FINAL DRAINAGE REPORT

FALCON RANCHETTES FILING NO. 1A
MERIDIAN STORAGE

El Paso County, Colorado

PCD File No. VR239 & PPR2336

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DATE:
May 6, 2024

Signature Page
Falcon Ranchettes Filing No. 1a (Meridian Storage)

Engineer's Statement

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

Brady Shyrock, PE # 38164
For and on behalf of Galloway & Company, Inc.

05/21/2024
Date

Developer's Certification

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

By: Mike Texer

05/15/2024
Date

Address: Mike D. Texer
11750 Owl Place
Petyon, CO 80831

El Paso County Certification

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.

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

Date

Conditions:

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I. Introduction

This document is the Final Drainage Report for Falcon Ranchettes Filing No. 1a (Meridian Storage). The project consists of two lots and public right-of-way that make up 9.604 acres. This project proposes storage units, an office building, roadway and utility infrastructure, RV parking, a water quality treatment pond, and drainage channel improvements to the existing east branch of Unnamed Tributary to Black Squirrel Creek (UTBSC East Branch).

Purpose

The purpose of this report is to identify on and offsite drainage patterns and confirm that the new development has no significant changes to existing drainage patterns.

Previous Drainage Studies

- Falcon Drainage Basin Planning Study, dated September 2015 – Referred to as **Falcon DBPS** hereon.
- Bent Grass MDDP Amendment & DBPS Amendment, dated September 2021 – Referred to as **Bent Grass MDDP** hereon.
- Request for Conditional Letter of Map Revision, Unnamed Tributary to Black Squirrel Creek, Falcon Owl Place, dated October 25, 2022 – Referred to as Falcon **Owl Place CLOMR** hereon.
- Request for Letter of Map Revision, Unnamed Tributary to Black Squirrel Creek, Falcon Marketplace, dated March 15, 2021 – Referred to as **Falcon Marketplace LOMR** hereon.
- Final Drainage Report for Falcon Marketplace, dated November 4, 2019 – Referred to as **Falcon Marketplace FDR** hereon.

Relevant excerpts from existing drainage reports are provided in **Appendix B** for reference.

Location

Falcon Ranchettes Filing No. 1a is located in the Southeast Quarter of Section 1, Township 13 South, Range 65 West of the 6th Principal Meridian, County of El Paso, State of Colorado.

The project site is located at the northwest corner of Owl Place and Meridian Road, bounded to the North by Lot 2A Bent Grass East Commercial Fil No 2a and Tract A Bent Grass East Commercial Fil No 2, to the south by Lots 14 & 15 of Falcon Ranchettes, to the East by Meridian Road right-of-way, to the West by Lot 3 of Falcon Ranchettes. A Vicinity Map is provided in **Appendix A**.

Description of Property

The existing parcel is currently developed with two residential properties (*Lot 1 & 2 of Falcon Ranchettes*). Two single-family homes occupy the site, but the majority of the existing parcels are covered by native prairie grass land. An existing drainage-way flows north to south along the eastern property line adjacent to Meridian Road right-of-way, named “Unnamed Tributary to Black Squirrel Creek - East Branch”.

Soils

According to the U.S. Department of Agriculture Natural Resources Conservation Service Soil Survey of El Paso County, Colorado (See **Appendix A**) the primary soil found is Columbine gravelly sandy loam, classified as Soil Conservation Service (SCS) hydrologic soil group “A”.

Climate
This area of El Paso County is located at the foothills of the Southern Rocky Mountains. Classified as an alpine desert, Falcon, CO averages 300 days of sunshine with low humidity. Annual precipitation ranges between 10-16 inches, occurring mostly in spring and summer months.

Geotechnical Recommendations
Positive drainage away from the structures should be provided during construction and maintained throughout the life of the structures. Any downspouts, roof drains or scuppers should discharge into splash blocks or extensions and away from the structures. Backfill against footings, exterior walls and in utility trenches should be properly compacted and free of all construction debris to reduce the possibility of moisture infiltration. Refer to the Geotechnical Exploration Report prepared by Universal Engineering Sciences for more detailed information.

Flood Insurance Rate Map
According to the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) #08041C0553G, effective date December 7, 2018. The project site is located in Zone X (Areas determined to be outside of the 0.2% annual chance floodplain). A copy of the FIRM map is provided in **Appendix A** for reference.

Major Drainage Basin
Falcon Ranchettes Filing No. 1a is located within the MT060 drainage basin as described in the **Falcon DBPS**. The Falcon Watershed is located in the north central portion of El Paso County and flows southeasterly from the southern slope of the Black Forest. The Falcon watershed contains three perennial streams and has a contributing drainage area of approximately 10.6 square miles at its confluence with Black Squirrel Creek.

Detailed recommendations from the **Falcon DBPS** are included below under "*IV. Proposed Drainage Patterns and Features*".

II. Drainage Design Criteria

Development Criteria Reference
The analysis and design of the drainage concept and stormwater management system for this project was prepared in accordance with the criteria set forth in the Mile High Flood District (MHFD) Urban Storm Drainage Criteria Manual (USDCM) dated January 2016 and the adopted chapters 6 & 13 from the City of Colorado Springs Drainage Criteria Manual (DCM) Vol. 1, last revised January 2021

Hydrologic Criteria
The rational method was used to calculate peak flows as the tributary areas are less than 100 acres. An analysis of the hydrology using the rational method can be found in **Appendix C** - Hydrologic Calculations. The rational method has proved to be accurate for basins of this size and is based on the following formula:

$Q = CIA$

Where:

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

The rainfall intensity calculations are based on the DCM Figure 6-5 and IDF equations. The one hour point rainfall data for the design are listed in Table 1 below.

Table 1 - Precipitation Data (Table 6.2 in DCM Vol. 1)

Return Period	One Hour Depth (in).	Intensity (in/hr)
5-year	1.50	5.17
100-year	2.52	8.68

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

$Tc=T_i + T_t$

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

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 runoff coefficients are calculated based on land use, percent imperviousness, and design storm for each basin, as shown in the DCM, (Table 6-6).

Hydraulic Criteria

Storm Pipe

Hydraulic design and analysis for this report were performed through the usage of StormCAD. A tabular summary from analysis performed by StormCAD can be found in **Appendix D** - Hydraulic Calculations. Additionally, the table below shows the parameters used for StormCAD Standard Method Coefficients taken from *DCM Vol 1 Chapter 9 Table 9-4.*

BEND LOSS		
BEND ANGLE	***K COEFFICIENT***	
0°	0.05	
22.5°	0.10	
45°	0.40	
60°	0.64	
90°	1.32	
LATERAL LOSS		
ONE LATERAL K COEFFICIENT		
BEND ANGLE	***NON -SURCHARGED***	***SURCHARGES***
45°	0.27	0.47
60°	0.52	0.90
90°	1.02	1.77
TWO LATERAL K COEFFICIENT		
45°	0.96	
60°	1.16	
90°	1.52	

Storm Inlets

CDOT-Type R Storm Curb Inlets and CDOT Type C Area Inlets are sized using the UD-Inlet_v5.02 spreadsheet from Mile High Flood District. Additionally, CDOT Type 13 area inlets are sized using a depth to capacity line graph. These calculations are provided in **Appendix D**.

Detention Pond

As shown in Part IV: Onsite PWQ Requirements, Documentation and Considerations of the PBMP Applicability Form, this project is required to provide treatment for the Water Quality Capture Volume (WQCV) Standard.

Proposed *Pond #1* was designed using the Mile High Flood District (MHFD) software spreadsheets; It is the recommended design software because it provides tabulated results of the WQCV, EURV, 2-, 5-, 10-, 25-, 50-, 100- and 500-year storm events routed through the pond. The detention criteria provided by the MHFD's design spreadsheets *MHFD-Detention_v4.06* 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 Calculations of this report.

Detailed water surface elevations and pond design information are included below under "*IV. Proposed Drainage Patterns and Features*".

Drainage Channel

Proposed improvements to UTBSC East Branch was analyzed using Bentley software *FlowMaster* to properly size a trapezoidal channel to safely convey stormwater while providing 1.0-ft minimum of freeboard. Additionally, the 3 proposed grouted stepped boulder drop structures were designed using criteria set forth in USDCM from Mile High Flood District. FlowMaster calculations can be found in **Appendix D.**

Detailed steps of the Simplified Design Procedure as shown in the USDCM are included below under "*IV. Proposed Drainage Patterns and Features*".

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**
   This step uses low impact development (LID) practices to reduce runoff at the source. Generally, rather than creating point discharges that are directly connected to impervious areas runoff is routed through pervious areas to promote infiltration. The Impervious Reduction Factor (IRF) method was used and calculations can be found in Appendix E.

2. **Implement BMP's That Provide a Water Quality Capture Volume with Slow Release**
   This step utilizes formalized water quality capture volume to slow the release of runoff from the site, while the WQCV will release in no less than 40 hours. Proposed Pond #1 will provide water quality treatment for all developed areas prior to the runoff being released into existing sub-regional detention pond SR-4.

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. Drainage channel improvements are proposed to the existing UTBSC East Branch (RMT064), including widening the existing channel with 3 proposed grouted stepped boulder drop structures.

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. A no vehicle maintenance policy will be enforced to avoid the potential contaminations caused from vehicle fluid replacement, and

equipment replacement and repair. In addition, the landscaping and snow removal is handled completely by the property management to ensure proper lawn mowing and grass clipping disposal, lawn aeration, and fertilizer application is being followed. Snow removal will also be handled by the property manager to ensure proper consideration of snow pile placement and use of deicing chemicals.

III. Existing Drainage Patterns and Features

Existing Drainage Patterns

On-Site:
The existing drainage pattern sheet flows from north to south. Basin **MT060** represents all flows from the existing roadside ditch entering the project site, including the 24" pond outfall from Bent Grass. Flows from basin **EX-1** sheet flow into the existing roadside ditch (RMT064) and then conveyed to **DP1** where existing 36" twin CMP culverts pipe conveys flows under Owl Place. The culverts are severely undersized and partially filled with sediment, a detailed analysis of these culverts is provided in the **Owl Place CLOMR**. Basins **EX-2** and **EX-3** flow south and pool along the north edge Owl Place near **DP2** and **DP3**. Flows eventually overtop the gravel road and continue south.

Off-Site:
Basins **EX-4**, **OS-1, OS-2 and OS-3** flow south and pool at **DP4**. These flows eventually overtop the gravel road and continue south.

Sub-Basin Descriptions

Note: an existing drainage map is provided in **Appendix F** and should be referenced when reading the basin descriptions below.

Basin MT060 (Q5 = 304.6 cfs, Q100 = 915.3 cfs): a basin that encompasses all flows from the existing roadside ditch (RMT064) entering the project site at the northeast corner, including the 24" pond outfall from Bent Grass. Flows are conveyed south to **DP1** where existing 36" twin CMP culverts pipe flows under Owl Place. Existing drainage channel (RMT064) conveys flows south to sub-regional detention pond SR4.

Basin EX-1 (4.97 acres, Q5 = 1.6 cfs, Q100 = 7.7 cfs): a basin that encompasses the northeast portion of the project site. Runoff sheet flows from north to south and eventually spills into the existing Meridian Road roadside ditch, RMT064. Flows continue south to **DP1** where existing 36" twin CMP culverts pipe flows under Owl Place. Existing drainage channel (RMT064) conveys flows south to sub-regional detention pond SR4.

Basin EX-2 (2.32 acres, Q5 = 0.6 cfs, Q100 = 3.2 cfs): a basin that encompasses a portion of the center of the site. Flows drain from north to south to **DP2** where flows pool along the north edge of Owl Place until eventually overtopping the gravel road and continuing south, ultimately to sub-regional detention pond SR4.

Basin EX-3 (2.85 acres, Q5 = 0.3 cfs, Q100 = 3.0 cfs): a basin that encompasses the west portion of the site. Flows drain from north to south to **DP3** where flows pool along the north edge of Owl Place until

eventually overtopping the gravel road and continuing south, ultimately to sub-regional detention pond SR4.

Basin EX-4 (1.08 acres, Q5 = 0.0 cfs, Q100 = 0.9 cfs): a basin that encompasses the far west portion of the site. Flows drain from north to south to **DP4** where flows pool along the north edge of Owl Place until eventually overtopping the gravel road and continuing south, ultimately to sub-regional detention pond SR4.

Basin OS-1 (3.89 acres, Q5 = 0.7 cfs, Q100 = 4.5 cfs): a basin that is associated with Lot 3 and 4 Falcon Ranchettes, and portions of the rear of lots 24, 25 and 26 of Bent Grass Residential Filing No. 1. Runoff sheet flows into a shallow swale and then conveyed from north to south to **DP4** where flows pool along the north edge of Owl Place until eventually overtopping the gravel road and continuing south, ultimately to sub-regional detention pond SR4.

Basin OS-2 (2.35 acres, Q5 = 0.6 cfs, Q100 = 3.0 cfs): a basin that is associated with Lot 3 and 4 Falcon Ranchettes, and portions of the rear of lots 26 and 27 of Bent Grass Residential Filing No. 1. Runoff sheet from north to south to **DP4** where flows pool along the north edge of Owl Place until eventually overtopping the gravel road and continuing south, ultimately to sub-regional detention pond SR4.

Basin OS-3 (0.24 acres, Q5 = 0.0 cfs, Q100 = 0.2 cfs): a basin that is associated with Lot 3 Falcon Ranchettes, a parcel immediately west of the project site. Flows drain from north to south to **DP4** where flows pool along the north edge of Owl Place until eventually overtopping the gravel road and continuing south, ultimately to sub-regional detention pond SR4.

Basin OS-4E (0.05 acres, Q5 = 0.2 cfs, Q100 = 0.4 cfs): a basin that encompasses the existing cul-de-sac in Meridian Park Drive ROW. This basin represents the limits of disturbance for roadway improvements and should be compared to proposed basin **OS-4P** located below in "*IV. Proposed Drainage Patterns and Features*". Runoff sheet flows north onto Type A curb and gutter and conveyed to an existing 6' CDOT Type 'R' Sump Inlet (Public), **DP14**.

IV. Proposed Drainage Patterns and Features

Proposed Drainage Plan

On-Site:

Proposed Lot 1a consists of 1 office building and 9 self-storage. Access is provided from Meridian Park Drive near the center of the site, with an emergency access drive to the north for emergency services only. An inverted crowned roadway with concrete valley gutter are used for all internal drive aisles to route runoff to proposed storm drain infrastructure. Flows are then piped to Pond #1 providing detention and treatment for the WQCV, EURV, and 100-Year. The pond outfall conveys flows south, directly outfalling into existing sub-regional pond (SR-4).

Proposed Lot 2a consists of RV Parking, Pond #1 is located at the southern end of the lot. RV Parking will likely be a temporary condition until Lot 2a is eventually redeveloped into additional self-storage units. Pond #1 is designed to accommodate the future self-storage imperviousness.

The proposed public roadway improvements convey runoff using curb and gutter and routing flows to proposed storm drain infrastructure and then piped to Pond #1 to provide detention and treatment for the WQCV. The pond outfall conveys flows south directly to an existing sub-regional pond (SR-4).

Drainage channel improvements to the existing RMT064 is discussed below under "*IV. Proposed Drainage Patterns and Features*", including the existing culvert crossing at Owl Place.

Off-Site:
The existing drainage pattern of OS-1, OS-2 and OS-3 remains unchanged. However, to avoid the stormwater pooling and overtopping at Owl Place, a CDOT Type C Area Inlet (Private) is proposed to capture flows and route the runoff safely to Pond SR-4.

Sub-Basin Descriptions

Note: a proposed drainage map is provided in **Appendix F** and should be referenced when reading the basin descriptions below.

Basin MT060 (Q5 = 304.6 cfs, Q100 = 915.3 cfs): a basin that encompasses all flows from the existing roadside ditch (RMT064) entering the project site at the northeast corner, including the 24" pond outfall from Bent Grass. Flows are conveyed south to **DP1** where existing 36" twin CMP culverts pipe flows under Owl Place. Existing drainage channel (RMT064) conveys flows south to sub-regional detention pond SR4.

Basin A-1 (1.82 AC, Q_5 = 2.0 cfs, Q_{100} = 5.4 cfs): a basin that encompasses the far east side of the site, this basin consists of the proposed drainage channel, and a portion of Meridian Road. Runoff from this basin will sheet flow into the drainage channel and then be conveyed south to **DP1** where existing 36" twin culverts pipes flows under Owl Place. Existing drainage channel (RMT064) conveys flows south to sub-regional detention pond SR4. Total flows at DP1 were slightly increased in the 5-year event and reduced in the 100-year event. The change to flows at DP1 is due to the change in tributary area. *The majority of Basin A-1 is eligible for WQ treatment exclusion as defined in Permit Part I E.4.a.i.(H). Refer to Appendix F for Water Quality Drainage Map, DR-4.*

Basin B-1 (1.46 AC, Q_5 = 6.0 cfs, Q_{100} = 10.8 cfs): a basin that encompasses the north half of the storage unit buildings and drive aisles. Runoff from this basin collects into a roof drain system and outfalls onto the proposed drive aisles. Then, an inverted crowned roadway with concrete valley gutter will convey flows south to a proposed CDOT Type 13 Area Inlet-Triple (Private), **DP3**. Lastly, flows are conveyed to Pond #1 via storm pipe, then routed south after treatment to sub-regional detention pond SR4.

Basin B-2 (1.18 AC, Q_5 = 5.1 cfs, Q_{100} = 9.0 cfs): a basin that encompasses the south half of the storage unit buildings and drive aisles. Runoff from this basin collects into a roof drain system and outfalls onto the proposed drive aisles. Then, an inverted crowned roadway with concrete valley gutter will convey flows south to a proposed CDOT Type 13 Area Inlet-Triple (Private), **DP4**. Lastly, flows are conveyed to Pond #1 via storm pipe, then routed south after treatment to sub-regional detention pond SR4.

Basin B-3 (0.95 AC, Q_5 = 2.1 cfs, Q_{100} = 4.4 cfs): a basin that encompasses the east half of Meridian Park Drive, landscaping and buildings A and E. Runoff from this basin will sheet flow onto Type A curb

and gutter and conveyed south to a 10' CDOT Type 'R' On-Grade Curb Inlet (Public), **DP5**. Captured flows are conveyed to Pond #1 via storm pipe, then routed south after treatment to sub-regional detention pond SR4. Any bypass flow will continue south to a riprap pad, DP12. Flows are ultimately conveyed to sub-regional detention pond SR4 via existing RMT064.

Basin B-4 (0.52 AC, Q_5 = 1.6 cfs, Q_{100} = 3.1 cfs): a basin that encompasses the east half of Meridian Park Drive. Runoff from this basin will sheet flow onto Type A curb and gutter and conveyed south to a 10' CDOT Type 'R' On-Grade Curb Inlet (Public), **DP6**. Captured flows are conveyed to Pond #1 via storm pipe, then routed south after treatment to sub-regional detention pond SR4. Any bypass flow will continue south to a riprap pad, DP13 (No bypass flows are anticipated in the minor and major storms). Flows are ultimately conveyed to sub-regional detention pond SR4 via existing RMT064.

Basin B-5 (0.13 AC, Q_5 = 0.5 cfs, Q_{100} = 0.9 cfs): a basin that encompasses the south half of Owl Place improvements. Runoff from this basin will sheet flow onto Type A curb and gutter and conveyed east to a 5' CDOT Type 'R' On-Grade Curb Inlet (Public), **DP7**. Captured flows are conveyed to Pond #1 via storm pipe, then routed south after treatment to sub-regional detention pond SR4. Any bypass flow will continue east to a riprap pad, DP13 (No bypass flows are anticipated in the minor and major storms). Flows are ultimately conveyed to sub-regional detention pond SR4 via existing RMT064.

Basin B-6 (0.16 AC, Q_5 = 0.4 cfs, Q_{100} = 0.9 cfs): a basin that encompasses the south half of Owl Place improvements. Runoff from this basin will sheet flow onto Type A curb and gutter and conveyed east to a 5' CDOT Type 'R' On-Grade Curb Inlet (Public), **DP8**. Captured flows are conveyed to Pond #1 via storm pipe, then routed south after treatment to sub-regional detention pond SR4. Any bypass flow will continue east to a riprap pad, DP13. Flows are ultimately conveyed to sub-regional detention pond SR4 via existing RMT064.

Basin B-7 (0.56 AC, Q_5 = 0.2 cfs, Q_{100} = 1.1 cfs): a basin that encompasses Pond #1 (Private) Full Spectrum Extended Detention Basin. Runoff from this basin sheet flows onto a concrete trick channel and conveyed to the outlet structure, **DP9**. After treatment, flows are conveyed via storm pipe to sub-regional detention pond SR4.

Basin C-1 (0.29 AC, Q_5 = 0.3 cfs, Q_{100} = 0.8 cfs): a basin that encompasses a portion of RV Storage and landscaping. Runoff from this basin will sheet flow onto Type A curb and gutter and conveyed south to a 10' CDOT Type 'R' On-Grade Curb Inlet (Public), **DP6**. Captured flows are conveyed to Pond #1 via storm pipe, then routed south after treatment to sub-regional detention pond SR4. Any bypass flow will continue south to a riprap pad, DP13. Flows are ultimately conveyed to sub-regional detention pond SR4 via existing RMT064.

Basin C-2 (3.12 AC, Q_5 = 5.2 cfs, Q_{100} = 11.3 cfs): a basin that encompasses most of Lot 2a and RV Storage. Runoff from this basin sheet flows south and directly enters Pond #1. Runoff is collected by a concrete trick channel and conveyed to the outlet structure, **DP9**. After treatment, flows are conveyed via storm pipe to sub-regional detention pond SR4.

Basin C-3 (0.29 AC, Q_5 = 0.4 cfs, Q_{100} = 1.0 cfs): a basin that encompasses the southwest corner of RV Storage. Runoff from this basin will sheet flow onto Type A curb and gutter and conveyed east to a 5' CDOT Type 'R' On-Grade Curb Inlet (Public), **DP8**. Captured flows are conveyed to Pond #1 via storm pipe, then routed south after treatment to sub-regional detention pond SR4. Any bypass flow will continue

east to a riprap pad, DP13. Flows are ultimately conveyed to sub-regional detention pond SR4 via existing RMT064.

Basin C-4 (0.09 AC, Q_5 = 0.0 cfs, Q_{100} = 0.1 cfs): a basin that is associated with the proposed drainage swale, located at the southwest corner of proposed Lot 2a. Flows are conveyed south via a drainage swale to a proposed CDOT Type C Area Inlet-Sump (Private), **DP10**. Flows are conveyed via storm pipe and directly outfall into proposed Forebay B at sub-regional detention pond SR4. *Basin C-4 is eligible for WQ treatment exclusion as defined in Permit Part I E.4.a.i.(C). Refer to Appendix F for Water Quality Drainage Map, DR-4.*

Basin D-1 (0.08 AC, Q_5 = 0.0 cfs, Q_{100} = 0.1 cfs): a basin that encompasses the north half of Owl Place containing tie-back grading and landscaping. Flows sheet flow south until overtopping proposed curb and gutter (by others) and continue south through Meridian Park Drive. Flows are ultimately routed to sub-regional detention pond SR4 via proposed storm infrastructure. Refer to the Final Drainage Report for Owl Marketplace Filing No. 1 prepared by Drexel, Barrel & Co., for more details. *A portion of Basin D-1 is eligible for WQ treatment exclusion as defined in Permit Part I E.4.a.i.(G). Refer to Appendix F for Water Quality Drainage Map, DR-4.*

Basin D-2 (0.05 AC, Q_5 = 0.1 cfs, Q_{100} = 0.3 cfs): a basin that encompasses the northeast corner of Meridian Park Drive & Owl Place intersection. Flows collect at **DP12** and continue south through Meridian Park Drive via curb and gutter (by others). Flows are ultimately routed to sub-regional detention pond SR4 via proposed storm infrastructure. Refer to the Final Drainage Report for Owl Marketplace Filing No. 1 prepared by Drexel, Barrel & Co., for more details. *A portion of Basin D-2 is eligible for WQ treatment exclusion as defined in Permit Part I E.4.a.i.(C). Refer to Appendix F for Water Quality Drainage Map, DR-4.*

Basin D-3 (0.33 AC, Q_5 = 1.0 cfs, Q_{100} = 2.0 cfs): a basin that encompasses the west side of Meridian Park Drive & Owl Place intersection. Flows collect in a proposed cross pan that conveys flows south to **DP13**. Flows are ultimately routed to sub-regional detention pond SR4 via proposed storm infrastructure. Refer to the Final Drainage Report for Owl Marketplace Filing No. 1 prepared by Drexel, Barrel & Co., for more details. *A portion of Basin D-2 is eligible for WQ treatment exclusion as defined in Permit Part I E.4.a.i.(C). Refer to Appendix F for Water Quality Drainage Map, DR-4.*

Basin OS-1 (3.89 acres, Q5 = 0.7 cfs, Q100 = 4.5 cfs): a basin that is associated with Lot 3 and 4 Falcon Ranchettes, and portions of the rear of lots 24, 25 and 26 of Bent Grass Residential Filing No. 1. Runoff sheet flows into a shallow swale and conveyed from north to south to a proposed CDOT Type C Area Inlet-Sump (Private), **DP10**. Flows are conveyed via storm pipe and directly outfall into proposed Forebay B at sub-regional detention pond SR4.

Basin OS-2 (2.35 acres, Q5 = 0.6 cfs, Q100 = 3.0 cfs): a basin that is associated with Lot 3 and 4 Falcon Ranchettes, and portions of the rear of lots 26 and 27 of Bent Grass Residential Filing No. 1. Runoff sheet from north to south to a proposed CDOT Type C Area Inlet-Sump (Private), **DP10**. Flows are conveyed via storm pipe and directly outfall into proposed Forebay B at sub-regional detention pond SR4.

Basin OS-3 (0.24 acres, Q5 = 0.0 cfs, Q100 = 0.2 cfs): a basin that is associated with Lot 3 Falcon Ranchettes, a parcel immediately west of the project site. Flows drain from north to south to a proposed

CDOT Type C Area Inlet-Sump (Private), **DP10**. Flows are conveyed via storm pipe and directly outfall into proposed Forebay B at sub-regional detention pond SR4.

Basin OS-4P (0.07 acres, Q5 = 0.3 cfs, Q100 = 0.5 cfs): a basin that is associated with the improvements to the existing cul-de-sac in Meridian Park Drive ROW. This basin represents increased tributary area and runoff and should be compared to existing basin **OS-4E** located above in "*III. Existing Drainage Patterns and Features*". Runoff sheet flows north onto Type A curb and gutter and conveyed to an existing 6' CDOT Type 'R' Sump Inlet (Public), **DP14**. The total flow to DP14 increased by 0.1 cfs in the 5-year and 100-year storm event. The increase in flow is considered nominal, and therefore, no analysis is provided for the downstream infrastructure.

Basin OS-5 (0.19 AC, Q_5 = 0.0 cfs, Q_{100} = 0.2 cfs): a basin that is associated with Tract A, Bent Grass East Commercial Filing No. 2, located just north of proposed Lot 2a, Falcon Ranchettes Filing No. 1a. This basin consists of the outside berm of the existing detention pond. Runoff from this basin sheet flows south and directly enters Pond #1. Runoff is collected by a concrete trick channel and conveyed to the outlet structure, **DP9**. After treatment, flows are conveyed via storm pipe to sub-regional detention pond SR4.

Basin OS-6 (0.08 AC, Q_5 = 0.0 cfs, Q_{100} = 0.1 cfs): a basin that is associated with Lot 2a, Bent Grass East Commercial Filing No. 2, located just north of proposed Lot 1a, Falcon Ranchettes Filing No. 1a. Flows are conveyed east by a drainage swale created from tie-back grading. Flows enter improved RMT064 and conveyed south to **DP1** where existing 36" twin culverts pipes flows under Owl Place. Existing drainage channel (RMT064) conveys flows south to sub-regional detention pond SR4. Total flows at DP1 we're increased in the 5-year event and remain the same in the 100-year event. The change to flows at DP1 is due to the decreased tributary area and slight increase in imperviousness from Building D.

Proposed Pond #1 Full Spectrum Extended Detention Basin

Pond #1 consists of 2 forebays, trickle channel, micropool, outlet structure (with trash rack, orifice plate, and overflow weir), and emergency spillway. Pond #1 provides treatment for the WQCV, EURV, and 100-Year.

Zone	Max Volume Stored
Water Quality Capture Volume (WQCV)	0.265 (ac-ft)
Excess Urban Runoff Volume (EURV)	0.739 (ac-ft)
100-Year	0.303 (ac-ft)
Total	1.307 (ac-ft)

Pond #1 is oversized in excess above the 100-year water surface elevation due to the hydraulic design of the storm sewer system. In order to keep 100-Year HGL's greater than 1 foot below finish grade, the pond footprint and depth was increased to lower the tailwater elevation (100-Year water surface elevation of Pond #1).

All drainage basins adjacent to Pond #1 are included in determining the tributary drainage area and imperviousness for Pond #1. It is anticipated that all C-Group basins will soon develop into additional

storage units or similar commercial use. Therefore, the C-Group drainage basins imperviousness are "overridden" to 100% imperviousness to accommodate for future development.

Refer to **Appendix E** for Pond #1 calculations.

Sub-Regional Detention Pond (SR4) Outfall

The outfall pipe for Pond #1 is routed south, directly into pond SR4. The calculated 100-Year storm event will result in a peak outflow of 1.6 cfs in the 5-year storm and 12.1 cfs in the 100-year storm. A concrete forebay is provided to adequately dissipate the proposed flows into pond SR4. A concrete trickle channel is proposed to directly connect to the existing trickle channel.

Sub-Regional Detention Pond (SR4) was designed to receive flows from Lot 1a and 2a (formerly Lot 1 and 2, Falcon Ranchettes). As shown in Figure 3-2 Drainage Basin Map, all lots located within the Falcon Ranchettes subdivision are routed to pond SR4. However, the assumed imperviousness was for 5 Acre Rural Residential land use, as shown in Figure 3-6 Future Land Use Buildout Condition. Therefore, detention and water quality are required to treat the difference in flows from 5 Acre Rural Residential to Commercial land uses.

As shown in the existing drainage map (refer to **Appendix F**) the total flow leaving the project site (Design Points 2, 3 and 4) totals 2.1 cfs in the minor storm, and 11.3 cfs in the major storm. The proposed peak outflow of 1.6 cfs in the minor storm and 12.1 cfs in the major storm shows a decrease of 0.5 cfs in the minor storm and an increase of 0.8 cfs in the major storm. The increase in the major storm can be attributed to the reroute of basin EX-1 to the southwest corner of the project, instead of the adjacent drainage channel. Therefore, sub-regional pond SR4 is adequate to receive the proposed flows from this project.

Drainage Channel Improvements – UTBSC East Branch (RMT064)

Falcon DBPS Analysis:

El Paso County completed hydrologic and hydraulic analyses summarized in the **Falcon DBPS**. The **Falcon DBPS** watershed encompasses three major basins, including the "Middle Tributary" which includes the subject property. The unnamed tributary to Black Squirrel Creek (UTBSC) in the Middle Tributary consists of an "East Branch" and "West Branch" that converges at the Falcon Marketplace site. The UTBSC East Branch is located along the eastern edge of the project site adjacent to Meridian Road, the West Branch does not cross the subject property.

The Falcon DBPS provides junctions north and south of the project site, named JMT050 and JMT060. These junctions are summarized below, also see **Appendix B** for Falcon DBPS excerpts showing the physical location of each junction.

Future Peak Discharges from Falcon DBPS				
Falcon DBPS Model Location	**Physical Location**	**Branch**	**Proximity to Project Site**	**Future Flow Q100 (cfs)**
JMT050	Bent Grass Meadows	East Branch	Upstream from Project Site	850

	Drive & Meridian Road			
JMT060	Eastonville Road & Meridian Road	East and West Convergence	Downstream from Project Site	1,000

The **Falcon DBPS** specifies reach improvements between junctions JMT050 and JMT060, the reach between these two junctions is named “RMT064”. This is visually shown in the **Falcon DBPS***, Figure 6-1. Selected Plan*, located in **Appendix B**. These improvements include small drop structures w/ toe protection.

Bent Grass MDDP Analysis:

A drainage diversion took place as part of the Bent Grass Residential Filing No. 1 development. The UTBSC West Branch was rerouted to the East towards the intersection of Meridian Road and Bent Grass Meadows Drive. This diversion is discussed extensively in the **Bent Grass MDDP**.

Because of the diversion, a new junction was created in the Middle Tributary named JMT060a. This junction is primarily known as “Design Point 20” in the text and drainage maps in **Bent Grass MDDP**. This new junction is located just south of JMT050 from the **Falcon DBPS** and summarized in the table below.

Future Peak Discharges from Bent Grass MDDP				
Bent Grass MDDP Model Location	**Physical Location**	**Branch**	**Proximity to Project Site**	**Future Flow Q100 (cfs)**
JMT060a	Bent Grass Meadows Drive & Meridian Road	East Branch	Upstream from Project Site	909.3

The **Bent Grass MDDP** specifies a 15’ wide bottom channel with 4:1 side slopes, 6.5’ deep and a longitudinal slope of 0.30% for RMT064 of the UTBSC East Branch. An excerpt of these calculations is provided in **Appendix B**.

Owl Place CLOMR Analysis:

The Falcon Owl Place development (located south of the project site across Owl Place) includes regrading and rerouting a portion of the UTBSC East Branch. The improvements intercept the existing creek immediately north of Owl Place and conveys it via a 10’x6’ box culvert to the subregional detention pond (SR4). The box culvert is designed to convey the full 100-year discharge.

The **Falcon DBPS** did not include a junction on the East Branch immediately upstream of the convergence (Pond SR4). Therefore, the **Owl Place CLOMR** modified the HMS model to create a new junction located at the southern boundary of the Falcon Owl Place development, immediately upstream of Pond SR4. This junction is summarized in the table below.

Peak Discharges from Owl Place CLOMR				
Owl Place CLOMR Model Location	**Physical Location**	**Branch**	**Proximity to Project Site**	**Future Flow Q100 (cfs)**

JMT051	Immediately Upstream of Pond SR4	East Branch	Downstream from Project Site	920

Previous Reports Conclusions:

Per **Falcon DBPS**, channel improvements are required to stabilize the adjacent RMT064 of UTBSC East Branch. A design flow of 925 cfs was used as the design flow for these improvements, as specified in the **Bent Grass MDDP**. The table below compares the proposed design flow against previous reports.

Proposed Design Flow Comparison				
Model Location	**Physical Location**	**Branch**	**Proximity to Project Site**	**Future Flow Q100 (cfs)**
RMT064	North of Owl Place, South of Bent Grass Meadows Drive	East Branch	-	925
JMT050 (Falcon DBPS)	*Bent Grass Meadows Drive & Meridian Road*	*East Branch*	*Upstream from Project Site*	*850*
JMT060a (Bent Grass MDDP)	*Bent Grass Meadows Drive & Meridian Road*	*East Branch*	*Upstream from Project Site*	*909.3*
JMT051 (Owl Place CLOMR)	*Immediately Upstream of Pond SR4*	*East Branch*	*Downstream from Project Site*	*920*

Because of added junctions (JMT060a & JMT051) from **Bent Grass MDDP** and **Owl Place CLOMR**, no revisions to existing HMS models are needed for identifying the proposed design flow for RMT064. As shown above, the design flow of 925 cfs exceeds all projected HMS models for junctions north and south of RMT064.

Due to the design slope of 0.30%, 3 drop structures are required. The USDCM provides guidance for a “Simplified Design Procedure” for drop structure design that requires no hydraulic analysis. This method was used to design the grade control structures for RMT064.

Urban Storm Drainage Criteria Manual (USDCM) Design Guidance:

The USDCM Vol. 2, Chapter 9, Section 2 includes guidance and design procedures for Grade Control Structures.

The simplified design procedure can be used for grade control structures meeting design criteria provided in the table below and where all of the following criteria are met:

- Maximum unit discharge for the design event (typically the 100-year) over any portion of the drop structure is 35 cfs/ft or less,
- Net drop height (upstream channel invert less downstream channel invert exclusive of stilling basin depth) is 5 feet or less,

- Drop structure is constructed of GSB or SC,
- Drop structure is located within a tangent section and at least twice the distance of the width of the drop at the crest both upstream and downstream from a point of curvature,
- Drop structure is located in a reach that has been evaluated per the design requirements of the Open Channel chapter.

The table below summarizes the specific design and geometric parameters used for RMT064.

Note: Channel construction drawings were prepared for the RMT064 improvements and should be referenced when reading this table.

Design Parameter	**Requirement to Use Simplified Design Procedure (As shown in USDCM)**	**Proposed Design**	**Meets or Exceeds Criteria?**
Maximum Net Drop Height (Hd)	5 feet	3 feet	Yes
Maximum Unit Discharge over any Portion of Drop Width	35 cfs per foot of drop width	25.9 cfs*	Yes
Maximum Longitudinal Slope (Steepest Face Slope)	4(H):1(V)	4:1	Yes
Minimum Stilling Basin Depression (Db)	1 foot	N/A**	Yes
Minimum Length of Approach Riprap	8 feet	10 feet	Yes
Minimum Stilling Basin Length (Lb)	Determine using Figure 9-1	N/A**	Yes
Minimum Stilling Basin Width (B)	Same as crest width	N/A**	Yes
Minimum Cutoff Wall Depth	6 feet	6 feet	Yes
Minimum Length of Riprap Downstream of Stilling Basin	10 feet	N/A**	Yes
Minimum D50 for Approach and Downstream Riprap	12 inches	12 inches (Type M Riprap)	Yes
Minimum Boulder Size for Drop Structure	Per Figure 9-1	24” Boulder Size	Yes

*Results from FlowMaster were used to calculate the approximate unit discharge per foot of drop width
**Due to the sandy soils on site and within the channel, future degradation is expected. Therefore, the stilling basins were removed and replaced with a sloping face extending five feet below the downstream toe invert of each drop structure.

Existing 36" Twin Culverts

The two 36" CMP culverts located at the southeast end of the project site, crossing Owl Place are severely undersized and partially filled with sediment. As stated in the **Owl Place CLOMR**, the culverts only convey 86-95 cfs, depending on tailwater depth. The remaining flow (approximately 825-834 cfs) in the 100-year event overtops Owl Place.

The Falcon Owl Place development (located south of the project site across Owl Place) includes regrading and rerouting a portion of the UTBSC East Branch. The improvements intercept the existing creek immediately north of Owl Place and conveys it via a 10'x6' box culvert to the subregional detention pond (SR4). The proposed box culvert begins just north of Owl Place and will replace the undersized culverts. Per discussions with the adjacent developer, construction is expected to run concurrently with the Meridian Storage project. If the proposed culvert replacements are not completed prior to the completion of Meridian Storage, flows will continue to overtop Owl Place.

Construction plans for the culvert replacement and associated improvements are located in **Appendix B**.

V. Ownership & Maintenance

After completion of construction and upon the Board of County Commissioners acceptance, it is anticipated all public drainage facilities are to be owned and maintained by El Paso County. All private drainage facilities are to be owned and maintained my Meridian Storage, LLC. The table below provides a summary of each facilities' ownership & maintenance responsibilities.

Drainage Facility	Ownership and Maintenance Entity
Drainage Channel (UTBSC East Branch) – RMT064	El Paso County & Meridian Storage, LLC (Refer to O&M Manual for more details)
Pond #1	Meridian Storage, LLC
Public Storm Drain Infrastructure (See Construction Drawings, and "*VI. Fee Development*" below for breakdown)	El Paso County
Private Storm Drain Infrastructure (See Construction Drawings, and "*VI. Fee Development*" below for breakdown)	Meridian Storage, LLC

VI. Fee Development

Drainage & Bridge Fees

The project is located within the Falcon drainage basin. The property is already platted, however, due to requirements in the ECM Appendix L 3.13a, if a replat results in an increase in the impervious acreage,

As the subdivision was submitted in 2023 you may use the 2023 fees. please update

drainage basin fees shall be assessed on the additional impervious acreage. The two lots proposed for vacation and replat were previously platted as 5-acre residential lots. The Falcon DBPS was used to approximate the existing impervious acres by multiplying the total parcel area by 3%.

Note: a proposed impervious exhibit is provided in **Appendix A** and should be referenced when reading the table below.

	Existing Impervious Acres	Proposed Impervious Acres	Impervious Acres Eligible for Fee Calculation
Lot 1a	3% x 5.00 = 0.150	2.832	2.832 - 0.150 = 2.682
Lot 2a	3% x 4.61 = 0.138	3.598	3.598 - 0.138 = 3.460
Tract A	3% x 0.732 = 0.022	0.125	0.125 - 0.022 = 0.103
Meridian Park Drive	3% x 0.879 = 0.026	0.748	0.748 - 0.026 = 0.722
Meridian Road	3% x 0.507 = 0.015	0.067	0.067 - 0.015 = 0.052
		Total =	**7.019**

Drainage Fee (2024)
$40,088 x 7.019 Impervious Acres = $281,377
Bridge Fee (2024)
$5,507 x 7.019 Impervious Acres = $38,653

Improvements and Reimbursable Costs

The Falcon Drainage Basin Planning Study – Fee Development, categorizes improvements into Developer Costs, County Costs, and Metro District Costs. Items identified as Developer Costs (those incurred by the Developer) are eligible for reimbursement. County Costs and Metro District Costs are not eligible for reimbursement. The applicable reach is classified in the DBPS as follows:

Reach/Feature	Reach Length (ft)	Improvement	Cost Category	Eligible for Reimbursement	Cost As Shown in Falcon DBPS
RMT064	3,358	Small Drop Structures w/ Toe Protection	County	No	$1,231,110 ($366/LF)

The developer intends to amend the Falcon DBPS to allow for the costs of ~700 LF of RMT064 (starting at Owl Place and measuring north) to become reimbursable by the process outlined below:

1. Drainage Reimbursement request application with PCD.
2. Prepare an amendment to the DBPS outlining the request for a portion of RMT064 changed from a County Cost to Developer Cost
    a. Amendment request hearing to the Drainage Board and Board of County Commissioners (BOCC).
3. Once construction of the reimbursable facilities is completed, procedures for Drainage Improvement Credits and Reimbursement outlined in Chapter 3 of the Drainage Criteria Manual will be utilized.

An Engineering Opinion of Probable Cost (OPC) for all drainage improvements is provided below:

Non-Reimbursable Public Facilities Estimate Total (Anticipated to be eligible for reimbursement pending DBPS Amendment)				
Item	**Quantity**	**Unit**	**Unit Cost**	**Cost**
Drainage Channel Improvements				
Drainage Channel Construction	700	LF	$ 200.00	$ 50,000.00
Type M Riprap	180	CY	$ 135.00	$ 24,300.00
Grouted Boulders (24")	514	SY	$ 225.00	$115,650.00
6' Concrete Cutoff Wall	106	CY	$ 631.00	$ 66,886.00
Reimbursable Public Facilities Estimate Total				**$256,836.00**

Non-Reimbursable Public Facilities Estimate Total				
Item	**Quantity**	**Unit**	**Unit Cost**	**Cost**
Sub-Regional Detention Pond (SR4) Improvements				
Grouted Sloped Boulder Removal	20	SF	$ 250.00	$ 5,000.00
Concrete Forebay	1	EA	$10,000.00	$ 10,000.00
Guard Rail Fence (Forebay)	35	LF	$ 6.00	$ 210.00
Type M Riprap (Forebay Apron)	5	CY	$ 125.00	$ 625.00
Trickle Channel	60	LF	$ 35.00	$ 2,100.00
Subtotal				**$ 17,935.00**
Storm Drain Improvements				
15" Reinforced Concrete Pipe	43	LF	$ 70.00	$ 3,010.00
36" Reinforced Concrete Pipe	42	LF	$ 151.00	$ 6,342.00
5' CDOT Type R Curb Inlet	2	EA	$ 9,377.00	$ 18,754.00
10' CDOT Type R Curb Inlet	2	EA	$10,230.00	$ 20,460.00
5' Storm Drain Manhole, Slab Base	1	EA	$ 8,322.00	$ 8,322.00
Subtotal				**$ 56,888.00**
Non-Reimbursable Public Facilities Estimate Total				**$ 74,823.00**

Private Facilities Estimate Total				
Item	**Quantity**	**Unit**	**Unit Cost**	**Cost**
Pond #1				
Earthwork	5000	CY	$ 10.00	$ 50,000.00
Forebay	2	EA	$ 5,000.00	$ 10,000.00
Guard Rail Fence (Forebays & Micropool)	165	LF	$ 6.00	$ 990.00

Type M Riprap (Forebay Aprons)	10	CY	$ 125.00	$ 1,250.00
Type L Riprap (Emergency Spillway)	60	CY	$ 100.00	$ 6,000.00
Trickle Channel	130	LF	$ 15.00	$ 1,950.00
Outlet Structure w/ Concrete Micropool	1	EA	$15,000.00	$ 15,000.00
Pond Access Road (CDOT Class 6 Gravel)	95	CY	$ 45.00	$ 4,275.00
Subtotal				**$ 89,465.00**
Storm Drain Improvements				
15" Reinforced Concrete Pipe	40	LF	$ 70.00	$ 2,800.00
18" Reinforced Concrete Pipe	1150	LF	$ 82.00	$ 94,300.00
24" Reinforced Concrete Pipe	126	LF	$ 98.00	$ 12,348.00
36" Reinforced Concrete Pipe	46	LF	$ 151.00	$ 6,946.00
4' Storm Drain Manhole, Box Base	1	EA	$ 8,322.00	$ 8,322.00
CDOT Type C Area Inlet	1	EA	$ 6,037.00	$ 6,037.00
CDOT Typ 13 Area Inlet (Triple)	2	EA	$15,130.00	$ 30,260.00
Subtotal				**$161,013.00**
Non-Reimbursable Public Facilities Estimate Total				**$250,478.00**

VII. Conclusion

This Final Drainage Report for Falcon Ranchettes Filing No. 1a was prepared using the criteria and methods as described in the Mile High Flood District (MHFD) Urban Storm Drainage Criteria Manual (USDCM) and the adopted chapters 6 & 13 from the City of Colorado Springs Drainage Criteria Manual (DCM) Vol. 1. The downstream facilities are adequate to protect the runoff proposed from the site. The site runoff will not adversely affect the downstream and surrounding developments. This report is in general conformance with all previously prepared reports that included this site.

VIII. References

1. Drainage Criteria Manual Volume 1, City of Colorado Springs, May 2014, revised January 2021.

2. Drainage Criteria Manual Volume 2, City of Colorado Springs, May 2014, revised December 2020.

3. El Paso County Board Resolution No. 15-042: El Paso County adoption of Chapter and Section 3.2.1, Chapter 14 of the City of Colorado Springs Drainage Criteria Manual Volume 1, May 2014

4. Urban Storm Drainage Criteria Manuals, Mile High Flood District, latest revisions.

5. Flood Insurance Rate Map, El Paso County Area, Colorado and Incorporated Areas, Map Number 08041C0553G, Effective Date December 7, 2018

6. Soil Map, El Paso County Area, Colorado as available through the Natural Resources Conservation Service National Cooperative Soil Survey website via Web Soil Survey 2.0

7. Geotechnical Exploration Report for 11690 and 11750 Owl Place, Prepared by Universal Engineering Sciences, April 18, 2023

8. Falcon Drainage Basin Planning Study, Prepared by Matrix Design Group, September 2015

9. Bent Grass MDDP Amendment & DBPS Amendment, Prepared by Galloway & Company, Inc., September 2021

10. Request for Conditional Letter of Map Revision, Unnamed Tributary to Black Squirrel Creek, Falcon Owl Place, Prepared by Drexel, Barrel & Co., October 25, 2022

11. Request for Letter of Map Revision, Unnamed Tributary to Black Squirrel Creek, Falcon Marketplace, Prepared by Drexel, Barrel & Co., March 15, 2021

12. Final Drainage Report for Falcon Marketplace, Prepared by Drexel, Barrel & Co., November 4, 2019

APPENDIX A

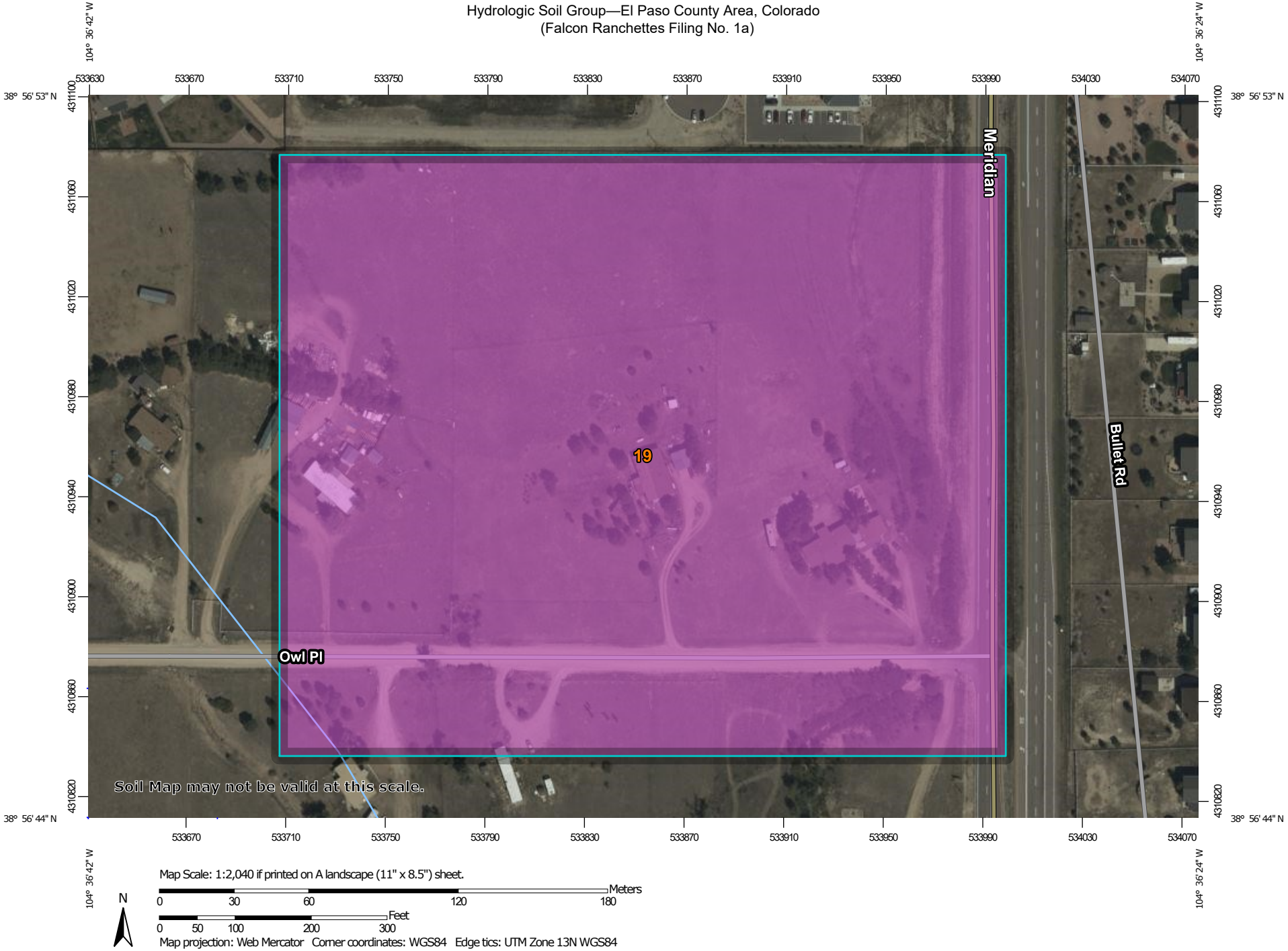
MERIDIAN STORAGE
FALCON RANCHETTES FILING NO. 1A

VICINITY MAP

Project No:	MRS01
Drawn By:	CMWJ
Checked By:	RGD
Date:	09/08/2023

Galloway
1155 Kelly Johnson Blvd., Suite 305
Colorado Springs, CO 80920
719.900.7220 • GallowayUS.com

Hydrologic Soil Group—El Paso County Area, Colorado
(Falcon Ranchettes Filing No. 1a)



Map Scale: 1:2,040 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 30 60 120 180

Feet
0 50 100 200 300

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

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

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

Soil Rating Lines

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

Soil Rating Points

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

Water Features

- Streams and Canals

Transportation

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

Background

- Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

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

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

Date(s) aerial images were photographed: Sep 11, 2018—Oct 20, 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.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
19	Columbine gravelly sandy loam, 0 to 3 percent slopes	A	17.4	100.0%
Totals for Area of Interest			**17.4**	**100.0%**

Description

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

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

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

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

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

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

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

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

NOTES TO USERS

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

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

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

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

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

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

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

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

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

Base Map information shown on this FIRM was provided in digital format by El Paso County, Colorado Springs Utilities, City of Fountain, Bureau of Land Management, National Oceanic and Atmospheric Administration, United States Geological Survey, and Anderson Consulting Engineers, Inc. These data are current as of 2006.

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

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

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

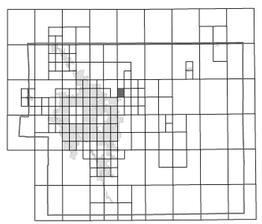
Contact **FEMA Map Service Center** (MSC) via the FEMA Map Information eXchange (FMIX) 1-877-336-2627 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this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

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

El Paso County Vertical Datum Offset Table

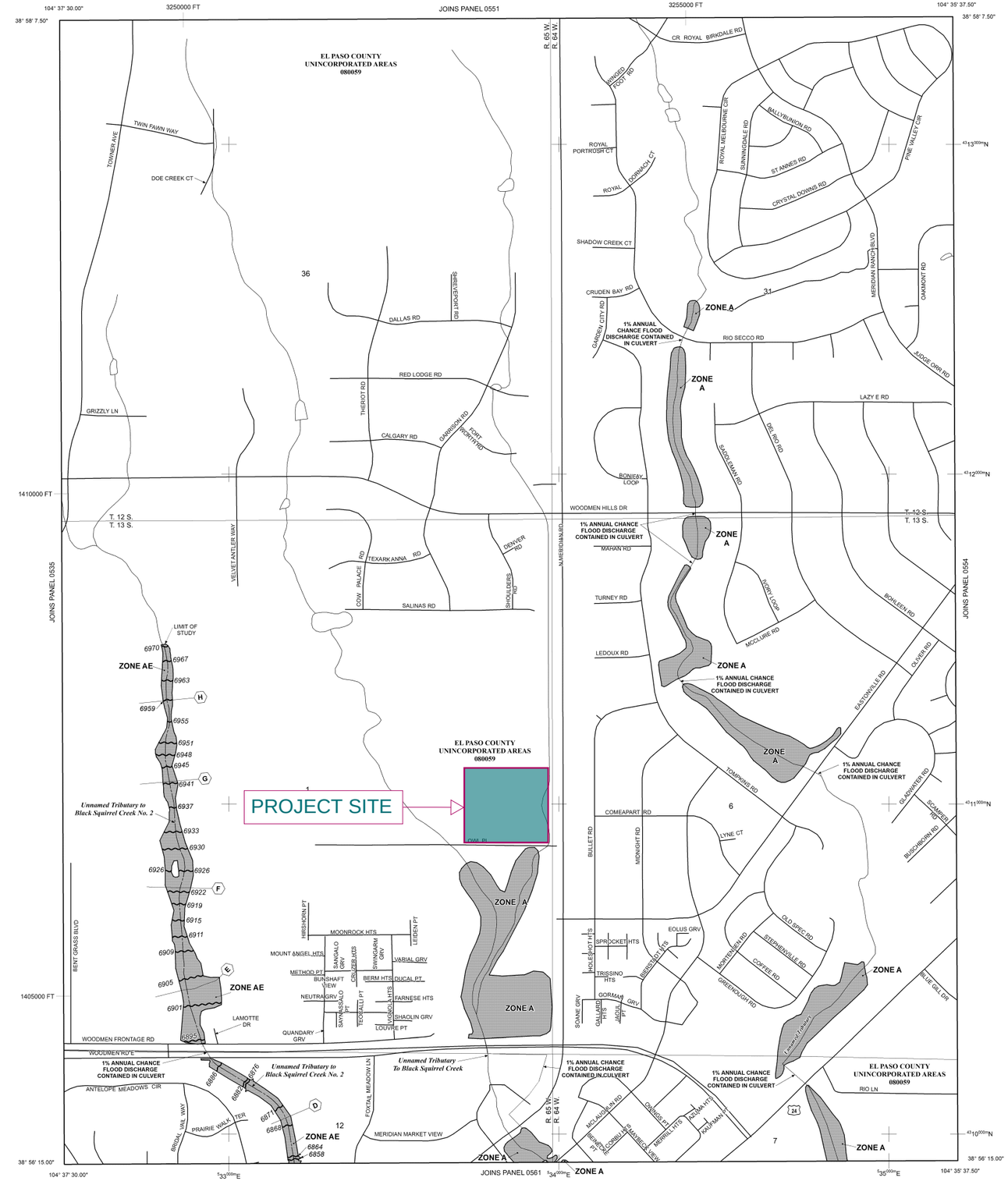
Flooding Source	Vertical Datum Offset (ft)
REFER TO SECTION 3.3 OF THE EL PASO COUNTY FLOOD INSURANCE STUDY FOR STREAM BY STREAM VERTICAL DATUM CONVERSION INFORMATION	

Panel Location Map



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

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



LEGEND

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

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

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

FLOODWAY AREAS IN ZONE AE

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

OTHER FLOOD AREAS

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

OTHER AREAS

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

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

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

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

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

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

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

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

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

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

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

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

NFIP

PANEL 0553G

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

EL PASO COUNTY, COLORADO
AND INCORPORATED AREAS

PANEL 553 OF 1300

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
EL PASO COUNTY	080059	0553	G

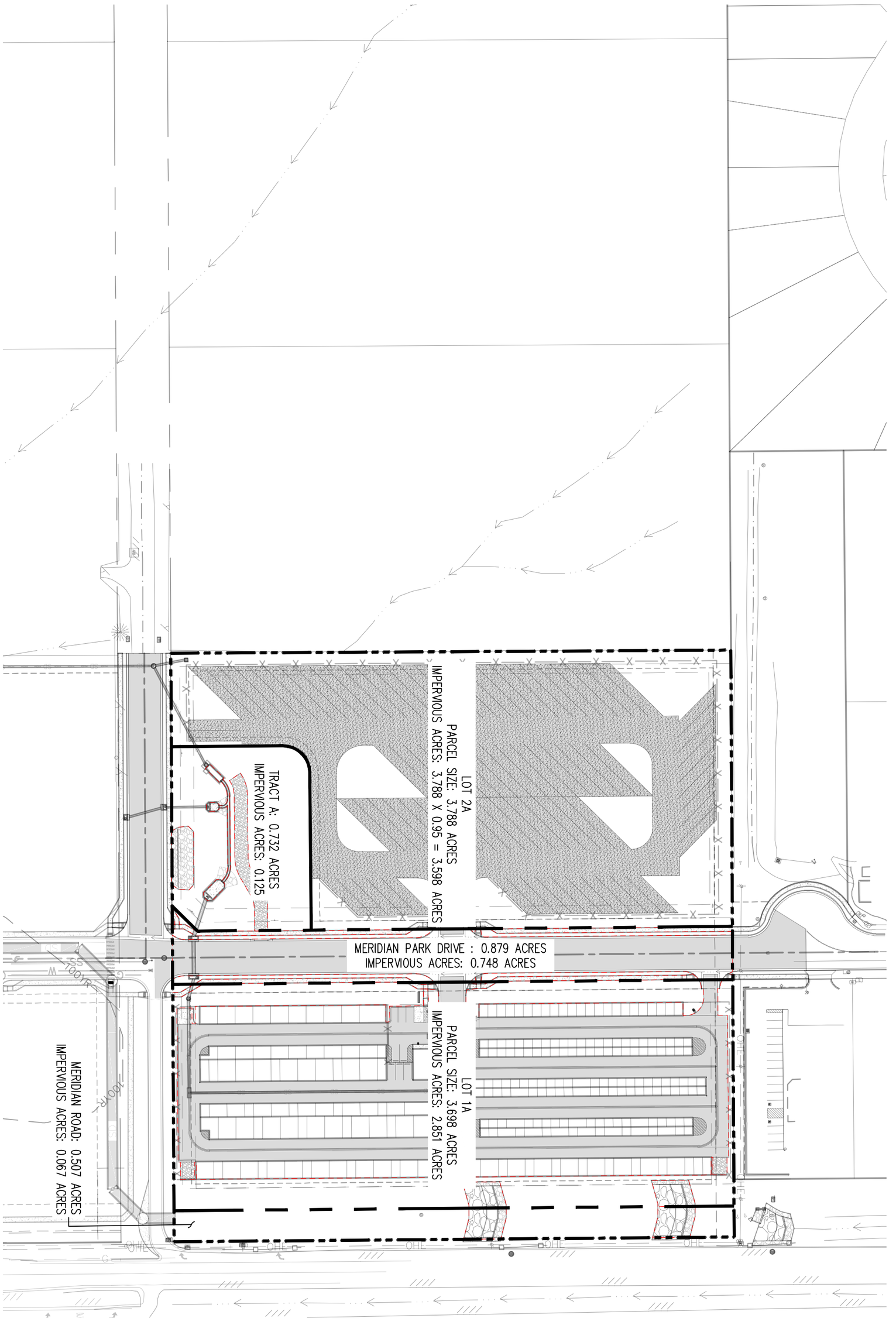
Notice: This map was reissued on 05/15/2020 to make a correction.This version replaces any previous versions. See the Notice-to-User Letter that accompanied this correction for details.

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
08041C0553G

MAP REVISED
DECEMBER 7, 2018

Federal Emergency Management Agency



FALCON RANCHETTES FILING NO. 1A
MERIDIAN STORAGE

% IMPERVIOUS EXHIBIT

Project No:	MRS02
Drawn By:	CMWJ
Checked By:	BAS
Date:	04/26/2024

Galloway
1155 Kelly Johnson Blvd., Suite 305
Colorado Springs, CO 80920
719.900.7220 • GallowayUS.com

APPENDIX B

FALCON DRAINAGE BASIN PLANNING STUDY

SELECTED PLAN REPORT

FINAL - SEPTEMBER 2015

Prepared for:

El Paso County Public Services Department
3275 Akers Drive
Colorado Springs, CO 80922

Prepared By:

Matrix Design Group
2435 Research Parkway, Suite 300
Colorado Springs, CO 80920

Matrix Project No. 10.122.003

LEGEND

«-- Subbasin ID
«-- Subbasin Area (square miles)

Existing Watershed Boundary
Historical and Future Watershed Boundary

Tributary Basin Boundary

East Tributary
Middle Tributary
West Tributary
Subbasin Boundary
Major Tributary
Elevation Contour (feet)

Falcon Drainage Basin	
Total Basin Area	10.7 mi^2
Average Subbasin Area	0.16 mi^2
Minimum Subbasin Area	0.03 mi^2
Maximum Subbasin Area	0.33 mi^2

East Tributary

West Tributary

Middle Tributary

BURGESS RD
GOODSON RD
MERIDIAN RD
RAYGOR RD
STAPLETON DR
EASTONVILLE RD
JUDGE ORR RD
WOODMEN RD
TAMLIN RD
FALCON HWY
GARRETT RD
MERIDIAN RD

WT020 0.07
WT010 0.14
WT030 0.08
WT040 0.19
WT050 0.19
WT070 0.17
WT060 0.20
WT080 0.07
WT090 0.15
WT110 0.19
WT100 0.19
WT140 0.13
WT150 0.23
WT120 0.05
WT130 0.10
WT160 0.11
WT170 0.12
WT180 0.10
WT190 0.06
WT200 0.30
WT210 0.27
WT220 0.19
WT230 0.20
WT240 0.08
WT250 0.15
WT260 0.14
WT270 0.03
WT280 0.27
WT290 0.10
WT300 0.10
WT310 0.28
WT320 0.21
WT330 0.33
WT340 0.28
WT350 0.30
WT360 0.07
WT370 0.21

ET010 0.15
ET020 0.21
MT020 0.09
MT040 0.31
ET030 0.20
MT010 0.29
MT030 0.16
ET040 0.15
ET050 0.12
ET060 0.29
MT050 0.12
MT060 0.19
ET070 0.25
ET090 0.12
ET080 0.29
MT070 0.20
MT080 0.06
MT090 0.04
ET130 0.13
ET100 0.05
MT100 0.06
ET110 0.23
ET140 0.27
MT110 0.12
ET120 0.11
ET150 0.18
ET160 0.19
FS010 0.12

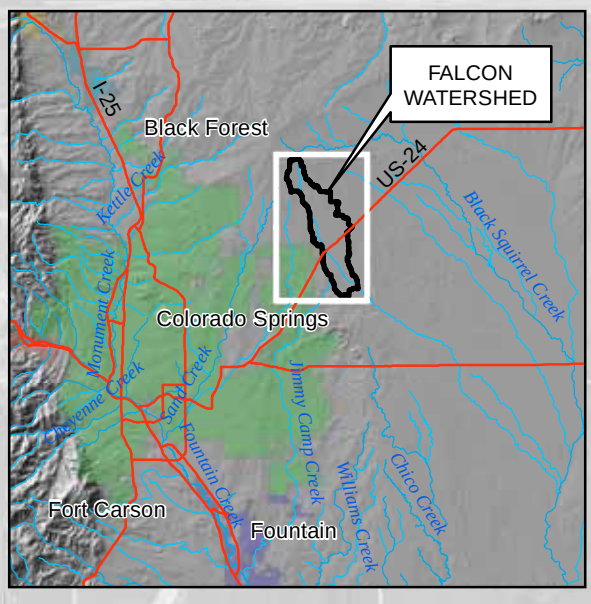
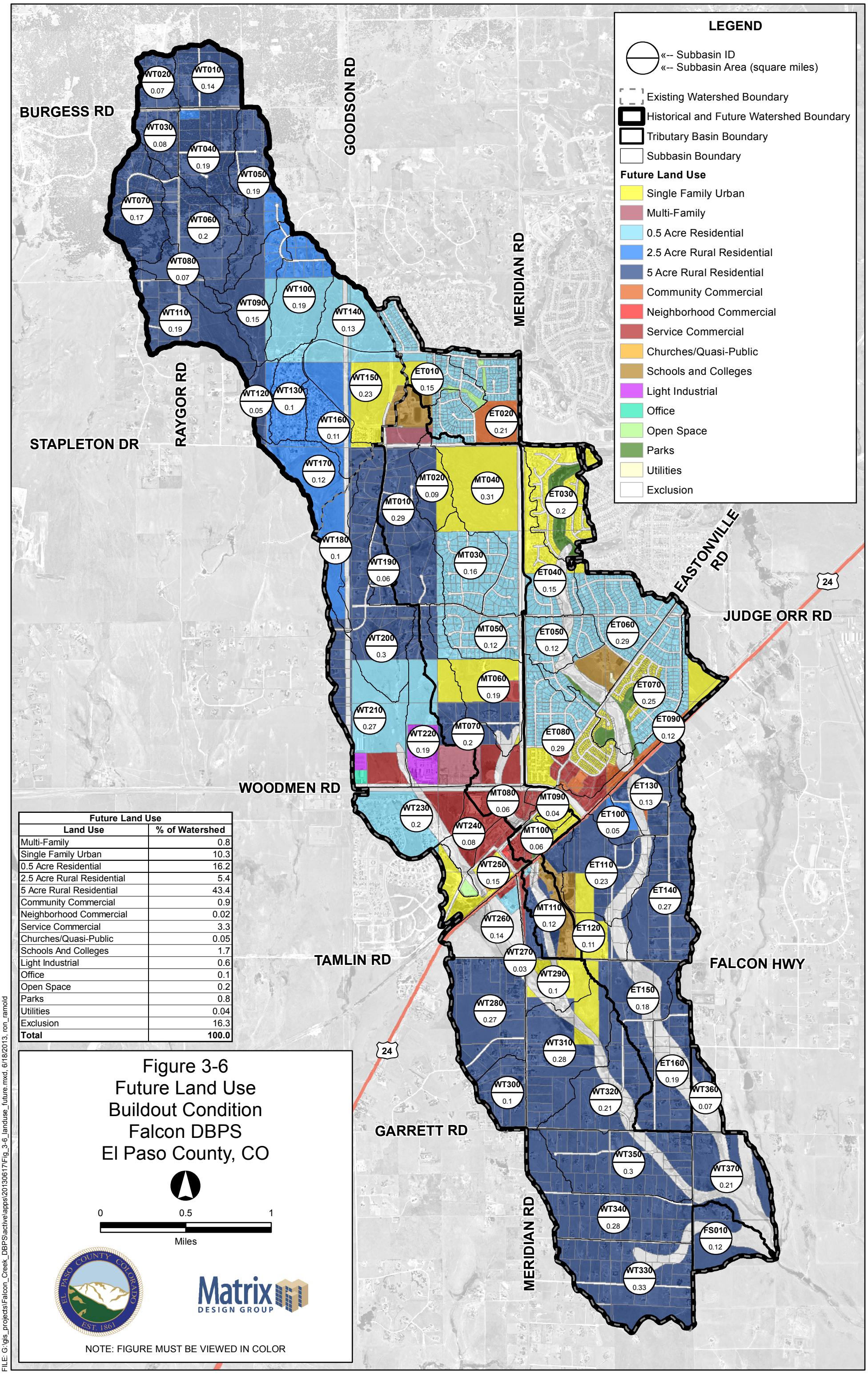


Figure 3-2
Drainage Basin Map
Falcon DBPS
El Paso County, CO

0 0.5 1
Miles

NOTE: FIGURE MUST BE VIEWED IN COLOR

FILE: G:\gis_projects\Falcon_Creek_DBPS\active\apps\20110613\basin_map.mxd, 8/29/2011, wilson_wheeler



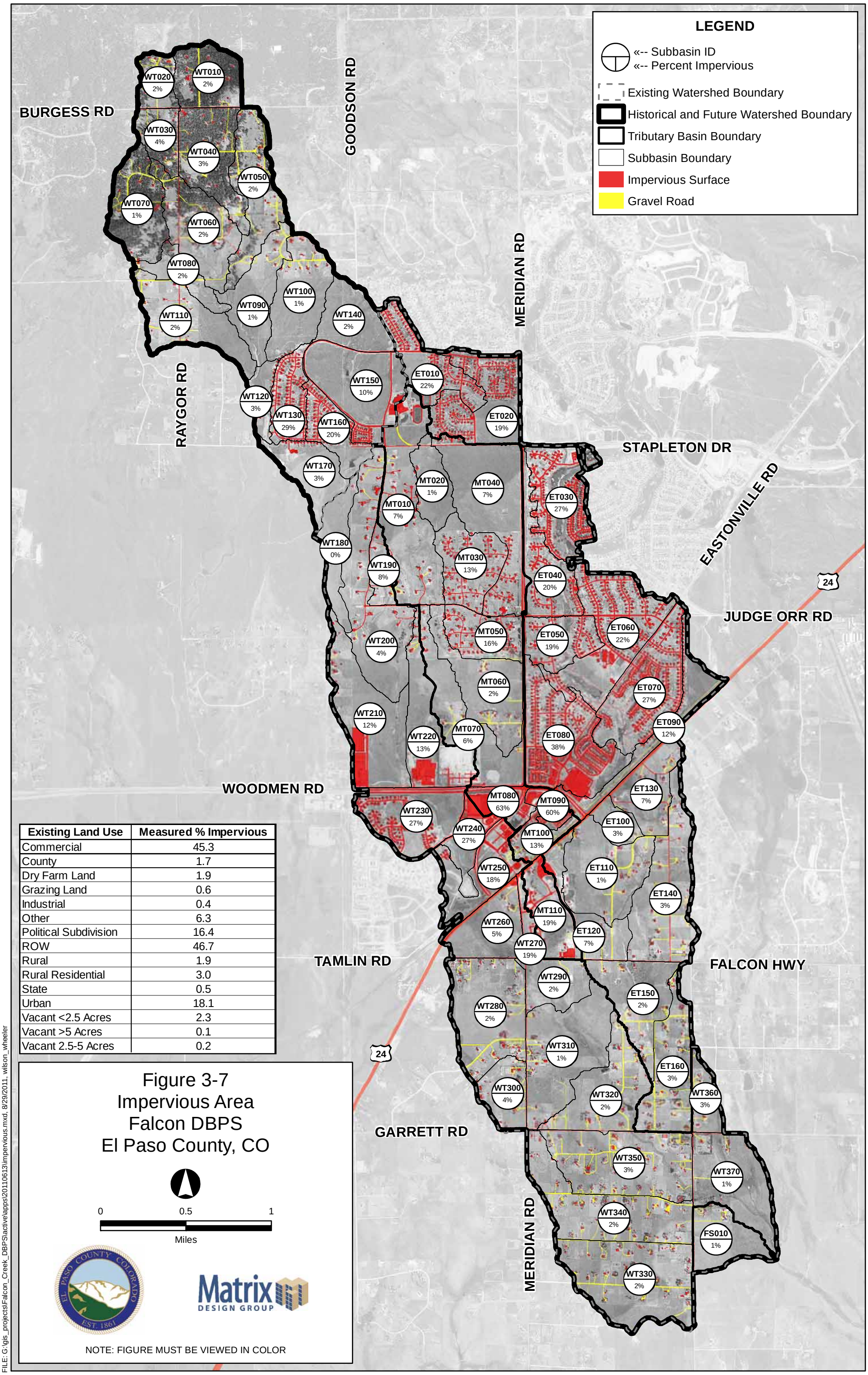
Future Land Use	
Land Use	**% of Watershed**
Multi-Family	0.8
Single Family Urban	10.3
0.5 Acre Residential	16.2
2.5 Acre Rural Residential	5.4
5 Acre Rural Residential	43.4
Community Commercial	0.9
Neighborhood Commercial	0.02
Service Commercial	3.3
Churches/Quasi-Public	0.05
Schools And Colleges	1.7
Light Industrial	0.6
Office	0.1
Open Space	0.2
Parks	0.8
Utilities	0.04
Exclusion	16.3
Total	**100.0**

Figure 3-6
Future Land Use
Buildout Condition
Falcon DBPS
El Paso County, CO

0 0.5 1
Miles

NOTE: FIGURE MUST BE VIEWED IN COLOR

FILE: G:\gis_projects\Falcon_Creek_DBPS\active\apps\20130617\Fig_3-6_landuse_future.mxd, 6/18/2013, ron_ramold



Existing Land Use	Measured % Impervious
Commercial	45.3
County	1.7
Dry Farm Land	1.9
Grazing Land	0.6
Industrial	0.4
Other	6.3
Political Subdivision	16.4
ROW	46.7
Rural	1.9
Rural Residential	3.0
State	0.5
Urban	18.1
Vacant <2.5 Acres	2.3
Vacant >5 Acres	0.1
Vacant 2.5-5 Acres	0.2

Figure 3-7
Impervious Area
Falcon DBPS
El Paso County, CO

0 0.5 1

Miles

NOTE: FIGURE MUST BE VIEWED IN COLOR

FILE: G:\gis_projects\Falcon_Creek_DBPS\active\apps\20110613\impervious.mxd, 8/29/2011, wilson_wheeler

Hydrologic Element	Area (sq mi)	Future Peak Flows (cfs)		Hydrologic Element	Area (sq mi)	Future Peak Flows (cfs)	
		2-year	100-year			2-year	100-year
ET010	0.15	38	200	RET050	0.71	27	570
ET020	0.21	73	360	RET060	0.83	11	530
ET030	0.20	45	240	RET070	1.11	13	430
ET040	0.15	28	170	RET080	1.36	65	420
ET050	0.12	37	200	RET090	1.66	15	350
ET060	0.29	110	530	RET100	1.78	26	390
ET070	0.25	94	460	RET110	1.83	27	390
ET080	0.29	110	520	RET120	2.05	39	430
ET090	0.12	26	130	RET140	0.13	11	85
ET100	0.05	11	72	RET152	2.16	49	450
ET110	0.23	24	200	RET154	0.40	26	200
ET120	0.11	11	89	RET156	2.57	50	650
ET130	0.13	11	85	RET162	2.74	59	680
ET140	0.27	16	120	RET164	2.93	66	710
ET150	0.18	17	140	RMT030	0.09	25	140
ET160	0.19	19	140	RMT040	0.25	49	290
FS010	0.12	6	75	RMT050	0.56	110	750
JET010	0.15	29	150	RMT062	0.29	1	160
JET020	0.36	74	390	RMT064	0.67	120	850
JET030	0.56	97	580	RMT070	1.16	130	1,000
JET040	0.71	27	570	RMT080	1.36	150	1,200
JET050	0.83	11	530	RMT090	0.04	9	32
JET060	1.11	13	430	RMT102	1.42	86	1,200
JET070	1.36	94	480	RMT104	0.04	9	32
JET080	1.66	15	350	RMT106	1.46	91	1,200
JET090	1.78	26	390	RMT112	1.52	92	1,200
JET100	1.83	27	390	RMT114	1.64	94	1,200
JET110	2.05	40	440	RWT030	0.07	4	42
JET120	2.16	49	450	RWT042	0.14	9	85
JET130	0.13	11	85	RWT044	0.14	9	89
JET140	0.40	26	200	RWT046	0.28	15	170
JET152	2.57	51	650	RWT054	0.46	24	260
JET154	2.74	62	680	RWT080	0.17	14	130
JET160	2.93	66	710	RWT092	0.85	43	480
JFS010 _OUTLET	0.12	6	75	RWT094	1.09	54	610
JMT010	0.29	1	160	RWT122	1.43	68	730
JMT020	0.09	26	140	RWT124	1.63	77	840
JMT030	0.25	50	290	RWT150	0.13	32	180
JMT040	0.56	110	750	RWT160	0.36	15	170
JMT050	0.67	120	850	RWT172	1.77	85	920
JMT060	1.16	130	1,000	RWT174	0.47	35	180
JMT070	1.36	150	1,200	RWT176	2.24	98	960
JMT080	1.42	86	1,200	RWT180	2.36	100	990
JMT090	0.04	9	32	RWT202	2.46	100	1,000
JMT102	1.46	91	1,200	RWT204	0.06	4	43
JMT104	0.04	9	32	RWT210	2.82	110	1,200
JMT106	1.52	92	1,200	RWT232	3.09	120	1,300
JMT110	1.64	94	1,200	RWT234	0.19	47	250
JWT010	0.14	9	89	RWT236	3.28	120	1,400
JWT020	0.07	4	42	RWT240 _Diversion			
JWT030	0.14	9	85	Reach	0.00	30	39
JWT042	0.28	15	170	RWT250	3.55	83	1,100
JWT044	0.46	24	260	RWT260	3.70	85	1,100
JWT050	0.85	43	480	RWT291	3.84	86	1,100
JWT070	0.17	14	130	RWT292	0.03	11	57
JWT080	1.09	54	610	RWT294	0.27	33	250
JWT090	1.43	68	730	RWT295	3.87	86	1,100
JWT110	1.63	77	840	RWT296	4.13	94	1,100
JWT120	1.77	85	920	RWT312	0.10	12	91
JWT140	0.13	32	180	RWT314	5.88	160	1,700
JWT150	0.36	15	170	RWT320	6.25	160	1,700
JWT160	0.47	35	190	RWT344	0.33	32	250
JWT172	2.24	99	960	RWT352	6.46	160	1,700
JWT174	2.36	100	990	RWT354	9.69	210	2,400
JWT180	2.46	100	1,000	RWT372	10.30	230	2,500
JWT190	0.06	4	43	RWT374	0.07	7	55
JWT200	2.82	110	1,200	RWT376	10.36	230	2,500
JWT210	3.09	120	1,300	M1	0.06	4	43
JWT220	0.19	47	250	M2	0.29	1	160
JWT232	3.28	120	1,400	WH1 North	0.71	88	570
JWT234	3.47	130	1,400	WH1 South	0.71	27	570
JWT240	3.55	83	1,100	WH2	0.83	11	530
JWT250	3.70	85	1,100	WH3	1.11	13	430
JWT260	3.84	86	1,100	WH4	1.66	15	350
JWT270	0.03	11	57	WH5	0.04	9	32
JWT280	0.27	33	250	WHH	0.56	110	750
JWT292	3.87	86	1,100	WT010	0.14	9	89
JWT294	4.13	96	1,100	WT020	0.07	4	42
JWT296	5.88	160	1,700	WT030	0.08	9	75
JWT300	0.10	12	92	WT040	0.19	9	93
JWT310	6.25	160	1,700	WT050	0.19	17	140
JWT320	6.46	160	1,700	WT060	0.20	14	120
JWT330	0.33	32	250	WT070	0.17	14	130
JWT352	9.69	210	2,400	WT080	0.07	9	67
JWT354	10.30	230	2,500	WT090	0.15	22	160
JWT360	0.07	7	55	WT100	0.19	56	300
JWT372	10.36	230	2,500	WT110	0.19	22	170
JWT374 _OUTLET	10.58	230	2,500	WT120	0.05	8	55
MT010	0.29	28	210	WT130	0.10	35	170
MT020	0.09	26	140	WT140	0.13	32	180
MT030	0.16	39	230	WT150	0.23	49	250
MT040	0.31	95	460	WT160	0.11	35	180
MT050	0.12	17	110	WT170	0.12	21	140
MT060	0.19	30	200	WT180	0.10	8	66
MT070	0.20	25	170	WT190	0.06	11	75
MT080	0.06	62	190	WT200	0.30	25	190
MT090	0.04	40	130	WT210	0.27	32	190
MT100	0.06	17	88	WT220	0.19	47	250
MT110	0.12	19	120	WT230	0.20	71	350
PBH4	0.15	29	150	WT240	0.08	36	160
PBHA	0.10	10	130	WT250	0.15	63	290
PBHB1	0.36	51	270	WT260	0.14	10	78
PBHB2	0.36	15	170	WT270	0.03	11	57
PBHC	0.19	11	160	WT280	0.27	33	250
RMN	1.42	86	1,200	WT290	0.10	15	110
RWU Diversion	3.55	83	1,300	WT300	0.10	12	92
RWU North	3.55	110	1,400	WT310	0.28	31	250
RWU South	3.55	55	1,000	WT320	0.21	27	200
RET020	0.15	29	150	WT330	0.33	32	250
RET030	0.36	71	380	WT340	0.28	19	150
RET040	0.56	95	580	WT350	0.30	38	280
				WT360	0.07	7	55
				WT370	0.21	7	120

Figure 3-13
Future Hydrology
Falcon DBPS
El Paso County, CO

0 0.5 1

Miles

NOTE: FIGURE MUST BE VIEWED IN COLOR

FILE: G:\gis_projects\Falcon_Creek_DBPS\active\apps\20110613\hydrology_future.mxd, 12/22/2011, wilson_wheeler

Sub Regional Detention Alternative[1]						
Pond		Q_2 In (cfs)	Q_2 Out (cfs)	Q_{100} In (cfs)	Q_{100} Out (cfs)	Required Volume (AF)[2]
Paint Brush Hills Pond #4	PBH 4	38	29	200	150	1.34
Paint Brush Hills Pond A	PBH A	35	7	170	140	2.62
Paint Brush Hills Pond B1	PBH B1	80	51	420	270	9.17
Paint Brush Hills Pond B2	PBH B2	51	10	270	180	12.09
Paint Brush Hills Pond C	PBH C	56	3	300	140	6.77
Regional Pond MN	R MN	65	32	850	820	7.53
Regional Pond R1	R R1	110	77	1,600	1,500	25.00
Regional Pond R2	R R2	140	140	2,200	2,200	3.13
Regional Pond WU South	R WUs	47	22	1,100	930	39.54
Sub Regional Pond SR1	SR 1	54	42	610	510	11.03
Sub Regional Pond SR2	SR 2	65	65	840	840	2.05
Sub Regional Pond SR3	SR 3	72	72	910	910	1.03
Sub Regional Pond SR4	SR 4	130	27	1,000	730	19.37
Sub Regional Pond SR6	SR 6	74	9	390	200	11.82
The Meadows Pond #1	M 1	11	0	70	0	3.25
The Meadows Pond #2	M 2	28	5	210	100	7.94
Woodmen Hills Pond #1 North	WH 1N	65	61	390	260	7.13
Woodmen Hills Pond #1 South	WH 1S	61	10	260	260	8.78
Woodmen Hills Pond #2	WH 2	37	10	270	250	9.18
Woodmen Hills Pond #3	WH 3	110	13	530	360	8.35
Woodmen Hills Pond #4	WH 4	110	15	790	260	40.45
Woodmen Hills Pond #5	WH 5	40	1	130	20	4.10
Woodmen Hills Pond H	WH H	140	110	750	750	2.66

Notes

1: Represents future hydrology with retrofit existing detention ponds and 7 new sub regional detention ponds

2: Required volume to highest WSE not including embankment

Reach Alternative	Total (ft)
Natural Channel Design	13,216
Protect in Place	64,325
Roadside Ditch Improvement	7,519
Small Drop Structures w/ Toe Protection	50,750

BURGESS RD

GOODSON RD

MERIDIAN RD

STAPLETON DR

EASTONVILLE RD

JUDGE ORR RD

DIVERSION

WOODMEN RD

TAMLIN RD

FALCON HWY

GARRETT RD

MERIDIAN RD

24

LEGEND

Detention Pond

- Existing
- Proposed
- Existing Watershed Boundary
- Historical and Future Watershed Boundary
- Tributary Basin Boundary
- Subbasin Boundary
- Major Tributary
- Immediate Action Required to Preserve Existing Condition

Reach Alternative

- Natural Channel Design
- Protect In Place
- Roadside Ditch Improvement
- Small Drop Structures w/ Toe Protection

Note:
Infrastructure and channel improvements shown may vary slightly from the final list published in the accompanying report as a result of fee revisions that have occurred following the preparation of this figure. For current information as of September 2015, please see tables in Section 6 of the accompanying report.

Figure 6-1
Selected Plan
Falcon DBPS
El Paso County, CO

0 0.5 1

Miles

NOTE: FIGURE MUST BE VIEWED IN COLOR

FILE: G:\gis_projects\Falcon_Creek_DBPS\active\apps\20130617\Fig_6-1_selected_plan_20150925.mxd, 9/25/2015, jeff_clonts

Sheet 6-23
Falcon DBPS
Conceptual Plan
Middle Tributary
El Paso County, CO

MT 6 - Woodmen Rd.
EX Size: 4' Circular RCP (x3)
PR Size: 5' Circular RCP (x3)
* Sub-Regional Pond SR4 will be designed to mitigate capacity issues.

Floodplain Enters Underground Storm System

Sub Regional Pond SR4
WQCV = 7.3 AF
100-yr Volume = 19 AF
$Q_{2\ in}$ = 130 cfs
$Q_{2\ out}$ = 27 cfs
$Q_{100\ in}$ = 1000 cfs
$Q_{100\ out}$ = 730 cfs
See Detail on Sheet 6-55

MT 7 - Owl Place
EX Size: 1.75' (W) x 1.25' (H) CMP Elliptical (x4)
PR Size: 4' (W) x 2' (H) Concrete Box (x9)
* Road profile would need to be raised to implement a feasible solution.

MT 6-2 - Woodmen Rd.
EX Size: 4' Circular RCP (x3)
PR Size: 5' Circular RCP (x3)
* Sub-Regional Pond SR4 will be designed to mitigate capacity issues.

Small Drop Structure
See Detail on Sheet 6-54

Future conveyance from Meridian Rd roadside ditch TBD

Note:
Infrastructure and channel improvements shown may vary slightly from the final list published in the accompanying report as a result of fee revisions that have occurred following the preparation of this figure. For current information as of September 2015, please see tables in Section 6 of the accompanying report.

Drainageway Crossing
Stream Centerline
Existing Approximate 100-yr Floodplain*
Floodplain Study Limit

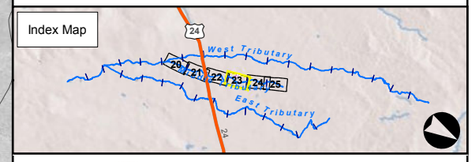
Storm Sewer
Inlet
Manhole
Pipe

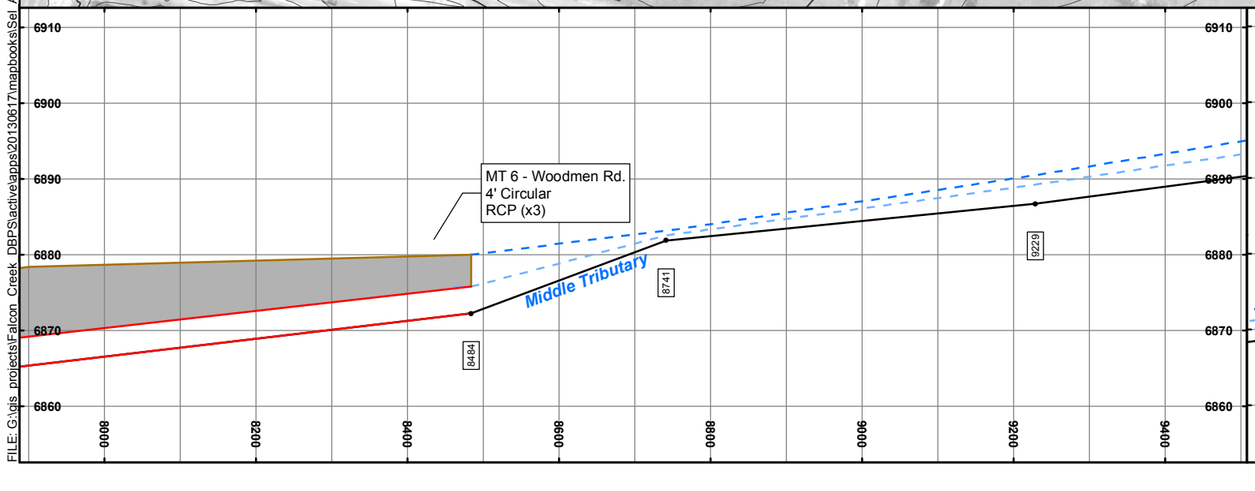
Reach Improvements
Natural Channel Design
Protect In Place
Roadside Ditch Improvement
Small Drop Structures w/ Toe Protection
Existing Detention
Proposed Detention
Proposed Detention Grading
Small Drop Structure
Cross Vane
Immediate Action Required to Preserve Existing Condition

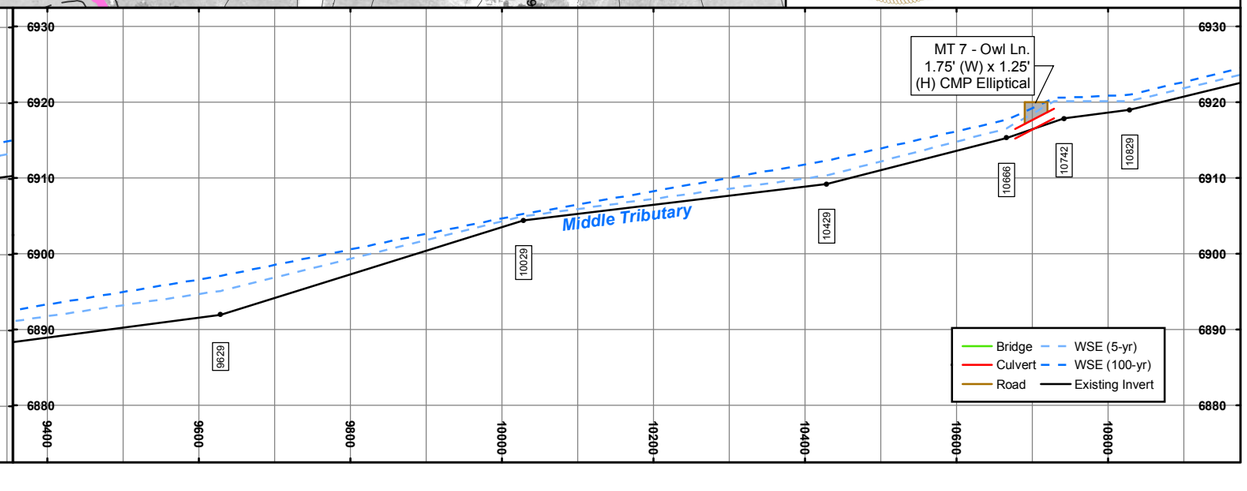
0 100 200 Feet

* These approximate 100-yr floodplain boundaries are for planning purposes only. This information is not intended to replace the information provided on the FEMA Flood Insurance Rate Maps for this area.
** These are conceptual design drawings and are subject to change. These drawings are not intended for construction purposes.

Index Map







FILE: G:\gis projects\Falcon Creek DBPS\active\apps\20130617\mapbooks\Sel Alt Middle Trib.mxd 1/11/2016 Jeff Clonts

Sheet 6-24
Falcon DBPS
Conceptual Plan
Middle Tributary
El Paso County, CO

Drainageway Crossing
Stream Centerline
Existing Approximate 100-yr Floodplain*
Floodplain Study Limit

Storm Sewer
Inlet
Manhole
Pipe

Reach Improvements
Natural Channel Design
Protect In Place
Roadside Ditch Improvement
Small Drop Structures w/ Toe Protection
Existing Detention
Proposed Detention
Proposed Detention Grading
Small Drop Structure
Cross Vane
Immediate Action Required to Preserve Existing Condition

0 100 200 Feet

* These approximate 100-yr floodplain boundaries are for planning purposes only. This information is not intended to replace the information provided on the FEMA Flood Insurance Rate Maps for this area.
** These are conceptual design drawings and are subject to change. These drawings are not intended for construction purposes.

Index Map

Small Drop Structure
See Detail on Sheet 6-54

Approximate Limits of Split Flow for Existing 100-yr Floodplain

Note:
Infrastructure and channel improvements shown may vary slightly from the final list published in the accompanying report as a result of fee revisions that have occurred following the preparation of this figure. For current information as of September 2015, please see tables in Section 6 of the accompanying report.

matchline - see Sheet 6-23

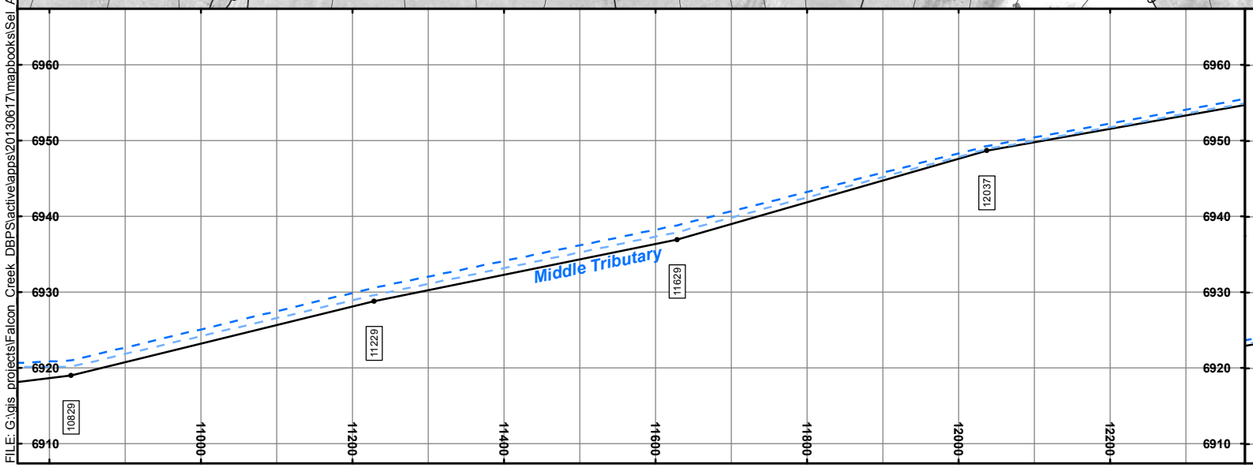
matchline - see Sheet 6-25

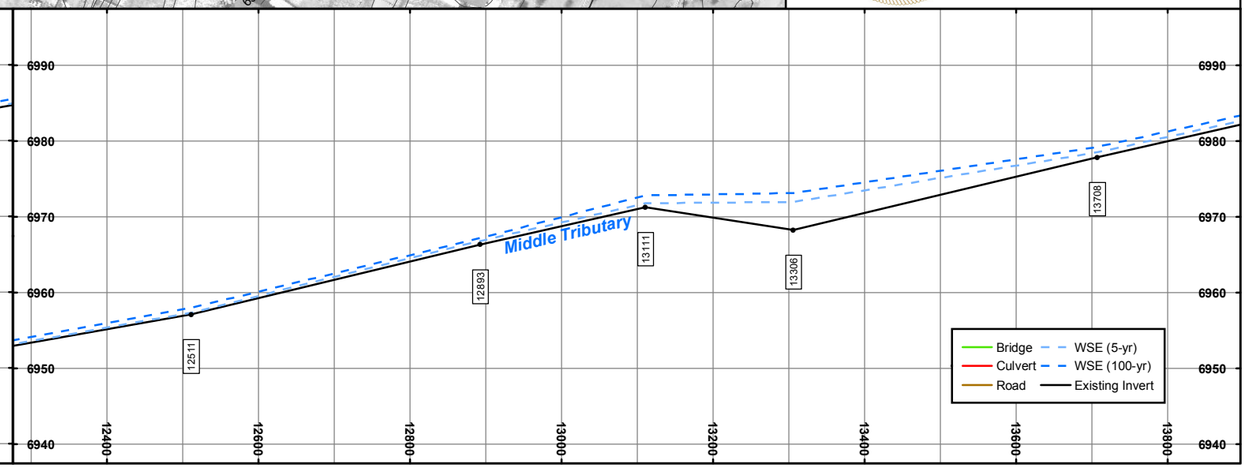
Middle Tributary

RMT062

Cow Palace Rd

Salinas Rd





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7.0 FEE DEVELOPMENT

7.1. Introduction

The objective of the fee development exercise was to determine the equitable share of drainage improvement costs that a developer is responsible for paying to El Paso County if they wish to plat a property. This fee is a function of the total cost for the selected plan outlined in Section 6 and will be used by the County to pay for drainage improvements that are necessary as a result of development. The product of this calculation is a unit fee (cost/impervious acre) that is a one-time charge to the developer based on the number of impervious acres within the platted property.

7.2. Developable Land

The Falcon Watershed has a total area of 6,847 acres. The entirety of the watershed is within the County with 1,969 acres unplatted, according to the GIS dataset received from the County. This dataset also includes unplatted areas that can't be developed because of specific land use designations. Table 7-1 provides a summary of land classifications in the Falcon Watershed. A complete summary of unplatted area land use is provided in Appendix E.

Table 7-1. Land Classification

Classification	Area (acres)
Platted	3,670
Unplatted	1,969
Other	1,208
Total	**6,847**

The projected impervious acreage within unplatted areas totals 645.58 acres. A summary of land classification within the Falcon Watershed is provided in Figure 7-3.

7.3. Fee Calculation & County Cost

The total cost for the Selected Plan was separated into a Development Fee, County Cost, Metropolitan District Cost, and Drainage and Bridge Funds. A description of how the aforementioned were defined is as follows:

- **County Cost** – Drainage improvement costs that are the responsibility of the County as shown in Figure 7-1.
- **Metropolitan District Cost** – Drainage improvement costs that are the responsibility of a metropolitan district as shown in Figure 7-2.
- **Development Fee** – All drainage improvement costs that are directly associated with new development.
- **Drainage and Bridge Funds** – The balance of drainage and bridge funds as of August 2015 was $584,134 and $510,777, respectively, with a liability of $300,000 cost for this DBPS (an additional contract amendment increased the cost of this DBPS to $339,088).

The anticipated reimbursements due for work completed in the Falcon Watershed are approximately equivalent to the available drainage and bridge funds. As a result, reimbursements were not included in the fee calculation. Drainage improvements that are required as a result of new development are listed in Appendix E.

The costs apportioned to County and metropolitan district drainage improvements are provided in Table 7-2 and Table 7-3. The bridge improvement fees shown in Table 7-2 and Table 7-3 were determined by classification of the crossing as either a bridge or a culvert. This classification was based on the DCM criteria.

Table 7-2. County Cost

Drainage Improvements	$ 24,051,349
Bridge Improvements	$ 2,887,437
Total Cost	**$ 26,938,786**

Table 7-3. Metropolitan District Cost

Drainage Improvements	$ 3,972,407
Bridge Improvements	$ 1,855,620
Total Cost	**$ 5,828,027**

The development cost and corresponding fee calculations based on impervious acreage are provided in Table 7-4 and 7-5.

Table 7-4. Development Drainage Cost and Fee

Drainage Improvements	$ 14,649,163
DBPS Cost	$ 339,088
Total Cost	**$ 14,988,251**
Drainage Fee (per imp. ac.)	**$ 23,217**

Table 7-5. Development Bridge Cost and Fee

Bridge Improvements	$ 2,058,474
Total Cost	**$ 2,058,474**
Bridge Fee (per imp. ac.)	**$ 3,189**

LEGEND

- Public Cost Reach Improvement
- Public Cost Detention Pond
- Public Cost Crossing
- Crossing

Detention Pond

- Existing
- Proposed
- Existing Watershed Boundary
- Historical and Future Watershed Boundary
- Tributary Basin Boundary
- Subbasin Boundary
- Major Tributary

Figure 7-1
County Cost Improvements
Falcon DBPS
El Paso County, CO

0 0.5 1

Miles

NOTE: FIGURE MUST BE VIEWED IN COLOR

FILE: G:\gis_projects\Falcon_Creek_DBPS\active\apps\Fig_7-1_County_Costs_20151229_JKC.mxd, 12/29/2015, jeff_clonts

Falcon DBPS
County Costs

Drainage Fees			
Reach/Pond	**Reach Length (ft)**	**Improvement**	**Cost**
RWT344	1,379	Roadside Ditch Improvement	$ 167,006
RET140	4,052	Roadside Ditch Improvement	$ 295,914
RET164	2,072	Roadside Ditch Improvement	$ 132,703
RET100	1,791	Small Drop Structures w/Toe Protection	$ 1,342,120
RET110	2,751	Small Drop Structures w/Toe Protection	$ 1,055,516
RET152	2,030	Small Drop Structures w/Toe Protection	$ 1,081,390
RET120	1,379	Natural Channel Design	$ 72,798
RET162	3,256	Small Drop Structures w/Toe Protection	$ 656,460
RMT050	1,568	Small Drop Structures w/Toe Protection	$ 814,189
RMT062	5,688	Small Drop Structures w/Toe Protection	$ 2,381,127
RMT064	3,358	Small Drop Structures w/Toe Protection	$ 1,231,110
RMT112	3,372	Small Drop Structures w/Toe Protection	$ 1,276,142
RWT054	2,497	Small Drop Structures w/Toe Protection	$ 1,414,531
RWT080	3,494	Small Drop Structures w/Toe Protection	$ 2,345,153
RWT092	626	Small Drop Structures w/Toe Protection	$ 414,434
RWT372	1,377	Small Drop Structures w/Toe Protection	$ 947,221
RMT102	1,021	Small Drop Structures w/Toe Protection	$ 636,082
RMT104	874	Small Drop Structures w/Toe Protection	$ 186,349
RET154	2,357	Natural Channel Design	$ 468,927
RET156	942	Natural Channel Design	$ 73,722
WT 5	43	Crossing - Culvert	$ 8,651
ET 13	50	Crossing - Culvert	$ 113,991
ET 11	40	Crossing - Culvert	$ 84,348
ET 9	40	Crossing - Culvert	$ 84,102
ET 4	61	Crossing - Culvert	$ 106,060
Sub Regional Pond SR1		Detention Pond	$ 405,769
The Meadows Pond #2		Detention Pond	$ 20,000
		Subtotal	$ 17,815,814
		Engineering/Construction Admin (15%)	$ 2,672,372
		Contingency (20%)	$ 3,563,163
		Total	**$ 24,051,349**

Bridge Fees			
Reach/Pond	**Reach Length (ft)**	**Improvement**	**Cost**
WT 6	43	Crossing - Bridge	$ 249,775
WT 4	48	Crossing - Bridge	$ 528,324
WT 3	46	Crossing - Bridge	$ 218,292
WT 1	40	Crossing - Bridge	$ 636,648
MT 2	83	Crossing - Bridge	$ 343,147
ET 10	44	Crossing - Bridge	$ 162,656
		Subtotal	$ 2,138,842
		Engineering/Construction Admin (15%)	$ 320,826
		Contingency (20%)	$ 427,768
		Total	**$ 2,887,437**

MDDP & DBPS AMENDMENT

BENT GRASS DEVELOPMENT

El Paso County, Colorado

PREPARED FOR:
Challenger Communities, LLC
8605 Explorer Dr., Suite 250
Colorado Springs, CO 80920

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

DATE:
January 2021
Revised: March 2021
Revised: April 2021
Revised: June 2021
Revised: August 2021
Revised: September 2021

PUDSP-20-005

recommendations from the Falcon DBPS, when additional land is obtained to expand the ROW along the southbound portion of Meridian Road.

In the interim condition, it has been proposed to add a temporary lining to the existing channel to handle the excess velocities and depth associated with the DBPS flows and Bent Grass development re-routed flows. This analysis has been included in the Appendix.

The West Tributary Channel will be natural, vegetated facility, helping to ensure that the overall velocities will be reduced, flow depth will not exceed 5' and minimize any potential for scour. If needed, grade control structures may be designed as proposed in the DBPS to ensure these criteria are met.

3. Implement BMPs That Provide a Water Quality Capture Volume with Slow Release

This step utilizes formalized water quality capture volume to slow the release of runoff from the site. The WQCV will release in no less than 40 hours. On-site water quality control volume detention ponds will provide water quality treatment prior to the runoff being released into the channel. WQCV facilities will be designed as Extended Detention Basins.

The Falcon Meadows at Bent Grass development, west of Bent Grass Residential, Filing No. 1 and No. 2, will include several water quality ponds throughout the site to ensure flows will be treated prior to being released into the West Tributary Channel, running through the site. Only a small area, less than 1.0 acres will not be treated prior to releasing into the channel.

Currently, the existing Meridian Road roadside ditch, ultimately conveys runoff to the existing detention and water quality pond MN, as shown and discussed in the Falcon DBPS. The Falcon DBPS also shows a future detention and water quality pond SR-4 that is to receive flows from basin MT060 and discharge into basin MT070, ultimately routing to existing Pond MN. Flows from Bent Grass Meadows Drive are listed in basin MT060 but are being routed to the existing roadside ditch along Meridian Road, which is in basin MT070. The flows from the "School Site" and upstream basins will release into the east side of Pond SR-4 (west of Falcon Market Place). Pond SR-4 is currently under construction. The proposed improvements impact on the existing drainage basin and both Pond MN and Pond SR-4 are discussed later in the report.

4. Consider Need for Industrial and Commercial BMPs

Source control BMPs for homeowners include the use of garages as the primary area where pollutants can be stored. The single-family detached homes provide garages which can act as storage areas. The proposed development does not include outdoor storage or the potential for introduction of contaminants to the Counties' MS4, thus no targeted source control BMPs are necessary. The biggest source control BMP is public education and discuss topics such as: pet waste, car washing, lawn care, fall leaves, and snow melt and deicer.

Bent Grass East Commercial Filing No. 1 contains commercial development. This area will need to consider the need for Industrial & Commercial BMPs. No industrial uses or outside storage is proposed for this area. Drainage will be routed through water quality ponds prior to leaving the site to minimize contaminants into the public system.

VII. Future Drainage Conditions

MIDDLE TRIBUTARY

Design Point 30 and Basins OS-25 and OS-26 are as described under Existing Drainage Conditions. However, Basins OS-25 and OS-26 now route through proposed “future” detention pond, on what’s been previously referred to as the “School Site”, north of Bent Grass Meadows Drive and just west of Bent Grass Filing No. 2. This “future” pond will replace the current sedimentation pond on the “School Site”. Upon any additional development within the Middle Tributary area of the Bent Grass Development and north of Bent Grass Meadows Drive, this pond will need to be constructed to accommodate the re-routed flows from the Meadows Pond #2 at DP 30.

This future facility will need to provide 2.76 ac-ft of water quality, 6.26 ac-ft for EURV and 11.98 ac-ft for 100-year storage volume. Preliminary release rates for the 5 and 100-year storms are 3.8 cfs and 32.2 cfs. These flows were then routed to Bent Grass Meadows to the south. With the decrease in flows, flows will not overtop Bent Grass Meadows Drive and continue east to the future box culvert under Bent Grass Meadows Drive at DP BG20 (5-year flow=292.5 cfs, 100-year flow=909.3 cfs). Flows were still checked against street capacity on the north and south side of Bent Grass Meadows Drive, as it continues to the east. With the construction of the future pond, Bent Grass Meadows Drive will be able to adequately handle the flows and no additional storm infrastructure would need to be built to carry these future developed flows. Any area north of Bent Grass Meadows Drive that will develop in the future will need to provide its own on-site detention. Should future development not be able to release flows into Bent Grass Meadows Drive, a 42” RCP would be able to convey the flows of DP BG 15n (Q100=40.9 cfs, Q5=8.8 cfs) to the northwest corner of the Bent Grass Meadows Drive and Meridian Road intersection. Analysis for this culvert sizing has been included in the appendix.

At the Bent Grass Meadows Drive/Meridian Road intersection, the elliptical rcp’s will need to be replaced with a double 16’ x 4’ rcbc. The future roadside ditch will have a 15’ wide bottom channel with 4:1 side slope, 6.5’ deep and a longitudinal slope of 0.30%. This will result is a flow depth of 5.15’ and velocity of 5.04 fps. This channel will direct flows to Owl Place where the existing twin cmp’s will be replaced with a 20’ x 4’ rcbc or equivalent. This structure will need to be built when any development west of Meridian Road at the intersection of Owl Place happens. With future development, it is anticipated that the existing channel conveying flows to the south will be removed to accommodate the new development. The new channel will need to be a 35’ wide bottom channel with 4:1 sides, 5’ deep and a longitudinal slope of 0.30%. This will produce a flow depth of 3.7’ and a velocity of 4.6 fps. If the channel option is not viable, twin 78” rcp’s at a minimum 0.50% slope would be able to handle this future flow. Analysis for this design option has been included in the appendix.

Calculations are provided in Appendix C for the future culverts and roadside channel.

WEST TRIBUTARY

Offsite flows entering the west tributary location of Bent Grass have not changed from what was discussed under Current Conditions. Reach RWT202 at the northwest corner of the development has a 100-year flow of 1000 cfs and Reach RWT204 has a flow of 43 cfs. These were obtained from the DBPS by Matrix. The Flood Insurance Study (FIS) by FEMA does not have flows evaluated this far north. The have a flow of 1482 cfs beginning at RWT210. The 8 undeveloped on-site basins for Bent Grass West have been replaced with 17 developed basins. These basins are found in the Falcon Meadows for Bent Grass PDR. A summary of these basins is provided below and are part of the hydrology analysis provided in Appendix B.

Sub Regional Detention Alternative[1]						
Pond		Q_2 In (cfs)	Q_2 Out (cfs)	Q_{100} In (cfs)	Q_{100} Out (cfs)	Required Volume (AF)[2]
Paint Brush Hills Pond #4	PBH 4	38	29	200	150	1.34
Paint Brush Hills Pond A	PBH A	35	7	170	140	2.62
Paint Brush Hills Pond B1	PBH B1	80	51	420	270	9.17
Paint Brush Hills Pond B2	PBH B2	51	10	270	180	12.09
Paint Brush Hills Pond C	PBH C	56	3	300	140	6.77
Regional Pond MN	R MN	65	32	850	820	7.53
Regional Pond R1	R R1	110	77	1,600	1,500	25.00
Regional Pond R2	R R2	140	140	2,100	2,100	7.90
Regional Pond WU South	R WU	47	22	1,070	930	39.54
Sub Regional Pond SR1	SR 1	54	42	610	510	11.03
Sub Regional Pond SR2	SR 2	65	65	840	840	2.05
Sub Regional Pond SR3	SR 3	72	72	910	910	1.03
Sub Regional Pond SR4	SR 4	130	27	1,000	730	19.37
Sub Regional Pond SR6	SR 6	74	9	390	200	11.82
The Meadows Pond #1	M 1	11	0	75	2	3.25
The Meadows Pond #2	M 2	28	5	210	99	7.94
Woodmen Hills Pond #1 North	WH 1N	65	61	390	260	7.13
Woodmen Hills Pond #1 South	WH 1S	61	10	260	260	8.78
Woodmen Hills Pond #2	WH 2	37	10	270	250	9.18
Woodmen Hills Pond #3	WH 3	105	13	530	360	8.35
Woodmen Hills Pond #4	WH 4	110	15	790	260	40.45
Woodmen Hills Pond #5	WH 5	40	1	130	19	4.10
Woodmen Hills Pond H	WH H	140	110	750	750	2.66

Notes
1: Represents future hydrology with retrofit existing detention ponds and 5 new subregional detention ponds
2: Required volume to highest WSE

Reach Alternative	Total (ft)
Protect In Place	30,066
Natural Channel Design	32,359
Small Drop Structures w/ Toe Protection	76,812
Large Drop Structures w/ Toe Protection	0

BURGESS RD
GOODSON RD
STAPLETON DR
EASTONVILLE RD
JUDGE ORR RD
WOODMEN RD
TAMLIN RD
FALCON HWY
GARRETT RD
MERIDIAN RD
DIVERSION
CHANGE DUE TO BENT GRASS R2 (RWT200)
DELETE POND WITH WQCV REPLACEMENTS & CHANNEL IMPROVEMENTS
CHANGE DUE TO BENT GRASS R1 (RMT063)

LEGEND

Detention Pond
- Existing
- Proposed
- Existing Watershed Boundary
- Historical and Future Watershed Boundary
- Tributary Basin Boundary
- Subbasin Boundary
- Major Tributary
- Immediate Action Required to Preserve Existing Condition

Reach Alternative
- Protect In Place
- Natural Channel Design
- Small Drop Structures w/ Toe Protection

Figure 5-3
Sub-Regional Detention Alternative
Falcon DBPS
El Paso County, CO

0 0.5 1
Miles

NOTE: FIGURE MUST BE VIEWED IN COLOR

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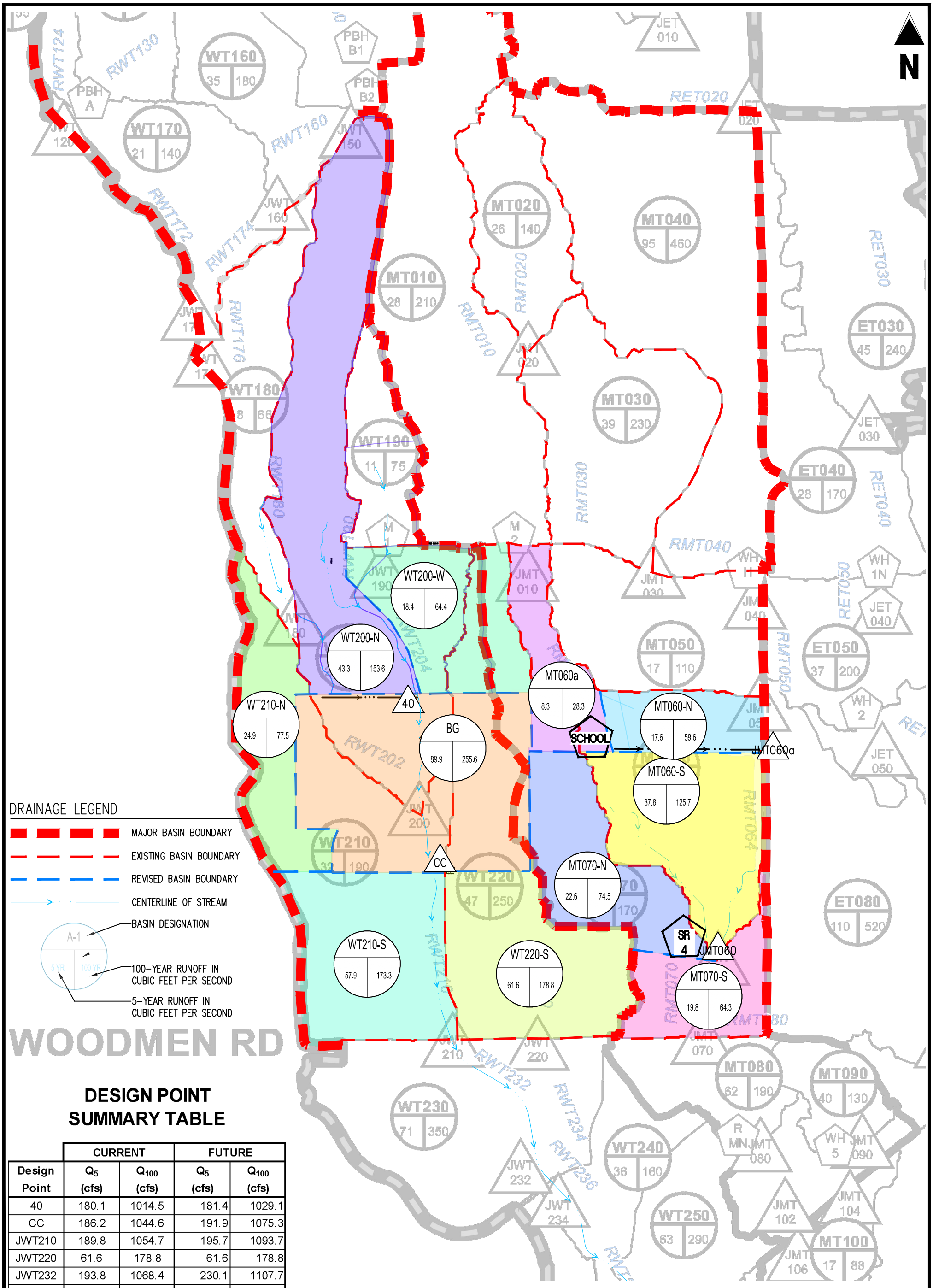


DESIGN POINT SUMMARY TABLE

	CURRENT		FUTURE	
Design Point	Q_5 (cfs)	Q_{100} (cfs)	Q_5 (cfs)	Q_{100} (cfs)
40	180.1	1014.5	181.4	1029.1
CC	186.2	1044.6	191.9	1075.3
JWT210	189.8	1054.7	195.7	1093.7
JWT220	61.6	178.8	61.6	178.8
JWT232	193.8	1068.4	230.1	1107.7
JMT060a	292.1	908.7	292.1	908.9
JMT060	43.3	700.4	43.7	700.3
JMT070	44.9	717.6	45.3	717.5
JMT080	47.3	692.3	47.8	691.7

FALCON MEADOWS AT BENT GRASS
MDDP

REVISED BASIN HYDROLOGY - HMS MODEL

Project No:	CLH0017
Drawn By:	CMD
Checked By:	GD
Date:	06/16/21

Galloway
6162 S. Willow Drive, Suite 320
Greenwood Village, CO 80111
303.770.8884 • GallowayUS.com

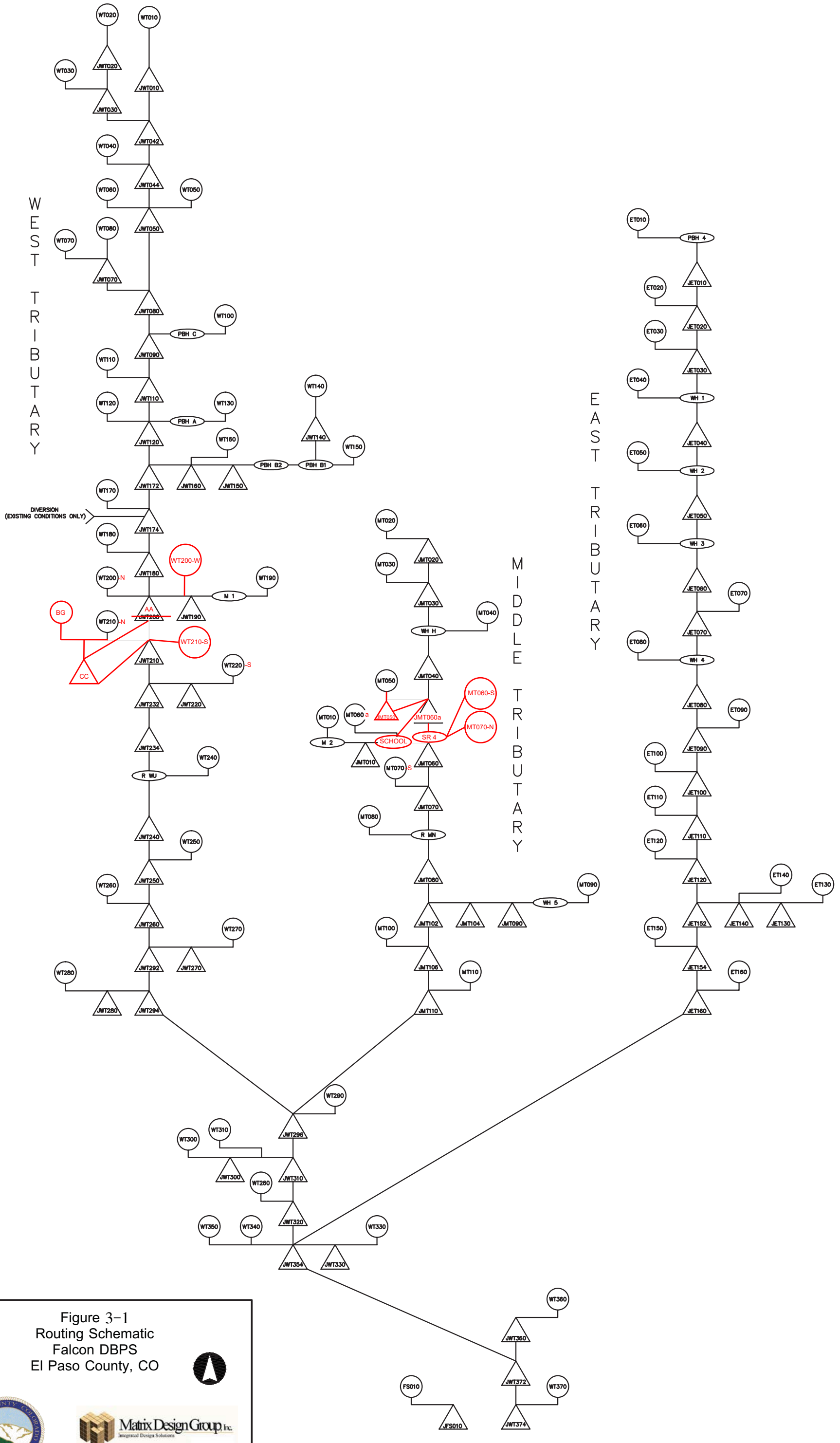


Figure 3-1
Routing Schematic
Falcon DBPS
El Paso County, CO

DRAWING NOT TO SCALE

MERIDIAN ROAD

Worksheet for Fut Channel - Pr 100 Yr Flow-MR

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.035	
Channel Slope	0.30	%
Left Side Slope	4.00	ft/ft (H:V)
Right Side Slope	4.00	ft/ft (H:V)
Bottom Width	15.00	ft
Discharge	925.00	ft³/s

Results

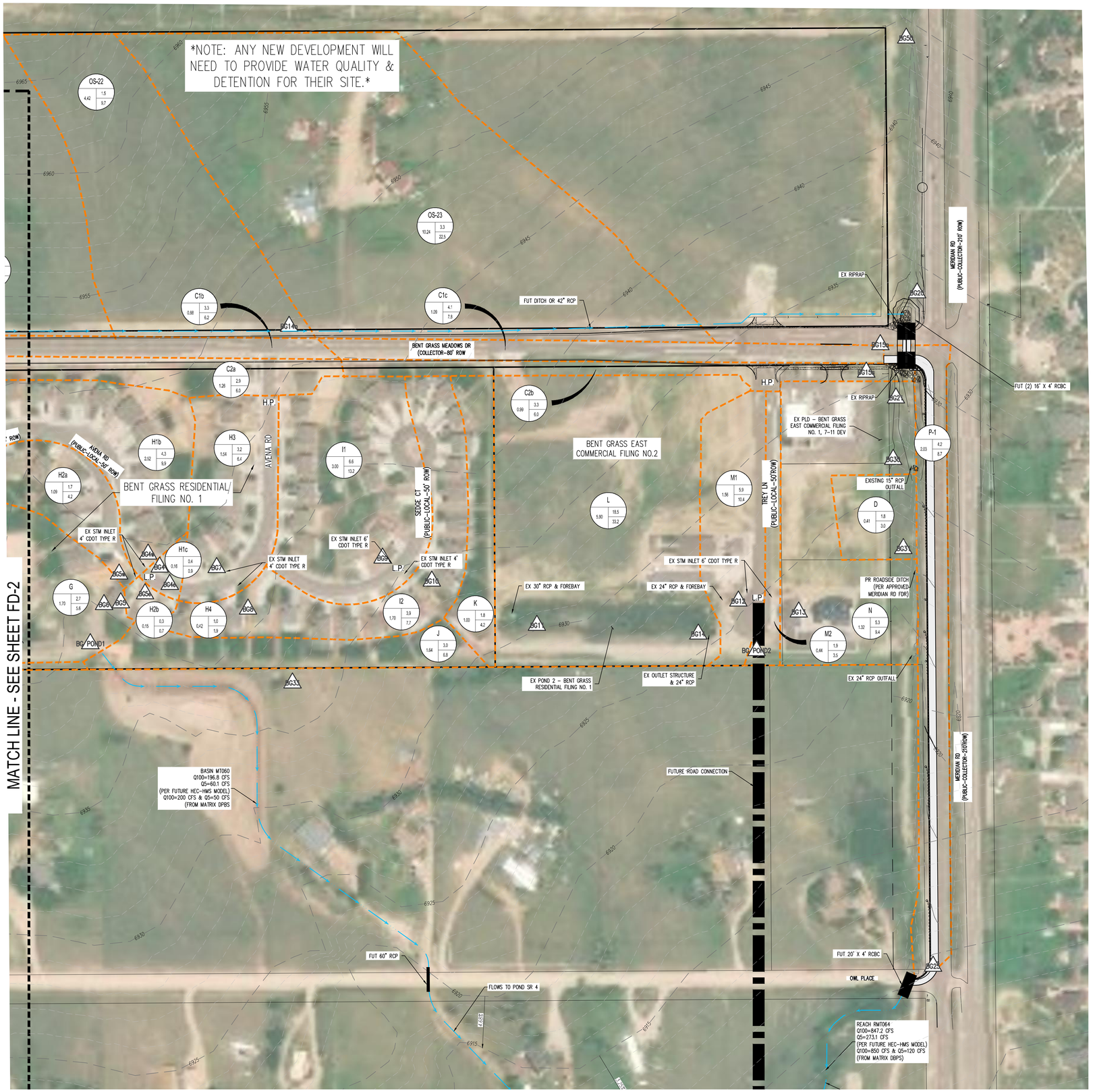
Normal Depth	5.15	ft
Flow Area	183.50	ft²
Wetted Perimeter	57.49	ft
Hydraulic Radius	3.19	ft
Top Width	56.22	ft
Critical Depth	3.58	ft
Critical Slope	0.01368	ft/ft
Velocity	5.04	ft/s
Velocity Head	0.39	ft
Specific Energy	5.55	ft
Froude Number	0.49	
Flow Type	Subcritical	

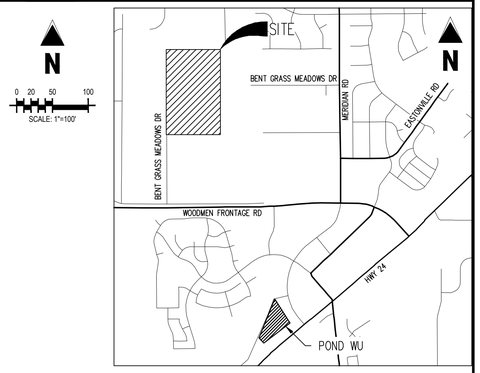
GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	5.15	ft
Critical Depth	3.58	ft
Channel Slope	0.30	%





VICINITY MAP

N

0 20 50 100
SCALE: 1"=100'

DRAINAGE LEGEND 1"=2,000'

- PROPERTY LINE
- 6485 EXISTING MAJOR CONTOUR
- 6483 EXISTING MINOR CONTOUR
- 6485 PROPOSED/FUTURE MAJOR CONTOUR
- 6483 PROPOSED/FUTURE MINOR CONTOUR
- BASIN BOUNDARY LINE
- 100YR FEMA EFFECTIVE 100-YR FLOODPLAIN
- CENTERLINE OF STREAM
- BASIN DESIGNATION
- 5-YEAR RUNOFF IN CUBIC FEET PER SECOND
- 100-YEAR RUNOFF IN CUBIC FEET PER SECOND
- BASIN AREA IN ACRES
- DIRECTION OF RUNOFF

RUNOFF SUMMARY TABLE

Basin ID	Area (acres)	Q_5 (cfs)	Q_{100} (cfs)
RWT202	1574.40	220.0	1000.0
RWT204	38.40	7.0	43.0
WT200	192.00	52.0	190.0
OS-2	20.08	9.0	43.4
OS-3	10.62	4.7	22.7
OS-25	18.74	6.3	35.8
OS-26	5.81	1.9	12.6
H5	6.37	3.2	15.1
OS-22	4.42	1.5	9.7
OS-23	10.24	3.3	22.5
C1a	0.48	1.8	3.4
C1b	0.88	3.3	6.2
C1c	1.09	4.1	7.8
D1a	0.56	1.6	3.5
D1b	0.68	2.0	4.2
D1c	1.20	3.2	6.6
D1d	2.79	6.7	13.6
C2a	1.26	2.9	6.0
C2b	0.99	3.3	6.0
D2a	1.00	1.8	4.8
D2b	0.41	1.0	2.3
H1a	0.40	1.0	2.3
H1b	2.52	4.3	9.9
H1c	0.16	0.4	0.9
H2a	1.09	1.7	4.2
H2b	0.15	0.3	0.7
F	1.37	2.6	5.9
G	1.70	2.7	5.6
H3	1.54	3.2	6.4
H4	0.42	1.0	1.9
I1	3.00	6.6	13.2
I2	1.70	3.9	7.7
J	1.64	3.0	6.8
K	1.00	1.8	4.2
L	5.90	18.5	33.2
M1	1.56	5.9	10.4
M2	0.44	1.9	3.5
N	1.32	5.3	9.4
D	0.41	1.8	3.0
OS-1	33.07	15.5	66.7
OS-4	4.46	5.6	14.0
OS-5	0.46	1.1	2.3
OS-6	1.17	2.0	4.3
A-1	2.70	3.3	8.6
A-2	1.19	1.5	4.2
A-3	1.57	2.1	5.0
A-4	2.24	2.9	7.5
C-1	1.35	2.6	5.9
C-2	6.80	7.1	18.5
C-3	2.38	3.3	7.8
C-4	3.61	5.3	12.0
C-5	7.86	10.9	24.9
C-6	5.54	7.0	16.9
C-7	0.89	0.3	2.1
E-1	1.71	3.6	7.7
E-2	0.68	2.4	4.6
E-3	0.76	2.9	5.3
E-4	0.91	3.0	5.7
E-5	0.89	3.3	6.1
F-1	0.44	0.6	1.6
F-2	0.55	1.5	3.1
G-1	1.47	1.3	4.5
H-1	0.52	0.2	1.4
I-1	0.31	1.0	2.1
AA-1	2.57	4.2	9.9
AA-2	2.28	4.2	9.3
B-1	5.25	2.3	10.7
B-2	4.16	1.4	9.1
CC-1	9.07	16.9	36.0
CC-2	1.53	4.6	9.8
CC-3	1.88	6.4	12.1
CC-4	3.64	6.2	16.0
CC-5	0.45	0.2	1.4
D-1	9.07	11.2	26.6
D-2	7.42	15.5	32.2
D-3	2.03	0.8	2.3
D-4	4.38	7.8	16.6
D-5	1.08	2.2	4.6
D-6	4.01	8.2	17.2
D-7	6.39	3.2	14.8
D-8	1.69	1.3	4.5
P-1	2.03	4.2	8.7

DESIGN POINT SUMMARY TABLE

Design Point	Q_5 (cfs)	Q_{100} (cfs)	REV HMS FLOWS Q_5 (cfs)	REV HMS FLOWS Q_{100} (cfs)
40	276.1	1227.8	181.4	1029.1
1	3.1	8.6		
2	4.3	11.9		
3	5.9	15.9		
4	8.3	22.3		
9	1.1	2.4		
11	6.0	15.5		
13	7.6	19.0		
5	10.9	27.1		
6	4.1	9.4		
7	2.9	5.5		
8	20.0	50.5		
12	4.6	10.2		
15	20.9	45.4		
10	23.9	52.7		
10A	6.0	21.9		
14	33.0	81.1		
14A	12.2	37.0		
AA	270.3	1188.7		
BB	269.5	1186.4		
16	16.6	39.4		
17	10.6	26.8		
18	13.5	39.2		
19	9.5	29.7		
20	1.3	4.6		
20A	18.4	57.1		
20B	21.3	66.0		
28	8.6	42.8		
29	12.2	60.9		
21	15.0	32.5		
22	10.5	26.0		
23	12.2	59.7		
24	2.1	15.9		
25	3.3	10.7		
26	8.0	41.7		
42	7.5	16.5		
43	10.0	21.8		
44	1.2	4.5		
45	53.8	173.9		
45A	1.1	45.8		
CC	268.2	1183.4	191.9	1075.3
30	2.1	63.5		
31	5.8	67.4		
32	6.5	64.8		
32A	4.9	34.5		
32A-N	4.9	33.2		
32A-S	12.5	3.6		
BG 1a-Os	0.0	0.0		
BG 1a-Ose	0.0	0.0		
BG 1a-Osw	0.0	0.0		
BG 4a	0.6	1.5		
BG 1b	1.3	2.8		
BG 1c	3.3	7.1		
BG 1	8.3	17.6		
BG 2e	1.8	5.0		
BG 2w	1.0	2.4		
BG 2	2.8	7.3		
BG 4e	0.4	0.9		
BG 4w	3.8	9.0		
BG 4	4.0	9.5		
BG 5e	0.3	0.7		
BG 5w	1.7	4.2		
BG 5	1.9	4.7		
BG 3	16.2	58.7		
BG 6	5.4	13.2		
BG POND1	0.3	2.9		
BG 14n	9.2	42.7		
BG 15n	8.8	40.9		
BG 50	280.0	850.0		
BG 20	292.5	969.3		
BG 14s	15.0	7.8		
BG 15s	16.8	12.4		
BG 21	304.6	915.3		
BG 32	2.6	6.1		
BG 33	2.9	7.0		
BG 7	3.1	6.4		
BG 8	1.0	2.0		
BG 9	6.5	13.4		
BG 10	3.8	7.9		
BG 11	13.5	27.8		
BG 12	5.8	10.7		
BG 13	7.0	13.0		
BG 14	12.3	22.8		
BG 15	42.2	82.0		
BG POND2	0.4	10.0		
BG 30	3.0	5.0		
BG 31	1.8	3.1		
BG 25	252.0	751.4		

Galloway
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GallowayUS.com

CHALLENGER HOMES

MASTER DRAINAGE DEVELOPMENT PLAN
FALCON MEADOWS AT BENT GRASS
FOR
CHALLENGER COMMUNITIES, LLC

BENT GRASS MEADOWS DRIVE & MERIDIAN ROAD
FALCON, CO 80831 - EL PASO COUNTY

#	Date	Issue / Description	Init.

Project No: CLH000014.20
Drawn By: CMWJ
Checked By: SMB
Date: OCTOBER 2019

FUTURE CONDITIONS DRAINAGE MAP

FD-3
Sheet 3 OF 5

REQUEST FOR
CONDITIONAL LETTER OF MAP REVISION

UNNAMED TRIBUTARY TO
BLACK SQUIRREL CREEK,
FALCON OWL PLACE

Falcon, Colorado
October 25, 2022

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DBC Project No. 21611-00BLWR

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REQUEST FOR CONDITIONAL LETTER OF MAP REVISION
UNNAMED TRIBUTARY TO BLACK SQUIRREL CREEK
FALCON OWL PLACE

1.0 INTRODUCTION

1.1 Background

The following report and supporting documentation are being submitted to FEMA for the purpose of requesting a Conditional Letter of Map Revision (CLOMR) for a portion of the Unnamed Tributary to Black Squirrel Creek (UTBSC) in El Paso County, Colorado.

The Falcon Owl Place consists of approximately 4.6 acres at the southwest corner of Owl Place and Meridian Road as shown in **Figure 1**. The property currently has an address of 11745 Owl Place, and is currently known as Lot 15 of the Falcon Ranchettes. The East Branch of the UTBSC flows southwest across the property and is proposed to be contained within a 10'x6' box culvert that will discharge into the Subregional Pond SR4 recently constructed on the Falcon Marketplace property. A general site layout of the Falcon Owl Place development is shown in the construction drawings included in **Appendix 1**.

The improvements associated with Falcon Owl Place are in general conformance with the Falcon Basin, Drainage Basin Planning Study (Falcon DBPS), prepared by El Paso County in 2015. The hydrologic analysis completed for the Falcon DBPS was used as the basis for the current CLOMR.

The Effective FEMA Flood Insurance Rate Map (FIRM) Number 08041C0553G in **Appendix 7** shows the East Branch of the UTBSC 100-year Zone A floodplain across the western portion of the Owl Place site. This report presents hydrologic and hydraulic study results showing that the proposed 100-year floodplain will be confined within a piped storm drain system (10'x 6' box culvert).

It is the Owner/Developer's intent to comply with all floodplain regulations.

1.2 General Location and Project Description

This CLOMR is limited to the 4.6-acre parcel located at the southwest corner of Owl Place and Meridian Road, SE 1/4 of the SE 1/4 of Section 1, Township 13 S, Range 65 W of the 6th P.M., El Paso County, Colorado. The subject property will be developed with a multi-pad shopping center (Falcon Owl Place).

The Falcon Owl Place development includes regrading the site and rerouting the East Branch of the UTBSC across the site. Approximately 1022 feet of the creek will be impacted by the development, which intercepts the existing creek north of Owl Place and conveys it via a 10'x6' box culvert to an off-site subregional detention pond (SR4). The box culvert is designed to convey the full 100-year discharge.

Figure 1 – Vicinity Map

1.3 Regulatory Floodplain

The Effective Zone A limits for the East Branch of the UTBSC on the Falcon Owl Place site are defined on Map Number 8041C0553G dated December 7, 2018. No flow rates, floodway data or flood profiles were defined for this section of UTBSC in the effective FIS for El Paso County, Colorado, Revised December 7, 2018.

2.0 PREVIOUS STUDIES

El Paso County completed hydrologic and hydraulic analyses summarized in a report titled Falcon Basin, Drainage Basin Planning Study, Selected Plan Report, Final, September 2015 (Falcon DBPS). The Falcon DBPS encompasses three unnamed tributaries to Black Squirrel Creek, including the "Middle Tributary" which flows across the subject property. Select output from the Falcon DBPS is included in **Appendix 3**.

3.0 HYDROLOGIC ANALYSIS

3.1 Falcon DBPS

The Falcon DBPS completed hydrologic analysis for the Falcon Basin Watershed, using HEC-HMS v3.5 software, for historical, existing, and future land use conditions by applying a 24-hour storm event with 2-, 5-, 10-, 25-, 50-, and 100-year recurrence intervals and current drainage infrastructure. Chapter 3 and Appendix A of the Falcon DBPS include a detailed discussion of the hydrologic analysis. An electronic copy of the HEC-HMS model (File: Aug15_Working_Falcon_DBPS_S.hms) is also provided.

The Falcon DBPS identified Subregional Pond SR4 to be installed on the Falcon Marketplace property. Pond SR4 was constructed in early 2021 and the property floodplain mapping was updated in LOMR Case Number 21-08-0534P.

El Paso County requires regional drainage infrastructure to be sized for future land use conditions. Therefore, peak discharges with existing drainage infrastructure and future land use conditions near Owl Place are summarized in Table 3-1.

Table 3-1. Future Land Use Conditions Peak Discharges near Falcon Owl Place on the Middle Tributary, Falcon DBPS

Model Location	Physical Location	Branch	Proximity to Owl Place	Q100 (cfs)
JMT050	Bent Grass Meadows Drive	Only East Branch	Upstream of Site	850
JMT060	Eastonville Road (Pond SR4 inflow)	Both East and West Branches	Downstream of Site	1,000

3.2 Falcon Owl Place

The Falcon DBPS HEC-HMS model with existing drainage infrastructure and future land use (Existing Conditions) was used as the basis for the Falcon Owl Place hydrologic analysis. The Existing Conditions model was replicated in HEC-HMS version 4.7.1, due to instabilities and runtime issues with the prior, outdated model version (3.5). The Existing model produced 100-year peak flows of 859 and 1,023 cfs upstream (JMT050) and downstream (JMT060) of the site, which are comparable to and more conservative than the 850 and 1,000 cfs in the DBPS. It should be noted that in Existing Conditions, JMT050 is on the East Branch of the Middle Tributary, whereas JMT060 includes flows from both the West and East Branches, immediately upstream of Pond SR4.

The Falcon watershed did not include a design point on the East Branch immediately upstream of Pond SR4. Therefore, it was necessary to modify the HMS model to obtain a design flow for Owl Place. In the Proposed Conditions basin model, the junction JMT051 was created on the East Branch of the UTBSC at the southern boundary of the Falcon Owl Place property, immediately upstream of Pond SR4.

The lag time and drainage area for Basin MT060 were reduced to 0.077 square miles and 17 minutes, respectively. The length and slope of Routing RMT060 were also updated. The NRCS soils for the proposed basin are Columbine gravelly sandy loam with a Hydrologic Soil Group (HSG) A. The basin is zoned for a combination of 5-acre residential, commercial, and planned unit development (PUD). The nearby PUD (Bent Grass Meadows) is residential with an average lot size of 0.22 acres. Based on TR-55 Table 2-2a, areas with 0.22-acre lots and HSG A have a Curve Number (CN) of 65. However, it is unknown how and when this area will develop in the future. For example, the Owl Place site is currently being rezoned from RR-5 to CS, which would increase the CN from 46 to 89. The future conditions CN of 66 used in the Falcon DBPS is a reasonable representation of the future development potential in the basin and was used in the proposed conditions model.

The hydrologic parameter calculations, base mapping, and select output from the HEC-HMS model is included in **Appendix 4,** and the model files (HEC-HMS file: Falcon_OwlCLOMR.hms) are provided. Proposed peak discharges used for the Falcon Owl Place development are summarized in Table 3-2.

Table 3-2. Proposed Peak Discharges at Falcon Owl Place (East Branch of the UTBSC)

Recurrence Interval	Q100 (cfs)
100-year	920
5-year	288.5

4.0 HYDRAULIC ANALYSIS

4.1 General

The effective FIRM identifies an approximate Zone A floodplain across the Falcon Owl Place property with no flood profiles, discharges, or BFE's defined. The Falcon Owl Place development includes filling and regrading the site and rerouting the East Branch of the UTBSC through a box culvert across the site.

4.2 Vertical Datum

The effective FIRM is on the North American Vertical Datum of 1988 (NAVD88). The ALTA survey completed for the site (Olsson, 2021) and the design and construction

drawings are on the National Geodetic Vertical Datum of 1929 (NGVD29). The Falcon DBPS and the hydraulic analysis for this CLOMR were both completed on the NGVD29. The difference between the NGVD29 and NAVD88 is 3.8 feet on the Falcon Owl Place.

4.3 Horizontal Datum

The field survey, design, construction drawings and hydraulic modeling for the Falcon Owl Place project were completed on the North American Datum of 1983 (NAD83), Colorado State Plane coordinate system, Central Zone.

4.4 Box Culvert Hydraulic Analysis

Under existing and proposed conditions, the East Branch of the UTBSC leaving the Falcon Owl Place site discharges to Pond SR4 on the Falcon Marketplace. The pond was designed for a 100-year discharge of 1,016 cfs, which includes both West and East branches of the UTBSC. The 100-year water surface elevation upstream of the pond as shown in the LOMR is 6902.5 (NAVD88), or 6898.7 (NGVD29). The starting HGL for the box culvert analysis was conservatively placed at the top of pipe elevation of 6895.84 feet (NGVD29) for analyzing flows to the East branch only. However, an additional analysis was performed with a starting HGL of 6898.7, to evaluate the backwater effects from the pond.

StormCAD was used to evaluate the hydraulic performance of the 10'x6' box culvert. The profile and output for the 100-year storm event is included in **Appendix 5**, and the model files are provided.

4.5 Existing and Proposed Owl Place Culverts

The East Branch of the UTBSC is currently conveyed under Owl Place via two 36" CMP near the northeast corner of the site. The HY-8 software was used to analyze the existing culverts for the 100-year storm event.

The 2-36" CMP culverts are severely undersized and partially filled with sediment as shown in the photo below. The culverts only convey 86-95 cfs, depending on tailwater depth. The remaining flow (approximately 825-834 cfs) in the 100-year event overtops Owl Place. The proposed box culvert will convey the entire 100-year event (920 cfs) with an HGL of 6911.31 at the proposed headwall upstream of Owl Place, which is more than one foot below Owl Place and contained within the existing and proposed channel upstream. Channel grading will be required for approximately 30 feet to tie into the existing creek profile upstream. The channel side slopes will be reduced from approximately 5.5H:1V to 1.8H:1V and protected with riprap.

The HY-8 output is included in **Appendix 5** and the model file (Owl Place.hy8) is provided.

Existing 2-36” CMP under Owl Place (Upstream Inlets)

5.0 NFIP REGULATION COMPLIANCE

5.1 Floodplain Work Map and Annotated FIRM

The effective Zone AE 100-year floodplain delineation for the UTBSC terminates at the boundary between the Falcon Marketplace and Falcon Owl Place properties and represents flows from both West and East branches. No changes are proposed to the Zone AE floodplain. The 100-year flood discharge for the East Branch is contained in the proposed culvert. Therefore, the Zone A floodplain for this branch has been removed, and the split between the Zone A floodplains for the West and East branches is denoted in the Annotated FIRM. The effective and proposed UTBSC floodplains are delineated on the Floodplain Work Map and Annotated FIRM in **Appendix 7**.

5.2 Forms and Notifications

The appropriate FEMA forms are located in **Appendix 6**. Modifications to 100-year floodplain elevations and delineations are limited to the Falcon Owl Place development. Furthermore, there are no proposed increases to the BFE's or floodplain extents. Therefore, individual legal notices are not required for this CLOMR submittal.

5.3 Compliance with Section 65.12

Although there are no increases to BFE's due to the proposed project, an alternatives evaluation was performed to evaluate options for closed conduit and open channel conveyance of the East Branch of the UTBSC. The alternatives evaluation can be provided upon request.

Furthermore, no structures are located in areas that would be impacted by the floodplain modifications proposed by this CLOMR.

5.4 Endangered Species Act (ESA)

ESA Compliance information is provided in **Appendix 8**.

6.0 CONCLUSIONS

The Falcon Owl Place development will relocate a portion of the East Branch of an Unnamed Tributary of Black Squirrel Creek (Middle Tributary). This report and supporting documentation are being submitted to FEMA for the purpose of requesting a CLOMR to conditionally change the floodplain in accordance with NFIP regulations.

7.0 REFERENCES

City of Colorado Springs/El Paso County, *Drainage Criteria Manual*, Revised January 2021.

FEMA, *FIRM Number 08041C0553G, El Paso County, Colorado and Incorporated Areas,* Revised December 7, 2018.

FEMA, *FIS Number 08041CV001A, El Paso County, Colorado and Incorporated Areas,* Revised December 7, 2018.

Hydraflow Storm Sewers Extension for Autodesk Civil 3D, Version 12.

Matrix Design Group, *Falcon Drainage Basin Planning Study, Selected Plan Report, Final,* September 2015.

Olsson, *ALTA Survey for Lot 15, Falcon Ranchettes*, September 30, 2021.

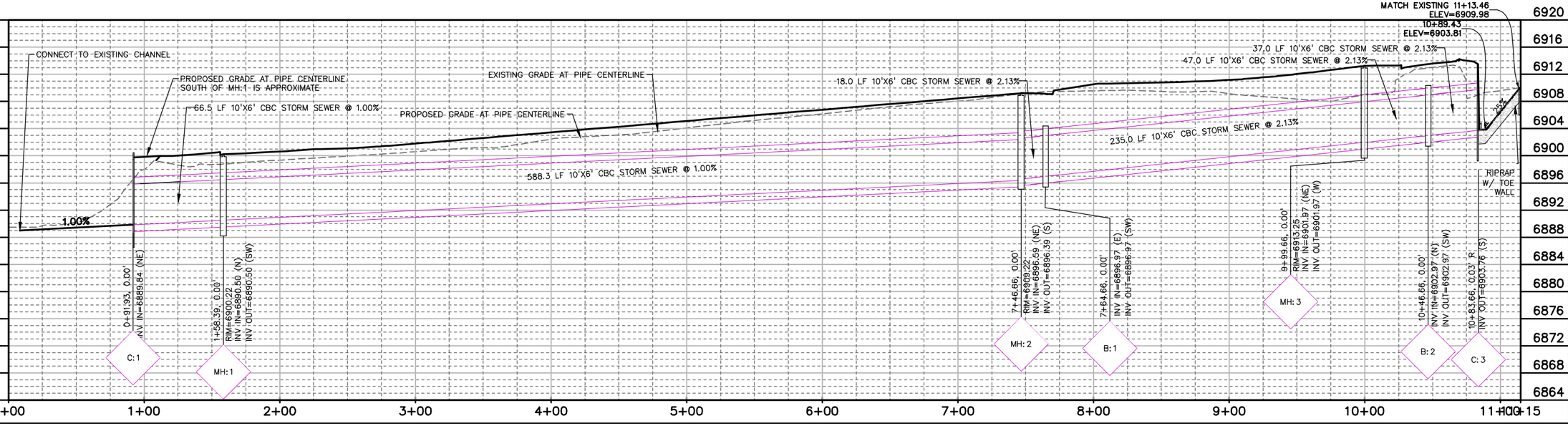
USACE, *Hydraulic Modeling System (HEC-HMS), Version 4.7.1, Build 11161,* January 14, 2021.

APPENDICES

APPENDIX 1

CONSTRUCTION DRAWINGS

GROUTED RIPRAP/REGRADE POND
TYPE VI STILLING BASIN (SEE CONSTRUCTION PLAN DETAILS)
HEADWALL WITH HANDRAIL (SEE CONSTRUCTION PLAN DETAILS)
66.5 LF 10'X6' CBC STORM SEWER @ 1.00%
588.3 LF 10'X6' CBC STORM SEWER @ 1.00%
FALCON LOMR_FP SEPT 2021
PROPOSED 25' WIDE STORM EASEMENT
CONCRETE TRICKLE CHANNEL (SEE CONSTRUCTION PLAN DETAILS)
MERIDIAN PARK DRIVE
EASTONVILLE ROAD
OWL PLACE
MERIDAN ROAD
C: 1
STA. 0+91.93, 0.00'
CONNECT TO HEADWALL
INV. IN= 6889.84' (NE)
N: 1405845.62
E: 3253372.49
MH: 1
STA. 1+58.39, 0.00'
10'X6' CBC 45 DEG BEND
W/ MH ACCESS
RIM= 6900.22'
INV. IN= 6890.50' (N)
INV. OUT= 6890.50' (SW)
N: 1405892.88
E: 3253419.22
STORM MANHOLE
RIM ELEV.=6899.55'
ZONE A
NO BASE FLOOD ELEVATIONS DETERMINED
MH: 3
STA. 9+99.66, 0.00'
10'X6' CBC 45 DEG BEND
W/ MH ACCESS
RIM= 6913.25'
INV. IN= 6901.97' (NE)
INV. OUT= 6901.97(W)
N: 1406495.26
E: 3253663.59
B: 2
STA. 10+46.66, 0.00'
10'x6' CBC 45 DEG BEND
INV. IN= 6902.97' (N)
INV. OUT= 6902.97'(SW)
N: 1406528.68
E: 3253696.64
STA. 7+46.66, 0.00'
MANHOLE (SPECIAL)
(SEE CONSTRUCTION SET DETAILS)
RIM= 6909.22'
INV. IN= 6896.59' (NE)
INV. OUT= 6896.39' (S)
N: 1406481.15
E: 3253415.93
MH: 2
18.0 LF 10'X6' CBC STORM SEWER @ 2.13%
STA. 7+64.66, 0.00'
10'x6' CBC 45 DEG BEND
INV. IN= 6896.97' (E)
INV. OUT= 6896.97' (SW)
N: 1406493.94
E: 3253428.59
B: 1
PROPOSED 25' WIDE STORM EASEMENT
235.0 LF 10'X6' CBC STORM SEWER @ 2.13%
47.0 LF 10'X6' CBC STORM SEWER @ 2.13%
37.0 LF 10'X6' CBC STORM SEWER @ 2.13%
PROPOSED HEADWALL (SEE CONTRUCTION PLANS FOR DETAIL)
RIPRAP W/ TOE WALL
FLARED END SECTION 36" CMP INV.= 6908.24'
FLARED END SECTION 36" CMP INV.= 6908.18'
FLARED END SECTION 36" CMP INV.= 6908.41'
FLARED END SECTION 36" CMP INV.= 6908.33'
STA. 10+83.66, 0.03' R
CONNECT TO HEADWALL
INV. OUT= 6903.76' (S)
N: 1406565.68
E: 3253696.43
C: 3
40 20 0 40 80
SCALE IN FEET



LEGEND

- PR. STORM SEWER
- PR. JUNCTION BOX
- PR. RIPRAP
- PR. ACCESS MH
- PR. STORM EASEMENT
- EX. CONTOUR 6905
- PR. CONTOUR 6908
- EX. ROW LINE
- EX. PROPERTY LINE

NOTES

1. SPATIAL PROJECTION IS NAD83 COLORADO STATE PLANE, CENTRAL ZONE (FEET).
2. VERTICAL DATUM IS NGVD29.

PREPARED BY:

DBC
Drexel, Barrell & Co.
Traditional Service, Innovative Solutions
Since 1978

Drexel, Barrell & Co.
Engineers • Surveyors
1376 MINERS DRIVE, STE 107
LAFAYETTE, COLORADO 80026
CONTACT: MICHELLE IBLINGS, P.E.
(303) 442-4338
LAFAYETTE
COLORADO SPRINGS

OWNER/CLIENT:

LUBERTUS HAYENGA
BH RE INVESTMENTS, LLC
106 S. KYRENE RD., STE 2
CHANDLER, AZ 85226

EXHIBIT FOR:
FALCON OWL PLACE
FALCON, COLORADO

ISSUE	DATE
EXHIBIT	10/17/22

DESIGNED BY:	MLI
DRAWN BY:	CAF
CHECKED BY:	MLI
FILE NAME:	EX01

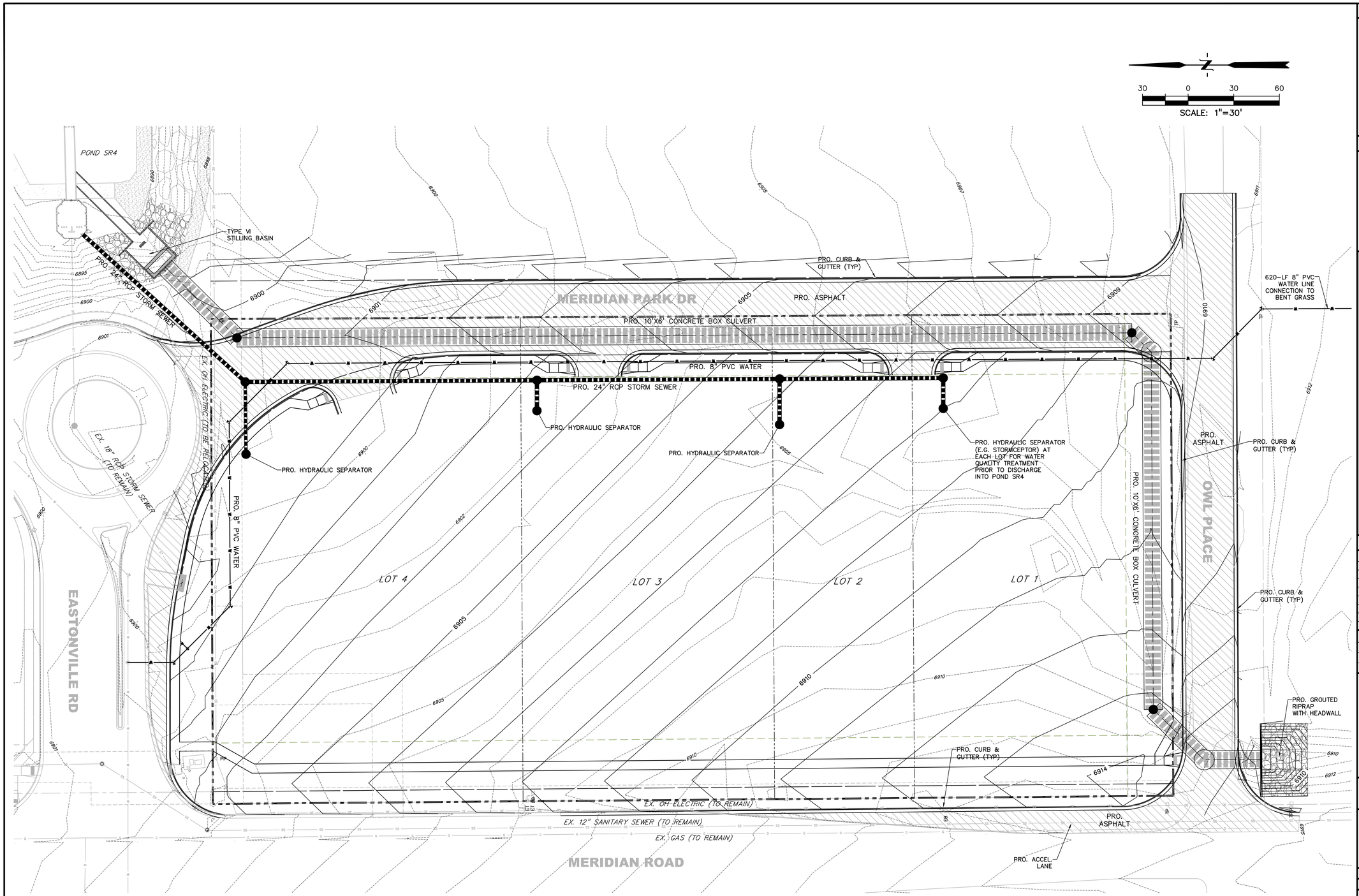
NOT FOR CONSTRUCTION

DRAWING SCALE:
HORIZONTAL: SEE PLAN
VERTICAL: SEE PLAN

PIPE SYSTEM EXHIBIT

PROJECT:21611-00BLWR
DRAWING NO.
EX01
SHEET: 1 OF 1

H:\21611-00BLWR\Plans\Sheets\EX01.dwg, 10/14/2022 7:46:58 AM



PREPARED BY:

DREXEL, BARRELL & CO.
Engineers • Surveyors
3 SOUTH 7TH STREET
COLORADO SPGS, COLORADO 80905
CONTACT: TIM D. McCONNELL, P.E.
(719)260-0887
COLORADO SPRINGS • LAFAYETTE

CLIENT:

CONSTRUCTION PLANS FOR:

FALCON OWL PLACE

FALCON, COLORADO

ISSUE	DATE
EXHIBIT	10/14/22

DESIGNED BY:	TDM
DRAWN BY:	KGV
CHECKED BY:	TDM
FILE NAME:	21611-SP

PREPARED UNDER MY DIRECT SUPERVISION FOR AND ON BEHALF OF DREXEL, BARRELL & CO.

DRAWING SCALE:
HORIZONTAL: 1" = 30'
VERTICAL: N/A

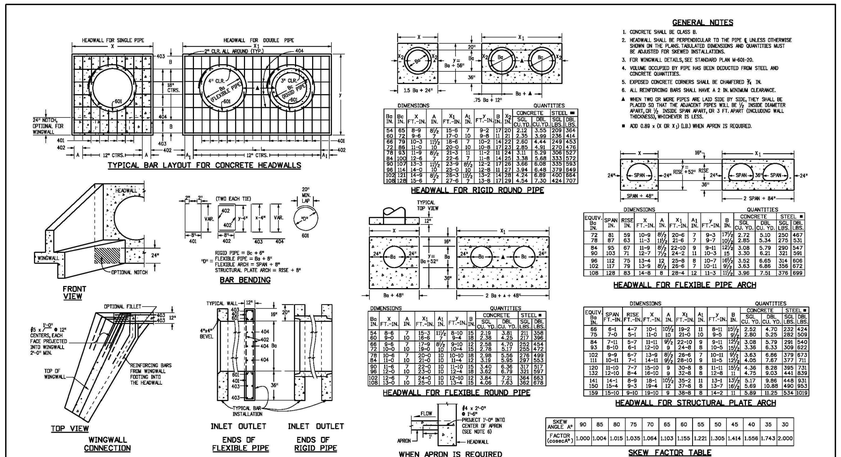
PRELIMINARY SITE PLAN

PROJECT NO. 21611-01CSCV

DRAWING NO.

SP

SHEET: 1 OF 1



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Full Path:www.coloradodot.info/business/designsupport	
Drawing File Name: 60101001.dgn	
CAD Ver.: MicroStation V8 Scale: Not to Scale Units: English	

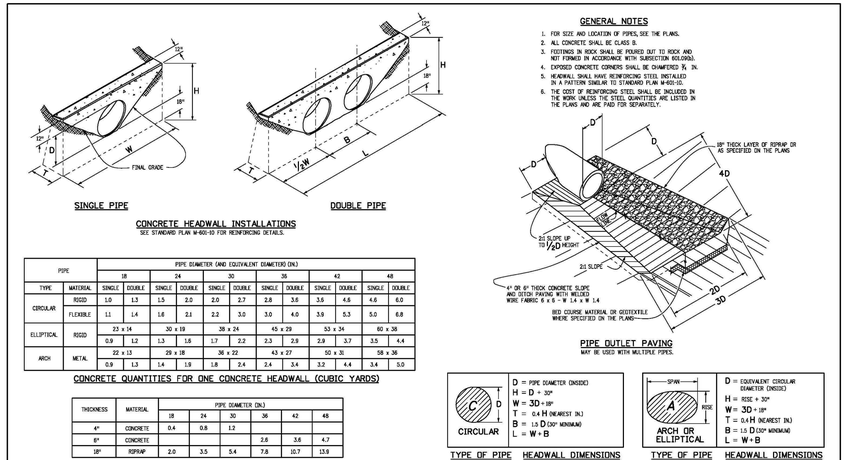
Sheet Revisions	
Dates	Comments

Colorado Department of Transportation
4201 East Arkansas Avenue
Denver, Colorado 80222
Phone: (303) 757-9083
Fax: (303) 757-9820
Project Development Branch DD/LTA

HEADWALL FOR PIPES

Issued By: Project Development Branch July 4, 2012

STANDARD PLAN NO.
M-601-10
Sheet No. 1 of 1



PIPE		PIPE DIAMETER (AND EQUIVALENT DIAMETERS) (IN.)									
		18		24		30		36		42	48
TYPE	MATERIAL	SINGLE	DOUBLE	SINGLE	DOUBLE	SINGLE	DOUBLE	SINGLE	DOUBLE	SINGLE	DOUBLE
CIRCULAR	RIGID	1.0	1.3	1.5	2.0	2.0	2.7	2.8	3.6	3.6	4.6	4.6	6.0
	FLEXIBLE	1.1	1.4	1.6	2.1	2.2	3.0	3.0	4.0	3.9	5.3	5.0	6.8
ELLIPTICAL	RIGID	23 x 14		30 x 19		38 x 24		45 x 29		53 x 34		60 x 38	
ARCH	METAL	22 x 13		29 x 18		36 x 22		43 x 27		50 x 30		58 x 36	
		0.9	1.2	1.3	1.8	1.7	2.2	2.3	2.9	2.9	3.7	3.5	4.4
		0.9	1.3	1.4	1.8	1.8	2.4	2.4	3.4	3.2	4.4	3.6	5.0

THICKNESS	MATERIAL	PIPE DIAMETER (IN.)					
		18	24	30	36	42	48
4"	CONCRETE	0.4	0.8	1.2			
6"	CONCRETE				2.8	3.6	4.7
18"	RIPRAP	2.0	3.5	5.4	7.8	10.7	13.9

Computer File Information	
Creation Date: 07/04/12	Initials: DD
Last Modification Date: 07/04/12	Initials: LTA
Full Path:www.coloradodot.info/business/designsupport	
Drawing File Name: 60101201.dgn	
CAD Ver.: MicroStation V8 Scale: Not to Scale Units: English	

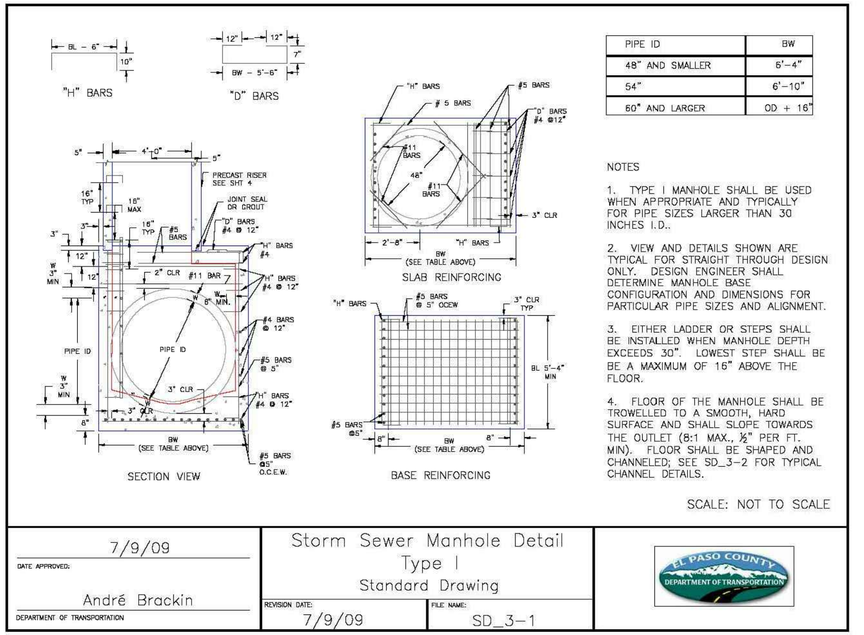
Sheet Revisions	
Dates	Comments

Colorado Department of Transportation
4201 East Arkansas Avenue
Denver, Colorado 80222
Phone: (303) 757-9083
Fax: (303) 757-9820
Project Development Branch DD/LTA

HEADWALLS AND PIPE OUTLET PAVING

Issued By: Project Development Branch July 4, 2012

STANDARD PLAN NO.
M-601-12
Sheet No. 1 of 1

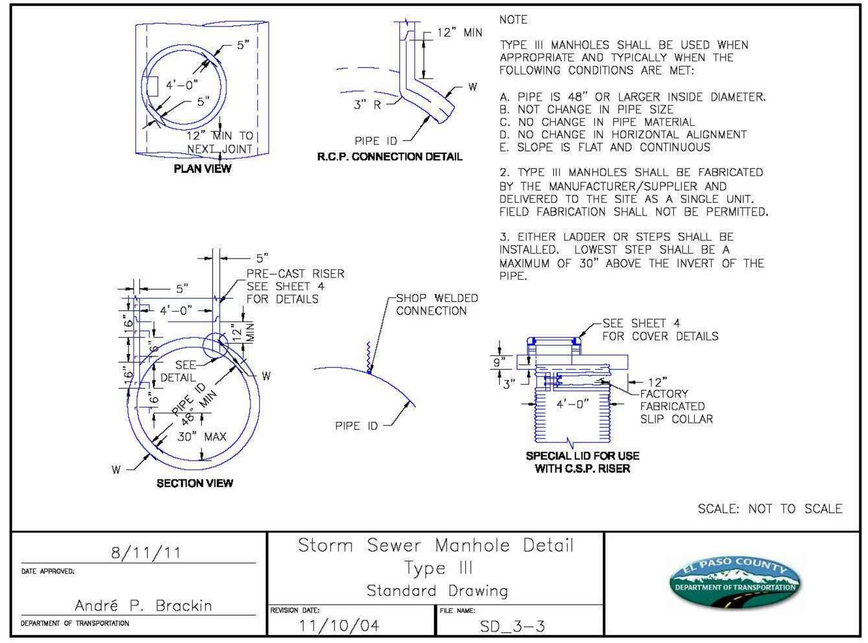


PIPE ID	BW
48" AND SMALLER	5'-4"
54"	6'-10"
60" AND LARGER	OD + 16"

7/9/09
DATE APPROVED:
André Brackin
DEPARTMENT OF TRANSPORTATION

Storm Sewer Manhole Detail Type I Standard Drawing

REVISION DATE: 7/9/09
FILE NAME: SD_3-1



8/11/11
DATE APPROVED:
André P. Brackin
DEPARTMENT OF TRANSPORTATION

Storm Sewer Manhole Detail Type III Standard Drawing

REVISION DATE: 11/10/04
FILE NAME: SD_3-3

PREPARED BY:

DREXEL, BARRELL & CO.
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COLORADO SPGS, COLORADO 80905
CONTACT: TIM D. McCONNELL, P.E.
(719)260-0887
COLORADO SPRINGS • LAFAYETTE

CLIENT:

CONSTRUCTION PLANS FOR:

FALCON OWL PLACE

FALCON, COLORADO

ISSUE	DATE
EXHIBIT	10/14/22

DESIGNED BY:	TDM
DRAWN BY:	KGV
CHECKED BY:	TDM
FILE NAME:	21611-STDT

NOT FOR CONSTRUCTION

PREPARED UNDER MY DIRECT SUPERVISION FOR AND ON BEHALF OF DREXEL, BARRELL & CO.

DRAWING SCALE:
HORIZONTAL: 1" = 10'
VERTICAL: N/A

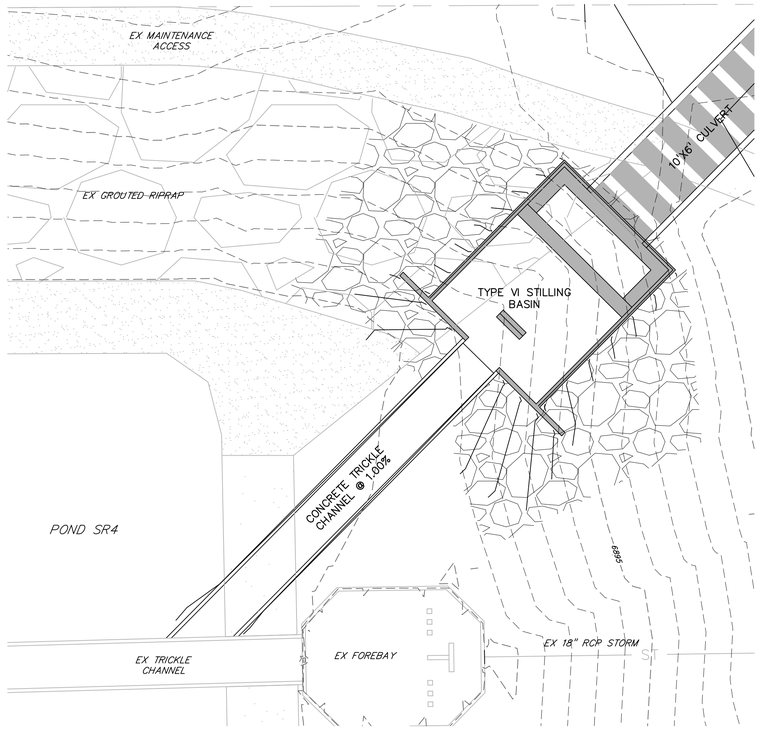
PRELIMINARY STORM CULVERT DETAILS

PROJECT NO. 21611-01CSCV

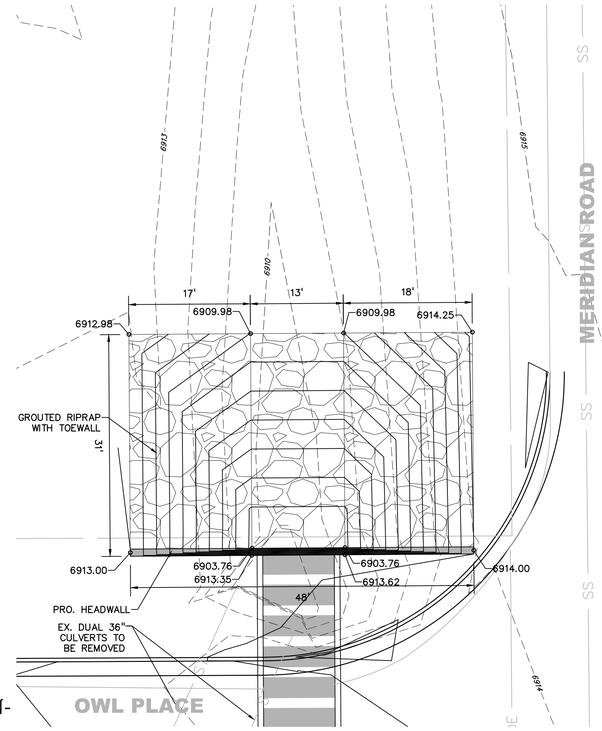
DRAWING NO.

DT1

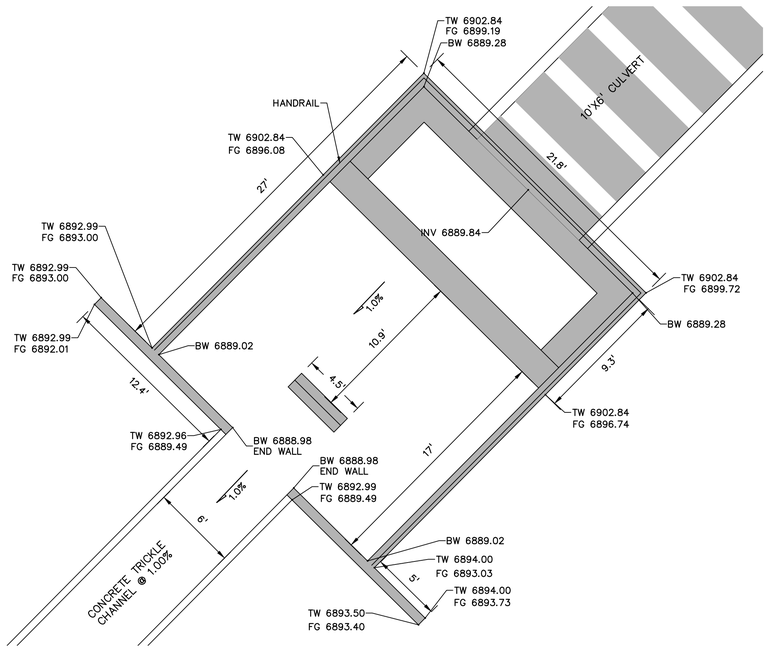
SHEET: 1 OF 2



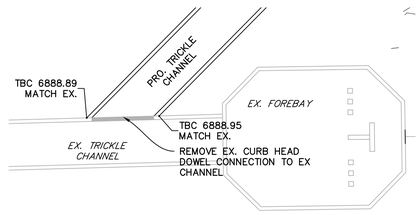
10'X6' CULVERT OUTLET
SCALE: 1"=10'



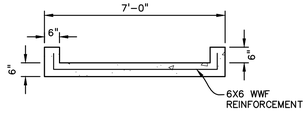
10'X6' CULVERT INLET
SCALE: 1"=10'



STILLING BASIN DETAIL
SCALE: 1"=5'



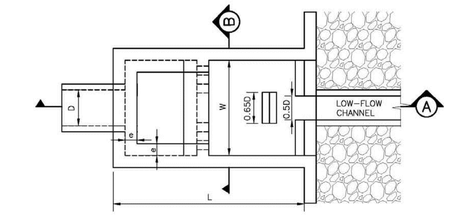
TRICKLE CHANNEL CONNECTION
NO SCALE



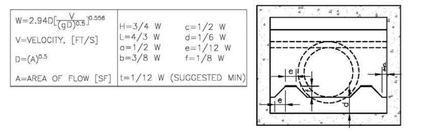
CONCRETE TRICKLE CHANNEL SECTION
NO SCALE

NOTES:

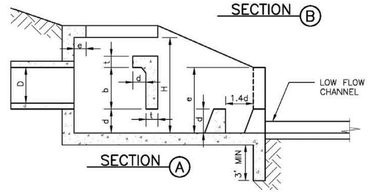
1. ALL ELEVATIONS ARE REFERENCED TO THE NATIONAL GEODETIC VERTICAL DATUM OF 1929 (NGVD29)



PLAN VIEW



SECTION B



SECTION A

Figure 9-45. UDFCD modified USBR type VI impacts stilling basin (general design dimensions)

PREPARED BY:
DREXEL, BARRELL & CO.
Engineers • Surveyors
3 SOUTH 7TH STREET
COLORADO SPGS, COLORADO 80905
CONTACT: TIM D. McCONNELL, P.E.
(719)260-0887
COLORADO SPRINGS • LAFAYETTE

CLIENT:

CONSTRUCTION PLANS FOR:

FALCON OWL PLACE

FALCON, COLORADO

ISSUE	DATE
EXHIBIT	10/14/22

DESIGNED BY:	TDM
DRAWN BY:	KGV
CHECKED BY:	TDM
FILE NAME:	21611-STDT

PREPARED UNDER MY DIRECT SUPERVISION FOR AND ON BEHALF OF DREXEL, BARRELL & CO.

DRAWING SCALE:
HORIZONTAL: 1" = 10'
VERTICAL: N/A

PRELIMINARY STORM CULVERT DETAILS

PROJECT NO. 21611-01CSCV

DRAWING NO.

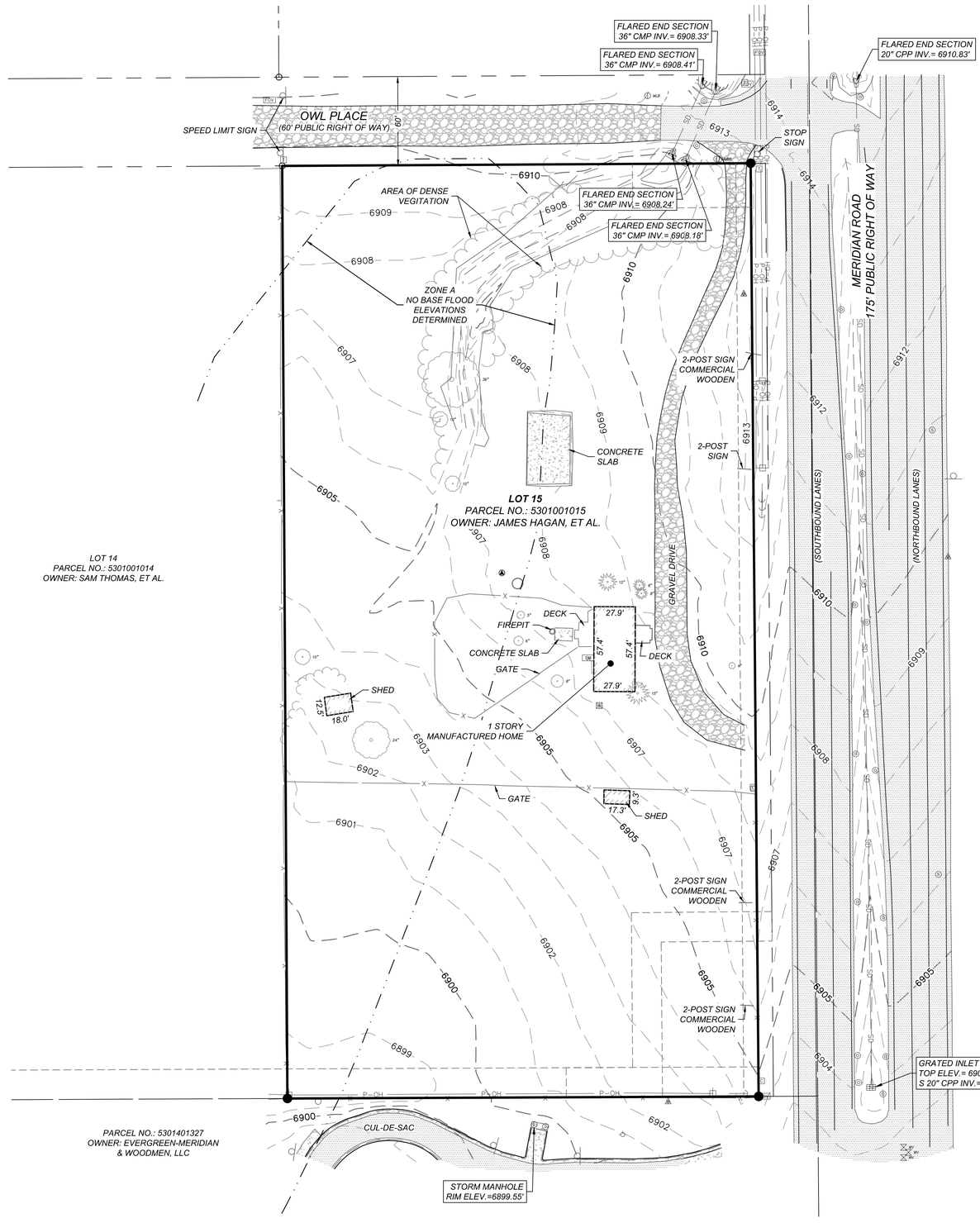
DT2

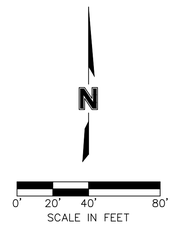
SHEET: 2 OF 2

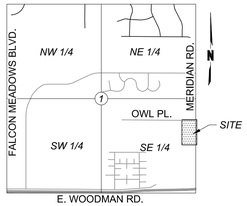
ALTA / NSPS Survey

LOT 15, FALCON RANCHETTES

Part of the Southeast Quarter of Section 1, Township 13 South, Range 65 West of the 6th Principal Meridian
Located in the Town of Falcon, County of El Paso, Colorado







SECTION MAP
SECTION 1-T13S-R65W of the Sixth Principal Meridian
-Not To Scale-

LEGEND

- Control Point (As-Described)
- Found Monument
- Section Corner
- Bollard
- Electric Meter
- Electric Transformer
- Fiber-Optic Vault
- Fiber-Optic Valve
- Guy Wire
- Mailbox
- Power Pole
- Reflector Post
- Sanitary Manhole
- Storm Manhole
- Single Support Sign
- Telephone Pedestal
- Water Manhole
- Water Valve
- Storm Drain Pipe (As-Described)
- Right-of-Way Line
- Parcel Line
- Easement Line
- Underground Gas
- Overhead Power
- Barbed-Wire Fence
- Chain Link Fence
- Wrought Iron Fence

olsson
1525 Raleigh Street
Suite 400
Denver, CO 80204
TEL 303.237.2072
www.olsson.com

OLSSON ASSUMES NO RESPONSIBILITY FOR EXISTING UTILITY LOCATIONS (HORIZONTAL OR VERTICAL). THE EXISTING UTILITIES SHOWN ON THIS DRAWING HAVE BEEN PLOTTED FROM THE BEST AVAILABLE INFORMATION. IT IS HOWEVER THE RESPONSIBILITY OF THE CONTRACTOR TO FIELD VERIFY THE LOCATION OF ALL UTILITIES PRIOR TO THE COMMENCEMENT OF ANY CONSTRUCTION ACTIVITIES.

811 Know what's below. Call before you dig.
CALL 811 SEVENTY-TWO HOURS PRIOR TO DIGGING, GRADING OR EXCAVATING FOR THE MARKING OF UNDERGROUND MEMBER UTILITIES

REV. NO.	DATE	REVISIONS DESCRIPTION
		REVISIONS

ALTA / NSPS LAND TITLE SURVEY
JB Partners CS, LLC

PROJECT TITLE
PHASE OR ADDITION

FALCON, COLORADO

2021

drawn by:	DMW
checked by:	EJD
approved by:	EJD
QA/QC by:	EJD
project no.:	021-06643
drawing no.:	V_XALT_02106643
date:	09.29.2021

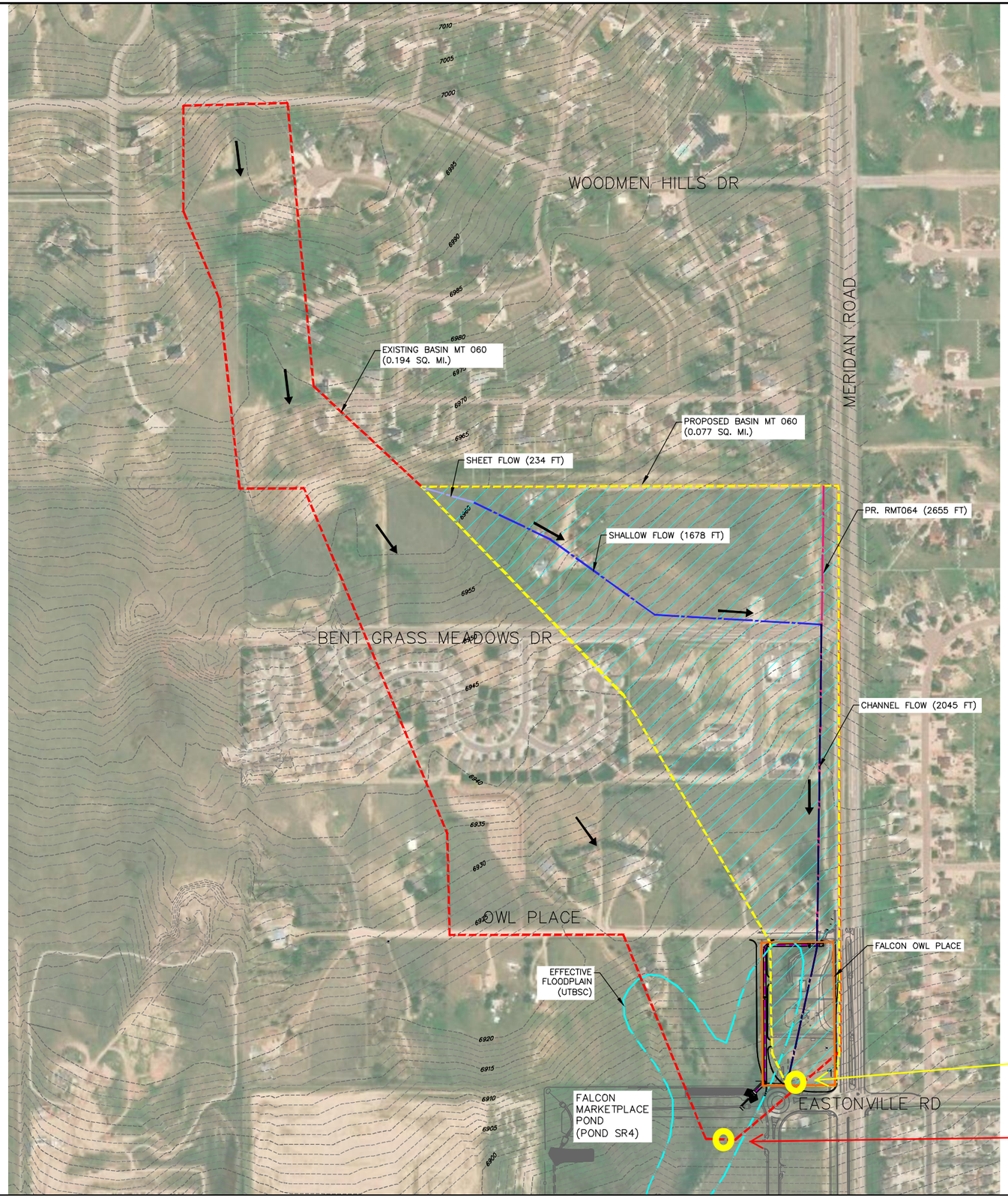
COLORADO LICENSED
ELI J. DONALDSON
38755
PROFESSIONAL LAND SURVEYOR

SHEET
3 of 3

DWG: F:\2021\06501-07000\021-06643\40-Design\Survey\SRVY\Sheets\V_XALT_02106643.dwg USER: edonaldson
DATE: Oct 01, 2021 12:03pm XREFS: V_XTOPO_02106643 V_XBNDY_02106643

APPENDIX 4

HEC-HMS MODELING



LEGEND

- EX. CONTOUR — 6925
- PR. STORM SEWER
- EFFECTIVE 100-YR FLOODPLAIN
- EX. BASIN MT060
- PR. BASIN MT060
- PR. BASIN MT060 AREA
- PR. SHEET FLOW
- PR. SHALLOW FLOW
- PR. CHANNEL FLOW
- PR. RMT064
- EX. FALCON OWL PLACE PROPERTY BOUNDARY
- FLOW DIRECTION

NOTES

1. SPATIAL PROJECTION IS NAD83 COLORADO STATE PLANE, CENTRAL ZONE (FEET).
2. VERTICAL DATUM IS NGVD29.

The existing basin delineation is approximated from the Falcon DBPS, which was developed in 2015.

The existing conditions contours are from Lidar, and may not reflect roadway and drainage infrastructure that is shown on the aerial image.

The proposed basin delineation is based on a combination of Lidar contours, drainage and roadway infrastructure, aerial mapping, and site survey.

N

250 0 250 500

SCALE IN FEET

PREPARED BY:

DBC
Drexel, Barrell & Co.
Traditional Surveying, Innovative Solutions
Since 1978

Drexel, Barrell & Co.
Engineers • Surveyors
1800 38TH STREET
BOULDER, COLORADO 80301
CONTACT: MICHELLE IBLINGS, P.E.
(303) 442-4338
BOULDER
COLORADO SPRINGS
GREELEY

OWNER/CLIENT:

EXHIBIT FOR:
FALCON
OWL PLACE
FALCON, COLORADO

ISSUE	DATE
EXHIBIT	06/07/22

DESIGNED BY:	MLI
DRAWN BY:	CAF
CHECKED BY:	MLI
FILE NAME:	HBM

NOT
FOR
CONSTRUCTION

DRAWING SCALE:
HORIZONTAL: SEE PLAN
VERTICAL: N/A

HYDROLOGIC
BASE MAP

PROJECT:21611-00BLWR
DRAWING NO.

HBM

SHEET: 1 OF 1

H:\21611-00BLWR\Plans\Sheets\Hydrologic Base Map\HBM.dwg, 6/7/2022 8:28:16 AM

APPENDIX 7

FPWM & ANNOTATED FIRM

PROPOSED FLOODPLAIN CONTAINED IN 10'X6' BOX CULVERT

OWL PLACE

MERIDAN PARK DRIVE

MERIDAN ROAD

FALCON MARKETPLACE POND (POND SR4)

EASTONVILLE RD

FALCON MARKET PLACE

LEGEND

- EX. CONTOUR — 6905
- PR. CONTOUR — 6905
- EX. STORM SEWER — ST
- OR
- PR. STORM SEWER
- EFFECTIVE FEMA STREAMLINE
- EFFECTIVE LOMR FLOODPLAIN
- FALCON OWL PLACE PROPERTY BOUNDARY
- PROPOSED 100-YEAR FLOODPLAIN
- PROPOSED 100-YEAR FLOODPLAIN
- PROPOSED CURB LINE
- EX. ROW LINE
- EX. PROPERTY LINE
- EX. EASEMENT

NOTES

1. SPATIAL PROJECTION IS NAD83 COLORADO STATE PLANE, CENTRAL ZONE (FEET).
2. VERTICAL DATUM IS NGVD29.

N

60 30 0 60 120

SCALE IN FEET

PREPARED BY:

DBC
Drexel, Barrell & Co.
Traditional Services, Innovative Solutions
Since 1978

Drexel, Barrell & Co.
Engineers • Surveyors
1376 MINERS DRIVE, STE 107
LAFAYETTE, COLORADO 800026
CONTACT: MICHELLE IBLINGS, P.E.
(303) 442-4338

LAFAYETTE
COLORADO SPRINGS

OWNER/CLIENT:

LUBERTUS HAYENGA
BH RE INVESTMENTS, LLC
106 S. KYRENE RD., STE 2
CHANDLER, AZ 85226

EXHIBIT FOR:
FALCON OWL PLACE
FALCON, COLORADO

ISSUE	DATE
EXHIBIT	10/25/22

DESIGNED BY:	MLI
DRAWN BY:	CAF
CHECKED BY:	MLI
FILE NAME:	FPWM

COLORADO LICENSED
MICHELLE IBLINGS
43515
Michelle Iblings
Digitally signed by Michelle Iblings
Date: 2022.10.25 14:14:49 -06'00'
PROFESSIONAL ENGINEER

DRAWING SCALE:
HORIZONTAL: SEE PLAN
VERTICAL: N/A

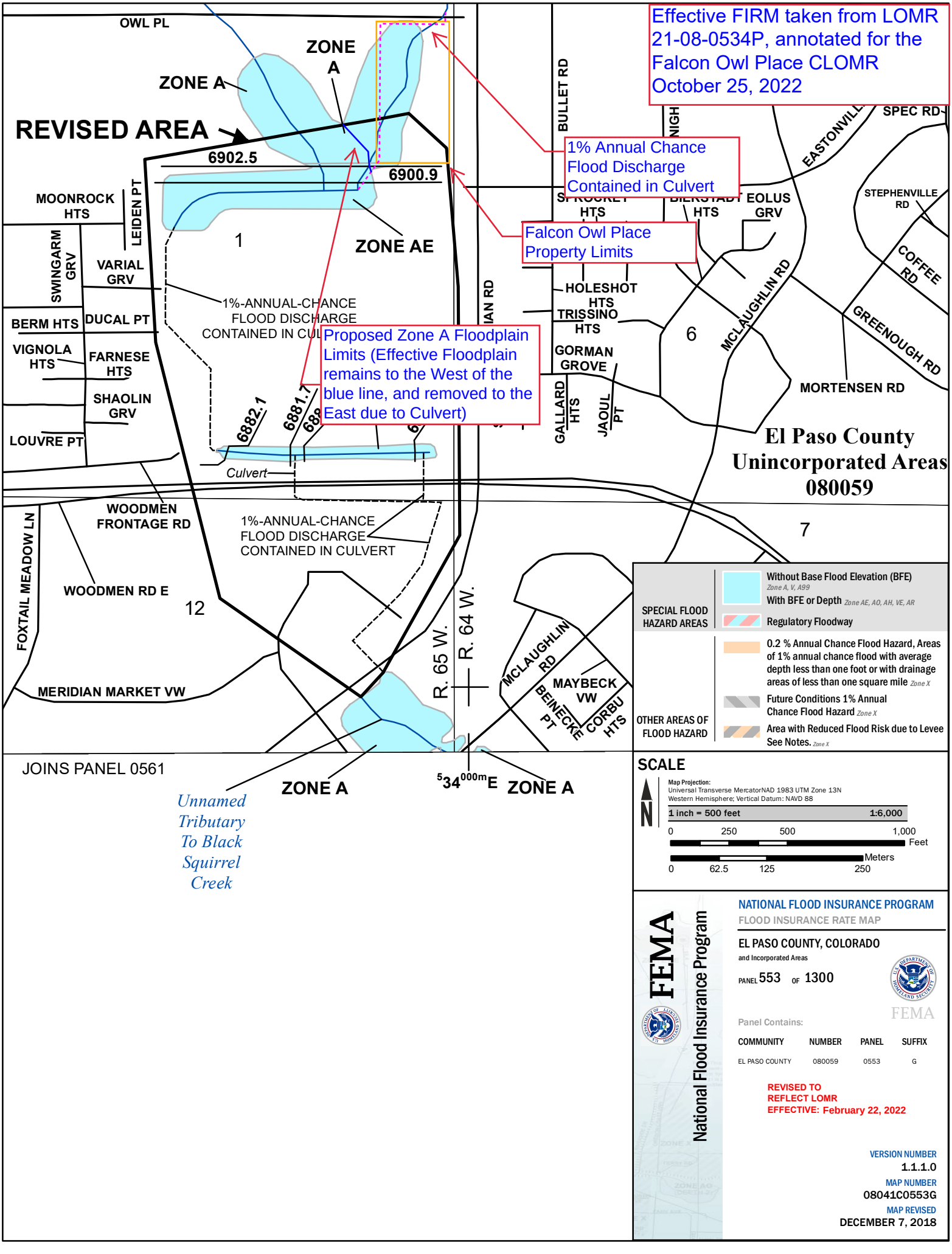
CLOMR
FLOODPLAIN
WORK MAP

PROJECT:21611-00BLWR
DRAWING NO.

FPWM

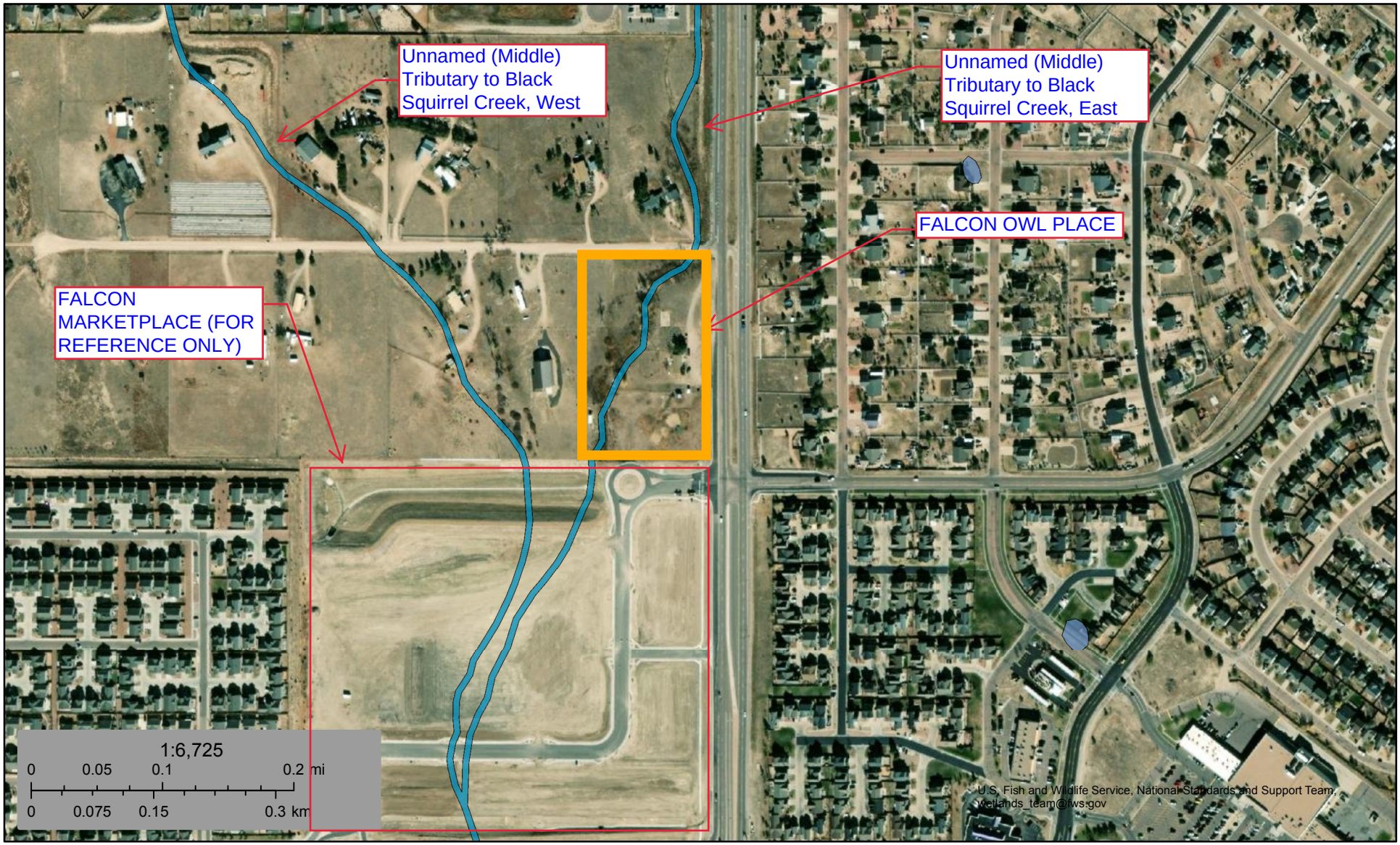
SHEET: 1 OF 1

H:\21611-00BLWR\Plans\Sheets\FPWM\FPWM.dwg, 10/25/2022 12:13:59 PM


Effective FIRM taken from LOMR 21-08-0534P, annotated for the Falcon Owl Place CLOMR October 25, 2022
1% Annual Chance Flood Discharge Contained in Culvert
Falcon Owl Place Property Limits
Proposed Zone A Floodplain Limits (Effective Floodplain remains to the West of the blue line, and removed to the East due to Culvert)
REVISED AREA
ZONE A
ZONE AE
6902.5
6900.9
6882.1
6881.7
Culvert
1%-ANNUAL-CHANCE FLOOD DISCHARGE CONTAINED IN CULVERT
OWL PL
BULLET RD
EASTONVILLE
SPEC RD
STEPHENVILLE RD
COFFEE RD
GREENOUGH RD
MCLAUGHLIN RD
MORTENSEN RD
EOLUS GRV
SPROCKET HTS
BIERSTADT HTS
HOLESHOT HTS
TRISSINO HTS
GORMAN GROVE
GALLARD HTS
JAOUL PT
MOONROCK HTS
LEIDEN PT
SWINGARM GRV
VARIAL GRV
BERM HTS
DUCAL PT
VIGNOLA HTS
FARNESE HTS
SHAOLIN GRV
LOUVRE PT
WOODMEN FRONTAGE RD
WOODMEN RD E
FOXTAIL MEADOW LN
MERIDIAN MARKET VW
MAYBECK VW
BEINECKE PT
CORBU HTS
1
6
7
12
R. 65 W.
R. 64 W.
534000mE
El Paso County Unincorporated Areas 080059
JOINS PANEL 0561
Unnamed Tributary To Black Squirrel Creek
SPECIAL FLOOD HAZARD AREAS
Without Base Flood Elevation (BFE) Zone A, V, A99
With BFE or Depth Zone AE, AO, AH, VE, AR
Regulatory Floodway
OTHER AREAS OF FLOOD HAZARD
0.2 % Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile Zone X
Future Conditions 1% Annual Chance Flood Hazard Zone X
Area with Reduced Flood Risk due to Levee See Notes. Zone X
SCALE
N
Map Projection:
Universal Transverse MercatorNAD 1983 UTM Zone 13N
Western Hemisphere; Vertical Datum: NAVD 88
1 inch = 500 feet 1:6,000
0 250 500 1,000 Feet
0 62.5 125 250 Meters
FEMA
National Flood Insurance Program
NATIONAL FLOOD INSURANCE PROGRAM
FLOOD INSURANCE RATE MAP
EL PASO COUNTY, COLORADO
and Incorporated Areas
PANEL 553 OF 1300
Panel Contains:
COMMUNITY NUMBER PANEL SUFFIX
EL PASO COUNTY 080059 0553 G
REVISED TO REFLECT LOMR EFFECTIVE: February 22, 2022
VERSION NUMBER 1.1.1.0
MAP NUMBER 08041C0553G
MAP REVISED DECEMBER 7, 2018

U.S. Fish and Wildlife Service
National Wetlands Inventory

Falcon Owl Place NWI



May 27, 2022

Wetlands

- Estuarine and Marine Deepwater
- Estuarine and Marine Wetland
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Other
- Riverine

This map is for general reference only. The US Fish and Wildlife Service is not responsible for the accuracy or currentness of the base data shown on this map. All wetlands related data should be used in accordance with the layer metadata found on the Wetlands Mapper web site.

FINAL DRAINAGE REPORT

for

FALCON MARKETPLACE

El Paso County, Colorado

November 4, 2019

SF-19-001

Prepared for:

LG HI Falcon, LLC.
3953 Maple Ave, #290
Dallas, TX 75219
Contact: Ben Hummel
(214) 416-9820

Prepared by:

Drexel, Barrell & Co.
3 South 7th Street
Colorado Springs, CO 80905
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(719) 260-0887

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FINAL DRAINAGE REPORT
for
FALCON MARKETPLACE
Falcon, Colorado

1.0 CERTIFICATION STATEMENTS

ENGINEER'S STATEMENT

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

Tim D. McConnell, P.E.
Colorado P.E. License No. 33797
For and on Behalf of Drexel, Barrell & Co.

COLORADO REGISTERED TIM D. McCONNELL 33797 12-18-19 PROFESSIONAL ENGINEER

Date

DEVELOPER'S STATEMENT

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

Business Name: LG HI Falcon, LLC.

By: _____ 12-18-19
Ben Hummel Date

Title: Owner
Address: 3953 Maple Ave, #290
Dallas, TX 75219

EL PASO COUNTY

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

For the County Engineer
CONDITIONS:

Approved
By: Elizabeth Nijkamp
Date:12/19/2019
El Paso County Planning & Community Development

Peak Discharges for the Future Developed Conditions at Points of Interest in vicinity of Falcon Marketplace Development (DBPS) without Pond SR4

Location	Future Conditions, with existing drainage infrastructure (source: Falcon Basin, DBPS, HEC-HMS model)								
	HEC-HMS Element	Area (sq mi)	Basin/ Design Point	Peak Flow (cfs)					
				2-yr	5-yr	10-yr	25-yr	50-yr	100-yr
West Branch at North Property Line of Falcon Marketplace	RMT062	0.29	1	1	11	25	62	110	160
East Branch at North Property Line of Falcon Marketplace	RMT064	0.67	2	120	270	370	590	710	850
Local Basin	MT060	0.19	MT060	30	59	83	140	170	200
Downstream of Proposed Falcon Marketplace Pond SR4	JMT060	1.16	3	130	310	430	690	840	1000
Local Basin	MT070	0.2	MT070	25	50	69	110	140	170
E. Woodmen Road, South Property Line of Falcon Marketplace	JMT070	1.36	4	150	350	490	800	980	**1200**

Peak Discharges for the Future Developed Conditions at Points of Interest in vicinity of Falcon Marketplace Development (DBPS) with Pond SR4

Location	Future Conditions, with existing drainage infrastructure and Pond SR4 (Pond #1) (source: Falcon Basin, DBPS, HEC-HMS model)								
	HEC-HMS Element	Area (sq mi)	Basin/ Design Point	Peak Flow (cfs)					
				2-yr	5-yr	10-yr	25-yr	50-yr	100-yr
West Branch at North Property Line of Falcon Marketplace	RMT062	0.29	1	5	21	34	64	81	99
East Branch at North Property Line of Falcon Marketplace	RMT064	0.67	2	121	273	373	591	712	847
Local Basin	MT060	0.19	MT060	30	59	83	137	167	199
Sub Regional Pond SR4 (Pond #1) Inflow		1.16		133	310	431	697	847	1016
Sub Regional Pond SR4 (Pond #1) Outflow	JMT060	1.16	3	27	142	246	467	595	727
Local Basin	MT070	0.2	MT070	25	50	69	114	139	165
E. Woodmen Road, South Property Line of Falcon Marketplace	JMT070	1.36	4	31	162	281	535	685	**844**

As shown by the above tables, the existing 100-year discharge to E. Woodmen Road at the south property line (JMT070) is 760-cfs. Future developed conditions with no drainage improvements result in a 100-year discharge at JMT070 of 1200-cfs, hence the need for drainage improvements recommended by the DBPS.

The DBPS went on to study the placement of a sub-regional detention facility (Pond SR4) on the Falcon Marketplace property, resulting in a 100-year discharge of 844-cfs at JMT070. To be in conformance with the DBPS recommendations and current drainage criteria, the allowable 100-year discharge from the Falcon Marketplace development can be no greater than **760-cfs**. The following describes the further refining of the Pond SR4 design, and other improvements required in order for the release in conformance.

Proposed Development & CLOMR Study

On October 17, 2016 a CLOMR, prepared by Drexel, Barrell & Co., was submitted to FEMA. The CLOMR specifically details how the Falcon Marketplace development proposes filling the site and rerouting the UTBSC. This will be accomplished by intercepting the existing creek at the north property line and conveying it via a rundown into a sub-regional detention pond (SR4 - Pond #1), as recommended by the DBPS.

Pond #1 Inflow/Outflow/Stage/Storage Parameters

Recurrence Interval	Pond Inflow (cfs)	Pond Outflow (cfs)	Water Surface Elevation (ft)	Storage Volume (ac-ft)
100-year	1,016	644	6897.0	26.6
50-year	847	481	6896.4	24.5
25-year	697	338	6895.8	22.5
10-year	431	106	6894.6	18.3
5-year	310	52	6894.2	17.0
2-year	133	12	6891.8	10.0

Peak discharges resulting from proposed Pond #1 are summarized above.

Pond #1 will discharge to a new 96" RCP storm drainage system which will flow from south to east across the property and discharge to a section of grass-lined channel that parallels the south perimeter of the property.

Onsite runoff generated from the site, represented as a portion of MT070 in the HEC-HMS model, will be conveyed via curb and gutter, and storm sewer to proposed water quality basins at the south end of the site. The water quality basins will discharge into the open grass-lined channel along the south perimeter of the site.

Specific developed runoff quantities for the site were determined using the Rational Method and are discussed further in section 5.0 of this report.

The open grass-lined channel will then discharge into two sets of existing triple 48" culverts under E. Woodmen Road. Detention pond #1, 96" pipe and open channel are all designed to convey the full 100-year discharge.

No changes to the existing culverts under E. Woodmen Road are proposed. HY-8 software was used to quantify a 765-cfs total capacity of the existing culverts with the culvert headwater at the elevation of the north edge of the roadway pavement.

Specific developed runoff quantities for the site were determined using the Rational Method and are discussed further in section 5.0 of this report.

Peak Discharges at Points of Interest of Falcon Marketplace

Location	Future Conditions, with existing drainage infrastructure + Falcon Marketplace Development (Source: Falcon Marketplace, HEC-HMS model)							
	HEC-HMS Element	Area (sq mi)	Peak Flow (cfs)					
			2-yr	5-yr	10-yr	25-yr	50-yr	100-yr
West branch at North Property Line of Falcon Marketplace	RMT062	0.29	5	21	34	64	81	99
East branch at North Property Line of Falcon Marketplace	RMT064	0.67	121	273	373	591	712	847
Local Basin	MT060	0.19	30	59	83	137	167	199
Sub Regional Pond SR4 Inflow	-	1.16	133	310	431	697	847	1016
Sub Regional Pond SR4 Outflow	JMT060	1.16	12	52	106	338	481	**644**
Local Basin (Falcon Marketplace)	MT070	0.20	30	57	79	129	157	186
E. Woodmen Road, South Property Line of Falcon Marketplace	JMT070	1.36	32	62	119	398	562	**757**

Per the above table, the 100-year discharge at the south property line is 757-cfs, which is less than the capacity of the existing culverts (765-cfs), and also less than the maximum allowable 100-year discharge (760-cfs) identified by the DBPS.

5.0 UPSTREAM DRAINAGE DIVERSIONS

During the drainage analysis for this Falcon Marketplace project, it came to light that upstream drainage diversions had taken place as part of the Bent Grass subdivision to the north. These diversions were not studied as part of this report, but will need to be addressed with any further development upstream.

6.0 EXISTING CONDITION HYDROLOGY SUMMARY

In addition to the DBPS, in order to confirm the "local basin (Falcon Marketplace)" flows listed above, a site specific analysis of the existing conditions was completed.

MyReport

Total Runoff (cfs)	Vel Ave (ft/s)	Vel Dn (ft/s)	Vel Hd Dn (ft)	Vel Hd Up (ft)	Vel Up (ft/s)	Cover Dn (ft)	Cover Up (ft)	Storage (cft)	
0.00	4.91	5.90	0.54	0.24	3.92	2.00	1.92	559.85	

Project File: P3-OUT-STM.stm	Number of lines: 1	Date: 7/18/2019

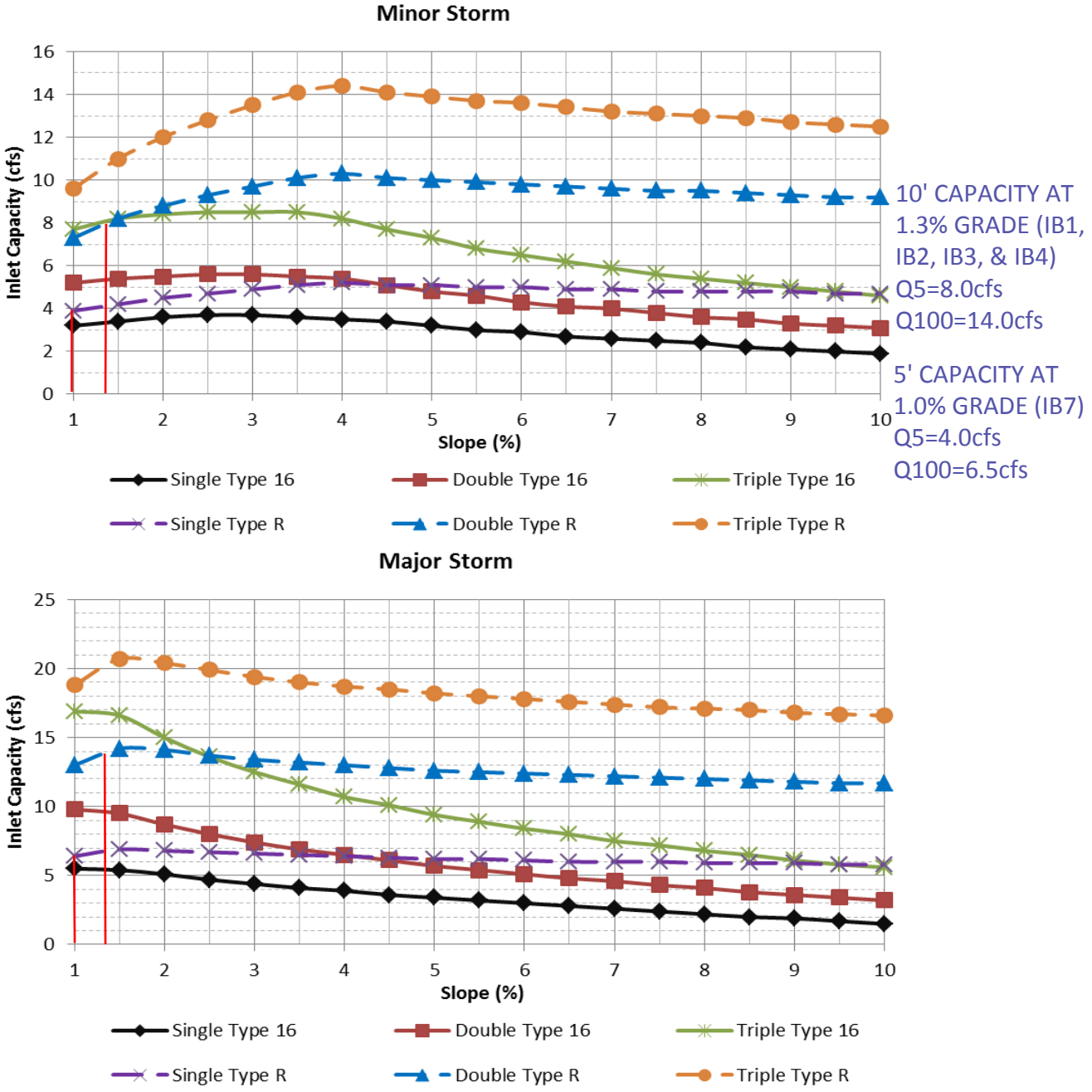
NOTES: ** Critical depth

Inlet Summary (see figures 8-7, 8-10 & 8-11)

			Flow		Capacity	
Inlet	**Type**		**Q5 (cfs)**	**Q100 (cfs)**	**Q5 (cfs)**	**Q100 (cfs)**
IA1	10' Type R	sump	3.4	7.7		
IB1	10' Type R	at-grade	2.8	5.1	8.0	14.0
IB2	10' Type R	at-grade	2.0	3.7	8.0	14.0
IB3	10' Type R	at-grade	1.4	2.5	8.0	14.0
IB4	10' Type R	at-grade	0.8	1.4	8.0	14.0
IB5	10' Type R	sump	0.8	1.5	10.5	10.5
IB6	10' Type R	sump	0.9	1.6	10.5	10.5
IB7	5' Type R	at-grade	1.6	2.9	4.0	6.5
IB8	10' Type R	sump	1.6	2.9	10.5	10.5
IB9	10' Type R	sump	1.5	2.7	10.5	10.5
IC1	5' Type R	sump	1.3	2.6	6.5	6.5
IC3	5' Type R	sump	0.8	1.5	6.5	6.5

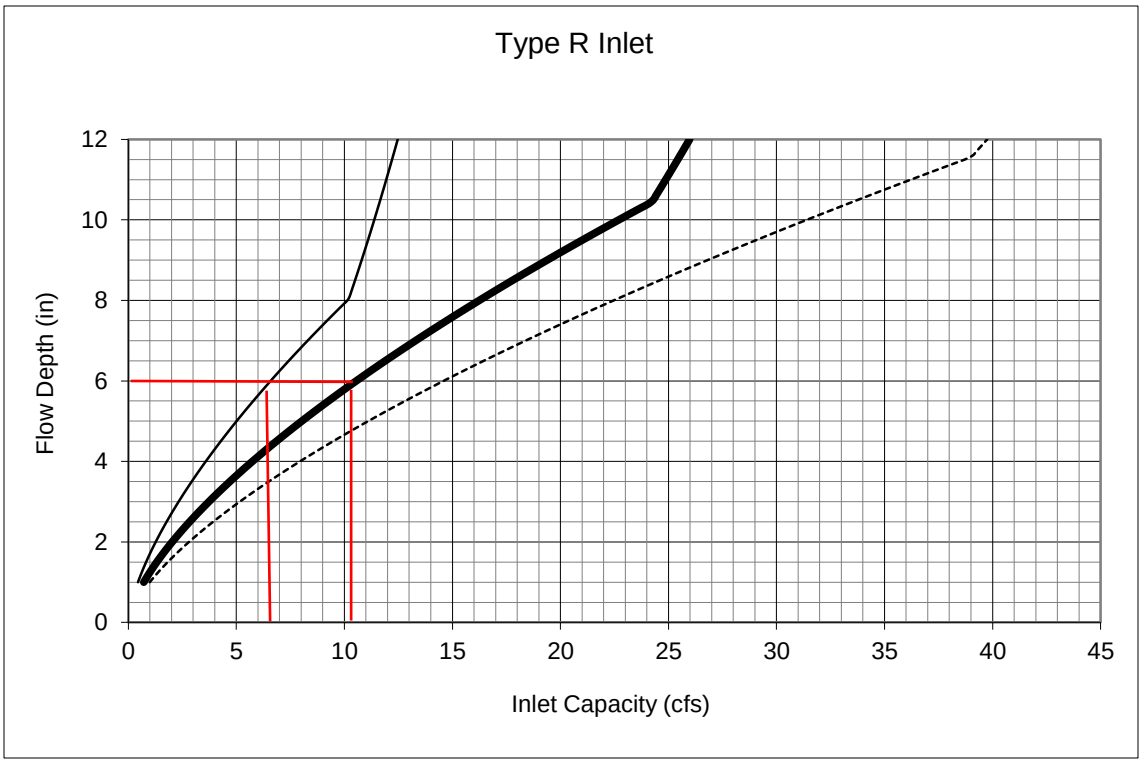
Figure 8-7. Inlet Capacity Chart Continuous Grade Conditions, Residential (Local)
(Attached and Detached Sidewalk)

Street Section Data: Street Width Flowline to Flowline = 34'
Type of Curb and Gutter: D-10-R = 8" vertical
Type 16 = 6" vertical



The standard street section parameters as defined in Chapter 7 must apply to use these charts. For non-standard sections, the inlet capacity shall be calculated using the UDFCD spreadsheets. The maximum spread width is limited by the curb height based on no curb overtopping during a minor storm and flow being contained within the public right-of-way during the major storm. Calculations were done using UD-Inlet 3.00.xls, Mar., 2011 with the default clogging factors.

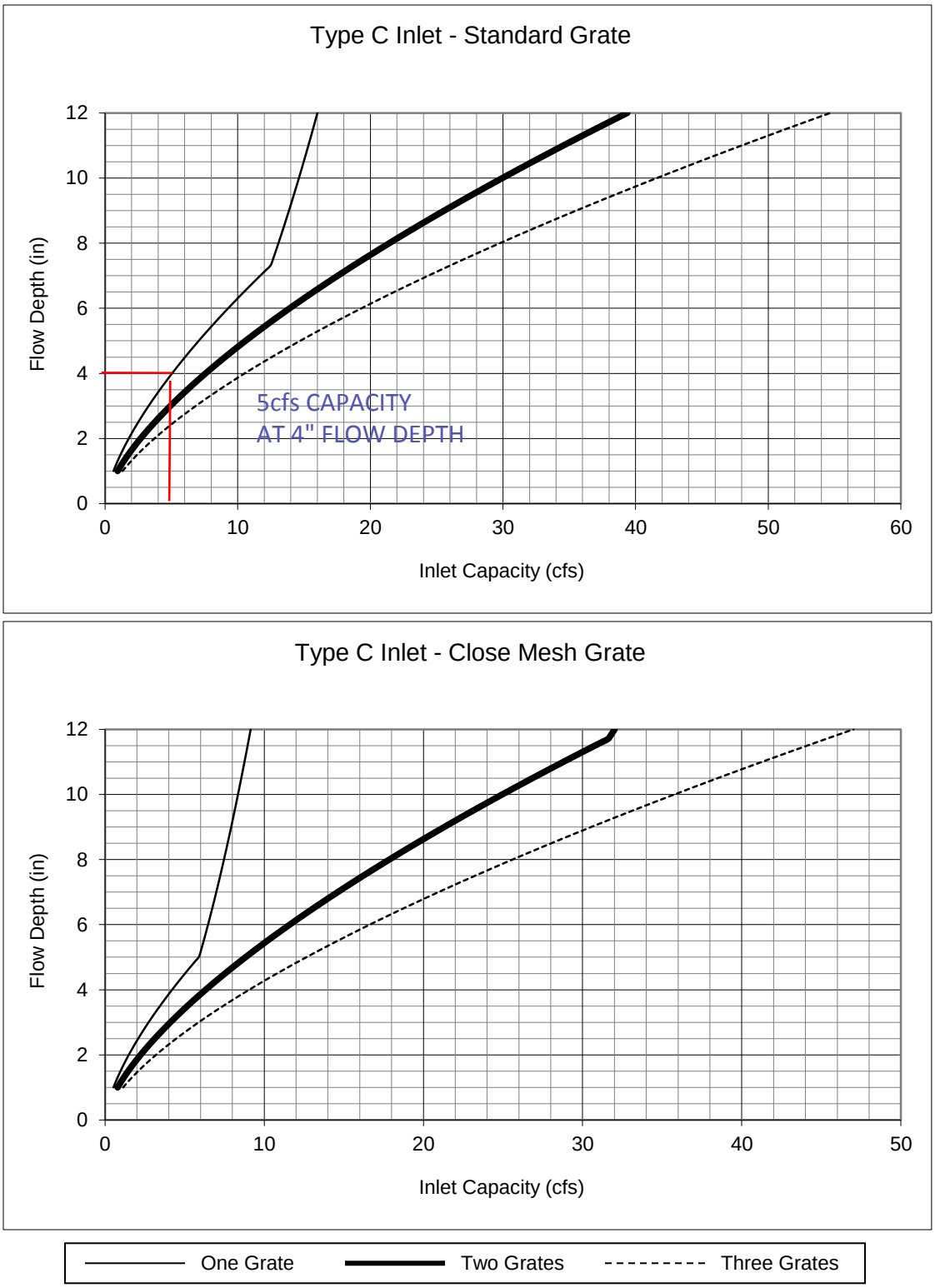
Figure 8-11. Inlet Capacity Chart Sump Conditions , Curb Opening (Type R) Inlet



Notes:

1. The standard inlet parameters must apply to use this chart.

Figure 8-10. Inlet Capacity Chart Sump Conditions, Area (Type C) Inlet



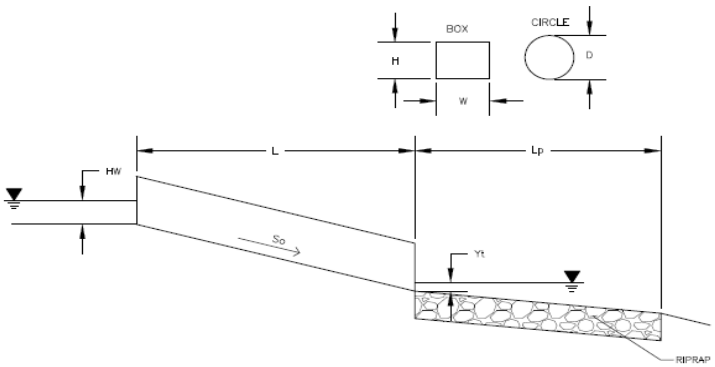
INLET IA2
Q5=0.0cfs
Q100= 0.2cfs

INLET IC2
Q5=0.0cfs
Q100=0.3cfs

Notes:
1. The standard inlet parameters must apply to use these charts.

Determination of Culvert Headwater and Outlet Protection

Project: Falcon Marketplace
Basin ID: DP27



Soil Type:
Choose One:
(•) Sandy
( ) Non-Sandy

Supercritical Flow! Using Da to calculate protection type

Design Information (Input):

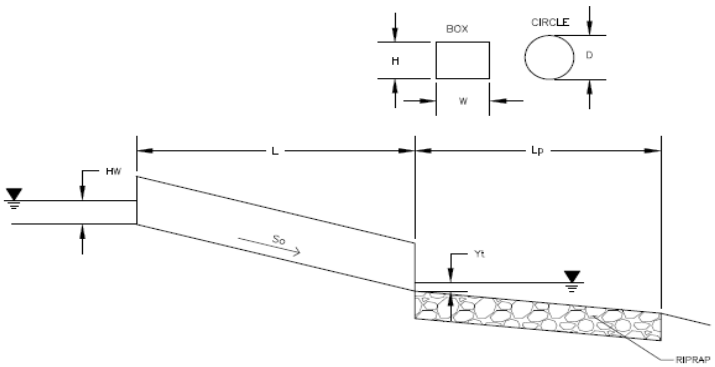
	Design Discharge	Q =	1.9	cfs
Circular Culvert:				
	Barrel Diameter in Inches	D =	18	inches
	Inlet Edge Type (Choose from pull-down list)		Square End with Headwall	
Box Culvert:			**OR**	
	Barrel Height (Rise) in Feet	Height (Rise) =		ft
	Barrel Width (Span) in Feet	Width (Span) =		ft
	Inlet Edge Type (Choose from pull-down list)			
	Number of Barrels	No =	1	
	Inlet Elevation	Elev IN =	6885.5	ft
	Outlet Elevation **OR** Slope	Elev OUT =	6885	ft
	Culvert Length	L =	24	ft
	Manning's Roughness	n =	0.012	
	Bend Loss Coefficient	k_b =	0	
	Exit Loss Coefficient	k_x =	1	
	Tailwater Surface Elevation	Elev Y_t =		ft
	Max Allowable Channel Velocity	V =	5	ft/s

Required Protection (Output):

	Tailwater Surface Height	Y_t =	0.60	ft
	Flow Area at Max Channel Velocity	A_t =	0.38	ft^2
	Culvert Cross Sectional Area Available	A =	1.77	ft^2
	Entrance Loss Coefficient	k_e =	0.50	
	Friction Loss Coefficient	k_f =	0.37	
	Sum of All Losses Coefficients	k_s =	1.87	ft
	Culvert Normal Depth	Y_n =	0.34	ft
	Culvert Critical Depth	Y_c =	0.52	ft
	Tailwater Depth for Design	d =	1.01	ft
	Adjusted Diameter **OR** Adjusted Rise	D_a =	0.92	ft
	Expansion Factor	1/(2*tan(Θ)) =	6.70	
	Flow/Diameter$^{2.5}$ **OR** Flow/(Span * Rise$^{1.5}$)	Q/D^2.5 =	0.69	$ft^{0.5}/s$
	Froude Number	Fr =	2.22	**Supercritical!**
	Tailwater/Adjusted Diameter **OR** Tailwater/Adjusted Rise	Yt/D =	0.65	
	Inlet Control Headwater	HW_I =	0.71	ft
	Outlet Control Headwater	HW_O =	0.54	
	Design Headwater Elevation	**HW =**	**6,886.21**	**ft**
	Headwater/Diameter OR Headwater/Rise Ratio	**HW/D =**	**0.47**	
	Minimum Theoretical Riprap Size	d_{50} =	1	in
	Nominal Riprap Size	d_{50} =	6	in
	UDFCD Riprap Type	**Type =**	**VL**	
	Length of Protection	**L_p =**	**5**	**ft**
	Width of Protection	**T =**	**3**	**ft**

Determination of Culvert Headwater and Outlet Protection

Project: Falcon Marketplace
Basin ID: DP30



Soil Type:
Choose One:
(●) Sandy
( ) Non-Sandy

Supercritical Flow! Using Da to calculate protection type

Design Information (Input):

	Design Discharge	Q =	6.6	cfs
Circular Culvert:				
	Barrel Diameter in Inches	D =	18	inches
	Inlet Edge Type (Choose from pull-down list)		Square End with Headwall	
Box Culvert:			**OR**	
	Barrel Height (Rise) in Feet	Height (Rise) =		ft
	Barrel Width (Span) in Feet	Width (Span) =		ft
	Inlet Edge Type (Choose from pull-down list)			
	Number of Barrels	No =	1	
	Inlet Elevation	Elev IN =	6879.49	ft
	Outlet Elevation **OR** Slope	Elev OUT =	6875	ft
	Culvert Length	L =	90.1	ft
	Manning's Roughness	n =	0.012	
	Bend Loss Coefficient	k_b =	0	
	Exit Loss Coefficient	k_x =	1	
	Tailwater Surface Elevation	Elev Y_t =		ft
	Max Allowable Channel Velocity	V =	5	ft/s

Required Protection (Output):

	Tailwater Surface Height	Y_t =	0.60	ft
	Flow Area at Max Channel Velocity	A_t =	1.32	ft^2
	Culvert Cross Sectional Area Available	A =	1.77	ft^2
	Entrance Loss Coefficient	k_e =	0.50	
	Friction Loss Coefficient	k_f =	1.39	
	Sum of All Losses Coefficients	k_s =	2.89	ft
	Culvert Normal Depth	Y_n =	0.52	ft
	Culvert Critical Depth	Y_c =	0.99	ft
	Tailwater Depth for Design	d =	1.25	ft
	Adjusted Diameter **OR** Adjusted Rise	D_a =	1.01	ft
	Expansion Factor	1/(2*tan(Θ)) =	6.66	
	Flow/Diameter$^{2.5}$ **OR** Flow/(Span * Rise$^{1.5}$)	Q/D^2.5 =	2.40	$ft^{0.5}/s$
	Froude Number	Fr =	3.45	**Supercritical!**
	Tailwater/Adjusted Diameter **OR** Tailwater/Adjusted Rise	Yt/D =	0.59	
	Inlet Control Headwater	HW_I =	1.53	ft
	Outlet Control Headwater	HW_O =	-2.62	
	Design Headwater Elevation	**HW =**	**6,881.02**	**ft**
	Headwater/Diameter OR Headwater/Rise Ratio	**HW/D =**	**1.02**	
	Minimum Theoretical Riprap Size	d_{50} =	3	in
	Nominal Riprap Size	d_{50} =	6	in
	UDFCD Riprap Type	**Type =**	**VL**	
	Length of Protection	**L_p =**	**5**	**ft**
	Width of Protection	**T =**	**3**	**ft**

DETENTION VOLUME BY THE FULL SPECTRUM METHOD

Project: _____

Basin ID: _____

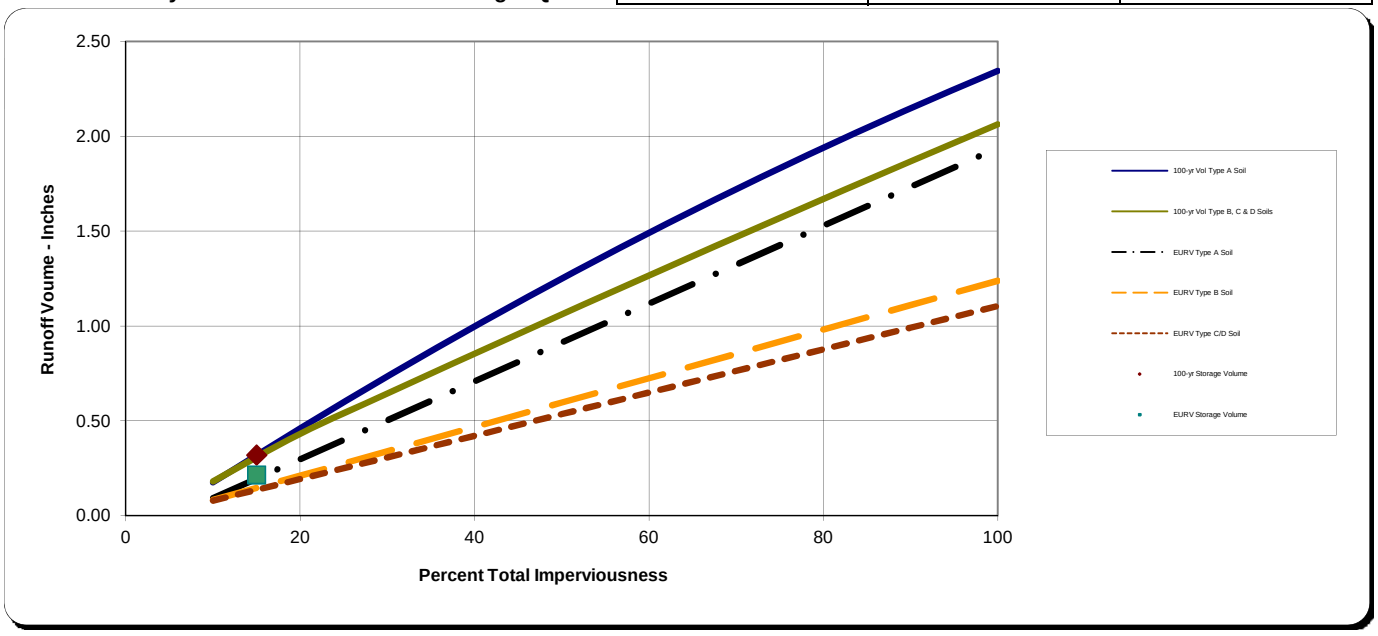
* User input data shown in blue.

Area of Watershed (acres)	740.00	
Subwatershed Imperviousness	15.0%	
Level of Minimizing Directly Connected Impervious Area (MDCIA)	0	0
Effective Imperviousness[1]	15.0%	

Hydrologic Soil Type	**Percentage of Area**	**Area (acres)**
Type A	100.0%	740.0
Type B		0.0
Type C or D		0.0

Recommended Horton's Equation Parameters for CUHP		
Infiltration (inches per hour)		**Decay Coefficient--α**
Initial--f_i	**Final--f_o**	
5	1.0	0.0007

	Detention Volumes [2,5]		
	(watershed inches)	**(acre-feet)**	**Maximum Allowable Release Rate, cfs**[3]
Excess Urban Runoff Volume[4]	0.22	13.30	Design Oulet to Empty EURV in 72 Hours
100-year Detention Volume Including WQCV [5]	0.32	19.72	370.00



Notes:

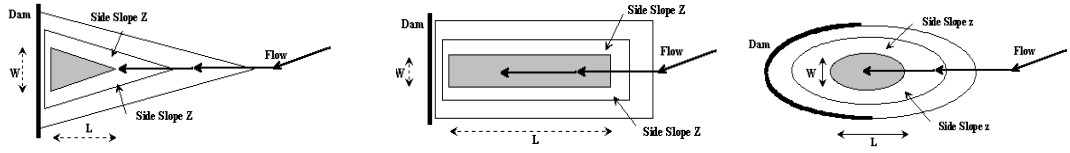
1) Effective imperviousness is based on Figure ND-1 of the Urban Storm Drainage Criteria Manual (USDCM).

2) Results shown reflect runoff reduction from Level 1 or 2 MDCIA and are plotted at the watershed's total imperviousness value; the impact of MDCIA is reflected by the results being below the curves.

3) Maximum allowable release rates for 100-year event are based on Table SO-1. Outlet for the Excess Urban Runoff Volume (EURV) to be designed to empty out the EURV in 72 hours. Outlet design is similar to one for the WQCV outlet of an extended detention basin (i.e., perforated plate with a micro-pool) and extends to top of EURV water surface elevation.

4) EURV approximates the difference between developed and pre-developed runoff volume.

5) 100-yr detention volume includes EURV. No need to add more volume for WQCV or EURV



STAGE-STORAGE SIZING FOR DETENTION BASINS

Project: FALCON MARKETPLACE
Basin ID: NORTH POND #1

Design Information (Input):

Width of Basin Bottom, W = ______ ft
Length of Basin Bottom, L = ______ ft
Dam Side-slope (H:V), Z_d = ______ ft/ft

Check Basin Shape

Right Triangle ______ OR…
Isosceles Triangle ______ OR…
Rectangle ______ OR…
Circle / Ellipse ______ OR…
Irregular ______ (Use Overide values in cells G32:G52)

Stage-Storage Relationship:

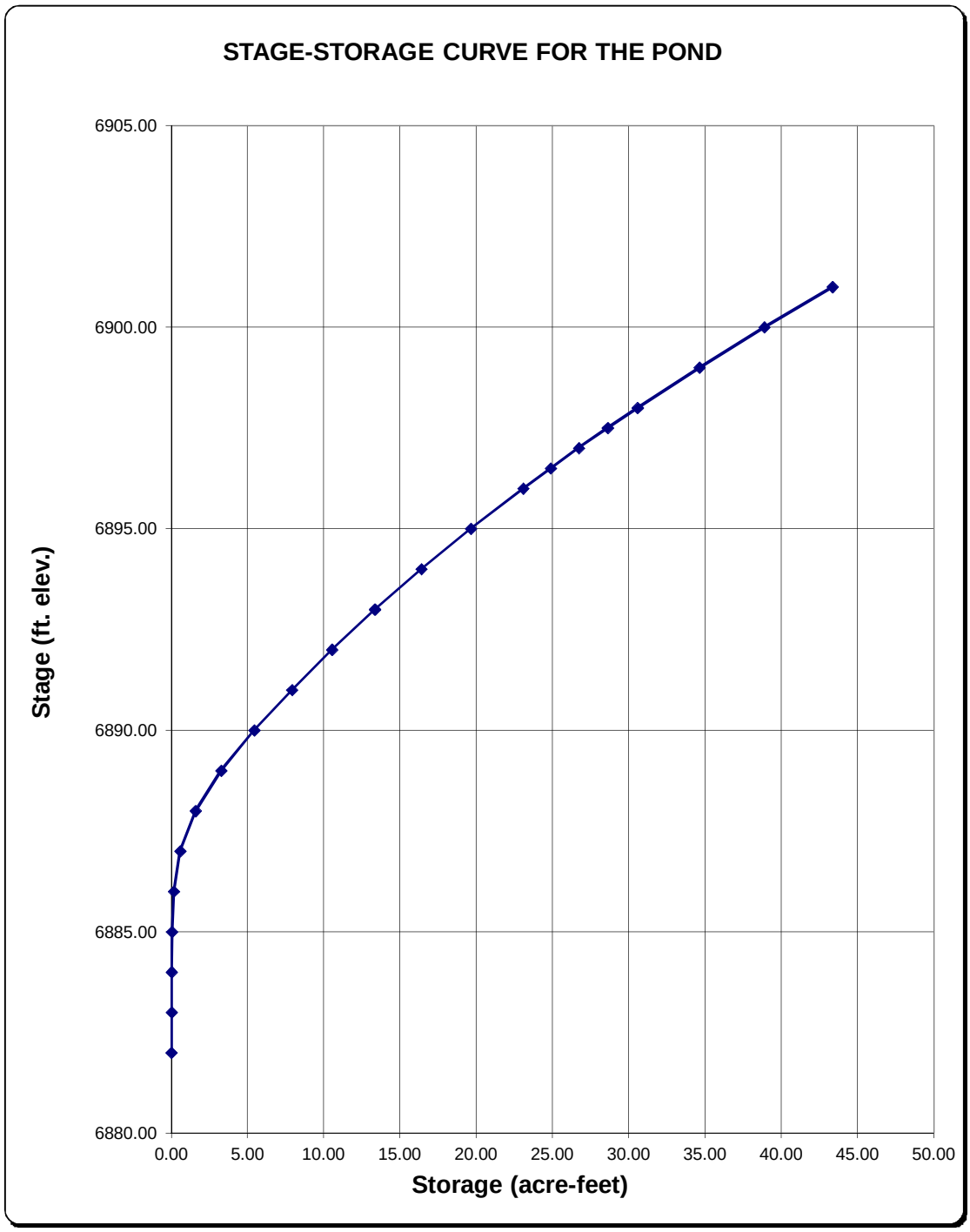
	MINOR	MAJOR	
Storage Requirement from Sheet 'Modified FAA':			acre-ft.
Storage Requirement from Sheet 'Hydrograph':			acre-ft.
Storage Requirement from Sheet 'Full-Spectrum':	13.30	19.72	acre-ft.

Labels for WQCV, Minor, & Major Storage Stages (input)	Water Surface Elevation ft (input)	Side Slope (H:V) ft/ft Below El.	Basin Width at Stage ft (output)	Basin Length at Stage ft (output)	Surface Area at Stage ft^2 (output)	Surface Area at Stage ft^2 User Overide	Volume Below Stage ft^3 (output)	Surface Area at Stage acres (output)	Volume Below Stage acre-ft (output)	Target Volumes for WQCV, Minor, & Major Storage Volumes (for goal seek)
	6882.00	(input)				531		0.012	0.000	
	6883.00		0.00	0.00		531	531	0.012	0.012	
	6884.00		0.00	0.00		531	1,062	0.012	0.024	
	6885.00		0.00	0.00		886	1,771	0.020	0.041	
	6886.00		0.00	0.00		9,189	6,808	0.211	0.156	
	6887.00		0.00	0.00		27,880	25,343	0.640	0.582	
	6888.00		0.00	0.00		60,263	69,414	1.383	1.594	
	6889.00		0.00	0.00		85,329	142,210	1.959	3.265	
	6890.00		0.00	0.00		103,874	236,812	2.385	5.436	
	6891.00		0.00	0.00		111,922	344,710	2.569	7.913	
	6892.00		0.00	0.00		116,616	458,979	2.677	10.537	
WQCV	6893.00		0.00	0.00		128,472	581,523	2.949	13.350	
	6894.00		0.00	0.00		136,926	714,222	3.143	16.396	
	6895.00		0.00	0.00		145,498	855,434	3.340	19.638	
	6896.00		0.00	0.00		154,188	1,005,277	3.540	23.078	
	6896.50		0.00	0.00		158,590	1,083,471	3.641	24.873	
100-YR	6897.00		0.00	0.00		162,992	1,163,867	3.742	26.719	
	6897.50		0.00	0.00		167,639	1,246,524	3.848	28.616	
	6898.00		0.00	0.00		172,286	1,331,506	3.955	30.567	
	6899.00		0.00	0.00		181,155	1,508,226	4.159	34.624	
	6900.00		0.00	0.00		190,124	1,693,866	4.365	38.886	
	6901.00		0.00	0.00		199,194	1,888,525	4.573	43.355	
							#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	
							#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	
							#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	
							#N/A		#N/A	

STAGE-STORAGE SIZING FOR DETENTION BASINS

Project: _____

Basin ID: _____



STAGE-DISCHARGE SIZING OF THE WATER QUALITY CAPTURE VOLUME (WQCV) OUTLET

Project: FALCON MARKETPLACE
Basin ID: NORTH POND #1

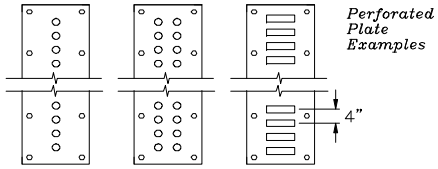
WQCV Design Volume (Input):

Catchment Imperviousness, I_a = 15.0 percent
Catchment Area, A = 740.00 acres
Depth at WQCV outlet above lowest perforation, H = 8 feet
Vertical distance between rows, h = 30.00 inches
Number of rows, NL = 3.00
Orifice discharge coefficient, C_o = 0.50
Slope of Basin Trickle Channel, S = 0.005 ft / ft
Time to Drain the Pond = 40 hours

Diameter of holes, D = 5.000 inches
Number of holes per row, N = 1
OR
Height of slot, H = inches
Width of slot, W = inches

Watershed Design Information (Input):

Percent Soil Type A = 100 %
Percent Soil Type B = %
Percent Soil Type C/D = %



Outlet Design Information (Output):

Excess Urban Runoff Volume (From 'Full-Spectrum Sheet') 0.216 watershed inches
N/A
Excess Urban Runoff Volume (From 'Full-Spectrum Sheet') 13.300 acre-feet
Outlet area per row, Ao = 69.21 square inches
Total opening area at each row based on user-input above, Ao = 19.63 square inches
Total opening area at each row based on user-input above, Ao = 0.136 square feet

3

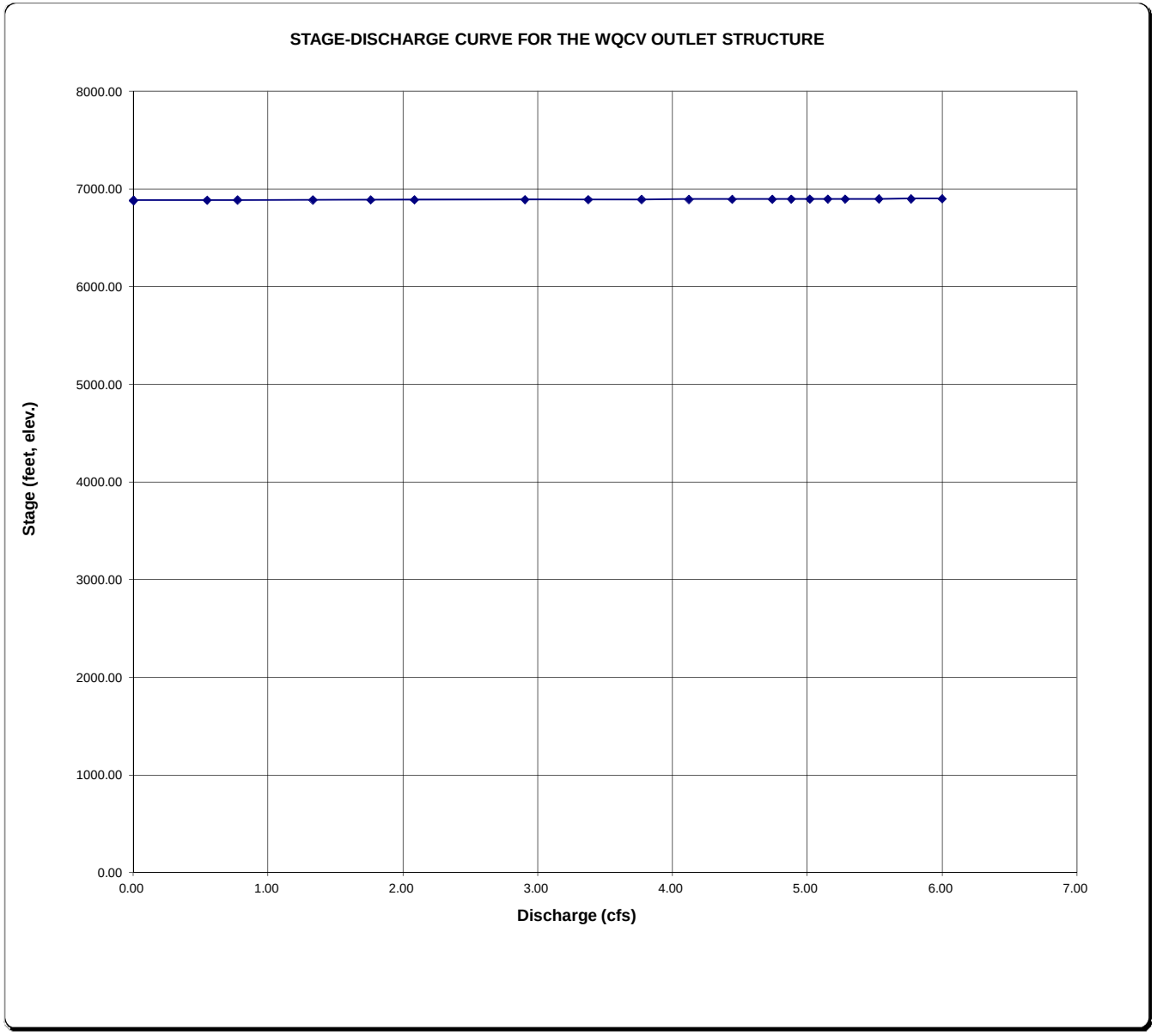
	Central Elevations of Rows of Holes in feet																								
	Row 1	Row 2	Row 3	Row 4	Row 5	Row 6	Row 7	Row 8	Row 9	Row 10	Row 11	Row 12	Row 13	Row 14	Row 15	Row 16	Row 17	Row 18	Row 19	Row 20	Row 21	Row 22	Row 23	Row 23	**Σ Flow**
	6885.00	6887.50	6890.00																						
	Collection Capacity for Each Row of Holes in cfs																								
6882.00	0.0000	0.0000	0.0000																			**0.00**
6883.00	0.0000	0.0000	0.0000																			**0.00**
6884.00	0.0000	0.0000	0.0000																			**0.00**
6885.00	0.0000	0.0000	0.0000																			**0.00**
6886.00	0.5457	0.0000	0.0000																			**0.55**
6887.00	0.7717	0.0000	0.0000																			**0.77**
6888.00	0.9452	0.3859	0.0000																			**1.33**
6889.00	1.0914	0.6683	0.0000																			**1.76**
6890.00	1.2202	0.8628	0.0000																			**2.08**
6891.00	1.3367	1.0209	0.5457																			**2.90**
6892.00	1.4438	1.1576	0.7717																			**3.37**
6893.00	1.5435	1.2798	0.9452																			**3.77**
6894.00	1.6371	1.3913	1.0914																			**4.12**
6895.00	1.7256	1.4945	1.2202																			**4.44**
6896.00	1.8099	1.5910	1.3367																			**4.74**
6896.50	1.8505	1.6371	1.3913																			**4.88**
6897.00	1.8904	1.6820	1.4438																			**5.02**
6897.50	1.9293	1.7256	1.4945																			**5.15**
6898.00	1.9675	1.7683	1.5435																			**5.28**
6899.00	2.0418	1.8505	1.6371																			**5.53**
6900.00	2.1135	1.9293	1.7256																			**5.77**
6901.00	2.1828	2.0050	1.8099																			**6.00**
	#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	#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**
	#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	#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**
	#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	#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**
	#N/A	#N/A	#N/A																			**#N/A**
	Override Area Row 1	Override Area Row 2	Override Area Row 3	Override Area Row 4	Override Area Row 5	Override Area Row 6	Override Area Row 7	Override Area Row 8	Override Area Row 9	Override Area Row 10	Override Area Row 11	Override Area Row 12	Override Area Row 13	Override Area Row 14	Override Area Row 15	Override Area Row 16	Override Area Row 17	Override Area Row 18	Override Area Row 19	Override Area Row 20	Override Area Row 21	Override Area Row 22	Override Area Row 23	Override Area Row 24	
	0.14	0.14	0.14																						

STAGE-DISCHARGE SIZING OF THE WATER QUALITY CAPTURE VOLUME (WQCV) OUTLET

Worksheet Protected

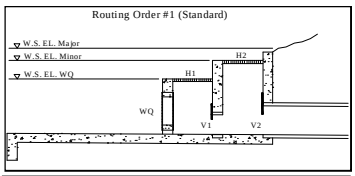
Project: FALCON MARKETPLACE

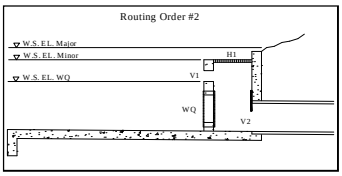
Basin ID: NORTH POND #1

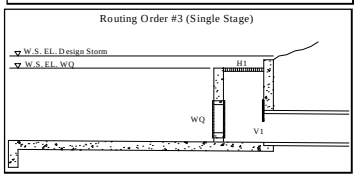


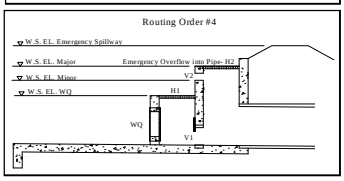
STAGE-DISCHARGE SIZING OF THE WEIRS AND ORIFICES (INLET CONTROL)

Project: **Falcon Marketplace #1**
Basin ID: **NORTH POND #1**









Current Routing Order is #3

Design Information (Input):

			#1 Horiz.	#2 Horiz.	#1 Vert.	#2 Vert.	
Circular Opening:	Diameter in Inches	Dia. =			96.00		inches
OR							
Rectangular Opening:	Width in Feet	W =	8.00				ft.
	Length (Height for Vertical)	L or H =	12.00				ft.
	Percentage of Open Area After Trash Rack Reduction	% open =	80		100		%
	Orifice Coefficient	C_o =	0.75		0.75		
	Weir Coefficient	C_w =	3.00				
	Orifice Elevation (Bottom for Vertical)	E_o =	6893.80		6,881.97		ft.

Calculation of Collection Capacity:

		#1 Horiz.	#2 Horiz.	#1 Vert.	#2 Vert.	
Net Opening Area (after Trash Rack Reduction)	A_o =	76.80		50.27		sq. ft.
OPTIONAL: User-Overide Net Opening Area	A_o =					sq. ft.
Perimeter as Weir Length	L_w =	36.80		ft.		
OPTIONAL: User-Overide Weir Length	L_w =			ft.		

Top Elevation of Vertical Orifice Opening, Top = 6889.97 ft.
Center Elevation of Vertical Orifice Opening, Cen = 6885.97 ft.

Routing 3: Single Stage - Water flows through WQCV plate and #1 horizontal opening into #1 vertical opening. This flow will be applied to culvert sheet (#2 vertical & horizontal openings is not used).

			Horizontal Orifices				Vertical Orifices			
Labels for WQCV, Minor, & Major Storage W.S. Elevations (input)	Water Surface Elevation ft (linked)	WQCV Plate/Riser Flow cfs (User-linked)	#1 Horiz. Weir Flow cfs (output)	#1 Horiz. Orifice Flow cfs (output)	#2 Horiz. Weir Flow cfs (output)	#2 Horiz. Orifice Flow cfs (output)	#1 Vert. Collection Capacity cfs (output)	#2 Vert. Collection Capacity cfs (output)	**Total Collection Capacity cfs (output)**	Target Volumes for WQCV, Minor, & Major Storage Volumes (link for goal seek)
	6882.00	0.00	0.00	0.00	0.00	0.00	0.14	0.00	**0.00**	
	6883.00	0.00	0.00	0.00	0.00	0.00	27.95	0.00	**0.00**	
	6884.00	0.00	0.00	0.00	0.00	0.00	77.34	0.00	**0.00**	
	6885.00	0.00	0.00	0.00	0.00	0.00	141.04	0.00	**0.00**	
	6886.00	0.55	0.00	0.00	0.00	0.00	216.33	0.00	**0.55**	
	6887.00	0.77	0.00	0.00	0.00	0.00	301.66	0.00	**0.77**	
	6888.00	1.33	0.00	0.00	0.00	0.00	395.95	0.00	**1.33**	
	6889.00	1.76	0.00	0.00	0.00	0.00	498.43	0.00	**1.76**	
	6890.00	2.08	0.00	0.00	0.00	0.00	607.33	0.00	**2.08**	
	6891.00	2.90	0.00	0.00	0.00	0.00	678.51	0.00	**2.90**	
	6892.00	3.37	0.00	0.00	0.00	0.00	742.90	0.00	**3.37**	
WQCV	6893.00	3.77	0.00	0.00	0.00	0.00	802.14	0.00	**3.77**	
	6894.00	4.12	9.87	206.72	0.00	0.00	857.30	0.00	**13.99**	
	6895.00	4.44	145.12	506.36	0.00	0.00	909.11	0.00	**149.56**	
	6896.00	4.74	360.25	685.61	0.00	0.00	958.13	0.00	**364.99**	
	6896.50	4.88	489.80	759.53	0.00	0.00	981.72	0.00	**494.67**	
100-YR	6897.00	5.02	631.97	826.88	0.00	0.00	1004.76	0.00	**636.98**	
	6897.50	5.15	785.73	889.13	0.00	0.00	1027.28	0.00	**790.88**	
	6898.00	5.28	950.26	947.31	0.00	0.00	1049.32	0.00	**952.58**	
	6899.00	5.53	1309.10	1054.06	0.00	0.00	1092.06	0.00	**1059.59**	
	6900.00	5.77	1704.34	1150.96	0.00	0.00	1133.19	0.00	**1133.19**	
	6901.00	6.00	2132.89	1240.31	0.00	0.00	1172.88	0.00	**1172.88**	
		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.00	**#N/A**	
		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.00	**#N/A**	
		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.00	**#N/A**	
		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.00	**#N/A**	
		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.00	**#N/A**	
		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.00	**#N/A**	
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		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.00	**#N/A**	
		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.00	**#N/A**	
		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.00	**#N/A**	
		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.00	**#N/A**	
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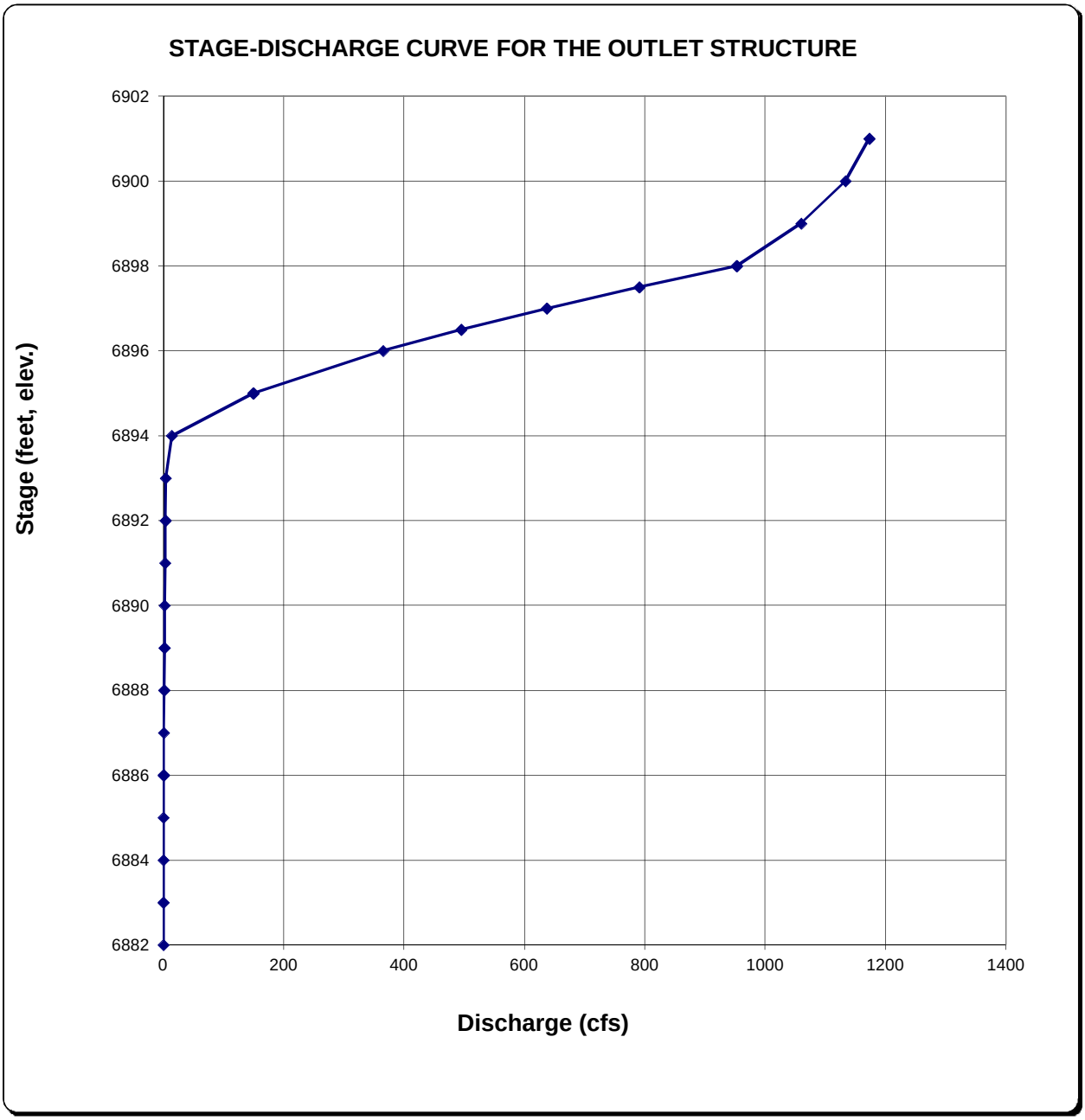
		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.00	**#N/A**	
		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.00	**#N/A**	
		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.00	**#N/A**	
		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.00	**#N/A**	
		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.00	**#N/A**	

STAGE-DISCHARGE SIZING OF THE WEIRS AND ORIFICES (INLET CONTROL)

Project: Falcon Marketplace #1
Basin ID: NORTH POND #1

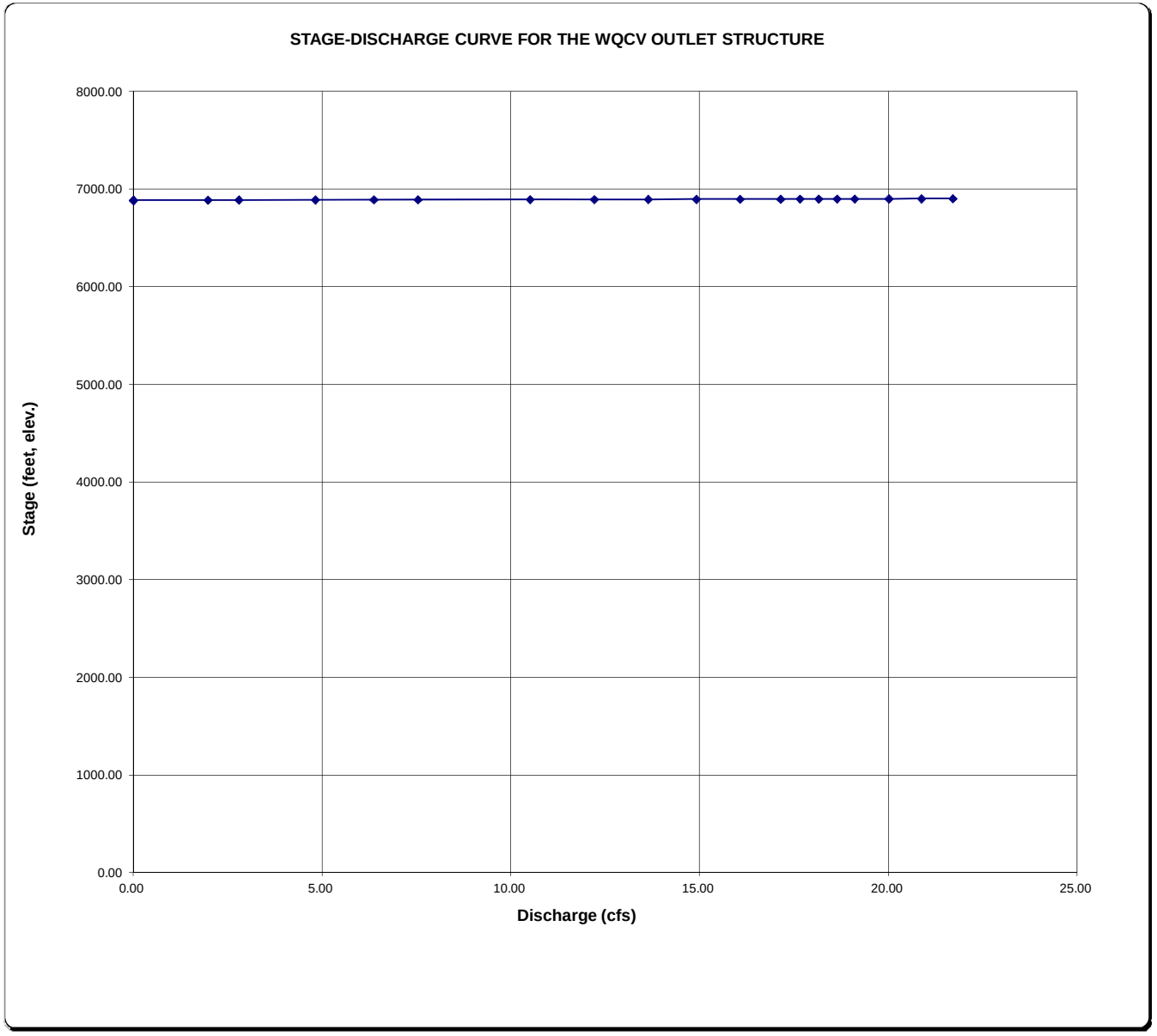


STAGE-DISCHARGE SIZING OF THE WATER QUALITY CAPTURE VOLUME (WQCV) OUTLET

Worksheet Protected

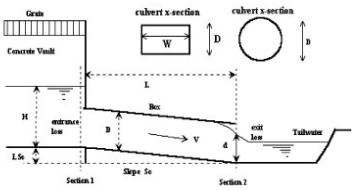
Project: FALCON MARKETPLACE

Basin ID: NORTH POND #1



STAGE-DISCHARGE SIZING OF THE OUTLET CULVERT (INLET vs. OUTLET CONTROL WITH TAILWATER EFFECTS)

Project: **FALCON MARKETPLACE**
Basin ID: **NORTH POND #1**



Status: Culvert Data is valid!

Design Information (Input):

Circular Culvert: Barrel Diameter in Inches	D =	96	in.
Circular Culvert: Inlet Edge Type (choose from pull-down list)		Grooved End with Headwall	
OR:			
Box Culvert: Barrel Height (Rise) in Feet	Height (Rise) =		ft.
Box Culvert: Barrel Width (Span) in Feet	Width (Span) =		ft.
Box Culvert: Inlet Edge Type (choose from pull-down list)		Square Edge w/ 90-15 deg. Flared Wingwall	
Number of Barrels	No =	1	
Inlet Elevation at Culvert Invert	I_{elev} =	6881.97	ft. elev.
Outlet Elevation at Culvert Invert	O_{elev} =	6880.85	ft. elev.
Culvert Length in Feet	L =	78.0	ft.
Manning's Roughness	n =	0.0120	
Bend Loss Coefficient	K_b =	0.00	
Exit Loss Coefficient	K_x =	1.00	

Design Information (calculated):

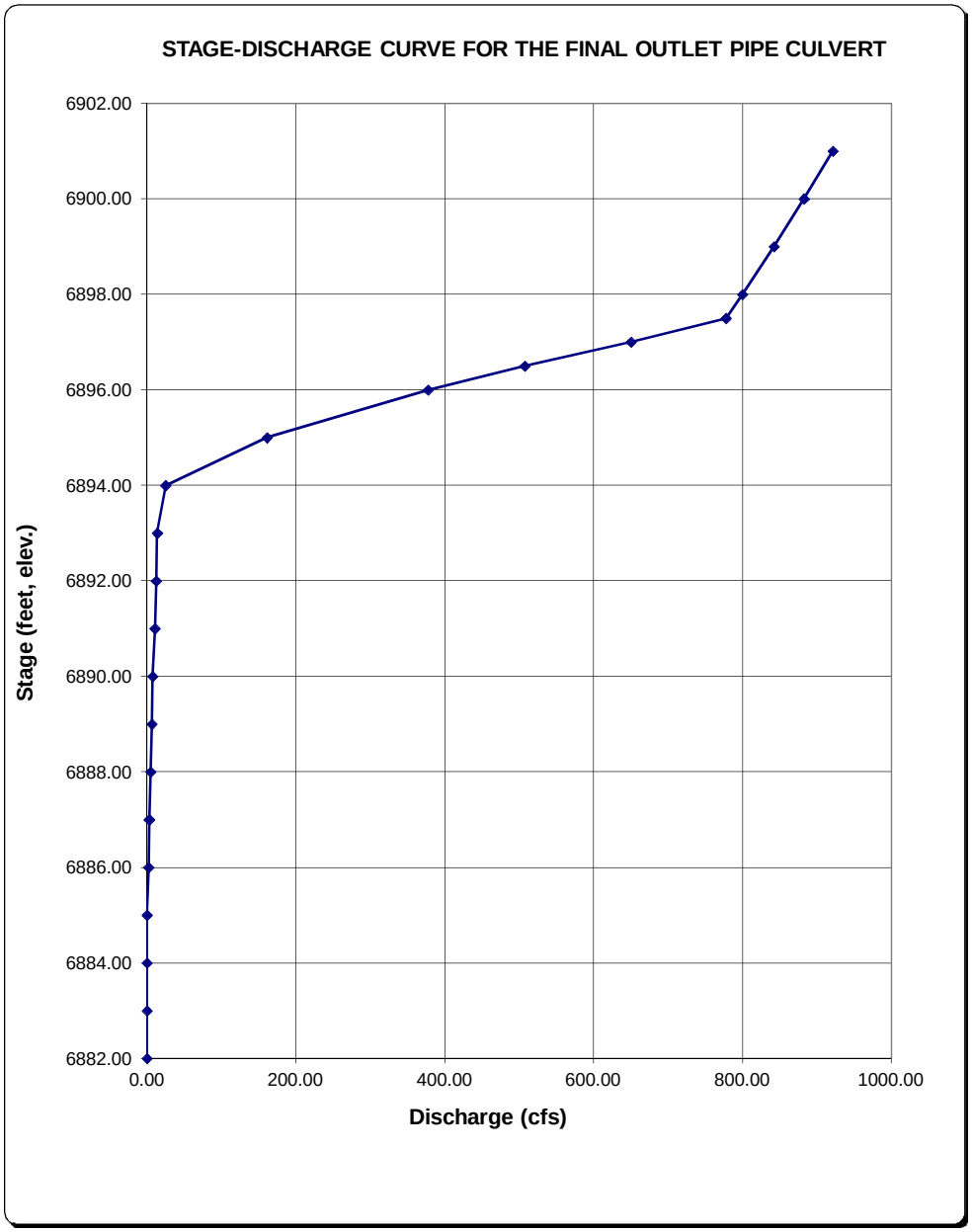
Entrance Loss Coefficient	K_e =	0.20
Friction Loss Coefficient	K_f =	0.13
Sum of All Loss Coefficients	K_s =	1.33
Orifice Inlet Condition Coefficient	C_d =	0.99
Minimum Energy Condition Coefficient	KE_{low} =	-0.04

Calculations of Culvert Capacity (output):

Water Surface Elevation From Sheet "Basin" (ft., linked)	Tailwater Surface Elevation ft (input if known)	Culvert Inlet-Control Flowrate cfs (output)	Culvert Outlet-Control Flowrate cfs (output)	Flowrate Into Culvert From Sheet "Outlet" (cfs, linked)	Controlling Culvert Flowrate cfs (output)	Inlet Equation Used (output)
6882.00	0.00	0.10	73.88	**0.00**	**0.00**	Min. Energy. Eqn.
6883.00	0.00	8.20	127.58	**0.00**	**0.00**	Min. Energy. Eqn.
6884.00	0.00	38.80	179.44	**0.00**	**0.00**	Min. Energy. Eqn.
6885.00	0.00	83.70	227.39	**0.00**	**0.00**	Min. Energy. Eqn.
6886.00	0.00	142.70	253.50	**1.98**	**1.98**	Regression Eqn.
6887.00	0.00	207.40	260.30	**2.79**	**2.79**	Regression Eqn.
6888.00	0.00	284.50	274.34	**4.82**	**4.82**	Regression Eqn.
6889.00	0.00	370.40	296.59	**6.37**	**6.37**	Regression Eqn.
6890.00	0.00	456.70	327.85	**7.54**	**7.54**	Regression Eqn.
6891.00	0.00	537.00	401.74	**10.51**	**10.51**	Regression Eqn.
6892.00	0.00	609.70	475.03	**12.21**	**12.21**	Regression Eqn.
6893.00	0.00	675.30	541.57	**13.64**	**13.64**	Regression Eqn.
6894.00	0.00	735.40	601.48	**24.79**	**24.79**	Regression Eqn.
6895.00	0.00	790.90	656.53	**161.20**	**161.20**	Regression Eqn.
6896.00	0.00	843.00	707.57	**377.40**	**377.40**	Regression Eqn.
6896.50	0.00	867.90	731.66	**507.45**	**507.45**	Regression Eqn.
6897.00	0.00	892.20	755.10	**650.12**	**650.12**	Regression Eqn.
6897.50	0.00	915.90	777.72	**804.36**	**777.72**	Regression Eqn.
6898.00	0.00	939.10	799.86	**966.41**	**799.86**	Regression Eqn.
6899.00	0.00	984.10	842.42	**1074.08**	**842.42**	Regression Eqn.
6900.00	0.00	1027.50	882.74	**1133.19**	**882.74**	Regression Eqn.
6901.00	0.00	1069.50	921.46	**1172.88**	**921.46**	Regression Eqn.
0.00	0.00	0.00	0.00	**#N/A**	**#N/A**	No Flow (WS < inlet)
0.00	0.00	0.00	0.00	**#N/A**	**#N/A**	No Flow (WS < inlet)
0.00	0.00	0.00	0.00	**#N/A**	**#N/A**	No Flow (WS < inlet)
0.00	0.00	0.00	0.00	**#N/A**	**#N/A**	No Flow (WS < inlet)
0.00	0.00	0.00	0.00	**#N/A**	**#N/A**	No Flow (WS < inlet)
0.00	0.00	0.00	0.00	**#N/A**	**#N/A**	No Flow (WS < inlet)
0.00	0.00	0.00	0.00	**#N/A**	**#N/A**	No Flow (WS < inlet)
0.00	0.00	0.00	0.00	**#N/A**	**#N/A**	No Flow (WS < inlet)
0.00	0.00	0.00	0.00	**#N/A**	**#N/A**	No Flow (WS < inlet)
0.00	0.00	0.00	0.00	**#N/A**	**#N/A**	No Flow (WS < inlet)
0.00	0.00	0.00	0.00	**#N/A**	**#N/A**	No Flow (WS < inlet)
0.00	0.00	0.00	0.00	**#N/A**	**#N/A**	No Flow (WS < inlet)
0.00	0.00	0.00	0.00	**#N/A**	**#N/A**	No Flow (WS < inlet)
0.00	0.00	0.00	0.00	**#N/A**	**#N/A**	No Flow (WS < inlet)
0.00	0.00	0.00	0.00	**#N/A**	**#N/A**	No Flow (WS < inlet)
0.00	0.00	0.00	0.00	**#N/A**	**#N/A**	No Flow (WS < inlet)
0.00	0.00	0.00	0.00	**#N/A**	**#N/A**	No Flow (WS < inlet)
0.00	0.00	0.00	0.00	**#N/A**	**#N/A**	No Flow (WS < inlet)
0.00	0.00	0.00	0.00	**#N/A**	**#N/A**	No Flow (WS < inlet)
0.00	0.00	0.00	0.00	**#N/A**	**#N/A**	No Flow (WS < inlet)
0.00	0.00	0.00	0.00	**#N/A**	**#N/A**	No Flow (WS < inlet)
0.00	0.00	0.00	0.00	**#N/A**	**#N/A**	No Flow (WS < inlet)

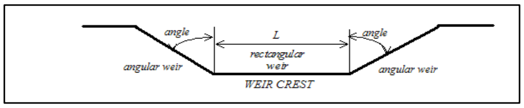
STAGE-DISCHARGE SIZING OF THE OUTLET CULVERT (INLET vs. OUTLET CONTROL WITH TAILWATER EFFECTS)

Project: FALCON MARKETPLACE
Basin ID: NORTH POND #1



STAGE-DISCHARGE SIZING OF THE SPILLWAY

Project: **FALCON MARKETPLACE**
Basin ID: **NORTH POND #1**



Design Information (input):

Bottom Length of Weir	L =	160.00	feet
Angle of Side Slope Weir	Angle =	75.96	degrees
Elev. for Weir Crest	EL. Crest =	6,898.00	feet
Coef. for Rectangular Weir	C_w =		
Coef. for Trapezoidal Weir	C_t =	3.50	

Calculation of Spillway Capacity (output):

Water Surface Elevation ft. (linked)	Rect. Weir Flowrate cfs (output)	Triangle Weir Flowrate cfs (output)	Total Spillway Release cfs (output)	Total Pond Release cfs (output)
6882.00	0.00	0.00	0.00	0.00
6883.00	0.00	0.00	0.00	0.00
6884.00	0.00	0.00	0.00	0.00
6885.00	0.00	0.00	0.00	0.00
6886.00	0.00	0.00	0.00	1.98
6887.00	0.00	0.00	0.00	2.79
6888.00	0.00	0.00	0.00	4.82
6889.00	0.00	0.00	0.00	6.37
6890.00	0.00	0.00	0.00	7.54
6891.00	0.00	0.00	0.00	10.51
6892.00	0.00	0.00	0.00	12.21
6893.00	0.00	0.00	0.00	13.64
6894.00	0.00	0.00	0.00	24.79
6895.00	0.00	0.00	0.00	161.20
6896.00	0.00	0.00	0.00	377.40
6896.50	0.00	0.00	0.00	507.45
6897.00	0.00	0.00	0.00	650.12
6897.50	0.00	0.00	0.00	777.72
6898.00	0.00	0.00	0.00	799.86
6899.00	0.00	14.00	14.00	856.42
6900.00	0.00	79.17	79.17	961.91
6901.00	0.00	218.18	218.18	1,139.63
#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	#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	#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	#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	#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
#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	#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	#N/A	#N/A
#N/A	#N/A	#N/A	#N/A	#N/A
#N/A	#N/A	#N/A	#N/A	#N/A

PROJECT INFORMATION

PROJECT:	Falcon Marketplace
PROJECT NO:	20988-00CSCV
DESIGN BY:	KGV
REV. BY:	TDM
AGENCY:	El Paso County
REPORT TYPE:	Preliminary
DATE:	6/19/2017

Drexel, Barrell & Co.

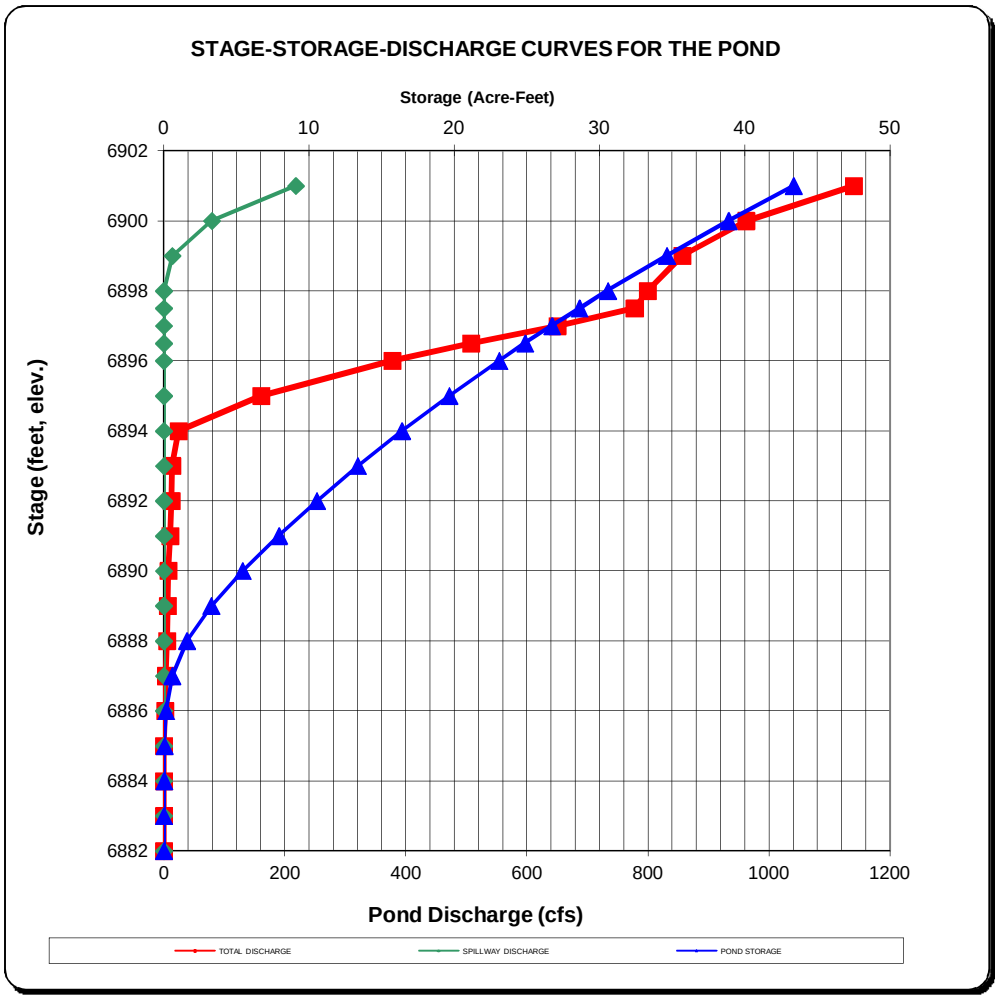
SPILLWAY CALCULATIONS

Q=CL(H^(2/3))

Weir coefficient C:	3.5
Depth H, ft:	1.5
Flowrate Q. cfs:	1016
Required L, ft:	**158.01**

STAGE-DISCHARGE SIZING OF THE SPILLWAY

Project: FALCON MARKETPLACE
Basin ID: NORTH POND #1



Aluminum Bar Grating

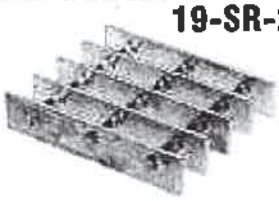
TRASH RACK GRATE
AT FRONT OF BOX

RECTANGULAR BAR SWAGE-LOCKED 1-3/16" C/C Bearing Bars

19-SR-4

Cross Rods 4" C/C

19-SR-2



Cross Rods 2" C/C

NON-SERRATED & SERRATED

PRESS-LOCKED 1-3/16" C/C Bearing Bars

19-AP-4

Cross Bars 4" C/C

19-AP-2

Cross Bars 2" C/C

LOAD & DEFLECTION TABLE

Bar Size	Symbol	Approx. Weight psf	Sec. Mod Per Ft. Of Width		SPAN (Direction of Bearing Bar) 24"	30"	36"	42"	48"	54"	60"	66"	72"	78"	84"	96"	108"
3/4" x 1/8"	19-SR-4	1.4	0.118	U	237	152	105	77									
	19-SR-2	1.6		D	0.192	0.300	0.432	0.588									
	19-AP-4	1.5		C	237	169	158	135									
	19-AP-2	1.8		D	0.154	0.240	0.346	0.470									
3/4" x 3/16"	19-SR-4	1.9	0.178	U	355	227	158	116									
	19-SR-2	2.1		D	0.192	0.300	0.432	0.588									
	19-AP-4	2.2		C	355	284	237	203									
	19-AP-2	2.7		D	0.154	0.240	0.346	0.470									
1" x 1/8"	19-SR-4	1.7	0.211	U	421	269	187	137	105								
	19-SR-2	1.9		D	0.144	0.225	0.324	0.441	0.576								
	19-AP-4	1.8		C	421	337	281	241	211								
	19-AP-2	2.2		D	0.115	0.180	0.259	0.353	0.461								
1" x 3/16"	19-SR-4	2.5	0.316	U	632	404	281	206	158	125							
	19-SR-2	2.7		D	0.144	0.225	0.324	0.441	0.576	0.729							
	19-AP-4	2.8		C	632	505	421	361	316	281							
	19-AP-2	3.3		D	0.115	0.180	0.259	0.353	0.461	0.583							
1-1/4" x 1/8"	19-SR-4	2.1	0.329	U	658	421	292	215	164	130							
	19-SR-2	2.3		D	0.115	0.180	0.259	0.353	0.461	0.583							
	19-AP-4	2.4		C	658	526	439	376	329	292							
	19-AP-2	2.8		D	0.092	0.144	0.207	0.282	0.369	0.467							
1-1/4" x 3/16"	19-SR-4	3.1	0.493	U	987	632	439	322	247	195	158						
	19-SR-2	3.3		D	0.115	0.180	0.259	0.353	0.461	0.583	0.720						
	19-AP-4	3.5		C	987	789	658	564	493	439	395						
	19-AP-2	4.2		D	0.092	0.144	0.207	0.282	0.369	0.467	0.576						
1-1/2" x 1/8"	19-SR-4	2.5	0.474	U	947	606	421	309	237	187	152						
	19-SR-2	2.7		D	0.096	0.150	0.216	0.294	0.384	0.486	0.600						
	19-AP-4	2.8		C	947	758	632	541	474	421	379						
	19-AP-2	3.2		D	0.077	0.120	0.173	0.235	0.307	0.389	0.480						
1-1/2" x 3/16"	19-SR-4	3.7	0.711	U	1421	909	632	464	355	281	227	188					
	19-SR-2	3.9		D	0.096	0.150	0.216	0.294	0.384	0.486	0.600	0.726					
	19-AP-4	4.1		C	1421	1137	947	812	711	632	568	517					
	19-AP-2	4.8		D	0.077	0.120	0.173	0.235	0.307	0.389	0.480	0.581					
1-3/4" x 3/16"	19-SR-4	4.2	0.967	U	1934	1238	860	632	484	382	309	256	215	183			
	19-SR-2	4.4		D	0.082	0.129	0.185	0.252	0.329	0.417	0.514	0.622	0.741	0.869			
	19-AP-4	4.7		C	1934	1547	1289	1105	967	860	774	703	645	595			
	19-AP-2	5.3		D	0.066	0.103	0.148	0.202	0.263	0.333	0.411	0.498	0.592	0.695			
2" x 3/16"	19-SR-4	4.8	1.263	U	2526	1617	1123	825	632	499	404	334	281	239	206		
	19-SR-2	5.0		D	0.072	0.113	0.162	0.221	0.288	0.365	0.450	0.545	0.648	0.761	0.882		
	19-AP-4	5.3		C	2526	2021	1684	1444	1263	1123	1011	919	842	777	722		
	19-AP-2	5.9		D	0.058	0.090	0.130	0.176	0.230	0.292	0.360	0.436	0.518	0.608	0.706		
2-1/4" x 3/16"	19-SR-4	5.4	1.599	U	3197	2046	1421	1044	799	632	512	423	355	303	261	200	
	19-SR-2	5.6		D	0.064	0.100	0.144	0.196	0.256	0.324	0.400	0.484	0.576	0.676	0.784	1.024	
	19-AP-4	5.8		C	3197	2558	2132	1827	1599	1421	1279	1163	1066	984	914	799	
	19-AP-2	6.5		D	0.051	0.080	0.115	0.157	0.205	0.259	0.320	0.387	0.461	0.541	0.627	0.819	
2-1/2" x 3/16"	19-SR-4	5.9	1.974	U	3947	2526	1754	1289	987	780	632	522	439	374	322	247	195
	19-SR-2	6.1		D	0.058	0.090	0.130	0.176	0.230	0.292	0.360	0.436	0.518	0.608	0.706	0.922	1.166
	19-AP-4	6.4		C	3947	3158	2632	2256	1974	1754	1579	1435	1316	1215	1128	987	877
	19-AP-2	7.1		D	0.046	0.072	0.104	0.141	0.184	0.233	0.288	0.348	0.415	0.487	0.564	0.737	0.933

U = safe uniform load, psf (page 93)
C = safe concentrated load, psf (page 93)
D = deflection, inches
E = modulus of elasticity, 10,000,000 psi
F = fiber stress, 12,000 psi
Material: ASTM B-221, 6063 or 6061
Deflection: Spans and loads to the right of the bold line exceed 1/4" deflection for uniform load of 100 psf which provides safe pedestrian comfort. These can be exceeded for other types of loads with engineer's approval.
Serrated Bars: For serrated grating, the depth of grating required for a specified load is 1/4" deeper than that shown in the table.
General: Loads and deflections are theoretical and based on static loading.
Finish: Mill finish unless otherwise specified.

FALCON MARKETPLACE
15-FT Head x 62.4 = 936 psf

SR/AP-19 PANEL WIDTH (inches)

Note: Includes 1/4" (1/8" each side) for extended cross rods on swage-locked (SR) and extended cross bars on press-locked (AP).

No. of Bars	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1/8" Bar	1 9/16	2 3/4	3 15/16	5 1/8	6 5/16	7 1/2	8 11/16	9 7/8	11 1/16	12 1/4	13 7/16	14 5/8	15 13/16	17	18 3/16
3/16" Bar	1 5/8	2 13/16	4	5 3/16	6 3/8	7 9/16	8 3/4	9 15/16	11 1/8	12 5/16	13 1/2	14 11/16	15 7/8	17 1/16	18 1/4
No. of Bars	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**	**31**
1/8" Bar	19 3/8	20 9/16	21 3/4	22 15/16	24 1/8	25 5/16	26 1/2	27 11/16	28 7/8	30 1/16	31 1/4	32 7/16	33 5/8	34 13/16	36
3/16" Bar	19 7/16	20 5/8	21 13/16	23	24 3/16	25 3/8	26 9/16	27 3/4	28 15/16	30 1/8	31 5/16	32 1/2	33 11/16	34 7/8	36 1/16

Flow depths entering Pond SR4

CLOMR

Min Ch El	6895.98	
WS Elev	6898.75	
Max flow depth (north)	***2.8***	ft

NORTHWEST SWALE

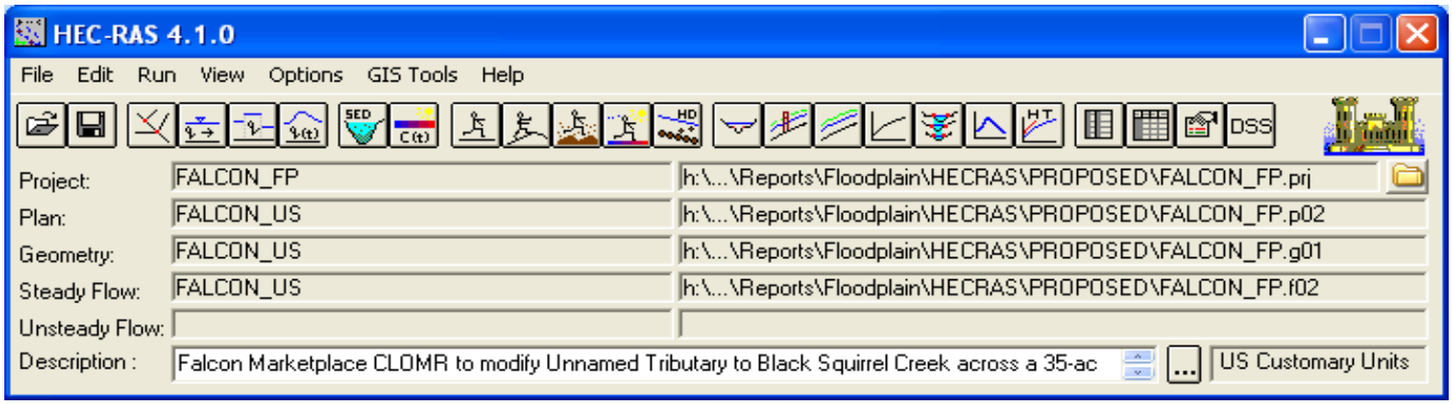
Assuming trapezoidal channelized flow at riprap entry

Q100	30.2	cfs
Width	8	ft
Side Slopes	5	:1
Slope	1.6	%
n	0.020	

Calculated flow depth	***0.5***	ft

Project: Falcon Marketplace
Project No.: 20988-00

HEC-RAS Data Output
Proposed Conditions Model, North (Drexel Barrell Model)
File: H:\20988-00CSCV\Reports\Floodplain\HECRAS\PROPOSED\FALCON_FP.prj
Plan: FALCON_US



Date: 10/17/16
100-year Output, Standard Tabel 1
Cross Sections: 2926-2842

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
FALCON_US	2926	100-YR	1016	6895.98	6898.75	6898.75	6899.12	0.025538	6.71	306.22	403.31	0.91
FALCON_US	2842	100-YR	1016	6888.58	6897	6889.37	6897	0.000001	0.15	6775.42	897.89	0.01

Drainage Map

LEGEND

PROPERTY LINE

EX. MINOR CONTOUR

EX. MAJOR CONTOUR 6800

BASIN BOUNDARY

FLOW DIRECTION

DESIGN POINT

BASIN DESCRIPTION ..... BASIN / IMPERVIOUS COVERAGE PERCENTAGE

BASIN AREA (ACRES)

N

100 0 100 200

SCALE: 1"=100'

RUNOFF SUMMARY

BASIN	DP	Area (Ac.)	Q_5 (CFS)	Q_{100} (CFS)
JMT060			160	670
O1	DP1	30.50	9.6	28.3
O2	DP2	2.06	0.7	4.9
O3	DP3	2.24	5.1	9.8
O4	DP4	4.46	7.2	15.8
E1		35.70	7.7	46.7
	DP5	74.96	20.0	70.8
O5	DP6	2.17	2.9	6.6
JMT070			180.0	740.8

PREPARED BY:

DREXEL, BARRELL & CO.
Engineers • Surveyors
3 SOUTH 7TH STREET
COLORADO SPGS, COLORADO 80905
CONTACT: TIM D. McCONNELL, P.E.
(719)260-0887
BOULDER • COLORADO SPRINGS

CLIENT:

HUMMEL INVESTMENTS, LLC
8117 PRESTON ROAD, SUITE 120
DALLAS, TEXAS 75225
(214) 416-9820

DRAINAGE PLAN FOR
FALCON MARKETPLACE
FALCON, COLORADO

ISSUE	DATE
INITIAL ISSUE	3-23-17
REVISION	7-19-19

DESIGNED BY:	TDM
DRAWN BY:	KGV
CHECKED BY:	TDM
FILE NAME:	

PREPARED UNDER MY DIRECT SUPERVISION FOR AND ON BEHALF OF DREXEL, BARRELL & CO.

DRAWING SCALE:
HORIZONTAL: 1"=100'
VERTICAL: N/A

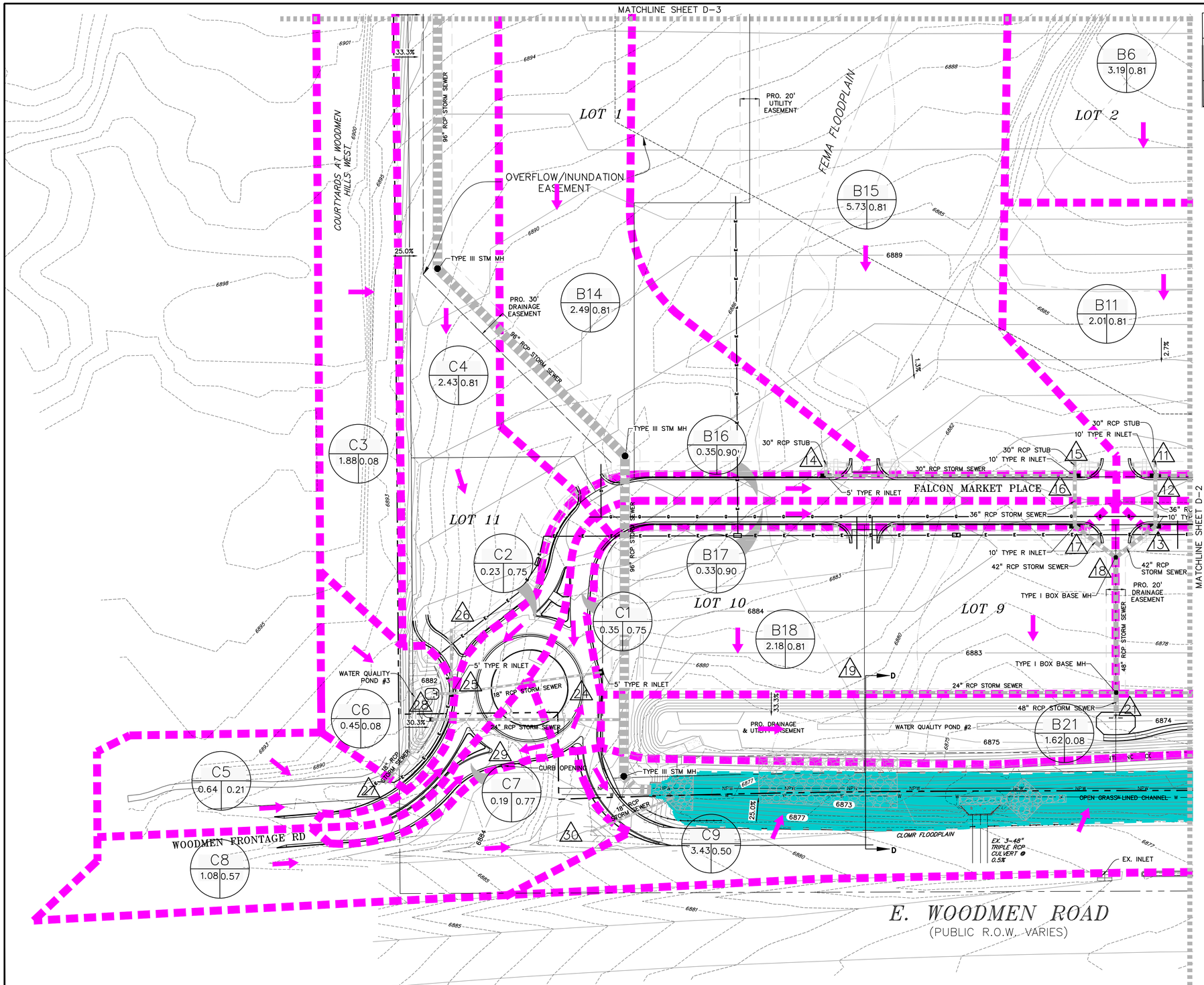
EXISTING DRAINAGE CONDITIONS

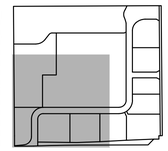
PROJECT NO. 20988-00CSCV

DRAWING NO.

ED-1

SHEET: 1 OF 1





KEY MAP
NTS

N

50 0 50 100
SCALE: 1"=50'

RUNOFF SUMMARY

BASIN	DP	Area (Ac.)	Q_5 (CFS)	Q_{100} (CFS)
A1	DP1	1.81	3.4	7.7
	DP2	1.81	3.4	7.7
A2		4.82	1.4	10.2
	DP3	6.63	4.6	17.3
B4	DP4	2.35	7.5	14.6
B5		0.63	2.8	5.1
	DP5	2.99	10.0	19.3
B6	DP6	3.19	12.8	23.6
B7		0.46	2.0	3.7
	DP7	6.63	23.8	28.0
B8	DP8	1.04	3.5	6.9
B9		0.30	1.4	2.5
	DP9	1.35	4.9	9.3
B10		0.18	0.8	1.4
	DP10	8.16	29.2	38.1
B11	DP11	2.01	7.8	14.6
B12		0.18	0.8	1.5
	DP12	10.35	36.4	51.9
B13		0.20	0.9	1.6
	DP13	10.55	37.1	53.2
B14	DP14	2.49	9.1	17.0
B15	DP15	5.73	20.3	38.0
B16		0.35	1.6	2.9
	DP16	8.56	30.6	57.1
B17		0.33	1.5	2.7

BASIN	DP	Area (Ac.)	Q_5 (CFS)	Q_{100} (CFS)
	DP17	8.89	31.9	59.3
	DP18	19.44	52.1	88.2
B18	DP19	2.18	7.8	15.0
B19	DP20	2.57	10.1	18.8
	DP21	24.19	67.6	117.5
B20	DP22	2.03	5.6	11.4
B21		1.62	0.5	4.0
	DP23	27.85	67.4	121.8
C1	DP24	0.35	1.3	2.6
C2		0.23	0.8	1.5
	DP25	0.59	2.0	3.8
C3		1.88	0.6	4.2
C4		2.19	6.9	13.8
	DP26	4.08	5.4	13.7
C5	DP27	0.64	0.5	1.9
C6		0.45	0.2	1.2
	DP28	5.31	7.4	18.3
C7	DP29	0.19	0.7	1.3
C8		1.14	2.5	5.5
	DP30	1.33	3.1	6.6
C9		3.43	7.3	16.2
D1		2.62	4.1	8.8
D2		0.07	0.3	0.6
D3		0.07	0.3	0.6
	DP01	32.50	10.3	30.2

PREPARED BY:

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DRAINAGE PLAN FOR FALCON MARKETPLACE

FALCON, COLORADO

ISSUE	DATE
INITIAL ISSUE	6-28-19
REVISED	7-19-19

DESIGNED BY:	TDM
DRAWN BY:	KGV
CHECKED BY:	TDM
FILE NAME:	

COLORADO REGISTERED T.D. McCONNELL 23707 12-18-19 PROFESSIONAL ENGINEER

PREPARED UNDER MY DIRECT SUPERVISION FOR AND ON BEHALF OF DREXEL, BARRELL & CO.

DRAWING SCALE:
HORIZONTAL: 1"=50'
VERTICAL: N/A

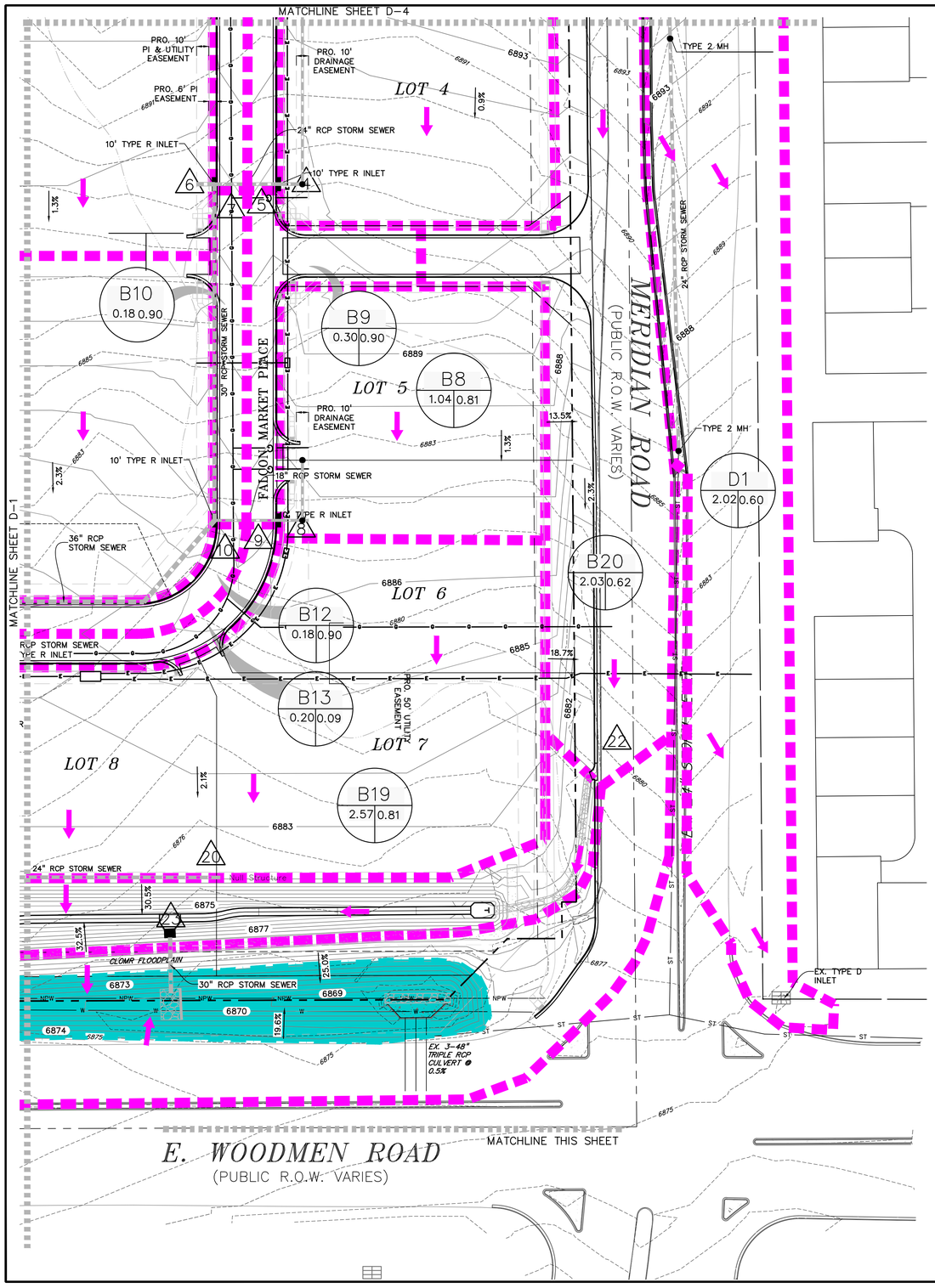
PROPOSED DRAINAGE CONDITIONS

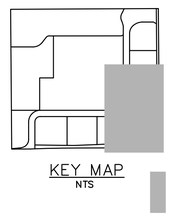
PROJECT NO. 20988-00CSCV

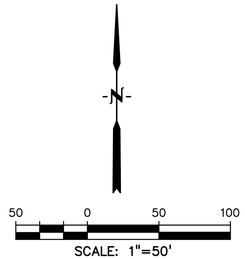
DRAWING NO.

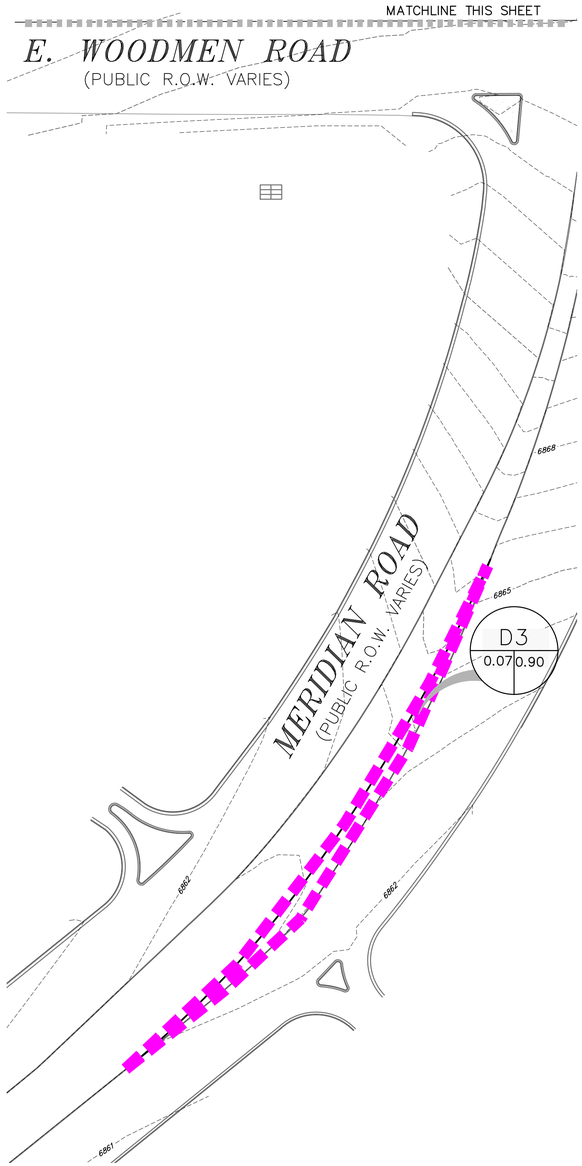
D-1

SHEET: 1 OF 5









RUNOFF SUMMARY

BASIN	DP	Area (Ac.)	Q_5 (CFS)	Q_{100} (CFS)
A1	DP1	1.81	3.4	7.7
	DP2	1.81	3.4	7.7
A2		4.82	1.4	10.2
	DP3	6.63	4.6	17.3
B4	DP4	2.35	7.5	14.6
B5		0.63	2.8	5.1
	DP5	2.99	10.0	19.3
B6	DP6	3.19	12.8	23.6
B7		0.46	2.0	3.7
	DP7	6.63	23.8	28.0
B8	DP8	1.04	3.5	6.9
B9		0.30	1.4	2.5
	DP9	1.35	4.9	9.3
B10		0.18	0.8	1.4
	DP10	8.16	29.2	38.1
B11	DP11	2.01	7.8	14.6
B12		0.18	0.8	1.5
	DP12	10.35	36.4	51.9
B13		0.20	0.9	1.6
	DP13	10.55	37.1	53.2
B14	DP14	2.49	9.1	17.0
B15	DP15	5.73	20.3	38.0
B16		0.35	1.6	2.9
	DP16	8.56	30.6	57.1
B17		0.33	1.5	2.7

BASIN	DP	Area (Ac.)	Q_5 (CFS)	Q_{100} (CFS)
	DP17	8.89	31.9	59.3
	DP18	19.44	52.1	88.2
B18	DP19	2.18	7.8	15.0
B19	DP20	2.57	10.1	18.8
	DP21	24.19	67.6	117.5
B20	DP22	2.03	5.6	11.4
B21		1.62	0.5	4.0
	DP23	27.85	67.4	121.8
C1	DP24	0.35	1.3	2.6
C2		0.23	0.8	1.5
	DP25	0.59	2.0	3.8
C3		1.88	0.6	4.2
C4		2.19	6.9	13.8
	DP26	4.08	5.4	13.7
C5	DP27	0.64	0.5	1.9
C6		0.45	0.2	1.2
	DP28	5.31	7.4	18.3
C7	DP29	0.19	0.7	1.3
C8		1.14	2.5	5.5
	DP30	1.33	3.1	6.6
C9		3.43	7.3	16.2
D1		2.62	4.1	8.8
D2		0.07	0.3	0.6
D3		0.07	0.3	0.6
	DP01	32.50	10.3	30.2

PREPARED BY:

DREXEL, BARRELL & CO.
Engineers • Surveyors
3 SOUTH 7TH STREET
COLORADO SPGS, COLORADO 80905
CONTACT: TIM D. McCONNELL, P.E.
(719)260-0887
BOULDER • COLORADO SPRINGS

CLIENT:

HUMMEL INVESTMENTS, LLC
8117 PRESTON ROAD, SUITE 120
DALLAS, TEXAS 75225
(214) 416-9820

DRAINAGE PLAN FOR
FALCON MARKETPLACE
FALCON, COLORADO

ISSUE	DATE
INITIAL ISSUE	6-28-19
REVISED	7-19-19

DESIGNED BY:	TDM
DRAWN BY:	KGV
CHECKED BY:	TDM
FILE NAME:	

COLORADO REGISTERED PROFESSIONAL ENGINEER
TIMOTHY D. McCONNELL
37907
7-12-19
PROFESSIONAL ENGINEER

PREPARED UNDER MY DIRECT SUPERVISION FOR AND ON BEHALF OF DREXEL, BARRELL & CO.

DRAWING SCALE:
HORIZONTAL: 1"=50'
VERTICAL: N/A

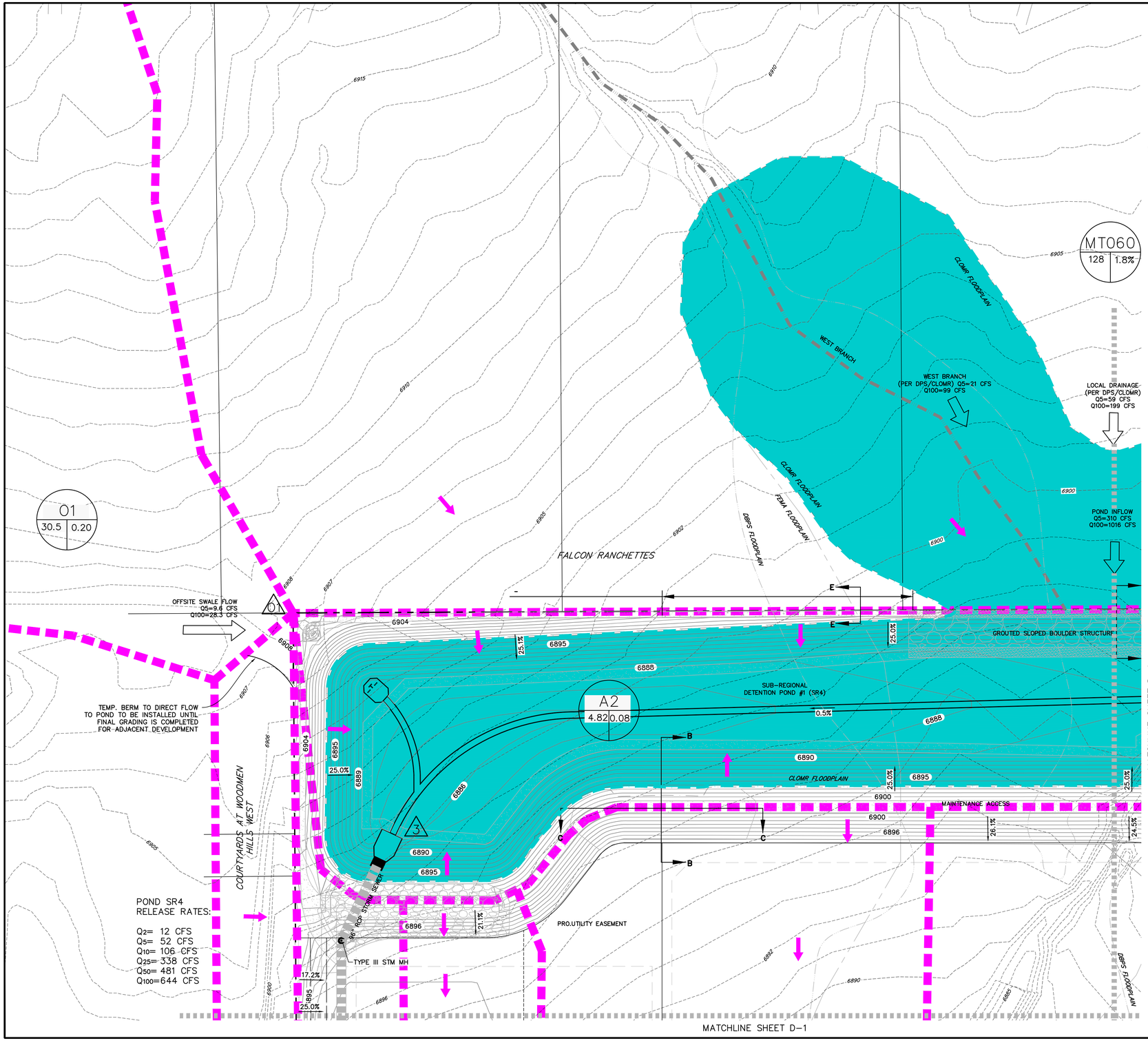
PROPOSED DRAINAGE CONDITIONS

PROJECT NO. 20988-00CSCV

DRAWING NO.

D-2

SHEET: 2 OF 5



N

50 0 50 100

SCALE: 1"=50'

KEY MAP
NTS

RUNOFF SUMMARY

BASIN	DP	Area (Ac.)	Q_5 (CFS)	Q_{100} (CFS)
A1	DP1	1.81	3.4	7.7
	DP2	1.81	3.4	7.7
A2		4.82	1.4	10.2
	DP3	6.63	4.6	17.3
B4	DP4	2.35	7.5	14.6
B5		0.63	2.8	5.1
	DP5	2.99	10.0	19.3
B6	DP6	3.19	12.8	23.6
B7		0.46	2.0	3.7
	DP7	6.63	23.8	28.0
B8	DP8	1.04	3.5	6.9
B9		0.30	1.4	2.5
	DP9	1.35	4.9	9.3
B10		0.18	0.8	1.4
	DP10	8.16	29.2	38.1
B11	DP11	2.01	7.8	14.6
B12		0.18	0.8	1.5
	DP12	10.35	36.4	51.9
B13		0.20	0.9	1.6
	DP13	10.55	37.1	53.2
B14	DP14	2.49	9.1	17.0
B15	DP15	5.73	20.3	38.0
B16		0.35	1.6	2.9
	DP16	8.56	30.6	57.1
B17		0.33	1.5	2.7

BASIN	DP	Area (Ac.)	Q_5 (CFS)	Q_{100} (CFS)
	DP17	8.89	31.9	59.3
	DP18	19.44	52.1	88.2
B18	DP19	2.18	7.8	15.0
B19	DP20	2.57	10.1	18.8
	DP21	24.19	67.6	117.5
B20	DP22	2.03	5.6	11.4
B21		1.62	0.5	4.0
	DP23	27.85	67.4	121.8
C1	DP24	0.35	1.3	2.6
C2		0.23	0.8	1.5
	DP25	0.59	2.0	3.8
C3		1.88	0.6	4.2
C4		2.19	6.9	13.8
	DP26	4.08	5.4	13.7
C5	DP27	0.64	0.5	1.9
C6		0.45	0.2	1.2
	DP28	5.31	7.4	18.3
C7	DP29	0.19	0.7	1.3
C8		1.14	2.5	5.5
	DP30	1.33	3.1	6.6
C9		3.43	7.3	16.2
D1		2.62	4.1	8.8
D2		0.07	0.3	0.6
D3		0.07	0.3	0.6
	DPO1	32.50	10.3	30.2

PREPARED BY:

DREXEL, BARRELL & CO.
Engineers • Surveyors
3 SOUTH 7TH STREET
COLORADO SPGS, COLORADO 80905
CONTACT: TIM D. McCONNELL, P.E.
(719)260-0887
BOULDER • COLORADO SPRINGS

CLIENT:

HUMMEL INVESTMENTS, LLC
8117 PRESTON ROAD, SUITE 120
DALLAS, TEXAS 75225
(214) 416-9820

DRAINAGE PLAN FOR
FALCON MARKETPLACE
FALCON, COLORADO

ISSUE	DATE
INITIAL ISSUE	6-28-19
REVISED	7-19-19

DESIGNED BY:	TDM
DRAWN BY:	KGV
CHECKED BY:	TDM
FILE NAME:	

COLORADO REGISTERED PROFESSIONAL ENGINEER
TIMOTHY D. McCONNELL
33707
12-18-19

PREPARED UNDER MY DIRECT SUPERVISION FOR AND ON BEHALF OF DREXEL, BARRELL & CO.

DRAWING SCALE:
HORIZONTAL: 1"=50'
VERTICAL: N/A

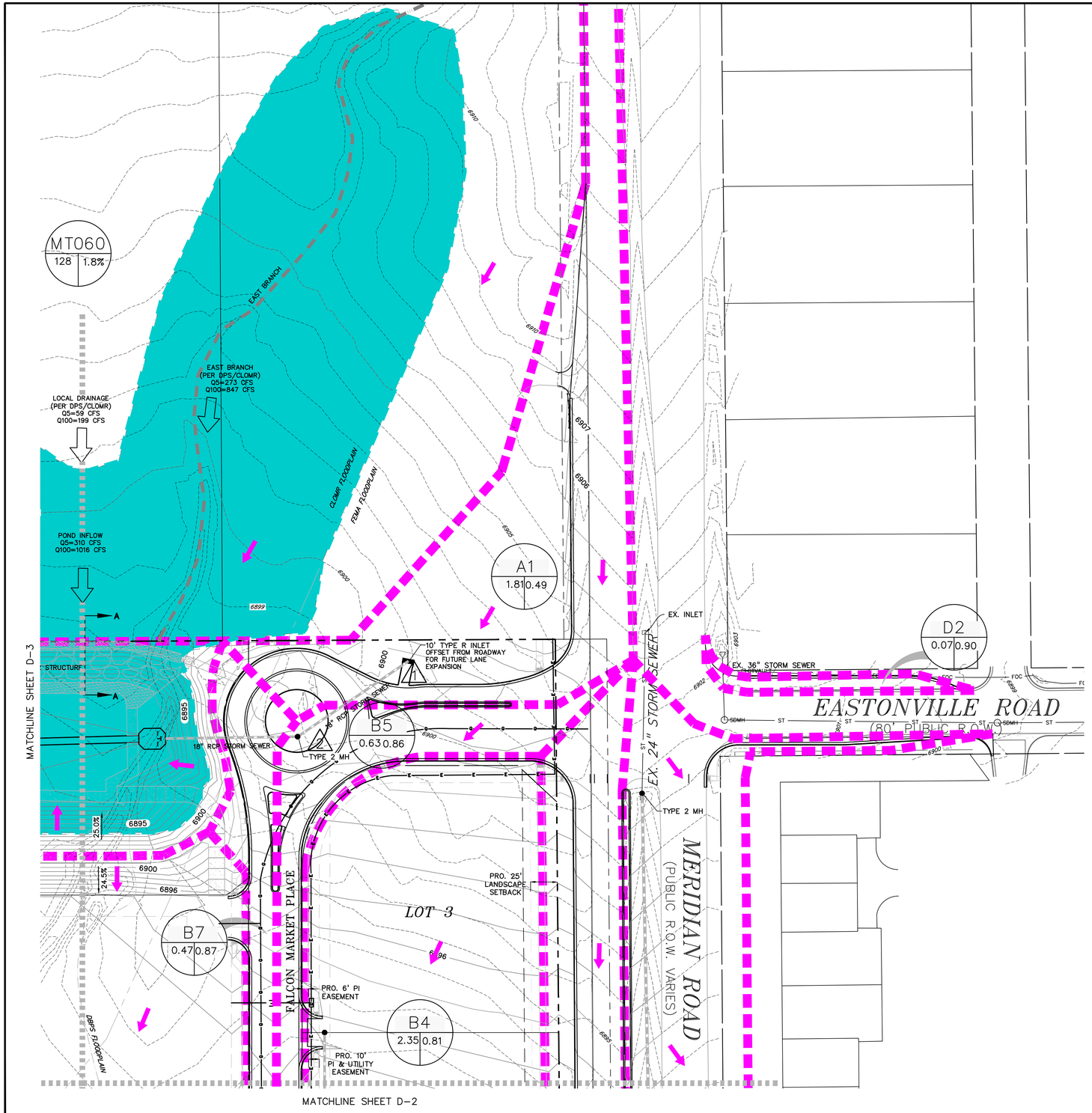
PROPOSED DRAINAGE CONDITIONS

PROJECT NO. 20988-00CSCV

DRAWING NO.

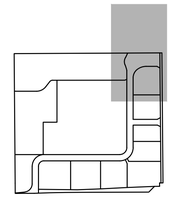
D-3

SHEET: 3 OF 5



50 0 50 100

SCALE: 1"=50'



KEY MAP
NTS

LEGEND

- PROPERTY LINE
- LOT LINE
- PROPOSED STORM SEWER
- EX. MINOR CONTOUR
- EX. MAJOR CONTOUR — 6800 —
- PR. MINOR CONTOUR
- PR. MAJOR CONTOUR — 6800 —
- BASIN BOUNDARY
- FLOW DIRECTION
- PROPOSED (CLOMR/LOMR) FLOODPLAIN
- DESIGN POINT
- BASIN DESCRIPTION — BASIN; IMPERVIOUS COVERAGE
- BASIN AREA (ACRES)

RUNOFF SUMMARY

BASIN	DP	Area (Ac.)	Q_5 (CFS)	Q_{100} (CFS)
A1	DP1	1.81	3.4	7.7
	DP2	1.81	3.4	7.7
A2		4.82	1.4	10.2
	DP3	6.63	4.6	17.3
B4	DP4	2.35	7.5	14.6
B5		0.63	2.8	5.1
	DP5	2.99	10.0	19.3
B6	DP6	3.19	12.8	23.6
B7		0.46	2.0	3.7
	DP7	6.63	23.8	28.0
B8	DP8	1.04	3.5	6.9
B9		0.30	1.4	2.5
	DP9	1.35	4.9	9.3
B10		0.18	0.8	1.4
	DP10	8.16	29.2	38.1
B11	DP11	2.01	7.8	14.6
B12		0.18	0.8	1.5
	DP12	10.35	36.4	51.9
B13		0.20	0.9	1.6
	DP13	10.55	37.1	53.2
B14	DP14	2.49	9.1	17.0
B15	DP15	5.73	20.3	38.0
B16		0.35	1.6	2.9
	DP16	8.56	30.6	57.1
B17		0.33	1.5	2.7

BASIN	DP	Area (Ac.)	Q_5 (CFS)	Q_{100} (CFS)
	DP17	8.89	31.9	59.3
	DP18	19.44	52.1	88.2
B18	DP19	2.18	7.8	15.0
B19	DP20	2.57	10.1	18.8
	DP21	24.19	67.6	117.5
B20	DP22	2.03	5.6	11.4
B21		1.62	0.5	4.0
	DP23	27.85	67.4	121.8
C1	DP24	0.35	1.3	2.6
C2		0.23	0.8	1.5
	DP25	0.59	2.0	3.8
C3		1.88	0.6	4.2
C4		2.19	6.9	13.8
	DP26	4.08	5.4	13.7
C5	DP27	0.64	0.5	1.9
C6		0.45	0.2	1.2
	DP28	5.31	7.4	18.3
C7	DP29	0.19	0.7	1.3
C8		1.14	2.5	5.5
	DP30	1.33	3.1	6.6
C9		3.43	7.3	16.2
D1		2.62	4.1	8.8
D2		0.07	0.3	0.6
D3		0.07	0.3	0.6
	DPO1	32.50	10.3	30.2

PREPARED BY:

DREXEL, BARRELL & CO.
Engineers • Surveyors
3 SOUTH 7TH STREET
COLORADO SPGS, COLORADO 80905
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(719)260-0887
BOULDER • COLORADO SPRINGS

CLIENT:

HUMMEL INVESTMENTS, LLC
8117 PRESTON ROAD, SUITE 120
DALLAS, TEXAS 75225
(214) 416-9820

DRAINAGE PLAN FOR
FALCON MARKETPLACE
FALCON, COLORADO

ISSUE	DATE
INITIAL ISSUE	6-28-19
REVISED	7-19-19

DESIGNED BY:	TDM
DRAWN BY:	KGV
CHECKED BY:	TDM
FILE NAME:	

COLORADO REGISTERED P.E. TIMOTHY D. McCONNELL 23707 12-18-19 PROFESSIONAL ENGINEER

PREPARED UNDER MY DIRECT SUPERVISION FOR AND ON BEHALF OF DREXEL, BARRELL & CO.

DRAWING SCALE:
HORIZONTAL: 1"=50'
VERTICAL: N/A

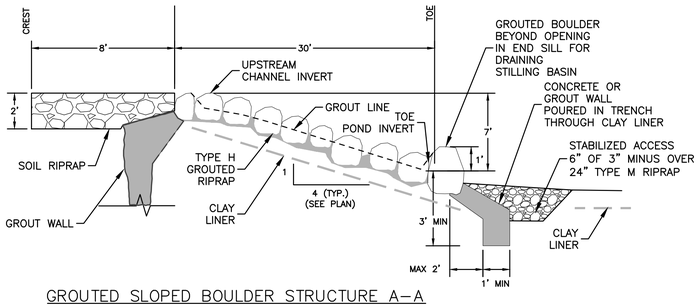
PROPOSED DRAINAGE CONDITIONS

PROJECT NO. 20988-00CSCV

DRAWING NO.

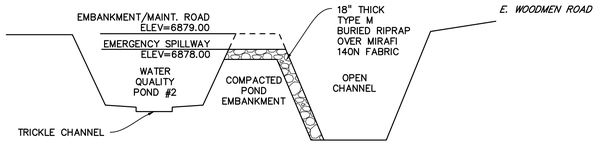
D-4

SHEET: 4 OF 5



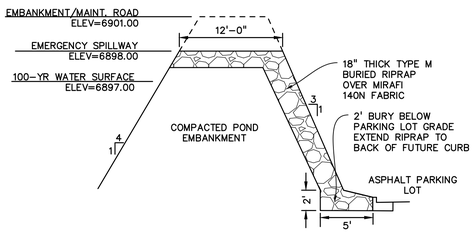
GROUTED SLOPED BOULDER STRUCTURE A–A

NO SCALE



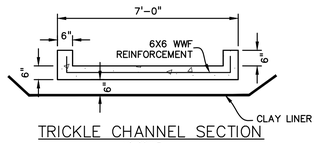
POND #2 & OPEN CHANNEL SECTION D–D

NO SCALE



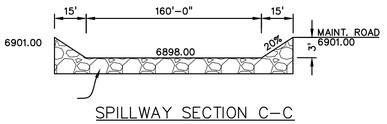
SPILLWAY SECTION B–B

NO SCALE



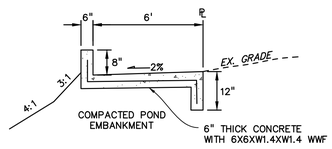
TRICKLE CHANNEL SECTION

NO SCALE



SPILLWAY SECTION C–C

NO SCALE



THIS SECTION REFERS TO A PORTION OF MAINTENANCE ROAD BEGINNING AT THE EAST EDGE OF THE GROUTED RIPRAP FOR A LENGTH OF 250–LF EAST ALONG THE NORTH PROPERTY LINE

MAINTENANCE ROAD SECTION E–E

NO SCALE

PREPARED BY:

DREXEL, BARRELL & CO.
Engineers • Surveyors
3 SOUTH 7TH STREET
COLORADO SPGS, COLORADO 80905
CONTACT: TIM D. McCONNELL, P.E.
(719)260-0887
BOULDER • COLORADO SPRINGS

CLIENT:

HUMMEL INVESTMENTS, LLC

8117 PRESTON ROAD, SUITE 120
DALLAS, TEXAS 75225

(214) 416–9820

DRAINAGE PLAN FOR
FALCON MARKETPLACE
FALCON, COLORADO

ISSUE	DATE
INITIAL ISSUE	6–28–19
REVISED	7–19–19

DESIGNED BY:	TDM
DRAWN BY:	KGV
CHECKED BY:	TDM
FILE NAME:	

PREPARED UNDER MY DIRECT SUPERVISION FOR AND ON BEHALF OF DREXEL, BARRELL & CO.

DRAWING SCALE:
HORIZONTAL: N/A
VERTICAL: N/A

PROPOSED DRAINAGE DETAILS

PROJECT NO. 20988–00CSCV

DRAWING NO.

D-5

SHEET: 5 OF 5

APPENDIX C

COMPOSITE % IMPERVIOUS CALCULATIONS

Subdivision: Falcon Ranchettes Filing No. 1A
Location: CO, Colorado Springs

Project Name: Meridian Storage
Project No.: MRS01
Calculated By: CMWJ
Checked By: BAS
Date: 4/26/24

		Roads			Lawns			Roofs			Basins Total
Basin ID	Total Area (ac)	% Imp.	Area (ac)	Weighted % Imp.	% Imp.	Area (ac)	Weighted % Imp.	% Imp.	Area (ac)	Weighted % Imp.	Weighted % Imp.
EX-1	4.97	100	0.68	13.7	2	4.27	1.7	100	0.02	0.40	15.8
EX-2	2.32	80	0.26	9.0	2	1.99	1.7	100	0.07	3.00	13.7
EX-3	2.85	80	0.12	3.4	2	2.67	1.9	100	0.06	2.10	7.4
EX-4	1.08	80	0.01	0.7	2	1.07	2.0	100	0.00	0.00	2.7
OS-1	3.89	80	0.38	7.8	2	3.46	1.8	100	0.05	1.30	10.9
OS-2	2.35	80	0.30	10.2	2	2.00	1.7	100	0.05	2.10	14.0
OS-3	0.24	100	0.00	0.0	2	0.24	2.0	100	0.00	0.00	2.0
OS-4E	0.05	100	0.05	100.0	2	0.00	0.0	100	0.00	0.00	100.0
A-1	1.82	100	0.68	37.4	2	1.14	1.3	100	0.00	0.00	38.7
B-1	1.46	100	0.89	61.0	2	0.08	0.1	100	0.49	33.60	94.7
B-2	1.18	100	0.59	50.0	2	0.02	0.0	100	0.57	48.30	98.3
B-3	0.95	100	0.41	43.2	2	0.37	0.8	100	0.17	17.90	61.9
B-4	0.52	100	0.41	78.9	2	0.11	0.4	100	0.00	0.00	79.3
B-5	0.13	100	0.11	84.6	2	0.02	0.3	100	0.00	0.00	84.9
B-6	0.16	100	0.11	68.8	2	0.05	0.6	100	0.00	0.00	69.4
B-7	0.56	100	0.07	12.5	2	0.49	1.8	100	0.00	0.00	14.3
C-1	0.29	80	0.15	41.4	2	0.14	1.0	100	0.00	0.00	42.4
C-2	3.12	80	2.25	57.7	2	0.87	0.6	100	0.00	0.00	58.3
C-3	0.29	80	0.19	52.4	2	0.10	0.7	100	0.00	0.00	53.1
C-4	0.09	100	0.00	0.0	2	0.09	2.0	100	0.00	0.00	2.0
D-1	0.08	100	0.00	0.0	2	0.08	2.0	100	0.00	0.00	2.0
D-2	0.05	100	0.03	60.0	2	0.02	0.8	100	0.00	0.00	60.8
D-3	0.33	100	0.25	75.8	2	0.08	0.5	100	0.00	0.00	76.3
OS-4P	0.07	100	0.06	85.7	2	0.01	0.3	100	0.00	0.00	86.0
OS-5	0.19	100	0.00	0.0	2	0.19	2.0	100	0.00	0.00	2.0
OS-6	0.08	100	0.00	0.0	2	0.08	2.0	100	0.00	0.00	2.0

**Impervious values are taken directly from "Table 6-6 Runoff Coefficients for Rational Method"*

Galloway

STANDARD FORM SF-2
TIME OF CONCENTRATION

Subdivision: Falcon Ranchettes Filing No. 1A
Location: CO, Colorado Springs

Project Name: Meridian Storage
Project No.: MRS01
Calculated By: CMWJ
Checked By: BAS
Date: 4/26/24

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)
EX-1	4.97	A	15.8	0.23	0.08	25	15.0	3.8	830	1.8	15.0	2.0	6.9	10.7	855.0	14.8	10.7
EX-2	2.32	A	13.7	0.22	0.07	15	1.0	7.3	540	1.9	5.0	0.7	13.1	20.4	555.0	13.1	13.1
EX-3	2.85	A	7.4	0.17	0.03	25	15.0	4.0	650	2.2	5.0	0.7	14.6	18.6	675.0	13.8	13.8
EX-4	1.08	A	2.7	0.13	0.01	25	1.0	10.0	620	2.3	5.0	0.8	13.6	23.6	645.0	13.6	13.6
OS-1	3.89	A	10.9	0.19	0.05	100	5.3	11.1	600	2.1	10.0	1.4	6.9	18.0	700.0	13.9	13.9
OS-2	2.35	A	14.0	0.22	0.07	100	5.3	10.8	900	1.9	7.0	1.0	15.5	26.4	1000.0	15.6	15.6
OS-3	0.24	A	2.0	0.13	0.01	25	10.0	4.6	325	2.4	7.0	1.1	5.0	9.6	350.0	11.9	9.6
OS-4E	0.05	A	100.0	0.89	0.86	10	1.0	1.4	80	1.0	15.0	1.5	0.9	2.3	90.0	10.5	5.0
A-1	1.82	A	38.7	0.41	0.26	25	25.0	2.6	620	1.3	15.0	1.7	6.2	8.8	645.0	13.6	8.8
B-1	1.46	A	94.7	0.85	0.80	60	7.0	2.2	350	2.0	20.0	2.8	2.1	4.3	410.0	12.3	5.0
B-2	1.18	A	98.3	0.88	0.84	12.5	2.0	1.3	335	1.2	20.0	2.2	2.5	3.9	347.5	11.9	5.0
B-3	0.95	A	61.9	0.59	0.47	20	2.0	4.1	640	3.2	20.0	3.6	3.0	7.1	660.0	13.7	7.1
B-4	0.52	A	79.3	0.73	0.64	20	2.0	3.0	640	3.2	20.0	3.6	3.0	6.0	660.0	13.7	6.0
B-5	0.13	A	84.9	0.77	0.70	30	2.2	3.1	148	0.8	20.0	1.8	1.4	4.5	178.0	11.0	5.0
B-6	0.16	A	69.4	0.65	0.54	30	2.2	4.3	154	0.8	20.0	1.8	1.4	5.8	184.0	11.0	5.8
B-7	0.56	A	14.3	0.22	0.07	25	25.0	3.2	125	3.0	7.0	1.2	1.7	4.9	150.0	10.8	5.0
C-1	0.29	A	42.4	0.44	0.29	100	2.8	10.5	190	2.8	20.0	3.3	0.9	11.5	290.0	11.6	11.5
C-2	3.12	A	58.3	0.56	0.43	100	2.2	9.4	450	2.2	20.0	3.0	2.5	12.0	550.0	13.1	12.0
C-3	0.29	A	53.1	0.52	0.38	100	2.3	10.0	200	2.3	20.0	3.0	1.1	11.1	300.0	11.7	11.1
C-4	0.09	A	2.0	0.13	0.01	5	25.0	1.5	250	2.0	15.0	2.1	2.0	3.5	255.0	11.4	5.0
D-1	0.08	A	2.0	0.13	0.01	25	25.0	3.4	1	1.0	20.0	2.0	0.0	3.4	26.0	10.1	5.0
D-2	0.05	A	60.8	0.58	0.46	35	15.0	2.8	35	1.5	20.0	2.4	0.2	3.1	70.0	10.4	5.0
D-3	0.33	A	76.3	0.70	0.61	30	2.0	3.9	166	1.0	20.0	2.0	1.4	5.3	196.0	11.1	5.3
OS-4P	0.07	A	86.0	0.78	0.71	20	2.0	2.5	46	1.0	20.0	2.0	0.4	2.9	66.0	10.4	5.0
OS-5	0.19	A	2.0	0.13	0.01	25	15.0	4.0	1	1.0	5.0	0.5	0.0	4.1	26.0	10.1	5.0
OS-6	0.08	A	2.0	0.13	0.01	25	15.0	4.0	160	1.0	5.0	0.5	5.3	9.4	185.0	11.0	9.4

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

Galloway

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

Subdivision: Falcon Ranchettes Filing No. 1A
Location: CO, Colorado Springs
Design Storm: 5-Year

Project Name: Meridian Storage
Project No.: MRS01
Calculated By: CMWJ
Checked By: BAS
Date: 4/26/24

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)	
	1	MT060						304.6													Flows from upstream offsite basin = 304.6 cfs
	1	EX-1	4.97	0.08	10.7	0.40	4.03	1.6													Flows from project site at DP1 = 1.6 cfs
	1											306.2									Total flow at DP1 = 306.2 cfs
	2	EX-2	2.32	0.07	13.1	0.16	3.73	0.6													Total flow at DP2 = 0.6 cfs
	3	EX-3	2.85	0.03	13.8	0.09	3.65	0.3													Total flow at DP3 = 0.3 cfs
	4	EX-4	1.08	0.01	13.6	0.01	3.67	0.0													Flows from basin at DP4 = 0 cfs
	4	OS-1	3.89	0.05	13.9	0.19	3.64	0.7													Flows from basin at DP4 = 0.7 cfs
	4	OS-2	2.35	0.07	15.6	0.16	3.47	0.6													Flows from basin at DP4 = 0.6 cfs
	4	OS-3	0.24	0.01	9.6	0.00	4.19	0.0													Flows from basin at DP4 = 0 cfs
	4								15.6	0.36	3.47	1.2									Total flow at DP4 = 1.2 cfs
See basin comparison OS-4E / OS-4P	14	OS-4E	0.05	0.86	5.0	0.04	5.17	0.2													Existing condition of contributing flow to DP14 = 0.2 cfs
	1	MT060						304.6													Flows from upstream offsite basin = 304.6 cfs
	1	OS-6	0.08	0.01	9.4	0.00	4.22	0.0													Flows from basin = 0 cfs
	1	A-1	1.82	0.26	8.8	0.47	4.32	2.0													Flows from basin = 2 cfs
	1								9.4	0.47	4.22	306.6									Total flow at DP1 = 306.6 cfs
		D-1	0.08	0.01	5.0	0.00	5.17	0.0													Total flow = 0 cfs
	3	B-1	1.46	0.80	5.0	1.17	5.17	6.0							6.0	1.3		290	2.2	2.2	Total flow captured by inlet, DP3 = 6 cfs
	4	B-2	1.18	0.84	5.0	0.99	5.17	5.1													Total flow captured by inlet, DP4 = 5.1 cfs
	4								7.2	2.16	4.63	10.0			10.0	1.0		128	2.0	1.1	Total flow in storm system, DP4 = 10 cfs
Proposed on-grade 10' CDOT Type R	5	B-3	0.95	0.47	7.1	0.45	4.65	2.1					1.5	0.0	2.1			95	2.4	0.6	Qcap = 2.1 cfs, Qbyp = 0 cfs; Qbyp to DP12
	5								8.2	2.61	4.42	11.5			11.5	0.5		41	1.4	0.5	Total flow in storm system, DP5 = 11.5 cfs
	6	B-4	0.52	0.64	6.0	0.33	4.90	1.6													Flows from basin = 1.6 cfs
	6	C-1	0.29	0.29	11.5	0.08	3.92	0.3					2.15	0.3				210	2.9	1.2	Flows from basin to DP6 = 0.3 cfs
Proposed on-grade 10' CDOT Type R	6								12.7	0.41	3.77	1.5	1.5	0.0	1.5			95	2.4	0.6	Qcap = 1.5 cfs, Qbyp = 0 cfs; Qbyp to DP13
	6								12.7	3.01	3.77	11.3			11.3	1.0		29	2.0	0.2	Total flow in storm system, DP6 = 11.3 cfs; piped to Forebay A
Proposed on-grade 5' CDOT Type R	7	B-5	0.13	0.70	5.0	0.09	5.17	0.5					0.8	0.0	0.5	1.0		150 42	1.8 2.0	1.4 0.4	Qcap = 0.5 cfs, Qbyp = 0 cfs; Qbyp to DP13
	8	C-3	0.29	0.38	11.1	0.11	3.97	0.4					0.5	0.4				75	1.4	0.9	Flows from basin to DP8 = 0.4 cfs
	8	B-6	0.16	0.54	5.8	0.09	4.96	0.4													Flows from basin = 0.4 cfs
Proposed on-grade 5' CDOT Type R	8								12.0	0.20	3.86	0.8	1.5	0.0	0.8			95	2.4	0.6	Qcap = 0.8 cfs, Qbyp = 0 cfs; Qbyp to DP13
	8								12.9	0.30	3.75	1.1									Total flow in storm system, DP8 = 1.1 cfs; piped to Forebay D
	9	OS-3	0.24	0.01	9.6	0.00	4.19	0.0													Flows from basin = 0 cfs
	9	OS-5	0.19	0.01	5.0	0.00	5.17	0.0													Flows from basin = 0 cfs
	9	C-2	3.12	0.43	12.0	1.34	3.86	5.2													Flows from basin = 5.2 cfs
	9	B-7	0.56	0.07	5.0	0.04	5.17	0.2													Flows from basin = 0.2 cfs
Flow taken from UD-Detention Worksheet	9											16.5									Total Flow entering Pond #1 = 16.5 cfs
Flow taken from UD-Detention Worksheet	9											0.4			0.4	1.0		140	2.0	1.2	Peak Outflow from Pond #1 = 0.4 cfs
	10	OS-1	3.89	0.05	13.9	0.19	3.64	0.7													Flows from basin at DP10 = 0.7 cfs
	10	OS-2	2.35	0.07	15.6	0.16	3.47	0.6													Flows from basin at DP10 = 0.6 cfs
	10	C-4	0.09	0.01	5.0	0.00	5.17	0.0													Flows from basin at DP10 = 0 cfs
	10								15.6	0.35	3.47	1.2			1.2	10.0		40	6.3	0.1	Total flow captured by inlet, DP10 = 1.2 cfs
	11								15.7	0.35	3.46	1.6									Total flow at manhole, DP11 = 1.6 cfs; conveyed to Subregional Pond SR4
	12	D-2	0.05	0.46	5.0	0.02	5.17	0.1													Flows from basin = 0.1 cfs
	12								5.0	0.02	5.17	0.1									Add bypass flows from DP5 Total flow at DP12 = 0.1 cfs
	13	D-3	0.33	0.61	5.3	0.20	5.09	1.0													Flows from basin = 1 cfs
	13								5.3	0.20	5.09	1.0									Add bypass flows from DP6, DP7, DP8 Total flow at DP13 = 1 cfs
See basin comparison OS-4P / OS-4E	14	OS-4P	0.07	0.71	5.0	0.05	5.17	0.3													Proposed condition of contributing flow to DP14 = 0.3 cfs

DESIGNER NOTES: Street flows & travel time located at top of cell, pipe flows & travel time located at bottom of cell

Galloway

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

Subdivision: Falcon Ranchettes Filing No. 1A
Location: CO, Colorado Springs
Design Storm: 100-Year

Project Name: Meridian Storage
Project No.: MRS01
Calculated By: CMWJ
Checked By: BAS
Date: 4/26/24

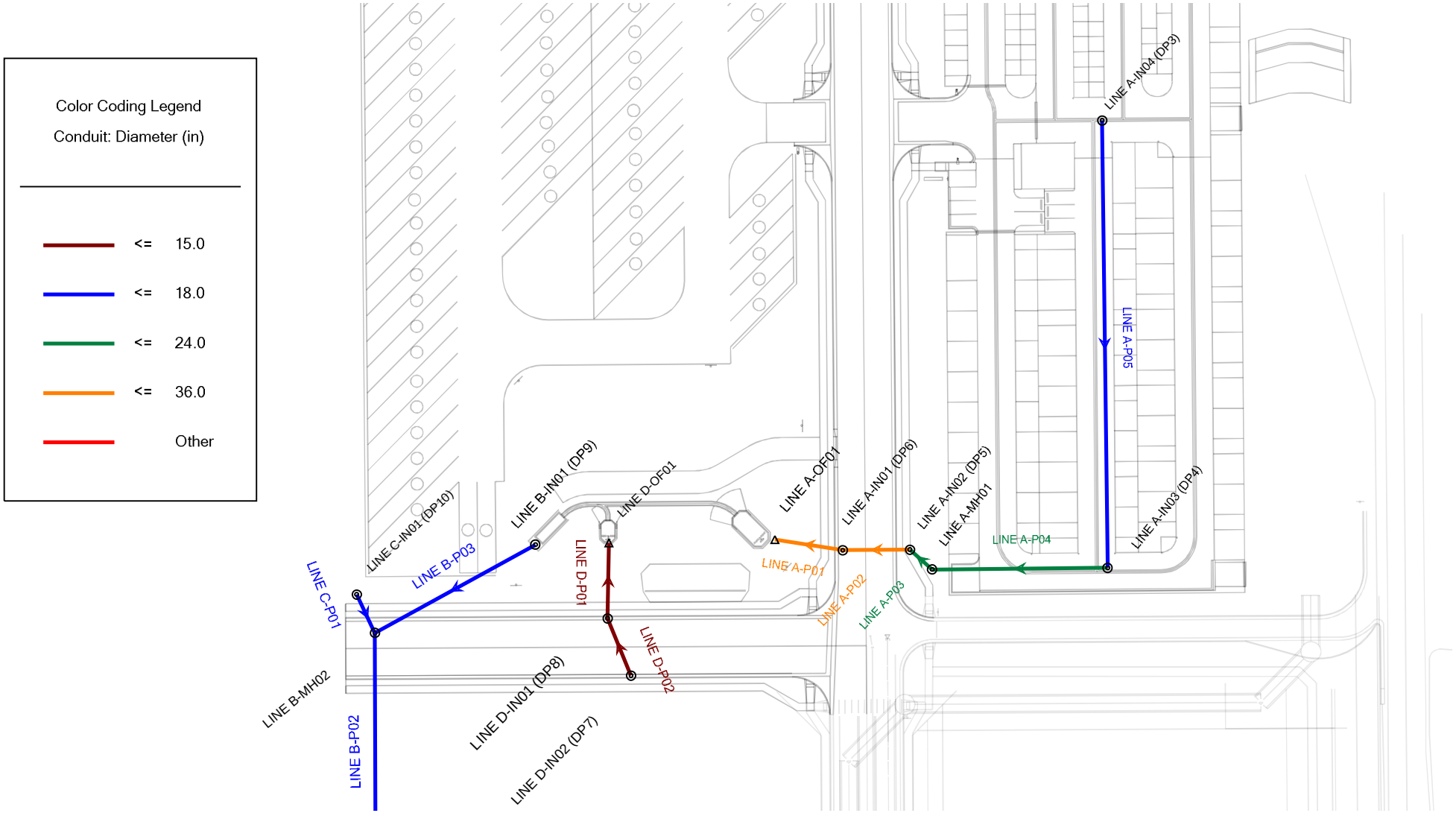
STREET	Design Point	DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
		Basin ID	Area (Ac)	Runoff Coeff.	Tc (min)	C*A (Ac)	I (in/hr)	Q (cfs)	Tc (min)	C*A (Ac)	I (in/hr)	Q (cfs)	Slope (%)	Street Flow (cfs)	Design Flow (cfs)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	Tt (min)	
	1	MT060						915.3													Flows from upstream offsite basin = 915.3 cfs
	1	EX-1	4.97	0.23	10.7	1.14	6.77	7.7													Flows from project site at DP1 = 7.7 cfs
	1											923.0									Total flow at DP1 = 923 cfs
	2	EX-2	2.32	0.22	13.1	0.51	6.26	3.2													Total flow at DP2 = 3.2 cfs
	3	EX-3	2.85	0.17	13.8	0.48	6.13	2.9													Total flow at DP3 = 2.9 cfs
	4	EX-4	1.08	0.13	13.6	0.14	6.16	0.9													Flows from basin at DP4 = 0.9 cfs
	4	OS-1	3.89	0.19	13.9	0.74	6.10	4.5													Flows from basin at DP4 = 4.5 cfs
	4	OS-2	2.35	0.22	15.6	0.52	5.82	3.0													Flows from basin at DP4 = 3 cfs
	4	OS-3	0.24	0.13	9.6	0.03	7.03	0.2													Flows from basin at DP4 = 0.2 cfs
	4								15.6	1.43	5.82	8.3									Total flow at DP4 = 8.3 cfs
See basin comparison OS-4E / OS-4P	14	OS-4E	0.05	0.89	5.0	0.04	8.68	0.3													Existing condition of contributing flow to DP14 = 0.3 cfs
	1	MT060						915.3													Flows from upstream offsite basin = 915.3 cfs
	1	OS-6	0.08	0.13	9.4	0.01	7.09	0.1													Flows from basin = 0.1 cfs
	1	A-1	1.82	0.41	8.8	0.75	7.26	5.4													Flows from basin = 5.4 cfs
	1								9.4	0.76	7.09	920.7									Total flow at DP1 = 920.7 cfs
		D-1	0.08	0.13	5.0	0.01	8.68	0.1													Total flow = 0.1 cfs
	3	B-1	1.46	0.85	5.0	1.24	8.68	10.8							10.8	1.3		290	2.2	2.2	Total flow captured by inlet, DP3 = 10.8 cfs
	4	B-2	1.18	0.88	5.0	1.04	8.68	9.0													Total flow captured by inlet, DP4 = 9 cfs
	4								7.2	2.28	7.77	17.7			17.7	1.0		128	2.0	1.1	Total flow in storm system, DP4 = 17.7 cfs
Proposed on-grade 10' CDOT Type R	5	B-3	0.95	0.59	7.1	0.56	7.80	4.4					1.5	0.2	4.2			95	2.4	0.6	Qcap = 4.2 cfs, Qbyp = 0.2 cfs; Qbyp to DP12
	5								8.2	2.82	7.42	20.9			20.9	0.5		41	1.4	0.5	Total flow in storm system, DP5 = 20.9 cfs
	6	B-4	0.52	0.73	6.0	0.38	8.23	3.1													Flows from basin = 3.1 cfs
	6	C-1	0.29	0.44	11.5	0.13	6.59	0.9					2.15	0.9				210	2.9	1.2	Flows from basin to DP6 = 0.9 cfs
Proposed on-grade 10' CDOT Type R	6								12.7	0.51	6.34	3.2	1.5	0.0	3.2			95	2.4	0.6	Qcap = 3.2 cfs, Qbyp = 0 cfs; Qbyp to DP13
	6								12.7	3.32	6.34	21.1			21.1	1.0		29	2.0	0.2	Total flow in storm system, DP6 = 21.1 cfs; piped to Forebay A
Proposed on-grade 5' CDOT Type R	7	B-5	0.13	0.77	5.0	0.10	8.68	0.9					0.8	0.0	0.9	1.0		150 42	1.8 2.0	1.4 0.4	Qcap = 0.9 cfs, Qbyp = 0 cfs; Qbyp to DP13
	8	C-3	0.29	0.52	11.1	0.15	6.67	1.0					0.5	1.0				75	1.4	0.9	Flows from basin to DP8 = 1 cfs
	8	B-6	0.16	0.65	5.8	0.10	8.33	0.8													Flows from basin = 0.8 cfs
Proposed on-grade 5' CDOT Type R	8								12.0	0.25	6.48	1.6	1.5	0.1	1.5			95	2.4	0.6	Qcap = 1.5 cfs, Qbyp = 0.1 cfs; Qbyp to DP13
	8								12.9	0.34	6.29	2.1									Total flow in storm system, DP8 = 2.1 cfs; piped to Forebay D
	9	OS-3	0.24	0.13	9.6	0.03	7.03	0.2													Flows from basin = 0.2 cfs
	9	OS-5	0.19	0.13	5.0	0.02	8.68	0.2													Flows from basin = 0.2 cfs
	9	C-2	3.12	0.56	12.0	1.75	6.48	11.3													Flows from basin = 11.3 cfs
	9	B-7	0.56	0.22	5.0	0.12	8.68	1.0													Flows from basin = 1 cfs
Flow taken from UD-Detention Worksheet	9											31.2									Total Flow entering Pond #1 = 31.2 cfs
Flow taken from UD-Detention Worksheet	9											4.7			4.7	1.0		140	2.0	1.2	Peak Outflow from Pond #1 = 4.7 cfs
	10	OS-1	3.89	0.19	13.9	0.74	6.10	4.5													Flows from basin at DP10 = 4.5 cfs
	10	OS-2	2.35	0.22	15.6	0.52	5.82	3.0													Flows from basin at DP10 = 3 cfs
	10	C-4	0.09	0.13	5.0	0.01	8.68	0.1													Flows from basin at DP10 = 0.1 cfs
	10								15.6	1.27	5.82	7.4			7.4	10.0		40	6.3	0.1	Total flow captured by inlet, DP10 = 7.4 cfs
	11								15.7	1.27	5.80	12.1									Total flow at manhole, DP11 = 12.1 cfs; conveyed to Subregional Pond SR4
	12	D-2	0.05	0.58	5.0	0.03	8.68	0.3													Flows from basin = 0.3 cfs
	12								5.0	0.05	8.68	0.4									Add bypass flows from DP5 Total flow at DP12 = 0.4 cfs
	13	D-3	0.33	0.70	5.3	0.23	8.54	2.0													Flows from basin = 2 cfs
	13								5.3	0.25	8.54	2.1									Add bypass flows from DP6, DP7, DP8 Total flow at DP13 = 2.1 cfs
See basin comparison OS-4P / OS-4E	14	OS-4P	0.07	0.78	5.0	0.05	8.68	0.4													Proposed condition of contributing flow to DP14 = 0.4 cfs

DESIGNER NOTES: Street flows & travel time located at top of cell, pipe flows & travel time located at bottom of cell

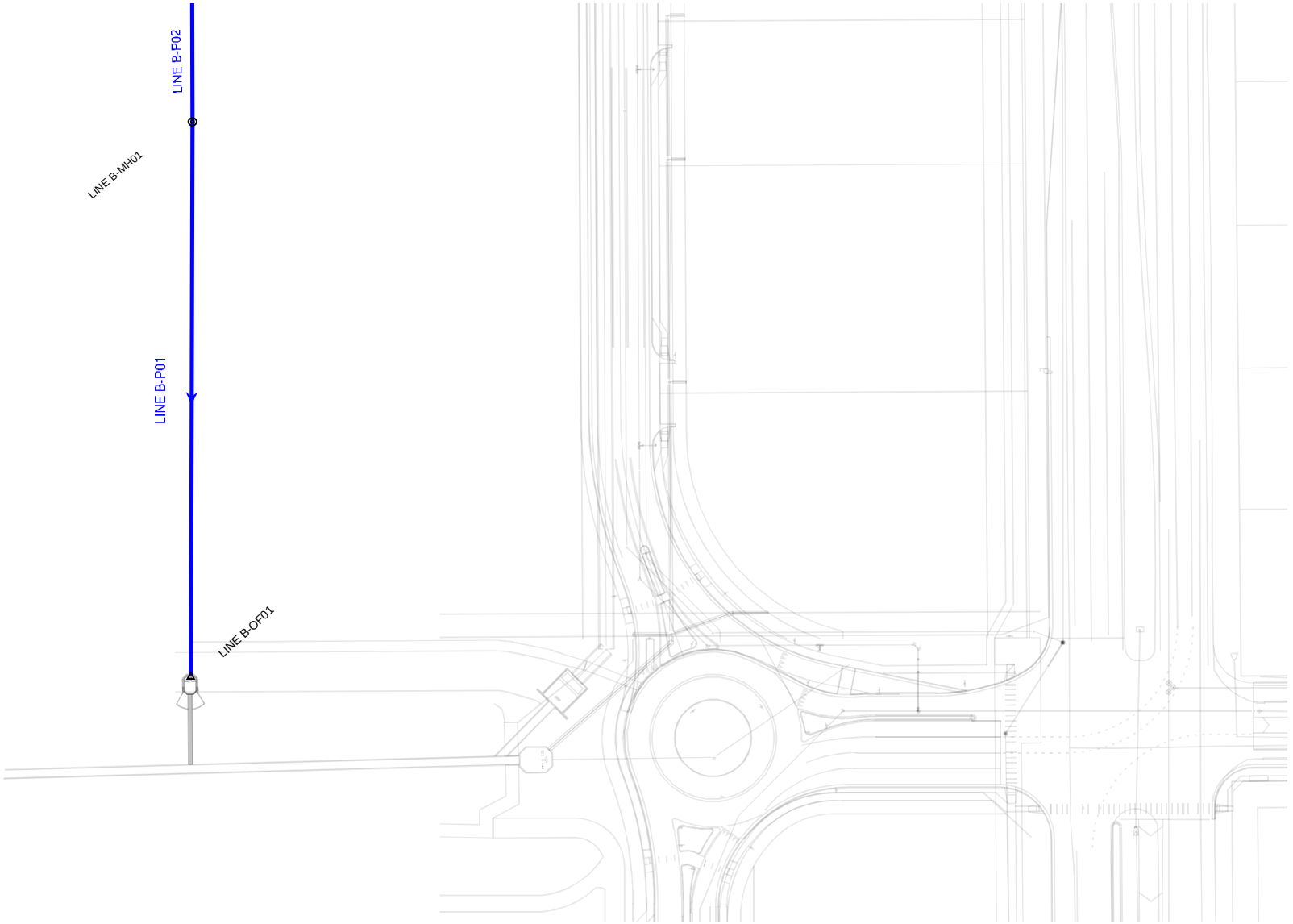
Galloway

APPENDIX D

StormCAD Layout



StormCAD Layout



FlexTable: Conduit Table

Active Scenario: 5-Year

Label	Start Node	Stop Node	Invert (Start) (ft)	Invert (Stop) (ft)	Length (User Defined) (ft)	Slope (Calculated) (ft/ft)	Section Type	Diameter (in)	Manning's n	Flow (cfs)	Velocity (ft/s)	Capacity (Full Flow) (cfs)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Energy Grade Line (In) (ft)	Energy Grade Line (Out) (ft)
LINE A-P04	LINE A-IN03 (DP4)	LINE A-MH01	6,907.71	6,906.44	101.6	0.013	Circle	24.0	0.013	10.00	7.58	25.29	6,908.84	6,907.31	6,909.30	6,908.21
LINE B-P03	LINE B-IN01 (DP9)	LINE B-MH02	6,901.92	6,900.67	125.1	0.010	Circle	18.0	0.013	0.40	2.86	10.50	6,902.15	6,901.02	6,902.23	6,901.05
LINE C-P01	LINE C-IN01 (DP10)	LINE B-MH02	6,906.50	6,901.37	36.0	0.143	Circle	18.0	0.013	1.20	10.06	39.67	6,906.91	6,901.55	6,907.06	6,903.12
LINE A-P03	LINE A-MH01	LINE A-IN02 (DP5)	6,906.34	6,906.05	23.3	0.012	Circle	24.0	0.013	10.00	7.56	25.22	6,907.47	6,907.41	6,907.93	6,907.71
LINE A-P02	LINE A-IN02 (DP5)	LINE A-IN01 (DP6)	6,905.05	6,904.64	41.3	0.010	Circle	36.0	0.013	11.50	7.04	66.43	6,907.40	6,907.41	6,907.46	6,907.45
LINE A-P01	LINE A-IN01 (DP6)	LINE A-OF01	6,904.54	6,904.08	45.4	0.010	Circle	36.0	0.013	11.30	7.06	67.16	6,907.40	6,907.39	6,907.44	6,907.43
LINE A-P05	LINE A-IN04 (DP3)	LINE A-IN03 (DP4)	6,911.91	6,908.21	295.9	0.013	Circle	18.0	0.013	6.00	6.68	11.75	6,912.86	6,909.45	6,913.26	6,909.68
LINE D-P02	LINE D-IN02 (DP7)	LINE D-IN01 (DP8)	6,906.75	6,906.32	42.8	0.010	Circle	15.0	0.013	0.40	2.93	6.47	6,907.40	6,907.40	6,907.41	6,907.40
LINE D-P01	LINE D-IN01 (DP8)	LINE D-OF01	6,906.22	6,903.94	45.9	0.050	Circle	15.0	0.013	1.10	6.94	14.40	6,907.40	6,907.39	6,907.41	6,907.40
LINE B-P02	LINE B-MH02	LINE B-MH01	6,900.37	6,897.69	268.3	0.010	Circle	18.0	0.013	1.60	4.29	10.50	6,900.85	6,898.09	6,901.02	6,898.37
LINE B-P01	LINE B-MH01	LINE B-OF01	6,897.59	6,889.40	425.0	0.019	Circle	18.0	0.013	1.60	5.42	14.58	6,898.06	6,894.20	6,898.24	6,894.21

FlexTable: Manhole Table

Active Scenario: 5-Year

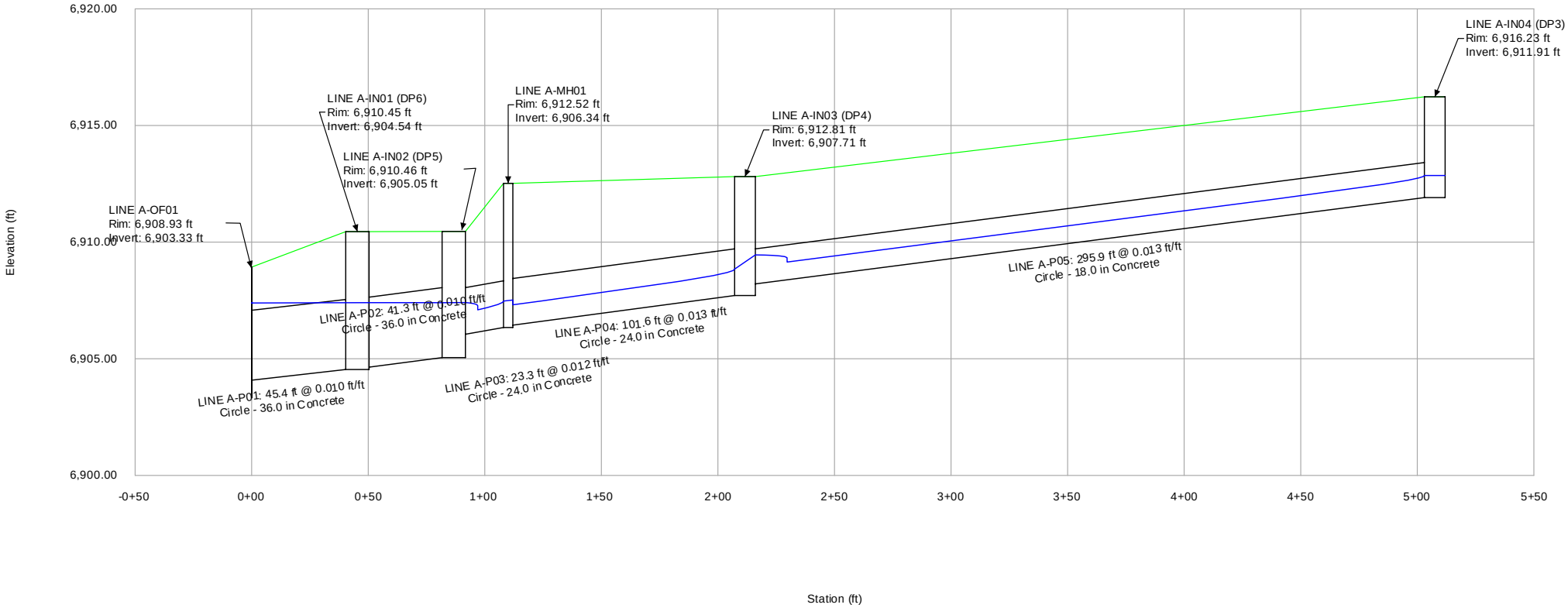
Label	Elevation (Rim) (ft)	Flow (Total Out) (cfs)	Headloss Method	Headloss Coefficient (Standard)	Headloss (ft)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Energy Grade Line (In) (ft)	Energy Grade Line (Out) (ft)
LINE A-IN03 (DP4)	6,912.81	10.00	Standard	1.320	0.61	6,909.45	6,908.84	6,909.68	6,909.30
LINE B-MH02	6,911.39	1.60	Standard	1.020	0.18	6,901.02	6,900.85	6,901.05	6,901.02
LINE C-IN01 (DP10)	6,909.45	1.20	Standard	0.000	0.00	6,906.91	6,906.91	6,907.06	6,907.06
LINE A-MH01	6,912.52	10.00	Standard	0.100	0.05	6,907.52	6,907.47	6,908.41	6,907.93
LINE A-IN02 (DP5)	6,910.46	11.50	Standard	0.100	0.01	6,907.41	6,907.40	6,907.71	6,907.46
LINE A-IN01 (DP6)	6,910.45	11.30	Standard	0.100	0.00	6,907.41	6,907.40	6,907.45	6,907.44
LINE B-IN01 (DP9)	6,907.92	0.40	Standard	0.000	0.00	6,902.15	6,902.15	6,902.23	6,902.23
LINE A-IN04 (DP3)	6,916.23	6.00	Standard	0.000	0.00	6,912.86	6,912.86	6,913.26	6,913.26
LINE D-IN01 (DP8)	6,910.66	1.10	Standard	0.100	0.00	6,907.40	6,907.40	6,907.40	6,907.41
LINE D-IN02 (DP7)	6,910.30	0.40	Standard	0.000	0.00	6,907.40	6,907.40	6,907.41	6,907.41
LINE B-MH01	6,905.18	1.60	Standard	0.100	0.02	6,898.08	6,898.06	6,898.37	6,898.24

FlexTable: Outfall Table

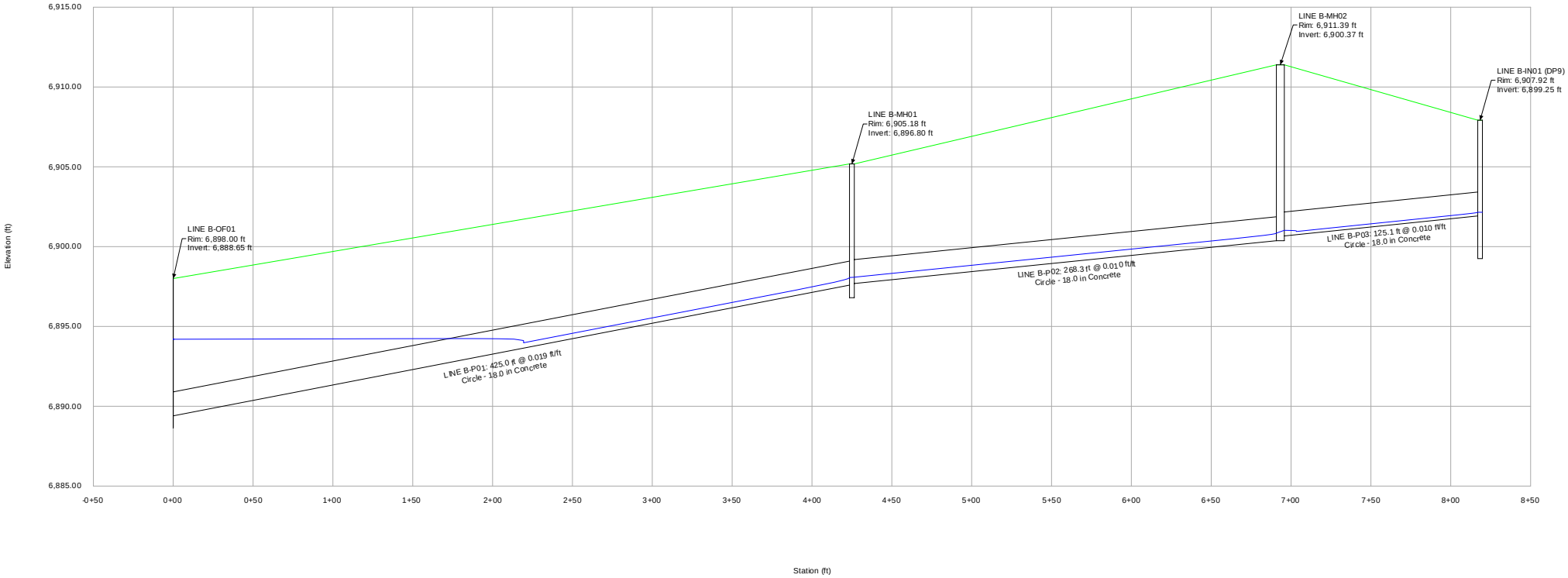
Active Scenario: 5-Year

Label	Elevation (Ground) (ft)	Elevation (Invert) (ft)	Boundary Condition Type	Elevation (User Defined Tailwater) (ft)	Flow (Total Out) (cfs)	Hydraulic Grade (ft)	Energy Grade Line (ft)
LINE B-OF01	6,898.00	6,888.65	User Defined Tailwater	6,894.20	1.60	6,894.20	6,894.20
LINE A-OF01	6,908.93	6,903.33	User Defined Tailwater	6,907.39	11.30	6,907.39	6,907.39
LINE D-OF01	6,906.80	6,903.19	User Defined Tailwater	6,907.39	1.10	6,907.39	6,907.39

Profile Report
Engineering Profile - LINE A (MRS01_StormCAD.stsw)
Active Scenario: 5-Year



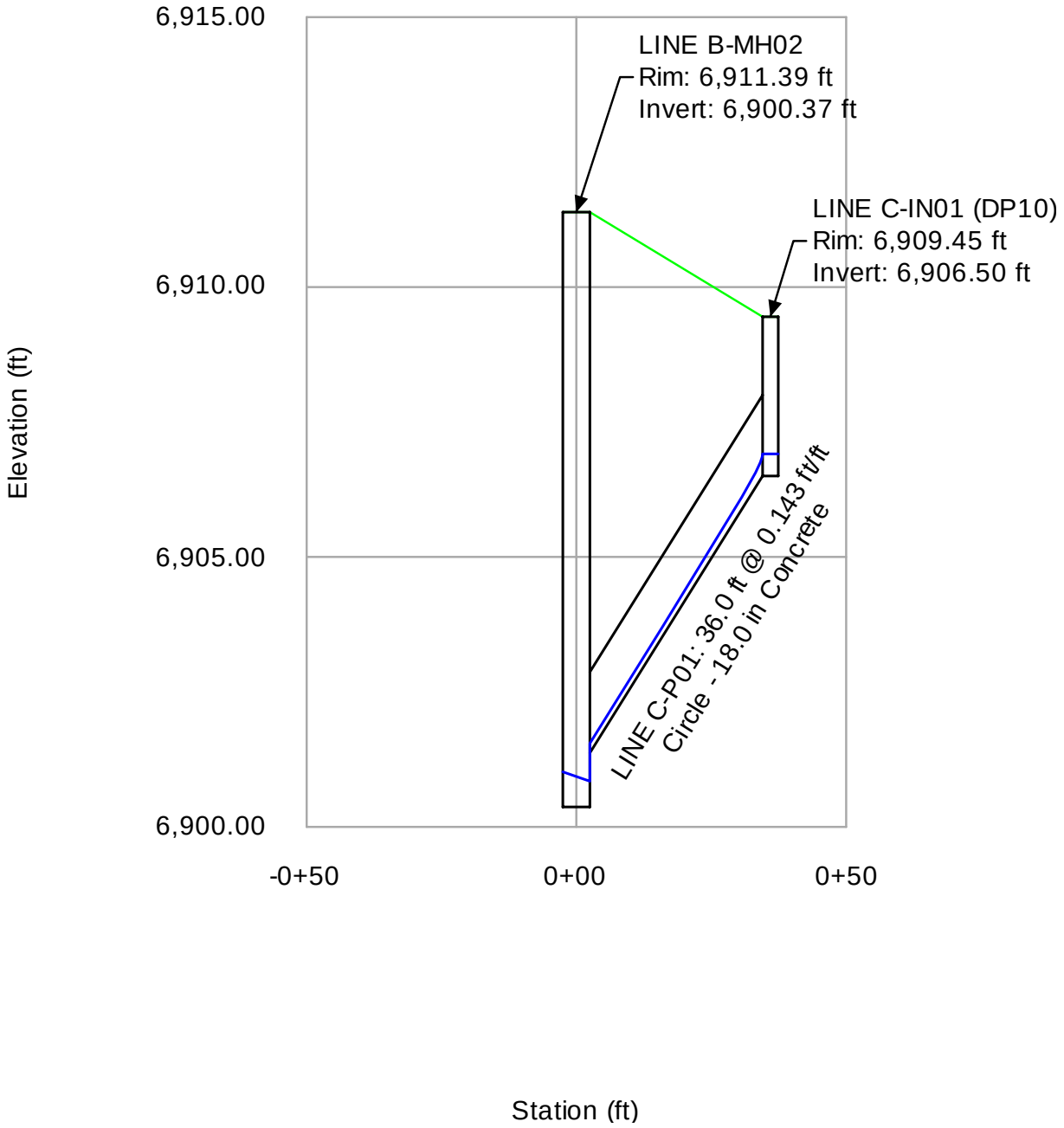
Profile Report
Engineering Profile - LINE B (MRS01_StormCAD.stsw)
Active Scenario: 5-Year



Profile Report

Engineering Profile - LINE C (MRS01_StormCAD.stsw)

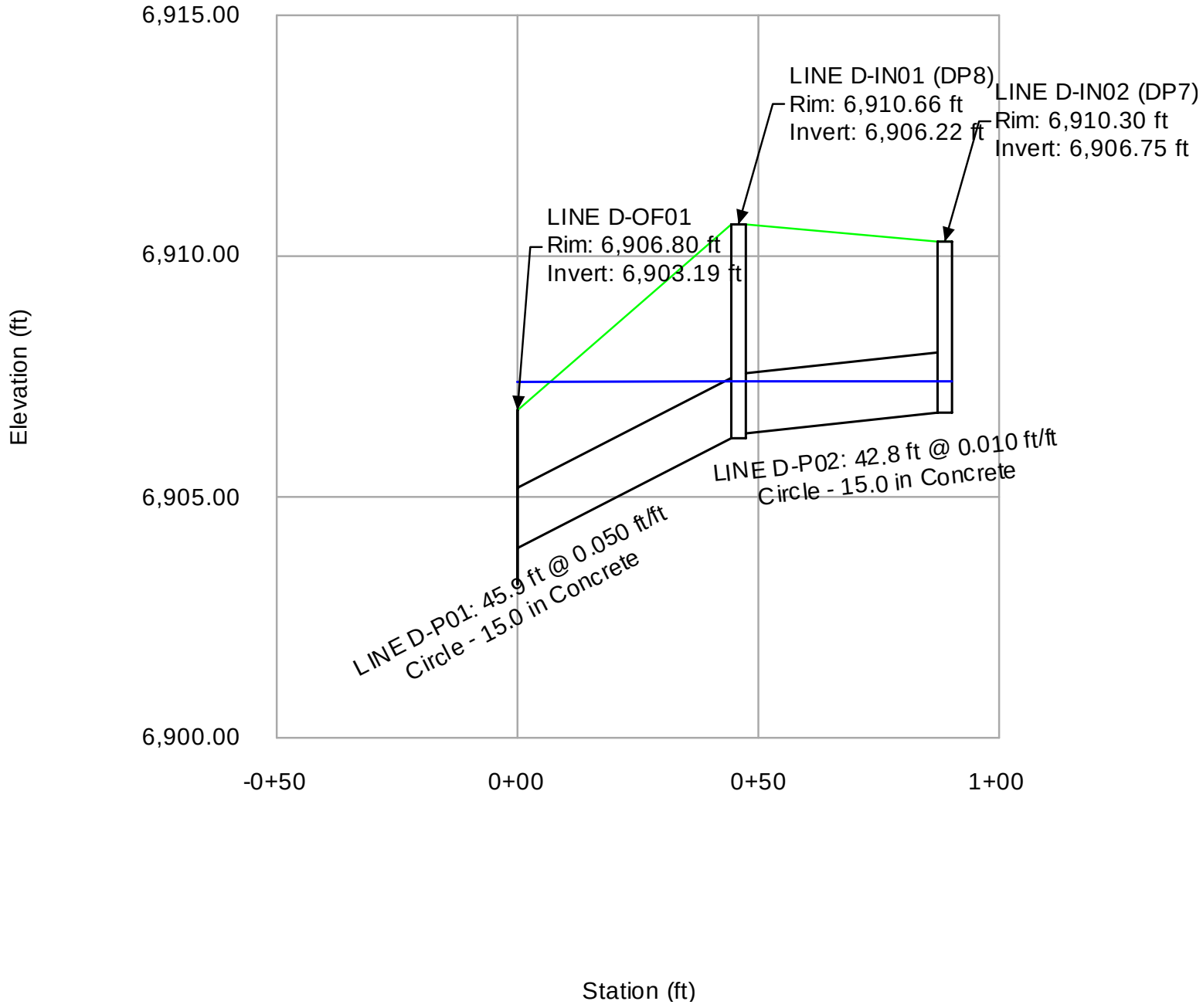
Active Scenario: 5-Year



Profile Report

Engineering Profile - LINE D (MRS01_StormCAD.stsw)

Active Scenario: 5-Year



FlexTable: Conduit Table

Active Scenario: 100-Year

Label	Start Node	Stop Node	Invert (Start) (ft)	Invert (Stop) (ft)	Length (User Defined) (ft)	Slope (Calculated) (ft/ft)	Section Type	Diameter (in)	Manning's n	Flow (cfs)	Velocity (ft/s)	Capacity (Full Flow) (cfs)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Energy Grade Line (In) (ft)	Energy Grade Line (Out) (ft)
LINE A-P04	LINE A-IN03 (DP4)	LINE A-MH01	6,907.71	6,906.44	101.6	0.013	Circle	24.0	0.013	17.70	8.71	25.29	6,909.58	6,909.00	6,910.10	6,909.49
LINE B-P03	LINE B-IN01 (DP9)	LINE B-MH02	6,901.92	6,900.67	125.1	0.010	Circle	18.0	0.013	4.70	2.66	10.50	6,907.27	6,907.02	6,907.38	6,907.13
LINE C-P01	LINE C-IN01 (DP10)	LINE B-MH02	6,906.50	6,901.37	36.0	0.143	Circle	18.0	0.013	7.40	17.18	39.67	6,907.55	6,907.02	6,908.04	6,907.29
LINE A-P03	LINE A-MH01	LINE A-IN02 (DP5)	6,906.34	6,906.05	23.3	0.012	Circle	24.0	0.013	17.70	5.63	25.22	6,908.95	6,908.80	6,909.44	6,909.30
LINE A-P02	LINE A-IN02 (DP5)	LINE A-IN01 (DP6)	6,905.05	6,904.64	41.3	0.010	Circle	36.0	0.013	20.90	2.96	66.43	6,908.79	6,908.75	6,908.93	6,908.89
LINE A-P01	LINE A-IN01 (DP6)	LINE A-OF01	6,904.54	6,904.08	45.4	0.010	Circle	36.0	0.013	21.10	2.99	67.16	6,908.74	6,908.69	6,908.87	6,908.83
LINE A-P05	LINE A-IN04 (DP3)	LINE A-IN03 (DP4)	6,911.91	6,908.21	295.9	0.013	Circle	18.0	0.013	10.80	7.54	11.75	6,913.39	6,910.27	6,913.98	6,910.85
LINE D-P02	LINE D-IN02 (DP7)	LINE D-IN01 (DP8)	6,906.75	6,906.32	42.8	0.010	Circle	15.0	0.013	0.80	0.65	6.47	6,908.75	6,908.74	6,908.76	6,908.75
LINE D-P01	LINE D-IN01 (DP8)	LINE D-OF01	6,906.22	6,903.94	45.9	0.050	Circle	15.0	0.013	2.10	1.71	14.40	6,908.74	6,908.69	6,908.78	6,908.74
LINE B-P02	LINE B-MH02	LINE B-MH01	6,900.37	6,897.69	268.3	0.010	Circle	18.0	0.013	12.10	6.85	10.50	6,906.27	6,902.71	6,907.00	6,903.44
LINE B-P01	LINE B-MH01	LINE B-OF01	6,897.59	6,889.40	425.0	0.019	Circle	18.0	0.013	12.10	6.85	14.58	6,902.64	6,897.00	6,903.37	6,897.73

FlexTable: Manhole Table

Active Scenario: 100-Year

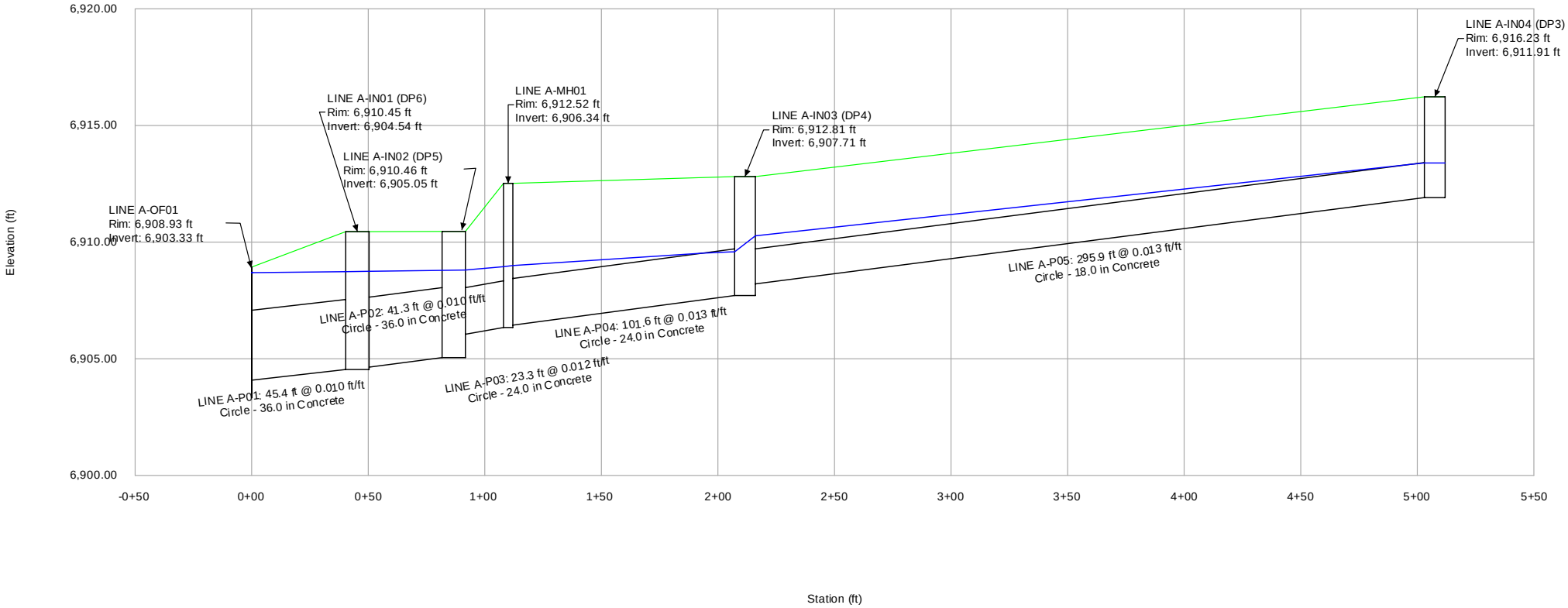
Label	Elevation (Rim) (ft)	Flow (Total Out) (cfs)	Headloss Method	Headloss Coefficient (Standard)	Headloss (ft)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Energy Grade Line (In) (ft)	Energy Grade Line (Out) (ft)
LINE A-IN03 (DP4)	6,912.81	17.70	Standard	1.320	0.69	6,910.27	6,909.58	6,910.85	6,910.10
LINE B-MH02	6,911.39	12.10	Standard	1.020	0.74	6,907.02	6,906.27	6,907.29	6,907.00
LINE C-IN01 (DP10)	6,909.45	7.40	Standard	0.000	0.00	6,907.55	6,907.55	6,908.04	6,908.04
LINE A-MH01	6,912.52	17.70	Standard	0.100	0.05	6,909.00	6,908.95	6,909.49	6,909.44
LINE A-IN02 (DP5)	6,910.46	20.90	Standard	0.100	0.01	6,908.80	6,908.79	6,909.30	6,908.93
LINE A-IN01 (DP6)	6,910.45	21.10	Standard	0.100	0.01	6,908.75	6,908.74	6,908.88	6,908.87
LINE B-IN01 (DP9)	6,907.92	4.70	Standard	0.000	0.00	6,907.27	6,907.27	6,907.38	6,907.38
LINE A-IN04 (DP3)	6,916.23	10.80	Standard	0.000	0.00	6,913.39	6,913.39	6,913.98	6,913.98
LINE D-IN01 (DP8)	6,910.66	2.10	Standard	0.100	0.00	6,908.74	6,908.74	6,908.75	6,908.78
LINE D-IN02 (DP7)	6,910.30	0.80	Standard	0.000	0.00	6,908.75	6,908.75	6,908.76	6,908.76
LINE B-MH01	6,905.18	12.10	Standard	0.100	0.07	6,902.71	6,902.64	6,903.44	6,903.37

FlexTable: Outfall Table

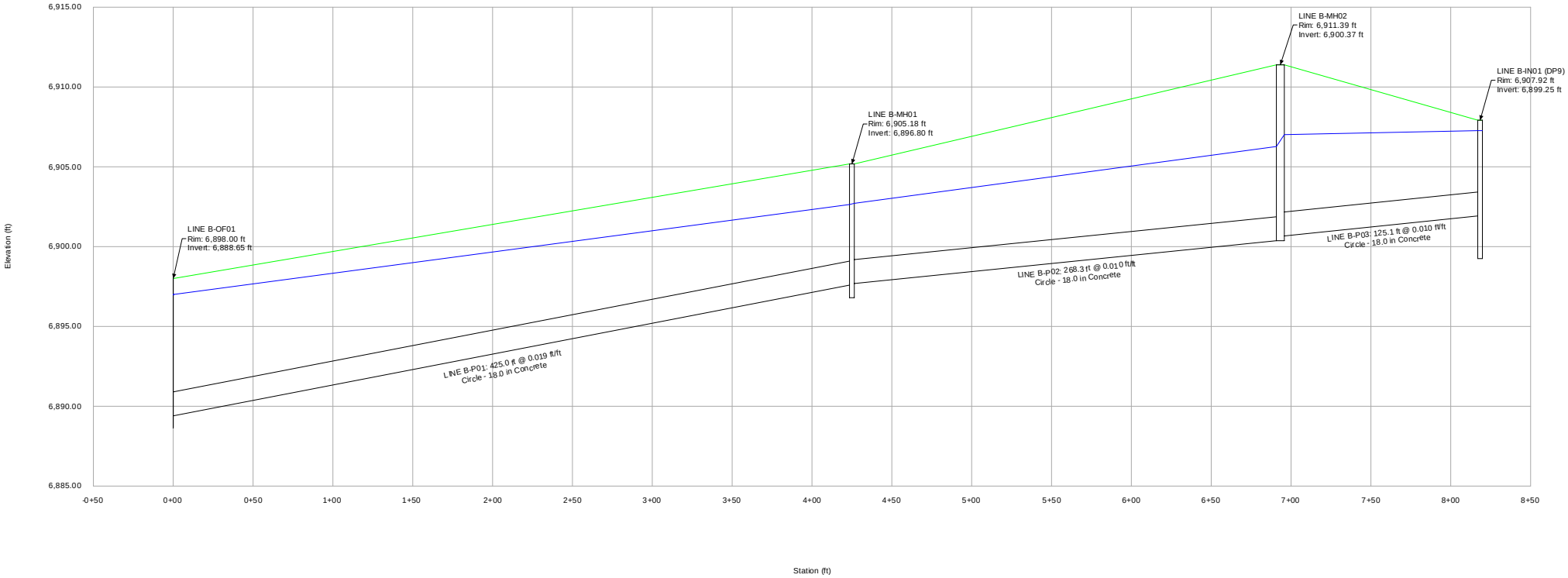
Active Scenario: 100-Year

Label	Elevation (Ground) (ft)	Elevation (Invert) (ft)	Boundary Condition Type	Elevation (User Defined Tailwater) (ft)	Flow (Total Out) (cfs)	Hydraulic Grade (ft)	Energy Grade Line (ft)
LINE B-OF01	6,898.00	6,888.65	User Defined Tailwater	6,897.00	12.10	6,897.00	6,897.00
LINE A-OF01	6,908.93	6,903.33	User Defined Tailwater	6,908.69	21.10	6,908.69	6,908.69
LINE D-OF01	6,906.80	6,903.19	User Defined Tailwater	6,908.69	2.10	6,908.69	6,908.69

Profile Report
Engineering Profile - LINE A (MRS01_StormCAD.stsw)
Active Scenario: 100-Year



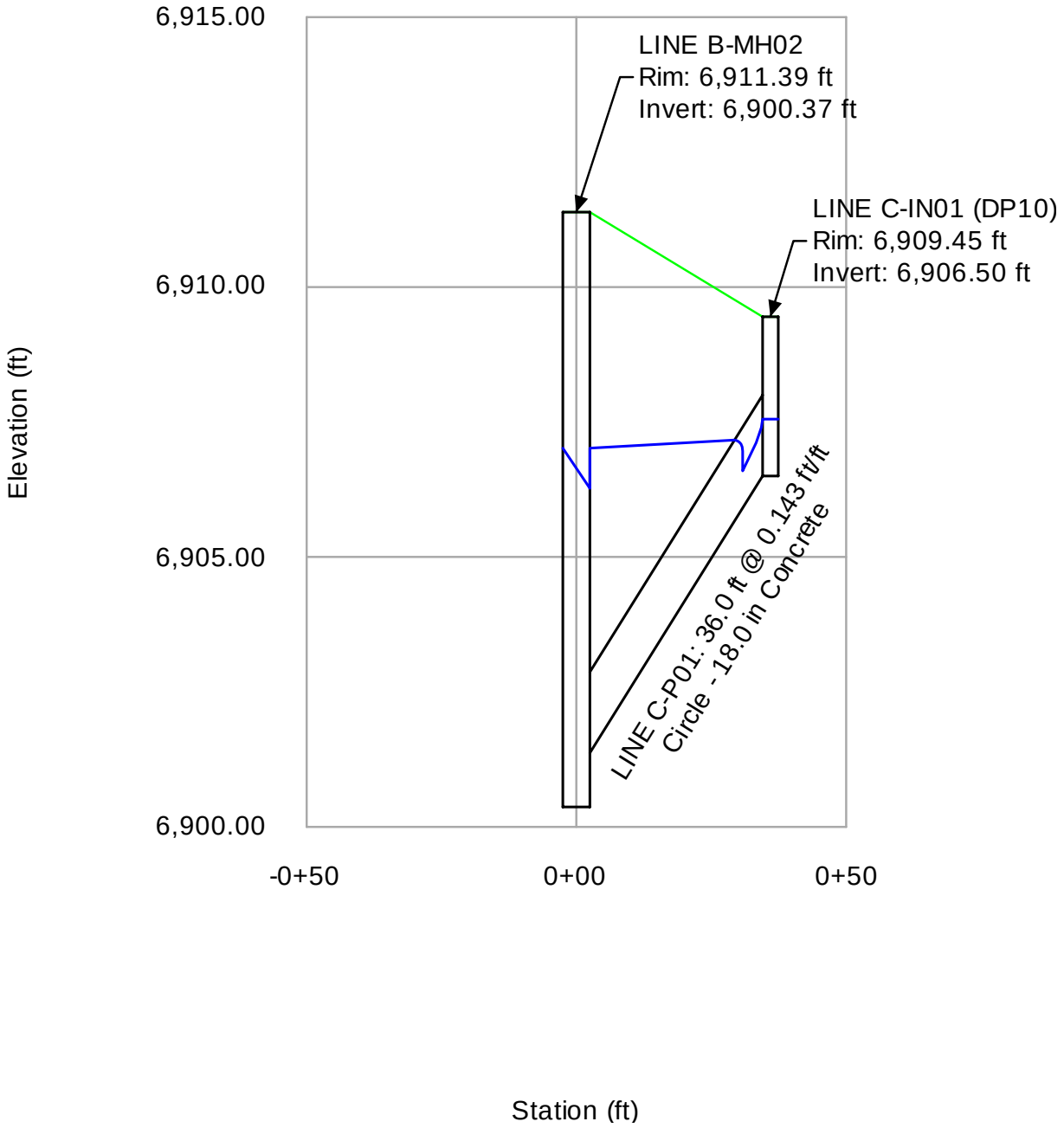
Profile Report
Engineering Profile - LINE B (MRS01_StormCAD.stsw)
Active Scenario: 100-Year



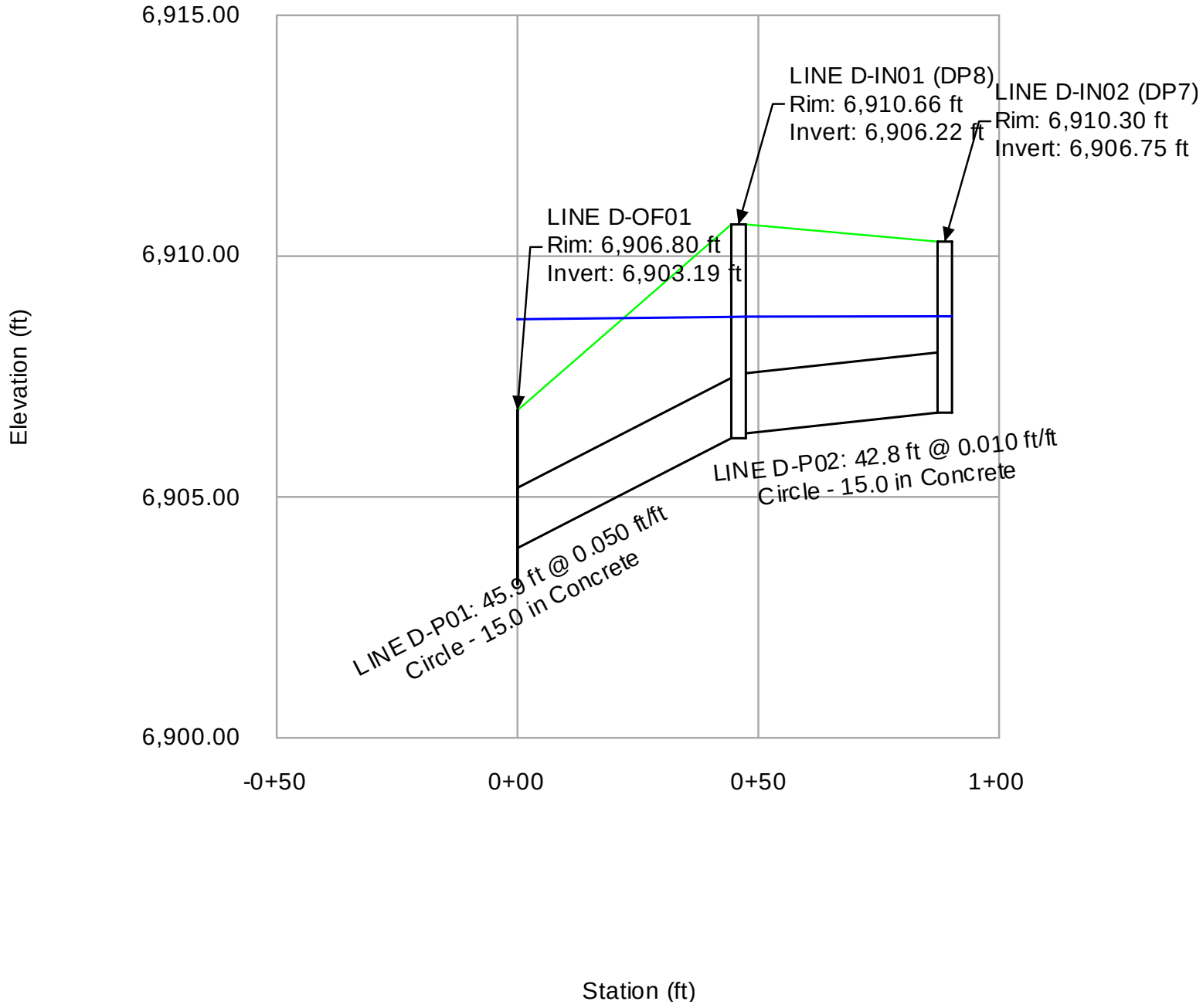
Profile Report

Engineering Profile - LINE C (MRS01_StormCAD.stsw)

Active Scenario: 100-Year



Profile Report
Engineering Profile - LINE D (MRS01_StormCAD.stsw)
Active Scenario: 100-Year

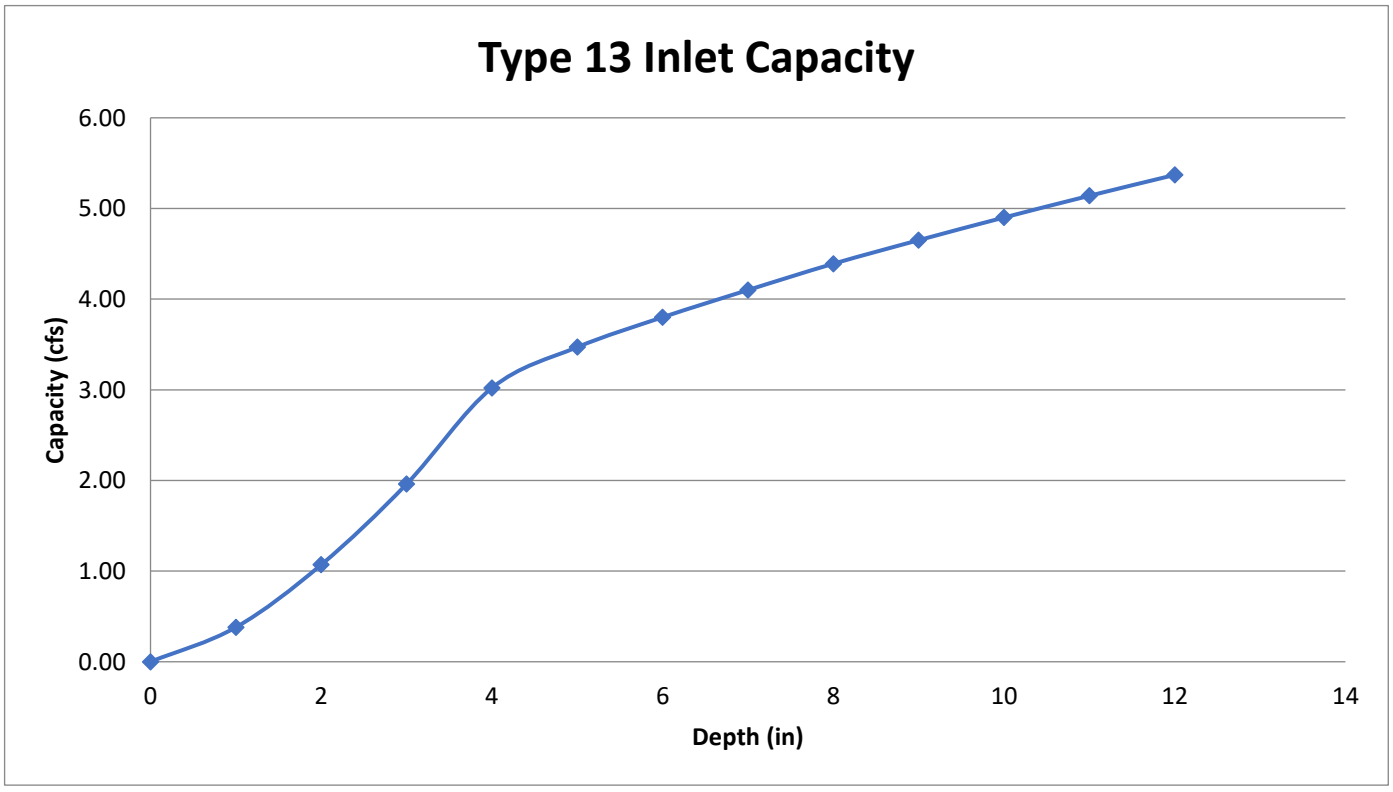


Type 13 Inlet Capacity Chart

Subdivision:	Falcon Ranchettes Filing No. 1a	**Project Name:**	Meridian Storage
Location:	El Paso County, CO	**Project No.:**	MRS01
		Calculated By:	CMWJ
		Checked By:	BAS
		Date:	9/8/23

Type 13 Inlet Capacity

Depth (in)	Single	Double	Triple
	Capacity (cfs)	Capacity (cfs)	Capacity (cfs)
0	0.00	0.00	0.00
1	0.38	0.76	1.14
2	1.07	2.14	3.21
3	1.96	3.92	5.88
4	3.02	6.04	9.06
5	3.47	6.94	10.41
6	3.80	7.60	11.40
7	4.10	8.20	12.30
8	4.39	8.78	13.17
9	4.65	9.30	13.95
10	4.90	9.80	14.70
11	5.14	10.28	15.42
12	5.37	10.74	16.11



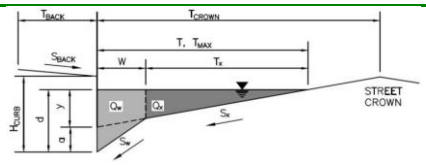
Calculations include a 50% clogging factor.

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

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

Project: **Falcon Ranchettes Filing No. 1a (Meridian Storage)**

Inlet ID: **DP5**



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	10.0	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} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	20.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.014	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} =	20.0	20.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	8.4	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☑	

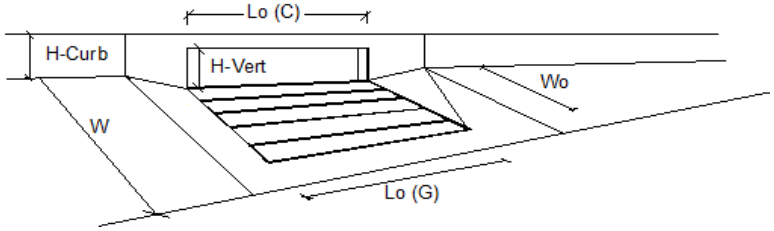
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**16.3**	**50.3**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 2.10 cfs on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design peak flow of 4.40 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.02 (August 2022)



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

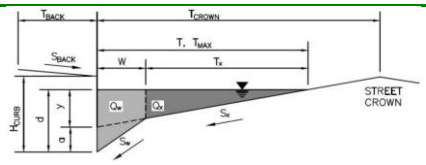
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**2.1**	**4.2**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.2**	**cfs**
Capture Percentage = Q_a/Q_o	**C% =**	**100**	**96**	**%**

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

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

Project: **Falcon Ranchettes Filing No. 1a (Meridian Storage)**

Inlet ID: **DP6**



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	10.0	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} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	20.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.014	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} =	20.0	20.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	8.4	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☑	

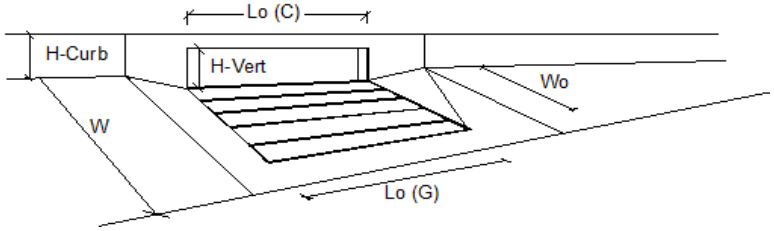
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**16.3**	**50.3**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 1.50 cfs on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design peak flow of 3.20 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.02 (August 2022)



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

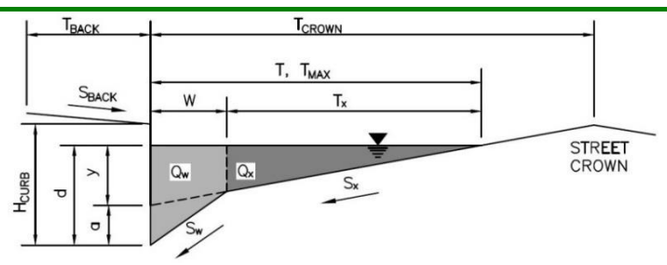
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**1.5**	**3.2**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.0**	**cfs**
Capture Percentage = Q_a/Q_o	**C% =**	**100**	**100**	**%**

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

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

Project: **Falcon Ranchettes Filing No. 1a (Meridian Storage)**

Inlet ID: **DP7**



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	10.0	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} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	20.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.008	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} =	20.0	20.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	8.4	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☑	

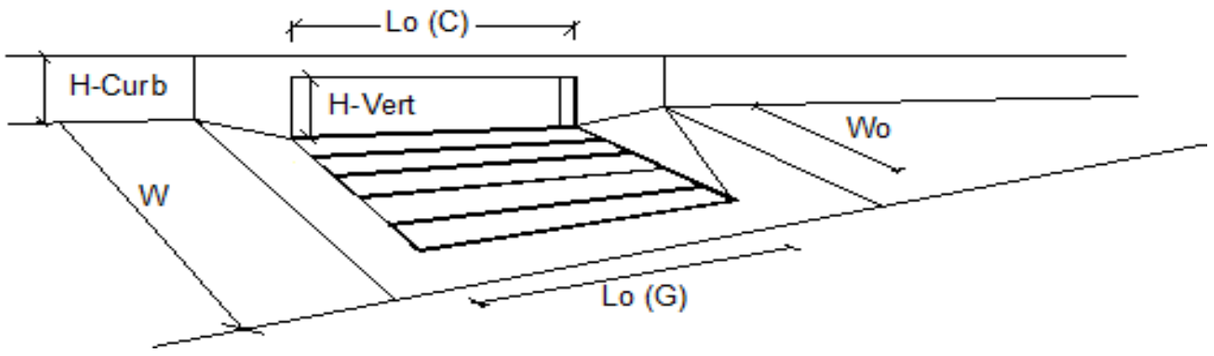
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**12.3**	**38.0**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 0.50 cfs on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design peak flow of 0.90 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.02 (August 2022)



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f (G) =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f (C) =	0.10	0.10	

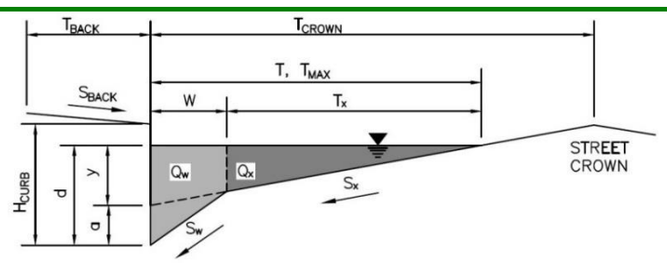
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**0.5**	**0.9**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.0**	**cfs**
Capture Percentage = Q_a/Q_o	**C% =**	**100**	**100**	**%**

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

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

Project: **Falcon Ranchettes Filing No. 1a (Meridian Storage)**

Inlet ID: **DP8**



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	10.0	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} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	20.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.005	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} =	20.0	20.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	8.4	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☑	

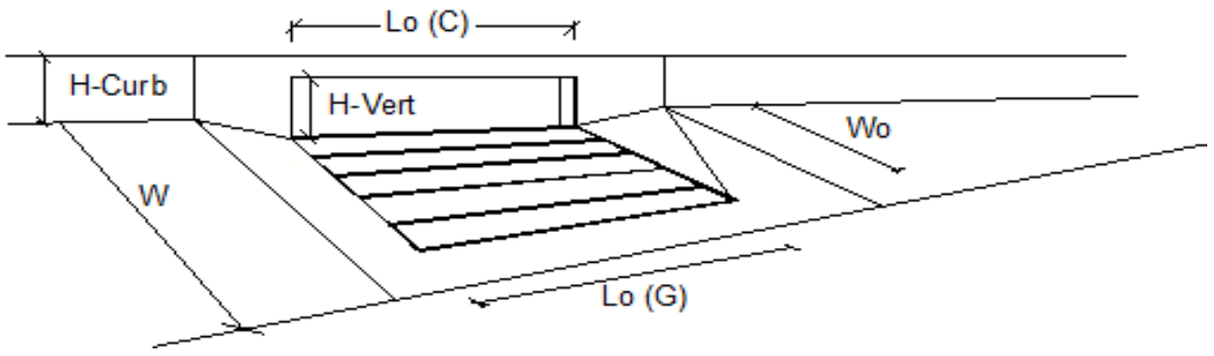
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**9.7**	**30.1**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 0.80 cfs on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design peak flow of 1.60 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.02 (August 2022)



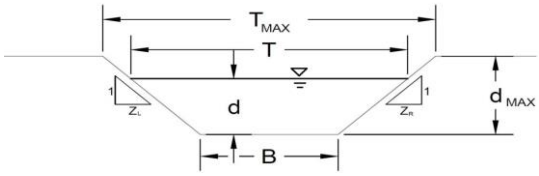
Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f (G) =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f (C) =	0.10	0.10	

Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**0.8**	**1.5**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.1**	**cfs**
Capture Percentage = Q_a/Q_o	**C% =**	**100**	**93**	**%**

AREA INLET IN A SWALE

Falcon Ranchettes Filing No. 1a (Meridian Storage)

DP10



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 =		
Manning's n (Leave cell D16 blank to manually enter an n value)	n =	0.030	
Channel Invert Slope	S_O =	0.0200	ft/ft
Bottom Width	B =	3.00	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} =	**11.00**	**11.00**	**ft**
Maximum Allowable Water Depth in Channel for Minor & Major Storm	d_{MAX} =	**1.00**	**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} =	**35.8**	**35.8**	**cfs**
MAJOR STORM Allowable Capacity is based on Depth Criterion	d_{allow} =	**1.00**	**1.00**	**ft**

Water Depth in Channel Based On Design Peak Flow

Design Peak Flow	Q_o =	**1.2**	**7.4**	**cfs**
Water Depth	d =	**0.17**	**0.46**	**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'

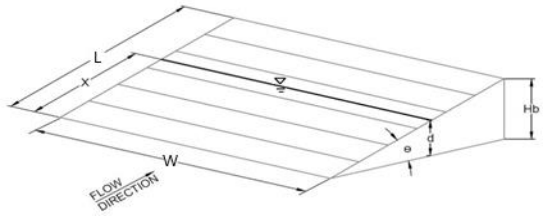
AREA INLET IN A SWALE

Falcon Ranchettes Filing No. 1a (Meridian Storage)

DP10

Inlet Design Information (Input)

Type of Inlet	CDOT Type C (Depressed)	Inlet Type =	CDOT Type C (Depressed)	
Angle of Inclined Grate (must be <= 30 degrees)		θ =	10.00	degrees
Width of Grate		W =	3.00	ft
Length of Grate		L =	3.00	ft
Open Area Ratio		A_{RATIO} =	0.70	
Height of Inclined Grate		H_B =	0.52	ft
Clogging Factor		C_f =	0.50	
Grate Discharge Coefficient		C_d =	0.57	
Orifice Coefficient		C_o =	0.38	
Weir Coefficient		C_w =	1.23	



		MINOR	MAJOR	
Water Depth at Inlet (for depressed inlets, 1 foot is added for depression)	d =	1.17	1.46	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**11.4**	**16.4**	**cfs**
Bypassed Flow	**Q_b =**	**0.0**	**0.0**	**cfs**
Capture Percentage = Qa/Qo	**C% =**	**100**	**100**	**%**

Warning 04: Froude No. exceeds USDCM Volume I recommendation.

PIPE OUTFALL RIPRAP SIZING CALCULATIONS

Subdivision: Falcon Ranchettes Filing No. 1A
Location: CO, Colorado Springs

Project Name: Meridian Storage
Project No.: MRS01
Calculated By: CMWJ
Checked By: BAS
Date: 4/26/24

	STORM DRAIN SYSTEM			
	DP-12	DP-13		
Q100 (cfs)	0.4	2.1		Flows are the greater of proposed vs. future
D or H (in)	6	6		
W (ft)	2	2		
Slope (%)	1.40	1.40		
Yn (in)	6.00	6.00		
Yt (ft)	Unknown	Unknown		If "unknown" Yt/D=0.4
Yt/D, Yt/H	0.40	0.40		Per section 11-3
Supercritical	Yes	Yes		
Q/D^2.5, Q/WH^1.5	0.63	3.02		
Q/D^1.5, Q/WH^0.5				
Da, Ha (in) *	6.00	6.00		Da=0.5(D+Yn), Ha=0.5(H+Yn)
Q/Da^1.5, Q/WHa^0.5 *	0.32	1.51		
d50 (in), Required	0.13	0.63		
Required Riprap Size	L	L		Fig. 8-34
Use Riprap Size	**L**	**L**		
d50 (in)	9	9		Fig. 8-34
1/(2 tan q)	4.75	2.90		Fig. 9-35 OR Fig 9-36
Erosive Soils	Yes	Yes		
At	0.08	0.39		At=Q/5.5
L	-7.6	-0.2		L=(1/(2 tan q))(At/Yt - D)
Min L	1.5	1.5		Min L=3D or 3H
Max L	5.0	5.0		Max L=10D or 10H
Length (ft)	1.5	1.5		
Bottom Width (ft)	6.0	6.0		Width=3D (Minimum)
Riprap Depth (in)	18	18		Depth=2(d50)
Type II Base Depth (in)	6	6		Table 8-34 fine grained soils)
Cutoff Wall	No	No		
Cutoff Wall Depth (ft)				Depth of Riprap and Base
Cutoff Wall Width (ft)				

Note: No Type II Base to be used if Soil Riprap is specified within the plans
* For use when the flow in the culvert is supercritical (and less than full).
CEDP--CONCRETE ENERGY DISIPATING BASIN

Galloway

Unnamed Tributary to Black Squirrel Creek - East Branch (RMT064)

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.035	
Channel Slope	0.00300	ft/ft
Left Side Slope	4.00	ft/ft (H:V)
Right Side Slope	4.00	ft/ft (H:V)
Bottom Width	15.00	ft
Discharge	925.00	ft^3/s

Results

Normal Depth	5.15	ft
Flow Area	183.50	ft^2
Wetted Perimeter	57.49	ft
Hydraulic Radius	3.19	ft
Top Width	56.22	ft
Critical Depth	3.58	ft
Critical Slope	0.01368	ft/ft
Velocity	5.04	ft/s
Velocity Head	0.39	ft
Specific Energy	5.55	ft
Froude Number	0.49	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	5.15	ft
Critical Depth	3.58	ft
Channel Slope	0.00300	ft/ft
Critical Slope	0.01368	ft/ft

APPENDIX E

DETENTION POND TRIBUTARY AREAS

Subdivision: Falcon Ranchettes Filing No. 1A
Location: CO, Colorado Springs

Project Name: Meridian Storage
Project No.: MRS01
Calculated By: CMWJ
Checked By: BAS
Date: 4/26/24

Detention Pond #1

	Basin	Area	% Imp
	B-1	1.46	94.7
	B-2	1.18	98.3
	B-3	0.95	61.9
	B-4	0.52	79.3
	B-5	0.13	84.9
	B-6	0.16	69.4
	B-7	0.56	14.3
*	C-1	0.29	100.0
*	C-2	3.12	100.0
*	C-3	0.29	100.0
	OS-3	0.24	2.0
	OS-5	0.19	2.0
	Total	**9.09**	**83.1**

*All "C" group basins' imperviousness changed to 100%. This will accomdate the future build out of the associated lot and provide full spectrum detention and avoid construction of an additional pond.

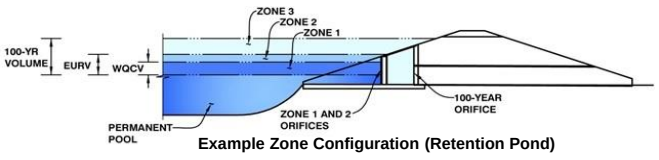
Galloway

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: **Falcon Ranchettes Filing No. 1a (Meridian Storage)**

Basin ID: **Pond #1**



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	9.09	acres
Watershed Length =	1,055	ft
Watershed Length to Centroid =	300	ft
Watershed Slope =	0.018	ft/ft
Watershed Imperviousness =	83.10%	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) =	0.264	acre-feet	acre-feet
Excess Urban Runoff Volume (EURV) =	1.004	acre-feet	acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	0.691	acre-feet	1.19 inches
5-yr Runoff Volume (P1 = 1.5 in.) =	0.893	acre-feet	1.50 inches
10-yr Runoff Volume (P1 = 1.75 in.) =	1.057	acre-feet	1.75 inches
25-yr Runoff Volume (P1 = 2 in.) =	1.243	acre-feet	2.00 inches
50-yr Runoff Volume (P1 = 2.25 in.) =	1.426	acre-feet	2.25 inches
100-yr Runoff Volume (P1 = 2.52 in.) =	1.635	acre-feet	2.52 inches
500-yr Runoff Volume (P1 = 3.68 in.) =	2.513	acre-feet	3.68 inches
Approximate 2-yr Detention Volume =	0.660	acre-feet	
Approximate 5-yr Detention Volume =	0.858	acre-feet	
Approximate 10-yr Detention Volume =	1.022	acre-feet	
Approximate 25-yr Detention Volume =	1.211	acre-feet	
Approximate 50-yr Detention Volume =	1.321	acre-feet	
Approximate 100-yr Detention Volume =	1.421	acre-feet	

Define Zones and Basin Geometry

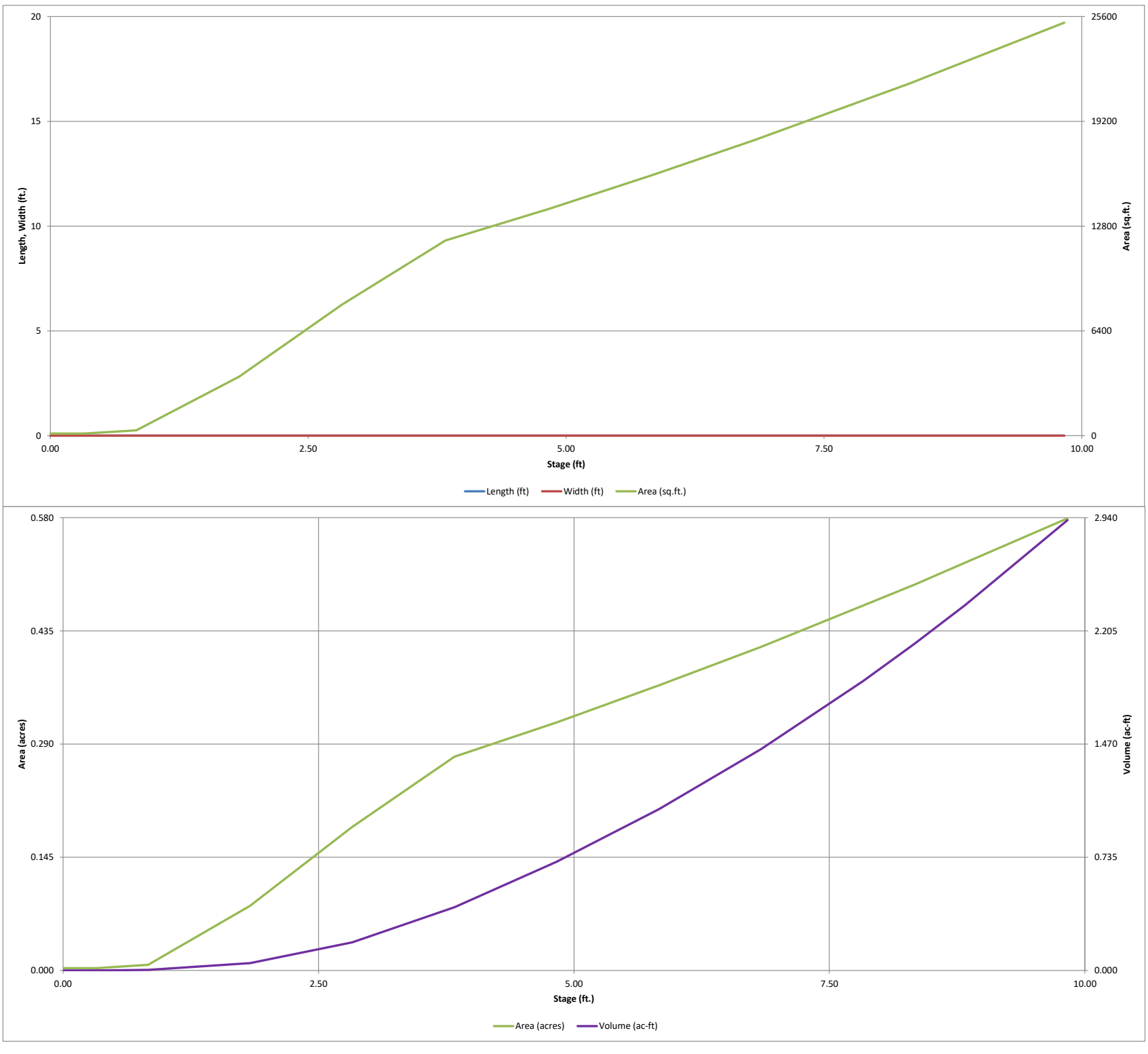
Zone 1 Volume (WQCV) =	0.264	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.740	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.417	acre-feet
Total Detention Basin Volume =	1.421	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (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 = 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)
6902.167	**Top of Micropool**	--	0.00	--	--	--	129	0.003		
6902.50	**Trickle Chan. Inv.**	--	0.33	--	--	--	129	0.003	43	0.001
	6903	--	0.83	--	--	--	318	0.007	154	0.004
	6904	--	1.83	--	--	--	3,600	0.083	2,108	0.048
	6905	--	2.83	--	--	--	8,014	0.184	7,915	0.182
	6906	--	3.83	--	--	--	11,924	0.274	17,884	0.411
	6907	--	4.83	--	--	--	13,843	0.318	30,768	0.706
	6908	--	5.83	--	--	--	15,900	0.365	45,639	1.048
	6909	--	6.83	--	--	--	18,058	0.415	62,618	1.438
	6910	--	7.83	--	--	--	20,359	0.467	81,827	1.878
6910.50	**Spillway Invert**	--	8.33	--	--	--	21,511	0.494	92,294	2.119
	6911	--	8.83	--	--	--	22,752	0.522	103,360	2.373
	6912	--	9.83	--	--	--	25,223	0.579	127,347	2.923

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

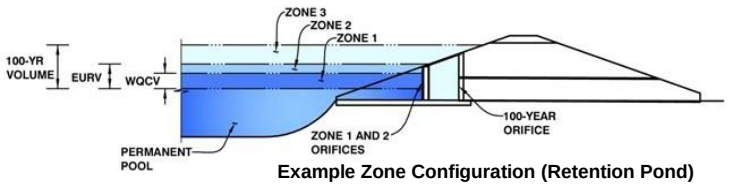


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: **Falcon Ranchettes Filing No. 1a (Meridian Storage)**

Basin ID: **Pond #1**



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.24	0.264	Orifice Plate
Zone 2 (EURV)	5.71	0.740	Orifice Plate
Zone 3 (100-year)	6.80	0.417	Weir&Pipe (Restrict)
Total (all zones)		1.421	

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

			Calculated Parameters for Underdrain		
Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

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

			Calculated Parameters for Plate		
Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	N/A	ft^2
Depth at top of Zone using Orifice Plate =	5.71	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	N/A	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	N/A	sq. inches	Elliptical Slot Area =	N/A	ft^2

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.67	3.50					
Orifice Area (sq. inches)	0.99	1.22	5.94					

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

User Input: Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected		Calculated Parameters for Vertical Orifice	Not Selected	Not Selected	
Invert of Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	N/A	N/A	ft^2
Depth at top of Zone using Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	N/A	N/A	feet
Vertical Orifice Diameter =	N/A	N/A	inches				

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 =	5.75	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	6.48	N/A	feet
Overflow Weir Front Edge Length =	2.92	N/A	feet	Overflow Weir Slope Length =	3.01	N/A	feet
Overflow Weir Grate Slope =	4.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	13.18	N/A	
Horiz. Length of Weir Sides =	2.92	N/A	feet	Overflow Grate Open Area w/o Debris =	6.95	N/A	ft^2
Overflow Grate Type =	Close Mesh Grate	N/A		Overflow Grate Open Area w/ Debris =	3.48	N/A	ft^2
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 =	0.25	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	0.53	N/A	ft^2
Outlet Pipe Diameter =	18.00	N/A	inches	Outlet Orifice Centroid =	0.30	N/A	feet
Restrictor Plate Height Above Pipe Invert =	6.10		inches	Half-Central Angle of Restrictor Plate on Pipe =	1.24	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

			Calculated Parameters for Spillway		
Spillway Invert Stage=	8.33	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.32	feet
Spillway Crest Length =	60.00	feet	Stage at Top of Freeboard =	9.83	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	0.58	acres
Freeboard above Max Water Surface =	1.18	feet	Basin Volume at Top of Freeboard =	2.92	acre-ft

Routed Hydrograph Results

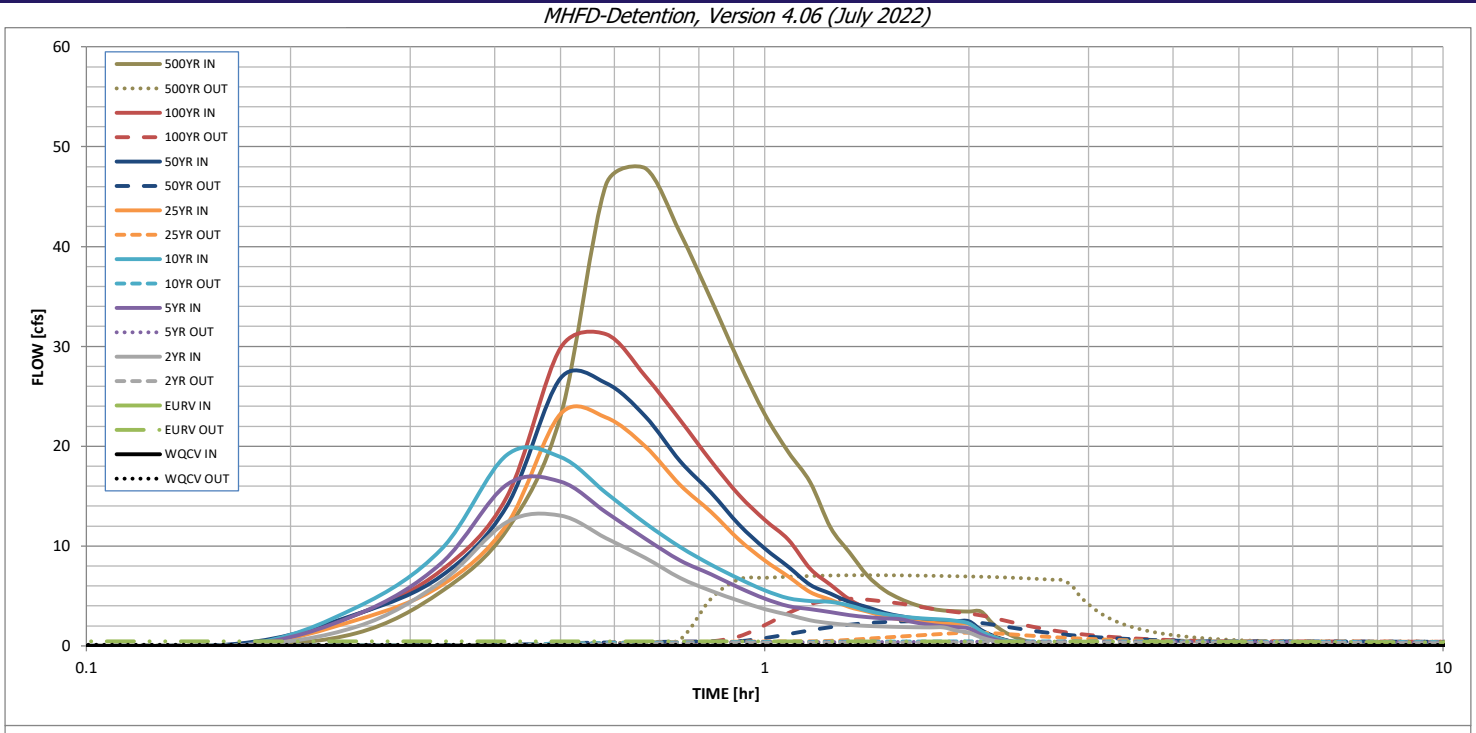
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

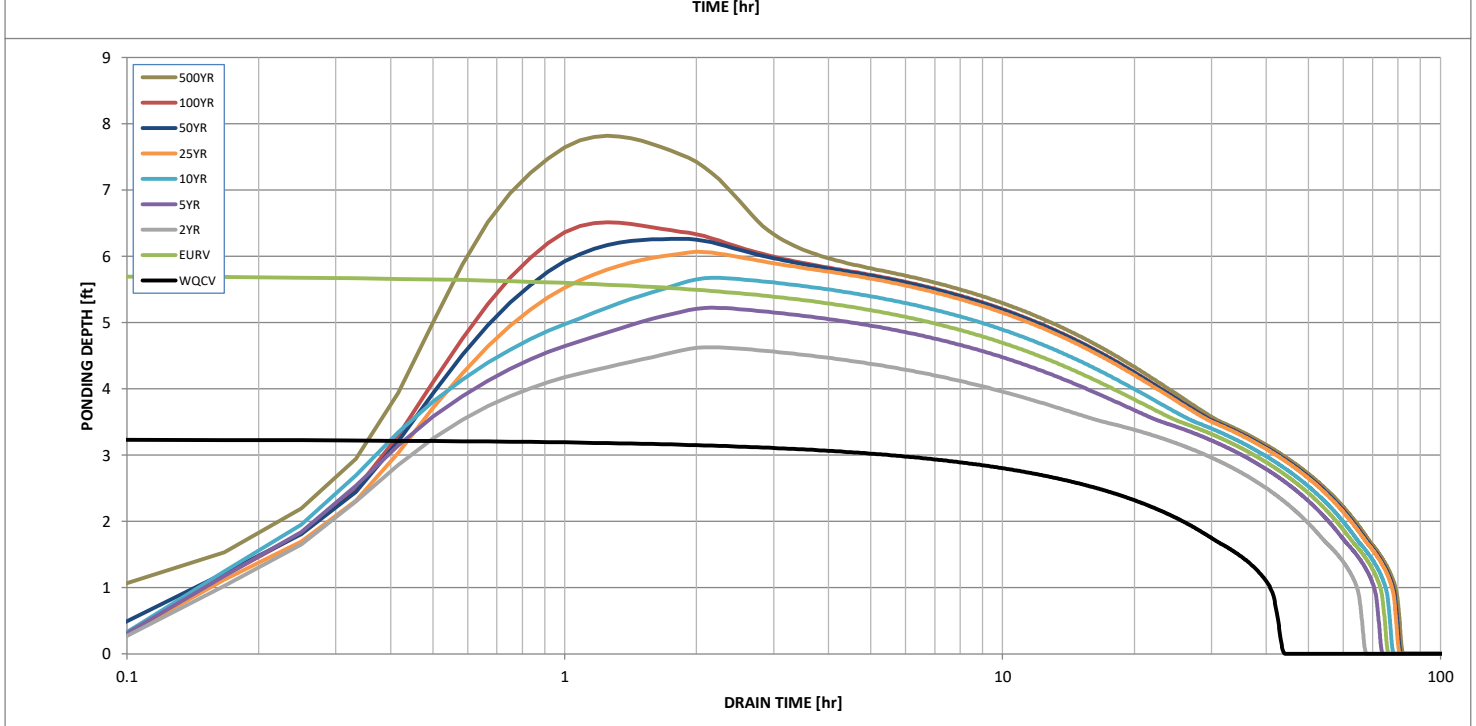
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.68
CUHP Runoff Volume (acre-ft) =	0.264	1.004	0.691	0.893	1.057	1.243	1.426	1.635	2.513
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.691	0.893	1.057	1.243	1.426	1.635	2.513
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.1	0.1	0.2	1.8	3.6	5.9	15.0
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.02	0.02	0.20	0.40	0.65	1.65
Peak Inflow Q (cfs) =	N/A	N/A	13.0	16.5	19.1	23.2	26.8	31.2	47.8
Peak Outflow Q (cfs) =	0.1	0.5	0.4	0.4	0.5	1.3	2.5	4.7	7.1
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	2.8	2.3	0.7	0.7	0.8	0.5
Structure Controlling Flow =	Plate	Plate	Plate	Plate	Plate	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	0.1	0.3	0.6	0.9
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) =	40	65	60	64	67	68	67	66	62
Time to Drain 99% of Inflow Volume (hours) =	**42**	72	64	70	73	75	75	75	73
Maximum Ponding Depth (ft) =	3.24	5.71	4.63	5.22	5.68	6.07	6.26	6.52	7.82
Area at Maximum Ponding Depth (acres) =	0.22	0.36	0.31	0.34	0.36	0.38	0.39	0.40	0.47
Maximum Volume Stored (acre-ft) =	0.265	1.004	0.641	0.834	0.990	1.133	1.209	1.307	1.874

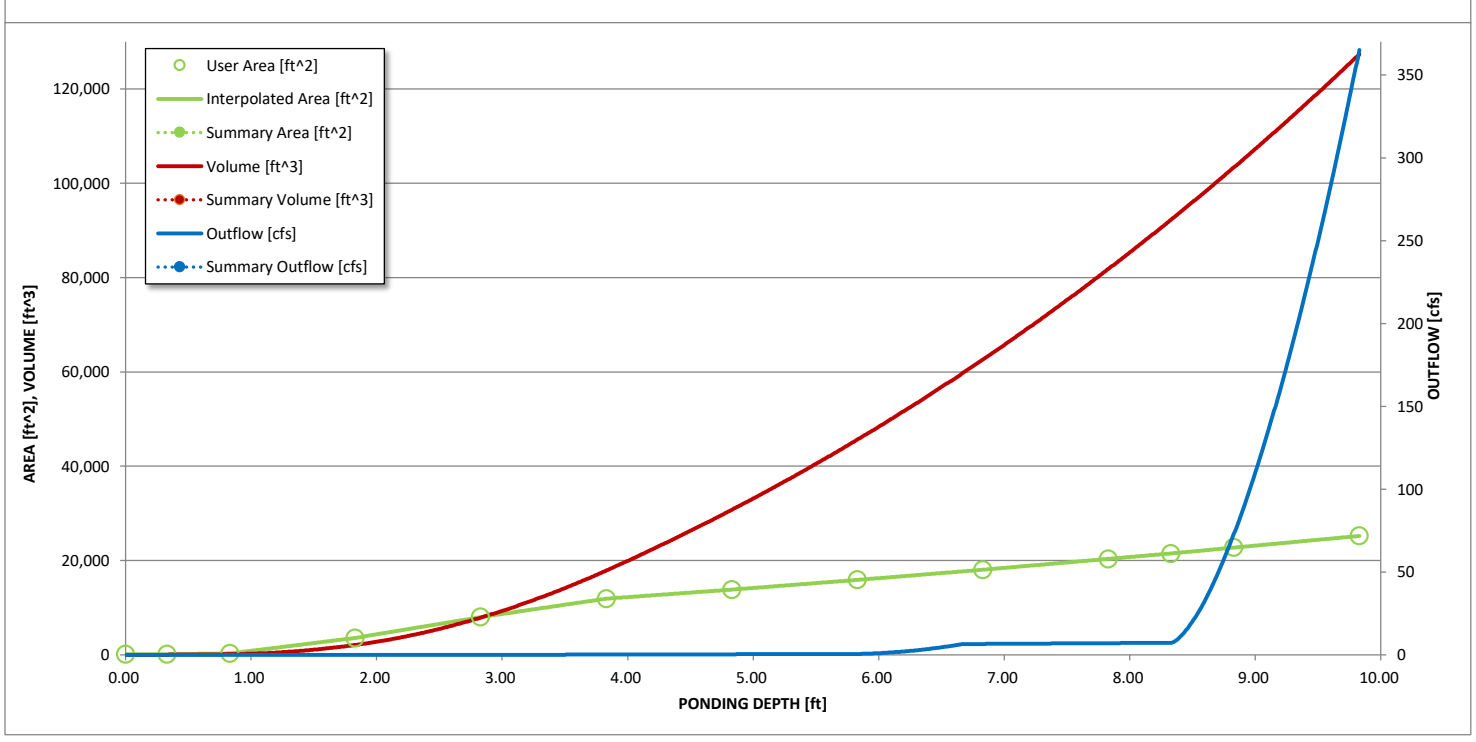
Saw the comment responses, the justification makes sense. Please add this discussion to the report text under the Proposed Pond #1 Full Spectrum EDB section so it is documented outside of the response document.

DETENTION BASIN OUTLET STRUCTURE DESIGN

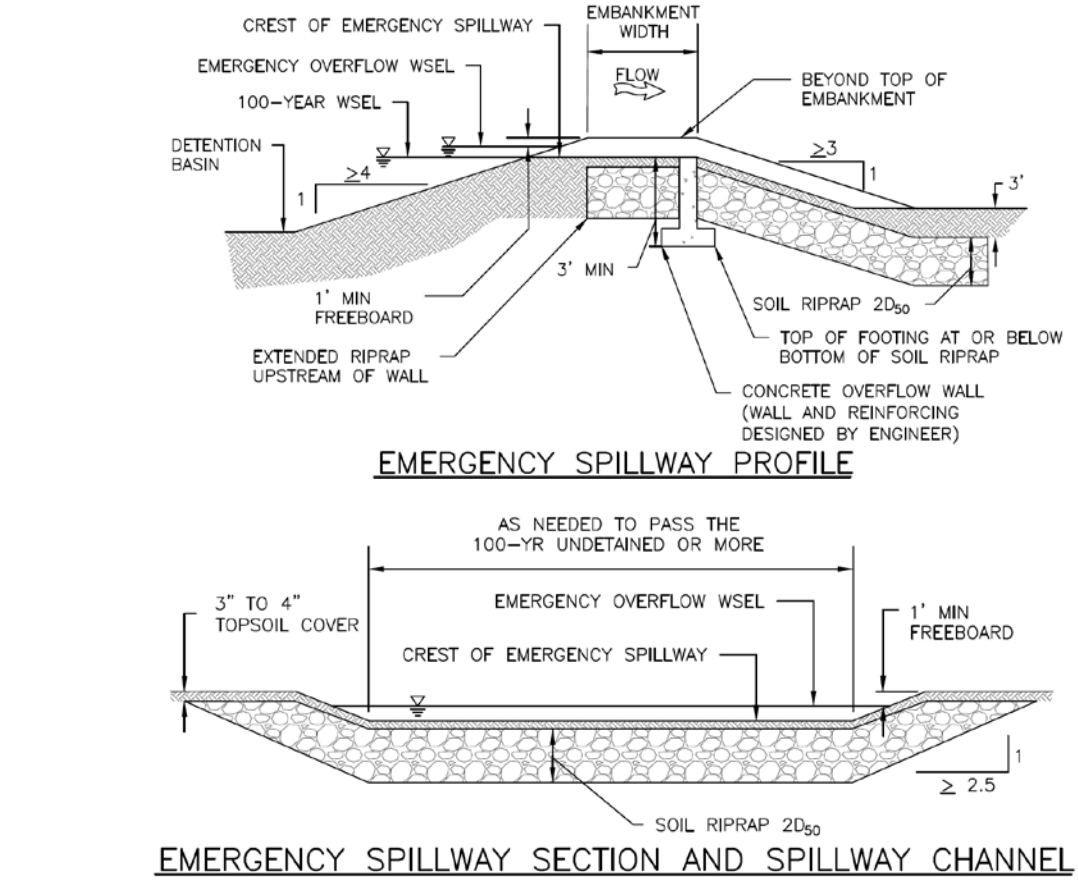
MHFD-Detention, Version 4.06 (July 2022)







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



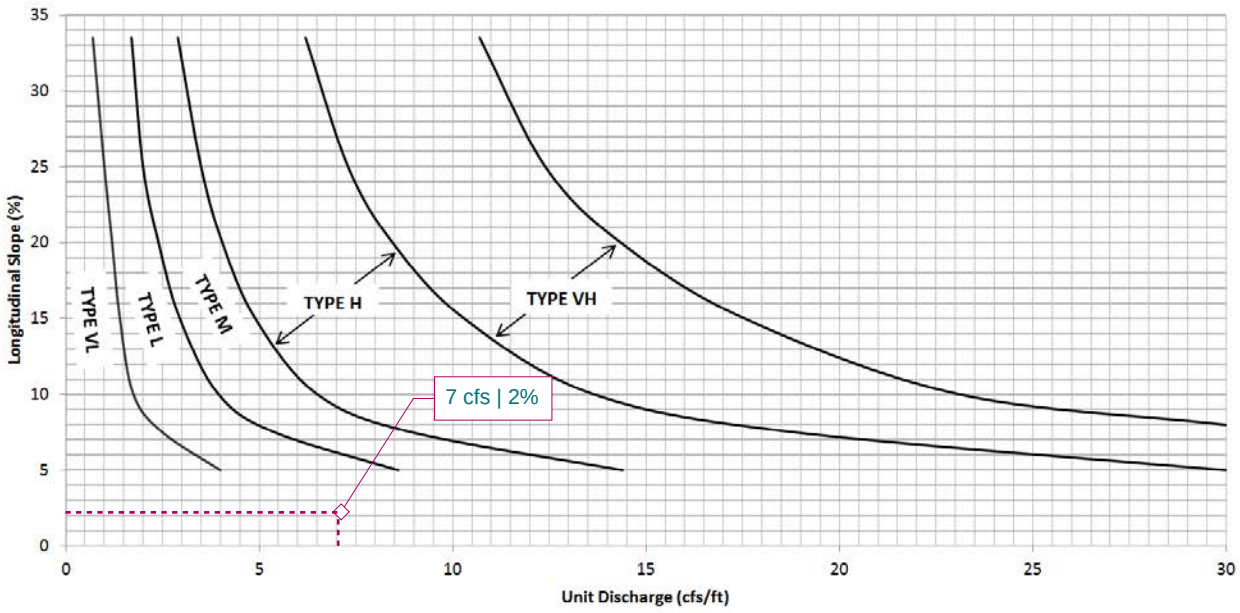


Figure 12-21. Embankment protection details and rock sizing chart (adapted from Arapahoe County)

Micropool/ISV SIZING CALCULATIONS

Subdivision: Falcon Ranchettes Filing No. 1a
Location: CO, El Paso County

Project Name: Meridian Storage
Project No.: MRS01
Calculated By: CMWJ
Checked By: BAS
Date: 5/6/24

	Pond #1			
WQCV Volume (Ac-Ft)	0.265			From MHFD-Detention Spreadsheet
Provided ISV Depth (in)	4.00			4" Min. per USDCM, Volume 3
Provided Micropool/ISV Area (Sq. Ft.)	129.00			
Provided ISV Volume (Cu. Ft.)	43.00			
Micropool/ISV Deisgn Results				
Minimum Micropool Area (Sq. Ft.)	**104**			Assuming ISV above - Min. 10 ft^2 per USDCM, Volume 3
Required ISV Volume (Cu. Ft.)	**35**			0.3% of WQCV, per USDCM, Volume 3
Is Required Micropool Area Met?	**YES**			
Is Required ISV Volume Met?	**YES**			

FOREBAY TRIBUTARY AREAS

Subdivision: Falcon Ranchettes Filing No. 1A
Location: CO, Colorado Springs

Project Name: Meridian Storage
Project No.: MRS01
Calculated By: CMWJ
Checked By: BAS
Date: 4/26/24

Forebay A

	Basin	Area	% Imp
	B-1	1.46	94.66
	B-2	1.18	98.3
	B-3	0.95	61.86
	B-4	0.52	79.25
*	C-1	0.29	100
	Total	**4.4**	**87.1**

*All "C" group basins' imperviousness changed to 100%. This will accomdate the future build out of the associated lot and provide sufficient area and imperviousness for future access drives.

Galloway

FOREBAY TRIBUTARY AREAS

Subdivision: Falcon Ranchettes Filing No. 1A
Location: CO, Colorado Springs

Project Name: Meridian Storage
Project No.: MRS01
Calculated By: CMWJ
Checked By: BAS
Date: 4/26/24

Forebay B

Basin	Area	% Imp
OS-1	3.89	10.91
OS-2	2.35	14.01
OS-3	0.24	2
C-4	0.09	2
Total	**6.57**	**11.6**

FOREBAY TRIBUTARY AREAS

Subdivision: Falcon Ranchettes Filing No. 1A
Location: CO, Colorado Springs

Project Name: Meridian Storage
Project No.: MRS01
Calculated By: CMWJ
Checked By: BAS
Date: 4/26/24

Forebay D

	Basin	Area	% Imp
	B-5	0.13	84.92
	B-6	0.16	69.35
*	C-3	0.29	100
	Total	**0.58**	**88.2**

*All "C" group basins' imperviousness changed to 100%. This will accomdate the future build out of the associated lot and provide sufficient area and imperviousness for future access drives.

Galloway

FOREBAY SIZING CALCULATIONS

Subdivision: Falcon Ranchettes Filing No. 1a
Location: CO, El Paso County

Project Name: Meridian Storage
Project No.: MRS01
Calculated By: CMWJ
Checked By: BAS
Date: 5/6/24

Pond #1

	Forebay A	Forebay B	Forebay D	
Impervious % (I)	87.1%	11.60%	88.20%	Total impervious area of contributing upstream basins
WQCV Drain Time Coeff (a)	1	1	1	a = 1 for 40 Hr WQCV Drain Time
Tributary Area (Ac)	4.40	6.57	0.58	
Forebay Depth (Ft)	1.50	1.50	1.50	(see Table EDB-4 of the USDCM Volume 3 for depth requirement)
% of WQCV for Forebay Volume	3.0%	3.0%	3.0%	(see Table EDB-4 of the USDCM Volume 3 for requirement)
100-year Discharge (Q)	21.1	12.10	2.10	100-Year Flow entering Forebay (un-detained)
WQCV Depth (in)	0.38	0.08	0.39	WQCV Depth = $a(0.91*I^3 - 1.19*I^2 + 0.78*I)$
WQCV Volume (Ac-Ft)	0.14	0.04	0.02	
Forebay Volume (Cu. Ft.)	181	54	24	
Forebay Discharge (Q)	0.42	0.24	0.04	(Release 2% of 100-year discharge via notch or berm/pipe configuration)
Forebay Notch Height (in)	15.00	15.00	15.00	(3" depression @ top of forebay assumed per COS DCM Volume 1, 13-30)
Forebay Deisgn Results				
Minimum Forebay Area (Sq. Ft.)	**121**	**36**	**16**	
Forebay Notch width (in)	**3**	**3**	**3**	From $Q=C_w*W*H^{1.5}$ assuming C_w=3.33 for sharp-crested weir - **If notch width <3", use 3" minimum.**

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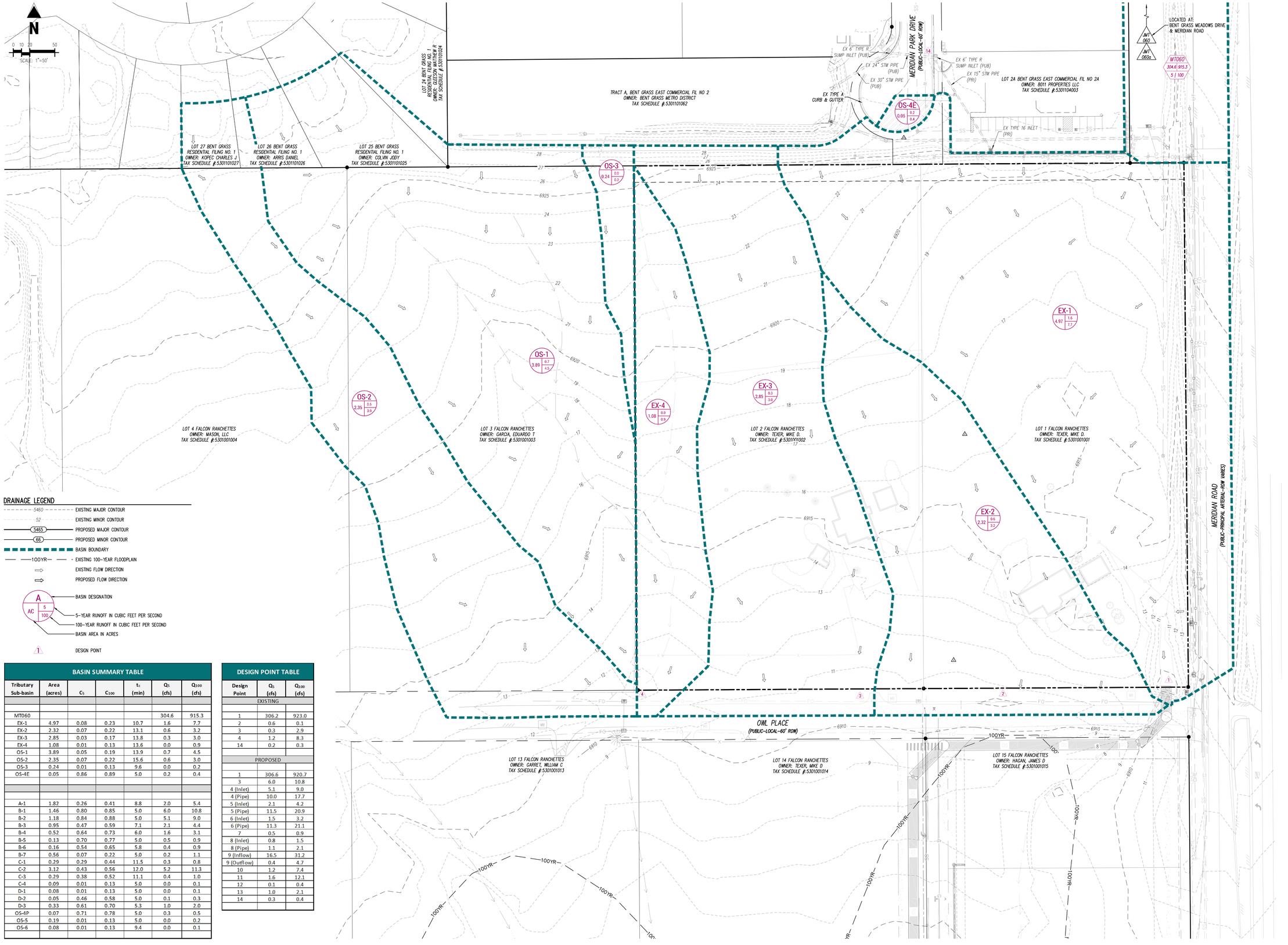
APPENDIX F



DRAINAGE LEGEND

- 5460 — EXISTING MAJOR CONTOUR
- 52 — EXISTING MINOR CONTOUR
- 5465 — PROPOSED MAJOR CONTOUR
- 66 — PROPOSED MINOR CONTOUR
- BASIN BOUNDARY
- 100YR — EXISTING 100-YEAR FLOODPLAIN
- EXISTING FLOW DIRECTION
- PROPOSED FLOW DIRECTION
- A / AC / 5 / 100 — BASIN DESIGNATION
  - 5-YEAR RUNOFF IN CUBIC FEET PER SECOND
  - 100-YEAR RUNOFF IN CUBIC FEET PER SECOND
  - BASIN AREA IN ACRES
- 1 — DESIGN POINT

BASIN SUMMARY TABLE

Tributary Sub-basin	Area (acres)	C_5	C_{100}	t_c (min)	Q_5 (cfs)	Q_{100} (cfs)
MT060					304.6	915.3
EX-1	4.97	0.08	0.23	10.7	1.6	7.7
EX-2	2.32	0.07	0.22	13.1	0.6	3.2
EX-3	2.85	0.03	0.17	13.8	0.3	3.0
EX-4	1.08	0.01	0.13	13.6	0.0	0.9
OS-1	3.89	0.05	0.19	13.9	0.7	4.5
OS-2	2.35	0.07	0.22	15.6	0.6	3.0
OS-3	0.24	0.01	0.13	9.6	0.0	0.2
OS-4E	0.05	0.86	0.89	5.0	0.2	0.4
A-1	1.82	0.26	0.41	8.8	2.0	5.4
B-1	1.46	0.80	0.85	5.0	6.0	10.8
B-2	1.18	0.84	0.88	5.0	5.1	9.0
B-3	0.95	0.47	0.59	7.1	2.1	4.4
B-4	0.52	0.64	0.73	6.0	1.6	3.1
B-5	0.13	0.70	0.77	5.0	0.5	0.9
B-6	0.16	0.54	0.65	5.8	0.4	0.9
B-7	0.56	0.07	0.22	5.0	0.2	1.1
C-1	0.29	0.29	0.44	11.5	0.3	0.8
C-2	3.12	0.43	0.56	12.0	5.2	11.3
C-3	0.29	0.38	0.52	11.1	0.4	1.0
C-4	0.09	0.01	0.13	5.0	0.0	0.1
D-1	0.08	0.01	0.13	5.0	0.0	0.1
D-2	0.05	0.46	0.58	5.0	0.1	0.3
D-3	0.33	0.61	0.70	5.3	1.0	2.0
OS-4P	0.07	0.71	0.78	5.0	0.3	0.5
OS-5	0.19	0.01	0.13	5.0	0.0	0.2
OS-6	0.08	0.01	0.13	9.4	0.0	0.1

DESIGN POINT TABLE

Design Point	Q_5 (cfs)	Q_{100} (cfs)
EXISTING		
1	306.2	923.0
2	0.6	0.1
3	0.3	2.9
4	1.2	8.3
14	0.2	0.3
PROPOSED		
1	306.6	920.7
3	6.0	10.8
4 (Inlet)	5.1	9.0
4 (Pipe)	10.0	17.7
5 (Inlet)	2.1	4.2
5 (Pipe)	11.5	20.9
6 (Inlet)	1.5	3.2
6 (Pipe)	11.3	21.1
7	0.5	0.9
8 (Inlet)	0.8	1.5
8 (Pipe)	1.1	2.1
9 (Inflow)	16.5	31.2
9 (Outflow)	0.4	4.7
10	1.2	7.4
11	1.6	12.1
12	0.1	0.4
13	1.0	2.1
14	0.3	0.4

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FALCON RANCHETTES FILING NO. 1A
MERIDIAN STORAGE
DRAINAGE MAP

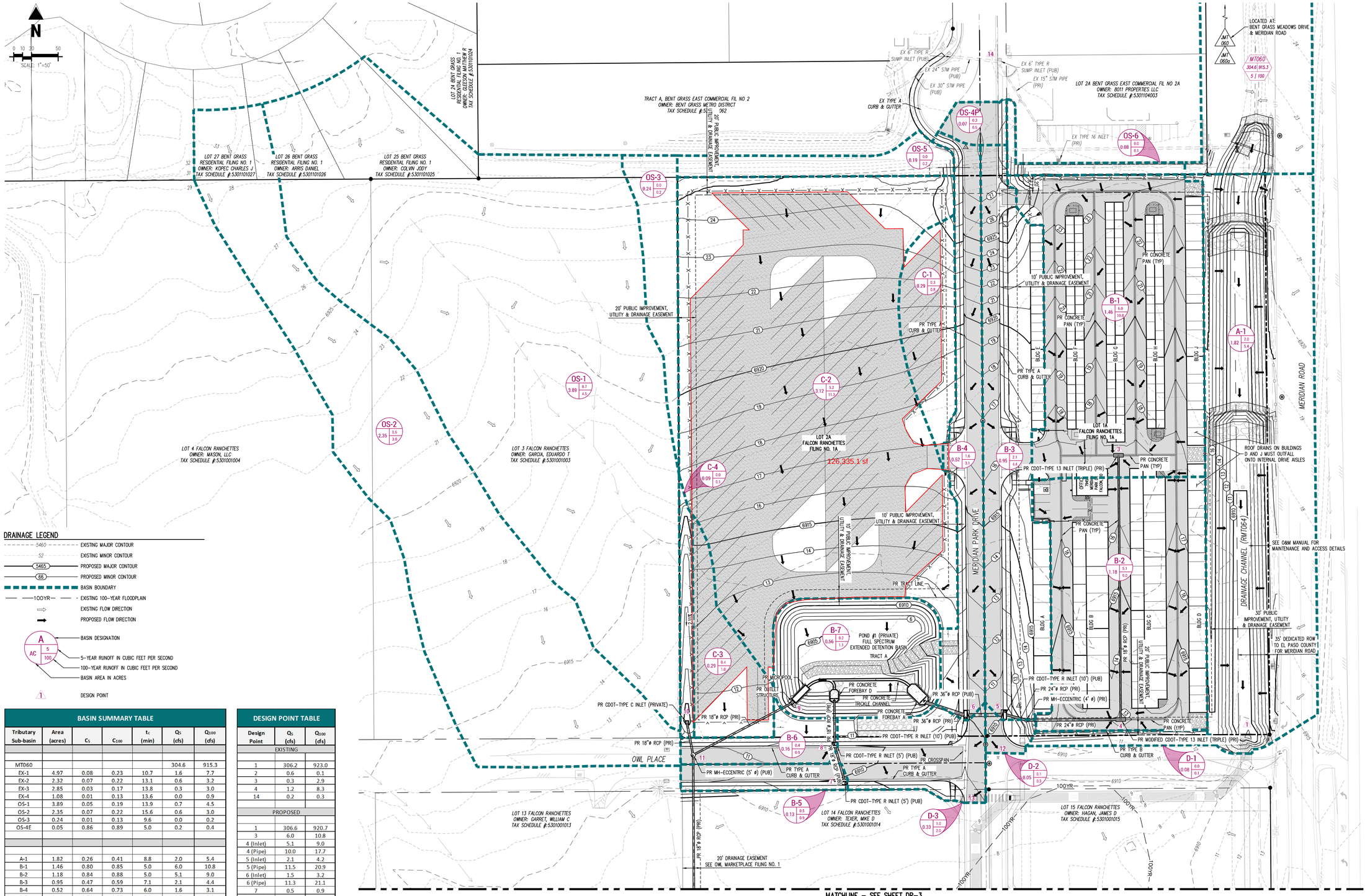
11750 OWL PLACE
PEYTON, CO 80831

#	Date	Issue / Description	Init.

Project No:	MRS01
Drawn By:	BLB
Checked By:	CMWJ
Date:	04/26/2024

EXISTING DRAINAGE MAP

DR-1
SHEET 1 OF 4



DRAINAGE LEGEND

- 5460 — EXISTING MAJOR CONTOUR
- 52 — EXISTING MINOR CONTOUR
- 5465 — PROPOSED MAJOR CONTOUR
- 66 — PROPOSED MINOR CONTOUR
- BASIN BOUNDARY
- 100YR — EXISTING 100-YEAR FLOODPLAIN
- EXISTING FLOW DIRECTION
- PROPOSED FLOW DIRECTION
- A / AC 5 100 — BASIN DESIGNATION
  - 5-YEAR RUNOFF IN CUBIC FEET PER SECOND
  - 100-YEAR RUNOFF IN CUBIC FEET PER SECOND
  - BASIN AREA IN ACRES
- 1 — DESIGN POINT

BASIN SUMMARY TABLE

Tributary Sub-basin	Area (acres)	C_5	C_{100}	t_c (min)	Q_5 (cfs)	Q_{100} (cfs)
MT060					304.6	915.3
EX-1	4.97	0.08	0.23	10.7	1.6	7.7
EX-2	2.32	0.07	0.22	13.1	0.6	3.2
EX-3	2.85	0.03	0.17	13.8	0.3	3.0
EX-4	1.08	0.01	0.13	13.6	0.0	0.9
OS-1	3.89	0.05	0.19	13.9	0.7	4.5
OS-2	2.35	0.07	0.22	15.6	0.6	3.0
OS-3	0.24	0.01	0.13	9.6	0.0	0.2
OS-4E	0.05	0.86	0.89	5.0	0.2	0.4
A-1	1.82	0.26	0.41	8.8	2.0	5.4
B-1	1.46	0.80	0.85	5.0	6.0	10.8
B-2	1.18	0.84	0.88	5.0	5.1	9.0
B-3	0.95	0.47	0.59	7.1	2.1	4.4
B-4	0.52	0.64	0.73	6.0	1.6	3.1
B-5	0.13	0.70	0.77	5.0	0.5	0.9
B-6	0.16	0.54	0.65	5.8	0.4	0.9
B-7	0.56	0.07	0.22	5.0	0.2	1.1
C-1	0.29	0.29	0.44	11.5	0.3	0.8
C-2	3.12	0.43	0.56	12.0	5.2	11.3
C-3	0.29	0.38	0.52	11.1	0.4	1.0
C-4	0.09	0.01	0.13	5.0	0.0	0.1
D-1	0.08	0.01	0.13	5.0	0.0	0.1
D-2	0.05	0.46	0.58	5.0	0.1	0.3
D-3	0.33	0.61	0.70	5.3	1.0	2.0
OS-4P	0.07	0.71	0.78	5.0	0.3	0.5
OS-5	0.19	0.01	0.13	5.0	0.0	0.2
OS-6	0.08	0.01	0.13	9.4	0.0	0.1

DESIGN POINT TABLE

Design Point	Q_5 (cfs)	Q_{100} (cfs)
EXISTING		
1	306.2	923.0
2	0.6	0.1
3	0.3	2.9
4	1.2	8.3
14	0.2	0.3
PROPOSED		
1	306.6	920.7
3	6.0	10.8
4 (Inlet)	5.1	9.0
4 (Pipe)	10.0	17.7
5 (Inlet)	2.1	4.2
5 (Pipe)	11.5	20.9
6 (Inlet)	1.5	3.2
6 (Pipe)	11.3	21.1
7	0.5	0.9
8 (Inlet)	0.8	1.5
8 (Pipe)	1.1	2.1
9 (Inflow)	16.5	31.2
9 (Outflow)	0.4	4.7
10	1.2	7.4
11	1.6	12.1
12	0.1	0.4
13	1.0	2.1
14	0.3	0.4

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FALCON RANCHETTES FILING NO. 1A
MERIDIAN STORAGE
DRAINAGE MAP

11750 OWL PLACE
PEYTON, CO 80831

#	Date	Issue / Description	Init.

Project No:	MRSD1
Drawn By:	BLB
Checked By:	CMWJ
Date:	04/26/2024

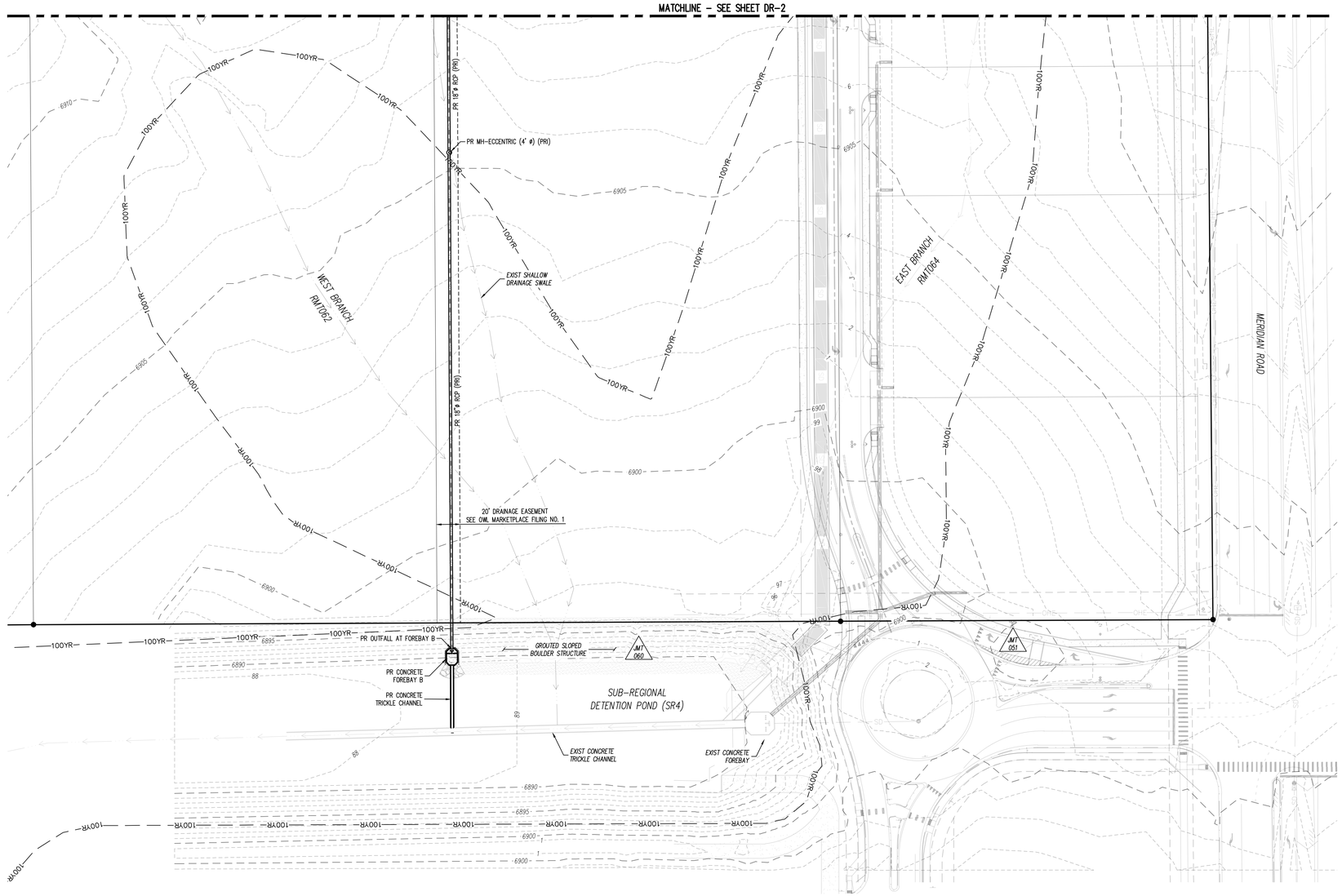
PROPOSED DRAINAGE MAP

DR-2
SHEET 2 OF 4

N

0 10 20 50

SCALE: 1"=50'



DRAINAGE LEGEND

- 5460 — EXISTING MAJOR CONTOUR
- 52 — EXISTING MINOR CONTOUR
- 5465 — PROPOSED MAJOR CONTOUR
- 66 — PROPOSED MINOR CONTOUR
- BASIN BOUNDARY
- 100YR — EXISTING 100-YEAR FLOODPLAIN
- EXISTING FLOW DIRECTION
- PROPOSED FLOW DIRECTION
- A / AC / 5 / 100 — BASIN DESIGNATION; 5-YEAR RUNOFF IN CUBIC FEET PER SECOND; 100-YEAR RUNOFF IN CUBIC FEET PER SECOND; BASIN AREA IN ACRES
- 1 — DESIGN POINT

BASIN SUMMARY TABLE

Tributary Sub-basin	Area (acres)	C_5	C_{100}	t_c (min)	Q_5 (cfs)	Q_{100} (cfs)
MT060					304.6	915.3
EX-1	4.97	0.08	0.23	10.7	1.6	7.7
EX-2	2.32	0.07	0.22	13.1	0.6	3.2
EX-3	2.85	0.03	0.17	13.8	0.3	3.0
EX-4	1.08	0.01	0.13	13.6	0.0	0.9
OS-1	3.89	0.05	0.19	13.9	0.7	4.5
OS-2	2.35	0.07	0.22	15.6	0.6	3.0
OS-3	0.24	0.01	0.13	9.6	0.0	0.2
OS-4E	0.05	0.86	0.89	5.0	0.2	0.4
A-1	1.82	0.26	0.41	8.8	2.0	5.4
B-1	1.46	0.80	0.85	5.0	6.0	10.8
B-2	1.18	0.84	0.88	5.0	5.1	9.0
B-3	0.95	0.47	0.59	7.1	2.1	4.4
B-4	0.52	0.64	0.73	6.0	1.6	3.1
B-5	0.13	0.70	0.77	5.0	0.5	0.9
B-6	0.16	0.54	0.65	5.8	0.4	0.9
B-7	0.56	0.07	0.22	5.0	0.2	1.1
C-1	0.29	0.29	0.44	11.5	0.3	0.8
C-2	3.12	0.43	0.56	12.0	5.2	11.3
C-3	0.29	0.38	0.52	11.1	0.4	1.0
C-4	0.09	0.01	0.13	5.0	0.0	0.1
D-1	0.08	0.01	0.13	5.0	0.0	0.1
D-2	0.05	0.46	0.58	5.0	0.1	0.3
D-3	0.33	0.61	0.70	5.3	1.0	2.0
OS-4P	0.07	0.71	0.78	5.0	0.3	0.5
OS-5	0.19	0.01	0.13	5.0	0.0	0.2
OS-6	0.08	0.01	0.13	9.4	0.0	0.1

DESIGN POINT TABLE

Design Point	Q_5 (cfs)	Q_{100} (cfs)
EXISTING		
1	306.2	923.0
2	0.6	0.1
3	0.3	2.9
4	1.2	8.3
14	0.2	0.3
PROPOSED		
1	306.6	920.7
3	6.0	10.8
4 (Inlet)	5.1	9.0
4 (Pipe)	10.0	17.7
5 (Inlet)	2.1	4.2
5 (Pipe)	11.5	20.9
6 (Inlet)	1.5	3.2
6 (Pipe)	11.3	21.1
7	0.5	0.9
8 (Inlet)	0.8	1.5
8 (Pipe)	1.1	2.1
9 (Inflow)	16.5	31.2
9 (Outflow)	0.4	4.7
10	1.2	7.4
11	1.6	12.1
12	0.1	0.4
13	1.0	2.1
14	0.3	0.4

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FALCON RANCHETTES FILING NO. 1A
MERIDIAN STORAGE
DRAINAGE MAP

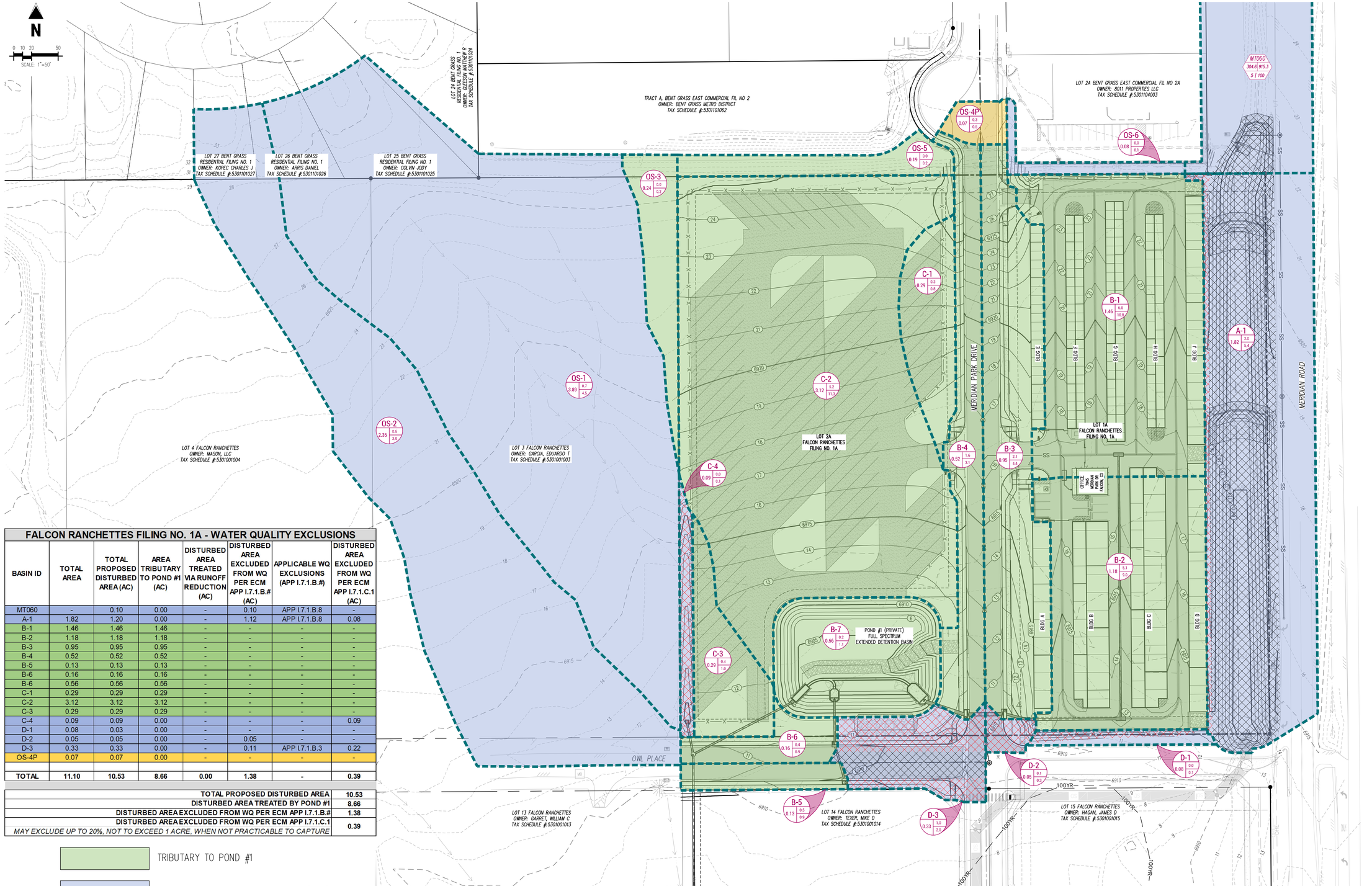
11750 OWL PLACE
PEYTON, CO 80831

#	Date	Issue / Description	Init.

Project No:	MRS01
Drawn By:	BLB
Checked By:	CMWJ
Date:	04/26/2024

PROPOSED DRAINAGE MAP

DR-3
SHEET 3 OF 4



FALCON RANCHETTES FILING NO. 1A - WATER QUALITY EXCLUSIONS

BASIN ID	TOTAL AREA	TOTAL PROPOSED DISTURBED AREA (AC)	AREA TRIBUTARY TO POND #1 (AC)	DISTURBED AREA TREATED VIA RUNOFF REDUCTION (AC)	DISTURBED AREA EXCLUDED FROM WQ PER ECM APP I.7.1.B.# (AC)	APPLICABLE WQ EXCLUSIONS (APP I.7.1.B.#)	DISTURBED AREA EXCLUDED FROM WQ PER ECM APP I.7.1.C.1 (AC)
MT060	-	0.10	0.00	-	0.10	APP I.7.1.B.8	-
A-1	1.82	1.20	0.00	-	1.12	APP I.7.1.B.8	0.08
B-1	1.46	1.46	1.46	-	-	-	-
B-2	1.18	1.18	1.18	-	-	-	-
B-3	0.95	0.95	0.95	-	-	-	-
B-4	0.52	0.52	0.52	-	-	-	-
B-5	0.13	0.13	0.13	-	-	-	-
B-6	0.16	0.16	0.16	-	-	-	-
B-6	0.56	0.56	0.56	-	-	-	-
C-1	0.29	0.29	0.29	-	-	-	-
C-2	3.12	3.12	3.12	-	-	-	-
C-3	0.29	0.29	0.29	-	-	-	-
C-4	0.09	0.09	0.00	-	-	-	0.09
D-1	0.08	0.03	0.00	-	-	-	-
D-2	0.05	0.05	0.00	-	0.05	-	-
D-3	0.33	0.33	0.00	-	0.11	APP I.7.1.B.3	0.22
OS-4P	0.07	0.07	0.00	-	-	-	-
TOTAL	**11.10**	**10.53**	**8.66**	**0.00**	**1.38**	**-**	**0.39**

TOTAL PROPOSED DISTURBED AREA	10.53
DISTURBED AREA TREATED BY POND #1	8.66
DISTURBED AREA EXCLUDED FROM WQ PER ECM APP I.7.1.B.#	1.38
DISTURBED AREA EXCLUDED FROM WQ PER ECM APP I.7.1.C.1	0.39
MAY EXCLUDE UP TO 20%, NOT TO EXCEED 1 ACRE, WHEN NOT PRACTICABLE TO CAPTURE	

TRIBUTARY TO POND #1

TRIBUTARY TO SUB REGIONAL POND (SR4)

TRIBUTARY TO BENT GRASS POND

EXCLUDED PER ECM, APPENDIX I.7.1.B.#

EXCLUDED PER ECM, APPENDIX I.7.1.C.1

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FALCON RANCHETTES FILING NO. 1A
MERIDIAN STORAGE
DRAINAGE MAP
FOR M.D. ROOFING

11750 OWL PLACE
PEYTON, CO 80831

#	Date	Issue / Description	Init.

Project No:	MRS01
Drawn By:	BLB
Checked By:	CMWJ
Date:	04/26/2024

WATER QUALITY DRAINAGE MAP

DR-4
SHEET 4 OF 4