PRELIMINARY DRAINAGE REPORT

for

THE COMMONS AT FALCON FIELD

El Paso County, Colorado

June 29, 2023

PCD FILE NO. SP-232

Prepared for:

Falcon Field, LLC
30 N. Tejon Street, #516
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APPENDICES

recommend including appendix cover sheet between appendix sections.

Missing several appendices.

PRELIMINARY DRAINAGE REPORT

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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 6th 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

Discuss the early grading work. The proposed condition described in this drainage report only covers the final condition not all the work done in early grading.

The Commons at Falcon Field is a proposed mixed-use commercial and residential Development. The development is proposed to consist of 169 single-family lots and 8 commercial pads, along with associated roadways and open space.

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

provide FIRM maps in the report.

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

floodway

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 floodplain. This reach of the channel is the subject of a FEMA floodplain study currently being completed by separate report and analysis.

Provide for EPC review.

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

review 1:Please discuss the problems identified in the DBPS for this site and the solutions indicated in the DBPS.
Review 2: unresolved. Please address the above comment.

Existing Conditions

The Falcon 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, these combine with onsite flows and follow the historic reach ET100 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.

6.0 EXISTING CONDITION

Address the DBPS recommendations for the downstream channels to Falcon Highway

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 are 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=41.6 cfs and Q_{100}=347.8 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 & 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

flows dont match text above

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.

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.

concentrated flow

label on drainage map and provide description of this basin.

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, OS6, and OS7, 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 PROPOSED CONDITION

These proposed conditions appear to be the final site conditions. Because early grading is occurring that needs to be discussed and those site conditions need to be mapped as well.

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

Add comment that any underdrain systems will be the responsibility of the district or POA, including State and groundwater district permitting for discharges.

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. Further culvert and channel design details will be provided at the Final Drainage Report stage.

A-group basins 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	0.39	1.5	2.8
A2	2	0.58	1.6	3.4
A3	3	1.34	1.5	4.2
A4		0.25	1.2	2.1
	4	2.56	4.6	10.3
A5		0.23	1.1	1.9
	5	2.79	5.4	11.7
A6	6	0.59	2.2	4.1
A7		2.85	3.3	8.3
	7	3.44	4.7	11.0
A8	8	1.82	3.0	6.7
A9		1.39	2.3	5.1
	9	6.65	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	9.90	13.3	29.8
A13	13	1.22	2.2	4.8
	13A	14.33	19.1	42.7
A14		0.97	0.2	1.8
	14	18.09	23.4	53.1
A15	15	2.39	1.4	7.7

add A16

Basin A1 is located on the western side of Jackdaw Drive. Runoff will flow south via curb and gutter at rates of Q_5=1.5 cfs and Q_{100}=2.8 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=1.6 cfs and Q_{100}=3.4 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.**

It appears that this paragraph was repeated below.

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}=4.1 cfs) is directed to the east via curb and gutter towards the intersection with Tody Way and **Design Point DP4.** From this point flows will continue to the east

Flow from the culvert is being diverted from going south within the proposed site to the east within the roadside ditch and ultimately into adjacent property owners. Please address downstream easements needed for the diverted flows and any necessary improvements beyond the roadside ditch.

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 1.82-acres of lots along the east side of Motmot Way. Flows generated by this basin (Q_5=3.0 cfs and Q_{100}=6.7 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=2.3 cfs and Q_{100}=5.1 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.

and bypass flows from DP 9

DP11 covers flow from Basin A10 (DP10) and Basin A11. 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 3.16 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 3.23-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.

the 0.25ac portion can use this exclusion (20% up to 1 ac), but the remainder of the basin should consider using Runoff Reduction Separate Pervious Areas (SPAs) for WQ.

discuss A16

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 1.38 acres of US-HWY 24, which acts as the northwestern boundary for the site. The runoff generated by this basin, Q_5=6.4 cfs and Q_{100}=11.5 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.

Please clarify the intent as the c/g shown on the drainage map does not extend to the inlet.

Basin B1 is 2.50 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=10.6 cfs and Q_{100}=19.4 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=5.2 cfs and Q_{100}=9.4 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	1.38	6.4	11.5
B1		2.54	10.6	19.4
	1A	3.92	16.5	29.9
B2	2	1.23	5.2	9.4
B3	3	0.49	2.3	4.0
B4	4	1.30	5.4	9.9
	4A	6.93	28.3	51.3
B5	5	2.08	8.7	15.9
	5A	9.02	35.5	64.5
B6	6	1.60	6.7	12.2
B7		1.09	5.1	9.1
	7	2.69	11.7	21.2
B8		0.62	2.9	5.1
	8	3.30	14.5	26.2
	8A	12.32	48.3	87.7
B9		1.42	0.6	4.3
	9	13.74	48.6	91.2

Basin B3 covers a portion of proposed Woodmen road right-of-way at the center of the commercial area. Flows of Q_5=2.3 cfs and Q_{100}=4.0 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=5.4 cfs and Q_{100}=9.9 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=8.7 cfs and Q_{100}=15.9 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 St. As with the previous commercial lot basins, the intention is to provide a storm sewer stub, located at the southeast corner at **Design Point 5** for the future lot developer to connect to.

provide design points for flows captured at the sump inlets.

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 1.47-acres in the central portion of the commercial area. Flows of Q_5=6.7 cfs and Q_{100}=12.2 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=5.1 cfs and Q_{100}=9.1 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=2.9 cfs and Q_{100}=5.1 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.

C-group basins 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 0.35-acres of US-HWY 24, which acts as the northwestern boundary for the site. The runoff generated by this basin, Q_5=0.3 cfs and Q_{100}=2.5 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=2.4 cfs and Q_{100}=8.9 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	0.35	0.3	2.5
C1		2.77	2.4	8.9
	1	3.12	2.6	11.2
C2		1.80	7.5	13.8
	2	4.57	11.0	30.7
C3	3	1.71	7.2	13.1
C4		1.72	7.2	13.1
	4	8.00	22.2	50.7
OSC2		2.98	2.6	10.1
C5		1.35	6.3	11.3
	5	4.33	8.2	20.1
C6		0.90	4.2	7.5
	6	5.23	13.3	29.7
	6A	13.24	31.7	71.9

Drainage Map table says 0.31 and 0.66

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 1.80-acres in the west-central portion of the commercial area. Flows of Q_5=7.5 cfs and Q_{100}=13.8 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 1.71-acres in the commercial area. Runoff rates of Q_5=7.2 cfs and Q_{100}=13.1 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=7.2 cfs and Q_{100}=13.1 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.

All of the C basin areas and flows do not match what is on the drainage map. Verify what is correct and update so both match.

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=6.3 cfs and Q_{100}=11.3 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=4.2 cfs and Q_{100}=7.5 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=1.9 cfs and Q_{100}=4.8 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 Trogon Way. Flows generated by this basin (Q_5=2.9 cfs and Q_{100}=7.1 cfs) travel to the east via side lot swale and south via curb and gutter towards **Design Point DP2.**

not shown on fig. please clarify

DP2 combines flows from Basins D1 and D2, to be captured by a proposed public sump curb inlet at the intersection of Trogon Way 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 Trogon Way. 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.

Rational Method Runoff Summary (D-group)

BASIN & DESIGN POINT SUMMARY				
BASIN	**DP**	**AREA (AC)**	**Q5**	**Q100**
D-BASINS				
D1	1	1.30	1.9	4.8
D2		1.81	2.9	7.1
	2	3.12	4.5	11.2
D3	3	0.91	1.4	3.3
	3A	17.26	36.4	83.7
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	1.26	2.6	5.8
D11		0.59	2.7	4.9
	11	1.86	5.1	10.2
D12		1.54	0.6	4.3
	12	28.34	57.2	131.7
OSD1	D1	2.94	1.0	7.3
D13		1.45	0.5	3.3
	13	4.39	1.4	9.6
D14	14	0.92	0.3	2.5

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.

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

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

contours show flows will bypass the detention facility and travel offsite into D14. Flows should be directed towards EDB.

Basin D10 covers the southern portion along Trogon Way at the western boundary. Flows of Q_5=2.6 cfs and Q_{100}=5.8 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**.

contours show flows will bypass the detention facility and travel offsite into D14. Flows should be directed towards EDB.

Basin D11 covers the southern portion of Trogon Way adjacent to Basin D10. Flows of Q_5=2.7 cfs and Q_{100}=4.9 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 travel 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.

clarify your intent as it appears that a swale is being created along these two basins. Easements are needed.

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.

the 0.04ac portion can use this exclusion (20% up to 1 ac), but the remainder of the basin should consider using Runoff Reduction Separate Pervious Areas (SPAs) for WQ.

bold

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 0.92-acre basin are directed offsite.

Regrading changes the slopes and cannot be considered undeveloped to remain undeveloped. Consider using Runoff Reduction Separate Pervious Areas (SPAs) for this basin.

8.0 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 the WQCV over a 40-hour period.

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 the WQCV over a 40-hour period.

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 the WQCV over a 40-hour period. Flows will discharge into a proposed storm sewer discharging to the south at historic rates.

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.

These should also be releasing at or slightly below historic rates.

9.0 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.

4-step process must be included in PDR as well

10.0 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. Further information will be added to this report upon completion.

Provide for EPC review prior to submitting to FEMA

Unresolved: Diversion of flows from sheet flow areas to point discharges requires thourough analysis of stabilized conveyances and easements to a suitable location.

11.0 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.

12.0 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.

13.0 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, Effect

6. EL Paso County Boc and Section 3.2.1, Manual, May 2014.

7. Falcon Drainage September 2015.

review 1: Please provide discussion/analysis of the proposed improvements at the existing floodplain/channel that traverses the site. Identify what is proposed in the DBPS and compare it with what this development proposes for this reach. Address DBPS recommendations downstream of the site. Are offsite downstream improvements needed? please provide more information and analysis.

Also, Discuss the estimated cost of the improvements and how it compares to listed costs in the DBPS. Are the improvements reimbursable? will the developer seek reimbursement? DBPS amendment will be required for changes to the DBPS. Also identify if the proposed improvement is intended to be public or privately owned and maintained. Address estimated drainage basin fees and any potential drainage fee offset credits in general.

review 2: unresolved. Please address the above comment.

Appendix

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: 6/28/2023

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	COMPOSITE RUNOFF COEFFICIENTS				% IMPERV
		ACRE	C2	C5	C10	C100	
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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DESIGN BY: KGV
REV. BY: TDM
AGENCY: El Paso County
REPORT TYPE: Preliminary
DATE: 6/28/2023

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

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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

	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: 6/28/2023

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.	MINIMUM	
				Ac			Ft	%	Min	Ft	%	FPS	Min	t_c	t_c	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**

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:	6/28/2023

Drexel, Barrell & Co.

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**

provide all sub-basins and DPs including OS5 and OS6, E6, H-M

PROJECT INFORMATION

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

provide all sub-basins and DPs including OS5 and OS6, E6, H-M

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: 6/28/2023

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	COMPOSITE RUNOFF COEFFICIENTS				% IMPERV
		ACRE	C2	C5	C10	C100	
A-BASINS							
A1	Open Space	0.08		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	0.31		0.90		0.96	100
	Streets: Gravel	0.00		0.80		0.85	80
	WEIGHTED AVERAGE			0.74		0.84	80%
TOTAL A1		0.39					
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	0.20		0.90		0.96	100
	Streets: Gravel	0.00		0.80		0.85	80
	WEIGHTED AVERAGE			0.53		0.67	64%
TOTAL A2		0.58					
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					

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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	0.47		0.90		0.96	100
	Streets: Gravel	0.00		0.80		0.85	80
	WEIGHTED AVERAGE			0.74		0.84	80%
TOTAL A6		0.59					
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)	1.82		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		1.82					
A9	Open Space	0.00		0.08		0.35	0
	Commercial Development	0.00		0.81		0.88	95
	Residential (< 1/8 Acre)	1.39		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		1.39					
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

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REV. BY: TDM
AGENCY: El Paso County
REPORT TYPE: Preliminary
DATE: 6/28/2023

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

	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: 6/28/2023

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	**18.09**		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	1.38		0.90		0.96	100
	Streets: Gravel	0.00		0.80		0.85	80
	WEIGHTED AVERAGE			0.90		0.96	100%
TOTAL OSB1		1.38					
B1	Open Space	0.00		0.08		0.35	0
	Commercial Development	2.54		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 B1		2.54					
B2	Open Space	0.00		0.08		0.35	0
	Commercial Development	1.23		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		1.23					
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	0.49		0.90		0.96	100
	Streets: Gravel	0.00		0.80		0.85	80
	WEIGHTED AVERAGE			0.90		0.96	100%

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	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		0.49					
B4	Open Space	0.00		0.08		0.35	0
	Commercial Development	1.30		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		1.30					
B5	Open Space	0.00		0.08		0.35	0
	Commercial Development	2.08		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		2.08					
B6	Open Space	0.00		0.08		0.35	0
	Commercial Development	1.60		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		1.60					
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	1.09		0.90		0.96	100
	Streets: Gravel	0.00		0.80		0.85	80
	WEIGHTED AVERAGE			0.90		0.96	100%
TOTAL B7		1.09					
B8	Open Space	0.00		0.08		0.35	0
	Commercial Development	0.00		0.81		0.88	95
	Streets: Paved	0.62		0.90		0.96	100

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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: Gravel	0.00		0.80		0.85	80
	WEIGHTED AVERAGE			0.90		0.96	100%
TOTAL B8		0.62					
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	**13.74**		**0.76**		**0.85**	**0.86**

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	0.35		0.90		0.96	100
	Streets: Gravel	0.00		0.80		0.85	80
	WEIGHTED AVERAGE			0.90		0.96	100%
TOTAL OSC1		0.35					
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	0.31		0.90		0.96	100
	Streets: Gravel	0.00		0.80		0.85	80

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	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		0.31					
C2	Open Space	0.00		0.08		0.35	0
	Commercial Development	1.80		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		1.80					
C3	Open Space	0.00		0.08		0.35	0
	Commercial Development	1.71		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		1.71					
C4	Open Space	0.00		0.08		0.35	0
	Commercial Development	1.72		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		1.72					
C5	Open Space	0.00		0.08		0.35	0
	Commercial Development	0.00		0.81		0.88	95
	Streets: Paved	1.35		0.90		0.96	100
	Streets: Gravel	0.00		0.80		0.85	80
	WEIGHTED AVERAGE			0.90		0.96	100%
TOTAL C5		1.35					
C6	Open Space	0.00		0.08		0.35	0

PROJECT INFORMATION

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PROJECT NO: 21604-00
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AGENCY: El Paso County
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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

	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 C6		0.90					
			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)	0.92		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 D1		1.30					
D2	Open Space	0.38		0.08		0.35	0
	Commercial Development	0.00		0.81		0.88	95
	Residential (< 1/8 Acre)	1.43		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			0.37		0.54	51%
TOTAL D2		1.81					
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

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	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: 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					

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	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)	1.26		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		1.26					
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	0.59		0.90		0.96	100
	Streets: Gravel	0.00		0.80		0.85	80
	WEIGHTED AVERAGE			0.90		0.96	100%
TOTAL D11		0.59					
D12	Open Space	1.54		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

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	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		1.54					
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	0.92		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		0.92					
	Area tributary to Pond C	**36.97**		**0.37**		**0.49**	**0.45**

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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	0.39	*0.29*	*0.33*	20	2.0	2.4	560	4.0	8.0	1.2					3.5	5.0	**5.0**
A2	2	0.53	0.67	0.58	*0.31*	*0.39*	20	2.0	3.7	500	4.0	8.0	1.0					4.8	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	2.56	*1.20*	*1.60*	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	0.50	0.65	2.79	*1.41*	*1.82*	From DP4							75	1.0	5.9	0.2	12.3	5.0	**12.3**
A6	6	0.74	0.84	0.59	*0.43*	*0.49*	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	3.44	*1.42*	*1.98*	From A7											17.1	5.0	**17.1**
A8	8	0.45	0.59	1.82	*0.82*	*1.07*	100	1.0	11.9	435	1.8	5.7	1.3					13.2	5.0	**13.2**
A9		0.45	0.59	1.39	*0.62*	*0.82*	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	6.65	*2.86*	*3.87*	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	9.90	*4.32*	*5.79*	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	14.33	*6.32*	*8.40*	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	18.09	*7.80*	*10.57*	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**
B-BASINS																				
OSB1	1	0.90	0.96	1.38	*1.24*	*1.32*	40	2.0	1.9	362	1.0	6.1	1.0					2.9	5.0	**5.0**
B1		0.81	0.88	2.54	*2.06*	*2.23*	60	2.3	3.2	511	3.3	6.6	1.3					4.5	5.0	**5.0**
DP1+B1	1A	0.84	0.91	3.92	*3.30*	*3.56*	From DP1							250	1.0	7.2	0.6	5.6	5.0	**5.6**
B2	2	0.81	0.88	1.23	*1.00*	*1.09*	40	4.0	2.2	308	4.0	7.0	0.7					2.9	5.0	**5.0**
B3	3	0.90	0.96	0.49	*0.44*	*0.47*	20	2.0	1.3	199	2.0	7.0	0.5					1.8	5.0	**5.0**
B4	4	0.81	0.88	1.30	*1.05*	*1.14*	50	3.5	2.5	326	3.3	6.3	0.9					3.4	5.0	**5.0**
DP1A+DP2+DP3+DP4	4A	0.83	0.90	6.93	*5.78*	*6.25*	From DP1A							195	1.0	7.2	0.5	6.0	5.0	**6.0**
B5	5	0.81	0.88	2.08	*1.69*	*1.83*	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	9.02	*7.47*	*8.08*	From DP4A							245	1.0	7.2	0.6	6.6	5.0	**6.6**
B6	6	0.81	0.88	1.60	*1.29*	*1.40*	50	3.9	2.4	388	3.6	6.9	0.9					3.4	5.0	**5.0**
B7		0.90	0.96	1.09	*0.98*	*1.05*	40	2.0	1.9	762	2.3	7.0	1.8					3.7	5.0	**5.0**
DP6+B7	7	0.85	0.91	2.69	*2.28*	*2.45*	From DP6							20	1.0	7.2	0.0	5.0	5.0	**5.0**
B8		0.90	0.96	0.62	*0.55*	*0.59*	40	1.0	2.4	544	2.8	7.0	1.3					3.7	5.0	**5.0**
DP7+DP8	8	0.86	0.92	3.30	*2.83*	*3.04*	From DP7							50	1.0	7.2	0.1	5.2	5.0	**5.2**
DP8+DP5A	8A	0.84	0.90	12.32	*10.30*	*11.13*	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	13.74	*10.41*	*11.62*	From DP8A							46	1.0	7.2	0.1	7.0	5.0	**7.0**
C-BASINS																				
OSC1	C1	0.90	0.96	0.35	*0.31*	*0.33*	40	2.5	1.7	165	2.0	5.2	0.5					2.3	5.0	**5.0**
C1		0.90	0.96	0.31	*0.28*	*0.30*	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	0.66	*0.59*	*0.63*	From OSC1			185	2.0	5.2	0.5					5.5	5.0	**5.5**
C2		0.81	0.88	1.80	*1.46*	*1.59*	60	3.2	2.9	412	3.0	6.5	1.1					3.9	5.0	**5.0**
DP1+C2	2	1.10	1.19	2.11	*2.34*	*2.52*	From DP1							260	1.0	7.2	0.6	6.1	5.0	**6.1**
C3	3	0.81	0.88	1.71	*1.39*	*1.51*	70	2.6	3.3	496	2.7	5.8	1.4					4.7	5.0	**5.0**
C4		0.81	0.88	1.72	*1.39*	*1.51*	60	4.8	2.5	371	4.7	7.5	0.8					3.3	5.0	**5.0**

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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
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	t_c
				Ac			Ft	%	Min	Ft	%	FPS	Min	Ft	%	FPS	Min	t_c	t_c	Min
DP2+DP3+C4	4	0.92	1.00	5.55	5.12	5.54	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	1.35	1.22	1.30	40	2.0	1.9	938	2.0	5.2	3.0					4.9	5.0	**5.0**
OSC2+C5	5	0.41	0.60	4.33	1.78	2.58	From OSC2			100	2.0	5.2	0.3					7.2	5.0	**7.2**
C6		0.90	0.96	0.90	0.81	0.86	40	2.0	1.9	703	2.0	5.2	2.3					4.1	5.0	**5.0**
DP5+C6	6	0.49	0.66	5.23	2.59	3.44	From DP5							58	1.0	7.2	0.1	5.1	5.0	**5.1**
DP4+DP6	6A	0.71	0.83	10.78	7.70	8.99	From DP4							430	1.0	7.2	1.0	7.8	5.0	**7.8**
D-BASINS																				
D1	1	0.34	0.52	1.30	0.45	0.68	70	2.7	8.5	594	2.6	9.6	1.0					9.5	5.0	**9.5**
D2		0.37	0.54	1.81	0.67	0.98	60	2.7	7.6	559	1.2	7.2	1.3					8.9	5.0	**8.9**
DP1+D2	2	0.36	0.53	3.12	1.12	1.65	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	0.62	0.75	14.81	9.18	11.15	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	1.26	0.57	0.75	70	3.9	6.5	479	4.5	11.6	0.7					7.2	5.0	**7.2**
D11		0.90	0.96	0.59	0.53	0.57	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	1.86	1.10	1.31	From DP10							50	1.0	7.2	0.1	7.3	5.0	**7.3**
D12		0.08	0.35	1.54	0.12	0.54	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	0.68	25.88	13.83	17.54	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	0.92	0.07	0.32	80	15.0	6.9	183	6.5	6.8	0.4					7.4	5.0	**7.4**

PROJECT INFORMATION

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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	0.39	0.74	5.0	0.29	5.17	**1.5**
A2	2	0.58	0.53	5.0	0.31	5.17	**1.6**
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	2.56	0.47	12.1	1.20	3.85	**4.6**
A5		0.23	0.90	5.0	0.21	5.17	**1.1**
DP4+A5	5	2.79	0.50	12.3	1.41	3.82	**5.4**
A6	6	0.59	0.74	5.7	0.43	4.98	**2.2**
A7		2.85	0.34	17.1	0.98	3.32	**3.3**
DP6+A7	7	3.44	0.41	17.1	1.42	3.32	**4.7**
A8	8	1.82	0.45	13.2	0.82	3.71	**3.0**
A9		1.39	0.45	13.5	0.62	3.68	**2.3**
DP7+DP8+A9	9	6.65	0.43	20.2	2.86	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	9.90	0.44	20.3	4.32	3.07	**13.3**
A13	13	1.22	0.45	11.4	0.55	3.93	**2.2**
DP12A+DP11+DP13	13A	14.33	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	18.09	0.43	21.3	7.80	2.99	**23.4**
A15	15	2.39	0.12	5.0	0.28	5.17	**1.4**
B-BASINS							
OSB1	1	1.38	0.90	5.0	1.24	5.17	**6.4**
B1		2.54	0.81	5.0	2.06	5.17	**10.6**
DP1+B1	1A	3.92	0.84	5.6	3.30	5.00	**16.5**
B2	2	1.23	0.81	5.0	1.00	5.17	**5.2**
B3	3	0.49	0.90	5.0	0.44	5.17	**2.3**
B4	4	1.30	0.81	5.0	1.05	5.17	**5.4**
DP1A+DP2+DP3+DP4	4A	6.93	0.83	6.0	5.78	4.89	**28.3**
B5	5	2.08	0.81	5.0	1.69	5.17	**8.7**
DP4A+DP5	5A	9.02	0.83	6.6	7.47	4.75	**35.5**
B6	6	1.60	0.81	5.0	1.29	5.17	**6.7**

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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)**
B7		1.09	0.90	5.0	0.98	5.17	**5.1**
DP6+B7	7	2.69	0.85	5.0	2.28	5.16	**11.7**
B8		0.62	0.90	5.0	0.55	5.17	**2.9**
DP7+DP8	8	3.30	0.86	5.2	2.83	5.12	**14.5**
DP8+DP5A	8A	12.32	0.84	6.9	10.30	4.69	**48.3**
B9		1.42	0.08	5.0	0.11	5.17	**0.6**
DP8A+B9	9	13.74	0.76	7.0	10.41	4.67	**48.6**
C-BASINS							
OSC1	C1	0.35	0.90	5.0	0.31	5.17	**1.6**
C1		0.31	0.90	5.0	0.28	5.17	**1.5**
DPC1+C1	1	0.66	0.90	5.5	0.59	5.03	**3.0**
C2		1.80	0.81	5.0	1.46	5.17	**7.5**
DP1+C2	2	2.11	1.10	6.1	2.34	4.87	**11.4**
C3	3	1.71	0.81	5.0	1.39	5.17	**7.2**
C4		1.72	0.81	5.0	1.39	5.17	**7.2**
DP2+DP3+C4	4	5.55	0.92	6.8	5.12	4.72	**24.1**
OSC2		2.98	0.19	6.8	0.56	4.70	**2.6**
C5		1.35	0.90	5.0	1.22	5.17	**6.3**
OSC2+C5	5	4.33	0.41	7.2	1.78	4.63	**8.2**
C6		0.90	0.90	5.0	0.81	5.17	**4.2**
DP5+C6	6	5.23	0.49	5.1	2.59	5.13	**13.3**
DP4+DP6	6A	10.78	0.71	7.8	7.70	4.51	**34.7**
D-BASINS							
D1	1	1.30	0.34	9.5	0.45	4.20	**1.9**
D2		1.81	0.37	8.9	0.67	4.31	**2.9**
DP1+D2	2	3.12	0.36	10.5	1.12	4.05	**4.5**
D3	3	0.91	0.40	11.9	0.36	3.87	**1.4**
DP6A(C)+DP2+DP3	3A	14.81	0.62	12.1	9.18	3.85	**35.3**
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**
D6	6	2.87	0.45	9.0	1.29	4.28	**5.5**

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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)**
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	1.26	0.45	7.2	0.57	4.63	**2.6**
D11		0.59	0.90	5.0	0.53	5.17	**2.7**
DP10+D11	11	1.86	0.59	7.3	1.10	4.61	**5.1**
D12		1.54	0.08	6.5	0.12	4.77	**0.6**
DP3A+DP7+DP8+DP9+DP11+D12	12	25.88	0.53	10.5	13.83	4.05	**56.0**
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	0.92	0.08	7.4	0.07	4.59	**0.3**

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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	0.39	0.84	5.0	0.33	8.68	**2.8**
A2	2	0.58	0.67	5.0	0.39	8.68	**3.4**
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	2.56	0.63	12.1	1.60	6.46	**10.3**
A5		0.23	0.96	5.0	0.22	8.68	**1.9**
DP4+A5	5	2.79	0.65	12.3	1.82	6.42	**11.7**
A6	6	0.59	0.84	5.7	0.49	8.36	**4.1**
A7		2.85	0.52	17.1	1.49	5.57	**8.3**
DP6+A7	7	3.44	0.58	17.1	1.98	5.57	**11.0**
A8	8	1.82	0.59	13.2	1.07	6.23	**6.7**
A9		1.39	0.59	13.5	0.82	6.18	**5.1**
DP7+DP8+A9	9	6.65	0.58	20.2	3.87	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	9.90	0.59	20.3	5.79	5.15	**29.8**
A13	13	1.22	0.59	11.4	0.72	6.60	**4.8**
DP12A+DP11+DP13	13A	14.33	0.59	20.9	8.40	5.08	**42.7**
A14		0.97	0.35	19.5	0.34	5.25	**1.8**
DP5+DP13A+A14	14	18.09	0.58	21.3	10.57	5.02	**53.1**
A15	15	2.39	0.37	5.0	0.89	8.68	**7.7**
B-BASINS							
OSB1	1	1.38	0.96	5.0	1.32	8.68	**11.5**
B1		2.54	0.88	5.0	2.23	8.68	**19.4**
DP1+B1	1A	3.92	0.91	5.6	3.56	8.40	**29.9**
B2	2	1.23	0.88	5.0	1.09	8.68	**9.4**
B3	3	0.49	0.96	5.0	0.47	8.68	**4.0**
B4	4	1.30	0.88	5.0	1.14	8.68	**9.9**
DP1A+DP2+DP3+DP4	4A	6.93	0.90	6.0	6.25	8.21	**51.3**
B5	5	2.08	0.88	5.0	1.83	8.68	**15.9**
DP4A+DP5	5A	9.02	0.90	6.6	8.08	7.98	**64.5**
B6	6	1.60	0.88	5.0	1.40	8.68	**12.2**

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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)**
B7		1.09	0.96	5.0	1.05	8.68	**9.1**
DP6+B7	7	2.69	0.91	5.0	2.45	8.66	**21.2**
B8		0.62	0.96	5.0	0.59	8.68	**5.1**
DP7+DP8	8	3.30	0.92	5.2	3.04	8.60	**26.2**
DP8+DP5A	8A	12.32	0.90	6.9	11.13	7.88	**87.7**
B9		1.42	0.35	5.0	0.50	8.68	**4.3**
DP8A+B9	9	13.74	0.85	7.0	11.62	7.84	**91.2**
C-BASINS							
OSC1	C1	0.35	0.96	5.0	0.33	8.68	**2.9**
C1		0.31	0.96	5.0	0.30	8.68	**2.6**
DPC1+C1	1	0.66	0.96	5.5	0.63	8.44	**5.4**
C2		1.80	0.88	5.0	1.59	8.68	**13.8**
DP1+C2	2	2.11	1.19	6.1	2.52	8.18	**20.6**
C3	3	1.71	0.88	5.0	1.51	8.68	**13.1**
C4		1.72	0.88	5.0	1.51	8.68	**13.1**
DP2+DP3+C4	4	5.55	1.00	6.8	5.54	7.92	**43.9**
OSC2		2.98	0.43	6.8	1.28	7.89	**10.1**
C5		1.35	0.96	5.0	1.30	8.68	**11.3**
OSC2+C5	5	4.33	0.60	7.2	2.58	7.77	**20.1**
C6		0.90	0.96	5.0	0.86	8.68	**7.5**
DP5+C6	6	5.23	0.66	5.1	3.44	8.61	**29.7**
DP4+DP6	6A	10.78	0.83	7.8	8.99	7.57	**68.0**
D-BASINS							
D1	1	1.30	0.52	9.5	0.68	7.05	**4.8**
D2		1.81	0.54	8.9	0.98	7.23	**7.1**
DP1+D2	2	3.12	0.53	10.5	1.65	6.80	**11.2**
D3	3	0.91	0.56	11.9	0.51	6.50	**3.3**
DP6A(C)+DP2+DP3	3A	14.81	0.75	12.1	11.15	6.46	**72.0**
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**
D7		0.70	0.83	6.2	0.58	8.12	**4.7**

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RATIONAL METHOD CALCULATIONS FOR STORM WATER RUNOFF

DEVELOPED RUNOFF 100 YR STORM P1= 2.52

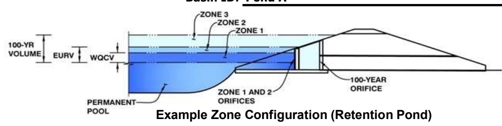
			DIRECT RUNOFF				
BASIN (S)	**DESIGN POINT**	**AREA (AC)**	**RUNOFF COEFF**	**t_c (MIN)**	**C * A**	**I (IN/HR)**	**Q (CFS)**
DP5+DP6+D7	7	6.98	0.59	10.2	4.13	6.88	**28.4**
D8	8	0.42	0.59	10.4	0.25	6.82	**1.7**
D9	9	0.29	0.59	7.2	0.17	7.77	**1.3**
D10	10	1.26	0.59	7.2	0.75	7.78	**5.8**
D11		0.59	0.96	5.0	0.57	8.68	**4.9**
DP10+D11	11	1.86	0.71	7.3	1.31	7.74	**10.2**
D12		1.54	0.35	6.5	0.54	8.01	**4.3**
DP3A+DP7+DP8+DP9+DP11+D12	12	25.88	0.68	10.5	17.54	6.80	**119.3**
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	0.92	0.35	7.4	0.32	7.70	**2.5**

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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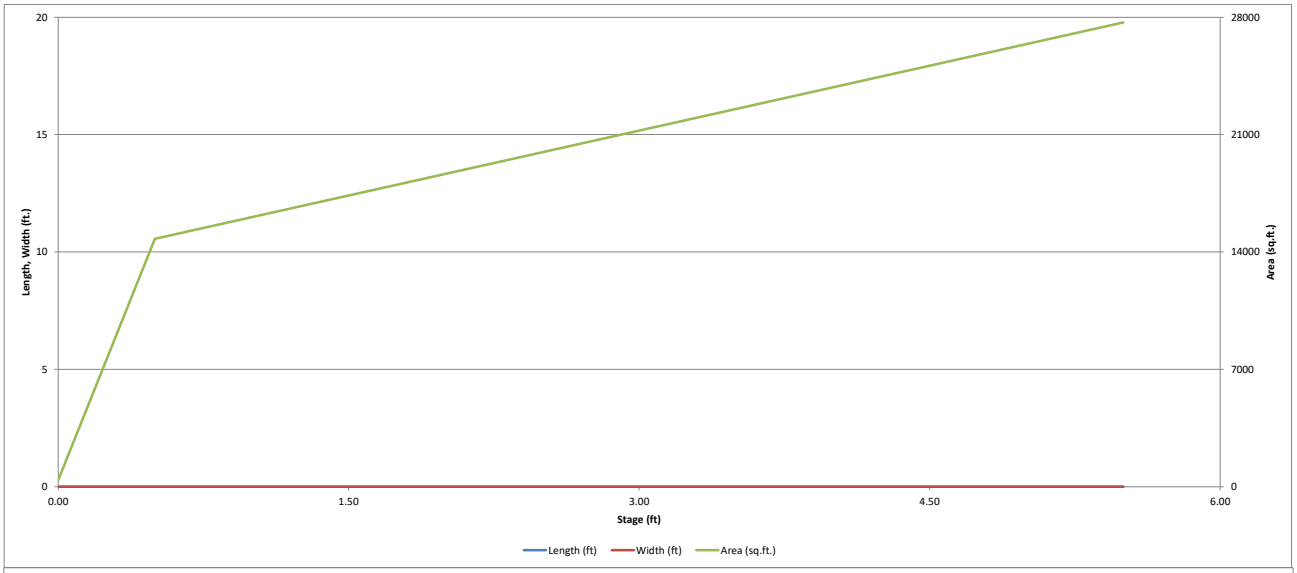
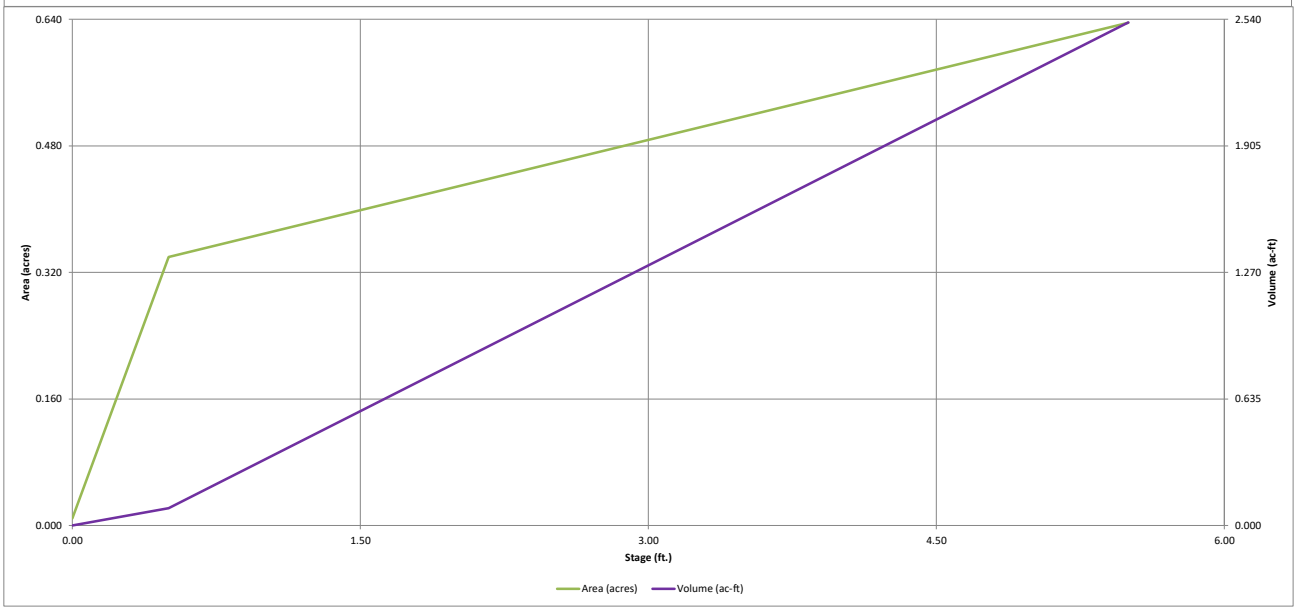
Note: Not all comments from submittal 1 were addressed on the MHFD-Detention spreadsheets. Since the spreadsheet is for the pond design and not finalized currently, previous comments can be addressed with the construction submittal for the pond construction.

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)



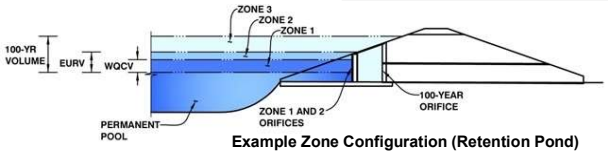


DETENTION BASIN OUTLET STRUCTURE DESIGN

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 Diameter = inches

Calculated Parameters for Underdrain

Underdrain Orifice Area = ft^2

Underdrain Orifice Centroid = 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)	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

Calculated Parameters for Plate

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.11	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)

	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				

Calculated Parameters for Vertical Orifice

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

	Zone 3 Weir	Not Selected			Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	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	%				

Calculated Parameters for Overflow Weir

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

	Zone 3 Restrictor	Not Selected			Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	0.00	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

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

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

Calculated Parameters for Spillway

Routed Hydrograph Results

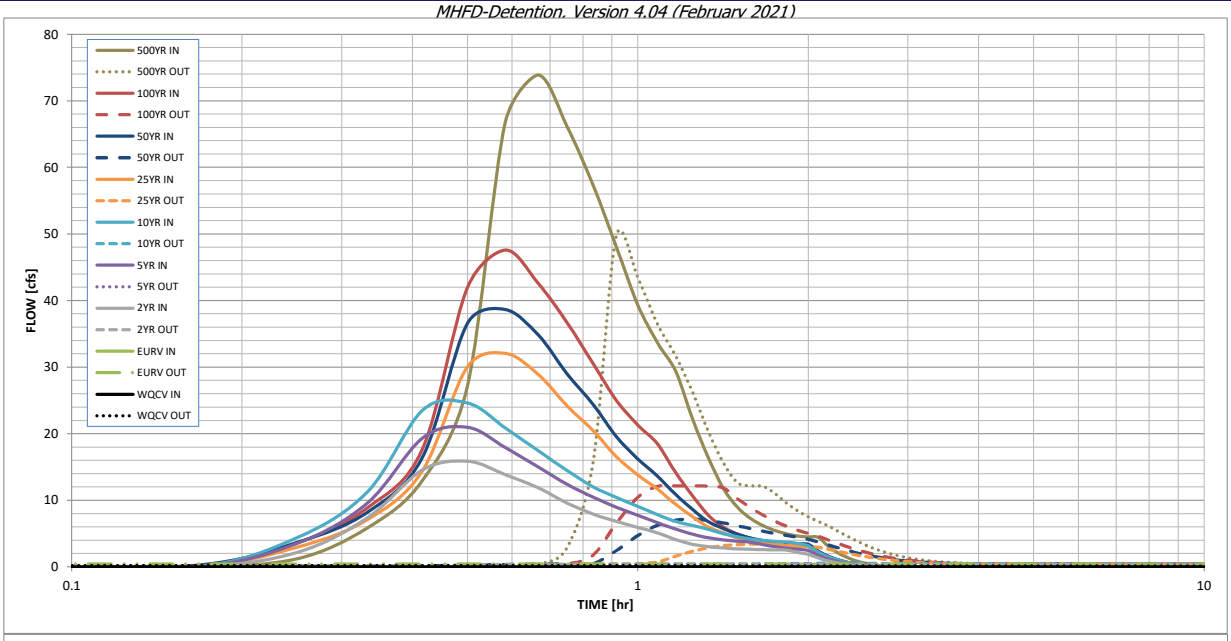
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

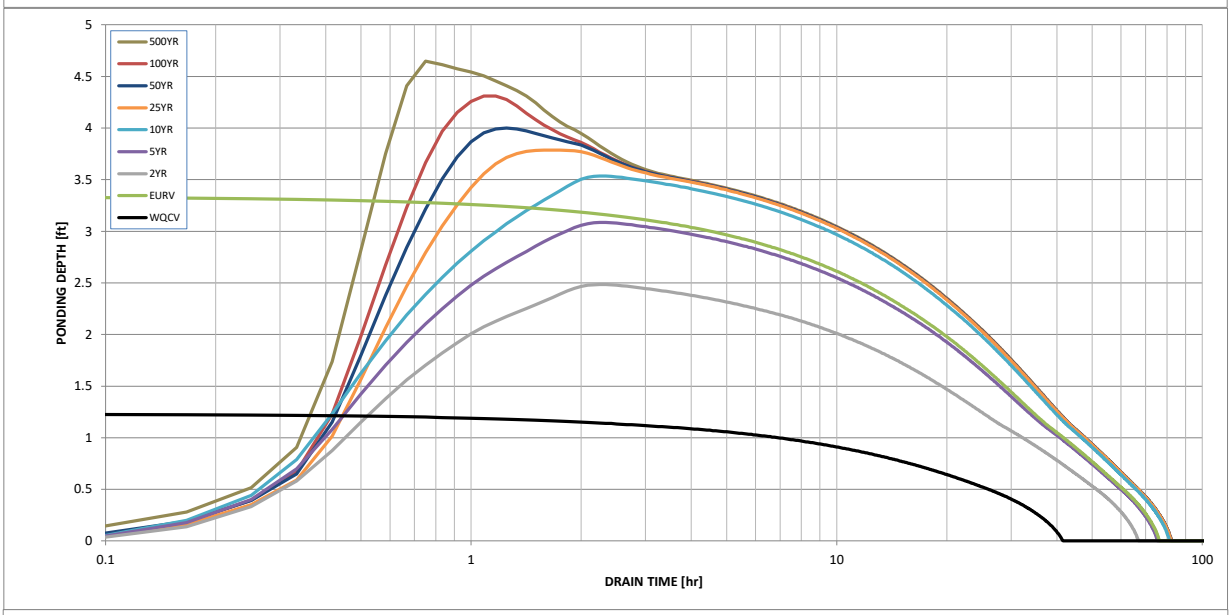
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.49
CUHP Runoff Volume (acre-ft) =	0.351	1.289	0.932	1.229	1.466	1.795	2.119	2.519	3.908
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.932	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

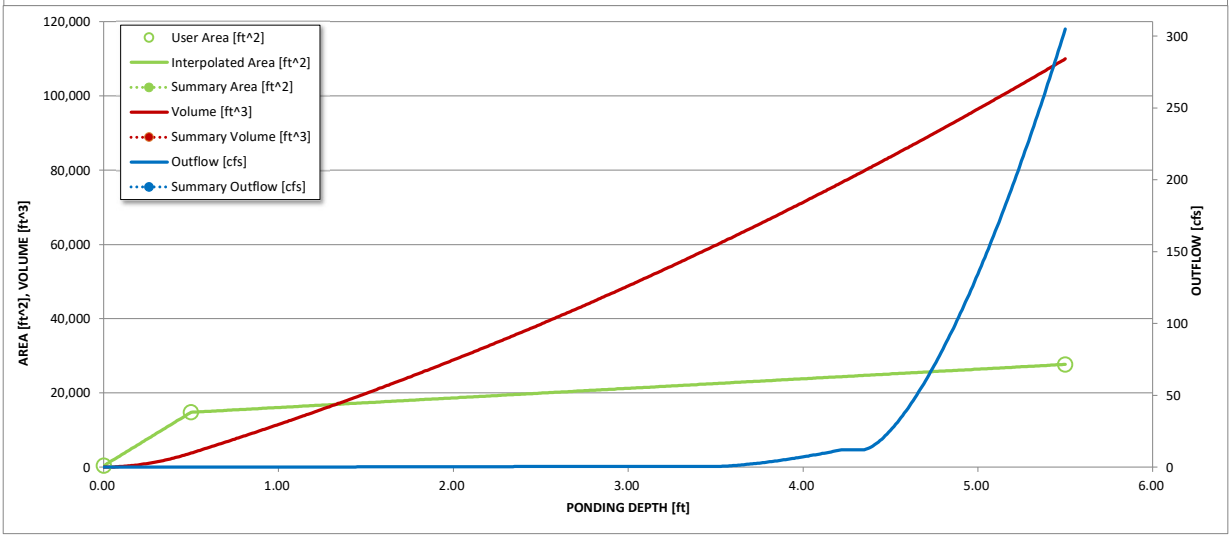
Note that pre-development peaks need to be addressed based on pre-existing contributing areas at each pond outfall. Provide calculations per MHFD USDCM Section 4.1.2.

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)

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]

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'.

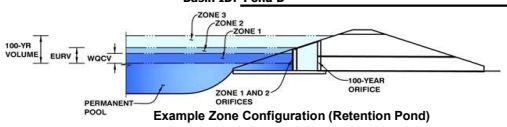
Also include the inverts of all outlets (e.g. vertical orifice, overflow grate, and spillway, where applicable).

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	

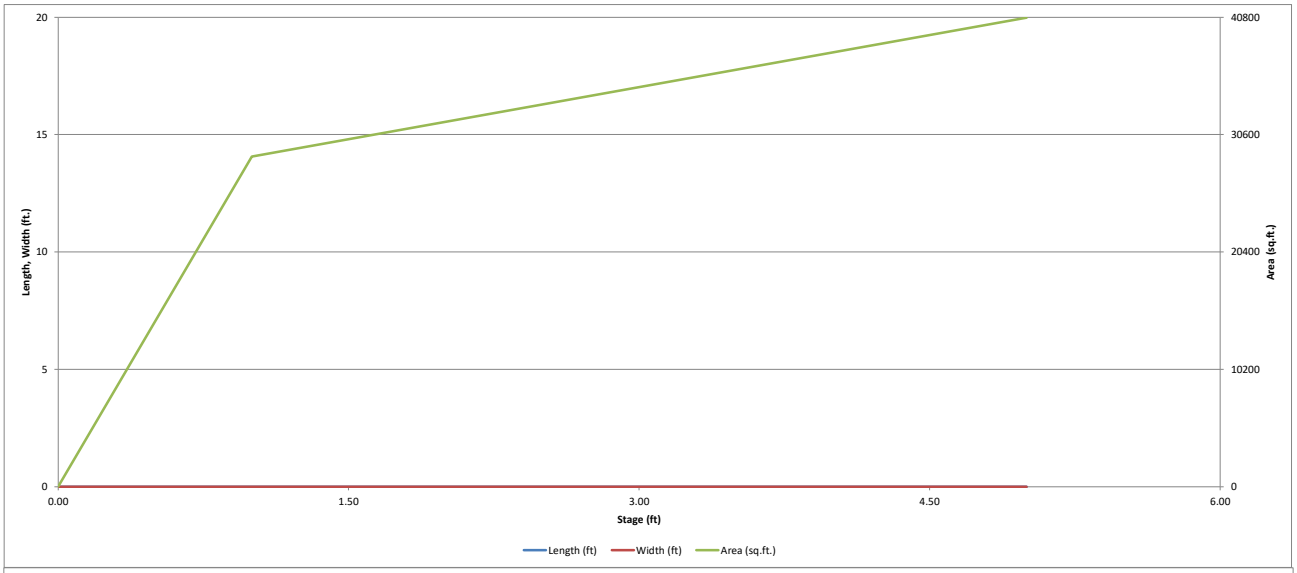
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	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

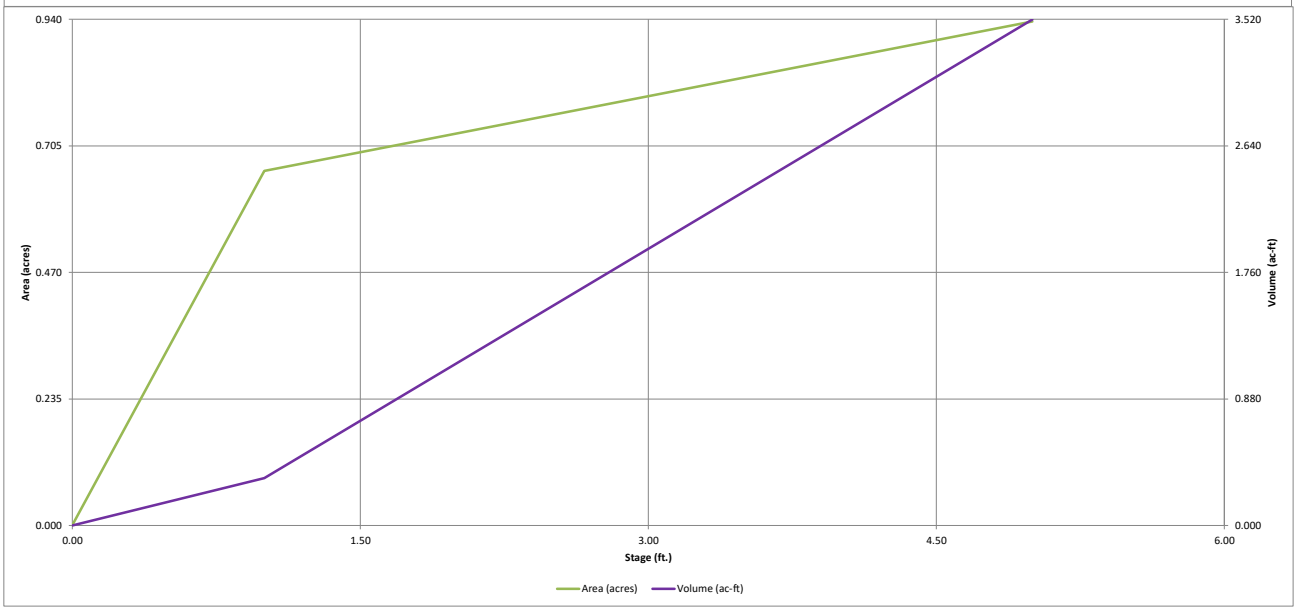
Depth Increment = ft

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

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)



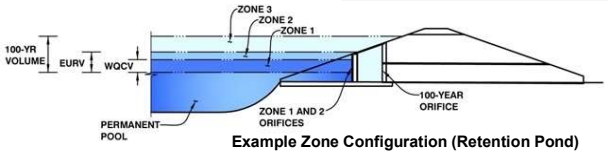


DETENTION BASIN OUTLET STRUCTURE DESIGN

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 Area =	N/A	ft^2
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

Calculated Parameters for Underdrain

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

Invert of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	3.021E-02	ft^2
Depth at top of Zone using Orifice Plate =	2.75	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	11.10	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	4.35	sq. inches (use rectangular openings)	Elliptical Slot Area =	N/A	ft^2

Calculated Parameters for Plate

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	0.92	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			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				

Calculated Parameters for Vertical Orifice

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

	Zone 3 Weir	Not Selected			Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	2.80	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	2.80	N/A	feet
Overflow Weir Front Edge Length =	6.00	N/A	feet	Overflow Weir Slope Length =	6.00	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	14.18	N/A	
Horiz. Length of Weir Sides =	6.00	N/A	feet	Overflow Grate Open Area w/o Debris =	25.06	N/A	ft^2
Overflow Grate Type =	Type C Grate	N/A		Overflow Grate Open Area w/ Debris =	12.53	N/A	ft^2
Debris Clogging % =	50%	N/A	%				

Calculated Parameters for Overflow Weir

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

	Zone 3 Circular	Not Selected			Zone 3 Circular	Not Selected	
Depth to Invert of Outlet Pipe =	0.00	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	1.77	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

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	3.25	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.74	feet
Spillway Crest Length =	25.00	feet	Stage at Top of Freeboard =	4.99	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	0.94	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	3.51	acre-ft

Calculated Parameters for Spillway

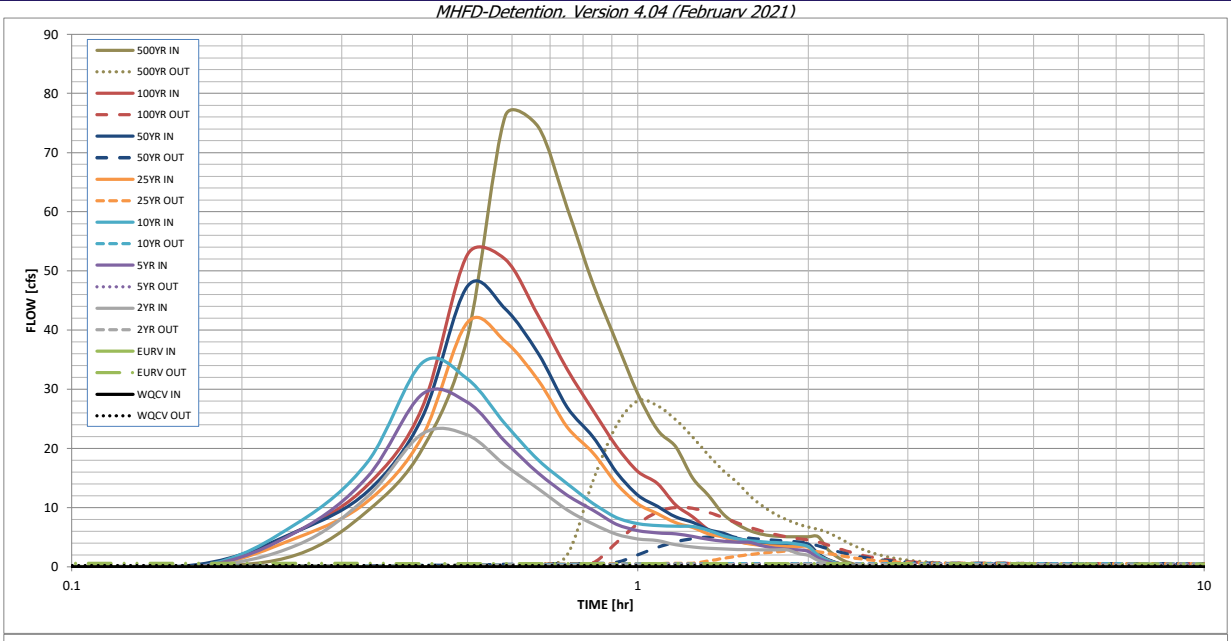
Routed Hydrograph Results

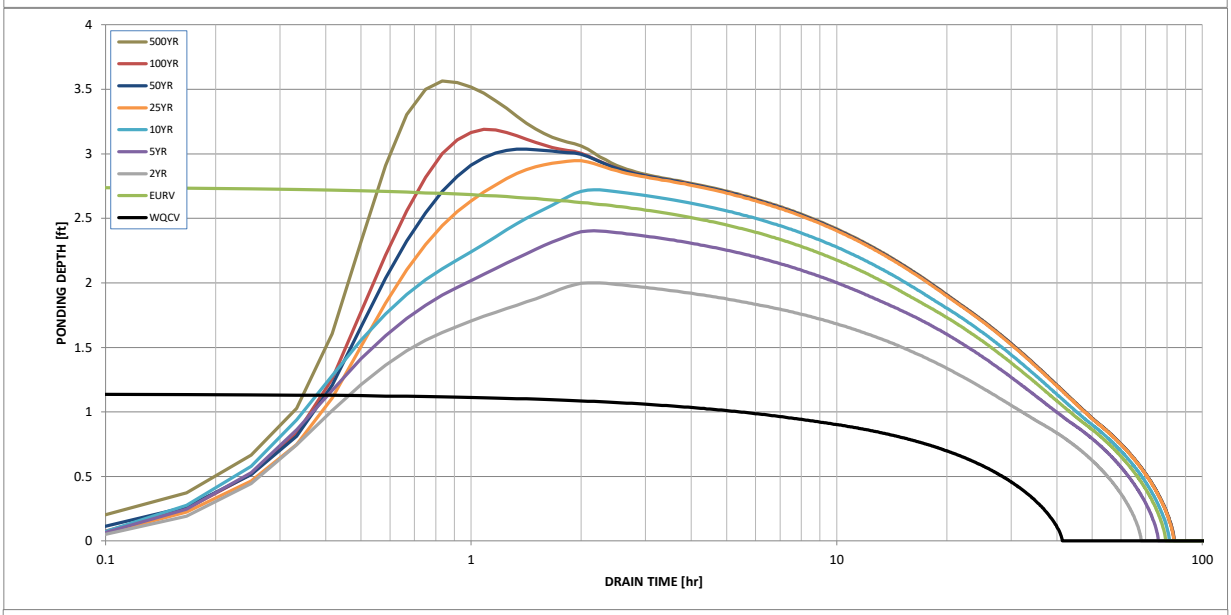
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

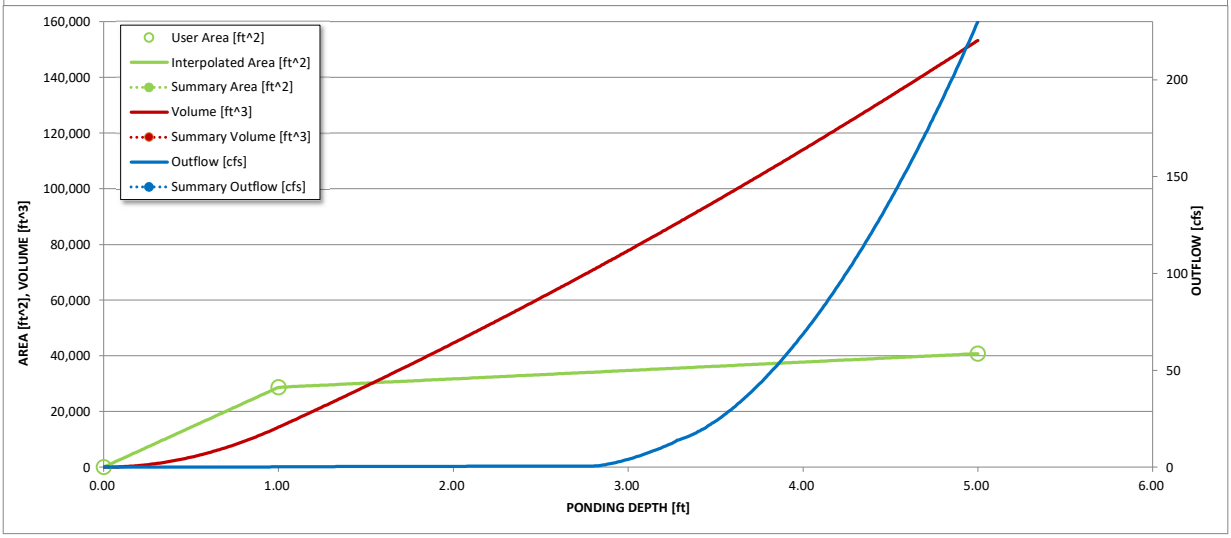
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.49
CUHP Runoff Volume (acre-ft) =	0.423	1.586	1.078	1.392	1.645	1.928	2.205	2.520	3.625
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	1.078	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
	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
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	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]

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'.

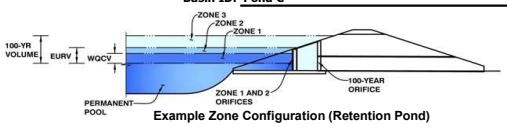
Also include the inverts of all outlets (e.g. vertical orifice, overflow grate, and spillway, where applicable).

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	

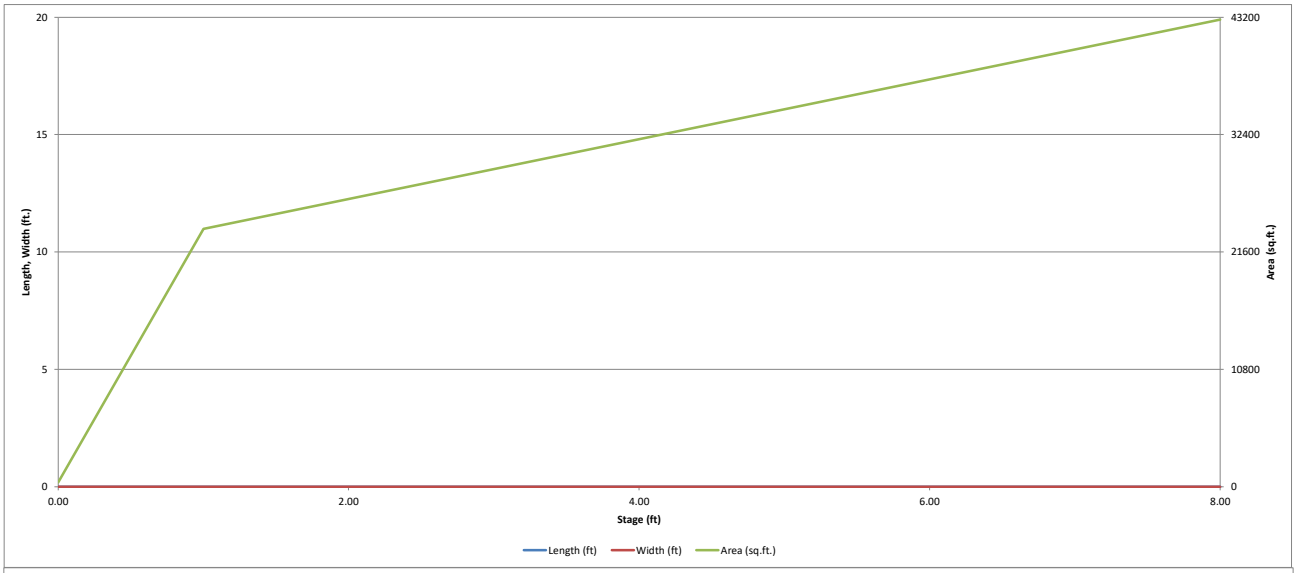
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	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

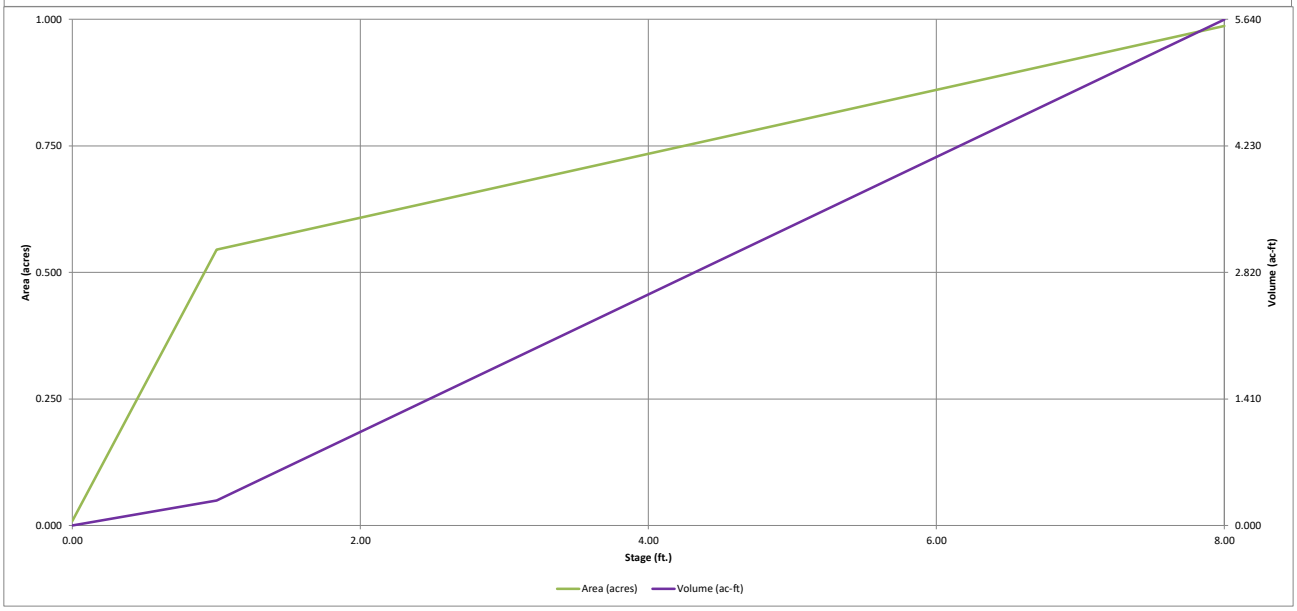
Depth Increment = ft

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

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)



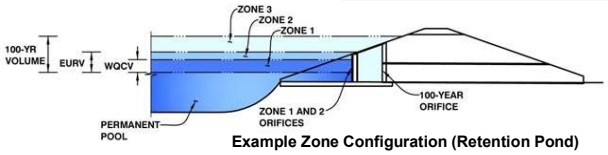


DETENTION BASIN OUTLET STRUCTURE DESIGN

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)

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

Calculated Parameters for Underdrain

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

Invert of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	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

Calculated Parameters for Plate

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.20	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			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				

Calculated Parameters for Vertical Orifice

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

	Zone 3 Weir	Not Selected			Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	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	%				

Calculated Parameters for Overflow Weir

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

	Zone 3 Circular	Not Selected			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

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

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

Calculated Parameters for Spillway

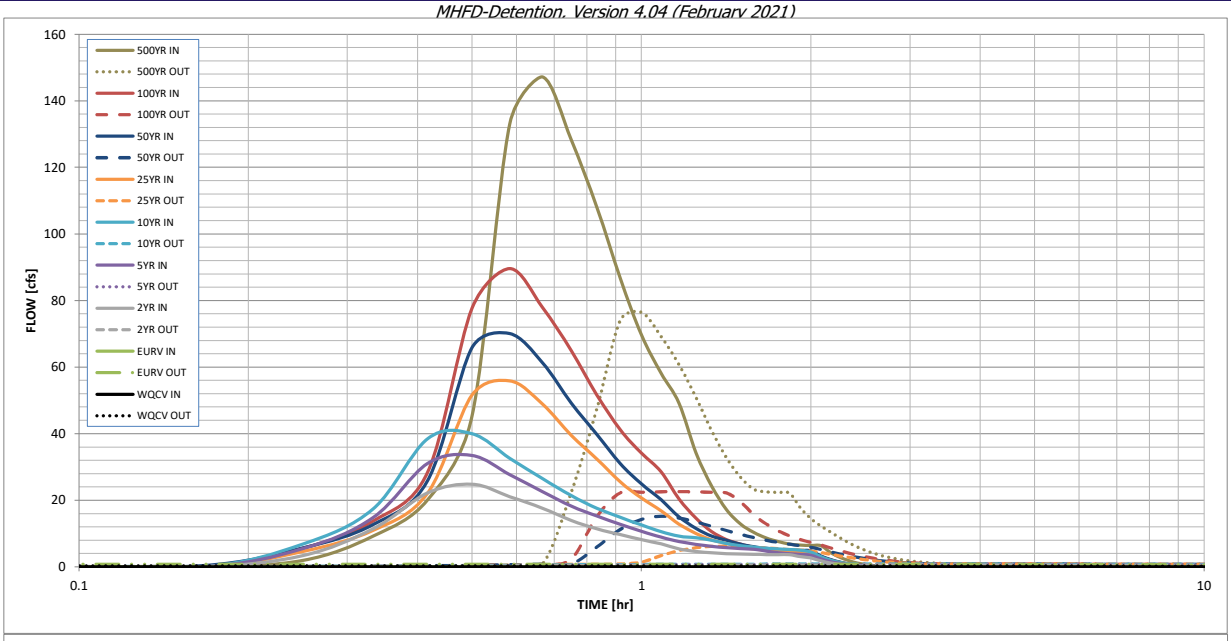
Routed Hydrograph Results

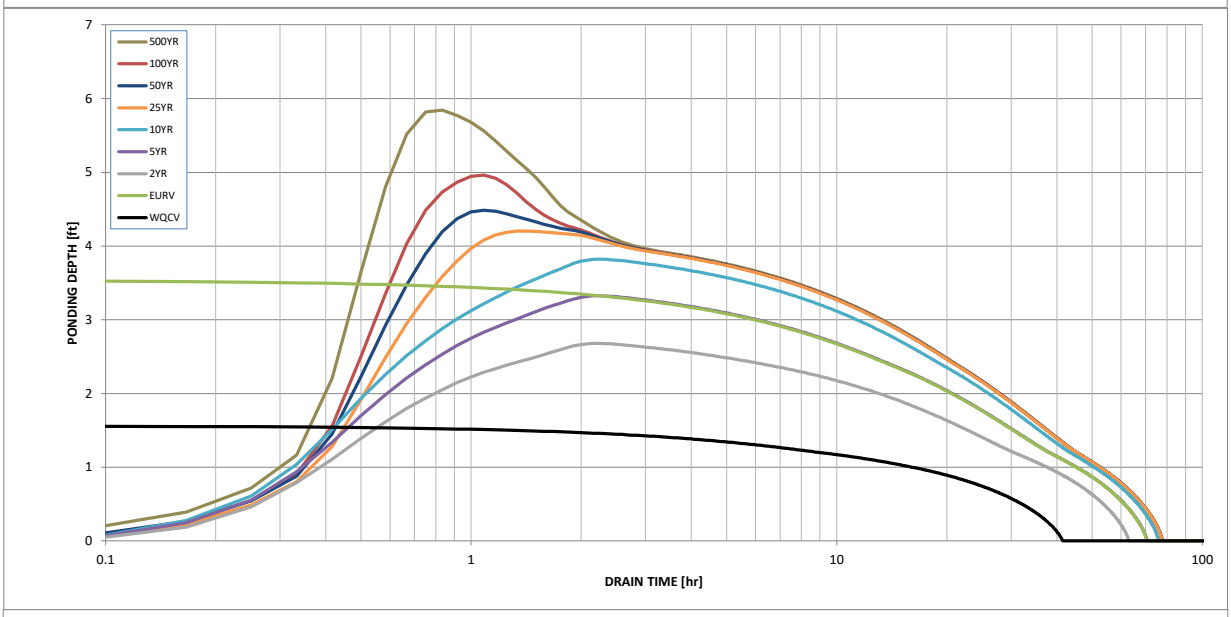
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

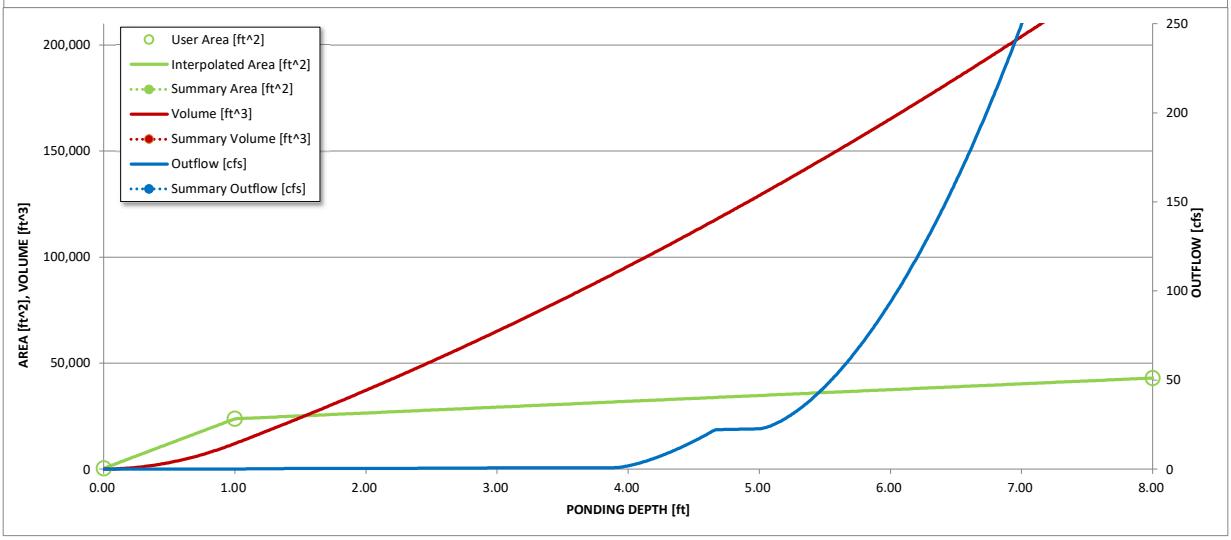
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.49
CUHP Runoff Volume (acre-ft) =	0.594	1.862	1.363	1.823	2.189	2.818	3.430	4.220	6.954
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	1.363	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

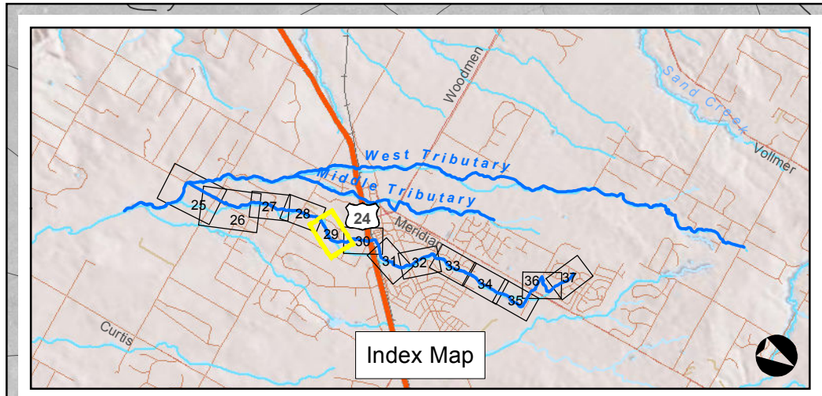
The user can create a summary S-A-V-D by entering the desired stage increments and the remainder of the table will populate automatically.

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]

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).



Flow Diverted from East Tributary

Pinto Pony Rd

Chief Rd

9292
9800
10000
10200
10400
10600
10800
11000
11200
11600
11800
12000
12200
12396
12457
12800
10092
10492
10892
11146
11425
11517
11552
11692
12092

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 4-29

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

also include 4-28 and Figure 6-1
https://epcdevplanreview.com/Public/ProjectDetails/144948
https://epcdevplanstorage.blob.core.windows.net/project/88e3cc80-e965-4ef9-a059-b9808eb384a2/182ddb7f-1f5e-4cb6-9a00-9649cfc365ec.pdf

N

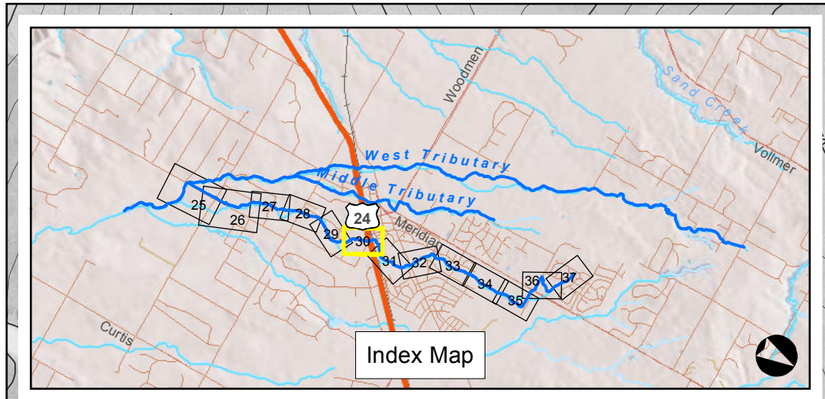
0 100 200 400

Feet

EL PASO COUNTY COLORADO EST. 1861

Matrix DESIGN GROUP

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



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

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

this should be included as an offsite basin

identify the flow entering the site from the upstream through the existing culvert.

call out culvert

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

Add asterisk or footnote about assumption

120 60 0 120 240

SCALE: 1"=120'

LEGEND

- EX. MINOR CONTOUR
- 6800 EX. MAJOR CONTOUR
- EX. FENCE LINE
- ST EX. STORM DRAIN
- BASIN BOUNDARY
- FLOW DIRECTION
- DESIGN POINT
- E5 5.91 0.12 0.38 — BASIN, AREA (ACRE), C5, C100

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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	3/16/23

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

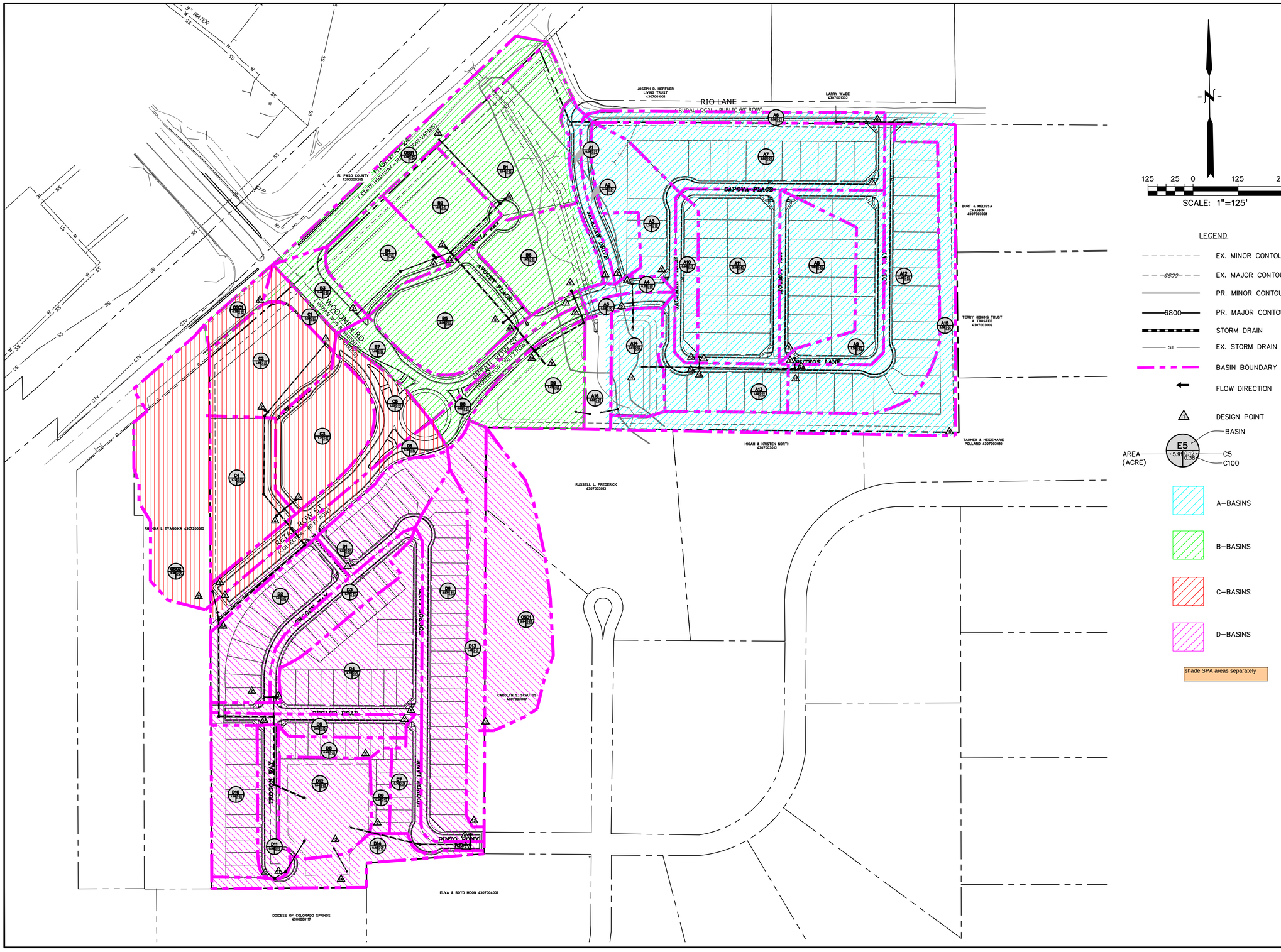
OVERALL EXISTING DRAINAGE MAP

PROJECT NO. 21604-00CSCV

DRAWING NO.

EDR1

SHEET: 1 OF 6



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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	3/16/23

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

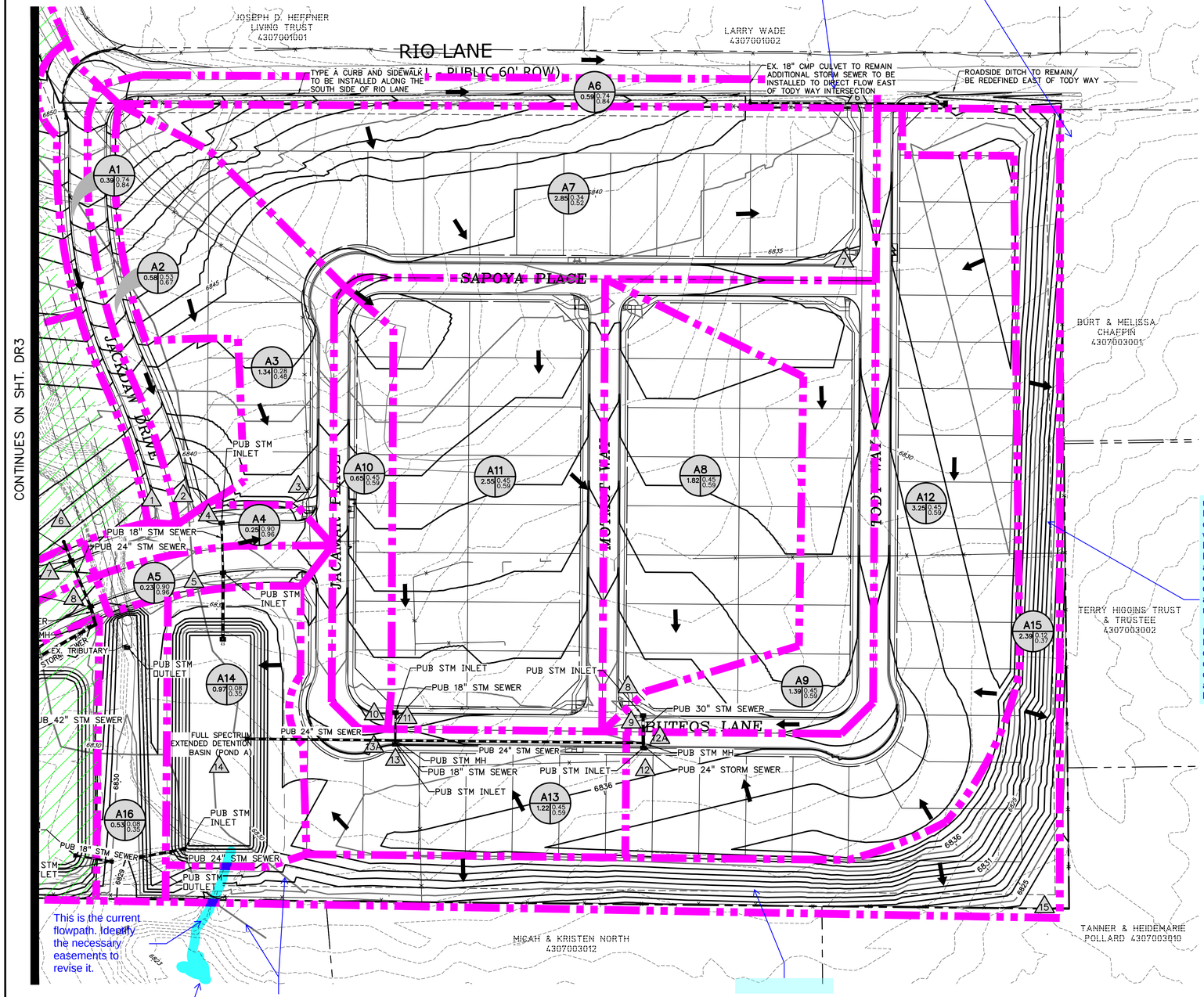
PROJECT NO. 21604-00CSCV

DRAWING NO.

DR1

SHEET: 2 OF 6

Show and address downstream easements needed for the diverted flows (not to be conveyed in roadside ditches or public storm drain).



review 1 comment: Per the proposed contours the drainage within this basin is being changed from historic conditions and is discharging offsite. This change in drainage shall be addressed in your report.

Review 2 comment: Please address the change from historic conditions and the creation of a swale along the property line.

This is the current flowpath. Identify the necessary easements to revise it.

Identify the necessary downstream improvements for increased flows (if that is the case) and low flow durations

What are the gray lines? They don't match floodplain.

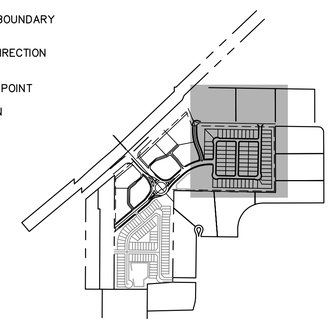
N

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
- 1 DESIGN POINT
- E5 BASIN
- AREA (ACRE) 5.91 0.12 0.38 C5 C100



BASIN & DESIGN POINT SUMMARY

BASIN	DP	AREA (AC)	Q5	Q100
		A-BASINS		
A1	1	0.39	1.5	2.8
A2	2	0.58	1.6	3.4
A3	3	1.34	1.5	4.2
A4		0.25	1.2	2.1
	4	2.56	4.6	10.3
A5		0.23	1.1	1.9
	5	2.79	5.4	11.7
A6	6	0.59	2.2	4.1
A7		2.85	3.3	8.3
	7	3.44	4.7	11.0
A8	8	1.82	3.0	6.7
A9		1.39	2.3	5.1
	9	6.65	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	9.90	13.3	29.8
A13	13	1.22	2.2	4.8
	13A	14.33	19.1	42.7
A14		0.97	0.2	1.8
	14	18.09	23.4	53.1
A15	15	2.39	1.4	7.7

add A16

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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	3/16/23

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

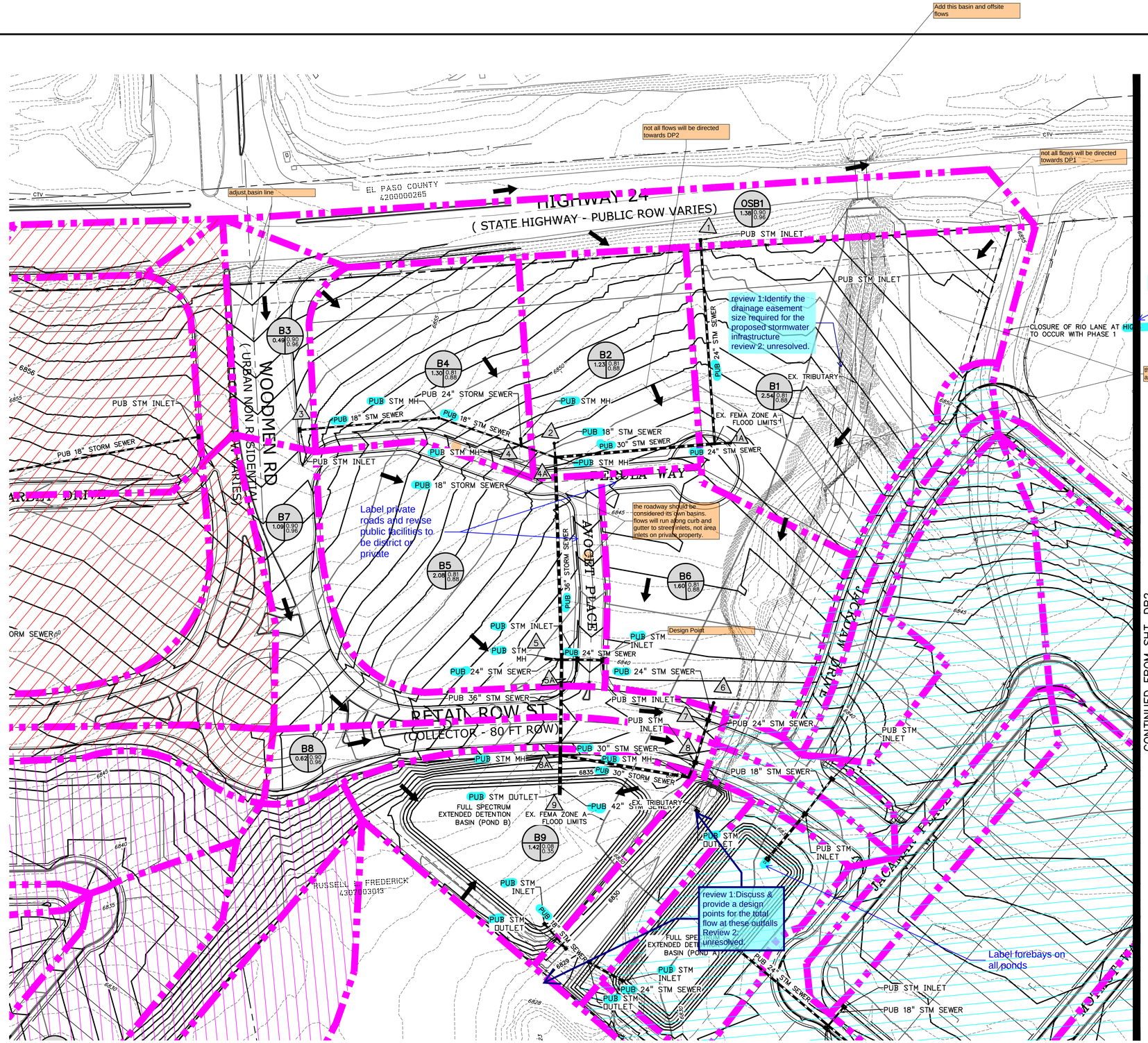
PROPOSED DRAINAGE MAP

PROJECT NO. 21604-00CSCV

DRAWING NO.

DR2

SHEET: 3 OF 6



BASIN & DESIGN POINT SUMMARY				
BASIN	DP	AREA (AC)	Q5	Q100
B-BASINS				
OSB1	1	1.38	6.4	11.5
B1		2.54	10.6	19.4
	1A	3.92	16.5	29.9
B2	2	1.23	5.2	9.4
B3	3	0.49	2.3	4.0
B4	4	1.30	5.4	9.9
	4A	6.93	28.3	51.3
B5	5	2.08	8.7	15.9
	5A	9.02	35.5	64.5
B6	6	1.60	6.7	12.2
B7		1.09	5.1	9.1
	7	2.69	11.7	21.2
B8		0.62	2.9	5.1
	8	3.30	14.5	26.2
	8A	12.32	48.3	87.7
B9		1.42	0.6	4.3
	9	13.74	48.6	91.2

PREPARED BY:

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PEYTON, EL PASO COUNTY, COLORADO

ISSUE	DATE
INITIAL ISSUE	3/16/23

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.

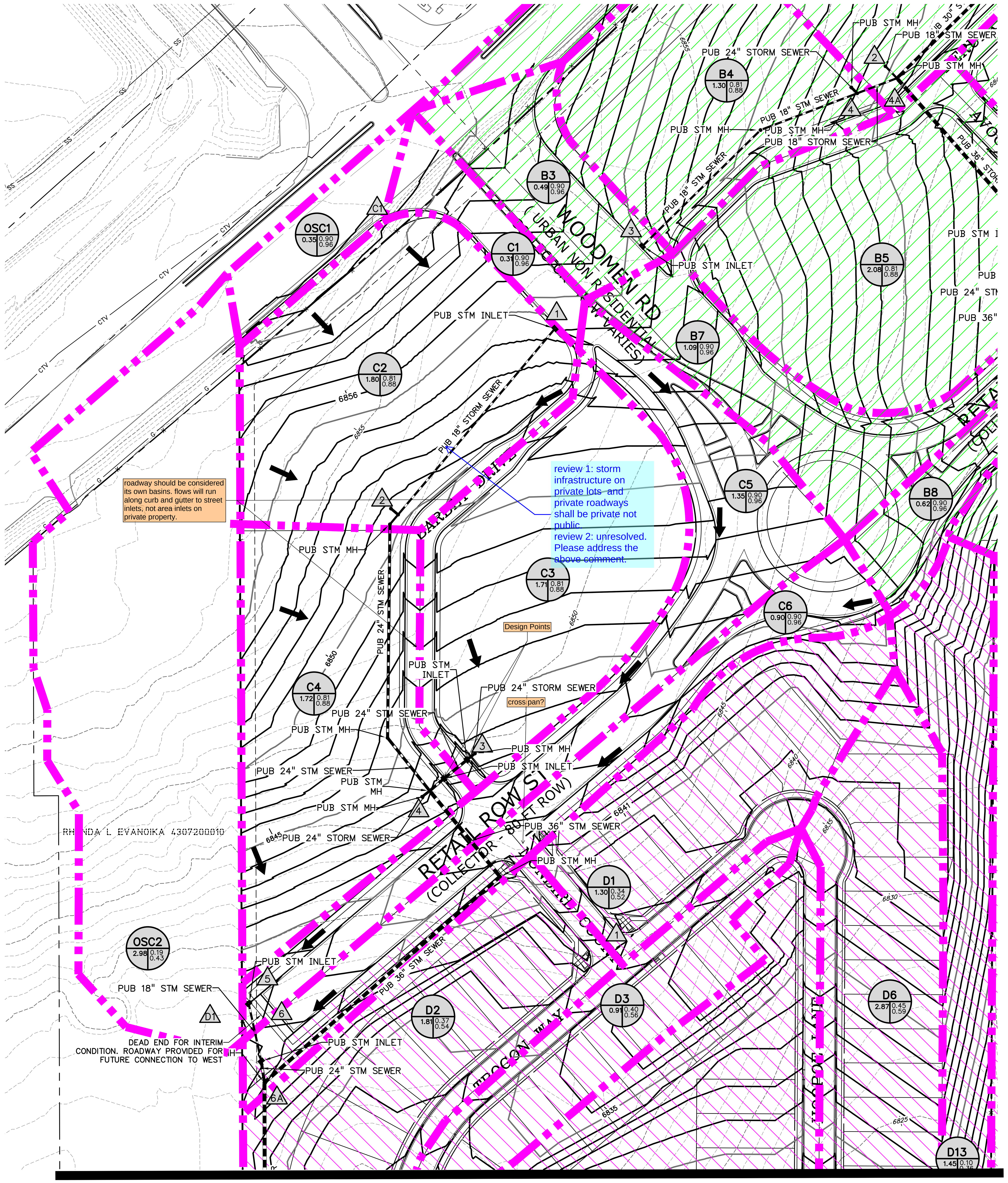
DRAWING SCALE:
HORIZONTAL: 1" = 60'
VERTICAL: N/A

PROPOSED DRAINAGE MAP

PROJECT NO. 21604-00CSCV

DRAWING NO.

DR3



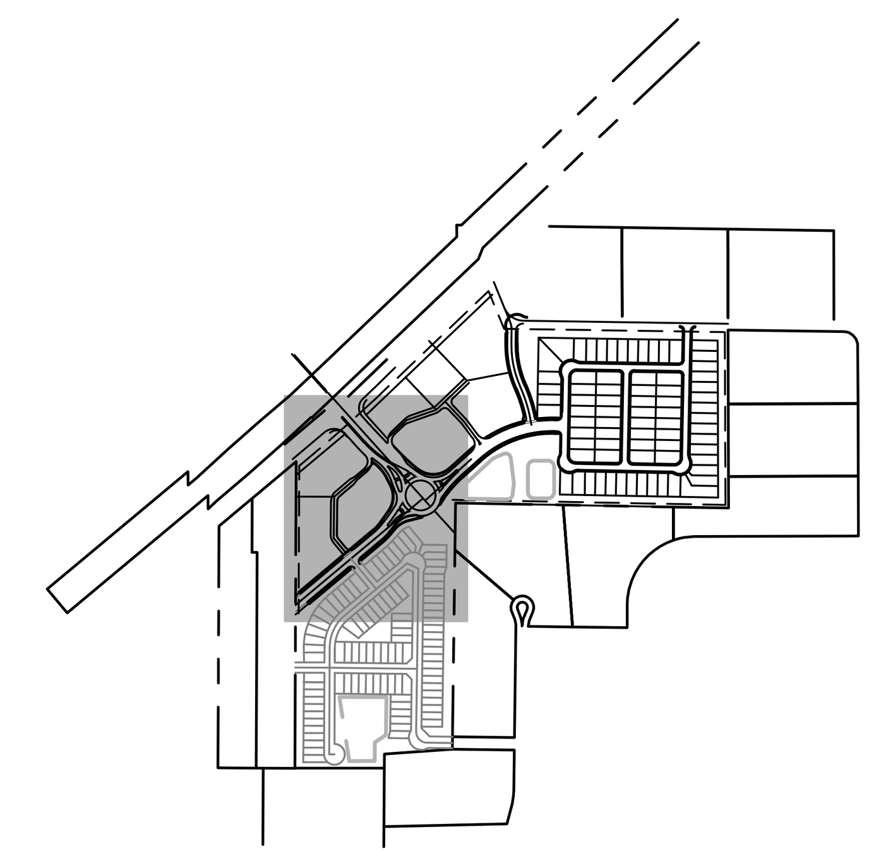
CONTINUES ON SHT. DR5

SCALE: 1"=60'

60 0 60 120

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



BASIN & DESIGN POINT SUMMARY				
BASIN	DP	AREA (AC)	Q5	Q100
C-BASINS				
OSC1	C1	0.35	1.6	2.9
C1		0.31	1.5	2.6
	1	0.66	3.0	5.4
C2		1.80	7.5	13.8
	2	2.11	11.4	20.6
C3	3	1.71	7.2	13.1
C4		1.72	7.2	13.1
	4	5.55	24.1	43.9
OSC2		2.98	2.6	10.1
C5		1.35	6.3	11.3
	5	4.33	8.2	20.1
C6		0.90	4.2	7.5
	6	5.23	13.3	29.7
	6A	10.78	34.7	68.0

doesnt match text

PREPARED BY:

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PEYTON, EL PASO COUNTY, COLORADO

ISSUE	DATE
INITIAL ISSUE	3/16/23

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

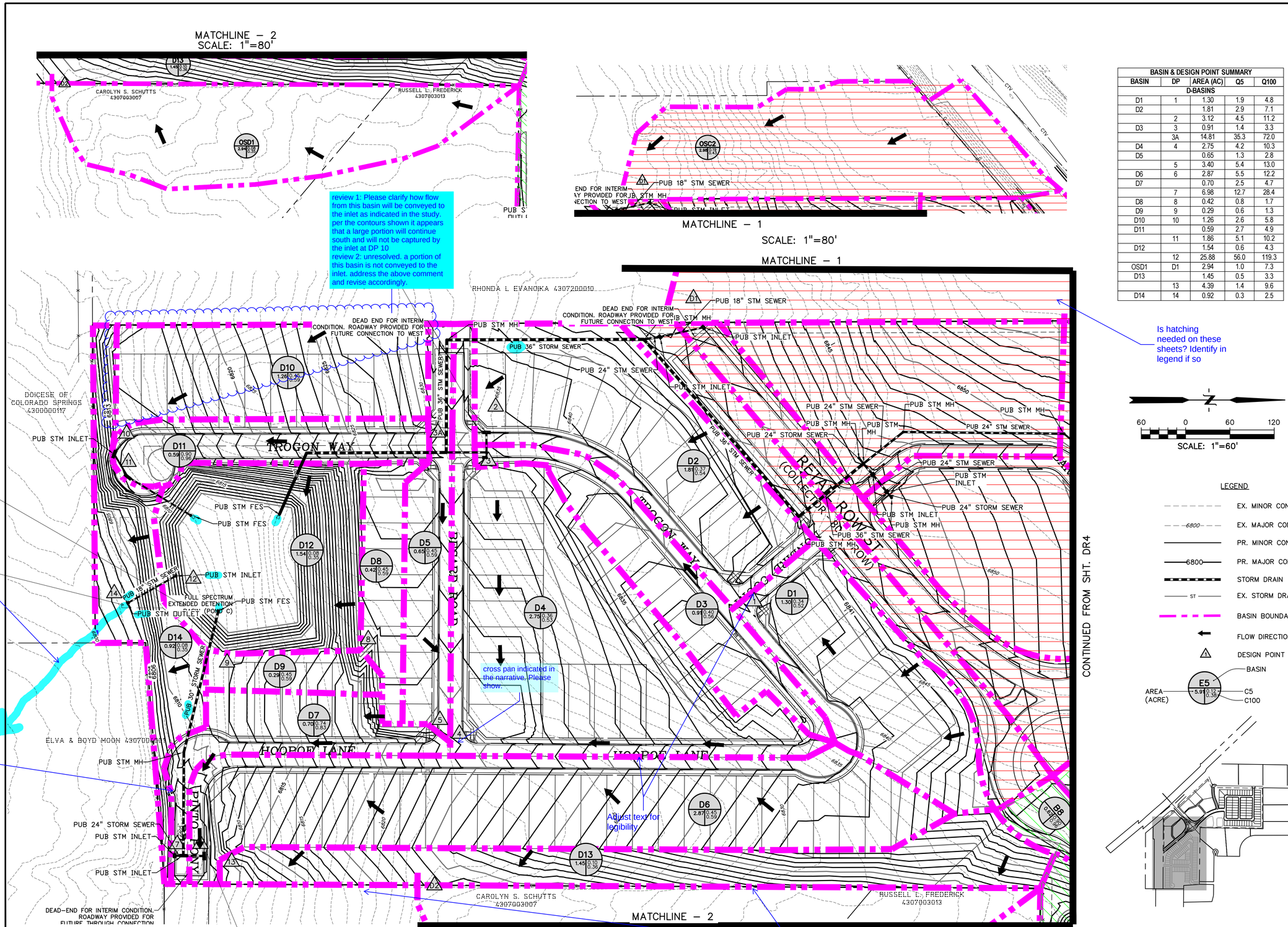
PROPOSED DRAINAGE MAP

PROJECT NO. 21604-00CSCV

DRAWING NO.

DR4

SHEET: 5 OF 6



BASIN & DESIGN POINT SUMMARY				
BASIN	DP	AREA (AC)	Q5	Q100
D-BASINS				
D1	1	1.30	1.9	4.8
D2		1.81	2.9	7.1
	2	3.12	4.5	11.2
D3	3	0.91	1.4	3.3
	3A	14.81	35.3	72.0
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	1.26	2.6	5.8
D11		0.59	2.7	4.9
	11	1.86	5.1	10.2
D12		1.54	0.6	4.3
	12	25.88	56.0	119.3
OSD1	D1	2.94	1.0	7.3
D13		1.45	0.5	3.3
	13	4.39	1.4	9.6
D14	14	0.92	0.3	2.5

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
- BASIN
- AREA (ACRE)
- C5
- C100

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

ISSUE	DATE
INITIAL ISSUE	3/16/23

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: 6 OF 6