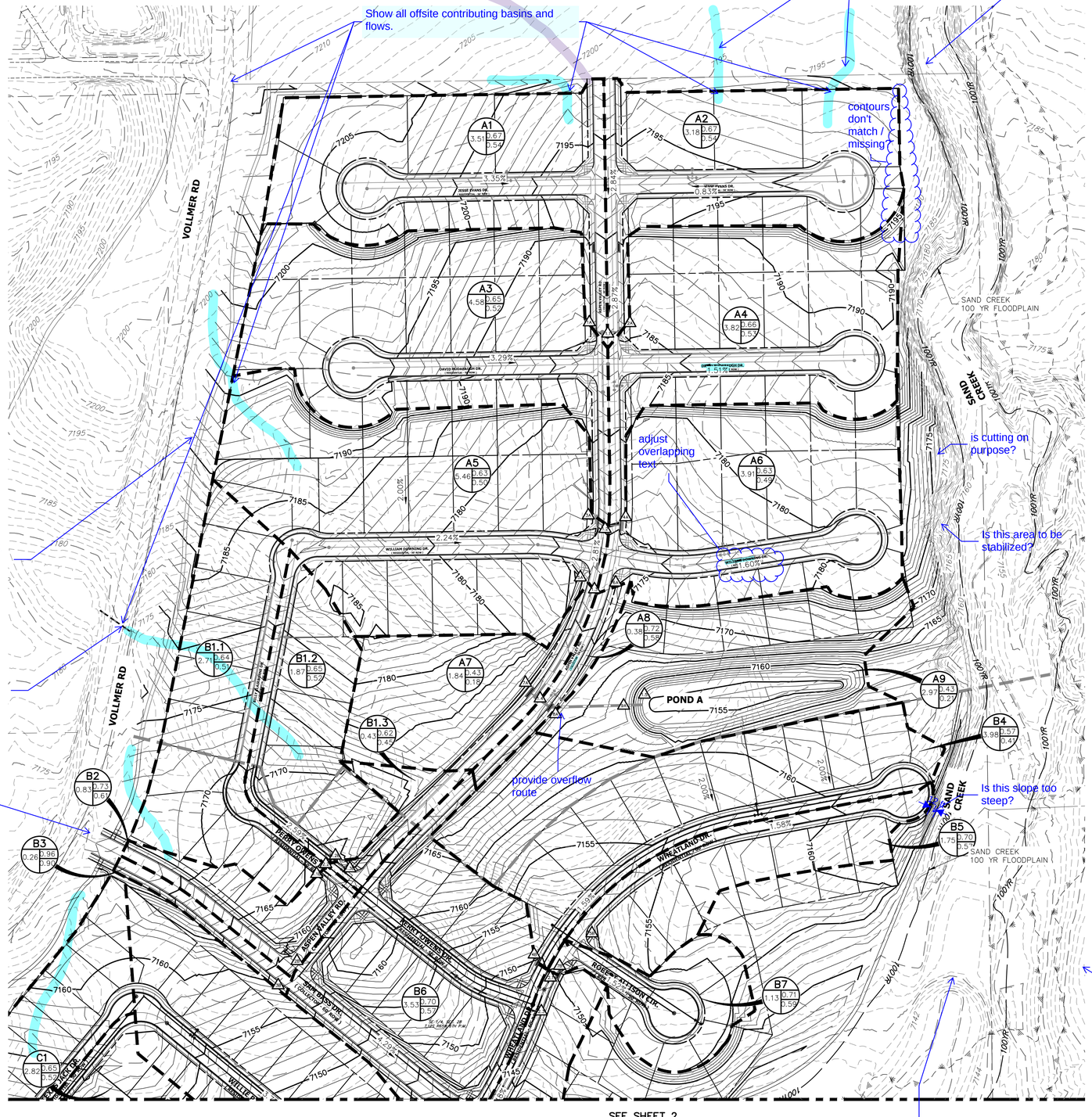
Design Information (Input)		MINOR	MAJOR	
Type of Inlet (CDOT Type R Curb Opening)	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	3	3	
Length of a Single Unit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

Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**3.6**	**7.4**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.2**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**97**	**%**

Appendix D
Drainage Maps

Provide existing drainage plan

DRAINAGE MAP



LEGEND

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

DESIGN POINT

PROPOSED FLOW DIRECTION

BASIN DRAINAGE AREA

EXISTING STORM SEWER

STORM SEWER PROPOSED

PROPOSED R.O.W

PROPOSED PROPERTY LINES

PROPOSED SIDEWALK

EXISTING PROPERTY LINE

ROW EXISTING

FL EXISTING

SIDEWALK EXISTING

DRAINAGE ACCESS & MAINTENANCE EASEMENT

EXISTING 6100

PROPOSED 6100

BASIN SUMMARY TABLE

Tributary Sub-basin	Area (acres)	Percent Impervious	C_5	C_{100}	t_c (min)	Q_5 (cfs)	Q_{100} (cfs)
A1	3.51	56%	0.54	0.67	12.8	7.1	14.8
A2	3.18	57%	0.54	0.67	13.5	6.4	13.2
A3	4.58	53%	0.52	0.65	13.4	8.7	18.3
A4	3.82	54%	0.53	0.66	14.0	7.3	15.2
A5	5.46	51%	0.50	0.63	10.9	10.8	23.1
A6	3.91	53%	0.51	0.64	12.6	7.6	16.0
A7	1.87	14%	0.18	0.43	16.6	1.1	4.5
A8	0.42	62%	0.58	0.72	5.0	1.2	2.6
A9	2.97	17%	0.21	0.43	13.3	2.3	7.9
B1.1	2.71	52%	0.51	0.64	12.4	5.3	11.1
B1.2	1.87	53%	0.51	0.65	12.9	3.6	7.6
B1.3	0.43	46%	0.45	0.62	8.2	0.8	2.0
B2	0.83	62%	0.58	0.71	5.0	2.5	5.1
B3	0.26	100%	0.90	0.96	5.0	1.2	2.2
B4	3.98	40%	0.41	0.57	9.5	6.8	16.0
B5	1.75	58%	0.56	0.68	7.7	4.4	9.0
B6	3.60	60%	0.57	0.70	6.5	9.8	20.2
B7	1.13	62%	0.59	0.71	8.7	2.9	5.8
B8	1.76	59%	0.56	0.69	9.2	4.2	8.6
B9	3.79	64%	0.50	0.64	13.2	7.0	15.0
B10	0.22	100%	0.90	0.96	5.0	1.0	1.8
B11	1.75	2%	0.08	0.35	17.3	0.5	3.4
C1	2.82	70%	0.52	0.65	13.0	5.5	11.5
C2.1	0.20	89%	0.81	0.89	5.0	0.8	1.6
C2.2	4.69	73%	0.56	0.68	12.8	9.9	20.3
C2.3	0.83	70%	0.57	0.69	9.8	2.0	4.1
C3.1	0.35	82%	0.75	0.85	5.0	1.3	2.6
C3.2	1.46	72%	0.56	0.68	8.4	3.6	7.4
C4.1	5.81	70%	0.52	0.65	12.7	11.5	23.9
C4.2	2.58	69%	0.50	0.64	16.7	4.4	9.3
C5	0.16	100%	0.90	0.96	5.0	0.7	1.3
C6	2.43	10%	0.13	0.38	5.0	1.6	8.1

Also provide design point summary table.

Include the entire preliminary plan boundary. Additional sheets at a closer scale are probably needed

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

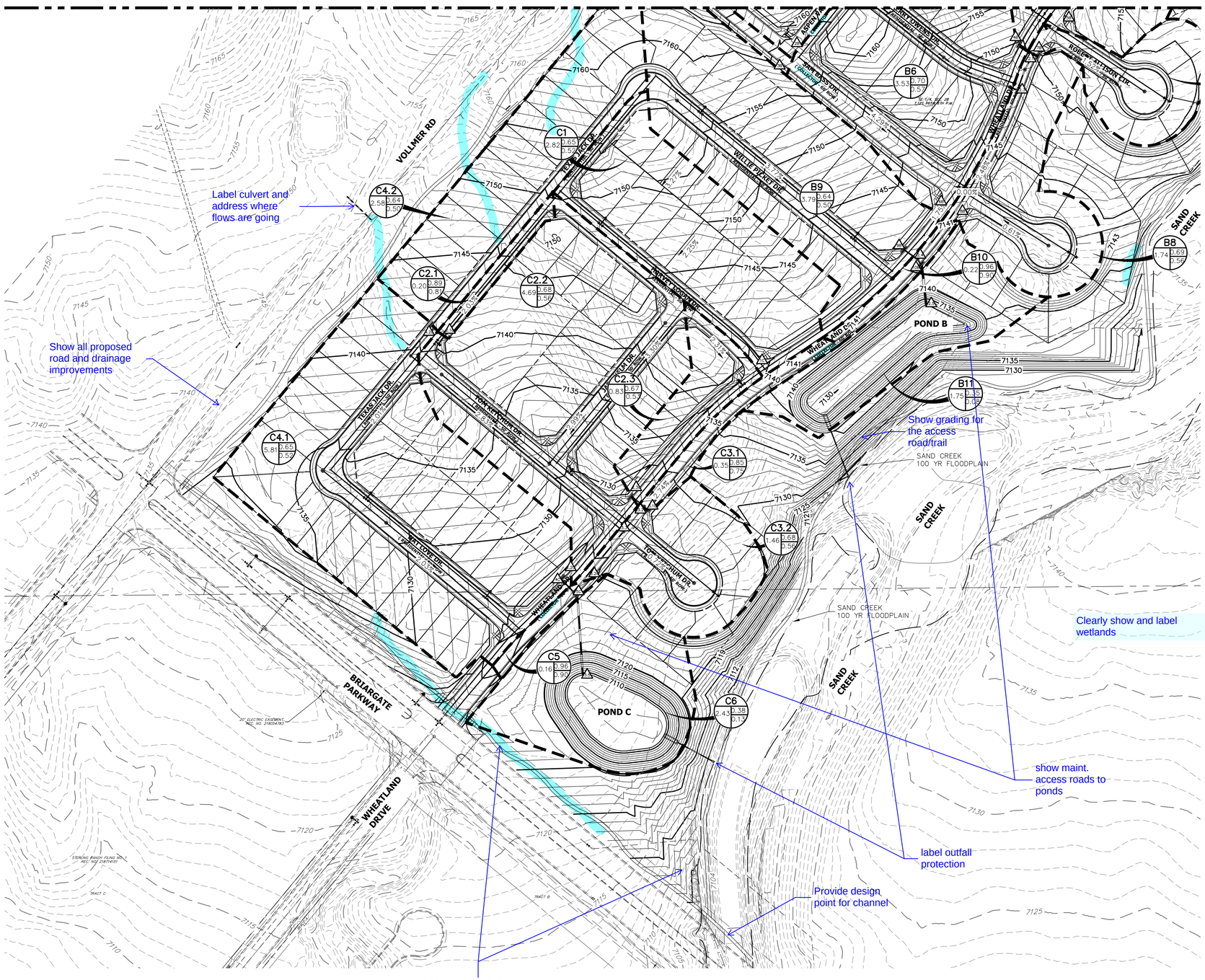
DRAINAGE MAP
HOMESTEAD NORTH
JOB NO. 25188.00
06/25/20
SHEET 1 OF 2

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

DRAINAGE MAP

Label lots and tracts

SEE SHEET 1



LEGEND

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

DESIGN POINT

PROPOSED FLOW DIRECTION

BASIN DRAINAGE AREA

EXISTING STORM SEWER

STORM SEWER PROPOSED

PROPOSED R.O.W

PROPOSED PROPERTY LINES

PROPOSED SIDEWALK

EXISTING PROPERTY LINE

ROW EXISTING

FL EXISTING

SIDEWALK EXISTING

DRAINAGE ACCESS & MAINTENANCE EASEMENT

EXISTING 6100

PROPOSED 6100

BASIN SUMMARY TABLE

Tributary Sub-basin	Area (acres)	Percent Impervious	C_5	C_{100}	t_c (min)	Q_5 (cfs)	Q_{100} (cfs)
A1	3.51	56%	0.54	0.67	12.8	7.1	14.8
A2	3.18	57%	0.54	0.67	13.5	6.4	13.2
A3	4.58	53%	0.52	0.65	13.4	8.7	18.3
A4	3.82	54%	0.53	0.66	14.0	7.3	15.2
A5	5.46	51%	0.50	0.63	10.9	10.8	23.1
A6	3.91	53%	0.51	0.64	12.6	7.6	16.0
A7	1.87	14%	0.18	0.43	16.6	1.1	4.5
A8	0.42	62%	0.58	0.72	5.0	1.2	2.6
A9	2.97	17%	0.21	0.43	13.3	2.3	7.9
B1.1	2.71	52%	0.51	0.64	12.4	5.3	11.1
B1.2	1.87	53%	0.51	0.65	12.9	3.6	7.6
B1.3	0.43	46%	0.45	0.62	8.2	0.8	2.0
B2	0.83	62%	0.58	0.71	5.0	2.5	5.1
B3	0.26	100%	0.90	0.96	5.0	1.2	2.2
B4	3.98	40%	0.41	0.57	9.5	6.8	16.0
B5	1.75	58%	0.56	0.68	7.7	4.4	9.0
B6	3.60	60%	0.57	0.70	6.5	9.8	20.2
B7	1.13	62%	0.59	0.71	8.7	2.9	5.8
B8	1.76	59%	0.56	0.69	9.2	4.2	8.6
B9	3.79	64%	0.50	0.64	13.2	7.0	15.0
B10	0.22	100%	0.90	0.96	5.0	1.0	1.8
B11	1.75	2%	0.08	0.35	17.3	0.5	3.4
C1	2.82	70%	0.52	0.65	13.0	5.5	11.5
C2.1	0.20	89%	0.81	0.89	5.0	0.8	1.6
C2.2	4.69	73%	0.56	0.68	12.8	9.9	20.3
C2.3	0.83	70%	0.57	0.69	9.8	2.0	4.1
C3.1	0.35	82%	0.75	0.85	5.0	1.3	2.6
C3.2	1.46	72%	0.56	0.68	8.4	3.6	7.4
C4.1	5.81	70%	0.52	0.65	12.7	11.5	23.9
C4.2	2.58	69%	0.50	0.64	16.7	4.4	9.3
C5	0.16	100%	0.90	0.96	5.0	0.7	1.3
C6	2.43	10%	0.13	0.38	5.0	1.6	8.1

100 50 0 100 200

ORIGINAL SCALE: 1" = 100'

DRAINAGE MAP
HOMESTEAD NORTH
JOB NO. 25188.00
06/25/20
SHEET 2 OF 2

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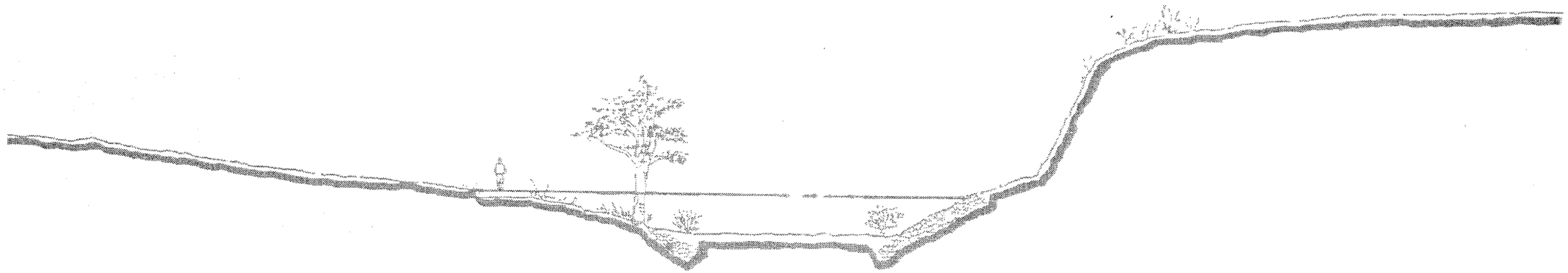
719-593-2593 Fort Collins 970-491-9888
www.jrengineering.com

Appendix E
Reference Material

SAND CREEK DRAINAGE BASIN PLANNING STUDY

PRELIMINARY DESIGN REPORT

CITY OF COLORADO SPRINGS, EL PASO COUNTY, COLORADO



PREPARED FOR:

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

PREPARED BY:

Kiowa Engineering Corporation
1011 North Weber
Colorado Springs, CO 80903

II. STUDY AREA DESCRIPTION

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

Basin Description

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

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

Climate

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

Soils and Geology

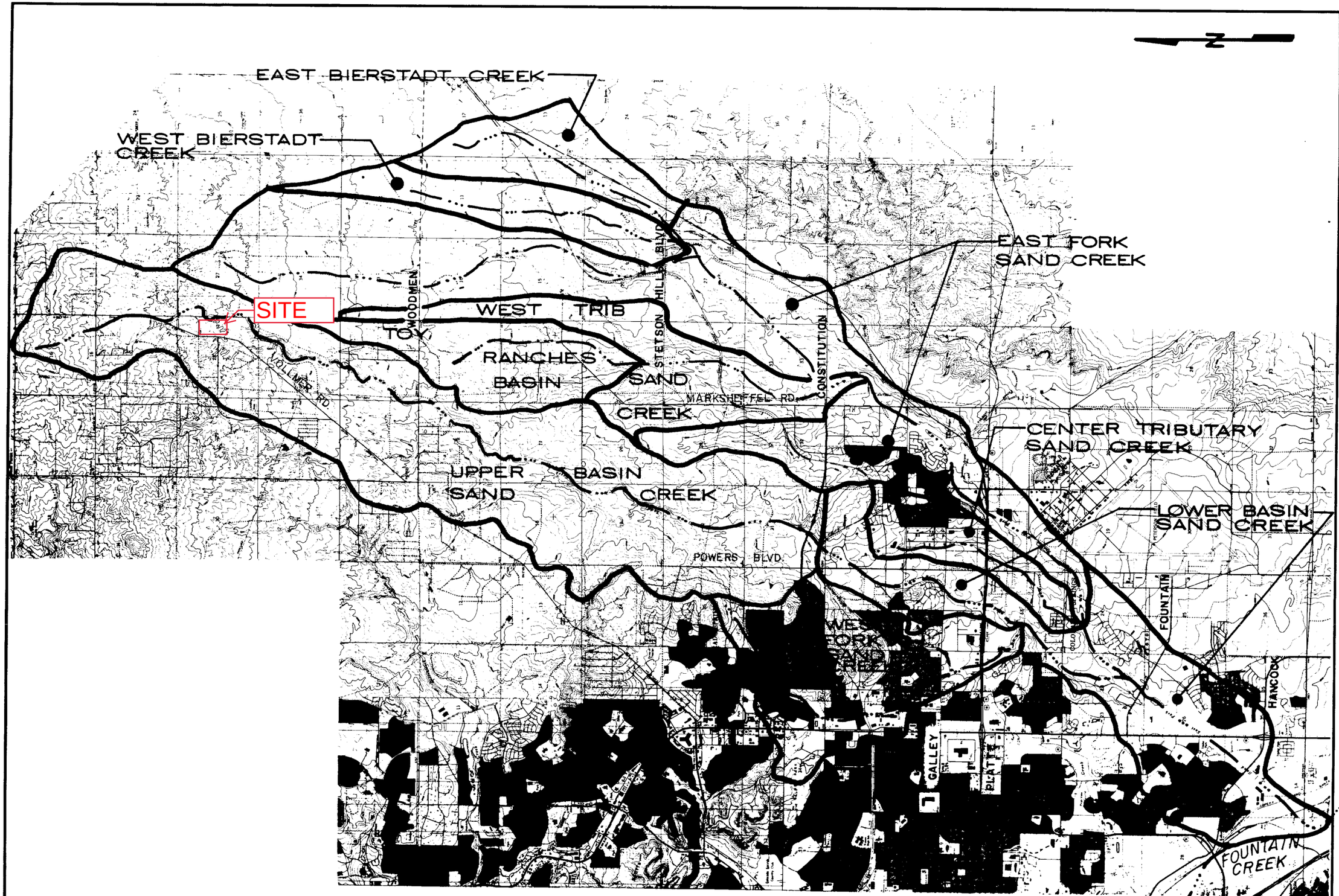
Soils within the Sand Creek basin vary between soil types A through D, as identified by the U. S. Department of Agriculture, Soil Conservation Service. The predominant soil groupings are in the Truckton and Bresser soil associations. The soils consist of deep, well drained soils that formed in alluvium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

Property Ownership and Impervious Land Densities

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

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

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



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

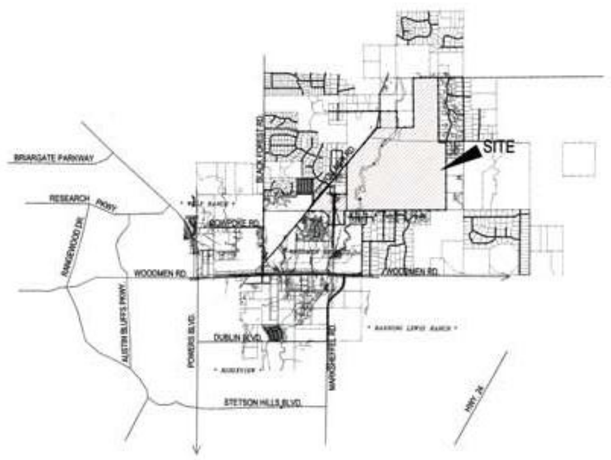
SAND CREEK DRAINAGE BASIN PLANNING STUDY

REGIONAL SUB-BASINS

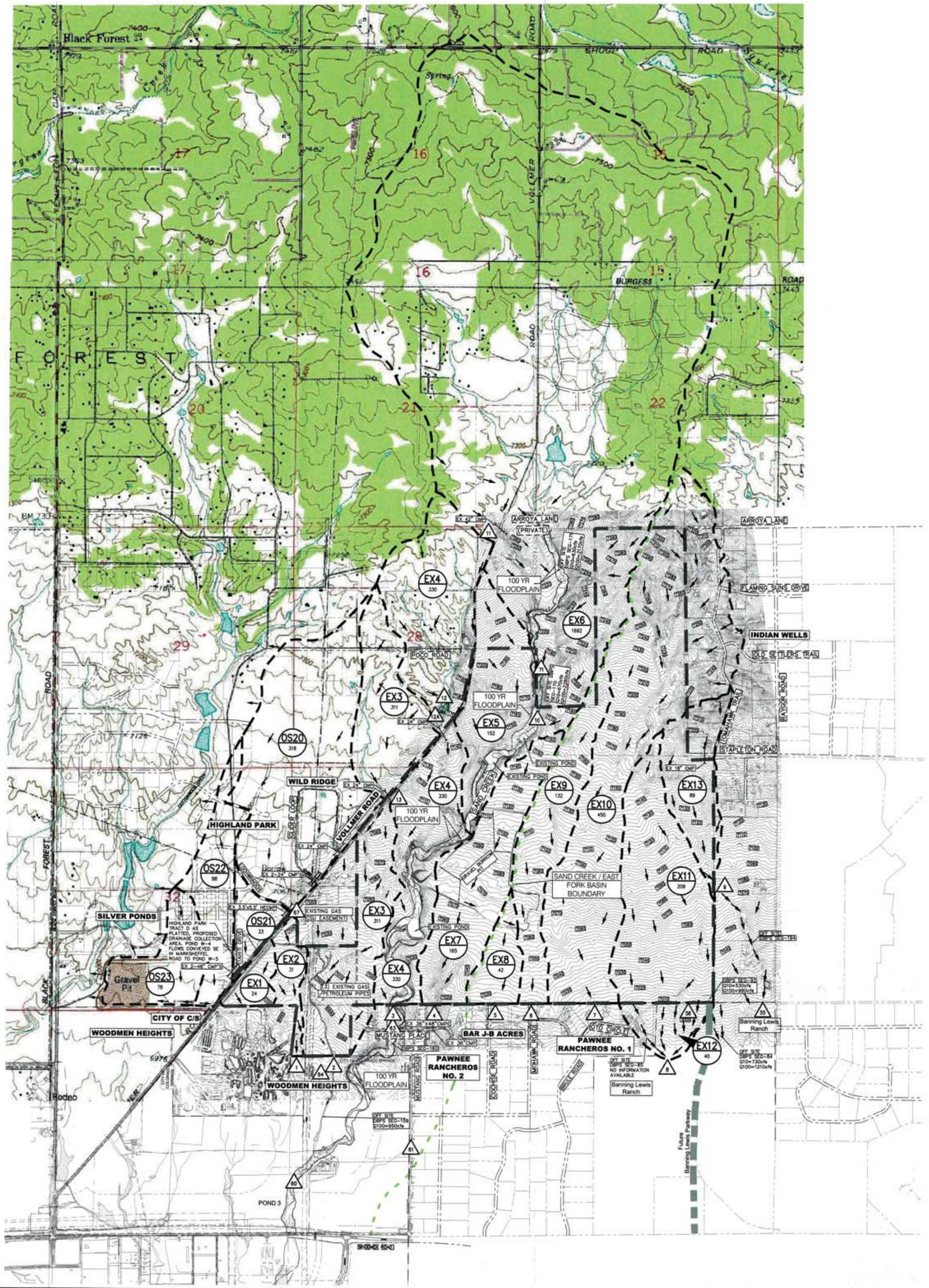
Project No	90-04-09
Date:	11/90
Design:	
Drawn:	EAK
Check:	
Revisions:	

11

FIG. III-1



STERLING RANCH
N.T.S.



HISTORIC CONDITION

BASIN SUMMARY			
BASIN	AREA (ACRES)	Q_5 (CFS)	Q_{100} (CFS)
EX-1	24	3	40
EX-2	31	3	45
EX-3	311	49	341
EX-4	330	71	353
EX-5	152	14	209
EX-6	1692	118	2168
EX-7	165	12	197
EX-8	42	4	64
EX-9	132	11	149
EX-10	450	48	474
EX-11	209	17	261
EX-12	40	5	65
EX-13	89	6	114
OS-20	318	61	310
OS-21	33	8	38
OS-22	88	18	91
OS-23	78	34	84

* NOTE: BASINS OS-22 & OS-23 NOT PART OF THIS REPORT. FLOWS FOLLOW HISTORIC PATTERNS ON THE WESTSIDE OF VOLLMER ROAD.

HISTORIC CONDITION

DESIGN POINTS						
DESIGN POINT	SQ. MI.	Q_5 (CFS)	Q_{100} (CFS)	SQ. MI.	DBPS Q_{100}	DBPS DP/ID
1	0.09	5	84			
2	0.49	55	465	0.74	465	64
3	0.52	139	2610	4.33	2552	63
4	0.26	12	197			
5	0.07	4	64			
6	0.21	11	149			
7	0.70	48	474			
8	0.39	18	305			
9	0.14	6	114			
10	2.64	122	2245	3.27	2245	71
11	0.09	5	83			
12A	0.01	3	16			
12	0.27	10	200			
13	0.17	6	126			
* NOTE: SQ. MI. ARE NOT CONSISTANT AT EACH DESIGN POINT DP-DBPS				0.48	#	55
				0.53	1210	56
				5.38	2629	60
* NOTE: DBPS FLOWS ARE FOR THE EXISTING CONDITION				0.38	76	61
				0.49	115	67

NO DATA GIVEN IN DBPS

1" = 1000'

0 250 500 1000 2000
Scale in Feet

LEGEND

- EX1 / 33.2 — EXISTING MDDP BASIN / ACREAGE
- E1 — EXISTING FLOW RELEASE POINT
- FLOW DIRECTION
- BASIN BOUNDARY
- PROPERTY BOUNDARY
- 6920 — EXISTING CONTOUR
- CULVERT PIPE

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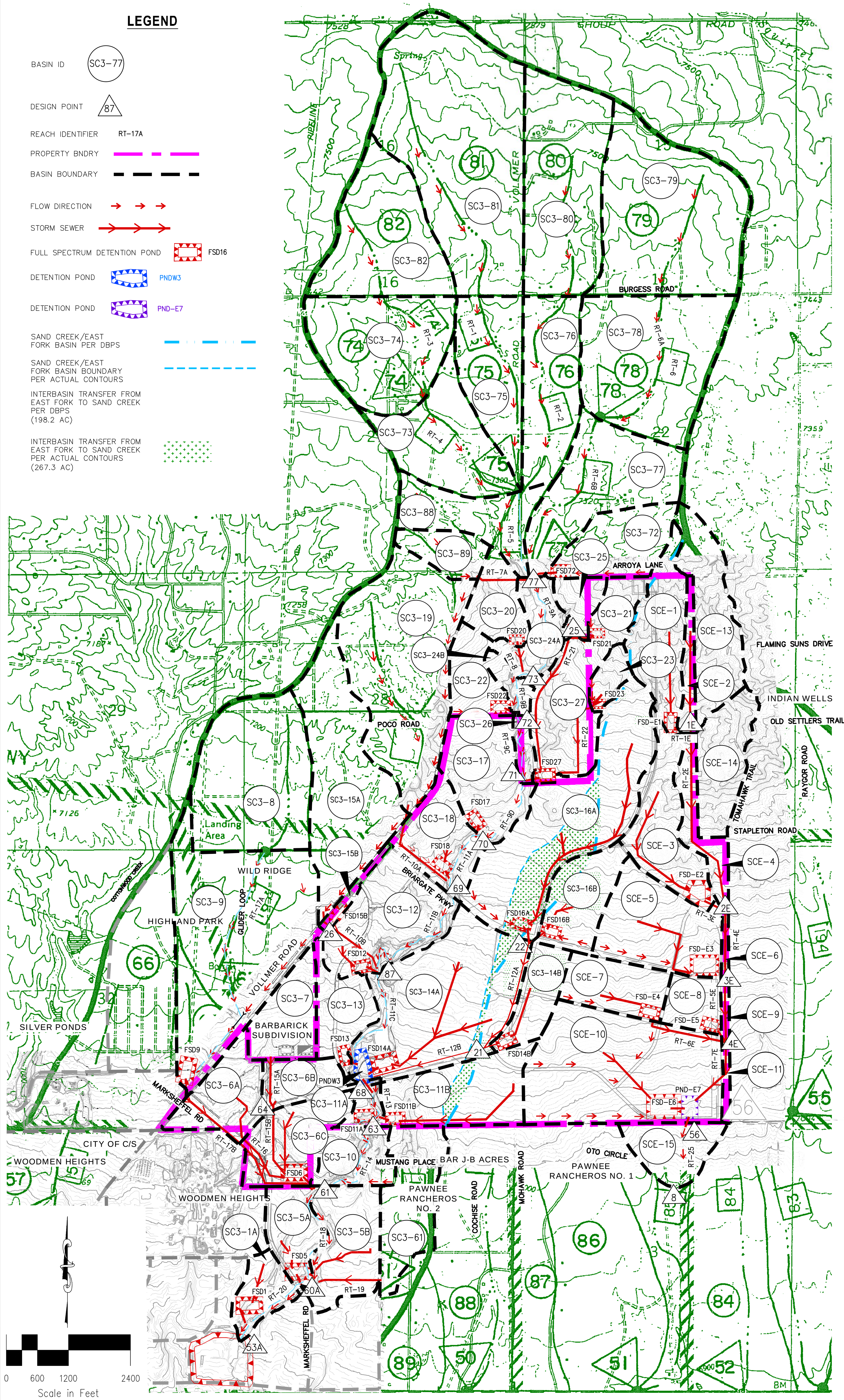
102 E. PIKES PEAK AVE. STE 306
COLORADO SPRINGS, CO 80903
(719) 955-5485, FAX (719) 444-8427

STERLING RANCH MDDP

HISTORIC – DRAINAGE MAP

PROJECT NO. 09-001		FILE: *\dwg\Dev Plan\09001-MDDP HISTORIC		
DESIGNED BY:	VAS	SCALE	DATE: 03/16/15	
DRAWN BY:	VAS	HORIZ: 1"=500'	SHEET 1 OF 1	D1
CHECKED BY:	VAS	VERT: N/A		



BASIN SUMMARY

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

DESIGN POINT SUMMARY

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

DESIGN POINT SUMMARY (VOLUME)

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

WATER QUALITY & DETENTION POND SUMMARY

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

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

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

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

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

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

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

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

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

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

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

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

SAND CREEK FLOW COMPARISON CHART

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

EFSC DBPS DESIGN POINT SUMMARY (PEAK FLOW)

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

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

WATER QUALITY & DETENTION POND SUMMARY

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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2018 STERLING RANCH MDDP

DEVELOPED HYDROLOGIC CONDITIONS MAP

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