FINAL DRAINAGE REPORT
FOR
THE VILLAS AT CLAREMONT RANCH

July 2022

Prepared for:

Phi Real Estate Services, LLC
200 W. City Center Dr. Ste 200
Pueblo, CO 81003

Prepared By:

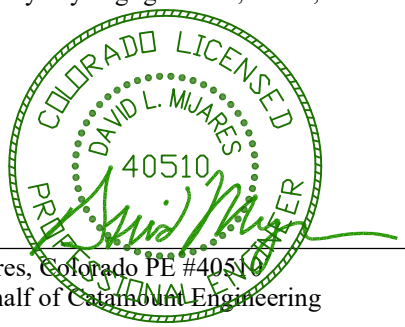
CATAMOUNT ENGINEERING
321 W. Henrietta Ave, Suite A
Woodland Park, CO 80863
719-426-2124

PCD NO. Pending

SF-22-028

FINAL DRAINAGE REPORT
THE VILLAS AT CLAREMONT RANCH

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 the criteria established 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.



8/02/22

David L. Mijares, Colorado PE #40510 Date
For and on behalf of Catamount Engineering

Developer's Statement:
Premiere Homes Inc. the developer has read and will comply with all of the requirements specified in this drainage report and plan.

Phi Real Estate Services, LLC
Business Name

By: _____

Title: Director of Operations

Address: 200 W. City Center Dr. Ste 200

Pueblo, CO 81003

El Paso County:
Filed in accordance with the requirements of the El Paso County land Development Code and the Drainage Criteria manual Volumes 1 and 2, and the El Paso County Engineering Criteria Manual, latest revision.

Josh Palmer

Jennifer Irvine, PE Date
County Engineer/ECM Administrator

Conditions:

FINAL DRAINAGE REPORT for
THE VILLAS AT CLAREMONT RANCH

PURPOSE

The purpose of this drainage report is to identify existing drainage patterns, quantify developed storm water runoff, and establish outfall scenarios from the proposed development. Additionally, this analysis will establish compliance with previous drainage studies and provide for water quality and detention of developed runoff.

GENERAL LOCATION AND DESCRIPTION

The subject 10.17 acres is proposed to be platted into 83 residential townhome lots and is located within the southwest ¼ of Section 4, Township 14 South, Range 65 West of the 6th principal meridian El Paso County, Colorado. The parcel was previously platted as tracts G and A, Claremont Ranch Filing No. 7

The parcel is bounded on the north by the East Fork of Sand Creek, on the east by the Claremont Ranch Filing No. 7 single family residential development, on the south by Meadowbrook Parkway and undeveloped tract F, and on the west by Tract I and Marksheffel Road.

The site has been previously stripped and contains little volunteer vegetation besides erosion control cover. The existing terrain generally slopes to the west at a 2% grade. A swale has been formed adjacent to the Marksheffel embankment conveying undeveloped flow overland to the east Fork of Sand Creek. The site lies within the Sand Creek Drainage Basin.

Soils in the development parcel consist predominantly of Blendon sandy loam (Hydrologic Group 'B' soils) and also contains Blakeland loamy sand and Ellicott loamy coarse sand (Hydrologic Group 'A' soils) as determined by the Natural Resources Conservation Service Web Soil Survey. Hydrologic Group B soils were used in analysis.

No portion of the development lies within an F.E.M.A. designated floodplain per FIRM 08041C0756 G, effective 12/07/2018. The revised F.E.M.A. Flood Insurance Rate Map has been provided in the appendix.

EXISTING DRAINAGE CONDITIONS

The site was previously studied in the Final Drainage Report for Claremont Ranch Filing No. 7. Development of Filing No. 7 required analysis and implementation of improvements within the adjacent Lower East Fork of Sand Creek. Improvements were implemented per the Sand Creek Drainage Basin Planning Study and Preliminary Design Report; City of Colorado Springs, El Paso County, Colorado (DBPS), prepared by Kiowa Engineering Corp., revised March 1996. As upstream detention proposed in the DBPS has not been implemented the more conservative FEMA 100-YR Flow was utilized in channel evaluation and improvement. The FEMA analysis assumes

a 100-YR flow of 4,500 cfs through the adjacent reach, while the DBPS estimates a flow of 3,310 cfs with upstream detention. The adjacent Lower East Fork Sand Creek improvements are detailed in the Final Drainage Report for Claremont Ranch Filing no. 7.

The Villas at Claremont Ranch were platted as Tracts 'G' and 'A' with development of Claremont Ranch Filing No. 7 and was identified as 12.21 acre commercial development (basin 7) in the final drainage report. Anticipated runoff from Basin 7 was Q_5=9.5 cfs, Q_{100}=24.4 in the interim condition and Q_5=56.0 cfs, Q_{100}=96.7 in the fully developed condition. The Villas at Claremont Ranch lies entirely with the Sand Creek Drainage Basin Planning Study area.

Flows do not match drainage map in appendix.

Basin 6 Claremont Ranch Filing No. 7 consists of undeveloped tract F south of Meadowbrook Parkway. The 11.18 acre basin is proposed for commercial use and generates anticipated runoff of was Q_5=10.1 cfs, Q_{100}=25.8 in the interim condition and Q_5=56.0 cfs, Q_{100}=96.7 in the fully developed condition. A temporary 24" culvert crossing was installed with development of Meadowbrook Parkway to convey flows north to Sand Creek. Interim flows will be conveyed in existing swale section developed with Filing No. 7 improvements within the 70' utility and drainage easement located along the west side of the proposed Villas at Claremont Ranch Development. Developed flows will not be accepted onto the Villas at Claremont Ranch and any development scenarios for Tract F will require water quality implementation and full spectrum detention prior to site release across Meadowbrook Parkway. Interim flows defined in the Final Drainage Report for Filing No. 7 will be accepted.

DEVELOPED DRAINAGE BASINS

delete

Developed basins proposed to receive an increase in impervious areas will be routed to an on-site extended detention basin providing full spectrum detention prior to release to the East Fork of Sand Creek. Basins routed through the proposed EDB will be collected in on proposed private roadway sections and collected in a private inlet system. Collected runoff will be conveyed in a private storm system to the EDB. A summary of peak developed runoff for the basins and design points are depicted in the Developed Drainage Plan in the appendix.

Basin 1 consists of perimeter landscape areas directly tributary to the East Fork of Sand Creek and will not be collected in the proposed extended detention basin. Basin 1 contains 2.25 acres and generates runoff of (Q_2=0.2 cfs, Q_5=0.6 cfs, Q_{10}=1.2 cfs, Q_{25}=2.0 cfs, Q_{50}=2.6 cfs, and Q_{100}=3.3 cfs). Runoff from Basin 1 will either sheet flow directly to the reach of Sand Creek or be combined with interim condition runoff from Basin 6 (Claremont Ranch Filing No. 7) of Q_5=10.1 cfs, Q_{100}=25.8 to the existing riprap rundown to Sand Creek. The swale and rundown installed with filing 7 improvements was developed to convey interim flows from both Basin 6 (tract F, Claremont Ranch Filing No. 7) and Basin 7 (tracts G and A, Claremont Ranch Filing No. 7) with a combined flow of Q_5=19.6 cfs, Q_{100}=50.2. Interim flows anticipated in Filing No. 7 are greater than the proposed flows with development of the Villas at Claremont Ranch.

Remove this statement as proposed flows are known. Add design point for Basin 1 & offsite flows combined and analyze existing swale and rundown to determine both are adequate for proposed conditions.

BASINS TRIBUTARY TO EDB

Basins 2-8 consist of the landscape areas, residential townhome lots, and private street improvements tributary to the proposed extended detention basin. Basin 9 consists of rear lots developed within the residential portion of Filing No. 7 tributary to the extended detention basin.

Basin 2 (1.92 Acres, Q_2=1.3 cfs, Q_5=1.9 cfs, Q_{10}=2.7 cfs, Q_{25}=3.8 cfs, Q_{50}=4.6 cfs, and Q_{100}=5.6 cfs) consists of lots and landscape area along the north and east of the development. Flows from basin 2 will be conveyed in a grass swale along the northeast of the development to outfall directly to the proposed detention pond.

Show and label swale on drainage map. Include calculations for sizing of swale in appendix.

Basin 3 (0.76 Acres, Q_2=1.1 cfs, Q_5=1.5 cfs, Q_{10}=2.0 cfs, Q_{25}=2.5 cfs, Q_{50}=2.9 cfs, and Q_{100}=3.4 cfs) consists of townhome lots and roadway improvements tributary to the proposed 5' type R inlet at Design Point 2. Calculations for Carrside Grove street capacity and inlet analysis are provided in the appendix.

Indicate whether all inlets will be su
or at-grade and public or private

Basin 4 (1.00 Acres, Q_2=1.3 cfs, Q_5=1.8 cfs, Q_{10}=2.3 cfs, Q_{25}=2.9 cfs, Q_{50}=3.5 cfs, and Q_{100}=4.1 cfs) consists of townhome lots, landscape corridors, and roadway improvements tributary to the proposed 5' type R inlet at Design Point 3. Calculations for Carrside Grove street capacity and inlet analysis are provided in the appendix.

Basin 5 (0.81 Acres, Q_2=1.2 cfs, Q_5=1.7 cfs, Q_{10}=2.2 cfs, Q_{25}=2.7 cfs, Q_{50}=3.2 cfs, and Q_{100}=3.8 cfs) consists of townhome lots, landscape corridors, and roadway improvements tributary to the proposed 5' type R inlet at Design Point 4. Calculations for Fieldside Way street capacity and inlet analysis are provided in the appendix.

Basin 6 (2.58 Acres, Q_2=2.9 cfs, Q_5=4.0 cfs, Q_{10}=5.2 cfs, Q_{25}=6.7 cfs, Q_{50}=8.0 cfs, and Q_{100}=9.4 cfs) consists of townhome lots, landscape corridors, and roadway improvements tributary to the proposed 10' type R inlet at Design Point 5. Calculations for Fieldside Way street capacity and inlet analysis are provided in the appendix.

Basin 7 (0.65 Acres, Q_2=1.0 cfs, Q_5=1.4 cfs, Q_{10}=1.7 cfs, Q_{25}=2.2 cfs, Q_{50}=2.6 cfs, and Q_{100}=3.0 cfs) consists of townhome lots, landscape corridors, and roadway improvements tributary to the proposed 5' type R inlet at Design Point 7. Calculations for Greengate Way street capacity and inlet analysis are provided in the appendix.

Basin 8 (0.06 Acres, Q_2=0.2 cfs, Q_5=0.2 cfs, Q_{10}=0.3 cfs, Q_{25}=0.3 cfs, Q_{50}=0.4 cfs, and Q_{100}=0.4 cfs) consists of a small landscape area and private roadway improvements tributary to the proposed 5' type R inlet at Design Point 6. Calculations for Greengate Way street capacity and inlet analysis are provided in the appendix.

Basin 9 (0.67 Acres, Q_2=0.1 cfs, Q_5=0.3 cfs, Q_{10}=0.5 cfs, Q_{25}=0.9 cfs, Q_{50}=1.2 cfs, and Q_{100}=1.5 cfs) consists of the rear yards of the residential portion of Filing No. 7 tributary to the Villas at Claremont development. Runoff from this area will sheet flow across the proposed landscape tract and be conveyed in a vegetated swale to the proposed EDB.

Show and label swale on drainage map. Include calculations for sizing of swale in appendix.

Calculations need to be provided for sizing of sidewalk chase widths

CONVEYANCE

Internal landscape and residential corridor areas, located within Basins 4 and 6 will utilize 2-foot-wide sidewalk chases to convey landscaped area stormwater swale flows into the adjacent street curb flow lines. A separate hydrologic analysis has been performed for the designated internal areas (Sub-Basin 4.1 and 6.1, respectively), and has been included in the Appendix.

Sub-Basin 4.1 (0.33 Acres, Q_2=0.7 cfs, Q_5=1.0 cfs, Q_{10}=1.2 cfs, Q_{25}=1.4 cfs, Q_{50}=1.7 cfs, and Q_{100}=1.9 cfs) will be collected into a 2' wide x 5.5' long sidewalk curb chase and outfall north into Carside Grove curb flow lines and be conveyed to a low point near a proposed private 5' storm inlet located at Design Point 3.

Sub-Basin 6.1 (0.46 Acres, Q_2=1.0 cfs, Q_5=1.3 cfs, Q_{10}=1.6 cfs, Q_{25}=1.9 cfs, Q_{50}=2.2 cfs, and Q_{100}=2.6 cfs) will be collected into a 2' wide x 5.5' long sidewalk curb chase and outfall north into Fieldside View curb flow lines and be conveyed to a low point near a proposed private 10' storm inlet located at Design Point 5.

Flows at DP-7 will be collected in a 5' Type R inlet and outfall in an 18" RCP at 0.50% to the inlet at DP-6. Combined flows at DP-A of Q_5=1.6 cfs, Q_{100}=3.4 will be conveyed north in an 18" RCP at 1.31% to the proposed manhole at DP-B.

Flows from DP-5 will be collected in a 5' Type R inlet and outfall in an 18" RCP at 0.50% to the inlet at DP-4. Flows from DP-4 will be collected in a 5' Type R inlet. Combined flows from DP-4 and DP-5 will be conveyed in an 18" RCP at 0.50% to the manhole at DP-B

Combined outflow from the manhole at DP-B will be conveyed in a 24" RCP storm sewer at 0.50% to the manhole at DP-C and combined with flows intercepted in the 5' Type R inlet at DP-3. Combined flows from DP-C of Q_5=6.1 cfs, Q_{100}=19.0 cfs will be conveyed in a 24" RCP at 0.75% to the 5' Type R inlet at DP-D. Combined flows at DP-D of Q_5=9.8 cfs, Q_{100}=21.9 will be conveyed in a 24" RCP at 8.07% to pond outfall within the proposed EDB.

EXTENDED DETENTION BASIN

Include EURV volume

Per DCMv2 Section 4.3, outlet pipe should be 18" minimum. CDs show 15" on plan and 24" on section. Revise to remove discrepancies.

Proposed EDB 'B will require a WQCV of 0.132 acre-feet and a total storage volume of 0.712 acre-ft. The pond provides 0.720 acre-ft of storage below the emergency outfall. The EDB will be designed to meet current Urban Drainage design criteria for forebay, outfall structure, and micropool to be presented in final construction drawings for the development. Proposed EDB 'B will outfall through a 12" RCP storm sewer directly to the East Branch of Sand Creek. The Basin outfalls developed runoff of (Q_5=1.1 cfs, Q_{100}=5.2 cfs) to Design Point E. The emergency spillway will consist of a 20' wide trapezoidal weir constructed of soil riprap conveying the undetained 100-YR flow from Design Point 1 of 26.1 cfs at a maximum depth of 0.5'. Emergency overflow will be conveyed directly to the East Branch of Sand Creek. See Appendix for calculations.

Provide calcs for forebay

The improved trail adjacent to Sand Creek has not been installed adjacent to the pond. The area will be graded to represent anticipated trail installation but will be constructed from pond overflow through channel toe with soil riprap with seeded topsoil cover. Future installation of trail segment is anticipated to be concrete trail along top of channel embankment. Spillway is intended only for

Per Pond spreadsheet, at 100-yr level volume provided is only 0.636 ac-ft, which does not meet required 100-year volume

This is construction drawing level. Design for all these items need to be provided in appendix.

Provide calculations in appendix for sizing of spillway riprap.

This is final design. Details need to be provided.

emergency outflow path to adjacent channel. Major storm event is conveyed through outlet structure and conveyed through pipe system to channel bottom. Final design will provide additional detail on conveyance.

The pond maintenance access is provided from proposed parking located north of the intersection of Belton Heights and Carrside Grove. The southerly portion of access above all proposed water surface elevations is combined with required sanitary sewer access and will be constructed to Utility District Standards which exceed county requirements. The portion of the pond will be constructed of an all-weather stable surface of roadbase, gravel, or roc a maximum 10% grade per ECM 3.3.3.K.

% impervious are not matching with C-values chosen in hydrology spreadsheet. Please update and coordinate between values.

The area of the development tributary to proposed EDB 'B' includes the following:

Tract/Use	Area	% Impervious
Townhome	2.50	80%
Roadways	1.57	100%
Open Space	3.71	10%
Rear Yards (Filing 7)	0.67	30%
Total Area	8.45	49% Ave % Impervious

UPdate spreadsheet to match this table.

DRAINAGE METHODOLOGY

Report should be done El Paso County CDM V and 2 with Vol 1 update

This drainage report was prepared in accordance to the criteria established in the City of Colorado Springs Drainage Criteria Manual Volumes 1 and 2, as revised January 2021.

The rational method for drainage basin study areas of less than 100 acres was utilized in the analysis. For the Rational Method, flows were calculated for the 2, 5, 10, 25, 50, and 100-year recurrence intervals. The average runoff coefficients, 'C' values, are taken from Table 6-6 and the Intensity-Duration-Frequency curves are taken from Figure 6-5 of the City Drainage Criteria Manual. Time of concentration for overland flow and storm drain or gutter flow are calculated per Section 3.2 of the City Drainage Criteria Manual. Calculations for the Rational Method are shown in the Appendix of this report.

Ch 6

Mile High Flood District

Urban Drainage and Flood Control District methodology was utilized for determination of street capacity and inlet sizing. Calculations are shown in the appendix of this report. Manning's Calculations are provided for preliminary pipe sizing and Hydraulic Grade Line Calculations will be submitted with Final Storm Sewer Construction Drawings and FDR Addendum.

The analysis, presented in the appendix, provides more detailed calculations for the system in accordance with the requirements of the City of Colorado Springs Drainage Criteria Manual Vol. I. The storm sewer plan and profile drawings have been submitted concurrently with this analysis.

Should be designed per El Paso County DCM criteria.

CD's were submitted with this report. HGL's need to be provided with next submittal.

WATER QUALITY/4-STEP PROCESS

4-STEP PROCESS

STEP 1: EMPLOY RUNOFF REDUCTION PRACTICES

The development addresses Low Impact Development strategies primarily through the utilization of landscape swales within rear lots directing runoff from rooflines and patios through swales with minimal longitudinal grade prior to outfall to the private street system.

STEP 2: STABILIZE DRAINAGEWAYS

The ultimate recipient of runoff from the site is the East Branch of Sand Creek. The adjacent reach of Sand Creek was improved to ultimate DBPW recommendations with the development of Filing No. 7.

STEP 3: PROVIDE WATER QUALITY CAPTURE VOLUME

On-site flow is directed to a proposed extended detention basin providing water quality capture volume and attenuated release rates prior to release off-site. Release from the extended detention basin is less than assumed in the Final Drainage Report for Filing No. 7 as development was assumed to be commercial in nature and no detention scenario was initially proposed.

STEP 4: CONSIDER NEED FOR INDUSTRIAL AND COMMERCIAL BMP'S

A Grading, Erosion Control, and Stormwater Quality Plan and narrative have been submitted concurrently for the development and will be subject to county approval prior to any soil disturbance. The erosion control plan included specific source control BMP's as well defined overall site management practices for the construction period. No industrial or commercial uses are proposed with the Villas at Claremont Ranch development. No temporary batch plant operations are proposed with residential development.

COST ESTIMATE

Private Improvements Non-reimbursable

5' TYPE R INLET	5 EA	@$	4,800/EA	$	24,000
10' TYPE R INLET	1 EA	@$	7,500/EA	$	7,500
TYPE I MH	3 EA	@$	4,000/EA	$	12,000
15" RCP	97 LF	@$	40/LF	$	3,880
18"RCP	381 LF	@$	45/LF	$	17,145
24" RCP	359 LF	@$	55/LF	$	19,745
Extended Detention Basin	1 LS	@$	15,000/LS	$	15,000
			SUBTOTAL	**$**	**99,270**
			15% CONTINGENCY	*$*	*14,891*
			TOTAL	**$**	**114,161**

Will review estimate at next submittal, when full storm design is submitted for comparison.

DRAINAGE FEE CALCULATION

Drainage Fees were accounted for with the original platting of the parcel as tracts G and A of Claremont Ranch Filing No. 7 (see appendix).

DRAINAGE METHODOLOGY

This drainage report was prepared in accordance to the criteria established in the City of Colorado Springs/El Paso County Drainage Criteria Manual Volumes 1 and 2, as revised May 2015.

The rational method for drainage basin study areas of less than 100 acres was utilized in the analysis. For the Rational Method, flows were calculated for the 2, 5, 10, 25, 50, and 100-year recurrence intervals. The average runoff coefficients, 'C' values, are taken from Table 6-6 and the Intensity-Duration-Frequency curves are taken from Figure 6-5 of the City of Colorado Springs/El Paso County Drainage Criteria Manual. Time of concentration for overland flow and storm drain or gutter flow are calculated per Section 3.2 of the City Drainage Criteria Manual. Calculations for the Rational Method are shown in the Appendix of this report.

SUMMARY

The Villas at Claremont Ranch Development exhibits drainage patterns consistent with those anticipated in the Final Drainage Report for Filing No. 7. Volume of water released from the site anticipated in the Filing 7 Final Drainage Report has been significantly reduced due to the parcel developing as residential rather commercial and implementation of on-site water quality and full spectrum detention facilities as required by current criteria. Private Storm system is designed to intercept the full 100-year runoff event and convey to existing east branch of sand creek. Development of the parcel is in conformance of current El Paso County criteria and will not adversely affect downstream properties or facilities.

REFERENCES:

El Paso County, Colorado Engineering Division Drainage Criteria Manual Volume 1, (1990), revised Oct 2018

El Paso County, Colorado Engineering Division Drainage Criteria Manual Volume 2, November 2002

El Paso County, Colorado Engineering Division Drainage Criteria Manual Update, (2015)

El Paso County Engineering Criteria Manual, (2004), revised Oct 2020

"Claremont Ranch Subdivision Filing No. 7 Preliminary and Final Drainage Report", prepared by Engineering and Surveying, Inc., dated May 2004.

"Final Master Development Drainage Plan and Preliminary Drainage Plan for the Claremont Ranch", prepared by Matrix Design Group, Inc., revised July 2002.

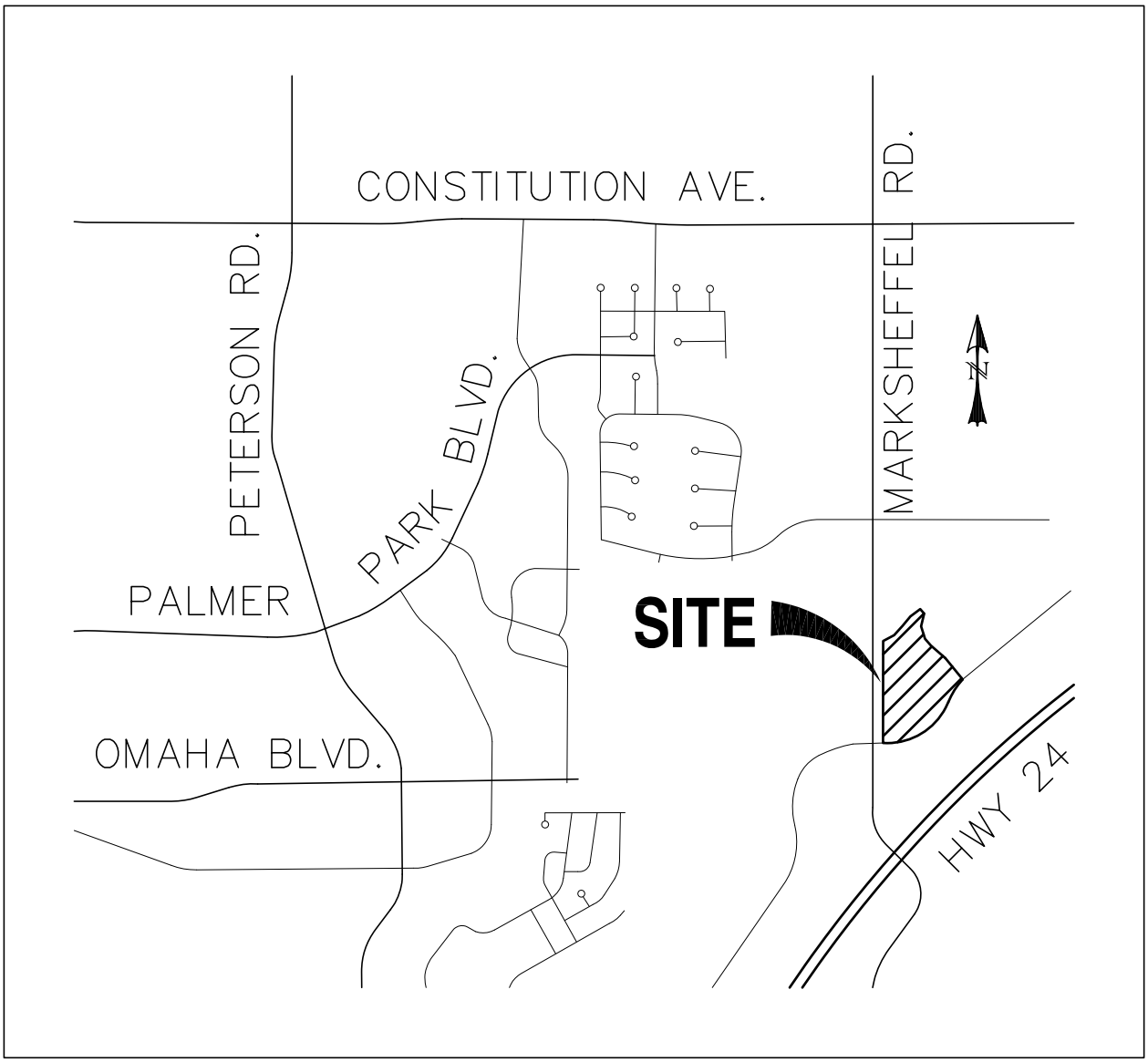
"Sand Creek Drainage Basin Planning Study Preliminary Drainage Report", prepared by Kiowa Engineering Corporation, revised March 21996.

Preliminary and Final Drainage Report for International Bible Society Filing No. 1" prepared by URS Consultants, dated August, 1988.

Flood Insurance rate map 08041C0756 F, as revised to reflect LOMR Case No. 08-08-0630P

Natural Resources Conservation Service Web Soil Survey

APPENDIX



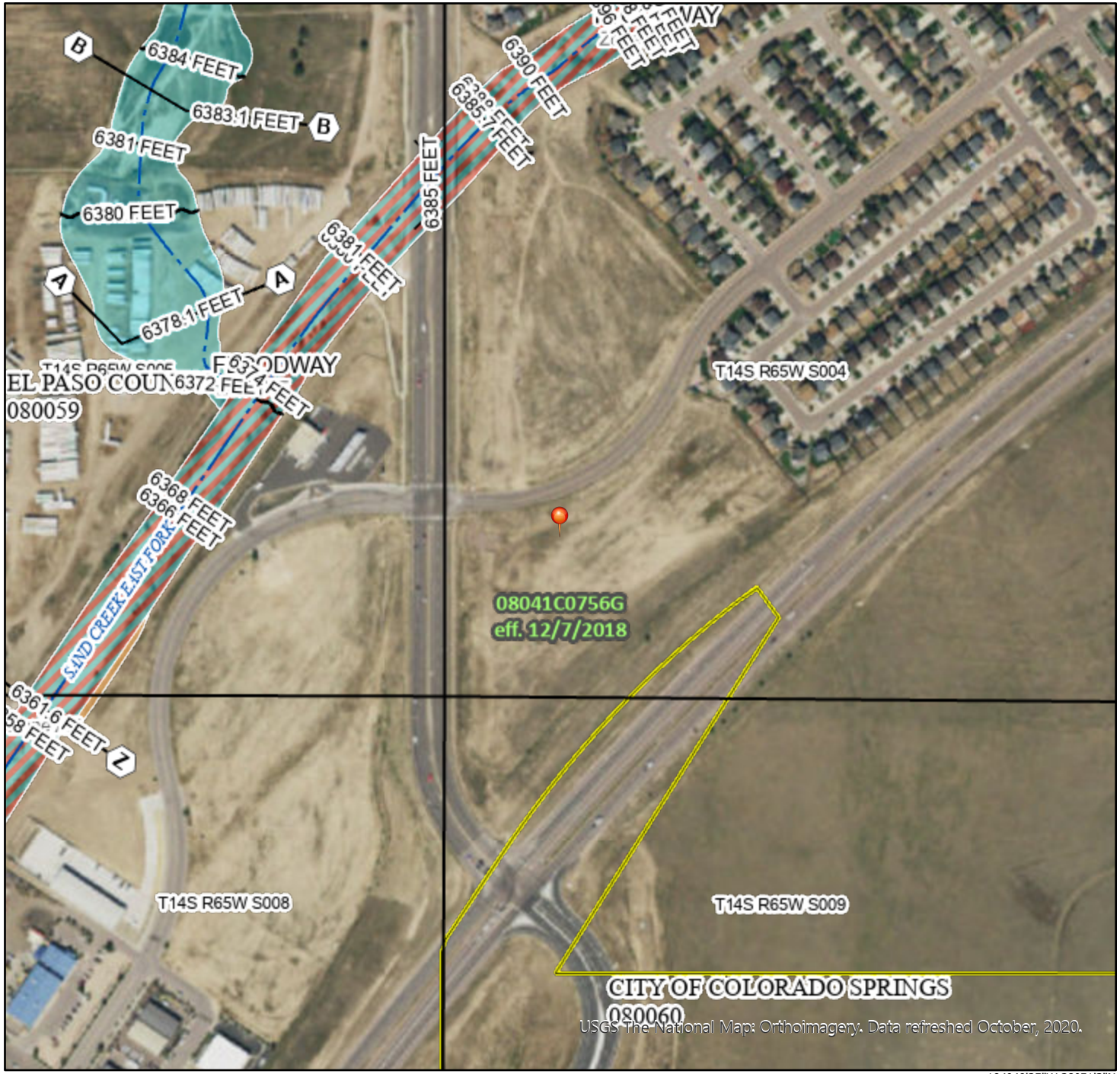
VICINITY MAP

SCALE: N.T.S.

National Flood Hazard Layer FIRMette

FEMA

104°41'12"W 38°51'31"N



104°40'35"W 38°51'3"N

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

1:6,000

Legend

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

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

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

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

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

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

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

N

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

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

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 11/17/2020 at 2:43 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

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

Hydrologic Soil Group—El Paso County Area, Colorado
(VILLAS AT CLAREMONT RANCH)

Map Scale: 1:1,920 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 25 50 100 150

Feet: 0 50 100 200 300

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 14, Sep 23, 2016

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

Date(s) aerial images were photographed: Apr 15, 2011—Mar 9, 2017

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
8	Blakeland loamy sand, 1 to 9 percent slopes	A	1.6	16.2%
10	Blendon sandy loam, 0 to 3 percent slopes	B	7.1	74.2%
28	Ellicott loamy coarse sand, 0 to 5 percent slopes	A	0.9	9.6%
Totals for Area of Interest			**9.6**	**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

CLAREMONT RANCH SUBDIVISION
FILING NO. 7
PRELIMINARY & FINAL DRAINAGE REPORT

May 2004

Prepared for:

SWAT X, LLC.
20 Boulder Crescent, 2nd Floor
Colorado Springs, CO 80903
(719) 471-1742

Prepared by:

Engineering and Surveying, Inc.
20 Boulder Crescent, 2nd Floor
Colorado Springs, CO 80903
(719) 955-5485

Project #01-006

DRAINAGE AND BRIDGE FEES

The Claremont Ranch Subdivision, Filing No. 7, site is located entirely within the Sand Creek Drainage Basin. The 2004 Drainage and Bridge Fees per El Paso County for this site are listed below.

Drainage Fee: $ 15,000/Impervious acre

Bridge Fee: $ 1,336/Impervious acre

The impervious area for this subdivision was calculated from the site plan since this is a residential project.

The total platted acreage for the site is 17.79 acres consisting of 16.61 residential acres with an impervious rating of 44% and 1.18 open space acres at 7% impervious. Therefore, the calculated impervious area is 7.38 acres (42%).

Drainage Fee: $ 15,000/Impervious acre x 42% Impervious = $ 6,222/ac.

Bridge Fee: $ 1,336/Impervious acre x 42% Impervious = $ 554/ac.

Total fees due per platted acreage = $ 6,776/ac.

The total fee obligation for Claremont Ranch Subdivision Filing No. 7 is summarized as follows:

Drainage fees for subdivision: $ 6,222/ac x 17.79 ac = $ 110,689.38

Bridge fees for subdivision: $ 554/ac x 17.79 ac = $ 9,855.66

Total fees for subdivision: $ 6,776/ac x 17.79 ac = $ 120,545.04

Bridge Fees in the amount of $9,855.66 are due with final platting of Filing No. 7.

Claremont Ranch Filings #1-7 – Overall Drainage Fee Calculations:

Filing #	Required Drainage Fees	Sand Creek & Sub-tributary Improvement Construction Costs
1	$316,744.50	$376,000.00
2	$197,274.00	$355,850.00
3	$200,700.00	$0.00
4	$293,100.00	$433,250.00
5	$140,285.00	$517,145.00
6	$283,228.50	$0.00
7	**$110,689.38**	**$282,000.00**
Total	**$1,542,011.38**	**$1,964,245.00**

C-values used are not corresponding to % impervious used in table within report. Please correlate spreadsheet and table.

Include Title for what this spreadsheet is.

											CONVEYANCE TC						TT	INTENSITY						TOTAL FLOWS					
BASIN	**AREA TOTAL (Acres)**	**C_2**	**C_5**	**C_{10}**	**C_{25}**	**C_{50}**	**C_{100}**	**Length (ft)**	**Height (ft)**	**TI (min)**	**Length (ft)**	**Height (ft)**	**C_V**	**Slope (%)**	**Velocity (fps)**	**TC (min)**	**TOTAL (min)**	**I_2 (in/hr)**	**I_5 (in/hr)**	**I_{10} (in/hr)**	**I_{25} (in/hr)**	**I_{50} (in/hr)**	**I_{100} (in/hr)**	**Q_2 (c.f.s.)**	**Q_5 (c.f.s.)**	**Q_{10} (c.f.s.)**	**Q_{25} (c.f.s.)**	**Q_{50} (c.f.s.)**	**Q_{100} (c.f.s.)**
1	2.25	**0.05**	**0.12**	**0.20**	**0.30**	**0.34**	**0.39**	100	4	12.0	1030	12	7	1.2%	0.8	22.7	34.7	1.8	2.3	2.6	3.0	3.4	3.8	**0.2**	**0.6**	**1.2**	**2.0**	**2.6**	**3.3**
LANDSCAPED	2.25	0.05	0.12	0.20	0.30	0.34	0.39																						
2	1.92	**0.25**	**0.30**	**0.37**	**0.45**	**0.48**	**0.52**	100	4	9.8	451	10	7	2.2%	1.0	7.2	17.0	2.7	3.3	3.9	4.4	5.0	5.6	**1.3**	**1.9**	**2.7**	**3.8**	**4.6**	**5.6**
HARDSCAPE	0.51	0.79	0.81	0.83	0.85	0.87	0.88																						
LANDSCAPED	1.41	0.05	0.12	0.20	0.30	0.34	0.39																						
3	0.76	**0.41**	**0.45**	**0.49**	**0.54**	**0.57**	**0.59**	46	2.5	4.8	440	7	20	1.6%	2.5	2.9	7.7	3.6	4.5	5.3	6.0	6.8	7.6	**1.1**	**1.5**	**2.0**	**2.5**	**2.9**	**3.4**
LOTS	0.76	0.41	0.45	0.49	0.54	0.57	0.59																						
4	1.00	**0.41**	**0.45**	**0.49**	**0.54**	**0.57**	**0.59**	49	2	5.5	197	3	7	1.5%	0.9	3.8	10.2	3.3	4.1	4.8	5.5	6.1	6.9	**1.3**	**1.8**	**2.3**	**2.9**	**3.5**	**4.1**
LOTS	1.00	0.41	0.45	0.49	0.54	0.57	0.59				*138*	*2*	*20*	1.4%	2.4	1.0													
5	0.81	**0.41**	**0.45**	**0.49**	**0.54**	**0.57**	**0.59**	51	2	5.7	176	2.5	20	1.4%	2.4	1.2	6.9	3.7	4.7	5.5	6.2	7.0	7.9	**1.2**	**1.7**	**2.2**	**2.7**	**3.2**	**3.8**
LOTS	0.81	0.41	0.45	0.49	0.54	0.57	0.59																						
6	2.58	**0.37**	**0.41**	**0.45**	**0.51**	**0.54**	**0.57**	91	2	9.8	441	10	20	2.3%	3.0	2.4	12.2	3.1	3.8	4.5	5.1	5.7	6.4	**2.9**	**4.0**	**5.2**	**6.7**	**8.0**	**9.4**
LOTS	2.26	0.41	0.45	0.49	0.54	0.57	0.59																						
LANDSCAPED	0.32	0.05	0.12	0.20	0.30	0.34	0.39																						
7	0.65	**0.41**	**0.45**	**0.49**	**0.54**	**0.57**	**0.59**	54	2	5.9	136	2	20	1.5%	2.4	0.9	6.9	3.7	4.7	5.5	6.3	7.0	7.9	**1.0**	**1.4**	**1.7**	**2.2**	**2.6**	**3.0**
LOTS	0.65	0.41	0.45	0.49	0.54	0.57	0.59																						
8	0.06	**0.73**	**0.75**	**0.77**	**0.80**	**0.82**	**0.83**	10	0.5	1.3	38	0.5	20	1.3%	2.3	0.3	5.0	4.1	5.2	6.0	6.9	7.8	8.7	**0.2**	**0.2**	**0.3**	**0.3**	**0.4**	**0.4**
HARDSCAPE	0.05	0.79	0.81	0.83	0.85	0.87	0.88										*MINIMUM*												
LOTS	0.01	0.41	0.45	0.49	0.54	0.57	0.59																						
9	0.67	**0.05**	**0.12**	**0.20**	**0.30**	**0.34**	**0.39**	87	3	11.8	451	10	15	2.2%	2.2	3.4	15.1	2.8	3.5	4.1	4.7	5.3	5.9	**0.1**	**0.3**	**0.5**	**0.9**	**1.2**	**1.5**
REAR YARD	0.67	0.05	0.12	0.20	0.30	0.34	0.39																						

Calculated by: DLM

Date: 10/1/2017

Include Title for what this spreadsheet is.

		WEIGHTED						TT	INTENSITY						TOTAL FLOWS					
DESIGN POINT	**AREA TOTAL (Acres)**	**C_2**	**C_5**	**C_{10}**	**C_{25}**	**C_{50}**	**C_{100}**	**TOTAL (min)**	**I_2 (in/hr)**	**I_5 (in/hr)**	**I_{10} (in/hr)**	**I_{25} (in/hr)**	**I_{50} (in/hr)**	**I_{100} (in/hr)**	**Q_2 (c.f.s.)**	**Q_5 (c.f.s.)**	**Q_{10} (c.f.s.)**	**Q_{25} (c.f.s.)**	**Q_{50} (c.f.s.)**	**Q_{100} (c.f.s.)**
7 BASIN 7	**0.65**	**0.41**	**0.45**	**0.49**	**0.54**	**0.57**	**0.59**	6.9	3.7	4.7	5.5	6.3	7.0	7.9	**1.0**	**1.4**	**1.7**	**2.2**	**2.6**	**3.0**
6 BASIN 8	**0.06**	**0.73**	**0.75**	**0.77**	**0.80**	**0.82**	**0.83**	5.0	4.1	5.2	6.0	6.9	7.8	8.7	**0.2**	**0.2**	**0.3**	**0.3**	**0.4**	**0.4**
5 BASIN 6	**2.58**	**0.37**	**0.41**	**0.45**	**0.51**	**0.54**	**0.57**	12.2	3.1	3.8	4.5	5.1	5.7	6.4	**2.9**	**4.0**	**5.2**	**6.7**	**8.0**	**9.4**
4 BASIN 5	**0.81**	**0.41**	**0.45**	**0.49**	**0.54**	**0.57**	**0.59**	6.9	3.7	4.7	5.5	6.2	7.0	7.9	**1.2**	**1.7**	**2.2**	**2.7**	**3.2**	**3.8**
3 BASIN 4	**1.00**	**0.41**	**0.45**	**0.49**	**0.54**	**0.57**	**0.59**	10.2	3.3	4.1	4.8	5.5	6.1	6.9	**1.3**	**1.8**	**2.3**	**2.9**	**3.5**	**4.1**
2 BASIN 3	**0.76**	**0.41**	**0.45**	**0.49**	**0.54**	**0.57**	**0.59**	7.7	3.6	4.5	5.3	6.0	6.8	7.6	**1.1**	**1.5**	**2.0**	**2.5**	**2.9**	**3.4**
1	**8.45**	**0.33**	**0.38**	**0.43**	**0.49**	**0.52**	**0.55**	17.0	2.7	3.3	3.9	4.4	5.0	5.6	**7.5**	**10.7**	**14.1**	**18.5**	**22.2**	**26.1**
BASIN 2	1.92	0.25	0.30	0.37	0.45	0.48	0.52													
BASIN 9	0.67	0.05	0.12	0.20	0.30	0.34	0.39													
DP-D	5.86	0.39	0.44	0.48	0.53	0.56	0.58													

Missing Design Points 8A and 8B as shown on drainage map. Please include here or in sub-basin spreadsheet. Also include calculations for sizing of riprap and length/width of riprap pads at these locations.

Calculated by: DLM

Date: 10/1/2017

Include Title for what this spreadsheet is.

		WEIGHTED						TT	INTENSITY						TOTAL FLOWS					
DESIGN POINT	**AREA TOTAL (Acres)**	**C_2**	**C_5**	**C_{10}**	**C_{25}**	**C_{50}**	**C_{100}**	**TOTAL (min)**	**I_2 (in/hr)**	**I_5 (in/hr)**	**I_{10} (in/hr)**	**I_{25} (in/hr)**	**I_{50} (in/hr)**	**I_{100} (in/hr)**	**Q_2 (c.f.s.)**	**Q_5 (c.f.s.)**	**Q_{10} (c.f.s.)**	**Q_{25} (c.f.s.)**	**Q_{50} (c.f.s.)**	**Q_{100} (c.f.s.)**
A	**0.71**	**0.44**	**0.48**	**0.51**	**0.56**	**0.59**	**0.61**	6.9	3.7	4.7	5.5	6.3	7.0	7.9	**1.2**	**1.6**	**2.0**	**2.5**	**3.0**	**3.4**
DP-6	0.06	0.73	0.75	0.77	0.80	0.82	0.83													
DP-7	0.65	0.41	0.45	0.49	0.54	0.57	0.59													
B	4.10	**0.39**	**0.43**	**0.47**	**0.53**	**0.56**	**0.58**	12.2	3.1	3.8	4.5	5.1	5.7	6.4	**4.8**	**6.7**	**8.6**	**11.0**	**13.1**	**15.2**
DP-5	2.58	0.37	0.41	0.45	0.51	0.54	0.57													
DP-4	0.81	0.41	0.45	0.49	0.54	0.57	0.59													
DP-A	0.71	0.44	0.48	0.51	0.56	0.59	0.61													
C	**5.10**	**0.39**	**0.43**	**0.48**	**0.53**	**0.56**	**0.58**	12.2	3.1	3.8	4.5	5.1	5.7	6.4	**6.1**	**8.5**	**10.8**	**13.8**	**16.4**	**19.0**
DP3	1.00	0.41	0.45	0.49	0.54	0.57	0.59													
DP-B	4.10	0.39	0.43	0.47	0.53	0.56	0.58													
D	**5.86**	**0.39**	**0.44**	**0.48**	**0.53**	**0.56**	**0.58**	12.2	3.1	3.8	4.5	5.1	5.7	6.4	**7.1**	**9.8**	**12.5**	**15.9**	**18.9**	**21.9**
DP-2	0.76	0.41	0.45	0.49	0.54	0.57	0.59													
DP-C	5.10	0.39	0.43	0.48	0.53	0.56	0.58													
E POND OUTFALL															**2.6**	**4.3**	**6.5**	**9.7**	**10.0**	**10.4**

Flows do not match release rates from pond pond spreadsheet

Calculated by: DLM

Date: 10/1/2017

Include Title for what this spreadsheet is.

Sub-Basin Analysis for Sidewalk Chase

											CONVEYANCE TC						TT	INTENSITY						TOTAL FLOWS					
BASIN	**AREA TOTAL (Acres)**	**C_2**	**C_5**	**C_{10}**	**C_{25}**	**C_{50}**	**C_{100}**	**Length (ft)**	**Height (ft)**	**TI (min)**	**Length (ft)**	**Height (ft)**	**C_V**	**Slope (%)**	**Velocity (fps)**	**TC (min)**	**TOTAL (min)**	**I_2 (in/hr)**	**I_5 (in/hr)**	**I_{10} (in/hr)**	**I_{25} (in/hr)**	**I_{50} (in/hr)**	**I_{100} (in/hr)**	**Q_2 (c.f.s.)**	**Q_5 (c.f.s.)**	**Q_{10} (c.f.s.)**	**Q_{25} (c.f.s.)**	**Q_{50} (c.f.s.)**	**Q_{100} (c.f.s.)**
4.1	0.33	**0.61**	**0.64**	**0.67**	**0.71**	**0.74**	**0.76**	47	2	3.8	190	3	7	1.6%	0.9	3.6	7.4	3.7	4.6	5.4	6.1	6.9	7.7	**0.7**	**1.0**	**1.2**	**1.4**	**1.7**	**1.9**
HARDSCAPE	0.25	0.79	0.81	0.83	0.85	0.87	0.88																						
LANDSCAPED	0.08	0.05	0.12	0.20	0.30	0.34	0.39																						
6.1	0.46	**0.63**	**0.66**	**0.69**	**0.73**	**0.75**	**0.77**	89	2	6.1	136	2	7	1.5%	0.8	2.7	8.8	3.4	4.3	5.0	5.8	6.5	7.3	**1.0**	**1.3**	**1.6**	**1.9**	**2.2**	**2.6**
HARDSCAPE	0.36	0.79	0.81	0.83	0.85	0.87	0.88																						
LANDSCAPED	0.10	0.05	0.12	0.20	0.30	0.34	0.39																						

Calculated by: SLP

Date: 7/27/2022

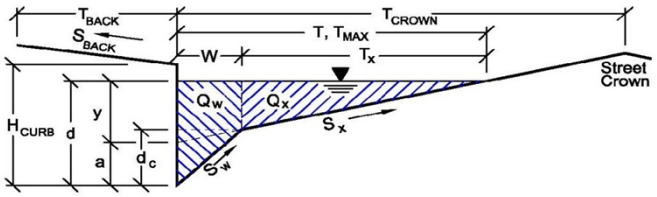
Use newest version of MHFD Inlet spreadsheet

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

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

Project: VILLAS AT CLAREMONT RANCH

Inlet ID: DP-2



Gutter Geometry (Enter data in the blue cells)			
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	5.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.015	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	13.2	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 =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.015	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	13.0	13.0	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} =**	**SUMP**	**SUMP**	**cfs**

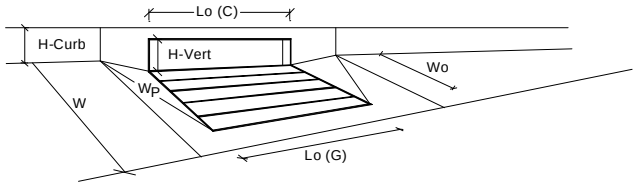
Minor storm max. allowable capacity GOOD - greater than flow given on sheet 'Q-Peak'

Major storm max. allowable capacity GOOD - greater than flow given on sheet 'Q-Peak'

INLET IN A SUMP OR SAG LOCATION

Project = VILLAS AT CLAREMONT RANCH

Inlet ID = DP-2



Based on width of road, 6" of depth can't be achieved prior to flows overtopping road. Re-evaluate inlet widths or flow routing on all inlets.

Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Inlet Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	4.0	6.0	inches
Grate Information		MINOR	MAJOR	
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 =	1.17	1.17	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**2.6**	**5.9**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	1.5	3.4	cfs

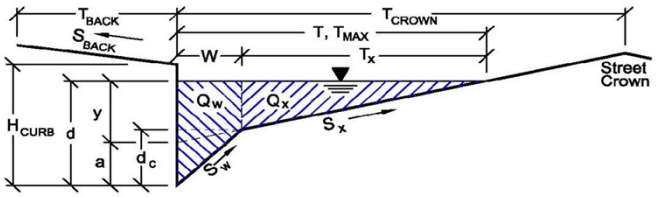
☐ Override Depths

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

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

Project: VILLAS AT CLAREMONT RANCH

Inlet ID: DP-3



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	5.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.015	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	13.2	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 =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.015	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	13.0	13.0	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 Depth Criterion

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

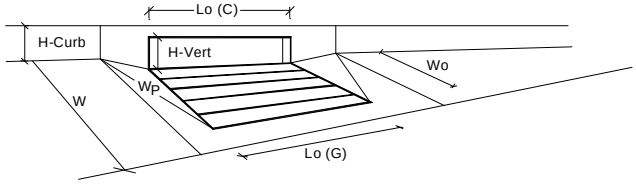
Minor storm max. allowable capacity GOOD - greater than flow given on sheet 'Q-Peak'

Major storm max. allowable capacity GOOD - greater than flow given on sheet 'Q-Peak'

INLET IN A SUMP OR SAG LOCATION

Project = VILLAS AT CLAREMONT RANCH

Inlet ID = DP-3



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Inlet Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	4.0	6.0	inches
Grate Information		MINOR	MAJOR	
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 =	1.17	1.17	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**2.6**	**5.9**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	1.8	4.1	cfs

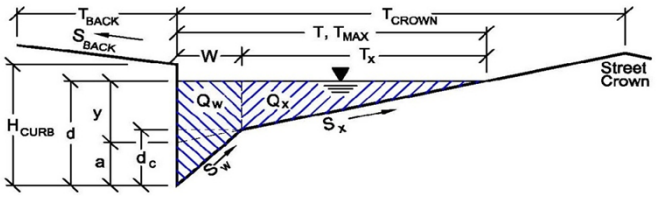
☐ Override Depths

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

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

Project: VILLAS AT CLAREMONT RANCH

Inlet ID: DP-4



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	5.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.015	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	13.2	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 =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.015	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	13.0	13.0	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 Depth Criterion

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

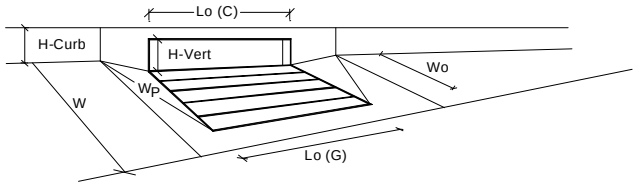
Minor storm max. allowable capacity GOOD - greater than flow given on sheet 'Q-Peak'

Major storm max. allowable capacity GOOD - greater than flow given on sheet 'Q-Peak'

INLET IN A SUMP OR SAG LOCATION

Project = VILLAS AT CLAREMONT RANCH

Inlet ID = DP-4



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Inlet Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	4.0	6.0	inches
Grate Information		MINOR	MAJOR	
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 =	1.17	1.17	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**2.6**	**5.9**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	1.7	3.8	cfs

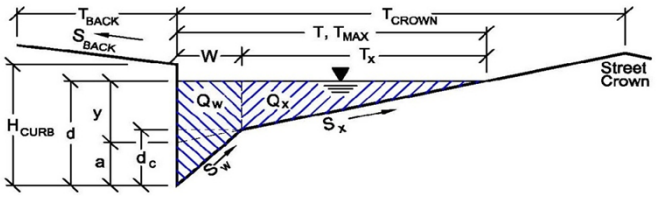
☐ Override Depths

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

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

Project: VILLAS AT CLAREMONT RANCH

Inlet ID: DP-5



Gutter Geometry (Enter data in the blue cells)			
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	5.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.015	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	13.2	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 =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.015	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	13.0	13.0	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} =**	**SUMP**	**SUMP**	**cfs**

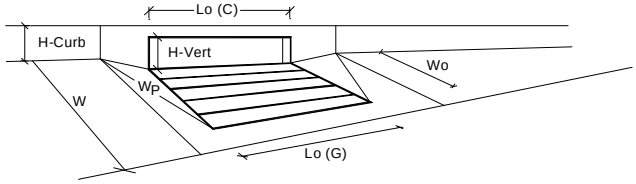
Minor storm max. allowable capacity GOOD - greater than flow given on sheet 'Q-Peak'

Major storm max. allowable capacity GOOD - greater than flow given on sheet 'Q-Peak'

INLET IN A SUMP OR SAG LOCATION

Project = VILLAS AT CLAREMONT RANCH

Inlet ID = DP-5



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Inlet Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	4.2	6.0	inches
Grate Information		MINOR	MAJOR	
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	10.00	10.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	1.17	1.17	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**4.2**	**9.8**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	4.0	9.4	cfs

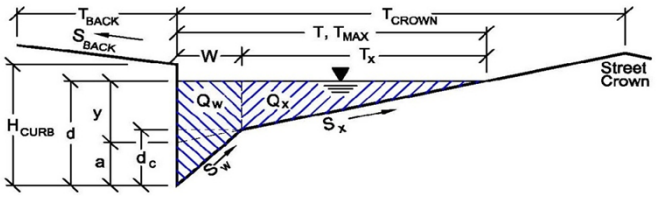
☐ Override Depths

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

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

Project: VILLAS AT CLAREMONT RANCH

Inlet ID: DP-6



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	5.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.015	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	13.2	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 =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.015	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	13.0	13.0	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 Depth Criterion

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

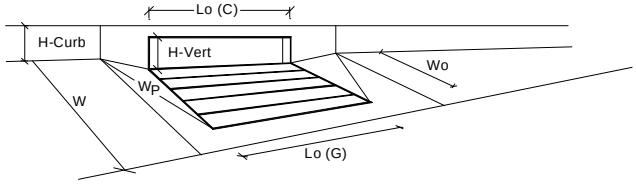
Minor storm max. allowable capacity GOOD - greater than flow given on sheet 'Q-Peak'

Major storm max. allowable capacity GOOD - greater than flow given on sheet 'Q-Peak'

INLET IN A SUMP OR SAG LOCATION

Project = VILLAS AT CLAREMONT RANCH

Inlet ID = DP-6



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Inlet Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	4.0	6.0	inches
Grate Information		MINOR	MAJOR	
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 =	1.17	1.17	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**2.6**	**5.9**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	0.2	0.4	cfs

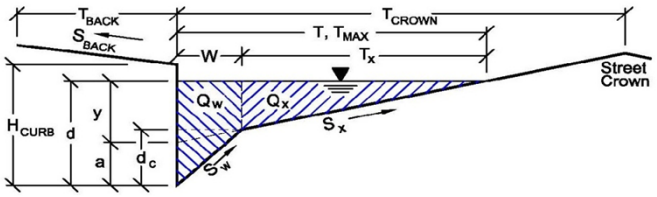
☐ Override Depths

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

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

Project: VILLAS AT CLAREMONT RANCH

Inlet ID: DP-7



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	5.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.015	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	13.2	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 =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.015	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	13.0	13.0	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 Depth Criterion

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

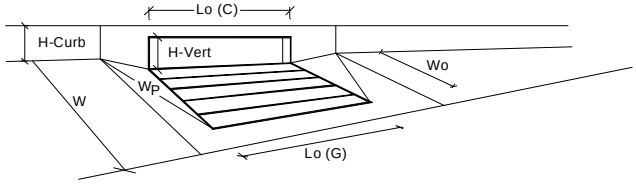
Minor storm max. allowable capacity GOOD - greater than flow given on sheet 'Q-Peak'

Major storm max. allowable capacity GOOD - greater than flow given on sheet 'Q-Peak'

INLET IN A SUMP OR SAG LOCATION

Project = VILLAS AT CLAREMONT RANCH

Inlet ID = DP-7

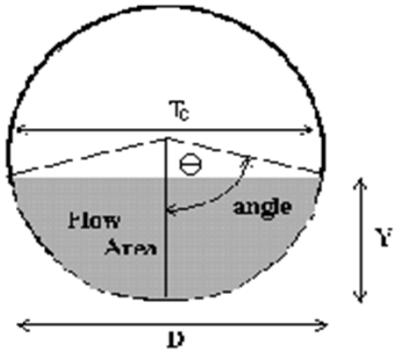


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Inlet Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	4.0	6.0	inches
Grate Information		MINOR	MAJOR	
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 =	1.17	1.17	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**2.6**	**5.9**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	1.4	3.0	cfs

☐ Override Depths

CIRCULAR CONDUIT FLOW (Normal & Critical Depth Computation)

Project: VILLAS AT CLAREMONT RANCH
Pipe ID: DP-A



Provide full design of storm sewer system including HGL's

Design Information (Input)			
Pipe Invert Slope	So =	0.0050	ft/ft
Pipe Manning's n-value	n =	0.0130	
Pipe Diameter	D =	18.00	inches
Design discharge	**Q =**	**3.40**	**cfs**

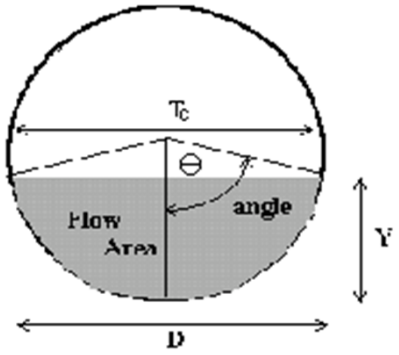
Full-flow Capacity (Calculated)			
Full-flow area	Af =	1.77	sq ft
Full-flow wetted perimeter	Pf =	4.71	ft
Half Central Angle	Theta =	3.14	radians
Full-flow capacity	Qf =	7.45	cfs

Calculation of Normal Flow Condition			
Half Central Angle (0<Theta<3.14)	Theta =	1.52	radians
Flow area	An =	0.83	sq ft
Top width	Tn =	1.50	ft
Wetted perimeter	Pn =	2.28	ft
Flow depth	Yn =	0.71	ft
Flow velocity	Vn =	4.12	fps
Discharge	Qn =	3.40	cfs
Percent Full Flow	Flow =	45.6%	of full flow
Normal Depth Froude Number	Fr_n =	0.98	subcritical

Calculation of Critical Flow Condition			
Half Central Angle (0<Theta-c<3.14)	Theta-c =	1.51	radians
Critical flow area	Ac =	0.81	sq ft
Critical top width	Tc =	1.50	ft
Critical flow depth	Yc =	0.70	ft
Critical flow velocity	Vc =	4.18	fps
Critical Depth Froude Number	Fr_c =	1.00	

CIRCULAR CONDUIT FLOW (Normal & Critical Depth Computation)

Project: VILLAS AT CLAREMONT RANCH
Pipe ID: DP-A



Why are there 2 calculations for the same design point?

Design Information (Input)			
Pipe Invert Slope	So =	0.0130	ft/ft
Pipe Manning's n-value	n =	0.0130	
Pipe Diameter	D =	18.00	inches
Design discharge	**Q =**	**3.40**	**cfs**

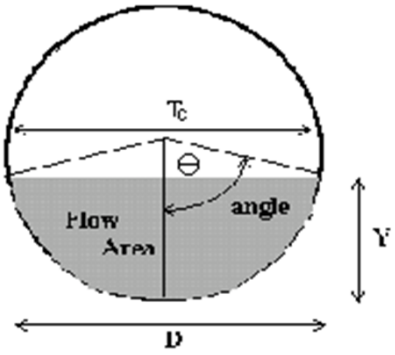
Full-flow Capacity (Calculated)			
Full-flow area	Af =	1.77	sq ft
Full-flow wetted perimeter	Pf =	4.71	ft
Half Central Angle	Theta =	3.14	radians
Full-flow capacity	Qf =	12.01	cfs

Calculation of Normal Flow Condition			
Half Central Angle (0<Theta<3.14)	Theta =	1.30	radians
Flow area	An =	0.58	sq ft
Top width	Tn =	1.44	ft
Wetted perimeter	Pn =	1.94	ft
Flow depth	Yn =	0.55	ft
Flow velocity	Vn =	5.85	fps
Discharge	Qn =	3.40	cfs
Percent Full Flow	Flow =	28.3%	of full flow
Normal Depth Froude Number	Fr_n =	1.62	supercritical

Calculation of Critical Flow Condition			
Half Central Angle (0<Theta-c<3.14)	Theta-c =	1.51	radians
Critical flow area	Ac =	0.81	sq ft
Critical top width	Tc =	1.50	ft
Critical flow depth	Yc =	0.70	ft
Critical flow velocity	Vc =	4.18	fps
Critical Depth Froude Number	Fr_c =	1.00	

CIRCULAR CONDUIT FLOW (Normal & Critical Depth Computation)

Project: VILLAS AT CLAREMONT RANCH
Pipe ID: DP-4



Design Information (Input)			
Pipe Invert Slope	So =	0.0050	ft/ft
Pipe Manning's n-value	n =	0.0130	
Pipe Diameter	D =	18.00	inches
Design discharge	**Q =**	**3.80**	**cfs**

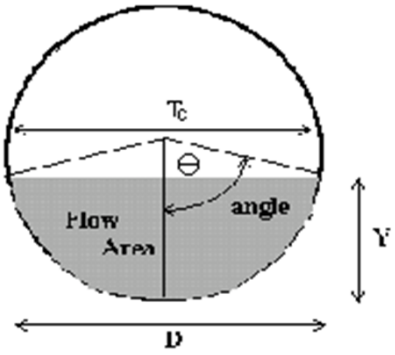
Full-flow Capacity (Calculated)			
Full-flow area	Af =	1.77	sq ft
Full-flow wetted perimeter	Pf =	4.71	ft
Half Central Angle	Theta =	3.14	radians
Full-flow capacity	Qf =	7.45	cfs

Calculation of Normal Flow Condition			
Half Central Angle (0<Theta<3.14)	Theta =	1.58	radians
Flow area	An =	0.90	sq ft
Top width	Tn =	1.50	ft
Wetted perimeter	Pn =	2.37	ft
Flow depth	Yn =	0.76	ft
Flow velocity	Vn =	4.24	fps
Discharge	Qn =	3.80	cfs
Percent Full Flow	Flow =	51.0%	of full flow
Normal Depth Froude Number	Fr_n =	0.97	subcritical

Calculation of Critical Flow Condition			
Half Central Angle (0<Theta-c<3.14)	Theta-c =	1.56	radians
Critical flow area	Ac =	0.88	sq ft
Critical top width	Tc =	1.50	ft
Critical flow depth	Yc =	0.75	ft
Critical flow velocity	Vc =	4.34	fps
Critical Depth Froude Number	Fr_c =	1.00	

CIRCULAR CONDUIT FLOW (Normal & Critical Depth Computation)

Project: VILLAS AT CLAREMONT RANCH
Pipe ID: DP-B



Design Information (Input)			
Pipe Invert Slope	So =	0.0050	ft/ft
Pipe Manning's n-value	n =	0.0130	
Pipe Diameter	D =	24.00	inches
Design discharge	**Q =**	**15.20**	**cfs**

Full-flow Capacity (Calculated)			
Full-flow area	Af =	3.14	sq ft
Full-flow wetted perimeter	Pf =	6.28	ft
Half Central Angle	Theta =	3.14	radians
Full-flow capacity	Qf =	16.04	cfs

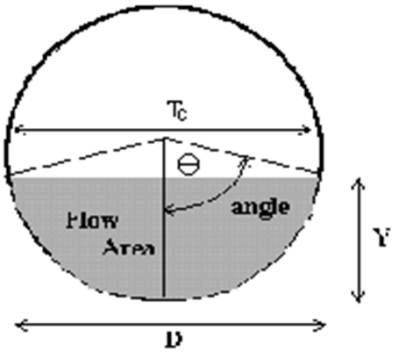
Calculation of Normal Flow Condition			
Half Central Angle (0<Theta<3.14)	Theta =	2.16	radians
Flow area	An =	2.62	sq ft
Top width	Tn =	1.67	ft
Wetted perimeter	Pn =	4.31	ft
Flow depth	Yn =	1.55	ft
Flow velocity	Vn =	5.81	fps
Discharge	Qn =	15.20	cfs
Percent Full Flow	Flow =	94.8%	of full flow
Normal Depth Froude Number	Fr_n =	0.82	subcritical

Calculation of Critical Flow Condition			
Half Central Angle (0<Theta-c<3.14)	Theta-c =	1.99	radians
Critical flow area	Ac =	2.36	sq ft
Critical top width	Tc =	1.83	ft
Critical flow depth	Yc =	1.41	ft
Critical flow velocity	Vc =	6.44	fps
Critical Depth Froude Number	Fr_c =	1.00	

CIRCULAR CONDUIT FLOW (Normal & Critical Depth Computation)

Project: VILLAS AT CLAREMONT RANCH

Pipe ID: DP-7



Design Information (Input)			
Pipe Invert Slope	So =	0.0050	ft/ft
Pipe Manning's n-value	n =	0.0130	
Pipe Diameter	D =	18.00	inches
Design discharge	**Q =**	**3.00**	**cfs**

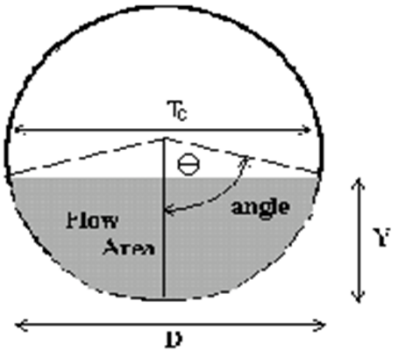
Full-flow Capacity (Calculated)			
Full-flow area	Af =	1.77	sq ft
Full-flow wetted perimeter	Pf =	4.71	ft
Half Central Angle	Theta =	3.14	radians
Full-flow capacity	Qf =	7.45	cfs

Calculation of Normal Flow Condition			
Half Central Angle (0<Theta<3.14)	Theta =	1.45	radians
Flow area	An =	0.75	sq ft
Top width	Tn =	1.49	ft
Wetted perimeter	Pn =	2.18	ft
Flow depth	Yn =	0.66	ft
Flow velocity	Vn =	3.99	fps
Discharge	Qn =	3.00	cfs
Percent Full Flow	Flow =	40.3%	of full flow
Normal Depth Froude Number	Fr_n =	0.99	subcritical

Calculation of Critical Flow Condition			
Half Central Angle (0<Theta-c<3.14)	Theta-c =	1.45	radians
Critical flow area	Ac =	0.75	sq ft
Critical top width	Tc =	1.49	ft
Critical flow depth	Yc =	0.66	ft
Critical flow velocity	Vc =	4.02	fps
Critical Depth Froude Number	Fr_c =	1.00	

CIRCULAR CONDUIT FLOW (Normal & Critical Depth Computation)

Project: VILLAS AT CLAREMONT RANCH
Pipe ID: DP-C



Design Information (Input)			
Pipe Invert Slope	So =	0.0075	ft/ft
Pipe Manning's n-value	n =	0.0130	
Pipe Diameter	D =	24.00	inches
Design discharge	**Q =**	**19.00**	**cfs**

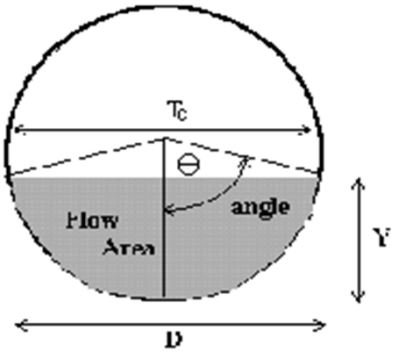
Full-flow Capacity (Calculated)			
Full-flow area	Af =	3.14	sq ft
Full-flow wetted perimeter	Pf =	6.28	ft
Half Central Angle	Theta =	3.14	radians
Full-flow capacity	Qf =	19.64	cfs

Calculation of Normal Flow Condition			
Half Central Angle (0<Theta<3.14)	Theta =	2.19	radians
Flow area	An =	2.67	sq ft
Top width	Tn =	1.62	ft
Wetted perimeter	Pn =	4.39	ft
Flow depth	Yn =	1.58	ft
Flow velocity	Vn =	7.12	fps
Discharge	Qn =	19.00	cfs
Percent Full Flow	Flow =	96.7%	of full flow
Normal Depth Froude Number	Fr_n =	0.98	subcritical

Calculation of Critical Flow Condition			
Half Central Angle (0<Theta-c<3.14)	Theta-c =	2.18	radians
Critical flow area	Ac =	2.64	sq ft
Critical top width	Tc =	1.65	ft
Critical flow depth	Yc =	1.57	ft
Critical flow velocity	Vc =	7.19	fps
Critical Depth Froude Number	Fr_c =	1.00	

CIRCULAR CONDUIT FLOW (Normal & Critical Depth Computation)

Project: VILLAS AT CLAREMONT RANCH
Pipe ID: DP-D



Design Information (Input)			
Pipe Invert Slope	So =	0.0807	ft/ft
Pipe Manning's n-value	n =	0.0130	
Pipe Diameter	D =	24.00	inches
Design discharge	**Q =**	**21.90**	**cfs**

Full-flow Capacity (Calculated)			
Full-flow area	Af =	3.14	sq ft
Full-flow wetted perimeter	Pf =	6.28	ft
Half Central Angle	Theta =	3.14	radians
Full-flow capacity	Qf =	64.44	cfs

Calculation of Normal Flow Condition			
Half Central Angle (0<Theta<3.14)	Theta =	1.37	radians
Flow area	An =	1.18	sq ft
Top width	Tn =	1.96	ft
Wetted perimeter	Pn =	2.75	ft
Flow depth	Yn =	0.80	ft
Flow velocity	Vn =	18.54	fps
Discharge	Qn =	21.90	cfs
Percent Full Flow	Flow =	34.0%	of full flow
Normal Depth Froude Number	Fr_n =	4.21	supercritical

Max velocity per DCM 6.3.3 is 18 fps

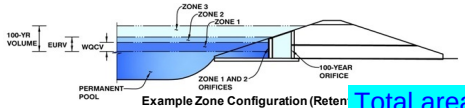
Calculation of Critical Flow Condition			
Half Central Angle (0<Theta-c<3.14)	Theta-c =	2.31	radians
Critical flow area	Ac =	2.81	sq ft
Critical top width	Tc =	1.48	ft
Critical flow depth	Yc =	1.67	ft
Critical flow velocity	Vc =	7.81	fps
Critical Depth Froude Number	Fr_c =	1.00	

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)

Project: VILLAS AT CLAREMONT RANCH

Basin ID:



Example Zone Configuration (Reten

Total area does not match table in report.

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	7.78	acres
Watershed Length =	1,300	ft
Watershed Length to Centroid =	1,130	ft
Watershed Slope =	0.015	ft/ft
Watershed Imperviousness =	49.00%	percent
Percentage Hydrologic Soil Group A =	25.8%	percent
Percentage Hydrologic Soil Group B =	74.2%	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) =	0.132	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	0.415	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	0.360	acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	0.518	acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	0.653	acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	0.855	acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	1.014	acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	1.225	acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 3.14 in.) =	1.632	acre-feet		inches
Approximate 2-yr Detention Volume =	0.300	acre-feet		
Approximate 5-yr Detention Volume =	0.408	acre-feet		
Approximate 10-yr Detention Volume =	0.531	acre-feet		
Approximate 25-yr Detention Volume =	0.598	acre-feet		
Approximate 50-yr Detention Volume =	0.635	acre-feet		
Approximate 100-yr Detention Volume =	0.712	acre-feet		

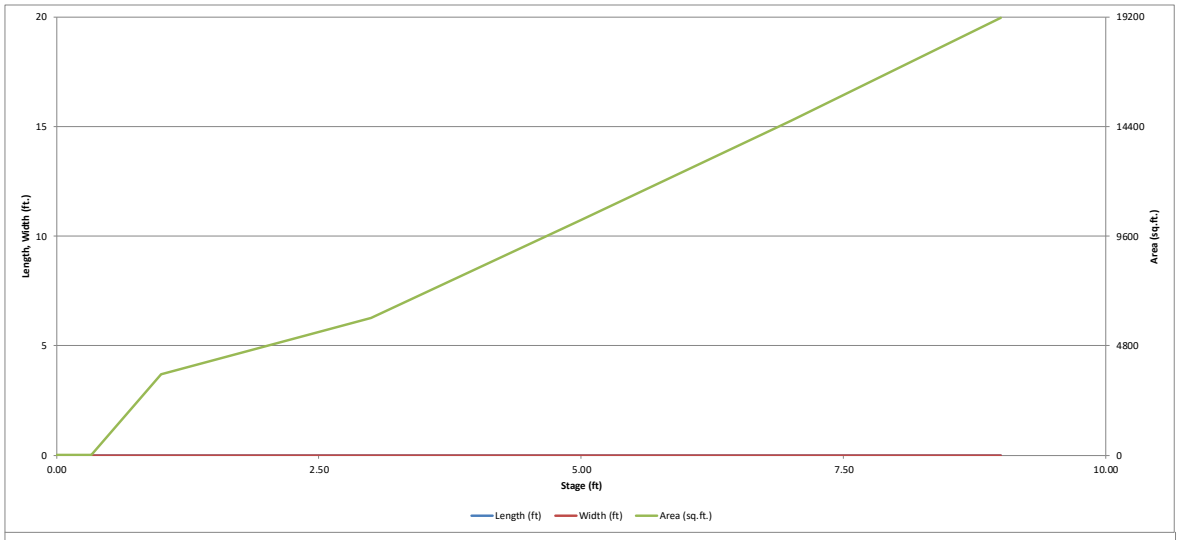
Define Zones and Basin Geometry

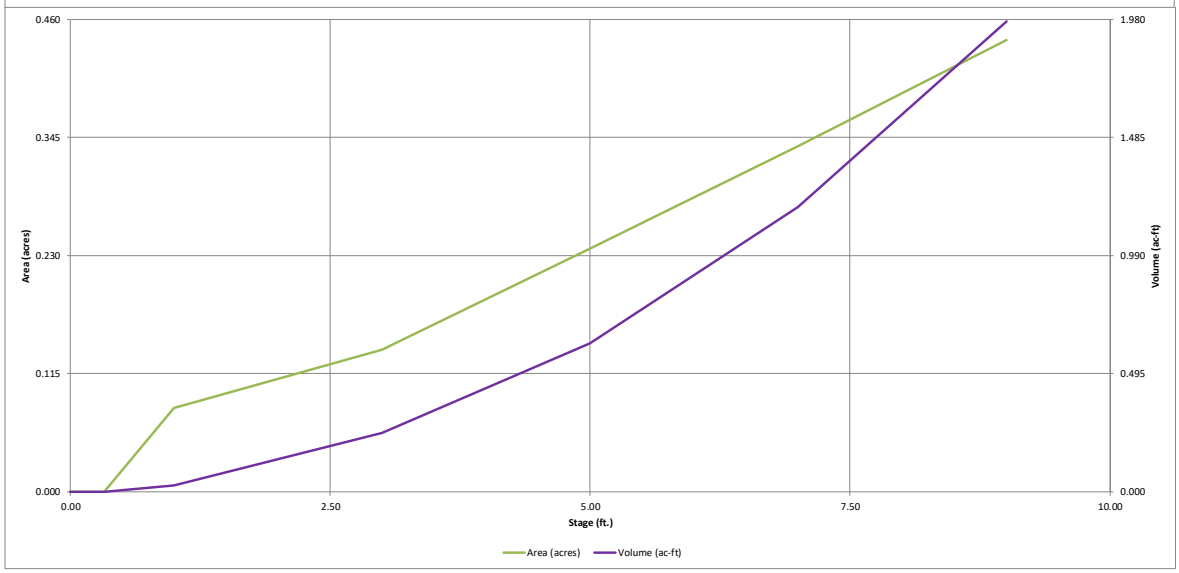
Zone 1 Volume (WQCV) =	0.132	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.283	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.298	acre-feet
Total Detention Basin Volume =	0.712	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio (R_{LW}) =	user	
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	user	acre-feet

Provide calculations for all pond requirements: forebay, spillway riprap sizing, trickle channel, etc

Depth Increment = 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)
		--	--	--	16	0.000		
		--	--	--	16	0.000	5	0.000
FLOOR-6384	--	1.00	--	--	--	3,553	0.082	1,201	0.028
6386	--	3.00	--	--	--	6,020	0.138	10,774	0.247
6388	--	5.00	--	--	--	10,299	0.236	27,093	0.622
6390	--	7.00	--	--	--	14,646	0.336	52,038	1.195
6392	--	9.00	--	--	--	19,186	0.440	85,870	1.971


20
15
10
5
0
19200
14400
9600
4800
0
Length, Width (ft.)
Area (sq.ft.)
0.00
2.50
5.00
7.50
10.00
Stage (ft)
Length (ft)
Width (ft)
Area (sq.ft.)

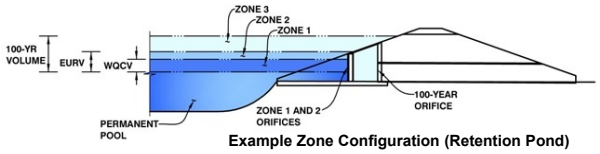

0.460
0.345
0.230
0.115
0.000
1.980
1.485
0.990
0.495
0.000
Area (acres)
Volume (ac-ft)
0.00
2.50
5.00
7.50
10.00
Stage (ft.)
Area (acres)
Volume (ac-ft)

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)

Project: **VILLAS AT CLAREMONT RANCH**

Basin ID:



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.08	0.132	Orifice Plate
Zone 2 (EURV)	4.03	0.283	Orifice Plate
Zone 3 (100-year)	5.37	0.298	Weir&Pipe (Restrict)
Total (all zones)		0.712	

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

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft²
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

Calculated Parameters for Underdrain

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

Invert of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	6.111E-03	ft²
Depth at top of Zone using Orifice Plate =	4.03	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	16.10	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	0.88	sq. inches (diameter = 1-1/16 inches)	Elliptical Slot Area =	N/A	ft²

Calculated Parameters for Plate

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.34	2.69					
Orifice Area (sq. inches)	0.88	0.88	0.88					

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

User Input: Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected			Not Selected	Not Selected	
Invert of Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	N/A	N/A	ft²
Depth at top of Zone using Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	N/A	N/A	feet
Vertical Orifice Diameter =	N/A	N/A	inches				

Calculated Parameters for Vertical Orifice

only 3ft on CDs.

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

	Zone 3 Weir	Not Selected			Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	4.03	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	4.03	N/A	feet
Overflow Weir Front Edge Length =	4.00	N/A	feet	Overflow Weir Slope Length =	4.00	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	23.41	N/A	
Horiz. Length of Weir Sides =	4.00	N/A	feet	Overflow Grate Open Area w/o Debris =	11.14	N/A	ft²
Overflow Grate Type =	Type C Grate	N/A		Overflow Grate Open Area w/ Debris =	5.57	N/A	ft²
Debris Clogging % =	50%	N/A	%				

Calculated Parameters for Overflow Weir

Restrictor plate not shown on CDs

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

	Zone 3 Restrictor	Not Selected			Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	0.50	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	0.48	N/A	ft²
Outlet Pipe Diameter =	12.00	N/A	inches	Outlet Orifice Centroid =	0.33	N/A	feet
Restrictor Plate Height Above Pipe Invert =	7.00		inches	Half-Central Angle of Restrictor Plate on Pipe =	1.74	N/A	radians

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

Per DCMv2 Section 4.3, outlet pipe should be 18" minimum.

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	5.40	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.32	feet
Spillway Crest Length =	20.00	feet	Stage at Top of Freeboard =	6.72	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	0.32	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	1.10	acre-ft

Calculated Parameters for Spillway

Does not appear to match what is shown on CDs.

Routed Hydrograph Results

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

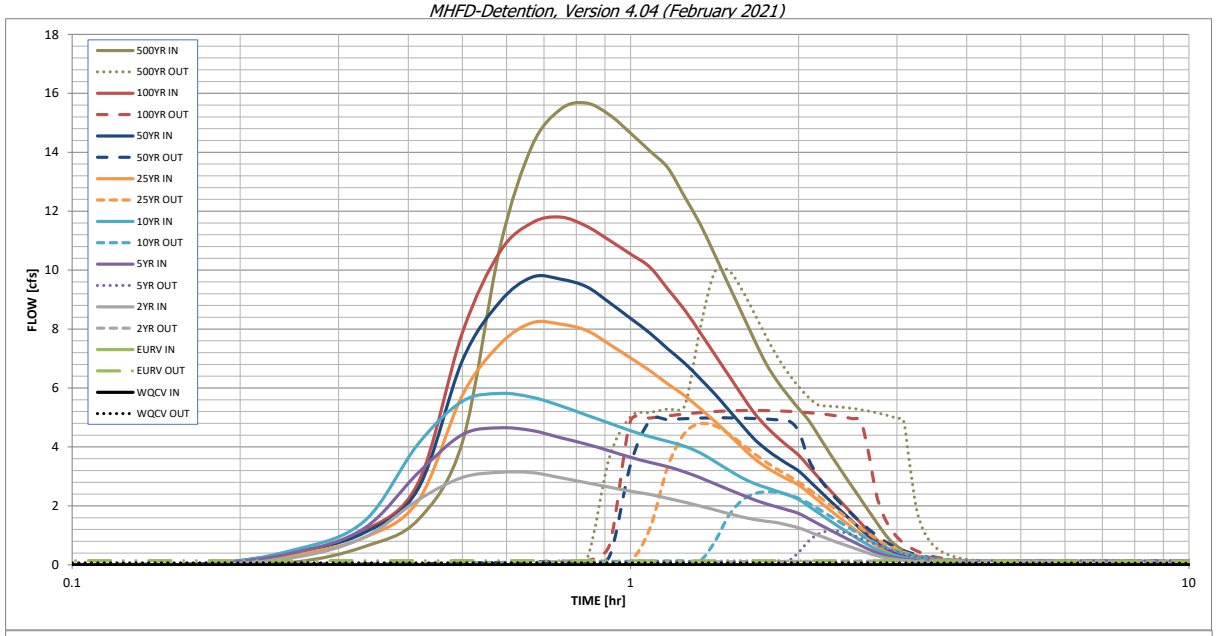
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.14
CUHP Runoff Volume (acre-ft) =	0.132	0.415	0.360	0.518	0.653	0.855	1.014	1.225	1.632
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.360	0.518	0.653	0.855	1.014	1.225	1.632
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.1	0.8	1.4	2.9	3.8	5.1	7.4
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.10	0.18	0.37	0.49	0.66	0.96
Peak Inflow Q (cfs) =	N/A	N/A	3.1	4.6	5.8	8.2	9.8	11.8	15.7
Peak Outflow Q (cfs) =	0.1	0.1	0.1	1.1	2.5	4.8	5.0	5.2	10.0
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	1.5	1.8	1.6	1.3	1.0	1.3
Structure Controlling Flow =	Plate	Overflow Weir 1	Plate	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Outlet Plate 1	Outlet Plate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	0.1	0.2	0.4	0.4	0.5	0.5
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	39	68	65	70	69	66	64	62	57
Time to Drain 99% of Inflow Volume (hours) =	**40**	72	68	75	75	74	73	72	70
Maximum Ponding Depth (ft) =	2.08	4.03	3.56	4.14	4.23	4.35	4.58	5.06	5.57
Area at Maximum Ponding Depth (acres) =	0.11	0.19	0.17	0.19	0.20	0.20	0.22	0.24	0.26
Maximum Volume Stored (acre-ft) =	0.132	0.416	0.332	0.437	0.454	0.477	0.525	0.626	0.765

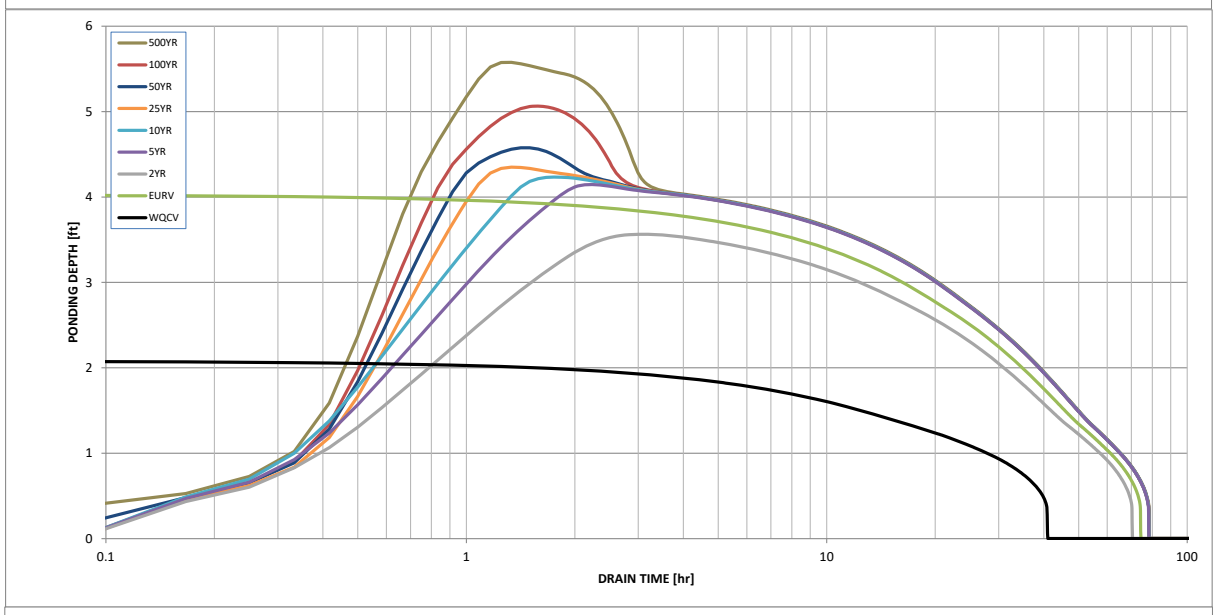
Ratio needs to be closer to 1.0

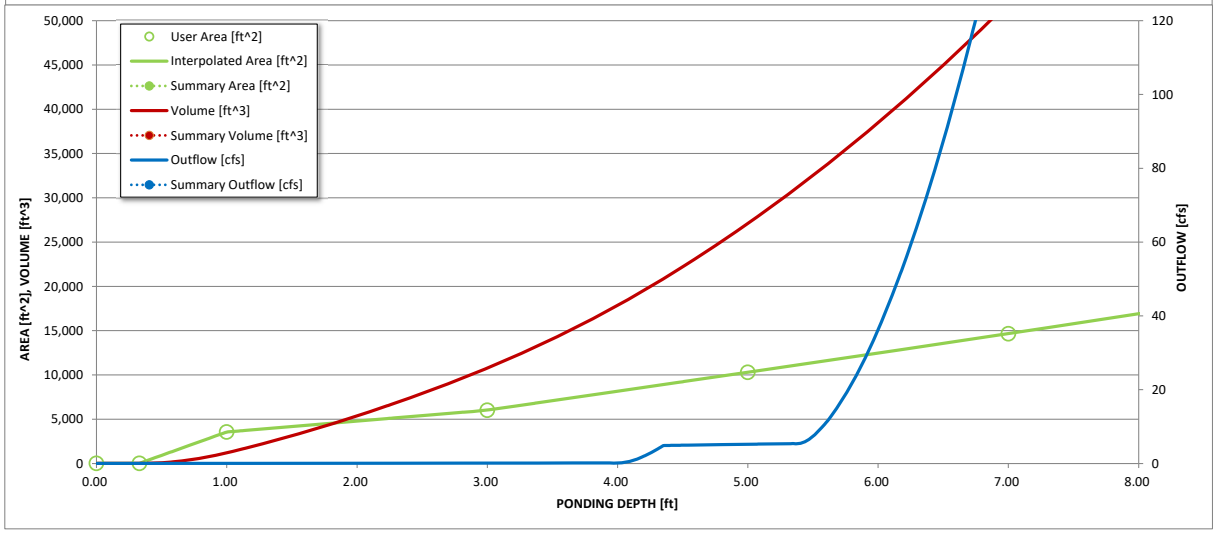
Volume does not meet 100-yr required volume

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)







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

DETENTION BASIN OUTLET STRUCTURE DESIGN

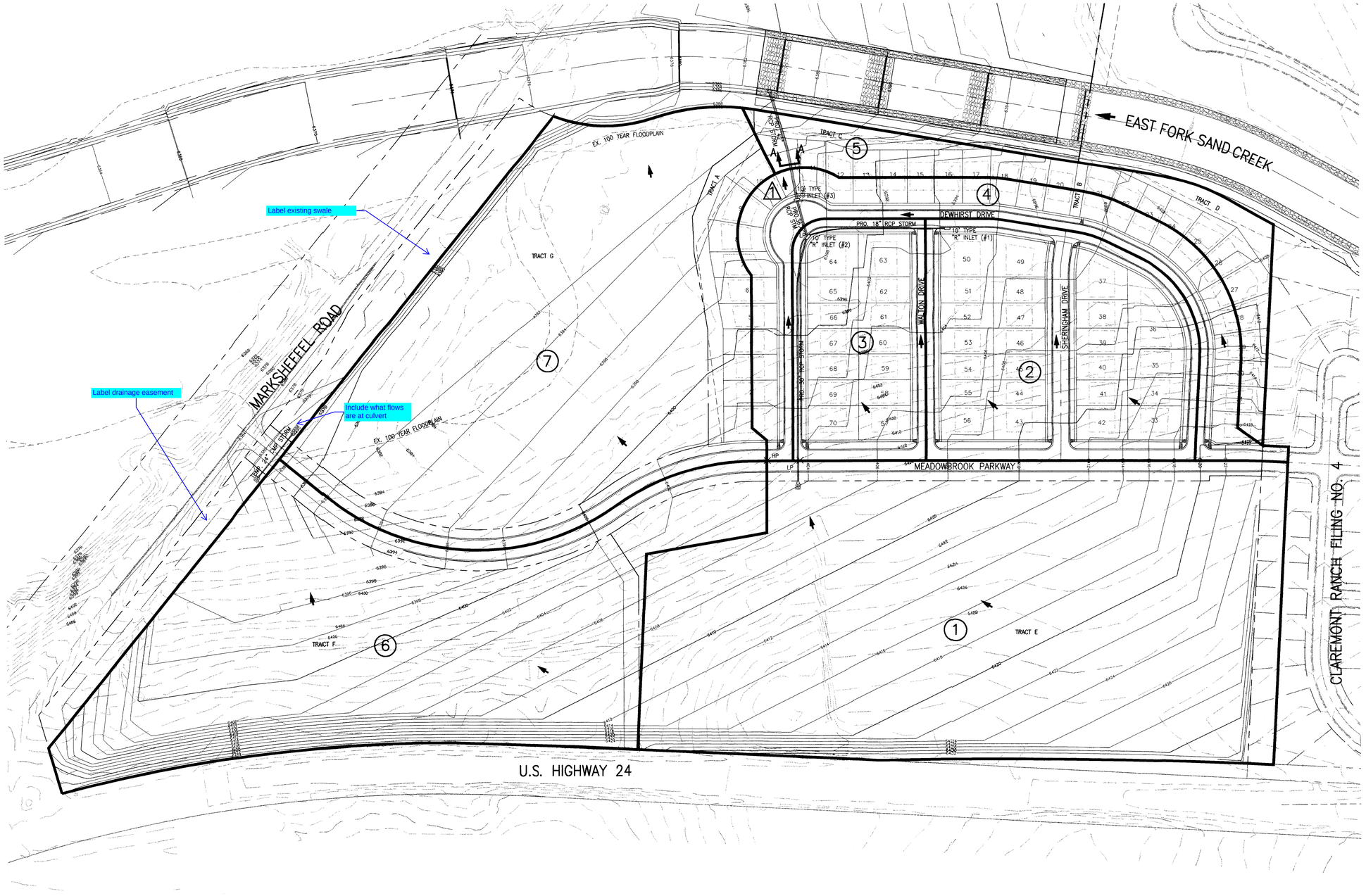
Outflow Hydrograph Workbook Filename:

Inflow Hydrographs

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

	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.09
	0:15:00	0.00	0.00	0.25	0.41	0.51	0.34	0.43	0.42	0.62
	0:20:00	0.00	0.00	0.93	1.24	1.48	0.93	1.09	1.16	1.53
	0:25:00	0.00	0.00	2.20	3.12	4.11	2.17	2.59	2.79	4.16
	0:30:00	0.00	0.00	2.96	4.42	5.55	5.75	6.93	7.88	10.75
	0:35:00	0.00	0.00	3.14	4.65	5.81	7.48	8.92	10.62	14.22
	0:40:00	0.00	0.00	3.13	4.55	5.69	8.22	9.76	11.61	15.46
	0:45:00	0.00	0.00	2.95	4.31	5.39	8.17	9.69	11.80	15.67
	0:50:00	0.00	0.00	2.79	4.10	5.08	7.96	9.44	11.49	15.27
	0:55:00	0.00	0.00	2.64	3.87	4.81	7.49	8.90	11.01	14.65
	1:00:00	0.00	0.00	2.50	3.65	4.55	7.02	8.36	10.55	14.04
	1:05:00	0.00	0.00	2.39	3.47	4.35	6.59	7.86	10.10	13.47
	1:10:00	0.00	0.00	2.26	3.33	4.19	6.14	7.33	9.35	12.49
	1:15:00	0.00	0.00	2.12	3.15	4.03	5.74	6.84	8.65	11.55
	1:20:00	0.00	0.00	2.00	2.95	3.79	5.30	6.31	7.87	10.50
	1:25:00	0.00	0.00	1.86	2.75	3.50	4.86	5.79	7.13	9.49
	1:30:00	0.00	0.00	1.74	2.55	3.22	4.42	5.25	6.42	8.53
	1:35:00	0.00	0.00	1.62	2.37	2.95	3.99	4.74	5.75	7.63
	1:40:00	0.00	0.00	1.54	2.20	2.76	3.60	4.26	5.15	6.82
	1:45:00	0.00	0.00	1.48	2.07	2.62	3.31	3.92	4.69	6.22
	1:50:00	0.00	0.00	1.43	1.96	2.49	3.08	3.64	4.33	5.73
	1:55:00	0.00	0.00	1.34	1.85	2.37	2.89	3.40	4.01	5.30
	2:00:00	0.00	0.00	1.26	1.75	2.22	2.71	3.19	3.72	4.91
	2:05:00	0.00	0.00	1.13	1.57	2.00	2.45	2.87	3.35	4.41
	2:10:00	0.00	0.00	1.01	1.40	1.77	2.19	2.56	2.98	3.92
	2:15:00	0.00	0.00	0.89	1.23	1.56	1.93	2.27	2.64	3.46
	2:20:00	0.00	0.00	0.78	1.08	1.36	1.70	1.99	2.31	3.03
	2:25:00	0.00	0.00	0.68	0.93	1.17	1.47	1.72	2.01	2.63
	2:30:00	0.00	0.00	0.58	0.79	1.00	1.26	1.47	1.71	2.23
	2:35:00	0.00	0.00	0.49	0.66	0.83	1.05	1.22	1.42	1.85
	2:40:00	0.00	0.00	0.40	0.54	0.67	0.85	0.99	1.14	1.48
	2:45:00	0.00	0.00	0.32	0.43	0.54	0.66	0.77	0.88	1.13
	2:50:00	0.00	0.00	0.26	0.34	0.43	0.50	0.57	0.65	0.83
	2:55:00	0.00	0.00	0.21	0.28	0.36	0.39	0.44	0.49	0.63
	3:00:00	0.00	0.00	0.18	0.24	0.30	0.30	0.35	0.38	0.49
	3:05:00	0.00	0.00	0.15	0.20	0.26	0.25	0.28	0.30	0.38
	3:10:00	0.00	0.00	0.13	0.17	0.21	0.20	0.23	0.23	0.30
	3:15:00	0.00	0.00	0.11	0.14	0.18	0.16	0.19	0.18	0.23
	3:20:00	0.00	0.00	0.09	0.12	0.15	0.13	0.15	0.14	0.18
	3:25:00	0.00	0.00	0.08	0.10	0.12	0.11	0.12	0.11	0.14
	3:30:00	0.00	0.00	0.06	0.08	0.10	0.09	0.10	0.09	0.11
	3:35:00	0.00	0.00	0.05	0.06	0.08	0.07	0.08	0.07	0.09
	3:40:00	0.00	0.00	0.04	0.05	0.06	0.06	0.06	0.06	0.07
	3:45:00	0.00	0.00	0.03	0.04	0.05	0.04	0.05	0.05	0.06
	3:50:00	0.00	0.00	0.02	0.03	0.04	0.03	0.04	0.03	0.04
	3:55:00	0.00	0.00	0.02	0.02	0.03	0.02	0.03	0.02	0.03
	4:00:00	0.00	0.00	0.01	0.01	0.02	0.02	0.02	0.02	0.02
	4:05:00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	4:10:00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.00	0.01
	4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

DRAINAGE MAPS



Provide a historic drainage map, prior to any development

Include copy of hydrology calculations in appendix which would accompany this plan.

1" = 100'

0 50 100 200

Scale in Feet

LEGEND

- EXISTING CONTOURS–MNR (2')
- EXISTING CONTOURS–MJR (10')
- PROPOSED CONTOURS–MNR (2')
- PROPOSED CONTOURS–MJR (10')
- BASIN BOUNDARY
- BASIN DESIGNATOR (1)
- DESIGN POINT DESIGNATOR (1)
- DIRECTION OF FLOW
- HIGH POINT (HP)
- LOW POINT (LP)

TEMPORARY OVERFLOW SECTION A–A

NTS

BASIN TABLE

#	AC	Q_5 (cfs)	Q_{100} (cfs)
1	15.60	35.6	77.5
2	5.15	11.1	24.9
3	2.77	6.5	14.6
4	3.36	7.9	18.1
5	2.43	5.8	13.1
6	11.18	60.4	90.5
7	12.21	56.0	96.7

DESIGN POINT TABLE

#	AC	Q_5 (cfs)	Q_{100} (cfs)
1	26.88	58.1	128.0

REVISIONS:

NO.	DATE:	BY:	DESCRIPTION:	APPROVED BY:	DATE:

TIM D. McCONNELL, COLORADO P.E. NO. 33797

FOR AND ON BEHALF OF ENGINEERING AND SURVEYING INC. (ESI)

ENGINEERING AND SURVEYING INC. ESI

20 BOULDER CRESCENT, 2nd FLOOR
COLORADO SPRINGS, CO 80903
(719) 955-5485, FAX (719) 471-4812

CLAREMONT RANCH FILING NO. 7

DRAINAGE PLAN

PROJECT NO. 01-006		FILE: Claremont #7\dwg\D1-drainage.dwg	
DESIGNED BY: TDM	SCALE	DATE: 05/17/04	
DRAWN BY: KGV	HORIZ: 1"=100'	SHEET 1 OF 1	D1
CHECKED BY: TDM	VERT: N/A		

DRAINAGE LEGEND

BASIN IDENTIFIER
BASIN AREA [AC] — F / 0.36

DESIGN POINT IDENTIFIERS — 3

STORM SEWER DESIGN POINT IDENTIFIERS — P5

DRAINAGE BASIN BOUNDARY

DRAINAGE SUB-BASIN BOUNDARY

SURFACE SHEET FLOW DIRECTION

EXISTING MAJOR CONTOUR (10')

EXISTING MINOR CONTOUR (2')

PROPOSED MAJOR CONTOUR (10')

EXISTING
PROPOSED MINOR CONTOUR (2')

FUTURE (E)
PROPOSED (P)
(F)

SLOPE/DIRECTION 1.00%

(E) STORM SEWER

(P) STORM SEWER, INLET, OUTFALL

-Use of 1-foot contours would provide better picture of flow drainage through project. Include drainage arrows.
-Label all storm as public or private & indicate if inlets are sump or at-grade.
-Label gutter & cross pans
-Include inlet, pipe and manhole sizes
-Calculations need to be included in appendix for sidewalk chase design.
-Need full design of storm sewer system, including HGL's

Provide Water Quality map, showing what areas drain to pond, not treated, offsite, etc.

A WQ summary table on the current map would also be acceptable (example provided):

PBMP SUMMARY TABLE

BASINS	PBMP TRIBUTARY AREA (AC)	PBMP
A1.1	1.43	RG-A1.1
A3.1	1.87	RG-A3.1
B1,B2	8.60	EDB-B
OA2,A2	0.95	EXCLUDED*

* EXCLUDED BASED ON < 1-ACRE OF DEVELOPED ROADWAY AREA PER ECM APP. 17.C.1.a

POND DESIGN

STORM EVENT	ELEVATION	VOLUME (A-FT)
WQCV	6385.08	0.13
EURV	6387.03	0.38
10-YR	6387.23	0.45
100-YR	6388.06	0.71
EM. OVERFLOW	6388.40	
MIN TOP OF BERM	6389.72	

Volumes do not match information shown on pond spreadsheet in appendix.

Design points need to be added to hydrology speadsheets along with calculations for riprap pads.

Label swale which is conveying flows from Basin 9. Calculation needs to be included for swale design.

Label swale which is conveying flows from Basin 2. Calculation needs to be included for swale design.

Label all easements

Label what this line is.

indicate width of access

Provide BFE's in floodplain

Label parts of pond

Label or include in legend

What are these lines through median? Label or remove.

Label all internal roads as private

Include hatch in legend.

This appears to be a ridge/HP through site. Hows does right portion of Basin 6 drain to the left? May need to break up into 2 separate basins.

Labels are hard to read. Please adjust

Is this culvert still temporary or now permanent, and public/private? Please indicate and label what flows are.

Label outlet protection and include design calculations in appendix.

Create a design point for combined flows of Basin 1 and offsite flows from existing culvert. Provide analysis of existing swale and rundown that they are adequate to handle proposed flows.

Turn off duplicate labels

PROPOSED DRAINAGE BASINS

BASIN	AREA (ACRES)	Q2 (CFS)	Q5 (CFS)	Q10 (CFS)	Q25 (CFS)	Q50 (CFS)	Q100 (CFS)
1	2.25	0.2	0.6	1.2	2.0	2.6	3.3
2	1.92	1.3	1.9	2.7	3.8	4.6	5.6
3	0.76	1.1	1.5	2.0	2.5	2.9	3.4
4	1.00	1.3	1.8	2.3	2.9	3.5	4.1
5	0.81	1.2	1.7	2.2	2.7	3.2	3.8
6	2.58	2.9	4.0	5.2	6.7	8.0	9.4
7	0.65	1.0	1.4	1.7	2.2	2.6	3.0
8	0.06	0.2	0.2	0.3	0.3	0.4	0.4
9	0.67	0.1	0.3	0.5	0.9	1.2	1.5

PROPOSED DRAINAGE SUB-BASINS

BASIN	AREA (ACRES)	Q2 (CFS)	Q5 (CFS)	Q10 (CFS)	Q25 (CFS)	Q50 (CFS)	Q100 (CFS)
4.1	0.33	0.7	1.0	1.2	1.4	1.7	1.9
6.1	0.46	1.0	1.3	1.6	1.9	2.2	2.6

PROPOSED DESIGN POINTS

DESIGN POINT	Q2 (CFS)	Q5 (CFS)	Q10 (CFS)	Q25 (CFS)	Q50 (CFS)	Q100 (CFS)
1	7.5	10.7	14.1	18.5	22.2	26.1
2	1.1	1.5	2.0	2.5	2.9	3.4
3	1.3	1.8	2.3	2.9	3.5	4.1
4	1.2	1.7	2.2	2.7	3.2	3.8
5	2.9	4.0	5.2	6.7	8.0	9.4
6	0.2	0.2	0.3	0.3	0.4	0.4
7	1.0	1.4	1.7	2.2	2.6	3.0
A	1.2	1.6	2.0	2.5	3.0	3.4
B	4.8	6.7	8.6	11.0	13.1	15.2
C	6.1	8.5	10.8	13.8	16.4	19.0
D	7.1	9.8	12.5	15.9	18.9	21.9
E (POND OUT)	0.1	0.2	1.7	3.9	4.1	4.30

Flows shown do not match release rates shown on pond spreadsheet. Please update

REV.	DESCRIPTION	DATE

PREPARED FOR:
PHI REAL ESTATE SERVICES, LLC
200 W. CITY CENTER DR. STE 200
PUEBLO, CO 81003

CATAMOUNT ENGINEERING
PO BOX 692 DIVIDE, CO 80814 (719)426-2124

THE VILLAS AT CLAREMONT RANCH

PROPOSED DRAINAGE MAP

DESIGNED BY:	DRAWN BY:
DLM	MGP
SCALE: 1"=50'	DATE: 06/13/17
JOB NUMBER: 16-102	SHEET: __ OF __