# PRELIMINARY DRAINAGE REPORT

for

# THE COMMONS AT FALCON FIELD

El Paso County, Colorado

**March 2024**

**PCD FILE NO. SP-232**

Prepared for:

**Falcon Field, LLC**
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**PRELIMINARY DRAINAGE REPORT**

for

**THE COMMONS AT FALCON FIELD**

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

### DEVELOPER'S STATEMENT

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

Business Name: Falcon Field, LLC.

By: ________________________________________
PJ Anderson Date
Title: Owner
Address: 30 N. Tejon St., #516
Colorado Springs, CO 80903

### EL PASO COUNTY

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

________________________________________

Joshua Palmer, P.E. Date
County Engineer/ECM Administrator
CONDITIONS:

**PRELIMINARY DRAINAGE REPORT**

for

**THE COMMONS AT FALCON FIELD**

Falcon, Colorado

## 2.0 PURPOSE

This report is prepared by Drexel, Barrel & Co in support of The Commons at Falcon Field project. The purpose of this report is to identify onsite and offsite drainage patterns, storm sewer, inlet locations, and areas tributary to the site, and to safely route developed storm water runoff to adequate outfall facilities.

## 3.0 GENERAL SITE DESCRIPTION

Location

The Commons at Falcon Field site is approximately 57.7 acres and is bounded by U.S. Highway 24 along the northwest, a school to the south, and a large-lot residential development to the east and northeast. The site is in the east half of Section 7, Township 13 South, Range 64 West of the 6$^{th}$ PM.

Drainage Fees will be assessed and paid according to the current rates at the time of platting. All easements for utilities and drainage features will be provided with the final plat process.

Existing Site Conditions

The site is currently open grass land with one single-family residence and barn. The residence is supported by a well and individual septic system. There are no known utilities on site. Offsite runoff enters the site through a box culvert under Highway 24, along the northern boundary of the property. The box culvert discharges through the site in an open drainage to the south. Smaller offsite basins, including Highway 24 along the northern boundary currently discharge onto the property, these basins are further described below.

Proposed Site Conditions

The Commons at Falcon Field is a proposed mixed-use commercial and residential development and is proposed to consist of 169 single-family lots and 8 commercial pads, along with associated roadways and open space. This development is anticipated to be phased into three separate areas – commercial, south residential and east residential. A pre-subdivision early grading request has been submitted to the County to allow for the overlot grading, box culvert installation and subsequent floodplain modification to occur. Overlot grading is proposed to cover the entirety of the site to allow for a balanced cut-fill scenario.

Soils

According to the Soil Survey of El Paso County Area, Colorado, prepared by the U.S. Department of Agriculture Soil Conservation Service, the site is partially underlain by Blakeland Loamy Sand (Soil No. 8), and predominantly by Columbine gravelly sandy loam (Soil No. 19). Both soils are type 'A' hydrological soil group. See appendix for map.

Climate

This area of El Paso County can be described as the foothills, with total precipitation amounts typical of a semi-arid region, roughly 15 inches annually. The climate of the site is typical of a sub-humid to semi-arid climate with mild summers and winters. The average temperature is 31 degrees F in the winter and 68.4 degrees F in the summer.

Floodplain Statement

The Flood Insurance Rate Maps (FIRM No. 08041C0553-G & 08041C0561-G both dated 12/7/18) indicate that there is a Zone A floodplain area that covers the "Falcon Creek East Tributary" that bisects the site, but this area is not a designated regulatory floodway. This reach of the channel is the subject of a FEMA floodplain study currently being completed by separate report and analysis.

Previous Drainage Studies

The site is located within the East Tributary Basin of the Falcon Basin Watershed, as studied in the Falcon Drainage Basin Planning Study, prepared by Matrix Design Group, September, 2015. DBPS recommendations are presented later in this report.

## 4.0 DRAINAGE CRITERIA

The drainage analysis has been prepared in accordance with the current El Paso County Drainage Criteria Manual. Calculations were performed to determine runoff quantities during the 5-year and 100-year frequency storms for historic and developed conditions using the Rational Method as required for basins containing less than 100 acres.

In addition, the following Mile High Flood District (MHFD) provided spreadsheet MHFD-Detention v4.04 was used for preliminary design of the detention facilities.

## 5.0 DBPS ANALYSIS

Existing Conditions

The Falcon DBPS watershed establishes three major basins, including the "East Tributary" which covers this property. The DBPS completed hydrologic analysis for the Falcon Basin Watershed, using HEC-HMS v.3.5 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 conveyance infrastructure.

As mentioned earlier, offsite flows from the Woodmen Hills Detention Pond #4 enter the

Commons at Falcon Field site via two 4.83'x12' box culverts underneath U.S. Highway 24 (DBPS identifier ET14), these combine with onsite flows and follow the historic reach RET100 of the Falcon Creek East Tributary to the south.

The following table details the HEC-HMS analysis of existing conditions across the Commons at Falcon Field development.

**Peak Discharges for the Existing Condition at Points of Interest in vicinity of The Commons at Falcon Field Development (DBPS)**

| Location | Existing Conditions (source: Falcon Basin, Drainage Planning Study, HEC-HMS model) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | HEC-HMS Element | Area (sq mi) | Peak Flow (cfs) | | | | | |
| | | | 2-yr | 5-yr | 10-yr | 25-yr | 50-yr | 100-yr |
| **East tributary at North Property Line of Commons at Falcon Field** | RET090 | 1.66 | 14 | 36 | 55 | 170 | 230 | 320 |
| **East tributary through Commons at Falcon Field** | RET100 | 1.78 | 15 | 39 | 64 | 170 | 270 | 370 |
| **Local Basin** | ET100 | 0.05 | 1 | 6 | 10 | 21 | 27 | 34 |
| **East tributary South of Commons at Falcon Field Property Line** | RET110 | 1.83 | 15 | 40 | 65 | 170 | 270 | 380 |

The DBPS flow rates shown in the table above were used as the basis of the existing condition analysis of the Commons at Falcon Field development. Site specific basins have been allocated and referenced on the existing conditions map in the appendix.

The Falcon DBPS recommends junction and reach improvements for RET100 (reach through project site) and subsequent reach RET110 downstream junction ET13 at Pinto Pony to Falcon Highway. The existing culvert at Highway 24 was identified as undersized, but not included in the DBPS recommendations as it is a CDOT owned structure. The improvements include the following recommendations:

Reach RET100 – Installation of small drop structures with toe protection
Reach RET110 – Installation of small drop structures with toe protection
Junction ET13 (Pinto Pony) – replace existing crossing with (2) 6'x8' culverts
Junction ET11 (Falcon Highway) – replace existing crossing with (2) 6'x8' culverts

The Commons at Falcon Field development includes regrading and rerouting a portion of the East Tributary. The improvements intercept the Highway 24 (CDOT owned) culvert immediately south of the Highway 24 and convey via 8'x4' concrete box culvert 750-lf to the south through the project site towards an open channel. The proposed box culver discharges to the proposed open channel via a headwall. The proposed open channel conveys the flow 275-lf downstream to tie into the existing creek and will be vegetated with mowable short grasses. The open channel is proposed with a 20-foot bottom width in a v-shape with two 10-foot sections set as a 2% slope to the invert.

Improvements downstream of the Commons at Falcon Marketplace project will be the responsibility of future land developers.

## 6.0 EXISTING CONDITION

In addition to the DBPS, a site specific analysis of the existing conditions was completed. The flows determined by the DBPS for the tributary entering the site from the north (RET090), were used in combination with rational method analysis for the surrounding onsite/offsite flows. For this preliminary analysis, the DBPS flows were directly added to the rational method flows. Further analysis of the flows will be completed with the CLOMR study.

**Basin OS1** represents a portion of the southern half of U.S. Highway 24 along the northwest boundary for the Commons at Falcon Field site. Due to no curb and gutter along this stretch of U.S. Highway 24, flows from this basin discharge directly into basin E1 as overland flow and are represented by **Design Point DPA**. Runoff rates at existing DPA are $Q_5$=3.4 cfs and $Q_{100}$=7.6 cfs.

**Basin E1** covers 13.85 acres of open space in the northwestern portion of the site. Flows from this basin combine with those from DPA and travel to the southwest towards the East Tributary of Falcon Creek. The east tributary bisects basin E1 running from northern most portion of the site south towards the bottom of Basin E1 where flows are discharged at rates of $Q_5$=3.2 cfs and $Q_{100}$=22.4 cfs. These flows are consistent with those established by the DBPS for the local basin, see table above. These flows combine with those from the DBPS RET090 at **Design Point DPB** with rates of $Q_5$=41.0 cfs and $Q_{100}$=346.4 cfs, and discharge to the south as defined channel flow. As previously mentioned for the purposes of this preliminary analysis, the DBPS flows were directly added to the Rational Method flows. Further detailed flow analysis will be completed as part of the CLOMR study.

**Basin OS2** represents the remainder of the southern half of U.S. Highway 24 along the northwest boundary for the Commons at Falcon Field site. Due to no curb and gutter along this stretch of U.S. Highway 24, flows from this basin discharge as overland flow directly into basin E2 and are represented by **Design Point DPC**. Runoff rates at existing DPC are $Q_5$=1.4 cfs and $Q_{100}$=3.2 cfs.

**Basin OS3** is located along the southeastern edge of Basin E2. This basin consists native grasses and vegetation, and a small outbuilding. The flows within this basin travel to the southwest where they will discharge as overland flow into basin E2 at **Design Point DPD**. The runoff rates entering basin E2 at DPD are $Q_5$=0.8 cfs and $Q_{100}$=5.6 cfs.

**Basin E2** is 12.88 acres of open space located to the west of Basin E1. The basin is sloped to the southeast at roughly 3% before turning directly south upon reaching the eastern border of the basin. Flows combine with those from Basin OS2 then travel south until roughly halfway down the basin where Basin OS3 adds to the flows. From there the combined flows from Basins OS2, OS3, and E2 continue to the south as overland flow where they are released from the site at **Design Point DPE** at rates of $Q_5$=3.8 cfs and $Q_{100}$=23.9 cfs.

## RATIONAL METHOD RUNOFF SUMMARY

| BASIN & DESIGN POINT SUMMARY | | | | |
|---|---|---|---|---|
| BASIN | DP | AREA (AC) | Q5 | Q100 |
| EXISTING BASINS | | | | |
| OS1 | A | 1.34 | 3.4 | 7.6 |
| E1 | | 13.85 | 3.2 | 22.4 |
| DPA+E1+RET090 | B | 15.19 | 41.0 | 346.4 |
| OS2 | C | 0.60 | 1.4 | 3.2 |
| OS3 | D | 2.56 | 0.8 | 5.6 |
| E2 | | 12.88 | 2.5 | 18.6 |
| DPC+DPD+E2 | E | 16.04 | 3.8 | 23.9 |
| E3 | F | 13.11 | 2.7 | 19.6 |
| OS4 | G | 3.29 | 2.4 | 9.7 |
| E4 | | 1.57 | 0.3 | 2.6 |
| DPG+E4 | H | 4.86 | 1.9 | 9.0 |
| E5 | I | 5.91 | 2.2 | 11.7 |
| OS5 | J | 5.50 | 6.6 | 6.6 |
| OS6 | K | 0.91 | 2.6 | 5.5 |
| E6 | | 10.37 | 1.7 | 12.5 |
| DPJ+DPL+E6 | M | 16.78 | 4.1 | 21.9 |

**Basin E3** represents 13.11 acres in the southwest corner of the site. Basin E3 directs flows from the north and south to the southern border, exiting the site as overland flow with runoff rates of $Q_5$=2.7 cfs and $Q_{100}$=19.6 cfs at **Design Point DPF**.

**Basin OS4** runs down the western side of the site and includes a portion of the southern edge of U.S. Highway 24. The 3.29-acre, offsite basin, generates flows that will travel to the south until they reach **Design Point DPG** at the bottom of the basin. Where they will enter Basin E4 as overland flow at rates of $Q_5$=2.4 cfs and $Q_{100}$=9.7 cfs.

**Basin E4** is a small, 1.57-acre basin on the far western side of the site. The basin will receive offsite flows from Basin OS4 before directing all of flow south where it exits the western side of the site as overland flow at **Design Point DPH**, with runoff rates of $Q_5$=1.9 cfs and $Q_{100}$=9.0 cfs.

**Basin E5** is 5.91 acres located on the eastern side of the site, sandwiched between the southern portions of Basin E1 and E6. The basin directs all of its flows south as overland flow towards the existing **Design Point DPG** which sits on the southern border of the site, directly in the middle of Basin E5. This basin generates runoff rates of $Q_5$=2.4 cfs and $Q_{100}$=9.7 cfs.

**Basin OS5** is an offsite basin located to the north of Rio Lane and includes the northern half of Rio Lane. Runoff from this basin is captured by a roadside ditch and travels towards an existing 18" CMP culvert underneath Rio Lane, located approximately two-thirds of the way along the project boundary. The full-flow capacity of this existing 18" CMP culvert at 1.0% (field-surveyed grade) has been conservatively used to determine the flows entering from the project site from this basin, rather than using the Rational Method calculation. This approach considers the existing roadside ditch along the north side of Rio Lane as emergency overflow for flows not captured by the existing culvert. Field observations indicate no evidence of roadway overtopping in this area. As a result, flows of $Q_{100}$=6.6 cfs exit the 18" CMP culvert and enter the project site at DPJ as concentrated flow.

**Basin OS6** covers the southern half of Rio Lane along the northern boundary of the Commons at Falcon Field site. Due to no curb and gutter along Rio Lane, flows from this basin discharge as overland flow directly into Basin E6 and are represented by **Design Point DPL** with runoff rates of $Q_5$=2.6 cfs and $Q_{100}$=5.5 cfs.

**Basin E6** represents the eastern most basin of the site. At 10.37 acres, the basin directs flows from its northwestern corner, and from Basins OS5, and OS6, southeast until they reach the existing **Design Point M** where they exit the site as overland flow. Runoff rates at DPM will be $Q_5$=4.1 cfs and $Q_{100}$=21.9 cfs.

## 7.0 PRESUBDIVISION OVERLOT GRADING

Presubdivision grading has been applied for at the Preliminary Plan stage to allow for overlot grading to occur. The site has been designed to balance, but all three phases need to be overlot graded simultaneously to allow this to happen.

For the purpose of site specific analysis, the project has been divided into several grouped drainage basins as shown on the proposed overlot drainage plan. These basins follow the same naming conventions as the proposed drainage basins described later in this report.

**A-Group Basins** are 2 basins that will represent the entire A-basin area, they will represent flows generated within the eastern residential portion of the site that will primarily be intercepted by Pond A, ultimately discharging out to the redefined tributary open channel. Pond A will act as a temporary sediment basin until full development occurs.

**Basin A1** is 17.73 acres, representing the large majority of the eastern residential portion of the site. All of the runoff generated within this basin will be directed via temporary diversion swales towards Pond A. The runoff reaching this pond during this preliminary overlot phase will be $Q_5$=4.1 cfs and $Q_{100}$=30.1 cfs.

**Basin A2** covers a portion of Tract A along the east and southern boundary. Flows generated by this 2.45-acre basin are directed offsite as overland sheet flow. The majority of this basin will be regraded but will remain undeveloped as an open space tract. A 0.25-acre portion of this basin covers the rear of the lots at the southeast corner of the property. It is anticipated that this area will fall under ECM 1.7.1.C.1. as the ability to capture and treat flows generated by Basin A2 is restricted due to grading constraints. Any area outside of the criteria exclusion limit will be considered for runoff reduction. This will be further analyzed at the final drainage report stage.

**RATIONAL METHOD RUNOFF SUMMARY**

| BASIN & DESIGN POINT SUMMARY | | | | |
|---|---|---|---|---|
| BASIN | DP | AREA (AC) | Q5 | Q100 |
| PRELIMINARY-BASINS | | | | |
| A1 | 1 | 17.73 | 4.1 | 30.1 |
| A2 | | 2.45 | 0.6 | 4.6 |
| B1 | | 12.47 | 3.0 | 22.4 |
| OB1 | O1 | 1.34 | 3.4 | 7.6 |
| OB2 | O2 | 0.60 | 1.4 | 3.2 |
| B1+O1+O2 | 2 | 14.41 | 5.9 | 28.9 |
| C1 | | 6.29 | 1.5 | 11.1 |
| OC | | 2.55 | 0.6 | 4.5 |
| C1+OC | 3 | 8.85 | 2.1 | 15.6 |
| D1 | 4 | 15.99 | 3.7 | 27.4 |
| D2 | | 2.81 | 0.7 | 5.2 |
| OD | | 2.70 | 0.7 | 4.8 |
| D2+OD | 5 | 5.51 | 1.4 | 10.2 |

**B-group basins** represent the central commercial portion of the site that will be intercepted by Pond B, ultimately discharging out to the redefined tributary open channel. Pond B will act as a temporary sediment basin until full development occurs.

**Basin OB1** represents 1.34 acres of US-HWY 24, which acts as the northwestern boundary for the site. The runoff generated by this basin, $Q_5$=3.4 cfs and $Q_{100}$=7.6 cfs, will discharge directly onto the project site at **Design Point O1**, where flows will continue to the southeast. Flows will be directed through the site towards the temporary sediment basin (Pond B) via temporary diversion swales.

**Basin OSB2** represents 0.60-acres of US-HWY 24, which acts as the northwestern boundary for the site. The runoff generated by this basin, $Q_5$=1.4 cfs and $Q_{100}$=3.2 cfs, is directed northeast towards the proposed Woodmen Road extension and **Design Point O2.**

**Basin B** covers the entirety of the central commercial portion of the site. Similar to basin A1, all of the runoff generated within this 12.47 acre basin will be directed southeast via temporary diversion swale towards the temporary sediment basin at Pond B. The runoff reaching Pond B during this preliminary overlot phase, which includes basins OSB1 and OSB2, will be $Q_5$=5.9 cfs and $Q_{100}$=28.9 cfs.

**C-group basins** represent the western commercial portion of the site that will be intercepted by a temporary sediment basin along the western project boundary, ultimately discharging to the south towards the temporary sediment basin located at Design Point 4.

**Basin OC** covers an offsite area along the western boundary of the project site, and includes a portion of U.S. Highway 24. The 2.55-acre offsite basin, will follow current conditions along the western property boundary of the site until they reach the southeast corner where they will enter Basin C1 at rates of $Q_5$=0.6 cfs and $Q_{100}$=4.5 cfs and be captured by a proposed temporary sediment basin at Design Point 3.

**Basin C1** is 6.29 acres, representing the entire western commercial portion of the site. The runoff generated within this basin will amount to $Q_5$=1.5 cfs and $Q_{100}$=11.1 cfs, this runoff will be directed via temporary diversion swales towards the southwest corner of the basin and the temporary sediment basin at Design Point 3.

**D-group basins** represent the southern residential portion of the site that will be intercepted by a temporary sediment basin located at Pond C, ultimately discharging out to follow historic conditions to the southeast.

**Basin OD** is located along the eastern side of the upper half of Basin D2. The flows within this basin will flow to the southwest where they will naturally gather and channel along the westerly edge of Basin D2. The runoff rates entering Basin D2 are $Q_5$=0.7 cfs and $Q_{100}$=4.8 cfs.

**Basin D1** covers the majority of the southern residential portion of the site. All of the runoff generated within this 15.99 acre basin captured by Pond C at the southern side of the basin. Runoff, at rates of $Q_5$=3.7 cfs and $Q_{100}$=27.4 cfs, will be channeled south within temporary diversion swales into the temporary sediment basin at Design Point 4.

**Basin D2** represents the southern and eastern boundaries for the southern residential portion of the site. Within this 2.81 acre basin, runoff will be generated at rates of $Q_5$=0.7 cfs and $Q_{100}$=5.2 cfs. This runoff, as well as that from basin OD, will be directed via temporary diversion swale towards the temporary sediment basin at Design Point 4. The temporary sediment basin outfalls have been design to release at historic rates. Installation of a level spreader berm at the pond outfall will allow flows to dissipate into a more natural overland condition rather than discharging as concentrated flow.

## 8.0 PROPOSED CONDITION

For the purposes of site specific analysis, the project site has been divided into several grouped drainage basins as shown on the proposed drainage plan.

The Rational Method was used to determine runoff quantities for the 5- and 100-year storm recurrence intervals. Mile High Flood District MHFD-Detention v,4.04 was used for preliminary pond sizing, see appendix for calculations and below for a summary runoff table.

A site investigation is currently underway to evaluate existing groundwater conditions. In order to mitigate potential issues, the site grading in several areas of the site will be raised from the existing condition and as such, will increase the separation above shallow water areas. The results of the groundwater monitoring will indicate whether further mitigation measures will be required on the site, particularly at the detention basins. This analysis will be completed at the final plat stage with the construction documents.

The existing channel through the site is proposed to be piped via 8'x4' box culvert from the existing outfall south of U.S. Highway 24, through the site before discharging into a redefined open channel to the south of the proposed Retail Row St. A CLOMR study is currently underway to determine the feasibility of this approach.

Any underdrain system to be installed will be the responsibility of the Falcon Field District. State and Groundwater District permitting for discharges will be the responsibility of the of the District.

**<u>A-group basins</u>** represent flows at the eastern residential portion of the site that will be intercepted by Pond A, ultimately discharging out to the redefined tributary open channel.

**Rational Method Runoff Summary (A-group)**

| BASIN & DESIGN POINT SUMMARY | | | | |
|---|---|---|---|---|
| **BASIN** | **DP** | **AREA (AC)** | **Q5** | **Q100** |
| **A-BASINS** | | | | |
| A1 | 1 | 0.30 | 1.1 | 2.2 |
| A2 | 2 | 0.64 | 1.9 | 3.9 |
| A3 | 3 | 1.34 | 1.5 | 4.2 |
| A4 | | 0.25 | 1.2 | 2.1 |
| | 4 | 2.53 | 4.6 | 10.2 |
| A5 | | 0.23 | 1.1 | 1.9 |
| | 5 | 2.76 | 5.3 | 11.6 |
| A6 | 6 | 0.60 | 2.2 | 4.2 |
| A7 | | 2.85 | 3.3 | 8.3 |
| | 7 | 3.45 | 4.7 | 11.1 |
| A8 | 8 | 1.74 | 2.9 | 6.4 |
| A9 | | 1.47 | 2.4 | 5.3 |
| | 9 | 6.66 | 8.8 | 20.0 |
| A10 | 10 | 0.65 | 1.4 | 3.0 |
| A11 | | 2.55 | 4.9 | 10.8 |
| | 11 | 3.21 | 5.2 | 11.4 |
| A12 | 12 | 3.25 | 5.6 | 12.2 |
| | 12A | 9.91 | 13.3 | 29.9 |
| A13 | 13 | 1.22 | 2.2 | 4.8 |
| | 13A | 14.34 | 19.1 | 42.7 |
| A14 | | 0.97 | 0.2 | 1.8 |
| | 14 | 18.07 | 23.3 | 53.1 |
| A15 | 15 | 2.39 | 1.4 | 7.7 |
| A16 | 16 | 0.53 | 0.2 | 1.4 |

**Basin A1** is located on the western side of Jackdaw Drive. Runoff will flow south via curb and gutter at rates of $Q_5$=1.1 cfs and $Q_{100}$=2.2 cfs towards **Design Point DP1.** From this point flows will continue to the east via cross-pan and curb and gutter flow.

**Basin A2** covers the eastern side of Jackdaw Drive and the rear of some lots along Jacamar Place. Flows of $Q_5$=1.9 cfs and $Q_{100}$=3.9 cfs will travel south overland and via curb and gutter towards the intersection with Retail Row St. and **Design Point DP2.** From this point flows will continue to the east via curb and gutter flow.

**Basin A3** is located between Jackdaw Drive to the west and Jacamar Place to the east. Runoff flows overland and via curb and gutter from the northwest corner of the basin to the southeast corner at **DP3** with runoff rates of $Q_5$=1.5 cfs and $Q_{100}$=4.2 cfs. From this point flows will continue to the west via curb and gutter flow.

**Basin A4** is 0.25 acres on the northern side of the Retail Row St., beginning directly south of Jackdaw Drive. Basin A4 generates runoff rates of $Q_5$=1.2 cfs and $Q_{100}$=2.1 cfs that travel towards a proposed low point at **Design Point DP4.**

**DP4** consists of flows from Basins A1 (DP1), A2 (DP2) and A3 (DP3) and A4 to be captured in their entirety by a proposed public curb sump inlet, prior to discharge to the south via public storm sewer and ultimately the proposed full spectrum detention facility **Pond A**.

**Basin A5** covers 0.23 acres on the southern portion of Retail Row St., that begins directly south of Jackdaw Drive. Flows from this basin will travel via curb and gutter towards a proposed low point and proposed public curb sump inlet (DP5) located on the southern side of basin A5 and **Design Point DP5.** Runoff generated by this basin will be $Q_5$=1.1 cfs and $Q_{100}$=1.9 cfs.

**DP5** consists of the piped flows from upstream DP4 and surface flows generated by Basin A5. These flows will discharge to the south via public storm sewer directly into the proposed full-spectrum detention facility **Pond A.**

As described in the existing conditions section of this report, an existing 18" CMP culvert currently discharges onto the project site. In the developed condition, it is proposed that this culvert flow be directed to the east via 18" RCP storm sewer extension, under the proposed Tody Way intersection with Rio Lane. The roadside ditch east of the proposed Tody Way and Rio Lane intersection is to be redefined with outfall protection to protect from downstream erosion and scour.

**Basin A6** covers the south side of Rio Lane, which is to be upgraded to a local roadway section with curb and gutter and sidewalk on the south side. Runoff generated by this basin ($Q_5$=2.2 cfs and $Q_{100}$=4.2 cfs) is directed to the east via curb and gutter towards the intersection with Tody Way and **Design Point DP6.** From this point flows will continue to the south via curb and gutter flow.

**Basin A7** is 2.85 acres made up of 11 residential lots on the north side of Sapoya Place. Runoff ($Q_5$=3.3 cfs and $Q_{100}$=8.3 cfs) flows from northwest to southeast as side lot flow and curb and gutter flow towards the intersection with Tody Way and **Design Point DP7**

**DP 7** covers flows generated by Basin A6 (DP6) and Basin A7 and directs them to the south via cross-pan and curb and gutter flow.

**Basin A8** covers 1.74-acres of lots along the east side of Motmot Way. Flows generated by this basin ($Q_5$=2.9 cfs and $Q_{100}$=6.4 cfs) are directed towards the south of the basin via side-lot swale and curb and gutter towards **Design Point DP8** at the intersection with Buteos Lane. From DP8 these flows will continue to the south via cross-pan and curb and gutter flow.

**Basin A9** covers an area of residential lots along Tody Way and generates flows of $Q_5$=2.4 cfs and $Q_{100}$=5.3 cfs. Flows will generally travel as curb and gutter flows towards **Design Point DP9** at the southwest end of the basin.

**DP9** consists of flows generated by Basins A6 (DP6), A7 (DP7), A8 (DP8) and A9. Flows at this design point are captured by a proposed public at-grade inlet. Flows captured by this inlet will discharge to the south via proposed public storm sewer. Bypass flows will continue on to the west towards a low point at DP11.

**Basin A10** covers the front of a portion of residential lots along the east side of Jacamar Place. Flows from this basin ($Q_5$=1.4 cfs and $Q_{100}$=3.0 cfs) are directed south via curb and gutter towards **Design Point DP10.** From this point flows will continue to the east via curb and gutter flow.

**Basin A11** covers the central portion of residential lots along Motmot Way and generates flows of $Q_5$=4.9 cfs and $Q_{100}$=10.8 cfs. Flows will generally travel as side-lot swale and curb and gutter flow to the east and south towards **Design Point DP11** at the southwest corner of the basin.

**DP11** covers flow from Basin A10 (DP10), Basin A11 and bypass flows from DP9. Flows at this design point are captured by a proposed public sump curb inlet and will be discharged to the south via public storm system.

**Basin A12** covers 3.25 acres of residential lots along Tody Way. Flows from this basin will be directed via side lot swales and curb and gutter at rates of $Q_5$=5.6 cfs and $Q_{100}$=12.2 cfs, towards a proposed public at-grade curb inlet at **Design Point DP12.** Flows captured by this inlet will discharge to the north via proposed public storm sewer. Bypass flows will continue on to the west towards a low point at DP13.

**Design Point 12A** represents the combining of flows from DP12 and DP10 at a proposed storm sewer manhole. Piped flows reaching this point will continue to the west via proposed storm sewer.

**Basin A13** consists of residential lots along the south side of Buteos Lane. Flows from this basin travel via side-lot swale to the north and then as curb and gutter flow to the west at rates of $Q_5$=2.2 cfs and $Q_{100}$=4.8 cfs towards a proposed low point and public sump curb inlet at **Design Point DP13.** Flows captured by this inlet will discharge to the north via proposed public storm sewer.

**Design Point 13A** represents the combining of flows from DP12A, DP11 and DP13 at a proposed storm sewer manhole. Piped flows reaching this point will continue to the west via proposed storm sewer.

**Basin A14** covers the area of the proposed full-spectrum detention facility **Pond A**. Flows generated by this basin ($Q_5$=0.2 cfs and $Q_{100}$=1.8 cfs) will be captured by the pond in their entirety.

**Design Point DP14** represents all flows reaching the full-spectrum detention facility (Basins A1-A14). Pond A will discharge at historic rates into the redefined open channel. See further detention facility discussion below.

**Basin A15** covers a portion of Tract A along the east and southern boundary. Flows generated by this 2.39-acre basin are directed offsite as overland sheet flow. The majority of this basin will be regraded but will remain undeveloped as an open space tract. A 0.25-acre portion of this basin covers the rear of the lots at the southeast corner of the property. It is anticipated that this area will fall under ECM 1.7.1.C.1. as the ability to capture and treat flows generated by Basin A15 is restricted due to grading constraints. Any area outside of the criteria exclusion limit will be considered for runoff reduction. This will be further analyzed at the final drainage report stage.

**Basin A16** is 0.53-acres located between the 2 northern proposed full-spectrum detention facilities, **Pond A and B**. This basin will generate runoff at rates of $Q_5$=0.2 cfs and $Q_{100}$=1.4 cfs. All of the runoff generated and passed through this basin will be directed south where it will follow historical drainage patterns, eventually joining the East Tributary of Falcon Creek.

**B-group basins** represent the central commercial portion of the site that will be intercepted by Pond B, ultimately discharging out to the redefined tributary open channel.

**Basin OSB1** represents 2.09 acres of US-HWY 24, which acts as the northwestern boundary for the site. The runoff generated by this basin, $Q_5$=9.7 cfs and $Q_{100}$=17.4 cfs, is directed northeast via proposed curb and gutter towards a proposed sump curb inlet at **Design Point DP1**, where captured flows will continue to the southeast via proposed private storm sewer. The ultimate cross section of Highway 24 is unknown at the time of this Preliminary Drainage Report. Conversations are ongoing with CDOT regarding the timeline of improvements. The intention of this storm extension is to provide for an outlet at the associated low point.

**Basin B1** is 2.15 acres at the northeast corner of the commercial area. Flows from this basin are intended to be captured and routed to a proposed storm sewer stub at the southwest corner. Final design of this onsite private storm system will be by the future lot developer. The runoff flows generated by this basin are $Q_5$=8.9 cfs and $Q_{100}$=16.3 cfs. Flows from this stub will travel to the southwest via proposed storm sewer towards **Design Point DP1A** where they combine with piped flows from DP1.

**Basin B2** is located along the northern boundary of the commercial area. Flows of $Q_5$=4.6 cfs and $Q_{100}$=8.5 cfs are generated by this basin and are intended be captured and routed to a proposed storm sewer stub at the southwest corner at **Design Point 2** and routed to the southeast via private storm sewer**.** Final design of the connection to the stub and onsite private storm system will be by the future lot developer.

**Rational Method Runoff Summary (B-group)**

| BASIN & DESIGN POINT SUMMARY | | | | |
|---|---|---|---|---|
| BASIN | DP | AREA (AC) | Q5 | Q100 |
| B-BASINS | | | | |
| OSB1 | 1 | 2.09 | 9.7 | 17.4 |
| B1 | | 2.15 | 9.0 | 16.4 |
| | 1A | 4.25 | 18.2 | 32.8 |
| B2 | 2 | 1.11 | 4.6 | 8.5 |
| B3 | 3 | 0.39 | 1.8 | 3.3 |
| B4 | 4 | 1.54 | 6.5 | 11.8 |
| | 4A | 7.29 | 30.0 | 54.3 |
| B5 | 5 | 2.13 | 8.9 | 16.3 |
| | 5A | 9.42 | 37.3 | 67.8 |
| B6 | 6 | 1.75 | 7.3 | 13.4 |
| B7 | | 0.90 | 4.2 | 7.5 |
| | 7 | 2.65 | 11.5 | 20.8 |
| B8 | | 0.72 | 3.4 | 6.0 |
| | 8 | 3.37 | 14.7 | 26.6 |
| | 8A | 12.79 | 50.4 | 91.3 |
| B9 | | 1.42 | 0.6 | 4.3 |
| | 9 | 14.21 | 50.7 | 94.8 |

**Basin B3** covers a portion of the proposed Woodmen road right-of-way at the center of the commercial area. Flows of $Q_5$=1.8 cfs and $Q_{100}$=3.3 cfs are generated by this basin, and travel via curb and gutter to the south towards a proposed at-grade curb inlet at **Design Point 3.** Captured flows continue to the east via proposed storm sewer. Bypass flows will continue to the south as curb and gutter flow towards DP7.

**Basin B4** is located along the northern boundary of the commercial area, to the southwest of Basin B2. Flows of $Q_5$=6.5 cfs and $Q_{100}$=11.8 cfs are generated by this basin, and travel overland to the southeast towards **Design Point 4** and a proposed storm sewer stub. As with the previous commercial lot basins, the intention is to provide a storm sewer stub for the future lot developer to connect to.

**Design Point 4A** represents the combining of flows from DP1A, DP2, DP3 and DP4 at a proposed storm sewer manhole. Flows reaching this Design Point will continue to the south via proposed storm sewer.

**Basin B5** is located in the central portion of the commercial area. Flows of $Q_5$=8.9 cfs and $Q_{100}$=16.3 cfs are generated by this basin. Roadway flow is proposed to be captured by sump curb inlets located close to the intersection with Retail Row Street, **Design Point 5**. As with the previous commercial lot basins, the intention is to provide a storm sewer stub, located at the southeast corner for the future lot developer to connect to.

**Design Point 5A** represents the combining of flows from DP4A and Basin 5 at a proposed storm sewer manhole. Flows reaching this Design Point will continue to the south via proposed storm sewer.

**Basin B6** covers 1.75-acres in the central portion of the commercial area. Flows of $Q_5$=7.3 cfs and $Q_{100}$=13.4 cfs are generated by this basin. As with the previous commercial lot basins, the intention is to provide a storm sewer stub, located at the southeast corner at **Design Point 6** for the future lot developer to connect to. Piped flows will discharge to the south via proposed storm sewer.

**Basin B7** covers a portion of Woodmen Road and Retail Row St. right-of-way at the center of the commercial area. Flows of $Q_5$=4.2 cfs and $Q_{100}$=7.5 cfs are generated by this basin, and travel via curb and gutter to the south and northeast towards a proposed low point and public sump curb inlet at **Design Point DP7**. Captured flows at this inlet combine with those from DP6 and continue to the south via proposed storm sewer.

**Basin B8** covers the southern portion of Retail Row St. right-of-way at the center of the commercial area, to the south of Basin B7. Flows of $Q_5$=3.4 cfs and $Q_{100}$=6.0 cfs are generated by this basin, and travel via curb and gutter to the northeast towards a proposed low point and public sump curb inlet at **Design Point DP8**. Flows captured by this inlet combine with the piped flows from DP7 and continue to the south and west via proposed storm sewer.

**Design Point 8A** represents the combining of piped flows from DP5A and DP8 at a proposed storm sewer manhole. Flows reaching this Design Point will continue to the south via proposed storm sewer towards the full-spectrum detention facility **Pond B.**

**Basin B9** covers the area of the proposed full-spectrum detention facility Pond B. Flows generated by this basin ($Q_5$=0.6 cfs and $Q_{100}$=4.3 cfs) will be captured by the pond in their entirety.

**Design Point DP9** represents all flows reaching the full-spectrum detention facility (Basins OSB1 & B1-B9). Pond B will discharge at historic rates into the redefined open channel. See further detention facility discussion below.

**<u>C-group basins</u>** represent the western commercial portion of the site that will be intercepted by Pond C, ultimately discharging out to follow historic conditions to the southeast.

**Basin OSC1** represents 0.56-acres of US-HWY 24, which acts as the northwestern boundary for the site. The runoff generated by this basin, $Q_5$=2.6 cfs and $Q_{100}$=4.6 cfs, is directed northeast via proposed curb and gutter towards the proposed Woodmen Road extension and **Design Point DPC1.**

**Basin C1** covers a portion of Woodmen Road right-of-way at the center of the commercial area, adjacent to Basin B3. Flows of $Q_5$=1.3 cfs and $Q_{100}$=2.3 cfs are generated by this basin, and travel via curb and gutter to the south towards a proposed at-grade public curb inlet at **Design Point DP1.**

**Rational Method Runoff Summary (C-group)**

| BASIN & DESIGN POINT SUMMARY | | | | |
|---|---|---|---|---|
| **BASIN** | **DP** | **AREA (AC)** | **Q5** | **Q100** |
| **C-BASINS** | | | | |
| OSC1 | C1 | 0.56 | 2.6 | 4.6 |
| C1 | | 0.27 | 1.3 | 2.3 |
| | 1 | 0.83 | 3.8 | 6.7 |
| C2 | | 2.24 | 9.4 | 17.1 |
| | 2 | 2.52 | 13.7 | 24.8 |
| C3 | 3 | 1.32 | 5.5 | 10.1 |
| C4 | | 1.51 | 6.3 | 11.5 |
| | 4 | 5.34 | 24.0 | 43.7 |
| OSC2 | | 2.98 | 2.6 | 10.1 |
| C5 | | 0.88 | 4.1 | 7.3 |
| | 5 | 3.86 | 6.3 | 16.5 |
| C6 | | 0.66 | 3.1 | 5.5 |
| | 6 | 4.52 | 10.0 | 23.8 |
| | 6A | 9.86 | 31.8 | 62.7 |

**DP1** combines flows from DPC1 and Basin C1 at a proposed at-grade curb inlet. Captured flows will continue to the west via proposed storm sewer. Bypass flows will continue to the south via curb and gutter towards DP5.

**Basin C2** covers 2.24-acres in the west-central portion of the commercial area. Flows of $Q_5$=9.4 cfs and $Q_{100}$=17.1 cfs are generated by this basin are intended be captured and routed to a proposed storm sewer stub at the southwest corner at **Design Point DP2.**

**DP2** combines flows from DP1 and Basin C2 and continues on to the south via proposed storm sewer.

**Basin C3** covers 1.32-acres in the commercial area. Runoff rates of $Q_5$=5.5 cfs and $Q_{100}$=10.1 cfs are generated by this basin and as with other commercial basins, are intended be captured and routed to a proposed storm sewer stub at the southwest corner at **Design Point DP3.**

**Basin C4** is located along the western boundary of the commercial area. Runoff rates of $Q_5$=6.3 cfs and $Q_{100}$=11.5 cfs are generated by this basin as with other commercial basins, are intended be captured and routed to a proposed storm sewer stub at the southwest corner at **Design Point DP4.**

**DP4** represents the combining of flows from DP2, DP3 and Basin C4 at a proposed storm sewer manhole. Flows reaching this Design Point will continue to the south via proposed storm sewer.

**Basin OSC2** covers an offsite area along the western boundary of the project site, and includes a portion of U.S. Highway 24. The 2.98-acre offsite basin, will follow current conditions along the western property boundary of the site until they reach the southeast corner where they will enter Basin C5 at rates of $Q_5$=2.6 cfs and $Q_{100}$=10.1 cfs and be captured by the proposed public sump curb inlet at Design Point DP5.

**Basin C5** covers a portion of Woodmen Road and Retail Row St. right-of-way to the west and south of the commercial area. Flows of $Q_5$=4.1 cfs and $Q_{100}$=7.3 cfs are generated by this basin, and travel via curb and gutter to the southwest towards a proposed lot point and public sump inlet at **Design Point DP5.** From this point flows will continue to the south via proposed storm sewer.

**Basin C6** covers a portion of Retail Row St. right-of-way to the south of the commercial area. Flows of $Q_5$=3.1 cfs and $Q_{100}$=5.5 cfs are generated by this basin, and travel via curb and gutter to the southwest towards a proposed low point and public sump curb inlet at **Design Point DP6**. Flows captured by this inlet combine with the piped flows from DP5 and continue to the south via proposed storm sewer.

**Design Point 6A** represents the combining of flows from DP4 and DP6 at a proposed storm sewer manhole. Piped flows reaching this Design Point will continue to the south via proposed storm sewer into the D-group basins.

**D-group basins** represent the southern residential portion of the site that will be intercepted by Pond C, ultimately discharging out to follow historic conditions to the southeast.

**Basin D1** is located to the north of this residential portion of the development. Flows generated by this basin ($Q_5$=2.0 cfs and $Q_{100}$=5.0 cfs) travel to the southeast via side lot swale and curb and gutter towards **Design Point DP1**.

**Basin D2** is located at the northwest corner of this residential portion of the development along Dovekie Drive. Flows generated by this basin ($Q_5$=3.1 cfs and $Q_{100}$=7.6 cfs) travel to the east and south via curb and gutter eventually reaching **Design Point DP2.**

**DP2** combines flows from Basins D1 and D2, to be captured by a proposed public sump curb inlet at the intersection of Dovekie Drive and Becard Road. Captured flows will continue to the east via public storm sewer.

**Basin D3** is located centrally within this residential portion of the development and covers the front of lots along the south side of Dovekie Drive. Flows generated by this basin ($Q_5$=1.4 cfs and $Q_{100}$=3.3 cfs) travel to the northwest via side lot swale and curb and gutter towards a low point and proposed inlet structure at **Design Point DP3.** Flows from this point continue to the west via proposed storm sewer.

**Design Point 3A** represents the combining of flows from DP6A(C-Basins), DP2 and DP3 at a proposed storm sewer manhole. Flows reaching this Design Point will continue to the south via proposed storm sewer.

**Rational Method Runoff Summary (D-group)**

| BASIN & DESIGN POINT SUMMARY | | | | |
|---|---|---|---|---|
| BASIN | DP | AREA (AC) | Q5 | Q100 |
| D-BASINS | | | | |
| D1 | 1 | 1.35 | 2.0 | 5.0 |
| D2 | | 1.93 | 3.1 | 7.6 |
| | 2 | 3.28 | 4.8 | 11.9 |
| D3 | 3 | 0.91 | 1.4 | 3.3 |
| | 3A | 14.05 | 33.1 | 68.0 |
| D4 | 4 | 2.75 | 4.2 | 10.3 |
| D5 | | 0.65 | 1.3 | 2.8 |
| | 5 | 3.40 | 5.4 | 13.0 |
| D6 | 6 | 2.87 | 5.5 | 12.2 |
| D7 | | 0.70 | 2.5 | 4.7 |
| | 7 | 6.98 | 12.7 | 28.4 |
| D8 | 8 | 0.42 | 0.8 | 1.7 |
| D9 | 9 | 0.29 | 0.6 | 1.3 |
| D10 | 10 | 1.31 | 2.7 | 6.0 |
| D11 | | 0.62 | 2.9 | 5.1 |
| | 11 | 1.93 | 5.3 | 10.6 |
| D12 | | 1.52 | 0.6 | 4.3 |
| | 12 | 25.18 | 53.8 | 115.5 |
| OSD1 | D1 | 2.94 | 1.0 | 7.3 |
| D13 | | 1.45 | 0.5 | 3.3 |
| | 13 | 4.39 | 1.4 | 9.6 |
| D14 | 14 | 0.86 | 0.3 | 2.3 |

**Basin D4** is located centrally within this residential portion of the development. Flows generated by this basin ($Q_5$=4.2 cfs and $Q_{100}$=10.3 cfs) travel to the south and east via side lot swale and curb and gutter towards **Design Point 4** at the intersection of Becard Road and Hoopoe Lane. Flows from this point continue to the south via cross-pan and curb and gutter flow.

**Basin D5** is located centrally within this residential portion of the development, to the south of Basin D4 along Becard Road. Flows generated by this basin ($Q_5$=1.3 cfs and $Q_{100}$=2.8 cfs) travel to the north and east via side lot swale and curb and gutter towards **Design Point DP5**, where flows combine with those from DP4 and continue to the south.

**Basin D6** is 2.87 acres along Hoopoe Lane at the eastern boundary. Flows of $Q_5$=5.5 cfs and $Q_{100}$=12.2 cfs travel to the west and south as curb and gutter flow towards a low point and proposed sump curb inlet at **Design Point DP6**.

**Basin D7** covers the front of a portion of residential lots at the south of this residential area along Hoopoe Lane. Flows of $Q_5$=2.5 cfs and $Q_{100}$=4.7 cfs travel to the east and south as curb and gutter flow, combining with street flows from DP5 towards a proposed sump curb inlet at **Design Point DP7**. Captured flows combine with those from DP6 and continue via proposed storm sewer to the west.

**Basin D8** covers the rear of a portion of residential lots directly south of Basin D5. Flows of $Q_5$=0.8 cfs and $Q_{100}$=1.7 cfs travel to the east and south towards **Design Point 8** and the adjacent detention facility. Final grading within this basin will be established at the final drainage report stage to ensure all flows generated by this basin are directed to the detention facility.

**Basin D9** covers the rear of a portion of residential lots directly west of Basin D7. Flows of $Q_5$=0.6 cfs and $Q_{100}$=1.3 cfs travel to the west and south towards **Design Point DP9** and the adjacent detention facility. Final grading within this basin will be established at the final drainage report stage to ensure all flows generated by this basin are directed to the detention facility.

**Basin D10** covers the southern portion along Dovekie Drive at the western boundary. Flows of $Q_5$=2.7 cfs and $Q_{100}$=6.0 cfs generated by this basin will be directed east via side lot swale before traveling south via curb and gutter towards a low point and proposed inlet structure at **Design Point DP10**.

**Basin D11** covers the southern portion of Dovekie Drive adjacent to Basin D10. Flows of $Q_5$=2.9 cfs and $Q_{100}$=5.1 cfs generated by this basin will travel south via curb and gutter towards a low point and proposed inlet structure at **Design Point DP11**. Captured flows will combine with those from DP10 and discharge directly into the proposed detention facility.

**Basin D12** covers the area of the proposed full-spectrum detention facility **Pond C**. Flows generated by this basin ($Q_5$=0.6 cfs and $Q_{100}$=4.3 cfs) will be captured by the pond in their entirety.

**Design Point D12** represents all flows reaching the full-spectrum detention facility (Basins OSC1-OSC2, C1-C6 & D1-D12). **Pond C** will discharge at historic rates to the south to follow historic drainage patterns. See further detention facility discussion below.

**Basin OSD1** is located along the eastern side of the upper half of Basin D13. This basin consists almost entirely of native grasses and vegetation, aside from a single small shed. The flows within this basin will flow to the southwest where they will naturally gather and channel along the westerly edge of Basin D13 towards **Design Point DPD1**. The runoff rates entering Basin D13 at DPD2 are $Q_5$=1.0 cfs and $Q_{100}$=7.3 cfs.

**Basin D13** covers Tract G along the eastern boundary of this residential area. Flows generated by this 1.45-acre basin are directed offsite as overland sheet flow. The majority of this basin will be regraded but will remain undeveloped as an open space tract. A 0.04-acre portion of this basin covers the rear of the lots at the northern corner of the basin. It is anticipated that this area will fall under ECM 1.7.1.C.1. as the ability to capture and treat flows generated by Basin A15 is restricted due to grading constraints. Any area outside of the criteria exclusion limit will be considered for runoff reduction. This will be further analyzed at the final drainage report stage.

**Basin D14** covers a section of open space area along the southern boundary of this residential area. While this area will be regraded, the area will remain undeveloped. Flows generated by this 0.86-acre basin are directed offsite. It is anticipated that this area will fall under ECM 1.7.1.C.1. as the ability to capture and treat flows generated by Basin A15 is restricted due to grading constraints. Any area outside of the criteria exclusion limit will be considered for runoff reduction. This will be further analyzed at the final drainage report stage.

## 9.0 PROPOSED FULL-SPECTRUM DETENTION FACILITIES

As previously mentioned, three separate full-spectrum Extended Detention Basin facilities are proposed with this development. Further detailed design of these detention facilities will be coordinated with the CLOMR study and addressed at the Final Drainage Report stage.

Pond A , a private 1.91 ac-ft full-spectrum Extended Detention Basin is proposed in the southwestern corner of the A-basin neighborhood, to intercept and treat flows from the neighborhood area and discharge at historic rates into the adjacent redefined East Tributary. In accordance with El Paso County criteria, an outlet structure with a permanent micropool will release flows at or slightly below historic rates. Pond design will be finalized with the final drainage report.

Pond B, is a proposed private 2.25 ac-ft full-spectrum Extended Detention Basin, designed to intercept the flows generated by the B-basin commercial region of the site, treat and discharge at historic rates into the adjacent redefined East Tributary. As with Pond A, in accordance with El Paso County criteria, an outlet structure with permanent micropool will release flows at or slightly below historic rates. Pond design will be finalized with the final drainage report.

Pond C, is a proposed private 2.81 ac-ft full-spectrum Extended Detention Basin intended to intercept the flows generated by both the C and D-basin areas of the site. As with both other ponds, in accordance with El Paso County criteria, an outlet structure with permanent micropool will release flows at or slightly below historic rates. Pond design will be finalized with the final drainage report. The concentrated piped outflow from the detention facility will discharge onto a proposed grassed berm level spreader prior to discharge on to the adjacent properties to the south. The intention of this level spreader is to provide for stabilized conveyance at the historic level.

Maintenance access will be provided to each of the ponds. Private maintenance agreements and O&M manuals will be established for all 3 ponds prior to Final Plat.

## 10.0 FOUR-STEP PROCESS

In conformance with the Four-Step Process, outlined in the DCM, Volume 2, the site development design is focused on reducing runoff volumes, treating the water quality capture volume, and creating stabilized drainage ways. Methods will be discussed further in the Final Drainage Report.

## 11.0 CONDITIONAL LETTER OF MAP REVISION (CLOMR)

A Conditional Letter of Map Revision (CLOMR) is currently in the design stage for the Falcon Creek East Tributary reach that bisects the site. Excerpts from the CLOMR report are included in the appendix, and a copy of the full report has been submitted as part of this Preliminary Plan application.

## 12.0 DRAINAGE/BRIDGE FEES

Design, phasing, responsibility for and maintenance of any proposed improvements will be discussed in the final drainage report(s) as development of the site proceeds. Fees will be assessed and paid according to the current rates at the time of platting.

The Falcon DBPS – Fee Development categorizes improvements into Developer Costs, County Costs and Metro District Costs. Items identified as Developer Costs (those incurred by the Developer) are currently eligible for reimbursement. Reach RET100 is identified as a County cost, and as such the developer intends to amend the Falcon DBPS to allow for the costs of the 1,000-lf of RET100 improvements to become reimbursable by the process outlined in County criteria.

## 13.0 CONCLUSIONS

The Commons at Falcon Field project has been designed in accordance with El Paso County criteria. The full-spectrum detention facilities have been designed to limit the release of storm runoff to historic flows. This development will not negatively impact the downstream facilities.

A small portion of the site will remain in the 100-year floodplain after grading is complete, and will be addressed further at the Final Drainage Report stage and by the CLOMR study currently underway. Upon completion, a LOMR will be submitted to FEMA after construction to revise the FIRM map. Future buildings will not be constructed in the floodplain.

## 14.0 REFERENCES

The sources of information used in the development of this study are listed below:

1. City of Colorado Springs/El Paso County Drainage Criteria Manual, May 2014.

2. Urban Storm Drainage Criteria Manuals, Urban Drainage and Flood Control District. June 2001, Revised April 2008.

3. Natural Resources Conservation Service (NRCS) Web Soil Survey

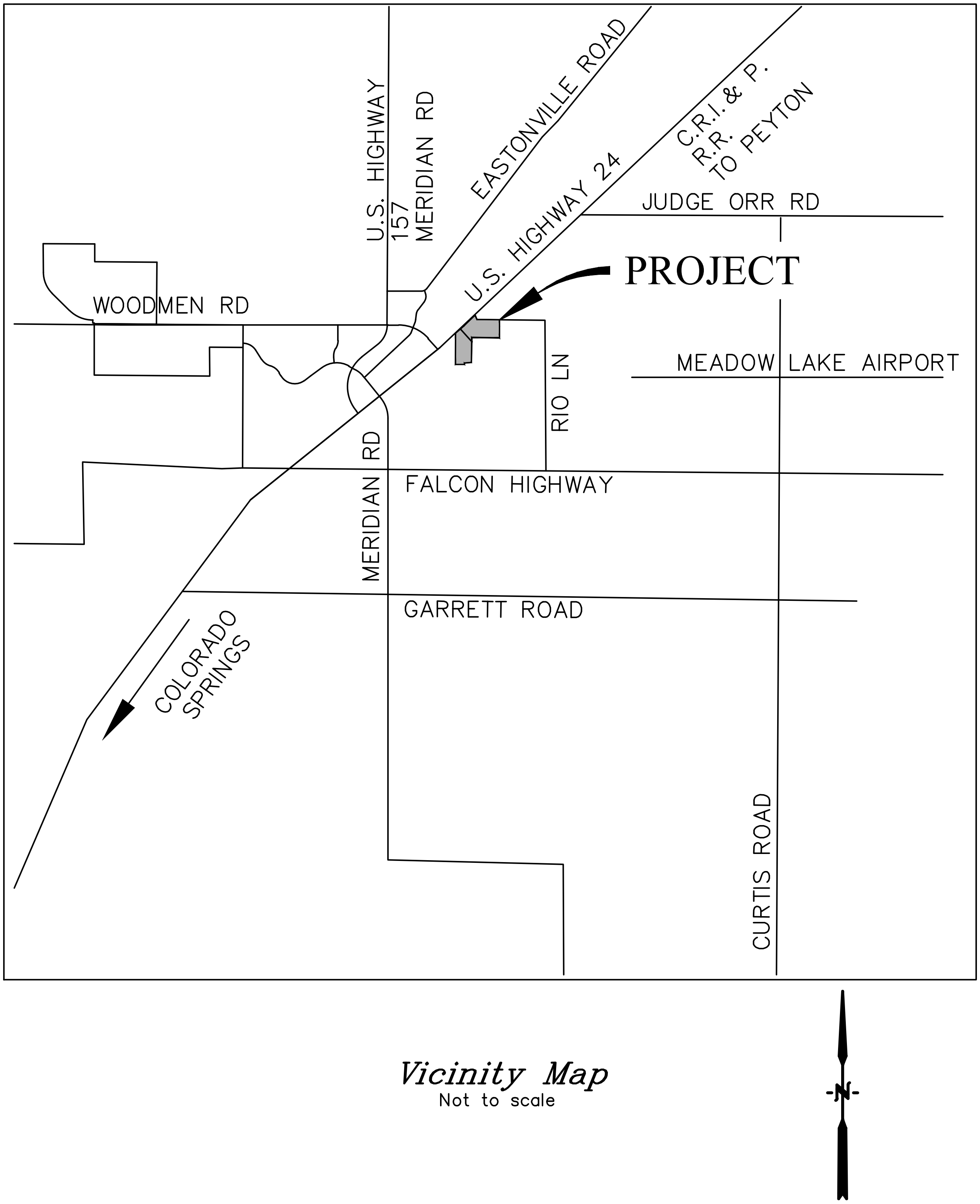
4. Federal Emergency Management Agency, Flood Insurance Rate Map, El Paso County, Colorado and Unincorporated Areas, Map Numbers 8041C0553G & 8041C0561G, Effective Date December 7, 2018.

6. EL Paso County Board Resolution No 15-042: El Paso County adoption of Chapter 6 and Section 3.2.1, Chapter 13 of the City of Colorado Springs Drainage Criteria Manual, May 2014.

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

# Appendix

**Vicinity Map**




*Vicinity Map*
Not to scale

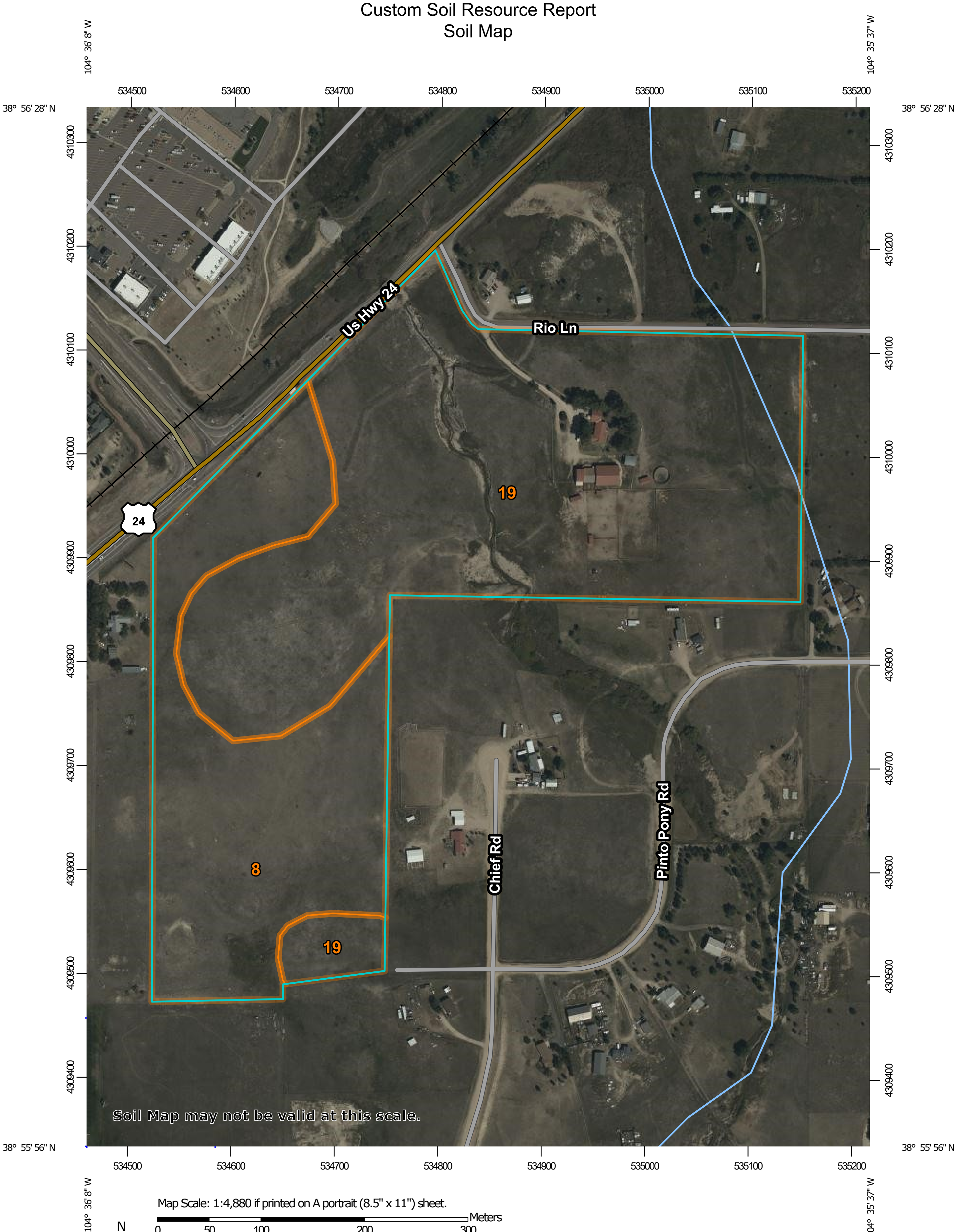
THE COMMONS AT FALCON FIELD
EL PASO COUNTY, CO
VICINITY MAP

Drexel, Barrell & Co.
Engineers • Surveyors

| | |
|---|---|
| DATE: | DWG. NO. VMAP |
| JOB NO: 21604-00CSCV | SHEET 1 OF 1 |

**Soils Map**

Soil Map




Map Scale: 1:4,880 if printed on A portrait (8.5" x 11") sheet.

Meters: 0, 50, 100, 200, 300

Feet: 0, 200, 400, 800, 1200

N

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

## MAP LEGEND

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

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

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

**Water Features**
- Streams and Canals

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

**Background**
- Aerial Photography

## MAP INFORMATION

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

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

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

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

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

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

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

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

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

Date(s) aerial images were photographed: 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.

# Map Unit Legend

| Map Unit Symbol | Map Unit Name | Acres in AOI | Percent of AOI |
|---|---|---|---|
| 8 | Blakeland loamy sand, 1 to 9 percent slopes | 18.8 | 32.8% |
| 19 | Columbine gravelly sandy loam, 0 to 3 percent slopes | 38.6 | 67.2% |
| **Totals for Area of Interest** | | **57.4** | **100.0%** |

# Map Unit Descriptions

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

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

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

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

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

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

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

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

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

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

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

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

# El Paso County Area, Colorado

## 8—Blakeland loamy sand, 1 to 9 percent slopes

### Map Unit Setting

*National map unit symbol:* 369v
*Elevation:* 4,600 to 5,800 feet
*Mean annual precipitation:* 14 to 16 inches
*Mean annual air temperature:* 46 to 48 degrees F
*Frost-free period:* 125 to 145 days
*Farmland classification:* Not prime farmland

### Map Unit Composition

*Blakeland and similar soils:* 98 percent
*Minor components:* 2 percent
*Estimates are based on observations, descriptions, and transects of the mapunit.*

### Description of Blakeland

#### Setting

*Landform:* Hills, flats
*Landform position (three-dimensional):* Side slope, talf
*Down-slope shape:* Linear
*Across-slope shape:* Linear
*Parent material:* Alluvium derived from sedimentary rock and/or eolian deposits derived from sedimentary rock

#### Typical profile

*A - 0 to 11 inches:* loamy sand
*AC - 11 to 27 inches:* loamy sand
*C - 27 to 60 inches:* sand

#### Properties and qualities

*Slope:* 1 to 9 percent
*Depth to restrictive feature:* More than 80 inches
*Drainage class:* Somewhat excessively drained
*Runoff class:* Low
*Capacity of the most limiting layer to transmit water (Ksat):* High to very high (5.95 to 19.98 in/hr)
*Depth to water table:* More than 80 inches
*Frequency of flooding:* None
*Frequency of ponding:* None
*Calcium carbonate, maximum content:* 5 percent
*Available water supply, 0 to 60 inches:* Low (about 4.5 inches)

#### Interpretive groups

*Land capability classification (irrigated):* 3e
*Land capability classification (nonirrigated):* 6e
*Hydrologic Soil Group:* A
*Ecological site:* R049XB210CO - Sandy Foothill
*Hydric soil rating:* No

### Minor Components

#### Other soils

*Percent of map unit:* 1 percent

*Hydric soil rating:* No

**Pleasant**

*Percent of map unit:* 1 percent
*Landform:* Depressions
*Hydric soil rating:* Yes

## 19—Columbine gravelly sandy loam, 0 to 3 percent slopes

**Map Unit Setting**

*National map unit symbol:* 367p
*Elevation:* 6,500 to 7,300 feet
*Mean annual precipitation:* 14 to 16 inches
*Mean annual air temperature:* 46 to 50 degrees F
*Frost-free period:* 125 to 145 days
*Farmland classification:* Not prime farmland

**Map Unit Composition**

*Columbine and similar soils:* 97 percent
*Minor components:* 3 percent
*Estimates are based on observations, descriptions, and transects of the mapunit.*

**Description of Columbine**

**Setting**

*Landform:* Flood plains, fan terraces, fans
*Down-slope shape:* Linear
*Across-slope shape:* Linear
*Parent material:* Alluvium

**Typical profile**

*A - 0 to 14 inches:* gravelly sandy loam
*C - 14 to 60 inches:* very gravelly loamy sand

**Properties and qualities**

*Slope:* 0 to 3 percent
*Depth to restrictive feature:* More than 80 inches
*Drainage class:* Well drained
*Runoff class:* Very low
*Capacity of the most limiting layer to transmit water (Ksat):* High to very high (5.95 to 19.98 in/hr)
*Depth to water table:* More than 80 inches
*Frequency of flooding:* None
*Frequency of ponding:* None
*Available water supply, 0 to 60 inches:* Very low (about 2.5 inches)

**Interpretive groups**

*Land capability classification (irrigated):* 4e
*Land capability classification (nonirrigated):* 6e
*Hydrologic Soil Group:* A
*Ecological site:* R049XY214CO - Gravelly Foothill

*Hydric soil rating:* No

**Minor Components**

**Fluvaquentic haplaquolls**

*Percent of map unit:* 1 percent
*Landform:* Swales
*Hydric soil rating:* Yes

**Other soils**

*Percent of map unit:* 1 percent
*Hydric soil rating:* No

**Pleasant**

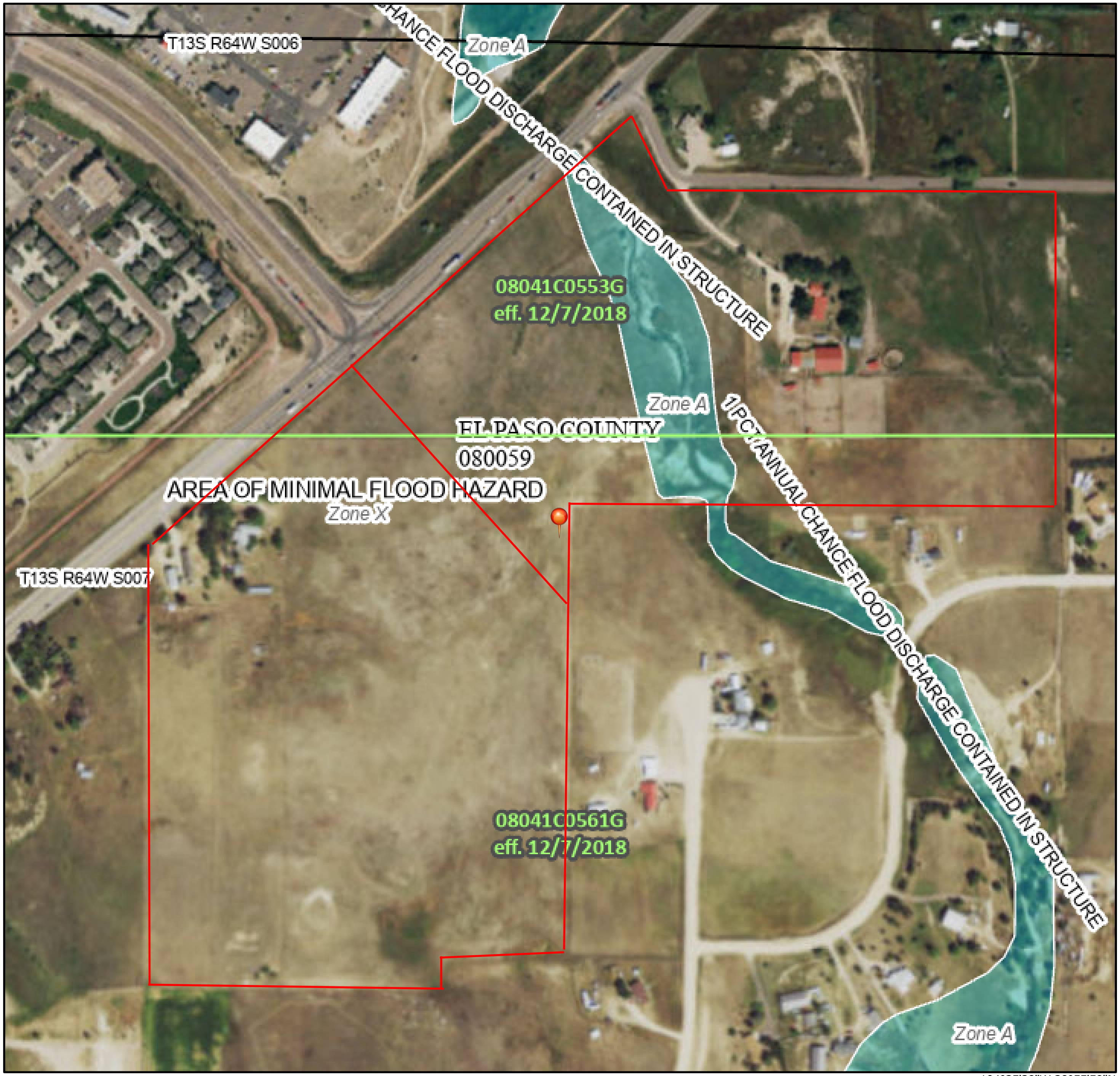
*Percent of map unit:* 1 percent
*Landform:* Depressions
*Hydric soil rating:* Yes

**Floodplain Map**

# National Flood Hazard Layer FIRMette

FEMA

104°36'16"W 38°56'26"N




104°35'38"W 38°55'58"N

Feet 1:6,000

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

*Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020*

## Legend

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

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

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

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

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

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

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

N

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

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

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 4/12/2022 at 2:02 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

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

# Hydrology Calculations

## PROJECT INFORMATION

| | |
|---|---|
| PROJECT: | Commons at Falcon Field |
| PROJECT NO: | 21604-00 |
| DESIGN BY: | KGV |
| REV. BY: | TDM |
| AGENCY: | El Paso County |
| REPORT TYPE: | Preliminary |
| DATE: | 3/17/2024 |

Drexel, Barrell & Co.

| | C2* | C5* | C10* | C100* | % IMPERV |
|---|---|---|---|---|---|
| **Pasture/Meadow** | | 0.08 | | 0.35 | 0 |
| **Roofs** | | 0.73 | | 0.81 | 90 |
| **Lawns** | | 0.08 | | 0.35 | 0 |
| **Streets: Paved** | | 0.90 | | 0.96 | 100 |
| **Streets: Gravel** | | 0.59 | | 0.70 | 80 |

**EXISTING CONIDTION**

| SUB-BASIN | SURFACE DESIGNATION | AREA ACRE | COMPOSITE RUNOFF COEFFICIENTS C2 | C5 | C10 | C100 | % IMPERV |
|---|---|---|---|---|---|---|---|
| **OS1** | Pasture/Meadow | 0.67 | | 0.08 | | 0.35 | 0 |
| | Roofs | 0.00 | | 0.73 | | 0.81 | 90 |
| | Lawns | 0.00 | | 0.08 | | 0.35 | 0 |
| | Streets: Paved | 0.67 | | 0.90 | | 0.96 | 100 |
| | Streets: Gravel | 0.00 | | 0.59 | | 0.70 | 80 |
| | WEIGHTED AVERAGE | | | 0.49 | | 0.66 | 50% |
| **TOTAL OS1** | | 1.34 | | | | | |
| | | | | | | | |
| **OS2** | Pasture/Meadow | 0.30 | | 0.08 | | 0.35 | 0 |
| | Roofs | 0.00 | | 0.73 | | 0.81 | 90 |
| | Lawns | 0.00 | | 0.08 | | 0.35 | 0 |
| | Streets: Paved | 0.30 | | 0.90 | | 0.96 | 100 |
| | Streets: Gravel | 0.00 | | 0.59 | | 0.70 | 80 |
| | WEIGHTED AVERAGE | | | 0.49 | | 0.66 | 50% |
| **TOTAL OS2** | | 0.60 | | | | | |
| | | | | | | | |
| **OS3** | Pasture/Meadow | 2.56 | | 0.08 | | 0.35 | 0 |
| | Roofs | 0.04 | | 0.73 | | 0.81 | 90 |
| | Lawns | 0.00 | | 0.08 | | 0.35 | 0 |
| | Streets: Paved | 0.00 | | 0.90 | | 0.96 | 100 |
| | Streets: Gravel | 0.00 | | 0.59 | | 0.70 | 80 |
| | WEIGHTED AVERAGE | | | 0.09 | | 0.36 | 1% |
| **TOTAL OS3** | | 2.56 | | | | | |
| | | | | | | | |
| **OS4** | Pasture/Meadow | 2.90 | | 0.08 | | 0.35 | 0 |
| | Roofs | 0.10 | | 0.73 | | 0.81 | 90 |
| | Lawns | 0.00 | | 0.08 | | 0.35 | 0 |
| | Streets: Paved | 0.29 | | 0.90 | | 0.96 | 100 |
| | Streets: Gravel | 0.00 | | 0.59 | | 0.70 | 80 |
| | WEIGHTED AVERAGE | | | 0.17 | | 0.42 | 12% |
| **TOTAL OS4** | | 3.29 | | | | | |
| | | | | | | | |
| **OS5** | Pasture/Meadow | 5.22 | | 0.08 | | 0.35 | 0 |
| | Roofs | 0.05 | | 0.73 | | 0.81 | 90 |
| | Lawns | 0.00 | | 0.08 | | 0.35 | 0 |
| | Streets: Paved | 0.23 | | 0.90 | | 0.96 | 100 |
| | Streets: Gravel | 0.00 | | 0.59 | | 0.70 | 80 |

## PROJECT INFORMATION

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Drexel, Barrell & Co.

| | | | C2* | C5* | C10* | C100* | % IMPERV |
|---|---|---|---|---|---|---|---|
| Pasture/Meadow | | | | 0.08 | | 0.35 | 0 |
| Roofs | | | | 0.73 | | 0.81 | 90 |
| Lawns | | | | 0.08 | | 0.35 | 0 |
| Streets: Paved | | | | 0.90 | | 0.96 | 100 |
| Streets: Gravel | | | | 0.59 | | 0.70 | 80 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | WEIGHTED AVERAGE | | | 0.12 | | 0.38 | 5% |
| TOTAL OS5 | | 5.50 | | | | | |
| | | | | | | | |
| OS6 | Pasture/Meadow | 0.39 | | 0.08 | | 0.35 | 0 |
| | Roofs | 0.00 | | 0.73 | | 0.81 | 90 |
| | Lawns | 0.00 | | 0.08 | | 0.35 | 0 |
| | Streets: Paved | 0.52 | | 0.90 | | 0.96 | 100 |
| | Streets: Gravel | 0.00 | | 0.59 | | 0.70 | 80 |
| | WEIGHTED AVERAGE | | | 0.55 | | 0.70 | 57% |
| TOTAL OS6 | | 0.91 | | | | | |
| | | | | | | | |
| E1 | Pasture/Meadow | 13.74 | | 0.08 | | 0.35 | 0 |
| | Roofs | 0.00 | | 0.73 | | 0.81 | 90 |
| | Lawns | 0.00 | | 0.08 | | 0.35 | 0 |
| | Streets: Paved | 0.00 | | 0.90 | | 0.96 | 100 |
| | Streets: Gravel | 0.11 | | 0.59 | | 0.70 | 80 |
| | WEIGHTED AVERAGE | | | 0.08 | | 0.35 | 1% |
| TOTAL E1 | | 13.85 | | | | | |
| | | | | | | | |
| E2 | Pasture/Meadow | 12.88 | | 0.08 | | 0.35 | 0 |
| | Roofs | 0.00 | | 0.73 | | 0.81 | 90 |
| | Lawns | 0.00 | | 0.08 | | 0.35 | 0 |
| | Streets: Paved | 0.00 | | 0.90 | | 0.96 | 100 |
| | Streets: Gravel | 0.00 | | 0.59 | | 0.70 | 80 |
| | WEIGHTED AVERAGE | | | 0.08 | | 0.35 | 0% |
| TOTAL E2 | | 12.88 | | | | | |
| | | | | | | | |
| E3 | Pasture/Meadow | 13.11 | | 0.08 | | 0.35 | 0 |
| | Roofs | 0.00 | | 0.73 | | 0.81 | 90 |
| | Lawns | 0.00 | | 0.08 | | 0.35 | 0 |
| | Streets: Paved | 0.00 | | 0.90 | | 0.96 | 100 |
| | Streets: Gravel | 0.00 | | 0.59 | | 0.70 | 80 |
| | WEIGHTED AVERAGE | | | 0.08 | | 0.35 | 0% |
| TOTAL E3 | | 13.11 | | | | | |
| | | | | | | | |
| E4 | Pasture/Meadow | 1.57 | | 0.08 | | 0.35 | 0 |
| | Roofs | 0.00 | | 0.73 | | 0.81 | 90 |
| | Lawns | 0.00 | | 0.08 | | 0.35 | 0 |

## PROJECT INFORMATION

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**PROJECT NO:** 21604-00
**DESIGN BY:** KGV
**REV. BY:** TDM
**AGENCY:** El Paso County
**REPORT TYPE:** Preliminary
**DATE:** 3/17/2024

Drexel, Barrell & Co.

| | | | C2* | C5* | C10* | C100* | % IMPERV |
|---|---|---|---|---|---|---|---|
| **Pasture/Meadow** | | | | 0.08 | | 0.35 | 0 |
| **Roofs** | | | | 0.73 | | 0.81 | 90 |
| **Lawns** | | | | 0.08 | | 0.35 | 0 |
| **Streets: Paved** | | | | 0.90 | | 0.96 | 100 |
| **Streets: Gravel** | | | | 0.59 | | 0.70 | 80 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Streets: Paved | 0.00 | | 0.90 | | 0.96 | 100 |
| | Streets: Gravel | 0.00 | | 0.59 | | 0.70 | 80 |
| | WEIGHTED AVERAGE | | | 0.08 | | 0.35 | 0% |
| **TOTAL E4** | | 1.57 | | | | | |
| | | | | | | | |
| **E5** | Pasture/Meadow | 5.49 | | 0.08 | | 0.35 | 0 |
| | Roofs | 0.25 | | 0.73 | | 0.81 | 90 |
| | Lawns | 0.00 | | 0.08 | | 0.35 | 0 |
| | Streets: Paved | 0.00 | | 0.90 | | 0.96 | 100 |
| | Streets: Gravel | 0.17 | | 0.59 | | 0.70 | 80 |
| | WEIGHTED AVERAGE | | | 0.12 | | 0.38 | 6% |
| **TOTAL E5** | | 5.91 | | | | | |
| | | | | | | | |
| **E6** | Pasture/Meadow | 10.37 | | 0.08 | | 0.35 | 0 |
| | Roofs | 0.00 | | 0.73 | | 0.81 | 90 |
| | Lawns | 0.00 | | 0.08 | | 0.35 | 0 |
| | Streets: Paved | 0.00 | | 0.90 | | 0.96 | 100 |
| | Streets: Gravel | 0.00 | | 0.59 | | 0.70 | 80 |
| | WEIGHTED AVERAGE | | | 0.08 | | 0.35 | 0% |
| **TOTAL E6** | | 10.37 | | | | | |

## PROJECT INFORMATION

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**REV. BY:** TDM
**AGENCY:** El Paso County
**REPORT TYPE:** Preliminary
**DATE:** 3/17/2024

## RATIONAL METHOD CALCULATIONS FOR STORM WATER RUNOFF

### EXISTING TIME OF CONCENTRATION

| SUB-BASIN DATA | | | | | | | INITIAL/OVERLAND TIME ($t_i$) | | | TRAVEL TIME ($t_t$) | | | | TIME OF CONCENTRATION | | FINAL $t_c$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BASIN | DESIGN PT: | $C_5$ | $C_{100}$ | AREA | *COMP* | | LENGTH | SLOPE | $t_i$ | LENGTH | SLOPE | VEL. | $t_t$ | COMP. $t_c$ | MINIMUM $t_c$ | |
| | | | | Ac | | | Ft | % | Min | Ft | % | FPS | Min | | | Min |
| OS1 | A | 0.49 | 0.66 | 1.34 | *0.66* | *0.88* | 30 | 2.0 | 5.0 | | | | | 5.0 | 5.0 | **5.0** |
| E1 | | 0.08 | 0.35 | 13.85 | *1.16* | *4.88* | 300 | 3.0 | 22.8 | 530 | 3.0 | 3.5 | 2.5 | 25.3 | 5.0 | **25.3** |
| DPA+E1 | B | 0.12 | 0.38 | 15.19 | | | From E1 | | | | | | | 25.3 | 5.0 | **25.3** |
| OS2 | C | 0.49 | 0.66 | 0.60 | *0.29* | *0.39* | 30 | 1.0 | 6.2 | | | | 0.0 | 6.2 | 5.0 | **6.2** |
| OS3 | D | 0.09 | 0.36 | 2.56 | *0.23* | *0.91* | 75 | 2.1 | 12.8 | | | | 1.0 | 13.8 | 5.0 | **13.8** |
| E2 | | 0.08 | 0.35 | 12.88 | *1.03* | *4.51* | 300 | 2.3 | 24.9 | 1360 | 3.5 | 4.0 | 5.7 | 30.6 | 5.0 | **30.6** |
| DPC+DPD+E2 | E | 0.10 | 0.36 | 16.04 | | | From E2 | | | | | | | 30.6 | 5.0 | **30.6** |
| E3 | F | 0.08 | 0.35 | 13.11 | *1.05* | *4.59* | 300 | 2.3 | 24.9 | 1120 | 4.2 | 5.0 | 3.7 | 28.6 | 5.0 | **28.6** |
| OS4 | G | 0.17 | 0.42 | 3.29 | *0.57* | *1.38* | 75 | 3.9 | 9.5 | | | | | 9.5 | 5.0 | **9.5** |
| E4 | | 0.08 | 0.35 | 1.57 | *0.13* | *0.55* | 300 | 2.7 | 23.8 | 250 | 4.0 | 5.0 | 0.8 | 24.7 | 5.0 | **24.7** |
| DPG+E4 | H | 0.14 | 0.40 | 4.86 | | | From E4 | | | | | | | 24.7 | 5.0 | **24.7** |
| E5 | I | 0.12 | 0.38 | 5.91 | *0.72* | *2.24* | 100 | 2.0 | 14.5 | 550 | 2.2 | 1.8 | 5.1 | 19.6 | 5.0 | **19.6** |
| OS5 | J | 0.12 | 0.38 | 5.50 | *0.66* | *2.09* | 75 | 2.0 | 12.6 | | | | | 12.6 | 5.0 | **12.6** |
| OS6 | L | 0.55 | 0.70 | 0.91 | *0.50* | *0.63* | 30 | 2.0 | 4.5 | | | | | 4.5 | 5.0 | **5.0** |
| E6 | | 0.08 | 0.35 | 10.37 | *0.83* | *3.63* | 300 | 2.3 | 24.9 | 1080 | 1.5 | 1.2 | 15.0 | 39.9 | 5.0 | **39.9** |
| DPJ+DPL+E6 | M | 0.12 | 0.38 | 16.78 | | | From E6 | | | | | | | 39.9 | 5.0 | **39.9** |

## PROJECT INFORMATION

Drexel, Barrell & Co.

| | |
|---|---|
| **PROJECT:** | Commons at Falcon Field |
| **PROJECT NO:** | 21604-00 |
| **DESIGN BY:** | KGV |
| **REV. BY:** | TDM |
| **AGENCY:** | El Paso County |
| **REPORT TYPE:** | Preliminary |
| **DATE:** | 3/17/2024 |

### RATIONAL METHOD CALCULATIONS FOR STORM WATER RUNOFF

**EXISTING RUNOFF 5 YR STORM P1= 1.50**

| | | | DIRECT RUNOFF | | | | |
|---|---|---|---|---|---|---|---|
| **BASIN (S)** | **DESIGN POINT** | **AREA (AC)** | **RUNOFF COEFF** | **$t_c$ (MIN)** | **C * A** | **I (IN/HR)** | **Q (CFS)** |
| OS1 | A | 1.34 | 0.49 | 5.0 | 0.66 | 5.17 | **3.4** |
| E1 | | 13.85 | 0.08 | 25.3 | 1.16 | 2.73 | **3.2** |
| RET090 (DBPS) | | | | | | | **36.0** |
| DPA+E1+RET090 | B | 15.19 | 0.12 | 25.3 | 1.82 | 2.73 | **41.0** |
| OS2 | C | 0.60 | 0.49 | 6.2 | 0.29 | 4.83 | **1.4** |
| OS3 | D | 2.56 | 0.09 | 13.8 | 0.23 | 3.65 | **0.8** |
| E2 | | 12.88 | 0.08 | 30.6 | 1.03 | 2.45 | **2.5** |
| DPC+DPD+E2 | E | 16.04 | 0.10 | 30.6 | 1.55 | 2.45 | **3.8** |
| E3 | F | 13.11 | 0.08 | 28.6 | 1.05 | 2.55 | **2.7** |
| OS4 | G | 3.29 | 0.17 | 9.5 | 0.57 | 4.20 | **2.4** |
| E4 | | 1.57 | 0.08 | 24.7 | 0.13 | 2.78 | **0.3** |
| DPG+E4 | H | 4.86 | 0.14 | 24.7 | 0.69 | 2.78 | **1.9** |
| E5 | I | 5.91 | 0.12 | 19.6 | 0.72 | 3.12 | **2.2** |
| OS5 | J | 5.50 | 0.12 | 12.6 | 0.66 | 3.78 | **6.6** |
| OS6 | L | 0.91 | 0.55 | 5.0 | 0.50 | 5.17 | **2.6** |
| E6 | | 10.37 | 0.08 | 39.9 | 0.83 | 2.05 | **1.7** |
| DPJ+DPL+E6 | M | 16.78 | 0.12 | 39.9 | 1.99 | 2.05 | **4.1** |

## PROJECT INFORMATION

**PROJECT:** Commons at Falcon Field
**PROJECT NO:** 21604-00
**DESIGN BY:** KGV
**REV. BY:** TDM
**AGENCY:** El Paso County
**REPORT TYPE:** Preliminary
**DATE:** 3/17/2024

Drexel, Barrell & Co.

### RATIONAL METHOD CALCULATIONS FOR STORM WATER RUNOFF

**EXISTING RUNOFF 100 YR STORM P1= 2.52**

| | | | DIRECT RUNOFF | | | | |
|---|---|---|---|---|---|---|---|
| **BASIN (S)** | **DESIGN POINT** | **AREA (AC)** | **RUNOFF COEFF** | **$t_c$ (MIN)** | **C * A** | **I (IN/HR)** | **Q (CFS)** |
| OS1 | A | 1.34 | 0.66 | 5.0 | 0.88 | 8.68 | **7.6** |
| E1 | | 13.85 | 0.35 | 25.3 | 4.88 | 4.59 | **22.4** |
| RET090 (DBPS) | | | | | | | **320.0** |
| DPA+E1+RET090 | B | 15.19 | 0.38 | 25.3 | 5.76 | 4.59 | **346.4** |
| OS2 | C | 0.60 | 0.66 | 6.2 | 0.39 | 8.12 | **3.2** |
| OS3 | D | 2.56 | 0.36 | 13.8 | 0.91 | 6.13 | **5.6** |
| E2 | | 12.88 | 0.35 | 30.6 | 4.51 | 4.12 | **18.6** |
| DPC+DPD+E2 | E | 16.04 | 0.36 | 30.6 | 5.81 | 4.12 | **23.9** |
| E3 | F | 13.11 | 0.35 | 28.6 | 4.59 | 4.28 | **19.6** |
| OS4 | G | 3.29 | 0.42 | 9.5 | 1.38 | 7.05 | **9.7** |
| E4 | | 1.57 | 0.35 | 24.7 | 0.55 | 4.66 | **2.6** |
| DPG+E4 | H | 4.86 | 0.40 | 24.7 | 1.93 | 4.66 | **9.0** |
| E5 | I | 5.91 | 0.38 | 19.6 | 2.24 | 5.23 | **11.7** |
| OS5 | J | 5.50 | 0.38 | 12.6 | 2.09 | 6.35 | **6.6** |
| OS6 | L | 0.91 | 0.70 | 5.0 | 0.63 | 8.68 | **5.5** |
| E6 | | 10.37 | 0.35 | 39.9 | 3.63 | 3.44 | **12.5** |
| DPJ+DPL+E6 | M | 16.78 | 0.38 | 39.9 | 6.35 | 3.44 | **21.9** |

## PROJECT INFORMATION

| | |
|---|---|
| PROJECT: | Commons at Falcon Field - Overlot |
| PROJECT NO: | 21604-00 |
| DESIGN BY: | KGV |
| REV. BY: | TDM |
| AGENCY: | El Paso County |
| REPORT TYPE: | Preliminary |
| DATE: | 3/17/2024 |

Drexel, Barrell & Co.

| | C2* | C5* | C10* | C100* | % IMPERV |
|---|---|---|---|---|---|
| **Open Space** | | 0.08 | | 0.35 | 0 |
| **Roofs** | | 0.73 | | 0.81 | 90 |
| **Drive and Walks** | | 0.90 | | 0.96 | 100 |
| **Streets: Paved** | | 0.90 | | 0.96 | 100 |
| **Streets: Gravel** | | 0.80 | | 0.85 | 80 |

**DEVELOPED CONIDTION**

| SUB-BASIN | SURFACE DESIGNATION | AREA ACRE | COMPOSITE RUNOFF COEFFICIENTS C2 | C5 | C10 | C100 | % IMPERV |
|---|---|---|---|---|---|---|---|
| | | | A-BASINS | | | | |
| A1 | Open Space | 17.73 | | 0.08 | | 0.35 | 0 |
| | Roofs | 0.00 | | 0.73 | | 0.81 | 90 |
| | Drive and Walks | 0.00 | | 0.90 | | 0.96 | 100 |
| | Streets: Paved | 0.00 | | 0.90 | | 0.96 | 100 |
| | Streets: Gravel | 0.00 | | 0.80 | | 0.85 | 80 |
| | WEIGHTED AVERAGE | | | 0.08 | | 0.35 | 0% |
| **TOTAL A1** | | 17.73 | | | | | |
| | | | | | | | |
| A2 | Open Space | 2.45 | | 0.08 | | 0.35 | 0 |
| | Roofs | 0.00 | | 0.73 | | 0.81 | 90 |
| | Drive and Walks | 0.00 | | 0.90 | | 0.96 | 100 |
| | Streets: Paved | 0.00 | | 0.90 | | 0.96 | 100 |
| | Streets: Gravel | 0.00 | | 0.80 | | 0.85 | 80 |
| | WEIGHTED AVERAGE | | | 0.08 | | 0.35 | 0% |
| **TOTAL A2** | | 2.45 | | | | | |
| | | | | | | | |
| B1 | Open Space | 12.47 | | 0.08 | | 0.35 | 0 |
| | Roofs | 0.00 | | 0.73 | | 0.81 | 90 |
| | Drive and Walks | 0.00 | | 0.90 | | 0.96 | 100 |
| | Streets: Paved | 0.00 | | 0.90 | | 0.96 | 100 |
| | Streets: Gravel | 0.00 | | 0.80 | | 0.85 | 80 |
| | WEIGHTED AVERAGE | | | 0.08 | | 0.35 | 0% |
| **TOTAL B1** | | 12.47 | | | | | |
| | | | | | | | |
| OB1 | Open Space | 0.67 | | 0.08 | | 0.35 | 0 |
| | Roofs | 0.00 | | 0.73 | | 0.81 | 90 |
| | Drive and Walks | 0.00 | | 0.90 | | 0.96 | 100 |
| | Streets: Paved | 0.67 | | 0.90 | | 0.96 | 100 |
| | Streets: Gravel | 0.00 | | 0.80 | | 0.85 | 80 |
| | WEIGHTED AVERAGE | | | 0.49 | | 0.66 | 50% |
| **TOTAL OB1** | | 1.34 | | | | | |
| | | | | | | | |
| OB2 | Open Space | 0.30 | | 0.08 | | 0.35 | 0 |
| | Roofs | 0.00 | | 0.73 | | 0.81 | 90 |
| | Drive and Walks | 0.00 | | 0.90 | | 0.96 | 100 |
| | Streets: Paved | 0.30 | | 0.90 | | 0.96 | 100 |
| | Streets: Gravel | 0.00 | | 0.80 | | 0.85 | 80 |
| | WEIGHTED AVERAGE | | | 0.49 | | 0.66 | 50% |
| **TOTAL OB2** | | 0.60 | | | | | |

## PROJECT INFORMATION

| | |
|---|---|
| **PROJECT:** | Commons at Falcon Field - Overlot |
| **PROJECT NO:** | 21604-00 |
| **DESIGN BY:** | KGV |
| **REV. BY:** | TDM |
| **AGENCY:** | El Paso County |
| **REPORT TYPE:** | Preliminary |
| **DATE:** | 3/17/2024 |

**Drexel, Barrell & Co.**

| | | C2* | C5* | C10* | C100* | % IMPERV |
|---|---|---|---|---|---|---|
| **Open Space** | | | 0.08 | | 0.35 | 0 |
| **Roofs** | | | 0.73 | | 0.81 | 90 |
| **Drive and Walks** | | | 0.90 | | 0.96 | 100 |
| **Streets: Paved** | | | 0.90 | | 0.96 | 100 |
| **Streets: Gravel** | | | 0.80 | | 0.85 | 80 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **C1** | Open Space | 6.29 | | 0.08 | | 0.35 | 0 |
| | Roofs | 0.00 | | 0.73 | | 0.81 | 90 |
| | Drive and Walks | 0.00 | | 0.90 | | 0.96 | 100 |
| | Streets: Paved | 0.00 | | 0.90 | | 0.96 | 100 |
| | Streets: Gravel | 0.00 | | 0.80 | | 0.85 | 80 |
| | WEIGHTED AVERAGE | | | 0.08 | | 0.35 | 0% |
| **TOTAL C1** | | 6.29 | | | | | |
| | | | | | | | |
| **OC** | Open Space | 2.55 | | 0.08 | | 0.35 | 0 |
| | Roofs | 0.00 | | 0.73 | | 0.81 | 90 |
| | Drive and Walks | 0.00 | | 0.90 | | 0.96 | 100 |
| | Streets: Paved | 0.00 | | 0.90 | | 0.96 | 100 |
| | Streets: Gravel | 0.00 | | 0.80 | | 0.85 | 80 |
| | WEIGHTED AVERAGE | | | 0.08 | | 0.35 | 0% |
| **TOTAL OC** | | 2.55 | | | | | |
| | | | | | | | |
| **D1** | Open Space | 15.99 | | 0.08 | | 0.35 | 0 |
| | Roofs | 0.00 | | 0.73 | | 0.81 | 90 |
| | Drive and Walks | 0.00 | | 0.90 | | 0.96 | 100 |
| | Streets: Paved | 0.00 | | 0.90 | | 0.96 | 100 |
| | Streets: Gravel | 0.00 | | 0.80 | | 0.85 | 80 |
| | WEIGHTED AVERAGE | | | 0.08 | | 0.35 | 0% |
| **TOTAL D1** | | 15.99 | | | | | |
| | | | | | | | |
| **D2** | Open Space | 2.81 | | 0.08 | | 0.35 | 0 |
| | Roofs | 0.00 | | 0.73 | | 0.81 | 90 |
| | Drive and Walks | 0.00 | | 0.90 | | 0.96 | 100 |
| | Streets: Paved | 0.00 | | 0.90 | | 0.96 | 100 |
| | Streets: Gravel | 0.00 | | 0.80 | | 0.85 | 80 |
| | WEIGHTED AVERAGE | | | 0.08 | | 0.35 | 0% |
| **TOTAL D2** | | 2.81 | | | | | |
| | | | | | | | |
| **OD** | Open Space | 2.70 | | 0.08 | | 0.35 | 0 |
| | Roofs | 0.00 | | 0.73 | | 0.81 | 90 |
| | Drive and Walks | 0.00 | | 0.90 | | 0.96 | 100 |
| | Streets: Paved | 0.00 | | 0.90 | | 0.96 | 100 |
| | Streets: Gravel | 0.00 | | 0.80 | | 0.85 | 80 |
| | WEIGHTED AVERAGE | | | 0.08 | | 0.35 | 0% |
| **TOTAL OD** | | 2.70 | | | | | |

## PROJECT INFORMATION

| | |
|---|---|
| **PROJECT:** | Commons at Falcon Field - Overlot |
| **PROJECT NO:** | 21604-00 |
| **DESIGN BY:** | KGV |
| **REV. BY:** | TDM |
| **AGENCY:** | El Paso County |
| **REPORT TYPE:** | Preliminary |
| **DATE:** | 3/17/2024 |

### RATIONAL METHOD CALCULATIONS FOR STORM WATER RUNOFF
### DEVELOPED TIME OF CONCENTRATION

| **SUB-BASIN DATA** | | | | | **INITIAL/OVERLAND TIME ($t_i$)** | | | **TRAVEL TIME ($t_t$)** | | | | **TIME OF CONCENTRATION** | | **FINAL** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | **$t_c$** |
| BASIN | DESIGN PT: | $C_5$ | $C_{100}$ | AREA | LENGTH | SLOPE | $t_i$ | LENGTH | SLOPE | VEL. | $t_t$ | COMP. | MINIMUM | |
| | | | | Ac | Ft | % | Min | Ft | % | FPS | Min | $t_c$ | $t_c$ | Min |
| A1 | 1 | 0.08 | 0.35 | 17.73 | 100 | 1.0 | 18.7 | 1250 | 1.0 | 5.0 | 4.2 | 22.9 | 5.0 | **22.9** |
| A2 | | 0.08 | 0.35 | 2.45 | 100 | 1.0 | 18.7 | 150 | 25.0 | 10.0 | 0.3 | 19.0 | 5.0 | **19.0** |
| B1 | | 0.08 | 0.35 | 12.47 | 100 | 1.0 | 18.7 | 750 | 2.0 | 7.0 | 1.8 | 20.5 | 5.0 | **20.5** |
| OB1 | O1 | 0.49 | 0.66 | 1.34 | 30 | 2.0 | 4.9 | | | | | 4.9 | 5.0 | **5.0** |
| OB2 | O2 | 0.49 | 0.66 | 0.60 | 30 | 1.0 | 6.1 | | | | | 6.1 | 5.0 | **6.1** |
| B1+O1+O2 | 2 | 0.14 | 0.39 | 14.41 | From Basin B1 | | 20.5 | | | | | 20.5 | 5.0 | **20.5** |
| C1 | | 0.08 | 0.35 | 6.29 | 100 | 1.0 | 18.7 | 860 | 1.5 | 6.0 | 2.4 | 21.1 | 5.0 | **21.1** |
| OC | | 0.08 | 0.35 | 2.55 | 100 | 1.0 | 18.7 | 756 | 1.5 | 6.0 | 2.1 | 20.8 | 5.0 | **20.8** |
| C1+OC | 3 | 0.08 | 0.35 | 8.85 | From Basin C1 | | 21.1 | | | | | 21.1 | 5.0 | **21.1** |
| D1 | 4 | 0.08 | 0.35 | 15.99 | 100 | 1.0 | 18.7 | 1350 | 1.5 | 6.0 | 3.8 | 22.5 | 5.0 | **22.5** |
| D2 | | 0.08 | 0.35 | 2.81 | 100 | 1.0 | 18.7 | 150 | 0.5 | 3.8 | 0.7 | 19.4 | 5.0 | **19.4** |
| OD | | 0.08 | 0.35 | 2.70 | 100 | 1.0 | 18.7 | 660 | 1.5 | 6.0 | 1.8 | 20.5 | 5.0 | **20.5** |
| D2+OD | 5 | 0.08 | 0.35 | 5.51 | From Basin D2 | | 19.4 | | | | | 19.4 | 5.0 | **19.4** |

## PROJECT INFORMATION

Drexel, Barrell & Co.

**PROJECT:** Commons at Falcon Field - Overlot
**PROJECT NO:** 21604-00
**DESIGN BY:** KGV
**REV. BY:** TDM
**AGENCY:** El Paso County
**REPORT TYPE:** Preliminary
**DATE:** 3/17/2024

### RATIONAL METHOD CALCULATIONS FOR STORM WATER RUNOFF

**DEVELOPED RUNOFF 5 YR STORM P1= 1.50**

| | | | DIRECT RUNOFF | | | | |
|---|---|---|---|---|---|---|---|
| **BASIN (S)** | **DESIGN POINT** | **AREA (AC)** | **RUNOFF COEFF** | **$t_c$ (MIN)** | **C * A** | **I (IN/HR)** | **Q (CFS)** |
| A1 | 1 | 17.73 | 0.08 | 22.9 | 1.42 | 2.89 | **4.1** |
| A2 | | 2.45 | 0.08 | 19.0 | 0.20 | 3.17 | **0.6** |
| B1 | | 12.47 | 0.08 | 20.5 | 1.00 | 3.05 | **3.0** |
| OB1 | O1 | 1.34 | 0.49 | 5.0 | 0.66 | 5.17 | **3.4** |
| OB2 | O2 | 0.60 | 0.49 | 6.1 | 0.29 | 4.86 | **1.4** |
| B1+O1+O2 | 2 | 14.41 | 0.14 | 20.5 | 1.95 | 3.05 | **5.9** |
| C1 | | 6.29 | 0.08 | 21.1 | 0.50 | 3.01 | **1.5** |
| OC | | 2.55 | 0.08 | 20.8 | 0.20 | 3.03 | **0.6** |
| C1+OC | 3 | 8.85 | 0.08 | 21.1 | 0.71 | 3.01 | **2.1** |
| D1 | 4 | 15.99 | 0.08 | 22.5 | 1.28 | 2.92 | **3.7** |
| D2 | | 2.81 | 0.08 | 19.4 | 0.23 | 3.14 | **0.7** |
| OD | | 2.70 | 0.08 | 20.5 | 0.22 | 3.05 | **0.7** |
| D2+OD | 5 | 5.51 | 0.08 | 19.4 | 0.44 | 3.14 | **1.4** |

## PROJECT INFORMATION

Drexel, Barrell & Co.

| | |
|---|---|
| PROJECT: | Commons at Falcon Field - Overlot |
| PROJECT NO: | 21604-00 |
| DESIGN BY: | KGV |
| REV. BY: | TDM |
| AGENCY: | El Paso County |
| REPORT TYPE: | Preliminary |
| DATE: | 3/17/2024 |

## RATIONAL METHOD CALCULATIONS FOR STORM WATER RUNOFF

**DEVELOPED RUNOFF 100 YR STORM P1= 2.52**

| | | | DIRECT RUNOFF | | | | |
|---|---|---|---|---|---|---|---|
| BASIN (S) | DESIGN POINT | AREA (AC) | RUNOFF COEFF | $t_c$ (MIN) | C * A | I (IN/HR) | Q (CFS) |
| A1 | 1 | 17.73 | 0.35 | 22.9 | 6.21 | 4.85 | **30.1** |
| A2 | | 2.45 | 0.35 | 19.0 | 0.86 | 5.32 | **4.6** |
| B1 | | 12.47 | 0.35 | 20.5 | 4.37 | 5.13 | **22.4** |
| OB1 | O1 | 1.34 | 0.66 | 5.0 | 0.88 | 8.68 | **7.6** |
| OB2 | O2 | 0.60 | 0.66 | 6.1 | 0.39 | 8.17 | **3.2** |
| B1+O1+O2 | 2 | 14.41 | 0.39 | 20.5 | 5.63 | 5.13 | **28.9** |
| C1 | | 6.29 | 0.35 | 21.1 | 2.20 | 5.05 | **11.1** |
| OC | | 2.55 | 0.35 | 20.8 | 0.89 | 5.09 | **4.5** |
| C1+OC | 3 | 8.85 | 0.35 | 21.1 | 3.10 | 5.05 | **15.6** |
| D1 | 4 | 15.99 | 0.35 | 22.5 | 5.60 | 4.89 | **27.4** |
| D2 | | 2.81 | 0.35 | 19.4 | 0.99 | 5.27 | **5.2** |
| OD | | 2.70 | 0.35 | 20.5 | 0.94 | 5.12 | **4.8** |
| D2+OD | 5 | 5.51 | 0.35 | 19.4 | 1.93 | 5.27 | **10.2** |

## PROJECT INFORMATION

| | |
|---|---|
| PROJECT: | Commons at Falcon Field |
| PROJECT NO: | 21604-00 |
| DESIGN BY: | KGV |
| REV. BY: | TDM |
| AGENCY: | El Paso County |
| REPORT TYPE: | Preliminary |
| DATE: | 3/17/2024 |

Drexel, Barrell & Co.

| | C2* | C5* | C10* | C100* | % IMPERV |
|---|---|---|---|---|---|
| Open Space | | 0.08 | | 0.35 | 0 |
| Commercial Development | | 0.81 | | 0.88 | 95 |
| Residential (< 1/8 Acre) | | 0.45 | | 0.59 | 65 |
| Streets: Paved | | 0.90 | | 0.96 | 100 |
| Streets: Gravel | | 0.80 | | 0.85 | 80 |

DEVELOPED CONIDTION

| SUB-BASIN | SURFACE DESIGNATION | AREA ACRE | COMPOSITE RUNOFF COEFFICIENTS C2 | C5 | C10 | C100 | % IMPERV |
|---|---|---|---|---|---|---|---|
| | | A-BASINS | | | | | |
| A1 | Open Space | 0.06 | | 0.08 | | 0.35 | 0 |
| | Commercial Development | 0.00 | | 0.81 | | 0.88 | 95 |
| | Residential (< 1/8 Acre) | 0.00 | | 0.45 | | 0.59 | 65 |
| | Streets: Paved | 0.24 | | 0.90 | | 0.96 | 100 |
| | Streets: Gravel | 0.00 | | 0.80 | | 0.85 | 80 |
| | WEIGHTED AVERAGE | | | 0.74 | | 0.84 | 80% |
| TOTAL A1 | | 0.30 | | | | | |
| | | | | | | | |
| A2 | Open Space | 0.12 | | 0.08 | | 0.35 | 0 |
| | Commercial Development | 0.00 | | 0.81 | | 0.88 | 95 |
| | Residential (< 1/8 Acre) | 0.26 | | 0.45 | | 0.59 | 65 |
| | Streets: Paved | 0.26 | | 0.90 | | 0.96 | 100 |
| | Streets: Gravel | 0.00 | | 0.80 | | 0.85 | 80 |
| | WEIGHTED AVERAGE | | | 0.56 | | 0.70 | 67% |
| TOTAL A2 | | 0.64 | | | | | |
| | | | | | | | |
| A3 | Open Space | 0.60 | | 0.08 | | 0.35 | 0 |
| | Commercial Development | 0.00 | | 0.81 | | 0.88 | 95 |
| | Residential (< 1/8 Acre) | 0.74 | | 0.45 | | 0.59 | 65 |
| | Streets: Paved | 0.00 | | 0.90 | | 0.96 | 100 |
| | Streets: Gravel | 0.00 | | 0.80 | | 0.85 | 80 |
| | WEIGHTED AVERAGE | | | 0.28 | | 0.48 | 36% |
| TOTAL A3 | | 1.34 | | | | | |
| | | | | | | | |
| A4 | Open Space | 0.00 | | 0.08 | | 0.35 | 0 |
| | Commercial Development | 0.00 | | 0.81 | | 0.88 | 95 |
| | Residential (< 1/8 Acre) | 0.00 | | 0.45 | | 0.59 | 65 |
| | Streets: Paved | 0.25 | | 0.90 | | 0.96 | 100 |
| | Streets: Gravel | 0.00 | | 0.80 | | 0.85 | 80 |
| | WEIGHTED AVERAGE | | | 0.90 | | 0.96 | 100% |
| TOTAL A4 | | 0.25 | | | | | |
| | | | | | | | |
| A5 | Open Space | 0.00 | | 0.08 | | 0.35 | 0 |
| | Commercial Development | 0.00 | | 0.81 | | 0.88 | 95 |
| | Residential (< 1/8 Acre) | 0.00 | | 0.45 | | 0.59 | 65 |
| | Streets: Paved | 0.23 | | 0.90 | | 0.96 | 100 |
| | Streets: Gravel | 0.00 | | 0.80 | | 0.85 | 80 |
| | WEIGHTED AVERAGE | | | 0.90 | | 0.96 | 100% |
| TOTAL A5 | | 0.23 | | | | | |

## PROJECT INFORMATION

| | |
|---|---|
| PROJECT: | Commons at Falcon Field |
| PROJECT NO: | 21604-00 |
| DESIGN BY: | KGV |
| REV. BY: | TDM |
| AGENCY: | El Paso County |
| REPORT TYPE: | Preliminary |
| DATE: | 3/17/2024 |

Drexel, Barrell & Co.

| | C2* | C5* | C10* | C100* | % IMPERV |
|---|---|---|---|---|---|
| **Open Space** | | 0.08 | | 0.35 | 0 |
| **Commercial Development** | | 0.81 | | 0.88 | 95 |
| **Residential (< 1/8 Acre)** | | 0.45 | | 0.59 | 65 |
| **Streets: Paved** | | 0.90 | | 0.96 | 100 |
| **Streets: Gravel** | | 0.80 | | 0.85 | 80 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **A6** | Open Space | 0.12 | | 0.08 | | 0.35 | 0 |
| | Commercial Development | 0.00 | | 0.81 | | 0.88 | 95 |
| | Residential (< 1/8 Acre) | 0.00 | | 0.45 | | 0.59 | 65 |
| | Streets: Paved | 0.48 | | 0.90 | | 0.96 | 100 |
| | Streets: Gravel | 0.00 | | 0.80 | | 0.85 | 80 |
| | WEIGHTED AVERAGE | | | 0.74 | | 0.84 | 80% |
| **TOTAL A6** | | 0.60 | | | | | |
| | | | | | | | |
| **A7** | Open Space | 0.81 | | 0.08 | | 0.35 | 0 |
| | Commercial Development | 0.00 | | 0.81 | | 0.88 | 95 |
| | Residential (< 1/8 Acre) | 2.04 | | 0.45 | | 0.59 | 65 |
| | Streets: Paved | 0.00 | | 0.90 | | 0.96 | 100 |
| | Streets: Gravel | 0.00 | | 0.80 | | 0.85 | 80 |
| | WEIGHTED AVERAGE | | | 0.34 | | 0.52 | 46% |
| **TOTAL A7** | | 2.85 | | | | | |
| | | | | | | | |
| **A8** | Open Space | 0.00 | | 0.08 | | 0.35 | 0 |
| | Commercial Development | 0.00 | | 0.81 | | 0.88 | 95 |
| | Residential (< 1/8 Acre) | 1.74 | | 0.45 | | 0.59 | 65 |
| | Streets: Paved | 0.00 | | 0.90 | | 0.96 | 100 |
| | Streets: Gravel | 0.00 | | 0.80 | | 0.85 | 80 |
| | WEIGHTED AVERAGE | | | 0.45 | | 0.59 | 65% |
| **TOTAL A8** | | 1.74 | | | | | |
| | | | | | | | |
| **A9** | Open Space | 0.00 | | 0.08 | | 0.35 | 0 |
| | Commercial Development | 0.00 | | 0.81 | | 0.88 | 95 |
| | Residential (< 1/8 Acre) | 1.47 | | 0.45 | | 0.59 | 65 |
| | Streets: Paved | 0.00 | | 0.90 | | 0.96 | 100 |
| | Streets: Gravel | 0.00 | | 0.80 | | 0.85 | 80 |
| | WEIGHTED AVERAGE | | | 0.45 | | 0.59 | 65% |
| **TOTAL A9** | | 1.47 | | | | | |
| | | | | | | | |
| **A10** | Open Space | 0.00 | | 0.08 | | 0.35 | 0 |
| | Commercial Development | 0.00 | | 0.81 | | 0.88 | 95 |
| | Residential (< 1/8 Acre) | 0.65 | | 0.45 | | 0.59 | 65 |
| | Streets: Paved | 0.00 | | 0.90 | | 0.96 | 100 |
| | Streets: Gravel | 0.00 | | 0.80 | | 0.85 | 80 |
| | WEIGHTED AVERAGE | | | 0.45 | | 0.59 | 65% |
| **TOTAL A10** | | 0.65 | | | | | |
| | | | | | | | |
| **A11** | Open Space | 0.00 | | 0.08 | | 0.35 | 0 |
| | Commercial Development | 0.00 | | 0.81 | | 0.88 | 95 |

## PROJECT INFORMATION

| | |
|---|---|
| PROJECT: | Commons at Falcon Field |
| PROJECT NO: | 21604-00 |
| DESIGN BY: | KGV |
| REV. BY: | TDM |
| AGENCY: | El Paso County |
| REPORT TYPE: | Preliminary |
| DATE: | 3/17/2024 |

Drexel, Barrell & Co.

| | C2* | C5* | C10* | C100* | % IMPERV |
|---|---|---|---|---|---|
| **Open Space** | | 0.08 | | 0.35 | 0 |
| **Commercial Development** | | 0.81 | | 0.88 | 95 |
| **Residential (< 1/8 Acre)** | | 0.45 | | 0.59 | 65 |
| **Streets: Paved** | | 0.90 | | 0.96 | 100 |
| **Streets: Gravel** | | 0.80 | | 0.85 | 80 |

| | | | C2* | C5* | C10* | C100* | % IMPERV |
|---|---|---|---|---|---|---|---|
| | Residential (< 1/8 Acre) | 2.55 | | 0.45 | | 0.59 | 65 |
| | Streets: Paved | 0.00 | | 0.90 | | 0.96 | 100 |
| | Streets: Gravel | 0.00 | | 0.80 | | 0.85 | 80 |
| | WEIGHTED AVERAGE | | | 0.45 | | 0.59 | 65% |
| **TOTAL A11** | | 2.55 | | | | | |
| | | | | | | | |
| **A12** | Open Space | 0.00 | | 0.08 | | 0.35 | 0 |
| | Commercial Development | 0.00 | | 0.81 | | 0.88 | 95 |
| | Residential (< 1/8 Acre) | 3.25 | | 0.45 | | 0.59 | 65 |
| | Streets: Paved | 0.00 | | 0.90 | | 0.96 | 100 |
| | Streets: Gravel | 0.00 | | 0.80 | | 0.85 | 80 |
| | WEIGHTED AVERAGE | | | 0.45 | | 0.59 | 65% |
| **TOTAL A12** | | 3.25 | | | | | |
| | | | | | | | |
| **A13** | Open Space | 0.00 | | 0.08 | | 0.35 | 0 |
| | Commercial Development | 0.00 | | 0.81 | | 0.88 | 95 |
| | Residential (< 1/8 Acre) | 1.22 | | 0.45 | | 0.59 | 65 |
| | Streets: Paved | 0.00 | | 0.90 | | 0.96 | 100 |
| | Streets: Gravel | 0.00 | | 0.80 | | 0.85 | 80 |
| | WEIGHTED AVERAGE | | | 0.45 | | 0.59 | 65% |
| **TOTAL A13** | | 1.22 | | | | | |
| | | | | | | | |
| **A14** | Open Space | 0.97 | | 0.08 | | 0.35 | 0 |
| | Commercial Development | 0.00 | | 0.81 | | 0.88 | 95 |
| | Residential (< 1/8 Acre) | 0.00 | | 0.45 | | 0.59 | 65 |
| | Streets: Paved | 0.00 | | 0.90 | | 0.96 | 100 |
| | Streets: Gravel | 0.00 | | 0.80 | | 0.85 | 80 |
| | WEIGHTED AVERAGE | | | 0.08 | | 0.35 | 0% |
| **TOTAL A14** | | 0.97 | | | | | |
| | | | | | | | |
| **A15** | Open Space | 2.16 | | 0.08 | | 0.35 | 0 |
| | Commercial Development | 0.00 | | 0.81 | | 0.88 | 95 |
| | Residential (< 1/8 Acre) | 0.23 | | 0.45 | | 0.59 | 65 |
| | Streets: Paved | 0.00 | | 0.90 | | 0.96 | 100 |
| | Streets: Gravel | 0.00 | | 0.80 | | 0.85 | 80 |
| | WEIGHTED AVERAGE | | | 0.12 | | 0.37 | 6% |
| **TOTAL A15** | | 2.39 | | | | | |
| | | | | | | | |
| **A16** | Open Space | 0.53 | | 0.08 | | 0.35 | 0 |
| | Commercial Development | 0.00 | | 0.81 | | 0.88 | 95 |
| | Residential (< 1/8 Acre) | 0.00 | | 0.45 | | 0.59 | 65 |
| | Streets: Paved | 0.00 | | 0.90 | | 0.96 | 100 |
| | Streets: Gravel | 0.00 | | 0.80 | | 0.85 | 80 |

## PROJECT INFORMATION

**PROJECT:** Commons at Falcon Field
**PROJECT NO:** 21604-00
**DESIGN BY:** KGV
**REV. BY:** TDM
**AGENCY:** El Paso County
**REPORT TYPE:** Preliminary
**DATE:** 3/17/2024

Drexel, Barrell & Co.

| | | | C2* | C5* | C10* | C100* | % IMPERV |
|---|---|---|---|---|---|---|---|
| **Open Space** | | | | 0.08 | | 0.35 | 0 |
| **Commercial Development** | | | | 0.81 | | 0.88 | 95 |
| **Residential (< 1/8 Acre)** | | | | 0.45 | | 0.59 | 65 |
| **Streets: Paved** | | | | 0.90 | | 0.96 | 100 |
| **Streets: Gravel** | | | | 0.80 | | 0.85 | 80 |
| | WEIGHTED AVERAGE | | | 0.08 | | 0.35 | 0% |
| **TOTAL A16** | | 0.53 | | | | | |
| | **Area tributary to Pond A** | **18.07** | | 0.45 | | 0.63 | 0.59 |
| **B-BASINS** | | | | | | | |
| | | | | | | | |
| **OSB1** | Open Space | 0.00 | | 0.08 | | 0.35 | 0 |
| | Commercial Development | 0.00 | | 0.81 | | 0.88 | 95 |
| | Residential (< 1/8 Acre) | 0.00 | | 0.45 | | 0.59 | 65 |
| | Streets: Paved | 2.09 | | 0.90 | | 0.96 | 100 |
| | Streets: Gravel | 0.00 | | 0.80 | | 0.85 | 80 |
| | WEIGHTED AVERAGE | | | 0.90 | | 0.96 | 100% |
| **TOTAL OSB1** | | 2.09 | | | | | |
| | | | | | | | |
| **B1** | Open Space | 0.00 | | 0.08 | | 0.35 | 0 |
| | Commercial Development | 2.15 | | 0.81 | | 0.88 | 95 |
| | Residential (< 1/8 Acre) | 0.00 | | 0.45 | | 0.59 | 65 |
| | Streets: Paved | 0.00 | | 0.90 | | 0.96 | 100 |
| | Streets: Gravel | 0.00 | | 0.80 | | 0.85 | 80 |
| | WEIGHTED AVERAGE | | | 0.81 | | 0.88 | 95% |
| **TOTAL B1** | | 2.15 | | | | | |
| | | | | | | | |
| **B2** | Open Space | 0.00 | | 0.08 | | 0.35 | 0 |
| | Commercial Development | 1.11 | | 0.81 | | 0.88 | 95 |
| | Residential (< 1/8 Acre) | 0.00 | | 0.45 | | 0.59 | 65 |
| | Streets: Paved | 0.00 | | 0.90 | | 0.96 | 100 |
| | Streets: Gravel | 0.00 | | 0.80 | | 0.85 | 80 |
| | WEIGHTED AVERAGE | | | 0.81 | | 0.88 | 95% |
| **TOTAL B2** | | 1.11 | | | | | |
| | | | | | | | |
| **B3** | Open Space | 0.00 | | 0.08 | | 0.35 | 0 |
| | Commercial Development | 0.00 | | 0.81 | | 0.88 | 95 |
| | Residential (< 1/8 Acre) | 0.00 | | 0.45 | | 0.59 | 65 |
| | Streets: Paved | 0.39 | | 0.90 | | 0.96 | 100 |
| | Streets: Gravel | 0.00 | | 0.80 | | 0.85 | 80 |
| | WEIGHTED AVERAGE | | | 0.90 | | 0.96 | 100% |

## PROJECT INFORMATION

| | |
|---|---|
| **PROJECT:** | Commons at Falcon Field |
| **PROJECT NO:** | 21604-00 |
| **DESIGN BY:** | KGV |
| **REV. BY:** | TDM |
| **AGENCY:** | El Paso County |
| **REPORT TYPE:** | Preliminary |
| **DATE:** | 3/17/2024 |

**Drexel, Barrell & Co.**

| | C2* | C5* | C10* | C100* | % IMPERV |
|---|---|---|---|---|---|
| **Open Space** | | 0.08 | | 0.35 | 0 |
| **Commercial Development** | | 0.81 | | 0.88 | 95 |
| **Residential (< 1/8 Acre)** | | 0.45 | | 0.59 | 65 |
| **Streets: Paved** | | 0.90 | | 0.96 | 100 |
| **Streets: Gravel** | | 0.80 | | 0.85 | 80 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **TOTAL B3** | | 0.39 | | | | | |
| | | | | | | | |
| **B4** | Open Space | 0.00 | | 0.08 | | 0.35 | 0 |
| | Commercial Development | 1.54 | | 0.81 | | 0.88 | 95 |
| | Residential (< 1/8 Acre) | 0.00 | | 0.45 | | 0.59 | 65 |
| | Streets: Paved | 0.00 | | 0.90 | | 0.96 | 100 |
| | Streets: Gravel | 0.00 | | 0.80 | | 0.85 | 80 |
| | WEIGHTED AVERAGE | | | 0.81 | | 0.88 | 95% |
| **TOTAL B4** | | 1.54 | | | | | |
| | | | | | | | |
| **B5** | Open Space | 0.00 | | 0.08 | | 0.35 | 0 |
| | Commercial Development | 2.13 | | 0.81 | | 0.88 | 95 |
| | Streets: Paved | 0.00 | | 0.90 | | 0.96 | 100 |
| | Streets: Gravel | 0.00 | | 0.80 | | 0.85 | 80 |
| | WEIGHTED AVERAGE | | | 0.81 | | 0.88 | 95% |
| **TOTAL B5** | | 2.13 | | | | | |
| | | | | | | | |
| **B6** | Open Space | 0.00 | | 0.08 | | 0.35 | 0 |
| | Commercial Development | 1.75 | | 0.81 | | 0.88 | 95 |
| | Residential (< 1/8 Acre) | 0.00 | | 0.45 | | 0.59 | 65 |
| | Streets: Paved | 0.00 | | 0.90 | | 0.96 | 100 |
| | Streets: Gravel | 0.00 | | 0.80 | | 0.85 | 80 |
| | WEIGHTED AVERAGE | | | 0.81 | | 0.88 | 95% |
| **TOTAL B6** | | 1.75 | | | | | |
| | | | | | | | |
| **B7** | Open Space | 0.00 | | 0.08 | | 0.35 | 0 |
| | Commercial Development | 0.00 | | 0.81 | | 0.88 | 95 |
| | Residential (< 1/8 Acre) | 0.00 | | 0.45 | | 0.59 | 65 |
| | Streets: Paved | 0.90 | | 0.90 | | 0.96 | 100 |
| | Streets: Gravel | 0.00 | | 0.80 | | 0.85 | 80 |
| | WEIGHTED AVERAGE | | | 0.90 | | 0.96 | 100% |
| **TOTAL B7** | | 0.90 | | | | | |
| | | | | | | | |
| **B8** | Open Space | 0.00 | | 0.08 | | 0.35 | 0 |
| | Commercial Development | 0.00 | | 0.81 | | 0.88 | 95 |
| | Streets: Paved | 0.72 | | 0.90 | | 0.96 | 100 |

## PROJECT INFORMATION

Drexel, Barrell & Co.

| | |
|---|---|
| PROJECT: | Commons at Falcon Field |
| PROJECT NO: | 21604-00 |
| DESIGN BY: | KGV |
| REV. BY: | TDM |
| AGENCY: | El Paso County |
| REPORT TYPE: | Preliminary |
| DATE: | 3/17/2024 |

| | C2* | C5* | C10* | C100* | % IMPERV |
|---|---|---|---|---|---|
| Open Space | | 0.08 | | 0.35 | 0 |
| Commercial Development | | 0.81 | | 0.88 | 95 |
| Residential (< 1/8 Acre) | | 0.45 | | 0.59 | 65 |
| Streets: Paved | | 0.90 | | 0.96 | 100 |
| Streets: Gravel | | 0.80 | | 0.85 | 80 |

| | | | C2* | C5* | C10* | C100* | % IMPERV |
|---|---|---|---|---|---|---|---|
| | Streets: Gravel | 0.00 | | 0.80 | | 0.85 | 80 |
| | WEIGHTED AVERAGE | | | 0.90 | | 0.96 | 100% |
| **TOTAL B8** | | 0.72 | | | | | |
| | | | | | | | |
| **B9** | Open Space | 1.42 | | 0.08 | | 0.35 | 0 |
| | Commercial Development | 0.00 | | 0.81 | | 0.88 | 95 |
| | Streets: Paved | 0.00 | | 0.90 | | 0.96 | 100 |
| | Streets: Gravel | 0.00 | | 0.80 | | 0.85 | 80 |
| | WEIGHTED AVERAGE | | | 0.08 | | 0.35 | 0% |
| **TOTAL B9** | | 1.42 | | | | | |
| | **Area tributary to Pond B** | **14.21** | | **0.76** | | **0.85** | **0.87** |
| **C-BASINS** | | | | | | | |
| | | | | | | | |
| **OSC1** | Open Space | 0.00 | | 0.08 | | 0.35 | 0 |
| | Commercial Development | 0.00 | | 0.81 | | 0.88 | 95 |
| | Residential (< 1/8 Acre) | 0.00 | | 0.45 | | 0.59 | 65 |
| | Streets: Paved | 0.56 | | 0.90 | | 0.96 | 100 |
| | Streets: Gravel | 0.00 | | 0.80 | | 0.85 | 80 |
| | WEIGHTED AVERAGE | | | 0.90 | | 0.96 | 100% |
| **TOTAL OSC1** | | 0.56 | | | | | |
| | | | | | | | |
| **OSC2** | Open Space | 2.59 | | 0.08 | | 0.35 | 0 |
| | Commercial Development | 0.00 | | 0.81 | | 0.88 | 95 |
| | Residential (< 1/8 Acre) | 0.00 | | 0.45 | | 0.59 | 65 |
| | Streets: Paved | 0.39 | | 0.90 | | 0.96 | 100 |
| | Streets: Gravel | 0.00 | | 0.80 | | 0.85 | 80 |
| | WEIGHTED AVERAGE | | | 0.19 | | 0.43 | 13% |
| **TOTAL OSC2** | | 2.98 | | | | | |
| | | | | | | | |
| **C1** | Open Space | 0.00 | | 0.08 | | 0.35 | 0 |
| | Commercial Development | 0.00 | | 0.81 | | 0.88 | 95 |
| | Residential (< 1/8 Acre) | 0.00 | | 0.45 | | 0.59 | 65 |
| | Streets: Paved | 0.27 | | 0.90 | | 0.96 | 100 |
| | Streets: Gravel | 0.00 | | 0.80 | | 0.85 | 80 |

## PROJECT INFORMATION

**PROJECT:** Commons at Falcon Field
**PROJECT NO:** 21604-00
**DESIGN BY:** KGV
**REV. BY:** TDM
**AGENCY:** El Paso County
**REPORT TYPE:** Preliminary
**DATE:** 3/17/2024

Drexel, Barrell & Co.

| | C2* | C5* | C10* | C100* | % IMPERV |
|---|---|---|---|---|---|
| **Open Space** | | 0.08 | | 0.35 | 0 |
| **Commercial Development** | | 0.81 | | 0.88 | 95 |
| **Residential (< 1/8 Acre)** | | 0.45 | | 0.59 | 65 |
| **Streets: Paved** | | 0.90 | | 0.96 | 100 |
| **Streets: Gravel** | | 0.80 | | 0.85 | 80 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | WEIGHTED AVERAGE | | | 0.90 | | 0.96 | 100% |
| **TOTAL C1** | | 0.27 | | | | | |
| | | | | | | | |
| **C2** | Open Space | 0.00 | | 0.08 | | 0.35 | 0 |
| | Commercial Development | 2.24 | | 0.81 | | 0.88 | 95 |
| | Residential (< 1/8 Acre) | 0.00 | | 0.45 | | 0.59 | 65 |
| | Streets: Paved | 0.00 | | 0.90 | | 0.96 | 100 |
| | Streets: Gravel | 0.00 | | 0.80 | | 0.85 | 80 |
| | WEIGHTED AVERAGE | | | 0.81 | | 0.88 | 95% |
| **TOTAL C2** | | 2.24 | | | | | |
| | | | | | | | |
| **C3** | Open Space | 0.00 | | 0.08 | | 0.35 | 0 |
| | Commercial Development | 1.32 | | 0.81 | | 0.88 | 95 |
| | Residential (< 1/8 Acre) | 0.00 | | 0.45 | | 0.59 | 65 |
| | Streets: Paved | 0.00 | | 0.90 | | 0.96 | 100 |
| | Streets: Gravel | 0.00 | | 0.80 | | 0.85 | 80 |
| | WEIGHTED AVERAGE | | | 0.81 | | 0.88 | 95% |
| **TOTAL C3** | | 1.32 | | | | | |
| | | | | | | | |
| **C4** | Open Space | 0.00 | | 0.08 | | 0.35 | 0 |
| | Commercial Development | 1.51 | | 0.81 | | 0.88 | 95 |
| | Residential (< 1/8 Acre) | 0.00 | | 0.45 | | 0.59 | 65 |
| | Streets: Paved | 0.00 | | 0.90 | | 0.96 | 100 |
| | Streets: Gravel | 0.00 | | 0.80 | | 0.85 | 80 |
| | WEIGHTED AVERAGE | | | 0.81 | | 0.88 | 95% |
| **TOTAL C4** | | 1.51 | | | | | |
| | | | | | | | |
| **C5** | Open Space | 0.00 | | 0.08 | | 0.35 | 0 |
| | Commercial Development | 0.00 | | 0.81 | | 0.88 | 95 |
| | Streets: Paved | 0.88 | | 0.90 | | 0.96 | 100 |
| | Streets: Gravel | 0.00 | | 0.80 | | 0.85 | 80 |
| | WEIGHTED AVERAGE | | | 0.90 | | 0.96 | 100% |
| **TOTAL C5** | | 0.88 | | | | | |
| | | | | | | | |
| **C6** | Open Space | 0.00 | | 0.08 | | 0.35 | 0 |

## PROJECT INFORMATION

Drexel, Barrell & Co.

| | |
|---|---|
| **PROJECT:** | Commons at Falcon Field |
| **PROJECT NO:** | 21604-00 |
| **DESIGN BY:** | KGV |
| **REV. BY:** | TDM |
| **AGENCY:** | El Paso County |
| **REPORT TYPE:** | Preliminary |
| **DATE:** | 3/17/2024 |

| | C2* | C5* | C10* | C100* | % IMPERV |
|---|---|---|---|---|---|
| **Open Space** | | 0.08 | | 0.35 | 0 |
| **Commercial Development** | | 0.81 | | 0.88 | 95 |
| **Residential (< 1/8 Acre)** | | 0.45 | | 0.59 | 65 |
| **Streets: Paved** | | 0.90 | | 0.96 | 100 |
| **Streets: Gravel** | | 0.80 | | 0.85 | 80 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Commercial Development | 0.00 | | 0.81 | | 0.88 | 95 |
| | Residential (< 1/8 Acre) | 0.00 | | 0.45 | | 0.59 | 65 |
| | Streets: Paved | 0.66 | | 0.90 | | 0.96 | 100 |
| | Streets: Gravel | 0.00 | | 0.80 | | 0.85 | 80 |
| | WEIGHTED AVERAGE | | | 0.90 | | 0.96 | 100% |
| **TOTAL C6** | | 0.66 | | | | | |
| **D-BASINS** | | | | | | | |
| | | | | | | | |
| **OSD1** | Open Space | 2.94 | | 0.08 | | 0.35 | 0 |
| | Commercial Development | 0.00 | | 0.81 | | 0.88 | 95 |
| | Residential (< 1/8 Acre) | 0.00 | | 0.45 | | 0.59 | 65 |
| | Streets: Paved | 0.00 | | 0.90 | | 0.96 | 100 |
| | Streets: Gravel | 0.00 | | 0.80 | | 0.85 | 80 |
| | WEIGHTED AVERAGE | | | 0.08 | | 0.35 | 0% |
| **TOTAL OSD1** | | 2.94 | | | | | |
| | | | | | | | |
| **D1** | Open Space | 0.38 | | 0.08 | | 0.35 | 0 |
| | Commercial Development | 0.00 | | 0.81 | | 0.88 | 95 |
| | Residential (< 1/8 Acre) | 0.96 | | 0.45 | | 0.59 | 65 |
| | Streets: Paved | 0.00 | | 0.90 | | 0.96 | 100 |
| | Streets: Gravel | 0.00 | | 0.80 | | 0.85 | 80 |
| | WEIGHTED AVERAGE | | | 0.35 | | 0.52 | 47% |
| **TOTAL D1** | | 1.35 | | | | | |
| | | | | | | | |
| **D2** | Open Space | 0.38 | | 0.08 | | 0.35 | 0 |
| | Commercial Development | 0.00 | | 0.81 | | 0.88 | 95 |
| | Residential (< 1/8 Acre) | 1.55 | | 0.45 | | 0.59 | 65 |
| | Streets: Paved | 0.00 | | 0.90 | | 0.96 | 100 |
| | Streets: Gravel | 0.00 | | 0.80 | | 0.85 | 80 |
| | WEIGHTED AVERAGE | | | 0.38 | | 0.54 | 52% |
| **TOTAL D2** | | 1.93 | | | | | |
| | | | | | | | |
| **D3** | Open Space | 0.13 | | 0.08 | | 0.35 | 0 |
| | Commercial Development | 0.00 | | 0.81 | | 0.88 | 95 |
| | Residential (< 1/8 Acre) | 0.78 | | 0.45 | | 0.59 | 65 |
| | Streets: Paved | 0.00 | | 0.90 | | 0.96 | 100 |

## PROJECT INFORMATION

PROJECT: Commons at Falcon Field
PROJECT NO: 21604-00
DESIGN BY: KGV
REV. BY: TDM
AGENCY: El Paso County
REPORT TYPE: Preliminary
DATE: 3/17/2024

Drexel, Barrell & Co.

| | | C2* | C5* | C10* | C100* | % IMPERV |
|---|---|---|---|---|---|---|
| **Open Space** | | | 0.08 | | 0.35 | 0 |
| **Commercial Development** | | | 0.81 | | 0.88 | 95 |
| **Residential (< 1/8 Acre)** | | | 0.45 | | 0.59 | 65 |
| **Streets: Paved** | | | 0.90 | | 0.96 | 100 |
| **Streets: Gravel** | | | 0.80 | | 0.85 | 80 |

| | | | | C5* | | C100* | % IMPERV |
|---|---|---|---|---|---|---|---|
| | Streets: Gravel | 0.00 | | 0.80 | | 0.85 | 80 |
| | WEIGHTED AVERAGE | | | 0.40 | | 0.56 | 56% |
| **TOTAL D3** | | 0.91 | | | | | |
| | | | | | | | |
| **D4** | Open Space | 0.63 | | 0.08 | | 0.35 | 0 |
| | Commercial Development | 0.00 | | 0.81 | | 0.88 | 95 |
| | Residential (< 1/8 Acre) | 2.11 | | 0.45 | | 0.59 | 65 |
| | Streets: Paved | 0.00 | | 0.90 | | 0.96 | 100 |
| | Streets: Gravel | 0.00 | | 0.80 | | 0.85 | 80 |
| | WEIGHTED AVERAGE | | | 0.36 | | 0.53 | 50% |
| **TOTAL D4** | | 2.75 | | | | | |
| | | | | | | | |
| **D5** | Open Space | 0.00 | | 0.08 | | 0.35 | 0 |
| | Commercial Development | 0.00 | | 0.81 | | 0.88 | 95 |
| | Residential (< 1/8 Acre) | 0.65 | | 0.45 | | 0.59 | 65 |
| | Streets: Paved | 0.00 | | 0.90 | | 0.96 | 100 |
| | Streets: Gravel | 0.00 | | 0.80 | | 0.85 | 80 |
| | WEIGHTED AVERAGE | | | 0.45 | | 0.59 | 65% |
| **TOTAL D5** | | 0.65 | | | | | |
| | | | | | | | |
| **D6** | Open Space | 0.00 | | 0.08 | | 0.35 | 0 |
| | Commercial Development | 0.00 | | 0.81 | | 0.88 | 95 |
| | Residential (< 1/8 Acre) | 2.87 | | 0.45 | | 0.59 | 65 |
| | Streets: Paved | 0.00 | | 0.90 | | 0.96 | 100 |
| | Streets: Gravel | 0.00 | | 0.80 | | 0.85 | 80 |
| | WEIGHTED AVERAGE | | | 0.45 | | 0.59 | 65% |
| **TOTAL D6** | | 2.87 | | | | | |
| | | | | | | | |
| **D7** | Open Space | 0.00 | | 0.08 | | 0.35 | 0 |
| | Commercial Development | 0.00 | | 0.81 | | 0.88 | 95 |
| | Residential (< 1/8 Acre) | 0.25 | | 0.45 | | 0.59 | 65 |
| | Streets: Paved | 0.45 | | 0.90 | | 0.96 | 100 |
| | Streets: Gravel | 0.00 | | 0.80 | | 0.85 | 80 |
| | WEIGHTED AVERAGE | | | 0.74 | | 0.83 | 87% |
| **TOTAL D7** | | 0.70 | | | | | |
| | | | | | | | |

## PROJECT INFORMATION

| | |
|---|---|
| **PROJECT:** | Commons at Falcon Field |
| **PROJECT NO:** | 21604-00 |
| **DESIGN BY:** | KGV |
| **REV. BY:** | TDM |
| **AGENCY:** | El Paso County |
| **REPORT TYPE:** | Preliminary |
| **DATE:** | 3/17/2024 |

Drexel, Barrell & Co.

| | | | C2* | C5* | C10* | C100* | % IMPERV |
|---|---|---|---|---|---|---|---|
| **Open Space** | | | | 0.08 | | 0.35 | 0 |
| **Commercial Development** | | | | 0.81 | | 0.88 | 95 |
| **Residential (< 1/8 Acre)** | | | | 0.45 | | 0.59 | 65 |
| **Streets: Paved** | | | | 0.90 | | 0.96 | 100 |
| **Streets: Gravel** | | | | 0.80 | | 0.85 | 80 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **D8** | Open Space | 0.00 | | 0.08 | | 0.35 | 0 |
| | Commercial Development | 0.00 | | 0.81 | | 0.88 | 95 |
| | Residential (< 1/8 Acre) | 0.42 | | 0.45 | | 0.59 | 65 |
| | Streets: Paved | 0.00 | | 0.90 | | 0.96 | 100 |
| | Streets: Gravel | 0.00 | | 0.80 | | 0.85 | 80 |
| | WEIGHTED AVERAGE | | | 0.45 | | 0.59 | 65% |
| **TOTAL D8** | | 0.42 | | | | | |
| | | | | | | | |
| **D9** | Open Space | 0.00 | | 0.08 | | 0.35 | 0 |
| | Commercial Development | 0.00 | | 0.81 | | 0.88 | 95 |
| | Residential (< 1/8 Acre) | 0.29 | | 0.45 | | 0.59 | 65 |
| | Streets: Paved | 0.00 | | 0.90 | | 0.96 | 100 |
| | Streets: Gravel | 0.00 | | 0.80 | | 0.85 | 80 |
| | WEIGHTED AVERAGE | | | 0.45 | | 0.59 | 65% |
| **TOTAL D9** | | 0.29 | | | | | |
| | | | | | | | |
| **D10** | Open Space | 0.00 | | 0.08 | | 0.35 | 0 |
| | Commercial Development | 0.00 | | 0.81 | | 0.88 | 95 |
| | Residential (< 1/8 Acre) | 1.31 | | 0.45 | | 0.59 | 65 |
| | Streets: Paved | 0.00 | | 0.90 | | 0.96 | 100 |
| | Streets: Gravel | 0.00 | | 0.80 | | 0.85 | 80 |
| | WEIGHTED AVERAGE | | | 0.45 | | 0.59 | 65% |
| **TOTAL D10** | | 1.31 | | | | | |
| | | | | | | | |
| **D11** | Open Space | 0.00 | | 0.08 | | 0.35 | 0 |
| | Commercial Development | 0.00 | | 0.81 | | 0.88 | 95 |
| | Residential (< 1/8 Acre) | 0.00 | | 0.45 | | 0.59 | 65 |
| | Streets: Paved | 0.62 | | 0.90 | | 0.96 | 100 |
| | Streets: Gravel | 0.00 | | 0.80 | | 0.85 | 80 |
| | WEIGHTED AVERAGE | | | 0.90 | | 0.96 | 100% |
| **TOTAL D11** | | 0.62 | | | | | |
| | | | | | | | |
| **D12** | Open Space | 1.52 | | 0.08 | | 0.35 | 0 |
| | Commercial Development | 0.00 | | 0.81 | | 0.88 | 95 |
| | Residential (< 1/8 Acre) | 0.00 | | 0.45 | | 0.59 | 65 |

## PROJECT INFORMATION

**PROJECT:** Commons at Falcon Field
**PROJECT NO:** 21604-00
**DESIGN BY:** KGV
**REV. BY:** TDM
**AGENCY:** El Paso County
**REPORT TYPE:** Preliminary
**DATE:** 3/17/2024

Drexel, Barrell & Co.

| | C2* | C5* | C10* | C100* | % IMPERV |
|---|---|---|---|---|---|
| **Open Space** | | 0.08 | | 0.35 | 0 |
| **Commercial Development** | | 0.81 | | 0.88 | 95 |
| **Residential (< 1/8 Acre)** | | 0.45 | | 0.59 | 65 |
| **Streets: Paved** | | 0.90 | | 0.96 | 100 |
| **Streets: Gravel** | | 0.80 | | 0.85 | 80 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Streets: Paved | 0.00 | | 0.90 | | 0.96 | 100 |
| | Streets: Gravel | 0.00 | | 0.80 | | 0.85 | 80 |
| | WEIGHTED AVERAGE | | | 0.08 | | 0.35 | 0% |
| **TOTAL D12** | | 1.52 | | | | | |
| | | | | | | | |
| **D13** | Open Space | 1.38 | | 0.08 | | 0.35 | 0 |
| | Commercial Development | 0.00 | | 0.81 | | 0.88 | 95 |
| | Residential (< 1/8 Acre) | 0.07 | | 0.45 | | 0.59 | 65 |
| | Streets: Paved | 0.00 | | 0.90 | | 0.96 | 100 |
| | Streets: Gravel | 0.00 | | 0.80 | | 0.85 | 80 |
| | WEIGHTED AVERAGE | | | 0.10 | | 0.36 | 3% |
| **TOTAL D13** | | 1.45 | | | | | |
| | | | | | | | |
| **D14** | Open Space | 0.86 | | 0.08 | | 0.35 | 0 |
| | Commercial Development | 0.00 | | 0.81 | | 0.88 | 95 |
| | Residential (< 1/8 Acre) | 0.00 | | 0.45 | | 0.59 | 65 |
| | Streets: Paved | 0.00 | | 0.90 | | 0.96 | 100 |
| | Streets: Gravel | 0.00 | | 0.80 | | 0.85 | 80 |
| | WEIGHTED AVERAGE | | | 0.08 | | 0.35 | 0% |
| **TOTAL D14** | | 0.86 | | | | | |
| | **Area tributary to Pond C** | **35.56** | | **0.37** | | **0.50** | **0.45** |

## PROJECT INFORMATION

**PROJECT:** Commons at Falcon Field
**PROJECT NO:** 21604-00
**DESIGN BY:** KGV
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**AGENCY:** El Paso County
**REPORT TYPE:** Preliminary
**DATE:** 3/17/2024

### RATIONAL METHOD CALCULATIONS FOR STORM WATER RUNOFF

**DEVELOPED TIME OF CONCENTRATION**

| SUB-BASIN DATA | | | | | | | INITIAL/OVERLAND TIME ($t_i$) | | | TRAVEL TIME ($t_t$) | | | | PIPE TRAVEL TIME ($t_t$) | | | | TIME OF CONCENTRATION | | FINAL $t_c$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BASIN | DESIGN PT: | $C_5$ | $C_{100}$ | AREA | COMP | | LENGTH | SLOPE | $t_i$ | LENGTH | SLOPE | VEL. | $t_t$ | LENGTH | SLOPE | VEL. | $t_t$ | COMP. | MINIMUM | |
| | | | | Ac | | | Ft | % | Min | Ft | % | FPS | Min | Ft | % | FPS | Min | $t_c$ | $t_c$ | Min |
| **A-BASINS** | | | | | | | | | | | | | | | | | | | | |
| A1 | 1 | 0.74 | 0.84 | 0.30 | 0.22 | 0.25 | 20 | 2.0 | 2.4 | 560 | 4.0 | 8.0 | 1.2 | | | | | 3.5 | 5.0 | **5.0** |
| A2 | 2 | 0.56 | 0.70 | 0.64 | 0.36 | 0.45 | 20 | 2.0 | 3.5 | 500 | 4.0 | 8.0 | 1.0 | | | | | 4.5 | 5.0 | **5.0** |
| A3 | 3 | 0.28 | 0.48 | 1.34 | 0.38 | 0.65 | 100 | 3.0 | 10.4 | 525 | 2.3 | 6.2 | 1.4 | | | | | 11.8 | 5.0 | **11.8** |
| A4 | | 0.90 | 0.96 | 0.25 | 0.23 | 0.24 | 20 | 2.0 | 1.3 | 145 | 1.5 | 5.5 | 0.4 | | | | | 1.7 | 5.0 | **5.0** |
| DP1+DP2+DP3+A4 | 4 | 0.47 | 0.63 | 2.53 | 1.19 | 1.59 | | From DP3 | | 100 | 2.0 | 5.8 | 0.3 | | | | | 12.1 | 5.0 | **12.1** |
| A5 | | 0.90 | 0.96 | 0.23 | 0.21 | 0.22 | 20 | 2.0 | 1.3 | 135 | 1.4 | 5.2 | 0.4 | | | | | 1.7 | 5.0 | **5.0** |
| DP4+A5 | 5 | 0.51 | 0.65 | 2.76 | 1.40 | 1.81 | | From DP4 | | | | | | 75 | 1.0 | 5.9 | 0.2 | 12.3 | 5.0 | **12.3** |
| A6 | 6 | 0.74 | 0.84 | 0.60 | 0.44 | 0.50 | 40 | 1.8 | 3.5 | 820 | 1.8 | 6.3 | 2.2 | | | | | 5.7 | 5.0 | **5.7** |
| A7 | | 0.34 | 0.52 | 2.85 | 0.98 | 1.49 | 100 | 1.0 | 13.8 | 750 | 0.5 | 3.8 | 3.3 | | | | | 17.1 | 5.0 | **17.1** |
| DP6+A7 | 7 | 0.41 | 0.58 | 3.45 | 1.42 | 1.99 | | From A7 | | | | | | | | | | 17.1 | 5.0 | **17.1** |
| A8 | 8 | 0.45 | 0.59 | 1.74 | 0.78 | 1.03 | 100 | 1.0 | 11.9 | 435 | 1.8 | 5.7 | 1.3 | | | | | 13.2 | 5.0 | **13.2** |
| A9 | | 0.45 | 0.59 | 1.47 | 0.66 | 0.86 | 100 | 1.5 | 10.4 | 700 | 0.5 | 3.8 | 3.1 | | | | | 13.5 | 5.0 | **13.5** |
| DP7+DP8+A9 | 9 | 0.43 | 0.58 | 6.66 | 2.87 | 3.88 | | From DP7 | | 700 | 0.5 | 3.8 | 3.1 | | | | | 20.2 | 5.0 | **20.2** |
| A10 | 10 | 0.45 | 0.59 | 0.65 | 0.29 | 0.39 | 40 | 2.0 | 6.0 | 390 | 1.8 | 5.7 | 1.1 | | | | | 7.1 | 5.0 | **7.1** |
| A11 | | 0.45 | 0.59 | 2.55 | 1.15 | 1.51 | 100 | 4.1 | 7.4 | 540 | 1.8 | 5.7 | 1.6 | | | | | 9.0 | 5.0 | **9.0** |
| DP10+A11 | 11 | 0.45 | 0.59 | 3.21 | 1.44 | 1.89 | | From DP9 | | 250 | 0.5 | 3.8 | 1.1 | | | | | 14.3 | 5.0 | **14.3** |
| A12 | 12 | 0.45 | 0.59 | 3.25 | 1.46 | 1.92 | 100 | 2.0 | 9.5 | 880 | 0.5 | 4.9 | 3.0 | | | | | 12.5 | 5.0 | **12.5** |
| DP9+DP12 | 12A | 0.44 | 0.59 | 9.91 | 4.33 | 5.80 | | From DP8 | | | | | | 30 | 0.5 | 5.8 | 0.1 | 20.3 | 5.0 | **20.3** |
| A13 | 13 | 0.45 | 0.59 | 1.22 | 0.55 | 0.72 | 100 | 2.0 | 9.5 | 580 | 0.5 | 4.9 | 2.0 | | | | | 11.4 | 5.0 | **11.4** |
| DP12A+DP11+DP13 | 13A | 0.44 | 0.59 | 14.34 | 6.32 | 8.41 | | From DP12A | | | | | | 206 | 0.5 | 5.8 | 0.6 | 20.9 | 5.0 | **20.9** |
| A14 | | 0.08 | 0.35 | 0.97 | 0.08 | 0.34 | 100 | 1.0 | 18.7 | 280 | 2.8 | 5.8 | 0.8 | | | | | 19.5 | 5.0 | **19.5** |
| DP5+DP13A+A14 | 14 | 0.43 | 0.58 | 18.07 | 7.80 | 10.56 | | From DP13A | | | | | | 150 | 0.5 | 5.8 | 0.4 | 21.3 | 5.0 | **21.3** |
| A15 | 15 | 0.12 | 0.37 | 2.39 | 0.28 | 0.89 | 25 | 18.0 | 3.4 | 72 | 10.0 | 14.0 | 0.1 | | | | | 3.5 | 5.0 | **5.0** |
| A16 | 16 | 0.08 | 0.35 | 0.53 | 0.04 | 0.19 | 25 | 2.1 | 7.3 | 311 | 3.0 | 5.8 | 0.9 | | | | | 8.2 | 5.0 | **8.2** |

| B-BASINS | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| OSB1 | 1 | 0.90 | 0.96 | 2.09 | 1.88 | 2.01 | 40 | 2.0 | 1.9 | 362 | 1.0 | 6.1 | 1.0 | | | | | 2.9 | 5.0 | **5.0** |
| B1 | | 0.81 | 0.88 | 2.15 | 1.74 | 1.90 | 60 | 2.3 | 3.2 | 511 | 3.3 | 6.6 | 1.3 | | | | | 4.5 | 5.0 | **5.0** |
| DP1+B1 | 1A | 0.85 | 0.92 | 4.25 | 3.63 | 3.90 | From DP1 | | | | | | | 250 | 1.0 | 7.2 | 0.6 | 5.6 | 5.0 | **5.6** |
| B2 | 2 | 0.81 | 0.88 | 1.11 | 0.90 | 0.98 | 40 | 4.0 | 2.2 | 308 | 4.0 | 7.0 | 0.7 | | | | | 2.9 | 5.0 | **5.0** |
| B3 | 3 | 0.90 | 0.96 | 0.39 | 0.35 | 0.38 | 20 | 2.0 | 1.3 | 199 | 2.0 | 7.0 | 0.5 | | | | | 1.8 | 5.0 | **5.0** |
| B4 | 4 | 0.81 | 0.88 | 1.54 | 1.25 | 1.36 | 50 | 3.5 | 2.5 | 326 | 3.3 | 6.3 | 0.9 | | | | | 3.4 | 5.0 | **5.0** |
| DP1A+DP2+DP3+DP4 | 4A | 0.84 | 0.91 | 7.29 | 6.13 | 6.61 | From DP1A | | | | | | | 195 | 1.0 | 7.2 | 0.5 | 6.0 | 5.0 | **6.0** |
| B5 | 5 | 0.81 | 0.88 | 2.13 | 1.73 | 1.88 | 60 | 3.5 | 2.8 | 286 | 2.6 | 5.5 | 0.9 | | | | | 3.6 | 5.0 | **5.0** |
| DP4A+DP5 | 5A | 0.83 | 0.90 | 9.42 | 7.86 | 8.49 | From DP4A | | | | | | | 245 | 1.0 | 7.2 | 0.6 | 6.6 | 5.0 | **6.6** |
| B6 | 6 | 0.81 | 0.88 | 1.75 | 1.42 | 1.54 | 50 | 3.9 | 2.4 | 388 | 3.6 | 6.9 | 0.9 | | | | | 3.4 | 5.0 | **5.0** |
| B7 | | 0.90 | 0.96 | 0.90 | 0.81 | 0.86 | 40 | 2.0 | 1.9 | 762 | 2.3 | 7.0 | 1.8 | | | | | 3.7 | 5.0 | **5.0** |
| DP6+B7 | 7 | 0.84 | 0.91 | 2.65 | 2.23 | 2.40 | From DP6 | | | | | | | 20 | 1.0 | 7.2 | 0.0 | 5.0 | 5.0 | **5.0** |
| B8 | | 0.90 | 0.96 | 0.72 | 0.65 | 0.69 | 40 | 1.0 | 2.4 | 544 | 2.8 | 7.0 | 1.3 | | | | | 3.7 | 5.0 | **5.0** |
| DP7+DP8 | 8 | 0.85 | 0.92 | 3.37 | 2.88 | 3.10 | From DP7 | | | | | | | 50 | 1.0 | 7.2 | 0.1 | 5.2 | 5.0 | **5.2** |
| DP8+DP5A | 8A | 0.84 | 0.91 | 12.79 | 10.73 | 11.59 | From DP5A | | | | | | | 115 | 1.0 | 7.2 | 0.3 | 6.9 | 5.0 | **6.9** |
| B9 | | 0.08 | 0.35 | 1.42 | 0.11 | 0.50 | 30 | 13.0 | 4.4 | 259 | 20.0 | 14.0 | 0.3 | | | | | 4.8 | 5.0 | **5.0** |
| DP8A+B9 | 9 | 0.76 | 0.85 | 14.21 | 10.85 | 12.08 | From DP8A | | | | | | | 46 | 1.0 | 7.2 | 0.1 | 7.0 | 5.0 | **7.0** |

| C-BASINS | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| OSC1 | C1 | 0.90 | 0.96 | 0.56 | 0.50 | 0.53 | 40 | 2.5 | 1.7 | 165 | 2.0 | 5.2 | 0.5 | | | | | 2.3 | 5.0 | **5.0** |
| C1 | | 0.90 | 0.96 | 0.27 | 0.25 | 0.26 | 40 | 2.5 | 1.7 | 193 | 2.0 | 5.2 | 0.6 | | | | | 2.4 | 5.0 | **5.0** |
| DPC1+C1 | 1 | 0.90 | 0.96 | 0.83 | 0.75 | 0.80 | From OSC1 | | | 185 | 2.0 | 5.2 | 0.5 | | | | | 5.5 | 5.0 | **5.5** |
| C2 | | 0.81 | 0.88 | 2.24 | 1.82 | 1.97 | 60 | 3.2 | 2.9 | 412 | 3.0 | 6.5 | 1.1 | | | | | 3.9 | 5.0 | **5.0** |
| DP1+C2 | 2 | 1.12 | 1.21 | 2.52 | 2.81 | 3.03 | From DP1 | | | | | | | 260 | 1.0 | 7.2 | 0.6 | 6.1 | 5.0 | **6.1** |
| C3 | 3 | 0.81 | 0.88 | 1.32 | 1.07 | 1.16 | 70 | 2.6 | 3.3 | 496 | 2.7 | 5.8 | 1.4 | | | | | 4.7 | 5.0 | **5.0** |

**PROJECT INFORMATION**

**PROJECT:** Commons at Falcon Field
**PROJECT NO:** 21604-00
**DESIGN BY:** KGV
**REV. BY:** TDM
**AGENCY:** El Paso County
**REPORT TYPE:** Preliminary
**DATE:** 3/17/2024

**RATIONAL METHOD CALCULATIONS FOR STORM WATER RUNOFF**

**DEVELOPED TIME OF CONCENTRATION**

| SUB-BASIN DATA | | | | | | | INITIAL/OVERLAND TIME ($t_i$) | | | TRAVEL TIME ($t_t$) | | | | PIPE TRAVEL TIME ($t_t$) | | | | TIME OF CONCENTRATION | | FINAL $t_c$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BASIN | DESIGN PT: | $C_5$ | $C_{100}$ | AREA | COMP | | LENGTH | SLOPE | $t_i$ | LENGTH | SLOPE | VEL. | $t_t$ | LENGTH | SLOPE | VEL. | $t_t$ | COMP. | MINIMUM | |
| | | | | Ac | | | Ft | % | Min | Ft | % | FPS | Min | Ft | % | FPS | Min | $t_c$ | $t_c$ | Min |
| C4 | | 0.81 | 0.88 | 1.51 | 1.22 | 1.33 | 60 | 4.8 | 2.5 | 371 | 4.7 | 7.5 | 0.8 | | | | | 3.3 | 5.0 | **5.0** |
| DP2+DP3+C4 | 4 | 0.95 | 1.03 | 5.34 | 5.10 | 5.52 | From DP2 | | | | | | | 286 | 1.0 | 7.2 | 0.7 | 6.8 | 5.0 | **6.8** |
| OSC2 | | 0.19 | 0.43 | 2.98 | 0.56 | 1.28 | 50 | 2.5 | 8.9 | 575 | 2.0 | 5.2 | 1.8 | | | | | 6.8 | 5.0 | **6.8** |
| C5 | | 0.90 | 0.96 | 0.88 | 0.79 | 0.84 | 40 | 2.0 | 1.9 | 938 | 2.0 | 5.2 | 3.0 | | | | | 4.9 | 5.0 | **5.0** |
| OSC2+C5 | 5 | 0.35 | 0.55 | 3.86 | 1.35 | 2.13 | From OSC2 | | | 100 | 2.0 | 5.2 | 0.3 | | | | | 7.2 | 5.0 | **7.2** |
| C6 | | 0.90 | 0.96 | 0.66 | 0.59 | 0.63 | 40 | 2.0 | 1.9 | 703 | 2.0 | 5.2 | 2.3 | | | | | 4.1 | 5.0 | **5.0** |
| DP5+C6 | 6 | 0.43 | 0.61 | 4.52 | 1.94 | 2.76 | From DP5 | | | | | | | 58 | 1.0 | 7.2 | 0.1 | 5.1 | 5.0 | **5.1** |
| DP4+DP6 | 6A | 0.71 | 0.84 | 9.86 | 7.04 | 8.28 | From DP4 | | | | | | | 430 | 1.0 | 7.2 | 1.0 | 7.8 | 5.0 | **7.8** |

| BASIN | DESIGN PT: | $C_5$ | $C_{100}$ | AREA | COMP | | LENGTH | SLOPE | $t_i$ | LENGTH | SLOPE | VEL. | $t_t$ | LENGTH | SLOPE | VEL. | $t_t$ | COMP. $t_c$ | MINIMUM $t_c$ | FINAL $t_c$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **D-BASINS** | | | | | | | | | | | | | | | | | | | | |
| D1 | 1 | 0.35 | 0.52 | 1.35 | 0.46 | 0.70 | 70 | 2.7 | 8.5 | 594 | 2.6 | 9.6 | 1.0 | | | | | 9.5 | 5.0 | **9.5** |
| D2 | | 0.38 | 0.54 | 1.93 | 0.73 | 1.05 | 60 | 2.7 | 7.5 | 559 | 1.2 | 7.2 | 1.3 | | | | | 8.8 | 5.0 | **8.8** |
| DP1+D2 | 2 | 0.36 | 0.53 | 3.28 | 1.19 | 1.75 | From DP1 | | | 430 | 1.2 | 7.2 | 1.0 | | | | | 10.5 | 5.0 | **10.5** |
| D3 | 3 | 0.40 | 0.56 | 0.91 | 0.36 | 0.51 | 70 | 1.2 | 10.3 | 592 | 1.4 | 6.4 | 1.5 | | | | | 11.9 | 5.0 | **11.9** |
| DP6A(C)+DP2+DP3 | 3A | 0.61 | 0.75 | 14.05 | 8.60 | 10.53 | From DP3 | | | | | | | 83 | 1.0 | 7.2 | 0.2 | 12.1 | 5.0 | **12.1** |
| D4 | 4 | 0.36 | 0.53 | 2.75 | 1.00 | 1.47 | 70 | 2.3 | 8.8 | 475 | 3.3 | 8.8 | 0.9 | | | | | 9.7 | 5.0 | **9.7** |
| D5 | | 0.45 | 0.59 | 0.65 | 0.29 | 0.39 | 50 | 1.5 | 7.5 | 386 | 1.9 | 7.2 | 0.9 | | | | | 8.4 | 5.0 | **8.4** |
| DP4+D5 | 5 | 0.38 | 0.55 | 3.40 | 1.30 | 1.86 | From DP4 | | | 30 | 1.9 | 7.2 | 0.1 | | | | | 9.7 | 5.0 | **9.7** |
| D6 | 6 | 0.45 | 0.59 | 2.87 | 1.29 | 1.69 | 60 | 3.0 | 6.5 | 1520 | 3.2 | 10.1 | 2.5 | | | | | 9.0 | 5.0 | **9.0** |
| D7 | | 0.74 | 0.83 | 0.70 | 0.52 | 0.58 | 100 | 2.0 | 5.4 | 587 | 3.8 | 11.6 | 0.8 | | | | | 6.2 | 5.0 | **6.2** |
| DP5+DP6+D7 | 7 | 0.45 | 0.59 | 6.98 | 3.11 | 4.13 | From DP5 | | | 307 | 3.8 | 11.6 | 0.4 | | | | | 10.2 | 5.0 | **10.2** |
| D8 | 8 | 0.45 | 0.59 | 0.42 | 0.19 | 0.25 | 80 | 1.5 | 9.5 | 362 | 1.5 | 6.4 | 0.9 | | | | | 10.4 | 5.0 | **10.4** |
| D9 | 9 | 0.45 | 0.59 | 0.29 | 0.13 | 0.17 | 80 | 4.0 | 6.8 | 229 | 5.5 | 12.2 | 0.3 | | | | | 7.2 | 5.0 | **7.2** |
| D10 | 10 | 0.45 | 0.59 | 1.31 | 0.59 | 0.78 | 70 | 3.9 | 6.5 | 479 | 4.5 | 11.6 | 0.7 | | | | | 7.2 | 5.0 | **7.2** |
| D11 | | 0.90 | 0.96 | 0.62 | 0.56 | 0.59 | 40 | 3.9 | 1.5 | 429 | 4.1 | 11.6 | 0.6 | | | | | 2.1 | 5.0 | **5.0** |
| DP10+D11 | 11 | 0.59 | 0.71 | 1.93 | 1.15 | 1.37 | From DP10 | | | | | | | 50 | 1.0 | 7.2 | 0.1 | 7.3 | 5.0 | **7.3** |
| D12 | | 0.08 | 0.35 | 1.52 | 0.12 | 0.53 | 80 | 25.0 | 5.8 | 166 | 25.0 | 4.0 | 0.7 | | | | | 6.5 | 5.0 | **6.5** |
| DP3A+DP7+DP8+DP9+DP11+D12 | 12 | 0.53 | 0.67 | 25.18 | 13.29 | 16.98 | From DP7 | | | | | | | 150 | 1.0 | 7.2 | 0.3 | 10.5 | 5.0 | **10.5** |
| OSD1 | D1 | 0.08 | 0.35 | 2.94 | 0.24 | 1.03 | 40 | 2.5 | 8.9 | 165 | 2.0 | 7.0 | 0.4 | | | | | 9.3 | 5.0 | **9.3** |
| D13 | | 0.10 | 0.36 | 1.45 | 0.14 | 0.52 | 80 | 5.9 | 9.3 | 1093 | 2.7 | 5.4 | 3.4 | | | | | 12.6 | 5.0 | **12.6** |
| DPD2+D13 | 13 | 0.09 | 0.35 | 4.39 | 0.38 | 1.56 | From D13 | | | 430 | 1.2 | 7.2 | 1.0 | | | | | 13.6 | 5.0 | **13.6** |
| D14 | 14 | 0.08 | 0.35 | 0.86 | 0.07 | 0.30 | 80 | 15.0 | 6.9 | 183 | 6.5 | 6.8 | 0.4 | | | | | 7.4 | 5.0 | **7.4** |

## PROJECT INFORMATION

| | |
|---|---|
| **PROJECT:** | Commons at Falcon Field |
| **PROJECT NO:** | 21604-00 |
| **DESIGN BY:** | KGV |
| **REV. BY:** | TDM |
| **AGENCY:** | El Paso County |
| **REPORT TYPE:** | Preliminary |
| **DATE:** | 3/17/2024 |

Drexel, Barrell & Co.

## RATIONAL METHOD CALCULATIONS FOR STORM WATER RUNOFF

**DEVELOPED RUNOFF 5 YR STORM P1= 1.50**

| | | | DIRECT RUNOFF | | | | |
|---|---|---|---|---|---|---|---|
| **BASIN (S)** | **DESIGN POINT** | **AREA (AC)** | **RUNOFF COEFF** | **$t_c$ (MIN)** | **C * A** | **I (IN/HR)** | **Q (CFS)** |
| **A-BASINS** | | | | | | | |
| A1 | 1 | 0.30 | 0.74 | 5.0 | 0.22 | 5.17 | **1.1** |
| A2 | 2 | 0.64 | 0.56 | 5.0 | 0.36 | 5.17 | **1.9** |
| A3 | 3 | 1.34 | 0.28 | 11.8 | 0.38 | 3.88 | **1.5** |
| A4 | | 0.25 | 0.90 | 5.0 | 0.23 | 5.17 | **1.2** |
| DP1+DP2+DP3+A4 | 4 | 2.53 | 0.47 | 12.1 | 1.19 | 3.85 | **4.6** |
| A5 | | 0.23 | 0.90 | 5.0 | 0.21 | 5.17 | **1.1** |
| DP4+A5 | 5 | 2.76 | 0.51 | 12.3 | 1.40 | 3.82 | **5.3** |
| A6 | 6 | 0.60 | 0.74 | 5.7 | 0.44 | 4.98 | **2.2** |
| A7 | | 2.85 | 0.34 | 17.1 | 0.98 | 3.32 | **3.3** |
| DP6+A7 | 7 | 3.45 | 0.41 | 17.1 | 1.42 | 3.32 | **4.7** |
| A8 | 8 | 1.74 | 0.45 | 13.2 | 0.78 | 3.71 | **2.9** |
| A9 | | 1.47 | 0.45 | 13.5 | 0.66 | 3.68 | **2.4** |
| DP7+DP8+A9 | 9 | 6.66 | 0.43 | 20.2 | 2.87 | 3.07 | **8.8** |
| A10 | 10 | 0.65 | 0.45 | 7.1 | 0.29 | 4.64 | **1.4** |
| A11 | | 2.55 | 0.45 | 9.0 | 1.15 | 4.28 | **4.9** |
| DP10+A11 | 11 | 3.21 | 0.45 | 14.3 | 1.44 | 3.59 | **5.2** |
| A12 | 12 | 3.25 | 0.45 | 12.5 | 1.46 | 3.80 | **5.6** |
| DP9+DP12 | 12A | 9.91 | 0.44 | 20.3 | 4.33 | 3.07 | **13.3** |
| A13 | 13 | 1.22 | 0.45 | 11.4 | 0.55 | 3.93 | **2.2** |
| DP12A+DP11+DP13 | 13A | 14.34 | 0.44 | 20.9 | 6.32 | 3.02 | **19.1** |
| A14 | | 0.97 | 0.08 | 19.5 | 0.08 | 3.13 | **0.2** |
| DP5+DP13A+A14 | 14 | 18.07 | 0.43 | 21.3 | 7.80 | 2.99 | **23.3** |
| A15 | 15 | 2.39 | 0.12 | 5.0 | 0.28 | 5.17 | **1.4** |
| A16 | 16 | 0.53 | 0.08 | 8.2 | 0.04 | 4.43 | **0.2** |
| **B-BASINS** | | | | | | | |
| OSB1 | 1 | 2.09 | 0.90 | 5.0 | 1.88 | 5.17 | **9.7** |
| B1 | | 2.15 | 0.81 | 5.0 | 1.74 | 5.17 | **9.0** |
| DP1+B1 | 1A | 4.25 | 0.85 | 5.6 | 3.63 | 5.00 | **18.2** |
| B2 | 2 | 1.11 | 0.81 | 5.0 | 0.90 | 5.17 | **4.6** |
| B3 | 3 | 0.39 | 0.90 | 5.0 | 0.35 | 5.17 | **1.8** |
| B4 | 4 | 1.54 | 0.81 | 5.0 | 1.25 | 5.17 | **6.5** |
| DP1A+DP2+DP3+DP4 | 4A | 7.29 | 0.84 | 6.0 | 6.13 | 4.89 | **30.0** |
| B5 | 5 | 2.13 | 0.81 | 5.0 | 1.73 | 5.17 | **8.9** |
| DP4A+DP5 | 5A | 9.42 | 0.83 | 6.6 | 7.86 | 4.75 | **37.3** |

## PROJECT INFORMATION

| | |
|---|---|
| **PROJECT:** | Commons at Falcon Field |
| **PROJECT NO:** | 21604-00 |
| **DESIGN BY:** | KGV |
| **REV. BY:** | TDM |
| **AGENCY:** | El Paso County |
| **REPORT TYPE:** | Preliminary |
| **DATE:** | 3/17/2024 |

Drexel, Barrell & Co.

## RATIONAL METHOD CALCULATIONS FOR STORM WATER RUNOFF

**DEVELOPED RUNOFF 5 YR STORM P1= 1.50**

| | | | DIRECT RUNOFF | | | | |
|---|---|---|---|---|---|---|---|
| BASIN (S) | DESIGN POINT | AREA (AC) | RUNOFF COEFF | $t_c$ (MIN) | C * A | I (IN/HR) | Q (CFS) |
| B6 | 6 | 1.75 | 0.81 | 5.0 | 1.42 | 5.17 | **7.3** |
| B7 | | 0.90 | 0.90 | 5.0 | 0.81 | 5.17 | **4.2** |
| DP6+B7 | 7 | 2.65 | 0.84 | 5.0 | 2.23 | 5.16 | **11.5** |
| B8 | | 0.72 | 0.90 | 5.0 | 0.65 | 5.17 | **3.4** |
| DP7+DP8 | 8 | 3.37 | 0.85 | 5.2 | 2.88 | 5.12 | **14.7** |
| DP8+DP5A | 8A | 12.79 | 0.84 | 6.9 | 10.73 | 4.69 | **50.4** |
| B9 | | 1.42 | 0.08 | 5.0 | 0.11 | 5.17 | **0.6** |
| DP8A+B9 | 9 | 14.21 | 0.76 | 7.0 | 10.85 | 4.67 | **50.7** |
| **C-BASINS** | | | | | | | |
| OSC1 | C1 | 0.56 | 0.90 | 5.0 | 0.50 | 5.17 | **2.6** |
| C1 | | 0.27 | 0.90 | 5.0 | 0.25 | 5.17 | **1.3** |
| DPC1+C1 | 1 | 0.83 | 0.90 | 5.5 | 0.75 | 5.03 | **3.8** |
| C2 | | 2.24 | 0.81 | 5.0 | 1.82 | 5.17 | **9.4** |
| DP1+C2 | 2 | 2.52 | 1.12 | 6.1 | 2.81 | 4.87 | **13.7** |
| C3 | 3 | 1.32 | 0.81 | 5.0 | 1.07 | 5.17 | **5.5** |
| C4 | | 1.51 | 0.81 | 5.0 | 1.22 | 5.17 | **6.3** |
| DP2+DP3+C4 | 4 | 5.34 | 0.95 | 6.8 | 5.10 | 4.72 | **24.0** |
| OSC2 | | 2.98 | 0.19 | 6.8 | 0.56 | 4.70 | **2.6** |
| C5 | | 0.88 | 0.90 | 5.0 | 0.79 | 5.17 | **4.1** |
| OSC2+C5 | 5 | 3.86 | 0.35 | 7.2 | 1.35 | 4.63 | **6.3** |
| C6 | | 0.66 | 0.90 | 5.0 | 0.59 | 5.17 | **3.1** |
| DP5+C6 | 6 | 4.52 | 0.43 | 5.1 | 1.94 | 5.13 | **10.0** |
| DP4+DP6 | 6A | 9.86 | 0.71 | 7.8 | 7.04 | 4.51 | **31.8** |
| **D-BASINS** | | | | | | | |
| D1 | 1 | 1.35 | 0.35 | 9.5 | 0.46 | 4.20 | **2.0** |
| D2 | | 1.93 | 0.38 | 8.8 | 0.73 | 4.32 | **3.1** |
| DP1+D2 | 2 | 3.28 | 0.36 | 10.5 | 1.19 | 4.06 | **4.8** |
| D3 | 3 | 0.91 | 0.40 | 11.9 | 0.36 | 3.87 | **1.4** |
| DP6A(C)+DP2+DP3 | 3A | 14.05 | 0.61 | 12.1 | 8.60 | 3.85 | **33.1** |
| D4 | 4 | 2.75 | 0.36 | 9.7 | 1.00 | 4.18 | **4.2** |
| D5 | | 0.65 | 0.45 | 8.4 | 0.29 | 4.39 | **1.3** |
| DP4+D5 | 5 | 3.40 | 0.38 | 9.7 | 1.30 | 4.17 | **5.4** |

## PROJECT INFORMATION

Drexel, Barrell & Co.

| | |
|---|---|
| PROJECT: | Commons at Falcon Field |
| PROJECT NO: | 21604-00 |
| DESIGN BY: | KGV |
| REV. BY: | TDM |
| AGENCY: | El Paso County |
| REPORT TYPE: | Preliminary |
| DATE: | 3/17/2024 |

## RATIONAL METHOD CALCULATIONS FOR STORM WATER RUNOFF

**DEVELOPED RUNOFF 5 YR STORM P1= 1.50**

| | | | DIRECT RUNOFF | | | | |
|---|---|---|---|---|---|---|---|
| BASIN (S) | DESIGN POINT | AREA (AC) | RUNOFF COEFF | $t_c$ (MIN) | C * A | I (IN/HR) | Q (CFS) |
| D6 | 6 | 2.87 | 0.45 | 9.0 | 1.29 | 4.28 | **5.5** |
| D7 | | 0.70 | 0.74 | 6.2 | 0.52 | 4.84 | **2.5** |
| DP5+DP6+D7 | 7 | 6.98 | 0.45 | 10.2 | 3.11 | 4.10 | **12.7** |
| D8 | 8 | 0.42 | 0.45 | 10.4 | 0.19 | 4.06 | **0.8** |
| D9 | 9 | 0.29 | 0.45 | 7.2 | 0.13 | 4.63 | **0.6** |
| D10 | 10 | 1.31 | 0.45 | 7.2 | 0.59 | 4.63 | **2.7** |
| D11 | | 0.62 | 0.90 | 5.0 | 0.56 | 5.17 | **2.9** |
| DP10+D11 | 11 | 1.93 | 0.59 | 7.3 | 1.15 | 4.61 | **5.3** |
| D12 | | 1.52 | 0.08 | 6.5 | 0.12 | 4.77 | **0.6** |
| DP3A+DP7+DP8+DP9+DP11+D12 | 12 | 25.18 | 0.53 | 10.5 | 13.29 | 4.05 | **53.8** |
| OSD1 | D1 | 2.94 | 0.08 | 9.3 | 0.24 | 4.24 | **1.0** |
| D13 | | 1.45 | 0.10 | 12.6 | 0.14 | 3.78 | **0.5** |
| DPD2+D13 | 13 | 4.39 | 0.09 | 13.6 | 0.38 | 3.66 | **1.4** |
| D14 | 14 | 0.86 | 0.08 | 7.4 | 0.07 | 4.59 | **0.3** |

## PROJECT INFORMATION

Drexel, Barrell & Co.

**PROJECT:** Commons at Falcon Field
**PROJECT NO:** 21604-00
**DESIGN BY:** KGV
**REV. BY:** TDM
**AGENCY:** El Paso County
**REPORT TYPE:** Preliminary
**DATE:** 3/17/2024

## RATIONAL METHOD CALCULATIONS FOR STORM WATER RUNOFF

**DEVELOPED RUNOFF 100 YR STORM P1= 2.52**

| | | | DIRECT RUNOFF | | | | |
|---|---|---|---|---|---|---|---|
| BASIN (S) | DESIGN POINT | AREA (AC) | RUNOFF COEFF | $t_c$ (MIN) | C * A | I (IN/HR) | Q (CFS) |
| A-BASINS | | | | | | | |
| A1 | 1 | 0.30 | 0.84 | 5.0 | 0.25 | 8.68 | **2.2** |
| A2 | 2 | 0.64 | 0.70 | 5.0 | 0.45 | 8.68 | **3.9** |
| A3 | 3 | 1.34 | 0.48 | 11.8 | 0.65 | 6.52 | **4.2** |
| A4 | | 0.25 | 0.96 | 5.0 | 0.24 | 8.68 | **2.1** |
| DP1+DP2+DP3+A4 | 4 | 2.53 | 0.63 | 12.1 | 1.59 | 6.46 | **10.2** |
| A5 | | 0.23 | 0.96 | 5.0 | 0.22 | 8.68 | **1.9** |
| DP4+A5 | 5 | 2.76 | 0.65 | 12.3 | 1.81 | 6.42 | **11.6** |
| A6 | 6 | 0.60 | 0.84 | 5.7 | 0.50 | 8.36 | **4.2** |
| A7 | | 2.85 | 0.52 | 17.1 | 1.49 | 5.57 | **8.3** |
| DP6+A7 | 7 | 3.45 | 0.58 | 17.1 | 1.99 | 5.57 | **11.1** |
| A8 | 8 | 1.74 | 0.59 | 13.2 | 1.03 | 6.23 | **6.4** |
| A9 | | 1.47 | 0.59 | 13.5 | 0.86 | 6.18 | **5.3** |
| DP7+DP8+A9 | 9 | 6.66 | 0.58 | 20.2 | 3.88 | 5.16 | **20.0** |
| A10 | 10 | 0.65 | 0.59 | 7.1 | 0.39 | 7.79 | **3.0** |
| A11 | | 2.55 | 0.59 | 9.0 | 1.51 | 7.19 | **10.8** |
| DP10+A11 | 11 | 3.21 | 0.59 | 14.3 | 1.89 | 6.03 | **11.4** |
| A12 | 12 | 3.25 | 0.59 | 12.5 | 1.92 | 6.38 | **12.2** |
| DP9+DP12 | 12A | 9.91 | 0.59 | 20.3 | 5.80 | 5.15 | **29.9** |
| A13 | 13 | 1.22 | 0.59 | 11.4 | 0.72 | 6.60 | **4.8** |
| DP12A+DP11+DP13 | 13A | 14.34 | 0.59 | 20.9 | 8.41 | 5.08 | **42.7** |
| A14 | | 0.97 | 0.35 | 19.5 | 0.34 | 5.25 | **1.8** |
| DP5+DP13A+A14 | 14 | 18.07 | 0.58 | 21.3 | 10.56 | 5.02 | **53.1** |
| A15 | 15 | 2.39 | 0.37 | 5.0 | 0.89 | 8.68 | **7.7** |
| A16 | 16 | 0.53 | 0.35 | 8.2 | 0.19 | 7.43 | **1.4** |
| B-BASINS | | | | | | | |
| OSB1 | 1 | 2.09 | 0.96 | 5.0 | 2.01 | 8.68 | **17.4** |
| B1 | | 2.15 | 0.88 | 5.0 | 1.90 | 8.68 | **16.4** |
| DP1+B1 | 1A | 4.25 | 0.92 | 5.6 | 3.90 | 8.40 | **32.8** |
| B2 | 2 | 1.11 | 0.88 | 5.0 | 0.98 | 8.68 | **8.5** |
| B3 | 3 | 0.39 | 0.96 | 5.0 | 0.38 | 8.68 | **3.3** |
| B4 | 4 | 1.54 | 0.88 | 5.0 | 1.36 | 8.68 | **11.8** |
| DP1A+DP2+DP3+DP4 | 4A | 7.29 | 0.91 | 6.0 | 6.61 | 8.21 | **54.3** |
| B5 | 5 | 2.13 | 0.88 | 5.0 | 1.88 | 8.68 | **16.3** |
| DP4A+DP5 | 5A | 9.42 | 0.90 | 6.6 | 8.49 | 7.98 | **67.8** |

## PROJECT INFORMATION

Drexel, Barrell & Co.

| | |
|---|---|
| PROJECT: | Commons at Falcon Field |
| PROJECT NO: | 21604-00 |
| DESIGN BY: | KGV |
| REV. BY: | TDM |
| AGENCY: | El Paso County |
| REPORT TYPE: | Preliminary |
| DATE: | 3/17/2024 |

## RATIONAL METHOD CALCULATIONS FOR STORM WATER RUNOFF

**DEVELOPED RUNOFF 100 YR STORM P1= 2.52**

| BASIN (S) | DESIGN POINT | AREA (AC) | DIRECT RUNOFF<br>RUNOFF COEFF | $t_c$ (MIN) | C * A | I (IN/HR) | Q (CFS) |
|---|---|---|---|---|---|---|---|
| B6 | 6 | 1.75 | 0.88 | 5.0 | 1.54 | 8.68 | **13.4** |
| B7 | | 0.90 | 0.96 | 5.0 | 0.86 | 8.68 | **7.5** |
| DP6+B7 | 7 | 2.65 | 0.91 | 5.0 | 2.40 | 8.66 | **20.8** |
| B8 | | 0.72 | 0.96 | 5.0 | 0.69 | 8.68 | **6.0** |
| DP7+DP8 | 8 | 3.37 | 0.92 | 5.2 | 3.10 | 8.60 | **26.6** |
| DP8+DP5A | 8A | 12.79 | 0.91 | 6.9 | 11.59 | 7.88 | **91.3** |
| B9 | | 1.42 | 0.35 | 5.0 | 0.50 | 8.68 | **4.3** |
| DP8A+B9 | 9 | 14.21 | 0.85 | 7.0 | 12.08 | 7.84 | **94.8** |
| **C-BASINS** | | | | | | | |
| OSC1 | C1 | 0.56 | 0.96 | 5.0 | 0.53 | 8.68 | **4.6** |
| C1 | | 0.27 | 0.96 | 5.0 | 0.26 | 8.68 | **2.3** |
| DPC1+C1 | 1 | 0.83 | 0.96 | 5.5 | 0.80 | 8.44 | **6.7** |
| C2 | | 2.24 | 0.88 | 5.0 | 1.97 | 8.68 | **17.1** |
| DP1+C2 | 2 | 2.52 | 1.21 | 6.1 | 3.03 | 8.18 | **24.8** |
| C3 | 3 | 1.32 | 0.88 | 5.0 | 1.16 | 8.68 | **10.1** |
| C4 | | 1.51 | 0.88 | 5.0 | 1.33 | 8.68 | **11.5** |
| DP2+DP3+C4 | 4 | 5.34 | 1.03 | 6.8 | 5.52 | 7.92 | **43.7** |
| OSC2 | | 2.98 | 0.43 | 6.8 | 1.28 | 7.89 | **10.1** |
| C5 | | 0.88 | 0.96 | 5.0 | 0.84 | 8.68 | **7.3** |
| OSC2+C5 | 5 | 3.86 | 0.55 | 7.2 | 2.13 | 7.77 | **16.5** |
| C6 | | 0.66 | 0.96 | 5.0 | 0.63 | 8.68 | **5.5** |
| DP5+C6 | 6 | 4.52 | 0.61 | 5.1 | 2.76 | 8.61 | **23.8** |
| DP4+DP6 | 6A | 9.86 | 0.84 | 7.8 | 8.28 | 7.57 | **62.7** |
| **D-BASINS** | | | | | | | |
| D1 | 1 | 1.35 | 0.52 | 9.5 | 0.70 | 7.06 | **5.0** |
| D2 | | 1.93 | 0.54 | 8.8 | 1.05 | 7.25 | **7.6** |
| DP1+D2 | 2 | 3.28 | 0.53 | 10.5 | 1.75 | 6.81 | **11.9** |
| D3 | 3 | 0.91 | 0.56 | 11.9 | 0.51 | 6.50 | **3.3** |
| DP6A(C)+DP2+DP3 | 3A | 14.05 | 0.75 | 12.1 | 10.53 | 6.46 | **68.0** |
| D4 | 4 | 2.75 | 0.53 | 9.7 | 1.47 | 7.01 | **10.3** |
| D5 | | 0.65 | 0.59 | 8.4 | 0.39 | 7.37 | **2.8** |
| DP4+D5 | 5 | 3.40 | 0.55 | 9.7 | 1.86 | 7.00 | **13.0** |
| D6 | 6 | 2.87 | 0.59 | 9.0 | 1.69 | 7.19 | **12.2** |

## PROJECT INFORMATION

Drexel, Barrell & Co.

| | |
|---|---|
| PROJECT: | Commons at Falcon Field |
| PROJECT NO: | 21604-00 |
| DESIGN BY: | KGV |
| REV. BY: | TDM |
| AGENCY: | El Paso County |
| REPORT TYPE: | Preliminary |
| DATE: | 3/17/2024 |

## RATIONAL METHOD CALCULATIONS FOR STORM WATER RUNOFF

**DEVELOPED RUNOFF 100 YR STORM P1= 2.52**

| | | | DIRECT RUNOFF | | | | |
|---|---|---|---|---|---|---|---|
| BASIN (S) | DESIGN POINT | AREA (AC) | RUNOFF COEFF | $t_c$ (MIN) | C * A | I (IN/HR) | Q (CFS) |
| D7 | | 0.70 | 0.83 | 6.2 | 0.58 | 8.12 | **4.7** |
| DP5+DP6+D7 | 7 | 6.98 | 0.59 | 10.2 | 4.13 | 6.88 | **28.4** |
| D8 | 8 | 0.42 | 0.59 | 10.4 | 0.25 | 6.82 | **1.7** |
| D9 | 9 | 0.29 | 0.59 | 7.2 | 0.17 | 7.77 | **1.3** |
| D10 | 10 | 1.31 | 0.59 | 7.2 | 0.78 | 7.78 | **6.0** |
| D11 | | 0.62 | 0.96 | 5.0 | 0.59 | 8.68 | **5.1** |
| DP10+D11 | 11 | 1.93 | 0.71 | 7.3 | 1.37 | 7.74 | **10.6** |
| D12 | | 1.52 | 0.35 | 6.5 | 0.53 | 8.01 | **4.3** |
| DP3A+DP7+DP8+DP9+DP11+D12 | 12 | 25.18 | 0.67 | 10.5 | 16.98 | 6.80 | **115.5** |
| OSD1 | D1 | 2.94 | 0.35 | 9.3 | 1.03 | 7.12 | **7.3** |
| D13 | | 1.45 | 0.36 | 12.6 | 0.52 | 6.34 | **3.3** |
| DPD2+D13 | 13 | 4.39 | 0.35 | 13.6 | 1.56 | 6.15 | **9.6** |
| D14 | 14 | 0.86 | 0.35 | 7.4 | 0.30 | 7.70 | **2.3** |

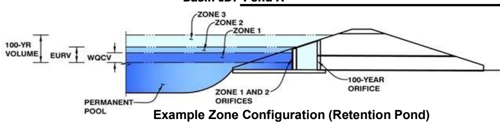
# Hydraulic Calculations

# DETENTION BASIN STAGE-STORAGE TABLE BUILDER

*MHFD-Detention, Version 4.04 (February 2021)*

**Project:** **The Commons at Falcon Field**

**Basin ID:** **Pond A**




**Example Zone Configuration (Retention Pond)**

Watershed Information

| | | |
|---|---|---|
| Selected BMP Type = | **EDB** | |
| Watershed Area = | 18.09 | acres |
| Watershed Length = | 1,191 | ft |
| Watershed Length to Centroid = | 550 | ft |
| Watershed Slope = | 0.025 | ft/ft |
| Watershed Imperviousness = | 59.00% | 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) = | 0.351 | acre-feet | | acre-feet |
| Excess Urban Runoff Volume (EURV) = | 1.289 | acre-feet | | acre-feet |
| 2-yr Runoff Volume (P1 = 1.19 in.) = | 0.932 | acre-feet | 1.19 | inches |
| 5-yr Runoff Volume (P1 = 1.5 in.) = | 1.229 | acre-feet | 1.50 | inches |
| 10-yr Runoff Volume (P1 = 1.75 in.) = | 1.466 | acre-feet | 1.75 | inches |
| 25-yr Runoff Volume (P1 = 2 in.) = | 1.795 | acre-feet | 2.00 | inches |
| 50-yr Runoff Volume (P1 = 2.25 in.) = | 2.119 | acre-feet | 2.25 | inches |
| 100-yr Runoff Volume (P1 = 2.52 in.) = | 2.519 | acre-feet | 2.52 | inches |
| 500-yr Runoff Volume (P1 = 3.49 in.) = | 3.908 | acre-feet | 3.49 | inches |
| Approximate 2-yr Detention Volume = | 0.835 | acre-feet | | |
| Approximate 5-yr Detention Volume = | 1.094 | acre-feet | | |
| Approximate 10-yr Detention Volume = | 1.325 | acre-feet | | |
| Approximate 25-yr Detention Volume = | 1.604 | acre-feet | | |
| Approximate 50-yr Detention Volume = | 1.776 | acre-feet | | |
| Approximate 100-yr Detention Volume = | 1.965 | acre-feet | | |

Define Zones and Basin Geometry

| | | |
|---|---|---|
| Zone 1 Volume (WQCV) = | 0.351 | acre-feet |
| Zone 2 Volume (EURV - Zone 1) = | 0.938 | acre-feet |
| Zone 3 Volume (100-year - Zones 1 & 2) = | 0.676 | acre-feet |
| Total Detention Basin Volume = | 1.965 | 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) |
|---|---|---|---|---|---|---|---|---|---|
| **Top of Micropool** | -- | 0.00 | -- | -- | -- | 400 | 0.009 | | |
| **6828** | -- | 0.50 | -- | -- | -- | 14,788 | 0.339 | 3,797 | 0.087 |
| **6835.5** | -- | 5.50 | -- | -- | -- | 27,694 | 0.636 | 110,002 | 2.525 |
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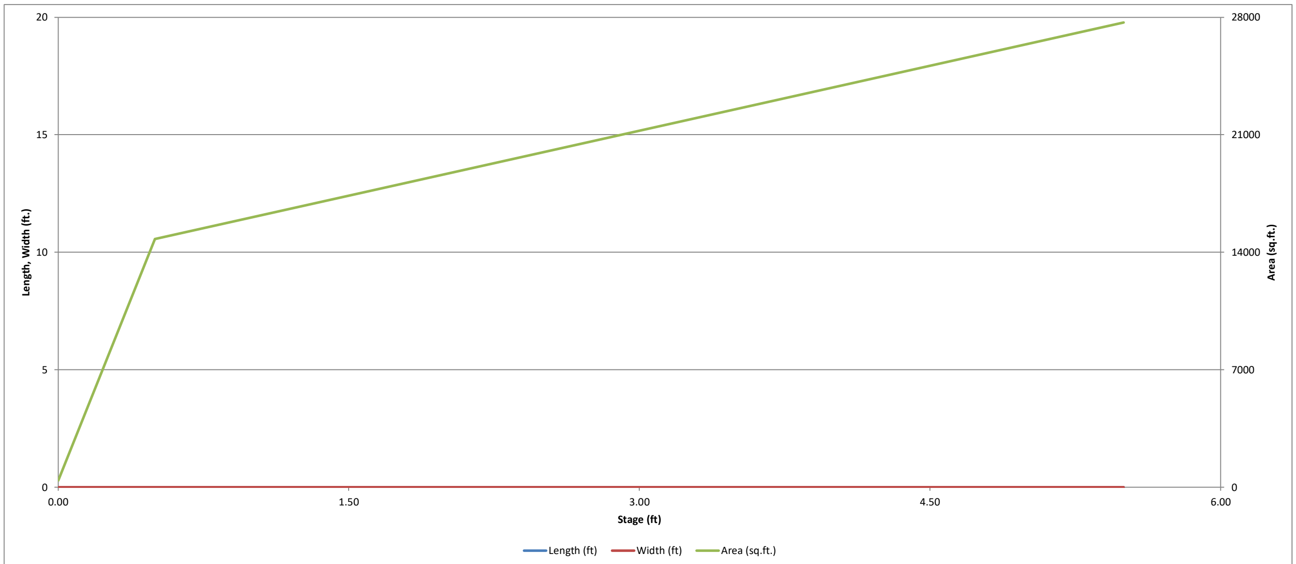
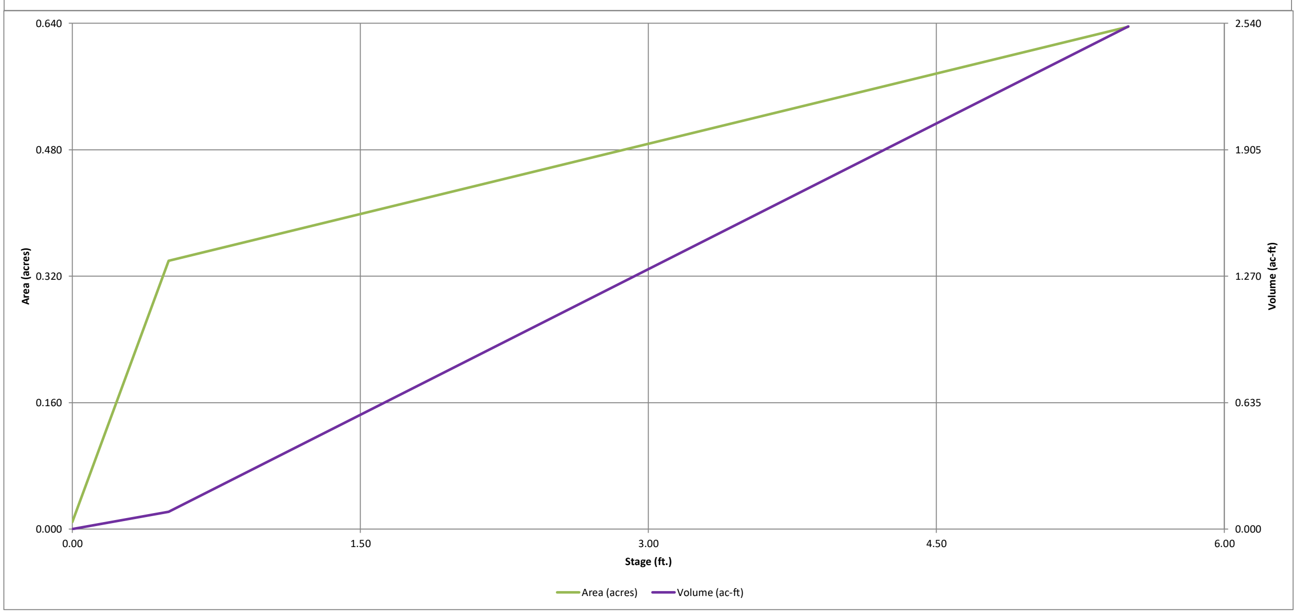
# DETENTION BASIN STAGE-STORAGE TABLE BUILDER

*MHFD-Detention, Version 4.04 (February 2021)*



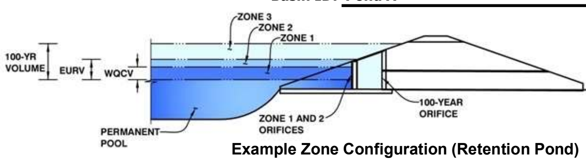



# DETENTION BASIN OUTLET STRUCTURE DESIGN

*MHFD-Detention, Version 4.04 (February 2021)*

**Project: The Commons at Falcon Field**

**Basin ID: Pond A**




**Example Zone Configuration (Retention Pond)**

| | Estimated Stage (ft) | Estimated Volume (ac-ft) | Outlet Type |
|---|---|---|---|
| Zone 1 (WQCV) | 1.24 | 0.351 | Orifice Plate |
| Zone 2 (EURV) | 3.34 | 0.938 | Orifice Plate |
| Zone 3 (100-year) | 4.58 | 0.676 | Weir&Pipe (Restrict) |
| | Total (all zones) | 1.965 | |

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

| | | | | | |
|---|---|---|---|---|---|
| Underdrain Orifice Invert Depth = | | ft (distance below the filtration media surface) | Underdrain Orifice Area = | | $ft^2$ |
| Underdrain Orifice Diameter = | | inches | Underdrain Orifice Centroid = | | feet |

Calculated Parameters for Underdrain

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

Calculated Parameters for Plate

| | | | | | |
|---|---|---|---|---|---|
| Invert 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 = | 3.34 | ft (relative to basin bottom at Stage = 0 ft) | Elliptical Half-Width = | N/A | feet |
| Orifice Plate: Orifice Vertical Spacing = | 13.00 | inches | Elliptical Slot Centroid = | N/A | feet |
| Orifice Plate: Orifice Area per Row = | N/A | 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 | 1.11 | 2.23 | | | | | |
| Orifice Area (sq. inches) | 3.92 | 3.75 | 1.00 | | | | | |

| | 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)

Calculated Parameters for Vertical Orifice

| | Not Selected | Not Selected | | | Not Selected | Not Selected | |
|---|---|---|---|---|---|---|---|
| Invert of Vertical Orifice = | N/A | N/A | ft (relative to basin bottom at Stage = 0 ft) | Vertical Orifice Area = | N/A | N/A | $ft^2$ |
| 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)

Calculated Parameters for Overflow Weir

| | Zone 3 Weir | Not Selected | | | Zone 3 Weir | Not Selected | |
|---|---|---|---|---|---|---|---|
| Overflow Weir Front Edge Height, Ho = | 3.50 | N/A | ft (relative to basin bottom at Stage = 0 ft) | Height of Grate Upper Edge, $H_t$ = | 3.50 | N/A | feet |
| Overflow Weir Front Edge Length = | 2.92 | N/A | feet | Overflow Weir Slope Length = | 2.92 | N/A | feet |
| Overflow Weir Grate Slope = | 0.00 | N/A | H:V | Grate Open Area / 100-yr Orifice Area = | 4.53 | N/A | |
| Horiz. Length of Weir Sides = | 2.92 | N/A | feet | Overflow Grate Open Area w/o Debris = | 5.93 | N/A | $ft^2$ |
| Overflow Grate Type = | Type C Grate | N/A | | Overflow Grate Open Area w/ Debris = | 2.97 | N/A | $ft^2$ |
| Debris Clogging % = | 50% | N/A | % | | | | |

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

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

| | Zone 3 Restrictor | Not Selected | | | Zone 3 Restrictor | Not Selected | |
|---|---|---|---|---|---|---|---|
| Depth to Invert of Outlet Pipe = | 0.00 | N/A | ft (distance below basin bottom at Stage = 0 ft) | Outlet Orifice Area = | 1.31 | N/A | $ft^2$ |
| Outlet Pipe Diameter = | 18.00 | N/A | inches | Outlet Orifice Centroid = | 0.58 | N/A | feet |
| Restrictor Plate Height Above Pipe Invert = | 12.50 | | inches | Half-Central Angle of Restrictor Plate on Pipe = | 1.97 | N/A | radians |

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Calculated Parameters for Spillway

| | | | | | |
|---|---|---|---|---|---|
| Spillway Invert Stage= | 4.35 | ft (relative to basin bottom at Stage = 0 ft) | Spillway Design Flow Depth= | 0.35 | feet |
| Spillway Crest Length = | 75.00 | feet | Stage at Top of Freeboard = | 5.70 | feet |
| Spillway End Slopes = | 4.00 | H:V | Basin Area at Top of Freeboard = | 0.64 | acres |
| Freeboard above Max Water Surface = | 1.00 | feet | Basin Volume at Top of Freeboard = | 2.53 | acre-ft |

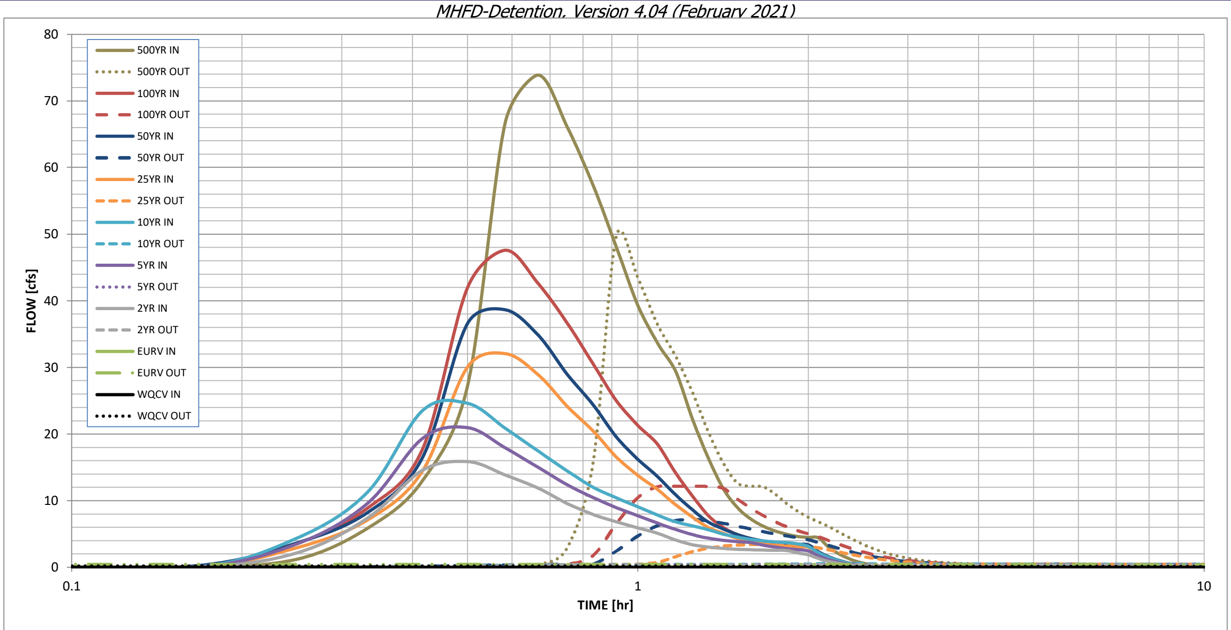
Routed Hydrograph Results

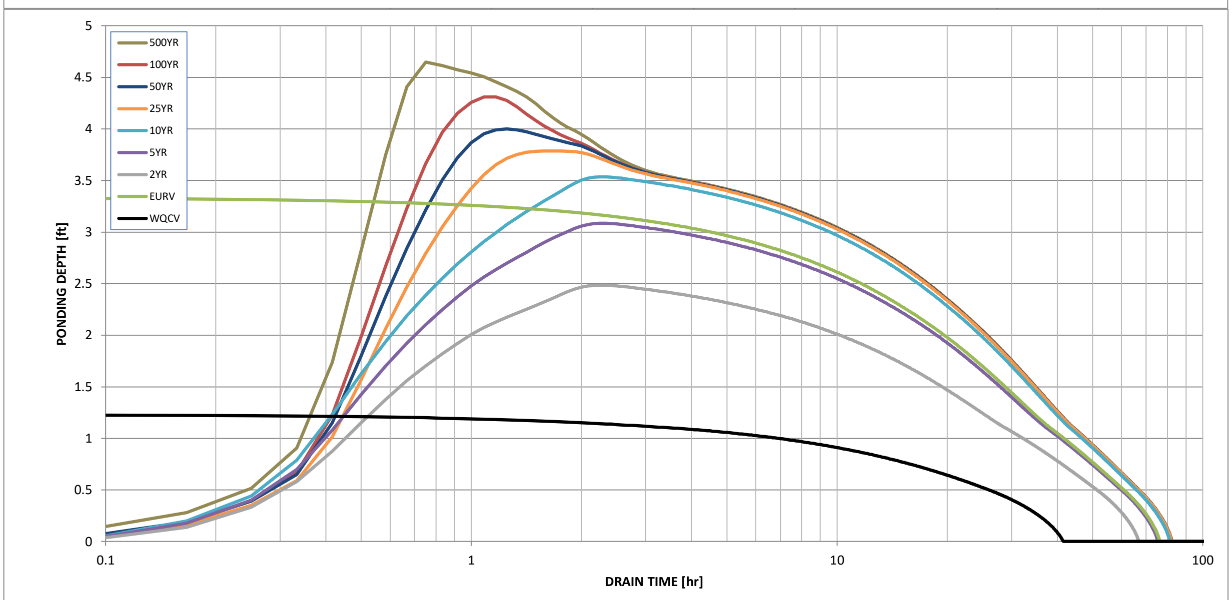
*The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).*

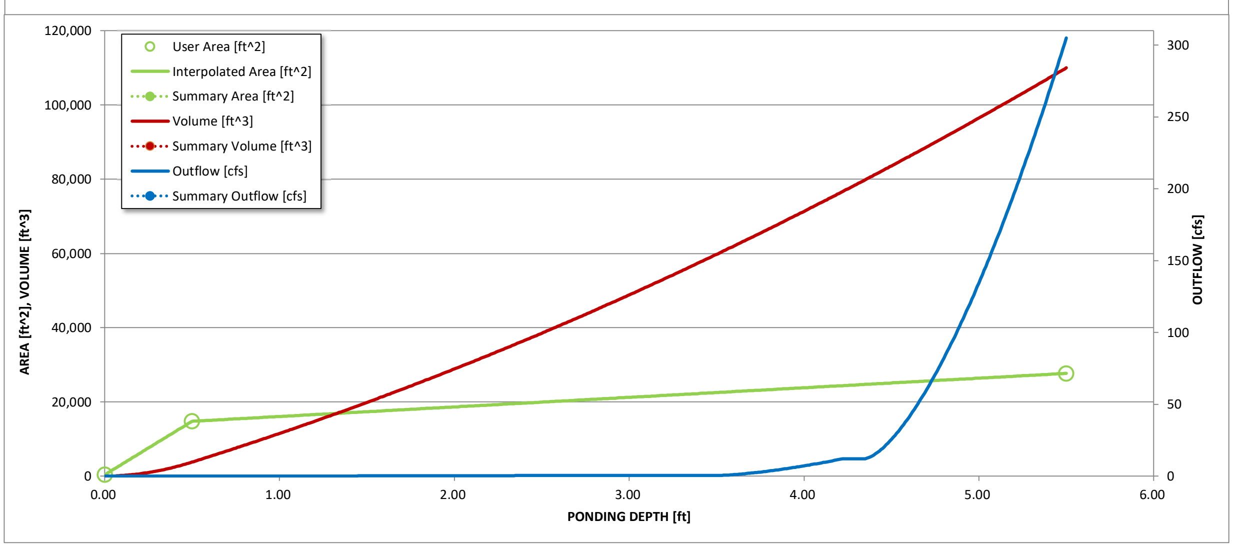
| Design Storm Return Period = | WQCV | EURV | 2 Year | 5 Year | 10 Year | 25 Year | 50 Year | 100 Year | 500 Year |
|---|---|---|---|---|---|---|---|---|---|
| One-Hour Rainfall Depth (in) = | N/A | N/A | 1.19 | 1.50 | 1.75 | 2.00 | 2.25 | 2.52 | 3.49 |
| CUHP Runoff Volume (acre-ft) = | 0.351 | 1.289 | 0.932 | 1.229 | 1.466 | 1.795 | 2.119 | 2.519 | 3.908 |
| Inflow Hydrograph Volume (acre-ft) = | N/A | N/A | 0.932 | 1.229 | 1.466 | 1.795 | 2.119 | 2.519 | 3.908 |
| CUHP Predevelopment Peak Q (cfs) = | N/A | N/A | 0.2 | 0.3 | 0.4 | 3.8 | 7.5 | 12.3 | 28.0 |
| 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 | 0.21 | 0.42 | 0.68 | 1.55 |
| Peak Inflow Q (cfs) = | N/A | N/A | 15.9 | 20.9 | 24.6 | 32.1 | 38.7 | 47.6 | 73.9 |
| Peak Outflow Q (cfs) = | 0.2 | 0.5 | 0.4 | 0.4 | 0.6 | 3.4 | 7.2 | 12.2 | 49.7 |
| Ratio Peak Outflow to Predevelopment Q = | N/A | N/A | N/A | 1.5 | 1.5 | 0.9 | 1.0 | 1.0 | 1.8 |
| Structure Controlling Flow = | Plate | Plate | Plate | Plate | Overflow Weir 1 | Overflow Weir 1 | Overflow Weir 1 | Outlet Plate 1 | Spillway |
| Max Velocity through Grate 1 (fps) = | N/A | N/A | N/A | N/A | 0.0 | 0.5 | 1.1 | 2.0 | 2.0 |
| Max Velocity through Grate 2 (fps) = | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Time to Drain 97% of Inflow Volume (hours) = | 38 | 68 | 60 | 67 | 72 | 71 | 70 | 68 | 63 |
| Time to Drain 99% of Inflow Volume (hours) = | **40** | 73 | 64 | 72 | 77 | 77 | 77 | 76 | 74 |
| Maximum Ponding Depth (ft) = | 1.24 | 3.34 | 2.48 | 3.08 | 3.53 | 3.79 | 4.00 | 4.31 | 4.65 |
| Area at Maximum Ponding Depth (acres) = | 0.38 | 0.51 | 0.46 | 0.49 | 0.52 | 0.53 | 0.55 | 0.57 | 0.58 |
| Maximum Volume Stored (acre-ft) = | 0.355 | 1.290 | 0.875 | 1.160 | 1.388 | 1.519 | 1.633 | 1.811 | 2.000 |

# DETENTION BASIN OUTLET STRUCTURE DESIGN

*MHFD-Detention, Version 4.04 (February 2021)*




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

# DETENTION BASIN OUTLET STRUCTURE DESIGN

*Outflow Hydrograph Workbook Filename:*

Inflow Hydrographs

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

| | SOURCE | CUHP | CUHP | CUHP | CUHP | CUHP | CUHP | CUHP | CUHP | CUHP |
|---|---|---|---|---|---|---|---|---|---|---|
| Time Interval | TIME | WQCV [cfs] | EURV [cfs] | 2 Year [cfs] | 5 Year [cfs] | 10 Year [cfs] | 25 Year [cfs] | 50 Year [cfs] | 100 Year [cfs] | 500 Year [cfs] |
| 5.00 min | 0:00:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0:05:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0:10:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.25 | 0.02 | 1.23 |
| | 0:15:00 | 0.00 | 0.00 | 2.17 | 3.53 | 4.38 | 2.95 | 3.65 | 3.60 | 5.89 |
| | 0:20:00 | 0.00 | 0.00 | 7.42 | 9.63 | 11.30 | 7.11 | 8.25 | 8.89 | 12.99 |
| | 0:25:00 | 0.00 | 0.00 | 14.55 | 19.34 | 23.49 | 14.43 | 16.44 | 17.71 | 27.18 |
| | 0:30:00 | 0.00 | 0.00 | 15.87 | 20.94 | 24.62 | 30.06 | 36.58 | 41.95 | 66.74 |
| | 0:35:00 | 0.00 | 0.00 | 13.86 | 17.91 | 20.88 | 32.08 | 38.67 | 47.57 | 73.87 |
| | 0:40:00 | 0.00 | 0.00 | 11.87 | 15.00 | 17.43 | 28.90 | 34.83 | 42.58 | 66.15 |
| | 0:45:00 | 0.00 | 0.00 | 9.59 | 12.40 | 14.49 | 24.16 | 28.99 | 36.70 | 57.37 |
| | 0:50:00 | 0.00 | 0.00 | 7.94 | 10.48 | 12.03 | 20.50 | 24.42 | 30.55 | 48.06 |
| | 0:55:00 | 0.00 | 0.00 | 6.83 | 8.96 | 10.41 | 16.54 | 19.55 | 24.99 | 39.32 |
| | 1:00:00 | 0.00 | 0.00 | 5.94 | 7.73 | 9.08 | 13.81 | 16.21 | 21.29 | 33.65 |
| | 1:05:00 | 0.00 | 0.00 | 5.12 | 6.62 | 7.84 | 11.68 | 13.63 | 18.45 | 29.35 |
| | 1:10:00 | 0.00 | 0.00 | 4.08 | 5.70 | 6.82 | 9.38 | 10.85 | 14.12 | 22.10 |
| | 1:15:00 | 0.00 | 0.00 | 3.39 | 4.89 | 6.23 | 7.51 | 8.59 | 10.64 | 16.35 |
| | 1:20:00 | 0.00 | 0.00 | 3.02 | 4.36 | 5.64 | 5.96 | 6.76 | 7.72 | 11.74 |
| | 1:25:00 | 0.00 | 0.00 | 2.82 | 4.06 | 4.98 | 5.09 | 5.75 | 5.97 | 8.94 |
| | 1:30:00 | 0.00 | 0.00 | 2.71 | 3.86 | 4.52 | 4.34 | 4.89 | 4.93 | 7.24 |
| | 1:35:00 | 0.00 | 0.00 | 2.64 | 3.72 | 4.19 | 3.85 | 4.33 | 4.27 | 6.17 |
| | 1:40:00 | 0.00 | 0.00 | 2.59 | 3.32 | 3.96 | 3.52 | 3.96 | 3.83 | 5.44 |
| | 1:45:00 | 0.00 | 0.00 | 2.55 | 3.02 | 3.80 | 3.31 | 3.72 | 3.53 | 4.95 |
| | 1:50:00 | 0.00 | 0.00 | 2.53 | 2.81 | 3.69 | 3.16 | 3.55 | 3.34 | 4.63 |
| | 1:55:00 | 0.00 | 0.00 | 2.16 | 2.65 | 3.50 | 3.07 | 3.45 | 3.24 | 4.49 |
| | 2:00:00 | 0.00 | 0.00 | 1.88 | 2.46 | 3.15 | 3.01 | 3.39 | 3.21 | 4.44 |
| | 2:05:00 | 0.00 | 0.00 | 1.33 | 1.73 | 2.21 | 2.12 | 2.38 | 2.26 | 3.13 |
| | 2:10:00 | 0.00 | 0.00 | 0.91 | 1.20 | 1.53 | 1.47 | 1.65 | 1.57 | 2.16 |
| | 2:15:00 | 0.00 | 0.00 | 0.62 | 0.81 | 1.05 | 1.01 | 1.13 | 1.08 | 1.49 |
| | 2:20:00 | 0.00 | 0.00 | 0.41 | 0.53 | 0.69 | 0.67 | 0.75 | 0.71 | 0.98 |
| | 2:25:00 | 0.00 | 0.00 | 0.26 | 0.34 | 0.45 | 0.44 | 0.49 | 0.46 | 0.64 |
| | 2:30:00 | 0.00 | 0.00 | 0.15 | 0.22 | 0.28 | 0.28 | 0.31 | 0.29 | 0.40 |
| | 2:35:00 | 0.00 | 0.00 | 0.08 | 0.12 | 0.15 | 0.16 | 0.17 | 0.16 | 0.22 |
| | 2:40:00 | 0.00 | 0.00 | 0.03 | 0.05 | 0.06 | 0.07 | 0.08 | 0.07 | 0.09 |
| | 2:45:00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.02 | 0.02 | 0.02 | 0.02 |
| | 2:50:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 2:55:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 3:00:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 3:05:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 3:10:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 3:15:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 3:20:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 3:25:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 3:30:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 3:35:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 3:40:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 3:45:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 3:50:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 3:55:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 4:00:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 4:05:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 4:10:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 4:15:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 4:20:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 4:25:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 4:30:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 4:35:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 4:40:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 4:45:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 4:50:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 4:55:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 5:00:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 5:05:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 5:10:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 5:15:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 5:20:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 5:25:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 5:30:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 5:35:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 5:40:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 5:45:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 5:50:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 5:55:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 6:00:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

# DETENTION BASIN OUTLET STRUCTURE DESIGN

*MHFD-Detention, Version 4.04 (February 2021)*

<u>Summary Stage-Area-Volume-Discharge Relationships</u>

The user can create a summary S-A-V-D by entering the desired stage increments and the remainder of the table will populate automatically.

The user should graphically compare the summary S-A-V-D table to the full S-A-V-D table in the chart to confirm it captures all key transition points.

| Stage - Storage Description | Stage [ft] | Area [ft$^2$] | Area [acres] | Volume [ft$^3$] | Volume [ac-ft] | Total Outflow [cfs] |
|---|---|---|---|---|---|---|
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For best results, include the stages of all grade slope changes (e.g. ISV and Floor) from the S-A-V table on Sheet 'Basin'.

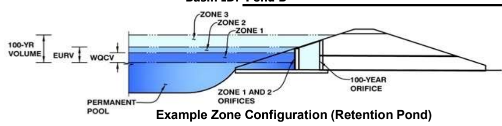
Also include the inverts of all outlets (e.g. vertical orifice, overflow grate, and spillway, where applicable).

# DETENTION BASIN STAGE-STORAGE TABLE BUILDER

*MHFD-Detention, Version 4.04 (February 2021)*

**Project:** **The Commons at Falcon Field**

**Basin ID:** **Pond B**




**Example Zone Configuration (Retention Pond)**

Watershed Information

| | | | | |
|---|---|---|---|---|
| Selected BMP Type = | **EDB** | | | |
| Watershed Area = | 13.74 | acres | | |
| Watershed Length = | 915 | ft | | |
| Watershed Length to Centroid = | 450 | ft | | |
| Watershed Slope = | 0.030 | ft/ft | | |
| Watershed Imperviousness = | 86.00% | 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) = | 0.423 | acre-feet | | acre-feet |
| Excess Urban Runoff Volume (EURV) = | 1.586 | acre-feet | | acre-feet |
| 2-yr Runoff Volume (P1 = 1.19 in.) = | 1.078 | acre-feet | 1.19 | inches |
| 5-yr Runoff Volume (P1 = 1.5 in.) = | 1.392 | acre-feet | 1.50 | inches |
| 10-yr Runoff Volume (P1 = 1.75 in.) = | 1.645 | acre-feet | 1.75 | inches |
| 25-yr Runoff Volume (P1 = 2 in.) = | 1.928 | acre-feet | 2.00 | inches |
| 50-yr Runoff Volume (P1 = 2.25 in.) = | 2.205 | acre-feet | 2.25 | inches |
| 100-yr Runoff Volume (P1 = 2.52 in.) = | 2.520 | acre-feet | 2.52 | inches |
| 500-yr Runoff Volume (P1 = 3.49 in.) = | 3.625 | acre-feet | 3.49 | inches |
| Approximate 2-yr Detention Volume = | 1.044 | acre-feet | | |
| Approximate 5-yr Detention Volume = | 1.356 | acre-feet | | |
| Approximate 10-yr Detention Volume = | 1.613 | acre-feet | | |
| Approximate 25-yr Detention Volume = | 1.907 | acre-feet | | |
| Approximate 50-yr Detention Volume = | 2.078 | acre-feet | | |
| Approximate 100-yr Detention Volume = | 2.230 | acre-feet | | |

Define Zones and Basin Geometry

| | | |
|---|---|---|
| Zone 1 Volume (WQCV) = | 0.423 | acre-feet |
| Zone 2 Volume (EURV - Zone 1) = | 1.163 | acre-feet |
| Zone 3 Volume (100-year - Zones 1 & 2) = | 0.644 | acre-feet |
| Total Detention Basin Volume = | 2.230 | 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) |
|---|---|---|---|---|---|---|---|---|---|
| **Top of Micropool** | -- | 0.00 | -- | -- | -- | 40 | 0.001 | | |
| **6832** | -- | 1.00 | -- | -- | -- | 28,695 | 0.659 | 14,367 | 0.330 |
| **6836** | -- | 5.00 | -- | -- | -- | 40,779 | 0.936 | 153,315 | 3.520 |
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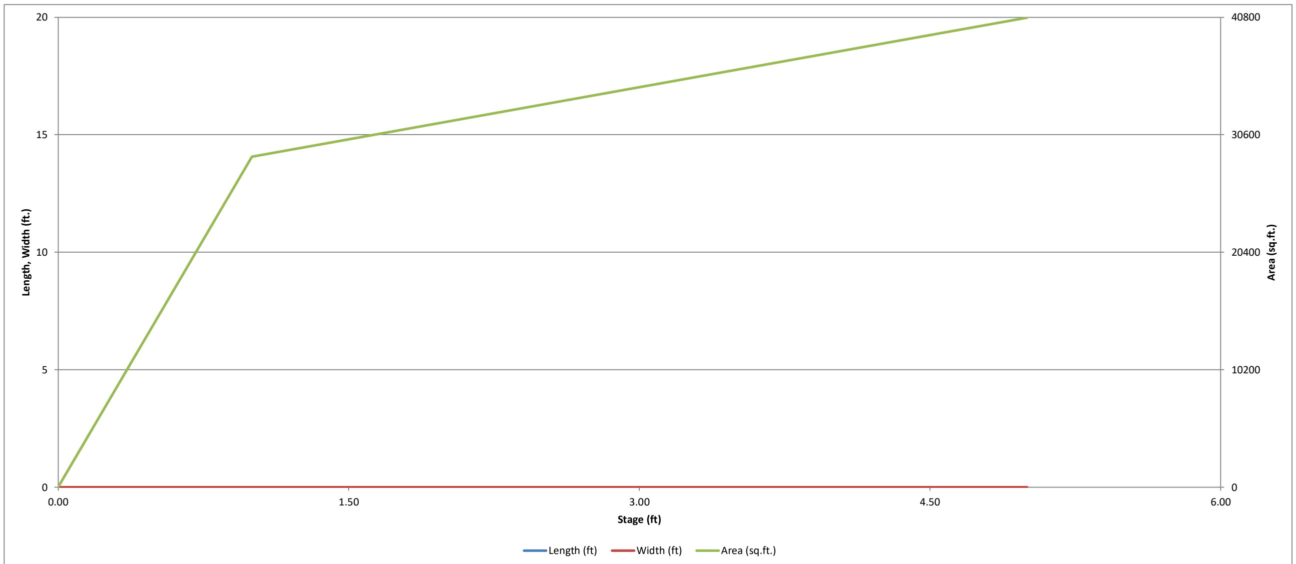
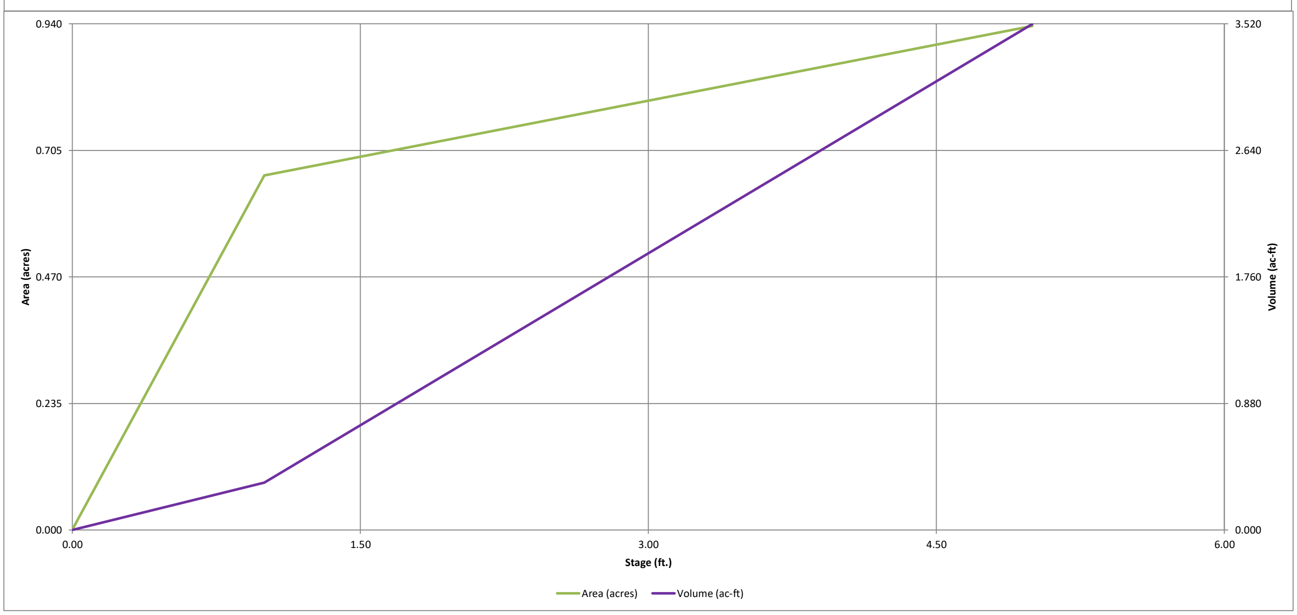
DETENTION BASIN STAGE-STORAGE TABLE BUILDER

*MHFD-Detention, Version 4.04 (February 2021)*

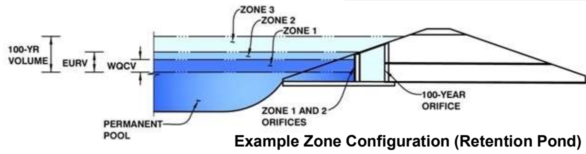


# DETENTION BASIN OUTLET STRUCTURE DESIGN

*MHFD-Detention, Version 4.04 (February 2021)*

**Project:** **The Commons at Falcon Field**
**Basin ID:** **Pond B**




**Example Zone Configuration (Retention Pond)**

| | Estimated Stage (ft) | Estimated Volume (ac-ft) | Outlet Type |
|---|---|---|---|
| Zone 1 (WQCV) | 1.15 | 0.423 | Orifice Plate |
| Zone 2 (EURV) | 2.75 | 1.163 | Orifice Plate |
| Zone 3 (100-year) | 3.55 | 0.644 | Weir&Pipe (Circular) |
| Total (all zones) | | 2.230 | |

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

| | | |
|---|---|---|
| Underdrain Orifice Invert Depth = | N/A | ft (distance below the filtration media surface) |
| Underdrain Orifice Diameter = | N/A | inches |

Calculated Parameters for Underdrain

| | | |
|---|---|---|
| Underdrain Orifice Area = | N/A | $ft^2$ |
| 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)

| | | |
|---|---|---|
| Invert of Lowest Orifice = | 0.00 | ft (relative to basin bottom at Stage = 0 ft) |
| Depth at top of Zone using Orifice Plate = | 2.75 | ft (relative to basin bottom at Stage = 0 ft) |
| Orifice Plate: Orifice Vertical Spacing = | 11.10 | inches |
| Orifice Plate: Orifice Area per Row = | 4.35 | sq. inches (use rectangular openings) |

Calculated Parameters for Plate

| | | |
|---|---|---|
| WQ Orifice Area per Row = | 3.021E-02 | $ft^2$ |
| Elliptical Half-Width = | N/A | feet |
| Elliptical Slot Centroid = | N/A | feet |
| 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 | 0.92 | 1.83 | | | | | |
| Orifice Area (sq. inches) | 4.35 | 4.35 | 4.35 | | | | | |

| | 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 | |
|---|---|---|---|
| Invert of Vertical Orifice = | N/A | N/A | ft (relative to basin bottom at Stage = 0 ft) |
| Depth at top of Zone using Vertical Orifice = | N/A | N/A | ft (relative to basin bottom at Stage = 0 ft) |
| Vertical Orifice Diameter = | N/A | N/A | inches |

Calculated Parameters for Vertical Orifice

| | Not Selected | Not Selected | |
|---|---|---|---|
| Vertical Orifice Area = | N/A | N/A | $ft^2$ |
| Vertical Orifice Centroid = | N/A | N/A | feet |

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 | |
|---|---|---|---|
| Overflow Weir Front Edge Height, Ho = | 2.80 | N/A | ft (relative to basin bottom at Stage = 0 ft) |
| Overflow Weir Front Edge Length = | 6.00 | N/A | feet |
| Overflow Weir Grate Slope = | 0.00 | N/A | H:V |
| Horiz. Length of Weir Sides = | 6.00 | N/A | feet |
| Overflow Grate Type = | Type C Grate | N/A | |
| Debris Clogging % = | 50% | N/A | % |

Calculated Parameters for Overflow Weir

| | Zone 3 Weir | Not Selected | |
|---|---|---|---|
| Height of Grate Upper Edge, $H_t$ = | 2.80 | N/A | feet |
| Overflow Weir Slope Length = | 6.00 | N/A | feet |
| Grate Open Area / 100-yr Orifice Area = | 14.18 | N/A | |
| Overflow Grate Open Area w/o Debris = | 25.06 | N/A | $ft^2$ |
| Overflow Grate Open Area w/ Debris = | 12.53 | N/A | $ft^2$ |

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

| | Zone 3 Circular | Not Selected | |
|---|---|---|---|
| Depth to Invert of Outlet Pipe = | 0.00 | N/A | ft (distance below basin bottom at Stage = 0 ft) |
| Circular Orifice Diameter = | 18.00 | N/A | inches |

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

| | Zone 3 Circular | Not Selected | |
|---|---|---|---|
| Outlet Orifice Area = | 1.77 | N/A | $ft^2$ |
| Outlet Orifice Centroid = | 0.75 | N/A | feet |
| Half-Central Angle of Restrictor Plate on Pipe = | N/A | N/A | radians |

User Input: Emergency Spillway (Rectangular or Trapezoidal)

| | | |
|---|---|---|
| Spillway Invert Stage= | 3.25 | ft (relative to basin bottom at Stage = 0 ft) |
| Spillway Crest Length = | 25.00 | feet |
| Spillway End Slopes = | 4.00 | H:V |
| Freeboard above Max Water Surface = | 1.00 | feet |

Calculated Parameters for Spillway

| | | |
|---|---|---|
| Spillway Design Flow Depth= | 0.74 | feet |
| Stage at Top of Freeboard = | 4.99 | feet |
| Basin Area at Top of Freeboard = | 0.94 | acres |
| Basin Volume at Top of Freeboard = | 3.51 | acre-ft |

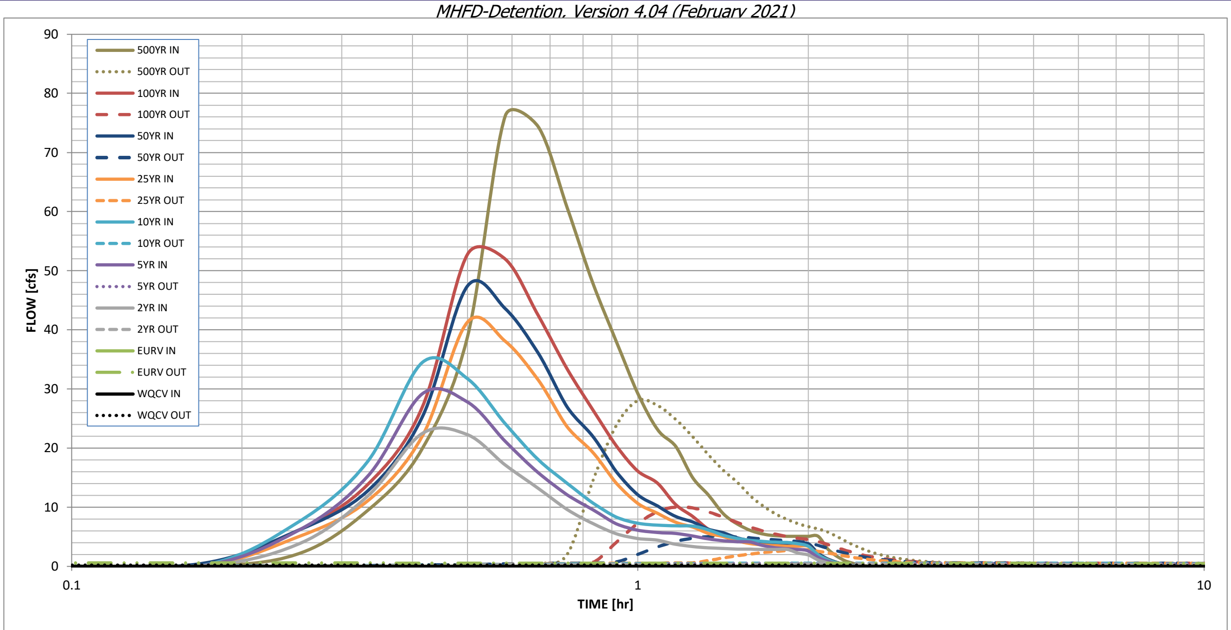
Routed Hydrograph Results

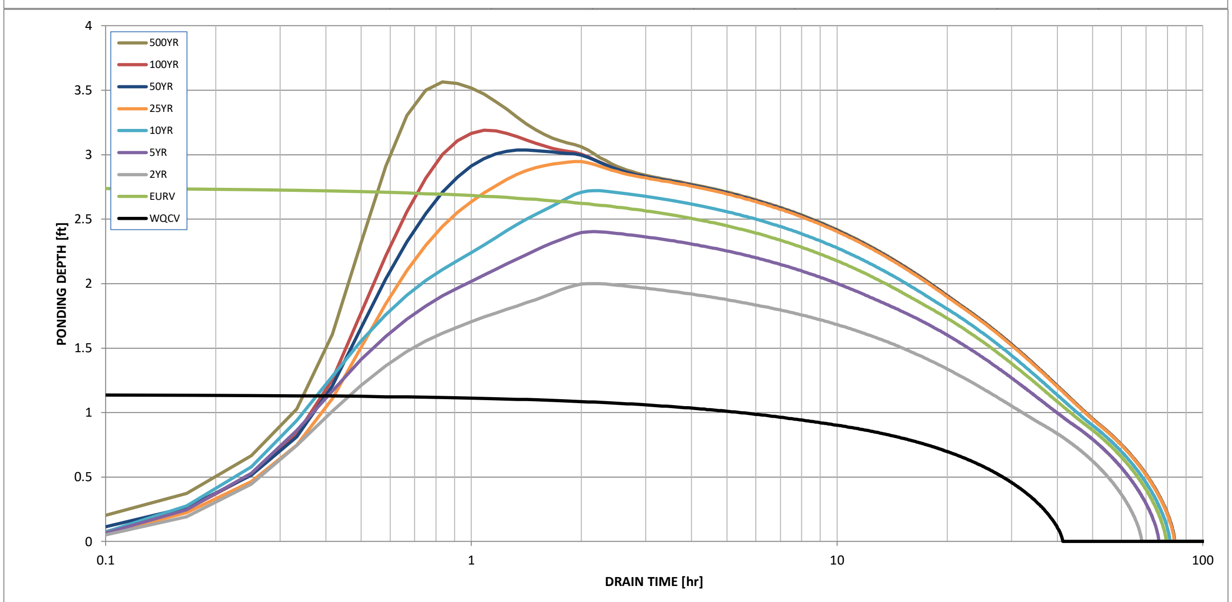
*The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).*

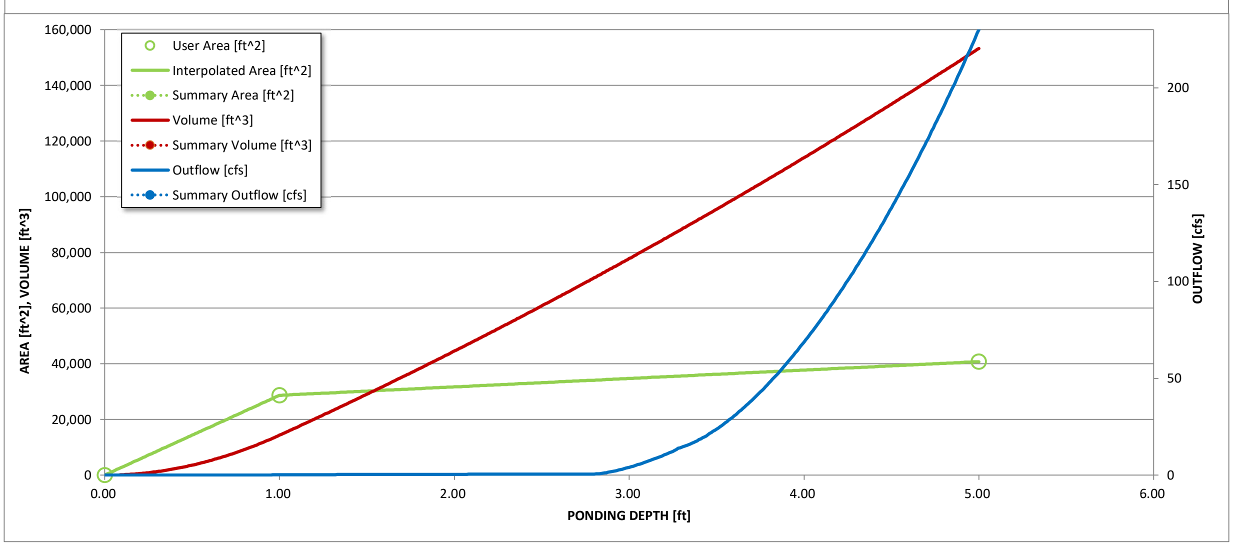
| Design Storm Return Period = | WQCV | EURV | 2 Year | 5 Year | 10 Year | 25 Year | 50 Year | 100 Year | 500 Year |
|---|---|---|---|---|---|---|---|---|---|
| One-Hour Rainfall Depth (in) = | N/A | N/A | 1.19 | 1.50 | 1.75 | 2.00 | 2.25 | 2.52 | 3.49 |
| CUHP Runoff Volume (acre-ft) = | 0.423 | 1.586 | 1.078 | 1.392 | 1.645 | 1.928 | 2.205 | 2.520 | 3.625 |
| Inflow Hydrograph Volume (acre-ft) = | N/A | N/A | 1.078 | 1.392 | 1.645 | 1.928 | 2.205 | 2.520 | 3.625 |
| CUHP Predevelopment Peak Q (cfs) = | N/A | N/A | 0.1 | 0.3 | 0.4 | 3.2 | 6.3 | 10.4 | 23.5 |
| 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 | 0.03 | 0.23 | 0.46 | 0.76 | 1.71 |
| Peak Inflow Q (cfs) = | N/A | N/A | 22.5 | 29.2 | 34.5 | 41.3 | 47.4 | 52.8 | 76.2 |
| Peak Outflow Q (cfs) = | 0.2 | 0.6 | 0.4 | 0.5 | 0.6 | 2.8 | 5.1 | 10.0 | 28.1 |
| Ratio Peak Outflow to Predevelopment Q = | N/A | N/A | N/A | 2.0 | 1.6 | 0.9 | 0.8 | 1.0 | 1.2 |
| Structure Controlling Flow = | Plate | Plate | Plate | Plate | Plate | Overflow Weir 1 | Overflow Weir 1 | Overflow Weir 1 | Spillway |
| Max Velocity through Grate 1 (fps) = | N/A | N/A | N/A | N/A | N/A | 0.1 | 0.2 | 0.4 | 0.5 |
| Max Velocity through Grate 2 (fps) = | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Time to Drain 97% of Inflow Volume (hours) = | 38 | 71 | 62 | 68 | 73 | 74 | 73 | 72 | 68 |
| Time to Drain 99% of Inflow Volume (hours) = | **40** | 76 | 65 | 73 | 77 | 79 | 79 | 78 | 77 |
| Maximum Ponding Depth (ft) = | 1.15 | 2.75 | 2.00 | 2.40 | 2.72 | 2.95 | 3.04 | 3.19 | 3.56 |
| Area at Maximum Ponding Depth (acres) = | 0.67 | 0.78 | 0.73 | 0.76 | 0.78 | 0.79 | 0.80 | 0.81 | 0.84 |
| Maximum Volume Stored (acre-ft) = | 0.429 | 1.589 | 1.023 | 1.320 | 1.565 | 1.738 | 1.810 | 1.931 | 2.243 |

# DETENTION BASIN OUTLET STRUCTURE DESIGN

*MHFD-Detention, Version 4.04 (February 2021)*




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

# DETENTION BASIN OUTLET STRUCTURE DESIGN

*Outflow Hydrograph Workbook Filename:*

Inflow Hydrographs

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

| | SOURCE | CUHP | CUHP | CUHP | CUHP | CUHP | CUHP | CUHP | CUHP | CUHP |
|---|---|---|---|---|---|---|---|---|---|---|
| Time Interval | TIME | WQCV [cfs] | EURV [cfs] | 2 Year [cfs] | 5 Year [cfs] | 10 Year [cfs] | 25 Year [cfs] | 50 Year [cfs] | 100 Year [cfs] | 500 Year [cfs] |
| 5.00 min | 0:00:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0:05:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0:10:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.41 | 0.04 | 2.04 |
| | 0:15:00 | 0.00 | 0.00 | 3.66 | 5.95 | 7.35 | 4.93 | 6.02 | 5.99 | 9.45 |
| | 0:20:00 | 0.00 | 0.00 | 11.90 | 15.24 | 17.77 | 11.10 | 12.78 | 13.86 | 19.93 |
| | 0:25:00 | 0.00 | 0.00 | 22.52 | 29.19 | 34.48 | 22.07 | 25.33 | 26.98 | 38.83 |
| | 0:30:00 | 0.00 | 0.00 | 22.25 | 27.79 | 31.75 | 41.29 | 47.40 | 52.76 | 76.18 |
| | 0:35:00 | 0.00 | 0.00 | 17.16 | 21.14 | 24.13 | 38.06 | 43.58 | 51.95 | 74.37 |
| | 0:40:00 | 0.00 | 0.00 | 13.22 | 15.87 | 18.07 | 31.53 | 36.08 | 42.45 | 60.71 |
| | 0:45:00 | 0.00 | 0.00 | 9.64 | 12.13 | 14.07 | 23.65 | 27.00 | 33.39 | 47.84 |
| | 0:50:00 | 0.00 | 0.00 | 7.24 | 9.56 | 10.72 | 19.28 | 21.98 | 26.47 | 38.04 |
| | 0:55:00 | 0.00 | 0.00 | 5.53 | 7.22 | 8.35 | 14.09 | 16.03 | 20.37 | 29.23 |
| | 1:00:00 | 0.00 | 0.00 | 4.73 | 6.13 | 7.30 | 10.66 | 12.11 | 16.12 | 23.13 |
| | 1:05:00 | 0.00 | 0.00 | 4.45 | 5.73 | 6.97 | 8.97 | 10.20 | 14.07 | 20.26 |
| | 1:10:00 | 0.00 | 0.00 | 3.74 | 5.58 | 6.86 | 7.44 | 8.43 | 10.44 | 14.97 |
| | 1:15:00 | 0.00 | 0.00 | 3.37 | 5.12 | 6.82 | 6.65 | 7.52 | 8.45 | 12.07 |
| | 1:20:00 | 0.00 | 0.00 | 3.15 | 4.63 | 6.18 | 5.58 | 6.30 | 6.27 | 8.87 |
| | 1:25:00 | 0.00 | 0.00 | 3.03 | 4.35 | 5.27 | 5.04 | 5.68 | 5.10 | 7.16 |
| | 1:30:00 | 0.00 | 0.00 | 2.94 | 4.19 | 4.73 | 4.29 | 4.83 | 4.34 | 6.05 |
| | 1:35:00 | 0.00 | 0.00 | 2.90 | 4.09 | 4.40 | 3.87 | 4.35 | 3.93 | 5.45 |
| | 1:40:00 | 0.00 | 0.00 | 2.89 | 3.50 | 4.21 | 3.62 | 4.08 | 3.76 | 5.21 |
| | 1:45:00 | 0.00 | 0.00 | 2.89 | 3.16 | 4.09 | 3.50 | 3.94 | 3.68 | 5.10 |
| | 1:50:00 | 0.00 | 0.00 | 2.89 | 2.96 | 4.05 | 3.44 | 3.87 | 3.67 | 5.09 |
| | 1:55:00 | 0.00 | 0.00 | 2.28 | 2.85 | 3.86 | 3.41 | 3.83 | 3.67 | 5.09 |
| | 2:00:00 | 0.00 | 0.00 | 1.93 | 2.63 | 3.40 | 3.40 | 3.83 | 3.67 | 5.09 |
| | 2:05:00 | 0.00 | 0.00 | 1.09 | 1.50 | 1.95 | 1.96 | 2.21 | 2.12 | 2.93 |
| | 2:10:00 | 0.00 | 0.00 | 0.61 | 0.85 | 1.10 | 1.13 | 1.26 | 1.21 | 1.68 |
| | 2:15:00 | 0.00 | 0.00 | 0.31 | 0.45 | 0.58 | 0.60 | 0.67 | 0.64 | 0.89 |
| | 2:20:00 | 0.00 | 0.00 | 0.14 | 0.23 | 0.29 | 0.31 | 0.35 | 0.34 | 0.46 |
| | 2:25:00 | 0.00 | 0.00 | 0.05 | 0.09 | 0.10 | 0.12 | 0.13 | 0.13 | 0.18 |
| | 2:30:00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.02 | 0.02 | 0.02 | 0.02 |
| | 2:35:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 2:40:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 2:45:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 2:50:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 2:55:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 3:00:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 3:05:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 3:10:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 3:15:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 3:20:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 3:25:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 3:30:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
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| | 3:50:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 3:55:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 4:00:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 4:05:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 4:10:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 4:15:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 4:20:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 4:25:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 4:30:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 4:35:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 4:40:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 4:45:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 4:50:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 4:55:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 5:00:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 5:05:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 5:10:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 5:15:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 5:20:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 5:25:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 5:30:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 5:35:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 5:40:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 5:45:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 5:50:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 5:55:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 6:00:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

# DETENTION BASIN OUTLET STRUCTURE DESIGN

*MHFD-Detention, Version 4.04 (February 2021)*

Summary Stage-Area-Volume-Discharge Relationships

The user can create a summary S-A-V-D by entering the desired stage increments and the remainder of the table will populate automatically.

The user should graphically compare the summary S-A-V-D table to the full S-A-V-D table in the chart to confirm it captures all key transition points.

| Stage - Storage Description | Stage [ft] | Area [$ft^2$] | Area [acres] | Volume [$ft^3$] | Volume [ac-ft] | Total Outflow [cfs] |
|---|---|---|---|---|---|---|
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For best results, include the stages of all grade slope changes (e.g. ISV and Floor) from the S-A-V table on Sheet 'Basin'.

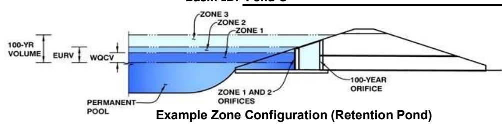
Also include the inverts of all outlets (e.g. vertical orifice, overflow grate, and spillway, where applicable).

# DETENTION BASIN STAGE-STORAGE TABLE BUILDER

*MHFD-Detention, Version 4.04 (February 2021)*

**Project:** **The Commons at Falcon Field**

**Basin ID:** **Pond C**




**Example Zone Configuration (Retention Pond)**

Watershed Information

| | | |
|---|---|---|
| Selected BMP Type = | **EDB** | |
| Watershed Area = | 36.97 | acres |
| Watershed Length = | 1,500 | ft |
| Watershed Length to Centroid = | 650 | ft |
| Watershed Slope = | 0.050 | ft/ft |
| Watershed Imperviousness = | 45.00% | 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) = | 0.594 | acre-feet | | acre-feet |
| Excess Urban Runoff Volume (EURV) = | 1.862 | acre-feet | | acre-feet |
| 2-yr Runoff Volume (P1 = 1.19 in.) = | 1.363 | acre-feet | 1.19 | inches |
| 5-yr Runoff Volume (P1 = 1.5 in.) = | 1.823 | acre-feet | 1.50 | inches |
| 10-yr Runoff Volume (P1 = 1.75 in.) = | 2.189 | acre-feet | 1.75 | inches |
| 25-yr Runoff Volume (P1 = 2 in.) = | 2.818 | acre-feet | 2.00 | inches |
| 50-yr Runoff Volume (P1 = 2.25 in.) = | 3.430 | acre-feet | 2.25 | inches |
| 100-yr Runoff Volume (P1 = 2.52 in.) = | 4.220 | acre-feet | 2.52 | inches |
| 500-yr Runoff Volume (P1 = 3.49 in.) = | 6.954 | acre-feet | 3.49 | inches |
| Approximate 2-yr Detention Volume = | 1.192 | acre-feet | | |
| Approximate 5-yr Detention Volume = | 1.574 | acre-feet | | |
| Approximate 10-yr Detention Volume = | 1.930 | acre-feet | | |
| Approximate 25-yr Detention Volume = | 2.377 | acre-feet | | |
| Approximate 50-yr Detention Volume = | 2.669 | acre-feet | | |
| Approximate 100-yr Detention Volume = | 3.048 | acre-feet | | |

Define Zones and Basin Geometry

| | | |
|---|---|---|
| Zone 1 Volume (WQCV) = | 0.594 | acre-feet |
| Zone 2 Volume (EURV - Zone 1) = | 1.268 | acre-feet |
| Zone 3 Volume (100-year - Zones 1 & 2) = | 1.185 | acre-feet |
| Total Detention Basin Volume = | 3.048 | 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) |
|---|---|---|---|---|---|---|---|---|---|
| **Top of Micropool** | -- | 0.00 | -- | -- | -- | 400 | 0.009 | | |
| **6805** | -- | 1.00 | -- | -- | -- | 23,745 | 0.545 | 12,072 | 0.277 |
| **6812** | -- | 8.00 | -- | -- | -- | 42,990 | 0.987 | 245,645 | 5.639 |
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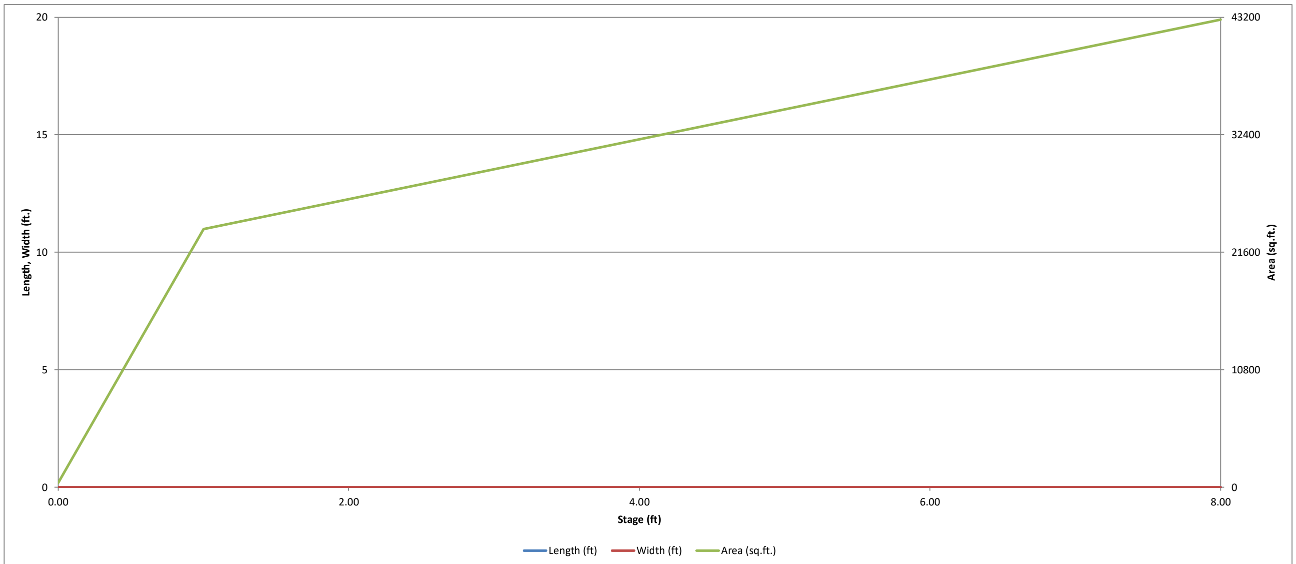
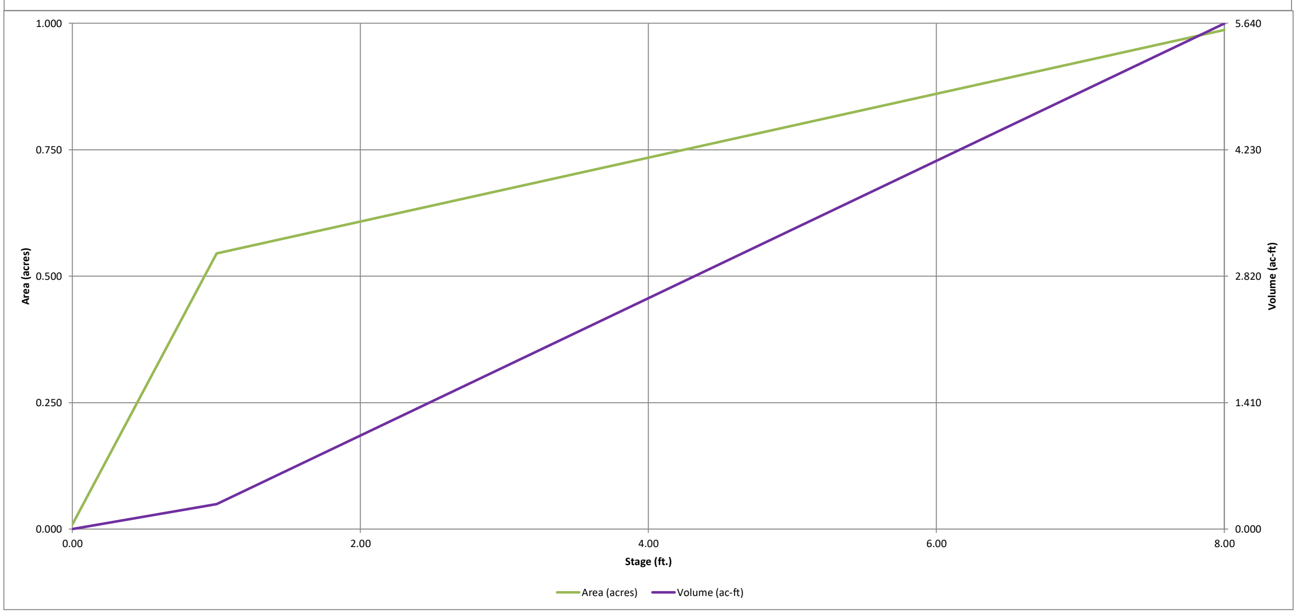
# DETENTION BASIN STAGE-STORAGE TABLE BUILDER

*MHFD-Detention, Version 4.04 (February 2021)*

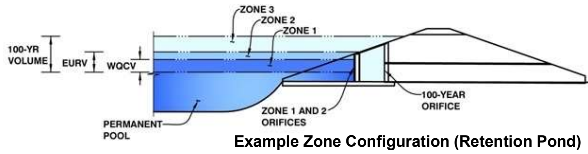


# DETENTION BASIN OUTLET STRUCTURE DESIGN

*MHFD-Detention, Version 4.04 (February 2021)*

**Project:** **The Commons at Falcon Field**
**Basin ID:** **Pond C**




**Example Zone Configuration (Retention Pond)**

| | Estimated Stage (ft) | Estimated Volume (ac-ft) | Outlet Type |
|---|---|---|---|
| Zone 1 (WQCV) | 1.57 | 0.594 | Orifice Plate |
| Zone 2 (EURV) | 3.54 | 1.268 | Orifice Plate |
| Zone 3 (100-year) | 5.11 | 1.185 | Weir&Pipe (Circular) |
| Total (all zones) | | 3.048 | |

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 | | |
|---|---|---|---|---|---|
| Invert of Lowest Orifice = | 0.00 | ft (relative to basin bottom at Stage = 0 ft) | WQ Orifice Area per Row = | 3.708E-02 | $ft^2$ |
| Depth at top of Zone using Orifice Plate = | 3.59 | ft (relative to basin bottom at Stage = 0 ft) | Elliptical Half-Width = | N/A | feet |
| Orifice Plate: Orifice Vertical Spacing = | 14.40 | inches | Elliptical Slot Centroid = | N/A | feet |
| Orifice Plate: Orifice Area per Row = | 5.34 | sq. inches (use rectangular openings) | 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 | 1.20 | 2.39 | | | | | |
| Orifice Area (sq. inches) | 5.34 | 5.34 | 5.34 | | | | | |

| | 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 = | 3.90 | N/A | ft (relative to basin bottom at Stage = 0 ft) | Height of Grate Upper Edge, $H_t$ = | 3.90 | N/A | feet |
| Overflow Weir Front Edge Length = | 4.92 | N/A | feet | Overflow Weir Slope Length = | 4.92 | N/A | feet |
| Overflow Weir Grate Slope = | 0.00 | N/A | H:V | Grate Open Area / 100-yr Orifice Area = | 9.53 | N/A | |
| Horiz. Length of Weir Sides = | 4.92 | N/A | feet | Overflow Grate Open Area w/o Debris = | 16.85 | N/A | $ft^2$ |
| Overflow Grate Type = | Type C Grate | N/A | | Overflow Grate Open Area w/ Debris = | 8.42 | 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 Circular | Not Selected | | Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate | Zone 3 Circular | Not Selected | |
|---|---|---|---|---|---|---|---|
| Depth to Invert of Outlet Pipe = | 2.83 | N/A | ft (distance below basin bottom at Stage = 0 ft) | Outlet Orifice Area = | 1.77 | N/A | $ft^2$ |
| Circular Orifice Diameter = | 18.00 | N/A | inches | Outlet Orifice Centroid = | 0.75 | N/A | feet |
| | | | | Half-Central Angle of Restrictor Plate on Pipe = | N/A | N/A | radians |

User Input: Emergency Spillway (Rectangular or Trapezoidal)

| | | | Calculated Parameters for Spillway | | |
|---|---|---|---|---|---|
| Spillway Invert Stage= | 5.00 | ft (relative to basin bottom at Stage = 0 ft) | Spillway Design Flow Depth= | 1.00 | feet |
| Spillway Crest Length = | 20.00 | feet | Stage at Top of Freeboard = | 7.00 | feet |
| Spillway End Slopes = | 4.00 | H:V | Basin Area at Top of Freeboard = | 0.92 | acres |
| Freeboard above Max Water Surface = | 1.00 | feet | Basin Volume at Top of Freeboard = | 4.68 | acre-ft |

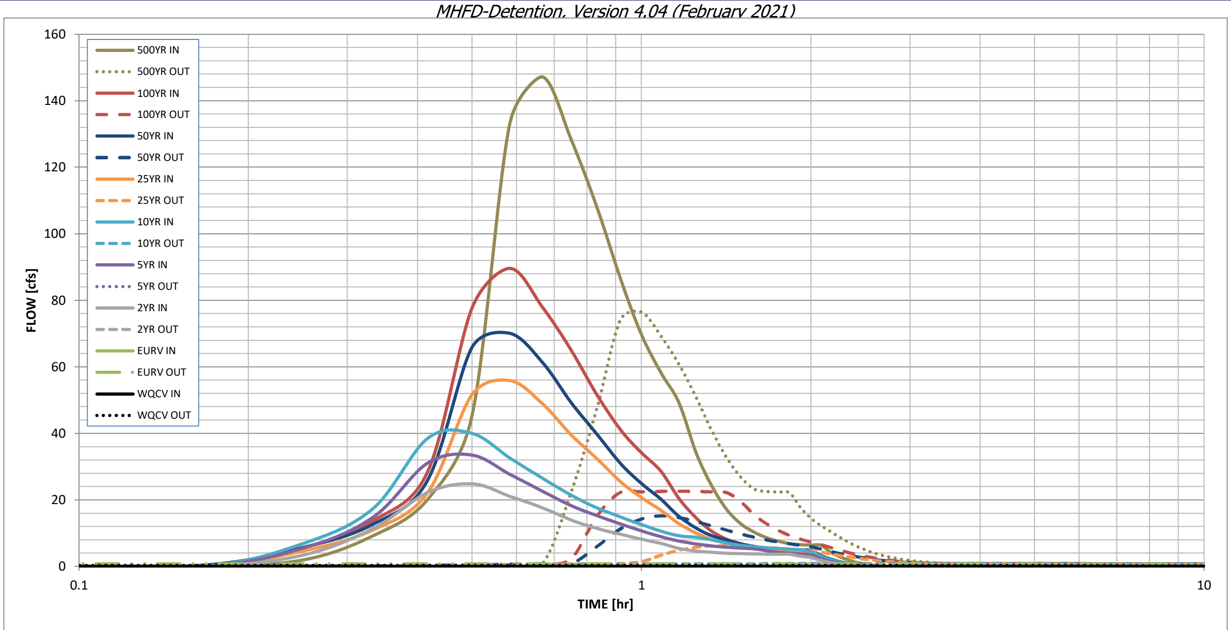
Routed Hydrograph Results

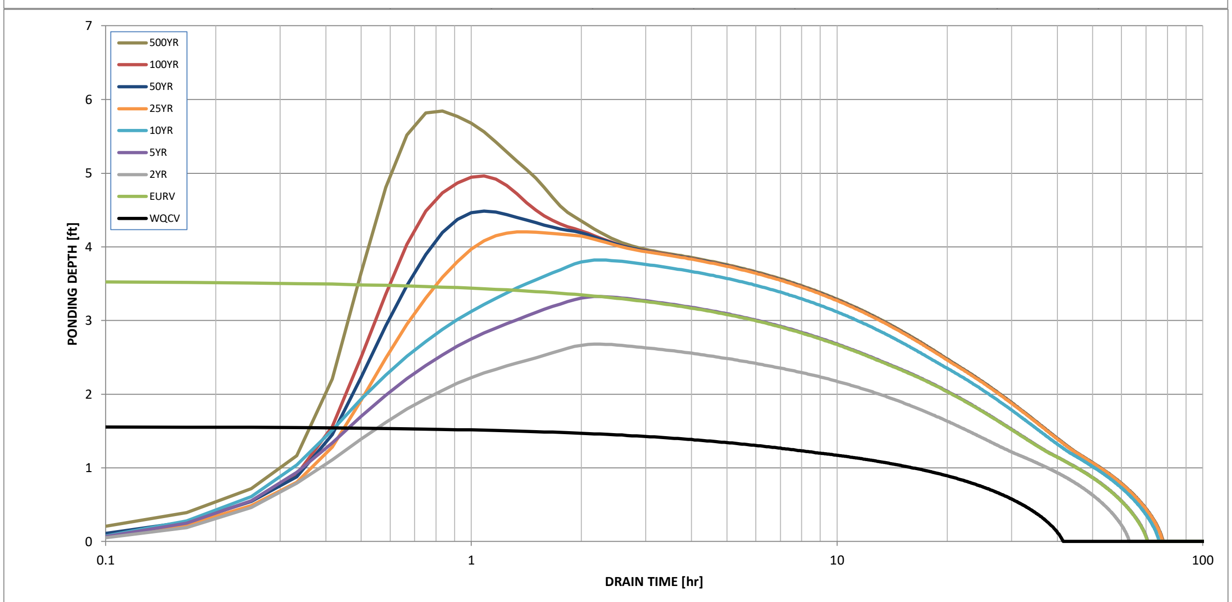
*The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).*

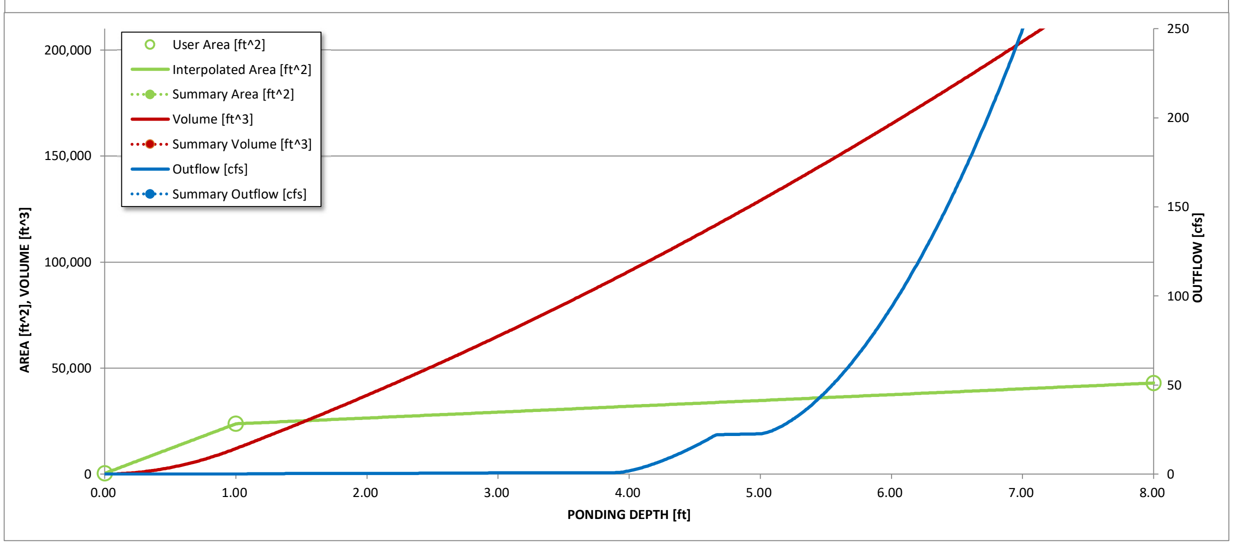
| Design Storm Return Period = | WQCV | EURV | 2 Year | 5 Year | 10 Year | 25 Year | 50 Year | 100 Year | 500 Year |
|---|---|---|---|---|---|---|---|---|---|
| One-Hour Rainfall Depth (in) = | N/A | N/A | 1.19 | 1.50 | 1.75 | 2.00 | 2.25 | 2.52 | 3.49 |
| CUHP Runoff Volume (acre-ft) = | 0.594 | 1.862 | 1.363 | 1.823 | 2.189 | 2.818 | 3.430 | 4.220 | 6.954 |
| Inflow Hydrograph Volume (acre-ft) = | N/A | N/A | 1.363 | 1.823 | 2.189 | 2.818 | 3.430 | 4.220 | 6.954 |
| CUHP Predevelopment Peak Q (cfs) = | N/A | N/A | 0.4 | 0.8 | 1.1 | 9.7 | 19.2 | 31.5 | 71.0 |
| 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 | 0.03 | 0.26 | 0.52 | 0.85 | 1.92 |
| Peak Inflow Q (cfs) = | N/A | N/A | 24.8 | 33.5 | 39.9 | 55.9 | 70.0 | 89.6 | 147.2 |
| Peak Outflow Q (cfs) = | 0.3 | 0.8 | 0.6 | 0.8 | 0.9 | 6.2 | 15.2 | 22.6 | 76.4 |
| Ratio Peak Outflow to Predevelopment Q = | N/A | N/A | N/A | 0.9 | 0.8 | 0.6 | 0.8 | 0.7 | 1.1 |
| Structure Controlling Flow = | Plate | Plate | Plate | Plate | Plate | Overflow Weir 1 | Overflow Weir 1 | Outlet Plate 1 | Spillway |
| Max Velocity through Grate 1 (fps) = | N/A | N/A | N/A | N/A | N/A | 0.3 | 0.9 | 1.3 | 1.4 |
| Max Velocity through Grate 2 (fps) = | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Time to Drain 97% of Inflow Volume (hours) = | 38 | 63 | 57 | 63 | 67 | 67 | 66 | 64 | 57 |
| Time to Drain 99% of Inflow Volume (hours) = | **40** | 67 | 60 | 67 | 72 | 73 | 72 | 72 | 69 |
| Maximum Ponding Depth (ft) = | 1.57 | 3.54 | 2.68 | 3.32 | 3.82 | 4.20 | 4.49 | 4.96 | 5.84 |
| Area at Maximum Ponding Depth (acres) = | 0.58 | 0.71 | 0.65 | 0.69 | 0.72 | 0.75 | 0.76 | 0.80 | 0.85 |
| Maximum Volume Stored (acre-ft) = | 0.598 | 1.865 | 1.275 | 1.712 | 2.065 | 2.345 | 2.556 | 2.931 | 3.655 |

# DETENTION BASIN OUTLET STRUCTURE DESIGN

*MHFD-Detention, Version 4.04 (February 2021)*




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

# DETENTION BASIN OUTLET STRUCTURE DESIGN

*Outflow Hydrograph Workbook Filename:*

Inflow Hydrographs

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

| | SOURCE | CUHP | CUHP | CUHP | CUHP | CUHP | CUHP | CUHP | CUHP | CUHP |
|---|---|---|---|---|---|---|---|---|---|---|
| Time Interval | TIME | WQCV [cfs] | EURV [cfs] | 2 Year [cfs] | 5 Year [cfs] | 10 Year [cfs] | 25 Year [cfs] | 50 Year [cfs] | 100 Year [cfs] | 500 Year [cfs] |
| 5.00 min | 0:00:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0:05:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0:10:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.38 | 0.04 | 1.93 |
| | 0:15:00 | 0.00 | 0.00 | 3.36 | 5.46 | 6.80 | 4.59 | 5.68 | 5.62 | 9.20 |
| | 0:20:00 | 0.00 | 0.00 | 11.41 | 14.77 | 17.39 | 10.96 | 12.73 | 13.76 | 20.13 |
| | 0:25:00 | 0.00 | 0.00 | 22.19 | 31.05 | 38.49 | 22.12 | 25.83 | 28.33 | 45.28 |
| | 0:30:00 | 0.00 | 0.00 | 24.85 | 33.49 | 39.94 | 51.59 | 65.81 | 77.69 | 133.04 |
| | 0:35:00 | 0.00 | 0.00 | 21.09 | 27.67 | 32.62 | 55.89 | 70.03 | 89.59 | 147.17 |
| | 0:40:00 | 0.00 | 0.00 | 17.62 | 22.61 | 26.50 | 48.90 | 61.37 | 77.97 | 128.29 |
| | 0:45:00 | 0.00 | 0.00 | 13.96 | 18.23 | 21.40 | 39.54 | 49.22 | 64.99 | 108.06 |
| | 0:50:00 | 0.00 | 0.00 | 11.42 | 15.28 | 17.60 | 32.41 | 39.77 | 51.65 | 86.76 |
| | 0:55:00 | 0.00 | 0.00 | 9.67 | 12.81 | 14.91 | 25.56 | 31.06 | 41.21 | 69.62 |
| | 1:00:00 | 0.00 | 0.00 | 8.16 | 10.69 | 12.56 | 20.66 | 24.88 | 34.17 | 58.19 |
| | 1:05:00 | 0.00 | 0.00 | 6.88 | 8.91 | 10.56 | 16.84 | 20.14 | 28.56 | 49.16 |
| | 1:10:00 | 0.00 | 0.00 | 5.42 | 7.63 | 9.19 | 12.83 | 15.04 | 20.39 | 34.25 |
| | 1:15:00 | 0.00 | 0.00 | 4.62 | 6.77 | 8.72 | 10.04 | 11.56 | 14.64 | 24.26 |
| | 1:20:00 | 0.00 | 0.00 | 4.23 | 6.15 | 8.01 | 8.11 | 9.25 | 10.58 | 17.22 |
| | 1:25:00 | 0.00 | 0.00 | 3.98 | 5.75 | 7.04 | 7.02 | 7.95 | 8.18 | 12.85 |
| | 1:30:00 | 0.00 | 0.00 | 3.85 | 5.48 | 6.37 | 6.02 | 6.80 | 6.80 | 10.34 |
| | 1:35:00 | 0.00 | 0.00 | 3.76 | 5.30 | 5.92 | 5.34 | 6.02 | 5.89 | 8.66 |
| | 1:40:00 | 0.00 | 0.00 | 3.69 | 4.70 | 5.60 | 4.94 | 5.56 | 5.29 | 7.57 |
| | 1:45:00 | 0.00 | 0.00 | 3.64 | 4.26 | 5.39 | 4.65 | 5.23 | 4.90 | 6.85 |
| | 1:50:00 | 0.00 | 0.00 | 3.62 | 3.96 | 5.24 | 4.47 | 5.02 | 4.70 | 6.51 |
| | 1:55:00 | 0.00 | 0.00 | 3.06 | 3.75 | 4.97 | 4.36 | 4.91 | 4.63 | 6.41 |
| | 2:00:00 | 0.00 | 0.00 | 2.65 | 3.48 | 4.46 | 4.30 | 4.84 | 4.60 | 6.37 |
| | 2:05:00 | 0.00 | 0.00 | 1.82 | 2.38 | 3.04 | 2.93 | 3.29 | 3.14 | 4.33 |
| | 2:10:00 | 0.00 | 0.00 | 1.20 | 1.58 | 2.03 | 1.96 | 2.19 | 2.09 | 2.87 |
| | 2:15:00 | 0.00 | 0.00 | 0.79 | 1.03 | 1.34 | 1.30 | 1.45 | 1.38 | 1.88 |
| | 2:20:00 | 0.00 | 0.00 | 0.49 | 0.65 | 0.85 | 0.82 | 0.91 | 0.87 | 1.17 |
| | 2:25:00 | 0.00 | 0.00 | 0.29 | 0.41 | 0.52 | 0.52 | 0.58 | 0.55 | 0.74 |
| | 2:30:00 | 0.00 | 0.00 | 0.15 | 0.24 | 0.29 | 0.30 | 0.33 | 0.31 | 0.41 |
| | 2:35:00 | 0.00 | 0.00 | 0.07 | 0.11 | 0.13 | 0.14 | 0.15 | 0.14 | 0.18 |
| | 2:40:00 | 0.00 | 0.00 | 0.02 | 0.03 | 0.04 | 0.04 | 0.04 | 0.04 | 0.05 |
| | 2:45:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 2:50:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 2:55:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 3:00:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 3:05:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 3:10:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 3:15:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 3:20:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 3:25:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 3:30:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 3:35:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 3:40:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 3:45:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 3:50:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 3:55:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 4:00:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 4:05:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 4:10:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 4:15:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 4:20:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 4:25:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 4:30:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 4:35:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 4:40:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 4:45:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 4:50:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 4:55:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 5:00:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 5:05:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 5:10:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 5:15:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 5:20:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 5:25:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 5:30:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 5:35:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 5:40:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 5:45:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 5:50:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 5:55:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 6:00:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

# DETENTION BASIN OUTLET STRUCTURE DESIGN

*MHFD-Detention, Version 4.04 (February 2021)*

Summary Stage-Area-Volume-Discharge Relationships

The user can create a summary S-A-V-D by entering the desired stage increments and the remainder of the table will populate automatically.

The user should graphically compare the summary S-A-V-D table to the full S-A-V-D table in the chart to confirm it captures all key transition points.

| Stage - Storage Description | Stage [ft] | Area [ft$^2$] | Area [acres] | Volume [ft$^3$] | Volume [ac-ft] | Total Outflow [cfs] |
|---|---|---|---|---|---|---|
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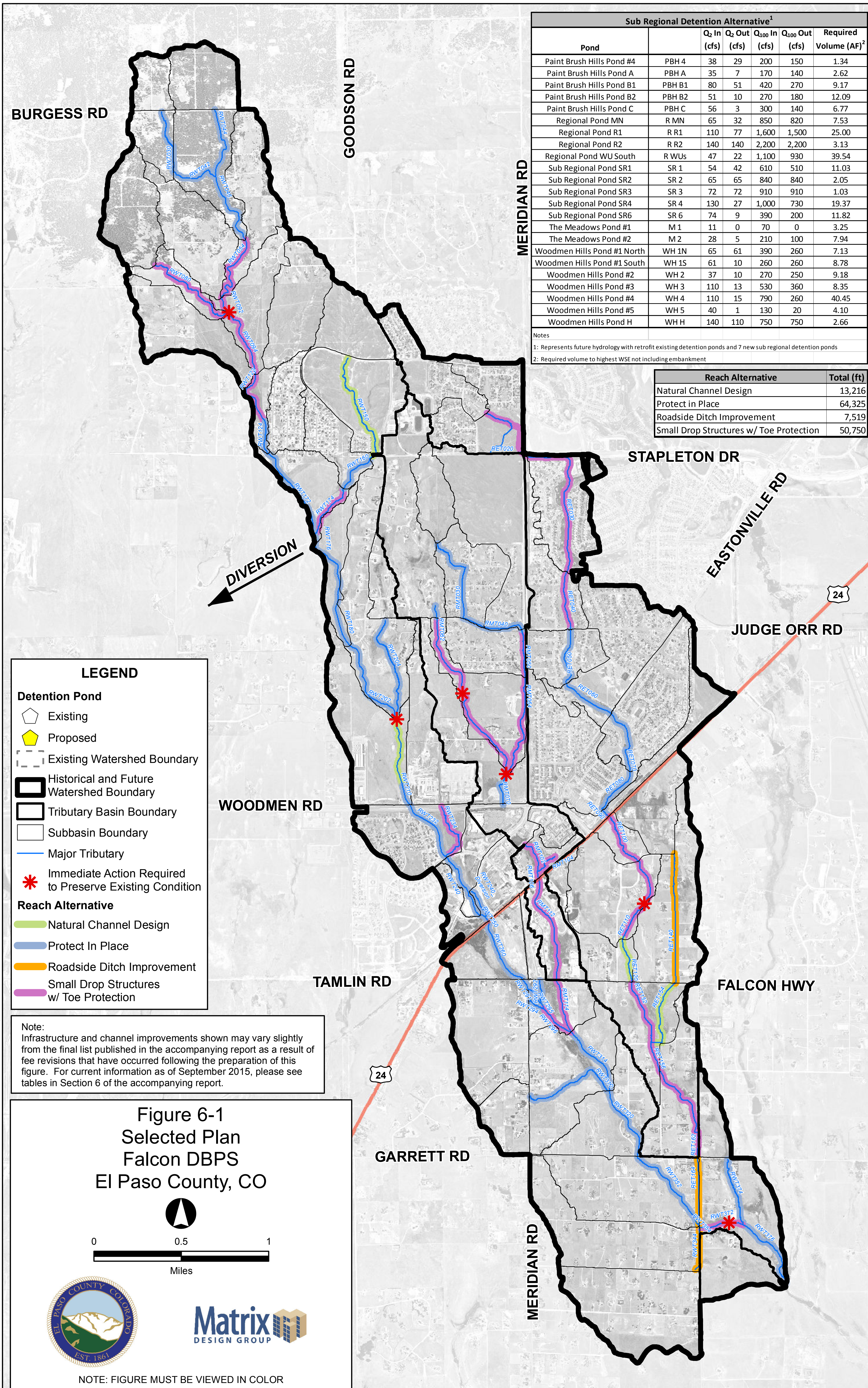
For best results, include the stages of all grade slope changes (e.g. ISV and Floor) from the S-A-V table on Sheet 'Basin'.

Also include the inverts of all outlets (e.g. vertical orifice, overflow grate, and spillway, where applicable).

**DBPS Excerpts**




| 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 |

## 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

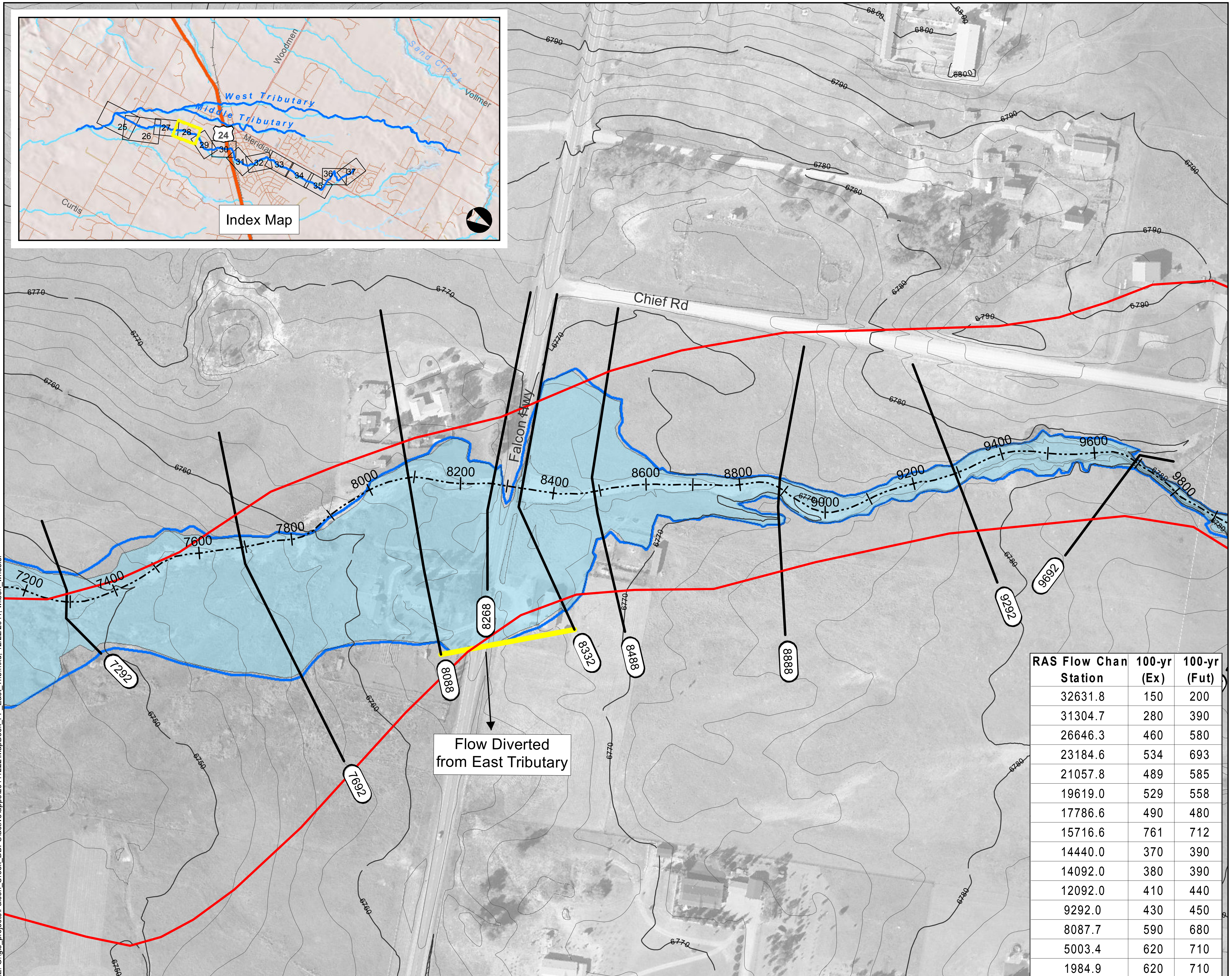
0 0.5 1
Miles

EL PASO COUNTY COLORADO EST. 1861

Matrix DESIGN GROUP

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




| RAS Flow Chan Station | 100-yr (Ex) | 100-yr (Fut) |
|---|---|---|
| 32631.8 | 150 | 200 |
| 31304.7 | 280 | 390 |
| 26646.3 | 460 | 580 |
| 23184.6 | 534 | 693 |
| 21057.8 | 489 | 585 |
| 19619.0 | 529 | 558 |
| 17786.6 | 490 | 480 |
| 15716.6 | 761 | 712 |
| 14440.0 | 370 | 390 |
| 14092.0 | 380 | 390 |
| 12092.0 | 410 | 440 |
| 9292.0 | 430 | 450 |
| 8087.7 | 590 | 680 |
| 5003.4 | 620 | 710 |
| 1984.9 | 620 | 710 |

# Sheet 4-28

## East Tributary Floodplain
## Falcon DBPS
## El Paso County, CO

### Legend

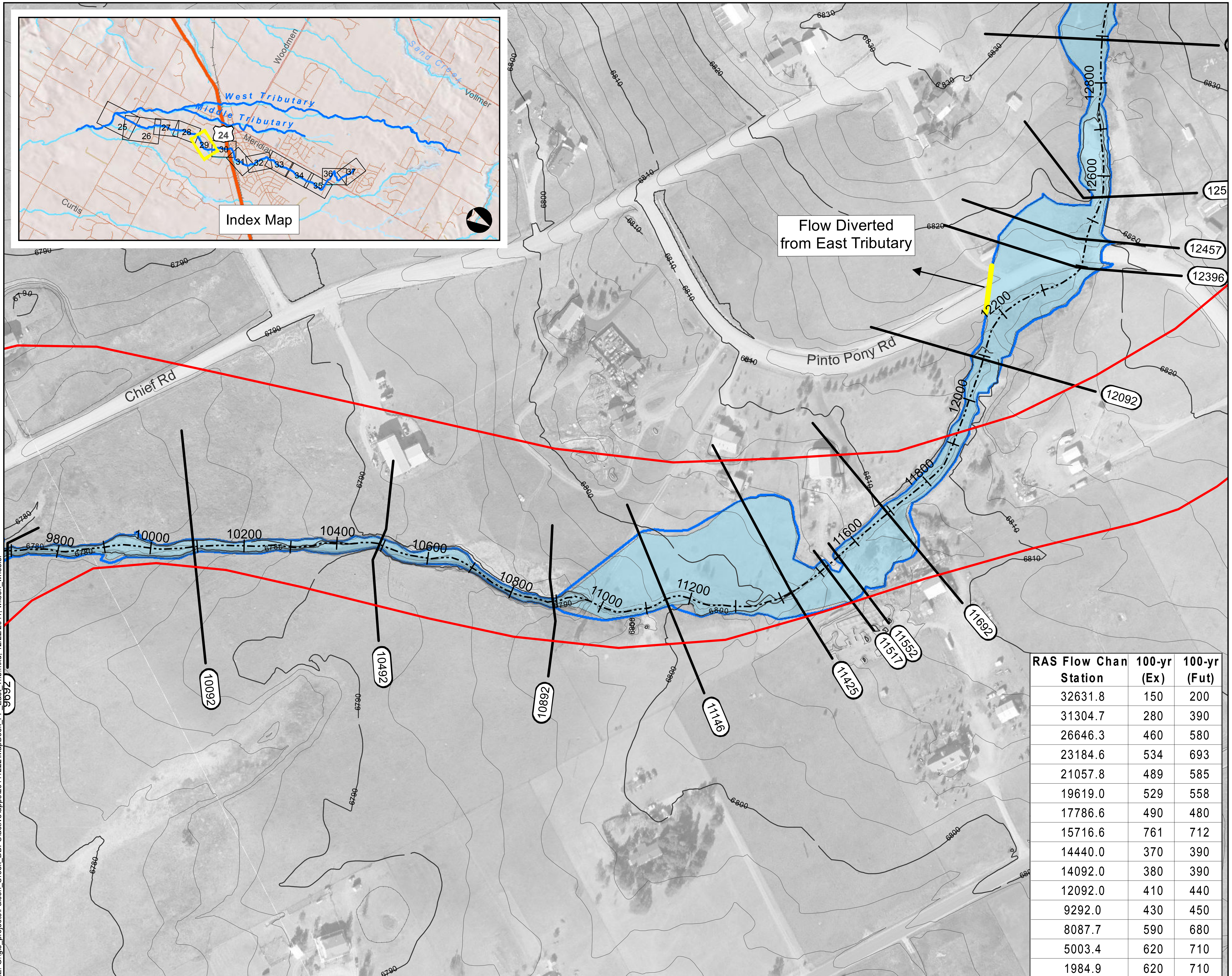
- Approximate 100-yr Floodplain Existing
- Approximate 100-yr Floodplain Existing (Based on Assumed Split Flow Condition)
- Approximate 100-yr Floodplain Future
- Approximate 100-yr Floodplain Future (Based on Assumed Split Flow Condition)
- Shallow Flooding
- HEC-RAS Centerline
- XSCutLines (East Trib)
- FEMA Regulatory Floodplain (Effective as of 1999)*
- Study Limit

*Letters of Map Change completed after 1999 are not shown

0 100 200 400
Feet

Matrix
DESIGN GROUP

FILE: G:\gis_projects\Falcon_Creek_DBPS\active\apps\20111222\MapBook_FP_East_Trib.mxd, 12/22/2011, wilson_wheeler




# Sheet 4-29

East Tributary Floodplain
Falcon DBPS
El Paso County, CO

## Legend

- Approximate 100-yr Floodplain Existing
- Approximate 100-yr Floodplain Existing (Based on Assumed Split Flow Condition)
- Approximate 100-yr Floodplain Future
- Approximate 100-yr Floodplain Future (Based on Assumed Split Flow Condition)
- Shallow Flooding
- HEC-RAS Centerline
- XSCutLines (East Trib)
- FEMA Regulatory Floodplain (Effective as of 1999)*
- Study Limit

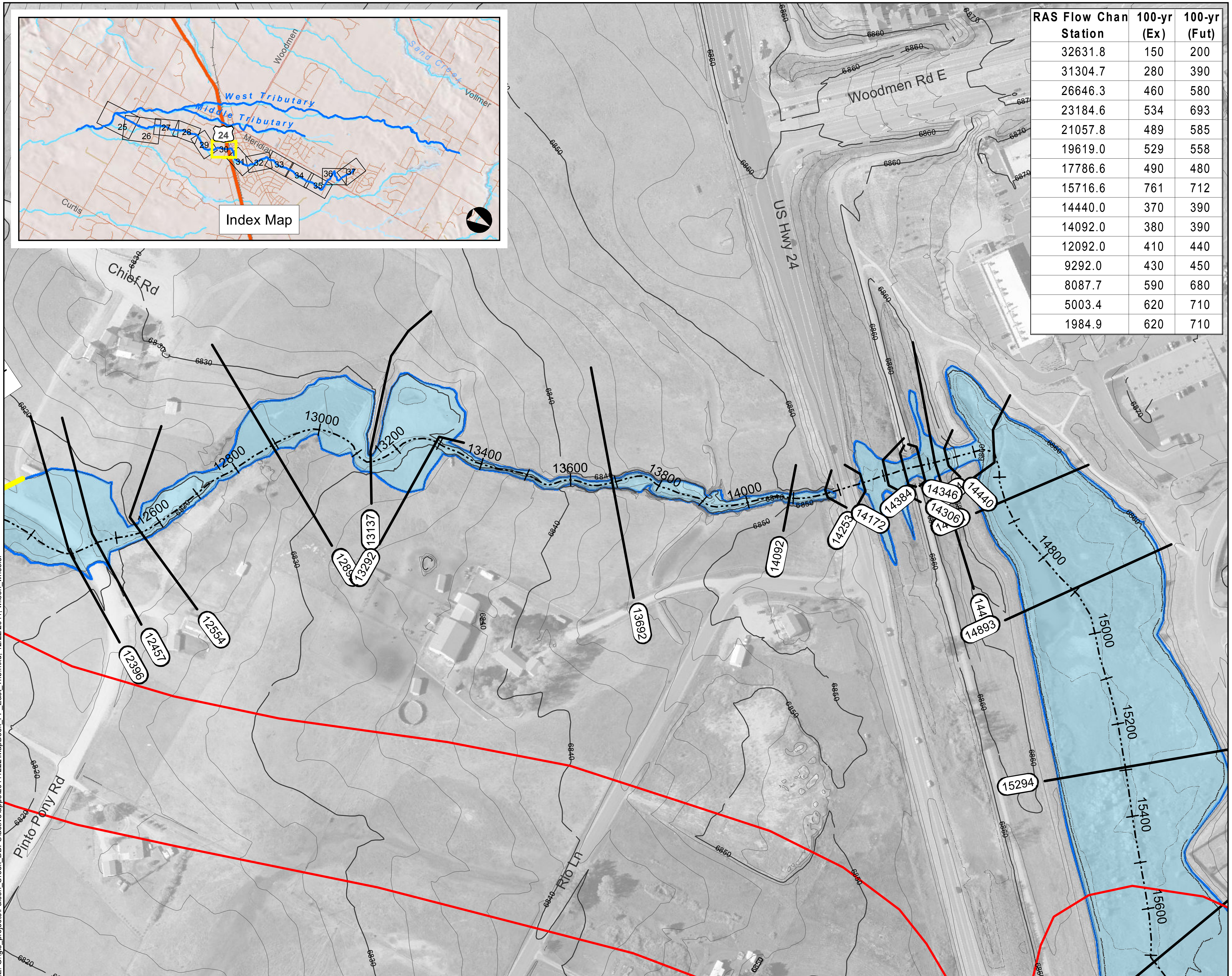
*Letters of Map Change completed after 1999 are not shown

| RAS Flow Chan Station | 100-yr (Ex) | 100-yr (Fut) |
|---|---|---|
| 32631.8 | 150 | 200 |
| 31304.7 | 280 | 390 |
| 26646.3 | 460 | 580 |
| 23184.6 | 534 | 693 |
| 21057.8 | 489 | 585 |
| 19619.0 | 529 | 558 |
| 17786.6 | 490 | 480 |
| 15716.6 | 761 | 712 |
| 14440.0 | 370 | 390 |
| 14092.0 | 380 | 390 |
| 12092.0 | 410 | 440 |
| 9292.0 | 430 | 450 |
| 8087.7 | 590 | 680 |
| 5003.4 | 620 | 710 |
| 1984.9 | 620 | 710 |

0 100 200 400
Feet

EL PASO COUNTY COLORADO EST. 1861

Matrix DESIGN GROUP




| RAS Flow Chan Station | 100-yr (Ex) | 100-yr (Fut) |
|---|---|---|
| 32631.8 | 150 | 200 |
| 31304.7 | 280 | 390 |
| 26646.3 | 460 | 580 |
| 23184.6 | 534 | 693 |
| 21057.8 | 489 | 585 |
| 19619.0 | 529 | 558 |
| 17786.6 | 490 | 480 |
| 15716.6 | 761 | 712 |
| 14440.0 | 370 | 390 |
| 14092.0 | 380 | 390 |
| 12092.0 | 410 | 440 |
| 9292.0 | 430 | 450 |
| 8087.7 | 590 | 680 |
| 5003.4 | 620 | 710 |
| 1984.9 | 620 | 710 |

# Sheet 4-30

East Tributary Floodplain
Falcon DBPS
El Paso County, CO

## Legend

- Approximate 100-yr Floodplain Existing
- Approximate 100-yr Floodplain Existing (Based on Assumed Split Flow Condition)
- Approximate 100-yr Floodplain Future
- Approximate 100-yr Floodplain Future (Based on Assumed Split Flow Condition)
- Shallow Flooding
- HEC-RAS Centerline
- XSCutLines (East Trib)
- FEMA Regulatory Floodplain (Effective as of 1999)*
- Study Limit

*Letters of Map Change completed after 1999 are not shown

N

0 100 200 400
Feet

EL PASO COUNTY COLORADO EST. 1861

Matrix DESIGN GROUP

## CLOMR Excerpts

# REQUEST FOR CONDITIONAL LETTER OF MAP REVISION
# UNNAMED TRIBUTARY TO BLACK SQUIRREL CREEK
# FALCON FIELD

## 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.

Falcon Field consists of approximately 57 acres adjacent to and southeast of Highway 24 near Rio Lane as shown in **Figure 1**. The UTBSC flows southeast across the property and is proposed to be contained within an 8’x4’ box culvert and open channel that will discharge into the existing tributary. A general site layout of the Falcon Field development is shown in the construction drawings included in **Appendix 1**.

The improvements associated with Falcon Field 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) Numbers 08041C0553G and 08041C0561G in **Appendix 5** show the UTBSC 100-year Zone A floodplain across the center of the Falcon Field. This report includes detailed hydraulic models showing that the proposed 100-year floodplain will be contained within a proposed box culvert and open channel.

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 57-acre parcel located at the southwest corner of Highway 24 and Rio Lane, in the east half of Section 7, Township 13 South, Range 64 West of the 6$^{th}$ P.M. in El Paso County, Colorado. The subject property will be developed with a mixed-use commercial and residential development (Falcon Field).

The Falcon Field development includes regrading the site and containing the UTBSC across the site. Approximately 1024 feet of the tributary will be impacted by the development, which intercepts the existing creek south of Highway 24 and conveys it via an 8’x4’ box culvert and open channel to the existing creek downstream. The box culvert and open channel are designed to convey the full 100-year discharge.


**Figure 1 – Vicinity Map**

### 1.3 Regulatory Floodplain

The Effective Zone A limits for the UTBSC on the Falcon Field site are defined on Map Numbers 8041C0553G and 08041C0561G 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 "East Tributary" which flows across the subject property. Select output from the Falcon DBPS is included in **Appendix 2**.

## 3.0 HYDROLOGIC ANALYSIS

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.

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 Falcon Field are summarized in Table 3-1.

**Table 3-1. Future Land Use Conditions Peak Discharges near Falcon Field on the East Tributary, Falcon DBPS**

| Model Location | Physical Location | Proximity to Falcon Field | Q100 (cfs) |
|---|---|---|---|
| JET090 | Highway 24 | Upstream of Site | 390 |
| JET100 | Pinto Pony Road | Downstream of Site | 390 |

## 4.0 HYDRAULIC ANALYSIS

### 4.1 General

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

### 4.2 Vertical Datum

The effective FIRM is on the North American Vertical Datum of 1988 (NAVD88). The survey completed for the site, the design and construction drawings, and the hydraulic analysis completed for this CLOMR are all on the NAVD88. The Falcon DBPS was completed on the NGVD29.

### 4.3 Horizontal Datum

The field survey, design, construction drawings and hydraulic modeling for the Falcon Field 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 conditions, the UTBSC discharges to an open channel through the site from 2-12’H x 4.83’W box culverts under Highway 24. The Falcon Field property limits are approximately 46 feet downstream of the Highway 24 box culvert exit. There is an 8-foot concrete vertical wall/drop immediately downstream of the culvert, then a short riprap channel section (shown in the photo below), before the open channel returns to a vegetated section through the site. This section of the tributary was realigned with the construction of the upstream railroad and highway and does not follow the historic flow path.

**Existing 2-12'H x 4.83' W box culverts under Highway 24**

The proposed 8' x 4' box culvert will begin at the upstream property boundary (approximately the fence line shown in the photo above) at a headwall and convey the tributary flows 750 feet downstream to a proposed open channel. StormCAD was used to evaluate the hydraulic performance of the box culvert. The profile and output for the 100-year storm event is included in **Appendix 3**, and the model files are provided.

### 4.5 Open Channel Hydraulic Analysis

The proposed box culvert discharges to a proposed open channel via a headwall. The proposed open channel conveys the UTBSC 275 feet downstream to the existing creek, and will be vegetated with mowable short grasses. The open channel has a 20-foot bottom width in a v-shape with two 10-foot sections set at a 2% slope to the invert. The side slopes above the v-shape bottom are set at a 3H:1V slope. HEC-RAS version 6.2 was used to model the proposed open channel and existing creek downstream. The profile and output for the 100-year storm event is included in **Appendix 3**, and the model files are provided.

The proposed geometry includes six cross sections over a modeled reach of 400 feet. Roughness coefficients (n-values) of 0.04 and 0.08 were used for the proposed and existing channel, respectively. The model was computed in a subcritical flow regime for the design flow of 390 cfs, with a normal depth starting water surface elevation.

## 5.0 NFIP REGULATION COMPLIANCE

### 5.1 Floodplain Work Map and Annotated FIRM

The effective Zone A 100-year floodplain delineation for the UTBSC begins downstream of Highway 24. The 100-year flood discharge will be contained in the proposed box culvert. The proposed floodplain for the on-site open channel is delineated on the Floodplain Work Map and Annotated FIRM in **Appendix 5**. The proposed Zone AE floodplain ties into the effective Zone A floodplain approximately 225 feet downstream of the Falcon Field downstream property limits.

### 5.2 Forms and Notifications

The appropriate FEMA forms are located in **Appendix 4**. Modifications to 100-year floodplain elevations and delineations are limited to the Falcon Field 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 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 6**.

## 6.0 CONCLUSIONS

The Falcon Field development will relocate a portion of an Unnamed Tributary to Black Squirrel Creek (East 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

Bentley (formerly Haestad Methods, Inc.), StormCAD v4.1.1.

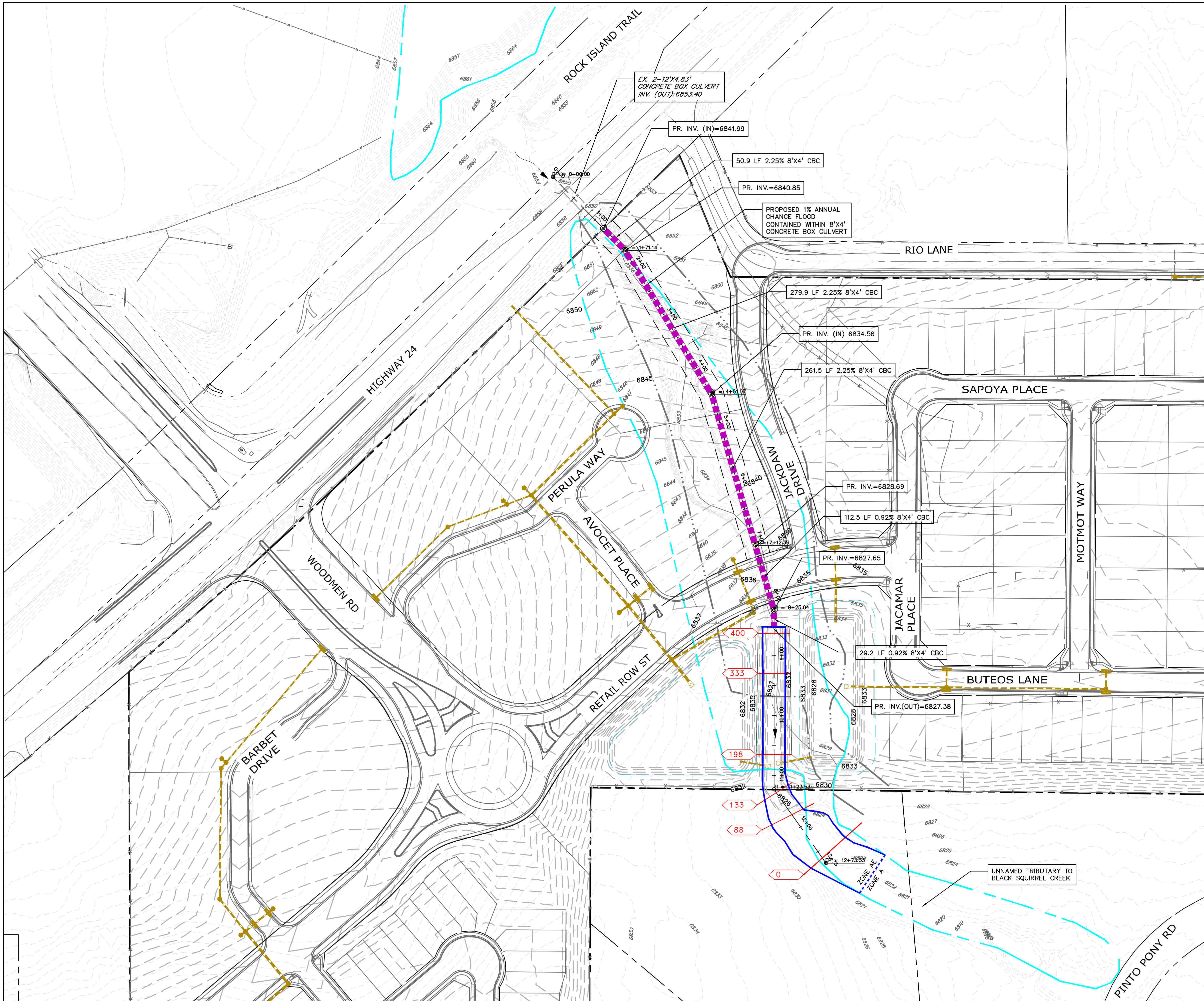
El Paso County, *Drainage Criteria Manual*, October 2018.

FEMA, *FIRM Numbers 08041C0553G and 08041C0561G, 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.

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

USACE, *Hydrologic Engineering Center River Analysis System (HEC-RAS), Version 6.2,* March 2022.




## LEGEND

- EX. CONTOUR
- PR. CONTOUR
- EX. STORM SEWER OR
- PR. CBC STORM SEWER
- PR. ON-SITE STORM DRAINAGE
- EFFECTIVE FEMA FLOODPLAIN (ZONE A)
- PROPOSED FLOODPLAIN (ZONE AE)
- CROSS SECTION
- CROSS SECTION LABEL
- FLOW DIRECTION
- PR. ON-SITE DETENTION
- PR. EASEMENT
- PR. LOT
- EX. PROPERTY LINE
- PR. SITE BOUNDARY
- PROPOSED CURB LINE & SIDEWALK

## NOTES

1. SPATIAL PROJECTION IS NAD83 COLORADO STATE PLANE, CENTRAL ZONE (FEET).
2. VERTICAL DATUM IS NAVD88.

80 40 0 80 160
SCALE IN FEET

PREPARED BY:

DBC
Drexel, Barrell & Co.
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:

PJ ANDERSON
FALCON FIELD, LLC
3230 ELECTRA DR. N
COLORADO SPRINGS, CO 80906

EXHIBIT FOR:
# FALCON FIELD
FALCON, COLORADO

| ISSUE | DATE |
|---|---|
| EXHIBIT | 8/3/23 |

DESIGNED BY: MLI
DRAWN BY: CAF
CHECKED BY: MLI
FILE NAME: 21705-00 FPWM

COLORADO LICENSED MICHELLE IBLINGS 43515 PROFESSIONAL ENGINEER

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

CLOMR FLOODPLAIN WORK MAP

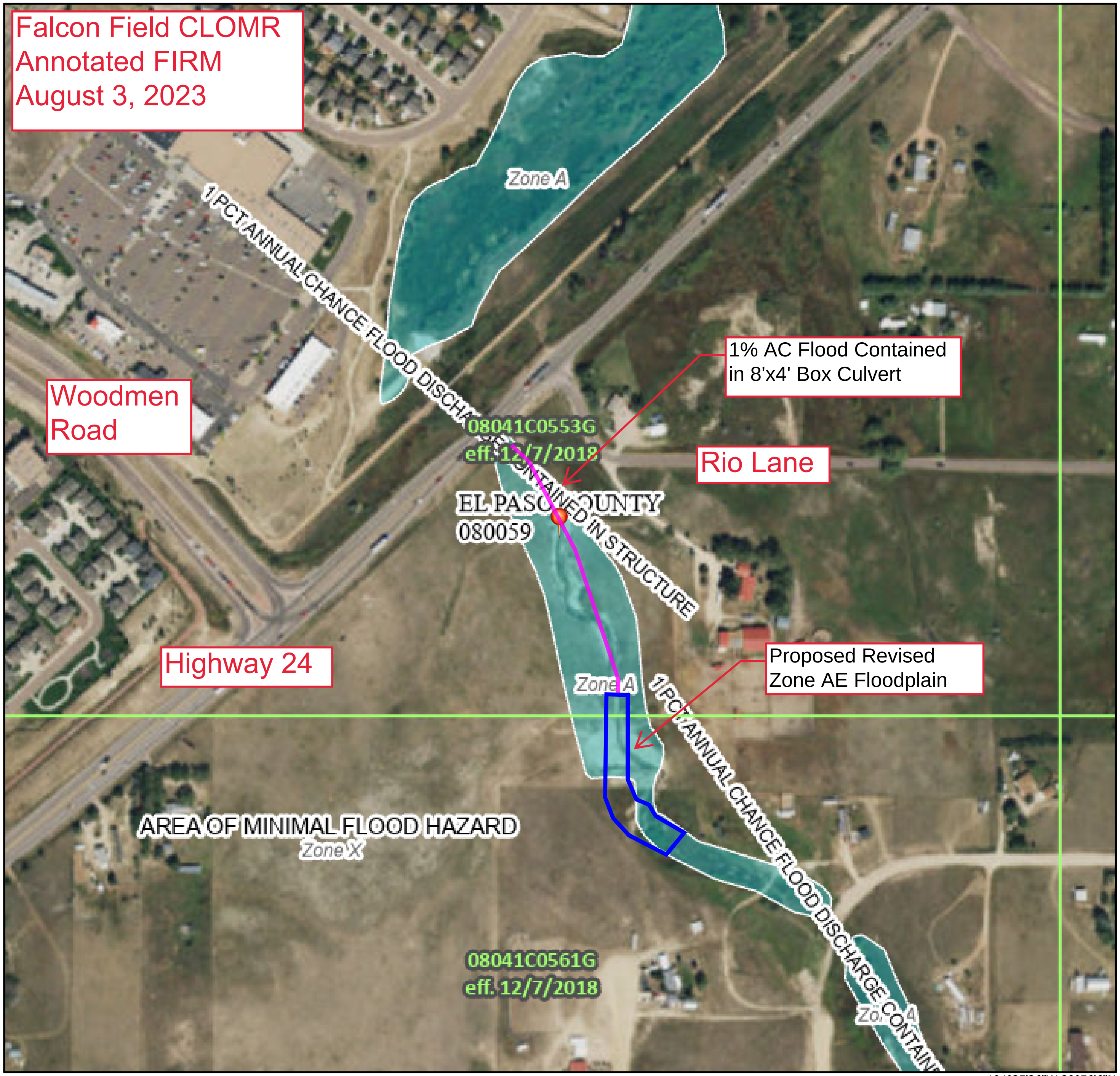
PROJECT:21705-00BLWR
DRAWING NO.
FPWM
SHEET: 1 OF 1

H:\21705-00BLWR\Plans\Sheets\21705-00 FPWM.dwg, 8/3/2023 2:02:51 PM

# National Flood Hazard Layer FIRMette

FEMA

104°36'13"W 38°56'34"N




104°35'36"W 38°56'6"N

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

1:6,000

*Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020*

## Legend

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

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

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

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

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

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

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

N

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

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

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 10/11/2021 at 10:04 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

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

**DEPARTMENT OF THE ARMY**
**CORPS OF ENGINEERS, ALBUQUERQUE DISTRICT**
**SOUTHERN COLORADO REGULATORY BRANCH**
**201 WEST 8TH STREET, SUITE 350**
**PUEBLO, COLORADO 81003**

August 26, 2022

Regulatory Division

SUBJECT: Jurisdictional Determination – Action No. SPA-2021-00180, Falcon Field

P. J. Anderson
Falcon Field, LLC
31 North Tejon Street, Suite 516
Colorado Springs, CO 80903
pja5713@gmail.com

Dear P.J. Anderson:

This letter responds to your request for a jurisdictional determination (JD) for property located at latitude 38.936555635255, longitude -104.600429740897, in El Paso County, Colorado. We have assigned Action No. SPA-2021-00180 to your request. Please reference this number in all future correspondence concerning the site.

Based on the information provided, we have determined that the site does not contain waters of the United States that are subject to regulation under Section 404 of the Clean Water Act. The attached JD form describes the area that was evaluated and determined to contain no waters of the United States. If you intend to conduct work that could result in a discharge of dredged or fill material into waters of the United States, please contact this office for a determination of Department of the Army permit requirements and refer to Action No. SPA-2021-00180.

The basis for this approved JD (attached) is that the project site contains isolated wetlands and/or other waters. Wetland 1 through 5 are intrastate, isolated waters that do not flow into a traditional navigable waterway (attached). A copy of this JD is also available at http://www.spa.usace.army.mil/reg/JD. This approved JD is valid for 5 years unless new information warrants revision of the determination before the expiration date.

You may accept or appeal this approved JD or provide new information in accordance with the attached Notification of Administration Appeal Options and Process and Request for Appeal. If you elect to appeal this approved JD, you must complete Section II of the form and return it to the Army Engineer Division, South Pacific, CESPD-PDS-O, Attn: Travis Morse, Administrative Appeal Review Officer, P.O. Box 36023, 450 Golden Gate Avenue, San Francisco, CA 94102 within 60 days of the date of this notice. Failure to notify the Corps within 60 days of the date of this notice means that you accept the approved JD in its entirety and waive all rights to appeal the approved JD.

If you have any questions, please contact Kraig Jashinsky at (719) 439-7281 or by email at Kraig.A.Jashinsky@usace.army.mil. At your convenience, please complete a Customer Service Survey online at https://regulatory.ops.usace.army.mil/customer-service-survey/.

Sincerely,

Kara A. Hellige
Chief, Southern Colorado Regulatory Branch

cc:
Daniel Maynard, Bristlecone Ecology, LLC, dmaynard@bristleconeecology.com

**APPROVED JURISDICTIONAL DETERMINATION FORM**
**U.S. Army Corps of Engineers**

This form should be completed by following the instructions provided in Section IV of the JD Form Instructional Guidebook.

## SECTION I: BACKGROUND INFORMATION

**A. REPORT COMPLETION DATE FOR APPROVED JURISDICTIONAL DETERMINATION (JD): August 26, 2022**

**B. DISTRICT OFFICE, FILE NAME, AND NUMBER: Albuquerque District, Falcon Field AJD Request, SPA-2021-00180**

**C. PROJECT LOCATION AND BACKGROUND INFORMATION:**

State: **Colorado** County/parish/borough: **El Paso County** City:
Center coordinates of site (lat/long in degree decimal format): Lat. **38.936555635255°**, Long. **-104.600429740897°**
Universal Transverse Mercator: **13 534630.43 4309812.02**
Name of nearest waterbody: **Jimmy Camp Creek**
Name of nearest Traditional Navigable Water (TNW) into which the aquatic resource flows:
Name of watershed or Hydrologic Unit Code (HUC): **Chico, 11020004**
☐ Check if map/diagram of review area and/or potential jurisdictional areas is/are available upon request.
☐ Check if other sites (e.g., offsite mitigation sites, disposal sites, etc…) are associated with this action and are recorded on a different JD form:

**D. REVIEW PERFORMED FOR SITE EVALUATION (CHECK ALL THAT APPLY):**

☒ Office (Desk) Determination. Date: **July 14, 2022**
☒ Field Determination. Date(s): **June 28, 2022**

## SECTION II: SUMMARY OF FINDINGS

**A. RHA SECTION 10 DETERMINATION OF JURISDICTION.**

There **Are no** "*navigable waters of the U.S.*" within Rivers and Harbors Act (RHA) jurisdiction (as defined by 33 CFR part 329) in the review area. [*Required*]

☐ Waters subject to the ebb and flow of the tide.
☐ Waters are presently used, or have been used in the past, or may be susceptible for use to transport interstate or foreign commerce.
Explain:

**B. CWA SECTION 404 DETERMINATION OF JURISDICTION.**

There **Are no** "*waters of the U.S.*" within Clean Water Act (CWA) jurisdiction (as defined by 33 CFR part 328) in the review area. [*Required*]

1. **Waters of the U.S.**
   a. **Indicate presence of waters of U.S. in review area (check all that apply):** [1]
      ☐ TNWs, including territorial seas
      ☐ Wetlands adjacent to TNWs
      ☐ Relatively permanent waters[2] (RPWs) that flow directly or indirectly into TNWs
      ☐ Non-RPWs that flow directly or indirectly into TNWs
      ☐ Wetlands directly abutting RPWs that flow directly or indirectly into TNWs
      ☐ Wetlands adjacent to but not directly abutting RPWs that flow directly or indirectly into TNWs
      ☐ Wetlands adjacent to non-RPWs that flow directly or indirectly into TNWs
      ☐ Impoundments of jurisdictional waters
      ☐ Isolated (interstate or intrastate) waters, including isolated wetlands

   b. **Identify (estimate) size of waters of the U.S. in the review area:**
      Non-wetland waters: linear feet, wide, and/or acres.
      Wetlands: acres.

   c. **Limits (boundaries) of jurisdiction** based on: **Pick List**
      Elevation of established OHWM (if known):

2. **Non-regulated waters/wetlands (check if applicable):**[3]
   ☒ Potentially jurisdictional waters and/or wetlands were assessed within the review area and determined to be not jurisdictional.
   Explain: **The review area contains five wetlands totalling 7.15 acres. A review of the downstream connectivity of the associated wetlands found there to be a lack of a connection to downstream waters. The drainage features and associated wetlands presented a southward flow path until reaching E. Blaney Road. The flow path consisting of a varying degree of broken stream channel and connected wetlands terminated across a portion of flat terrain with not apparent wetland vegetation. Flow does not appear to reach any downstream waters via the nearby roadside ditch. Flow also does not cross E. Blaney Road due to the lack of culverts and a slight elevation rise. Due to a lack of downstream connectivity, the drainage features and associated wetlands under review are found to be isolated.**

[1] Boxes checked below shall be supported by completing the appropriate sections in Section III below.
[2] For purposes of this form, an RPW is defined as a tributary that is not a TNW and that typically flows year-round or has continuous flow at least "seasonally" (e.g., typically 3 months).
[3] Supporting documentation is presented in Section III.F.

**SECTION III: CWA ANALYSIS**

**A. TNWs AND WETLANDS ADJACENT TO TNWs**

**The agencies will assert jurisdiction over TNWs and wetlands adjacent to TNWs. If the aquatic resource is a TNW, complete Section III.A.1 and Section III.D.1. only; if the aquatic resource is a wetland adjacent to a TNW, complete Sections III.A.1 and 2 and Section III.D.1.; otherwise, see Section III.B below**.

1. **TNW**
   Identify TNW:

   Summarize rationale supporting determination:

2. **Wetland adjacent to TNW**
   Summarize rationale supporting conclusion that wetland is "adjacent":

**B. CHARACTERISTICS OF TRIBUTARY (THAT IS NOT A TNW) AND ITS ADJACENT WETLANDS (IF ANY):**

**This section summarizes information regarding characteristics of the tributary and its adjacent wetlands, if any, and it helps determine whether or not the standards for jurisdiction established under *Rapanos* have been met.**

**The agencies will assert jurisdiction over non-navigable tributaries of TNWs where the tributaries are "relatively permanent waters" (RPWs), i.e. tributaries that typically flow year-round or have continuous flow at least seasonally (e.g., typically 3 months). A wetland that directly abuts an RPW is also jurisdictional. If the aquatic resource is not a TNW, but has year-round (perennial) flow, skip to Section III.D.2. If the aquatic resource is a wetland directly abutting a tributary with perennial flow, skip to Section III.D.4.**

**A wetland that is adjacent to but that does not directly abut an RPW requires a significant nexus evaluation. Corps districts and EPA regions will include in the record any available information that documents the existence of a significant nexus between a relatively permanent tributary that is not perennial (and its adjacent wetlands if any) and a traditional navigable water, even though a significant nexus finding is not required as a matter of law.**

**If the waterbody[4] is not an RPW, or a wetland directly abutting an RPW, a JD will require additional data to determine if the waterbody has a significant nexus with a TNW. If the tributary has adjacent wetlands, the significant nexus evaluation must consider the tributary in combination with all of its adjacent wetlands. This significant nexus evaluation that combines, for analytical purposes, the tributary and all of its adjacent wetlands is used whether the review area identified in the JD request is the tributary, or its adjacent wetlands, or both. If the JD covers a tributary with adjacent wetlands, complete Section III.B.1 for the tributary, Section III.B.2 for any onsite wetlands, and Section III.B.3 for all wetlands adjacent to that tributary, both onsite and offsite. The determination whether a significant nexus exists is determined in Section III.C below.**

1. **Characteristics of non-TNWs that flow directly or indirectly into TNW**

   **(i) General Area Conditions:**
   Watershed size: **Pick List**
   Drainage area: **Pick List**
   Average annual rainfall: inches
   Average annual snowfall: inches

   **(ii) Physical Characteristics:**
   (a) Relationship with TNW:
   ☐ Tributary flows directly into TNW.
   ☐ Tributary flows through **Pick List** tributaries before entering TNW.

   Project waters are **Pick List** river miles from TNW.
   Project waters are **Pick List** river miles from RPW.
   Project waters are **Pick List** aerial (straight) miles from TNW.
   Project waters are **Pick List** aerial (straight) miles from RPW.
   Project waters cross or serve as state boundaries. Explain:

   Identify flow route to TNW[5]:
   Tributary stream order, if known:

---

[4] Note that the Instructional Guidebook contains additional information regarding swales, ditches, washes, and erosional features generally and in the arid West.
[5] Flow route can be described by identifying, e.g., tributary a, which flows through the review area, to flow into tributary b, which then flows into TNW.

(b) General Tributary Characteristics (check all that apply):

**Tributary** is: ☐ Natural
☐ Artificial (man-made). Explain:
☐ Manipulated (man-altered). Explain:

**Tributary** properties with respect to top of bank (estimate):
Average width: feet
Average depth: feet
Average side slopes: **Pick List.**

Primary tributary substrate composition (check all that apply):

☐ Silts ☐ Sands ☐ Concrete
☐ Cobbles ☐ Gravel ☐ Muck
☐ Bedrock ☐ Vegetation. Type/% cover:
☐ Other. Explain:

Tributary condition/stability [e.g., highly eroding, sloughing banks]. Explain:
Presence of run/riffle/pool complexes. Explain:
Tributary geometry: **Pick List**
Tributary gradient (approximate average slope): %

(c) Flow:

Tributary provides for: **Pick List**
Estimate average number of flow events in review area/year: **Pick List**
Describe flow regime:
Other information on duration and volume:

Surface flow is: **Pick List.** Characteristics:

Subsurface flow: **Pick List**. Explain findings:
☐ Dye (or other) test performed:

Tributary has (check all that apply):
☐ Bed and banks
☐ OHWM[6] (check all indicators that apply):
☐ clear, natural line impressed on the bank
☐ changes in the character of soil
☐ shelving
☐ vegetation matted down, bent, or absent
☐ leaf litter disturbed or washed away
☐ sediment deposition
☐ water staining
☐ other (list):
☐ the presence of litter and debris
☐ destruction of terrestrial vegetation
☐ the presence of wrack line
☐ sediment sorting
☐ scour
☐ multiple observed or predicted flow events
☐ abrupt change in plant community
☐ Discontinuous OHWM.[7] Explain:

If factors other than the OHWM were used to determine lateral extent of CWA jurisdiction (check all that apply):
☐ High Tide Line indicated by:
☐ oil or scum line along shore objects
☐ fine shell or debris deposits (foreshore)
☐ physical markings/characteristics
☐ tidal gauges
☐ other (list):
☐ Mean High Water Mark indicated by:
☐ survey to available datum;
☐ physical markings;
☐ vegetation lines/changes in vegetation types.

**(iii) Chemical Characteristics:**

Characterize tributary (e.g., water color is clear, discolored, oily film; water quality; general watershed characteristics, etc.).
Explain:
Identify specific pollutants, if known:

**(iv) Biological Characteristics. Channel supports (check all that apply):**

☐ Riparian corridor. Characteristics (type, average width):
☐ Wetland fringe. Characteristics:
☐ Habitat for:

[6]A natural or man-made discontinuity in the OHWM does not necessarily sever jurisdiction (e.g., where the stream temporarily flows underground, or where the OHWM has been removed by development or agricultural practices). Where there is a break in the OHWM that is unrelated to the waterbody's flow regime (e.g., flow over a rock outcrop or through a culvert), the agencies will look for indicators of flow above and below the break.

[7]Ibid.

☐ Federally Listed species. Explain findings:
☐ Fish/spawn areas. Explain findings:
☐ Other environmentally-sensitive species. Explain findings:
☐ Aquatic/wildlife diversity. Explain findings:

**2. Characteristics of wetlands adjacent to non-TNW that flow directly or indirectly into TNW**

**(i) Physical Characteristics:**

(a) General Wetland Characteristics:
Properties:
Wetland size: acres
Wetland type. Explain:
Wetland quality. Explain:
Project wetlands cross or serve as state boundaries. Explain:

(b) General Flow Relationship with Non-TNW:
Flow is: **Pick List**. Explain:

Surface flow is**: Pick List**
Characteristics:

Subsurface flow: **Pick List**. Explain findings:
☐ Dye (or other) test performed:

(c) Wetland Adjacency Determination with Non-TNW:
☐ Directly abutting
☐ Not directly abutting
☐ Discrete wetland hydrologic connection. Explain:
☐ Ecological connection. Explain:
☐ Separated by berm/barrier. Explain:

(d) Proximity (Relationship) to TNW
Project wetlands are **Pick List** river miles from TNW.
Project waters are **Pick List** aerial (straight) miles from TNW.
Flow is from: **Pick List.**
Estimate approximate location of wetland as within the **Pick List** floodplain.

**(ii) Chemical Characteristics:**
Characterize wetland system (e.g., water color is clear, brown, oil film on surface; water quality; general watershed characteristics; etc.). Explain:
Identify specific pollutants, if known:

**(iii) Biological Characteristics. Wetland supports (check all that apply):**
☐ Riparian buffer. Characteristics (type, average width):
☐ Vegetation type/percent cover. Explain:
☐ Habitat for:
☐ Federally Listed species. Explain findings:
☐ Fish/spawn areas. Explain findings:
☐ Other environmentally-sensitive species. Explain findings:
☐ Aquatic/wildlife diversity. Explain findings:

**3. Characteristics of all wetlands adjacent to the tributary (if any)**
All wetland(s) being considered in the cumulative analysis: **Pick List**
Approximately acres in total are being considered in the cumulative analysis.

For each wetland, specify the following:

| Directly abuts? (Y/N) | Size (in acres) | Directly abuts? (Y/N) | Size (in acres) |
|---|---|---|---|

Summarize overall biological, chemical and physical functions being performed:

## C. SIGNIFICANT NEXUS DETERMINATION

**A significant nexus analysis will assess the flow characteristics and functions of the tributary itself and the functions performed by any wetlands adjacent to the tributary to determine if they significantly affect the chemical, physical, and biological integrity of a TNW. For each of the following situations, a significant nexus exists if the tributary, in combination with all of its adjacent wetlands, has more than a speculative or insubstantial effect on the chemical, physical and/or biological integrity of a TNW. Considerations when evaluating significant nexus include, but are not limited to the volume, duration, and frequency of the flow of water in the tributary and its proximity to a TNW, and the functions performed by the tributary and all its adjacent wetlands. It is not appropriate to determine significant nexus based solely on any specific threshold of distance (e.g. between a tributary and its adjacent wetland or between a tributary and the TNW). Similarly, the fact an adjacent wetland lies within or outside of a floodplain is not solely determinative of significant nexus.**

**Draw connections between the features documented and the effects on the TNW, as identified in the *Rapanos* Guidance and discussed in the Instructional Guidebook. Factors to consider include, for example:**

- Does the tributary, in combination with its adjacent wetlands (if any), have the capacity to carry pollutants or flood waters to TNWs, or to reduce the amount of pollutants or flood waters reaching a TNW?
- Does the tributary, in combination with its adjacent wetlands (if any), provide habitat and lifecycle support functions for fish and other species, such as feeding, nesting, spawning, or rearing young for species that are present in the TNW?
- Does the tributary, in combination with its adjacent wetlands (if any), have the capacity to transfer nutrients and organic carbon that support downstream foodwebs?
- Does the tributary, in combination with its adjacent wetlands (if any), have other relationships to the physical, chemical, or biological integrity of the TNW?

**Note: the above list of considerations is not inclusive and other functions observed or known to occur should be documented below:**

1. **Significant nexus findings for non-RPW that has no adjacent wetlands and flows directly or indirectly into TNWs.** Explain findings of presence or absence of significant nexus below, based on the tributary itself, then go to Section III.D:

2. **Significant nexus findings for non-RPW and its adjacent wetlands, where the non-RPW flows directly or indirectly into TNWs.** Explain findings of presence or absence of significant nexus below, based on the tributary in combination with all of its adjacent wetlands, then go to Section III.D:

3. **Significant nexus findings for wetlands adjacent to an RPW but that do not directly abut the RPW.** Explain findings of presence or absence of significant nexus below, based on the tributary in combination with all of its adjacent wetlands, then go to Section III.D:

## D. DETERMINATIONS OF JURISDICTIONAL FINDINGS. THE SUBJECT WATERS/WETLANDS ARE (CHECK ALL THAT APPLY):

1. **TNWs and Adjacent Wetlands.** Check all that apply and provide size estimates in review area:
   ☐ TNWs: linear feet, wide, Or acres.
   ☐ Wetlands adjacent to TNWs: acres.

2. **RPWs that flow directly or indirectly into TNWs.**
   ☐ Tributaries of TNWs where tributaries typically flow year-round are jurisdictional. Provide data and rationale indicating that tributary is perennial:
   ☐ Tributaries of TNW where tributaries have continuous flow "seasonally" (e.g., typically three months each year) are jurisdictional. Data supporting this conclusion is provided at Section III.B. Provide rationale indicating that tributary flows seasonally:

   Provide estimates for jurisdictional waters in the review area (check all that apply):
   ☐ Tributary waters: linear feet wide.
   ☐ Other non-wetland waters: acres.
   Identify type(s) of waters:

3. **Non-RPWs[8] that flow directly or indirectly into TNWs.**
   ☐ Waterbody that is not a TNW or an RPW, but flows directly or indirectly into a TNW, and it has a significant nexus with a TNW is jurisdictional. Data supporting this conclusion is provided at Section III.C.

   Provide estimates for jurisdictional waters within the review area (check all that apply):
   ☐ Tributary waters: linear feet, wide.
   ☐ Other non-wetland waters: acres.
   Identify type(s) of waters:

[8] See Footnote # 3.

4. **Wetlands directly abutting an RPW that flow directly or indirectly into TNWs.**
☐ Wetlands directly abut RPW and thus are jurisdictional as adjacent wetlands.
☐ Wetlands directly abutting an RPW where tributaries typically flow year-round. Provide data and rationale indicating that tributary is perennial in Section III.D.2, above. Provide rationale indicating that wetland is directly abutting an RPW:

☐ Wetlands directly abutting an RPW where tributaries typically flow "seasonally." Provide data indicating that tributary is seasonal in Section III.B and rationale in Section III.D.2, above. Provide rationale indicating that wetland is directly abutting an RPW:

Provide acreage estimates for jurisdictional wetlands in the review area: acres.

5. **Wetlands adjacent to but not directly abutting an RPW that flow directly or indirectly into TNWs.**
☐ Wetlands that do not directly abut an RPW, but when considered in combination with the tributary to which they are adjacent and with similarly situated adjacent wetlands, have a significant nexus with a TNW are jurisidictional. Data supporting this conclusion is provided at Section III.C.

Provide acreage estimates for jurisdictional wetlands in the review area: acres.

6. **Wetlands adjacent to non-RPWs that flow directly or indirectly into TNWs.**
☐ Wetlands adjacent to such waters, and have when considered in combination with the tributary to which they are adjacent and with similarly situated adjacent wetlands, have a significant nexus with a TNW are jurisdictional. Data supporting this conclusion is provided at Section III.C.

Provide estimates for jurisdictional wetlands in the review area: acres.

7. **Impoundments of jurisdictional waters.**[9]
As a general rule, the impoundment of a jurisdictional tributary remains jurisdictional.
☐ Demonstrate that impoundment was created from "waters of the U.S.," or
☐ Demonstrate that water meets the criteria for one of the categories presented above (1-6), or
☐ Demonstrate that water is isolated with a nexus to commerce (see E below).

**E. ISOLATED [INTERSTATE OR INTRA-STATE] WATERS, INCLUDING ISOLATED WETLANDS, THE USE, DEGRADATION OR DESTRUCTION OF WHICH COULD AFFECT INTERSTATE COMMERCE, INCLUDING ANY SUCH WATERS (CHECK ALL THAT APPLY):**[10]
☐ which are or could be used by interstate or foreign travelers for recreational or other purposes.
☐ from which fish or shellfish are or could be taken and sold in interstate or foreign commerce.
☐ which are or could be used for industrial purposes by industries in interstate commerce.
☐ Interstate isolated waters. Explain:
☐ Other factors. Explain:

**Identify water body and summarize rationale supporting determination:**

Provide estimates for jurisdictional waters in the review area (check all that apply):
☐ Tributary waters: linear feet, wide.
☐ Other non-wetland waters: acres.
Identify type(s) of waters:
☐ Wetlands: acres.

**F. NON-JURISDICTIONAL WATERS, INCLUDING WETLANDS (CHECK ALL THAT APPLY):**
☐ If potential wetlands were assessed within the review area, these areas did not meet the criteria in the 1987 Corps of Engineers Wetland Delineation Manual and/or appropriate Regional Supplements.
☒ Review area included isolated waters with no substantial nexus to interstate (or foreign) commerce.
☒ Prior to the Jan 2001 Supreme Court decision in "*SWANCC*," the review area would have been regulated based solely on the "Migratory Bird Rule" (MBR).
☐ Waters do not meet the "Significant Nexus" standard, where such a finding is required for jurisdiction. Explain:
☐ Other: (explain, if not covered above):

[9] To complete the analysis refer to the key in Section III.D.6 of the Instructional Guidebook.
**[10] Prior to asserting or declining CWA jurisdiction based solely on this category, Corps Districts will elevate the action to Corps and EPA HQ for review consistent with the process described in the Corps/EPA *Memorandum Regarding CWA Act Jurisdiction Following Rapanos.***

Provide acreage estimates for non-jurisdictional waters in the review area, where the sole potential basis of jurisdiction is the MBR factors (i.e., presence of migratory birds, presence of endangered species, use of water for irrigated agriculture), using best professional judgment (check all that apply):

☐ Non-wetland waters (i.e., rivers, streams): linear feet, wide.
☐ Lakes/ponds: acres.
☒ Other non-wetland waters: acres. List type of aquatic resource:
☒ Wetlands: **7.15** acres.

Provide acreage estimates for non-jurisdictional waters in the review area that do not meet the "Significant Nexus" standard, where such a finding is required for jurisdiction (check all that apply):

☐ Non-wetland waters (i.e., rivers, streams): linear feet, wide.
☐ Lakes/ponds: acres.
☐ Other non-wetland waters: acres. List type of aquatic resource:
☐ Wetlands: acres.

**SECTION IV: DATA SOURCES.**

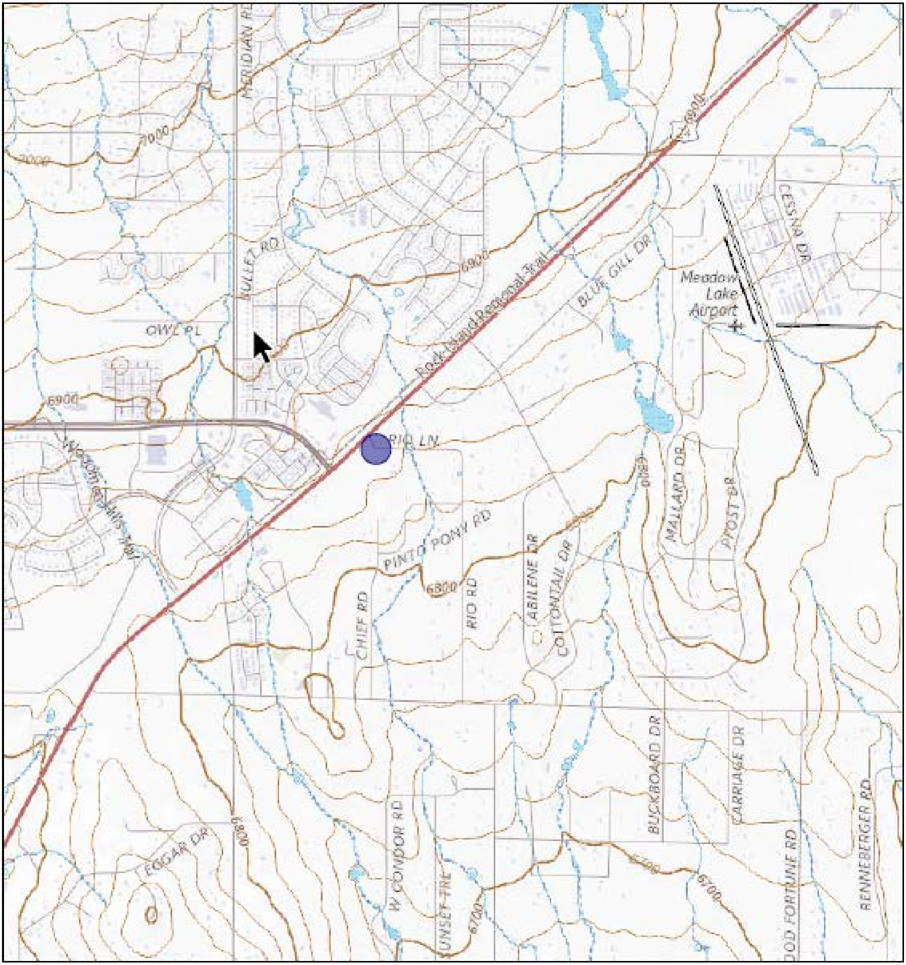
**A. SUPPORTING DATA. Data reviewed for JD (check all that apply -** checked items shall be included in case file and, where checked and requested, appropriately reference sources below):

☒ Maps, plans, plots or plat submitted by or on behalf of the applicant/consultant: **2021-180 Falcon Field AJD Request 12-15-2020_29-Nov-21.pdf**
☐ Data sheets prepared/submitted by or on behalf of the applicant/consultant.
  ☐ Office concurs with data sheets/delineation report.
  ☐ Office does not concur with data sheets/delineation report.
☐ Data sheets prepared by the Corps:
☐ Corps navigable waters' study:
☐ U.S. Geological Survey Hydrologic Atlas:
  ☐ USGS NHD data.
  ☐ USGS 8 and 12 digit HUC maps.
☐ U.S. Geological Survey map(s). Cite scale & quad name: **1:24K; Falcon**
☒ USDA Natural Resources Conservation Service Soil Survey. Citation: **2021-180 Soil Map**
☒ National wetlands inventory map(s). Cite name: **2021-180 NWI Map**
☐ State/Local wetland inventory map(s):
☐ FEMA/FIRM maps:
☐ 100-year Floodplain Elevation is: (National Geodectic Vertical Datum of 1929)
☐ Photographs: ☒ Aerial (Name & Date): **2021-180 Aerial - May 2020**
  or ☐ Other (Name & Date):
☐ Previous determination(s). File no. and date of response letter:
☐ Applicable/supporting case law:
☐ Applicable/supporting scientific literature:
☒ Other information (please specify): **2021-180 EPA Watershed Report, 2021-180 Flow Path and Pictures, 2021-180 Inspection Report - June 2022, 2021-180 NE Stream StreamStats, 2021-180 SW Stream StreamStats, 2021-180 USGS Topo**

**B. ADDITIONAL COMMENTS TO SUPPORT JD:**

**A review of the downstream connectivity of the associated wetlands found there to be a lack of a connection to downstream waters. The drainage features and associated wetlands presented a southward flow path until reaching E. Blaney Road. The flow path consisting of a varying degree of broken stream channel and connected wetlands terminated across a portion of flat terrain with not apparent wetland vegetation. Flow does not appear to reach any downstream waters via the nearby roadside ditch. Flow also does not cross E. Blaney Road due to the lack of culverts and a slight elevation rise. Due to a lack of downstream connectivity, the drainage features and associated wetlands under review are found to be isolated.**

# 2021-180 USGS Topo




7/25/2022, 4:06:58 PM

Override 1

Forest/shrub Wetlands

Emergent Wetlands

Inland Waters

Normal Intermediate Contours

Normal Index Contours

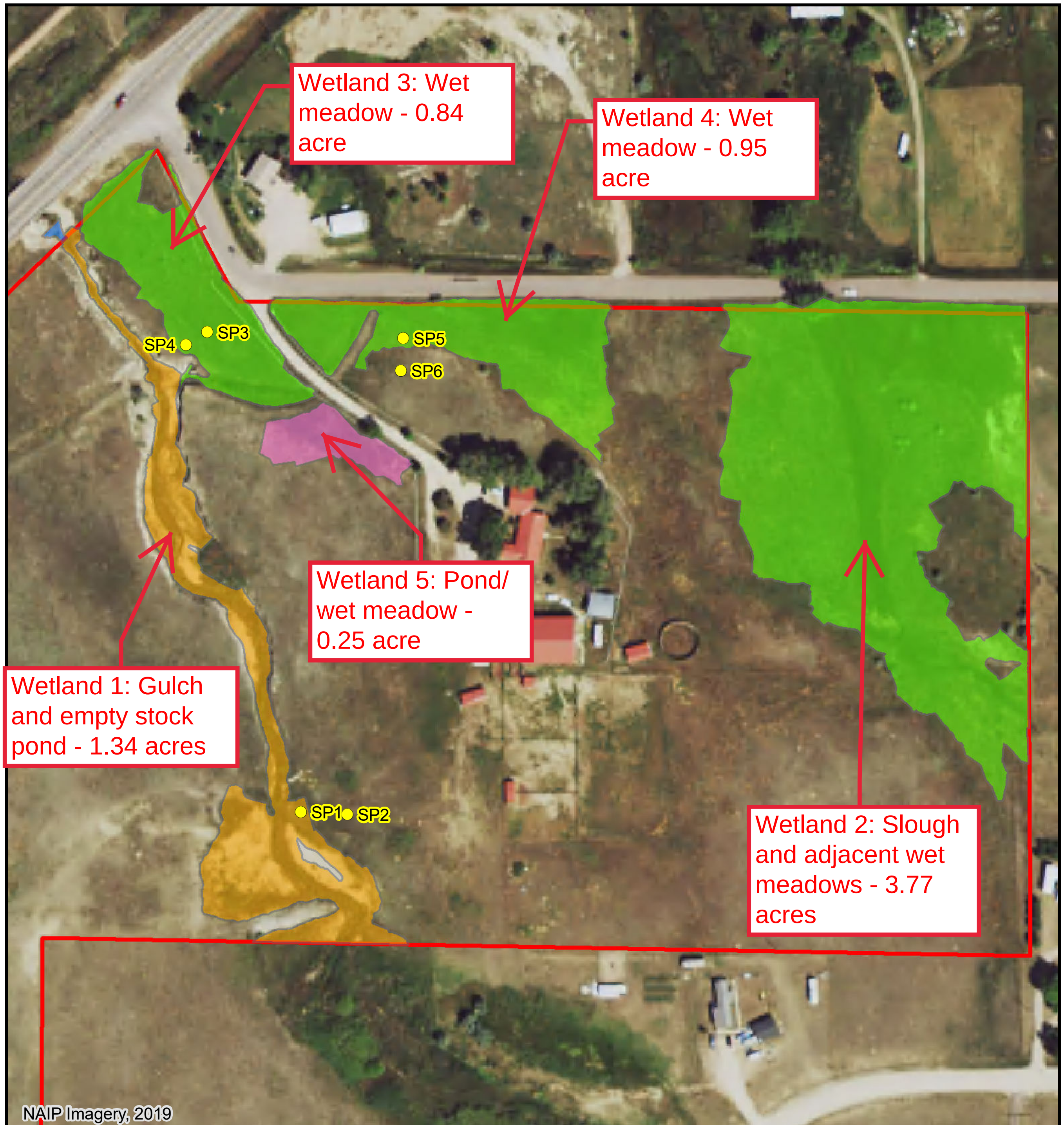
1:36,112

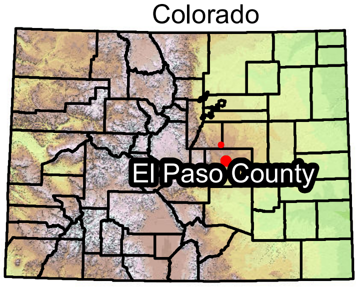
0 0.23 0.45 0.9 mi

0 0.38 0.75 1.5 km

USGS The National Map: National Boundaries Dataset, 3DEP Elevation Program, Geographic Names Information System, National Hydrography Dataset, National Land Cover Database, National Structures Dataset, and National Transportation Dataset; USGS Global Ecosystems; U.S. Census

USGS
2021 USGS




Project Area
Data Point
Open Water
Pond
Slough
Wet Meadow

Feet
0 200 400

N

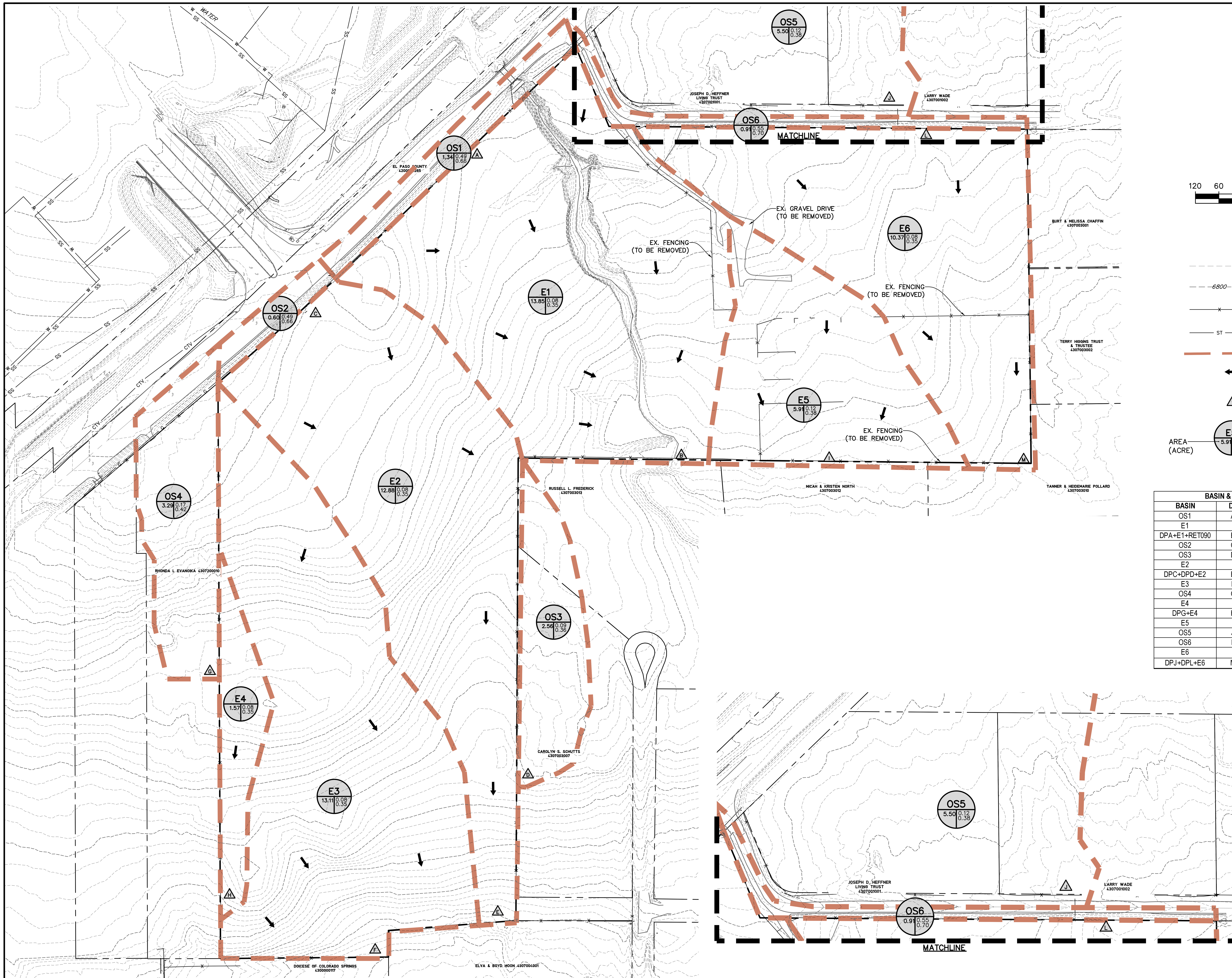
**Falcon Field**

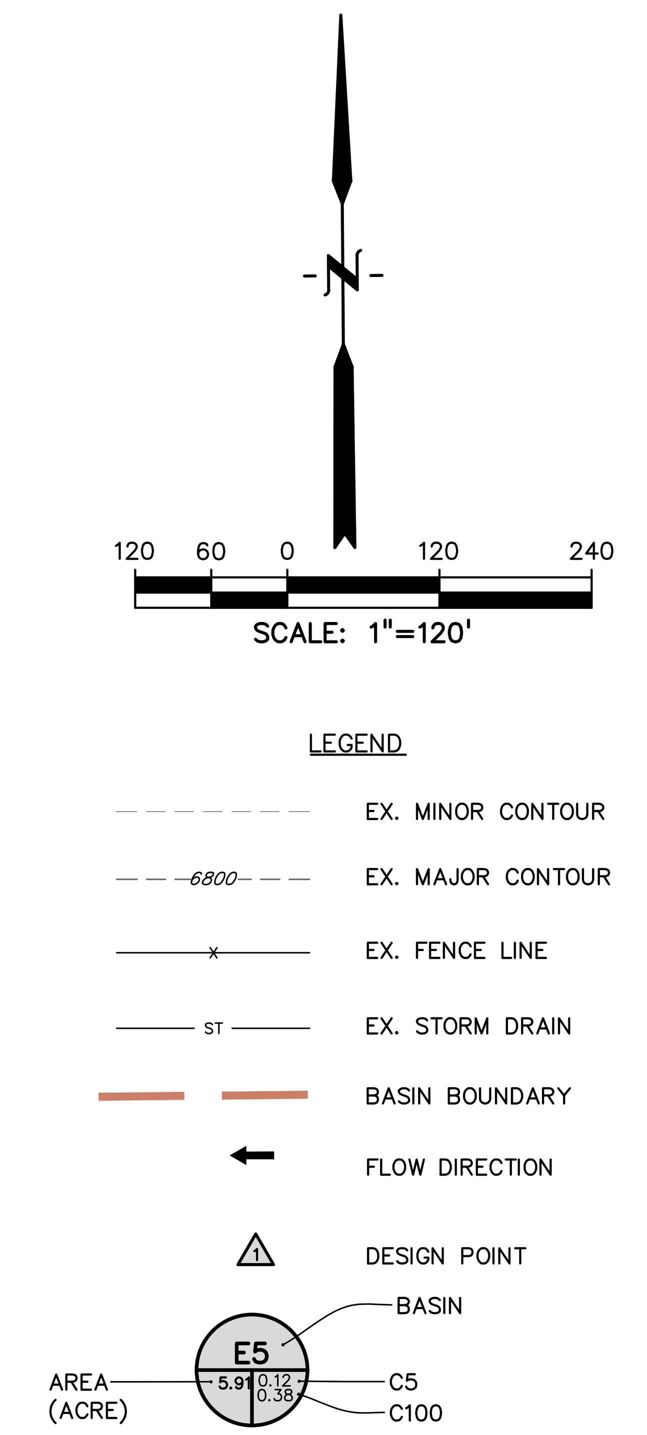
Wetlands

bristlecone ecology

12/8/2020 C:\GIS_Projects\Bristlecone_Ecology\20_013_Falcon_Field\Wetlands_Zoomed.mxd

**Drainage Maps**




**BASIN & DESIGN POINT SUMMARY**

| BASIN | DP | AREA (AC) | Q5 (cfs) | Q100 (cfs) |
|---|---|---|---|---|
| OS1 | A | 1.34 | 3.4 | 7.6 |
| E1 | | 13.85 | 3.2 | 22.4 |
| DPA+E1+RET090 | B | 15.19 | 41.0 | 346.4 |
| OS2 | C | 0.60 | 1.4 | 3.2 |
| OS3 | D | 2.56 | 0.8 | 5.6 |
| E2 | | 12.88 | 2.5 | 18.6 |
| DPC+DPD+E2 | E | 16.04 | 3.8 | 23.9 |
| E3 | F | 13.11 | 2.7 | 19.6 |
| OS4 | G | 3.29 | 2.4 | 9.7 |
| E4 | | 1.57 | 0.3 | 2.6 |
| DPG+E4 | H | 4.86 | 1.9 | 9.0 |
| E5 | I | 5.91 | 2.2 | 11.7 |
| OS5 | J | 5.50 | 6.6 | 6.6 |
| OS6 | L | 0.91 | 2.6 | 5.5 |
| E6 | | 10.37 | 1.7 | 12.5 |
| DPJ+DPL+E6 | M | 16.78 | 4.1 | 21.9 |

PREPARED BY: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CLIENT:

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CONTACT: PJ ANDERSON

DRAINAGE PLANS FOR
THE COMMONS AT FALCON FIELD
12445 RIO LANE, AND VACANT LAND
PEYTON, EL PASO COUNTY, COLORADO

| ISSUE | DATE |
|---|---|
| INITIAL ISSUE | 1/31/24 |
| RESUBMITTAL | 3/17/24 |

| | |
|---|---|
| DESIGNED BY: | TDM |
| DRAWN BY: | CGH |
| CHECKED BY: | KGV |
| FILE NAME: | 21604-00EDR |

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

DRAWING SCALE:
HORIZONTAL: 1" = 120"
VERTICAL: N/A

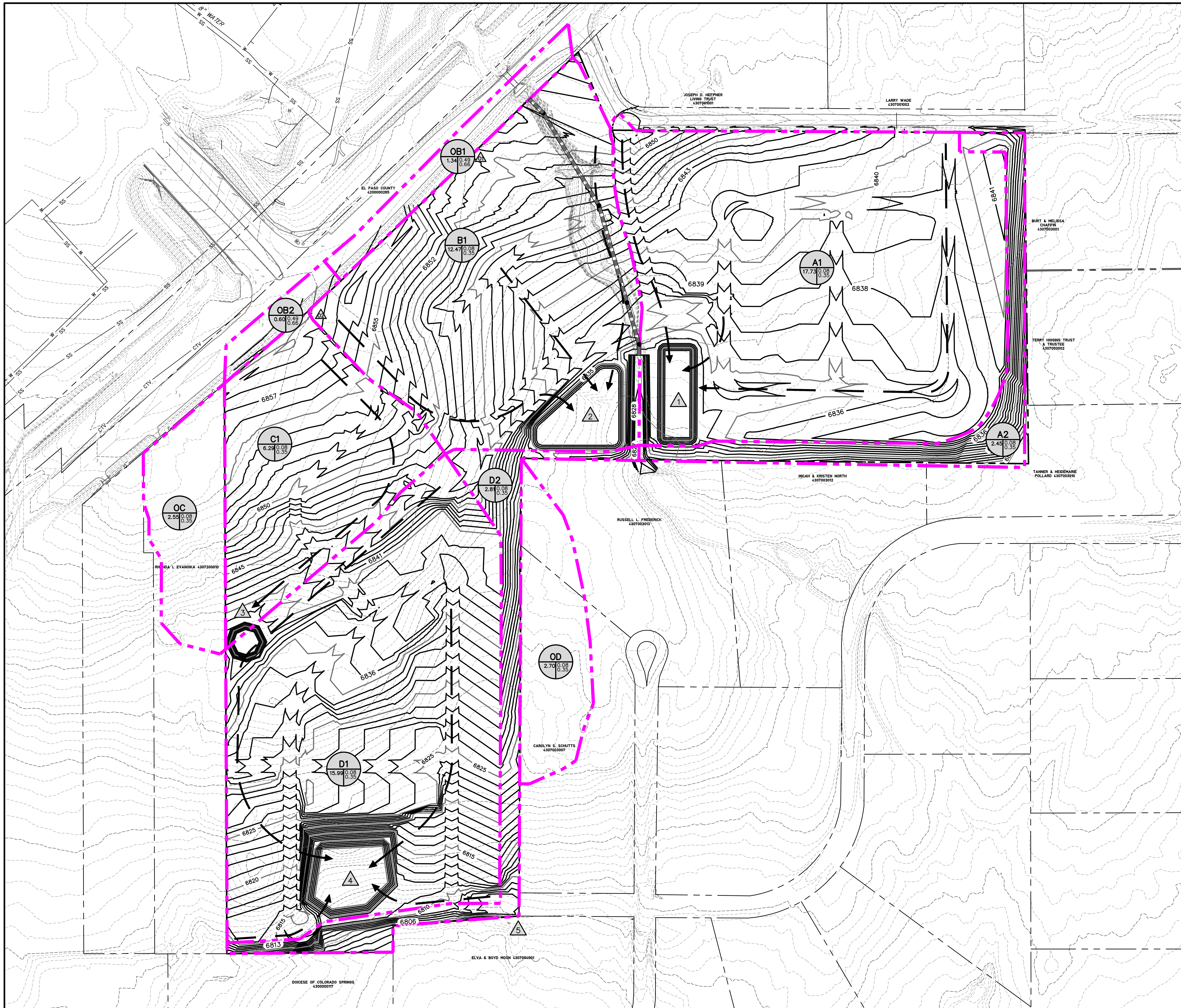
OVERALL EXISTING DRAINAGE MAP

PROJECT NO. 21604-00CSCV

DRAWING NO.

**EDR1**

SHEET: 1 OF 7




-N-

125 25 0 125 250

SCALE: 1"=125'

LEGEND

EX. MINOR CONTOUR

6800 EX. MAJOR CONTOUR

PR. MINOR CONTOUR

6800 PR. MAJOR CONTOUR

STORM DRAIN

ST EX. STORM DRAIN

BASIN BOUNDARY

FLOW DIRECTION

1 DESIGN POINT

E5 BASIN

AREA (ACRE) 5.91 0.12 C5

0.38 C100

| BASIN & DESIGN POINT SUMMARY | | | | |
|---|---|---|---|---|
| BASIN | DP | AREA (AC) | Q5 | Q100 |
| PRELIMINARY-BASINS | | | | |
| A1 | 1 | 17.73 | 4.1 | 30.1 |
| A2 | | 2.45 | 0.6 | 4.6 |
| B1 | | 12.47 | 3.0 | 22.4 |
| OB | O1 | 1.34 | 3.4 | 7.6 |
| OB2 | O2 | 0.60 | 1.4 | 3.2 |
| B1+O1+O2 | 2 | 14.41 | 5.9 | 28.9 |
| C1 | | 6.29 | 1.5 | 11.1 |
| OC | | 2.55 | 0.5 | 4.4 |
| C1+OC | 3 | 8.85 | 2.0 | 15.5 |
| D1 | 4 | 15.99 | 3.7 | 27.4 |
| D2 | | 2.81 | 0.7 | 5.2 |
| OD | | 2.70 | 0.7 | 4.8 |
| D2+OD | 5 | 5.51 | 1.4 | 10.2 |

PREPARED BY:

DREXEL, BARRELL & CO.
Engineers • Surveyors
101 SAHWATCH STREET, STE #100
COLORADO SPGS, COLORADO 80903
CONTACT: TIM D. McCONNELL, P.E.
(719)260-0887
COLORADO SPRINGS • LAFAYETTE

CLIENT:

FALCON FIELD, LLC.

3230 ELECTRA DR N.
COLORADO SPRINGS, CO 80906
(719) 475-7474
CONTACT: PJ ANDERSON

DRAINAGE PLANS FOR
THE COMMONS AT FALCON FIELD
12445 RIO LANE, AND VACANT LAND
PEYTON, EL PASO COUNTY, COLORADO

| ISSUE | DATE |
|---|---|
| INITIAL ISSUE | 1/31/24 |
| RESUBMITTAL | 3/17/24 |

| | |
|---|---|
| DESIGNED BY: | TDM |
| DRAWN BY: | CGH |
| CHECKED BY: | KGV |
| FILE NAME: | 21604-00DR-OG |

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

DRAWING SCALE:
HORIZONTAL: 1" = 125"
VERTICAL: N/A

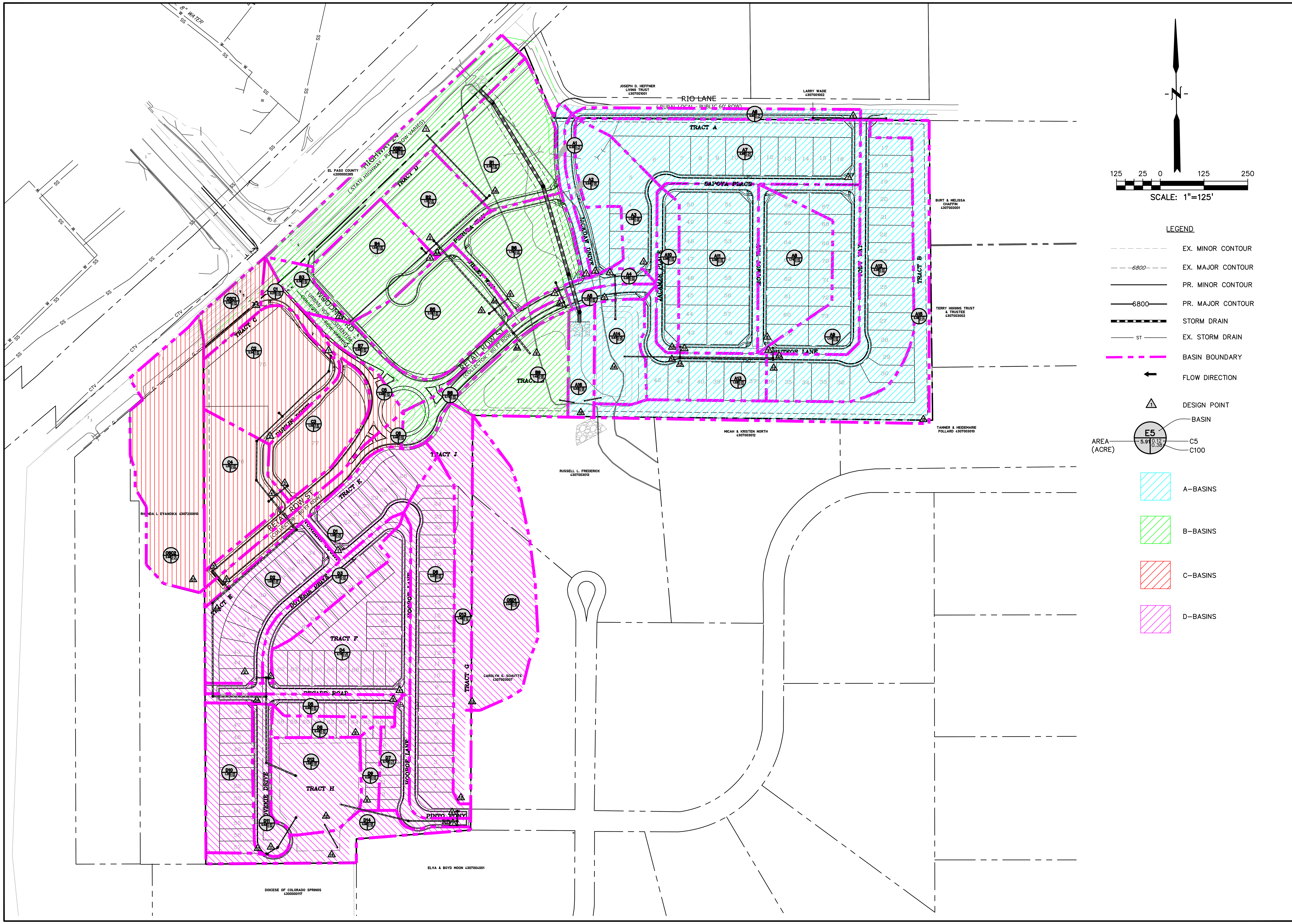
OVERLOT PROPOSED DRAINAGE MAP

PROJECT NO. 21604-00CSCV

DRAWING NO.

**OVDR**

SHEET: 2 OF 7

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DRAINAGE PLANS FOR
THE COMMONS AT FALCON FIELD
12445 RIO LANE, AND VACANT LAND
PEYTON, EL PASO COUNTY, COLORADO

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| | |
|---|---|
| DESIGNED BY: | TDM |
| DRAWN BY: | CGH |
| CHECKED BY: | KGV |
| FILE NAME: | 21604-00DR |

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

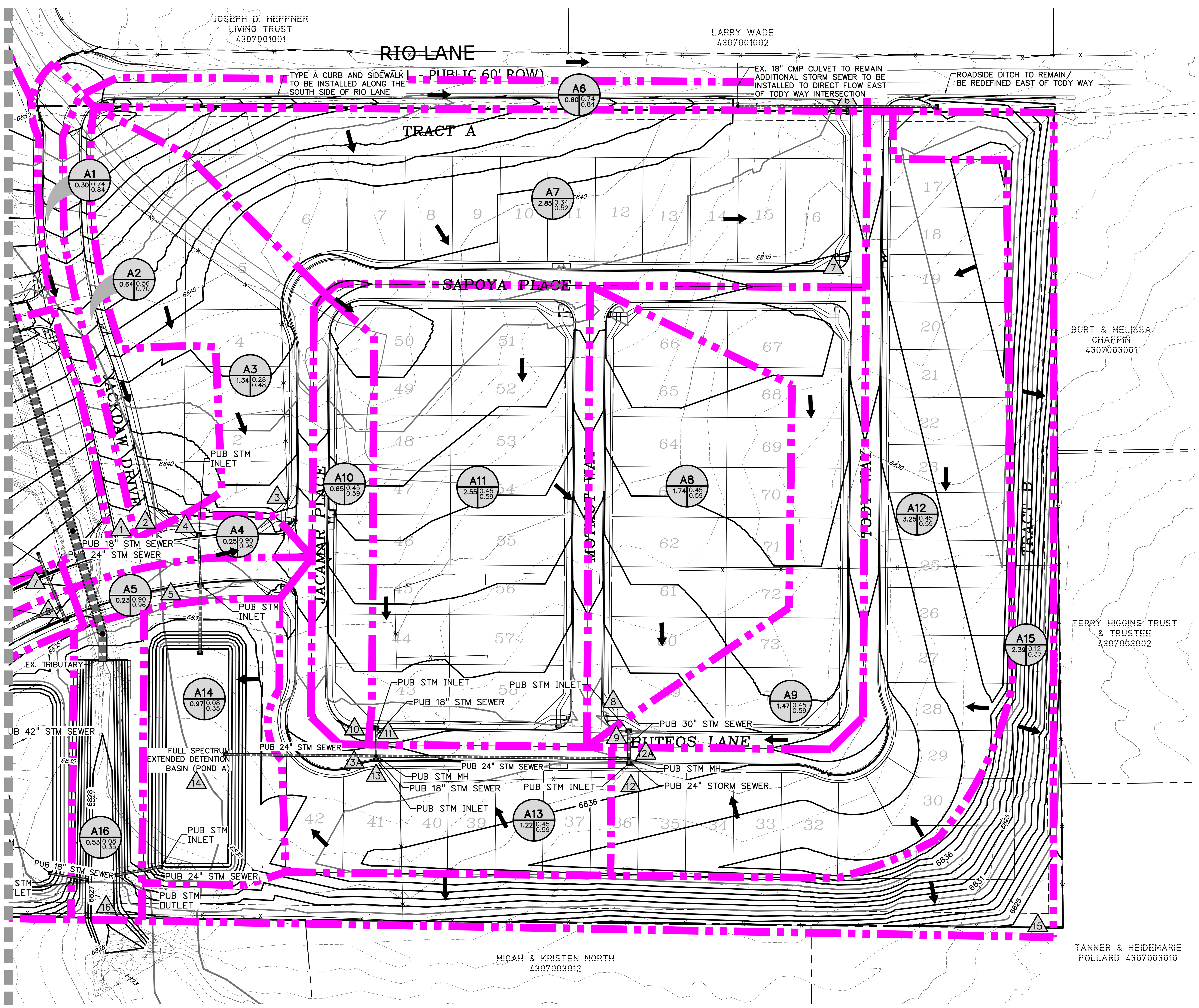
DRAWING SCALE:
HORIZONTAL: 1" = 125"
VERTICAL: N/A

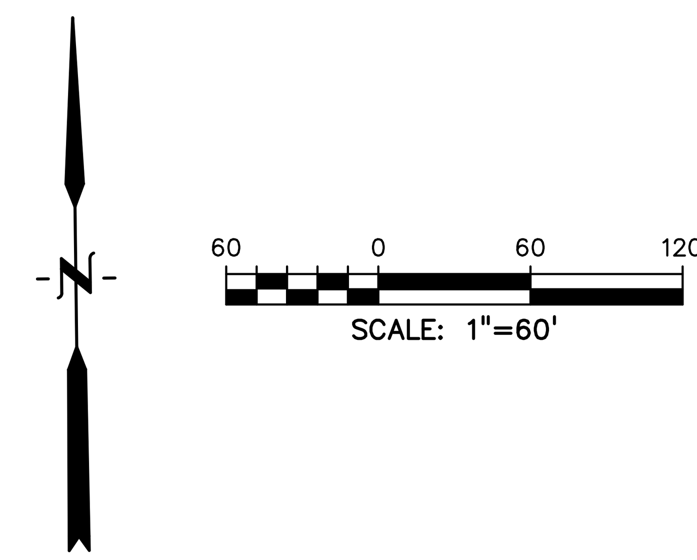
OVERALL
PROPOSED
DRAINAGE MAP

PROJECT NO. 21604-00CSCV
DRAWING NO.

**DR1**

SHEET: 3 OF 7




LEGEND

EX. MINOR CONTOUR

EX. MAJOR CONTOUR (6800)

PR. MINOR CONTOUR

PR. MAJOR CONTOUR (6800)

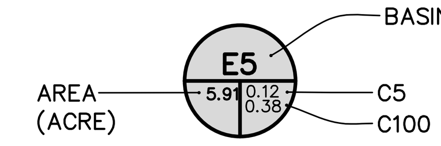
STORM DRAIN

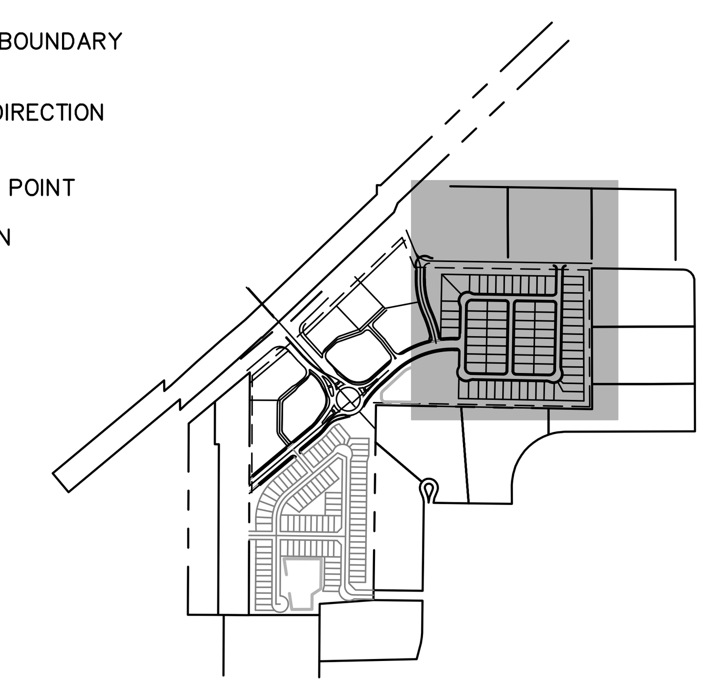
EX. STORM DRAIN (ST)

BASIN BOUNDARY

FLOW DIRECTION

DESIGN POINT



| BASIN & DESIGN POINT SUMMARY | | | | |
|---|---|---|---|---|
| BASIN | DP | AREA (AC) | Q5 | Q100 |
| A-BASINS | | | | |
| A1 | 1 | 0.30 | 1.1 | 2.2 |
| A2 | 2 | 0.64 | 1.9 | 3.9 |
| A3 | 3 | 1.34 | 1.5 | 4.2 |
| A4 | | 0.25 | 1.2 | 2.1 |
| | 4 | 2.53 | 4.6 | 10.2 |
| A5 | | 0.23 | 1.1 | 1.9 |
| | 5 | 2.76 | 5.3 | 11.6 |
| A6 | 6 | 0.60 | 2.2 | 4.2 |
| A7 | | 2.85 | 3.3 | 8.3 |
| | 7 | 3.45 | 4.7 | 11.1 |
| A8 | 8 | 1.74 | 2.9 | 6.4 |
| A9 | | 1.47 | 2.4 | 5.3 |
| | 9 | 6.66 | 8.8 | 20.0 |
| A10 | 10 | 0.65 | 1.4 | 3.0 |
| A11 | | 2.55 | 4.9 | 10.8 |
| | 11 | 3.21 | 5.2 | 11.4 |
| A12 | 12 | 3.25 | 5.6 | 12.2 |
| | 12A | 9.91 | 13.3 | 29.9 |
| A13 | 13 | 1.22 | 2.2 | 4.8 |
| | 13A | 14.34 | 19.1 | 42.7 |
| A14 | | 0.97 | 0.2 | 1.8 |
| | 14 | 18.07 | 23.3 | 53.1 |
| A15 | 15 | 2.39 | 1.4 | 7.7 |
| A16 | 16 | 0.53 | 0.2 | 1.4 |

PREPARED BY: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CLIENT:


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DRAINAGE PLANS FOR

# THE COMMONS AT FALCON FIELD

12445 RIO LANE, AND VACANT LAND
PEYTON, EL PASO COUNTY, COLORADO

| ISSUE | DATE |
|---|---|
| INITIAL ISSUE | 1/31/24 |
| RESUBMITTAL | 3/17/24 |

| | |
|---|---|
| DESIGNED BY: | TDM |
| DRAWN BY: | CGH |
| CHECKED BY: | KGV |
| FILE NAME: | 21604-00DR |

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

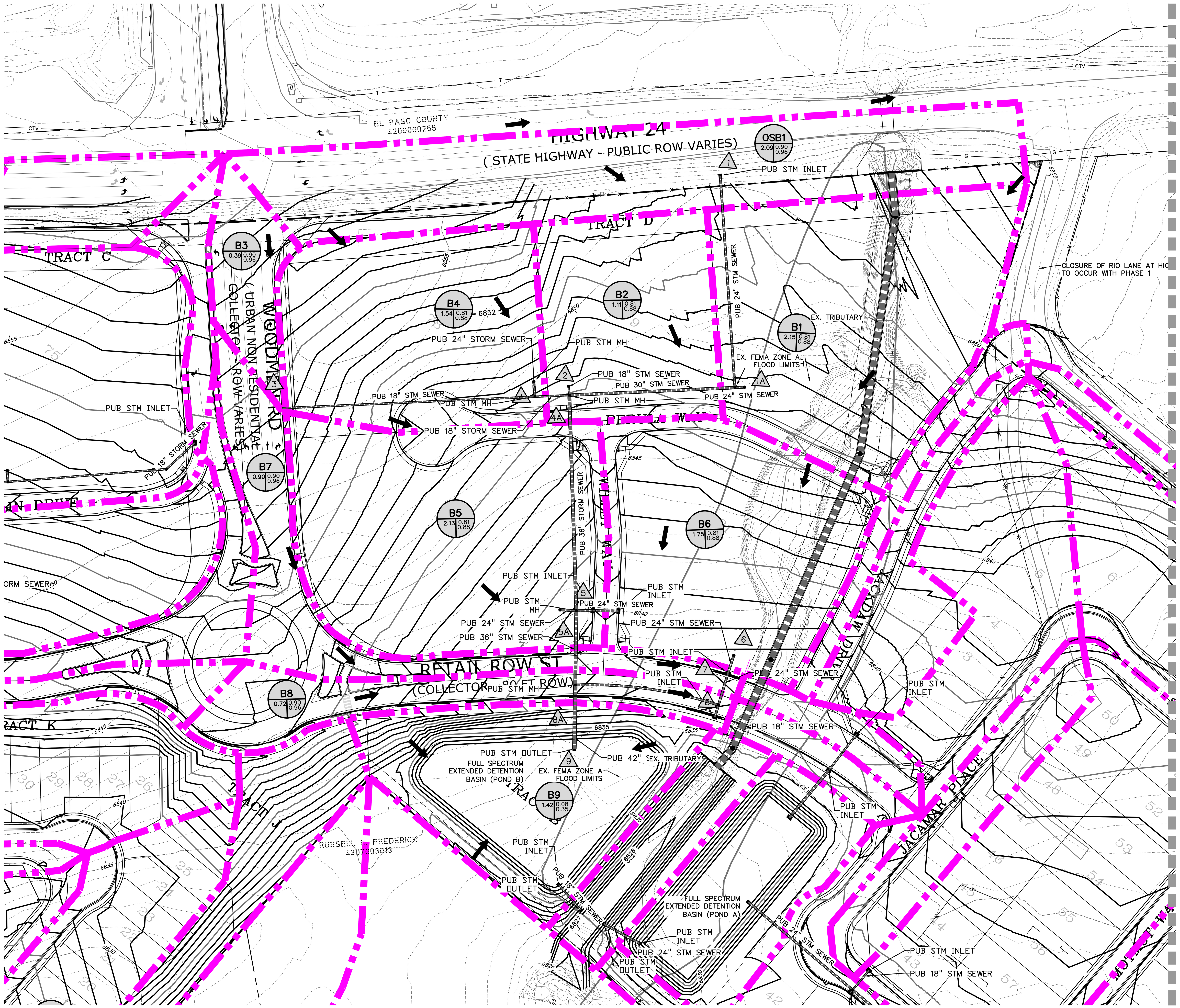
DRAWING SCALE:
HORIZONTAL: 1" = 60"
VERTICAL: N/A

## PROPOSED DRAINAGE MAP

PROJECT NO. 21604-00CSCV

DRAWING NO.

# DR2



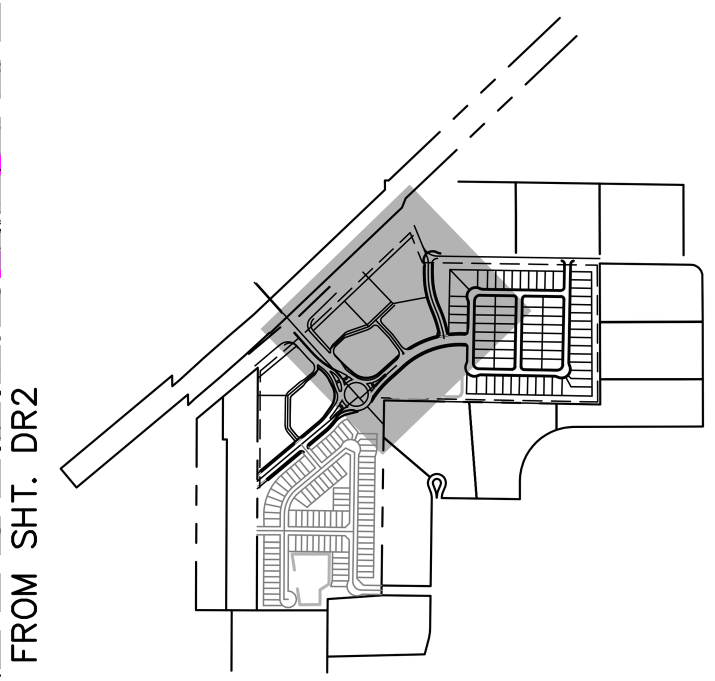

60 0 60 120

SCALE: 1"=60'

LEGEND

- EX. MINOR CONTOUR
- 6800 EX. MAJOR CONTOUR
- PR. MINOR CONTOUR
- 6800 PR. MAJOR CONTOUR
- STORM DRAIN
- ST EX. STORM DRAIN
- BASIN BOUNDARY
- FLOW DIRECTION
- DESIGN POINT

E5 — BASIN; AREA (ACRE) 5.91; C5 0.12; C100 0.38



| BASIN & DESIGN POINT SUMMARY | | | | |
|---|---|---|---|---|
| BASIN | DP | AREA (AC) | Q5 | Q100 |
| B-BASINS | | | | |
| OSB1 | 1 | 2.09 | 9.7 | 17.4 |
| B1 | | 2.15 | 9.0 | 16.4 |
| | 1A | 4.25 | 18.2 | 32.8 |
| B2 | 2 | 1.11 | 4.6 | 8.5 |
| B3 | 3 | 0.39 | 1.8 | 3.3 |
| B4 | 4 | 1.54 | 6.5 | 11.8 |
| | 4A | 7.29 | 30.0 | 54.3 |
| B5 | 5 | 2.13 | 8.9 | 16.3 |
| | 5A | 9.42 | 37.3 | 67.8 |
| B6 | 6 | 1.75 | 7.3 | 13.4 |
| B7 | | 0.90 | 4.2 | 7.5 |
| | 7 | 2.65 | 11.5 | 20.8 |
| B8 | | 0.72 | 3.4 | 6.0 |
| | 8 | 3.37 | 14.7 | 26.6 |
| | 8A | 12.79 | 50.4 | 91.3 |
| B9 | | 1.42 | 0.6 | 4.3 |
| | 9 | 14.21 | 50.7 | 94.8 |

PREPARED BY:

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CLIENT:

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# DRAINAGE PLANS FOR THE COMMONS AT FALCON FIELD

12445 RIO LANE, AND VACANT LAND
PEYTON, EL PASO COUNTY, COLORADO

| ISSUE | DATE |
|---|---|
| INITIAL ISSUE | 1/31/24 |
| RESUBMITTAL | 3/17/24 |

| | |
|---|---|
| DESIGNED BY: | TDM |
| DRAWN BY: | CGH |
| CHECKED BY: | KGV |
| FILE NAME: | 21604-00DR |

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

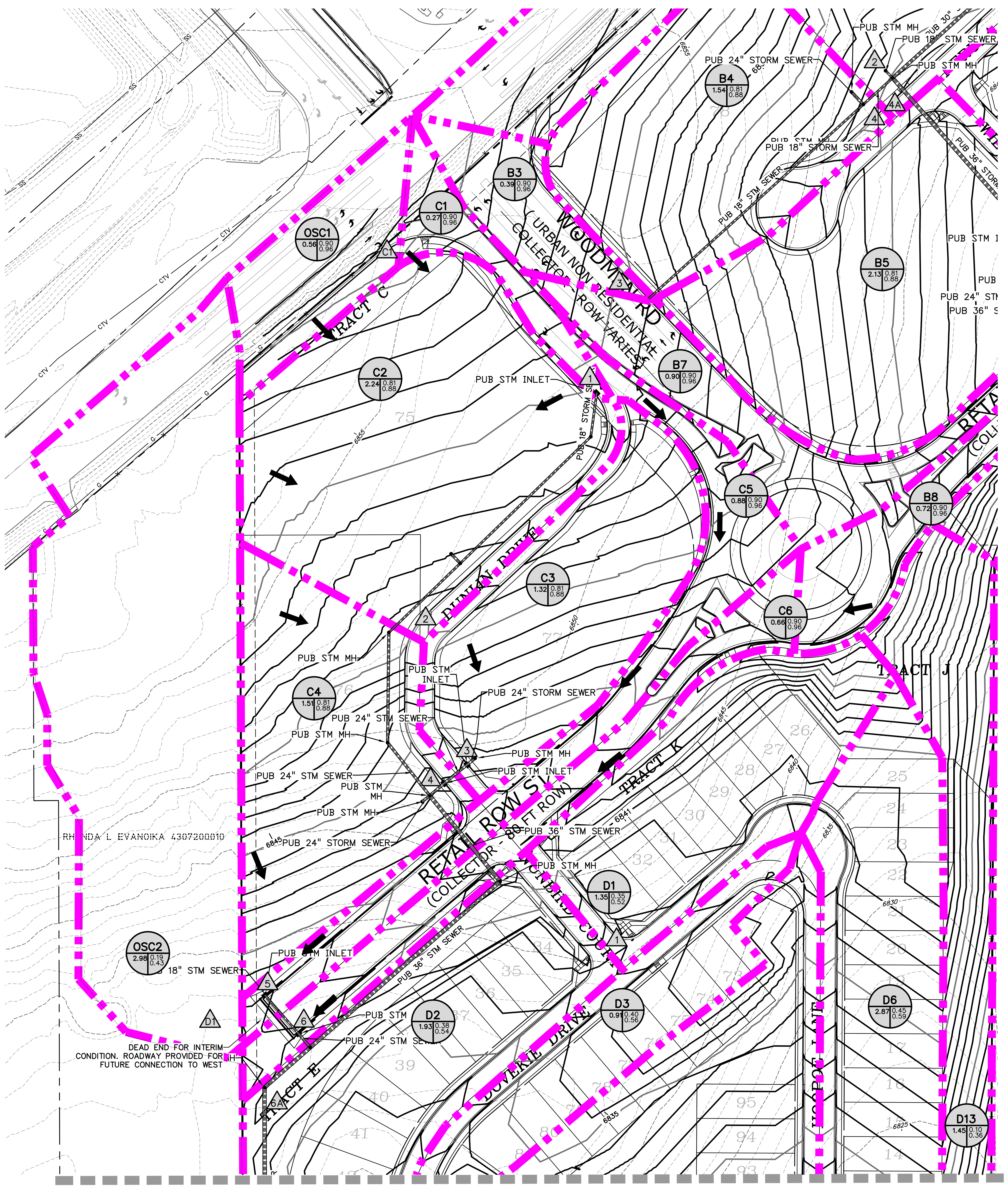
DRAWING SCALE:
HORIZONTAL: 1" = 60"
VERTICAL: N/A

## PROPOSED DRAINAGE MAP

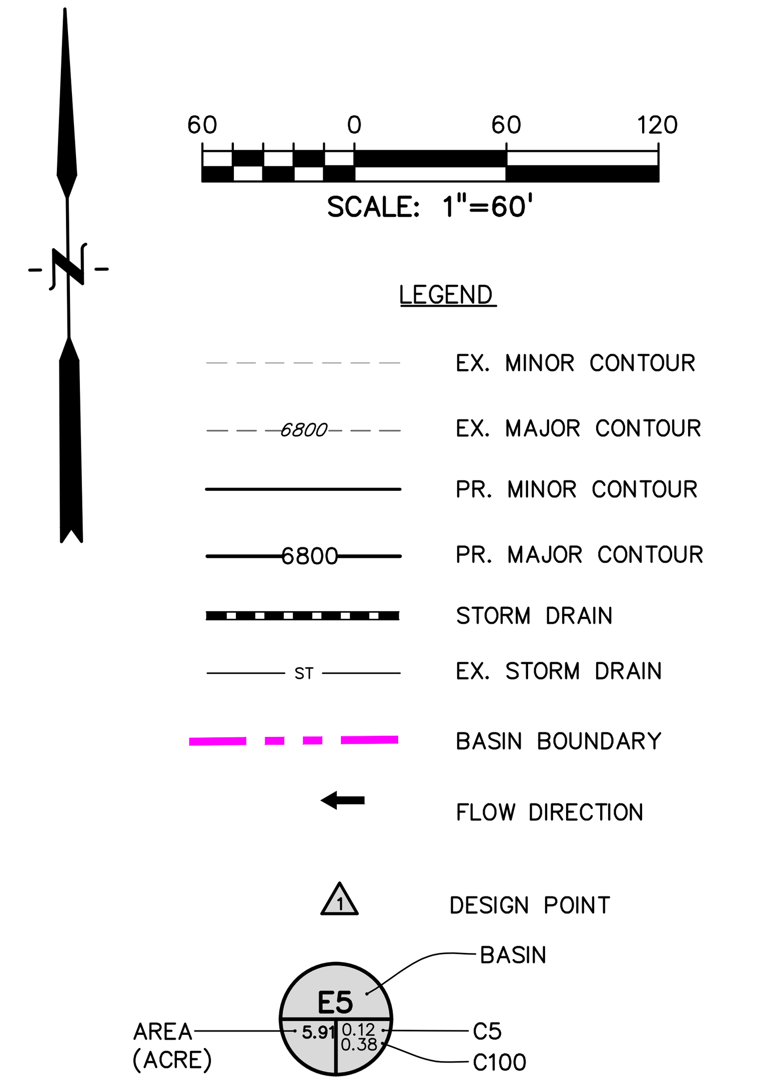
PROJECT NO. 21604-00CSCV

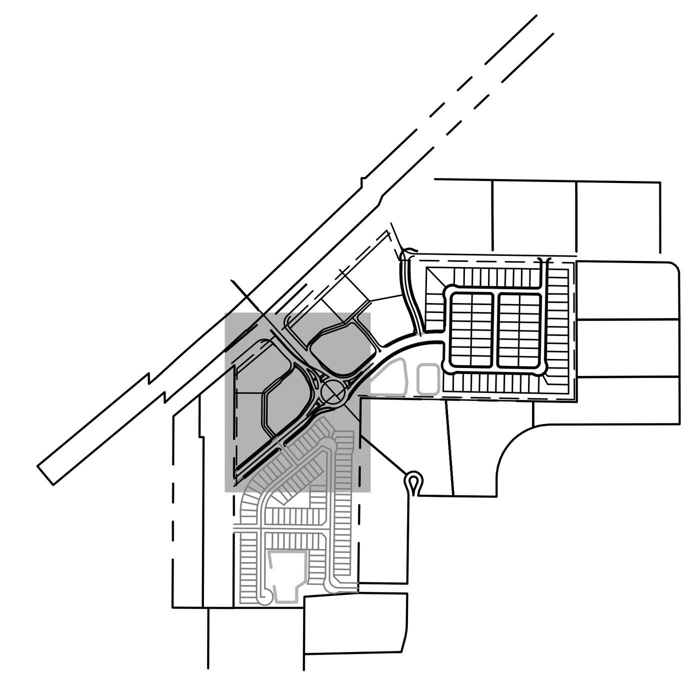
DRAWING NO.

# DR3




CONTINUES ON SHT. DR5



| BASIN & DESIGN POINT SUMMARY | | | | |
|---|---|---|---|---|
| BASIN | DP | AREA (AC) | Q5 | Q100 |
| C-BASINS | | | | |
| OSC1 | C1 | 0.56 | 2.6 | 4.6 |
| C1 | | 0.27 | 1.3 | 2.3 |
| | 1 | 0.83 | 3.8 | 6.7 |
| C2 | | 2.24 | 9.4 | 17.1 |
| | 2 | 2.52 | 13.7 | 24.8 |
| C3 | 3 | 1.32 | 5.5 | 10.1 |
| C4 | | 1.51 | 6.3 | 11.5 |
| | 4 | 5.34 | 24.0 | 43.7 |
| OSC2 | | 2.98 | 2.6 | 10.1 |
| C5 | | 0.88 | 4.1 | 7.3 |
| | 5 | 3.86 | 6.3 | 16.5 |
| C6 | | 0.66 | 3.1 | 5.5 |
| | 6 | 4.52 | 10.0 | 23.8 |
| | 6A | 9.86 | 31.8 | 62.7 |

PREPARED BY: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CLIENT:

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DRAINAGE PLANS FOR
THE COMMONS AT FALCON FIELD
12445 RIO LANE, AND VACANT LAND
PEYTON, EL PASO COUNTY, COLORADO

| ISSUE | DATE |
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| | |
|---|---|
| DESIGNED BY: | TDM |
| DRAWN BY: | CGH |
| CHECKED BY: | KGV |
| FILE NAME: | 21604-00DR |

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

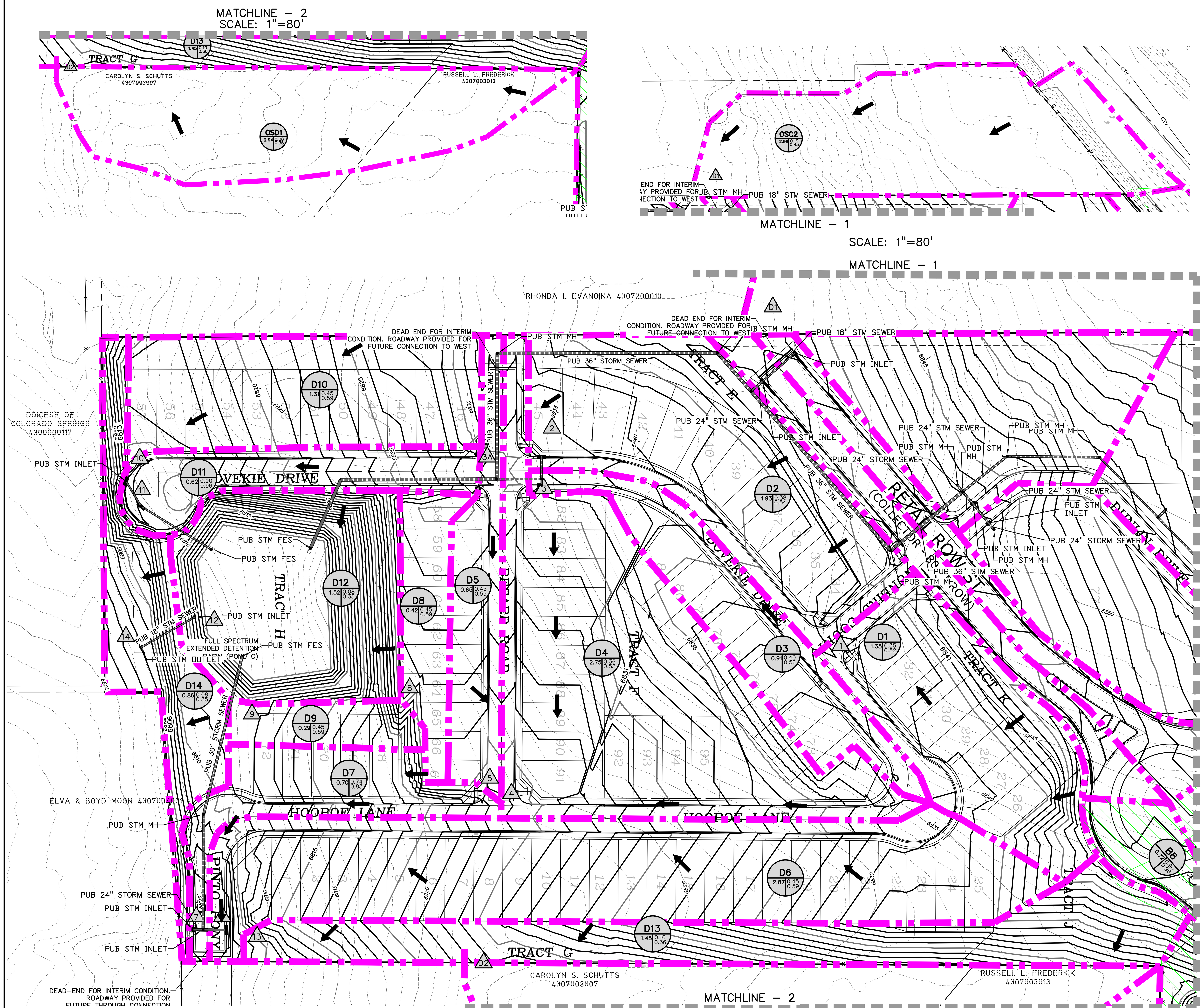
DRAWING SCALE:
HORIZONTAL: 1" = 60"
VERTICAL: N/A

PROPOSED DRAINAGE MAP

PROJECT NO. 21604-00CSCV
DRAWING NO.

**DR4**

SHEET: 6 OF 7

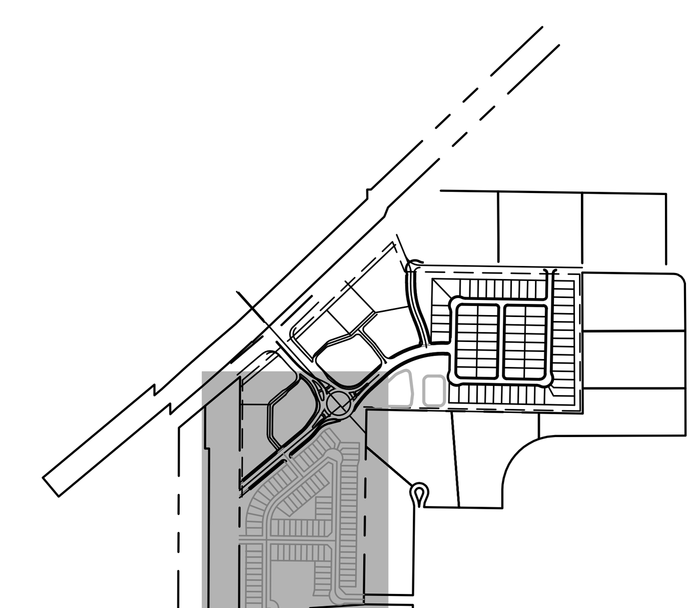



| BASIN & DESIGN POINT SUMMARY | | | | |
|---|---|---|---|---|
| BASIN | DP | AREA (AC) | Q5 | Q100 |
| D-BASINS | | | | |
| D1 | 1 | 1.35 | 2.0 | 5.0 |
| D2 | | 1.93 | 3.1 | 7.6 |
| | 2 | 3.28 | 4.8 | 11.9 |
| D3 | 3 | 0.91 | 1.4 | 3.3 |
| | 3A | 14.05 | 33.1 | 68.0 |
| D4 | 4 | 2.75 | 4.2 | 10.3 |
| D5 | | 0.65 | 1.3 | 2.8 |
| | 5 | 3.40 | 5.4 | 13.0 |
| D6 | 6 | 2.87 | 5.5 | 12.2 |
| D7 | | 0.70 | 2.5 | 4.7 |
| | 7 | 6.98 | 12.7 | 28.4 |
| D8 | 8 | 0.42 | 0.8 | 1.7 |
| D9 | 9 | 0.29 | 0.6 | 1.3 |
| D10 | 10 | 1.31 | 2.7 | 6.0 |
| D11 | | 0.62 | 2.9 | 5.1 |
| | 11 | 1.93 | 5.3 | 10.6 |
| D12 | | 1.52 | 0.6 | 4.3 |
| | 12 | 25.18 | 53.8 | 115.5 |
| OSD1 | D1 | 2.94 | 1.0 | 7.3 |
| D13 | | 1.45 | 0.5 | 3.3 |
| | 13 | 4.39 | 1.4 | 9.6 |
| D14 | 14 | 0.86 | 0.3 | 2.3 |

60 0 60 120
SCALE: 1"=60'

LEGEND

- EX. MINOR CONTOUR
- EX. MAJOR CONTOUR (6800)
- PR. MINOR CONTOUR
- PR. MAJOR CONTOUR (6800)
- STORM DRAIN
- EX. STORM DRAIN (ST)
- BASIN BOUNDARY
- FLOW DIRECTION
- DESIGN POINT
- BASIN: E5; AREA (ACRE): 5.91; C5: 0.12; C100: 0.38



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DRAINAGE PLANS FOR
THE COMMONS AT FALCON FIELD
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PEYTON, EL PASO COUNTY, COLORADO

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|---|---|
| DESIGNED BY: | TDM |
| DRAWN BY: | CGH |
| CHECKED BY: | KGV |
| FILE NAME: | 21604–00DR |

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

DRAWING SCALE:
HORIZONTAL: 1" = 60'
VERTICAL: N/A

PROPOSED DRAINAGE MAP

PROJECT NO. 21604–00CSCV
DRAWING NO.
DR5
SHEET: 7 OF 7