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Joyful View Subdivision
Final Drainage Report

December 2023

HR Green Project No: 2202179

PCD File No. SF2231

Prepared For:

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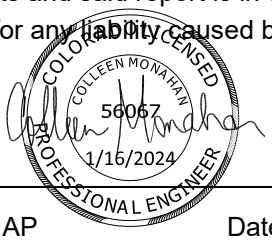
Engineer's Statement

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



Colleen Monahan, PE, LEED AP Date

State of Colorado No.

For and on behalf of HR Green Development, LLC

Developer's Statement

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

1.4.2024

Authorized Signature Date

Kevin O'Neil PO Box 1385, Colorado Springs, CO 80901

Printed Name Address

El Paso County Certification

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

Joshua Palmer, P.E. Date

County Engineer/ECM Administrator

Conditions:

Table of Contents

I. General Purpose, Location and Description 4
a. Purpose 4
b. Location 4
c. Description of Property 4
d. Floodplain Statement 4
II. Drainage Basins and Subbasins 5
a. Major Basin Description 5
b. Subbasin Description 5
III. Drainage Design Criteria 5
a. Drainage Criteria 5
IV. Drainage Planning Four Step Process 6
V. General Drainage Recommendations 7
VI. Drainage Basins and Subbasins 7
a. General Concept 7
b. Existing Drainage Conditions 7
c. Proposed Subbasin Description 8
d. Comparison of Developed to Historic Discharges 10
VII. Water Quality and Detention Facilities 10
a. Water Quality Detention Sand Filter 10
b. On-Site Stormwater Conveyance Design 11
c. Analysis of Existing and Proposed Downstream Facilities 12
d. Anticipated Drainage Problems and Solutions 12
VIII. Grading and Erosion Control Plan 12
IX. Floodplain Protection 12
X. Proposed Channel Improvements 13
XI. Maintenance 13
XII. Cost Estimate and Drainage Fees 13
XIII. Conclusion 14
XIV. Drawings 14
XV. References 14

Appendices

A. Vicinity Map, FEMA Map, NRCS Soil Survey

B. Hydrologic Analysis

C. Hydraulic Analysis

D. Water Quality and Detention Calculations

E. Drainage Maps

I. General Purpose, Location and Description

a. Purpose

The purpose of this Final Drainage Report (FDR) for Joyful View Subdivision is to describe the onsite and offsite drainage patterns and impacts on downstream facilities. This report is based on the guidelines and criteria presented in El Paso County Drainage Criteria Manual and is intended to fulfill the requirements for a Final Drainage Report in support of the Final Plat process for this property.

b. Location

Joyful View Subdivision, referred to as 'the site' herein, is a proposed 9-lot rural single-family residential subdivision located in El Paso County, Colorado. The site lies within a portion of the southern half of Section 33, Township 13 South, Range 63 West of the 6th Principal meridian in El Paso County, Colorado. The site is approximately 70.18 acres located approximately 600 feet east of North Peyton Hwy and approximately 2.0 miles north of SH94. The parcel #'s are 3300000466 and 3300000467 and they are currently unplatted Grand View Subdivision Tracts 2 and 3. A vicinity map is presented in Appendix A.

c. Description of Property

The site is currently undeveloped land with existing vegetation consisting of native grasses. The property is zoned RR-5 (rural residential), allowing for 5-acre minimum lot sizes, and the proposed subdivision is fully in conformance with the existing zoning for the site. The development will plat 9 single family residential lots with access to the lots off of a proposed private local gravel cul-de-sac (Ellas Way) extending from a proposed private local gravel road connection (Joyful View) to North Peyton Hwy within an existing 30-ft access easement. North Peyton Hwy is an improved, asphalt paved public road (2-lane Major Collector) located approximately 600 feet west of the proposed Ellas Way cul-de-sac road entrance. The site is bordered by other RR-5 zoned rural residential properties on all sides.

The site is located in the Haegler Ranch Drainage Basin. Flows from the site generally sheet flow southeasterly into unnamed tributary that traverses the south part of the site and into the Haegler Channel which is tributary to the West Fork of Black Squirrel Creek. The onsite elevations range from 6270' – 6243' with slopes ranging 1-2%, and up to 10% at the unnamed tributary.

There is an above-ground electric line that runs along the northern property line of the site. There are no existing irrigation facilities, major utilities, or significant encumbrances impacting the site.

Water for the site will be from individual wells. Wastewater service will be provided by On Site Wastewater Treatment (OSWT).

Per a NRCS soil survey, the site's soil is comprised of Blakeland Loamy Sand (8) which has a Hydrologic Soil Group A, and Blendon Sandy Loams (10) with a Hydrologic Soil Group B. The NRCS soil survey is presented in Appendix A.

d. Floodplain Statement

A portion of the south side of the site is located within a designated FEMA 100-year floodplain Zone AE according to the information published in the Federal Emergency Management Agency Flood Plan Map No. 08041C0805G, dated December 7, 2018 and LOMR #20-08-0369P-080059 dated February 16, 2021. Base flood elevations are provided and shown on Drainage Maps in Appendix D. See Firmette exhibit in Appendix A.

II. Drainage Basins and Subbasins

a. Major Basin Description

The site is located within the Haegler Ranch Drainage Basin. Drainage from this site flows to existing natural drainage channels draining southeasterly. There is an existing Drainage Basin Planning Study (DBPS) on file for this drainage basin that studied the site's drainage characteristics:

1. "Haegler Ranch Drainage Basin Planning Study" prepared by URS, May 2009, File No. MP091.

Haegler Ranch Drainage Basin is a 16.6 square mile watershed located in El Paso County. The basin is tributary to Black Squirrel Creek and is generally located north of the Town of Falcon, and bound by just past Eastonville Road to the west, McDaniels Road to the East.

The DBPS identified no improvements needed in the project site area. No significant impact is anticipated within the Haegler Ranch Drainage Basin from the Joyful View Subdivision.

b. Subbasin Description

The existing 70.18-acre site is currently undeveloped. An existing dirt drive is located off N. Peyton Hwy along the north side of the westerly adjacent Tract 1 Grand View Estates III to service an existing home within that tract. A 30-foot travel easement is located along the north property line of the adjacent Tract 1 and Tracts 2 and 3, but currently no road exists within Tracts 2 and 3. The existing drainage basins lying in and around the proposed development are on the existing Drainage Map DR-1 in Appendix D. The property has been delineated as three on-site developed drainage basins (EX1-EX3) flowing to existing drainage channels along the southeast side of the property.

The site is impacted by off-site drainage areas on the west, south and north sides of the property (OS1-OS3). OS1 flows affect a culvert under the proposed Joyful View at the intersection of N. Peyton Highway. OS2 affects a culvert that will also be under proposed Joyful View near the intersection of proposed Ellas Way.

Developed runoff in this subdivision will continue to follow historic paths.

III. Drainage Design Criteria

a. Drainage Criteria

Hydrologic data and calculations were performed using Drainage Criteria Manual Volume 1 of El Paso County (EPCDCM), with County adopted Chapter 6 and Section 3.2.1 of Chapter 13 of the City of Colorado Springs Drainage Criteria Manual (CCSDCM), May 2014 revised January 2021.

Onsite drainage improvements are designed for the 5-year storm (minor event) and 100-year storm (major event) using rainfall values from EPCDCM Table 6-2 below. Runoff was calculated per CCSDCM Section 6.3.0 - Rational Method.

Table 6-2: Rainfall Depths for El Paso County		
Return Period (yr)	5	100
1-hr Rainfall Depth (in)	1.50	2.52

5-year and 100-year runoff coefficients are as follows (source: Table 6-6: Runoff Coefficients for Rational Method, UDFCD 2001).

Undeveloped, Pasture/Meadow Areas: C5: 0.09 C100: 0.36

Developed, Proposed Building/Pavement areas: C5: 0.90 C100: 0.96

Refer to composite runoff coefficient calculations in Appendix B.

Hydrologic calculations can be found in Appendix B, and peak design flows are identified on the drainage plan drawings.

The private full spectrum sand filter basin is designed per the EPCDCM criteria using the Mile High Flood District UD-Detention Spreadsheet.

Culverts were sized per the methods described in EPCDCM Volume 1 Section III Chapter 9- Culvert Design. Swales were sized per Chapter 10- Open Channels and Structures. Culvert and swale calculations can be found in Appendix C.

IV. 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 DCM Volume 2, 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. This project disturbs more than 1 acre. The Four Step Process has been implemented as follows in the planning of this project.

Step 1: Employ Runoff Reduction Practices

Swales are provided to convey stormwater runoff from impervious areas to the private full spectrum sand filter basin. These swales will promote infiltration of runoff prior to sand filter basin. The sand filter basin has been designed to store and treat the WQCV and EURV.

Step 2: Stabilize Drainageways

Portions of Lots 4 and 5 lie within the floodplain that lies around the drainageway through the southern part of the site. Subdivision development will be restricted to outside of the floodplain limit by 'No Build Area' as shown on the Plat and Proposed Drainage Map (DR-2) in Appendix D. No improvements will occur within the existing floodplain and drainageway. With the utilization of a full spectrum sand filter basin which restricts flow via an outlet structure orifice plate, development of the proposed subdivision will result in no increase in developed flow from the site, and runoff remains consistent with pre-development drainage conditions. Rip-Rap will be provided at the outfall from the sand filter and discharges of grass Swales 2 and 3 to dissipate energy and mitigate impacts from flows prior to discharge into the existing channel. All runoff that leads to the

floodplain will sheet flow overland over the 5-acre tracts prior to entering the drainageway. No significant subdivision development impact is anticipated for the drainageways.

Step 3: Provide Water Quality Capture Volume (WQCV)

Water quality treatment is required for the roadways proposed in this development (private gravel roads Joyful View & Ellas Way). WQ treatment is provided in a full spectrum sand filter basin which also provides flood control to mitigate effects on downstream properties and drainage ways.

Step 4: Consider Need for Industrial and Commercial BMPs

No industrial or commercial land uses are proposed as part of this development.

V. General Drainage Recommendations

The developed drainage plan for the site is to provide and maintain positive drainage away from structures and conform to the established drainage patterns for the overall site. It is recommended that positive drainage be established and maintained away from all structures within the site in conformance with applicable building codes and geotechnical engineering recommendations.

Individual lot grading is the sole responsibility of the individual builders and property owners. Final grading of each home site should establish proper protective slopes and positive drainage in accordance with HUD guidelines and building codes. In general, main floor elevations for each home should be established a minimum of 32” above the finished grade of the adjoining gravel road and a minimum of 1 foot above the BFE of the FEMA floodplain. In addition, ‘No Build’ areas have been established on the Plat and shall be respected in the Individual Construction of the home sites.

In general, it is recommended that a minimum of 6 inches clearance from the top of concrete foundation walls to adjacent finished site grades be established. Positive drainage slopes should be maintained away from all structures, with a minimum recommended slope of 5 percent for the first 10 feet away from buildings in landscaped areas, a minimum recommended slope of 2 percent for the first 10 feet away from buildings in paved areas, and a minimum slope of 1 percent for paved areas beyond buildings.

VI. Drainage Basins and Subbasins

a. General Concept

The general concept for management of developed storm runoff is to establish site grading to provide positive drainage away from the building pads and divert runoff to drainage swales following historic drainage patterns.

b. Existing Drainage Conditions

Historic drainage conditions are depicted on Figure DR-1 (Appendix D). The property is currently undeveloped. There are two existing drainageways within the property and one existing floodplain which also contains a drainageway. The 3 drainageways combine approximately 500 feet easterly of the site into the floodplain as shown on DR-1. There are 2 existing culverts that are impacted by the proposed entrance roadway Joyful View. OS1 flows affect a culvert under the proposed Joyful View at the intersection of N. Peyton Highway. OS2 affects a culvert that will also be under proposed Joyful View near the intersection of proposed Ellas Way.

Basin OS-1 is 25.98 acres of offsite undeveloped land that flows overland southerly to DP1 at the intersection of Joyful View and N. Peyton Highway. Existing stormwater (Q_5 = 4.5 cfs Q_{100} = 30.1 cfs) flows south along N. Peyton Hwy to an existing 18" culvert at DP1. Flow continues in swale along the east side of N. Peyton Highway to the unnamed tributary (floodplain) that traverses the site and discharges offsite at DP3.

Basin OS-2 is 30.52 acres of offsite undeveloped land north of Joyful View. Existing stormwater (Q_5 = 6.0 cfs Q_{100} = 40.2 cfs) flows to an existing 18" culvert at DP5. Flow then traverses the site in an existing swale and discharges offsite at DP6.

Basin OS-3 is 2.77 acres of offsite land that contains part of N. Peyton Highway and roadside ditch. Existing stormwater (Q_5 = 2.3 cfs Q_{100} = 4.6 cfs) is conveyed to DP2 and to the unnamed tributary (floodplain) that traverses the site and discharges offsite at DP3.

Basin EX1 is 70.82 acres of undeveloped onsite and offsite land. Existing stormwater (Q_5 = 7.9 cfs Q_{100} = 53.2 cfs) drains southeast both by overland sheet flow and through the unnamed tributary (floodplain). Flows discharge offsite by sheet flow off the east property line and at DP3 in the unnamed tributary.

Basin EX2 is 18.22 acres of undeveloped onsite and offsite land. Existing stormwater (Q_5 = 2.8 cfs Q_{100} = 18.6 cfs) drains southeast both by overland sheet flow and in an existing swale. Flows discharge offsite by sheet flow off the east property line and at DP9 in the existing swale.

Basin EX3 is 27.31 acres of undeveloped onsite and offsite land. Existing stormwater (Q_5 = 4.1 cfs Q_{100} = 27.8 cfs) drains southeast both by overland sheet flow and in an existing swale. Flow discharge offsite by sheet flow off the east property line and at DP6 in the existing swale.

The 3 drainageways that discharge at DP3, DP6, and DP9 combine approximately 500 feet easterly of the site into the floodplain as shown on DR-1.

c. Proposed Subbasin Description

The proposed site has been divided into 9 proposed basins.

The following 6 basins, a total of 150.89 acres of onsite and offsite areas will not be detained but will follow existing drainage patterns and will be discharged at less than historic conditions. See below for basin descriptions:

Design Point 3 – Contributing Basin OS-1, O3-1, and A

Basin OS-1 will remain unchanged and is 25.98 acres of offsite undeveloped land that flows overland southerly to DP1 at the intersection of Joyful View and N. Peyton Highway. The existing 18" culvert located at DP1 will be replaced with dual 24" RCP culverts that will convey the flow under proposed Joyful View. Stormwater (Q_5 = 4.5 cfs Q_{100} = 30.1 cfs) continues in the existing swale that runs along the south side of N. Peyton Highway to DP2 then into the unnamed tributary (floodplain) that traverses the site and discharges offsite at DP3. Basin OS-1 will remain as-is.

Basin OS-3 is 2.77 acres of offsite undeveloped land, paved roadway, and existing swale. Stormwater (Q_5 = 2.3 cfs Q_{100} = 4.6 cfs) discharges at DP2, continues through Basin A, and discharges offsite at DP3. Basin OS-3 will remain as-is.

Basin A is 69.83 acres of undeveloped offsite and developed onsite area and will contain 1 house on 5+ acre lots. Stormwater (Q_5 = 7.9 Q_{100} = 52.3 cfs) follows historic drainage patterns by flowing southeast both by overland sheet flow and through the unnamed tributary (floodplain). Flows discharge offsite by sheet flow off

the east property line and at DP3 in the unnamed tributary. Runoff from the house and backs of lots in this drainage area will sheet flow over the 5+ acre tracts prior to discharging by sheet flow off the east property line or entering the drainageway to DP3.

Design Point 6 – Contributing Basins OS-2, D, and C

Basin OS-2 is 30.52 acres of offsite undeveloped land north of Joyful View. The existing 18" culvert located at DP5 will be replaced with dual 24" RCP culverts that will convey the flow under proposed Joyful View and into proposed Swale 3. Stormwater (Q_5 = 6.0 cfs Q_{100} = 40.2 cfs) continues to the unnamed tributary that traverses the site and discharges offsite at DP6. Basin OS-2 will remain as-is.

Basin D is 0.37 acres of offsite area that will be developed with proposed gravel road and asphalt road of Joyful View. Stormwater (Q_5 = 0.9 cfs Q_{100} = 1.8 cfs) is conveyed via an existing swale along the north side of Joyful View to DP4 and then DP5 where it is conveyed under Joyful View to proposed Swale 3 via dual 24" RCP culverts. Stormwater continues in Swale 3 and discharges at DP6. Due to layout and grading limitations confined within the existing 30' Travel Easement, runoff from the 0.37 acres of developed offsite area in Basin D is not receiving water quality treatment per exclusions in ECM Section I.7.1.C.1.a.

Basin C is 14.16 acres of developed onsite area to contain three houses on 5+ acre lots. Stormwater (Q_5 = 3.5 Q_{100} = 21.6 cfs) follows historic drainage patterns by overland sheet flow and in an existing swale. Flow discharge offsite by sheet flow off the east property line and at DP6 in Swale 3 and discharges offsite at DP6. Future culvert sizes for the individual homesite owners on Lots 8 and 9 are noted on the proposed drainage map and the construction drawings for installation by the future homeowners.

Design Point 9 – Contributing B3

Basin B3 is 7.26 acres of undeveloped offsite and developed onsite area and will contain one house on a 5+ acre lot. Stormwater (Q_5 = 2.0 Q_{100} = 10.8). This flow will be undetained and will sheet flow through the 5+ acre tracts prior to discharging by sheet flow off the east property line or entering the swale to DP9.

Design Point 10 -- Contributing Basins B1, B2, Sand Filter A

The following 2 basins, B1 and B2, a total of 23.65 acres of developed onsite area, will be treated and detained in proposed Sand Filter A. See below for basin descriptions:

Basin B1 is 0.50 acres of proposed gravel road and proposed roadside Swale 1 along the south side of Joyful View. Stormwater (Q_5 = 0.7 cfs Q_{100} = 1.6 cfs) is conveyed in a roadside Swale 1 to DP7 at the intersection of Joyful View and Ellas Way where it travels south in Swale 2 along the west side Ellas Way to DP8 and is detained in Sand Filter A.

Basin B2 is 23.15 acres of undeveloped offsite and developed onsite area and contains the entirety of the gravel road of Ellas Way and will contain three houses on 5+ acre lots. Stormwater (Q_5 = 4.9 Q_{100} = 26.0 cfs) follows historic drainage patterns to proposed Swale 2 that discharges to a proposed 18" culvert at DP8 and will convey flows under Ellas Way and into proposed Sand Filter A. Flows will be and will be detained in Sand Filter A.

Total Developed Flows Offsite – Contributing Basins: DP3, DP6, DP9 and Sand Filter A Release

DP3, DP6, DP9 and Sand Filter A Release flow into the 3 drainageways that flow downstream offsite combining approximately 500 feet easterly of the site into the floodplain as shown on DR-1 and DR-2.

Proposed hydrologic calculations for proposed conditions and Sand Filter release are contained in Appendix B and C. The flow comparison is shown in Table 1 below.

d. Comparison of Developed to Historic Discharges

Based on the hydrologic calculations in Appendix B and Sand Filter A calculations in Appendix C, the comparison of developed to historic discharges at key design points is summarized as follows:

Table 1 – Flow Comparison

DESIGN POINT	EX Q_5 (cfs)	PR Q_5 (cfs)	EX Q_{100} (cfs)	PR Q_{100} (cfs)
DP-3	10.6	10.6	62.7	62.2
DP-6	8.8	8.0	58.8	50.5
DP-9	2.8	1.7	18.6	10.8
DP-10 (SAND FILTER)	-	1.7	-	16.1
TOTAL	**22.2**	**21.9**	**140.1**	**139.5**

The flow increases due to gravel roads and impervious area from the developed lots will be mitigated by infiltration and a full spectrum sand filter basin. Runoff from developed lots that are not detained by the sand filter will sheet flow overland over the 5+ acre tracts before flowing offisite. With proper site drainage and erosion control measures within the site, the proposed rural residential subdivision will not have any significant developed drainage impact.

Rip-Rap will be provided at the outfall from the sand filter to dissipate energy prior to discharge into the existing channel. The drainage outfalls at design points 3, 6, 9, and 10 have capacity and have no visual erosion degradation at this time. Rip-Rap will also be used to mitigate impacts from flows at discharge of grass Swale 3. Rip-rap sizing calculations can be found in Appendix D

As shown in Table 1, Sand Filter A release rate was set so that total proposed offsite flow rates will be less than historic values, and meeting drainage criteria. With the utilization of a full spectrum sand filter and infiltration of runoff from within swales, development of the proposed subdivision is anticipated to result in no increase in developed runoff from the site, and runoff remains consistent with pre-development drainage conditions.

VII. Water Quality and Detention Facilities

a. Water Quality Sand Filter Basin

There is one full spectrum sand filter basin that is proposed on site. The full spectrum detention sand filter basin “Sand Filter A” is designed to provide the required volume stages for the Water Quality Capture Volume (WQCV), Excess Urban Runoff Volume (EURV), and the 100-year stage. The WQCV and EURV are treated by Sand Filter A. The UD-Detention spreadsheet is utilized to determine basin sizing and create a stage-storage table to design the outlet structures with orifice plates and restrictor plates. The outlet structures and plates are designed to achieve the target release rates of the various stages: WQCV at a minimum of 40

hours, EURV between 68-72 hours (may vary based on sand filter conditions), and the 100-year volume at less than 120 hours. The developed condition outlet flow rates are not to exceed predeveloped conditions.

Sand Filter A provides full spectrum detention and water quality treatment for the stormwater runoff from Basins B1 and B2. These basins include gravel roadway, grass swales, undeveloped area, as well as future lot developments. Sand Filter A has a tributary area of 23.65 acres with an imperviousness of 9% which includes assumed future gravel driveways and impervious roofs. The sand filter includes 1.0-foot of freeboard to the top of berm and the 100-year water surface elevation is below the crest of the emergency spillway weir.

The MHFD UD-Detention spreadsheet yields the following sizing results:

Proposed Sand Filter A

EURV (ac-ft)	100-year (ac-ft)	Total Required Volume (ac-ft)
0.078	0.632	0.831

Sand Filter hydraulics are described in the following table:

	Peak Inflow (cfs)	Design Release/Outflow (cfs)	Pre-Development Release(cfs)	Time to Drain 99% of Inflow Volume (hrs)
Minor Storm (Q5)	5.9	1.7	4.9	77
Major Storm (Q100)	23.4	16.1	22.2	68

Sand Filter A includes a concrete forebay sized for the required volume of the inflow, riprap, minimum required filter area, a 4" perforated pvc underdrain, and an outlet structure that is designed as a single CDOT Type C Inlet that is to include a top trash rack, orifice plate, restrictor plan on the underdrain pipe, and restrictor plate on the outlet pipe. Sand Filter A will release its detained flows to DP10 at (Q_5 = 1.7 Q_{100} = 16.1). Forebay design calculations have been provided in Appendix D.

Sand Filter A includes a 10' width maintenance path with vehicular access to the bottom of sand filter to access forebay and outlet structure for continued maintenance. The pathway has access from the public right-of-way and proper turning radii and longitudinal and cross slopes for a maintenance vehicle. The sand filters include 1.0' of freeboard to the emergency spillway berm of the sand filter with the crest elevation at or above the 100-year water surface elevation. The spillways are sized with a trapezoidal weir for the 100-year inflow with rip-rap prescribed for the outflow velocity.

Per ECM Section I.7.1.C.1.a, 20% of the site may free release offsite, not to exceed 1 acre. Because of the constraints of grading and layout within the existing 30' Travel Easement to get to the site, proposed Basin D1 free release off-site into an existing swale, totaling 0.37 acres and less than 1% of the total site area. This basin also generally reflects existing drainage pattern in this area. Since the basin is less than 20% of the site and does not exceed 1 acre, the project site complies with Per ECM Section I.7.1.C.1.a

b. On-Site Stormwater Conveyance Design

Developed drainage basins and drainage patterns are depicted on the enclosed Proposed Drainage Map (DR-2 in Appendix D). Two existing culverts that traverse under Joyful View will need to be upgraded as part of this project. Grass-lined swales will convey the stormwater along the gravel road to the proposed Sand Filter. The culvert and swale sizing are in the Appendix. Water quality treatment is provided by the full spectrum sand filter basin "Sand Filter A". Calculations are contained in the Appendix.

Future culverts have been sized for Lots 8 and 9 that will be required to be installed during individual homesite construction of those lots. The culvert sizes are identified on the Construction Drawings and the Proposed Drainage Map at the end of this report.

c. Analysis of Existing and Proposed Downstream Facilities

The proposed subdivision area will drain easterly to existing, natural drainage swales that are within the Haegler Ranch Drainage Basin. Development of this property as a rural residential subdivision will have no significant impact on downstream drainage facilities.

There is no evidence of erosive conditions at the outfall points, and the existing downstream grass-lined drainage channels provide a hydrologically and hydraulically adequate outfall system. Rip-rap will be used at the outfalls from the swales to further protect downstream facilities.

d. Anticipated Drainage Problems and Solutions

The drainage plan for this subdivision consists of maintaining positive drainage away from home sites and conveying surface drainage through the site in general conformance with historic drainage patterns. The primary drainage problems anticipated within this type of development consist of maintenance of proper drainage patterns and erosion control.

Care will need to be taken to implement proper erosion control measures associated with the proposed driveways, home sites, and drainage swales. Proposed drainage facilities, such as the sand filter basin, swales and culverts, will be owned and maintained by the Joyful View HOA.

VIII. Grading and Erosion Control Plan

Due to the project disturbance area, a separate Grading and Erosion Control plan is required. Additionally, during individual homesite construction, contractors and owners will need to implement and maintain proper Best Management Practices (BMP's) and control measures for erosion and sediment control during and after construction. Erosion control measures should include a vehicle tracking control pad at access points, riprap protection at culvert outlets, and revegetation of disturbed areas. Cut slopes will need to be stabilized during excavation as necessary and vegetation will need to be re-established as soon as possible for stabilization of graded areas.

IX. Floodplain Protection

The designated FEMA 100-year floodplain Zone AE is part of unnamed drainage channel tributary to the West Fork of Black Squirrel Creek which runs through the south end of the site. This development will not disturb any of the 100-yr floodplain. This development will also not direct any additional generated site runoff into this channel or floodplain. Any runoff that leads to the floodplain will sheet flow overland over the 5-acre tracts prior to entering the floodplain. No additional stabilization or improvements are necessary in the floodplain at the time of this development.

Portions of Lots 4 and 5 lie within the floodplain. Subdivision development will be restricted to outside of the floodplain limit by a No Build Area as shown on the Plat and Proposed Drainage Map (DR-2) in Appendix D. No improvements will occur within the existing floodplain. No significant subdivision development impact is anticipated for the floodplain.

X. Proposed Channel Improvements

There are no proposed channel improvements as part of this project. With the utilization of a full spectrum sand filter basin, development of the proposed subdivision will result in no increase in developed flow from the site, and runoff remains consistent with pre-development drainage conditions. Rip-Rap will be provided at the outfall from the Sand Filter and discharge of grass Swale 3 to dissipate energy and mitigate impacts from flows prior to discharge into the existing channel. The drainage outfalls have capacity and have no visual erosion degradation at this time. Any drainage or stormwater runoff from the backs of lots will sheet flow across the 5-acre tracts and will not cause degradation to the downstream areas. Additionally, the channel and floodplain area on the west side of the property has been designated as 'No Build' areas and any flows to this channel will sheet flow across the backs of lots.

XI. Maintenance

After completion of construction, the drainage facility (Sand Filter A) will be privately owned and maintained by Joyful View Home Owners Association.

XII. Cost Estimate and Drainage Fees

The developer will finance all costs for the required subdivision improvements, and there are no public drainage facilities proposed as part of this subdivision plat.

The estimated cost of the private sand filter basin "Sand Filter A" is provided below:

Private PBMP Cost Estimate			
Line Item	**Quantity**	**Unit Price**	**Cost**
Concrete Forebay	1	$5,000 EA	$5,000
Riprap Inflow Protection	4	$50 /CY	$200
Sand Filter Media	112	$100 /CY	$11,200
4" Perforated PVC Underdrain	176	$10 /LF	$1,760
12" ABC Maintenance Access	80.5	$40 /CY	$3,220
Outlet Structure w/ Orifice Plate	1	$5,000 EA	$5,000
Riprap Spillway Protection	48	$50 /CY	$2,400
18" RCP Outlet Pipe	246.5	$115 /LF	$28,348
18" RCP FES	1	$1,750 EA	$1,750
10% Contingency			$5,888
TOTAL:			**$64,765**

The property is located entirely within the Haegler Ranch Drainage Basin, which has a 2022 drainage basin fee of $11,891 and $1,755 bridge fee per impervious acre. Applicable drainage basin fees are calculated as follows:

On-site Total Area =70.18 acres

On-site Road Area =

Gravel Pavement = 66,102 sf * 80% Impervious =52,882 sf (1.21 ac.)

On-Site Impervious Road Area = 1.21 ac.

On-site Subdivision Area =

Developed Lots= Total Area- Road Area= 70.18 ac. – 1.21 ac. = 68.97 acres

On-Site Percent Impervious Area = 7% (per Table 3-1 Typical Values of Percent Impervious in ECM Appendix L of the DCM)

On-Site Estimated Subdivision Impervious area = 4.82 ac.

On-Site Estimated *Reduced** Subdivision Impervious area = 3.62 ac.

*(includes 25% reduction on drainage fees for 2.5 to 5- acre lots per ECM Appendix L Section 3.10.2a)

Total Calculated Impervious area = (3.62 + 1.21) acres = 4.83 acres

Drainage Basin Fee = (4.83 ac.) @ $11,891/ac. = $57,444.53

Bridge Fee = (4.83 ac.) @ $1,755/ac. = $8,476.65

Total Onsite Fee = $65,921.18

Total Drainage Fee

$65,921.18

XIII. Conclusion

The Joyful View Subdivision is a proposed rural residential subdivision consisting of nine (9) lots on a 70.18-acre site. With the utilization of a full spectrum sand filter and infiltration of runoff from swales, development of the proposed subdivision is anticipated to result in no increase in developed runoff from the site, and runoff mains consistent with pre-development drainage conditions. The proposed development will not adversely affect downstream stormwater infrastructure or surrounding developments. Erosion control best management practices will be implemented to mitigate developed drainage impacts. There are no significant adverse drainage impacts anticipated on downstream properties or drainage facilities associated with the Joyful View development.

XIV. Drawings

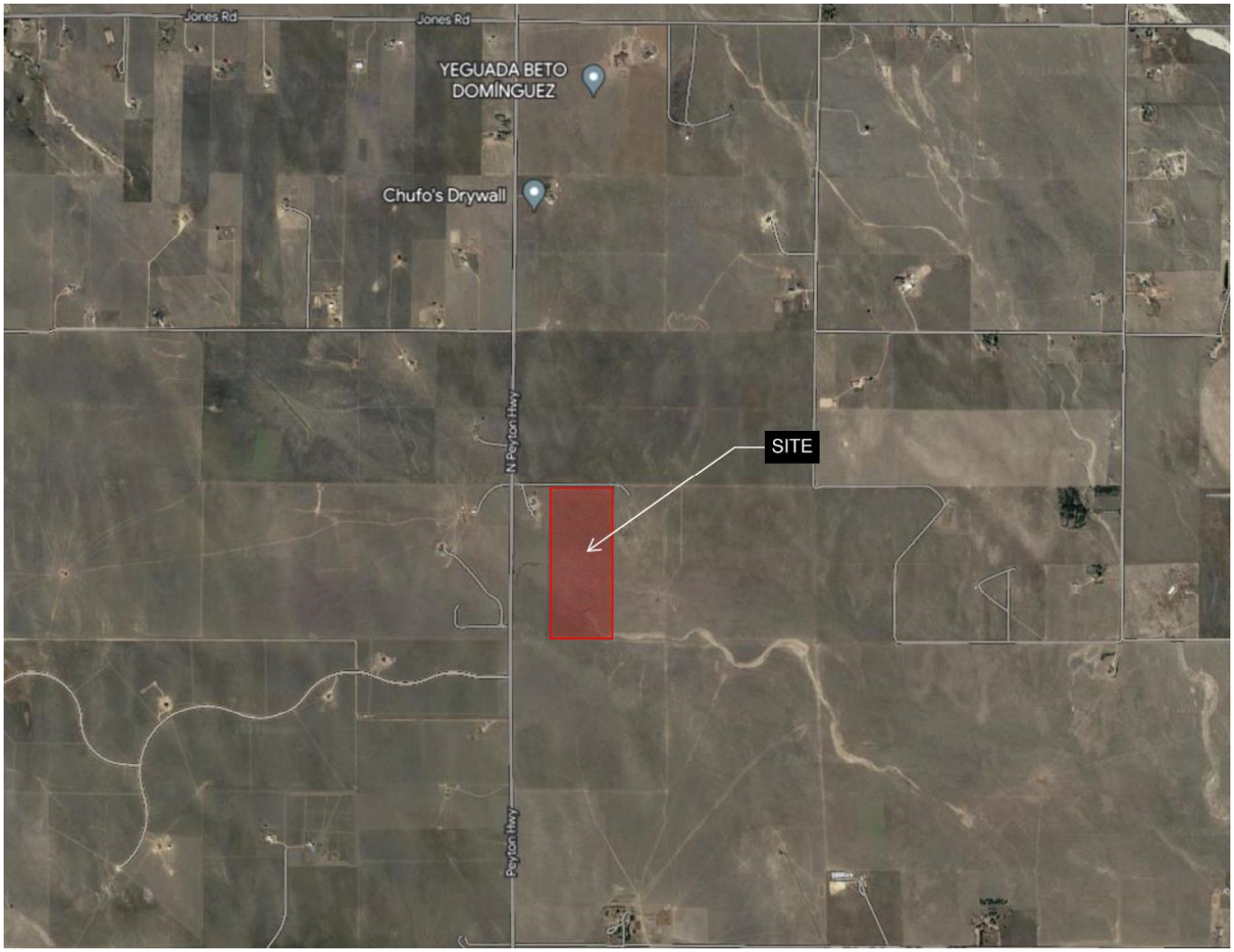
Please refer to the appendices for vicinity and drainage basin maps.

XV. References

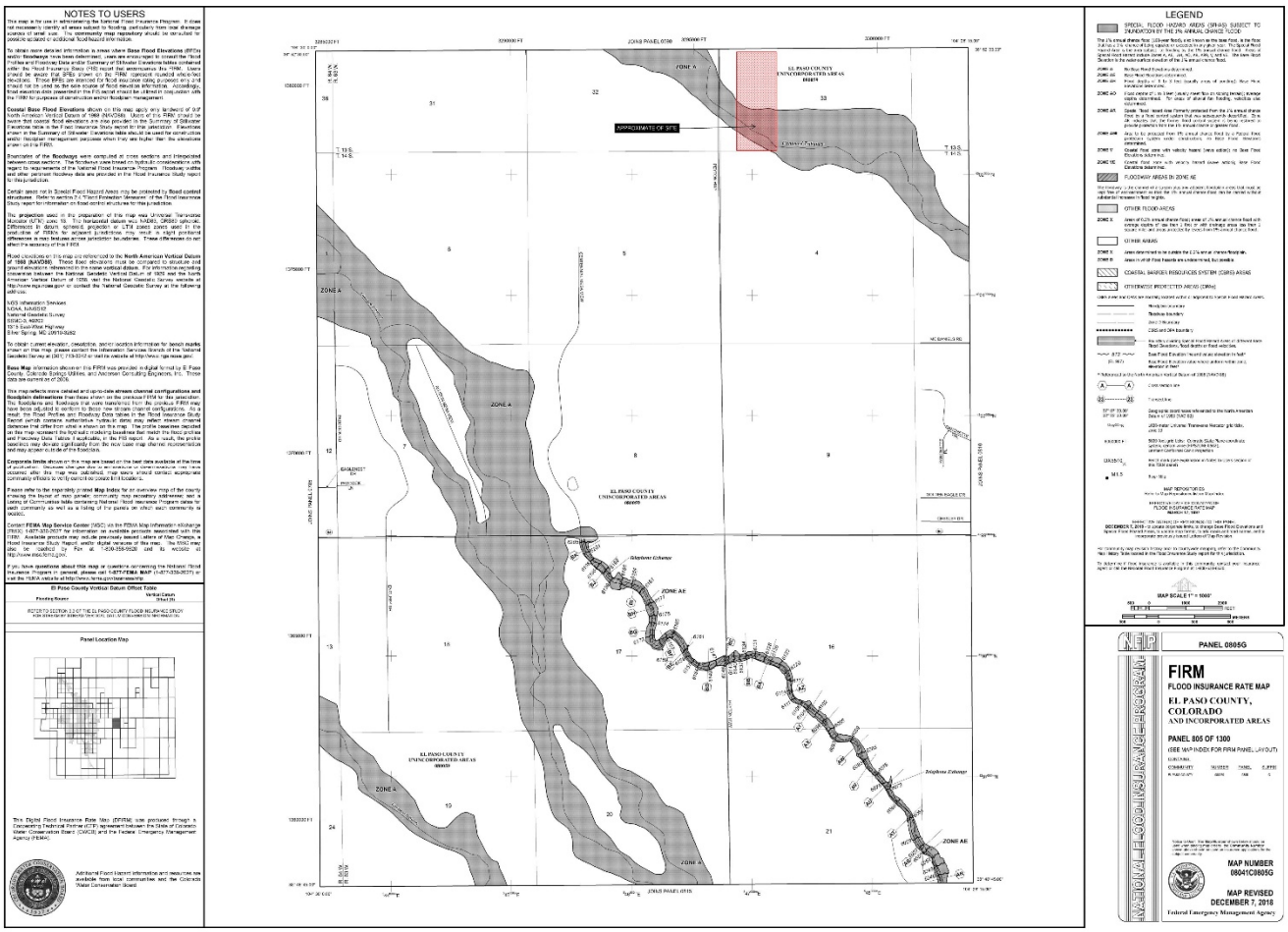
1. City of Colorado Springs – Drainage Criteria Manual, May 2014, Revised January 2021.
2. Urban Storm Drainage Criteria Manual, Urban Drainage Flood Control District, January 2018.
3. El Paso County – Drainage Criteria Manual- Vol 1, 2014

APPENDIX A – VICINITY MAP, SOIL MAP, FEMA MAP

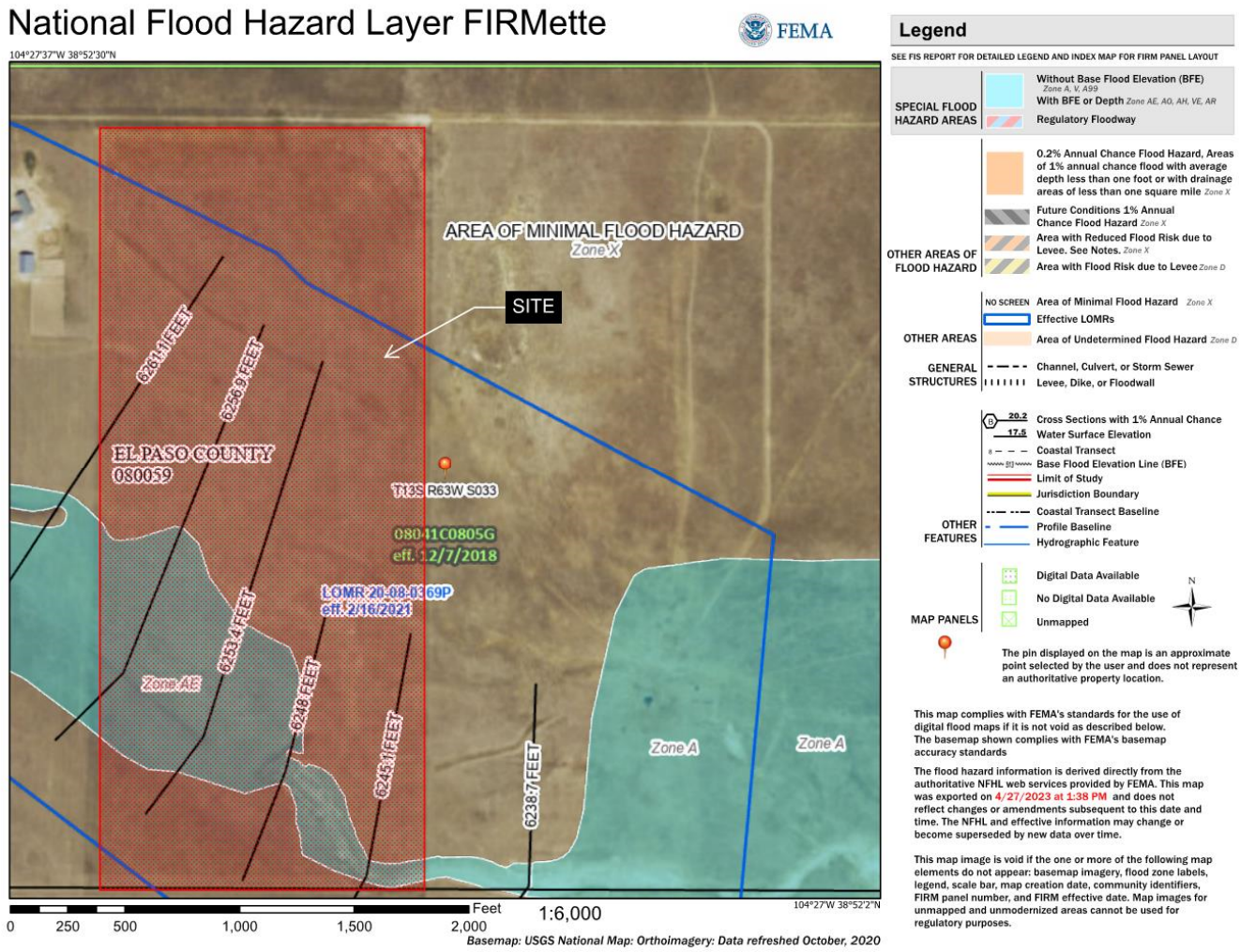
VICINITY MAP



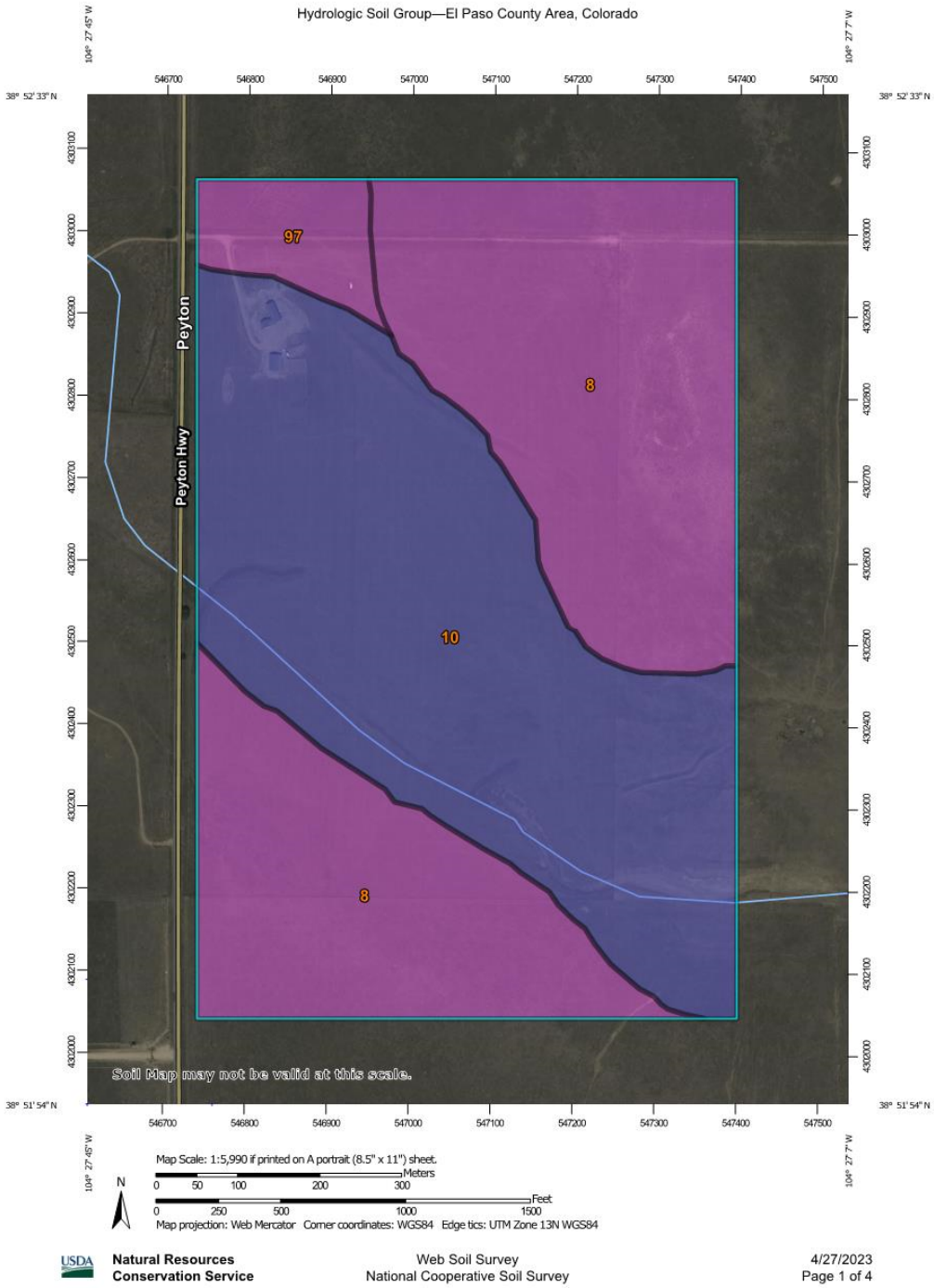
FEMA FIRM MAP



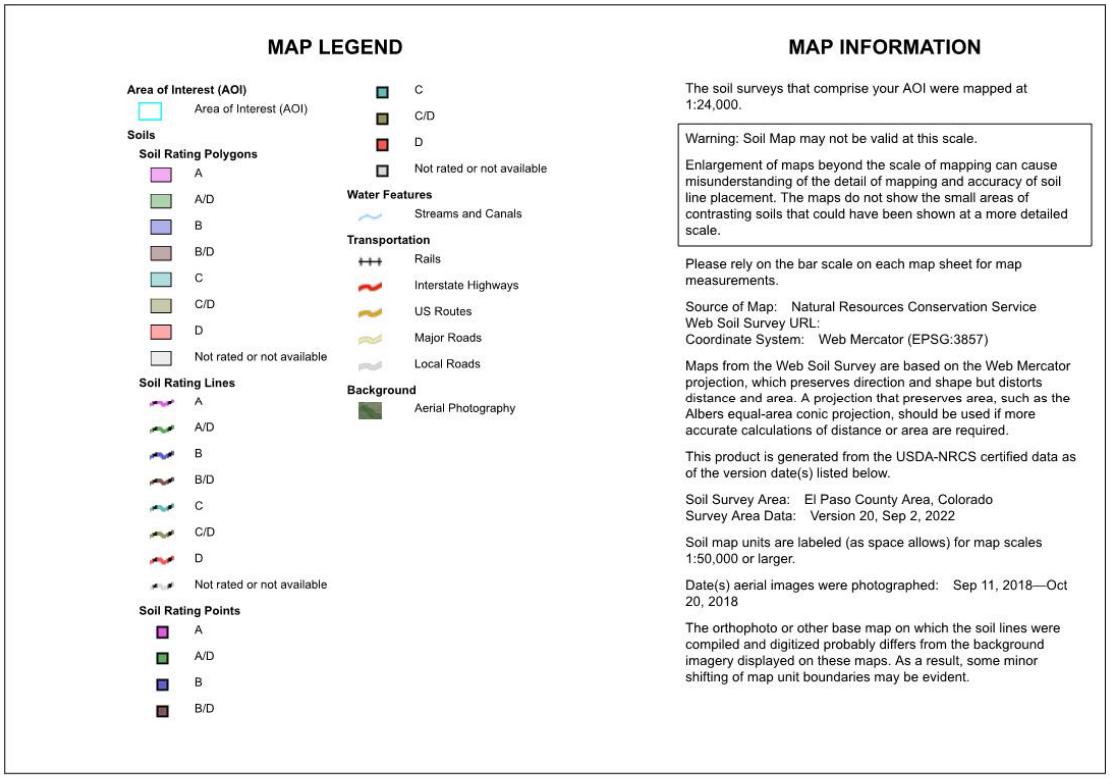
FEMA MAP


National Flood Hazard Layer FIRMette
FEMA
104°27'37"W 38°52'30"N
AREA OF MINIMAL FLOOD HAZARD
Zone X
SITE
6261.1 FEET
6256.9 FEET
EL PASO COUNTY
080059
T13S R63W S033
08041C0805G
eff. 12/7/2018
LOMR 20-08-0369P
eff. 2/16/2021
6253.4 FEET
6248 FEET
6245.1 FEET
6238.7 FEET
Zone AE
Zone A
Zone A
Feet
0 250 500 1,000 1,500 2,000
1:6,000
104°27'W 38°52'2"N
Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020
Legend
SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT
SPECIAL FLOOD HAZARD AREAS
Without Base Flood Elevation (BFE) Zone A, V, A99
With BFE or Depth Zone AE, AO, AH, VE, AR
Regulatory Floodway
OTHER AREAS OF FLOOD HAZARD
0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile Zone X
Future Conditions 1% Annual Chance Flood Hazard Zone X
Area with Reduced Flood Risk due to Levee. See Notes. Zone X
Area with Flood Risk due to Levee Zone D
OTHER AREAS
NO SCREEN Area of Minimal Flood Hazard Zone X
Effective LOMRs
Area of Undetermined Flood Hazard Zone D
GENERAL STRUCTURES
Channel, Culvert, or Storm Sewer
Levee, Dike, or Floodwall
OTHER FEATURES
20.2 Cross Sections with 1% Annual Chance
17.5 Water Surface Elevation
Coastal Transect
Base Flood Elevation Line (BFE)
Limit of Study
Jurisdiction Boundary
Coastal Transect Baseline
Profile Baseline
Hydrographic Feature
MAP PANELS
Digital Data Available
No Digital Data Available
Unmapped
N
The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.
This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards
The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 4/27/2023 at 1:38 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.
This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

SOILS MAP


Hydrologic Soil Group—El Paso County Area, Colorado
104° 27' 45" W
104° 27' 7" W
38° 52' 33" N
38° 51' 54" N
546700
546800
546900
547000
547100
547200
547300
547400
547500
4303100
4303000
4302900
4302800
4302700
4302600
4302500
4302400
4302300
4302200
4302100
4302000
97
8
10
8
Peyton
Peyton Hwy
Soil Map may not be valid at this scale.
Map Scale: 1:5,990 if printed on A portrait (8.5" x 11") sheet.
Meters
0 50 100 200 300
N
Feet
0 250 500 1000 1500
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 13N WGS84
USDA
Natural Resources
Conservation Service
Web Soil Survey
National Cooperative Soil Survey
4/27/2023
Page 1 of 4

Hydrologic Soil Group—El Paso County Area, Colorado



Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
8	Blakeland loamy sand, 1 to 9 percent slopes	A	83.1	49.7%
10	Blendon sandy loam, 0 to 3 percent slopes	B	76.9	46.0%
97	Truckton sandy loam, 3 to 9 percent slopes	A	7.1	4.2%
Totals for Area of Interest			**167.1**	**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.

APPENDIX B – HYDROLOGIC CALCULATIONS

HRGreen	**JOYFUL VIEW**	**Calc'd by:**	**AXB**
	EXISTING CONDITIONS	**Checked by:**	**CM**
	EL PASO COUNTY, CO	**Date:**	**11/17/2023**

SUMMARY RUNOFF TABLE

BASIN	AREA (ac)	% IMPERVIOUS	Q_5 (cfs)	Q_{100} (cfs)
EX1	70.82	2	7.9	53.2
EX2	18.22	2	2.8	18.6
EX3	27.31	2	4.1	27.8
OS1	25.98	2	4.5	30.1
OS2	30.52	2	6.0	40.2
OS3	2.77	67	2.3	4.6

DESIGN POINT SUMMARY TABLE

DESIGN POINT	CONTRIBUTING BASINS	ΣQ_5 (cfs)	ΣQ_{100} (cfs)
1	OS1	4.5	30.1
2	OS3	2.3	4.6
3	OS1,OS3,EX1	10.6	62.7
5	OS2	6.0	40.2
6	OS2, EX3	8.8	58.8
9	EX2	2.8	18.6

HRGreen	**JOYFUL VIEW**						**Calc'd by:**	**AXB**	
	EXISTING CONDITIONS						**Checked by:**	**CM**	
	EL PASO COUNTY, CO						**Date:**	**11/17/2023**	

COMPOSITE 'C' FACTORS

BASIN	UNDEVELOPED	PAVED	TOTAL	SOIL TYPE	UNDEVELOPED			PAVED			COMPOSITE IMPERVIOUSNESS & C		
	ACRES				%I	C_5	C_{100}	%I	C_5	C_{100}	%I	C_5	C_{100}
EX1	70.82	0.00	70.82	A/B	2	0.09	0.36	100	0.90	0.96	2	0.09	0.36
EX2	18.22	0.00	18.22	A/B	2	0.09	0.36	100	0.90	0.96	2	0.09	0.36
EX3	27.31	0.00	27.31	A/B	2	0.09	0.36	100	0.90	0.96	2	0.09	0.36
OS1	25.98	0.00	25.98	A/B	2	0.09	0.36	100	0.90	0.96	2	0.09	0.36
OS2	30.52	0.00	30.52	A/B	2	0.09	0.36	100	0.90	0.96	2	0.09	0.36
OS3	0.94	1.83	2.77	A/B	2	0.09	0.36	100	0.90	0.96	67	0.63	0.76
Total			175.62										

HRGreen	**JOYFUL VIEW**	**Calc'd by:**	**AXB**
	EXISTING CONDITIONS	**Checked by:**	**CM**
	EL PASO COUNTY, CO	**Date:**	**11/17/2023**

TIME OF CONCENTRATION

BASIN DATA			OVERLAND TIME (T_i)			TRAVEL TIME (T_t)					TOTAL
DESIGNATION	C_5	AREA (ac)	LENGTH (ft)	SLOPE %	t_i (min)	C_V	LENGTH (ft)	SLOPE %	V (ft/s)	t_t (min)	t_c (min)
EX1	0.09	70.82	300	4.1	20.0	10	3178	1.2	1.1	48.4	68.4
EX2	0.09	18.22	270	2.1	23.8	10	1783	1.2	1.1	27.1	50.9
EX3	0.09	27.31	244	2.0	23.0	10	1766	1.1	1.0	28.1	51.0
OS1	0.09	25.98	300	2.6	23.3	10	1898	2.4	1.5	20.4	43.7
OS2	0.09	30.52	300	2.2	24.7	10	1312	3.3	1.8	12.0	36.7
OS3	0.63	2.77	20	2.0	3.1	10	2635	0.5	0.7	62.1	65.2

FORMULAS:

$$t_i = \frac{0.395(1.1 - C_5)\sqrt{L}}{S^{0.33}} \qquad V = C_v S_w^{0.5}$$

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.

HRGreen

JOYFUL VIEW
EXISTING CONDITIONS
DESIGN STORM: 5-YEAR

Calc'd by: AXB
Checked by: CM
Date: 11/17/2023

			DIRECT RUNOFF						TOTAL RUNOFF				SURFACE			PIPE				TRAVEL TIME			REMARKS
STREET	DESIGN POINT	BASIN ID	AREA (ac)	C_5	t_c (min)	C_5*A (ac)	I (in./ hr.)	Q (cfs)	t_c (min)	C_5*A (ac)	I (in./ hr.)	Q (cfs)	Q_{street} (cfs)	C_5*A (ac)	SLOPE %	Q_{PIPE} (cfs)	C_5*A (ac)	SLOPE %	PIPE SIZE (in)	LENGTH (FT)	VEL. (FPS)	TRAVEL TIME (min	
	1	OS1	25.98	0.09	43.7	2.34	1.92	4.5					4.5	2.34	1.0					3254	2.0	27.12	BASIN OS1 FLOW, CAPTURED IN 18" CUVLERT @ DP1, SWALE FLOW TO DP2
	5	OS2	30.52	0.09	36.7	2.75	2.18	6.0					6.0	2.75	1.1					1149	2.1	9.13	BASIN OS2 FLOW, CAPTURED IN 18" CULVERT @ DP5, SWALE FLOW TO DP6
	2	OS3	2.77	0.63	65.2	1.73	1.32	2.3					2.3	1.73	1.4					2078	2.4	14.64	BASIN OS3 FLOW IN SWALE TO DP2, SWALE FLOW TO DP3
		EX1	70.82	0.09	68.4	6.37	1.25	7.9															BASIN EX1 SWALE FLOW @ DP3
	3								79.8	10.44	1.01	10.6											**SWALE FLOW FROM DP1, DP2, AND EX1 @DP3, DISCHARGE OFFSITE**
	9	EX2	18.22	0.09	50.9	1.64	1.69	2.8															**BASIN EX2 SWALE FLOW @ DP9, DISCHARGE OFFSITE**
		EX3	27.31	0.09	51.0	2.46	1.68	4.1															BASIN EX 3 SWALE FLOW @ DP6
	6								51.0	5.20	1.68	8.8											**SWALE FLOW FROM EX3 AND DP5 @DP6, DISCHARGE OFFSITE**

HRGreen

JOYFUL VIEW
EXISTING CONDITIONS
DESIGN STORM: 100-YEAR

Calc'd by: AXB
Checked by: CM
Date: 11/17/2023

			DIRECT RUNOFF						TOTAL RUNOFF				SURFACE			PIPE				TRAVEL TIME			REMARKS
STREET	DESIGN POINT	BASIN ID	AREA (ac)	C_{100}	t_c (min)	C_{100}*A (ac)	I (in./ hr.)	Q (cfs)	t_c (min)	C_{100}*A (ac)	I (in./ hr.)	Q (cfs)	Q_{street} (cfs)	C_{100}*A (ac)	SLOPE %	Q_{PIPE} (cfs)	C_{100}*A (ac)	SLOPE %	PIPE SIZE (in)	LENGTH (FT)	VEL. (FPS)	TRAVEL TIME (min)	
	1	OS1	25.98	0.36	43.7	9.35	3.21	30.1					30.1	9.35	1.0					3254	2.0	27.12	BASIN OS1 FLOW, CAPTURED IN 18" CUVLERT @ DP1, SWALE FLOW TO DP2
	5	OS2	30.52	0.36	36.7	10.99	3.66	40.2					40.2	10.99	1.1					1149	2.1	9.13	BASIN OS2 FLOW, CAPTURED IN 18" CULVERT @ DP5, SWALE FLOW TO DP6
	2	OS3	2.77	0.76	65.2	2.10	2.21	4.6					4.6	2.10	1.4					2078	2.4	14.64	BASIN OS3 FLOW IN SWALE TO DP2, SWALE FLOW TO DP3
		EX1	70.82	0.36	68.4	25.50	2.09	53.2															BASIN EX1 SWALE FLOW @ DP3
	3								79.8	36.94	1.70	62.7											**SWALE FLOW FROM DP1, DP2, AND EX1 @DP3, DISCHARGE OFFSITE**
	9	EX2	18.22	0.36	50.9	6.56	2.83	18.6															**BASIN EX2 SWALE FLOW @ DP9, DISCHARGE OFFSITE**
		EX3	27.31	0.36	51.0	9.83	2.83	27.8															BASIN EX 3 SWALE FLOW @ DP6
	6								51.0	20.82	2.83	58.8											**SWALE FLOW FROM EX3 AND DP5 @DP6, DISCHARGE OFFSITE**

HRGreen	**JOYFUL VIEW**	**Calc'd by:**	**CBM**
	PROPOSED CONDITIONS	**Checked by:**	**SPC**
	EL PASO COUNTY, CO	**Date:**	**12/19/2023**

SUMMARY RUNOFF TABLE

BASIN	AREA (ac)	% IMPERVIOUS	Q_5 (cfs)	Q_{100} (cfs)
A	69.83	2	7.9	52.3
B1	0.50	54	0.7	1.6
B2	23.15	8	4.9	26.0
B3	7.26	4	1.7	10.8
C	14.16	5	3.5	21.6
D	0.37	82	0.9	1.8
OS1	25.98	2	4.5	30.1
OS2	30.52	2	6.0	40.2
OS3	2.77	67	2.3	4.6

RUNOFF DISCHARGE TABLE

DESIGN POINT	EX Q_5 (cfs)	PR Q_5 (cfs)	EX Q_{100} (cfs)	PR Q_{100} (cfs)
1	4.5	4.5	30.1	30.1
2	2.3	5.4	4.6	25.3
3	10.6	10.6	62.7	62.2
4	-	0.9	-	1.8
5	6.0	6.5	40.2	41.2
6	8.8	8.0	58.8	50.5
7	-	0.7	-	1.6
8	-	5.3	-	26.9
9	2.8	1.7	18.6	10.8
10 (POND)	-	1.7	-	16.1
3+6+9+10	**22.2**	**21.9**	**140.1**	**139.5**

DESIGN POINT SUMMARY TABLE

DESIGN POINT	CONTRIBUTING BASINS	ΣQ_5 (cfs)	ΣQ_{100} (cfs)
1	OS1	4.5	30.1
2	OS1, OS3	5.4	25.3
3	OS1, 0S3, A	10.6	62.2
4	D	0.9	1.8
5	D, OS2	6.5	41.2
6	D, OS2, C	8.0	50.5
7	B1	0.7	1.6
8	B1, B2	5.3	26.9
9	B3	1.7	10.8
10	POND RELEASE	1.7	16.1

HRGreen

JOYFUL VIEW

PROPOSED CONDITIONS

EL PASO COUNTY, CO

Calc'd by: CBM

Checked by: CM

Date: 12/19/2023

COMPOSITE 'C' FACTORS

BASIN	UNDEVELOPED	GRAVEL ROAD	ASPHALT ROAD	ROOFS	TOTAL	SOIL TYPE	UNDEVELOPED			GRAVEL ROAD			ASPHALT ROAD			ROOFS			COMPOSITE IMPERVIOUSNESS & C		
	ACRES						%I	C_5	C_{100}	%I	C_5	C_{100}	%I	C_5	C_{100}	%I	C_5	C_{100}	%I	C_5	C_{100}
A	69.62	0.14	0.00	0.07	69.83	A/B	2	0.09	0.36	80	0.59	0.70	100	0.90	0.96	90	0.08	0.35	2	0.09	0.36
B1	0.17	0.33	0.00	0.00	0.50	A/B	2	0.09	0.36	80	0.59	0.70	100	0.90	0.96	90	0.08	0.35	54	0.42	0.59
B2	21.52	1.42	0.00	0.21	23.15	A/B	2	0.09	0.36	80	0.59	0.70	100	0.90	0.96	90	0.08	0.35	8	0.12	0.38
B3	7.12	0.07	0.00	0.07	7.26	A/B	2	0.09	0.36	80	0.59	0.70	100	0.90	0.96	90	0.08	0.35	4	0.09	0.36
C	13.71	0.24	0.00	0.21	14.16	A/B	2	0.09	0.36	80	0.59	0.70	100	0.90	0.96	90	0.08	0.35	5	0.10	0.37
D	0.00	0.33	0.04	0.00	0.37	A/B	2	0.09	0.36	80	0.59	0.70	100	0.90	0.96	90	0.08	0.35	82	0.62	0.73
OS1	25.98	0.00	0.00	0.00	25.98	A/B	2	0.09	0.36	80	0.59	0.70	100	0.90	0.96	90	0.08	0.35	2	0.09	0.36
OS2	30.52	0.00	0.00	0.00	30.52	A/B	2	0.09	0.36	80	0.59	0.70	100	0.90	0.96	90	0.08	0.35	2	0.09	0.36
OS3	0.94	0.00	1.83	0.00	2.77	A/B	2	0.09	0.36	80	0.59	0.70	100	0.90	0.96	90	0.08	0.35	67	0.63	0.76
AVG HOUSE - 3000 SF WITH AVE 250 X 12 GRAVEL DRIVEWAY																					
Pond Summary	Basins:				Area:																
Pond A	B1,B2				23.65														9		
Total					174.54														4.46		

HRGreen	**JOYFUL VIEW**	**Calc'd by:**	**CBM**
	PROPOSED CONDITIONS	**Checked by:**	
	EL PASO COUNTY, CO	**Date:**	**12/19/2023**

TIME OF CONCENTRATION

BASIN DATA			OVERLAND TIME (T_i)			TRAVEL TIME (T_t)					TOTAL
DESIGNATION	C_5	AREA (ac)	LENGTH (ft)	SLOPE %	t_i (min)	C_V	LENGTH (ft)	SLOPE %	V (ft/s)	t_t (min)	t_c (min)
A	0.09	69.83	300	4.1	20.0	10	3198	1.2	1.1	48.7	68.7
B1	0.42	0.50	20	2.0	4.4	15	1123	1.0	1.5	12.5	16.9
B2	0.12	23.15	300	2.0	24.7	10	1200	0.7	0.8	23.9	48.6
B3	0.09	7.26	265	2.1	23.4	10	450	1.0	1.0	7.5	30.9
C	0.10	14.16	150	1.7	18.8	15	988	1.0	1.5	11.0	29.8
D	0.62	0.37	34	2.0	4.0	15	560	1.0	1.5	6.2	10.3
OS1	0.09	25.98	300	2.6	23.3	10	1898	2.4	1.5	20.4	43.7
OS2	0.09	30.52	300	2.2	24.7	10	1312	3.3	1.8	12.0	36.7
OS3	0.63	2.77	20	2.0	3.1	10	2635	0.5	0.7	62.1	65.2

FORMULAS:

$$t_i = \frac{0.395(1.1 - C_5)\sqrt{L}}{S^{0.33}} \qquad V = C_v S_w^{0.5}$$

25.99476

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.

HRGreen

JOYFUL VIEW
PROPOSED CONDITIONS
DESIGN STORM: 5-YEAR

Calc'd by: CBM
Checked by:
Date: 12/19/2023

			DIRECT RUNOFF						TOTAL RUNOFF				SURFACE			PIPE				TRAVEL TIME			REMARKS
STREET	DESIGN POINT	BASIN ID	AREA (ac)	C_5	t_c (min)	C_5*A (ac)	I (in./ hr.)	Q (cfs)	t_c (min)	C_5*A (ac)	I (in./ hr.)	Q (cfs)	Q_{street} (cfs)	C_5*A (ac)	SLOPE %	Q_{PIPE} (cfs)	C_5*A (ac)	SLOPE %	PIPE SIZE (in)	LENGTH (FT)	VEL. (FPS)	TRAVEL TIME (min)	
	1	OS1	25.98	0.09	43.7	2.34	1.92	4.5					4.5	2.34	1.0					1450	2.0	12.08	BASIN OS1 FLOW, CAPTURED IN 18" CULVERT @ DP1, SWALE FLOW TO DPB
	2	OS3	2.77	0.63	65.2	1.73	1.32	2.3	65.2	4.07	1.32	5.4	5.4	4.07	1.4					2078	2.4	14.64	BASIN OS3 FLOW @ DP2, SWALE FLOW TO DPC
	3	A	69.83	0.09	68.7	6.35	1.24	7.9	79.8	10.42	1.01	10.6											**DP1, DP2 & BASIN A FLOW @ DP3, FOLLOW HISTORIC DRAINAGE PATTERNS OFFSITE**
	4	D	0.37	0.62	10.3	0.23	4.09	0.9					0.9	0.23	1.0					640	2.0	5.33	BASIN D FLOW CAPTURED IN EXISTING ROADSIDE SWALE ON NORTH SIDE OF JOYFUL VIEW TO DP4, SWALE FLOW TO DP5
	5	OS2	30.52	0.09	36.7	2.75	2.18	6.0	36.7	2.98	2.18	6.5	6.5	2.98	1.0					1150	2.0	9.58	BASIN D, OS2 FLOW, CAPTURED IN 18" CUVLERT @ DP5, SWALE FLOW TO DP6
	6	C	14.16	0.10	29.8	1.39	2.49	3.5	46.3	4.37	1.83	8.0											**BASIN D, OS2, C FLOW @ DP6, FOLLOWS HISTORIC DRAINAGE PATTERNS OFFSITE**
	7	B1	0.5	0.42	16.9	0.21	3.34	0.7					0.7	0.21	0.7					750	1.6	7.69	BASIN B1 FLOW CAPTURED AT DP7 SWALE 2 TO DP8 TO POND A
	8	B2	23.15	0.12	48.6	2.79	1.76	4.9	48.6	3.01	1.76	5.3	5.3	3.01	0.7					550	1.7	5.48	BASIN B2 COMBINES WITH DP7 IN SWALE 2 TO DP8 TO POND A
	9	B3	7.26	0.09	30.9	0.69	2.44	1.7															**BASIN B3 FLOWS TO DP9, FOLLOWS HISTORIC DRAINAGE PATTERNS OFFSITE**
	10	POND A RELEASE						2.0															**POND A RELEASE TO DP10**

HRGreen

JOYFUL VIEW
PROPOSED CONDITIONS
DESIGN STORM: 100-YEAR

Calc'd by: CBM
Checked by:
Date: 12/19/2023

			DIRECT RUNOFF						TOTAL RUNOFF				SURFACE			PIPE				TRAVEL TIME			REMARKS
STREET	DESIGN POINT	BASIN ID	AREA (ac)	C_{100}	t_c (min)	C_{100}*A (ac)	I (in./ hr.)	Q (cfs)	t_c (min)	C_{100}*A (ac)	I (in./ hr.)	Q (cfs)	Q_{street} (cfs)	C_{100}*A (ac)	SLOPE %	Q_{PIPE} (cfs)	C_{100}*A (ac)	SLOPE %	PIPE SIZE (in)	LENGTH (FT)	VEL. (FPS)	TRAVEL TIME (min)	
	1	OS1	25.98	0.36	43.7	9.35	3.21	30.1					30.1	9.35	1.0					1450	2.0	12.08	BASIN OS1 FLOW, CAPTURED IN 18" CULVERT @ DP1, SWALE FLOW TO DPB
	2	OS3	2.77	0.76	65.2	2.10	2.21	4.6	65.2	11.45	2.21	25.3	25.3	11.45	1.4					2078	2.4	14.64	BASIN OS3 FLOW @ DP2, SWALE FLOW TO DPC
	3	A	69.83	0.36	68.7	25.18	2.08	52.3	79.8	36.63	1.70	62.2											**DP1, DP2 & BASIN A FLOW @ DP3, FOLLOW HISTORIC DRAINAGE PATTERNS OFFSITE**
	4	D	0.37	0.73	10.3	0.27	6.87	1.8					1.8	0.27	1.0					640	2.0	5.33	BASIN D FLOW CAPTURED IN EXISTING ROADSIDE SWALE ON NORTH SIDE OF JOYFUL VIEW TO DP4, SWALE FLOW TO DP5
	5	OS2	30.52	0.36	36.7	10.99	3.66	40.2	36.7	11.26	3.66	41.2	41.2	11.26	1.0					1150	2.0	9.58	BASIN D, OS2 FLOW, CAPTURED IN 18" CUVLERT @ DP5, SWALE FLOW TO DP6
	6	C	14.16	0.37	29.8	5.18	4.18	21.6	46.3	16.43	3.07	50.5											**BASIN D, OS2, C FLOW @ DP6, FOLLOWS HISTORIC DRAINAGE PATTERNS OFFSITE**
	7	B1	0.5	0.59	16.9	0.29	5.61	1.6					1.6	0.29	0.7					750	1.6	7.69	BASIN B1 FLOW CAPTURED AT DP7 SWALE 2 TO DP8 TO POND A
	8	B2	23.15	0.38	48.6	8.82	2.95	26.0	48.6	9.11	2.95	26.9	26.9	9.11	0.7					550	1.7	5.48	BASIN B2 COMBINES WITH DP7 IN SWALE 2 TO DP8 TO POND A
	9	B3	7.26	0.36	30.9	2.64	4.09	10.8															**BASIN B3 FLOWS TO DP9, FOLLOWS HISTORIC DRAINAGE PATTERNS OFFSITE**
	POND A							16.1															**POND A RELEASE TO DP10**

APPENDIX C – HYDRAULIC CALCULATIONS

Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Wednesday, Oct 18 2023

Culvert 1 (Q100 = 30.1 CFS - DP1)

Invert Elev Dn (ft)	=	6273.36
Pipe Length (ft)	=	91.37
Slope (%)	=	0.50
Invert Elev Up (ft)	=	6273.82
Rise (in)	=	24.0
Shape	=	Circular
Span (in)	=	24.0
No. Barrels	=	2
n-Value	=	0.013
Culvert Type	=	Circular Concrete
Culvert Entrance	=	Groove end projecting (C)
Coeff. K,M,c,Y,k	=	0.0045, 2, 0.0317, 0.69, 0.2

Embankment

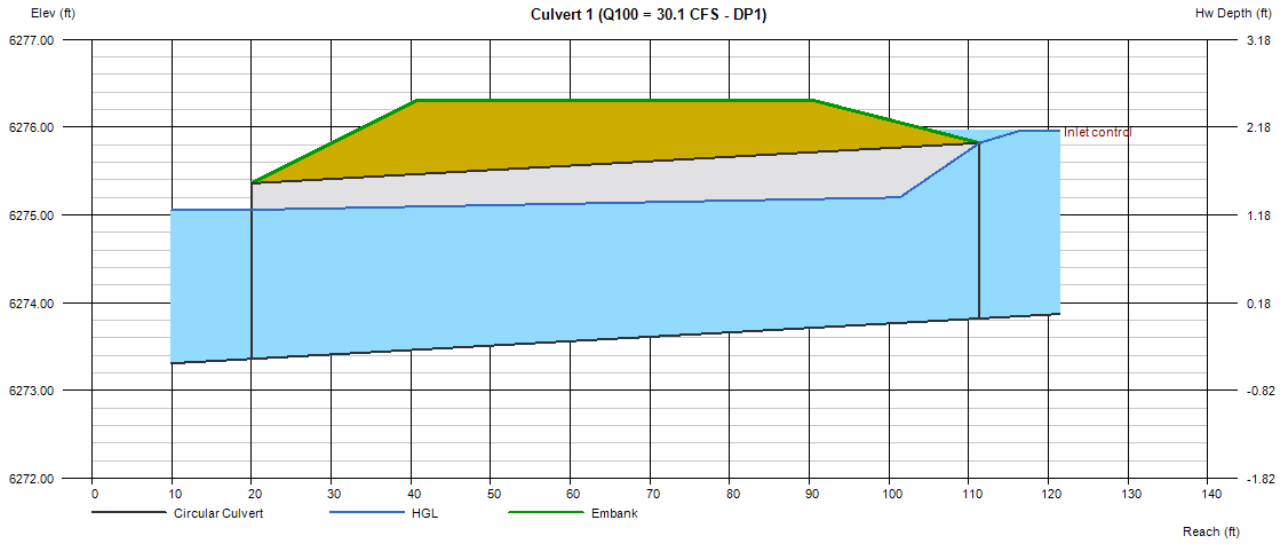
Top Elevation (ft)	=	6276.30
Top Width (ft)	=	50.00
Crest Width (ft)	=	100.00

Calculations

Qmin (cfs)	=	30.10
Qmax (cfs)	=	30.10
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	30.10
Qpipe (cfs)	=	30.10
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	5.29
Veloc Up (ft/s)	=	6.42
HGL Dn (ft)	=	6275.06
HGL Up (ft)	=	6275.22
Hw Elev (ft)	=	6275.96
Hw/D (ft)	=	1.07
Flow Regime	=	Inlet Control



Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, Dec 21 2023

CULVERT 2 (Q100 = 24.4 CFS - DP8)

Invert Elev Dn (ft)	=	6250.29
Pipe Length (ft)	=	102.60
Slope (%)	=	0.50
Invert Elev Up (ft)	=	6250.80
Rise (in)	=	24.0
Shape	=	Circular
Span (in)	=	24.0
No. Barrels	=	1
n-Value	=	0.013
Culvert Type	=	Circular Concrete
Culvert Entrance	=	Groove end projecting (C)
Coeff. K,M,c,Y,k	=	0.0045, 2, 0.0317, 0.69, 0.2

Embankment

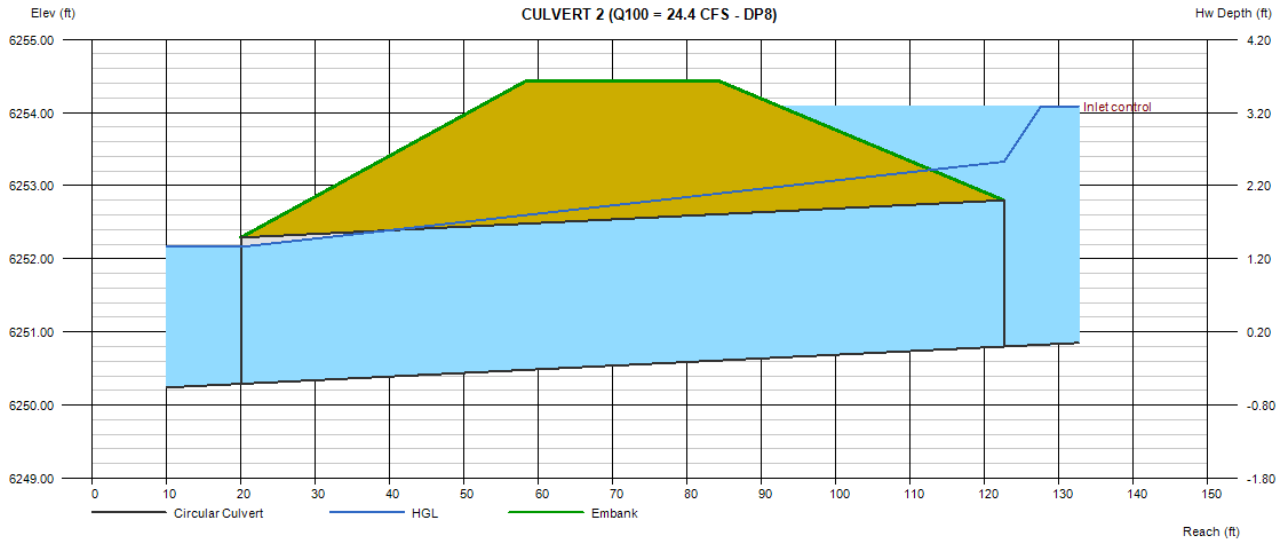
Top Elevation (ft)	=	6254.43
Top Width (ft)	=	26.00
Crest Width (ft)	=	100.00

Calculations

Qmin (cfs)	=	24.40
Qmax (cfs)	=	24.40
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	24.40
Qpipe (cfs)	=	24.40
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	7.98
Veloc Up (ft/s)	=	7.77
HGL Dn (ft)	=	6252.16
HGL Up (ft)	=	6253.33
Hw Elev (ft)	=	6254.09
Hw/D (ft)	=	1.64
Flow Regime	=	Inlet Control



Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Monday, Oct 16 2023

CULVERT 3 (Q100=41.2 CFS - DP5)

Invert Elev Dn (ft)	=	6260.74
Pipe Length (ft)	=	78.50
Slope (%)	=	2.75
Invert Elev Up (ft)	=	6262.90
Rise (in)	=	24.0
Shape	=	Circular
Span (in)	=	24.0
No. Barrels	=	2
n-Value	=	0.012
Culvert Type	=	Circular Concrete
Culvert Entrance	=	Groove end projecting (C)
Coeff. K,M,c,Y,k	=	0.0045, 2, 0.0317, 0.69, 0.2

Embankment

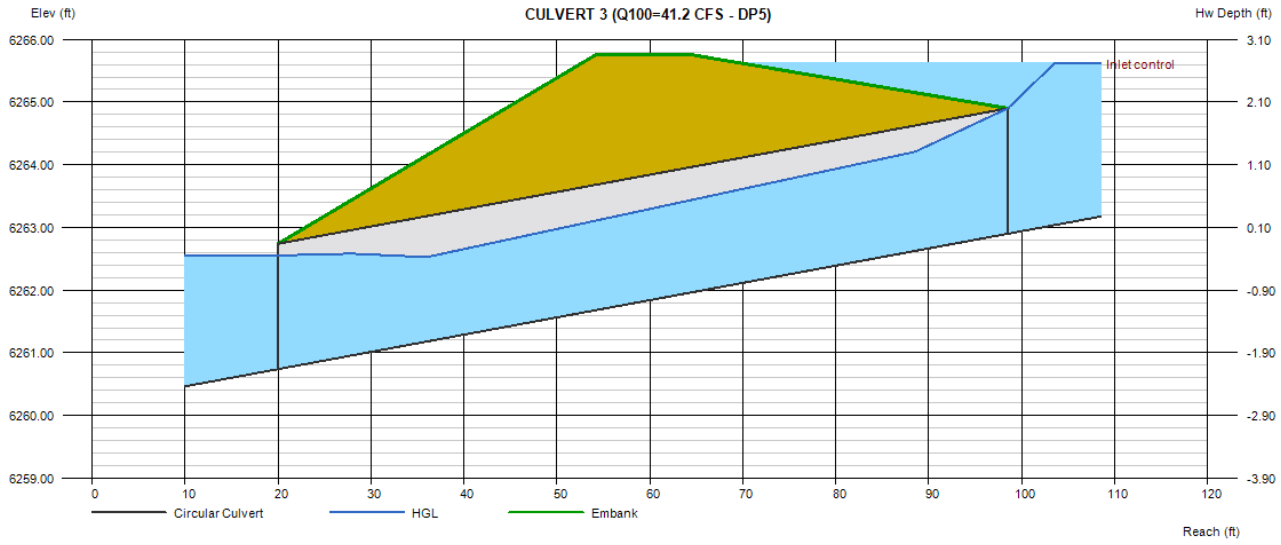
Top Elevation (ft)	=	6265.76
Top Width (ft)	=	10.00
Crest Width (ft)	=	40.00

Calculations

Qmin (cfs)	=	41.20
Qmax (cfs)	=	41.20
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	41.20
Qpipe (cfs)	=	41.20
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	6.88
Veloc Up (ft/s)	=	7.53
HGL Dn (ft)	=	6262.55
HGL Up (ft)	=	6264.53
Hw Elev (ft)	=	6265.62
Hw/D (ft)	=	1.36
Flow Regime	=	Inlet Control



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, Oct 17 2023

SWALE 1 - JOYFUL VIEW

Triangular

Side Slopes (z:1)	= 3.00, 3.00
Total Depth (ft)	= 1.67
Invert Elev (ft)	= 1.00
Slope (%)	= 0.94
N-Value	= 0.035

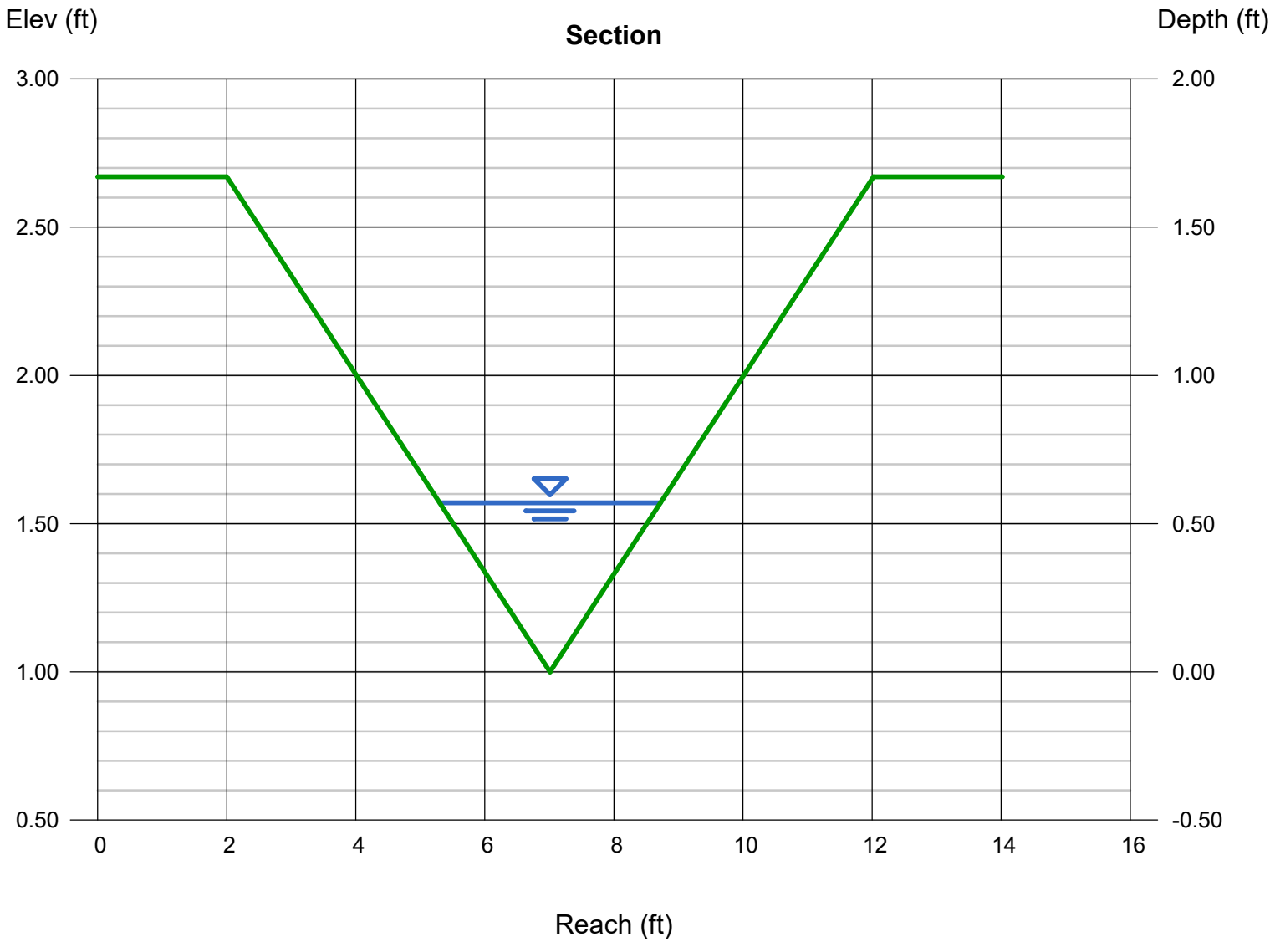
Calculations

Compute by:	Known Q
Known Q (cfs)	= 1.60

Highlighted

Depth (ft)	= 0.57
Q (cfs)	= 1.600
Area (sqft)	= 0.97
Velocity (ft/s)	= 1.64
Wetted Perim (ft)	= 3.60
Crit Depth, Yc (ft)	= 0.45
Top Width (ft)	= 3.42
EGL (ft)	= 0.61

Fr= 1.64/ (sqrt ((32.17* 0.57))= 0.38 < 0.90



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, Oct 17 2023

Swale 2 (DP8)

Triangular

Side Slopes (z:1)	= 3.00, 3.00
Total Depth (ft)	= 2.75
Invert Elev (ft)	= 1.00
Slope (%)	= 0.60
N-Value	= 0.035

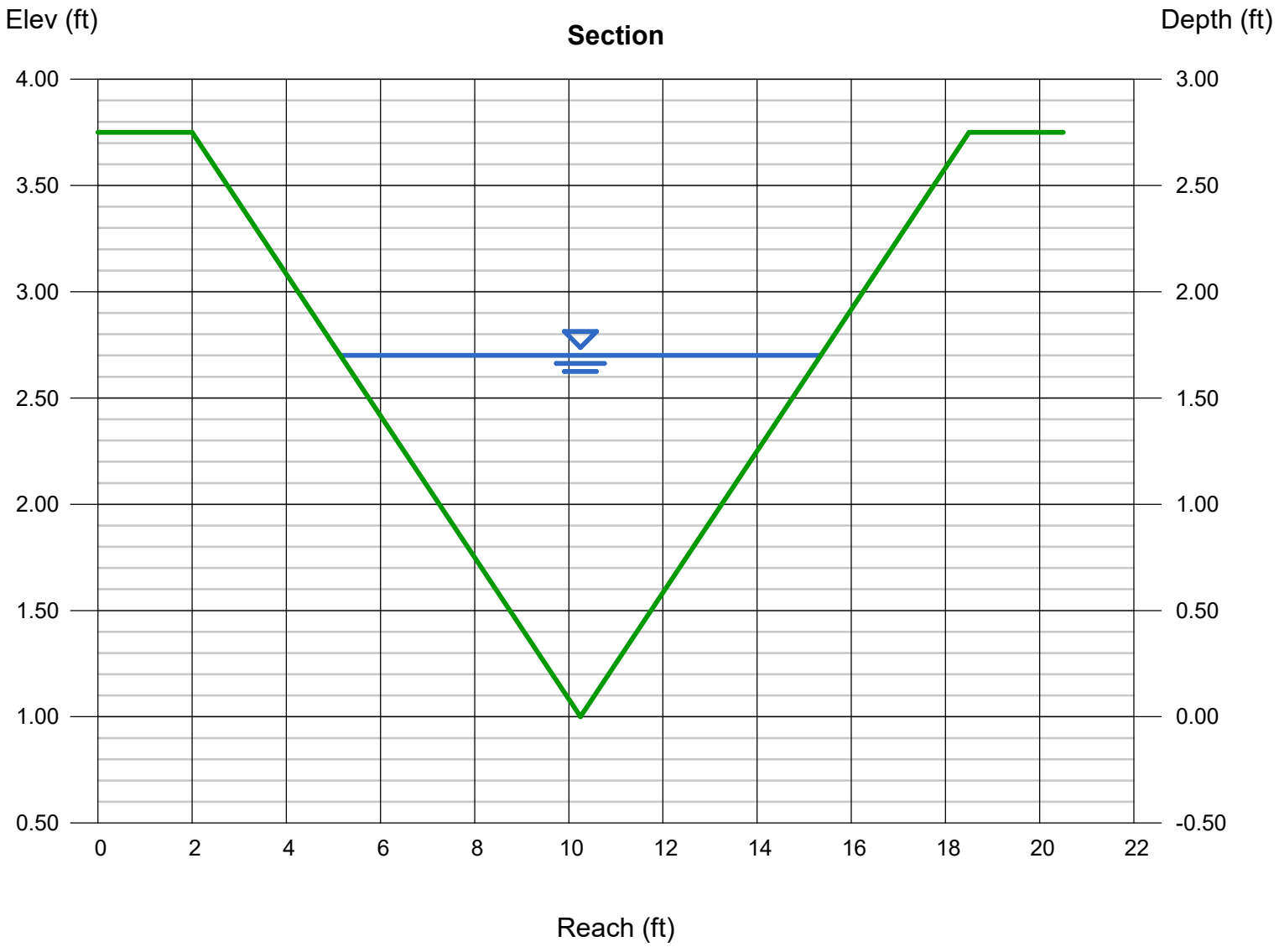
Calculations

Compute by:	Known Q
Known Q (cfs)	= 24.40

Highlighted

Depth (ft)	= 1.70
Q (cfs)	= 24.40
Area (sqft)	= 8.67
Velocity (ft/s)	= 2.81
Wetted Perim (ft)	= 10.75
Crit Depth, Yc (ft)	= 1.33
Top Width (ft)	= 10.20
EGL (ft)	= 1.82

Fr= 2.81/ (sqrt ((32.17*1.70))= 0.38 < 0.90



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, Oct 17 2023

SWALE 3 - LOTS 8 & 9

Triangular

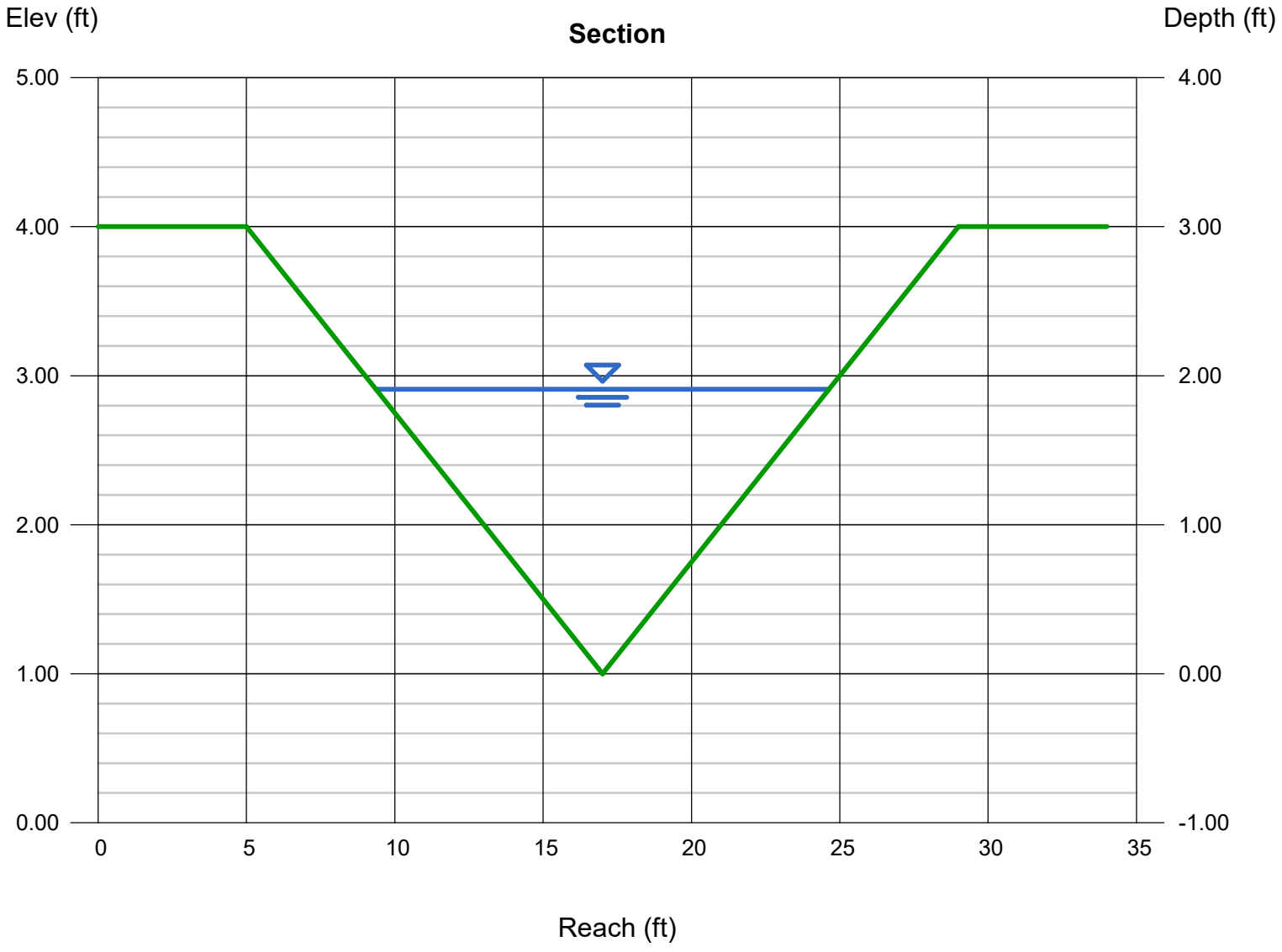
Side Slopes (z:1)	= 4.00, 4.00
Total Depth (ft)	= 3.00
Invert Elev (ft)	= 1.00
Slope (%)	= 0.50
N-Value	= 0.035

Calculations

Compute by:	Known Q
Known Q (cfs)	= 41.20

Highlighted

Depth (ft)	= 1.91
Q (cfs)	= 41.20
Area (sqft)	= 14.59
Velocity (ft/s)	= 2.82
Wetted Perim (ft)	= 15.75
Crit Depth, Yc (ft)	= 1.46
Top Width (ft)	= 15.28
EGL (ft)	= 2.03



THIS SHEET IS USED ONLY FOR FOREBAY NOTCH SIZING.

Design Procedure Form: Extended Detention Basin (EDB)

UD-BMP (Version 3.07, March 2018)

Designer: CM
Company: HR Green
Date: October 17, 2023
Project: Joyful View Subdivision
Location: EL PASO COUNTY, CO

1. Basin Storage Volume

A) Effective Imperviousness of Tributary Area, I_a — I_a = 9.0 %

B) Tributary Area's Imperviousness Ratio ($i = I_a / 100$) — i = 0.090

C) Contributing Watershed Area — Area = 25.630 ac

D) For Watersheds Outside of the Denver Region, Depth of Average Runoff Producing Storm — d_6 = in

E) Design Concept (Select EURV when also designing for flood control)

Choose One
- ○ Water Quality Capture Volume (WQCV)
- ◉ Excess Urban Runoff Volume (EURV)

F) Design Volume (WQCV) Based on 40-hour Drain Time
($V_{DESIGN} = (1.0 * (0.91 * i^3 - 1.19 * i^2 + 0.78 * i) / 12 * Area$)
— V_{DESIGN} = 0.131 ac-ft

G) For Watersheds Outside of the Denver Region, Water Quality Capture Volume (WQCV) Design Volume
($V_{WQCV\ OTHER} = (d_6 * (V_{DESIGN}/0.43))$)
— $V_{DESIGN\ OTHER}$ = ac-ft

H) User Input of Water Quality Capture Volume (WQCV) Design Volume (Only if a different WQCV Design Volume is desired)
— $V_{DESIGN\ USER}$ = ac-ft

I) NRCS Hydrologic Soil Groups of Tributary Watershed
- i) Percentage of Watershed consisting of Type A Soils — HSG_A = 0 %
- ii) Percentage of Watershed consisting of Type B Soils — HSG_B = 100 %
- iii) Percentage of Watershed consisting of Type C/D Soils — $HSG_{C/D}$ = 0 %

J) Excess Urban Runoff Volume (EURV) Design Volume
For HSG A: $EURV_A = 1.68 * i^{1.28}$
For HSG B: $EURV_B = 1.36 * i^{1.08}$
For HSG C/D: $EURV_{C/D} = 1.20 * i^{1.08}$
— $EURV_{DESIGN}$ = 0.216 ac-f t

K) User Input of Excess Urban Runoff Volume (EURV) Design Volume (Only if a different EURV Design Volume is desired)
— $EURV_{DESIGN\ USER}$ = ac-f t

2. Basin Shape: Length to Width Ratio
(A basin length to width ratio of at least 2:1 will improve TSS reduction.)
— L : W = 2.0 : 1

3. Basin Side Slopes

A) Basin Maximum Side Slopes
(Horizontal distance per unit vertical, 4:1 or flatter preferred)
— Z = 4.00 ft / ft

4. Inlet

A) Describe means of providing energy dissipation at concentrated inflow locations:

5. Forebay

A) Minimum Forebay Volume
(V_{FMIN} = 2% of the WQCV)
— V_{FMIN} = 0.003 ac-ft

B) Actual Forebay Volume
— V_F = ac-ft

C) Forebay Depth
(D_F = 18 inch maximum)
— D_F = 15.0 in

D) Forebay Discharge

i) Undetained 100-year Peak Discharge
— Q_{100} = 24.40 cfs

ii) Forebay Discharge Design Flow
($Q_F = 0.02 * Q_{100}$)
— Q_F = 0.49 cfs

E) Forebay Discharge Design

Choose One
- ○ Berm With Pipe
- ◉ Wall with Rect. Notch
- ○ Wall with V-Notch Weir

Flow too small for berm w/ pipe

F) Discharge Pipe Size (minimum 8-inches)
— Calculated D_P = in

G) Rectangular Notch Width
— Calculated W_N = 4.3 in

APPENDIX D – WATER QUALITY AND DETENTION CALCULATIONS

Design Procedure Form: Sand Filter (SF)

UD-BMP (Version 3.07, March 2018) **Sheet 1 of 2**

Designer: SPC
Company: HR Green
Date: December 19, 2023
Project: Joyful View Subdivision
Location: El Paso County, CO

1. Basin Storage Volume	
A) Effective Imperviousness of Tributary Area, I_a (100% if all paved and roofed areas upstream of sand filter)	I_a = 9.0 %
B) Tributary Area's Imperviousness Ratio (i = I_a/100)	i = 0.090
C) Water Quality Capture Volume (WQCV) Based on 12-hour Drain Time WQCV= 0.8 * (0.91* i^3 - 1.19 * i^2 + 0.78 * i)	WQCV = 0.05 watershed inches
D) Contributing Watershed Area (including sand filter area)	Area = 1,116,443 sq ft
E) Water Quality Capture Volume (WQCV) Design Volume V_{WQCV} = WQCV / 12 * Area	V_{WQCV} = 4,557 cu ft
F) For Watersheds Outside of the Denver Region, Depth of Average Runoff Producing Storm	d_6 = in
G) For Watersheds Outside of the Denver Region, Water Quality Capture Volume (WQCV) Design Volume	$V_{WQCV\ OTHER}$ = cu ft
H) User Input of Water Quality Capture Volume (WQCV) Design Volume (Only if a different WQCV Design Volume is desired)	$V_{WQCV\ USER}$ = cu ft
2. Basin Geometry	
A) WQCV Depth	D_{WQCV} = 0.7 ft
B) Sand Filter Side Slopes (Horizontal distance per unit vertical, 4:1 or flatter preferred). Use "0" if sand filter has vertical walls.	Z = 4.00 ft / ft
C) Minimum Filter Area (Flat Surface Area)	A_{Min} = 1256 sq ft
D) Actual Filter Area	A_{Actual} = 1301 sq ft
E) Volume Provided	V_T = 67169 cu ft
3. Filter Material	Choose One: (•) 18" CDOT Class B or C Filter Material; ( ) Other (Explain):
4. Underdrain System	
A) Are underdrains provided?	Choose One: (•) YES; ( ) NO
B) Underdrain system orifice diameter for 12 hour drain time	
i) Distance From Lowest Elevation of the Storage Volume to the Center of the Orifice	y = 2.7 ft
ii) Volume to Drain in 12 Hours	Vol_{12} = 4,557 cu ft
iii) Orifice Diameter, 3/8" Minimum	D_O = ~~1 7/16~~ in

Diameter is for a 12 hour drain time, this pond has been designed for a 40 hour drain time.

Design Procedure Form: Sand Filter (SF)

Designer: SPC
Company: HR Green
Date: December 19, 2023
Project: Joyful View Subdivision
Location: El Paso County, CO

5. Impermeable Geomembrane Liner and Geotextile Separator Fabric A) Is an impermeable liner provided due to proximity of structures or groundwater contamination?	Choose One ○ YES ◉ NO
6. Inlet / Outlet Works A) Describe the type of energy dissipation at inlet points and means of conveying flows in excess of the WQCV through the outlet	Engery dissapation at inlet points provided via concrete forebay, riprap, and means of conveying flows in excess of the WQCV through the outlet is via the modified type 'C' inlet outlet structure grate, and a restricted outlet pipe.

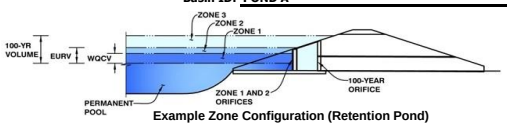
Notes:

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)

Project: Joyful View

Basin ID: POND A



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	SF	
Watershed Area =	23.65	acres
Watershed Length =	2,000	ft
Watershed Length to Centroid =	900	ft
Watershed Slope =	0.010	ft/ft
Watershed Imperviousness =	9.00%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	100.0%	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	

Drain Time Too Long

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) =	0.097	acre-feet	acre-feet
Excess Urban Runoff Volume (EURV) =	0.198	acre-feet	acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	0.298	acre-feet	1.19 inches
5-yr Runoff Volume (P1 = 1.5 in.) =	0.675	acre-feet	1.50 inches
10-yr Runoff Volume (P1 = 1.75 in.) =	1.053	acre-feet	1.75 inches
25-yr Runoff Volume (P1 = 2 in.) =	1.735	acre-feet	2.00 inches
50-yr Runoff Volume (P1 = 2.25 in.) =	2.196	acre-feet	2.25 inches
100-yr Runoff Volume (P1 = 2.52 in.) =	2.864	acre-feet	2.52 inches
500-yr Runoff Volume (P1 = 3.14 in.) =	4.077	acre-feet	3.14 inches
Approximate 2-yr Detention Volume =	0.125	acre-feet	
Approximate 5-yr Detention Volume =	0.198	acre-feet	
Approximate 10-yr Detention Volume =	0.431	acre-feet	
Approximate 25-yr Detention Volume =	0.613	acre-feet	
Approximate 50-yr Detention Volume =	0.639	acre-feet	
Approximate 100-yr Detention Volume =	0.831	acre-feet	

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.097	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.102	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.632	acre-feet
Total Detention Basin Volume =	0.831	acre-feet
Initial Surcharge Volume (ISV) =	N/A	ft^3
Initial Surcharge Depth (ISD) =	N/A	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	N/A	ft
Slope of Trickle Channel (S_{TC}) =	N/A	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

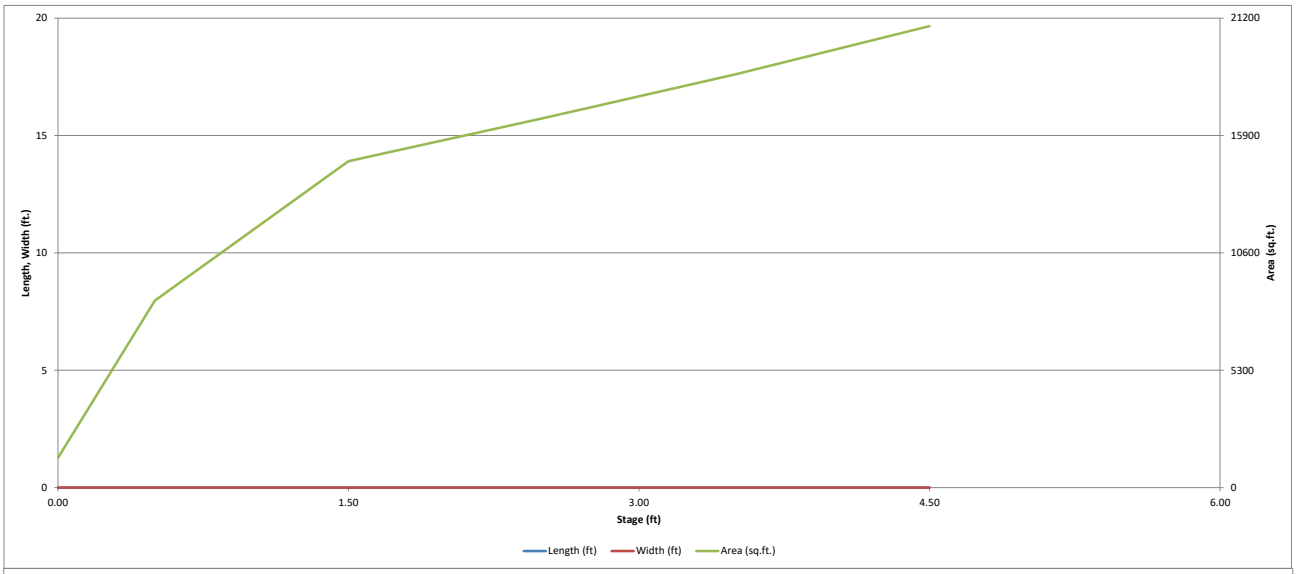
6249.5

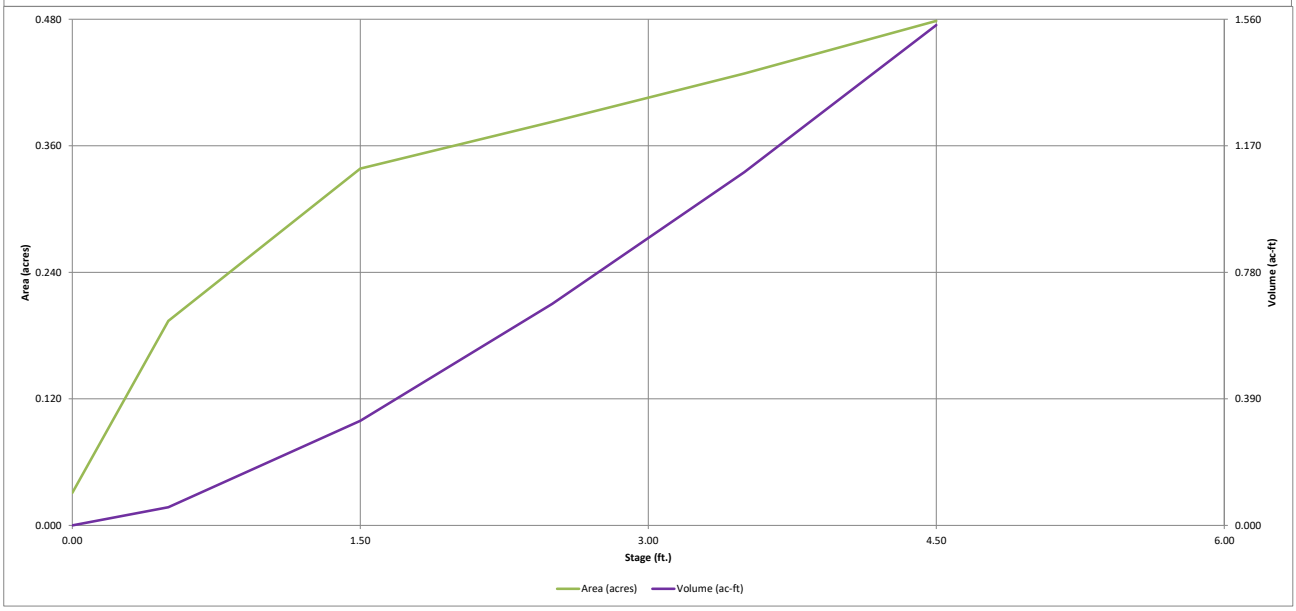
Depth Increment = ft

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)
Media Surface	--	0.00	--	--	--	1,344	0.031		
50	--	0.50	--	--	--	8,448	0.194	2,448	0.056
51	--	1.50	--	--	--	14,739	0.338	14,041	0.322
52	--	2.50	--	--	--	16,670	0.383	29,746	0.683
53	--	3.50	--	--	--	18,664	0.428	47,413	1.088
54	--	4.50	--	--	--	20,840	0.478	67,165	1.542

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)



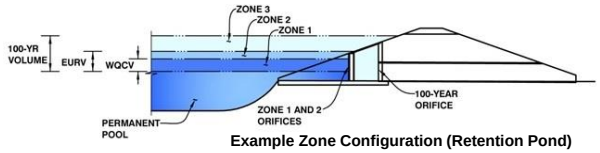


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)

Project: **Joyful View**

Basin ID: **POND A**



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	0.70	0.097	Filtration Media
Zone 2 (EURV)	1.10	0.102	Rectangular Orifice
Zone 3 (100-year)	2.88	0.632	Weir&Pipe (Restrict)
Total (all zones)		0.831	

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

Underdrain Orifice Invert Depth =	2.72	ft (distance below the filtration media surface)	Underdrain Orifice Area =	0.0	ft^2
Underdrain Orifice Diameter =	0.79	inches	Underdrain Orifice Centroid =	0.03	feet

Calculated Parameters for Underdrain

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

Invert of Lowest Orifice =	N/A	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 =	N/A	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	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 (optional)	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)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Orifice Area (sq. inches)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

	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)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Orifice Area (sq. inches)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

User Input: Vertical Orifice (Circular or Rectangular)

	Zone 2 Rectangular	Not Selected			Zone 2 Rectangular	Not Selected	
Invert of Vertical Orifice =	0.84	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	0.22	N/A	ft^2
Depth at top of Zone using Vertical Orifice =	1.10	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	0.38	N/A	feet
Vertical Orifice Height =	9.00	N/A	inches				
Vertical Orifice Width =	3.50		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 =	1.80	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	1.80	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 =	4.22	N/A	
Horiz. Length of Weir Sides =	3.00	N/A	feet	Overflow Grate Open Area w/o Debris =	6.26	N/A	ft^2
Overflow Grate Type =	Type C Grate	N/A		Overflow Grate Open Area w/ Debris =	3.13	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 =	2.74	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	1.49	N/A	ft^2
Outlet Pipe Diameter =	18.00	N/A	inches	Outlet Orifice Centroid =	0.64	N/A	feet
Restrictor Plate Height Above Pipe Invert =	14.10		inches	Half-Central Angle of Restrictor Plate on Pipe =	2.17	N/A	radians

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	3.00	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.50	feet
Spillway Crest Length =	20.00	feet	Stage at Top of Freeboard =	4.50	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	0.48	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	1.54	acre-ft

Calculated Parameters for Spillway

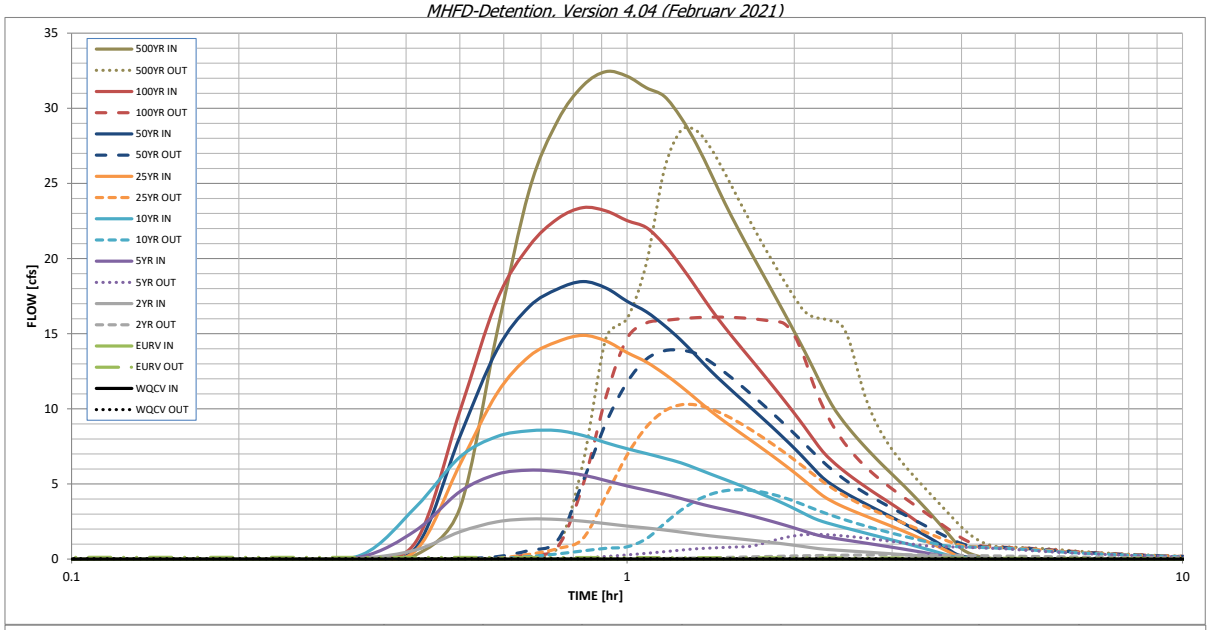
Routed Hydrograph Results

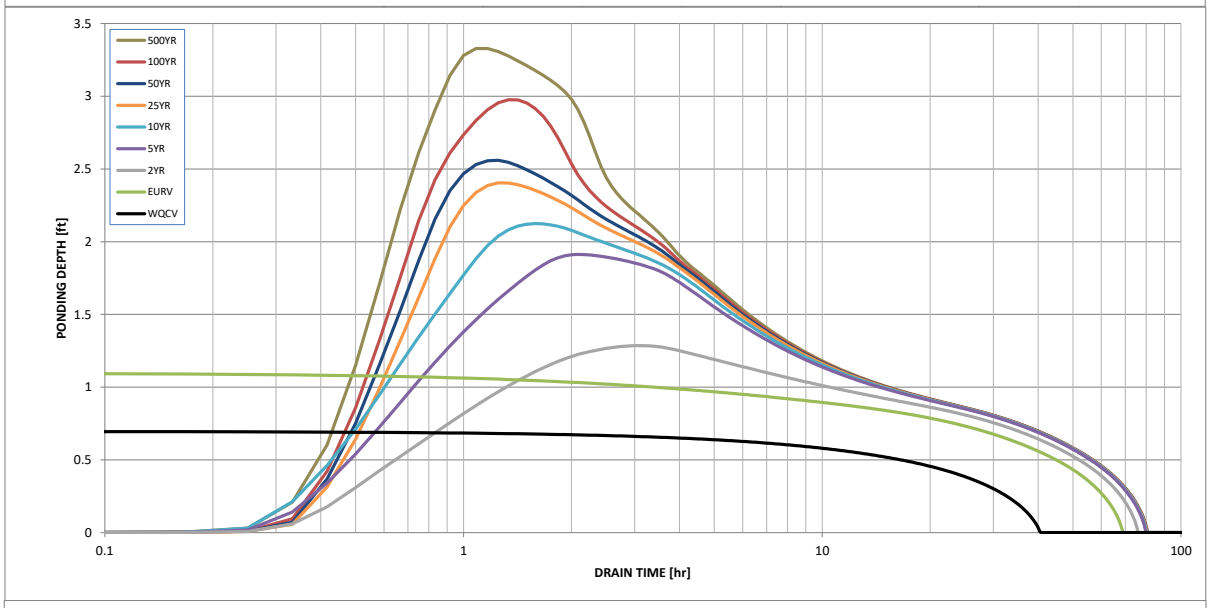
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

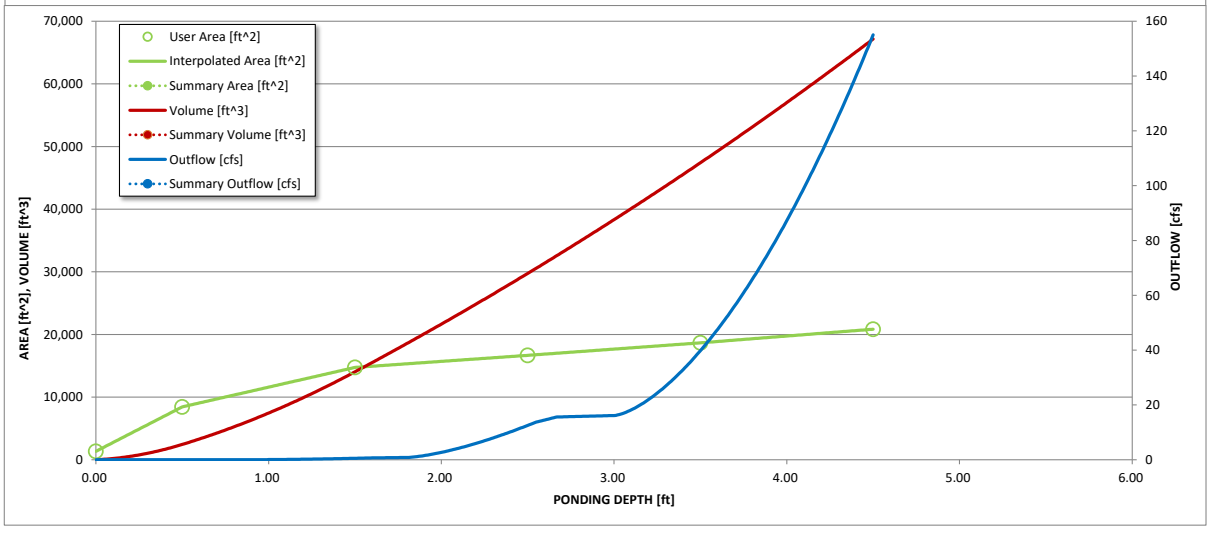
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.14
CUHP Runoff Volume (acre-ft) =	0.097	0.198	0.298	0.675	1.053	1.735	2.196	2.864	4.077
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.298	0.675	1.053	1.735	2.196	2.864	4.077
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	1.7	4.9	7.5	13.8	17.3	22.2	31.2
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.07	0.21	0.32	0.58	0.73	0.94	1.32
Peak Inflow Q (cfs) =	N/A	N/A	2.7	5.9	8.6	14.9	18.5	23.4	32.4
Peak Outflow Q (cfs) =	0.0	0.1	0.3	1.7	4.6	10.3	13.9	16.1	28.5
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.3	0.6	0.7	0.8	0.7	0.9
Structure Controlling Flow =	Filtration Media	Vertical Orifice 1	Vertical Orifice 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	0.1	0.6	1.4	2.0	2.3	2.4
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	39	66	72	71	67	58	53	45	30
Time to Drain 99% of Inflow Volume (hours) =	**40**	68	75	77	76	73	71	68	63
Maximum Ponding Depth (ft) =	0.70	1.10	1.29	1.91	2.12	2.40	2.56	2.98	3.33
Area at Maximum Ponding Depth (acres) =	0.22	0.28	0.31	0.36	0.37	0.38	0.38	0.40	0.42
Maximum Volume Stored (acre-ft) =	0.098	0.199	0.251	0.465	0.541	0.645	0.702	0.868	1.012
			2 max					16.1 max	

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)







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

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename: _____

Inflow Hydrographs

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

	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
	0:15:00	0.00	0.00	0.02	0.03	0.03	0.02	0.03	0.03	0.04
	0:20:00	0.00	0.00	0.06	0.17	0.30	0.07	0.08	0.08	0.29
	0:25:00	0.00	0.00	0.61	1.91	3.48	0.59	0.77	1.16	3.39
	0:30:00	0.00	0.00	1.82	4.49	6.79	6.28	8.15	9.84	15.09
	0:35:00	0.00	0.00	2.48	5.65	8.16	11.04	13.93	17.24	24.54
	0:40:00	0.00	0.00	2.67	5.92	8.54	13.50	16.80	20.83	29.17
	0:45:00	0.00	0.00	2.64	5.83	8.55	14.48	17.98	22.65	31.51
	0:50:00	0.00	0.00	2.52	5.59	8.23	14.89	18.47	23.39	32.44
	0:55:00	0.00	0.00	2.36	5.22	7.74	14.51	18.04	23.17	32.14
	1:00:00	0.00	0.00	2.20	4.87	7.35	13.75	17.16	22.53	31.36
	1:05:00	0.00	0.00	2.08	4.59	7.03	13.12	16.46	22.07	30.80
	1:10:00	0.00	0.00	1.94	4.32	6.72	12.33	15.56	20.93	29.39
	1:15:00	0.00	0.00	1.80	4.04	6.41	11.50	14.57	19.51	27.62
	1:20:00	0.00	0.00	1.66	3.75	6.03	10.64	13.52	18.04	25.63
	1:25:00	0.00	0.00	1.54	3.50	5.65	9.84	12.51	16.63	23.69
	1:30:00	0.00	0.00	1.45	3.30	5.30	9.14	11.64	15.42	22.00
	1:35:00	0.00	0.00	1.36	3.11	4.97	8.51	10.85	14.34	20.48
	1:40:00	0.00	0.00	1.27	2.90	4.64	7.93	10.11	13.35	19.06
	1:45:00	0.00	0.00	1.18	2.69	4.32	7.37	9.40	12.40	17.71
	1:50:00	0.00	0.00	1.10	2.49	4.01	6.83	8.72	11.48	16.41
	1:55:00	0.00	0.00	1.01	2.28	3.69	6.30	8.05	10.58	15.14
	2:00:00	0.00	0.00	0.92	2.07	3.36	5.77	7.38	9.71	13.90
	2:05:00	0.00	0.00	0.83	1.87	3.03	5.24	6.71	8.84	12.65
	2:10:00	0.00	0.00	0.74	1.67	2.73	4.71	6.04	7.96	11.41
	2:15:00	0.00	0.00	0.67	1.52	2.50	4.22	5.42	7.16	10.31
	2:20:00	0.00	0.00	0.63	1.42	2.33	3.87	4.98	6.57	9.47
	2:25:00	0.00	0.00	0.59	1.33	2.18	3.59	4.62	6.08	8.77
	2:30:00	0.00	0.00	0.55	1.25	2.03	3.35	4.30	5.65	8.14
	2:35:00	0.00	0.00	0.52	1.17	1.90	3.13	4.01	5.26	7.57
	2:40:00	0.00	0.00	0.48	1.09	1.76	2.92	3.75	4.90	7.04
	2:45:00	0.00	0.00	0.45	1.01	1.64	2.73	3.49	4.56	6.55
	2:50:00	0.00	0.00	0.42	0.94	1.51	2.54	3.25	4.24	6.09
	2:55:00	0.00	0.00	0.38	0.86	1.39	2.36	3.01	3.95	5.65
	3:00:00	0.00	0.00	0.35	0.79	1.28	2.17	2.78	3.65	5.22
	3:05:00	0.00	0.00	0.32	0.72	1.16	2.00	2.55	3.35	4.80
	3:10:00	0.00	0.00	0.29	0.65	1.05	1.82	2.33	3.06	4.38
	3:15:00	0.00	0.00	0.26	0.58	0.94	1.64	2.10	2.77	3.96
	3:20:00	0.00	0.00	0.23	0.51	0.83	1.46	1.87	2.47	3.54
	3:25:00	0.00	0.00	0.20	0.44	0.73	1.29	1.65	2.18	3.12
	3:30:00	0.00	0.00	0.17	0.37	0.62	1.11	1.42	1.89	2.70
	3:35:00	0.00	0.00	0.14	0.30	0.51	0.93	1.20	1.60	2.28
	3:40:00	0.00	0.00	0.11	0.24	0.40	0.76	0.98	1.30	1.86
	3:45:00	0.00	0.00	0.08	0.17	0.30	0.58	0.75	1.01	1.45
	3:50:00	0.00	0.00	0.05	0.10	0.20	0.40	0.53	0.72	1.04
	3:55:00	0.00	0.00	0.03	0.06	0.14	0.24	0.33	0.46	0.70
	4:00:00	0.00	0.00	0.02	0.04	0.11	0.15	0.22	0.31	0.48
	4:05:00	0.00	0.00	0.01	0.03	0.08	0.10	0.15	0.21	0.34
	4:10:00	0.00	0.00	0.01	0.03	0.07	0.06	0.10	0.14	0.23
	4:15:00	0.00	0.00	0.01	0.02	0.05	0.04	0.07	0.09	0.16
	4:20:00	0.00	0.00	0.01	0.02	0.04	0.03	0.05	0.05	0.10
	4:25:00	0.00	0.00	0.01	0.01	0.03	0.02	0.03	0.03	0.06
	4:30:00	0.00	0.00	0.00	0.01	0.02	0.01	0.02	0.01	0.04
	4:35:00	0.00	0.00	0.00	0.01	0.02	0.01	0.02	0.01	0.03
	4:40:00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.02
	4:45:00	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.01	0.02
	4:50:00	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.01	0.01
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
	5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
	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

APPENDIX E – DRAINAGE MAPS

MONAHAN, COLLEEN, 11/17/2023 12:31 PM

EX Q_{100}=1,892 cfs
(LOMR REV 2-16-21)
EX DUAL 18" CULVERTS

N. PEYTON HIGHWAY
PUBLIC ROADWAY

OS3
2.77

EXIST. 18" CULVERT
FL 6274.09

EXIST. 18" CULVERT
FL 6274.82

OS1
25.98

EX SWALE

BFE: 6261.1 FEET

TRACT 1 GRAND VIEW ESTATES III

30' TRAVEL ESMT

EX PROPERTY LINE

EX OVERHEAD ELECTRIC

EX1
70.82

EX2
18.22

BFE: 6258.9 FEET

EX 100 YR
FLOODPLAIN
ZONE AE

OGC RE2 LLC
SCH. NO. 3300000466

POTENTIALLY SHALLOW
GROUNDWATER
AREA

OS2
30.52

BFE: 6253.4 FEET

EX PROPERTY LINE

EX3
27.31

EXIST. 18" CULVERT
FL 6262.32

EXIST. 18" CULVERT
FL 6262.5

ROBERTO & NATHALIEB
ZEPEDA
SCH. NO. 3400000467

CLASSIC MEDIA
MONEY PURCHASE
PLAN & TRUST
SCH. NO. 3300000458

EX PROPERTY LINE

BFE: 6248 FEET

POTENTIALLY SHALLOW
GROUNDWATER
AREA

EX SWALE

OGC RE2 LLC
SCH. NO. 330000067

EX SWALE

BFE: 6245.1
FEET

EX PROPERTY LINE

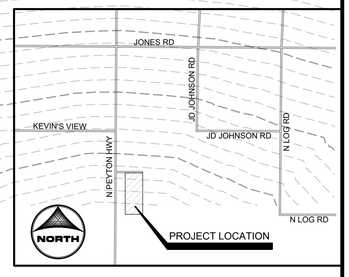
GARRETT & ELIZABETH J GIBSON
SCH. NO. 3300000468

2.4%

2.6%

2.2%

NORTH
0 150
75



VICINITY MAP
(NOT TO SCALE)

LEGEND:

- PROPOSED MAJOR CONTOUR — 5250
- PROPOSED MINOR CONTOUR
- EXISTING MAJOR CONTOUR — 5250
- EXISTING MINOR CONTOUR
- EXISTING DRAINAGE SWALE
- PROPOSED DRAINAGE SWALE
- PROJECT SITE BOUNDARY
- FLOW DIRECTION
- EXISTING DRAINAGE BASIN
- PROPOSED DRAINAGE BASIN
- EXISTING STORM CULVERT
- PROPOSED STORM CULVERT
- BASE FLOOD ELEVATION
- DESIGN POINT
- PROPOSED BASIN LABEL
- 11 / 1.25 — BASIN DESIGNATION / AREA (AC.)

SUMMARY RUNOFF TABLE

BASIN	AREA (ac)	% IMPERVIOUS	Q_5 (cfs)	Q_{100} (cfs)
EX1	70.82	2	7.9	53.2
EX2	18.22	2	2.8	18.6
EX3	27.31	2	4.1	27.8
OS1	25.98	2	4.5	30.1
OS2	30.52	2	6.0	40.2
OS3	2.77	67	2.3	4.6

DESIGN POINT SUMMARY TABLE

DESIGN POINT	CONTRIBUTING BASINS	ΣQ_5 (cfs)	ΣQ_{100} (cfs)
1	OS1	4.5	30.1
2	OS3	2.3	4.6
3	OS1,OS3,EX1	10.6	62.7
5	OS2	6.0	40.2
6	OS2, EX3	8.8	58.8
9	EX2	2.8	18.6

* THE DP3 FLOW SHOWN DOES NOT ACCOUNT FOR THE UPSTREAM FLOW OF 1,892 CFS THAT COMES FROM WEST OF NORTH PEYTON HWY SINCE THIS FLOW WOULD REMAIN CONSTANT IN EXISTING AND PROPOSED CONDITIONS.

PCD FILING NO. SF2231

DRAWN BY: AXB
APPROVED: CM
CAD DATE: 11/17/2023
CAD FILE: J:\2022\2202179\CAD\Dwgs\C\Drainage\Ex_Drainage
JOB DATE: 11/3/2023
JOB NUMBER: 2202179

BAR IS ONE INCH ON OFFICIAL DRAWINGS. 0 1"
IF NOT ONE INCH, ADJUST SCALE ACCORDINGLY.

NO.	DATE	BY	REVISION DESCRIPTION

HR GREEN - COLORADO SPRINGS
1975 RESEARCH PARKWAY SUITE 230
COLORADO SPRINGS, CO 80920
PHONE: 719.394.2440
FAX: 713.965.0044

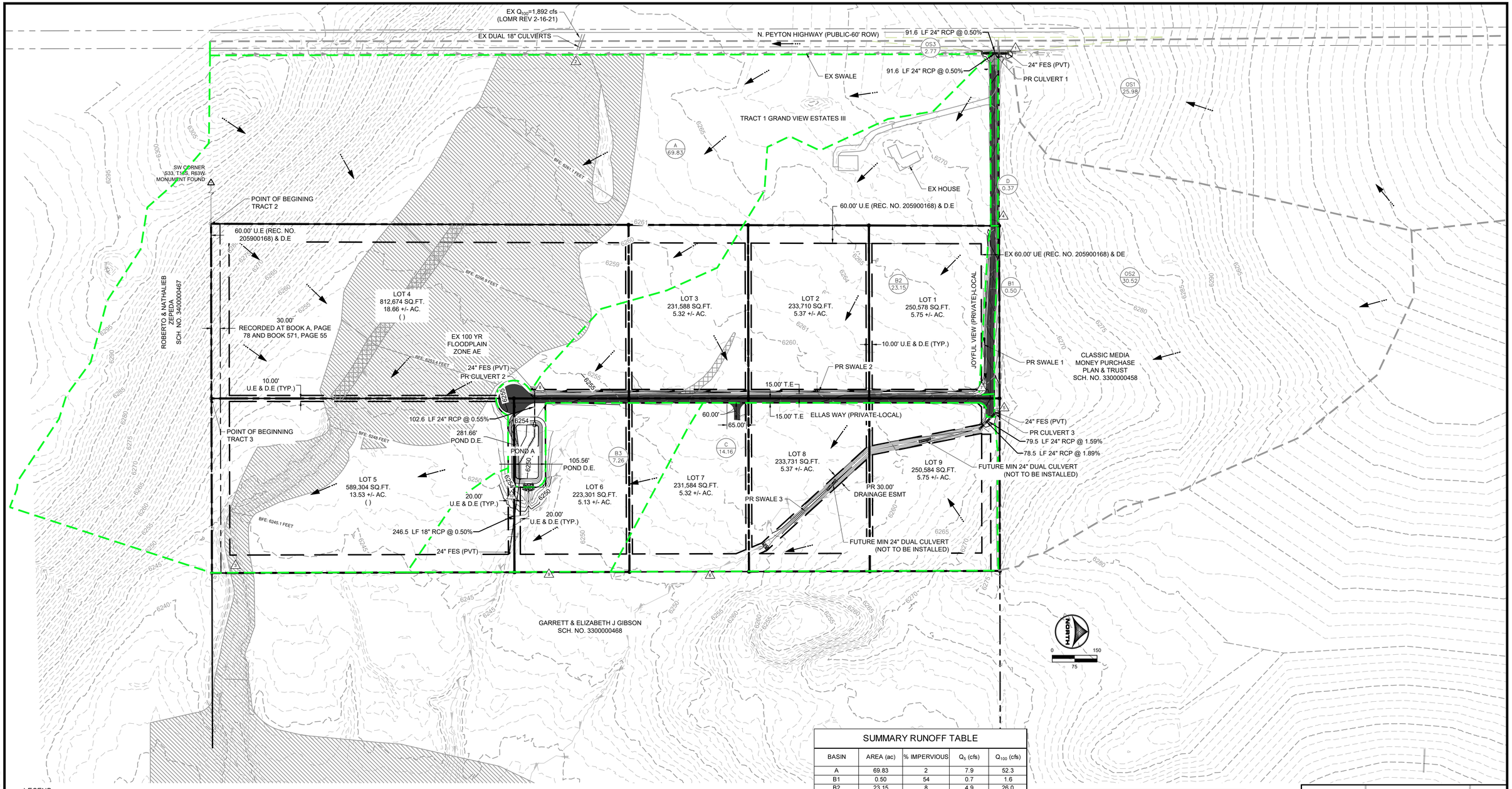
JOYFUL VIEW SUBDIVISION
OGC RE2, LLC.
EL PASO COUNTY, CO

DRAINAGE MAPS
EXISTING DRAINAGE

SHEET DR 1

HR GREEN Xrefs: xv-dsgn; xv-cnv; xgr1-dh01-2179; xv-utl; Legend_FDR_Map

CALLAHAN, SEAN, 12/19/2023 1:06 PM



LEGEND:

- PROPOSED MAJOR CONTOUR — 5250
- PROPOSED MINOR CONTOUR
- EXISTING MAJOR CONTOUR — 5250
- EXISTING MINOR CONTOUR
- EXISTING DRAINAGE SWALE
- PROPOSED DRAINAGE SWALE
- PROJECT SITE BOUNDARY
- FLOW DIRECTION
- EXISTING DRAINAGE BASIN
- PROPOSED DRAINAGE BASIN
- EXISTING STORM CULVERT
- PROPOSED STORM CULVERT
- BASE FLOOD ELEVATION
- DESIGN POINT
- PROPOSED BASIN LABEL
- 11 / 1.25 — BASIN DESIGNATION / AREA (AC.)
- D.E. DRAINAGE EASEMENT
- U.E. UTILITY EASEMENT
- T.E. TRAVEL EASEMENT
- UTILITY & DRAINAGE EASEMENT HATCH
- TRAVEL EASEMENT HATCH
- UTILITY & TRAVEL EASEMENT HATCH
- FLOODPLAIN / NO BUILD AREA

SUMMARY RUNOFF TABLE

BASIN	AREA (ac)	% IMPERVIOUS	Q_5 (cfs)	Q_{100} (cfs)
A	69.83	2	7.9	52.3
B1	0.50	54	0.7	1.6
B2	23.15	8	4.9	26.0
B3	7.26	4	1.7	10.8
C	14.16	5	3.5	21.6
D	0.37	82	0.9	1.8
OS1	25.98	2	4.5	30.1
OS2	30.52	2	6.0	40.2
OS3	2.77	67	2.3	4.6

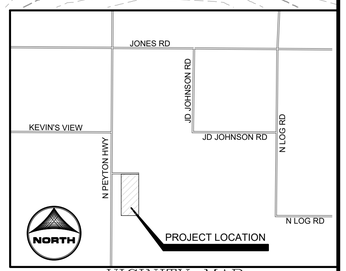
RUNOFF DISCHARGE TABLE

DESIGN POINT	EX Q_5 (cfs)	PR Q_5 (cfs)	EX Q_{100} (cfs)	PR Q_{100} (cfs)
1	4.5	4.5	30.1	30.1
2	2.3	5.4	4.6	25.3
3	10.6	10.6	62.7	62.2
4	-	0.9	-	1.8
5	6.0	6.5	40.2	41.2
6	8.8	8.0	58.8	50.5
7	-	0.7	-	1.6
8	-	5.3	-	26.9
9	2.8	1.7	18.6	10.8
10 (POND)	-	1.7	-	16.1
3+6+9+10	**22.2**	**21.9**	**140.1**	**139.5**

DESIGN POINT SUMMARY TABLE

DESIGN POINT	CONTRIBUTING BASINS	ΣQ_5 (cfs)	ΣQ_{100} (cfs)
1	OS1	4.5	30.1
2	OS1, OS3	5.4	25.3
3	OS1, OS3, A	10.6	62.2
4	D	0.9	1.8
5	D, OS2	6.5	41.2
6	D, OS2, C	8.0	50.5
7	B1	0.7	1.6
8	B1, B2	5.3	26.9
9	B3	1.7	10.8
10	POND RELEASE	1.7	16.1

* THE DP3 FLOW SHOWN DOES NOT ACCOUNT FOR THE UPSTREAM FLOW OF 1,892 CFS THAT COMES FROM WEST OF NORTH PEYTON HWY SINCE THIS FLOW WOULD REMAIN CONSTANT IN EXISTING AND PROPOSED CONDITIONS.



VICINITY MAP
(NOT TO SCALE)
PCD FILING NO. SF2231

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OGC RE2, LLC.
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DRAINAGE MAPS
PROPOSED DRAINAGE

SHEET DR 2

HR GREEN Xrefs: xv-dsgn; xv-row; xv-util; xgl-t-dt01-2179; xc-dsgn; xc-row; Legend_FDR_Map; Legend_FDR_Map_Platt