MDDP & FINAL DRAINAGE REPORT

Mountain Bluffs Subdivision

Colorado Springs, CO

PREPARED FOR:
AMH Development, LLC
3131 S. Vaughn Way, Suite 220
Aurora, CO 80014

PREPARED BY:
Galloway & Company, Inc.
1155 Kelly Johnson Blvd., Suite 305
Colorado Springs, CO 80920

DATE:
March 04, 2022

Signature Page
Mountain Bluffs Subdivision

Engineer's Statement
This report and plan for the drainage design of Mountain Bluffs Subdivision was prepared by me (or under my direct supervision) and is correct to the best of my knowledge and belief. Said report and plan has been prepared in accordance with the City of Colorado Springs Drainage Criteria Manual and is in conformity with the master plan of the drainage basin. I understand that the City of Colorado Springs does not and will not assume liability for drainage facilities designed by others. I accept responsibility for any liability caused by any negligent acts, errors or omissions on my part in preparing this report.

SIGNATURE (Affix Seal): _____

Treven Edwards, PE #60124 Date

Developer's Statement
AMH Development, LLC hereby certifies that the drainage facilities for Mountain Bluffs Subdivision shall be constructed according to the design presented in this report. I understand that the City of Colorado Springs does not and will not assume liability for the drainage facilities designed and/or certified by my engineer and that are submitted to the City of Colorado Springs pursuant to section 7.7.906 of the City Code; and cannot, on behalf of Mountain Bluffs Subdivision, guarantee that final drainage design review will absolve AMH Development, LLC and/or their successors and/or assigns of future liability for improper design. I further understand that approval of the final plat does not imply approval of my engineer's drainage design.

AMH Development, LLC
Name of Developer

_____
Authorized Signature Date

Brent Johnson
Printed Name

VP – Land Development
Title

3131 S. Vaughn Way, Suite 220, Aurora, CO 80014
Address

City of Colorado Springs Statement:
Filed in accordance with Section 7.7.906 of the Code of the City of Colorado Springs, 2001, as amended.

_____ _____
For City Engineer Date

Conditions:

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I. INTRODUCTION

This document is the MDDP and Final Drainage Report for the proposed 16.36-acre single family residential development named Mountain Bluffs Subdivision. The project site is currently unplatted and zoned for PBC use.

The purpose of this MDDP and Final Drainage Report is to identify onsite and offsite drainage patterns associated with the Mountain Bluffs Subdivision property. This report will also provide hydrologic and hydraulic analyses of this project area, locate and identify tributary or downstream drainage features and facilities that impact the site, and identify which types of drainage facilities will be needed and where they will be located to ensure compliance with the City of Colorado Springs Drainage Criteria Manual (DCM).

LOCATION

The project site is located east of Marksheffel Road between Barnes Road and N. Carefree Circle. Mountain Bluffs Subdivision is situated immediately west from the Enclaves at Mountain Bluffs Ranch Filing No. 2A.

Figure 1 – Project Location

More specifically, the Mountain Bluffs Subdivision is located in the northwest quarter of Section 28, Township 13 South, Range 65 West of the 6th Principal Meridian in the City of Colorado Springs, County of El Paso, State of Colorado.

Description of Property

Mountain Bluffs Subdivision occupies 16.36 acres and is comprised of undeveloped land covered entirely by native grasses and weeds. The site generally drains from the northeast to the southwest and to the west at approximately 7%. There are two existing overlapping gas easements running along the east side of the property.

PROPOSED DEVELOPMENT

The project site covers ±16.36 acres. The proposed improvements include 102 single-family lots, public internal roadways, wet/dry utilities, open space and landscaping in common areas.

The project area is located within the Sand Creek Drainage Basin and is situated directly east of the existing Pond 4, water quality pond as identified within the “Preliminary / Final Drainage Report, Enclaves at Mountain Vista Filing No. 1” by Galloway & Company, Inc., February 2017, Revised April 2017.

The proposed development will have medium-high density and an approximate composite imperviousness of 52.5% for the overall development.

The site is located outside of the 100-year floodplain per FIRM Map Panel #08041C0543G, effective 12/07/2018. There are no major drainage ways or irrigation facilities located through the site. The development will not affect the floodplain or be affected by any floodplains. A copy of the FEMA FIRM Map can be found in Appendix A for reference.

Soils can be classified in four different hydrologic groups, A, B, C, or D to help predict stormwater runoff rates. Hydrologic group “A” is characterized by deep, well-drained coarse-grained soils with a rapid infiltration rate when thoroughly wet and having a low runoff potential. Group “D” typically has a clay layer at or near to the surface, or very shallow depth to impervious bedrock and has a very slow infiltration rate and a high runoff potential. According to the Natural Resources Conservation Service (NRCS) Web Soil Survey, the project site consists of a mix of soil types and Hydrologic Soil Groups (HSGs) including: Truckton sandy loam, HSG ‘A’ (100% of the site). Refer to Appendix A, pages A-2 to A-11 for soils information.

No variances from drainage criteria are being requested at this time.

II. HISTORIC DRAINAGE

OVERALL BASIN DESCRIPTION

Mountain Bluffs Subdivision is located within the Sand Creek Drainage basin as described in the “Sand Creek Drainage Basin Planning Study, Final Report” by Stantec, HDR, Dewberry, January 2021 and the “Master Development Drainage Plan for Enclaves at Mountain Bluffs, Branes Road and Marksheffel Road” by Galloway & Company, Inc., February 2016, Revised May 2016. The Sand Creek basin generally flows in a south-southwesterly direction in the Sand Creek channel and East Fork Sand Creek, entering Fountain Creek approximately one and one quarter mile southeast from the Interstate 25 and South Circle Drive Interchange.

Existing drainage patterns onsite flow from the northeast corner to the southwest and west at grades ranging from 4.0% up to 7.0%.

SUB-BASIN DESCRIPTION

A Historic Conditions basin map from the "Master Development Drainage Plan for Enclaves at Mountain Bluffs, Branes Road and Marksheffel Road" by Galloway & Company, Inc., February 2016, Revised May 2016 has been provided in Appendix B and can be used to reference the basins discussed below:

The majority of the proposed project site lies within the "**34a**" (Q_5 = 5.06 cfs, Q_{100} = 9.58 cfs) with a small portion of the proposed project site situated within the "**34b**" (Q_5 = 0.91 cfs, Q_{100} = 1.79 cfs) drainage basins within the "Master Development Drainage Plan for Enclaves at Mountain Bluffs, Branes Road and Marksheffel Road" by Galloway & Company, Inc., February 2016, Revised May 2016.

Mountain Bluffs Subdivision was also studied within the "Preliminary / Final Drainage Report, Enclaves at Mountain Vista Filing No. 1" by Galloway & Company, Inc., February 2017, Revised April 2017.

A final drainage plan (DR-1 as shown in the Preliminary / Final Drainage Report, Enclaves at Mountain Vista Filing No. 1" by Galloway & Company, Inc., February 2017, Revised April 2017) has been provided in Appendix B and can be used to reference the basins discussed below:

The majority of the proposed project site lies within the "**F1-A4**" (Q_5 = 29.2 cfs, Q_{100} = 64.3 cfs) with small portions of the proposed project site situated within the "**F1-A2**" (Q_5 = 1.7 cfs, Q_{100} = 3.6 cfs) and "**F1-A3**" (Q_5 = 1.4 cfs, Q_{100} = 3.7 cfs) drainage basins within the **FDR**.

Basin F1-A4 sheet flows to the existing outfall from Pond 4 (WQ Pond) where runoff crosses beneath Marksheffel Road to the west in a 24" RCP pipe.

Relevant excerpts from the "Master Development Drainage Plan for Enclaves at Mountain Bluffs, Branes Road and Marksheffel Road" by Galloway & Company, Inc., February 2016, Revised May 2016 and "Preliminary / Final Drainage Report, Enclaves at Mountain Vista Filing No. 1" by Galloway & Company, Inc., February 2017, Revised April 2017 have been provided in Appendix B for reference.

III. DESIGN CRITERIA

DEVELOPMENT CRITERIA REFERENCE

The analysis and design of the stormwater management system for this project was prepared in accordance with the criteria set forth in the City of Colorado Springs Drainage Criteria Manual (DCM) Volumes 1 & 2, dated May 2014.

The drainage calculations were based on the City of Colorado Springs drainage criteria manual Figure 6-5 and IDF equations to determine the intensity, and are listed in Table 1 below.

Table 1 - Precipitation Data

Return Period	One Hour Depth (in).
5-year	1.50
100-year	2.52

*The intensities above are calculated using Tc=5 minutes

HYDROLOGIC CRITIERIA

The rational method was used to calculate peak flows as the tributary areas are less than 100 acres. The rational method has been proven to be accurate for basins of this size and is based on the following formula from the City of Colorado Springs Drainage Criteria Manual Volume 1, Eq 6-5:

$Q = CIA$

Where:

- Q = Peak Discharge (cfs)
- C = Runoff Coefficient
- I = Runoff intensity (inches/hour)
- A = Drainage area (acres)

The runoff coefficients are calculated based on land use, percent imperviousness, and design storm for each basin. Composite percent impervious and composite C values were calculated using the streets, roofs, and lawn coefficients found in Table 6-6 of the DCM Vol. 1. The corresponding coefficients for the HSG A soils were used for the 5-year and 100-year storm event. The associated calculations can be found in Appendix C.

Time of Concentration

Time of concentrations have been adapted from the equation 6-7 of The City of Colorado Springs Drainage Criteria Manual, Volume 1 which are as follows:

$T_c = t_t + t_t$

Where:

- T_c = time of concentration (min)
- T_i = overland (initial) flow time (min)
- T_t = travel time in the ditch, channel, gutter, storm sewer, etc. (min)

Overland (Initial) Flow Time: from equations 6-8 from the City of Colorado Springs Drainage Criteria Manual, Volume 1.

$$t_t = \frac{0.395(1.1 - C_5)\sqrt{L}}{S^{0.33}}$$

Where:

- T_i = overland (initial) flow
- C_5 = runoff coefficient for 5-year frequency
- L = length of overland flow (300 ft maximum for non-urban land uses, 100 ft maximum for urban land uses)
- S = average basin slope

Travel Time

$V = C_v * S_w^{0.5}$

Where:

- V = Velocity (ft/s)
- C_v = conveyance coefficient

S_w = watercourse slope (ft/ft)

The 100-year event was used as the major storm event for pipes and inlets. The 5-year event was used as the minor event. All of the flows in the Rational Method calculations were routed to account for time of concentration on the surface and travel time in the pipe. As the travel time across a basin or in a pipe increases, the peak flowrate also decreases.

HYDRAULIC CRITERIA

Storm Pipe

Hydraulic design and analysis for this report will be provided as an amendment to this FDR at a later time once more detailed design elements have been completed.

Storm Inlets

CDOT Type R Curb and Type C Area Storm Inlets were sized using the UD-Inlet_v5.01 spreadsheet from Mile High Flood District and Figure 8-12 Inlet Capacity Chart for sump conditions. These calculations are provided in Appendix E.

Detention Pond

The proposed *Pond A (Public)*, was designed using the full spectrum detention design approach. Full Spectrum Detention (FSD) is a design concept introduced by Mile High Flood District (MHFD); It is the recommended design approach because it provides better control of the full range of runoff rates that pass through the detention facility compared to the traditional multi-stage concept. Volume 2 of the Urban Storm Drainage Criteria Manual (USDCM) describes the FSD approach as:

> The intent of full spectrum detention is to reduce the flooding and stream degradation impacts associated with urban development by controlling peak flows in the stream for a range of events.

The detention criteria provided by the MHFD's design spreadsheets *MHFD-Detention_v4.04* was used to determine the adequate storage capacity of the detention pond, and the associated elements of the outlet structure. The UDFCD Manual provides approximate, empirical equations that are utilized in the spreadsheet provided by MHFD. These equations and methods are further described in the USDCM Vol. 2, Ch. 12. The required volume calculations as well as the outlet structure design calculations are provided in Appendix E – Pond Computations of this report.

IV. DRAINAGE PLAN

GENERAL CONCEPT

The proposed drainage system is designed to safely convey the storm runoff generated from the proposed development to the proposed private detention pond. The proposed detention pond will provide full spectrum detention which includes water quality and 100-year detention.

The Mountain Bluffs Subdivision will be developed as a single-family development. Runoff from the project site will either sheet flow or concentrate in swales around buildings being conveyed onto the proposed public internal roadways. The roadways will direct channelized runoff to CDOT Type R Curb Storm Inlets that capture runoff. Storm sewer will then carry the collected flows directly to the detention pond.

Four Step Process

The Four Step Process is used to minimize the adverse impacts of urbanization and is a vital component of developing a balanced, sustainable project. Below identifies the approach to the four-step process:

1. **Employ Runoff Reduction Practices**

The proposed development uses Low Impact Development (LID) practices to reduce runoff at the source. Rather than creating point discharges that are directly connected to impervious areas, runoff is routed through pervious areas to promote infiltration. Grass buffers, open space landscaped areas, and swales are used where practical. Refer to Appendix C for the IRF spreadsheet.

2. **Implement BMP's That Provide a Water Quality Capture Volume with Slow Release**

The proposed development utilizes formalized water quality capture volume to slow the release of runoff from the site. A single proposed pond will provide EURV volume for the new development which incorporates a 72-hour release. This pond will also provide WQCV which will release in no less than 40 hours. By providing detention, the downstream channel has more than adequate capacity to handle the developed flows. The release rates from this development will be at or less than the site's historic release rates, which will help the overall stability of the downstream channel.

3. **Stabilize Drainageways**

This step implements stabilization to channels to accommodate developed flows while protecting infrastructure and controlling sediment loading from erosion in the drainageways. Sand Creek has had improvements made in the past to stabilize it, including grouted sloping boulder drops and riprap lining on the banks to prevent scouring.

Pond A discharges treated flows to the existing 24" RCP pipe, which conveys flows to the west under Marksheffel Road.

4. **Implement Site Specific and Other Source Control BMPs**

The biggest source control BMP is public education which can be found on the City of Colorado Springs website and discuss topics such as: pet waste, car washing, private maintenance landscaping, fall leaves, and snow melt and deicer. Dumping of waste materials in the proposed storm sewer system is not permitted. During construction, the contractor will have designated concrete washout areas and will implement sediment control logs and inlet protection in order to control pollutants at their source. There are no plans for outdoor stockpiling of materials onsite after construction has been completed, therefore, no other source control BMPs are anticipated at this time.

SPECIFIC DETAILS

The general location and description of each basin is described as follows. The Proposed Drainage Map has been provided in Appendix F and can be used to reference the basins discussed below:

Basin OS-1A (0.30 ac, Q5 = 0.3 cfs, Q100 = 0.9 cfs): an offsite sub-basin defining an area immediately adjacent to the proposed development situated to the northeast within Enclaves at Mountain Vista Filing 1. This offsite basin will have a single-family use with similar density to the proposed subdivision. Runoff will be routed via sheet flow across the existing gas easements to the west onto the Mountain Bluffs Subdivision property at **Design Point 4**. Flows will be routed via channelized flow along the rear property line to the south end of sub-basin A-4a, where runoff is conveyed via the proposed roadway to the west downstream to **Design Point 8**.

Basin OS-1B (0.81 ac, Q5 = 1.1 cfs, Q100 = 2.7 cfs): an offsite sub-basin defining an area immediately adjacent to the proposed development situated to the northeast within Enclaves at Mountain Vista Filing 1. This offsite basin will have a single-family use with similar density to the proposed subdivision. Runoff will be routed via sheet flow across the existing gas easements to the west onto the Mountain Bluffs Subdivision property at **Design Point 7a**. Flows will be routed via channelized flow along the rear property line to the south end of sub-basin A-4a, where runoff is conveyed via the proposed roadway to the west downstream to **Design Point 8**.

Basin OS-1C (0.34 ac, Q5 = 0.5 cfs, Q100 = 1.2 cfs): an offsite sub-basin defining an area immediately adjacent to the proposed development situated to the northeast within Enclaves at Mountain Vista Filing 1. This offsite basin will have a single-family use with similar density to the proposed subdivision. Runoff will be routed via sheet flow across the existing gas easements to the west onto the Mountain Bluffs Subdivision property at **Design Point 7b**. Flows will be routed via channelized flow along the rear property line to the north end of sub-basin A-4b, where runoff is conveyed via the proposed roadway to the west downstream to **Design Point 8**.

Basin A-1 (0.52 ac, Q5 = 0.6 cfs, Q100 = 1.7 cfs): an onsite sub-basin defining an area situated at the north end of the development containing homes, sidewalks roadway, and landscaping. Runoff from the lots will sheet flow to the north within the proposed roadside swale where flow will become channelized and be conveyed downstream to **Design Point 1**. Flows will be captured by a proposed CDOT Type C Storm Inlet. Flows will be routed downstream via proposed 24" RCP Storm Pipe (Public) to Design Point 3. Emergency overflows will overtop the proposed curb & gutter and will be directed downstream to **Design Point 14** (Pond 4 – Preliminary / Final Drainage Report, Enclaves at Mountain Vista Filing No. 1" by Galloway & Company, Inc., February 2017, Revised April 2017) where runoff crosses beneath Marksheffel Road to the west in a 24" RCP pipe.

Basin A-2 (1.34 ac, Q5 = 2.6 cfs, Q100 = 5.4 cfs): a sub-basin defining a portion of the development within the northern end of the development containing homes, sidewalks, roadway and landscaping. Runoff from the lots will sheet flow to their respective frontages to the proposed roadway, where runoff is conveyed to the west via curb & gutter downstream to **Design Point 2**. Flows will be captured by a proposed 5' CDOT Type R Storm Inlet. Flows will be routed downstream via proposed 18" RCP Storm Pipe (Public) to Design Point 3. Emergency overflows will overtop the proposed curb & gutter and will be directed downstream to **Design Point 14** (Pond 4 – Preliminary / Final Drainage Report, Enclaves at Mountain Vista Filing No. 1" by Galloway & Company, Inc., February 2017, Revised April 2017) where runoff crosses beneath Marksheffel Road to the west in a 24" RCP pipe.

Basin A-3 (2.61 ac, Q5 = 5.1 cfs, Q100 = 11.2 cfs): a sub-basin defining a portion of the development within the north-central area of the development containing homes, sidewalks, roadway and landscaping. Runoff from the lots will sheet flow to their respective frontages to the proposed roadway, where runoff is conveyed to the west via curb & gutter downstream to **Design Point 5**. Flows will be captured by a proposed 20' CDOT Type R Storm Inlet. Flows will be routed downstream via proposed 18" RCP Storm Pipe (Public) to Design Point 6. Emergency overflows will overtop the proposed curb & gutter and will be directed downstream to **Design Point 14** (Pond 4 – Preliminary / Final Drainage Report, Enclaves at Mountain Vista Filing No. 1" by Galloway & Company, Inc., February 2017, Revised April 2017) where runoff crosses beneath Marksheffel Road to the west in a 24" RCP pipe.

Basin A-4a (2.29 ac, Q5 = 3.6 cfs, Q100 = 8.2 cfs): a sub-basin defining a portion of the development within the central area of the development containing homes, sidewalks, roadway and landscaping. Runoff from the lots will sheet flow to their respective frontages to the proposed roadway, where runoff is conveyed to the west via curb & gutter downstream to **Design Point 8a**. Flows will be captured by a proposed 15' CDOT Type R Storm Inlet. Flows will be routed downstream via proposed 18" RCP Storm Pipe (Public) to Design Point 8. Emergency overflow will overtop proposed curb & gutter and be directed into Pond A situated to the west.

Basin A-4b (2.00 ac, Q5 = 3.4 cfs, Q100 = 7.7 cfs): a sub-basin defining a portion of the development within the central area of the development containing homes, sidewalks, roadway and landscaping. Runoff from the lots will sheet flow to their respective frontages to the proposed roadway, where runoff is conveyed to the west via curb & gutter downstream to **Design Point 8b**. Flows will be captured by a proposed 10' CDOT Type R Storm Inlet. Flows will be routed downstream via proposed 18" RCP Storm Pipe (Public) to Design Point 8. Emergency overflow will overtop proposed curb & gutter and be directed into Pond A situated to the west.

Basin A-5 (1.34 ac, Q5 = 2.3 cfs, Q100 = 4.9 cfs): a sub-basin defining a portion of the development within the south-central area of the development containing homes, sidewalks, roadway and landscaping. Runoff from the lots will sheet flow to their respective frontages to the proposed roadway, where runoff is conveyed to the west via curb & gutter downstream to **Design Point 10**. Flows will be captured by a proposed 5' CDOT Type R Storm Inlet. Flows will be routed downstream via proposed 18" RCP Storm Pipe (Public) to Design Point 11. Emergency overflows will overtop the proposed curb & gutter and will be directed downstream to **Design Point 14** (Pond 4 – Preliminary / Final Drainage Report, Enclaves at Mountain Vista Filing No. 1" by Galloway & Company, Inc., February 2017, Revised April 2017) where runoff crosses beneath Marksheffel Road to the west in a 24" RCP pipe.

Basin A-6 (1.76 ac, Q5 = 3.0 cfs, Q100 = 6.6 cfs): a sub-basin defining a portion of the development within the southern end of the development containing homes, sidewalks, roadway and landscaping. Runoff from the lots will sheet flow to their respective frontages to the proposed roadway, where runoff is conveyed to the west via curb & gutter downstream to **Design Point 9**. Flows will be captured by a proposed 5' CDOT Type R Storm Inlet. Flows will be routed downstream via proposed 18" & 24" RCP Storm Pipe (Public) to Design Point 11. Emergency overflows will overtop the proposed curb & gutter and will be directed downstream to **Design Point 14** (Pond 4 – Preliminary / Final Drainage Report, Enclaves at Mountain Vista Filing No. 1" by Galloway & Company, Inc., February 2017, Revised April 2017) where runoff crosses beneath Marksheffel Road to the west in a 24" RCP pipe.

Basin A-7 (0.88 ac, Q5 = 0.0 cfs, Q100 = 0.9 cfs): a sub-basin defining a portion of the development within the western area of the development containing the proposed full spectrum detention facility, **Pond A**. Runoff from the upstream storm sewer infrastructure is conveyed to the Pond at **Design Point 12**. Flows will be treated and detained within the proposed pond. Once treated, the pond will release at historic rates and will be directed through a proposed outlet structure (Inlet 8), where flows will be routed downstream to **Design Point 14** (Pond 4 – Preliminary / Final Drainage Report, Enclaves at Mountain Vista Filing No. 1" by Galloway & Company, Inc., February 2017, Revised April 2017) where runoff crosses beneath Marksheffel Road to the west in a 24" RCP pipe.

Basin B-1 (0.68 ac, Q5 = 0.6 cfs, Q100 = 1.9 cfs): an onsite sub-basin defining an area situated at the south end of the development containing sidewalks and landscaping. Majority of runoff from the lots, roadway access and landscaping, will sheet flow to the south within the proposed landscaping area to

existing Zircon Drive where flow will be conveyed as described for sub-basin F1-A3 within the Preliminary / Final Drainage Report, Enclaves at Mountain Vista Filing No. 1" by Galloway & Company, Inc., February 2017, Revised April 2017.

Basin B-2 (2.96 ac, Q5 = 0.1 cfs, Q100 = 2.7 cfs): a sub-basin defining a portion of the development within the western area of the development containing landscaping and open space. Runoff from the eastern edge of this sub-basin will sheet flow to the existing low point at the western edge of the sub-basin to **Design Point 14** (Pond 4 – Preliminary / Final Drainage Report, Enclaves at Mountain Vista Filing No. 1" by Galloway & Company, Inc., February 2017, Revised April 2017) where runoff crosses beneath Marksheffel Road to the west in a 24" RCP pipe.

STORMWATER CONVEYANCE FACILITIES

Runoff generated from the project site will be conveyed through the site via overland flow and side lot swales to curb and gutter where the flows will be intercepted by proposed storm sewer inlets and conveyed to the proposed full spectrum detention pond (Pond A) by the public storm sewer pipe systems.

STORMWATER STORAGE FACILITIES

The detention facility for the site, *Pond A (Public)* is located in the western portion of the site (see Pr Conditions Map – Appendix F). This pond will provide full spectrum detention for the entire Mountain Bluffs Subdivision development. *Pond A* total tributary area is 14.2 acres at 52.5% imperviousness. From the Proposed Drainage Map (DR-2), sub-basins OS-1A, OS-1B, OS-1C, A-1, A-2, A-3, A-4, A-5, A-6, and A-7 flow to the detention pond. These tributary area calculations are included in Appendix E. The pond is designed to be a full spectrum extended detention basins utilizing the Mile High Flood District's UD-Detention v4.04 spreadsheet. The 0.874 acre-feet of EURV volume will release 97% of the inflow volume in 67 hours, while the 0.253 acre-feet of WQCV will release 99% of the inflow volume in 40 hours. The total 100-year volume of the pond is 1.419.

For *Pond A,* three (3) proposed forebays will provide energy dissipation baffles for the pond inlet pipes. Riprap will also be provided per the DCM Vol. 1, Figure 13-9.

The proposed detention pond will ultimately outfall into the East Fork Sand Creek Channel. For *Pond A,* the maximum outflow from the proposed outlet structure will have a peak outflow of 12.3 cfs in the 100-year storm event. Per the existing conditions analysis, the peak outflows from the proposed development at **Design Point EX2** was determined to be 15.5 cfs. With the addition of the EDBs, the peak flow into East Fork Sand Creek is being reduced by 3.2 cfs.

An emergency spillway will convey any runoff above the 100-year volume for the pond. For *Pond A,* the spillway will direct flows to the west where flows from the proposed development discharge to **Design Point 14** (Pond 4 – Preliminary / Final Drainage Report, Enclaves at Mountain Vista Filing No. 1" by Galloway & Company, Inc., February 2017, Revised April 2017) where runoff crosses beneath Marksheffel Road to the west in a 24" RCP pipe. The proposed spillway is 50' in width (See Detention Basin Outlet Structure Design in Appendix E), respectively. The spillways will be armored by type VL riprap per DCM Vol 1, Figure 13-12d. The proposed pond computations have been included in Appendix E.

BASIN FEES AND COST OPINION

The property is located in the Sand Creek Drainage Basin and was not previously platted. Therefore, drainage and/or bridge fees are as follow:

Mountain Bluffs Subdivision Final Drainage Report 2022 Original Drainage and Bridge Fees						
	Platted Area (Ac.)	Fee/ Platted Acre	Fee Due	Reimbursable Const. Costs	Fee Due at Platting	Drainage Fee Credit
Sand Creek Drainage Fee Basin						
Drainage Fee	16.36	$20,160	$329,817.60	$0.00	$329,817.60	$0.00
				$0.00	***$329,817.60***	***$0.00***

Items listed in the construction cost estimate below are public unless otherwise noted. All items are non-reimbursable.

COST OPINION

Item	Quantity	Unit	Unit Cost	Cost
Storm Drain Infrastructure (Public)				
18" RCP	443	LF	$ 80.00	$ 35,440.00
24" RCP	333	LF	$ 96.00	$ 31,968.00
30" RCP	65	LF	$ 120.00	$ 7,800.00
CDOT Type R 5' Curb Inlet	2	EA	$ 5,500.00	$ 11,000.00
CDOT Type R 10' Curb Inlet	2	EA	$ 6,500.00	$ 13,000.00
CDOT Type R 15' Curb Inlet	1	EA	$ 7,500.00	$ 7,500.00
CDOT Type R 20' Curb Inlet	1	EA	$ 8,500.00	$ 8,500.00
CDOT Type C Area Inlet	1	EA	$ 7,000.00	$ 7,000.00
Outlet Protection	3	EA	$ 5,000.00	$ 15,000.00
5' Storm Manhole	7	EA	$ 3,500.00	$ 24,500.00
Subtotal				$ 161,708.00
Pond (Public)				
Earthwork	4,941	CY	$ 15.00	$ 74,115.00
Forebay	3	EA	$ 5,000.00	$ 15,000.00
Hand Rail Fence (Forebays)	120	LF	$ 6.00	$ 720.00
Type VL RipRap (Emergency Spillway)	61	CY	$ 120.00	$ 7,320.00
Trickle Channel	322	LF	$ 15.00	$ 4,830.00
Outlet Structure w/ Concrete Micropool	1	EA	$ 10,000.00	$ 10,000.00
18" RCP Storm Pipe	157	LF	$ 80.00	$ 12,560.00
Pond Access Road (CDOT Class 6 Gravel)	179	CY	$ 45.00	$ 8,055.00
Subtotal				$ 132,600.00
Total (Public)				**$ 294,308.00**
Contingency			**10%**	**$ 29,430.80**
Grand Total (Public)				**$ 323,738.80**

V. CONCLUSIONS

This report for Mountain Bluffs Subdivision has demonstrated that the proposed development will comply with the City of Colorado Springs **DCM,** DBPS, MDDP, and City of Colorado Springs MS4 permit. No adverse effect on downstream infrastructure is anticipated. Therefore, we recommend approval of the proposed development.

Grading and erosion control plans, storm sewer plans and permanent control measure plans associated with this development will be submitted to SWENT for review and approval prior to construction.

VARIANCES

No variance(s) are being requested at this time.

VI. REFERENCES

1. Drainage Criteria Manual Volumes 1&2, City of Colorado Springs (May 2014) (with current revisions)

2. Urban Storm Drainage Criteria Manual, Vol. 1-3, Urban Drainage and Flood Control District, January 2016 (with current revisions).

3. Flood Insurance Rate Map – El Paso County, Colorado and Incorporated Areas Community Panel No. 08041C0543G, Effective December 7th, 2018.

4. Soil Map – El Paso County Area, Colorado as available through the Natural Resources Conservation Service National Cooperative Soil Survey web site via Web Soil Survey 2.0.

5. "Master Development Drainage Plan for Enclaves at Mountain Bluffs, Branes Road and Marksheffel Road" by Galloway & Company, Inc., February 2016, Revised May 2016

6. "Preliminary / Final Drainage Report, Enclaves at Mountain Vista Filing No. 1" by Galloway & Company, Inc., February 2017, Revised April 2017

APPENDIX A

Soil & FEMA Data

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for El Paso County Area, Colorado

April 15, 2022

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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Contents

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map

Map Scale: 1:1,980 if printed on A portrait (8.5" x 11") sheet.

N

0 25 50 100 150 Meters

0 50 100 200 300 Feet

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

MAP LEGEND

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

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

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

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 19, Aug 31, 2021

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

Date(s) aerial images were photographed: Aug 19, 2018—Sep 23, 2018

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
97	Truckton sandy loam, 3 to 9 percent slopes	21.2	100.0%
Totals for Area of Interest		**21.2**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

El Paso County Area, Colorado

97—Truckton sandy loam, 3 to 9 percent slopes

Map Unit Setting

National map unit symbol: 2x0j2
Elevation: 5,300 to 6,850 feet
Mean annual precipitation: 14 to 19 inches
Mean annual air temperature: 48 to 52 degrees F
Frost-free period: 85 to 155 days
Farmland classification: Not prime farmland

Map Unit Composition

Truckton and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Truckton

Setting

Landform: Interfluves, hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Re-worked alluvium derived from arkose

Typical profile

A - 0 to 4 inches: sandy loam
Bt1 - 4 to 12 inches: sandy loam
Bt2 - 12 to 19 inches: sandy loam
C - 19 to 80 inches: sandy loam

Properties and qualities

Slope: 3 to 9 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 1 percent
Maximum salinity: Nonsaline (0.1 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 6.6 inches)

Interpretive groups

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

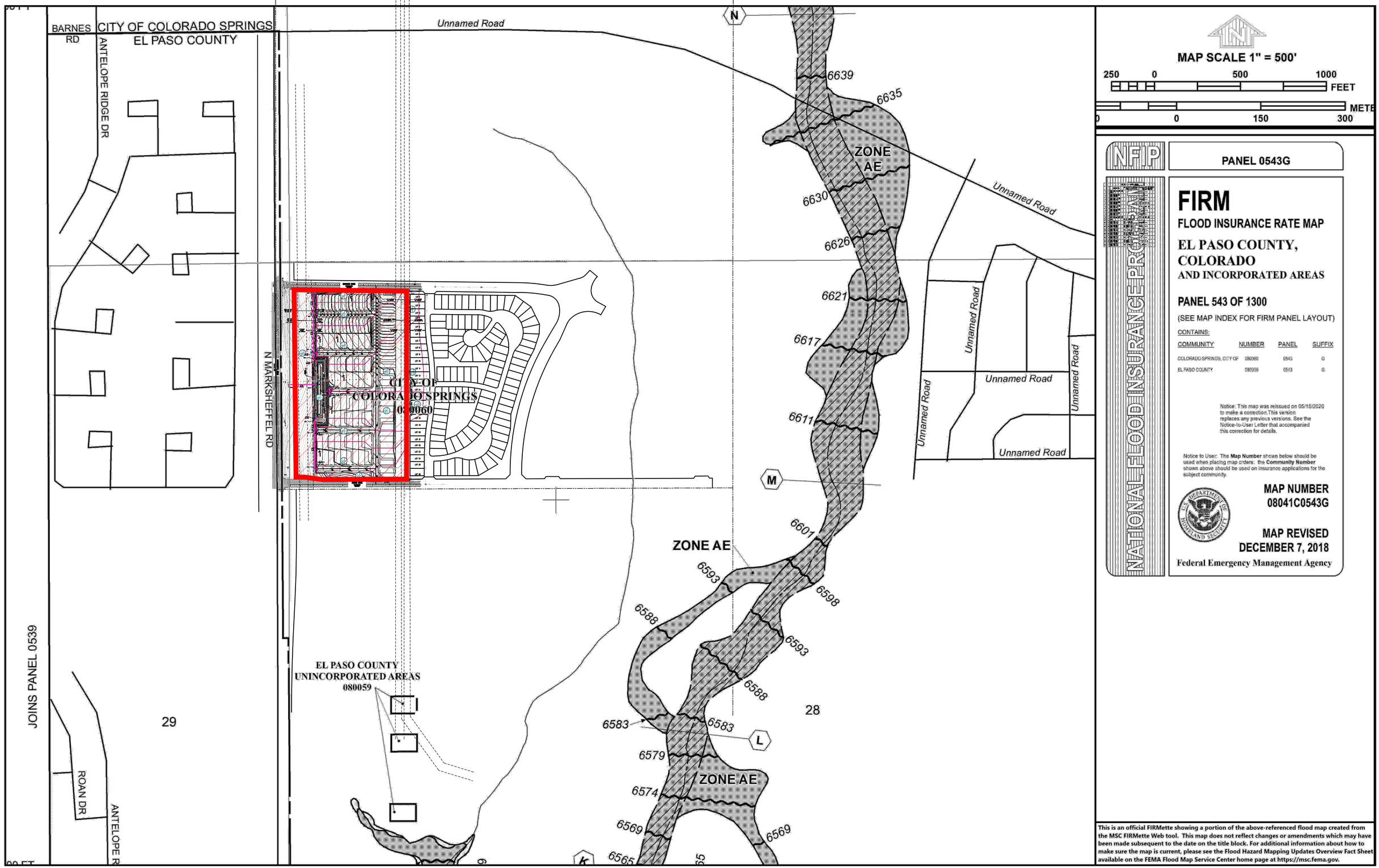
Minor Components

Blakeland

Percent of map unit: 8 percent
Landform: Interfluves, hillslopes
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Convex, linear
Ecological site: R049XB210CO - Sandy Foothill
Hydric soil rating: No

Bresser

Percent of map unit: 7 percent
Landform: Interfluves, low hills
Landform position (two-dimensional): Footslope, toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave, linear
Across-slope shape: Concave, linear
Ecological site: R049XB210CO - Sandy Foothill
Hydric soil rating: No


BARNES RD
CITY OF COLORADO SPRINGS
EL PASO COUNTY
ANTELOPE RIDGE DR
Unnamed Road
N MARKSHEFFEL RD
CITY OF COLORADO SPRINGS 080060
EL PASO COUNTY UNINCORPORATED AREAS 080059
ZONE AE
6639
6635
6630
6626
6621
6617
6611
6601
6593
6588
6598
6583
6579
6574
6569
6565
Unnamed Road
Unnamed Road
Unnamed Road
Unnamed Road
Unnamed Road
N
M
L
K
JOINS PANEL 0539
29
28
ROAN DR
ANTELOPE RIDGE DR
MAP SCALE 1" = 500'
250 0 500 1000 FEET
0 150 300
NFIP
PANEL 0543G
FIRM
FLOOD INSURANCE RATE MAP
EL PASO COUNTY, COLORADO
AND INCORPORATED AREAS
PANEL 543 OF 1300
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)
CONTAINS:
COMMUNITY NUMBER PANEL SUFFIX
COLORADO SPRINGS, CITY OF 080060 0543 G
EL PASO COUNTY 080059 0543 G
Notice: This map was reissued on 05/15/2020 to make a correction.This version replaces any previous versions. See the Notice-to-User Letter that accompanied this correction for details.
Notice to User: The Map Number shown below should be used when placing map orders; the Community Number shown above should be used on insurance applications for the subject community.
MAP NUMBER
08041C0543G
MAP REVISED
DECEMBER 7, 2018
Federal Emergency Management Agency
NATIONAL FLOOD INSURANCE PROGRAM
This is an official FIRMette showing a portion of the above-referenced flood map created from the MSC FIRMette Web tool. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For additional information about how to make sure the map is current, please see the Flood Hazard Mapping Updates Overview Fact Sheet available on the FEMA Flood Map Service Center home page at https://msc.fema.gov.

APPENDIX B

Excerpts From Existing Drainage Studies

COMPOSITE % IMPERVIOUS CALCULATIONS

Subdivision: Enclaves at Mountain Vistas
Location: CO, Colorado Springs

Project Name: Filing I
Project No.: CLH07.01
Calculated By: JG
Checked By:
Date: 4/24/17

Basin ID	Total Area (ac)	Paved Roads			Lawns			Residential			Basins Total Weighted % Imp.
		% Imp.	Area (ac)	Weighted % Imp.	% Imp.	Area (ac)	Weighted % Imp.	% Imp.	Area (ac)	Weighted % Imp.	
F1-A1	25.44	100	0.17	0.67	5	25.27	5.00	65	0.00	0.00	5.67
F1-A1A	1.01	100	0.33	32.67	5	0.68	3.40	65	0.00	0.00	36.07
F1-A2	0.72	100	0.50	69.75	5	0.22	1.50	65	0.00	0.00	71.25
F1-A3	0.98	100	0.40	40.66	5	0.58	3.00	65	0.00	0.00	43.66
F1-A4	18.60	100	0.00	0.00	5	0.00	0.00	65	18.60	65.00	65.00
F1-A5	0.88	100	0.40	45.70	5	0.48	2.70	65	0.00	0.00	48.40
F1-B1	1.10	100	0.29	26.36	5	0.28	1.30	65	0.53	31.30	58.96
F1-B1A	1.41	100	0.33	23.40	5	1.08	3.80	65	0.00	0.00	27.20
F1-B2	1.15	100	0.40	34.78	5	0.41	1.80	65	0.34	19.20	55.78
F1-B3	1.31	100	0.65	49.62	5	0.66	2.50	65	0.00	0.00	52.12
F1-C1	1.22	100	0.31	25.41	5	0.35	1.40	65	0.56	29.80	56.61
F1-C2	0.73	100	0.14	19.18	5	0.24	1.60	65	0.35	31.20	51.98
F1-D1	0.94	100	0.55	58.51	5	0.39	2.10	65	0.00	0.00	60.61
F1-D2	1.18	100	0.57	48.31	2	0.16	0.30	65	0.00	0.00	48.61
F2-A	1.06	100	0.00	0.00	5	0.72	3.40	65	0.34	20.80	24.20
F2-B1	8.76	100	0.06	0.68	5	0.91	0.50	65	7.79	57.80	58.98
F2-B3	3.54	100	0.10	2.82	5	0.07	0.10	65	3.37	61.90	64.82
F2-C1	1.45	100	0.00	0.00	5	0.00	0.00	65	1.45	65.00	65.00
F2-B6	0.56	100	0.00	0.00	5	0.31	2.80	65	0.25	29.00	31.80
OS1	10.24	100	0.00	0.00	5	0.00	0.00	67	10.24	67.00	67.00
OS2	6.18	100	0.00	0.00	5	0.00	0.00	68	6.18	68.00	68.00
OS3	0.36	100	0.26	72.22	5	0.10	1.40	68	0.00	0.00	73.62
OS4	0.31	100	0.21	67.74	5	0.10	1.60	68	0.00	0.00	69.34

STANDARD FORM SF-2
TIME OF CONCENTRATION

Subdivision: Enclaves at Mountain Vistas
Location: CO, Colorado Springs

Project Name: Filing I
Project No.: CLH07.01
Calculated By: JG
Checked By:
Date: 4/24/17

SUB-BASIN DATA						INITIAL/OVERLAND (T_i)			TRAVEL TIME (T_t)					Tc CHECK (URBANIZED BASINS)			FINAL
BASIN ID	D.A. (AC)	Hydrologic Soils Group	Impervious (%)	C_{100}	C_5	L (FT)	S (%)	T_i (MIN)	L (FT)	S (%)	Cv	VEL. (FPS)	T_t (MIN)	COMP. T_c (MIN)	TOTAL LENGTH(FT)	Urbanized T_c (MIN)	T_c (MIN)
F1-A1	25.44	B	5.67	0.38	0.11	500	6.5	21.7	1500	3.6	10.0	1.9	13.2	34.9	2000.0	21.1	21.1
F1-A1A	1.01	B	36.07	0.48	0.28	25	2.0	6.0	760	6.7	10.0	2.6	4.9	10.9	785.0	14.4	10.9
F1-A2	0.72	B	71.25	0.63	0.50	25	2.0	4.4	850	9.0	20.0	6.0	2.4	6.7	875.0	14.9	6.7
F1-A3	0.98	B	43.66	0.51	0.32	25	2.0	5.7	850	9.0	20.0	6.0	2.4	8.0	875.0	14.9	8.0
F1-A4	18.60	B	65.00	0.59	0.45	100	3.0	8.3	850	1.4	2.5	0.3	47.9	56.1	950.0	15.3	15.3
F1-A5	0.88	B	48.40	0.52	0.34	25	2.0	5.5	850	9.0	20.0	6.0	2.4	7.9	875.0	14.9	7.9
F1-B1	1.10	B	58.96	0.56	0.40	75	12.0	4.9	450	5.0	20.0	4.5	1.7	6.5	525.0	12.9	6.5
F1-B1A	1.41	B	27.20	0.46	0.23	136	25.0	6.4	575	5.0	20.0	4.5	2.1	8.5	711.0	14.0	8.5
F1-B2	1.15	B	55.78	0.55	0.38	75	12.0	5.0	300	2.0	20.0	2.8	1.8	6.8	375.0	12.1	6.8
F1-B3	1.31	B	52.12	0.53	0.36	120	5.0	8.7	950	3.5	20.0	3.7	4.2	12.9	1070.0	15.9	12.9
F1-C1	1.22	B	56.61	0.55	0.39	90	10.0	5.7	490	2.0	20.0	2.8	2.9	8.6	580.0	13.2	8.6
F1-C2	0.73	B	51.98	0.53	0.36	105	2.0	11.0	270	3.0	20.0	3.5	1.3	12.3	375.0	12.1	12.1
F1-D1	0.94	B	60.61	0.57	0.42	10	1.5	3.4	1530	2.5	20.0	3.2	8.1	11.5	1540.0	18.6	11.5
F1-D2	1.18	B	48.61	0.52	0.34	50	1.5	8.6	1410	1.0	20.0	2.0	11.8	20.3	1460.0	18.1	18.1
F2-A	1.06	B	24.20	0.45	0.22	140	12.0	8.3						8.3	140.0	10.8	8.3
F2-B1	8.76	B	58.98	0.56	0.41	100	2.0	10.0	950	3.0	20.0	3.5	4.6	14.6	1050.0	15.8	14.6
F2-B3	3.54	B	64.82	0.59	0.45	50	3.0	5.8	950	3.0	20.0	3.5	4.6	10.4	1000.0	15.6	10.4
F2-C1	1.45	B	65.00	0.59	0.45	75	2.0	8.2						8.2	75.0	10.4	8.2
F2-B6	0.56	B	31.80	0.47	0.26	70	5.0	7.5						7.5	70.0	10.4	7.5
OS1	10.24	B	67.00	0.60	0.47	50	2.0	6.5	1885	1.0	20.0	2.0	15.7	22.2	1935.0	20.8	20.8
OS2	6.18	B	68.00	0.61	0.47	50	2.0	6.5	1200	2.5	20.0	3.2	6.3	12.8	1250.0	16.9	12.8
OS3	0.36	B	73.62	0.65	0.53	35	2.0	4.9	100	2.0	20.0	2.8	0.6	5.5	135.0	10.8	5.5
OS4	0.31	B	69.34	0.62	0.49	40	2.0	5.61	275	2.0	20.0	2.8	1.6	7.2	315.0	11.8	7.2

NOTES:

$T_i = (0.395*(1.1 - C_5)*(L)^0.5)/((S)^0.33)$, S in ft/ft

T_t=L/60V (Velocity From Fig. 501)

Velocity V=Cv*S^0.5, S in ft/ft

T_c Check = 10+L/180

For Urbanized basins a minimum T_c of 5.0 minutes is required.

DRAINAGE LEGEND

- EXISTING MAJOR CONTOUR (4850)
- EXISTING MINOR CONTOUR
- PROPOSED MAJOR CONTOUR (6485)
- PROPOSED MINOR CONTOUR
- MAJOR BASIN BOUNDARY LINE
- BASIN DESIGNATION (A-114)
- 5 YR FLOW RATE (5.0)
- 100 YR FLOW RATE (10.0)
- BASIN AREA IN ACRES (1.57)
- DESIGN POINT (1)
- PROPOSED DRAINAGE ARROW
- PROPOSED STORM SEWER
- EXISTING STORM SEWER

SITE SCHEDULE

1. PROPOSED CITY OF COLORADO SPRING TYPE 1 CURB & GUTTER
2. EXISTING PROPERTY LINE TO REMAIN

NOTE:

BASIN OS1 DOES NOT CONTRIBUTE RUNOFF TO THE SITE BUT WILL CONTRIBUTE TO THE WATER QUALITY VOLUME DURING FULL DEVELOPMENT BUILD-OUT

DRAINAGE ANALYSIS OF THE PUBLIC ROADWAYS TO BE SUBMITTED IN A SEPARATE DRAINAGE REPORT.

FILING 1 DRAINAGE TABLE

BASIN SUMMARY TABLE

Design Point	Q_5 (cfs)	Q_{100} (cfs)
1	8.4	48.8
2A	1.1	3.2
2	10.4	53.5
3	1.4	3.7
4	36.5	111.5
5	1.3	3.5
OS1	14.6	31.3
6A	15.5	34.2
6	16.9	36.8
7	2.1	3.8
OS2	10.5	23.8
8	11.6	21.3
A1	27.7	62.2
8A	0.7	5.1
9	11.2	18.1
10	7.1	16.0
11	2.1	4.9
12	1.5	3.6
13	2.6	6.3

FILING 2 DRAINAGE TABLE

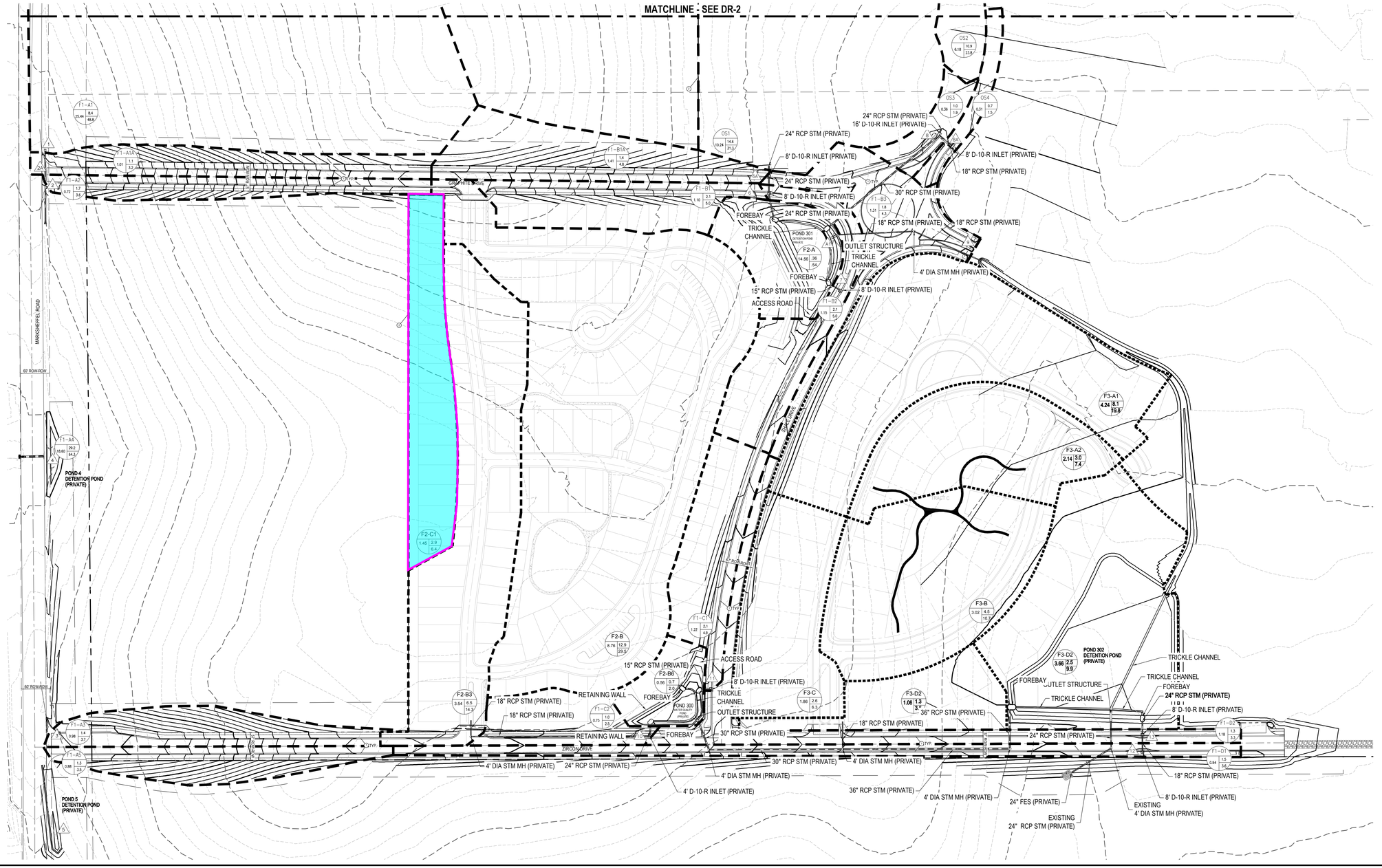
BASIN SUMMARY TABLE

Design Point	Q_5 (cfs)	Q_{100} (cfs)
1	2.1	5.0
2	2.1	5.0
3	4.9	12.8
4	9.5	21.1
5	12.1	27.8
6	12.9	29.5
7	6.5	14.3
8	7.1	16.0
9	2.1	4.9
10	21.8	50.1
11	2.9	6.4
12	16.3	35.9
13	16.2	34.3

FILING 3 DRAINAGE TABLE

BASIN SUMMARY TABLE

Design Point	Q_5 (cfs)	Q_{100} (cfs)
1	1.5	3.9
2	4.7	10.5
3	2.6	6.2
4	3.3	7.7
5	9.0	20.9
6	3.3	8.0
7	4.5	10.7
8	2.4	5.9
9	2.8	6.5
10	1.3	3.5
11	2.3	4.3
12	5.2	11.1
13	1.9	5.2
14	22.7	55.8



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719.900.7220 Office
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FINAL DRAINAGE PLAN
ENCLAVES AT MOUNTAIN VISTAS
- - - COLORADO SPRINGS, CO

#	Date	Issue / Description	Init.

Project No:	CLH000007.01
Drawn By:	RAL
Checked By:	JCA
Date:	APRIL 24, 2017

FINAL
DRAINAGE PLAN

DR-1

DRAINAGE LEGEND

- 4850 — EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- 6485 — PROPOSED MAJOR CONTOUR
- PROPOSED MINOR CONTOUR
- MAJOR BASIN BOUNDARY LINE
- A-114 — BASIN DESIGNATION
- 5.0 — 5 YR FLOW RATE
- 10.0 — 100 YR FLOW RATE
- 1.57 — BASIN AREA IN ACRES
- 1 — DESIGN POINT
- PROPOSED DRAINAGE ARROW
- PROPOSED STORM SEWER
- EXISTING STORM SEWER

SITE SCHEDULE

1. PROPOSED CITY OF COLORADO SPRING TYPE 1 CURB & GUTTER
2. EXISTING PROPERTY LINE TO REMAIN

NOTE:

BASIN OS1 DOES NOT CONTRIBUTE RUNOFF TO THE SITE BUT WILL CONTRIBUTE TO THE WATER QUALITY VOLUME DURING FULL DEVELOPMENT BUILD-OUT

DRAINAGE ANALYSIS OF THE PUBLIC ROADWAYS TO BE SUBMITTED IN A SEPARATE DRAINAGE REPORT.

FILING 1 DRAINAGE TABLE

BASIN SUMMARY TABLE

Design Point	Q_5 (cfs)	Q_{100} (cfs)
1	8.4	48.8
2A	1.1	3.2
2	10.4	53.5
3	1.4	3.7
4	36.5	111.5
5	1.3	3.5
OS1	14.6	31.3
6A	15.5	34.2
6	16.9	36.8
7	2.1	3.8
OS2	10.5	23.8
8	11.6	21.3
A1	27.7	62.2
8A	0.7	5.1
9	11.2	18.1
10	7.1	16.0
11	2.1	4.9
12	1.5	3.6
13	2.6	6.3

FILING 2 DRAINAGE TABLE

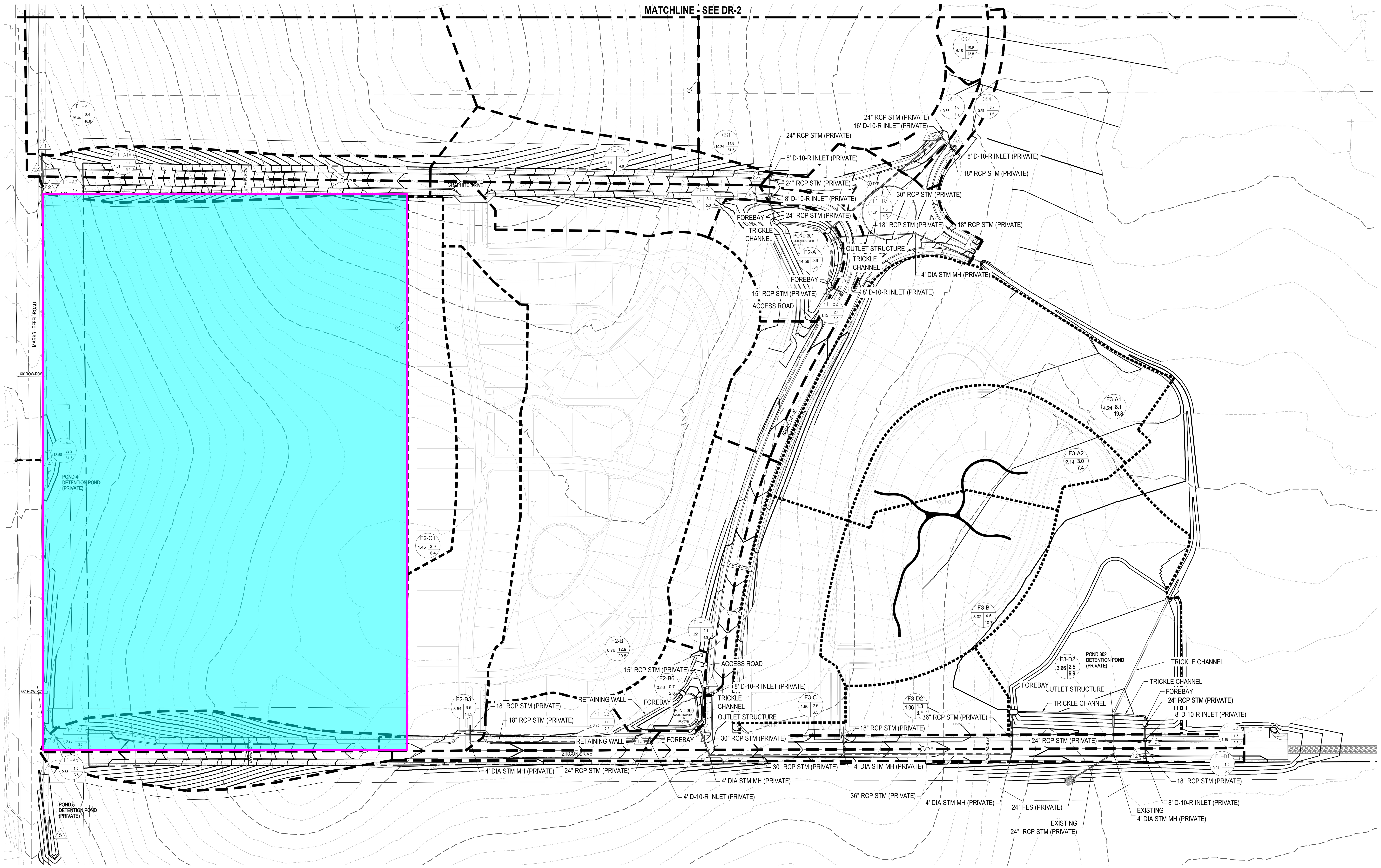
BASIN SUMMARY TABLE

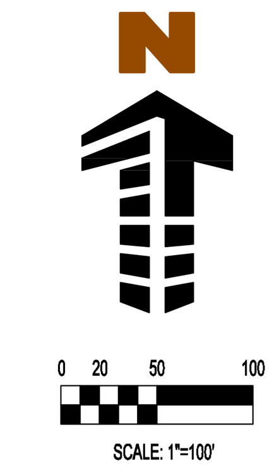
Design Point	Q_5 (cfs)	Q_{100} (cfs)
1	2.1	5.0
2	2.1	5.0
3	4.9	12.8
4	9.5	21.1
5	12.1	27.8
6	12.9	29.5
7	6.5	14.3
8	7.1	16.0
9	2.1	4.9
10	21.8	50.1
11	2.9	6.4
12	16.3	35.9
13	16.2	34.3

FILING 3 DRAINAGE TABLE

BASIN SUMMARY TABLE

Design Point	Q_5 (cfs)	Q_{100} (cfs)
1	1.5	3.9
2	4.7	10.5
3	2.6	6.2
4	3.3	7.7
5	9.0	20.9
6	3.3	8.0
7	4.5	10.7
8	2.4	5.9
9	2.8	6.5
10	1.3	3.5
11	2.3	4.3
12	5.2	11.1
13	1.9	5.2
14	22.7	55.8





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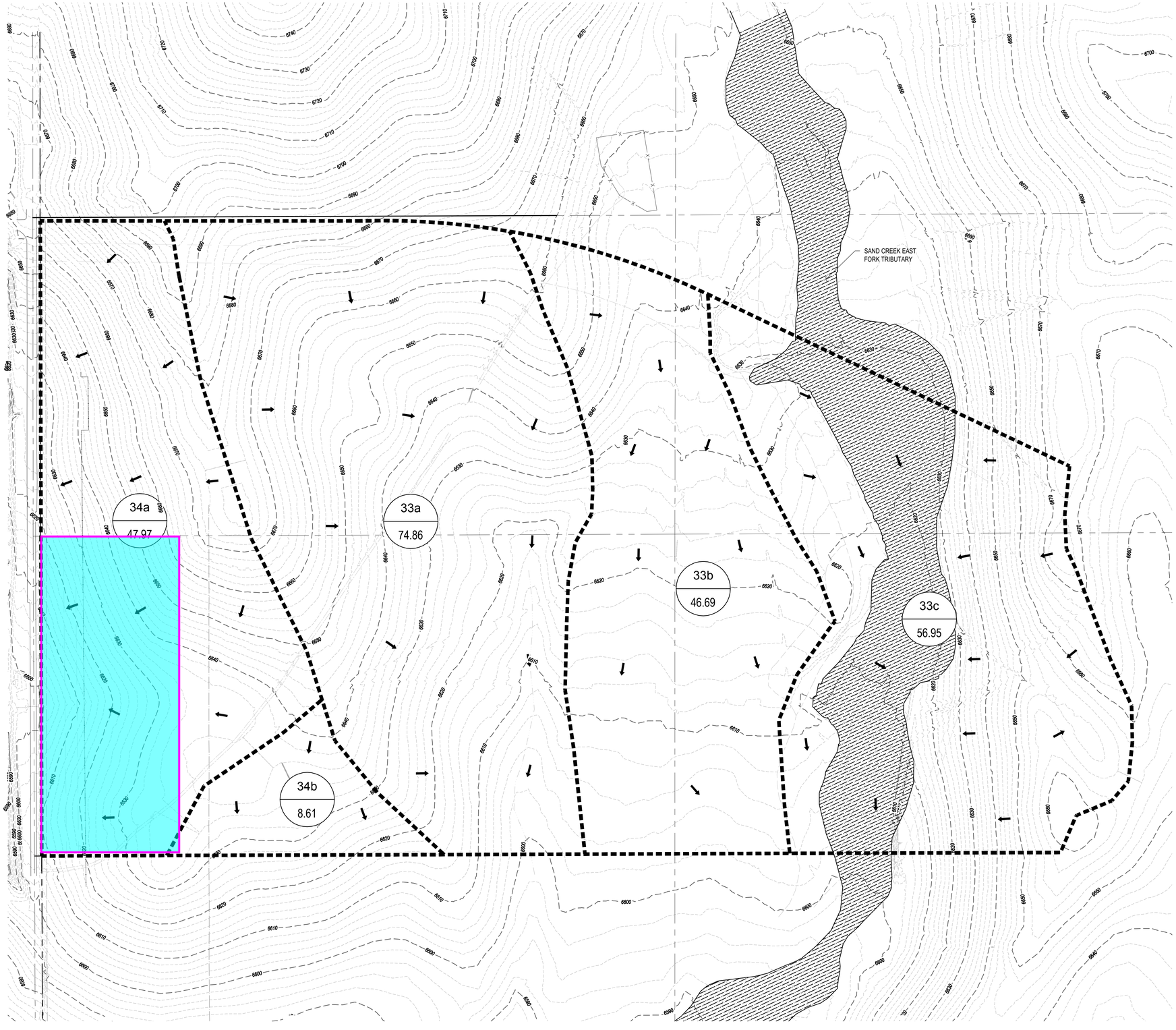
FINAL DRAINAGE PLAN
ENCLAVES AT MOUNTAIN VISTAS
COLORADO SPRINGS, CO

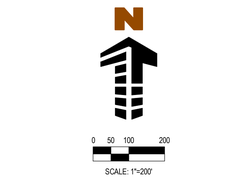
#	Date	Issue / Description	Init.

Project No:	CLH000007.01
Drawn By:	RAL
Checked By:	JCA
Date:	APRIL 24, 2017

FINAL DRAINAGE PLAN

DR-1





EXISTING CONDITIONS DRAINAGE CALCULATIONS			
BASIN	AREA (ACRES)	5 YEAR EVENT	100 YEAR EVENT
33A	74.86 ACRES	7.85 CFS	18.42 CFS
33B	46.69 ACRES	4.85 CFS	10.69 CFS
33C	56.95 ACRES	5.88 CFS	12.68 CFS
34A	47.97 ACRES	5.06 CFS	9.58 CFS
34B	8.61 ACRES	0.91 CFS	1.79 CFS
TOTAL DISCHARGE	OUTFALL 33	18.58 CFS	41.79 CFS
TOTAL DISCHARGE	OUTFALL 34	5.97 CFS	11.37 CFS
	TOTAL COMBINED	24.55 CFS	53.16 CFS

HISTORIC DRAINAGE PLAN

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COLORADO LICENSED
SCOTT MICHAEL BROWN
45900
PROFESSIONAL ENGINEER
06/29/2017

PRELIMINARY DRAINAGE PLAN
ENCLAVES AT MOUNTAIN VISTAS
COLORADO SPRINGS, CO

#	Date	Issue / Description	Init.

Project No:	CLH000007.01
Drawn By:	RAL
Checked By:	JCA
Date:	MARCH 18, 2016

HISTORIC DRAINAGE PLAN

DR-1
Sheet 1 of 4

2022 DRAINAGE, BRIDGE AND POND FEES
CITY OF COLORADO SPRINGS

Basin Name	DBPS Year	Drainage Fee/Acre	Bridge Fee/Acre	Pond Land Fee/Acre	Pond Facility Fee/Acre	Surcharge/ Acre
19th Street	1964	$4,641				
21st Street	1977	$7,084				
Bear Creek	1980	$4,559	$430			
Big Johnson, Crews	1991	$17,641	$1,450	$308		
Black Squirrel Creek	1989	$16,161		$4,784		
Camp Creek	1964	$2,614				
Cottonwood Creek[1] ,[2]	2019	$16,428	$1,301			$833
Douglas Creek	1981	$14,659	$328			
Dry Creek[3]	1966	$0				
Elkhorn Basin[4]	n/a	$0				
Fishers Canyon[5]	1991	$0				
Fountain Creek[6]	n/a	VAR				
Jimmy Camp Creek	2015	$9,185			$2,993	
Kettle Creek[7] Old Ranch Trib.	2001	$0				
Little Johnson	1988	$15,396		$1,570		
Mesa	1986	$12,323				
Middle Tributary	1987	$27,583		$1,434		
Miscellaneous[8]	n/a	$13,711				
Monument Branch[12]	1987	$0				
North Rockrimmon	1973	$7,085				
Park Vista (MDDP)	2004	$19,735				
Peterson Field	1984	$14,886	$686			
Pine Creek[9]	1988	$0				
Pope's Bluff	1976	$4,718	$807			
Pulpit Rock	1968	$7,813				
Sand Creek	2021	$20,160				
Shooks Run[10]	1994	$0				
Smith Creek[11]	2002	$0				
South Rockrimmon	1976	$5,539				
Southwest Area	1984	$15,748				
Spring Creek	1968	$12,220				
Templeton Gap	1977	$8,004	$89			
Windmill Gulch	1992	$16,809	$312	$3,909		

All Drainage, Bridge and Detention Pond Facilities Fees adjusted by 7.0% over 2021 by City Council Resolution No. 195-21 on December 14, 2021 to be effective on January 1, 2022. Land Fees are based on the Park Land Dedication Fee which is currently $98,010/acre for Community Parks (28% change for inflation in 2021).

[1] The 2021 Cottonwood Creek drainage fee consists of a capital improvement fee of $12,500 per acre and land fee of $3,928 per acre for a total of $16,428 per acre. These fees are adjusted annually using different procedures but are combined for collection purposes. **The surcharge fee of $833/ac is due in cash; credits for prior facility construction cannot be used to offset this fee,** which is deposited into a separate City fund known as the "Cottonwood Creek Surcharge" fund.

[2] The Wolf Ranch portion of the Cottonwood Creek Drainage Basin was approved as a "no fee" basin **as to Drainage Fees only** by City Council on August 28, 2018 by Resolution No. 96-18

[3] Dry Creek is a closed basin per City Council Resolution No.118-08 on June 24, 2008

[4] Elkhorn Basin is a closed basin per the Annexation Agreements for the area.

[5] Fishers Canyon is a closed basin per City Council Resolution No. 74-08 on April 22, 2008.

[6] Pursuant to the recommendation of the Subdivision Storm Drainage Board adopted at its meeting of September 15, 1977, there are exempted and excluded from the provisions of this part construction of the main Fountain Creek Channel from the confluence of Fountain Creek with Monument Creek northwest to the City limits. Land developments taking place adjacent to Fountain Creek shall remain responsible for dedicating rights of way necessary for the channelization of Fountain Creek, and the developers shall continue to pay to the City as a condition of subdivision plat approval the applicable drainage fees. Drainage fees are required in accordance with the appropriate basin study.

[7] Kettle Creek Old Ranch Tributary is a closed basin per City Council Resolution 139-02 on August 27, 2002.

[8] Miscellaneous fee is assessed on unstudied areas and the Roswell and Westside Basins.

[9] Pine Creek is a closed basin per City Council Resolution No.236-88 on December 13, 1988.

[10] Shooks Run is a closed basin pursuant to the recommendation of the Drainage Board, adopted at its meeting on October 15, 1963.

[11] Smith Creek is a closed basin per City Council Resolution 140-02 on August 27, 2002

[12] Monument Branch Basin is a closed basin per City Council Res. 177-10 on October 12, 2010

APPENDIX C

Hydrologic Computations

COMPOSITE % IMPERVIOUS CALCULATIONS

Subdivision: Mountain Vista
Location: CO, Colorado Springs

Project Name: Project Name
Project No.: AHR01.20
Calculated By: TJE
Checked By: BAS
Date: 4/21/22

Basin ID	Total Area (ac)	Paved Roads			Lawns/Un-Developed Areas			Residential - <1/8 Acre			Basins Total Weighted % Imp.
		% Imp.	Area (ac)	Weighted % Imp.	% Imp.	Area (ac)	Weighted % Imp.	% Imp.	Area (ac)	Weighted % Imp.	
EXISTING CONDITION											
OS-1	1.46	100	0.00	0.0	2	0.37	0.5	65	1.09	48.50	49.0
EX-1	15.04	100	0.00	0.0	2	15.04	2.0	65	0.00	0.00	2.0
EX-2	1.32	100	0.00	0.0	2	1.32	2.0	65	0.00	0.00	2.0
PROPOSED CONDITION											
A-1	0.52	100	0.00	0.0	2	0.21	0.8	65	0.31	38.80	39.6
A-2	1.34	100	0.00	0.00	2	0.04	0.10	65	1.30	63.10	63.20
A-3	2.61	100	0.00	0.00	2	0.26	0.20	65	2.35	58.50	58.70
A-4a	2.29	100	0.00	0.00	2	0.49	0.40	65	1.80	51.10	51.50
A-4b	2.00	100	0.00	0.00	2	0.34	0.30	65	1.66	54.00	54.30
A-5	1.34	100	0.00	0.00	2	0.09	0.10	65	1.25	60.60	60.70
A-6	1.76	100	0.00	0.00	2	0.11	0.10	65	1.65	60.90	61.00
A-7	0.88	100	0.00	0.00	2	0.88	2.00	65	0.00	0.00	2.00
B-1	0.68	100	0.17	25.00	2	0.51	1.50	65	0.00	0.00	26.50
B-2	2.96	100	0.00	0.00	2	2.96	2.00	65	0.00	0.00	2.00
OS-1A	0.30	100	0.00	0.00	2	0.12	0.80	65	0.18	39.00	39.80
OS-1B	0.81	100	0.00	0.00	2	0.21	0.50	65	0.60	48.10	48.60
OS-1C	0.34	100	0.00	0.00	2	0.08	0.50	65	0.26	49.70	50.20

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STANDARD FORM SF-2
TIME OF CONCENTRATION

Subdivision: Mountain Vista
Location: CO, Colorado Springs

Project Name: Project Name
Project No.: AHR01.20
Calculated By: TJE
Checked By: BAS
Date: 4/21/22

SUB-BASIN DATA						INITIAL/OVERLAND (T_i)			TRAVEL TIME (T_t)					Tc CHECK (URBANIZED BASINS)			FINAL
BASIN ID	D.A. (AC)	Hydrologic Soils Group	Impervious (%)	C_{100}	C_5	L (FT)	S (%)	T_i (MIN)	L (FT)	S (%)	Cv	VEL. (FPS)	T_t (MIN)	COMP. T_c (MIN)	TOTAL LENGTH (FT)	Urbanized T_c (MIN)	T_c (MIN)
EXISTING CONDITION																	
OS-1	1.46	A	49.0	0.49	0.35	80	2.0	9.7	23	2.0	20.0	2.8	0.1	9.9	103.0	10.6	9.9
EX-1	15.04	A	2.0	0.13	0.01	300	7.5	17.7	731	5.9	10.0	2.4	5.0	22.7	1031.0	15.7	15.7
EX-2	1.32	A	2.0	0.13	0.01	300	1.0	34.6	33	5.2	10.0	2.3	0.2	34.8	333.0	11.9	11.9
PROPOSED CONDITION																	
A-1	0.52	A	39.6	0.42	0.26	67	9.0	6.1	269	6.5	15.0	3.8	1.2	7.2	336.0	11.9	7.2
A-2	1.34	A	63.2	0.60	0.48	100	2.0	9.0	490	5.3	20.0	4.6	1.8	10.8	590.0	13.3	10.8
A-3	2.61	A	58.7	0.57	0.44	100	9.0	5.8	675	6.8	20.0	5.2	2.2	8.0	775.0	14.3	8.0
A-4a	2.29	A	51.5	0.51	0.37	98	6.5	7.1	618	4.5	20.0	4.2	2.4	9.5	716.0	14.0	9.5
A-4b	2.00	A	54.3	0.53	0.40	65	6.5	5.5	568	2.0	20.0	2.8	3.3	8.9	633.0	13.5	8.9
A-5	1.34	A	60.7	0.58	0.46	100	1.6	10.0	550	3.3	20.0	3.6	2.5	12.5	650.0	13.6	12.5
A-6	1.76	A	61.0	0.59	0.46	100	1.6	10.0	565	2.9	20.0	3.4	2.8	12.8	665.0	13.7	12.8
A-7	0.88	A	2.0	0.13	0.01	100	25.0	6.8	140	1.0	20.0	2.0	1.2	8.0	240.0	11.3	8.0
B-1	0.68	A	26.5	0.32	0.16	42	10.0	5.2	0	0.0	20.0	0.0	0.0	5.2	42.0	10.2	5.2
B-2	2.96	A	2.0	0.13	0.01	100	10.0	9.3	0	0.0	10.0	0.0	0.0	9.3	100.0	10.6	9.3
OS-1A	0.30	A	39.8	0.42	0.27	52	2.0	8.7	90	5.0	10.0	2.2	0.7	9.4	142.0	10.8	9.4
OS-1B	0.81	A	48.6	0.49	0.34	80	2.0	9.9	23	2.0	10.0	1.4	0.3	10.2	103.0	10.6	10.2
OS-1C	0.34	A	50.2	0.50	0.36	80	2.0	9.6	23	2.0	10.0	1.4	0.3	9.9	103.0	10.6	9.9

NOTES:

T_i = (0.395*(1.1 - C_5)*(L)^0.5)/((S)^0.33), S in ft/ft

T_t=L/60V (Velocity From Fig. 501)

Velocity V=Cv*S^0.5, S in ft/ft

Tc Check = 10+L/180

For Urbanized basins a minimum T_c of 5.0 minutes is required.

For non-urbanized basins a minimum T_c of 10.0 minutes is required

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

Subdivision: Mountain Vista
Location: CO, Colorado Springs
Design Storm: 5-Year

Project Name: Project Name
Project No.: AHR01.20
Calculated By: TJE
Checked By: BAS
Date: 4/21/22

		DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			
STREET	Design Point	Basin ID	Area (Ac)	Runoff Coeff.	Tc (min)	C*A (Ac)	I (in/hr)	Q (cfs)	Tc (min)	C*A (Ac)	I (in/hr)	Q (cfs)	Slope (%)	Street Flow (cfs)	Design Flow (cfs)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	Tt (min)	REMARKS
EXISTING CONDITION																					
	EX1	OS-1	1.46	0.35	9.9	0.51	4.15	2.1				2.1									Off-site Sheet Flows to Basin EX-1
	EX2	EX-1	15.04	0.01	15.7	0.15	3.45	0.5	15.7	0.66	3.45	2.3									Sheet Flows West - To Road Side Ditch
	EX3	EX-2	1.32	0.01	11.9	0.01	3.87	0.0				0.0									Sheet Flows South - To Zircon Drive
PROPOSED CONDITION																					
	1	A-1	0.52	0.26	7.2	0.14	4.62	0.6				0.6									Proposed Type C Inlet
	2	A-2	1.34	0.48	10.8	0.64	4.02	2.6				2.6									Proposed Type R Inlet
	3								10.8	0.78	4.02	3.1									Proposed Manhole
	4	OS-1A	0.30	0.27	9.4	0.08	4.23	0.3				0.3									Off-site Sheet Flows to Basin A-3
		A-3	2.61	0.44	8.0	1.15	4.47	5.1													
	5								9.4	1.23	4.23	5.2									Proposed Type R Inlet - Rec from DP 4 & Basin A-3
	6								10.8	2.01	4.02	8.1									Proposed Manhole - Rec from DP 3 & DP 5
	7a	OS-1B	0.81	0.34	10.2	0.28	4.11	1.2				1.2									Off-site Sheet Flows to Basin A-4a
		A-4a	2.29	0.37	9.5	0.85	4.20	3.6													
	8a								10.2	1.13	4.11	4.6									Proposed Type R Inlet - Rec from DP 7a & Basin A-4a
	7b	OS-1C	0.34	0.36	9.9	0.12	4.15	0.5				0.5									Off-site Sheet Flows to Basin A-4b
		A-4b	2.00	0.40	8.9	0.80	4.31	3.4													
	8b								9.9	0.92	4.15	3.8									Proposed Type R Inlet - Rec from DP 7b & Basin A-4b
	8								10.2	2.05	4.11	8.4									Proposed Manhole - Rec from DP 8a & DP 8b
	9	A-6	1.76	0.46	12.8	0.81	3.76	3.0				3.0									Proposed Type R Inlet
	10	A-5	1.34	0.46	12.5	0.62	3.79	2.3				2.3									Proposed Type R Inlet
	11								12.8	1.43	3.76	5.4									Proposed Manhole - Rec from DP 9 & DP 10
		A-7	0.88	0.01	8.0	0.01	4.46	0.0													
	12								12.8	5.50	3.76	20.7									Total Flows Rec from DP 6, DP 8, DP 11 & Basin A-7
	13	B-1	0.68	0.16	5.2	0.11	5.12	0.6				0.6									On-site Sheet Flow to Zircon Drive
	14	B-2	2.96	0.01	9.3	0.03	4.24	0.1				0.1									On-site Sheet Flow Offsite West

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

Subdivision: Mountain Vista
Location: CO, Colorado Springs
Design Storm: 100-Year

Project Name: Project Name
Project No.: AHR01.20
Calculated By: TJE
Checked By: BAS
Date: 4/21/22

STREET	Design Point	DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
		Basin ID	Area (Ac)	Runoff Coeff.	Tc (min)	C*A (Ac)	I (in/hr)	Q (cfs)	Tc (min)	C*A (Ac)	I (in/hr)	Q (cfs)	Slope (%)	Street Flow (cfs)	Design Flow (cfs)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	Tt (min)	
EXISTING CONDITION																					
	EX1	OS-1	1.46	0.49	9.9	0.72	6.96	5.0				5.0									Off-site Sheet Flows to Basin EX-1
	EX2	EX-1	15.04	0.13	15.7	1.96	5.79	11.3	15.7	2.68	5.79	15.5									Sheet Flows West - To Road Side Ditch
	EX3	EX-2	1.32	0.13	11.9	0.17	6.50	1.1				1.1									Sheet Flows South - To Zircon Drive
PROPOSED CONDITION																					
	1	A-1	0.52	0.42	7.2	0.22	7.75	1.7				1.7									Proposed Type C Inlet
	2	A-2	1.34	0.60	10.8	0.80	6.74	5.4				5.4									Proposed Type R Inlet
	3								10.8	1.02	6.74	6.9									Proposed Manhole
	4	OS-1A	0.30	0.42	9.4	0.13	7.10	0.9				0.9									Off-site Sheet Flows to Basin A-3
		A-3	2.61	0.57	8.0	1.49	7.50	11.2													
	5								9.4	1.62	7.10	11.5									Proposed Type R Inlet - Rec from DP 4 & Basin A-3
	6								10.8	2.64	6.74	17.8									Proposed Manhole - Rec from DP 3 & DP 5
	7a	OS-1B	0.81	0.49	10.2	0.40	6.89	2.8				2.8									Off-site Sheet Flows to Basin A-4a
		A-4a	2.29	0.51	9.5	1.17	7.06	8.3													
	8a								10.2	1.57	6.89	10.8									Proposed Type R Inlet - Rec from DP 7a & Basin A-4a
	7b	OS-1C	0.34	0.50	9.9	0.17	6.96	1.2				1.2									Off-site Sheet Flows to Basin A-4b
		A-4b	2.00	0.53	8.9	1.06	7.23	7.7													
	8b								9.9	1.23	6.96	8.6									Proposed Type R Inlet - Rec from DP 7b & Basin A-4b
	8								10.2	2.80	6.89	19.3									Proposed Manhole - Rec from DP 8a & DP 8b
	9	A-6	1.76	0.59	12.8	1.04	6.31	6.6				6.6									Proposed Type R Inlet
	10	A-5	1.34	0.58	12.5	0.78	6.36	5.0				5.0									Proposed Type R Inlet
	11								12.8	1.82	6.31	11.5									Proposed Manhole - Rec from DP 9 & DP 10
		A-7	0.88	0.13	8.0	0.11	7.50	0.8													
	12								12.8	7.37	6.31	46.5									Total Flows Rec from DP 6, DP 8, DP 11 & Basin A-7
	13	B-1	0.68	0.32	5.2	0.22	8.59	1.9				1.9									On-site Sheet Flow to Zircon Drive
	14	B-2	2.96	0.13	9.3	0.38	7.12	2.7				2.7									On-site Sheet Flow Offsite West

Site-Level Low Impact Development (LID) Design Effective Impervious Calculator

LID Credit by Impervious Reduction Factor (IRF) Method

UD-BMP (Version 3.06, November 2016)

User Input

Calculated cells

***Design Storm: 1-Hour Rain Depth	WQCV Event	0.60	inches
***Minor Storm: 1-Hour Rain Depth	5-Year Event	1.25	inches
***Major Storm: 1-Hour Rain Depth	100-Year Event	2.61	inches
Optional User Defined Storm	CUHP		
(CUHP) NOAA 1 Hour Rainfall Depth and Frequency for User Defined Storm	100-Year Event		
Max Intensity for Optional User Defined Storm	0		

Designer: TJE
Company: Galloway & Company
Date: April 27, 2022
Project: AHR01.20
Location: Mountain Bluffs Subdivision

SITE INFORMATION (USER-INPUT)

Sub-basin Identifier	OS-1A	OS-1B	OS-1C	A-1	A-2	A-3	A-4a	A-4b	A-5	A-6	A-7			
Receiving Pervious Area Soil Type	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam			
Total Area (ac., Sum of DCIA, UIA, RPA, & SPA)	0.300	0.810	0.340	0.520	1.340	2.610	2.290	2.000	1.340	1.760	0.880			
Directly Connected Impervious Area (DCIA, acres)	0.119	0.394	0.171	0.206	0.847	1.532	1.179	1.086	0.813	1.074	0.018			
Unconnected Impervious Area (UIA, acres)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000			
Receiving Pervious Area (RPA, acres)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000			
Separate Pervious Area (SPA, acres)	0.181	0.416	0.169	0.314	0.493	1.078	1.111	0.914	0.527	0.686	0.862			
RPA Treatment Type: Conveyance (C), Volume (V), or Permeable Pavement (PP)	C	C	C	C	C	C	C	C	C	C	C			

CALCULATED RESULTS (OUTPUT)

Total Calculated Area (ac, check against input)	0.300	0.810	0.340	0.520	1.340	2.610	2.290	2.000	1.340	1.760	0.880			
Directly Connected Impervious Area (DCIA, %)	39.8%	48.6%	50.2%	39.6%	63.2%	58.7%	51.5%	54.3%	60.7%	61.0%	2.0%			
Unconnected Impervious Area (UIA, %)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			
Receiving Pervious Area (RPA, %)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			
Separate Pervious Area (SPA, %)	60.2%	51.4%	49.8%	60.4%	36.8%	41.3%	48.5%	45.7%	39.3%	39.0%	98.0%			
A_R (RPA / UIA)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000			
I_a Check	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000			
f / I for WQCV Event:	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7			
f / I for 5-Year Event:	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5			
f / I for 100-Year Event:	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3			
f / I for Optional User Defined Storm CUHP:														
IRF for WQCV Event:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
IRF for 5-Year Event:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
IRF for 100-Year Event:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
IRF for Optional User Defined Storm CUHP:														
Total Site Imperviousness: I_{total}	39.8%	48.6%	50.2%	39.6%	63.2%	58.7%	51.5%	54.3%	60.7%	61.0%	2.0%			
Effective Imperviousness for WQCV Event:	39.8%	48.6%	50.2%	39.6%	63.2%	58.7%	51.5%	54.3%	60.7%	61.0%	2.0%			
Effective Imperviousness for 5-Year Event:	39.8%	48.6%	50.2%	39.6%	63.2%	58.7%	51.5%	54.3%	60.7%	61.0%	2.0%			
Effective Imperviousness for 100-Year Event:	39.8%	48.6%	50.2%	39.6%	63.2%	58.7%	51.5%	54.3%	60.7%	61.0%	2.0%			
Effective Imperviousness for Optional User Defined Storm CUHP:														

LID / EFFECTIVE IMPERVIOUSNESS CREDITS

WQCV Event CREDIT: Reduce Detention By:	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	N/A	N/A	N/A
This line only for 10-Year Event	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
100-Year Event CREDIT**: Reduce Detention By:	0.0%	0.1%	0.1%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	-460.2%	N/A	N/A	N/A
User Defined CUHP CREDIT: Reduce Detention By:														

Total Site Imperviousness:	**52.4%**
Total Site Effective Imperviousness for WQCV Event:	**52.4%**
Total Site Effective Imperviousness for 5-Year Event:	**52.4%**
Total Site Effective Imperviousness for 100-Year Event:	**52.4%**
Total Site Effective Imperviousness for Optional User Defined Storm CUHP:	

Notes:

* Use Green-Ampt average infiltration rate values from Table 3-3.
** Flood control detention volume credits based on empirical equations from Storage Chapter of USDCM.
*** Method assumes that 1-hour rainfall depth is equivalent to 1-hour intensity for calculation purposed

PIPE OUTFALL RIPRAP SIZING CALCULATIONS

Subdivision: Mountain Vista
Location: CO, Colorado Springs

Project Name: Project Name
Project No.: AHR01.20
Calculated By: TJE
Checked By: BAS
Date: 4/28/22

	STORM DRAIN SYSTEM			
	DP-12			
Q100 (cfs)	12.3			Flows are the greater of proposed vs. future
D or H (in)	18			
W (ft)				
Slope (%)	0.02			
Yn (in)	12.72			
Yt (ft)	Unknown			If "unknown" Yt/D=0.4
Yt/D, Yt/H	0.40			Per section 11-3
Supercritical	Yes			
Q/D^2.5, Q/WH^1.5	4.46			
Q/D^1.5, Q/WH^0.5				
Da, Ha (in) *	15.36			Da=0.5(D+Yn), Ha=0.5(H+Yn)
Q/Da^1.5, Q/WHa^0.5 *	8.49			
d50 (in), Required	7.35			
Required Riprap Size	L			Fig. 8-34
Use Riprap Size	**L**			
d50 (in)	9			Fig. 8-34
1/(2 tan q)	4.30			Fig. 9-35 OR Fig 9-36
Erosive Soils	Yes			
At	2.24			At=Q/5.5
L	9.6			L=(1/(2 tan q))(At/Yt - D)
Min L	4.5			Min L=3D or 3H
Max L	15.0			Max L=10D or 10H
Length (ft)	10.0			
Bottom Width (ft)	4.5			Width=3D (Minimum)
Riprap Depth (in)	18			Depth=2(d50)
Type II Base Depth (in)	6			Table 8-34 fine grained soils)
Cutoff Wall	No			
Cutoff Wall Depth (ft)				Depth of Riprap and Base
Cutoff Wall Width (ft)				

Galloway

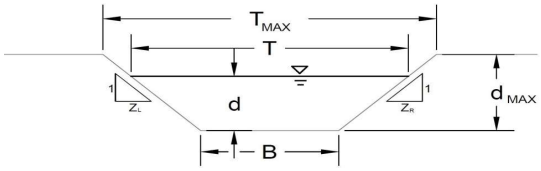
APPENDIX D

Hydraulic Computations

AREA INLET IN A SWALE

American Homes 4 Rent - Mountain Vista

Basin A-1 (DP 1)



This worksheet uses the NRCS vegetal retardance method to determine Manning's n.

For more information see Section 7.2.3 of the USDCM.

Analysis of Trapezoidal Grass-Lined Channel Using SCS Method

NRCS Vegetal Retardance (A, B, C, D, or E)	A, B, C, D, or E =	A	
Manning's n (Leave cell D16 blank to manually enter an n value)	n =	see details below	
Channel Invert Slope	S_O =	0.0650	ft/ft
Bottom Width	B =	0.00	ft
Left Side Slope	Z1 =	4.00	ft/ft
Right Side Sloe	Z2 =	4.00	ft/ft

Check one of the following soil types:

Soil Type:	Max. Velocity (V_{MAX})	Max Froude No. (F_{MAX})
Non-Cohesive	5.0 fps	0.60
Cohesive	7.0 fps	0.80
Paved	N/A	N/A

Choose One:
- (•) **Non-Cohesive**
- ( ) **Cohesive**
- ( ) **Paved**

		Minor Storm	Major Storm	
Maximum Allowable Top Width of Channel for Minor & Major Storm	T_{MAX} =	**26.00**	**26.00**	**ft**
Maximum Allowable Water Depth in Channel for Minor & Major Storm	d_{MAX} =	**0.67**	**1.00**	**ft**

Allowable Channel Capacity Based On Channel Geometry

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	**1.0**	**2.6**	**cfs**
MAJOR STORM Allowable Capacity is based on Depth Criterion	d_{allow} =	**0.67**	**1.00**	**ft**

Water Depth in Channel Based On Design Peak Flow

Design Peak Flow	Q_o =	**0.6**	**1.7**	**cfs**
Water Depth	**d** =	**0.53**	**0.83**	**ft**

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

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

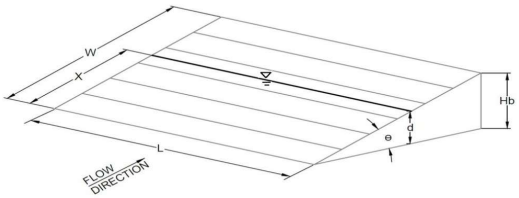
AREA INLET IN A SWALE

American Homes 4 Rent - Mountain Vista

Basin A-1 (DP 1)

Inlet Design Information (Input)

Type of Inlet	CDOT Type C	Inlet Type =	CDOT Type C	
Angle of Inclined Grade (must be <= 30 degrees)		θ =	0.00	degrees
Width of Grade		W =	3.00	ft
Length of Grade		L =	3.00	ft
Open Area Ratio		A_{RATIO} =	0.70	
Height of Inclined Grade		H_B =	0.00	ft
Clogging Factor		C_f =	0.50	
Grade Discharge Coefficient		C_d =	0.96	
Orifice Coefficient		C_o =	0.64	
Weir Coefficient		C_w =	2.05	



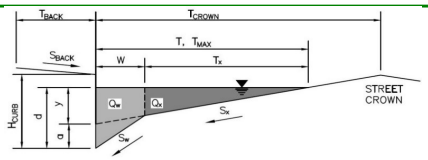
		MINOR	MAJOR	
Water Depth at Inlet (for depressed inlets, 1 foot is added for depression)	d =	0.53	0.83	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**7.2**	**14.0**	**cfs**
Bypassed Flow	**Q_b =**	**0.0**	**0.0**	**cfs**
Capture Percentage = Qa/Qo	**C% =**	**100**	**100**	**%**

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

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

Project: **American Homes 4 Rent - Mountain Vista**

Inlet ID: **Basin A-2 (DP 2)**



Gutter Geometry:

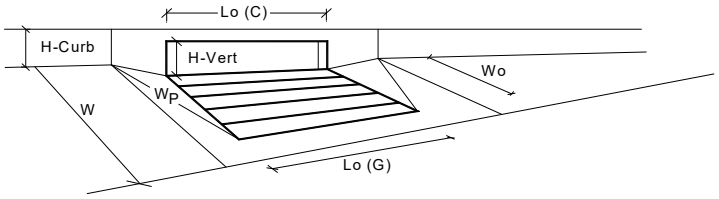
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	12.8	ft
Gutter Width	W =	0.83	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	12.8	12.8	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	3.9	7.9	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)



CDOT Type R Curb Opening

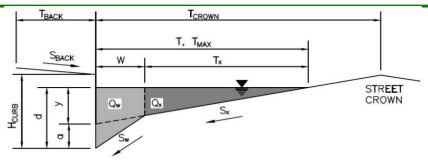
Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	3.9	7.9	☑ Override Depths
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 =	0.83	0.83	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.25	0.59	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.50	1.00	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**2.7**	**9.1**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	2.6	5.4	cfs

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

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

Project: **American Homes 4 Rent - Mountain Vista**

Inlet ID: **Basin A-3 (DP 5)**



Gutter Geometry:

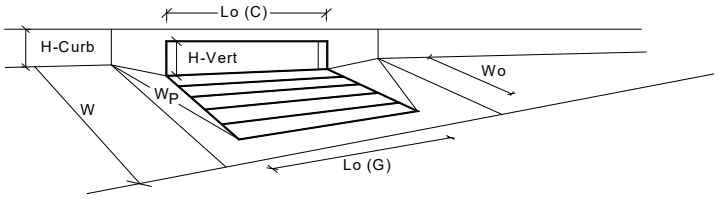
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	12.8	ft
Gutter Width	W =	0.83	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	12.8	12.8	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	3.9	7.9	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)



CDOT Type R Curb Opening

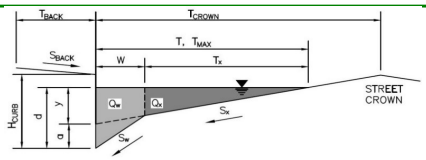
Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	3.9	7.9	☑ Override Depths
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) =	20.00	20.00	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 =	0.83	0.83	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.25	0.59	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.37	0.75	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.63	0.89	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**6.0**	**30.2**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	5.2	11.5	cfs

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

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

Project: **American Homes 4 Rent - Mountain Vista**

Inlet ID: **Basin A-4a (DP 8a)**



Gutter Geometry:

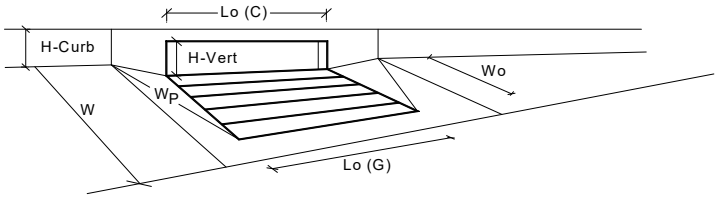
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	12.8	ft
Gutter Width	W =	0.83	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	12.8	12.8	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	3.9	7.9	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)



CDOT Type R Curb Opening

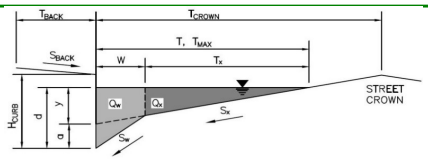
Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	3.9	7.9	☑ Override Depths
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) =	15.00	15.00	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 =	0.83	0.83	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.26	0.59	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.37	0.75	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.63	0.89	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**4.6**	**22.9**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	4.6	10.8	cfs

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

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

Project: **American Homes 4 Rent - Mountain Vista**

Inlet ID: **Basin A-4b (DP 8b)**



Gutter Geometry:

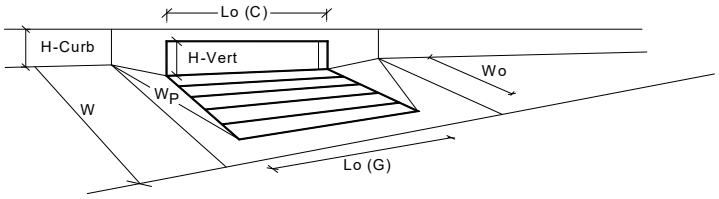
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	12.8	ft
Gutter Width	W =	0.83	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	12.8	12.8	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	3.9	7.9	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)



CDOT Type R Curb Opening

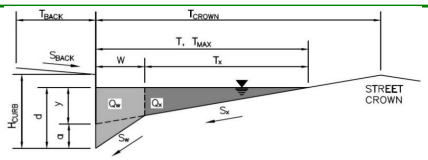
Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	3.9	7.9	☑ Override Depths
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 =	0.83	0.83	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.25	0.59	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.37	0.75	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.78	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**3.9**	**17.6**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	3.8	8.6	cfs

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

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

Project: **American Homes 4 Rent - Mountain Vista**

Inlet ID: **Basin A-6 (DP 9)**



Gutter Geometry:

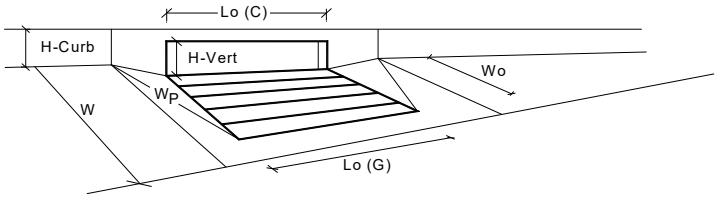
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	12.8	ft
Gutter Width	W =	0.83	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	12.8	12.8	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	3.9	7.9	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)



CDOT Type R Curb Opening

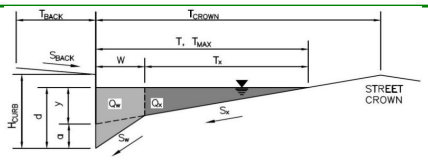
Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	3.9	7.9	☑ Override Depths
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 =	0.83	0.83	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.25	0.59	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.37	0.75	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.78	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**3.9**	**17.6**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	3.0	6.6	cfs

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

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

Project: **American Homes 4 Rent - Mountain Vista**

Inlet ID: **Basin A-5 (DP 10)**



Gutter Geometry:

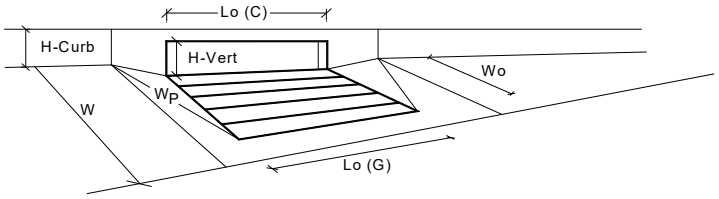
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	12.8	ft
Gutter Width	W =	0.83	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	12.8	12.8	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	3.9	7.9	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)



CDOT Type R Curb Opening

Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	3.9	7.9	☑ Override Depths
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 =	0.83	0.83	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.25	0.59	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.50	1.00	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**2.7**	**9.1**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	2.3	5.0	cfs

APPENDIX E

Pond Computations

DETENTION POND TRIBUTARY AREAS

Subdivision: Mountain Vista
Location: CO, Colorado Springs

Project Name: Project Name
Project No.: AHR01.20
Calculated By: TJE
Checked By: BAS
Date: 4/28/22

Detention Pond #1

Basin	Area	% Imp
A-1	0.52	39.6
A-2	1.34	63.2
A-3	2.61	58.7
A-4a	2.29	51.5
A-4b	2	54.3
A-5	1.34	60.7
A-6	1.76	61
A-7	0.88	2
OS-1A	0.3	39.8
OS-1B	0.81	48.6
OS-1C	0.34	50.2
Total	**13.85**	**52.5**

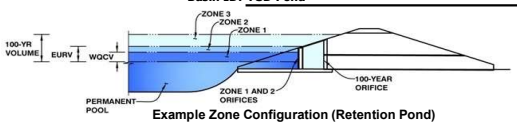
Galloway

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)

Project: Mount Vista

Basin ID: FSD Pond



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	14.20	acres
Watershed Length =	840	ft
Watershed Length to Centroid =	420	ft
Watershed Slope =	0.060	ft/ft
Watershed Imperviousness =	52.60%	percent
Percentage Hydrologic Soil Group A =	100.0%	percent
Percentage Hydrologic Soil Group B =	0.0%	percent
Percentage Hydrologic Soil Groups C/D =	0.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

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

			Optional User Overrides
Water Quality Capture Volume (WQCV) =	0.253	acre-feet	acre-feet
Excess Urban Runoff Volume (EURV) =	0.874	acre-feet	acre-feet
2-yr Runoff Volume (P1 = 0.97 in.) =	0.489	acre-feet	0.97 inches
5-yr Runoff Volume (P1 = 1.25 in.) =	0.655	acre-feet	1.25 inches
10-yr Runoff Volume (P1 = 1.5 in.) =	0.817	acre-feet	1.50 inches
25-yr Runoff Volume (P1 = 1.9 in.) =	1.132	acre-feet	1.90 inches
50-yr Runoff Volume (P1 = 2.24 in.) =	1.455	acre-feet	2.24 inches
100-yr Runoff Volume (P1 = 2.61 in.) =	1.858	acre-feet	2.61 inches
500-yr Runoff Volume (P1 = 3.59 in.) =	2.921	acre-feet	3.59 inches
Approximate 2-yr Detention Volume =	0.458	acre-feet	
Approximate 5-yr Detention Volume =	0.617	acre-feet	
Approximate 10-yr Detention Volume =	0.772	acre-feet	
Approximate 25-yr Detention Volume =	1.044	acre-feet	
Approximate 50-yr Detention Volume =	1.218	acre-feet	
Approximate 100-yr Detention Volume =	1.419	acre-feet	

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.253	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.621	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.545	acre-feet
Total Detention Basin Volume =	1.419	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	

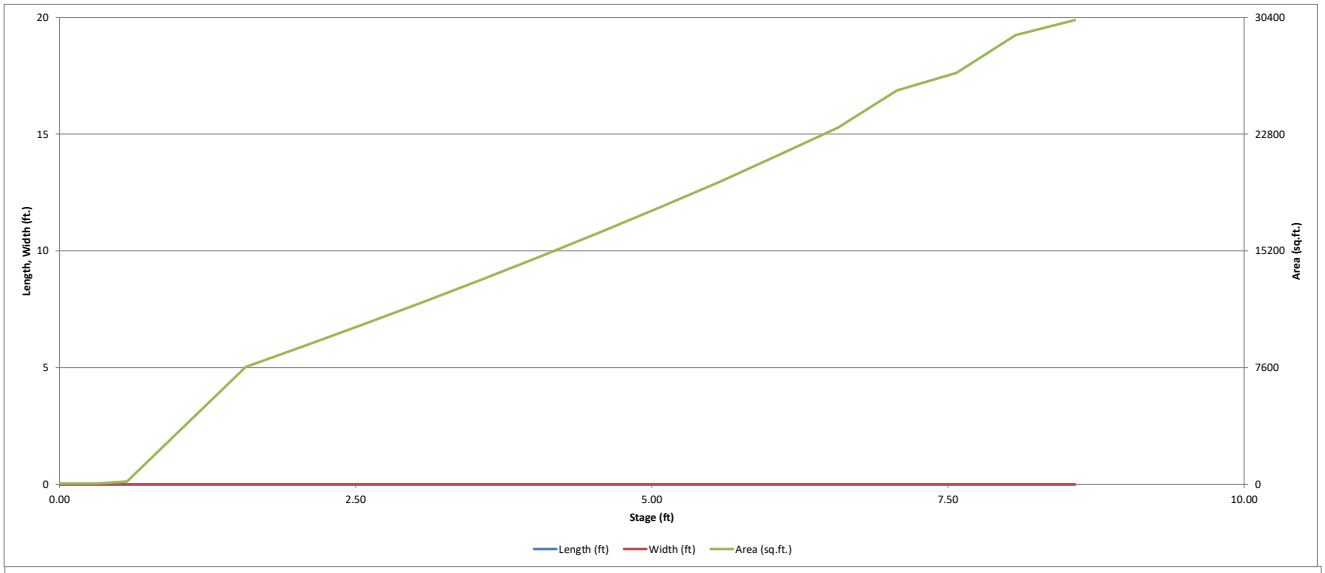
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	**user**	acre-feet

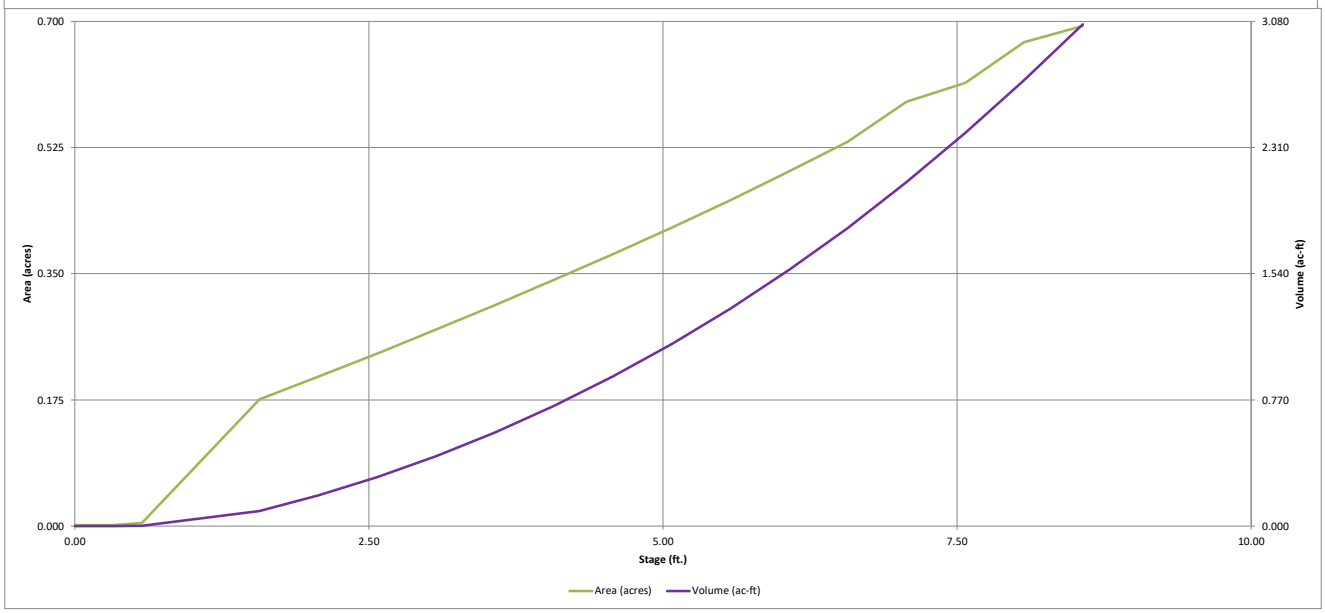
Depth Increment = 0.50 ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	46	0.001		
ISV (6607.58)	--	0.33	--	--	--	46	0.001	15	0.000
6608	--	0.57	--	--	--	187	0.004	43	0.001
6609	--	1.57	--	--	--	7,646	0.176	3,960	0.091
	--	2.07	--	--	--	9,018	0.207	8,126	0.187
6610	--	2.57	--	--	--	10,425	0.239	12,987	0.298
	--	3.07	--	--	--	11,866	0.272	18,559	0.426
6611	--	3.57	--	--	--	13,343	0.306	24,862	0.571
	--	4.07	--	--	--	14,863	0.341	31,913	0.733
6612	--	4.57	--	--	--	16,425	0.377	39,735	0.912
	--	5.07	--	--	--	18,030	0.414	48,349	1.110
6613	--	5.57	--	--	--	19,689	0.452	57,779	1.326
	--	6.07	--	--	--	21,425	0.492	68,057	1.562
6614	--	6.57	--	--	--	23,226	0.533	79,220	1.819
	--	7.07	--	--	--	25,637	0.589	91,436	2.099
6615	--	7.57	--	--	--	26,776	0.615	104,539	2.400
	--	8.07	--	--	--	29,242	0.671	118,544	2.721
6616	--	8.57	--	--	--	30,217	0.694	133,409	3.063

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)



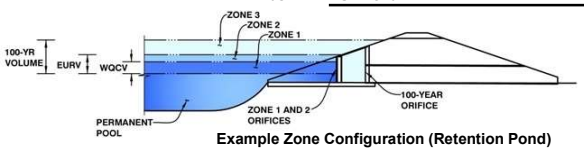


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)

Project: **Mount Vista**

Basin ID: **FSD Pond**



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.38	0.253	Orifice Plate
Zone 2 (EURV)	4.47	0.621	Circular Orifice
Zone 3 (100-year)	5.78	0.545	Weir&Pipe (Restrict)
Total (all zones)		1.419	

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 =	6.667E-03	ft²
Depth at top of Zone using Orifice Plate =	2.38	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	9.50	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	0.96	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	0.79	1.59					
Orifice Area (sq. inches)	0.96	0.96	0.96					

	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)

	Zone 2 Circular	Not Selected		Calculated Parameters for Vertical Orifice: Zone 2 Circular	Not Selected	
Invert of Vertical Orifice =	2.38	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	0.02	N/A	ft²
Depth at top of Zone using Vertical Orifice =	4.47	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	0.07	N/A	feet
Vertical Orifice Diameter =	1.70	N/A	inches				

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		Calculated Parameters for Overflow Weir: Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	4.50	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	5.25	N/A	feet
Overflow Weir Front Edge Length =	13.00	N/A	feet	Overflow Weir Slope Length =	3.09	N/A	feet
Overflow Weir Grate Slope =	4.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	27.75	N/A	
Horiz. Length of Weir Sides =	3.00	N/A	feet	Overflow Grate Open Area w/o Debris =	27.98	N/A	ft²
Overflow Grate Type =	Type C Grate	N/A		Overflow Grate Open Area w/ Debris =	13.99	N/A	ft²
Debris Clogging % =	50%	N/A	%				

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

	Zone 3 Restrictor	Not Selected		Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate: Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	2.50	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	1.01	N/A	ft²
Outlet Pipe Diameter =	18.00	N/A	inches	Outlet Orifice Centroid =	0.48	N/A	feet
Restrictor Plate Height Above Pipe Invert =	10.00		inches	Half-Central Angle of Restrictor Plate on Pipe =	1.68	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	6.75	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.42	feet
Spillway Crest Length =	50.00	feet	Stage at Top of Freeboard =	8.17	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	0.68	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	2.79	acre-ft

Calculated Parameters for Spillway

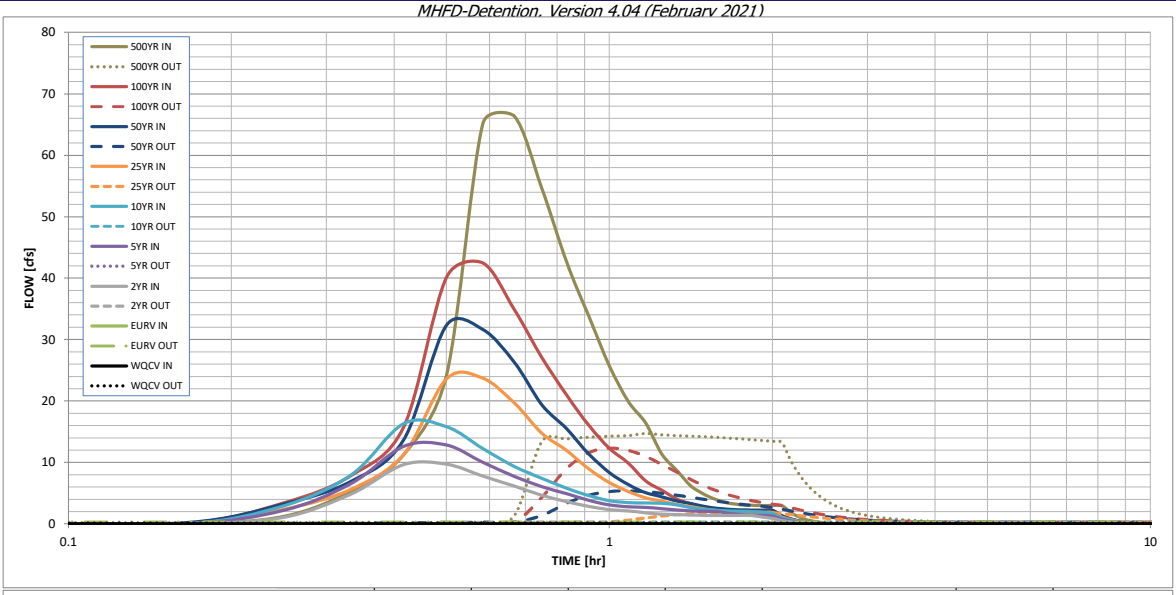
Routed Hydrograph Results

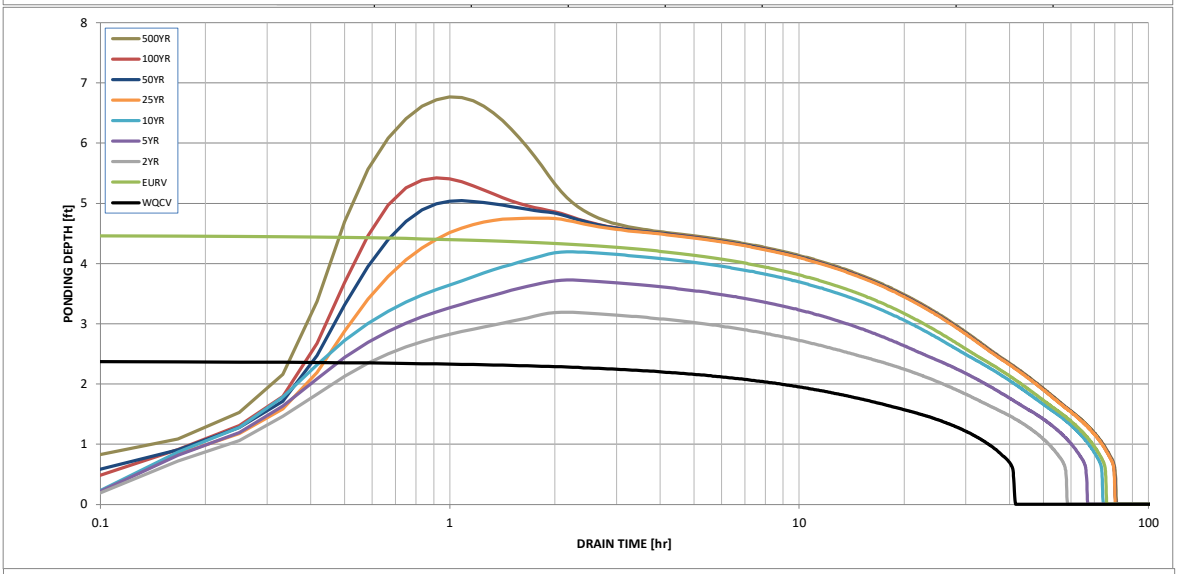
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

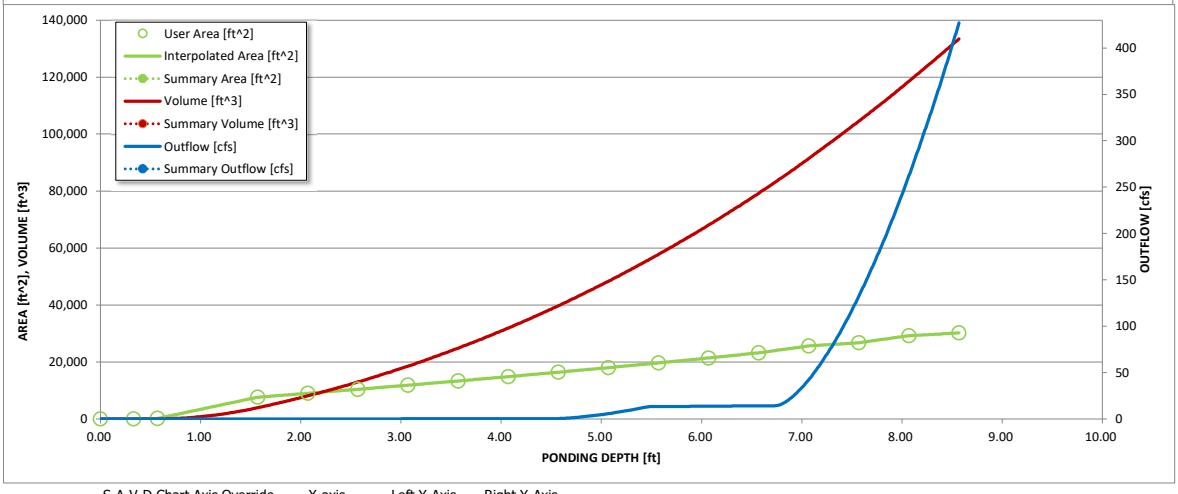
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	0.97	1.25	1.50	1.90	2.24	2.61	3.59
CUHP Runoff Volume (acre-ft) =	0.253	0.874	0.489	0.655	0.817	1.132	1.455	1.858	2.921
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.489	0.655	0.817	1.132	1.455	1.858	2.921
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.0	0.2	0.3	2.6	7.9	14.5	31.2
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.00	0.01	0.02	0.19	0.55	1.02	2.19
Peak Inflow Q (cfs) =	N/A	N/A	9.7	12.8	16.3	23.7	32.4	42.5	66.4
Peak Outflow Q (cfs) =	0.1	0.3	0.2	0.2	0.3	1.8	5.4	12.3	14.7
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	1.3	0.9	0.7	0.7	0.9	0.5
Structure Controlling Flow =	Plate	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	0.1	0.2	0.4	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) =	38	67	53	60	66	70	68	66	60
Time to Drain 99% of Inflow Volume (hours) =	**40**	72	56	64	71	76	75	74	72
Maximum Ponding Depth (ft) =	2.38	4.47	3.19	3.73	4.20	4.76	5.04	5.42	6.77
Area at Maximum Ponding Depth (acres) =	0.23	0.37	0.28	0.32	0.35	0.39	0.41	0.44	0.55
Maximum Volume Stored (acre-ft) =	0.254	0.875	0.459	0.617	0.774	0.981	1.098	1.259	1.922

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	0.21	0.12	1.21
	0:15:00	0.00	0.00	1.07	2.18	2.95	2.37	3.22	3.40	5.34
	0:20:00	0.00	0.00	4.87	6.56	7.96	5.63	6.92	7.87	11.28
	0:25:00	0.00	0.00	9.62	12.62	16.30	11.34	13.70	15.81	24.30
	0:30:00	0.00	0.00	9.72	12.81	15.79	23.60	32.37	40.19	65.15
	0:35:00	0.00	0.00	7.75	10.02	12.23	23.70	31.63	42.47	66.40
	0:40:00	0.00	0.00	6.14	7.73	9.34	19.68	26.33	34.90	54.64
	0:45:00	0.00	0.00	4.65	6.06	7.40	14.77	19.39	27.08	42.65
	0:50:00	0.00	0.00	3.63	4.91	5.81	11.93	15.49	20.96	33.70
	0:55:00	0.00	0.00	2.83	3.81	4.58	8.89	11.34	15.99	25.75
	1:00:00	0.00	0.00	2.32	3.09	3.76	6.72	8.36	12.30	19.96
	1:05:00	0.00	0.00	2.11	2.78	3.47	5.25	6.40	9.89	16.41
	1:10:00	0.00	0.00	1.78	2.69	3.39	4.22	5.07	7.00	11.38
	1:15:00	0.00	0.00	1.60	2.47	3.36	3.71	4.41	5.48	8.65
	1:20:00	0.00	0.00	1.49	2.24	3.06	3.12	3.69	4.02	6.13
	1:25:00	0.00	0.00	1.43	2.10	2.64	2.79	3.29	3.23	4.77
	1:30:00	0.00	0.00	1.39	2.02	2.37	2.39	2.82	2.72	3.89
	1:35:00	0.00	0.00	1.36	1.97	2.20	2.15	2.53	2.41	3.37
	1:40:00	0.00	0.00	1.35	1.70	2.10	2.00	2.36	2.25	3.11
	1:45:00	0.00	0.00	1.35	1.53	2.03	1.93	2.27	2.20	3.02
	1:50:00	0.00	0.00	1.35	1.43	2.00	1.88	2.22	2.18	2.99
	1:55:00	0.00	0.00	1.08	1.38	1.90	1.86	2.19	2.18	2.99
	2:00:00	0.00	0.00	0.92	1.27	1.69	1.85	2.18	2.18	2.99
	2:05:00	0.00	0.00	0.55	0.76	1.03	1.12	1.32	1.31	1.79
	2:10:00	0.00	0.00	0.33	0.45	0.61	0.67	0.79	0.78	1.06
	2:15:00	0.00	0.00	0.18	0.26	0.35	0.38	0.44	0.44	0.59
	2:20:00	0.00	0.00	0.09	0.14	0.19	0.21	0.25	0.25	0.33
	2:25:00	0.00	0.00	0.04	0.07	0.08	0.10	0.12	0.11	0.15
	2:30:00	0.00	0.00	0.01	0.02	0.02	0.03	0.03	0.03	0.04
	2:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	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

Figure 13-12c. Emergency Spillway Protection

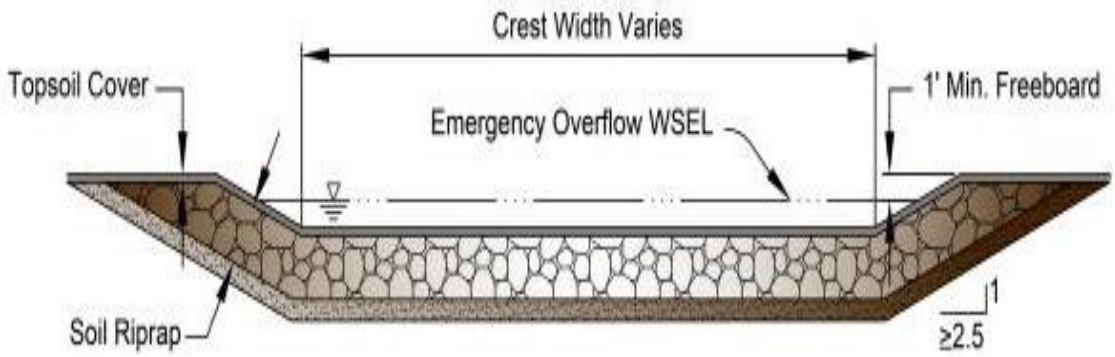
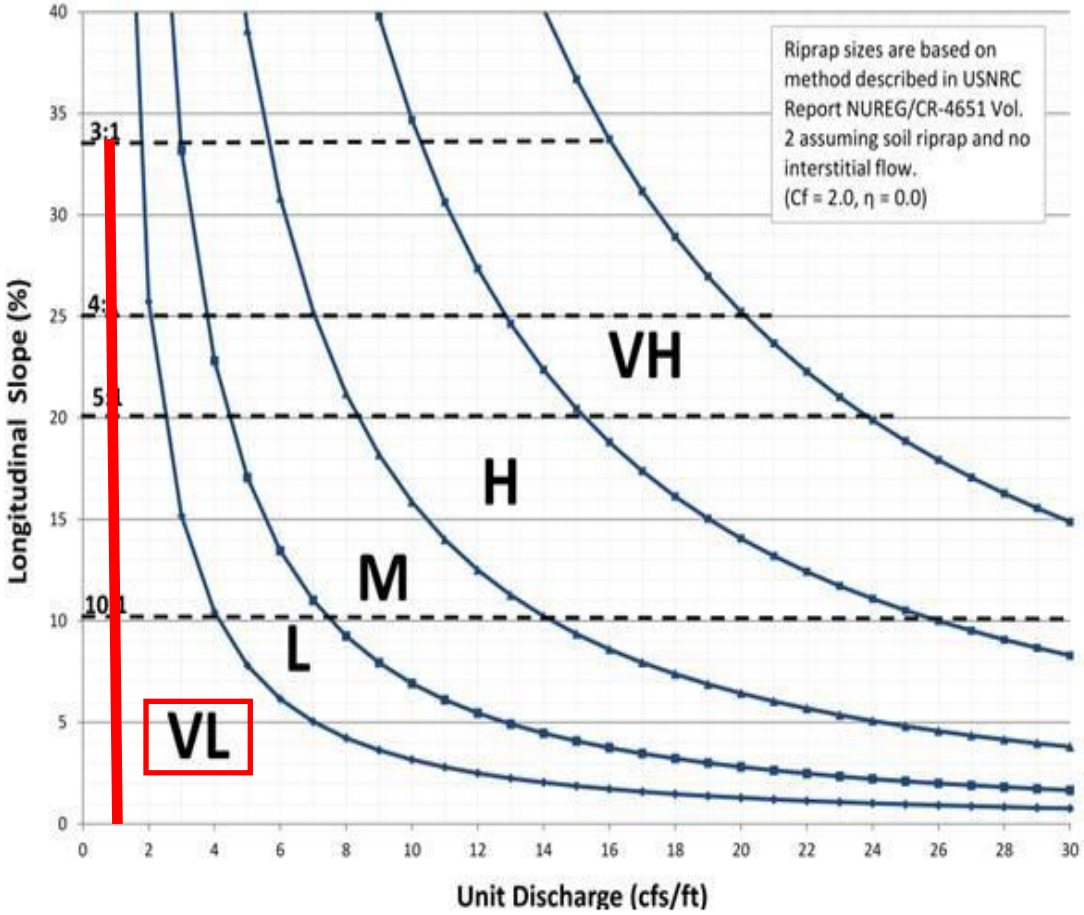


Figure 13-12d. Riprap Types for Emergency Spillway Protection



POND - NORTH FOREBAY CALCULATIONS

1) WQCV (inches) = $a(.91I^3 - 1.19I^2 + .78I)$

I = impervious percentage = 57%

a = Coefficient corresponding to WQCV drain time = 1 (40 hours)

WQCV (inches) = 0.23 inches

2) WQCV (ac-ft) = (WQCV (inches))/12 x A

Area = tributary area = 4.77 acres *Based on basins; A-1 thru A-3 & OS-1A

WQCV (ac-ft) = 0.00

WQCV (cubic feet) = 172

3) Forebay Volume

Per Table EDB-4, Section T-5 of USDCM Volume 3 - Forebay Volume = 2% of WQCV and be 18" depth since watershed up to 5 impervious acres

Forebay Volume = 2% of WQCV = 3 cubic feet

with pond depth at 1.5', Forebay Area = 2.3 sq-ft (minimum)

4) Forebay Discharge

Per Table EDB-4, Section T-5 of USDCM Volume 3 - Forebay Discharge = 2% of 100-yr Flow into pond

Q100 = 17.8 cfs

Forebay discharge = 0.36 cfs

Worksheet for Forebay - North Slot

Project Description

Solve For	Crest Length

Input Data

Discharge		0.36	ft³/s
Headwater Elevation		1.25	ft
Crest Elevation		0.00	ft
Tailwater Elevation		0.00	ft
Weir Coefficient		3.00	US
Number Of Contractions	0		

Results

Crest Length	0.09	ft
Headwater Height Above Crest	1.25	ft
Tailwater Height Above Crest	0.00	ft
Flow Area	0.11	ft²
Velocity	3.35	ft/s
Wetted Perimeter	2.59	ft
Top Width	0.09	ft

POND - EAST FOREBAY CALCULATIONS

1) WQCV (inches) = $a(.91I^3 - 1.19I^2 + .78I)$

I = impervious percentage = 52%

a = Coefficient corresponding to WQCV drain time = 1 (40 hours)

WQCV (inches) = 0.21 inches

2) WQCV (ac-ft) = (WQCV (inches))/12 x A

Area = tributary area = 5.1 acres *Based on basins; OS-1B, OS-1C, A-4a & A-4b

WQCV (ac-ft) = 0.00

WQCV (cubic feet) = 151

3) Forebay Volume

Per Table EDB-4, Section T-5 of USDCM Volume 3 - Forebay Volume = 2% of WQCV and be 18" depth since watershed up to 5 impervious acres

Forebay Volume = 2% of WQCV = 3 cubic feet

with pond depth at 1.5', Forebay Area = 2.0 sq-ft (minimum)

4) Forebay Discharge

Per Table EDB-4, Section T-5 of USDCM Volume 3 - Forebay Discharge = 2% of 100-yr Flow into pond

Q100 = 19.3 cfs

Forebay discharge = 0.39 cfs

Worksheet for Forebay - East Slot

Project Description

Solve For	Crest Length

Input Data

Discharge		0.39	ft³/s
Headwater Elevation		1.25	ft
Crest Elevation		0.00	ft
Tailwater Elevation		0.00	ft
Weir Coefficient		3.00	US
Number Of Contractions	0		

Results

Crest Length	0.09	ft
Headwater Height Above Crest	1.25	ft
Tailwater Height Above Crest	0.00	ft
Flow Area	0.12	ft²
Velocity	3.35	ft/s
Wetted Perimeter	2.59	ft
Top Width	0.09	ft

POND - SOUTH FOREBAY CALCULATIONS

1) WQCV (inches) = $a(.91I^3 - 1.19I^2 + .78I)$

I = impervious percentage = 61%

a = Coefficient corresponding to WQCV drain time = 1 (40 hours)

WQCV (inches) = 0.24 inches

2) WQCV (ac-ft) = (WQCV (inches))/12 x A

Area = tributary area = 3.1 acres *Based on basins; A-5 & A-6

WQCV (ac-ft) = 0.01

WQCV (cubic feet) = 280

3) Forebay Volume

Per Table EDB-4, Section T-5 of USDCM Volume 3 - Forebay Volume = 2% of WQCV and be 18" depth since watershed up to 5 impervious acres

Forebay Volume = 2% of WQCV = 6 cubic feet

with pond depth at 1.5', Forebay Area = 3.7 sq-ft (minimum)

4) Forebay Discharge

Per Table EDB-4, Section T-5 of USDCM Volume 3 - Forebay Discharge = 2% of 100-yr Flow into pond

Q100 = 11.5 cfs

Forebay discharge = 0.23 cfs

Worksheet for Forebay - South Slot

Project Description

Solve For	Crest Length

Input Data

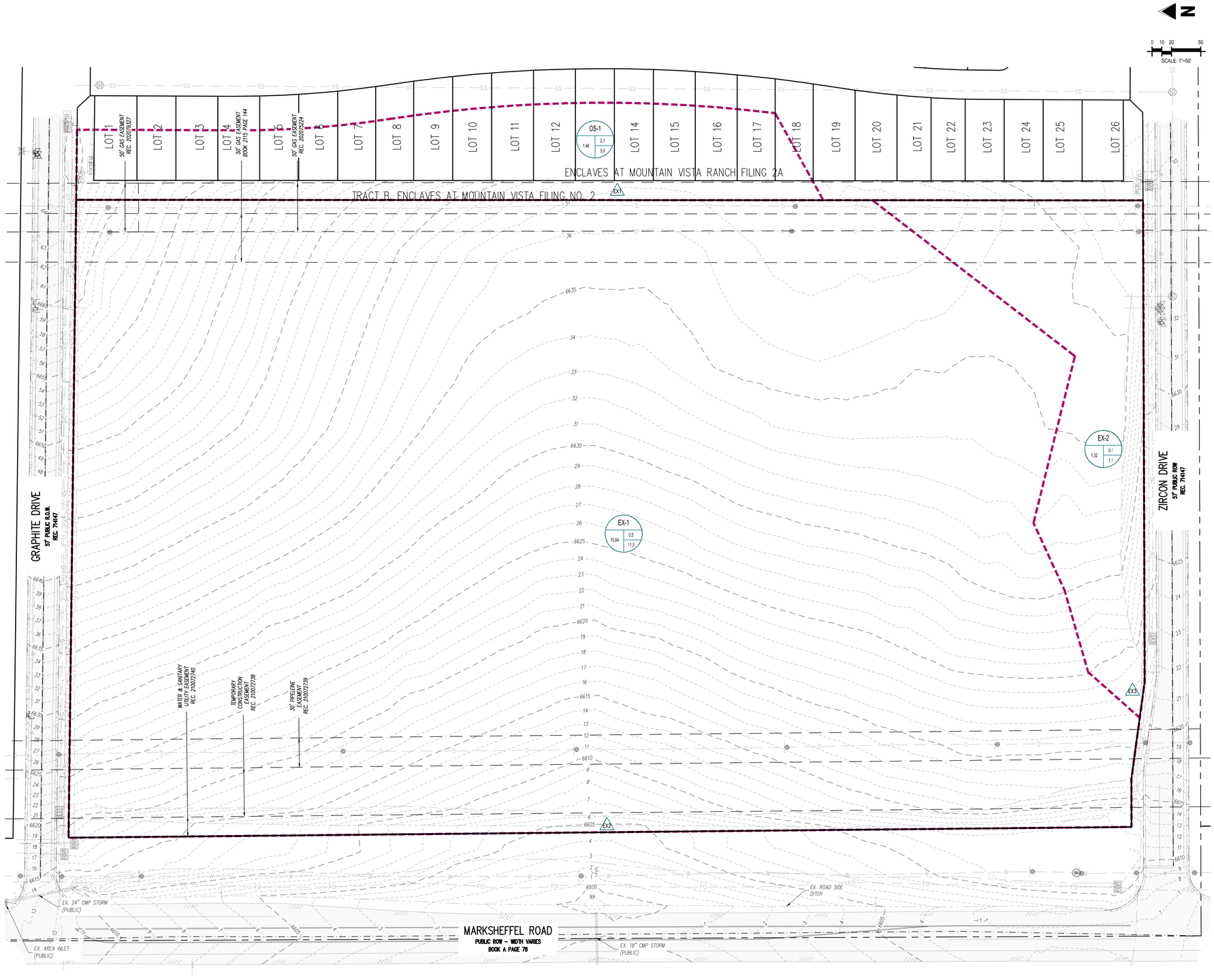
Discharge		0.23	ft³/s
Headwater Elevation		1.25	ft
Crest Elevation		0.00	ft
Tailwater Elevation		0.00	ft
Weir Coefficient		3.00	US
Number Of Contractions	0		

Results

Crest Length	0.05	ft
Headwater Height Above Crest	1.25	ft
Tailwater Height Above Crest	0.00	ft
Flow Area	0.07	ft²
Velocity	3.35	ft/s
Wetted Perimeter	2.55	ft
Top Width	0.05	ft

APPENDIX F

Drainage Maps



DRAINAGE LEGEND

- EXISTING PROPERTY LINE
- LOT BOUNDARY LINE
- 6480 EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- BASIN BOUNDARY LINE
- BASIN DESIGNATION
- 5-YEAR RUNOFF IN CUBIC FEET PER SECOND
- 100-YEAR RUNOFF IN CUBIC FEET PER SECOND
- BASIN AREA IN ACRES
- DESIGN POINT
- DIRECTION OF RUNOFF

BASIN SUMMARY TABLE

Tributary Sub-basin	Area (acres)	C_5	C_{100}	t_c (min)	Q_5 (cfs)	Q_{100} (cfs)
OS-1	1.46	0.35	0.49	9.88	2.1	5.0
EX-1	15.04	0.01	0.13	15.73	0.5	11.3
EX-2	1.32	0.01	0.13	11.85	0.1	1.1

DESIGN POINT SUMMARY

Design Point	Q_5 (cfs)	Q_{100} (cfs)
EX1	2.1	5.0
EX2	2.3	15.5
EX3	0.0	1.1

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RESIDENTIAL DEVELOPMENT
FOR AMERICAN HOMES 4 RENT

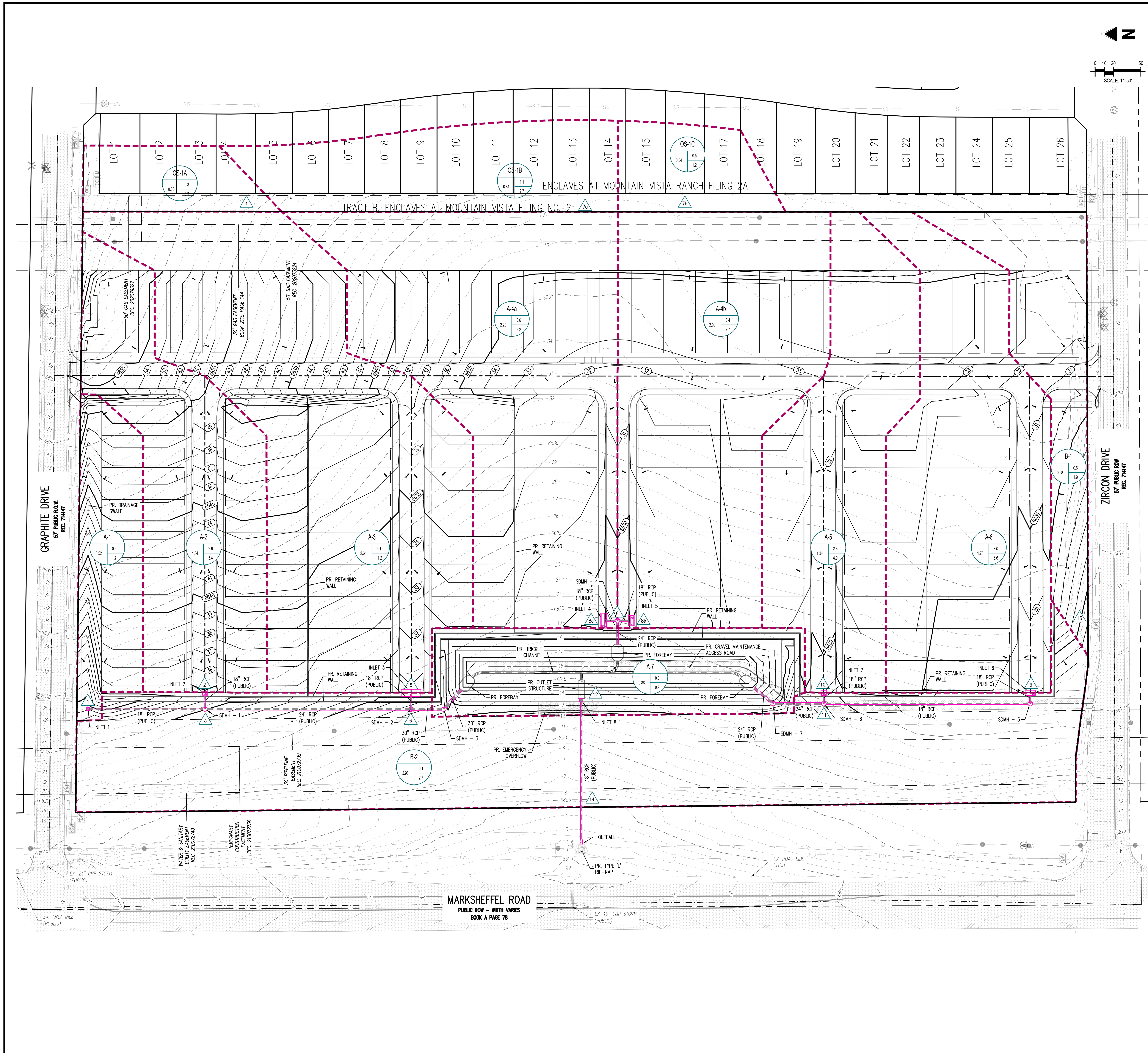
NEC ZICRON DR. & MARKSHEFFEL RD.
COLORADO SPRINGS, CO

#	Date	Issue / Description	Init.

Project No:	AHR01.20
Drawn By:	TJE
Checked By:	BAS
Date:	04/29/22

EXISTING DRAINAGE MAP

DR-1



DRAINAGE LEGEND

- EXISTING PROPERTY LINE
- PROPOSED PROPERTY LINE
- LOT BOUNDARY LINE
- EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- PROPOSED MAJOR CONTOUR
- PROPOSED MINOR CONTOUR
- PROPOSED ROAD CENTERLINE
- BASIN BOUNDARY LINE
- PROPOSED STORM SEWER
- PROPOSED STORM STRUCTURES
- BASIN DESIGNATION
- 5-YEAR RUNOFF IN CUBIC FEET PER SECOND
- 100-YEAR RUNOFF IN CUBIC FEET PER SECOND
- BASIN AREA IN ACRES
- DESIGN POINT
- DIRECTION OF RUNOFF

BASIN SUMMARY TABLE

Tributary Sub-basin	Area (acres)	C_5	C_{100}	t_c (min)	Q_5 (cfs)	Q_{100} (cfs)
A-1	0.52	0.26	0.42	7.23	0.6	1.7
A-2	1.34	0.48	0.60	10.78	2.6	5.4
A-3	2.61	0.44	0.57	7.97	5.1	11.2
A-4a	2.29	0.37	0.51	9.52	3.6	8.2
A-4b	2.00	0.40	0.53	8.89	3.4	7.7
A-5	1.34	0.46	0.58	12.54	2.3	4.9
A-6	1.76	0.46	0.59	12.78	3.0	6.6
A-7	0.88	0.01	0.13	8.00	0.0	0.9
B-1	0.68	0.16	0.32	5.18	0.6	1.9
B-2	2.96	0.01	0.13	9.27	0.1	2.7
OS-1A	0.30	0.27	0.42	9.37	0.3	0.9
OS-1B	0.81	0.34	0.49	10.15	1.1	2.7
OS-1C	0.34	0.36	0.50	9.89	0.5	1.2

DESIGN POINT SUMMARY TABLE

Design Point	Q_5 (cfs)	Q_{100} (cfs)
1	0.6	1.7
2	2.6	5.4
3	3.1	6.9
4	0.3	0.9
5	5.2	11.5
6	8.1	17.8
7a	1.2	2.8
7b	0.5	1.2
8a	4.6	10.8
8b	3.8	8.6
8	8.4	19.3
9	3.0	6.6
10	2.3	5.0
11	5.4	11.5
12	20.7	46.5
13	0.6	1.9
14	0.1	2.7

STRUCTURES – AHR01_STORM

ID	DESCRIPTION	INV. IN – PIPE ID (DESC.) – ELEV. & DIRECTION	INV. OUT – PIPE ID (DESC.) – ELEV. & DIRECTION
INLET 1	CDOT-TYPE C INLET (35" X 35") (PUBLIC)		P-1 (18" RCP – S)
INLET 2	CDOT-TYPE R INLET (5') (SUMP – PUBLIC)		P-5 (18" RCP – W)
INLET 3	CDOT-TYPE R INLET (20') (SUMP – PUBLIC)		P-6 (18" RCP – W)
INLET 4	CDOT-TYPE R INLET (15') (SUMP – PUBLIC)		P-1 (2) (18" RCP – S)
INLET 5	CDOT-TYPE R INLET (10') (SUMP – PUBLIC)		P-1 (3) (18" RCP – N)
INLET 6	CDOT-TYPE R INLET (10') (SUMP – PUBLIC)		P-8 (18" RCP – W)
INLET 7	CDOT-TYPE R INLET (5') (SUMP – PUBLIC)		P-12 (18" RCP – W)
INLET 8	CDOT-TYPE C INLET (35" X 35")		P-1 (1) (18" RCP – W)
OUTFALL	18" FES (PUBLIC)	P-1 (1) (18" RCP – E)	
SDMH – 1	MH-ECCENTRIC (5' ø) (TYPE II – PUBLIC)	P-1 (18" RCP – N) P-5 (18" RCP – E)	P-2 (24" RCP – S)
SDMH – 2	MH-ECCENTRIC (5' ø) (TYPE II – PUBLIC)	P-2 (24" RCP – N) P-6 (18" RCP – E)	P-3 (30" RCP – S)
SDMH – 3	MH-ECCENTRIC (5' ø) (TYPE II – PUBLIC)	P-3 (30" RCP – N)	P-4 (30" RCP – SE)
SDMH – 4	MH-ECCENTRIC (5' ø) (TYPE II – PUBLIC)	P-1 (2) (18" RCP – N) P-1 (3) (18" RCP – S)	P-7 (24" RCP – W)

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PROPOSED DRAINAGE MAP

DR-2