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Flying Horse North Filing 9
Final Drainage Report Amendment

November 2026

Prepared For:

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Vice President / Project Manager

Flying Horse Development

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Drainage 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 or omissions on my part in preparing this report.

_____ _____

Richie Lyon, PE
State of Colorado No. 53921
For and on behalf of HR Green Development, LLC

Date

Developer's Statement

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

_____ _____

Drew Balsick, Vice President
Flying Horse Development, LLC
2138 Flying Horse Club Drive
Colorado Springs, CO 80921

Date

El Paso County:

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

_____ _____

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

Date

Conditions:

Final Drainage Report – Flying Horse North

I. General Location and Description

This purpose of this Final Drainage Report (FDR) Amendment is to identify any changes being made to the Classic PDR, Flying Horse North Filing No. 3 FDR, Flying Horse North Filing No. 9 PDR, and provide specific solutions to drainage concerns on-site and off-site resulting from the development of the subdivision to be platted as well as any drainage issues that exist prior to development. The FDR Amendment is to describe the on-site and off-site drainage patterns, quantify storm water runoff and detention volumes, assess existing and proposed storm infrastructure as it relates to water quality and stormwater detention, describe areas tributary to the site and the planned stormwater management for the Flying Horse North Filing No. 9 development. This FDR provides an amendment to the following reports:

The *Preliminary Drainage Report for Flying Horse North Preliminary Plan and Final Drainage Report for Flying Horse North Filing No. 1* developed by Classic Consulting (SP-17-012 and SF-18-001) is a combined Preliminary Drainage Report (PDR) and Final Drainage Report (FDR) that was developed by Classic Consulting, latest revision June 2018. The combined FDR/PDR was approved by the County in September of 2018 and relevant portions are included in Appendix E.

The *Final Drainage Report for Flying Horse North Filing No. 3* developed by HR Green, LLC (SF2326) is a Final Drainage Report (FDR) that was developed by HR Green, latest revision June 2024. The combined FDR was approved by the County in July of 2024 and relevant portions are included in Appendix E.

The *Preliminary Drainage Report Amendment for Flying Horse North PUD/SP Amendment (Major Filings 6, 7, & 8)* developed by HR Green, LLC (PUDSP252) is a Preliminary Drainage Report (PDR) that was developed by HR Green, latest revision February 2025. This FDR is an amendment to the original Classic FDR/PDR for the Flying Horse North subdivision to include Filings 6, 7, and 8. The combined PDR was approved by the County in March of 2026.

The *Final Drainage Report for The Clubhouse at Flying Horse North* developed by HR Green, LLC (PPR-259) is a Final Drainage Report (FDR) that was developed by HR Green, latest revision July 2025. The combined FDR was approved by the County in December of 2025 and relevant portions are included in Appendix E.

This FDR will primarily provide a comparison to the FDR for Flying Horse North Filing No. 3, and the FDR for The Clubhouse at Flying Horse North which are the latest reports that studied the Flying Horse North Filing No. 9 development area. Due to significant differences in design methods between the Filing No. 3 report and the 2018 Classic Consulting PDR, a detailed description of the differences and justifications for design decisions was provided in the previous report. This report will continue to follow the assumptions and applicable design references from the Filing No. 3 FDR. Refer to the FDR for Flying Horse North Filing No. 3 FDR for a more detailed comparison to the 2018 Classic Consulting PDR. This FDR only analyzes and amends the area of the previous PDR's / FDR's that are part of or impacted by the Flying Horse North Filing No. 9 Development.

a. Location

1. City and county, and local streets within and adjacent to the subdivision, township, range, section, ¼ section, major drainageways and existing facilities, names of surrounding platted developments)

The Flying Horse North development is bordered by Highway 83 to the west, Black Forest Road to the east, Cathedral Pines to the south, and High Forest Ranch to the north. The greater Flying Horse North area is within the whole Section 36, Township 11 South, Range 66 West of the Sixth Principal Meridian, and a portion of Section 30 and 31, Township 11 South, and Range 65 West of the Sixth Principal Meridian.

Flying Horse North is split by the Arkansas River Basin and South Platte Basin. Within the South Platte Basin, the site is within the East Cherry Creek Drainage Basin. A Drainage Basin Planning Study (DBPS) does not currently exist for the East Cherry Creek Drainage Bain. This FDR is consistent with the 2022 MDDP which complies with standard El Paso County regulations regarding drainage within this corridor.

The surrounding developments around the Flying Horse North Development include C&H Estates, Terra Ridge Estates, and Whispering Hills Estates to the east, Providence Point Estates to the north, and Cathedral Pines Community to the south.

b. Description of Property

1. Area in acres, ground cover, general topography, general soil conditions, major drainageways, irrigation facilities, utilities and other encumbrances

This FDR Amendment covers the Flying Horse North Filing No. 9 subdivision and includes any offsite upstream and downstream areas to analyze existing and proposed drainageways and facilities. The Flying Horse North Filing No. 9 project area is approximately 32 acres including 11 total 2.5-acre estate lots. This development includes the 2.5-acre estate lots, and 60’ width rights-of-way that consist of asphalt paved roadways with roadside swale sections and electric easements.

Ground cover consists of mid-grass prairie grasslands and former farmland which consists of non-native weeds and grasses and pinyon pine trees. The existing vegetative cover is 90 percent as evidenced by a field survey and aerial imagery. According to the Natural Resources Conservation Service (NRCS) website, the site consists of type B soils. See Appendix A for the NRCS Soil Map.

Drainage generally flows from the northeast to the southwest across the site. Slopes range from 1% to 25% with a maximum elevation of 7619’ and a minimum elevation of 7498’.

No major drainage ways exist within the development; however, small tertiary tributaries are within the site currently and function to convey flows throughout the site. The specific informal drainageways that are within the limits of Filing No. 9 are assessed in this report for stability, stormwater runoff capacity, and water surface elevations during the 100-year event.

No irrigation facilities exist on-site.

There is existing storm sewer infrastructure in Allen Ranch Road that is part of the Flying Horse North Filing 3 development and The Clubhouse at Flying Horse North. There are no other existing utilities on the site.

II. Drainage Basins and Sub-Basins

a. Major Drainage Basin Descriptions

1. Reference should be made to major drainage-way planning studies; such as drainage basin planning studies, flood hazard delineation reports, and flood insurance studies or maps available

Flying Horse North is split by the Arkansas River Basin and South Platte Basin. Within each of those river basins, the site stretches across the Black Squirrel Basin and East Cherry Creek Drainage Basins.

Major drainageway planning study for the Black Squirrel Basin includes *The Black Squirrel Drainage Basin Planning Study (DBPS) Preliminary Design Report prepared by URS Corporation,* January 1989.

For the portion of Flying Horse North which lies within the East Cherry Creek Drainage Basin, a DBPS does not currently exist. This FDR is consistent with the 2018 Classic PDR and the 2022 MDDP which complies with standard El Paso County regulations regarding drainage within this corridor.

Flood Insurance Rate Maps (FIRMS) covering the Flying Horse North site include:

- FEMA Flood Insurance Rate Map Number 08041C0305G effective date December 7, 2018.
- FEMA Flood Insurance Rate Map Number 08041C0315G effective date December 7, 2018.

2. A floodplain statement shall be provided indication whether any portion of the development is in a designated floodplain as delineated on the current FEMA mapping.

Per FEMA FIRM 08041C0305G and 08041C0315G (eff. 12/7/2018), Flying Horse North has the East Cherry Creek run through the northwest portion of the site. Currently, FEMA shows a LOMR effective April 4th, 2019 Base Flood Elevations and Zone A. Per the El Paso County Land Development Code Chapter 8 Section 8.4.2.B.1.e.i, the base flood elevations for Zone A will be determined once the platted lots are solidified and are confirmed within 300-ft of the current floodplain designation. A draft floodplain, which is not yet effective and subject to change, has been added to the drainage maps in Appendix F. Certification of the flood elevations will be via the FEMA CLOMR/LOMR process or Floodplain Certification Letter.

3. Major Drainage Basin Description

The Flying Horse North site is located at the north end of the Black Squirrel Creek Drainage Basin. The existing conditions of this basin consists of forested land across hills and valleys with natural tertiary swales draining southwest off the property. Runoff from the black squirrel creek drainage basin converges at the main channel of Black Squirrel Creek, noted as Reach 12 and 13 in the *Black Squirrel Creek Drainage Basin Planning Study* by URS Consultants, January 1989.

The majority of Flying Horse North is located in the East Cherry Creek Drainage Basin. The existing conditions of the basin consists of grazing prairie land and meadows with little tree coverage. Runoff generated in this basin travels northeast through existing channels and tertiary swales toward Hodgen Road.

4. Identification of all nearby irrigation facilities and other obstruction which could influence or be influence by the local drainage

There are no nearby irrigation facilities that will influence or be influenced by local drainage.

b. Sub-basin Description

1. Discussion of historic drainage patterns on of the property in question

Existing Subbasin Description

The existing sub-basin naming remains consistent with the most recent analysis and description found in the *Final Drainage Report for Flying Horse North Filing No. 3* (SF2326). Refer to the FDR for Flying Horse Filing No. 3 for all other subbasin descriptions tributary to Pond 8 not included in this section of the report.

Subbasins with a prefix of "BS" refer to basins within the Black Squirrel Creek Drainage Basin, and basins with a prefix of "CC" refer to basins within the East Cherry Creek Drainage Basin. Basins with a prefix of "PR" are per The Clubhouse at Flying Horse North FDR. Basins with a prefix of "OS" referred to offsite basins in the previous report. Existing condition subbasins within the development area of Flying Horse Filing No. 9 have been re-analyzed in this report and are described below.

Existing Basin PR-5: 2.26 acres, undeveloped / roadway (Q_5 = 1.4 cfs, Q_{100} = 5.7 cfs)

Runoff generated in this basin sheet flows generally from the west to the east over existing topography through native grass until it is concentrated within the existing curb and gutter for Allen Ranch Road. Concentrated flow at design point PR-5 is conveyed south through subbasin CC-34.3 via the Allen Ranch Road curb and gutter. Slopes in this basin average between 1% and 10% with a maximum elevation of 7626' and a minimum elevation of 7602'.

Existing Basin OS-2: 0.30 acres, roadway (Q_5 = 1.4 cfs, Q_{100} = 2.5 cfs)

Runoff generated in this basin generally drains from the north to the south and is concentrated within the existing curb and gutter for Allen Ranch Road. Concentrated flow at design point OS-2 is conveyed south through subbasin CC-34.2 via the Allen Ranch Road curb and gutter. Slopes in this basin average between 1% and 10% with a maximum elevation of 7607' and a minimum elevation of 7602'.

Existing Basin BS-20: 23.97 acres, undeveloped / residential (Q_5 = 6.4 cfs, Q_{100} = 44.8 cfs)

Runoff generated in this basin sheet flows generally from the north to the south over existing topography through native grass until it is concentrated within existing natural drainage channels. Concentrated flow at design point BS-20 is conveyed south through subbasin BS-20.1 via existing natural drainage channels. Slopes in this basin average between 6% and 22% with a maximum elevation of 7626' and a minimum elevation of 7501'.

Existing Basin BS-20.1: 41.64 acres, undeveloped / residential (Q_5 = 12.3 cfs, Q_{100} = 71.9 cfs)

Runoff generated in this basin sheet flows generally from the east to the west over existing topography through native grass until it is concentrated within existing natural drainage channels. Concentrated flow at design point BS-20.1 is conveyed west offsite via existing natural drainage channels through the Flying Horse North Filing 1 development. Slopes in this basin average between 1% and 20% with a maximum elevation of 7592' and a minimum elevation of 7466'.

Existing Basin BS-20.2: 4.32 acres, undeveloped / roadway / residential (Q_5 = 3.8 cfs, Q_{100} = 11.8 cfs)

Runoff generated in this basin sheet flows generally from the east to the west over existing topography through native grass until it is concentrated within the existing roadside swale for Bourbon Court.

Concentrated flow at design point 5 is conveyed west through subbasin BS-20.1 via existing natural drainage channels. Slopes in this basin average between 1% and 10% with a maximum elevation of 7559' and a minimum elevation of 7490'. There is no disturbance associated with the Flying Horse North Filing 9 development within this subbasin.

Existing Basin BS-20.3: 0.56 acres, roadway (Q_5 = 2.6 cfs, Q_{100} = 4.7 cfs)

Runoff generated in this basin sheet flows generally drains from the south to the north and is concentrated within the existing roadside swale for Bourbon Court. Concentrated flow at design point 5 is conveyed west through subbasin BS-20.1 via existing natural drainage channels. Slopes in this basin average between 1% and 10% with a maximum elevation of 7536' and a minimum elevation of 7490'. There is no disturbance associated with the Flying Horse North Filing 9 development within this subbasin.

Existing Basin BS-21.1: 15.22 acres, undeveloped / roadway / residential (Q_5 = 7.6 cfs, Q_{100} = 33.2 cfs)

Runoff generated in this basin sheet flows generally from the east to the west over existing topography through native grass until it is concentrated within existing natural drainage channels. Concentrated flow at design point 4 is conveyed west offsite via an existing public 36" RCP culvert to the Flying Horse North Filing 4 development. Slopes in this basin average between 6% and 25% with a maximum elevation of 7612' and a minimum elevation of 7536'.

Existing Basin CC-34: 0.88 acres, undeveloped / roadway (Q_5 = 1.0 cfs, Q_{100} = 2.8 cfs)

Runoff generated in this basin sheet flows generally from the west to the east over existing topography through native grass until it is concentrated within the existing curb and gutter for Allen Ranch Road. Concentrated flow at design point 1.1 is conveyed east via existing public storm sewer to the existing Pond A for the Flying Horse Filing 3 development. Slopes in this basin average between 1% and 7% with a maximum elevation of 7591' and a minimum elevation of 7576'.

Existing Basin CC-34.1a: 10.47 acres, undeveloped / residential (Q_5 = 5.3 cfs, Q_{100} = 25.9 cfs)

Runoff generated in this basin sheet flows generally from the west to the east over existing topography through native grass offsite. Runoff at design point CC-34.1a is conveyed east offsite via sheet flow to the Flying Horse North Filing 1 development. Slopes in this basin average between 4% and 10% with a maximum elevation of 7608' and a minimum elevation of 7561'.

Existing Basin CC-34.1b: 4.63 acres, undeveloped / detention pond (Q_5 = 1.4 cfs, Q_{100} = 10.5 cfs)

Runoff generated in this basin sheet flows generally from the west to the east over existing topography and through the existing Pond A for the Flying Horse North Filing 3 development to the existing outlet structure at design point 2. Runoff to design point 2 is conveyed east offsite via an existing public 24" RCP outlet pipe to the Flying Horse North Filing 1 development. Design point CC-34.1a has accounted for the release rates from existing Pond A for the total discharge offsite. Slopes in this basin average between 2% and 6% with a maximum elevation of 7602' and a minimum elevation of 7559'. There is no disturbance associated with the Flying Horse North Filing 9 development within this subbasin.

Existing Basin CC-34.2: 1.84 acres, roadway (Q_5 = 5.2 cfs, Q_{100} = 9.4 cfs)

Runoff generated in this basin generally drains from the north to the south and south to north to the middle of the basin and is concentrated within the existing curb and gutter for Allen Ranch Road. Concentrated flow at design point 1.3 is conveyed east via existing public storm sewer to the existing

Pond A for the Flying Horse Filing 3 development. Slopes in this basin average between 1% and 10% with a maximum elevation of 7608' and a minimum elevation of 7576'.

Existing Basin CC-34.3: 1.09 acres, undeveloped / roadway (Q_5 = 1.8 cfs, Q_{100} = 4.7 cfs)

Runoff generated in this basin sheet flows generally from the west to the east over existing topography through native grass until it is concentrated within the existing curb and gutter for Allen Ranch Road. Concentrated flow at design point 1 is conveyed east via existing public storm sewer to the existing Pond A for the Flying Horse Filing 3 development. Slopes in this basin average between 1% and 7% with a maximum elevation of 7592' and a minimum elevation of 7577'.

Existing Basin CC-34.4: 3.32 acres, undeveloped / roadway (Q_5 = 2.2 cfs, Q_{100} = 7.7 cfs)

Runoff generated in this basin sheet flows generally from the west to the east over existing topography through native grass until it is concentrated within the existing curb and gutter for Allen Ranch Road. Concentrated flow at design point 1.2 is conveyed east via existing public storm sewer to the existing Pond A for the Flying Horse Filing 3 development. Slopes in this basin average between 1% and 33% with a maximum elevation of 7612' and a minimum elevation of 7581'.

Existing Basin PR-1: 0.27 acres, rooftop (Q_5 = 1.0 cfs, Q_{100} = 1.9 cfs)

Runoff generated in this basin is captured by roof drains for the Flying Horse North Clubhouse. Drainage is discharged from downspouts that drain west to the east over existing parking lot area to a private CDOT Type D inlet as design point PR-2. Flow at design point PR-2 is conveyed south via existing public / private storm sewer to the existing Pond A for the Flying Horse Filing 3 development. Slopes in this basin average at 1% with an elevation of 7623'.

Existing Basin PR-2: 1.66 acres, rooftop / roadway (Q_5 = 4.8 cfs, Q_{100} = 9.1 cfs)

Runoff generated in this basin drains west to the east over existing parking lot area to a private CDOT Type D inlet as design point PR-2. Flow at design point PR-2 is conveyed south via existing public / private storm sewer to the existing Pond A for the Flying Horse Filing 3 development. Slopes in this basin average between 1% and 25% with a maximum elevation of 7623' and a minimum elevation of 7608'.

Existing Basin PR-3: 2.16 acres, rooftop / roadway (Q_5 = 7.1 cfs, Q_{100} = 13.3 cfs)

Runoff generated in this basin drains west to the east over existing parking lot area to a private 15' CDOT Type R inlet as design point PR-3. Flow at design point PR-3 is conveyed south via existing public / private storm sewer to the existing Pond A for the Flying Horse Filing 3 development. Slopes in this basin average between 1% and 25% with a maximum elevation of 7623' and a minimum elevation of 7612'.

Proposed Subbasin Description

The proposed sub-basins naming remains consistent with the existing condition subbasin analysis, and the most recent analysis and description found in the *Final Drainage Report for Flying Horse North Filing No. 3* (SF2326). Refer to the FDR for Flying Horse Filing No. 3 for all other subbasin descriptions tributary to Pond 8 not included in this section of the report.

Where basins with a prefix of "BS" refer to basins within the Black Squirrel Creek Drainage Basin, and basins with a prefix of "CC" refer to basins within the East Cherry Creek Drainage Basin. Basins with a prefix of "PR" are per The Clubhouse at Flying Horse North FDR. Basins with a prefix of "OS" referred to offsite basins in the previous report. Proposed subbasins within the development area of Flying Horse

Filing No. 9 that have been divided from the existing condition analysis are assigned a suffix of a, b, c, etc..

Proposed Basin PR-5: 2.26 acres, undeveloped / roadway / residential (Q_5 = 2.0 cfs, Q_{100} = 6.4 cfs)

Proposed subbasin PR-5 includes additional 2.5-acre estate lot area and maintains the existing drainage patterns of subbasin PR-5. Runoff generated in this basin sheet flows generally from the west to the east over existing topography through native grass until it is concentrated within the existing curb and gutter for Allen Ranch Road. Concentrated flow at design point PR-5 is conveyed south through subbasin CC-34.3 via the Allen Ranch Road curb and gutter. Slopes in this basin average between 1% and 10% with a maximum elevation of 7626' and a minimum elevation of 7602'. Drainage from subbasin PR-5 is treated and detained within the existing district full-spectrum detention basin "Pond A".

Proposed Basin OS-2: 0.30 acres, roadway (Q_5 = 1.4 cfs, Q_{100} = 2.5 cfs)

There is no change to subbasin OS-2 drainage patterns in the proposed condition. Runoff generated in this basin generally drains from the north to the south and is concentrated within the existing curb and gutter for Allen Ranch Road. Concentrated flow at design point OS-2 is conveyed south through subbasin CC-34.2 via the Allen Ranch Road curb and gutter. Slopes in this basin average between 1% and 10% with a maximum elevation of 7607' and a minimum elevation of 7602'. Drainage from subbasin OS-2 is treated and detained within the existing district full-spectrum detention basin "Pond A".

Proposed Basin BS-20a: 1.75 acres, roadway (Q_5 = 8.1 cfs, Q_{100} = 14.6 cfs)

Runoff generated in this basin generally drains from the east to the west and is concentrated within the proposed curb & gutter for Ace Way. Concentrated flow is captured in a District owned 15' CDOT Type 'R' inlet in a sump in the cul-de-sac for Ace Way. Flow is then discharged south via a District owned 24" HDPE pipe and outfall at design point BS-20a into a natural drainage channel that drains through Flying Horse North Filing 1. The emergency overflow for the sump inlet will overtop the curb and drain south to the natural drainage channel that drains through Flying Horse Northing Filing 1. Slopes in this basin average between 1% and 7.5% with a maximum elevation of 7590' and a minimum elevation of 7522'. Drainage from subbasin BS-20a is treated and detained within the existing district full-spectrum detention basin from Filing No. 1 "Pond 8".

Proposed Basin BS-20b: 13.39 acres, residential (Q_5 = 7.6 cfs, Q_{100} = 31.4 cfs)

Runoff generated in this basin sheet flows generally from the east to the west over existing topography through native grass until it is concentrated within existing natural drainage channels. Concentrated flow to design point BS-20b is conveyed south through subbasin BS-20.1 via existing natural drainage channels. Slopes in this basin average between 6% and 22% with a maximum elevation of 7626' and a minimum elevation of 7512'. Drainage from subbasin BS-20b is treated and detained within the existing district full-spectrum detention basin from Filing No. 1 "Pond 8".

Proposed Basin BS-20c: 9.31 acres, undeveloped / residential (Q_5 = 2.8 cfs, Q_{100} = 18.1 cfs)

Runoff generated in this basin sheet flows generally from the north to the south over existing topography through native grass until it is concentrated within existing natural drainage channels. Concentrated flow at design point BS-20c is conveyed south through subbasin BS-20.1 via existing natural drainage channels. Slopes in this basin average between 6% and 22% with a maximum elevation of 7626' and a minimum elevation of 7501'. There is no disturbance associated with the Flying Horse North Filing 9

development within this subbasin. Drainage from subbasin BS-20c is treated and detained within the existing district full-spectrum detention basin from Filing No. 1 “Pond 8”.

Proposed Basin BS-20.1: 41.26 acres, undeveloped / residential (Q_5 = 13.2 cfs, Q_{100} = 72.6 cfs)

Proposed subbasin BS-20.1 includes additional 2.5-acre estate lot area and maintains the existing drainage patterns of subbasin BS-20.1. Runoff generated in this basin sheet flows generally from the east to the west over existing topography through native grass until it is concentrated within existing natural drainage channels. Concentrated flow at design point BS-20.1 is conveyed west offsite via existing natural drainage channels through the Flying Horse North Filing 1 development. Slopes in this basin average between 1% and 20% with a maximum elevation of 7592’ and a minimum elevation of 7466’. Drainage from subbasin BS-20.1 is treated and detained within the existing district full-spectrum detention basin from Filing No. 1 “Pond 8”.

Proposed Basin BS-20.2: 4.32 acres, undeveloped / roadway / residential (Q_5 = 3.8 cfs, Q_{100} = 11.8 cfs)

There is no change to subbasin BS-20.2 drainage patterns in the proposed condition. Runoff generated in this basin sheet flows generally from the east to the west over existing topography through native grass until it is concentrated within the existing roadside swale for Bourbon Court. Concentrated flow at design point 5 is conveyed west through subbasin BS-20.1 via existing natural drainage channels. Slopes in this basin average between 1% and 10% with a maximum elevation of 7559’ and a minimum elevation of 7490’. There is no disturbance associated with the Flying Horse North Filing 9 development within this subbasin.

Proposed Basin BS-20.3: 0.56 acres, roadway (Q_5 = 2.6 cfs, Q_{100} = 4.7 cfs)

There is no change to subbasin BS-20.3 drainage patterns in the proposed condition. Runoff generated in this basin sheet flows generally drains from the south to the north and is concentrated within the existing roadside swale for Bourbon Court. Concentrated flow at design point 5 is conveyed west through subbasin BS-20.1 via existing natural drainage channels. Slopes in this basin average between 1% and 10% with a maximum elevation of 7536’ and a minimum elevation of 7490’. There is no disturbance associated with the Flying Horse North Filing 9 development within this subbasin.

Proposed Basin BS-21.1: 15.22 acres, undeveloped / roadway / residential (Q_5 = 7.9 cfs, Q_{100} = 33.6 cfs)

Proposed subbasin BS-21.1 includes additional 2.5-acre estate lot area and maintains the existing drainage patterns of subbasin BS-21.1. Runoff generated in this basin sheet flows generally from the east to the west over existing topography through native grass until it is concentrated within existing natural drainage channels. Concentrated flow at design point 4 is conveyed west offsite via an existing public 36” RCP culvert to the Flying Horse North Filing 4 development. Slopes in this basin average between 6% and 25% with a maximum elevation of 7612’ and a minimum elevation of 7536’. Drainage from subbasin BS-21.1 is treated and detained within the existing district full-spectrum detention basin from Filing No. 1 “Pond 8”.

Proposed Basin CC-34: 0.88 acres, undeveloped / roadway (Q_5 = 1.2 cfs, Q_{100} = 3.1 cfs)

Proposed subbasin CC-34 includes additional 2.5-acre estate lot area and maintains the existing drainage patterns of subbasin CC-34. Runoff generated in this basin sheet flows generally from the west to the east over existing topography through native grass until it is concentrated within the existing curb

and gutter for Allen Ranch Road. Concentrated flow at design point 1.1 is conveyed east via existing public storm sewer to the existing Pond A for the Flying Horse Filing 3 development. Slopes in this basin average between 1% and 7% with a maximum elevation of 7591' and a minimum elevation of 7576'. Drainage from subbasin OS-2 is treated and detained within the existing district full-spectrum detention basin "Pond A".

Proposed Basin CC-34.1a: 10.47 acres, undeveloped / residential (Q_5 = 6.5 cfs, Q_{100} = 27.4 cfs)

Proposed subbasin CC-34.1a includes additional 2.5-acre estate lot area and maintains the existing drainage patterns of subbasin CC-34. Runoff generated in this basin sheet flows generally from the west to the east over existing topography through native grass offsite. Runoff at design point CC-34.1a is conveyed east offsite via sheet flow to the Flying Horse North Filing 1 development. Slopes in this basin average between 4% and 10% with a maximum elevation of 7608' and a minimum elevation of 7561'. The additional 2.5-acre estate lot area within subbasin CC-34.1a from the Flying Horse North Filing 9 development has an applicable exclusion from WQ treatment per ECM I.6.1.B.5.

Proposed Basin CC-34.1b: 4.63 acres, undeveloped / detention pond (Q_5 = 1.4 cfs, Q_{100} = 10.5 cfs)

There is no change to subbasin CC-34.1b drainage patterns in the proposed condition. Runoff generated in this basin sheet flows generally from the west to the east over existing topography and through the existing Pond A for the Flying Horse North Filing 3 development to the existing outlet structure at design point 2. Runoff to design point 2 is conveyed east offsite via an existing public 24" RCP outlet pipe to the Flying Horse North Filing 1 development. Design point CC-34.1a has accounted for the release rates from existing Pond A for the total discharge offsite. Slopes in this basin average between 2% and 6% with a maximum elevation of 7602' and a minimum elevation of 7559'. There is no disturbance associated with the Flying Horse North Filing 9 development within this subbasin. Drainage from subbasin CC-34.1b is treated and detained within the existing district full-spectrum detention basin "Pond A".

Proposed Basin CC-34.2: 1.84 acres, roadway (Q_5 = 5.2 cfs, Q_{100} = 9.4 cfs)

There is no change to subbasin CC-34.2 drainage patterns in the proposed condition. Runoff generated in this basin generally drains from the north to the south and south to north to the middle of the basin and is concentrated within the existing curb and gutter for Allen Ranch Road. Concentrated flow at design point 1.3 is conveyed east via existing public storm sewer to the existing Pond A for the Flying Horse Filing 3 development. Slopes in this basin average between 1% and 10% with a maximum elevation of 7608' and a minimum elevation of 7576'. Drainage from subbasin CC-34.2 is treated and detained within the existing district full-spectrum detention basin "Pond A".

Proposed Basin CC-34.3: 1.00 acres, undeveloped / roadway (Q_5 = 2.4 cfs, Q_{100} = 5.2 cfs)

Proposed subbasin CC-34.3 includes additional 2.5-acre estate lot area and maintains the existing drainage patterns of subbasin CC-34.3. Runoff generated in this basin sheet flows generally from the west to the east over existing topography through native grass until it is concentrated within the existing curb and gutter for Allen Ranch Road. Concentrated flow at design point 1 is conveyed east via existing public storm sewer to the existing Pond A for the Flying Horse Filing 3 development. Slopes in this basin average between 1% and 7% with a maximum elevation of 7592' and a minimum elevation of 7577'. Drainage from subbasin CC-34.3 is treated and detained within the existing district full-spectrum detention basin "Pond A".

Proposed Basin CC-34.4: 3.32 acres, undeveloped / roadway (Q_5 = 2.8 cfs, Q_{100} = 8.4 cfs)

Proposed subbasin CC-34.4 includes additional 2.5-acre estate lot area and maintains the existing drainage patterns of subbasin CC-34.4.Runoff generated in this basin sheet flows generally from the west to the east over existing topography through native grass until it is concentrated within the existing curb and gutter for Allen Ranch Road. Concentrated flow at design point 1.2 is conveyed east via existing public storm sewer to the existing Pond A for the Flying Horse Filing 3 development. Slopes in this basin average between 1% and 33% with a maximum elevation of 7612' and a minimum elevation of 7581'. Drainage from subbasin CC34.4 is treated and detained within the existing district full-spectrum detention basin "Pond A".

Proposed Basin PR-1: 0.27 acres, rooftop (Q_5 = 1.0 cfs, Q_{100} = 1.9 cfs)

There is no change to subbasin PR-1 drainage patterns in the proposed condition. Runoff generated in this basin is captured by roof drains for the Flying Horse North Clubhouse. Drainage is discharged from downspouts that drain west to the east over existing parking lot area to a private CDOT Type D inlet as design point PR-2. Flow at design point PR-2 is conveyed south via existing public / private storm sewer to the existing Pond A for the Flying Horse Filing 3 development. Slopes in this basin average at 1% with an elevation of 7623'.

Proposed Basin PR-2: 1.66 acres, rooftop / roadway (Q_5 = 4.8 cfs, Q_{100} = 9.1 cfs)

There is no change to subbasin PR-2 drainage patterns in the proposed condition. Runoff generated in this basin drains west to the east over existing parking lot area to a private CDOT Type D inlet as design point PR-2. Flow at design point PR-2 is conveyed south via existing public / private storm sewer to the existing Pond A for the Flying Horse Filing 3 development. Slopes in this basin average between 1% and 25% with a maximum elevation of 7623' and a minimum elevation of 7608'.

Proposed Basin PR-3: 2.16 acres, rooftop / roadway (Q_5 = 7.1 cfs, Q_{100} = 13.3 cfs)

There is no change to subbasin PR-3 drainage patterns in the proposed condition. Runoff generated in this basin drains west to the east over existing parking lot area to a private 15' CDOT Type R inlet as design point PR-3. Flow at design point PR-3 is conveyed south via existing public / private storm sewer to the existing Pond A for the Flying Horse Filing 3 development. Slopes in this basin average between 1% and 25% with a maximum elevation of 7623' and a minimum elevation of 7612'.

A comparison of existing and proposed flows leaving the site are provided in the table below. The downstream infrastructure at each offsite design point has capacity for the proposed improvements. Refer to additional descriptions below for each design point discharging runoff offsite from the Flying Horse North Filing 9 development.

	FHN Filing 9 Outfall Peak Flows			
	Existing		Proposed (FHN F9)	
	Q_5 (cfs)	Q_{100} (cfs)	Q_5 (cfs)	Q_{100} (cfs)
4	7.6	33.2	7.9	33.6
BS-20.1	22.6	124.0	31.0	134.7
CC-34.1a	5.6	48.5	7.0	43.4
Total:	35.8	205.6	46.0	211.7
Refer to additional description for design point CC-34.1a.				

Design Point 4:

The total flow offsite at design point 4 in the Flying Horse North Filing 9 developed condition (Q_5 = 7.9 cfs, Q_{100} = 33.6 cfs) is less than the anticipated developed flow offsite at design point 4 per the approved Flying Horse North Filing 3 FDR in the minor and major storms (Q_5 = 8.5 cfs, Q_{100} = 34.3 cfs). The reduction in the developed flow to design point 4 is due to the assumptions made in the Flying Horse North Filing 3 report for the Flying Horse North Filing 9 development which included "flats" with a higher impervious percentage at the time of that report. The proposed Flying Horse North Filing 9 development proposes 2.5-acre estate lots with a lower impervious percentage than assumed. Therefore, downstream drainage infrastructure has capacity for the proposed improvements and there are no negative impacts on downstream drainageways anticipated by this development.

Design Point BS-20.1:

The total flow offsite at design point BS-20.1 in the Flying Horse North Filing 9 developed condition (Q_5 = 31.01 cfs, Q_{100} = 134.68 cfs). The Classic FDR accounted for future 2 acre lots within Basin BS-20 & BS-21 that should ultimately travel southwesterly towards Pond 8. The proposed Flying Horse North Filing 9 development proposes 2.5-acre estate lots that are consistent with the assumptions made by the Classic FDR for the future development. Additional specific calculations for any downstream drainage infrastructure on the flow path to Pond 8 is analyzed in this report. There is an orifice plate replacement proposed and an increase in the spillway crest elevation proposed by this development for Pond 8. With these improvements, Pond 8 has capacity for the proposed improvements and there are no negative impacts on downstream drainageways anticipated by this development.

Design Point CC-34.1a:

The total flow offsite at design point CC-34.1a in the Flying Horse North Filing 9 developed condition (Q_5 = 7.0 cfs, Q_{100} = 43.4 cfs) is less than the pre-development release for subbasins that were intended to be tributary to Pond A per the approved Flying Horse North Filing 3 FDR (Q_5 = 10.9 cfs, Q_{100} = 44.3 cfs) which drained offsite at design point CC-34.1a prior to the Flying Horse North Filing 3 development. The Flying Horse North Filing 3 report accounted for all drainage from subbasin CC34.1, draining into Pond A. In the as-built condition, a portion of basin CC-34.1 (described in this report as basin CC-34.1a) drains off-site without detention. Due to this, the "anticipated" flow offsite at this design point was lower than what is happening in the as-built/existing condition. This report proposes replacing the water quality orifice plate on Pond A to meet full-spectrum drain time requirements for the actual tributary area to Pond A, and lower the restrictor plate on the outlet structure to further reduce the major storm release rate. This report also analyzes the total release rate from basin CC-34.1a in the un-detained condition, and the existing full-spectrum Pond A release rates to ensure that to the peak flow at design point CC-34.1a is less than the pre-development condition. As stated at the beginning of this paragraph, the total release rate from basin CC-34.1a and Pond A is less than the pre-development release rate to design point CC-34.1a per the Flying Horse North Filing 3 FDR. Therefore, downstream drainage infrastructure has capacity for the proposed improvements and there are no negative impacts on downstream drainageways anticipated by this development.

2. Discussion of off-site drainage flow patterns and their impact on the development

There is no offsite flow draining into the Flying Horse North Filing 9 development.

III. Drainage Design Criteria

a. Development Criteria Reference

1. Reference all criteria, master plans, and technical information used for report preparation and design; any deviation from such material must be discussed and justified

Listed Below are the technical resources reviewed in the preparation of this FDR amendment:

- El Paso County Drainage Criteria Manual (DCM)
- City of Colorado Springs Drainage Criteria Manual
- Mile High Flood District
- NOAA Atlas 14
- NRCS Soil Survey for El Paso County Area, Colorado
- El Paso County Assessor Property Records

2. Discussion of previous drainage studies for the site in question that influence or are influenced by the drainage design and how the studies affect drainage design for the site.

The *Preliminary Drainage Report for Flying Horse North Preliminary Plan and Final Drainage Report for Flying Horse North Filing No. 1* developed by Classic Consulting (SP-17-012 and SF-18-001) is a combined Preliminary Drainage Report (PDR) and Final Drainage Report (FDR) that was developed by Classic Consulting, latest revision June 2018. The combined FDR/PDR was approved by the County in September of 2018 and relevant portions are included in Appendix E.

The *Final Drainage Report for Flying Horse North Filing No. 3* developed by HR Green, LLC (SF2326) is a Final Drainage Report (FDR) that was developed by HR Green, latest revision June 2024. The combined FDR was approved by the County in July of 2024 and relevant portions are included in Appendix E.

The *Final Drainage Report for The Clubhouse at Flying Horse North* developed by HR Green, LLC (PPR-259) is a Final Drainage Report (FDR) that was developed by HR Green, latest revision July 2025. The combined FDR was approved by the County in December of 2025 and relevant portions are included in Appendix E.

This FDR will primarily provide a comparison to the FDR for Flying Horse North Filing No. 3, and the FDR for The Clubhouse at Flying Horse North which are the latest reports that studied the Flying Horse North Filing No. 9 development area. Due to significant differences in design methods between the Filing No. 3 report and the 2018 Classic Consulting PDR, a detailed description of the differences and justifications for design decisions was provided in the previous report. This report will continue to follow the assumptions and applicable design references from the Filing No. 3 FDR. Refer to the FDR for Flying Horse North Filing No. 3 FDR for a more detailed comparison to the 2018 Classic Consulting PDR. This FDR only analyzes and amends the area of the previous PDR's / FDR's that are part of or impacted by the Flying Horse North Filing No. 9 Development.

b. Hydrologic Criteria

1. Identify design rainfall

One-hour design point rainfall values from the NOAA Atlas will be used for development of Intensity-Duration-Frequency (IDF) curves. The one-hour point rainfall values are 1.19 in/ hr for the 5-year event and 2.48 in/hr for the 100-year event.

2. Identify runoff calculation method

The proposed development will consist of (11) 2.5-acre residential estate lots Filing No. 9. For hydrologic analysis, these lots have an assumed percent imperviousness of 11% per the County ECM Table 3-1 Typical Values of Percent Impervious within Appendix L of the ECM which provides guidance for larger rural lot developments. While a hydrologic imperviousness variable of 11% for the estate lots is utilized, Final Plat notes are to be included for these filings to limit development of each lot to a 10% maximum imperviousness, allowing the lots to meet the Large Lot Exclusion (ECM Section I.6.1.B.5). Existing golf course areas outside of the Filing 9 improvements are to remain undisturbed and utilize a land use category of “lawn” with a percent imperviousness of 2% per the County DCM Volume I Update Table 6-6 land use table. Composite coefficients, rainfall intensities, and runoff flow rates are calculated using the Rational Method and provided within Appendix B.

Refer to the descriptions provided in the Flying Horse North Filing No. 3 FDR for a description of differences between this report and the 2018 Classic FDR. This report remains consistent with the assumptions and design decisions approved in the Flying Horse North Filing No. 3 FDR. Applicable portions of the Filing No. 3 FDR have been provided in Appendix E of this report.

The chosen method for most hydrologic computations included with this report is the Rational Method to ensure sound design of the storm infrastructure including swales, channels, storm pipes, inlets, and roadway capacities and peak flows at stormwater discharge locations from the property.

3. identify design storm recurrence intervals

The 5-year storm has been utilized as the minor storm event and the 100-year as the major storm event.

4. identify detention discharge and storage calculation method

There are two existing district full spectrum detention ponds from Filing 1 and Filing 3 that are utilized for this development. Full Spectrum Detention (FSD) is a design concept introduced by the Mile High Flood District (MHFD, Urbonas and Wulliman 2005) that provides better control of the full range of runoff rates that pass through detention facilities than the conventional multi-stage concept. This concept also provides some mitigation of increased runoff volumes by releasing a portion of the increased runoff volume at a low rate over an extended period of time. Full spectrum detention ponds are designed as FSDs to provide the required volume stages for Water Quality Capture Volume (WQCV), Excess Urban Runoff Volume (EURV), and the 100-year stage (flood control volume). In FSDs, the flood volume is equal to the entire volume and is inclusive of the EURV and the WQCV.

The MHFD-Detention workbook is utilized to design the outlet structures with orifice plates and restrictor plates and calculate required storage volumes. The outlet structures and plates are designed to achieve the target release rates of the various stages: WQCV at 40 hours, EURV at 68-72 hours, and 100-year release rates within the requisite 120 hours. Per state senate bill 15-212, CRS 37-92-602(8), the facility must continuously release or infiltrate at least 97% of all runoff from a rainfall event that is less than or

equal to a 5-year storm within 72 hours, and must continuously release or infiltrate at least 99% of runoff within 120 hours after the end of events greater than a 5-year storm. The developed condition outlet flow rates are not to exceed predeveloped conditions.

The ponds include the required infrastructure such as concrete forebays, an emergency spillway with rip-rap weirs, concrete trickle channels, and a 2.5-foot depth micro-pool attached to the outlet structure. Ponds include 15'-20' width maintenance paths with vehicular access to the bottom of pond to access forebays and outlet structures for continued maintenance. The pathways have 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-foot 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 as energy dissipation. All detailed calculations for the ponds will be provided with the final submittal.

IV. Drainage Facility Design

a. General Concept

1. Discussion of compliance with off-site runoff considerations

There is no off-site runoff tributary to the Flying Horse North Filing No. 9 development.

2. Discussion of anticipated and proposed drainage patterns

The site was previously assessed in the 2018 Classic Consulting report with a similar land use plan. As discussed in the Flying Horse North Filing No. 3 FDR, the layout shown in the developed conditions hydrology map of this report and the corresponding construction drawings differs slightly from the approved Classic PDR with adjusted roadway alignments and lot lines. However, the drainage patterns, typical roadway section, and land use densities are similar. This project will also continue to generally follow the same drainage patterns, and land uses that were assumed in the Flying Horse North Filing No. 3 FDR and The Clubhouse at Flying Horse North FDR.

Drainage on-site will be conveyed through curb and gutter, proposed storm sewer, and existing natural swales to existing full-spectrum detention facilities that will detain and treat stormwater before releasing downstream at or below historical rates to the anticipated downstream outfall. Areas of the site that drain directly offsite without being detained in a detention facility will maintain historical flow patterns and drainage flows offsite will meet assumptions made by previous reports.

b. Specific Details

2. Presentation of approach to accommodate drainage impacts on existing and proposed improvements and facilities

As part of the development, (2) existing full spectrum detention facilities will be modified. The facilities are designed using El Paso County criteria and provide stormwater quality by slowing the release of stormwater captured by the ponds and allowing solids to settle out. Additionally, when possible, the existing natural drainage ways will be used to convey stormwater to more closely mimic the natural hydrologic and hydraulic cycle. Some of the existing drainage ways will be used to convey water to the ponds and others will receive water from the ponds and in both scenarios will provide additional water quality benefits.

On site practices for the estate homes includes direct discharge of roof and hardscape runoff to the surrounding landscaped areas. This would include discharge of the gutters onto landscape areas vs. directly connecting to storm sewer and as discussed above as well using natural ditches and swales where it is logical and makes sense to convey stormwater in lieu of storm sewer piping.

3. Presentation of proposed facilities with respect to alignment, material and structure type

Pond A (Design Point 2) is an existing full-spectrum detention basin designed and constructed with Flying Horse North Filing No. 3. This development proposes to utilize this existing full-spectrum detention basin for treatment and detention from the Filing 9 area, replace the water quality plate to meet required drain times for full-spectrum detention, and lower the outlet pipe restrictor plate to further reduce the major storm release rate. Pond A provides full-spectrum detention and treatment for the WQCV and EURV for the stormwater runoff from basins PR-1, PR-2, PR-3, PR-5, OS2, CC-34, CC-34.1b, CC-34.2, CC-34.3, and CC-34.4. These basins include undeveloped open space area, onsite developed area for proposed 2.5-acre single-family residential lots, Flying Horse North Clubhouse area, and Allen Ranch Road right-of-way. The pond includes a minimum 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-Detention analysis yields the following pond sizing results:

Pond A

(Ownership and maintenance by the Flying Horse North HOA)

Tributary Area (acres)	WQCV (ac-ft)	EURV (ac-ft)	100-year (ac-ft)
18.31	0.273	0.762	1.456

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)	19.9	0.5	7.0	77
Major Storm (Q100)	48.8	16.0	29.0	74

Pond A includes concrete forebays sized for the required volume of the inflow, a concrete trickle channel, a concrete micro pool, and an outlet structure that is includes a top trash rack, orifice plate, and restrictor plate on the outlet pipe. This Pond A infrastructure is existing, does not require retrofitting, and remains code compliant for the addition of Filing 9 improvements.

Pond 8 provides water quality and detention for the stormwater runoff from Filing No. 1 and part of Filing No. 3 as well as offsite basins as described in the 2018 Classic Consulting FDR/PDR for the full build-out conditions of Filing 9. Pond 8 provides treatment and detention for stormwater runoff from basins affected by Filing 9 disturbed area, including BS-20a, BS-20b, BS-20.1, and BS-21.1. The total tributary area to Pond 8 is re-analyzed in this report utilizing the information for tributary basins to Pond 8 from the FHN Filing 3 FDR. This report modifies the tributary subbasins that are affected by the FHN Filng 9

development. Refer to the Filing 3 FDR for all other basins and descriptions tributary to Pond 8. These basins include undeveloped open space area, onsite developed area for proposed 2.5-acre single-family residential lots, and Ace Way right-of-way. These basins include the Flying Horse Filing No. 9 area of undeveloped area assumed as future 2.5-acre lot development, golf course areas, and the roadways. The 2018 report has hydrology calculations and lists the acreage and percent imperviousness for the final developed conditions for the full build out within the MHFD UD-Detention spreadsheet for the Pond 8 Full Buildout conditions which consists of assumed future developed conditions for 2-acre single-family residential estate lots within Filing No. 3 with assumed roadway alignments. The 2018 FDR/PDR calculation lists a tributary area of 255 acres at 10.0 percent impervious. The developed conditions hydrology tabulations for Filing No. 3 are provided within this report and closely compare to that of the 2018 report with a slight decrease in the tributary area and imperviousness. The full buildout condition has been re-analyzed in this report with the proposed FHN Filing No. 9 improvements and compared to the previous assumptions made for the pond. The FHN Pond 8 tributary area with the full buildout of FHN Filing No. 9 is 249.33 acres with a percent imperviousness of 9.28 percent. Due to the decrease in these figures, there is no expansion of volume required in the pond. However, this development proposes to replace the WQ plate to meet required drain times, and raise the spillway crest 3” in order to keep the 100-yr volume below the spillway crest. The top of the required freeboard is still below the top of the pond berm.

The WQCV, EURV, and 100-year volumes for the Existing FHN Pond 8 detention facility for as-built conditions and per calculations within this report are shown below for comparison:

Existing FHN Pond 8

(Ownership and maintenance by the Flying Horse North HOA)

	Tributary Area (ac)	Percent Impervious (%)	WQCV (ac-ft)	EURV (ac-ft)	100-year (ac-ft)	Total Required Volume (ac-ft)	Total Required Volume (CY)
2018 Classic Consulting FDR/PDR	255.00	10.00	1.424	0.973	7.011	9.408	15,178
2023 HR Green FDR (Filing 3)	248.93	8.74	1.244	0.791	6.614	8.649	13,954
2026 HR Green FDR (Filing 9)	249.33	9.28	1.306	0.856	6.722	8.884	14,333

Proposed 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)	69.6	25.9	56.2	67
Major Storm (Q100)	273.5	197.2	260.8	56

The existing downstream pond that was designed and constructed per the 2018 Classic Consulting FDR/PDR and Construction Drawings has sufficient capacity for the Filing No. 9 development. A UD-Detention spreadsheet with inputs for the final design parameters within this report with the as-built conditions of the pond is provided within the appendix to demonstrate that the existing pond was built with sufficient volume and infrastructure for the final design conditions of Filing No. 9. The only retrofitting of the pond is a swap out of a new orifice plate to maintain the WQCV release rate of 40 hours, and raise the spillway 3" in order to keep the 100-yr volume below the spillway crest.

Preliminary proposed inlet and storm sewer sizing is analyzed within this report to provide capacity and velocity analysis for the proposed storm sewer. All proposed storm sewer meets the El Paso County Criteria. This analysis assumes a free-outfall condition for storm sewer discharging offsite. See Appendix C for storm sewer calculation results.

4. discussion of drainage impact of site constraints such as streets, utilities, existing and proposed structures

The existing inlets and storm sewer system designed for the Flying Horse Filing No. 3 development have capacity for the proposed improvements of Filing No. 9. This storm system was approved with The Clubhouse at Flying Horse North CDR application (CDR259). Peak flows to design points are less than previously assumed by the Filing No. 3 report due to the change from assumed "flats" are which had a higher impervious percentage to 2.5-acre estate lots. A summary table is provided below with the total surface flow to each design point where storm water is captured in inlets per the Filing No. 3 report.

	FHN Filing 9 Inlet Peak Flows			
	Anticipated (FHN F3)		Proposed (FHN F9)	
	Q_5 (cfs)	Q_{100} (cfs)	Q_5 (cfs)	Q_{100} (cfs)
1	4.4	12.1	3.4	9.2
1.1	1.2	7.5	1.2	3.1
1.2	7.9	14.6	2.8	8.4
1.3	6.2	11.0	6.1	10.9

Note: The proposed flow to design point 1.3 is the surface flow from basins CC-34.2 and OS2. The cumulative design point flow to design point 1.3 includes the underground flow from design points 1, 1.1, and 1.2.

Existing tertiary swales are analyzed within this report to assess the water surface elevation within the swales during the 100-year storm event to determine capacity requirements and buildability of lots adjacent to these sections. There are six swale sections that have been analyzed as part of this report (Sections A-A through F-F), which are located within the Filing 9 development area or at the Filing 9 discharge locations. Calculations that show the existing swale sections have capacity for the analyzed flows for each swale section and at the discharge points. Calculations have been included in Appendix C, and a map/cross sections of swales is included in Appendix F.

5. environmental features and issues shall be presented if applicable

The developer has engaged Bristlecone Ecology, LLC to perform environmental studies of the site that will be submitted with the planning documents. These documents have been included in the greater 2016 PUD as well as previous Final Plat filings. Major information in the report concerning wetlands concludes that there is a wetland associated with Black Squirrel Creek. Black Squirrel Creek is known to be a jurisdictional stream. This filing is not within the vicinity of the jurisdictional stream of wetland area.

At this time, there are no improvements proposed for Black Squirrel Creek. The minimal impact to the stream will keep the natural habitat intact and the natural function of the Creek as it is to maintain the wetland habitat.

c. Permitting Requirements

When work infringes upon the wetlands or floodplain a 404 Permit will be required. If the work within the waterways is minimal, it will likely be covered under a nationwide 404 permit or a state dredge and fill permit; it is however possible that an individual permit will be required.

The Colorado Department of Public Health and Environment will require permits for any disturbance that exceeds 1 acre of land. Should groundwater be encountered, a dewatering permit will also be required.

El Paso County will require an Erosion and Stormwater Quality Control Permit, and any other construction permits required to complete the construction of the site.

Should development occur which affects the floodplain, FEMA will require a permit for work withing the floodplain prior to the commencement of any construction or development within any special flood hazard area (SFHA). If the infrastructure is to be installed within the channel the designer shall route the design through the proper FEMA channels whether that be with a no rise certification or via the CLOMR/LOMR process should a more major improvement within the floodplain be proposed. At this time the project does not propose any direct development within the floodplain, however storm infrastructure will discharge into the existing FEMA channel.

d. 4-Step Process

In accordance with the Engineering Criteria Manual I.7.2.A and DCM V2, this site has implemented the four-step process to minimize adverse impacts of urbanization. The four-step process includes reducing runoff volumes, stabilizing drainageways, treating the water quality capture volume, and considering the need for Industrial Commercial BMPs.

Step 1 – Reducing Runoff Volumes: Disturbed areas on site are routed to (2) existing full-spectrum detention ponds (Pond A, Pond 8) for WQ treatment and detention. Impervious areas are routed overland through grass swales and buffers to promote infiltration and water quality prior to entering storm sewer systems.

Step 2 – Stabilize Drainageways: The existing tertiary drainage ways are assessed in this report for stormwater runoff capacity, velocity, and shear stress. Any altered drainage way should be designed in a manner that provides water quality benefits through infiltration and the removal of pollutants via phytoremediation. Vegetation and/or matting will also be selected to stabilize the drainage ways by reducing the velocity of flows and decreasing any scour. These improvements help stabilize drainageways and minimize erosion and sediment runoff.

Step 3 – Provide WQCV: Runoff from this development is treated through capture and slow release of the WQCV via detention ponds that are designed per current El Paso County DCM V2 and the MHFD. Pond A and Pond 8 provide full-spectrum detention for their respective tributary basins. There is 3.53 acres of 2.5-acre lot area that drains directly offsite which is covered by the large lot exclusion under ECM code I.6.1.B.5 and are excluded from water quality treatment. There are 0 acres of the applicable disturbed area, that drains offsite without water quality treatment. Per El Paso County ECM I.7.1.C.1 up to 20%, not to exceed 1 acre of the applicable development site area may drain offsite where it is not practicable to capture runoff. The areas that fall under the exclusion under I.6.1.B.5 of the El Paso County ECM may not exceed 10 percent imperviousness unless a study specific to the watershed and/or MS4 shows that expected soil and vegetation conditions are suitable for infiltration/filtration of the WQCV for a typical site, and the permittee accepts such study as applicable with the MS4 boundaries. Although 11% imperviousness is assumed for the hydrologic analysis of these large lots, a plat note is to be added that restricts these lots to 10% maximum imperviousness upon development. Refer to the water quality summary table provided at the end of this section.

Step 4 – Consider the need for Industrial and Commercial BMP's: A site specific storm water quality and erosion control plan and narrative will be prepared with subsequent land use approvals prepared in conjunction with the report prior to any construction. Site specific temporary source control BMPs as well as permanent BMPs are detailed in this plan and narrative. Guidelines detailed in the El Paso DCM V2 4.2 pertaining to the covering and storage handline and spill containment and control shall be followed as necessary. This filing does not contain any commercial or industrial land use.

Water Quality Treatment Summary Table			
Flying Horse North Filing No. 9			
Subbasin ID	Disturbed Area [AC]	Treatement CM	Notes:
BS-20a	1.56	Pond 8 (Filing 1)	District full-spectrum WQ and stormwater detention facility
BS-20b	1.23	Pond 8 (Filing 1)	District full-spectrum WQ and stormwater detention facility
BS-20.1	0.67	Pond 8 (Filing 1)	District full-spectrum WQ and stormwater detention facility
CC-34.3	0.36	Pond A (Filing 3)	District full-spectrum WQ and stormwater detention facility
	Non-Treated	0.00	0%
NOTE: Only subbsins with associated disturbed area from this development included in the WQ Summary Table.			

Min Required Area to Receive WQ	Total Disturbed Area	Total Proposed Treated Area	Total Proposed Disturbed Area Excluded from WQ	Total Treated %
3.82	3.82	3.82	0.00	100%

e. Drainage and Bridge Fees

Drainage basin and bridge fees for Flying Horse North Filing 9 are presented below. Drainage Fees will be paid prior to platting.

2026 BLACK SQUIRREL CREEK DRAINAGE BASIN FEES				
Impervious Acres	Drainage Fee / Imp. Acre	Bridge Fee/ Imp. Acre	Drainage Fee	Bridge Fee
3.96	$12,387	$780	$49,053	$3,089

V. Drawings

Refer to the appendices for the Vicinity Map, FEMA Floodplain Map, NRCS Soils Map, hydrology and hydraulic calculations, and drainage basin maps. Reference materials from previously approved reports are included in Appendix E.

VI. Summary

The drainage design contained within this report for the Flying Horse North Filing No. 9 improvements remain consistent with pre-development drainage conditions, and anticipated drainage conditions of the previously approved reports that studied the development area. This report and its findings are in general conformance with the DBPS, MDDP, and other pertinent studies. The proposed development will not adversely affect downstream stormwater infrastructure or the surrounding developments. Drainage released from the site does not exceed existing flowrates, and downstream infrastructure has been described in this report as having capacity for stormwater peak flows discharged from the site. This report meets the latest El Paso County Drainage Criteria.

VII. References

El Paso County – Drainage Criteria Manual, 1991. Update 2015.

City of Colorado Springs – Drainage Criteria Manual, May 2014

Urban Storm Drainage Criteria Manual, Urban Drainage Flood Control District, January 2018

Mile High Flood District Urban Storm Drainage Criteria Manual Volumes 1, 2, and 3; latest revisions

Mile High Flood District Software Resources and Tools (MHFD-Detention, UD-BMP)

Preliminary Drainage Report for Flying Horse North Preliminary Plan and Final Drainage Report for Flying Horse North Filing No. 1, Classic Consulting Engineers and Surveyors, November 2017

Flying Horse North Filing No. 3 Final Drainage Report, HR Green Development, LLC., June 2024

Flying Horse North PUD/SP Amendment (Major Filings 6, 7, & 8) Preliminary Drainage Report Amendment, HR Green Development, LLC., February 2025

The Clubhouse at Flying Horse North Final Drainage Report, HR Green Development, LLC., July 2025

Black Squirrel Drainage Basin Planning Study (DBPS), URS Consultants, January 1989

HRGreen

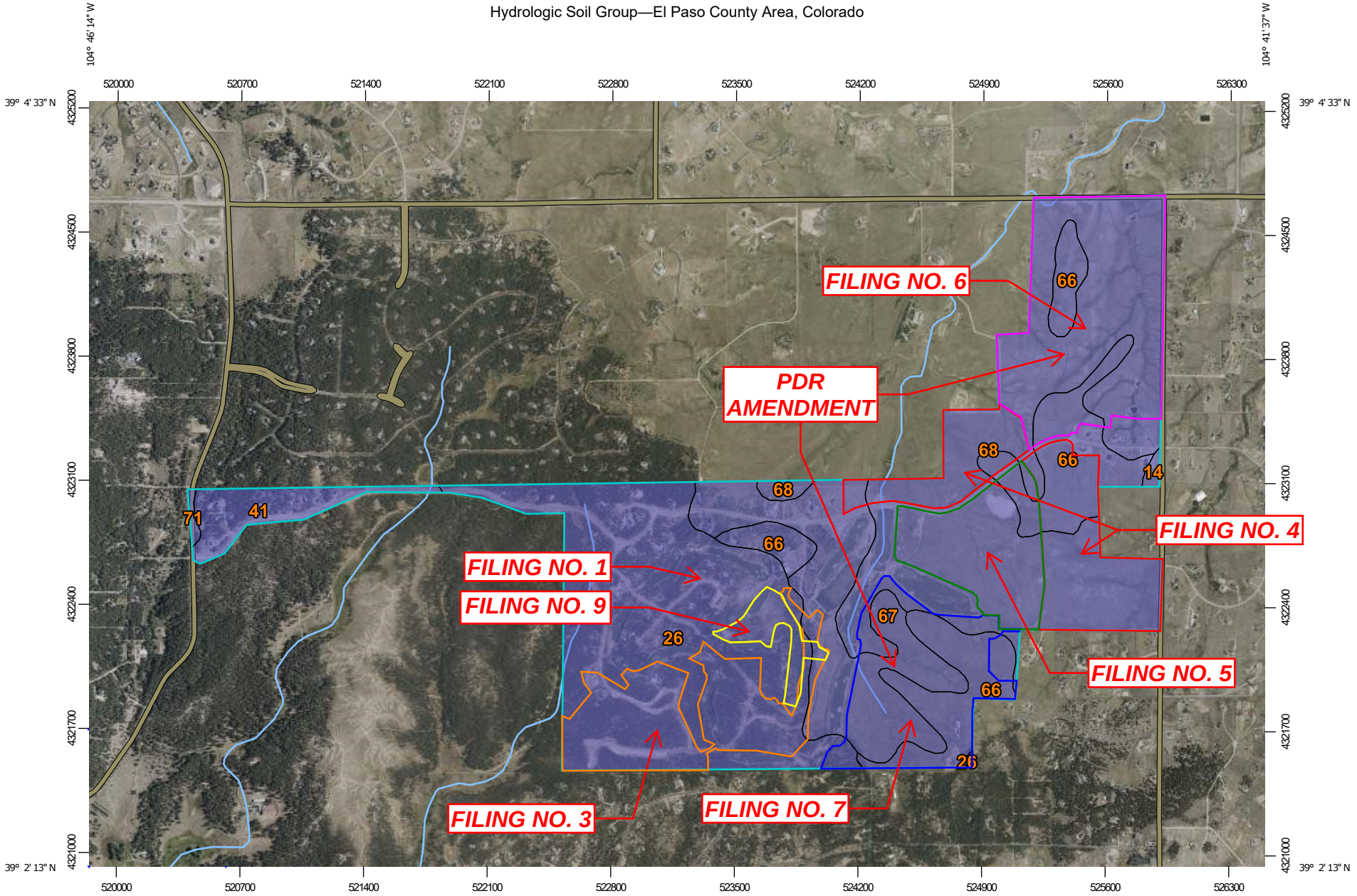
APPENDIX A

VICINITY MAP

NRCS SOILS MAP

FEMA FLOODPLAIN MAP

EL PASO COUNTY MAJOR DRAINAGE BASINS MAP



Map Scale: 1:30,400 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 450 900 1800 2700

Feet: 0 1000 2000 4000 6000

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

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Lines

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Points

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

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

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

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

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

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

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 22, Sep 3, 2024

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

Date(s) aerial images were photographed: Jun 9, 2021—Aug 4, 2024

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
14	Brussett loam, 1 to 3 percent slopes	B	3.6	0.2%
26	Elbeth sandy loam, 8 to 15 percent slopes	B	521.0	32.8%
41	Kettle gravelly loamy sand, 8 to 40 percent slopes	B	53.1	3.3%
66	Peyton sandy loam, 1 to 5 percent slopes	B	224.0	14.1%
67	Peyton sandy loam, 5 to 9 percent slopes	B	216.2	13.6%
68	Peyton-Pring complex, 3 to 8 percent slopes	B	567.2	35.7%
71	Pring coarse sandy loam, 3 to 8 percent slopes	B	3.0	0.2%
Totals for Area of Interest			**1,588.3**	**100.0%**

Drainage Basins

El Paso County
Colorado

Legend

- Drainage Basins Source: Muller Engineering Company (1988)
- US Interstate Highways
- US Highways
- Colorado State Highways
- Major Roadways
- Local Streets & Roads

Creeks

- Perennial
- Intermittent
- Lakes & Reservoirs
- Summits
- Unincorporated Urban Areas
- Incorporated Cities
- Military
- Forest
- County Lines

N W E S

Miles

0 0.5 1 2 3 4 5

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Douglas County
Elbert County
Teller County
Lincoln County
Fremont County
Pueblo County
Pike National Forest
USAF Academy
Fort Carson
Air Force Academy FOMO3200
Manitou Reservoir FOFO7400
SITE
COLORADO SPRINGS
MANITOU SPRINGS
MONUMENT
PALMER LAKE
FOUNTAIN
Cascade
Chipita Park
Cripple
Falcon
Peyton
Calhan
Ellicott
Yoder
Rush
Truckton
Schriever AFB
Peterson AFB
Peterson Field FOFO3400
Jimmy Camp Creek FOFO2000
Cottonwood Creek FOMO2200
Sand Creek FOFO4000
Kettle Creek FOMO3000
Upper Monument Creek FOMO5800
East Cherry Creek CYCY0200
West Cherry Creek CYCY0400
Bijou Creek BIBI0200
West Kiowa Creek KIKI0200
East Kiowa Creek KIKI0400
Upper Big Sandy Creek BGBG1400
Calhan BGBG1000
Upper Black Squirrel Creek CHBS2000
Upper Bracket Creek CHBR0600
Geick Ranch CHMS0400
La Vega Ranch CHBR0400
Hook And Line Ranch CHBS1800
Haegler Ranch CHMS0200
Upper Big Springs Creek CHBG0400
Steels Fork HOPO1000
Little Horse Creek HOHO0200
Horse Creek HOHO0600
North Fork HOHO0400
Rush HOPO0800
Upper Pond Creek HOPO0600
Lower Pond Creek HOPO0400
Crows Roost CHBS1000
Drennan CHDS0400
Lower Black Squirrel CHBS0600
Squirrel Creek CHBS0200
Haynes Creek HAHA0600
St.lukes HOPO0200
East Kramer KRKR0600
Kramer Creek KRKR0400
West Kramer KRKR0200
East Haynes HAHA0400
West Haynes HAHA0200
Finch Ranch CHCH0400
Windmill CHCH0200
Lower East Chico CHCH0800
Upper East Chico CHEC0400
Middle East Chico CHEC0200
Upper Chico Creek CHCH1600
West Chico Tributary CHCH1200
Chico Creek CHCH1400
West Chico Creek CHCH0600
Upper Dry Squirrel CHDS0200
Lower Dry Squirrel CHBS0400
Upper Williams Creek FOWI0600
Upper Williams Tributary FOWI0400
Lower Williams Creek FOFO1000
Lower Williams Tributary FOWI0200
Williams Ranch FOFO0400
Hammer Ranch CHCH0600
Midway Ranch FOFO0800
Sand Canyon FOFO1600
Calhan Reservoir FOFO1400
Fort Carson FOFO2200
Big Johnson FOFO2600
Windmill Gulch FOFO3000
Fishers Canyon FOFO3600
Southwest Area FOFO4600
Little Fountain Creek FOFO1800
Turkey Creek TUTU0200
Red Creek BEBE0200
Young Hollow FOFO0200
Sand Creek FOFO0600
Upper Beaver Creek BEBE0400
Ruxton Creek FOFO7000
Sutherland Creek FOFO6400
Bear Creek FOFO4800
Shooks Run FOFO5400
Williams Canyon FOFO7200
Camp Creek FOFO5800
Douglas Creek FOMO1000
Templeton Gap FOMO1200
Upper Fountain FOFO7600
Dry Creek FOMO2400
South Pine Creek FOMO2600
Pine Creek FOMO2800
Monument Branch FOMO3800
Black Forest FOMO4200
Jackson Creek FOMO4400
Monument Rock FOMO5000
Dirty Woman Creek FOMO5200
Beaver Creek FOMO4600
Black Squirrel Creek FOMO3600
Air Force Academy FOMO3200
Falcon CHWS1400
Bennett Ranch CHWS1200
Curtis Ranch CHWS1000
Solbers Ranch CHWS0800
Livestock Company CHWS0400
Telephone Exchange CHWS0200
Ellicott CHBS1600
Ellicott Consolidated CHBS1200
Lower Big Springs Creek CHBS1400
Baggett CHBR0200
West Big Springs Creek CHBG0200
Lenard BGBG1200
Antelope Creek BGBG0800
Ramah BGBG0600
Simla BGBG0400
Mustang Creek BGBG0200
Elbert
Ramah
Calhan
Peyton
Falcon
Ellicott
Yoder
Rush
Truckton
Cripple
Cascade
Chipita Park
Palmer Lake
Monument
Fountain
Manitou Springs
Colorado Springs
Schriever AFB
Peterson AFB
Fort Carson
Air Force Academy
Pike National Forest
Reservoir
Municipal Airport
AFA Aux Field
Interstate
Highway
Colorado State Highway
Major Roadway
Local Street & Road
Creek
Perennial
Intermittent
Lake & Reservoir
Summit
Unincorporated Urban Area
Incorporated City
Military
Forest
County Line

NOTES TO USERS

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

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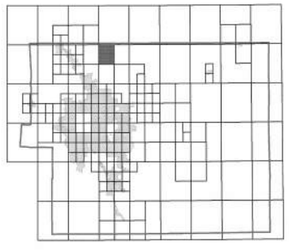
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El Paso County Vertical Datum Offset Table

Flooding Source	Vertical Datum Offset (ft)

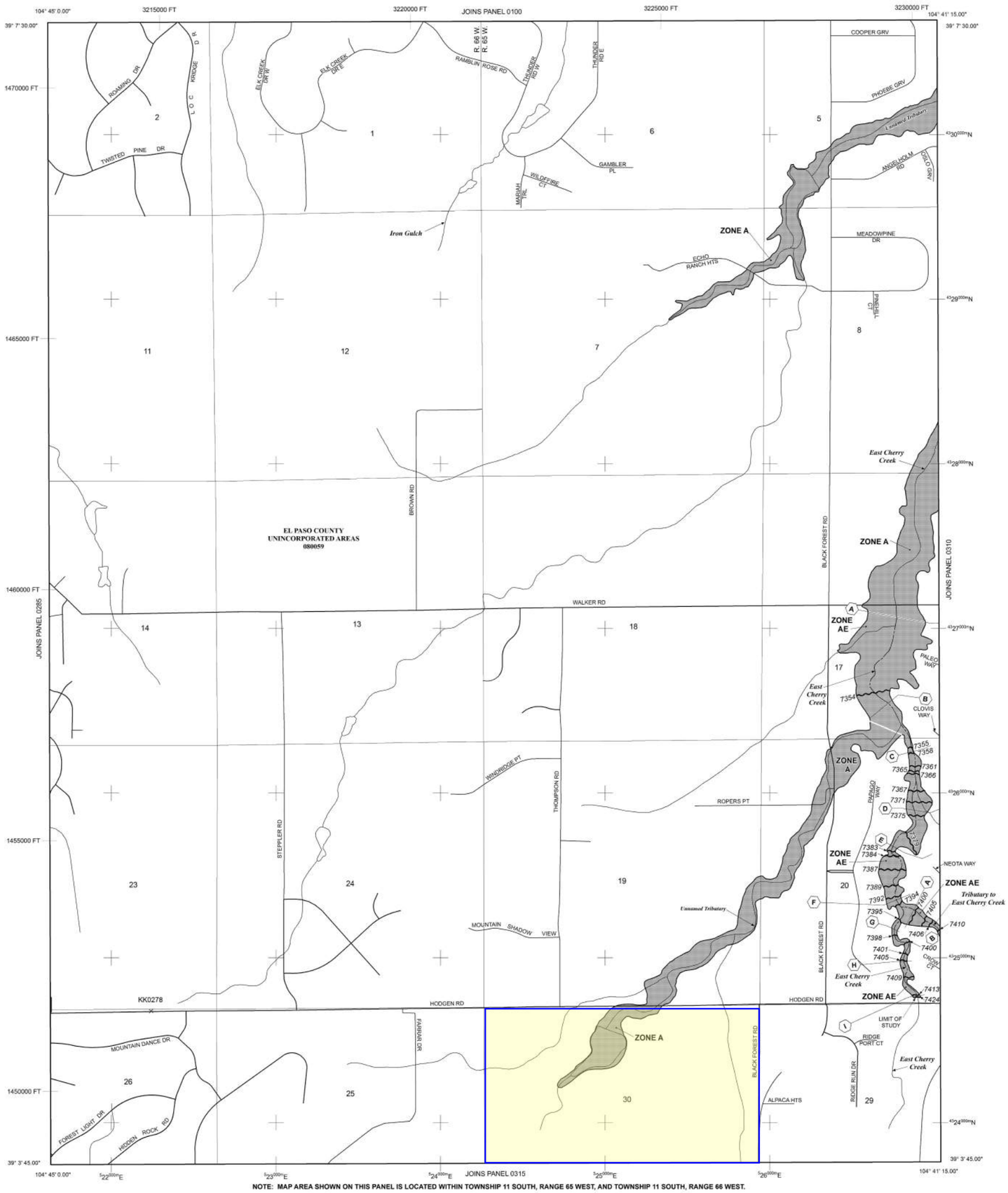
REFER TO SECTION 3.3 OF THE EL PASO COUNTY FLOOD INSURANCE STUDY FOR STREAM BY STREAM VERTICAL DATUM CONVERSION INFORMATION

Panel Location Map



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



NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 11 SOUTH, RANGE 65 WEST, AND TOWNSHIP 11 SOUTH, RANGE 66 WEST.

LEGEND

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

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

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

FLOODWAY AREAS IN ZONE AE

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

OTHER FLOOD AREAS

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

OTHER AREAS

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

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

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

Floodplain boundary
Floodway boundary
Zone D Boundary
CBRS and OPA boundary
Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
513 — Base Flood Elevation line and value; elevation in feet*
(EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*
* Referenced to the North American Vertical Datum of 1988 (NAVD 88)
A — A — Cross section line
23 — 23 — Transect line
97° 07' 30.00" / 32° 22' 30.00" — Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
4275000mN — 1000-meter Universal Transverse Mercator grid ticks, zone 13
6000000 FT — 5000-foot grid ticks: Colorado State Plane coordinate system, central zone (FIPSZONE 0502), Lambert Conformal Conic Projection
DX5510 — Bench mark (see explanation in Notes to Users section of this FIRM panel)
M1.5 — River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

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

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

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

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

MAP SCALE 1" = 1000'
500 0 1000 2000 FEET
300 0 300 600 METERS

NFIP

PANEL 0305G

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

EL PASO COUNTY, COLORADO
AND INCORPORATED AREAS

PANEL 305 OF 1300

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
EL PASO COUNTY	080059	0305	G

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

MAP NUMBER
08041C0305G

MAP REVISED
DECEMBER 7, 2018

Federal Emergency Management Agency

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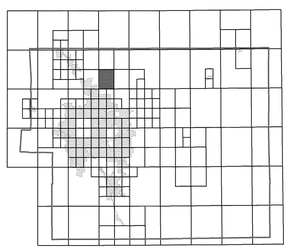
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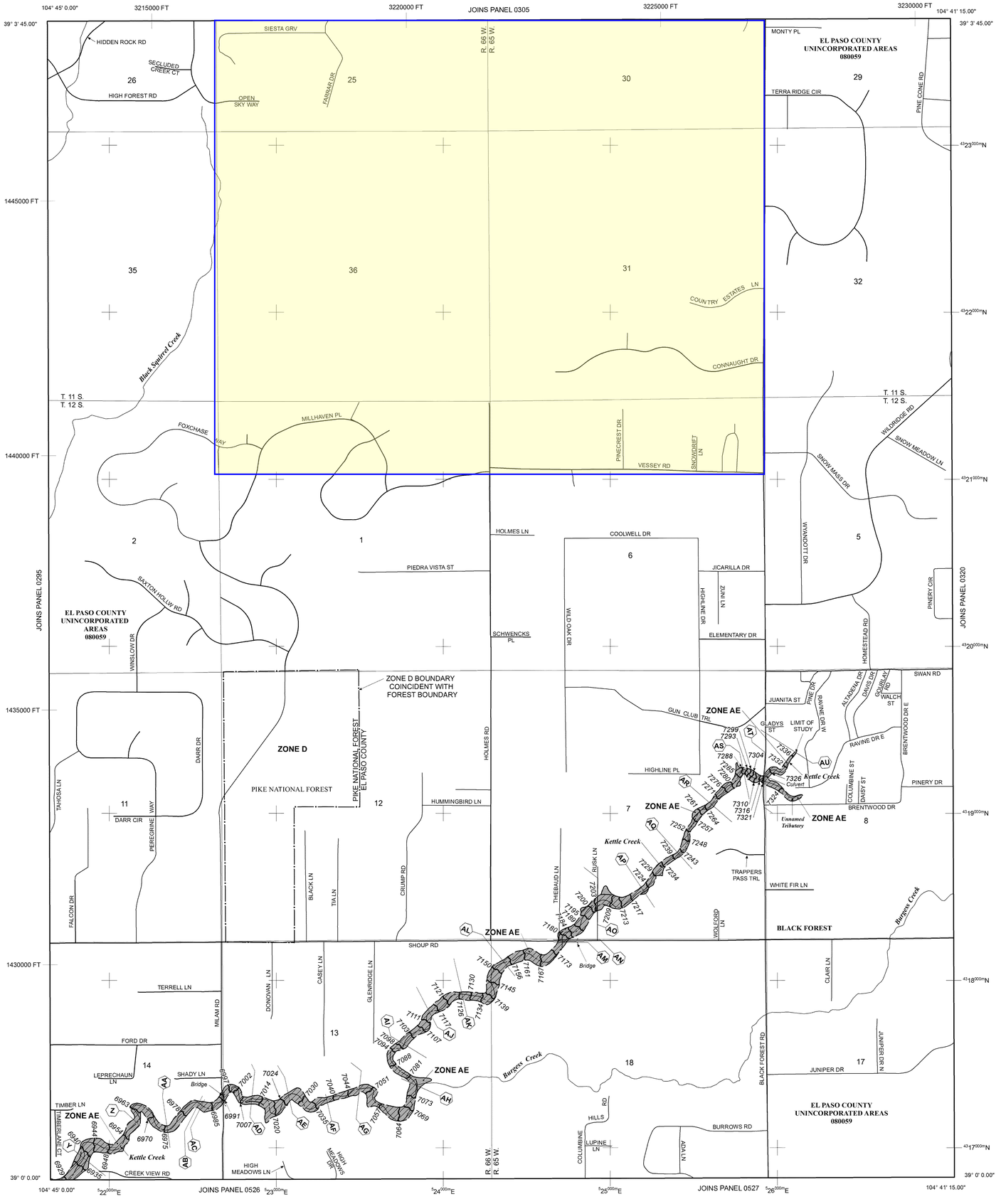
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ZONE A	No Base Flood Elevations determined.
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ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

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OTHER FLOOD AREAS

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

OTHER AREAS

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

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

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

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

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

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

MAP SCALE 1" = 1000'
500 0 1000 2000 FEET
300 0 300 600 METERS

NFIP

PANEL 0315G

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

EL PASO COUNTY, COLORADO AND INCORPORATED AREAS

PANEL 315 OF 1300

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
EL PASO COUNTY	080059	0315	G

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

MAP NUMBER
08041C0315G

MAP REVISED
DECEMBER 7, 2018

Federal Emergency Management Agency

NOAA Atlas 14, Volume 8, Version 2
Location name: Colorado Springs, Colorado, USA*
Latitude: 39.0564°, Longitude: -104.7109°
Elevation: 7596 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Deborah Martin, Sandra Pavlovic, Ishani Roy, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Michael Yekta, Geoffery Bonnin

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.237 (0.194-0.291)	0.287 (0.235-0.353)	0.375 (0.306-0.462)	0.453 (0.367-0.561)	0.567 (0.447-0.733)	0.661 (0.507-0.864)	0.760 (0.562-1.02)	0.866 (0.612-1.19)	1.01 (0.687-1.43)	1.13 (0.744-1.61)
10-min	0.347 (0.284-0.426)	0.421 (0.344-0.517)	0.549 (0.448-0.677)	0.663 (0.538-0.821)	0.831 (0.654-1.07)	0.968 (0.742-1.26)	1.11 (0.822-1.49)	1.27 (0.896-1.74)	1.48 (1.01-2.09)	1.66 (1.09-2.35)
15-min	0.423 (0.347-0.520)	0.513 (0.420-0.631)	0.670 (0.547-0.826)	0.809 (0.656-1.00)	1.01 (0.798-1.31)	1.18 (0.905-1.54)	1.36 (1.00-1.82)	1.55 (1.09-2.12)	1.81 (1.23-2.55)	2.02 (1.33-2.87)
30-min	0.604 (0.495-0.742)	0.732 (0.599-0.900)	0.955 (0.779-1.18)	1.15 (0.934-1.43)	1.44 (1.14-1.86)	1.68 (1.29-2.20)	1.93 (1.43-2.58)	2.20 (1.56-3.02)	2.58 (1.75-3.63)	2.87 (1.89-4.08)
60-min	0.769 (0.630-0.944)	0.921 (0.754-1.13)	1.19 (0.974-1.47)	1.44 (1.17-1.79)	1.82 (1.44-2.37)	2.14 (1.64-2.80)	2.48 (1.84-3.33)	2.85 (2.02-3.92)	3.37 (2.29-4.76)	3.80 (2.50-5.40)
2-hr	0.933 (0.769-1.14)	1.11 (0.914-1.36)	1.43 (1.18-1.75)	1.73 (1.41-2.13)	2.20 (1.75-2.85)	2.60 (2.01-3.39)	3.02 (2.26-4.04)	3.50 (2.50-4.79)	4.17 (2.86-5.86)	4.72 (3.13-6.67)
3-hr	1.02 (0.845-1.24)	1.20 (0.993-1.46)	1.54 (1.27-1.88)	1.87 (1.53-2.29)	2.38 (1.91-3.09)	2.83 (2.20-3.69)	3.32 (2.49-4.43)	3.87 (2.77-5.29)	4.66 (3.20-6.53)	5.31 (3.53-7.46)
6-hr	1.19 (0.992-1.44)	1.38 (1.15-1.67)	1.76 (1.46-2.13)	2.13 (1.75-2.58)	2.72 (2.20-3.52)	3.25 (2.55-4.22)	3.83 (2.90-5.10)	4.49 (3.25-6.12)	5.45 (3.78-7.61)	6.25 (4.19-8.74)
12-hr	1.40 (1.17-1.68)	1.62 (1.35-1.94)	2.04 (1.70-2.45)	2.46 (2.03-2.96)	3.12 (2.55-4.01)	3.72 (2.94-4.80)	4.37 (3.33-5.77)	5.11 (3.72-6.91)	6.19 (4.32-8.58)	7.08 (4.78-9.83)
24-hr	1.64 (1.38-1.95)	1.91 (1.61-2.28)	2.42 (2.03-2.89)	2.90 (2.41-3.48)	3.64 (2.97-4.61)	4.29 (3.40-5.47)	4.99 (3.81-6.52)	5.76 (4.22-7.72)	6.88 (4.83-9.45)	7.80 (5.30-10.8)
2-day	1.91 (1.62-2.26)	2.26 (1.91-2.68)	2.89 (2.43-3.42)	3.44 (2.88-4.10)	4.28 (3.49-5.32)	4.97 (3.94-6.25)	5.70 (4.37-7.34)	6.48 (4.76-8.58)	7.59 (5.35-10.3)	8.48 (5.80-11.6)
3-day	2.10 (1.78-2.47)	2.48 (2.11-2.92)	3.15 (2.66-3.72)	3.74 (3.15-4.44)	4.62 (3.78-5.72)	5.34 (4.26-6.68)	6.10 (4.69-7.82)	6.92 (5.10-9.11)	8.06 (5.71-10.9)	8.97 (6.17-12.2)
4-day	2.26 (1.93-2.65)	2.66 (2.26-3.12)	3.34 (2.83-3.93)	3.96 (3.33-4.67)	4.86 (3.98-5.99)	5.61 (4.48-6.99)	6.39 (4.93-8.17)	7.24 (5.35-9.50)	8.42 (5.98-11.3)	9.36 (6.45-12.7)
7-day	2.66 (2.28-3.10)	3.08 (2.63-3.59)	3.81 (3.24-4.45)	4.46 (3.77-5.23)	5.42 (4.46-6.63)	6.21 (4.98-7.69)	7.05 (5.46-8.95)	7.94 (5.90-10.4)	9.20 (6.57-12.3)	10.2 (7.08-13.8)
10-day	3.01 (2.58-3.49)	3.46 (2.96-4.02)	4.24 (3.62-4.93)	4.92 (4.18-5.76)	5.94 (4.91-7.24)	6.77 (5.46-8.36)	7.65 (5.95-9.67)	8.59 (6.41-11.2)	9.90 (7.10-13.2)	10.9 (7.62-14.8)
20-day	4.00 (3.45-4.60)	4.58 (3.94-5.28)	5.56 (4.77-6.43)	6.40 (5.47-7.43)	7.60 (6.30-9.15)	8.56 (6.93-10.4)	9.56 (7.47-11.9)	10.6 (7.94-13.6)	12.0 (8.65-15.9)	13.1 (9.20-17.6)
30-day	4.81 (4.16-5.52)	5.51 (4.77-6.33)	6.68 (5.76-7.69)	7.65 (6.56-8.85)	9.01 (7.47-10.7)	10.1 (8.16-12.2)	11.1 (8.72-13.8)	12.2 (9.18-15.6)	13.7 (9.89-18.0)	14.8 (10.4-19.7)
45-day	5.83 (5.07-6.66)	6.69 (5.81-7.65)	8.08 (6.99-9.26)	9.22 (7.93-10.6)	10.8 (8.92-12.7)	11.9 (9.67-14.3)	13.1 (10.2-16.1)	14.2 (10.7-18.0)	15.7 (11.4-20.4)	16.7 (11.9-22.3)
60-day	6.70 (5.83-7.62)	7.69 (6.69-8.76)	9.27 (8.04-10.6)	10.5 (9.08-12.1)	12.2 (10.1-14.3)	13.4 (10.9-16.1)	14.6 (11.5-17.9)	15.8 (11.9-19.9)	17.2 (12.5-22.4)	18.3 (13.0-24.2)

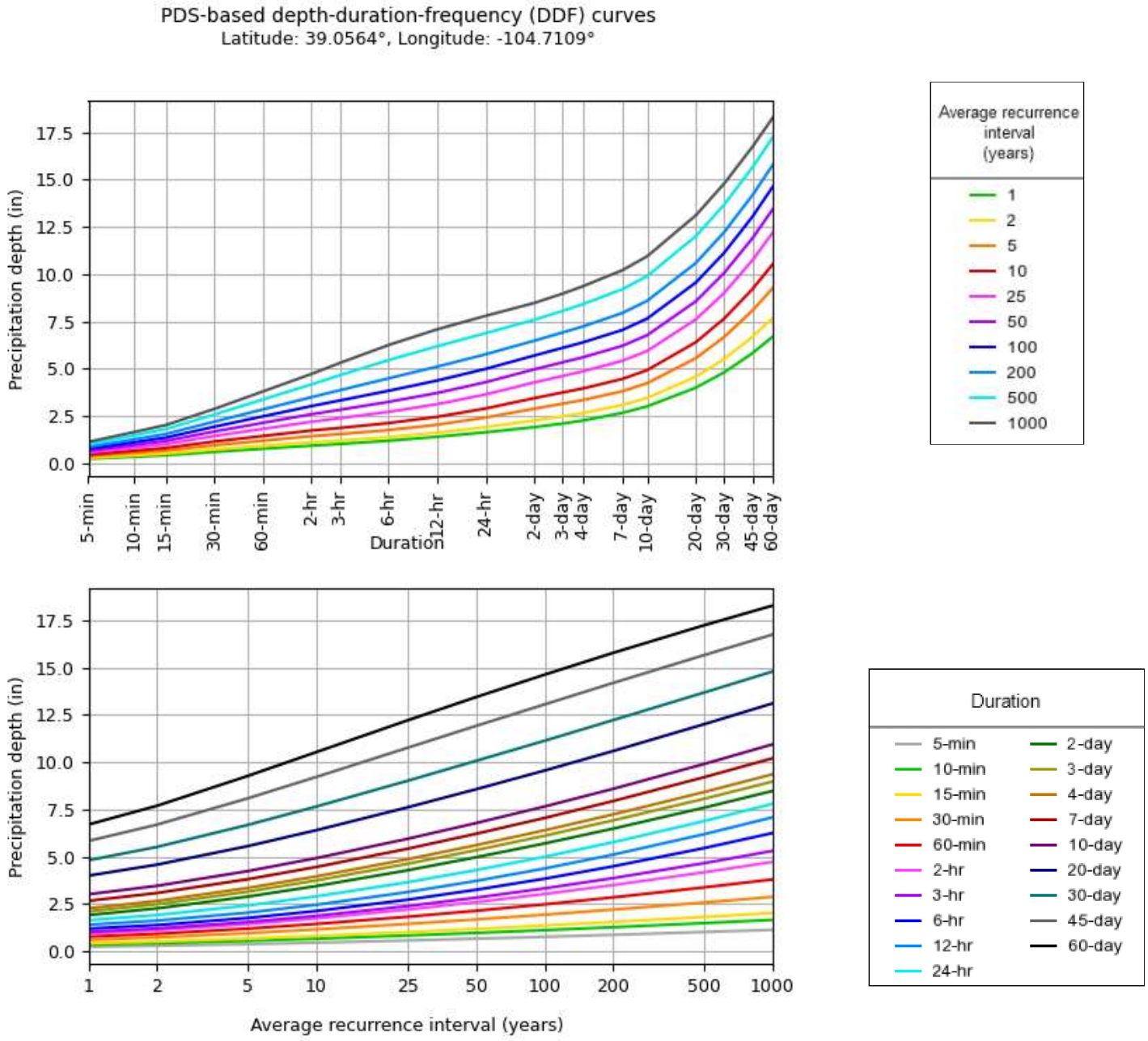
[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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PF graphical



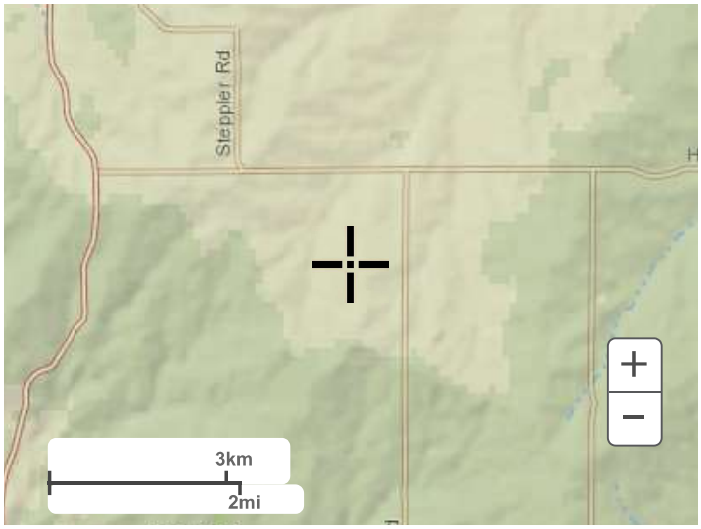
NOAA Atlas 14, Volume 8, Version 2

Created (GMT): Tue Jan 14 17:10:08 2025

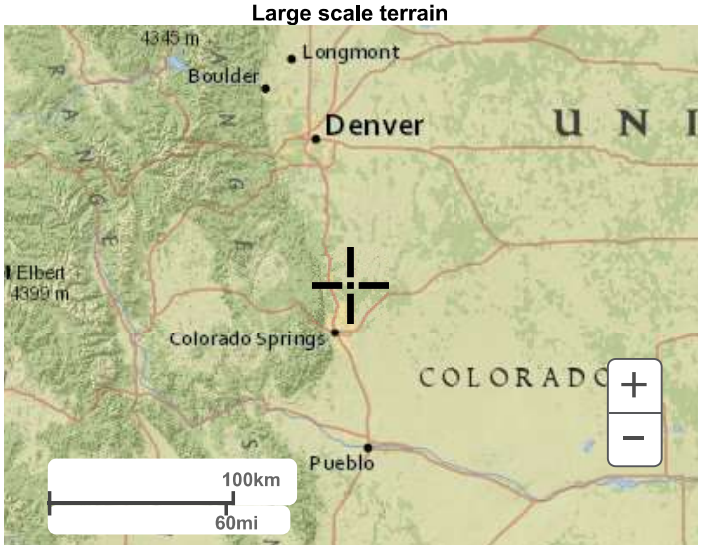
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Maps & aerials

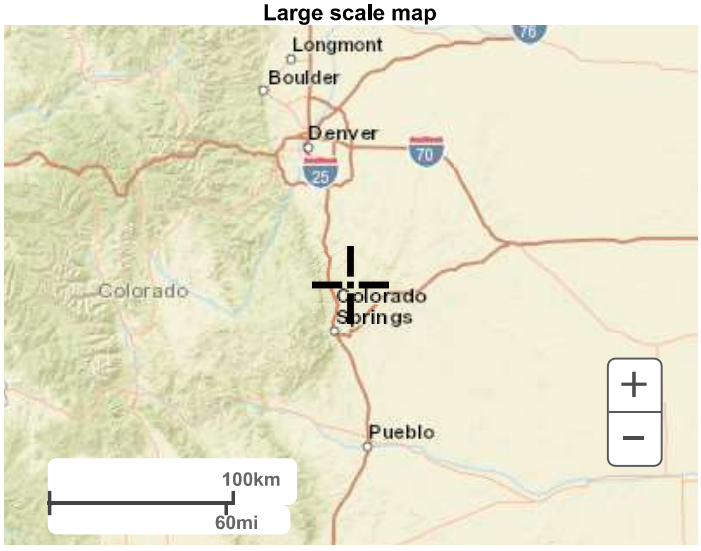
Small scale terrain



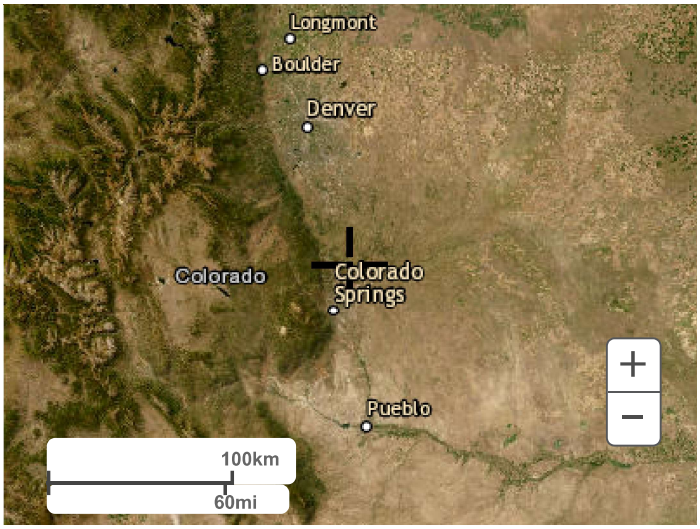
Large scale terrain



Large scale map



Large scale aerial



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US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

Disclaimer

APPENDIX B

HYDROLOGY CALCULATIONS

FLYING HORSE NORTH FILING 9 - PDR AMENDMENT
EXISTING CONDITIONS
EL PASO COUNTY, COLORADO

HRGreen

Calc'd by:	**SPC**
Checked by:	**RDL**
Date:	**7/29/2026**

SUMMARY RUNOFF TABLE

BASIN	AREA (ac)	% IMP.	C_5	C_{100}	Q_5 (cfs)	Q_{100} (cfs)
PR-5	2.26	12.84	0.17	0.42	1.4	5.7
OS-2	0.30	100.00	0.90	0.96	1.4	2.5
BS-20	23.97	2.51	0.09	0.35	6.4	44.8
BS-20.1	41.64	4.64	0.11	0.37	12.3	71.9
BS-20.2	4.32	22.54	0.26	0.49	3.8	11.8
BS-20.3	0.56	100.00	0.90	0.96	2.6	4.7
BS-21.1	15.22	9.60	0.16	0.41	7.6	33.2
CC-34	0.88	26.50	0.29	0.50	1.0	2.8
CC-34.1a	10.47	7.51	0.14	0.39	5.3	25.9
CC-34.1b	4.63	2.00	0.08	0.35	1.4	10.5
CC-34.2	1.84	100.00	0.90	0.96	5.2	9.4
CC-34.3	1.09	37.96	0.38	0.57	1.8	4.7
CC-34.4	3.32	18.83	0.22	0.45	2.2	7.7
PR-1	0.27	90.00	0.73	0.81	1.0	1.9
PR-2	1.66	79.33	0.72	0.83	4.8	9.1
PR-3	2.16	85.19	0.77	0.86	7.1	13.3
GRAND TOTAL	114.59	11.79	0.17	0.41		

CUMULATIVE DESIGN POINT SUMMARY TABLE

DESIGN POINT	CONTRIBUTING BASINS	ΣQ_5 (cfs)	ΣQ_{100} (cfs)	Tributary Area (ac.)
1	CC-34.3, DESIGN POINT [PR-5]	2.52	8.29	3.35
1.1	CC-34	0.96	2.84	0.88
1.2	CC-34.4	2.22	7.68	3.32
1.3	CC-34.2, DESIGN POINT [1, 1.1, 1.2, OS-2, PR-2]	20.41	45.67	13.78
2	CC-34.1b, DESIGN POINT [1.3]	21.44	53.66	18.41
4	BS-21.1	7.58	33.19	15.22
5	BS-20.2, BS-20.3	5.50	14.81	4.88
PR-5	PR-5	1.38	5.67	2.26
OS-2	OS-2	1.37	2.45	0.30
BS-20	BS-20	6.42	44.82	23.97
BS-20.1	BS-20.1, DESIGN POINT [BS-20, 5]	22.55	123.99	70.49
CC-34.1a	CC-34.1a, POND A RELEASE RATE	5.63	48.46	28.88
PR-1	PR-1	1.02	1.90	0.27
PR-2	PR-2, DESIGN POINT [PR-1,PR-3]	12.15	23.01	4.09
PR-3	PR-3	7.06	13.26	2.16

POND SUMMARY

POND ID	TRIBUTARY AREA (ac)	EFFECTIVE % IMPERVIOUS	C5	C100	PREDEV. PEAK INFLOW (UD-DET.) (cfs)	PEAK OUTFLOW (UD-DET.) (cfs)
POND A (FILING 3)	18.41	36.49	0.37	0.55	29.2	22.6

HRGreen

FLYING HORSE NORTH FILING 9 - PDR AMENDMENT

EXISTING CONDITIONS

EL PASO COUNTY, COLORADO

Calc'd by:		SPC
Checked by:		RDL
Date:		7/29/2026

COMPOSITE 'C' FACTORS

BASIN	GOLF COURSE / UNDEVELOPED	ROADWAY	RESIDENTIAL (2.5 AC LOT)	ROOFTOP	TOTAL	SOIL TYPE	GOLF COURSE / UNDEVELOPED			ROADWAY			RESIDENTIAL (2.5 AC LOT)			ROOFTOP			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}
PR-5	2.01	0.25	0.00	0.00	2.26	B	2	0.08	0.35	100	0.90	0.96	11	0.17	0.42	90	0.73	0.81	12.8	0.17	0.42
OS-2	0.00	0.30	0.00	0.00	0.30	B	2	0.08	0.35	100	0.90	0.96	11	0.17	0.42	90	0.73	0.81	100.0	0.90	0.96
BS-20	22.62	0.00	1.35	0.00	23.97	B	2	0.08	0.35	100	0.90	0.96	11	0.17	0.42	90	0.73	0.81	2.5	0.09	0.35
BS-20.1	31.39	0.20	10.05	0.00	41.64	B	2	0.08	0.35	100	0.90	0.96	11	0.17	0.42	90	0.73	0.81	4.6	0.11	0.37
BS-20.2	0.00	0.56	3.76	0.00	4.32	B	2	0.08	0.35	100	0.90	0.96	11	0.17	0.42	90	0.73	0.81	22.5	0.26	0.49
BS-20.3	0.00	0.56	0.00	0.00	0.56	B	2	0.08	0.35	100	0.90	0.96	11	0.17	0.42	90	0.73	0.81	100.0	0.90	0.96
BS-21.1	2.86	0.05	12.31	0.00	15.22	B	2	0.08	0.35	100	0.90	0.96	11	0.17	0.42	90	0.73	0.81	9.6	0.16	0.41
CC-34	0.66	0.22	0.00	0.00	0.88	B	2	0.08	0.35	100	0.90	0.96	11	0.17	0.42	90	0.73	0.81	26.5	0.29	0.50
CC-34.1a	4.06	0.00	6.41	0.00	10.47	B	2	0.08	0.35	100	0.90	0.96	11	0.17	0.42	90	0.73	0.81	7.5	0.14	0.39
CC-34.1b	4.63	0.00	0.00	0.00	4.63	B	2	0.08	0.35	100	0.90	0.96	11	0.17	0.42	90	0.73	0.81	2.0	0.08	0.35
CC-34.2	0.00	1.84	0.00	0.00	1.84	B	2	0.08	0.35	100	0.90	0.96	11	0.17	0.42	90	0.73	0.81	100.0	0.90	0.96
CC-34.3	0.69	0.40	0.00	0.00	1.09	B	2	0.08	0.35	100	0.90	0.96	11	0.17	0.42	90	0.73	0.81	38.0	0.38	0.57
CC-34.4	2.75	0.57	0.00	0.00	3.32	B	2	0.08	0.35	100	0.90	0.96	11	0.17	0.42	90	0.73	0.81	18.8	0.22	0.45
PR-1	0.00	0.00	0.00	0.27	0.27	B	2	0.08	0.35	100	0.90	0.96	11	0.17	0.42	90	0.73	0.81	90.0	0.73	0.81
PR-2	0.34	1.22	0.00	0.10	1.66	B	2	0.08	0.35	100	0.90	0.96	11	0.17	0.42	90	0.73	0.81	79.3	0.72	0.83
PR-3	0.31	1.69	0.00	0.16	2.16	B	2	0.08	0.35	100	0.90	0.96	11	0.17	0.42	90	0.73	0.81	85.2	0.77	0.86
GRAND TOTAL	**72.32**	**7.86**	**33.88**	**0.53**	**114.59**	**B**	**2**	**0.08**	**0.35**	**100**	**0.90**	**0.96**	**11**	**0.17**	**0.42**	**90**	**0.73**	**0.81**	**12**	**0.17**	**0.41**
POND SUMMARY																					
POND A (FILING 3)	**11.39**	**6.49**	**0.00**	**0.53**	**18.41**	**B**	**2**	**0.08**	**0.35**	**100**	**0.90**	**0.96**	**11**	**0.17**	**0.42**	**90**	**0.73**	**0.81**	**36.49**	**0.37**	**0.55**

HRGreen	FLYING HORSE NORTH FILING 9 - PDR AMENDMENT	Calc'd by:	SPC
	EXISTING CONDITIONS	Checked by:	RDL
	EL PASO COUNTY, COLORADO	Date:	7/29/2026

TIME OF CONCENTRATION

BASIN DATA			OVERLAND TIME (T_i)			TRAVEL TIME (T_t)					TOTAL	*tc=(L/180)+10*	Design tc
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)	*tc max*	*tc design (min)*
PR-5	0.17	2.26	300	3.0	20.5	20	500	1.0	2.0	4.2	24.6	14.4	14.4
OS-2	0.90	0.30	16	2.0	1.2	20	500	1.0	2.0	4.2	5.3	12.9	5.3
BS-20	0.09	23.97	260	7.0	15.7	10	1400	8.0	2.8	8.2	23.9	19.2	19.2
BS-20.1	0.11	41.64	300	7.0	16.5	10	2300	10.0	3.2	12.1	28.6	24.4	24.4
BS-20.2	0.26	4.32	300	5.4	15.1	20	950	5.0	4.5	3.5	18.7	16.9	16.9
BS-20.3	0.90	0.56	16	2.0	1.2	20	860	5.0	4.5	3.2	5.0	14.9	5.0
BS-21.1	0.16	15.22	300	7.0	15.7	10	1250	8.0	2.8	7.4	23.0	18.6	18.6
CC-34	0.29	0.88	100	2.0	11.9	20	300	1.0	2.0	2.5	14.4	12.2	12.2
CC-34.1a	0.14	10.47	100	2.0	14.0	10	400	1.0	1.0	6.7	20.7	12.8	12.8
CC-34.1b	0.08	4.63	100	2.0	14.8	10	250	1.0	1.0	4.2	19.0	11.9	11.9
CC-34.2	0.90	1.84	16	2.0	1.2	20	2150	1.0	2.0	17.9	19.1	22.0	19.1
CC-34.3	0.38	1.09	16	2.0	4.2	20	480	1.0	2.0	4.0	8.2	12.8	8.2
CC-34.4	0.22	3.32	100	2.0	12.8	20	1839	1.0	2.0	15.3	28.1	20.8	20.8
PR-1	0.73	0.27	25	1.0	3.4	20	75	1.0	2.0	0.6	5.0	10.6	5.0
PR-2	0.72	1.66	100	1.0	6.9	20	500	1.0	2.0	4.2	11.1	13.3	11.1
PR-3	0.77	2.16	100	0.5	7.6	20	340	3.0	3.5	1.6	9.3	12.4	9.3

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

FLYING HORSE NORTH FILING 9 - PDR AMENDMENT

EXISTING CONDITIONS

DESIGN STORM: 5-YEAR

Calc'd by: SPC

Checked by: RDL

Date: 7/29/2026

		DIRECT RUNOFF						TOTAL RUNOFF				OVERLAND			PIPE				TRAVEL TIME			REMARKS
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 (FT)	LENGTH (FT)	VEL. (FPS)	TRAVEL TIME (min	
1								19.2	0.80	3.15	**2.5**				2.5	0.80	2.0	1.5	175	8.4	0.35	DRAINS VIA PIPE FLOW TO DP 1.3.
	CC-34.3	1.09	0.38	8.2	0.42	4.43	**1.8**															
1.1								12.2	0.25	3.83	**1.0**				1.0	0.25	2.0	2.0	35	10.2	0.06	DRAINS VIA PIPE FLOW TO DP 1.3.
	CC-34	0.88	0.29	12.2	0.25	3.83	**1.0**															
1.2								20.8	0.73	3.03	**2.2**				2.2	0.73	3.0	2.0	185	12.5	0.25	DRAINS VIA PIPE FLOW TO DP 1.3.
	CC-34.4	3.32	0.22	20.8	0.73	3.03	**2.2**															
1.3								21.0	6.77	3.01	**20.4**				20.4	6.77	2.0	3.0	135	13.3	0.17	DRAINS VIA PIPE FLOW TO EXISTING FILING 3 POND A, AND TO THE EXISTING
	CC-34.2	1.84	0.90	19.1	1.66	3.16	**5.2**															OUTLET STRUCTRUE AT DP 2.
2								21.2	7.14	3.00	**21.4**											TOTAL FLOW TO EXISTING OUTLET STRUCTURE AT DP 2.
	CC-34.1b	4.63	0.08	11.9	0.37	3.86	**1.4**															DETAINED FLOW DRAINS OFFSITE, ACCOUNTED FOR IN FLOW AT DP CC-34.1a.
4								18.6	2.37	3.20	**7.6**											DRAINS OFFSITE AT DP 4.
	BS-21.1	15.22	0.16	18.6	2.37	3.20	**7.6**															
5								16.9	1.65	3.34	**5.5**	5.5	1.65	6.0					400	2.45	2.72	DRAINS VIA OVERLAND FLOW TO DP BS-20.1.
	BS-20.2	4.32	0.26	16.9	1.14	3.34	**3.8**															
	BS-20.3	0.56	0.90	5.0	0.50	5.17	**2.6**															
PR-5								14.4	0.39	3.58	**1.4**	1.4	0.39	1.0					575	2.00	4.79	DRAINS VIA ALLEN RANCH RD. CURB AND GUTTER TO DP 1.
	PR-5	2.26	0.17	14.4	0.39	3.58	**1.4**															
OS-2								5.3	0.27	5.07	**1.4**	1.4	0.27	1.0					725	2.00	6.04	DRAINS VIA ALLEN RANCH RD. CURB AND GUTTER TO DP 1.3.
	OS-2	0.30	0.90	5.3	0.27	5.07	**1.4**															
BS-20								19.2	2.04	3.15	**6.4**	6.4	2.04	4.0					550	2.00	4.58	DRAINS VIA OVERLAND FLOW TO DP BS-20.1.
	BS-20	23.97	0.09	19.2	2.04	3.15	**6.4**															
BS-20.1								24.4	8.09	2.79	**22.6**											DRAINS OFFSITE AT DP BS-20.1.
	BS-20.1	41.64	0.11	24.4	4.40	2.79	**12.3**															
CC-34.1a								12.8	1.42	3.76	**5.6**											DRAINS OFFSITE AT DP CC-34.1a, INCLUDES FILING 3 POND A RELEASE.
	CC-34.1a	10.47	0.14	12.8	1.42	3.76	**5.3**															POND A Q5 RELEASE RATE: 0.3 CFS
PR-1								5.0	0.20	5.17	**1.0**	1.0	0.20	4.0					350	4.00	1.46	DRAINS VIA PIPE FLOW TO DP PR-2.
	PR-1	0.27	0.73	5.0	0.20	5.17	**1.0**															
PR-2								11.1	3.06	3.97	**12.1**				12.1	3.06	1.0	2.0	1100	7.2	2.55	DRAINS VIA PIPE FLOW TO DP 1.3.
	PR-2	1.66	0.72	11.1	1.20	3.97	**4.8**															
PR-3								9.3	1.66	4.24	**7.1**				7.1	1.66	1.0	2.0	350	7.2	0.81	DRAINS VIA SURFACE FLOW TO DP 1.3.
	PR-3	2.16	0.77	9.3	1.66	4.24	**7.1**															

HRGreen

FLYING HORSE NORTH FILING 9 - PDR AMENDMENT

EXISTING CONDITIONS

DESIGN STORM: 100-YEAR

Calc'd by: SPC

Checked by: RDL

Date: 7/29/2026

		DIRECT RUNOFF						TOTAL RUNOFF				OVERLAND			PIPE				TRAVEL TIME			REMARKS
DESIGN PONT	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 (ft)	LENGTH (ft)	VEL. (ft/s)	TRAVEL TIME (min	
1								19.2	1.57	5.28	**8.3**				8.3	1.57	2.0	1.5	175	8.4	0.35	DRAINS VIA PIPE FLOW TO DP 1.3.
	CC-34.3	1.09	0.57	8.2	0.63	7.44	**4.7**															
1.1								12.2	0.44	6.43	**2.8**				2.8	0.44	2.0	2.0	35	10.2	0.06	DRAINS VIA PIPE FLOW TO DP 1.3.
	CC-34	0.88	0.50	12.2	0.44	6.43	**2.8**															
1.2								20.8	1.51	5.09	**7.7**				7.7	1.51	3.0	2.0	185	12.5	0.25	DRAINS VIA PIPE FLOW TO DP 1.3.
	CC-34.4	3.32	0.45	20.8	1.51	5.09	**7.7**															
1.3								21.0	9.03	5.06	**45.7**				45.7	9.03	2.0	3.0	135	13.3	0.17	DRAINS VIA PIPE FLOW TO EXISTING FILING 3 POND A, AND TO THE EXISTING
	CC-34.2	1.84	0.96	19.1	1.77	5.30	**9.4**															OUTLET STRUCTRUE AT DP 2.
2								21.2	10.65	5.04	**53.7**											TOTAL FLOW TO EXISTING OUTLET STRUCTURE AT DP 2.
	CC-34.1b	4.63	0.35	11.9	1.62	6.48	**10.5**															DETAINED FLOW DRAINS OFFSITE, ACCOUNTED FOR IN FLOW AT DP CC-34.1a.
4								18.6	6.18	5.37	**33.2**											DRAINS OFFSITE AT DP 4.
	BS-21.1	15.22	0.41	18.6	6.18	5.37	**33.2**															
5								16.9	2.64	5.60	**14.8**	14.8	2.64	6.0					400	2.45	2.72	DRAINS VIA OVERLAND FLOW TO DP BS-20.1.
	BS-20.2	4.32	0.49	16.9	2.11	5.60	**11.8**															
	BS-20.3	0.56	0.96	5.0	0.54	8.68	**4.7**															
PR-5								14.4	0.94	6.01	**5.7**	5.7	0.94	1.0					575	2.00	4.79	DRAINS VIA ALLEN RANCH RD. CURB AND GUTTER TO DP 1.
	PR-5	2.26	0.42	14.4	0.94	6.01	**5.7**															
OS-2								5.3	0.29	8.52	**2.5**	2.5	0.29	1.0					725	2.00	6.04	DRAINS VIA ALLEN RANCH RD. CURB AND GUTTER TO DP 1.3.
	OS-2	0.30	0.96	5.3	0.29	8.52	**2.5**															
BS-20								19.2	8.48	5.29	**44.8**	44.8	8.48	4.0					550	2.00	4.58	DRAINS VIA OVERLAND FLOW TO DP BS-20.1.
	BS-20	23.97	0.35	19.2	8.48	5.29	**44.8**															
BS-20.1								24.4	26.49	4.68	**124.0**											DRAINS OFFSITE AT DP BS-20.1.
	BS-20.1	41.64	0.37	24.4	15.37	4.68	**71.9**															
CC-34.1a								12.8	4.09	6.31	**48.5**											DRAINS OFFSITE AT DP CC-34.1a, INCLUDES FILING 3 POND A RELEASE.
	CC-34.1a	10.47	0.39	12.8	4.09	6.31	**25.9**															POND A Q100 RELEASE RATE: 22.6 CFS
PR-1								5.0	0.22	8.68	**1.9**	1.9	0.22	4.0					350	4.00	1.46	DRAINS VIA PIPE FLOW TO DP PR-2.
	PR-1	0.27	0.81	5.0	0.22	8.68	**1.9**															
PR-2								11.1	3.45	6.67	**23.0**				23.0	3.45	1.0	2.0	1100	7.2	2.55	DRAINS VIA PIPE FLOW TO DP 1.3.
	PR-2	1.66	0.83	11.1	1.37	6.67	**9.1**															
PR-3								9.3	1.86	7.12	**13.3**				13.3	1.86	1.0	2.0	350	7.2	0.81	DRAINS VIA SURFACE FLOW TO DP 1.3.
	PR-3	2.16	0.86	9.3	1.86	7.12	**13.3**															

FLYING HORSE NORTH FILING 9 - FDR
PROPOSED CONDITIONS
EL PASO COUNTY, COLORADO

Calc'd by:	**SPC**
Checked by:	**RDL**
Date:	**11/11/2026**

SUMMARY RUNOFF TABLE

BASIN	AREA (ac)	% IMP.	C_5	C_{100}	Q_5 (cfs)	Q_{100} (cfs)
PR-5	2.26	20.51	0.24	0.47	2.0	6.4
OS-2	0.30	100.00	0.90	0.96	1.4	2.5
BS-20a	1.75	100.00	0.90	0.96	8.1	14.6
BS-20b	13.39	11.00	0.17	0.42	7.6	31.4
BS-20c	9.31	3.36	0.09	0.36	2.8	18.1
BS-20.1	41.26	5.50	0.12	0.38	13.2	72.6
BS-20.2	4.32	22.54	0.26	0.49	3.8	11.8
BS-20.3	0.56	100.00	0.90	0.96	2.6	4.7
BS-21.1	15.22	10.31	0.16	0.41	7.9	33.6
CC-34	0.88	33.09	0.35	0.55	1.2	3.1
CC-34.1a	10.47	10.54	0.17	0.41	6.5	27.4
CC-34.1b	4.63	2.00	0.08	0.35	1.4	10.5
CC-34.2	1.84	100.00	0.90	0.96	5.2	9.4
CC-34.3	1.00	54.15	0.52	0.68	2.4	5.2
CC-34.4	3.32	24.43	0.28	0.50	2.8	8.4
PR-1	0.27	90.00	0.73	0.81	1.0	1.9
PR-2	1.66	79.33	0.72	0.83	4.8	9.1
PR-3	2.16	85.19	0.77	0.86	7.1	13.3
GRAND TOTAL	114.60	15.49	0.20	0.44		

CUMULATIVE DESIGN POINT SUMMARY TABLE

DESIGN POINT	CONTRIBUTING BASINS	ΣQ_5 (cfs)	ΣQ_{100} (cfs)	Tributary Area (ac.)
1	CC-34.3, DESIGN POINT [PR-5]	3.35	9.18	3.26
1.1	CC-34	1.18	3.11	0.88
1.2	CC-34.4	2.78	8.38	3.32
1.3	CC-34.2, DESIGN POINT [1, 1.1, 1.2, OS-2, PR-2]	21.93	47.44	13.68
2	CC-34.1b, DESIGN POINT [1.3]	22.96	55.41	18.31
4	BS-21.1	7.92	33.63	15.22
5	BS-20.2, BS-20.3	5.50	14.81	4.88
PR-5	PR-5	1.95	6.39	2.26
OS-2	OS-2	1.37	2.45	0.30
BS-20a	BS-20a	8.14	14.58	1.75
BS-20b	BS-20b	7.64	31.41	15.14
BS-20c	BS-20c	2.80	18.06	24.45
BS-20.1	BS-20.1, DESIGN POINT [BS-20a, BS-20b, BS-20c, 5]	31.01	134.68	87.48
CC-34.1a	CC-34.1a, POND A RELEASE RATE	7.02	43.36	28.79
PR-1	PR-1	1.02	1.90	0.27
PR-2	PR-2, DESIGN POINT [PR-1,PR-3]	12.15	23.01	4.09
PR-3	PR-3	7.06	13.26	2.16

POND SUMMARY						
POND ID	**TRIBUTARY AREA (ac)**	**EFFECTIVE % IMPERVIOUS**	**C5**	**C100**	**PREDEV. PEAK INFLOW (UD-DET.) (cfs)**	**PEAK OUTFLOW (UD-DET.) (cfs)**
POND A (FILING 3)	18.31	39.64	0.40	0.58	29.0	16.0
POND 8 (FILING 1)	249.34	9.17	0.15	0.40	260.8	197.2

HRGreen

FLYING HORSE NORTH FILING 9 - FDR

PROPOSED CONDITIONS

EL PASO COUNTY, COLORADO

Calc'd by:		SPC
Checked by:		RDL
Date:		11/11/2026

COMPOSITE 'C' FACTORS

BASIN	GOLF COURSE / UNDEVELOPED	ROADWAY	RESIDENTIAL (2.5 AC LOT)	ROOFTOP	TOTAL	SOIL TYPE	GOLF COURSE / UNDEVELOPED			ROADWAY			RESIDENTIAL (2.5 AC LOT)			ROOFTOP			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}
PR-5	0.97	0.34	0.95	0.00	2.26	B	2	0.08	0.35	100	0.90	0.96	11	0.17	0.42	90	0.73	0.81	20.5	0.24	0.47
OS-2	0.00	0.30	0.00	0.00	0.30	B	2	0.08	0.35	100	0.90	0.96	11	0.17	0.42	90	0.73	0.81	100.0	0.90	0.96
BS-20a	0.00	1.75	0.00	0.00	1.75	B	2	0.08	0.35	100	0.90	0.96	11	0.17	0.42	90	0.73	0.81	100.0	0.90	0.96
BS-20b	0.00	0.00	13.39	0.00	13.39	B	2	0.08	0.35	100	0.90	0.96	11	0.17	0.42	90	0.73	0.81	11.0	0.17	0.42
BS-20c	7.91	0.00	1.40	0.00	9.31	B	2	0.08	0.35	100	0.90	0.96	11	0.17	0.42	90	0.73	0.81	3.4	0.09	0.36
BS-20.1	25.22	0.00	16.04	0.00	41.26	B	2	0.08	0.35	100	0.90	0.96	11	0.17	0.42	90	0.73	0.81	5.5	0.12	0.38
BS-20.2	0.00	0.56	3.76	0.00	4.32	B	2	0.08	0.35	100	0.90	0.96	11	0.17	0.42	90	0.73	0.81	22.5	0.26	0.49
BS-20.3	0.00	0.56	0.00	0.00	0.56	B	2	0.08	0.35	100	0.90	0.96	11	0.17	0.42	90	0.73	0.81	100.0	0.90	0.96
BS-21.1	1.67	0.05	13.50	0.00	15.22	B	2	0.08	0.35	100	0.90	0.96	11	0.17	0.42	90	0.73	0.81	10.3	0.16	0.41
CC-34	0.02	0.22	0.64	0.00	0.88	B	2	0.08	0.35	100	0.90	0.96	11	0.17	0.42	90	0.73	0.81	33.1	0.35	0.55
CC-34.1a	0.53	0.00	9.94	0.00	10.47	B	2	0.08	0.35	100	0.90	0.96	11	0.17	0.42	90	0.73	0.81	10.5	0.17	0.41
CC-34.1b	4.63	0.00	0.00	0.00	4.63	B	2	0.08	0.35	100	0.90	0.96	11	0.17	0.42	90	0.73	0.81	2.0	0.08	0.35
CC-34.2	0.00	1.84	0.00	0.00	1.84	B	2	0.08	0.35	100	0.90	0.96	11	0.17	0.42	90	0.73	0.81	100.0	0.90	0.96
CC-34.3	0.25	0.51	0.24	0.00	1.00	B	2	0.08	0.35	100	0.90	0.96	11	0.17	0.42	90	0.73	0.81	54.1	0.52	0.68
CC-34.4	0.69	0.57	2.06	0.00	3.32	B	2	0.08	0.35	100	0.90	0.96	11	0.17	0.42	90	0.73	0.81	24.4	0.28	0.50
PR-1	0.00	0.00	0.00	0.27	0.27	B	2	0.08	0.35	100	0.90	0.96	11	0.17	0.42	90	0.73	0.81	90.0	0.73	0.81
PR-2	0.34	1.22	0.00	0.10	1.66	B	2	0.08	0.35	100	0.90	0.96	11	0.17	0.42	90	0.73	0.81	79.3	0.72	0.83
PR-3	0.31	1.69	0.00	0.16	2.16	B	2	0.08	0.35	100	0.90	0.96	11	0.17	0.42	90	0.73	0.81	85.2	0.77	0.86
GRAND TOTAL	**42.54**	**9.61**	**61.92**	**0.53**	**114.60**	**B**	**2**	**0.08**	**0.35**	**100**	**0.90**	**0.96**	**11**	**0.17**	**0.42**	**90**	**0.73**	**0.81**	**15**	**0.20**	**0.44**
SUBBASINS PER FILING 3 REPORT FOR POND 8 ANALYSIS ONLY																					
BS-18	12.15	0.00	21.75	0.00	33.90	B	2	0.08	0.35	100	0.90	0.96	11	0.17	0.42	90	0.73	0.81	7.8	0.14	0.39
BS-19	0.00	0.00	6.35	0.00	6.35	B	2	0.08	0.35	100	0.90	0.96	11	0.17	0.42	90	0.73	0.81	11.0	0.17	0.42
BS-20.2	0.00	0.00	4.32	0.00	4.32	B	2	0.08	0.35	100	0.90	0.96	11	0.17	0.42	90	0.73	0.81	11.0	0.17	0.42
BS-20.3	0.00	0.56	0.00	0.00	0.56	B	2	0.08	0.35	100	0.90	0.96	11	0.17	0.42	90	0.73	0.81	100.0	0.90	0.96
BS-21	0.00	0.77	0.00	0.00	0.77	B	2	0.08	0.35	100	0.90	0.96	11	0.17	0.42	90	0.73	0.81	100.0	0.90	0.96
BS-21.2	0.00	0.18	0.00	0.00	0.18	B	2	0.08	0.35	100	0.90	0.96	11	0.17	0.42	90	0.73	0.81	100.0	0.90	0.96
BS-21.3	21.87	0.40	28.65	0.00	50.92	B	2	0.08	0.35	100	0.90	0.96	11	0.17	0.42	90	0.73	0.81	7.8	0.14	0.39
BS-22	0.00	0.24	0.00	0.00	0.24	B	2	0.08	0.35	100	0.90	0.96	11	0.17	0.42	90	0.73	0.81	100.0	0.90	0.96
BS-22.1	2.56	0.00	14.31	0.00	16.87	B	2	0.08	0.35	100	0.90	0.96	11	0.17	0.42	90	0.73	0.81	9.6	0.16	0.41
BS-23A	2.65	0.00	6.63	0.00	9.28	B	2	0.08	0.35	100	0.90	0.96	11	0.17	0.42	90	0.73	0.81	8.4	0.14	0.40
BS-23A.1	0.27	0.00	7.69	0.00	7.96	B	2	0.08	0.35	100	0.90	0.96	11	0.17	0.42	90	0.73	0.81	10.7	0.17	0.41
BS-23	15.38	0.00	21.68	0.00	37.06	B	2	0.08	0.35	100	0.90	0.96	11	0.17	0.42	90	0.73	0.81	7.3	0.13	0.39
POND SUMMARY																					
POND A (FILING 3)	**7.21**	**6.69**	**3.89**	**0.53**	**18.31**	**B**	**2**	**0.08**	**0.35**	**100**	**0.90**	**0.96**	**11**	**0.17**	**0.42**	**90**	**0.73**	**0.81**	**39.64**	**0.40**	**0.58**
POND 8 (FILING 1)	**89.68**	**3.95**	**155.71**	**0.00**	**249.34**	**B**	**2**	**0.08**	**0.35**	**100**	**0.90**	**0.96**	**11**	**0.17**	**0.42**	**90**	**0.73**	**0.81**	**9.17**	**0.15**	**0.40**

HRGreen	FLYING HORSE NORTH FILING 9 - FDR	Calc'd by:		SPC
	PROPOSED CONDITIONS	Checked by:		RDL
	EL PASO COUNTY, COLORADO	Date:		11/11/2026

COMPOSITE 'C' FACTORS

BASIN	GOLF COURSE / UNDEVELOPED	ROADWAY	RESIDENTIAL (2.5 AC LOT)	ROOFTOP	TOTAL	SOIL TYPE	GOLF COURSE / UNDEVELOPED			ROADWAY			RESIDENTIAL (2.5 AC LOT)			ROOFTOP			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}
SWALE SECTIONS																					
A-A	0.00	0.00	1.64	0.00	1.64	B	2	0.08	0.35	100	0.90	0.96	11	0.17	0.42	90	0.73	0.81	11.0	0.17	0.42
B-B	0.00	0.00	3.78	0.00	3.78	B	2	0.08	0.35	100	0.90	0.96	11	0.17	0.42	90	0.73	0.81	11.0	0.17	0.42
C-C	0.00	0.00	2.60	0.00	2.60	B	2	0.08	0.35	100	0.90	0.96	11	0.17	0.42	90	0.73	0.81	11.0	0.17	0.42
D1-D1N	0.00	0.00	3.87	0.00	3.87	B	2	0.08	0.35	100	0.90	0.96	11	0.17	0.42	90	0.73	0.81	11.0	0.17	0.42
D1-D1S	0.00	0.00	5.09	0.00	5.09	B	2	0.08	0.35	100	0.90	0.96	11	0.17	0.42	90	0.73	0.81	11.0	0.17	0.42
D-D	0.00	0.00	10.16	0.00	10.16	B	2	0.08	0.35	100	0.90	0.96	11	0.17	0.42	90	0.73	0.81	11.0	0.17	0.42

HRGreen	FLYING HORSE NORTH FILING 9 - FDR	Calc'd by:	SPC
	PROPOSED CONDITIONS	Checked by:	RDL
	EL PASO COUNTY, COLORADO	Date:	11/11/2026

TIME OF CONCENTRATION

BASIN DATA			OVERLAND TIME (T_i)			TRAVEL TIME (T_t)					TOTAL	tc=(L/180)+10	Design tc
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)	tc max	tc design (min)
PR-5	0.24	2.26	300	3.0	18.9	20	500	1.0	2.0	4.2	23.1	14.4	14.4
OS-2	0.90	0.30	16	2.0	1.2	20	500	1.0	2.0	4.2	5.3	12.9	5.3
BS-20a	0.90	1.75	40	2.0	1.8	20	875	5.5	4.7	3.1	5.0	15.1	5.0
BS-20b	0.17	13.39	300	16.0	11.7	10	925	6.3	2.5	6.2	17.9	16.8	16.8
BS-20c	0.09	9.31	300	15.0	13.0	10	1225	6.3	2.5	8.2	21.1	18.5	18.5
BS-20.1	0.12	41.26	300	7.0	16.4	10	2300	10.0	3.2	12.1	28.5	24.4	24.4
BS-20.2	0.26	4.32	300	5.4	15.1	20	950	5.0	4.5	3.5	18.7	16.9	16.9
BS-20.3	0.90	0.56	16	2.0	1.2	20	860	5.0	4.5	3.2	5.0	14.9	5.0
BS-21.1	0.16	15.22	300	7.0	15.6	10	1250	8.0	2.8	7.4	22.9	18.6	18.6
CC-34	0.35	0.88	100	2.0	10.9	20	300	1.0	2.0	2.5	13.4	12.2	12.2
CC-34.1a	0.17	10.47	100	2.0	13.6	10	400	1.0	1.0	6.7	20.3	12.8	12.8
CC-34.1b	0.08	4.63	100	2.0	14.8	10	250	1.0	1.0	4.2	19.0	11.9	11.9
CC-34.2	0.90	1.84	16	2.0	1.2	20	2150	1.0	2.0	17.9	19.1	22.0	19.1
CC-34.3	0.52	1.00	16	2.0	3.4	20	480	1.0	2.0	4.0	7.4	12.8	7.4
CC-34.4	0.28	3.32	100	2.0	12.0	20	1839	1.0	2.0	15.3	27.3	20.8	20.8
PR-1	0.73	0.27	25	1.0	3.4	20	75	1.0	2.0	0.6	5.0	10.6	5.0
PR-2	0.72	1.66	100	1.0	6.9	20	500	1.0	2.0	4.2	11.1	13.3	11.1
PR-3	0.77	2.16	100	0.5	7.6	20	340	3.0	3.5	1.6	9.3	12.4	9.3
A-A	0.17	1.64	300	13.9	12.3	10	25	6.8	2.6	0.2	12.4	11.8	11.8
B-B	0.17	3.78	300	13.9	12.3	10	275	4.9	2.2	2.1	14.4	13.2	13.2
C-C	0.17	2.60	300	16.5	11.6	10	210	9.0	3.0	1.2	12.8	12.8	12.8
D1-D1N	0.17	3.87	300	16.5	11.6	10	547	7.4	2.7	3.4	14.9	14.7	14.7
D1-D1S	0.17	5.09	300	13.9	12.3	10	569	5.3	2.3	4.1	16.4	14.8	14.8
D-D	0.17	10.16	300	13.9	12.3	10	910	5.3	2.3	6.6	18.9	16.7	16.7

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

FLYING HORSE NORTH FILING 9 - FDR

PROPOSED CONDITIONS

DESIGN STORM: 5-YEAR

Calc'd by: SPC

Checked by: RDL

Date: 11/11/2026

		DIRECT RUNOFF						TOTAL RUNOFF				OVERLAND			PIPE				TRAVEL TIME			REMARKS
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 (FT)	LENGTH (FT)	VEL. (FPS)	TRAVEL TIME (min	
1								19.2	1.06	3.15	**3.3**				3.3	1.06	2.0	1.5	175	8.4	0.35	DRAINS VIA PIPE FLOW TO DP 1.3.
	CC-34.3	1.00	0.52	7.4	0.52	4.59	**2.4**															
1.1								12.2	0.31	3.83	**1.2**				1.2	0.31	2.0	2.0	35	10.2	0.06	DRAINS VIA PIPE FLOW TO DP 1.3.
	CC-34	0.88	0.35	12.2	0.31	3.83	**1.2**															
1.2								20.8	0.92	3.03	**2.8**				2.8	0.92	3.0	2.0	185	12.5	0.25	DRAINS VIA PIPE FLOW TO DP 1.3.
	CC-34.4	3.32	0.28	20.8	0.92	3.03	**2.8**															
1.3								21.0	7.27	3.01	**21.9**				21.9	7.27	2.0	3.0	135	13.3	0.17	DRAINS VIA PIPE FLOW TO EXISTING FILING 3 POND A, AND TO THE EXISTING
	CC-34.2	1.84	0.90	19.1	1.66	3.16	**5.2**															OUTLET STRUCTRUE AT DP 2.
1.3*								19.1	1.93	3.16	**6.1**											TOTAL SURFACE FLOW TO INLET AT DESIGN POINT 1.3.
Surface	CC-34.2	1.84	0.90	19.1	1.66	3.16	**5.2**															
2								21.2	7.64	3.00	**23.0**											TOTAL FLOW TO EXISTING OUTLET STRUCTURE AT DP 2.
	CC-34.1b	4.63	0.08	11.9	0.37	3.86	**1.4**															DETAINED FLOW DRAINS OFFSITE, ACCOUNTED FOR IN FLOW AT DP CC-34.1a.
4								18.6	2.48	3.20	**7.9**											DRAINS OFFSITE AT DP 4.
	BS-21.1	15.22	0.16	18.6	2.48	3.20	**7.9**															
5								16.9	1.65	3.34	**5.5**	5.5	1.65	6.0					400	2.45	2.72	DRAINS VIA OVERLAND FLOW TO DP BS-20.1.
	BS-20.2	4.32	0.26	16.9	1.14	3.34	**3.8**															
	BS-20.3	0.56	0.90	5.0	0.50	5.17	**2.6**															

HRGreen

FLYING HORSE NORTH FILING 9 - FDR

PROPOSED CONDITIONS

DESIGN STORM: 5-YEAR

Calc'd by: SPC

Checked by: RDL

Date: 11/11/2026

		DIRECT RUNOFF						TOTAL RUNOFF				OVERLAND			PIPE				TRAVEL TIME			REMARKS
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 (FT)	LENGTH (FT)	VEL. (FPS)	TRAVEL TIME (min	
PR-5								14.4	0.55	3.58	**2.0**	2.0	0.55	1.0					575	2.00	4.79	DRAINS VIA ALLEN RANCH RD. CURB AND GUTTER TO DP 1.
	PR-5	2.26	0.24	14.4	0.55	3.58	**2.0**															
OS-2								5.3	0.27	5.07	**1.4**	1.4	0.27	1.0					725	2.00	6.04	DRAINS VIA ALLEN RANCH RD. CURB AND GUTTER TO DP 1.3.
	OS-2	0.30	0.90	5.3	0.27	5.07	**1.4**															
BS-20a								5.0	1.58	5.17	**8.1**	8.1	1.58	4.0					650	2.00	5.42	DRAINS VIA OVERLAND FLOW TO DP BS-20.1.
	BS-20a	1.75	0.90	5.0	1.58	5.17	**8.1**															
BS-20b								16.8	2.28	3.35	**7.6**	7.6	2.28	4.0					600	2.00	5.00	DRAINS VIA OVERLAND FLOW TO DP BS-20.1.
	BS-20b	13.39	0.17	16.8	2.28	3.35	**7.6**															
BS-20c								18.5	0.87	3.21	**2.8**	2.8	0.87	4.0					550	2.00	4.58	DRAINS VIA OVERLAND FLOW TO DP BS-20.1.
	BS-20c	9.31	0.09	18.5	0.87	3.21	**2.8**															
BS-20.1								24.4	11.12	2.79	**31.0**											DRAINS OFFSITE AT DP BS-20.1 THROUGH FILING 1 TO POND 8.
	BS-20.1	41.26	0.12	24.4	4.75	2.79	**13.2**															
CC-34.1a								12.8	1.73	3.76	**7.0**											DRAINS OFFSITE AT DP CC-34.1a, INCLUDES FILING 3 POND A RELEASE.
	CC-34.1a	10.47	0.17	12.8	1.73	3.76	**6.5**															POND A Q5 RELEASE RATE: 0.5 CFS
PR-1								5.0	0.20	5.17	**1.0**	1.0	0.20	4.0					350	4.00	1.46	DRAINS VIA PIPE FLOW TO DP PR-2.
	PR-1	0.27	0.73	5.0	0.20	5.17	**1.0**															
PR-2								11.1	3.06	3.97	**12.1**				12.1	3.06	1.0	2.0	1100	7.2	2.55	DRAINS VIA PIPE FLOW TO DP 1.3.
	PR-2	1.66	0.72	11.1	1.20	3.97	**4.8**															
PR-3								9.3	1.66	4.24	**7.1**				7.1	1.66	1.0	2.0	350	7.2	0.81	DRAINS VIA SURFACE FLOW TO DP 1.3.
	PR-3	2.16	0.77	9.3	1.66	4.24	**7.1**															
A-A								11.8	0.28	3.88	**1.1**											
	A-A	1.64	0.17	11.8	0.28	3.88	**1.1**															
B-B								13.2	0.64	3.71	**2.4**											
	B-B	3.78	0.17	13.2	0.64	3.71	**2.4**															
C-C								12.8	0.44	3.76	**1.7**											
	C-C	2.60	0.17	12.8	0.44	3.76	**1.7**															
D1-D1N								14.7	0.66	3.55	**2.3**											
	D1-D1N	3.87	0.17	14.7	0.66	3.55	**2.3**															
D1-D1S								14.8	0.87	3.54	**3.1**											
	D1-D1S	5.09	0.17	14.8	0.87	3.54	**3.1**															
D-D								16.7	1.73	3.36	**5.8**											
	D-D	10.16	0.17	16.7	1.73	3.36	**5.8**															

HRGreen

FLYING HORSE NORTH FILING 9 - FDR

PROPOSED CONDITIONS

DESIGN STORM: 100-YEAR

Calc'd by:	**SPC**
Checked by:	**RDL**
Date:	**11/11/2026**

		DIRECT RUNOFF						TOTAL RUNOFF				OVERLAND			PIPE				TRAVEL TIME			REMARKS
DESIGN PONT	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 (ft)	LENGTH (ft)	VEL. (ft/s)	TRAVEL TIME (min	
1								19.2	1.74	5.28	**9.2**				9.2	1.74	2.0	1.5	175	8.4	0.35	DRAINS VIA PIPE FLOW TO DP 1.3.
	CC-34.3	1.00	0.68	7.4	0.67	7.70	**5.2**															
1.1								12.2	0.48	6.43	**3.1**				3.1	0.48	2.0	2.0	35	10.2	0.06	DRAINS VIA PIPE FLOW TO DP 1.3.
	CC-34	0.88	0.55	12.2	0.48	6.43	**3.1**															
1.2								20.8	1.65	5.09	**8.4**				8.4	1.65	3.0	2.0	185	12.5	0.25	DRAINS VIA PIPE FLOW TO DP 1.3.
	CC-34.4	3.32	0.50	20.8	1.65	5.09	**8.4**															
1.3								21.0	9.37	5.06	**47.4**				47.4	9.37	2.0	3.0	135	13.3	0.17	DRAINS VIA PIPE FLOW TO EXISTING FILING 3 POND A, AND TO THE EXISTING
	CC-34.2	1.84	0.96	19.1	1.77	5.30	**9.4**															OUTLET STRUCTRUE AT DP 2.
1.3*								19.1	2.05	5.30	**10.9**											TOTAL SURFACE FLOW TO INLET AT DESIGN POINT 1.3.
Surface	CC-34.2	1.84	0.96	19.1	1.77	5.30	**9.4**															
2								21.2	10.99	5.04	**55.4**											TOTAL FLOW TO EXISTING OUTLET STRUCTURE AT DP 2.
	CC-34.1b	4.63	0.35	11.9	1.62	6.48	**10.5**															DETAINED FLOW DRAINS OFFSITE, ACCOUNTED FOR IN FLOW AT DP CC-34.1a.
4								18.6	6.27	5.37	**33.6**											DRAINS OFFSITE AT DP 4.
	BS-21.1	15.22	0.41	18.6	6.27	5.37	**33.6**															
5								16.9	2.64	5.60	**14.8**	14.8	2.64	6.0					400	2.45	2.72	DRAINS VIA OVERLAND FLOW TO DP BS-20.1.
	BS-20.2	4.32	0.49	16.9	2.11	5.60	**11.8**															
	BS-20.3	0.56	0.96	5.0	0.54	8.68	**4.7**															

HRGreen

FLYING HORSE NORTH FILING 9 - FDR

PROPOSED CONDITIONS

DESIGN STORM: 100-YEAR

Calc'd by: SPC

Checked by: RDL

Date: 11/11/2026

		DIRECT RUNOFF						TOTAL RUNOFF				OVERLAND			PIPE				TRAVEL TIME			REMARKS
DESIGN PONT	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 (ft)	LENGTH (ft)	VEL. (ft/s)	TRAVEL TIME (min	
PR-5								14.4	1.06	6.01	**6.4**	6.4	1.06	1.0					575	2.00	4.79	DRAINS VIA ALLEN RANCH RD. CURB AND GUTTER TO DP 1.
	PR-5	2.26	0.47	14.4	1.06	6.01	**6.4**															
OS-2								5.3	0.29	8.52	**2.5**	2.5	0.29	1.0					725	2.00	6.04	DRAINS VIA ALLEN RANCH RD. CURB AND GUTTER TO DP 1.3.
	OS-2	0.30	0.96	5.3	0.29	8.52	**2.5**															
BS-20a								5.0	1.68	8.68	**14.6**	14.6	1.68	4.0					650	2.00	5.42	DRAINS VIA OVERLAND FLOW TO DP BS-20.1.
	BS-20a	1.75	0.96	5.0	1.68	8.68	**14.6**															
BS-20b								16.8	5.58	5.62	**31.4**	31.4	5.58	4.0					600	2.00	5.00	DRAINS VIA OVERLAND FLOW TO DP BS-20.1.
	BS-20b	13.39	0.42	16.8	5.58	5.62	**31.4**															
BS-20c								18.5	3.35	5.39	**18.1**	18.1	3.35	4.0					550	2.00	4.58	DRAINS VIA OVERLAND FLOW TO DP BS-20.1.
	BS-20c	9.31	0.36	18.5	3.35	5.39	**18.1**															
BS-20.1								24.4	28.78	4.68	**134.7**											DRAINS OFFSITE AT DP BS-20.1 THROUGH FILING 1 TO POND 8.
	BS-20.1	41.26	0.38	24.4	15.52	4.68	**72.6**															
CC-34.1a								12.8	4.33	6.31	**43.4**											DRAINS OFFSITE AT DP CC-34.1a, INCLUDES FILING 3 POND A RELEASE.
	CC-34.1a	10.47	0.41	12.8	4.33	6.31	**27.4**															POND A Q100 RELEASE RATE: 21.0 CFS
PR-1								5.0	0.22	8.68	**1.9**	1.9	0.22	4.0					350	4.00	1.46	DRAINS VIA PIPE FLOW TO DP PR-2.
	PR-1	0.27	0.81	5.0	0.22	8.68	**1.9**															
PR-2								11.1	3.45	6.67	**23.0**				23.0	3.45	1.0	2.0	1100	7.2	2.55	DRAINS VIA PIPE FLOW TO DP 1.3.
	PR-2	1.66	0.83	11.1	1.37	6.67	**9.1**															
PR-3								9.3	1.86	7.12	**13.3**				13.3	1.86	1.0	2.0	350	7.2	0.81	DRAINS VIA SURFACE FLOW TO DP 1.3.
	PR-3	2.16	0.86	9.3	1.86	7.12	**13.3**															
A-A								11.8	0.68	6.51	**4.5**											
	A-A	1.64	0.42	11.8	0.68	6.51	**4.5**															
B-B								13.2	1.58	6.23	**9.8**											
	B-B	3.78	0.42	13.2	1.58	6.23	**9.8**															
C-C								12.8	1.08	6.32	**6.9**											
	C-C	2.60	0.42	12.8	1.08	6.32	**6.9**															
D1-D1N								14.7	1.61	5.96	**9.6**											
	D1-D1N	3.87	0.42	14.7	1.61	5.96	**9.6**															
D1-D1S								14.8	2.12	5.94	**12.6**											
	D1-D1S	5.09	0.42	14.8	2.12	5.94	**12.6**															
D-D								16.7	4.24	5.64	**23.9**											
	D-D	10.16	0.42	16.7	4.24	5.64	**23.9**															

APPENDIX C

HYDRAULIC CALCULATIONS

FROUDE NUMBER CALCULATIONS			CALCULATED BY:	SPC	DATE:	11/11/2026
PROJECT:			CHECKED BY:	RDL		
Froude Number Calculations: 100-YR (USING MAXIMUM VELOCITY CALCULATIONS)						
DP	Velocity	Gravitational Constant	Hydraulic depth [A/T]	Xsectional Area	Top Width	Froude #
-	ft/s	ft/s^2	ft	ft^2	ft	N/A
Section A-A	2.39	32.17	0.13	1.88	14.97	1.19
Section B-B	2.57	32.17	0.15	3.81	26.26	1.19
Section C-C	2.29	32.17	0.12	3.01	24.30	1.15
Section D1-D1N	4.90	32.17	0.35	1.96	5.60	1.46
Section D1-D1S	3.80	32.17	0.24	3.31	13.90	1.37
Section D-D MIN	2.25	32.17	0.66	10.61	15.96	0.49
Section D-D MAX	5.65	32.17	0.42	4.23	10.08	1.54
Section E-E	3.54	32.17	0.17	8.87	51.26	1.50
Section F-F	2.55	32.17	0.16	5.73	36.92	1.14

SHEAR STRESS & CHANNEL LININGS		CALCULATED BY:	SPC	DATE:	11/11/2026
PROJECT:		CHECKED BY:	RDL		

Shear Stress Calculations: 100-YR

DP	unit weight of water	Depth of flow	Slope	Shear Stress
-	lb/ft^3	ft	ft/ft	lb/ft^2
Section A-A	62.43	0.14	0.060	0.52
Section B-B	62.43	0.15	0.054	0.51
Section C-C	62.43	0.13	0.056	0.45
Section D1-D1N	62.43	0.70	0.060	2.62
Section D1-D1S	62.43	0.31	0.060	1.16
Section D-D MIN	62.43	1.33	0.005	0.42
Section D-D MAX	62.43	0.84	0.060	3.15
Section E-E	62.43	0.18	0.073	0.82
Section F-F	62.43	0.16	0.046	0.46

Channel Lining Determination

Calculated Values				P300 Max Values		
DP	Shear Stress	Velocity	Lining Required	Shear Stress	Velocity	Lining Required
Section A-A	0.52	2.39	NO LINING RQD	3	9	NO LINING RQD
Section B-B	0.51	2.57	NO LINING RQD	3	9	NO LINING RQD
Section C-C	0.45	2.29	NO LINING RQD	3	9	NO LINING RQD
Section D1-D1N	2.62	4.90	LINING RQD	3	9	P300
Section D1-D1S	1.16	3.80	NO LINING RQD	3	9	NO LINING RQD
Section D-D MIN	0.42	2.25	NO LINING RQD	3	9	NO LINING RQD
Section D-D MAX	3.15	5.65	LINING RQD	3	9	TMAX
Section E-E	0.82	3.54	NO LINING RQD	3	9	NO LINING RQD
Section F-F	0.46	2.55	NO LINING RQD	3	9	NO LINING RQD

Note: Permissible Shear Stress of 1.5lb/ft^2 and Permissible Velocity of 5ft/s assumed for existing channels (grassland)

Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Wednesday, Nov 11 2026

A-A - MAJOR

Trapezoidal

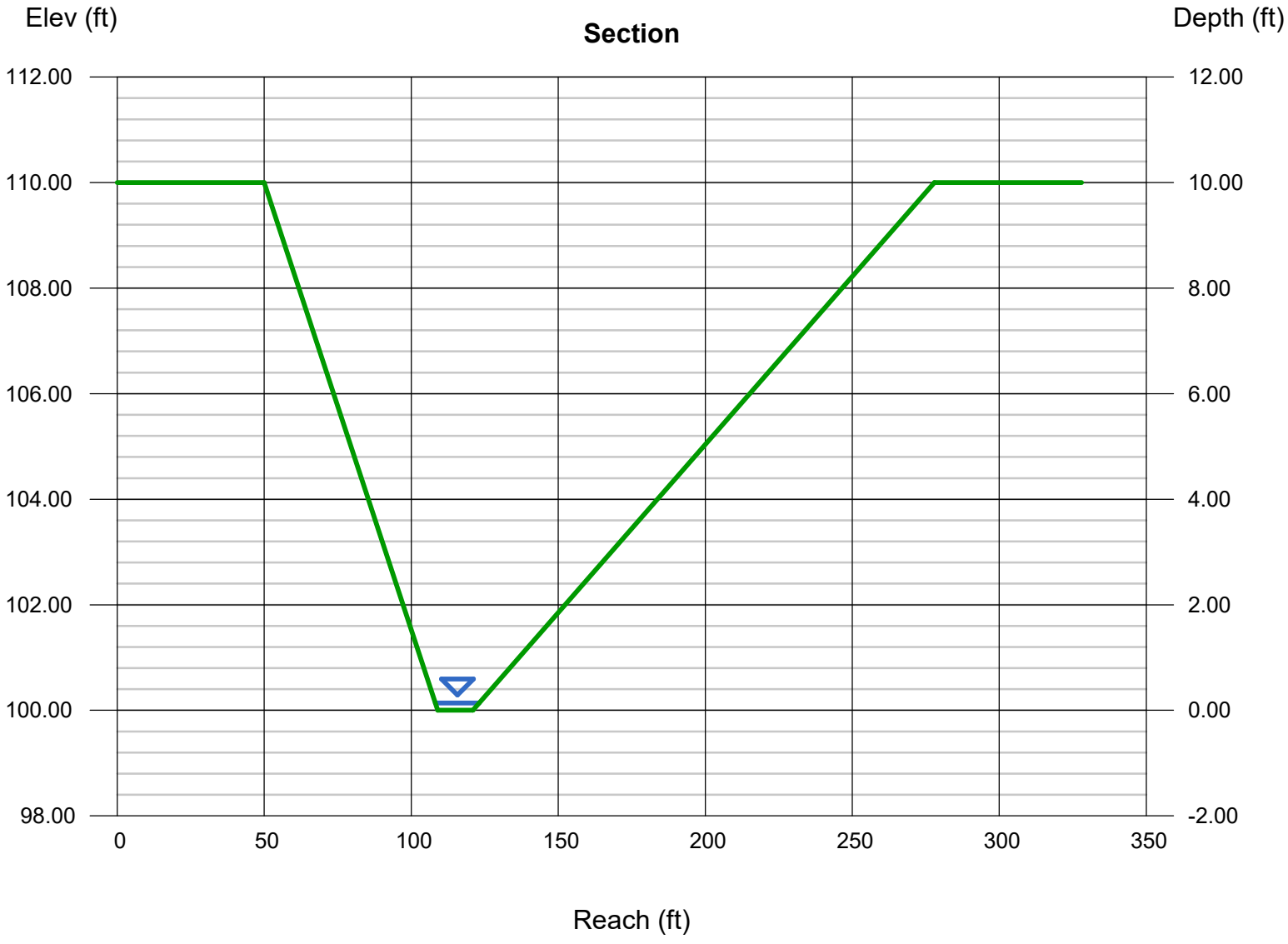
Bottom Width (ft)	= 11.95
Side Slopes (z:1)	= 5.90, 15.70
Total Depth (ft)	= 10.00
Invert Elev (ft)	= 100.00
Slope (%)	= 6.00
N-Value	= 0.035

Calculations

Compute by:	Known Q
Known Q (cfs)	= 4.50

Highlighted

Depth (ft)	= 0.14
Q (cfs)	= 4.500
Area (sqft)	= 1.88
Velocity (ft/s)	= 2.39
Wetted Perim (ft)	= 14.99
Crit Depth, Yc (ft)	= 0.16
Top Width (ft)	= 14.97
EGL (ft)	= 0.23



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Wednesday, Nov 11 2026

B-B - MAJOR

Trapezoidal

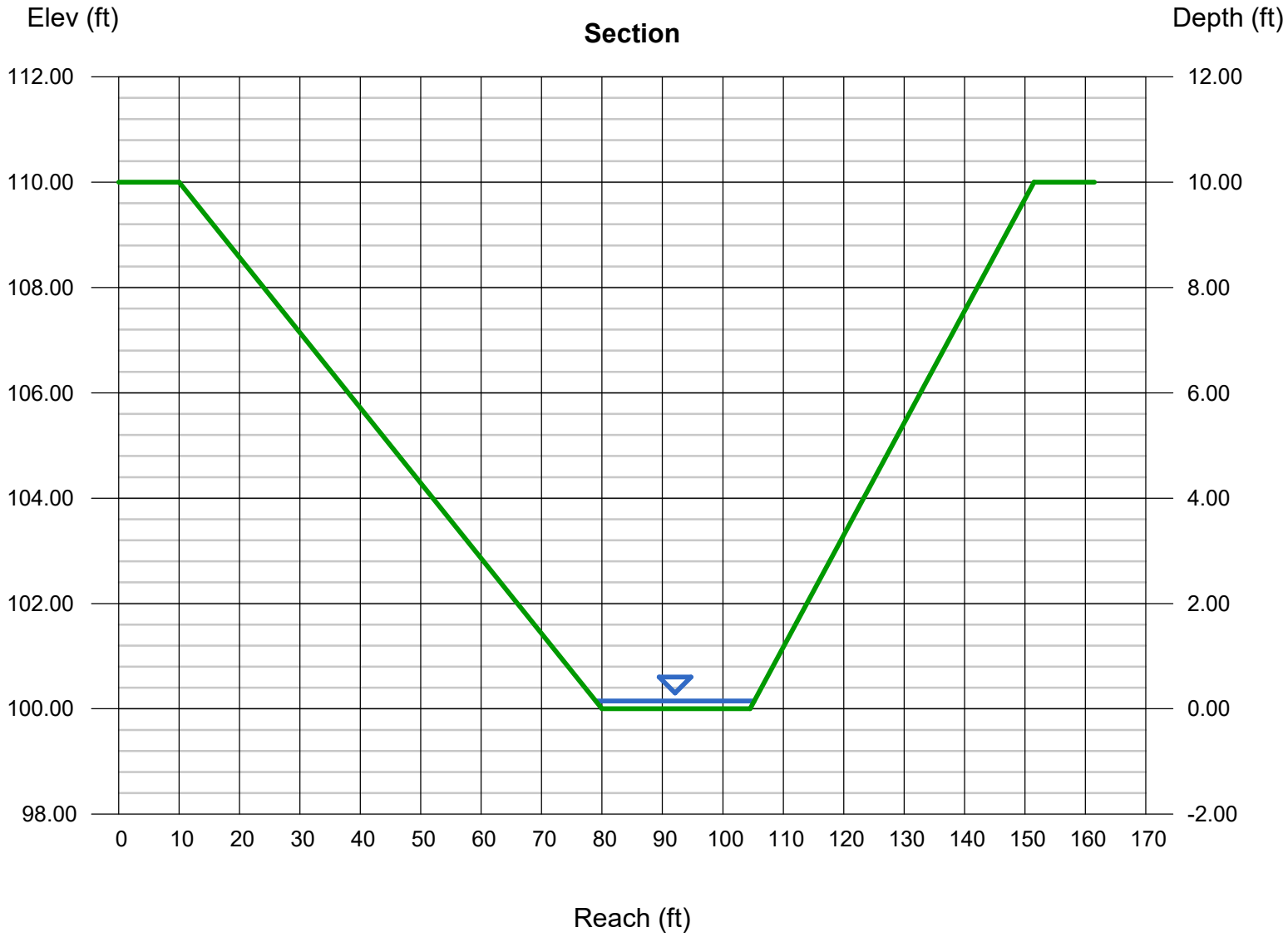
Bottom Width (ft)	= 24.50
Side Slopes (z:1)	= 7.00, 4.70
Total Depth (ft)	= 10.00
Invert Elev (ft)	= 100.00
Slope (%)	= 5.40
N-Value	= 0.035

Calculations

Compute by:	Known Q
Known Q (cfs)	= 9.80

Highlighted

Depth (ft)	= 0.15
Q (cfs)	= 9.800
Area (sqft)	= 3.81
Velocity (ft/s)	= 2.57
Wetted Perim (ft)	= 26.28
Crit Depth, Yc (ft)	= 0.17
Top Width (ft)	= 26.26
EGL (ft)	= 0.25



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Wednesday, Nov 11 2026

C-C - MAJOR

Trapezoidal

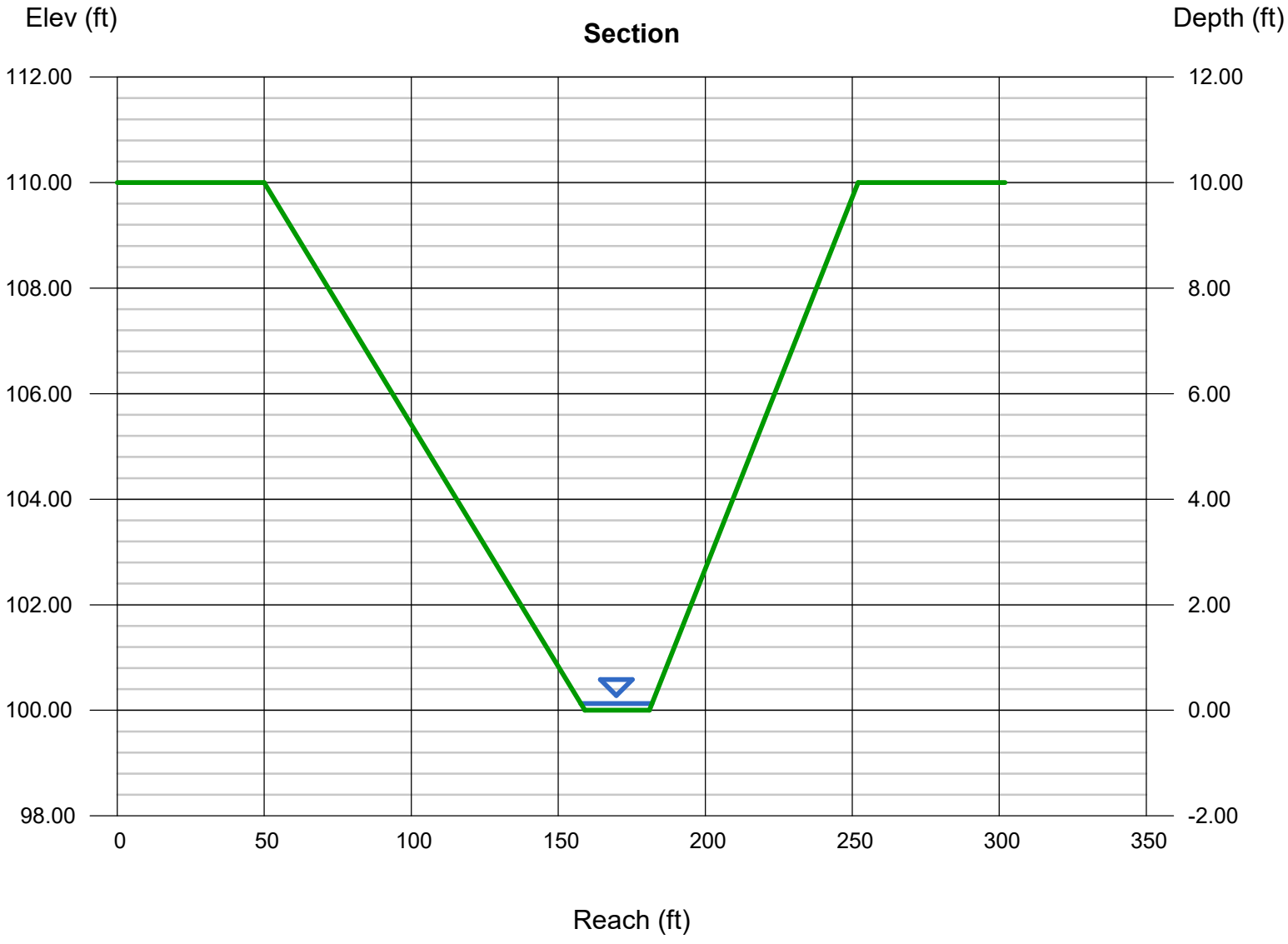
Bottom Width (ft)	= 21.96
Side Slopes (z:1)	= 10.90, 7.10
Total Depth (ft)	= 10.00
Invert Elev (ft)	= 100.00
Slope (%)	= 5.60
N-Value	= 0.035

Calculations

Compute by:	Known Q
Known Q (cfs)	= 6.90

Highlighted

Depth (ft)	= 0.13
Q (cfs)	= 6.900
Area (sqft)	= 3.01
Velocity (ft/s)	= 2.29
Wetted Perim (ft)	= 24.32
Crit Depth, Yc (ft)	= 0.15
Top Width (ft)	= 24.30
EGL (ft)	= 0.21



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Wednesday, Nov 11 2026

FHN F9 - DIVERSION SWALE D1-D1N

Triangular

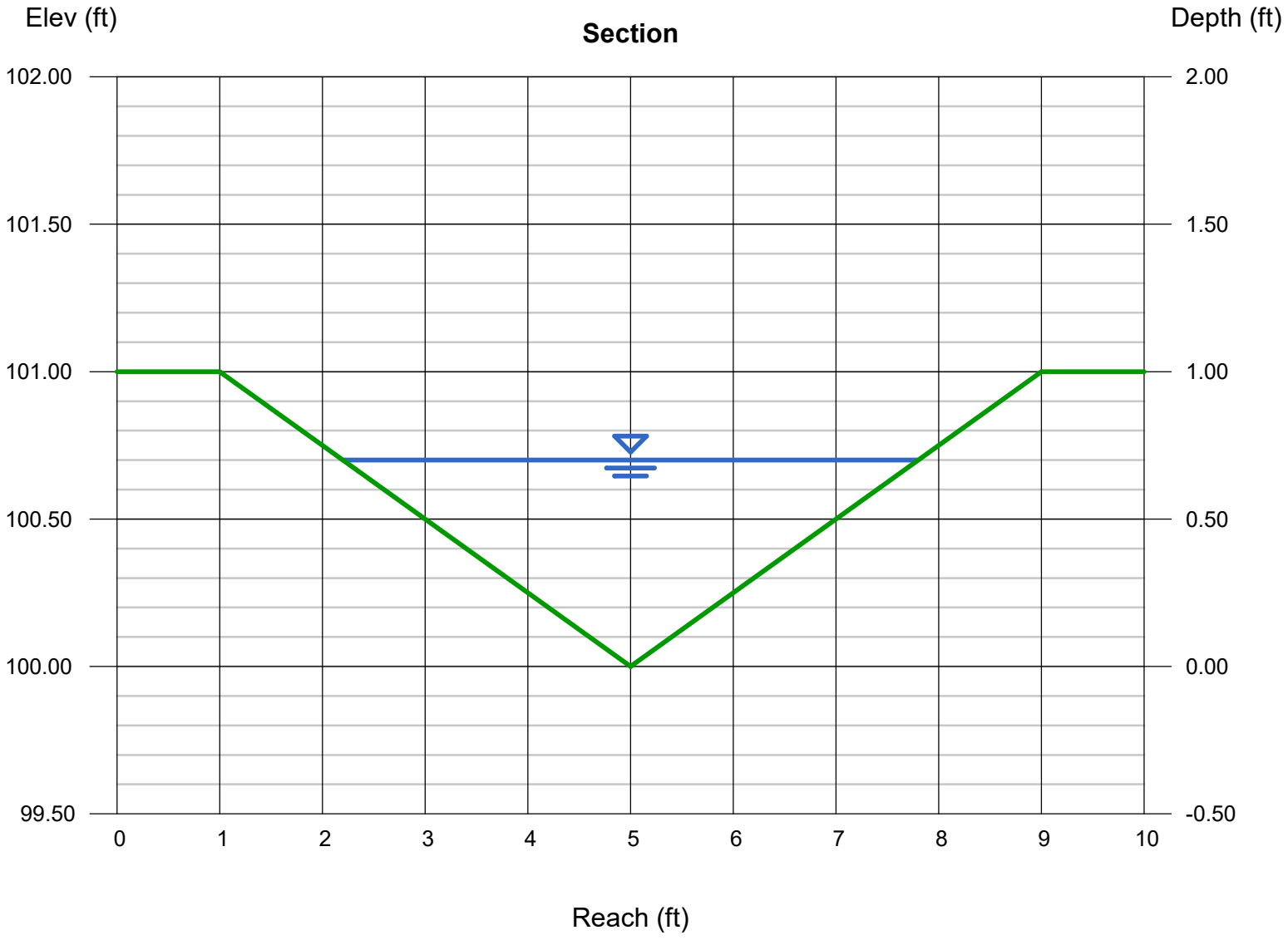
Side Slopes (z:1)	= 4.00, 4.00
Total Depth (ft)	= 1.00
Invert Elev (ft)	= 100.00
Slope (%)	= 6.00
N-Value	= 0.035

Calculations

Compute by:	Known Q
Known Q (cfs)	= 9.60

Highlighted

Depth (ft)	= 0.70
Q (cfs)	= 9.600
Area (sqft)	= 1.96
Velocity (ft/s)	= 4.90
Wetted Perim (ft)	= 5.77
Crit Depth, Yc (ft)	= 0.82
Top Width (ft)	= 5.60
EGL (ft)	= 1.07



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Wednesday, Nov 11 2026

D1-D1S - MAJOR

Trapezoidal

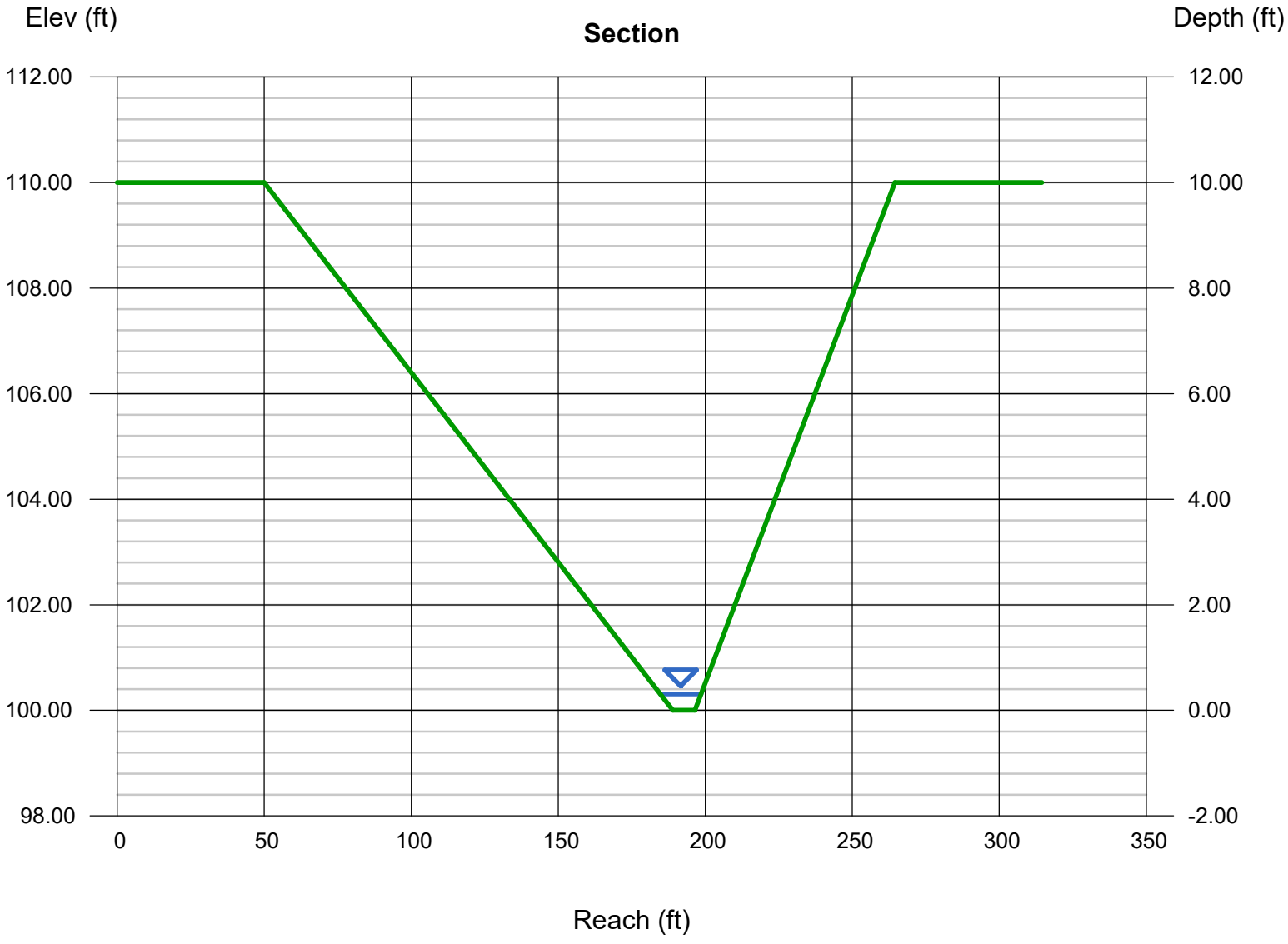
Bottom Width (ft)	= 7.48
Side Slopes (z:1)	= 13.90, 6.80
Total Depth (ft)	= 10.00
Invert Elev (ft)	= 100.00
Slope (%)	= 6.00
N-Value	= 0.035

Calculations

Compute by:	Known Q
Known Q (cfs)	= 12.60

Highlighted

Depth (ft)	= 0.31
Q (cfs)	= 12.60
Area (sqft)	= 3.31
Velocity (ft/s)	= 3.80
Wetted Perim (ft)	= 13.93
Crit Depth, Yc (ft)	= 0.38
Top Width (ft)	= 13.90
EGL (ft)	= 0.53



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Wednesday, Nov 11 2026

FHN F9 - DIVERSION SWALE D-D MIN SLOPE

Triangular

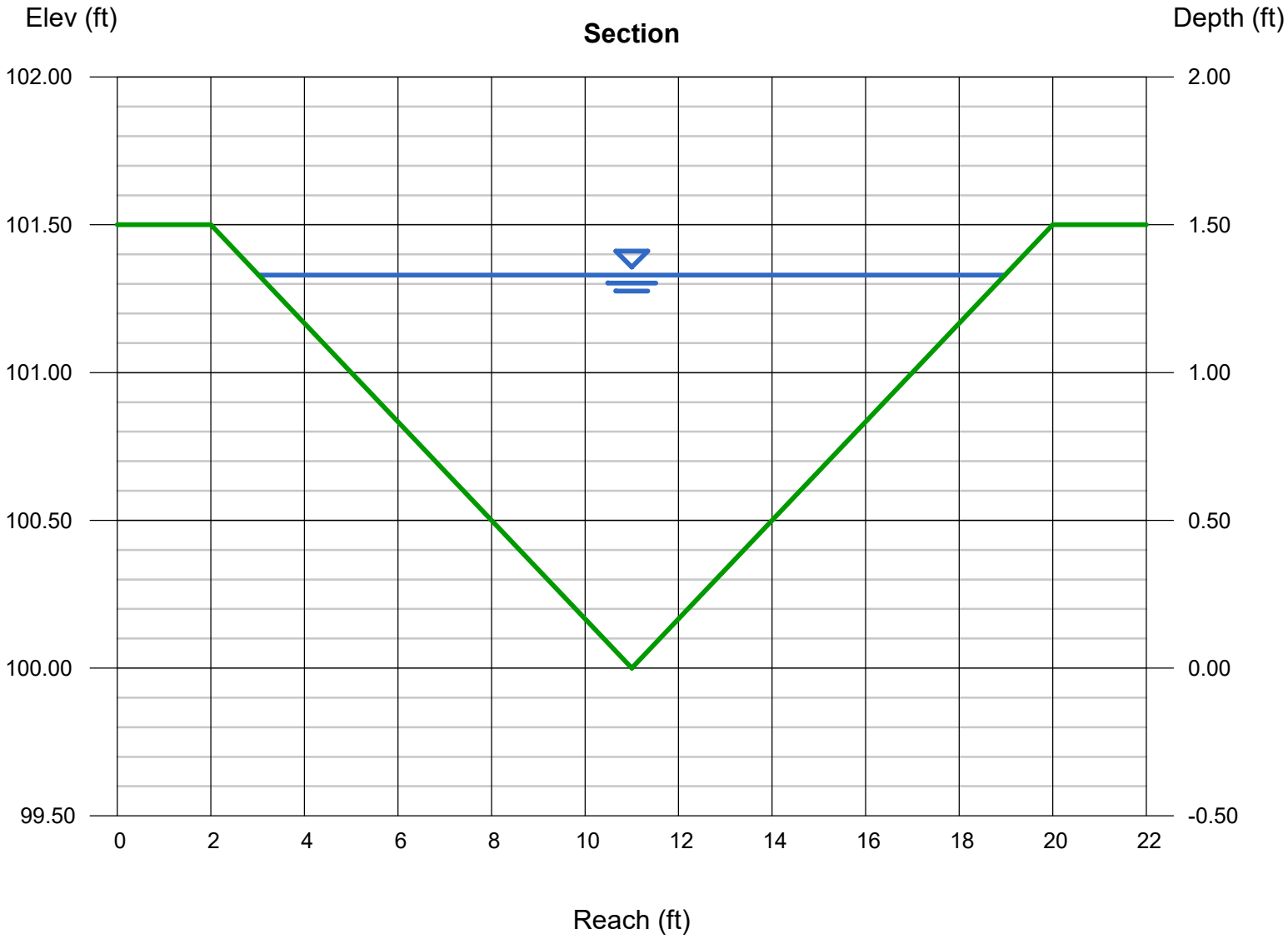
Side Slopes (z:1)	= 6.00, 6.00
Total Depth (ft)	= 1.50
Invert Elev (ft)	= 100.00
Slope (%)	= 0.50
N-Value	= 0.035

Calculations

Compute by:	Known Q
Known Q (cfs)	= 23.90

Highlighted

Depth (ft)	= 1.33
Q (cfs)	= 23.90
Area (sqft)	= 10.61
Velocity (ft/s)	= 2.25
Wetted Perim (ft)	= 16.18
Crit Depth, Yc (ft)	= 1.00
Top Width (ft)	= 15.96
EGL (ft)	= 1.41



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Wednesday, Nov 11 2026

FHN F9 - DIVERSION SWALE D-D MAX SLOPE

Triangular

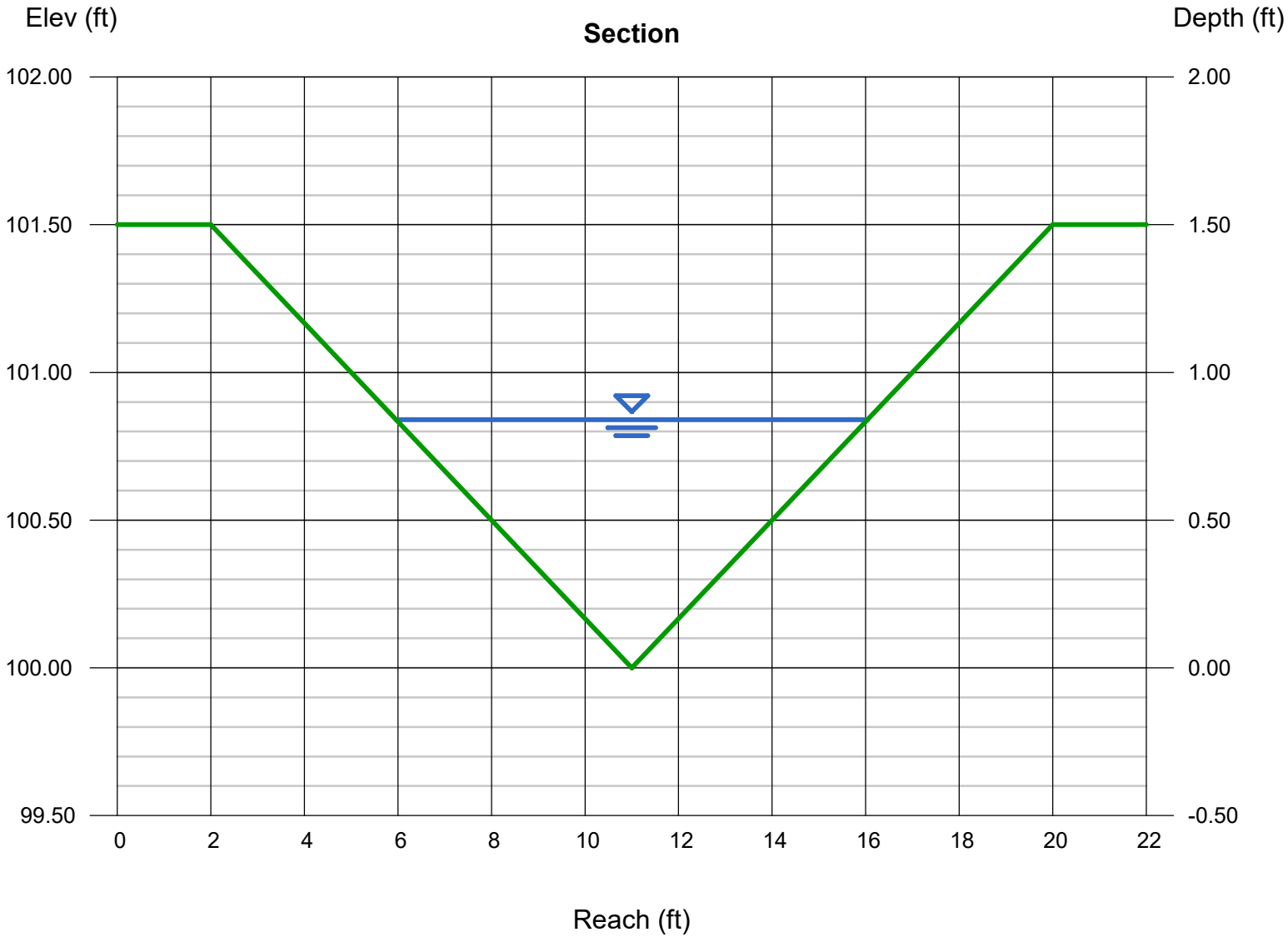
Side Slopes (z:1)	= 6.00, 6.00
Total Depth (ft)	= 1.50
Invert Elev (ft)	= 100.00
Slope (%)	= 6.00
N-Value	= 0.035

Calculations

Compute by:	Known Q
Known Q (cfs)	= 23.90

Highlighted

Depth (ft)	= 0.84
Q (cfs)	= 23.90
Area (sqft)	= 4.23
Velocity (ft/s)	= 5.65
Wetted Perim (ft)	= 10.22
Crit Depth, Yc (ft)	= 1.00
Top Width (ft)	= 10.08
EGL (ft)	= 1.34



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, Sep 8 2026

E-E - MAJOR

Trapezoidal

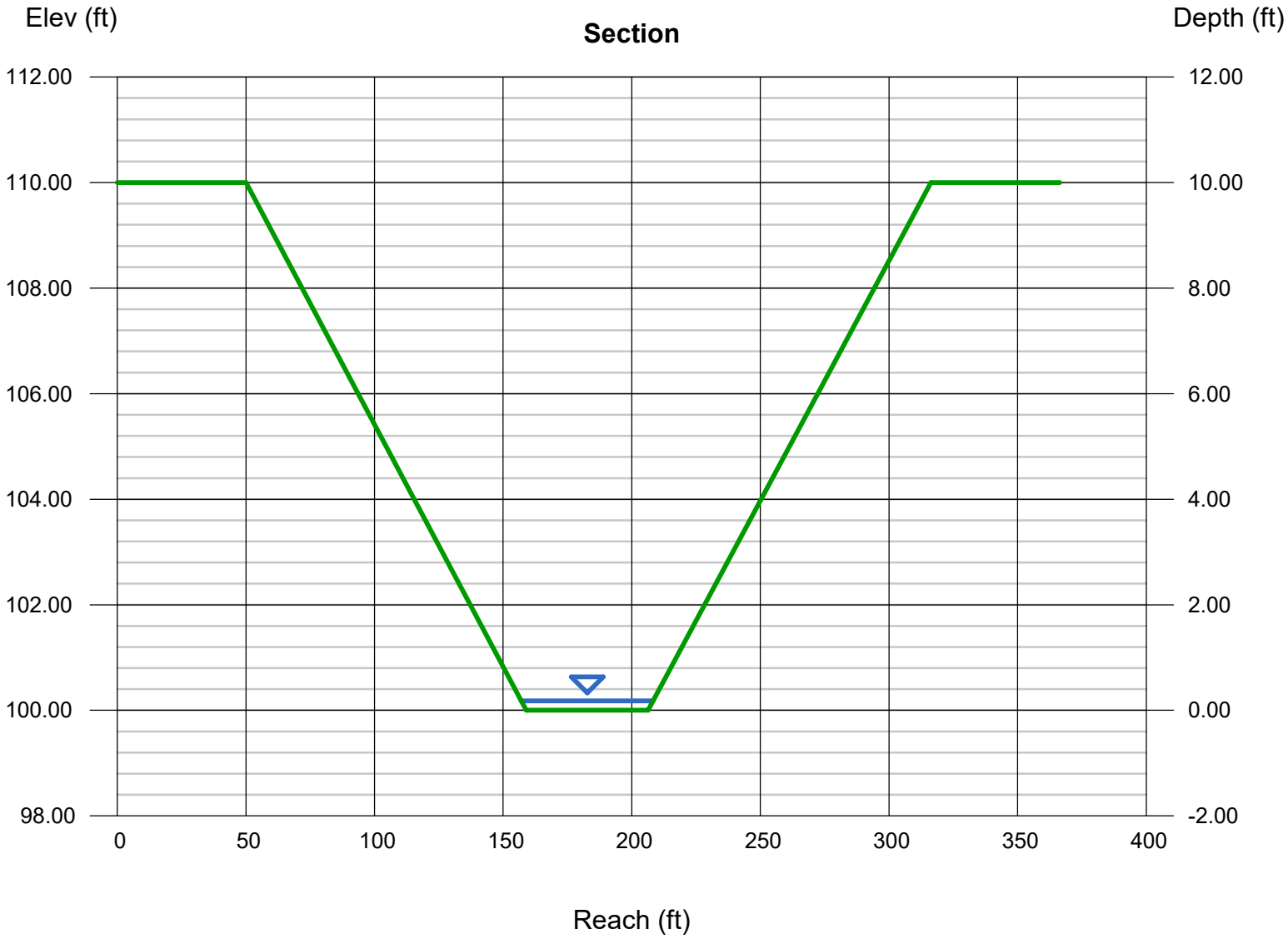
Bottom Width (ft)	= 47.32
Side Slopes (z:1)	= 10.90, 11.00
Total Depth (ft)	= 10.00
Invert Elev (ft)	= 100.00
Slope (%)	= 7.30
N-Value	= 0.035

Calculations

Compute by:	Known Q
Known Q (cfs)	= 31.40

Highlighted

Depth (ft)	= 0.18
Q (cfs)	= 31.40
Area (sqft)	= 8.87
Velocity (ft/s)	= 3.54
Wetted Perim (ft)	= 51.28
Crit Depth, Yc (ft)	= 0.24
Top Width (ft)	= 51.26
EGL (ft)	= 0.37



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, Sep 8 2026

F-F - MAJOR

Trapezoidal

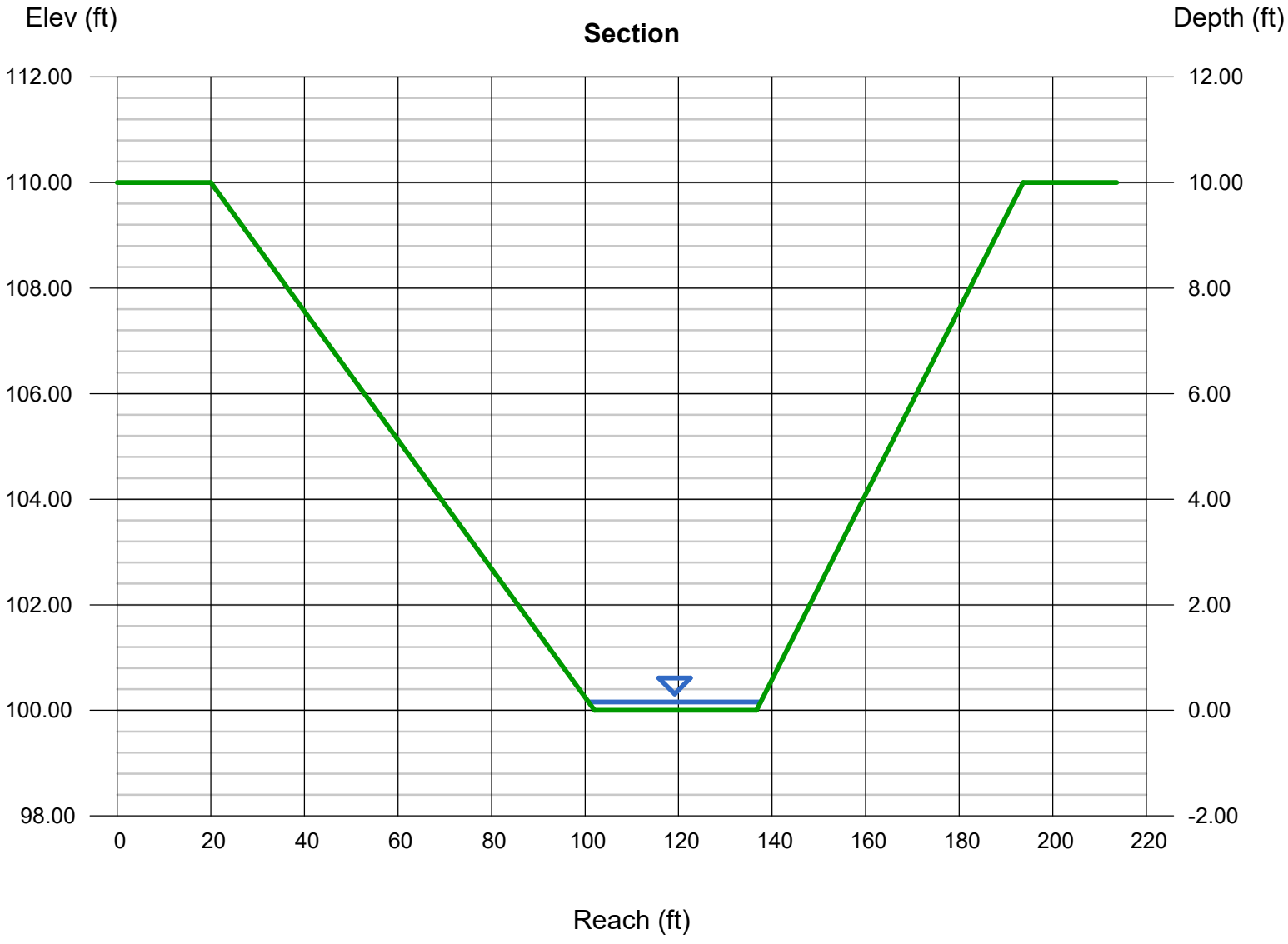
Bottom Width (ft)	= 34.70
Side Slopes (z:1)	= 8.20, 5.70
Total Depth (ft)	= 10.00
Invert Elev (ft)	= 100.00
Slope (%)	= 4.60
N-Value	= 0.035

Calculations

Compute by:	Known Q
Known Q (cfs)	= 14.60

Highlighted

Depth (ft)	= 0.16
Q (cfs)	= 14.60
Area (sqft)	= 5.73
Velocity (ft/s)	= 2.55
Wetted Perim (ft)	= 36.95
Crit Depth, Yc (ft)	= 0.18
Top Width (ft)	= 36.92
EGL (ft)	= 0.26



ROLLMAX™
ROLLED EROSION CONTROL

Specification Sheet – EroNet™ P300® Permanent Erosion Control Blanket

DESCRIPTION

The permanent erosion control blanket shall be a machine-produced mat of 100% UV stable polypropylene fiber. The matting shall be of consistent thickness with the synthetic fibers evenly distributed over the entire area of the mat. The matting shall be covered on the top side with black heavyweight UV-stabilized polypropylene netting having ultraviolet additives to delay breakdown and an approximate 0.50 x 0.50 inch (1.27 x 1.27 cm) mesh. The bottom net shall also be UV-stabilized polypropylene with a 0.63 x 0.63 inch (1.57 x 1.57 cm) mesh size. The blanket shall be sewn together on 1.5 inch (3.81 cm) centers with non-degradable thread. All mats shall be manufactured with a colored thread stitched along both outer edges as an overlap guide for adjacent mats. The P300 shall meet Type 5A, 5B, specification requirements established by the Erosion Control Technology Council (ECTC) and Federal Highway Administration's (FHWA) FP-03 Section 713.18

Material Content		
Matrix	100% UV stable Polypropylene Fiber	0.7 lbs/sq yd (0.38 kg/sm)
Netting	Top: UV-stabilized Polypropylene	5 lbs/1000 sq ft (24.4 g/sm)
	Bottom: UV-stabilized Polypropylene	3 lbs/1000 sq ft (14.7 g/sm)
Thread	Polypropylene, UV stable	

Standard Roll Sizes		
Width	6.5 ft (2.0 m)	8 ft (2.44 m)
Length	108 ft (32.92 m)	112 ft (35.14 m)
Weight ± 10%	61 lbs (27.66 kg)	76.25 lbs (34.59 kg)
Area	80 sq yd (66.0 sm)	100 sq yd (83.61 sm)

Slope Design Data: C Factors			
	Slope Gradients (S)		
Slope Length (L)	≤ 3:1	3:1 – 2.1	≥ 2:1
≤ 20 ft (6 m)	0.001	0.029	0.082
20-50 ft	0.036	0.060	0.086
≥ 50 ft (15.2 m)	0.070	0.090	0.110

Index Property	Test Method	Typical
Thickness	ASTM D6525	0.47 in. (11.94 mm)
Resiliency	ASTM D6524	91.5%
Density	ASTM D792	0.916 g/cm^3
Mass/Unit Area	ASTM 6566	13.03 oz/sy (443 g/m2)
UV Stability	ASTM D4355/ 1000 hr	90%
Porosity	ECTC Guidelines	95.89%
Stiffness	ASTM D1388	0.94 in-lb (1085378 mg-cm)
Light Penetration	ASTM D6567	17.9%
Tensile Strength - MD	ASTM D6818	438 lbs/ft (6.49 kN/m)
Elongation - MD	ASTM D6818	28.1%
Tensile Strength - TD	ASTM D6818	291.9 lbs/ft (4.32 kN/m)
Elongation - TD	ASTM D6818	26.7%
Biomass Improvement	ASTM D7322	497%

Design Permissible Shear Stress		
	Short Duration	**Long Duration**
Phase 1: Unvegetated	3.0 psf (144 Pa)	2.0 psf (96 Pa)
Phase 2: Partially Veg.	8.0 psf (383 Pa)	8.0 psf (383 Pa)
Phase 3: Fully Veg.	8.0 psf (383 Pa)	8.0 PSF (383 Pa)
Unvegetated Velocity	9.0 fps (2.7 m/s)	
Vegetaged Velocity	16 fps (4.9 m/s)	

Roughness Coefficients – Unveg.	
Flow Depth	Manning's n
≤ 0.50 ft (0.15 m)	0.034
0.50 – 2.0 ft	0.034-0.020
≥ 2.0 ft (0.60 m)	0.020

NORTH AMERICAN GREEN®

North American Green
5401 St. Wendel-Cynthiana Road
Poseyville, Indiana 47633

nagreen.com
800-772-2040

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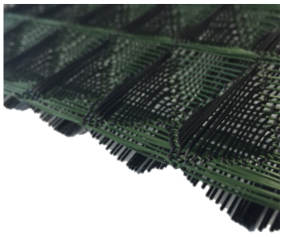
MATERIAL PROPERTY DATA SHEET

WESTERN GREEN

TMAX™

Permanent • 3-D Woven • UV Stable •
High Performance Turf Reinforcement Mat

DESCRIPTION



TMAX is a High-Performance Turf Reinforcement Mat (HP-TRM) produced by weaving 100% UV-stabilized, high denier synthetic mono-filament yarns woven into permanent, high-strength, three-dimensional structure. The optimized properties of the material provide immediate erosion control with excellent vegetation establishment and class-leading long-term turf reinforcement. Additionally, the high strength at low elongation is ideal for slope stability applications (when paired with deep-seated, high strength anchors) and is unique compared to other HPTRMs. The design life of TMAX is rated at fifty years in typical installations, however, can vary based on conditions. TMAX is made in the USA and monitored by quality assurance testing at a GAI-LAP accredited laboratory.

Material Content	
Woven , Single Layer	Green or Tan

Standard Roll Sizes				
Width	11.5 ft	(3.5 m)	11.5 ft	(3.5 m)
Length	78 ft	(24.0 m)	156 ft	(47.5 m)
Weight ± 10%	75 lb	(35.0 kg)	150 lb	(70.0 kg)
Area	100 sy	(83.6 m^2)	200 SY	(167.0 m^2)

Material available in custom roll sizes

Approvals & Classification	
Classification	FHWA: Type 5.C / ECTC: 5.F
TTI Approvals	N/A
NTPEP Number	N/A

Index Property	Test Method	MARV	
Thickness	ASTM D6525	0.4 in.	(9 mm)
Mass/Unit Area	ASTM D6566	10.0 oz/sy	(350 g/sm)
Tensile Strength – MD	ASTM D6818	4,400 lbs/ft	(64.2 kN/m)
Tensile Strength – TD	ASTM D6818	3,300 lbs/ft	(48.2 kN/m)
Elongation - MD	ASTM D6818	35%	
Elongation – TD	ASTM D6818	30%	
UV Stability	ASTM D4355	90% @6000 hr	
UV Stability	ASTM D7238	90% @6000 hr	
Resiliency	ASTM D6524	75%	
Light Penetration	ASTM D6567	25%	
Biomass Improvement	ASTM D7322	300%	
Specific Gravity	ASTM D792	57.4 lb/ft^3	(0.92 g/cm^3)
Porosity	ECTC	96%	
Carbon Footprint	GHG*	1.9 kg CO_2 e/m^2	

Design Parameters		
Property	**Unvegetated**	**Vegetated[3]**
RUSLE C Factor[2]	N/A	N/A
Slope Maximum Gradient[1]	0.5H:1V	0.5H:1V
Permissible Shear Stress[2]	2.3 psf	16.0 psf (765 Pa)
Permissible Velocity[2]	8.0 fps	25.0 fps (7.6 m/s)
τ_{veg} / τ_{TRM} (HEC-15)	N/A	0.47

Manning's n Roughness (HEC-15)		
τ_{lower}	τ_{mid}	τ_{upper}
0.041	0.031	0.027

1 Maximum Gradient a recomendation for typical installations.
2 Hydraulic thresholds compliant with ASTM D6459/D6460 but generalized for typical applications.
3 Vegetated values dependent on established stand of vegetation
*WRI/WBCSD Greenhouse Gas Protocol: Product Life Cycle Accounting and Reporting Standard, 2013.

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Rev. 4.2023
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NORTH AMERICAN GREEN®

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MHFD-Inlet, Version 6.00 (August 2025)

INLET MANAGEMENT

Project: Flying Horse North Filing No. 9
Minor: 5-year
Major: 100-year

Worksheet Protected

INLET NAME	BS-20a
Inlet Application (Street or Area)	STREET
Hydraulic Condition	In Sump
Inlet Type	CDOT Type R Curb Opening
Number of Inlet Units	2

USER-DEFINED INPUT

User-Defined Peak Flows

Minor Peak Flow, Q (cfs)	8.10
Major Peak Flow, Q (cfs)	14.60

Bypass (Carry-Over) Flow from Upstream Inlets must be organized from upstream (left) t

Receive Bypass Flow from:	No Bypass Flow Received
Bypass Flow Description (Optional):	
Minor Bypass Flow Received, Q_b (cfs)	0.00
Major Bypass Flow Received, Q_b (cfs)	0.00

CALCULATED OUTPUT

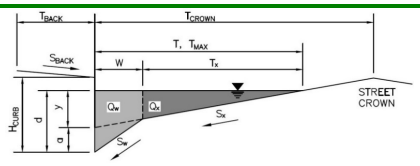
Minor Total Design Peak Flow, Q (cfs)	8.10
Major Total Design Peak Flow, Q (cfs)	14.60
Minor Inlet Interception Capacity, Q_a (cfs)	8.28
Major Inlet Interception Capacity, Q_a (cfs)	15.82
Minor Flow Bypassed Downstream, Qb (cfs)	N/A
Major Flow Bypassed Downstream, Qb (cfs)	N/A
Minor Flow Capture Percentage, C%	100%
Major Flow Capture Percentage, C%	100%

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: **Flying Horse North Filing No. 9**

Inlet ID: **BS-20a**



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	10.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.015	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	14.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.012	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	14.0	14.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	7.9	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

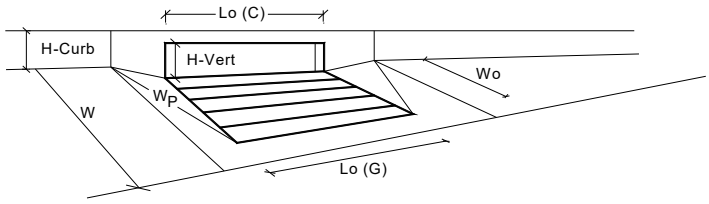
MINOR STORM Allowable Capacity is not applicable to Sump Condition

MAJOR STORM Allowable Capacity is not applicable to Sump Condition

	Minor Storm	Major Storm	
Q_{allow} =	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 6.00 (August 2025)



Design Information (Input)		MINOR	MAJOR	
Type of Inlet (CDOT Type R Curb Opening)	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	2	2	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	7.9	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Open Area Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.33	0.49	ft
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.93	1.00	
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**8.3**	**15.8**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)	$Q_{PEAK\ REQUIRED}$ =	8.1	14.6	cfs

MHFD-Inlet, Version 6.00 (August 2025)

INLET MANAGEMENT

Project: Flying Horse North Filing No. 9
Minor: 5-year
Major: 100-year

Worksheet Protected

INLET NAME	BS-20a - Street Capacity
Inlet Application (Street or Area)	STREET
Hydraulic Condition	On Grade
Inlet Type	
Number of Inlet Units	

USER-DEFINED INPUT

User-Defined Peak Flows

Minor Peak Flow, Q (cfs)	8.10
Major Peak Flow, Q (cfs)	14.60

Bypass (Carry-Over) Flow from Upstream Inlets must be organized from upstream (left) t

Receive Bypass Flow from:	No Bypass Flow Received
Bypass Flow Description (Optional):	
Minor Bypass Flow Received, Q_b (cfs)	0.00
Major Bypass Flow Received, Q_b (cfs)	0.00

CALCULATED OUTPUT

Minor Total Design Peak Flow, Q (cfs)	8.10
Major Total Design Peak Flow, Q (cfs)	14.60
Minor Inlet Interception Capacity, Q_a (cfs)	
Major Inlet Interception Capacity, Q_a (cfs)	
Minor Flow Bypassed Downstream, Qb (cfs)	
Major Flow Bypassed Downstream, Qb (cfs)	
Minor Flow Capture Percentage, C%	
Major Flow Capture Percentage, C%	

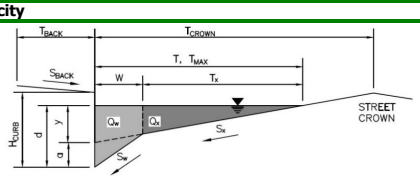
MHFD-Inlet, Version 6.00 (August 2025)

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: **Flying Horse North Filing No. 9**

Inlet ID: **BS-20a - Street Capacity**



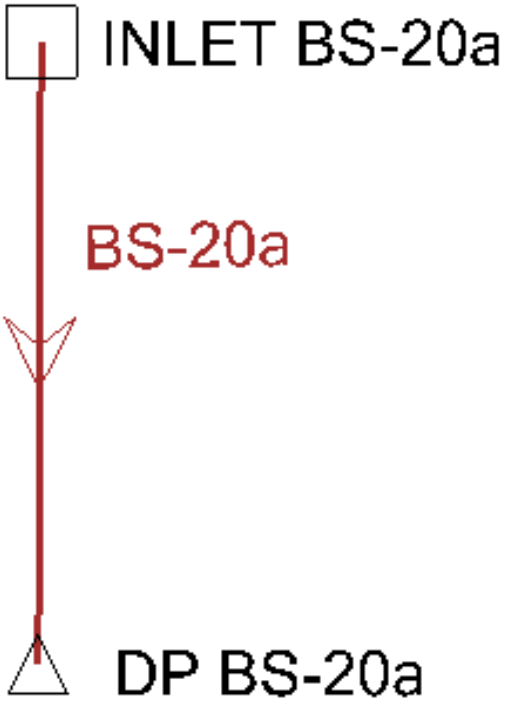
Gutter Geometry:			
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	10.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.015	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	14.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.073	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.012	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	14.0	14.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.9	7.9	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☑	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**17.7**	**32.5**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 8.10 cfs on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design peak flow of 14.60 cfs on sheet 'Inlet Management'


INLET BS-20a
BS-20a
DP BS-20a

5-YR RESULTS

FlexTable: Catch Basin Table (FHN F9 - Proposed Storm.stsw)

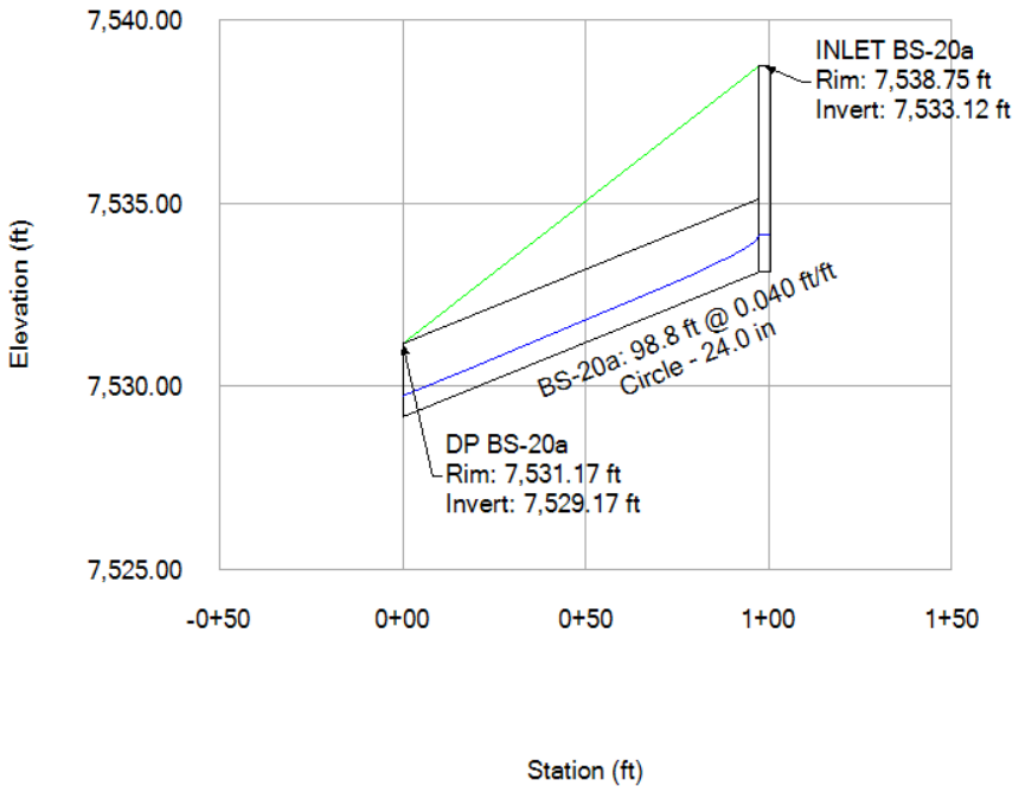
	Label	Elevation (Ground) (ft)	Elevation (Rim) (ft)	Elevation (Invert) (ft)	Inlet Type	Flow (Known) (cfs)	Headloss Coefficient (Standard)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)
32: INLET BS-2	INLET BS-20a	7,538.75	7,538.75	7,533.12	Full Capture	8.10	0.050	7,534.15	7,534.13

FlexTable: Conduit Table (FHN F9 - Proposed Storm.stsw)

	Label	Start Node	Invert (Start) (ft)	Stop Node	Invert (Stop) (ft)	Length (User Defined) (ft)	Slope (Calculated) (ft/ft)	Diameter (in)	Manning's n	Flow (cfs)	Velocity (ft/s)
33: BS-20a	BS-20a	INLET BS-20a	7,533.12	DP BS-20a	7,529.17	98.8	0.040	24.0	0.013	8.10	10.89

FlexTable: Outfall Table (FHN F9 - Proposed Storm.stsw)

	Label	Elevation (Ground) (ft)	Elevation (Invert) (ft)	Boundary Condition Type	Hydraulic Grade (ft)	Flow (Total Out) (cfs)
31: DP BS-20a	DP BS-20a	7,531.17	7,529.17	Free Outfall	7,529.74	8.10



100-YR RESULTS

FlexTable: Catch Basin Table (FHN F9 - Proposed Storm.stsw)

	Label	Elevation (Ground) (ft)	Elevation (Rim) (ft)	Elevation (Invert) (ft)	Inlet Type	Flow (Known) (cfs)	Headloss Coefficient (Standard)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)
32: INLET BS-2	INLET BS-20a	7,538.75	7,538.75	7,533.12	Full Capture	14.60	0.050	7,534.53	7,534.50

FlexTable: Conduit Table (FHN F9 - Proposed Storm.stsw)

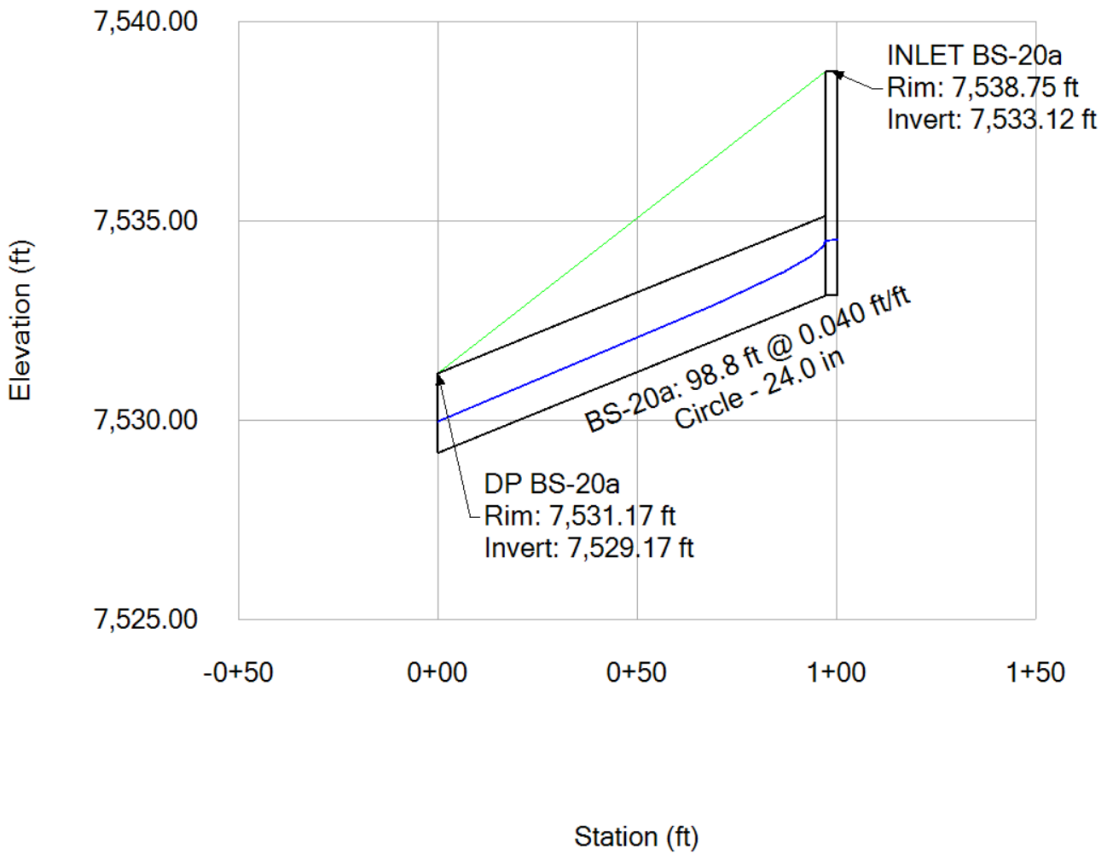
	Label	Start Node	Invert (Start) (ft)	Stop Node	Invert (Stop) (ft)	Length (User Defined) (ft)	Slope (Calculated) (ft/ft)	Diameter (in)	Manning's n	Flow (cfs)	Velocity (ft/s)
33: BS-20a	BS-20a	INLET BS-20a	7,533.12	DP BS-20a	7,529.17	98.8	0.040	24.0	0.013	14.60	12.84

1 of 1 elements displayed

FlexTable: Outfall Table (FHN F9 - Proposed Storm.stsw)

	Label	Elevation (Ground) (ft)	Elevation (Invert) (ft)	Boundary Condition Type	Hydraulic Grade (ft)	Flow (Total Out) (cfs)
31: DP BS-20a	DP BS-20a	7,531.17	7,529.17	Free Outfall	7,529.96	14.60

1 of 1 elements displayed



HRGreen	FHN FILING 9	Calc'd by:	SPC
	2502599	Checked by:	RDL
	OUTLET BS-20a	Date:	6/24/2026

Input Parameters		
Flow (Q)	14.6	cfs
Tailwater depth (Y_t)	0.80	ft
Conduit Diameter (D_c)	24	in
Expansion Factor (per Fig. 9-35)	4.5	
Soil Type	Non-Cohesive Soils	

Calculated Parameters		
Froude Parameter ($Q/D^{2.5}$)	2.58	
D_{50} =	4.28	in
UDFCD Riprap Type =	Type VL	
Design D_{50} =	6	in
Minimum Mantle Thickness =	12	in
Minimum Length of Apron (L_p) =	8	ft
Minimum Width of Apron (T) =	3	ft

Calculated D_{50} for riprap was calculated using Equation 9-16 in the USDCM Vol 2.

$$d_{50} = \frac{0.023Q}{Y_t^{1.2} D_c^{0.3}}$$

Calculated minimum length of apron was calculated using Equations 9-11 and 9-12 in the USDCM Vol. 2

$$L_p = \left(\frac{1}{2\tan\theta}\right)\left(\frac{A_t}{Y_t} - W\right)$$ Equation 9-11

$$A_t = \frac{Q}{V}$$ Equation 9-12

Where:

L_p = length of protection (ft)

W = width of the conduit (ft, use diameter for circular conduits)

Y_t = tailwater depth (ft)

θ = the expansion angle of the culvert flow

Where:

Q = design discharge (cfs)

V = the allowable non-eroding velocity in the downstream channel (ft/sec)

A_t = required area of flow at allowable velocity (ft^2)

Calculated minimum width of apron was calculated using Equations 9-14 in the USDCM Vol. 2

$$T = 2(L_p \tan\theta) + W$$ Equation 9-14

Note:

[1] Calculations follow criteria in the USDCM Vol.2 Chapter 9

[2] Calculations assume a circular culvert

[3] This spreadsheet assumes y_t/D_t=0.4 in cases where y_t is unknown or a hydraulic jump is suspected downstream of the outlet.

[4] Per the USDCM Vol.2 in no case should L_p be less than 3D, nor does L_p need to be greater than 10D whenever the Froude parameter is less than 6.0. whenever the Froude parameter is greater than 6, increase the maximum L_p required by 1/4 D_c for each whole number by which the Froude parameter is greater than 6. The minimum width of Apron (T) should not be less than 1.5* the outlet pipe diameter.

APPENDIX D

WATER QUALITY AND DETENTION CALCULATIONS

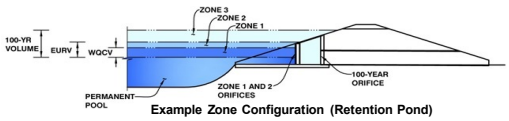
DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: FLYING HORSE NORTH FILING NO. 3

Basin ID: DESIGN POINT 2 (FLATS/CONDO AREA)

FILING 3 POND A EXISTING CONDITIONS, USED FOR EX. CONDITION ANALYSIS ONLY



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	18.41	acres
Watershed Length =	1,800	ft
Watershed Length to Centroid =	400	ft
Watershed Slope =	0.050	ft/ft
Watershed Imperviousness =	36.49%	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) =	0.261	acre-feet	acre-feet
Excess Urban Runoff Volume (EURV) =	0.700	acre-feet	acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	0.680	acre-feet	1.19 inches
5-yr Runoff Volume (P1 = 1.5 in.) =	1.043	acre-feet	1.50 inches
10-yr Runoff Volume (P1 = 1.75 in.) =	1.372	acre-feet	1.75 inches
25-yr Runoff Volume (P1 = 2 in.) =	1.849	acre-feet	2.00 inches
50-yr Runoff Volume (P1 = 2.25 in.) =	2.221	acre-feet	2.25 inches
100-yr Runoff Volume (P1 = 2.52 in.) =	2.706	acre-feet	2.52 inches
500-yr Runoff Volume (P1 = 3.14 in.) =	3.661	acre-feet	inches
Approximate 2-yr Detention Volume =	0.511	acre-feet	
Approximate 5-yr Detention Volume =	0.720	acre-feet	
Approximate 10-yr Detention Volume =	1.008	acre-feet	
Approximate 25-yr Detention Volume =	1.139	acre-feet	
Approximate 50-yr Detention Volume =	1.197	acre-feet	
Approximate 100-yr Detention Volume =	1.385	acre-feet	

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.261	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.439	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.685	acre-feet
Total Detention Basin Volume =	1.385	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	

Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	**user**	acre-feet

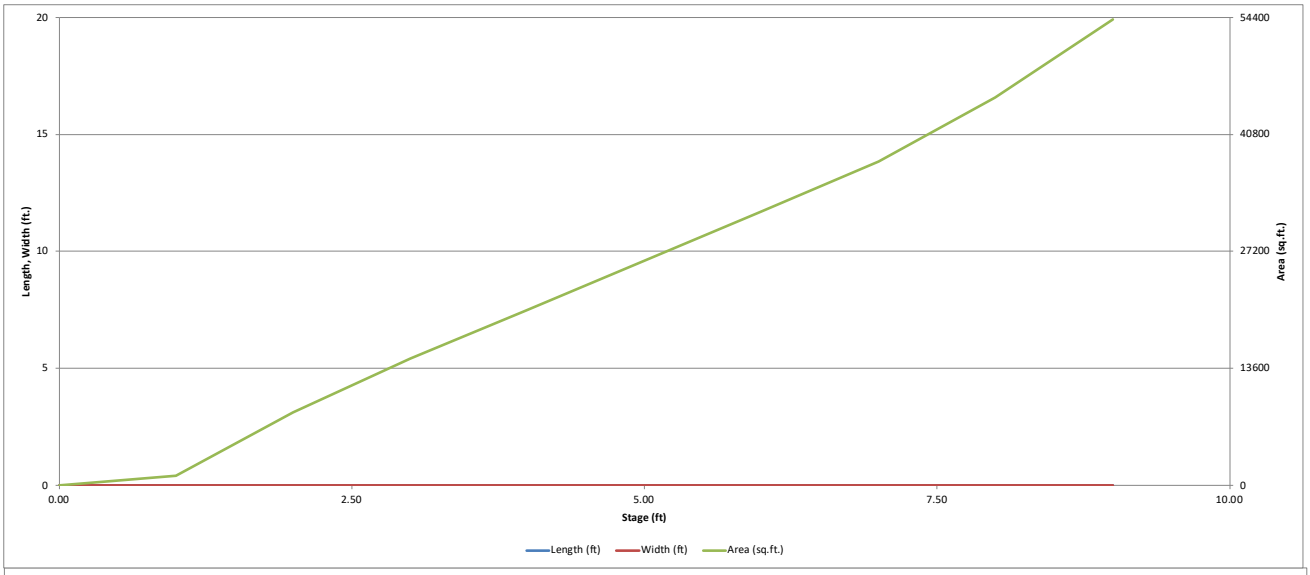
Depth Increment = ft

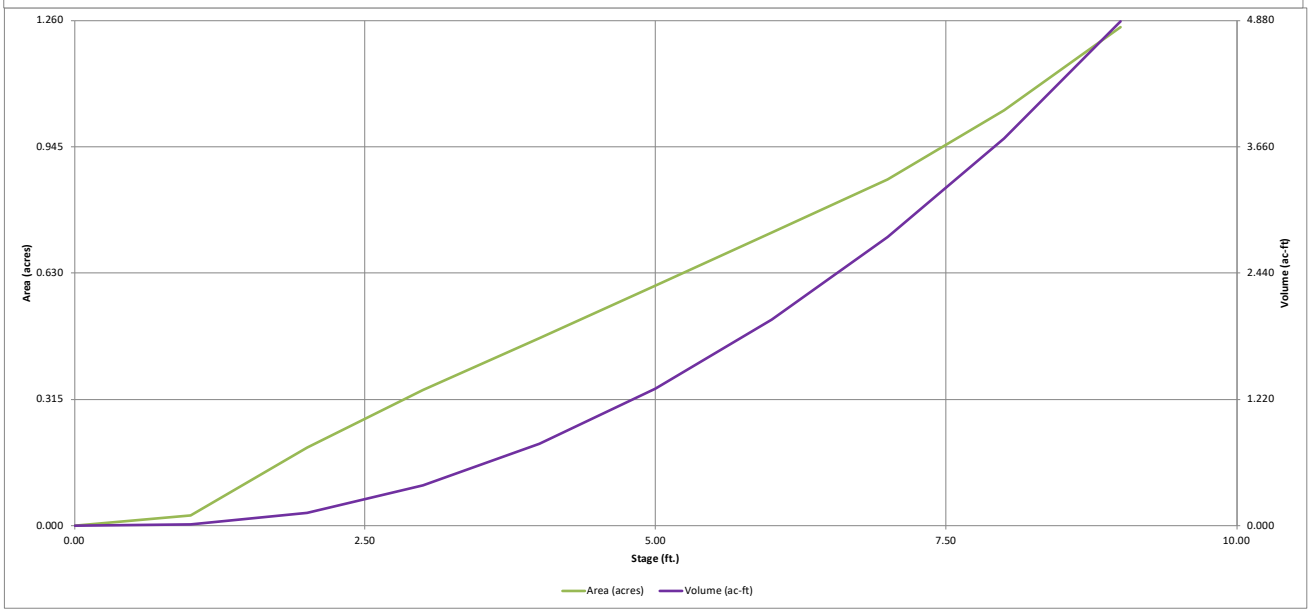
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	10	0.000		
7560	--	1.00	--	--	--	1,113	0.026	561	0.013
7561	--	2.00	--	--	--	8,453	0.194	5,344	0.123
7562	--	3.00	--	--	--	14,744	0.338	16,943	0.389
7563	--	4.00	--	--	--	20,362	0.467	34,496	0.792
7564	--	5.00	--	--	--	26,080	0.599	57,717	1.325
7565	--	6.00	--	--	--	31,869	0.732	86,691	1.990
7566	--	7.00	--	--	--	37,633	0.864	121,442	2.788
7567	--	8.00	--	--	--	45,096	1.035	162,807	3.738
7568	--	9.00	--	--	--	54,170	1.244	212,440	4.877

7559

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)



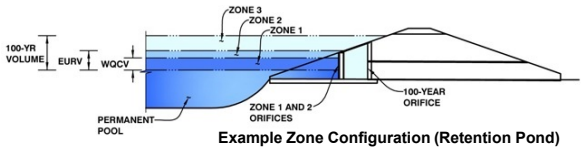


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: **FLYING HORSE NORTH FILING NO. 3**

Basin ID: **DESIGN POINT 2 (FLATS/CONDO AREA)**



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.59	0.261	Orifice Plate
Zone 2 (EURV)	3.80	0.439	Orifice Plate
Zone 3 (100-year)	5.10	0.685	Weir&Pipe (Restrict)
Total (all zones)		1.385	

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

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

Calculated Parameters for Underdrain

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

Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	N/A	ft^2
Depth at top of Zone using Orifice Plate =	3.80	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	N/A	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	N/A	sq. inches	Elliptical Slot Area =	N/A	ft^2

Calculated Parameters for Plate

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	2.00						
Orifice Area (sq. inches)	1.77	3.14						

	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 =	4.50	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	4.50	N/A	feet
Overflow Weir Front Edge Length =	6.00	N/A	feet	Overflow Weir Slope Length =	3.00	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	6.07	N/A	
Horiz. Length of Weir Sides =	3.00	N/A	feet	Overflow Grate Open Area w/o Debris =	12.53	N/A	ft^2
Overflow Grate Type =	Type C Grate	N/A		Overflow Grate Open Area w/ Debris =	6.26	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 =	0.50	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	2.07	N/A	ft^2
Outlet Pipe Diameter =	24.00	N/A	inches	Outlet Orifice Centroid =	0.71	N/A	feet
Restrictor Plate Height Above Pipe Invert =	15.00		inches	Half-Central Angle of Restrictor Plate on Pipe =	1.82	N/A	radians

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	6.00	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.87	feet
Spillway Crest Length =	16.00	feet	Stage at Top of Freeboard =	7.87	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	1.01	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	3.60	acre-ft

Calculated Parameters for Spillway

Routed Hydrograph Results

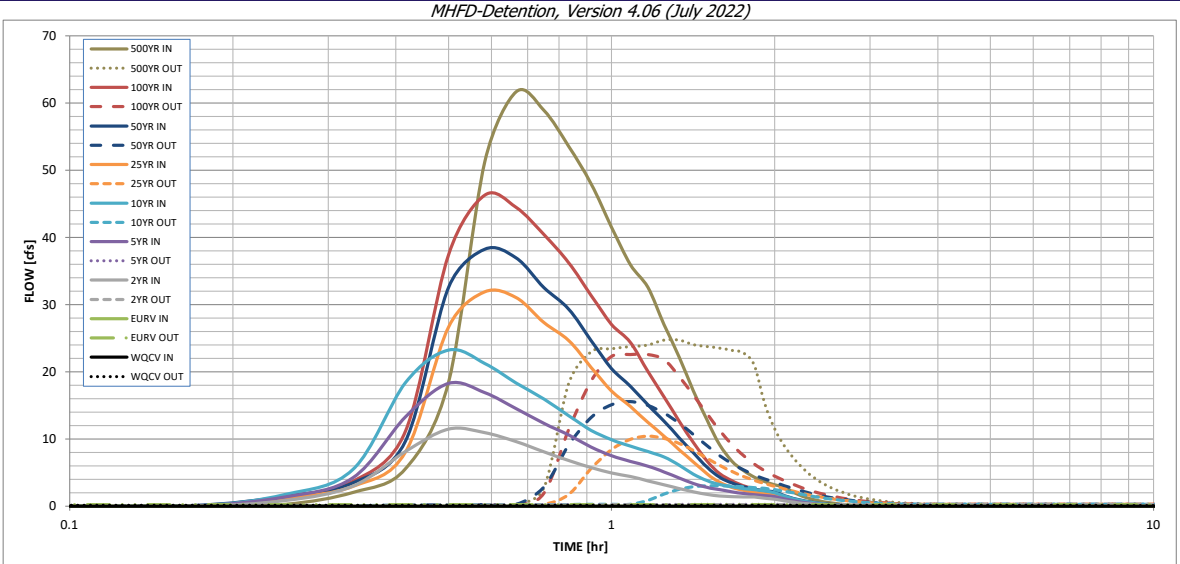
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

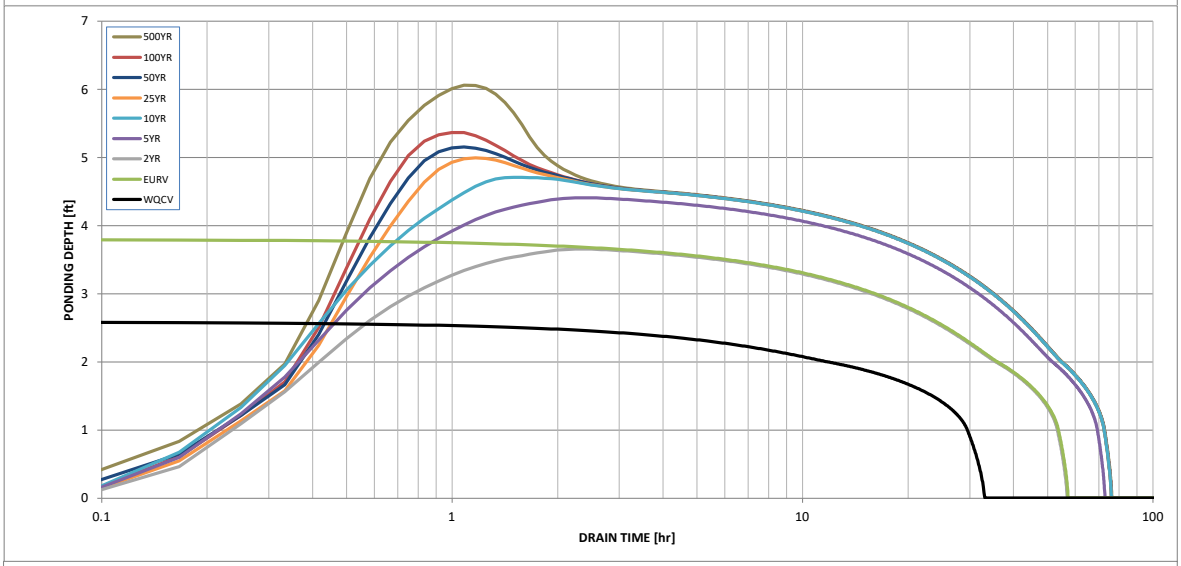
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.14
CUHP Runoff Volume (acre-ft) =	0.261	0.700	0.680	1.043	1.372	1.849	2.221	2.706	3.661
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.680	1.043	1.372	1.849	2.221	2.706	3.661
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	2.5	7.1	10.6	18.7	23.4	29.2	40.7
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.14	0.38	0.57	1.01	1.27	1.59	2.21
Peak Inflow Q (cfs) =	N/A	N/A	11.5	18.3	23.3	31.9	38.3	46.3	61.7
Peak Outflow Q (cfs) =	0.2	0.3	0.2	0.3	3.0	10.4	15.6	22.6	24.7
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.0	0.3	0.6	0.7	0.8	0.6
Structure Controlling Flow =	Plate	Plate	Plate	Plate	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	0.2	0.8	1.2	1.8	1.9
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) =	31	52	52	66	68	65	63	61	57
Time to Drain 99% of Inflow Volume (hours) =	32	55	55	70	73	72	71	70	69
Maximum Ponding Depth (ft) =	2.59	3.80	3.66	4.41	4.71	5.00	5.15	5.37	6.06
Area at Maximum Ponding Depth (acres) =	0.28	0.44	0.42	0.52	0.56	0.60	0.62	0.65	0.74
Maximum Volume Stored (acre-ft) =	0.262	0.701	0.636	0.989	1.151	1.319	1.416	1.549	2.027

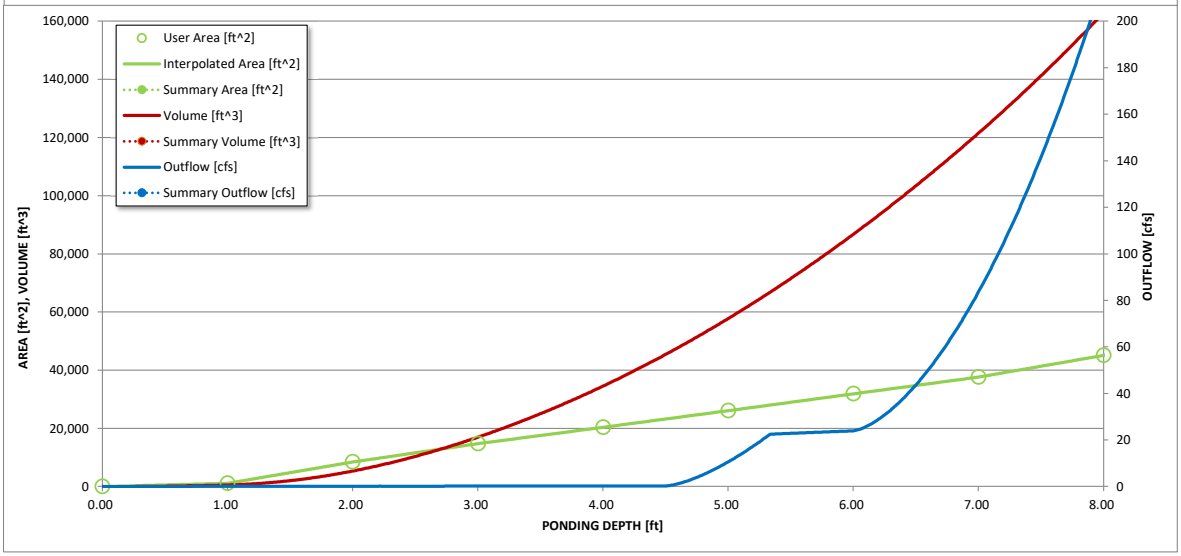
REQUIRES ORIFICE PLATE REPLACEMENT DUE TO ANALYSIS OF AS-BUILT BASINS IN THIS REPORT. SEE PROPOSED POND A CONDITION.

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)







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	0.10	0.01	0.32
	0:15:00	0.00	0.00	0.86	1.41	1.75	1.18	1.47	1.45	2.08
	0:20:00	0.00	0.00	3.03	4.24	5.50	2.98	3.48	3.74	5.56
	0:25:00	0.00	0.00	8.15	13.32	18.37	8.05	9.68	11.14	18.48
	0:30:00	0.00	0.00	11.50	18.28	23.26	26.69	32.57	37.45	51.24
	0:35:00	0.00	0.00	10.94	16.91	21.27	31.90	38.26	46.30	61.69
	0:40:00	0.00	0.00	9.65	14.55	18.36	31.05	36.95	44.47	58.92
	0:45:00	0.00	0.00	8.09	12.34	15.96	27.35	32.54	40.44	53.58
	0:50:00	0.00	0.00	6.83	10.61	13.49	24.68	29.36	36.27	48.00
	0:55:00	0.00	0.00	5.75	8.82	11.31	20.69	24.67	31.39	41.53
	1:00:00	0.00	0.00	4.96	7.53	9.90	17.15	20.51	27.06	35.98
	1:05:00	0.00	0.00	4.43	6.68	8.96	14.86	17.88	24.39	32.58
	1:10:00	0.00	0.00	3.78	5.97	8.13	12.48	15.09	20.06	27.04
	1:15:00	0.00	0.00	3.19	5.13	7.33	10.46	12.69	16.27	22.17
	1:20:00	0.00	0.00	2.65	4.22	6.12	8.40	10.16	12.63	17.16
	1:25:00	0.00	0.00	2.16	3.41	4.78	6.60	7.95	9.47	12.81
	1:30:00	0.00	0.00	1.77	2.81	3.80	4.82	5.80	6.74	9.15
	1:35:00	0.00	0.00	1.55	2.48	3.24	3.56	4.32	4.87	6.74
	1:40:00	0.00	0.00	1.45	2.15	2.89	2.84	3.46	3.80	5.32
	1:45:00	0.00	0.00	1.40	1.90	2.65	2.38	2.92	3.08	4.35
	1:50:00	0.00	0.00	1.37	1.72	2.49	2.08	2.55	2.59	3.68
	1:55:00	0.00	0.00	1.20	1.59	2.29	1.88	2.31	2.24	3.20
	2:00:00	0.00	0.00	1.06	1.45	2.02	1.75	2.15	2.00	2.86
	2:05:00	0.00	0.00	0.81	1.10	1.52	1.31	1.60	1.45	2.08
	2:10:00	0.00	0.00	0.61	0.82	1.11	0.96	1.17	1.05	1.50
	2:15:00	0.00	0.00	0.46	0.60	0.81	0.70	0.86	0.77	1.09
	2:20:00	0.00	0.00	0.34	0.44	0.59	0.52	0.63	0.57	0.81
	2:25:00	0.00	0.00	0.25	0.32	0.43	0.37	0.45	0.41	0.58
	2:30:00	0.00	0.00	0.18	0.22	0.31	0.26	0.32	0.30	0.42
	2:35:00	0.00	0.00	0.13	0.16	0.22	0.19	0.23	0.22	0.30
	2:40:00	0.00	0.00	0.08	0.11	0.15	0.13	0.16	0.15	0.21
	2:45:00	0.00	0.00	0.05	0.07	0.09	0.08	0.10	0.09	0.13
	2:50:00	0.00	0.00	0.03	0.04	0.05	0.05	0.06	0.05	0.07
	2:55:00	0.00	0.00	0.01	0.02	0.02	0.02	0.02	0.02	0.03
	3:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00
	3:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
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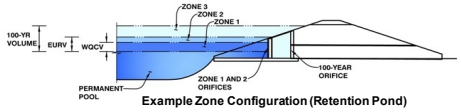
DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

FILING 3 POND A
PROPOSED CONDITIONS

Project: FLYING HORSE NORTH FILING NO. 3

Basin ID: DESIGN POINT 2 (FLATS/CONDO AREA)



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	18.31	acres
Watershed Length =	1,800	ft
Watershed Length to Centroid =	400	ft
Watershed Slope =	0.050	ft/ft
Watershed Imperviousness =	39.64%	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) =	0.273	acre-feet	acre-feet
Excess Urban Runoff Volume (EURV) =	0.762	acre-feet	acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	0.734	acre-feet	1.19 inches
5-yr Runoff Volume (P1 = 1.5 in.) =	1.100	acre-feet	1.50 inches
10-yr Runoff Volume (P1 = 1.75 in.) =	1.429	acre-feet	1.75 inches
25-yr Runoff Volume (P1 = 2 in.) =	1.903	acre-feet	2.00 inches
50-yr Runoff Volume (P1 = 2.25 in.) =	2.271	acre-feet	2.25 inches
100-yr Runoff Volume (P1 = 2.52 in.) =	2.751	acre-feet	2.52 inches
500-yr Runoff Volume (P1 = 3.14 in.) =	3.705	acre-feet	inches
Approximate 2-yr Detention Volume =	0.561	acre-feet	
Approximate 5-yr Detention Volume =	0.784	acre-feet	
Approximate 10-yr Detention Volume =	1.081	acre-feet	
Approximate 25-yr Detention Volume =	1.210	acre-feet	
Approximate 50-yr Detention Volume =	1.269	acre-feet	
Approximate 100-yr Detention Volume =	1.456	acre-feet	

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.273	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.489	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.694	acre-feet
Total Detention Basin Volume =	1.456	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	

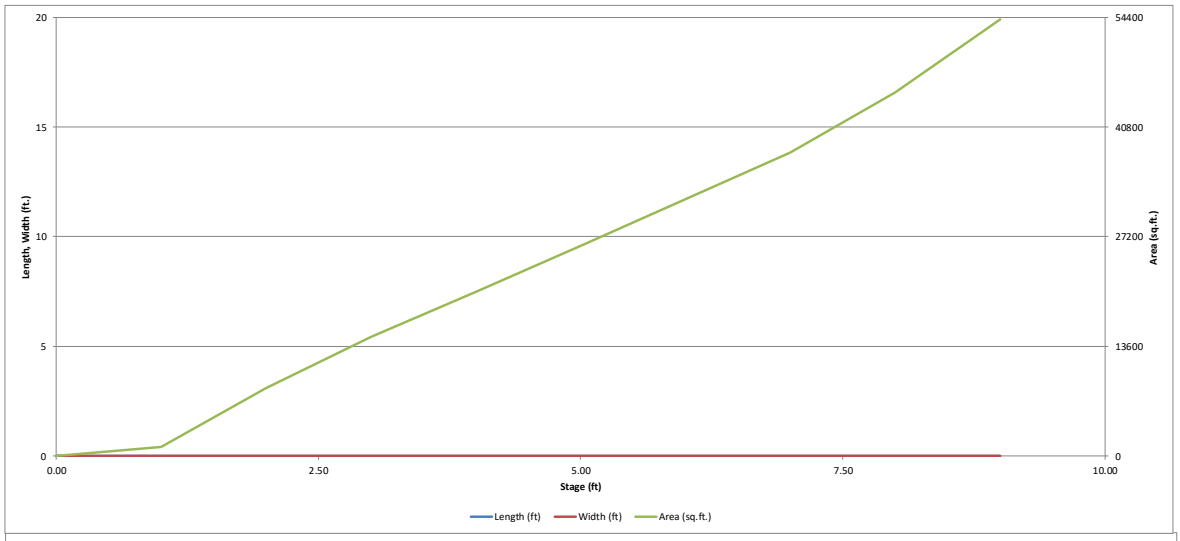
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	**user**	acre-feet

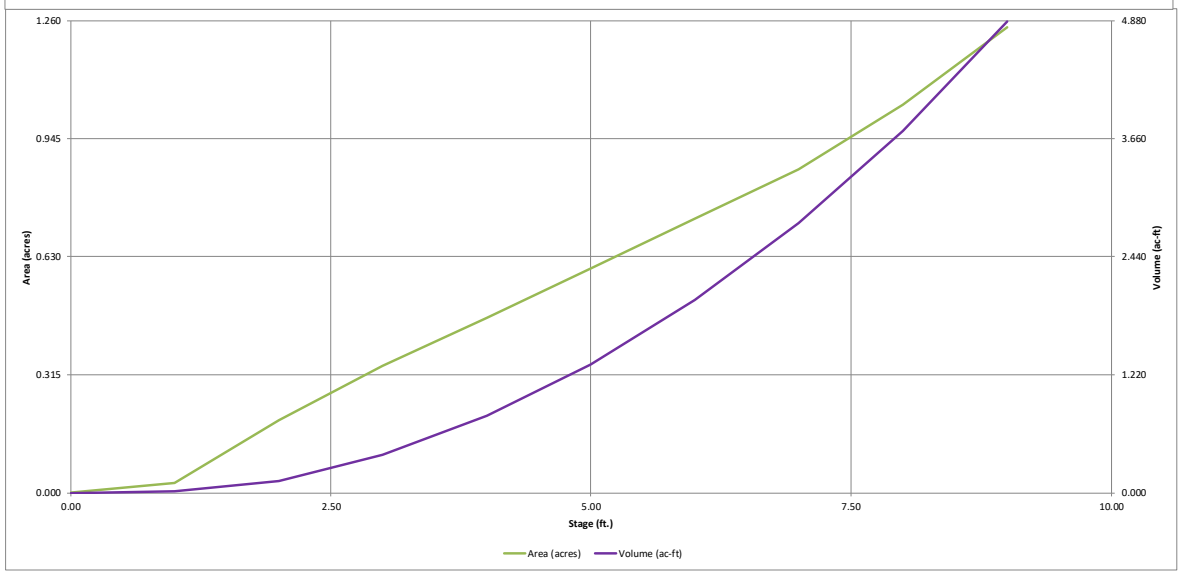
Depth Increment = ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
7559 **Top of Micropool**	--	0.00	--	--	--	10	0.000		
7560	--	1.00	--	--	--	1,113	0.026	561	0.013
7561	--	2.00	--	--	--	8,453	0.194	5,344	0.123
7562	--	3.00	--	--	--	14,744	0.338	16,943	0.389
7563	--	4.00	--	--	--	20,362	0.467	34,496	0.792
7564	--	5.00	--	--	--	26,080	0.599	57,717	1.325
7565	--	6.00	--	--	--	31,869	0.732	86,691	1.990
7566	--	7.00	--	--	--	37,633	0.864	121,442	2.788
7567	--	8.00	--	--	--	45,096	1.035	162,807	3.738
7568	--	9.00	--	--	--	54,170	1.244	212,440	4.877

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)



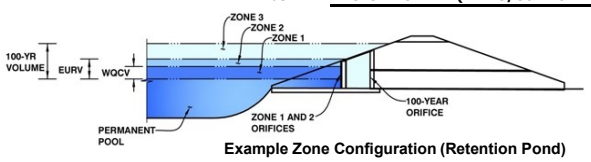


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: FLYING HORSE NORTH FILING NO. 3

Basin ID: DESIGN POINT 2 (FLATS/CONDO AREA)



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.63	0.273	Orifice Plate
Zone 2 (EURV)	3.94	0.489	Orifice Plate
Zone 3 (100-year)	5.22	0.694	Weir&Pipe (Restrict)
Total (all zones)		1.456	

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

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

Calculated Parameters for Underdrain

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

Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	N/A	ft^2
Depth at top of Zone using Orifice Plate =	4.51	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	N/A	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	N/A	sq. inches	Elliptical Slot Area =	N/A	ft^2

Calculated Parameters for Plate

PROPOSED ORIFICE PLATE REPLACEMENT.

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	1.50	3.00					
Orifice Area (sq. inches)	1.23	1.23	8.30					

	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 =	4.50	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	4.50	N/A	feet
Overflow Weir Front Edge Length =	6.00	N/A	feet	Overflow Weir Slope Length =	3.00	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V	-yr Orifice Area =	8.92	N/A	
Horiz. Length of Weir Sides =	3.00	N/A	feet	Area w/o Debris =	12.53	N/A	ft^2
Overflow Grate Type =	Type C Grate	N/A		Area w/ Debris =	6.26	N/A	ft^2
Debris Clogging % =	50%	N/A	%				

Calculated Parameters for Overflow Weir

PROPOSED RESTRICTOR PLATE ADJUSTMENT

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 =	0.50	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	1.40	N/A	ft^2
Outlet Pipe Diameter =	24.00	N/A	inches	Outlet Orifice Centroid =	0.53	N/A	feet
Restrictor Plate Height Above Pipe Invert =	11.00		inches	Half-Central Angle of Restrictor Plate on Pipe =	1.49	N/A	radians

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	6.00	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.87	feet
Spillway Crest Length =	16.00	feet	Stage at Top of Freeboard =	7.87	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	1.01	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	3.60	acre-ft

Calculated Parameters for Spillway

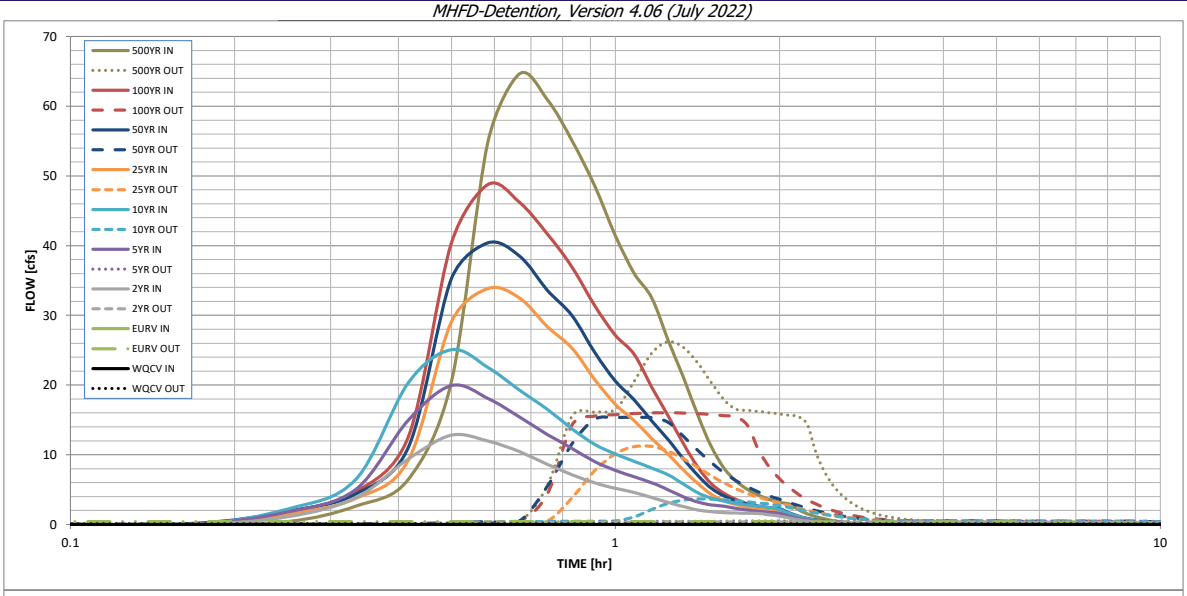
Routed Hydrograph Results

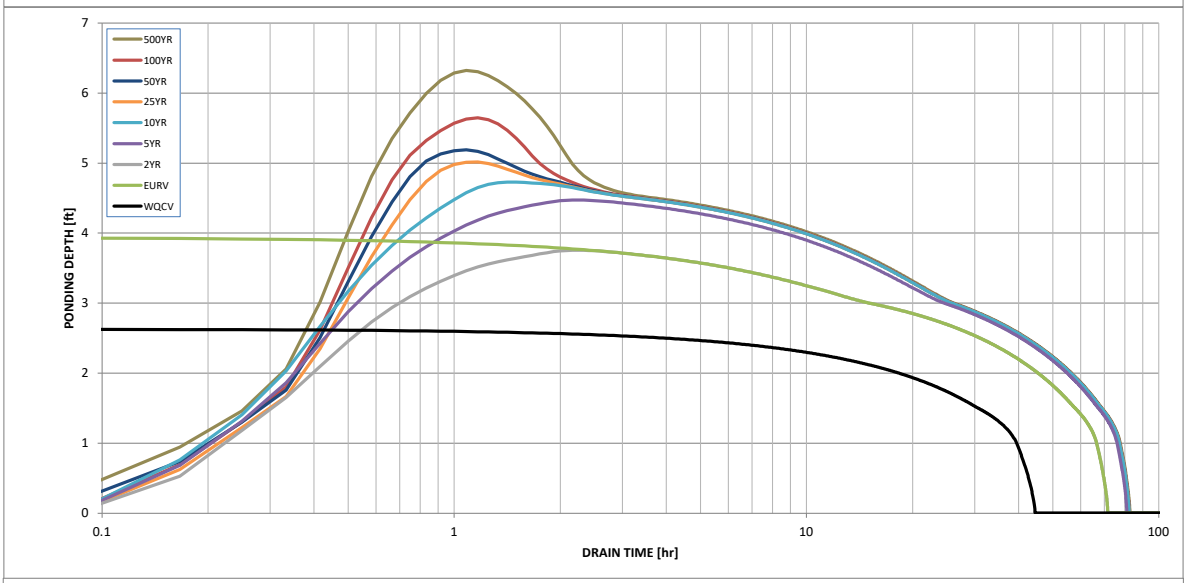
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

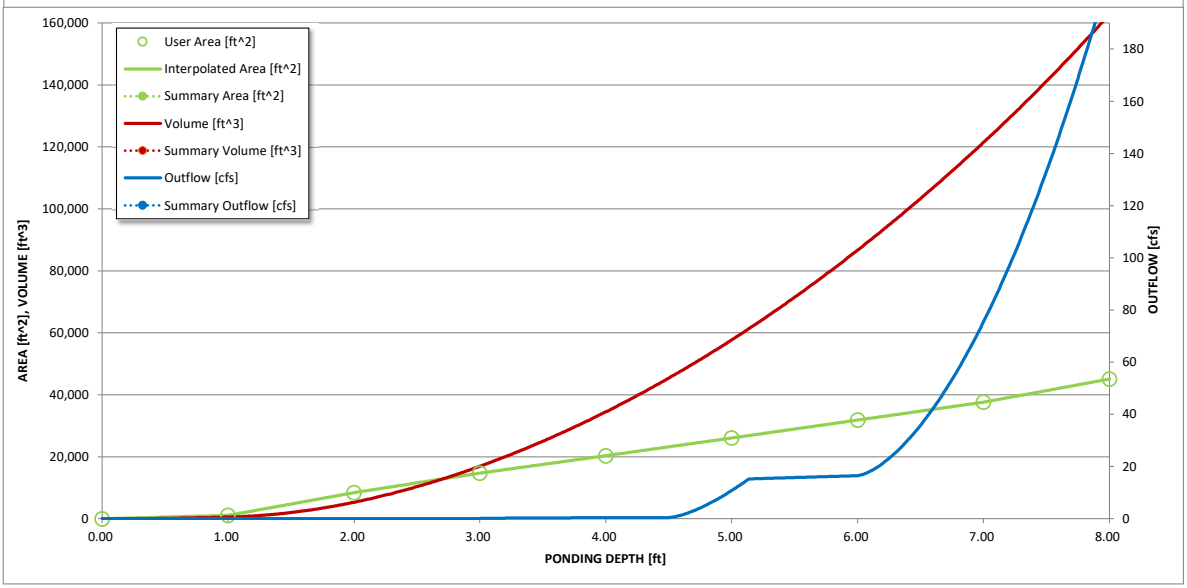
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.14
CUHP Runoff Volume (acre-ft) =	0.273	0.762	0.734	1.100	1.429	1.903	2.271	2.751	3.705
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.734	1.100	1.429	1.903	2.271	2.751	3.705
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	2.5	7.0	10.5	18.5	23.2	29.0	40.4
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.14	0.38	0.57	1.01	1.27	1.59	2.21
Peak Inflow Q (cfs) =	N/A	N/A	12.8	19.9	25.0	33.8	40.4	48.8	64.6
Peak Outflow Q (cfs) =	0.1	0.4	0.4	0.5	3.6	11.2	15.4	16.0	26.2
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.1	0.3	0.6	0.7	0.6	0.6
Structure Controlling Flow =	Plate	Plate	Plate	Plate	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	N/A	0.3	0.8	1.2	1.2	1.3
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) =	41	64	64	71	70	67	65	62	58
Time to Drain 99% of Inflow Volume (hours) =	**43**	68	68	77	77	76	75	74	71
Maximum Ponding Depth (ft) =	2.63	3.94	3.75	4.47	4.73	5.01	5.19	5.64	6.32
Area at Maximum Ponding Depth (acres) =	0.29	0.46	0.44	0.53	0.56	0.60	0.62	0.68	0.77
Maximum Volume Stored (acre-ft) =	0.274	0.764	0.679	1.026	1.163	1.331	1.435	1.735	2.231

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)







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.

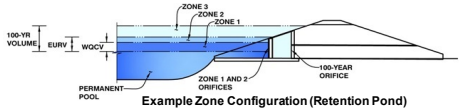
	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.12	0.01	0.40
	0:15:00	0.00	0.00	1.09	1.79	2.22	1.49	1.86	1.82	2.60
	0:20:00	0.00	0.00	3.82	5.02	6.41	3.72	4.34	4.66	6.47
	0:25:00	0.00	0.00	9.39	14.98	20.34	9.23	11.05	12.59	20.40
	0:30:00	0.00	0.00	12.80	19.91	25.04	29.02	35.20	40.31	54.76
	0:35:00	0.00	0.00	11.97	18.09	22.54	33.85	40.38	48.75	64.63
	0:40:00	0.00	0.00	10.45	15.42	19.28	32.51	38.53	46.22	60.97
	0:45:00	0.00	0.00	8.62	12.91	16.51	28.38	33.62	41.70	54.98
	0:50:00	0.00	0.00	7.13	10.89	13.70	25.25	29.91	36.86	48.54
	0:55:00	0.00	0.00	5.96	9.00	11.49	20.76	24.65	31.37	41.39
	1:00:00	0.00	0.00	5.16	7.73	10.10	17.22	20.55	27.13	36.00
	1:05:00	0.00	0.00	4.59	6.81	9.05	14.89	17.85	24.39	32.46
	1:10:00	0.00	0.00	3.84	5.97	8.06	12.30	14.81	19.65	26.37
	1:15:00	0.00	0.00	3.15	4.97	7.11	10.06	12.15	15.54	21.09
	1:20:00	0.00	0.00	2.54	3.96	5.78	7.79	9.39	11.56	15.65
	1:25:00	0.00	0.00	2.08	3.21	4.52	5.86	7.03	8.21	11.14
	1:30:00	0.00	0.00	1.81	2.81	3.78	4.30	5.17	5.83	8.04
	1:35:00	0.00	0.00	1.70	2.61	3.33	3.38	4.06	4.44	6.18
	1:40:00	0.00	0.00	1.64	2.29	3.01	2.82	3.37	3.56	4.99
	1:45:00	0.00	0.00	1.60	2.06	2.79	2.45	2.91	2.96	4.16
	1:50:00	0.00	0.00	1.57	1.88	2.63	2.21	2.60	2.54	3.59
	1:55:00	0.00	0.00	1.37	1.75	2.43	2.05	2.40	2.25	3.18
	2:00:00	0.00	0.00	1.21	1.61	2.15	1.94	2.26	2.06	2.92
	2:05:00	0.00	0.00	0.91	1.20	1.59	1.44	1.67	1.51	2.13
	2:10:00	0.00	0.00	0.67	0.87	1.14	1.04	1.20	1.09	1.53
	2:15:00	0.00	0.00	0.49	0.63	0.82	0.75	0.87	0.79	1.11
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	2:25:00	0.00	0.00	0.25	0.31	0.41	0.38	0.43	0.40	0.56
	2:30:00	0.00	0.00	0.17	0.21	0.29	0.27	0.30	0.28	0.39
	2:35:00	0.00	0.00	0.11	0.14	0.19	0.18	0.21	0.20	0.27
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	2:50:00	0.00	0.00	0.01	0.02	0.03	0.03	0.03	0.03	0.04
	2:55:00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01
	3:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
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	3:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
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	4:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
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	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
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	5:25:00	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 STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: **FHN FILING 9**

Basin ID: **POND 8**



Example Zone Configuration (Retention Pond)

This calculation utilizes the as built conditions of Pond 8 as described in the FHN Filing 3 report with changes to the watershed area and percent imperviousness only per this report.

Watershed Information

Selected BMP Type =	**EDB**	
Watershed Area =	249.33	acres
Watershed Length =	5,500	ft
Watershed Length to Centroid =	2,500	ft
Watershed Slope =	0.017	ft/ft
Watershed Imperviousness =	9.28%	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) =	1.306 acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	2.162 acre-feet		acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	3.197 acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	7.187 acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	11.186 acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	18.369 acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	23.245 acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	30.287 acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 3.14 in.) =	43.087 acre-feet		inches
Approximate 2-yr Detention Volume =	1.369 acre-feet		
Approximate 5-yr Detention Volume =	2.162 acre-feet		
Approximate 10-yr Detention Volume =	4.639 acre-feet		
Approximate 25-yr Detention Volume =	6.556 acre-feet		
Approximate 50-yr Detention Volume =	6.843 acre-feet		
Approximate 100-yr Detention Volume =	8.884 acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	1.306	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.856	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	6.722	acre-feet
Total Detention Basin Volume =	8.884	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	

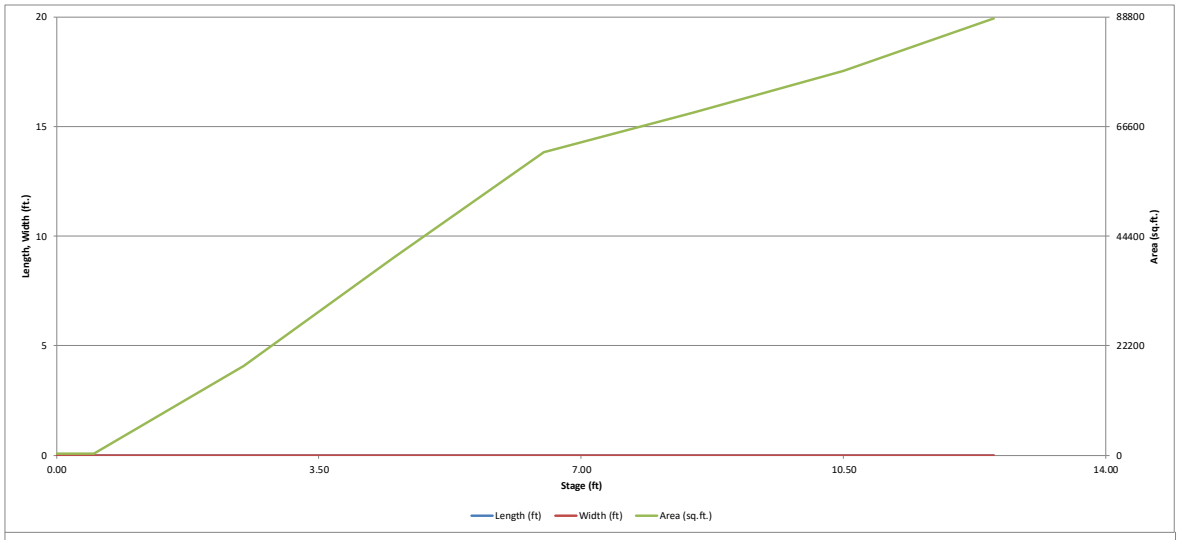
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	**user**	acre-feet

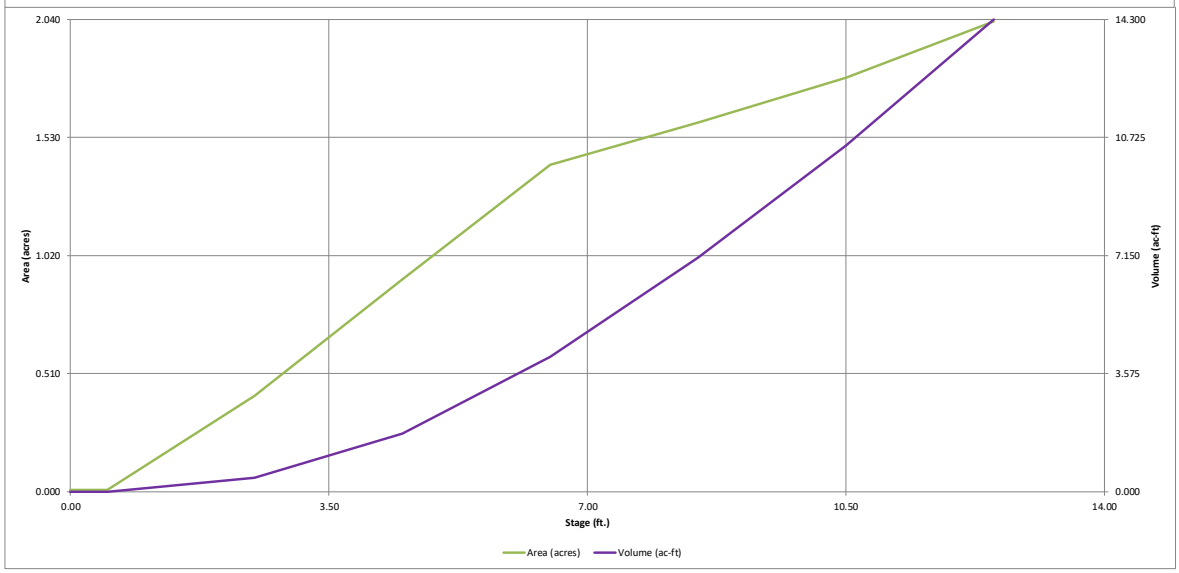
Depth Increment = ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
7369.5 **Top of Micropool**	--	0.00	--	--	--	384	0.009		
7370	--	0.50	--	--	--	384	0.009	192	0.004
7372	--	2.50	--	--	--	18,082	0.415	18,658	0.428
7374	--	4.50	--	--	--	40,004	0.918	76,744	1.762
7376	--	6.50	--	--	--	61,465	1.411	178,213	4.091
7378	--	8.50	--	--	--	69,433	1.594	309,111	7.096
7380	--	10.50	--	--	--	77,895	1.788	456,439	10.478
7382	--	12.50	--	--	--	88,522	2.032	622,856	14.299

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)





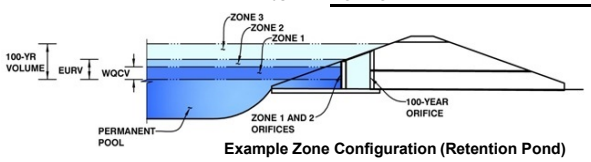
This calculation utilizes the as built conditions of Pond 8 as described in the FHN Filing 3 report with changes to the watershed area and percent imperviousness only per this report. The proposed changes to the orifice plate, and spillway crest elevation are the only deviations from the previous report.

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: FHN FILING 9

Basin ID: POND 8



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.97	1.306	Orifice Plate
Zone 2 (EURV)	4.92	0.856	Orifice Plate
Zone 3 (100-year)	9.59	6.722	Weir&Pipe (Restrict)
Total (all zones)		8.884	

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

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft²
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

Calculated Parameters for Underdrain

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

Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	3.319E-02	ft²
Depth at top of Zone using Orifice Plate =	5.43	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 =	4.78	sq. inches (use rectangular openings)	Elliptical Slot Area =	N/A	ft²

Calculated Parameters for Plate

Replace orifice 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	1.80	3.60					
Orifice Area (sq. inches)	4.78	4.78	4.78					

	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	ft²
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 =	5.43	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	6.43	N/A	feet
Overflow Weir Front Edge Length =	16.00	N/A	feet	Overflow Weir Slope Length =	4.12	N/A	feet
Overflow Weir Grate Slope =	4.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	2.47	N/A	
Horiz. Length of Weir Sides =	4.00	N/A	feet	Overflow Grate Open Area w/o Debris =	45.91	N/A	ft²
Overflow Grate Type =	Type C Grate	N/A		Overflow Grate Open Area w/ Debris =	22.96	N/A	ft²
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 =	0.50	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	18.61	N/A	ft²
Outlet Pipe Diameter =	60.00	N/A	inches	Outlet Orifice Centroid =	2.38	N/A	feet
Restrictor Plate Height Above Pipe Invert =	54.00		inches	Half-Central Angle of Restrictor Plate on Pipe =	2.50	N/A	radians

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	10.25	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	1.10	feet
Spillway Crest Length =	75.00	feet	Stage at Top of Freeboard =	12.35	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	2.01	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	14.00	acre-ft

Raise spillway crest ~3" to prevent overtopping during 100-yr storm.

Calculated Parameters for Spillway

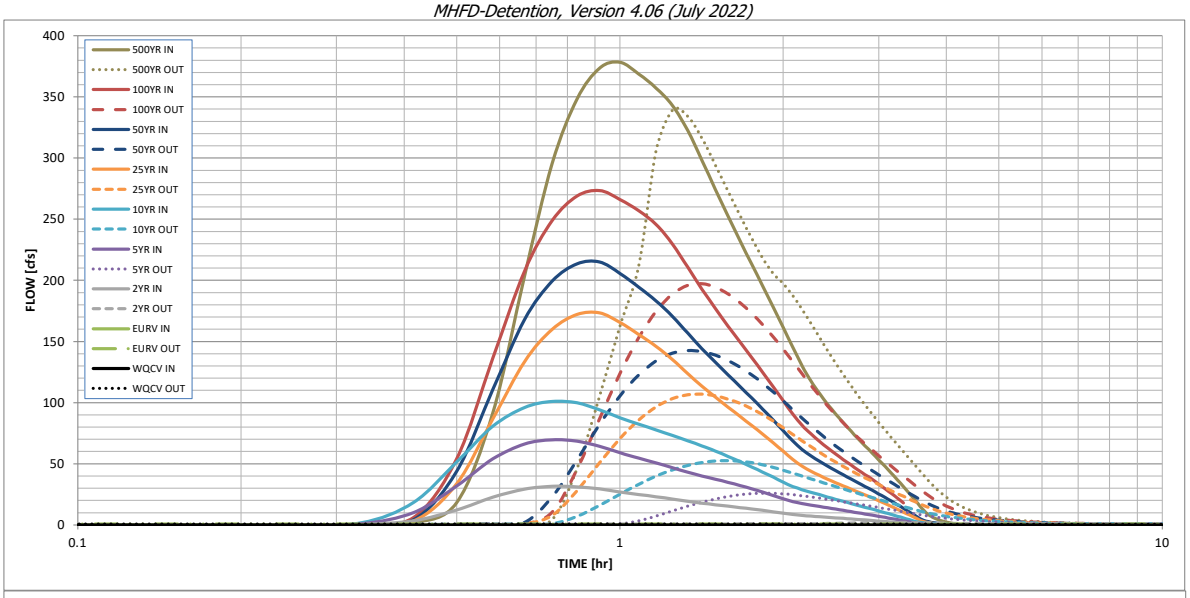
Routed Hydrograph Results

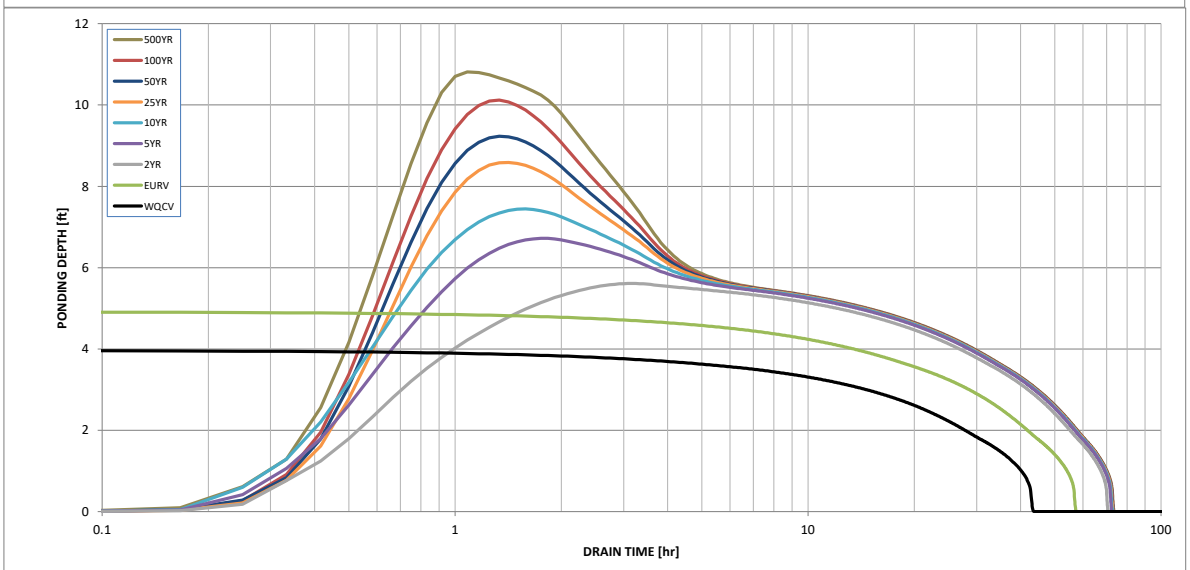
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

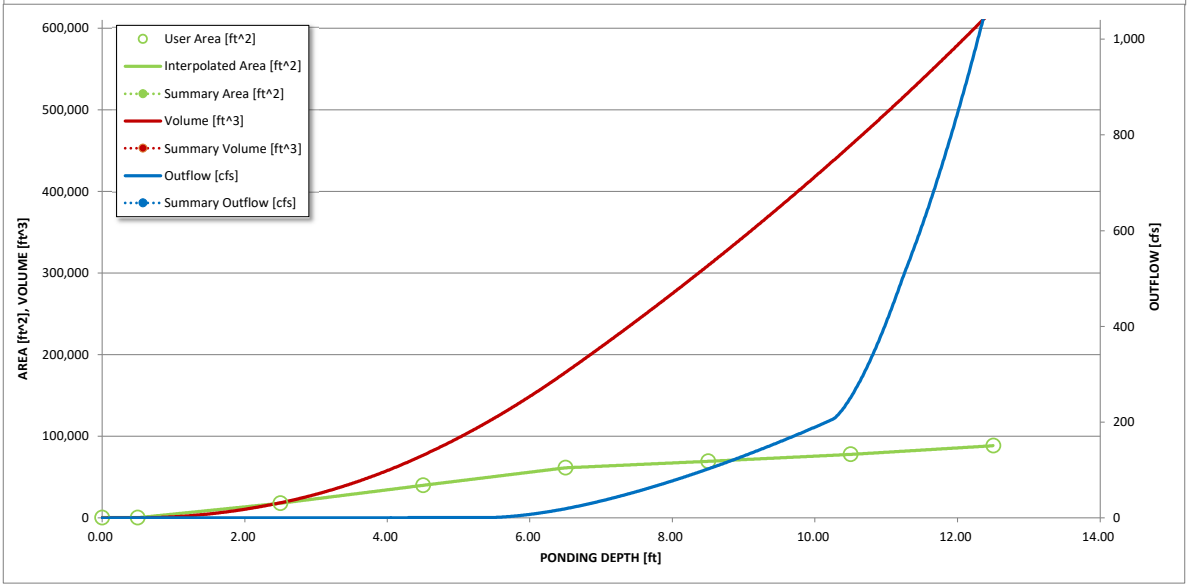
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.14
CUHP Runoff Volume (acre-ft) =	1.306	2.162	3.197	7.187	11.186	18.369	23.245	30.287	43.087
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	3.197	7.187	11.186	18.369	23.245	30.287	43.087
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	20.0	56.2	87.5	161.5	203.1	260.8	365.6
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.08	0.23	0.35	0.65	0.81	1.05	1.47
Peak Inflow Q (cfs) =	N/A	N/A	31.5	69.6	100.9	173.3	215.0	273.5	378.3
Peak Outflow Q (cfs) =	0.6	0.8	2.0	25.9	52.6	106.8	142.6	197.2	339.0
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.5	0.6	0.7	0.7	0.8	0.9
Structure Controlling Flow =	Plate	Plate	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	0.02	0.5	1.1	2.3	3.1	4.3	5.3
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) =	40	52	63	58	54	48	44	38	30
Time to Drain 99% of Inflow Volume (hours) =	**42**	55	68	67	64	60	58	56	52
Maximum Ponding Depth (ft) =	3.97	4.92	5.61	6.72	7.44	8.59	9.23	10.12	10.81
Area at Maximum Ponding Depth (acres) =	0.79	1.02	1.19	1.43	1.50	1.60	1.66	1.75	1.82
Maximum Volume Stored (acre-ft) =	1.310	2.169	2.921	4.390	5.443	7.224	8.269	9.788	11.020

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)







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

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename: _____

Inflow Hydrographs

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

	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.03
	0:15:00	0.00	0.00	0.08	0.13	0.16	0.11	0.15	0.14	0.24
	0:20:00	0.00	0.00	0.41	0.97	1.67	0.45	0.55	0.57	1.67
	0:25:00	0.00	0.00	3.40	10.25	18.53	3.32	4.32	6.24	18.28
	0:30:00	0.00	0.00	12.17	31.94	51.36	33.74	43.85	54.16	91.81
	0:35:00	0.00	0.00	22.60	53.96	80.77	86.88	110.95	136.54	203.42
	0:40:00	0.00	0.00	29.24	66.13	95.98	133.46	167.82	207.56	295.46
	0:45:00	0.00	0.00	31.50	69.59	100.94	159.91	199.20	248.69	348.15
	0:50:00	0.00	0.00	31.18	68.41	99.80	172.01	213.51	268.83	373.44
	0:55:00	0.00	0.00	29.40	64.23	94.11	173.34	215.03	273.49	378.30
	1:00:00	0.00	0.00	26.97	58.98	87.61	165.57	205.72	266.09	368.64
	1:05:00	0.00	0.00	24.87	54.49	82.34	155.74	194.46	256.87	357.16
	1:10:00	0.00	0.00	23.04	50.59	77.67	145.87	183.14	245.61	342.91
	1:15:00	0.00	0.00	21.18	46.76	73.15	135.13	170.57	229.60	322.58
	1:20:00	0.00	0.00	19.37	43.11	68.85	123.71	156.84	210.74	298.24
	1:25:00	0.00	0.00	17.82	40.04	64.69	113.38	144.16	192.84	274.35
	1:30:00	0.00	0.00	16.54	37.38	60.40	104.51	133.08	177.02	252.41
	1:35:00	0.00	0.00	15.34	34.81	56.02	96.32	122.75	162.53	232.00
	1:40:00	0.00	0.00	14.18	32.22	51.67	88.65	113.02	149.32	213.19
	1:45:00	0.00	0.00	13.04	29.54	47.37	81.31	103.71	136.85	195.37
	1:50:00	0.00	0.00	11.90	26.82	43.19	74.18	94.71	124.80	178.24
	1:55:00	0.00	0.00	10.76	24.11	39.06	67.16	85.87	113.08	161.61
	2:00:00	0.00	0.00	9.61	21.43	34.94	60.27	77.19	101.68	145.48
	2:05:00	0.00	0.00	8.56	19.12	31.45	53.52	68.68	90.62	130.17
	2:10:00	0.00	0.00	7.78	17.47	28.84	48.02	61.78	81.51	117.57
	2:15:00	0.00	0.00	7.20	16.20	26.67	43.83	56.48	74.41	107.47
	2:20:00	0.00	0.00	6.69	15.04	24.66	40.37	52.01	68.34	98.70
	2:25:00	0.00	0.00	6.21	13.94	22.78	37.29	48.00	62.92	90.79
	2:30:00	0.00	0.00	5.75	12.88	20.99	34.49	44.33	57.97	83.53
	2:35:00	0.00	0.00	5.29	11.85	19.25	31.86	40.89	53.36	76.78
	2:40:00	0.00	0.00	4.85	10.85	17.58	29.32	37.60	49.05	70.47
	2:45:00	0.00	0.00	4.43	9.87	15.96	26.88	34.45	45.03	64.58
	2:50:00	0.00	0.00	4.01	8.90	14.41	24.50	31.39	41.13	58.90
	2:55:00	0.00	0.00	3.59	7.96	12.91	22.14	28.37	37.26	53.33
	3:00:00	0.00	0.00	3.17	7.02	11.45	19.80	25.39	33.40	47.80
	3:05:00	0.00	0.00	2.76	6.09	9.99	17.46	22.41	29.55	42.28
	3:10:00	0.00	0.00	2.35	5.17	8.55	15.14	19.45	25.71	36.78
	3:15:00	0.00	0.00	1.94	4.26	7.11	12.81	16.50	21.87	31.29
	3:20:00	0.00	0.00	1.54	3.35	5.68	10.49	13.55	18.04	25.81
	3:25:00	0.00	0.00	1.13	2.45	4.27	8.18	10.61	14.21	20.34
	3:30:00	0.00	0.00	0.74	1.57	2.90	5.87	7.68	10.40	14.93
	3:35:00	0.00	0.00	0.42	0.94	1.99	3.65	4.87	6.77	10.03
	3:40:00	0.00	0.00	0.26	0.64	1.51	2.27	3.17	4.45	6.89
	3:45:00	0.00	0.00	0.19	0.49	1.19	1.45	2.14	3.01	4.84
	3:50:00	0.00	0.00	0.15	0.39	0.95	0.96	1.47	2.00	3.36
	3:55:00	0.00	0.00	0.12	0.31	0.75	0.62	1.00	1.28	2.28
	4:00:00	0.00	0.00	0.10	0.24	0.58	0.41	0.70	0.78	1.49
	4:05:00	0.00	0.00	0.08	0.19	0.44	0.27	0.47	0.43	0.91
	4:10:00	0.00	0.00	0.06	0.14	0.32	0.17	0.31	0.23	0.54
	4:15:00	0.00	0.00	0.05	0.10	0.22	0.12	0.23	0.16	0.38
	4:20:00	0.00	0.00	0.04	0.08	0.16	0.09	0.16	0.12	0.28
	4:25:00	0.00	0.00	0.03	0.06	0.11	0.07	0.12	0.10	0.22
	4:30:00	0.00	0.00	0.02	0.04	0.09	0.05	0.09	0.08	0.17
	4:35:00	0.00	0.00	0.02	0.02	0.06	0.04	0.07	0.06	0.13
	4:40:00	0.00	0.00	0.01	0.02	0.04	0.03	0.05	0.04	0.09
	4:45:00	0.00	0.00	0.01	0.01	0.03	0.02	0.03	0.03	0.06
	4:50:00	0.00	0.00	0.00	0.01	0.01	0.01	0.02	0.02	0.04
	4:55:00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.02
	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

Water Quality Treatment Summary Table			
Flying Horse North Filing No. 9			
Subbasin ID	Disturbed Area [AC]	Treatement CM	Notes:
BS-20a	1.56	Pond 8 (Filing 1)	District full-spectrum WQ and stormwater detention facility
BS-20b	1.23	Pond 8 (Filing 1)	District full-spectrum WQ and stormwater detention facility
BS-20.1	0.67	Pond 8 (Filing 1)	District full-spectrum WQ and stormwater detention facility
CC-34.3	0.36	Pond A (Filing 3)	District full-spectrum WQ and stormwater detention facility
	Non-Treated	0.00	0%
NOTE: Only subbsins with associated disturbed area from this development included in the WQ Summary Table.			

Min Required Area to Receive WQ	Total Disturbed Area	Total Proposed Treated Area	Total Proposed Disturbed Area Excluded from WQ	Total Treated %
3.82	3.82	3.82	0.00	100%

Total Water Quality Summary		
Treatement CM	Area [AC]	% of total
Total Disturbed Area	3.82	
Exclusions	0.00	0%
Total Non-Excluded Area	3.82	
Treated by Pond A	0.36	9%
Treated by Pond 8	3.46	91%

Total:	3.82	100%

APPENDIX E

REFERENCE MATERIALS

INNOVATIVE DESIGN. **CLASSIC RESULTS.**

PRELIMINARY DRAINAGE REPORT
FOR
FLYING HORSE NORTH PRELIMINARY PLAN
AND
FINAL DRAINAGE REPORT
FOR
FLYING HORSE NORTH FILING NO. 1

NOVEMBER 2017
Revised June 2018

Prepared for:
PRI #2 LLC
6385 CORPORATE DRIVE SUITE 200
COLORADO SPRINGS CO 80919
(719) 592-9333

Prepared by:
CLASSIC CONSULTING ENGINEERS & SURVEYORS
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Job no. 1096.11
PCD File No. SP-17-012 and SF-18-001

PRELIMINARY DRAINAGE REPORT
FLYING HORSE NORTH PRELIMINARY PLAN AND
FINAL DRAINAGE REPORT FOR FLYING HORSE NORTH FILING NO. 1

DRAINAGE REPORT STATEMENT

ENGINEER'S STATEMENT:

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

COLORADO REGISTERED MARC ALAN WHORTON 37155 PROFESSIONAL ENGINEER

Marc A. Whorton, P.E. Colorado P.E. #37155 — Date: 6/14/18

OWNER/DEVELOPER'S STATEMENT:

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

Business Name: PRI #2 LLC

By: _____

Title: VP

Address: 6385 Corporate Drive, Suite 200

Colorado Springs, CO 80919

EL PASO COUNTY:

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.

Approved
by Elizabeth Nijkamp
El Paso County Planning and Community Development
on behalf of Jennifer Irvine, County Engineer, ECM Administrator
09/25/2018 2:42:28 PM

Jennifer Irvine, P.E. — Date
County Engineer / ECM Administrator

Conditions:

CLASSIC CONSULTING ENGINEERS & SURVEYORS

PRELIMINARY DRAINAGE REPORT
FLYING HORSE NORTH PRELIMINARY PLAN AND
FINAL DRAINAGE REPORT FOR FLYING HORSE NORTH FILING NO. 1

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APPENDICES

VICINITY MAP

SOILS MAP (WEB SOIL SURVEY)

F.E.M.A. MAP

HYDROLOGY/HYDRAULIC CALCULATIONS

CHANNEL/DITCH/DRIVEWAY CULVERT CALCULATIONS

DETENTION FACILITY CALCULATIONS

DRAINAGE MAPS

CLASSIC SM
CONSULTING
ENGINEERS & SURVEYORS

PURPOSE

The purpose of this Drainage Report is two-fold: first to identify major drainage corridors within this area and recommend preliminary facilities based on the Preliminary Plan layout and secondly to provide specific final design for the necessary facilities within the Filing No. 1 Final Plat area. These proposed facilities will route all developed storm water runoff to adequate outfall facilities. The drainage improvements proposed in this report that are outside of Filing No. 1 are preliminary in nature and future final drainage reports will be required for these areas. The Filing No. 1 design area within the proposed golf course includes the design of a jurisdictional dam facility. This specific facility design is handled in a separate report and submittal package reviewed and approved by the Colorado Dam Safety Board. However, El Paso County Engineering Staff will have the opportunity to review and approved specific aspects of the facility as well.

GENERAL DESCRIPTION

Flying Horse North is a 1,418 acre site located in all of section 36, township 11 south, range 66 west of the sixth principal meridian, and a portion of sections 30 and 31 township 11 south, range 65 west of the sixth principal meridian. The site is bounded on the north by Hodgen Road and the High Forest Ranch Community, to the south by the Cathedral Pines Subdivision and unplatted county land, to the east by Black Forest Road, and to the west by the State Highway 83 and unplatted county land. The site stretches across 2 existing drainage basins, the Black Squirrel Creek Drainage Basin and East Cherry Creek Drainage Basin. Large lot single family residential and a golf course with a club house are included in the proposed Preliminary Plan for this site. A site specific PUD plan and early grading plan for the golf course and associated private access roads was previously approved in the Fall of 2016. Tree removal, grading and erosion control for the golf course and access roads is currently under construction based on this approval.

The average soil condition reflects Hydrologic Group "B" (Brussett Loam, Elbeth Sandy Loam, Kettle Gravelly Loamy Sand, Peyton Sandy Loam, Peyton Pring Complex, Pring Course Sandy Loam, and Tomah-Crowfoot Loamy Sand) as determined by the "Soil Survey of El Paso County Area," prepared by the Soil Conservation Service (see map in Appendix).

EXISTING DRAINAGE CONDITIONS

As described in the MDDP for Flying Horse North, this site sits in the upper reaches of both the Black Squirrel Creek and the East Cherry Creek Drainage Basins. There are approximately 540 acres in the Black Squirrel Creek Drainage Basin and 878 acres of area in the East Cherry Creek Drainage Basin. The majority of the Filing No. 1 area will be within the Black Squirrel Creek Basin, however, all required improvements for Filing No. 1 including the golf course within both basins will be discussed below.

Black Squirrel Creek Drainage Basin

The Flying Horse North property is located at the top of the Black Squirrel Creek Drainage Basin. Currently there are corrugated metal culverts within Hwy. 83 to convey flows across the existing roadway. Existing conditions in this basin are largely forested with rolling hills and natural valleys and swales draining offsite to the southwest. This basin has been previously studied in the "Black Squirrel Creek Drainage Basin Planning Study" prepared by URS Consultants, January 1989. The majority of the runoff from the area located in the Black Squirrel Drainage Basin converges at the main channel of the Black Squirrel Creek located on the adjacent property (Reach 12 and 13). As a part of the MDDP for Flying Horse North, also prepared by Classic consulting, an existing drainage analysis was performed to confirm allowable release rates at key design points along the project boundary. Offsite flows were recreated from surrounding reports that were previously approved. Drainage Criteria has been updated since these reports have been approved. Flow differences will occur due to the updated drainage criteria. Using these previous reports contributing areas, CN values and time of concentrations, this report along with the MDDP have attempted to recreate offsite flows for use in calculating existing conditions. Currently in the Flying Horse North property boundary within the Black Squirrel Drainage basin there are existing stock ponds with berms that retain existing flows from reaching downstream channels until overtopping. There are no records or design plans for these stock ponds. For this existing condition analysis these ponds were removed from the project model.

Along the northern boundary of the property there are numerous locations where off-site flows come onto the site. The High Forest Ranch development has two detention facilities that release concentrated flows directly onto the property. The on-site downstream corridors from these facilities will remain natural to the greatest extent possible and where required improved to accommodate these existing flows. High Forest Ranch Pond 26 releases flows on-site at the northwest corner of the site (DBPS Reach 1) that then travel through the site towards an existing 48" CMP at Hwy. 83. No significant erosion currently exists in this channel and upon development and re-vegetation, no additional erosion is anticipated. The Pre-development flows at this point as presented in the Flying Horse North MDDP (DP 7) equal (Q_2 = 4 cfs Q_5 = 18 cfs, Q_{100} = 153 cfs). The Highway 83 roadway improvements that will be required with this development will formalize the channel design at the approach to the existing 48" CMP. (See Appendix – Section C-C for channel calculations) At this location the majority of the flows are traveling through the site.

However, the additional development proposed will be routed to an on-site detention/SWQ facility (Pond 1) to properly mitigate any affects to the downstream corridor. High Forest Ranch Pond 16 releases flows on-site approximately 4100 LF east of Hwy. 83 (Reach 6). These flows cross the site and continue to travel in a southwest direction through the Shamrock Ranch property. This is the start of the headwaters of the Black Squirrel Creek Drainage Basin with the majority of the existing flows coming from the High Forest Ranch Development. With little development proposed in this area, there is no significant affect on the downstream corridor.

Section 36 lies approximately 1.5 miles east of Hwy. 83 and this is where the bulk of the Flying Horse North property ownership begins. Several major drainage corridors feeding the Black Squirrel Creek Basin traverse Section 36 and travel in a southwest direction towards the west edge of the property (Reach 12 and 13). Reach 13 is entirely on the Shamrock Ranch property to the west. However, Reach 12 exists within the planned Flying Horse North Golf Course and portions of the Filing No. 1 development. Most of these historic natural drainageways will remain within the Golf Course property and be left as natural as possible with the addition of some private channel improvements (i.e. Permanent TRM with reinforced rock check dams is specified locations) to mitigate the effects of development and minimize erosion transfer potential. These facilities will be contained within proposed drainage easements as shown on the Filing No. 1 final plat. (See Appendix for channel improvement details) The Flying Horse North development remains consistent with the Black Squirrel DBPS assumed land use of 5 acre average over the entire 1400+ acres. This enables even the developed flows within the subdivision to be consistent with what the DBPS anticipated downstream. The DBPS also specified that all developments within the basin that are tributary to the sub-regional detention ponds either, 1) construct a permanent detention facility on-site or 2) construct a temporary detention facility on-site that could later be removed. As seen later in this report, multiple permanent full-spectrum detention/SWQ facilities are proposed to be constructed on-site. More specifically, ponds 4 and 8 will be installed along the west boundary prior to entering existing Reach 13 located just off-site within the Shamrock property. This report has analyzed the downstream corridors below both of these facilities for the pre-development condition (per DBPS hydrology) and post-development condition (per UD-detention designed release) No significant erosion currently exists in these channels and we have been diligently coordinating with the adjacent property owner and his engineer on consistently maintaining proper BMPs along this property boundary. This effort will continue through final construction and revegetation of the permanent detention/SWQ facilities. (See Appendix for Sections A-A

and B-B channel calculations) These facilities not only meet all current drainage criteria but also remain consistent with the intent of the DBPS. It is also noted that these facilities release well under the pre-development flows as established by the DBPS. Thus, the downstream corridor within the existing Reach 13 on the adjacent property will not be significantly affected with the installation of these full-spectrum facilities. Portions of the Cathedral Pines Development to the south contributes developed flows to this property. These flows will be accommodated in the various on-site facility designs. A smaller on-site basin at the southeast corner of section 36 releases historic flows onto the Cathedral Pines and the Edmonds Subdivision. An on-site detention/storm water quality facility is planned in this corridor to help mitigate development.

East Cherry Creek Drainage Basin

The Palmer Divide traverses the eastern half of section 36 which defines the major basin line between the Black Squirrel Creek and the East Cherry Creek Basins. The vegetation also changes drastically in this area. The majority of the East Cherry Creek Basin contains very little trees and more grazing prairie land and meadows. This area defines the edge of Black Forest. In general, historic flow patterns in this basin travel in a northeasterly direction towards Hodgen Road. The MDDP designates several major design points along the north boundary. Again, multiple detention/storm water quality facilities are planned for these corridors and to be constructed along with future land development. This report has analyzed the downstream corridors along the north property line for the pre-development condition (per MDDP hydrology) and post-development condition (per UD-detention designed release). No significant erosion currently exists in these channels and we have been consistently maintaining proper BMPs along this property boundary. This effort will continue through final construction and revegetation of the permanent detention/SWQ facilities. (See Appendix for Sections D-D and E-E channel calculations). Portions of the Palmer Divide Subdivision and multiple large unplatted properties the south contribute developed flows to this property. These flows will be accommodated in the various on-site facility designs.

PROPOSED DRAINAGE CONDITIONS

The proposed land development within the Flying Horse North Filing No. 1 and future development within the remaining portions of the Preliminary Plan will be 2.5-5 acre large lot residential with associated paved streets and roadside ditches. The 18-hole private Golf Course with a club house site, driving range and

maintenance facility is also planned as a part of Filing No. 1. Based on the current El Paso County ECM Section I.7.1.B. and given the size of the lots within this entire development area, stormwater quality is not required to be provided. However, detention/EURV will still be provided in specific locations on-site to limit the on-site development flow release to remain consistent with pre-development conditions within the major drainage corridors. These proposed facilities will aide in limiting any detrimental effects on downstream corridors. At specific areas where the Filing No. 1 development creates concentrated flows into future development areas, temporary sediment basins will be constructed to minimize sediment transfer downstream and off-site. The Filing No. 1 Final Drainage Report portion of this report will define the permanent facilities providing an Excess Urban Runoff Volume (EURV) in the lower portion of the facility storage volume with an outlet control device. Frequent and infrequent inflows are released at rates approximating undeveloped conditions. This concept provides some mitigation of increased runoff volume by releasing a portion of the increased runoff at a low rate over an extended period of time, up to 72 hours. This means that frequent storms, smaller than the 2 year event, will be reduced to very low flows near or below the sediment carrying threshold value for downstream drainage ways. Also, by incorporating an outlet structure that limits the 100-year runoff to the undeveloped condition rate, the discharge hydrograph for storms between the 2 year and the 100 year event will approximate the hydrograph for the undeveloped conditions and will help effectively mitigate the effects of this development. Again, prior to any land development beyond the Filing No. 1 Final Plat area, additional final drainage reports, final plats and construction plans will be required detailing this criteria.

Given the rural nature of this development, roadside ditches are planned along all roadways. Concrete curb and gutter will only be used at the round-about locations and along the jurisdictional dam embankment as required by the State. The typical roadside ditch will be designed as a V-ditch with a depth of 24 inches. The natural terrain within much of this development creates some steeper slopes on many of the roadways. These slopes range from 1% to 10%. An analysis of the roadside ditches was performed in order to determine the necessary ditch lining required to maintain allowable velocity and shear stress.
The following three basic ditch improvements are recommended throughout the development:
(See Appendix for reference)

1. Revegetation with native seeding (Grass lined only)
   Slope 2% or less and minimal flow

2. Erosion Control Blanket (North American Green SC150 or equiv.) with native seeding Slope 5% or less and max. flow range of 7-43 cfs.
3. Turf Reinforcement Mat (North American Green P300 or equiv.) with natives seeding Slope 10% or less and max. flow of 70 cfs.

The specific ditch lining locations will be shown on the street improvements plans

The following hydrology descriptions will start at the western edge of the Flying Horse North property and move east into the East Cherry Creek Basin, describing the development within the Filing No. 1 area first.

FLYING HORSE NORTH FILING NO. 1

Black Squirrel Creek Drainage Basin

As mentioned previously, Flying Horse North is located in the upper region of the Black Squirrel Creek Drainage Basin. Per the approved DBPS for Black Squirrel Creek, the reaches in this area were proposed to remain as natural as possible. There were no recommendations for detention facilities within the area that is Flying Horse North, but due to current drainage criteria, detention/EURV facilities will be proposed with this development.

High Forest Ranch Detention Pond 26 outfalls onto the property at the very northwest corner of the site. These existing flows will continue to enter the site and travel within the natural channel towards the existing 48" CMP culvert crossing at Hwy. 83. Drainage easements across the proposed lots in this area will be provided on the final plat. The existing stock pond within lots 2 and 3 will be removed with grading of the road in this area. Tract B is platted in order to provide a detention/EURV facility for the lots and public road in this area. This facility will be constructed with Filing No. 1 with ownership and maintenance by the Flying Horse North HOA.

Design Point 1 (Q_2 = 2 cfs Q_5 = 3 cfs, Q_{100} = 11 cfs) represents the existing off-site and on-site developed flows from Basins OS-1A and BS-2B. The combined flow from these basins travel to a low point just east of Stagecoach Road where a proposed 24" RCP culvert will be installed to convey these flows under the road. (See Appendix for culvert design)

Design Point 2 (Q_2 = 3 cfs Q_5 = 9 cfs, Q_{100} = 35 cfs) represents flows from DP 1 and Basin BS-4. These combined flows are collected at a low point where a proposed 30" RCP culvert will be installed to replace the temporary sediment basin installed with early grading. (See Appendix for culvert design)

The total developed flows entering **Detention Facility 1** including Basin BS-1A equal **(Q_2 = 4 cfs Q_5 = 7 cfs, Q_{100} = 38 cfs)**. These combined flows will travel in the natural drainage corridor across lot 1 within a drainage easement and enter the detention facility. The following describes the design of this facility (See Appendix for UD Detention pond design sheets):

Detention Pond 1 (Full Spectrum – see multiple storm release data below)
0.43 Ac.-ft. EURV required
0.50 Ac.-ft. EURV design with 3:1 max. slopes
1.1 Ac.-ft. 100-yr. Storage

Total In-flow:	**Q_2 = 4 cfs,**	**Q_5 = 7 cfs,**	**Q_{100} = 38 cfs**
Pond Design Release:	**Q_2 = 0.1 cfs,**	**Q_5 = 0.2 cfs,**	**Q_{100} = 21 cfs**
Pre-development Release:	**Q_2 = 0.2 cfs,**	**Q_5 = 0.4 cfs,**	**Q_{100} = 23 cfs**

(Ownership and maintenance by the Flying Horse North HOA)

The downstream corridor from this proposed facility shows no indication of erosion at this time and is anticipated to continue to adequately handle the detained developed flows from this portion of the subdivision.

Design Point 4 (Q_2 = 3 cfs Q_5 = 4 cfs, Q_{100} = 8 cfs) represents existing and developed flows from Basin BS-2 (north side of Stagecoach Rd.) These flows will travel in a side road ditch towards Hwy. 83. A temporary sediment basin will be installed during construction of this portion of the roadway. This development will be required to provide improvements to this intersection and Hwy. 83 per the site traffic study. Upon review/approval from CDOT, these improvements will be constructed along with final design of drainage at this intersection which will include the relocation of the dual 18" ERCP culverts and the removal of the temporary sediment basin.

Design Point 5 (Q_2 = 2 cfs Q_5 = 4 cfs, Q_{100} = 13 cfs) represents existing and developed flows from Basins OS-1B and BS-2A (south side of Stagecoach Rd.) These flows will travel in a side road ditch towards Hwy. 83. A temporary sediment basin will be installed during construction of this portion of the roadway. Upon review/approval from CDOT, these improvements will be constructed along with final design of drainage at this intersection and the removal of the temporary sediment basin at this location.

Design Point 6 (Q_2 = 1 cfs Q_5 = 3 cfs, Q_{100} = 15 cfs) represents flows from Basins OS-2 and BS-3. These combined flows travel via the side road ditch along the east side of the road and then around the cul-de-sac, through lot 3 within a drainage easement towards the existing natural channel to the west. These flows then combine with Basin BS-1B and continue to travel in the existing natural channel towards the existing downstream 48" CMP culvert. **Design Point 3 (Q_2 = 1 cfs Q_5 = 6 cfs, Q_{100} = 39 cfs)** then represents the total flow from this site leaving the property at this location. The pre-development on-site flow at this location equals **Q_2 = 1 cfs Q_5 = 5 cfs, Q_{100} = 41 cfs.** Thus, the downstream facilities will not see a significant change in flows.

Design Point 7 (Q_2 = 2 cfs Q_5 = 8 cfs, Q_{100} = 38 cfs) represents existing and developed flows from Basins OS-3 and BS-5. These flows will travel as sheet flow towards the low point where dual 30" RCP culverts will installed under Stagecoach Road to replace the temporary sediment basin installed with early grading. (See Appendix for culvert design)

High Forest Ranch Detention Pond 16 outfalls onto the property just upstream of Design Point 8. These existing flows will continue to enter the site and travel through proposed triple 48" RCP culverts under Stagecoach Road. (See Appendix for culvert design) **Design Point 8 (Q_2 = 21 cfs Q_5 = 70 cfs, Q_{100} = 284 cfs)** represents the existing and developed flows exiting the property and continuing south within the natural channel on the Shamrock Ranch property. These flows remain consistent with the historic flows at this location.

Design Point 9 (Q_2 = 1 cfs Q_5 = 5 cfs, Q_{100} = 23 cfs) represents existing flows from Basins OS-7 and BS-12. These combined flows are collected at a low point where proposed dual 24" RCP culverts will be installed to replace the temporary sediment basin installed with early grading. (See Appendix for culvert design) **Design Point 10 (Q_2 = 11 cfs Q_5 = 32 cfs, Q_{100} = 143 cfs)** represents existing and developed flows

from Basins OS-8, OS-10, OS-11, BS-13 and BS-14. These flows will travel to the low point at this location where dual 42" RCP culverts will be installed for the crossing of Stagecoach Road. (See Appendix for culvert design)

Design Point 11 (Q_2 = 5 cfs Q_5 = 12 cfs, Q_{100} = 36 cfs) represents developed flow from Basin BS-16. These flows will travel to the low point at this location where dual 24" RCP culverts will be installed for the crossing of the road. (See Appendix for culvert design) **Design Point 11A (Q_2 = 0.3 cfs Q_5 = 0.64 cfs, Q_{100} = 4.6 cfs)** represents a small 1.0 ac. sub-basin of BS-17 that will travel as ditch flow to a lowpoint where an 18" culvert will convey the developed flows to the south side of Shortwall Dr. into Basin BS-15. (See Appendix for culvert design) **Design Point 12 (Q_2 = 4 cfs Q_5 = 11 cfs, Q_{100} = 44 cfs)** represents the combined developed flow from Basins BS-16 and BS-15. These flows will travel to the low point at this location where a 36" RCP culvert and storm system will be installed to route the collected flows directly into Detention Pond 4 at the south end. (See Appendix for culvert design)

The total developed flows entering **Detention Facility 4**, including Basins OS-9 and BS-17 equal **(Q_2 = 10 cfs Q_5 = 16 cfs, Q_{100} = 217 cfs)**. The major flows enter the facility at the north end through a rock chute. (See Appendix for rock chute and pond design) The following describes the design of this facility:
(See Appendix for UD Detention pond design sheets):

Detention Pond 4 (Full Spectrum – see multiple storm release data below)
0.99 Ac.-ft. EURV required
1.05 Ac.-ft. EURV design with 4:1 max. slopes
5.1 Ac.-ft. 100-yr. Storage

Total In-flow:	**Q_2 = 10 cfs,**	**Q_5 = 16 cfs,**	**Q_{100} = 217 cfs**
Pond Design Release:	**Q_2 = 0.3 cfs,**	**Q_5 = 0.4 cfs,**	**Q_{100} = 142 cfs**
Pre-development Release:	**Q_2 = 1.5 cfs,**	**Q_5 = 2.5 cfs,**	**Q_{100} = 152cfs**

(Ownership and maintenance by the Flying Horse North HOA)

The downstream corridor from this proposed facility shows little indication of erosion at this time and is anticipated to continue to adequately handle the detained developed flows from this portion of the subdivision. In addition, we have been coordinating with the adjacent property owner and his engineering

consultant on this specific corridor and will continue to do so until the on-site detention facility construction is complete and all disturbed areas are re-established.

Design Point 14 (Q_2 = 4 cfs Q_5 = 12 cfs, Q_{100} = 56 cfs) represents the developed flow from Basin BS-18. These flows will travel to the low point at this location where three 24" RCP culverts will be installed to cross under the road. (See Appendix for culvert design) These flows then enter Basin OS-23 through a drainage easement on the rear of lot 65 and continue to travel towards DP-16. **Design Point 15 (Q_2 = 2 cfs Q_5 = 5 cfs, Q_{100} = 15 cfs)** represents the developed flow from Basin BS-19. These flows will travel to the low point at this location where dual 18" RCP culverts will be installed to cross under the road. (See Appendix for culvert design) These flows then enter Basin OS-22 through a drainage easement across lots 60 and 61 and continue to travel towards the golf course.

Basins BS-20, BS-21, BS-22, BS-23 and BS-23A are relatively large basins that contain both Filing 1 lots, much of the golf course but also future lots that will remain undeveloped at this time. However, these basins all ultimately travel in a southwesterly direction towards the proposed Detention Facility 8. This report analyzes both the "Filing 1 Only" condition as well as the "full build-out condition" in the design of this detention facility. With the development of Filing 1, Detention Facility 8 will be sized and graded for the ultimate design accounting for the future lot development. The outlet structure and emergency overflow weir will also be designed for the ultimate condition. However, we will provide two orifice plate designs for the outlet box. The initial plate will be constructed that will handle the proper release for the Filing 1 development only. Upon the next phase of lot development within these basins (BS-20, BS-21, BS-22, BS-23 and BS-23A) the ultimate plate will be installed to replace this initial plate design. No further changes to the outlet structure or pond will need to take place. Thus, the following describes the two scenarios:

Full Build-out Design (accounting for future lot development)

Design Point 16 (Q_2 = 25 cfs Q_5 = 78 cfs, Q_{100} = 362 cfs) represents the total developed flows from Basins BS-18 thru BS-23 with the fully developed golf course and lots in Filing 1 and the future phases. These flows travel to the low point at this location where dual 60" RCP culverts will be installed to cross under the road. (See Appendix for culvert design) These flows represent the major portion of the flows entering Detention Facility 8 with the remaining flows coming from Basin OS-23A.

The total developed flow entering **Detention Facility 4** includes Basin BS-23A. The following describes the design of this facility: (See Appendix for UD Detention pond – **Full Build-out** design sheets):

Detention Pond 8 (Full Spectrum – see multiple storm release data below)
2.40 Ac.-ft. EURV required
2.45 Ac.-ft. EURV design with 4:1 max. slopes
9.32 Ac.-ft. 100-yr. Storage
Total In-flow: Q_2 = 28 cfs, Q_5 = 85 cfs, Q_{100} = 383 cfs
Pond Design Release: Q_2 = 0.8 cfs, Q_5 = 1.0 cfs, Q_{100} = 253 cfs
Pre-development Release: Q_2 = 2.6 cfs, Q_5 = 4.5 cfs, Q_{100} = 274cfs
(Ownership and maintenance by the Flying Horse North HOA)

Filing 1 Only Design (accounting for golf course and Filing 1 lot development)

Under this scenario, only the golf course and Filing 1 lots are developed and Basins BS-20, BS-21, BS-22, BS-23 and BS-23A have been adjusted to account for only this initial phase of development. The following describes the facility requirements for this design: (See Appendix for UD Detention pond – **Filing 1 Only** design sheets):

****Detention Pond 8 (Full Spectrum – see multiple storm release data below)**
1.13 Ac.-ft. EURV required
2.45 Ac.-ft. EURV design with 4:1 max. slopes
7.76 Ac.-ft. 100-yr. Storage
Total In-flow: Q_2 = 9 cfs, Q_5 = 14 cfs, Q_{100} = 301 cfs
Pond Design Release: Q_2 = 0.4 cfs, Q_5 = 0.5 cfs, Q_{100} = 219 cfs
Pre-development Release: Q_2 = 2.2 cfs, Q_5 = 3.9 cfs, Q_{100} = 237cfs
(Ownership and maintenance by the Flying Horse North HOA)

**Please note that all facility design remains the same as the Full Build-out scenario except for the different orifice plate.

The downstream corridor from this proposed facility shows little indication of erosion at this time and is anticipated to continue to adequately handle the detained developed flows from this portion of the subdivision. In addition, we have been coordinating with the adjacent property owner and his engineering consultant on this specific corridor and will continue to do so until the on-site detention facility construction is complete and all disturbed areas are re-established.

Basin BS-24 (Q_2 = 0.6 cfs Q_5 = 3 cfs, Q_{100} = 18 cfs) represents sheet flow from three residential lots within Filing No. 1 that will continue to direct release off-site. However, portions of this historic basin area will be routed into Flying Horse North Pond 8, therefore the developed flows from this basin do not significantly change from the pre-development condition. The pre-development flows from the historic basin area equal **Q_2 = 0.2 cfs Q_5 = 2 cfs, Q_{100} = 18 cfs.** Also, given the lot size, no water quality is required.

FLYING HORSE NORTH FILING NO. 1

East Cherry Creek Drainage Basin

The following basins are still tributary to the Filing No. 1 platting area but are within the East Chery Creek Drainage Basin:

Design Point 24 (Q_2 = 2 cfs Q_5 = 8 cfs, Q_{100} = 45 cfs) represents developed flows from Basins CC-4C and CC-5. Basin CC-4C represents the future golf course clubhouse site. Upon future development of this site a site specific detention/SWQ facility will be installed. This future facility will release into the side road ditch on the west side of Allen Ranch Road and travel in a northerly direction. The side road ditch along this stretch of Allen Ranch Road and the south side of Old Stagecoach Road will be sized to handle these flows. The 100-yr. emergency overflow from this future facility will also be into the side road ditch of Allen Ranch Road and not towards any residential lots. For ultimate downstream design purposes this basin is assumed to release pre-development flows. These flows will travel towards Design Point 24 where a 36" RCP culvert is sized to handle the fully developed flows at this location. (See Appendix for culvert design)

The total developed flows entering **Detention Facility 12**, including Basin CC-6 equals **(Q_2 = 6 cfs Q_5 = 9 cfs, Q_{100} = 85 cfs)**. The following describes the design of this facility:
(See Appendix for UD Detention pond design sheets):

Detention Pond 12 (Full Spectrum – see multiple storm release data below)
0.66 Ac.-ft. EURV required
0.75 Ac.-ft. EURV design with 4:1 max. slopes
2.69 Ac.-ft. 100-yr. Storage

Total In-flow:	**Q_2 = 6 cfs, Q_5 = 9 cfs, Q_{100} = 85 cfs**
Pond Design Release:	**Q_2 = 0.2 cfs, Q_5 = 0.3 cfs, Q_{100} = 45 cfs**
Pre-development Release:	**Q_2 = 0.5 cfs, Q_5 = 0.9 cfs, Q_{100} = 55 cfs**

(Ownership and maintenance by the Flying Horse North HOA)

The downstream corridor from this proposed facility shows no indication of erosion at this time and is anticipated to continue to adequately handle the detained developed flows from this portion of the subdivision.

Design Point 25 (Q_2 = 0.2 cfs Q_5 = 0.3cfs, Q_{100} = 45 cfs) then represents the total flow leaving the site at this location. The pre-development flow at this location equals **Q_2 = 0.5 cfs Q_5 = 0.9 cfs, Q_{100} = 55 cfs.** Thus, the downstream facilities will not see a significant change in flows.

Basins OS-12, OS-13, OS-14, CC-1A, CC-1B, CC-2A, CC-2B, CC-2C, CC-3, CC-4A, CC-4B and CC-9 are all tributary to the proposed Flying Horse North Pond 13. Nearly all the proposed residential lots within these basins are part of future development outside of Filing No. 1 platting. The only structure associated with Filing No. 1 development is the pond embankment/outlet structure crossing Stagecoach Road. However, this facility has been classified by the Colorado Dam Safety Branch (DSB) as a low-hazard, jurisdictional facility. As such, a separate Design Report including hydrology/hydraulic design and embankment/structure design has been prepared for DSB and El Paso County review and approval. Please reference this report for the required detention/SWQ design for this facility.

Design Point 26 (Q_2 = 3 cfs Q_5 = 16 cfs, Q_{100} = 102 cfs) represents the full build-out developed flows from Basins CC-8 and CC-10. Basin CC-8 represents future residential lots and CC-10 mostly future passive park area. These flows will continue to sheet flow towards the low-point where a 48" RCP culvert is sized to handle the fully developed flows at this location. (See Appendix for culvert design) After crossing Stagecoach Road, these flows will continue to flow directly into the existing stock pond just north of the roadway. This facility will provided sediment control for the small developed roadway area. Upon future development and plating of the lots planned within these basins, this stock pond will be formally designed into a detention facility.

Basin CC-15 (Q_2 = 1 cfs Q_5 = 4 cfs, Q_{100} = 20 cfs) represents the full build-out developed flows from the future residential lots tributary to this basin. These flows will continue to sheet flow towards the low-point where a 30" RCP culvert is sized to handle the fully developed flows at this location. (See Appendix for culvert design) A downstream sediment basin will be installed to provide sediment control for the small developed roadway area.

Basin CC-16 (Q_2 = 1 cfs Q_5 = 5 cfs, Q_{100} = 24 cfs) represents the full build-out developed flows from the future residential lots tributary to this basin. These flows will continue to sheet flow towards the low-point at the southwest corner of Old Stagecoach Road and Rubble Drive where a 24" RCP culvert is sized to handle the fully developed flows at this location. (See Appendix for culvert design) A downstream sediment basin will be installed to provide sediment control for the small developed roadway area.

Design Point 30 (Q_2 = 0.7 cfs Q_5 = 2 cfs, Q_{100} = 10 cfs) represents the full build-out developed flows from Basin CC-18. This Basin represents future residential lots. The flows will continue to sheet flow towards the low-point where a 24" RCP culvert is sized to handle the fully developed flows at this location. (See Appendix for culvert design) A downstream sediment basin will be installed to provide sediment control for the small developed roadway area.

Design Point 31 (Q_2 = 0.9 cfs Q_5 = 3 cfs, Q_{100} = 15 cfs) represents the full build-out developed flows from Basin CC-19 and the upstream release from DP-30. This Basin represents future residential 5 ac. lots. The flows will continue to sheet flow within a proposed drainage easement towards the existing low-point where an existing 24" CMP culvert will adequately handle the fully developed flows at this location.

Design Point 32 (Q_2 = 2 cfs Q_5 = 8 cfs, Q_{100} = 40 cfs) represents the full build-out developed flows from Basins OS-16 and CC-17. Basin CC-17 represents future residential lots and OS-16 unplatted, 5-ac. zoned residential property. These flows will continue to sheet flow towards the low-point where a 36" RCP culvert is sized to handle the fully developed flows at this location. (See Appendix for culvert design) A downstream sediment basin will be installed to provide sediment control for the small developed roadway area.

FLYING HORSE NORTH PRELIMINARY PLAN (Future Platting)

Black Squirrel Creek Drainage Basin

The following basins are in the Black Squirrel Creek Drainage Basin but are not a part of Filing 1 lot development. These areas will require future final drainage report(s) upon future lot development.

Design Point 18 (Q_2 = 5 cfs Q_5 = 22 cfs, Q_{100} = 115 cfs) represents developed flows from Basins BS-28, BS-29, BS-30 and OS-18. Portions of basins BS-28 and BS-29 include golf course development taking place with Filing No. 1. However, the majority of these basins include forested future residential lots with basin OS-18 being existing 2.5 ac. minimum lots. Future developed flows will be routed to this location where a future detention facility will be installed. This facility will be sized to meet EURV requirements and release pre-development flow quantities into the future side road ditch and through future drainage easements towards the future detention facility at Design Point 19. These future facilities will be further analyzed as ponds in series and emergency overflow paths well defined with the future final drainage report. In the interim, with only the golf course construction, a temporary sediment basin located within the future roadway in basin BS-28 will be installed to provide sediment control from the developed golf course area.

Design Point 19 (Q_2 = 4 cfs Q_5 = 17 cfs, Q_{100} = 126 cfs) represents developed flows from Basins BS-27 and OS-17. These basins include forested future residential lots with basin OS-17 being existing 2.5 ac. minimum lots. Future developed flows will be routed to this location where a future detention facility will be installed to meet EURV requirements and release pre-development flow quantities. Both of these future facilities will be constructed in tracts with ownership and maintenance by the Flying Horse North HOA.

Basin BS-26 (Q_2 = 0.04 cfs Q_5 = 0.4 cfs, Q_{100} = 3 cfs) represents sheet flow from the extreme rear portion of a future residential lot. This area of the lot will likely not be built upon, therefore not significantly changing the drainage conditions from the pre-development condition. The pre-development flow from the historic basin area equals **Q_2 = 0.04 cfs Q_5 = 0.4 cfs, Q_{100} = 3 cfs.** Also, given the lot size, no water quality is required.

Basins BS-31 (Q_2 = 0.3 cfs Q_5 = 2 cfs, Q_{100} = 12 cfs), BS-32 (Q_2 = 0.3 cfs Q_5 = 2 cfs, Q_{100} = 9 cfs) and BS-33 (Q_2 = 0.8 cfs Q_5 = 3 cfs, Q_{100} = 15 cfs) represent smaller basins that will continue to sheet flow off-site to the south. These basins represent some golf course development and multiple future residential lots. Given the lot size, no water quality is required. However, permanent sediment basins will be installed downstream of the golf course development to provide sediment control. Developed flows released from these basins will not be significantly different than the pre-development flows.

East Cherry Creek Drainage Basin

The following basins are not tributary to the Filing No. 1 platting area but are within the East Chery Creek Drainage Basin and planned for future residential lot development.

Design Point 28 (Q_2 = 5 cfs Q_5 = 20 cfs, Q_{100} = 110 cfs) represents the full build-out developed flows from Basins OS-13 and CC-13A. Basin CC-13A represents future residential lots and OS-13 platted, 5-ac. zoned residential property. These flows will continue to sheet flow towards the low-point where a future culvert will be installed to handle the fully developed flows at this location. The flows are then conveyed in the natural channel towards Design Point 29.

Design Point 29 (Q_2 = 6 cfs Q_5 = 27 cfs, Q_{100} = 155 cfs) represents the full build-out developed flows from Basins CC-13B, CC-13C and release from DP-28. These basins represent future residential lots. At this location, a future detention facility will be installed to meet EURV requirements and release pre-development flow quantities. This future facility will be constructed in a tract with ownership and maintenance by the Flying Horse North HOA.

Basin CC-13D (Q_2 = 2 cfs Q_5 = 6 cfs, Q_{100} = 29 cfs) represents future residential lots that will continue to sheet flow off-site. Given the lot size, no water quality is required. However, a permanent sediment basin will be installed just prior to release off-site to provide sediment control. Developed flows released from this basin will not be significantly different than the pre-development flows.

Basin CC-14 (Q_2 = 0.4 cfs Q_5 = 2 cfs, Q_{100} = 8 cfs) represents sheet flow from the rear portion of two future residential lots. The majority of this area is not anticipated to be developed, therefore not significantly changing the drainage conditions from the pre-development condition. Also, given the lot size, no water quality is required.

Design Point 27 (Q_2 = 4 cfs Q_5 = 17 cfs, Q_{100} = 81 cfs) represents the full build-out developed flows from the previously described basin CC-15 and CC-20. These basins represent future residential lots. At this location, a future detention facility will be installed to meet EURV requirements and release pre-development flow quantities. This future facility will be constructed in a tract with ownership and maintenance by the Flying Horse North HOA.

Basins CC-21 (Q_2 = 0.1 cfs Q_5 = 1 cfs, Q_{100} = 9 cfs) and CC-22 (Q_2 = 1 cfs Q_5 = 5 cfs, Q_{100} = 21 cfs) represent future residential 5 ac. lots and park area that will continue to sheet flow off-site. Given the lot size, no water quality is required. However, a permanent sediment basin will be installed just prior to release off-site to provide sediment control. Developed flows released from this basin will not be significantly different than the pre-development flows.

Basins CC-23 (Q_2 = 0.4 cfs Q_5 = 1 cfs, Q_{100} = 8 cfs) and CC-24 (Q_2 = 3 cfs Q_5 = 13 cfs, Q_{100} = 62 cfs) represent future 5 ac. residential lots that will continue to sheet flow off-site. Given the lot size, no water quality is required. Given that the proposed lots are planned for 5 ac. residential, the developed flows released from this basin will not be significantly different than the pre-development flows. However, multiple permanent sediment basins may be installed just prior to release off-site to provide sediment control. This basin also contains a portion of the adjacent Franktown/Parker Reservoir emergency spillway crossing two proposed lots. This existing facility, which doesn't appear to be within any existing easement, will be further analyzed with a final drainage report for this area. Appropriate drainage easements may be provided at time of final plating.

Basin CC-25 (Q_2 = 0.3 cfs Q_5 = 1 cfs, Q_{100} = 6 cfs) represents a small portion of two future residential 5 ac. lots that will continue to sheet flow off-site. Given that the proposed lots are planned for 5 ac. residential, the developed flows released from this basin will not be significantly different than the pre-development flows.

Design Point 34 (Q_2 = 6 cfs Q_5 = 24 cfs, Q_{100} = 168 cfs) represents the full build-out developed flows from Basins CC-26, CC-27, CC-28, release from CC-16 and release from DP-32. These basins represent future residential lots and park area. At this location, a future detention facility will be installed and likely replace the existing stock pond to meet EURV requirements and release pre-development flow quantities. The downstream existing culvert under Hodgen Road will be further analyzed with future final drainage reports. This future facility will be constructed in a tract with ownership and maintenance by the Flying Horse North HOA.

FACILITY MAINTENANCE

All proposed drainage structures within the platted County ROW will be owned and maintained by El Paso County. All proposed drainage structures within easements or tracts will be owned and maintained by the Flying Horse North HOA of Golf Course owner.

DRAINAGE CRITERIA

Hydrologic calculations were performed using the City of Colorado Springs/El Paso County Drainage Criteria Manual, revised in November 1991 and October 1994 with County adopted Chapter 6 and Section 3.2.1 of Chapter 13 of the City of Colorado Springs/El Paso County Drainage Criteria Manual as revised in May 2014. Detention storage and storm sewer conveyance to Black Squirrel Creek Drainage Basin was established with the Black Squirrel DBPS, previously referenced. The IDF curves from Figure 6-5 of the City of Colorado Springs/El Paso County DCM was used to estimate storm water runoff anticipated from design storms for the 2 year, 5 year and 100 year recurrence interval. (See Appendix)

The City of Colorado Springs/El Paso County DCM requires the Four Step Process for receiving water protection that focuses on reducing runoff volumes, treating the water quality capture volume (WQCV),

stabilizing drainage ways, and implementing long-term source controls. The Four Step Process pertains to management of smaller, frequently occurring storm events, as opposed to larger storms for which drainage and flood control infrastructure are sized. Implementation of these four steps helps to achieve storm water permit requirements. This site adheres to this **Four Step Process** as follows:

1. **Employ Runoff Reduction Practices:** Development of project site is proposed large lot single family residential (2.5 ac. min.) with homes and associated landscaping along with a private golf course. Proposed impervious areas (roof tops, patios) will sheet flow across landscaped ground, through open space areas and across the golf course to slow runoff and increase time of concentration prior to being conveyed to the proposed public streets. This will minimize directly connected impervious areas within the project site.

2. **Stabilize Drainageways:** This site will utilize roadside ditches with culvert crossings throughout the site and channel stabilization and grade control structures installed within some of the historic natural channels. These facilities will then direct the on-site development flows to the multiple detention/SWQ ponds mentioned above, designed to release at or below historic rates into Black Squirrel and East Cherry Creek. Based upon the proposed reduction in released flows compared to the pre-developed flows, no impact to downstream drainageways is anticipated.

3. **Provide Water Quality Capture Volume (WQCV):** Runoff from this development will be treated through capture and slow release of the WQCV in multiple permanent Extended Detention Basins designed per current El Paso County drainage criteria.

4. **Consider need for Industrial and Commercial BMPs**: No industrial or commercial uses are proposed within this development. However, a site specific storm water quality and erosion control plan and narrative was previously approved for this development in October 2016 (PUD-16-002). Details such as site specific source control construction BMP's as well as permanent BMP's were detailed in this plan and narrative to protect receiving waters. Much of these BMP's are currently constructed and being maintained as the majority of the development has been graded and erosion control methods employed.

FLOODPLAIN STATEMENT

A small portion of the Preliminary Plan (future lots not platted at this time) is located within a floodplain as determined by the Flood Insurance Rate Maps (F.I.R.M.) Map Number 08041C 0295F, 0841C 0315F, 04081C 0325F effective date, March 17, 1997 (See Appendix). However, no portion of property proposed to be platted with Filing No. 1 is within the floodplain.

DRAINAGE AND BRIDGE FEES

FLYING HORSE NORTH FILING NO. 1

The East Cherry Creek Basin does not currently have a Drainage Basin Fee. However, the following fees for the Filing No. 1 platted area within the Black Squirrel Creek Basin are due prior to platting:

The fees are calculated using the following impervious acreage method approved by El Paso County. The acreage for Flying Horse Filing No. 1 within the Black Squirrel Creek Basin is 342.7 acres. This total area is broken into two uses: 2.5 ac. lots (including roads and tracts) and golf course. The 2.5 ac. lot area equals 234.4 acres and the golf course area equals 108.3 acres. Thus, the percent imperviousness for this subdivision is calculated as follows (See Figure 1.1 for Basin Area Exhibit):

2.5 ac. lots (incl. roads and tracts)

(Per El Paso County Percent Impervious Chart: 11%)

234.4 Ac. x 11% = **25.78 Impervious Ac.**

Golf Course Development

(Per El Paso County Percent Impervious Chart for greenbelts: 2%)

108.3 Ac. x 2% = **2.17 Impervious Ac.**

Total Impervious Acreage for Filing 1: 27.95 Imp. Ac.

The following calculations are based on the 2018 drainage/bridge fees for the Black Squirrel Creek Drainage Basin:

FILING 1 FEE TOTALS (prior to reduction):

Bridge Fees

$ 492.00 x 27.95 Impervious Ac. = $ 13,751.40

Drainage Fees

$ 7,808.00 x 27.95 Impervious Ac. = $ 218,233.60

Per the ECM 3.10.4a, this development requests a reduction of drainage fees based on the three on-site full spectrum detention/SWQ facilities proposed within the Black Squirrel Creek Drainage Basin to be constructed with Filing 1 rather than utilizing a reduction for low density lots. The following facilities within the Black Squirrel Creek basin meet the required six criteria as follows:

1. No downstream regional facility in place yet.
2. All three proposed facilities are less than 15 ac-ft. in volume
3. The proposed on-site facilities are not part of a regional plan.
4. The proposed outlets are designed to release to full-spectrum criteria.
5. Proposed facilities are per County criteria and will gain County approval.
6. All three proposed facilities will be private with ownership and maintenance by HOA.

Detention Pond 1	1.1 ac-ft. full spectrum	$ 24,448 x 50% =	$ 12,224.00
Detention Pond 4	4.5 ac-ft. full spectrum	$ 130,270 x 50% =	$ 65,135.00
Detention Pond 8	9.4 ac-ft. full spectrum	$ 111,320 x 50% =	$ 55,660.00
Total Reduction			**$ 133,019.00**

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FILING 1 FEE TOTALS:

Bridge Fees

$ 492.00 x 20.96 Impervious Ac.	=	$ 13,751.40

Drainage Fees

$ 218,233.60 - 133,019.00	=	$ 85,214.60

SUMMARY

This proposed development remains consistent with the previously approved Flying Horse North MDDP and Preliminary Drainage Report for Flying Horse North (Golf Course grading and private access roads). The proposed storm facilities have been sized to adequately handle the 100-yr. developed flows. All proposed detention facilities meet current criteria and provide full spectrum design. Upon future development outside of Filing No. 1, final drainage reports will be required finalizing final design of the proposed future drainage facilities. The proposed development will not adversely impact surrounding developments.

PREPARED BY:

Classic Consulting Engineers & Surveyors, LLC

Marc A. Whorton, P.E.
Project Manager

Maw/109611/reports/109611PDR.doc

REFERENCES

1. City of Colorado Springs/County of El Paso Drainage Criteria Manual, as revised in November 1991 and 1994 with County adopted Chapter 6 and Section 3.2.1 of Chapter 13 of the City of Colorado Springs/El Paso County Drainage Criteria Manual as revised in May 2014.

2. "Master Development Drainage Plan for Flying Horse North", Classic Consulting, dated September 2016.

3. "Preliminary Drainage Report for Flying Horse North (Golf Course Grading and Private Access Roads)", Classic Consulting, dated September 2016.

4. "Final Drainage Report High Forest Ranch Filing No. 1" JR Engineering, dated March 2001.

5. "Final Drainage Report for High Forest Ranch Filing No. 2 and High Forest Ranch Filing No. 3" Classic Consulting Engineers and Surveyors dated May 2001.

6. "Final Drainage Report and Plan for Cathedral Pines Subdivision Filing No. 2," Leigh Whitehead & Associates, dated March 2005.

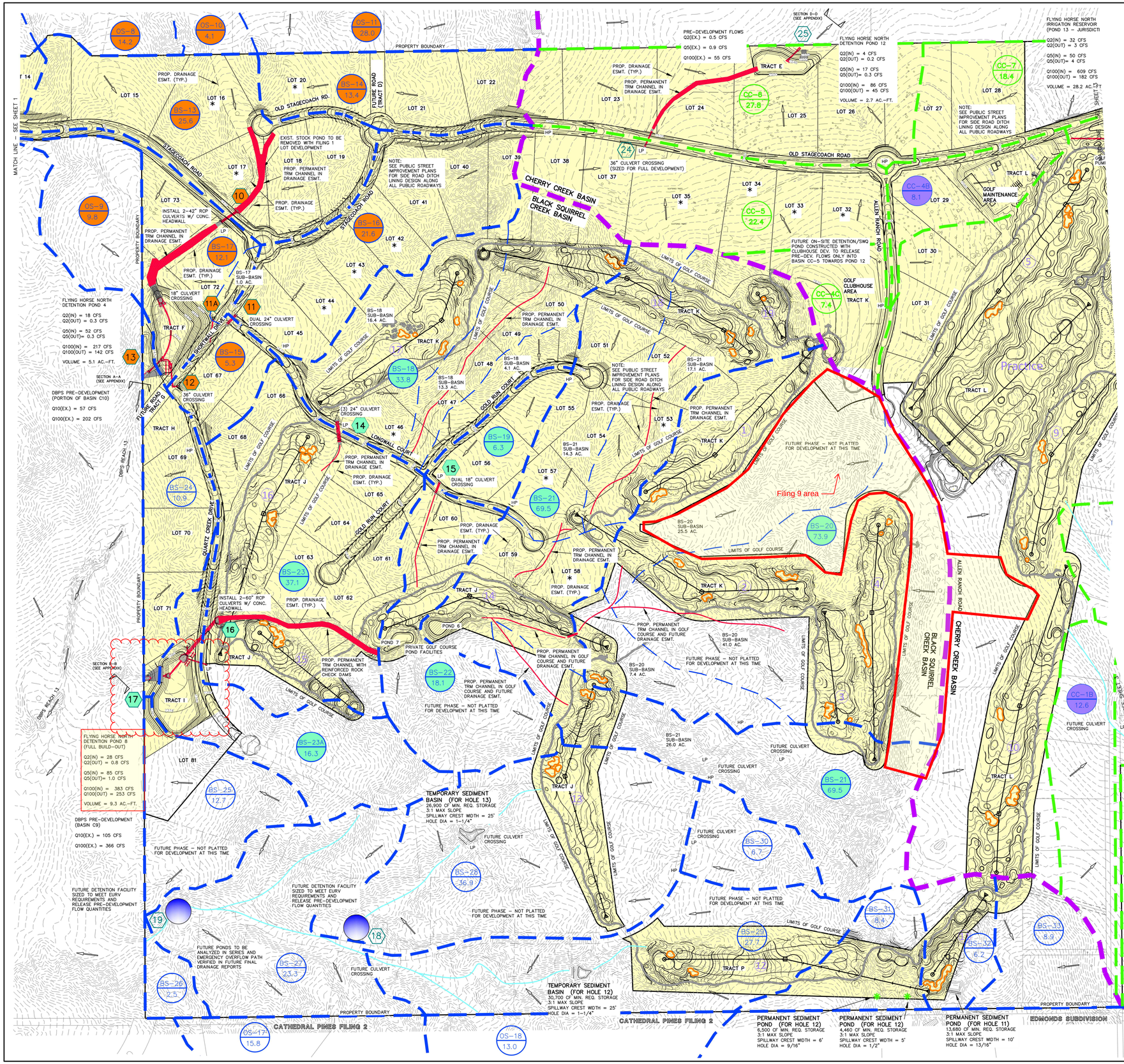
7. "Final Drainage Report and Plan for Cathedral Pines Subdivision Filing No. 3," Stillwater Engineering, dated July 2006.

8. "Black Squirrel Creek Drainage Basin Planning Study," URS Corporation, dated August 1987.

9. "Final Drainage Report for Country View Estates" Associated Design Professionals Inc, dated October 1998.

10. "Urban Storm Drainage Criteria Manual Volume 1, 2 & 3" Urban Drainage and Flood Control District, dated January 2016.

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BASIN SUMMARY - DEVELOPED CONDITIONS

BASIN (label)	AREA (acres)	COMPOSITE CN	TOTAL LAG TIME (hours)	Q 2 Yr. (cfs)	Q 5 Yr. (cfs)	Q 100 Yr. (cfs)
OS-8	14.20	65.0	0.27	2.1	6.2	24.7
OS-9	9.80	60.0	0.37	0.1	1.0	9.1
OS-10	4.10	65.0	0.17	0.7	2.1	8.2
OS-11	28.00	65.0	0.35	2.4	8.2	38.7
OS-12	68.10	62.7	0.37	2.2	11.9	75.8
OS-13	36.90	63.0	0.33	1.4	7.4	45.0
OS-14	26.40	62.0	0.31	0.7	4.6	31.0
OS-15	70.80	63.9	0.38	3.3	14.8	84.2
OS-16	4.50	65.0	0.24	0.4	1.5	7.2
OS-17	15.80	65.0	0.19	1.6	5.9	27.7
OS-18	13.00	65.0	0.20	1.3	4.7	22.6
BS-13	25.60	65.0	0.23	3.7	10.2	40.7
BS-14	13.40	65.0	0.23	2.6	6.8	26.5
BS-15	5.30	65.0	0.18	1.6	3.7	12.2
BS-16	21.60	65.0	0.34	4.6	11.8	44.1
BS-17	12.10	65.0	0.21	3.1	7.7	26.7
BS-18	33.80	63.6	0.41	3.5	12.4	56.0
BS-19	6.30	65.0	0.18	2.1	4.6	15.0
BS-20	73.90	63.4	0.31	7.4	24.6	112.4
BS-21	69.50	64.3	0.35	7.8	23.9	103.0
BS-22	18.10	64.4	0.22	3.7	9.6	36.5
BS-23	37.10	63.3	0.33	4.5	13.6	58.2
BS-23A	16.30	64.4	0.29	5.5	12.0	38.3
BS-24	10.90	63.0	0.17	0.6	3.3	17.6
EX-24 (Pre-Dev.)	13.20	60.0	0.17	0.2	2.2	17.8
BS-25	12.70	63.0	0.23	0.4	2.7	17.3
BS-26	2.50	60.0	0.18	0.0	0.4	3.4
BS-27	23.30	65.0	0.22	2.1	8.0	38.8
BS-28	36.90	64.4	0.32	2.2	9.3	49.4
BS-29	27.70	64.0	0.33	1.4	6.5	35.9
BS-30	6.70	65.0	0.20	0.7	2.4	11.7
BS-31	8.40	62.5	0.23	0.3	1.9	11.8
BS-32	6.20	62.6	0.20	0.3	1.6	9.4
BS-33	8.90	64.7	0.19	0.8	3.2	15.3
CC-1A	9.80	65.0	0.23	0.8	3.3	16.0
CC-1B	12.60	64.8	0.25	1.0	4.0	19.4
CC-2A	11.00	65.0	0.22	1.0	3.8	18.3
CC-2B	20.80	65.0	0.22	1.9	7.1	34.6
CC-2C	6.40	65.0	0.18	0.7	2.5	11.5
CC-3	52.50	63.1	0.43	1.8	8.8	54.5
CC-4A	108.70	62.6	0.44	15.4	39.0	156.0
CC-4B	8.10	76.1	0.26	4.0	7.3	20.6
CC-4C (Pre-Dev.)	7.40	61.0	0.13	0.2	1.8	11.2
CC-5	22.40	65.0	0.26	1.8	7.1	34.3
CC-6	27.80	65.0	0.25	2.3	9.1	43.2
CC-7	18.40	65.0	0.29	1.4	5.4	27.0

DESIGN POINTS SURFACE ROUTING SUMMARY - DEVELOPED CONDITIONS

Design Point (label)	Contributing Basins	Q 2 Yr. Q (cfs)	Q 5 Yr. Q (cfs)	Q 100 Yr. Q (cfs)
DP-10 DEV	OS-8, OS-10, OS-11, BS-13, BS-14	10.7	32.0	143
DP-11 DEV	BS-16	4.6	11.8	36
DP-12 DEV	DP-11, 1.0 Ac. Portion of BS-17 and BS-15	4.2	11.8	46
TOTAL INFLOW TO POND 4 (UD Detention hydrograph)	**DP-10, DP-12, BS-17, OS-9**	**10**	**16**	**217**
DP-13 DEV	**Release from FHN Pond 4**	**0.3**	**0.3**	**142**
DP-14 DEV	BS-18	3.5	12.4	56
DP-15 DEV	BS-19	2.1	4.6	15
DP-16 DEV	DP-14, DP-15, BS-20, BS-21, BS-22, BS-23	25.0	78.0	362
TOTAL INFLOW TO FHN POND 8 (Full Build-out) (UD Detention hydrograph)	**DP-10, DP-12, BS-17, OS-9**	**24**	**37**	**390**
DP-17 DEV (Full Build-out)	**Release from FHN Pond 8**	**0.8**	**1.0**	**253**
TOTAL INFLOW TO FHN POND 8 (Filing 1 Only) (UD Detention hydrograph)	**DP-10, DP-12, BS-17, OS-9**	**9**	**14**	**301**
DP-17 DEV (Filing 1 Only)	**Release from FHN Pond 8**	**0.4**	**0.5**	**219**
DP-18 DEV	BS-28, BS-29, BS-30, OS-18	5.0	21.6	115
DP-19 DEV	BS-27, OS-17, Release from DP-18	3.8	16.8	126
DP-20 DEV	CC-1A, OS-12	3.2	14.3	88
DP-21 DEV	CC-2A, OS-13	2.1	10.5	62
DP-22 DEV	CC-2B, Release from DP-21	3.7	16.6	92
DP-23 DEV	CC-3, OS-14	2.5	13.0	84
DP-24 DEV	CC-4C (Pre-Dev.), CC-5	1.9	8.4	45
TOTAL INFLOW TO POND 12 (UD Detention hydrograph)	**CC-4C, CC-5, CC-6**	**6**	**9**	**85**
DP-25 DEV	**Release from FHN Pond 12**	**0.2**	**0.3**	**45**

LEGEND

DESCRIPTION	SYMBOL
EXISTING GROUND CONTOUR	6910
PROPOSED FINISHED CONTOUR	6910
BASIN BOUNDARY EAST CHERRY CREEK	
MAJOR BASIN BOUNDARY	
BASIN BOUNDARY BLACK SQUIRREL	
DESIGN POINT	3
LOTS WITH NON-STANDARD CULVERT SIZE	*
BASIN IDENTIFIER / AREA IN ACRES	BB 10.0
EXISTING DIRECTION OF FLOW	
PROPOSED DIRECTION OF FLOW	
STORM SEWER	
FILING NO. 1 PLAT AREA	

N

200 100 0 200 400

SCALE: 1" = 200'

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Colorado Springs, Colorado 80903
(719)785-0790
(719)785-0799 (Fax)

FLYING HORSE NORTH
PRELIMINARY/FINAL DRAINAGE REPORT
FILING NO. 1 DRAINAGE MAP

DESIGNED BY	MAW	SCALE		DATE	10-25-17
DRAWN BY	MAW	(H) 1"= 200'		SHEET	2 OF 4
CHECKED BY		(V) 1"= N/A		JOB NO.	1096.11

HRGreen

HRGREEN.COM

Flying Horse North Filing No. 3
Final Drainage Report

June 2024

Prepared For:

Mr. Drew Balsick

Vice President / Project Manager

Flying Horse Development, LLC
2138 Flying Horse Club Drive

Colorado Springs, CO 80921

(719) 785-3237

Prepared By:

HR Green Development, LLC

Contact: Richie Lyon, PE

Richie.Lyon@hrgreen.com

719-318-0871

PCD File No. SF2326

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Engineer's Statement

This report and plan for the drainage design of the development, Flying Horse North, was prepared by me (or under my direct supervision) and is correct to the best of my knowledge and belief. Said report and plan has been prepared in accordance with the *El Paso County Drainage Criteria* Manual and is in conformity with the master plan of the drainage basin. I understand that El Paso County does not and will not assume liability for drainage facilities designed by others. I accept responsibility for any liability caused by any negligent acts, errors or omissions on my part in preparing this report.



6/14/2024

Richie Lyon, PE Date

State of Colorado No. 53921

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.

Flying Horse Development, LLC

6/14/2024

Drew Balsick Date

Vice President / Project Manager

Flying Horse Development, LLC
2138 Flying Horse Club Drive

Colorado Springs, CO 80921

El Paso County:

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

Gilbert LaForce, P.E. Digitally signed by Gilbert LaForce, P.E.
Reason: On Behalf of the County Engineer
Date: 2024.07.08 14:08:10-06'00'

07/08/2024

Joshua Palmer, P.E. Date

County Engineer/ECM Administrator

Final Drainage Report – Flying Horse North

I. General Purpose, Location and Description

a. Purpose and Scope

The Purpose of this Final Drainage Report (FDR) is to identify specific solutions to drainage concerns for onsite and offsite tributary areas resulting from the development of the subdivision to be platted. The FDR is to describe the onsite and offsite drainage patterns, existing and proposed storm infrastructure as it relates to water quality and stormwater detention for any proposed or existing facilities, the planned storm water management for the Flying Horse North development for Filing No. 3.

Preliminary Drainage Report for Flying Horse North Preliminary Plan and Final Drainage Report for Flying Horse North Filing No. 1 is a combined Preliminary Drainage Report (PDR) and Final Drainage Report (FDR) that was developed by Classic Consulting, latest revision June 2018. The combined PDR/FDR was approved by the County in September of 2018 and is included in Appendix F. This approved report identifies the proposed Filing No. 3 area for the PDR and Preliminary Plan portion of the report and the Filing No. 1 area for the FDR portion.

A more recent Master Development Drainage Plan (MDDP) was prepared by HR Green Development, LLC. and was approved by the County in September of 2022, entitled *Flying Horse North Master Development Drainage Plan* latest revision date of September 9, 2022. This MDDP also referenced the Classic Consulting report from 2018 for master drainage design of the proposed Filing No. 3 area.

The items discussed in this FDR include final plat layout, land uses, and drainage patterns for Filing No. 3. Included in this report are final hydrologic and hydraulic drainage calculations and design as required for the final design of the development of the single-family residential estate lot areas with assumed conservative drainage analysis for a future Flats area. This report references the aforementioned reports to compare and contrast findings in the final design to ensure that existing infrastructure and facilities are not negatively impacted by this development.

b. DBPS Investigations

Flying Horse North is split by the Arkansas River Basin and South Platte Basin. Within each of those river basins, the site stretches across the Black Squirrel Basin and East Cherry Creek Drainage Basins.

The Black Squirrel Drainage Basin Planning Study (DBPS) Preliminary Design Report prepared by URS Corporation was reviewed to determine existing plans and constraints that would influence the design of the Flying Horse North Development. The proposed plans for Flying Horse North are in general conformance with the DBPS.

Flying Horse North Filing No. 3 is located within a major portion of the Black Squirrel Creek Drainage Basin and there is a small portion to the east of the proposed development that is within the East Cherry Creek Drainage Basin. A Preliminary Drainage Report and Final Drainage Report for this area were prepared in June 2018 by Classic Consulting and approved by El Paso County in September of 2018, and a more recent MDDP by HR Green demonstrated the general drainage approach for this area where densities for the development will remain similar to the report.

For the portion of Flying Horse North which lies within the East Cherry Creek Drainage Basin, a DBPS does not currently exist, and this FDR is consistent with the 2022 MDDP which complies with standard El Paso County regulations regarding drainage within this corridor.

The majority of the Filing No. 3 area falls within the Black Squirrel Creek Basin which is to consist of 2.5-acre single-family residential estate lots, the existing golf course, and a portion of future Flats development that is assumed at a conservative imperviousness for the purpose of this report. Proposed developed areas are provided with water quality and full spectrum detention prior to release offsite to the west. Areas that are tributary to Flying Horse Filing No. 1 have no increase in required stormwater quality or detention volumes. There is a relatively small area of 2.5-acre single-family lots that fall within the East Cherry Creek Basin that drain directly offsite. The future Flats development area and the proposed roadway within the East Cherry Creek Drainage Basin are detained on site prior to release to the east golf course area. There is no proposed basin transfer and therefore the historical drainage patterns are to remain in place including at the roadway and lots at the major basin delineation.

c. Stakeholder Process

There are no amendments to the current DBPS.

d. Agency Jurisdictions

Listed below are the jurisdictions that this project will conform to:

El Paso County

Federal Emergency Management Agency

e. General Project Description

Flying Horse North Filing No. 3 is in El Paso County jurisdiction and is located within the larger Flying Horse North subdivision, adjacent to Filing No. 1 and the existing golf course. The larger Flying Horse North development is bordered by Highway 83 to the west, Black Forest Road to the east, Cathedral Pines to the south, and High Forest Ranch to the north. The greater Flying Horse North area contains approximately 1,459 acres within the whole Section 36, Township 11 South, Range 66 West of the Sixth Principal Meridian, and a portion of Section 30 and 31, Township 11 South, and Range 65 West of the Sixth Principal Meridian. The Flying Horse Filing No. 3 area is 293.7 acres in total.

This FDR covers Filing No. 3 and includes offsite upstream and downstream areas to analyze existing and proposed drainageways and facilities. The Filing No. 3 area includes 138.42 acres of 2.5-acre single-family residential estate lots totaling 51 lots, one of which includes the previously platted Flying Horse North Filing No. 2 which is now platted to be a part of Filing No. 3 as lot number 4. The development includes the single-family residential estate lots, 60’ width rights-of-way that include asphalt paved roadways with roadside swale sections and electric easements. There are basins to the east that are dedicated to future Flats development, one sub-basin within the Black Squirrel Creek Basin that is tributary to an existing detention facility in Filing No. 1 and one sub-basin within the East Cherry Creek Basin that is tributary to a proposed detention pond as a part of this filing. The future Flats area consists of 60’ right-of-way similar to an urban local typical roadway section with tree lawn and detached sidewalk.

The Filing No. 3 area was previously assessed in the 2018 Classic Consulting report with a similar land use plan that included 2-acre single-family residential estate lots and roadways. This report assesses the lots as 2.5-acre lots. The layout shown in the developed conditions hydrology map of this report and the

corresponding construction drawings differs slightly from the approved FDR/PDR with adjusted roadway alignments and lot lines. However, the drainage patterns, typical roadway section, and land use densities are similar.

The existing vegetative cover is 90 percent as evidenced by a field survey and aerial imagery. The existing vegetation includes native grasses and weeds, shrubs, and pinyon pine trees. Previous clearing of future planned roadways was done several years ago, and native grass and weeds have covered those areas.

f. Data Sources

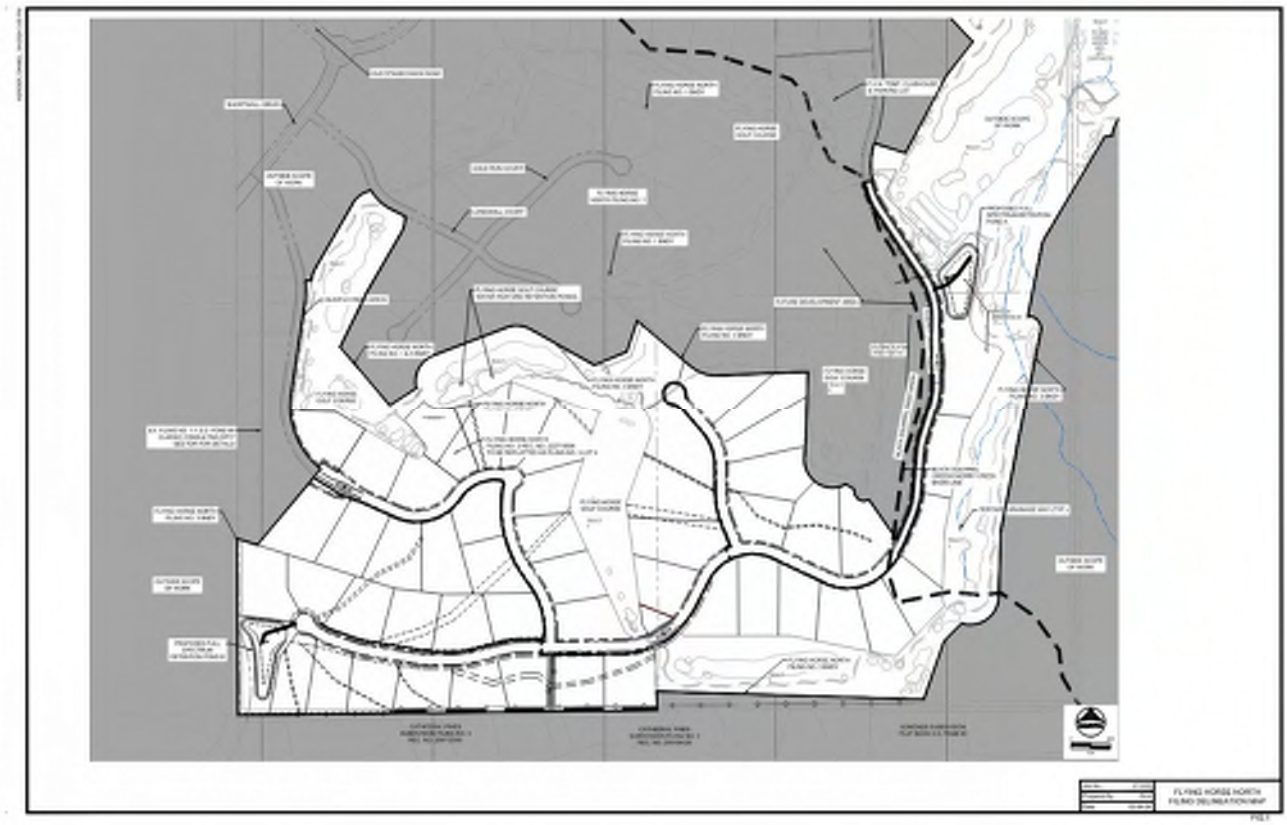


Figure 1 - Site Map

Listed Below are the technical resources reviewed in the preparation of this MDDP:

El Paso County Drainage Criteria Manual (DCM)

Mile High Flood District

NOAA Atlas 14

NRCS Soil Survey for El Paso County Area, Colorado

FEMA FIRM 08041C0305G and FIRM 08041C0315G (eff. 12/7/2018)

El Paso County Assessor Property Records

Preliminary Drainage Report for Flying Horse North Preliminary Plan and Final Drainage Report for Flying Horse North Filing No. 1 prepared by Classic Consulting – June 2018

Flying Horse North Master Development Drainage Report prepared by HR Green Development, LLC. – latest revision September 9, 2022

Flying Horse North Irrigation Reservoir Embankment Design Report – August 2018

g. Applicable Criteria and Standards

Per the DBPS and El Paso County Criteria Manual, flows from the proposed site will be limited to historic flows to maintain the stability of the existing channels within the drainage basins. The master plan follows the Drainage Criteria Manual for El Paso County which refers to the City of Colorado Springs Drainage Criteria Manuals as amended. Criteria within the County and City manuals refer to the Mile High Flood District manuals, particularly for extended detention basin design and runoff reduction calculations which are utilized in this report.

A distinct difference in the 2018 FDR/PDR and this report are the hydrologic methodologies utilized to compute peak runoff values. The 2018 Classic Consulting report utilized the NRCS Curve Number method in order to be consistent with their previous MDDP for the greater Flying Horse North master development. The NRCS Curve Number method was used for Filing No. 1 and the future development of Filing No. 3 for sub-basins that did not exceed 100 acres. Typically, the Rational Method is used for hydrologic computations when basin analysis is under 100 acres due to the NRCS Curve Number method yielding smaller minor and major storm event peak runoff values. The resultant hydraulics in this report are similar to that of the approved 2018 FDR/PDR on a basin-by-basin basis, however, any differences in calculated stormwater runoff will be discussed. The difference in methodologies between the 2018 report and this report result in larger cumulative stormwater runoff values reported for the minor and major storm events. Due to the more conservative nature of the Rational Method, cumulative peak flow rates are greater than that of the 2018 FDR/PDR for the minor and major storm events for downstream design points including existing channels and ponds that were designed and constructed as a part of the Filing No. 1 report and construction drawings. Because of the discrepancy between methodologies of the NRCS Curve Number and Rational Method's, existing hydrology calculations have been completed on the proposed Filing No. 3 area using the rational method. This was done to determine if any downstream mitigation was needed, which will be discussed later in this report.

HR Green has discussed this discrepancy in hydrologic methodology with El Paso County engineering staff and it has been expressed that the chosen method for hydrologic computations is the Rational Method for this report to ensure sound design of the storm infrastructure for Filing No. 3 including swales, channels, culvert pipes, inlets, and roadway capacities. It was discussed that no Filing No. 1 drainage infrastructure will require redesign or retrofits unless explicit discrepancies in detention volumes are discovered as the tributary areas and percent imperviousness for respective detention ponds have not changed significantly between the 2018 FDR/PDR and this report for Filing No. 3. The existing regional detention ponds have been assessed in this report and it is verified that required volumes due to development of Filing No. 3 are less than the 2018 FDR/PDR for the tributary areas contributing to Filing No. 1 ponds. Due to the use of the NRCS Curve Number method in the 2018 FDR/PDR, the peak runoff values in this report are larger than that of the approved 2018 FDR/PDR. To complete a fair assessment of the impacts downstream of the site, existing hydrology calculations have been completed and included in appendix B. As discussed with County engineering staff, while peak runoff values have increased due

to the use of the Rational Method, there are no anticipated negative impacts to downstream offsite infrastructure because of this development as all other drainage parameters remain consistent with the 2018 FDR/PDR.

II. Project Characteristics

a. Location in Drainage Basin, Offsite Flows, Size

Flying Horse North is located within both the Black Squirrel Drainage Basin and East Cherry Creek Basin. The existing Filing No.1 and a large portion of the proposed Filing No. 3 is located within the Black Squirrel Drainage Basin. This drainage basin encompasses 10.9 square miles of mostly forested area and generally slopes from east to west and outfalls into Monument Creek. Black Squirrel is a sub-basin of the Arkansas River. The remaining filings and a small part of Filing No. 3 is located within the East Cherry Creek Basin. There is not a current planning study of the drainage basin, but generally it slopes from southwest to northeast. The basin eventually flows into the South Platte River.

For the East Cherry Creek one drainage basin consisting of five sub-basins is conveyed to the proposed detention pond at Design Point 2, Pond A. Two offsite basins are tributary to this pond from the north near the existing club building. The respective contributing flow from the sub-basins is shown in the table below:

Basin Name	Acreage	5 Year Flow (cfs)	100 Year Flow (cfs)
CC-34	0.89	1.0	2.9
CC-34.1	15.09	6.7	36.1
CC-34.2	1.84	4.9	8.7
CC-34.3	1.01	1.6	3.9
CC-34.4	3.44	7.9	14.6
OS-1	2.73	2.8	8.2
OS-2	0.34	1.3	2.3

The future Flats development area west of the proposed roadway drains directly to the roadway via overland sheet flow and is channelized within the curb and gutter and conveyed into three public CDOT Type R inlets: two 15' CDOT Type R on-grade inlets, and a 5' CDOT Type R curb sump inlet. These inlets ultimately drain to Pond A for water quality and detention. The area represented by the eastern half of the proposed roadway is channelized within the curb and gutter and makes its way down to a 10' CDOT Type R curb sump inlet which also is ultimately released into Pond A for water quality & detention. Areas within CC-34.1 drain directly offsite and are not directed to Pond A. These areas have 100 percent water quality runoff reduction as they are open space or 2.5-acre single family residential estate lots with grass buffers at the rear of the lots. These areas do not fall under the large lot exemption as they are calculated with a maximum of 11 imperviousness. UD-BMP runoff reduction calculations are provided in Appendix B to demonstrate that 100 percent water quality runoff reduction is achieved in these areas. Pond A has volume capacity for over-detention of these areas that drain directly offsite to the existing golf course to the east.

The northern basins of the filing follow natural drainageways, proposed roadside swales and proposed public culvert pipes that are analyzed for capacity. The northern basins ultimately direct stormwater runoff to existing Filing No. 1 Pond 6, Pond 7, and Tract I which outfalls to Flying Horse North Detention Pond 8

(DP17 of the 2018 Classic Consulting PDR/FDR, PCD No. SF-18-001). There are offsite basins that drain to Pond B that are consistent with the previous FDR's assumptions. The 2018 Classic Consulting FDR/PDR represented this area as future development of 2-acre lots that would drain due east through the existing golf course with future culvert crossings.

Most of the Filing No. 3 area is within the Black Squirrel Creek Basin. Generally, the areas north of proposed roadways within the filing follows the historic drainage pattern and ultimately flows to Flying Horse North Detention Pond 8 as described in the 2018 Classic Consulting FDR/PDR which is represented as Design Point 10 in this report. The southern areas containing proposed roadways and most of the 2.5-acre single family residential estate lots drain due west to proposed detention Pond B. The Filing No. 3 area has offsite flow from the Cathedral Pines Filing No. 2 subdivision that drains to roadside swales that convey the runoff to a proposed detention Pond B (DP19 of the 2018 Classic Consulting PDR/FDR).

The respective contributing flows from the sub-basins within the Black Squirrel Creek Basin are shown in the table below. The first table includes the onsite and offsite basins that contribute to Design Point 10 (Pond 8 of the Classic Consulting report) and the second table includes the onsite and offsite basins that contribute to Pond B within this filing.

Sub-basins contributing to existing Pond 8 (Design Point 10 of this report):

Basin Name	Acreage	5 Year Flow (cfs)	100 Year Flow (cfs)
BS-18	33.90	12.6	60.1
BS-19	6.35	4.1	16.8
BS-20	23.79	9.6	48.5
BS-20.1	42.26	16.3	77.7
BS-20.2	4.32	2.5	10.1
BS-20.3	0.56	2.3	4.1
BS-21.1	15.24	8.5	34.3
BS-21.2	0.18	0.8	1.5
BS-21.3	50.92	17.7	85.0
BS-22	0.24	1.1	2.0
BS-22.1	16.87	8.8	38.4
BS-23	37.06	15.6	76.7
BS-23A	9.28	4.1	19.0
BS-23A.1	7.96	4.2	17.4

Sub-basins contributing to proposed Pond B, Design Point 17 of this report:

Basin Name	Acreage	5 Year Flow (cfs)	100 Year Flow (cfs)
BS-21	0.77	3.0	5.4
BS-26	4.90	1.7	10.6
BS-27	9.68	5.6	22.9
BS-28	24.03	12.3	50.6
BS-28.1	5.76	2.8	12.5
BS-28.2	19.47	9.0	41.0
BS-28.3	0.54	2.5	4.5
BS-29	22.93	8.3	39.7
BS-30	11.53	4.9	20.4
OS-17	15.8	9.9	40.6
OS-18	13.00	8.2	33.7

There are four sub-basins that drain directly offsite due to the natural drainage patterns. These sub-basins have relatively small areas within Filing No. 3 and include parts of the 2.5-acre single-family residential estate lots at the southeast & western edges of the development. These sub-basins are excluded from detention requirements as they fall under the large lot exclusion ECM code I.7.1.B.5. The sub-basins are listed in the table below:

Basin Name	Acreage	5 Year Flow (cfs)	100 Year Flow (cfs)
BS-25	12.65	6.1	28.1
BS-31	8.40	3.2	18.6
BS-32	6.33	3.0	15.4
BS-33	8.91	5.2	21.9

This Filing No. 3 FDR utilizes a similar naming convention for the sub-basins for comparison to the 2018 Classic Consulting FDR/PDR. The tributary basins have similar acreage, runoff coefficients (when comparing the NRCS Curve Number method and the Rational Method), and percent imperviousness for respective sub-basins and downstream detention facilities. Any deviation in the sub-basin area, coefficient, or percent imperviousness is due to slight roadway alignment adjustments for the final design as compared to the preliminary layout in the 2018 report. Any change in the peak runoff numbers as compared to the 2018 report are due to the change in hydrologic computation methodology as discussed in a previous section of this report. Due to these differences in the computational methodology between the previously approved 2018 FDR and the values being reported in this report, additional analysis of existing conditions has been completed on the entire site. The existing conditions major flow values have been added to appendix B. A table showing the Classic 2018 FDR/PDR NRCS Method peak runoff values compared to the HR Green 2024 FDR Rational Method peak runoff values for proposed and existing conditions is provided below. This table is for basins that qualify for large lot exclusion under ECM code I.7.1.B.5.

Basin Name (Classic/HRG)	Acreage (Classic/HRG)	HRG 2024 Existing Major Flows	Classic 2018 Proposed Major Flows	HRG 2024 Proposed Major Flows
BS-25/BS-25	12.7/12.65	24.7	17.3	28.1
BS-31/BS-31	8.4/8.37	17.6	11.8	18.6
BS-32/BS-32	6.2/6.33	14.0	9.4	15.4
BS-33/BS-33	8.9/8.91	18.6	15.3	21.9

While there is an increase in peak runoff for these basins as compared to the 2018 report, there is a discrepancy in methodology. To negate this difference, the existing conditions of these basins have also been analyzed using the Rational Method, and it can be seen that the increase in runoff is insignificant. Additionally, as seen in appendix B, the total flowrates being released off-site into both Black Squirrel Creek Basin and Cherry Creek basin have been reduced overall. Combined for both basins, the total flow released off-site has been reduced by 55% and 44% respectively for the minor and major storm events. This is largely in part because of the over detention provided in the proposed detention ponds. While there is a slight increase of runoff downstream for the basins that qualify for large lot exclusion and do not require detention, the total flows being released downstream have been reduced. Because of this no downstream mitigation is proposed.

b. Compliance with DBPS

This FDR is in general conformance with the guidelines outlined in the Black Squirrel DBPS and current drainage flows of the East Cherry Creek Basin. Flying Horse North will construct multiple full spectrum detention facilities to limit the effects of development and mimic natural flow patterns. The Filing No. 3 development will follow historic drainage patterns and utilize the existing natural swales throughout the area for conveyance of stormwater runoff toward respective proposed and existing detention facilities. The southeast area of the filing that consists of the major basin delineation between the Black Squirrel Creek Basin and the Cherry Creek Basin determines the drainage pattern of the roadway and future development grading of the lots within and along the basin delineation. The roadway is designed to drain according to the basin delineation (west for Black Squirrel Creek Basin and east for Cherry Creek Basin) and future single-family lot developments shall be graded to follow this drainage pattern at the plot plan level.

Existing downstream infrastructure is currently limited to the historic drainage channels and minimal downstream improvements exist. As such, the site follows the DBPS and restricts offsite flow rates to not exceed historic flow rates. The sites ultimate outfalls will generally be along the same historic tributaries. Although outfall rates will be at or below historic, the cumulative volume of runoff will increase and therefore downstream facilities may see an increase in the duration of flows. This may provide a net benefit to the downstream facilities by providing more water to assist with the sustenance of vegetation however it should be noted that increased volume may expedite potential erosion or channel movement. Any deviations from the approved 2018 Classic Consulting PDR/FDR in terms of runoff flow rate and water quality and detention volumes are assessed within this report to show compliance with the previously approved report in terms of capacities for drainage facilities including roadside swales, natural drainageways, and detention ponds (both onsite and offsite).

c. Site Characteristics

Per the NRCS web soil survey, the site is made up entirely of Type B soils. The ridge line between the Arkansas River and South Platte River Basins creates different soil environments for each. The portion of site that is within the Black Squirrel Drainage Basin, which includes Flying Horse Norse Filing No. 2 and No. 3, are predominately Elbeth sandy loam. The remaining filings are within the East Cherry Creek Basin which consists of Peyton sandy loam and Peyton-Pring complex. See Appendix A for the NRCS soil map.

Current ground cover varies between the two basins as well. Filings No. 2 and 3 are predominantly covered by Ponderosa Pine trees as a part of Black Forest and pasture. The remaining filings are short- to mid-grass prairie grasslands and former farmland which consists of non-native weeds and grasses. This portion of the site has very few, if any, trees and a minimal number of shrubs are found on the site.

d. Major Drainage Ways and Structures

No major drainage ways exist within the development; however, small tertiary tributaries are within the site currently and function to convey flows to unnamed tributaries of the Black Squirrel Creek. These informal drainage ways are assessed within this report for stormwater runoff capacity and water surface elevations during the 100-year event as future development of single-family residential lots with basement or walkout conditions is considered. Roadside swales are included as a part of the typical roadway section and are assessed within sub-basins to ensure that swale and culvert pipe capacities are met and do not result in excessive pooling in the roadway sections per code.

The existing minor drainage channels within the site are planned to be maintained to the maximum extent possible. These will continue to be used for conveyance of storm drainage flows. The limits of construction and disturbance plan for no significant earthwork alterations to the existing minor drainage channels that would affect the drainage patterns or capacity of the sections throughout the filing as they are proven to have sufficient capacities for their respective tributary areas and to maintain the natural features of the site including existing trees and vegetation.

Drainageways of note including roadside swales are described within this report with parameters to demonstrate compliance with swale design criteria and capacities. Culvert pipes are sized to convey upstream flow under proposed roadways and maintain historic drainage patterns. Natural tertiary drainageways and roadside swales are prescribed matting products for various areas in order to minimize erosion and sediment runoff downstream per hydraulic analysis.

There are two areas in which storm sewer infrastructure is designed, beyond culvert pipes for driveway and roadway crossings. The first area is the future Flats development area to the east where there is an urban roadway section. A deviation is to be approved for this roadway section. Conservative land use areas were utilized for the hydrologic and hydraulic calculations to plan for future design and development of this area including Pond A. Storm sewer infrastructure in this area consists of two public CDOT Type R on-grade inlets & two public CDOT Type R sump curb inlets with public and private storm sewer pipes that drain to the private concrete forebay of the proposed private detention facility to the east. The second area that consists of storm sewer infrastructure is the Allen Ranch Road cul-de-sac to the southwest of the site where cumulative stormwater runoff is conveyed on the north and south roadside swales that are expanded ditch sections to accommodate the cumulative flow from the upstream design points. The expanded ditch sections further convey the runoff via private culvert pipes, a private 48” RCP culvert pipe from the north (Section L-L) expanded ditch section and private dual 42” RCP storm culvert pipes from the south (Section M-M) expanded ditch section. These two culvert pipes daylight to a Rip-Rap Rundown Rock Chute that is designed for energy dissipation and capacity of the cumulative flow that enters the private concrete forebay for Pond B.

e. Existing and proposed land uses

The existing Filing No. 3 area is open rangeland within a forested area consisting of sparse native grasses, weeds, and pinyon pine trees as well as baren pervious soil. The existing Filing No. 3 area consists of no development other than a previously cut-in maintenance pathway that was originally planned as the future roadway corridor and golf cart paths. As part of Filing No. 1, a road was constructed along with facilities to support a golf course. The Filing No. 3 development will connect to these existing roadways at the boundary between the two filings.

The 2018 Classic Consulting PDR/FDR assumed 2-acre single-family residential estate lot development with the same percent imperviousness within the filing area. This report includes the final design layout of 2.5-acre lots with rural roadway sections and a future Flats area with an urban roadway section. Any deviations in basin areas, land use acreages, and resultant composite coefficients are shown within this report and demonstrated to meet downstream stormwater runoff and volume capacities for proposed and existing facilities. The proposed land use of future development for Flats to the east of the filing differs from the assumed 2-acre residential lots in the same area. The downstream existing detention facility that this future development area is tributary to is assessed within this report to demonstrate that the existing pond has sufficient volume and requires no retrofitting.

III. Hydrologic Analysis

a. Major Basins and Sub-basins

Major Basin Description

- Previous basin study: Black Squirrel Drainage Basin Planning Study
- Per FEMA FIRM 08041C0305G and 08041C0315G (eff. 12/7/2018), Flying Horse North has the East Cherry Creek run through the northwest portion of the site. Currently, FEMA shows a LOMR effective April 4th, 2019 Base Flood Elevations and Zone A. Per the El Paso County Land Development Code Chapter 8 Section 8.4.2.B.1.e.i, the base flood elevations for Zone A will be determined once the platted lots are solidified and are confirmed within 300-ft of the current floodplain designation. Certification of the flood elevations will be via the FEMA CLOMR/LOMR process or Floodplain Certification Letter.
- There are no FEMA Floodplains within this Filing

The site has been divided into several major drainage basins where each basin is tributary to a full spectrum detention pond facility with the exception of basins that drain directly offsite which have supporting water quality runoff reduction calculations. These basins and associated sub-basins are described in more detail in the next section of this report.

This FDR utilizes a similar naming convention for the basins and sub-basin as the 2018 Classic Consulting PDR/FDR in order to more easily compare and contrast the final developed drainage conditions for the filing.

Existing Subbasin Description

The existing conditions for Filing No. 3 are consistent with the conditions and hydrology map presented within the 2022 HR Green Development MDDP. The previous report's existing and developed conditions drainage maps are included in the appendix section of this report for reference. The developed conditions drainage map within the Filing No. 1 area are now the existing conditions of that area for this report and the existing conditions drainage map within the 2022 MDDP within Filing No. 3 remain as is and is utilized as the existing conditions drainage map for this report.

The 2022 HR Green Development MDDP drainage maps represent the existing conditions for assessment of the Filing No. 3 development as there has been no disturbance outside of the previously developed Filing No. 1 area. Therefore, all existing topography and historical drainage patterns remain the same.

The onsite basins relevant to this report that are utilized in the 2018 report are the following: Basins BS-18, BS-19, BS-20, BS21, BS-22, BS23, BS-23A, BS25, BS-26, BS-27, BS-28, BS-29, BS-30, BS-31, BS-32, and BS-33.

The offsite basins relevant to this report that are utilized in the 2018 report are the following: OS-17 and OS-18.

Proposed Subbasin Description

The net area of some basins described in this report may differ from the 2018 Classic Consulting FDR/PDR due to changes of alignment of proposed roads and slight adjustments of the delineations with new topographic survey information. The net Q_5 & Q_{100} values may differ in this report because of the different methodologies used between the reports. Classic Consulting's FDR had used a Curve Number Method to report 5-year and 100-year drainage flows while this report had used the Rational Method to report those values. The rational method yields higher minor and major storm peak runoff values. Because of these two discrepancies, the values reported in this FDR may be higher across all design points that had also been evaluated in Classic Consulting's FDR from 2018. After conversations with El Paso County, discrepancies in design, basin delineation, and calculation methodology do not require HR Green to redesign any existing storm infrastructure that has been built in Flying Horse North Filing No. 1 including culvert pipes, channels, and rock chutes. The existing Pond 8 (Design Point 10 of this report) is assessed for detention volumes as a result of the development of Filing No. 3 for areas that are tributary to the existing pond.

The following design points are presented on the Developed Conditions Drainage Map within the appendix and are described as follows:

Design Point 1 (Q_5 = 4.4 cfs, Q_{100} = 12.1 cfs) represents the developed flows from basins OS-1 & -34.3. These flows are captured at a 15' CDOT type R on-grade inlet. The on-grade inlet is capable of capturing 4.4 CFS (100%) of the 5-year flow and 10.5 CFS (87%) of the 100-year flow, leaving a total of 0 & 1.6 CFS left as bypass, respectively, to be channelized in EPC type A curb and gutter and captured at design point 1.1. The captured flow will travel down to design point 1.1 as well via an 18" RCP storm sewer.

Design Point 1.1 (Q_5 = 1.2 cfs, Q_{100} = 7.5 cfs) represents the developed direct basin flow from basin CC-34 as well as the bypass flow mentioned above in design point 1 and design point 1.2. These flows will be channelized into the streets curb and gutter to design point 1.1 where they will be captured by a 5' CDOT type R sump inlet. All flow will be captured and piped via 24" RCP storm sewer to converge with flows captured at design point 1.3, then down to Pond A at design point 2. Flows captured within this design point shall only be from the East side of the Black Squirrel Creek and Cherry Creek basin line so that drainage patterns stay consistent with pre-development flows.

Design Point 1.2 (Q_5 = 7.9 cfs, Q_{100} = 14.6 cfs) represents the developed basin flows from basin CC-34.4. Flows from this basin have been calculated to be conservative to account for future development and will be directed via EPC type A curb and gutter to be captured by a 15' CDOT type R on-grade inlet. The on-grade inlet is capable of capturing 7.7 CFS (97%) of the 5-year flow and 11.6 CFS (79%) of the 100-year flow, leaving a total of 0.2 CFS and 3.0 CFS left as bypass, respectively, to be channelized and captured at design point 1.1. The captured flow will travel down to design point 1.1 as well via a 24" RCP storm sewer.

Design Point 1.3 (Q_5 = 6.2 cfs, Q_{100} = 11.0 cfs) represents the developed basin flows from basins CC-34.2 & OS-2. These basins represent the east side of the proposed roadway and are to be channelized via EPC type A curb and gutter. Channelized flows are directed to a low point at this design point and are captured with a 10' CDOT type R sump inlet. Captured runoff is combined with flows from design point 1.1, and are routed to Pond B via a 36" RCP storm sewer.

Design Point 2 (Q_5 = 26.2cfs, Q_{100} = 76.6 cfs) represents the developed flows from basins CC-34, CC-34.1, CC-34.2, CC-34.3, CC-34.4, OS-1 & OS-2. Developed flows will be routed to this location via the

proposed public roadway curb and gutter to two public CDOT Type R curb sump inlets. The public storm infrastructure conveys the runoff to Pond A to meet WQCV, EURV, & 100-Year detention capacity and release pre-development flow quantities (see appendix D for pond calculations).

Design Point 4 (Q_5 = 8.5 cfs, Q_{100} = 34.3 cfs) represents the developed flows from basin BS-21.1. These flows are to channelize into channel section D-D and end up at design point 4 where a 36" RCP culvert has been sized to route the flows underneath Bourbon Court (see Appendix C for culvert design). These flows ultimately combine with basin BS-21.2, BS-21.3, BS-20, BS-20.1, & design point 5, which flow to a Flying Horse North golf course retention pond at design point 6.

From Classic Consulting's FDR for Flying Horse North Filing No. 1, the basin that design point 4 contains, basin BS-21.1, was originally a part of basin BS-21 as seen in Classic Consulting's FDR (see appendix F). Classic's FDR reported a total basin area for BS-21 to be 69.5 acres with a Q_5=23.9 CFS and a Q_{100}=103.0 CFS. The cumulative basin BS-21 (this includes basins BS-21 through BS-21.3) shown in this report have a net area of 66.34 acres, a net Q_5= 30.1 CFS, and a net Q_{100}=126.3 CFS. See the statement preceding design point 1 description for an explanation of discrepancies between values reported here and values reported in Classic Consulting's 2018 FDR.

Design Point 5 (Q_5 = 4.7 cfs, Q_{100} = 14.2 cfs) represents the developed flows from basins BS-20.2 & BS-20.3. Flows from these basins sheet flow into typical roadside ditch sections to the end of the cul-de-sac where the flows from each basin will converge at design point 5. At this design point, the flows will be channeled through a weir cutout section within the typical roadside ditch section (see weir calculations in appendix C) and ultimately be led to design point 6 via natural channels existing downstream.

Design Point 6 (Q_5 = 57.7 cfs, Q_{100} = 261.3 cfs) represents the cumulative developed & existing flows of the following basins: BS-20, BS-20.1, BS-20.2, BS-20.3, BS-21.1, BS-21.2, & BS-21.3. This design point is located within the Flying Horse North golf course and is currently an existing retention pond within the golf course to provide a water feature for the course. Flows from this design point are fed into the next retention pond located within the golf course, design point 7.

From Classic Consulting's FDR for Flying Horse North Filing No. 1, the basins that design point 6 contain as mentioned above (Classic Consulting pond 6) were originally a part of basins BS-20 & BS-21 from Classic's FDR. Classic Consulting's FDR cumulative reporting of basins BS-20 & BS-21 were 143.4 acres with a net Q_5=48.5 CFS and a net Q_{100}=215.4 CFS. The cumulative basins draining towards design point 6 shown in this report have a net area of 137.3 acres, a net Q_5= 57.6 CFS, and a net Q_{100}=261.1 CFS. See the statement preceding design point 1 description for an explanation of discrepancies between values reported here and values reported in Classic Consulting's 2018 FDR.

Design Point 7 (Q_5 = 71.7 cfs, Q_{100} = 318.4 cfs) represents the cumulative developed flows of basins BS-19, BS-22, BS-22.1, and all basins associated with design point 6. Flows from the proposed area of disturbance in basins BS-22 and BS-22.1 are to drain down an existing swale labeled G-G on the drainage map and will be lined with a proposed turf reinforced matt. This design point is located within the Flying Horse North golf course and is currently an existing retention pond within the golf course to provide a water feature to the course. Flows from this design point exit from the pond via an existing permanent turf reinforced mat (TRM) channel with reinforced rock check dams. This channel ultimately leads the flow down to two existing 60" RCP culverts at design point 8, to pass beneath Quartz Creek Drive and into design point 10 where an existing detention pond has been designed by Classic and is described within their FDR from 2018.

From Classic Consulting's FDR for Flying Horse North Filing No. 1, the basins that design point 7 contain as mentioned above (Classic Consulting Pond 7) were originally a part of basins BS-19, BS-20, BS-21, BS-22 from Classic's FDR. Classic Consulting's FDR cumulative reporting of these basins was 167.8 acres with a net Q_5=62.7 CFS and a net Q_{100}=266.9 CFS. The cumulative basins draining towards design point 7 shown in this report have a net area of 160.7 acres, a net Q_5=71.7 CFS, and a net Q_{100}=318.4 CFS. See the statement preceding design point 1 description for an explanation of discrepancies between values reported here and values reported in Classic Consulting's 2018 FDR.

Design Point 8 (Q_5 = 99.8 cfs, Q_{100} = 455.3 cfs) represents the cumulative developed flows from basins BS-18, BS-23, and all basins associated with design point 7. Flows leading to this design point converge at a low point where two 60" RCP culvert pipes are to lead the flow underneath Quartz Creek Drive and into the existing detention pond at design point 10 (see Appendix for culvert design).

From Classic Consulting's FDR for Flying Horse North Filing No. 1, the basins that design point 8 contain as mentioned above (Classic Consulting design point 16) were originally a part of basins BS-18, BS-19, BS-20, BS-21, BS-22, & BS-23 from Classic's FDR. Classic Consulting's FDR cumulative reporting of design point 16 was 238.7 acres with a net Q_5=78 CFS and a net Q_{100}=390 CFS. The cumulative basins draining towards design point 8 shown in this report have a net area of 231.6 acres, a net Q_5= 100.1 CFS, and a net Q_{100}=455.6 CFS. See the statement preceding design point 1 description for an explanation of discrepancies between values reported here and values reported in Classic Consulting's 2018 FDR.

Design Point 9 (Q_5 = 4.2 cfs, Q_{100} = 17.4 cfs) represents the developed flows from basin BS-23A.1. Basin flows drain into a roadside ditch that will lead flows from the basin towards a low point within Quartz Creek Drive where an existing 24" RCP culvert will carry flows into an existing concrete forebay at design point 10, where an existing detention facility (Classic Consulting pond 8) will detain flows.

From Classic Consulting's FDR for Flying Horse North Filing No. 1, the basins that design point 9 contain as mentioned above were originally a part of basin BS-23A from Classics FDR. Classic Consulting's FDR cumulative reporting of basin BS-23A was 16.3 acres with a net Q_5=12 CFS and a net Q_{100}=38.3 CFS. Basin BS-23A.1 draining towards design point 9 shown in this report has a net area of 7.8 acres, a net Q_5= 4.1 CFS, and a net Q_{100}=17.1 CFS. See the statement preceding Design Point 1 description for an explanation of discrepancies between values reported here and values reported in Classic Consulting's 2018 FDR.

Design Point 10 (Q_5 = 108.1 cfs, Q_{100} = 491.7 cfs) represents the developed and existing flows from basins BS-18 through BS-21.3, excluding basin BS-21. All basins that flows to this design point are to be captured in an existing detention facility that was constructed during FHN Filing No. 1 and is referenced in Classic Consulting's FDR as pond 8. Flows entering the facility from design points 8 and 9, which account for all basins except for basin BS-23A, are entering the concrete forebay via dual 60" RCP culverts (DP8) and a single 24" RCP culvert (DP9). Run-off from BS-23A is entering the detention facility via sheet flow from the south.

A pond design description as provided by the 2018 Classic Consulting FDR is provided in section B of the proposed subbasin descriptions. The calculated tributary area entering the pond at design point 10 (Classic Consulting design point 17) reported in Classic Consulting's FDR was 255 acres with total in-flows of Q_5=85 CFS & Q_{100}=383 CFS. The calculated tributary area entering Pond 8 as calculated in this report is 248.9 acres at 8.74 percent impervious with total in-flows of Q_5=108.1 CFS & Q_{100}=491.7 CFS. See the statement preceding Design Point 1 description for an explanation of discrepancies between

values reported here and values reported in Classic Consulting's 2018 FDR. While peak runoff values may have discrepancies due to hydrologic calculation methodologies, the tributary area acreages and percent imperviousness parameters yield a decrease in required detention volumes and therefore no pond infrastructure retrofits are proposed.

Design Point 11 (Q_5 = 3.0 cfs, Q_{100} = 5.4 cfs) represents channelized developed flows from basin BS-21. These flows drain west towards an 18" RCP culvert that will cross underneath Bourbon Court (see Appendix C for culvert design). After passing through the culvert, the flows continue in a typical roadside ditch section west and converge with basin BS-28.1 at design point 12.

Design Point 12 (Q_5 = 5.9 cfs, Q_{100} = 17.9 cfs) represents the culmination of flows from design point 11 and basin BS-28.1. Continued flows from design point 11 are carried via a typical roadside ditch section down to design point 12. Run-off from basin BS-28.1 sheet flows down into the typical roadside ditch sections along Allen Ranch Road and a portion of Waterhole Way near the intersection of the two aforementioned roads. The cumulative flows enter a 24" RCP culvert at design point 12 where the flows will continue down to design point 14 via a modified roadside ditch section seen as Channel Section R-R and then into a wider Channel Section L-L (see Appendix C for channel section analysis & culvert design).

Design Point 13 (Q_5 = 9.0 cfs, Q_{100} = 41.0 cfs) represents the developed flows from basin BS-28.2. Most of the run-off within the basin will be sheet flow, but as the water flows west, it will begin to channelize in a natural swale which has been analyzed in two locations within this subbasin as channel section E-E & F-F (see Appendix C for analysis). Flows from the basin, as well as the road run-off from the east side of Waterhole Way, which is captured in a typical roadside ditch section, will converge at design point 13 where a 36" RCP culvert will carry flows underneath Waterhole Way (see Appendix C for culvert design). These flows ultimately run through basin BS-28, into a modified roadside ditch section to design point 14, and are finally captured in a detention facility at design point 17.

Design Point 14 (Q_5 = 29.7 cfs, Q_{100} = 114.0 cfs) represents the cumulative developed flows from basins BS-28 through BS-28.3, and BS-21. Flows from basins BS-28.1 and BS-28.2 have already been described in design points 12 and 13 respectively. Flows from basin BS-28 are mostly sheet flow at the north east section of the subbasin until they collect into natural channels analyzed in channel sections K-K & J-J (see Appendix C for analysis). Run-off from basin BS-28.3 is sourced from the west side of street 2 and is captured in a typical roadside ditch and released via a weir cutout (see Appendix C for weir design) into a natural channel which has been assessed as channel section J-J. Design point 14 then converges all basin flows to a low point on the north-east side of the cul-de-sac at the end of Allen Ranch Road. At this low point where the modified roadside ditch section L-L ends, a 48" RCP culvert will direct flows to a rock chute designed to convey flows down into Pond B at design point 17 (Classic Consulting design point 19).

From Classic Consulting's FDR for Flying Horse North Filing No. 1, the basins that design point 14 contain (Classic Consulting design point 18) were originally a part of basin BS-28 from Classics FDR. Classic Consulting's FDR reporting of basin BS-28 was 36.9 acres with a Q_5=9.3 CFS and a Q_{100}=49.4 CFS. Basins BS-28 through BS-28.3 as well as BS-21 now drain to design point 14 (Classic Consulting design point 18) as shown in this report and have a net area of 50.6 acres, a net Q_5= 29.7 CFS, and a net Q_{100}=114.0 CFS. See the statement preceding design point 1 description for an explanation of discrepancies between values reported here and values reported in Classic Consulting's 2018 FDR.

Design Point 15 (Q_5 = 21.4 cfs, Q_{100} = 93.8 cfs) represents the cumulative flows developed and existing flows from basins OS-18, BS-29, & BS-30. Run-off from basin BS-30 sheet flows north into the typical roadside ditch on the south side of Allen Ranch Road where the ditch section will evolve into Channel Section S-S to accommodate for larger driveway culverts as flow increases downstream (see Appendix C for analysis). Flows from basins OS-18 & BS-29 sheet flow into natural channel sections N-N & O-O where they will converge with the flows of BS-30 into a modified roadside ditch section analyzed as Channel Section Q-Q (see Appendix C for analysis). These flows ultimately continue west towards design point 16 where they are collected in dual 42" RCP culverts near the beginning of the cul-de-sac at the end of Allen Ranch Road to be discharged into a rock chute that will convey flows to Pond B at design point 17 (Classic Consulting design point 19).

Design Point 16 (Q_5 = 36.9 cfs, Q_{100} = 157.3 cfs) represents the cumulative flows from basins OS-17 & BS-27, and design point 15. Run-off from basins OS-17 flow through and channelize in BS-27. A portion of the flow from BS-27 sheets off into the modified roadside ditch section Channel Q-Q, while most flow from BS-27 channelizes and converges into the modified roadside ditch Channel M-M at the western end of Allen Ranch Road (see Appendix C for channel analysis). At the end of channel section M-M, flows will be captured in dual 42" RCP culvert pipes and released into a rock chute designed to convey flows into Pond B (Classic Consulting design point 19).

Design Point 17 (Q_5 = 68.2 cfs, Q_{100} = 281.8 cfs) represents the cumulative developed and existing flows from basin BS-26 and design points 14, & 16. Flows from basin BS-26 are direct sheet flow into the detention pond that is proposed at design point 17. Design points 14 & 16 enter the detention pond via a 48" RCP culvert, crossing the cul-de-sac at the end of Allen Ranch Road, and a pair of 42" RCP culverts at the western end of the modified roadside ditch section M-M, respectively. These culverts discharge into a rock chute that leads flows down into the pond's concrete forebay (see Appendix C for rock chute design). The proposed detention facility sizing is described in the following section.

According to Classic Consulting's FDR for Flying Horse North Filing No. 1, the basins that design point 17 contain (Classic Consulting design point 19) were originally a part of basins OS-17, OS-18, BS-28, BS-29, & BS-30 from Classics FDR. Classic Consulting's design point 19 did not originally contain basin OS-18, BS-29 or BS-30 but instead had those draining into a separate pond at design point 18 of Classics FDR. The proposed design being conveyed in this report now joins Classic Consulting's two separate ponds at design point 17 (Classic Consulting design point 18 & 19). The cumulative acreage of Classic's design points 18 and 19 were reported as 123.4 acres, the net Q_5=38.4 CFS, and the net Q_{100}=241 CFS. Design point 17 contains a tributary area of 128.4 acres. For more explanation of the difference between Classic Consulting's 2018 FDR report values for these basins as compared to the values being reported in this FDR, see the statement preceding the design point 1 description.

Design Point 18 (Q_5 = 3.2 cfs, Q_{100} = 18.6 cfs), Design Point 19 (Q_5 = 3.0 cfs, Q_{100} = 18.6 cfs), Design Point 20 (Q_5 = 5.2 cfs, Q_{100} = 21.9 cfs) represent smaller basins that will continue to sheet flow off-site to the south. These basins represent mostly golf course development and a small portion of the proposed developed 2.5 acre lots. Given the lot size, no water quality is required under ECM code I.7.1.B.5. However, permanent sediment basins will be installed downstream of the golf course development to provide sediment control. Developed flows released from these basins will not be significantly different than the pre-development flows. See the statement preceding Design Point 1 description for an explanation of discrepancies between values reported here and values reported in Classic Consulting's 2018 FDR. While peak runoff values may have discrepancies due to hydrologic calculation

methodologies, the tributary area acreages and percent imperviousness parameters yield a decrease in required detention volumes and therefore no pond infrastructure retrofits are proposed.

Design Point 21 (Q_5 = 6.1 cfs, Q_{100} = 28.1 cfs) represents basin BS-25 which flows off-site to the west and converges with outfall flows from Pond 8. This basin consists entirely of 2.5 acres residential lots that sheet flow into natural drainage ways. Proposed flows off-site as reported from this basin in the 2018 FDR/PDR from Classic Consulting report 17.3 CFS for the major storm event. Additional analysis has been completed for existing conditions of the entire Filing 3 area, as seen in appendix B. This analysis shows that the existing conditions of this basin result in a major storm event flowing off-site of 24.7 CFS. As compared, the proposed conditions result in an increase of 3.4 CFS for the major storm event, a minimal increase of flows. See section II.A for a comparison of existing and proposed conditions flowing off-site. Given the lot size, no water quality is required under ECM code I.7.1.B.5. Over-detention is provided in the proposed ponds for the Filing as this basin drains directly off-site.

b. Water Quality and Detention Facilities

There are two water quality and full spectrum detention ponds that are proposed within this filing. The detention ponds are designed to provide the required volume stages for Water Quality Capture Volume (WQCV), Excess Urban Runoff Volume (EURV), and the 100-year stage. The UD-Detention spreadsheet is utilized to determine basin sizing and create a stage-storage table to design the outlet structures with orifice plates and restrictor plates. The outlet structures and plates are designed to achieve the target release rates of the various stages: WQCV at 40 hours, EURV around 68 hours (may vary based on pond conditions), and the 100-year volume at 72 hours. The developed condition outlet flow rates are not to exceed predeveloped conditions. The ponds include the required infrastructure such as concrete forebays, an emergency spillway with rip-rap weirs, concrete trickle channels, and a 2.5-foot depth micropool attached to the outlet structure. Ponds include 15’ width maintenance paths with vehicular access to the bottom of pond to access forebays and outlet structures for continued maintenance. The pathways have an 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.

The proposed ponds and assessment of an existing downstream pond are described below.

Pond A (Design Point 2, Classic Consulting Design Points 18, 19 Combined) provides water quality and full spectrum detention for the stormwater runoff from Basin CC34, 34.1, 34.2, 34.3, 34.4, OS-1, and OS-2. These basins include offsite area of undeveloped area, future development of Flats and the proposed urban roadway section located on the east side of the filing. As shown in the hydrology calculations summary table, Pond A has a tributary area of 25.3 acres with an imperviousness of 32.84% which includes roof, pavement, landscaped/lawn, and undeveloped land use categories. The impervious areas used in the future Flats development area are conservative and are to be assessed in a future filing FDR. 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 – Flats Area

WQCV (ac-ft)	EURV (ac-ft)	100-year (ac-ft)	Total Required Volume (ac-ft)	Total Required Volume (CY)	Total Design Volume (CY)
0.350	0.570	0.933	1.853	2,989	8,552

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)	26.5	2.1	10.9	76
Major Storm (Q100)	67.6	24.0	44.3	73

(Ownership and maintenance by the Flying Horse North HOA)

Pond A includes a concrete forebay sized for the required volume of the inflow, a 2-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 C Inlet that is to include a top trash rack, orifice plate, and restrictor plate on the outlet pipe.

Pond B (Design Point 17) provides water quality and detention for the stormwater runoff from Basins BS-21, BS-27, BS-26, BS-28, BS-28.1, BS-28.2, BS-28.3, BS-29, BS-30, OS-17, and OS-18. These basins include offsite area of undeveloped area assumed as future 2.5 acre lot development, future development of Flats and the proposed urban and local roadway sections. While the Flats area falls on the west side of the high point ridge near Allen Ranch Road, it is anticipated that the future roofs will drain due east into Allen Ranch Road. As shown in the hydrology calculations summary table, Pond B has a tributary area of 128.4 acres with an imperviousness of 10.04% which includes roof, pavement, landscaped/lawn, and undeveloped land use categories. 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 B – Estates Area

WQCV (ac-ft)	EURV (ac-ft)	100-year (ac-ft)	Total Required Volume (ac-ft)	Total Required Volume (CY)	Total Design Volume (CY)
0.719	0.493	3.534	4.746	7,657	13,224

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)	73.1	18.7	60.3	78
Major Storm (Q100)	255.5	161.5	245.6	69

(Ownership and maintenance by the Flying Horse North HOA)

Pond B includes a concrete forebay sized for the required volume of the inflow, a 2-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 dual CDOT Type C Inlet that is to include a top trash rack, orifice plate, and restrictor plate on the outlet pipe.

Existing FHN Pond 8 (HR Green Design Point 10, Classic Consulting Design Point 17) provides water quality and detention for the stormwater runoff from Filing No. 1 and part of Filing No. 3 as well as offsite basins as described in the 2018 Classic Consulting FDR/PDR for the full build-out conditions. These basins include offsite area of undeveloped area assumed as future 2.5-acre lot development, golf course areas, and the roadways. The 2018 report has hydrology calculations and lists the acreage and percent imperviousness for the final developed conditions for the full build out within the MHFD UD-Detention spreadsheet for the Pond 8 Full Buildout conditions which consists of assumed future developed conditions for 2-acre single-family residential estate lots within Filing No. 3 with assumed roadway alignments. The 2018 FDR/PDR calculation lists a tributary area of 255 acres at 10.0 percent impervious. The final developed conditions hydrology tabulations for Filing No. 3 are provided within this report and closely compare to that of the 2018 report with a slight decrease in the tributary area and imperviousness. The Existing FHN Pond 8 (Design Point 10) tributary area is 248.9 acres with a percent imperviousness of 8.79 percent. Due to the decrease in these figures, there is no expansion of volume required in the pond.

The WQCV, EURV, and 100-year volumes for the Existing FHN Pond 8 detention facility for as-built conditions and per calculations within this report are shown below for comparison:

Existing FHN Pond 8

	Tributary Area (ac)	Percent Impervious (%)	WQCV (ac-ft)	EURV (ac-ft)	100-year (ac-ft)	Total Required Volume (ac-ft)	Total Required Volume (CY)
2018 Classic Consulting FDR/PDR	255.00	10.00	1.424	0.973	7.011	9.408	15,178
2023 HR Green FDR	248.93	8.74	1.244	0.791	6.614	8.649	13,954

The existing downstream pond that was designed and constructed per the 2018 Classic Consulting FDR/PDR and Construction Drawings has sufficient capacity for the Filing No. 3 development. The 2018 report assumed a higher density of 2.0-acre single family residential estate lots within the Filing No. 3 area including the area now designated for future development of Flats but did utilize the same 11

percent imperviousness figure for the lots. While the Flats area within Filing No. 3 results in a higher imperviousness for its respective sub-basins, the overall imperviousness and tributary area to the downstream Existing Pond 8 within Filing No. 1 is decreased due to more of the Flats Area being tributary to proposed Detention Pond A. A UD-Detention spreadsheet with inputs for the final design parameters within this report (248.9 acres at 8.74 percent impervious) with the as-built conditions of the pond is provided within the appendix to demonstrate that the existing pond was built with sufficient volume and infrastructure for the final design conditions of Filing No. 3. The only potential retrofitting of the pond is a swap out of a new orifice plate to maintain the WQCV release rate of 40 hours which has fallen to 37 hours for the time to drain 99% of inflow volume for the final design.

A comparison of the existing conditions as identified in the 2022 MDDP, and proposed conditions releasing off-site from the identified Filing No. 3 boundary into both Black Squirrel Creek and Cherry Creek is provided below to show that the detention being provided on site from the existing pond 8 and proposed ponds in Filing No. 3 will negate any impact downstream.

Basin Identification	Existing Conditions (HRG MDDP 2022)	Proposed Conditions (HRG Filing 3 FDR 2024)
Black Squirrel Creek	784.8 CFS	498.5 CFS
Cherry Creek	57.4 CFS	24.0 CFS

c. Methodology

Design rainfall was determined utilizing Table 6-2 from the City of Colorado Springs Drainage Criteria Manual to determine the 5-year and 100-year rainfall values for the 1-hour events. The 1-hour rainfall depths are 1.5 and 2.52 in/hr respectively.

The proposed development will consist of 50 2.5-acre single-family residential estate lots which are assumed at a percent imperviousness of 11% per the County ECM Table 3-1 Typical Values of Percent Impervious within Appendix L of the ECM which provides guidance for larger rural lot developments. Existing golf course areas are to remain undisturbed and utilize a land use category of “lawn” with a percent imperviousness of 2% per the County ECM Table 6-6 land use table. Composite coefficients, rainfall intensities, and runoff flow rates are calculated on a Rational Method spreadsheet and provided within the Appendix. As discussed previously, the Rational Method used in this report will result in higher peak flow rates for the minor and major storm events as compared to the 2018 Classic Consulting FDR/PDR which utilized the NRCS Curve Number Method. Design points within Filing No. 3 are designed per the findings of this report and existing Filing No. 1 storm infrastructure and design points are to remain as-is.

Mile High Flood District (MHFD) UD-BMP Runoff Reduction calculations are provided to demonstrate WQCV reduction for the sub-basins that drain directly offsite, however the sub-basins that drain directly off-site do fall under ECM code I.7.1.B.5, which excludes areas of “large lots” to require detention. The provided Runoff Reduction calculations are to show the good stormwater management practices of the site. The MHFD UD-Detention spreadsheet is utilized for stormwater detention basin sizing and outlet structure design to meet standard release rates at or lower than historical drainage rates. The outlet structure orifice plate and restrictor plate for the proposed detention ponds located are designed to meet standard release rates of 40 hours for Water Quality Capture Volume (WQCV), as near 68 hours for

Excess Urban Runoff Volume (EURV) as feasible, and 72 hours for the 100-year storm volume. Reference to the 2018 Classic Consulting PDR/FDR set of calculations and spreadsheets is included to demonstrate compliance and consistency with the previously approved report which anticipated similar land uses and basin acreages tributary to existing stormwater facilities.

IV. Hydraulic Analysis

a. Major Drainageways

There are no major drainageways that exist within the development of Filing No. 3; however, small tertiary tributaries are within the site currently and function to convey flows to unnamed tributaries of the Black Squirrel Creek. These tertiary drainage ways are analyzed within this report to assess the water surface elevation within the swales during the 100-year storm event and determine buildability of lots adjacent to these sections. Roadside swales are to be constructed at a minimum to meet the typical roadway section (4:1 for 10' and 3:1 for 9' resulting in a total swale depth of 2.5'). The roadside swales are assessed along the roadways that capture sub-basins and result in cumulative flow. Downstream roadside swales to the north and south of Allen Ranch Road are expanded along the road to accommodate the cumulative flow from upstream tributary areas. A 30' width Drainage Easement is platted in the areas of Allen Ranch Road in which expanded ditch sections will be needed for County maintenance access.

Allen Ranch Road terminates at a cul-de-sac where private storm culvert pipes convey the stormwater runoff to a rip-rap rundown rock chute that drains directly to the concrete forebay of Pond B. The Rock Chute is designed per the National Resources Conservation Service Rock Chute Design Data spreadsheet, a publicly available design worksheet created by the U.S. Department of Agriculture last modified on July 17, 2023. The Rock Chute data sheets are provided within the Appendix. A portion of the rock chute falls within Lot 19. A Drainage Easement is platted within Lot 19 for continued access for maintenance by the HOA and/or the County.

b. Storm Sewer Infrastructure and Culvert Pipes

The Filing No. 3 development consists of an area of future Flats development to the east of the filing with an urban roadway section that contains a public storm system to capture and convey stormwater runoff from the future developed areas that drain to the public roadway. The storm system is relatively small with a total of four CDOT Type R inlets, two on-grade inlets sized at 15' each, and two sump inlets sized at 10' & 5', as well as public and private storm sewer pipes that outfall to the concrete forebay of Pond A. UD-Inlet calculations as well as hydraulic grade analysis reports are provided within the Appendix of this report to demonstrate roadway, inlet, and pipe capacities of the proposed storm system.

The remainder of the filing consists of rural development with 2.5-acre single family residential estate lots and rural roadway sections with roadside swales. The storm infrastructure within these areas consist of public culvert pipes for roadway crossings and consideration for future public culvert pipes for future driveways for each lot. Culvert calculations and graphics are provided within the Appendix of this report to demonstrate culvert capacities and show any roadway/driveway overtopping as a result of peak flows. The culverts are designed to have full capacity of the minor (5-year) storm event and a maximum of 4" of roadway or driveway pooling during the major (100-year) storm event.

V. Environmental Evaluations

a. Significant Existing or Potential Wetland and Riparian Areas Impacts

As part of this work, the developer has engaged Bristlecone Ecology, LLC to perform environmental studies of the site that will be submitted with the planning documents. Major information in the report concerning wetlands concludes that there is a wetland associated with Black Squirrel Creek. Black Squirrel Creek is known to be a jurisdictional stream.

At this time, there are no improvements proposed for Black Squirrel Creek. The minimal impact to the stream will keep the natural habitat intact and the natural function of the Creek as it is to maintain the wetland habitat.

c. Stormwater Quality Considerations and Proposed Practices

As part of the development, full spectrum detention facilities will be installed to provide water quality for the development. The facilities are designed using El Paso County criteria and provide stormwater quality by slowing the release of stormwater captured by the ponds and allowing solids to settle out. Additionally, when possible, the existing natural drainage ways will be used to convey stormwater to more closely mimic the natural hydrologic and hydraulic cycle. Some of the drainage ways will be used to convey water to the ponds and others will receive water from the ponds and in both scenarios will provide additional water quality benefits.

On site practices for the estate homes includes direct discharge of roof and hardscape runoff to the surrounding landscaped areas. This would include discharge of the gutters onto landscape areas vs. directly connecting to storm sewer and as discussed above as well using natural ditches and swales where it is logical and makes sense to convey stormwater in lieu of storm sewer piping.

Areas in which stormwater runoff is directed offsite without detention being provided have grass buffers that provide 100 percent water quality runoff reduction due to the small percent imperviousness compared to their respective buffer areas that consist of pervious open landscaped areas. Runoff reduction calculations can be found in the appendix of this report.

d. Permitting Requirements

When work infringes upon the wetlands or floodplain a 404 Permit will be required. If the work within the waterways is minimal, it will likely be covered under a nationwide 404 permit; it is however possible that an individual permits will be required.

The Colorado Department of Public Health and Environment will require permits for any disturbance that exceeds 1 acre of land. Should groundwater be encountered, a dewatering permit will also be required.

El Paso County will require an Erosion and Stormwater Quality Control Permit and any other construction permits required to complete the construction of the site.

Should development occur which affects the floodplain, FEMA will require a permit for work withing the floodplain prior to the commencement of any construction or development within any special flood hazard area (SFHA). If the infrastructure is to be installed within the channel the designer shall route the design through the proper FEMA channels whether that be with a no rise certification or via the CLOMR/LOMR process should a more major improvement within the floodplain be proposed. At this time the project

does not propose any direct development within the floodplain, however storm infrastructure will discharge into the existing FEMA channel.

e. 4-Step Process

In accordance with the Engineering Criteria Manual I.7.2.A and DCM V2, this site has implemented the four-step process to minimize adverse impacts of urbanization. The four-step process includes reducing runoff volumes, stabilizing drainageways, treating the water quality capture volume, and considering the need for Industrial Commercial BMPs.

Step 1 – Reducing Runoff Volumes: The majority of the development of the project site includes the land use categories of 2.5-acre single-family residential and lawn (golf course area). Both land uses have relatively minor imperviousness and runoff coefficients. The developed areas for the homes as designated by pad areas on the plans are disbursed with open land areas of vegetation and trees between which provide runoff reduction into the pervious soil.

Step 2 – Stabilize Drainageways: The existing tertiary drainage ways are assessed for stormwater runoff capacity, velocity, and shear stress. Any altered drainage ways will be designed in a manner that provides water quality benefits through infiltration and the removal of pollutants via phytoremediation. Vegetation and/or matting will also be selected to stabilize the drainage ways by reducing the velocity of flows and decreasing any scour. These improvements help stabilize drainageways and minimize erosion and sediment runoff. Roadside ditches are stabilized swales by way of compaction per the roadway typical section and are also prescribed any required seeding, erosion control blanketing, and/or matting.

Step 3 – Provide WQCV: Runoff from this development is treated through capture and slow release of the WQCV via detention ponds that are designed per current El Paso County DCM V2 and the MHFD. Proposed ponds A and B as well as the existing pond in Filing No. 1, pond 8, all provide WQCV for their respective tributary basins. Areas that are not tributary to a detention pond have been proven to be excluded from WQCV requirements as they fall under the “large lot” exclusion I.7.1.B.5 of the El Paso County ECM. While runoff reduction is not required for these areas, it is being provided with well managed stormwater practices. A map included in the appendix shows all basins that are tributary to each respective pond in which they are tributary to.

Step 4 – Consider the need for Industrial and Commercial BMP’s: A site specific storm water quality and erosion control plan and narrative will be prepared with subsequent land use approvals prepared in conjunction with the report prior to any construction. Site specific temporary source control BMPs as well as permanent BMPs are detailed in this plan and narrative. Guidelines detailed in the El Paso DCM V2 4.2 pertaining to the covering and storage handline and spill containment and control shall be followed as necessary. This filing does not contain any commercial of industrial land uses.

VI. Drawings

Please refer to the appendices for the Vicinity Map, FEMA Floodplain Map, NRCS Soils Map, hydrology and hydraulic calculations, and drainage basin maps. Reference materials from previously approved reports are included in the appendix including the 2018 Classic Consulting FDR/PDR calculations and drainage maps.

VII. Drainage and Bridge Fees

The East Cherry Creek Basin does not currently have a Drainage Basin Fee. However, the following fees for the filing no. 1 platted area within the black Squirrel Creek Basin are due prior to platting:

The fees are calculated using the following impervious acreage method approved by El Paso County. The acreage for Flying Horse Filing No. 3 within the Black Squirrel Creek Basin is 151.9 acres. This total area is entirely made up of 2.5 acre lots which have an imperviousness of 11%. The acreage of imperviousness is calculated below:

2.5 ac. Lots (incl. roads and tracts)

147.9 Ac. 10% = 14.79 Impervious Ac.

The following calculations are based on the 2024 drainage/bridge fees for the Black Squirrel Creek Drainage Basin:

Filing 3 Fee Totals (prior to reduction):

Bridge Fees

$ 710.00 x 14.79 Ac. = $ 10,500.90

Drainage Fees

$ 11,275.00 x 14.79 Ac. = $ 166,757.25

Per the ECM 3.10.4a, this development requests a reduction of drainage fees based on the one on-site full spectrum detention/SWQ facilities proposed within the Black Squirrel Creek Drainage Basin to be construction with Filing 3 rather than utilizing a reduction for low density lots. The following facilities within the Black Squirrel Creek basin meet the required six criteria as follows:

1. No downstream regional facility in place yet.
2. The proposed facility is less than 15 ac-ft. in volume.
3. The proposed on-site facility is not part of a regional plan.
4. The proposed outlet is designed to release to full-spectrum criteria.
5. The proposed facility is per county criteria and will gain county approval.
6. The proposed facility will be private with ownership and maintenance by HOA.

Detention Pond B 4.75 ac-ft. full spectrum $ 50,000 x 50% = $ 25,000

Filing 3 Fee Totals:

Bridge Fees ($10,500.90) + Drainage Fees ($166,757.25) – $25,000.00 = **$ 152,258.15**

VIII. Summary

Flying Horse North Filing No. 3 is a 166.4-acre single-family residential estate lot development area that will contain paved roadways and roadside ditch sections. A portion of one of the road sections will serve a future development area intended for Flats that are to be built in a later filing. The future development area has been accounted for with assumed land use and imperviousness. Full spectrum detention facilities are proposed to provide water quality and detention to release the stormwater at or below historical rates. Existing detention facilities within the Filing No. 1 area are utilized per the 2018 Classic Consulting PDR/FDR and require no retrofitting.

The Filing No. 3 final design is assessed for stormwater capacity of roadway sections, roadside swales and the existing tertiary drainage ways to ensure that development of the 2.5-acre single-family residential estate lots and the future Flats areas will not be negatively impacted by drainage conditions, including existing and proposed altered areas for the roadway and lot construction phases.

All County and MHFD drainage design standards are met. It is anticipated that there will be no negative impacts to downstream and surrounding developments and facilities due to the development of Filing No. 3.

IX. References

El Paso County – Drainage Criteria Manual, 2014

City of Colorado Springs – Drainage Criteria Manual, May 2014

Urban Storm Drainage Criteria Manual, Urban Drainage Flood Control District, January 2018

Mile High Flood District Urban Storm Drainage Criteria Manual Volumes 1, 2, and 3; latest revisions

Mile High Flood District Software Resources and Tools (UD-Detention, UD-Inlet, UD-BMP)

United States Department of Agriculture National Resources Conservation Service Rock Chute Design Data Spreadsheet

Preliminary Drainage Report for Flying Horse North Preliminary Plan and Final Drainage Report for Flying Horse North Filing No. 1, Classic Consulting Engineers and Surveyors, November 2017

Flying Horse North Master Development Drainage Plan, HR Green Development, LLC., September 2022

Flying Horse North Irrigation Reservoir Embankment Design Report, Classic Consulting Engineers and Surveyors, latest revision June 2018, County approved on September 25, 2018

Black Squirrel Drainage Basin Planning Study (DBPS), URS Consultants, January 1989

HRGreen

Flying Horse North Filing No. 3
PROPOSED CONDITIONS
EL PASO COUNTY, COLORADO

Calc'd by:	**DLH**
Checked by:	**RDL**
Date:	**3/4/2024**

SUMMARY RUNOFF TABLE

BASIN	AREA (ac)	% IMP.	C_5	C_{100}	Q_5 (cfs)	Q_{100} (cfs)
BS-18	33.90	7.77	0.14	0.39	12.6	60.1
BS-19	6.35	11.00	0.17	0.42	4.1	16.8
BS-20	23.79	6.83	0.13	0.39	9.6	48.5
BS-20.1	42.26	8.49	0.14	0.39	16.3	77.7
BS-20.2	4.32	11.00	0.17	0.42	2.5	10.1
BS-20.3	0.56	100.00	0.90	0.96	2.3	4.1
BS-21	0.77	100.00	0.90	0.96	3.0	5.4
BS-21.1	15.24	11.95	0.17	0.42	8.5	34.3
BS-21.2	0.18	100.00	0.90	0.96	0.8	1.5
BS-21.3	50.92	7.83	0.14	0.39	17.7	85.0
BS-22	0.24	100.00	0.90	0.96	1.1	2.0
BS-22.1	16.87	9.63	0.16	0.41	8.8	38.4
BS-23A	9.28	8.43	0.14	0.40	4.1	19.0
BS-23A.1	7.96	10.69	0.17	0.41	4.2	17.4
BS-23	37.06	7.26	0.13	0.39	15.6	76.7
BS-25	12.65	8.49	0.15	0.40	6.1	28.1
BS-26	4.90	3.74	0.10	0.36	1.7	10.6
BS-27	9.68	11.00	0.17	0.42	5.6	22.9
BS-28	24.03	11.00	0.17	0.42	12.3	50.6
BS-28.1	5.76	9.56	0.16	0.41	2.8	12.5
BS-28.2	19.47	8.75	0.15	0.40	9.0	41.0
BS-28.3	0.54	100.00	0.90	0.96	2.5	4.5
BS-29	22.93	7.78	0.14	0.39	8.3	39.7
BS-30	11.53	10.84	0.17	0.42	4.9	20.4
BS-31	8.40	4.57	0.11	0.37	3.2	18.6
BS-32	6.33	6.73	0.13	0.39	3.0	15.4
BS-33	8.91	10.39	0.16	0.41	5.2	21.9
CC-34	0.89	26.22	0.28	0.50	1.0	2.9
CC-34.1	15.09	5.82	0.12	0.38	6.7	36.1
CC-34.2	1.84	100.00	0.90	0.96	4.9	8.7
CC-34.3	1.01	40.81	0.40	0.59	1.6	3.9
CC-34.4	3.44	91.66	0.76	0.83	7.9	14.6
OS-1	2.70	29.55	0.29	0.51	2.8	8.2
OS-2	0.34	100.00	0.90	0.96	1.3	2.3
OS-17	15.80	11.00	0.17	0.42	9.9	40.6
OS-18	13.00	11.00	0.17	0.42	8.2	33.7

DESIGN POINT SUMMARY TABLE

DESIGN POINT	CONTRIBUTING BASINS	ΣQ_5 (cfs)	ΣQ_{100} (cfs)	Tributary Area (ac.)	Weighted % Impervious
1	OS-1 & CC-34.3	4.4	12.1	3.7	32.62%
1.1	CC-34, DP1, DP1.2	1.2	7.5	8.0	57.17%
1.2	CC-34.4	7.9	14.6	3.4	91.66%
1.3	CC-34.2, OS-2	6.2	11.0	2.2	100.00%
2	CC-34-34.4, OS-1-2	26.2	76.6	25.3	30.25%
4	BS-21.1	8.5	34.3	15.2	11.95%
5	BS-20.2-20.3	4.7	14.2	4.9	21.21%
6	BS-20-20.3, 21.1-21.3	57.7	261.3	137.3	8.92%
7	BS-19, BS-22-22.1, DP6	71.7	318.4	160.7	9.21%
8	BS-18, 23, DP7	99.8	455.3	231.7	8.69%
9	BS-23A.1	4.2	17.4	8.0	7.96%
10	BS-23A, DP8, DP9	108.1	491.7	248.9	8.74%
11	BS-21	3.0	5.4	0.8	100.00%
12	BS-28.1, DP11	5.9	17.9	6.5	20.23%
13	BS-28.2	9.0	41.0	19.5	8.75%
14	BS-28, BS-28.3, DP12, DP13	29.7	114.0	50.6	12.28%
15	OS-18, BS-29-30	21.4	93.8	47.5	9.41%
16	OS-17, BS-27, DP15	36.9	157.3	72.9	9.96%
17	BS-26, DP14, DP16	68.2	281.8	128.4	10.04%
18	BS-31	3.2	18.6	8.4	4.57%
19	BS-32	3.0	15.4	6.3	6.73%
20	BS-33	5.2	21.9	8.9	10.39%
21	BS-25	6.1	28.1	12.7	8.49%

HRGreen

Flying Horse North Filing No. 3 | Calc'd by: | DLH

PROPOSED CONDITIONS | Checked by: | RDL

EL PASO COUNTY, COLORADO | Date: | 3/4/2024

COMPOSITE 'C' FACTORS

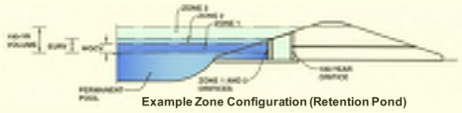
BASIN	GOLF COURSE / UNDEVELOPED	ROADWAY	RESIDENTIAL (2.5AC LOT)	ROOFTOP	TOTAL	SOIL TYPE	GOLF COURSE /			ROADWAY			RESIDENTIAL (2.5AC LOT)			ROOFTOP			COMPOSITE IMPERVIOUSNESS & C		
	ACRES						%I	C_5	C_{100}	%I	C_5	C_{100}	%I	C_5*	C_{100}*	%I	C_5	C_{100}	%I	C_5	C_{100}
BS-18	12.15	0.00	21.75	0.00	33.90	B	2	0.08	0.35	100	0.90	0.96	11	0.17	0.42	90	0.73	0.81	7.8	0.14	0.39
BS-19	0.00	0.00	6.35	0.00	6.35	B	2	0.08	0.35	100	0.90	0.96	11	0.17	0.42	90	0.73	0.81	11.0	0.17	0.42
BS-20	11.02	0.00	12.77	0.00	23.79	B	2	0.08	0.35	100	0.90	0.96	11	0.17	0.42	90	0.73	0.81	6.8	0.13	0.39
BS-20.1	23.35	0.20	17.62	1.09	42.26	B	2	0.08	0.35	100	0.90	0.96	11	0.17	0.42	90	0.73	0.81	8.5	0.14	0.39
BS-20.2	0.00	0.00	4.32	0.00	4.32	B	2	0.08	0.35	100	0.90	0.96	11	0.17	0.42	90	0.73	0.81	11.0	0.17	0.42
BS-20.3	0.00	0.56	0.00	0.00	0.56	B	2	0.08	0.35	100	0.90	0.96	11	0.17	0.42	90	0.73	0.81	100.0	0.90	0.96
BS-21	0.00	0.77	0.00	0.00	0.77	B	2	0.08	0.35	100	0.90	0.96	11	0.17	0.42	90	0.73	0.81	100.0	0.90	0.96
BS-21.1	1.56	0.05	13.33	0.30	15.24	B	2	0.08	0.35	100	0.90	0.96	11	0.17	0.42	90	0.73	0.81	11.9	0.17	0.42
BS-21.2	0.00	0.18	0.00	0.00	0.18	B	2	0.08	0.35	100	0.90	0.96	11	0.17	0.42	90	0.73	0.81	100.0	0.90	0.96
BS-21.3	21.87	0.40	28.65	0.00	50.92	B	2	0.08	0.35	100	0.90	0.96	11	0.17	0.42	90	0.73	0.81	7.8	0.14	0.39
BS-22	0.00	0.24	0.00	0.00	0.24	B	2	0.08	0.35	100	0.90	0.96	11	0.17	0.42	90	0.73	0.81	100.0	0.90	0.96
BS-22.1	2.56	0.00	14.31	0.00	16.87	B	2	0.08	0.35	100	0.90	0.96	11	0.17	0.42	90	0.73	0.81	9.6	0.16	0.41
BS-23A	2.65	0.00	6.63	0.00	9.28	B	2	0.08	0.35	100	0.90	0.96	11	0.17	0.42	90	0.73	0.81	8.4	0.14	0.40
BS-23A.1	0.27	0.00	7.69	0.00	7.96	B	2	0.08	0.35	100	0.90	0.96	11	0.17	0.42	90	0.73	0.81	10.7	0.17	0.41
BS-23	15.38	0.00	21.68	0.00	37.06	B	2	0.08	0.35	100	0.90	0.96	11	0.17	0.42	90	0.73	0.81	7.3	0.13	0.39
BS-25	3.53	0.00	9.12	0.00	12.65	B	2	0.08	0.35	100	0.90	0.96	11	0.17	0.42	90	0.73	0.81	8.5	0.15	0.40
BS-26	3.95	0.00	0.95	0.00	4.90	B	2	0.08	0.35	100	0.90	0.96	11	0.17	0.42	90	0.73	0.81	3.7	0.10	0.36
BS-27	0.00	0.00	9.68	0.00	9.68	B	2	0.08	0.35	100	0.90	0.96	11	0.17	0.42	90	0.73	0.81	11.0	0.17	0.42
BS-28	0.00	0.00	24.03	0.00	24.03	B	2	0.08	0.35	100	0.90	0.96	11	0.17	0.42	90	0.73	0.81	11.0	0.17	0.42
BS-28.1	0.92	0.00	4.84	0.00	5.76	B	2	0.08	0.35	100	0.90	0.96	11	0.17	0.42	90	0.73	0.81	9.6	0.16	0.41
BS-28.2	4.87	0.00	14.60	0.00	19.47	B	2	0.08	0.35	100	0.90	0.96	11	0.17	0.42	90	0.73	0.81	8.7	0.15	0.40
BS-28.3	0.00	0.54	0.00	0.00	0.54	B	2	0.08	0.35	100	0.90	0.96	11	0.17	0.42	90	0.73	0.81	100.0	0.90	0.96
BS-29	8.20	0.00	14.73	0.00	22.93	B	2	0.08	0.35	100	0.90	0.96	11	0.17	0.42	90	0.73	0.81	7.8	0.14	0.39
BS-30	0.20	0.00	11.33	0.00	11.53	B	2	0.08	0.35	100	0.90	0.96	11	0.17	0.42	90	0.73	0.81	10.8	0.17	0.42
BS-31	6.00	0.00	2.40	0.00	8.40	B	2	0.08	0.35	100	0.90	0.96	11	0.17	0.42	90	0.73	0.81	4.6	0.11	0.37
BS-32	3.00	0.00	3.33	0.00	6.33	B	2	0.08	0.35	100	0.90	0.96	11	0.17	0.42	90	0.73	0.81	6.7	0.13	0.39
BS-33	0.60	0.00	8.31	0.00	8.91	B	2	0.08	0.35	100	0.90	0.96	11	0.17	0.42	90	0.73	0.81	10.4	0.16	0.41
CC-34	0.67	0.22	0.00	0.00	0.89	B	2	0.08	0.35	100	0.90	0.96	11	0.17	0.42	90	0.73	0.81	26.2	0.28	0.50
CC-34.1	8.68	0.00	6.41	0.00	15.09	B	2	0.08	0.35	100	0.90	0.96	11	0.17	0.42	90	0.73	0.81	5.8	0.12	0.38
CC-34.2	0.00	1.84	0.00	0.00	1.84	B	2	0.08	0.35	100	0.90	0.96	11	0.17	0.42	90	0.73	0.81	100.0	0.90	0.96
CC-34.3	0.61	0.40	0.00	0.00	1.01	B	2	0.08	0.35	100	0.90	0.96	11	0.17	0.42	90	0.73	0.81	40.8	0.40	0.59
CC-34.4	0.00	0.57	0.00	2.87	3.44	B	2	0.08	0.35	100	0.90	0.96	11	0.17	0.42	90	0.73	0.81	91.7	0.76	0.83
OS-1	1.89	0.32	0.00	0.49	2.70	B	2	0.08	0.35	100	0.90	0.96	11	0.17	0.42	90	0.73	0.81	29.6	0.29	0.51
OS-2	0.00	0.34	0.00	0.00	0.34	B	2	0.08	0.35	100	0.90	0.96	11	0.17	0.42	90	0.73	0.81	100.0	0.90	0.96
OS-17	0.00	0.00	15.80	0.00	15.80	B	2	0.08	0.35	100	0.90	0.96	11	0.17	0.42	90	0.73	0.81	11.0	0.17	0.42
OS-18	0.00	0.00	13.00	0.00	13.00	B	2	0.08	0.35	100	0.90	0.96	11	0.17	0.42	90	0.73	0.81	11.0	0.17	0.42
TOTAL ONSITE	**132.04**	**5.97**	**264.82**	**4.26**	**407.10**														**10.21%**	**0.16**	**0.41**
TOTAL OFFSITE	**1.89**	**0.66**	**28.80**	**0.49**	**31.84**														**13.52%**	**0.19**	**0.43**
GRAND TOTAL	**133.93**	**6.63**	**293.62**	**4.75**	**438.94**														**10.45%**	**0.16**	**0.41**

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: FLYING HORSE NORTH FILING NO. 3

Basin ID: POND 8 (FULL-BUILD OUT)



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	248.90	acres
Watershed Length =	5,500	ft
Watershed Length to Centroid =	2,500	ft
Watershed Slope =	0.017	ft/ft
Watershed Imperviousness =	8.79%	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) =	1.244 acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	2.035 acre-feet		acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	3.100 acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	7.058 acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	11.036 acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	18.224 acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	23.083 acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	30.120 acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 3.14 in.) =	42.887 acre-feet		inches
Approximate 2-yr Detention Volume =	1.282 acre-feet		
Approximate 5-yr Detention Volume =	2.033 acre-feet		
Approximate 10-yr Detention Volume =	4.473 acre-feet		
Approximate 25-yr Detention Volume =	6.375 acre-feet		
Approximate 50-yr Detention Volume =	6.643 acre-feet		
Approximate 100-yr Detention Volume =	8.649 acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	1.244	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.791	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	6.614	acre-feet
Total Detention Basin Volume =	8.649	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	user	acre-feet

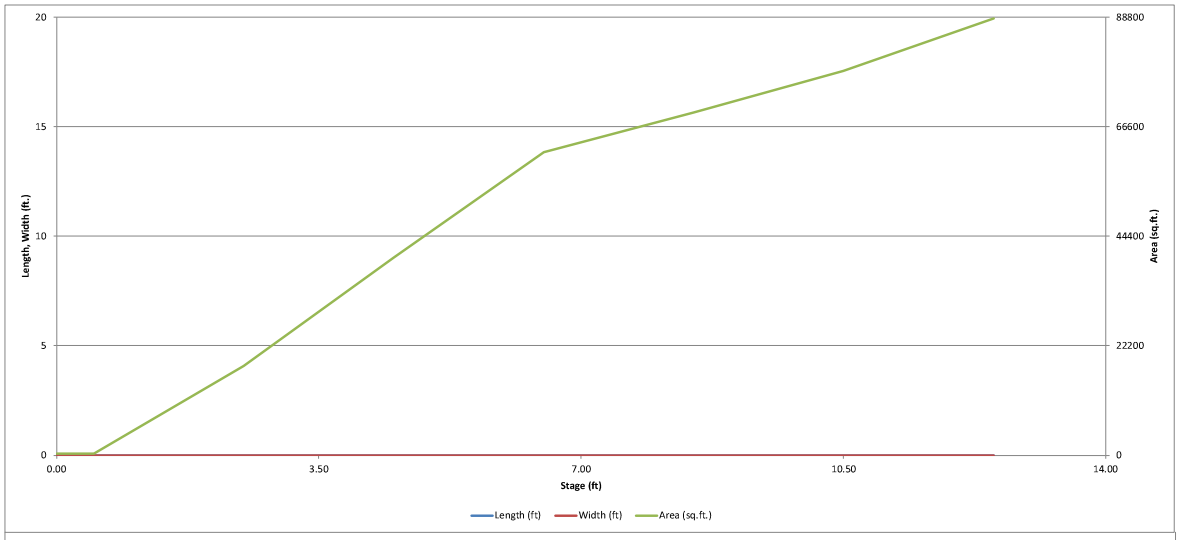
Depth Increment = ft

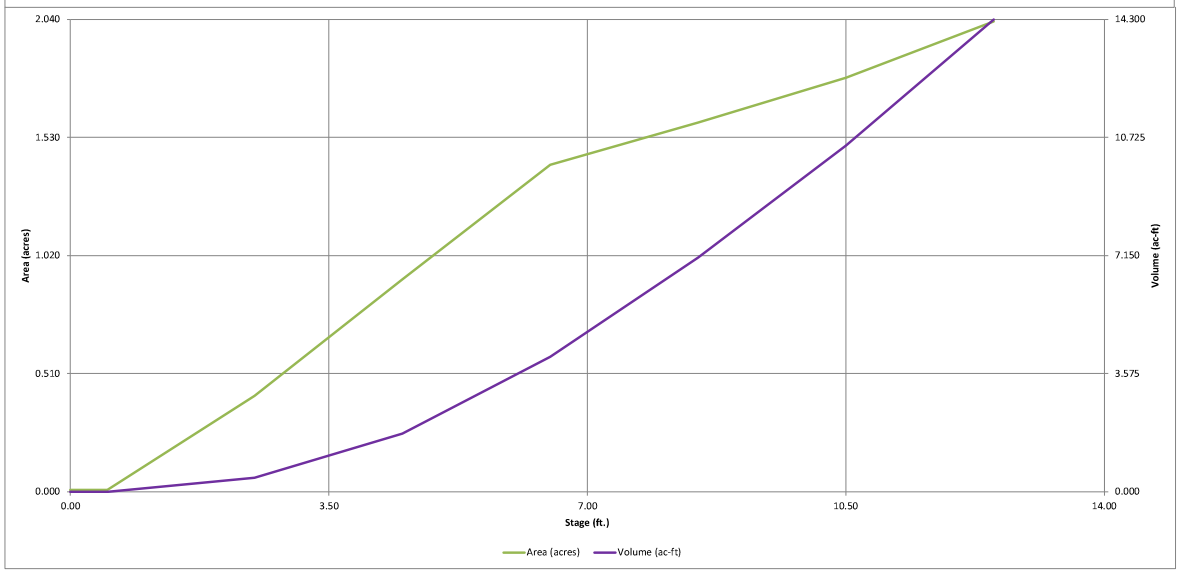
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
7369.5 **Top of Micropool**	–	0.00	--	--	--	384	0.009		
7370	–	0.50	--	--	--	384	0.009	192	0.004
7372	–	2.50	--	--	--	18,082	0.415	18,658	0.428
7374	–	4.50	--	--	--	40,004	0.918	76,744	1.762
7376	–	6.50	--	--	--	61,465	1.411	178,213	4.091
7378	–	8.50	--	--	--	69,433	1.594	309,111	7.096
7380	–	10.50	--	--	--	77,895	1.788	456,439	10.478
7382	–	12.50	--	--	--	88,522	2.032	622,856	14.299
	–		--	--	--				
	–		--	--	--				

THIS CALCULATION UTILIZES THE AS-BUILT CONDITIONS OF POND 8 IN FILING NO. 1 WITH CHANGES TO THE WATERSHED AREA AND PERCENT IMPERVIOUSNESS ONLY.

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)





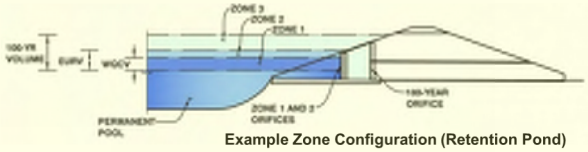
THIS CALCULATION UTILIZES THE AS-BUILT CONDITIONS OF POND 8 IN FILING NO. 1 WITH CHANGES TO THE WATERSHED AREA AND PERCENT IMPERVIOUSNESS ONLY. AS-BUILT CONDITIONS FOR THE OUTLET STRUCTURE ARE SHOWN BELOW AND CHANGES TO WQCV, EURV, AND 100-YEAR RELEASE RATES AND TIME DEVIATE SLIGHTLY FROM THE ORIGINAL DESIGN IN THE 2018 CLASSIC CONSULTING FDR/PDR DUE TO LESS WATERSHED AREA AND PERCENT IMPERVIOUSNESS.

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: FLYING HORSE NORTH FILING NO. 3

Basin ID: POND 8 (FULL-BUILD OUT)



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.89	1.244	Orifice Plate
Zone 2 (EURV)	4.79	0.791	Orifice Plate
Zone 3 (100-year)	9.45	6.614	Weir&Pipe (Restrict)
Total (all zones)		8.649	

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

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft²
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

Calculated Parameters for Underdrain

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

Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	3.715E-02	ft²
Depth at top of Zone using Orifice Plate =	5.43	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 =	5.35	sq. inches (use rectangular openings)	Elliptical Slot Area =	N/A	ft²

Calculated Parameters for Plate

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest) 5.25

	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	1.80	3.60					
Orifice Area (sq. inches)	5.35	5.35	5.35					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected			Not Selected	Not Selected	
Invert of Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	N/A	N/A	ft²
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 =	5.43	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	6.43	N/A	feet
Overflow Weir Front Edge Length =	16.00	N/A	feet	Overflow Weir Slope Length =	4.12	N/A	feet
Overflow Weir Grate Slope =	4.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	2.47	N/A	
Horiz. Length of Weir Sides =	4.00	N/A	feet	Overflow Grate Open Area w/o Debris =	45.91	N/A	ft²
Overflow Grate Type =	Type C Grate	N/A		Overflow Grate Open Area w/ Debris =	22.96	N/A	ft²
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 =	0.50	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	18.61	N/A	ft²
Outlet Pipe Diameter =	60.00	N/A	inches	Outlet Orifice Centroid =	2.38	N/A	feet
Restrictor Plate Height Above Pipe Invert =	54.00		inches	Half-Central Angle of Restrictor Plate on Pipe =	2.50	N/A	radians

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	10.00	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	1.10	feet
Spillway Crest Length =	75.00	feet	Stage at Top of Freeboard =	12.10	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	1.98	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	13.50	acre-ft

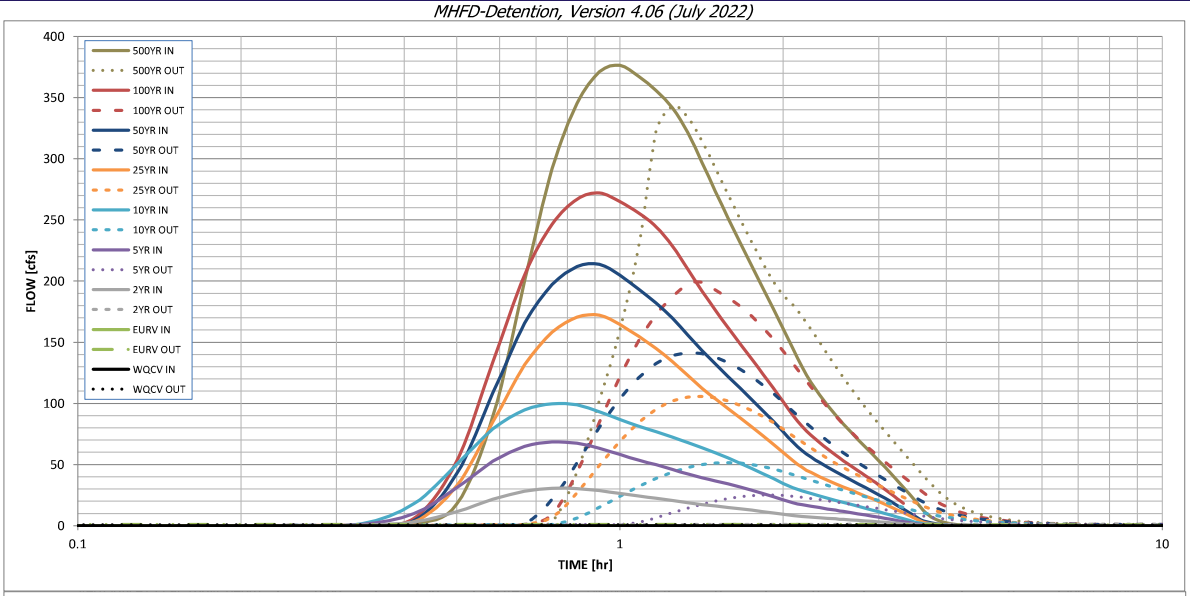
Calculated Parameters for Spillway

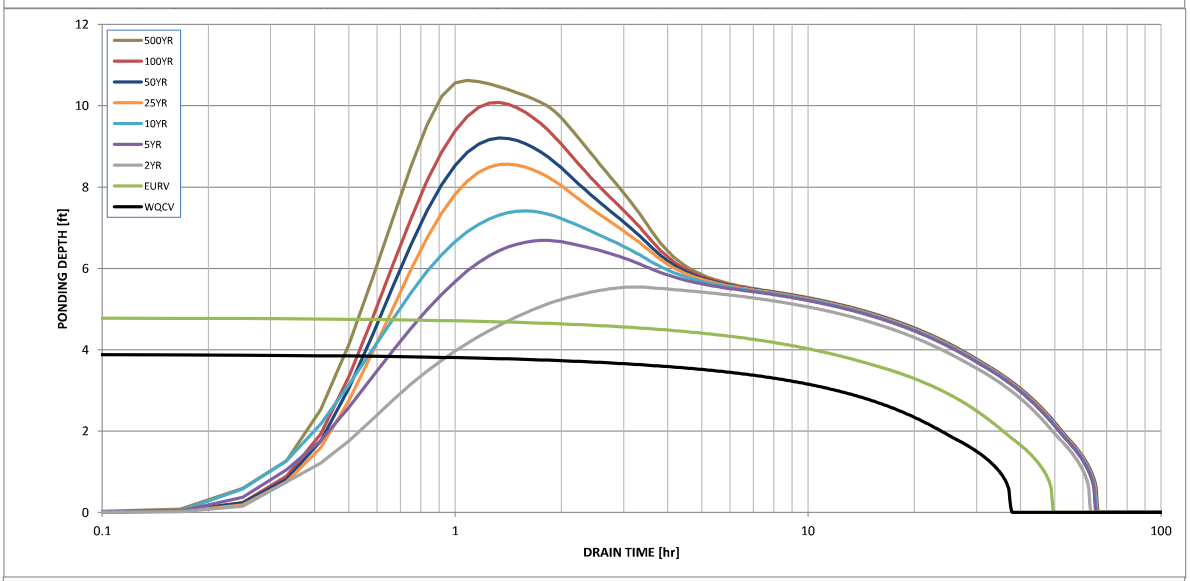
Routed Hydrograph Results *The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).*

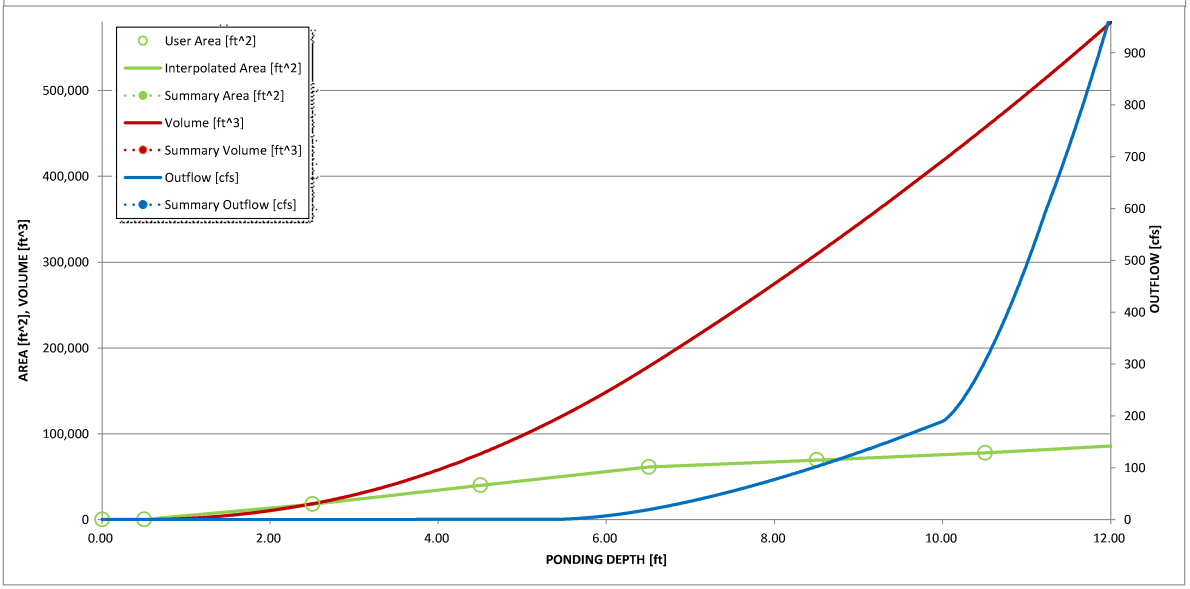
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.14
CUHP Runoff Volume (acre-ft) =	1.244	2.035	3.100	7.058	11.036	18.224	23.083	30.120	42.887
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	3.100	7.058	11.036	18.224	23.083	30.120	42.887
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	19.9	56.1	87.4	161.1	202.7	260.2	364.9
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.08	0.23	0.35	0.65	0.81	1.05	1.47
Peak Inflow Q (cfs) =	N/A	N/A	30.6	68.5	99.7	172.1	213.7	272.0	376.5
Peak Outflow Q (cfs) =	0.7	0.9	1.5	25.1	51.6	105.8	141.4	199.2	343.1
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.4	0.6	0.7	0.7	0.8	0.9
Structure Controlling Flow =	Plate	Plate	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Spillway	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	0.01	0.5	1.1	2.3	3.1	4.2	5.0
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	35	45	57	53	49	43	40	35	28
Time to Drain 99% of Inflow Volume (hours) =	37	48	61	60	58	55	53	50	47
Maximum Ponding Depth (ft) =	3.89	4.79	5.54	6.69	7.41	8.56	9.21	10.07	10.62
Area at Maximum Ponding Depth (acres) =	0.76	0.99	1.17	1.43	1.49	1.60	1.66	1.75	1.80
Maximum Volume Stored (acre-ft) =	1.248	2.038	2.850	4.347	5.413	7.192	8.236	9.718	10.676

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)







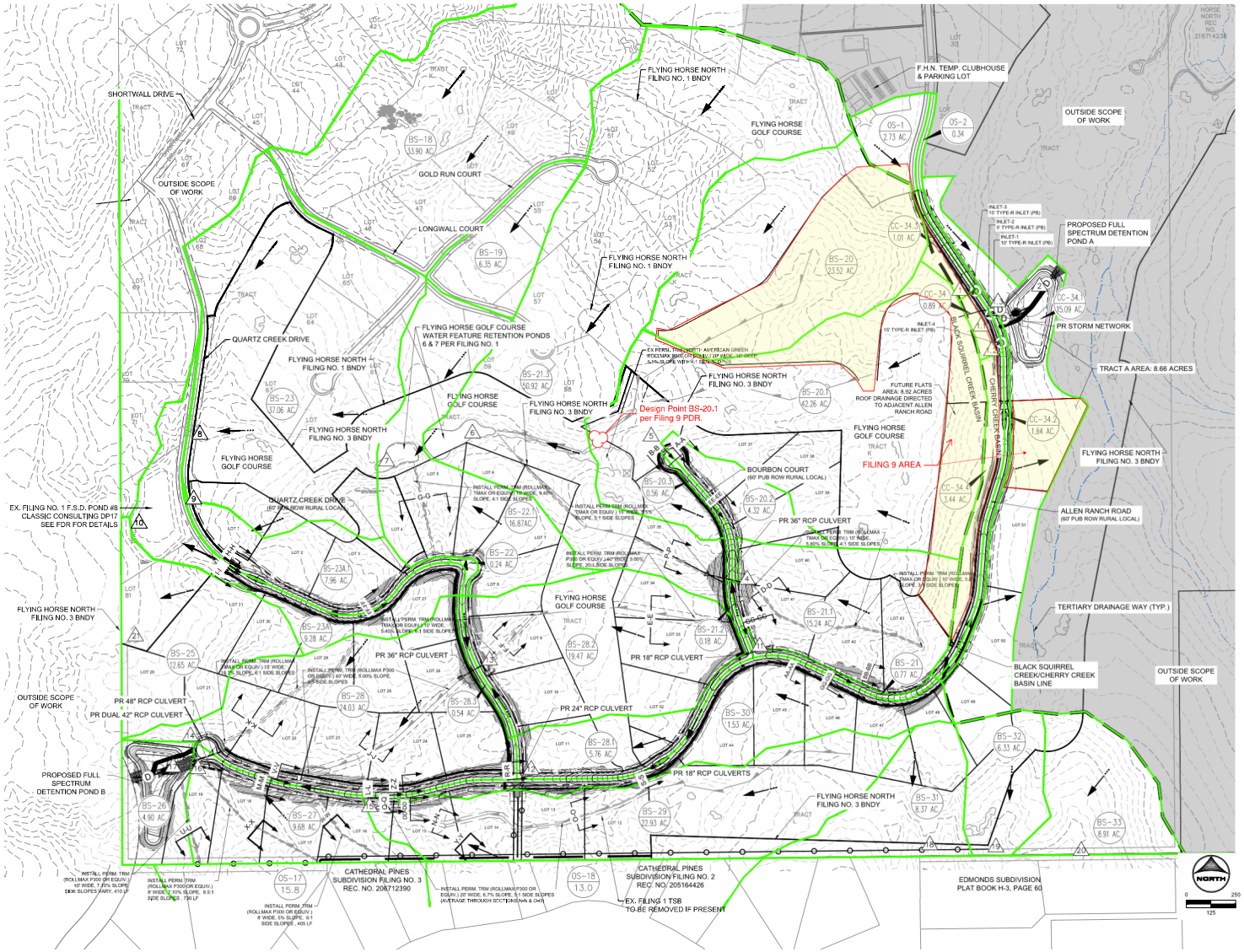
DETENTION BASIN OUTLET STRUCTURE DESIGN

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	0.01	0.00	0.03
	0:15:00	0.00	0.00	0.07	0.12	0.14	0.10	0.13	0.12	0.21
	0:20:00	0.00	0.00	0.36	0.89	1.53	0.40	0.49	0.51	1.53
	0:25:00	0.00	0.00	3.14	9.79	17.86	3.06	3.99	5.87	17.59
	0:30:00	0.00	0.00	11.55	30.95	50.07	32.69	42.54	52.66	89.66
	0:35:00	0.00	0.00	21.73	52.71	79.26	85.10	108.79	134.03	200.11
	0:40:00	0.00	0.00	28.31	64.92	94.61	131.48	165.51	204.86	292.04
	0:45:00	0.00	0.00	30.61	68.51	99.73	158.19	197.26	246.41	345.32
	0:50:00	0.00	0.00	30.36	67.43	98.75	170.53	211.86	266.92	371.14
	0:55:00	0.00	0.00	28.65	63.37	93.21	172.13	213.72	271.98	376.54
	1:00:00	0.00	0.00	26.29	58.15	86.71	164.62	204.72	264.93	367.28
	1:05:00	0.00	0.00	24.20	53.65	81.42	154.77	193.42	255.65	355.73
	1:10:00	0.00	0.00	22.41	49.78	76.77	144.93	182.14	244.46	341.58
	1:15:00	0.00	0.00	20.60	45.99	72.28	134.26	169.64	228.60	321.45
	1:20:00	0.00	0.00	18.82	42.36	67.97	122.92	156.00	209.89	297.28
	1:25:00	0.00	0.00	17.30	39.30	63.83	112.56	143.29	191.99	273.39
	1:30:00	0.00	0.00	16.05	36.68	59.60	103.73	132.25	176.22	251.52
	1:35:00	0.00	0.00	14.88	34.17	55.28	95.61	121.98	161.81	231.20
	1:40:00	0.00	0.00	13.76	31.62	50.98	88.00	112.32	148.66	212.45
	1:45:00	0.00	0.00	12.65	28.99	46.75	80.73	103.09	136.28	194.74
	1:50:00	0.00	0.00	11.54	26.33	42.62	73.68	94.17	124.32	177.70
	1:55:00	0.00	0.00	10.43	23.67	38.55	66.74	85.41	112.69	161.18
	2:00:00	0.00	0.00	9.32	21.04	34.48	59.92	76.81	101.38	145.15
	2:05:00	0.00	0.00	8.29	18.75	30.99	53.23	68.37	90.39	129.89
	2:10:00	0.00	0.00	7.52	17.10	28.39	47.68	61.40	81.20	117.19
	2:15:00	0.00	0.00	6.96	15.85	26.25	43.51	56.11	74.09	107.07
	2:20:00	0.00	0.00	6.47	14.73	24.29	40.06	51.66	68.05	98.34
	2:25:00	0.00	0.00	6.01	13.66	22.45	37.01	47.68	62.65	90.47
	2:30:00	0.00	0.00	5.56	12.63	20.68	34.24	44.05	57.74	83.26
	2:35:00	0.00	0.00	5.13	11.63	18.98	31.64	40.65	53.16	76.55
	2:40:00	0.00	0.00	4.70	10.65	17.34	29.13	37.39	48.88	70.28
	2:45:00	0.00	0.00	4.29	9.69	15.76	26.73	34.28	44.89	64.43
	2:50:00	0.00	0.00	3.89	8.75	14.23	24.37	31.25	41.03	58.81
	2:55:00	0.00	0.00	3.48	7.83	12.76	22.04	28.27	37.20	53.29
	3:00:00	0.00	0.00	3.08	6.91	11.32	19.73	25.32	33.39	47.81
	3:05:00	0.00	0.00	2.69	6.01	9.90	17.42	22.38	29.58	42.35
	3:10:00	0.00	0.00	2.29	5.11	8.48	15.13	19.46	25.77	36.90
	3:15:00	0.00	0.00	1.90	4.21	7.07	12.83	16.53	21.97	31.46
	3:20:00	0.00	0.00	1.50	3.33	5.67	10.54	13.62	18.18	26.03
	3:25:00	0.00	0.00	1.11	2.44	4.27	8.25	10.71	14.39	20.61
	3:30:00	0.00	0.00	0.73	1.58	2.92	5.97	7.82	10.62	15.25
	3:35:00	0.00	0.00	0.42	0.93	1.99	3.76	5.02	6.99	10.33
	3:40:00	0.00	0.00	0.25	0.62	1.49	2.32	3.23	4.57	7.05
	3:45:00	0.00	0.00	0.18	0.47	1.17	1.47	2.17	3.07	4.94
	3:50:00	0.00	0.00	0.14	0.37	0.93	0.96	1.48	2.04	3.43
	3:55:00	0.00	0.00	0.11	0.29	0.73	0.62	1.00	1.31	2.32
	4:00:00	0.00	0.00	0.09	0.23	0.57	0.41	0.69	0.80	1.52
	4:05:00	0.00	0.00	0.07	0.18	0.43	0.27	0.47	0.44	0.93
	4:10:00	0.00	0.00	0.05	0.13	0.31	0.17	0.31	0.23	0.55
	4:15:00	0.00	0.00	0.04	0.10	0.22	0.12	0.22	0.15	0.37
	4:20:00	0.00	0.00	0.04	0.07	0.15	0.08	0.16	0.12	0.27
	4:25:00	0.00	0.00	0.03	0.05	0.11	0.06	0.12	0.09	0.21
	4:30:00	0.00	0.00	0.02	0.04	0.08	0.05	0.09	0.07	0.17
	4:35:00	0.00	0.00	0.02	0.02	0.06	0.03	0.07	0.05	0.13
	4:40:00	0.00	0.00	0.01	0.01	0.04	0.02	0.05	0.04	0.09
	4:45:00	0.00	0.00	0.01	0.01	0.03	0.02	0.03	0.03	0.06
	4:50:00	0.00	0.00	0.00	0.01	0.01	0.01	0.02	0.02	0.04
	4:55:00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.02
	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



SUMMARY RUNOFF TABLE

BASIN	AREA (ac)	% IMP.	C_5	C_{100}	Q_5 (cfs)	Q_{100} (cfs)
BS-18	33.90	7.77	0.14	0.39	12.6	60.1
BS-19	6.35	11.00	0.17	0.42	4.1	16.8
BS-20	23.79	6.83	0.13	0.39	9.6	48.5
BS-20.1	42.26	8.49	0.14	0.39	16.3	77.7
BS-20.2	4.32	11.00	0.17	0.42	2.5	10.1
BS-20.3	0.56	100.00	0.90	0.96	2.3	4.1
BS-21	0.77	100.00	0.90	0.96	3.0	5.4
BS-21.1	15.24	11.95	0.17	0.42	8.5	34.3
BS-21.2	0.18	100.00	0.90	0.96	0.8	1.5
BS-21.3	50.92	7.83	0.14	0.39	17.7	85.0
BS-22	0.24	100.00	0.90	0.96	1.1	2.0
BS-22.1	16.87	9.63	0.16	0.41	8.8	38.4
BS-23A	9.28	8.43	0.14	0.40	4.1	19.0
BS-23A.1	7.96	10.69	0.17	0.41	4.2	17.4
BS-23	37.06	7.26	0.13	0.39	15.6	76.7
BS-25	12.65	8.49	0.15	0.40	6.1	28.1
BS-26	4.90	3.74	0.10	0.36	1.7	10.6
BS-27	9.68	11.00	0.17	0.42	5.6	22.9
BS-28	24.03	11.00	0.17	0.42	12.3	50.6
BS-28.1	5.76	9.56	0.16	0.41	2.8	12.5
BS-28.2	19.47	8.75	0.15	0.40	9.0	41.0
BS-28.3	0.54	100.00	0.90	0.96	2.5	4.5
BS-29	22.93	7.78	0.14	0.39	8.3	39.7
BS-30	11.53	10.84	0.17	0.42	4.9	20.4
BS-31	8.40	4.57	0.11	0.37	3.2	18.6
BS-32	6.33	6.73	0.13	0.39	3.0	15.4
BS-33	8.91	10.39	0.16	0.41	5.2	21.9
CC-34	0.89	26.22	0.28	0.50	1.0	2.9
CC-34.1	15.09	5.82	0.12	0.38	6.7	36.1
CC-34.2	1.84	100.00	0.90	0.96	4.9	8.7
CC-34.3	1.01	40.81	0.40	0.59	1.6	3.9
CC-34.4	3.44	91.66	0.76	0.83	7.9	14.6
OS-1	2.70	29.55	0.29	0.51	2.8	8.2
OS-2	0.34	100.00	0.90	0.96	1.3	2.3
OS-17	15.80	11.00	0.17	0.42	9.9	40.6
OS-18	13.00	11.00	0.17	0.42	8.2	33.7

DESIGN POINT SUMMARY TABLE

DESIGN POINT	CONTRIBUTING BASINS	ΣQ_5 (cfs)	ΣQ_{100} (cfs)	Tributary Area (ac.)	Weighted % Impervious
1	OS-1 & CC-34.3	4.4	12.1	3.7	32.62%
1.1	CC-34, DP1, DP1.2	1.2	7.5	8.0	57.17%
1.2	CC-34.4	7.9	14.6	3.4	91.66%
1.3	CC-34.2, OS-2	6.2	11.0	2.2	100.00%
2	CC-34.3-4, OS-1-2	26.2	76.6	25.3	30.25%
4	BS-21.1	8.5	34.3	15.2	11.95%
5	BS-20.2-20.3	4.7	14.2	4.9	21.21%
6	BS-20-20.3, 21.1-21.3	57.7	261.3	137.3	8.92%
7	BS-19, BS-22-22.1, DP6	71.7	318.4	160.7	9.21%
8	BS-18, 23, DP7	99.8	455.3	231.7	8.69%
9	BS-23A.1	4.2	17.4	8.0	7.96%
10	BS-23A, DP8, DP9	108.1	491.7	248.9	8.74%
11	BS-21	3.0	5.4	0.8	100.00%
12	BS-28.1, DP11	5.9	17.9	6.5	20.23%
13	BS-28.2	9.0	41.0	19.5	8.75%
14	BS-28, BS-28.3, DP12, DP13	29.7	114.0	50.6	12.28%
15	OS-18, BS-29-30	21.4	93.8	47.5	9.41%
16	OS-17, BS-27, DP15	36.9	157.3	72.9	9.96%
17	BS-26, DP14, DP16	68.2	281.8	128.4	10.04%
18	BS-31	3.2	18.6	8.4	4.57%
19	BS-32	3.0	15.4	6.3	6.73%
20	BS-33	5.2	21.9	8.9	10.39%
21	BS-25	6.1	28.1	12.7	8.49%

LEGEND:

- PROPOSED MAJOR CONTOUR — 5250
- PROPOSED MINOR CONTOUR
- EXISTING MAJOR CONTOUR — 5250
- EXISTING MINOR CONTOUR
- PROPOSED STORM SEWER
- PROPOSED STORM SEWER
- EXISTING DRAINAGE SWALE
- PROPOSED DRAINAGE SWALE
- EXISTING TERTIARY DRAINAGE WAY
- PROPOSED DRAINAGE ESMT
- BASIN BOUNDARY
- PROPERTY BOUNDARY
- BUILDING PAD
- PROPOSED FLOW DIRECTION
- PROPOSED DRAINAGE BASIN
- DESIGN POINT
- PROPOSED BASIN LABEL — 11 / 1.25 — BASIN DESIGNATION / AREA (AC.)

PCD FILE NO.: SF2328

DRAWN BY: DLH | JOB DATE: 4/10/2024
APPROVED: RDL | JOB NUMBER: 211030
CAD DATE: 6/14/2024
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NO.	DATE	BY	REVISION DESCRIPTION

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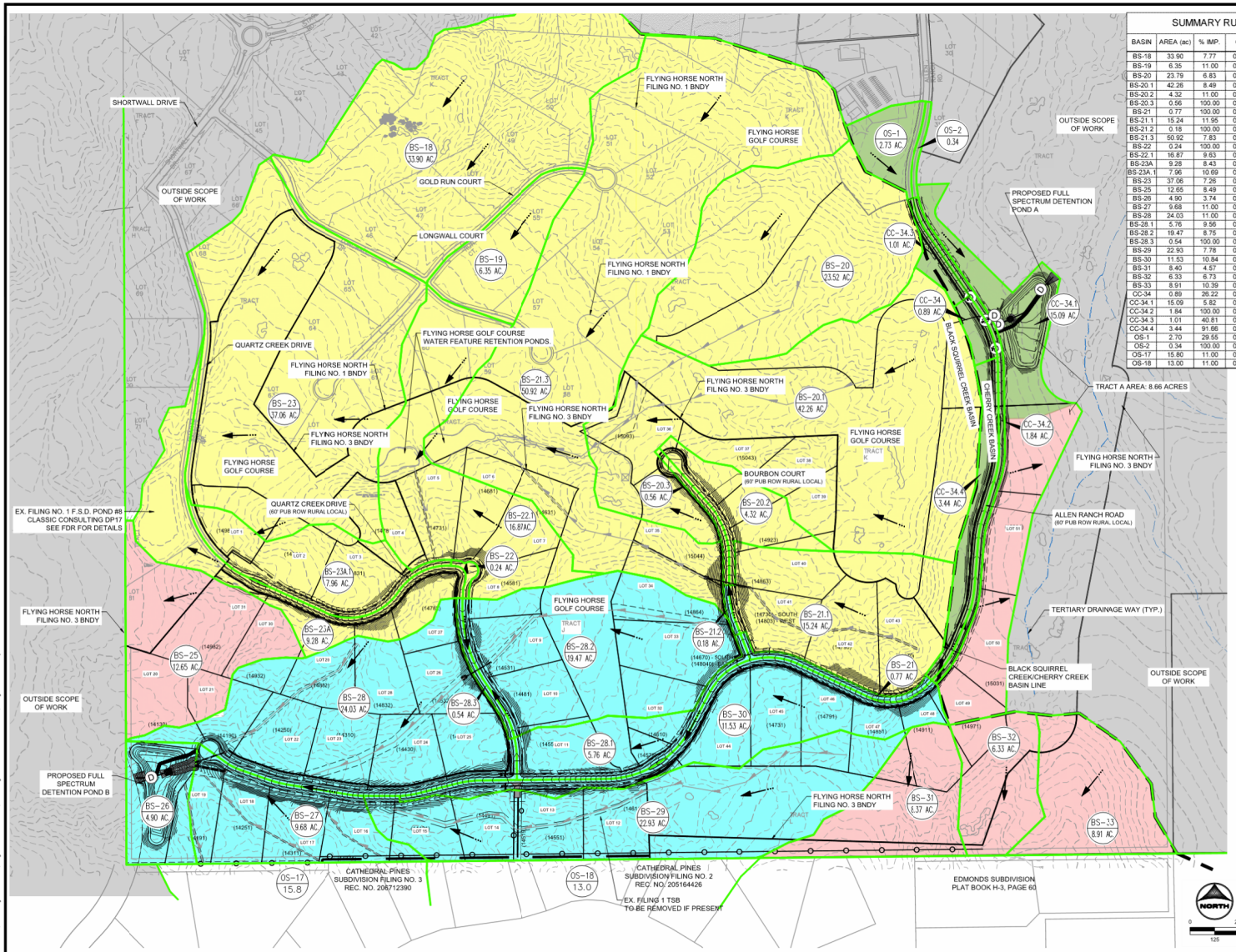
FLYING HORSE NORTH FILING 3
PRI #2, LLC.
EL PASO COUNTY, CO

PROPOSED CONDITIONS
DRAINAGE MAP

SHEET
MAP

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HR GREEN Xrefs: xv-row-1030; xv-dgn-1030; xc-row-030.202; xc-dgn-030.202; xg-1-BID1-1030; xc-dgn-030.202-Plats Area; Legend_FDR_Map



SUMMARY RUNOFF TABLE

BASIN	AREA (ac)	% IMP.	C_5	C_{100}	Q_5 (cfs)	Q_{100} (cfs)
BS-18	33.90	7.77	0.14	0.39	12.6	60.1
BS-19	6.35	11.00	0.17	0.42	4.1	16.8
BS-20	23.79	6.83	0.13	0.39	9.6	48.5
BS-20.1	42.26	8.49	0.14	0.39	16.3	77.7
BS-20.2	4.32	11.00	0.17	0.42	2.5	10.1
BS-20.3	0.56	100.00	0.90	0.96	2.3	4.1
BS-21	0.77	100.00	0.90	0.96	3.0	5.4
BS-21.1	15.24	11.95	0.17	0.42	8.5	34.3
BS-21.2	0.18	100.00	0.90	0.96	0.8	1.5
BS-21.3	50.92	7.83	0.14	0.39	17.7	85.0
BS-22	0.24	100.00	0.90	0.96	1.1	2.0
BS-22.1	16.87	9.63	0.16	0.41	8.8	38.4
BS-23A	9.28	8.43	0.14	0.42	4.1	19.0
BS-23A.1	7.96	10.69	0.17	0.41	4.2	17.4
BS-23	37.06	7.26	0.13	0.39	15.6	76.7
BS-25	12.65	8.49	0.15	0.40	6.1	28.1
BS-26	4.90	3.74	0.10	0.36	1.7	10.6
BS-27	9.68	11.00	0.17	0.42	5.6	22.9
BS-28	24.03	11.00	0.17	0.42	12.3	50.6
BS-28.1	5.76	9.56	0.16	0.41	2.8	12.5
BS-28.2	19.47	8.75	0.15	0.40	9.0	41.0
BS-28.3	0.54	100.00	0.90	0.96	2.5	4.5
BS-29	22.93	7.78	0.14	0.39	8.3	39.7
BS-30	11.53	10.84	0.17	0.42	4.9	20.4
BS-31	8.40	4.57	0.11	0.37	3.2	18.6
BS-32	6.33	6.73	0.13	0.39	3.0	15.4
BS-33	8.91	10.39	0.16	0.41	5.2	21.9
CC-34	0.89	26.22	0.28	0.50	1.0	2.9
CC-34.1	15.09	5.82	0.12	0.38	6.7	36.1
CC-34.2	1.84	100.00	0.90	0.96	4.9	8.7
CC-34.3	1.01	40.81	0.40	0.59	1.6	3.9
CC-34.4	3.44	91.86	0.76	0.83	7.9	14.6
OS-1	2.70	29.55	0.29	0.51	2.8	8.2
OS-2	0.34	100.00	0.90	0.96	1.3	2.3
OS-17	15.80	11.00	0.17	0.42	9.9	40.6
OS-18	13.00	11.00	0.17	0.42	8.2	33.7

TRIBUTARY AREA SUMMARY TABLE

BASIN ID	TOTAL AREA (AC)	TOTAL PROPOSED DISTURBED AREA (AC)	AREA TRIB TO POND A (AC)	AREA TRIB TO POND B (AC)	AREA TRIB TO FILING NO. 1 POND B (AC)	TOTAL AREA W 100% WQ REDUCTION
BS-18	33.90	12.15	-	-	33.9	-
BS-19	6.35	0.00	-	-	6.35	-
BS-20	23.79	11.02	-	-	23.79	-
BS-20.1	42.26	23.35	-	-	42.26	-
BS-20.2	4.32	0.00	-	-	4.32	-
BS-20.3	0.56	0.00	-	-	0.56	-
BS-21	0.77	0.00	-	0.77	-	-
BS-21.1	15.24	1.56	-	-	15.24	-
BS-21.2	0.18	0.00	-	-	0.18	-
BS-21.3	50.92	21.87	-	-	50.92	-
BS-22	0.24	0.00	-	-	0.24	-
BS-22.1	16.87	2.56	-	-	16.87	-
BS-23A	9.28	2.65	-	-	9.28	-
BS-23A.1	7.96	0.27	-	-	7.96	-
BS-23	37.06	15.38	-	-	37.06	-
BS-25	12.65	3.53	-	-	-	12.65
BS-26	4.90	3.95	-	4.9	-	-
BS-27	9.68	0.00	-	9.68	-	-
BS-28	24.03	0.00	-	24.03	-	-
BS-28.1	5.76	0.92	-	5.76	-	-
BS-28.2	19.47	4.87	-	19.47	-	-
BS-28.3	0.54	0.00	-	0.54	-	-
BS-29	22.93	8.20	-	22.93	-	-
BS-30	11.53	0.20	-	11.53	-	-
BS-31	8.40	6.00	-	-	-	8.4
BS-32	6.33	3.00	-	-	-	6.33
BS-33	8.91	0.60	-	-	-	8.91
CC-34	0.89	0.67	0.89	-	-	-
CC-34.1	15.09	8.68	15.09	-	-	-
CC-34.2	1.84	0.00	1.84	-	-	-
CC-34.3	1.01	0.61	1.01	-	-	-
CC-34.4	3.44	0.00	3.44	-	-	-
OS-1	2.70	1.89	2.7	-	-	-
OS-2	0.34	0.00	0.34	-	-	-
OS-17	15.80	0.00	-	15.8	-	-
OS-18	13.00	0.00	-	13	-	-
TOTALS	438.94	133.93	25.31	128.41	248.93	36.29

DESIGN POINT SUMMARY TABLE

DESIGN POINT	CONTRIBUTING BASINS	ΣQ_5 (cfs)	ΣQ_{100} (cfs)	Tributary Area (ac.)	Weighted % Impervious
1	OS-1 & CC-34.3	4.4	12.1	3.7	32.62%
1.1	CC-34, DP1, DP1.2	1.2	7.5	8.0	57.17%
1.2	CC-34.4	7.9	14.6	3.4	91.66%
1.3	CC-34.2, OS-2	6.2	11.0	2.2	100.00%
2	CC-34-34.4, OS-1-2	26.2	76.6	25.3	30.25%
4	BS-21.1	8.5	34.3	15.2	11.95%
5	BS-20-2-20.3	4.7	14.2	4.9	21.21%
6	BS-20-20.3, 21.1-21.3	57.7	261.3	137.3	8.92%
7	BS-19, BS-22-22.1, DP6	71.7	318.4	160.7	9.21%
8	BS-18, 23, DP7	99.8	455.3	231.7	8.69%
9	BS-23A.1	4.2	17.4	8.0	7.96%
10	BS-23A, DP8, DP9	108.1	491.7	248.9	8.74%
11	BS-21	3.0	5.4	0.8	100.00%
12	BS-28.1, DP11	5.9	17.9	6.5	20.23%
13	BS-28.2	9.0	41.0	19.5	8.75%
14	BS-28, BS-28.3, DP12, DP13	29.7	114.0	50.6	12.28%
15	OS-18, BS-29-30	21.4	93.8	47.5	9.41%
16	OS-17, BS-27, DP15	36.9	157.3	72.9	9.96%
17	BS-26, DP14, DP16	68.2	281.8	128.4	10.04%
18	BS-31	3.2	18.6	8.4	4.57%
19	BS-32	3.0	15.4	6.3	6.73%
20	BS-33	5.2	21.9	8.9	10.39%
21	BS-25	6.1	28.1	12.7	8.49%

LEGEND:

- PROPOSED MAJOR CONTOUR — 5250
- PROPOSED MINOR CONTOUR
- EXISTING MAJOR CONTOUR — 5250
- EXISTING MINOR CONTOUR
- PROPOSED STORM SEWER
- PROPOSED STORM SEWER
- EXISTING DRAINAGE SWALE
- PROPOSED DRAINAGE SWALE
- EXISTING TERTIARY DRAINAGE WAY
- PROPOSED DRAINAGE ESMT
- BASIN BOUNDARY
- PROPERTY BOUNDARY
- PROPOSED FLOW DIRECTION
- PROPOSED DRAINAGE BASIN
- PROPOSED BASIN LABEL — 11 / 1.25 — BASIN DESIGNATON / AREA (AC.)
- AREA TRIBUTARY TO FILING NO. 1 POND B
- AREA TRIBUTARY TO FILING NO. 1 POND A
- AREA TRIBUTARY TO FILING NO. 1 POND B
- ECM LARGE LOT EXCLUSION (I.7.1.B.5)

PCD FILE NO.: SF2328

DRAWN BY: DLH | JOB DATE: 4/11/2024 | APPROVED: RDL | JOB NUMBER: 211030 | CAD DATE: 4/11/2024 | CAD FILE: J:\2021\211030\CAD\Dwgs\C\Drainage\Estates\PBMP_Treatment

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

NO.	DATE	BY	REVISION DESCRIPTION

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PHONE: 719.300.4140
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FLYING HORSE NORTH FILING 3
PRI #2, LLC.
EL PASO COUNTY, CO

PROPOSED DRAINAGE CONDITIONS
TRIBUTARY AREAS

SHEET MAP

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HR GREEN Xrefs: xv-row-1030; xv-dsgn-1030; xc-row-030.202; xc-dsgn-030.202; xg1-1-@01-1030; xc-dsgn-030.202-Plats Arcs; Legend_FDR_Map

HRGreen

HRGREEN.COM

The Clubhouse at Flying Horse North
Final Drainage Report

July 2025

Prepared For:

Mr. Drew Balsick

Vice President / Project Manager

Flying Horse Country Club, LLC
2138 Flying Horse Club Drive

Colorado Springs, CO 80921

(719) 785-3237

Prepared By:

HR Green Development, LLC

Contact: Richie Lyon, PE

Richie.Lyon@hrgreen.com

719-318-0871

PCD File No. PPR-259

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Engineer's Statement

This report and plan for the drainage design of the development, Clubhouse at Flying Horse North, was prepared by me (or under my direct supervision) and is correct to the best of my knowledge and belief. Said report and plan has been prepared in accordance with the *El Paso County Drainage Criteria* Manual and is in conformity with the master plan of the drainage basin. I understand that El Paso County does not and will not assume liability for drainage facilities designed by others. I accept responsibility for any liability caused by any negligent acts, errors or omissions on my part in preparing this report.

RDL 8/19/2025

Richie Lyon, PE Date

State of Colorado No. 53921

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.

Flying Horse Country Club, LLC

8/19/2025

Drew Balsick Date

Vice President / Project Manager

Flying Horse Country Club, LLC
2138 Flying Horse Club Drive

Colorado Springs, CO 80921

El Paso County:

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

Charlene Durham, P.E. Digitally signed by Charlene Durham, P.E. Reason: Authorized Signatory as County Engineer designee Date: 2025.12.03 10:46:43-07'00'

12/03/2025

Joshua Palmer, P.E. Date

County Engineer/ECM Administrator

Design Point 1.1 (Q_5 = 1.0 cfs, Q_{100} = 5.6 cfs)

Design Point 1.1 represents the developed direct basin flow from **Basin CC-34** as well as the bypass flow in **Design Point 1** and **Design Point 1.2**. These flows will be channelized into the streets curb and gutter **to Design Point 1.1** where they will be captured by an existing 5' CDOT type R sump inlet. Flows at this are location have decreased compared to existing (Q5=1.2, Q100=7.3 cfs). All flows are captured and piped via existing public 24" RCP storm sewer to converge with flows captured at **Design Point 1.3**, then are conveyed to existing Pond A at **Design Point 2**. Adequate street and inlet capacity has been verified and hydraulic calculations are included in Appendix C.

Design Point 1.2 (Q_5 = 7.9 cfs, Q_{100} = 14.6 cfs)

Design Point 1.2 represents the developed basin flows from **Basin CC-34.4**. Flows from this basin have been calculated to be conservative to account for future development and will be directed via EPC type A curb and gutter to be captured by an existing 15' CDOT type R on-grade inlet. The on-grade inlet is capable of capturing 7.7 CFS (97%) of the 5-year flow and 11.6 CFS (79%) of the 100-year flow, leaving a total of 0.2 CFS and 3.0 CFS left as bypass, respectively, to be channelized and captured at **Design Point 1.1**. The captured flow is conveyed to **Design Point 1.1** via existing public 24" RCP storm sewer. Captured flows remain the same at this location as previously analyzed in the Filing 3 FDR.

Design Point 1.3 (Q_5 = 6.2 cfs, Q_{100} = 11.0 cfs)

Design Point 1.3 represents the developed basin flows from **Basins CC-34.2 & OS-2**. These basins represent the east side of the proposed roadway and are channelized via EPC type A curb and gutter. Channelized flows are directed to a low point at this design point and are captured by an existing 10' CDOT type R sump inlet. Captured runoff is combined with flows from **Design Point 1.1** and is routed to Pond A via existing public 36" RCP storm sewer. Captured flows in the 5 year event are slightly lower than previously analyzed in the Filing 3 FDR.

Design Point 2 (Q_5 = 30.7 cfs, Q_{100} = 79.1 cfs)

Design Point 2 represents the developed flows from **DP1.3 and Basin CC-34.1** at the existing, private full spectrum detention pond (Pond A). **Basin CC-34.1** is conveyed to the pond via sheet flow. The public storm infrastructure conveys the runoff to Pond A for full spectrum detention. The rational flows at this design point are used for existing spillway design verification calculations. Design revisions to the original CD's have been incorporated into construction of the pond's outlet structure and spillway. The revisions are shown in Appendix E.

In order to meet WQCV, EURV, and 100 year drain times, pond regrading from 4:1 to 3:1 side slopes is proposed as well as an orifice plate swap. See Appendix D for Pond A calculations.

Design Point 3 (Q_5 = 7.1 cfs, Q_{100} = 13.3 cfs)

Basin PR-3 comprises the northern portion of the site's stormwater that is tributary to the proposed 15' Type R sump inlet at the design point. It is comprised of the proposed permanent clubhouse, asphalt paved parking lot, existing storage cart building, and landscaped area. This onsite area was previously studied as **Basin CC-4C** in the 2018 Classic Report. The shortest pavement width of the parking lot is 28', similar to that of Allen Ranch Road. Therefore, the assumption was made that capacity through the parking lot is also proportional. Flows from this basin are conveyed south via proposed private 18" storm sewer to **DP9**. A low point utilizing an ~8 inch depth is graded in to keep peak flows onsite. See Appendix C for hydraulic calculations of the sump inlet capacity.

Design Point 8 (Q_5 = 0.5 cfs, Q_{100} = 3.3 cfs)

Basin PR-4 is comprised of 1.48 acres of the northern, undeveloped portion of the Site. This basin follows historic drainage patterns, sheet flowing to the Allen Ranch Road public roadside ditch and is conveyed ultimately to the existing public 36" RCP culvert (Filing 1) that crosses Old Stagecoach Road. Flows are decreased to this location since the remaining onsite flows are not conveyed to this ditch and culvert. The imperviousness of this basin is not increased and therefore contributes no volume to the WQCV.

Design Point 9 (Q_5 = 5.7 cfs, Q_{100} = 10.9 cfs)

Basin PR-1 consists of 0.27 acres of the proposed clubhouse roof that is directed to the southern parking lot area (**Basin PR-2**) via roof drains. **Basin PR-2** is comprised of 1.66 acres of the proposed parking lot that is split by a high point. Flows are conveyed southeast to a proposed rip rap lined channel that outfalls onsite to a proposed private Type D sump inlet. Captured runoff is directed south via proposed public 24" storm sewer under Allen Ranch Road. Capacity of the inlet at the design point can be viewed in Appendix C.

b. Water Quality and Detention Facilities

The flows and WQCV to the existing off-site Pond 12 are decreased. Therefore, no improvements are recommended to the existing infrastructure. The flows to the existing off-site Pond 13 remain unchanged from the existing condition and therefore no volume is contributed to the WQCV and no improvements are recommended. The flows and WQCV to the existing off-site Pond 6 are decreased, so there are no recommended improvements to the existing infrastructure.

With the proposed changes in drainage pattern and peak runoff described in this report, some of the existing Filing No. 3 Pond A infrastructure including the trickle channel and outlet structure with 2.5-foot depth micropool are sufficient for the increased flows from the developed site without modification. The Flying Horse Filing No. 3 FDR sized the Pond A forebay per a now superseded MHFD EBD factsheet using volume of 3% of the WQCV. Per current criteria, MHFD now prescribes sizing the forebay with a volume of 1% of the WQCV. Therefore, it was calculated that the existing forebay has capacity for the increased WQCV. A 12' width maintenance path allows vehicular access to the bottom of pond to access forebays and outlet structures for continued maintenance. The pathway provides access from the public right-of-way and proper turning radii and longitudinal and cross slopes for a maintenance vehicle. The pond is privately maintained by the Flying Horse North Metropolitan District.

The increased flows and WQCV from the clubhouse development require the following modifications to Filing No. 3 Pond A in the developed condition. To sufficiently increase the storage volume of the pond and lower ponding depths, regrading the side slopes from 4:1 to 3:1 is proposed. The existing forebay notch width is to be resized by saw cut to maintain a drain time between 4 and 5 minutes. The orifice plate within the outlet structure is to be swapped to maintain required WQCV and EURV drain times. The riprap apron at the emergency spillway is to be widened due to the increased overall spillway width. The calculations for this analysis and the modifications are provided in Appendix D.

The summary assessment of the existing downstream private pond (Pond A) is described in the table below. Calculations are provided in Appendix D. Notable conclusions include similar functionality of the pond with the increase in required volumes.

The Clubhouse at Flying Horse North
PROPOSED CONDITIONS
EL PASO COUNTY, COLORADO

Calc'd by:	**CVW**
Checked by:	**RDL**
Date:	**7/23/2025**

SUMMARY RUNOFF TABLE

BASIN	AREA (ac)	% IMP.	C_5	C_{100}	Q_5 (cfs)	Q_{100} (cfs)
CC-34	0.89	26.22	0.28	0.50	1.0	2.9
CC-34.1	15.09	5.82	0.12	0.38	6.7	36.1
CC-34.2	1.84	100.00	0.90	0.96	4.9	8.7
CC-34.3	1.01	40.81	0.40	0.59	1.6	3.9
CC-34.4	3.44	91.66	0.76	0.83	7.9	14.6
PR-2	1.66	79.32	0.72	0.83	4.8	9.1
OS-2	0.34	100.00	0.90	0.96	1.3	2.3
PR-3	2.16	85.28	0.77	0.86	7.1	13.3
EX-3	0.81	8.08	0.13	0.39	0.5	20.1
EX-4	1.33	2.00	0.08	0.35	0.5	21.3
PR-1	0.27	90.00	0.73	0.81	1.0	1.9
OS-3	0.71	100.00	0.90	0.96	3.2	3.9
OS-4	0.48	100.00	0.90	0.96	2.2	3.9
PR-4	1.48	2.00	0.08	0.35	0.5	3.3
PR-5	1.95	2.00	0.19	0.43	1.4	5.4

DESIGN POINT SUMMARY TABLE

DESIGN POINT	CONTRIBUTING BASINS	ΣQ_5 (cfs)	ΣQ_{100} (cfs)	Tributary Area (ac.)	Weighted % Impervious
1	PR-5 & CC-34.3	2.9	9.2	1.3	35.23%
1.1	CC-34, DP1, DP1.2	1.0	5.6	5.3	71.13%
1.2	CC-34.4	7.9	14.6	3.4	91.66%
1.3	CC-34.2, OS-2	6.2	11.0	2.2	100.00%
2	DP1.3, CC-34.1	30.7	79.1	28.7	35.95%
3	PR-3	7.1	13.3	2.2	85.28%
4	OS-3	3.2	5.8	0.7	100.00%
5	OS-4	2.2	3.9	0.5	100.00%
6	EX-3	0.5	20.1	0.8	8.08%
7	EX-4	0.5	21.3	1.3	2.00%
8	PR-4	0.5	3.3	1.5	2.00%
9	PR-1, PR-2	5.7	10.9	1.9	84.66%

HRGreen

The Clubhouse at Flying Horse North

PROPOSED CONDITIONS

EL PASO COUNTY, COLORADO

Calc'd by: CVW

Checked by: RDL

Date: 7/23/2025

COMPOSITE 'C' FACTORS

BASIN	GOLF COURSE / UNDEVELOPED	ROADWAY	RESIDENTIAL (2.5AC LOT)	ROOFTOP	TOTAL	SOIL TYPE	GOLF COURSE /			ROADWAY			RESIDENTIAL (2.5AC LOT)			ROOFTOP			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}
CC-34	0.67	0.22	0.00	0.00	0.89	B	2	0.08	0.35	100	0.90	0.96	11	0.17	0.42	90	0.73	0.81	26.2	0.28	0.50
CC-34.1	8.68	0.00	6.41	0.00	15.09	B	2	0.08	0.35	100	0.90	0.96	11	0.17	0.42	90	0.73	0.81	5.8	0.12	0.38
CC-34.2	0.00	1.84	0.00	0.00	1.84	B	2	0.08	0.35	100	0.90	0.96	11	0.17	0.42	90	0.73	0.81	100.0	0.90	0.96
CC-34.3	0.61	0.40	0.00	0.00	1.01	B	2	0.08	0.35	100	0.90	0.96	11	0.17	0.42	90	0.73	0.81	40.8	0.40	0.59
CC-34.4	0.00	0.57	0.00	2.87	3.44	B	2	0.08	0.35	100	0.90	0.96	11	0.17	0.42	90	0.73	0.81	91.7	0.76	0.83
PR-2	0.34	1.22	0.00	0.10	1.66	B	2	0.08	0.35	100	0.90	0.96	11	0.17	0.42	90	0.73	0.81	79.3	0.72	0.83
OS-2	0.00	0.34	0.00	0.00	0.34	B	2	0.08	0.35	100	0.90	0.96	11	0.17	0.42	90	0.73	0.81	100.0	0.90	0.96
EX-3	0.76	0.05	0.00	0.00	0.81	B	2	0.08	0.35	100	0.90	0.96	11	0.17	0.42	90	0.73	0.81	8.1	0.13	0.39
EX-4	1.33	0.00	0.00	0.00	1.33	B	2	0.08	0.35	100	0.90	0.96	11	0.17	0.42	90	0.73	0.81	2.0	0.08	0.35
PR-1	0.00	0.00	0.00	0.27	0.27	B	2	0.08	0.35	100	0.90	0.96	11	0.17	0.42	90	0.73	0.81	90.0	0.73	0.81
PR-3	0.31	1.69	0.00	0.16	2.16	B	2	0.08	0.35	100	0.90	0.96	11	0.17	0.42	90	0.73	0.81	85.3	0.77	0.86
OS-3	0.00	0.71	0.00	0.00	0.71	B	2	0.08	0.35	100	0.90	0.96	11	0.17	0.42	90	0.73	0.81	100.0	0.90	0.96
OS-4	0.00	0.48	0.00	0.00	0.48	B	2	0.08	0.35	100	0.90	0.96	11	0.17	0.42	90	0.73	0.81	100.0	0.90	0.96
PR-4	1.48	0.00	0.00	0.00	1.48	B	2	0.08	0.35	100	0.90	0.96	11	0.17	0.42	90	0.73	0.81	2.0	0.08	0.35
PR-5	1.70	0.25	0.00	0.00	1.95	B	2	0.08	0.35	100	0.90	0.96	11	0.17	0.42	90	0.73	0.81	2.0	0.19	0.43
TOTAL TO POND A	**12.31**	**6.53**	**6.41**	**3.40**	**28.65**														**35.95%**	**0.29**	**0.46**
TOTAL OFFSITE	**3.57**	**1.24**	**0.00**	**0.00**	**4.81**														**27.27%**	**0.04**	**0.16**
GRAND TOTAL	**15.88**	**7.77**	**6.41**	**3.40**	**33.46**														**34.58%**	**0.35**	**0.55**

The Clubhouse at Flying Horse North

PROPOSED CONDITIONS

EL PASO COUNTY, COLORADO

Calc'd by:	**CVW**
Checked by:	**RDL**
Date:	**7/23/2025**

TIME OF CONCENTRATION

BASIN DATA			OVERLAND TIME (T_i)			TRAVEL TIME (T_t)					TOTAL	*tc=(L/180)+10*	Design tc
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)	*tc max*	*tc design (min)*
CC-34	0.28	0.89	100	2.0	11.9	10	300	1.00	1.0	5.0	16.9	12.2	12.2
CC-34.1	0.12	15.09	100	2.0	14.3	10	400	1.00	1.0	6.7	21.0	12.8	12.8
CC-34.2	0.90	1.84	16	2.0	1.2	10	2150	1.00	1.0	35.8	37.0	22.0	22.0
CC-34.3	0.40	1.01	16	2.0	4.0	10	480	1.00	1.0	8.0	12.0	12.8	12.0
CC-34.4	0.76	3.44	100	2.0	5.0	10	1839	1.00	1.0	30.7	35.6	20.8	20.8
PR-2	0.72	1.66	100	1.0	6.9	20	500	1.00	2.0	4.2	11.1	13.3	11.1
OS-2	0.90	0.34	16	2.0	1.2	10	500	1.00	1.0	8.3	9.5	12.9	9.5
EX-3	0.13	0.81	34	5.0	6.1	7	74	22.00	3.3	0.4	6.4	10.6	6.4
EX-4	0.08	1.33	50	5.0	7.7	7	84	20.00	3.1	0.4	8.2	10.7	8.2
PR-1	0.73	0.27	25	1.0	3.4	20	75	1.00	2.0	0.6	5.0	10.6	5.0
PR-3	0.77	2.16	100	0.5	7.6	20	340	3.00	3.5	1.6	9.3	12.4	9.3
OS-3	0.90	0.71	91	2.0	2.8	20	638	3.80	3.9	2.7	5.5	14.1	5.5
OS-4	0.90	0.48	91	2.0	2.8	20	638	3.80	3.9	2.7	5.5	14.1	5.5
PR-4	0.08	1.48	100	2.0	14.8	7	310	0.50	0.5	10.4	25.3	12.3	12.3
PR-5	0.19	1.95	100	1.0	16.8	7	310	0.50	0.5	10.4	27.2	12.3	12.3

HRGreen

The Clubhouse at Flying Horse North
PROPOSED CONDITIONS
DESIGN STORM: 5-YEAR

Calc'd by:	CVW
Checked by:	RDL
Date:	7/23/2025

		DIRECT RUNOFF						TOTAL RUNOFF				OVERLAND			PIPE				TRAVEL TIME			REMARKS
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 (FT)	LENGTH (FT)	VEL. (FPS)	TRAVEL TIME (min)	
		BASIN CC-34.4 TC USED													BASIN CC-34.4 TC USED							(DIRECT FLOW ADDITION USED IN DOWNSTREAM PIPE)
															1.0	0.32		Pipe-(39)				
1.1	CC-34	0.89	0.28	12.2	0.25	3.83	1.0	20.8	0.32	3.03	1.0				20.3	6.69		Total @ MH-3				BS-34 & OVERFLOW FROM DP'S 1 & 1.2 CAPTURED AT EXISTING 5' SUMP INLET
	CC-34.1	15.09	0.12	12.8	1.79	3.76	6.7															BASIN FLOW CAPTURED IN ROADSIDE DITCH, COLLECTED AT DP2 POND
															BASIN CC-34.2 TC USED							(DIRECT FLOW ADDITION USED IN PIPE)
1.3	CC-34.2	1.84	0.90	22.0	1.66	2.94	4.9		1.96		6.2				25.5	8.65						BS-34.2 & OS-2 CAPTURED W/ EX. 10' TYPE R SUMP INLET, PIPE FLOW FROM DP1.1 & DP1.3 CONVERGE
	CC-34.3	1.01	0.40	12.0	0.41	3.85	1.6															BS-34.3 TO FLOW DOWNSTREAM INTO EXISTING ON-GRADE INLET AT DP1
												0.2	0.07	1.0	DIRECT FLOW USED							
1.2	CC-34.4	3.44	0.76	20.8	2.61	3.03	7.9		2.61		7.9				7.7	2.54	1.1	2.0	185	7.6	0.41	BS-34.4 CAPTURED ON GRADE BY 15' CDOT TYPE R INLET
								BASIN CC-34.2 TC USED														
2								22.0	10.44	2.94	30.7											EXISTING FULL SPECTRUM DETENTION POND A AT DP2
	PR-5	1.95	0.19	12.3	0.36	3.82	1.4															PR-1 CONVEYED TO PR-2 VIA PROPOSED CLUBHOUSE ROOF DRAINS
		BASIN PR-5 USED										0.0	0.00	0.0	INCLUDES PIPE TRAVEL TIME							PR-5 & CC-34.3 CAPTURED ON GRADE BY EXISTING 15' CDOT TYPE R INLET
															2.9	0.77		P10				
1								12.3	0.77	3.82	2.9				14.6	3.83		Total @ MH-4				& COMBINES WITH CAPTURED FLOWS FROM DP9
	OS-2	0.34	0.90	9.5	0.31	4.21	1.3															OS-2 FLOWS TO DP1.3
	OS-3	0.71	0.90	5.5	0.64	5.02	3.2															OS-3 CONVEYED TO ROADSIDE DITCH VIA RIP RAP RUNDOWN
															INCLUDES PIPE TRAVEL TIME							
3	PR-3	2.16	0.77	9.3	1.66	4.25	7.1								6.9	1.66			354	7.8	0.76	PR-3 CONVEYED TO PROPOSED 15' PRIVATE SUMP TYPE R INLET; PIPED TO DP9
4	OS-3	0.71	0.90	5.5	0.64	5.02	3.2															CONVEYED TO EXISTING ALLEN RANCH ROAD ROADSIDE DITCH VIA RIP RAP RUNDOWN
5	OS-4	0.48	0.90	5.5	0.43	5.02	2.2															CONVEYED TO EXISTING ALLEN RANCH ROAD ROADSIDE DITCH VIA RIP RAP RUNDOWN
6	EX-3	0.81	0.13	6.4	0.11	4.79	0.5															PORTION OF ONSITE BASIN BS-21.3 THAT IS CONVEYED WEST VIA SHEET FLOW
7	EX-4	1.33	0.08	8.2	0.11	4.43	0.5															PORTION OF ONSITE BASIN BS-20 THAT IS CONVEYED WEST VIA SHEET FLOW
8	PR-4	1.48	0.08	12.3	0.12	3.82	0.5															BASIN PR-4 SHEET FLOWS OFFSITE TO THE NORTH; NO IMPERVIOUSNESS ADDED
	PR-1	0.27	0.73	5.0	0.20	5.17	1.0															PR-1 CONVEYED TO PR-2 PARKING LOT VIA ROOF DRAINS
	PR-2	1.66	0.72	11.1	1.20	3.97	4.8															PR-2 CONVEYED TO TYPE D SUMP INLET VIA RIP RAP RUNDOWN
		WEIGHTED TC USED													INCLUDES PIPE TRAVEL TIME							BASIN PR-1, PR-2, & DP3 FLOWS COMBINE AT PROPOSED TYPE D SUMP INLET
9								10.2	1.40	4.09	5.7				11.7	3.06			975	8.0	2.03	VIA PR. RIP RAP RUNDOWN & PR. 18" PRIVATE STORM SEWER

HRGreen

The Clubhouse at Flying Horse North

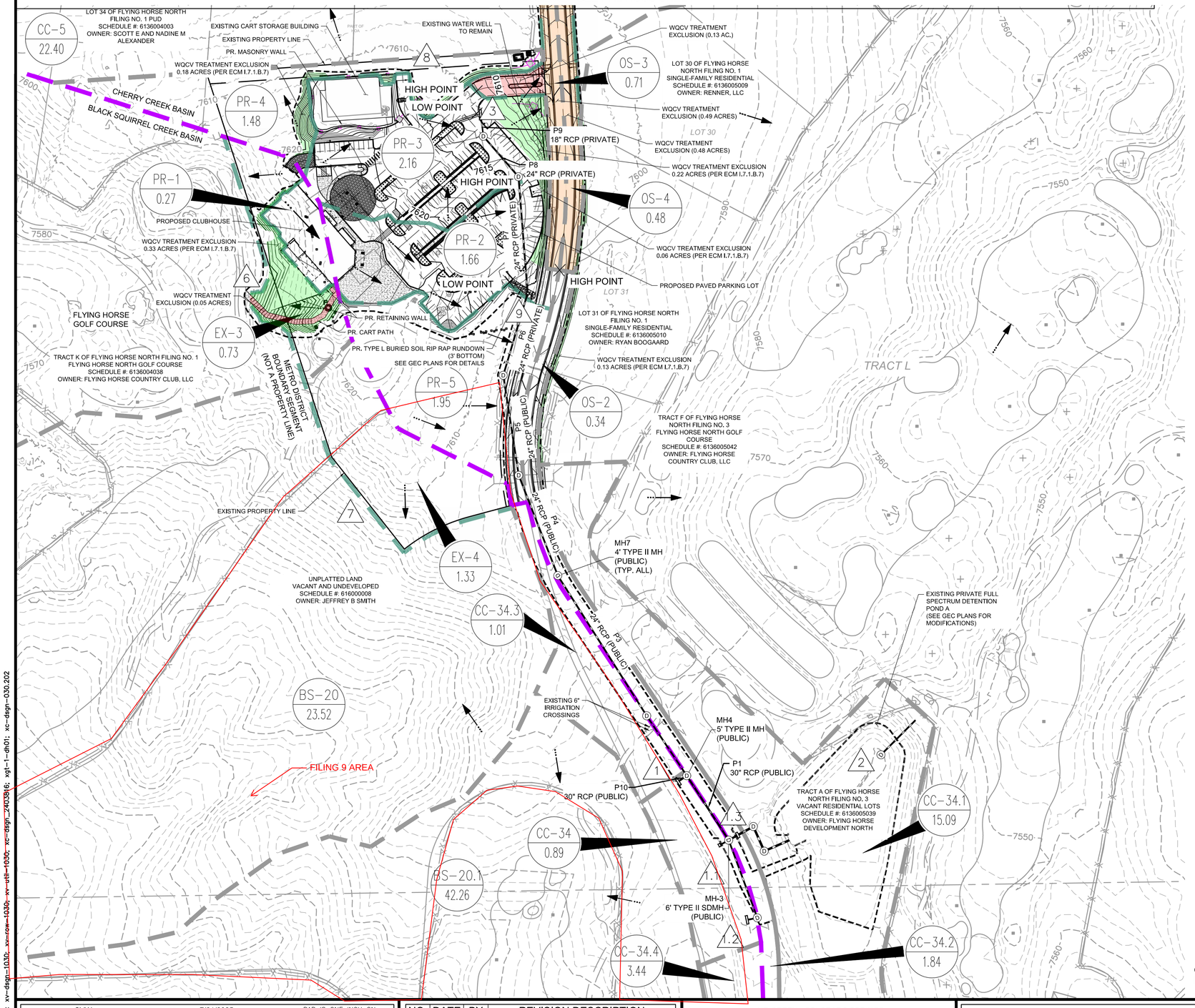
PROPOSED CONDITIONS

DESIGN STORM: 100-YEAR

Calc'd by:	CVW
Checked by:	RDL
Date:	7/23/2025

		DIRECT RUNOFF						TOTAL RUNOFF				OVERLAND			PIPE				TRAVEL TIME			REMARKS
DESIGN PONT	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 (ft)	LENGTH (ft)	VEL. (ft/s)	TRAVEL TIME (min)	
		BASIN CC-34.4 TC USED													BASIN CC-34.4 TC USED							(DIRECT FLOW ADDITION USED IN DOWNSTREAM PIPE)
															5.6	1.10		Pipe-(39)				
1.1	CC-34	0.89	0.50	12.2	0.45	6.43	2.9	20.8	1.10	5.09	5.6				41.8	8.20		Total @ MH-3				BS-34 & OVERFLOW FROM DP'S 1 & 1.2 CAPTURED AT EXISTING 5' SUMP INLET
	CC-34.1	15.09	0.38	12.8	5.71	6.31	36.1															BASIN FLOW CAPTURED IN ROADSIDE DITCH, COLLECTED AT DP2 POND
															BASIN CC-34.2 TC USED							
1.3	CC-34.2	1.84	0.96	22.0	1.77	4.94	8.7		2.09		11.0				50.9	10.29						BS-34.2 & OS-2 CAPTURED W/ EX. 10' TYPE R SUMP INLET, PIPE FLOW FROM DP1.1 & DP1.3 CONVERGE
	CC-34.3	1.01	0.59	12.0	0.60	6.46	3.9															BS-34.3 TO FLOW DOWNSTREAM INTO EXISTING ON-GRADE INLET AT DP1
												3.0	0.59	1.0	DIRECT FLOW USED							
1.2	CC-34.4	3.44	0.83	20.8	2.87	5.09	14.6		2.87		14.6				11.6	2.28	1.1	2.0	185	7.6	0.41	BS-34.4 CAPTURED ON GRADE BY 15' CDOT TYPE R INLET
								BASIN CC-34.2 TC USED														
2								22.0	16.01	4.94	79.1											EXISTING FULL SPECTRUM DETENTION POND A AT DP2
	PR-5	1.95	0.43	12.3	0.84	6.42	5.4															PR-1 CONVEYED TO PR-2 VIA PROPOSED CLUBHOUSE ROOF DRAINS
		BASIN PR-5 TC USED										0.4	0.06	4.0	INCLUDES PIPE TRAVEL TIME							PR-5 & CC-34.3 CAPTURED ON GRADE BY EXISTING 15' CDOT TYPE R INLET
															8.8	1.37		P10				
1								12.3	1.43	6.42	9.2				30.9	4.82		Total @ MH-4	17	7.8	0.04	& COMBINES WITH CAPTURED FLOWS FROM DP9
	OS-2	0.34	0.96	9.5	0.33	7.06	2.3															OS-2 FLOWS TO DP1.3
	OS-3	0.48	0.96	5.5	0.46	8.44	3.9															OS-3 CONVEYED TO ROADSIDE DITCH VIA RIP RAP RUNDOWN
															INCLUDES PIPE TRAVEL TIME							
3	PR-3	2.16	0.86	9.3	1.86	7.13	13.3								12.9	1.86			354	7.8	0.76	PR-3 CONVEYED TO PROPOSED 15' PRIVATE SUMP TYPE R INLET; PIPED TO DP9
4	OS-3	0.71	0.96	5.5	0.68	8.44	5.8															CONVEYED TO EXISTING ALLEN RANCH ROAD ROADSIDE DITCH VIA RIP RAP RUNDOWN
5	OS-4	0.48	0.96	5.5	0.46	8.44	3.9															CONVEYED TO EXISTING ALLEN RANCH ROAD ROADSIDE DITCH VIA RIP RAP RUNDOWN
6	EX-3	0.81	0.39	6.4	2.50	8.04	20.1															PORTION OF ONSITE BASIN BS-21.3 THAT IS CONVEYED WEST VIA SHEET FLOW
7	EX-4	1.33	0.35	8.2	2.86	7.44	21.3															PORTION OF ONSITE BASIN BS-20 THAT IS CONVEYED WEST VIA SHEET FLOW
8	PR-4	1.48	0.35	12.3	0.52	6.42	3.3															BASIN PR-4 SHEET FLOWS OFFSITE TO THE NORTH; NO IMPERVIOUSNESS ADDED
	PR-1	0.27	0.81	5.0	0.22	8.68	1.9															PR-1 CONVEYED TO PR-2 PARKING LOT VIA ROOF DRAINS
	PR-2	1.66	0.83	11.1	1.37	6.67	9.1															PR-2 CONVEYED TO TYPE D SUMP INLET VIA RIP RAP RUNDOWN
		WEIGHTED TC USED													INCLUDES PIPE TRAVEL TIME							BASIN PR-1, PR-2, & DP3 FLOWS COMBINE AT PROPOSED TYPE D SUMP INLET
9								10.3	1.59	6.87	10.9				22.1	3.45			975	8.0	2.03	VIA PR. RIP RAP RUNDOWN & PR. 18" PRIVATE STORM SEWER

MATCHLINE - SEE PREVIOUS SHEET



LEGEND:

- EXISTING MAJOR CONTOUR — 5250
- EXISTING MINOR CONTOUR
- EXISTING STORM SEWER
- PROPOSED STORM SEWER
- EXISTING BASIN BOUNDARY
- PR. SUBBASIN BOUNDARY
- MAJOR BASIN BOUNDARY
- PROPERTY BOUNDARY
- PR. RETAINING WALL
- PR. MAINTENANCE ACCESS
- ECM EXCLUSION I.7.1.B.2.2 (EXCLUDED ROADWAY REDEVELOPMENT) 0.98 AC. TOTAL
- ECM EXCLUSION I.7.1.B.7 (LAND DISTURBANCE TO UNDEVELOPED LAND THAT WILL REMAIN UNDEVELOPED) 1.31 AC. TOTAL
- ECM EXCLUSION I.7.1.C.1 (UP TO 20% OF APPLICABLE DEVELOPMENT SITE AREA, NOT TO EXCEED 1 ACRE) 0.18 AC. TOTAL
- FLOW DIRECTION
- DESIGN POINT
- PROPOSED BASIN LABEL
- 11 / 1.25 — BASIN DESIGNATION / AREA (AC.)

NOTES:
1.) REFER TO "PRELIMINARY DRAINAGE REPORT FOR FLYING HORSE NORTH PRELIMINARY PLAN AND FINAL DRAINAGE REPORT FOR FLYING HORSE FILING NO. 1", APPROVED SEPTEMBER 25TH, 2018, BY CLASSIC CONSULTING FOR ENTIRE BASINS CC-5, CC-4B, CC-7, AND CC-48 DELINEATION AND CALCULATIONS.
2.) REFER TO "FLYING HORSE NORTH FILING NO. 3 FINAL DRAINAGE REPORT", APPROVED JULY 8TH, 2024, BY HR GREEN FOR ENTIRE BASINS BS-18, BS-19, BS-21.3, BS-20.1, CC-34.4, AND CC-34.2 DELINEATIONS AND RATIONAL CALCULATIONS.

SUMMARY RUNOFF TABLE

BASIN	AREA (ac)	% IMP.	C5	C100	Q5 (cfs)	Q100 (cfs)	POND
CC-34	0.89	26.22	0.28	0.50	1.0	2.9	F3-A
CC-34.1	15.09	5.82	0.12	0.38	6.7	36.1	F3-A
CC-34.2	1.84	100.00	0.90	0.96	4.9	8.7	F3-A
CC-34.3	1.01	40.81	0.40	0.59	1.6	3.9	F3-A
CC-34.4	3.44	91.66	0.76	0.83	7.9	14.6	F3-A
PR-2	1.66	79.32	0.72	0.83	4.8	9.1	F3-A
OS-2	0.34	100.00	0.90	0.96	1.3	2.3	F3-A
PR-3	2.16	85.28	0.77	0.86	7.1	13.3	F3-A
EX-3	0.81	8.08	0.13	0.39	0.5	20.1	F1-6
EX-4	1.33	2.00	0.08	0.35	0.5	21.3	F1-6
PR-1	0.27	90.00	0.73	0.81	1.0	1.9	F3-A
OS-3	0.71	100.00	0.90	0.96	3.2	3.9	F1-12
OS-4	0.48	100.00	0.90	0.96	2.2	3.9	F1-13
PR-4	1.48	2.00	0.08	0.35	0.5	3.3	F1-12
PR-5	1.95	2.00	0.19	0.43	1.4	5.4	F3-A

DESIGN POINT SUMMARY TABLE

DESIGN POINT	CONTRIBUTING BASINS	SQ5 (cfs)	SQ100 (cfs)	Tributary Area (ac.)	Weighted % Impervious
1	PR-5 & CC-34.3	2.9	9.2	1.3	35.23%
1.1	CC-34, DP1, DP1.2	1.0	5.6	5.3	71.13%
1.2	CC-34.4	7.9	14.6	3.4	91.66%
1.3	CC-34.2, OS-2	6.2	11.0	2.2	100.00%
2	DP1.3, CC-34.1	30.7	79.1	28.7	35.95%
3	PR-3	7.1	13.3	2.2	85.28%
4	OS-3	3.2	5.8	0.7	100.00%
5	OS-4	2.2	3.9	0.5	100.00%
6	EX-3	0.5	20.1	0.8	8.08%
7	EX-4	0.5	21.3	1.3	2.00%
8	PR-4	0.5	3.3	1.5	2.00%
9	PR-1, PR-2	5.7	10.9	1.9	84.66%

NORTH
0 100
50

DRAWN BY:	CVW	JOB DATE:	7/21/2025
APPROVED:	RDL	JOB NUMBER:	2403816
CAD DATE:	7/23/2025		
CAD FILE:	J:\2024\2403816\CAD\Dwgs\C\Drainage\Pr_Drainage		

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: 719.300.4140
FAX: 713.965.0044

THE CLUBHOUSE AT FLYING HORSE NORTH
FLYING HORSE COUNTRY CLUB, LLC.
EL PASO COUNTY, CO

PROPOSED CONDITIONS
DRAINAGE MAP

SHEET NO.
PR 2

HR GREEN Xrefs: xv=dsgn=1030; xv=cov=1030; xv=utl=1030; xc=dsgn_2403816; xg1=1=dh01; xc=dsgn=030.202

HRGreen®

1975 Research Parkway | Suite 160
Colorado Springs, CO 80920
Main 719.300.4140 + **Fax** 713.965.0044

HRGREEN.COM

October 3, 2025

El Paso County Engineering Division
Department of Public Works
3275 Akers Drive
Colorado Springs, Colorado 80922

Re: Professional Engineer's Certification of Permanent Control Measure
Flying Horse North Filing No. 3, Pond A

This letter serves as a Pond Certification for the constructed Full Spectrum Detention Facility "Pond A" located in Flying Horse North Filing No. 3. The permanent control measure is located south of Old Stagecoach Road, east of Allen Ranch Road, and north of Lot 51 within the Flying Horse North subdivision, Filing No. 3, El Paso County, Colorado.

The detention facility was designed by a Colorado Licensed Professional Engineer of HR Green Development, LLC. and the design is within the County approved Construction Drawings dated July 8, 2024 and is referred to as "Pond A" within Tract A of the development. A Colorado Licensed Professional Surveyor conducted an as-built survey of the facility in August of 2025 to verify the basin and infrastructure dimensions, elevations, materials, inverts, and slopes as required for determination of inflow and outflow hydraulics.

The as-built conditions of the basin and its infrastructure were assessed and compared to the approved Construction Drawings and design worksheets within the approved Final Drainage Report. The facility was found to be in general compliance with the design, and it is anticipated that the facility will function as intended with no negative impacts to surrounding and downstream developments, property, or infrastructure. General compliance allows for construction tolerances and is based on the information provided by the as-built survey.

The pond basin required a modified grading of side slopes from 4:1 to 3:1 and a new spillway configuration to accommodate future development of the Flying Horse North Clubhouse, anticipated to be built in the near future. These modifications were completed in August of 2025.

The August 2025 as-built survey determined that the pond outlet structure orifice plate was required to be replaced and was completed.

The facility is in a stabilized condition and there are no proposed modifications required at this time.

Sincerely,

HR GREEN, INC.

Richard D Lyon

Richard D. Lyon, PE
Project Manager, Civil Engineer
HR Green Development, LLC.

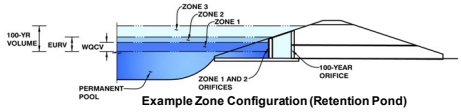


DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: THE CLUBHOUSE AT FLYING HORSE NORTH (AS-BUILT CONDITION POND CERTIFICATION)

Basin ID: PROPOSED POND A MODIFICATIONS



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	28.65	acres
Watershed Length =	3,155	ft
Watershed Length to Centroid =	500	ft
Watershed Slope =	0.020	ft/ft
Watershed Imperviousness =	35.95%	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 =	Denver - Capitol Building	

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) =	0.403 acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	1.072 acre-feet		acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	1.063 acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	1.639 acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	2.162 acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	2.922 acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	3.515 acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	4.288 acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 3.14 in.) =	5.809 acre-feet		inches
Approximate 2-yr Detention Volume =	0.782 acre-feet		
Approximate 5-yr Detention Volume =	1.102 acre-feet		
Approximate 10-yr Detention Volume =	1.547 acre-feet		
Approximate 25-yr Detention Volume =	1.752 acre-feet		
Approximate 50-yr Detention Volume =	1.841 acre-feet		
Approximate 100-yr Detention Volume =	2.135 acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.403	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.669	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	1.063	acre-feet
Total Detention Basin Volume =	2.135	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	

Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	**user**	acre-feet

Depth Increment = ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
7559 **Top of Micropool**	--	0.00	--	--	--	10	0.000		
7560	--	1.00	--	--	--	1,113	0.026	561	0.013
	--	2.00	--	--	--	8,453	0.194	5,344	0.123
	--	3.00	--	--	--	14,744	0.338	16,943	0.389
	--	4.00	--	--	--	20,362	0.467	34,496	0.792
	--	5.00	--	--	--	26,080	0.599	57,717	1.325
7565	--	6.00	--	--	--	31,869	0.732	86,691	1.990
	--	7.00	--	--	--	37,633	0.864	121,442	2.788
	--	8.00	--	--	--	45,096	1.035	162,807	3.738
7568	--	9.00	--	--	--	54,170	1.244	212,440	4.877

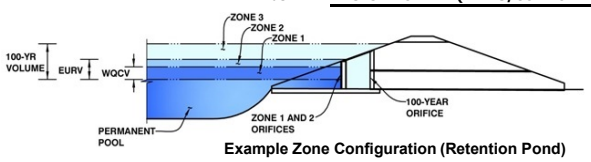
as-built condition - August 2025 survey

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: FLYING HORSE NORTH FILING NO. 3 - 9/22/25 as-built conditions

Basin ID: DESIGN POINT 2 (FLATS/CONDO AREA)



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.89	0.350	Orifice Plate
Zone 2 (EURV)	4.27	0.570	Orifice Plate
Zone 3 (100-year)	5.81	0.933	Weir&Pipe (Restrict)
Total (all zones)		1.853	

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

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

Calculated Parameters for Underdrain

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

Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	N/A	ft^2
Depth at top of Zone using Orifice Plate =	4.00	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	N/A	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	N/A	sq. inches	Elliptical Slot Area =	N/A	ft^2

Calculated Parameters for Plate

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	2.60						
Orifice Area (sq. inches)	3.14	3.14						

	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 =	5.00	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	5.00	N/A	feet
Overflow Weir Front Edge Length =	6.00	N/A	feet	Overflow Weir Slope Length =	3.00	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	6.07	N/A	
Horiz. Length of Weir Sides =	3.00	N/A	feet	Overflow Grate Open Area w/o Debris =	12.53	N/A	ft^2
Overflow Grate Type =	Type C Grate	N/A		Overflow Grate Open Area w/ Debris =	6.26	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 =	0.50	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	2.07	N/A	ft^2
Outlet Pipe Diameter =	24.00	N/A	inches	Outlet Orifice Centroid =	0.71	N/A	feet
Restrictor Plate Height Above Pipe Invert =	15.00		inches	Half-Central Angle of Restrictor Plate on Pipe =	1.82	N/A	radians

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	8.00	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.91	feet
Spillway Crest Length =	23.00	feet	Stage at Top of Freeboard =	9.91	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	1.24	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	4.92	acre-ft

Calculated Parameters for Spillway

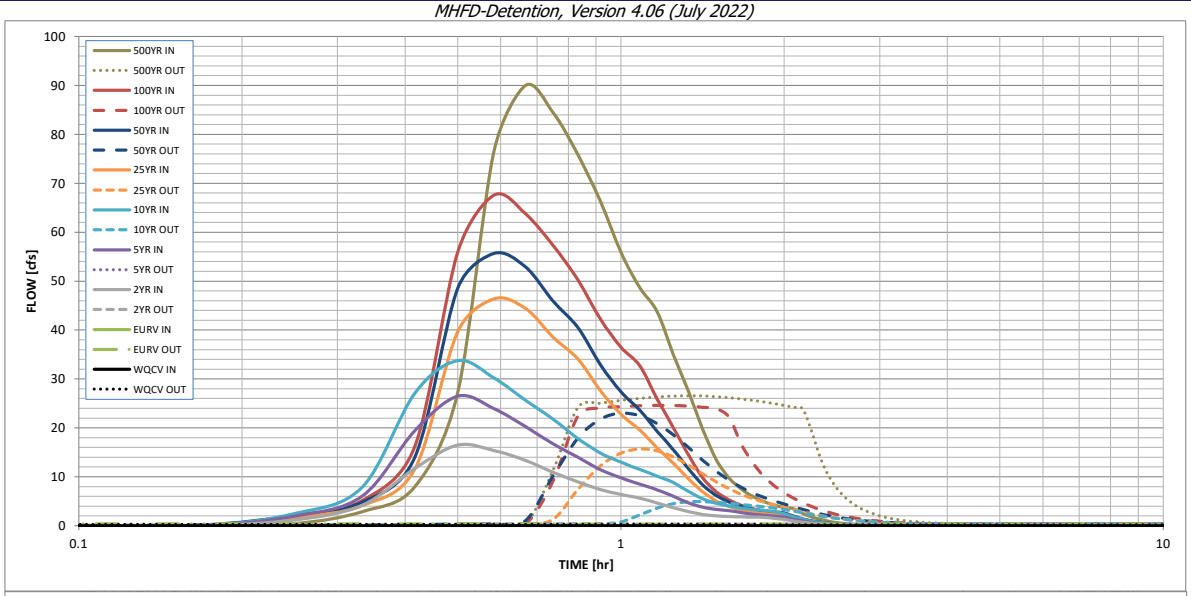
Routed Hydrograph Results

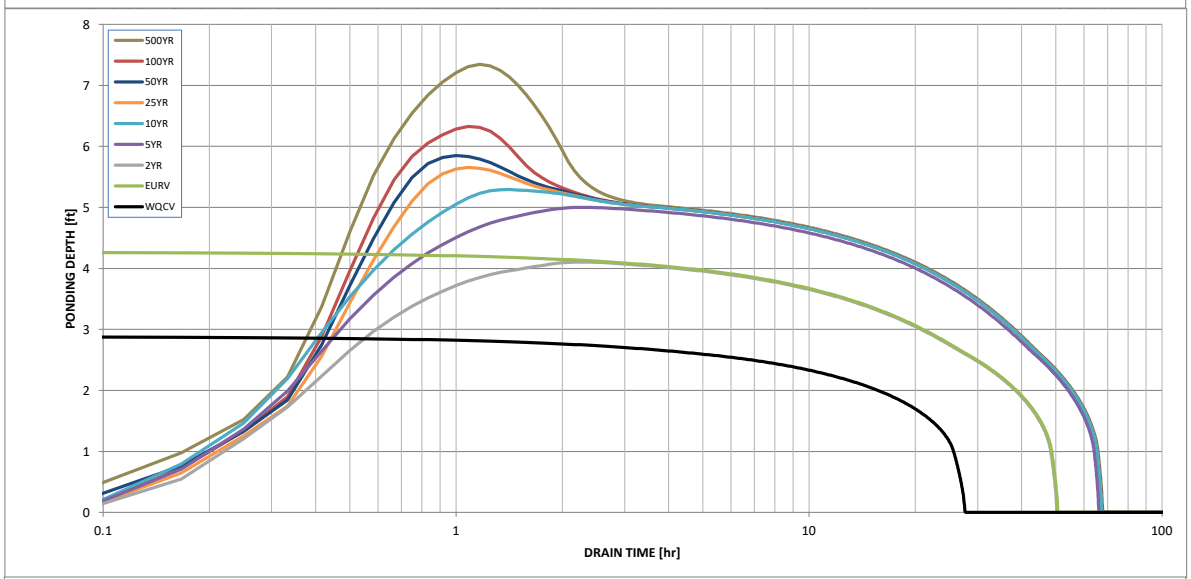
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

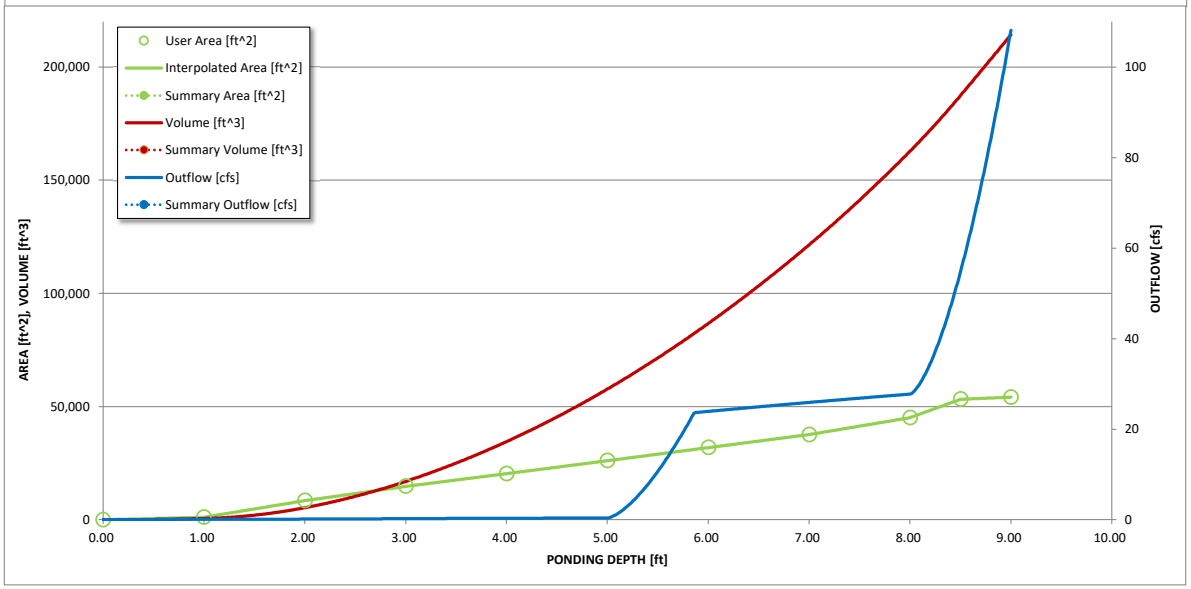
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.14
CUHP Runoff Volume (acre-ft) =	0.350	0.920	0.896	1.390	1.839	2.496	3.004	3.671	4.979
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.896	1.390	1.839	2.496	3.004	3.671	4.979
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	4.0	10.9	16.1	28.3	35.4	44.3	61.5
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.16	0.43	0.64	1.12	1.40	1.75	2.43
Peak Inflow Q (cfs) =	N/A	N/A	16.5	26.5	33.7	46.4	55.6	67.6	90.0
Peak Outflow Q (cfs) =	0.2	0.4	0.3	0.4	4.9	15.7	23.0	24.6	26.6
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.0	0.3	0.6	0.6	0.6	0.4
Structure Controlling Flow =	Plate	Plate	Plate	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Outlet Plate 1
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	0.4	1.2	1.8	1.9	2.1
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) =	26	47	47	61	61	60	58	57	54
Time to Drain 99% of Inflow Volume (hours) =	**27**	49	49	64	65	64	64	63	62
Maximum Ponding Depth (ft) =	2.89	4.27	4.10	5.00	5.29	5.65	5.85	6.32	7.34
Area at Maximum Ponding Depth (acres) =	0.32	0.50	0.48	0.60	0.64	0.69	0.71	0.77	0.92
Maximum Volume Stored (acre-ft) =	0.353	0.923	0.839	1.319	1.498	1.742	1.875	2.231	3.092

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)







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.

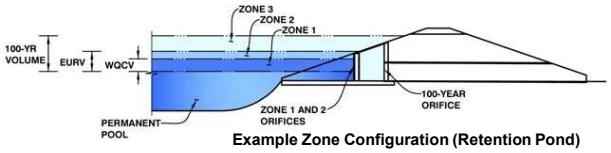
	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.14	0.01	0.45
	0:15:00	0.00	0.00	1.20	1.98	2.46	1.66	2.06	2.03	2.90
	0:20:00	0.00	0.00	4.20	6.05	7.89	4.12	4.80	5.16	7.95
	0:25:00	0.00	0.00	11.73	19.44	27.07	11.59	13.98	16.18	27.22
	0:30:00	0.00	0.00	16.48	26.46	33.72	39.65	48.53	55.91	76.43
	0:35:00	0.00	0.00	15.39	23.95	30.18	46.35	55.64	67.59	90.00
	0:40:00	0.00	0.00	13.34	20.25	25.65	44.39	52.88	63.75	84.45
	0:45:00	0.00	0.00	10.91	16.76	21.76	38.54	45.89	57.28	75.78
	0:50:00	0.00	0.00	8.93	13.97	17.79	34.04	40.51	50.20	66.31
	0:55:00	0.00	0.00	7.40	11.45	14.85	27.59	32.92	42.22	55.94
	1:00:00	0.00	0.00	6.37	9.77	12.98	22.81	27.38	36.51	48.67
	1:05:00	0.00	0.00	5.62	8.51	11.51	19.57	23.63	32.71	43.72
	1:10:00	0.00	0.00	4.61	7.34	10.11	15.92	19.30	25.90	34.95
	1:15:00	0.00	0.00	3.68	5.99	8.79	12.73	15.51	20.03	27.35
	1:20:00	0.00	0.00	2.88	4.65	6.96	9.56	11.60	14.39	19.62
	1:25:00	0.00	0.00	2.31	3.77	5.47	6.89	8.32	9.72	13.47
	1:30:00	0.00	0.00	2.00	3.33	4.59	5.05	6.16	6.93	9.75
	1:35:00	0.00	0.00	1.86	3.09	4.01	3.93	4.83	5.29	7.51
	1:40:00	0.00	0.00	1.79	2.68	3.61	3.23	3.99	4.19	5.99
	1:45:00	0.00	0.00	1.74	2.36	3.33	2.76	3.42	3.44	4.95
	1:50:00	0.00	0.00	1.70	2.12	3.13	2.47	3.06	2.93	4.23
	1:55:00	0.00	0.00	1.48	1.95	2.86	2.27	2.80	2.57	3.72
	2:00:00	0.00	0.00	1.29	1.77	2.48	2.14	2.64	2.36	3.43
	2:05:00	0.00	0.00	0.96	1.30	1.81	1.57	1.93	1.74	2.50
	2:10:00	0.00	0.00	0.71	0.94	1.28	1.12	1.38	1.24	1.78
	2:15:00	0.00	0.00	0.51	0.67	0.91	0.80	0.98	0.90	1.29
	2:20:00	0.00	0.00	0.37	0.47	0.65	0.57	0.69	0.64	0.91
	2:25:00	0.00	0.00	0.26	0.32	0.45	0.39	0.48	0.44	0.63
	2:30:00	0.00	0.00	0.17	0.21	0.31	0.27	0.33	0.31	0.43
	2:35:00	0.00	0.00	0.11	0.14	0.20	0.18	0.22	0.20	0.29
	2:40:00	0.00	0.00	0.07	0.09	0.12	0.11	0.13	0.12	0.17
	2:45:00	0.00	0.00	0.03	0.05	0.06	0.06	0.07	0.06	0.08
	2:50:00	0.00	0.00	0.01	0.02	0.02	0.02	0.02	0.02	0.03
	2:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
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	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: THE CLUBHOUSE AT FLYING HORSE NORTH (AS-BUILT CONDITION POND CERTIFICATION)

Basin ID: PROPOSED POND A MODIFICATIONS



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.05	0.403	Orifice Plate
Zone 2 (EURV)	4.56	0.669	Orifice Plate
Zone 3 (100-year)	6.20	1.063	Weir&Pipe (Restrict)
Total (all zones)		2.135	

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

			Calculated Parameters for Underdrain		
Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft²
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

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

			Calculated Parameters for Plate		
Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	N/A	ft²
Depth at top of Zone using Orifice Plate =	3.58	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	N/A	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	N/A	sq. inches	Elliptical Slot Area =	N/A	ft²

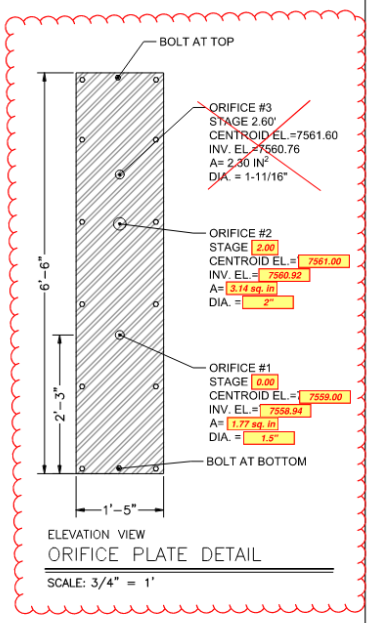
User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

elevation: 7561.00 D = 2 in.

elevation: 7559.00 D = 1.5 in.

	Row 1 (required)	Row 2 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	2.00			
Orifice Area (sq. inches)	1.77	3.14			

	Row 9 (optional)	Row 10 (optional)	w 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)					
Orifice Area (sq. inches)					



User Input: Vertical Orifice (Circular or Rectangular)

				Calculated Parameters for Vertical Orifice		
	Not Selected	Not Selected		Not Selected	Not Selected	
Invert of Vertical Orifice =		N/A	ft (re	Orifice Area =	N/A	ft²
Depth at top of Zone using Vertical Orifice =		N/A	ft (re	fice Centroid =	N/A	feet
Vertical Orifice Diameter =		N/A	inche			

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangu

				Calculated Parameters for Overflow Weir		
	Zone 3 Weir	Not Selected		Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	4.50	N/A	ft (re	per Edge, H_t =	4.50	N/A feet
Overflow Weir Front Edge Length =	6.00	N/A	feet	slope Length =	3.00	N/A feet
Overflow Weir Grate Slope =	0.00	N/A	H:V	Orifice Area =	6.07	N/A
Horiz. Length of Weir Sides =	3.00	N/A	feet	a w/o Debris =	12.53	N/A ft²
Overflow Grate Type =	Type C Grate	N/A		ea w/ Debris =	6.26	N/A ft²
Debris Clogging % =	50%	N/A	%			

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

				ated Parameters for Outlet Pipe w/ Flow Restriction Plate		
	Zone 3 Restrictor	Not Selected		Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	0.50	N/A	ft (di	Orifice Area =	2.07	N/A ft²
Outlet Pipe Diameter =	24.00	N/A	inche	fice Centroid =	0.71	N/A feet
Restrictor Plate Height Above Pipe Invert =	15.00		inche	Plate on Pipe =	1.82	N/A radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

			Calculated Parameters for Spillway		
Spillway Invert Stage=	6.00	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.97	feet
Spillway Crest Length =	16.00	feet	Stage at Top of Freeboard =	7.97	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	1.03	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	3.71	acre-ft

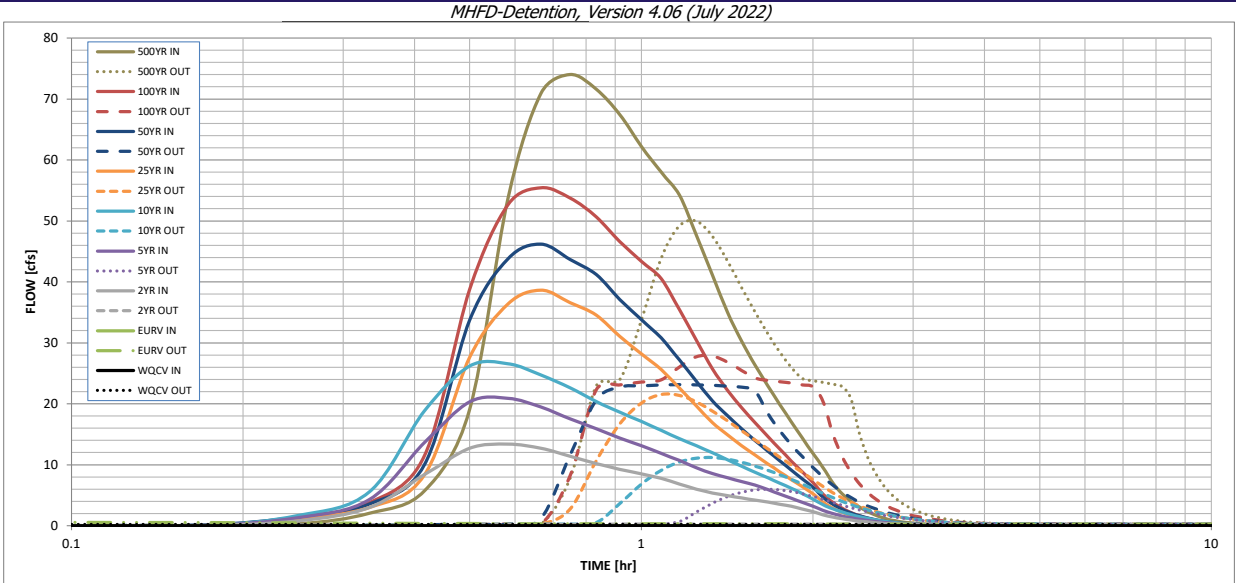
Routed Hydrograph Results

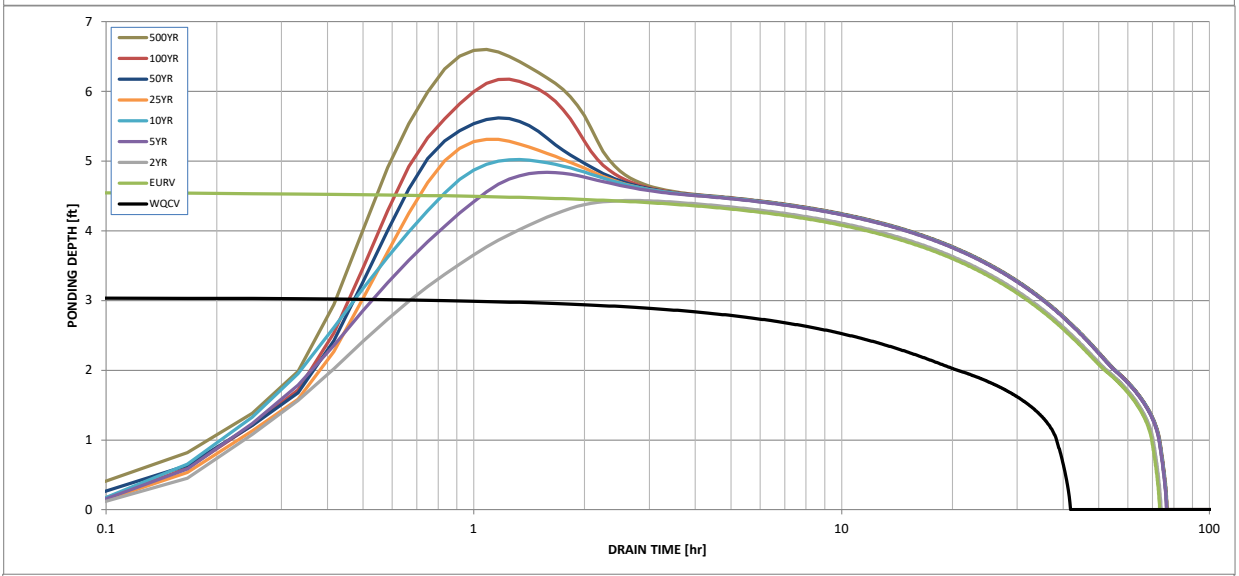
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

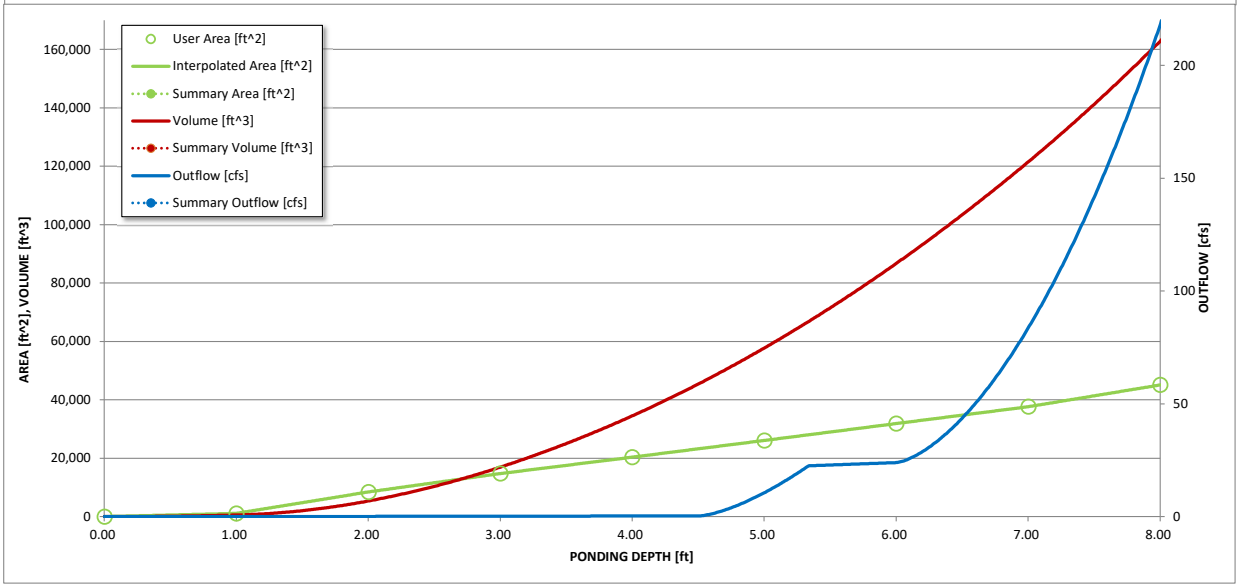
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.14
CUHP Runoff Volume (acre-ft) =	0.403	1.072	1.063	1.639	2.162	2.922	3.515	4.288	5.809
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	1.063	1.639	2.162	2.922	3.515	4.288	5.809
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	2.8	7.8	11.9	21.4	26.8	34.2	47.8
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.10	0.27	0.41	0.75	0.94	1.19	1.67
Peak Inflow Q (cfs) =	N/A	N/A	13.4	20.9	26.6	38.6	46.2	55.5	74.0
Peak Outflow Q (cfs) =	0.2	0.6	0.3	6.0	11.2	21.5	23.1	27.8	50.0
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.8	0.9	1.0	0.9	0.8	1.0
Structure Controlling Flow =	Plate	Overflow Weir 1	Plate	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Spillway	Spillway
Max Velocity through Grate 1 (fps) =	N/A	0.03	N/A	0.5	0.9	1.7	1.8	1.9	2.0
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	39	66	67	67	64	61	58	55	50
Time to Drain 99% of Inflow Volume (hours) =	**41**	70	71	72	71	70	69	68	65
Maximum Ponding Depth (ft) =	3.05	4.56	4.43	4.84	5.02	5.31	5.62	6.17	6.60
Area at Maximum Ponding Depth (acres) =	0.34	0.54	0.52	0.58	0.60	0.64	0.68	0.75	0.81
Maximum Volume Stored (acre-ft) =	0.406	1.074	1.005	1.225	1.331	1.517	1.715	2.116	2.445

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)







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

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename:

Inflow Hydrographs

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

	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.01	0.30
	0:15:00	0.00	0.00	0.81	1.33	1.66	1.12	1.41	1.37	2.02
	0:20:00	0.00	0.00	3.00	4.28	5.56	3.02	3.55	3.78	5.71
	0:25:00	0.00	0.00	8.38	13.67	18.85	8.34	10.04	11.50	19.06
	0:30:00	0.00	0.00	12.70	20.32	26.17	27.60	33.69	38.75	53.72
	0:35:00	0.00	0.00	13.36	20.91	26.59	36.36	43.78	52.64	70.91
	0:40:00	0.00	0.00	12.70	19.46	24.71	38.64	46.18	55.46	74.02
	0:45:00	0.00	0.00	11.39	17.54	22.62	36.60	43.67	53.76	71.62
	0:50:00	0.00	0.00	10.21	15.90	20.37	34.54	41.19	50.66	67.44
	0:55:00	0.00	0.00	9.26	14.40	18.61	31.07	37.14	46.62	62.23
	1:00:00	0.00	0.00	8.50	13.11	17.10	28.19	33.80	43.38	57.98
	1:05:00	0.00	0.00	7.76	11.87	15.65	25.61	30.79	40.54	54.20
	1:10:00	0.00	0.00	6.85	10.69	14.26	22.57	27.19	35.44	47.59
	1:15:00	0.00	0.00	6.00	9.50	13.11	19.63	23.70	30.39	41.12
	1:20:00	0.00	0.00	5.37	8.56	11.98	16.92	20.46	25.74	35.01
	1:25:00	0.00	0.00	4.93	7.86	10.82	14.94	18.05	22.23	30.27
	1:30:00	0.00	0.00	4.55	7.23	9.74	13.14	15.89	19.36	26.34
	1:35:00	0.00	0.00	4.21	6.65	8.76	11.58	13.99	16.89	22.96
	1:40:00	0.00	0.00	3.87	5.92	7.85	10.15	12.25	14.66	19.89
	1:45:00	0.00	0.00	3.53	5.20	6.98	8.84	10.66	12.58	17.04
	1:50:00	0.00	0.00	3.20	4.50	6.14	7.58	9.13	10.62	14.36
	1:55:00	0.00	0.00	2.74	3.84	5.27	6.38	7.68	8.80	11.87
	2:00:00	0.00	0.00	2.30	3.21	4.37	5.25	6.32	7.11	9.56
	2:05:00	0.00	0.00	1.79	2.50	3.44	3.90	4.69	5.20	7.03
	2:10:00	0.00	0.00	1.41	1.98	2.76	2.89	3.51	3.83	5.27
	2:15:00	0.00	0.00	1.13	1.60	2.24	2.19	2.68	2.88	4.00
	2:20:00	0.00	0.00	0.93	1.30	1.83	1.70	2.08	2.16	3.03
	2:25:00	0.00	0.00	0.76	1.05	1.48	1.31	1.61	1.62	2.28
	2:30:00	0.00	0.00	0.61	0.85	1.19	1.02	1.25	1.21	1.70
	2:35:00	0.00	0.00	0.49	0.68	0.94	0.79	0.97	0.88	1.25
	2:40:00	0.00	0.00	0.39	0.54	0.73	0.61	0.74	0.65	0.92
	2:45:00	0.00	0.00	0.32	0.42	0.56	0.47	0.57	0.50	0.70
	2:50:00	0.00	0.00	0.25	0.33	0.43	0.36	0.44	0.39	0.55
	2:55:00	0.00	0.00	0.20	0.25	0.34	0.28	0.35	0.31	0.44
	3:00:00	0.00	0.00	0.16	0.19	0.26	0.22	0.27	0.24	0.34
	3:05:00	0.00	0.00	0.12	0.14	0.20	0.17	0.20	0.18	0.26
	3:10:00	0.00	0.00	0.08	0.10	0.14	0.12	0.15	0.13	0.18
	3:15:00	0.00	0.00	0.06	0.07	0.09	0.08	0.10	0.09	0.12
	3:20:00	0.00	0.00	0.03	0.04	0.06	0.05	0.06	0.06	0.07
	3:25:00	0.00	0.00	0.02	0.02	0.03	0.03	0.03	0.03	0.04
	3:30:00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	3:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Summary Stage-Area-Volume-Discharge Relationships

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

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

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

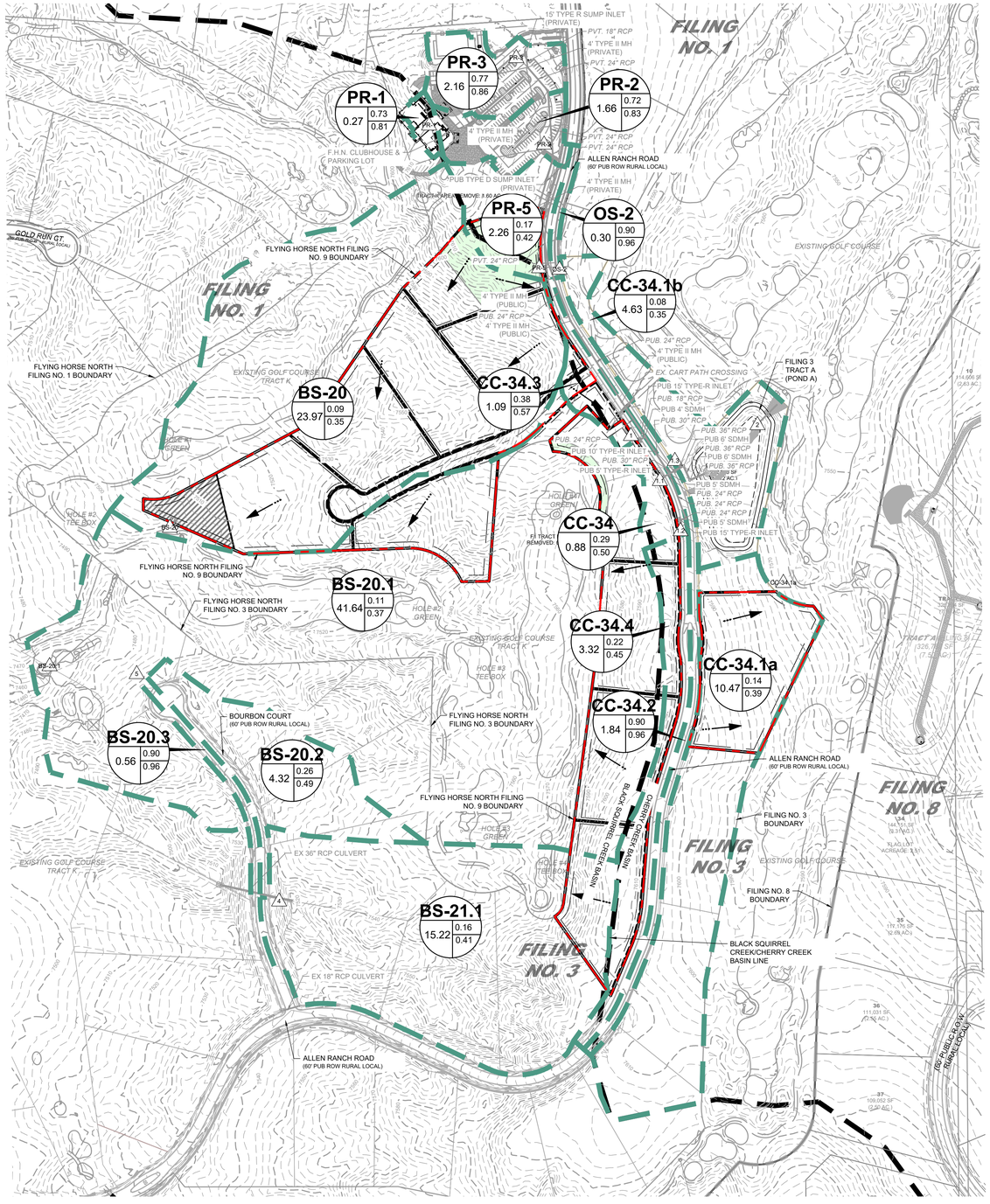
For best results, include the stages of all grade slope changes (e.g. ISV and Floor) from the S-A-V table on Sheet 'Basin'.

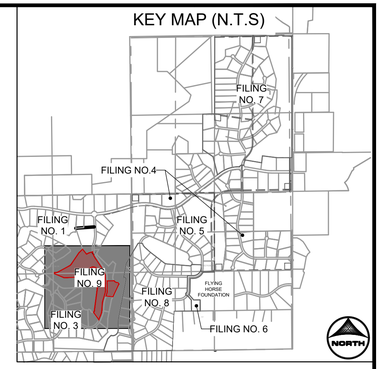
Also include the inverts of all outlets (e.g. vertical orifice, overflow grate, and spillway, where applicable).

APPENDIX F

DRAINAGE MAPS

CALLAHAN, SEAN, 9/16/2026 7:50 AM





LEGEND:

- PROPOSED MAJOR CONTOUR — 5250
- PROPOSED MINOR CONTOUR
- EXISTING MAJOR CONTOUR — 5250
- EXISTING MINOR CONTOUR
- PROPOSED STORM SEWER
- EXISTING STORM SEWER
- EXISTING DRAINAGE SWALE
- PROPOSED DRAINAGE SWALE
- EXISTING TERTIARY DRAINAGE WAY
- FILING NO. 9 PARCEL BOUNDARY
- FLOW DIRECTION
- DRAINAGE BASIN
- MAJOR BASIN BOUNDARY
- DESIGN POINT — X
- SWALE CROSS SECTION
- BASIN LABEL — A1 — BASIN DESIGNATION
  - AREA (AC.) — 1.00
  - 0.40 — MINOR 5-YR RUNOFF COEF.
  - 0.60 — MAJOR 100-YR RUNOFF COEF.

SUMMARY RUNOFF TABLE

BASIN	AREA (ac)	% IMP.	C5	C100	Q5 (cfs)	Q100 (cfs)
PR-5	2.26	12.84	0.17	0.42	1.4	5.7
OS-2	0.30	100.00	0.90	0.96	1.4	2.5
BS-20	23.97	2.51	0.09	0.35	6.4	44.8
BS-20.1	41.64	4.64	0.11	0.37	12.3	71.9
BS-20.2	4.32	22.54	0.26	0.49	3.8	11.8
BS-20.3	0.56	100.00	0.90	0.96	2.6	4.7
BS-21.1	15.22	9.60	0.16	0.41	7.6	33.2
CC-34	0.88	26.50	0.29	0.50	1.0	2.8
CC-34.1a	10.47	7.51	0.14	0.39	5.3	25.9
CC-34.1b	4.63	2.00	0.08	0.35	1.4	10.5
CC-34.2	1.84	100.00	0.90	0.96	5.2	9.4
CC-34.3	1.09	37.96	0.38	0.57	1.8	4.7
CC-34.4	3.32	18.83	0.22	0.45	2.2	7.7
PR-1	0.27	90.00	0.73	0.81	1.0	1.9
PR-2	1.66	79.33	0.72	0.83	4.8	9.1
PR-3	2.16	85.19	0.77	0.86	7.1	13.3

CUMULATIVE DESIGN POINT SUMMARY TABLE

DESIGN POINT	CONTRIBUTING BASINS	SQ5 (cfs)	SQ100 (cfs)	Tributary Area (ac.)
1	CC-34.3, DESIGN POINT [PR-5]	2.52	8.29	3.35
1.1	CC-34	0.96	2.84	0.88
1.2	CC-34.4	2.22	7.68	3.32
1.3	CC-34.2, DESIGN POINT [1, 1.1, 1.2, OS-2, PR-2]	20.41	45.67	13.78
2	CC-34.1b, DESIGN POINT [1.3]	21.44	53.66	18.41
4	BS-21.1	7.58	33.19	15.22
5	BS-20.2, BS-20.3	5.50	14.81	4.88
PR-5	PR-5	1.38	5.67	2.26
OS-2	OS-2	1.37	2.45	0.30
BS-20	BS-20	6.42	44.82	23.97
BS-20.1	BS-20.1, DESIGN POINT [BS-20, 5]	22.55	123.99	70.49
CC-34.1a	CC-34.1a, POND A RELEASE RATE	5.63	48.46	28.88
PR-1	PR-1	1.02	1.90	0.27
PR-2	PR-2, DESIGN POINT [PR-1,PR-3]	12.15	23.01	4.09
PR-3	PR-3	7.06	13.26	2.16

PCD FILE NO.: PUDSP263

DRAWN BY: SPC JOB DATE: 9/15/2026
APPROVED: RDL JOB NUMBER: 2502599
CAD DATE: 9/16/2026
CAD FILE: J:\2025\2502599\CAD\Dwgs\C_Drainage\PDR\2502599 - Existing Drainage Map

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 160
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FLYING HORSE NORTH FILING NO. 9
PUD & PRELIMINARY PLAN MAJOR AMENDMENT
PRI #2, LLC.
EL PASO COUNTY, CO

FINAL DRAINAGE REPORT
EXISTING DRAINAGE MAP

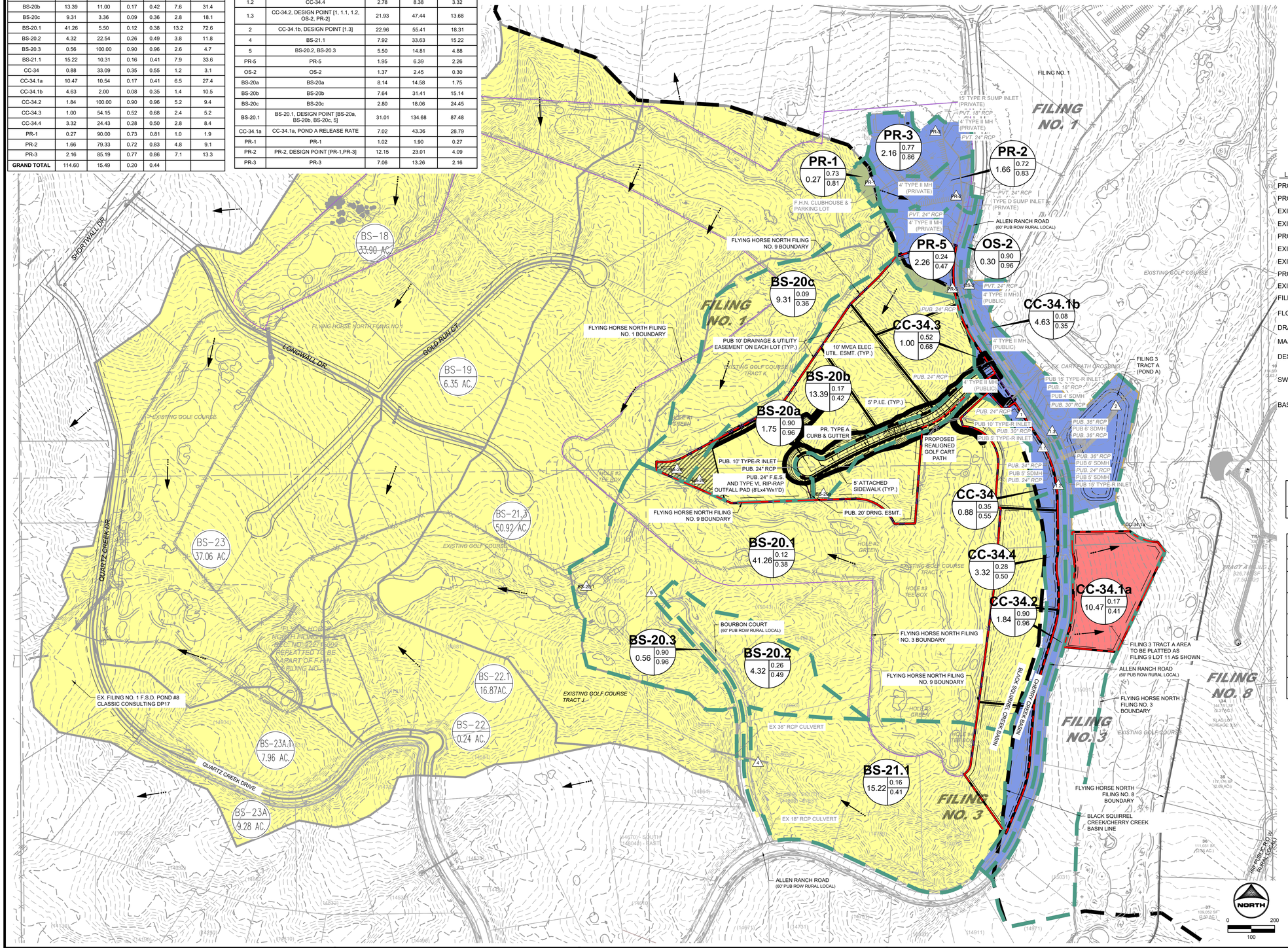
SHEET DR01 | 01

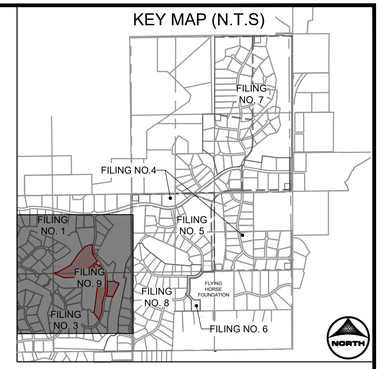
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CALLAHAN, SEAN, 11/13/2026 9:39 AM

SUMMARY RUNOFF TABLE						
BASIN	AREA (ac)	% IMP.	C5	C100	Q5 (cfs)	Q100 (cfs)
PR-5	2.26	20.51	0.24	0.47	2.0	6.4
OS-2	0.30	100.00	0.90	0.96	1.4	2.5
BS-20a	1.75	100.00	0.90	0.96	8.1	14.6
BS-20b	13.39	11.00	0.17	0.42	7.6	31.4
BS-20c	9.31	3.36	0.09	0.36	2.8	18.1
BS-20.1	41.26	5.50	0.12	0.38	13.2	72.6
BS-20.2	4.32	22.54	0.26	0.49	3.8	11.8
BS-20.3	0.56	100.00	0.90	0.96	2.6	4.7
BS-21.1	15.22	10.31	0.16	0.41	7.9	33.6
CC-34	0.88	33.09	0.35	0.55	1.2	3.1
CC-34.1a	10.47	10.54	0.17	0.41	6.5	27.4
CC-34.1b	4.63	2.00	0.08	0.35	1.4	10.5
CC-34.2	1.84	100.00	0.90	0.96	5.2	9.4
CC-34.3	1.00	54.15	0.52	0.68	2.4	5.2
CC-34.4	3.32	24.43	0.28	0.50	2.8	8.4
PR-1	0.27	90.00	0.73	0.81	1.0	1.9
PR-2	1.66	79.33	0.72	0.83	4.8	9.1
PR-3	2.16	85.19	0.77	0.86	7.1	13.3
GRAND TOTAL	114.60	15.49	0.20	0.44		

CUMULATIVE DESIGN POINT SUMMARY TABLE				
DESIGN POINT	CONTRIBUTING BASINS	SQ5 (cfs)	SQ100 (cfs)	Tributary Area (ac.)
1	CC-34.3, DESIGN POINT [PR-5]	3.35	9.18	3.26
1.1	CC-34	1.18	3.11	0.88
1.2	CC-34.4	2.78	8.38	3.32
1.3	CC-34.2, DESIGN POINT [1, 1.1, 1.2, OS-2, PR-2]	21.93	47.44	13.68
2	CC-34.1b, DESIGN POINT [1.3]	22.96	55.41	18.31
4	BS-21.1	7.92	33.63	15.22
5	BS-20.2, BS-20.3	5.50	14.81	4.88
PR-5	PR-5	1.95	6.39	2.26
OS-2	OS-2	1.37	2.45	0.30
BS-20a	BS-20a	8.14	14.58	1.75
BS-20b	BS-20b	7.64	31.41	15.14
BS-20c	BS-20c	2.80	18.06	24.45
BS-20.1	BS-20.1, DESIGN POINT [BS-20a, BS-20b, BS-20c, 5]	31.01	134.68	87.48
CC-34.1a	CC-34.1a, POND A RELEASE RATE	7.02	43.36	28.79
PR-1	PR-1	1.02	1.90	0.27
PR-2	PR-2, DESIGN POINT [PR-1,PR-3]	12.15	23.01	4.09
PR-3	PR-3	7.06	13.26	2.16





LEGEND:

- PROPOSED MAJOR CONTOUR — 5250
- PROPOSED MINOR CONTOUR
- EXISTING MAJOR CONTOUR — 5250
- EXISTING MINOR CONTOUR
- PROPOSED STORM SEWER
- EXISTING STORM SEWER
- EXISTING DRAINAGE SWALE
- PROPOSED DRAINAGE SWALE
- EXISTING TERTIARY DRAINAGE WAY
- FILING NO. 9 PARCEL BOUNDARY
- FLOW DIRECTION
- DRAINAGE BASIN
- MAJOR BASIN BOUNDARY
- DESIGN POINT — X
- SWALE CROSS SECTION — 10 FLOW DEPTH 1.5 FLOW WIDTH
- BASIN LABEL — A1 / 1.00 / 0.40 / 0.60 — BASIN DESIGNATION; AREA (AC.); MINOR 5-YR RUNOFF COEF.; MAJOR 100-YR RUNOFF COEF.

Min Required Area to Receive WQ	Total Disturbed Area	Total Proposed Treated Area	Total Proposed Disturbed Area Excluded from WQ	Total Treated %
3.82	3.82	3.82	0.00	100%

Water Quality Treatment Summary Table			
Flying Horse North Filing No. 9			
Subbasin ID	Disturbed Area [AC]	Treatement CM	Notes:
BS-20a	1.56	Pond 8 (Filing 1)	District full-spectrum WQ and stormwater detention facility
BS-20b	1.23	Pond 8 (Filing 1)	District full-spectrum WQ and stormwater detention facility
BS-20.1	0.67	Pond 8 (Filing 1)	District full-spectrum WQ and stormwater detention facility
CC-34.3	0.36	Pond A (Filing 3)	District full-spectrum WQ and stormwater detention facility
	Non-Treated	0.00	0%
NOTE: Only subbsins with associated disturbed area from this development included in the WQ Summary Table.			

AREA TRIBUTARY TO EX. POND 8
DIST. AREA = 3.46 ACRES
TOTAL AREA = 249.33 ACRES

AREA TRIBUTARY TO EX. POND A
DIST. AREA = 0.36 ACRES
TOTAL AREA = 18.31 ACRES

LARGE LOT EXCLUSION PER ECM (I.6.1.B.5)
TOTAL AREA = 3.53 ACRES

PCD FILE NO.: PUDSP263

DRAWN BY:	SPC	JOB DATE:	11/12/2026
APPROVED:	RDL	JOB NUMBER:	2502599
CAD DATE:	11/13/2026		
CAD FILE:	J:\2025\2502599\CAD\Dwgs\C_Drainage\PDR\2502599 - Proposed Drainage Map		

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1975 RESEARCH PARKWAY SUITE 160
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FLYING HORSE NORTH FILING NO. 9
PUD & PRELIMINARY PLAN MAJOR AMENDMENT
PRI #2, LLC.
EL PASO COUNTY, CO

FINAL DRAINAGE REPORT

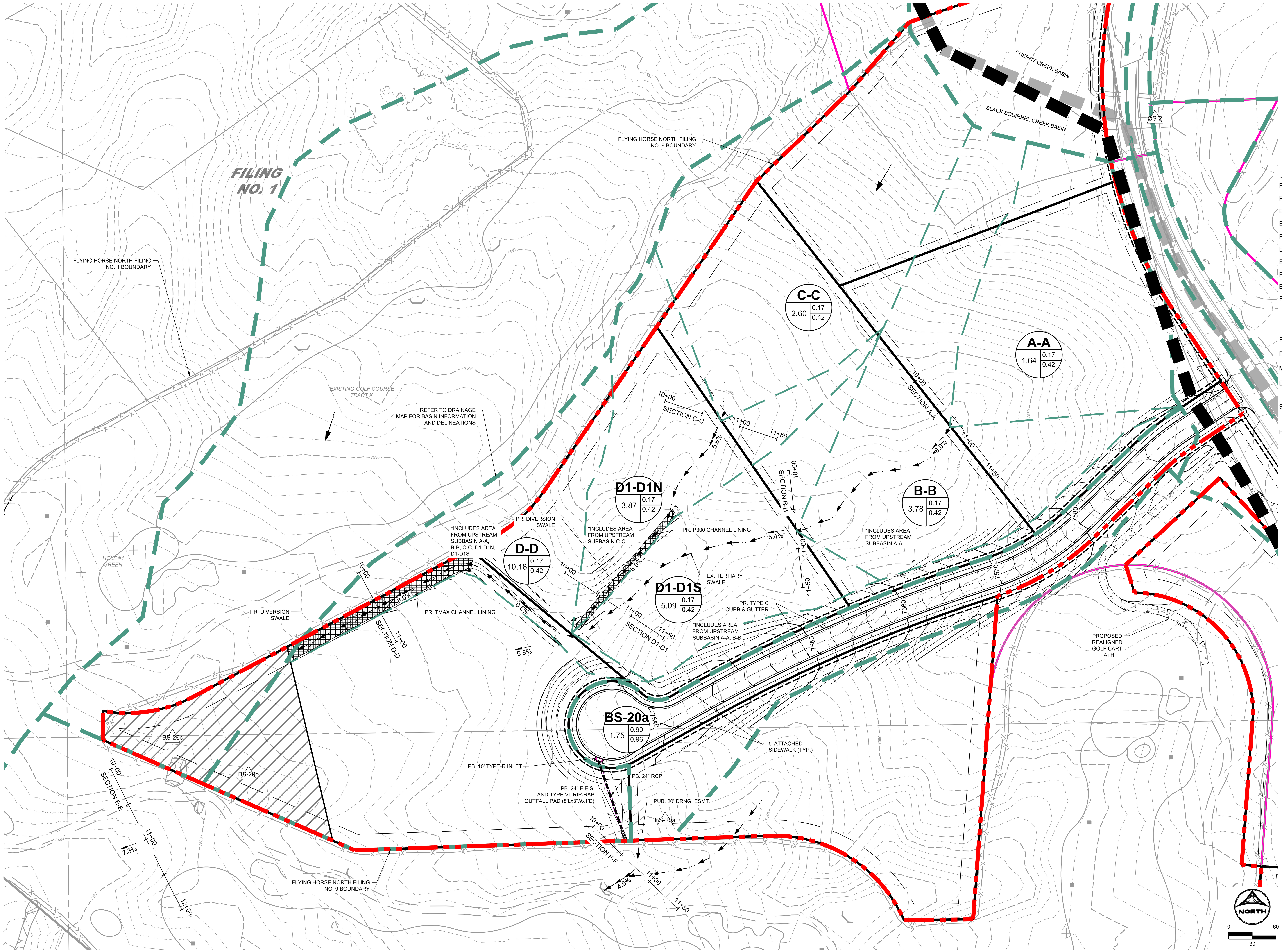
PROPOSED DRAINAGE MAP

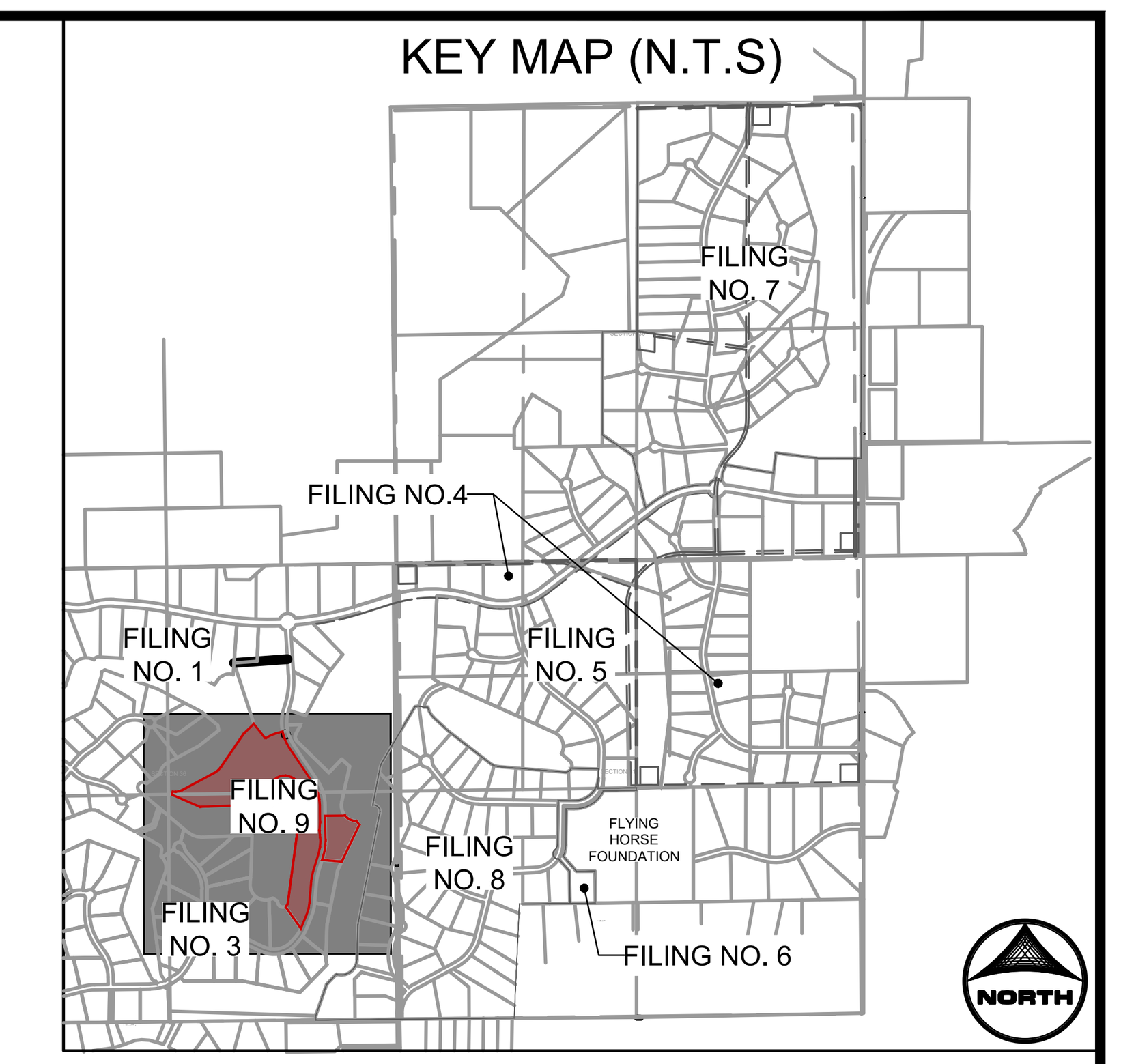
SHEET DR02 | 02

HR GREEN Xrefs: xv-dsgn-1030; xv-row-1030; xv-utl-1030; xv-aerial-NM-1030; Site_Plan_Linework_Legend; OVERALL_KEY_MAP; xc-row-030 202; xc-dsgn-030 202; XC-ROW-F9; TB_HRG_FHN-F9-PUD; xc-dsgn-250; xc-row-030 250; xv-row-1030; xv-utl-1030; xv-aerial-NM-1030; Site_Plan_Linework_Legend; OVERALL_KEY_MAP; xc-row-030 270; xc-dsgn-270; XC-DSGN-F9; XV-BASINS-F9

CALLAHAN, SEAN, 11/11/2026 2:39 PM

HR GREEN Xrefs: xv-dsgn-1030; xv-row-1030; xv-util-1030; xv-aerial-NM-1030; Site_Plan_Linework_Legend; OVERALL_KEY_MAP; xc-row-030.202; xc-dsgn-030.202; XC-ROW-F9; TB_HRG_FHN-F9-PUD; xc-dsgn-250; xc-row-030.250; xc-row-030.270; xc-dsgn-270; XC-DSGN-F9; XV-BASINS-F9





LEGEND:

- PROPOSED MAJOR CONTOUR (5250)
- PROPOSED MINOR CONTOUR
- EXISTING MAJOR CONTOUR (5250)
- EXISTING MINOR CONTOUR
- PROPOSED STORM SEWER
- EXISTING STORM SEWER
- EXISTING DRAINAGE SWALE
- PROPOSED DRAINAGE SWALE
- EXISTING TERTIARY DRAINAGE WAY
- FILING NO. 9 PARCEL BOUNDARY
- FLOW DIRECTION
- DRAINAGE BASIN
- MAJOR BASIN BOUNDARY
- DESIGN POINT (X)
- SWALE CROSS SECTION
- BASIN LABEL: A1 (BASIN DESIGNATION); 1.00 AREA (AC.); 0.40 MINOR 5-YR RUNOFF COEF.; 0.60 MAJOR 100-YR RUNOFF COEF.

NOTES:

1. REFER TO PROPOSED DRAINAGE PLAN FOR ALL OTHER BASINS AND INFORMATION NOT SHOWN ON THIS PLAN.
2. THE DRAINAGE SUBBASINS SHOWN ON THIS PLAN ARE USED FOR DRAINAGE SWALE CAPACITY AND STABILITY ANALYSIS ONLY.

PCD FILE NO.: PUDSP263

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APPROVED: RDL JOB NUMBER: 2502599
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CAD FILE: J:\2025\2502599\CAD\Dwgs\C_Drainage\PDR\2502599 - Proposed Onsite Drainage Map

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FLYING HORSE

FLYING HORSE NORTH FILING NO. 9
PUD & PRELIMINARY PLAN MAJOR AMENDMENT
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EL PASO COUNTY, CO

FINAL DRAINAGE REPORT
EXISTING SWALE SECTIONS

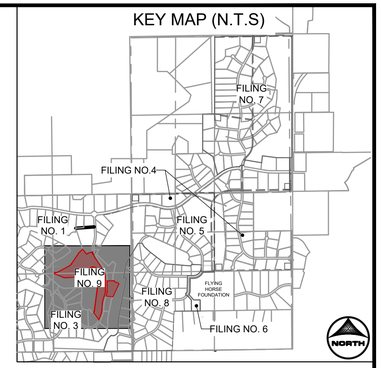
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CALLAHAN, SEAN, 11/11/2026 1:53 PM

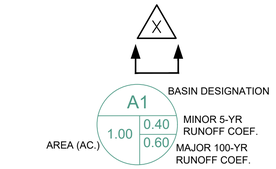
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KEY MAP (N.T.S)

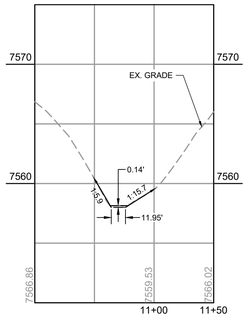


LEGEND:

- PROPOSED MAJOR CONTOUR — 5250
- PROPOSED MINOR CONTOUR
- EXISTING MAJOR CONTOUR — 5250
- EXISTING MINOR CONTOUR
- PROPOSED STORM SEWER
- EXISTING STORM SEWER
- EXISTING DRAINAGE SWALE
- PROPOSED DRAINAGE SWALE
- EXISTING TERTIARY DRAINAGE WAY
- FILING NO. 9 PARCEL BOUNDARY
- FLOW DIRECTION
- DRAINAGE BASIN
- MAJOR BASIN BOUNDARY
- DESIGN POINT
- SWALE CROSS SECTION
- BASIN LABEL

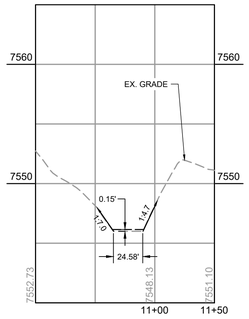


SWALE SECTION: A-A



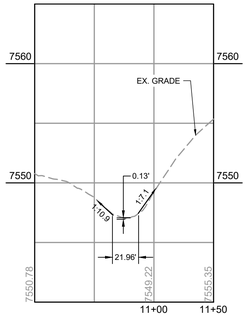
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BASIN: A-A
Q100: 4.5 CFS
SLOPE: 0.06 FT/FT
DEPTH: 0.14 FT
VELOCITY: 2.39 FT/S
FROUDE: 1.19

SWALE SECTION: B-B



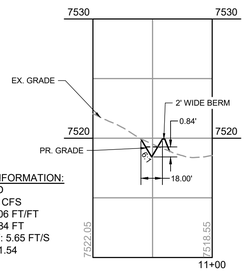
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BASIN: B-B
Q100: 9.8 CFS
SLOPE: .054 FT/FT
DEPTH: 0.15 FT
VELOCITY: 2.57 FT/S
FROUDE: 1.19

SWALE SECTION: C-C



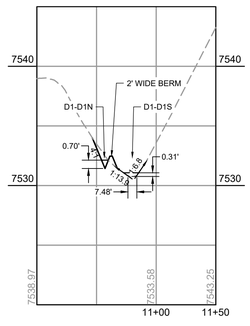
DESIGN INFORMATION:
BASIN: C-C
Q100: 6.9 CFS
SLOPE: 0.056 FT/FT
DEPTH: 0.13 FT
VELOCITY: 2.29 FT/S
FROUDE: 1.15

SWALE SECTION: D-D



DESIGN INFORMATION:
BASIN: D-D
Q100: 23.9 CFS
SLOPE: 0.06 FT/FT
DEPTH: 0.84 FT
VELOCITY: 5.65 FT/S
FROUDE: 1.54

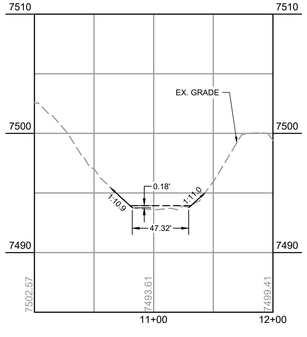
SWALE SECTION: D1-D1



DESIGN INFORMATION:
BASIN: D1-D1N
Q100: 9.6 CFS
SLOPE: 0.06FT/FT
DEPTH: 0.70 FT
VELOCITY: 4.90 FT/S
FROUDE: 1.46

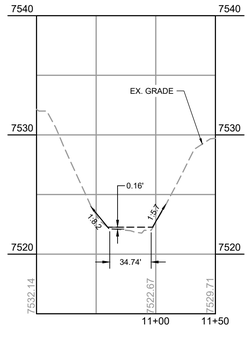
DESIGN INFORMATION:
BASIN: D1-D1S
Q100: 12.6 CFS
SLOPE: 0.06 FT/FT
DEPTH: 0.31 FT
VELOCITY: 3.80 FT/S
FROUDE: 1.37

SWALE SECTION: E-E



DESIGN INFORMATION:
BASIN: BS-20b
Q100: 31.4 CFS
SLOPE: 0.073 FT/FT
DEPTH: 0.18 FT
VELOCITY: 3.54 FT/S
FROUDE: 1.50

SWALE SECTION: F-F



DESIGN INFORMATION:
BASIN: BS-20a
Q100: 14.6 CFS
SLOPE: 0.046 FT/FT
DEPTH: 0.16 FT
VELOCITY: 2.55 FT/S
FROUDE: 1.14



PCD FILE NO.: PUDSP263

DRAWN BY:	SPC	JOB DATE:	11/11/2026
APPROVED:	RDL	JOB NUMBER:	########
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FLYING HORSE

FLYING HORSE NORTH FILING NO. 9
PUD & PRELIMINARY PLAN MAJOR AMENDMENT
PRI #2, LLC.
EL PASO COUNTY, CO

PRELIMINARY DRAINAGE REPORT

EXISTING SWALE SECTIONS

SHEET DR04

04