



Flying Horse North Master Development Drainage Plan

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Master Development Drainage Plan – Flying Horse North

I. General Purpose, Location and Description

a. Purpose and Scope

The Purpose of this Master Development Drainage Plan (MDDP) is to describe the onsite and offsite drainage patterns, existing and proposed storm infrastructure as it relates to preliminary water quality and stormwater detention, areas tributary to the site and the planned storm water management for the Flying Horse North development for Filings No. 2, 3 and remaining filings. Flying Horse North Filing No. 1 combined Preliminary Drainage Report (PDR) and Final Drainage Report (FDR) was previously written by Classic Engineering and included in Appendix F. The items discussed in this report are preliminary in nature and final drainage calculations and design will be required as development proceeds. This report provides a general drainage concept and guidance for future development of Flying Horse North.

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.

Currently Flying Horse North Filing 1 is located within a major portion of the Black Squirrel Creek Drainage Basin of the development. A Preliminary Drainage Report and Final Drainage Report for this area was prepared in June 2018 by Classic Consulting and it is the intent of this MDDP to follow 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 the MDDP will comply with standard El Paso County regulations regarding drainage within this corridor.

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 is in El Paso County. The 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 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.

This MDDP will cover approximately 912.5 acres of 973 residential units, which is shown in the figure below. This development will include estate lots, low through high density residential lots, commercial development, an 18-acre hotel site, open space and park areas, fitness center and a clubhouse.

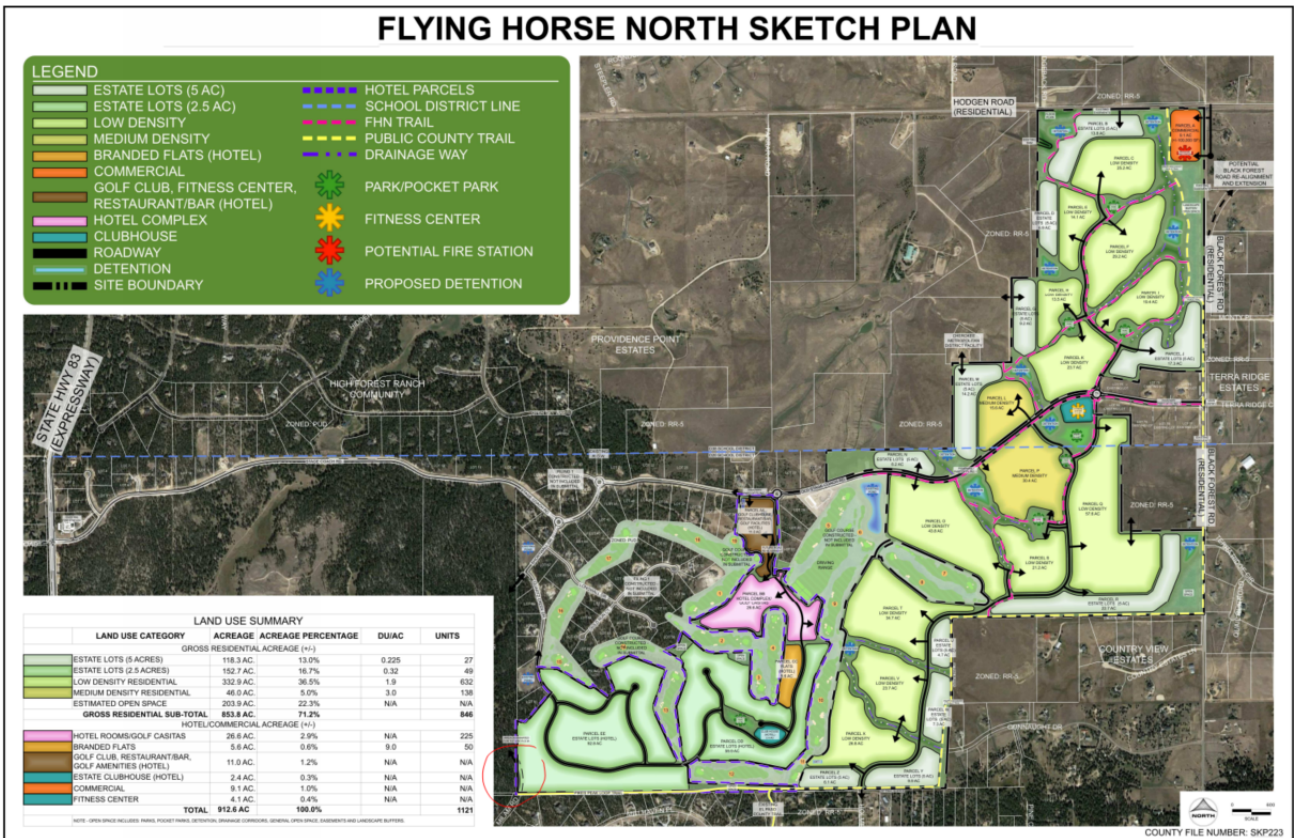


Figure 1 - Site Map

f. Data Sources

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 – June 2018

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.

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. Predominantly, the existing Filing No.1 and part of the proposed Filing No. 2 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 part of Filing No. 2 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.

As the site generally lies at the top of each of the respective basins, minimal offsite flows are conveyed onto the site. The Black Squirrel Creek Drainage basin has no offsite flow come onto the site sans those flows generated as part of Filing 1 of Flying Horse North. The development which is within the Black Squirrel Creek Drainage Basin is unchanged from the FDR shown in Filing 1.

For the East Cherry Creek basin, 4 drainage basins are conveyed onto the site on the southwestern portion of the basin. These basins are labeled A, C, F and Q. The respective contributing flows from these basins is shown in the table below:

Basin Name	Acreage	5 Year Flow (cfs)	100 Year Flow (cfs)
A	18.99	20.84	43.83
C	36.39	33.36	71.27
F	25.25	24.27	51.63
Q	72.29	64.68	137.80

These four basins are generally conveyed through the development via natural drainage ways. The proposed ponds discussed later within this report have been sized to pass through the offsite flows.

b. Compliance with DBPS

This MDDP 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.

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.

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 East Cherry Creek and Black Squirrel Creek. Additionally, as part of the Flying Horse North Filing 1 development, a large irrigation pond was built for water storage and flood control. This drains to the north and to the aforementioned unnamed tributary.

Existing minor drainage channels within the site are planned to be maintained to the maximum extent possible within parkways and greenways with the development. These will continue to be used for conveyance of storm drainage flows.

The Franktown Parker Dam (080130) is located near the northwest corner of site. The dam is designated as a jurisdictional dam and has a low hazard class. It is located along East Cherry Creek. See Appendix A for characteristics and location of dam.

e. Existing and proposed land uses

The existing site is open rangeland on the eastern portion of the site and the western site is single family homes on large (~2.5 acre) home site within a heavily forested area. As part of Filing 1, a road was constructed along with facilities to support a golf course. Structures, outside of the homes are scattered throughout the overall development which will either be removed as part of the project or were built as part of Filing 1. The proposed development will consist of estate, low and medium lots, along with a future hotel site and multiple green spaces and small parks. The current land plan assumes approximately 897 dwelling units will be constructed on the site, not including an approximate 225 provided the proposed hotel.

Land Use	MAX DU/AC
Estate Lots (2.5 Acres)	0.32
Estate Lots (5 Acres)	0.2
Low	1.9
Medium	3.0

III. Hydrologic Analysis

a. Major Basins and subbasins

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 is a large irrigation pond that accounts for water storage and water control on the east side of the site.

The site has been divided into several major drainage basins per where each basin is tributary to a full spectrum detention pond facility. These basins and associated sub basins are described in more detail in the next section of this report.

Existing Subbasin Description

The site's flows are split by the major ridgeline of the Arkansas River Basin and South Platte Basin. Within the South Platte Basin, flow is generally carried northeast throughout the site. On the other side of the ridgeline, the Arkansas River Basin flows in a southwest direction. Subbasin IDs with single letters are part of the South Platte Basin and Subbasin IDs with double letters are part of the Arkansas River Basin.

- Subbasin A is located off site and on the southeast corner. The basin drains towards the northwest and towards Subbasin B1. The basin is 18.99 acres, with a composite impervious value of 2.00% and runoff rates for the 5 and 100 year of 20.84 cfs and 43.83 cfs respectively.
- Subbasin B is located north of Subbasin A. The basin drains towards the northwest into a natural drainageway that flows directly to an existing irrigation pond. The basin is 59.74 acres, with a composite impervious value of 2.00% and runoff rates for the 5 and 100 year of 103.48 cfs and 221.28 cfs respectively.
- Subbasin C is located off site and on the southeast corner. The basin drains towards the northwest and towards Subbasin B2. The basin is 36.39 acres, with a composite impervious value of 2.00% and runoff rates for the 5 and 100 year of 33.36 cfs and 71.27 cfs respectively.
- Subbasin D is located north of Subbasin B. The basin drains towards the northwest and towards the existing irrigation pond. The basin is 38.84 acres, with a composite impervious value of 2.00% and runoff rates for the 5 and 100 year of 31.56 cfs and 67.84 cfs respectively.
- Subbasin E is in a central location of the site and includes the existing irrigation pond. The basin drains towards the north and towards existing irrigation pond. The basin is 106.53 acres, with a composite impervious value of 2.00% and runoff rates for the 5 and 100 year of 223.69 cfs and 483.10 cfs respectively.

- Subbasin F is located off site and on the southeast corner. The basin drains towards the northwest and towards Subbasin G. The basin is 25.25 acres, with a composite impervious value of 2.00% and runoff rates for the 5 and 100 year of 24.27 cfs and 51.63 cfs respectively.
- Subbasin G is directly north of Subbasin D and east of Subbasin E. The basin drains towards the northwest and towards Subbasin E with the irrigation pond. The basins consist of the existing golf course. The basin is 52.19 acres, with a composite impervious value of 2.00% and runoff rates for the 5 and 100 year of 79.17 cfs and 166.51 cfs respectively.
- Subbasin H is located directly downstream of Subbasin E and on the north side of Stagecoach Rd. The basin drains towards the north through a natural drainageway. There are existing lots on the west side of the basin. The basin is 20.63 acres, with a composite impervious value of 2.00% and runoff rates for the 5 and 100 year of 18.59 cfs and 39.78 cfs respectively.
- Subbasin I is located west of Subbasin E and northeast of the major ridgeline between basins. The basin drains towards the northwest and towards an existing culvert. There are existing lots on the west side of the basin. The basin is 31.93 acres, with a composite impervious value of 2.00% and runoff rates for the 5 and 100 year of 34.58 cfs and 72.63 cfs respectively.
- Subbasin J is located downstream of Subbasin I. The basin drains towards the northeast to an unnamed tributary of the East Cherry Creek. The basin is 28.47 acres, with a composite impervious value of 2.00% and runoff rates for the 5 and 100 year of 56.31 cfs and 120.46 cfs respectively.
- Subbasin K is located south of proposed section of Stagecoach Rd. The basin drains towards the northwest and into an existing 48" culvert. The basin is 93.15 acres, with a composite impervious value of 2.00% and runoff rates for the 5 and 100 year of 92.05 cfs and 195.43 cfs respectively.
- Subbasin L is downstream of Subbasin K and is located on the north side of the proposed section of Stagecoach Rd. The basin drains towards the northwest to a natural drainageway of East Cherry Creek. The basin is 16.39 acres, with a composite impervious value of 2.00% and runoff rates for the 5 and 100 year of 107.58 cfs and 228.73 cfs respectively.
- Subbasin M is located on the east side of the site and between Subbasin N and V1. The basin drains towards the northwest and into an existing 30" culvert. The basin is 13.85 acres, with a composite impervious value of 2.00% and runoff rates for the 5 and 100 year of 11.48 cfs and 24.61 cfs respectively.
- Subbasin N is located south of Subbasin O and north of proposed Stagecoach Rd. The basin drains towards the northwest to a nearby unnamed tributary and eventually East Cherry Creek. The basin is 49.00 acres, with a composite impervious value of 2.00% and runoff rates for the 5 and 100 year of 64.68 cfs and 143.11 cfs respectively.
- Subbasin O is located south of Subbasin P. The basin drains towards the northwest and towards the north. The basin is 24.76 acres, with a composite impervious value of 2.00% and runoff rates for the 5 and 100 year of 22.69 cfs and 48.54 cfs respectively.
- Subbasin P is in the northeast corner of the site and downstream of Subbasin O. The basin drains towards the northeast to an unnamed tributary of East Cherry Creek. The basin is 43.80 acres, with a composite impervious value of 2.00% and runoff rates for the 5 and 100 year of 38.52 cfs and 82.17 cfs respectively.

- Subbasin Q is located off site and on the southeast corner. The basin drains towards the northeast and towards Subbasin R. The basin is 72.29 acres, with a composite impervious value of 2.00% and runoff rates for the 5 and 100 year of 64.68 cfs and 137.80 cfs respectively.
- Subbasin R is located on the east side of site adjacent to Black Forest Rd. The basin drains towards the northeast. The basin is 54.98 acres, with a composite impervious value of 2.00% and runoff rates for the 5 and 100 year of 108.65 cfs and 232.13 cfs respectively.
- Subbasin S is located north of Subbasin Q. The basin drains towards the southeast and overland towards Subbasin R. The basin is 24.36 acres, with a composite impervious value of 2.00% and runoff rates for the 5 and 100 year of 25.99 cfs and 54.65 cfs respectively.
- Subbasin T is located off site and on the southeast corner. The basin drains towards the southeast and towards Black Forest Rd. The basin is 5.24 acres, with a composite impervious value of 2.00% and runoff rates for the 5 and 100 year of 4.04 cfs and 8.68 cfs respectively.
- Subbasin U is located east of subbasin V and is composed of existing 2.5 acre lots. The basin drains offsite towards the southeast and follows historic drainage patterns. The basin is 5.86 acres, with a composite impervious value of 10.00% and runoff rates for the 5 and 100 year of 4.15 cfs and 8.95 cfs respectively.
- Subbasin V is located on the east side of the site in between Subbasin M and U. The basin drains towards the north and towards Subbasin X via culvert. The basin is 38.57 acres, with a composite impervious value of 2.00% and runoff rates for the 5 and 100 year of 29.63 cfs and 63.92 cfs respectively.
- Subbasin W is located north of Subbasin U on the site. The basin drains offsite through an existing 24" CMP culvert. The basin is 3.96 acres, with a composite impervious value of 2.00% and runoff rates for the 5 and 100 year of 3.45 cfs and 7.33 cfs respectively.
- Subbasin X is located on the northeastern corner of the site. The basin drains north towards an unnamed tributary of East Cherry Creek. The basin is 190.88 acres, with a composite impervious value of 2.00% and runoff rates for the 5 and 100 year of 167.76 cfs and 361.56 cfs respectively.
- Subbasins AA and CC are located on the west side of the site along the major ridgeline. Both basins were developed in Filing No. 1 and are included in the analysis to provide a better understanding for the flows draining towards Black Squirrel Creek. The basins drain towards the southwest. The basins are 33.8 acres and 37.15 acres, with a composite impervious value of 10% and 10% and runoff rates for the 5 and 100 year of 38.76 cfs and 80.22 cfs and 6.53 cfs and 13.57 cfs respectively.
- Subbasin BB is located downstream of Subbasin AA. The basin drains towards the southwest and towards Subbasin GG. A section of the area of the basin was developed in Filing No. 1 and consists of 2.5-acre lots. The basin is 37.15 acres, with a composite impervious value of 10.00% and runoff rates for the 5 and 100 year of 40.62 cfs and 84.15 cfs respectively.
- Subbasin DD is located west and downstream of Subbasin EE. The basin drains towards the west. A portion developed in Filing No. 1 consists of the Flying Horse North Golf Course and 2.5-acre lots. The basin is 70.07 acres, with a composite impervious value of 10.00% and runoff rates for the 5 and 100 year of 58.42 cfs and 123.69 cfs respectively.

- Subbasin EE is upstream of subbasin DD. The basin drains towards the west. A portion of the area was developed in Filing No. 1 consists of the Flying Horse North Golf Course and 2.5-acre lots. The basin is 69.47 acres, with a composite impervious value of 10.00% and runoff rates for the 5 and 100 year of 81.16 cfs and 167.45 cfs respectively.
- Subbasin FF is located downstream of Subbasins DD and EE. The basin drains towards the southwest. The north half consists of 2.5-acre lots and part of the Flying Horse North Golf Course constructed during Filing No. 1. The basin is 17.62 acres, with a composite impervious value of 10.00% and runoff rates for the 5 and 100 year of 162.77 cfs and 340.42 cfs respectively.
- Subbasin GG located downstream of Subbasin FF. The basin drains towards the southwest and towards an existing detention pond developed in Filing No. 1. The basin is 16.35 acres, with a composite impervious value of 10.00% and runoff rates for the 5 and 100 year of 14.93 cfs and 31.99 cfs respectively.
- Subbasin HH is located on the west side of the site. The basin drains towards the west and an unnamed tributary of Black Squirrel Creek. The basin is 12.61 acres, with a composite impervious value of 10.00% and runoff rates for the 5 and 100 year of 13.01 cfs and 27.42 cfs respectively.
- Subbasin II is located in the southwest corner of site. The basin drains towards the west and to an unnamed tributary of Black Squirrel. The basin is 97.53 acres, with a composite impervious value of 10.00% and runoff rates for the 5 and 100 year of 81.77 cfs and 175.60 cfs respectively.
- Subbasin JJ is in the southcentral part of the site. The basin drains towards the south and to an unnamed tributary of Black Squirrel Creek. The basin is 8.9 acres, with a composite impervious value of 2.00% and runoff rates for the 5 and 100 year of 9.74 cfs and 20.50 cfs respectively.
- Subbasin KK is in the southcentral part of the site. The basin drains towards the south and to an unnamed tributary of Black Squirrel Creek. A portion of the area is occupied by the existing Flying Horse Golf Course. The basin is 8.12 acres, with a composite impervious value of 2.00% and runoff rates for the 5 and 100 year of 7.51 cfs and 15.99 cfs respectively.
- Subbasin LL is in the southcentral part of the site. The basin drains towards the south and to an unnamed tributary of Black Squirrel Creek. The basin is 6.1 acres, with a composite impervious value of 2.00% and runoff rates for the 5 and 100 year of 6.88 cfs and 14.48 cfs respectively.

Proposed Subbasin Description

- Subbasin A is located off site and on the southeast corner. The basin drains towards the northwest and towards Subbasin B1. The basin is 18.99 acres, with a composite impervious value of 2.00% and runoff rates for the 5 and 100 year of 20.84 cfs and 43.83 cfs respectively.
- Subbasin B1 is located north of Subbasin A. The basin drains towards the northwest and towards proposed Detention Pond 11. Current planning documents call for low density dwelling units. The basin is 59.74 acres, with a composite impervious value of 29.83% and runoff rates for the 5 and 100 year of 66.93 cfs and 133.69 cfs respectively.
- Subbasin B2 is located northeast of Subbasin B1. The basin drains towards the northwest and towards the proposed Detention Pond 11. Current planning documents call for low density dwelling units. The basin is 19.99 acres, with a composite impervious value of 24.55% and runoff rates for the 5 and 100 year of 17.99 cfs and 37.14 cfs respectively.
- Subbasin C is located off site and on the southeast corner. The basin drains towards the northwest and towards Subbasin B2. The basin is 36.39 acres, with a composite impervious value of 2.00% and runoff rates for the 5 and 100 year of 35.31 cfs and 75.28 cfs respectively.
- Subbasin D is located north of north of Subbasins B1 and B2. The basin drains towards the northwest and towards Detention Pond 15. Current planning documents call for low density dwelling units. The basin is 40.87 acres, with a composite impervious value of 37.20% and runoff rates for the 5 and 100 year of 61.12 cfs and 117.38 cfs respectively.
- Subbasin E is in a central location of the site and includes the existing irrigation pond. The basin drains towards the north and towards existing irrigation pond. Current planning documents call for two small parking lots. The basin is 106.53 acres, with a composite impervious value of 14.35% and runoff rates for the 5 and 100 year of 74.68 cfs and 157.91 cfs respectively.
- Subbasin F is located off site and on the southeast corner. The basin drains towards the northwest and towards Subbasin G. The basin is 25.25 acres, with a composite impervious value of 2.00% and runoff rates for the 5 and 100 year of 24.27 cfs and 51.63 cfs respectively.
- Subbasin G is directly north of Subbasin D and east of Subbasin E. The basin drains towards the northwest and towards Subbasin E. Current planning documents call for a small amount of low density dwelling units, where most of the basin consist of the existing golf course. The basin is 31.45 acres, with a composite impervious value of 12.48% and runoff rates for the 5 and 100 year of 27.18 cfs and 57.12 cfs respectively.
- Subbasin H is located located directly downstream of Subbasin E and on the north side of Stagecoach Rd. The basin drains towards the north and towards Detention Pond 10. Current planning documents call for medium density dwelling units. There are existing lots on the west side of the basin. The basin is 21.96 acres, with a composite impervious value of 10.00% and runoff rates for the 5 and 100 year of 17.86 cfs and 37.8 cfs respectively.
- Subbasin I is located west of Subbasin E and northeast of the major ridgeline between basins. The basin drains towards the northwest and towards proposed Detention Pond 16. There are existing lots on the west side of the basin. Current planning documents call for a commercial golf club. The basin is 28.99 acres, with a composite impervious value of 34.66% and runoff rates for the 5 and 100 year of 40.37 cfs and 78.06 cfs respectively

- Subbasin J is located downstream of Subbasin I. The basin drains towards the northeast to an unnamed tributary of the East Cherry Creek. Current planning documents do not call for any changes to this basin. The basin is 28.07 acres, with a composite impervious value of 10% and runoff rates for the 5 and 100 year of 24.25 cfs and 51.19 cfs respectively.
- Subbasin K is located south of proposed section of Stagecoach Rd. The basin drains towards the northwest and towards proposed Detention Pond 7. Current planning documents call for high, medium, and low density dwelling units and a few pocket parks. The basin is 114.73 acres, with a composite impervious value of 38.08% and runoff rates for the 5 and 100 year of 200.94 cfs and 382.3 cfs respectively
- Subbasin L is downstream of Subbasin K and is located on the north side of the proposed section of Stagecoach Rd. The basin drains towards the northwest into proposed Detention Pond 8. Current planning documents call for medium density dwelling units. The basin is 15.89 acres, with a composite impervious value of 24.82% and runoff rates for the 5 and 100 year of 15.97 cfs and 32.4 cfs respectively. The pond will discharge at predevelopment rates into an unnamed tributary of the East Cherry Creek via the ponds outlet structure.
- Subbasin M is located on the east side of the site and between Subbasin N and V1. The basin drains towards the northwest and towards proposed Detention Pond 6. Detention Pond 6 outlets into a culvert under proposed Stagecoach Rd. and eventually to Subbasin N. Current planning documents call for medium density dwelling units, potential fitness center, and a park. The basin is 26.83 acres, with a composite impervious value of 33.19% and runoff rates for the 5 and 100 year of 46.54 cfs and 89.08 cfs respectively.
- Subbasin N is located south of Subbasin O and North of proposed Stagecoach Rd. The basin drains towards the northwest towards proposed Detention Pond 5. Detention Pond 5 outlets to a nearby unnamed tributary and eventually East Cherry Creek. Current planning documents call for medium density dwelling units along with a pocket park. The basin is 41.57 acres, with a composite impervious value of 29.60% and runoff rates for the 5 and 100 year of 73.48 cfs and 141.24 cfs respectively.
- Subbasin O is located south of Subbasin P. The basin drains towards the northwest and towards Detention Pond 3. Current planning documents call for medium density dwelling units. The basin is 52.52 acres, with a composite impervious value of 30.10% and runoff rates for the 5 and 100 year of 63.86 cfs and 127.4 cfs respectively. The pond will discharge at predevelopment rates and into Pond 1 via a swale.
- Subbasin P is in the northeast corner of the site and downstream of Subbasin O. The basin drains towards the northeast to proposed Detention Pond 1. Current planning documents call for low density dwelling units. The basin is 43.71 acres, with a composite impervious value of 20.71% and runoff rates for the 5 and 100 year of 40 cfs and 82.83 cfs respectively. The pond will discharge at predevelopment rates into an unnamed tributary of the East Cherry Creek via the ponds outlet structure.
- Subbasin Q is located off site and on the southeast corner. The basin drains towards the northeast and towards Subbasin R. The basin is 72.29 acres, with a composite impervious value of 2.00% and runoff rates for the 5 and 100 year of 64.68 cfs and 137.8 cfs respectively.

- Subbasin R is located on the east side of site adjacent to Black Forest Rd. The basin drains towards the northeast and towards Detention Pond 9. Current planning documents call for low density and 1-acre lots. The basin is 76.38 acres, with a composite impervious value of 21.81% and runoff rates for the 5 and 100 year of 56.59 cfs and 116.06 cfs respectively. The pond will discharge at predevelopment rates into an unnamed tributary of the East Cherry Creek via the ponds outlet structure.
- Subbasin S is located north of Subbasin Q. The basin drains towards the southeast and overland towards Subbasin R. Current planning documents call for low density dwelling units. The basin is 21.67 acres, with a composite impervious value of 40.88% and runoff rates for the 5 and 100 year of 30.83 cfs and 58.96 cfs respectively.
- Subbasin T is located off site and on the southeast corner. The basin drains towards the southeast and towards Black Forest Rd. The basin is 5.24 acres, with a composite impervious value of 2.00% and runoff rates for the 5 and 100 year of 4.04 cfs and 8.68 cfs respectively.
- Subbasin U is located east of subbasin V2 and is composed of existing 2.5 acre lots. The basin drains offsite towards the southeast and follows historic drainage patterns. The basin is 5.86 acres, with a composite impervious value of 2% and runoff rates for the 5 and 100 year of 4.96 cfs and 10.51 cfs respectively.
- Subbasin V1 is located on the east side of the site in between Subbasin M and V2. The basin drains towards the north and towards Subbasin X3 via culvert. Current planning documents call for low density dwelling units. The basin is 11.57 acres, with a composite impervious value of 38.62% and runoff rates for the 5 and 100 year of 13.99 cfs and 27.67 cfs respectively.
- Subbasin V2 is located south of subbasin X3 and proposed Stagecoach Rd. The basin drains towards the north and towards subbasin X3. The flows are directed through a culvert and eventually to Detention Pond 4. There are no proposed dwelling unit for the area, as there are existing 2.5 acre lots that cover the basin. The basin is 15.34 acres, with a composite impervious value of 15.00% and runoff rates for the 5 and 100 year of 16.15 cfs and 33.25 cfs respectively.
- Subbasin W is located on the north side of subbasin U. The basin drains offsite to the southeast. The basin is 3.76 acres, with a composite impervious value of 10.00% and runoff rates for the 5 and 100 year of 3.58 cfs and 7.46 cfs respectively.
- Subbasin X1 is located on the northeastern corner of the site. The basin drains north towards proposed Detention Pond 2. Current planning documents call for low density dwelling units, potential fire station and a pocket park. The basin is 76.38 acres, with a composite impervious value of 29.50% and runoff rates for the 5 and 100 year of 80.91 cfs and 163.27 cfs respectively. The pond will discharge at predevelopment rates into an unnamed tributary of the East Cherry Creek via the ponds outlet structure.
- Subbasin X2 is located south of Subbasin X1 The basin drains towards the northeast towards proposed Detention Pond 4. Current planning documents call for low density dwelling units along with a pocket park. The basin is 36.33 acres, with a composite impervious value of 33.33% and runoff rates for the 5 and 100 year of 41.46 cfs and 82.46 cfs respectively.
- Subbasin X3 is located south of Subbasin X2. The basin drains towards the north and towards Detention Pond 4. Current planning documents call for low density dwelling units and a pocket

- park. The basin is 65.75 acres, with a composite impervious value of 13.53% and runoff rates for the 5 and 100 year of 47.59 cfs and 100.73 cfs respectively.
- Subbasins AA and CC are located on the west side of the site along the major ridgeline. Both basins were developed in Filing No. 1 and are included in the analysis to provide a better understanding for the flows draining towards Black Squirrel Creek. The basins drain towards the southwest. The basins are 33.8 acres and 37.15 acres, with a composite impervious value of 10% and 10% and runoff rates for the 5 and 100 year of 39.23 cfs and 81.18 cfs and 6.53 cfs and 13.57 cfs respectively.
 - Subbasin BB is located downstream of Subbasin AA. The basin drains towards the southwest and towards Subbasin GG. Current planning documents call for a small portion of 2.5-acre estate lots. The remaining area of the basin was developed in Filing No. 1 and consists of 2.5-acre lots. The basin is 37.15 acres, with a composite impervious value of 10.00% and runoff rates for the 5 and 100 year of 40.62 cfs and 84.15 cfs respectively.
 - Subbasin DD is located west and downstream of Subbasin EE1. The basin drains towards the west. Current planning documents call for 2.5-acre estate lots and a 2.4-acre clubhouse. The portion that was developed in Filing No. 1 consists of the Flying Horse North Golf Course and 2.5-acre lots. The basin is 69.5 acres, with a composite impervious value of 10.00% and runoff rates for the 5 and 100 year of 57.78 cfs and 122.41 cfs respectively.
 - Subbasin EE1 is located west of Subbasins EE2 and EE3. The basin drains towards the west. Current planning documents call for a small section of 2.5-acre estate lots. The remaining portion consists of the Flying Horse North Golf Course constructed in Filing No. 1. The portion that was developed in Filing No. 1 consists of the Flying Horse North Golf Course and 2.5-acre lots. The basin is 50.87 acres, with a composite impervious value of 10.00% and runoff rates for the 5 and 100 year of 53.25 cfs and 110.3 cfs respectively.
 - Subbasin EE2 is located along the west side of the major ridgeline. The basin drains towards the southeast and entirely towards proposed Detention Pond 13. Current planning documents call for a hotel complex/golf casitas. The basin is 16.36 acres, with a composite impervious value of 75.00% and runoff rates for the 5 and 100 year of 35.71 cfs and 63.62 cfs respectively. The pond will discharge at predevelopment rates into a swale via the ponds outlet structure.
 - Subbasin EE3 is located south of Subbasin EE2. The basin drains towards the west and Subbasin EE2. Current planning documents call for high density dwelling units. The basin is 16.36 acres, with a composite impervious value of 55.00% and runoff rates for the 5 and 100 year of 10.38 cfs and 19.33 cfs respectively.
 - Subbasin FF is located downstream of Subbasins DD and EE. The basin drains towards the southwest. Current planning documents call for 2.5-acre estate lots on the south side of the basin. The north half consists of 2.5-acre lots and part of the Flying Horse North Golf Course constructed during Filing No. 1. The basin is 18.1 acres, with a composite impervious value of 10.00% and runoff rates for the 5 and 100 year of 20.78 cfs and 43.07 cfs respectively.
 - Subbasin GG located downstream of Subbasin FF. The basin drains towards the southwest and towards an existing detention pond developed in Filing No. 1. Current planning documents call for

- 2.5-acre estate lots. The basin is 16.35 acres, with a composite impervious value of 10.00% and runoff rates for the 5 and 100 year of 15.49 cfs and 32.48 cfs respectively.
- Subbasin HH is located on the west side of the site. The basin drains towards the west and to an unnamed tributary of Black Squirrel Creek. Current planning documents call for 2.5-acre estate lots. The basin is 12.7 acres, with a composite impervious value of 10.00% and runoff rates for the 5 and 100 year of 13.56 cfs and 28.16 cfs respectively. Per El Paso County Engineering Criteria Manual – Appendix I Section 1.7.1.B, large lot single family sites greater than or equal to 2.5 acres in size and that have a maximum imperviousness of less than 20% are excluded from water quality capture volume (WQCV).
 - Subbasin II1 is located in the southwest corner of site. The basin drains towards the west and to proposed Detention Pond 14. Current planning documents call for 2.5-acre estate lots. The basin is 50.43 acres, with a composite impervious value of 10.00% and runoff rates for the 5 and 100 year of 34.94 cfs and 74.39 cfs respectively. The pond will discharge at predevelopment rates into an unnamed tributary of Black Squirrel Creek via the ponds outlet structure
 - Subbasin II2 is located north of Subbasin II1 and downstream of Subbasin II3 in the southwest corner of site. The basin drains towards the west and to Subbasin II1 via a proposed culvert. Current planning documents call for 2.5-acre estate lots. The basin is 23.13 acres, with a composite impervious value of 10.00% and runoff rates for the 5 and 100 year of 28.04 cfs and 57.88 cfs respectively.
 - Subbasin II3 is located north of Subbasin II1. The basin drains towards the west and to Subbasin II2 via a proposed culvert. Current planning documents call for 2.5-acre estate lots. The basin is 23.97 acres, with a composite impervious value of 10.00% and runoff rates for the 5 and 100 year of 28.32 cfs and 58.65 cfs respectively.
 - Subbasin JJ is in the southcentral part of the site. The basin drains towards the south and to an unnamed tributary of Black Squirrel Creek. Current planning documents call for low density and 1-acre dwelling units. The basin is 8.9 acres, with a composite impervious value of 20.70% and runoff rates for the 5 and 100 year of 11.49 cfs and 22.8 cfs respectively.
 - Subbasin LL is in the southcentral part of the site. The basin drains towards the south and to an unnamed tributary of Black Squirrel Creek. Current planning documents call for low density and 1-acre dwelling units. The basin is 6.2 acres, with a composite impervious value of 12.09% and runoff rates for the 5 and 100 year of 7.36 cfs and 15.07 cfs respectively.
 - Subbasin KK is in the southcentral part of the site. The basin drains towards the south and to an unnamed tributary of Black Squirrel Creek. Current planning documents call for 2.5 acre lots. The rest of the area is occupied by the existing Flying Horse Golf Course. The basin is 8.4 acres, with a composite impervious value of 10.00% and runoff rates for the 5 and 100 year of 8.14 cfs and 16.95 cfs respectively.

The above-mentioned basins are large planning area basins and as drainage reports are developed for the individual developed parcels additional drainage reports and calculations will be required. It is expected that storm drainage infrastructure consisting of inlets, storm sewer and open drainage channels will be constructed as the property develops.

- Although mentioned above, offsite basins include basins A, C, F, and Q. Flow contributing to the site from these basins will be routed through the proposed detention ponds. Flow rates are shown below.

Offsite Flow Summary					
Basin Description	Ultimate Design Point	Basin Area (ac)	Receiving Detention Pond	5 Year Peak Runoff (cfs)	100 Year Peak Runoff (cfs)
A	A	18.99	Pond 11	20.84	43.83
C	C	36.39	Pond 11	33.36	71.27
F	F	25.25	Irr. Pond	24.27	51.63
Q	Q	72.29	Pond 9	64.68	137.80

b. 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.

Composite percent impervious calculations were completed for each subbasin based on the density of lots and can be found in Appendix B. The El Paso County Drainage Criteria Manual Table 5-1 was used for reference when correlating land use to percent impervious values and located in Appendix F. Impervious values for 5-Acre Lots, 2.5-Acre Lots, Medium Density, Low Density, and Commercial Lots had impervious values of 10%, 15%, 45%, 55% and 75% respectively. The rainfall and percent impervious values were then used as inputs into the Colorado Urban Hydrograph Procedure (CUHP) spreadsheets to determine runoff values for both pre-development and post-development site.

CUHP is an evolution of the Snyder unit hydrograph and is calibrated for use along the Colorado Front Range. 1 Hour rainfall amounts are input into the program to produce a storm hyetograph that is then used to calculate a storm hydrograph for each basin depending on the subbasins properties including slope, length, shape, impervious area, pervious depression storage area, and various infiltration rates. Tabular hydrographs are then computed and can be used in EPA SWMM. The CUHP results are included within Appendix B.

EPA SWMM was used to determine flow routing via the kinematic wave method. Subbasins were routed to their respective design points and detention ponds for both the developed and predeveloped condition to determine peak runoff amounts for the 5-year and 100-year storm events. Information from these models along with information and calculations performed in the Mile High Flood District BMP spreadsheets was used to determine pond sizing calculations and release rates.

c. Basin Hydrology

A summary of the flows for both the predeveloped and developed cases for each basin, subbasin and Pond are found on next page along with the full computation found in Appendix B.

Existing SWMM Basin Summary				
Basin Description	Basin Area (ac)	% Impervious	5 Year Peak Runoff (cfs)	100 Year Peak Runoff (cfs)
A	18.99	2.00	20.84	43.83
B	59.74	2.00	103.48	221.48
C	34.87	2.00	33.36	71.27
D	38.84	2.00	31.56	67.84
E	127.86	2.00	223.69	483.10
F	25.25	2.00	24.27	51.63
G	52.19	2.00	79.17	166.51
H	20.63	2.00	18.59	39.78
I	31.93	2.00	34.58	72.63
J	28.47	2.00	56.31	120.46
K	93.14	2.00	92.05	195.43
L	16.39	2.00	107.58	228.73
M	13.87	2.00	11.48	24.61
N	49.00	2.00	68.16	143.11
O	24.76	2.00	22.69	48.54
P	43.80	2.00	38.52	82.17
Q	72.29	2.00	64.68	137.80
R	54.98	2.00	108.65	232.13
S	24.36	2.00	25.99	48.54
T	5.24	2.00	4.04	8.68
U	5.48	2.00	4.15	8.95
V	38.47	2.00	29.63	63.92
W	3.76	2.00	3.45	7.33
X	190.88	2.00	167.76	361.56
AA	33.49	10.00	38.76	80.22
BB	37.15	10.00	40.62	84.15
CC	6.33	10.00	6.53	13.57
DD	70.06	10.00	58.42	123.69
EE	69.47	10.00	81.16	167.45
FF	17.62	2.00	162.77	340.42
GG	16.35	2.00	14.93	31.99
HH	12.61	2.00	13.01	27.42
II	97.53	2.00	81.77	175.59
JJ	8.72	2.00	9.74	20.50
KK	8.12	2.00	7.51	15.99
LL	6.10	2.00	6.88	14.48

Proposed SWMM Basin and Pond Summary						
Basin Description	Basin Area (ac)	% Impervious	5 Year Peak Runoff (cfs)	100 Year Peak Runoff (cfs)	5 Year Pond Volume (ac-ft)	100 Year Pond Volume (ac-ft)
P	43.71	20.71%	40.00	82.83		
Pond 1					1.03	1.97
X1	76.38	29.50%	80.91	163.27		
Pond 2					6.56	8.80
O	52.52	30.10%	63.86	127.40		
Pond 3					3.79	6.37
X2	36.33	33.33%	41.46	82.46		
X3	61.99	13.53%	47.59	100.73		
V2	15.34	15.00%	16.15	33.25		
V1	11.57	38.62%	13.99	27.67		
Pond 4					7.21	7.35
N	41.57	29.60%	73.48	141.24		
Pond 5					1.86	2.55
M	26.83	33.19%	46.54	89.09		
Pond 6					0.84	0.94
K	114.73	38.03%	200.94	382.30		
Pond 7					8.38	12.59
L	15.89	24.82%	15.97	32.40		
Pond 8					1.05	1.09
S	21.67	40.88%	30.83	58.96		
R	56.16	21.81%	56.59	116.06		
Q	72.29	2.00%	64.68	137.80		
Pond 9					6.28	10.31
H	21.96	10.00%	17.86	37.80		
Pond 10					0.66	0.94
B2	19.99	24.55%	17.99	37.14		
B1	59.74	29.83%	66.93	133.69		
A	18.99	2.00%	20.84	43.83		
C	36.39	2.00%	35.31	75.28		
Pond 11					1.94	3.23
J	28.07	10.00%	24.25	51.19		
Existing Pond 12						
EE2	16.36	75.00%	35.71	63.62		
EE3	6.67	55.00%	10.38	19.93		
Pond 13					1.33	1.61
II3	23.97	10.0%	28.32	58.65		
II2	23.13	10.0%	28.04	116.62		
II1	50.43	10.0%	34.94	74.39		
Pond 14					1.06	3.99
D	40.87	37.20%	61.12	117.38		
Pond 15					1.94	3.23
E	106.53	14.35%	74.68	157.91		

I	26.99	34.66%	40.37	78.06		
Pond 16					1.40	1.79
JJ	8.9	20.70%	11.49	22.8		
KK	8.4	12.09%	8.14	16.95		
LL	6.2	10.00%	7.36	15.07		
Pond 17					1.09	1.23
G	31.45	12.48%	37.69	107.75		
Irrigation Pond						
JJ	8.90	20.70%	11.06	28.04		
LL	6.2	12.09%	5.85	15.68		
KK	8.4	10.00%	5.9	16.72		
Natural Drainage Way						
DD	69.5	10.0%	42.26	120.76		
EE1	50.87	10.0%	42.6	154.16		
Existing Flying Horse North Detention Pond 6						
CC	6.33	10.0%	4.74	13.39		
FF	18.1	10.0%	100.02	325.29		
Existing Flying Horse North Detention Pond 7						
GG	16.35	10.0%	11.25	32.04		
AA	33.8	10.0%	28.57	80.08		
BB	37.15	10.0%	29.52	83.01		
Existing Flying Horse North Detention Pond 8						
HH	12.7	10.0%	9.86	27.77		
Natural Drainage Way						
T	5.24	2.00%	2.92	8.56		
U	5.86	10.0%	3.63	10.37		
W	3.76	10.0%	2.6	7.36		
Natural Drainage Way						

IV. Hydraulic Analysis

a. Major Drainageways

There are 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 East Cherry Creek and Black Squirrel Creek.

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.

b. 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 will be 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 homes, schools, churches, and other buildings should use means such that impervious areas drain across pervious area to allow for infiltration during the minor events. 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.

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; 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 exceed 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 effects the floodplain, FEMA will require a permit for work within 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: The development of the project site includes a variety of land uses including open and vegetated areas interspersed to help disconnect impervious areas and reduce runoff volumes.

Step 2 – Stabilize Drainageways: Altered drainage ways will be designed in a manner that provides water quality benefits through infiltration and the removal of pollutants via phytoremediation. Vegetation will also be selected to stabilize the drainage ways by reducing the velocity of flows and decreasing any scour. Should the final drainage ways require, grade control structures may be implemented to further reduce flow velocities and protect against erosion. These improvements will help stabilize drainageways.

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.

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.

VI. Alternatives Evaluation

The current selected plan for drainage follows the DPBS for the Black Squirrel Basin and will not require an evaluation of alternatives.

VII. Selected Plan

a. Plan Hydrology

This MDDP schematically addressed on-site and off-site drainage patterns using the existing topography and proposed land use plan for the overall drainage design. Individual preliminary and final drainage reports will better define the planning areas as the site is developed.

The overall site is divided into several separate major basins. Basin sizes range from 35 acres to 181 acres in size. Basins A through V2 drain and eventually discharge into an unnamed tributary of the Arkansas River. Basins AA through LL drain towards unnamed tributaries of Black Squirrel Creek.

The sub-basins are described in additional detail above.

b. System Improvements

The site plans propose the construction of 15 separate full spectrum detention facilities and utilize the capacity of 2 existing full spectrum detention facilities. The ponds are preliminarily sized to ensure that the 5-year and 100-year release rates are equal to or less than the historic rates. For the PDR and FDR, the consultant will need to use a routing software to accurately model the routed hydrographs for ponds upstream of the irrigation pond. The irrigation pond has a 12 hr drain time for WQCV. All drains times must be within 72 hours for the 5-year storm or within 120 hours for storm events greater than the 5-year storm per Senate Bill 15-212.

- Pond 1 is located in the northwest corner of the site and discharges into an unnamed tributary of East Cherry Creek. The pond is planned to store a maximum of 1.97 ac-ft during the 100-year event and have a peak outflow of 81.7 cfs which is slightly below the predevelopment peak outflow of 81.0 cfs. The 5-year storage volume is 1.03 ac-ft with a peak outflow of 24.9 cfs.

- Pond 2 is located to the east of Pond 1 and discharges into another unnamed tributary of East Cherry Creek. The pond is planned to store a maximum of 8.8 ac-ft during the 100-year event and have a peak outflow of 74.6 cfs which is slightly below the predevelopment peak outflow of 81.0 cfs. The 5-year storage volume is 6.56 ac-ft with a peak outflow of 27.8 cfs.
- Pond 3 is located on the eastern portion of the site and south of Pond 1. The pond discharges into an unnamed tributary of East Cherry Creek. The pond is planned to store a maximum of 6.37 ac-ft during the 100-year event and have a peak outflow of 46.1 cfs which is slightly below the predevelopment peak outflow of 48.5 cfs. The 5-year storage volume is 3.79 ac-ft with a peak outflow of 22.7 cfs.
- Pond 4 is located near the eastern portion of the site adjacent to Black Forest Rd. The pond discharges into a natural drainage way, which outlets into an unnamed tributary of East Cherry Creek. The pond is planned to store a maximum of 7.35 ac-ft during the 100-year event and have a peak outflow of 198.8 cfs which is slightly below the predevelopment peak flow rate of 231.6 cfs. The 5-year storage volume is 7.12 ac-ft with a peak outflow of 70.6 cfs.
- Pond 5 is located in the northwest portion of the site. The pond discharges natural drainageway, which outlets into an unnamed tributary of East Cherry Creek. The pond is planned to store a maximum of 2.5 ac-ft during the 100-year event and have a peak outflow of 103.1 cfs which is greater than the predevelopment peak outflow of 116.9 cfs. The 5-year storage volume is 1.86 ac-ft with a peak outflow of 39.4 cfs.
- Pond 6 is located near the northwest corner of the site and upstream of Pond 5. The pond discharges into a natural drainageway which outlets into an unnamed tributary of East Cherry Creek. The pond is planned to store a maximum of 2.93 ac-ft during the 100-year event and have a peak outflow of 48.2 cfs which is greater than the predevelopment peak outflow of 47.5 cfs. The 5-year storage volume is 1.77 ac-ft with a peak outflow of 12.2 cfs.
- Pond 7 is located in the central portion of site. The pond discharges into a natural drainageway that eventually outlets to an unnamed tributary of East Cherry Creek. The pond is planned to store a maximum of 12.59 ac-ft during the 100-year event and have a peak outflow of 172.2 cfs which is slightly lower than the predevelopment peak outflow of 191.6 cfs. The 5-year storage volume is 8.38 ac-ft with a peak outflow of 65.4 cfs.
- Pond 8 is located near the central portion of the site and downstream of Pond 7. The pond discharges into an unnamed tributary of East Cherry Creek. The pond is planned to store a maximum of 0.94 ac-ft during the 100-year event and have a peak outflow of 28.9 cfs which lower than the predevelopment peak outflow of 32.7. The 5-year storage volume is 0.84 ac-ft with a peak outflow of 11.4 cfs.
- Pond 9 is located near the southeast corner of the site just and adjacent to Black Forest Road. The pond discharges into a natural drainageway and flows under Black Forest Rd. via culvert. The natural drainageway is southeast of the existing property and eventually drains northeast to East Cherry Creek. The pond is planned to store a maximum of 10.31 ac-ft during the 100-year

event and have a peak outflow of 220.7 cfs which is lower than the predevelopment peak outflow of 282.3 cfs. The 5-year storage volume is 6.28 ac-ft with a peak outflow of 94.8 cfs.

- Pond 10 is located on the north central portion of the site and north of Stagecoach Road. The pond discharges into an unnamed tributary of East Cherry Creek. The pond is planned to store a maximum of 0.94 ac-ft during the 100-year event and have a peak outflow of 33.9 cfs which is lower than the predevelopment peak outflow of 39.2 cfs. The 5-year storage volume is 0.68 ac-ft with a peak outflow of 13.6 cfs.
- Pond 11 is located near the central portion of the site. The pond discharges into a natural drainageway which eventually discharges into the Irrigation Pond. The pond is planned to store a maximum of 6.83 ac-ft during the 100-year event and have a peak outflow of 230.0 cfs which is above than the predevelopment peak outflow of 221.3 cfs. The 5-year storage volume is 3.66 ac-ft with a peak outflow of 98.4 cfs.
- Existing Pond 12 is designed in the Classic Homes Filing No. 1 FDR and located near the northwest corner of the site and north of Stagecoach Road. The pond discharges into an unnamed tributary of East Cherry Creek. The pond is planned to have a peak outflow of 45.0 cfs.
- Pond 13 is located central portion of the site and just west of the major ridgeline between the two basins. The pond discharges into a natural drainageway to an existing pond of Filing No. 1, which ultimately outlets to Black Squirrel Creek. The pond is planned to store a maximum of 1.8 ac-ft during the 100-year event and have a peak outflow of 54.2 cfs which lower than the predevelopment peak outflow of 55.0. The 5-year storage volume is 1.3 ac-ft with a peak outflow of 17.2 cfs.
- Pond 14 is located near the southwest corner of the site just east of the Black Squirrel Creek. The pond discharges into a natural drainageway of Black Squirrel Creek. The pond is planned to store a maximum of 3.99 ac-ft during the 100-year event and have a peak outflow of 152.3 cfs which is slightly lower than the predevelopment peak outflow of 173.0 cfs. The 5-year storage volume is 1.06 ac-ft with a peak outflow of 59.0 cfs.
- Pond 15 is near the central portion of the site. The pond discharges into a natural drainageway which eventually discharges into the existing Irrigation Pond. The pond is planned to store a maximum of 3.23 ac-ft during the 100- year event and have a peak outflow of 68.4 cfs which is slightly above the predevelopment peak of 67.8 cfs. The 5-year storage volume is 1.94 ac-ft with a peak outflow of 30.9 cfs.
- Pond 16 is near the central portion of the site. The pond discharges into a culvert and goes under Stagecoach Road, which eventually discharges into an existing drainageway of East Cherry Creek. The pond is planned to store a maximum of 5.40 ac-ft during the 100-year event and have a peak outflow of 63.8 cfs which is slightly below the predevelopment peak of 71.2 cfs. The 5 year storage volume is 4.66 ac-ft with a peak outflow of 24.3 cfs.

- Pond 17 is near near the central portion of the site. The pond discharges into a natural drainageway which eventually discharges into an existing drainageway of Black Squirrel Creek. The pond is planned to store a maximum of 1.23 ac-ft during the 100 year event and have a peak outflow of 49.6 cfs which is slightly below the predevelopment peak of 49.9 cfs. The 5 year storage volume is 1.09 ac-ft with a peak outflow of 16.8 cfs..
- The existing Irrigation Pond is in the central portion of site and just south of existing Stagecoach Road. The pond discharges towards an unnamed tributary of East Cherry Creek. The irrigation pond was design and subsequently built as part of the Filing 1 project. Storage Volumes for the pond assumed different upstream development conditions and therefore the pond will receive a higher volume of water during the storm events however the rate into the pond will be reduced. The irrigation pond will store 35.92 ac-ft during the 100-year event with a peak outflow of 274.73 cfs and the 5 year storage volume is 19.67 ac-ft with a peak outflow of 114.0 cfs.

The site plans propose the construction of 2 culverts in the southwest corner of site that navigates flow under roads to proposed Detention Pond 14. Analyses were completed by flow master and calculations can be found in Appendix E.

- Culvert 1 carries flow from Subbasin II3 to Subbasin II2 in the southwest corner of site. Each of the basins consist of the Flying Horse Golf Course and 2.5-acre estate lots. The culvert is 36” RCP at a 1% slope and designed for the 100-year event. The culvert will have a peak outflow of 58.65 cfs, where the pipe is 72% full.
- Culvert 2 carries flow from Subbasin II2 to Subbasin II1 in the southwest corner of site. Each of the basins consist of the Flying Horse Golf Course and 2.5-acre estate lots. The culvert is 42” RCP at a 2% slope and designed for the 100-year event. The culvert will have a peak outflow of 116.62 cfs, where the pipe is 68% full.

The culverts sizes should be refined in the PDR and FDR. Energy dissipation calcs can also be performed later within the design.

Overall runoff from the site will by and large match or be less than predevelopment peak flows sans those for outfall 5 which is slightly greater than predevelopment flows. The volume of water will increase however as the drainage channels are designs, continuous simulation models will be done to see the effects of prolonged runoff rates. Predevelopment and post development flows for the 5-year and 100-year events are summarized in the following table for the 5 site outfalls.

OUTFALL	Predevelopment		Postdevelopment*	
	5 year	100 year	5 year	100 year
1	320.31	725.59	183.76	705.93
2	145.46	311.00	80.36	242.18
3	167.76	361.56	70.06	271.49
4	346.26	733.92	230.07	646.46
5	24.12	50.88	16.85	45.91

*Values to be refined with Preliminary and Final Drainage Reports for each filing

VIII. Drawings

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

IX. Summary

Flying Horse North is a large master planned community consisting of various densities of dwelling units to include single family homes, multifamily homes, parks, institutional sites, and commercial areas. Due to development increased runoff will occur. To mitigate downstream impacts, 16 large full spectrum detention facilities will be built to reduce the runoff rate to near historic levels. These detention facilities will provide water quality enhancements to account for the increased urbanization of the upstream catchment areas. The ponds are preliminarily sized to ensure that the 5-year and 100-year release rates are equal to or less than the historic rates. For the PDR and FDR, the consultant will need to use a routing software to accurately model the routed hydrographs for ponds upstream of the irrigation pond. The irrigation pond has a 12 hour drain time for WQCV. All drains times must be within 72 hours for the 5-year storm or within 120 hours for storm events greater than the 5-year storm per Senate Bill 15-212.

Additional analysis will be required and completed to review the hydraulics of the proposed major drainage channels and be included in future submittals. The proposed design, as described in this report, is not anticipated to cause any adverse impact to downstream properties however as noted previously due to the increased volume of water, downstream tributaries will see increases in the volume of flow. It is advised that low impact design be considered when designing and developing each filing. This shall include those items listed in the four-step process above and any additional measures that are within reason to disconnect impervious areas and increase infiltration. This will alleviate the additional volume of water due to development. Although the rate will remain at or below historic levels, the amount of time the channels will see water will increase which may cause more channel movement than historic. Downstream planning efforts should allow for the natural migration and movement of the channel by continuing to provide large floodplain areas to allow movement of the channel.

X. 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

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 Irrigation Reservoir Embankment Design Report, Classic Consulting Engineers and Surveyors, August 2018

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

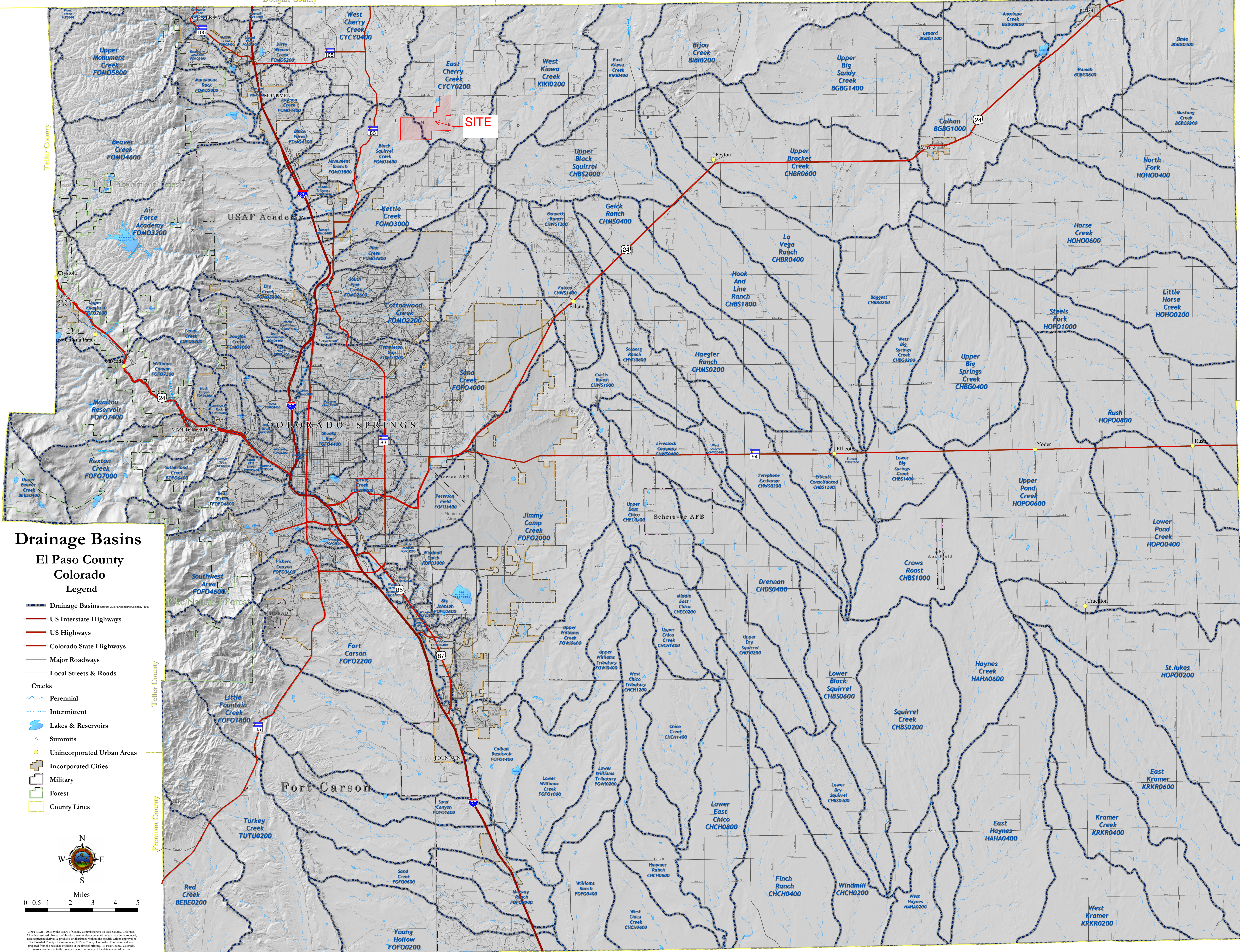


Appendix A



Douglas County

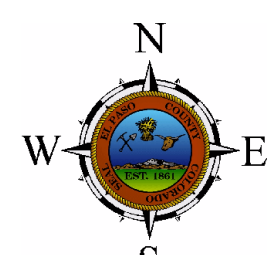
Elbert County



Drainage Basins

El Paso County Colorado Legend

- Drainage Basins (Source: Mule 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



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Teller County

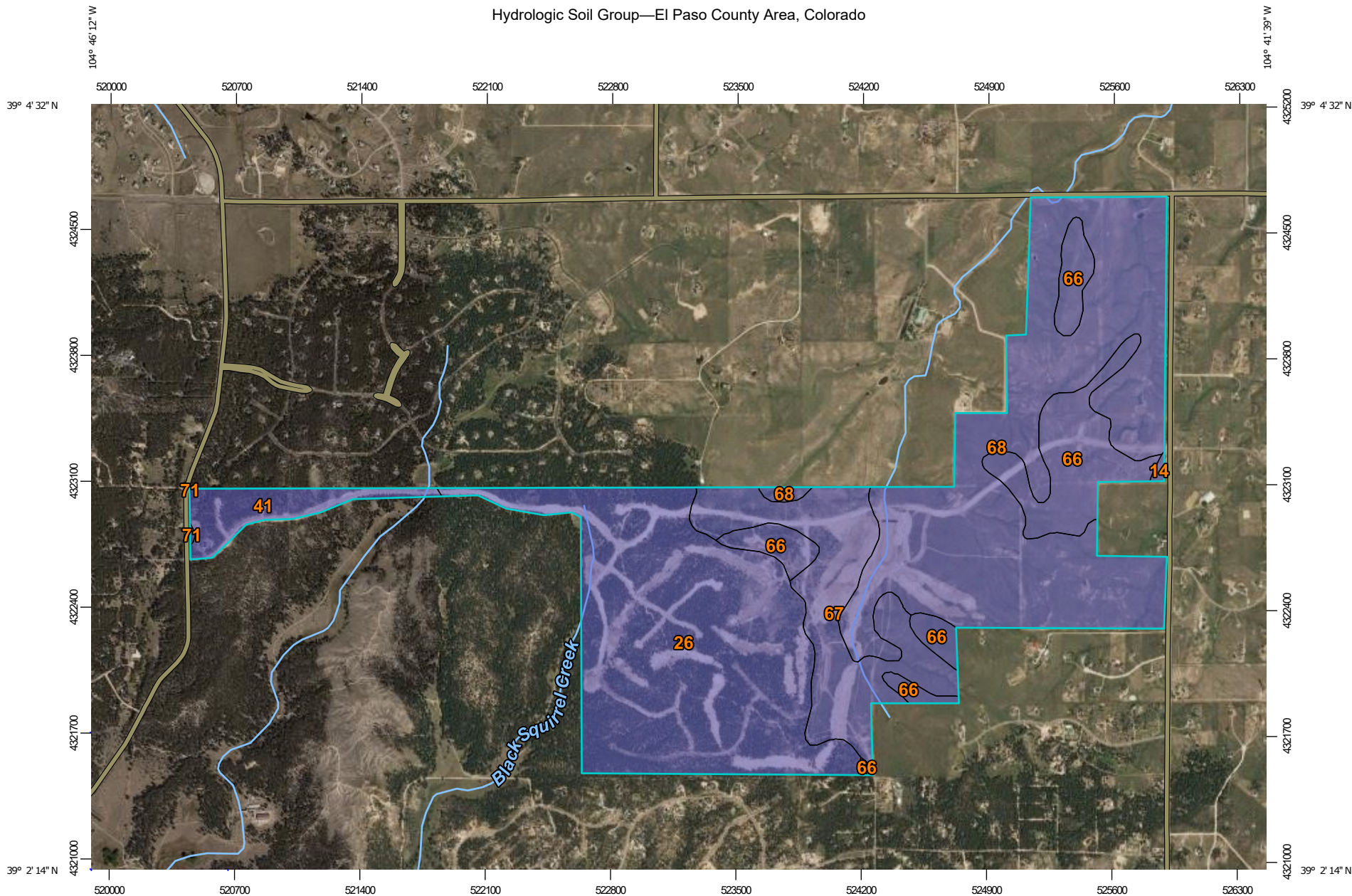
Fremont County

Elbert County

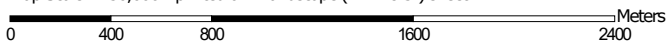
Lincoln County

Pueblo County

Hydrologic Soil Group—El Paso County Area, Colorado



Map Scale: 1:30,000 if printed on A landscape (11" x 8.5") sheet.




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 19, Aug 31, 2021

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

Date(s) aerial images were photographed: Aug 19, 2018—May 26, 2019

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	1.9	0.1%
26	Elbeth sandy loam, 8 to 15 percent slopes	B	474.2	33.7%
41	Kettle gravelly loamy sand, 8 to 40 percent slopes	B	53.4	3.8%
66	Peyton sandy loam, 1 to 5 percent slopes	B	160.9	11.4%
67	Peyton sandy loam, 5 to 9 percent slopes	B	182.8	13.0%
68	Peyton-Pring complex, 3 to 8 percent slopes	B	533.4	37.9%
71	Pring coarse sandy loam, 3 to 8 percent slopes	B	0.6	0.0%
Totals for Area of Interest			1,407.3	100.0%

Description

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

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

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

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

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

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

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

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

NOTES TO USERS

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NGS Information Services
 NOAA, NNGS12
 National Geodetic Survey
 SSMC-3, #9202
 1315 East-West Highway
 Silver Spring, MD 20910-3282

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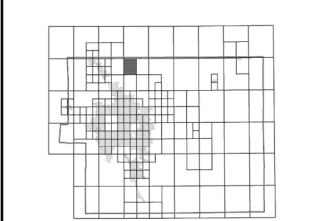
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El Paso County Vertical Datum Offset Table

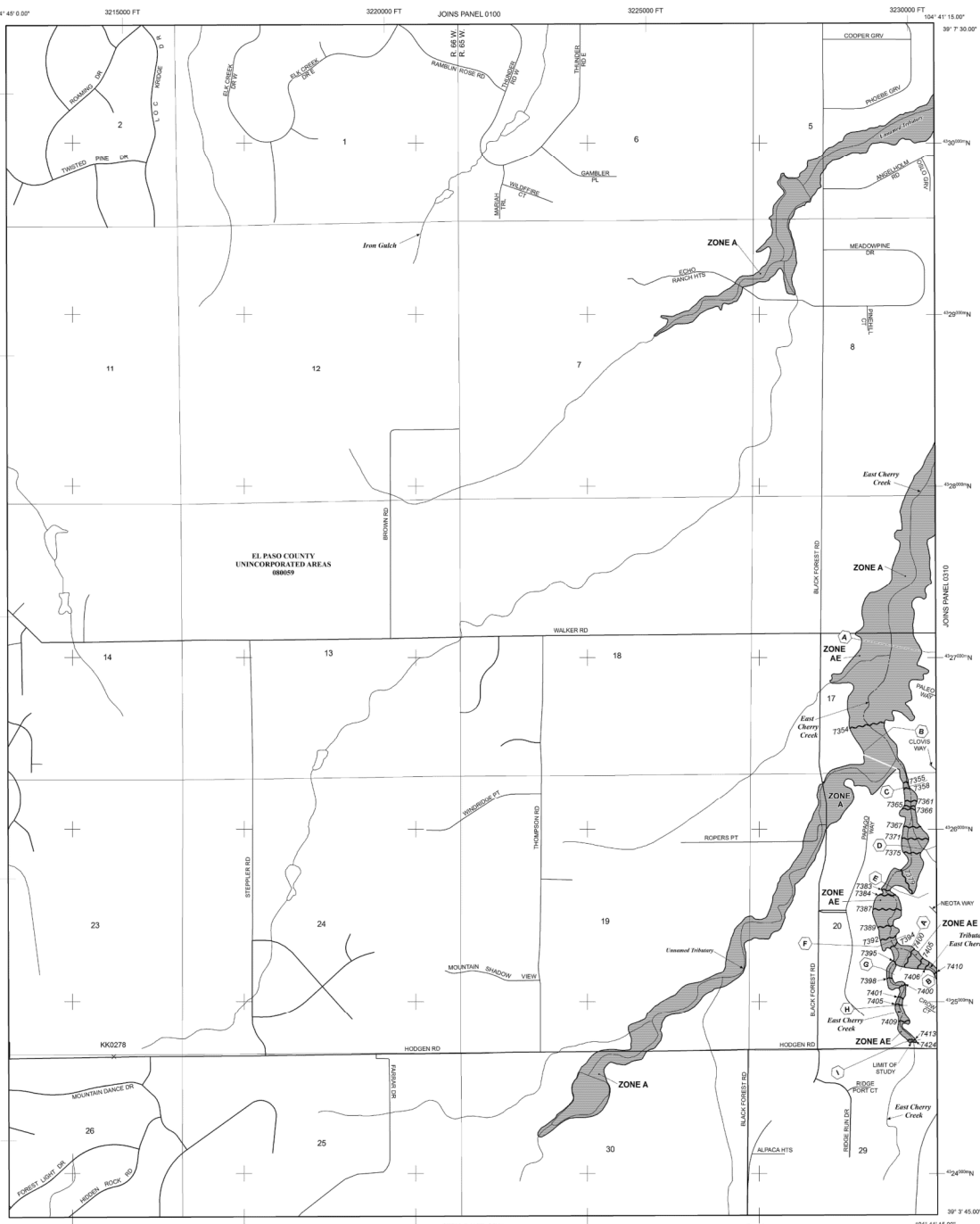
Flooding Source	Vertical Datum Offset (ft)
REFER TO SECTION 3.3 OF THE EL PASO COUNTY FLOOD INSURANCE STUDY FOR STREAM BY STREAM VERTICAL DATUM CONVERSION INFORMATION.	

Panel Location Map



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

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



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 Zone A, AE, AH, AO, AR, AR9, 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); Base Flood Elevations determined.

ZONE AR Special Flood Hazard Area Formerly protected from the 1% annual chance flood by a flood control system that was subsequently abandoned. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.

ZONE AR9 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 floodways in the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachments 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 in any given area. The Special Flood Hazard Area is the area subject to flooding by the 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 A boundary
 Zone D boundary
 CBRS and OPA boundary

Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
 Base Flood Elevation line where uniform within zone; elevation in feet.
 Base Flood Elevation value where uniform within zone; elevation in feet.

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

Criss section line

513
 (EL 987)
 Base Flood Elevation value where uniform within zone; elevation in feet

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

Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)

1000-meter Universal Transverse Mercator grid, zone 13

6000000 FT
 1000-foot grid ticks: Colorado State Plane coordinate system, central area (EPSK06 650), Lambert Conformal Conic Projection

Bench mark (see explanation in Notes to Users section of this FIRM report)

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 1, 2011. In update incorporates limits to the 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'

0 500 1000 2000 FEET
 0 150 300 600 METERS

NFP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0305G

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 0305 030 5

Map Number shown below should be used when displaying map online. 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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Panel Location Map

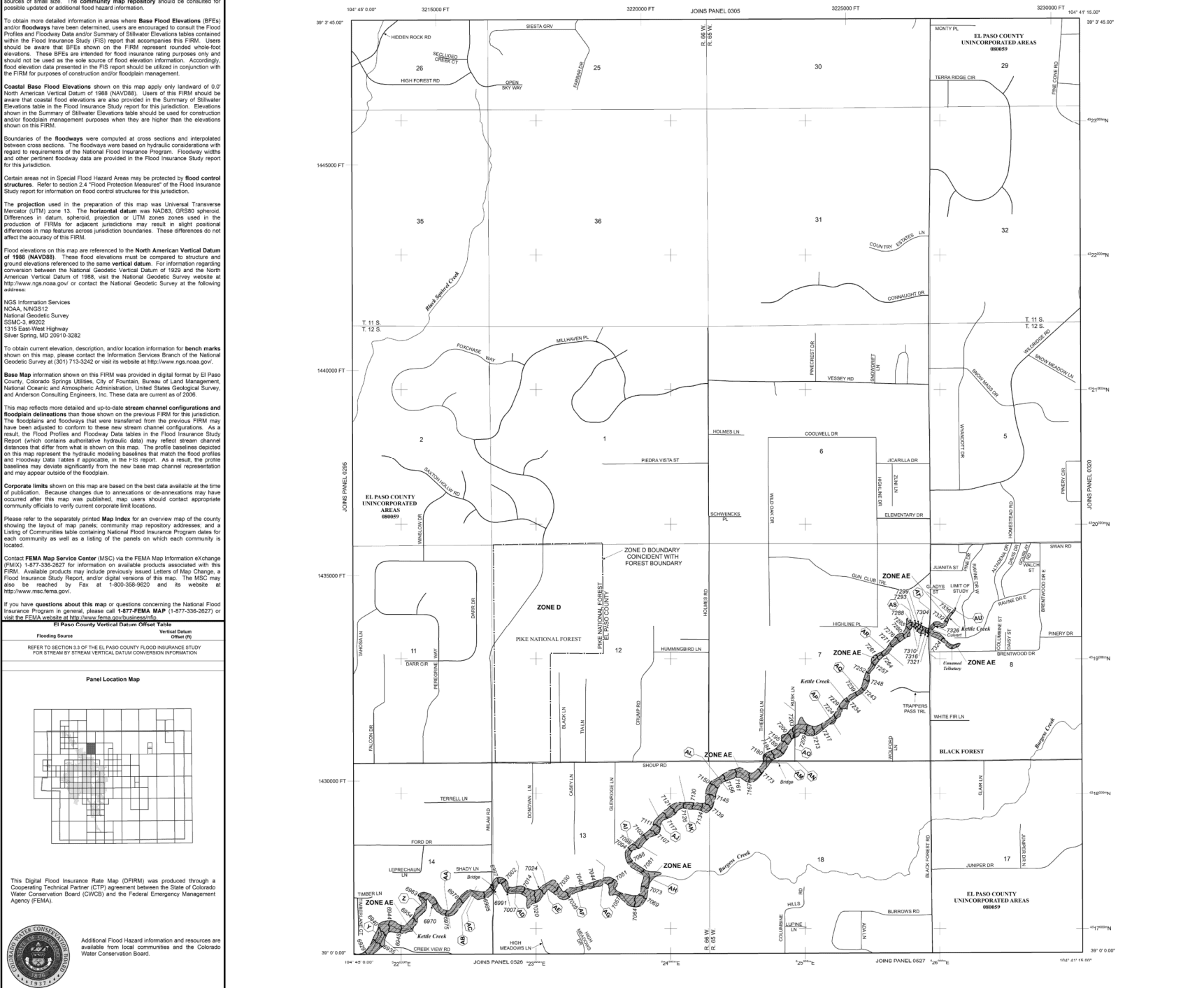
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Additional Flood Hazard information and resources are available from local communities and the Colorado Water Conservation Board.



LEGEND

- SPECIAL FLOOD HAZARD AREAS (SFHAS) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD**
- The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones AE, AH, AO, AV, AR, and VE. The base flood elevation is the water-surface elevation of the 1% annual chance flood.
- ZONE A** No Base Flood Elevations determined.
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 structural flood 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 removed. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
- ZONE AV** Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
- ZONE VE** Coastal flood zone with velocity hazard (wave action); no 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 encroachments 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 average 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. Areas in which flood hazards are undetermined, but possible.
- ZONE D** 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.
Base Flood Elevation line and value; elevation in feet*
Base Flood Elevation value where uniform within zone; elevation in feet*
Crisis section line
Transect line
Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
1000-meter Universal Transverse Mercator grid ticks, zone 13
1000-foot grid ticks - Colorado State Plane coordinate system, central zone (EPSK09030)
Lambert Conformal Conic Projection
Bench mark (See explanation in Notes to Users section of this FIRM report)
M1.5
River Mile
- MAP REPOSITORIES**
Refer to Map Repositories list on Map Index
- EFFECTIVE DATE OF COUNTY-WIDE FLOOD INSURANCE RATE MAP**
MARCH 17, 1997
- EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL**
DECEMBER 7, 2018. In update increases limits in the 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'**
-



NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0316G

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 SURFEX
EL PASO COUNTY 0808 0316 G

MAP NUMBER
08041C0315G

MAP REVISED
DECEMBER 7, 2018

Federal Emergency Management Agency

Note to User: The Map Number shown below should be used when ordering map forms. The Community Number shown above should be used on recurrence applications for the subject community.

National Flood Hazard Layer FIRMMette



104°42'47"W 39°4'31"N



Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS		Without Base Flood Elevation (BFE) Zone A, V, A99
		With BFE or Depth Zone AE, AO, AH, VE, AR
		Regulatory Floodway
OTHER AREAS OF FLOOD HAZARD		0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile Zone X
		Future Conditions 1% Annual Chance Flood Hazard Zone X
		Area with Reduced Flood Risk due to Levee. See Notes. Zone X
		Area with Flood Risk due to Levee Zone D
OTHER AREAS		NO SCREEN Area of Minimal Flood Hazard Zone X
		Effective LOMRs
GENERAL STRUCTURES		Area of Undetermined Flood Hazard Zone D
		Channel, Culvert, or Storm Sewer
		Levee, Dike, or Floodwall
OTHER FEATURES		20.2 Cross Sections with 1% Annual Chance
		17.5 Water Surface Elevation
		8 Coastal Transect
		5.1 Base Flood Elevation Line (BFE)
		Limit of Study
		Jurisdiction Boundary
MAP PANELS		Digital Data Available
		No Digital Data Available
		Unmapped
		The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.



0 250 500 1,000 1,500 2,000 Feet 1:6,000

104°42'9"W 39°4'4"N

Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 9/9/2022 at 3:00 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.



Dam Overview

Dam Name FRANKTOWN PARKER FPE-2 (080130)
Administration Type Jurisdictional Dam
NID ID CO00274
WDID
Physical Status Active
Hazard Class Low
Stream EAST CHERRY CR
Last Inspection Result Conditionally Satisfactory (04/11/2018)

▼ **Location**

Division 1
Water District 8
County EL PASO
Downstream Town FRANKTOWN
Town Distance 25



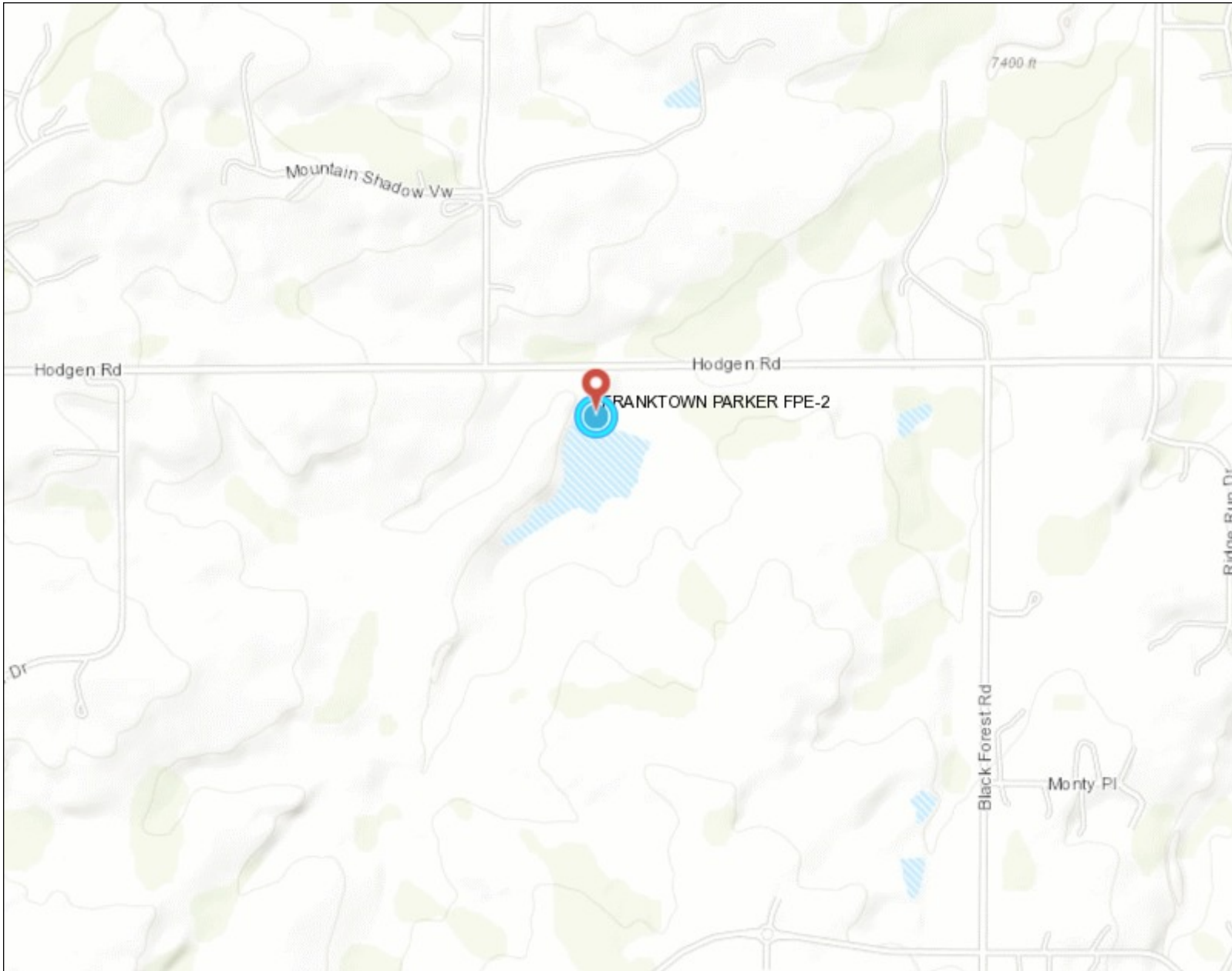
Q40	Q160	Section	Township	Range	PM	UTM X	UTM Y	Latitude	Longitude	Location Accuracy
NE	NW	30	11.0 S	65.0 W	S	524990.8	4324584.3	39.070004	-104.711118	GPS

▼ **Dam Details**

Primary Name EL PASO COUNTY
EAP Not Required
EAP Date
Primary Contact STEVE JACOBSEN
EAP Inundation Map No
Inundation Map Date



Map Viewer



Legend

Jurisdictional Dam

- High
- Significant
- Low
- NPH

Non Jurisdictional Dam

-

County

-

Location

Notes

2,339 0 1,169 2,339 Feet



1: 14,032



This product is for informational purposes and may not have been prepared for, or be suitable for legal, engineering, or surveying purposes. Users of this information should review or consult the primary data and information sources to ascertain the usability of the information.

Date Prepared: 9/22/2021 11:42:36 AM



Appendix B

Basin Description	Park/Open Space	5 Acre	2.5 Acre	Low Density	Med Density	Commercial	Total Impervious	Total Acreage	Composite Percent Impervious	Predominant Soil Group	5 Year C Factor	100 Year C Factor
Impervious Percentage	10%	10%	15%	45%	55%	75%						
P	15.55	14.78	0.00	13.38	0.00	0.00	9.05	43.71	20.71%	B	0.15	0.41
						Pond 1		43.71	20.71%			
X1	38.32	3.30	0.00	25.66	0.00	9.10	22.53	76.38	29.50%	B	0.24	0.47
						Pond 2		76.38	29.50%			
O	13.17	0.00	10.72	28.63	0.00	0.00	15.81	52.52	30.10%	B	0.19	0.44
						Pond 3		52.52	30.10%			
X2	12.11	0.00	0.00	24.22	0.00	0.00	12.11	36.33	33.33%	B	0.19	0.44
X3	38.88	16.85	0.00	6.26	0.00	0.00	8.39	61.99	13.53%	B	0.13	0.40
V2	0.00	0.00	15.34	0.00	0.00	0.00	2.30	15.34	15.00%	B		
V1	2.11	0.00	0.00	9.46	0.00	0.00	4.47	11.57	38.62%	B	0.20	0.45
						Pond 4		125.23	20.85%			
N	10.44	11.52	0.00	6.77	12.84	0.00	12.30	41.57	29.60%	B	0.19	0.46
						Pond 5		41.57	29.60%			
M	14.55	0.00	0.00	1.24	6.94	4.10	8.91	26.83	33.19%	B	0.28	0.52
						Pond 6		26.83	33.19%			
K	26.45	2.93	0.00	61.89	23.46	0.00	43.69	114.73	38.08%	B	0.21	0.47
						Pond 7		114.73	38.08%			
L	6.93	5.54	0.00	0.00	2.72	0.00	2.74	15.19	18.06%	B	0.15	0.42
						Pond 8		15.19	18.06%			
S	2.31	0.24	0.00	19.12	0	0.00	8.86	21.67	40.88%	B	0.21	0.45
R	26.63	16.11	0.00	21.77	0.00	0.00	14.07	64.51	21.81%	B	0.15	0.41
						Pond 9		86.18	21.81%			
H	17.65	4.31	0.00	0.00	0.00	0.00	2.20	21.96	10.00%	B	0.12	0.39
						Pond 10		21.96	10.00%			
B2	7.20	4.48	0.00	8.31	0.00	0.00	4.91	19.99	24.55%	B	0.16	0.42
B1	12.86	13.03	0.00	33.85	0.00	0.00	17.82	59.74	29.83%	B	0.18	0.43
						Pond 11		79.73	28.51%			
J	28.07	0.00	0.00	0.00	0.00	0.00	2.81	28.07	10.00%	B	0.12	0.39
						Existing Pond 12						
I	17.99	0.00	0.00	0.00	0.00	11.00	10.05	28.99	34.66%	B	0.38	0.58
						Pond 16		57.06	22.53%			
EE2	0.00	0.00	0.00	0.00	0.00	16.36	12.27	16.36	75.00%	B	0.81	0.88
EE3	0.00	0.00	0.00	0.00	6.67	0.00	3.67	6.67	55.00%	B	0.30	0.58
						Pond 13		23.03	69.21%			
II2	0.00	23.13	0.00	0.00	0.00	0.00	2.31	23.13	10.00%	B	0.12	0.39
II3	0.00	23.97	0.00	0.00	0.00	0.00	2.40	23.97	10.00%	B	0.12	0.39
II1	15.77	34.66	0.00	0.00	0.00	0.00	5.04	50.43	10.00%	B	0.12	0.39
						Pond 14		97.53	10.00%			
D	4.41	4.70	0.00	31.76	0.00	0.00	15.20	40.87	37.20%	B	0.20	0.44
						Pond 15		40.87	37.20%			
E	99.63	8.80	0.00	1.72	0.00	6.90	16.79	117.05	14.35%	B	0.16	0.42
G	25.81	3.41	0.00	2.23	0.00	0.00	3.93	31.45	12.48%	B	0.13	0.39
						Irrigation Pond		148.50	13.95%			
JJ	1.86	4.32	0.00	2.72	0.00	0.00	1.84	8.90	20.70%	B	0.15	0.41
LL	4.39	1.44	0.00	0.37	0.00	0.00	0.75	6.20	12.09%	B	0.13	0.39
						Pond 17		15.10	17.16%			
KK	5.98	2.42	0.00	0.00	0.00	0.00	8.40	8.40	10.00%	B	0.12	0.39
AA	0.00	33.88	0.00	0.00	0.00	0.00	3.39	33.88	10.00%	B	0.12	0.39
BB	0.00	37.15	0.00	0.00	0.00	0.00	3.72	37.15	10.00%	B	0.12	0.39
CC	0.00	6.33	0.00	0.00	0.00	0.00	6.33	6.33	10.00%	B	0.12	0.39
DD	0.00	69.5	0.00	0.00	0.00	0.00	6.95	69.50	10.00%	B	0.12	0.39
FF	0.00	18.1	0.00	0.00	0.00	0.00	1.81	18.10	10.00%	B	0.12	0.39
GG	0.00	16.35	0.00	0.00	0.00	0.00	1.64	16.35	10.00%	B	0.12	0.39
HH	0.00	12.7	0.00	0.00	0.00	0.00	1.27	12.70	10.00%	B	0.12	0.39

*2% imperviousness for all, and runoff coefficients are .09 and .36 for 5 and 100 yr respectively

Summary of Unit Hydrograph Parameters Used By Program and Calculated Results (Version 2.0.1)

Catchment Name/ID	User Comment for Catchment	Unit Hydrograph Parameters and Results									Excess Precip.		Storm Hydrograph			
		CT	Cp	W50 (min.)	W50 Before Peak	W75 (min.)	W75 Before Peak	Time to Peak (min.)	Peak (cfs)	Volume (c.f)	Excess (inches)	Excess (c.f.)	Time to Peak (min.)	Peak Flow (cfs)	Total Volume (c.f.)	Runoff per Unit Area (cfs/acre)
1	P	0.156	0.139	37.1	5.47	19.3	3.87	9.1	55	158,994	1.36	215,685	40.0	39	215,259	0.89
2	X	0.156	0.249	50.8	11.22	26.4	7.93	18.7	176	692,894	1.36	939,952	50.0	139	939,989	0.73
3	O	0.156	0.108	34.9	4.39	18.2	3.10	7.3	33	89,879	1.36	121,926	40.0	23	121,661	0.92
4	N	0.156	0.147	25.7	4.39	13.4	3.10	7.3	89	177,870	1.36	241,291	35.0	57	240,676	1.16
5	W	0.156	0.046	33.7	2.70	17.5	1.90	4.5	5	13,649	1.36	18,515	35.0	3	18,246	0.92
6	M	0.156	0.083	40.0	4.05	20.8	2.86	6.7	16	50,348	1.36	68,300	40.0	11	68,114	0.83
7	V	0.156	0.132	45.0	6.05	23.4	4.27	10.1	40	140,009	1.36	189,931	45.0	30	189,854	0.77
8	U	0.156	0.055	44.5	3.37	23.2	2.38	5.6	6	19,892	1.36	26,985	40.0	4	26,889	0.76
9	L	0.156	0.090	32.6	3.74	17.0	2.64	6.2	24	59,496	1.36	80,709	35.0	16	80,352	0.96
10	K	0.156	0.196	32.6	6.40	17.0	4.52	10.7	134	338,098	1.36	458,650	40.0	92	458,862	0.99
11	S	0.156	0.107	28.6	3.85	14.9	2.72	6.4	40	88,427	1.36	119,956	35.0	26	119,542	1.07
12	R	0.156	0.154	42.5	6.54	22.1	4.62	10.9	61	199,577	1.36	270,738	45.0	44	270,785	0.80
13	G	0.156	0.151	29.3	4.89	15.2	3.46	8.2	83	189,450	1.36	257,000	35.0	55	256,005	1.05
14	D	0.156	0.132	41.6	5.71	21.6	4.04	9.5	44	140,989	1.36	191,260	40.0	32	191,160	0.81
15	B	0.156	0.160	40.3	6.46	20.9	4.56	10.8	70	216,856	1.36	294,178	40.0	50	294,255	0.84
16	E	0.156	0.221	50.4	10.04	26.2	7.10	16.7	119	464,132	1.36	629,622	50.0	93	629,347	0.73
17	H	0.156	0.099	35.7	4.22	18.6	2.98	7.0	27	74,887	1.36	101,588	40.0	19	101,348	0.90
18	J	0.156	0.115	42.2	5.22	21.9	3.69	8.7	32	103,346	1.36	140,195	40.0	23	139,959	0.80
19	I	0.156	0.121	28.1	4.11	14.6	2.90	6.8	53	115,906	1.36	157,233	35.0	35	156,699	1.08
20	JJ	0.156	0.067	26.0	2.84	13.5	2.01	4.7	16	31,654	1.36	42,940	35.0	10	42,323	1.12
21	LL	0.156	0.057	25.2	2.61	13.1	1.84	4.4	11	22,143	1.36	30,038	35.0	7	29,402	1.13
22	KK	0.156	0.065	33.9	3.20	17.6	2.26	5.3	11	29,476	1.36	39,985	35.0	8	39,724	0.92
23	EE	0.126	0.142	26.2	4.37	13.6	3.09	7.3	124	252,176	1.37	346,639	35.0	81	345,618	1.17
24	DD	0.126	0.143	41.4	6.04	21.5	4.27	10.1	79	254,318	1.37	349,583	40.0	58	349,629	0.83
25	CC	0.126	0.048	29.8	2.61	15.5	1.84	4.3	10	22,978	1.37	31,585	35.0	7	31,056	1.03
26	AA	0.126	0.102	26.1	3.55	13.6	2.51	5.9	60	121,569	1.37	167,107	35.0	39	166,376	1.16
27	BB	0.126	0.107	28.4	3.84	14.8	2.72	6.4	61	134,855	1.37	185,370	35.0	41	184,724	1.09
28	FF	0.156	0.092	26.9	3.41	14.0	2.41	5.7	31	63,961	1.36	86,766	35.0	20	86,304	1.11
29	II	0.156	0.200	40.7	7.75	21.2	5.48	12.9	112	354,034	1.36	480,268	45.0	82	479,975	0.84
30	HH	0.156	0.080	29.6	3.31	15.4	2.34	5.5	20	45,774	1.36	62,096	35.0	13	61,731	1.03
31	GG	0.156	0.089	34.8	3.89	18.1	2.75	6.5	22	59,351	1.36	80,512	40.0	15	80,308	0.91
(OS1) 32	A	0.156	0.096	27.3	3.51	14.2	2.48	5.8	33	68,934	1.36	93,513	35.0	21	93,026	1.10
(OS2) 33	C	0.156	0.126	32.9	4.68	17.1	3.31	7.8	50	126,578	1.36	171,711	40.0	33	171,254	0.96
(OS3) 34	F	0.156	0.109	32.6	4.22	17.0	2.98	7.0	36	91,658	1.36	124,339	35.0	24	123,917	0.96
(OS4) 35	Q	0.156	0.175	37.1	6.48	19.3	4.58	10.8	91	262,413	1.36	355,978	40.0	65	355,849	0.89
(OS5) 36	T	0.156	0.054	43.6	3.29	22.7	2.33	5.5	6	19,021	1.36	25,803	40.0	4	25,686	0.77

Printouts for Storm Hydrographs

flow in cfs

Time in minutes	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	(OS)32	(OS)33	(OS)34	(OS)35	(OS)36
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20	2.82	3.48	2.02	5.45	0.37	1.07	1.85	0.40	1.58	5.79	2.64	2.56	4.68	2.14	2.98	2.78	1.69	1.68	3.39	1.11	0.80	0.79	10.09	4.91	0.93	5.44	5.37	2.13	3.81	1.40	1.45	2.24	2.89	2.27	3.89	0.59
25	18.80	27.13	13.04	35.04	2.31	6.66	12.64	2.53	9.97	40.01	16.73	17.76	30.60	14.43	20.61	21.20	10.87	11.12	21.63	6.95	0.00	4.96	51.39	26.67	4.61	27.07	26.92	13.35	27.49	8.77	17.19	14.08	18.75	14.54	26.98	2.48
30	32.20	67.65	20.11	53.34	3.24	10.00	22.93	3.63	14.51	74.95	24.38	33.73	49.31	25.32	38.86	50.45	16.51	18.62	32.22	9.54	6.81	7.00	76.33	46.83	6.28	37.57	38.42	18.76	57.40	12.34	13.56	19.93	29.68	22.02	50.95	3.55
35	37.59	103.16	22.47	56.97	3.45	11.18	27.54	4.01	15.71	89.75	25.59	41.20	54.90	29.98	47.20	73.62	18.37	21.73	34.58	9.74	6.88	7.51	81.16	55.57	6.53	38.76	40.62	19.51	74.33	13.01	14.88	20.84	33.29	24.27	61.71	3.91
40	38.83	124.37	22.69	54.61	3.41	11.48	29.34	4.15	15.53	92.05	25.51	43.97	53.65	31.56	50.01	85.68	18.58	22.78	33.51	9.35	6.59	7.45	77.77	58.42	6.34	37.09	39.28	18.79	80.97	12.66	14.93	20.11	33.26	24.13	64.68	4.04
45	37.82	134.83	22.01	51.22	3.31	11.24	29.63	4.12	15.02	88.60	24.01	44.21	51.36	31.41	49.79	91.24	18.06	22.66	31.84	8.81	6.19	7.22	72.99	58.09	6.07	34.82	37.29	17.75	81.77	12.11	14.48	19.03	32.21	23.30	63.33	3.99
50	36.92	138.66	21.39	48.22	3.22	11.07	29.11	4.08	14.53	85.11	22.86	43.25	49.03	30.77	48.59	92.81	17.59	22.25	30.23	8.36	5.87	7.02	68.67	56.74	5.80	32.88	35.42	16.82	79.60	11.60	14.09	18.03	31.10	22.51	61.61	3.95
55	35.74	137.39	20.54	45.47	3.08	10.79	28.60	4.00	13.83	81.17	21.71	42.31	46.51	30.07	47.34	91.29	16.94	21.76	28.69	7.89	5.53	6.72	64.77	55.32	5.52	31.00	33.58	15.93	77.56	11.03	13.52	17.20	29.67	21.44	59.64	3.87
60	34.38	134.37	19.77	42.83	2.98	10.46	28.03	3.92	13.34	77.66	20.74	41.24	44.46	29.23	45.88	89.61	16.31	21.20	27.35	7.45	5.20	6.49	61.11	53.67	5.29	29.23	32.01	15.13	75.26	10.57	13.03	16.17	28.53	20.65	57.32	3.79
65	33.42	132.08	19.22	40.10	2.90	10.20	27.40	3.84	12.93	74.96	19.77	40.09	42.52	28.38	44.42	88.22	15.87	20.61	26.02	6.99	4.85	6.30	57.32	52.02	5.07	27.41	30.44	14.29	72.80	10.13	12.67	15.41	27.63	19.99	55.57	3.70
70	32.67	129.88	18.71	37.41	2.81	10.01	26.80	3.77	12.51	72.41	18.77	39.24	40.53	27.84	43.51	86.72	15.48	20.23	24.62	6.54	4.51	6.12	53.59	50.94	4.83	25.62	28.81	13.44	71.13	9.67	12.33	14.52	26.74	19.34	54.26	3.64
75	31.65	127.10	17.97	35.03	2.68	9.74	26.26	3.69	11.89	69.15	17.47	38.39	37.93	27.21	42.48	84.83	14.90	19.78	22.87	6.12	4.25	5.85	49.95	49.74	4.51	23.92	26.77	12.49	69.50	9.04	11.83	13.46	25.49	18.39	52.62	3.56
80	30.26	123.94	17.01	32.95	2.52	9.38	25.58	3.59	11.12	64.89	16.30	37.25	35.20	26.33	41.03	82.83	14.15	19.16	21.39	5.76	4.00	5.50	46.93	48.09	4.19	22.48	24.99	11.74	67.30	8.39	11.18	12.65	23.91	17.21	50.36	3.45
85	28.72	121.14	16.00	31.11	2.36	8.99	24.82	3.48	10.38	60.44	15.46	35.96	33.28	25.36	39.37	80.95	13.35	18.48	20.30	5.45	3.78	5.16	44.35	46.24	3.97	21.26	23.69	11.14	64.70	7.96	10.51	12.01	22.31	16.05	47.81	3.34
90	27.15	118.36	15.07	29.45	2.25	8.59	24.03	3.36	9.91	57.34	14.78	34.60	31.83	24.34	37.64	79.04	12.58	17.77	19.38	5.18	3.58	4.90	42.04	44.32	3.81	20.16	22.63	10.60	61.93	7.63	9.92	11.45	21.23	15.32	45.18	3.22
95	25.76	115.47	14.48	27.89	2.17	8.19	23.21	3.25	9.57	55.17	14.17	33.22	30.55	23.30	35.88	77.07	12.06	17.04	18.54	4.91	3.38	4.72	39.89	42.36	3.66	19.13	21.66	10.11	59.10	7.33	9.55	10.93	20.47	14.78	42.76	3.10
100	24.47	111.99	13.76	25.59	2.05	7.68	22.11	3.07	9.04	52.49	13.19	31.42	28.66	21.96	33.75	74.65	11.44	16.07	17.25	4.50	3.08	4.47	36.69	39.91	3.42	17.53	20.14	9.32	55.77	6.85	9.05	10.11	19.39	13.98	40.69	2.92
105	23.25	107.68	13.03	23.18	1.94	7.29	20.84	2.89	8.52	49.42	12.22	29.45	26.63	20.67	31.52	71.64	10.86	15.10	15.93	4.09	2.78	4.22	33.37	37.57	3.18	15.93	18.62	8.54	52.60	6.38	8.58	9.29	18.28	13.17	38.65	2.75
110	22.13	102.87	12.26	20.87	1.84	6.96	19.64	2.74	8.03	46.45	11.29	28.01	24.69	19.70	30.45	68.33	10.32	14.39	14.66	3.70	2.49	4.00	30.18	35.79	2.96	14.41	17.17	7.80	50.08	5.93	8.13	8.51	17.23	12.40	36.77	2.62
115	21.09	97.87	11.73	18.77	1.74	6.68	18.78	2.63	7.57	43.67	10.42	26.86	22.88	18.89	29.15	64.92	9.81	13.81	13.88	3.34	2.23	3.79	27.20	34.30	2.75	13.00	15.81	7.10	47.91	5.51	7.72	7.77	16.25	11.69	35.02	2.51
120	20.02	92.74	11.06	16.98	1.63	6.37	18.02	2.52	7.07	40.83	9.47	25.73	20.95	18.08	27.85	61.47	9.27	13.22	12.20	3.00	2.04	3.55	24.35	32.80	2.52	11.64	14.33	6.36	45.79	5.05	7.27	6.99	15.20	10.92	33.25	2.41
125	18.19	87.18	9.84	14.26	1.43	5.79	16.80	2.31	6.15	36.37	7.85	23.93	17.76	16.70	25.74	57.84	8.28	12.19	10.08	2.47	1.68	3.11	20.41	30.34	2.11	9.65	11.84	5.22	42.65	4.23	6.44	5.71	13.37	9.54	30.40	2.20
130	16.10	81.27	8.57	11.64	1.23	5.20	15.35	2.11	5.23	31.03	6.35	21.72	14.40	15.09	23.17	53.82	7.25	11.04	8.20	2.02	1.37	2.69	16.72	27.41	1.72	7.90	9.59	4.27	38.62	3.44	5.60	4.67	11.43	8.12	26.93	2.00
135	14.09	75.08	7.37	9.43	1.04	4.64	13.95	1.92	4.38	25.87	5.19	19.58	11.69	13.55	20.67	49.59	6.28	9.94	6.71	1.65	1.11	2.29	13.59	24.59	1.39	6.43	7.85	3.50	34.54	2.79	4.81	3.83	9.59	6.79	23.57	1.82
140	12.23	68.95	6.26	7.64	0.88	4.11	12.63	1.74	3.59	21.12	4.29	17.55	9.66	12.10	18.33	45.49	5.39	8.91	5.53	1.34	0.90	1.92	11.07	21.94	1.15	5.24	6.48	2.87	30.66	2.30	4.08	3.15	7.89	5.57	20.43	1.64
145	10.54	63.10	5.24	6.18	0.72	3.63	11.41	1.57	2.92	17.15	3.54	15.68	7.99	10.77	16.17	41.61	4.56	7.96	4.55	1.09	0.73	1.58	8.98	19.50	0.96	4.26	5.35	2.34	27.08	1.91	3.41	2.58	6.38	4.52	17.57	1.48
150	8.94	57.66	4.29	4.97	0.59	3.19	10.29	1.42	2.42	14.19	2.92	13.96	6.61	9.54	14.19	38.02	3.79	7.08	3.74	0.88	0.58	1.29	7.27	17.24	0.80	3.44	4.41	1.91	23.82	1.59	2.79	2.11	5.28	3.75	14.90	1.32
155	7.45	52.70	3.52	3.94	0.49	2.76	9.24	1.27	2.03	11.87	2.39	12.36	5.44	8.39	12.32	34.76	3.08	6.25	3.05	0.70	0.46	1.07	5.80	15.13	0.66	2.75	3.60	1.54	20.77	1.31	2.29	1.71	4.43	3.14	12.39	1.18
160	6.09	48.12	2.95	3.08	0.41	2.37	8.26	1.13	1.70	9.93	1.94	10.85	4.44	7.30	10.57	31.71	2.56	5.48	2.46	0.55	0.36	0.90	4.57	13.14	0.54	2.16	2.91	1.22	17.90	1.07	1.92	1.36	3.71	2.63	10.11	1.05
165	5.05	43.81	2.48	2.39	0.35	1.99	7.34	1.01	1.41	8.24	1.55	9.43	3.58	6.28	8.92	28.85	2.16	4.75	1.96	0.43	0.28	0.76	3.56	11.27	0.44	1.69	2.33	0.96	15.20	0.87	1.62	1.08	3.09	2.19	8.40	0.92
170	4.26	39.79	2.08	1.87	0.29	1.63	6.46	0.88	1.17	6.78	1.24	8.08	2.86	5.30	7.36	26.17	1.81	4.05	1.55	0.34	0.22	0.63	2.79	9.47	0.35											

Summary of Unit Hydrograph Parameters Used By Program and Calculated Results (Version 2.0.1)

Catchment Name/ID	User Comment for Catchment	Unit Hydrograph Parameters and Results									Excess Precip.		Storm Hydrograph			
		CT	Cp	W50 (min.)	W50 Before Peak	W75 (min.)	W75 Before Peak	Time to Peak (min.)	Peak (cfs)	Volume (c.f.)	Excess (inches)	Excess (c.f.)	Time to Peak (min.)	Peak Flow (cfs)	Total Volume (c.f.)	Runoff per Unit Area (cfs/acre)
1	P	0.156	0.139	37.5	5.52	19.5	3.90	9.2	55	158,994	2.54	403,480	45.0	82	402,649	1.88
2	X	0.156	0.249	50.8	11.22	26.4	7.93	18.7	176	692,894	2.54	1,758,362	55.0	299	1,758,430	1.56
3	O	0.156	0.108	34.9	4.39	18.2	3.10	7.3	33	89,879	2.54	228,086	45.0	49	227,590	1.96
4	N	0.156	0.147	25.7	4.39	13.4	3.10	7.3	89	177,870	2.54	451,382	40.0	119	450,230	2.43
5	W	0.156	0.046	33.7	2.70	17.5	1.90	4.5	5	13,649	2.54	34,637	45.0	7	34,132	1.95
6	M	0.156	0.083	40.0	4.05	20.8	2.86	6.7	16	50,348	2.54	127,769	45.0	25	127,421	1.77
7	V	0.156	0.132	45.0	6.05	23.4	4.27	10.1	40	140,009	2.54	355,302	50.0	64	355,159	1.66
8	U	0.156	0.055	44.5	3.37	23.2	2.38	5.6	6	19,992	2.54	50,481	50.0	9	50,301	1.63
9	L	0.156	0.090	32.6	3.74	17.0	2.64	6.2	24	59,496	2.54	150,983	45.0	33	150,313	2.03
10	K	0.156	0.196	32.6	6.40	17.0	4.52	10.7	134	338,098	2.54	857,993	45.0	195	858,390	2.10
11	S	0.156	0.107	28.6	3.85	14.9	2.72	6.4	40	88,427	2.54	224,401	40.0	55	223,627	2.24
12	R	0.156	0.154	42.5	6.54	22.1	4.62	10.9	61	199,577	2.54	506,469	50.0	95	506,557	1.73
13	G	0.156	0.151	29.3	4.89	15.2	3.46	8.2	83	189,450	2.54	480,767	40.0	115	478,906	2.21
14	D	0.156	0.132	41.6	5.71	21.6	4.04	9.5	44	140,989	2.54	357,789	50.0	68	357,603	1.75
15	B	0.156	0.160	40.3	6.46	20.9	4.56	10.8	70	216,856	2.54	550,317	50.0	107	550,461	1.80
16	E	0.156	0.221	50.4	10.04	26.2	7.10	16.7	119	464,132	2.54	1,177,830	55.0	200	1,177,315	1.56
17	H	0.156	0.099	35.7	4.22	18.6	2.98	7.0	27	74,887	2.54	190,041	45.0	40	189,591	1.93
18	J	0.156	0.115	42.2	5.22	21.9	3.69	8.7	32	103,346	2.54	262,262	50.0	49	261,821	1.72
19	I	0.156	0.121	28.1	4.11	14.6	2.90	6.8	53	115,906	2.54	294,135	40.0	73	293,135	2.27
20	JJ	0.156	0.067	26.0	2.84	13.5	2.01	4.7	16	31,654	2.54	80,327	40.0	20	79,174	2.35
21	LL	0.156	0.057	25.2	2.61	13.1	1.84	4.4	11	22,143	2.54	56,192	40.0	14	55,003	2.37
22	KK	0.156	0.065	33.9	3.20	17.6	2.26	5.3	11	29,476	2.54	74,800	45.0	16	74,311	1.97
23	EE	0.126	0.142	26.2	4.37	13.6	3.09	7.3	124	252,176	2.55	643,212	40.0	167	641,316	2.41
24	DD	0.126	0.143	41.4	6.04	21.5	4.27	10.1	79	254,318	2.55	648,674	50.0	124	648,759	1.77
25	CC	0.126	0.048	29.8	2.61	15.5	1.84	4.3	10	22,978	2.55	58,608	40.0	14	57,626	2.14
26	AA	0.126	0.102	26.1	3.55	13.6	2.51	5.9	60	121,569	2.55	310,079	40.0	80	308,721	2.40
27	BB	0.126	0.107	28.4	3.84	14.8	2.72	6.4	61	134,855	2.55	343,966	40.0	84	342,767	2.27
28	FF	0.156	0.092	26.9	3.41	14.0	2.41	5.7	31	63,961	2.54	162,313	40.0	41	161,448	2.33
29	II	0.156	0.200	40.7	7.75	21.2	5.48	12.9	112	354,034	2.54	898,434	50.0	176	897,885	1.80
30	HH	0.156	0.080	29.6	3.31	15.4	2.34	5.5	20	45,774	2.54	116,162	40.0	27	115,480	2.17
31	GG	0.156	0.089	34.8	3.89	18.1	2.75	6.5	22	59,351	2.54	150,614	45.0	32	150,232	1.96
(OS1) 32	A	0.156	0.096	27.3	3.51	14.2	2.48	5.8	33	68,934	2.54	174,933	40.0	44	174,023	2.31
(OS2) 33	C	0.156	0.126	32.9	4.68	17.1	3.31	7.8	50	126,578	2.54	321,218	45.0	71	320,363	2.04
(OS3) 34	F	0.156	0.109	32.6	4.22	17.0	2.98	7.0	36	91,658	2.54	232,600	45.0	52	231,811	2.04
(OS4) 35	Q	0.156	0.175	37.1	6.48	19.3	4.58	10.8	91	262,413	2.54	665,926	45.0	138	665,685	1.91
(OS5) 36	T	0.156	0.054	43.6	3.29	22.7	2.33	5.5	6	19,021	2.54	48,270	45.0	9	48,050	1.66

Printouts for Storm Hydrographs

flow in cfs

Time in minutes	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	(OS)32	(OS)33	(OS)34	(OS)35	(OS)36	
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00
20	1.89	2.38	1.38	3.72	0.25	0.71	1.27	0.37	1.08	3.95	1.80	1.75	3.19	1.46	2.03	1.90	1.16	1.15	2.32	0.76	0.55	0.54	7.65	3.74	0.71	4.12	4.06	1.45	2.60	0.96	0.99	1.53	1.97	1.55	2.66	0.27	
25	16.40	23.27	11.67	31.36	2.09	5.97	11.15	2.27	8.96	35.21	15.03	15.61	27.27	12.78	18.13	18.26	9.73	9.88	19.40	6.27	4.51	4.47	46.24	23.73	4.17	24.47	24.30	12.02	23.96	7.90	8.25	12.67	16.74	13.02	23.73	2.23	
30	46.39	82.49	31.11	83.11	5.29	15.71	32.52	5.84	23.19	104.57	38.93	46.73	74.46	36.52	54.05	62.80	25.75	27.54	50.82	15.77	11.30	11.39	117.59	65.65	10.19	60.28	60.63	30.58	75.91	20.11	21.51	32.35	45.26	34.42	70.80	5.73	
35	69.09	162.29	43.09	112.51	6.85	21.45	50.22	7.76	30.80	163.84	51.46	74.27	105.37	55.21	85.40	118.83	35.33	40.44	68.13	19.89	14.14	14.83	157.98	100.15	12.94	77.20	79.49	39.31	129.02	25.98	28.91	41.83	63.63	46.99	111.84	7.58	
40	79.29	228.50	47.69	119.24	7.31	23.88	59.12	8.60	33.21	190.17	54.65	88.38	115.21	64.18	101.04	161.25	39.04	45.53	72.63	20.50	14.48	15.91	167.45	116.87	13.57	80.22	84.15	41.02	159.97	27.42	31.57	43.83	70.43	51.30	131.63	8.38	
45	82.17	269.90	48.54	116.29	7.33	24.61	63.10	8.94	33.30	195.43	53.91	94.33	114.54	67.65	107.03	185.35	39.78	48.88	71.58	20.00	14.10	15.99	163.51	123.33	13.42	78.17	82.85	40.16	173.37	27.13	31.99	42.98	71.27	51.63	137.80	8.68	
50	81.25	291.70	47.63	110.46	7.19	24.40	63.92	8.95	32.51	190.88	51.86	95.25	110.85	67.84	107.33	197.23	39.11	48.99	68.72	19.05	13.40	15.66	155.55	123.69	12.96	74.34	79.58	38.34	175.60	26.20	31.38	41.09	69.62	50.40	136.63	8.66	
55	79.05	298.70	45.92	103.36	6.90	23.83	62.86	8.79	31.10	182.94	48.99	93.36	105.15	66.39	104.83	199.80	37.78	47.99	64.82	17.87	12.55	15.04	145.67	120.92	12.30	69.64	75.09	36.02	171.77	24.83	30.22	38.64	66.70	48.22	132.78	8.50	
60	76.42	295.79	44.16	97.30	6.64	23.21	61.68	8.64	29.77	174.34	46.62	91.15	99.88	64.72	101.85	196.92	36.40	46.87	61.58	16.89	11.83	14.46	137.37	117.73	11.75	65.74	71.38	34.16	167.01	23.70	29.07	36.69	63.80	46.12	128.07	8.34	
65	73.96	290.36	42.71	91.72	6.44	22.60	60.50	8.47	28.80	167.42	44.59	88.91	95.63	63.02	98.84	193.71	35.23	45.71	58.78	15.97	11.13	14.01	129.80	114.52	11.29	62.13	68.18	32.47	162.06	22.77	28.15	34.94	61.58	44.56	123.64	8.17	
70	70.19	283.34	40.17	82.29	6.01	21.38	57.96	8.04	26.84	157.83	40.73	84.99	88.34	60.00	94.15	188.90	33.18	43.50	53.61	14.24	9.85	13.09	116.95	109.09	10.34	55.61	62.18	29.24	154.87	20.87	26.41	31.58	57.69	41.62	117.58	7.74	
75	66.02	272.60	37.49	72.93	5.58	20.23	54.96	7.65	24.81	145.94	36.70	80.47	80.03	56.82	89.00	181.26	31.05	41.23	48.13	12.66	8.73	12.16	103.92	103.23	9.39	49.45	55.95	26.09	146.57	18.94	24.64	28.21	53.39	38.46	110.47	7.36	
80	61.15	258.84	34.27	64.19	5.06	18.83	51.86	7.19	22.34	132.25	32.32	75.67	70.77	53.28	83.31	171.84	28.47	38.69	42.31	11.16	7.71	11.03	91.36	96.80	8.31	43.49	49.24	22.91	137.53	16.73	22.47	24.76	48.29	34.68	102.36	6.91	
85	56.07	244.43	31.03	57.10	4.55	17.44	48.66	6.74	19.98	117.95	28.79	70.59	62.77	49.58	77.20	162.34	25.89	36.06	37.72	9.96	6.88	9.94	81.33	89.99	7.40	38.78	43.89	20.47	127.70	14.89	20.34	22.13	43.20	30.98	93.67	6.47	
90	51.21	230.90	27.97	51.11	4.10	16.12	45.60	6.32	17.94	105.45	26.03	65.68	56.63	46.02	71.30	153.30	23.42	33.55	34.07	8.96	6.17	8.95	72.97	83.45	6.71	34.85	39.67	18.46	118.03	13.48	18.34	19.98	38.74	27.79	85.33	6.05	
95	46.51	218.06	25.37	45.94	3.75	14.82	42.70	5.92	16.43	95.87	23.76	60.99	51.70	42.59	65.61	144.76	21.25	31.13	31.03	8.08	5.53	8.17	65.81	77.15	6.15	31.43	36.18	16.75	108.79	12.35	16.67	18.16	35.37	25.43	77.34	5.64	
100	42.49	206.00	23.45	41.20	3.48	13.60	39.86	5.52	15.23	88.43	21.73	56.41	47.40	39.25	60.11	136.79	19.60	28.77	28.31	7.28	4.95	7.58	59.27	71.05	5.66	28.31	33.06	15.18	99.82	11.35	15.42	16.51	32.72	23.55	70.60	5.25	
105	39.54	194.57	21.89	36.78	3.25	12.57	37.10	5.13	14.16	82.02	19.88	52.00	43.50	36.19	55.32	129.13	18.31	26.54	26.82	6.53	4.40	7.07	53.18	65.47	5.21	25.40	30.21	13.74	91.76	10.45	14.40	14.99	30.42	21.89	65.62	4.86	
110	37.14	183.51	20.51	32.57	3.04	11.80	34.43	4.77	13.20	76.26	18.14	48.19	39.87	33.71	51.72	121.71	17.18	24.69	23.47	5.81	3.87	6.61	47.39	60.98	4.80	22.62	27.51	12.36	85.40	9.60	13.49	13.54	28.36	20.39	61.56	4.52	
115	35.03	172.69	19.25	28.63	2.84	11.17	32.16	4.48	12.30	70.94	16.49	45.38	36.42	31.81	48.83	114.41	16.16	23.30	21.24	5.13	3.39	6.19	41.92	57.52	4.40	20.01	24.95	11.05	80.46	8.80	12.66	12.56	26.44	19.00	57.98	4.26	
120	33.10	162.09	18.08	25.18	2.66	10.60	30.46	4.26	11.45	65.89	14.92	43.10	33.15	30.21	46.31	107.29	15.21	22.14	19.12	4.52	2.98	5.79	36.87	54.60	4.02	17.61	22.53	9.82	76.26	8.04	11.89	10.85	24.63	17.67	54.71	4.06	
125	30.13	150.76	16.11	20.40	2.33	9.64	28.28	3.90	9.97	58.65	12.48	39.99	28.03	27.86	42.76	99.67	13.59	20.39	16.62	3.57	2.38	5.09	36.64	50.43	3.36	13.99	18.48	7.82	70.86	6.71	10.54	8.69	21.68	15.45	50.01	3.71	
130	26.78	138.93	14.06	16.20	2.01	8.67	25.84	3.56	8.50	50.11	9.71	36.34	22.47	25.22	38.56	91.83	11.94	18.50	12.29	2.83	1.89	4.40	34.20	45.64	2.72	11.09	14.59	6.15	64.23	5.41	9.19	6.81	18.56	11.18	44.39	3.37	
135	23.58	127.73	12.12	12.81	1.71	7.75	23.52	3.24	7.10	41.73	7.59	32.83	17.56	22.70	34.49	84.33	10.37	16.69	9.66	2.26	1.50	3.74	31.65	41.04	2.15	8.82	11.43	4.88	57.58	4.25	7.91	5.40	15.56	11.00	38.96	3.06	
140	20.61	117.21	10.30	10.14	1.43	6.90	21.35	2.94	5.80	33.86	6.06	29.50	13.92	20.32	30.66	77.35	8.91	14.99	7.72	1.79	1.19	3.14	14.82	36.71	1.69	7.01	9.12	3.90	51.26	3.36	6.71	4.32	12.76	8.97	33.88	2.77	
145	17.86	107.39	8.60	8.00	1.16	6.12	19.33	2.67	4.60	26.82	4.85	26.43	11.14	18.15	27.16	70.84	7.54	13.43	6.17	1.42	0.93	2.56	11.73	32.74	1.35	5.55	7.30	3.10	45.44	2.69	5.59	3.44	10.15	7.11	29.18	2.50	
150	15.24	98.30	6.97	6.29	0.92	5.38	17.49	2.41	3.61	21.07	3.89	23.65	8.94	16.14	23.90	64.85	6.22	12.00	4.94	1.12	0.73	2.03	9.27	29.08	1.09	4.38	5.85	2.47	40.11	2.16	4.52	2.74	7.95	5.59	24.73	2.26	
155	12.73	90.01	5.52	4.88	0.73	4.67	15.78	2.17	2.90	16.90	3.10	21.00	7.15	14.23	20.80	59.40	4.98	10.63	3.92	0.87	0.57	1.60	7.23	25.59	0.87	3.42	4.66	1.94	35.05	1.73	3.57	2.16	6.37	4.49	20.46	2.02	
160	10.34	82.42	4.37	3.80	0.59	3.99	14.16	1.95	2.34	13.64	2.44	18.48	5.68	12.40	17.82	54.36	3.92	9.33	3.08	0.68	0.44	1.29	5.61	22.26	0.70	2.66	3.67	1.51	30.20	1.38	2.83	1.69	5.14	3.62	16.42	1.80	
165	8.18	75.36	3.51	2.97	0.47	3.33	12.61	1.73	1.88	10.95	1.92	16.06	4.46	10.65	14.97	49.68	3.13	8.08	2.40	0.53	0.35	1.04	4.41	19.05	0.55	2.09	2.87	1.18	25.55	1.09	2.28	1.32	4.14	2.91	12.91	1.58	

Summary of Unit Hydrograph Parameters Used By Program and Calculated Results (Version 2.0.1)

Catchment Name/ID	User Comment for Catchment	Unit Hydrograph Parameters and Results									Excess Precip.		Storm Hydrograph			
		CT	Cp	W50 (min.)	W50 Before Peak	W75 (min.)	W75 Before Peak	Time to Peak (min.)	Peak (cfs)	Volume (c.f)	Excess (inches)	Excess (c.f.)	Time to Peak (min.)	Peak Flow (cfs)	Total Volume (c.f.)	Runoff per Unit Area (cfs/acre)
C1	P	0.109	0.109	37.4	4.63	19.5	3.27	7.7	55	158,667	1.40	221,934	40.0	40	221,363	0.92
C2	X1	0.100	0.155	31.9	5.30	16.6	3.75	8.8	112	277,259	1.42	393,306	35.0	81	392,534	1.06
C3	O	0.099	0.133	26.4	4.19	13.7	2.96	7.0	93	190,648	1.42	270,701	35.0	64	269,846	1.22
C4	X2	0.097	0.119	29.1	4.16	15.1	2.94	6.9	59	131,878	1.43	188,214	35.0	41	187,567	1.14
C5	X3	0.120	0.131	46.9	6.23	24.4	4.40	10.4	62	225,024	1.38	311,107	45.0	48	311,075	0.77
C6	N	0.100	0.118	15.2	2.87	7.9	2.03	4.8	129	150,899	1.42	214,092	30.0	73	208,706	1.77
C7	V2	0.118	0.069	30.0	3.10	15.6	2.19	5.2	24	55,684	1.39	77,171	35.0	16	76,523	1.05
C8	U	0.156	0.056	40.0	3.23	20.8	2.28	5.4	7	21,272	1.36	28,856	40.0	5	28,711	0.82
C9	M	0.097	0.104	15.7	2.75	8.2	1.94	4.6	80	97,393	1.43	138,967	30.0	47	135,178	1.73
C10	V1	0.094	0.078	26.5	3.09	13.8	2.18	5.1	20	41,999	1.44	60,441	35.0	14	59,892	1.21
C11	L	0.105	0.069	32.9	3.24	17.1	2.29	5.4	23	57,681	1.41	81,214	35.0	16	80,597	1.01
C12	K	0.094	0.217	16.6	4.26	8.6	3.01	7.1	324	416,470	1.44	598,839	30.0	201	596,187	1.75
C13	R	0.108	0.122	33.0	4.58	17.1	3.23	7.6	80	203,861	1.40	285,653	35.0	57	284,875	1.01
C14	H	0.126	0.085	42.1	4.24	21.9	3.00	7.1	24	79,715	1.37	109,575	40.0	18	109,307	0.81
C15	J	0.126	0.095	38.9	4.33	20.2	3.06	7.2	34	101,894	1.37	140,063	40.0	24	139,728	0.86
C16	I	0.096	0.110	22.0	3.36	11.4	2.38	5.6	62	105,234	1.43	150,503	30.0	40	149,058	1.39
C17	E	0.119	0.167	54.0	8.41	28.1	5.95	14.0	92	386,704	1.38	535,352	50.0	75	534,977	0.70
C18	G	0.122	0.098	39.3	4.44	20.4	3.14	7.4	38	114,164	1.38	157,567	40.0	27	157,168	0.86
C19	D	0.095	0.134	20.3	3.59	10.5	2.54	6.0	94	148,358	1.44	213,029	30.0	61	211,555	1.50
C20	B2	0.105	0.076	38.3	3.74	19.9	2.65	6.2	24	72,564	1.41	102,126	40.0	18	101,809	0.90
C21	B1	0.100	0.140	29.6	4.67	15.4	3.30	7.8	95	216,856	1.42	307,783	35.0	67	306,584	1.12
C22	W	0.156	0.046	33.7	2.70	17.5	1.90	4.5	5	13,649	1.36	18,515	35.0	3	18,246	0.92
C23	S	0.093	0.107	21.8	3.29	11.3	2.32	5.5	47	78,662	1.44	113,604	30.0	31	112,488	1.42
B1	JJ	0.109	0.053	22.5	2.42	11.7	1.71	4.0	19	32,307	1.40	45,188	30.0	11	43,903	1.29
B2	LL	0.122	0.047	24.1	2.37	12.5	1.68	4.0	12	22,506	1.38	31,043	30.0	7	30,181	1.19
B3	KK	0.126	0.055	32.6	2.87	16.9	2.03	4.8	12	30,492	1.37	41,914	35.0	8	41,402	0.97
B4	EE1	0.126	0.124	30.2	4.37	15.7	3.09	7.3	79	184,658	1.37	253,830	35.0	53	252,727	1.05
B5	DD	0.126	0.142	41.6	6.04	21.6	4.27	10.1	78	252,285	1.37	346,789	40.0	58	346,842	0.83
B6	II3	0.126	0.088	25.0	3.19	13.0	2.25	5.3	45	87,011	1.37	119,605	35.0	28	118,504	1.18
B7	II2	0.126	0.087	23.9	3.09	12.4	2.18	5.1	45	83,962	1.37	115,413	30.0	28	114,044	1.21
B8	II1	0.126	0.123	53.3	6.54	27.7	4.62	10.9	44	183,061	1.37	251,634	50.0	35	251,692	0.69
B9	CC	0.126	0.048	29.8	2.61	15.5	1.84	4.3	10	22,978	1.37	31,585	35.0	7	31,056	1.03
B10	AA	0.126	0.103	26.0	3.55	13.5	2.51	5.9	61	122,694	1.37	168,654	35.0	39	167,923	1.16
B11	BB	0.126	0.107	28.4	3.84	14.8	2.72	6.4	61	134,855	1.37	185,370	35.0	41	184,724	1.09
B12	FF	0.126	0.078	26.0	3.05	13.5	2.15	5.1	33	65,703	1.37	90,315	35.0	21	89,406	1.15
B13	GG	0.126	0.074	33.9	3.43	17.6	2.43	5.7	23	59,351	1.37	81,583	35.0	15	81,214	0.95
B14	HH	0.126	0.066	28.7	2.96	14.9	2.09	4.9	21	46,101	1.37	63,370	35.0	14	62,681	1.07
B15	EE2	0.078	0.121	11.6	2.58	6.0	1.83	4.3	66	59,387	1.52	90,334	30.0	36	86,502	2.18
B16	EE3	0.086	0.073	19.8	2.61	10.3	1.84	4.3	16	24,212	1.48	35,738	30.0	10	34,826	1.56
OS1	A	0.156	0.096	27.3	3.51	14.2	2.48	5.8	33	68,934	1.36	93,513	35.0	21	93,026	1.10
OS2	C	0.156	0.128	32.3	4.68	16.8	3.31	7.8	53	132,096	1.36	179,196	35.0	35	178,684	0.97
OS3	F	0.156	0.109	32.6	4.22	17.0	2.98	7.0	36	91,658	1.36	124,339	35.0	24	123,917	0.96
OS4	Q	0.156	0.175	37.1	6.48	19.3	4.58	10.8	91	262,413	1.36	355,978	40.0	65	355,849	0.89
OS5	T	0.156	0.054	43.6	3.29	22.7	2.33	5.5	6	19,021	1.36	25,803	40.0	4	25,686	0.77

Summary of Unit Hydrograph Parameters Used By Program and Calculated Results (Version 2.0.1)

Catchment Name/ID	User Comment for Catchment	Unit Hydrograph Parameters and Results									Excess Precip.		Storm Hydrograph			
		CT	Cp	W50 (min.)	W50 Before Peak	W75 (min.)	W75 Before Peak	Time to Peak (min.)	Peak (cfs)	Volume (c.f)	Excess (inches)	Excess (c.f.)	Time to Peak (min.)	Peak Flow (cfs)	Total Volume (c.f.)	Runoff per Unit Area (cfs/acre)
C1	P	0.109	0.109	37.4	4.63	19.5	3.27	7.7	55	158,667	2.57	407,452	45.0	83	406,404	1.90
C2	X1	0.100	0.155	31.9	5.30	16.6	3.75	8.8	112	277,259	2.58	715,935	45.0	163	714,529	2.14
C3	O	0.099	0.133	26.4	4.19	13.7	2.96	7.0	93	190,648	2.58	492,472	40.0	127	490,916	2.43
C4	X2	0.097	0.119	29.1	4.16	15.1	2.94	6.9	59	131,878	2.59	341,350	40.0	82	340,177	2.27
C5	X3	0.120	0.131	46.9	6.23	24.4	4.40	10.4	62	225,024	2.56	575,240	50.0	101	575,182	1.62
C6	N	0.100	0.118	15.2	2.87	7.9	2.03	4.8	129	150,899	2.58	389,674	35.0	141	379,871	3.40
C7	V2	0.118	0.069	30.0	3.10	15.6	2.19	5.2	24	55,684	2.56	142,481	40.0	33	141,285	2.17
C8	U	0.126	0.047	39.1	2.90	20.3	2.05	4.8	7	21,272	2.55	54,257	45.0	11	53,777	1.79
C9	M	0.097	0.104	15.7	2.75	8.2	1.94	4.6	80	97,393	2.59	252,068	35.0	89	245,194	3.32
C10	V1	0.094	0.078	26.5	3.09	13.8	2.18	5.1	20	41,999	2.60	109,069	40.0	28	108,078	2.39
C11	L	0.105	0.069	32.9	3.24	17.1	2.29	5.4	23	57,681	2.57	148,506	40.0	32	147,376	2.04
C12	K	0.094	0.217	16.6	4.26	8.6	3.01	7.1	324	416,470	2.60	1,081,182	35.0	382	1,076,395	3.33
C13	R	0.108	0.122	33.0	4.58	17.1	3.23	7.6	80	203,861	2.57	523,871	45.0	116	522,444	2.07
C14	H	0.126	0.085	42.1	4.24	21.9	3.00	7.1	24	79,715	2.55	203,324	45.0	38	202,827	1.72
C15	J	0.126	0.095	38.9	4.33	20.2	3.06	7.2	34	101,894	2.55	259,896	45.0	51	259,274	1.82
C16	I	0.096	0.110	22.0	3.36	11.4	2.38	5.6	62	105,234	2.59	272,611	35.0	78	269,994	2.69
C17	E	0.119	0.167	54.0	8.41	28.1	5.95	14.0	92	386,704	2.56	989,065	55.0	158	988,371	1.48
C18	G	0.122	0.098	39.3	4.44	20.4	3.14	7.4	38	114,164	2.55	291,648	45.0	57	290,911	1.82
C19	D	0.095	0.134	20.3	3.59	10.5	2.54	6.0	94	148,358	2.59	384,936	35.0	117	382,272	2.87
C20	B2	0.105	0.076	38.3	3.74	19.9	2.65	6.2	24	72,564	2.57	186,792	45.0	37	186,213	1.86
C21	B1	0.100	0.140	29.6	4.67	15.4	3.30	7.8	95	216,856	2.58	560,078	40.0	134	557,898	2.24
C22	W	0.126	0.038	32.9	2.47	17.1	1.74	4.1	5	13,649	2.55	34,813	40.0	7	34,153	1.98
C23	S	0.093	0.107	21.8	3.29	11.3	2.32	5.5	47	78,662	2.60	204,568	35.0	59	202,558	2.72
B1	JJ	0.109	0.053	22.5	2.42	11.7	1.71	4.0	19	32,307	2.57	82,963	35.0	23	80,603	2.56
B2	LL	0.122	0.047	24.1	2.37	12.5	1.68	4.0	12	22,506	2.55	57,481	40.0	15	55,886	2.43
B3	KK	0.126	0.055	32.6	2.87	16.9	2.03	4.8	12	30,492	2.55	77,774	40.0	17	76,823	2.02
B4	EE1	0.126	0.124	30.2	4.37	15.7	3.09	7.3	79	184,658	2.55	470,997	40.0	110	468,951	2.17
B5	DD	0.126	0.142	41.6	6.04	21.6	4.27	10.1	78	252,285	2.55	643,489	50.0	122	643,587	1.76
B6	II3	0.126	0.088	25.0	3.19	13.0	2.25	5.3	45	87,011	2.55	221,934	40.0	59	219,892	2.45
B7	II2	0.126	0.087	23.9	3.09	12.4	2.18	5.1	45	83,962	2.55	214,157	40.0	58	211,616	2.50
B8	II1	0.126	0.123	53.3	6.54	27.7	4.62	10.9	44	183,061	2.55	466,923	50.0	74	467,031	1.48
B9	CC	0.126	0.048	29.8	2.61	15.5	1.84	4.3	10	22,978	2.55	58,608	40.0	14	57,626	2.14
B10	AA	0.126	0.103	26.0	3.55	13.5	2.51	5.9	61	122,694	2.55	312,949	40.0	81	311,592	2.40
B11	BB	0.126	0.107	28.4	3.84	14.8	2.72	6.4	61	134,855	2.55	343,966	40.0	84	342,767	2.27
B12	FF	0.126	0.078	26.0	3.05	13.5	2.15	5.1	33	65,703	2.55	167,585	40.0	43	165,899	2.38
B13	GG	0.126	0.074	33.9	3.43	17.6	2.43	5.7	23	59,351	2.55	151,382	45.0	32	150,699	1.99
B14	HH	0.126	0.066	28.7	2.96	14.9	2.09	4.9	21	46,101	2.55	117,587	40.0	28	116,310	2.22
B15	EE2	0.078	0.121	11.6	2.58	6.0	1.83	4.3	66	59,387	2.66	157,718	35.0	64	151,027	3.89
B16	EE3	0.086	0.073	19.8	2.61	10.3	1.84	4.3	16	24,212	2.62	63,519	35.0	19	61,897	2.90
OS1	A	0.156	0.096	27.3	3.51	14.2	2.48	5.8	33	68,934	2.54	174,933	40.0	44	174,023	2.31
OS2	C	0.156	0.128	32.3	4.68	16.8	3.31	7.8	53	132,096	2.54	335,220	45.0	75	334,263	2.07
OS3	F	0.156	0.109	32.6	4.22	17.0	2.98	7.0	36	91,658	2.54	232,600	45.0	52	231,811	2.04
OS4	Q	0.156	0.175	37.1	6.48	19.3	4.58	10.8	91	262,413	2.54	665,926	45.0	138	665,685	1.91
OS5	T	0.156	0.054	43.6	3.29	22.7	2.33	5.5	6	19,021	2.54	48,270	45.0	9	48,050	1.66



Appendix C

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.012)

 NOTE: The summary statistics displayed in this report are based on results found at every computational time step, not just on results from each reporting time step.

 Analysis Options

Flow Units CFS
 Process Models:
 Rainfall/Runoff NO
 RDII NO
 Snowmelt NO
 Groundwater NO
 Flow Routing YES
 Ponding Allowed NO
 Water Quality NO
 Flow Routing Method KINWAVE
 Starting Date 01/01/2022 00:00:00
 Ending Date 01/01/2022 06:00:00
 Antecedent Dry Days 0.0
 Report Time Step 00:05:00
 Routing Time Step 30.00 sec

*****	Volume	Volume
Flow Routing Continuity	acre-feet	10 ⁶ gal
*****	-----	-----
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.000	0.000
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	164.959	53.754
External Outflow	152.095	49.563
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	12.843	4.185
Continuity Error (%)	0.013	

 Highest Flow Instability Indexes

Link SP101 (3)
Link SP103 (3)
Link SP102 (2)

Routing Time Step Summary

Minimum Time Step : 30.00 sec
Average Time Step : 30.00 sec
Maximum Time Step : 30.00 sec
Percent in Steady State : 0.00
Average Iterations per Step : 1.00
Percent Not Converging : 0.00

Node Depth Summary

Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days hr:min	Reported Max Depth Feet
A	JUNCTION	0.00	0.00	7625.00	0 00:00	0.00
AA	JUNCTION	0.00	0.00	7525.00	0 00:00	0.00
B	JUNCTION	0.00	0.00	7570.00	0 00:00	0.00
BB	JUNCTION	0.00	0.00	7410.00	0 00:00	0.00
BB1	JUNCTION	0.00	0.00	7385.00	0 00:00	0.00
BB2	JUNCTION	0.00	0.00	7365.00	0 00:00	0.00
C	JUNCTION	0.00	0.00	7635.00	0 00:00	0.00
CC	JUNCTION	0.00	0.00	7495.00	0 00:00	0.00
D	JUNCTION	0.00	0.00	7575.00	0 00:00	0.00
DD	JUNCTION	0.00	0.00	7500.00	0 00:00	0.00
E	JUNCTION	0.00	0.00	7572.00	0 00:00	0.00
EE	JUNCTION	0.00	0.00	7525.00	0 00:00	0.00
F	JUNCTION	0.00	0.00	7633.00	0 00:00	0.00
FF	JUNCTION	0.00	0.00	7430.00	0 00:00	0.00
G	JUNCTION	0.00	0.00	7565.00	0 00:00	0.00
GG	JUNCTION	0.00	0.00	7420.00	0 00:00	0.00
H1	JUNCTION	0.00	0.00	7525.00	0 00:00	0.00
HH	JUNCTION	0.00	0.00	7410.00	0 00:00	0.00
I	JUNCTION	0.00	0.00	7595.00	0 00:00	0.00
II	JUNCTION	0.00	0.00	7495.00	0 00:00	0.00
II1	JUNCTION	0.00	0.00	7375.00	0 00:00	0.00
BB3	JUNCTION	0.00	0.00	7330.00	0 00:00	0.00
J	JUNCTION	0.00	0.00	7560.00	0 00:00	0.00
JJ	JUNCTION	0.00	0.00	7575.00	0 00:00	0.00

K	JUNCTION	0.00	0.00	7585.00	0	00:00	0.00
KK	JUNCTION	0.00	0.00	7590.00	0	00:00	0.00
L	JUNCTION	0.00	0.00	7548.00	0	00:00	0.00
LL	JUNCTION	0.00	0.00	7580.00	0	00:00	0.00
LL1	JUNCTION	0.00	0.00	7525.00	0	00:00	0.00
M	JUNCTION	0.00	0.00	7590.00	0	00:00	0.00
N	JUNCTION	0.00	0.00	7535.00	0	00:00	0.00
O	JUNCTION	0.00	0.00	7525.00	0	00:00	0.00
P	JUNCTION	0.00	0.00	7480.00	0	00:00	0.00
Q	JUNCTION	0.00	0.00	7585.00	0	00:00	0.00
R	JUNCTION	0.00	0.00	7596.00	0	00:00	0.00
S	JUNCTION	0.00	0.00	7598.00	0	00:00	0.00
SP1	JUNCTION	0.00	0.00	7495.00	0	00:00	0.00
SP2	JUNCTION	0.00	0.00	7490.00	0	00:00	0.00
SP3	JUNCTION	0.00	0.00	7435.00	0	00:00	0.00
T	JUNCTION	0.00	0.00	7583.00	0	00:00	0.00
T1	JUNCTION	0.00	0.00	7565.00	0	00:00	0.00
U	JUNCTION	0.00	0.00	7567.00	0	00:00	0.00
T2	JUNCTION	0.00	0.00	7555.00	0	00:00	0.00
V	JUNCTION	0.00	0.00	7577.00	0	00:00	0.00
X	JUNCTION	0.00	0.00	7500.00	0	00:00	0.00
W	JUNCTION	0.00	0.00	7546.00	0	00:00	0.00
H	JUNCTION	0.00	0.00	7560.00	0	00:00	0.00
OF2	OUTFALL	0.00	0.00	7550.00	0	00:00	0.00
OF1	OUTFALL	0.00	0.00	7430.00	0	00:00	0.00
OF3	OUTFALL	0.00	0.00	7435.00	0	00:00	0.00
OF5	OUTFALL	0.00	0.00	7520.00	0	00:00	0.00
OF4	OUTFALL	0.00	0.00	7325.00	0	00:00	0.00
IRR_POND	STORAGE	2.17	3.25	7533.25	0	02:12	3.25

Node Inflow Summary

Total Inflow Volume		Flow Balance Error	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Time of Max Occurrence	Lateral Inflow Volume
gal	Percent			CFS	CFS	days hr:min	10^6 gal
A			JUNCTION	20.84	20.84	0 00:35	0.696

0.696	0.000						
AA		JUNCTION	38.76	38.76	0	00:35	1.24
1.24	0.000						
B		JUNCTION	50.01	103.48	0	00:40	2.2
4.18	0.000						
BB		JUNCTION	40.62	40.62	0	00:35	1.38
1.38	0.000						
BB1		JUNCTION	0.00	242.15	0	00:35	0
8.7	0.000						
BB2		JUNCTION	0.00	257.03	0	00:35	0
9.31	0.000						
C		JUNCTION	33.36	33.36	0	00:40	1.28
1.28	0.000						
CC		JUNCTION	6.53	6.53	0	00:35	0.232
0.232	0.000						
D		JUNCTION	31.56	31.56	0	00:40	1.43
1.43	0.000						
DD		JUNCTION	58.42	58.42	0	00:40	2.62
2.62	0.000						
E		JUNCTION	92.81	223.69	0	00:45	4.71
10.3	0.000						
EE		JUNCTION	81.16	81.16	0	00:35	2.59
2.59	0.000						
F		JUNCTION	24.27	24.27	0	00:35	0.927
0.927	0.000						
FF		JUNCTION	19.51	162.77	0	00:35	0.646
6.08	0.000						
G		JUNCTION	54.90	79.17	0	00:35	1.91
2.84	0.000						
GG		JUNCTION	14.93	14.93	0	00:40	0.601
0.601	0.000						
H1		JUNCTION	0.00	133.51	0	02:08	0
9.72	0.000						
HH		JUNCTION	13.01	13.01	0	00:35	0.462
0.462	0.000						
I		JUNCTION	34.58	34.58	0	00:35	1.17
1.17	0.000						
II		JUNCTION	81.77	81.77	0	00:45	3.59
3.59	0.000						
II1		JUNCTION	0.00	81.77	0	00:45	0
3.59	0.000						
BB3		JUNCTION	0.00	346.26	0	00:40	0
13.4	0.000						
J		JUNCTION	22.78	56.31	0	00:35	1.05
2.22	0.000						
JJ		JUNCTION	9.74	9.74	0	00:35	0.317
0.317	0.000						
K		JUNCTION	92.05	92.05	0	00:40	3.43
3.43	0.000						
KK		JUNCTION	7.51	7.51	0	00:35	0.297

0.297	0.000						
L		JUNCTION	15.71	107.58	0	00:40	0.601
4.03	0.000						
LL		JUNCTION	6.88	6.88	0	00:35	0.22
0.22	0.000						
LL1		JUNCTION	0.00	24.12	0	00:35	0
0.834	0.000						
M		JUNCTION	11.48	11.48	0	00:40	0.509
0.509	0.000						
N		JUNCTION	56.97	68.16	0	00:35	1.8
2.31	0.000						
O		JUNCTION	22.69	22.69	0	00:40	0.91
0.91	0.000						
P		JUNCTION	38.52	38.52	0	00:40	1.61
1.61	0.000						
Q		JUNCTION	64.68	64.68	0	00:40	2.66
2.66	0.000						
R		JUNCTION	44.21	108.65	0	00:40	2.03
4.69	0.000						
S		JUNCTION	25.99	25.99	0	00:35	0.894
0.894	0.000						
SP1		JUNCTION	0.00	207.17	0	01:51	0
16	0.000						
SP2		JUNCTION	0.00	281.79	0	00:40	0
19.2	0.000						
SP3		JUNCTION	0.00	320.31	0	00:40	0
20.8	0.000						
T		JUNCTION	4.04	4.04	0	00:40	0.192
0.192	0.000						
T1		JUNCTION	0.00	137.90	0	00:40	0
5.77	0.000						
U		JUNCTION	4.15	4.15	0	00:40	0.201
0.201	0.000						
T2		JUNCTION	0.00	145.46	0	00:40	0
6.11	0.000						
V		JUNCTION	29.63	29.63	0	00:45	1.42
1.42	0.000						
X		JUNCTION	138.66	167.76	0	00:50	7.03
8.45	0.000						
W		JUNCTION	3.45	3.45	0	00:35	0.136
0.136	0.000						
H		JUNCTION	18.59	18.59	0	00:40	0.758
0.758	0.000						
OF2		OUTFALL	0.00	145.46	0	00:40	0
6.11	0.000						
OF1		OUTFALL	0.00	320.31	0	00:40	0
20.8	0.000						
OF3		OUTFALL	0.00	167.76	0	00:50	0
8.45	0.000						
OF5		OUTFALL	0.00	24.12	0	00:35	0

0.834	0.000						
OF4		OUTFALL	0.00	346.26	0	00:40	0
13.4	0.000						
IRR_POND		STORAGE	0.00	298.49	0	00:40	0
13.2	0.052						

Node Flooding Summary

No nodes were flooded.

Storage Volume Summary

of Max Occurrence		Maximum Outflow Storage Unit	Average Volume	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume	Max Pcnt Full	Time days
hr:min		CFS	1000 ft3				1000 ft3		
IRR_POND			718.772	33	0	0	1098.529	50	0
02:12		126.25							

Outfall Loading Summary

Outfall Node	Flow Freq Pcnt	Avg Flow CFS	Max Flow CFS	Total Volume 10^6 gal
OF2	75.42	50.15	145.46	6.111
OF1	98.06	131.34	320.31	20.806
OF3	83.19	62.87	167.76	8.451
OF5	64.44	8.01	24.12	0.834
OF4	74.72	110.64	346.26	13.357
System	79.17	363.02	989.13	49.559

Link Flow Summary

Link	Type	Maximum Flow CFS	Time of Max Occurrence days hr:min	Maximum Veloc ft/sec	Max/ Full Flow	Max/ Full Depth
A100	DUMMY	20.84	0 00:35			
AA100	DUMMY	38.76	0 00:35			
B100	DUMMY	103.48	0 00:40			
BB100	DUMMY	40.62	0 00:35			
BB101	DUMMY	242.15	0 00:35			
BB102	DUMMY	257.03	0 00:35			
C100	DUMMY	33.36	0 00:40			
CC100	DUMMY	6.53	0 00:35			
D100	DUMMY	31.56	0 00:40			
DD100	DUMMY	58.42	0 00:40			
E100	DUMMY	223.69	0 00:45			
EE100	DUMMY	81.16	0 00:35			
EE101	DUMMY	162.77	0 00:35			
F100	DUMMY	24.27	0 00:35			
G100	DUMMY	79.17	0 00:35			
GG100	DUMMY	14.93	0 00:40			
H101	DUMMY	133.51	0 02:08			
HH100	DUMMY	13.01	0 00:35			
I100	DUMMY	34.58	0 00:35			
II100	DUMMY	81.77	0 00:45			
II101	DUMMY	81.77	0 00:45			
J100	DUMMY	56.31	0 00:35			
JJ100	DUMMY	9.74	0 00:35			
K100	DUMMY	92.05	0 00:40			
KK100	DUMMY	7.51	0 00:35			
L100	DUMMY	107.58	0 00:40			
LL100	DUMMY	6.88	0 00:35			
M100	DUMMY	11.48	0 00:40			
N100	DUMMY	68.16	0 00:35			
O100	DUMMY	22.69	0 00:40			
BB103	DUMMY	346.26	0 00:40			
OF5	DUMMY	24.12	0 00:35			
P100	DUMMY	38.52	0 00:40			
Q100	DUMMY	64.68	0 00:40			
R100	DUMMY	108.65	0 00:40			
S100	DUMMY	25.99	0 00:35			
SP101	DUMMY	207.17	0 01:51			
SP102	DUMMY	281.79	0 00:40			
SP103	DUMMY	320.31	0 00:40			

T100	DUMMY	4.04	0	00:40
T101	DUMMY	137.90	0	00:40
U100	DUMMY	4.15	0	00:40
U101	DUMMY	145.46	0	00:40
V100	DUMMY	29.63	0	00:45
W100	DUMMY	3.45	0	00:35
X100	DUMMY	167.76	0	00:50
H100	DUMMY	18.59	0	00:40
IRR_OUTLET	DUMMY	126.25	0	02:12

Conduit Surcharge Summary

No conduits were surcharged.

Analysis begun on: Mon Jul 18 10:52:15 2022
Analysis ended on: Mon Jul 18 10:52:15 2022
Total elapsed time: < 1 sec

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.012)

 NOTE: The summary statistics displayed in this report are based on results found at every computational time step, not just on results from each reporting time step.

 Analysis Options

Flow Units CFS
 Process Models:
 Rainfall/Runoff NO
 RDII NO
 Snowmelt NO
 Groundwater NO
 Flow Routing YES
 Ponding Allowed NO
 Water Quality NO
 Flow Routing Method KINWAVE
 Starting Date 01/01/2022 00:00:00
 Ending Date 01/01/2022 06:00:00
 Antecedent Dry Days 0.0
 Report Time Step 00:05:00
 Routing Time Step 30.00 sec

*****	Volume	Volume
Flow Routing Continuity	acre-feet	10 ⁶ gal
*****	-----	-----
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.000	0.000
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	308.214	100.436
External Outflow	294.043	95.818
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	14.142	4.608
Continuity Error (%)	0.009	

 Highest Flow Instability Indexes

All links are stable.

Routing Time Step Summary

Minimum Time Step : 30.00 sec
Average Time Step : 30.00 sec
Maximum Time Step : 30.00 sec
Percent in Steady State : 0.00
Average Iterations per Step : 1.00
Percent Not Converging : 0.00

Node Depth Summary

Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days hr:min	Reported Max Depth Feet
A	JUNCTION	0.00	0.00	7625.00	0 00:00	0.00
AA	JUNCTION	0.00	0.00	7525.00	0 00:00	0.00
B	JUNCTION	0.00	0.00	7570.00	0 00:00	0.00
BB	JUNCTION	0.00	0.00	7410.00	0 00:00	0.00
BB1	JUNCTION	0.00	0.00	7385.00	0 00:00	0.00
BB2	JUNCTION	0.00	0.00	7365.00	0 00:00	0.00
C	JUNCTION	0.00	0.00	7635.00	0 00:00	0.00
CC	JUNCTION	0.00	0.00	7495.00	0 00:00	0.00
D	JUNCTION	0.00	0.00	7575.00	0 00:00	0.00
DD	JUNCTION	0.00	0.00	7500.00	0 00:00	0.00
E	JUNCTION	0.00	0.00	7572.00	0 00:00	0.00
EE	JUNCTION	0.00	0.00	7525.00	0 00:00	0.00
F	JUNCTION	0.00	0.00	7633.00	0 00:00	0.00
FF	JUNCTION	0.00	0.00	7430.00	0 00:00	0.00
G	JUNCTION	0.00	0.00	7565.00	0 00:00	0.00
GG	JUNCTION	0.00	0.00	7420.00	0 00:00	0.00
H1	JUNCTION	0.00	0.00	7525.00	0 00:00	0.00
HH	JUNCTION	0.00	0.00	7410.00	0 00:00	0.00
I	JUNCTION	0.00	0.00	7595.00	0 00:00	0.00
II	JUNCTION	0.00	0.00	7495.00	0 00:00	0.00
II1	JUNCTION	0.00	0.00	7375.00	0 00:00	0.00
BB3	JUNCTION	0.00	0.00	7330.00	0 00:00	0.00
J	JUNCTION	0.00	0.00	7560.00	0 00:00	0.00
JJ	JUNCTION	0.00	0.00	7575.00	0 00:00	0.00
K	JUNCTION	0.00	0.00	7585.00	0 00:00	0.00
KK	JUNCTION	0.00	0.00	7590.00	0 00:00	0.00

L	JUNCTION	0.00	0.00	7548.00	0	00:00	0.00
LL	JUNCTION	0.00	0.00	7580.00	0	00:00	0.00
LL1	JUNCTION	0.00	0.00	7525.00	0	00:00	0.00
M	JUNCTION	0.00	0.00	7590.00	0	00:00	0.00
N	JUNCTION	0.00	0.00	7535.00	0	00:00	0.00
O	JUNCTION	0.00	0.00	7525.00	0	00:00	0.00
P	JUNCTION	0.00	0.00	7480.00	0	00:00	0.00
Q	JUNCTION	0.00	0.00	7585.00	0	00:00	0.00
R	JUNCTION	0.00	0.00	7596.00	0	00:00	0.00
S	JUNCTION	0.00	0.00	7598.00	0	00:00	0.00
SP1	JUNCTION	0.00	0.00	7495.00	0	00:00	0.00
SP2	JUNCTION	0.00	0.00	7490.00	0	00:00	0.00
SP3	JUNCTION	0.00	0.00	7435.00	0	00:00	0.00
T	JUNCTION	0.00	0.00	7583.00	0	00:00	0.00
T1	JUNCTION	0.00	0.00	7565.00	0	00:00	0.00
U	JUNCTION	0.00	0.00	7567.00	0	00:00	0.00
T2	JUNCTION	0.00	0.00	7555.00	0	00:00	0.00
V	JUNCTION	0.00	0.00	7577.00	0	00:00	0.00
X	JUNCTION	0.00	0.00	7500.00	0	00:00	0.00
W	JUNCTION	0.00	0.00	7546.00	0	00:00	0.00
H	JUNCTION	0.00	0.00	7560.00	0	00:00	0.00
OF2	OUTFALL	0.00	0.00	7550.00	0	00:00	0.00
OF1	OUTFALL	0.00	0.00	7430.00	0	00:00	0.00
OF3	OUTFALL	0.00	0.00	7435.00	0	00:00	0.00
OF5	OUTFALL	0.00	0.00	7520.00	0	00:00	0.00
OF4	OUTFALL	0.00	0.00	7325.00	0	00:00	0.00
IRR_POND	STORAGE	2.90	4.82	7534.82	0	01:51	4.82

Node Inflow Summary

Total Inflow Volume		Flow Balance Error	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Time of Max Occurrence	Lateral Inflow Volume
gal	Percent			CFS	CFS	days hr:min	10^6 gal
1.3	0.000		JUNCTION	43.83	43.83	0 00:40	1.3
AA			JUNCTION	80.22	80.22	0 00:40	2.31

2.31	0.000						
B		JUNCTION	107.33	221.28	0	00:45	4.12
7.82	0.000						
BB		JUNCTION	84.15	84.15	0	00:40	2.56
2.56	0.000						
BB1		JUNCTION	0.00	503.29	0	00:40	0
16.2	0.000						
BB2		JUNCTION	0.00	534.86	0	00:40	0
17.3	0.000						
C		JUNCTION	71.27	71.27	0	00:45	2.4
2.4	0.000						
CC		JUNCTION	13.57	13.57	0	00:40	0.431
0.431	0.000						
D		JUNCTION	67.84	67.84	0	00:50	2.67
2.67	0.000						
DD		JUNCTION	123.69	123.69	0	00:50	4.85
4.85	0.000						
E		JUNCTION	199.80	483.10	0	00:50	8.81
19.3	0.000						
EE		JUNCTION	167.45	167.45	0	00:40	4.8
4.8	0.000						
F		JUNCTION	51.63	51.63	0	00:45	1.73
1.73	0.000						
FF		JUNCTION	41.02	340.42	0	00:45	1.21
11.3	0.000						
G		JUNCTION	115.21	166.51	0	00:40	3.58
5.32	0.000						
GG		JUNCTION	31.99	31.99	0	00:45	1.12
1.12	0.000						
H1		JUNCTION	0.00	323.27	0	01:49	0
21.4	0.000						
HH		JUNCTION	27.42	27.42	0	00:40	0.864
0.864	0.000						
I		JUNCTION	72.63	72.63	0	00:40	2.19
2.19	0.000						
II		JUNCTION	175.60	175.60	0	00:50	6.72
6.72	0.000						
III1		JUNCTION	0.00	175.60	0	00:50	0
6.72	0.000						
BB3		JUNCTION	0.00	733.92	0	00:45	0
24.9	0.000						
J		JUNCTION	48.99	120.46	0	00:45	1.96
4.15	0.000						
JJ		JUNCTION	20.50	20.50	0	00:40	0.592
0.592	0.000						
K		JUNCTION	195.43	195.43	0	00:45	6.42
6.42	0.000						
KK		JUNCTION	15.99	15.99	0	00:45	0.556
0.556	0.000						
L		JUNCTION	33.30	228.73	0	00:45	1.12

7.55	0.000						
LL		JUNCTION	14.48	14.48	0	00:40	0.411
0.411	0.000						
LL1		JUNCTION	0.00	50.88	0	00:40	0
1.56	0.000						
M		JUNCTION	24.61	24.61	0	00:45	0.953
0.953	0.000						
N		JUNCTION	119.24	143.11	0	00:40	3.37
4.32	0.000						
O		JUNCTION	48.54	48.54	0	00:45	1.7
1.7	0.000						
P		JUNCTION	82.17	82.17	0	00:45	3.01
3.01	0.000						
Q		JUNCTION	137.80	137.80	0	00:45	4.98
4.98	0.000						
R		JUNCTION	95.25	232.13	0	00:45	3.79
8.77	0.000						
S		JUNCTION	54.65	54.65	0	00:40	1.67
1.67	0.000						
SP1		JUNCTION	0.00	515.49	0	01:15	0
33.1	0.000						
SP2		JUNCTION	0.00	653.32	0	01:09	0
39.1	0.000						
SP3		JUNCTION	0.00	725.59	0	01:06	0
42.1	0.000						
T		JUNCTION	8.68	8.68	0	00:45	0.359
0.359	0.000						
T1		JUNCTION	0.00	294.73	0	00:45	0
10.8	0.000						
U		JUNCTION	8.95	8.95	0	00:50	0.376
0.376	0.000						
T2		JUNCTION	0.00	311.00	0	00:45	0
11.4	0.000						
V		JUNCTION	63.92	63.92	0	00:50	2.66
2.66	0.000						
X		JUNCTION	298.70	361.56	0	00:55	13.2
15.8	0.000						
W		JUNCTION	7.33	7.33	0	00:45	0.255
0.255	0.000						
H		JUNCTION	39.78	39.78	0	00:45	1.42
1.42	0.000						
OF2		OUTFALL	0.00	311.00	0	00:45	0
11.4	0.000						
OF1		OUTFALL	0.00	725.59	0	01:06	0
42.1	0.000						
OF3		OUTFALL	0.00	361.56	0	00:55	0
15.8	0.000						
OF5		OUTFALL	0.00	50.88	0	00:40	0
1.56	0.000						
OF4		OUTFALL	0.00	733.92	0	00:45	0

24.9 0.000
 IRR_POND STORAGE 0.00 644.35 0 00:50 0
 24.6 0.038

 Node Flooding Summary

No nodes were flooded.

 Storage Volume Summary

of Max Occurrence		Maximum Outflow Storage Unit	Average Volume 1000 ft3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 ft3	Max Pcnt Full	Time days
IRR_POND	01:51	306.06	988.180	45	0	0	1697.949	78	0

 Outfall Loading Summary

Outfall Node	Flow Freq Pcnt	Avg Flow CFS	Max Flow CFS	Total Volume 10^6 gal
OF2	76.53	92.46	311.00	11.432
OF1	98.33	265.29	725.59	42.145
OF3	83.75	116.84	361.56	15.810
OF5	64.58	14.95	50.88	1.559
OF4	74.86	205.58	733.92	24.865
System	79.61	695.11	2117.11	95.811

 Link Flow Summary

Link	Type	Maximum Flow CFS	Time of Max Occurrence days hr:min	Maximum Veloc ft/sec	Max/ Full Flow	Max/ Full Depth
A100	DUMMY	43.83	0 00:40			
AA100	DUMMY	80.22	0 00:40			
B100	DUMMY	221.28	0 00:45			
BB100	DUMMY	84.15	0 00:40			
BB101	DUMMY	503.29	0 00:40			
BB102	DUMMY	534.86	0 00:40			
C100	DUMMY	71.27	0 00:45			
CC100	DUMMY	13.57	0 00:40			
D100	DUMMY	67.84	0 00:50			
DD100	DUMMY	123.69	0 00:50			
E100	DUMMY	483.10	0 00:50			
EE100	DUMMY	167.45	0 00:40			
EE101	DUMMY	340.42	0 00:45			
F100	DUMMY	51.63	0 00:45			
G100	DUMMY	166.51	0 00:40			
GG100	DUMMY	31.99	0 00:45			
H101	DUMMY	323.27	0 01:49			
HH100	DUMMY	27.42	0 00:40			
I100	DUMMY	72.63	0 00:40			
II100	DUMMY	175.60	0 00:50			
II101	DUMMY	175.60	0 00:50			
J100	DUMMY	120.46	0 00:45			
JJ100	DUMMY	20.50	0 00:40			
K100	DUMMY	195.43	0 00:45			
KK100	DUMMY	15.99	0 00:45			
L100	DUMMY	228.73	0 00:45			
LL100	DUMMY	14.48	0 00:40			
M100	DUMMY	24.61	0 00:45			
N100	DUMMY	143.11	0 00:40			
O100	DUMMY	48.54	0 00:45			
BB103	DUMMY	733.92	0 00:45			
OF5	DUMMY	50.88	0 00:40			
P100	DUMMY	82.17	0 00:45			
Q100	DUMMY	137.80	0 00:45			
R100	DUMMY	232.13	0 00:45			
S100	DUMMY	54.65	0 00:40			
SP101	DUMMY	515.49	0 01:15			
SP102	DUMMY	653.32	0 01:09			
SP103	DUMMY	725.59	0 01:06			
T100	DUMMY	8.68	0 00:45			
T101	DUMMY	294.73	0 00:45			

U100	DUMMY	8.95	0	00:50
U101	DUMMY	311.00	0	00:45
V100	DUMMY	63.92	0	00:50
W100	DUMMY	7.33	0	00:45
X100	DUMMY	361.56	0	00:55
H100	DUMMY	39.78	0	00:45
IRR_OUTLET	DUMMY	306.06	0	01:51

Conduit Surcharge Summary

No conduits were surcharged.

Analysis begun on: Mon Jul 18 10:53:23 2022
Analysis ended on: Mon Jul 18 10:53:23 2022
Total elapsed time: < 1 sec

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.012)

 NOTE: The summary statistics displayed in this report are based on results found at every computational time step, not just on results from each reporting time step.

 Analysis Options

Flow Units CFS
 Process Models:
 Rainfall/Runoff NO
 RDII NO
 Snowmelt NO
 Groundwater NO
 Flow Routing YES
 Ponding Allowed NO
 Water Quality NO
 Flow Routing Method KINWAVE
 Starting Date 01/01/2005 00:00:00
 Ending Date 01/01/2005 06:00:00
 Antecedent Dry Days 0.0
 Report Time Step 00:05:00
 Routing Time Step 30.00 sec

*****	Volume	Volume
Flow Routing Continuity	acre-feet	10 ⁶ gal
*****	-----	-----
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.000	0.000
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	167.014	54.424
External Outflow	135.513	44.159
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	32.666	10.645
Continuity Error (%)	-0.697	

 Highest Flow Instability Indexes

Link J1200 (3)
 Link J1300 (3)
 Link SP104 (3)
 Link SP101 (2)
 Link 07 (2)

Routing Time Step Summary

Minimum Time Step : 30.00 sec
 Average Time Step : 30.00 sec
 Maximum Time Step : 30.00 sec
 Percent in Steady State : 0.00
 Average Iterations per Step : 1.00
 Percent Not Converging : 0.00

Node Depth Summary

Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days hr:min	Reported Max Depth Feet
A	JUNCTION	0.00	0.00	7625.00	0 00:00	0.00
AA	JUNCTION	0.00	0.00	7525.00	0 00:00	0.00
B1	JUNCTION	0.53	1.73	7576.73	0 00:35	1.73
B2	JUNCTION	0.55	1.60	7576.60	0 00:40	1.60
BB	JUNCTION	0.00	0.00	7410.00	0 00:00	0.00
BB1	JUNCTION	0.54	1.41	7386.41	0 00:49	1.41
BB2	JUNCTION	0.00	0.00	7365.00	0 00:00	0.00
BB3	JUNCTION	0.00	0.00	7330.00	0 00:00	0.00
C	JUNCTION	0.00	0.00	7635.00	0 00:00	0.00
CC	JUNCTION	0.00	0.00	7495.00	0 00:00	0.00
D	JUNCTION	0.00	0.00	7609.00	0 00:00	0.00
DD	JUNCTION	0.00	0.00	7495.00	0 00:00	0.00
E	JUNCTION	0.62	1.37	7573.37	0 00:50	1.37
EE1	JUNCTION	0.42	1.02	7476.02	0 00:53	1.02
EE2	JUNCTION	0.00	0.00	7550.00	0 00:00	0.00
EE3	JUNCTION	0.18	0.74	7575.74	0 00:30	0.73
F	JUNCTION	0.00	0.00	7633.00	0 00:00	0.00
FF	JUNCTION	0.54	1.41	7431.41	0 00:48	1.41
G	JUNCTION	0.44	1.26	7566.26	0 00:40	1.26
GG	JUNCTION	0.00	0.00	7420.00	0 00:00	0.00
H	JUNCTION	0.00	0.00	7530.00	0 00:00	0.00
HH	JUNCTION	0.00	0.00	7410.00	0 00:00	0.00
I	JUNCTION	0.00	0.00	7595.00	0 00:00	0.00

II1	JUNCTION	0.33	0.75	7495.75	0	00:50	0.75
II2	JUNCTION	0.32	1.13	7451.13	0	00:35	1.13
II3	JUNCTION	0.20	0.71	7515.71	0	00:35	0.71
IRR_J	JUNCTION	0.00	0.00	7528.00	0	00:00	0.00
J10	JUNCTION	0.00	0.00	7520.00	0	00:00	0.00
J11	JUNCTION	0.00	0.00	7565.00	0	00:00	0.00
J12	JUNCTION	0.08	0.23	7545.23	0	01:04	0.22
J13	JUNCTION	0.31	0.74	7520.74	0	01:00	0.74
J14	JUNCTION	0.00	0.00	7375.00	0	00:00	0.00
J15	JUNCTION	0.00	0.00	7552.00	0	00:00	0.00
J2	JUNCTION	0.55	1.24	7436.24	0	01:46	1.24
J3	JUNCTION	0.82	1.35	7496.35	0	01:51	1.35
J4	JUNCTION	0.55	1.24	7466.24	0	01:42	1.24
J5	JUNCTION	0.30	0.53	7525.53	0	01:29	0.53
J6	JUNCTION	0.30	0.53	7570.53	0	01:27	0.53
J7	JUNCTION	0.40	1.23	7546.23	0	00:37	1.22
J8	JUNCTION	0.40	1.23	7526.23	0	00:38	1.23
J9	JUNCTION	0.00	0.00	7550.00	0	00:00	0.00
JJ	JUNCTION	0.00	0.00	7575.00	0	00:00	0.00
K	JUNCTION	0.32	1.48	7586.48	0	00:30	1.46
KK	JUNCTION	0.00	0.00	7590.00	0	00:00	0.00
L	JUNCTION	0.00	0.00	7548.00	0	00:00	0.00
LL	JUNCTION	0.00	0.00	7580.00	0	00:00	0.00
M	JUNCTION	0.20	0.96	7590.96	0	00:30	0.95
N	JUNCTION	0.35	1.63	7536.63	0	00:30	1.62
O	JUNCTION	0.00	0.00	7559.00	0	00:00	0.00
P	JUNCTION	0.00	0.00	7500.37	0	00:00	0.00
Q	JUNCTION	0.00	0.00	7585.00	0	00:00	0.00
R	JUNCTION	0.00	0.00	7576.00	0	00:00	0.00
S	JUNCTION	0.00	0.00	7598.00	0	00:00	0.00
SP1	JUNCTION	0.50	0.82	7510.82	0	00:39	0.82
SP2	JUNCTION	0.83	1.39	7496.39	0	00:48	1.38
SP3	JUNCTION	0.87	1.34	7491.34	0	02:06	1.34
SP4	JUNCTION	0.54	0.88	7420.88	0	01:06	0.88
T	JUNCTION	0.00	0.00	7583.00	0	00:00	0.00
T1	JUNCTION	0.00	0.00	7565.00	0	00:00	0.00
T2	JUNCTION	0.00	0.00	7555.00	0	00:00	0.00
U	JUNCTION	0.00	0.00	7567.00	0	00:00	0.00
V1	JUNCTION	0.00	0.00	7598.00	0	00:00	0.00
V2	JUNCTION	0.19	0.61	7565.61	0	00:35	0.61
W	JUNCTION	0.00	0.00	7546.00	0	00:00	0.00
X1	JUNCTION	0.00	0.00	7485.00	0	00:00	0.00
X2	JUNCTION	0.30	1.00	7506.00	0	00:35	0.99
X3	JUNCTION	0.38	1.01	7501.01	0	00:40	1.01
I2	JUNCTION	0.00	0.00	7577.00	0	00:00	0.00
P12	JUNCTION	0.00	0.00	7550.00	0	00:00	0.00
LL1	JUNCTION	0.00	0.00	0.00	0	00:00	0.00
OF3	OUTFALL	0.00	0.00	7431.00	0	00:00	0.00
OF1	OUTFALL	0.53	0.88	7415.88	0	01:07	0.88
OF2	OUTFALL	0.00	0.00	7550.00	0	00:00	0.00

OF4	OUTFALL	0.00	0.00	7325.00	0	00:00	0.00
OF5	OUTFALL	0.00	0.00	7520.00	0	00:00	0.00
IRR_POND	STORAGE	2.04	3.13	7533.13	0	02:26	3.13
P1	STORAGE	2.52	3.53	7428.53	0	01:24	3.53
P10	STORAGE	3.00	4.85	7529.85	0	01:31	4.85
P11	STORAGE	3.04	5.09	7575.09	0	01:18	5.08
P13	STORAGE	2.85	3.99	7528.99	0	01:00	3.99
P14	STORAGE	2.97	4.54	7404.54	0	01:01	4.54
P15	STORAGE	2.80	4.26	7559.26	0	01:11	4.26
P2	STORAGE	5.57	7.19	7443.19	0	02:07	7.19
P3	STORAGE	4.48	6.33	7516.33	0	01:51	6.33
P4	STORAGE	4.93	7.13	7476.13	0	01:42	7.12
P5	STORAGE	3.20	4.68	7534.68	0	00:56	4.68
P6	STORAGE	3.85	5.74	7579.74	0	01:27	5.74
P7	STORAGE	4.50	7.59	7557.59	0	00:37	7.54
P8	STORAGE	4.01	6.15	7540.15	0	02:03	6.15
P9	STORAGE	3.74	5.58	7575.58	0	01:28	5.58
P16	STORAGE	3.37	4.66	7604.66	0	01:04	4.66
P17	STORAGE	4.41	5.85	7566.85	0	01:15	5.85

Node Inflow Summary

Total Inflow Volume Node gal	Flow Balance Error Percent	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 gal
0.696	0.000	A	20.84	20.84	0 00:35	0.696
1.26	0.000	AA	39.23	39.23	0 00:35	1.26
2.99	0.000	B1	66.93	87.77	0 00:35	2.29
2.1	0.000	B2	17.99	53.23	0 00:40	0.762
1.38	0.000	BB	40.62	40.62	0 00:35	1.38
		BB1	0.00	214.28	0 00:41	0

8.75	0.000						
BB2		JUNCTION	0.00	229.61	0	00:40	0
9.36	0.000						
BB3		JUNCTION	0.00	307.27	0	00:48	0
13.3	0.000						
C		JUNCTION	35.31	35.31	0	00:35	1.34
1.34	0.000						
CC		JUNCTION	6.53	6.53	0	00:35	0.232
0.232	0.000						
D		JUNCTION	61.12	61.12	0	00:30	1.58
1.58	0.000						
DD		JUNCTION	57.78	57.78	0	00:40	2.59
2.59	0.000						
E		JUNCTION	74.68	74.68	0	00:50	4
4	0.000						
EE1		JUNCTION	53.25	60.58	0	00:53	1.89
2.62	0.000						
EE2		JUNCTION	35.71	35.71	0	00:30	0.647
0.647	0.000						
EE3		JUNCTION	10.38	10.38	0	00:30	0.26
0.26	0.000						
F		JUNCTION	24.27	24.27	0	00:35	0.927
0.927	0.000						
FF		JUNCTION	20.78	139.72	0	00:48	0.669
6.11	0.000						
G		JUNCTION	27.18	51.31	0	00:40	1.18
2.1	0.000						
GG		JUNCTION	15.49	15.49	0	00:35	0.607
0.607	0.000						
H		JUNCTION	17.86	17.86	0	00:40	0.818
0.818	0.000						
HH		JUNCTION	13.56	13.56	0	00:35	0.469
0.469	0.000						
I		JUNCTION	40.37	40.37	0	00:30	1.11
1.11	0.000						
II1		JUNCTION	34.94	34.94	0	00:50	1.88
1.88	0.000						
II2		JUNCTION	28.04	56.21	0	00:35	0.853
1.74	0.000						
II3		JUNCTION	28.32	28.32	0	00:35	0.886
0.886	0.000						
IRR_J		JUNCTION	0.00	114.18	0	02:26	0
7.97	0.000						
J10		JUNCTION	0.00	124.52	0	02:25	0
8.74	0.000						
J11		JUNCTION	0.00	98.74	0	01:18	0
4.78	0.000						
J12		JUNCTION	0.00	24.66	0	01:04	0
0.985	-0.000						
J13		JUNCTION	0.00	17.17	0	01:00	0

0.729	0.000						
J14		JUNCTION	0.00	76.43	0	01:01	0
3.44	0.000						
J15		JUNCTION	0.00	30.95	0	01:11	0
1.38	0.000						
J2		JUNCTION	0.00	95.68	0	02:04	0
5.46	0.000						
J3		JUNCTION	0.00	22.74	0	01:51	0
1.57	0.000						
J4		JUNCTION	0.00	70.77	0	01:42	0
3.92	0.000						
J5		JUNCTION	0.00	49.82	0	00:58	0
2.19	0.000						
J6		JUNCTION	0.00	12.23	0	01:27	0
0.847	0.000						
J7		JUNCTION	0.00	180.87	0	00:37	0
4.34	0.000						
J8		JUNCTION	0.00	182.92	0	00:38	0
4.88	0.000						
J9		JUNCTION	0.00	94.99	0	01:28	0
4.83	0.000						
JJ		JUNCTION	11.49	11.49	0	00:30	0.328
0.328	0.000						
K		JUNCTION	200.94	200.94	0	00:30	4.46
4.46	0.000						
KK		JUNCTION	8.14	8.14	0	00:35	0.31
0.31	0.000						
L		JUNCTION	15.97	15.97	0	00:35	0.603
0.603	0.000						
LL		JUNCTION	7.36	7.36	0	00:30	0.226
0.226	0.000						
M		JUNCTION	46.54	46.54	0	00:30	1.01
1.01	0.000						
N		JUNCTION	73.48	73.48	0	00:30	1.56
1.56	0.000						
O		JUNCTION	63.86	63.86	0	00:35	2.02
2.02	0.000						
P		JUNCTION	40.00	40.00	0	00:40	1.66
1.66	0.000						
Q		JUNCTION	64.68	64.68	0	00:40	2.66
2.66	0.000						
R		JUNCTION	56.59	120.84	0	00:40	2.13
4.79	0.000						
S		JUNCTION	30.83	30.83	0	00:30	0.841
0.841	0.000						
SP1		JUNCTION	0.00	189.85	0	00:39	0
14.6	0.000						
SP2		JUNCTION	0.00	223.43	0	00:48	0
16.7	0.000						
SP3		JUNCTION	0.00	212.45	0	01:03	0

18.1	0.000						
SP4		JUNCTION	0.00	240.49	0	01:06	0
19.4	0.000						
T		JUNCTION	4.04	4.04	0	00:40	0.192
0.192	0.000						
T1		JUNCTION	0.00	98.27	0	01:27	0
5.02	0.000						
T2		JUNCTION	0.00	104.34	0	01:26	0
5.37	0.000						
U		JUNCTION	4.81	4.81	0	00:40	0.215
0.215	0.000						
V1		JUNCTION	13.99	13.99	0	00:35	0.448
0.448	0.000						
V2		JUNCTION	16.15	16.15	0	00:35	0.572
0.572	0.000						
W		JUNCTION	3.45	3.45	0	00:35	0.136
0.136	0.000						
X1		JUNCTION	80.91	80.91	0	00:35	2.94
2.94	0.000						
X2		JUNCTION	41.46	41.46	0	00:35	1.4
1.4	0.000						
X3		JUNCTION	47.59	76.22	0	00:40	2.33
3.35	0.000						
I2		JUNCTION	0.00	24.36	0	01:04	0
0.936	0.000						
P12		JUNCTION	0.30	0.30	0	00:00	0.0485
0.0484	0.000						
LL1		JUNCTION	0.00	16.85	0	01:15	0
0.663	0.000						
OF3		OUTFALL	0.00	95.68	0	02:04	0
5.46	0.000						
OF1		OUTFALL	0.00	240.43	0	01:07	0
19.4	0.000						
OF2		OUTFALL	0.00	104.34	0	01:26	0
5.37	0.000						
OF4		OUTFALL	0.00	307.27	0	00:48	0
13.3	0.000						
OF5		OUTFALL	0.00	16.85	0	01:15	0
0.663	0.000						
IRR_POND		STORAGE	0.00	243.77	0	01:09	0
12.3	0.046						
P1		STORAGE	0.00	40.00	0	00:40	0
1.66	0.117						
P10		STORAGE	0.00	17.86	0	00:40	0
0.818	0.062						
P11		STORAGE	0.00	139.15	0	00:38	0
5.09	0.072						
P13		STORAGE	0.00	45.11	0	00:30	0
0.907	0.149						
P14		STORAGE	0.00	87.41	0	00:41	0

3.62	0.147							
P15		STORAGE	0.00	61.12	0	00:30		0
1.58	0.081							
P2		STORAGE	0.00	80.91	0	00:35		0
2.94	0.039							
P3		STORAGE	0.00	63.86	0	00:35		0
2.02	0.027							
P4		STORAGE	0.00	116.70	0	00:41		0
4.75	0.055							
P5		STORAGE	0.00	72.03	0	00:32		0
1.56	0.175							
P6		STORAGE	0.00	46.22	0	00:31		0
1.01	0.049							
P7		STORAGE	0.00	200.43	0	00:31		0
4.46	0.122							
P8		STORAGE	0.00	15.97	0	00:35		0
0.603	0.032							
P9		STORAGE	0.00	148.40	0	00:40		0
5.63	0.062							
P16		STORAGE	0.00	40.37	0	00:30		0
1.11	0.188							
P17		STORAGE	0.00	26.64	0	00:35		0
0.864	0.119							

Node Flooding Summary

No nodes were flooded.

Storage Volume Summary

of Max Occurrence	Maximum Storage Unit	Average Volume	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume	Max Pcnt Full	Time
hr:min	Outflow CFS	1000 ft3		Loss	Loss	1000 ft3	Full	days

IRR_POND		674.845	31	0	0	1055.638	48	0
02:26	114.18							

P1		32.632	11	0	0	57.543	19	0
01:24	29.38							
P10		13.875	13	0	0	29.668	27	0
01:31	13.64							
P11		69.800	15	0	0	160.007	35	0
01:18	98.74							
P13		33.097	13	0	0	58.073	23	0
01:00	17.17							
P14		31.811	14	0	0	62.216	28	0
01:01	76.43							
P15		41.957	28	0	0	85.004	57	0
01:11	30.95							
P2		202.937	43	0	0	286.797	61	0
02:06	27.93							
P3		99.633	29	0	0	165.333	49	0
01:50	22.74							
P4		136.283	35	0	0	230.559	59	0
01:42	70.77							
P5		44.714	16	0	0	81.028	30	0
00:56	39.47							
P6		42.385	22	0	0	77.410	40	0
01:27	12.23							
P7		26.618	25	0	0	63.403	60	0
00:37	180.87							
P8		22.504	21	0	0	43.356	41	0
02:02	6.50							
P9		152.526	23	0	0	274.350	42	0
01:27	94.99							
P16		37.021	17	0	0	61.293	29	0
01:03	24.36							
P17		31.286	38	0	0	47.674	58	0
01:14	16.85							

 Outfall Loading Summary

Outfall Node	Flow Freq Pcmt	Avg Flow CFS	Max Flow CFS	Total Volume 10^6 gal
OF3	98.06	34.46	95.68	5.458
OF1	93.61	128.25	240.43	19.393
OF2	98.33	33.80	104.34	5.371
OF4	98.47	83.41	307.27	13.270
OF5	96.39	4.25	16.85	0.663
System	96.97	284.18	707.87	44.155

Link Flow Summary

Link	Type	Maximum Flow CFS	Time of Max Occurrence days hr:min	Maximum Veloc ft/sec	Max/ Full Flow	Max/ Full Depth
A100	DUMMY	20.84	0 00:35			
AA100	DUMMY	39.23	0 00:35			
B100	CONDUIT	87.22	0 00:37	4.63	0.29	0.58
B200	CONDUIT	53.15	0 00:42	3.55	0.23	0.53
BB100	DUMMY	40.62	0 00:35			
BB101	DUMMY	214.28	0 00:41			
BB102	DUMMY	229.61	0 00:40			
BB103	DUMMY	307.27	0 00:48			
C100	DUMMY	35.31	0 00:35			
C900	CONDUIT	46.22	0 00:31	7.08	0.08	0.32
CC100	DUMMY	6.53	0 00:35			
D100	DUMMY	61.12	0 00:30			
DD100	DUMMY	57.78	0 00:40			
E100	CONDUIT	74.39	0 00:53	6.43	0.16	0.46
EE100	CONDUIT	60.55	0 00:55	8.40	0.09	0.34
EE101	CONDUIT	139.71	0 00:49	10.28	0.18	0.47
EE200	DUMMY	35.71	0 00:30			
EE300	CONDUIT	10.11	0 00:33	9.87	0.28	0.36
F100	DUMMY	24.27	0 00:35			
G100	CONDUIT	50.38	0 00:45	5.08	0.13	0.42
GG100	DUMMY	15.49	0 00:35			
H100	DUMMY	17.86	0 00:40			
H101	DUMMY	124.52	0 02:25			
HH100	DUMMY	13.56	0 00:35			
I100	DUMMY	40.37	0 00:30			
II100	CONDUIT	34.92	0 00:51	7.77	0.12	0.38
II200	CONDUIT	56.13	0 00:37	7.64	0.26	0.57
II300	CONDUIT	28.31	0 00:36	8.19	0.09	0.36
IRR_J100	DUMMY	114.18	0 02:26			
J1100	DUMMY	98.74	0 01:18			
J1200	CONDUIT	22.46	0 01:23	2.08	0.01	0.05
J1300	CONDUIT	17.08	0 01:06	4.66	0.10	0.37
J1400	DUMMY	76.43	0 01:01			
J1500	DUMMY	30.95	0 01:11			
J300	CONDUIT	22.56	0 02:06	2.06	0.16	0.45
J400	CONDUIT	70.72	0 01:46	5.83	0.08	0.31
J500	DUMMY	49.82	0 00:58			
J600	CONDUIT	12.23	0 01:29	5.66	0.05	0.26
J700	CONDUIT	180.84	0 00:38	23.78	0.02	0.25

J800	DUMMY	182.92	0	00:38			
J900	DUMMY	94.99	0	01:28			
JJ100	DUMMY	11.49	0	00:30			
JP20	DUMMY	95.68	0	02:04			
K100	CONDUIT	200.43	0	00:31	13.74	0.20	0.49
L100	DUMMY	15.97	0	00:35			
LL100	DUMMY	7.36	0	00:30			
N100	CONDUIT	72.03	0	00:32	4.31	0.25	0.54
O100	DUMMY	63.86	0	00:35			
P100	DUMMY	40.00	0	00:40			
Q100	DUMMY	64.68	0	00:40			
R100	DUMMY	120.84	0	00:40			
S100	DUMMY	30.83	0	00:30			
SP101	CONDUIT	186.49	0	00:44	3.96	0.05	0.20
SP102	CONDUIT	208.08	0	01:03	2.46	0.12	0.33
SP103	CONDUIT	212.07	0	01:06	6.78	0.02	0.11
SP104	CONDUIT	240.43	0	01:07	4.59	0.04	0.18
SP206	DUMMY	104.34	0	01:26			
T100	DUMMY	4.04	0	00:40			
T101	DUMMY	98.27	0	01:27			
U100	DUMMY	4.81	0	00:40			
V100	DUMMY	13.99	0	00:35			
V200	CONDUIT	16.01	0	00:38	5.98	0.07	0.30
W100	DUMMY	3.45	0	00:35			
X100	DUMMY	80.91	0	00:35			
X200	CONDUIT	41.01	0	00:38	5.96	0.08	0.33
X300	CONDUIT	76.15	0	00:41	9.36	0.09	0.34
I200	DUMMY	24.36	0	01:04			
O12	DUMMY	0.30	0	00:00			
KK100	DUMMY	8.14	0	00:35			
LL200	DUMMY	16.85	0	01:15			
IRR_OUTLET	DUMMY	114.18	0	02:26			
O1	DUMMY	29.38	0	01:24			
O10	DUMMY	13.64	0	01:31			
O11	DUMMY	98.74	0	01:18			
O13	DUMMY	17.17	0	01:00			
O14	DUMMY	76.43	0	01:01			
O2	DUMMY	27.93	0	02:07			
O3	DUMMY	22.74	0	01:51			
O5	DUMMY	39.47	0	00:56			
O6	DUMMY	12.23	0	01:27			
O7	DUMMY	180.87	0	00:37			
O8	DUMMY	6.50	0	02:03			
O9	DUMMY	94.99	0	01:28			
O16	DUMMY	24.36	0	01:04			
O15	DUMMY	30.95	0	01:11			
O17	DUMMY	16.85	0	01:15			
O4	DUMMY	70.77	0	01:42			

Conduit Surcharge Summary

No conduits were surcharged.

Analysis begun on: Thu Jul 28 14:53:53 2022
Analysis ended on: Thu Jul 28 14:53:53 2022
Total elapsed time: < 1 sec

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.012)

 NOTE: The summary statistics displayed in this report are based on results found at every computational time step, not just on results from each reporting time step.

 Analysis Options

Flow Units CFS
 Process Models:
 Rainfall/Runoff NO
 RDII NO
 Snowmelt NO
 Groundwater NO
 Flow Routing YES
 Ponding Allowed NO
 Water Quality NO
 Flow Routing Method KINWAVE
 Starting Date 01/01/2005 00:00:00
 Ending Date 01/01/2005 06:00:00
 Antecedent Dry Days 0.0
 Report Time Step 00:05:00
 Routing Time Step 30.00 sec

*****	Volume	Volume
Flow Routing Continuity	acre-feet	10 ⁶ gal
*****	-----	-----
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.000	0.000
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	328.826	107.153
External Outflow	290.042	94.514
Flooding Loss	2.515	0.820
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	37.312	12.159
Continuity Error (%)	-0.317	

 Highest Flow Instability Indexes

Link J700 (3)
 Link 07 (3)
 Link J1300 (2)
 Link J1200 (2)
 Link J500 (2)

Routing Time Step Summary

Minimum Time Step : 30.00 sec
 Average Time Step : 30.00 sec
 Maximum Time Step : 30.00 sec
 Percent in Steady State : 0.00
 Average Iterations per Step : 1.00
 Percent Not Converging : 0.00

Node Depth Summary

Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days hr:min	Reported Max Depth Feet
A	JUNCTION	0.00	0.00	7625.00	0 00:00	0.00
AA	JUNCTION	0.00	0.00	7525.00	0 00:00	0.00
B1	JUNCTION	0.67	2.37	7577.37	0 00:40	2.37
B2	JUNCTION	0.71	2.22	7577.22	0 00:45	2.21
BB	JUNCTION	0.00	0.00	7410.00	0 00:00	0.00
BB1	JUNCTION	0.69	2.09	7387.09	0 00:52	2.08
BB2	JUNCTION	0.00	0.00	7365.00	0 00:00	0.00
BB3	JUNCTION	0.00	0.00	7330.00	0 00:00	0.00
C	JUNCTION	0.00	0.00	7635.00	0 00:00	0.00
CC	JUNCTION	0.00	0.00	7495.00	0 00:00	0.00
D	JUNCTION	0.00	0.00	7609.00	0 00:00	0.00
DD	JUNCTION	0.00	0.00	7495.00	0 00:00	0.00
E	JUNCTION	0.81	1.91	7573.91	0 00:55	1.91
EE1	JUNCTION	0.52	1.57	7476.57	0 00:52	1.57
EE2	JUNCTION	0.00	0.00	7550.00	0 00:00	0.00
EE3	JUNCTION	0.23	1.05	7576.05	0 00:35	1.04
F	JUNCTION	0.00	0.00	7633.00	0 00:00	0.00
FF	JUNCTION	0.69	2.09	7432.09	0 00:51	2.08
G	JUNCTION	0.57	1.76	7566.76	0 00:45	1.76
GG	JUNCTION	0.00	0.00	7420.00	0 00:00	0.00
H	JUNCTION	0.00	0.00	7530.00	0 00:00	0.00
HH	JUNCTION	0.00	0.00	7410.00	0 00:00	0.00
I	JUNCTION	0.00	0.00	7595.00	0 00:00	0.00

II1	JUNCTION	0.44	1.08	7496.08	0	00:50	1.08
II2	JUNCTION	0.41	1.55	7451.55	0	00:40	1.55
II3	JUNCTION	0.26	0.99	7515.99	0	00:40	0.99
IRR_J	JUNCTION	0.00	0.00	7528.00	0	00:00	0.00
J10	JUNCTION	0.00	0.00	7520.00	0	00:00	0.00
J11	JUNCTION	0.00	0.00	7565.00	0	00:00	0.00
J12	JUNCTION	0.36	0.54	7545.54	0	00:55	0.54
J13	JUNCTION	0.39	1.25	7521.25	0	00:51	1.24
J14	JUNCTION	0.00	0.00	7375.00	0	00:00	0.00
J15	JUNCTION	0.00	0.00	7552.00	0	00:00	0.00
J2	JUNCTION	0.76	2.02	7437.02	0	01:15	2.02
J3	JUNCTION	1.10	1.84	7496.84	0	01:39	1.84
J4	JUNCTION	0.75	2.02	7467.02	0	01:12	2.02
J5	JUNCTION	0.41	0.99	7525.99	0	01:07	0.99
J6	JUNCTION	0.41	0.99	7570.99	0	01:05	0.99
J7	JUNCTION	0.46	1.36	7546.36	0	00:31	1.36
J8	JUNCTION	0.46	1.37	7526.37	0	00:32	1.36
J9	JUNCTION	0.00	0.00	7550.00	0	00:00	0.00
JJ	JUNCTION	0.00	0.00	7575.00	0	00:00	0.00
K	JUNCTION	0.41	1.98	7586.98	0	00:35	1.96
KK	JUNCTION	0.00	0.00	7590.00	0	00:00	0.00
L	JUNCTION	0.00	0.00	7548.00	0	00:00	0.00
LL	JUNCTION	0.00	0.00	7580.00	0	00:00	0.00
M	JUNCTION	0.26	1.30	7591.30	0	00:35	1.29
N	JUNCTION	0.44	2.18	7537.18	0	00:35	2.17
O	JUNCTION	0.00	0.00	7559.00	0	00:00	0.00
P	JUNCTION	0.00	0.00	7500.37	0	00:00	0.00
Q	JUNCTION	0.00	0.00	7585.00	0	00:00	0.00
R	JUNCTION	0.00	0.00	7576.00	0	00:00	0.00
S	JUNCTION	0.00	0.00	7598.00	0	00:00	0.00
SP1	JUNCTION	0.85	1.43	7511.43	0	01:14	1.43
SP2	JUNCTION	1.37	2.40	7497.40	0	01:16	2.38
SP3	JUNCTION	1.33	2.37	7492.37	0	01:20	2.37
SP4	JUNCTION	0.87	1.61	7421.61	0	01:22	1.60
T	JUNCTION	0.00	0.00	7583.00	0	00:00	0.00
T1	JUNCTION	0.00	0.00	7565.00	0	00:00	0.00
T2	JUNCTION	0.00	0.00	7555.00	0	00:00	0.00
U	JUNCTION	0.00	0.00	7567.00	0	00:00	0.00
V1	JUNCTION	0.00	0.00	7598.00	0	00:00	0.00
V2	JUNCTION	0.24	0.85	7565.85	0	00:40	0.85
W	JUNCTION	0.00	0.00	7546.00	0	00:00	0.00
X1	JUNCTION	0.00	0.00	7485.00	0	00:00	0.00
X2	JUNCTION	0.38	1.37	7506.37	0	00:40	1.36
X3	JUNCTION	0.50	1.44	7501.44	0	00:46	1.43
I2	JUNCTION	0.00	0.00	7577.00	0	00:00	0.00
P12	JUNCTION	0.00	0.00	7550.00	0	00:00	0.00
LL1	JUNCTION	0.00	0.00	0.00	0	00:00	0.00
OF3	OUTFALL	0.00	0.00	7431.00	0	00:00	0.00
OF1	OUTFALL	0.87	1.61	7416.61	0	01:22	1.60
OF2	OUTFALL	0.00	0.00	7550.00	0	00:00	0.00

OF4	OUTFALL	0.00	0.00	7325.00	0	00:00	0.00
OF5	OUTFALL	0.00	0.00	7520.00	0	00:00	0.00
IRR_POND	STORAGE	2.76	4.57	7534.57	0	02:06	4.57
P1	STORAGE	2.80	4.52	7429.52	0	01:07	4.52
P10	STORAGE	3.39	5.83	7530.83	0	01:09	5.83
P11	STORAGE	3.68	7.59	7577.59	0	01:11	7.59
P13	STORAGE	3.01	4.81	7529.81	0	00:51	4.80
P14	STORAGE	3.99	8.57	7408.57	0	01:10	8.57
P15	STORAGE	3.14	5.82	7560.82	0	01:09	5.82
P2	STORAGE	6.20	8.76	7444.76	0	01:38	8.76
P3	STORAGE	5.54	8.81	7518.81	0	01:39	8.81
P4	STORAGE	5.49	8.80	7477.80	0	01:12	8.79
P5	STORAGE	3.36	5.72	7535.72	0	00:52	5.70
P6	STORAGE	4.75	7.78	7581.78	0	01:05	7.78
P7	STORAGE	4.94	10.00	7560.00	0	00:55	10.00
P8	STORAGE	4.50	7.09	7541.09	0	01:14	7.09
P9	STORAGE	4.37	7.80	7577.80	0	01:17	7.79
P16	STORAGE	3.53	5.40	7605.40	0	00:55	5.40
P17	STORAGE	4.59	6.39	7567.39	0	00:53	6.39

Node Inflow Summary

Total Inflow Volume Node gal	Flow Balance Error Percent	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 gal
1.3	0.000	JUNCTION	43.83	43.83	0 00:40	1.3
2.33	0.000	JUNCTION	81.18	81.18	0 00:40	2.33
5.47	0.000	JUNCTION	133.69	177.52	0 00:40	4.17
3.89	0.000	JUNCTION	37.14	112.42	0 00:45	1.39
2.56	0.000	JUNCTION	84.15	84.15	0 00:40	2.56
BB1	0.000	JUNCTION	0.00	483.72	0 00:50	0

16.3	0.000						
BB2		JUNCTION	0.00	515.49	0	00:50	0
17.4	0.000						
BB3		JUNCTION	0.00	646.46	0	00:51	0
24.8	0.000						
C		JUNCTION	75.28	75.28	0	00:45	2.5
2.5	0.000						
CC		JUNCTION	13.57	13.57	0	00:40	0.431
0.431	0.000						
D		JUNCTION	117.38	117.38	0	00:35	2.86
2.86	0.000						
DD		JUNCTION	122.41	122.41	0	00:50	4.81
4.81	0.000						
E		JUNCTION	157.91	157.91	0	00:55	7.39
7.39	0.000						
EE1		JUNCTION	110.30	156.68	0	00:52	3.51
4.92	0.000						
EE2		JUNCTION	63.62	63.62	0	00:35	1.13
1.13	0.000						
EE3		JUNCTION	19.33	19.33	0	00:35	0.463
0.463	0.000						
F		JUNCTION	51.63	51.63	0	00:45	1.73
1.73	0.000						
FF		JUNCTION	43.07	330.28	0	00:51	1.24
11.4	-0.000						
G		JUNCTION	57.12	108.76	0	00:45	2.18
3.91	0.000						
GG		JUNCTION	32.48	32.48	0	00:45	1.13
1.13	0.000						
H		JUNCTION	37.80	37.80	0	00:45	1.52
1.52	0.000						
HH		JUNCTION	28.16	28.16	0	00:40	0.87
0.87	0.000						
I		JUNCTION	78.06	78.06	0	00:35	2.02
2.02	0.000						
II1		JUNCTION	74.39	74.39	0	00:50	3.49
3.49	0.000						
II2		JUNCTION	57.88	116.26	0	00:40	1.58
3.23	0.000						
II3		JUNCTION	58.65	58.65	0	00:40	1.64
1.64	0.000						
IRR_J		JUNCTION	0.00	274.80	0	02:06	0
18.3	0.000						
J10		JUNCTION	0.00	292.64	0	02:03	0
19.7	0.000						
J11		JUNCTION	0.00	230.44	0	01:11	0
9.06	0.000						
J12		JUNCTION	0.00	108.72	0	00:55	0
9.1	0.000						
J13		JUNCTION	0.00	54.35	0	00:51	0

1.41	0.000						
J14		JUNCTION	0.00	155.08	0	01:10	0
6.54	0.000						
J15		JUNCTION	0.00	68.43	0	01:09	0
2.65	0.000						
J2		JUNCTION	0.00	271.49	0	01:15	0
11.8	0.000						
J3		JUNCTION	0.00	46.10	0	01:39	0
3.15	0.000						
J4		JUNCTION	0.00	199.13	0	01:12	0
7.87	0.000						
J5		JUNCTION	0.00	139.06	0	01:02	0
4.27	0.000						
J6		JUNCTION	0.00	47.71	0	01:05	0
1.65	0.000						
J7		JUNCTION	0.00	234.87	0	00:31	0
7.11	0.000						
J8		JUNCTION	0.00	259.47	0	01:14	0
8.15	0.000						
J9		JUNCTION	0.00	221.14	0	01:17	0
9.59	0.000						
JJ		JUNCTION	22.80	22.80	0	00:35	0.603
0.603	0.000						
K		JUNCTION	382.30	382.30	0	00:35	8.05
8.05	0.000						
KK		JUNCTION	16.95	16.95	0	00:40	0.575
0.575	0.000						
L		JUNCTION	32.40	32.40	0	00:40	1.1
1.1	0.000						
LL		JUNCTION	15.07	15.07	0	00:40	0.418
0.418	0.000						
M		JUNCTION	89.08	89.08	0	00:35	1.83
1.83	0.000						
N		JUNCTION	141.24	141.24	0	00:35	2.84
2.84	0.000						
O		JUNCTION	127.40	127.40	0	00:40	3.67
3.67	0.000						
P		JUNCTION	82.83	82.83	0	00:45	3.04
3.04	0.000						
Q		JUNCTION	137.80	137.80	0	00:45	4.98
4.98	0.000						
R		JUNCTION	116.06	253.86	0	00:45	3.91
8.89	0.000						
S		JUNCTION	58.96	58.96	0	00:35	1.52
1.52	0.000						
SP1		JUNCTION	0.00	511.89	0	01:14	0
36.8	0.000						
SP2		JUNCTION	0.00	618.35	0	01:16	0
40.8	0.000						
SP3		JUNCTION	0.00	641.31	0	01:20	0

43.3	0.000						
SP4		JUNCTION	0.00	706.05	0	01:22	0
46	0.000						
T		JUNCTION	8.68	8.68	0	00:45	0.359
0.359	0.000						
T1		JUNCTION	0.00	228.33	0	01:17	0
9.95	0.000						
T2		JUNCTION	0.00	242.18	0	01:16	0
10.6	0.000						
U		JUNCTION	10.51	10.51	0	00:45	0.402
0.402	0.000						
V1		JUNCTION	27.67	27.67	0	00:40	0.808
0.808	0.000						
V2		JUNCTION	33.25	33.25	0	00:40	1.06
1.06	0.000						
W		JUNCTION	7.46	7.46	0	00:40	0.255
0.255	0.000						
X1		JUNCTION	163.27	163.27	0	00:45	5.34
5.34	0.000						
X2		JUNCTION	82.46	82.46	0	00:40	2.54
2.54	0.000						
X3		JUNCTION	100.73	158.96	0	00:46	4.3
6.17	0.000						
I2		JUNCTION	0.00	63.72	0	00:55	0
1.84	0.000						
P12		JUNCTION	45.00	45.00	0	00:00	7.27
7.27	0.000						
LL1		JUNCTION	0.00	49.55	0	00:53	0
1.39	0.000						
OF3		OUTFALL	0.00	271.49	0	01:15	0
11.8	0.000						
OF1		OUTFALL	0.00	705.93	0	01:22	0
45.9	0.000						
OF2		OUTFALL	0.00	242.18	0	01:16	0
10.6	0.000						
OF4		OUTFALL	0.00	646.46	0	00:51	0
24.8	0.000						
OF5		OUTFALL	0.00	49.55	0	00:53	0
1.39	0.000						
IRR_POND		STORAGE	0.00	550.27	0	01:07	0
23	0.038						
P1		STORAGE	0.00	82.83	0	00:45	0
3.04	0.095						
P10		STORAGE	0.00	37.80	0	00:45	0
1.52	0.076						
P11		STORAGE	0.00	287.54	0	00:46	0
9.37	0.043						
P13		STORAGE	0.00	81.59	0	00:35	0
1.59	0.115						
P14		STORAGE	0.00	184.37	0	00:47	0

6.72	0.071						
P15		STORAGE	0.00	117.38	0	00:35	0
2.86	0.060						
P2		STORAGE	0.00	163.27	0	00:45	0
5.34	0.041						
P3		STORAGE	0.00	127.40	0	00:40	0
3.67	0.027						
P4		STORAGE	0.00	240.47	0	00:46	0
8.71	0.064						
P5		STORAGE	0.00	139.56	0	00:37	0
2.84	0.133						
P6		STORAGE	0.00	88.72	0	00:36	0
1.83	0.087						
P7		STORAGE	0.00	381.85	0	00:36	0
8.05	0.051						
P8		STORAGE	0.00	32.40	0	00:40	0
1.1	0.111						
P9		STORAGE	0.00	309.44	0	00:45	0
10.4	0.048						
P16		STORAGE	0.00	78.06	0	00:35	0
2.02	0.131						
P17		STORAGE	0.00	54.80	0	00:40	0
1.6	0.221						

Node Flooding Summary

Flooding refers to all water that overflows a node, whether it ponds or not.

Node	Hours Flooded	Maximum Rate CFS	Time of Max Occurrence days hr:min	Total Flood Volume 10 ⁶ gal	Maximum Ponded Volume 1000 ft ³
P7	0.39	144.38	0 00:37	0.819	0.000

Storage Volume Summary

of Max Occurrence	Maximum Outflow	Average Volume	Avg Pcnt	Evap Pcnt	Exfil Pcnt	Maximum Volume	Max Pcnt	Time
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Storage Unit hr:min	Unit CFS	1000 ft3	Full	Loss	Loss	1000 ft3	Full	days

IRR_POND		937.643	43	0	0	1601.097	73	0
02:06	274.80							
P1		40.419	13	0	0	86.546	29	0
01:06	73.03							
P10		17.750	16	0	0	40.965	37	0
01:09	33.90							
P11		102.795	23	0	0	298.174	65	0
01:10	230.44							
P13		36.773	14	0	0	78.989	31	0
00:51	54.35							
P14		58.001	26	0	0	174.628	77	0
01:09	155.08							
P15		53.042	36	0	0	140.809	95	0
01:09	68.43							
P2		240.111	51	0	0	385.792	82	0
01:38	74.57							
P3		143.247	42	0	0	277.490	82	0
01:39	46.10							
P4		163.739	42	0	0	320.570	82	0
01:11	199.13							
P5		49.222	18	0	0	111.726	41	0
00:52	103.73							
P6		61.785	32	0	0	127.676	65	0
01:05	47.71							
P7		33.332	32	0	0	105.140	100	0
00:36	234.87							
P8		27.994	26	0	0	56.030	53	0
01:14	24.60							
P9		198.987	31	0	0	450.202	69	0
01:17	221.14							
P16		40.266	19	0	0	77.891	37	0
00:55	63.72							
P17		33.643	41	0	0	55.496	68	0
00:52	49.55							

 Outfall Loading Summary

Outfall Node	Flow Freq Pcnt	Avg Flow CFS	Max Flow CFS	Total Volume 10^6 gal

OF3	98.19	74.32	271.49	11.790
OF1	93.47	303.87	705.93	45.881
OF2	98.47	66.67	242.18	10.607
OF4	98.47	156.12	646.46	24.839
OF5	96.53	8.92	49.55	1.391

System	97.03	609.90	1777.26	94.507

Link Flow Summary

Link	Type	Maximum Flow CFS	Time of Max Occurrence days hr:min	Maximum Veloc ft/sec	Max/ Full Flow	Max/ Full Depth

A100	DUMMY	43.83	0 00:40			
AA100	DUMMY	81.18	0 00:40			
B100	CONDUIT	176.88	0 00:42	5.55	0.58	0.79
B200	CONDUIT	112.09	0 00:47	4.28	0.49	0.74
BB100	DUMMY	84.15	0 00:40			
BB101	DUMMY	483.72	0 00:50			
BB102	DUMMY	515.49	0 00:50			
BB103	DUMMY	646.46	0 00:51			
C100	DUMMY	75.28	0 00:45			
C900	CONDUIT	88.72	0 00:36	8.38	0.14	0.43
CC100	DUMMY	13.57	0 00:40			
D100	DUMMY	117.38	0 00:35			
DD100	DUMMY	122.41	0 00:50			
E100	CONDUIT	157.49	0 00:58	7.78	0.34	0.64
EE100	CONDUIT	156.62	0 00:53	10.75	0.22	0.52
EE101	CONDUIT	330.14	0 00:52	12.84	0.43	0.70
EE200	DUMMY	63.62	0 00:35			
EE300	CONDUIT	19.07	0 00:39	11.63	0.53	0.52
F100	DUMMY	51.63	0 00:45			
G100	CONDUIT	107.69	0 00:51	6.18	0.28	0.58
GG100	DUMMY	32.48	0 00:45			
H100	DUMMY	37.80	0 00:45			
H101	DUMMY	292.64	0 02:03			
HH100	DUMMY	28.16	0 00:40			
I100	DUMMY	78.06	0 00:35			
II100	CONDUIT	74.41	0 00:56	9.49	0.25	0.54
II200	CONDUIT	116.09	0 00:42	9.17	0.54	0.77
II300	CONDUIT	58.55	0 00:41	9.88	0.20	0.50
IRR_J100	DUMMY	274.80	0 02:06			
J1100	DUMMY	230.44	0 01:11			
J1200	CONDUIT	107.12	0 01:04	3.63	0.03	0.13
J1300	CONDUIT	53.90	0 00:55	6.31	0.33	0.62

J1400	DUMMY	155.08	0	01:10			
J1500	DUMMY	68.43	0	01:09			
J300	CONDUIT	45.89	0	01:51	2.49	0.32	0.61
J400	CONDUIT	198.78	0	01:15	7.55	0.21	0.51
J500	DUMMY	139.06	0	01:02			
J600	CONDUIT	47.66	0	01:07	8.11	0.19	0.49
J700	CONDUIT	238.60	0	00:32	25.63	0.03	0.27
J800	DUMMY	259.47	0	01:14			
J900	DUMMY	221.14	0	01:17			
JJ100	DUMMY	22.80	0	00:35			
JP20	DUMMY	271.49	0	01:15			
K100	CONDUIT	381.85	0	00:36	16.23	0.38	0.66
L100	DUMMY	32.40	0	00:40			
LL100	DUMMY	15.07	0	00:40			
N100	CONDUIT	139.56	0	00:37	5.09	0.48	0.72
O100	DUMMY	127.40	0	00:40			
P100	DUMMY	82.83	0	00:45			
Q100	DUMMY	137.80	0	00:45			
R100	DUMMY	253.86	0	00:45			
S100	DUMMY	58.96	0	00:35			
SP101	CONDUIT	511.87	0	01:16	5.57	0.14	0.35
SP102	CONDUIT	600.43	0	01:20	3.41	0.36	0.59
SP103	CONDUIT	640.21	0	01:22	9.89	0.05	0.21
SP104	CONDUIT	705.93	0	01:22	6.50	0.11	0.32
SP206	DUMMY	242.18	0	01:16			
T100	DUMMY	8.68	0	00:45			
T101	DUMMY	228.33	0	01:17			
U100	DUMMY	10.51	0	00:45			
V100	DUMMY	27.67	0	00:40			
V200	CONDUIT	33.09	0	00:43	7.22	0.14	0.43
W100	DUMMY	7.46	0	00:40			
X100	DUMMY	163.27	0	00:45			
X200	CONDUIT	81.91	0	00:43	7.13	0.16	0.45
X300	CONDUIT	158.95	0	00:47	11.36	0.19	0.48
I200	DUMMY	63.72	0	00:55			
O12	DUMMY	45.00	0	00:00			
KK100	DUMMY	16.95	0	00:40			
LL200	DUMMY	49.55	0	00:53			
IRR_OUTLET	DUMMY	274.80	0	02:06			
O1	DUMMY	73.03	0	01:07			
O10	DUMMY	33.90	0	01:09			
O11	DUMMY	230.44	0	01:11			
O13	DUMMY	54.35	0	00:51			
O14	DUMMY	155.08	0	01:10			
O2	DUMMY	74.57	0	01:38			
O3	DUMMY	46.10	0	01:39			
O5	DUMMY	103.73	0	00:52			
O6	DUMMY	47.71	0	01:05			
O7	DUMMY	234.87	0	00:31			
O8	DUMMY	24.60	0	01:14			

09	DUMMY	221.14	0	01:17
016	DUMMY	63.72	0	00:55
015	DUMMY	68.43	0	01:09
017	DUMMY	49.55	0	00:53
04	DUMMY	199.13	0	01:12

Conduit Surcharge Summary

No conduits were surcharged.

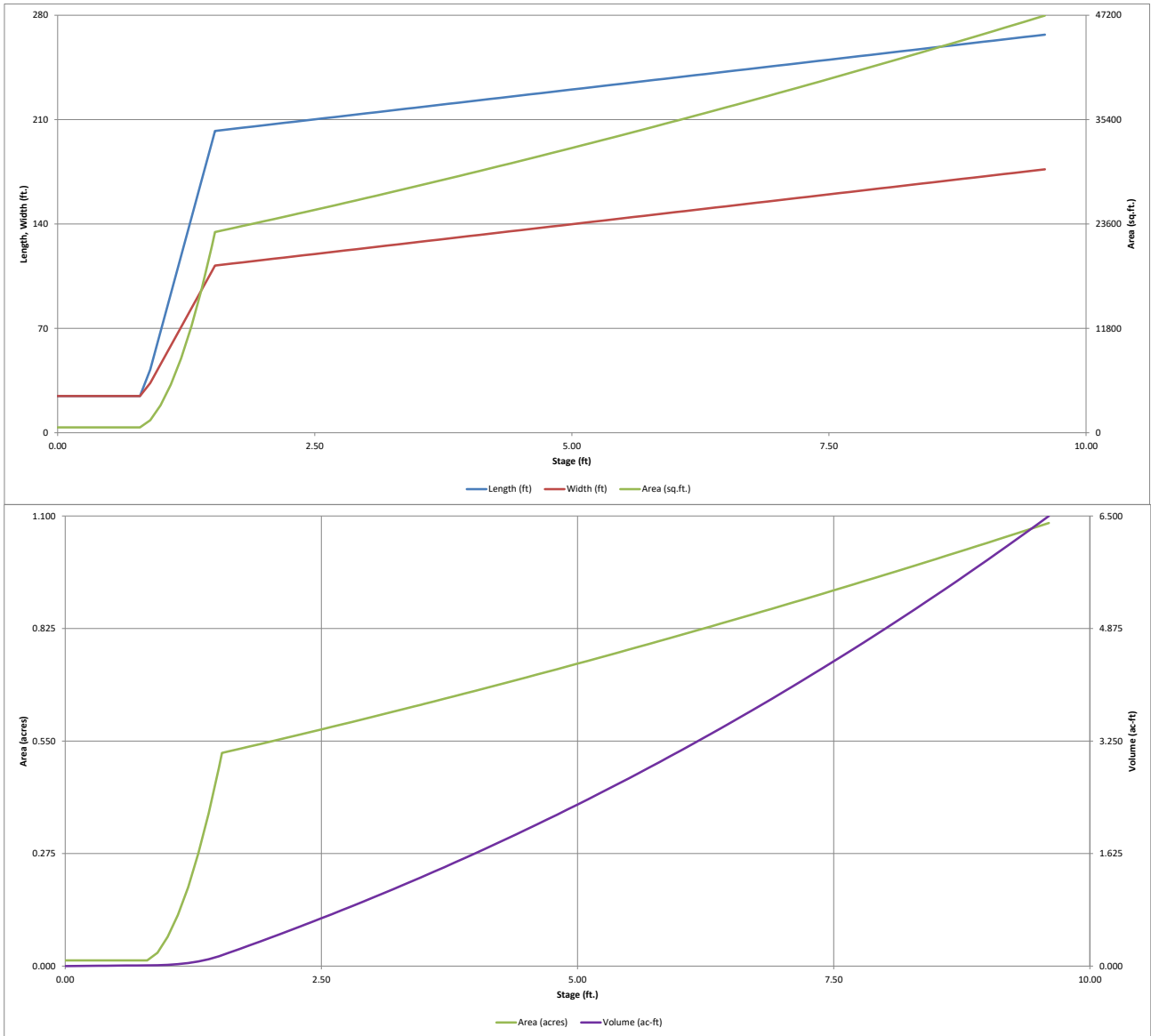
Analysis begun on: Thu Jul 28 14:48:24 2022
Analysis ended on: Thu Jul 28 14:48:24 2022
Total elapsed time: < 1 sec



Appendix D

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)

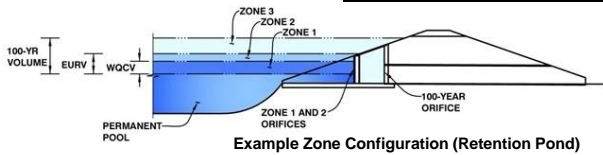


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)

Project: Flying Horse North Drainage Plan

Basin ID: Pond 1



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.34	0.598	Orifice Plate
Zone 2 (5-year)	3.47	0.679	Weir&Pipe (Circular)
Zone 3 (100-year)	6.02	1.845	Weir&Pipe (Restrict)
Total (all zones)		3.122	

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 Diameter =	N/A	inches

Calculated Parameters for Underdrain

Underdrain Orifice Area =	N/A	ft ²
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)

Invert of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate =	2.34	ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing =	9.40	inches
Orifice Plate: Orifice Area per Row =	2.12	sq. inches (diameter = 1-5/8 inches)

Calculated Parameters for Plate

WQ Orifice Area per Row =	1.472E-02	ft ²
Elliptical Half-Width =	N/A	feet
Elliptical Slot Centroid =	N/A	feet
Elliptical Slot Area =	N/A	ft ²

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	0.78	1.56					
Orifice Area (sq. inches)	2.12	2.12	2.12					
	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	
Invert of Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter =	N/A	N/A	inches

Calculated Parameters for Vertical Orifice

	Not Selected	Not Selected	
Vertical Orifice Area =	N/A	N/A	ft ²
Vertical Orifice Centroid =	N/A	N/A	feet

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir (and No Outlet Pipe).

	Zone 2 Weir	Zone 3 Weir	
Overflow Weir Front Edge Height, Ho =	2.34	3.47	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	6.00	6.00	feet
Overflow Weir Grate Slope =	0.00	0.00	H:V
Horiz. Length of Weir Sides =	6.00	6.00	feet
Overflow Grate Type =	Type C Grate	Type C Grate	
Debris Clogging % =	50%	50%	%

Calculated Parameters for Overflow Weir

	Zone 2 Weir	Zone 3 Weir	
Height of Grate Upper Edge, H _u =	2.34	3.47	feet
Overflow Weir Slope Length =	6.00	6.00	feet
Grate Open Area / 100-yr Orifice Area =	9.49	3.69	
Overflow Grate Open Area w/o Debris =	25.06	25.06	ft ²
Overflow Grate Open Area w/ Debris =	12.53	12.53	ft ²

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

	Zone 2 Circular	Zone 3 Restrictor	
Depth to Invert of Outlet Pipe =	2.50	2.70	ft (distance below basin bottom at Stage = 0 ft)
Circular Orifice Diameter or Pipe Diameter =	22.00	36.00	inches
Restrictor Plate Height Above Pipe Invert =		33.00	inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 2 Circular	Zone 3 Restrictor	
Outlet Orifice Area =	2.64	6.79	ft ²
Outlet Orifice Centroid =	0.92	1.44	feet
Half-Central Angle of Restrictor Plate on Pipe =	N/A	2.56	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage =	5.00	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	27.00	feet
Spillway End Slopes =	4.00	H:V
Freeboard above Max Water Surface =	1.00	feet

Calculated Parameters for Spillway

Spillway Design Flow Depth =	0.93	feet
Stage at Top of Freeboard =	6.93	feet
Basin Area at Top of Freeboard =	0.88	acres
Basin Volume at Top of Freeboard =	3.89	acre-ft

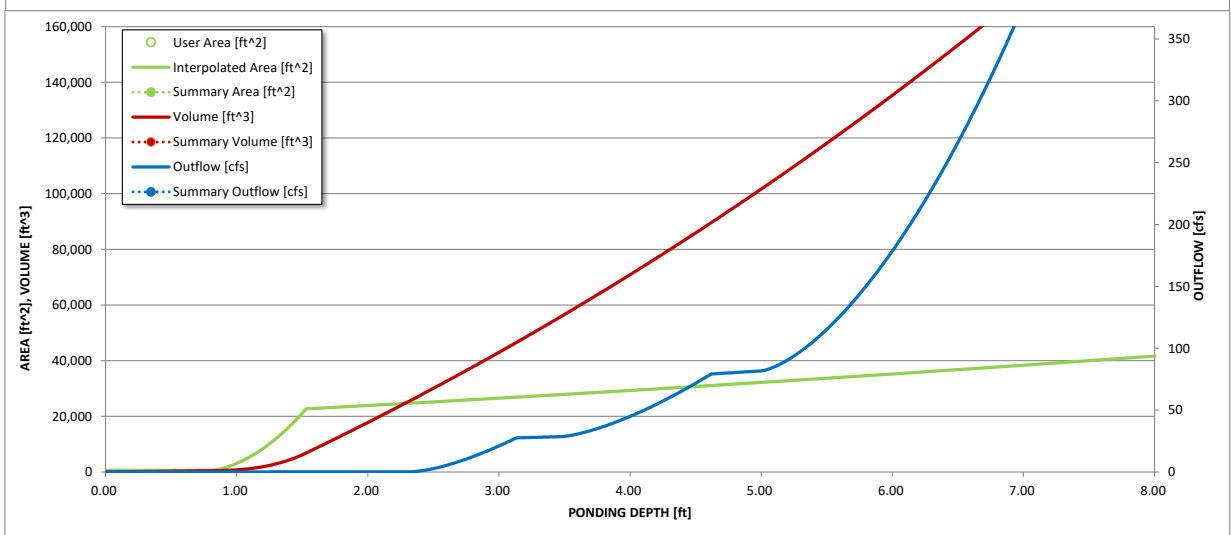
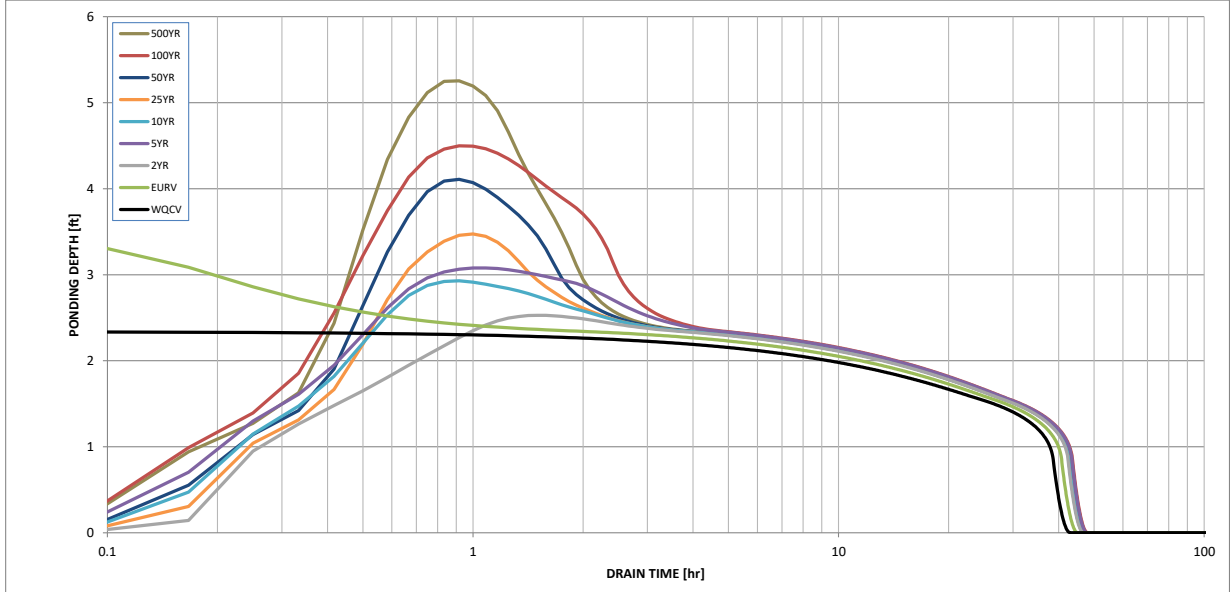
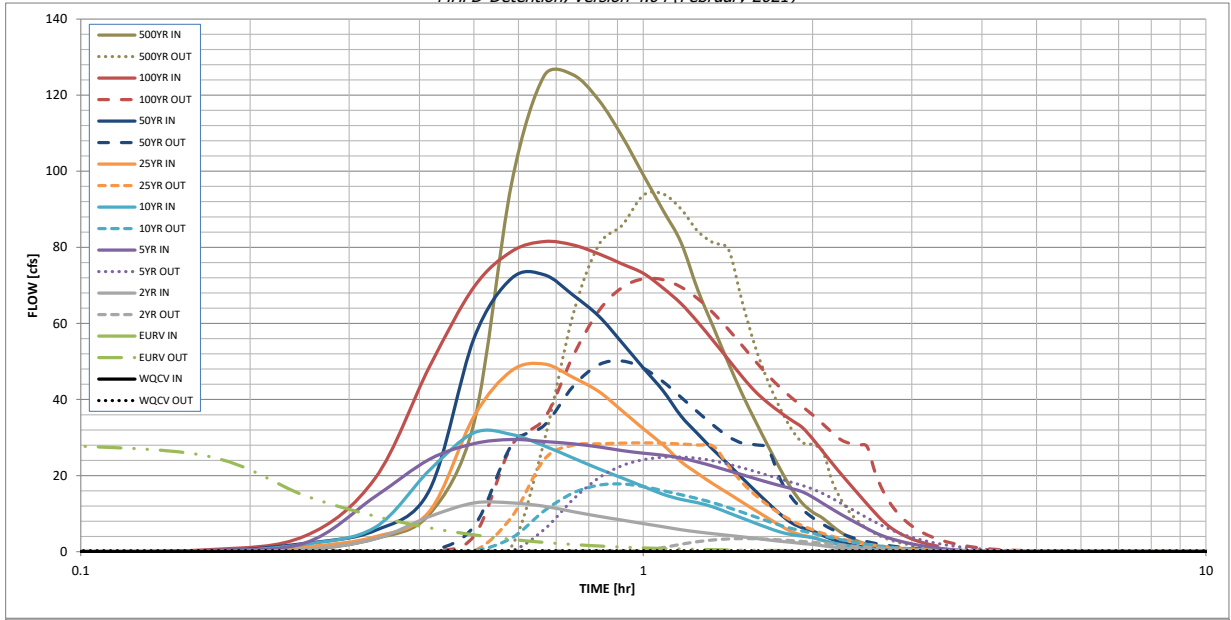
Routed Hydrograph Results

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

	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Design Storm Return Period =	N/A	N/A	0.92	1.20	1.45	1.69	2.15	2.49	3.14
One-Hour Rainfall Depth (in) =	0.598	1.555	0.962	1.511	2.197	3.278	4.893	6.323	8.741
CUHP Runoff Volume (acre-ft) =	0.598	1.555	0.962	1.511	2.197	3.278	4.893	6.323	8.741
User Override Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.962	3.851	2.197	3.278	4.893	9.206	8.741
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.5	3.9	11.5	26.5	44.5	60.8	86.2
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A		27.9				81.0	
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.64	0.26	0.61	1.02	1.85	1.97
Peak Inflow Q (cfs) =	N/A	N/A	12.8	29.5	31.3	49.3	72.8	81.5	125.3
Peak Outflow Q (cfs) =	0.3	33.9	3.4	24.9	17.8	28.6	50.1	71.7	94.0
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.9	1.6	1.1	1.1	0.9	1.1
Structure Controlling Flow =	Overflow Weir 1	Overflow Weir 2	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 2	Overflow Weir 2	Overflow Weir 2	Spillway
Max Velocity through Grate 1 (fps) =	N/A	1.17	0.13	1.0	0.7	1.1	1.2	1.2	1.3
Max Velocity through Grate 2 (fps) =	N/A	0.44	N/A	N/A	N/A	0.0	0.8	1.6	2.0
Time to Drain 97% of Inflow Volume (hours) =	38	37	41	34	37	34	30	22	22
Time to Drain 99% of Inflow Volume (hours) =	40	41	43	41	42	40	39	36	35
Maximum Ponding Depth (ft) =	2.34	3.90	2.53	3.08	2.93	3.48	4.11	4.50	5.25
Area at Maximum Ponding Depth (acres) =	0.57	0.67	0.58	0.61	0.60	0.64	0.68	0.70	0.76
Maximum Volume Stored (acre-ft) =	0.598	1.561	0.702	1.030	0.938	1.280	1.695	1.965	2.520

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)



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

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename: ...[SWM]Outflow hydrographs\Pond6 OutflowHydrograph.xlsx

Inflow Hydrographs

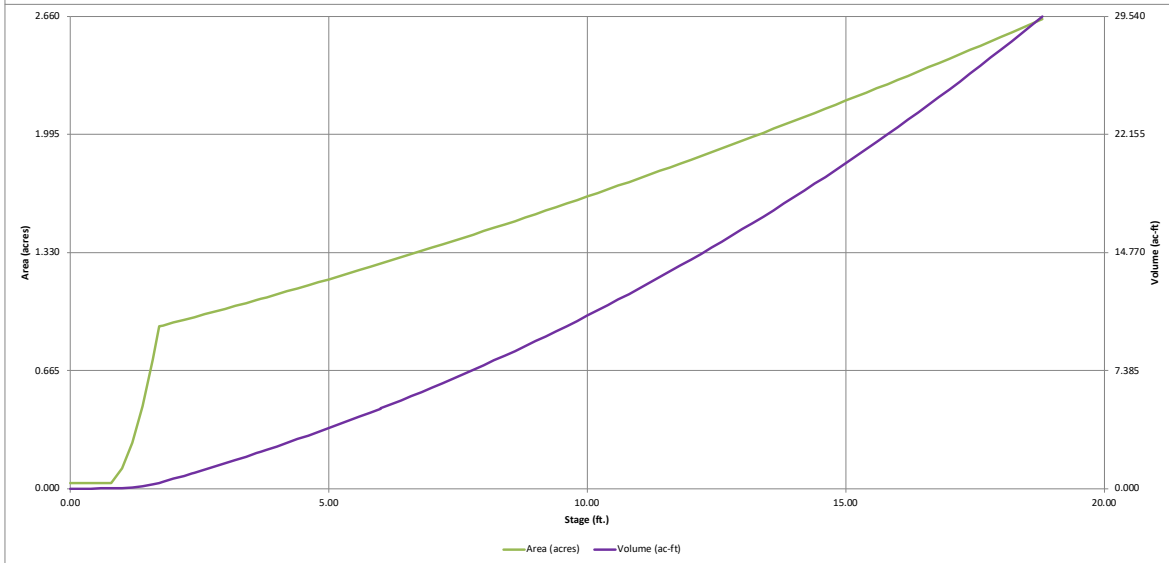
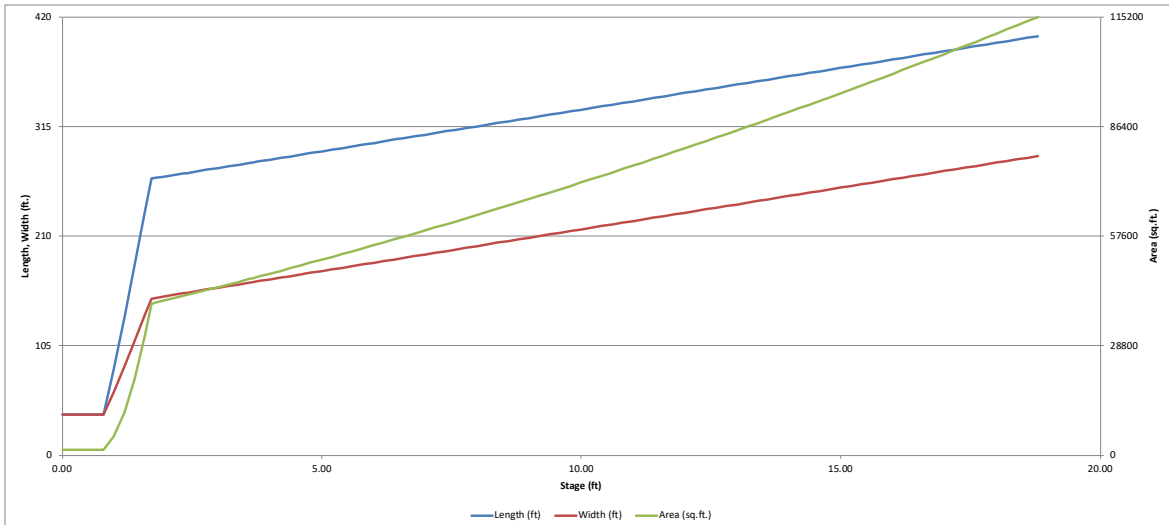
The user can override the calculated inflow hydrographs from this workbook with inflow hydrographs developed in a separate program.

Time Interval	SOURCE	CUHP	CUHP	CUHP	USER	CUHP	CUHP	CUHP	USER	CUHP
	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	0.08	0.00
	0:10:00	0.00	0.00	0.00	0.33	0.00	0.00	0.06	0.49	0.51
	0:15:00	0.00	0.00	0.60	2.28	1.96	1.28	2.18	4.09	3.39
	0:20:00	0.00	0.00	3.35	14.46	6.37	3.91	5.55	19.23	9.84
	0:25:00	0.00	0.00	9.22	24.28	21.41	10.60	16.17	48.59	33.82
	0:30:00	0.00	0.00	12.81	28.40	31.25	35.56	56.08	69.57	96.85
	0:35:00	0.00	0.00	12.83	29.49	30.81	47.58	71.86	78.91	125.12
	0:40:00	0.00	0.00	11.94	28.96	27.81	49.32	72.78	81.52	125.34
	0:45:00	0.00	0.00	10.52	28.36	24.63	45.81	67.44	80.62	118.69
	0:50:00	0.00	0.00	9.31	27.54	21.78	42.11	61.92	78.29	109.19
	0:55:00	0.00	0.00	8.31	26.58	19.39	37.05	54.93	75.63	99.04
	1:00:00	0.00	0.00	7.39	25.89	17.15	32.31	48.29	73.17	89.80
	1:05:00	0.00	0.00	6.57	25.36	15.10	28.14	42.37	69.34	81.30
	1:10:00	0.00	0.00	5.78	24.60	13.74	23.67	35.68	65.22	68.77
	1:15:00	0.00	0.00	5.19	23.58	12.87	20.54	30.96	60.34	58.88
	1:20:00	0.00	0.00	4.72	22.44	11.71	17.74	26.69	55.32	49.58
	1:25:00	0.00	0.00	4.30	21.29	10.22	15.33	22.96	50.50	41.35
	1:30:00	0.00	0.00	3.90	20.22	8.81	12.98	19.31	45.93	34.25
	1:35:00	0.00	0.00	3.50	19.18	7.48	10.83	15.93	42.03	27.75
	1:40:00	0.00	0.00	3.10	18.23	6.26	8.80	12.80	39.09	21.80
	1:45:00	0.00	0.00	2.74	17.37	5.19	6.92	9.92	36.69	16.59
	1:50:00	0.00	0.00	2.47	16.59	4.51	5.28	7.60	34.59	12.76
	1:55:00	0.00	0.00	2.15	15.76	4.08	4.33	6.29	32.67	10.41
	2:00:00	0.00	0.00	1.92	14.33	3.68	3.77	5.47	29.67	8.86
	2:05:00	0.00	0.00	1.57	12.73	2.99	2.96	4.27	26.39	6.77
	2:10:00	0.00	0.00	1.26	11.19	2.37	2.26	3.25	23.24	5.00
	2:15:00	0.00	0.00	1.00	9.75	1.86	1.75	2.49	20.31	3.66
	2:20:00	0.00	0.00	0.80	8.45	1.45	1.34	1.88	17.59	2.65
	2:25:00	0.00	0.00	0.63	7.22	1.11	1.02	1.42	15.00	1.96
	2:30:00	0.00	0.00	0.49	6.07	0.84	0.78	1.08	12.51	1.47
	2:35:00	0.00	0.00	0.39	5.01	0.63	0.58	0.80	10.17	1.11
	2:40:00	0.00	0.00	0.30	4.14	0.48	0.44	0.60	8.06	0.85
	2:45:00	0.00	0.00	0.23	3.47	0.37	0.34	0.46	6.38	0.65
	2:50:00	0.00	0.00	0.17	2.93	0.27	0.25	0.34	5.13	0.48
	2:55:00	0.00	0.00	0.12	2.46	0.19	0.18	0.24	4.15	0.34
	3:00:00	0.00	0.00	0.08	2.06	0.13	0.12	0.16	3.36	0.22
	3:05:00	0.00	0.00	0.05	1.73	0.07	0.07	0.09	2.73	0.12
	3:10:00	0.00	0.00	0.03	1.45	0.04	0.04	0.05	2.23	0.06
	3:15:00	0.00	0.00	0.01	1.20	0.01	0.01	0.01	1.81	0.02
	3:20:00	0.00	0.00	0.00	0.98	0.00	0.00	0.00	1.48	0.00
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	3:30:00	0.00	0.00	0.00	0.62	0.00	0.00	0.00	0.97	0.00
	3:35:00	0.00	0.00	0.00	0.48	0.00	0.00	0.00	0.76	0.00
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	3:55:00	0.00	0.00	0.00	0.11	0.00	0.00	0.00	0.19	0.00
	4:00:00	0.00	0.00	0.00	0.06	0.00	0.00	0.00	0.11	0.00
	4:05:00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.05	0.00
	4:10:00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.00
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	4:25:00	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

0 5:50:00 0

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

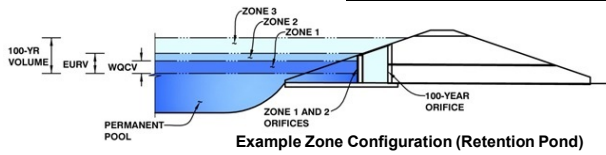
MHFD-Detention, Version 4.04 (February 2021)



DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-*Detention*, Version 4.04 (February 2021)

Project: Flying Horse North MDDP
Basin ID: Pond 2



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.35	0.954	Orifice Plate
Zone 2 (EURV)	3.69	1.355	Circular Orifice
Zone 3 (100-year)	6.01	2.712	Weir&Pipe (Restrict)
Total (all zones)		5.021	

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

Underdrain Orifice Invert Depth = ft (distance below the filtration media surface)
 Underdrain Orifice Diameter = inches

Calculated Parameters for Underdrain
 Underdrain Orifice Area = ft²
 Underdrain Orifice Centroid = 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)

Invert of Lowest Orifice = ft (relative to basin bottom at Stage = 0 ft)
 Depth at top of Zone using Orifice Plate = ft (relative to basin bottom at Stage = 0 ft)
 Orifice Plate: Orifice Vertical Spacing = inches
 Orifice Plate: Orifice Area per Row = sq. inches (use rectangular openings)

Calculated Parameters for Plate
 WQ Orifice Area per Row = ft²
 Elliptical Half-Width = feet
 Elliptical Slot Centroid = feet
 Elliptical Slot Area = ft²

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	0.78	1.57					
Orifice Area (sq. inches)	3.41	3.41	3.41					

	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)

	Zone 2 Circular	Not Selected	
Invert of Vertical Orifice =	2.35	N/A	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =	3.69	N/A	ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter =	10.34	N/A	inches

Calculated Parameters for Vertical Orif

	Zone 2 Circular	Not Selected
Vertical Orifice Area =	0.58	N/A
Vertical Orifice Centroid =	0.43	N/A

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	
Overflow Weir Front Edge Height, Ho =	6.00	N/A	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	6.50	N/A	feet
Overflow Weir Grate Slope =	7.00	N/A	H:V
Horiz. Length of Weir Sides =	7.00	N/A	feet
Overflow Grate Type =	Type C Grate	N/A	
Debris Clogging % =	50%	N/A	%

Calculated Parameters for Overflow W

	Zone 3 Weir	Not Selected
Height of Grate Upper Edge, H _t =	7.00	N/A
Overflow Weir Slope Length =	7.07	N/A
Grate Open Area / 100-yr Orifice Area =	6.05	N/A
Overflow Grate Open Area w/o Debris =	31.99	N/A
Overflow Grate Open Area w/ Debris =	15.99	N/A

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

	Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	1.00	N/A	ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter =	36.00	N/A	inches
Restrictor Plate Height Above Pipe Invert =	25.20	N/A	inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Pl

	Zone 3 Restrictor	Not Selected
Outlet Orifice Area =	5.29	N/A
Outlet Orifice Centroid =	1.17	N/A
Half-Central Angle of Restrictor Plate on Pipe =	1.98	N/A

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage =	8.80	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	54.00	feet
Spillway End Slopes =	4.00	H:V
Freeboard above Max Water Surface =	1.00	feet

Calculated Parameters for Spillway

Spillway Design Flow Depth =	0.96	feet
Stage at Top of Freeboard =	10.76	feet
Basin Area at Top of Freeboard =	1.72	acres
Basin Volume at Top of Freeboard =	12.10	acre-ft

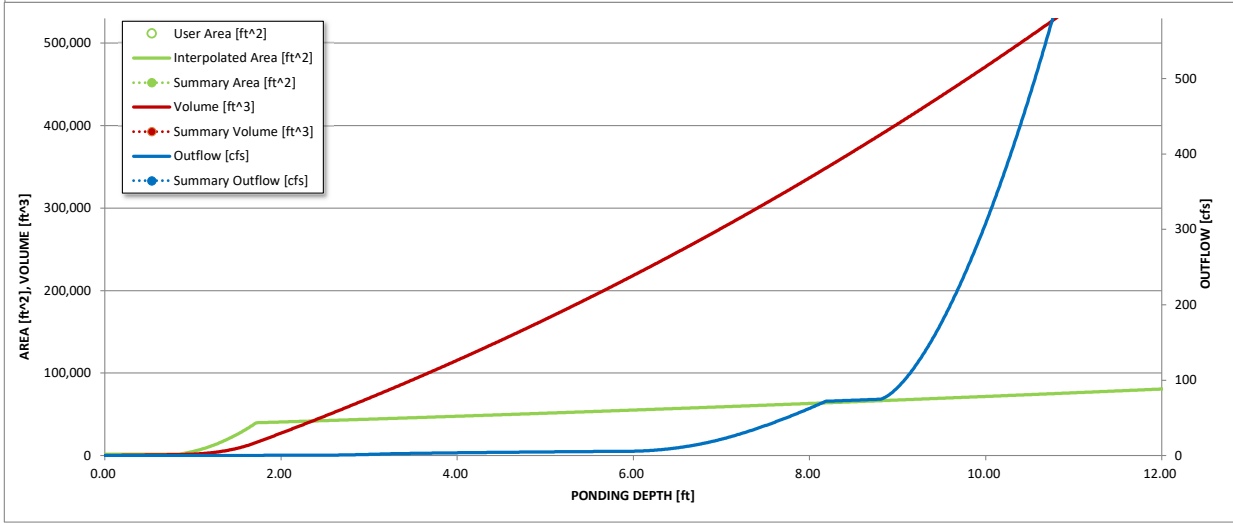
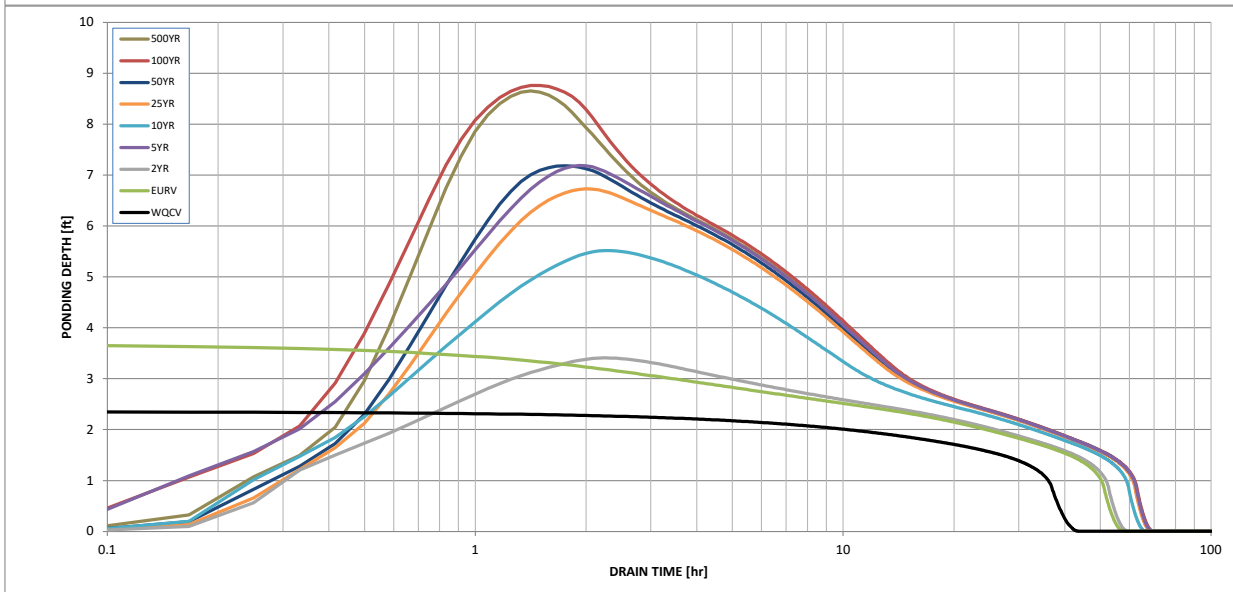
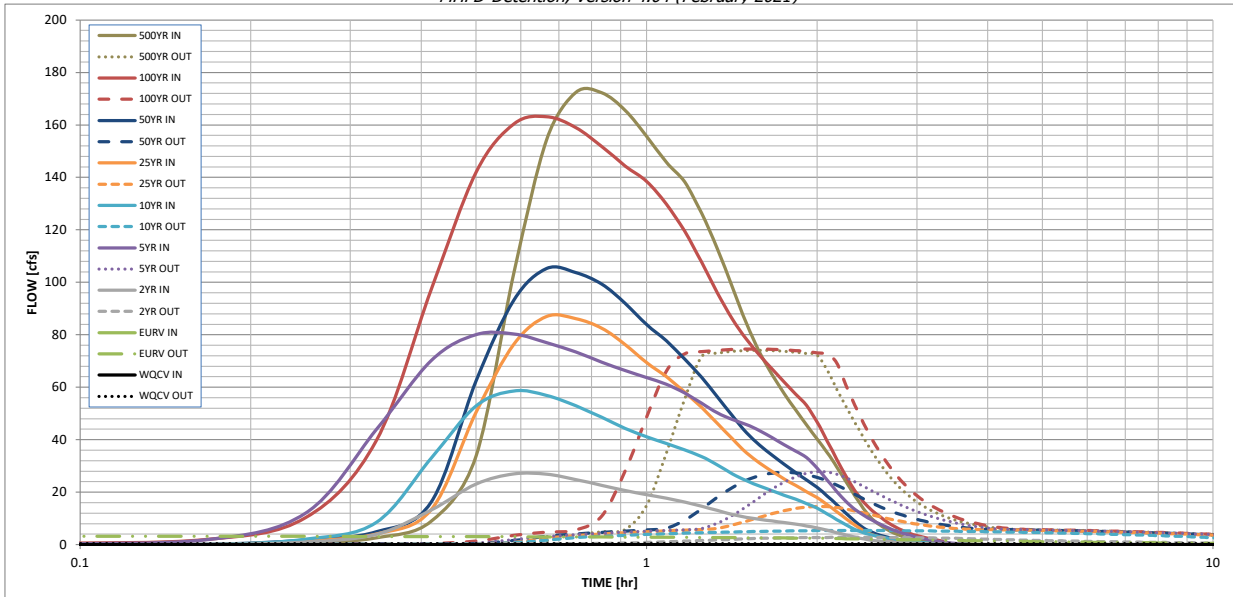
Routed Hydrograph Results

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

	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
Design Storm Return Period =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52
CUHP Runoff Volume (acre-ft) =	0.954	2.309	2.348	3.828	5.193	7.260	8.821	10.908
User Override Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	2.348	9.011	5.193	7.260	8.821	16.404
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	7.6	21.4	32.6	58.3	73.3	93.7
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A	27.9					81.0
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.10	0.37	0.43	0.76	0.96	1.06
Peak Inflow Q (cfs) =	N/A	N/A	26.9	80.3	58.6	87.0	105.2	163.2
Peak Outflow Q (cfs) =	0.4	3.2	2.8	27.8	5.4	14.5	27.5	74.6
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	1.0	0.2	0.2	0.4	0.9
Structure Controlling Flow =	Plate	Vertical Orifice 1	Vertical Orifice 1	Overflow Weir 1	Vertical Orifice 1	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1
Max Velocity through Gate 1 (fps) =	N/A	N/A	N/A	0.7	N/A	0.3	0.7	2.1
Max Velocity through Gate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	37	49	50	49	52	51	49	41
Time to Drain 99% of Inflow Volume (hours) =	40	52	54	59	58	59	59	55
Maximum Ponding Depth (ft) =	2.35	3.69	3.41	7.19	5.52	6.72	7.18	8.76
Area at Maximum Ponding Depth (acres) =	0.96	1.07	1.05	1.37	1.22	1.33	1.37	1.52
Maximum Volume Stored (acre-ft) =	0.956	2.317	2.010	6.569	4.402	5.947	6.556	8.842

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)



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

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename: _____

Inflow Hydrographs

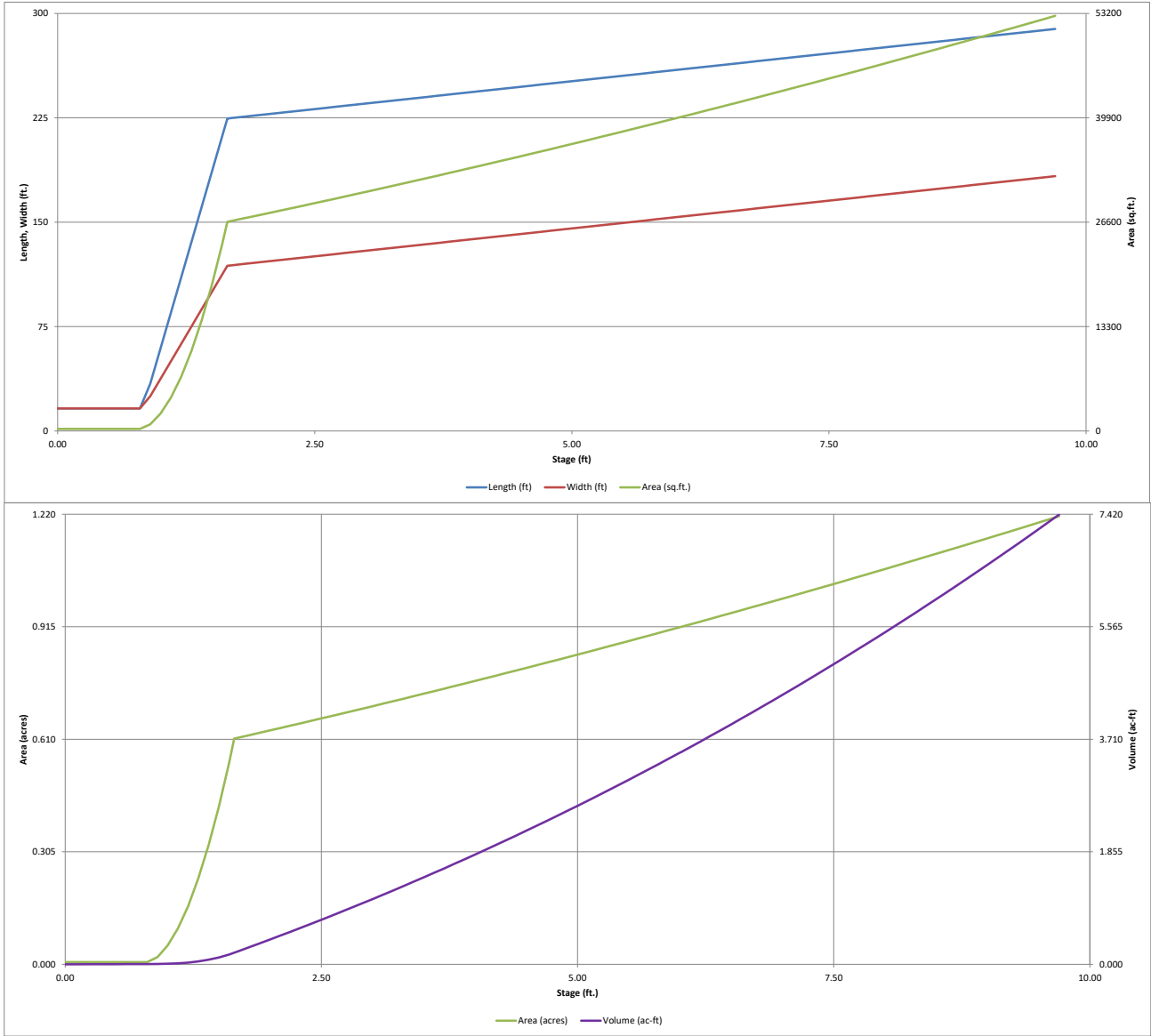
The user can override the calculated inflow hydrographs from this workbook with inflow hydrographs developed in a separate program.

Time Interval	SOURCE	CUHP	CUHP	CUHP	USER	CUHP	CUHP	CUHP	USER	CUHP
	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	0.13	0.00	0.00	0.00	0.32	0.00
	0:10:00	0.00	0.00	0.00	1.80	0.00	0.00	0.11	1.90	0.37
	0:15:00	0.00	0.00	0.97	11.97	2.02	1.37	1.76	10.22	2.60
	0:20:00	0.00	0.00	3.87	43.79	8.48	4.07	4.83	39.58	8.88
	0:25:00	0.00	0.00	13.19	70.16	32.99	13.33	16.21	97.23	33.67
	0:30:00	0.00	0.00	23.12	80.09	52.87	50.35	62.29	141.84	103.95
	0:35:00	0.00	0.00	26.92	80.26	58.60	76.45	93.34	160.45	154.46
	0:40:00	0.00	0.00	26.87	76.94	56.82	86.98	105.24	163.15	172.38
	0:45:00	0.00	0.00	24.83	73.40	52.91	86.09	103.73	158.97	172.22
	0:50:00	0.00	0.00	22.58	69.54	48.53	82.51	99.35	151.80	165.57
	0:55:00	0.00	0.00	20.60	66.38	44.34	76.24	91.93	144.38	155.67
	1:00:00	0.00	0.00	18.99	63.71	41.14	69.38	83.89	138.52	145.77
	1:05:00	0.00	0.00	17.72	61.08	38.56	64.02	77.70	129.85	138.29
	1:10:00	0.00	0.00	16.21	57.80	36.08	58.18	70.80	119.57	126.35
	1:15:00	0.00	0.00	14.59	53.88	33.59	52.31	63.81	107.76	112.87
	1:20:00	0.00	0.00	13.00	50.24	30.43	46.20	56.32	96.06	98.23
	1:25:00	0.00	0.00	11.52	47.71	27.01	40.35	49.12	86.02	84.46
	1:30:00	0.00	0.00	10.40	45.81	24.37	35.06	42.76	78.34	73.27
	1:35:00	0.00	0.00	9.62	43.38	22.31	31.09	37.98	72.21	64.70
	1:40:00	0.00	0.00	8.98	40.71	20.50	27.87	34.07	66.82	57.64
	1:45:00	0.00	0.00	8.41	38.11	18.84	25.07	30.63	61.95	51.34
	1:50:00	0.00	0.00	7.85	35.67	17.29	22.53	27.51	57.40	45.60
	1:55:00	0.00	0.00	7.14	33.13	15.68	20.18	24.61	53.06	40.22
	2:00:00	0.00	0.00	6.38	29.16	13.87	17.91	21.82	46.73	35.16
	2:05:00	0.00	0.00	5.48	24.64	11.73	15.27	18.55	39.57	29.60
	2:10:00	0.00	0.00	4.57	20.28	9.56	12.56	15.20	32.54	24.00
	2:15:00	0.00	0.00	3.69	16.43	7.53	9.93	11.96	26.09	18.60
	2:20:00	0.00	0.00	2.87	13.45	5.75	7.44	8.92	20.54	13.70
	2:25:00	0.00	0.00	2.15	11.17	4.48	5.23	6.32	16.29	9.92
	2:30:00	0.00	0.00	1.65	9.34	3.63	3.85	4.72	13.11	7.39
	2:35:00	0.00	0.00	1.33	7.79	2.98	2.91	3.60	10.56	5.56
	2:40:00	0.00	0.00	1.09	6.44	2.43	2.24	2.78	8.46	4.15
	2:45:00	0.00	0.00	0.90	5.28	1.98	1.71	2.13	6.74	3.06
	2:50:00	0.00	0.00	0.73	4.30	1.59	1.33	1.65	5.35	2.23
	2:55:00	0.00	0.00	0.60	3.49	1.26	1.02	1.26	4.27	1.62
	3:00:00	0.00	0.00	0.49	2.84	1.00	0.79	0.98	3.48	1.22
	3:05:00	0.00	0.00	0.40	2.27	0.78	0.63	0.78	2.82	0.97
	3:10:00	0.00	0.00	0.33	1.78	0.61	0.49	0.61	2.27	0.77
	3:15:00	0.00	0.00	0.26	1.36	0.47	0.39	0.48	1.78	0.61
	3:20:00	0.00	0.00	0.20	1.00	0.36	0.30	0.36	1.35	0.47
	3:25:00	0.00	0.00	0.15	0.71	0.27	0.22	0.27	0.99	0.34
	3:30:00	0.00	0.00	0.11	0.48	0.19	0.16	0.19	0.68	0.24
	3:35:00	0.00	0.00	0.08	0.30	0.12	0.11	0.13	0.42	0.15
	3:40:00	0.00	0.00	0.05	0.16	0.07	0.06	0.08	0.23	0.09
	3:45:00	0.00	0.00	0.02	0.06	0.03	0.03	0.04	0.10	0.04
	3:50:00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.02	0.01
	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	

0 5:50:00 0.72

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

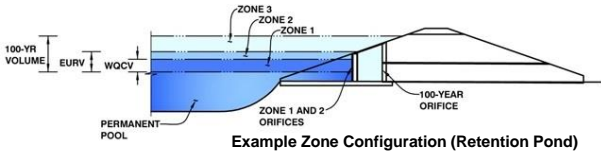
MHFD-Detention, Version 4.04 (February 2021)



DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)

Project: Flying Horse North
Basin ID: Pond 3



	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.40	0.664	Orifice Plate
Zone 2 (EURV)	3.76	0.958	Rectangular Orifice
Zone 3 (100-year)	6.01	1.873	Weir&Pipe (Restrict)
Total (all zones)		3.496	

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 Diameter =	N/A	inches

Calculated Parameters for Underdrain

Underdrain Orifice Area =	N/A	ft ²
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)

Invert of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate =	2.36	ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing =	9.40	inches
Orifice Plate: Orifice Area per Row =	2.20	sq. inches (diameter = 1-11/16 inches)

Calculated Parameters for Plate

WQ Orifice Area per Row =	1.528E-02	ft ²
Elliptical Half-Width =	N/A	feet
Elliptical Slot Centroid =	N/A	feet
Elliptical Slot Area =	N/A	ft ²

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	0.79	1.57					
Orifice Area (sq. inches)	2.20	2.20	2.20					

	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)

	Zone 2 Rectangular	Not Selected	
Invert of Vertical Orifice =	2.43	N/A	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =	3.66	N/A	ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Height =	3.00	N/A	inches
Vertical Orifice Width =	34.00		inches

Calculated Parameters for Vertical Orifice

	Zone 2 Rectangular	Not Selected	
Vertical Orifice Area =	0.71	N/A	ft ²
Vertical Orifice Centroid =	0.13	N/A	feet

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	
Overflow Weir Front Edge Height, Ho =	3.76	N/A	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	3.60	N/A	feet
Overflow Weir Grate Slope =	3.00	N/A	H:V
Horiz. Length of Weir Sides =	3.00	N/A	feet
Overflow Grate Type =	Type C Grate	N/A	
Debris Clogging % =	50%	N/A	%

Calculated Parameters for Overflow Weir

	Zone 3 Weir	Not Selected	
Height of Grate Upper Edge, H _u =	4.76	N/A	feet
Overflow Weir Slope Length =	3.16	N/A	feet
Grate Open Area / 100-yr Orifice Area =	2.48	N/A	
Overflow Grate Open Area w/o Debris =	7.92	N/A	ft ²
Overflow Grate Open Area w/ Debris =	3.96	N/A	ft ²

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

	Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	1.00	N/A	ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter =	28.00	N/A	inches
Restrictor Plate Height Above Pipe Invert =	19.60		inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 3 Restrictor	Not Selected	
Outlet Orifice Area =	3.20	N/A	ft ²
Outlet Orifice Centroid =	0.91	N/A	feet
Half-Central Angle of Restrictor Plate on Pipe =	1.98	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage =	8.80	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	42.00	feet
Spillway End Slopes =	4.00	H:V
Freeboard above Max Water Surface =	1.00	feet

Calculated Parameters for Spillway

Spillway Design Flow Depth =	0.95	feet
Stage at Top of Freeboard =	10.75	feet
Basin Area at Top of Freeboard =	1.31	acres
Basin Volume at Top of Freeboard =	8.74	acre-ft

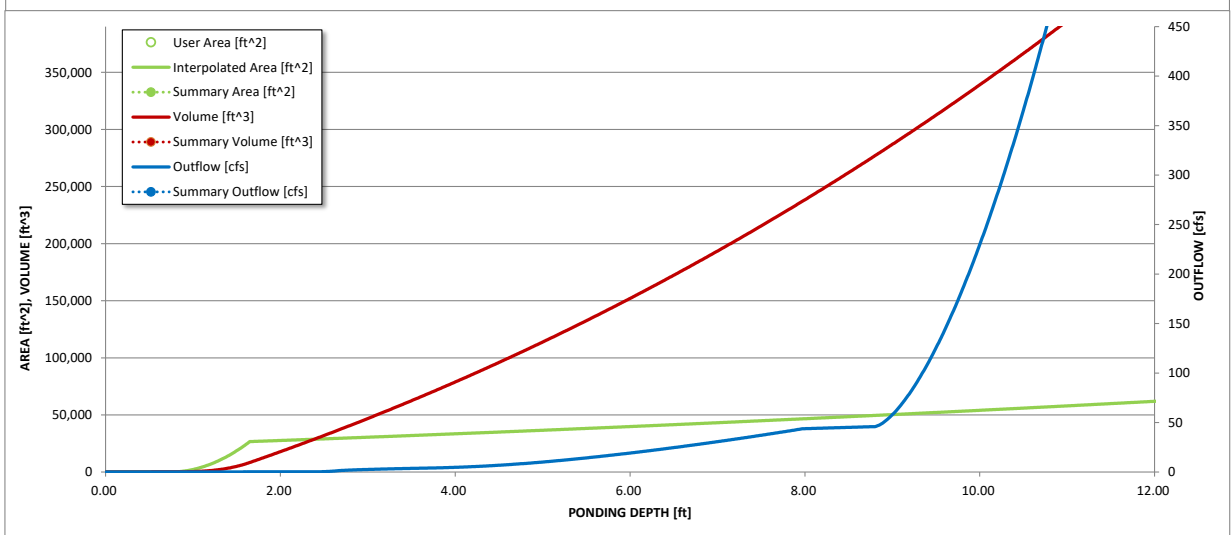
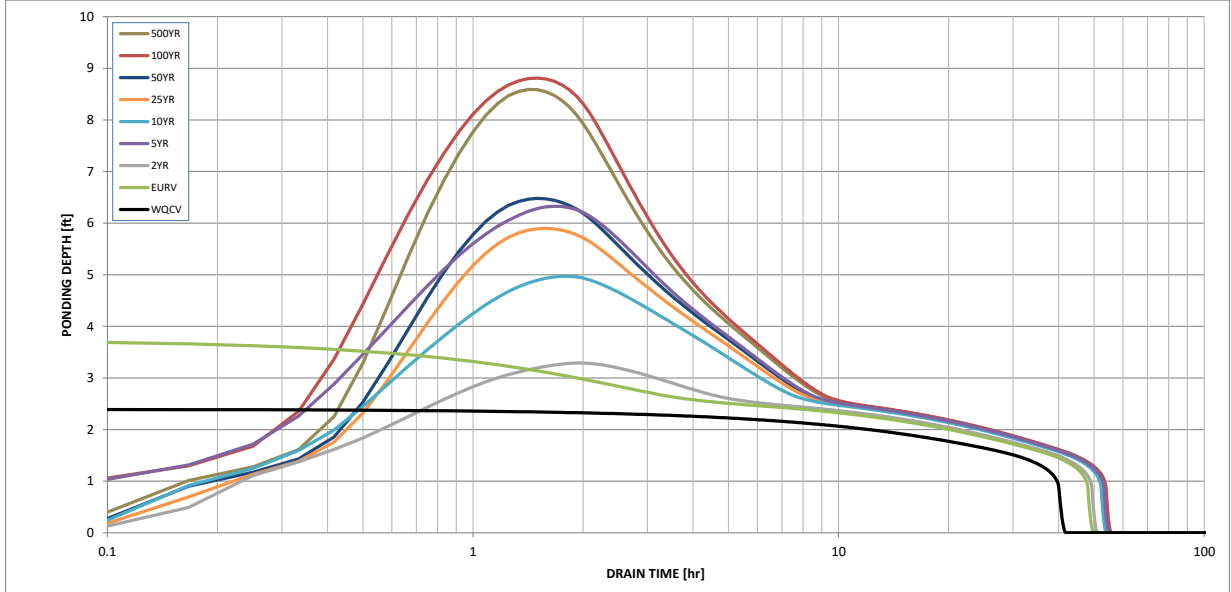
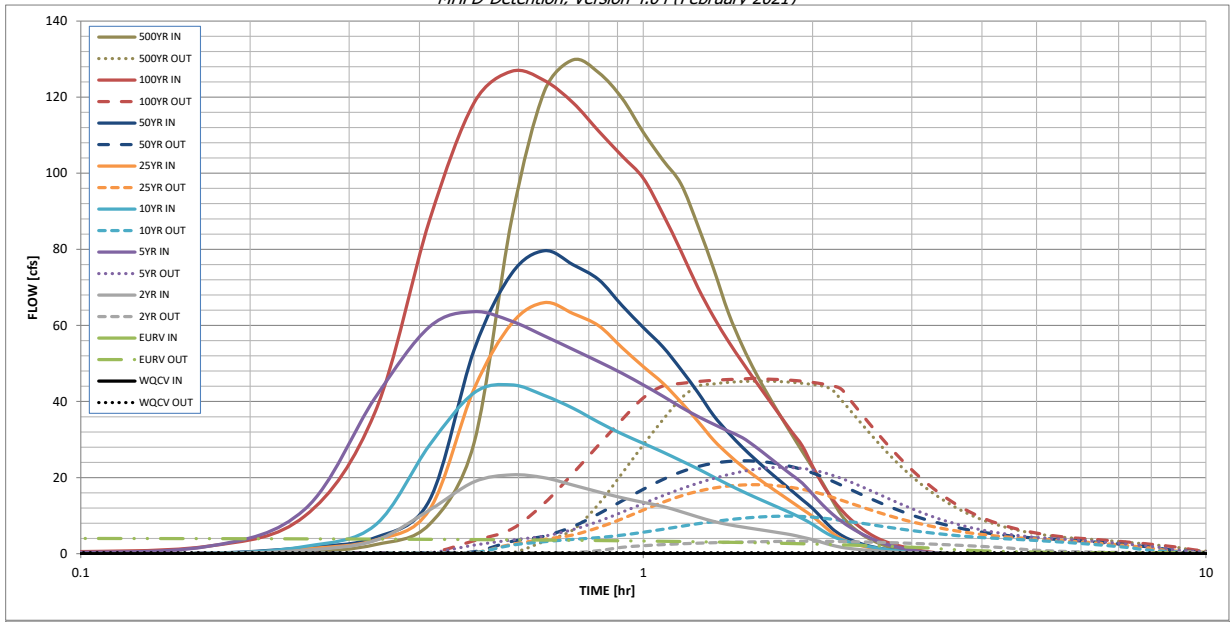
Routed Hydrograph Results

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

	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Design Storm Return Period =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.14
One-Hour Rainfall Depth (in) =	0.664	1.623	1.643	2.665	3.605	5.023	6.095	7.524	10.289
CUHP Runoff Volume (acre-ft) =	N/A	N/A	1.643	6.195	3.605	5.023	6.095	11.270	10.289
User Override Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	5.7	16.0	24.2	43.4	54.4	69.3	96.6
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.11	0.43	0.46	0.83	1.04	0.92	1.84
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A	20.7	63.6	44.4	66.0	79.6	126.8	129.8
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	3.3	22.7	9.9	18.1	24.4	46.1	45.3
Peak Inflow Q (cfs) =	N/A	N/A	1.0	0.4	0.4	0.4	0.4	0.9	0.5
Peak Outflow Q (cfs) =	Plate	Overflow Weir 1	Vertical Orifice 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Spillway	Outlet Plate 1
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	1.0	0.4	0.4	0.4	0.4	0.5
Structure Controlling Flow =	N/A	N/A	N/A	2.0	0.5	1.4	2.2	4.6	4.6
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Max Velocity through Grate 2 (fps) =	39	44	45	38	43	40	38	30	31
Time to Drain 97% of Inflow Volume (hours) =	40	47	48	48	49	49	48	44	45
Time to Drain 99% of Inflow Volume (hours) =	2.40	3.76	3.29	6.33	4.97	5.90	6.48	8.81	8.59
Maximum Ponding Depth (ft) =	0.66	0.75	0.72	0.94	0.84	0.91	0.95	1.14	1.12
Area at Maximum Ponding Depth (acres) =	0.668	1.627	1.275	3.786	2.580	3.390	3.928	6.368	6.108
Maximum Volume Stored (acre-ft) =									

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)



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

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename: ..\SWMM\Outflow hydrographs\Pond6 OutflowHydrograph.xlsx

Inflow Hydrographs

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

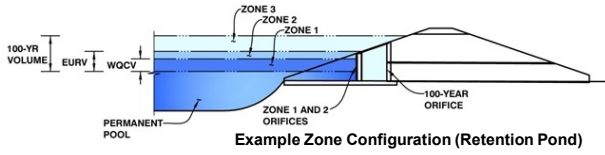
Time Interval	SOURCE	CUHP	CUHP	CUHP	USER	CUHP	CUHP	CUHP	USER	CUHP
	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.13	0.00	0.00	0.00	0.33	0.00
	0:10:00	0.00	0.00	0.00	1.83	0.00	0.00	0.11	1.89	0.35
	0:15:00	0.00	0.00	0.91	11.64	1.89	1.28	1.63	9.87	2.36
	0:20:00	0.00	0.00	3.46	40.91	7.45	3.55	4.20	37.13	7.71
	0:25:00	0.00	0.00	11.48	59.62	28.51	11.54	14.03	87.57	29.01
	0:30:00	0.00	0.00	18.87	63.61	42.26	43.25	53.46	118.46	87.82
	0:35:00	0.00	0.00	20.73	61.11	44.37	60.48	73.62	126.79	121.47
	0:40:00	0.00	0.00	19.96	57.24	41.59	65.99	79.62	124.39	129.80
	0:45:00	0.00	0.00	18.03	53.69	38.23	63.11	75.94	118.52	126.42
	0:50:00	0.00	0.00	16.23	50.46	34.54	59.90	72.01	111.04	119.71
	0:55:00	0.00	0.00	14.69	47.42	31.48	54.16	65.22	104.53	110.75
	1:00:00	0.00	0.00	13.49	44.36	29.00	49.17	59.44	98.67	103.46
	1:05:00	0.00	0.00	12.42	41.41	26.70	44.83	54.37	89.30	97.18
	1:10:00	0.00	0.00	11.05	38.52	24.44	39.84	48.42	79.54	86.29
	1:15:00	0.00	0.00	9.67	36.09	22.31	34.83	42.42	69.99	74.89
	1:20:00	0.00	0.00	8.49	34.04	20.16	29.85	36.33	62.24	63.32
	1:25:00	0.00	0.00	7.64	32.21	18.16	26.08	31.81	55.82	54.62
	1:30:00	0.00	0.00	7.02	30.50	16.38	22.93	27.98	50.32	47.61
	1:35:00	0.00	0.00	6.48	28.09	14.79	20.27	24.73	45.34	41.70
	1:40:00	0.00	0.00	5.97	25.54	13.34	17.87	21.79	40.71	36.37
	1:45:00	0.00	0.00	5.47	23.07	11.96	15.71	19.14	36.32	31.50
	1:50:00	0.00	0.00	4.98	20.78	10.64	13.66	16.61	32.17	26.90
	1:55:00	0.00	0.00	4.34	18.57	9.24	11.69	14.19	28.35	22.58
	2:00:00	0.00	0.00	3.69	15.62	7.71	9.81	11.89	22.96	18.59
	2:05:00	0.00	0.00	2.93	12.84	5.99	7.59	9.15	18.22	14.08
	2:10:00	0.00	0.00	2.21	10.46	4.61	5.47	6.57	14.45	10.15
	2:15:00	0.00	0.00	1.69	8.53	3.67	3.96	4.83	11.50	7.51
	2:20:00	0.00	0.00	1.35	6.94	2.99	2.97	3.67	9.12	5.66
	2:25:00	0.00	0.00	1.10	5.63	2.43	2.27	2.82	7.22	4.23
	2:30:00	0.00	0.00	0.90	4.51	1.97	1.74	2.17	5.65	3.15
	2:35:00	0.00	0.00	0.73	3.57	1.58	1.34	1.67	4.39	2.31
	2:40:00	0.00	0.00	0.59	2.79	1.24	1.03	1.28	3.45	1.66
	2:45:00	0.00	0.00	0.47	2.19	0.97	0.78	0.97	2.73	1.21
	2:50:00	0.00	0.00	0.38	1.71	0.75	0.60	0.75	2.18	0.93
	2:55:00	0.00	0.00	0.31	1.30	0.58	0.47	0.58	1.71	0.74
	3:00:00	0.00	0.00	0.25	0.95	0.45	0.37	0.46	1.29	0.59
	3:05:00	0.00	0.00	0.19	0.66	0.35	0.29	0.35	0.93	0.46
	3:10:00	0.00	0.00	0.15	0.44	0.26	0.22	0.27	0.63	0.34
	3:15:00	0.00	0.00	0.11	0.27	0.18	0.16	0.19	0.39	0.24
	3:20:00	0.00	0.00	0.07	0.14	0.12	0.11	0.13	0.20	0.16
	3:25:00	0.00	0.00	0.05	0.05	0.07	0.07	0.08	0.08	0.09
3:30:00	0.00	0.00	0.02	0.01	0.04	0.04	0.04	0.01	0.05	
3:35:00	0.00	0.00	0.01	0.00	0.01	0.01	0.02	0.00	0.01	
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	

0 5:50:00 0

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-*Detention*, Version 4.04 (February 2021)

Project: Flying Horse North MDDP
Basin ID: Pond 4



	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.90	1.201	Orifice Plate
Zone 2 (5-year)	4.54	1.398	Weir&Pipe (Circular)
Zone 3 (100-year)	8.10	3.853	Weir&Pipe (Restrict)
Total (all zones)		6.452	

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

Underdrain Orifice Invert Depth = ft (distance below the filtration media surface)
 Underdrain Orifice Diameter = inches

Calculated Parameters for Underdrain
 Underdrain Orifice Area = ft²
 Underdrain Orifice Centroid = 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)

Invert of Lowest Orifice = ft (relative to basin bottom at Stage = 0 ft)
 Depth at top of Zone using Orifice Plate = ft (relative to basin bottom at Stage = 0 ft)
 Orifice Plate: Orifice Vertical Spacing = inches
 Orifice Plate: Orifice Area per Row = sq. inches (use rectangular openings)

Calculated Parameters for Plate
 WQ Orifice Area per Row = ft²
 Elliptical Half-Width = feet
 Elliptical Slot Centroid = feet
 Elliptical Slot Area = ft²

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	1.51	3.03					
Orifice Area (sq. inches)	5.55	5.55	5.55					

	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
Invert of Vertical Orifice =	<input type="text" value="N/A"/>	<input type="text" value="N/A"/>
Depth at top of Zone using Vertical Orifice =	<input type="text" value="N/A"/>	<input type="text" value="N/A"/>
Vertical Orifice Diameter =	<input type="text" value="N/A"/>	<input type="text" value="N/A"/>

ft (relative to basin bottom at Stage = 0 ft)
 ft (relative to basin bottom at Stage = 0 ft)
 inches

Calculated Parameters for Vertical Orif
 Vertical Orifice Area =
 Vertical Orifice Centroid =

Not Selected	Not Selected
<input type="text" value="N/A"/>	<input type="text" value="N/A"/>
<input type="text" value="N/A"/>	<input type="text" value="N/A"/>

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir (and No Outlet Pipe)

	Zone 2 Weir	Zone 3 Weir
Overflow Weir Front Edge Height, Ho =	4.54	7.00
Overflow Weir Front Edge Length =	6.00	6.00
Overflow Weir Grate Slope =	0.00	0.00
Horiz. Length of Weir Sides =	6.00	10.00
Overflow Grate Type =	Type C Grate	Type C Grate
Debris Clogging % =	50%	50%

ft (relative to basin bottom at Stage = 0 ft)

Calculated Parameters for Overflow W
 Height of Grate Upper Edge, H_u =
 Overflow Weir Slope Length =
 Grate Open Area / 100-yr Orifice Area =
 Overflow Grate Open Area w/o Debris =
 Overflow Grate Open Area w/ Debris =

Zone 2 Weir	Zone 3 Weir
<input type="text" value="4.54"/>	<input type="text" value="7.00"/>
<input type="text" value="6.00"/>	<input type="text" value="10.00"/>
<input type="text" value="5.10"/>	<input type="text" value="2.01"/>
<input type="text" value="25.06"/>	<input type="text" value="41.76"/>
<input type="text" value="12.53"/>	<input type="text" value="20.88"/>

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

	Zone 2 Circular	Zone 3 Restrictor
Depth to Invert of Outlet Pipe =	2.50	2.60
Circular Orifice Diameter or Pipe Diameter =	30.00	65.00
Restrictor Plate Height Above Pipe Invert =		55.00

ft (distance below basin bottom at Stage = 0 ft)
 inches
 inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Pl
 Outlet Orifice Area =
 Outlet Orifice Centroid =
 Half-Central Angle of Restrictor Plate on Pipe =

Zone 2 Circular	Zone 3 Restrictor
<input type="text" value="4.91"/>	<input type="text" value="20.80"/>
<input type="text" value="1.25"/>	<input type="text" value="2.47"/>
<input type="text" value="N/A"/>	<input type="text" value="2.34"/>

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage =	11.00
Spillway Crest Length =	79.00
Spillway End Slopes =	4.00
Freeboard above Max Water Surface =	1.00

ft (relative to basin bottom at Stage = 0 ft)
 feet
 H:V
 feet

Calculated Parameters for Spillway
 Spillway Design Flow Depth =
 Stage at Top of Freeboard =
 Basin Area at Top of Freeboard =
 Basin Volume at Top of Freeboard =

feet
 feet
 acres
 acre-ft

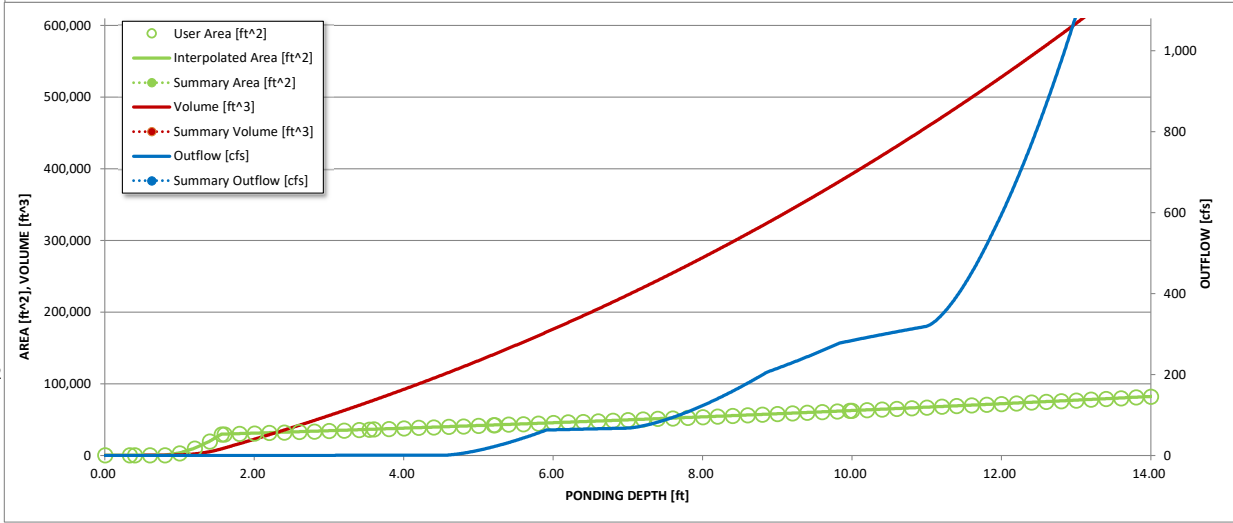
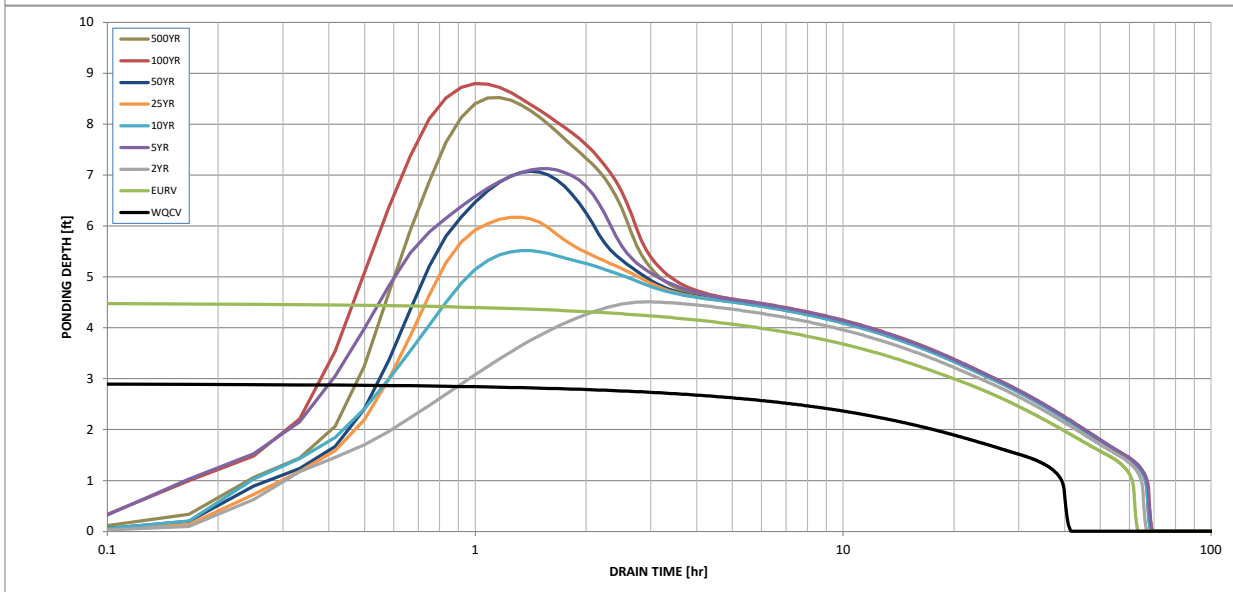
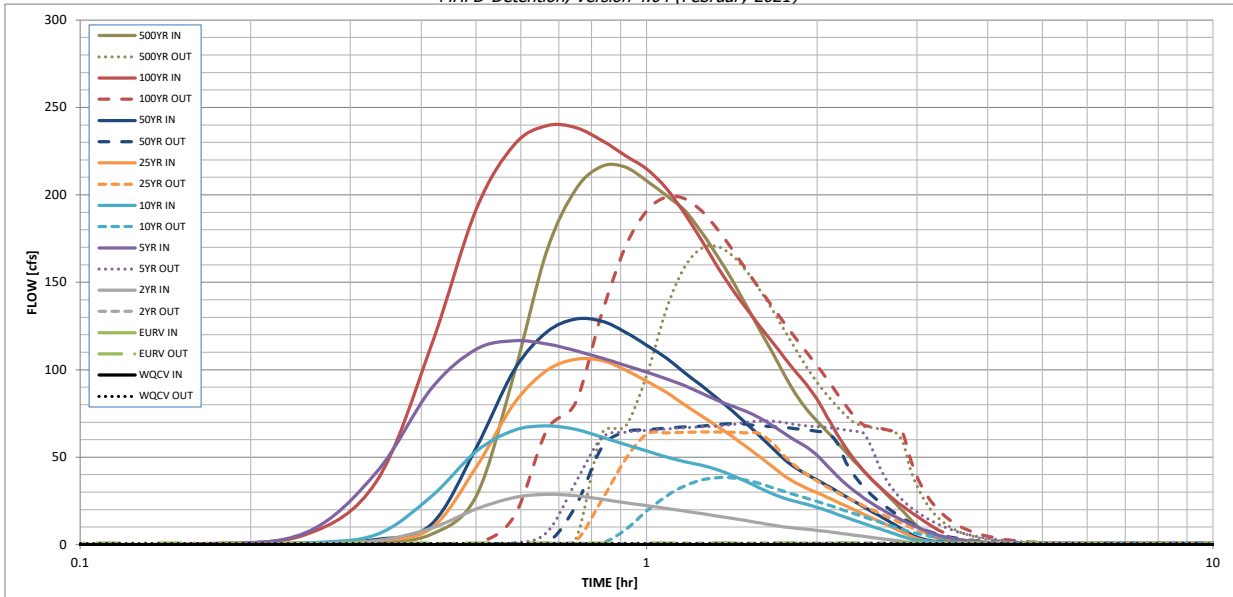
Routed Hydrograph Results

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

	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
Design Storm Return Period =								
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52
CUHP Runoff Volume (acre-ft) =	1.201	2.555	2.764	4.915	6.951	10.216	12.579	15.835
User Override Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	2.764	14.585	6.951	10.216	12.579	26.746
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	10.7	29.9	46.0	84.0	105.5	134.7
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A		69.9				231.6
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.09	0.60	0.39	0.72	0.90	1.97
Peak Inflow Q (cfs) =	N/A	N/A	28.7	116.6	67.8	106.0	128.9	239.6
Peak Outflow Q (cfs) =	0.5	0.9	0.9	70.6	38.3	64.4	69.2	198.8
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	1.0	0.8	0.8	0.7	0.9
Structure Controlling Flow =	Plate	Plate	Plate	Overflow Weir 2	Overflow Weir 1	Outlet Plate 1	Overflow Weir 2	Overflow Weir 2
Max Velocity through Gate 1 (fps) =	N/A	N/A	N/A	2.7	1.5	2.5	2.7	2.9
Max Velocity through Gate 2 (fps) =	N/A	N/A	N/A	0.1	N/A	N/A	0.0	3.0
Time to Drain 97% of Inflow Volume (hours) =	38	58	61	48	56	52	50	38
Time to Drain 99% of Inflow Volume (hours) =	40	61	64	60	64	62	60	54
Maximum Ponding Depth (ft) =	2.90	4.49	4.51	7.12	5.52	6.17	7.07	8.79
Area at Maximum Ponding Depth (acres) =	0.79	0.92	0.92	1.16	1.01	1.07	1.15	1.32
Maximum Volume Stored (acre-ft) =	1.203	2.560	2.569	5.284	3.543	4.228	5.226	7.349

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)



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

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename: _____

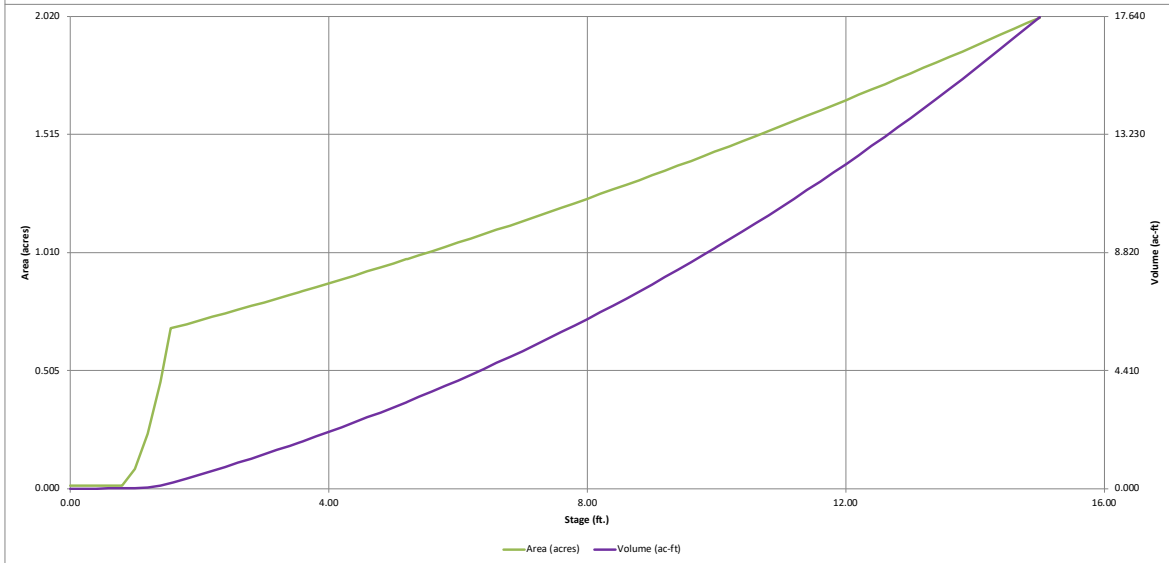
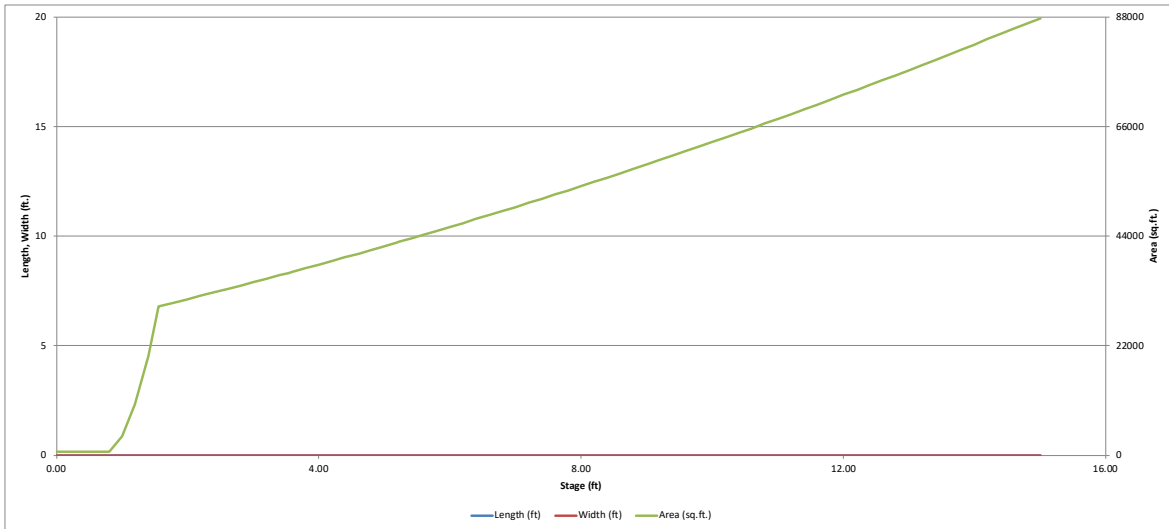
Inflow Hydrographs

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

Time Interval	SOURCE	CUHP	CUHP	CUHP	USER	CUHP	CUHP	CUHP	USER	CUHP
	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	0.01	0.00
	0:10:00	0.00	0.00	0.00	0.36	0.00	0.00	0.06	0.49	0.18
	0:15:00	0.00	0.00	0.48	6.73	0.99	0.67	0.88	5.67	1.32
	0:20:00	0.00	0.00	2.13	41.21	5.65	2.26	2.89	35.90	5.82
	0:25:00	0.00	0.00	9.38	89.05	27.50	9.26	11.47	113.64	27.45
	0:30:00	0.00	0.00	20.30	111.59	53.20	44.07	55.13	191.47	97.49
	0:35:00	0.00	0.00	26.92	116.56	65.38	80.67	99.67	228.61	167.89
	0:40:00	0.00	0.00	28.75	114.74	67.85	99.55	121.59	239.57	203.14
	0:45:00	0.00	0.00	27.97	110.81	65.87	105.99	128.94	238.45	216.31
	0:50:00	0.00	0.00	25.92	106.63	61.53	105.24	127.82	231.20	215.91
	0:55:00	0.00	0.00	23.93	102.54	57.32	99.95	121.53	222.57	208.11
	1:00:00	0.00	0.00	22.26	98.67	53.59	93.45	114.06	214.84	199.58
	1:05:00	0.00	0.00	20.71	94.84	50.07	87.10	106.71	203.76	191.23
	1:10:00	0.00	0.00	19.18	90.87	47.47	79.98	98.34	189.33	178.69
	1:15:00	0.00	0.00	17.72	86.57	45.43	73.58	90.88	174.06	165.11
	1:20:00	0.00	0.00	16.34	82.55	42.85	67.61	83.67	159.11	151.09
	1:25:00	0.00	0.00	15.00	79.15	39.55	61.79	76.45	146.10	136.67
	1:30:00	0.00	0.00	13.68	76.09	36.01	55.97	69.25	135.00	122.93
	1:35:00	0.00	0.00	12.39	72.49	32.45	50.28	62.20	125.07	109.91
	1:40:00	0.00	0.00	11.15	68.09	29.09	44.69	55.31	115.83	97.41
	1:45:00	0.00	0.00	10.11	63.64	26.50	39.42	48.83	107.08	86.08
	1:50:00	0.00	0.00	9.38	59.52	24.62	35.39	43.95	98.86	77.49
	1:55:00	0.00	0.00	8.76	55.77	22.98	32.29	40.17	91.43	70.60
	2:00:00	0.00	0.00	8.13	51.08	21.28	29.70	36.99	83.00	64.62
	2:05:00	0.00	0.00	7.45	45.18	19.40	27.11	33.76	73.06	58.71
	2:10:00	0.00	0.00	6.72	39.50	17.45	24.54	30.53	63.57	52.86
	2:15:00	0.00	0.00	6.01	34.58	15.56	22.07	27.42	55.20	47.30
	2:20:00	0.00	0.00	5.34	30.40	13.75	19.69	24.44	48.18	42.08
	2:25:00	0.00	0.00	4.70	26.78	12.05	17.43	21.62	42.28	37.24
	2:30:00	0.00	0.00	4.09	23.59	10.43	15.25	18.91	37.20	32.58
	2:35:00	0.00	0.00	3.50	20.73	8.90	13.13	16.27	32.73	28.03
	2:40:00	0.00	0.00	2.92	18.16	7.42	11.04	13.68	28.74	23.55
	2:45:00	0.00	0.00	2.35	15.85	5.98	8.99	11.15	25.16	19.13
	2:50:00	0.00	0.00	1.80	13.75	4.59	6.98	8.65	21.91	14.79
	2:55:00	0.00	0.00	1.28	11.84	3.38	5.04	6.26	18.95	10.72
3:00:00	0.00	0.00	0.92	10.10	2.62	3.40	4.29	16.20	7.55	
3:05:00	0.00	0.00	0.72	8.49	2.13	2.42	3.11	13.61	5.49	
3:10:00	0.00	0.00	0.59	7.01	1.76	1.78	2.31	11.16	4.04	
3:15:00	0.00	0.00	0.49	5.74	1.45	1.33	1.75	8.92	2.96	
3:20:00	0.00	0.00	0.41	4.74	1.19	1.01	1.34	7.06	2.16	
3:25:00	0.00	0.00	0.33	3.97	0.96	0.79	1.03	5.65	1.55	
3:30:00	0.00	0.00	0.27	3.35	0.77	0.60	0.79	4.58	1.10	
3:35:00	0.00	0.00	0.22	2.82	0.60	0.47	0.61	3.73	0.82	
3:40:00	0.00	0.00	0.18	2.36	0.46	0.37	0.48	3.04	0.64	
3:45:00	0.00	0.00	0.15	1.96	0.35	0.29	0.37	2.45	0.50	
3:50:00	0.00	0.00	0.11	1.61	0.27	0.22	0.29	1.98	0.40	
3:55:00	0.00	0.00	0.09	1.31	0.20	0.17	0.22	1.60	0.31	
4:00:00	0.00	0.00	0.06	1.06	0.15	0.13	0.16	1.30	0.23	
4:05:00	0.00	0.00	0.04	0.85	0.10	0.09	0.11	1.05	0.16	
4:10:00	0.00	0.00	0.03	0.67	0.06	0.06	0.07	0.85	0.10	
4:15:00	0.00	0.00	0.01	0.52	0.03	0.03	0.04	0.67	0.06	
4:20:00	0.00	0.00	0.01	0.39	0.01	0.02	0.02	0.51	0.03	
4:25:00	0.00	0.00	0.00	0.28	0.00	0.00	0.01	0.38	0.01	
4:30:00	0.00	0.00	0.00	0.20	0.00	0.00	0.00	0.27	0.00	
4:35:00	0.00	0.00	0.00	0.14	0.00	0.00	0.00	0.18	0.00	
4:40:00	0.00	0.00	0.00	0.09	0.00	0.00	0.00	0.12	0.00	
4:45:00	0.00	0.00	0.00	0.05	0.00	0.00	0.00	0.07	0.00	
4:50:00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.04	0.00	
4:55:00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.02	0.00	
5:00:00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.00	
5:05:00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.00	
5:10:00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.01	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	

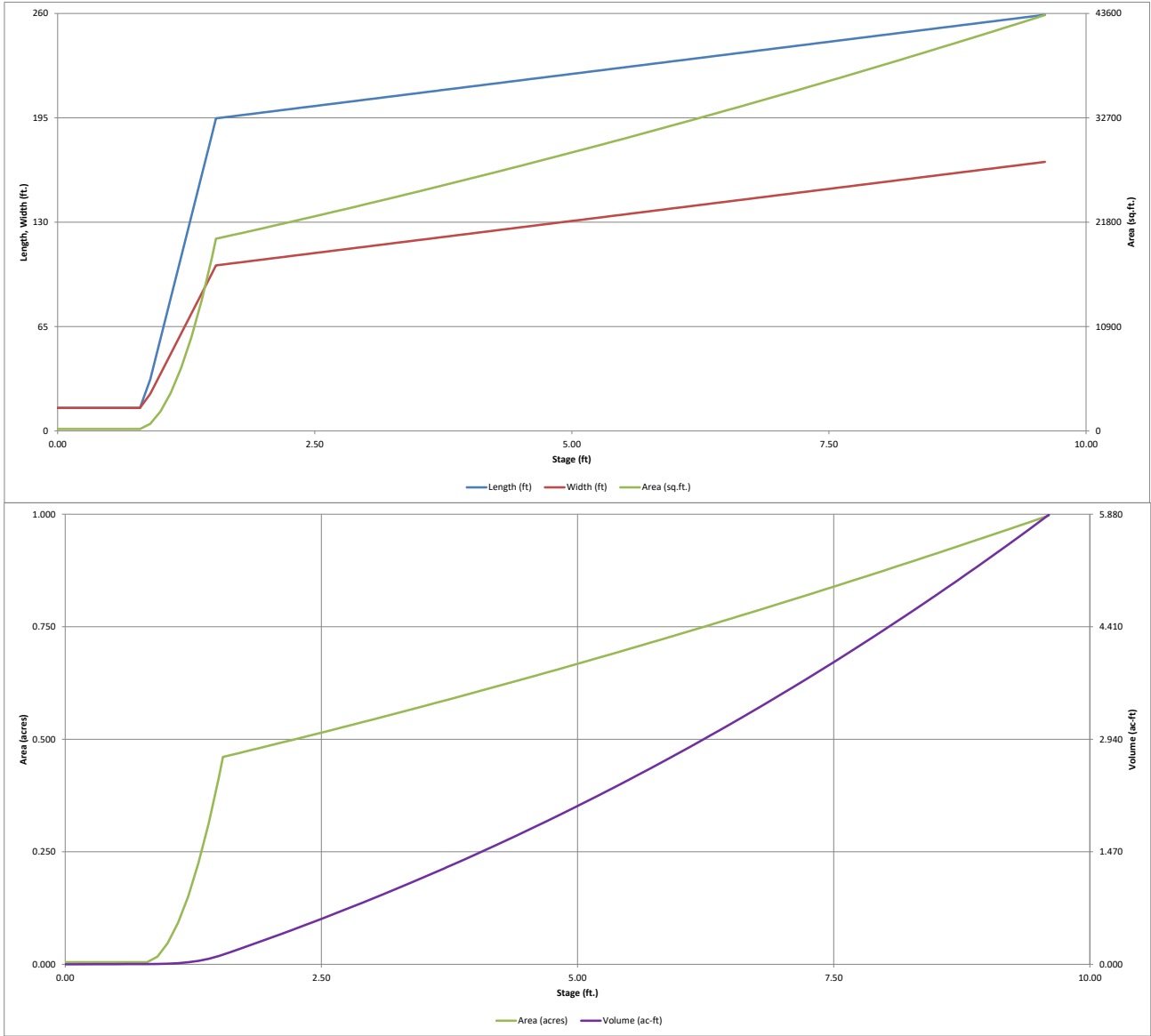
DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)



DETENTION BASIN STAGE-STORAGE TABLE BUILDER

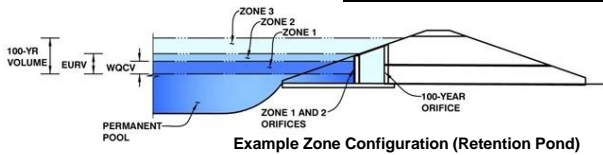
MHFD-Detention, Version 4.04 (February 2021)



DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)

Project: Flying Horse North
Basin ID: Pond 5



	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.36	0.520	Orifice Plate
Zone 2 (EURV)	3.72	0.741	Circular Orifice
Zone 3 (100-year)	5.96	1.477	Weir&Pipe (Restrict)
Total (all zones)		2.738	

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

Underdrain Orifice Invert Depth = ft (distance below the filtration media surface)
Underdrain Orifice Diameter = inches

Calculated Parameters for Underdrain
Underdrain Orifice Area = ft²
Underdrain Orifice Centroid = 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)

Invert of Lowest Orifice = ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate = ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing = inches
Orifice Plate: Orifice Area per Row = sq. inches (diameter = 1-1/2 inches)

Calculated Parameters for Plate
WQ Orifice Area per Row = ft²
Elliptical Half-Width = feet
Elliptical Slot Centroid = feet
Elliptical Slot Area = ft²

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	0.79	1.57					
Orifice Area (sq. inches)	1.77	1.77	1.77					

	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)

Invert of Vertical Orifice = ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice = ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter = inches

Calculated Parameters for Vertical Orifice
Zone 2 Circular = ft²
Not Selected = ft²
Vertical Orifice Centroid = feet

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir (and No Outlet Pipe))

Overflow Weir Front Edge Height, Ho = ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length = feet
Overflow Weir Grate Slope = H:V
Horiz. Length of Weir Sides = feet
Overflow Grate Type =
Debris Clogging % = %

Calculated Parameters for Overflow Weir
Zone 3 Weir = feet
Not Selected = feet
Overflow Weir Slope Length = feet
Grate Open Area / 100-yr Orifice Area =
Overflow Grate Open Area w/o Debris = ft²
Overflow Grate Open Area w/ Debris = ft²

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

Depth to Invert of Outlet Pipe = ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter = inches
Restrictor Plate Height Above Pipe Invert = inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate
Zone 3 Restrictor = ft²
Not Selected = ft²
Outlet Orifice Centroid = feet
Half-Central Angle of Restrictor Plate on Pipe = radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage = ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length = feet
Spillway End Slopes = H:V
Freeboard above Max Water Surface = feet

Calculated Parameters for Spillway
Spillway Design Flow Depth = feet
Stage at Top of Freeboard = feet
Basin Area at Top of Freeboard = acres
Basin Volume at Top of Freeboard = acre-ft

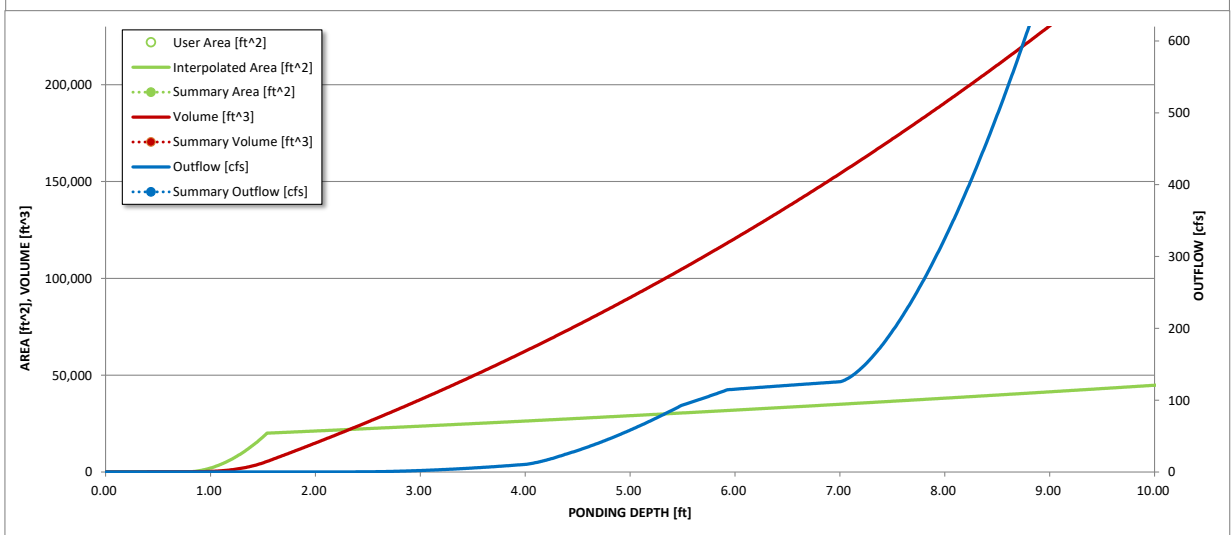
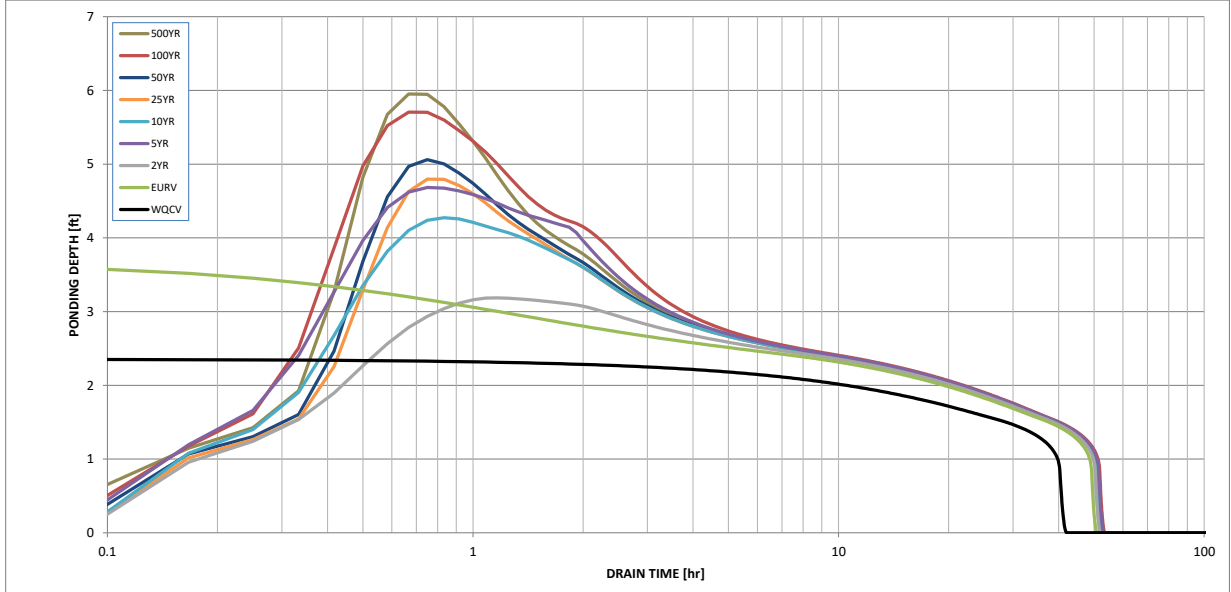
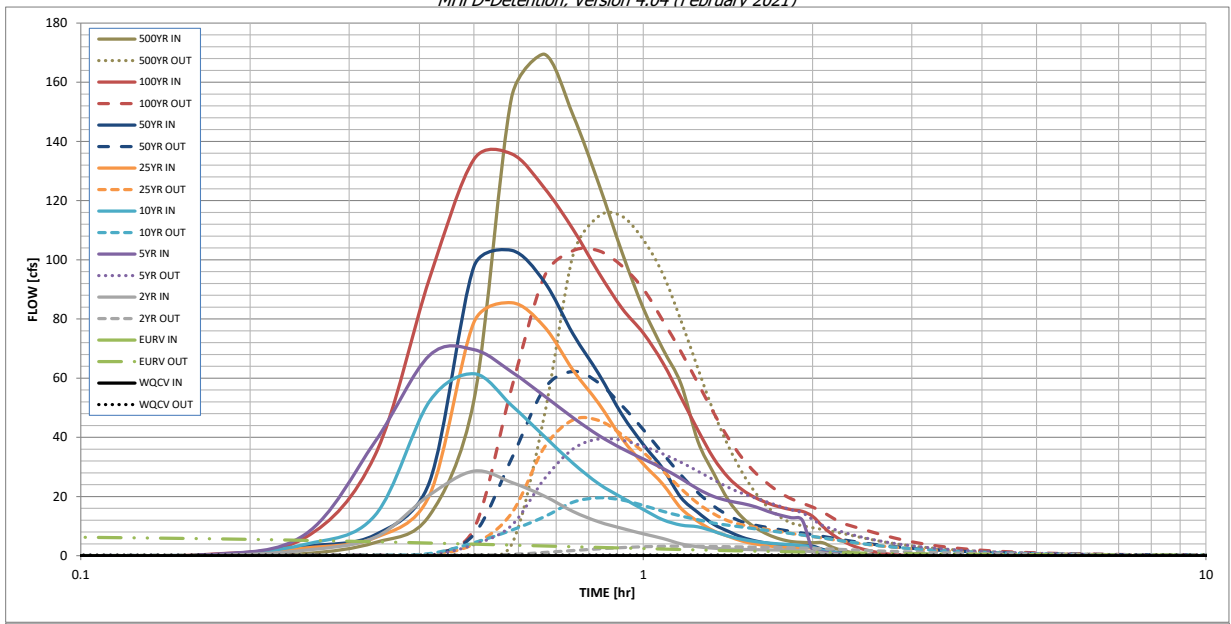
Routed Hydrograph Results

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

	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Design Storm Return Period	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.14
One-Hour Rainfall Depth (in)	0.520	1.261	1.226	1.996	2.708	3.784	4.596	5.681	7.783
CUHP Runoff Volume (acre-ft)	N/A	N/A	1.226	4.578	2.708	3.784	4.596	8.724	7.783
User Override Inflow Hydrograph Volume (acre-ft)	N/A	N/A	9.0	25.3	37.9	62.0	78.4	99.1	137.2
CUHP Predevelopment Peak Q (cfs)	N/A	N/A	0.22	0.96	0.91	1.49	1.89	2.81	3.30
OPTIONAL Override Predevelopment Peak Q (cfs)	N/A	N/A	28.6	69.6	61.5	85.5	103.2	135.8	169.5
Predevelopment Unit Peak Flow, q (cfs/acre)	N/A	N/A	3.2	39.4	19.6	45.9	62.2	103.1	114.7
Peak Inflow Q (cfs)	N/A	N/A	N/A	1.0	0.5	0.7	0.8	0.9	0.8
Peak Outflow Q (cfs)	Plate	Vertical Orifice 1	Vertical Orifice 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1
Ratio Peak Outflow to Predevelopment Q	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Structure Controlling Flow	N/A	N/A	N/A	0.9	0.2	1.1	1.7	3.2	3.6
Max Velocity through Grate 1 (fps)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Max Velocity through Grate 2 (fps)	39	45	46	37	42	39	37	28	29
Time to Drain 97% of Inflow Volume (hours)	40	48	49	46	48	47	46	42	43
Time to Drain 99% of Inflow Volume (hours)	2.36	3.72	3.19	4.68	4.27	4.80	5.06	5.70	5.95
Maximum Ponding Depth (ft)	0.51	0.59	0.55	0.65	0.62	0.65	0.67	0.71	0.73
Area at Maximum Ponding Depth (acres)	0.522	1.265	0.957	1.858	1.598	1.929	2.108	2.551	2.732
Maximum Volume Stored (acre-ft)									

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)



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

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename: ...[SWM]Outflow hydrographs\Pond6 OutflowHydrograph.xlsx

Inflow Hydrographs

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

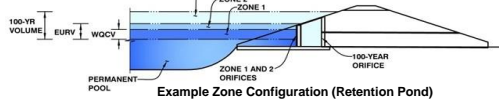
Time Interval	SOURCE	CUHP	CUHP	CUHP	USER	CUHP	CUHP	CUHP	USER	CUHP
TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]	
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.27	0.00	0.00	0.22	0.40	0.70
	0:15:00	0.00	0.00	1.84	7.09	3.80	2.57	3.17	6.01	4.42
	0:20:00	0.00	0.00	6.21	38.48	13.58	6.05	7.03	33.89	13.57
	0:25:00	0.00	0.00	20.49	67.67	52.13	20.37	24.85	93.63	52.58
	0:30:00	0.00	0.00	28.59	69.63	61.49	78.91	97.73	133.95	154.89
	0:35:00	0.00	0.00	24.76	62.10	50.77	85.48	103.19	135.78	169.46
	0:40:00	0.00	0.00	20.16	54.00	40.35	77.39	92.60	124.29	148.88
	0:45:00	0.00	0.00	14.94	46.63	31.22	62.69	74.92	110.29	125.63
	0:50:00	0.00	0.00	11.44	40.64	24.29	51.40	61.39	95.61	102.47
	0:55:00	0.00	0.00	9.23	36.18	19.62	39.56	47.65	83.59	83.62
	1:00:00	0.00	0.00	7.39	32.69	15.61	30.99	37.59	75.22	69.81
	1:05:00	0.00	0.00	5.81	29.50	12.14	24.16	29.44	65.17	58.06
	1:10:00	0.00	0.00	4.00	26.06	10.35	16.01	19.65	53.50	38.75
	1:15:00	0.00	0.00	3.01	22.56	9.76	11.60	14.65	42.49	27.91
	1:20:00	0.00	0.00	2.54	20.01	8.24	8.40	10.62	32.94	18.76
	1:25:00	0.00	0.00	2.28	18.54	6.59	6.53	8.22	26.39	12.92
	1:30:00	0.00	0.00	2.14	17.63	5.51	4.92	6.21	22.26	9.46
	1:35:00	0.00	0.00	2.04	16.51	4.77	3.94	4.98	19.57	7.13
	1:40:00	0.00	0.00	1.96	14.95	4.30	3.32	4.19	17.72	5.64
	1:45:00	0.00	0.00	1.92	13.73	3.97	2.92	3.68	16.45	4.78
	1:50:00	0.00	0.00	1.90	12.82	3.73	2.73	3.44	15.55	4.51
	1:55:00	0.00	0.00	1.59	12.02	3.37	2.61	3.29	14.99	4.39
	2:00:00	0.00	0.00	1.38	1.90	2.81	2.56	3.23	13.30	4.39
	2:05:00	0.00	0.00	0.92	1.25	1.86	1.68	2.12	9.94	2.89
	2:10:00	0.00	0.00	0.60	0.80	1.20	1.10	1.38	7.23	1.87
	2:15:00	0.00	0.00	0.39	0.49	0.76	0.70	0.88	5.23	1.18
	2:20:00	0.00	0.00	0.24	0.30	0.46	0.43	0.53	3.73	0.71
	2:25:00	0.00	0.00	0.14	0.19	0.27	0.26	0.32	2.62	0.42
	2:30:00	0.00	0.00	0.07	0.10	0.13	0.14	0.16	1.85	0.21
	2:35:00	0.00	0.00	0.03	0.04	0.04	0.05	0.06	1.26	0.07
	2:40:00	0.00	0.00	0.01	0.01	0.01	0.01	0.00	0.81	0.00
	2:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.49	0.00
	2:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.28	0.00
	2:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.13	0.00
	3:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.00
	3:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00
	3:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00
	3:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00
	3:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00
	3:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00
	3:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00
	3:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	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 STAGE-STORAGE TABLE BUILDER

MHFD- Detention, Version 4.04 (February 2021)

Project: **Flying Horse North Master Drainage Plan**

Basin ID: **Pond 6**



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	26.83	acres
Watershed Length =	1,140	ft
Watershed Length to Centroid =	570	ft
Watershed Slope =	0.039	ft/ft
Watershed Imperviousness =	33.19%	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.

Water Quality Capture Volume (WQCV) =	0.360	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	0.921	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	0.903	acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	1.424	acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	1.899	acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	2.602	acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	3.143	acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	3.855	acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 3.14 in.) =	5.243	acre-feet		inches
Approximate 2-yr Detention Volume =	0.666	acre-feet		
Approximate 5-yr Detention Volume =	0.945	acre-feet		
Approximate 10-yr Detention Volume =	1.349	acre-feet		
Approximate 25-yr Detention Volume =	1.543	acre-feet		
Approximate 50-yr Detention Volume =	1.623	acre-feet		
Approximate 100-yr Detention Volume =	1.899	acre-feet		

Define Zones and Basin Geometry

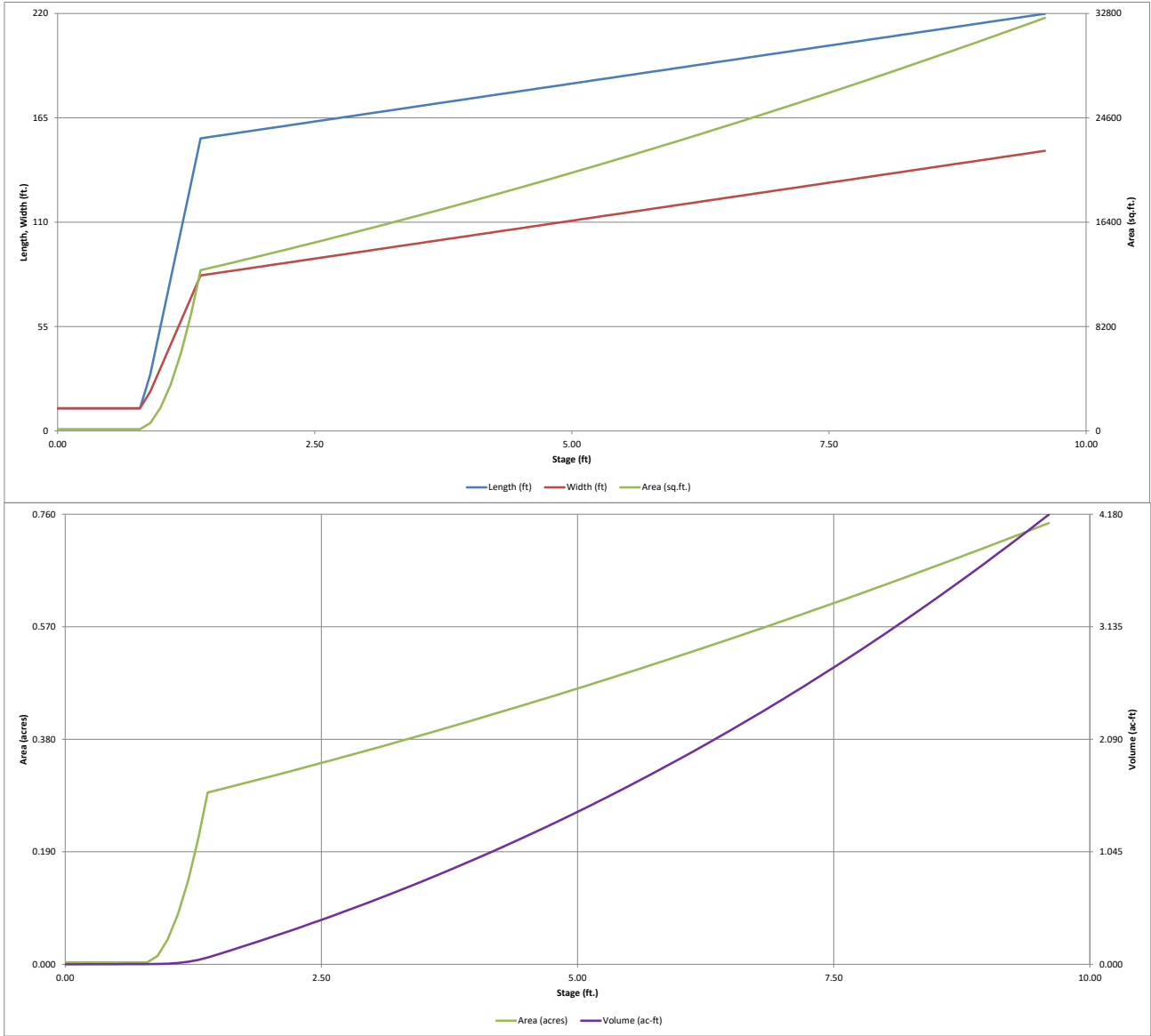
Zone 1 Volume (WQCV) =	0.360	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.561	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.978	acre-feet
Total Detention Basin Volume =	1.899	acre-feet
Initial Surcharge Volume (ISV) =	47	ft ³
Initial Surcharge Depth (ISD) =	0.33	ft
Total Available Detention Depth (H _{total}) =	6.00	ft
Depth of Trickle Channel (H _{TC}) =	0.50	ft
Slope of Trickle Channel (S _{TC}) =	0.004	ft/ft
Slopes of Main Basin Sides (S _{main}) =	4	H:V
Basin Length-to-Width Ratio (R _{LW}) =	2	
Initial Surcharge Area (A _{ISV}) =	143	ft ²
Surcharge Volume Length (L _{ISV}) =	11.9	ft
Surcharge Volume Width (W _{ISV}) =	11.9	ft
Depth of Basin Floor (H _{FLOOR}) =	0.56	ft
Length of Basin Floor (L _{FLOOR}) =	154.2	ft
Width of Basin Floor (W _{FLOOR}) =	81.9	ft
Area of Basin Floor (A _{FLOOR}) =	12,634	ft ²
Volume of Basin Floor (V _{FLOOR}) =	2,636	ft ³
Depth of Main Basin (H _{MAIN}) =	4.61	ft
Length of Main Basin (L _{MAIN}) =	191.1	ft
Width of Main Basin (W _{MAIN}) =	118.8	ft
Area of Main Basin (A _{MAIN}) =	22,702	ft ²
Volume of Main Basin (V _{MAIN}) =	80,325	ft ³
Calculated Total Basin Volume (V _{total}) =	1.907	acre-feet

Depth Increment = 0.10 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		11.9	11.9	143		0.003		
ISV	0.33		11.9	11.9	143		0.003	47	0.001
	0.40		11.9	11.9	143		0.003	57	0.001
	0.50		11.9	11.9	143		0.003	71	0.002
	0.60		11.9	11.9	143		0.003	86	0.002
	0.70		11.9	11.9	143		0.003	100	0.002
	0.80		11.9	11.9	143		0.003	114	0.003
	0.90		29.7	20.7	615		0.014	143	0.003
	1.00		55.1	33.2	1,830		0.042	260	0.006
	1.10		80.5	45.7	3,679		0.084	530	0.012
	1.20		105.9	58.2	6,164		0.142	1,017	0.023
	1.30		131.3	70.7	9,283		0.213	1,784	0.041
Floor	1.39		154.2	81.9	12,634		0.290	2,766	0.064
	1.40		154.3	82.0	12,653		0.290	2,893	0.066
	1.50		155.1	82.8	12,842		0.295	4,168	0.096
	1.60		155.9	83.6	13,033		0.299	5,461	0.125
	1.70		156.7	84.4	13,226		0.304	6,774	0.156
	1.80		157.5	85.2	13,419		0.308	8,107	0.186
	1.90		158.3	86.0	13,614		0.313	9,458	0.217
	2.00		159.1	86.8	13,810		0.317	10,829	0.249
	2.10		159.9	87.6	14,007		0.322	12,220	0.281
	2.20		160.7	88.4	14,206		0.326	13,631	0.313
	2.30		161.5	89.2	14,406		0.331	15,062	0.346
Zone 1 (WQCV)	2.35		161.9	89.6	14,506		0.333	15,784	0.362
	2.40		162.3	90.0	14,607		0.335	16,512	0.379
	2.50		163.1	90.8	14,810		0.340	17,983	0.413
	2.60		163.9	91.6	15,013		0.345	19,474	0.447
	2.70		164.7	92.4	15,218		0.349	20,986	0.482
	2.80		165.5	93.2	15,425		0.354	22,518	0.517
	2.90		166.3	94.0	15,632		0.359	24,071	0.553
	3.00		167.1	94.8	15,841		0.364	25,644	0.589
	3.10		167.9	95.6	16,051		0.368	27,239	0.625
	3.20		168.7	96.4	16,263		0.373	28,855	0.662
	3.30		169.5	97.2	16,475		0.378	30,492	0.700
	3.40		170.3	98.0	16,689		0.383	32,150	0.738
	3.50		171.1	98.8	16,905		0.388	33,829	0.777
	3.60		171.9	99.6	17,121		0.393	35,531	0.816
	3.70		172.7	100.4	17,339		0.398	37,254	0.855
	3.80		173.5	101.2	17,558		0.403	38,999	0.895
Zone 2 (EURV)	3.87		174.0	101.8	17,712		0.407	40,233	0.924
	3.90		174.3	102.0	17,778		0.408	40,765	0.936
	4.00		175.1	102.8	18,000		0.413	42,554	0.977
	4.10		175.9	103.6	18,223		0.418	44,365	1.018
	4.20		176.7	104.4	18,447		0.423	46,199	1.061
	4.30		177.5	105.2	18,673		0.429	48,055	1.103
	4.40		178.3	106.0	18,900		0.434	49,934	1.146
	4.50		179.1	106.8	19,128		0.439	51,835	1.190
	4.60		179.9	107.6	19,357		0.444	53,759	1.234
	4.70		180.7	108.4	19,588		0.450	55,706	1.279
	4.80		181.5	109.2	19,820		0.455	57,677	1.324
	4.90		182.3	110.0	20,053		0.460	59,670	1.370
	5.00		183.1	110.8	20,287		0.466	61,687	1.416
	5.10		183.9	111.6	20,523		0.471	63,728	1.463
	5.20		184.7	112.4	20,760		0.477	65,792	1.510
	5.30		185.5	113.2	20,998		0.482	67,880	1.558
	5.40		186.3	114.0	21,238		0.488	69,992	1.607
	5.50		187.1	114.8	21,479		0.493	72,127	1.656
	5.60		187.9	115.6	21,721		0.499	74,287	1.705
	5.70		188.7	116.4	21,964		0.504	76,472	1.756
	5.80		189.5	117.2	22,209		0.510	78,680	1.806
	5.90		190.3	118.0	22,455		0.515	80,914	1.858
Zone 3 (100-year)	5.98		190.9	118.7	22,653		0.520	82,718	1.899
	6.00		191.1	118.8	22,702		0.521	83,171	1.909
	6.10		191.9	119.6	22,951		0.527	85,454	1.962
	6.20		192.7	120.4	23,201		0.533	87,762	2.015
	6.30		193.5	121.2	23,452		0.538	90,094	2.068
	6.40		194.3	122.0	23,704		0.544	92,452	2.122
	6.50		195.1	122.8	23,958		0.550	94,835	2.177
	6.60		195.9	123.6	24,213		0.556	97,244	2.232
	6.70		196.7	124.4	24,469		0.562	99,678	2.288
	6.80		197.5	125.2	24,727		0.568	102,137	2.345
	6.90		198.3	126.0	24,985		0.574	104,623	2.402
	7.00		199.1	126.8	25,245		0.580	107,135	2.459
	7.10		199.9	127.6	25,507		0.586	109,672	2,518
	7.20		200.7	128.4	25,769		0.592	112,236	2,577
	7.30		201.5	129.2	26,033		0.598	114,826	2,636
	7.40		202.3	130.0	26,298		0.604	117,443	2,696
	7.50		203.1	130.8	26,565		0.610	120,086	2,757
	7.60		203.9	131.6	26,833		0.616	122,756	2,818
	7.70		204.7	132.4	27,102		0.622	125,452	2,880
	7.80		205.5	133.2	27,372		0.628	128,176	2,943
	7.90		206.3	134.0	27,644		0.635	130,927	3,006
	8.00		207.1	134.8	27,916		0.641	133,705	3,069
	8.10		207.9	135.6	28,191		0.647	136,510	3,134
	8.20		208.7	136.4	28,466		0.653	139,343	3,199
	8.30		209.5	137.2	28,743		0.660	142,203	3,265
	8.40		210.3	138.0	29,021		0.666	145,092	3,331
	8.50		211.1	138.8	29,300		0.673	148,008	3,398
	8.60		211.9	139.6	29,581		0.679	150,952	3,465
	8.70		212.7	140.4	29,862		0.686	153,924	3,534
	8.80		213.5	141.2	30,145		0.693	156,924	3,602

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)

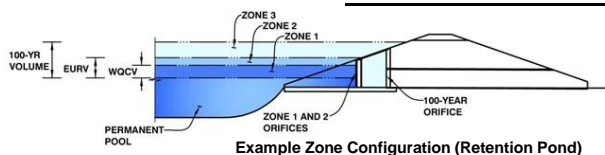


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD- Detention, Version 4.04 (February 2021)

Project: Flying Horse North Master Drainage Plan

Basin ID: Pond 6



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.35	0.360	Orifice Plate
Zone 2 (EURV)	3.87	0.561	Circular Orifice
Zone 3 (100-year)	5.98	0.978	Weir&Pipe (Restrict)
Total (all zones)		1.899	

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 Diameter =	N/A	inches

Calculated Parameters for Underdrain

Underdrain Orifice Area =	N/A	ft ²
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)

Invert of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate =	2.35	ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing =	9.40	inches
Orifice Plate: Orifice Area per Row =	1.27	sq. inches (diameter = 1-1/4 inches)

Calculated Parameters for Plate

WQ Orifice Area per Row =	8.819E-03	ft ²
Elliptical Half-Width =	N/A	feet
Elliptical Slot Centroid =	N/A	feet
Elliptical Slot Area =	N/A	ft ²

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	0.78	1.57					
Orifice Area (sq. inches)	1.27	1.27	1.27					
	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)

	Zone 2 Circular	Not Selected	
Invert of Vertical Orifice =	2.35	N/A	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =	3.87	N/A	ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter =	12.00	N/A	inches

Calculated Parameters for Vertical Orifice

	Zone 2 Circular	Not Selected	
Vertical Orifice Area =	0.79	N/A	ft ²
Vertical Orifice Centroid =	0.50	N/A	feet

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	
Overflow Weir Front Edge Height, Ho =	4.20	N/A	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	1.50	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V
Horiz. Length of Weir Sides =	1.50	N/A	feet
Overflow Grate Type =	Type C Grate	N/A	
Debris Clogging % =	50%	N/A	%

Calculated Parameters for Overflow Weir

	Zone 3 Weir	Not Selected	
Height of Grate Upper Edge, H _u =	4.20	N/A	feet
Overflow Weir Slope Length =	1.50	N/A	feet
Grate Open Area / 100-yr Orifice Area =	0.39	N/A	
Overflow Grate Open Area w/o Debris =	1.57	N/A	ft ²
Overflow Grate Open Area w/ Debris =	0.78	N/A	ft ²

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

	Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	1.00	N/A	ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter =	30.00	N/A	inches
Restrictor Plate Height Above Pipe Invert =	23.00		inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 3 Restrictor	Not Selected	
Outlet Orifice Area =	4.04	N/A	ft ²
Outlet Orifice Centroid =	1.05	N/A	feet
Half-Central Angle of Restrictor Plate on Pipe =	2.13	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage =	7.30	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	29.00	feet
Spillway End Slopes =	4.00	H:V
Freeboard above Max Water Surface =	1.00	feet

Calculated Parameters for Spillway

Spillway Design Flow Depth =	0.93	feet
Stage at Top of Freeboard =	9.23	feet
Basin Area at Top of Freeboard =	0.72	acres
Basin Volume at Top of Freeboard =	3.91	acre-ft

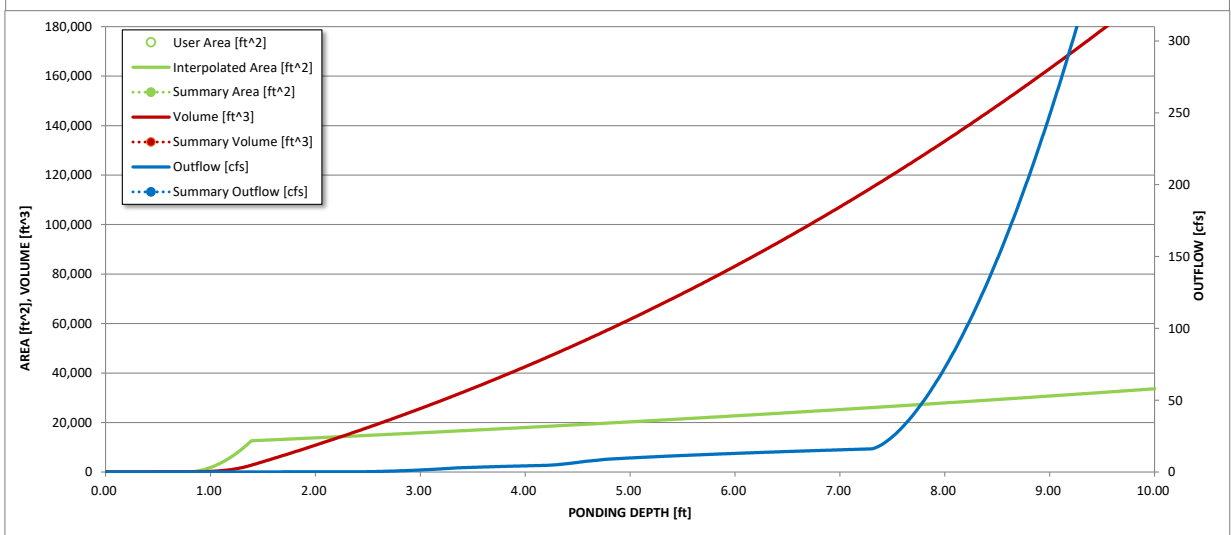
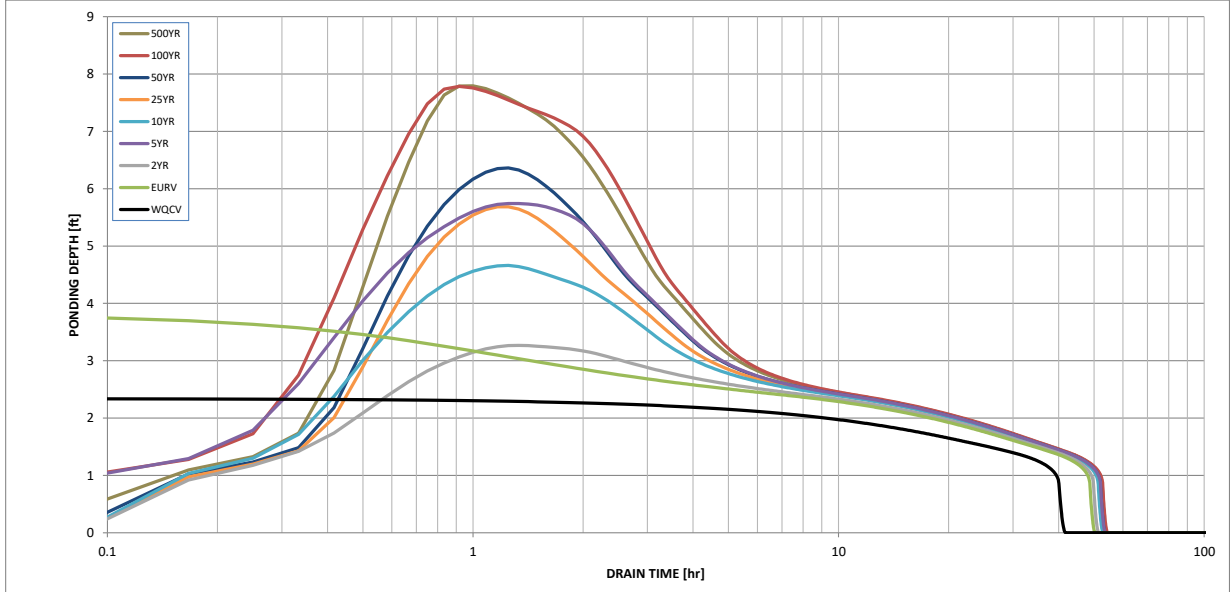
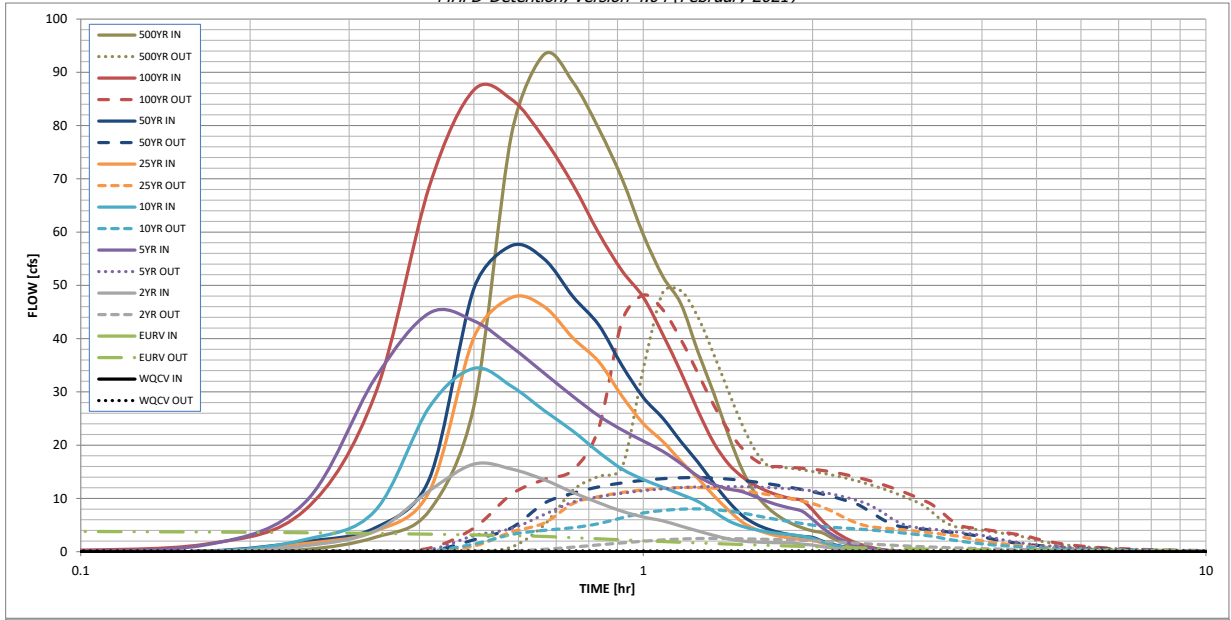
Routed Hydrograph Results

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

	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Design Storm Return Period =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.14
One-Hour Rainfall Depth (in) =	0.360	0.921	0.903	1.424	1.899	2.602	3.143	3.855	5.243
CUHP Runoff Volume (acre-ft) =	N/A	N/A	0.903	3.107	1.899	2.602	3.143	5.635	5.243
User Override Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	4.3	11.6	17.2	30.3	37.9	47.5	65.9
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A							
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	1.13	1.41	1.77	2.46
Peak Inflow Q (cfs) =	N/A	N/A	16.5	44.8	34.4	47.7	57.5	86.7	93.4
Peak Outflow Q (cfs) =	0.2	4.0	2.5	12.2	8.0	12.1	13.9	48.2	49.0
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	1.0	0.5	0.4	0.4	1.0	0.7
Structure Controlling Flow =	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 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	N/A	3.5	1.7	3.4	4.2	5.4	5.4
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	39	44	46	38	43	40	38	30	31
Time to Drain 99% of Inflow Volume (hours) =	40	48	49	47	48	48	47	44	44
Maximum Ponding Depth (ft) =	2.35	3.87	3.27	5.74	4.66	5.68	6.36	7.79	7.79
Area at Maximum Ponding Depth (acres) =	0.33	0.41	0.38	0.51	0.45	0.50	0.54	0.63	0.63
Maximum Volume Stored (acre-ft) =	0.362	0.924	0.685	1.776	1.261	1.745	2.101	2.930	2.936

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)



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

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename: ...[SWM]Outflow hydrographs\Pond6 OutflowHydrograph.xlsx

Inflow Hydrographs

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

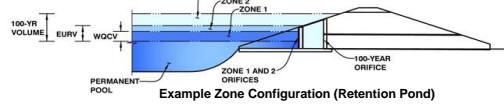
Time Interval	SOURCE	CUHP	CUHP	CUHP	USER	CUHP	CUHP	CUHP	USER	CUHP
	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.09	0.00
	0:10:00	0.00	0.00	0.00	1.28	0.00	0.00	0.13	1.42	0.41
	0:15:00	0.00	0.00	1.10	9.19	2.27	1.53	1.91	7.77	2.68
	0:20:00	0.00	0.00	3.88	32.51	7.65	3.83	4.46	29.44	7.72
	0:25:00	0.00	0.00	11.46	44.81	27.18	11.35	13.73	68.64	27.37
	0:30:00	0.00	0.00	16.45	43.32	34.42	40.25	49.45	86.70	78.42
	0:35:00	0.00	0.00	15.52	38.43	31.05	47.72	57.47	84.90	93.38
	0:40:00	0.00	0.00	13.51	33.50	26.49	46.00	54.93	77.48	88.14
	0:45:00	0.00	0.00	11.12	29.15	22.63	40.10	47.88	68.88	79.41
	0:50:00	0.00	0.00	9.18	25.51	18.68	35.67	42.56	59.79	70.00
	0:55:00	0.00	0.00	7.60	22.86	15.52	29.20	34.93	52.73	59.52
	1:00:00	0.00	0.00	6.52	20.78	13.55	24.05	28.95	47.77	51.66
	1:05:00	0.00	0.00	5.79	18.84	12.11	20.68	25.05	40.76	46.51
	1:10:00	0.00	0.00	4.81	16.55	10.75	16.99	20.66	33.68	37.61
	1:15:00	0.00	0.00	3.90	14.19	9.44	13.77	16.83	26.52	29.85
	1:20:00	0.00	0.00	3.08	12.64	7.58	10.57	12.86	20.51	21.91
	1:25:00	0.00	0.00	2.40	11.79	5.80	7.81	9.45	16.51	15.33
	1:30:00	0.00	0.00	2.00	11.26	4.76	5.55	6.78	14.04	10.88
	1:35:00	0.00	0.00	1.82	10.33	4.13	4.22	5.21	12.41	8.22
	1:40:00	0.00	0.00	1.74	9.38	3.70	3.41	4.23	11.29	6.50
	1:45:00	0.00	0.00	1.68	8.67	3.39	2.88	3.58	10.51	5.31
	1:50:00	0.00	0.00	1.64	8.14	3.18	2.53	3.16	9.96	4.49
	1:55:00	0.00	0.00	1.43	7.59	2.90	2.31	2.88	9.61	3.90
	2:00:00	0.00	0.00	1.25	6.09	2.51	2.16	2.68	7.83	3.53
	2:05:00	0.00	0.00	0.94	4.45	1.84	1.59	1.97	5.73	2.57
	2:10:00	0.00	0.00	0.69	3.20	1.32	1.15	1.42	4.16	1.84
	2:15:00	0.00	0.00	0.51	2.27	0.94	0.82	1.02	3.00	1.33
	2:20:00	0.00	0.00	0.37	1.57	0.68	0.59	0.73	2.12	0.96
	2:25:00	0.00	0.00	0.26	1.08	0.48	0.41	0.51	1.48	0.67
	2:30:00	0.00	0.00	0.18	0.73	0.33	0.29	0.36	1.02	0.47
	2:35:00	0.00	0.00	0.12	0.48	0.22	0.20	0.25	0.66	0.32
	2:40:00	0.00	0.00	0.08	0.28	0.14	0.13	0.16	0.39	0.20
	2:45:00	0.00	0.00	0.04	0.15	0.07	0.07	0.09	0.20	0.11
	2:50:00	0.00	0.00	0.02	0.07	0.03	0.03	0.04	0.09	0.04
	2:55:00	0.00	0.00	0.01	0.02	0.01	0.01	0.01	0.03	0.01
	3:00:00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.01	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
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	3:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
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	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
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	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 STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)

Project: **Flying Horse North Master Drainage Plan**

Basin ID: **Pond 7**



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	Note: L / W Ratio < 1
Watershed Area =	114.73 acres	L / W Ratio = 0.57
Watershed Length =	1,683 ft	
Watershed Length to Centroid =	1,362 ft	
Watershed Slope =	0.040 ft/ft	
Watershed Imperviousness =	38.80% 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.

Water Quality Capture Volume (WQCV) =	1.689 acre-feet	Optional User Overrides
Excess Urban Runoff Volume (EURV) =	4.663 acre-feet	
2-yr Runoff Volume (P1 = 1.19 in.) =	4.575 acre-feet	1.19 inches
5-yr Runoff Volume (P1 = 1.5 in.) =	6.891 acre-feet	1.50 inches
10-yr Runoff Volume (P1 = 1.75 in.) =	8.978 acre-feet	1.75 inches
25-yr Runoff Volume (P1 = 2 in.) =	11.989 acre-feet	2.00 inches
50-yr Runoff Volume (P1 = 2.25 in.) =	14.328 acre-feet	2.25 inches
100-yr Runoff Volume (P1 = 2.52 in.) =	17.379 acre-feet	2.52 inches
500-yr Runoff Volume (P1 = 3.14 in.) =	23.422 acre-feet	
Approximate 2-yr Detention Volume =	3.427 acre-feet	
Approximate 5-yr Detention Volume =	4.799 acre-feet	
Approximate 10-yr Detention Volume =	6.641 acre-feet	
Approximate 25-yr Detention Volume =	7.450 acre-feet	
Approximate 50-yr Detention Volume =	7.822 acre-feet	
Approximate 100-yr Detention Volume =	8.992 acre-feet	

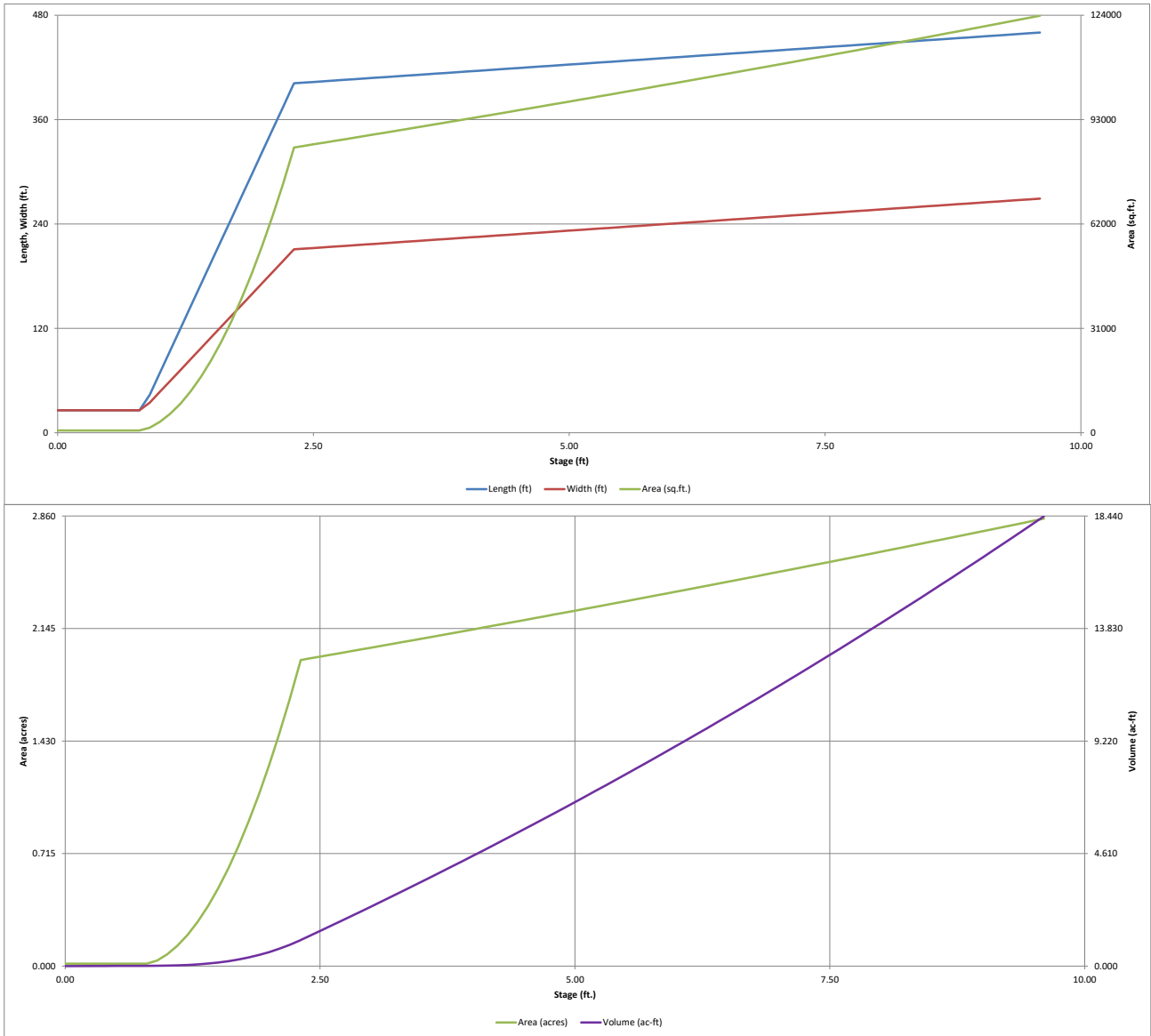
Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	1.689 acre-feet
Zone 2 Volume (EURV - Zone 1) =	2.974 acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	4.329 acre-feet
Total Detention Basin Volume =	8.992 acre-feet
Initial Surge Volume (ISV) =	221 ft ³
Initial Surge Depth (ISD) =	0.33 ft
Total Available Detention Depth (H _{total}) =	6.00 ft
Depth of Trickle Channel (H _{TC}) =	0.50 ft
Slope of Trickle Channel (S _{TC}) =	0.004 ft/ft
Slopes of Main Basin Sides (S _{main}) =	4 H:V
Basin Length-to-Width Ratio (R _{LW}) =	2
Initial Surge Area (A _{ISV}) =	669 ft ²
Surcharge Volume Length (L _{ISV}) =	25.9 ft
Surcharge Volume Width (W _{ISV}) =	25.9 ft
Depth of Basin Floor (H _{FLOOR}) =	1.48 ft
Length of Basin Floor (L _{FLOOR}) =	401.8 ft
Width of Basin Floor (W _{FLOOR}) =	210.9 ft
Area of Basin Floor (A _{FLOOR}) =	84,720 ft ²
Volume of Basin Floor (V _{FLOOR}) =	45,839 ft ³
Depth of Main Basin (H _{MAIN}) =	3.69 ft
Length of Main Basin (L _{MAIN}) =	431.3 ft
Width of Main Basin (W _{MAIN}) =	240.4 ft
Area of Main Basin (A _{MAIN}) =	103,677 ft ²
Volume of Main Basin (V _{MAIN}) =	347,004 ft ³
Calculated Total Basin Volume (V _{total}) =	9.031 acre-feet

Depth Increment = 0.10 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		25.9	25.9	669		0.015		
ISV	0.33		25.9	25.9	669		0.015	221	0.005
	0.40		25.9	25.9	669		0.015	268	0.006
	0.50		25.9	25.9	669		0.015	334	0.008
	0.60		25.9	25.9	669		0.015	401	0.009
	0.70		25.9	25.9	669		0.015	468	0.011
	0.80		25.9	25.9	669		0.015	535	0.012
	0.90		43.6	34.6	1,510		0.035	630	0.014
	1.00		69.0	47.1	3,253		0.075	862	0.020
	1.10		94.4	59.6	5,630		0.129	1,301	0.030
	1.20		119.8	72.1	8,642		0.198	2,010	0.046
	1.30		145.2	84.6	12,289		0.282	3,051	0.070
	1.40		170.6	97.1	16,571		0.380	4,489	0.103
	1.50		196.0	109.6	21,488		0.493	6,386	0.147
	1.60		221.4	122.1	27,040		0.621	8,807	0.202
	1.70		246.8	134.6	33,228		0.763	11,815	0.271
	1.80		272.2	147.1	40,050		0.919	15,474	0.355
	1.90		297.6	159.6	47,507		1.091	19,847	0.456
	2.00		323.0	172.1	55,599		1.276	24,997	0.574
	2.10		348.4	184.6	64,326		1.477	30,988	0.711
	2.20		373.8	197.1	73,688		1.692	37,883	0.870
	2.30		399.2	209.6	83,685		1.921	45,746	1.050
Floor	2.31		401.8	210.9	84,720		1.945	46,588	1.070
	2.40		402.5	211.6	85,162		1.955	54,233	1.245
	2.50		403.3	212.4	85,654		1.966	62,774	1.441
	2.60		404.1	213.2	86,147		1.978	71,364	1.638
Zone 1 (WQCV)	2.63		404.3	213.4	86,295		1.981	73,950	1.698
	2.70		404.9	214.0	86,641		1.989	80,003	1.837
	2.80		405.7	214.8	87,137		2.000	88,692	2.036
	2.90		406.5	215.6	87,634		2.012	97,431	2.237
	3.00		407.3	216.4	88,132		2.023	106,219	2.438
	3.10		408.1	217.2	88,632		2.035	115,057	2.641
	3.20		408.9	218.0	89,133		2.046	123,945	2.845
	3.30		409.7	218.8	89,635		2.058	132,884	3.051
	3.40		410.5	219.6	90,138		2.069	141,872	3.257
	3.50		411.3	220.4	90,643		2.081	150,913	3.464
	3.60		412.1	221.2	91,149		2.092	160,001	3.673
	3.70		412.9	222.0	91,656		2.104	169,141	3.883
	3.80		413.7	222.8	92,165		2.116	178,332	4.094
	3.90		414.5	223.6	92,675		2.128	187,574	4.306
	4.00		415.3	224.4	93,186		2.139	196,867	4.519
Zone 2 (EURV)	4.07		415.9	224.9	93,544		2.147	203,403	4.669
	4.10		416.1	225.2	93,698		2.151	206,211	4.734
	4.20		416.9	226.0	94,212		2.163	215,607	4.950
	4.30		417.7	226.8	94,727		2.175	225,054	5.167
	4.40		418.5	227.6	95,243		2.186	234,552	5.385
	4.50		419.3	228.4	95,760		2.198	244,103	5.604
	4.60		420.1	229.2	96,279		2.210	253,705	5.824
	4.70		420.9	230.0	96,799		2.222	263,358	6.046
	4.80		421.7	230.8	97,321		2.234	273,064	6.269
	4.90		422.5	231.6	97,843		2.246	282,823	6.493
	5.00		423.3	232.4	98,367		2.258	292,633	6.718
	5.10		424.1	233.2	98,892		2.270	302,496	6.944
	5.20		424.9	234.0	99,419		2.282	312,412	7.172
	5.30		425.7	234.8	99,947		2.294	322,380	7.401
	5.40		426.5	235.6	100,476		2.307	332,401	7.631
	5.50		427.3	236.4	101,006		2.319	342,475	7.862
	5.60		428.1	237.2	101,538		2.331	352,602	8.095
	5.70		428.9	238.0	102,070		2.343	362,783	8.328
	5.80		429.7	238.8	102,605		2.355	373,016	8.563
	5.90		430.5	239.6	103,140		2.368	383,304	8.799
Zone 3 (100-year)	5.99		431.2	240.3	103,623		2.379	392,608	9.013
	6.00		431.3	240.4	103,677		2.380	393,644	9.037
	6.10		432.1	241.2	104,215		2.392	404,039	9.275
	6.20		432.9	242.0	104,754		2.405	414,487	9.515
	6.30		433.7	242.8	105,294		2.417	424,990	9.756
	6.40		434.5	243.6	105,836		2.430	435,546	9.999
	6.50		435.3	244.4	106,379		2.442	446,157	10.242
	6.60		436.1	245.2	106,924		2.455	456,822	10.487
	6.70		436.9	246.0	107,469		2.467	467,542	10.733
	6.80		437.7	246.8	108,016		2.480	478,316	10.981
	6.90		438.5	247.6	108,565		2.492	489,145	11.229
	7.00		439.3	248.4	109,114		2.505	500,029	11.479
	7.10		440.1	249.2	109,665		2.518	510,968	11.730
	7.20		440.9	250.0	110,217		2.530	521,962	11.983
	7.30		441.7	250.8	110,770		2.543	533,012	12.236
	7.40		442.5	251.6	111,325		2.556	544,116	12.491
	7.50		443.3	252.4	111,881		2.568	555,277	12.747
	7.60		444.1	253.2	112,438		2.581	566,493	13.005
	7.70		444.9	254.0	112,997		2.594	577,764	13.264
	7.80		445.7	254.8	113,556		2.607	589,092	13.524
	7.90		446.5	255.6	114,117		2.620	600,476	13.785
	8.00		447.3	256.4	114,680		2.633	611,915	14.048
	8.10		448.1	257.2	115,245		2.646	623,411	14.312
	8.20		448.9	258.0	115,808		2.659	634,964	14.577
	8.30		449.7	258.8	116,374		2.672	646,573	14.843
	8.40		450.5	259.6	116,942		2.685	658,239	15.111
	8.50		451.3	260.4	117,510		2.698	669,962	15.380
	8.60		452.1	261.2	118,080		2.711	681,741	15.651
	8.70		452.9	262.0	118,652		2.724	693,578	15.922
	8.80		453.7	262.8	119,224		2.737	705,471	16.195
	8.90		454.5	263.6	119,798		2.750	717,	

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)

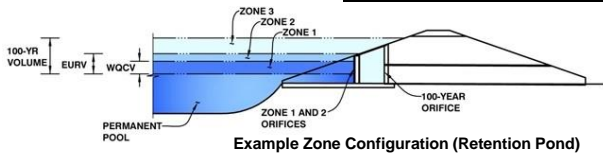


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD- Detention, Version 4.04 (February 2021)

Project: Flying Horse North Master Drainage Plan

Basin ID: Pond 7



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.63	1.689	Orifice Plate
Zone 2 (EURV)	4.07	2.974	Weir&Pipe (Circular)
Zone 3 (100-year)	5.99	4.329	Weir&Pipe (Restrict)
Total (all zones)		8.992	

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 Diameter =	N/A	inches

Calculated Parameters for Underdrain

Underdrain Orifice Area =	N/A	ft ²
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)

Invert of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate =	2.65	ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing =	10.60	inches
Orifice Plate: Orifice Area per Row =	5.17	sq. inches (use rectangular openings)

Calculated Parameters for Plate

WQ Orifice Area per Row =	3.590E-02	ft ²
Elliptical Half-Width =	N/A	feet
Elliptical Slot Centroid =	N/A	feet
Elliptical Slot Area =	N/A	ft ²

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	0.88	1.77					
Orifice Area (sq. inches)	5.17	5.17	5.17					

	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	
Invert of Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter =	N/A	N/A	inches

Calculated Parameters for Vertical Orifice

	Not Selected	Not Selected	
Vertical Orifice Area =	N/A	N/A	ft ²
Vertical Orifice Centroid =	N/A	N/A	feet

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir (and No Outlet Pipe).

	Zone 2 Weir	Zone 3 Weir	
Overflow Weir Front Edge Height, Ho =	4.50	4.70	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	6.00	10.00	feet
Overflow Weir Grate Slope =	0.00	4.00	H:V
Horiz. Length of Weir Sides =	6.00	12.00	feet
Overflow Grate Type =	Type C Grate	Type C Grate	
Debris Clogging % =	50%	50%	%

Calculated Parameters for Overflow Weir

	Zone 2 Weir	Zone 3 Weir	
Height of Grate Upper Edge, H _u =	4.50	7.70	feet
Overflow Weir Slope Length =	6.00	12.37	feet
Grate Open Area / 100-yr Orifice Area =	3.54	3.42	
Overflow Grate Open Area w/o Debris =	25.06	86.09	ft ²
Overflow Grate Open Area w/ Debris =	12.53	43.05	ft ²

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

	Zone 2 Circular	Zone 3 Restrictor	
Depth to Invert of Outlet Pipe =	2.50	2.70	ft (distance below basin bottom at Stage = 0 ft)
Circular Orifice Diameter or Pipe Diameter =	36.00	72.00	inches
Restrictor Plate Height Above Pipe Invert =		60.00	inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 2 Circular	Zone 3 Restrictor	
Outlet Orifice Area =	7.07	25.18	ft ²
Outlet Orifice Centroid =	1.50	2.70	feet
Half-Central Angle of Restrictor Plate on Pipe =	N/A	2.30	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage =	7.80	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	119.00	feet
Spillway End Slopes =	4.00	H:V
Freeboard above Max Water Surface =	1.00	feet

Calculated Parameters for Spillway

Spillway Design Flow Depth =	0.98	feet
Stage at Top of Freeboard =	9.78	feet
Basin Area at Top of Freeboard =	2.87	acres
Basin Volume at Top of Freeboard =	18.94	acre-ft

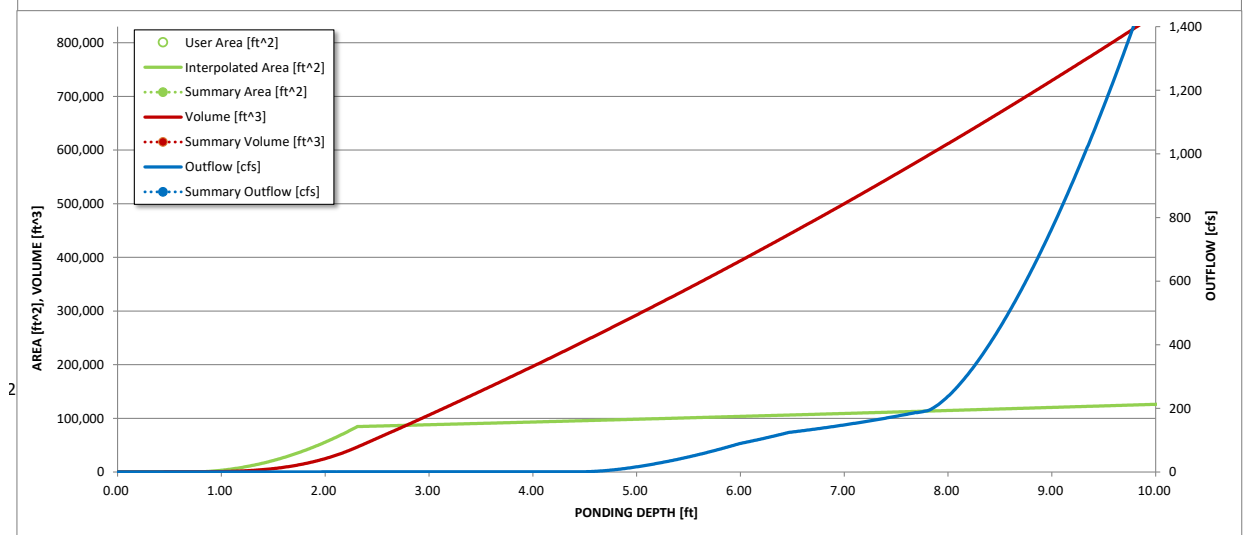
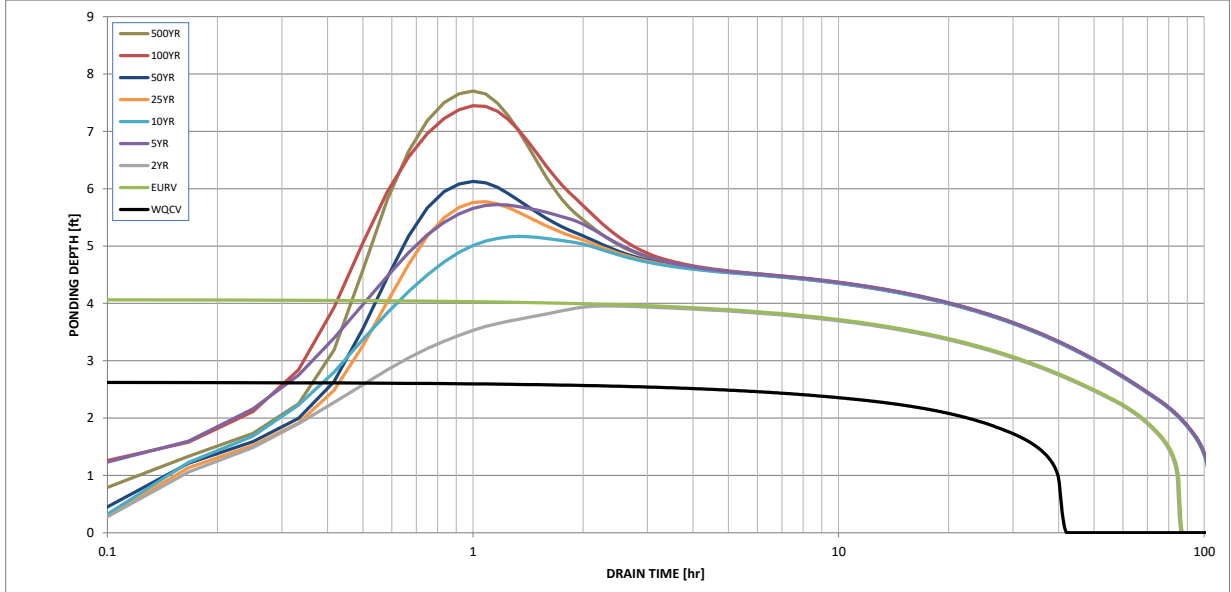
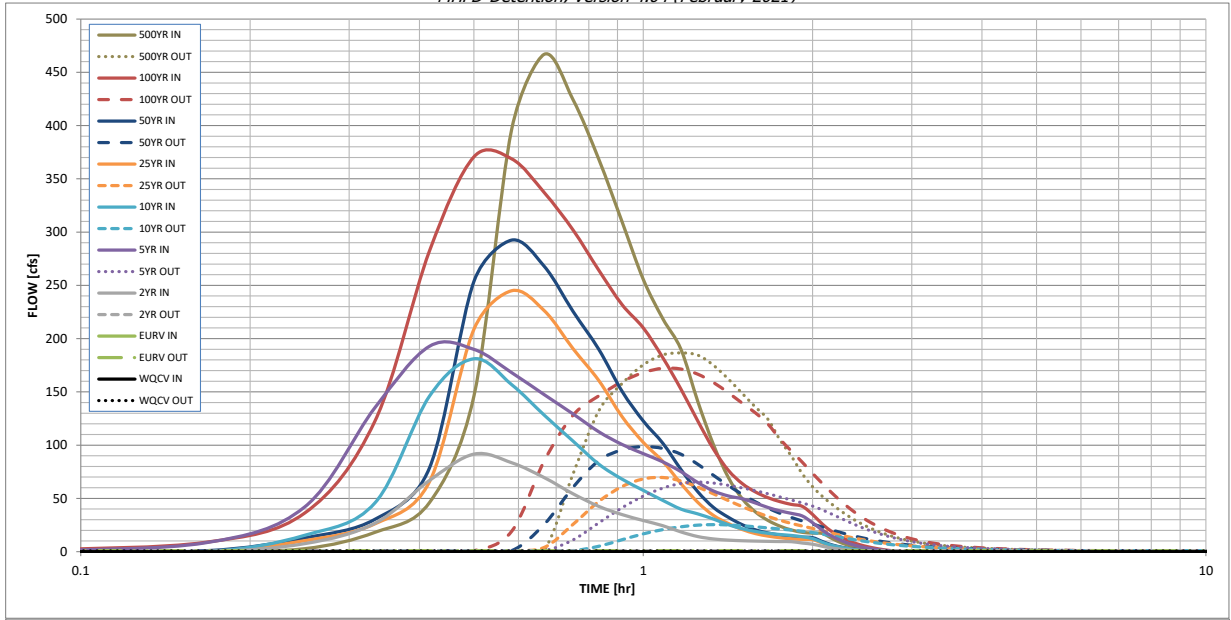
Routed Hydrograph Results

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

	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Design Storm Return Period =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.14
One-Hour Rainfall Depth (in) =	1.689	4.663	4.575	6.891	8.978	11.989	14.328	17.379	23.422
CUHP Runoff Volume (acre-ft) =	1.689	4.663	4.575	13.698	8.978	11.989	14.328	24.727	23.422
User Override Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	4.575	13.698	8.978	11.989	14.328	24.727	23.422
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	19.1	53.5	79.8	138.4	173.6	217.5	301.7
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A	19.1	65.3				191.6	
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.17	0.57	0.70	1.21	1.51	1.67	2.63
Peak Inflow Q (cfs) =	N/A	N/A	91.6	192.8	181.1	244.9	292.5	370.7	466.9
Peak Outflow Q (cfs) =	0.7	0.9	0.9	65.4	25.4	69.6	98.6	172.2	186.6
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	1.0	0.3	0.5	0.6	0.9	0.6
Structure Controlling Flow =	Plate	Plate	Plate	Overflow Weir 2	Overflow Weir 2	Overflow Weir 2	Overflow Weir 2	Overflow Weir 2	Overflow Weir 2
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	2.1	0.8	2.2	3.0	3.9	4.0
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	0.1	0.0	0.1	0.2	0.9	1.0
Time to Drain 97% of Inflow Volume (hours) =	38	80	80	90	94	91	89	82	83
Time to Drain 99% of Inflow Volume (hours) =	40	84	83	99	100	99	98	95	95
Maximum Ponding Depth (ft) =	2.63	4.07	3.95	5.73	5.17	5.77	6.13	7.45	7.70
Area at Maximum Ponding Depth (acres) =	1.98	2.15	2.13	2.35	2.28	2.35	2.39	2.56	2.59
Maximum Volume Stored (acre-ft) =	1.698	4.669	4.413	8.375	7.081	8.493	9.323	12.594	13.264

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)



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

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename: ...[SWMW]Outflow hydrographs\Pond6 OutflowHydrograph.xlsx

Inflow Hydrographs

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

Time Interval	SOURCE	CUHP	CUHP	CUHP	USER	CUHP	CUHP	CUHP	USER	CUHP
5.00 min	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]
	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	0.35	0.00	0.00	0.00	1.15	0.00
	0:10:00	0.00	0.00	0.00	8.35	0.00	0.00	0.87	8.80	2.79
	0:15:00	0.00	0.00	7.53	41.96	15.37	10.35	12.91	36.23	18.14
	0:20:00	0.00	0.00	26.66	135.18	45.76	26.13	30.39	122.53	46.04
	0:25:00	0.00	0.00	66.84	192.81	145.94	65.52	78.49	282.20	146.25
	0:30:00	0.00	0.00	91.59	189.89	181.09	208.88	253.77	370.69	396.24
	0:35:00	0.00	0.00	83.49	168.08	156.84	244.93	292.46	368.77	466.90
	0:40:00	0.00	0.00	69.51	147.36	128.13	226.22	267.84	337.06	424.31
	0:45:00	0.00	0.00	54.32	129.31	103.79	190.55	225.54	301.99	368.42
	0:50:00	0.00	0.00	42.53	112.57	82.17	160.69	189.97	264.23	309.75
	0:55:00	0.00	0.00	34.81	100.65	68.10	126.75	150.57	231.91	255.54
	1:00:00	0.00	0.00	29.24	91.99	57.54	102.55	122.63	210.05	218.61
	1:05:00	0.00	0.00	24.37	84.30	48.10	84.65	101.75	182.04	189.95
	1:10:00	0.00	0.00	18.53	75.10	39.94	63.92	77.12	152.54	140.96
	1:15:00	0.00	0.00	14.20	64.91	35.46	46.28	56.24	122.62	100.15
	1:20:00	0.00	0.00	11.95	56.89	30.57	33.94	41.44	96.04	69.57
	1:25:00	0.00	0.00	10.84	52.28	25.28	26.43	32.25	76.32	49.57
	1:30:00	0.00	0.00	10.26	49.65	21.53	20.77	25.24	63.82	37.19
	1:35:00	0.00	0.00	9.94	45.63	19.01	16.94	20.45	55.99	29.25
	1:40:00	0.00	0.00	9.68	41.44	17.27	14.62	17.52	50.64	23.93
	1:45:00	0.00	0.00	9.50	38.27	16.09	13.10	15.56	46.97	20.37
	1:50:00	0.00	0.00	9.40	35.96	15.24	12.09	14.28	44.36	18.18
	1:55:00	0.00	0.00	8.11	33.53	13.98	11.56	13.59	42.55	17.39
	2:00:00	0.00	0.00	7.01	27.14	12.28	11.24	13.17	34.89	17.03
	2:05:00	0.00	0.00	5.02	19.98	8.67	8.06	9.43	25.68	12.26
	2:10:00	0.00	0.00	3.38	14.45	5.83	5.40	6.30	18.63	8.24
	2:15:00	0.00	0.00	2.27	10.39	3.91	3.64	4.25	13.59	5.54
	2:20:00	0.00	0.00	1.48	7.28	2.54	2.37	2.76	9.71	3.59
	2:25:00	0.00	0.00	0.92	5.00	1.60	1.52	1.76	6.81	2.28
	2:30:00	0.00	0.00	0.53	3.43	0.95	0.94	1.09	4.77	1.39
	2:35:00	0.00	0.00	0.26	2.28	0.48	0.50	0.57	3.20	0.72
	2:40:00	0.00	0.00	0.10	1.39	0.18	0.20	0.22	1.96	0.26
	2:45:00	0.00	0.00	0.02	0.74	0.03	0.03	0.03	1.04	0.02
	2:50:00	0.00	0.00	0.00	0.32	0.00	0.00	0.00	0.45	0.00
	2:55:00	0.00	0.00	0.00	0.11	0.00	0.00	0.00	0.15	0.00
	3:00:00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.03	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
	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
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	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)

Summary Stage-Area-Volume-Discharge Relationships

The user can create a summary S-A-V-D by entering the desired stage increments and the remainder of the table will populate automatically.
The user should graphically compare the summary S-A-V-D table to the full S-A-V-D table in the chart to confirm it captures all key transition points.

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

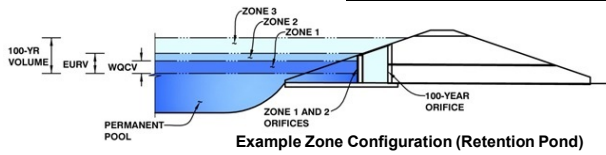
For best results, include the stages of all grade slope changes (e.g. ISV and Floor) from the S-A-V table on Sheet 'Basin'.

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

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-*Detention*, Version 4.04 (February 2021)

Project: Flying Horse North MDDP
Basin ID: Pond 8



	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.39	0.178	Orifice Plate
Zone 2 (EURV)	3.67	0.221	Circular Orifice
Zone 3 (100-year)	5.97	0.543	Weir&Pipe (Restrict)
Total (all zones)		0.942	

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

Underdrain Orifice Invert Depth = ft (distance below the filtration media surface)
 Underdrain Orifice Diameter = inches

Calculated Parameters for Underdrain
 Underdrain Orifice Area = ft²
 Underdrain Orifice Centroid = 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)

Invert of Lowest Orifice = ft (relative to basin bottom at Stage = 0 ft)
 Depth at top of Zone using Orifice Plate = ft (relative to basin bottom at Stage = 0 ft)
 Orifice Plate: Orifice Vertical Spacing = inches
 Orifice Plate: Orifice Area per Row = sq. inches (diameter = 7/8 inch)

Calculated Parameters for Plate
 WQ Orifice Area per Row = ft²
 Elliptical Half-Width = feet
 Elliptical Slot Centroid = feet
 Elliptical Slot Area = ft²

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	0.80	1.59					
Orifice Area (sq. inches)	0.65	0.65	0.65					

	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)

	Zone 2 Circular	Not Selected	
Invert of Vertical Orifice =	2.39	N/A	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =	3.67	N/A	ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter =	2.88	N/A	inches

Calculated Parameters for Vertical Orif

	Zone 2 Circular	Not Selected
Vertical Orifice Area =	0.05	N/A
Vertical Orifice Centroid =	0.12	N/A

User Input: Overflow Weir (Dropbox with Flat or Sloped Gate and Outlet Pipe OR Rectangular/Trapezoidal Weir (and No Outlet Pipe))

	Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	5.00	N/A	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	4.00	N/A	feet
Overflow Weir Gate Slope =	0.00	N/A	H:V
Horiz. Length of Weir Sides =	5.00	N/A	feet
Overflow Gate Type =	Type C Gate	N/A	
Debris Clogging % =	50%	N/A	%

Calculated Parameters for Overflow W

	Zone 3 Weir	Not Selected
Height of Gate Upper Edge, H _t =	5.00	N/A
Overflow Weir Slope Length =	5.00	N/A
Gate Open Area / 100-yr Orifice Area =	5.22	N/A
Overflow Gate Open Area w/o Debris =	13.92	N/A
Overflow Gate Open Area w/ Debris =	6.96	N/A

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

	Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	1.00	N/A	ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter =	24.00	N/A	inches
Restrictor Plate Height Above Pipe Invert =	19.00	N/A	inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Pl

	Zone 3 Restrictor	Not Selected
Outlet Orifice Area =	2.67	N/A
Outlet Orifice Centroid =	0.87	N/A
Half-Central Angle of Restrictor Plate on Pipe =	2.19	N/A

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage =	6.30	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	11.00	feet
Spillway End Slopes =	4.00	H:V
Freeboard above Max Water Surface =	1.00	feet

Calculated Parameters for Spillway

Spillway Design Flow Depth =	0.85 feet
Stage at Top of Freeboard =	8.15 feet
Basin Area at Top of Freeboard =	0.38 acres
Basin Volume at Top of Freeboard =	1.66 acre-ft

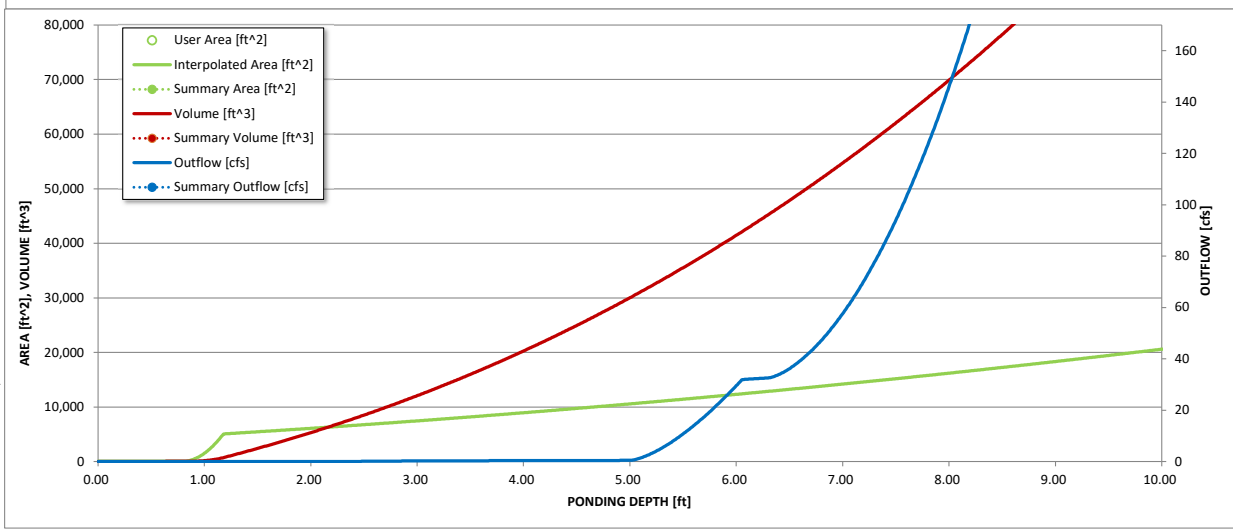
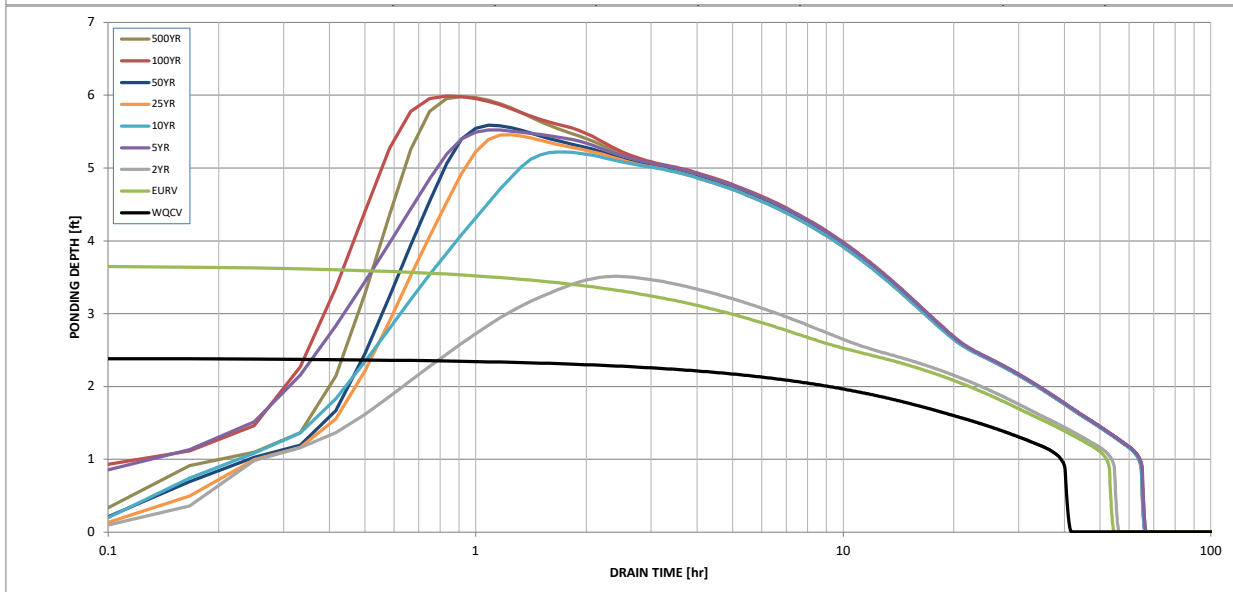
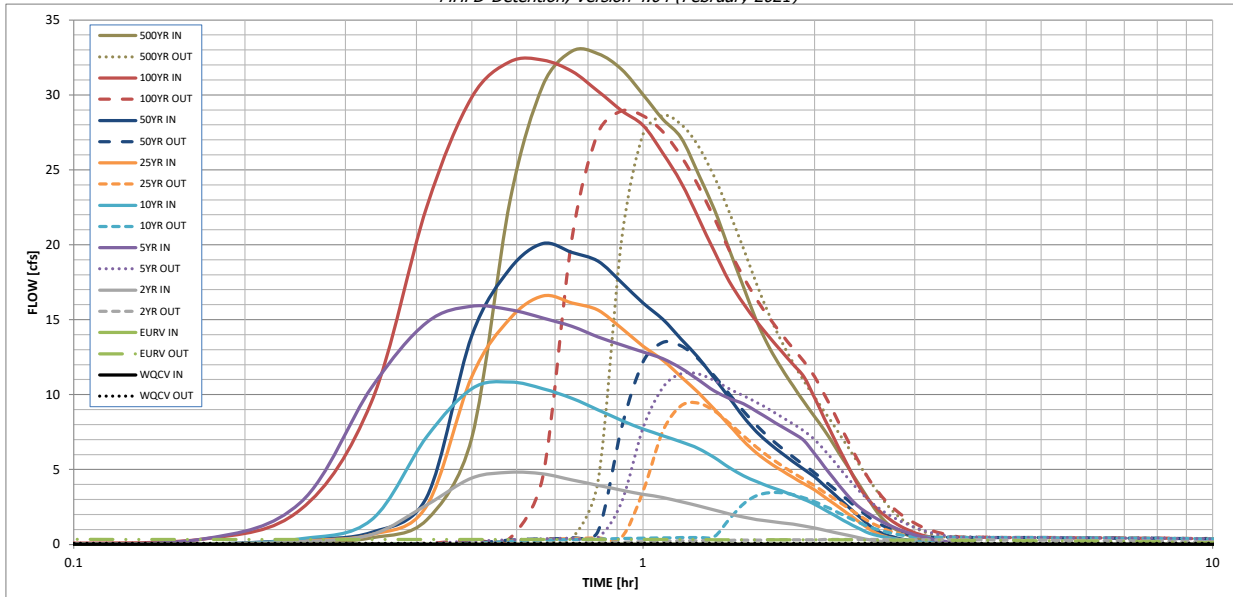
Routed Hydrograph Results

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

	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
Design Storm Return Period =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52
One-Hour Rainfall Depth (in) =	N/A	N/A	0.416	0.713	0.991	1.426	1.746	2.181
CUHP Runoff Volume (acre-ft) =	0.178	0.399	0.416	1.850	0.991	1.426	1.746	3.383
User Override Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	1.6	4.6	6.9	12.4	15.5	19.9
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	11.1	11.1	11.1	11.1	11.1	11.1
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A	0.10	0.70	0.44	0.78	0.98	2.06
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	4.8	15.9	10.8	16.6	20.1	32.3
Peak Inflow Q (cfs) =	0.1	0.3	0.3	11.4	3.5	9.4	13.5	28.9
Peak Outflow Q (cfs) =	N/A	N/A	N/A	1.0	0.5	0.8	0.9	0.9
Ratio Peak Outflow to Predevelopment Q =	Plate	Vertical Orifice 1	Vertical Orifice 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1
Structure Controlling Flow =	N/A	N/A	N/A	0.8	0.2	0.6	0.9	2.1
Max Velocity through Gate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Max Velocity through Gate 2 (fps) =	39	49	51	48	55	51	49	38
Time to Drain 97% of Inflow Volume (hours) =	40	52	54	59	62	60	59	54
Time to Drain 99% of Inflow Volume (hours) =	2.39	3.67	3.51	5.52	5.22	5.46	5.58	5.99
Maximum Ponding Depth (ft) =	0.15	0.19	0.19	0.26	0.25	0.26	0.27	0.28
Area at Maximum Ponding Depth (acres) =	0.179	0.399	0.369	0.821	0.741	0.802	0.837	0.946
Maximum Volume Stored (acre-ft) =								

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)



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

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename:

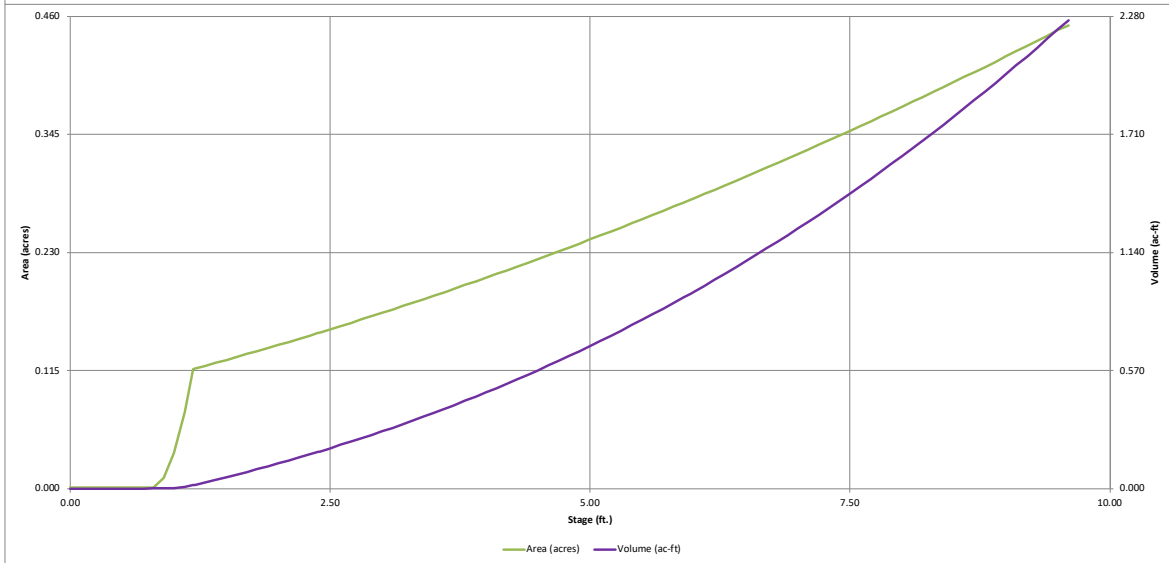
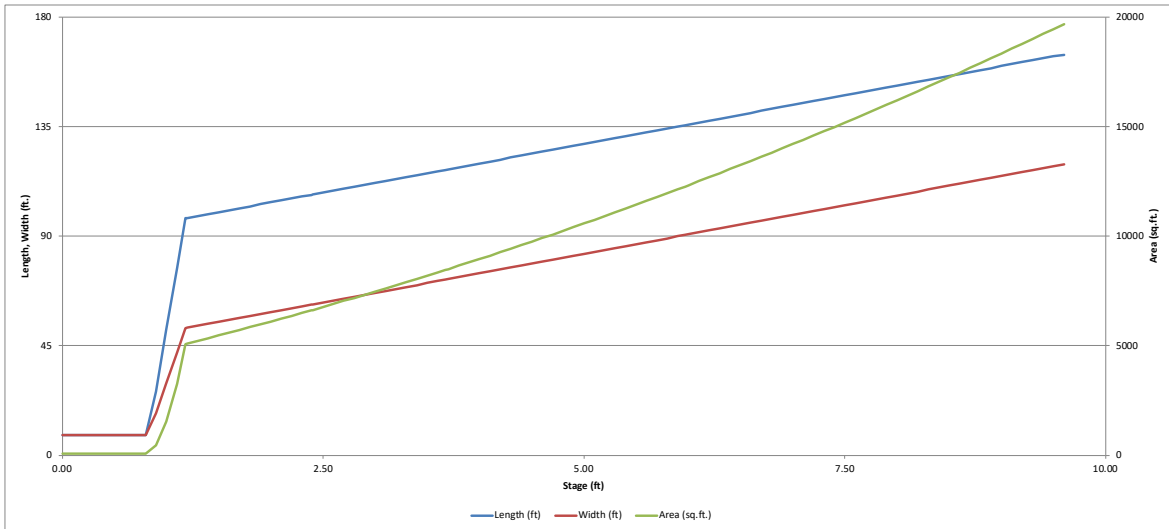
Inflow Hydrographs

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

Time Interval	SOURCE	CUHP	CUHP	CUHP	USER	CUHP	CUHP	CUHP	USER	CUHP
	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	0.02	0.00	0.00	0.00	0.06	0.00
	0:10:00	0.00	0.00	0.00	0.34	0.00	0.00	0.02	0.34	0.07
	0:15:00	0.00	0.00	0.18	2.78	0.37	0.25	0.31	2.31	0.44
	0:20:00	0.00	0.00	0.66	10.46	1.64	0.65	0.80	9.50	1.64
	0:25:00	0.00	0.00	2.63	14.81	7.18	2.58	3.15	22.52	7.13
	0:30:00	0.00	0.00	4.43	15.89	10.39	11.21	13.94	29.84	22.90
	0:35:00	0.00	0.00	4.81	15.66	10.85	15.07	18.39	32.21	30.64
	0:40:00	0.00	0.00	4.71	15.11	10.40	16.58	20.07	32.32	32.92
	0:45:00	0.00	0.00	4.31	14.56	9.75	16.12	19.49	31.57	32.76
	0:50:00	0.00	0.00	3.95	13.85	8.98	15.64	18.90	30.25	31.70
	0:55:00	0.00	0.00	3.62	13.31	8.27	14.42	17.48	28.95	30.01
	1:00:00	0.00	0.00	3.35	12.85	7.71	13.24	16.11	27.97	28.37
	1:05:00	0.00	0.00	3.13	12.39	7.26	12.28	15.01	26.11	27.13
	1:10:00	0.00	0.00	2.85	11.75	6.83	11.17	13.71	24.14	24.72
	1:15:00	0.00	0.00	2.57	10.98	6.41	10.13	12.46	21.80	22.36
	1:20:00	0.00	0.00	2.30	10.25	5.80	9.02	11.10	19.55	19.70
	1:25:00	0.00	0.00	2.04	9.75	5.13	7.96	9.80	17.56	17.19
	1:30:00	0.00	0.00	1.82	9.39	4.59	6.91	8.50	16.06	14.90
	1:35:00	0.00	0.00	1.66	8.88	4.19	6.09	7.51	14.87	13.13
	1:40:00	0.00	0.00	1.55	8.36	3.86	5.46	6.74	13.83	11.76
	1:45:00	0.00	0.00	1.45	7.87	3.57	4.94	6.10	12.89	10.57
	1:50:00	0.00	0.00	1.35	7.42	3.30	4.47	5.53	12.01	9.51
	1:55:00	0.00	0.00	1.22	6.93	3.01	4.05	5.01	11.18	8.53
	2:00:00	0.00	0.00	1.10	6.06	2.68	3.65	4.51	9.79	7.61
	2:05:00	0.00	0.00	0.95	5.17	2.31	3.17	3.91	8.39	6.58
	2:10:00	0.00	0.00	0.81	4.34	1.94	2.70	3.34	7.04	5.61
	2:15:00	0.00	0.00	0.67	3.57	1.60	2.25	2.78	5.79	4.67
	2:20:00	0.00	0.00	0.53	2.90	1.28	1.82	2.25	4.63	3.76
	2:25:00	0.00	0.00	0.41	2.39	0.98	1.40	1.73	3.63	2.89
	2:30:00	0.00	0.00	0.30	2.01	0.74	1.01	1.25	2.90	2.09
	2:35:00	0.00	0.00	0.22	1.68	0.59	0.70	0.88	2.34	1.50
	2:40:00	0.00	0.00	0.18	1.40	0.48	0.51	0.65	1.89	1.11
	2:45:00	0.00	0.00	0.15	1.16	0.39	0.38	0.49	1.51	0.82
	2:50:00	0.00	0.00	0.12	0.96	0.32	0.29	0.37	1.21	0.60
	2:55:00	0.00	0.00	0.10	0.78	0.26	0.22	0.29	0.97	0.44
	3:00:00	0.00	0.00	0.08	0.64	0.21	0.17	0.22	0.78	0.32
	3:05:00	0.00	0.00	0.07	0.52	0.16	0.13	0.17	0.64	0.23
	3:10:00	0.00	0.00	0.05	0.42	0.13	0.10	0.13	0.52	0.17
	3:15:00	0.00	0.00	0.04	0.32	0.10	0.08	0.10	0.42	0.14
	3:20:00	0.00	0.00	0.03	0.25	0.08	0.06	0.08	0.32	0.11
	3:25:00	0.00	0.00	0.03	0.18	0.06	0.05	0.06	0.24	0.09
	3:30:00	0.00	0.00	0.02	0.13	0.04	0.04	0.05	0.18	0.06
	3:35:00	0.00	0.00	0.01	0.08	0.03	0.03	0.04	0.12	0.05
	3:40:00	0.00	0.00	0.01	0.05	0.02	0.02	0.02	0.07	0.03
	3:45:00	0.00	0.00	0.01	0.03	0.01	0.01	0.02	0.04	0.02
	3:50:00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01
	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
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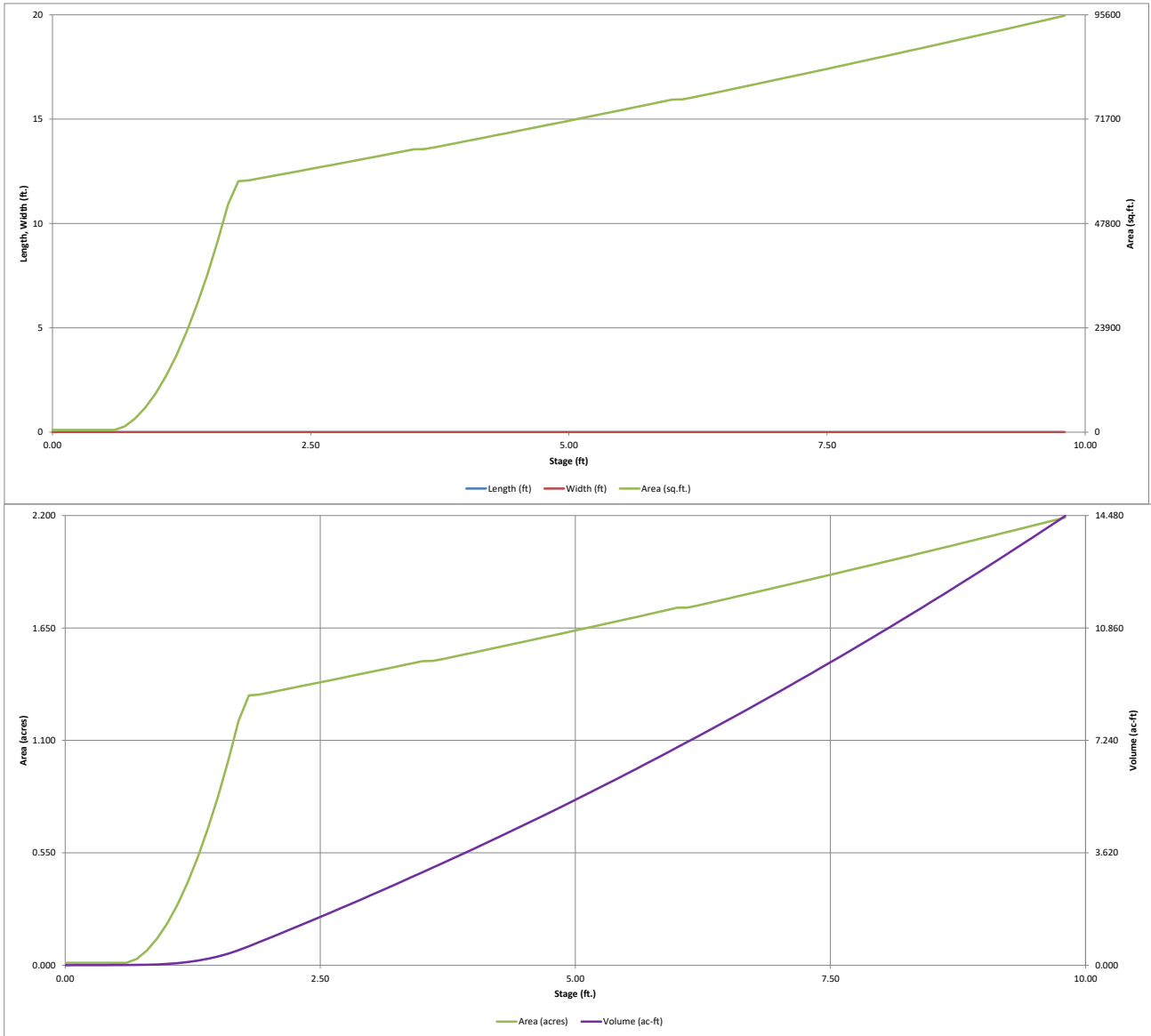
DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)



DETENTION BASIN STAGE-STORAGE TABLE BUILDER

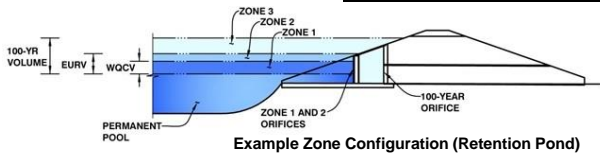
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DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD- Detention, Version 4.04 (February 2021)

Project: Flying Horse North MDDP
Basin ID: Pond 9



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.01	0.883	Orifice Plate
Zone 2 (5-year)	2.76	1.030	Weir&Pipe (Restrict)
Zone 3 (100-year)	4.64	2.829	Weir&Pipe (Restrict)
Total (all zones)		4.742	

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 Diameter =	N/A	inches

Underdrain Orifice Area =	N/A	ft ²
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)

Invert of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate =	2.36	ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing =	9.40	inches
Orifice Plate: Orifice Area per Row =	3.45	sq. inches (use rectangular openings)

WQ Orifice Area per Row =	2.396E-02	ft ²
Elliptical Half-Width =	N/A	feet
Elliptical Slot Centroid =	N/A	feet
Elliptical Slot Area =	N/A	ft ²

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	0.79	1.57					
Orifice Area (sq. inches)	3.45	3.45	3.45					
	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	
Invert of Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter =	N/A	N/A	inches

	Not Selected	Not Selected	
Vertical Orifice Area =	N/A	N/A	ft ²
Vertical Orifice Centroid =	N/A	N/A	feet

User Input: Overflow Weir (Dropbox with Flat or Sloped Gate and Outlet Pipe OR Rectangular/Trapezoidal Weir (and No Outlet Pipe)

	Zone 2 Weir	Zone 3 Weir	
Overflow Weir Front Edge Height, Ho =	3.10	4.10	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	4.00	8.00	feet
Overflow Weir Gate Slope =	0.00	4.00	H:V
Horiz. Length of Weir Sides =	6.00	12.00	feet
Overflow Gate Type =	Type C Gate	Type C Gate	
Debris Clogging % =	50%	50%	%

	Zone 2 Weir	Zone 3 Weir	
Height of Gate Upper Edge, H _u =	3.10	7.10	feet
Overflow Weir Slope Length =	6.00	12.37	feet
Gate Open Area / 100-yr Orifice Area =	1.82	2.92	
Overflow Gate Open Area w/o Debris =	16.70	68.87	ft ²
Overflow Gate Open Area w/ Debris =	8.35	34.44	ft ²

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

	Zone 2 Restrictor	Zone 3 Restrictor	
Depth to Invert of Outlet Pipe =	2.30	2.60	ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter =	42.00	66.00	inches
Restrictor Plate Height Above Pipe Invert =	38.00	64.00	inches

	Zone 2 Restrictor	Zone 3 Restrictor	
Outlet Orifice Area =	9.16	23.55	ft ²
Outlet Orifice Centroid =	1.67	2.73	feet
Half-Central Angle of Restrictor Plate on Pipe =	2.51	2.79	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage =	7.80	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	113.00	feet
Spillway End Slopes =	4.00	H:V
Freeboard above Max Water Surface =	1.00	feet

Spillway Design Flow Depth =	0.98	feet
Stage at Top of Freeboard =	9.78	feet
Basin Area at Top of Freeboard =	2.19	acres
Basin Volume at Top of Freeboard =	14.42	acre-ft

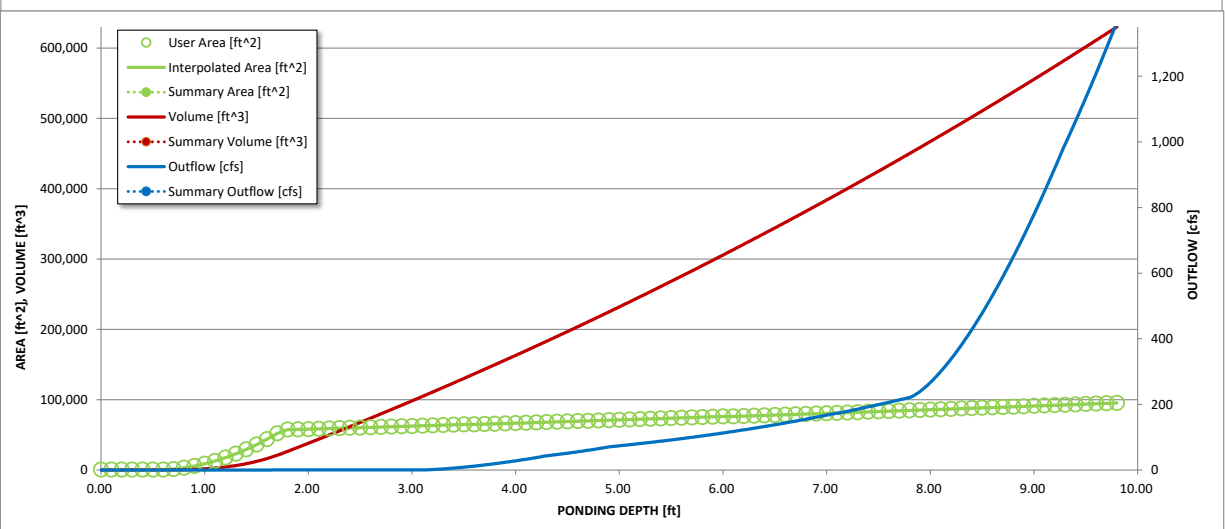
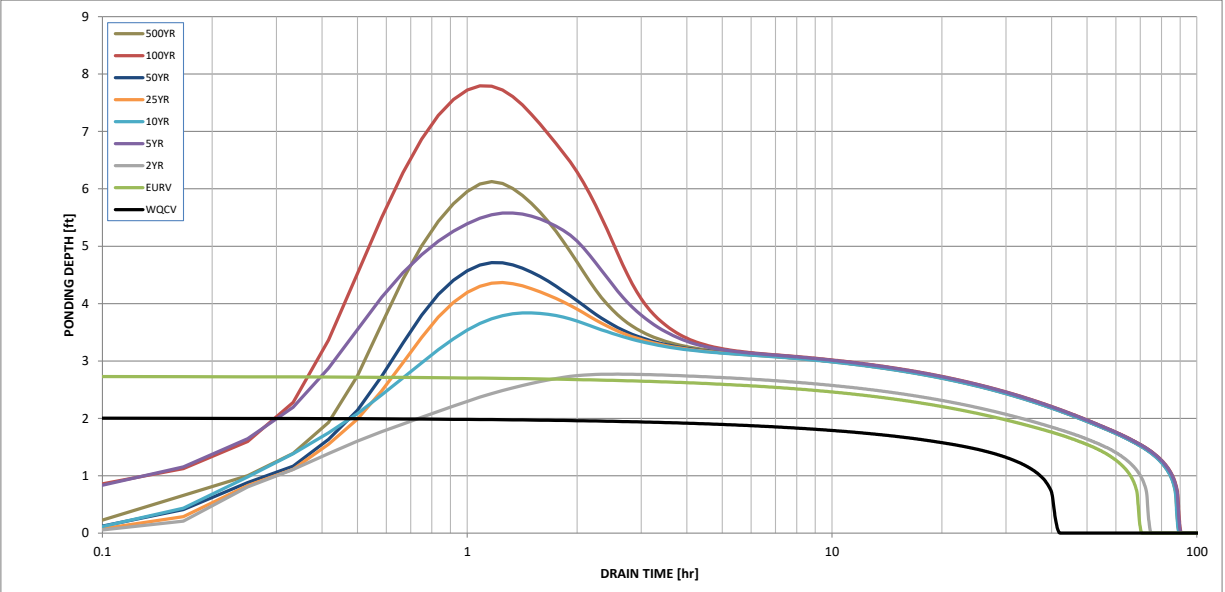
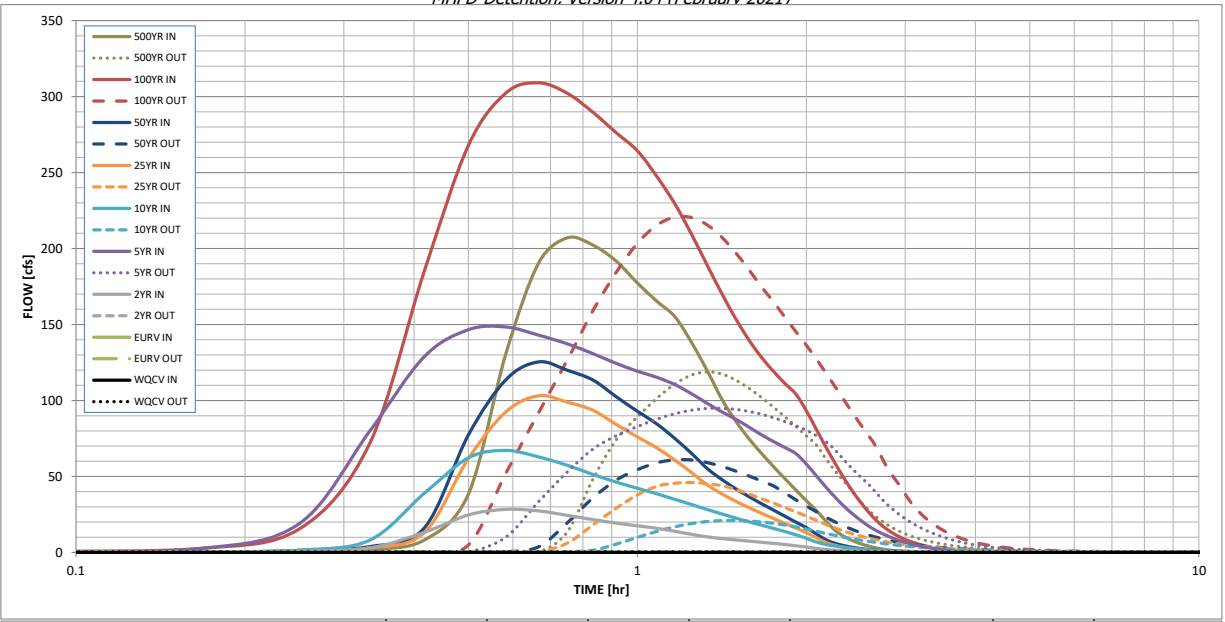
Routed Hydrograph Results

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

	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Design Storm Return Period =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.14
One-Hour Rainfall Depth (in) =	0.883	1.880	2.026	3.599	5.087	7.473	9.201	11.580	16.065
CUHP Runoff Volume (acre-ft) =	0.883	1.880	2.026	3.599	5.087	7.473	9.201	11.580	16.065
User Override Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	2.026	17.291	5.087	7.473	9.201	31.926	16.065
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	11.0	30.3	46.1	81.0	101.4	129.3	179.9
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A	11.0	95.0				282.3	
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.13	1.10	0.53	0.94	1.18	3.28	2.09
Peak Inflow Q (cfs) =	N/A	N/A	28.4	148.4	67.1	103.1	125.4	309.0	207.1
Peak Outflow Q (cfs) =	0.4	0.5	0.5	94.8	21.0	46.0	61.0	220.7	118.9
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	1.0	0.5	0.6	0.6	0.8	0.7
Structure Controlling Flow =	Plate	Plate	Plate	Overflow Weir 2	Overflow Weir 1	Overflow Weir 2	Overflow Weir 2	Overflow Weir 2	Overflow Weir 2
Max Velocity through Gate 1 (fps) =	N/A	N/A	N/A	4.5	1.2	2.7	3.4	6.1	4.9
Max Velocity through Gate 2 (fps) =	N/A	N/A	N/A	0.3	N/A	0.0	0.1	1.7	0.5
Time to Drain 97% of Inflow Volume (hours) =	38	65	69	61	78	74	71	46	62
Time to Drain 99% of Inflow Volume (hours) =	40	68	72	78	84	83	82	70	78
Maximum Ponding Depth (ft) =	2.01	2.74	2.77	5.58	3.84	4.37	4.71	7.79	6.13
Area at Maximum Ponding Depth (acres) =	1.33	1.41	1.41	1.70	1.51	1.57	1.61	1.94	1.75
Maximum Volume Stored (acre-ft) =	0.889	1.890	1.932	6.278	3.484	4.300	4.856	10.314	7.229

DETENTION BASIN OUTLET STRUCTURE DESIGN

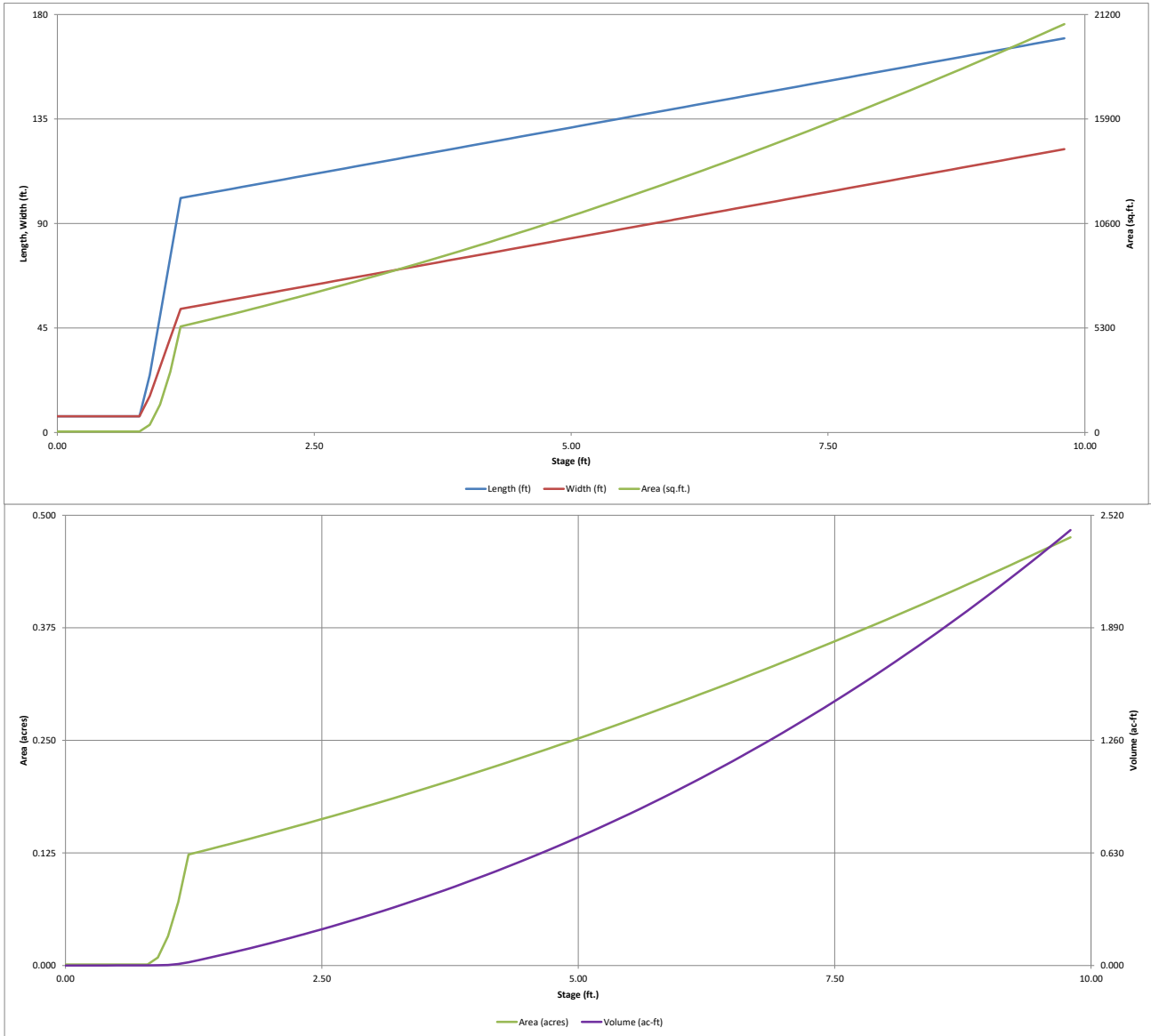
MHFD-Detention, Version 4.04 (February 2021)



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

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)

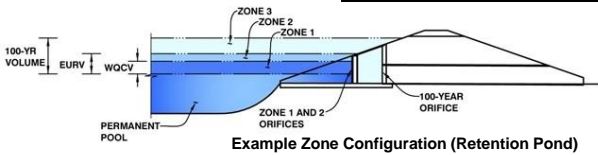


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD- Detention, Version 4.04 (February 2021)

Project: Flying Horse North Master Drainage Plan

Basin ID: Pond 10



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	1.98	0.123	Orifice Plate
Zone 2 (5-year)	2.53	0.084	Circular Orifice
Zone 3 (100-year)	5.36	0.603	Weir&Pipe (Restrict)
Total (all zones)		0.810	

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

Underdrain Orifice Invert Depth = ft (distance below the filtration media surface)
 Underdrain Orifice Diameter = inches

Calculated Parameters for Underdrain
 Underdrain Orifice Area = ft²
 Underdrain Orifice Centroid = 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)

Invert of Lowest Orifice = ft (relative to basin bottom at Stage = 0 ft)
 Depth at top of Zone using Orifice Plate = ft (relative to basin bottom at Stage = 0 ft)
 Orifice Plate: Orifice Vertical Spacing = inches
 Orifice Plate: Orifice Area per Row = sq. inches (diameter = 3/4 inch)

Calculated Parameters for Plate
 WQ Orifice Area per Row = ft²
 Elliptical Half-Width = feet
 Elliptical Slot Centroid = feet
 Elliptical Slot Area = ft²

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	0.66	1.32					
Orifice Area (sq. inches)	0.45	0.45	0.45					
	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)

	Zone 2 Circular	Not Selected	
Invert of Vertical Orifice =	1.98	N/A	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =	2.53	N/A	ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter =	18.00	N/A	inches

Calculated Parameters for Vertical Orifice

	Zone 2 Circular	Not Selected	
Vertical Orifice Area =	1.77	N/A	ft ²
Vertical Orifice Centroid =	0.75	N/A	feet

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	
Overflow Weir Front Edge Height, H _o =	4.70	N/A	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	3.00	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V
Horiz. Length of Weir Sides =	3.00	N/A	feet
Overflow Grate Type =	Type C Grate	N/A	
Debris Clogging % =	50%	N/A	%

Calculated Parameters for Overflow Weir

	Zone 3 Weir	Not Selected	
Height of Grate Upper Edge, H _u =	4.70	N/A	feet
Overflow Weir Slope Length =	3.00	N/A	feet
Grate Open Area / 100-yr Orifice Area =	1.55	N/A	
Overflow Grate Open Area w/o Debris =	6.26	N/A	ft ²
Overflow Grate Open Area w/ Debris =	3.13	N/A	ft ²

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

	Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	1.00	N/A	ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter =	36.00	N/A	inches
Restrictor Plate Height Above Pipe Invert =	20.00		inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 3 Restrictor	Not Selected	
Outlet Orifice Area =	4.03	N/A	ft ²
Outlet Orifice Centroid =	0.95	N/A	feet
Half-Central Angle of Restrictor Plate on Pipe =	1.68	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage =	6.70	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	26.00	feet
Spillway End Slopes =	4.00	H:V
Freeboard above Max Water Surface =	1.00	feet

Calculated Parameters for Spillway

Spillway Design Flow Depth =	0.94	feet
Stage at Top of Freeboard =	8.64	feet
Basin Area at Top of Freeboard =	0.42	acres
Basin Volume at Top of Freeboard =	1.92	acre-ft

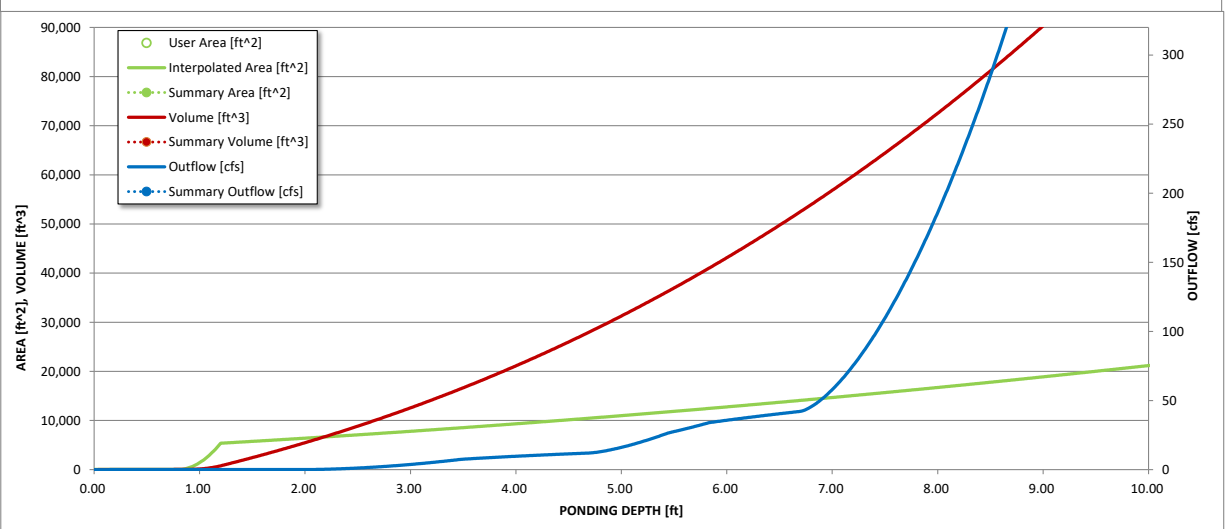
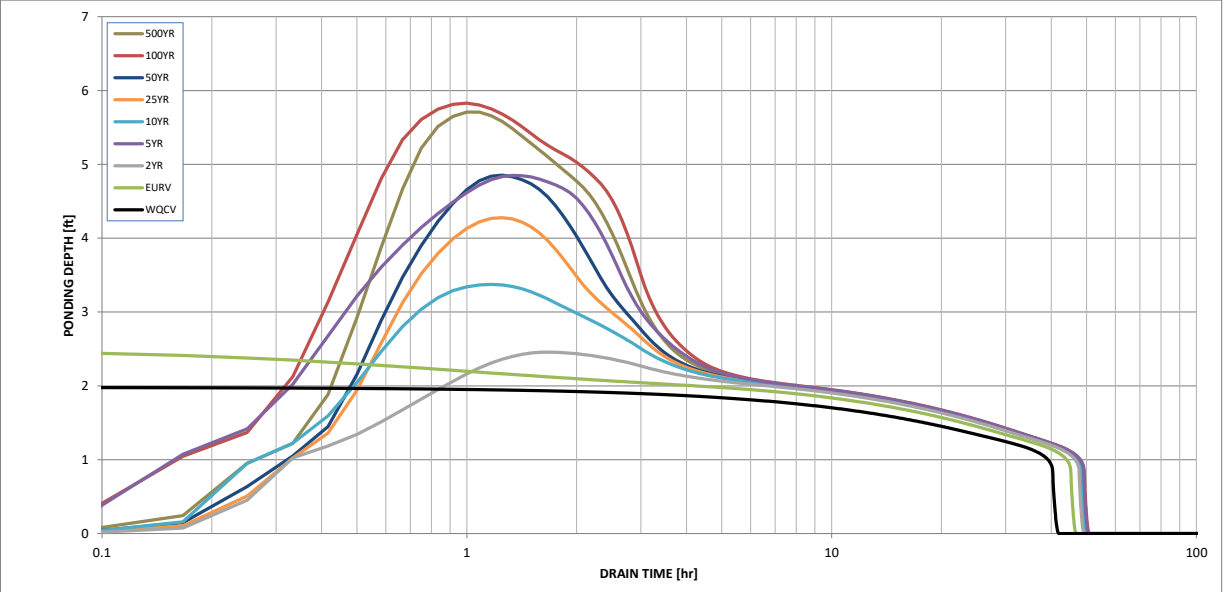
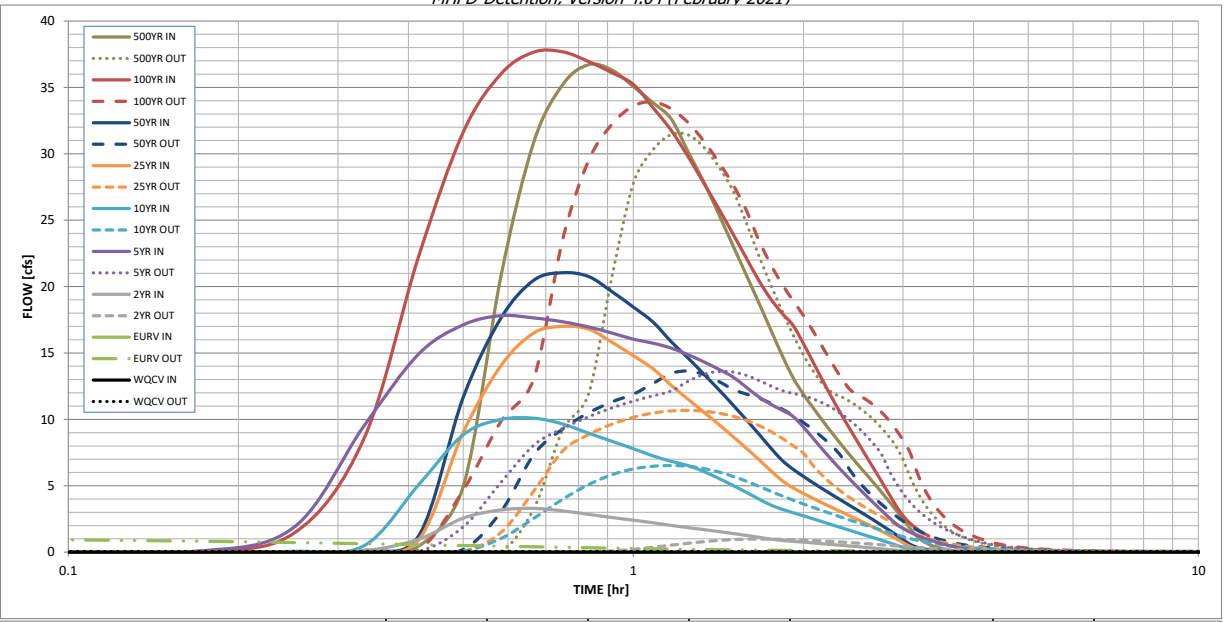
Routed Hydrograph Results

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

	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Design Storm Return Period	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.14
One-Hour Rainfall Depth (in)			0.293	0.647	1.000	1.630	2.059	2.677	3.804
CUHP Runoff Volume (acre-ft)	0.123	0.206	0.293	0.647	1.000	1.630	2.059	2.677	3.804
User Override Inflow Hydrograph Volume (acre-ft)	N/A	N/A	0.293	2.509	1.000	1.630	2.059	4.656	3.804
CUHP Predevelopment Peak Q (cfs)	N/A	N/A	2.0	5.7	8.7	15.6	19.6	25.0	35.0
OPTIONAL Override Predevelopment Peak Q (cfs)	N/A	N/A		13.3				39.2	
Predevelopment Unit Peak Flow, q (cfs/acre)	N/A	N/A	0.09	0.60	0.40	0.71	0.89	1.79	1.60
Peak Inflow Q (cfs)	N/A	N/A	3.3	17.8	10.1	17.0	21.0	37.7	36.7
Peak Outflow Q (cfs)	0.1	1.1	1.0	13.6	6.5	10.7	13.6	33.9	31.4
Ratio Peak Outflow to Predevelopment Q	N/A	N/A	N/A	1.0	0.8	0.7	0.7	0.9	0.9
Structure Controlling Flow	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Overflow Weir 1	Vertical Orifice 1	Vertical Orifice 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1
Max Velocity through Grate 1 (fps)	N/A	N/A	N/A	0.2	N/A	N/A	0.2	3.0	2.7
Max Velocity through Grate 2 (fps)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours)	39	43	44	21	35	29	25	6	11
Time to Drain 99% of Inflow Volume (hours)	40	45	47	38	44	41	40	30	33
Maximum Ponding Depth (ft)	1.99	2.52	2.46	4.85	3.37	4.28	4.85	5.83	5.71
Area at Maximum Ponding Depth (acres)	0.15	0.16	0.16	0.25	0.19	0.22	0.25	0.29	0.28
Maximum Volume Stored (acre-ft)	0.124	0.206	0.195	0.680	0.357	0.544	0.680	0.938	0.904

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)



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

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename: ..\SWMM\Outflow hydrographs\Pond6 OutflowHydrograph.xlsx

Inflow Hydrographs

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

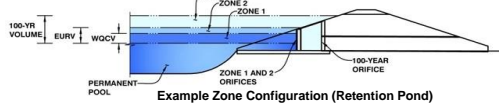
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5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
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	0:15:00	0.00	0.00	0.03	1.83	0.06	0.04	0.05	1.39	0.07
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	0:40:00	0.00	0.00	3.29	17.64	10.09	16.51	20.48	37.66	35.22
	0:45:00	0.00	0.00	3.11	17.35	9.65	17.00	21.04	37.68	36.71
	0:50:00	0.00	0.00	2.84	16.96	8.96	16.79	20.76	36.95	36.31
	0:55:00	0.00	0.00	2.61	16.50	8.35	15.81	19.62	36.11	35.07
	1:00:00	0.00	0.00	2.41	16.04	7.79	14.79	18.46	35.23	33.85
	1:05:00	0.00	0.00	2.22	15.74	7.25	13.82	17.33	33.48	32.63
	1:10:00	0.00	0.00	2.01	15.37	6.84	12.57	15.85	31.77	30.15
	1:15:00	0.00	0.00	1.85	14.87	6.52	11.51	14.62	29.79	27.86
	1:20:00	0.00	0.00	1.70	14.33	6.07	10.54	13.40	27.78	25.45
	1:25:00	0.00	0.00	1.55	13.77	5.55	9.62	12.24	25.86	23.11
	1:30:00	0.00	0.00	1.41	13.20	5.03	8.72	11.10	23.99	20.91
	1:35:00	0.00	0.00	1.26	12.43	4.51	7.84	9.99	22.18	18.81
	1:40:00	0.00	0.00	1.12	11.70	4.01	6.98	8.91	20.48	16.77
	1:45:00	0.00	0.00	0.99	11.14	3.55	6.14	7.85	19.08	14.83
	1:50:00	0.00	0.00	0.88	10.69	3.23	5.39	6.92	17.99	13.15
	1:55:00	0.00	0.00	0.81	10.23	2.98	4.85	6.25	17.09	11.89
	2:00:00	0.00	0.00	0.75	9.42	2.74	4.42	5.71	15.71	10.84
	2:05:00	0.00	0.00	0.69	8.54	2.50	4.03	5.21	14.26	9.85
	2:10:00	0.00	0.00	0.63	7.69	2.27	3.68	4.74	12.87	8.95
	2:15:00	0.00	0.00	0.57	6.90	2.05	3.35	4.31	11.57	8.10
	2:20:00	0.00	0.00	0.52	6.17	1.84	3.03	3.90	10.38	7.31
	2:25:00	0.00	0.00	0.46	5.49	1.64	2.73	3.51	9.28	6.57
	2:30:00	0.00	0.00	0.41	4.85	1.44	2.44	3.13	8.23	5.87
	2:35:00	0.00	0.00	0.35	4.25	1.25	2.15	2.76	7.22	5.19
	2:40:00	0.00	0.00	0.30	3.68	1.07	1.86	2.39	6.26	4.51
	2:45:00	0.00	0.00	0.25	3.14	0.89	1.58	2.03	5.32	3.84
	2:50:00	0.00	0.00	0.20	2.62	0.72	1.29	1.67	4.39	3.17
	2:55:00	0.00	0.00	0.15	2.14	0.54	1.01	1.31	3.51	2.50
	3:00:00	0.00	0.00	0.10	1.79	0.37	0.73	0.95	2.76	1.84
	3:05:00	0.00	0.00	0.06	1.52	0.25	0.45	0.61	2.21	1.24
	3:10:00	0.00	0.00	0.04	1.29	0.19	0.28	0.40	1.80	0.85
	3:15:00	0.00	0.00	0.03	1.10	0.15	0.18	0.27	1.47	0.60
	3:20:00	0.00	0.00	0.02	0.94	0.12	0.12	0.19	1.22	0.42
	3:25:00	0.00	0.00	0.02	0.79	0.10	0.08	0.13	1.00	0.28
	3:30:00	0.00	0.00	0.01	0.66	0.07	0.05	0.09	0.81	0.19
	3:35:00	0.00	0.00	0.01	0.54	0.06	0.04	0.06	0.66	0.12
	3:40:00	0.00	0.00	0.01	0.44	0.04	0.02	0.04	0.54	0.07
	3:45:00	0.00	0.00	0.01	0.35	0.03	0.02	0.03	0.44	0.05
	3:50:00	0.00	0.00	0.01	0.27	0.02	0.01	0.02	0.35	0.04
	3:55:00	0.00	0.00	0.00	0.21	0.02	0.01	0.02	0.27	0.03
	4:00:00	0.00	0.00	0.00	0.15	0.01	0.01	0.01	0.21	0.02
	4:05:00	0.00	0.00	0.00	0.11	0.01	0.00	0.01	0.15	0.02
	4:10:00	0.00	0.00	0.00	0.07	0.01	0.00	0.01	0.10	0.01
	4:15:00	0.00	0.00	0.00	0.04	0.00	0.00	0.00	0.06	0.01
	4:20:00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.03	0.01
	4:25:00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.01	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 STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)

Project: Flying Horse North Master Drainage Plan

Basin ID: Pond 11



Example Zone Configuration (Retention Pond)

Watershed Information

Table with watershed parameters: Selected BMP Type (EDB), Watershed Area (79.73 acres), Watershed Length (2,715 ft), Watershed Length to Centroid (1,530 ft), Watershed Slope (0.037 ft/ft), Watershed Imperviousness (28.50%), Percentage Hydrologic Soil Group A (0.0%), Percentage Hydrologic Soil Group B (100.0%), Percentage Hydrologic Soil Groups C/D (0.0%), 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.

Table with water quality capture volume (WQCV) and excess urban runoff volume (EURV) for various return periods (2-yr, 5-yr, 10-yr, 25-yr, 50-yr, 100-yr, 500-yr). Includes 'Optional User Overrides' for inches and acre-feet.

Define Zones and Basin Geometry

Table with zone volumes (Zone 1, Zone 2, Zone 3), total detention basin volume, initial surcharge volume (ISV), initial surcharge depth (ISD), total available detention depth (Htotal), depth of trickle channel (Htc), slope of trickle channel (Stc), slopes of main basin sides (Smain), and basin length-to-width ratio (RLW).

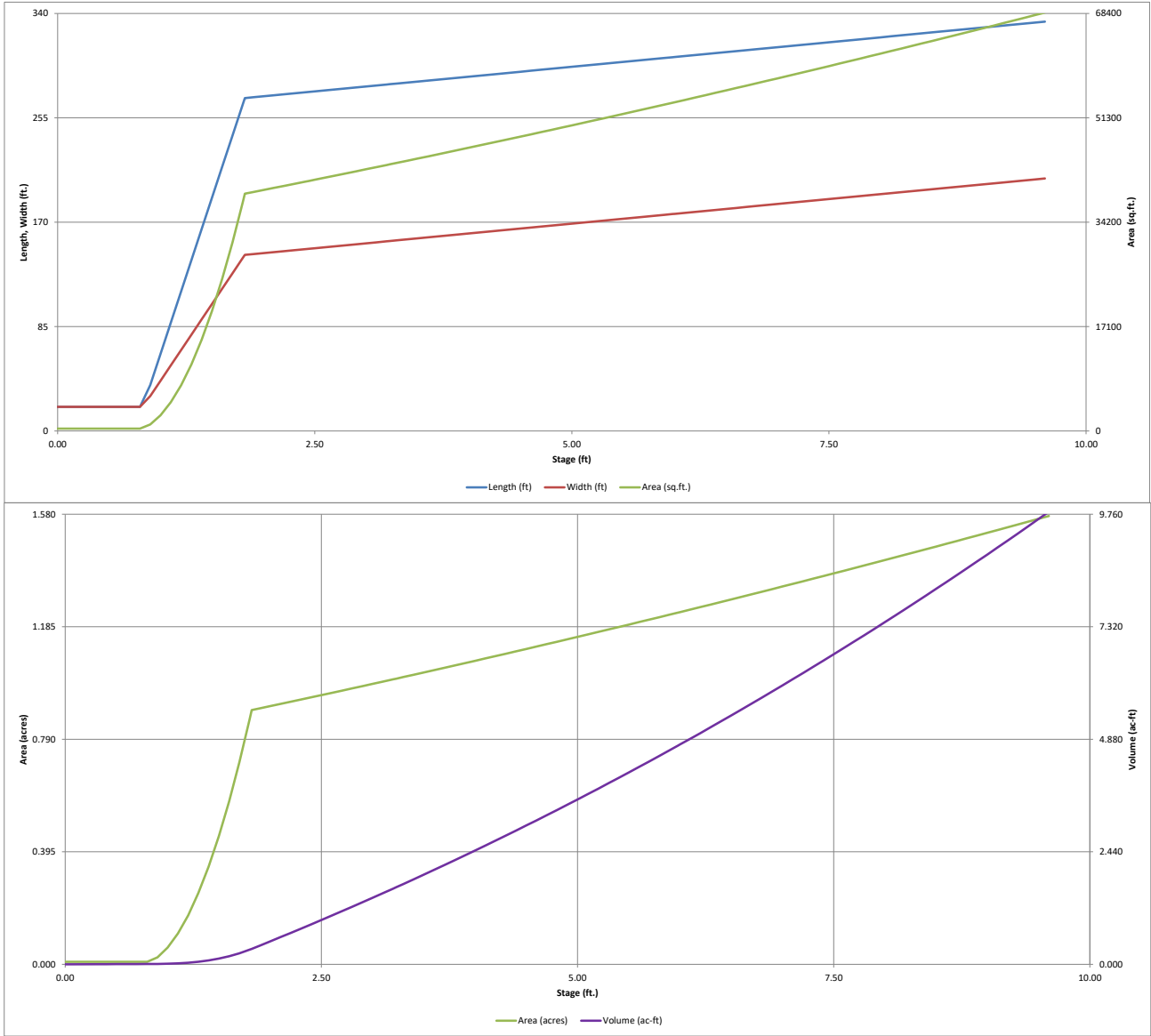
Table with basin geometry parameters: Initial Surcharge Area (AISV), surcharge volume length (LSV), surcharge volume width (WSV), depth of basin floor (HFLOOR), length of basin floor (LFLOOR), width of basin floor (WFLOOR), area of basin floor (AFLOOR), volume of basin floor (VFLOOR), depth of main basin (HMAIN), length of main basin (LMAIN), width of main basin (WMAIN), area of main basin (AMAIN), and volume of main basin (VMAIN).

Depth Increment = 0.10 ft

Main stage-storage table with columns: Stage (ft), Optional Override Stage (ft), Length (ft), Width (ft), Area (ft^2), Optional Override Area (ft^2), Area (acre), Volume (ft^3), and Volume (ac-ft). Rows include Top of Micropool, ISV, Floor, Zone 1 (WQCV), Zone 2 (5-year), and Zone 3 (100-year).

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

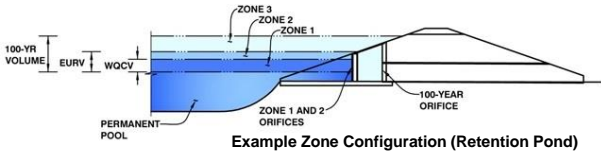
MHFD-Detention, Version 4.04 (February 2021)



DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD- Detention, Version 4.04 (February 2021)

Project: Flying Horse North Master Drainage Plan
Basin ID: Pond 11



	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.52	0.975	Orifice Plate
Zone 2 (5-year)	3.92	1.400	Weir&Pipe (Circular)
Zone 3 (100-year)	6.30	2.757	Weir&Pipe (Restrict)
Total (all zones)		5.132	

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 Diameter =	N/A	inches

Underdrain Orifice Area =	N/A	ft ²
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)

Invert of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate =	3.92	ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing =	N/A	inches
Orifice Plate: Orifice Area per Row =	N/A	inches

WQ Orifice Area per Row =	N/A	ft ²
Elliptical Half-Width =	N/A	feet
Elliptical Slot Centroid =	N/A	feet
Elliptical Slot Area =	N/A	ft ²

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	1.00	2.00	3.00				
Orifice Area (sq. inches)	3.57	3.57	3.57	10.00				

	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	
Invert of Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter =	N/A	N/A	inches

	Not Selected	Not Selected	
Vertical Orifice Area =	N/A	N/A	ft ²
Vertical Orifice Centroid =	N/A	N/A	feet

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir (and No Outlet Pipe)

	Zone 2 Weir	Zone 3 Weir	
Overflow Weir Front Edge Height, Ho =	2.52	3.92	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	10.00	10.00	feet
Overflow Weir Grate Slope =	0.00	4.00	H:V
Horiz. Length of Weir Sides =	10.00	18.00	feet
Overflow Grate Type =	Type C Grate	Type C Grate	
Debris Clogging % =	50%	50%	%

	Zone 2 Weir	Zone 3 Weir	
Height of Grate Upper Edge, H _g =	2.52	8.42	feet
Overflow Weir Slope Length =	10.00	18.55	feet
Grate Open Area / 100-yr Orifice Area =	9.85	7.39	
Overflow Grate Open Area w/o Debris =	69.60	129.14	ft ²
Overflow Grate Open Area w/ Debris =	34.80	64.57	ft ²

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

	Zone 2 Circular	Zone 3 Restrictor	
Depth to Invert of Outlet Pipe =	2.50	2.80	ft (distance below basin bottom at Stage = 0 ft)
Circular Orifice Diameter or Pipe Diameter =	36.00	60.00	inches
Restrictor Plate Height Above Pipe Invert =		50.00	inches

	Zone 2 Circular	Zone 3 Restrictor	
Outlet Orifice Area =	7.07	17.48	ft ²
Outlet Orifice Centroid =	1.50	2.25	feet
Half-Central Angle of Restrictor Plate on Pipe =	N/A	2.30	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage =	15.30	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	96.00	feet
Spillway End Slopes =	4.00	H:V
Freeboard above Max Water Surface =	1.00	feet

Spillway Design Flow Depth =	0.97	feet
Stage at Top of Freeboard =	17.27	feet
Basin Area at Top of Freeboard =	2.42	acres
Basin Volume at Top of Freeboard =	25.02	acre-ft

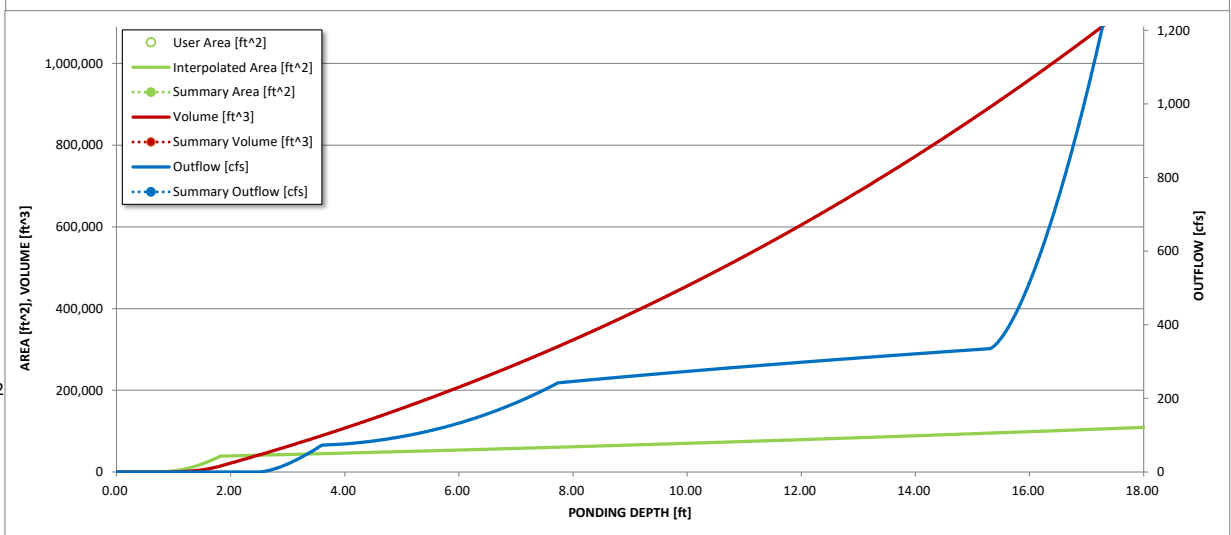
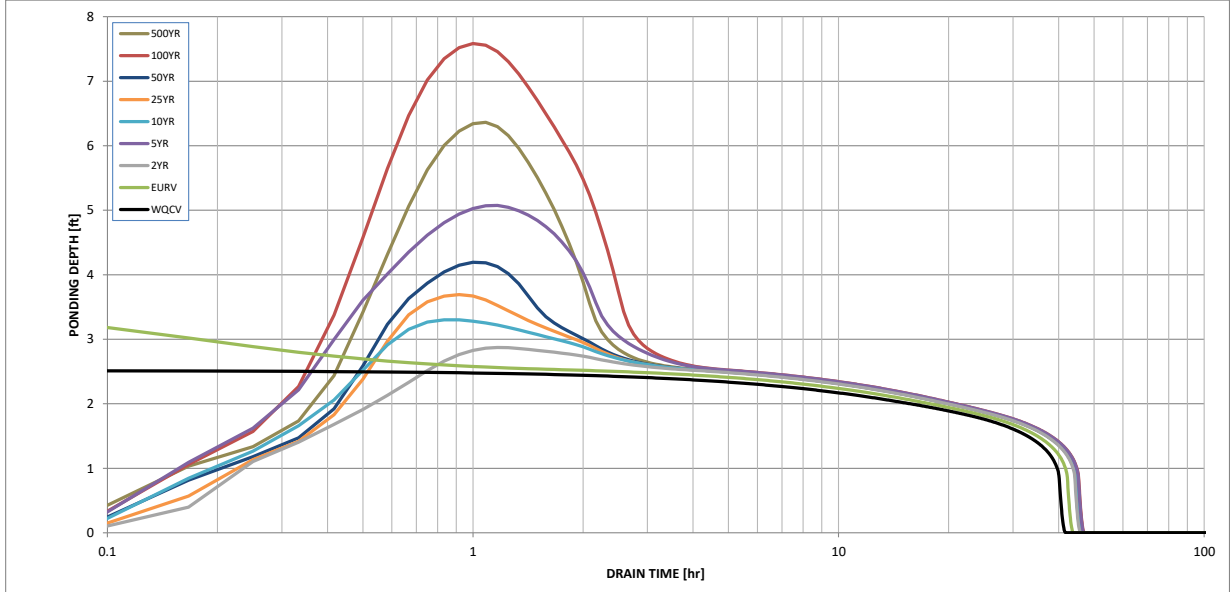
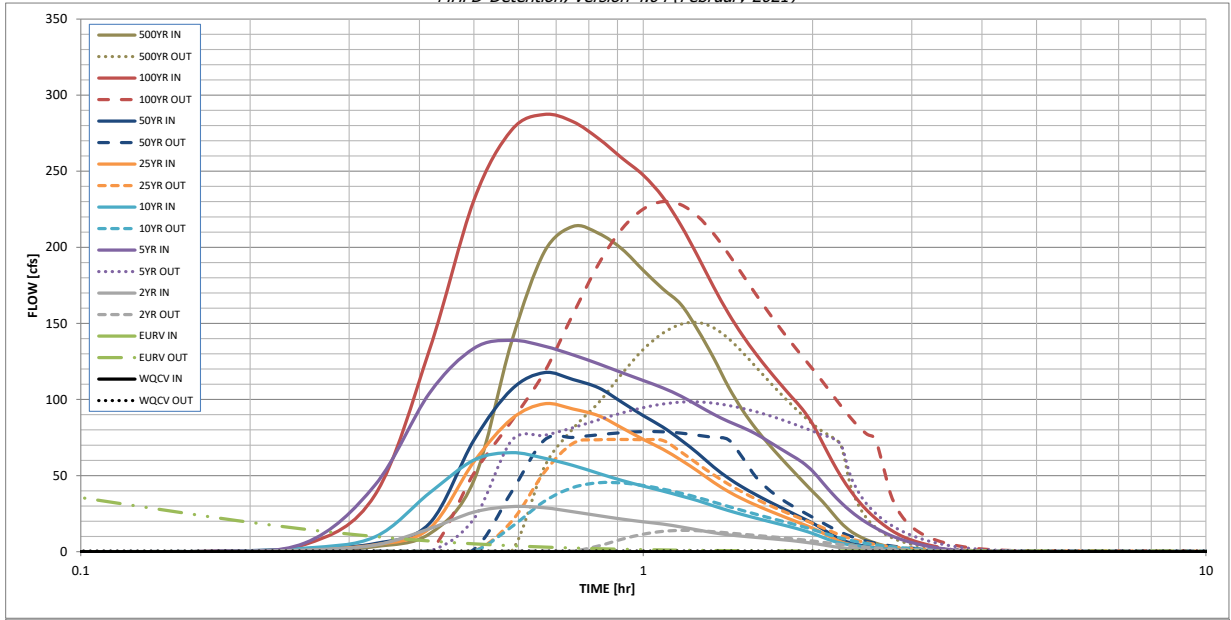
Routed Hydrograph Results

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

	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Design Storm Return Period =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.39
One-Hour Rainfall Depth (in) =	0.975	2.322	2.370	3.903	5.321	7.486	9.112	11.293	17.208
CUHP Runoff Volume (acre-ft) =	0.975	2.322	2.370	3.903	5.321	7.486	9.112	11.293	17.208
User Override Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	2.370	15.619	5.321	7.486	9.112	28.758	17.208
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	9.0	25.0	37.8	67.7	85.0	108.0	168.2
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A		103.5				221.3	
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.11	1.30	0.47	0.85	1.07	2.78	2.11
Peak Inflow Q (cfs) =	N/A	N/A	29.6	138.9	65.1	97.2	117.7	287.3	213.7
Peak Outflow Q (cfs) =	0.4	73.2	14.0	98.4	45.3	73.7	78.9	230.0	150.6
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	1.0	1.2	1.1	0.9	1.0	0.9
Structure Controlling Flow =	Overflow Weir 1	Outlet Plate 1	Overflow Weir 1	Overflow Weir 2	Overflow Weir 1	Outlet Plate 1	Overflow Weir 2	Overflow Weir 2	Overflow Weir 1
Max Velocity through Grate 1 (fps) =	N/A	1.07	0.19	1.2	0.6	1.0	1.1	1.4	1.3
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	0.1	N/A	N/A	0.0	1.0	0.4
Time to Drain 97% of Inflow Volume (hours) =	38	38	40	22	36	32	30	9	20
Time to Drain 99% of Inflow Volume (hours) =	40	41	43	36	41	40	39	30	35
Maximum Ponding Depth (ft) =	2.52	3.87	2.87	5.07	3.30	3.69	4.19	7.58	6.36
Area at Maximum Ponding Depth (acres) =	0.95	1.05	0.97	1.16	1.01	1.04	1.08	1.38	1.27
Maximum Volume Stored (acre-ft) =	0.979	2.329	1.315	3.655	1.741	2.141	2.671	6.833	5.218

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)



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

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename: ...[SWM]Outflow hydrographs[Pond6 OutflowHydrograph.xlsx

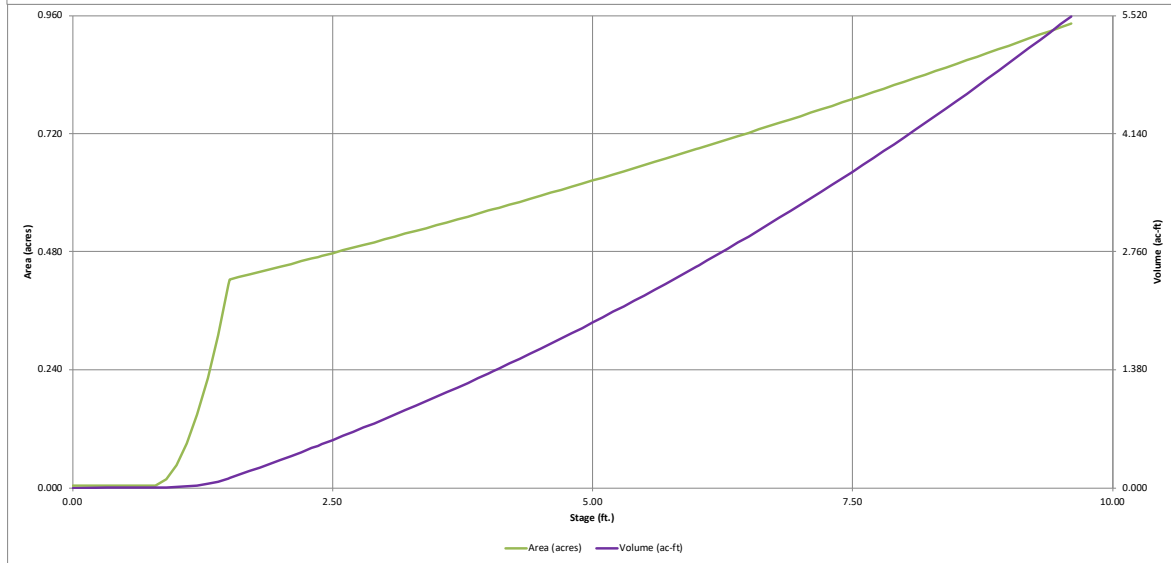
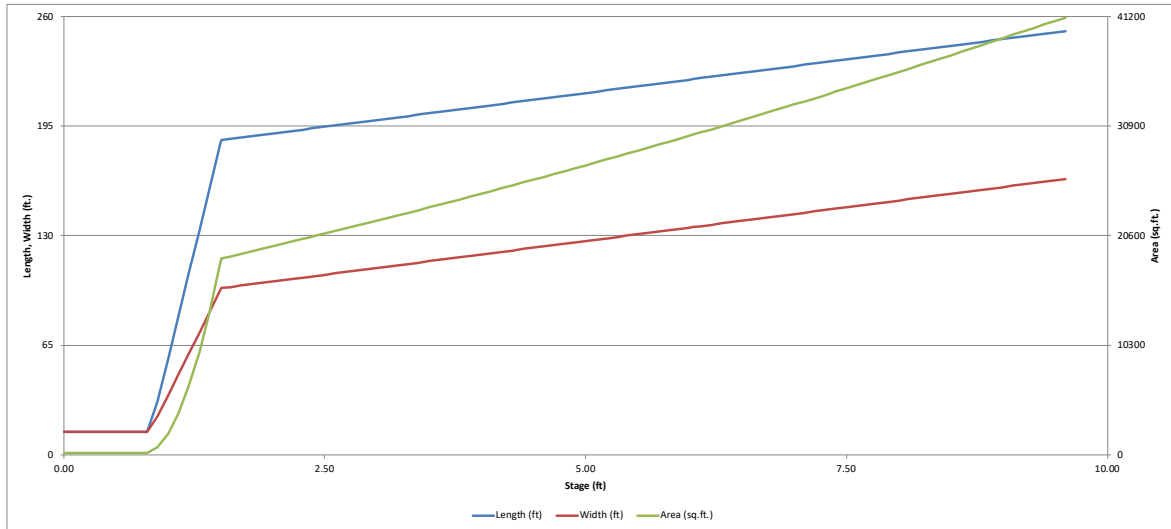
Inflow Hydrographs

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

Time Interval	SOURCE	CUHP	CUHP	CUHP	USER	CUHP	CUHP	CUHP	USER	CUHP
	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	0.15	0.00	0.00	0.13	0.23	0.59
	0:15:00	0.00	0.00	1.10	5.66	2.29	1.55	1.99	4.66	3.32
	0:20:00	0.00	0.00	4.30	43.71	9.70	4.49	5.33	37.21	11.68
	0:25:00	0.00	0.00	15.06	104.14	38.56	15.22	18.54	132.57	46.97
	0:30:00	0.00	0.00	26.05	133.65	60.20	59.13	73.34	231.06	138.01
	0:35:00	0.00	0.00	29.62	138.88	65.06	87.24	106.62	277.06	196.91
	0:40:00	0.00	0.00	28.86	135.05	61.42	97.17	117.65	287.31	213.74
	0:45:00	0.00	0.00	26.23	129.30	56.65	93.75	113.10	282.54	209.10
	0:50:00	0.00	0.00	23.66	123.37	51.42	89.28	107.62	271.32	198.85
	0:55:00	0.00	0.00	21.40	117.59	46.77	81.30	98.15	258.59	184.87
	1:00:00	0.00	0.00	19.63	112.46	43.09	73.75	89.36	247.38	172.67
	1:05:00	0.00	0.00	18.13	107.62	39.83	67.32	81.86	232.96	162.45
	1:10:00	0.00	0.00	16.24	102.21	36.61	60.20	73.37	214.44	145.69
	1:15:00	0.00	0.00	14.28	96.08	33.50	52.93	64.66	194.13	127.38
	1:20:00	0.00	0.00	12.44	90.31	30.08	45.60	55.68	174.02	108.38
	1:25:00	0.00	0.00	11.10	85.56	27.02	39.51	48.32	156.65	93.15
	1:30:00	0.00	0.00	10.17	81.68	24.41	34.69	42.46	142.30	81.07
	1:35:00	0.00	0.00	9.39	77.51	22.10	30.68	37.56	130.26	71.10
	1:40:00	0.00	0.00	8.68	72.64	20.00	27.16	33.23	119.80	62.24
	1:45:00	0.00	0.00	7.98	67.83	18.03	23.98	29.32	110.45	54.17
	1:50:00	0.00	0.00	7.29	63.29	16.14	21.03	25.66	101.85	46.61
	1:55:00	0.00	0.00	6.43	58.80	14.16	18.18	22.15	93.77	39.51
	2:00:00	0.00	0.00	5.54	52.93	11.97	15.45	18.79	83.86	32.89
	2:05:00	0.00	0.00	4.50	45.41	9.47	12.30	14.90	71.47	25.53
	2:10:00	0.00	0.00	3.48	38.21	7.13	9.14	11.03	59.49	18.66
	2:15:00	0.00	0.00	2.60	32.02	5.56	6.40	7.83	49.02	13.63
	2:20:00	0.00	0.00	2.00	26.82	4.51	4.72	5.84	40.28	10.21
	2:25:00	0.00	0.00	1.61	22.47	3.68	3.56	4.44	33.01	7.66
	2:30:00	0.00	0.00	1.31	18.85	2.99	2.72	3.41	27.03	5.71
	2:35:00	0.00	0.00	1.07	15.76	2.41	2.08	2.62	22.10	4.21
	2:40:00	0.00	0.00	0.86	13.07	1.92	1.61	2.01	17.94	3.04
	2:45:00	0.00	0.00	0.69	10.76	1.50	1.22	1.53	14.43	2.18
	2:50:00	0.00	0.00	0.56	8.85	1.17	0.93	1.16	11.58	1.64
	2:55:00	0.00	0.00	0.45	7.28	0.90	0.73	0.91	9.35	1.28
	3:00:00	0.00	0.00	0.37	5.98	0.70	0.57	0.71	7.60	1.02
	3:05:00	0.00	0.00	0.29	4.89	0.54	0.45	0.55	6.19	0.80
	3:10:00	0.00	0.00	0.23	3.95	0.41	0.34	0.42	5.01	0.61
	3:15:00	0.00	0.00	0.17	3.16	0.30	0.25	0.31	4.01	0.44
	3:20:00	0.00	0.00	0.12	2.49	0.21	0.18	0.22	3.17	0.30
	3:25:00	0.00	0.00	0.08	1.93	0.13	0.12	0.14	2.46	0.19
	3:30:00	0.00	0.00	0.05	1.47	0.07	0.07	0.08	1.88	0.10
	3:35:00	0.00	0.00	0.03	1.11	0.03	0.03	0.04	1.41	0.04
	3:40:00	0.00	0.00	0.01	0.82	0.01	0.01	0.01	1.04	0.01
	3:45:00	0.00	0.00	0.00	0.60	0.00	0.00	0.00	0.76	0.00
	3:50:00	0.00	0.00	0.00	0.43	0.00	0.00	0.00	0.54	0.00
	3:55:00	0.00	0.00	0.00	0.31	0.00	0.00	0.00	0.39	0.00
	4:00:00	0.00	0.00	0.00	0.22	0.00	0.00	0.00	0.28	0.00
4:05:00	0.00	0.00	0.00	0.17	0.00	0.00	0.00	0.20	0.00	
4:10:00	0.00	0.00	0.00	0.12	0.00	0.00	0.00	0.15	0.00	
4:15:00	0.00	0.00	0.00	0.09	0.00	0.00	0.00	0.12	0.00	
4:20:00	0.00	0.00	0.00	0.07	0.00	0.00	0.00	0.08	0.00	
4:25:00	0.00	0.00	0.00	0.05	0.00	0.00	0.00	0.06	0.00	
4:30:00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.04	0.00	
4:35:00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.03	0.00	
4:40:00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.02	0.00	
4:45:00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.02	0.00	
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5:00:00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.00	
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5:15:00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.00	
5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	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 STAGE-STORAGE TABLE BUILDER

MHFD-Depotion, Version 4.04 (February 2021)

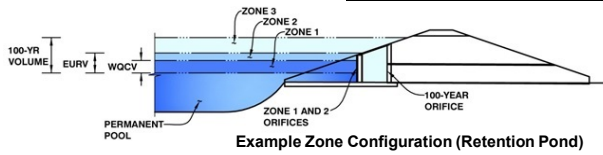


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD- Detention, Version 4.04 (February 2021)

Project: Flying Horse North Master Drainage Plan

Basin ID: Pond 13



	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.36	0.488	Orifice Plate
Zone 2 (5-year)	4.63	1.211	Circular Orifice
Zone 3 (100-year)	6.06	0.927	Weir&Pipe (Restrict)
Total (all zones)		2.627	

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

Underdrain Orifice Invert Depth = ft (distance below the filtration media surface)
 Underdrain Orifice Diameter = inches

Calculated Parameters for Underdrain

Underdrain Orifice Area = ft²
 Underdrain Orifice Centroid = 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)

Invert of Lowest Orifice = ft (relative to basin bottom at Stage = 0 ft)
 Depth at top of Zone using Orifice Plate = ft (relative to basin bottom at Stage = 0 ft)
 Orifice Plate: Orifice Vertical Spacing = inches
 Orifice Plate: Orifice Area per Row = sq. inches (diameter = 1-7/16 inches)

Calculated Parameters for Plate

WQ Orifice Area per Row = ft²
 Elliptical Half-Width = feet
 Elliptical Slot Centroid = feet
 Elliptical Slot Area = ft²

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	0.79	1.57					
Orifice Area (sq. inches)	1.68	1.68	1.68					

	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)

	Zone 2 Circular	Not Selected	
Invert of Vertical Orifice =	2.36	N/A	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =	4.04	N/A	ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter =	48.00	N/A	inches

Calculated Parameters for Vertical Orif

	Zone 2 Circular	Not Selected
Vertical Orifice Area =	12.57	N/A
Vertical Orifice Centroid =	2.00	N/A

User Input: Overflow Weir (Dropbox with Flat or Sloped Gate and Outlet Pipe OR Rectangular/Trapezoidal Weir (and No Outlet Pipe)

	Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	4.00	N/A	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	4.00	N/A	feet
Overflow Weir Gate Slope =	0.00	N/A	H:V
Horiz. Length of Weir Sides =	4.00	N/A	feet
Overflow Gate Type =	Type C Gate	N/A	
Debris Clogging % =	50%	N/A	%

Calculated Parameters for Overflow Weir

	Zone 3 Weir	Not Selected
Height of Gate Upper Edge, H ₁ =	4.00	N/A
Overflow Weir Slope Length =	4.00	N/A
Gate Open Area / 100-yr Orifice Area =	1.68	N/A
Overflow Gate Open Area w/o Debris =	11.14	N/A
Overflow Gate Open Area w/ Debris =	5.57	N/A

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

	Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	1.00	N/A	ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter =	48.00	N/A	inches
Restrictor Plate Height Above Pipe Invert =	25.00	N/A	inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 3 Restrictor	Not Selected
Outlet Orifice Area =	6.62	N/A
Outlet Orifice Centroid =	1.20	N/A
Half-Central Angle of Restrictor Plate on Pipe =	1.61	N/A

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage =	6.00	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	25.00	feet
Spillway End Slopes =	4.00	H:V
Freeboard above Max Water Surface =	1.00	feet

Calculated Parameters for Spillway

Spillway Design Flow Depth =	0.92	feet
Stage at Top of Freeboard =	7.92	feet
Basin Area at Top of Freeboard =	0.82	acres
Basin Volume at Top of Freeboard =	4.03	acre-ft

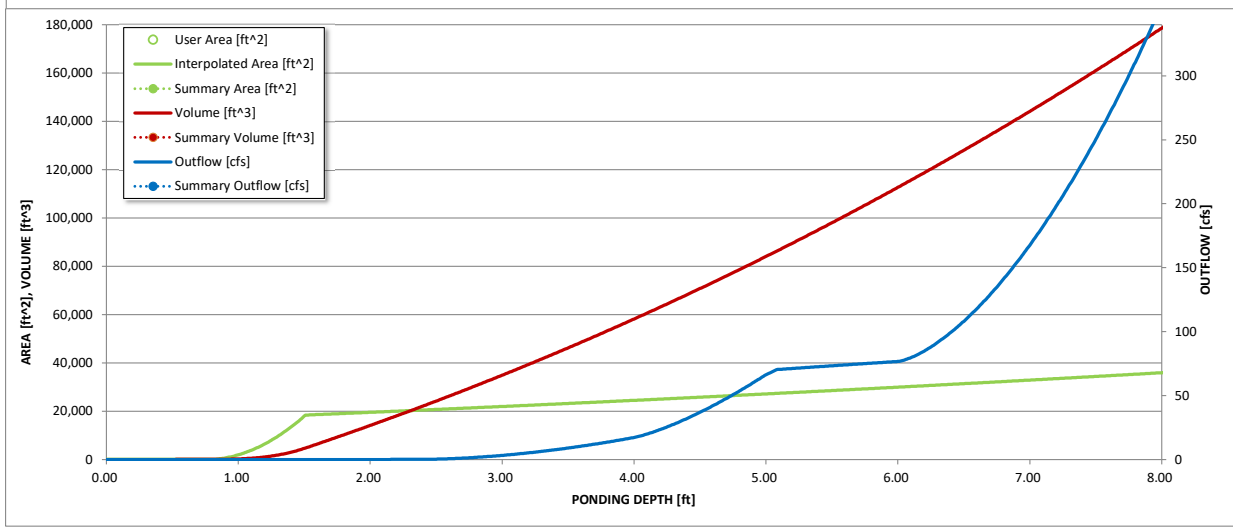
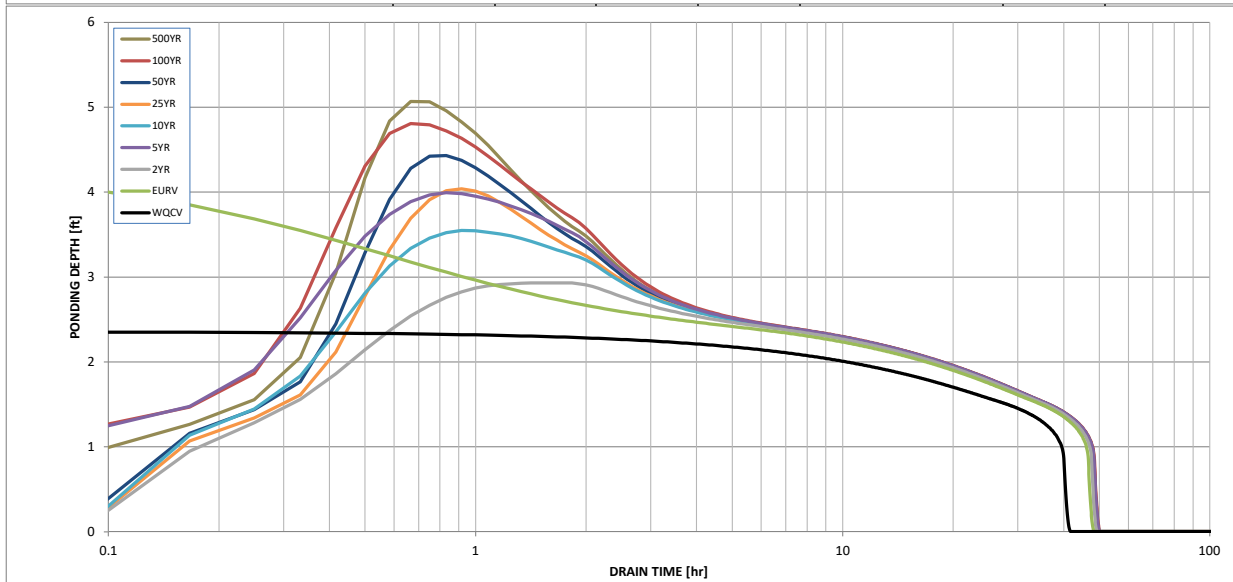
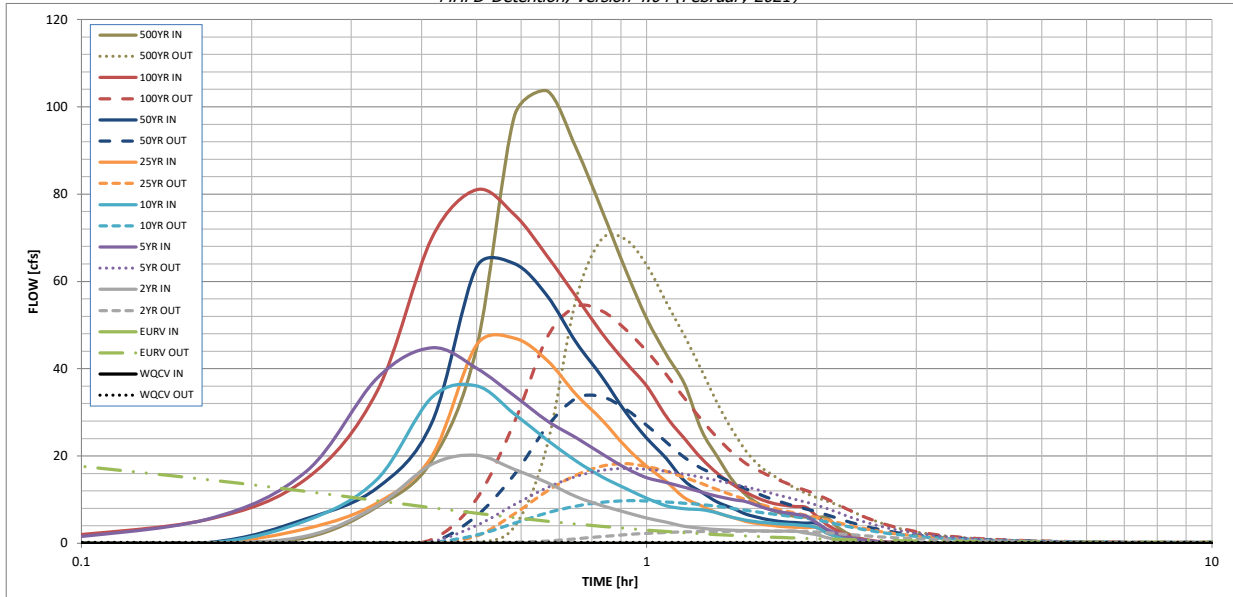
Routed Hydrograph Results

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

	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
Design Storm Return Period =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52
CUHP Runoff Volume (acre-ft) =	0.488	1.634	1.042	1.456	1.884	2.406	3.276	3.989
User Override Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	1.042	2.782	1.884	2.406	3.276	4.881
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.3	2.3	6.7	15.4	26.0	34.7
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A		20.0				55.0
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.87	0.29	0.67	1.13	2.39
Peak Inflow Q (cfs) =	N/A	N/A	20.1	44.8	36.0	47.0	64.0	81.0
Peak Outflow Q (cfs) =	0.2	29.5	2.8	17.2	9.8	18.2	33.6	54.2
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.9	1.4	1.2	1.3	1.0
Structure Controlling Flow =	Vertical Orifice 1	Overflow Weir 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1
Max Velocity through Gate 1 (fps) =	N/A	0.87	N/A	N/A	N/A	0.0	0.7	1.7
Max Velocity through Gate 2 (fps) =	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	41	44	39	42	40	37	33
Time to Drain 99% of Inflow Volume (hours) =	40	45	47	45	46	46	45	43
Maximum Ponding Depth (ft) =	2.36	4.52	2.93	3.99	3.55	4.04	4.43	4.81
Area at Maximum Ponding Depth (acres) =	0.47	0.59	0.50	0.56	0.54	0.57	0.59	0.61
Maximum Volume Stored (acre-ft) =	0.490	1.637	0.767	1.331	1.083	1.353	1.584	1.806

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)



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

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename: ..\[SWM]Outflow hydrographs\Pond6_OutflowHydrograph.xlsx

Inflow Hydrographs

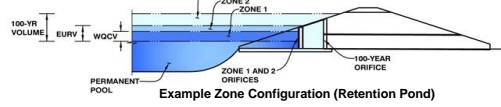
The user can override the calculated inflow hydrographs from this workbook with inflow hydrographs developed in a separate program.

Time Interval	SOURCE	CUHP	CUHP	CUHP	USER	CUHP	CUHP	CUHP	USER	CUHP
	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	0.41	0.00	0.00	0.00	1.01	0.00
	0:10:00	0.00	0.00	0.00	5.50	0.00	0.00	0.16	5.44	1.32
	0:15:00	0.00	0.00	1.65	16.52	5.18	3.36	5.62	14.77	8.33
	0:20:00	0.00	0.00	8.60	37.83	14.67	9.22	12.68	34.79	18.87
	0:25:00	0.00	0.00	18.09	44.78	33.40	19.95	27.64	69.96	44.82
	0:30:00	0.00	0.00	20.15	40.12	36.04	45.48	63.36	81.03	97.91
	0:35:00	0.00	0.00	16.94	33.76	29.63	47.00	64.04	75.29	103.64
	0:40:00	0.00	0.00	13.89	28.06	23.69	41.94	56.72	65.86	90.52
	0:45:00	0.00	0.00	10.69	24.15	18.86	34.08	46.05	56.52	76.40
	0:50:00	0.00	0.00	8.62	20.52	15.26	28.31	38.19	48.17	62.76
	0:55:00	0.00	0.00	7.12	17.27	12.58	22.18	30.11	41.54	51.52
	1:00:00	0.00	0.00	5.79	15.04	10.31	17.65	24.11	36.06	43.26
	1:05:00	0.00	0.00	4.82	13.92	8.58	14.12	19.40	29.01	36.45
	1:10:00	0.00	0.00	3.89	12.85	7.88	10.43	14.27	23.97	25.86
	1:15:00	0.00	0.00	3.42	11.72	7.67	8.59	11.74	19.45	19.89
	1:20:00	0.00	0.00	3.15	10.79	6.93	6.94	9.44	16.03	14.49
	1:25:00	0.00	0.00	3.00	10.06	5.95	5.95	8.05	13.55	11.02
	1:30:00	0.00	0.00	2.90	9.51	5.30	5.01	6.68	11.61	8.96
	1:35:00	0.00	0.00	2.84	8.46	4.86	4.43	5.82	10.19	7.57
	1:40:00	0.00	0.00	2.79	7.61	4.57	4.06	5.27	9.21	6.69
	1:45:00	0.00	0.00	2.77	7.03	4.38	3.81	4.90	8.72	6.17
	1:50:00	0.00	0.00	2.77	6.64	4.25	3.69	4.72	8.40	5.99
	1:55:00	0.00	0.00	2.30	6.20	4.02	3.61	4.60	8.20	5.90
	2:00:00	0.00	0.00	1.98	4.66	3.60	3.58	4.55	6.18	5.90
	2:05:00	0.00	0.00	1.30	3.24	2.36	2.35	2.99	4.29	3.89
	2:10:00	0.00	0.00	0.82	2.25	1.52	1.52	1.93	3.00	2.50
	2:15:00	0.00	0.00	0.52	1.57	0.95	0.96	1.21	2.06	1.58
	2:20:00	0.00	0.00	0.30	1.09	0.56	0.57	0.73	1.43	0.94
	2:25:00	0.00	0.00	0.16	0.74	0.32	0.34	0.43	0.96	0.56
	2:30:00	0.00	0.00	0.07	0.48	0.15	0.17	0.21	0.62	0.28
	2:35:00	0.00	0.00	0.02	0.32	0.05	0.06	0.07	0.41	0.09
	2:40:00	0.00	0.00	0.00	0.24	0.00	0.00	0.00	0.31	0.00
	2:45:00	0.00	0.00	0.00	0.18	0.00	0.00	0.00	0.24	0.00
	2:50:00	0.00	0.00	0.00	0.13	0.00	0.00	0.00	0.18	0.00
	2:55:00	0.00	0.00	0.00	0.09	0.00	0.00	0.00	0.12	0.00
	3:00:00	0.00	0.00	0.00	0.06	0.00	0.00	0.00	0.08	0.00
	3:05:00	0.00	0.00	0.00	0.04	0.00	0.00	0.00	0.06	0.00
	3:10:00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.03	0.00
	3:15:00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.02	0.00
	3:20:00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.00
	3:25:00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.00
	3:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-*Detention*, Version 4.04 (February 2021)

Project: Flying Horse North
Basin ID: Pond 14



Watershed Information

Selected BMP Type =	EDB
Watershed Area =	97.53 acres
Watershed Length =	4,027 ft
Watershed Length to Centroid =	2,183 ft
Watershed Slope =	0.059 ft/ft
Watershed Imperviousness =	10.00% percent
Percentage Hydrologic Soil Group A =	0.0% percent
Percentage Hydrologic Soil Group B =	100.0% percent
Percentage Hydrologic Soil Groups C/D =	0.0% percent
Target WQCV Drain Time =	40.0 hours
Location for 1-hr Rainfall Depths =	User Input

After providing required inputs above including 1-hour rainfall depths, click "Run CUHP" to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

Water Quality Capture Volume (WQCV) =	0.545 acre-feet
Excess Urban Runoff Volume (EURV) =	0.917 acre-feet
2-yr Runoff Volume (P1 = 0.92 in.) =	0.450 acre-feet
5-yr Runoff Volume (P1 = 1.2 in.) =	1.153 acre-feet
10-yr Runoff Volume (P1 = 1.45 in.) =	2.407 acre-feet
25-yr Runoff Volume (P1 = 1.69 in.) =	4.971 acre-feet
50-yr Runoff Volume (P1 = 2.15 in.) =	8.392 acre-feet
100-yr Runoff Volume (P1 = 2.49 in.) =	11.684 acre-feet
500-yr Runoff Volume (P1 = 3.14 in.) =	16.938 acre-feet
Approximate 2-yr Detention Volume =	0.452 acre-feet
Approximate 5-yr Detention Volume =	0.734 acre-feet
Approximate 10-yr Detention Volume =	1.579 acre-feet
Approximate 25-yr Detention Volume =	2.249 acre-feet
Approximate 50-yr Detention Volume =	2.660 acre-feet
Approximate 100-yr Detention Volume =	3.555 acre-feet

Optional User Overrides

	acre-feet
0.92	inches
1.20	inches
1.45	inches
	inches
2.15	inches
2.49	inches
	inches

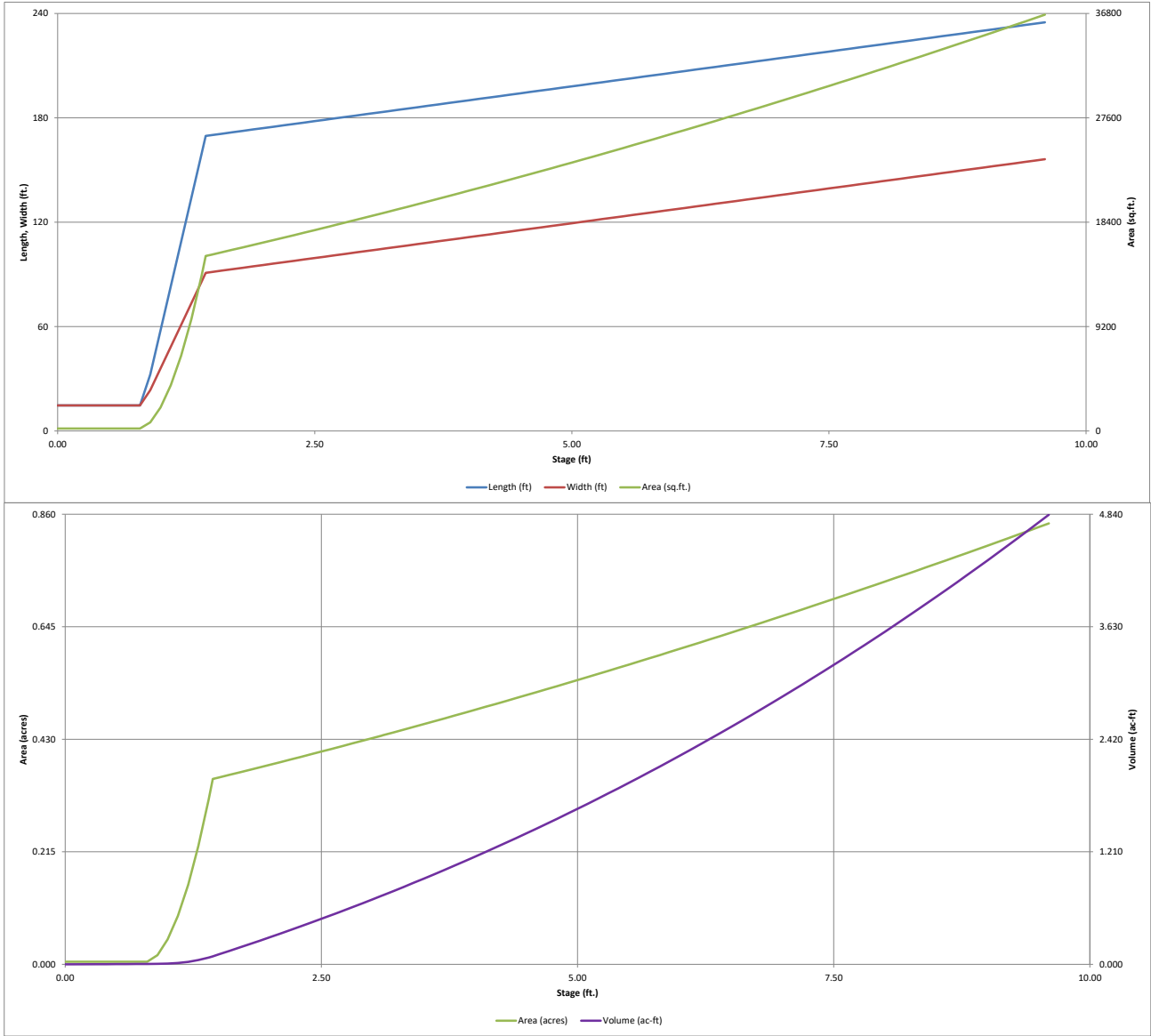
Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.545 acre-feet
Zone 2 Volume (5-year - Zone 1) =	0.190 acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	2.821 acre-feet
Total Detention Basin Volume =	3.555 acre-feet
Initial Surge Volume (ISV) =	71 ft ³
Initial Surge Depth (ISD) =	0.33 ft
Total Available Detention Depth (H _{total}) =	8.00 ft
Depth of Trickle Channel (H _{TC}) =	0.50 ft
Slope of Trickle Channel (S _{TC}) =	0.004 ft/ft
Slopes of Main Basin Sides (S _{Main}) =	4 H:V
Basin Length-to-Width Ratio (R _{LW}) =	2
Initial Surge Area (A _{ISV}) =	216 ft ²
Surcharge Volume Length (L _{ISV}) =	14.7 ft
Surcharge Volume Width (W _{ISV}) =	14.7 ft
Depth of Basin Floor (H _{FLOOR}) =	0.61 ft
Length of Basin Floor (L _{FLOOR}) =	169.6 ft
Width of Basin Floor (W _{FLOOR}) =	90.9 ft
Area of Basin Floor (A _{FLOOR}) =	15,425 ft ²
Volume of Basin Floor (V _{FLOOR}) =	3,551 ft ³
Depth of Main Basin (H _{MAIN}) =	6.56 ft
Length of Main Basin (L _{MAIN}) =	222.1 ft
Width of Main Basin (W _{MAIN}) =	143.4 ft
Area of Main Basin (A _{MAIN}) =	31,853 ft ²
Volume of Main Basin (V _{MAIN}) =	151,852 ft ³
Calculated Total Basin Volume (V _{total}) =	3.572 acre-feet

Depth Increment =	0.10	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		14.7	14.7	216		0.005		
ISV	0.33		14.7	14.7	216		0.005	71	0.002
	0.40		14.7	14.7	216		0.005	86	0.002
	0.50		14.7	14.7	216		0.005	108	0.002
	0.60		14.7	14.7	216		0.005	129	0.003
	0.70		14.7	14.7	216		0.005	151	0.003
	0.80		14.7	14.7	216		0.005	173	0.004
	0.90		32.5	23.4	761		0.017	211	0.005
	1.00		57.9	35.9	2,079		0.048	348	0.008
	1.10		83.3	48.4	4,033		0.093	648	0.015
	1.20		108.7	60.9	6,622		0.152	1,176	0.027
	1.30		134.1	73.4	9,845		0.226	1,994	0.046
	1.40		159.5	85.9	13,704		0.315	3,166	0.073
Floor	1.44		169.6	90.9	15,425		0.354	3,748	0.086
	1.50		170.1	91.4	15,550		0.357	4,678	0.107
	1.60		170.9	92.2	15,760		0.362	6,243	0.143
	1.70		171.7	93.0	15,971		0.367	7,830	0.180
	1.80		172.5	93.8	16,184		0.372	9,437	0.217
	1.90		173.3	94.6	16,397		0.376	11,066	0.254
	2.00		174.1	95.4	16,612		0.381	12,717	0.292
	2.10		174.9	96.2	16,829		0.386	14,389	0.330
	2.20		175.7	97.0	17,046		0.391	16,083	0.369
	2.30		176.5	97.8	17,265		0.396	17,798	0.409
	2.40		177.3	98.6	17,485		0.401	19,536	0.448
	2.50		178.1	99.4	17,707		0.406	21,295	0.489
	2.60		178.9	100.2	17,929		0.412	23,077	0.530
Zone 1 (WQCV)	2.64		179.2	100.5	18,019		0.414	23,796	0.546
	2.70		179.7	101.0	18,153		0.417	24,881	0.571
	2.80		180.5	101.8	18,378		0.422	26,708	0.613
	2.90		181.3	102.6	18,605		0.427	28,557	0.656
	3.00		182.1	103.4	18,833		0.432	30,429	0.699
Zone 2 (5-year)	3.09		182.8	104.1	19,039		0.437	32,333	0.738
	3.10		182.9	104.2	19,062		0.438	32,323	0.742
	3.20		183.7	105.0	19,292		0.443	34,241	0.786
	3.30		184.5	105.8	19,524		0.448	36,182	0.831
	3.40		185.3	106.6	19,757		0.454	38,146	0.876
	3.50		186.1	107.4	19,991		0.459	40,133	0.921
	3.60		186.9	108.2	20,226		0.464	42,144	0.967
	3.70		187.7	109.0	20,463		0.470	44,179	1.014
	3.80		188.5	109.8	20,701		0.475	46,237	1.061
	3.90		189.3	110.6	20,940		0.481	48,319	1.109
	4.00		190.1	111.4	21,181		0.486	50,425	1.158
	4.10		190.9	112.2	21,423		0.492	52,555	1.206
	4.20		191.7	113.0	21,666		0.497	54,709	1.256
	4.30		192.5	113.8	21,910		0.503	56,888	1.306
	4.40		193.3	114.6	22,156		0.509	59,091	1.357
	4.50		194.1	115.4	22,403		0.514	61,319	1.408
	4.60		194.9	116.2	22,651		0.520	63,572	1.459
	4.70		195.7	117.0	22,901		0.526	65,850	1.512
	4.80		196.5	117.8	23,151		0.531	68,152	1.565
	4.90		197.3	118.6	23,404		0.537	70,480	1.618
	5.00		198.1	119.4	23,657		0.543	72,833	1.672
	5.10		198.9	120.2	23,912		0.549	75,211	1.727
	5.20		199.7	121.0	24,168		0.555	77,615	1.782
	5.30		200.5	121.8	24,425		0.561	80,045	1.838
	5.40		201.3	122.6	24,683		0.567	82,500	1.894
	5.50		202.1	123.4	24,943		0.573	84,982	1.951
	5.60		202.9	124.2	25,204		0.579	87,499	2.008
	5.70		203.7	125.0	25,466		0.585	90,023	2.067
	5.80		204.5	125.8	25,730		0.591	92,582	2.125
	5.90		205.3	126.6	25,995		0.597	95,169	2.185
	6.00		206.1	127.4	26,261		0.603	97,781	2.245
	6.10		206.9	128.2	26,529		0.609	100,421	2.305
	6.20		207.7	129.0	26,797		0.615	103,087	2.367
	6.30		208.5	129.8	27,067		0.621	105,780	2.428
	6.40		209.3	130.6	27,339		0.628	108,501	2.491
	6.50		210.1	131.4	27,611		0.634	111,248	2.554
	6.60		210.9	132.2	27,885		0.640	114,023	2.618
	6.70		211.7	133.0	28,160		0.646	116,825	2.682
	6.80		212.5	133.8	28,437		0.653	119,655	2.747
	6.90		213.3	134.6	28,714		0.659	122,513	2.813
	7.00		214.1	135.4	28,993		0.666	125,398	2.879
	7.10		214.9	136.2	29,274		0.672	128,311	2.946
	7.20		215.7	137.0	29,555		0.678	131,255	3.013
	7.30		216.5	137.8	29,838		0.685	134,227	3.081
	7.40		217.3	138.6	30,122		0.692	137,220	3.150
	7.50		218.1	139.4	30,407		0.698	140,247	3.220
	7.60		218.9	140.2	30,694		0.705	143,302	3.290
	7.70		219.7	141.0	30,982		0.711	146,386	3.361
	7.80		220.5	141.8	31,271		0.718	149,498	3.432
	7.90		221.3	142.6	31,562		0.725	152,640	3.504
Zone 3 (100-year)	7.98		221.9	143.3	31,795		0.730	155,174	3.562
	8.00		222.1	143.4	31,853		0.731	155,811	3.577
	8.10		222.9	144.2	32,147		0.738	159,011	3.650
	8.20		223.7	145.0	32,441		0.745	162,240	3.725
	8.30		224.5	145.8	32,736		0.752	165,499	3.799
	8.40		225.3	146.6	33,033		0.758	168,787	3.875
	8.50		226.1	147.4	33,332		0.765	172,106	3.951
	8.60		226.9	148.2	33,631		0.772	175,454	4.028
	8.70		227.7	149.0	33,932		0.779	178,832	4.105
	8.80		228.5	149.8	34,234		0.786	182,240	4.184
	8.90		229.3	150.6	34,537		0.793	185,679	4.263
	9.00		230.1	151.4	34,842		0.800	189,147	4.342
	9.10		230.9	152.2	35,147		0.807	192,647	4.423
	9.20		231.7	153.0	35,455		0.814	196,177	4.504
	9.30		232.5	153.8	35,763		0.821	199,738	4.585
	9.40		233.3	154.6	36,073		0.828	203,330	4.668
	9.50		234.1	155.4	36,384		0.835	206,952	4.751
	9.60		234.9	156.2	36,696		0.842	210,606	4.835

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

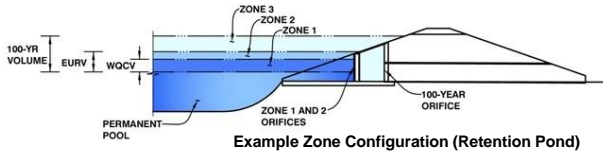
MHFD-Detention, Version 4.04 (February 2021)



DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)

Project: Flying Horse North
Basin ID: Pond 14



	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.64	0.545	Orifice Plate
Zone 2 (5-year)	3.09	0.190	Weir&Pipe (Circular)
Zone 3 (100-year)	7.98	2.821	Weir&Pipe (Restrict)
Total (all zones)		3.555	

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 Diameter =	N/A	inches

Calculated Parameters for Underdrain

Underdrain Orifice Area =	N/A	ft ²
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)

Invert of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate =	2.36	ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing =	9.40	inches
Orifice Plate: Orifice Area per Row =	1.77	sq. inches (diameter = 1-1/2 inches)

Calculated Parameters for Plate

WQ Orifice Area per Row =	1.229E-02	ft ²
Elliptical Half-Width =	N/A	feet
Elliptical Slot Centroid =	N/A	feet
Elliptical Slot Area =	N/A	ft ²

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	0.79	1.57					
Orifice Area (sq. inches)	1.77	1.77	1.77					
	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	
Invert of Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter =	N/A	N/A	inches

Calculated Parameters for Vertical Orifice

	Not Selected	Not Selected	
Vertical Orifice Area =	N/A	N/A	ft ²
Vertical Orifice Centroid =	N/A	N/A	feet

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir (and No Outlet Pipe).

	Zone 2 Weir	Zone 3 Weir	
Overflow Weir Front Edge Height, Ho =	2.64	3.09	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	8.00	8.00	feet
Overflow Weir Grate Slope =	0.00	4.00	H:V
Horiz. Length of Weir Sides =	8.00	16.00	feet
Overflow Grate Type =	Type C Grate	Type C Grate	
Debris Clogging % =	50%	50%	%

Calculated Parameters for Overflow Weir

	Zone 2 Weir	Zone 3 Weir	
Height of Grate Upper Edge, H _u =	2.64	7.09	feet
Overflow Weir Slope Length =	8.00	16.49	feet
Grate Open Area / 100-yr Orifice Area =	9.07	12.49	
Overflow Grate Open Area w/o Debris =	44.54	91.83	ft ²
Overflow Grate Open Area w/ Debris =	22.27	45.91	ft ²

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

	Zone 2 Circular	Zone 3 Restrictor	
Depth to Invert of Outlet Pipe =	2.64	3.09	ft (distance below basin bottom at Stage = 0 ft)
Circular Orifice Diameter or Pipe Diameter =	30.00	42.00	inches
Restrictor Plate Height Above Pipe Invert =		30.00	inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 2 Circular	Zone 3 Restrictor	
Outlet Orifice Area =	4.91	7.35	ft ²
Outlet Orifice Centroid =	1.25	1.39	feet
Half-Central Angle of Restrictor Plate on Pipe =	N/A	2.01	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage =	8.00	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	30.00	feet
Spillway End Slopes =	4.00	H:V
Freeboard above Max Water Surface =	1.00	feet

Calculated Parameters for Spillway

Spillway Design Flow Depth =	0.93	feet
Stage at Top of Freeboard =	9.93	feet
Basin Area at Top of Freeboard =	0.87	acres
Basin Volume at Top of Freeboard =	5.12	acre-ft

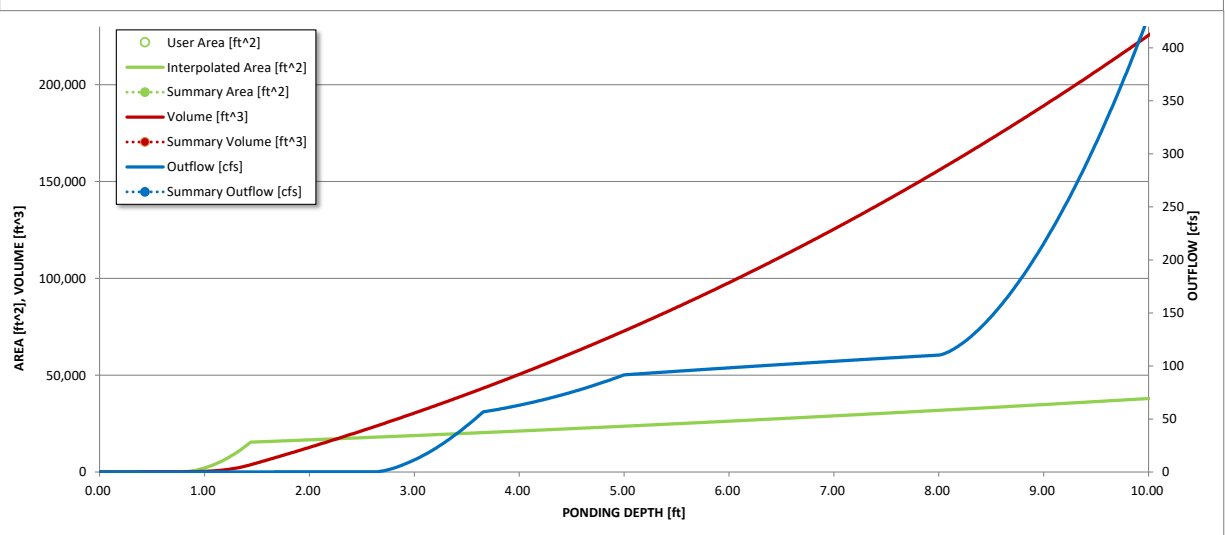
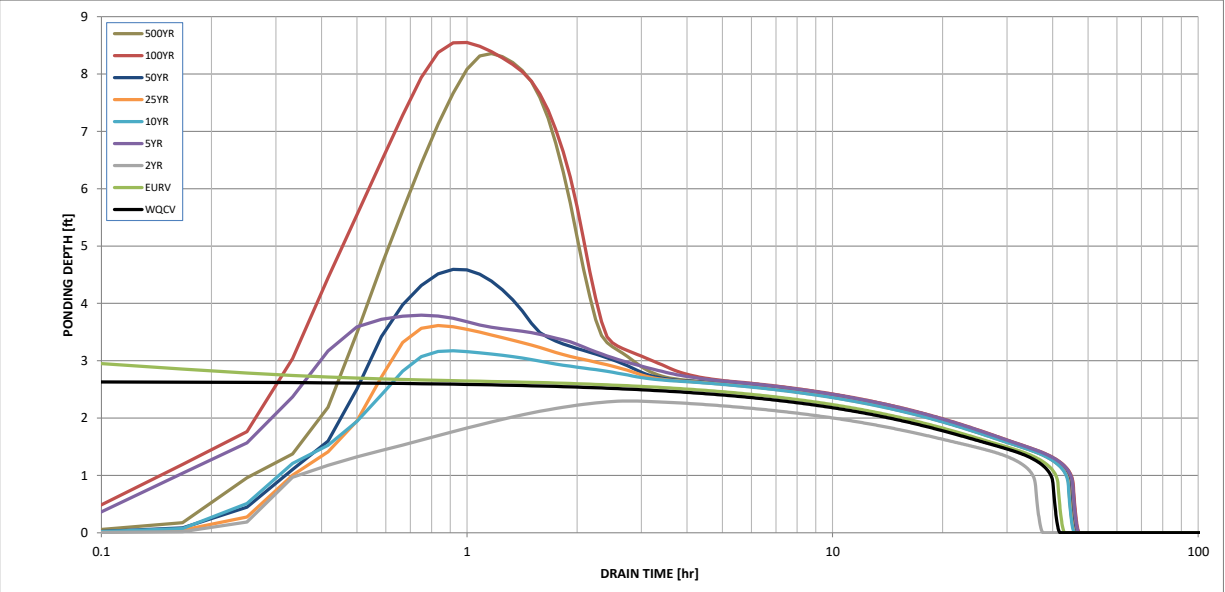
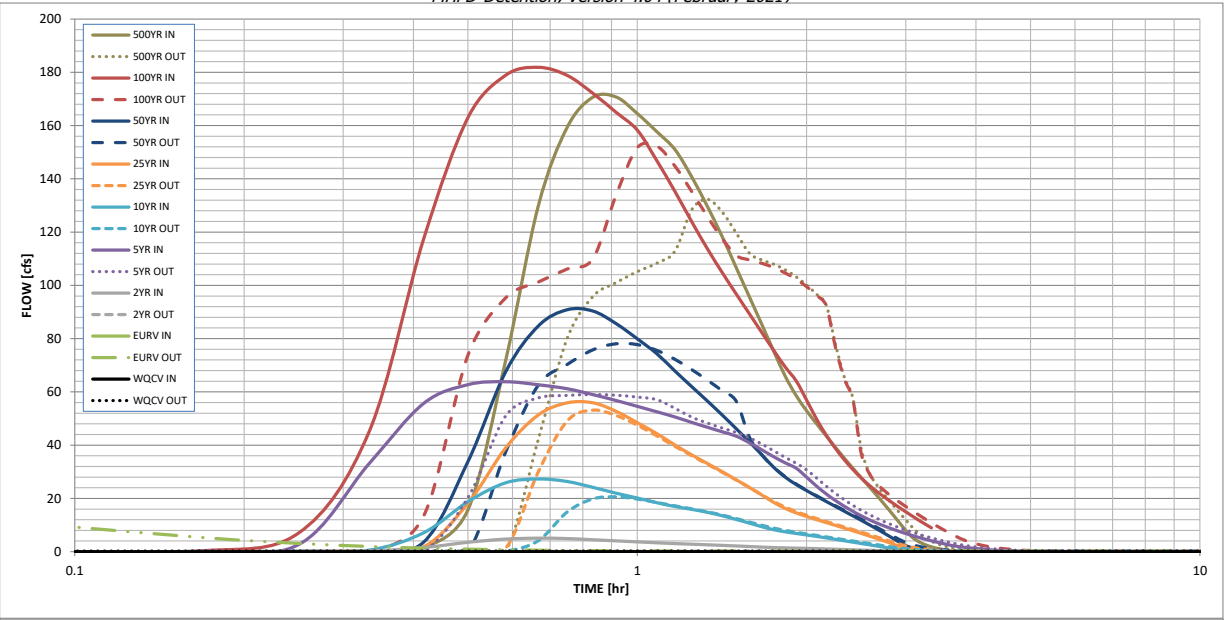
Routed Hydrograph Results

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

	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Design Storm Return Period =	N/A	N/A	0.92	1.20	1.45	1.69	2.15	2.49	3.14
One-Hour Rainfall Depth (in) =	0.545	0.917	0.450	1.153	2.407	4.971	8.392	11.684	16.938
CUHP Runoff Volume (acre-ft) =	N/A	N/A	0.450	8.367	2.407	4.971	8.392	20.351	16.938
User Override Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	1.0	7.0	20.9	50.3	84.7	115.8	164.5
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.01	59.5				173.0	
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A	0.01	0.61	0.21	0.52	0.87	1.77	1.69
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	5.1	63.8	27.3	55.9	90.8	181.9	170.7
Peak Inflow Q (cfs) =	0.2	27.4	0.2	59.0	20.6	53.1	78.1	152.3	132.3
Peak Outflow Q (cfs) =	N/A	N/A	N/A	1.0	1.0	1.1	0.9	0.9	0.8
Ratio Peak Outflow to Predevelopment Q =	Overflow Weir 1	Overflow Weir 2	Plate	Overflow Weir 2	Overflow Weir 2	Overflow Weir 2	Overflow Weir 2	Spillway	Spillway
Structure Controlling Flow =	N/A	0.92	N/A	1.2	0.4	1.1	1.3	1.7	1.6
Max Velocity through Grate 1 (fps) =	N/A	0.02	N/A	0.1	0.0	0.0	0.2	0.4	0.4
Max Velocity through Grate 2 (fps) =	39	39	35	22	36	29	21	4	6
Time to Drain 97% of Inflow Volume (hours) =	40	41	36	36	42	39	35	26	28
Time to Drain 99% of Inflow Volume (hours) =	2.64	3.50	2.30	3.79	3.17	3.62	4.59	8.55	8.36
Maximum Ponding Depth (ft) =	0.41	0.46	0.40	0.47	0.44	0.46	0.52	0.77	0.75
Area at Maximum Ponding Depth (acres) =	0.546	0.921	0.405	1.057	0.773	0.972	1.454	3.989	3.837
Maximum Volume Stored (acre-ft) =									

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)



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

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename: ...[SWM]Outflow hydrographs\Pond6 OutflowHydrograph.xlsx

Inflow Hydrographs

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

Time Interval	SOURCE	CUHP	CUHP	CUHP	USER	CUHP	CUHP	CUHP	USER	CUHP
	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	0.05	0.00
	0:10:00	0.00	0.00	0.00	0.20	0.00	0.00	0.00	0.29	0.03
	0:15:00	0.00	0.00	0.04	2.68	0.12	0.08	0.14	7.02	0.23
	0:20:00	0.00	0.00	0.24	32.98	0.57	0.30	0.44	44.87	1.48
	0:25:00	0.00	0.00	1.54	55.61	7.07	1.79	3.51	117.19	15.75
	0:30:00	0.00	0.00	3.53	62.71	18.79	18.19	33.86	163.00	71.73
	0:35:00	0.00	0.00	4.73	63.81	25.86	38.97	67.52	178.88	129.78
	0:40:00	0.00	0.00	5.08	62.67	27.30	51.32	84.73	181.87	159.22
	0:45:00	0.00	0.00	4.92	61.19	26.36	55.87	90.83	178.86	170.61
	0:50:00	0.00	0.00	4.49	58.99	24.17	55.91	90.37	172.14	170.73
	0:55:00	0.00	0.00	4.06	56.77	21.97	52.72	85.64	164.98	164.50
	1:00:00	0.00	0.00	3.69	54.57	20.15	48.45	79.93	158.30	157.70
	1:05:00	0.00	0.00	3.34	52.53	18.39	44.34	74.33	146.80	150.98
	1:10:00	0.00	0.00	3.05	50.58	16.96	40.05	67.83	135.25	140.66
	1:15:00	0.00	0.00	2.81	48.53	15.88	36.34	61.94	123.84	129.49
	1:20:00	0.00	0.00	2.58	46.69	14.77	33.08	56.51	113.61	118.13
	1:25:00	0.00	0.00	2.37	44.99	13.47	29.99	51.25	104.70	106.53
	1:30:00	0.00	0.00	2.15	43.36	12.09	26.98	46.11	96.67	95.52
	1:35:00	0.00	0.00	1.94	40.87	10.71	24.08	41.15	89.22	85.10
	1:40:00	0.00	0.00	1.72	38.18	9.35	21.22	36.26	82.14	75.03
	1:45:00	0.00	0.00	1.55	35.58	8.22	18.43	31.56	75.42	65.77
	1:50:00	0.00	0.00	1.43	33.33	7.45	16.21	27.95	69.27	58.57
	1:55:00	0.00	0.00	1.34	31.33	6.84	14.55	25.21	64.11	52.89
	2:00:00	0.00	0.00	1.24	27.96	6.29	13.23	22.93	56.89	48.02
	2:05:00	0.00	0.00	1.14	24.60	5.73	12.03	20.83	49.77	43.47
	2:10:00	0.00	0.00	1.03	21.71	5.18	10.93	18.86	43.80	39.17
	2:15:00	0.00	0.00	0.92	19.22	4.63	9.88	16.99	38.80	35.13
	2:20:00	0.00	0.00	0.82	17.06	4.10	8.85	15.19	34.54	31.34
	2:25:00	0.00	0.00	0.72	15.15	3.58	7.85	13.48	30.86	27.81
	2:30:00	0.00	0.00	0.62	13.49	3.08	6.87	11.80	27.71	24.41
	2:35:00	0.00	0.00	0.53	12.02	2.60	5.90	10.15	24.97	21.07
	2:40:00	0.00	0.00	0.43	10.74	2.12	4.94	8.51	22.58	17.76
	2:45:00	0.00	0.00	0.34	9.62	1.66	3.99	6.88	20.48	14.46
	2:50:00	0.00	0.00	0.25	8.60	1.19	3.03	5.27	18.53	11.19
	2:55:00	0.00	0.00	0.17	7.68	0.76	2.09	3.67	16.71	8.01
	3:00:00	0.00	0.00	0.11	6.83	0.48	1.24	2.26	14.99	5.37
	3:05:00	0.00	0.00	0.09	6.05	0.36	0.74	1.48	13.35	3.73
	3:10:00	0.00	0.00	0.07	5.34	0.28	0.45	0.99	11.80	2.62
	3:15:00	0.00	0.00	0.06	4.69	0.23	0.29	0.67	10.34	1.81
	3:20:00	0.00	0.00	0.05	4.09	0.18	0.19	0.45	8.96	1.22
	3:25:00	0.00	0.00	0.04	3.54	0.14	0.13	0.31	7.68	0.79
	3:30:00	0.00	0.00	0.04	3.03	0.10	0.09	0.21	6.45	0.48
	3:35:00	0.00	0.00	0.03	2.54	0.08	0.06	0.14	5.28	0.30
	3:40:00	0.00	0.00	0.02	2.14	0.05	0.05	0.11	4.22	0.22
	3:45:00	0.00	0.00	0.02	1.84	0.04	0.03	0.08	3.39	0.16
	3:50:00	0.00	0.00	0.02	1.59	0.03	0.03	0.06	2.78	0.13
	3:55:00	0.00	0.00	0.01	1.37	0.02	0.02	0.04	2.30	0.10
	4:00:00	0.00	0.00	0.01	1.17	0.02	0.01	0.03	1.90	0.08
	4:05:00	0.00	0.00	0.01	0.99	0.01	0.01	0.02	1.56	0.05
	4:10:00	0.00	0.00	0.00	0.83	0.01	0.01	0.02	1.28	0.03
	4:15:00	0.00	0.00	0.00	0.69	0.00	0.00	0.01	1.04	0.02
	4:20:00	0.00	0.00	0.00	0.56	0.00	0.00	0.00	0.85	0.01
	4:25:00	0.00	0.00	0.00	0.45	0.00	0.00	0.00	0.69	0.00
	4:30:00	0.00	0.00	0.00	0.36	0.00	0.00	0.00	0.56	0.00
	4:35:00	0.00	0.00	0.00	0.27	0.00	0.00	0.00	0.44	0.00
	4:40:00	0.00	0.00	0.00	0.20	0.00	0.00	0.00	0.34	0.00
	4:45:00	0.00	0.00	0.00	0.14	0.00	0.00	0.00	0.25	0.00
	4:50:00	0.00	0.00	0.00	0.10	0.00	0.00	0.00	0.17	0.00
	4:55:00	0.00	0.00	0.00	0.06	0.00	0.00	0.00	0.11	0.00
	5:00:00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.06	0.00
	5:05:00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.03	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	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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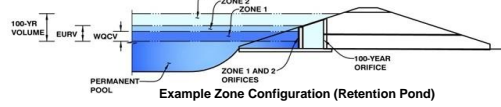
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DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Depention, Version 4.04 (February 2021)

Project: **Flying Horse North Master Drainage Plan**

Basin ID: **Pond 15**



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB
Watershed Area =	40.87 acres
Watershed Length =	1,765 ft
Watershed Length to Centroid =	1,089 ft
Watershed Slope =	0.036 ft/ft
Watershed Imperviousness =	37.20% 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) =	0.587	acre-feet
Excess Urban Runoff Volume (EURV) =	1.587	acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	1.565	acre-feet
5-yr Runoff Volume (P1 = 1.5 in.) =	2.388	acre-feet
10-yr Runoff Volume (P1 = 1.75 in.) =	3.133	acre-feet
25-yr Runoff Volume (P1 = 2 in.) =	4.211	acre-feet
50-yr Runoff Volume (P1 = 2.25 in.) =	5.054	acre-feet
100-yr Runoff Volume (P1 = 2.52 in.) =	6.152	acre-feet
500-yr Runoff Volume (P1 = 3.39 in.) =	9.210	acre-feet
Approximate 2-yr Detention Volume =	1.161	acre-feet
Approximate 5-yr Detention Volume =	1.632	acre-feet
Approximate 10-yr Detention Volume =	2.277	acre-feet
Approximate 25-yr Detention Volume =	2.567	acre-feet
Approximate 50-yr Detention Volume =	2.696	acre-feet
Approximate 100-yr Detention Volume =	3.115	acre-feet

Define Zones and Basin Geometry

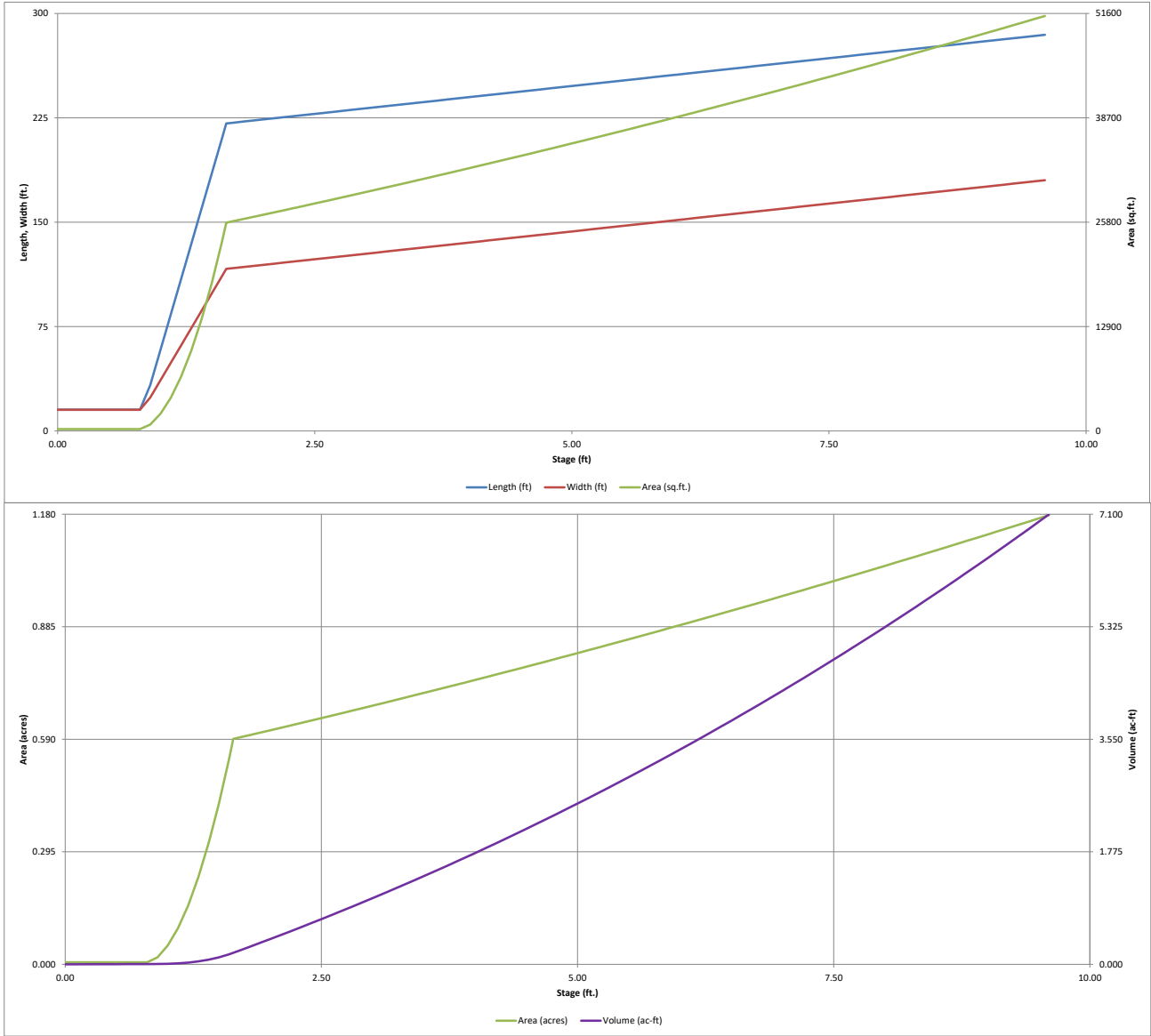
Zone 1 Volume (WQCV) =	0.587	acre-feet
Zone 2 Volume (EURV - Zone 1) =	1.000	acre-feet
Zone 3 (100yr + 1 / 2 WQCV - Zones 1 & 2) =	1.821	acre-feet
Total Detention Basin Volume =	3.408	acre-feet
Initial Surge Volume (ISV) =	77	ft ³
Initial Surge Depth (ISD) =	0.33	ft
Total Available Detention Depth (H _{total}) =	6.00	ft
Depth of Trickle Channel (H _{TC}) =	0.50	ft
Slope of Trickle Channel (S _{TC}) =	0.004	ft/ft
Slopes of Main Basin Sides (S _{main}) =	4	H:V
Basin Length-to-Width Ratio (L _{LW}) =	2	

Initial Surge Area (A _{ISV}) =	232	ft ²
Surcharge Volume Length (L _{ISV}) =	15.2	ft
Surcharge Volume Width (W _{ISV}) =	15.2	ft
Depth of Basin Floor (H _{FLOOR}) =	0.81	ft
Length of Basin Floor (L _{FLOOR}) =	221.0	ft
Width of Basin Floor (W _{FLOOR}) =	116.5	ft
Area of Basin Floor (A _{FLOOR}) =	25,744	ft ²
Volume of Basin Floor (V _{FLOOR}) =	7,674	ft ³
Depth of Main Basin (H _{MAIN}) =	4.36	ft
Length of Main Basin (L _{MAIN}) =	255.9	ft
Width of Main Basin (W _{MAIN}) =	151.4	ft
Area of Main Basin (A _{MAIN}) =	38,732	ft ²
Volume of Main Basin (V _{MAIN}) =	139,596	ft ³
Calculated Total Basin Volume (V _{total}) =	3.385	acre-feet

Depth Increment = 0.10 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		15.2	15.2	232		0.005		
ISV	0.33		15.2	15.2	232		0.005	77	0.002
	0.40		15.2	15.2	232		0.005	93	0.002
	0.50		15.2	15.2	232		0.005	116	0.003
	0.60		15.2	15.2	232		0.005	139	0.003
	0.70		15.2	15.2	232		0.005	163	0.004
	0.80		15.2	15.2	232		0.005	186	0.004
	0.90		33.0	24.0	792		0.018	227	0.005
	1.00		58.4	36.5	2,132		0.049	368	0.008
	1.10		83.8	49.0	4,107		0.094	675	0.015
	1.20		109.2	61.5	6,717		0.154	1,210	0.028
	1.30		134.6	74.0	9,962		0.229	2,039	0.047
	1.40		160.0	86.5	13,841		0.318	3,224	0.074
	1.50		185.4	99.0	18,356		0.421	4,829	0.111
	1.60		210.8	111.5	23,506		0.540	6,916	0.159
Floor	1.64		221.0	116.5	25,744		0.591	7,901	0.181
	1.70		221.5	117.0	25,906		0.595	9,451	0.217
	1.80		222.3	117.8	26,177		0.601	12,055	0.277
	1.90		223.1	118.6	26,450		0.607	14,686	0.337
	2.00		223.9	119.4	26,724		0.613	17,345	0.398
	2.10		224.7	120.2	26,999		0.620	20,031	0.460
	2.20		225.5	121.0	27,276		0.626	22,745	0.522
	2.30		226.3	121.8	27,554		0.633	25,486	0.585
Zone 1 (WQCV)	2.31		226.3	121.9	27,581		0.633	25,762	0.591
	2.40		227.1	122.6	27,833		0.639	28,255	0.649
	2.50		227.9	123.4	28,113		0.645	31,053	0.713
	2.60		228.7	124.2	28,395		0.652	33,878	0.778
	2.70		229.5	125.0	28,678		0.658	36,732	0.843
	2.80		230.3	125.8	28,962		0.665	39,614	0.909
	2.90		231.1	126.6	29,247		0.671	42,524	0.976
	3.00		231.9	127.4	29,534		0.678	45,463	1.044
	3.10		232.7	128.2	29,822		0.685	48,431	1.112
	3.20		233.5	129.0	30,111		0.691	51,428	1.181
	3.30		234.3	129.8	30,402		0.698	54,453	1.250
	3.40		235.1	130.6	30,694		0.705	57,508	1.320
	3.50		235.9	131.4	30,987		0.711	60,597	1.391
	3.60		236.7	132.2	31,281		0.718	63,705	1.462
	3.70		237.5	133.0	31,577		0.725	66,848	1.535
Zone 2 (EURV)	3.78		238.1	133.6	31,815		0.730	69,384	1.593
	3.80		238.3	133.8	31,874		0.732	70,021	1.607
	3.90		239.1	134.6	32,172		0.739	73,223	1.681
	4.00		239.9	135.4	32,472		0.745	76,455	1.755
	4.10		240.7	136.2	32,773		0.752	79,718	1.830
	4.20		241.5	137.0	33,075		0.759	83,010	1.906
	4.30		242.3	137.8	33,378		0.766	86,333	1.982
	4.40		243.1	138.6	33,683		0.773	89,686	2.059
	4.50		243.9	139.4	33,989		0.780	93,069	2.137
	4.60		244.7	140.2	34,296		0.787	96,483	2.215
	4.70		245.5	141.0	34,605		0.794	99,928	2.294
	4.80		246.3	141.8	34,914		0.802	103,404	2.374
	4.90		247.1	142.6	35,225		0.809	106,911	2.454
	5.00		247.9	143.4	35,538		0.816	110,449	2.536
	5.10		248.7	144.2	35,851		0.823	114,019	2.618
	5.20		249.5	145.0	36,166		0.830	117,620	2.700
	5.30		250.3	145.8	36,483		0.838	121,252	2.784
	5.40		251.1	146.6	36,800		0.845	124,916	2.868
	5.50		251.9	147.4	37,119		0.852	128,612	2.953
	5.60		252.7	148.2	37,439		0.859	132,340	3.038
	5.70		253.5	149.0	37,760		0.867	136,100	3.124
	5.80		254.3	149.8	38,083		0.874	139,892	3.211
	5.90		255.1	150.6	38,407		0.882	143,717	3.299
	6.00		255.9	151.4	38,732		0.889	147,574	3.388
Z3 (100+1/2WQCV)	6.03		256.1	151.6	38,830		0.891	148,737	3,415
	6.10		256.7	152.2	39,058		0.897	151,463	3,477
	6.20		257.5	153.0	39,386		0.904	155,385	3,567
	6.30		258.3	153.8	39,715		0.912	159,340	3,658
	6.40		259.1	154.6	40,045		0.919	163,328	3,750
	6.50		259.9	155.4	40,377		0.927	167,349	3,842
	6.60		260.7	156.2	40,710		0.935	171,404	3,935
	6.70		261.5	157.0	41,044		0.942	175,491	4,029
	6.80		262.3	157.8	41,379		0.950	179,612	4,123
	6.90		263.1	158.6	41,716		0.958	183,767	4,219
	7.00		263.9	159.4	42,054		0.965	187,956	4,315
	7.10		264.7	160.2	42,393		0.973	192,178	4,412
	7.20		265.5	161.0	42,733		0.981	196,434	4,510
	7.30		266.3	161.8	43,075		0.989	200,725	4,608
	7.40		267.1	162.6	43,418		0.997	205,049	4,707
	7.50		267.9	163.4	43,763		1.005	209,408	4,807
	7.60		268.7	164.2	44,108		1.013	213,802	4,908
	7.70		269.5	165.0	44,455		1.021	218,230	5,010
	7.80		270.3	165.8	44,803		1.029	222,693	5,112
	7.90		271.1	166.6	45,153		1.037	227,191	5,216
	8.00		271.9	167.4	45,504		1.045	231,724	5,320
	8.10		272.7	168.2	45,856		1.053	236,291	5,425
	8.20		273.5	169.0	46,209		1.061	240,895	5,530
	8.30		274.3	169.8	46,564		1.069	245,533	5,637
	8.40		275.1	170.6	46,919		1.077	250,207	5,744
	8.50		275.9	171.4	47,277		1.085	254,917	5,852
	8.60		276.7	172.2	47,635		1.094	259,663	5,961
	8.70		277.5	173.0	47,995		1.102	264,444	6,071
	8.80		278.3	173.8	48,356		1.110	269,262	6,181
	8.90		279.1	174.6	48,718		1.118	274,115	6,293
	9.00		279.9	175.4	49,081		1.127	279,005	6,405
	9.10		280.7	176.2	49,446		1.135	283,932	6,518
	9.20		281.5	177.0	49,812		1.144	288,895	6,632
	9.30		282.3	177.8	50,180		1.152	293,894	6,747
	9.40		283.1	178.6	50,549		1.160	298,931	6,863
	9.50		283.9	179.4	50,918		1.169	304,004	6,979
	9.60		284.7	180.2	51,290		1.177	309,114	7,096

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)

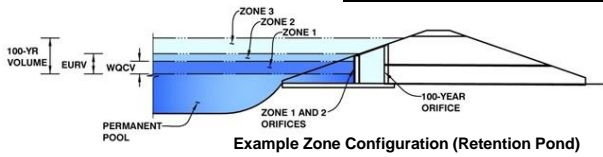


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)

Project: Flying Horse North Master Drainage Plan

Basin ID: Pond 15



	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.31	0.587	Orifice Plate
Zone 2 (EURV)	3.78	1.000	Weir&Pipe (Circular)
Zone 3 (100+1/2WQCV)	6.03	1.821	Weir&Pipe (Restrict)
Total (all zones)		3.408	

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 Diameter =	N/A	inches

Calculated Parameters for Underdrain

Underdrain Orifice Area =	N/A	ft ²
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)

Invert of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate =	2.36	ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing =	9.40	inches
Orifice Plate: Orifice Area per Row =	1.99	sq. inches (diameter = 1-9/16 inches)

Calculated Parameters for Plate

WQ Orifice Area per Row =	1.382E-02	ft ²
Elliptical Half-Width =	N/A	feet
Elliptical Slot Centroid =	N/A	feet
Elliptical Slot Area =	N/A	ft ²

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	0.79	1.57					
Orifice Area (sq. inches)	1.99	1.99	1.99					

	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	
Invert of Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter =	N/A	N/A	inches

Calculated Parameters for Vertical Orifice

	Not Selected	Not Selected	
Vertical Orifice Area =	N/A	N/A	ft ²
Vertical Orifice Centroid =	N/A	N/A	feet

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir (and No Outlet Pipe).

	Zone 2 Weir	Zone 3 Weir	
Overflow Weir Front Edge Height, Ho =	2.39	2.49	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	5.00	5.00	feet
Overflow Weir Grate Slope =	0.00	4.00	H:V
Horiz. Length of Weir Sides =	5.00	10.00	feet
Overflow Grate Type =	Type C Grate	Type C Grate	
Debris Clogging % =	50%	50%	%

Calculated Parameters for Overflow Weir

	Zone 2 Weir	Zone 3 Weir	
Height of Grate Upper Edge, H _u =	2.39	4.99	feet
Overflow Weir Slope Length =	5.00	10.31	feet
Grate Open Area / 100-yr Orifice Area =	22.15	6.85	
Overflow Grate Open Area w/o Debris =	17.40	35.87	ft ²
Overflow Grate Open Area w/ Debris =	8.70	17.94	ft ²

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

	Zone 2 Circular	Zone 3 Restrictor	
Depth to Invert of Outlet Pipe =	2.50	2.70	ft (distance below basin bottom at Stage = 0 ft)
Circular Orifice Diameter or Pipe Diameter =	12.00	36.00	inches
Restrictor Plate Height Above Pipe Invert =		25.00	inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 2 Circular	Zone 3 Restrictor	
Outlet Orifice Area =	0.79	5.24	ft ²
Outlet Orifice Centroid =	0.50	1.16	feet
Half-Central Angle of Restrictor Plate on Pipe =	N/A	1.97	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage =	7.00	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	31.00	feet
Spillway End Slopes =	4.00	H:V
Freeboard above Max Water Surface =	1.00	feet

Calculated Parameters for Spillway

Spillway Design Flow Depth =	0.93	feet
Stage at Top of Freeboard =	8.93	feet
Basin Area at Top of Freeboard =	1.12	acres
Basin Volume at Top of Freeboard =	6.33	acre-ft

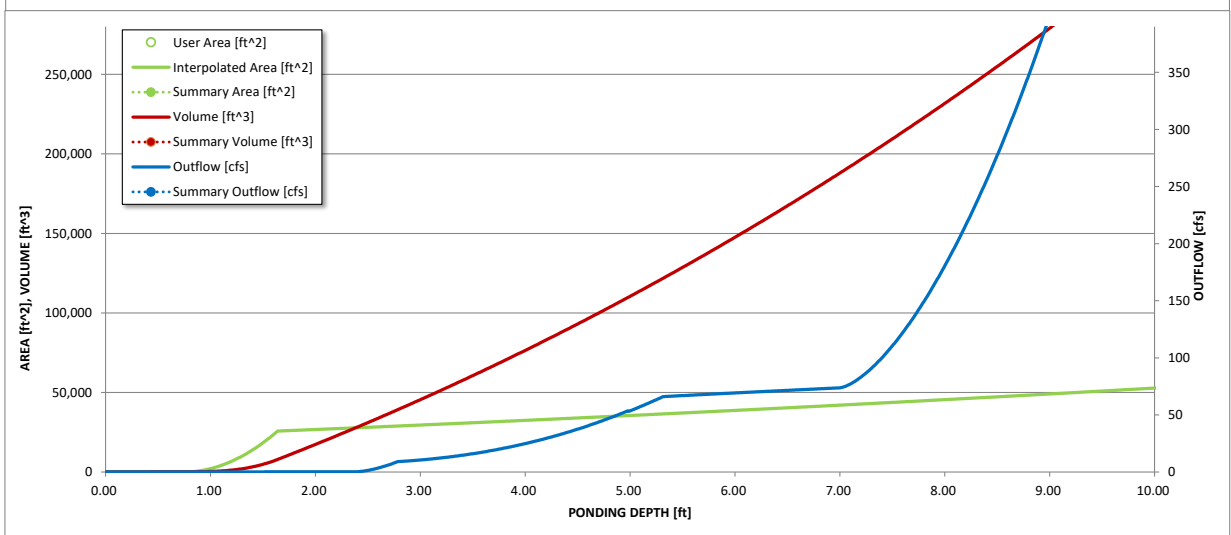
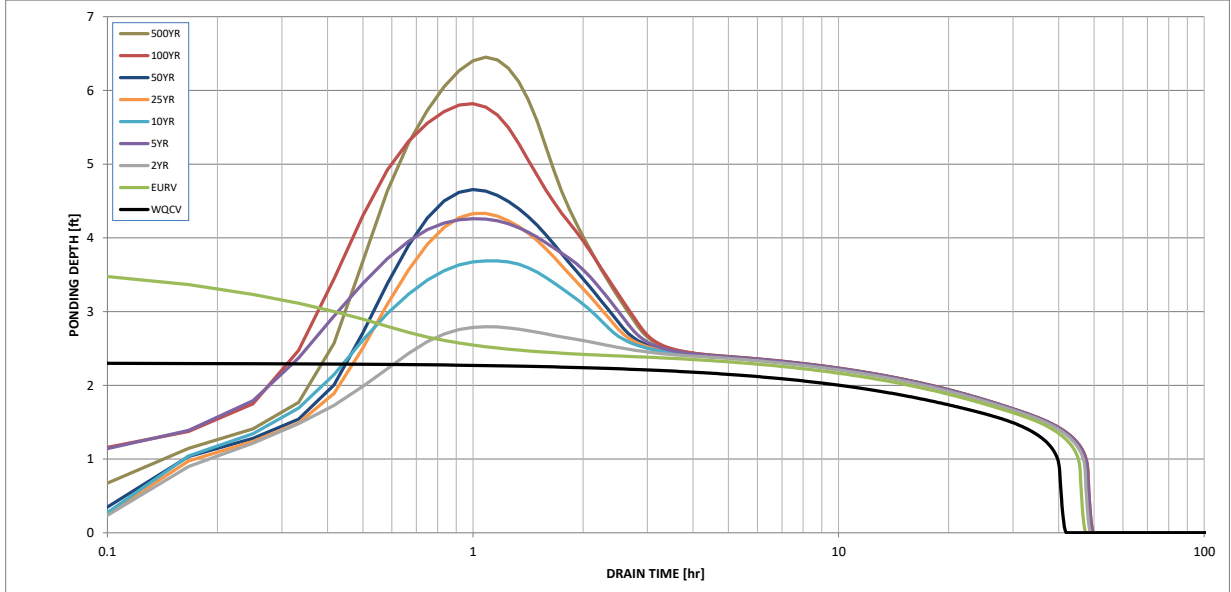
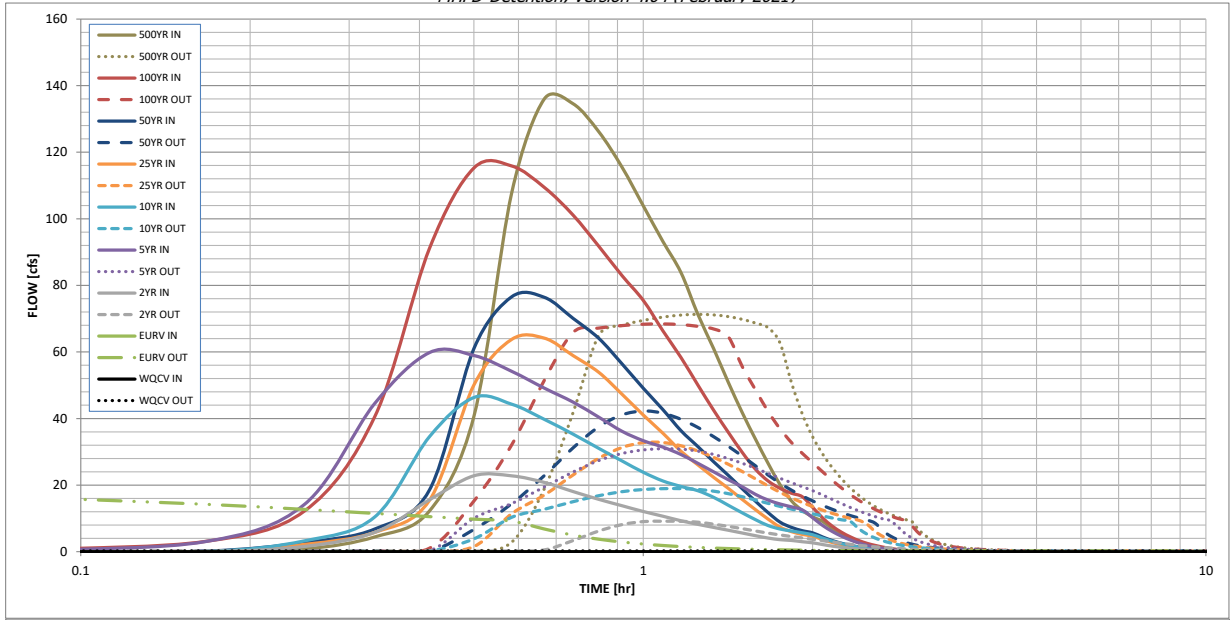
Routed Hydrograph Results

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

	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Design Storm Return Period =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.39
One-Hour Rainfall Depth (in) =	0.587	1.587	1.565	2.388	3.133	4.211	5.054	6.152	9.210
CUHP Runoff Volume (acre-ft) =	0.587	1.587	1.565	2.388	3.133	4.211	5.054	6.152	9.210
User Override Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	1.565	4.857	3.133	4.211	5.054	8.775	9.210
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	4.8	13.3	20.2	35.6	44.6	57.0	88.8
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A		31.6				67.8	
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.12	0.77	0.49	0.87	1.09	1.66	2.17
Peak Inflow Q (cfs) =	N/A	N/A	22.8	59.8	46.3	64.1	76.5	115.9	136.0
Peak Outflow Q (cfs) =	0.2	18.8	9.1	30.9	18.9	32.8	42.3	68.4	71.3
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	1.0	0.9	0.9	0.9	1.0	0.8
Structure Controlling Flow =	Plate	Overflow Weir 2	Overflow Weir 2	Overflow Weir 2	Overflow Weir 2	Overflow Weir 2	Overflow Weir 2	Outlet Plate 2	Outlet Plate 2
Max Velocity through Gate 1 (fps) =	N/A	0.50	0.46	0.5	0.5	0.5	0.5	0.6	0.6
Max Velocity through Gate 2 (fps) =	N/A	0.32	0.02	0.6	0.3	0.6	0.9	1.6	1.7
Time to Drain 97% of Inflow Volume (hours) =	39	41	43	34	39	36	34	26	25
Time to Drain 99% of Inflow Volume (hours) =	40	45	46	43	45	44	43	40	39
Maximum Ponding Depth (ft) =	2.31	3.78	2.80	4.26	3.69	4.33	4.65	5.82	6.45
Area at Maximum Ponding Depth (acres) =	0.63	0.73	0.66	0.76	0.72	0.77	0.79	0.88	0.92
Maximum Volume Stored (acre-ft) =	0.591	1.593	0.903	1.944	1.520	2.005	2.254	3.229	3.786

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)



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

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename: ..\SWM\Outflow hydrographs\Pond6 OutflowHydrograph.xlsx

Inflow Hydrographs

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

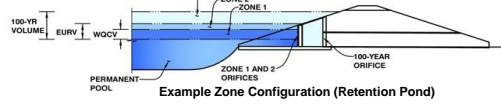
	SOURCE	CUHP	CUHP	CUHP	USER	CUHP	CUHP	CUHP	USER	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.23	0.00	0.00	0.00	0.55	0.00
	0:10:00	0.00	0.00	0.00	3.05	0.00	0.00	0.18	3.10	0.83
	0:15:00	0.00	0.00	1.60	14.26	3.27	2.20	2.77	12.25	4.45
	0:20:00	0.00	0.00	5.84	44.61	10.48	5.83	6.83	40.67	12.21
	0:25:00	0.00	0.00	15.59	59.80	34.54	15.42	18.52	91.07	40.72
	0:30:00	0.00	0.00	22.81	58.93	46.32	50.11	61.06	115.27	107.68
	0:35:00	0.00	0.00	22.79	54.19	44.31	63.75	76.55	115.87	135.98
	0:40:00	0.00	0.00	20.82	49.14	39.76	64.15	76.41	109.44	134.56
	0:45:00	0.00	0.00	18.07	44.94	35.32	58.91	70.09	101.12	126.16
	0:50:00	0.00	0.00	15.72	40.41	31.03	53.88	64.09	91.75	115.49
	0:55:00	0.00	0.00	13.81	36.16	27.25	47.29	56.41	82.92	103.88
	1:00:00	0.00	0.00	12.08	33.34	23.85	41.04	49.09	75.47	93.21
	1:05:00	0.00	0.00	10.66	31.42	21.25	35.60	42.69	66.36	83.86
	1:10:00	0.00	0.00	9.30	29.19	19.60	30.17	36.36	58.34	71.33
	1:15:00	0.00	0.00	8.22	26.56	18.32	26.11	31.60	50.09	61.02
	1:20:00	0.00	0.00	7.29	24.00	16.33	22.35	27.02	42.51	50.81
	1:25:00	0.00	0.00	6.44	21.60	13.93	19.00	22.91	35.82	41.70
	1:30:00	0.00	0.00	5.60	19.48	11.66	15.68	18.87	29.78	33.76
	1:35:00	0.00	0.00	4.80	17.20	9.61	12.60	15.14	24.73	26.53
	1:40:00	0.00	0.00	4.10	15.51	7.86	9.79	11.74	21.24	20.15
	1:45:00	0.00	0.00	3.61	14.34	6.81	7.38	8.89	19.03	15.30
	1:50:00	0.00	0.00	3.38	13.48	6.22	6.03	7.31	17.57	12.38
	1:55:00	0.00	0.00	2.99	12.56	5.69	5.19	6.31	16.52	10.47
	2:00:00	0.00	0.00	2.67	10.20	5.09	4.65	5.66	13.33	9.11
	2:05:00	0.00	0.00	2.15	7.89	4.08	3.63	4.42	10.15	6.95
	2:10:00	0.00	0.00	1.68	6.09	3.16	2.77	3.36	7.70	5.08
	2:15:00	0.00	0.00	1.32	4.66	2.43	2.10	2.54	5.86	3.70
	2:20:00	0.00	0.00	1.02	3.53	1.85	1.58	1.91	4.46	2.71
	2:25:00	0.00	0.00	0.79	2.62	1.39	1.20	1.44	3.35	2.04
	2:30:00	0.00	0.00	0.61	1.92	1.03	0.89	1.07	2.50	1.52
	2:35:00	0.00	0.00	0.46	1.41	0.77	0.66	0.80	1.89	1.14
	2:40:00	0.00	0.00	0.35	1.00	0.58	0.50	0.60	1.38	0.87
	2:45:00	0.00	0.00	0.25	0.68	0.43	0.37	0.45	0.96	0.64
	2:50:00	0.00	0.00	0.18	0.43	0.30	0.27	0.32	0.61	0.45
	2:55:00	0.00	0.00	0.11	0.24	0.19	0.18	0.21	0.35	0.30
3:00:00	0.00	0.00	0.07	0.10	0.11	0.11	0.13	0.15	0.17	
3:05:00	0.00	0.00	0.03	0.03	0.05	0.05	0.06	0.04	0.08	
3:10:00	0.00	0.00	0.01	0.00	0.02	0.02	0.02	0.00	0.02	
3:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
3:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
3:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
3:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
3:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
3:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
3:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
3:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
3:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
4:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
4:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
4:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-DETENTION, Version 4.05 (January 2022)

Project: **Flying Horse North MDDP**

Basin ID: **Pond 16**



Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	28.99	acres
Watershed Length =	1,505	ft
Watershed Length to Centroid =	954	ft
Watershed Slope =	0.035	ft/ft
Watershed Imperviousness =	34.66%	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.

Water Quality Capture Volume (WQCV) =	0.399	acre-feet
Excess Urban Runoff Volume (EURV) =	1.043	acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	1.034	acre-feet
5-yr Runoff Volume (P1 = 1.5 in.) =	1.610	acre-feet
10-yr Runoff Volume (P1 = 1.75 in.) =	2.133	acre-feet
25-yr Runoff Volume (P1 = 2 in.) =	2.899	acre-feet
50-yr Runoff Volume (P1 = 2.25 in.) =	3.492	acre-feet
100-yr Runoff Volume (P1 = 2.52 in.) =	4.270	acre-feet
500-yr Runoff Volume (P1 = 3.14 in.) =	5.793	acre-feet
Approximate 2-yr Detention Volume =	0.758	acre-feet
Approximate 5-yr Detention Volume =	1.071	acre-feet
Approximate 10-yr Detention Volume =	1.515	acre-feet
Approximate 25-yr Detention Volume =	1.723	acre-feet
Approximate 50-yr Detention Volume =	1.812	acre-feet
Approximate 100-yr Detention Volume =	2.110	acre-feet

Optional User Overrides

	acre-feet
	acre-feet
	1.19
	inches
	1.50
	inches
	1.75
	inches
	2.00
	inches
	2.25
	inches
	2.52
	inches

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.399	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.644	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	1.067	acre-feet
Total Detention Basin Volume =	2.110	acre-feet
Initial Surcharge Volume (ISV) =	52	ft ³
Initial Surcharge Depth (ISD) =	0.33	ft
Total Available Detention Depth (H _{total}) =	6.00	ft
Depth of Trickle Channel (H _{TC}) =	0.50	ft
Slope of Trickle Channel (S _{TC}) =	0.004	ft/ft
Slopes of Main Basin Sides (S _{main}) =	4	H:V
Basin Length-to-Width Ratio (R _{LW}) =	2	

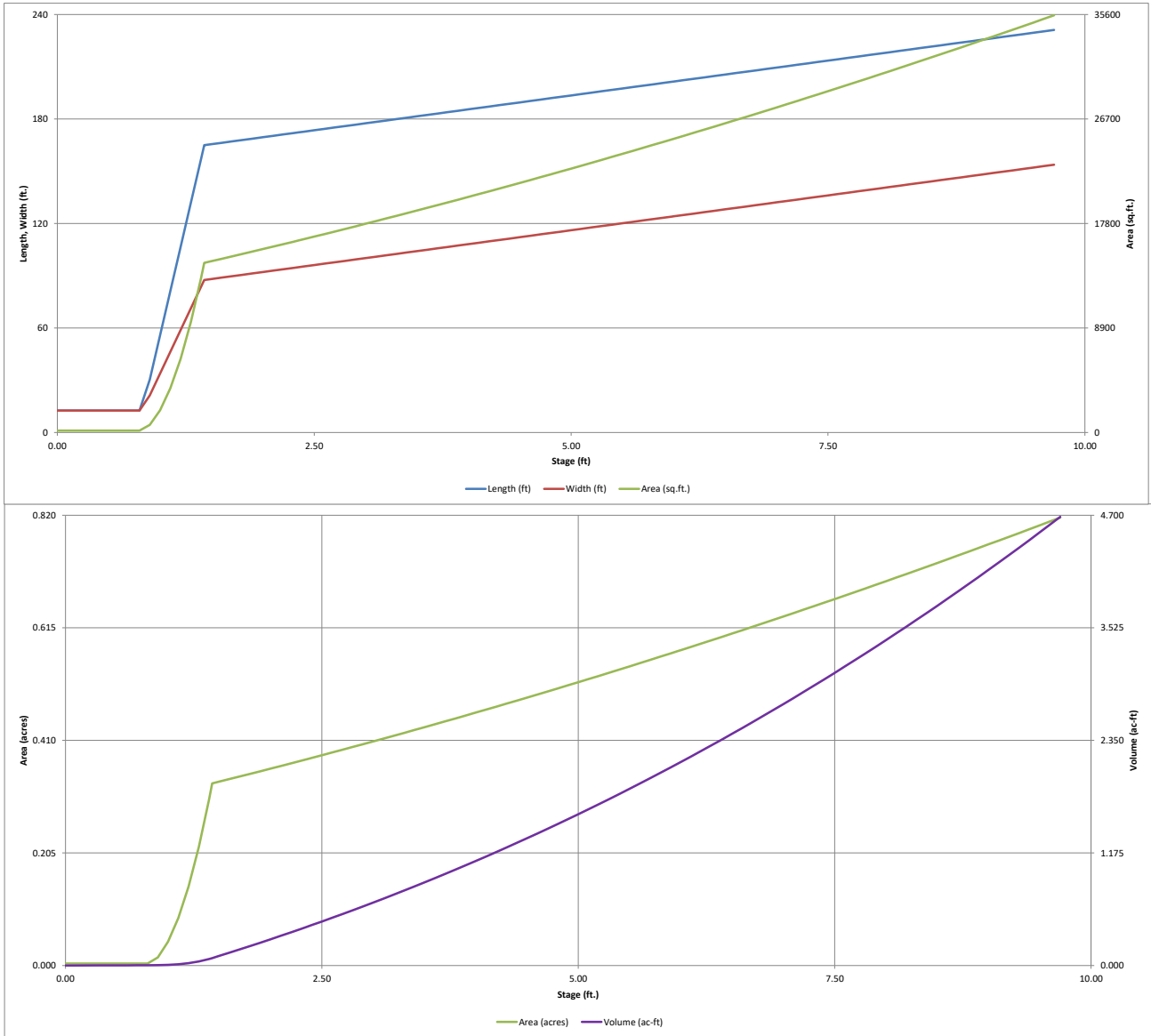
Initial Surcharge Area (A _{ISV}) =	158	ft ²
Surcharge Volume Length (L _{ISV}) =	12.6	ft
Surcharge Volume Width (W _{ISV}) =	12.6	ft
Depth of Basin Floor (H _{FLOOR}) =	0.60	ft
Length of Basin Floor (L _{FLOOR}) =	165.0	ft
Width of Basin Floor (W _{FLOOR}) =	87.6	ft
Area of Basin Floor (A _{FLOOR}) =	14,448	ft ²
Volume of Basin Floor (V _{FLOOR}) =	3,223	ft ³
Depth of Main Basin (H _{MAIN}) =	4.57	ft
Length of Main Basin (L _{MAIN}) =	201.5	ft
Width of Main Basin (W _{MAIN}) =	124.1	ft
Area of Main Basin (A _{MAIN}) =	25,017	ft ²
Volume of Main Basin (V _{MAIN}) =	89,079	ft ³
Calculated Total Basin Volume (V _{total}) =	2.122	acre-feet

Depth Increment = **0.10** 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		12.6	12.6	158		0.004		
ISV	0.33		12.6	12.6	158		0.004	52	0.001
	0.40		12.6	12.6	158		0.004	63	0.001
	0.50		12.6	12.6	158		0.004	79	0.002
	0.60		12.6	12.6	158		0.004	95	0.002
	0.70		12.6	12.6	158		0.004	111	0.003
	0.80		12.6	12.6	158		0.004	126	0.003
	0.90		30.4	21.3	647		0.015	158	0.004
	1.00		55.8	33.8	1,886		0.043	279	0.006
	1.10		81.2	46.3	3,759		0.086	556	0.013
	1.20		106.6	58.8	6,268		0.144	1,052	0.024
	1.30		132.0	71.3	9,412		0.216	1,831	0.042
	1.40		157.4	83.8	13,190		0.303	2,956	0.068
Floor	1.43		165.0	87.6	14,448		0.332	3,370	0.077
	1.50		165.5	88.1	14,589		0.335	4,386	0.101
	1.60		166.3	88.9	14,793		0.340	5,855	0.134
	1.70		167.1	89.7	14,998		0.344	7,345	0.169
	1.80		167.9	90.5	15,204		0.349	8,855	0.203
	1.90		168.7	91.3	15,411		0.354	10,386	0.238
	2.00		169.5	92.1	15,620		0.359	11,937	0.274
	2.10		170.3	92.9	15,830		0.363	13,510	0.310
	2.20		171.1	93.7	16,041		0.368	15,103	0.347
	2.30		171.9	94.5	16,254		0.373	16,718	0.384
Zone 1 (WQCV)	2.35		172.3	94.9	16,361		0.376	17,533	0.403
	2.40		172.7	95.3	16,468		0.378	18,354	0.421
	2.50		173.5	96.1	16,683		0.383	20,012	0.459
	2.60		174.3	96.9	16,899		0.388	21,691	0.498
	2.70		175.1	97.7	17,117		0.393	23,391	0.537
	2.80		175.9	98.5	17,336		0.398	25,114	0.577
	2.90		176.7	99.3	17,556		0.403	26,859	0.617
	3.00		177.5	100.1	17,777		0.408	28,625	0.657
	3.10		178.3	100.9	18,000		0.413	30,414	0.698
	3.20		179.1	101.7	18,224		0.418	32,225	0.740
	3.30		179.9	102.5	18,450		0.424	34,059	0.782
	3.40		180.7	103.3	18,676		0.429	35,915	0.825
	3.50		181.5	104.1	18,904		0.434	37,794	0.868
	3.60		182.3	104.9	19,133		0.439	39,696	0.911
	3.70		183.1	105.7	19,364		0.445	41,621	0.955
	3.80		183.9	106.5	19,595		0.450	43,569	1.000
Zone 2 (EURV)	3.90		184.7	107.3	19,828		0.455	45,540	1.045
	4.00		185.5	108.1	20,063		0.461	47,535	1.091
	4.10		186.3	108.9	20,298		0.466	49,553	1.138
	4.20		187.1	109.7	20,535		0.471	51,594	1.184
	4.30		187.9	110.5	20,773		0.477	53,660	1.232
	4.40		188.7	111.3	21,013		0.482	55,749	1.280
	4.50		189.5	112.1	21,253		0.488	57,862	1.328
	4.60		190.3	112.9	21,495		0.493	60,000	1.377
	4.70		191.1	113.7	21,739		0.499	62,161	1.427
	4.80		191.9	114.5	21,983		0.505	64,347	1.477
	4.90		192.7	115.3	22,229		0.510	66,558	1.528
	5.00		193.5	116.1	22,476		0.516	68,793	1.579
	5.10		194.3	116.9	22,724		0.522	71,053	1.631
	5.20		195.1	117.7	22,974		0.527	73,338	1.684
	5.30		195.9	118.5	23,225		0.533	75,648	1.737
	5.40		196.7	119.3	23,477		0.539	77,983	1.790
	5.50		197.5	120.1	23,731		0.545	80,344	1.844
	5.60		198.3	120.9	23,986		0.551	82,729	1.899
	5.70		199.1	121.7	24,242		0.557	85,141	1.955
	5.80		199.9	122.5	24,499		0.562	87,578	2.011
	5.90		200.7	123.3	24,758		0.568	90,041	2.067
Zone 3 (100-year)	5.98		201.4	124.0	24,965		0.573	92,030	2.113
	6.00		201.5	124.1	25,017		0.574	92,529	2.124
	6.10		202.3	124.9	25,279		0.580	95,044	2.182
	6.20		203.1	125.7	25,541		0.586	97,585	2.240
	6.30		203.9	126.5	25,805		0.592	100,152	2.299
	6.40		204.7	127.3	26,070		0.598	102,746	2.359
	6.50		205.5	128.1	26,336		0.605	105,366	2.419
	6.60		206.3	128.9	26,604		0.611	108,013	2.480
	6.70		207.1	129.7	26,873		0.617	110,687	2.541
	6.80		207.9	130.5	27,143		0.623	113,388	2.603
	6.90		208.7	131.3	27,414		0.629	116,116	2.666
	7.00		209.5	132.1	27,687		0.636	118,871	2.729
	7.10		210.3	132.9	27,961		0.642	121,653	2.793
	7.20		211.1	133.7	28,236		0.648	124,463	2.857
	7.30		211.9	134.5	28,513		0.655	127,300	2.922
	7.40		212.7	135.3	28,790		0.661	130,166	2.988
	7.50		213.5	136.1	29,069		0.667	133,059	3.055
	7.60		214.3	136.9	29,350		0.674	135,979	3.122
	7.70		215.1	137.7	29,631		0.680	138,929	3.189
	7.80		215.9	138.5	29,914		0.687	141,906	3.258
	7.90		216.7	139.3	30,199		0.693	144,911	3.327
	8.00		217.5	140.1	30,484		0.700	147,946	3.396
	8.10		218.3	140.9	30,771		0.706	151,008	3.467
	8.20		219.1	141.7	31,059		0.713	154,100	3.538
	8.30		219.9	142.5	31,348		0.720	157,220	3.609
	8.40		220.7	143.3	31,639		0.726	160,369	3.682
	8.50		221.5	144.1	31,931		0.733	163,548	3.755
	8.60		222.3	144.9	32,224		0.740	166,756	3.828
	8.70		223.1	145.7	32,518		0.747	169,993	3.902
	8.80		223.9	146.5	32,814		0.753	173,259	3.977

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

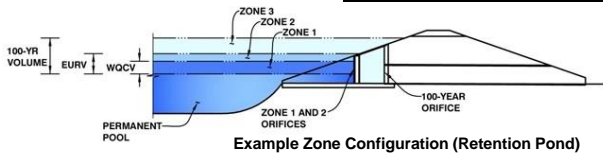
MHFD-*Detention*, Version 4.05 (January 2022)



DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD- Detention, Version 4.05 (January 2022)

Project: Flying Horse North MDDP
Basin ID: Pond 16



	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.35	0.399	Orifice Plate
Zone 2 (EURV)	3.90	0.644	Circular Orifice
Zone 3 (100-year)	5.98	1.067	Weir&Pipe (Restrict)
Total (all zones)		2.110	

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 Diameter =	N/A	inches

Calculated Parameters for Underdrain

Underdrain Orifice Area =	N/A	ft ²
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)

Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate =	2.35	ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing =	9.00	inches
Orifice Plate: Orifice Area per Row =	1.40	sq. inches (diameter = 1-5/16 inches)

Calculated Parameters for Plate

WQ Orifice Area per Row =	9.722E-03	ft ²
Elliptical Half-Width =	N/A	feet
Elliptical Slot Centroid =	N/A	feet
Elliptical Slot Area =	N/A	ft ²

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	0.80	1.60					
Orifice Area (sq. inches)	1.40	1.40	1.40					

	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)

	Zone 2 Circular	Not Selected	
Invert of Vertical Orifice =	2.35	N/A	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =	3.90	N/A	ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter =	12.00	N/A	inches

Calculated Parameters for Vertical Orifice

	Zone 2 Circular	Not Selected	
Vertical Orifice Area =	0.79	N/A	ft ²
Vertical Orifice Centroid =	0.50	N/A	feet

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	
Overflow Weir Front Edge Height, Ho =	4.00	N/A	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	5.00	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V
Horiz. Length of Weir Sides =	6.00	N/A	feet
Overflow Grate Type =	Type C Grate	N/A	
Debris Clogging % =	50%	N/A	%

Calculated Parameters for Overflow Weir

	Zone 3 Weir	Not Selected	
Height of Grate Upper Edge, H _u =	4.00	N/A	feet
Overflow Weir Slope Length =	6.00	N/A	feet
Grate Open Area / 100-yr Orifice Area =	1.85	N/A	
Overflow Grate Open Area w/o Debris =	20.88	N/A	ft ²
Overflow Grate Open Area w/ Debris =	10.44	N/A	ft ²

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

	Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	1.00	N/A	ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter =	54.00	N/A	inches
Restrictor Plate Height Above Pipe Invert =	36.00		inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 3 Restrictor	Not Selected	
Outlet Orifice Area =	11.26	N/A	ft ²
Outlet Orifice Centroid =	1.68	N/A	feet
Half-Central Angle of Restrictor Plate on Pipe =	1.91	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage =	7.00	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	50.00	feet
Spillway End Slopes =	4.00	H:V
Freeboard above Max Water Surface =	1.00	feet

Calculated Parameters for Spillway

Spillway Design Flow Depth =	0.64	feet
Stage at Top of Freeboard =	8.64	feet
Basin Area at Top of Freeboard =	0.74	acres
Basin Volume at Top of Freeboard =	3.86	acre-ft

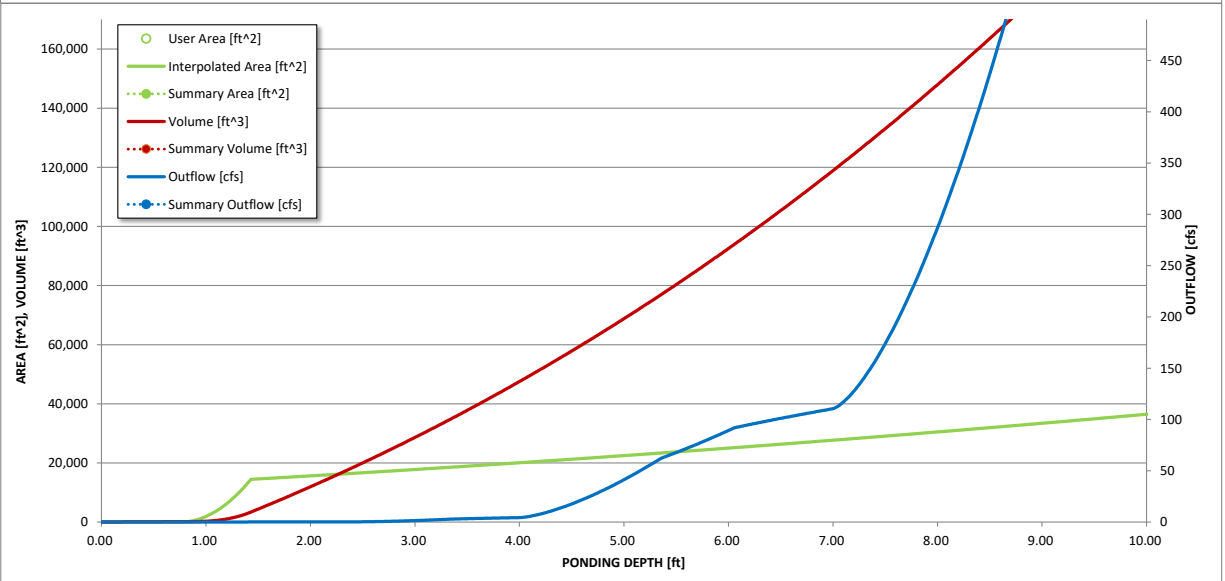
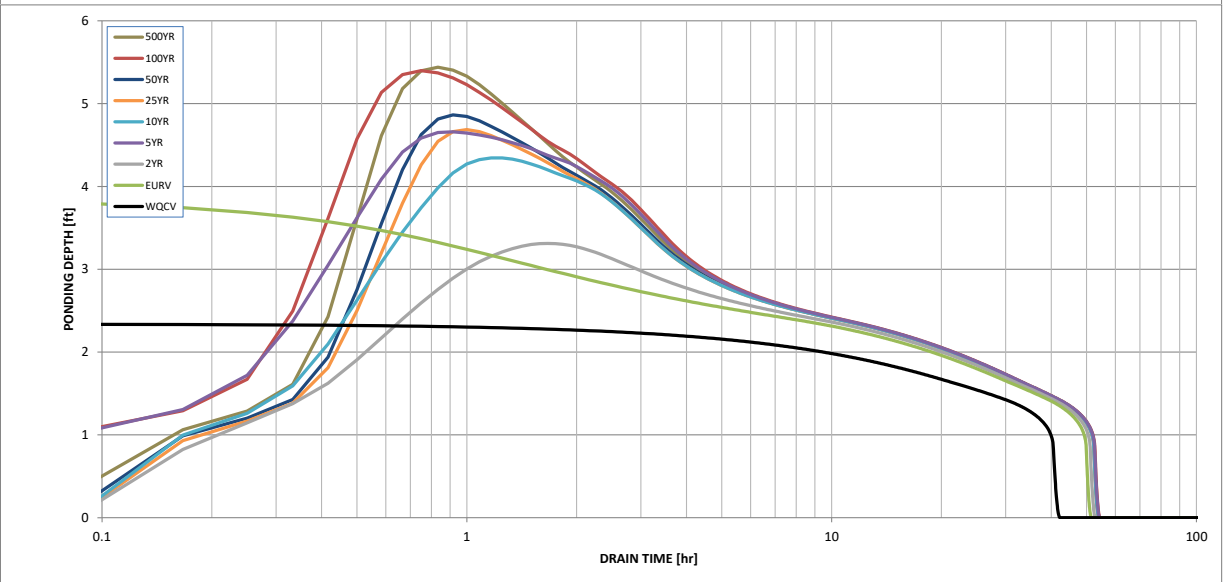
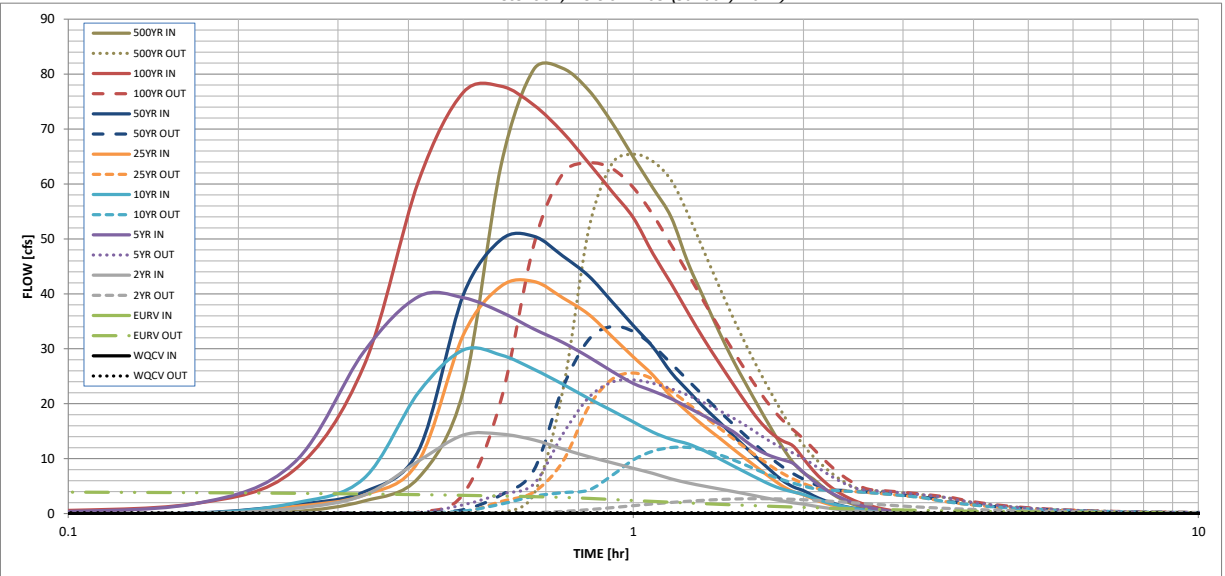
Routed Hydrograph Results

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

	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Design Storm Return Period =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.14
One-Hour Rainfall Depth (in) =	0.399	1.043	1.034	1.610	2.133	2.899	3.492	4.270	5.793
CUHP Runoff Volume (acre-ft) =	N/A	N/A	1.034	3.422	2.133	2.899	3.492	6.198	5.793
User Override Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	3.3	9.3	14.0	24.7	31.0	39.7	55.2
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.11	0.84	0.48	0.85	1.07	2.46	1.91
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A	14.5	39.5	29.8	42.2	50.5	77.8	81.0
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	2.7	24.3	12.0	25.6	34.1	63.8	65.4
Peak Inflow Q (cfs) =	N/A	N/A	N/A	1.0	0.9	1.0	1.1	0.9	1.2
Peak Outflow Q (cfs) =	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Structure Controlling Flow =	N/A	N/A	N/A	0.9	0.3	1.0	1.4	2.8	2.8
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Max Velocity through Grate 2 (fps) =	39	46	47	39	43	40	38	29	31
Time to Drain 97% of Inflow Volume (hours) =	40	49	50	48	49	48	47	44	44
Time to Drain 99% of Inflow Volume (hours) =	2.35	3.90	3.31	4.66	4.34	4.69	4.86	5.40	5.44
Maximum Ponding Depth (ft) =	0.38	0.46	0.42	0.50	0.48	0.50	0.51	0.54	0.54
Area at Maximum Ponding Depth (acres) =	0.403	1.045	0.786	1.402	1.251	1.417	1.508	1.785	1.806
Maximum Volume Stored (acre-ft) =									

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.05 (January 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

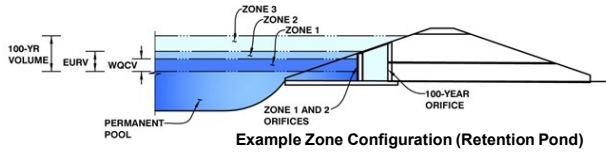
The user can override the calculated inflow hydrographs from this workbook with inflow hydrographs developed in a separate program.

Time Interval	SOURCE	CUHP	CUHP	CUHP	USER	CUHP	CUHP	CUHP	USER	CUHP
	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	0.13	0.00	0.00	0.00	0.32	0.00
	0:10:00	0.00	0.00	0.00	1.77	0.00	0.00	0.11	1.79	0.34
	0:15:00	0.00	0.00	0.92	9.10	1.88	1.27	1.60	7.77	2.28
	0:20:00	0.00	0.00	3.34	29.42	6.38	3.35	3.92	26.81	6.51
	0:25:00	0.00	0.00	9.57	39.49	22.05	9.51	11.47	60.50	22.27
	0:30:00	0.00	0.00	14.29	39.30	29.77	32.48	39.77	76.66	63.40
	0:35:00	0.00	0.00	14.47	36.68	28.86	41.39	49.87	77.79	80.87
	0:40:00	0.00	0.00	13.41	33.60	26.27	42.25	50.47	74.36	81.05
	0:45:00	0.00	0.00	11.76	31.16	23.55	39.28	46.89	69.39	77.08
	0:50:00	0.00	0.00	10.37	28.52	20.96	36.28	43.27	63.84	71.17
	0:55:00	0.00	0.00	9.25	25.89	18.74	32.24	38.58	58.62	64.89
	1:00:00	0.00	0.00	8.24	23.69	16.69	28.51	34.22	53.85	59.25
	1:05:00	0.00	0.00	7.31	22.30	14.81	25.19	30.31	47.30	53.94
	1:10:00	0.00	0.00	6.32	20.91	13.52	21.30	25.69	41.88	45.60
	1:15:00	0.00	0.00	5.58	19.32	12.68	18.43	22.36	36.55	39.18
	1:20:00	0.00	0.00	5.01	17.80	11.48	15.95	19.36	31.73	33.21
	1:25:00	0.00	0.00	4.51	16.35	10.05	13.86	16.79	27.53	28.00
	1:30:00	0.00	0.00	4.04	14.97	8.71	11.81	14.28	23.67	23.53
	1:35:00	0.00	0.00	3.57	13.11	7.47	9.92	11.98	20.13	19.43
	1:40:00	0.00	0.00	3.12	11.52	6.31	8.17	9.85	17.04	15.66
	1:45:00	0.00	0.00	2.69	10.50	5.26	6.52	7.85	14.74	12.20
	1:50:00	0.00	0.00	2.33	9.82	4.48	5.06	6.09	13.29	9.32
	1:55:00	0.00	0.00	1.97	9.15	3.95	4.02	4.89	12.33	7.44
	2:00:00	0.00	0.00	1.73	7.52	3.49	3.41	4.18	10.02	6.27
	2:05:00	0.00	0.00	1.40	5.94	2.83	2.64	3.26	7.78	4.79
	2:10:00	0.00	0.00	1.13	4.69	2.25	2.01	2.49	6.03	3.57
	2:15:00	0.00	0.00	0.90	3.67	1.78	1.55	1.91	4.63	2.64
	2:20:00	0.00	0.00	0.71	2.86	1.39	1.18	1.46	3.57	1.92
	2:25:00	0.00	0.00	0.56	2.19	1.07	0.90	1.11	2.74	1.41
	2:30:00	0.00	0.00	0.44	1.65	0.82	0.69	0.84	2.09	1.05
	2:35:00	0.00	0.00	0.34	1.24	0.61	0.52	0.63	1.60	0.79
	2:40:00	0.00	0.00	0.27	0.92	0.46	0.39	0.48	1.23	0.61
	2:45:00	0.00	0.00	0.21	0.67	0.35	0.30	0.37	0.91	0.47
	2:50:00	0.00	0.00	0.16	0.46	0.27	0.23	0.28	0.65	0.36
	2:55:00	0.00	0.00	0.11	0.30	0.19	0.17	0.20	0.42	0.26
	3:00:00	0.00	0.00	0.08	0.17	0.13	0.12	0.14	0.25	0.18
	3:05:00	0.00	0.00	0.05	0.08	0.08	0.07	0.09	0.12	0.11
	3:10:00	0.00	0.00	0.02	0.03	0.04	0.04	0.05	0.04	0.06
	3:15:00	0.00	0.00	0.01	0.00	0.02	0.02	0.02	0.00	0.02
	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
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	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 4.04 (February 2021)

Project: Flying Horse North Drainage Plan
Basin ID: Pond 17



	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.20	0.203	Orifice Plate
Zone 2 (EURV)	3.19	0.193	Circular Orifice
Zone 3 (100-year)	5.98	0.739	Weir&Pipe (Restrict)
Total (all zones)		1.134	

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

Underdrain Orifice Invert Depth = ft (distance below the filtration media surface)
 Underdrain Orifice Diameter = inches

Calculated Parameters for Underdrain
 Underdrain Orifice Area = ft²
 Underdrain Orifice Centroid = 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)

Invert of Lowest Orifice = ft (relative to basin bottom at Stage = 0 ft)
 Depth at top of Zone using Orifice Plate = ft (relative to basin bottom at Stage = 0 ft)
 Orifice Plate: Orifice Vertical Spacing = inches
 Orifice Plate: Orifice Area per Row = sq. inches (diameter = 1-1/16 inches)

Calculated Parameters for Plate
 WQ Orifice Area per Row = ft²
 Elliptical Half-Width = feet
 Elliptical Slot Centroid = feet
 Elliptical Slot Area = ft²

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	0.73	1.47					
Orifice Area (sq. inches)	0.86	0.86	0.86					

	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)

	Zone 2 Circular	Not Selected	
Invert of Vertical Orifice =	2.20	N/A	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =	3.19	N/A	ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter =	1.98	N/A	inches

Calculated Parameters for Vertical Orif
 Vertical Orifice Area = ft²
 Vertical Orifice Centroid = feet

User Input: Overflow Weir (Dropbox with Flat or Sloped Gate and Outlet Pipe OR Rectangular/Trapezoidal Weir (and No Outlet Pipe)

	Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	4.20	N/A	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	4.00	N/A	feet
Overflow Weir Gate Slope =	4.00	N/A	H:V
Horiz. Length of Weir Sides =	6.00	N/A	feet
Overflow Gate Type =	Type C Gate	N/A	
Debris Clogging % =	50%	N/A	%

Calculated Parameters for Overflow W
 Height of Gate Upper Edge, H_t = feet
 Overflow Weir Slope Length = feet
 Gate Open Area / 100-yr Orifice Area = N/A
 Overflow Gate Open Area w/o Debris = N/A
 Overflow Gate Open Area w/ Debris = N/A

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

	Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	1.00	N/A	ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter =	30.00	N/A	inches
Restrictor Plate Height Above Pipe Invert =	22.50	N/A	inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Pl
 Outlet Orifice Area = ft²
 Outlet Orifice Centroid = feet
 Half-Central Angle of Restrictor Plate on Pipe = N/A

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage =	5.90	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	18.00	feet
Spillway End Slopes =	4.00	H:V
Freeboard above Max Water Surface =	1.00	feet

Calculated Parameters for Spillway
 Spillway Design Flow Depth = feet
 Stage at Top of Freeboard = feet
 Basin Area at Top of Freeboard = acres
 Basin Volume at Top of Freeboard = acre-ft

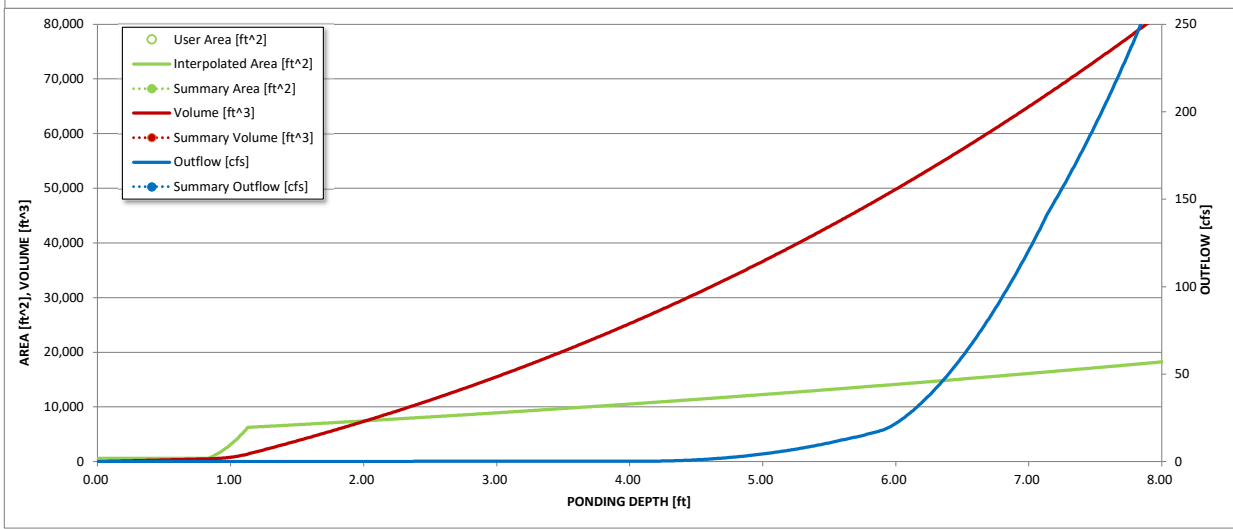
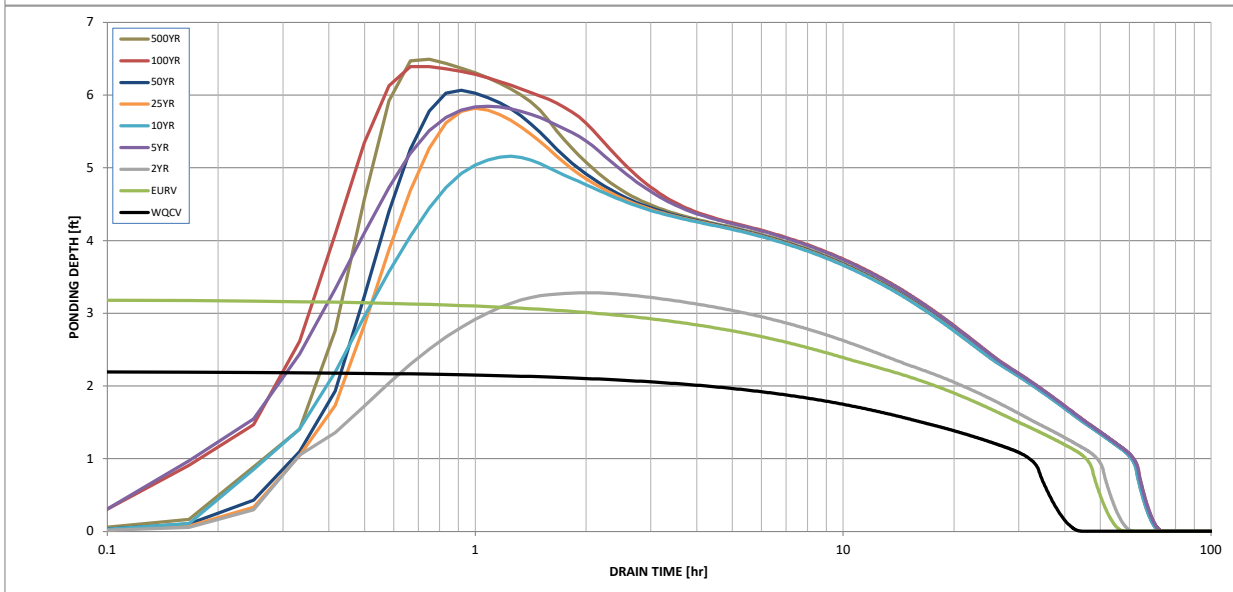
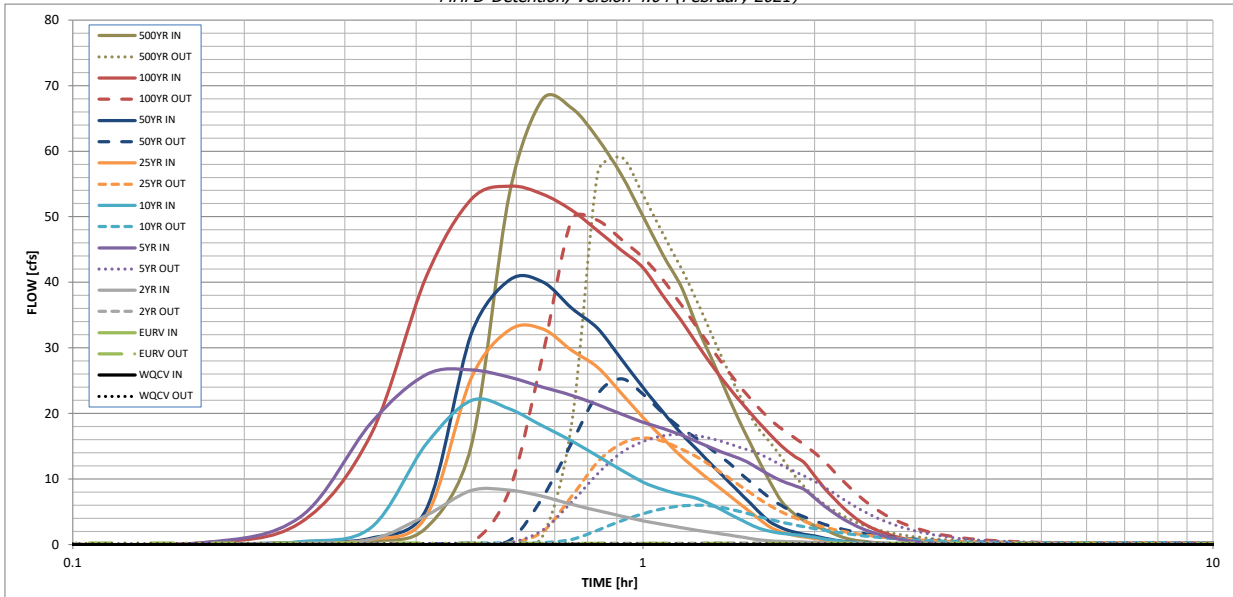
Routed Hydrograph Results

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

	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
Design Storm Return Period =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52
CUHP Runoff Volume (acre-ft) =	0.203	0.396	0.447	0.851	1.240	1.888	2.346	2.988
User Override Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.447	2.651	1.240	1.888	2.346	4.897
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	4.1	11.0	16.6	28.4	35.5	44.4
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A	N/A	17.0	N/A	N/A	N/A	50.0
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.17	0.72	0.71	1.21	1.51	2.13
Peak Inflow Q (cfs) =	N/A	N/A	8.3	26.6	22.0	32.9	40.4	54.7
Peak Outflow Q (cfs) =	0.1	0.2	0.2	16.8	6.0	16.3	25.3	49.6
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	1.0	0.4	0.6	0.7	1.0
Structure Controlling Flow =	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Spillway	Spillway
Max Velocity through Gate 1 (fps) =	N/A	N/A	N/A	1.0	0.3	0.9	1.2	1.7
Max Velocity through Gate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	37	48	51	47	56	52	49	37
Time to Drain 99% of Inflow Volume (hours) =	40	52	55	59	63	61	60	54
Maximum Ponding Depth (ft) =	2.20	3.20	3.28	5.85	5.16	5.82	6.07	6.39
Area at Maximum Ponding Depth (acres) =	0.18	0.21	0.21	0.32	0.29	0.32	0.33	0.34
Maximum Volume Stored (acre-ft) =	0.203	0.398	0.415	1.092	0.883	1.083	1.163	1.273

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)



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

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename: _____

Inflow Hydrographs

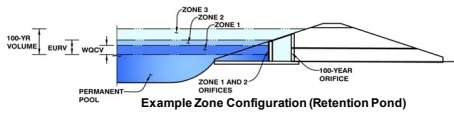
The user can override the calculated inflow hydrographs from this workbook with inflow hydrographs developed in a separate program.

Time Interval	SOURCE	CUHP	CUHP	CUHP	USER	CUHP	CUHP	CUHP	USER	CUHP
	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	0.02	0.00	0.00	0.00	0.05	0.00
	0:10:00	0.00	0.00	0.00	0.26	0.00	0.00	0.02	0.27	0.08
	0:15:00	0.00	0.00	0.22	4.18	0.45	0.30	0.37	3.29	0.52
	0:20:00	0.00	0.00	0.79	18.56	2.61	0.77	0.98	16.80	2.53
	0:25:00	0.00	0.00	4.46	25.92	15.35	4.29	5.35	40.82	15.05
	0:30:00	0.00	0.00	8.26	26.63	21.95	25.39	32.12	52.64	53.58
	0:35:00	0.00	0.00	8.30	25.54	20.68	32.77	40.35	54.68	67.92
	0:40:00	0.00	0.00	7.36	24.02	18.10	32.91	40.08	53.45	66.58
	0:45:00	0.00	0.00	6.15	22.77	15.80	29.61	36.06	50.98	61.89
	0:50:00	0.00	0.00	5.18	21.33	13.47	27.01	32.92	47.85	56.39
	0:55:00	0.00	0.00	4.37	19.93	11.38	23.07	28.30	44.90	50.07
	1:00:00	0.00	0.00	3.63	18.66	9.55	19.40	23.96	42.22	44.24
	1:05:00	0.00	0.00	3.09	17.72	8.40	16.26	20.24	37.98	39.36
	1:10:00	0.00	0.00	2.60	16.73	7.64	13.48	16.97	34.23	32.88
	1:15:00	0.00	0.00	2.18	15.62	6.97	11.29	14.34	30.38	27.54
	1:20:00	0.00	0.00	1.81	14.58	5.89	9.31	11.82	26.90	22.25
	1:25:00	0.00	0.00	1.45	13.70	4.70	7.53	9.55	23.90	17.62
	1:30:00	0.00	0.00	1.11	12.91	3.60	5.82	7.39	21.31	13.49
	1:35:00	0.00	0.00	0.80	11.76	2.62	4.19	5.34	19.01	9.72
	1:40:00	0.00	0.00	0.58	10.63	2.04	2.73	3.53	16.90	6.62
	1:45:00	0.00	0.00	0.49	9.74	1.74	1.93	2.57	15.06	4.83
	1:50:00	0.00	0.00	0.44	9.07	1.53	1.45	1.97	13.62	3.68
	1:55:00	0.00	0.00	0.38	8.43	1.35	1.16	1.59	12.53	2.88
	2:00:00	0.00	0.00	0.33	7.13	1.12	0.95	1.33	10.52	2.30
	2:05:00	0.00	0.00	0.25	5.87	0.86	0.71	0.99	8.61	1.62
	2:10:00	0.00	0.00	0.19	4.80	0.64	0.51	0.71	6.98	1.08
	2:15:00	0.00	0.00	0.14	3.88	0.47	0.36	0.51	5.58	0.73
	2:20:00	0.00	0.00	0.11	3.11	0.34	0.27	0.37	4.39	0.53
	2:25:00	0.00	0.00	0.08	2.50	0.24	0.20	0.27	3.43	0.39
	2:30:00	0.00	0.00	0.06	2.01	0.17	0.14	0.20	2.70	0.29
	2:35:00	0.00	0.00	0.05	1.61	0.13	0.10	0.14	2.14	0.21
	2:40:00	0.00	0.00	0.03	1.29	0.09	0.08	0.11	1.70	0.16
	2:45:00	0.00	0.00	0.02	1.02	0.06	0.06	0.08	1.34	0.11
	2:50:00	0.00	0.00	0.01	0.79	0.04	0.04	0.05	1.03	0.08
	2:55:00	0.00	0.00	0.01	0.61	0.02	0.02	0.03	0.79	0.05
	3:00:00	0.00	0.00	0.00	0.46	0.01	0.01	0.02	0.59	0.02
	3:05:00	0.00	0.00	0.00	0.34	0.00	0.00	0.01	0.44	0.01
	3:10:00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.32	0.00
	3:15:00	0.00	0.00	0.00	0.18	0.00	0.00	0.00	0.23	0.00
	3:20:00	0.00	0.00	0.00	0.13	0.00	0.00	0.00	0.17	0.00
	3:25:00	0.00	0.00	0.00	0.09	0.00	0.00	0.00	0.12	0.00
	3:30:00	0.00	0.00	0.00	0.06	0.00	0.00	0.00	0.09	0.00
	3:35:00	0.00	0.00	0.00	0.04	0.00	0.00	0.00	0.06	0.00
	3:40:00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.03	0.00
	3:45:00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.02	0.00
	3:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	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 STAGE-STORAGE TABLE BUILDER

MHFD- Detention, Version 4.04 (February 2021)

Project: Flying Horse North Drainage Plan
Basin ID: Pond 17



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type = **EDB**

Watershed Area	=	23.50	acres
Watershed Length	=	1,050	ft
Watershed Length to Centroid	=	540	ft
Watershed Slope	=	0.060	ft/ft
Watershed Imperviousness	=	17.16%	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 WQC 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 CJHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

Water Quality Capture Volume (WQCV)	=	0.203	acre-feet
Excess Urban Runoff Volume (EURV)	=	0.396	acre-feet
2-yr Runoff Volume (P1 = 1.19 in.)	=	0.447	acre-feet
5-yr Runoff Volume (P1 = 1.5 in.)	=	0.851	acre-feet
10-yr Runoff Volume (P1 = 1.75 in.)	=	1.240	acre-feet
25-yr Runoff Volume (P1 = 2 in.)	=	1.888	acre-feet
50-yr Runoff Volume (P1 = 2.25 in.)	=	2.346	acre-feet
100-yr Runoff Volume (P1 = 2.52 in.)	=	2.988	acre-feet
500-yr Runoff Volume (P1 = 3.14 in.)	=	4.182	acre-feet
Approximate 2-yr Detention Volume	=	0.267	acre-feet
Approximate 5-yr Detention Volume	=	0.401	acre-feet
Approximate 10-yr Detention Volume	=	0.679	acre-feet
Approximate 25-yr Detention Volume	=	0.863	acre-feet
Approximate 50-yr Detention Volume	=	0.911	acre-feet
Approximate 100-yr Detention Volume	=	1.134	acre-feet

Optional User Overrides

<input type="checkbox"/>	acre-feet
<input type="checkbox"/>	acre-feet
<input type="checkbox"/>	inches
<input type="checkbox"/>	inches
<input type="checkbox"/>	inches
<input type="checkbox"/>	inches
<input type="checkbox"/>	inches
<input type="checkbox"/>	inches
<input type="checkbox"/>	inches

Define Zones and Basin Geometry

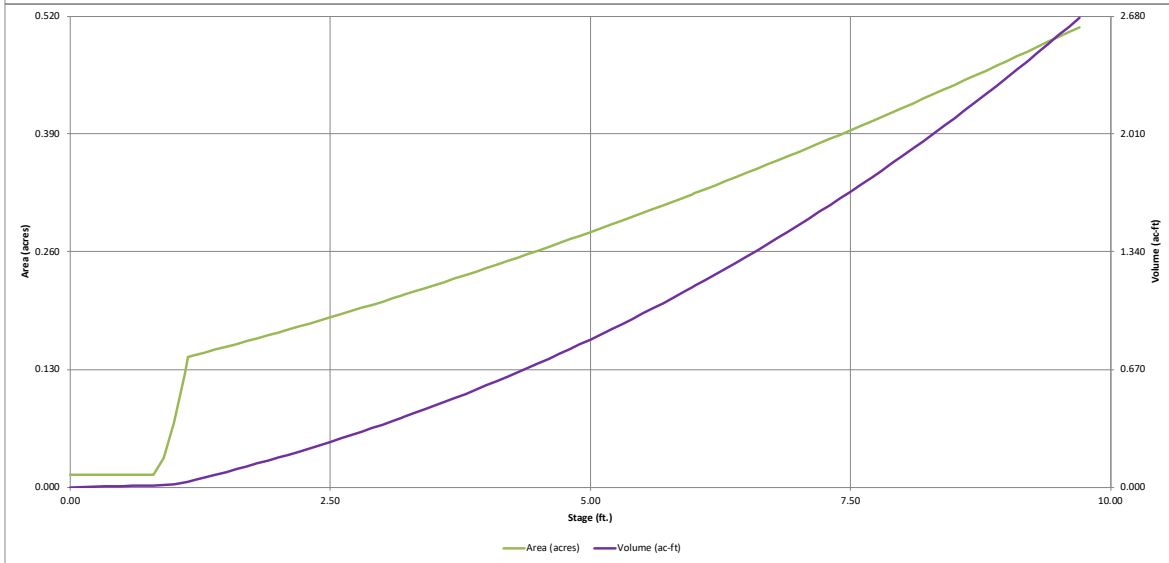
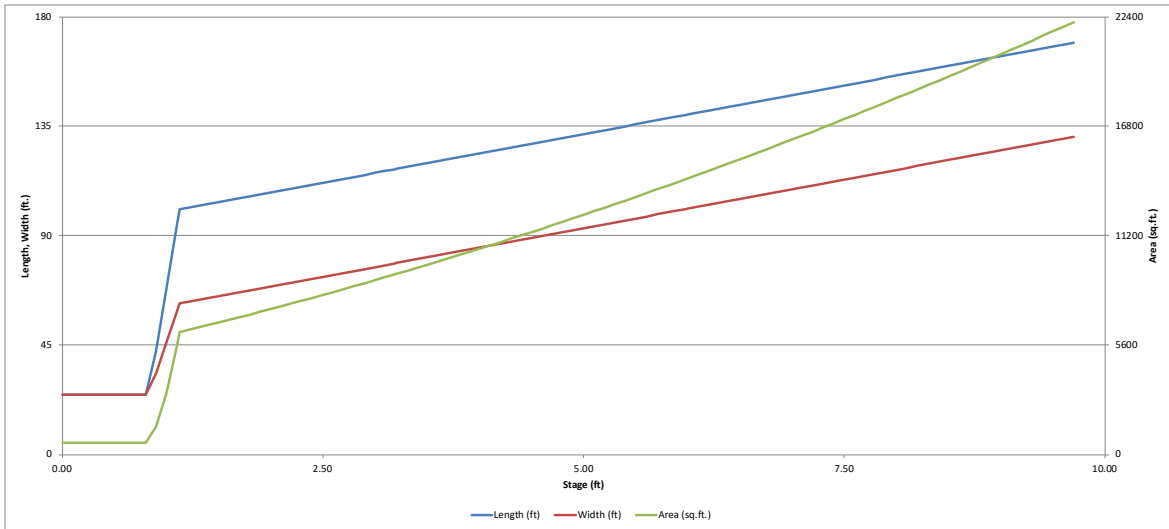
Zone 1 Volume (WQCV)	=	0.203	acre-feet
Zone 2 Volume (EURV - Zone 1)	=	0.193	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2)	=	0.739	acre-feet
Total Detention Basin Volume	=	1.134	acre-feet
Initial Surcharge Volume (ISV)	=	200	ft ³
Initial Surcharge Depth (ISD)	=	0.33	ft
Total Available Detention Depth (H _{total})	=	6.00	ft
Depth of Trickle Channel (H _{TC})	=	0.50	ft
Slope of Trickle Channel (S _{TC})	=	0.004	ft/ft
Slopes of Main Basin Sides (S _{Main})	=	4	H:V
Basin Length-to-Width Ratio (R _{L/W})	=	2	

Initial Surcharge Area (A _{ISV})	=	606	ft ²
Surcharge Volume Length (L _{ISV})	=	24.6	ft
Surcharge Volume Width (W _{ISV})	=	24.6	ft
Depth of Basin Floor (H _{FLOOR})	=	0.30	ft
Length of Basin Floor (L _{FLOOR})	=	100.8	ft
Width of Basin Floor (W _{FLOOR})	=	62.1	ft
Area of Basin Floor (A _{FLOOR})	=	6,263	ft ²
Volume of Basin Floor (V _{FLOOR})	=	882	ft ³
Depth of Main Basin (H _{Main})	=	4.87	ft
Length of Main Basin (L _{Main})	=	139.8	ft
Width of Main Basin (W _{Main})	=	101.1	ft
Area of Main Basin (A _{Main})	=	14,129	ft ²
Volume of Main Basin (V _{Main})	=	48,372	ft ³
Calculated Total Basin Volume (V _{Total})	=	1,142	acre-feet

Depth Increment = 0.10 ft		ft	ft	ft	ft	ft	ft	ft	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		24.6	24.6	606		0.014		
ISV	0.33		24.6	24.6	606		0.014	200	0.005
	0.40		24.6	24.6	606		0.014	242	0.006
	0.50		24.6	24.6	606		0.014	303	0.007
	0.60		24.6	24.6	606		0.014	364	0.008
	0.70		24.6	24.6	606		0.014	424	0.010
	0.80		24.6	24.6	606		0.014	485	0.011
	0.90		42.4	33.4	1,415		0.032	572	0.013
	1.00		67.8	45.9	3,110		0.071	793	0.018
	1.10		93.2	58.4	5,440		0.125	1,215	0.028
	Floor	1.13		100.8	62.1	6,263		0.144	1,390
1.20			101.4	62.7	6,354		0.146	1,832	0.042
1.30			102.2	63.5	6,486		0.149	2,474	0.057
1.40			103.0	64.3	6,619		0.152	3,129	0.072
1.50			103.8	65.1	6,754		0.155	3,798	0.087
1.60			104.6	65.9	6,889		0.158	4,480	0.103
1.70			105.4	66.7	7,026		0.161	5,176	0.119
1.80			106.2	67.5	7,165		0.164	5,885	0.135
1.90			107.0	68.3	7,304		0.168	6,609	0.152
2.00			107.8	69.1	7,445		0.171	7,346	0.169
2.10		108.6	69.9	7,587		0.174	8,098	0.186	
Zone 1 (WQCV)	2.20		109.4	70.7	7,731		0.177	8,864	0.203
	2.30		110.2	71.5	7,875		0.181	9,644	0.221
	2.40		111.0	72.3	8,021		0.184	10,439	0.240
	2.50		111.8	73.1	8,169		0.188	11,248	0.258
	2.60		112.6	73.9	8,317		0.191	12,073	0.277
	2.70		113.4	74.7	8,467		0.194	12,912	0.296
	2.80		114.2	75.5	8,618		0.198	13,766	0.316
	2.90		115.0	76.3	8,770		0.201	14,636	0.336
	3.00		115.8	77.1	8,924		0.205	15,520	0.356
	3.10		116.6	77.9	9,079		0.208	16,420	0.377
Zone 2 (EURV)	3.19		117.3	78.6	9,219		0.212	17,244	0.396
	3.20		117.4	78.7	9,235		0.212	17,336	0.398
	3.30		118.2	79.5	9,393		0.216	18,267	0.419
	3.40		119.0	80.3	9,551		0.219	19,215	0.441
	3.50		119.8	81.1	9,711		0.223	20,178	0.463
	3.60		120.6	81.9	9,873		0.227	21,157	0.486
	3.70		121.4	82.7	10,035		0.230	22,152	0.509
	3.80		122.2	83.5	10,199		0.234	23,164	0.532
	3.90		123.0	84.3	10,364		0.238	24,192	0.555
	4.00		123.8	85.1	10,531		0.242	25,237	0.579
4.10		124.6	85.9	10,699		0.246	26,298	0.604	
4.20		125.4	86.7	10,868		0.249	27,377	0.628	
4.30		126.2	87.5	11,038		0.253	28,472	0.654	
4.40		127.0	88.3	11,209		0.257	29,584	0.679	
4.50		127.8	89.1	11,382		0.261	30,714	0.705	
4.60		128.6	89.9	11,556		0.265	31,861	0.731	
4.70		129.4	90.7	11,732		0.269	33,025	0.758	
4.80		130.2	91.5	11,908		0.273	34,207	0.785	
4.90		131.0	92.3	12,086		0.277	35,407	0.813	
5.00		131.8	93.1	12,266		0.282	36,625	0.841	
5.10		132.6	93.9	12,446		0.286	37,860	0.869	
5.20		133.4	94.7	12,628		0.290	39,114	0.898	
5.30		134.2	95.5	12,811		0.294	40,386	0.927	
5.40		135.0	96.3	12,995		0.298	41,676	0.957	
5.50		135.8	97.1	13,181		0.303	42,985	0.987	
5.60		136.6	97.9	13,368		0.307	44,312	1.017	
5.70		137.4	98.7	13,556		0.311	45,659	1.048	
5.80		138.2	99.5	13,746		0.316	47,024	1.080	
5.90		139.0	100.3	13,937		0.320	48,408	1.111	
Zone 3 (100-year)	5.98		139.6	100.9	14,090		0.323	49,529	1.137
6.00		139.8	101.1	14,129		0.324	49,811	1.144	
6.10		140.6	101.9	14,322		0.329	51,234	1.176	
6.20		141.4	102.7	14,516		0.333	52,675	1.209	
6.30		142.2	103.5	14,712		0.338	54,137	1.243	
6.40		143.0	104.3	14,910		0.342	55,618	1.277	
6.50		143.8	105.1	15,108		0.347	57,119	1.311	
6.60		144.6	105.9	15,308		0.351	58,640	1.346	
6.70		145.4	106.7	15,509		0.356	60,180	1.382	
6.80		146.2	107.5	15,711		0.361	61,741	1.417	
6.90		147.0	108.3	15,915		0.365	63,323	1.454	
7.00		147.8	109.1	16,119		0.370	64,924	1.490	
7.10		148.6	109.9	16,326		0.375	66,547	1.528	
7.20		149.4	110.7	16,533		0.380	68,190	1.565	
7.30		150.2	111.5	16,742		0.384	69,853	1.604	
7.40		151.0	112.3	16,952		0.389	71,538	1.642	
7.50		151.8	113.1	17,163		0.394	73,244	1.681	
7.60		152.6	113.9	17,375		0.399	74,970	1.721	
7.70		153.4	114.7	17,588		0.404	76,719	1.761	
7.80		154.2	115.5	17,804		0.409	78,488	1.802	
7.90		155.0	116.3	18,021		0.414	80,280	1.843	
8.00		155.8	117.1	18,238		0.419	82,093	1.885	
8.10		156.6	117.9	18,457		0.424	83,927	1.927	
8.20		157.4	118.7	18,677		0.429	85,784	1.968	
8.30		158.2	119.5	18,899		0.434	87,663	2.013	
8.40		159.0	120.3	19,122		0.439	89,564	2.056	
8.50		159.8	121.1	19,346		0.444	91,487	2.100	
8.60		160.6	121.9	19,571		0.449	93,433	2.145	
8.70		161.4	122.7	19,798		0.454	95,401	2.190	
8.80		162.2	123.5	20,026		0.460	97,393	2.236	
8.90		163.0	124.3	20,255		0.465	99,407	2.283	
9.00		163.8	125.1	20,485		0.470	101,444	2.329	
9.10		164.6	125.9	20,717		0.476	103,504	2.376	
9.20		165.4	126.7	20,950		0.481	105,587	2.424	
9.30		166.2	127.5	21,184		0.486	107,694	2.472	
9.40		167.0	128.3	21,420		0.492	109,824	2.521	
9.50		167.8	129.1	21,657		0.497	111,978	2.571	
9.60		168.6	129.9	21,895		0.503	114,155	2.621	
9.70		169.4	130.7	22,134		0.508	116,357	2.671	

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)





Appendix E

Worksheet for Culvert 1

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.01000	ft/ft
Diameter	3.00	ft
Discharge	58.65	ft ³ /s

Results

Normal Depth	2.18	ft
Flow Area	5.51	ft ²
Wetted Perimeter	6.13	ft
Hydraulic Radius	0.90	ft
Top Width	2.67	ft
Critical Depth	2.48	ft
Percent Full	72.8	%
Critical Slope	0.00763	ft/ft
Velocity	10.65	ft/s
Velocity Head	1.76	ft
Specific Energy	3.94	ft
Froude Number	1.31	
Maximum Discharge	71.74	ft ³ /s
Discharge Full	66.69	ft ³ /s
Slope Full	0.00773	ft/ft
Flow Type	SuperCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	72.76	%
Downstream Velocity	Infinity	ft/s

Worksheet for Culvert 1

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	2.18	ft
Critical Depth	2.48	ft
Channel Slope	0.01000	ft/ft
Critical Slope	0.00763	ft/ft

Cross Section for Culvert 1

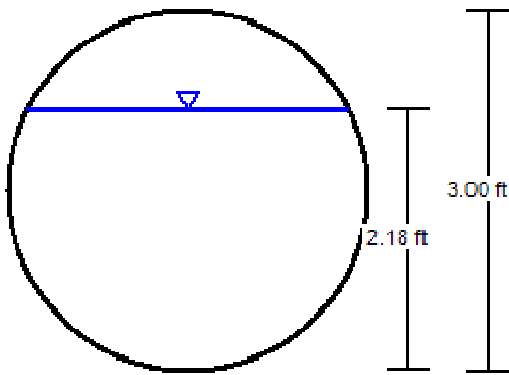
Project Description


Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	0.01000 ft/ft
Normal Depth	2.18 ft
Diameter	3.00 ft
Discharge	58.65 ft ³ /s

Cross Section Image



V: 1 
H: 1

Worksheet for Culvert 2

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.02000	ft/ft
Diameter	3.50	ft
Discharge	116.26	ft ³ /s

Results

Normal Depth	2.41	ft
Flow Area	7.05	ft ²
Wetted Perimeter	6.84	ft
Hydraulic Radius	1.03	ft
Top Width	3.25	ft
Critical Depth	3.22	ft
Percent Full	68.7	%
Critical Slope	0.01159	ft/ft
Velocity	16.49	ft/s
Velocity Head	4.23	ft
Specific Energy	6.63	ft
Froude Number	1.97	
Maximum Discharge	153.05	ft ³ /s
Discharge Full	142.28	ft ³ /s
Slope Full	0.01335	ft/ft
Flow Type	SuperCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	68.73	%
Downstream Velocity	Infinity	ft/s

Worksheet for Culvert 2

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	2.41	ft
Critical Depth	3.22	ft
Channel Slope	0.02000	ft/ft
Critical Slope	0.01159	ft/ft

Cross Section for Culvert 2

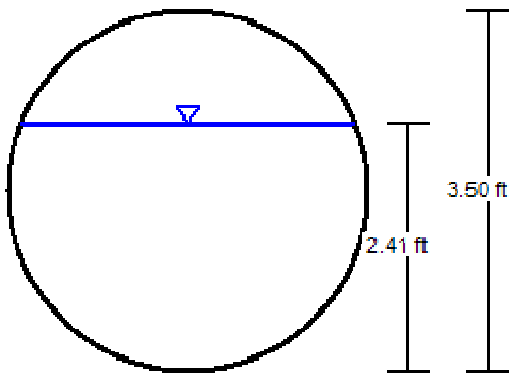
Project Description


Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	0.02000 ft/ft
Normal Depth	2.41 ft
Diameter	3.50 ft
Discharge	116.26 ft ³ /s

Cross Section Image

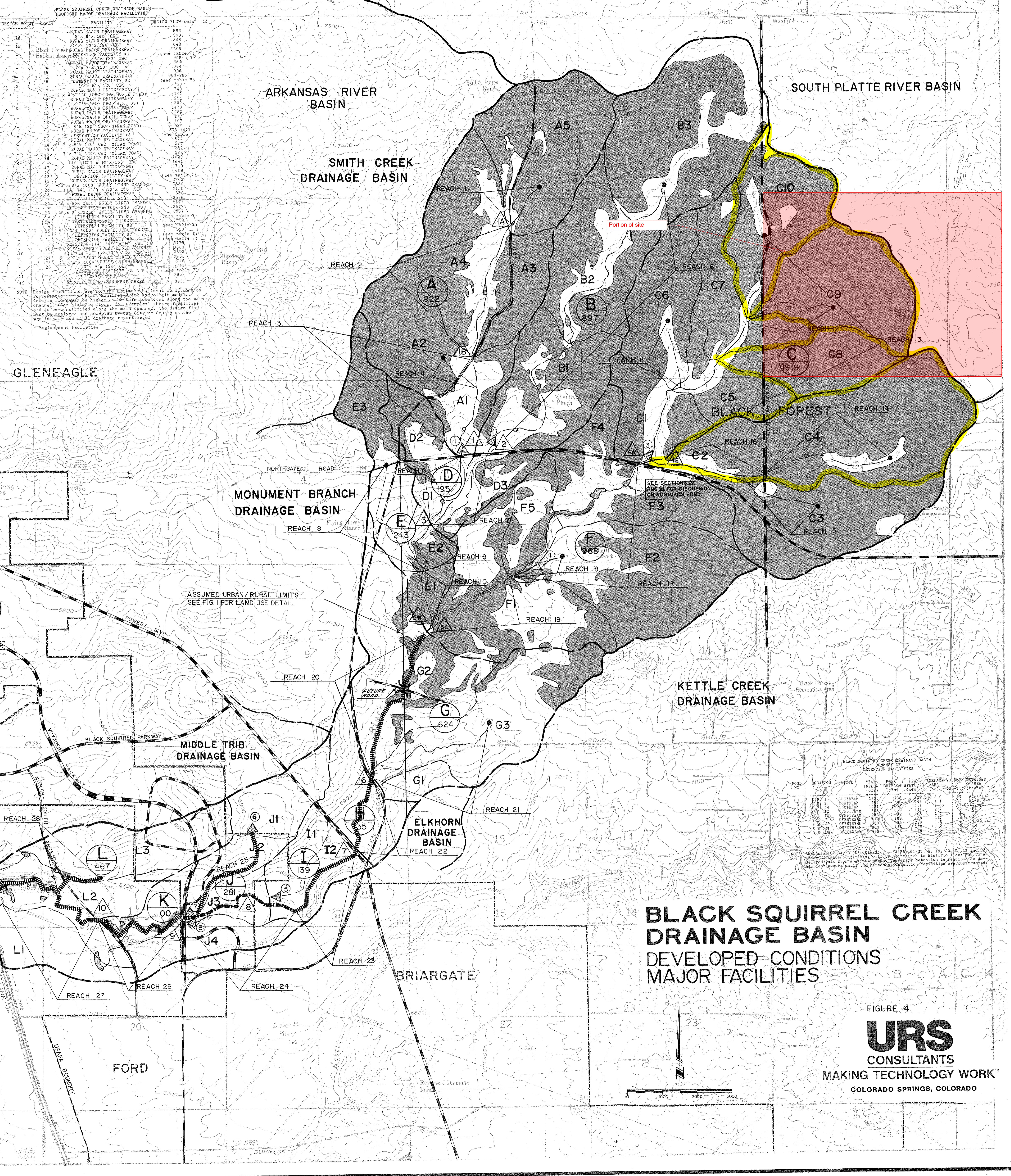


V: 1 
H: 1



Appendix F

- LEGEND**
- MAJOR ROADWAYS
 - BLACK SQUIRREL BASIN BOUNDARY
 - MAJOR BASIN BOUNDARY
 - MINOR SUB-BASIN BOUNDARY
 - CITY LIMITS
 - NORTHGATE BOUNDARY
 - FOREST AREA
 - MAJOR BASIN ACREAGE
 - MINOR SUB-BASIN DESIGNATION
 - 100-ACRE LIMIT & STABILIZED CHANNEL
 - DESIGN POINT
 - DETENTION POND
 - PARTIALLY LINED CHANNEL
 - FULLY LINED CHANNEL



BLACK SQUIRREL CREEK DRAINAGE BASIN DEVELOPED CONDITIONS MAJOR FACILITIES

FIGURE 4
URS
 CONSULTANTS
 MAKING TECHNOLOGY WORK™
 COLORADO SPRINGS, COLORADO



INNOVATIVE DESIGN. **CLASSIC RESULTS.**

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

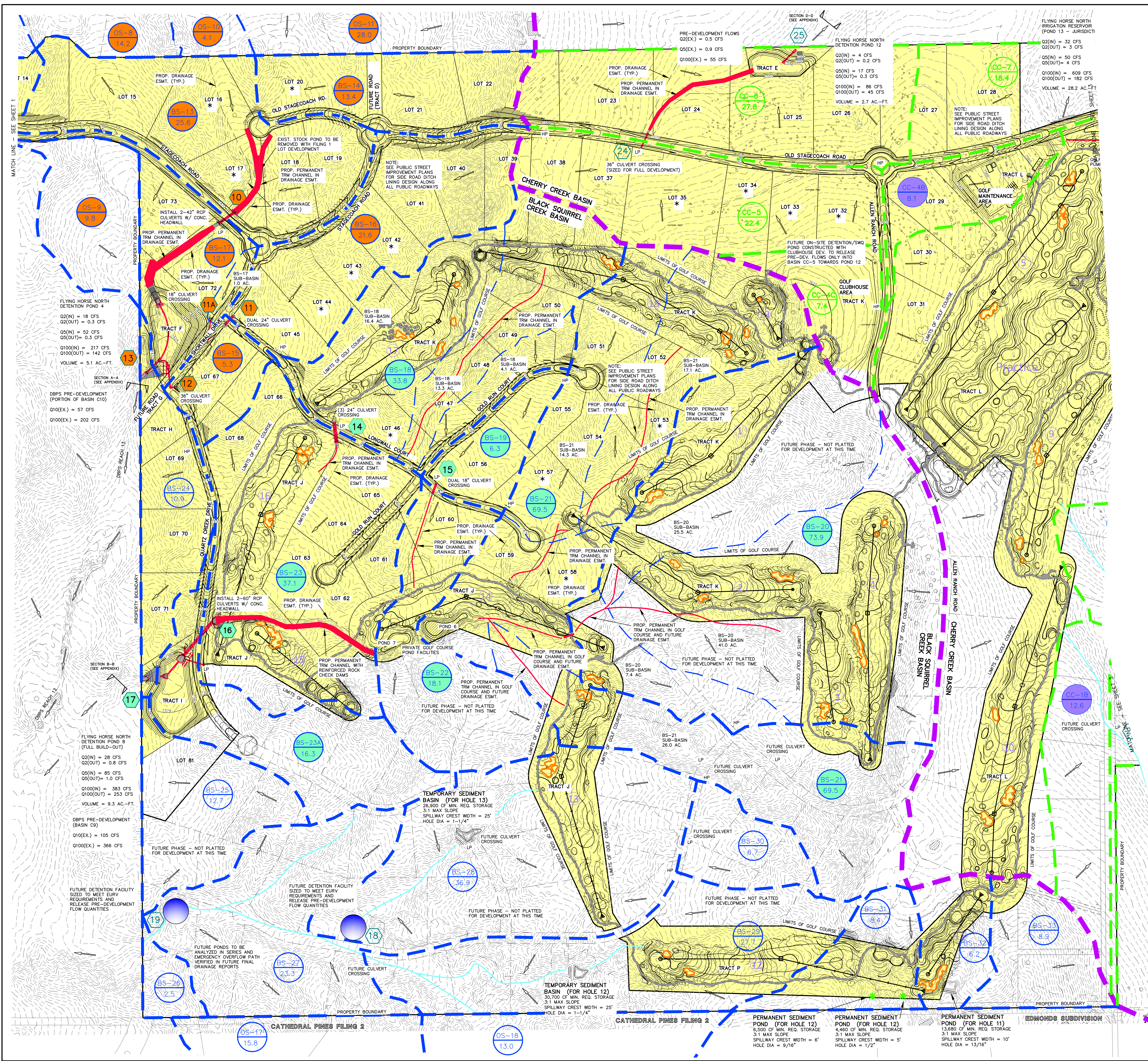
**NOVEMBER 2017
Revised June 2018**

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

Prepared by:
**CLASSIC CONSULTING ENGINEERS &
SURVEYORS**
619 N. CASCADE AVE SUITE 200
COLORADO SPRINGS CO 80903
(719) 785-0790

Job no. 1096.11
PCD File No. SP-17-012 and SF-18-001





BASIN SUMMARY - DEVELOPED CONDITIONS

BASIN (label)	AREA (acres)	COMPOSITE CN	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	76.8
OS-13	38.90	65.0	0.33	1.4	7.4	45.0
OS-14	28.40	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	21.50	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-24	18.30	64.4	0.29	5.5	12.0	38.3
BS-25	19.90	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	2.90	65.0	0.18	0.0	0.4	3.4
BS-27	23.30	65.0	0.22	2.1	8.0	38.8
BS-28	38.90	64.4	0.32	2.2	9.3	49.4
BS-29	27.70	64.0	0.33	1.4	6.5	36.9
BS-30	6.70	65.0	0.20	0.7	2.4	11.7
BS-31	8.40	63.1	0.43	1.8	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	12.80	64.8	0.28	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	72.80	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. (cfs)	Q 5 Yr. (cfs)	Q 100 Yr. (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 (Filling 1 Only) (UD Detention hydrograph)	DP-10, DP-12, BS-17, OS-9	9	14	301
DP-17 DEV (Filling 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

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	BB 10.0
EXISTING DIRECTION OF FLOW	→
PROPOSED DIRECTION OF FLOW	→
STORM SEWER	---
FILING NO. 1 PLAT AREA	---

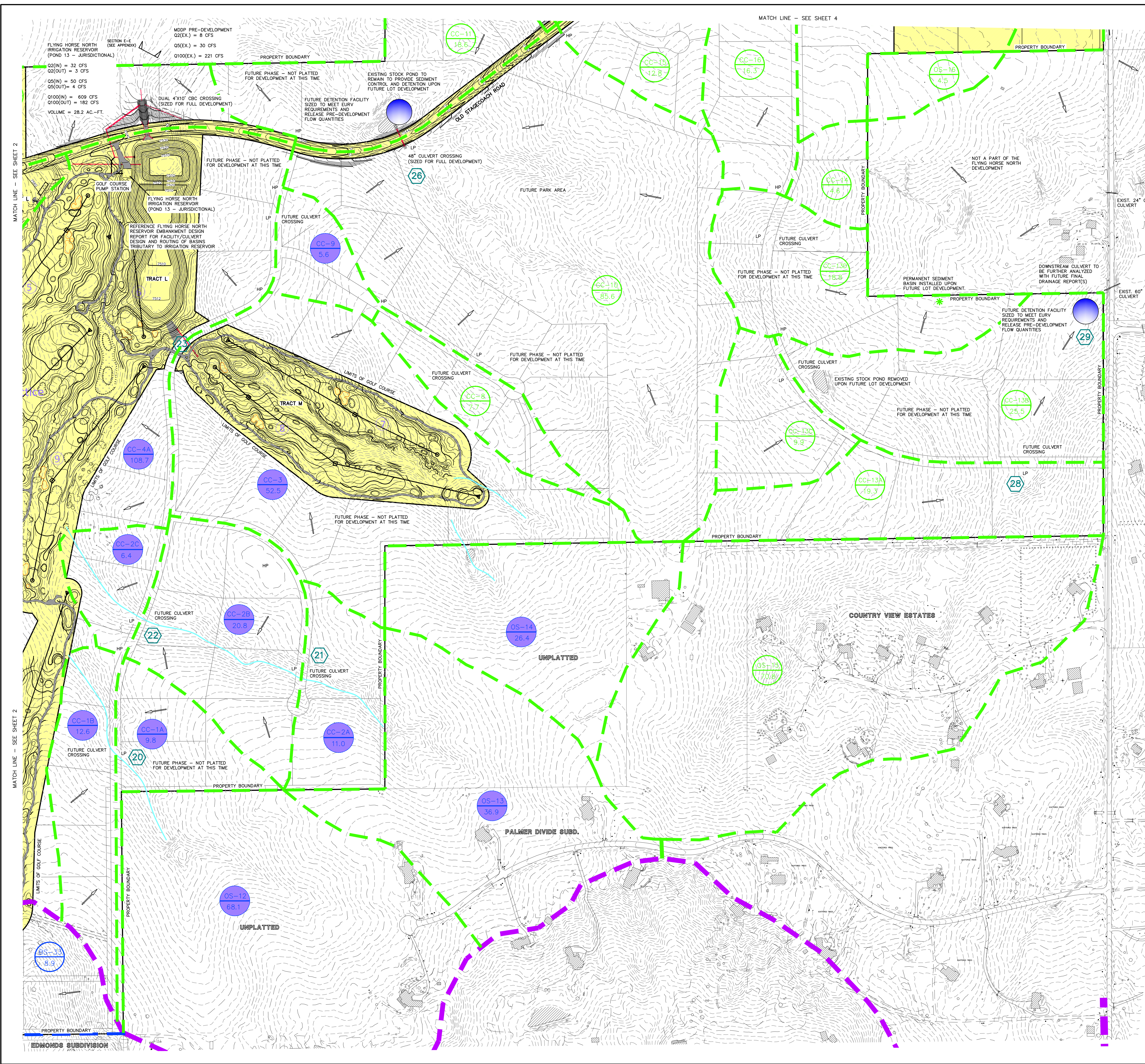
SCALE: 1" = 200'

CLASSIC CONSULTING ENGINEERS & SURVEYORS

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

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

619 N. Cascade Avenue, Suite 200 (719)785-0790
 Colorado Springs, Colorado 80903 (719)785-0799 (Fax)



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
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
CC-8	7.70	65.0	0.25	0.4	6.2	29.2
CC-9	5.00	65.0	0.19	0.5	2.1	9.8
CC-10	85.60	62.6	0.39	2.6	14.1	91.9
CC-11	18.60	63.1	0.21	0.9	5.0	28.1
CC-12	12.20	65.0	0.26	1.0	3.9	19.7
CC-13A	19.30	65.0	0.31	1.4	5.4	27.3
CC-13B	25.50	65.0	0.31	1.8	7.2	36.1
CC-13C	9.90	65.0	0.22	0.9	3.4	16.5
CC-13D	18.80	65.0	0.25	1.5	6.2	29.2
CC-14	4.60	65.0	0.21	0.4	1.6	7.8
CC-15	12.80	65.0	0.24	1.1	4.3	20.4
CC-16	16.30	65.0	0.30	1.2	4.6	23.6
CC-17	25.00	65.0	0.35	1.7	6.5	32.8
CC-18	6.20	66.5	0.30	0.7	2.2	9.7
CC-19	3.70	65.0	0.25	0.3	1.2	5.8
CC-20	39.30	65.0	0.25	3.2	12.9	61.0
CC-21	6.20	61.0	0.20	0.1	1.2	8.5
CC-22	13.80	65.0	0.25	1.1	4.5	21.4
CC-23	5.70	64.7	0.33	0.4	1.5	7.7
CC-24	39.60	65.0	0.25	3.3	13.0	61.5
CC-25	3.50	65.0	0.23	0.3	1.2	5.7
CC-26	19.70	65.0	0.26	1.4	5.3	26.8
CC-27	18.90	64.4	0.31	1.2	4.9	25.8
CC-28	154.80	64.4	0.63	6.5	24.7	136.3

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-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
DP-26 DEV	CC-8, CC-10	3.0	15.9	102
DP-27 DEV	CC-15, CC-20	4.3	17.2	81
DP-28 DEV	CC-13A, OS-15	4.6	19.8	110
DP-29 DEV	CC-13B, CC-13C, Release from DP-28	5.8	26.6	155
DP-30 DEV	CC-18	0.7	2.2	10
DP-31 DEV	CC-19, Release from DP-30	0.9	3.2	15
DP-32 DEV	CC-17, OS-16	2.0	7.8	40
DP-33 DEV	CC-23, CC-24	3.6	14.4	69
DP-34 DEV	CC-26, CC-27, CC-28 and Release from CC-16 & DP-32	6.0	23.5	168

LEGEND

DESCRIPTION	SYMBOL
EXISTING GROUND CONTOUR	6910
PROPOSED FINISHED CONTOUR	6910
BASIN BOUNDARY EAST CHERRY CREEK	---
MAJOR BASIN BOUNDARY	---
DESIGN POINT	3
BASIN IDENTIFIER	BB 10.0
EXISTING DIRECTION OF FLOW	→
PROPOSED DIRECTION OF FLOW	→
STORM SEWER	---
FLING NO. 1 PLAT AREA	---

SCALE: 1" = 200'

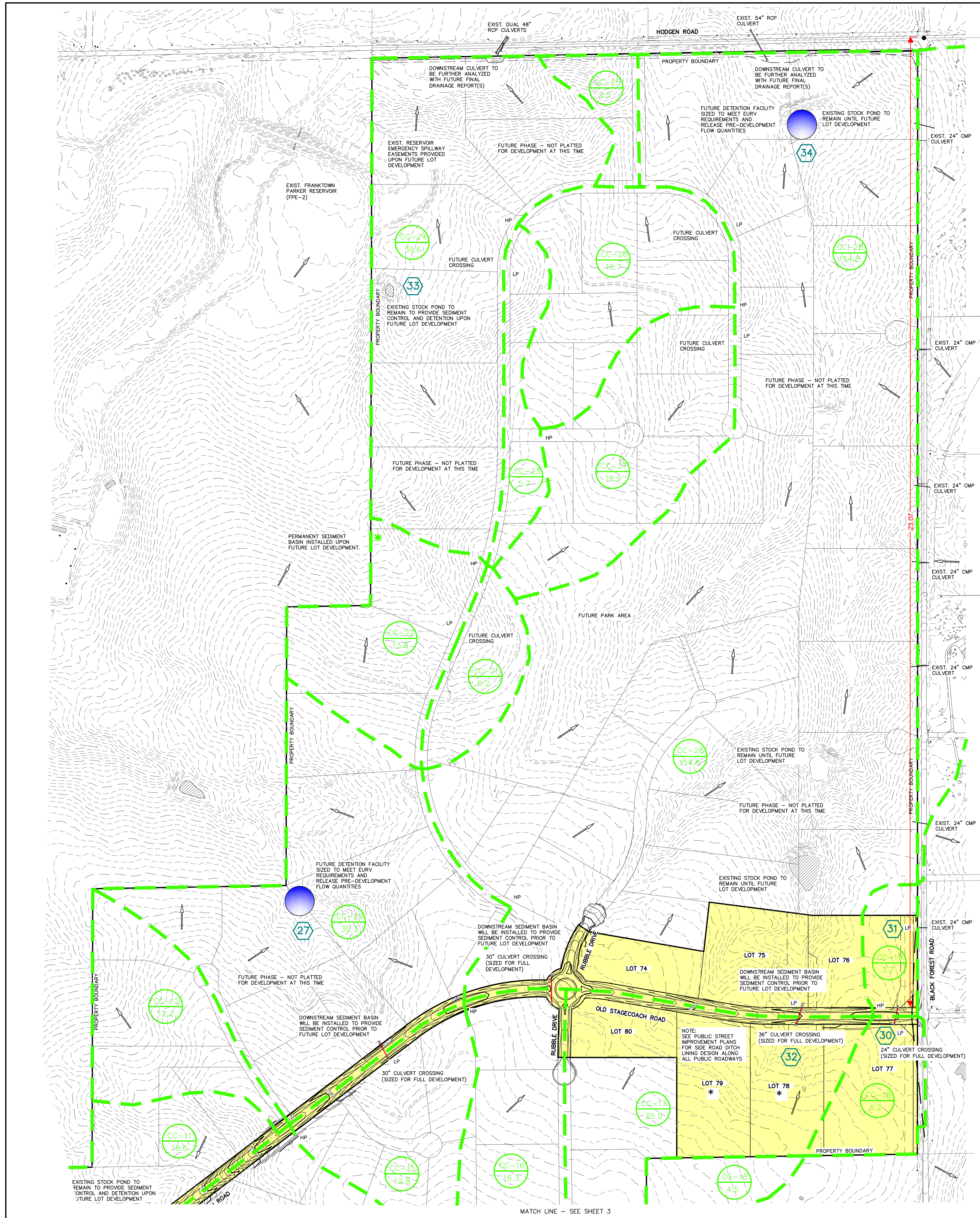
CLASSIC CONSULTING ENGINEERS & SURVEYORS

FLYING HORSE NORTH
PRELIMINARY/FINAL DRAINAGE REPORT
FLING NO. 1 AND
PRELIMINARY PLAN DRAINAGE MAP

DESIGNED BY	MAW	SCALE	DATE	10-25-17
DRAWN BY	MAW	(H) 1" = 200'	SHEET	3 OF 4
CHECKED BY	(V) 1" = N/A	JOB NO.	1096.11	

619 N. Cascade Avenue, Suite 200 Colorado Springs, Colorado 80903 (719)785-0790 (719)785-0789 (Fax)

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BASIN SUMMARY - DEVELOPED CONDITIONS

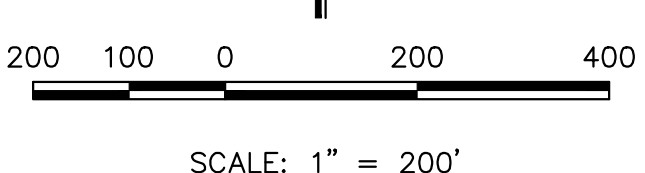
BASIN (label)	AREA (acres)	COMPOSITE CN	TOTAL LAG TIME (hours)	Q 2 Yr. (cfs)	Q 5 Yr. (cfs)	Q 100 Yr. (cfs)
OS-16	4.50	65.0	0.24	0.4	1.5	7.2
OS-17	15.80	65.0	0.19	1.6	5.9	27.7
OS-18	13.00	65.0	0.20	1.3	4.7	22.6
CC-11	18.60	63.1	0.21	0.9	5.0	28.1
CC-12	12.20	65.0	0.26	1.0	3.9	18.7
CC-13A	19.30	65.0	0.31	1.4	5.4	27.3
CC-13B	25.50	65.0	0.31	1.8	7.2	36.1
CC-13C	9.90	65.0	0.22	0.9	3.4	16.5
CC-13D	18.80	65.0	0.25	1.5	6.2	29.2
CC-14	4.60	65.0	0.21	0.4	1.6	7.8
CC-15	12.80	65.0	0.24	1.1	4.3	20.4
CC-16	16.30	65.0	0.30	1.2	4.6	23.6
CC-17	25.00	65.0	0.35	1.7	6.5	32.8
CC-18	6.20	66.5	0.30	0.7	2.2	9.7
CC-19	3.70	65.0	0.25	0.3	1.2	5.8
CC-20	39.30	65.0	0.25	3.2	12.9	61.0
CC-21	6.20	61.0	0.20	0.1	1.2	8.5
CC-22	13.80	65.0	0.25	1.1	4.5	21.4
CC-23	5.70	64.7	0.33	0.4	1.5	7.7
CC-24	39.60	65.0	0.25	3.3	13.0	61.5
CC-25	3.50	65.0	0.23	0.3	1.2	5.7
CC-26	16.70	65.0	0.26	1.4	5.3	25.6
CC-27	18.90	64.4	0.31	1.2	4.9	25.8
CC-28	154.80	64.4	0.63	6.5	24.7	136.3

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-27 DEV	CC-15, CC-20	4.3	17.2	81
DP-28 DEV	CC-13A, OS-15	4.6	19.8	110
DP-29 DEV	CC-13B, CC-13C, Release from DP-28	5.8	26.6	155
DP-30 DEV	CC-18	0.7	2.2	10
DP-31 DEV	CC-19, Release from DP-30	0.9	3.2	15
DP-32 DEV	CC-17, OS-16	2.0	7.8	40
DP-33 DEV	CC-23, CC-24	3.6	14.4	69
DP-34 DEV	CC-26, CC-27, CC-28 and Release from CC-16 & DP-32	6.0	23.5	168

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	---
FLING NO. 1 PLAT AREA	---



CLASSIC CONSULTING ENGINEERS & SURVEYORS

FLYING HORSE NORTH
PRELIMINARY/FINAL DRAINAGE REPORT
FLING NO. 1 AND
PRELIMINARY PLAN DRAINAGE MAP

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

619 N. Cascade Avenue, Suite 200 (719) 785-0790
Colorado Springs, Colorado 80903 (719) 785-0799 (Fax)

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MATCH LINE - SEE SHEET 3



INNOVATIVE DESIGN. **CLASSIC RESULTS.**

FLYING HORSE NORTH
IRRIGATION RESERVOIR EMBANKMENT
DESIGN REPORT

DAMID: 080459
Construction File No.: C-2085

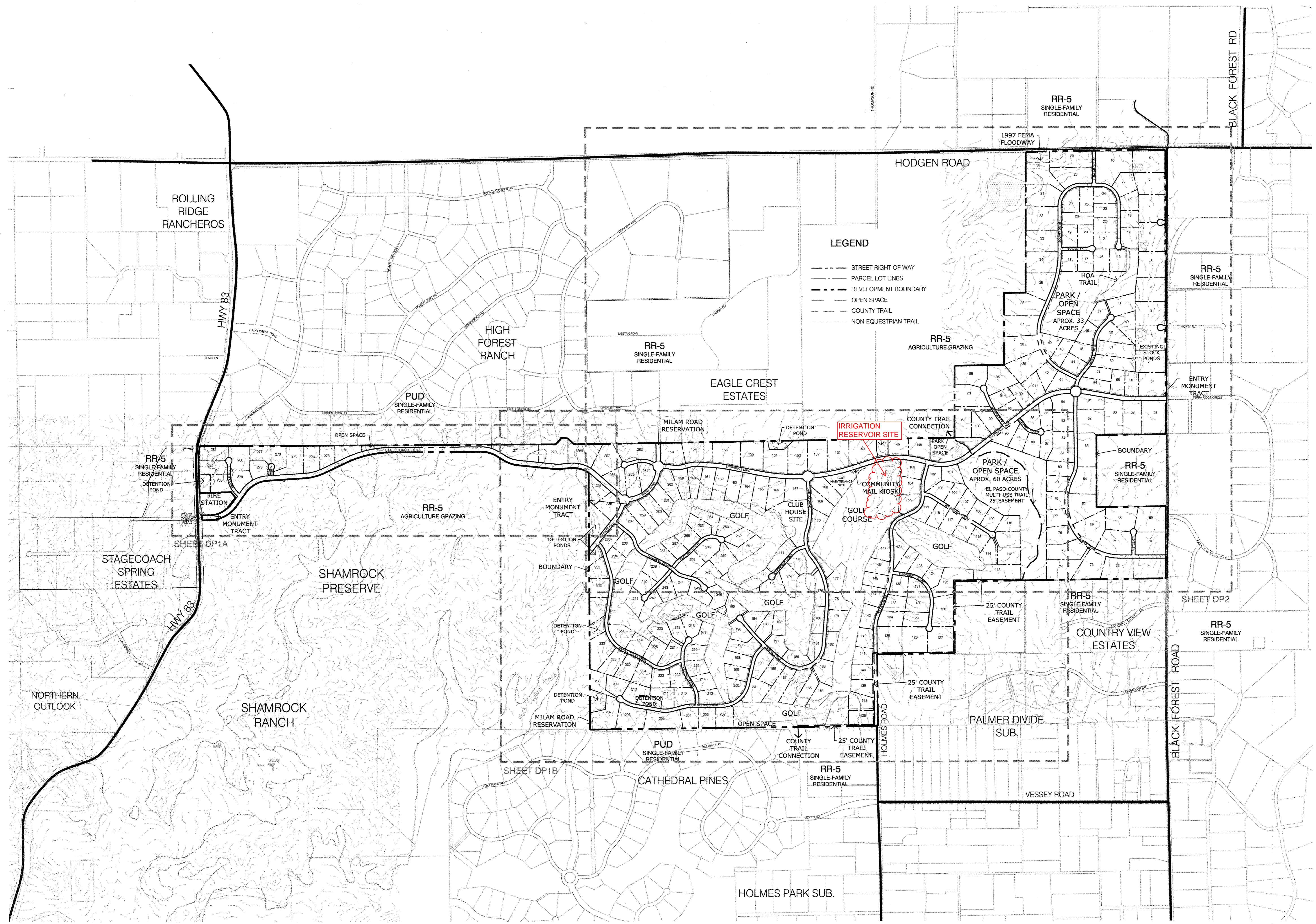
AUGUST 2018

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

Prepared by:
**CLASSIC CONSULTING ENGINEERS &
SURVEYORS**
619 N. CASCADE AVE SUITE 200
COLORADO SPRINGS CO 80903
(719) 785-0790

Job no. 1096.11
PCD File No. SF-18-001





FLYING HORSE NORTH
PLANNED UNIT DEVELOPMENT

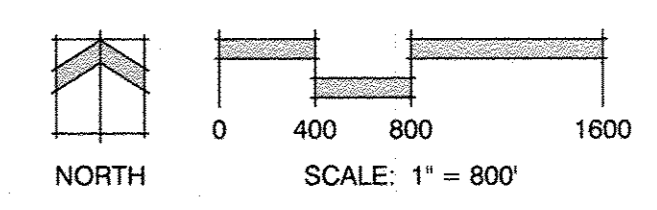
DATE: 04-18-2016
PROJECT MGR: J. MAYNARD
PREPARED BY: K. MARSHALL

DATE:	BY:	DESCRIPTION:
07-25-16	KMM	Per review comments
09-07-16	KMM	Per 2nd review comments
11-28-16	KMM	Milam Revisions

**DEVELOPMENT PLAN
OVERALL SITE**

DP
2 OF 6

FIGURE 1.2



3/22/2017 217032585

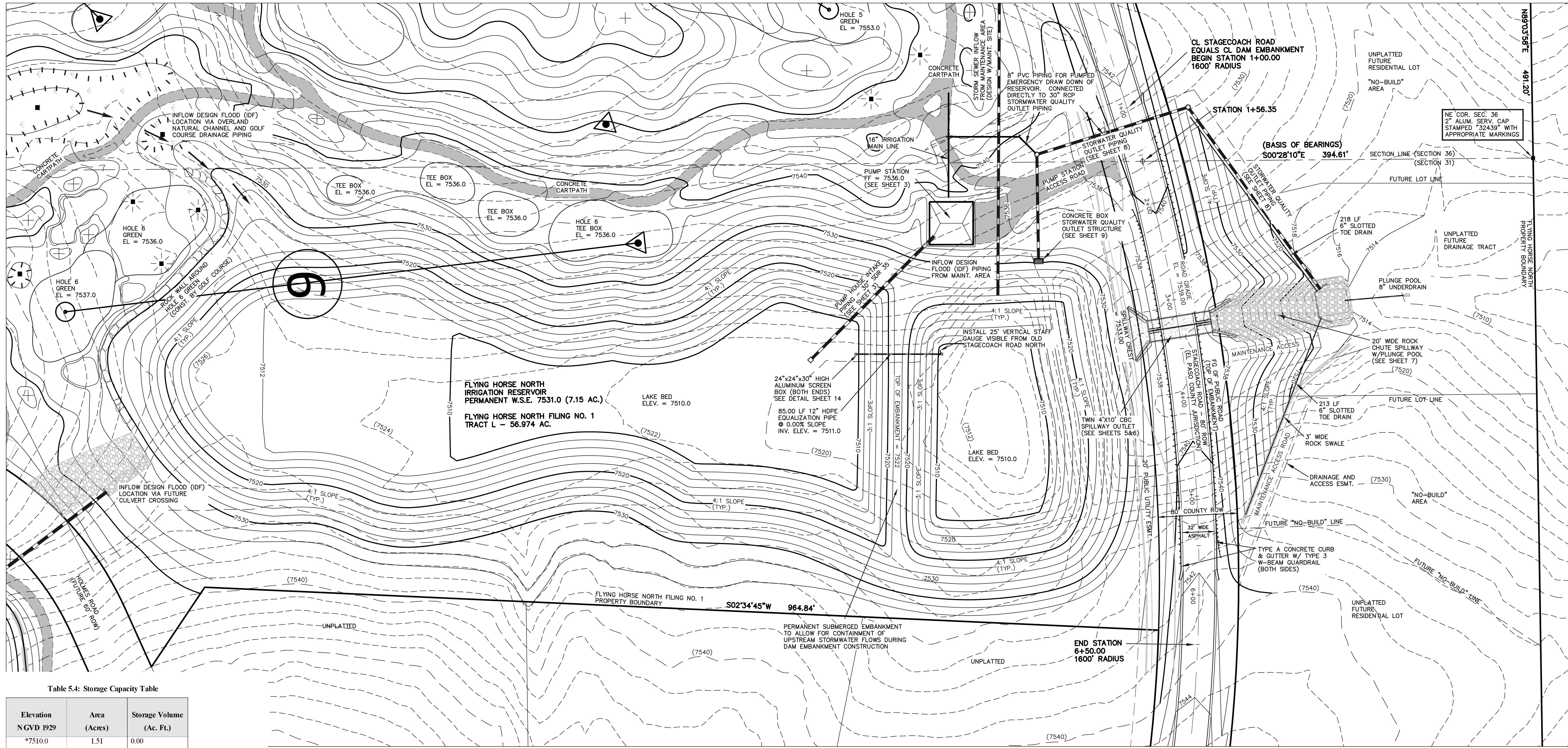


Table 5.4: Storage Capacity Table

Elevation NGVD 1929	Area (Acres)	Storage Volume (Ac. Ft.)
*7510.0	1.51	0.00
*7511.0	1.99	1.74
*7512.0	2.52	3.99
*7513.0	2.85	6.68
*7514.0	3.05	9.63
*7515.0	3.26	12.78
7516.0	3.48	16.15
7517.0	3.70	19.74
7518.0	3.93	23.56
7519.0	4.16	27.60
7520.0	4.40	31.88
7521.0	4.64	36.40
7522.0	4.88	41.16
7523.0	5.14	46.17
7524.0	5.36	51.42
7525.0	5.59	56.89
7526.0	5.84	62.61
7527.0	6.08	68.57
7528.0	6.33	74.77
7529.0	6.57	81.22
7530.0	6.81	87.91
7531.0	7.15	94.89
7532.0	7.52	102.22
7533.0	7.83	109.90
7534.0	8.37	118.00
7535.0	8.77	126.57
7536.0	9.17	135.53

*Indicates dead storage below pumping ability

Table 5.5: Reservoir Discharge Table

Elevation	Discharge (cfs) (SWQ Outlet Box)	Discharge (cfs) (Twin CBC Spillway)	Discharge (cfs) (Total)
7531.0	0.0	0.0	0.0
7532.0	13.89	0.0	13.89
7533.0	27.77	0.0	27.77
7534.0	51.31	49.05	100.36
7535.0	69.52	138.56	208.08
7536.0	74.61	254.72	329.33

Permanent WSE = 7531.0
 Top of SWQ Outlet box = 7533.0
 Spillway elevation = 7533.0

NOTES:

- TOPOGRAPHIC BASE MAPPING PRODUCED FROM AERIAL PHOTOGRAPHY PROVIDED BY NORTH AMERICAN MAPPING IN 2009. HORIZONTAL CONTROL IS BASED ON LOCAL CALIBRATION TIED TO SECTION CORNER AND VERTICAL CONTROL IS BASED ON NGVD 1929 DATUM.
- PERMANENT WSE = 7531.0
- RESERVOIR LINER INSTALLED UP TO ELEVATION 7534.0

STAFF GAUGE DETAILS:

- 12"x25"x1/2" PVC
- LASER CUT ACRYLIC NUMBERS AND HATCH MARKS LIQUID WELDED TO PVC ON 1 FT. INCREMENTS
- MOUNTED ON ALUMINUM FRAME WITH CROSS BRACKETS ANCHORED INTO SLOPE
- BASE FASTENED TO 12" PIPE
- ELEVATION DISPLAY RANGE: 7512-7535

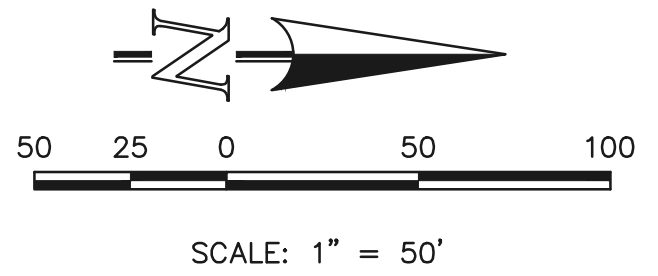


FIGURE 1.3

STATE ENGINEER'S CONSTRUCTION FILE NUMBER: C-2085

48 HOURS BEFORE YOU DIG,
 CALL UTILITY LOCATORS
811
 UTILITY NOTIFICATION CENTER OF COLORADO
 IT'S THE LAW

THE LOCATIONS OF EXISTING UNDERGROUND UTILITIES ARE SHOWN IN AN APPROXIMATE WAY ONLY. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION OF ALL EXISTING UTILITIES BEFORE COMMENCING WORK. THE CONTRACTOR SHALL BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGES WHICH MIGHT BE CAUSED BY HIS FAILURE TO EXACTLY LOCATE AND PRESERVE ANY AND ALL UNDERGROUND UTILITIES.

NO.	REVISION	DATE
1	REVISED PER STATE COMMENTS	5-14-18
2	REVISED PER COUNTY COMMENTS	7-31-18

REVIEW:
 PREPARED UNDER MY DIRECT SUPERVISION FOR AND ON BEHALF OF CLASSIC CONSULTING ENGINEERS AND SURVEYORS, LLC

MARC A. WHORTON, COLORADO P.E. #37155 DATE

FLYING HORSE NORTH IRRIGATION RESERVOIR EMBANKMENT			
SITE LAYOUT WITH GRADING			
DAM ID - 080459			
DESIGNED BY	MAW	SCALE	DATE
DRAWN BY	MAW	(H) 1" = 50'	SHEET 4 OF 14
CHECKED BY	(V) 1" = N/A	JOB NO.	1096.11

CLASSIC CONSULTING ENGINEERS & SURVEYORS

The travel time for overland flow is the estimate in time required for flow to travel from the uppermost part of a drainage basin to a defined channel or inlet of a local storm sewer system. Overland flow can be significant in small basins because a significant portion of time of concentration is due to overland flow. The velocity of overland flow can vary greatly with the surface cover and tillage characteristics. If the slope and land use of the overland flow reach are known, the travel time can be read from figure 5-2 or calculated using the following equation:

TABLE 5-1 RECOMMENDED AVERAGE RUNOFF COEFFICIENTS AND PERCENT IMPERVIOUS

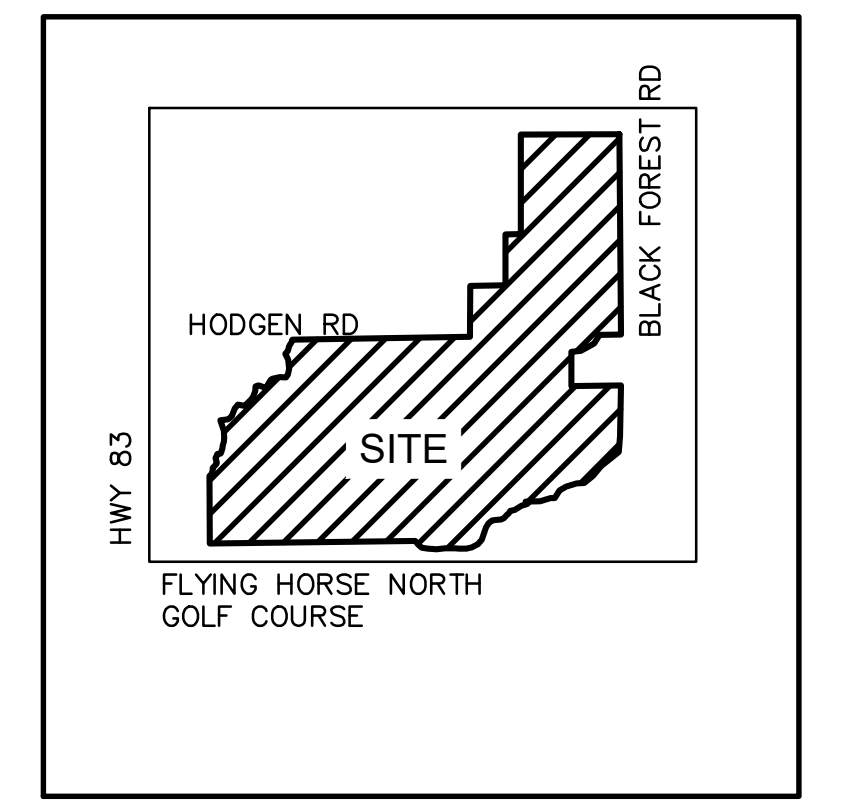
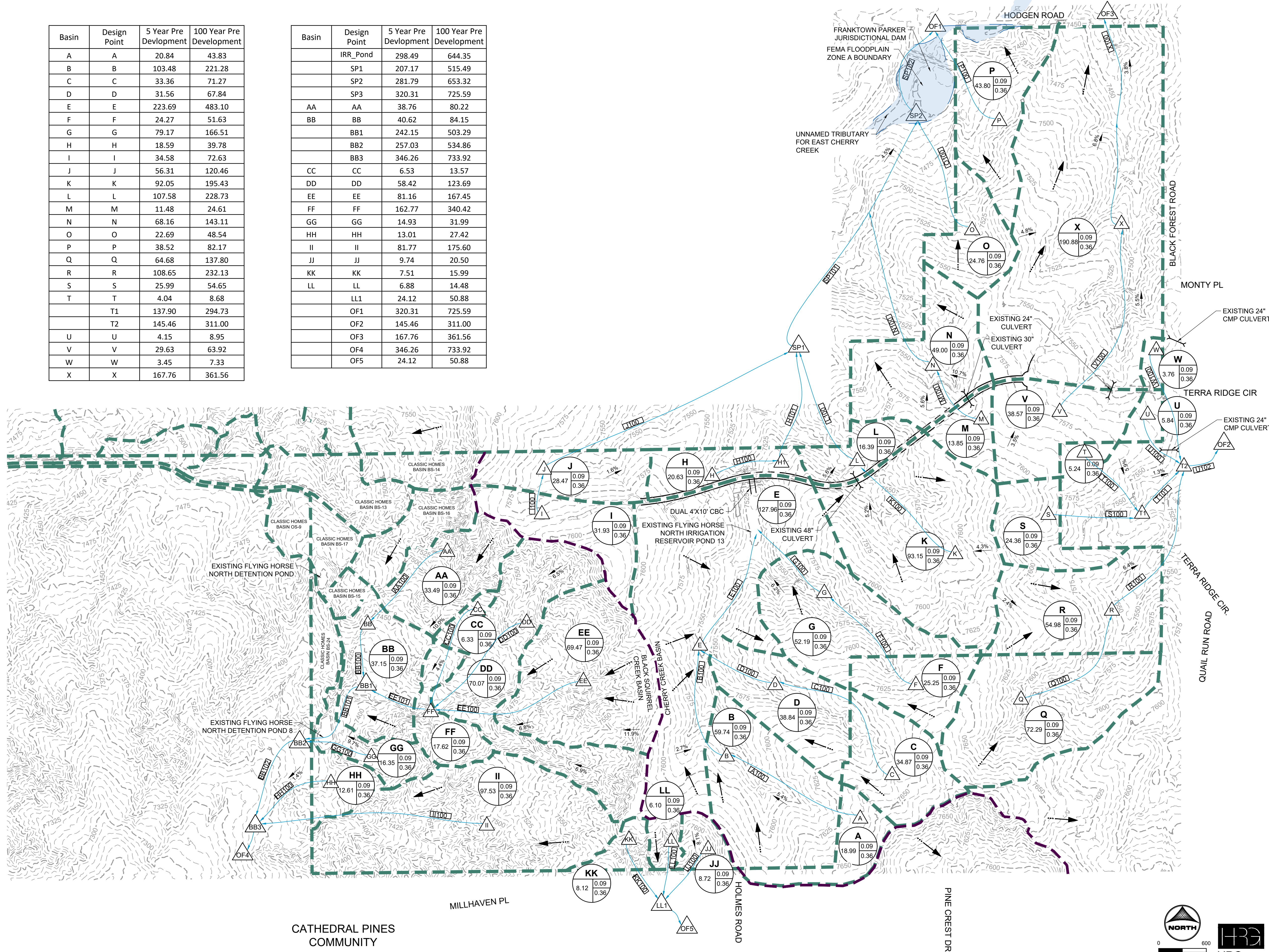
LAND USE OR SURFACE CHARACTERISTICS	PERCENT IMPERVIOUS	"C" FREQUENCY			
		10		100	
		A&B*	C&D*	A&B*	C&D*
Business					
Commercial Areas	95	0.90	0.90	0.90	0.90
Neighborhood Areas	70	0.75	0.75	0.80	0.80
Residential					
1/8 Acre or less	65	0.60	0.70	0.70	0.80
1/4 Acre	40	0.50	0.60	0.60	0.70
1/2 Acre	30	0.40	0.50	0.55	0.60
1/2 Acre	25	0.35	0.45	0.45	0.55
1 Acre	20	0.30	0.40	0.40	0.50
Industrial					
Light Areas	80	0.70	0.70	0.80	0.80
Heavy Areas	90	0.80	0.80	0.90	0.90
Parks and Cemeteries	7	0.30	0.35	0.55	0.60
Playgrounds	13	0.30	0.35	0.60	0.65
Railroad Yard Areas	40	0.50	0.55	0.60	0.65
Undeveloped Areas					
Historic Flow Analysis-Greenbelts, Agricultural	2	0.15	0.25	0.20	0.30
Pasture/Meadow	0	0.25	0.30	0.35	0.45
Forest	0	0.10	0.15	0.15	0.20
Exposed Rock	100	0.90	0.90	0.95	0.95
Offsite Flow Analysis (when land use not defined)	45	0.55	0.60	0.65	0.70
Streets					
Paved	100	0.90	0.90	0.95	0.95
Gravel	80	0.80	0.80	0.85	0.85
Drive and Walks	100	0.90	0.90	0.95	0.95
Roofs	90	0.90	0.90	0.95	0.95
Lawns	0	0.25	0.30	0.35	0.45
*Hydrologic Soil Group					



Appendix G

Basin	Design Point	5 Year Pre Development	100 Year Pre Development
A	A	20.84	43.83
B	B	103.48	221.28
C	C	33.36	71.27
D	D	31.56	67.84
E	E	223.69	483.10
F	F	24.27	51.63
G	G	79.17	166.51
H	H	18.59	39.78
I	I	34.58	72.63
J	J	56.31	120.46
K	K	92.05	195.43
L	L	107.58	228.73
M	M	11.48	24.61
N	N	68.16	143.11
O	O	22.69	48.54
P	P	38.52	82.17
Q	Q	64.68	137.80
R	R	108.65	232.13
S	S	25.99	54.65
T	T	4.04	8.68
T1	T1	137.90	294.73
T2	T2	145.46	311.00
U	U	4.15	8.95
V	V	29.63	63.92
W	W	3.45	7.33
X	X	167.76	361.56

Basin	Design Point	5 Year Pre Development	100 Year Pre Development
	IRR_Pond	298.49	644.35
	SP1	207.17	515.49
	SP2	281.79	653.32
	SP3	320.31	725.59
AA	AA	38.76	80.22
BB	BB	40.62	84.15
	BB1	242.15	503.29
	BB2	257.03	534.86
	BB3	346.26	733.92
CC	CC	6.53	13.57
DD	DD	58.42	123.69
EE	EE	81.16	167.45
FF	FF	162.77	340.42
GG	GG	14.93	31.99
HH	HH	13.01	27.42
II	II	81.77	175.60
JJ	JJ	9.74	20.50
KK	KK	7.51	15.99
LL	LL	6.88	14.48
	LL1	24.12	50.88
	OF1	320.31	725.59
	OF2	145.46	311.00
	OF3	167.76	361.56
	OF4	346.26	733.92
	OF5	24.12	50.88



LEGEND:

- PROPOSED MAJOR CONTOUR: Solid purple line
- PROPOSED MINOR CONTOUR: Dashed purple line
- EXISTING MAJOR CONTOUR: Solid blue line
- EXISTING MINOR CONTOUR: Dashed blue line
- EXISTING CULVERT: Solid black line with 'X' markers
- PROPOSED DRAINAGE CHANNEL: Solid blue line
- PROPOSED ROAD: Solid black line
- PROPERTY LINE: Dashed black line
- DIRECTIONAL FLOW ARROW: Arrow with tail
- EMERGENCY OVERFLOW ARROW: Arrow with tail and a bar across the head
- EXISTING 100-YR FLOODWAY: Dashed purple line
- EXISTING 100-YR FLOODPLAIN: Dotted purple line
- PROPOSED 100-YR FLOODPLAIN: Dotted blue line
- WATERSHED BOUNDARY: Dashed green line
- MAJOR BASIN LINE: Dashed black line
- 100YR ZONE A FLOODPLAIN: Solid blue shaded area
- PROPOSED DETENTION LOCATION: Circle with 'A' inside
- POTENTIAL WATER QUALITY LOCATION: Circle with 'WQ' inside
- SWMM CONVEYANCE ELEMENT: Square with 'SWMM' inside
- PROPOSED PEAK FLOW RATE (CFS): Circle with '850' inside
- DESIGN POINT: Triangle with 'X' inside
- PROPOSED BASIN LABEL: Circle with 'XX' inside
- BASIN DESIGNATION: Circle with 'XX' inside
- AREA (AC.): Circle with 'XX' inside
- C5: Circle with 'XX' inside
- C100: Circle with 'XX' inside

NOTES:

Job No.: 211030.01
 Prepared By: CLB
 Date: 02/21/2022

EXISTING EX1
 FIG. EX1

FLYING HORSE NORTH SKETCH PLAN

A PORTION OF SECTIONS 34, 35 AND 36 TOWNSHIP 11 SOUTH, RANGE 66 WEST, AND A PORTION OF SECTIONS 30 AND 31, TOWNSHIP 11 SOUTH, RANGE 65 WEST OF THE SIXTH PRINCIPAL MERIDIAN, EL PASO COUNTY, COLORADO

NOTES

GENERAL NOTES

- A TOTAL OF 846 DWELLING UNITS ARE PROPOSED WITHIN THE FLYING HORSE NORTH SKETCH PLAN ON APPROXIMATELY 912.6 ACRES. THE SUBMITTAL ALSO INCLUDES A LUXURY RESORT HOTEL, CASITAS AND FLATS THAT TOTAL 275 KEYS (ROOMS)/UNITS.
- CLUSTERING OF UNITS WITHIN RESIDENTIAL DISTRICTS IS PERMITTED, BUT NOT REQUIRED, SO LONG AS THE OVERALL DENSITY LIMIT IS NOT EXCEEDED. THE USE OF CLUSTERING IS ENCOURAGED TO PROMOTE COMMON OPEN SPACE, PROTECT NATURAL FEATURES, AND PROVIDE CREATIVE AND FLEXIBLE DESIGN ALTERNATIVES.
- A DENSITY TRANSFER MAY BE PERMITTED ON FLYING HORSE NORTH FOR ALL RESIDENTIAL DISTRICTS. THIS TRANSFER WOULD BE PROPOSED AT THE TIME OF REZONING AND/OR PRELIMINARY PLAN (WHERE APPROPRIATE) AND WOULD NEED TO BE REVIEWED BY STAFF TO ENSURE THAT THE OVERALL DEVELOPMENT CONCEPT IS ADHERED TO. A DENSITY TRANSFER NOT TO EXCEED TWENTY PERCENT (20%) OF THE MAXIMUM UNITS FOR EACH PARCEL IS PERMITTED. THE TRANSFERRED DENSITY SHALL MEET ALL MINIMUM REQUIREMENTS OF THE RECEIVING AREA SUCH AS LOT SIZE, SETBACKS, ETC. IN NO CASE SHALL THE OVERALL DENSITY CAP EXCEED THE TOTAL UNITS APPROVED FOR THE PROJECT.
- SPECIFIC DEVELOPMENT STANDARDS SUCH AS SETBACKS, LOT COVERAGE, BUILDING HEIGHTS AND LAND USES SHALL BE ADDRESSED WITH A SUBSEQUENT ZONING OF THE PROPERTY AT A LATER DATE. THESE STANDARDS WILL EITHER FOLLOW SPECIFIC PROPOSED PUD DEVELOPMENT PLANS OR PER COUNTY ZONING STANDARDS IF FOLLOWING "CONVENTIONAL ZONING" OF THE COUNTY.
- ALL COMMON LANDSCAPE, OPEN SPACE, PARKS, TRACTS AND DRAINAGE FACILITIES WITHIN THIS DEVELOPMENT SHALL BE OWNED AND MAINTAINED BY THE HOA (TO BE NAMED) OR FLYING HORSE NORTH METROPOLITAN DISTRICT WITH THE EXCEPTION OF THE COUNTY TRAIL AS DEPICTED ON THE SKETCH PLAN.
- ALL DETENTION PONDS AND CROSS LOT DRAINAGE DITCHES WILL BE LOCATED WITHIN DRAINAGE EASEMENTS PROVIDING ACCESS FOR MAINTENANCE TO THE FLYING HORSE NORTH METROPOLITAN DISTRICT OR HOA (TO BE NAMED).
- THERE SHALL BE NO DIRECT RESIDENTIAL LOT ACCESS TO BLACK FOREST ROAD EXCEPT FOR THE EXISTING STAGECOACH ROAD ACCESS AND POTENTIAL COMMERCIAL ACCESS.
- PARK IMPROVEMENTS PROVIDED BY THE DEVELOPER MAY BE APPLIED TO PARK LAND DEDICATION AND/OR FEES WITH REVIEW AND APPROVAL BY EL PASO COUNTY PARKS. ANY PARK IMPROVEMENTS WILL BE COORDINATED AT A LATER DATE WITH EL PASO COUNTY PARKS VIA PARK LAND AGREEMENTS.
- ALL ELECTRIC SERVICE SHALL BE PROVIDED BY MOUNTAIN VIEW ELECTRIC ASSOCIATION AND GAS TO BE PROVIDED BY BLACK HILLS ENERGY. NATURAL GAS EASEMENTS WILL BE PROVIDED AS REQUIRED.
- SITE LIGHTING, IF REQUIRED, WILL MEET THE REQUIREMENTS SET FORTH IN SECTION 6.2.3 OF EL PASO COUNTY LAND DEVELOPMENT CODE.
- THE DEVELOPER SHALL COMPLY WITH FEDERAL AND STATE LAWS, REGULATIONS, ORDINANCES, REVIEW AND PERMIT REQUIREMENTS, AN OTHER AGENCY REQUIREMENTS, IF ANY, OF APPLICABLE AGENCIES INCLUDING, BUT NOT LIMITED TO, THE COLORADO PARKS AND WILDLIFE, COLORADO DEPARTMENT OF TRANSPORTATION, U.S. ARMY CORPS OF ENGINEERS, AND THE U.S. FISH AND WILDLIFE SERVICE REGARDING THE ENDANGERED SPECIES ACT, PARTICULARLY AS IT RELATES TO ANY LISTED SPECIES.
- THE FOLLOWING DISTRICTS WILL SERVE THE PROPERTY
LEWIS-PALMER DISTRICT 38 AND ACADEMY DISTRICT 20
FIRE EMERGENCY - BLACK FOREST FIRE PROTECTION DISTRICT
EMERGENCY SERVICES - BLACK FOREST FIRE PROTECTION DISTRICT
TELECOM/FIBER - FORCE BROADBAND & COMCAST
PIKES PEAK LIBRARY DISTRICT
ELECTRICAL SERVICES - MVEA
- THE MAILBOX KIOSK WILL BE DETERMINED WITH EACH FINAL PLAT AND IN COORDINATION WITH THE U.S. POSTAL SERVICE.
- THE FIRE STATION LOCATED IN FILING 1 CAN BE RELOCATED ANYWHERE IN THE SKETCH PLAN AREA IF NEEDED. IF FIRE DEPARTMENT DETERMINES RELOCATION IS NOT NEEDED, THE LAND NEED NOT BE DEDICATED TO THEM.
- APPLICABLE PARK, SCHOOL, TRANSPORTATION, DRAINAGE, BRIDGE, AND TRAFFIC FEES SHALL BE PAID TO THE EL PASO COUNTY PLANNING AND COMMUNITY DEVELOPMENT DEPARTMENT AT THE TIME OF RECORDING ANY FINAL PLAT.
- ACCESS LOCATIONS AND ROADWAY CLASSIFICATIONS ARE CONCEPTUAL ONLY AND WILL BE DETERMINED AT THE TIME PRELIMINARY PLAN REVIEW. FINAL LOCATIONS AND CLASSIFICATIONS OF ROADWAYS WILL BE SUBJECT MORE DETAILED LAND DESIGN AND SUBDIVISION REVIEW.

FLOODPLAIN NOTES:

- PORTIONS OF THIS PROPERTY ARE LOCATED WITHIN A DESIGNATED FEMA FLOODPLAIN AS DETERMINED BY THE FEMA NATIONAL FLOOD INSURANCE PROGRAM FLOOD INSURANCE MAP NUMBERS '08041C0305G' AND '08041C0315G' WITH AN EFFECTIVE DATE OF DECEMBER 7, 2018.
- THE EXISTING FLOODPLAIN BOUNDARIES ARE INTENDED TO REMAIN AND DEVELOPMENT WILL OCCUR OUTSIDE THE FLOODPLAIN LIMITS.
- NO STRUCTURES OR SOLID FENCES ARE PERMITTED WITHIN THE DESIGNATED FLOODPLAIN AREA.

PUBLIC STREETS

- PER THE INTERGOVERNMENTAL AGREEMENT, THE CITY OF COLORADO SPRINGS WILL REQUIRE THE STREETS TO BE DESIGNED AND CONSTRUCTED TO THE CITY STANDARDS.
- SIDEWALKS OR WALKWAYS WILL BE PROVIDED ALONG ALL STREETS AND INTERIOR TO DEVELOPMENT PARCELS, PARKS AND TRAIL SYSTEMS.
- PUBLIC STREETS WITHIN THIS DEVELOPMENT SHALL PROVIDE FOR LEVELS OF VEHICULAR CIRCULATION REQUIRED BY THE TRAFFIC STUDY AND SHALL BE PAVED.
- UNTIL APPROVED BY THE COUNTY ENGINEER ALL ACCESS POINTS SHOWN ON THIS PLAN ARE CONCEPTUAL AND NON-BINDING UPON THE COUNTY APPROVAL OF THIS SKETCH PLAN AMENDMENT SHALL NOT BE INTERPRETED TO INCLUDE APPROVAL OF ANY ACCESS TO ANY PUBLIC ROADS. THE COUNTY ENGINEER SHALL APPROVE ALL ACCESSES IN ACCORDANCE WITH THE REQUIREMENTS AND PROCEDURES OF THE ENGINEERING CRITERIA MANUAL AT THE TIME OF PUD DEVELOPMENT PLAN AND/OR SUBDIVISION SUBMITTAL AND REVIEW.

PRIVATE STREETS

- ANY FUTURE PRIVATE STREETS, IF PROPOSED, WILL BE PRIVATELY OWNED AND MAINTAINED BY THE FLYING HORSE NORTH METROPOLITAN DISTRICT NO. 1 OR HOA (HOMEOWNERS ASSOCIATION-TO BE NAMED).

PHASING PLAN:

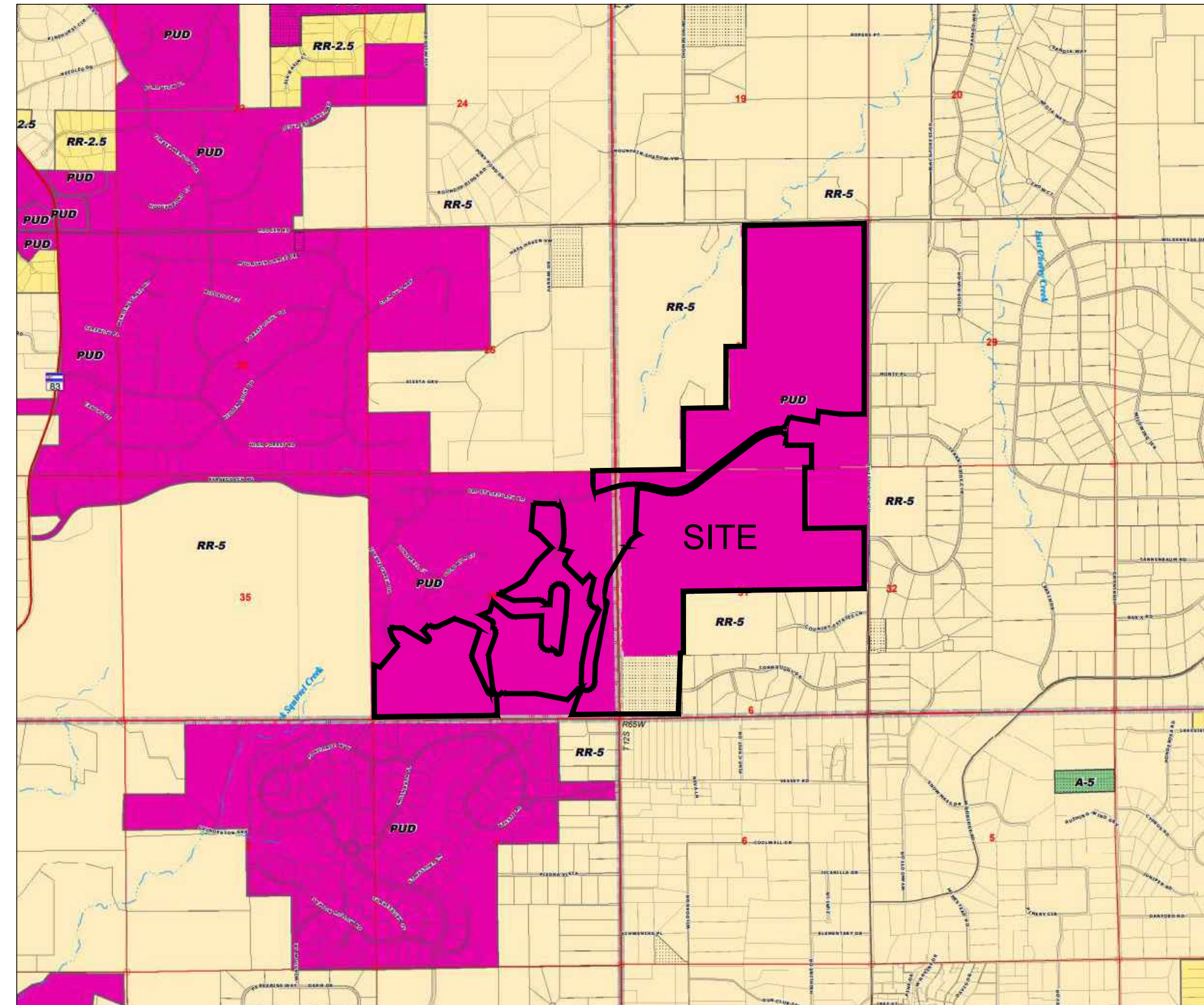
- THE FLYING HORSE NORTH PROJECT WILL BE DEVELOPED IN MULTIPLE PHASES AND PLATTED IN MULTIPLE FILINGS, WHICH HAVE YET TO BE DETERMINED. THE SEQUENCE OF CONSTRUCTION AND DEVELOPMENT IS NOT DEPENDENT UPON UTILITIES OR INFRASTRUCTURE.

GEOLOGIC HAZARDS DISCLOSURE STATEMENT:

- AREAS OF PROPOSED SUBDIVISION HAVE BEEN FOUND TO BE IMPACTED BY GEOLOGICAL CONDITIONS, INCLUDING SEASONAL AND POTENTIALLY SEASONAL SHALLOW GROUND WATER, ARTIFICIAL FILL, LOOSE AND EXPANSIVE SOILS AND SLOPE STABILITY. THESE CONDITIONS CAN BE MITIGATED BY AVOIDANCE, RE-GRADING, PROPER ENGINEERING DESIGN, AND CONSTRUCTION TECHNIQUES. A MAP OF THE HAZARD AREAS AND PROPOSED MITIGATION MEASURES CAN BE FOUND IN THE GEOLOGICAL HAZARD STUDY AND WASTEWATER STUDY PREPARED BY ENTECH ENGINEERING INC., DATED JANUARY 15, 2019. FURTHER STUDIES OF THESE CONDITIONS SHALL BE PROVIDED WITH EITHER PRELIMINARY OR FINAL PLANS.

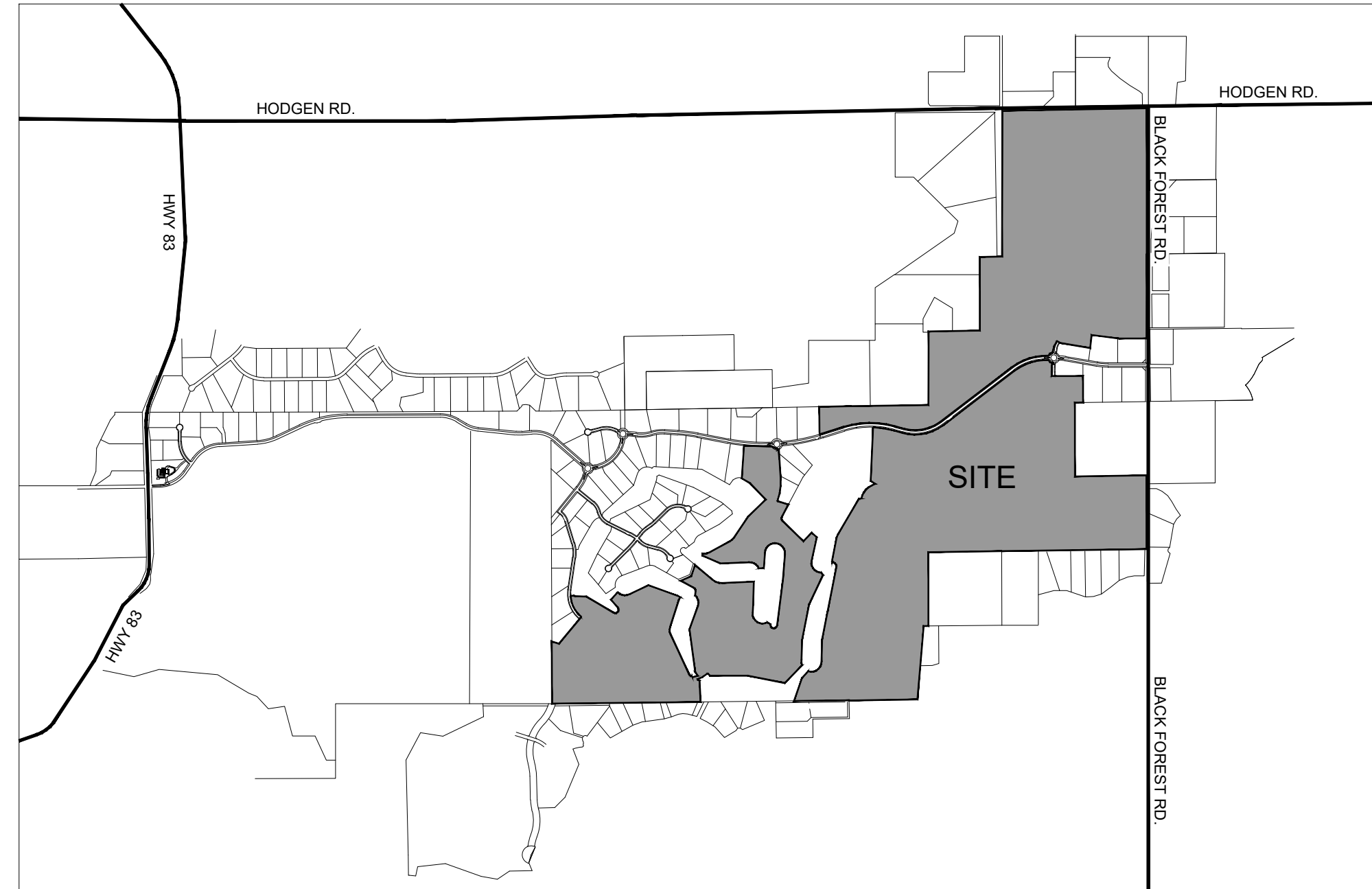
ZONING MAP

SCALE = N.T.S



VICINITY MAP

SCALE = N.T.S



SHEET INDEX

- SHEET 1 OF 5: COVER SHEET
- SHEET 2 OF 5: SKETCH PLAN
- SHEET 3 OF 5: ADJACENT PROPERTY MAP
- SHEET 4 OF 5: ADJACENT PROPERTY OWNERS
- SHEET 5 OF 5: ADJACENT PROPERTY OWNERS

OWNER/DEVELOPER:

FLYING HORSE DEVELOPMENT LLC
2138 FLYING HORSE CLUB DRIVE
COLORADO SPRINGS, CO 80921

PLANNER/LANDSCAPE ARCHITECT:

HRGREEN DEVELOPMENT, LLC
1975 RESEARCH PARKWAY SUITE 230
COLORADO SPRINGS, CO 80920
720.602.4941

CIVIL ENGINEER:

HRGREEN DEVELOPMENT, LLC
1975 RESEARCH PARKWAY SUITE 230
COLORADO SPRINGS, CO 80920
720.602.4965

ECOLOGIST:

BRISTLECONE ECOLOGY
2023 W. SCOTT PLACE
DENVER, CO 80211
971.237.3906

TRANSPORTATION CONSULTANTS:

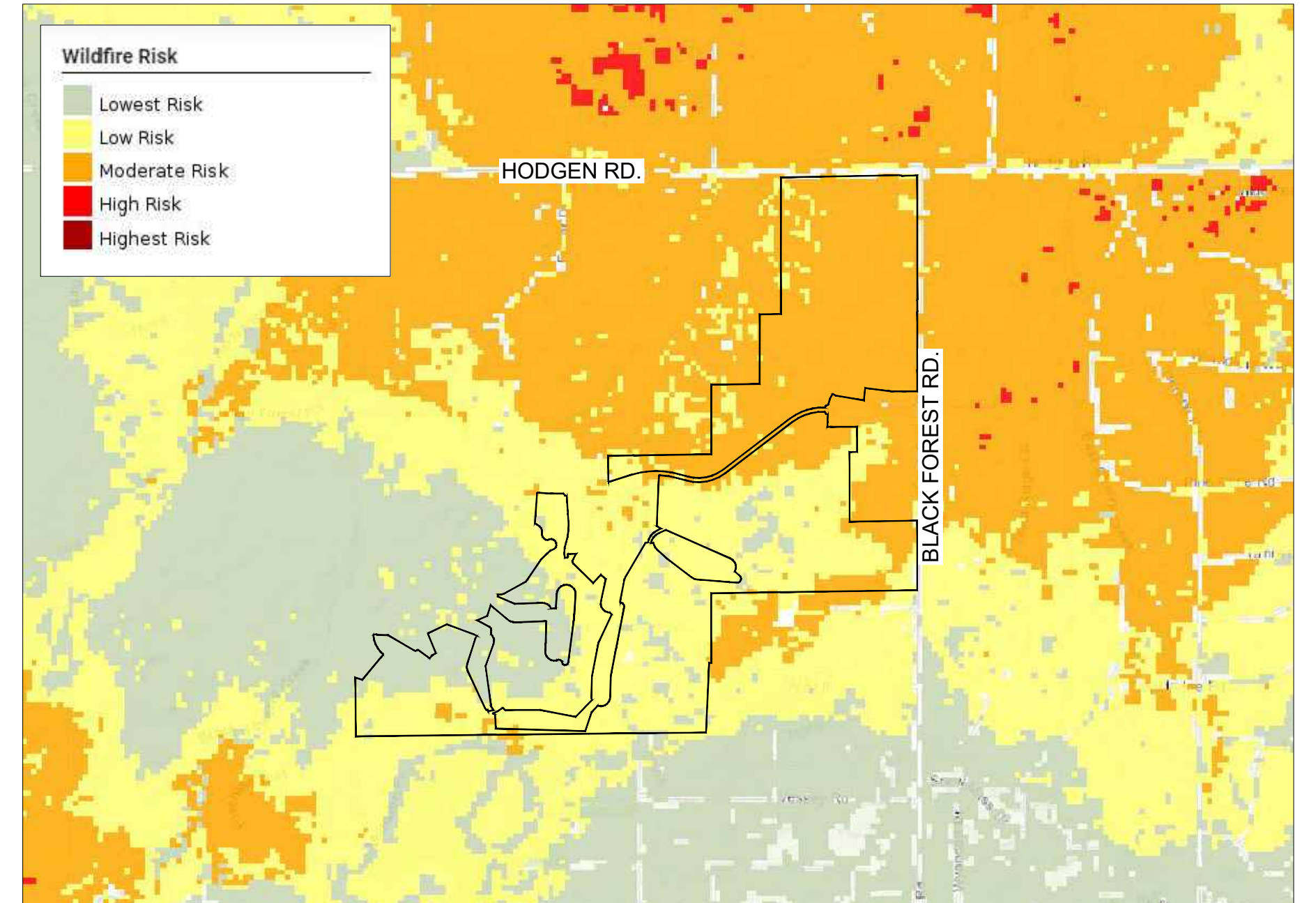
SM ROCHA, LLC
DENVER, CO 80211
303.458.9798

SITE DATA

EXISTING LAND USE:	VACANT
EXISTING ZONING:	PUD & RR-5
SITE ACREAGE:	912.6 AC
MAXIMUM NUMBER OF RESIDENTIAL UNITS:	846
MAXIMUM GROSS DENSITY FOR RESIDENTIAL UNITS:	0.93 DU/AC
TOTAL AREAS (SEE LAND USE CHART ON SHEET 2)	
RESIDENTIAL:	853.8 AC
ESTATE LOTS (5 ACRES)	118.3 AC
ESTATE LOTS (2.5 ACRES)	152.7 AC
LOW DENSITY	332.9 AC
MEDIUM DENSITY	46.0 AC
ESTIMATED OPEN SPACE	203.9 AC
HOTEL/CASITAS/FLATS	32.2 AC
GOLF CLUB, RESTAURANT/BAR, GOLF AMENITIES (HOTEL)	11.0 AC
ESTATE CLUBHOUSE (HOTEL)	2.4 AC
COMMERCIAL	9.1 AC
FITNESS CENTER	4.1 AC

WILDFIRE RISK MAP

SCALE = N.T.S



COUNTY FILE NUMBER: SKP223

DRAWN BY: JAG JOB DATE: 3/1/2022
APPROVED: PLS JOB NUMBER: 211030
CAD DATE: 9/15/2022
CAD FILE: J:\2021\211030\CAD\Drawings\CIS\Sketch-Plan\COVER-SHEET

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

NO.	DATE	BY	REVISION DESCRIPTION



FLYING HORSE NORTH DEVELOPMENT, LLC.
EL PASO COUNTY, COLORADO

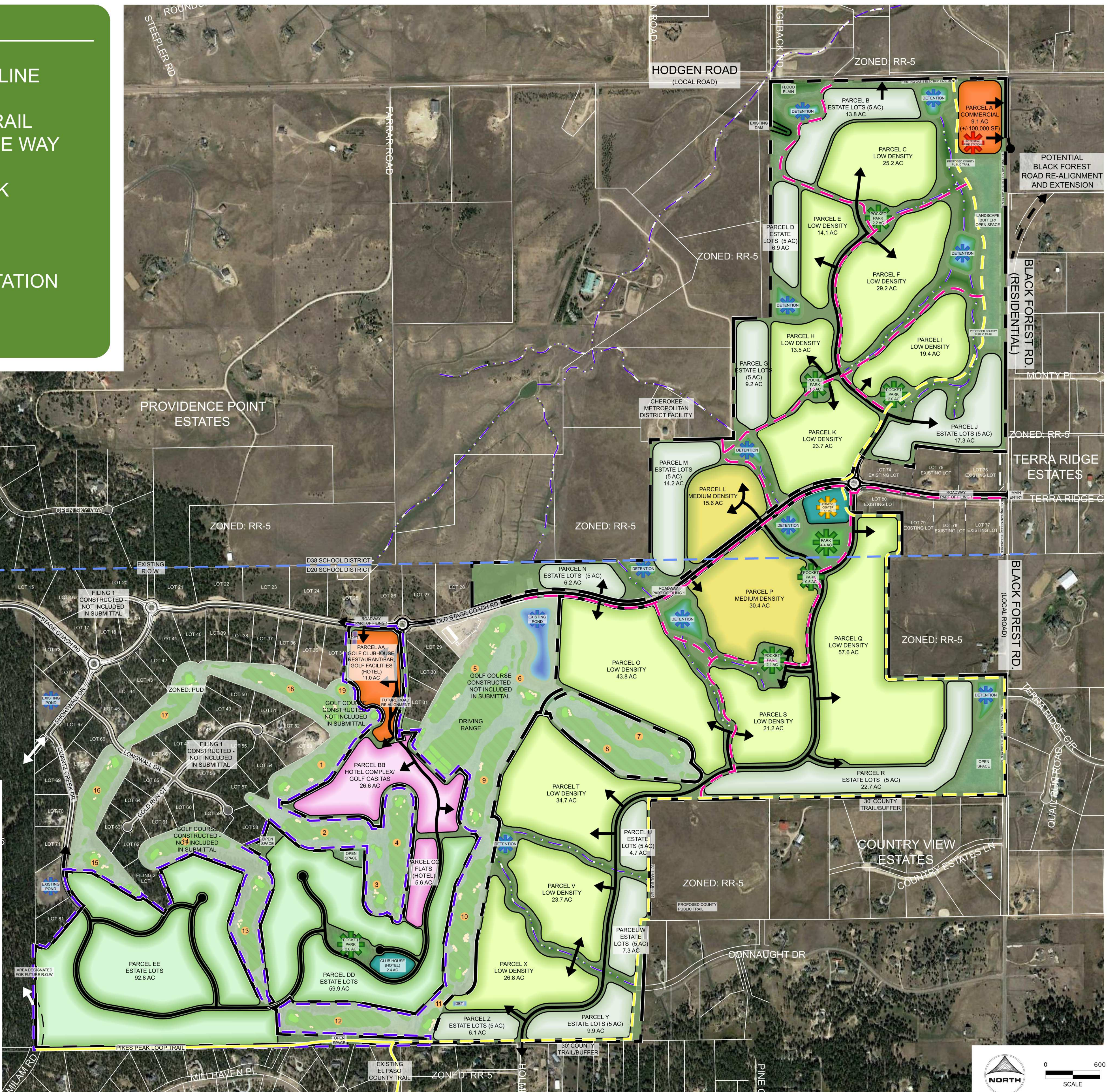
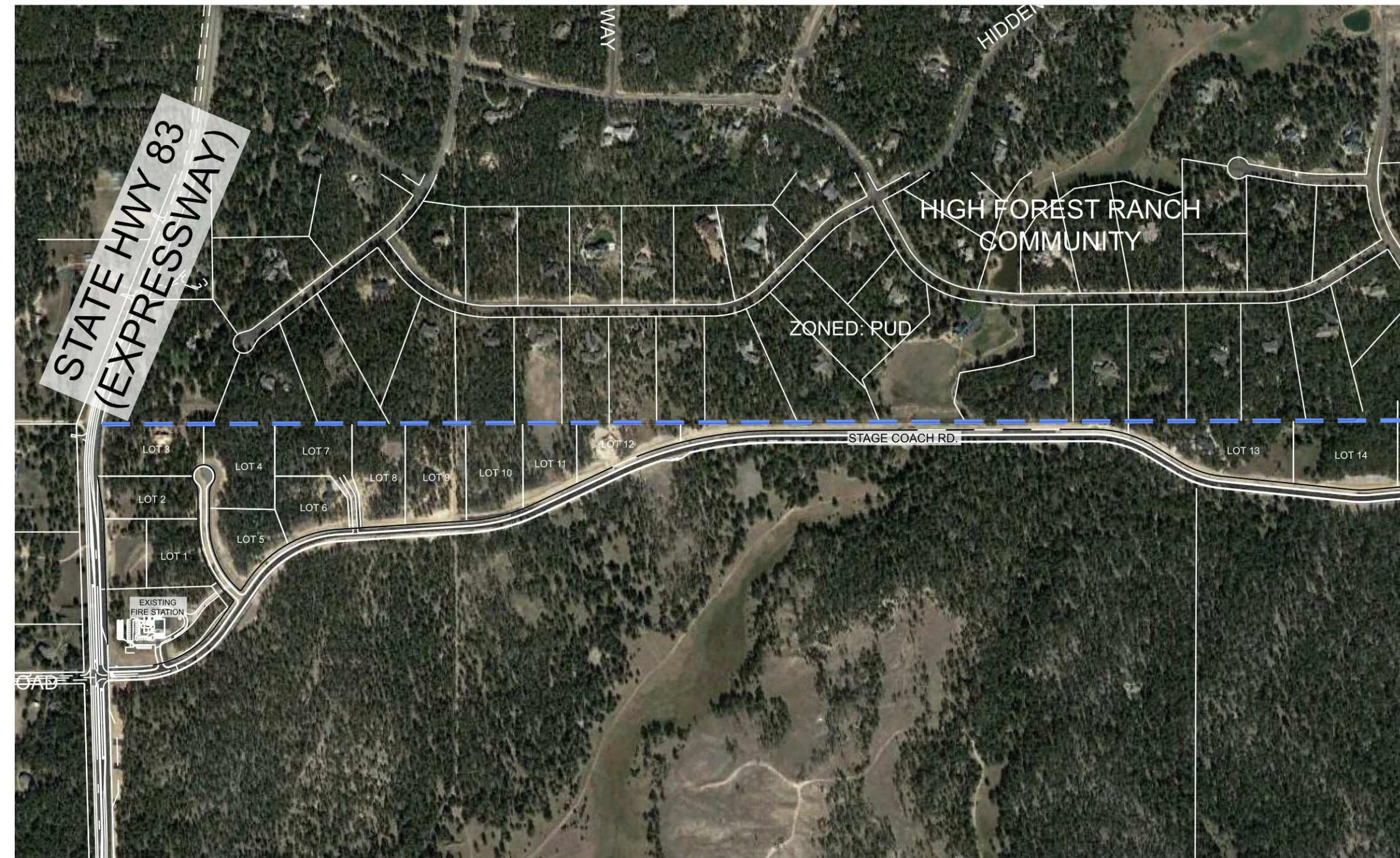
FLYING HORSE NORTH SKETCH PLAN
COVER SHEET

SHEET SP.1
1

FLYING HORSE NORTH SKETCH PLAN

LEGEND

- ESTATE LOTS (5 AC)
- ESTATE LOTS (2.5 AC)
- LOW DENSITY
- MEDIUM DENSITY
- COMMERCIAL
- GOLF CLUB, FITNESS CENTER, RESTAURANT/BAR (HOTEL)
- HOTEL COMPLEX
- CLUBHOUSE
- ROADWAY
- DETENTION
- SITE BOUNDARY
- HOTEL PARCELS
- SCHOOL DISTRICT LINE
- FHN TRAIL
- PUBLIC COUNTY TRAIL
- EXISTING DRAINAGE WAY
- PARK/POCKET PARK
- FITNESS CENTER
- POTENTIAL FIRE STATION
- DETENTION



LAND USE SUMMARY				
LAND USE CATEGORY	ACREAGE	ACREAGE PERCENTAGE	DU/AC	UNITS
GROSS RESIDENTIAL ACREAGE (+/-)				
ESTATE LOTS (5 ACRES)	118.3 AC.	13.0%	0.225	27
ESTATE LOTS (2.5 ACRES)	152.7 AC.	16.7%	0.32	49
LOW DENSITY RESIDENTIAL	332.9 AC.	36.5%	1.9	632
MEDIUM DENSITY RESIDENTIAL	46.0 AC.	5.0%	3.0	138
ESTIMATED OPEN SPACE	203.9 AC.	22.3%		
GROSS RESIDENTIAL SUB-TOTAL	853.8 AC.			846
HOTEL/COMMERCIAL ACREAGE (+/-)				
HOTEL ROOMS/CASITAS/FLATS	32.2 AC.	3.5%		275
GOLF CLUB, RESTAURANT/BAR, GOLF AMENITIES (HOTEL)	11.0 AC.	1.2%		
ESTATE CLUBHOUSE (HOTEL)	2.4 AC.	0.3%		
COMMERCIAL	9.1 AC.	1.0%		
FITNESS CENTER	4.1 AC.	0.4%		
TOTAL	912.6 AC	100.0%		

NOTE - OPEN SPACE INCLUDES: PARKS, POCKET PARKS, DETENTION, DRAINAGE CORRIDORS, GENERAL OPEN SPACE, EASEMENTS AND LANDSCAPE BUFFERS.

HR GREEN Xrefs: EX:Topo; EX:Alts; wfp-LARCH; D101; EX:Parcels

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 APPROVED: PLS JOB NUMBER: 211030
 CAD DATE: 07/01/2022
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BAR IS ONE INCH ON OFFICIAL DRAWINGS.
 IF NOT ONE INCH, ADJUST SCALE ACCORDINGLY.

NO.	DATE	BY	REVISION DESCRIPTION

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FLYING HORSE NORTH DEVELOPMENT, LLC.
 EL PASO COUNTY, COLORADO

FLYING HORSE NORTH SKETCH PLAN
 SKETCH PLAN DRAWING

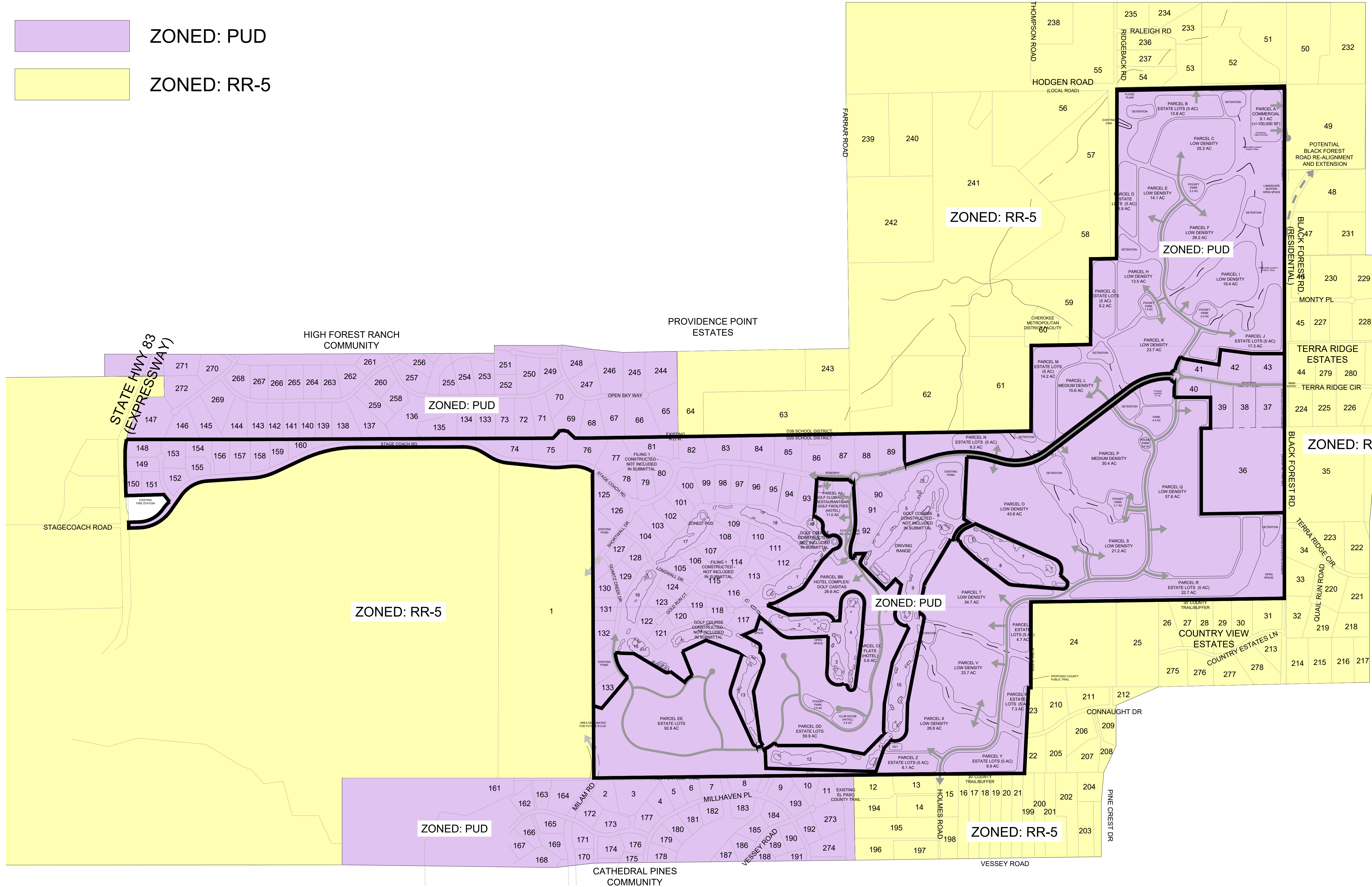
SHEET SP.2 2

COUNTY FILE NUMBER: SKP223

FLYING HORSE NORTH SKETCH PLAN

LEGEND

- ZONED: PUD
- ZONED: RR-5



COUNTY FILE NUMBER: SKP223

DRAWN BY: JAG JOB DATE: 3/1/2022 BAR IS ONE INCH ON OFFICIAL DRAWINGS.
 APPROVED: PLS JOB NUMBER: 211030 0" = 1" IF NOT ONE INCH, ADJUST SCALE ACCORDINGLY.
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NO.	DATE	BY	REVISION DESCRIPTION



FLYING HORSE NORTH DEVELOPMENT, LLC.
 EL PASO COUNTY, COLORADO

FLYING HORSE NORTH SKETCH PLAN
 ADJACENT PROPERTY DATA MAP

SHEET SP.3 3

FLYING HORSE NORTH SKETCH PLAN

1. SHAMROCK SS LLC ZONING - RR-5 15555 HWY 83 COLORADO SPRINGS, CO	19. RUPP JERRREY D ZONED - RR-5 5970 VESSEY ROAD COLORADO SPRINGS, CO	37. DERKSEN PROPERTIES LLC ZONED - PUD 6755 OLD STAGECOACH ROAD COLORADO SPRINGS, CO	55. NAVARETTE JEANINE A ZONED - RR-5 6280 HODGEN ROAD COLORADO SPRINGS, CO	72. JOHNSON LIVING TRUST ZONED - PUD 4841 HIGH FOREST ROAD COLORADO SPRINGS, CO	90. PECK MICHAEL S ZONED - PUD 5555 OLD STAGECOACH ROAD COLORADO SPRINGS, CO	108. HENDRICKS JAMES ZONED - PUD 5202 GOLD RUN COURT COLORADO SPRINGS, CO	126. HOWARTH WILLIAM ZONED - PUD 15290 SHORTWALL DRIVE COLORADO SPRINGS, CO	144. DESAUTELS BRUCE T ZONED - PUD 4661 HIDDEN ROCK ROAD COLORADO SPRINGS, CO
2. BRI J FAMILY TRUST ZONED - PUD 4820 FOXCHASE WAY COLORADO SPRINGS, CO	20. LITTLETON STANLEY ZONED - RR-5 6010 VESSEY ROAD COLORADO SPRINGS, CO	38. NGUYEN LINH T ZONED - PUD 6715 OLD STAGECOACH ROAD COLORADO SPRINGS, CO	56. ANDREWS SCOTT W ZONED - RR-5 HODGEN ROAD COLORADO SPRINGS, CO	73. RAMIREZ MELODY B ZONED - PUD 4781 HIGH FOREST ROAD COLORADO SPRINGS, CO	91. RENNER LLC ZONED - PUD 15331 ALLEN RANCH ROAD COLORADO SPRINGS, CO	109. C&C LIVING TRUST ZONED - PUD 5232 GOLD RUN COURT COLORADO SPRINGS, CO	127. GERBER JOSEPH DAVID ZONED - PUD 15262 SHORTWALL DRIVE COLORADO SPRINGS, CO	145. HOUSE JAMIE GLEN ZONED - PUD 15575 WINDING TRAIL ROAD COLORADO SPRINGS, CO
3. PIASECKI NANCY L REVOC TRUST ZONED - PUD 4940 FOXCHASE WAY COLORADO SPRINGS, CO	21. SWANSON BRECK C ZONED - RR-5 6030 VESSEY ROAD COLORADO SPRINGS, CO	39. MONACO57 LIVING TRUST ZONED - PUD 6675 OLD STAGECOACH ROAD COLORADO SPRINGS, CO	57. DEIM CONNIE ZONED - RR-5 SUNDANCE RANCH LANE COLORADO SPRINGS, CO	74. FOWLER NORMAN W ZONED - PUD 4670 STAGECOACH ROAD COLORADO SPRINGS, CO	92. BOOGAARD RYAN ZONED - PUD 15271 ALLEN RANCH ROAD COLORADO SPRINGS, CO	110. ALBRIGHT MARK PHILLIP ZONED - PUD 5262 GOLD RUN COURT COLORADO SPRINGS, CO	128. COFFEY LAVANSON C III ZONED - PUD 15192 SHORTWALL DRIVE COLORADO SPRINGS, CO	146. MATALIUS ANDREW J III ZONED - PUD 15525 WINDING TRAIL ROAD COLORADO SPRINGS, CO
4. BRINGARD FAMILY LICING TRUST ZONED - PUD 14465 MILLHAVEN PLACE COLORADO SPRINGS, CO	22. HOOKS GROUP LP ZONED - RR-5 6005 CONNAUGHT DRIVE COLORADO SPRINGS, CO	40. ST HENRYS LLC ZONED - PUD 6595 OLD STAGECOACH ROAD COLORADO SPRINGS, CO	58. BR&C INC ZONED - RR-5 30-11-65 COLORADO SPRINGS, CO	75. OLSON TYRONE L ZONED - PUD 4760 STAGECOACH ROAD COLORADO SPRINGS, CO	93. ALEXANDER SCOTT E ZONED - PUD 5395 OLD STAGECOACH ROAD COLORADO SPRINGS, CO	111. VIJESIS TRUST ZONED - PUD 5292 GOLD RUN COURT COLORADO SPRINGS, CO	129. ST AUBYN JARED ZONED - PUD 15233 QUARTZ CREEK DRIVE COLORADO SPRINGS, CO	147. WATSON RANDY ZONED - PUD 15520 WINDING TRAIL ROAD COLORADO SPRINGS, CO
5. ALLAN NEAL A ZONED - PUD 14425 MILLHAVEN PLACE COLORADO SPRINGS, CO	23. MCILRATH WILLIAM F TRUSTEE ZONED - RR-5 6010 CONNAUGHT DRIVE COLORADO SPRINGS, CO	41. SMITH AARON ZONED - PUD 6590 OLD STAGECOACH ROAD COLORADO SPRINGS, CO	59. BR&C INC ZONED - RR-5 30-11-65 COLORADO SPRINGS, CO	76. JONES CHRISTOPHER P ZONED - PUD 4850 STAGECOACH ROAD COLORADO SPRINGS, CO	94. CLAWSON MATTHEW R ZONED - PUD 5355 OLD STAGECOACH ROAD COLORADO SPRINGS, CO	112. SHOPTHUGH GLENN MARK ZONED - PUD 5261 GOLD RUN COURT COLORADO SPRINGS, CO	130. MOMBER SIMON R ZONED - PUD 15232 QUARTZ CREEK DRIVE COLORADO SPRINGS, CO	148. MARSHALL KARLYE ZONED - PUD 15480 BILLINGS COURT COLORADO SPRINGS, CO
6. ALEX & AUTUMM SIMPSON ZONED - PUD 14385 MILLHAVEN PLACE COLORADO SPRINGS, CO	24. WAY MARGARET E ZONED - RR-5 14820 BLACK FOREST ROAD COLORADO SPRINGS, CO	42. HARRIS GEORGE D ZONED - PUD 6670 OLD STAGECOACH ROAD COLORADO SPRINGS, CO	60. CHEROKEE METROPOLITAN DISTRICT ZONED - RR-5 30-11-65 COLORADO SPRINGS, CO	77. WALTERS MICHAEL A ZONED - PUD 4910 STAGECOACH ROAD COLORADO SPRINGS, CO	95. PLAISTOWE NORMAN H ZONED - PUD 5315 OLD STAGECOACH ROAD COLORADO SPRINGS, CO	113. VILLAGREE LLC ZONED - PUD 5231 GOLD RUN COURT COLORADO SPRINGS, CO	131. SHABE ERIC M ZONED - PUD 15182 QUARTZ CREEK DRIVE COLORADO SPRINGS, CO	149. VANCE ERZA G ZONED - PUD 15450 BILLINGS COURT COLORADO SPRINGS, CO
7. MAITHILI VENKATACHALLAM ZONED - PUD 14345 MILLHAVEN PLACE COLORADO SPRINGS, CO	25. ABELL LIVING TRUST ZONED - RR-5 6620 COUNTRY ESTATES LANE COLORADO SPRINGS, CO	43. MCCGRATH DONALD T ZONED - PUD 6750 OLD STAGECOACH ROAD COLORADO SPRINGS, CO	61. SUNDANCE RANCH OF BLACK FOREST ZONED - RR-5 HODGEN ROAD COLORADO SPRINGS, CO	78. YOUNG MICHAEL J ZONED - PUD 4915 STAGECOACH ROAD COLORADO SPRINGS, CO	96. RAMPART ENTERPRISES INC ZONED - PUD 5235 OLD STAGECOACH ROAD COLORADO SPRINGS, CO	114. S&J TRUST ZONED - PUD 5201 GOLD RUN COURT COLORADO SPRINGS, CO	132. ZACHAR MICHAEL R ZONED - PUD 15132 QUARTZ CREEK DRIVE COLORADO SPRINGS, CO	150. PRI #2 LLC ZONED - PUD HIGHWAY 83 COLORADO SPRINGS, CO
8. DULANEY KIMBERLY L ZONED - PUD 14325 MILLHAVEN PLACE COLORADO SPRINGS, CO	26. HERRON PATRICK J ZONED - RR-5 6650 COUNTRY ESTATES LANE COLORADO SPRINGS, CO	44. MIKUSKA ERIC ZONED - RR-5 15645 TERRA RIDGE CIRCLE COLORADO SPRINGS, CO	62. SUNDANCE RANCH OF BLACK FOREST ZONED - RR-5 HODGEN ROAD COLORADO SPRINGS, CO	79. DAY GREGORY ZONED - PUD 4955 OLD STAGECOACH ROAD COLORADO SPRINGS, CO	97. KELLY J PHELAN TRUST ZONED - PUD 5155 OLD STAGECOACH ROAD COLORADO SPRINGS, CO	115. CHAVEZ XAVIER D ZONED - PUD 5141 GOLD RUN COURT COLORADO SPRINGS, CO	133. HARVEY SETH A ZONED - PUD 15032 QUARTZ CREEK DRIVE COLORADO SPRINGS, CO	151. MCKENZIE J THOMAS ZONED - PUD 15420 BILLINGS COURT COLORADO SPRINGS, CO
9. SMITH PAUL R ZONED - PUD 14265 MILLHAVEN PLACE COLORADO SPRINGS, CO	27. ABELL LIVING TRUST ZONED - RR-5 6620 COUNTRY ESTATES LANE COLORADO SPRINGS, CO	45. GARD DIANA M ZONED - RR-5 6835 MONTY PLACE COLORADO SPRINGS, CO	63. SHELL JAMES R II ZONED - RR-5 15550 FARRAR ROAD COLORADO SPRINGS, CO	80. RZONCA THADDEUS ZONED - PUD 4995 OLD STAGECOACH ROAD COLORADO SPRINGS, CO	98. WINGO JAMES D ZONED - PUD 5115 OLD STAGECOACH ROAD COLORADO SPRINGS, CO	116. DALY FAMILY TRUST ZONED - PUD 14911 LONGWALL DRIVE COLORADO SPRINGS, CO	134. PITTS JOHN ZONED - PUD 4661 HIGH FOREST ROAD COLORADO SPRINGS, CO	152. JONE LUCAS ZONED - PUD 15419 BILLINGS COURT COLORADO SPRINGS, CO
10. ANDERSON MATTHEW P ZONED - PUD 5025 VESSEY ROAD COLORADO SPRINGS, CO	28. COPPOCK AARON O ZONED - RR-5 6680 COUNTRY ESTATES LANE COLORADO SPRINGS, CO	46. FRANKOVIS JESSE J ZONED - RR-5 6840 MONTY PLACE COLORADO SPRINGS, CO	64. SHELL JAMES R II ZONED - RR-5 15550 FARRAR ROAD COLORADO SPRINGS, CO	81. SIDWELL DUSTIN JEFFREY ZONED - PUD 4990 OLD STAGECOACH ROAD COLORADO SPRINGS, CO	99. KIM MICHAEL SANG-HAK ZONED - PUD 5075 OLD STAGECOACH ROAD COLORADO SPRINGS, CO	117. STIMPLE FAMILY LLLP ZONED - PUD 14842 LONGWALL DRIVE COLORADO SPRINGS, CO	135. LAVEZZO NICHOLAS J ZONED - PUD 1601 HIGH FOREST ROAD COLORADO SPRINGS, CO	153. ROGER WILLIAM T ZONED - PUD 15479 BILLINGS COURT COLORADO SPRINGS, CO
11. ESPENLAUB ECTON ZONED - PUD 4985 VESSEY ROAD COLORADO SPRINGS, CO	29. MACEDO JUAN H LOMEIL ZONED - RR-5 6710 COUNTRY ESTATES LANE COLORADO SPRINGS, CO	47. OLIVAS SOCORRO J ZONED - RR-5 6905 ALPACA HEIGHTS COLORADO SPRINGS, CO	65. BREWER GEORGE F II ZONED - PUD 15501 OPEN SKY WAY COLORADO SPRINGS, CO	82. SPARKS DUSTIN R ZONED - PUD 5070 OLD STAGECOACH ROAD COLORADO SPRINGS, CO	100. TEUSCHER KURT ZONED - PUD 5035 OLD STAGECOACH ROAD COLORADO SPRINGS, CO	118. CREPS DARREL E III ZONED - PUD 14912 LONGWALL DRIVE COLORADO SPRINGS, CO	136. HIGH FOREST RANCH HOMEOWNERS ZONED - PUD 4541 HIGH FOREST ROAD COLORADO SPRINGS, CO	154. DOMBROWSKI MICHAEL J ZONED - PUD 3680 STAGECOACH ROAD COLORADO SPRINGS, CO
12. DILLINGHAM MICHAEL V ZONED - RR-5 14498 HOLMES ROAD COLORADO SPRINGS, CO	30. SOMBRIC WAYNE S ZONED - RR-5 6740 COUNTRY ESTATES LANE COLORADO SPRINGS, CO	48. HILL DOUGLAS E ZONED - RR-5 6910 ALPACA HEIGHTS COLORADO SPRINGS, CO	66. MONTGOMERY MONTIE C ZONED - PUD 15547 OPEN SKY WAY COLORADO SPRINGS, CO	83. SPILLERS STEVEN HOWARD ZONED - PUD 5150 OLD STAGECOACH ROAD COLORADO SPRINGS, CO	101. DOWNS BRADLEY JAMES ZONED - PUD 55305 OLD STAGECOACH ROAD COLORADO SPRINGS, CO	119. CAIN JASON ZONED - PUD 14982 LONGWALL DRIVE COLORADO SPRINGS, CO	137. SALGADO PAUL R ZONED - PUD 4415 HIDDEN ROCK ROAD COLORADO SPRINGS, CO	155. ROBIN SCOTT BROWN LIVING TRUST ZONED - PUD 3590 STAGECOACH ROAD COLORADO SPRINGS, CO
13. THOMAS JOHN K ZONED - RR-5 14490 HOLMES ROAD COLORADO SPRINGS, CO	31. HOPSON SEAN ZONED - RR-5 6770 COUNTRY ESTATES LANE COLORADO SPRINGS, CO	49. WHITNEY CHRISTOPHER D ZONED - RR-5 16485 BLACK FOREST ROAD COLORADO SPRINGS, CO	67. RANGER CANDACE S LIVING TRUST ZONED - PUD 15593 OPEN SKY WAY COLORADO SPRINGS, CO	84. PECK JAMES D ZONED - PUD 5230 OLD STAGECOACH ROAD COLORADO SPRINGS, CO	102. KAVERMAN JOSEPH A ZONED - PUD 5215 OLD STAGECOACH ROAD COLORADO SPRINGS, CO	120. DICKEY MICHAEL R ZONED - PUD 5021 GOLD RUN CT COLORADO SPRINGS, CO	138. JOHNSON GREGG ZONED - PUD 4365 HIDDEN ROCK ROAD COLORADO SPRINGS, CO	156. JACKOWIAK RYAN ZONED - PUD 3770 STAGECOACH ROAD COLORADO SPRINGS, CO
14. ERNST CHARLES H ZONED - RR-5 14410 HOMES ROAD COLORADO SPRINGS, CO	32. MCKINLEY DAVID R ZONED - RR-5 14920 QUAIL RUN ROAD COLORADO SPRINGS, CO	50. BERENS MARK E ZONED - RR-5 6850 HODGEN ROAD COLORADO SPRINGS, CO	68. JANNELLE EVA ALLEN REVOCABLE TRUST ZONED - PUD 15639 OPEN SKY WAY COLORADO SPRINGS, CO	85. WELLER ERICH G ZONED - PUD 5310 OLD STAGECOACH ROAD COLORADO SPRINGS, CO	103. PIEPER RANDALL L ZONED - PUD 5125 OLD STAGECOACH ROAD COLORADO SPRINGS, CO	121. LIDDIARD JEREMY ZONED - PUD 5013 GOLD RUN CT COLORADO SPRINGS, CO	139. ROMANS LIVING TRUST ZONED - PUD 4315 HIDDEN ROCK ROAD COLORADO SPRINGS, CO	157. BALSICK LUKE A ZONED - PUD 3860 STAGECOACH ROAD COLORADO SPRINGS, CO
15. WAUGH JOSHUA T ZONED - RR-5 14445 HOLMES ROAD COLORADO SPRINGS, CO	33. WINNINGHAM AARON JASON ZONED - RR-5 14940 QUAIL RUN ROAD COLORADO SPRINGS, CO	51. MOLES JUSTIN ZONED - RR-5 16550 BLACK FOREST ROAD COLORADO SPRINGS, CO	69. STUDHOLME FAMILY TRUST ZONED - PUD 15685 OPEN SKY WAY COLORADO SPRINGS, CO	86. LAM TU T ZONED - PUD 5390 OLD STAGECOACH ROAD COLORADO SPRINGS, CO	104. SHECTER TRUST ZONED - PUD 15291 LONGWALL DRIVE COLORADO SPRINGS, CO	122. MILLER SCOTT G ZONED - PUD 5012 GOLD RUN CT COLORADO SPRINGS, CO	140. RYAN CHRISTOPHER J ZONED - PUD 4265 HIDDEN ROCK ROAD COLORADO SPRINGS, CO	158. HIMES ELMER S ZONED - PUD 3950 STAGECOACH ROAD COLORADO SPRINGS, CO
16. HOFFPAUIR DAN W JR ZONED - RR-5 14495 HOMES ROAD COLORADO SPRINGS, CO	34. LYNDE ROBERT A ZONED - RR-5 15015 TERRA RIDGE CIRCLE COLORADO SPRINGS, CO	52. MUNSON BRANDON J ZONED - RR-5 16710 BLACK FOREST ROAD COLORADO SPRINGS, CO	70. MAHER FAMILY REVOC LIVING TRUST ZONED - PUD 4961 HIGH FOREST ROAD COLORADO SPRINGS, CO	87. LUERS BEACH LLC ZONED - PUD 5470 OLD STAGECOACH ROAD COLORADO SPRINGS, CO	105. CHRISTOPHER MICHAEL MARSHALL ZONED - PUD 15051 LONGWALL DRIVE COLORADO SPRINGS, CO	123. BRENNAN THOMAS LIVING TRUST ZONED - PUD 5022 GOLD RUN CT COLORADO SPRINGS, CO	141. MARY CLAUDE F TRUSTEE ZONED - PUD 4215 HIDDEN ROCK ROAD COLORADO SPRINGS, CO	159. OTERO THEODORE M III ZONED - PUD 4040 STAGECOACH ROAD COLORADO SPRINGS, CO
17. SELF BOB J ZONED - RR-5 5910 VESSEY ROAD COLORADO SPRINGS, CO	35. SPLIT PINE RANCH LIVING TRUST ZONED - RR-5 15385 BLACK FOREST ROAD COLORADO SPRINGS, CO	53. MILLER ROBERT S ZONED - RR-5 6520 HODGEN ROAD COLORADO SPRINGS, CO	71. STEPHENSON TRAVIS ZONED - PUD 4901 HIGH FOREST ROAD COLORADO SPRINGS, CO	88. GREENWOOD TAYLOR J ZONED - PUD 5550 OLD STAGECOACH ROAD COLORADO SPRINGS, CO	106. BECKER JACOB J ZONED - PUD 5142 GOLD RUN COURT COLORADO SPRINGS, CO	124. WINTER CHARLES C ZONED - PUD 5082 GOLD RUN CT COLORADO SPRINGS, CO	142. STREVELL MICHAEL W ZONED - PUD 4165 HIDDEN ROCK ROAD COLORADO SPRINGS, CO	160. HARRIS GUY MCALLISTER ZONED - PUD 4130 STAGECOACH ROAD COLORADO SPRINGS, CO
18. JONES INGRID L ZONED - RR-5 5940 VESSEY ROAD COLORADO SPRINGS, CO	36. APODACA LESLIE E ZONED - RR-5 15380 BLACK FOREST ROAD COLORADO SPRINGS, CO	54. JOHN R SHANTZ & BELINDA S ZONED - RR-5 16547 RIDGEBACK ROAD COLORADO SPRINGS, CO		89. LONG RUSSEL I ZONED - PUD 5630 OLD STAGECOACH ROAD COLORADO SPRINGS, CO	107. KEV PARTNERS LTD ZONED - PUD 5172 GOLD RUN COURT COLORADO SPRINGS, CO	125. THEOBARD CHARLES N ZONED - PUD 4945 STAGECOACH ROAD COLORADO SPRINGS, CO	143. GOULD TODD E ZONED - PUD 4115 HIDDEN ROCK ROAD COLORADO SPRINGS, CO	

COUNTY FILE NUMBER: SKP223

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APPROVED: PLS	JOB NUMBER: 211030	0"
CAD DATE: 9/15/2022	IF NOT ONE INCH, ADJUST SCALE ACCORDINGLY.	
CAD FILE: J:\2021\211030\CAD\Drawgs\CIS\Sketch-Plan\ADJACENT-PROPERTY		

NO.	DATE	BY	REVISION DESCRIPTION



HRGreen.com

FLYING HORSE NORTH DEVELOPMENT, LLC.
EL PASO COUNTY, COLORADO

FLYING HORSE NORTH SKETCH PLAN
ADJACENT PROPERTY DATA OWNERS

SHEET
SP.4
4

FLYING HORSE NORTH SKETCH PLAN

161. RED HORSE HILL LLC ZONED - PUD AUNDERTON GRV COLORADO SPRINGS, CO	180. COLOSSEE PARTNERS LLLP ZONED - PUD 14470 MILLHAVEN PLACE COLORADO SPRINGS, CO	199. WANTY LISA M ZONED - RR-5 6060 VESSEY ROAD COLORADO SPRINGS, CO	218. ELLSWORTH FRANK F ZONED - RR-5 15105 TERRA RIDGE CIRCLE COLORADO SPRINGS, CO	236. GIBB RONALD JESSE ZONED - RR-5 6387 RALEIGH ROAD COLORADO SPRINGS, CO	254. MOORE DAVID S ZONED - RR-5 4662 HIGH FOREST ROAD COLORADO SPRINGS, CO	272. CASE FAMILY REVOC LIVING TRUST ZONED - RR-5 15570 WINDING TRAIL ROAD COLORADO SPRINGS, CO	COLORADO SPRINGS, CO 80908 RYE LLC 16755 HAPPY LANDING MONUMENT, CO 80132
162. WILKINSON SUZANNE ELIZABETH ZONED - PUD 4540 FOXCHASE WAY COLORADO SPRINGS, CO	181. SEDDON JOHN TA ZONED - PUD 14390 MILLHAVEN PLACE COLORADO SPRINGS, CO	200. HAYES MARK G ZONED - RR-5 6090 VESSEY ROAD COLORADO SPRINGS, CO	219. DENNIS REBECCA L ZONED - RR-5 14915 QUAIL RUN ROAD COLORADO SPRINGS, CO	237. SAVAGE JORDAN L ZONED - RR-5 16587 RIDGEBACK ROAD COLORADO SPRINGS, CO	255. CIABARRA JAIMIE K ZONED - RR-5 4602 HIGH FOREST ROAD COLORADO SPRINGS, CO	273. PARKER JEFFREY ZONED - RR-5 5030 VESSEY ROAD COLORADO SPRINGS, CO	MARK A SLUTZ 6730 CONNAUGHT DRIVE COLORADO SPRINGS, CO 80908
163. JOHNSON SAM CHRISTOPHER ZONED - PUD 4580 FOXCHASE WAY COLORADO SPRINGS, CO	182. MEDRICK JAMES G ZONED - PUD 14350 MILLHAVEN PLACE COLORADO SPRINGS, CO	201. DOLES THOMAS ALBERT ZONED - PUD 6130 VESSEY ROAD COLORADO SPRINGS, CO	220. JAMES P REEG REVOCABLE TRUST ZONED - RR-5 14935 QUAIL RUN ROAD COLORADO SPRINGS, CO	238. BISHOP BARBARA K TRUST ZONED - RR-5 16755 THOMPSON ROAD COLORADO SPRINGS, CO	256. VAN AUKEN LIVING TRUST ZONED - RR-5 4715 HIDDEN ROCK ROAD COLORADO SPRINGS, CO	274. TERESA L FERGUSON LIVING TRUST ZONED - RR-5 14145 MILLHAVEN PLACE COLORADO SPRINGS, CO	JEFFREY B SMITH 13925 HIGHWAY 83 COLORADO SPRINGS, CO 80921
164. S&BT LIVING TRUST ZONED - PUD 4660 FOXCHASE WAY COLORADO SPRINGS, CO	183. JAIN RUPESH ZONED - PUD 14320 MILLHAVEN PLACE COLORADO SPRINGS, CO	202. ELLEN KLEIN LIVING TRUST ZONED - RR-5 6180 VESSEY ROAD COLORADO SPRINGS, CO	221. FELLAR DENNIS W ZONED - RR-5 15095 TERRA RIDGE CIRCLE COLORADO SPRINGS, CO	239. DUNSTON MATTHEW W ZONED - RR-5 5525 HODGEN ROAD COLORADO SPRINGS, CO	257. BRAY THEODORE C ZONED - RR-5 4482 HIGH FOREST ROAD COLORADO SPRINGS, CO	275. HOLLINGSWORTH KIMBERLEY ZONED - RR-5 6625 COUNTRY ESTATES LANE COLORADO SPRINGS, CO	JEFFREY B SMITH 13925 HIGHWAY 83 COLORADO SPRINGS, CO 80921
165. CURRAN LARRY DAVID ZONED - PUD 4615 FOXCHASE WAY COLORADO SPRINGS, CO	184. KLAIBER LIVING TRUST ZONED - PUD 14230 MILLHAVEN PLACE COLORADO SPRINGS, CO	203. BRADBURY DAVID J ZONED - PUD 6220 VESSEY ROAD COLORADO SPRINGS, CO	222. HUTCHINS-VAN TASSEL LESLIE ZONED - RR-5 15090 TERRA RIDGE CIRCLE COLORADO SPRINGS, CO	240. LAVALLEY BRANDON DALE ZONED - RR-5 5735 HODGEN ROAD COLORADO SPRINGS, CO	258. CICCONE LYNDA M ZONED - RR-5 4481 HIGH FOREST ROAD COLORADO SPRINGS, CO	276. BURST DAVID K ZONED - RR-5 6655 COUNTRY ESTATES LANE COLORADO SPRINGS, CO	BART W TIMM 14695 BLACK FOREST ROAD COLORADO SPRINGS, CO 80908
166. LEE MARVIN ZONED - PUD 4455 FOXCHASE WAY COLORADO SPRINGS, CO	185. SEXTON KENNETH R ZONED - PUD 5225 VESSEY ROAD COLORADO SPRINGS, CO	204. STEWART ANTHONY NEIL ZONED - RR-5 14450 PINE CREST DRIVE COLORADO SPRINGS, CO	223. FERL DIANE F ZONED - RR-5 15010 TERRA RIDGE CIRCLE COLORADO SPRINGS, CO	241. STEARNS KRYSTAL ZONED - RR-5 HODGEN ROAD COLORADO SPRINGS, CO	259. CICCONE LYNDA M ZONED - RR-5 4481 HIGH FOREST ROAD COLORADO SPRINGS, CO	277. PIRTLER CYNTHIA K ZONED - RR-5 6685 COUNTRY ESTATES LANE COLORADO SPRINGS, CO	MAYNARD MARCI L TWOMBLY 6745 COUNTRY ESTATES LANE COLORADO SPRINGS, CO 80908
167. JASMIN TREMBLAY REVOCABLE TRUST ZONED - PUD 4415 FOXCHASE WAY COLORADO SPRINGS, CO	186. POPE MARK S ZONED - PUD 5265 VESSEY ROAD COLORADO SPRINGS, CO	205. CHAMBERS REVOCABLE TRUST ZONED - RR-5 6065 CONNAUGHT DRIVE COLORADO SPRINGS, CO	224. CHAFFEE GREGORY B ZONED - RR-5 15650 TERRA RIDGE CIRCLE COLORADO SPRINGS, CO	242. STEARNS KRYSTAL ZONED - RR-5 FARRAR DRIVE COLORADO SPRINGS, CO	260. STONESTREET JOHN B ZONED - RR-5 4515 HIDDEN ROCK ROAD COLORADO SPRINGS, CO	278. TWOMBLY MARCI ZONED - RR-5 6715 COUNTRY ESTATES LANE COLORADO SPRINGS, CO	KEVIN J VIDER 6365 CONNAUGHT DRIVE COLORADO SPRINGS, CO 80908
168. EVANS LIVING TRUST ZONED - PUD 14190 MARBLE ARCH COURT COLORADO SPRINGS, CO	187. ALDER FAMILY TRUST ZONED - PUD 5345 VESSEY ROAD COLORADO SPRINGS, CO	206. CARTER THOMAS J ZONED - RR-5 6125 CONNAUGHT DRIVE COLORADO SPRINGS, CO	225. PETERSON JEFFREY L ZONED - RR-5 15610 TERRA RIDGE CIRCLE COLORADO SPRINGS, CO	243. HARVEY TINA MARIE ZONED - RR-5 15975 FARRAR DRIVE COLORADO SPRINGS, CO	261. OLIVIAS RAYMOND B ZONED - RR-5 4301 HIGH FOREST ROAD COLORADO SPRINGS, CO	279. SUMPTER JUSTIN MICHAEL ZONED - RR-5 15605 TERRA RIDGE CIRCLE COLORADO SPRINGS, CO	
169. TAYLOR CHRISTINA MARIE ZONED - PUD 4535 FOXCHASE WAY COLORADO SPRINGS, CO	188. LNB FAMILY TRUST ZONED - PUD 5270 VESSEY ROAD COLORADO SPRINGS, CO	207. MOREAU WILLIAM J ZONED - RR-5 6185 CONNAUGHT DRIVE COLORADO SPRINGS, CO	226. MCLELLAN CHRISTOPHER S ZONED - RR-5 15570 TERRA RIDGE CIRCLE COLORADO SPRINGS, CO	244. HARVEY CAROLYN C ZONED - RR-5 15502 OPEN SKY WAY COLORADO SPRINGS, CO	262. SUTHERLAND STEPHEN ARTHUR ZONED - RR-5 4460 HIDDEN ROCK ROAD COLORADO SPRINGS, CO	280. DAVIS MARK K ZONED - RR-5 15565 TERRA RIDGE CIRCLE COLORADO SPRINGS, CO	
170. LUTHY ROBERT EDWARD ZONED - PUD 14250 FARNHAM ROYAL COURT COLORADO SPRINGS, CO	189. RAYMOND CHARLES DENT JR. ZONED - PUD 5230 VESSEY ROAD COLORADO SPRINGS, CO	208. MOREAU WILLIAM J ZONED - RR-5 6245 CONNAUGHT DRIVE COLORADO SPRINGS, CO	227. BARR RHONDA LYN ZONED - RR-5 6915 MONTY PLACE COLORADO SPRINGS, CO	245. ROEHRICH DN FAMILY TRUST ZONED - RR-5 15548 OPEN SKY WAY COLORADO SPRINGS, CO	263. WEBER CHARLES L ZONED - RR-5 4360 HIDDEN ROCK ROAD COLORADO SPRINGS, CO	SCOTT W ANDREWS PO BOX 158 USAF ACADEMY, CO 80840	
171. BEHNKEN CHAD L ZONED - PUD 4735 FOXCHASE WAY COLORADO SPRINGS, CO	190. KOSZEWNIK JOHN JOSEPH ZONED - PUD 5190 VESSEY ROAD COLORADO SPRINGS, CO	209. RODAS PETER G ZONED - RR-5 6305 CONNAUGHT DRIVE COLORADO SPRINGS, CO	228. KHALIQI DAVID H ZONED - RR-5 6985 MONTY PLACE COLORADO SPRINGS, CO	246. JAMES F BREGGIO LIVING TRUST ZONED - RR-5 15594 OPEN SKY WAY COLORADO SPRINGS, CO	264. NELSON NORMAN D ZONED - RR-5 4260 HIDDEN ROCK ROAD COLORADO SPRINGS, CO	CHRISTOPHER A BOWMAN 6425 CONNAUGHT DRIVE COLORADO SPRINGS, CO 80908	
172. SWARTHOUT ANDREW T ZONED - PUD 4740 FOXCHASE WAY COLORADO SPRINGS, CO	191. ENEA STEVEN A ZONED - PUD 14150 MILLHAVEN PLACE COLORADO SPRINGS, CO	210. DAWSON FAMILY TRUST ZONED - RR-5 6070 CONNAUGHT DRIVE COLORADO SPRINGS, CO	229. ANDREWS TODD ZONED - RR-5 6990 MONTY PLACE COLORADO SPRINGS, CO	247. CARPER CHRISTOPHER ZONED - RR-5 15686 OPEN SKY WAY COLORADO SPRINGS, CO	265. JOHNSON TRACIE LIVING TRUST ZONED - RR-5 4210 HIDDEN ROCK ROAD COLORADO SPRINGS, CO	GREGORY B CHAFFEE 15650 TERRA RIDGE CIRCLE COLORADO SPRINGS, CO 80908	
173. ERLING BRIAN F ZONED - PUD 4780 FOXCHASE WAY COLORADO SPRINGS, CO	192. KARL C & DAWN M FINDLEY ZONED - PUD 5070 VESSEY ROAD COLORADO SPRINGS, CO	211. PALAZZARI ANTHONY A ZONED - RR-5 6250 CONNAUGHT DRIVE COLORADO SPRINGS, CO	230. LEVY JOEL D ZONED - RR-5 6950 MONTY PLACE COLORADO SPRINGS, CO	248. COYLE JOHN MORGAN LIVING TRUST ZONED - RR-5 15778 OPEN SKY WAY COLORADO SPRINGS, CO	266. BREWER STEVEN W ZONED - RR-5 4160 HIDDEN ROCK ROAD COLORADO SPRINGS, CO	AARON O COPPOCK 6680 COUNTRY ESTATES LANE COLORADO SPRINGS, CO 80908	
174. ARORA PRATHEEP ZONED - PUD 14285 FARNHAM ROYAL COURT COLORADO SPRINGS, CO	193. MURPHY ROBERT C JR ZONED - PUD 5065 VESSEY ROAD COLORADO SPRINGS, CO	212. TRUMP CAROLYN D ZONED - PUD 6370 CONNAUGHT DRIVE COLORADO SPRINGS, CO	231. SANCHEZ LAISSA ZONED - RR-5 6925 ALPACA HEIGHTS COLORADO SPRINGS, CO	249. JONES CHARLES D ZONED - RR-5 4781 SECLUDED CREEK COURT COLORADO SPRINGS, CO	267. WOGEN BRYAN ZONED - RR-5 4110 HIDDEN ROCK ROAD COLORADO SPRINGS, CO	DERKSEN PROPERTIES LLC 5491 PADDINGTON CREEK COLORADO SPRINGS, CO 80924	
175. ROSENBAUM DAVID A REVOC TRUST ZONED - PUD 14585 MILLHAVEN PLACE COLORADO SPRINGS, CO	194. HAWKINS JOSEPH C JR ZONED - RR-5 14450 HOLMES ROAD COLORADO SPRINGS, CO	213. CORBETT NORMAN ZONED - RR-5 6745 COUNTY ESTATES LANE COLORADO SPRINGS, CO	232. ENGET AARON ZONED - RR-5 6950 HODGEN ROAD COLORADO SPRINGS, CO	250. SELVA MICHAEL D ZONED - RR-5 4691 SECLUDED CREEK COURT COLORADO SPRINGS, CO	268. FRANZ CHRISTOPHER A ZONED - RR-5 4010 HIDDEN ROCK ROAD COLORADO SPRINGS, CO	JOHN R AND BELINDA SHANTZ 2651 19 TH AVE KINGSBURG, CA 93631	
176. KELLY LIVING TRUST ZONED - PUD 4975 FOXCHASE WAY COLORADO SPRINGS, CO	195. KRISTY MICHAEL H ZONED - PUD 14350 HOLMES ROAD COLORADO SPRINGS, CO	214. BAHR JACOB ZONED - RR-5 6818 MARSHBERN COURT COLORADO SPRINGS, CO	233. SAVAGE JORDAN L ZONED - RR-5 6498 RALEIGH ROAD COLORADO SPRINGS, CO	251. PRIBBLE FAMILY LIVING TRUST ZONED - RR-5 4601 SECLUDED CREEK COURT COLORADO SPRINGS, CO	269. PAESCHKE TRACY ZONED - RR-5 4015 HIDDEN ROCK ROAD COLORADO SPRINGS, CO	DANIEL W LULCHUK 6790 CONNAUGHT DRIVE COLORADO SPRINGS, CO 80908	
177. FLEMING FAMILY LIVING TRUST ZONED - PUD 14505 MILLHAVEN PLACE COLORADO SPRINGS, CO	196. GARLICK JEFFREY ZONED - RR-5 14320 HOLMES ROAD COLORADO SPRINGS, CO	215. WESTOVER HOMES LLC ZONED - RR-5 6902 MARSHBERN COURT COLORADO SPRINGS, CO	234. CONNOLLY ANDREW ZONED - RR-5 6442 RALEIGH ROAD COLORADO SPRINGS, CO	252. CHAMBERS MARK L ZONED - RR-5 4782 HIGH FOREST ROAD COLORADO SPRINGS, CO	270. OLSEN TODD A ZONED - RR-5 3985 CANOPY COURT COLORADO SPRINGS, CO	ROBERT MELANSON 14725 BLACK FOREST ROAD COLORADO SPRINGS, CO 80908	
178. LONGHORNS 07 TURST ZONED - PUD 14550 MILLHAVEN PLACE COLORADO SPRINGS, CO	197. STELZEL DANIEL M ZONED - RR-5 14290 HOLMES ROAD COLORADO SPRINGS, CO	216. WESTOVER HOMES LLC ZONED - RR-5 6986 MARSHBERN COURT COLORADO SPRINGS, CO	235. VOLK SETH K ZONED - RR-5 6386 RALEIGH ROAD COLORADO SPRINGS, CO	253. MURROW RICHARD C TRUST ZONED - RR-5 4722 HIGH FOREST ROAD COLORADO SPRINGS, CO	271. DAHILL DEVIN ZONED - RR-5 3955 CANOPY COURT COLORADO SPRINGS, CO	ERIC MIKUSKA 15645 TERRA RIDGE CIRCLE COLORADO SPRINGS, CO 80908	
179. KROEKER KARL ZONED - PUD 14510 MILLHAVEN PLACE COLORADO SPRINGS, CO	198. MCGOWAN PATRICK J JR ZONED - RR-5 14355 HOLMES ROAD COLORADO SPRINGS, CO	217. WESTOVER HOMES LLC ZONED - RR-5 7070 MARSHBERN COURT COLORADO SPRINGS, CO				ANTHONY A PALAZZARI 6250 CONNAUGHT DRIVE COLORADO SPRINGS, CO 80908	
						PETER G RODAS 6305 CONNAUGHT DRIVE COLORADO SPRINGS, CO 80908	
						ERIC J ROWE 6670 CONNAUGHT DRIVE	

COUNTY FILE NUMBER: SKP223

DRAWN BY: JAG JOB DATE: 3/1/2022
 APPROVED: PLS JOB NUMBER: 211030
 CAD DATE: 9/15/2022
 CAD FILE: J:\2021\211030\CAD\Drawings\CIS\Sketch-Plan\ADJACENT-PROPERTY

NO.	DATE	BY	REVISION DESCRIPTION

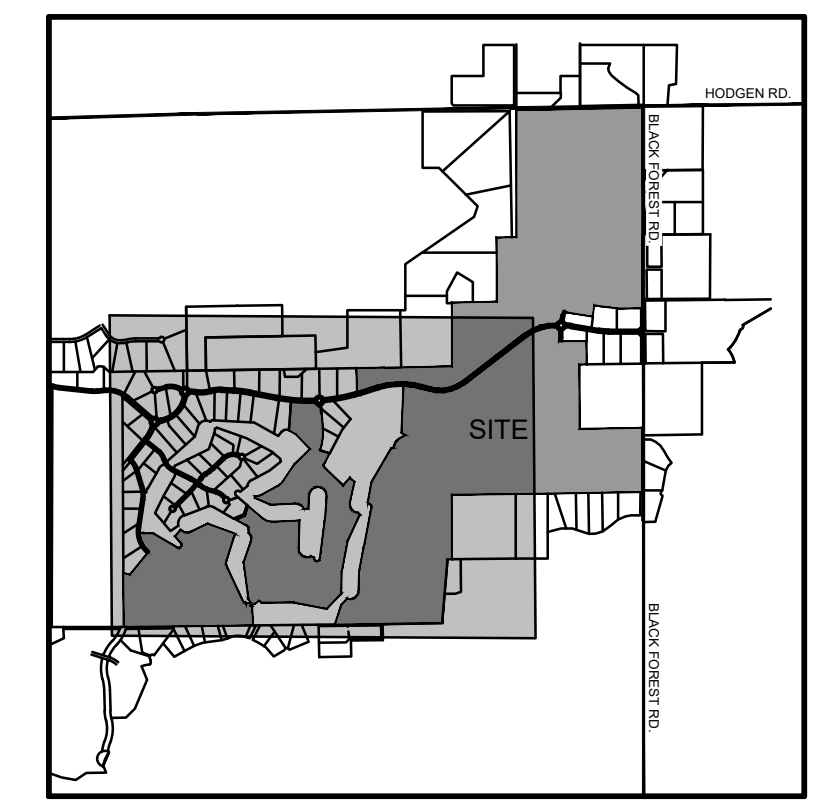
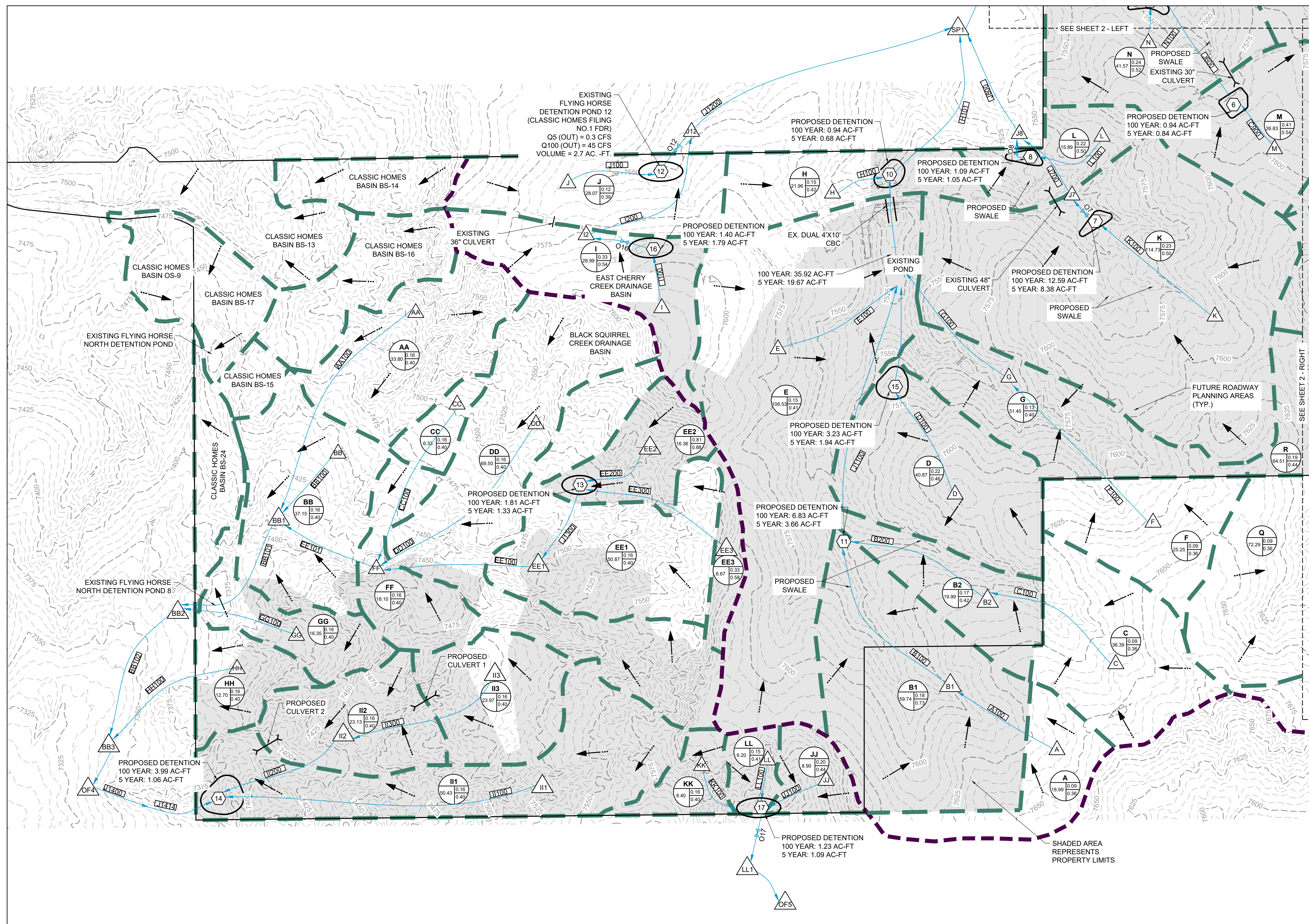


FLYING HORSE NORTH DEVELOPMENT, LLC.
EL PASO COUNTY, COLORADO

FLYING HORSE NORTH SKETCH PLAN
ADJACENT PROPERTY DATA OWNERS

SHEET SP.5 5

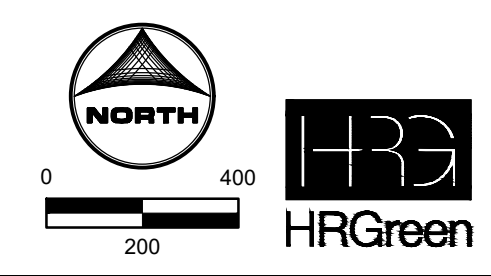
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LEGEND:

- PROPOSED MAJOR CONTOUR: — 5250 —
- PROPOSED MINOR CONTOUR: - - - - -
- EXISTING MAJOR CONTOUR: — 5250 —
- EXISTING MINOR CONTOUR: - - - - -
- PROPOSED STORM DRAIN PIPE: —●—
- EXISTING STORM DRAIN PIPE: —●—
- PROPOSED DRAINAGE CHANNEL: —■—
- PROPOSED ROAD: —■—
- PROPERTY LINE: —■—
- DIRECTIONAL FLOW ARROW: —>—
- EMERGENCY OVERFLOW ARROW: —>—
- EXISTING 100-YR FLOODWAY: —■—
- EXISTING 100-YR FLOODPLAIN: —■—
- PROPOSED 100-YR FLOODPLAIN: —■—
- WATERSHED BOUNDARY: —■—
- MAJOR BASIN LINE: —■—
- 100YR ZONE A FLOODPLAIN: —■—
- PROPOSED DETENTION LOCATION: (A)
- POTENTIAL WATER QUALITY LOCATION: (WQ)
- SWMM CONVEYANCE ELEMENT: (SWMM)
- PROPOSED PEAK FLOW RATE (CFS): (850)
- DESIGN POINT: (A)
- PROPOSED BASIN LABEL: (XX) BASIN DESIGNATION
(XX) C5
(XX) C100

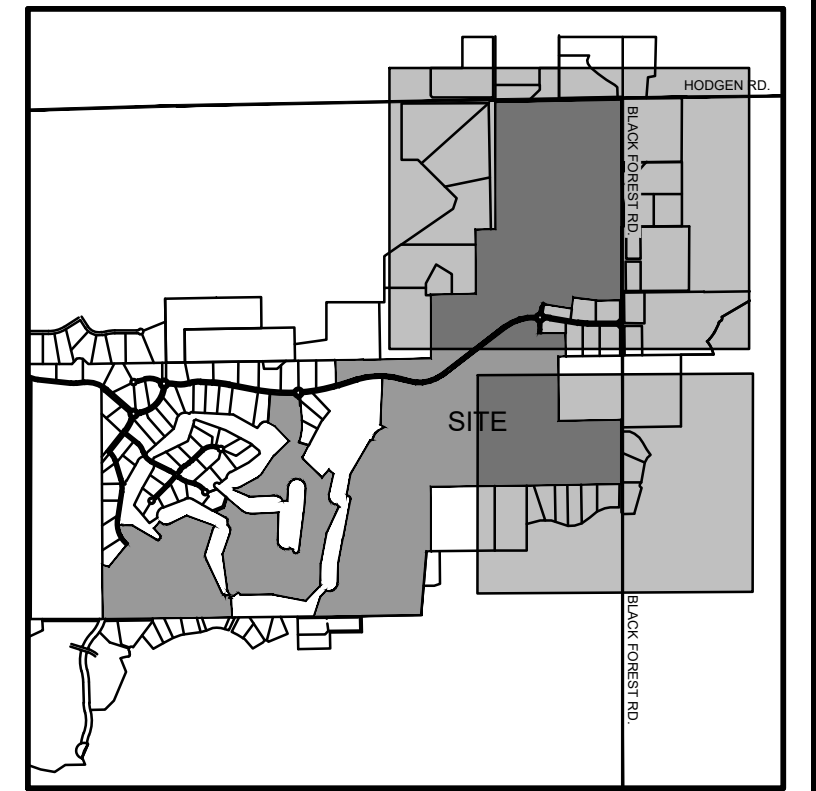
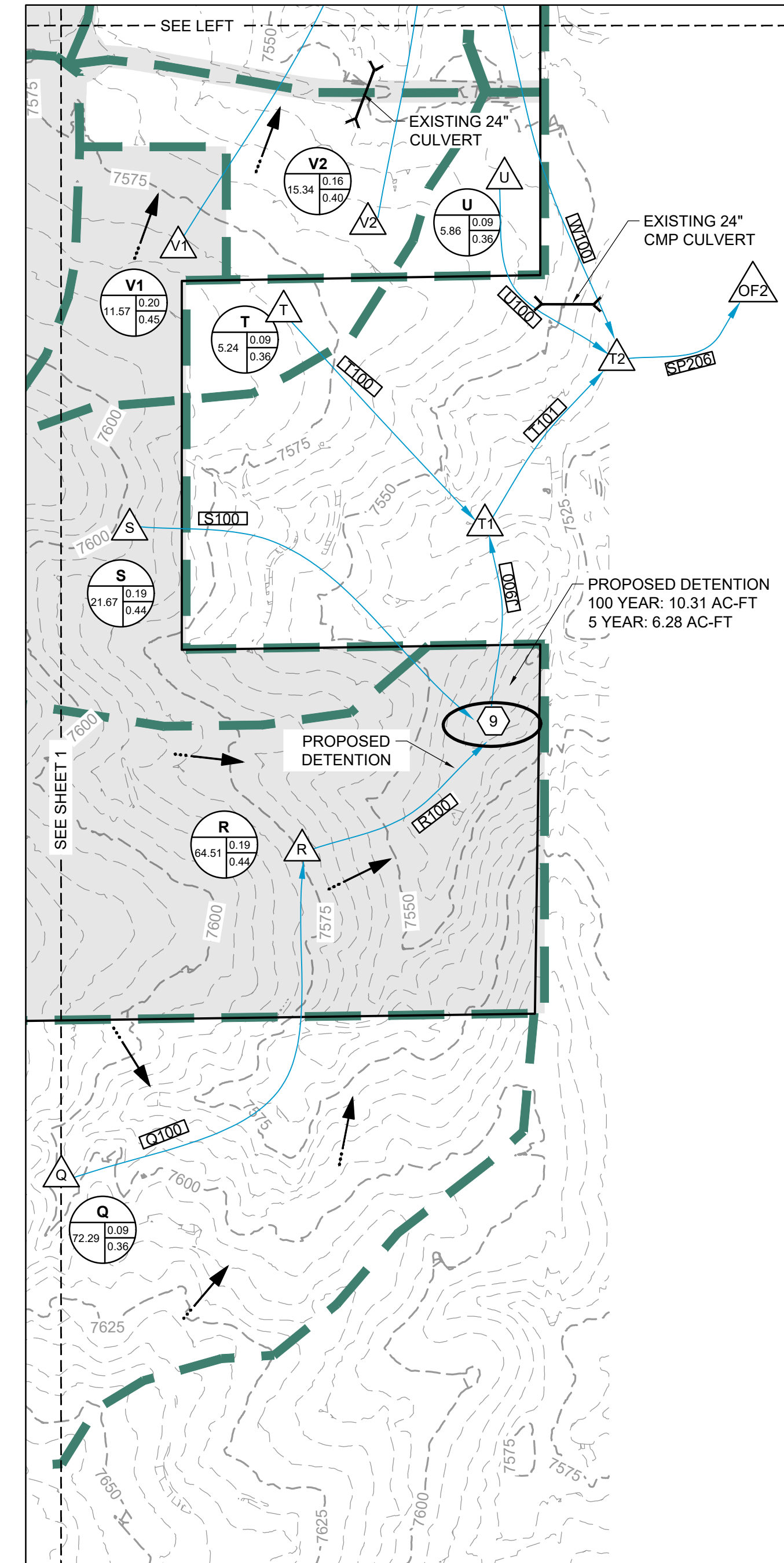
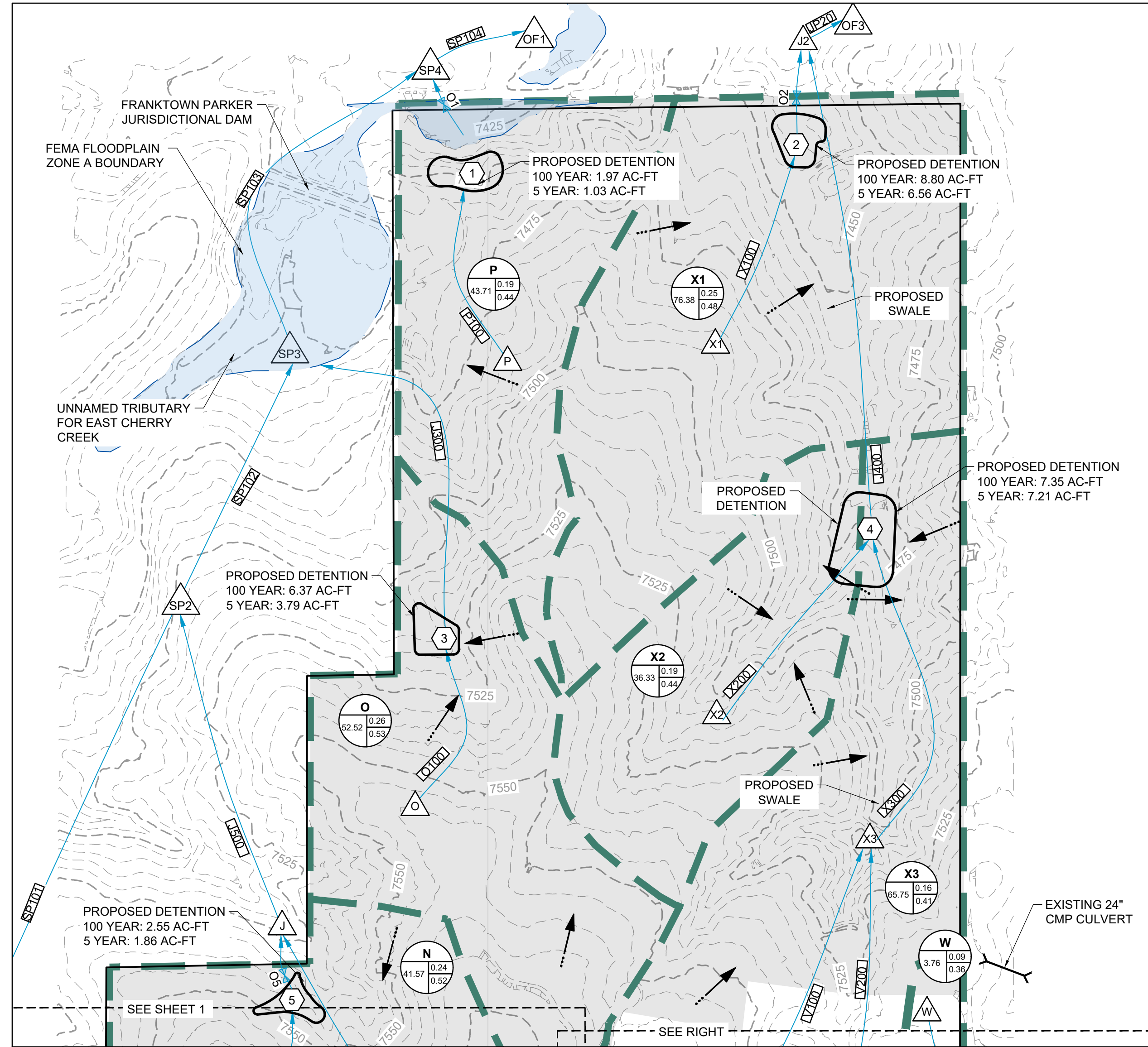
NOTES:
SEE SHEET 2 FOR DESIGN FLOWS



Job No.:	211030.01
Prepared By:	TBI
Date:	9/9/2022

PROPOSED DRAINAGE BASINS

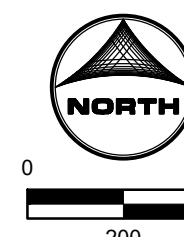
BASIN	DESIGN POINT	5 YEAR POST DEVELOPMENT	100 YEAR POST DEVELOPMENT
A	A	20.84	43.83
AA	AA	39.23	81.18
B1	B1	66.93	133.69
B2	B2	17.99	37.14
BB	BB	40.62	84.15
BB1	BB1	214.28	483.72
BB2	BB2	229.61	515.49
BB3	BB3	307.27	646.46
C	C	35.31	75.28
CC	CC	6.53	13.57
D	D	61.12	117.38
DD	DD	57.78	122.41
E	E	74.68	157.91
EE1	EE1	53.25	156.68
EE2	EE2	35.71	63.62
EE3	EE3	10.38	19.33
F	F	24.27	51.63
FF	FF	20.78	330.28
G	G	27.18	108.76
GG	GG	15.49	32.48
H	H	17.86	37.80
HH	HH	13.56	28.16
I	I	40.37	78.06
II1	II1	34.94	74.39
II2	II2	28.04	116.26
II3	II3	28.32	58.65
IRR_J	IRR_J	114.18	274.80
IRR_POND	IRR_POND	243.77	550.27
J	J	24.45	51.19
JJ	JJ	11.49	22.80
K	K	200.94	382.30
KK	KK	8.14	16.95
L	L	15.97	32.40
LL	LL	7.36	15.07
LL1	LL1	0	49.55
M	M	46.54	89.08
N	N	73.48	141.24
O	O	63.86	127.40
OF1	OF1	240.43	705.93
OF2	OF2	104.34	242.18
OF3	OF3	95.68	271.49
OF4	OF4	307.27	646.46
OF5	OF5	16.85	49.55
P	P	40	82.83
Q	Q	64.68	137.80
R	R	56.59	253.86
S	S	30.83	58.96
SP1	SP1	189.85	511.89
SP2	SP2	223.43	618.35
SP3	SP3	212.45	641.31
SP4	SP4	240.49	706.05
T	T	4.04	8.68
T1	T1	98.27	228.33
T2	T2	104.34	242.18
U	U	4.81	10.51
V1	V1	13.99	27.67
V2	V2	16.15	33.25
W	W	3.45	7.46
X1	X1	80.91	163.27
X2	X2	41.46	82.46
X3	X3	47.59	100.73



LEGEND:

- PROPOSED MAJOR CONTOUR: — 5250 —
- PROPOSED MINOR CONTOUR: - - - - -
- EXISTING MAJOR CONTOUR: — 5250 —
- EXISTING MINOR CONTOUR: - - - - -
- PROPOSED STORM DRAIN PIPE: ————
- EXISTING STORM DRAIN PIPE: - - - - -
- PROPOSED DRAINAGE CHANNEL: ————
- PROPOSED ROAD: ————
- PROPERTY LINE: ————
- DIRECTIONAL FLOW ARROW: ————
- EMERGENCY OVERFLOW ARROW: ————
- EXISTING 100-YR FLOODWAY: ————
- EXISTING 100-YR FLOODPLAIN: ————
- PROPOSED 100-YR FLOODPLAIN: ————
- WATERSHED BOUNDARY: ————
- MAJOR BASIN LINE: ————
- 100YR ZONE A FLOODPLAIN: ————
- PROPOSED DETENTION LOCATION: (A) (WQ)
- POTENTIAL WATER QUALITY LOCATION: (SWMM)
- SWMM CONVEYANCE ELEMENT: (850)
- PROPOSED PEAK FLOW RATE (CFS): (850)
- DESIGN POINT: (XX)
- PROPOSED BASIN LABEL: (XX) BASIN DESIGNATION
(XX) C5
(XX) C100

NOTES:



Job No.: 211030.01
Prepared By: TBI
Date: 9/9/2022

PROPOSED DRAINAGE BASINS