

MERIDIAN SERVICE METROPOLITAN DISTRICT WATER TREATMENT PLANT EXPANSION DRAINAGE LETTER

(THE ESTATES AT ROLLING HILLS
RANCH FILING NO. 2)

PCD FILE NO. PPR-22-12

PREPARED BY

Rich Gallegos, P.E., CFM
RESPEC
121 S. Tejon St., Suite 1110
Colorado Springs, CO 80903

PREPARED FOR

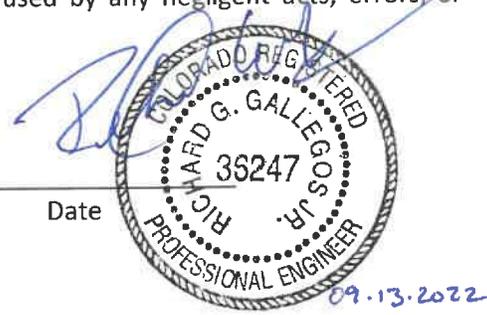
Meridian Service Metropolitan District
11886 Stapleton Drive
Falcon, CO 80831

NOVEMBER 2022



ENGINEER'S STATEMENT

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



Richard Gallegos, P.E., CFM
Registered Professional Engineer State of Colorado No. 36247

Date

DEVELOPER'S STATEMENT

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

11/12/22

Jim Nikkel
Meridian Service Metropolitan District
11886 Stapleton Drive
Falcon, CO 80831

Date

EL PASO COUNTY

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

County Engineer/ECM Administrator

Date



On behalf of the Meridian Service Metropolitan District, RESPEC Engineering is submitting this Small Subdivision Drainage Report to support the development of the Meridian Service Metropolitan Water Treatment Plant Expansion.

1. GENERAL PROPERTY DESCRIPTION WITH ACREAGE

The 3.3-acre site is located within the larger Meridian Ranch Master Planned Community east of Sunrise Ridge Drive and south of Palmer Peak Place. More specifically, the current water treatment facility is southeast of the intersection of Sunrise Ridge Drive and Palmer Peak Place.

Two County-approved Drainage Reports were found within the County's files that include the project site:

- *Preliminary Drainage Report for Estates at Rolling Hills Ranch Filing 2* by Tech Contractors, revised September 28, 2020, and approved on November 25, 2020, by the County.
- *Final Drainage Report for Estates at Rolling Hills Ranch Filing 2* by Tech Contractors, revised September 30, 2021 and approved on October 7, 2021, by the County.

Each report provides an existing and proposed conditions analysis. The reports also conform to requirements for Gieck Ranch Drainage Basin. Based upon the approval dates listed, the *Final Drainage Report for Estates at Rolling Hills Ranch Filing 2* has been used as the guiding document for this analysis.

Pertinent excerpts from the Estates at Rolling Hills Ranch FDR report are attached to this Small Subdivision Drainage Report.

2. GENERAL EXISTING DRAINAGE CHARACTERISTICS

The majority of the site drains to the south toward a channel. The site consists of slopes between 1% and 3%. Currently, underground storm sewer lines and swales exist on the site, shown in Appendix A – Estates at Rolling Hills Ranch Existing Drainage Map. The expansion of a water treatment facility, located on the central portion of the site (Appendix A – Proposed Drainage Conditions), warrants additional drainage considerations. The 5-year storm event and 100-year storm event were used in this analysis in order to compare flow values provided in the Final Drainage Report for Estates at Rolling Hills Ranch Filing 2.

The Estates at Rolling Hills Ranch FDR included the site as part of the existing conditions analysis within Drainage Area D01; see attached Estates at Rolling Hills Ranch Existing Drainage Map. D01 totals 9.6 acres with peak runoff rates of 14.0 cfs for the 5-year storm event and 31.0 cfs for the 100-year storm event. Flows travel overland and into a channel located on the southern portion of the drainage basin.

The site is located in an Unshaded Zone X (areas outside of the 100-year floodway) flood hazard area per the Federal Emergency Management Agency's Flood Insurance Rate Map panel 08041C0552G, effective date December 7, 2018. See attached floodplain exhibit.

3. GENERAL PROPOSED DRAINAGE CHARACTERISTICS

All of the improvements will be located in Drainage Area D01, per the Estates of the Rolling Hills Ranch FDR. Per the FDR, basin D01 totals 9.8-acres and generates peak runoff rates of 14.0 cfs for the 5-year storm event and 31.0 cfs for the 100-year storm event. Basin D01 has a calculated percent impervious cover of 43.3% and calculated composite runoff coefficients of 0.44 for the 5-year storm and 0.59 for the 100-year storm. The 3.3-acre proposed site is accounted for in the Drainage Area D01. According to the FDR, this portion of the drainage area is considered a commercial area, with an assumed percent impervious cover of 95.0%.

The site will be comprised of the existing water treatment plant, the proposed water treatment plant expansion, gravel driveway, and an easement for utilities. The site is divided into three proposed sub-basins (see Appendix A – Proposed Drainage Exhibit). Sub-basin PP1 and Sub-basin PP2 will drain to the southeasternmost portion of the site. Sub-basin PP1 will produce flows of 7.9 cfs for the 5-year storm and 14.5 cfs for the 100-year storm. Sub-basin PP1 will sheetflow to the east into a 2' deep swale with 3:1 side slope, which will then divert flows to the south towards the channel. Sub-basin PP2 will produce flows of 5.4 cfs for the 5-year storm and 9.9 cfs for the 100-year storm. Sub-basin PP2 will sheetflow to the south into a 2' deep swale with 3:1 side slopes, which will then divert flows east towards the southeasternmost portion of the site. A rock chute will carry flows from swales in both Sub-basin PP1 and Sub-basin PP2 into the channel located south of the site. Details on this rock chute are provided below in Appendix B - Rock Chute Design.

Sub-basin PP3 will flow to the northwest. This sub-basin will produce flows of 0.4 cfs for the 5-year storm and 0.8 cfs for the 100-year storm. These flows will sheetflow to the northwest.

Add that this meets the MS4 Permit Section 4.a.iv.E requirement that at least 20% of the upstream imperviousness must be disconnected from the storm drainage system and drain through a receiving pervious area control measure.

Based upon the Estates of the Rolling Hills Ranch FDR, flows from both drainage areas will be collected in swales and conveyed into a proposed 10' wide rock chute in the southeast corner of the site. This location is deemed suitable according to the existing topography. These flows will continue towards the existing channel and onto Pond G downstream of the channel. Based on arial imagery from July of 2022, the channel has been stabilized with riprap according to the *Final Drainage Report for Estates at Rolling Hills Ranch Filing 2*. Offsite detention is provided by Pond G, where proposed flows are conveyed. Pond G requires no improvements.

Onsite water quality is provided by two grass swales located on the east and south ends of the property. These pervious areas reduce runoff by 42.0%, according to the UD-BMP spreadsheet version 3.07. The two swales comprise of 17.6% of the footprint of the total upstream disconnected impervious area, exceeding the 10% required by the County's MS4 Permit. This information and calculations can be found below in Appendix A – Green Infrastructure Exhibit and Appendix B – UD-BMP spreadsheet.

4. HYRDOLOGOCIAL CALCULATIONS

For this drainage analysis, we have completed two evaluations. The first is to compute the overall percent of impervious cover to verify that the proposed land use complies with the assumptions outlined in the Estates of the Rolling Hills Ranch FDR. The second is to size the proposed swales on the eastern and southern portions of the property, as well as the outlet pipe that will drain into the existing channel.

Compliance with the Estates of the Rolling Hills Ranch FDR:

As part of the analysis of the proposed conditions completed for the Estates of the Rolling Hill Ranch, the assumptions for the one drainage area (D01) were reviewed. The FDR assumes the 3.3-acre proposed site, a portion of drainage area D01, is a commercial site. The area assumes a hydrologic soil type “B” and a maximum percent impervious of 95.0%. The overall percent impervious calculation for the Meridian Service Metropolitan District Water Treatment District as designed was completed to verify that the proposed development complies with the FDR analysis.

- Total Acreage: 3.3-acres
 - Total area of pavement/building: 0.15-acres @ 100% Impervious
 - Total area of Gravel Drive/Rock Landscaping: 0.65-acres @ 80% Impervious
 - Total area of vegetated area: 2.50-ac @ 0% Impervious
- Computed Site Percent Impervious: 20.3%
- Maximum Allowable Percent Impervious: 95%

The site as designed has an overall percent impervious of 20.3%, which is less than the maximum allowed by the Meridian Service Metropolitan District of 95%; **therefore, the land use design complies with the approved master drainage plan.** Sufficient stormwater mitigation capacity and water quality exist within Pond G downstream.

Swale and Outlet Pipe Calculations:

Two drainage areas were delineated to compute flows directed to two proposed swales. Each area considers the proposed grades for the Meridian Service Metropolitan District Water Treatment Plant Expansion. The Rational Method was used to determine the peak 5-year and 100-year flows and utilize the same assumptions given within the Estates at the Rolling Hills FDR.

The 5-year, $C(5) = 0.80$, and 100-year, $C(100) = 0.88$, runoff coefficients for commercial areas given in the *El Paso County Drainage Criteria Manual*. Runoff coefficients were compared to those in the Estates at Rolling Hills Ranch Filing No. 2 Final Drainage Report. See Appendix D for the referenced runoff coefficients. The drainage areas delineated specifically for this analysis also are contained within the larger FDR drainage delineations given within the County approved report.

Computed peak flow rates of $Q(5) = 7.9$ cfs and $Q(100) = 14.5$ cfs from Sub-basin PP1 will sheetflow east to a proposed swale. Given a minimum 1.9% slope across this proposed swale on the eastern portion of the site, Manning’s normal depth calculation was used to size the proposed swale. A Manning’s n value of 0.025 was used for grass lined channels. According to these calculations, a minimum 2.0 foot deep triangular channel is required to accommodate the 100-year flow. This minimum value accounts for 1’ of freeboard above the water surface. A value of 2’ was selected for this channel. This calculation is shown below in Appendix B – East Swale Calculation.

Computed peak flow rates of $Q(5) = 5.4$ cfs and $Q(100) = 9.9$ cfs from Sub-basin PP2 will sheetflow south to a proposed swale. Given a minimum 1.4% slope across this proposed swale on the eastern portion of the site, a Manning’s normal depth calculation was used to size the proposed swale. A Manning’s n value of 0.025 was used for grass lined channels. According to these calculations, a minimum 1.8 foot deep triangular channel is required to accommodate the 100-year flow. This minimum value accounts for 1’ of freeboard above the water surface. A value of 2’ was selected for this channel for simplicity. This calculation is shown below in Appendix B – South Swale Calculation.

Flows from Sub-basin PP1 and Sub-basin PP2 combine in the southeasternmost portion of the site. This produces combined flows of approximately 13.3 cfs for the 5-year storm and 24.4 cfs for the 100-year storm.



5. DRAINAGE FEES

The proposed development falls in the Gieck Ranch Drainage Basin. The entire development occupies 3.3 acres of land. The calculated percent impervious for this site is 20.3%. This calculation is shown above in the Hydrologic Calculations section of this report.

Gieck Ranch Fees:

Drainage Fees: There are currently no drainage fees for this basin.

Bridge Fees: There are no bridge fees for this basin.



APPENDIX A

MAPS

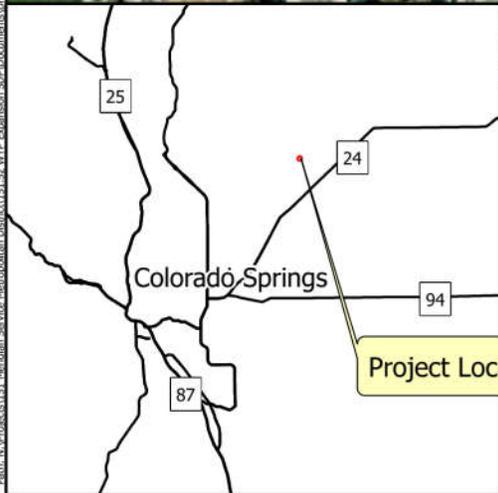




Project Location

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Path: N:\Projects\151_Meridian_Service_Metropolitan_District_Water_Treatment_Plant_Expansion_Site_Documentation\151_GIS\MapDocs_VTPE\MapDocs_VTPE_151.mxd



Project Location



1"=500'



Prepared by:



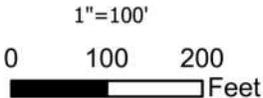
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Meridian Service Metropolitan
District Water Treatment Plant Expansion

VICINITY MAP



Maxar, Microsoft



Map Unit Symbol	Map Unit Name	Rating	Percent of Site, %
83	Stapleton sandy loam, 3 to 8 percent slopes	B	100.0

Prepared by:



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Meridian Service Metropolitan
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SOILS MAP



Project Location

Zone A (100-year studied floodplain)

Zone AE (100-year studied floodplain)



1" = 1000'

0 500 1,000 Feet

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0552G

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

PANEL 552 OF 1300
 (SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS	COMMUNITY	NUMBER	PANEL	SHEET
	6100010000	0500	050	1

Notes to User: The Map Number shown on this map No. 1000 is the primary map number. The Community Number shown above should be used for insurance coverage for the project community.

MAP NUMBER
08041C0552G

MAP REVISED
DECEMBER 7, 2018

Federal Emergency Management Agency

Prepared by:

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Meridian Service Metropolitan
 District Water Treatment Plant Expansion

FIRM MAP

Path: N:\Projects\151_Meridian Service Metropolitan District\151_52_WTP_Expansion_SDP\Documents\Drawings\4_GIS\Meridian_WTP\FIRM\WTP.aprx

is this area concrete?

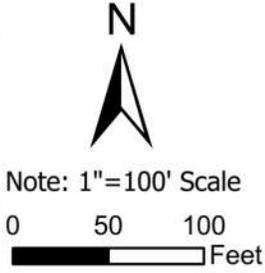
add gravel areas

interface width

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MERIDIAN RANCH WTP EXPANSION

Total Site Area, ac	3.3
Total Impervious Area, ac	0.65
Total Site Percent Impervious, %	20.3
Upstream Impervious Area (in blue), ac	0.65
PIA (in green), ac	0.12
WQCV, cf	1180
Stormwater Volume Reduction, cf	499
Stormwater Volume Reduction as % of WQCV	42



Prepared by:



DOCUMENT IS FOR REVIEW PURPOSES ONLY AND NOT INTENDED FOR CONSTRUCTION, BIDDING, OR PERMIT PURPOSES. PARCEL DATA SOURCED FROM EL PASO COUNTY OPEN DATA PORTAL. CONSULTANT MAKES NO CLAIMS TO ACCURACY OF DATA.

MERIDIAN RANCH SERVICE METROPOLITAN DISTRICT WATER TREATMENT EXPANSION

Green Infrastructure Exhibit



APPENDIX B

CALCULATIONS



PROJECT: Meridian Service Metropolitan District Water Treatment Plant Expansion

PREPARED BY: CTD

DATE: SEPTEMBER 2022

COMPOSITE RUNOFF COEFFICIENTS						
SUBBASIN	AREA (AC)	LAND USE IMPERVIOUS, %	HYDROLOGIC SOIL GROUP	LAND USE	5-YEAR RUNOFF COEFFICIENT	100-YEAR RUNOFF COEFFICIENT
COMPOSITE	9.6	43.1	B	COMMERCIAL AREAS; RESIDENTIAL AREAS - 1/2 ACRE; HISTORIC FLOW ANALYSIS - GREENBELTS	0.44	0.59

*Note that above calculation was provided by the Estates at Rolling Hills Ranch Filing No. 2 Final Drainage Report

PROJECT Meridian Service Metropolitan District Water Treatment Plant Expansion

PREPARED BY CTD

DATE SEPTEMBER 2022

PROPOSED CONDITIONS - RATIONAL METHOD CALCULATIONS										
STREET	DESIGN POINT	DIRECT RUNOFF								REMARKS
		AREA DESIGN	AREA (A)	RUNOFF COEFF (C)	t_c	CA	I_5	I_{100}	Q	
			ac	10yr	min		in/hr	in/hr	cfs	
5-Year Runoff Calculations										
	PP1	Commercial	1.9	0.80	5.0	1.52	5.2	-	7.9	
	PP2	Commercial	1.3	0.80	5.0	1.04	5.2	-	5.4	
	PP3	Commercial	0.1	0.80	5.0	0.1	5.2	-	0.4	
	DP1	Commercial	3.2	0.80	5.0	2.56	5.2	-	13.2	
100-Year Runoff Calculations										
	PP1	Commercial	1.9	0.88	5.0	1.672	-	8.7	14.5	
	PP2	Commercial	1.3	0.88	5.0	1.144	-	8.7	9.9	
	PP3	Commercial	0.1	0.88	5.0	0.088	-	8.7	0.8	
	DP1	Commercial	3.2	0.88	5.0	2.82	-	8.7	24.4	

Rock Chute Design Data

(Version WI-July-2010, Based on Design of Rock Chutes by Robinson, Rice, Kadavy, ASAE, 1998)

Project: Meridian Service Metro District WTP Exp.
Designer: CTD
Date: September 2022

County: El Paso, Colorado
Checked by: RGG
Date: _____

Input Geometry:

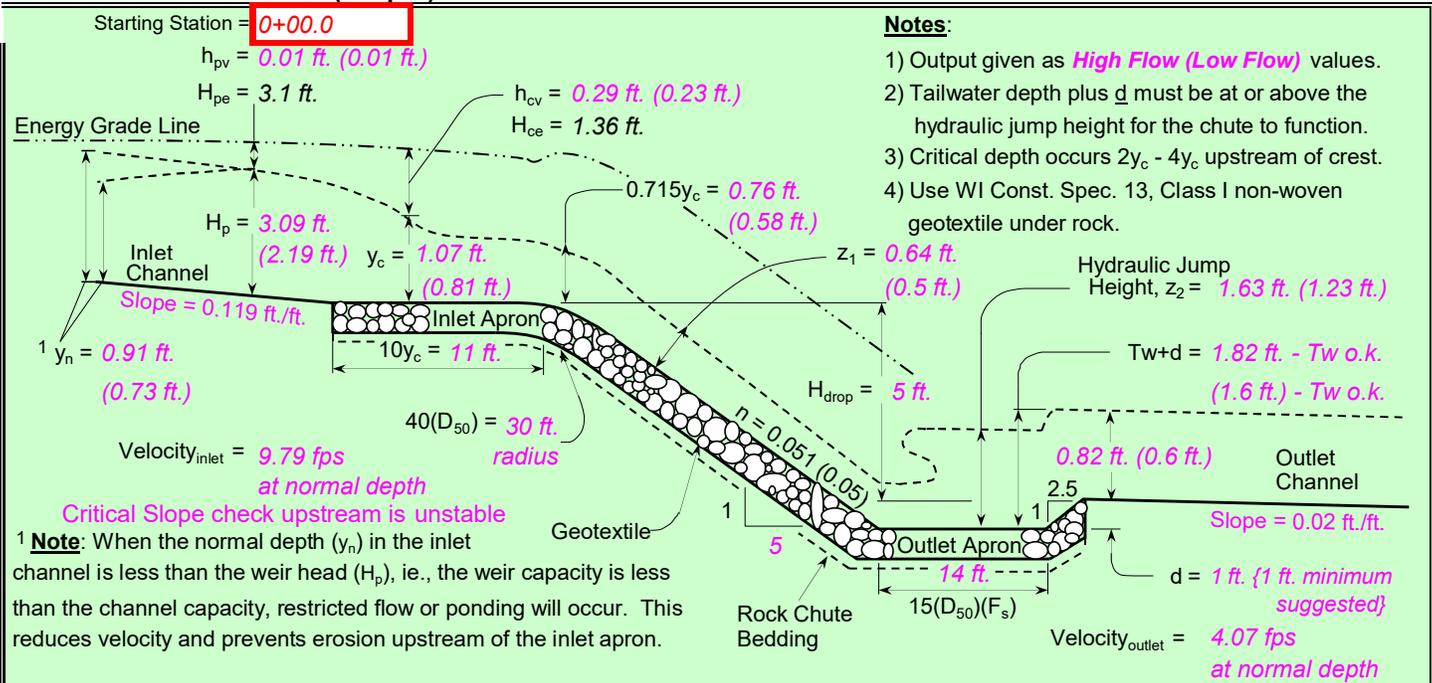
→ <u>Upstream Channel</u>	→ <u>Chute</u>	→ <u>Downstream Channel</u>
Bw = 0.0 ft.	Bw = 1.0 ft.	Bw = 4.0 ft.
Side slopes = 3.0 (m:1)	Factor of safety = 1.30 (F _s) 1.2 Min	Side slopes = 4.0 (m:1)
Velocity n-value = 0.030	Side slopes = 4.0 (m:1) → 2.0:1 max.	Velocity n-value = 0.035
Bed slope = 0.1190 ft./ft.	Bed slope (5:1) = 0.200 ft./ft. → 3.0:1 max.	Bed slope = 0.0200 ft./ft.
Freeboard = 1.0 ft. →		
Outlet apron depth, d = 1.0 ft.		Base flow = 0.0 cfs

Note: n value = a) velocity n from waterway program
 or b) computed mannings n for channel

Design Storm Data (Table 2, FOTG, WI-NRCS Grade Stabilization Structure No. 410):

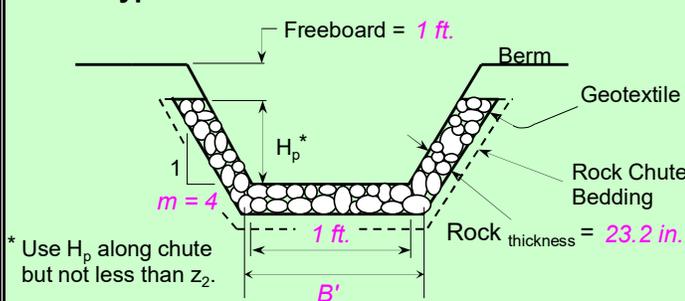
Apron elev. --- Inlet = 7072.0 ft. ----- Outlet = 7066.0 ft. --- (H _{drop} = 5 ft.)	Note: The total required capacity is routed through the chute (principal spillway) or in combination with an auxiliary spillway.
Q _{high} = Runoff from design storm capacity from Table 2, FOTG Standard 410	Input tailwater (Tw): 0.20 1.30
Q ₅ = Runoff from a 5-year, 24-hour storm.	
Q _{high} = 24.4 cfs High flow storm through chute	→ Tw (ft.) = Program
Q ₅ = 13.2 cfs Low flow storm through chute	→ Tw (ft.) = Program

Profile and Cross Section (Output):



Profile Along Centerline of Chute

Typical Cross Section



6.24 cfs/ft.	Equivalent unit discharge
F _s = 1.30	Factor of safety (multiplier)
z ₁ = 0.64 ft.	Normal depth in chute
n-value = 0.051	Manning's roughness coefficient
D ₅₀ (F _s) = 11.6 in.	Minimum Design D50*
2(D ₅₀)(F _s) = 23.2 in.	Rock chute thickness
Tw + d = 1.82 ft.	Tailwater above outlet apron
z ₂ = 1.63 ft.	Hydraulic jump height
*** The outlet will	function adequately

High Flow Storm Information

Manning Formula: East Swales

Irregular Section

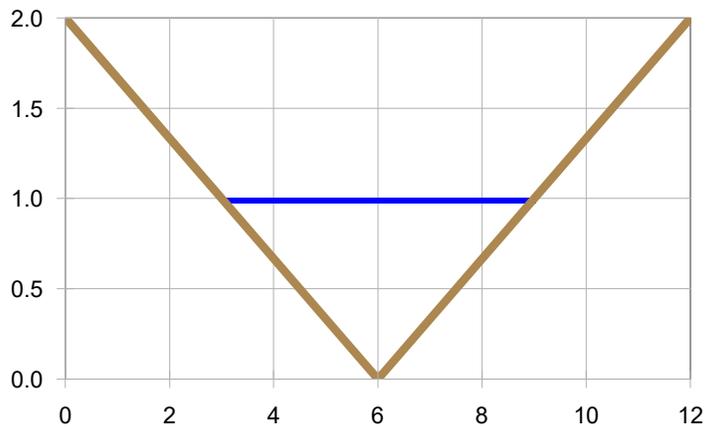
Input

Flow 14.5 cfs
Slope 0.019 ft/ft

Sta	Elev	n	Sta	Elev	n	Sta	Elev	n	Sta	Elev	n
0	2	0.025	6	0	0.025	12	2	0.025			

Output

WSElev 0.989 ft
Flow Area 2.93 sf
Velocity 4.95 fps
Velocity Head 0.380 ft
Top Width 5.93 ft
Froude Number 1.24
Critical WSElev 1.077 ft
Critical Slope ft/ft



Manning Formula: South Swale

Irregular Section

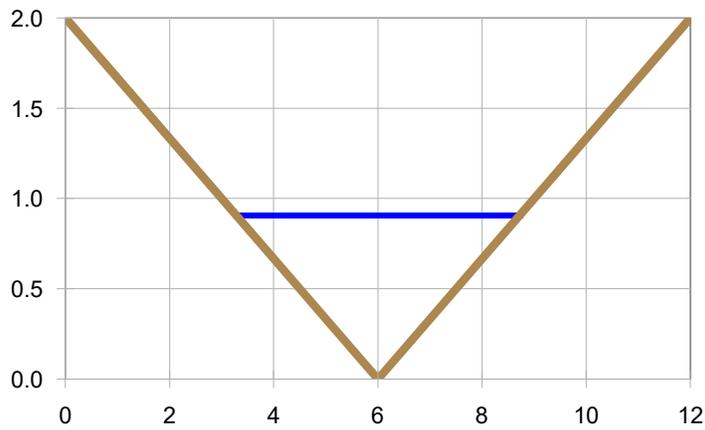
Input

Flow 9.9 cfs
Slope 0.014 ft/ft

Sta	Elev	n	Sta	Elev	n	Sta	Elev	n	Sta	Elev	n
0	2	0.025	6	0	0.025	12	2	0.025			

Output

WSElev 0.907 ft
Flow Area 2.47 sf
Velocity 4.01 fps
Velocity Head 0.250 ft
Top Width 5.44 ft
Froude Number 1.05
Critical WSElev 0.925 ft
Critical Slope ft/ft





APPENDIX C

DESIGN CHARTS



3.1. - Rational Method Runoff Coefficient (C)

The runoff coefficient represents the integrated effects of infiltration, detention storage, evaporation, retention, flow routing, and interception, all of which affect the time distribution and peak rate of runoff. Runoff coefficients are based on the imperviousness of a particular land use and the hydrologic soil type of the area and are to be selected in accordance with Table 6-6.

The procedure for determining the runoff coefficient includes these steps:

1. Categorize the site area into one or more similar land uses, each with a representative imperviousness, according to the information in Table 6-6.
2. Based on the dominant hydrologic soil type in the area, use Table 6-6 to estimate the runoff coefficient for the particular land use category for the design storms of interest.
3. Calculate an area-weighted average runoff coefficient for the site based on the runoff coefficients from individual land use areas of the site.

When analyzing an area for design purposes, urbanization of the full watershed, including both on-site and off-site areas, shall be assumed.

Gravel parking areas, storage areas, and access drives proposed on Site Improvement Plans shall be analyzed based on an imperviousness of 80%. This is due to the potential for gravel areas being paved over time by property owners and the resulting adverse impacts on the stormwater management facilities and adjacent properties.

There are some circumstances where the selection of impervious percentage values may require additional investigation due to unique land characteristics (e.g., recent burn areas). When these circumstances arise, it is the designer's responsibility to verify that the correct land use assumptions are made.

When multiple sub-basins are delineated, the composite C value calculation is:

$$C_c = (C_1 A_1 + C_2 A_2 + C_3 A_3 + \dots + C_i A_i) / A_t \quad (\text{Eq. 6-6})$$

Where:

C_c = composite runoff coefficient for total area

C_i = runoff coefficient for subarea corresponding to surface type or land use

A_i = area of surface type corresponding to C_i (units must be the same as those used for total area)

A_t = total area of all subareas for which composite runoff coefficient applies

i = number of surface types in the drainage area

Table 6-6. Runoff Coefficients for Rational Method
(Source: UDFCD 2001)

Land Use or Surface Characteristics	Percent Impervious	Runoff Coefficients					
		2-year	5-year	10-year	25-year	50-year	100-year

		HSG A&B	HSG C&D										
Business													
Commercial Areas	95	0.79	0.80	0.81	0.82	0.83	0.84	0.85	0.87	0.87	0.88	0.88	0.89
Neighborhood Areas	70	0.45	0.49	0.49	0.53	0.53	0.57	0.58	0.62	0.60	0.65	0.62	0.68
Residential													
1/8 Acre or less	65	0.41	0.45	0.45	0.49	0.49	0.54	0.54	0.59	0.57	0.62	0.59	0.65
1/4 Acre	40	0.23	0.28	0.30	0.35	0.36	0.42	0.42	0.50	0.46	0.54	0.50	0.58
1/3 Acre	30	0.18	0.22	0.25	0.30	0.32	0.38	0.39	0.47	0.43	0.52	0.47	0.57
1/2 Acre	25	0.15	0.20	0.22	0.28	0.30	0.36	0.37	0.46	0.41	0.51	0.46	0.56
1 Acre	20	0.12	0.17	0.20	0.26	0.27	0.34	0.35	0.44	0.40	0.50	0.44	0.55
Industrial													
Light Areas	80	0.57	0.60	0.59	0.63	0.63	0.66	0.66	0.70	0.68	0.72	0.70	0.74
Heavy Areas	90	0.71	0.73	0.73	0.75	0.75	0.77	0.78	0.80	0.80	0.82	0.81	0.83
Parks and Cemeteries	7	0.05	0.09	0.12	0.19	0.20	0.29	0.30	0.40	0.34	0.46	0.39	0.52
Playgrounds	13	0.07	0.13	0.16	0.23	0.24	0.31	0.32	0.42	0.37	0.48	0.41	0.54
Railroad Yard Areas	40	0.23	0.28	0.30	0.35	0.36	0.42	0.42	0.50	0.46	0.54	0.50	0.58
Undeveloped Areas													



APPENDIX D

REPORT EXCERPTS



COMPOSITE 'C' FACTORS

PROJECT: **Estates at Rolling Hills Ranch Filing 2**

9/16/2020

BASIN DESIGNATION	AREA (AC.)											COMPOSITE FACTOR		Percent Impervious
	UNDEV	2.5 AC	1 DU/AC	2 DU/AC	3 DU/AC	GRADED	TANK SITE	STREETS	OPEN SPACE PARKS/GC LAWNS	COMM	TOTAL	5-year	100-year	
OS7c	5.9	4.1									10.0	0.12	0.38	4.6%
A01	4.7		1.4								6.1	0.11	0.38	4.4%
OS8	1.7	23.5									25.2	0.16	0.40	10.3%
B01	9.0		2.3								11.3	0.11	0.38	4.0%
B02	0.4		4.1	3.8							8.3	0.20	0.45	21.5%
B03	7.8		1.0				1.7				10.5	0.16	0.41	13.2%
B04	0.1		3.9	6.3			0.3				10.6	0.22	0.46	24.1%
B05	1.8		1.5	1.0			1.3				5.6	0.23	0.46	25.9%
B06				1.5							1.5	0.22	0.46	25.0%
B07			3.5	3.6					0.4		7.4	0.21	0.45	21.5%
B08				9.4							9.4	0.22	0.46	25.0%
B09				6.1							6.1	0.22	0.46	25.0%
B10				12.2							12.2	0.22	0.46	25.0%
B11				0.4							0.4	0.22	0.46	25.0%
B12				3.3							3.3	0.22	0.46	25.0%
C01						8.5		1.1	2.4		12.0	0.27	0.45	9.6%
D01				3.8					2.5	3.3	9.5	0.44	0.59	43.3%
E01	2.0					1.8		0.6	2.0		6.4	0.24	0.44	9.3%
E02	0.3							0.2	0.1		0.6	0.40	0.58	35.1%
E03	1.5			0.2				0.5	0.3		2.6	0.29	0.50	23.7%
											158.8	Composite:		17.3%
TOTAL	35.2	27.6	17.6	51.4	0.0	10.3	3.3	2.4	7.6	3.3	158.8	0.21	0.44	17.3%
FB11				0.4							0.4	0.22	0.46	25.0%
FB12				3.8				1.4	1.1		6.2	0.38	0.56	38.0%
FC01					3.7			1.0	1.5		6.2	0.35	0.53	34.0%
											146.3	Composite:		21.1%
TOTAL	31.4	27.6	17.6	51.7	3.7	0.0	3.3	2.4	5.4	6.6	149.6	0.22	0.45	21.1%

A01	4.7		1.4								6.1	0.12	0.38	4.6%
C01						8.5		1.1	2.4		12.0	0.27	0.45	9.6%

TIME OF CONCENTRATION

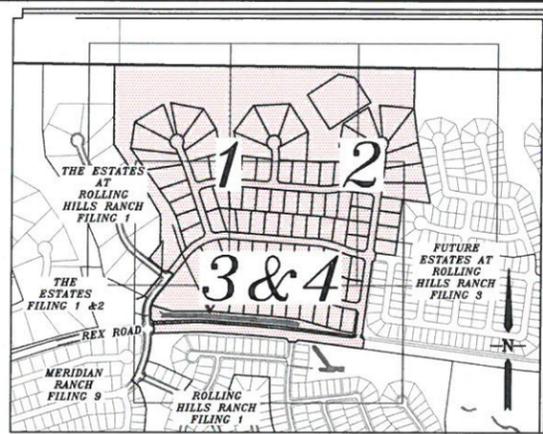
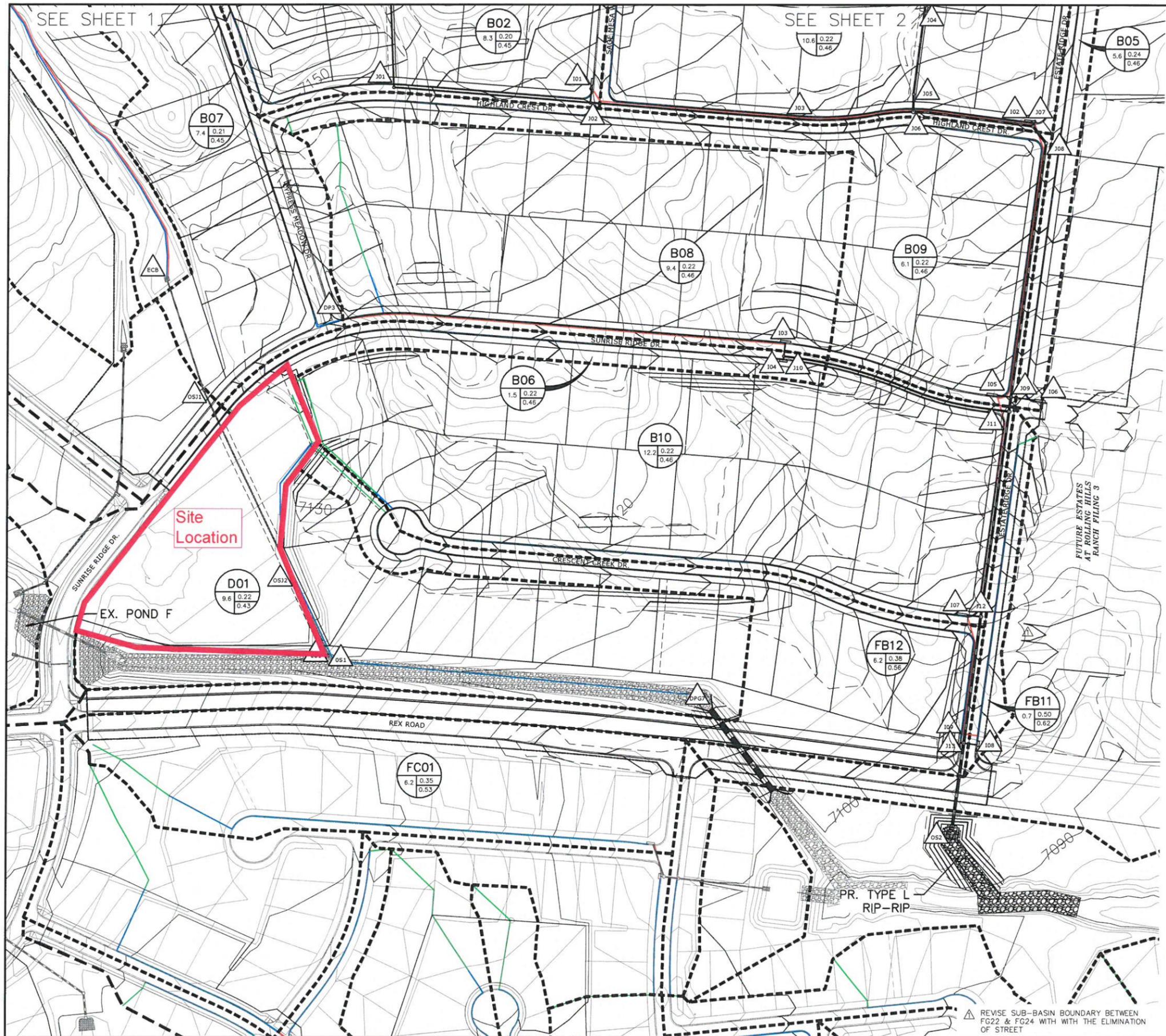
PROJECT: **Estates at Rolling Hills Ranch Filing 2**

DATE: 9/16/2020

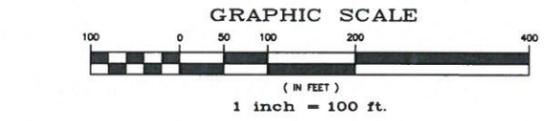
TIME OF CONCENTRATION																	
SUBBASIN DATA			INIT./OVERLAND TIME (T _i)				TRAVEL TIME (T _t)							TOTAL	T _c Check (Urbanized Basins)		FINAL
BASIN DESIGNATION	C _s	AREA (AC)	LENGTH (FT)	ΔH	SLOPE %	T _i (Min.)*	LENGTH (FT)	ΔH	SLOPE %	CONVEYANCE		VEL. (FPS)	T _t (Min.)**	T _i +T _t (Min.)	L (FT)	T _c = (L/180) + 10	T _c (min)
										TYPE	COEF.						
OS7c	0.12	10.0	190	11.0	5.8%	13.8	890	50	5.6%	G	15	3.6	4.2	18.0	1080.00	16.0	16.0
A01	0.11	6.1	185	6.0	3.2%	16.6	1275	34	2.7%	L	7	1.1	18.6	35.2	1460.00	18.1	18.1
OS8	0.16	25.2	FROM APPROVED MERIDIAN RANCH FILING MDDP, JAN 2018														26.6
B01	0.11	11.3	230	9.0	3.9%	17.4	1050	31	3.0%	L	7	1.2	14.5	32.0	1280.00	17.1	17.1
B02	0.20	8.3	290	15.0	5.2%	16.2	1135	21	1.9%	P	20	2.7	7.0	23.1	1425.00	17.9	17.9
B03	0.16	10.5	300	7.0	2.3%	22.4	1120	37	3.3%	G	15	2.7	6.8	29.2	1420.00	17.9	17.9
B04	0.22	10.6	260	23.0	8.8%	12.6	1270	23	1.8%	P	20	2.7	7.9	20.5	1530.00	18.5	18.5
B05	0.23	5.6	300	20.0	6.7%	14.6	1500	42	2.8%	P	20	3.3	7.5	22.1	1800.00	20.0	20.0
B06	0.22	1.5	30	0.6	2.0%	7.0	1150	14	1.2%	P	20	2.2	8.7	15.7	1180.00	16.6	15.7
B07	0.21	7.4	300	12.0	4.0%	17.8	1080	25	2.3%	P	20	3.0	5.9	23.7	1380.00	17.7	17.7
B08	0.22	9.4	300	11.0	3.7%	18.1	890	8	0.9%	P	20	1.9	7.8	25.9	1190.00	16.6	16.6
B09	0.22	6.1	30	0.6	2.0%	7.0	2030	32	1.6%	P	20	2.5	13.5	20.5	2060.00	21.4	20.5
B10	0.22	12.2	300	14.0	4.7%	16.7	1230	25	2.0%	P	20	2.9	7.2	23.9	1530.00	18.5	18.5
B11	0.22	0.4	30	0.6	2.0%	7.0	170	4	2.4%	P	20	3.1	0.9	7.9	200.00	11.1	7.9
B12	0.22	3.3	195	13.0	6.7%	12.0	1480	29	2.0%	P	20	2.8	8.8	20.8	1675.00	19.3	19.3
C01	0.27	12.0	185	9.0	4.9%	12.2	1310	35	2.7%	B	10	1.6	13.4	25.5	1495.00	18.3	18.3
D01	0.44	9.5	100	2.0	2.0%	9.7	1200	37	3.1%	L	7	1.2	16.3	25.9	1300.00	17.2	17.2
E01	0.24	6.4	125	4.0	3.2%	12.0	375	6	1.6%	L	7	0.9	7.1	19.0	500.00		19.0
E02	0.40	0.6	45	2.0	4.4%	5.2	375	12	3.2%	P	20	3.6	1.7	7.0	420.00	12.3	7.0
E03	0.29	2.6	125	4.0	3.2%	11.3	595	13	2.2%	P	20	3.0	3.4	14.6	720.00	14.0	14.0
FB11	0.22	0.4	30	0.6	2.0%	7.0	170	4	2.4%	P	20	3.1	0.9	7.9	200.00	11.1	7.9
FB12	0.38	6.2	195	13.0	6.7%	9.8	1480	29	2.0%	P	20	2.8	8.8	18.7	1675.00	19.3	18.7
FC01	0.35	6.2	185	9.0	4.9%	11.0	985	25	2.5%	P	20	3.2	5.2	16.2	1170.00	16.5	16.2

Notes:	$* T_i = \frac{0.395 (1.1 - C_s) L^{0.5}}{S^{0.33}}$
	$V = C_v S_w^{0.5} \quad ** T_t = L \times V$

TYPE OF SURFACE		C _v
HEAVY MEADOW	H	2.5
TILLAGE/FIELD	T	5
RIPRAP (not buried)	R	6.5
SHORT PASTURE AND LAWNS	L	7
NEARLY BARE GROUND	B	10
GRASSED WATERWAY	G	15
PAVED AREAS	P	20



- N.T.S.**
- G01 BASIN DESIGNATION
 - 2.7 SUB-WATERSHED DESIGNATION
 - 0.55 MINOR/MAJOR STORM COEFFICIENT
 - 61 BASIN AREA IN ACRES
 - 61 DESIGN POINT DESIGNATION
 - MAJOR BASIN BOUNDARY
 - SUB-BASIN BOUNDARY
 - EXISTING CONTOUR
 - PROPOSED CONTOUR
 - PROPOSED STORM SEWER
 - INITIAL OVERLAND TIME (T_i)
 - TRAVEL TIME (T_t)
 - OVERLAND TIME (T_o)



DP	BASIN	AREA (AC)	Q(5) (CFS)	Q(100) (CFS)	INLET	Q(5) (CFS)	Q(100) (CFS)	PIPE
DP1	OS7c	10.0	4.1	22	EX 30" CULVERT	4.1	22	24" RCP
ECB	A01	6.1	5.0	27	EX TYPE C INLET	5.0	27	24" RCP
OS101						5.0	27	24" RCP
OS102						5.0	27	24" RCP
CB01	B01	11.3	4.2	24	PR TYPE C INLET	4.2	24	24" RCP
JO1						4.2	24	24" RCP
IO1	B02	8.3	5.5	20	PR 20" FORCED SUMP	5.5	17	18" RCP
JO2						9.5	40	30" RCP
JO3						9.5	40	30" RCP
DP2	OS8	25.2	10	45	EX 30" CULVERT	10	45	36" RCP
CB02	B03	10.5	14	57	PR TYPE D INLET	14	57	36" RCP
JO4						13	57	36" RCP
JO5						13	57	36" RCP
IO2	B04	10.6	7.4	26	PR 20" FORCED SUMP	7	17	24" RCP
JO6						20	86	42" RCP
JO7						26	98	42" RCP
JO8						26	98	42" RCP
IO5	B09	6.1	4.1	22	PR 20" SUMP	4.1	17	18" RCP
IO6	B05	5.6	4.0	13	PR 20" FLOW-BY	3.6	10	18" RCP
JO9						31	118	42" RCP
DP3	B07	7.4	5.1	18				
IO3	B08	9.4	10	35	PR 20" SUMP	10.0	17	18" RCP
IO4	B06	1.5	1.1	21	PR 15" SUMP	1.1	21	18" RCP
JO10						11	38	30" RCP
JO11						41	151	42" RCP
IO7	B10	12.2	8.6	31	PR 20" FORCED SUMP	8.6	17	24" RCP
JO12						47	164	48" RCP
IO8	B11	1.0	1.7	5	PR 10" SUMP	1.7	5.1	18" RCP
IO9	B12	3.3	2.3	20	PR 20" SUMP	2.3	17	18" RCP
JO13						51	182	54" RCP
IO8	FB11	0.7	1.6	14	PR 10" SUMP	1.6	14	18" RCP
IO9	FB12	6.2	7.5	29	PR 20" SUMP	7.5	17	18" RCP
JO13						55	189	54" RCP

BENCH MARK:
INTERSECTION OF WOODMEN RD AND MERIDIAN ROAD AT SW CORNER (BRASS CAP W/ NO. GF-9)
ELEVATION = 6874.00

NOTE:
COUNTY PLAN REVIEW IS PROVIDED ONLY FOR GENERAL CONFORMANCE WITH COUNTY DESIGN CRITERIA. THE COUNTY IS NOT RESPONSIBLE FOR THE ACCURACY AND ADEQUACY OF THE DESIGN, DIMENSIONS, AND/OR ELEVATIONS WHICH SHALL BE CONFIRMED AT THE JOB SITE. THE COUNTY THROUGH THE APPROVAL OF THIS DOCUMENT ASSUMES NO RESPONSIBILITY FOR THE COMPLETENESS AND/OR ACCURACY OF THIS DOCUMENT.

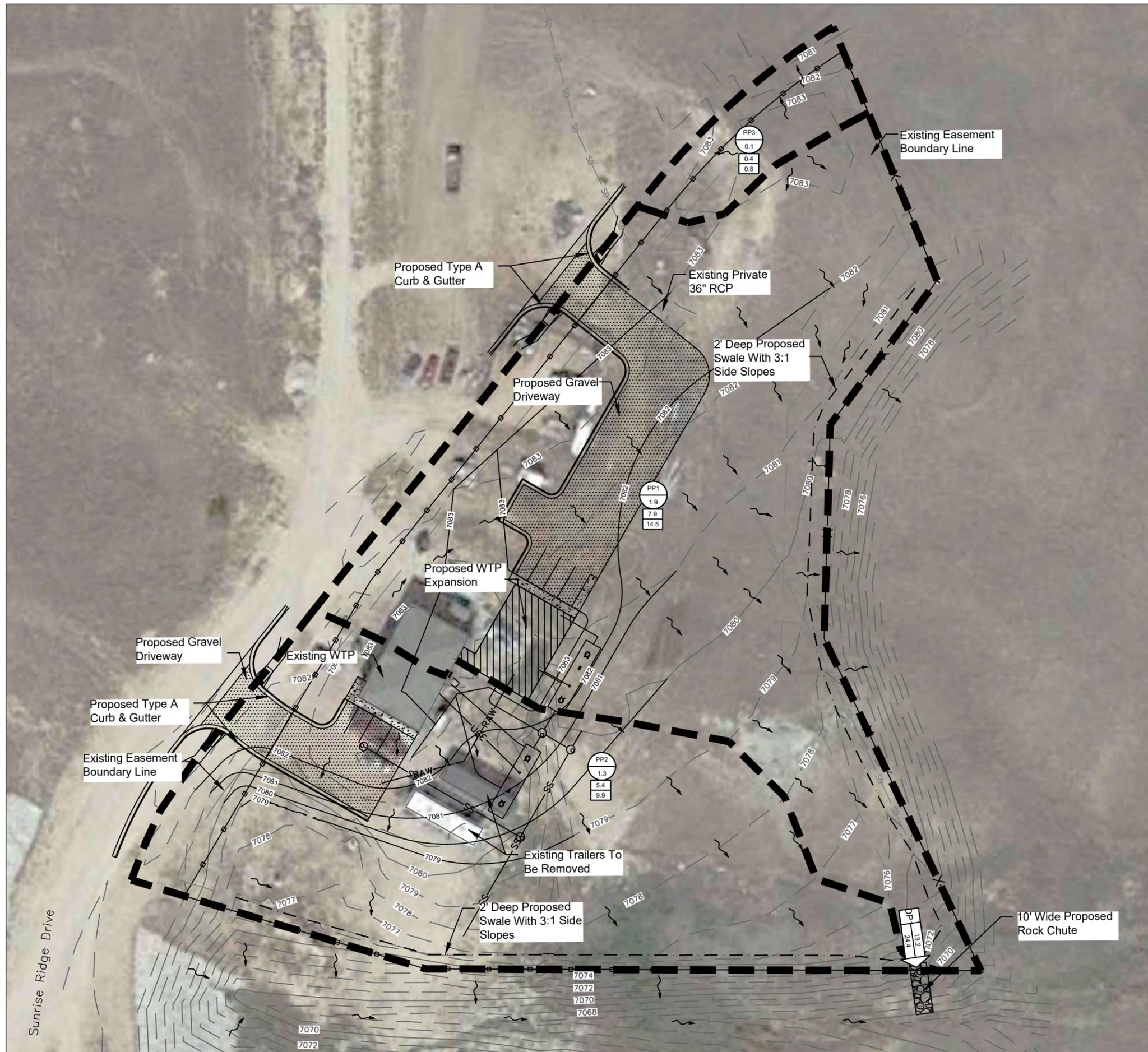
REVISE SUB-BASIN BOUNDARY BETWEEN FG22 & FG24 WITH THE ELIMINATION OF STREET

No.	Revisions	Date	Frnt.	Appr.	Date	Frnt.	Appr.	Date	Frnt.
<p>TECH CONTRACTORS 11886 STAPLETON DRIVE FALCON, CO 80831 TELEPHONE: 719.495.7444 FAX: 719.495.3349</p>									
<p>MERIDIAN RANCH</p>									
<p>FUTURE RATIONAL DRAINAGE MAP FINAL DRAINAGE REPORT THE ESTATES AT ROLLING HILLS RANCH FILING 2</p>									
Drawn by	TAK	Checked by	Date						
Scale	1" = 100'	4	of	4					
<p>SEPT 2020</p>									



BACK POCKET

2022/09/12 7:16 PM By: Coleton Deltz N:\Projects\151 Meridian Service Metropolitan District\151.52 WTP Expansion SPP\Documents\Drainage\2_Drainage Plans\1_Proposed Conditions.dwg



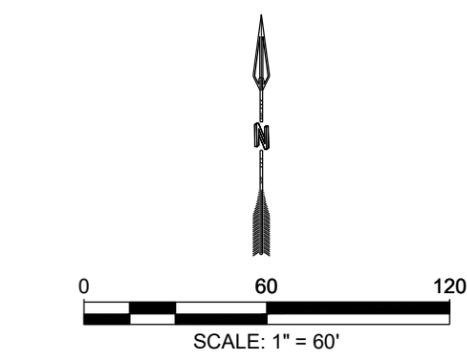
BENCHMARK

- SURVEY CONTROL POINT AS SHOWN HERON. ELEVATIONS ARE BASED ON COLORADO SPRINGS "FIMS" VERTICAL DATUM, FIMS MONUMENT "ELPASOW" ELEVATION = 7106.2' (NGVD 29). "FIMS" BRASS CAP SET ABOUT 3 MILES NORTH AND 1 MILE EAST OF FALCON, CO.

LEGEND

- PROPOSED GRAVEL
- PROPOSED CONCRETE
- PROPOSED RIPRAP
- PROPOSED WROUGHT IRON FENCE
- PROPOSED WOOD FENCE
- PROPOSED SWALE
- EXISTING STORM PIPE
- BASIN DESIGNATION
- BASIN CALLOUT
- BASIN INFORMATION
- DESIGN POINT
- DIRECTION OF DRAINAGE FLOW
- PROPOSED SUB-BASIN BOUNDARY
- PROPOSED MAJOR CONTOUR
- PROPOSED MINOR CONTOUR
- EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR

PROPOSED CONDITIONS			
SUB-BASIN	AREA (AC)	Q5 (CFS)	Q100 (CFS)
PP1	1.9	7.9	14.5
PP2	1.3	5.4	9.9
PP3	0.1	0.4	0.8



JDS-HYDRO CONSULTANTS, INC.
 5540 TECH CENTER DR., SUITE 100
 COLORADO SPRINGS, COLORADO 80919
 (719) 227-0072

DISCLAIMER: THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS. ANY ERRORS OR OMISSIONS SHALL BE REPORTED TO JDS-HYDRO CONSULTANTS, INC. JDS-HYDRO ASSUMES NO LIABILITY FOR UNAUTHORIZED CHANGES AND/OR REVISIONS MADE TO PLANS.

MERIDIAN SERVICE METROPOLITAN DISTRICT
WATER TREATMENT PLANT EXPANSION
PROPOSED DRAINAGE EXHIBIT

NO.	DESCRIPTION	BY	APP.	DATE
1				
2				
3				
4				
5				
6				
7				

Project No.: 151.52
 Date: JULY 2022
 Design: CTD
 Drawn: CTD
 Check: RG