EPC STORMWATER REVIEW COMMENTS
IN ORANGE BOXES WITH BLACK TEXT

DRAINAGE LETTER REPORT

for

NOR'WOOD BIBLE CHURCH
LOT 38, SADDLEHORN RANCH FILING NO. 3

Prepared for:

ROI Property Group, LLC
2495 Rigdon Street
Napa, CA 94558

October 13, 2023

Prepared by:

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Colorado Springs, CO 80903
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JPS Project No. 042303
PCD Filing No. PPR____

2346

NOR'WOOD BIBLE CHURCH
LOT 38, SADDLEHORN RANCH FILING NO. 3
DRAINAGE LETTER REPORT
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APPENDICES

DRAINAGE STATEMENT

Engineer's Statement:

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

_____

John P. Schwab, P.E. #29891

Developer's Statement:

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

By:

_____

Date

El Paso County's Statement

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

_____

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

Conditions:

I. INTRODUCTION

A. Property Location and Description

Nor'Wood Bible Church is planning to construct a new church on a vacant 5-acre property in the Saddlehorn Ranch Subdivision southeast of the intersection of Judge Orr Road and Curtis Road in eastern El Paso County, Colorado. The property is currently being platted as Lot 38, Saddlehorn Ranch Filing No. 3 (currently a part of the tract identified as El Paso County Assessor's Parcel Number 43000-00-635). The site is located along the east side of Barrosito Trail.

The project consists of a new 12,000 square-foot, single-story Church Building with associated parking and site improvements. The property is bounded by platted rural residential lots within Saddlehorn Ranch Filing No. 3 along the west, south, and east sides. The north boundary of the property adjoins Judge Orr Road, which is an asphalt-paved arterial public street. The west boundary of the site adjoins Barrosito Trail, which is an asphalt-paved local public street.

The total anticipated land disturbance associated with the project is approximately 3.7 acres.

The property is zoned RR-2.5 (Rural Residential – 2.5-acre minimum lot sizes), and the proposed site development is a permitted use within the existing zoning of the site. Access to the site will be provided by two private driveway connections to Barrosito Trail along the west boundary of the property.

The site is located in the Haegler Ranch Drainage Basin, and surface drainage from this site flows southeasterly to existing drainage swales and channels, ultimately flowing to Black Squirrel Creek.

This report is intended to meet the requirements of a site-specific "Letter Type" drainage report in accordance with El Paso County subdivision drainage criteria.

Reference Final Drainage Report for Saddlehorn Filing No. 3 (Proj # SF234).

B. Drainage Analysis Methods and Criteria

ITEM	DESCRIPTION	REFERENCE
Design Storm (initial/major)	5-year/100-year	CS/EPC DCM
Storm Runoff	Rational Method (Area<100acres)	CS/EPC DCM
Major Drainage Basin	Haegler Ranch	
Floodplain Impacts	Parcel is located outside any delineated FEMA floodplains	FIRM
Existing Downstream Facilities	Existing roadside ditches and culverts flowing to Saddlehorn Ranch Detention Pond D	

CS/EPC DCM = City of Colorado Springs & El Paso County Drainage Criteria Manual

C. References

City of Colorado Springs & El Paso County "Drainage Criteria Manual, Volumes 1 and 2," revised May, 2014.

El Paso County "Engineering Criteria Manual," December 13, 2016.

JR Engineering, LLC, "Final Drainage Report for Saddlehorn Ranch – Filing 3," July 13, 2023.

JR Engineering, LLC, "Master Development Drainage Plan and Preliminary Drainage Report for Saddlehorn Ranch," May 8, 2020.

II. EXISTING / PROPOSED DRAINAGE CONDITIONS

The site slopes downward to the southeast, with average grades of 1-4 percent.

As detailed in the subdivision drainage report, on-site soils are classified by SCS as type 19, "Columbine gravelly sandy loam" soils. These soils have high infiltration rates, rapid permeability, and low runoff potential. The soils are classified as hydrologic soils group A.

Subdivision Drainage Report

Drainage planning for this site was previously studied in the detailed subdivision drainage report entitled "Final Drainage Report (FDR) for Saddlehorn Ranch – Filing 3," dated July 13, 2023, by JR Engineering, LLC. According to the FDR, the proposed church site lies within Basin D1, which is described as follows:

> "Basin D consists of Sub-basins D1-D7 combining for a total of 74.66 acres. In its existing condition, Basin D is rolling rangeland and runoff generally flows east to Draingeway WF-R7A. In the proposed condition, Basin D will be rural 2.5 acre lots, paved roadway, a church site and will include Pond D located in the northeast corner of the future Filing 4 development. Pond D is a full spectrum water quality and detention pond, and will release at less than historic rates into Drainageway WF-R7A."

The subdivision drainage report accounted for the proposed church site development within Basin D1. As shown in the "Proposed Drainage Map, Sheet 1 of 4" (Appendix A), the church site layout depicted on the subdivision drainage plan is fully consistent with the proposed site development plan. "Proposed Drainage Map, Sheet 2 of 4" depicts the downstream roadside ditches and culverts flowing easterly along Barrosito Trail and Barranca Place into Detention Pond D.

The rational method hydrologic calculations in the FDR assumed an impervious area of 35% for the church site development (see Appendix A), which is slightly higher than the actual impervious area calculated for the proposed church site (29% as shown on Sh. D1, Appendix D).

Existing Conditions Drainage Plan

For consistency with the previously approved subdivision drainage report, the church site has been delineated as Basin D1.1 (see Sh. EX1, Appendix D). The existing vacant site sheet flows towards the southeast corner of the property, with existing peak flows calculated as $Q_5 = 1.1$ cfs and $Q_{100} = 7.8$ cfs.

Clarify if the imperviousness includes the future pole barn and gravel parking area. If not the downstream facilities will need to be reanalyzed and potentially upsized when that development occurs.

Developed Drainage Plan

As shown on the Developed Drainage Plan (Sh. D1, Appendix D), the proposed church site has been delineated as Basin D1.1, which drains by sheet flow, curb and gutter, and drainage swales to the roadside ditch at the southeast corner of the property.

Developed flows have been calculated based on the impervious areas associated with the proposed building and parking improvements. Developed peak flows from Basin D1.1 are calculated as $Q_5 = 5.5$ cfs and $Q_{100} = 15.5$ cfs.

The proposed building pad will be graded with protective slopes to provide positive drainage away from the building, and the curb, gutter, crosspans, and drainage swales will convey developed flows to the existing roadside ditch at the southeast corner of the site. Runoff reduction will be provided by routing developed flows through grass-lined drainage ditches and channels within the property.

As detailed in the subdivision drainage report, the downstream ditches and culverts have been designed to convey developed flows from the church site to Saddlehorn Ranch Detention Pond D, whjch provides stormwater detention and water quality for this site.

Channel hydraulic calculations have been performed to evaluate stability of the proposed ditches and drainage swales within the site. As detailed in Appendix C, erosion-control blanket lining has been specified for Channel D1.1b and Channel D1.1c to mitigate potential concerns with channel velocities.

The subdivision drainage report identified the proposed culverts at the church access points as Culverts CH1 and CH2. Both culverts were sized as 18" RCP culverts in the subdivision drainage report (see Appendix A).

Hydrologic and hydraulic calculations for the site are detailed in the appendices (Appendix B and C), and peak flows are identified on Figure D1 (Appendix D).

Please confirm culvert sizing is still sufficient given higher runoff calculated.

State if Pond D has been built and under which filing.

III. DRAINAGE PLANNING FOUR STEP PROCESS

El Paso County Drainage Criteria require drainage planning to include a Four Step Process for receiving water protection that focuses on reducing runoff volumes, treating the water quality capture volume (WQCV), stabilizing drainageways, and implementing long-term source controls.

As stated in ECM Appendix I.7., the Four Step Process is applicable to all new and re-development projects with construction activities that disturb 1 acre or greater or that disturb less than 1 acre but are part of a larger common plan of development. The Four Step Process has been implemented as follows in the planning of this project:

Step 1: Employ Runoff Reduction Practices

- Minimize Directly Connected Impervious Areas (MDCIA): Roof drain downspouts will flow across grass-lined drainage swales, ditches, and channels within the property prior to reaching the downstream roadside ditch.
- Grass-Lined Drainage Swales: Grass-lined drainage swales, ditches, and channels have been designed to convey developed drainage across the site, encouraging stormwater infiltration while flowing to the existing downstream roadside ditch.

Step 2: Stabilize Drainageways

- There are no drainageways directly adjacent to this project site. The on-site private drainage improvements will convey developed flows to the existing downstream roadside ditches and culverts flowing to the subdivision detention basin which has been designed to minimize downstream drainage impacts.
- Drainage basin fees paid during recording of the subdivision plat provide the applicable cost contribution towards regional drainage improvements.

Step 3: Provide Water Quality Capture Volume (WQCV)

- Water quality treatment for this site is provided in the subdivision detention pond.

Step 4: Consider Need for Industrial and Commercial BMPs

- No industrial uses are proposed for this site.
- The church property owner will implement a Stormwater Management Plan including proper housekeeping practices and spill containment procedures.

IV. FLOODPLAIN IMPACTS

According to the FEMA floodplain map for this area, El Paso County FIRM Panel No. 08041C0558G, dated December 7, 2018, the site is located beyond the limits of any delineated 100-year floodplains. The site is identified as being in Zone X, which is defined as areas outside of the Special Flood Hazard Area (SFHA) and higher than the elevation of the 0.2-percent annual chance (or 500-year) flood.

Provide the detention pond name, subdivision filing it was built with, and the EDARP project number associated with its construction.

Provide the detention pond name, subdivision filing it was built with, and the EDARP project number associated with its construction. Engineer must confirm in the Drainage Report that the existing offsite or pond that the site is tributary to is functioning as intended

V. STORMWATER DETENTION AND WATER QUALITY

Stormwater detention and water quality for this site is provided in Saddlehorn Ranch Detention Pond D, which was sized to account for fully developed flows from this church site.

As stated in the FDR, "In the proposed condition, Basin D will be rural 2.5 acre lots, paved roadway, a church site and will include Pond D located in the northeast corner of the future Filing 4 development. Pond D is a full spectrum water quality and detention pond, and will release at less than historic rates into Drainageway WF-R7A."

As detailed in Appendix B, the calculated impervious area for the proposed site development is 29 percent, which is lower than the impervious area of 35 percent that was previously assumed for the church site in the subdivision drainage report. As such, the downstream drainage and detention facilities have been designed conservatively to fully account for the church site development.

VI. PUBLIC IMPROVEMENTS / DRAINAGE BASIN FEES

No public drainage improvements are required or proposed for the church site development project, with the exception of the two driveway culverts that were included in the subdivision drainage report.

The site lies completely within the Haegler Ranch Drainage Basin. Applicable drainage basin fees were due at the time of subdivision platting, so no drainage basin fees or bridge fees are applicable at this time.

Basin D1 is larger than the proposed site and the proposed site basins as well, so the calculated flows would be anticipated to be slightly smaller than the total D1 flows, as stated below verify culvert and Pond D can accept the increase in flows.

VII. SUMMARY

The developed drainage patterns for the proposed Nor'Wood Bible Church site development on Lot 38, Saddlehorn Ranch Filing No. 3 will be fully consistent with the assumptions in the approved subdivision drainage report. The grading and drainage plan for the proposed church site development fully conforms to the approved drainage plan for this subdivision.

Developed flows from the site will drain through on-site grass-lined drainage swales, ditches, and channels, flowing into the public roadside ditch at the southeast corner of the property. The downstream roadside ditches and culverts flow into Saddlehorn Ranch Detention Pond D, which has been designed to provide stormwater detention and water quality for the proposed church site development.

Construction and proper maintenance of the on-site drainage facilities, in conjunction with proper erosion control practices, will ensure that this developed site has no significant adverse drainage impact on downstream or surrounding areas.

Saddlehorn Ranch Filing 3 drainage report shows a Q5 of 4.2 and Q100 of 13.5 for Basin D1. The calculated flows in this report are 5.5 and 15.5. Please state/evauluate the difference in flows and confirm drainage infrastructure is adequate to handle flows and if any improvements are required. Please confirm Pond D and the proposed culverts, CH1 and CH2, that were sized in the subdivision's drainage report are adequate for the increased flows. Provide calculations.

Please provide a cost estimate for all drainage improvements (culverts, etc).

Please include a references section for all referenced reports, documents, and criteria.

APPENDIX A

EXCERPTS FROM SUBDIVISION DRAINAGE REPORT

FINAL DRAINAGE REPORT
FOR
SADDLEHORN RANCH – FILING 3

Prepared For:
ROI Property Group, LLC
2495 Rigdon Street
Napa, CA 94558
(707) 365-6891

July 13, 2023
Project No. 25142.05

Prepared By:
JR Engineering, LLC
5475 Tech Center Drive
Colorado Springs, CO 80919
719-593-2593

El Paso County PCD File No.:
SF234

Existing Sub-basin Drainage

On-site, existing sub-basin drainage patterns are generally from northwest to southeast by way of Drainageway MS-06 and Drainageway WF-R7A. On-site areas flow directly into these drainageways, which also bypass off-site flows through the site.

On-site, existing drainage basins were established based upon existing topography and the limits of the 100-year floodplain. These existing sub-basins were analyzed in the *Master Development Drainage Plan and Preliminary Drainage Report for Saddlehorn Ranch.* An existing drainage map has been provided in Appendix E.

Proposed Sub-basin Drainage

The proposed Filing 3 basin delineation is as follows;

Basin C consists of Sub-Basins C1-C10 combining for a total of 93.77 acres. In its existing condition, Basin C is rolling rangeland and runoff generally flows southeast towards Drainageway MS-06. In the proposed condition, Basin C will be rural 2.5 acre lots, paved roadway, and will include Pond C. Runoff from this basin will be collected in road side ditches and conveyed to Pond C located in the southeast corner of the future Filing 4 development. Pond C will be a full spectrum water quality and detention pond, and will release at less than historic rates into Drainageway MS-06.

Basin D consists of Sub-basins D1-D7 combining for a total of 74.66 acres. In its existing condition, Basin D is rolling rangeland and runoff generally flows east to Drainageway WF-R7A. In the proposed condition, Basin D will be rural 2.5 acre lots, paved roadway, a church site and will include Pond D. Runoff from this basin will be collected in road side ditches and conveyed west to Pond D located in the northeast corner of the future Filing 4 development. Pond D is a full spectrum water quality and detention pond, and will release at less than historic rates into Drainageway WF-R7A.

Basin E consists of Sub-basins E1-E4 combining for a total of 18.37 acres. In its existing condition, Basin E is rolling rangeland and runoff generally flows south towards Drainageway MS-06. In the proposed condition, Basin E will be rural 2.5 acre lots, paved roadway, and will include Pond E. Runoff from this basin will be collected in road side ditches and conveyed to Pond E located in the southern portion of the Filing 3 development along San Isidro Trail. Pond E will be a full spectrum water quality and detention pond, and will release at less than historic rates into Drainageway MS-06.

Basin F consists of Sub-basins F1-F4 combining for a total of 14.32 acres. In its existing condition, Basin F is rolling rangeland and paved road (Curtis Road and Benito Wells Trail). Runoff generally flows east along Benito Wells Trail. In the proposed condition, Basin F will be rural 2.5 acre lots and paved roadway. Runoff from this basin will be collected in road side ditches and conveyed to Pond F located in the southeastern portion of the Filing 2 development along Benito Wells Trail. Pond F will be a full spectrum water quality and detention pond, and will release at less than historic rates into Drainageway MS-06.

Basin UD consists of Sub-basins UD1-UD5 combining for a total of 74.27 acres. In their existing condition, these basins are rolling rangeland. Runoff from Basins UD1-UD3 generally flows south and

east to Drainageway MS-06. Basin UD5 flows east to Drainageway MS-06. Basin UD4 represents Drainageway MS-06 and the runoff generated along the Filing 3 boundary. In the proposed condition, Basins UD1, UD2, UD3, and most of UD5 will be rural 2.5 acre lots with an Imperviousness = 6.2% and will be excluded from permanent stormwater quality management per Section I.7.1.B.5 of the ECM – Stormwater Quality Policy and Procedures. Per the MS4 Permit Exclusion Map, 0.53 acres of Basin UD5, which consists of paved roads at 45% imperviousness, will be excluded per Section I.7.1.C.1. shown in red. Additionally, the entirety of Basin UD4, which is a non-jurisdictional wetland to remain undeveloped at 2% impervious, will not be detained in PBMP per section I.7.1.B.7.

Basin OS consists of Sub-basins OS1-OS5 combining for a total of 9.35 acres of offsite area. In their existing condition, these basins are paved roadway (Curtis Road & Judge Orr Road) and undeveloped area. In the proposed condition, these basins will be improved with 8' of pavement width for both the Curtis Road and Judge Orr Road stretches. Basins OS1-OS4 will flow on-site prior to being captured in a roadside swale and conveyed to a proposed full spectrum detention pond prior to being released into Drainageway MS-06 or Drainageway WF-R7A. Basin OS5 will not be detained by a pond due to its location relative to the site. The improvements along Curtis Road within Basin OS5 will follow historic patterns and drain directly into Drainageway MS-06.

A summary table of proposed basin parameters and flow rates are presented in Appendix B.

Basin C runoff along with runoff from Sub-Basins OS1 and OS2 will be captured in roadside swales and conveyed to the proposed Pond C. This full spectrum pond will release treated flows at less than historic rates to minimize adverse impacts downstream. Basin D along with runoff from Sub-Basins OS3 and OS4 will be captured in roadside swales and conveyed to the proposed Pond D. Basin E will be captured in roadside swales and conveyed to the proposed Pond E. Pond C and Pond E will discharge into Drainageway MS-06. Pond D will discharge into Drainageway WF-R7A.

See Table 3 below for proposed Filing 3 pond parameters.

Table 3: Pond Summary

Tributary Sub-Basin	Pond Name	Tributary Acres	WQ Volume (ac-ft)	Total Detention Volume (ac-ft)	Provided Volume (ac-ft)	Maximum 100-Year Discharge (cfs)
C	POND C	96.84	0.737	3.064	4.235	41.2
D	POND D	78.02	0.673	3.026	3.127	60.9
E	POND E	18.37	0.086	0.419	0.424	9.2

Drainageway MS-06

Drainageway MS-06 was evaluated in its existing conditions as part of the Filing 2 report to analyze the existing flood plain and channel stability. The proposed improvements for the upper reach (5,300 FT) of this Filing 3 adjacent drainage way have been evaluated in this Filing 3 Drainage report. In

COMPOSITE % IMPERVIOUS CALCULATIONS

Subdivision: Saddlehorn Ranch Filing 3
Location: El Paso County

Project Name: Saddlehorn Ranch
Project No.: 25142.05
Calculated By: AAM
Checked By: TBD
Date: 6/16/23

Basin ID	Total Area (ac)	Paved Roads			2.5 Acre Rural Lots			Lawns			Church Site			Basins Total Weighted % Imp.
		% Imp.	Area (ac)	Weighted % Imp.	% Imp.	Area (ac)	Weighted % Imp.	% Imp.	Area (ac)	Weighted % Imp.	% Imp.	Area (ac)	Weighted % Imp.	
C1	6.04	45%	1.07	8.0%	6.2%	4.97	5.1%	2%	0.00	0.0%	35%	0.00	0.0%	13.1%
C2	3.35	45%	1.50	20.1%	6.2%	1.85	3.4%	2%	0.00	0.0%	35%	0.00	0.0%	23.6%
C3	23.44	45%	1.63	3.1%	6.2%	21.81	5.8%	2%	0.00	0.0%	35%	0.00	0.0%	8.9%
C4	10.94	45%	3.40	14.0%	6.2%	7.54	4.3%	2%	0.00	0.0%	35%	0.00	0.0%	18.3%
C5	2.35	45%	0.83	15.9%	6.2%	1.52	4.0%	2%	0.00	0.0%	35%	0.00	0.0%	19.9%
C6	3.95	45%	1.59	18.1%	6.2%	2.36	3.7%	2%	0.00	0.0%	35%	0.00	0.0%	21.8%
C7	2.14	45%	1.00	21.0%	6.2%	1.14	3.3%	2%	0.00	0.0%	35%	0.00	0.0%	24.3%
C8	22.55	45%	2.21	4.4%	6.2%	20.34	5.6%	2%	0.00	0.0%	35%	0.00	0.0%	10.0%
C9	2.63	45%	1.98	33.9%	6.2%	0.65	1.5%	2%	0.00	0.0%	35%	0.00	0.0%	35.4%
C10	16.38	45%	2.47	6.8%	6.2%	11.85	4.5%	2%	2.06	0.3%	35%	0.00	0.0%	11.5%
D1	9.11	45%	1.53	7.6%	6.2%	2.70	1.8%	2%	0.00	0.0%	35%	4.88	18.7%	28.1%
D2	8.49	45%	1.49	7.9%	6.2%	7.00	5.1%	2%	0.00	0.0%	35%	0.00	0.0%	13.0%
D3	3.21	45%	0.19	2.7%	6.2%	3.02	5.8%	2%	0.00	0.0%	35%	0.00	0.0%	8.5%
D4	10.01	45%	0.35	1.6%	6.2%	8.21	5.1%	2%	1.45	0.3%	35%	0.00	0.0%	6.9%
D5	9.56	45%	2.78	13.1%	6.2%	6.78	4.4%	2%	0.00	0.0%	35%	0.00	0.0%	17.5%
D6	0.34	45%	0.34	45.0%	6.2%	0.00	0.0%	2%	0.00	0.0%	35%	0.00	0.0%	45.0%
D7	33.94	45%	7.65	10.1%	6.2%	24.05	4.4%	2%	2.24	0.1%	35%	0.00	0.0%	14.7%
E1	17.12	45%	0.71	1.9%	6.2%	13.22	4.8%	2%	3.19	0.4%	35%	0.00	0.0%	7.0%
E2	0.37	45%	0.37	45.0%	6.2%	0.00	0.0%	2%	0.00	0.0%	35%	0.00	0.0%	45.0%
E3	0.20	45%	0.20	45.0%	6.2%	0.00	0.0%	2%	0.00	0.0%	35%	0.00	0.0%	45.0%
E4	0.68	45%	0.00	0.0%	6.2%	0.19	1.7%	2%	0.49	1.4%	35%	0.00	0.0%	3.2%
UD1	7.48	45%	0.00	0.0%	6.2%	7.48	6.2%	2%	0.00	0.0%	35%	0.00	0.0%	6.2%
UD2	9.17	45%	0.00	0.0%	6.2%	9.17	6.2%	2%	0.00	0.0%	35%	0.00	0.0%	6.2%
UD3	2.23	45%	0.00	0.0%	6.2%	2.23	6.2%	2%	0.00	0.0%	35%	0.00	0.0%	6.2%
UD4	34.90	45%	0.00	0.0%	6.2%	0.00	0.0%	2%	34.90	2.0%	35%	0.00	0.0%	2.0%
UD5	17.63	45%	0.00	0.0%	6.2%	17.63	6.2%	2%	0.00	0.0%	35%	0.00	0.0%	6.2%
OS1	2.37	100%	1.35	57.0%	6.2%	0.00	0.0%	2%	1.02	0.9%	35%	0.00	0.0%	57.8%
OS2	0.70	100%	0.21	30.0%	6.2%	0.00	0.0%	2%	0.49	1.4%	35%	0.00	0.0%	31.4%
OS3	2.28	100%	1.35	59.2%	6.2%	0.00	0.0%	2%	0.93	0.8%	35%	0.00	0.0%	60.0%
OS4	1.08	100%	0.58	53.7%	6.2%	0.00	0.0%	2%	0.50	0.9%	35%	0.00	0.0%	54.6%
OS5	2.92	100%	0.59	20.2%	6.2%	0.94	2.0%	2%	1.39	1.0%	35%	0.00	0.0%	23.2%
F1	1.35	100%	0.53	39.3%	6.2%	0.00	0.0%	2%	0.82	1.2%	35%	0.00	0.0%	40.5%
F2	7.67	45%	0.98	5.7%	6.2%	6.69	5.4%	2%	0.00	0.0%	35%	0.00	0.0%	11.2%
F3	5.44	45%	2.37	19.6%	6.2%	3.07	3.5%	2%	3.07	1.1%	35%	0.00	0.0%	24.2%
F4	2.93	45%	2.93	45.0%	6.2%	0.00	0.0%	2%	0.00	0.0%	35%	0.00	0.0%	45.0%
TOTAL	**284.95**													**12.9%**

Land Use or Surface Characteristics	Percent Impervious	Runoff Coefficients											
		2-year		5-year		10-year		25-year		50-year		100-year	
		HSG A&B	HSG C&D	HSG A&B	HSG C&D	HSG A&B	HSG C&D	HSG A&B	HSG C&D	HSG A&B	HSG C&D	HSG A&B	HSG C&D
Business													
Commercial Areas	95	0.79	0.80	0.81	0.82	0.83	0.84	0.85	0.87	0.87	0.88	0.88	0.89
Neighborhood Areas	70	0.45	0.49	0.49	0.53	0.53	0.57	0.58	0.62	0.60	0.65	0.63	0.68
Residential													
1/8 Acre or less	65	0.43	0.45	0.45	0.49	0.49	0.54	0.54	0.59	0.57	0.62	0.59	0.65
1/4 Acre	40	0.19	0.26	0.30	0.35	0.36	0.42	0.42	0.50	0.46	0.54	0.50	0.58
1/3 Acre	30	0.18	0.22	0.25	0.30	0.32	0.38	0.39	0.47	0.43	0.52	0.47	0.57
1/2 Acre	25	0.15	0.20	0.22	0.28	0.30	0.36	0.37	0.46	0.41	0.51	0.46	0.56
1 Acre	20	0.12	0.17	0.20	0.26	0.27	0.34	0.35	0.44	0.40	0.50	0.44	0.55
Industrial													
Light Areas	80	0.57	0.60	0.59	0.63	0.63	0.66	0.66	0.70	0.68	0.72	0.70	0.74
Heavy Areas	90	0.71	0.73	0.73	0.75	0.75	0.77	0.78	0.80	0.80	0.82	0.81	0.83
Parks and Cemeteries	7	0.05	0.09	0.12	0.19	0.20	0.29	0.30	0.40	0.34	0.46	0.39	0.50
Playgrounds	13	0.07	0.13	0.16	0.23	0.24	0.31	0.32	0.42	0.37	0.48	0.41	0.54
Railroad Yard Areas	40	0.28	0.28	0.30	0.35	0.36	0.42	0.42	0.50	0.46	0.54	0.50	0.58
Undeveloped Areas													
Historic Flow Analysis- Greenbelts, Agriculture	2	0.03	0.05	0.09	0.16	0.17	0.26	0.26	0.38	0.31	0.45	0.36	0.51
Pasture/Meadow	0	0.02	0.04	0.08	0.15	0.15	0.25	0.25	0.37	0.30	0.44	0.35	0.50
Forest	0	0.02	0.04	0.08	0.15	0.15	0.25	0.25	0.37	0.30	0.44	0.35	0.50
Exposed Rock	100	0.89	0.89	0.90	0.90	0.92	0.92	0.94	0.94	0.95	0.95	0.96	0.96
Offsite Flow Analysis (when landuse is undefined)	45	0.26	0.31	0.32	0.37	0.38	0.44	0.44	0.51	0.48	0.55	0.51	0.59
Streets													
Paved	100	0.89	0.89	0.90	0.90	0.92	0.92	0.94	0.94	0.95	0.95	0.96	0.96
Gravel	80	0.57	0.60	0.59	0.63	0.63	0.66	0.66	0.70	0.68	0.72	0.70	0.74
Drive and Walks	100	0.89	0.89	0.90	0.90	0.92	0.92	0.94	0.94	0.95	0.95	0.96	0.96
Roofs	90	0.71	0.73	0.73	0.75	0.75	0.77	0.78	0.80	0.80	0.82	0.81	0.83
Lawns	0	0.02	0.04	0.08	0.15	0.15	0.25	0.25	0.37	0.30	0.44	0.35	0.50

2.5 Acre Rural Lots - Comp. % Impervious Calculation

Total Area (ac)	Area (ac) - Roofs (90%)	Area (ac)- Drives (100%)	Area (ac) - Lawns (2%)
2.50	0.068	0.046	2.39
Comp % Imperviousness	**6.20%**		

Roads w/ Roadside Ditches - Comp. % Impervious Calculation

Area* (ac)	Area - Ditch (5%)	Area - Roads (100%)
0.2124	0.1320	0.0804
Comp % Imperviousness	**0.41**	

*Area based on 250 LF roadway from CL to outside edge of roadside ditch

The above conservatively rounded to 45%.

Church Site - Comp. % Impervious Calculation

Total Area (ac)	Area (ac) - Roofs (90%)	Area (ac)- Paved (100%)	Area (ac) - Gravel (80%)	Area (ac) - Lawns (2%)
4.88	0.30	1.01	0.22	3.35
Comp % Imperviousness	**31.21%**			

*Area based on Church site comprising of lot 38 and lot 39

The above conservatively rounded to 35%.

Please provide copies of hydrology spreadsheet that shows time of concentration and flow calculations for Basin D1

Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, Jun 29 2023

Culvert CH1 (Q5=1.40 cfs, Q100=4.50 cfs)

Invert Elev Dn (ft)	=	6750.26
Pipe Length (ft)	=	58.66
Slope (%)	=	2.69
Invert Elev Up (ft)	=	6751.84
Rise (in)	=	18.0
Shape	=	Circular
Span (in)	=	18.0
No. Barrels	=	1
n-Value	=	0.013
Culvert Type	=	Circular Concrete
Culvert Entrance	=	Square edge w/headwall (C)
Coeff. K,M,c,Y,k	=	0.0098, 2, 0.0398, 0.67, 0.5

Embankment

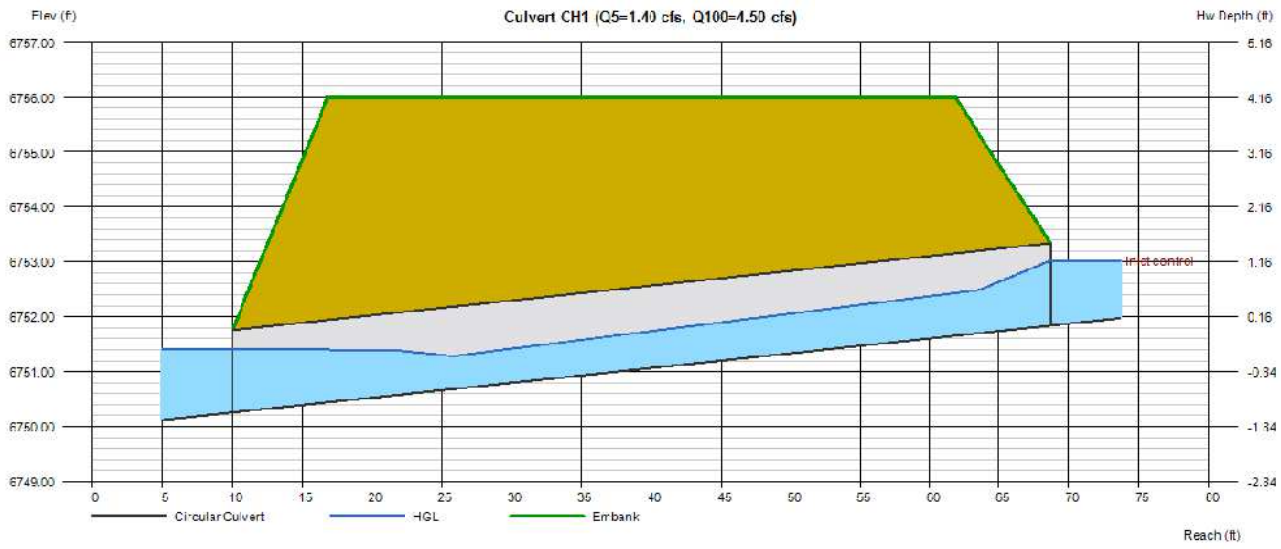
Top Elevation (ft)	=	6756.00
Top Width (ft)	=	45.00
Crest Width (ft)	=	0.00

Calculations

Qmin (cfs)	=	1.40
Qmax (cfs)	=	4.50
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	4.50
Qpipe (cfs)	=	4.50
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	3.08
Veloc Up (ft/s)	=	4.60
HGL Dn (ft)	=	6751.42
HGL Up (ft)	=	6752.65
Hw Elev (ft)	=	6753.03
Hw/D (ft)	=	0.79
Flow Regime	=	Inlet Control



This culvert will be constructed by a different contractor alongside construction of the church site. The estimated flow being captured by this culvert is estimated to be 33% of the flow generated by Basin D1. This flow estimate is larger than what will actually flow to this culvert given where the culvert is placed in relation to the basin.

Please provide update culvert calculations due to the runoff for the church site being greater than the runoff of Basin D1, which included lot 38 & 39, from the subdivision's drainage report.

Culvert Report

Culvert CH2 (Q5=2.81 cfs, Q100=9.05 cfs)

Invert Elev Dn (ft)	=	6755.18
Pipe Length (ft)	=	62.61
Slope (%)	=	2.78
Invert Elev Up (ft)	=	6756.92
Rise (in)	=	18.0
Shape	=	Circular
Span (in)	=	18.0
No. Barrels	=	1
n-Value	=	0.013
Culvert Type	=	Circular Concrete
Culvert Entrance	=	Square edge w/headwall (C)
Coeff. K,M,c,Y,k	=	0.0098, 2, 0.0398, 0.67, 0.5

Embankment

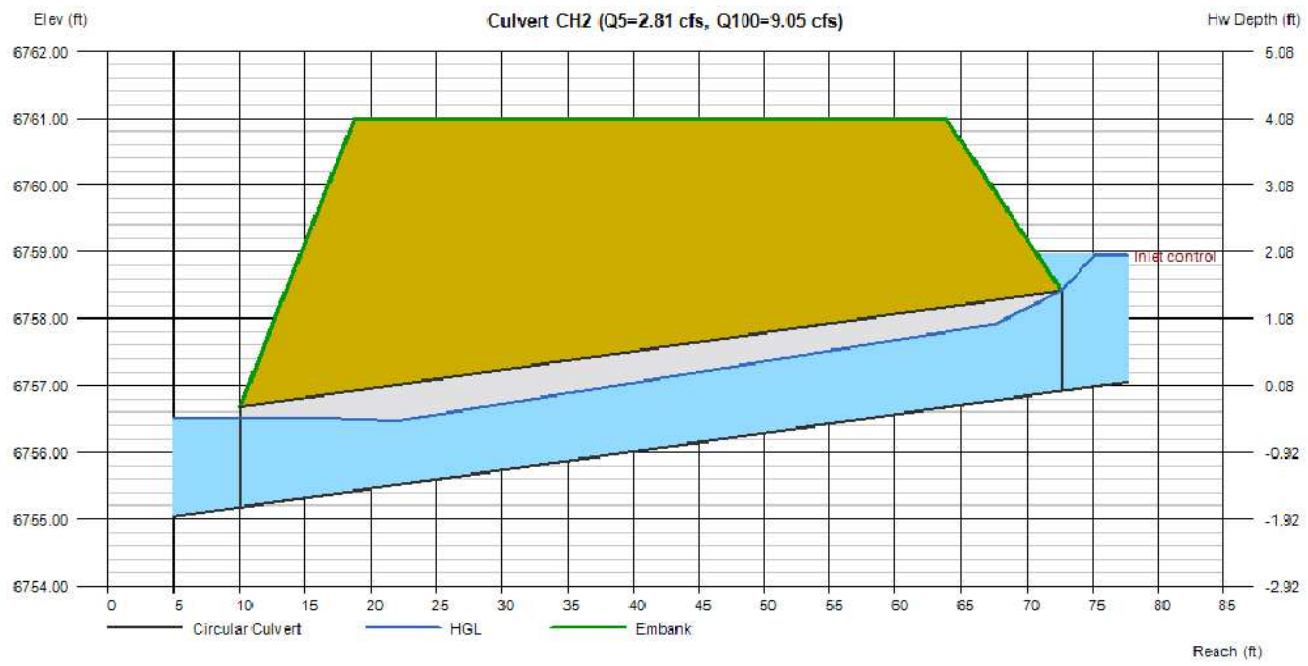
Top Elevation (ft)	=	6761.00
Top Width (ft)	=	45.00
Crest Width (ft)	=	0.00

Calculations

Qmin (cfs)	=	2.81
Qmax (cfs)	=	9.05
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

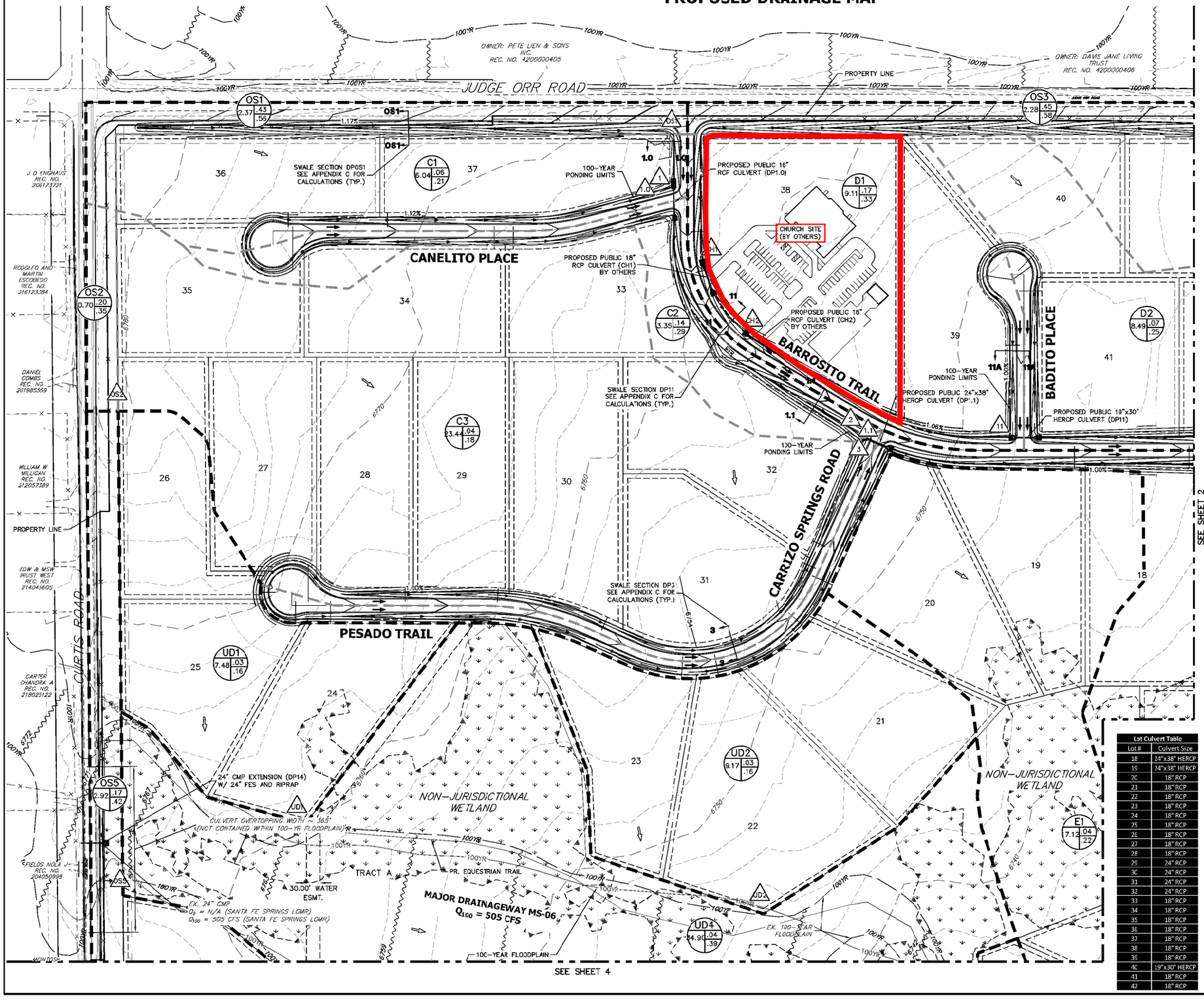
Qtotal (cfs)	=	9.05
Qpipe (cfs)	=	9.05
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	5.46
Veloc Up (ft/s)	=	6.16
HGL Dn (ft)	=	6756.51
HGL Up (ft)	=	6758.08
Hw Elev (ft)	=	6758.95
Hw/D (ft)	=	1.35
Flow Regime	=	Inlet Control



This culvert will be constructed by a different contractor alongside construction of the church site. The estimated flow being captured by this culvert is estimated to be 67% of the flow generated by Basin D1. This flow estimate is larger than what will actually flow to this culvert given where the culvert is placed in relation to the basin.

SADDLEHORN RANCH - FILING 3

PROPOSED DRAINAGE MAP



KEY MAP
N.T.S

FILING 3 - SUB-BASIN SUMMARY TABLE

Tributary Sub-basin	Area (acres)	Percent Impervious	C_5	C_{100}	t_c (min)	Q_5 (cfs)	Q_{100} (cfs)
C1	6.04	13%	0.06	0.21	35.8	0.9	4.8
C2	3.35	24%	0.14	0.29	31.5	1.1	4.0
C3	23.44	9%	0.04	0.18	41.2	1.8	14.1
C4	10.94	18%	0.14	0.42	40.3	3.2	15.5
C5	2.35	20%	0.11	0.26	23.8	0.7	2.9
C6	3.95	22%	0.12	0.28	26.6	1.3	5.0
C7	2.14	24%	0.17	0.38	13.9	1.3	4.9
C8	22.55	10%	0.05	0.19	33.7	2.4	16.4
C9	2.63	35%	0.23	0.39	29.6	1.5	4.3
C10	16.38	12%	0.05	0.20	27.6	2.3	14.3
D1	9.11	28%	0.17	0.33	26.4	4.2	13.5
D2	8.49	13%	0.07	0.25	34.7	1.4	8.2
D3	3.21	8%	0.04	0.18	21.1	0.4	2.8
D4	10.01	7%	0.07	0.40	39.8	1.5	13.9
D5	9.56	17%	0.14	0.43	37.6	3.0	14.9
D6	0.34	45%	0.36	0.57	8.3	0.5	1.4
D7	33.94	15%	0.10	0.31	38.3	6.9	37.3
E1	17.12	7%	0.04	0.22	46.6	1.3	11.8
E2	0.37	45%	0.31	0.46	7.8	0.5	1.3
E3	0.20	45%	0.32	0.48	5.2	0.3	0.8
E4	0.68	3%	0.01	0.14	14.6	0.04	0.6
UD1	7.48	6%	0.03	0.16	33.5	0.4	4.6
UD2	9.17	6%	0.03	0.16	30.4	0.6	6.0
UD3	2.23	6%	0.04	0.24	27.0	0.2	2.3
UD4	34.90	2%	0.04	0.39	54.3	2.2	36.5
UD5	17.63	6%	0.04	0.26	41.9	1.5	15.4
OS1	2.37	58%	0.43	0.56	20.3	3.1	6.8
OS2	0.70	31%	0.20	0.35	13.1	0.5	1.6
OS3	2.28	60%	0.45	0.58	19.5	3.2	6.9
OS4	1.08	55%	0.44	0.63	11.8	1.9	4.4
OS5	2.92	23%	0.17	0.42	17.8	1.7	6.7
F1	1.35	40%	0.27	0.43	12.7	1.4	3.6
F2	7.67	11%	0.05	0.20	35.0	0.9	5.7
F3	5.44	24%	0.20	0.48	31.1	2.6	10.6
F4	2.93	45%	0.34	0.52	32.3	2.3	6.0

FILING 3 - DESIGN POINT SUMMARY TABLE

Design Point	Q_5 (cfs)	Q_{100} (Cfs)
1	0.9	4.8
2	1.1	4.0
3	1.8	14.1
4	3.2	15.5
5	0.7	2.9
6	1.3	5.0
7	1.3	4.9
8	2.4	16.4
9	1.5	4.3
10	2.3	14.3
11	4.2	13.5
12	1.4	8.2
13	0.4	2.8
14	1.5	13.9
15	3.0	14.9
16	0.5	1.4
17	6.9	37.3
21	1.3	11.8
22	0.5	1.3
23	0.3	0.8
24	0.04	0.6
25	0.50	5.7
OS1	3.1	6.8
OS2	0.5	1.6
OS3	3.2	6.9
OS4	1.9	4.4
OS5	1.7	6.7
UD1	0.4	4.6
UD2	0.6	6.0
UD3	0.2	2.3
UD4	2.2	36.5
UD5	1.5	15.4
1.0	3.1	9.7
1.1	5.6	26.2
1.2	6.8	32.2
1.3	6.8	32.2
1.4	7.6	35.0
1.5	3.2	19.6
1.6	10.5	50.0
1.7	11.1	58.1
2.0	5.0	19.6
2.1	3.4	9.5
2.2	4.3	11.3
2.3	6.7	34.1
2.4	10.7	55.5
2.5	15.0	83.6
3.0	1.6	12.6
3.1	1.5	12.6

Lot Culvert Table

Lot#	Culvert Size
18	24"x38" HERCP
19	24"x38" HERCP
20	18" RCP
21	18" RCP
22	18" RCP
23	18" RCP
24	18" RCP
25	18" RCP
26	18" RCP
27	18" RCP
28	18" RCP
29	24" RCP
30	24" RCP
31	24" RCP
32	24" RCP
33	18" RCP
34	18" RCP
35	18" RCP
36	18" RCP
37	18" RCP
38	18" RCP
39	18" RCP
40	19"x30" HERCP
41	18" RCP
42	18" RCP

LEGEND

- BASIN DESIGNATION (I.D.: A = BASIN AREA, B = C_5, C = C_{100})
- DESIGN POINT
- MAJOR BASIN DELINEATION
- SUB-BASIN DELINEATION
- 6710 EXISTING INDEX CONTOURS
- EXISTING INTERMEDIATE CONTOURS
- 6700 PROPOSED INDEX CONTOURS
- PROPOSED INTERMEDIATE CONTOURS
- EXISTING FLOW DIRECTION
- PROPOSED FLOW DIRECTION
- HP PROPOSED HIGH POINT
- LP PROPOSED LOW POINT
- WETLANDS HATCH
- SETBACK LINE

100 50 0 100 200
ORIGINAL SCALE: 1" = 100'

SADDLEHORN RANCH-FILING 3
PROPOSED DRAINAGE MAP
JOB NO. 25142.05
6/16/23
SHEET 1 OF 4

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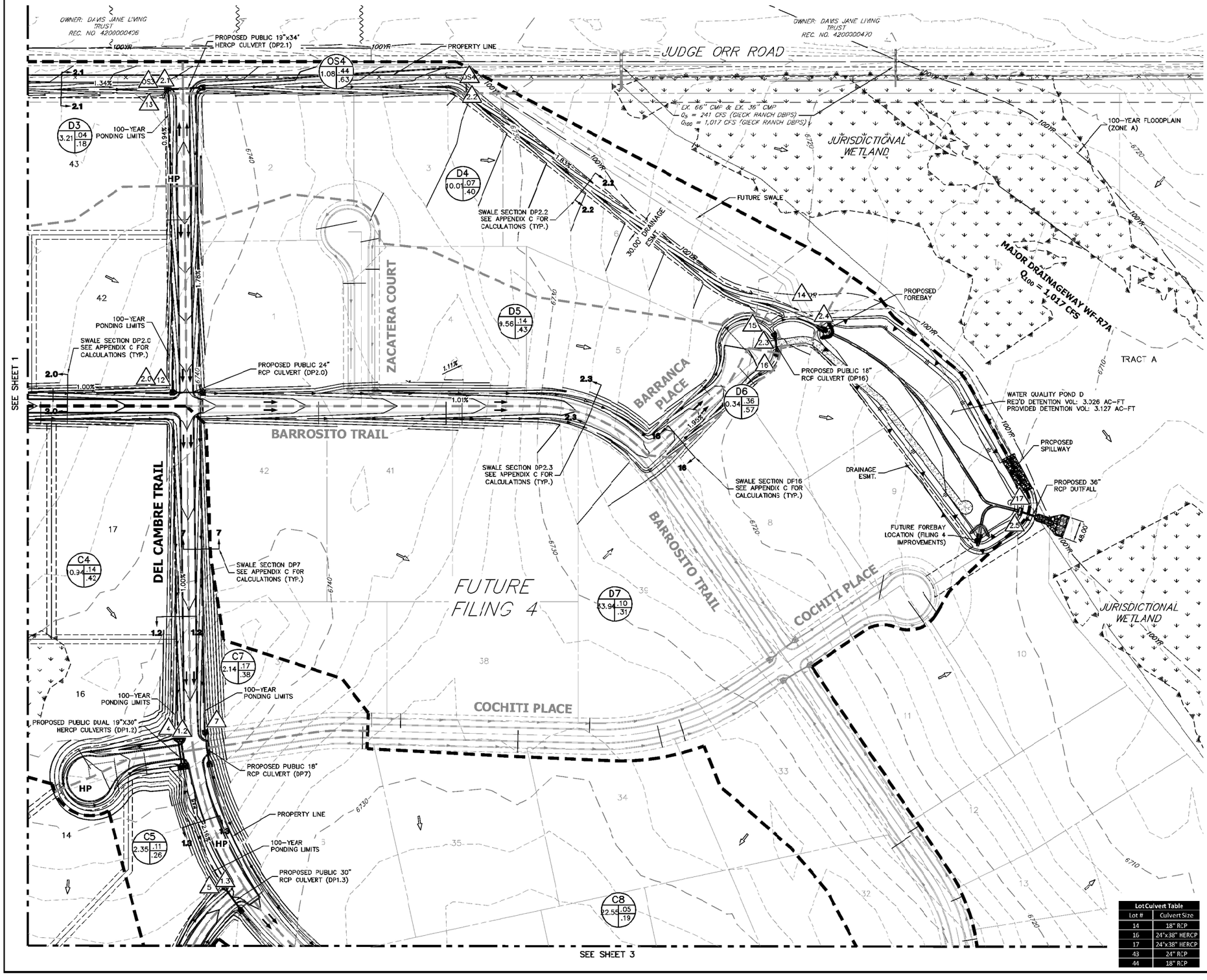
SADDLEHORN RANCH - FILING 3

PROPOSED DRAINAGE MAP



FILING 3 - SUB-BASIN SUMMARY TABLE

Tributary Sub-basin	Area (acres)	Percent Impervious	C_5	C_{100}	t_c (min)	Q_5 (cfs)	Q_{100} (cfs)
C1	6.04	13%	0.06	0.21	35.8	0.9	4.8
C2	3.35	24%	0.14	0.29	31.5	1.1	4.0
C3	23.44	9%	0.04	0.18	41.2	1.8	14.1
C4	10.94	18%	0.14	0.42	40.3	3.2	15.5
C5	2.35	20%	0.11	0.25	23.8	0.7	2.9
C6	3.95	22%	0.12	0.28	26.6	1.3	5.0
C7	2.14	24%	0.17	0.38	13.9	1.3	4.9
C8	22.55	10%	0.05	0.19	33.7	2.4	16.4
C9	2.63	35%	0.23	0.39	29.6	1.5	4.3
C10	16.38	12%	0.05	0.22	27.6	2.3	14.3
D1	9.11	28%	0.17	0.33	26.4	4.2	13.5
D2	8.49	13%	0.07	0.25	34.7	1.4	8.2
D3	3.21	8%	0.04	0.18	21.1	0.4	2.8
D4	10.01	7%	0.07	0.40	39.8	1.5	13.9
D5	9.56	17%	0.14	0.43	37.6	3.0	14.9
D6	0.34	45%	0.36	0.57	8.3	0.5	1.4
D7	33.94	15%	0.10	0.31	38.3	6.9	37.3
E1	17.12	7%	0.04	0.22	46.6	1.3	11.8
E2	0.37	45%	0.31	0.45	7.8	0.5	1.3
E3	0.20	45%	0.32	0.48	5.2	0.3	0.8
E4	0.68	3%	0.01	0.14	14.6	0.04	0.6
UD1	7.48	6%	0.03	0.15	33.5	0.4	4.6
UD2	9.17	6%	0.03	0.15	30.4	0.6	6.0
UD3	2.23	6%	0.04	0.24	27.0	0.2	2.3
UD4	34.90	2%	0.04	0.33	54.3	2.2	36.5
UD5	17.63	6%	0.04	0.25	41.9	1.5	15.4
OS1	2.37	58%	0.43	0.55	20.3	3.1	6.8
OS2	0.70	31%	0.20	0.35	13.1	0.5	1.6
OS3	2.28	60%	0.45	0.58	19.5	3.2	6.9
OS4	1.08	55%	0.44	0.63	11.8	1.9	4.4
OS5	2.92	23%	0.17	0.42	17.8	1.7	6.7
F1	1.35	40%	0.27	0.43	12.7	1.4	3.6
F2	7.67	11%	0.05	0.22	35.0	0.9	5.7
F3	5.44	24%	0.20	0.48	31.1	2.6	10.6
F4	2.93	45%	0.34	0.52	32.3	2.3	6.0

FILING 3 - DESIGN POINT SUMMARY TABLE

Design Point	Q_5 (cfs)	Q_{100} (Cfs)
1	0.9	4.8
2	1.1	4.0
3	1.8	14.1
4	3.2	15.5
5	0.7	2.9
6	1.3	5.0
7	1.3	4.9
8	2.4	16.4
9	1.5	4.3
10	2.3	14.3
11	4.2	13.5
12	1.4	8.2
13	0.4	2.8
14	1.5	13.9
15	3.0	14.9
16	0.5	1.4
17	6.9	37.3
21	1.3	11.8
22	0.5	1.3
23	0.3	0.8
24	0.04	0.6
25	0.90	5.7
OS1	3.1	6.8
OS2	0.5	1.6
OS3	3.2	6.9
OS4	1.9	4.4
OS5	1.7	6.7
UD1	0.4	4.6
UD2	0.6	6.0
UD3	0.2	2.3
UD4	2.2	36.5
UD5	1.5	15.4
1.0	3.1	9.7
1.1	5.6	26.2
1.2	6.8	32.2
1.3	6.8	32.2
1.4	7.6	35.0
1.5	3.2	19.6
1.6	10.5	50.0
1.7	11.1	58.1
2.0	5.0	19.6
2.1	3.4	9.5
2.2	4.3	11.3
2.3	6.7	34.1
2.4	10.7	55.5
2.5	15.0	83.6
3.0	1.6	12.6
3.1	1.5	12.6

Lot Culvert Table

Lot #	Culvert Size
14	18" RCP
16	24"x38" HERCP
17	24"x38" HERCP
43	24" RCP
44	18" RCP

LEGEND

- BASIN DESIGNATION (I.D.: A: BASIN IDENTIFIER; B: BASIN AREA; C: C_{100})
- DESIGN POINT
- MAJOR BASIN DELINEATION
- SUB-BASIN DELINEATION
- 6700 EXISTING INDEX CONTOURS
- EXISTING INTERMEDIATE CONTOURS
- 6700 PROPOSED INDEX CONTOURS
- PROPOSED INTERMEDIATE CONTOURS
- EXISTING FLOW DIRECTION
- PROPOSED FLOW DIRECTION
- HP PROPOSED HIGH POINT
- LP PROPOSED LOW POINT
- WETLANDS HATCH
- SETBACK LINE

100 50 0 100 200

ORIGINAL SCALE: 1" = 100'

SADDLEHORN RANCH-FILING 3
PROPOSED DRAINAGE MAP
JOB NO. 25142.05
6/16/23
SHEET 2 OF 4

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APPENDIX B

HYDROLOGIC CALCULATIONS

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

Land Use or Surface Characteristics	Percent Impervious	Runoff Coefficients											
		2-year		5-year		10-year		25-year		50-year		100-year	
		HSG A&B	HSG C&D	HSG A&B	HSG C&D	HSG A&B	HSG C&D	HSG A&B	HSG C&D	HSG A&B	HSG C&D	HSG A&B	HSG C&D
Business													
Commercial Areas	95	0.79	0.80	0.81	0.82	0.83	0.84	0.85	0.87	0.87	0.88	0.88	0.89
Neighborhood Areas	70	0.45	0.49	0.49	0.53	0.53	0.57	0.58	0.62	0.60	0.65	0.62	0.68
Residential													
1/8 Acre or less	65	0.41	0.45	0.45	0.49	0.49	0.54	0.54	0.59	0.57	0.62	0.59	0.65
1/4 Acre	40	0.23	0.28	0.30	0.35	0.36	0.42	0.42	0.50	0.46	0.54	0.50	0.58
1/3 Acre	30	0.18	0.22	0.25	0.30	0.32	0.38	0.39	0.47	0.43	0.52	0.47	0.57
1/2 Acre	25	0.15	0.20	0.22	0.28	0.30	0.36	0.37	0.46	0.41	0.51	0.46	0.56
1 Acre	20	0.12	0.17	0.20	0.26	0.27	0.34	0.35	0.44	0.40	0.50	0.44	0.55
Industrial													
Light Areas	80	0.57	0.60	0.59	0.63	0.63	0.66	0.66	0.70	0.68	0.72	0.70	0.74
Heavy Areas	90	0.71	0.73	0.73	0.75	0.75	0.77	0.78	0.80	0.80	0.82	0.81	0.83
Parks and Cemeteries	7	0.05	0.09	0.12	0.19	0.20	0.29	0.30	0.40	0.34	0.46	0.39	0.52
Playgrounds	13	0.07	0.13	0.16	0.23	0.24	0.31	0.32	0.42	0.37	0.48	0.41	0.54
Railroad Yard Areas	40	0.23	0.28	0.30	0.35	0.36	0.42	0.42	0.50	0.46	0.54	0.50	0.58
Undeveloped Areas													
Historic Flow Analysis--Greenbelts, Agriculture	2	0.03	0.05	0.09	0.16	0.17	0.26	0.26	0.38	0.31	0.45	0.36	0.51
Pasture/Meadow	0	0.02	0.04	0.08	0.15	0.15	0.25	0.25	0.37	0.30	0.44	0.35	0.50
Forest	0	0.02	0.04	0.08	0.15	0.15	0.25	0.25	0.37	0.30	0.44	0.35	0.50
Exposed Rock	100	0.89	0.89	0.90	0.90	0.92	0.92	0.94	0.94	0.95	0.95	0.96	0.96
Offsite Flow Analysis (when landuse is undefined)	45	0.26	0.31	0.32	0.37	0.38	0.44	0.44	0.51	0.48	0.55	0.51	0.59
Streets													
Paved	100	0.89	0.89	0.90	0.90	0.92	0.92	0.94	0.94	0.95	0.95	0.96	0.96
Gravel	80	0.57	0.60	0.59	0.63	0.63	0.66	0.66	0.70	0.68	0.72	0.70	0.74
Drive and Walks	100	0.89	0.89	0.90	0.90	0.92	0.92	0.94	0.94	0.95	0.95	0.96	0.96
Roofs	90	0.71	0.73	0.73	0.75	0.75	0.77	0.78	0.80	0.80	0.82	0.81	0.83
Lawns	0	0.02	0.04	0.08	0.15	0.15	0.25	0.25	0.37	0.30	0.44	0.35	0.50

3.2 Time of Concentration

One of the basic assumptions underlying the Rational Method is that runoff is a function of the average rainfall rate during the time required for water to flow from the hydraulically most remote part of the drainage area under consideration to the design point. However, in practice, the time of concentration can be an empirical value that results in reasonable and acceptable peak flow calculations.

For urban areas, the time of concentration (t_c) consists of an initial time or overland flow time (t_i) plus the travel time (t_t) in the storm sewer, paved gutter, roadside drainage ditch, or drainage channel. For non-urban areas, the time of concentration consists of an overland flow time (t_i) plus the time of travel in a concentrated form, such as a swale or drainageway. The travel portion (t_t) of the time of concentration can be estimated from the hydraulic properties of the storm sewer, gutter, swale, ditch, or drainageway. Initial time, on the other hand, will vary with surface slope, depression storage, surface cover, antecedent rainfall, and infiltration capacity of the soil, as well as distance of surface flow. The time of concentration is represented by Equation 6-7 for both urban and non-urban areas.

$$t_c = t_i + t_t \quad \text{(Eq. 6-7)}$$

Where:

t_c = time of concentration (min)

t_i = overland (initial) flow time (min)

t_t = travel time in the ditch, channel, gutter, storm sewer, etc. (min)

3.2.1 Overland (Initial) Flow Time

The overland flow time, t_i, may be calculated using Equation 6-8.

$$t_i = \frac{0.395(1.1 - C_5)\sqrt{L}}{S^{0.33}} \quad \text{(Eq. 6-8)}$$

Where:

t_i = overland (initial) flow time (min)
C_5 = runoff coefficient for 5-year frequency (see Table 6-6)
L = length of overland flow (300 ft maximum for non-urban land uses, 100 ft maximum for urban land uses)
S = average basin slope (ft/ft)

Note that in some urban watersheds, the overland flow time may be very small because flows quickly concentrate and channelize.

3.2.2 Travel Time

For catchments with overland and channelized flow, the time of concentration needs to be considered in combination with the travel time, t_t, which is calculated using the hydraulic properties of the swale, ditch, or channel. For preliminary work, the overland travel time, t_t, can be estimated with the help of Figure 6-25 or Equation 6-9 (Guo 1999).

$$V = C_v S_w^{0.5} \quad \text{(Eq. 6-9)}$$

Where:

V = velocity (ft/s)

C_v = conveyance coefficient (from Table 6-7)

S_w = watercourse slope (ft/ft)

Table 6-7. Conveyance Coefficient, C_v

Type of Land Surface	C_v
Heavy meadow	2.5
Tillage/field	5
Riprap (not buried)*	6.5
Short pasture and lawns	7
Nearly bare ground	10
Grassed waterway	15
Paved areas and shallow paved swales	20

* For buried riprap, select C_v value based on type of vegetative cover.

The travel time is calculated by dividing the flow distance (in feet) by the velocity calculated using Equation 6-9 and converting units to minutes.

The time of concentration (t_c) is then the sum of the overland flow time (t_i) and the travel time (t_t) per Equation 6-7.

3.2.3 First Design Point Time of Concentration in Urban Catchments

Using this procedure, the time of concentration at the first design point (typically the first inlet in the system) in an urbanized catchment should not exceed the time of concentration calculated using Equation 6-10. The first design point is defined as the point where runoff first enters the storm sewer system.

$$t_c = \frac{L}{180} + 10 \qquad \text{(Eq. 6-10)}$$

Where:

t_c = maximum time of concentration at the first design point in an urban watershed (min)

L = waterway length (ft)

Equation 6-10 was developed using the rainfall-runoff data collected in the Denver region and, in essence, represents regional "calibration" of the Rational Method. Normally, Equation 6-10 will result in a lesser time of concentration at the first design point and will govern in an urbanized watershed. For subsequent design points, the time of concentration is calculated by accumulating the travel times in downstream drainageway reaches.

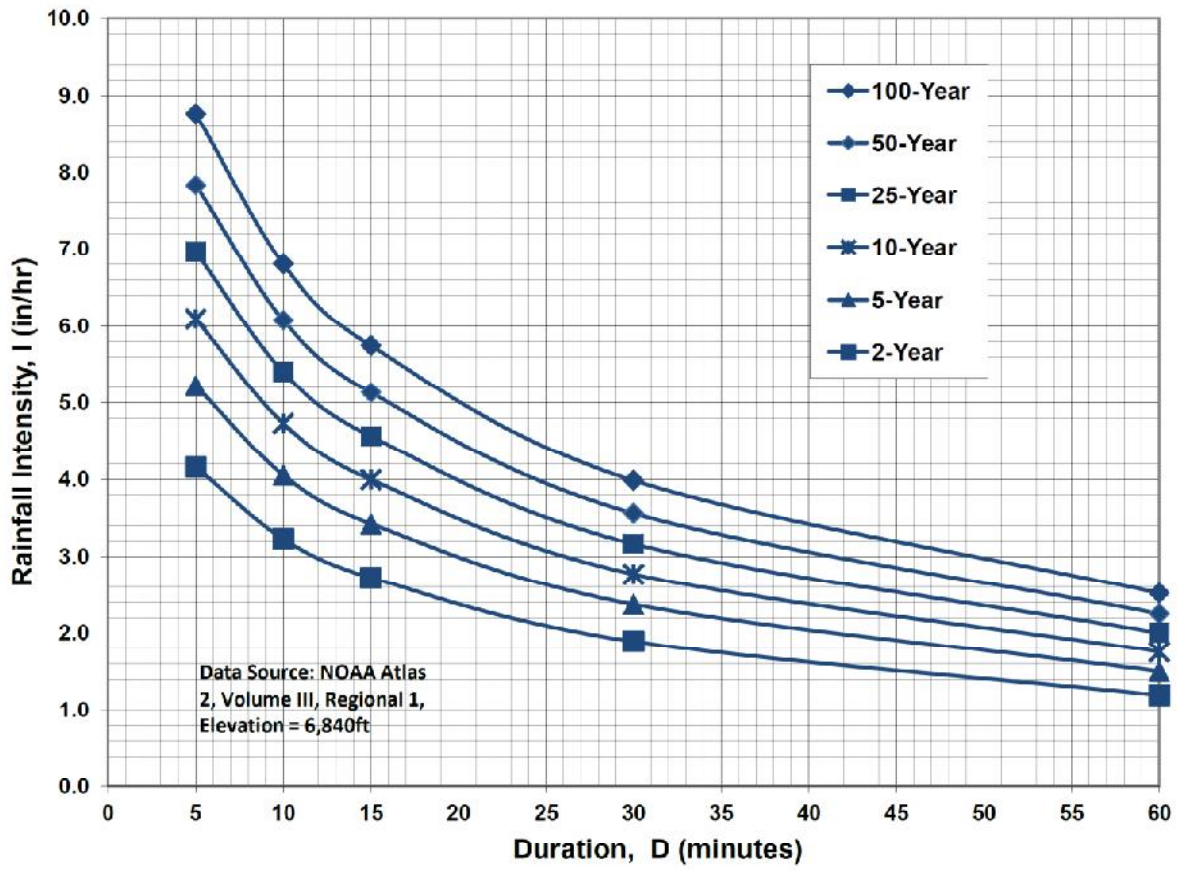
3.2.4 Minimum Time of Concentration

If the calculations result in a t_c of less than 10 minutes for undeveloped conditions, it is recommended that a minimum value of 10 minutes be used. The minimum t_c for urbanized areas is 5 minutes.

3.2.5 Post-Development Time of Concentration

As Equation 6-8 indicates, the time of concentration is a function of the 5-year runoff coefficient for a drainage basin. Typically, higher levels of imperviousness (higher 5-year runoff coefficients) correspond to shorter times of concentration, and lower levels of imperviousness correspond to longer times of

Figure 6-5. Colorado Springs Rainfall Intensity Duration Frequency



IDF Equations

$I_{100} = -2.52 \ln(D) + 12.735$

$I_{50} = -2.25 \ln(D) + 11.375$

$I_{25} = -2.00 \ln(D) + 10.111$

$I_{10} = -1.75 \ln(D) + 8.847$

$I_{5} = -1.50 \ln(D) + 7.583$

$I_{2} = -1.19 \ln(D) + 6.035$

Note: Values calculated by equations may not precisely duplicate values read from figure.

NORWOOD BIBLE CHURCH
COMPOSITE RUNOFF COEFFICIENTS

DEVELOPED CONDITIONS

5-YEAR C VALUES

BASIN	TOTAL AREA (AC)	(AC)	SUB-AREA 1 DEVELOPMENT/ COVER	C	AREA (AC)	SUB-AREA 2 DEVELOPMENT/ COVER	C	(AC)	SUB-AREA 3 DEVELOPMENT/ COVER	C	WEIGHTED C VALUE
D1.1	5.00	1.276	BUILDING / ASPHALT	0.9	0.214	GRAVEL	0.59	3.510	LANDSCAPED	0.08	0.311

100-YEAR C VALUES

BASIN	TOTAL AREA (AC)	(AC)	SUB-AREA 1 DEVELOPMENT/ COVER	C	AREA (AC)	SUB-AREA 2 DEVELOPMENT/ COVER	C	(AC)	SUB-AREA 3 DEVELOPMENT/ COVER	C	WEIGHTED C VALUE
D1.1	5.00	1.276	BUILDING / ASPHALT	0.96	0.214	GRAVEL	0.70	3.510	LANDSCAPED	0.35	0.521

IMPERVIOUS AREAS

BASIN	TOTAL AREA (AC)	(AC)	SUB-AREA 1 DEVELOPMENT/ COVER	PERCENT IMPERVIOUS	AREA (AC)	SUB-AREA 2 DEVELOPMENT/ COVER	PERCENT IMPERVIOUS	(AC)	SUB-AREA 3 DEVELOPMENT/ COVER	PERCENT IMPERVIOUS	WEIGHTED % IMP
D1.1	5.00	1.276	BUILDING / ASPHALT	100	0.214	GRAVEL	80	3.510	LANDSCAPED	0	28.944

NORWOOD BIBLE CHURCH
RATIONAL METHOD

HISTORIC (PRE-DEVELOPMENT) CONDITIONS

					Overland Flow			Channel flow										
BASIN	DESIGN POINT	AREA (AC)	C 5-YEAR	C 100-YEAR	LENGTH (FT)	SLOPE (FT/FT)	Tco [1] (MIN)	CHANNEL LENGTH (FT)	CONVEYANCE COEFFICIENT C	SLOPE (FT/FT)	SCS [2] VELOCITY (FT/S)	Tt [3] (MIN)	TOTAL Tc [4] (MIN)	TOTAL Tc [4] (MIN)	INTENSITY [5] 5-YR (IN/HR)	INTENSITY [5] 100-YR (IN/HR)	PEAK FLOW Q5 [6] (CFS)	PEAK FLOW Q100 [6] (CFS)
D1.1	D1.1	5.0	0.080	0.350	300	0.023	24.5	320	15	0.028	2.51	2.1	26.6	26.6	2.66	4.46	1.06	7.81

DEVELOPED CONDITIONS

					Overland Flow			Channel flow										
BASIN	DESIGN POINT	AREA (AC)	C 5-YEAR	C 100-YEAR	LENGTH (FT)	SLOPE (FT/FT)	Tco [1] (MIN)	CHANNEL LENGTH (FT)	CONVEYANCE COEFFICIENT C	SLOPE (FT/FT)	SCS [2] VELOCITY (FT/S)	Tt [3] (MIN)	TOTAL Tc [4] (MIN)	TOTAL Tc [4] (MIN)	INTENSITY [5] 5-YR (IN/HR)	INTENSITY [5] 100-YR (IN/HR)	PEAK FLOW Q5 [6] (CFS)	PEAK FLOW Q100 [6] (CFS)
D1.1	D1.1	5.0	0.311	0.521	100	0.030	10.0	810	20	0.020	2.83	4.8	14.8	14.8	3.54	5.95	5.51	15.49

1) OVERLAND FLOW Tco = (0.395*(1.1-RUNOFF COEFFICIENT)*(OVERLAND FLOW LENGTH^(0.5)/(SLOPE^(0.333))
2) SCS VELOCITY = C * ((SLOPE(FT/FT)^0.5)
C = 2.5 FOR HEAVY MEADOW
C = 5 FOR TILLAGE/FIELD
C = 7 FOR SHORT PASTURE AND LAWNS
C = 10 FOR NEARLY BARE GROUND
C = 15 FOR GRASSED WATERWAY
C = 20 FOR PAVED AREAS AND SHALLOW PAVED SWALES

3) MANNING'S CHANNEL TRAVEL TIME = L/V (WHEN CHANNEL VELOCITY IS KNOWN)
4) Tc = Tco + Tt
*** IF TOTAL TIME OF CONCENTRATION IS LESS THAN 5 MINUTES, THEN 5 MINUTES IS USED
5) INTENSITY BASED ON I-D-F EQUATIONS IN CITY OF COLORADO SPRINGS DRAINAGE CRITERIA MANUAL
$I_5 = -1.5 * \ln(Tc) + 7.583$
$I_{100} = -2.52 * \ln(Tc) + 12.735$
6) Q = CiA

APPENDIX C

HYDRAULIC CALCULATIONS

Provide design calculation for cross pan, curb chase, riprap

NORWOOD BIBLE CHURCH
CHANNEL CALCULATIONS
DEVELOPED FLOWS

PROPOSED CHANNELS

CHANNEL	PROPOSED SLOPE (%)	BOTTOM WIDTH (B, FT)	SIDE SLOPE (Z)	CHANNEL DEPTH (FT)	FRICTION FACTOR (n)		DESIGN POINT	BASIN Q100 (CFS)	CHANNEL PERCENT OF BASIN	Q100 FLOW (CFS)	Q100 DEPTH (FT)	Q100 VELOCITY (FT/S)	CHANNEL LINING
D1.1a	1.0	0	4:1	1.5	0.030		D1.1	15.5	30	4.7	0.7	2.4	GRASS
D1.1b	6.4	0	4:1	1.5	0.030		D1.1	15.5	35	5.4	0.5	5.0	**GRASS / ECB**
D1.1c	6.7	4	4:1	1.5	0.030		D1.1	15.5	50	7.8	0.3	5.0	**GRASS / ECB**
D1.1d	0.88	4	4:1	1.5	0.030		D1.1	15.5	100	15.5	0.7	3.0	GRASS

Please revise design point names and show design point labels on the drainage map.

How were these other flows developed, only D1.1 has a row in the hydrologic calculations spreadsheet in Appendix B.

Please specify type of grass. Refer to DCM Vol. 1 Section 3 Chapter 10 Table 10-4 maximum permissible velocities for earth channels. Provide ECB specs.

Hydraulic Analysis Report

Project Data

Project Title: Project - Norwood Bible Church
Designer: JPS
Project Date: Friday, September 22, 2023
Project Units: U.S. Customary Units
Notes:

Channel Analysis: Channel Analysis - Ditch D1.1a

Notes:

Input Parameters

Channel Type: Triangular
Side Slope 1 (Z1): 4.0000 ft/ft
Side Slope 2 (Z2): 4.0000 ft/ft
Longitudinal Slope: 0.0100 ft/ft
Manning's n: 0.0300
Flow: 4.7000 cfs

Result Parameters

Depth: 0.6986 ft
Area of Flow: 1.9521 ft^2
Wetted Perimeter: 5.7608 ft
Hydraulic Radius: 0.3389 ft
Average Velocity: 2.4076 ft/s
Top Width: 5.5888 ft
Froude Number: 0.7179
Critical Depth: 0.6119 ft
Critical Velocity: 3.1386 ft/s
Critical Slope: 0.0203 ft/ft
Critical Top Width: 4.89 ft
Calculated Max Shear Stress: 0.4359 lb/ft^2
Calculated Avg Shear Stress: 0.2115 lb/ft^2

Channel Analysis: Channel Analysis - Ditch D1.1b

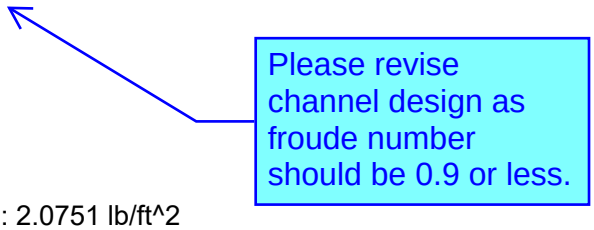
Notes:

Input Parameters

Channel Type: Triangular
Side Slope 1 (Z1): 4.0000 ft/ft
Side Slope 2 (Z2): 4.0000 ft/ft
Longitudinal Slope: 0.0640 ft/ft
Manning's n: 0.0300
Flow: 5.4000 cfs

Result Parameters

Depth: 0.5196 ft
Area of Flow: 1.0800 ft^2
Wetted Perimeter: 4.2848 ft
Hydraulic Radius: 0.2520 ft
Average Velocity: 5.0001 ft/s
Top Width: 4.1569 ft
Froude Number: 1.7287
Critical Depth: 0.6468 ft
Critical Velocity: 3.2270 ft/s
Critical Slope: 0.0199 ft/ft
Critical Top Width: 5.17 ft
Calculated Max Shear Stress: 2.0751 lb/ft^2
Calculated Avg Shear Stress: 1.0066 lb/ft^2



Channel Analysis: Channel Analysis - D1.1c

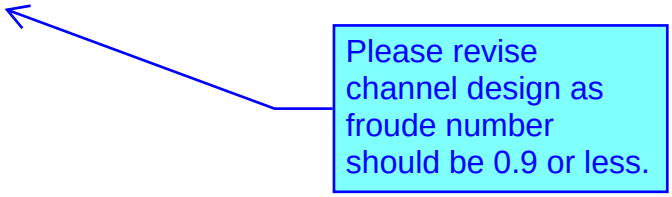
Notes:

Input Parameters

Channel Type: Trapezoidal
Side Slope 1 (Z1): 4.0000 ft/ft
Side Slope 2 (Z2): 4.0000 ft/ft
Channel Width: 4.0000 ft
Longitudinal Slope: 0.0670 ft/ft
Manning's n: 0.0300
Flow: 7.8000 cfs

Result Parameters

Depth: 0.3012 ft
Area of Flow: 1.5675 ft^2
Wetted Perimeter: 6.4835 ft
Hydraulic Radius: 0.2418 ft
Average Velocity: 4.9760 ft/s
Top Width: 6.4094 ft
Froude Number: 1.7732
Critical Depth: 0.4230 ft
Critical Velocity: 3.2400 ft/s
Critical Slope: 0.0194 ft/ft
Critical Top Width: 7.38 ft
Calculated Max Shear Stress: 1.2591 lb/ft^2
Calculated Avg Shear Stress: 1.0108 lb/ft^2



Channel Analysis: Channel Analysis - D1.1d

Notes:

Input Parameters

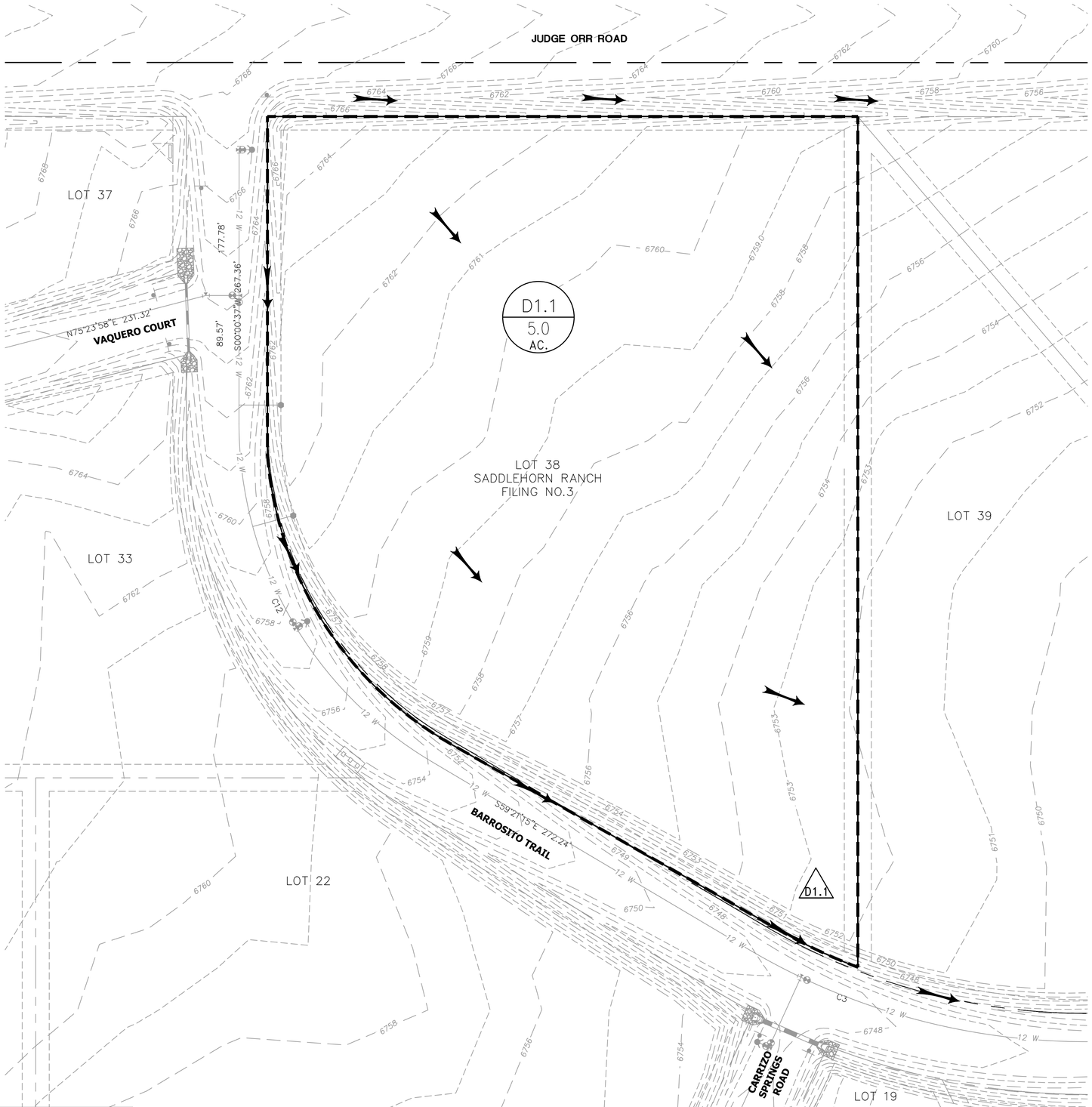
Channel Type: Trapezoidal
Side Slope 1 (Z1): 4.0000 ft/ft
Side Slope 2 (Z2): 4.0000 ft/ft
Channel Width: 4.0000 ft
Longitudinal Slope: 0.0088 ft/ft
Manning's n: 0.0300
Flow: 15.5000 cfs

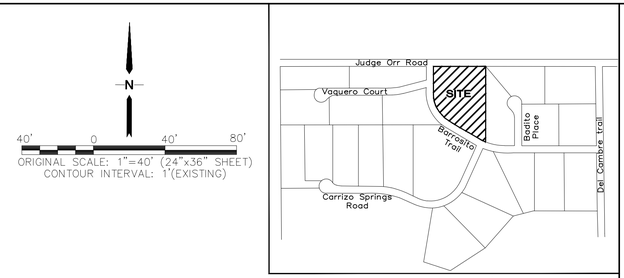
Result Parameters

Depth: 0.7456 ft
Area of Flow: 5.2062 ft^2
Wetted Perimeter: 10.1485 ft
Hydraulic Radius: 0.5130 ft
Average Velocity: 2.9772 ft/s
Top Width: 9.9649 ft
Froude Number: 0.7259
Critical Depth: 0.6253 ft
Critical Velocity: 3.8131 ft/s
Critical Slope: 0.0175 ft/ft
Critical Top Width: 9.00 ft
Calculated Max Shear Stress: 0.4094 lb/ft^2
Calculated Avg Shear Stress: 0.2817 lb/ft^2

APPENDIX D

FIGURES





VICINITY MAP
NTS

LEGEND

- LOD — LIMITS OF DISTURBANCE
- FEMA 100-YEAR FLOODWAY
- FEMA 100-YR FLOODPLAIN
- PROPERTY BOUNDARY
- DRAINAGE BASIN BOUNDARY
- 6750 — PROPOSED CONTOUR
- 6750 — EXISTING CONTOUR
- FLOWLINE
- FLOW DIRECTION ARROW
- 1 — DESIGN POINT
- A / 1.46 AC. — BASIN DESIGNATION / BASIN AREA (ACRES)

SUMMARY HYDROLOGY TABLE

DESIGN POINT	Q5 (CFS)	Q100 (CFS)
D1.1	1.1	7.8

BENCHMARK

THE VERTICAL DATUM IS BASED OFF AN OPUS SOLUTION RAN ON CONTROL POINT #100 (NO. 4 REBAR) AND IS ADJUSTED TO NGVD 1929, ELEVATION 6754.61

Add "PCD File No. PPR2346"

NOR'WOOD BIBLE CHURCH
LOT 38, SADDLEHORN RANCH FILING NO. 3

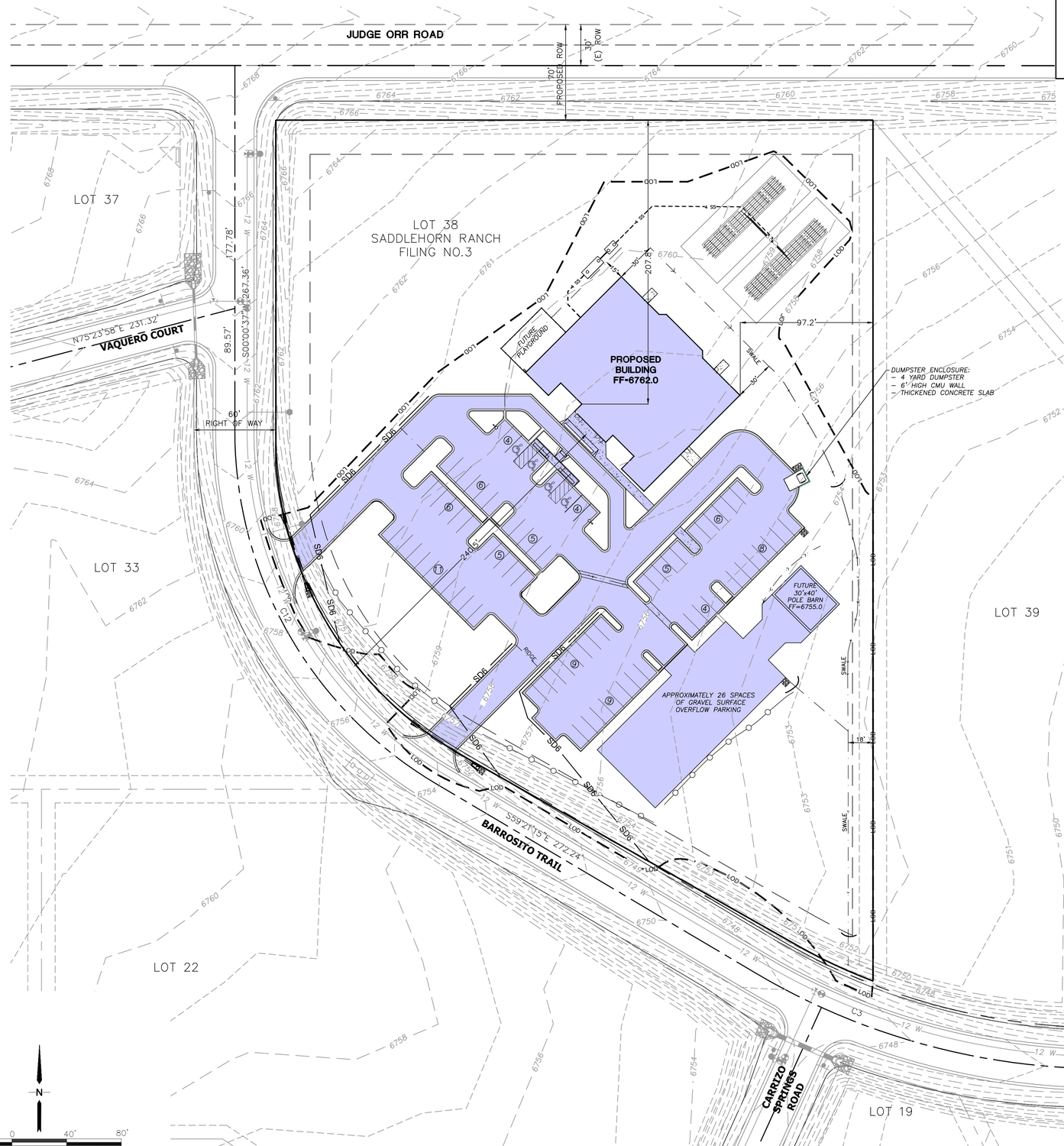
EXISTING CONDITIONS DRAINAGE PLAN

JPS ENGINEERING
19 E. Willamette Ave.
Colorado Springs, CO
80903
PH: 719-477-9429
FAX: 719-471-0766
www.jpsengr.com

CALL UTILITY NOTIFICATION CENTER OF COLORADO
1-800-922-1987
CALL 2 BUSINESS DAYS IN ADVANCE BEFORE YOU DIG, GRADE, OR EXCAVATE FOR THE MARKING OF UNDERGROUND MEMBER UTILITIES.

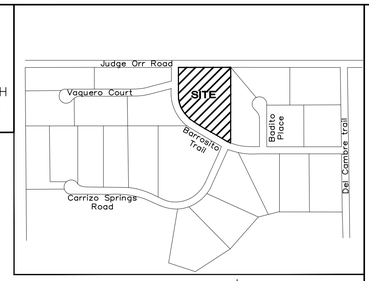
REVISION	BY	DATE
No. 1		

HORZ. SCALE: 1"=40'	DRAWN: PV
VERT. SCALE: N/A	DESIGNED: JPS
SURVEYED: JR	CHECKED: JPS
CREATED: 08/29/22	LAST MODIFIED: 09/26/23
PROJECT NO: 042303	MODIFIED BY: PV
SHEET: EX1	



PBMP SUMMARY TABLE

BASINS	PBMP TRIBUTARY AREA (AC)	PBMP
D1.1	5.0	SADDLEHORN RANCH DETENTION POND D



VICINITY MAP
NTS

The PBMP form states that Saddlehorn Ranch Pond D will accept the flows from the project site, not that Runoff Reduction is proposed. If Runoff Reductiion is proposed then calculations must be provided and very likely may not work due to the small UIA:RPA interface.

For the PBMP applicability map, all disturbed areas must be accounted for with the proposed map not just impervious areas. Runoff reduction is not proposed to satisfy WQ requirements, but rather offsite WQ from Pond D per the DR text. The site area so all be one color denoting that the WQCV standard is satisfied through Pond D, if that is the proposed strategy to handle WQ as is discussed in the text.

LEGEND

- LOD — LIMITS OF DISTURBANCE
- FEMA 100-YEAR FLOODWAY
- FEMA 100-YR FLOODPLAIN
- PROPERTY BOUNDARY
- DRAINAGE BASIN BOUNDARY
- 6750 — PROPOSED CONTOUR
- 6750 — EXISTING CONTOUR
- FLOWLINE
- FLOW DIRECTION ARROW
- (E) EXISTING
- (P) PROPOSED
- DS → DOWNSPOUT CONNECTION TO STORM SEWER; INSTALL TRANSITION COUPLINGS & EXTEND 6" PVC (SDR35) AT 1.0% MIN. SLOPE TO SD
- 1 — DESIGN POINT
- A / 1.3 AC. — BASIN DESIGNATION / BASIN AREA (ACRES)

LEGEND

- UNCONNECTED IMPERVIOUS AREA (UIA)
- RECEIVING PERVIOUS AREA (RPA)
- DIRECTLY CONNECTED IMPERVIOUS AREA (DCIA)
- SEPARATE PERVIOUS AREA (SPA)

IMPERVIOUS AREA CALCULATIONS:

BASIN D1.1 AREA = 5.0 AC.

SURFACE TYPE	AREA
PROP. BUILDING	12,550 SF
PROP. ASPHALT/SIDEWALK	43,017 SF
PROP. GRAVEL 9,340 SF. @ 80% IMPERVIOUS=	7,472 SF.
TOTAL IMPERVIOUS AREA	63,039 SF = 1.45 AC

= 29%

SUMMARY HYDROLOGY TABLE

DESIGN POINT	Q5 (CFS)	Q100 (CFS)
D1.1	5.5	15.5

NOR'WOOD BIBLE CHURCH
LOT 38, SADDLEHORN RANCH FILING NO. 3
PBMP APPLICABILITY EXHIBIT

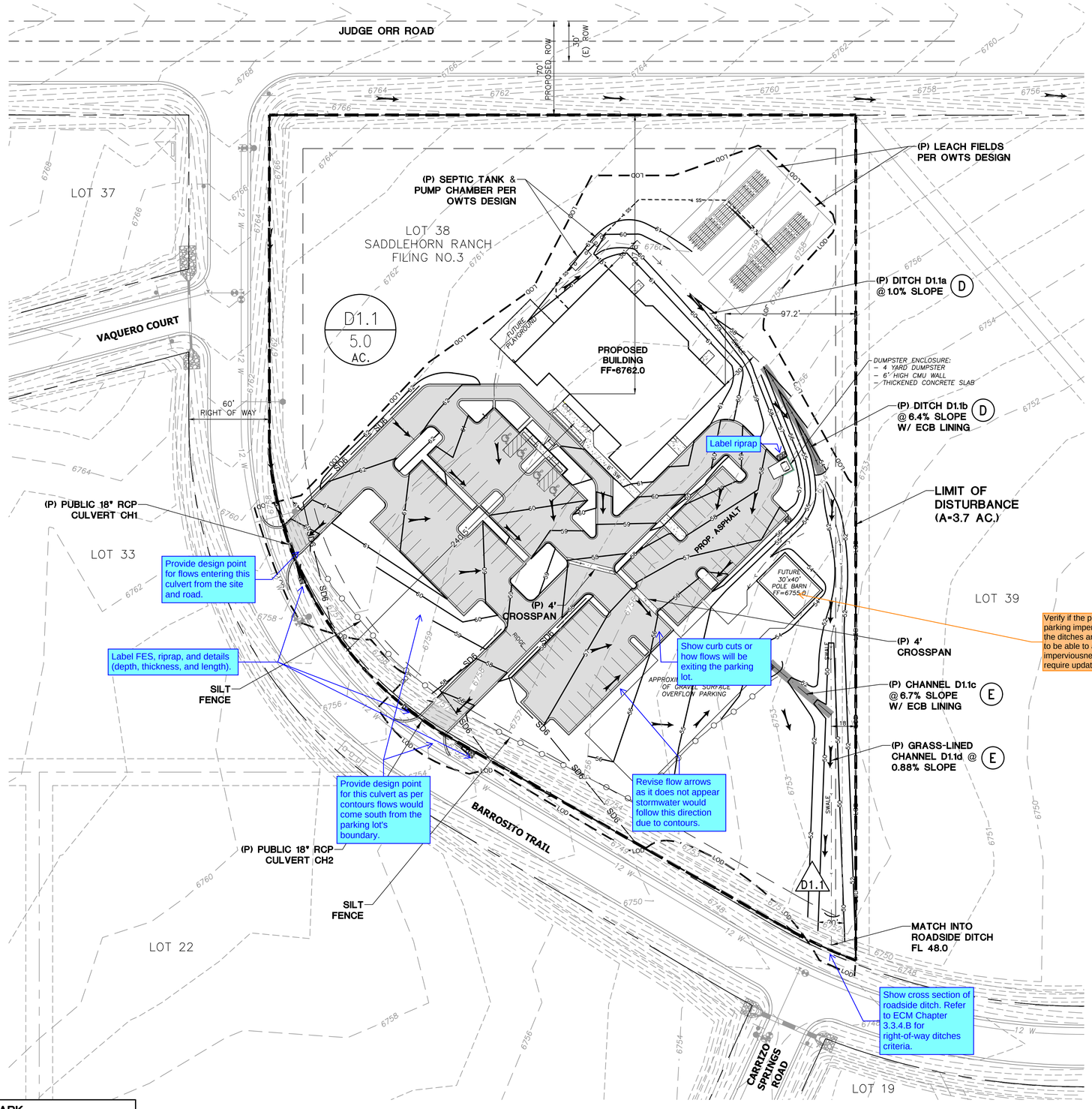
JPS ENGINEERING
19 E. Willamette Ave.
Colorado Springs, CO 80903
PH: 719-477-9429
FAX: 719-471-0766
www.jpsengr.com

CALL UTILITY NOTIFICATION CENTER OF COLORADO
1-800-922-1987
CALL 2 BUSINESS DAYS IN ADVANCE BEFORE YOU DIG, GRADE, OR EXCAVATE FOR THE MARKING OF UNDERGROUND MEMBER UTILITIES.

No.	REVISION	BY	DATE
1		JPS	

HORZ. SCALE:	1"=40'	DRAWN:	PV
VERT. SCALE:	N/A	DESIGNED:	JPS
SURVEYED:	JR	CHECKED:	JPS
CREATED:	08/29/22	LAST MODIFIED:	10/12/23
PROJECT NO:	2221	MODIFIED BY:	PV

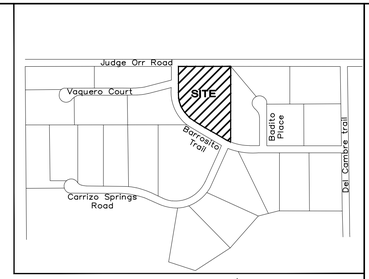
SHEET: PBMP



N

40' 0 40' 80'

ORIGINAL SCALE: 1"=40' (24"x36" SHEET)
CONTOUR INTERVAL: 1'(EXISTING)
CONTOUR INTERVAL: 2'(PROPOSED)



VICINITY MAP
NTS

LEGEND

LOD	LIMITS OF DISTURBANCE
	FEMA 100-YEAR FLOODWAY
	FEMA 100-YR FLOODPLAIN
	PROPERTY BOUNDARY
	DRAINAGE BASIN BOUNDARY
6750	PROPOSED CONTOUR
6750	EXISTING CONTOUR
	FLOWLINE
	FLOW DIRECTION ARROW
(E)	EXISTING
(P)	PROPOSED
DS	DOWNSPOUT CONNECTION TO STORM SEWER; INSTALL TRANSITION COUPLINGS & EXTEND 6" PVC (SDR35) AT 1.0% MIN. SLOPE TO SD
1	DESIGN POINT
A 1.3 AC	BASIN DESIGNATION / BASIN AREA (ACRES)

IMPERVIOUS AREA CALCULATIONS:

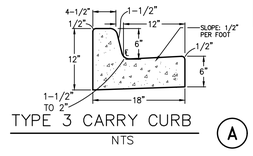
BASIN D1.1 AREA = 5.0 AC.

SURFACE TYPE	AREA
PROP. BUILDING	12,550 SF
PROP. ASPHALT/SIDEWALK	43,017 SF
PROP. GRAVEL 9,340 SF. @ 80% IMPERVIOUS=	7,472 SF.
TOTAL IMPERVIOUS AREA	63,039 SF = 1.45 AC

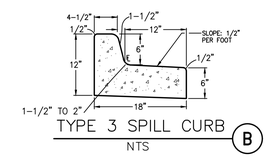
= 29%

SUMMARY HYDROLOGY TABLE

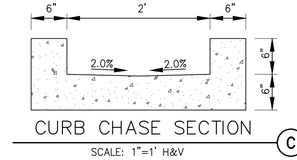
DESIGN POINT	Q5 (CFS)	Q100 (CFS)
D1.1	5.5	15.5



TYPE 3 CARRY CURB (A)
NTS

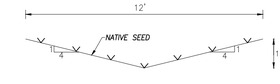


TYPE 3 SPILL CURB (B)
NTS

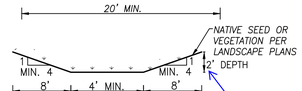


CURB CHASE SECTION (C)
SCALE: 1"=1' H&V

Show and label location on the map



GRASS-LINED DITCH SECTION (D)
NTS



SWALE SECTION (E)
NTS

Calculations show 1.5' depth. Please revise for consistency.

BENCHMARK:
THE VERTICAL DATUM IS BASED OFF AN OPUS SOLUTION RAN ON CONTROL POINT #100 (NO. 4 REBAR) AND IS ADJUSTED TO NGVD 1929, ELEVATION 6754.61

Add "PCD File No. PPR2346"

NOR'WOOD BIBLE CHURCH
LOT 38, SADDLEHORN RANCH FILING NO. 3

DEVELOPED DRAINAGE PLAN

REVISION	BY	DATE
NO. 1	JPS	

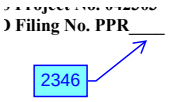
JPS ENGINEERING
19 E. Willamette Ave.
Colorado Springs, CO 80903
PH: 719-477-9429
FAX: 719-471-0766
www.jpsengr.com

CALL UTILITY NOTIFICATION CENTER OF COLORADO
1-800-922-1987
CALL 2 BUSINESS DAYS IN ADVANCE BEFORE YOU DIG, GRADE, OR EXCAVATE FOR THE MARKING OF UNDERGROUND MEMBER UTILITIES.

HORZ. SCALE:	1"=40'
VERT. SCALE:	N/A
SURVEYED:	JR
CREATED:	08/29/22
PROJECT NO:	042303
DRAWN:	PV
DESIGNED:	JPS
CHECKED:	JPS
LAST MODIFIED:	10/12/23
MODIFIED BY:	PV
SHEET:	D1

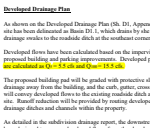
V1_Drainage Report Comments.pdf Markup Summary

Carlos (23)



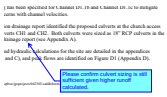
Subject: Text Box
Page Label: 1
Author: Carlos
Date: 12/11/2023 2:17:22 PM
Color:

2346



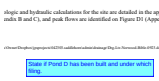
Subject: Highlight
Page Label: 5
Author: Carlos
Date: 12/12/2023 8:59:55 AM
Color:

are calculated as Q5 = 5.5 cfs and Q100 = 15.5 cfs.



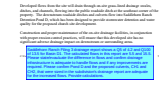
Subject: Text Box
Page Label: 5
Author: Carlos
Date: 12/12/2023 9:01:21 AM
Color:

Please confirm culvert sizing is still sufficient given higher runoff calculated.



Subject: Text Box
Page Label: 5
Author: Carlos
Date: 12/12/2023 10:16:59 AM
Color:

State if Pond D has been built and under which filing.



Subject: Text Box
Page Label: 7
Author: Carlos
Date: 12/12/2023 9:05:39 AM
Color:

Saddlehorn Ranch Filing 3 drainage report shows a Q5 of 4.2 and Q100 of 13.5 for Basin D1. The calculated flows in this report are 5.5 and 15.5. Please state/evaluate the difference in flows and confirm drainage infrastructure is adequate to handle flows and if any improvements are required. Please confirm Pond D and the proposed culverts, CH1 and CH2, that were sized in the subdivision's drainage report are adequate for the increased flows. Provide calculations.

Subject: Text Box
Page Label: 8
Author: Carlos
Date: 12/12/2023 9:06:07 AM
Color:

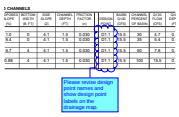
Please provide a cost estimate for all drainage improvements (culverts, etc).

Subject: Text Box
Page Label: 8
Author: Carlos
Date: 12/12/2023 9:10:49 AM
Color:

Please include a references section for all referenced reports, documents, and criteria.

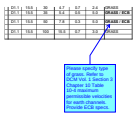
Subject: Text Box
Page Label: 13
Author: Carlos
Date: 12/12/2023 9:09:14 AM
Color:

Please provide update culvert calculations due to the runoff for the church site being greater than the runoff of Basin D1, which included lot 38 & 39, from the subdivision's drainage report.



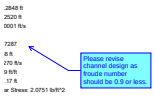
Subject: Cloud+
Page Label: 8
Author: Carlos
Date: 12/12/2023 9:21:25 AM
Color:

Please revise design point names and show design point labels on the drainage map.



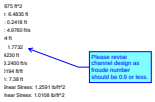
Subject: Callout
Page Label: 8
Author: Carlos
Date: 12/12/2023 9:32:31 AM
Color:

Please specify type of grass. Refer to DCM Vol. 1 Section 3 Chapter 10 Table 10-4 maximum permissible velocities for earth channels. Provide ECB specs.



Subject: Callout
Page Label: 10
Author: Carlos
Date: 12/12/2023 9:51:58 AM
Color:

Please revise channel design as froude number should be 0.9 or less.

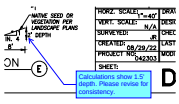


Subject: Callout
Page Label: 11
Author: Carlos
Date: 12/12/2023 9:52:10 AM
Color:

Please revise channel design as froude number should be 0.9 or less.

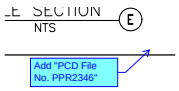
Subject: Text Box
Page Label: [1] EX1
Author: Carlos
Date: 12/12/2023 9:52:57 AM
Color:

Add "PCD File No. PPR2346"



Subject: Callout
Page Label: [1] D1
Author: Carlos
Date: 12/12/2023 9:16:01 AM
Color:

Calculations show 1.5' depth. Please revise for consistency.

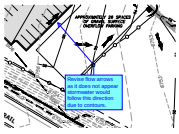


Subject: Text Box
Page Label: [1] D1
Author: Carlos
Date: 12/12/2023 9:16:29 AM
Color:

Add "PCD File No. PPR2346"

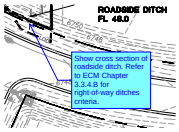
Subject: Callout
Page Label: [1] D1
Author: Carlos
Date: 12/12/2023 9:25:08 AM
Color:

Label FES, riprap, and details (depth, thickness, and length).



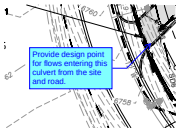
Subject: Callout
Page Label: [1] D1
Author: Carlos
Date: 12/12/2023 9:20:29 AM
Color:

Revise flow arrows as it does not appear stormwater would follow this direction due to contours.



Subject: Callout
Page Label: [1] D1
Author: Carlos
Date: 12/12/2023 9:26:45 AM
Color:

Show cross section of roadside ditch. Refer to ECM Chapter 3.3.4.B for right-of-way ditches criteria.



Subject: Callout
Page Label: [1] D1
Author: Carlos
Date: 12/12/2023 9:55:41 AM
Color:

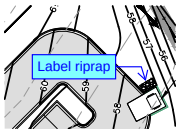
Provide design point for flows entering this culvert from the site and road.

Subject: Callout
Page Label: [1] D1
Author: Carlos
Date: 12/12/2023 9:56:37 AM
Color:

Provide design point for this culvert as per contours flows would come south from the parking lot's boundary.

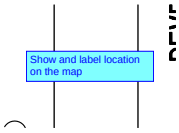
Subject: Callout
Page Label: [1] D1
Author: Carlos
Date: 12/12/2023 9:57:24 AM
Color:

Show curb cuts or how flows will be exiting the parking lot.



Subject: Callout
Page Label: [1] D1
Author: Carlos
Date: 12/12/2023 9:57:46 AM
Color:

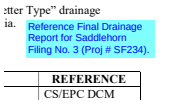
Label riprap



Subject: Text Box
Page Label: [1] D1
Author: Carlos
Date: 12/12/2023 9:58:50 AM
Color:

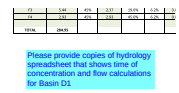
Show and label location on the map

CDurham (3)



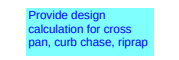
Subject: Text Box
Page Label: 3
Author: CDurham
Date: 12/12/2023 12:20:32 PM
Color:

Reference Final Drainage Report for Saddlehorn Filing No. 3 (Proj # SF234).



Subject: Text Box
Page Label: 12
Author: CDurham
Date: 12/13/2023 9:50:09 AM
Color:

Please provide copies of hydrology spreadsheet that shows time of concentration and flow calculations for Basin D1

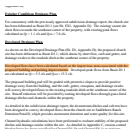


Subject: Text Box
Page Label: 7
Author: CDurham
Date: 12/13/2023 4:59:06 PM
Color:

Provide design calculation for cross pan, curb chase, riprap

Mikayla Hartford (9)

Subject: Stamp - Stormwater Comment Legend
Page Label: 1
Author: Mikayla Hartford
Date: 12/12/2023 11:05:48 AM
Color:



Subject: SW - Highlight
Page Label: 5
Author: Mikayla Hartford
Date: 12/12/2023 3:01:38 PM
Color:

Developed flows have been calculated based on the impervious areas associated with the proposed building and parking improvements

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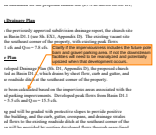
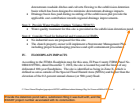


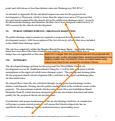
Subject: SW - Textbox with Arrow
Page Label: 5
Author: Mikayla Hartford
Date: 12/12/2023 3:02:32 PM
Color:

Clarify if the imperviousness includes the future pole barn and gravel parking area. If not the downstream facilities will need to be reanalyzed and potentially upsized when that development occurs.



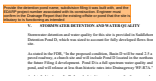
Subject: SW - Textbox with Arrow
Page Label: 6
Author: Mikayla Hartford
Date: 12/12/2023 2:49:51 PM
Color:

Provide the detention pond name, subdivision filing it was built with, and the EDARP project number associated with its construction.



Subject: SW - Textbox with Arrow
Page Label: 7
Author: Mikayla Hartford
Date: 12/12/2023 2:50:02 PM
Color:

Basin D1 is larger than the proposed site and the proposed site basins as well, so the calculated flows would be anticipated to be slightly smaller than the total D1 flows, as stated below verify culvert and Pond D can accept the increase in flows.



Subject: SW - Textbox with Arrow
Page Label: 7
Author: Mikayla Hartford
Date: 12/12/2023 2:49:25 PM
Color:

Provide the detention pond name, subdivision filing it was built with, and the EDARP project number associated with its construction. Engineer must confirm in the Drainage Report that the existing offsite or pond that the site is tributary to is functioning as intended

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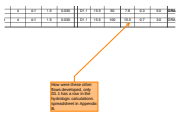
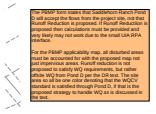


Subject: SW - Textbox with Arrow
Page Label: 8
Author: Mikayla Hartford
Date: 12/12/2023 2:55:19 PM
Color:

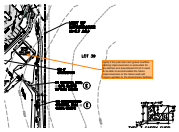
How were these other flows developed, only D1.1 has a row in the hydrologic calculations spreadsheet in Appendix B.



Subject: SW - Textbox
Page Label: [1] PBMP
Author: Mikayla Hartford
Date: 12/12/2023 2:57:32 PM
Color:

The PBMP form states that Saddlehorn Ranch Pond D will accept the flows from the project site, not that Runoff Reduction is proposed. If Runoff Reductiion is proposed then calculations must be provided and very likely may not work due to the small UIA:RPA interface.

For the PBMP applicability map, all disturbed areas must be accounted for with the proposed map not just impervious areas. Runoff reduction is not proposed to satisfy WQ requirements, but rather offsite WQ from Pond D per the DR text. The site area so all be one color denoting that the WQCV standard is satisfied through Pond D, if that is the proposed strategy to handle WQ as is discussed in the text.



Subject: SW - Textbox with Arrow
Page Label: [1] D1
Author: Mikayla Hartford
Date: 12/12/2023 3:00:48 PM
Color:

Verify if the pole barn and gravel overflow parking imperviousness is accounted for - the ditches and downstream Pond D need to be able to accommodate the future imperviousness or the future work will require updates to the downstream facilities.