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Joyful View Subdivision
Final Drainage Report

November 2023

HR Green Project No: 2202179

PCD File No. SF2231

Prepared For:

The O'Neil Group

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Prepared By:

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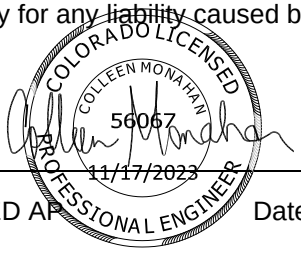
Engineer's Statement

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.

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:

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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 then drain 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.

Extended Detention Basins were 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

Runoff reduction is provided for the site by draining the proposed gravel road impervious area into receiving pervious areas (RPA's) and an extended detention basin which provides water quality treatment and flood control.

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 detention basin and runoff reduction, 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 pond 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 by draining impervious gravel road area to grass swale RPA's. In addition to the grass swales, a full spectrum extended detention basin is proposed for water quality treatment and 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, Pond 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 Pond 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 Pond 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 Pond A. Flows will be and will be detained in Pond A.

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

DP3, DP6, DP9 and Pond 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 Pond 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 Pond 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 (POND)	-	2.0	-	16.1
TOTAL	**22.2**	**22.2**	**140.1**	**139.5**

The flow increases due to gravel roads and impervious area from the developed lots will be mitigated by runoff reduction and a full spectrum detention pond. Runoff from developed lots that are not detained by the pond 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 pond 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, Pond 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 detention basin and runoff reduction, 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 Detention Pond

There is one full spectrum detention pond that is proposed on site. The detention Pond A is designed to provide the required volume stages for Excess Urban Runoff Volume (EURV), and the 100-year stage. Storage for the Water Quality Capture Volume (WQCV) is not required in the detention facility as it is provided via runoff reduction. Runoff reduction calcs are provided in Appendix C. 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

Look at the MHFD-Detention spreadsheet in relation to this. WQCV is still provided for the tributary area, which includes the entire roadway area (minus Basin D, which is excluded). Therefore, I think you could revise this statement accordingly and likely get rid of the Runoff Reduction from this project (which would allow you to make the UE/DE on the North side of Ellas Way thinner and have less post-construction inspection & maintenance responsibilities without the RPAs).

of the various stages: EURV around 68 hours (may vary based on pond conditions), and the 100-year volume at less than 120 hours. The developed condition outlet flow rates are not to exceed predeveloped conditions.

Pond A provides full spectrum detention for the stormwater runoff from Basins B1 and B2. These basins include gravel roadway, grass swales, undeveloped area, as well as future lot developments. Pond A has a tributary area of 23.65 acres with an imperviousness of 9% which includes assumed future gravel driveways and impervious roofs. The pond 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 pond sizing results:

Proposed Pond A

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

Pond 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	2.0	4.9	107
Major Storm (Q100)	23.4	16.1	22.2	95

Pond A includes a concrete forebay sized for the required volume of the inflow, a 6-foot width concrete trickle channel with 6" vertical concrete curb, a 2.5-foot depth concrete micro pool, and an outlet structure that is designed as a single CDOT Type D Inlet that is to include a top trash rack, orifice plate, and restrictor plate on the outlet pipe. Pond A will release its detained flows to DP10 at (Q_5 = 2.0 Q_{100} = 16.1). Forebay design calculations have been provided in Appendix D.

Pond A includes a 10' width maintenance path with vehicular access to the bottom of pond 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 ponds include 1.0' of freeboard to the emergency spillway berm of the pond 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

The swales don't flow to the Haegler DB as the site is already within that DB. So please reword to clarify your intent of this statement.

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 pond. The culvert and swale sizing are in the Appendix. Runoff reduction is provided through grass-lined swales and the extended detention basin. Calculations are contained in the Appendix and runoff reduction areas are shown on DR-2.

RR is not provided by the EDB.

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 flowing to 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 detention pond, 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 detention basin and runoff reduction, 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 pond 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 (Pond 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 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:

Include a cost estimate for each PBMP with line items for all components (ex: riprap, road base, forebay, trickle channel, outlet structure, outlet pipe, spillway, etc). Input the total value into the FAE form under "Permanent Pond/BMP (provide engineer's estimate)" in Section 1. The total should not include grading, which is a separate line item in Section 1: "Earthwork."

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 ✔

Can remove this and not include in total. Not on property.

Off-site Road Impervious Area= 0.37 acres (through Tract 1 Grand View Estates III)

Additional Fee to be incurred for offsite new gravel road = ($11,891+$1,755) * 0.37 = *$5,049.02* X

Total Drainage Fee

~~$5,049.02~~ + $65,921.18 = **~~$70,970.20~~**

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 detention basin and runoff reduction, 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

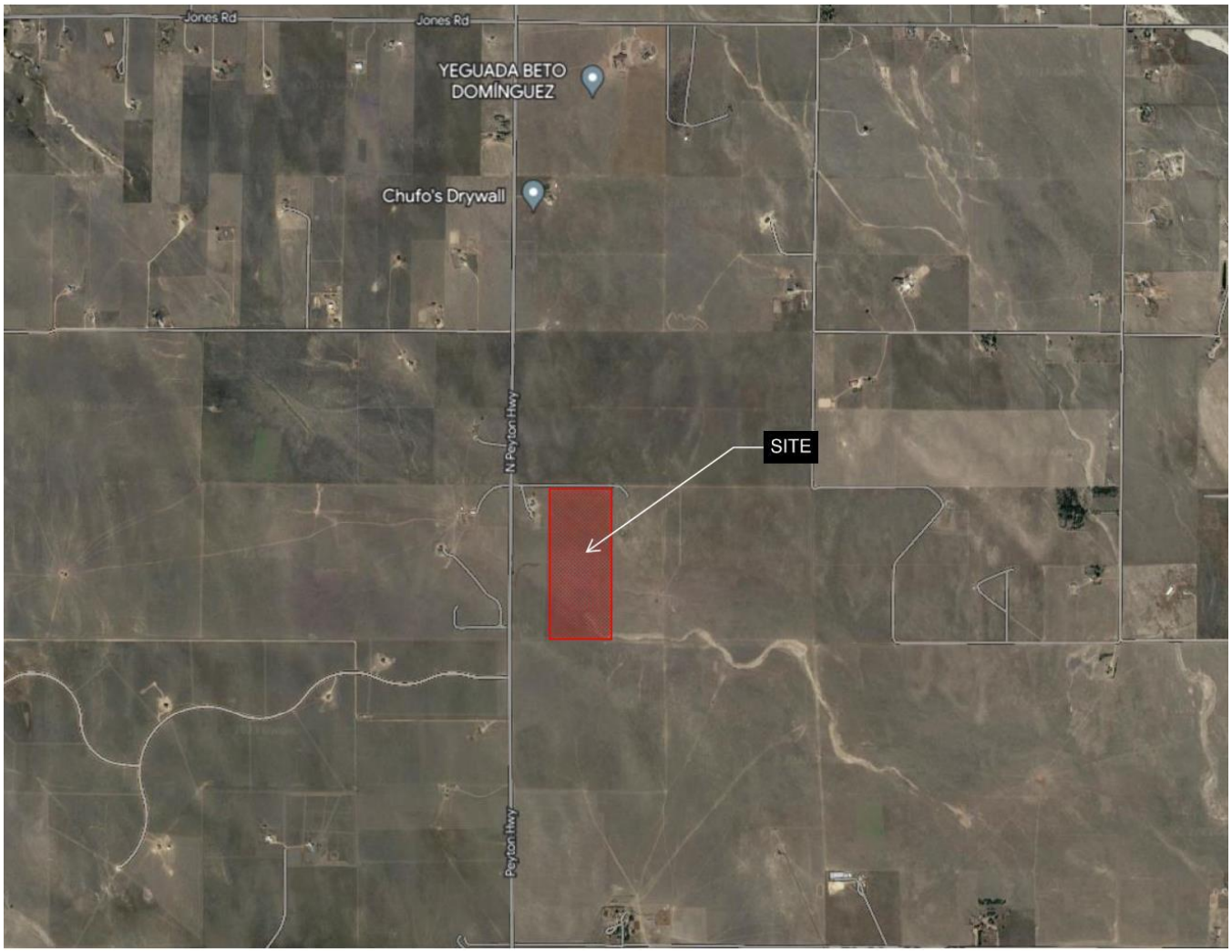
1. City of Colorado Springs – Drainage Criteria Manual, May 2014, Revised January 2021.
2. Urban Storm Drainage Criteria Manual, Urban Drainage Flood Control District, January 2018.
3. El Paso County – Drainage Criteria Manual- Vol 1, 2014

Unresolved comments from Review 2:

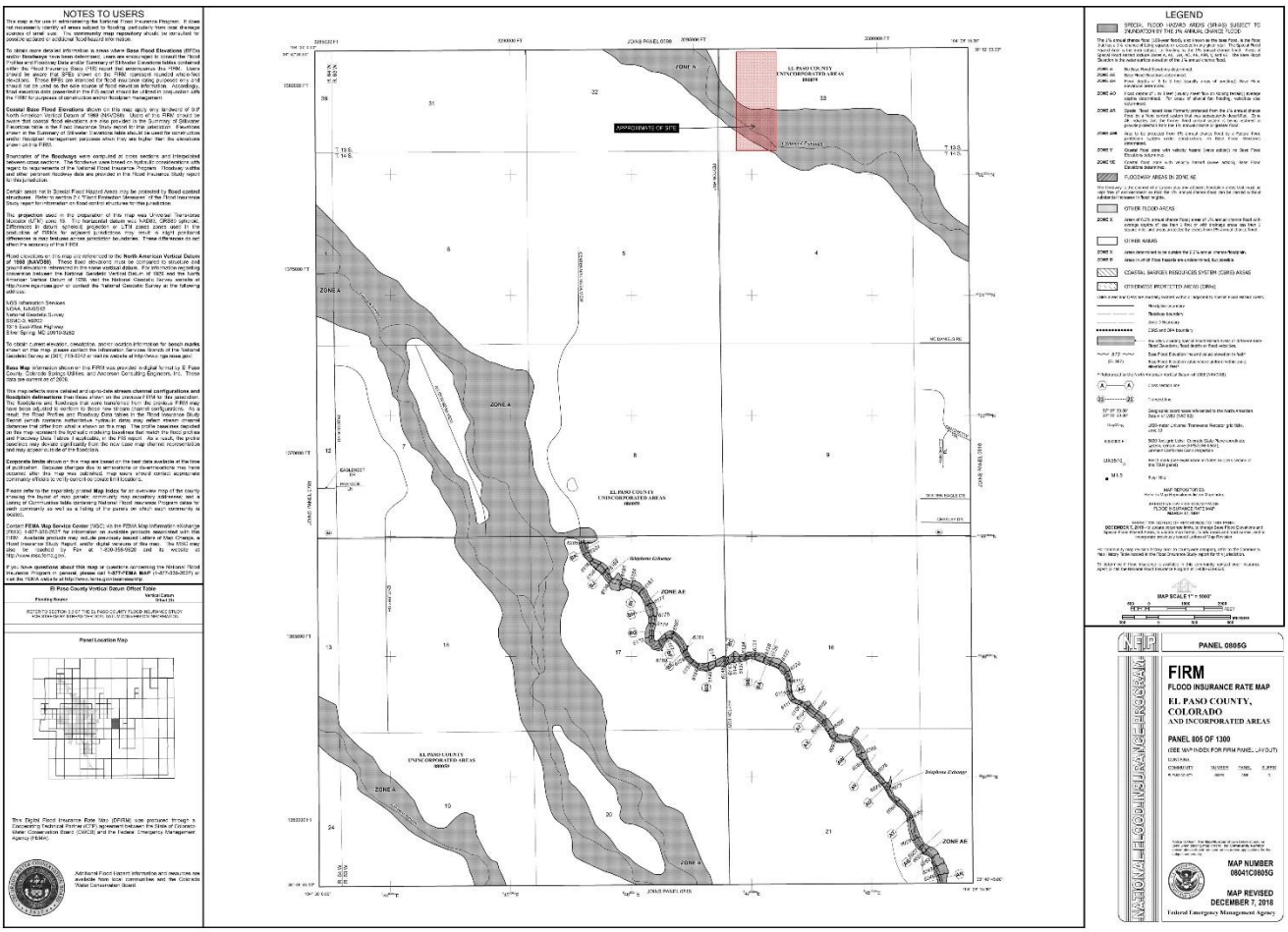
For Runoff Reduction:
- Reference MHFD Detail T-0 for guidance..
- The runoff reduction RPA is considered a WQ Facility and requires a signed Maintenance Agreement
- Provide an O&M manual for the RPAs. See the City's template for grass buffers / grass swales to use as a starting point.
- Provide a figure in drainage report showing all proposed UIA, RPA and SPA areas to be utilized for runoff reduction with labels that correspond to the MHFD calcs spreadsheet.
- Provide a detail for the UIA:RPA interface that shows the recommended vertical drop of 4”.

APPENDIX A – VICINITY MAP, SOIL MAP, FEMA MAP

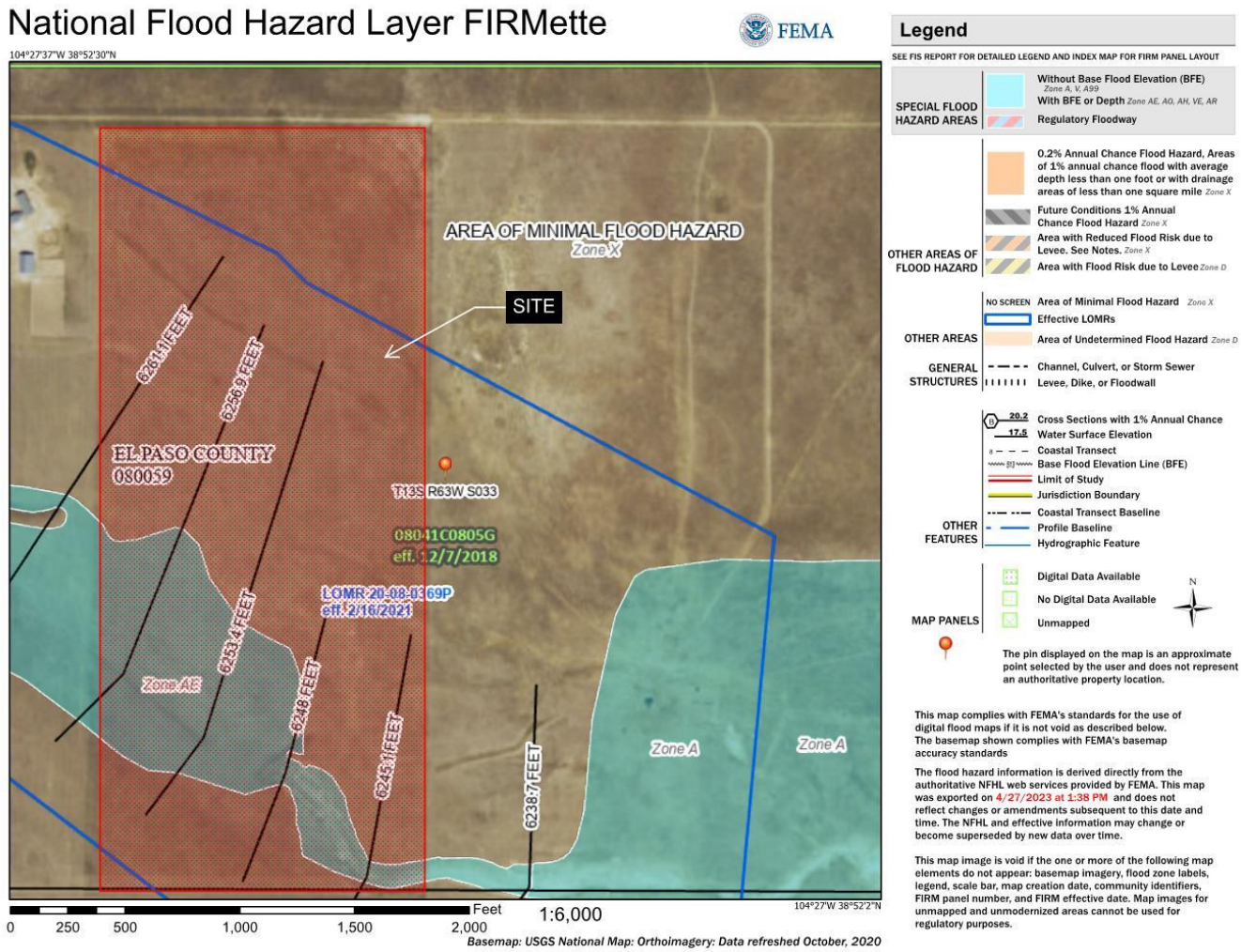
VICINITY MAP



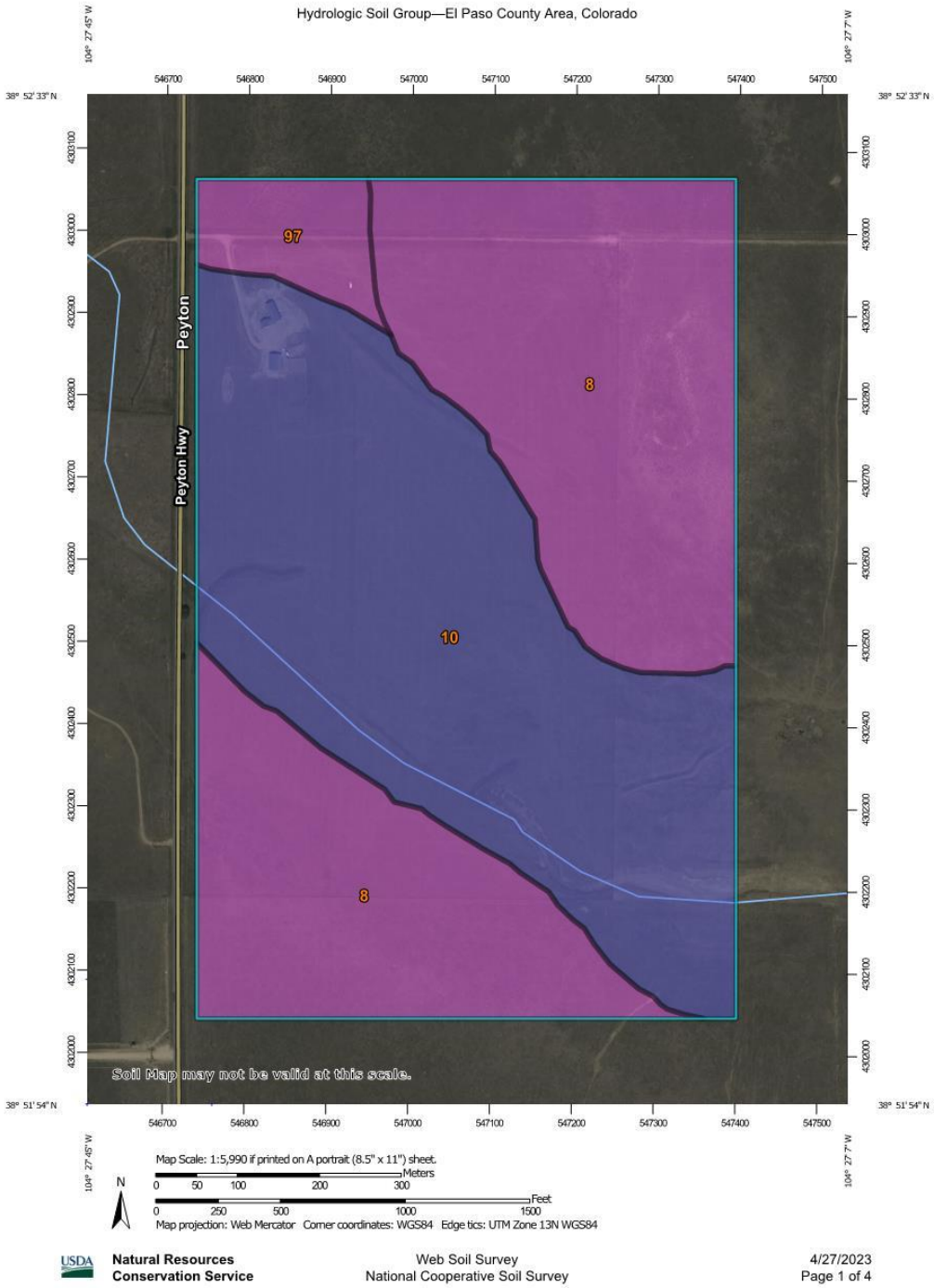
FEMA FIRM MAP



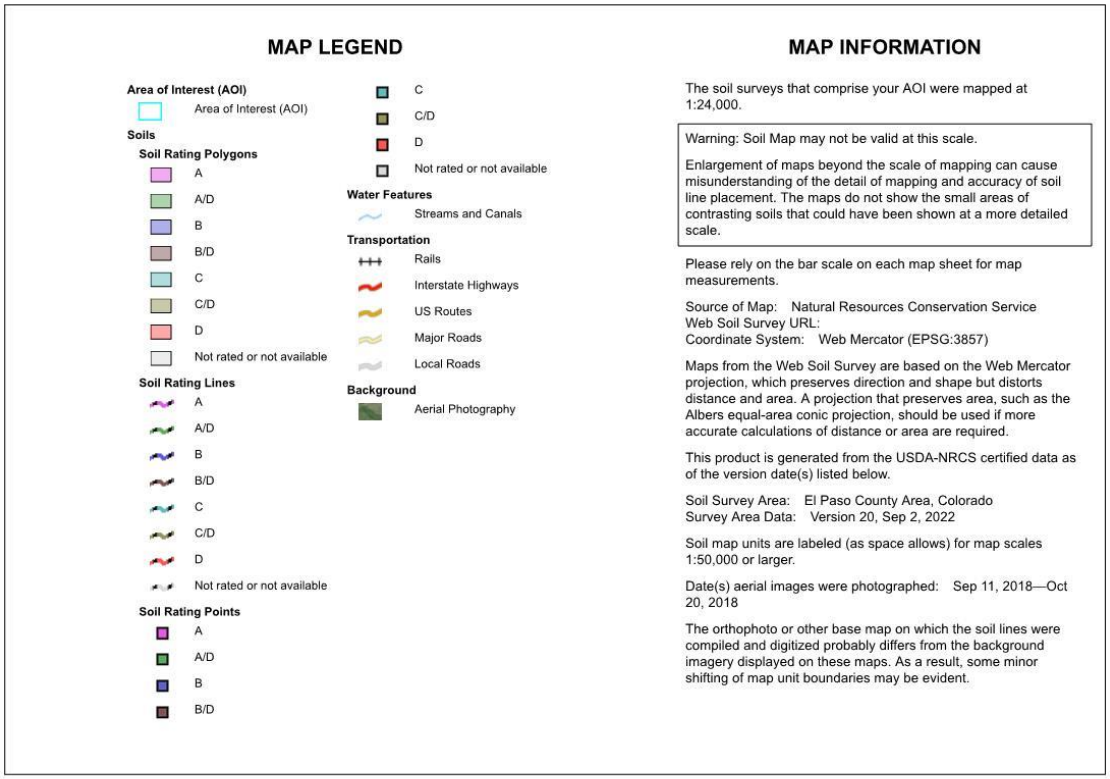
FEMA MAP


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
6251.4 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
17.5
Cross Sections with 1% Annual Chance
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:**	**11/17/2023**

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)	-	2.0	-	16.1
3+6+9+10	**22.2**	**22.2**	**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	2.0	16.1

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

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:**	**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)
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: 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 (mi	
	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: 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					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**

All of these Area IDs need to be labeled and delineated on a map so that these calcs can be properly reviewed and verified.

Design Procedure Form: Runoff Reduction

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

Designer:	**CBM**
Company:	**HR Green**
Date:	**October 17, 2023**
Project:	**Joyful View Subdivision**
Location:	**El Paso Co, CO**

SITE INFORMATION (User Input in Blue Cells)

WQCV Rainfall Depth: 0.60 inches

Depth of Average Runoff Producing Storm, d_6 = 0.43 inches (for Watersheds Outside of the Denver Region, Figure 3-1 in USDCM Vol. 3)

Area Type	UIA:RPA	UIA:RPA	UIA:RPA	UIA:RPA	UIA:RPA	UIA:RPA	UIA:RPA	UIA:RPA	UIA:RPA	UIA:RPA	UIA:RPA	UIA:RPA
Area ID	Joyful View Rd	Lot 5-1	Lot 5-2	Lot 4-1	Lot 4-2	Lot 6	Lot 3-1	Lot 3-2	Lot 7-1	Lot 7-2	Lot 2	Lot 8
Downstream Design Point ID	8	6	6	6	6	10	6	8	10	9	8	9
Downstream BMP Type	EDB	None	None	None	None	None	None	EDB	None	None	EDB	None
DCIA (ft^2)	--	--	--	--	--	--	--	--	--	--	--	--
UIA (ft^2)	18,568	15,351	3,570	3,266	13,432	13,300	3,000	10,403	3,319	9,766	13,583	13,169
RPA (ft^2)	29,370	64,649	66,005	76,734	62,410	66,700	77,000	69,597	76,681	70,234	66,417	66,831
SPA (ft^2)	--	--	--	--	--	--	--	--	--	--	--	--
HSG A (%)	0%	0%	100%	0%	0%	26%	0%	0%	7%	73%	17%	2%
HSG B (%)	100%	100%	0%	100%	100%	74%	100%	100%	93%	27%	83%	98%
HSG C/D (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Average Slope of RPA (ft/ft)	0.008	0.010	0.015	0.008	0.008	0.013	0.011	0.011	0.014	0.013	0.012	0.010
UIA:RPA Interface Width (ft)	1121.84	400.00	250.00	150.00	180.00	365.00	880.00	350.00	100.00	300.00	400.00	400.00

CALCULATED RUNOFF RESULTS

Area ID	Joyful View Rd	Lot 5-1	Lot 5-2	Lot 4-1	Lot 4-2	Lot 6	Lot 3-1	Lot 3-2	Lot 7-1	Lot 7-2	Lot 2	Lot 8
UIA:RPA Area (ft^2)	47,938	80,000	69,575	80,000	75,842	80,000	80,000	80,000	80,000	80,000	80,000	80,000
L / W Ratio	0.06	0.50	1.11	3.56	2.34	0.60	0.10	0.65	8.00	0.89	0.50	0.50
UIA / Area	0.3873	0.1919	0.0513	0.0408	0.1771	0.1663	0.0375	0.1300	0.0415	0.1221	0.1698	0.1646
Runoff (in)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Runoff (ft^3)	0	0	0	0	0	0	0	0	0	0	0	0
Runoff Reduction (ft^3)	774	640	149	136	560	554	125	433	138	407	566	549

CALCULATED WQCV RESULTS

Area ID	Joyful View Rd	Lot 5-1	Lot 5-2	Lot 4-1	Lot 4-2	Lot 6	Lot 3-1	Lot 3-2	Lot 7-1	Lot 7-2	Lot 2	Lot 8
WQCV (ft^3)	774	640	149	136	560	554	125	433	138	407	566	549
WQCV Reduction (ft^3)	774	640	149	136	560	554	125	433	138	407	566	549
WQCV Reduction (%)	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Untreated WQCV (ft^3)	0	0	0	0	0	0	0	0	0	0	0	0

CALCULATED DESIGN POINT RESULTS (sums results from all columns with the same Downstream Design Point ID)

Downstream Design Point ID	8	6	6	6	6	10	6	8	10	9	8	9
DCIA (ft^2)	0	0	0	0	0	0	0	0	0	0	0	0
UIA (ft^2)	42,554	38,618	38,618	38,618	38,618	16,619	38,618	42,554	16,619	22,934	42,554	22,934
RPA (ft^2)	165,384	346,799	346,799	346,799	346,799	143,381	346,799	165,384	143,381	137,066	165,384	137,066
SPA (ft^2)	0	0	0	0	0	0	0	0	0	0	0	0
Total Area (ft^2)	207,938	385,417	385,417	385,417	385,417	160,000	385,417	207,938	160,000	160,000	207,938	160,000
Total Impervious Area (ft^2)	42,554	38,618	38,618	38,618	38,618	16,619	38,618	42,554	16,619	22,934	42,554	22,934
WQCV (ft^3)	1,773	1,609	1,609	1,609	1,609	692	1,609	1,773	692	956	1,773	956
WQCV Reduction (ft^3)	1,773	1,609	1,609	1,609	1,609	692	1,609	1,773	692	956	1,773	956
WQCV Reduction (%)	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Untreated WQCV (ft^3)	0	0	0	0	0	0	0	0	0	0	0	0

CALCULATED SITE RESULTS (sums results from all columns in worksheet)

Total Area (ft^2)	3,190,899
Total Impervious Area (ft^2)	399,857
WQCV (ft^3)	5,030
WQCV Reduction (ft^3)	5,030
WQCV Reduction (%)	100%
Untreated WQCV (ft^3)	0

Design Procedure Form: Runoff Reduction

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

Designer:
Company:
Date: October 17, 2023
Project:
Location:

SITE INFORMATION (User Input in Blue Cells)

WQCV Rainfall Depth = 0.60 inches
Depth of Average Runoff Producing Storm, d_6 = 0.43 inches (for Watersheds Outside of the Denver Region, Figure 3-1 in USDCM Vol. 3)

Area Type	UIA:RPA	UIA:RPA	UIA:RPA									
Area ID	Lot 1	Lot 9	Ellas Way									
Downstream Design Point ID	8	9	8									
Downstream BMP Type	EDB	None	EDB									
DCIA (ft^2)	--	--	--									
UIA (ft^2)	12,886	12,484	34,876									
RPA (ft^2)	67,114	67,516	35,072									
SPA (ft^2)	--	--	--									
HSG A (%)	12%	100%	40%									
HSG B (%)	88%	0%	60%									
HSG C/D (%)	0%	0%	0%									
Average Slope of RPA (ft/ft)	0.012	0.030	0.080									
UIA:RPA Interface Width (ft)	360.00	400.00	1652.00									

CALCULATED RUNOFF RESULTS

Area ID	Lot 1	Lot 9	Ellas Way									
UIA:RPA Area (ft^2)	80,000	80,000	69,948									
L / W Ratio	0.62	0.50	0.06									
UIA / Area	0.1611	0.1561	0.4986									
Runoff (in)	0.00	0.00	0.00									
Runoff (ft^3)	0	0	0									
Runoff Reduction (ft^3)	537	520	1453									

CALCULATED WQCV RESULTS

Area ID	Lot 1	Lot 9	Ellas Way									
WQCV (ft^3)	537	520	1453									
WQCV Reduction (ft^3)	537	520	1453									
WQCV Reduction (%)	100%	100%	100%									
Untreated WQCV (ft^3)	0	0	0									

CALCULATED DESIGN POINT RESULTS (sums results from all columns with the same Downstream Design Point ID)

Downstream Design Point ID	8	9	8									
DCIA (ft^2)	0	0	0									
UIA (ft^2)	47,762	12,484	47,762									
RPA (ft^2)	102,186	67,516	102,186									
SPA (ft^2)	0	0	0									
Total Area (ft^2)	149,948	80,000	149,948									
Total Impervious Area (ft^2)	47,762	12,484	47,762									
WQCV (ft^3)	1,990	520	1,990									
WQCV Reduction (ft^3)	1,990	520	1,990									
WQCV Reduction (%)	100%	100%	100%									
Untreated WQCV (ft^3)	0	0	0									

CALCULATED SITE RESULTS (sums results from all columns in worksheet)

Total Area (ft^2)	379,897
Total Impervious Area (ft^2)	108,009
WQCV (ft^3)	2,510
WQCV Reduction (ft^3)	2,510
WQCV Reduction (%)	100%
Untreated WQCV (ft^3)	0

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

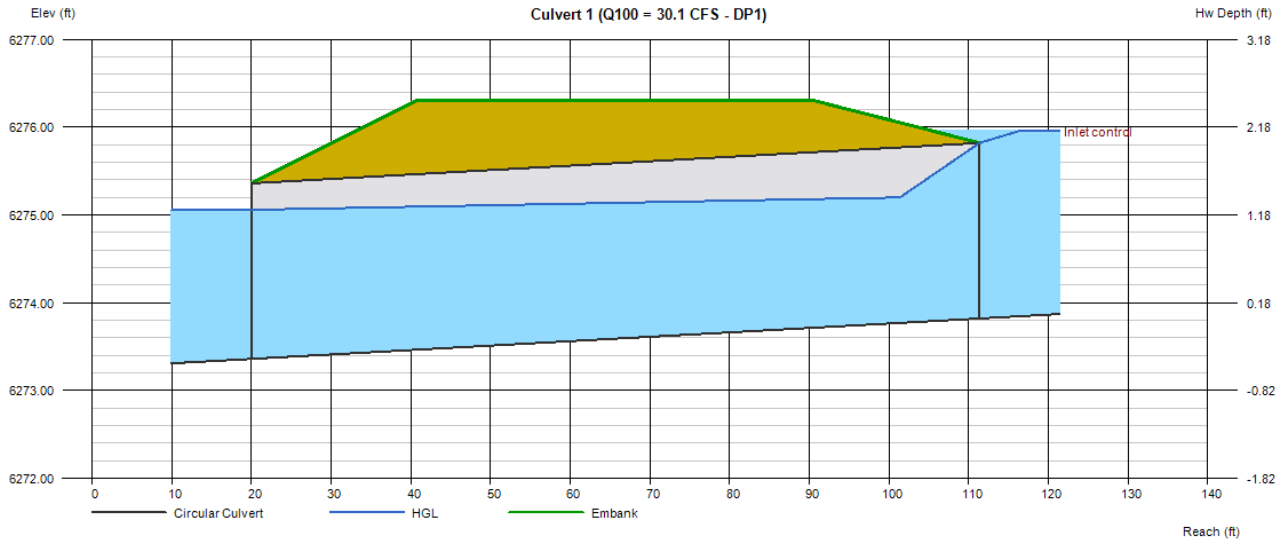
Top Elevation (ft)	=	6276.30
Top Width (ft)	=	50.00
Crest Width (ft)	=	100.00

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

CULVERT 2 (Q100 = 24.4 CFS - DP8)

Invert Elev Dn (ft)	=	6249.83
Pipe Length (ft)	=	102.60
Slope (%)	=	0.69
Invert Elev Up (ft)	=	6250.54
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

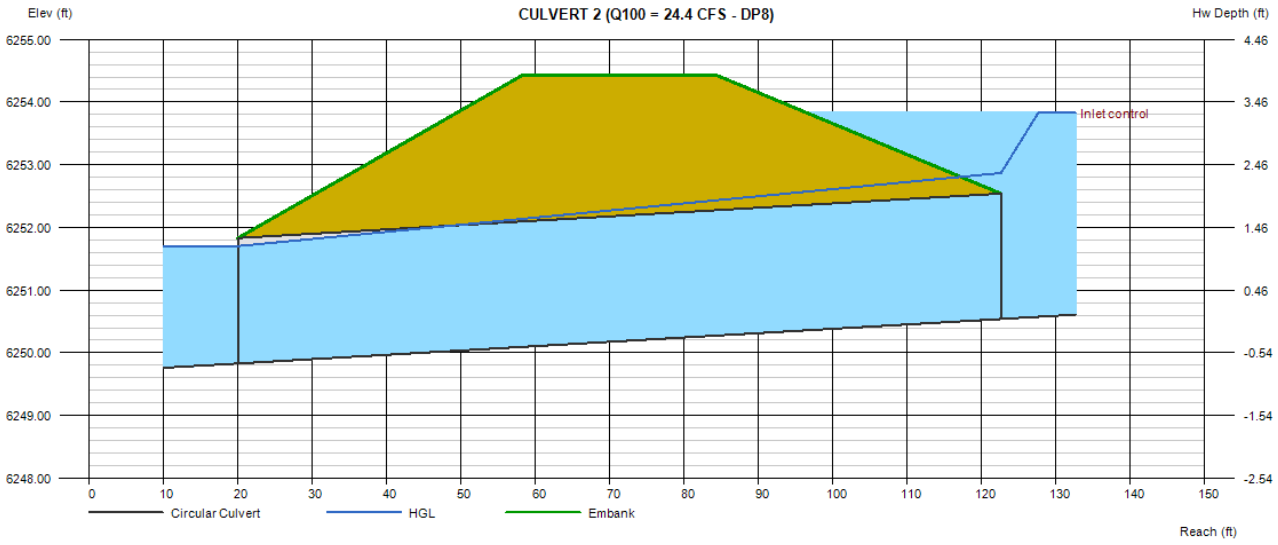
Top Elevation (ft)	=	6254.43
Top Width (ft)	=	26.00
Crest Width (ft)	=	100.00

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)	=	6251.70
HGL Up (ft)	=	6252.87
Hw Elev (ft)	=	6253.83
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

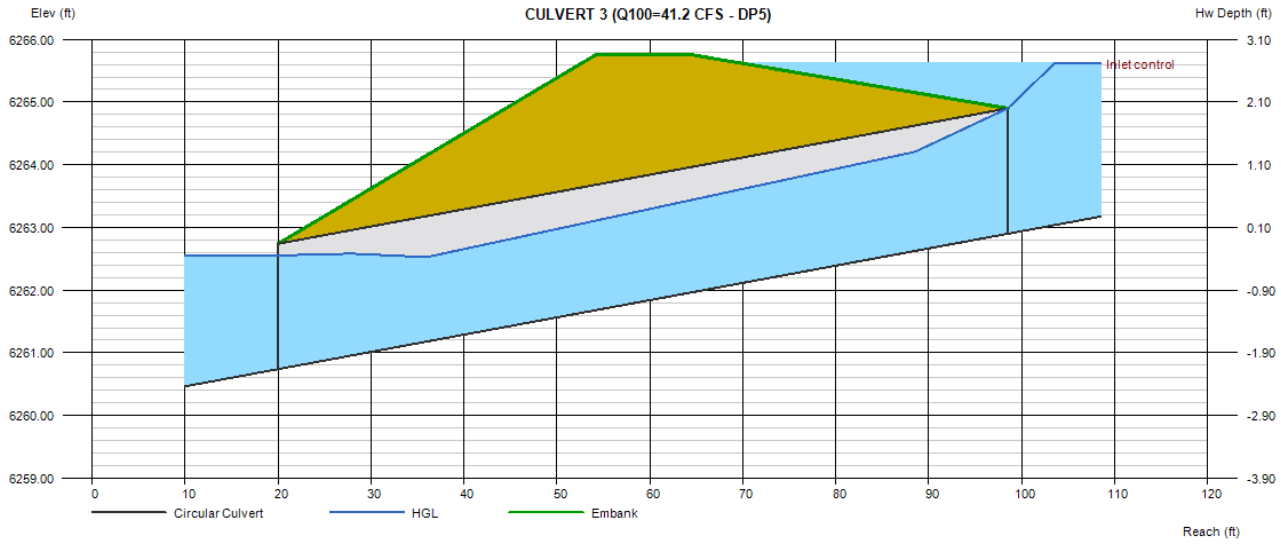
Top Elevation (ft)	=	6265.76
Top Width (ft)	=	10.00
Crest Width (ft)	=	40.00

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

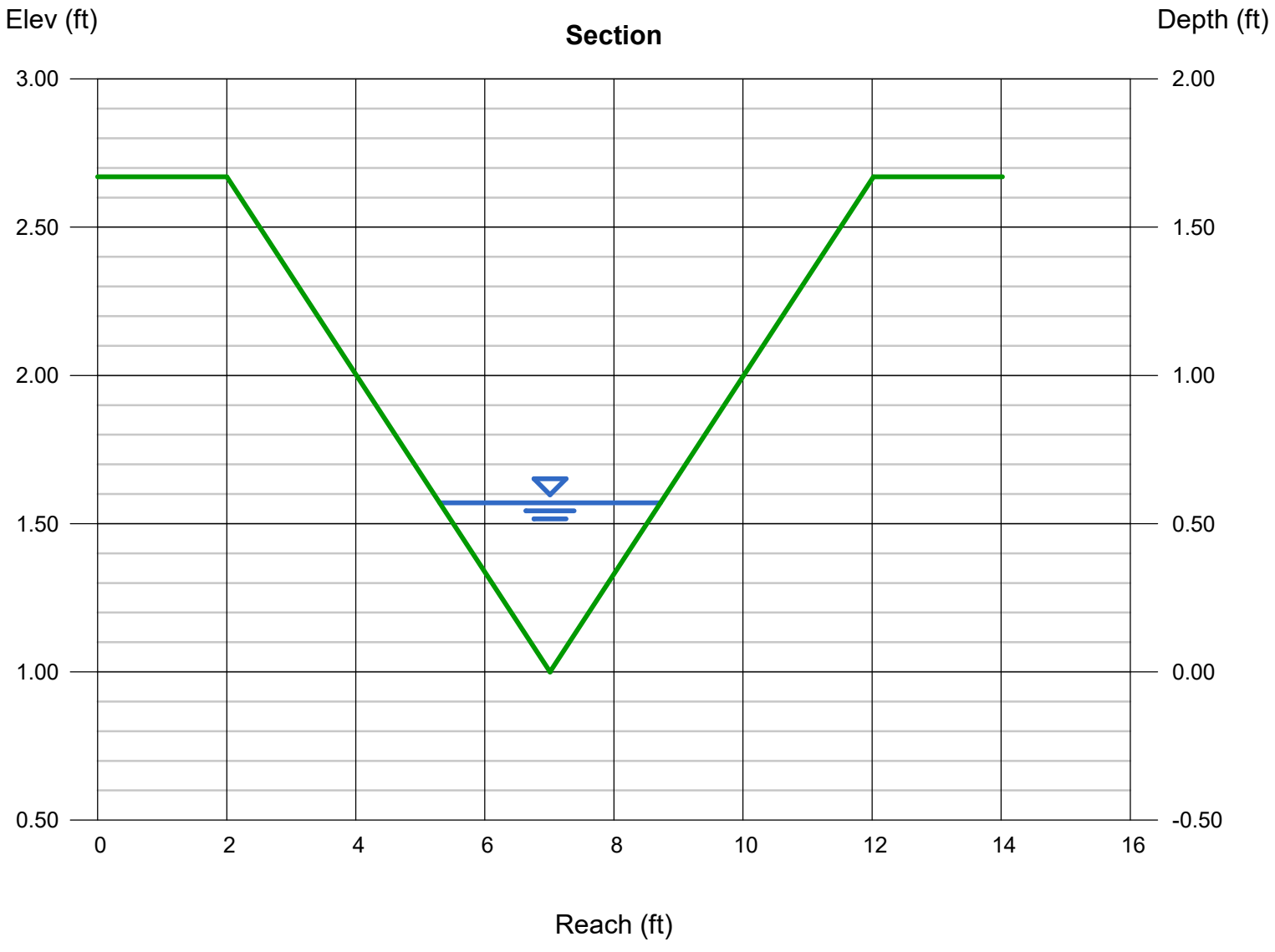
Calculations

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

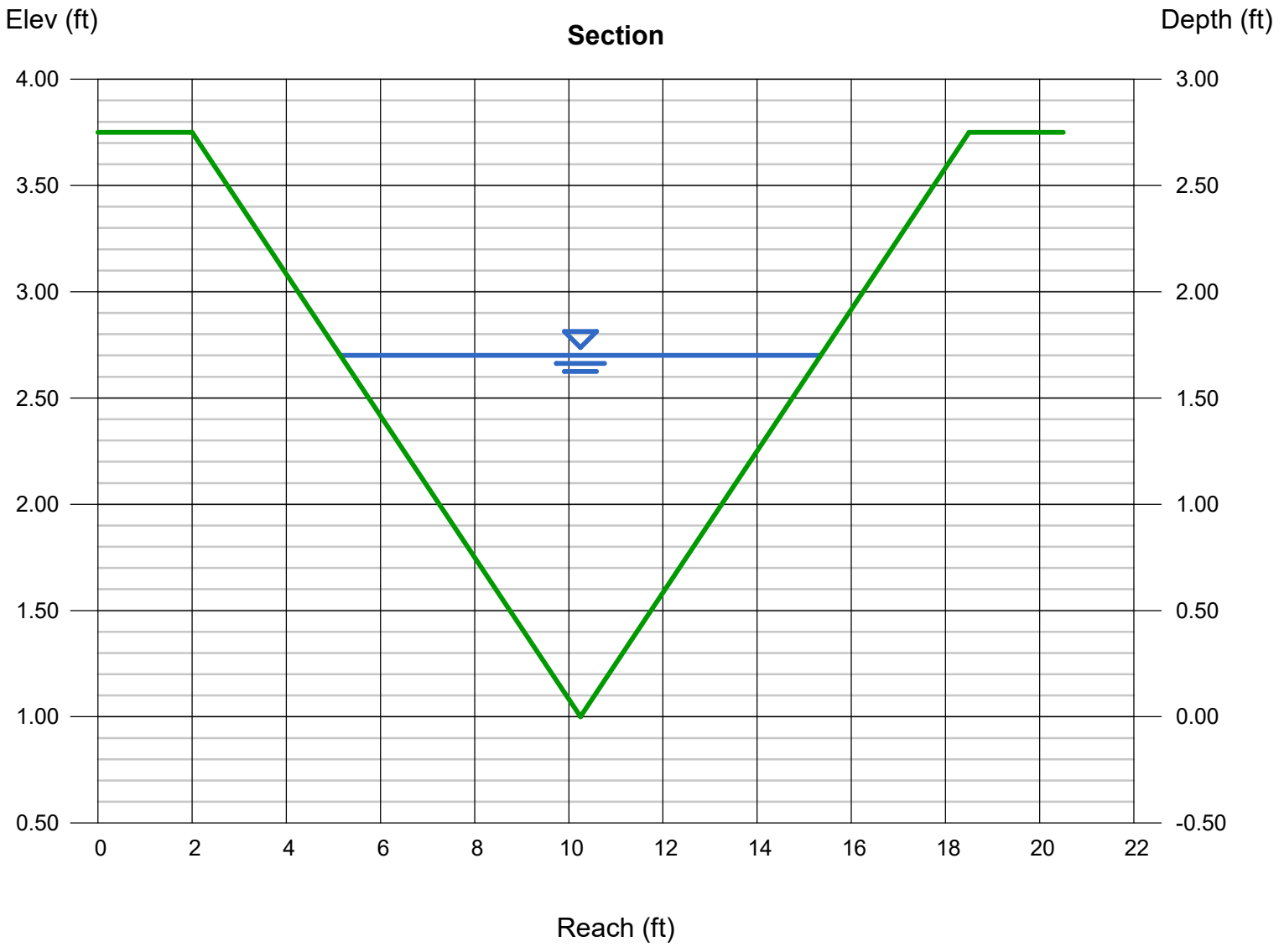
Calculations

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

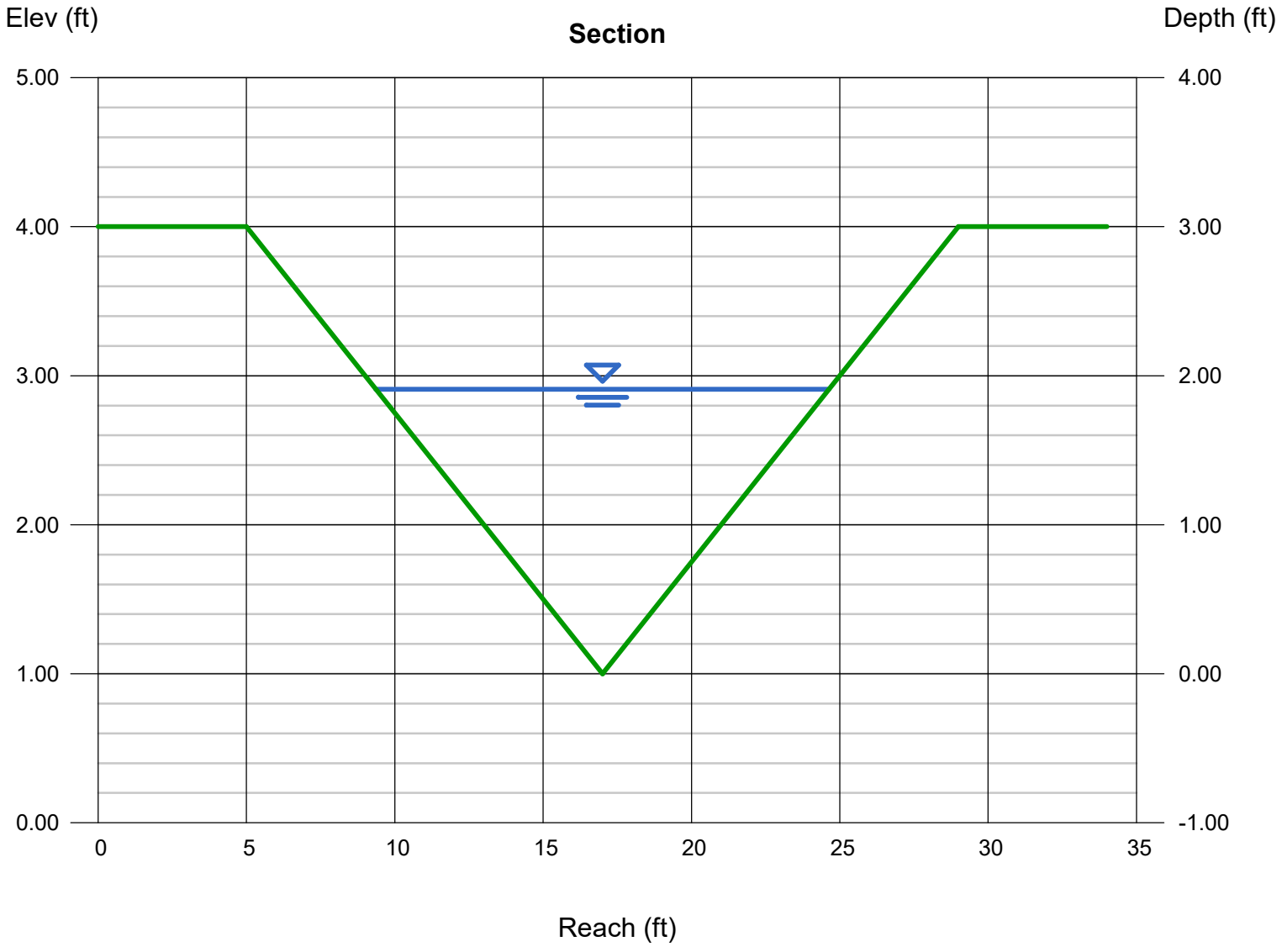
Side Slopes (z:1)	= 4.00, 4.00
Total Depth (ft)	= 3.00
Invert Elev (ft)	= 1.00
Slope (%)	= 0.50
N-Value	= 0.035

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



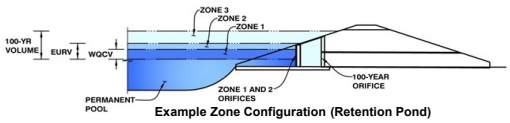
APPENDIX D – WATER QUALITY AND DETENTION CALCULATIONS

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 =	**EDB**	
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	

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) =	0.121	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) =	0.121	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.078	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) =	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

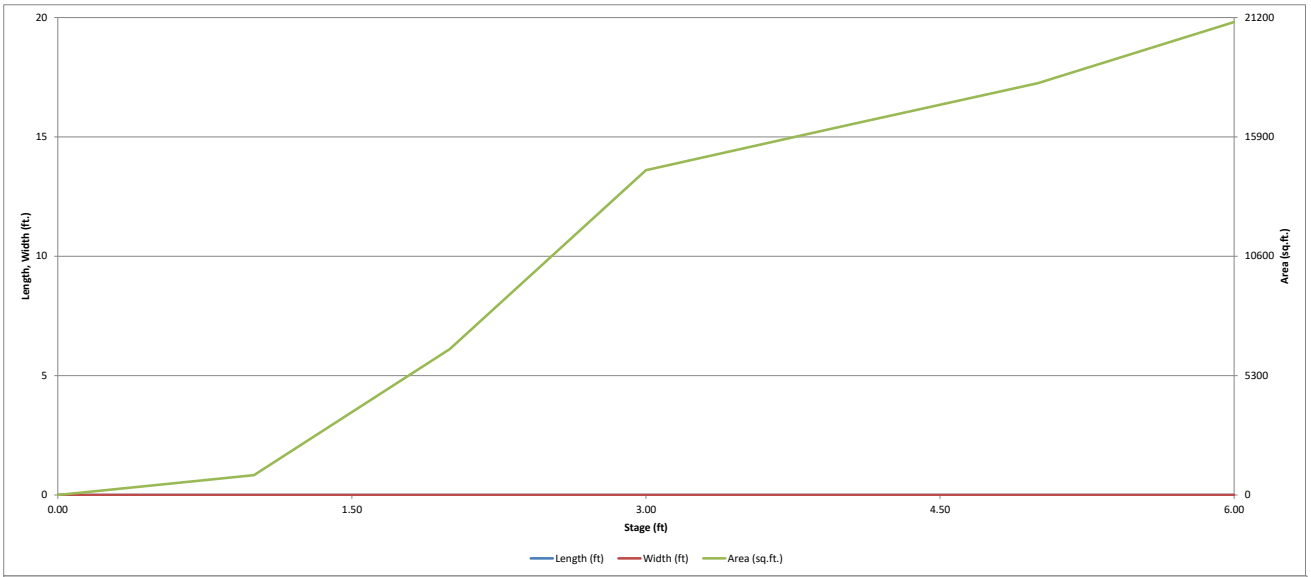
Depth Increment = 1.00 ft

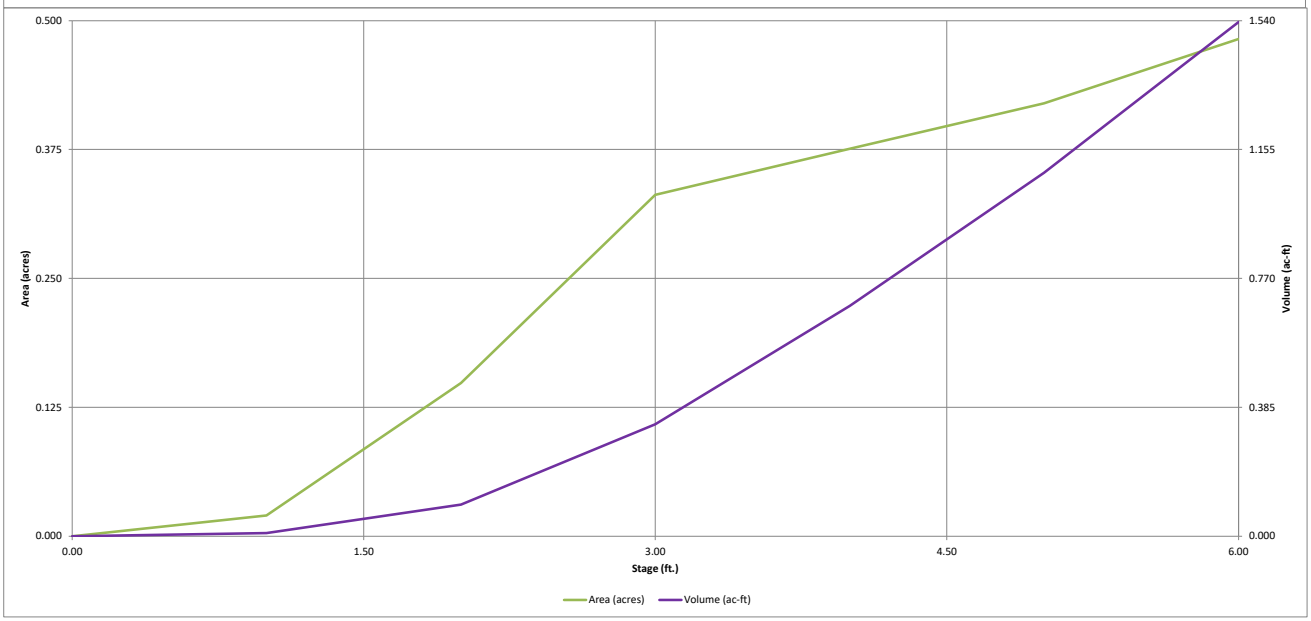
6248

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	--	--	--	0	0.000		
49	--	1.00	--	--	--	875	0.020	437	0.010
50	--	2.00	--	--	--	6,475	0.149	4,112	0.094
51	--	3.00	--	--	--	14,421	0.331	14,560	0.334
52	--	4.00	--	--	--	16,365	0.376	29,953	0.688
53	--	5.00	--	--	--	18,288	0.420	47,280	1.085
54	--	6.00	--	--	--	21,000	0.482	66,924	1.536

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)



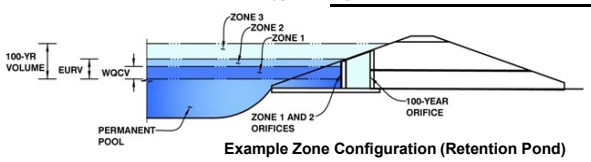


DETENTION BASIN OUTLET STRUCTURE DESIGN

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)	2.17	0.121	Orifice Plate
Zone 2 (EURV)	2.53	0.078	Orifice Plate
Zone 3 (100-year)	4.38	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 =		ft (distance below the filtration media surface)	Underdrain Orifice Area =		ft^2
Underdrain Orifice Diameter =		inches	Underdrain Orifice Centroid =		feet

Calculated Parameters for Underdrain

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

Invert of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	N/A	ft^2
Depth at top of Zone using Orifice Plate =	2.85	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 (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	1.05	2.10					
Orifice Area (sq. inches)	0.44	0.44	0.89					

	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 =	3.25	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	3.25	N/A	feet
Overflow Weir Front Edge Length =	5.67	N/A	feet	Overflow Weir Slope Length =	2.92	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	6.97	N/A	
Horiz. Length of Weir Sides =	2.92	N/A	feet	Overflow Grate Open Area w/o Debris =	11.52	N/A	ft^2
Overflow Grate Type =	Type C Grate	N/A		Overflow Grate Open Area w/ Debris =	5.76	N/A	ft^2
Debris Clogging % =	50%	N/A	%				

Calculated Parameters for Overflow Weir

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

	Zone 3 Restrictor	Not Selected			Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	0.25	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	1.65	N/A	ft^2
Outlet Pipe Diameter =	24.00	N/A	inches	Outlet Orifice Centroid =	0.60	N/A	feet
Restrictor Plate Height Above Pipe Invert =	12.50		inches	Half-Central Angle of Restrictor Plate on Pipe =	1.61	N/A	radians

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	4.50	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.50	feet
Spillway Crest Length =	22.50	feet	Stage at Top of Freeboard =	6.00	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).*

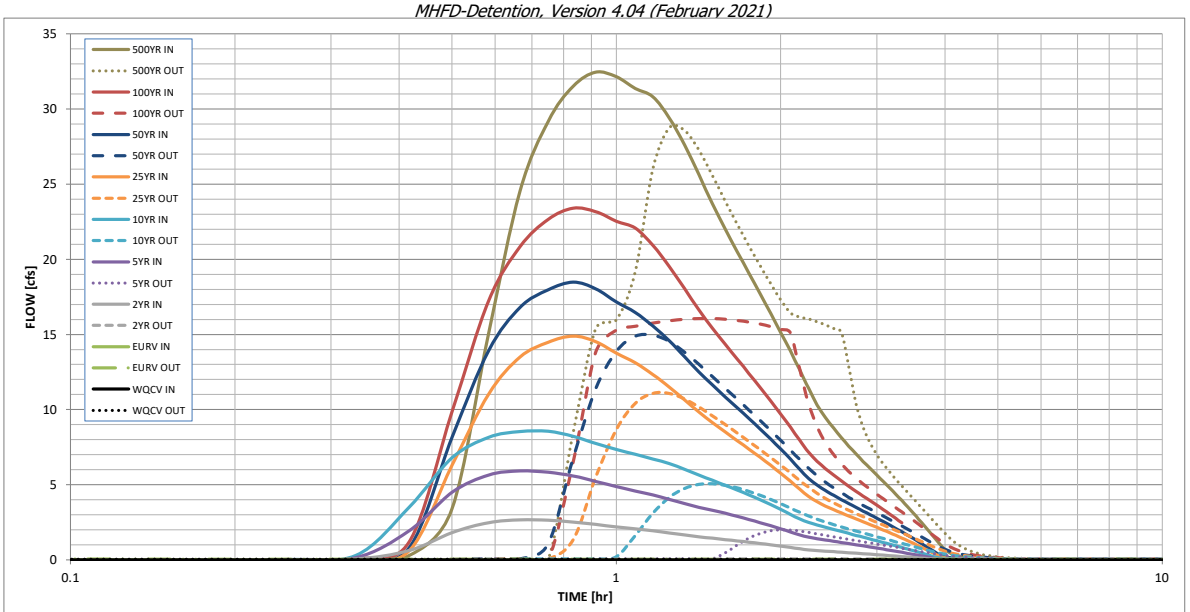
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.14
CUHP Runoff Volume (acre-ft) =	0.121	0.198	0.298	0.675	1.053	1.735	2.196	2.864	4.077
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.298	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	0.1	2.0	5.1	11.1	14.9	16.1	28.7
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.4	0.7	0.8	0.9	0.7	0.9
Structure Controlling Flow =	Plate	Plate	Plate	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Outlet Plate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	0.2	0.4	1.0	1.3	1.4	1.5
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	50	65	82	98	93	84	79	72	60
Time to Drain 99% of Inflow Volume (hours) =	**53**	69	87	107	104	100	98	95	89
Maximum Ponding Depth (ft) =	2.17	2.53	2.83	3.42	3.57	3.79	3.91	4.41	4.81
Area at Maximum Ponding Depth (acres) =	0.18	0.25	0.30	0.35	0.36	0.37	0.37	0.39	0.41
Maximum Volume Stored (acre-ft) =	0.122	0.199	0.281	0.474	0.527	0.610	0.654	0.841	1.002

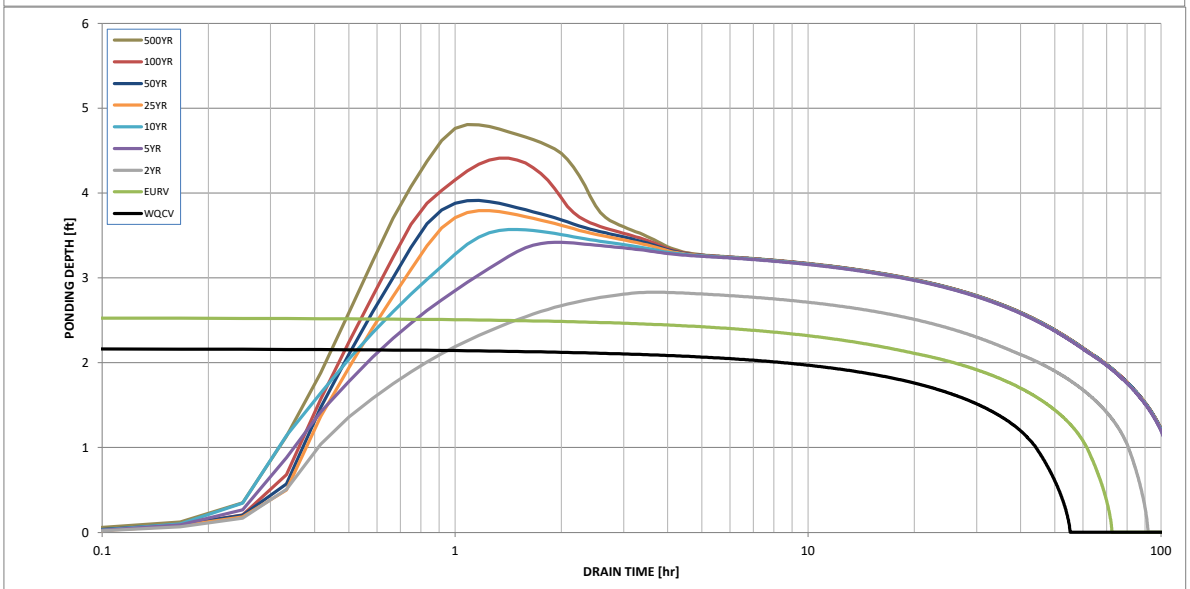
16.1 max

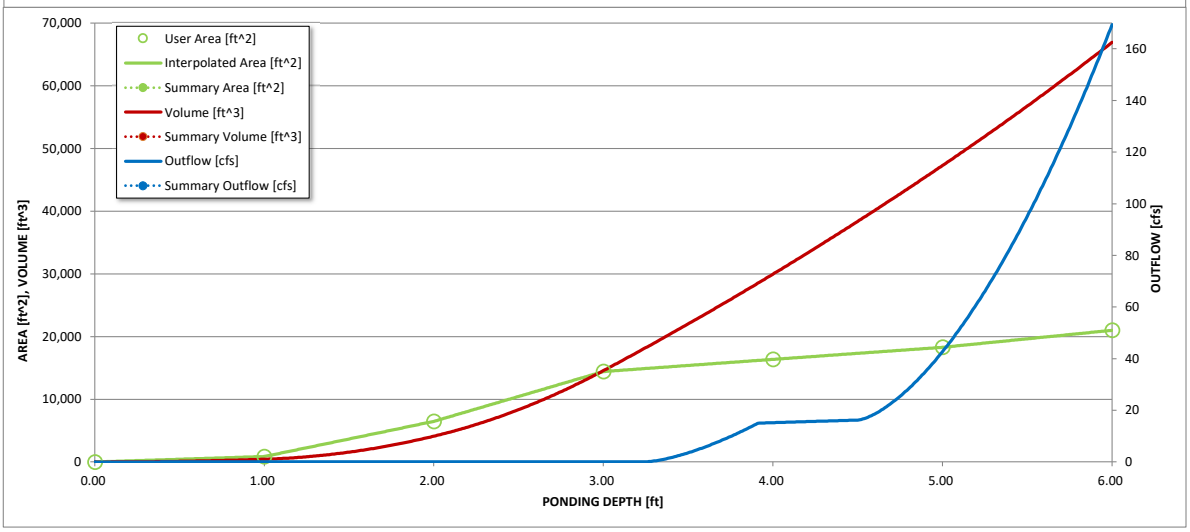
The state statutes indicate all of the runoff from the rainfall event that is less than or equal to the 5 year storm must be infiltrated or released in 72 hrs/120 hrs (97%/99%) (per state senate bill 15-212, CRS 37-92-602(8).

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

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)

Summary Stage-Area-Volume-Discharge Relationships

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

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

Stage - Storage Description	Stage [ft]	Area [ft^2]	Area [acres]	Volume [ft^3]	Volume [ac-ft]	Total Outflow [cfs]

For best results, include the stages of all grade slope changes (e.g. ISV and Floor) from the S-A-V table on Sheet 'Basin'.

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

Spillway Riprap Sizing			
S (ft/ft)	C_f	q (cfs/ft)	D_{50} (in)
0.25	2	0.71	4.15

Type VL Riprap (D_{50} = 6") will be utilized for the spillway protection

Unit Discharge Calculation		
	Spillway	Outfall
Q (cfs)	15.9	16.1
d (ft)	22.5	6.0
q (cfs/ft)	0.71	2.68

"d"	spillway width	outfall to channel length

$$D_{50} = 5.23\, S^{0.43}\, (1.35 C_f\, q)^{0.56}$$ Equation 13-9

Where:

D_{50} = median rock size (in)

S = longitudinal slope (ft/ft)

C_f = concentration factor (1.0 to 3.0)

q = unit discharge (cfs/ft)

When:

η (porosity) = 0.0 (i.e., for buried soil riprap)

Riprap Sizing - Pond Outfall							
Pipe Dia (ft)	q (cfs/ft)	S (ft/ft)	C_f	n	D_{50} min. (in)	Length (ft, = 3x Pipe Dia)	Width (ft, = 3x Pipe Dia)
2	3.55	0.05	2	0	5.11	6	6

Type VL Riprap (D_{50} = 6") will be utilized for the outfall protection

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

shown as 18" on detail on CDs. Revise to remove discrepancy.

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

Design Procedure Form: Extended Detention Basin (EDB)

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

6. Trickle Channel

A) Type of Trickle Channel — Choose One: (●) Concrete ( ) Soft Bottom

F) Slope of Trickle Channel — S = 0.0050 ft / ft

7. Micropool and Outlet Structure

A) Depth of Micropool (2.5-feet minimum) — D_M = 2.5 ft

B) Surface Area of Micropool (10 ft^2 minimum) — A_M = 10 sq ft

C) Outlet Type — Choose One: (●) Orifice Plate ( ) Other (Describe):

D) Smallest Dimension of Orifice Opening Based on Hydrograph Routing (Use UD-Detention) — $D_{orifice}$ = 0.75 inches

E) Total Outlet Area — A_{ot} = 1.93 square inches

Double check this against details in CDs. Does not appear to match.

8. Initial Surcharge Volume

A) Depth of Initial Surcharge Volume (Minimum recommended depth is 4 inches) — D_{IS} = 4 in

B) Minimum Initial Surcharge Volume (Minimum volume of 0.3% of the WQCV) — V_{IS} = cu ft

C) Initial Surcharge Provided Above Micropool — V_s = 3.3 cu ft

9. Trash Rack

A) Water Quality Screen Open Area: $A_t = A_{ot} * 38.5*(e^{-0.095D})$ — A_t = 69 square inches

B) Type of Screen (If specifying an alternative to the materials recommended in the USDCM, indicate "other" and enter the ratio of the total open are to the total screen are for the material specified.) — *S.S. Well Screen with 60% Open Area*

Other (Y/N): N

C) Ratio of Total Open Area to Total Area (only for type 'Other') — User Ratio =

D) Total Water Quality Screen Area (based on screen type) — A_{total} = 115 sq. in.

E) Depth of Design Volume (EURV or WQCV) (Based on design concept chosen under 1E) — H= 2.53 feet

F) Height of Water Quality Screen (H_{TR}) — H_{TR}= 58.36 inches

G) Width of Water Quality Screen Opening ($W_{opening}$) (Minimum of 12 inches is recommended) — $W_{opening}$ = 12.0 inches

VALUE LESS THAN RECOMMENDED MIN. WIDTH. WIDTH HAS BEEN SET TO 12 INCHES.

Design Procedure Form: Extended Detention Basin (EDB)

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

10. Overflow Embankment

A) Describe embankment protection for 100-year and greater overtopping:

B) Slope of Overflow Embankment
(Horizontal distance per unit vertical, 4:1 or flatter preferred)

Ze = 4.00 ft / ft

11. Vegetation

Choose One
- ○ Irrigated
- ◉ Not Irrigated

12. Access

A) Describe Sediment Removal Procedures

Notes:

APPENDIX E – DRAINAGE MAPS

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

EX PROPERTY LINE

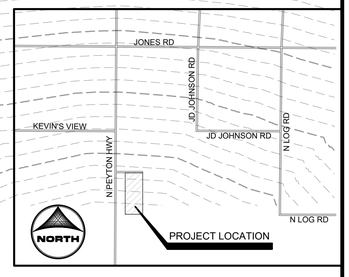
GARRETT & ELIZABETH J GIBSON
SCH. NO. 3300000468

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

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

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

EX DUAL 18" CULVERTS

N. PEYTON HIGHWAY (PUBLIC-60' ROW)

91.6 LF 24" RCP @ 0.50%

OS3
2.77

24" FES (PVT)
PR CULVERT 1

EX SWALE

OS1
25.98

TRACT 1 GRAND VIEW ESTATES III

A
69.83

SW CORNER
S33, T13S, R63W
MONUMENT FOUND

POINT OF BEGINING
TRACT 2

BFE: 6261.1 FEET

AREA LOT 2
UIA = 13,583 FT^2
RPA = 66,417 FT^2

EX HOUSE

D
0.37

60.00' U.E (REC. NO. 205900168) & D.E

AREA LOT 1
UIA = 12,886 FT^2
RPA = 66,114 FT^2

EX 60.00' UE (REC. NO. 205900168) & DE

Show the green basin divider line between Basins D and B1. It doesn't appear to be shown on this map.

OS2
30.52

B1
0.50

B2
23.15

60.00' U.E (REC. NO. 205900168) & D.E

ROBERTO & NATHALIEB ZEPEDA
SCH. NO. 3400000467

LOT 4
812,674 SQ.FT.
18.66 +/- AC.
( )

30.00'
RECORDED AT BOOK A, PAGE 78 AND BOOK 571, PAGE 55

BFE: 6256.1 FEET

AREA LOT 4-1
UIA = 3,266 FT^2
RPA = 76,734 FT^2

LOT 3
231,588 SQ.FT.
5.32 +/- AC.

LOT 2
233,710 SQ.FT.
5.37 +/- AC.

LOT 1
250,578 SQ.FT.
5.75 +/- AC.

AREA JOYFUL VIEW RD
UIA = 18,568 FT^2
RPA = 10,770 FT^2

JOYFUL VIEW (PRIVATE)-LOCAL

EX 100 YR FLOODPLAIN ZONE AE

AREA LOT 4-2
UIA = 16,790 FT^2
RPA = 62,420 FT^2

10.00' U.E & D.E (TYP.)

BFE: 6253.4 FEET

24" FES (PVT)
PR CULVERT 2

PR SWALE 2

PR SWALE 1

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

10.00'
U.E & D.E (TYP.)

15.00' T.E

AREA ELLAS WAY
UIA = 34,876 FT^2
RPA = 35,072 FT^2

102.6 LF 24" RCP @ 0.69%

60.00'

65.00'

15.00' T.E

ELLAS WAY (PRIVATE-LOCAL)

24" FES (PVT)
PR CULVERT 3
79.5 LF 24" RCP @ 1.59%
78.5 LF 24" RCP @ 1.89%

281.66'
POND D.E.

AREA LOT 7-1
UIA = 15,351 FT^2
RPA = 64,649 FT^2

POND A

POINT OF BEGINNING
TRACT 3

BFE: 6248 FEET

AREA LOT 5-1
UIA = 15,351 FT^2
RPA = 64,649 FT^2

B3
7.26

105.56'
POND D.E.

C
14.16

LOT 8
233,731 SQ.FT.
5.37 +/- AC.

LOT 9
250,584 SQ.FT.
5.75 +/- AC.

FUTURE MIN 24" DUAL CULVERT
(NOT TO BE INSTALLED)

LOT 5
589,304 SQ.FT.
13.53 +/- AC.
( )

LOT 7
231,584 SQ.FT.
5.32 +/- AC.

LOT 6
223,301 SQ.FT.
5.13 +/- AC.

PR 30.00'
DRAINAGE ESMT

20.00'
U.E & D.E (TYP.)

20.00'
U.E & D.E (TYP.)

PR SWALE 3

AREA LOT 9
UIA = 12,484 FT^2
RPA = 67,516 FT^2

195.8 LF 24" RCP @ 0.50%

24" FES (PVT)

BFE: 6245.1 FEET

FUTURE MIN 24" DUAL CULVERT
(NOT TO BE INSTALLED)

AREA LOT 5-2
UIA = 3,570 FT^2
RPA = 66,005 FT^2

AREA LOT 6
UIA = 13,300 FT^2
RPA = 66,700 FT^2

AREA LOT 7-2
UIA = 9,766 FT^2
RPA = 70,234 FT^2

AREA LOT 8
UIA = 13,169 FT^2
RPA = 66,831 FT^2

GARRETT & ELIZABETH J GIBSON
SCH. NO. 3300000468

NORTH
0 150
75

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
- UNCONNECTED IMPERVIOUS AREA (UIA)
- RECEIVING PERVIOUS AREA (RPA)
- DEVELOPED LOT AREA -UIA MODELED AS 7% IMPERVIOUS, 93% PERVIOUS
- SEPARATE PERVIOUS AREA (SPA)

Not a UIA. Just a region with an applicable WQ treatment exclusion.

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 (POND)	-	2.0	-	16.1
TOTAL	**22.2**	**22.2**	**140.1**	**139.5**

UIA = 213,993 FT^2 (4.91 ACRES)
RPA = 2,967,864 FT^2 (68.13 ACRES)
DCIA = 0 FT^2 (0 ACRES)
SPA = 1,481,475 FT^2 (34.01 ACRES)
REQUIRED WQCV:19623 FT^3 (0.45 AC-FT)
REDUCED WQCV:19623 FT^3 (0.45 AC-FT)
PERCENT REDUCTION: 100%

* THESE CALCULATIONS USE TOTAL LOT AREA AND DO NOT HAVE THE RESTRICTION OF UIA+RPA < 80,000 THAT SWMM MODELING REQUIRES

* 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.

SUMMARY RUNOFF TABLE

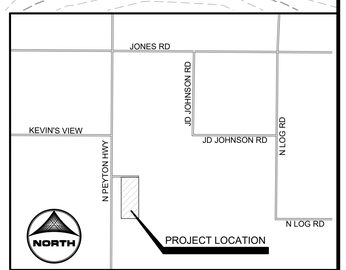
BASIN	AREA (ac)	% IMPERVIOUS	Q_5 (cfs)	Q_{100} (cfs)
A	69.83	2	7.9	52.3
B1	0.50	54	0.7	1.6
B2	23.15	8	4.9	26.0
B3	7.26	4	1.7	10.8
C	14.16	5	3.5	21.6
D	0.37	82	0.9	1.8
OS1	25.98	2	4.5	30.1
OS2	30.52	2	6.0	40.2
OS3	2.77	67	2.3	4.6

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)	-	2.0	-	16.1
3+6+9+10	**22.2**	**22.2**	**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	2.0	16.1



VICINITY MAP
(NOT TO SCALE)

PCD FILING NO. SF2231

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

HRGreen
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
PROPOSED DRAINAGE

SHEET
DR

2

V3_Drainage Report - Final_Comments.pdf Markup Summary

Cloud+ (1)

Subject: Cloud+
Page Label: 15
Author: eschoenheit
Date: 12/12/2023 3:52:30 PM
Status:
Color:
Layer:
Space:

Can remove this and not include in total. Not on property.

Line (2)

= $~~$70,970.20$~~

Subject: Line
Page Label: 15
Author: eschoenheit
Date: 12/12/2023 3:54:30 PM
Status:
Color:
Layer:
Space:

Total Drainag

$~~$5,049.02$~~ + $

Subject: Line
Page Label: 15
Author: eschoenheit
Date: 12/12/2023 3:54:36 PM
Status:
Color:
Layer:
Space:

SW - Highlight (3)

Subject: SW - Highlight
Page Label: 11
Author: Glenn Reese - EPC Stormwater
Date: 12/12/2023 2:04:23 PM
Status:
Color:
Layer:
Space:

Storage for the Water Quality Capture Volume (WQCV) is not required in the detention facility as it is provided
via runoff reduction.

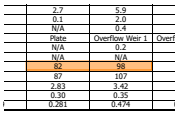
Subject: SW - Highlight
Page Label: 13
Author: Glenn Reese - EPC Stormwater
Date: 12/12/2023 2:05:25 PM
Status:
Color:
Layer:
Space:

Runoff reduction is provided through grass-lined swales
and the extended detention basin.

Subject: SW - Highlight
Page Label: 13
Author: Glenn Reese - EPC Stormwater
Date: 12/12/2023 11:32:44 AM
Status:
Color:
Layer:
Space:

flowing to the Haegler
Ranch Drainage Basin.

SW - Rectangle (2)



Subject: SW - Rectangle
Page Label: 46
Author: Glenn Reese - EPC Stormwater
Date: 12/12/2023 12:06:13 PM
Status:
Color:
Layer:
Space:

Subject: SW - Rectangle
Page Label: 34
Author: Glenn Reese - EPC Stormwater
Date: 12/12/2023 2:08:31 PM
Status:
Color:
Layer:
Space:

SW - Textbox (2)

Subject: SW - Textbox
Page Label: 16
Author: Glenn Reese - EPC Stormwater
Date: 12/12/2023 2:08:58 PM
Status:
Color:
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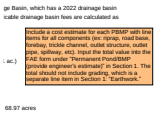
Space:

Unresolved comments from Review 2:

For Runoff Reduction:
- Reference MHFD Detail T-0 for guidance..
- The runoff reduction RPA is considered a WQ Facility and requires a signed Maintenance Agreement
- Provide an O&M manual for the RPAs. See the City's template for grass buffers / grass swales to use as a starting point.
- Provide a figure in drainage report showing all proposed UIA, RPA and SPA areas to be utilized for runoff reduction with labels that correspond to the MHFD calcs spreadsheet.
- Provide a detail for the UIA:RPA interface that shows the recommended vertical drop of 4”.



Subject: SW - Textbox
Page Label: 14
Author: Glenn Reese - EPC Stormwater
Date: 12/12/2023 2:11:30 PM
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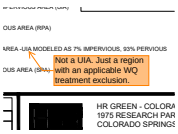
Include a cost estimate for each PBMP with line items for all components (ex: riprap, road base, forebay, trickle channel, outlet structure, outlet pipe, spillway, etc). Input the total value into the FAE form under “Permanent Pond/BMP (provide engineer’s estimate)” in Section 1. The total should not include grading, which is a separate line item in Section 1: “Earthwork.”

SW - Textbox with Arrow (9)



Subject: SW - Textbox with Arrow
Page Label: [1] 24x36
Author: Glenn Reese - EPC Stormwater
Date: 12/12/2023 1:13:22 PM
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Not a UIA. Just a region with an applicable WQ treatment exclusion.

Subject: SW - Textbox with Arrow
Page Label: 13
Author: Glenn Reese - EPC Stormwater
Date: 12/12/2023 2:04:53 PM
Status:
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The swales don't flow to the Haegler DB as the site is already within that DB. So please reword to clarify your intent of this statement.

Subject: SW - Textbox with Arrow
Page Label: 46
Author: Glenn Reese - EPC Stormwater
Date: 12/12/2023 1:59:51 PM
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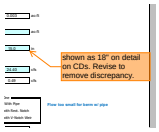
The state statutes indicate all of the runoff from the rainfall event that is less than or equal to the 5 year storm must be infiltrated or released in 72 hrs/120 hrs (97%/99%) (per state senate bill 15-212, CRS 37-92-602(8).



Subject: SW - Textbox with Arrow
Page Label: 51
Author: Glenn Reese - EPC Stormwater
Date: 12/12/2023 12:08:54 PM
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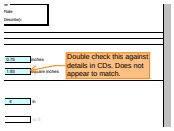
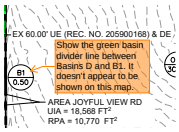
shown as 18" on detail on CDs. Revise to remove discrepancy.



Subject: SW - Textbox with Arrow
Page Label: 52
Author: Glenn Reese - EPC Stormwater
Date: 12/12/2023 12:48:17 PM
Status:
Color:
Layer:
Space:

Double check this against details in CDs. Does not appear to match.



Subject: SW - Textbox with Arrow
Page Label: [1] 24x36
Author: Glenn Reese - EPC Stormwater
Date: 12/12/2023 1:20:53 PM
Status:
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Show the green basin divider line between Basins D and B1. It doesn't appear to be shown on this map.

Subject: SW - Textbox with Arrow
Page Label: 11
Author: Glenn Reese - EPC Stormwater
Date: 12/12/2023 1:43:35 PM
Status:
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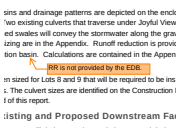
Look at the MHFD-Detention spreadsheet in relation to this. WQCV is still provided for the tributary area, which includes the entire roadway area (minus Basin D, which is excluded). Therefore, I think you could revise this statement accordingly and likely get rid of the Runoff Reduction from this project (which would allow you to make the UE/DE on the North side of Ellas Way thinner and have less post-construction inspection & maintenance responsibilities without the RPAs).



Subject: SW - Textbox with Arrow
Page Label: 13
Author: Glenn Reese - EPC Stormwater
Date: 12/12/2023 2:05:22 PM
Status:
Color:
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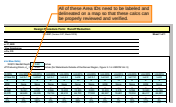
RR is not provided by the EDB.



Subject: SW - Textbox with Arrow
Page Label: 34
Author: Glenn Reese - EPC Stormwater
Date: 12/12/2023 2:08:19 PM
Status:
Color:
Layer:
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All of these Area IDs need to be labeled and delineated on a map so that these calcs can be properly reviewed and verified.

Text Box (4)

9.02 X

Subject: Text Box
Page Label: 15
Author: eschoenheit
Date: 12/12/2023 3:52:40 PM
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Color:
Layer:
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X

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53 ✔

Subject: Text Box
Page Label: 15
Author: eschoenheit
Date: 12/12/2023 3:52:58 PM
Status:
Color:
Layer:
Space:

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.65 ✔

Subject: Text Box
Page Label: 15
Author: eschoenheit
Date: 12/12/2023 3:53:07 PM
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Layer:
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..18 ✔

Subject: Text Box
Page Label: 15
Author: eschoenheit
Date: 12/12/2023 3:53:10 PM
Status:
Color:
Layer:
Space: