FINAL DRAINAGE REPORT
FOR
TAMLIN ROAD RV STORAGE-EXPANSION
EL PASO COUNTY, COLORADO

December 2024

Prepared For:

Tamlin Storage, LLC
57 Newport Circle Unit B
Colorado Springs, CO 80906
(719) 659-7126

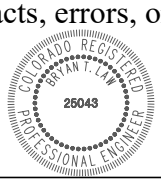
Prepared By:

JR ENGINEERING
5475 Tech Center Drive
Colorado Springs, CO 80919
(719) 593-2593

Job No. 25305.00

PCD File No.: PPR2437

ENGINEER'S STATEMENT:
The attached drainage report and plan was 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 omissions on my part in preparing this report.



Bryan T. Law, Colorado P.E. # 25043 Date
For and On Behalf of JR Engineering, LLC

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

Business Name: Tamlin Storage, LLC

By: _____
Parker Samelson

Title: _____

Address: 57 Newport Circle Unit B
Colorado Springs, CO 80906

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 Engineering Criteria Manual, as amended.

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

Conditions:

CONTENTS

PURPOSE

This document is the Final Drainage Report for Tamlin Road RV Storage-Expansion. The purpose of this report is to identify on-site and off-site drainage patterns, culverts, areas tributary to the site, and to safely route developed storm water to adequate outfall facilities.

GENERAL LOCATION AND DESCRIPTION

General Location

The proposed Tamlin Road RV Storage-Expansion development (hereby referred to as the "site") is located in a portion of Section 20, Township 13 South, Range 65 West of the Principal Meridian in unincorporated El Paso County, Colorado. The site is located northeast of the Tamlin Road and Marksheffel Road intersection. The site is bound by the existing Tamlin Road to the west and north, existing Tamlin Storage to the east, vacant land owned by BLH No. 2, LLC to the south. A vicinity map is presented in Appendix A.

Description of Property

The proposed site development proposes gravel drive aisles, parking spaces and a full-spectrum Extended Detention Basin (EDB). The site is currently unoccupied and undeveloped with an existing gravel maintenance road connecting from Tamlin Road to the Cherokee Water & Sanitation District parcel to the south. The existing ground cover is native vegetation.

Per a NRCS web soil survey of the area, the site is made up of Hydrologic Group A soils. Type A soils are typically deep well-drained to excessively drained sands that have a high infiltration rate when thoroughly wet. A NRCS soil survey map is presented in Appendix A.

Floodplain Statement

Based on the FEMA FIRM number 08041C0543G dated December 7, 2018, the site lies within Zone X. Zone X is defined as area outside the SFHA and higher than the elevation of the 0.2-percent-annual-chance (or 500-year) flood. The FIRM panel is presented in Appendix A.

MAJOR DRAINAGE BASINS AND SUB-BASINS

Major Basin Descriptions

The site lies within the West Tributary Sand Creek regional sub-basin within the Sand Creek Major Drainage Basin. The *Sand Creek Drainage Basin Planning Study* prepared by Kiowa Engineering revised in March 1996, evaluated the Sand Creek Major Drainage Basin, the existing facilities therein and provided recommendations for future development. A map of the Sand Creek regional sub-basins is presented in Appendix D.

The Sand Creek Basin covers approximately 54 square miles in unincorporated El Paso County and Colorado Springs. The undeveloped portions of the basin are generally rolling range land with fair vegetative cover associated with semi-arid climates. The headwaters of the basin are in Black Forest and general topography trends south to southwest towards the ultimate outfall into Fountain Creek. Per the *Sand Creek Drainage Basin Planning Study,* the Sand Creek East Fork sub tributary runs outside the western boundary of the site.

The East Tamlin Road RV and Boat Storage (PCD File PPR1945) covers approximately 10 acres with an existing full spectrum detention pond. The area was developed in 2020 under EPC Project No. 25134.00. The pond is functioning normally and is in good condition. A drainage map of the area is presented in Appendix D.

EXISTING DRAINAGE CONDITIONS

Existing Sub-basin Drainage

The existing basin delineation for the site as shown on the map within Appendix E is as follows:

Basin OS1 is approximately 1.10 acres and is comprised of undeveloped areas to the south of the project site. Flow will follow the historic path overland from the east to west and south to north towards DP1 (Q_5=0.3 cfs, Q_{100}=2.3 cfs). DP1 flows will then enter Basin EXA and follow the drainage patterns of that basin. The basin flows will combine at DP2.1.

Existing Basin EXA is approximately 3.18 acres and in the existing condition is comprised of undeveloped land and an existing gravel road. Runoff from this basin sheet flows from the eastern site boundary towards the western site boundary and to the low point located at DP2 (Q_5=1.2 cfs, Q_{100}=6.9 cfs). DP2 flows combine at DP2.1 (Q_5=1.5 cfs, Q_{100}=9.1 cfs) before flowing off-site to the southwest low point along Tamlin Road and continues downwards towards Marksheffel Rd.

A summary of existing basin parameters is presented in Appendix B.

PROPOSED DRAINAGE CONDITIONS

Proposed Drainage Conveyance

In general, developed flows are collected in a curb and gutter that leads to a swale, which convey water to the proposed full-spectrum EDB. The Proposed swale will be designed per the typical county rural roadside ditch section and designed to ensure they are stable and have required capacity to satisfy criteria. A swale is considered stable with a velocity of 5 ft/s or less. To ensure capacity, swales will have a minimum of 1 ft. of freeboard over the water surface for flows anticipated in a 100-year storm event. The roadside swales shall comply with Table 6-1 of the EPC DCM Volume 1.

Proposed Basin A is approximately 2.18 acres and in the proposed condition is comprised of proposed gravel drives, parking areas, and landscaping areas. Runoff from this basin sheet flows from the eastern site boundary towards the western site boundary towards the proposed swale. Runoff is then directed to the swale at DP1 (Q_5=3.8 cfs, Q_{100}=9.2 cfs) via curb and gutter. Captured flows are then directed to the proposed concrete bottom riprap berm forebay within the full-spectrum EDB (Pond A). Flows combine within Pond A at DP2.1

Proposed Basin B is approximately 0.62 acres and in the proposed condition is comprised of proposed parking areas and Pond A. Runoff from this basin sheet flows from the eastern site boundary towards Pond A at DP2 (Q_5=1.1 cfs, Q_{100}=2.8 cfs). DP2 flows combine with DP1 flows at the pond outlet structure, DP2.1 (Q_5=4.8 cfs, Q_{100}=11.6 cfs). Once treated, the flows are released through the proposed outlet structure at DP2.2 (Q_5=0.0 cfs, Q_{100}=2.8 cfs) and combine at DP4.1.

Basin OS1 is approximately 1.10 acres and is comprised of undeveloped areas to the south of the project site. Flow will follow the historic path overland from the east to west and south to north towards DP3 (Q_5=0.3 cfs, Q_{100}=2.3 cfs). DP3 flows will then enter Basin C and follow the drainage patterns of that basin. The basin flows will combine at DP4.1.

Proposed Basin C is approximately 0.37 acres and in the proposed condition is comprised of proposed grading to remain undeveloped once stabilized. Runoff from this basin sheet flows from north to south at DP4 (Q_5=0.2 cfs, Q_{100}=1.2 cfs). Runoff combines with DP3 and DP2.2 at DP4.1 (Q_5=0.5 cfs, Q_{100}=5.9 cfs) before flowing off-site to the low point along Tamlin Road.

A summary of proposed basin parameters is presented in Appendix B.

Comparison of Flows

Flows leave the southwestern part of the site at existing DP2.1 and proposed DP4.1. Existing DP2.1 flows (Q_5=1.5 cfs, Q_{100}=9.1 cfs) are greater than the proposed DP4.1 (Q_5=0.5 cfs, Q_{100}=5.9 cfs). The proposed flows in both the minor and major storm leave the site at less than or equal to the historic flow rates. Therefore, there is no negative impact anticipated to downstream properties.

DRAINAGE DESIGN CRITERIA

Development Criteria Reference

Storm drainage analysis and design criteria for the project were taken from the "City of Colorado Spring/El Paso County Drainage Criteria Manual" Volumes 1 and 2 (EPCDCM), dated October 12, 1994, the "Urban Storm Drainage Criteria Manual" Volumes 1 - 3 (USDCM) and Chapter 6 and Section 3.2.1 of Chapter 13 of the "Colorado Springs Drainage Criteria Manual (CCSDCM)", dated May 2014, as adopted by El Paso County, as well as the El Paso County "Engineering Criteria Manual" (ECM), dated October 14, 2020.

Hydrologic Criteria

All hydrologic data was obtained from the "El Paso Drainage Criteria Manual" Volumes 1 and 2, and the "Urban Drainage and Flood Control District Urban Storm Drainage Criteria Manual" Volumes 1, 2, and 3. On-site flows were determined based on the 5-year (minor) storm event and the 100-year (major) storm event. Runoff was calculated using the Rational Method, and rainfall intensities for the 5-year and the 100-year storm return frequencies were obtained from Figure 6-5 Intensity Duration Frequency Curve of the Colorado Springs DCM. Runoff coefficients were determined based on proposed land use and from data in Table 6-6 from the DCM. One-hour point rainfall data for the storm events are 1.50 inches for the 5-year and 2.52 inches for the 100-year storm.

Hydraulic Criteria

The Rational Method and USDCM's SF-2 and SF-3 forms were used to determine the runoff from the minor and major storms on the site. Autodesk Inc.'s Hydraflow Express Extension (Volume 10.5) was used to size the proposed drainage swales per criteria. The MHFD-Detention_v4.06 spreadsheet was utilized for evaluating proposed detention and water quality for Pond A. Required detention volumes and allowable release rates were designed per USDCM and CCS/EPCDCM. See Appendix C for calculations and preliminary pond sizing spreadsheets. The hydraulic design will be finalized with the Final Drainage Report.

DRAINAGE FACILITY DESIGN

General Concept

The proposed stormwater conveyance system was designed to convey the developed site flows to a full-spectrum EDB via swales and curb and gutter. The proposed full-spectrum EDB will be designed to release flows at less than or equal to historic rates to minimize adverse impacts downstream. Due to this, there are no drainage problems anticipated downstream of the site.

Specific Details

The proposed full-spectrum EDB (Pond A) will have a proposed forebay at the inflow point, concrete trickle channel and outlet structure. The proposed pond forebays and weir contain the required percentage of the Water Quality Capture Volume (WQCV). The forebay weir will release 1% of the undetained peak 100-year inflow into Pond A to the proposed concrete trickle channel. The trickle channel will direct flows into the proposed outlet structure, which will detain water per times specified by criteria. The WQCV will be released within 40 hours and the EURV will be released within 72 hours.

Four Step Process to Minimize Adverse Impacts of Urbanization

In accordance with the El Paso County Drainage Criteria Manual Volume 2, this site has implemented the four step process to minimize adverse impacts of urbanization. The four step process includes reducing runoff volumes, treating the water quality capture volume (WQCV), stabilizing drainageways and implement source controls.

Step 1: Reducing Runoff Volumes – The site development consists of gravel drive aisles and parking spaces with lawn areas interspersed within the development. This layout will allow for increased infiltration and reduce runoff volume.

Step 2: Provide WQCV - Runoff from this development is treated through capture and slow release of the WQCV in the on-site permanent full-spectrum EDB that is designed per current El Paso County drainage criteria. The 2.5-acre (minimum) residential lots will be limited to a maximum of 10% imperviousness to meet the requirements of Section I.7.1.B.5 of the ECM Stormwater Quality Policy and Procedure for water quality through a plat note. Should any lot exceed 10% imperviousness, a lot specific drainage report addressing the increased imperviousness must be submitted.

Step 3: Stabilize Drainageways – There are no major drainageways on the site that need to be stabilized. No drainage fees are due with this site development plan. If the site were to be platted in the future, drainage fees will be paid at that time in order to help fund major drainage improvements per the *Sand Creek Drainage Basin Planning Study*. Developed flows leaving the site are limited to below existing rates, and therefore no impact to downstream drainageways is anticipated.

Step 4: Implementing Long Term Source Controls - A site specific stormwater quality and erosion control plan and narrative shall be prepared in conjunction with the final drainage report. Site specific temporary source control BMPs as well as permanent BMP's will be detailed in that plan and narrative to protect receiving waters.

Water Quality

In accordance with Section 13.3.2.1 of the CCS/EPCDCM, full-spectrum water quality and detention will be provided for all of the development site not meeting exclusions present in the ECM - Stormwater Quality Policy and Procedures Section I.7.1.B. As previously stated, the applicable exclusions for Basin B fall under Section I.7.1.B.7 of the ECM Stormwater Quality Policy and Procedure for areas with land disturbance to undeveloped land that will remain undeveloped.

See the table below for the water quality treatment summary table indicating which basins are treated and which are excluded.

Table 1 - Water quality treatment summary table.

PBMP Summary Table		
Basins	**Tributary Area (acres)**	**PBMP**
A	2.18	POND A
B	0.62	POND A
C	0.37	EXCLUDED*
*EXCLUDED BASED ON LAND DISTURBANCE TO UNDEVELOPED LAND THAT WILL REMAIN UNDEVELOPED PER ECM APP. I.7.B.7		

Proposed Full-Spectrum EDB-Pond A

Water quality is provided for the site by a private full-spectrum detention pond. Table 2 below shows the basin parameters the proposed pond. Refer to Appendix C for the MHFD-Detention design sheets that include the tributary basin parameters as well as the stage-storage table and outlet structure design. The outlet structure includes an orifice plate, overflow grate, and restrictor plate to release stormwater at the appropriate rates. The 5-year and 100-year peak flows were overridden with the values of 1.2 and 6.9 found from a water analysis to size the pond more accurately, it is able to detain a higher volume of water than required. The WQCV will be released within 40 hours, the EURV will be released within 72 hours, and the minor and major flows will be released at or below the pre-development flow rate. Table 3 below gives the designed results for the Proposed Pond 1-5.

Table 2 - Watershed design parameters for both EDBs

Name	Watershed Area	Percent Impervious	Watershed Slope
Pond A	2.80 ac	50.00%	0.035 ft/ft

Table 3- Full-spectrum EDB design for both EDBs

Name	**Required Volume (ac-ft)**	**Provided Volume (ac-ft)**	**WQCV (ac-ft)**	**EURV (ac-ft)**	**5-year Release (cfs)**	**100-year Release (cfs)**
Pond A	0.205	0.233	0.05	0.16	0.0	2.8

Calculations and pond design parameters are presented in Appendix C.

For Pond A, a broad-crested weir lined with buried soil riprap is provided as an emergency spillway along the western embankment of the pond. Pond A emergency flows and outlet outfalls via an 18" RCP directed to a riprap reinforced low-tailwater basin before being released off-site per the historic pattern.

Erosion Control Plan

See the Erosion Control Plans and Financial Assurance Estimate by JR Engineering.

Operation & Maintenance

In order to ensure the function and effectiveness of the stormwater infrastructure, maintenance activities such as inspection, routine maintenance, restorative maintenance, rehabilitation and repair, are required. All proposed drainage structures within any platted County R.O.W. (roadside ditches and local road culverts) will be owned and maintained by El Paso County. All proposed drainage structures within easements or tracts (full-spectrum water quality ponds and drainageway improvements) will be owned and maintained by the property owner unless another party accepts such responsibility in writing and responsibility is properly assigned through legal documentation. Inspection access for El Paso County will be provided through a maintenance easement.

Drainage and Bridge Fees

The proposed site lies within the Sand Creek Drainage Basin. This site is not proposed to be platted.

Construction Cost Opinion

Private Storm Facilities- (for Information Only):

Item	Description	Quantity	Unit	Unit Price	Cost
1	18' RCP	13	LF	$ 82.00	$ 1,066.00
2	18" FES	1	EA	$ 492.00	
3	Emergency Spillway- Type LV Riprap	43	CY	$ 60.00	$ 2,580.00
4	Full-Spectrum EDB (inflow pipes, forebay, trickle channel, outlet structure, spillway, and maintenace trail)	1	EA	$ 12,000.00	$ 12,000.00
				Sub-Total	$ 15,646.00
				10% Contingency	$ 1,564.60
				Total	**$ 17,210.60**

Notes: Cost estimate does not include: site landscaping, irrigation, fence/gate, site lighting, utilitities off-site or public improvements. The cost estimate assumes no traffic/ public roadway improvements are required. Unit costs are from the 2024 El Paso County FAE form.

See FAE for proposed public improvements. JR Engineering cannot and does not guarantee that the construction cost will not vary from these opinions of probable construction costs.

SUMMARY

The Preliminary Drainage Report for Tamlin Road RV Storage-Expansion identifies on-site and off-site drainage patterns, storm sewer, areas tributary to the site and safely routes developed storm water to adequate outfall facilities. The proposed Tamlin Road RV Storage-Expansion development will not adversely affect the off-site major drainageways or surrounding development. This report meets the latest El Paso County Drainage Criteria requirements for this site.

REFERENCES:

1. Engineering Criteria Manual, El Paso County, October 14, 2020.

2. City of Colorado Springs Drainage Criteria Manual Volume 1, City of Colorado Springs, CO, May 2014.

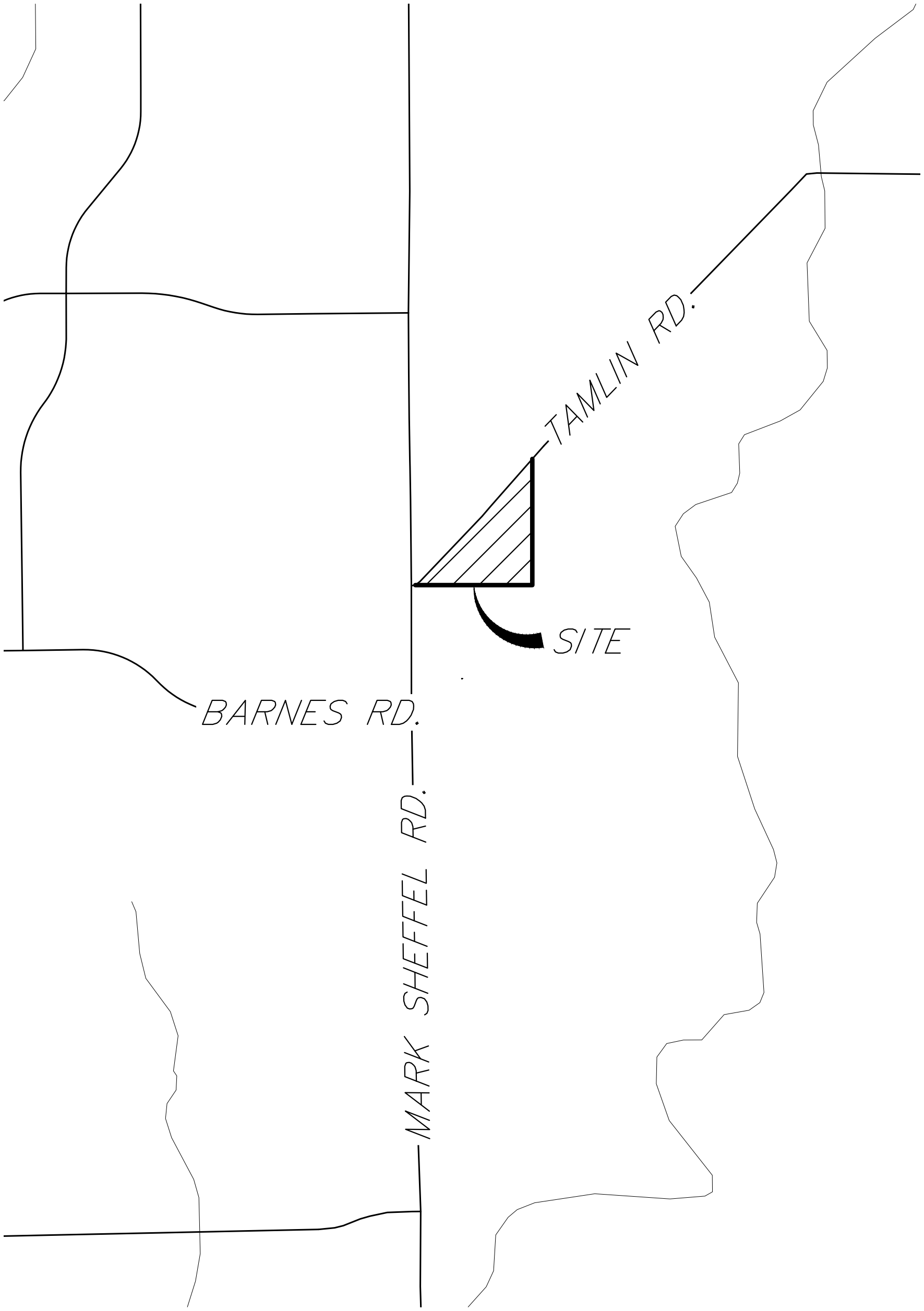
3. Urban Storm Drainage Criteria Manual, Urban Drainage and Flood Control District, Latest Revision.

4. Sand Creek Drainage Basin Planning Study Final Drainage Report, Kiowa Engineering Corporation, March 1996.

5. Final Drainage Report for Tamlin Road RV & Boat Storage, JR Engineering, LLC, July 2020.

APPENDIX A

FIGURES AND EXHIBITS



1000 500 0 1000 2000

ORIGINAL SCALE: 1" = 1000'

VICINITY MAP
TAMLIN STORAGE LLC.
JOB NO. 25305.00
07/29/2024
SHEET 1 OF 1

J·R ENGINEERING
A Westrian Company

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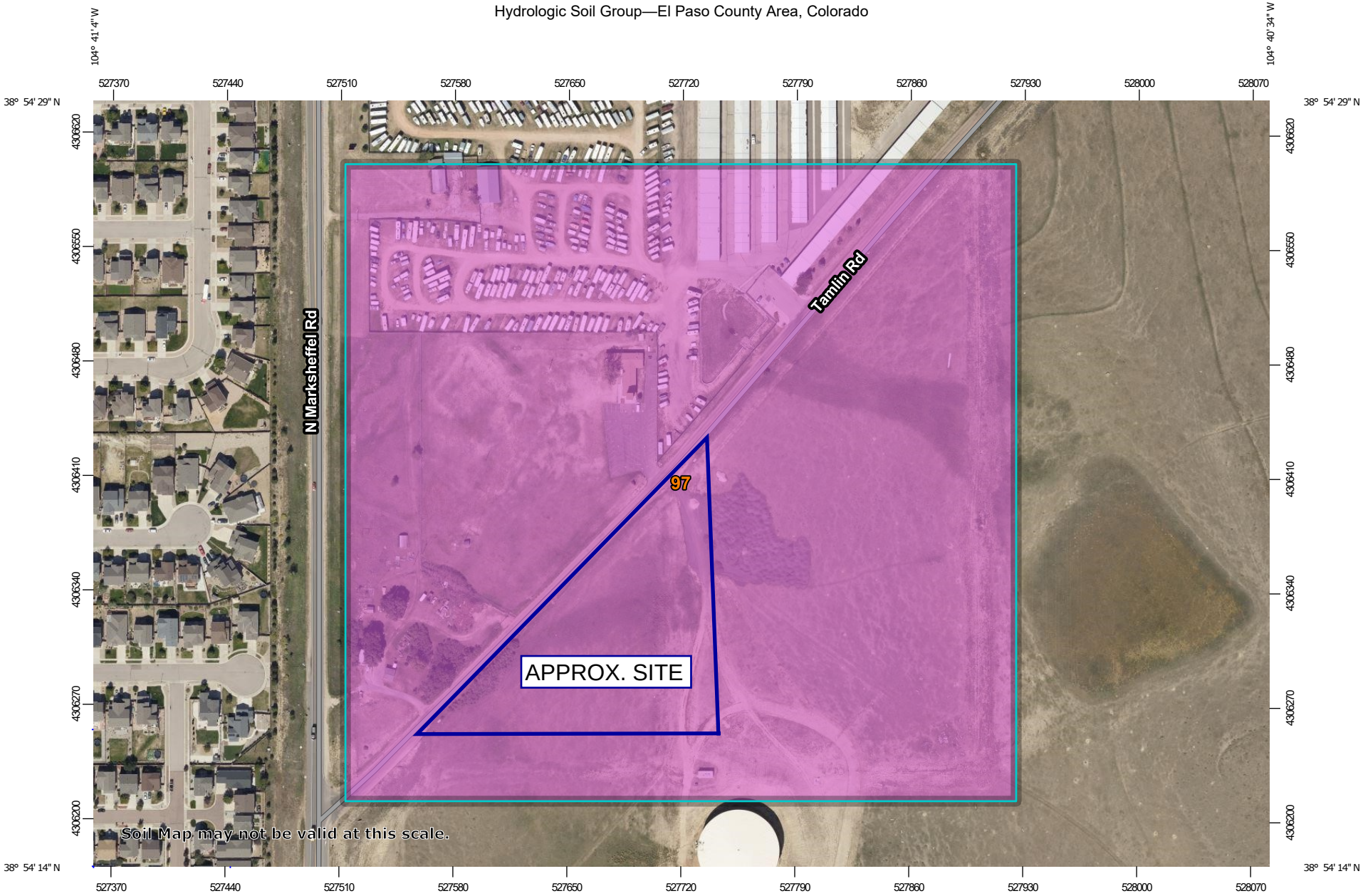


Map Scale: 1:3,300 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 45 90 180 270

Feet
0 150 300 600 900

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

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

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

Soil Rating Lines

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

Soil Rating Points

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

Water Features

- Streams and Canals

Transportation

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

Background

- Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 21, Aug 24, 2023

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

Date(s) aerial images were photographed: Aug 19, 2018—Sep 23, 2018

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
97	Truckton sandy loam, 3 to 9 percent slopes	A	39.8	100.0%
Totals for Area of Interest			**39.8**	**100.0%**

Description

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

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

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

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

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

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

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

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

NOTES TO USERS

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

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

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

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

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

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

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

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

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

Base Map information shown on this FIRM was provided in digital format by El Paso County, Colorado Springs Utilities, and Anderson Consulting Engineers, Inc. These data are current as of 2008.

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

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

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

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

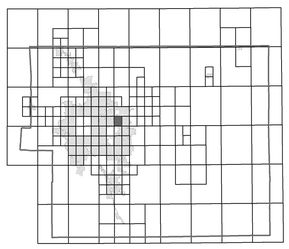
If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call **1-877-FEMA MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/business/nfip.

El Paso County Vertical Datum Offset Table

Flooding Source	Vertical Datum Offset (ft)

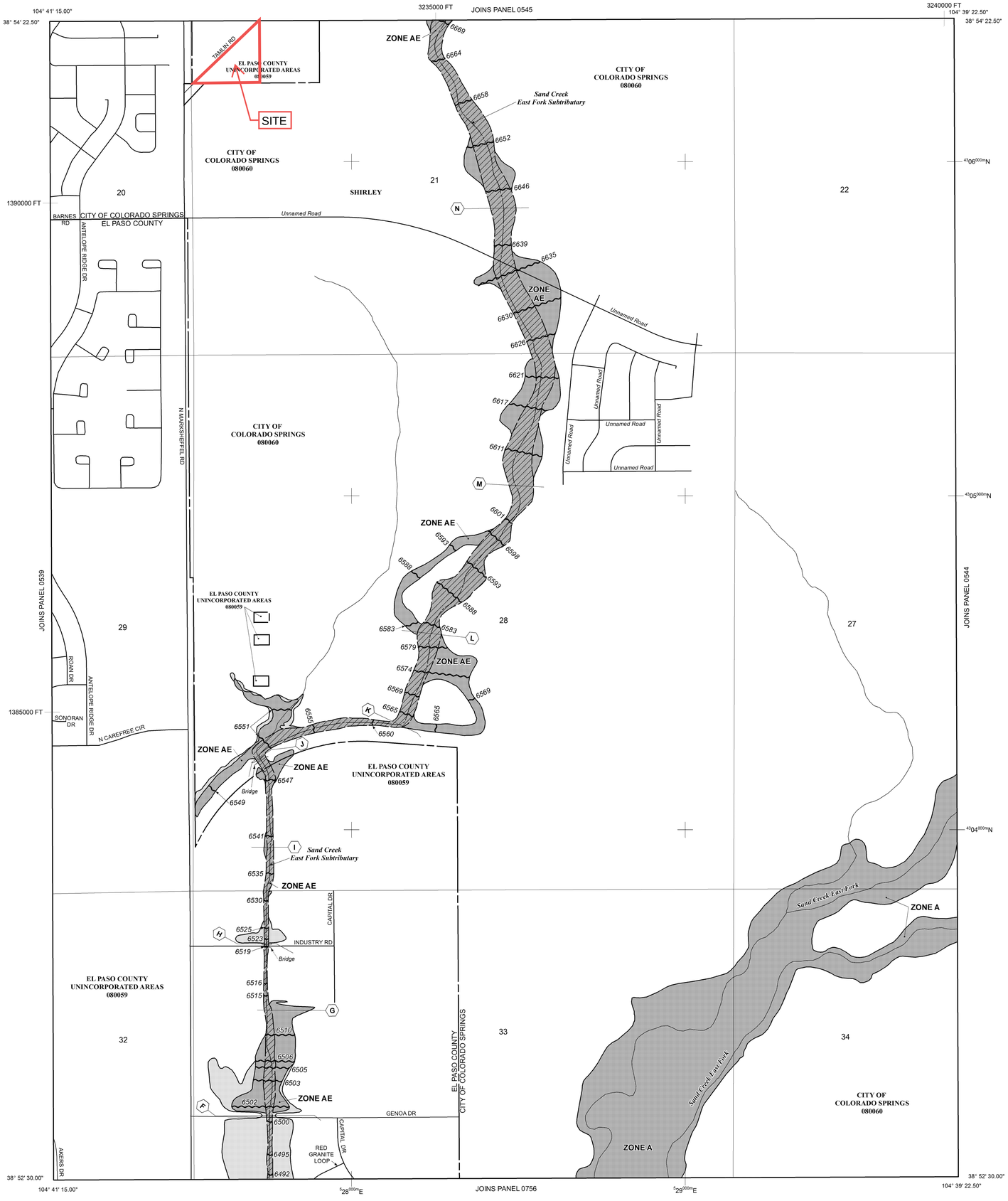
REFER TO SECTION 3.3 OF THE EL PASO COUNTY FLOOD INSURANCE STUDY FOR STREAM BY STREAM VERTICAL DATUM CONVERSION INFORMATION

Panel Location Map



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

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



LEGEND

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

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

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

FLOODWAY AREAS IN ZONE AE

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

OTHER FLOOD AREAS

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

OTHER AREAS

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

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

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

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

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

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

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

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

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

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

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

MAP SCALE 1" = 500'

250 0 500 1000 FEET
150 0 150 300 METERS

NFIP

PANEL 0543G

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

EL PASO COUNTY, COLORADO AND INCORPORATED AREAS

PANEL 543 OF 1300

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
COLORADO SPRINGS, CITY OF	080060	0543	G
EL PASO COUNTY	080059	0543	G

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
08041C0543G

MAP REVISED
DECEMBER 7, 2018

Federal Emergency Management Agency

APPENDIX B

HYDROLOGIC CALCULATIONS

EXISTING COMPOSITE % IMPERVIOUS/C VALUE CALCULATIONS

Subdivision: Tamlin Road RV Storage-Expansion
Location: Colorado Springs

Project Name: Tamlin Road RV Storage-Expansion
Project No.: 25305.00
Calculated By: GAG
Checked By:
Date: 8/2/24

Basin ID	Total Area (ac)	Paved Streets/Concrete (100% Impervious)				Gravel Streets (80% Impervious)				Lawns/ Undeveloped (2% Impervious)				Basin Total Weighted C		Basins Total Weighted % Imp.
		C_5	C_{100}	Area (ac)	Weighted % Imp.	C_5	C_{100}	Area (ac)	Weighted % Imp.	C_5	C_{100}	Area (ac)	Weighted % Imp.	C_5	C_{100}	
EXA	3.18	0.90	0.96	0.00	0.0%	0.59	0.70	0.12	3.0%	0.09	0.36	3.06	1.9%	0.11	0.37	4.9%
OS1	1.10	0.90	0.96	0.00	0.0%	0.59	0.70	0.00	0.0%	0.09	0.36	1.10	2.0%	0.09	0.36	2.0%
Total	4.28															4.2%
Total On-Site	3.18															4.9%

EXISTING STANDARD FORM SF-2
TIME OF CONCENTRATION

Subdivision: Tamlin Road RV Storage-Expansion
Location: Colorado Springs

Project Name: Tamlin Road RV Storage-Expansion
Project No.: 25305.00
Calculated By: GAG
Checked By:
Date: 8/2/24

SUB-BASIN DATA						INITIAL/OVERLAND (T_i)			TRAVEL TIME (T_t)					*tc* CHECK (URBANIZED BASINS)			FINAL
BASIN ID	D.A. (ac)	Hydrologic Soils Group	Impervious (%)	C_5	C_{100}	L (ft)	S_o (%)	t_i (min)	L_t (ft)	S_t (%)	K	VEL. (ft/s)	t_t (min)	COMP. t_c (min)	TOTAL LENGTH (ft)	Urbanized t_c (min)	t_c (min)
EXA	3.18	A	5%	0.11	0.37	300	9.7%	14.6	90	6.7%	7.0	1.8	0.8	15.5	390.0	25.8	15.5
OS1	1.10	A	2%	0.09	0.36	300	8.3%	15.7	25	3.8%	7.0	1.4	0.3	16.0	325.0	25.9	16.0

NOTES:

$$t_c = t_i + t_t$$ Equation 6-2

Where:

t_c = computed time of concentration (minutes)

t_i = overland (initial) flow time (minutes)

t_t = channelized flow time (minutes).

$$t_t = \frac{L_t}{60K\sqrt{S_o}} = \frac{L_t}{60V_t}$$ Equation 6-4

Where:

t_t = channelized flow time (travel time, min)
L_t = waterway length (ft)
S_o = waterway slope (ft/ft)
V_t = travel time velocity (ft/sec) = $K\sqrt{S_o}$
K = NRCS conveyance factor (see Table 6-2).

$$t_i = \frac{0.395(1.1 - C_5)\sqrt{L_i}}{S_o^{0.33}}$$ Equation 6-3

Where:

t_i = overland (initial) flow time (minutes)
C_5 = runoff coefficient for 5-year frequency (from Table 6-4)
L_i = length of overland flow (ft)
S_o = average slope along the overland flow path (ft/ft).

$$t_c = (26 - 17i) + \frac{L_t}{60(14i + 9)\sqrt{S_t}}$$ Equation 6-5

Where:

t_c = minimum time of concentration for first design point when less than t_c from Equation 6-1.
L_t = length of channelized flow path (ft)
i = imperviousness (expressed as a decimal)
S_t = slope of the channelized flow path (ft/ft).

Table 6-2. NRCS Conveyance factors, K

Type of Land Surface	Conveyance Factor, K
Heavy meadow	2.5
Tillage/field	5
Short pasture and lawns	7
Nearly bare ground	10
Grassed waterway	15
Paved areas and shallow paved swales	20

Use a minimum t_c value of 5 minutes for urbanized areas and a minimum t_c value of 10 minutes for areas that are not considered urban. Use minimum values even when calculations result in a lesser time of concentration.

EXISTING STANDARD FORM SF-3

STORM DRAINAGE SYSTEM DESIGN

(RATIONAL METHOD PROCEDURE)

Subdivision: Tamlin Road RV Storage-Expansion
Location: Colorado Springs
Design Storm: 5-Year

Project Name: Tamlin Road RV Storage-Expansion
Project No.: 25305.00
Calculated By: GAG
Checked By:
Date: 8/2/24

STREET	Design Point	DIRECT RUNOFF							TOTAL RUNOFF				STREET			PIPE				TRAVEL TIME			REMARKS
		Basin ID	Area (Ac)	Runoff Coeff.	t_c (min)	C*A (Ac)	I (in/hr)	Q (cfs)	tc (min)	C*A (ac)	I (in/hr)	Q (cfs)	Q_{street} (cfs)	C*A (ac)	Slope (%)	Q_{pipe} (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t_t (min)	
	1	OS1	1.10	0.09	16.0	0.10	3.42	0.3															Off-site flows from the south towards DP1 Combines flow at DP2.1
	2	EXA	3.18	0.11	15.5	0.35	3.47	1.2															Sheet flows to the western boundary at DP2 Combines flow at DP2.1
	2.1								16.0	0.45	3.42	1.5											Combines flow of DP1 and DP2 at low point Flows offsite to existing low point in Tamlin Road

Notes:
Street and Pipe C*A values are determined by Q/i using the catchment's intensity value.

EXISTING STANDARD FORM SF-3

STORM DRAINAGE SYSTEM DESIGN

(RATIONAL METHOD PROCEDURE)

Subdivision: Tamlin Road RV Storage-Expansion
Location: Colorado Springs
Design Storm: 100-Year

Project Name: Tamlin Road RV Storage-Expansion
Project No.: 25305.00
Calculated By: GAG
Checked By:
Date: 8/2/24

		DIRECT RUNOFF							TOTAL RUNOFF				STREET			PIPE				TRAVEL TIME			
STREET	Design Point	Basin ID	Area (ac)	Runoff Coeff.	t_c (min)	C*A (ac)	I (in/hr)	Q (cfs)	tc (min)	C*A (ac)	I (in/hr)	Q (cfs)	Q_{street} (cfs)	C*A (ac)	Slope (%)	Q_{pipe} (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t_t (min)	REMARKS
	1	OS1	1.10	0.36	16.0	0.40	5.75	2.3															Off-site flows from the south towards DP1 Combines flow at DP2.1
	2	EXA	3.18	0.37	15.5	1.19	5.83	6.9															Sheet flows to the western boundary at DP2 Combines flow at DP2.1
	2.1								16.0	1.59	5.75	9.1											Combines flow of DP1 and DP2 at low point Flows offsite to existing low point in Tamlin Road

Notes:
Street and Pipe C*A values are determined by Q/i using the catchment's intensity value.

PROPOSED COMPOSITE % IMPERVIOUS/C VALUE CALCULATIONS

Subdivision: Tamlin Road RV Storage-Expansion
Location: Colorado Springs

Project Name: Tamlin Road RV Storage-Expansion
Project No.: 25305.00
Calculated By: DSG
Checked By:
Date: 9/3/24

Basin ID	Total Area (ac)	Paved Streets/Concrete (100% Impervious)				Gravel Streets (80% Impervious)				Lawns/ Undeveloped (2% Impervious)				Basin Total Weighted C		Basins Total Weighted % Imp.
		C_5	C_{100}	Area (ac)	Weighted % Imp.	C_5	C_{100}	Area (ac)	Weighted % Imp.	C_5	C_{100}	Area (ac)	Weighted % Imp.	C_5	C_{100}	
A	2.18	0.90	0.96	0.00	0.0%	0.59	0.70	1.37	50.3%	0.09	0.36	0.81	0.7%	0.40	0.57	51.0%
B	0.62	0.90	0.96	0.01	1.6%	0.59	0.70	0.34	43.9%	0.09	0.36	0.27	0.9%	0.38	0.56	46.4%
C	0.37	0.90	0.96	0.00	0.0%	0.59	0.70	0.02	4.3%	0.09	0.36	0.35	1.9%	0.12	0.38	6.2%
OS1	1.10	0.90	0.96	0.00	0.0%	0.59	0.70	0.00	0.0%	0.09	0.36	1.10	2.0%	0.09	0.36	2.0%
Total	**4.27**															**33.8%**
Total On-site	**3.17**															**33.3%**
Total Pond A (Basin A)	**2.80**															**50.0%**

PROPOSED STANDARD FORM SF-2
TIME OF CONCENTRATION

Subdivision: Tamlin Road RV Storage-Expansion
Location: Colorado Springs

Project Name: Tamlin Road RV Storage-Expansion
Project No.: 25305.00
Calculated By: DSG
Checked By:
Date: 9/3/24

SUB-BASIN DATA						INITIAL/OVERLAND (T_i)			TRAVEL TIME (T_t)					*tc* CHECK (URBANIZED BASINS)			FINAL
BASIN ID	D.A. (ac)	Hydrologic Soils Group	Impervious (%)	C_5	C_{100}	L (ft)	S_o (%)	t_i (min)	L_t (ft)	S_t (%)	K	VEL. (ft/s)	t_t (min)	COMP. t_c (min)	TOTAL LENGTH (ft)	Urbanized t_c (min)	t_c (min)
A	2.18	A	51%	0.40	0.57	100	6.5%	6.8	340	2.5%	20.0	3.2	1.8	8.6	440.0	19.5	8.6
B	0.62	A	46%	0.38	0.56	100	15.0%	5.3	95	3.5%	15.0	2.8	0.6	5.9	195.0	18.7	5.9
C	0.37	A	6%	0.12	0.38	30	25.0%	3.4	0	0.0%	10.0	0.0	0.0	3.4	30.0	24.9	5.0
OS1	1.10	A	2%	0.09	0.36	300	8.3%	15.7	25	3.8%	7.0	1.4	0.3	16.0	325.0	25.9	16.0

NOTES:

$$t_c = t_i + t_t$$ Equation 6-2

Where:

t_c = computed time of concentration (minutes)

t_i = overland (initial) flow time (minutes)

t_t = channelized flow time (minutes).

$$t_t = \frac{L_t}{60K\sqrt{S_o}} = \frac{L_t}{60V_t}$$ Equation 6-4

Where:

t_t = channelized flow time (travel time, min)
L_t = waterway length (ft)
S_o = waterway slope (ft/ft)
V_t = travel time velocity (ft/sec) = $K\sqrt{S_o}$
K = NRCS conveyance factor (see Table 6-2).

$$t_i = \frac{0.395(1.1 - C_5)\sqrt{L_i}}{S_o^{0.33}}$$ Equation 6-3

Where:

t_i = overland (initial) flow time (minutes)
C_5 = runoff coefficient for 5-year frequency (from Table 6-4)
L_i = length of overland flow (ft)
S_o = average slope along the overland flow path (ft/ft).

$$t_c = (26 - 17i) + \frac{L_t}{60(14i + 9)\sqrt{S_t}}$$ Equation 6-5

Where:

t_c = minimum time of concentration for first design point when less than t_c from Equation 6-1.
L_t = length of channelized flow path (ft)
i = imperviousness (expressed as a decimal)
S_t = slope of the channelized flow path (ft/ft).

Table 6-2. NRCS Conveyance factors, K

Type of Land Surface	Conveyance Factor, K
Heavy meadow	2.5
Tillage/field	5
Short pasture and lawns	7
Nearly bare ground	10
Grassed waterway	15
Paved areas and shallow paved swales	20

Use a minimum t_c value of 5 minutes for urbanized areas and a minimum t_c value of 10 minutes for areas that are not considered urban. Use minimum values even when calculations result in a lesser time of concentration.

PROPOSED STANDARD FORM SF-3

STORM DRAINAGE SYSTEM DESIGN

(RATIONAL METHOD PROCEDURE)

Subdivision: Tamlin Road RV Storage-Expansion
Location: Colorado Springs
Design Storm: 5-Year

Project Name: Tamlin Road RV Storage-Expansion
Project No.: 25305.00
Calculated By: DSG
Checked By:
Date: 9/3/24

		DIRECT RUNOFF							TOTAL RUNOFF				STREET			PIPE				TRAVEL TIME			
STREET	Design Point	Basin ID	Area (Ac)	Runoff Coeff.	t_c (min)	C*A (Ac)	I (in/hr)	Q (cfs)	tc (min)	C*A (ac)	I (in/hr)	Q (cfs)	Q_{street} (cfs)	C*A (ac)	Slope (%)	Q_{pipe} (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t_t (min)	REMARKS
	1	A	2.18	0.40	8.6	0.88	4.36	3.8															Flows along roadside swale to rundown at DP1 Combines flow at DP2.1 within Pond A
	2	B	0.62	0.38	5.9	0.23	4.92	1.1															Sheet flows into Pond A at DP2 Combines flow at DP2.1 within Pond A
	2.1								8.6	1.11	4.36	4.8											Combines flow of D1 and DP2 Combines at outlet structure at DP2.1
	2.2								-	-	-	0.0											Treats DP1 flow within Pond A Flows released to boundary along west
	3	OS1	1.10	0.09	16.0	0.10	3.42	0.3															Off-site flows from the south towards DP3 Combines flow at DP4.1
	4	C	0.37	0.12	5.0	0.04	5.17	0.2															Proposed flow around pond berm Combines flow at DP4.1
	4.1								16.0	0.14	3.42	0.5											Combines flow of DP2.2, DP3 and DP4 Flow released off-site to the west boundary

Notes:
Street and Pipe C*A values are determined by Q/i using the catchment's intensity value.

PROPOSED STANDARD FORM SF-3

STORM DRAINAGE SYSTEM DESIGN

(RATIONAL METHOD PROCEDURE)

Subdivision: Tamlin Road RV Storage-Expansion
Location: Colorado Springs
Design Storm: 100-Year

Project Name: Tamlin Road RV Storage-Expansion
Project No.: 25305.00
Calculated By: DSG
Checked By:
Date: 9/3/24

		DIRECT RUNOFF							TOTAL RUNOFF				STREET			PIPE				TRAVEL TIME			
STREET	Design Point	Basin ID	Area (ac)	Runoff Coeff.	t_c (min)	C*A (ac)	I (in/hr)	Q (cfs)	tc (min)	C*A (ac)	I (in/hr)	Q (cfs)	Q_{street} (cfs)	C*A (ac)	Slope (%)	Q_{pipe} (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t_t (min)	REMARKS
	1	A	2.18	0.57	8.6	1.25	7.32	9.2															Flows along roadside swale to rundown at DP1 Combines flow at DP2.1 within Pond A
	2	B	0.62	0.56	5.9	0.34	8.26	2.8															Sheet flows into Pond A at DP2 Combines flow at DP2.1 within Pond A
	2.1								8.6	1.59	7.32	11.6											Combines flow of D1 and DP2 Combines at outlet structure at DP2.1
	2.2								-	-	-	2.8											Treats DP1 flow within Pond A Flows released to boundary along west
	3	OS1	1.10	0.36	16.0	0.40	5.75	2.3															Off-site flows from the south towards DP3 Combines flow at DP4.1
	4	C	0.37	0.38	5.0	0.14	8.68	1.2															Proposed flow around pond berm Combines flow at DP4.1
	4.1								16.0	0.54	5.75	5.9											Combines flow of DP2.2, DP3 and DP4 Flow released off-site to the west boundary

Notes:
Street and Pipe C*A values are determined by Q/i using the catchment's intensity value.

APPENDIX C

HYDRAULIC CALCULATIONS

Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Monday, Sep 9 2024

DP1 Swale

Triangular

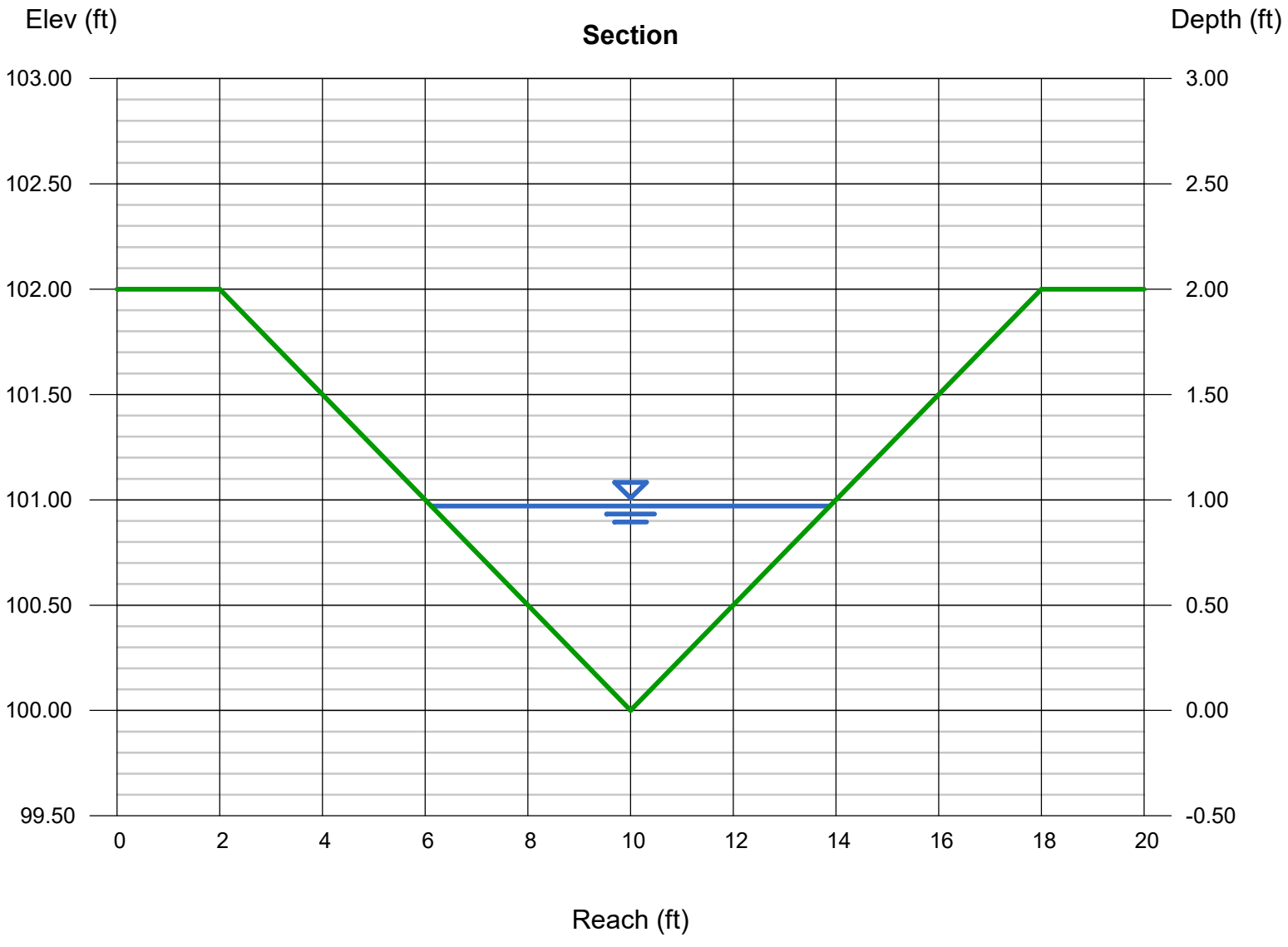
Side Slopes (z:1)	= 4.00, 4.00
Total Depth (ft)	= 2.00
Invert Elev (ft)	= 100.00
Slope (%)	= 1.00
N-Value	= 0.030

Calculations

Compute by:	Known Q
Known Q (cfs)	= 11.00

Highlighted

Depth (ft)	= 0.97
Q (cfs)	= 11.00
Area (sqft)	= 3.76
Velocity (ft/s)	= 2.92
Wetted Perim (ft)	= 8.00
Crit Depth, Yc (ft)	= 0.86
Top Width (ft)	= 7.76
EGL (ft)	= 1.10



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Monday, Sep 9 2024

DP1 Rundown

Triangular

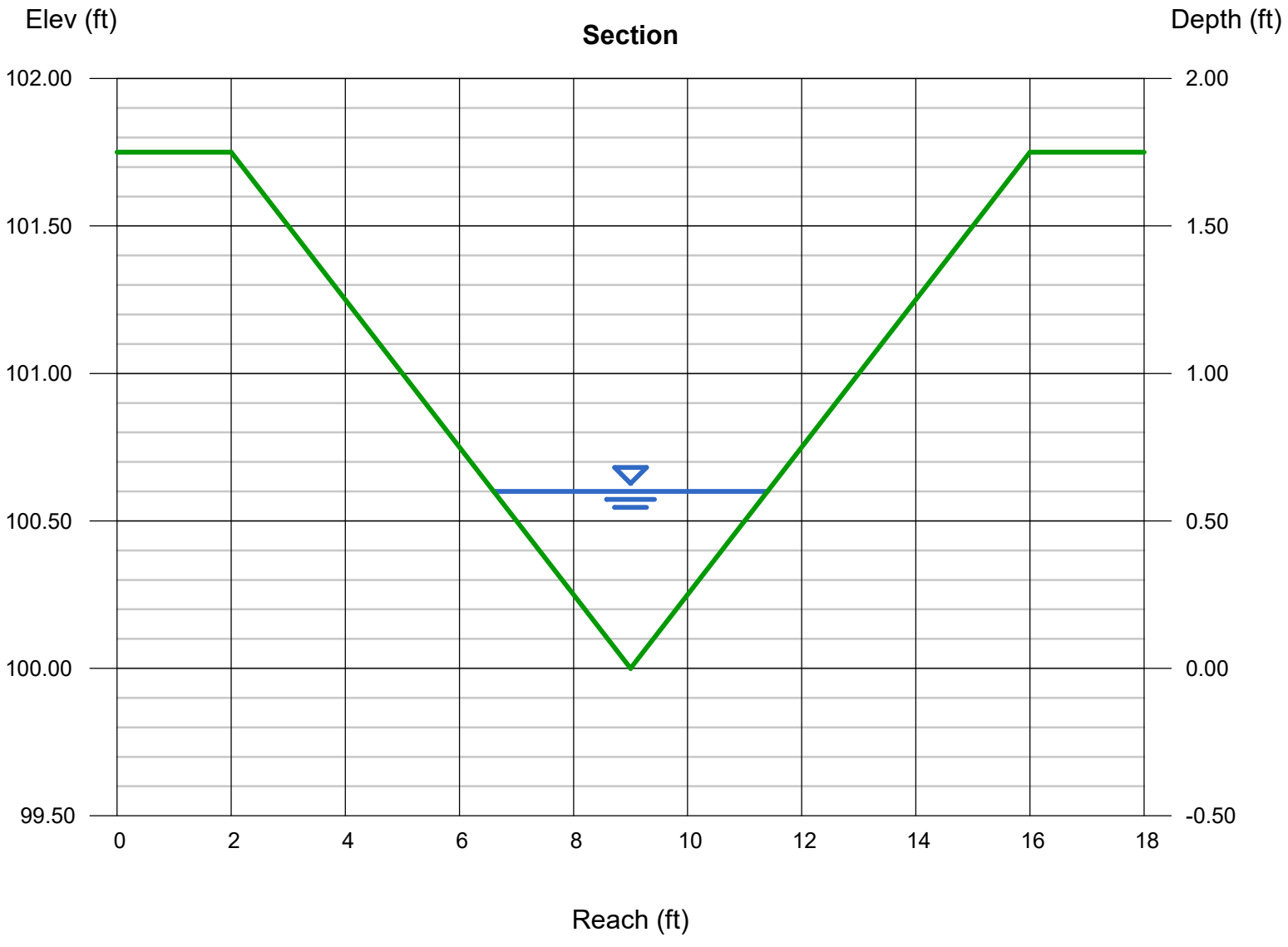
Side Slopes (z:1)	= 4.00, 4.00
Total Depth (ft)	= 1.75
Invert Elev (ft)	= 100.00
Slope (%)	= 13.00
N-Value	= 0.030

Calculations

Compute by:	Known Q
Known Q (cfs)	= 11.00

Highlighted

Depth (ft)	= 0.60
Q (cfs)	= 11.00
Area (sqft)	= 1.44
Velocity (ft/s)	= 7.64
Wetted Perim (ft)	= 4.95
Crit Depth, Yc (ft)	= 0.86
Top Width (ft)	= 4.80
EGL (ft)	= 1.51

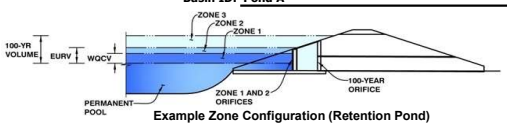


DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: **Tamlin Road RV Storage-Expansion**

Basin ID: **Pond A**



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	**EDB**	
Watershed Area =	2.80	acres
Watershed Length =	650	ft
Watershed Length to Centroid =	280	ft
Watershed Slope =	0.035	ft/ft
Watershed Imperviousness =	50.00%	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) =	0.048	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	0.161	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	0.117	acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	0.155	acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	0.186	acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	0.235	acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	0.282	acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	0.342	acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 3.14 in.) =	0.473	acre-feet		inches
Approximate 2-yr Detention Volume =	0.104	acre-feet		
Approximate 5-yr Detention Volume =	0.137	acre-feet		
Approximate 10-yr Detention Volume =	0.167	acre-feet		
Approximate 25-yr Detention Volume =	0.204	acre-feet		
Approximate 50-yr Detention Volume =	0.228	acre-feet		
Approximate 100-yr Detention Volume =	0.257	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.048	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.113	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.095	acre-feet
Total Detention Basin Volume =	0.257	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	

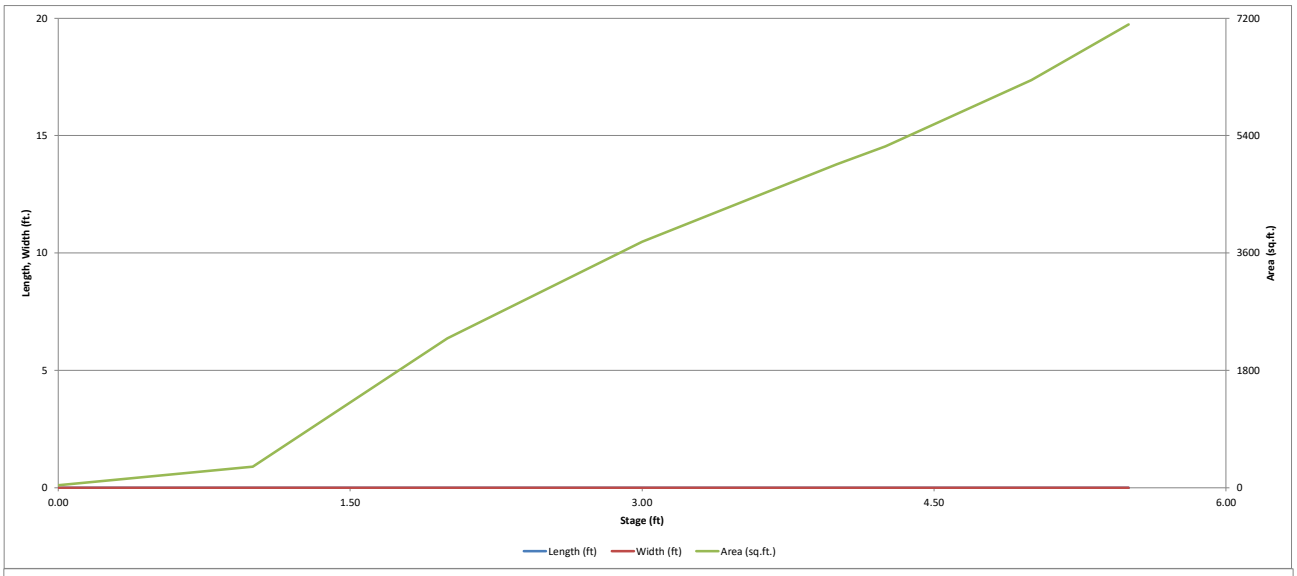
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user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

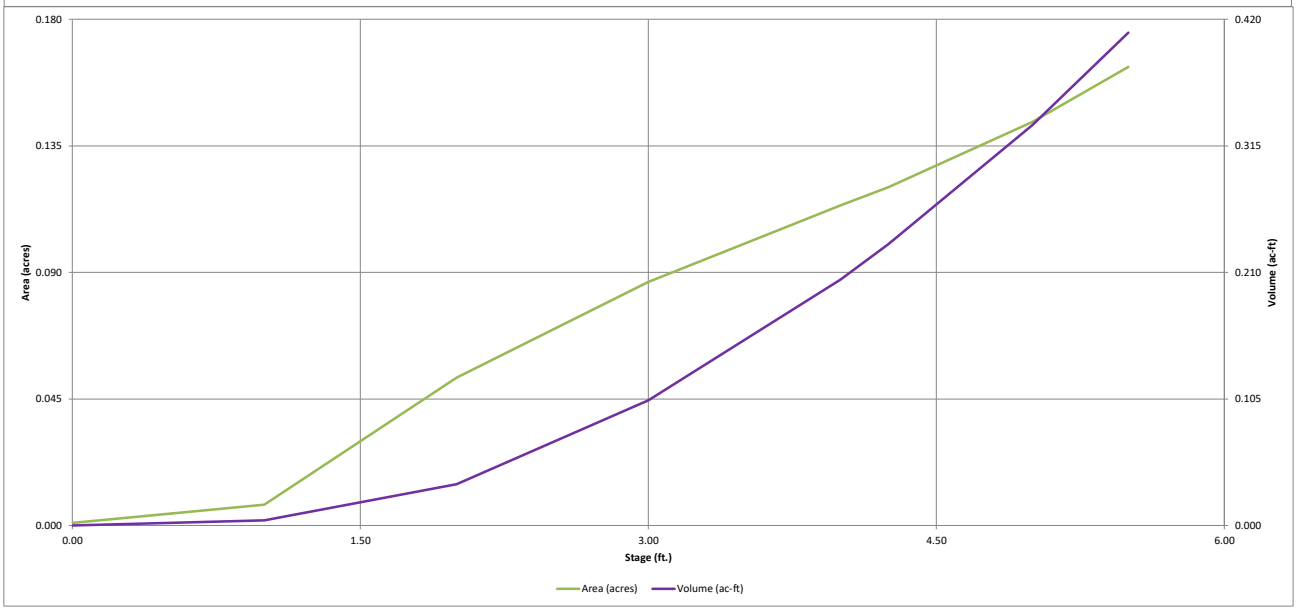
Depth Increment = ft

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		
6714	--	1.00	--	--	--	325	0.007	182	0.004
6715	--	2.00	--	--	--	2,290	0.053	1,490	0.034
6716	--	3.00	--	--	--	3,775	0.087	4,522	0.104
6717	--	4.00	--	--	--	4,960	0.114	8,890	0.204
6717.25	--	4.25	--	--	--	5,239	0.120	10,165	0.233
6718	--	5.00	--	--	--	6,254	0.144	14,475	0.332
6718.5	--	5.50	--	--	--	7,107	0.163	17,815	0.409

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)



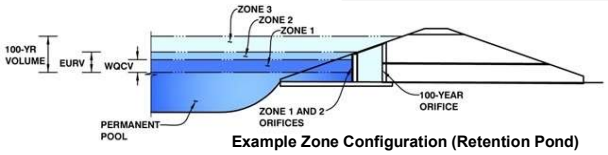


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: **Tamlin Road RV Storage-Expansion**

Basin ID: **Pond A**



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.25	0.048	Orifice Plate
Zone 2 (EURV)	3.61	0.113	Orifice Plate
Zone 3 (100-year)	4.44	0.095	Weir&Pipe (Restrict)
Total (all zones)		0.257	

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)

Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	N/A	ft^2
Depth at top of Zone using Orifice Plate =	3.71	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	N/A	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	N/A	sq. inches	Elliptical Slot Area =	N/A	ft^2

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	1.06	1.70					
Orifice Area (sq. inches)	0.17	0.30	0.42					

	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 =	3.75	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	3.75	N/A	feet
Overflow Weir Front Edge Length =	3.00	N/A	feet	Overflow Weir Slope Length =	3.00	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	4.03	N/A	
Horiz. Length of Weir Sides =	3.00	N/A	feet	Overflow Grate Open Area w/o Debris =	7.12	N/A	ft^2
Overflow Grate Type =	Close Mesh Grate	N/A		Overflow Grate Open Area w/ Debris =	3.56	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 =	2.08	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	1.77	N/A	ft^2
Outlet Pipe Diameter =	18.00	N/A	inches	Outlet Orifice Centroid =	0.75	N/A	feet
Restrictor Plate Height Above Pipe Invert =	18.00		inches	Half-Central Angle of Restrictor Plate on Pipe =	3.14	N/A	radians

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	4.25	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.25	feet
Spillway Crest Length =	14.00	feet	Stage at Top of Freeboard =	5.50	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	0.16	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	0.41	acre-ft

Calculated Parameters for Spillway

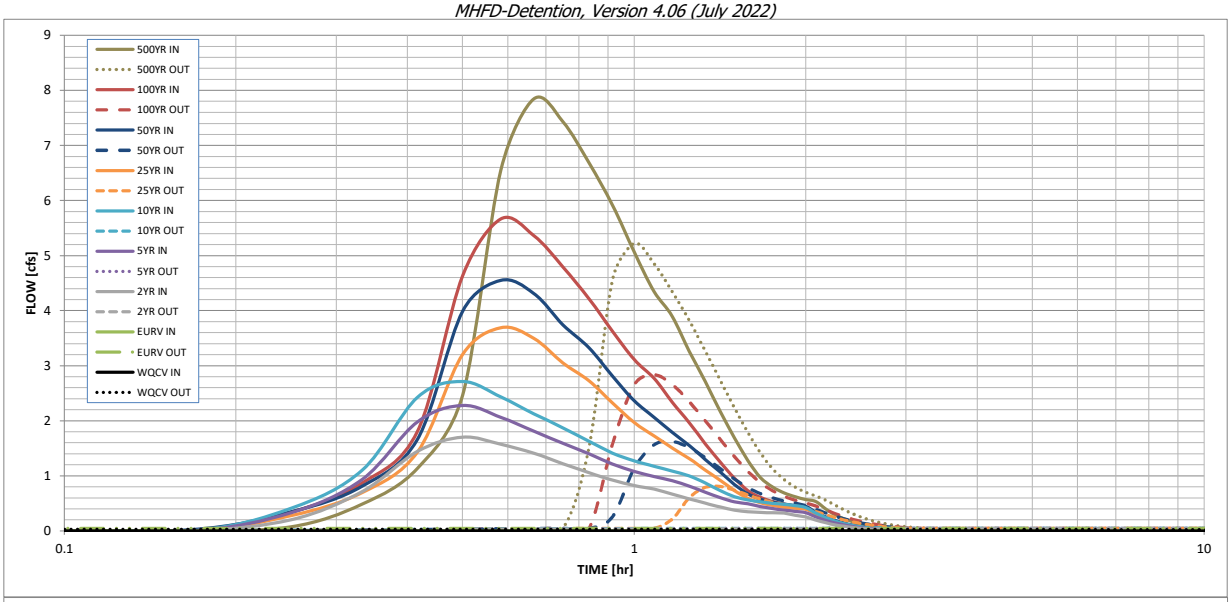
Routed Hydrograph Results

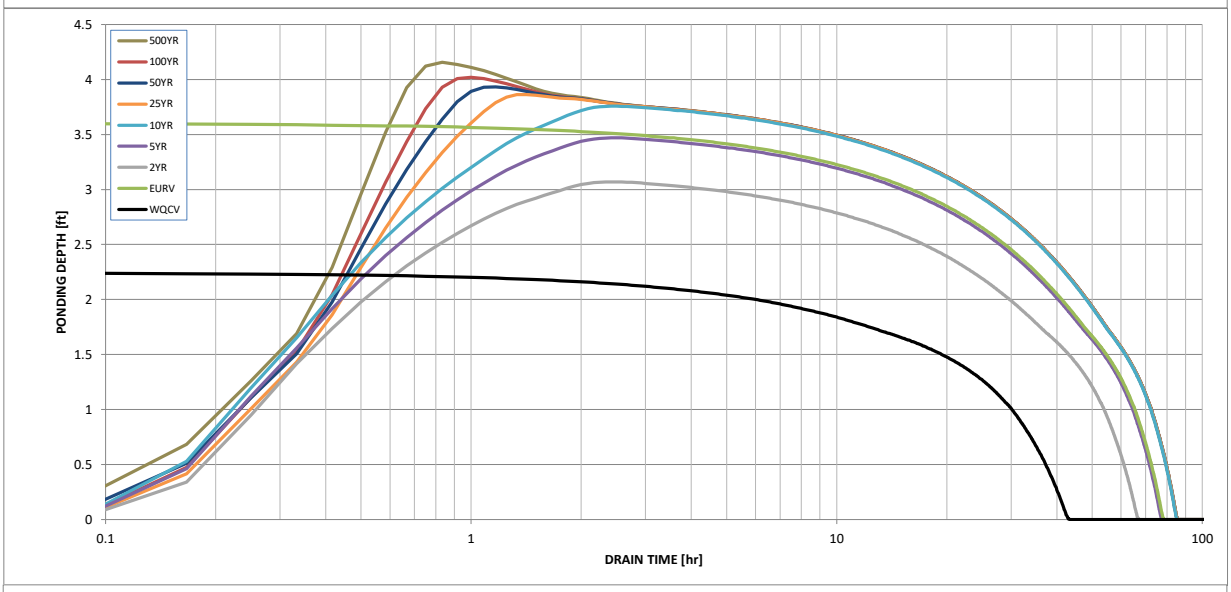
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

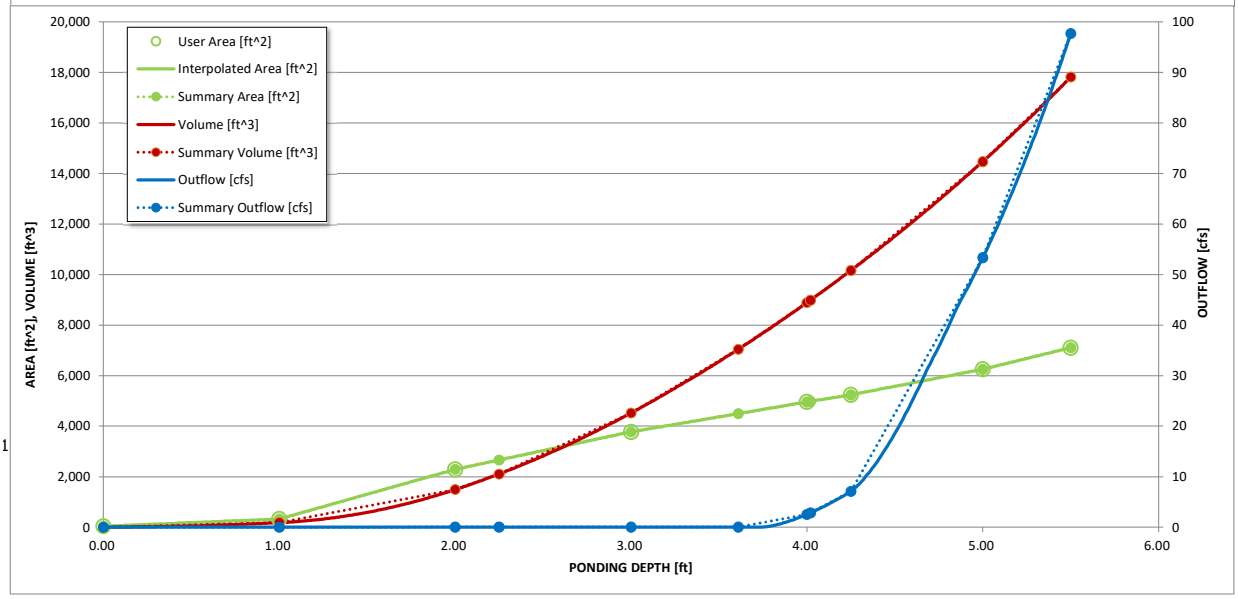
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.14
CUHP Runoff Volume (acre-ft) =	0.048	0.161	0.117	0.155	0.186	0.235	0.282	0.342	0.473
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.117	0.155	0.186	0.235	0.282	0.342	0.473
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.0	0.0	0.1	0.5	1.0	1.7	3.0
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A		1.2				6.9	
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.43	0.02	0.18	0.36	2.46	1.06
Peak Inflow Q (cfs) =	N/A	N/A	1.7	2.3	2.7	3.7	4.6	5.7	7.8
Peak Outflow Q (cfs) =	0.0	0.0	0.0	0.0	0.1	0.8	1.6	2.8	5.2
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.0	1.1	1.6	1.6	0.4	1.8
Structure Controlling Flow =	Plate	Plate	Plate	Plate	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	0.0	0.1	0.2	0.4	0.7
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) =	37	64	55	64	70	68	67	65	61
Time to Drain 99% of Inflow Volume (hours) =	**40**	72	61	71	78	77	76	74	72
Maximum Ponding Depth (ft) =	2.25	3.61	3.07	3.47	3.76	3.86	3.93	4.02	4.16
Area at Maximum Ponding Depth (acres) =	0.06	0.10	0.09	0.10	0.11	0.11	0.11	0.11	0.12
Maximum Volume Stored (acre-ft) =	0.048	0.162	0.110	0.147	0.176	0.188	0.196	0.205	0.221

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)







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

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	0.02	0.00	0.07
	0:15:00	0.00	0.00	0.20	0.33	0.41	0.28	0.35	0.34	0.49
	0:20:00	0.00	0.00	0.72	0.94	1.10	0.70	0.81	0.87	1.14
	0:25:00	0.00	0.00	1.44	1.98	2.43	1.44	1.67	1.81	2.47
	0:30:00	0.00	0.00	1.70	2.28	2.71	3.20	3.99	4.64	6.55
	0:35:00	0.00	0.00	1.57	2.06	2.43	3.69	4.55	5.67	7.85
	0:40:00	0.00	0.00	1.41	1.81	2.13	3.50	4.31	5.36	7.43
	0:45:00	0.00	0.00	1.22	1.59	1.87	3.05	3.74	4.79	6.68
	0:50:00	0.00	0.00	1.06	1.40	1.63	2.72	3.32	4.21	5.91
	0:55:00	0.00	0.00	0.92	1.21	1.41	2.32	2.81	3.62	5.07
	1:00:00	0.00	0.00	0.82	1.08	1.27	1.97	2.36	3.11	4.35
	1:05:00	0.00	0.00	0.76	0.99	1.17	1.73	2.06	2.77	3.89
	1:10:00	0.00	0.00	0.67	0.91	1.09	1.50	1.79	2.34	3.26
	1:15:00	0.00	0.00	0.58	0.81	1.00	1.31	1.55	1.96	2.71
	1:20:00	0.00	0.00	0.50	0.70	0.87	1.10	1.29	1.58	2.17
	1:25:00	0.00	0.00	0.43	0.60	0.73	0.92	1.07	1.25	1.69
	1:30:00	0.00	0.00	0.38	0.53	0.62	0.73	0.84	0.96	1.28
	1:35:00	0.00	0.00	0.35	0.49	0.56	0.59	0.67	0.73	0.97
	1:40:00	0.00	0.00	0.34	0.44	0.53	0.51	0.58	0.61	0.79
	1:45:00	0.00	0.00	0.33	0.40	0.50	0.46	0.52	0.53	0.69
	1:50:00	0.00	0.00	0.32	0.38	0.48	0.43	0.49	0.48	0.62
	1:55:00	0.00	0.00	0.28	0.35	0.46	0.41	0.46	0.45	0.57
	2:00:00	0.00	0.00	0.25	0.33	0.42	0.39	0.44	0.43	0.53
	2:05:00	0.00	0.00	0.19	0.25	0.32	0.30	0.34	0.32	0.40
	2:10:00	0.00	0.00	0.15	0.19	0.24	0.23	0.25	0.24	0.30
	2:15:00	0.00	0.00	0.11	0.14	0.18	0.17	0.19	0.18	0.22
	2:20:00	0.00	0.00	0.08	0.11	0.14	0.13	0.14	0.13	0.17
	2:25:00	0.00	0.00	0.06	0.08	0.10	0.09	0.10	0.10	0.12
	2:30:00	0.00	0.00	0.04	0.06	0.07	0.07	0.07	0.07	0.09
	2:35:00	0.00	0.00	0.03	0.04	0.05	0.05	0.05	0.05	0.06
	2:40:00	0.00	0.00	0.02	0.03	0.04	0.03	0.04	0.04	0.04
	2:45:00	0.00	0.00	0.01	0.02	0.02	0.02	0.03	0.02	0.03
	2:50:00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.02
	2:55:00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01
	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 4.06 (July 2022)

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]
6713- Top of Micropool	0.00	40	0.001	0	0.000	0.00
6714	1.00	325	0.007	182	0.004	0.01
6715	2.00	2,290	0.053	1,490	0.034	0.03
6715.25-WQCV	2.25	2,661	0.061	2,109	0.048	0.03
6716	3.00	3,775	0.087	4,522	0.104	0.04
6716.61- EURV	3.61	4,498	0.103	7,046	0.162	0.05
6717	4.00	4,960	0.114	8,890	0.204	2.54
6717.23 -100 yr	4.02	4,982	0.114	8,989	0.206	2.85
6717.25 - Spillway	4.25	5,239	0.120	10,165	0.233	7.10
6718	5.00	6,254	0.144	14,475	0.332	53.36
6718.5- Top of Pond	5.50	7,107	0.163	17,815	0.409	97.70

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).

FOREBAY VOLUME AND RELEASE REQUIREMENTS

Equation 3-1	WQCV= a(0.91I^3-1.19I^2+0.781I)			
Pond Forebay	WQCV=watershed-inches, I =% Impervious, a=1 (40 hour drain time)			
	I (Impervious,%) =	50.00%	WQCV =	0.20625
Equation 3-3	V=(WQCV/12)A			
Pond Forebay	V=Volume (ac-ft.), A=Area (acres)			
	A (ac.) =	2.80	V (ac-ft.) =	**0.0481**
1% OF WQCV	(V_{req})=.01(V)			
Forebay Required Volume				
			V_{req} (ac-ft.) =	0.000
			V_{req} (ft^3) =	**21**
Volume Provided For Pond (Forebay) =			V_{prop} (ft^3) =	90
Forebay Release Rate	2% OF Q_{100} Inflow Into Pond			
Q_{100} Discharges				
			Q_{100} (cfs) =	5.7
			Q_{out} (cfs) =	**0.11**

Weir Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Wednesday, Nov 6 2024

Pond Forebay Notch

V-Notch Weir

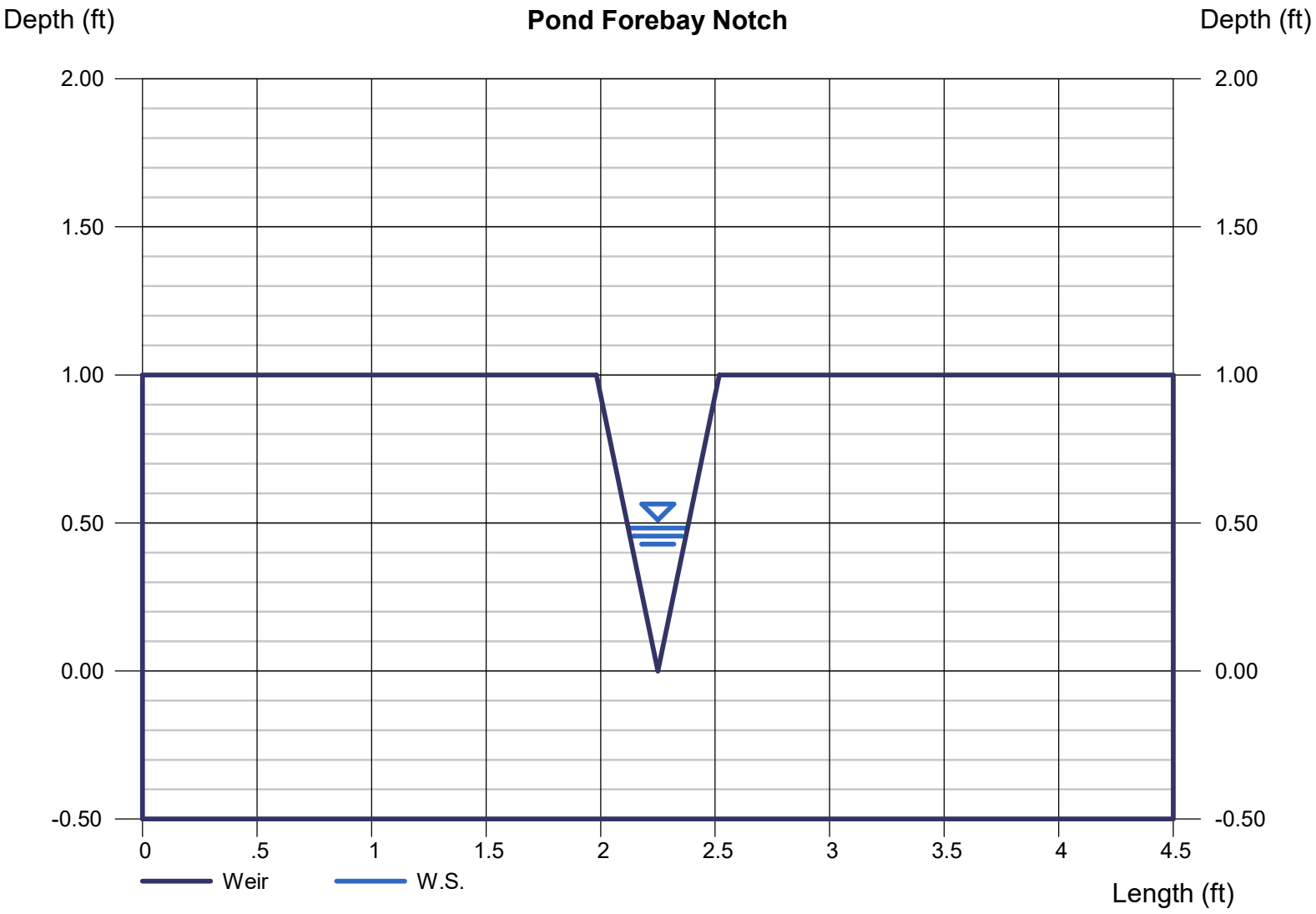
Crest	= Sharp
Angle (Deg)	= 30
Total Depth (ft)	= 1.00

Calculations

Weir Coeff. Cw	= 0.68
Compute by:	Known Q
Known Q (cfs)	= 0.11

Highlighted

Depth (ft)	= 0.48
Q (cfs)	= 0.110
Area (sqft)	= 0.06
Velocity (ft/s)	= 1.76
Top Width (ft)	= 0.26



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Wednesday, Nov 6 2024

Pond Trickle Channel Capacity

Rectangular

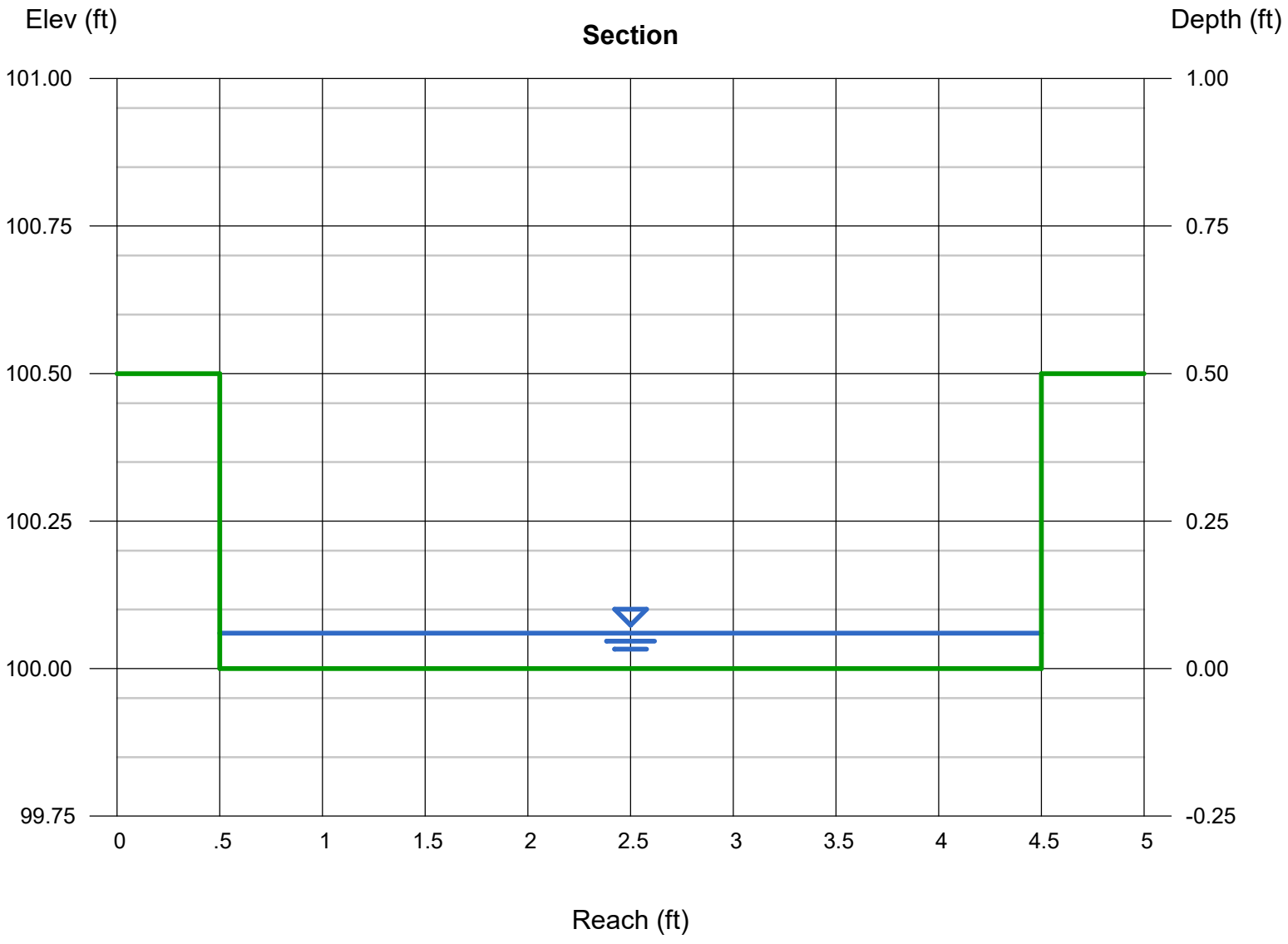
Bottom Width (ft)	= 4.00
Total Depth (ft)	= 0.50
Invert Elev (ft)	= 100.00
Slope (%)	= 0.50
N-Value	= 0.013

Calculations

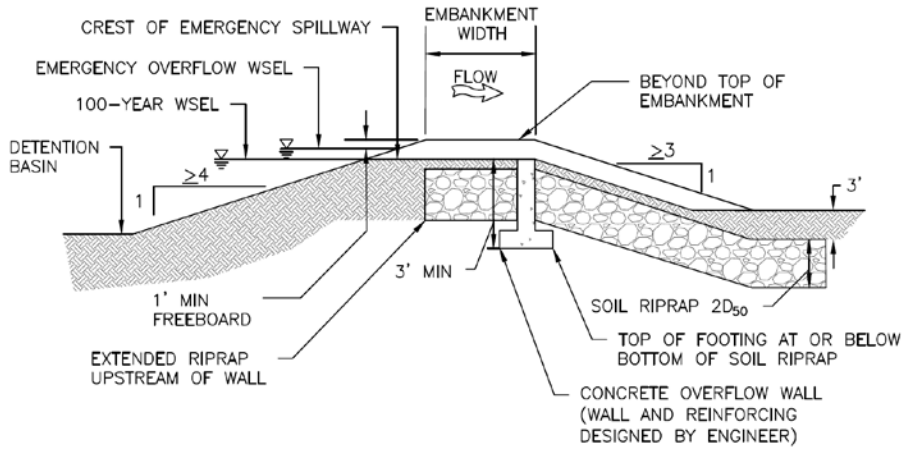
Compute by:	Known Q
Known Q (cfs)	= 0.22

Highlighted

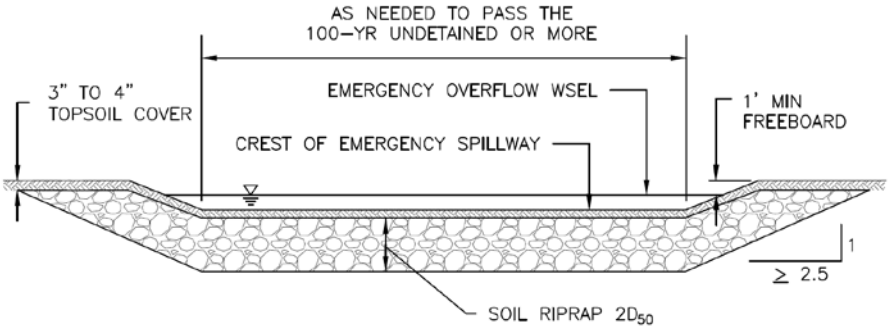
Depth (ft)	= 0.06
Q (cfs)	= 0.220
Area (sqft)	= 0.24
Velocity (ft/s)	= 0.92
Wetted Perim (ft)	= 4.12
Crit Depth, Yc (ft)	= 0.05
Top Width (ft)	= 4.00
EGL (ft)	= 0.07



SPILLWAY RIPRAP CALCULATION

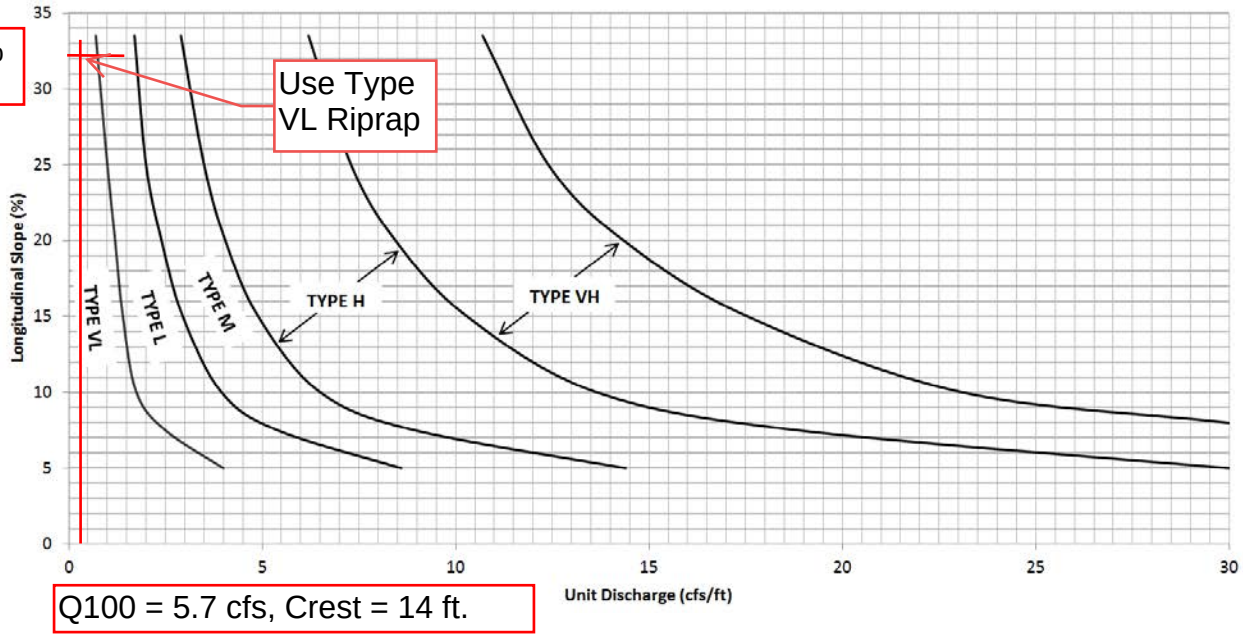


EMERGENCY SPILLWAY PROFILE



EMERGENCY SPILLWAY SECTION AND SPILLWAY CHANNEL

Slope=33%



Q100 = 5.7 cfs, Crest = 14 ft.

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

Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Monday, Nov 11 2024

<Name>

User-defined

Invert Elev (ft)	= 6721.72
Slope (%)	= 1.00
N-Value	= 0.013

Calculations

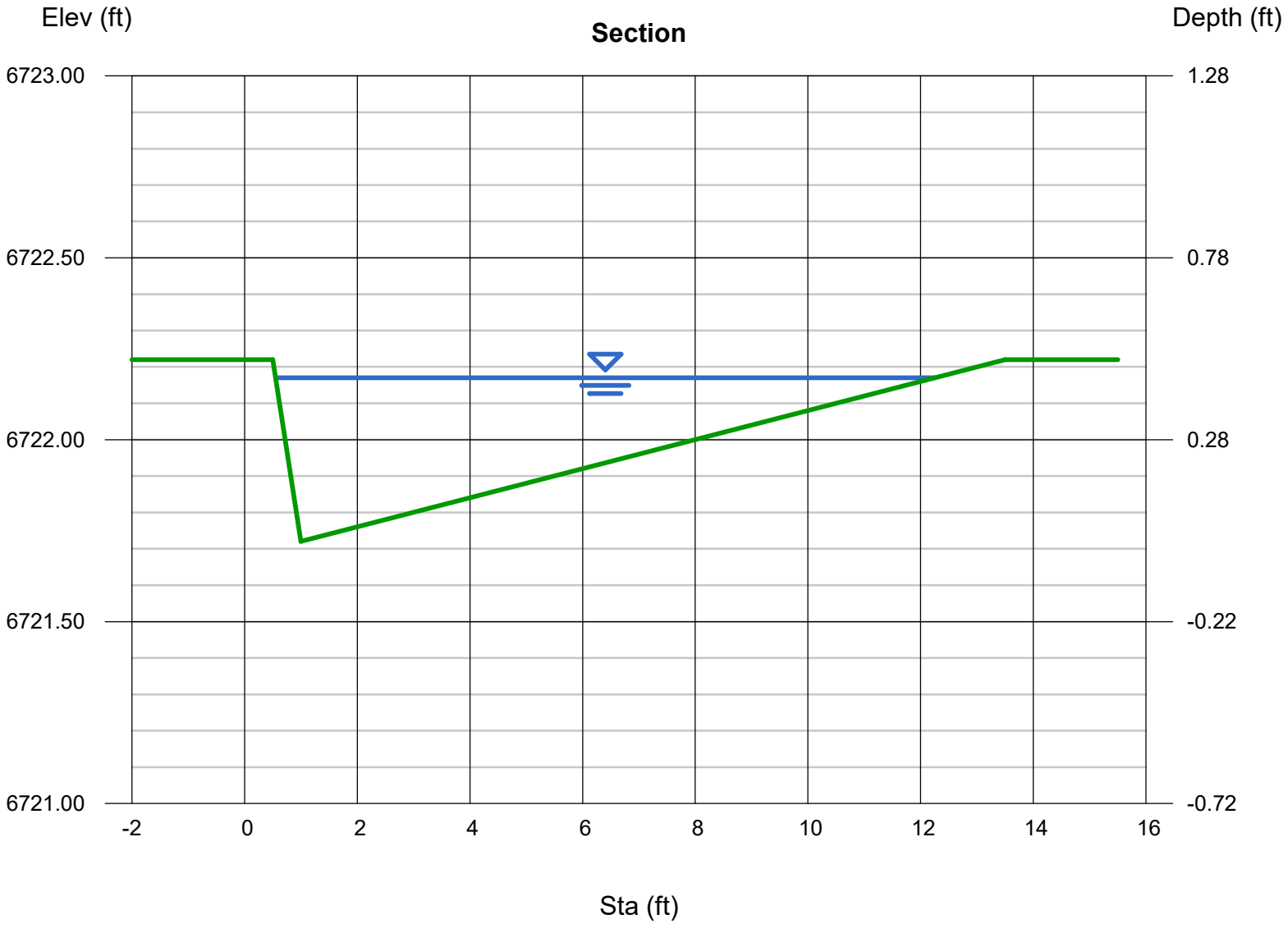
Compute by:	Known Q
Known Q (cfs)	= 11.00

Highlighted

Depth (ft)	= 0.45
Q (cfs)	= 11.00
Area (sqft)	= 2.63
Velocity (ft/s)	= 4.17
Wetted Perim (ft)	= 11.90
Crit Depth, Yc (ft)	= 0.50
Top Width (ft)	= 11.71
EGL (ft)	= 0.72

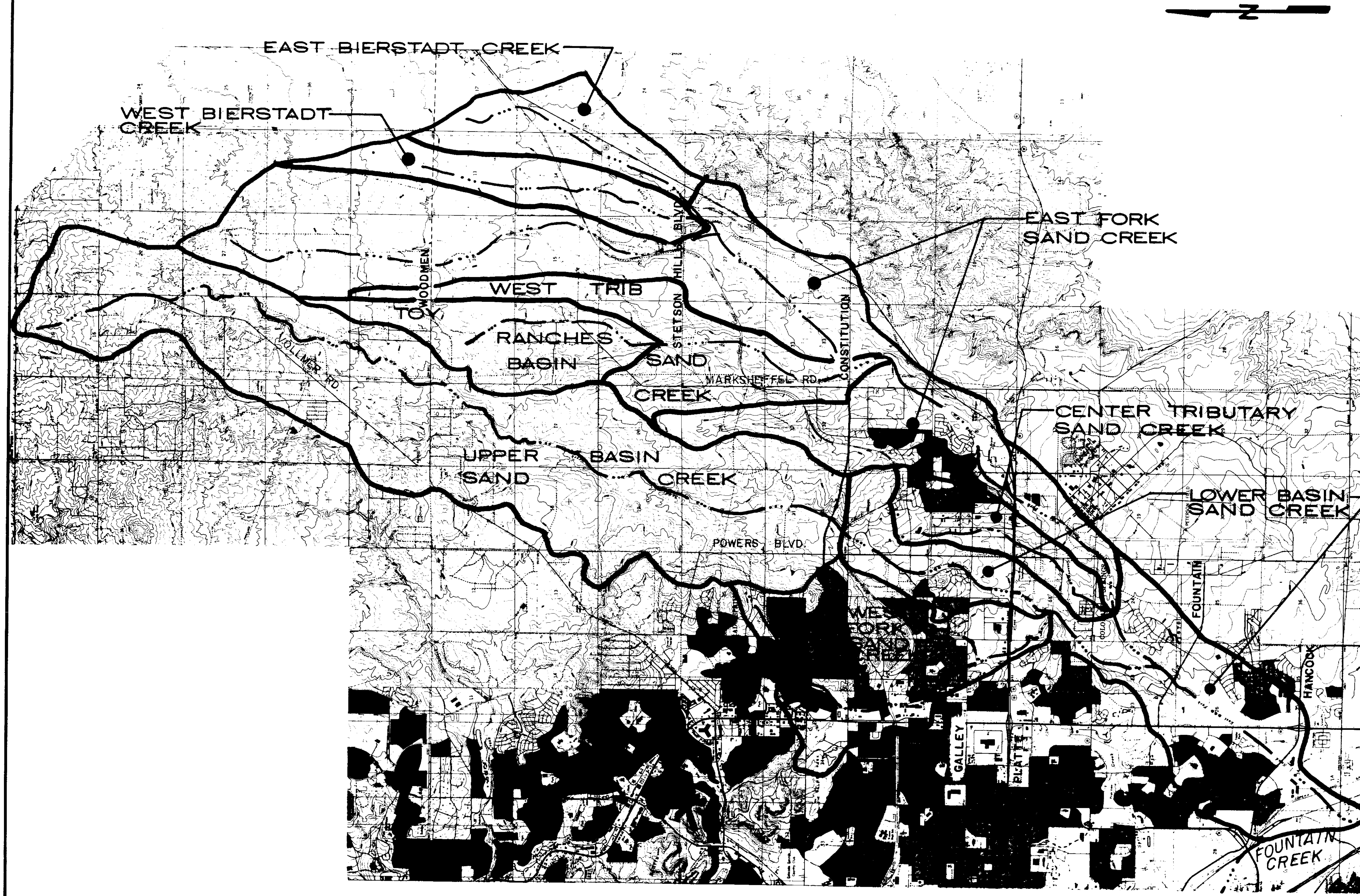
(Sta, El, n)-(Sta, El, n)...

(0.00, 6722.22)-(0.50, 6722.22, 0.013)-(1.00, 6721.72, 0.013)-(13.50, 6722.22, 0.013)



APPENDIX D

REFERENCE MATERIALS



Kiowa Engineering Corporation
419 W. Bijou Street
Colorado Springs, Colorado
80905-1308

SAND CREEK DRAINAGE BASIN PLANNING STUDY

REGIONAL SUB-BASINS

Project No	90-04-09
Date:	11/90
Design:	
Drawn:	EAK
Check:	
Revisions:	

FIG. III-1

FINAL DRAINAGE REPORT
FOR
TAMLIN ROAD RV & BOAT STORAGE

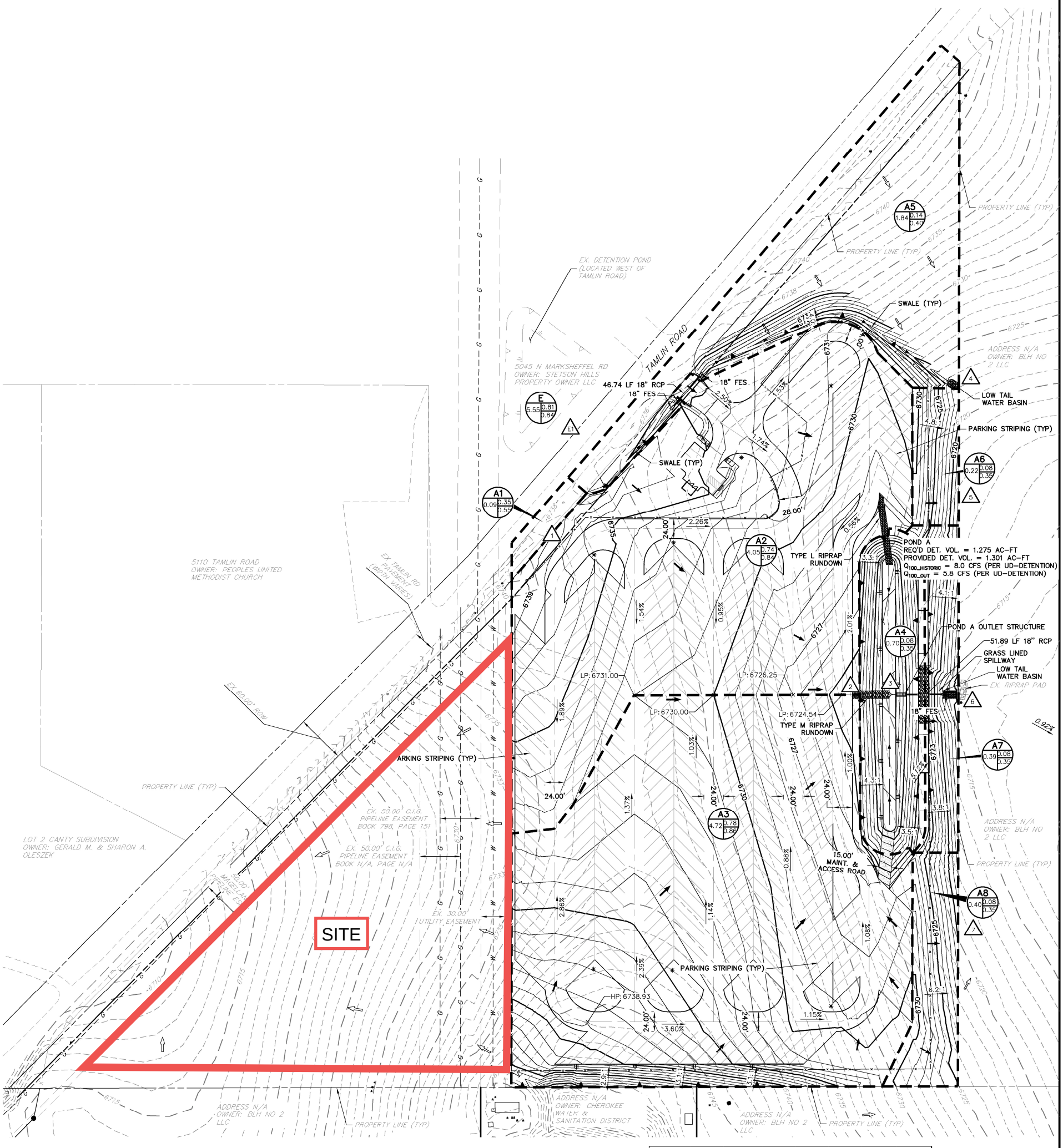
Prepared For:
C&M Properties, LLC
12748 Barossa Valley Road
Colorado Springs, CO 80921

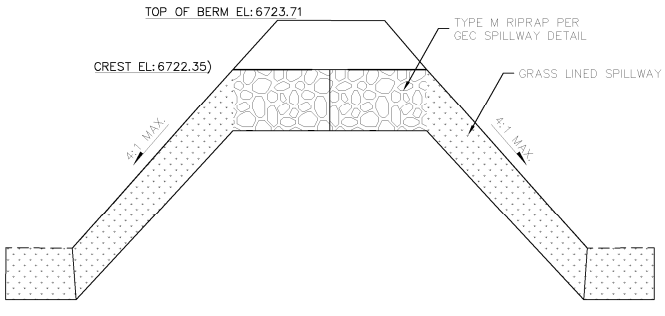
July 2020
Project No. 2513400

Prepared By:
JR Engineering, LLC
5475 Tech Center Drive, Suite 235
Colorado Springs, CO 80919
719-593-2593

PCD FILE NO.: PPR1945

TAMLIN ROAD RV & BOAT STORAGE
PROPOSED DRAINAGE MAP





POND SPILLWAY BERM SECTION
NTS

LEGEND

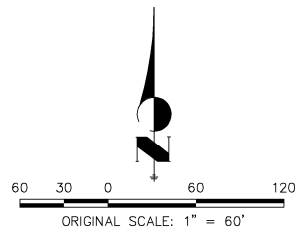
- I.D. (A: BASIN AREA, B: C_5, C: C_{100}) — BASIN DESIGNATION
- I.D.: BASIN IDENTIFIER
- X — DESIGN POINT
- BASIN DELINEATION
- 6100 — EXISTING INDEX CONTOURS
- EXISTING INTERMEDIATE CONTOURS
- 6100 — PROPOSED INDEX CONTOURS
- PROPOSED INTERMEDIATE CONTOURS
- EXISTING FLOW DIRECTION
- PROPOSED FLOW DIRECTION

BASIN SUMMARY TABLE

Tributary Sub-basin	Area (acres)	Percent Impervious	C_5	C_{100}	t_c (min)	Q_5 (cfs)	Q_{100} (cfs)
A1	0.09	33%	0.35	0.55	5.0	0.2	0.4
A2	4.05	74%	0.71	0.81	6.8	13.5	26.0
A3	4.72	81%	0.78	0.86	8.5	16.0	30.0
A4	0.70	0%	0.08	0.35	7.0	0.3	1.9
A5	1.84	9%	0.15	0.40	8.5	1.2	5.5
A6	0.22	0%	0.08	0.35	5.0	0.1	0.7
A7	0.39	0%	0.08	0.35	5.0	0.2	1.2
A8	0.40	0%	0.08	0.35	5.0	0.2	1.2
E	5.55	86%	0.79	0.84	n/a	n/a	5.6

DESIGN POINT SUMMARY TABLE

DP#	Q_5 (cfs)	Q_{100} (cfs)
1	0.2	0.4
2	28.7	54.6
3	28.8	56.3
4	1.2	11.0
5	0.1	0.7
6	0.2	1.2
7	0.2	1.2
E1	n/a	5.6



ORIGINAL SCALE: 1" = 60'

TAMLIN ROAD RV & BOAT STORAGE
DRAINAGE MAP
25134.00
06/08/2020
SHEET 1 OF 1

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A Westrian Company
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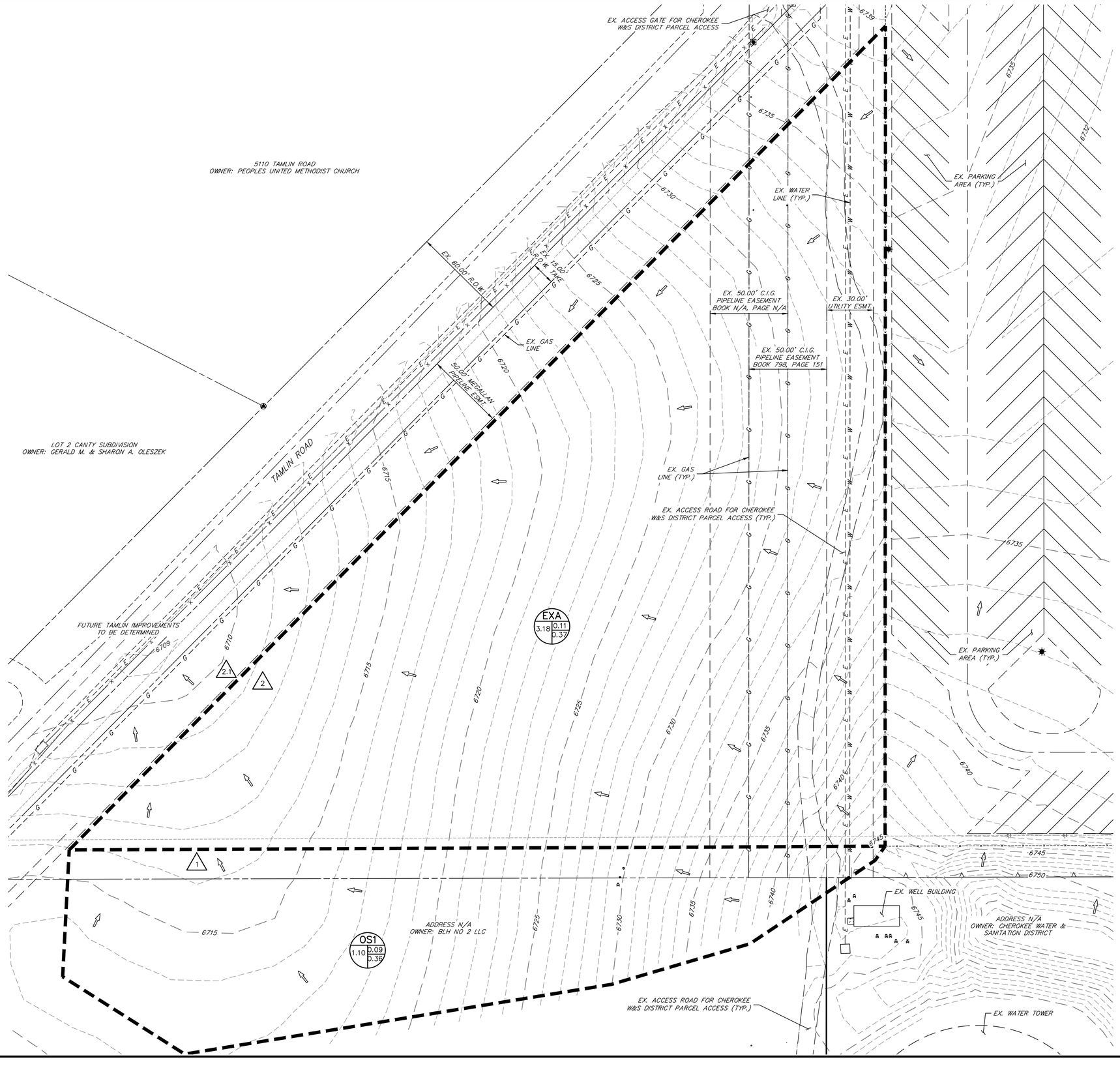
APPENDIX E

DRAINAGE MAPS



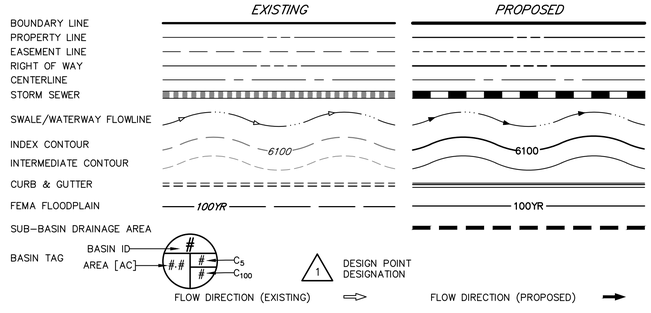
BASIN SUMMARY TABLE

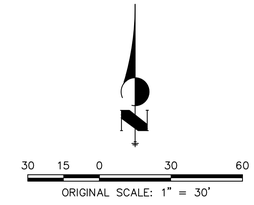
Tributary Sub-basin	Area (acres)	Percent Impervious	C_5	C_{100}	t_c (min)	Q_5 (cfs)	Q_{100} (cfs)
EXA	3.18	4.9%	0.11	0.37	15.5	1.2	6.9
OS1	1.10	2.0%	0.09	0.36	16.0	0.3	2.3

DESIGN POINT SUMMARY TABLE

DP#	Q_5	Q_{100}
1	0.3	2.3
2	1.2	6.9
2.1	1.5	9.1

LAYER LINETYPE LEGEND





PROPOSED EXISTING MAP
TAMLIN RD RV STORAGE–EXPANSION
JOB NO. 25305.00
11/26/2024
SHEET 1 OF 1

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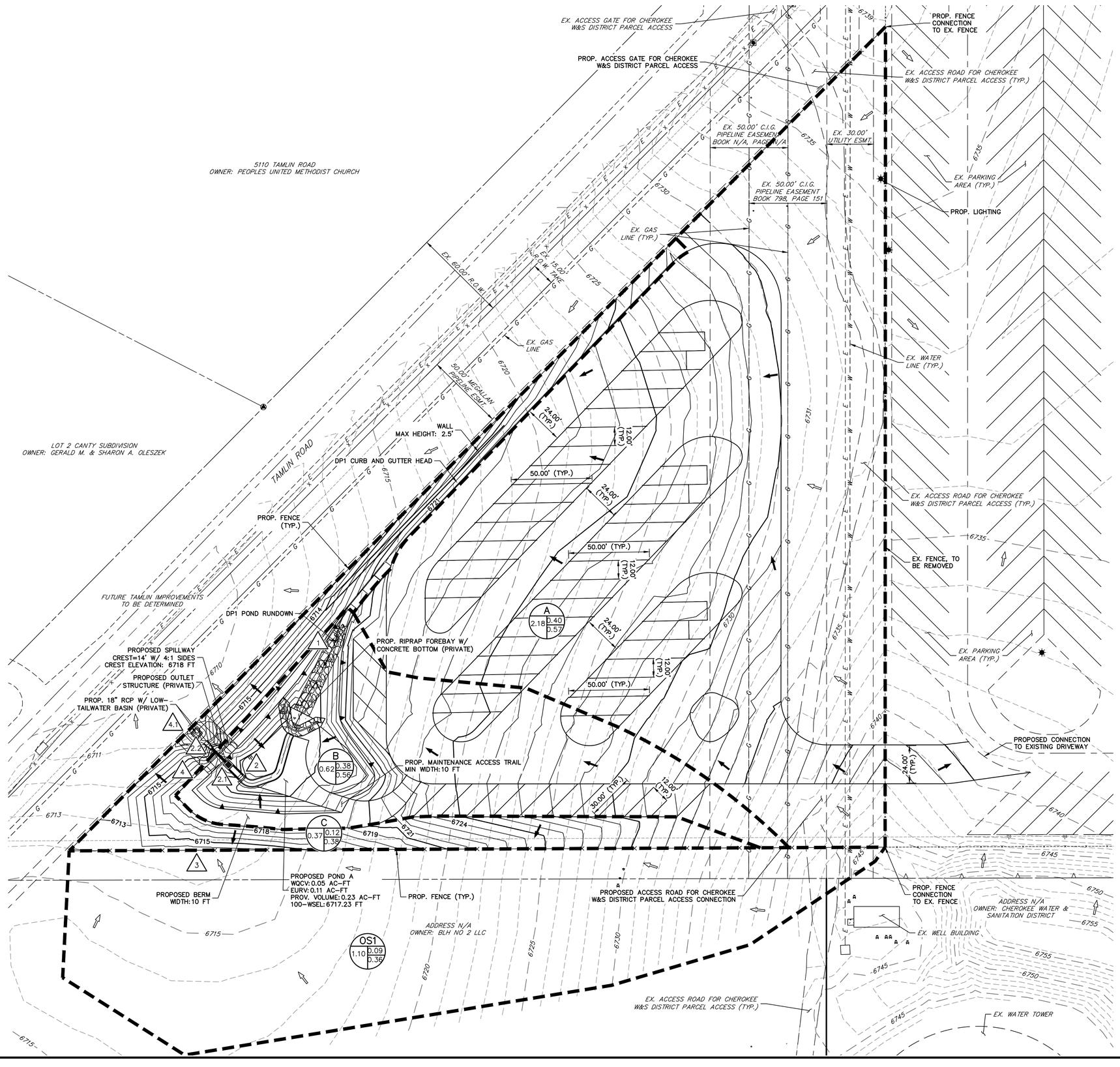


BASIN SUMMARY TABLE

Tributary Sub-basin	Area (acres)	Percent Impervious	C_5	C_{100}	t_c (min)	Q_5 (cfs)	Q_{100} (cfs)
A	2.18	51%	0.40	0.57	8.6	3.8	9.2
B	0.62	46%	0.38	0.56	5.9	1.1	2.8
C	0.37	6%	0.12	0.38	5.0	0.2	1.2
OS1	1.10	2%	0.09	0.36	16.0	0.3	2.3

DESIGN POINT SUMMARY TABLE

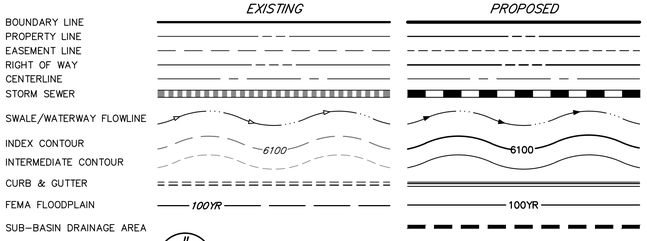
DP#	Q_5	Q_{100}
1	3.8	9.2
2	1.1	2.8
2.1	4.8	11.6
2.2	0.0	2.8
3	0.3	2.3
4	0.2	1.2
4.1	0.5	5.9

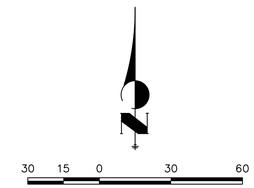
PBMP Summary Table

Basins	Tributary Area (acres)	PBMP
A	2.18	POND A
B	0.62	POND A
C	0.37	EXCLUDED*

*EXCLUDED BASED ON LAND DISTURBANCE TO UNDEVELOPED LAND THAT WILL REMAIN UNDEVELOPED PER ECM APP. I.7.B.7

LAYER LINETYPE LEGEND





PROPOSED DRAINAGE MAP
TAMLIN RD RV STORAGE-EXPANSION
JOB NO. 25305.00
11/26/2024
SHEET 1 OF 1

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