Drainage Report

Village Camp Durango

La Plata County, Colorado

ROBRE 168892 | January 17th, 2025

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Contents

List of Tables

List of Figures

Contents (continued)

List of Appendices

Drainage Report

Village Camp Durango

Prepared for Roberts Resorts and Properties

1 Introduction

The purpose of this Drainage Report is to present the design methodology and results of a drainage study associated with the proposed Village Camp Development. This study describes existing conditions at the project site, compares them to the conditions of the proposed development and estimates appropriate drainage and detention features to accommodate the Water Quality Capture Volume (WQCV) per La Plata County Code 70-9.4.a.ii. This drainage study demonstrates conformity to the criteria from Chapter 70 of La Plata County Land Use Code Development Standards.

1.1 Site Location

The site is located north of Durango, in La Plata County, Colorado. The property is part of the Burnett – Trimble Lane Subdivision with a Parcel Number ID 559715100076. The project is bordered by Hermosa Sanitation to the north, the Animas River to the south, CR 252 to the east and Dalton Ranch to the west.

Figure 1 – Site Location

1.2 Site Description

The proposed project includes the re-development of a historic gravel pit. The site will include new gravel and asphalt drives, amenity areas, and RV Sites. The site will drain via a network of grass lined swales and culverts. The site will provide water quality treatment but is not required to detain the 10- or 100-year runoff events per the County Code allowance (LUDC Section 70-9 Technical Appendix, F.4.a.i.ii). The 10-year event will be conveyed to the detention areas and then into the Animas River via site infrastructure. The detention outlets are not designed to drain the 10-year event, simply to discharge it. The 100-year event will overtop site infrastructure and surface flow into the River. In this case, on-site runoff will flow directly into the Animas River without endangering any adjacent properties or structures.

The project parcel area is approximately 34 acres. The site surface drains undetained from north to south directly into the Animas River. The watershed area tributary to the site is approximately 34 acres.

According to the Natural Resources Conservation Service Web Soil Survey (NRCS), the project site contains a mixture of hydrologic soil Group B and C with 0 to 3 percent slopes. Group B (Pescar fine sandy loam) being the most prominent with 55.4%, and Group C (Tefton loam) the least with 29.2%. The remaining 15.4% of soil was defined as River wash and water. The *NRCS Custom Soil Resource Report* can be found in Appendix A.

2 Drainage Design Criteria

2.1 Development Criteria Reference

The drainage design criteria used for this development was obtained from the 2020 Land Use Code of La Plata County, Colorado. Rainfall data was obtained from NOAA Atlas 14 while runoff calculation methodology and drainage facility design was performed in accordance with the Urban Storm Drainage Criteria Manual (USDCM) dated August 2018. References to relevant Sections of the USDCM Design Manual are made throughout the report.

2.2 Hydrologic Criteria

2.2.1 Design Rainfall

Precipitation frequency estimates for the location of the proposed project were taken from NOAA Atlas 14, Volume 8, Version 2, with a duration of 60 minutes. The frequency estimates were then used as inputs into the Mile High Flood District (MHFD) Detention Basin Workbook to analyze site drainage. The frequency estimates for the site are shown in Table 1 and the rainfall data can be found in Appendix B.

Table 1 – NOAA Precipitation Frequency Estimates (inches)

Duration	10-Year (in)	100-Year (in)
1-hour	1.08	2.09

2.2.2 Runoff Calculation Method

Runoff calculations were performed using the MHFD Peak Runoff Prediction by the Rational Method Workbook. Precipitation frequencies were taken from NOAA Atlas 14 and surface characteristics of the site. The results from the MHFD Peak Runoff Prediction by the Rational Method Workbook are demonstrated in Appendix D.

2.2.3 Detention and Storage

Detention and conveyance facilities were designed and sized according to the requirements outlined in Section 70-9 of the La Plata County Site Development Standards. Detention basins on-site were designed using the Mile High Flood District (MHFD) Detention Basin Workbook while conveyance design, sizing and analysis was performed using Hydraflow Software.

2.2.4 Water Quality

Extended Detention Basins (EDB's) were sized for each subbasin using the MHFD Detention Basin Workbook to provide the necessary water quality treatment. Each EDB will detain the WQCV and drain over a period of 40 hours per La Plata County Code 70-9.4.a.ii. Detention Worksheets and analysis are included in Appendix D.

3 Drainage Basins

3.1 Offsite Basins

Offsite drainage has been addressed by the lots adjacent to the property as part of their development requirements. Both northern lots discharge into the wetlands west of the site via engineered infrastructure and then into the Animas River.

3.2 Onsite Sub-basins

The project site was divided into seven subbasins to perform the drainage analysis as shown in Appendix C. Detention and conveyance facilities were sized to each individual subbasin per the MFHD requirements. Table 2 summarizes the imperviousness calculations for each subbasin, and Table 3 shows the post development peak flows for the site. Pre-development imperviousness and peak flows were not calculated, as detention to historic values was not a project requirement. Percent imperviousness values were obtained from UDFCD Table 6-3 and are in Table 2. Subbasin Peak flows are shown in Table 3.

Table 2 – Proposed Basin Impervious Calculations

SUB-BASIN	CONTRIBUTING AREA (ACRES)	CONCRETE AREAS 100% (ACRES)	PAVEMENT 100% (ACRES)	GRAVEL 40% (ACRES)	OPEN SPACE AREA 2% (ACRES)	ROOFS 90% (ACRES)	% IMPERVIOUS
1	6.15	0.20	1.37	1.11	3.47	0.00	34%
2	1.35	0.10	0.17	0.36	0.72	0.00	32%
3	2.34	0.10	0.38	0.85	1.01	0.00	36%
4	3.83	0.16	0.56	1.30	1.81	0.00	33%

5	5.95	0.15	0.59	1.25	3.96	0.00	22%
6	8.77	0.57	2.27	1.02	4.85	0.06	39%
7	0.64	0.07	0.19	0.00	0.33	0.06	50%

Table 3 – Basin Peak Flow Summary

SUBBASIN	DEVELOPED PEAK FLOW, Q (CFS)	
	10-YR	100-YR
1	3.34	11.38
2	1.04	3.66
3	1.56	5.14
4	2.25	7.81
5	2.30	10.04
6	5.59	17.68
7	0.73	2.02
TOTAL	16.81	57.73

4 Detention Treatment Facilities

4.1 Detention

Four extended detention basins were designed to provide water quality for the site as demonstrated in Appendix C. The EDB's were designed to provide Water Quality Treatment by capturing the Water Quality Control Volume (WQCV). Detailed design of the EDB's and outlet structures have been provided in the plans and in Appendix E for reference.

The WQCV is detained by the EDB's and release via the outlet piping over 40 hours as required by La Plata County. Table 3 shows the WQCV required and outlet structure data.

Table 4 – Required and Provided Water Quality Volume

POND	SUBBASINS RECEIVED	WQCV (AC-FT)	OUTLET STRUCTURE	DRAIN ORIFICES DIAMETER (IN)	NUMBER OF ORIFICES
1	1	0.084	CDOT TYPE C	1-1/4	3
2	2, 3, 4, 5	0.166	CDOT TYPE C	1-7/16	3
3	6	0.129	CDOT TYPE C	1	3
4	7	0.011	CDOT TYPE C	7/16	1

5 Conveyance Design

All storm water on site will be conveyed via sheet flow, swales and culverts. Appendix F shows the Grading and Drainage plan for the proposed development. Appendix E shows the outlet

structure, swale and culvert design and capacity. All proposed on-site drainage infrastructure was designed to have capacity for the 10-Year storm event. The site will provide detention for WQCV and discharge higher intensity events undetained per the County Code (LUDC Section 70-9 Technical Appendix, F.4.a.i.ii). It is expected that the 100-Year storm event will overwhelm the proposed site infrastructure. However, in this case, on-site runoffs will flow directly into the Animas River without endangering any adjacent properties.

6 Conclusion

The proposed project includes the re-development of a historic gravel pit for the proposed Village Camp Durango Development. The site will include new gravel and asphalt drives, amenity areas, and RV Sites. The site will largely drain via a network of grass lined swales and culverts. Four extended detention basins were designed to provide water quality treatment for the proposed site.

All conveyance via swales and culverts has been analyzed and deemed adequate to convey the 10-year event.

Appendix A

NRCS Soil Report

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for La Plata County Area, Colorado

March 27, 2023

Custom Soil Resource Report
Soil Map

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: La Plata County Area, Colorado
Survey Area Data: Version 20, Sep 6, 2022

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

Date(s) aerial images were photographed: Sep 6, 2021—Sep 17, 2021

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.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
50	Pescar fine sandy loam	22.7	55.4%
57	Riverwash	5.1	12.3%
66	Tefton loam	12.0	29.2%
84	Water	1.3	3.1%
Totals for Area of Interest		**41.1**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The

delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

La Plata County Area, Colorado

50—Pescar fine sandy loam

Map Unit Setting

National map unit symbol: 1yp1
Elevation: 6,500 to 8,000 feet
Mean annual precipitation: 18 to 22 inches
Mean annual air temperature: 42 to 45 degrees F
Frost-free period: 90 to 110 days
Farmland classification: Not prime farmland

Map Unit Composition

Pescar and similar soils: 75 percent
Minor components: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Pescar

Setting

Landform: Flood plains, terraces, valleys
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Stratified, calcareous alluvium

Typical profile

H1 - 0 to 8 inches: fine sandy loam
H2 - 8 to 20 inches: stratified loam to loamy fine sand
H3 - 20 to 60 inches: very gravelly sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: 18 to 30 inches to strongly contrasting textural stratification
Drainage class: Somewhat poorly drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: About 18 to 30 inches
Frequency of flooding: NoneFrequent
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Very low (about 2.8 inches)

Interpretive groups

Land capability classification (irrigated): 4w
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: B
Ecological site: R048AY241CO - Mountain Meadow
Hydric soil rating: No

Minor Components

Tefton

Percent of map unit: 15 percent

Hydric soil rating: No

Aquents

Percent of map unit: 5 percent
Landform: Depressions
Hydric soil rating: Yes

Other soils

Percent of map unit: 5 percent
Hydric soil rating: No

57—Riverwash

Map Unit Composition

Riverwash: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Riverwash

Setting

Landform: Valleys, drainageways, flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Sandy and/or cobbly or gravelly alluvium

66—Tefton loam

Map Unit Setting

National map unit symbol: 1ypl
Elevation: 6,000 to 7,500 feet
Mean annual precipitation: 16 to 19 inches
Mean annual air temperature: 45 to 53 degrees F
Frost-free period: 105 to 130 days
Farmland classification: Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season

Map Unit Composition

Tefton and similar soils: 70 percent
Minor components: 30 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Tefton

Setting

Landform: Flood plains, valley floors
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear

Parent material: Mixed alluvium

Typical profile

H1 - 0 to 5 inches: loam
H2 - 5 to 56 inches: stratified fine sandy loam to clay loam
H3 - 56 to 60 inches: very gravelly sand

Properties and qualities

Slope: 1 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat poorly drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 2.00 in/hr)
Depth to water table: About 24 to 36 inches
Frequency of flooding: NoneRare
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Available water supply, 0 to 60 inches: High (about 9.6 inches)

Interpretive groups

Land capability classification (irrigated): 3w
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: C
Ecological site: R048AY241CO - Mountain Meadow
Hydric soil rating: No

Minor Components

Pescar

Percent of map unit: 20 percent
Hydric soil rating: No

Alamosa

Percent of map unit: 10 percent
Landform: Alluvial fans
Hydric soil rating: Yes

84—Water

Map Unit Composition

Water: 95 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Minor Components

Aquolls

Percent of map unit: 5 percent
Landform: Marshes
Hydric soil rating: Yes

Appendix B

NOAA ATLAS 14 – Rainfall Intensity Estimates

NOAA Atlas 14, Volume 8, Version 2
Location name: Durango, Colorado, USA*
Latitude: 37.3857°, Longitude: -107.8397°
Elevation: m/ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

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

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

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

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.191** (0.155-0.244)	**0.245** (0.199-0.315)	**0.347** (0.281-0.446)	**0.443** (0.357-0.572)	**0.592** (0.471-0.807)	**0.721** (0.557-0.985)	**0.862** (0.643-1.20)	**1.02** (0.730-1.44)	**1.24** (0.857-1.79)	**1.42** (0.953-2.06)
10-min	**0.279** (0.227-0.358)	**0.359** (0.292-0.461)	**0.508** (0.412-0.653)	**0.649** (0.523-0.837)	**0.867** (0.689-1.18)	**1.06** (0.815-1.44)	**1.26** (0.942-1.75)	**1.49** (1.07-2.11)	**1.82** (1.25-2.62)	**2.08** (1.40-3.01)
15-min	**0.340** (0.277-0.436)	**0.438** (0.356-0.562)	**0.620** (0.502-0.797)	**0.791** (0.638-1.02)	**1.06** (0.841-1.44)	**1.29** (0.994-1.76)	**1.54** (1.15-2.14)	**1.82** (1.30-2.57)	**2.21** (1.53-3.20)	**2.54** (1.70-3.67)
30-min	**0.417** (0.339-0.535)	**0.532** (0.433-0.682)	**0.748** (0.606-0.962)	**0.954** (0.769-1.23)	**1.28** (1.02-1.74)	**1.56** (1.20-2.13)	**1.87** (1.40-2.60)	**2.21** (1.59-3.13)	**2.70** (1.87-3.91)	**3.11** (2.08-4.49)
60-min	**0.499** (0.406-0.640)	**0.623** (0.506-0.799)	**0.857** (0.694-1.10)	**1.08** (0.872-1.40)	**1.44** (1.14-1.96)	**1.75** (1.35-2.39)	**2.09** (1.56-2.91)	**2.47** (1.77-3.50)	**3.01** (2.08-4.36)	**3.47** (2.32-5.01)
2-hr	**0.582** (0.480-0.735)	**0.713** (0.587-0.902)	**0.965** (0.792-1.22)	**1.21** (0.987-1.54)	**1.60** (1.29-2.15)	**1.93** (1.52-2.61)	**2.31** (1.75-3.16)	**2.72** (1.99-3.81)	**3.33** (2.34-4.74)	**3.83** (2.60-5.45)
3-hr	**0.664** (0.551-0.831)	**0.789** (0.655-0.989)	**1.03** (0.854-1.30)	**1.27** (1.05-1.60)	**1.65** (1.35-2.20)	**1.99** (1.58-2.66)	**2.37** (1.81-3.22)	**2.78** (2.05-3.86)	**3.40** (2.41-4.80)	**3.91** (2.68-5.51)
6-hr	**0.872** (0.734-1.08)	**0.992** (0.834-1.23)	**1.23** (1.03-1.52)	**1.46** (1.22-1.81)	**1.83** (1.51-2.39)	**2.16** (1.73-2.83)	**2.52** (1.96-3.37)	**2.93** (2.19-3.99)	**3.53** (2.54-4.90)	**4.03** (2.81-5.59)
12-hr	**1.18** (1.00-1.43)	**1.31** (1.12-1.59)	**1.56** (1.33-1.90)	**1.80** (1.52-2.20)	**2.17** (1.81-2.77)	**2.49** (2.02-3.19)	**2.84** (2.23-3.71)	**3.22** (2.44-4.30)	**3.78** (2.76-5.14)	**4.23** (3.00-5.78)
24-hr	**1.51** (1.30-1.80)	**1.69** (1.46-2.02)	**2.00** (1.73-2.40)	**2.28** (1.95-2.74)	**2.69** (2.25-3.34)	**3.02** (2.47-3.78)	**3.37** (2.68-4.30)	**3.74** (2.86-4.87)	**4.26** (3.15-5.67)	**4.67** (3.36-6.27)
2-day	**1.82** (1.60-2.15)	**2.08** (1.82-2.44)	**2.49** (2.17-2.94)	**2.84** (2.47-3.36)	**3.33** (2.81-4.04)	**3.71** (3.07-4.54)	**4.09** (3.29-5.11)	**4.48** (3.48-5.72)	**5.01** (3.76-6.53)	**5.41** (3.97-7.15)
3-day	**2.05** (1.81-2.39)	**2.32** (2.05-2.71)	**2.77** (2.44-3.24)	**3.15** (2.76-3.70)	**3.68** (3.14-4.43)	**4.10** (3.42-4.98)	**4.52** (3.67-5.59)	**4.95** (3.88-6.26)	**5.53** (4.19-7.14)	**5.98** (4.43-7.81)
4-day	**2.23** (1.98-2.59)	**2.52** (2.24-2.92)	**3.00** (2.65-3.48)	**3.40** (3.00-3.96)	**3.97** (3.41-4.74)	**4.42** (3.71-5.33)	**4.87** (3.98-5.99)	**5.34** (4.21-6.71)	**5.98** (4.56-7.67)	**6.47** (4.82-8.39)
7-day	**2.65** (2.38-3.03)	**3.00** (2.69-3.43)	**3.57** (3.19-4.09)	**4.05** (3.60-4.65)	**4.72** (4.10-5.56)	**5.25** (4.47-6.25)	**5.79** (4.79-7.02)	**6.34** (5.07-7.85)	**7.09** (5.48-8.96)	**7.66** (5.79-9.80)
10-day	**3.02** (2.73-3.42)	**3.40** (3.07-3.85)	**4.02** (3.63-4.57)	**4.55** (4.08-5.19)	**5.29** (4.62-6.17)	**5.87** (5.03-6.92)	**6.45** (5.38-7.75)	**7.05** (5.68-8.65)	**7.86** (6.13-9.85)	**8.48** (6.47-10.8)
20-day	**4.06** (3.73-4.53)	**4.50** (4.12-5.01)	**5.21** (4.76-5.82)	**5.80** (5.28-6.50)	**6.63** (5.88-7.60)	**7.28** (6.34-8.43)	**7.93** (6.72-9.36)	**8.60** (7.04-10.4)	**9.49** (7.53-11.7)	**10.2** (7.90-12.7)
30-day	**4.90** (4.53-5.41)	**5.40** (4.99-5.96)	**6.22** (5.73-6.88)	**6.90** (6.33-7.66)	**7.83** (7.00-8.88)	**8.55** (7.51-9.80)	**9.27** (7.93-10.8)	**10.0** (8.27-11.9)	**11.0** (8.79-13.3)	**11.7** (9.19-14.4)
45-day	**5.90** (5.51-6.45)	**6.54** (6.10-7.15)	**7.58** (7.05-8.31)	**8.43** (7.81-9.26)	**9.57** (8.62-10.7)	**10.4** (9.24-11.8)	**11.3** (9.72-13.0)	**12.1** (10.1-14.3)	**13.2** (10.7-15.9)	**14.0** (11.1-17.1)
60-day	**6.71** (6.30-7.28)	**7.52** (7.06-8.16)	**8.81** (8.25-9.59)	**9.85** (9.18-10.8)	**11.2** (10.2-12.5)	**12.3** (10.9-13.8)	**13.3** (11.5-15.1)	**14.2** (11.9-16.6)	**15.5** (12.6-18.4)	**16.3** (13.1-19.8)

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

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

Please refer to NOAA Atlas 14 document for more information.

Back to Top

PF graphical

Appendix C

Subbasin Exhibit

SUBBASIN 1			
LAND USE	AREA (ACRES)	% IMPERVIOUSNESS	IMPERVIOUS AREA (ACRES)
LAWNS AND SANDY SOILS	3.47	2%	0.07
GRAVEL DRIVES	1.11	40%	0.44
ROOFS	0.00	90%	0.00
PAVED STREETS	1.37	100%	1.37
CONCRETE AREAS	0.20	100%	0.20
TOTAL AREA	6.15		2.08
WEIGHTED IMPERVIOUSNESS			34%

SUBBASIN 3			
LAND USE	AREA (ACRES)	% IMPERVIOUSNESS	IMPERVIOUS AREA (ACRES)
LAWNS AND SANDY SOILS	1.01	2%	0.02
GRAVEL DRIVES	0.85	40%	0.34
ROOFS	0.00	90%	0.00
PAVED STREETS	0.38	100%	0.38
CONCRETE AREAS	0.10	100%	0.10
TOTAL AREA	2.34		0.84
WEIGHTED IMPERVIOUSNESS			36%

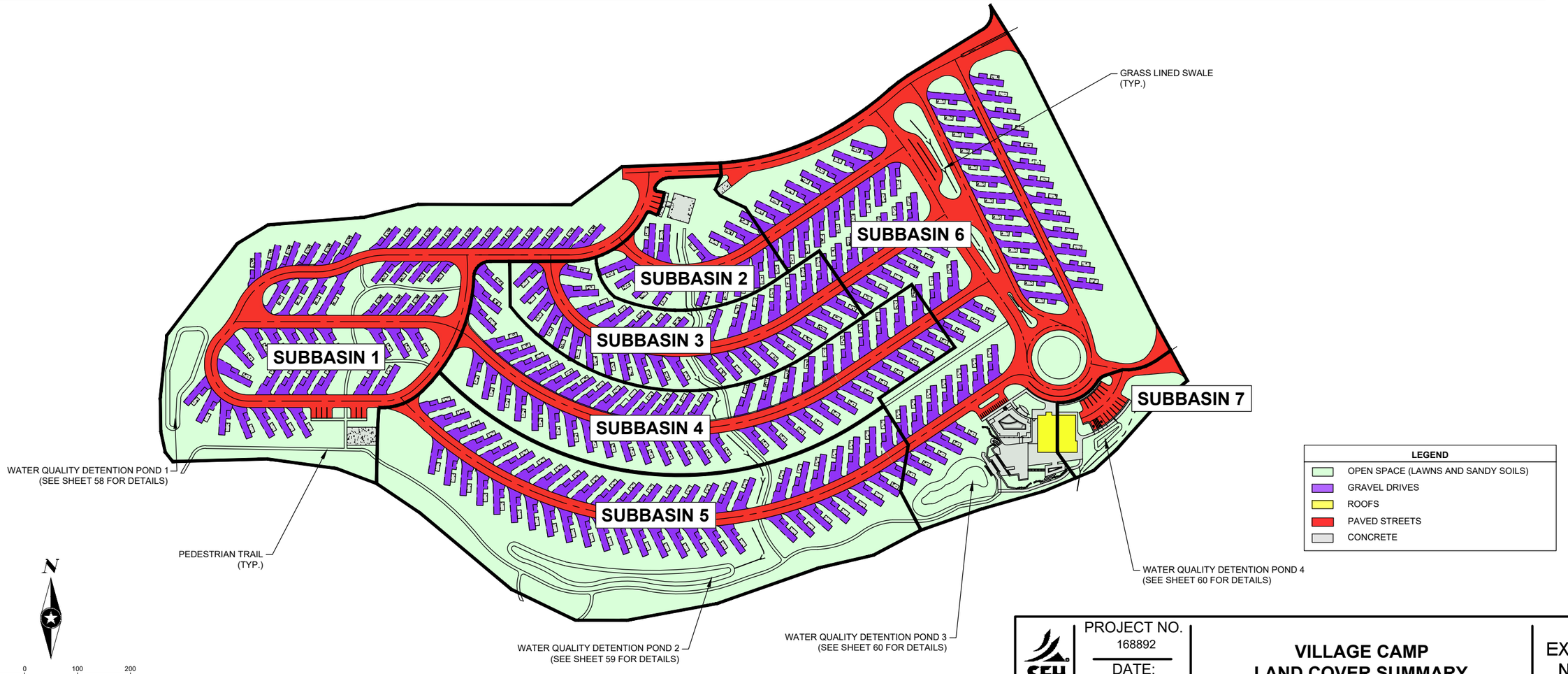
SUBBASIN 5			
LAND USE	AREA (ACRES)	% IMPERVIOUSNESS	IMPERVIOUS AREA (ACRES)
LAWNS AND SANDY SOILS	3.96	2%	0.08
GRAVEL DRIVES	1.25	40%	0.50
ROOFS	0.00	90%	0.00
PAVED STREETS	0.59	100%	0.59
CONCRETE AREAS	0.15	100%	0.15
TOTAL AREA	5.95		1.32
WEIGHTED IMPERVIOUSNESS			22%

SUBBASIN 7			
LAND USE	AREA (ACRES)	% IMPERVIOUSNESS	IMPERVIOUS AREA (ACRES)
LAWNS AND SANDY SOILS	0.32	2%	0.01
GRAVEL DRIVES	0.00	40%	0.00
ROOFS	0.06	90%	0.05
PAVED STREETS	0.19	100%	0.19
CONCRETE AREAS	0.07	100%	0.07
TOTAL AREA	0.64		0.32
WEIGHTED IMPERVIOUSNESS			50%

SUBBASIN 2			
LAND USE	AREA (ACRES)	% IMPERVIOUSNESS	IMPERVIOUS AREA (ACRES)
LAWNS AND SANDY SOILS	0.72	2%	0.01
GRAVEL DRIVES	0.36	40%	0.14
ROOFS	0.00	90%	0.00
PAVED STREETS	0.17	100%	0.17
CONCRETE AREAS	0.10	100%	0.10
TOTAL AREA	1.35		0.43
WEIGHTED IMPERVIOUSNESS			32%

SUBBASIN 4			
LAND USE	AREA (ACRES)	% IMPERVIOUSNESS	IMPERVIOUS AREA (ACRES)
LAWNS AND SANDY SOILS	1.81	2%	0.04
GRAVEL DRIVES	1.30	40%	0.52
ROOFS	0.00	90%	0.00
PAVED STREETS	0.56	100%	0.56
CONCRETE AREAS	0.16	100%	0.16
TOTAL AREA	3.83		1.28
WEIGHTED IMPERVIOUSNESS			33%

SUBBASIN 6			
LAND USE	AREA (ACRES)	% IMPERVIOUSNESS	IMPERVIOUS AREA (ACRES)
LAWNS AND SANDY SOILS	4.85	2%	0.10
GRAVEL DRIVES	1.02	40%	0.41
ROOFS	0.06	90%	0.05
PAVED STREETS	2.27	100%	2.27
CONCRETE AREAS	0.57	100%	0.57
TOTAL AREA	8.77		3.40
WEIGHTED IMPERVIOUSNESS			39%



PROJECT NO. 168892

DATE: 2025/01/06

VILLAGE CAMP
LAND COVER SUMMARY

EXHIBIT NO. 1

Save: 1/6/2025 2:22 PM gfrizzell Plot: 1/6/2025 2:23 PM X:\PTI\R\ROBRE\168892\5-final-dsgn\50-final-dsgn\50-Hydro\dwg\168892_Land Cover.dwg

Appendix D

MHFD Workbook Analysis – Runoff and Detention Results

Calculation of Peak Runoff using Rational Method

Designer:
Company: SEH Inc.
Date: 1/6/2025
Project: Village Camp Durango - Post Developmen
Location:

Version 2.00 released May 2017

Cells of this color are for required user-input
Cells of this color are for optional override values
Cells of this color are for calculated results based on overrides

$$t_i = \frac{0.395(1.1 - C_5)\sqrt{L_i}}{S^{0.33}}$$

$$t_t = \frac{L_t}{60K\sqrt{S_t}} = \frac{L_t}{60V_t}$$

Computed $t_c = t_i + t_t$

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

$t_{minimum}$= 5 (urban)
$t_{minimum}$= 10 (non-urban)

Selected $t_c = \max\{t_{minimum}, \min(\text{Computed } t_c, \text{Regional } t_c)\}$

Select UDFCD location for NOAA Atlas 14 Rainfall Depths from the pulldown list OR enter your own depths obtained from the NOAA website (click this link)

	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	500-yr
1-hour rainfall depth, P1 (in) =	0.62	0.86	1.08	1.44	1.75	2.09	3.01
	a	b	c				
Rainfall Intensity Equation Coefficients =	28.50	10.00	0.786				

$$I(in/hr) = \frac{a * P_1}{(b + t_c)^c}$$

$$Q(cfs) = CIA$$

Subcatchment Name	Area (ac)	NRCS Hydrologic Soil Group	Percent Imperviousness	Runoff Coefficient, C							Overland (Initial) Flow Time					Channelized (Travel) Flow Time						Time of Concentration			Rainfall Intensity, I (in/hr)							Peak Flow, Q (cfs)						
				2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	500-yr	Overland Flow Length L_i (ft)	U/S Elevation (ft) (Optional)	D/S Elevation (ft) (Optional)	Overland Flow Slope S_i (ft/ft)	Overland Flow Time t_i (min)	Channelized Flow Length L_t (ft)	U/S Elevation (ft) (Optional)	D/S Elevation (ft) (Optional)	Channelized Flow Slope S_t (ft/ft)	NRCS Conveyance Factor K	Channelized Flow Velocity V_t (ft/sec)	Channelized Flow Time t_t (min)	Computed t_c (min)	Regional t_c (min)	Selected t_c (min)	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	500-yr	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	500-yr
SUBBASIN 1	6.16	B	34.0	0.24	0.26	0.33	0.46	0.52	0.58	0.66	300.00			0.020	20.77	1000.00			0.010	15	1.50	11.11	31.88	32.33	31.88	0.94	1.30	1.63	2.18	2.65	3.16	4.55	1.37	2.12	3.34	6.21	8.45	11.38	18.53
SUBBASIN 2	1.35	B	32.0	0.22	0.25	0.32	0.45	0.51	0.57	0.65	100.00			0.020	12.24	263.00			0.010	15	1.50	2.92	15.16	23.81	15.16	1.41	1.94	2.44	3.25	3.95	4.72	6.80	0.42	0.65	1.04	1.98	2.70	3.66	6.00
SUBBASIN 3	2.34	B	36.0	0.25	0.28	0.35	0.48	0.53	0.59	0.67	300.00			0.020	20.35	369.00			0.010	15	1.50	4.10	24.45	24.26	24.26	1.10	1.52	1.91	2.55	3.10	3.70	5.33	0.65	1.00	1.56	2.84	3.84	5.14	8.33
SUBBASIN 4	3.83	B	33.0	0.23	0.26	0.32	0.46	0.51	0.58	0.66	300.00			0.020	20.98	506.00			0.010	15	1.50	5.62	26.61	26.58	26.58	1.05	1.44	1.82	2.42	2.95	3.52	5.07	0.92	1.42	2.25	4.24	5.78	7.81	12.74
SUBBASIN 5	5.95	B	22.0	0.14	0.17	0.23	0.39	0.45	0.53	0.62	300.00			0.020	23.26	730.00			0.010	15	1.50	8.11	31.37	32.33	31.37	0.95	1.31	1.65	2.20	2.67	3.19	4.60	0.81	1.29	2.30	5.07	7.17	10.04	16.87
SUBBASIN 6	8.77	B	39.0	0.28	0.31	0.37	0.49	0.55	0.61	0.68	300.00			0.020	19.71	870.00			0.010	15	1.50	9.67	29.38	29.40	29.38	0.99	1.36	1.72	2.29	2.78	3.32	4.78	2.41	3.67	5.59	9.91	13.30	17.68	28.46
SUBBASIN 7	0.64	B	50.0	0.37	0.40	0.46	0.56	0.61	0.66	0.72	150.00			0.020	12.26	215.00			0.010	15	1.50	2.39	14.65	19.74	14.65	1.43	1.97	2.48	3.31	4.02	4.80	6.91	0.34	0.51	0.73	1.19	1.56	2.02	3.18

Calculation of Peak Runoff using Rational Method

Designer:
Company: SEH Inc.
Date: 1/6/2025
Project: Village Camp Durango - Pre Development
Location:

Version 2.00 released May 2017

Cells of this color are for required user-input
Cells of this color are for optional override values
Cells of this color are for calculated results based on overrides

$$t_i = \frac{0.395(1.1 - C_5)\sqrt{L_i}}{S^{0.33}}$$

$$t_t = \frac{L_t}{60K\sqrt{S_t}} = \frac{L_t}{60V_t}$$

Computed $t_c = t_i + t_t$

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

$t_{minimum}$= 5 (urban)
$t_{minimum}$= 10 (non-urban)

Selected $t_c = \max\{t_{minimum}, \min(\text{Computed } t_c, \text{Regional } t_c)\}$

Select UDFCD location for NOAA Atlas 14 Rainfall Depths from the pulldown list OR enter your own depths obtained from the NOAA website (click this link)

	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	500-yr
1-hour rainfall depth, P1 (in) =	0.62	0.86	1.08	1.44	1.75	2.09	3.01
	a	b	c				
Rainfall Intensity Equation Coefficients =	28.50	10.00	0.786				

$$I(in/hr) = \frac{a * P_1}{(b + t_c)^c}$$

$$Q(cfs) = CIA$$

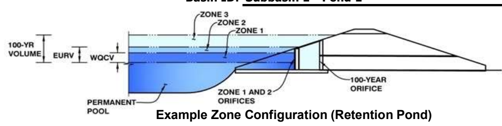
Subcatchment Name	Area (ac)	NRCS Hydrologic Soil Group	Percent Imperviousness	Runoff Coefficient, C							Overland (Initial) Flow Time					Channelized (Travel) Flow Time							Time of Concentration			Rainfall Intensity, I (in/hr)							Peak Flow, Q (cfs)						
				2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	500-yr	Overland Flow Length L_i (ft)	U/S Elevation (ft) (Optional)	D/S Elevation (ft) (Optional)	Overland Flow Slope S_i (ft/ft)	Overland Flow Time t_i (min)	Channelized Flow Length L_t (ft)	U/S Elevation (ft) (Optional)	D/S Elevation (ft) (Optional)	Channelized Flow Slope S_t (ft/ft)	NRCS Conveyance Factor K	Channelized Flow Velocity V_t (ft/sec)	Channelized Flow Time t_t (min)	Computed t_c (min)	Regional t_c (min)	Selected t_c (min)	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	500-yr	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	500-yr
SUBBASIN 1	6.16	B	2.0	0.01	0.01	0.07	0.26	0.34	0.44	0.54	300.00			0.020	27.06	1000.00			0.010	15	1.50	11.11	38.17	43.62	38.17	0.84	1.16	1.46	1.95	2.37	2.83	4.08	0.04	0.09	0.66	3.15	4.96	7.60	13.66
SUBBASIN 2	1.35	B	2.0	0.01	0.01	0.07	0.26	0.34	0.44	0.54	100.00			0.020	15.63	263.00			0.010	15	1.50	2.92	18.55	30.38	18.55	1.27	1.75	2.21	2.95	3.58	4.27	6.16	0.01	0.03	0.22	1.04	1.64	2.51	4.52
SUBBASIN 3	2.34	B	2.0	0.01	0.01	0.07	0.26	0.34	0.44	0.54	300.00			0.020	27.06	369.00			0.010	15	1.50	4.10	31.16	32.29	31.16	0.96	1.31	1.66	2.21	2.68	3.21	4.62	0.02	0.04	0.28	1.35	2.13	3.27	5.87
SUBBASIN 4	3.83	B	2.0	0.01	0.01	0.07	0.26	0.34	0.44	0.54	300.00			0.020	27.06	506.00			0.010	15	1.50	5.62	32.69	34.75	32.69	0.93	1.28	1.61	2.15	2.61	3.12	4.49	0.03	0.06	0.45	2.15	3.39	5.19	9.34
SUBBASIN 5	5.95	B	2.0	0.01	0.01	0.07	0.26	0.34	0.44	0.54	300.00			0.020	27.06	730.00			0.010	15	1.50	8.11	35.17	38.77	35.17	0.89	1.22	1.54	2.05	2.50	2.98	4.29	0.05	0.09	0.67	3.20	5.04	7.72	13.88
SUBBASIN 6	8.77	B	2.0	0.01	0.01	0.07	0.26	0.34	0.44	0.54	300.00			0.020	27.06	870.00			0.010	15	1.50	9.67	36.73	41.29	36.73	0.87	1.19	1.50	2.00	2.43	2.90	4.18	0.07	0.13	0.96	4.59	7.23	11.08	19.91
SUBBASIN 7	0.64	B	2.0	0.01	0.01	0.07	0.26	0.34	0.44	0.54	150.00			0.020	19.14	215.00			0.010	15	1.50	2.39	21.53	29.52	21.53	1.18	1.62	2.04	2.72	3.31	3.95	5.69	0.01	0.01	0.10	0.46	0.72	1.10	1.98

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)

Project: **Village Camp**

Basin ID: **Subbasin 1 - Pond 1**



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	**EDB**	
Watershed Area =	6.15	acres
Watershed Length =	533	ft
Watershed Length to Centroid =	200	ft
Watershed Slope =	0.005	ft/ft
Watershed Imperviousness =	41.00%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	68.0%	percent
Percentage Hydrologic Soil Groups C/D =	32.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	Denver - Capitol Building	

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

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	0.094	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	0.256	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 0.62 in.) =	0.096	acre-feet	0.62	inches
5-yr Runoff Volume (P1 = 0.86 in.) =	0.151	acre-feet	0.86	inches
10-yr Runoff Volume (P1 = 1.08 in.) =	0.206	acre-feet	1.08	inches
25-yr Runoff Volume (P1 = 1.44 in.) =	0.388	acre-feet	1.44	inches
50-yr Runoff Volume (P1 = 1.75 in.) =	0.534	acre-feet	1.75	inches
100-yr Runoff Volume (P1 = 2.09 in.) =	0.725	acre-feet	2.09	inches
500-yr Runoff Volume (P1 = 3.01 in.) =	1.192	acre-feet	3.01	inches
Approximate 2-yr Detention Volume =	0.104	acre-feet		
Approximate 5-yr Detention Volume =	0.165	acre-feet		
Approximate 10-yr Detention Volume =	0.229	acre-feet		
Approximate 25-yr Detention Volume =	0.297	acre-feet		
Approximate 50-yr Detention Volume =	0.335	acre-feet		
Approximate 100-yr Detention Volume =	0.411	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.094	acre-feet
Select Zone 2 Storage Volume (Optional) =		acre-feet
Select Zone 3 Storage Volume (Optional) =		acre-feet
Total Detention Basin Volume =	0.094	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	**user**	acre-feet

Total detention volume is less than 100-year volume.

Depth Increment = 1.00 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	--	--	--	5,451	0.125		
	--	2.50	--	--	--	8,770	0.201	17,776	0.408
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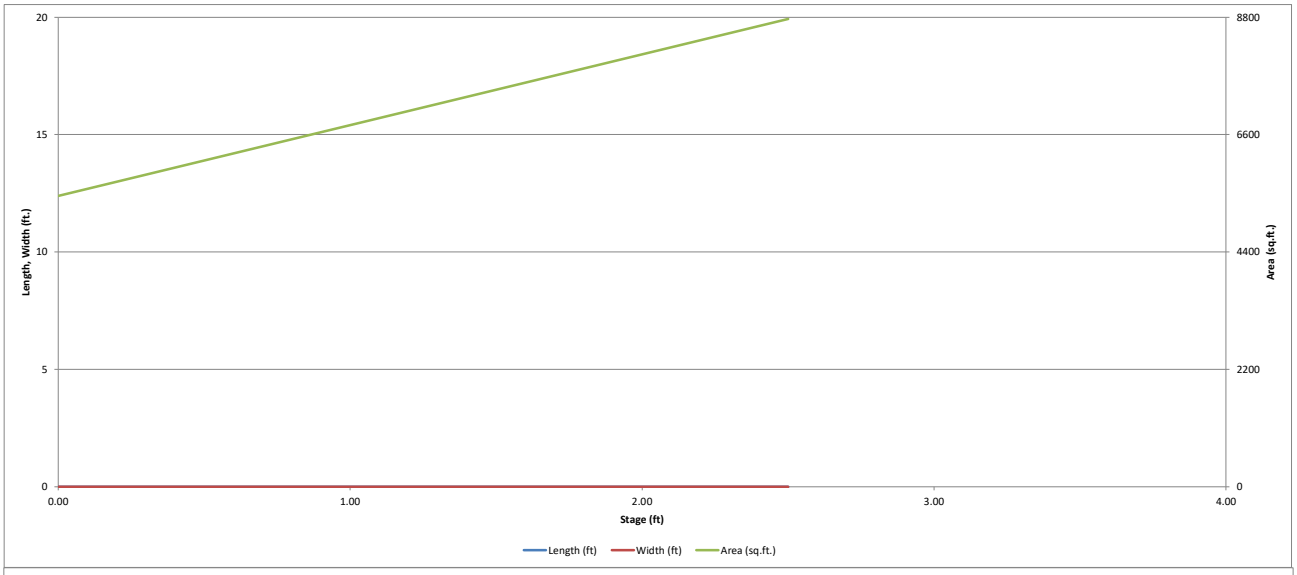
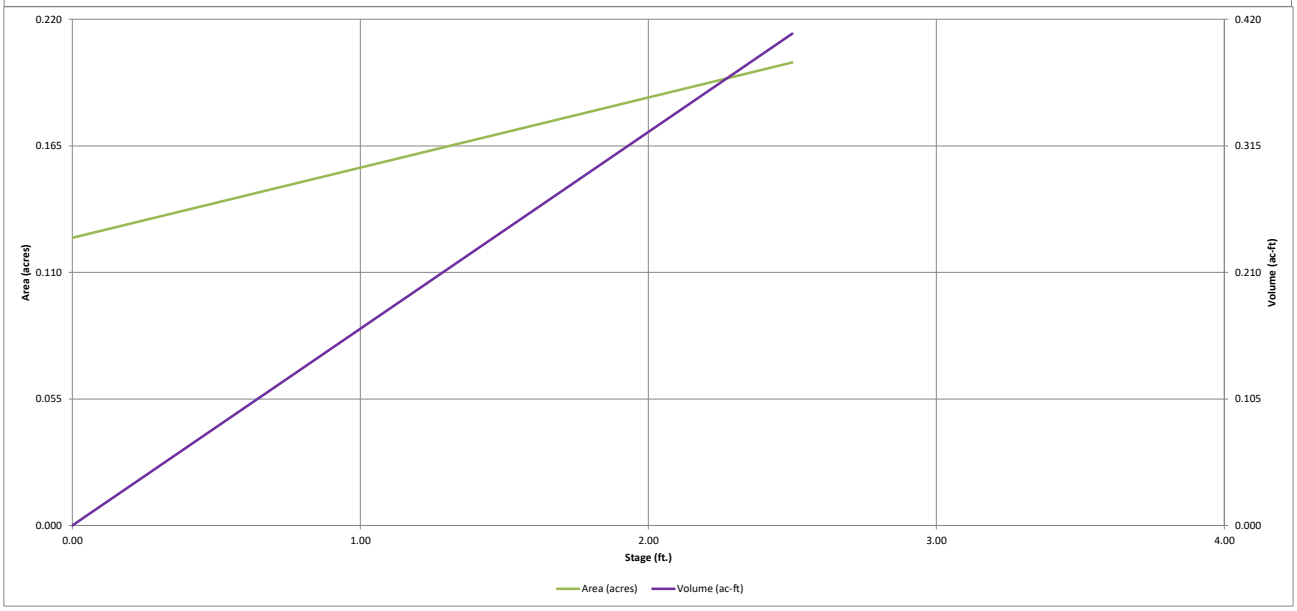
DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)



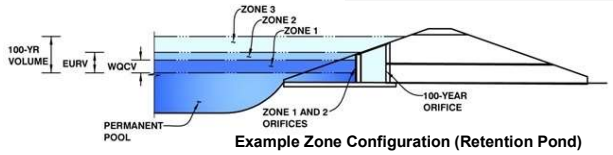


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)

Project: Village Camp

Basin ID: Subbasin 1 - Pond 1



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1	#N/A		Orifice Plate
Zone 2			Weir&Pipe (Circular)
Zone 3			
Total (all zones)			

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

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

Calculated Parameters for Underdrain

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

Invert of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	8.333E-03	ft²
Depth at top of Zone using Orifice Plate =	0.40	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	1.60	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	1.20	sq. inches (diameter = 1-1/4 inches)	Elliptical Slot Area =	N/A	ft²

Calculated Parameters for Plate

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

	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	0.13	0.27					
Orifice Area (sq. inches)	1.20	1.20	1.20					

	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)

	Not Selected	Not Selected				
Invert of Vertical Orifice =			ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =		ft²
Depth at top of Zone using Vertical Orifice =			ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =		feet
Vertical Orifice Diameter =			inches			

Calculated Parameters for Vertical Orifice

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

	Zone 2 Weir	Not Selected					
Overflow Weir Front Edge Height, Ho =	1.30		ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	1.97		feet
Overflow Weir Front Edge Length =	2.00		feet	Overflow Weir Slope Length =	2.11		feet
Overflow Weir Grate Slope =	3.00		H:V	Grate Open Area / 100-yr Orifice Area =	3.74		
Horiz. Length of Weir Sides =	2.00		feet	Overflow Grate Open Area w/o Debris =	2.93		ft²
Overflow Grate Type =	Type C Grate			Overflow Grate Open Area w/ Debris =	1.47		ft²
Debris Clogging % =	50%		%				

Calculated Parameters for Overflow Weir

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

	Zone 2 Circular	Not Selected					
Depth to Invert of Outlet Pipe =	1.25		ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	0.79		ft²
Circular Orifice Diameter =	12.00		inches	Outlet Orifice Centroid =	0.50		feet
				Half-Central Angle of Restrictor Plate on Pipe =	N/A	N/A	radians

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

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

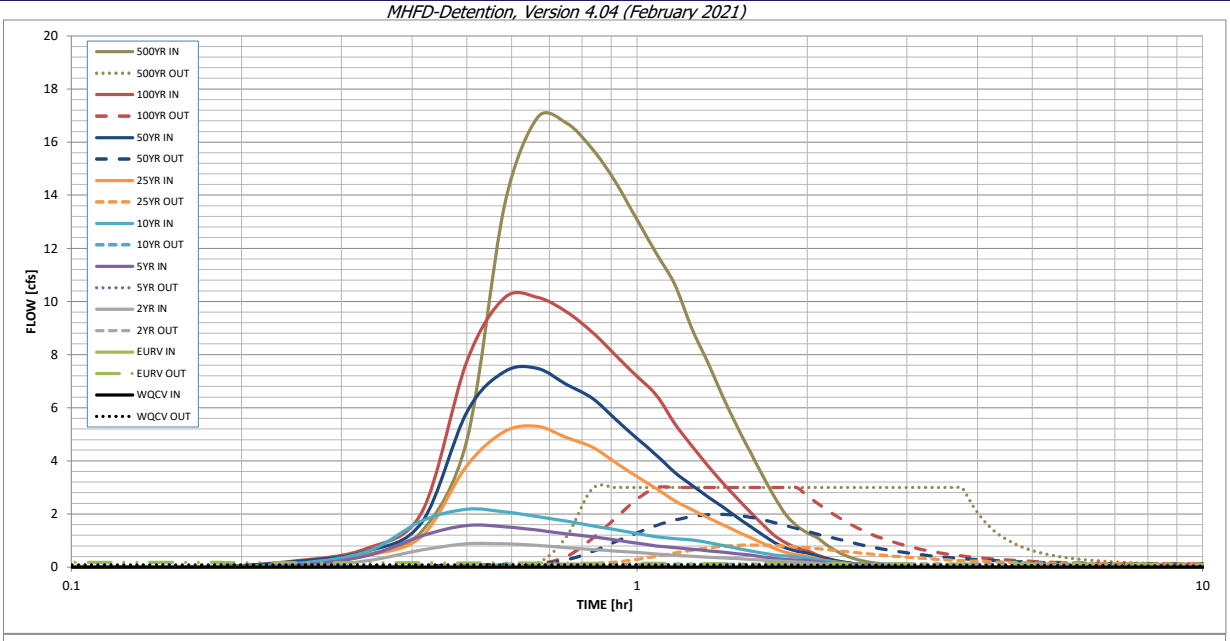
Calculated Parameters for Spillway

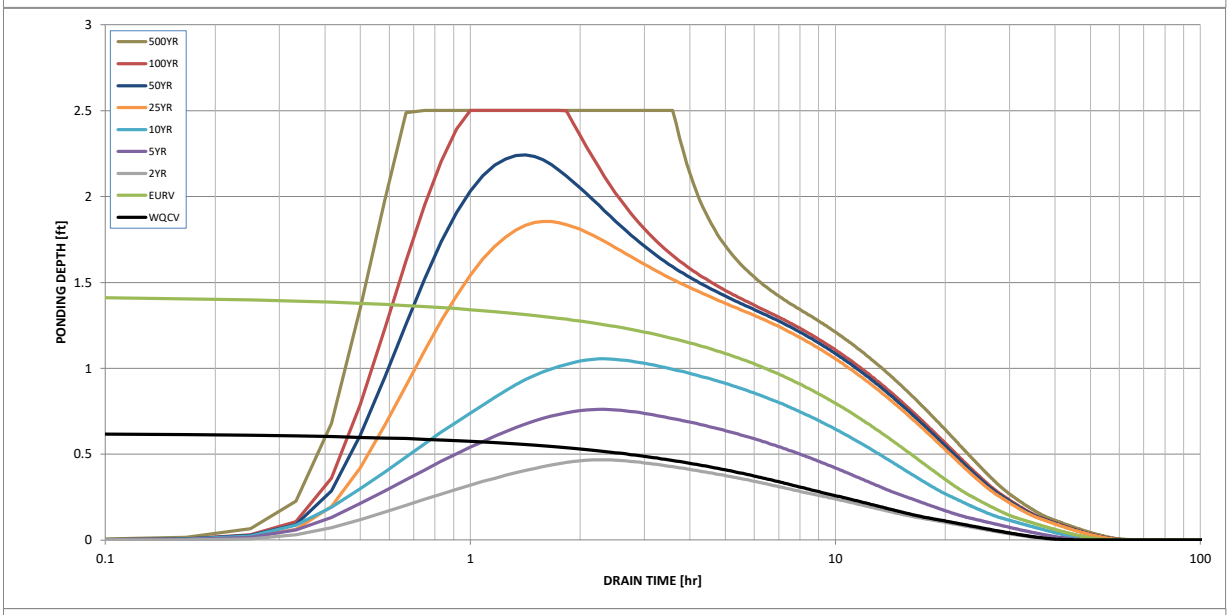
Routed Hydrograph Results

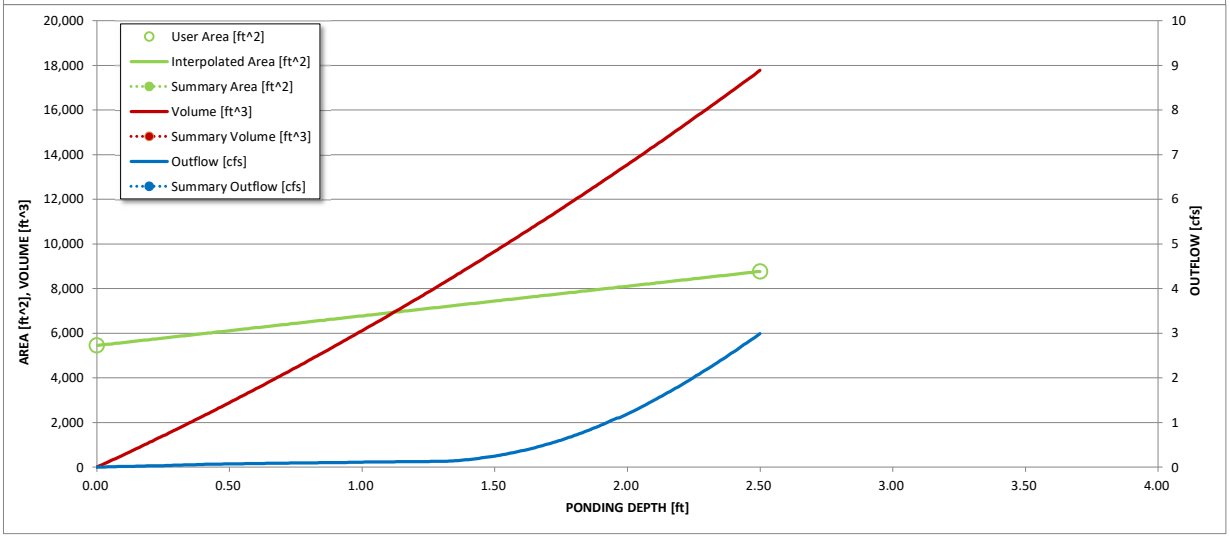
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	0.62	0.86	1.08	1.44	1.75	2.09	3.01
CUHP Runoff Volume (acre-ft) =	0.084	0.209	0.072	0.118	0.167	0.348	0.493	0.686	1.154
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.072	0.118	0.167	0.348	0.493	0.686	1.154
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.0	0.1	0.1	2.6	4.4	6.5	11.7
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.00	0.01	0.02	0.43	0.71	1.06	1.91
Peak Inflow Q (cfs) =	N/A	N/A	0.9	1.6	2.2	5.3	7.5	10.2	16.9
Peak Outflow Q (cfs) =	0.1	0.2	0.07	0.1	0.1	0.8	2.0	3.0	3.0
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	1.5	1.2	0.3	0.5	0.5	0.3
Structure Controlling Flow =	Plate	Overflow Weir 1	Plate	Plate	Plate	Overflow Wei	Overflow Weir	N/A	N/A
Max Velocity through Grate 1 (fps) =	N/A	0.02	N/A	N/A	N/A	0.2	0.6	1.0	1.0
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	35	42	35	38	41	42	38	34	30
Time to Drain 99% of Inflow Volume (hours) =	**39**	49	39	43	47	51	49	47	43
Maximum Ponding Depth (ft) =	0.63	1.43	0.47	0.76	1.05	1.86	2.24	2.50	2.50
Area at Maximum Ponding Depth (acres) =	0.14	0.17	0.14	0.15	0.16	0.18	0.19	0.20	0.20
Maximum Volume Stored (acre-ft) =	0.085	0.210	0.061	0.104	0.148	0.284	0.357	0.408	0.408

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)







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

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename:

Inflow Hydrographs

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

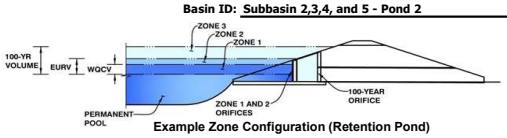
	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06
	0:15:00	0.00	0.00	0.00	0.07	0.14	0.12	0.21	0.23	0.47
	0:20:00	0.00	0.00	0.24	0.43	0.59	0.44	0.60	0.70	1.36
	0:25:00	0.00	0.00	0.65	1.18	1.75	1.17	1.70	2.08	4.76
	0:30:00	0.00	0.00	0.87	1.57	2.18	3.82	5.83	7.74	13.64
	0:35:00	0.00	0.00	0.87	1.52	2.08	5.10	7.36	10.14	16.92
	0:40:00	0.00	0.00	0.82	1.39	1.90	5.30	7.48	10.16	16.72
	0:45:00	0.00	0.00	0.73	1.25	1.73	4.88	6.88	9.62	15.75
	0:50:00	0.00	0.00	0.66	1.14	1.56	4.51	6.35	8.85	14.49
	0:55:00	0.00	0.00	0.61	1.02	1.40	3.93	5.56	7.97	13.08
	1:00:00	0.00	0.00	0.55	0.90	1.26	3.41	4.84	7.18	11.79
	1:05:00	0.00	0.00	0.50	0.80	1.14	2.94	4.21	6.46	10.63
	1:10:00	0.00	0.00	0.44	0.73	1.07	2.49	3.56	5.39	8.99
	1:15:00	0.00	0.00	0.41	0.67	1.02	2.17	3.09	4.57	7.71
	1:20:00	0.00	0.00	0.37	0.61	0.93	1.86	2.65	3.82	6.44
	1:25:00	0.00	0.00	0.34	0.56	0.81	1.60	2.27	3.18	5.33
	1:30:00	0.00	0.00	0.32	0.51	0.71	1.35	1.89	2.61	4.35
	1:35:00	0.00	0.00	0.29	0.45	0.61	1.12	1.54	2.09	3.46
	1:40:00	0.00	0.00	0.26	0.39	0.53	0.90	1.22	1.61	2.64
	1:45:00	0.00	0.00	0.24	0.33	0.46	0.70	0.93	1.19	1.97
	1:50:00	0.00	0.00	0.22	0.29	0.42	0.55	0.72	0.91	1.55
	1:55:00	0.00	0.00	0.19	0.27	0.39	0.46	0.60	0.73	1.29
	2:00:00	0.00	0.00	0.17	0.25	0.35	0.41	0.53	0.62	1.11
	2:05:00	0.00	0.00	0.14	0.20	0.28	0.32	0.41	0.46	0.83
	2:10:00	0.00	0.00	0.11	0.16	0.22	0.24	0.31	0.34	0.61
	2:15:00	0.00	0.00	0.09	0.13	0.18	0.19	0.24	0.24	0.44
	2:20:00	0.00	0.00	0.07	0.10	0.14	0.15	0.18	0.18	0.32
	2:25:00	0.00	0.00	0.06	0.08	0.11	0.11	0.14	0.13	0.24
	2:30:00	0.00	0.00	0.04	0.06	0.08	0.08	0.10	0.10	0.18
	2:35:00	0.00	0.00	0.03	0.05	0.06	0.06	0.08	0.08	0.14
	2:40:00	0.00	0.00	0.03	0.03	0.05	0.05	0.06	0.06	0.10
	2:45:00	0.00	0.00	0.02	0.03	0.04	0.04	0.04	0.04	0.08
	2:50:00	0.00	0.00	0.02	0.02	0.03	0.03	0.03	0.03	0.06
	2:55:00	0.00	0.00	0.01	0.01	0.02	0.02	0.02	0.02	0.04
	3:00:00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.02
	3:05:00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01
	3:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)

Project: Village Camp

Basin ID: Subbasin 2,3,4, and 5 - Pond 2



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	**EDB**	
Watershed Area =	13.47	acres
Watershed Length =	975	ft
Watershed Length to Centroid =	475	ft
Watershed Slope =	0.005	ft/ft
Watershed Imperviousness =	29.00%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	68.0%	percent
Percentage Hydrologic Soil Groups C/D =	32.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	Denver - Capitol Building	

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

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	0.166	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	0.385	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 0.62 in.) =	0.126	acre-feet	0.62	inches
5-yr Runoff Volume (P1 = 0.86 in.) =	0.217	acre-feet	0.86	inches
10-yr Runoff Volume (P1 = 1.08 in.) =	0.312	acre-feet	1.08	inches
25-yr Runoff Volume (P1 = 1.44 in.) =	0.715	acre-feet	1.44	inches
50-yr Runoff Volume (P1 = 1.75 in.) =	1.038	acre-feet	1.75	inches
100-yr Runoff Volume (P1 = 2.09 in.) =	1.471	acre-feet	2.09	inches
500-yr Runoff Volume (P1 = 3.01 in.) =	2.518	acre-feet	3.01	inches
Approximate 2-yr Detention Volume =	0.152	acre-feet		
Approximate 5-yr Detention Volume =	0.253	acre-feet		
Approximate 10-yr Detention Volume =	0.370	acre-feet		
Approximate 25-yr Detention Volume =	0.497	acre-feet		
Approximate 50-yr Detention Volume =	0.565	acre-feet		
Approximate 100-yr Detention Volume =	0.723	acre-feet		

Define Zones and Basin Geometry

Select Zone 1 Storage Volume (Required) =		acre-feet
Select Zone 2 Storage Volume (Optional) =		acre-feet
Select Zone 3 Storage Volume (Optional) =		acre-feet
Total Detention Basin Volume =		acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	

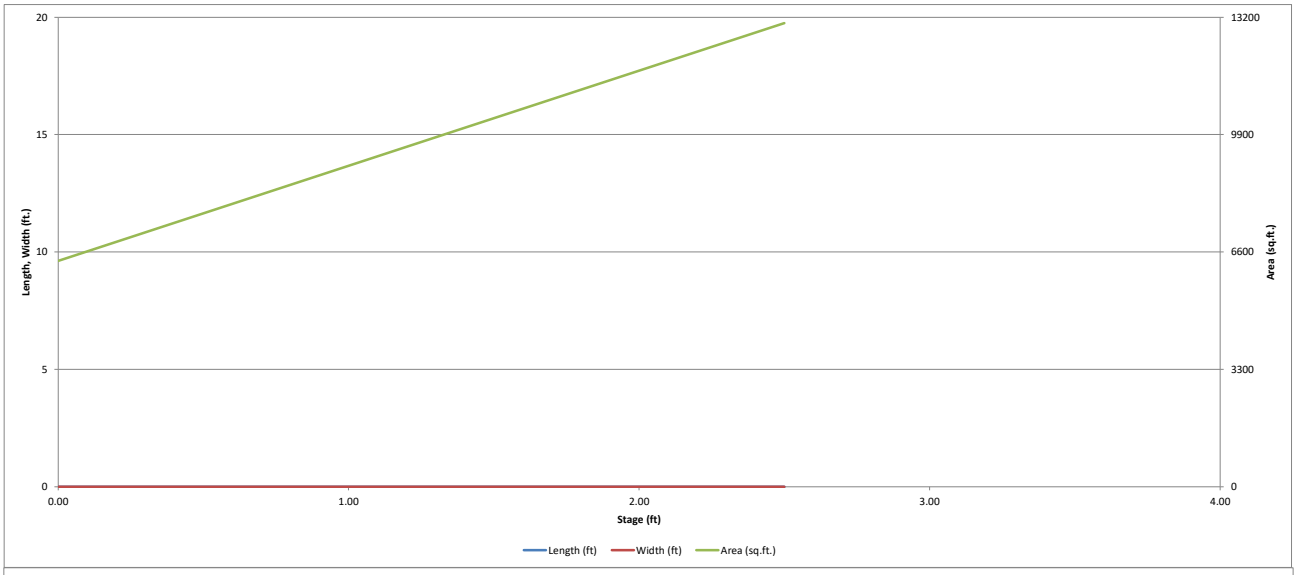
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user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

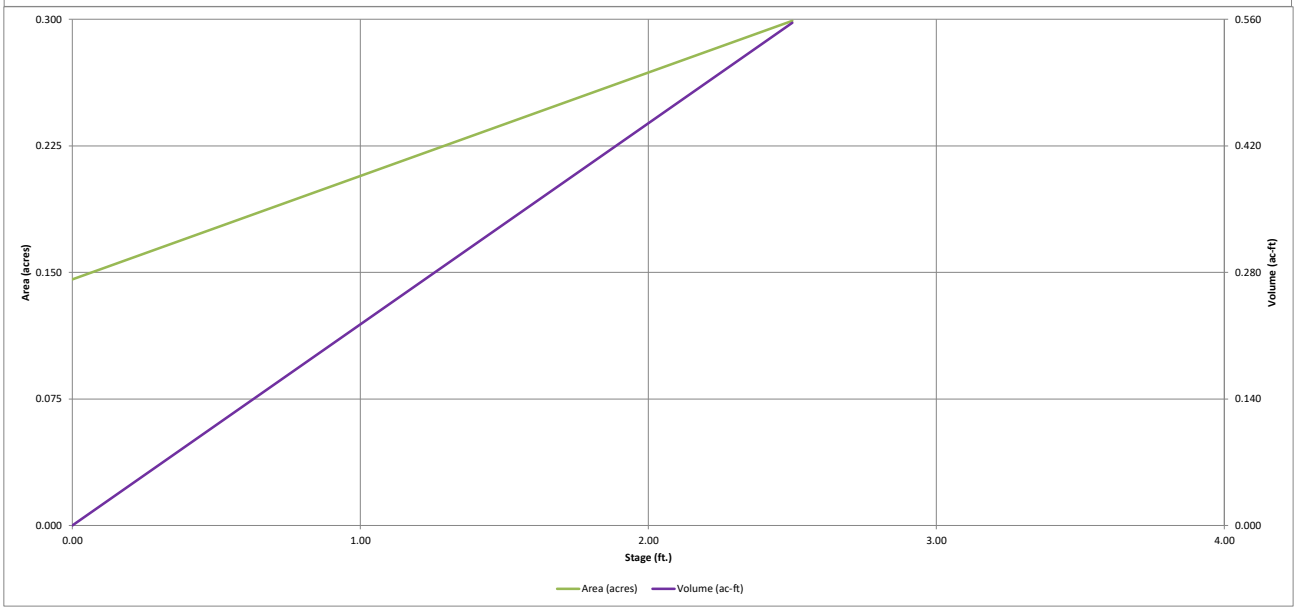
Depth Increment = 1.00 ft

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	--	--	--	6,352	0.146		
	--	2.50	--	--	--	13,033	0.299	24,231	0.556

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)



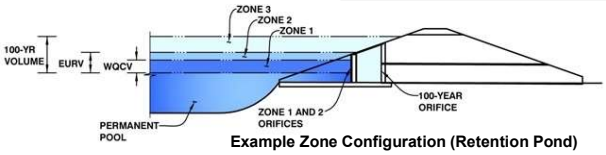


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)

Project: Village Camp

Basin ID: Subbasin 2,3,4, and 5 - Pond 2



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1	#N/A		Orifice Plate
Zone 2			Weir&Pipe (Circular)
Zone 3			
Total (all zones)			

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

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

Calculated Parameters for Underdrain

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

Invert of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	1.146E-02	ft^2
Depth at top of Zone using Orifice Plate =	0.47	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	1.90	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	1.65	sq. inches (diameter = 1-7/16 inches)	Elliptical Slot Area =	N/A	ft^2

Calculated Parameters for Plate

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	0.16	0.31					
Orifice Area (sq. inches)	1.65	1.65	1.65					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	ow 15 (optiona	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 =			ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =		ft^2
Depth at top of Zone using Vertical Orifice =			ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =		feet
Vertical Orifice Diameter =			inches			

Calculated Parameters for Vertical Orifice

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

	Zone 2 Weir	Not Selected					
Overflow Weir Front Edge Height, Ho =	1.25		ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	1.92		feet
Overflow Weir Front Edge Length =	2.00		feet	Overflow Weir Slope Length =	2.11		feet
Overflow Weir Grate Slope =	3.00		H:V	Grate Open Area / 100-yr Orifice Area =	3.74		
Horiz. Length of Weir Sides =	2.00		feet	Overflow Grate Open Area w/o Debris =	2.93		ft^2
Overflow Grate Type =	Type C Grate			Overflow Grate Open Area w/ Debris =	1.47		ft^2
Debris Clogging % =	50%		%				

Calculated Parameters for Overflow Weir

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

	Zone 2 Circular	Not Selected				
Depth to Invert of Outlet Pipe =	1.25		ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	0.79	ft^2
Circular Orifice Diameter =	12.00		inches	Outlet Orifice Centroid =	0.50	feet
				Half-Central Angle of Restrictor Plate on Pipe =	N/A	radians

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 2 Circula	Not Selected

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	2.00	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.59	feet
Spillway Crest Length =	10.00	feet	Stage at Top of Freeboard =	2.59	feet
Spillway End Slopes =	2.00	H:V	Basin Area at Top of Freeboard =	0.30	acres
Freeboard above Max Water Surface =		feet	Basin Volume at Top of Freeboard =	0.56	acre-ft

Calculated Parameters for Spillway

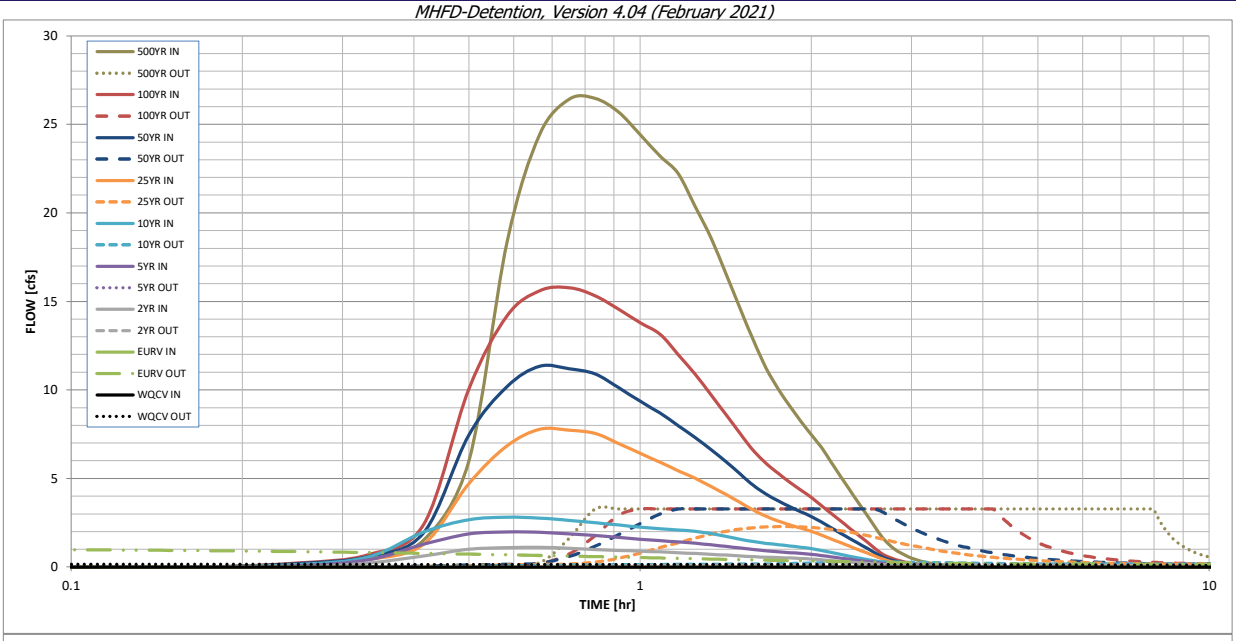
Routed Hydrograph Results

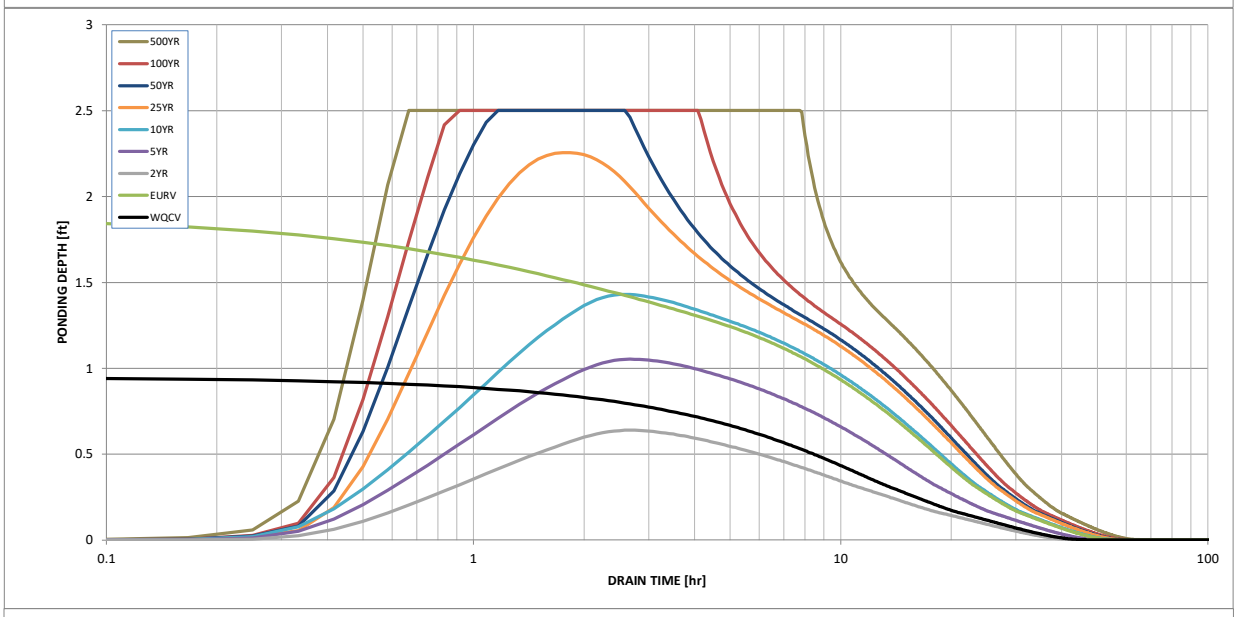
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

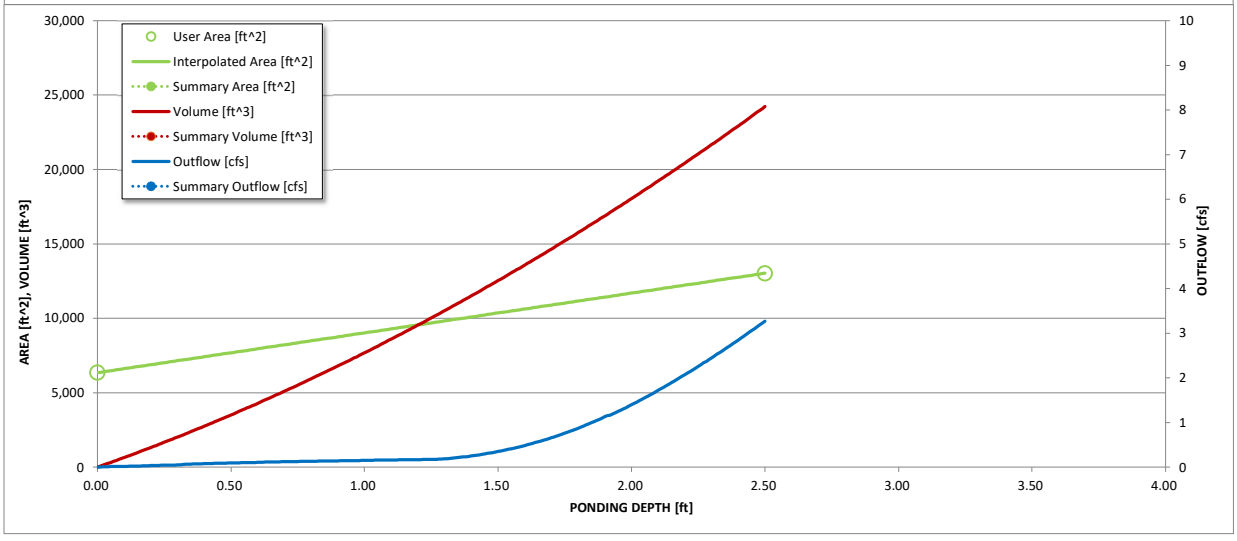
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	0.62	0.86	1.08	1.44	1.75	2.09	3.01
CUHP Runoff Volume (acre-ft) =	0.166	0.385	0.126	0.217	0.312	0.715	1.038	1.471	2.518
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.126	0.217	0.312	0.715	1.038	1.471	2.518
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.0	0.1	0.2	4.4	7.3	11.2	20.1
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.00	0.01	0.01	0.33	0.54	0.83	1.50
Peak Inflow Q (cfs) =	N/A	N/A	1.1	2.0	2.8	7.8	11.3	15.8	26.5
Peak Outflow Q (cfs) =	0.1	1.1	0.1	0.2	0.3	2.3	3.3	3.3	3.3
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	1.5	1.7	0.5	0.4	0.3	0.2
Structure Controlling Flow =	Plate	Overflow Weir 1	Plate	Plate	Overflow Weir 1	Overflow Weir 1	N/A	N/A	N/A
Max Velocity through Grate 1 (fps) =	N/A	0.30	N/A	N/A	0.0	0.7	1.0	1.0	1.0
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	35	39	34	39	41	36	32	30	28
Time to Drain 99% of Inflow Volume (hours) =	**40**	47	39	44	48	46	44	42	39
Maximum Ponding Depth (ft) =	0.95	1.89	0.64	1.05	1.43	2.26	2.50	2.50	2.50
Area at Maximum Ponding Depth (acres) =	0.20	0.26	0.18	0.21	0.23	0.28	0.30	0.30	0.30
Maximum Volume Stored (acre-ft) =	0.166	0.385	0.104	0.187	0.271	0.483	0.556	0.556	0.556

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)







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

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename:

Inflow Hydrographs

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

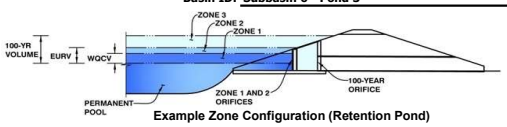
	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06
	0:15:00	0.00	0.00	0.00	0.06	0.13	0.11	0.20	0.22	0.45
	0:20:00	0.00	0.00	0.23	0.41	0.57	0.43	0.59	0.69	1.53
	0:25:00	0.00	0.00	0.63	1.29	1.98	1.30	1.95	2.42	6.00
	0:30:00	0.00	0.00	1.00	1.86	2.67	4.71	7.46	10.05	18.33
	0:35:00	0.00	0.00	1.10	1.98	2.81	6.84	10.19	14.19	24.47
	0:40:00	0.00	0.00	1.11	1.96	2.76	7.78	11.34	15.61	26.42
	0:45:00	0.00	0.00	1.05	1.86	2.64	7.72	11.19	15.78	26.47
	0:50:00	0.00	0.00	0.99	1.78	2.50	7.54	10.90	15.32	25.69
	0:55:00	0.00	0.00	0.94	1.67	2.37	6.97	10.12	14.55	24.43
	1:00:00	0.00	0.00	0.89	1.57	2.25	6.42	9.37	13.80	23.21
	1:05:00	0.00	0.00	0.85	1.49	2.16	5.92	8.70	13.15	22.21
	1:10:00	0.00	0.00	0.81	1.42	2.09	5.44	7.98	12.00	20.37
	1:15:00	0.00	0.00	0.76	1.34	2.01	5.01	7.32	10.89	18.57
	1:20:00	0.00	0.00	0.72	1.25	1.89	4.54	6.62	9.71	16.52
	1:25:00	0.00	0.00	0.67	1.16	1.72	4.09	5.94	8.59	14.58
	1:30:00	0.00	0.00	0.62	1.07	1.57	3.63	5.25	7.53	12.76
	1:35:00	0.00	0.00	0.58	0.99	1.43	3.20	4.59	6.56	11.21
	1:40:00	0.00	0.00	0.55	0.92	1.34	2.86	4.11	5.84	10.05
	1:45:00	0.00	0.00	0.53	0.86	1.26	2.59	3.73	5.28	9.09
	1:50:00	0.00	0.00	0.51	0.81	1.19	2.38	3.41	4.78	8.24
	1:55:00	0.00	0.00	0.48	0.77	1.12	2.19	3.12	4.34	7.47
	2:00:00	0.00	0.00	0.45	0.72	1.04	2.02	2.85	3.93	6.75
	2:05:00	0.00	0.00	0.41	0.65	0.93	1.80	2.53	3.46	5.91
	2:10:00	0.00	0.00	0.36	0.57	0.81	1.58	2.22	3.02	5.12
	2:15:00	0.00	0.00	0.32	0.50	0.71	1.38	1.91	2.61	4.38
	2:20:00	0.00	0.00	0.28	0.44	0.61	1.18	1.62	2.20	3.66
	2:25:00	0.00	0.00	0.24	0.38	0.52	0.98	1.34	1.81	2.96
	2:30:00	0.00	0.00	0.21	0.32	0.43	0.80	1.07	1.43	2.29
	2:35:00	0.00	0.00	0.17	0.26	0.35	0.62	0.81	1.06	1.67
	2:40:00	0.00	0.00	0.14	0.21	0.28	0.45	0.57	0.74	1.21
	2:45:00	0.00	0.00	0.11	0.16	0.22	0.32	0.41	0.53	0.90
	2:50:00	0.00	0.00	0.09	0.13	0.19	0.24	0.31	0.39	0.68
	2:55:00	0.00	0.00	0.08	0.11	0.15	0.18	0.23	0.29	0.50
	3:00:00	0.00	0.00	0.06	0.09	0.13	0.14	0.18	0.21	0.37
	3:05:00	0.00	0.00	0.05	0.08	0.11	0.11	0.14	0.15	0.27
	3:10:00	0.00	0.00	0.05	0.06	0.09	0.09	0.11	0.11	0.20
	3:15:00	0.00	0.00	0.04	0.05	0.07	0.07	0.09	0.08	0.16
	3:20:00	0.00	0.00	0.03	0.04	0.06	0.06	0.07	0.07	0.12
	3:25:00	0.00	0.00	0.03	0.04	0.05	0.04	0.05	0.05	0.10
	3:30:00	0.00	0.00	0.02	0.03	0.04	0.04	0.04	0.04	0.08
	3:35:00	0.00	0.00	0.02	0.02	0.03	0.03	0.03	0.03	0.06
	3:40:00	0.00	0.00	0.01	0.02	0.02	0.02	0.02	0.02	0.04
	3:45:00	0.00	0.00	0.01	0.01	0.02	0.02	0.02	0.02	0.03
	3:50:00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.02
	3:55:00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	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: Village Camp

Basin ID: Subbasin 6 - Pond 3



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	**EDB**	
Watershed Area =	8.77	acres
Watershed Length =	915	ft
Watershed Length to Centroid =	435	ft
Watershed Slope =	0.005	ft/ft
Watershed Imperviousness =	39.00%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	68.0%	percent
Percentage Hydrologic Soil Groups C/D =	32.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	Denver - Capitol Building	

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

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	0.129	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	0.345	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 0.62 in.) =	0.129	acre-feet	0.62	inches
5-yr Runoff Volume (P1 = 0.86 in.) =	0.208	acre-feet	0.86	inches
10-yr Runoff Volume (P1 = 1.08 in.) =	0.285	acre-feet	1.08	inches
25-yr Runoff Volume (P1 = 1.44 in.) =	0.552	acre-feet	1.44	inches
50-yr Runoff Volume (P1 = 1.75 in.) =	0.765	acre-feet	1.75	inches
100-yr Runoff Volume (P1 = 2.09 in.) =	1.045	acre-feet	2.09	inches
500-yr Runoff Volume (P1 = 3.01 in.) =	1.729	acre-feet	3.01	inches
Approximate 2-yr Detention Volume =	0.139	acre-feet		
Approximate 5-yr Detention Volume =	0.223	acre-feet		
Approximate 10-yr Detention Volume =	0.312	acre-feet		
Approximate 25-yr Detention Volume =	0.406	acre-feet		
Approximate 50-yr Detention Volume =	0.459	acre-feet		
Approximate 100-yr Detention Volume =	0.568	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.129	acre-feet
Select Zone 2 Storage Volume (Optional) =		acre-feet
Select Zone 3 Storage Volume (Optional) =		acre-feet
Total Detention Basin Volume =	0.129	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	

Total detention volume is less than 100-year volume.

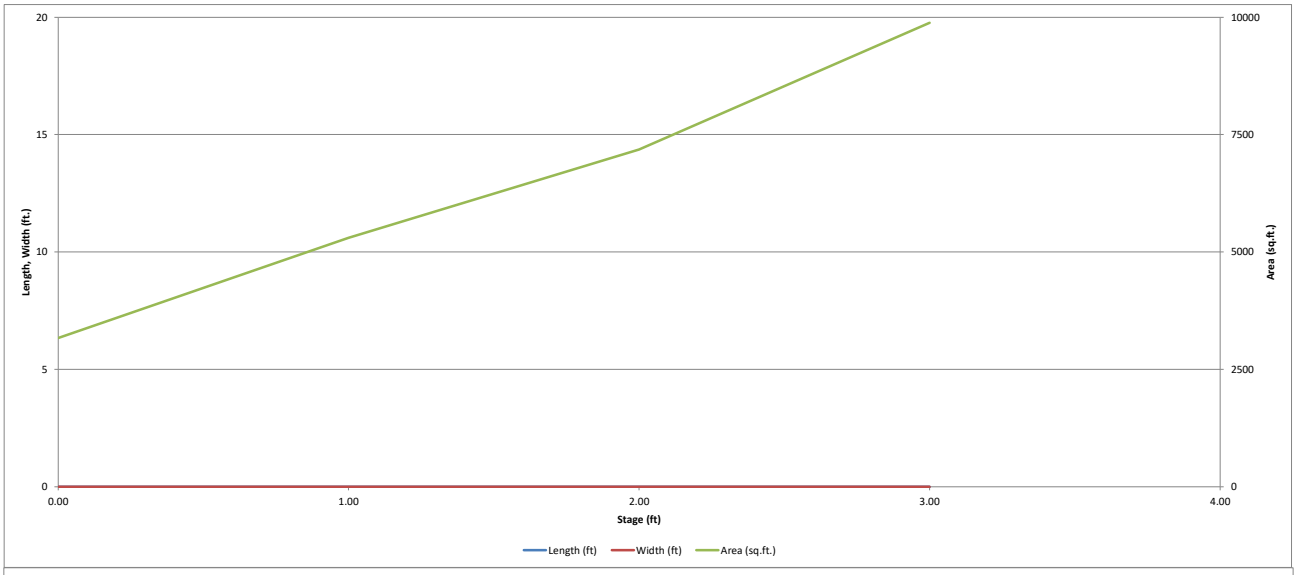
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user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

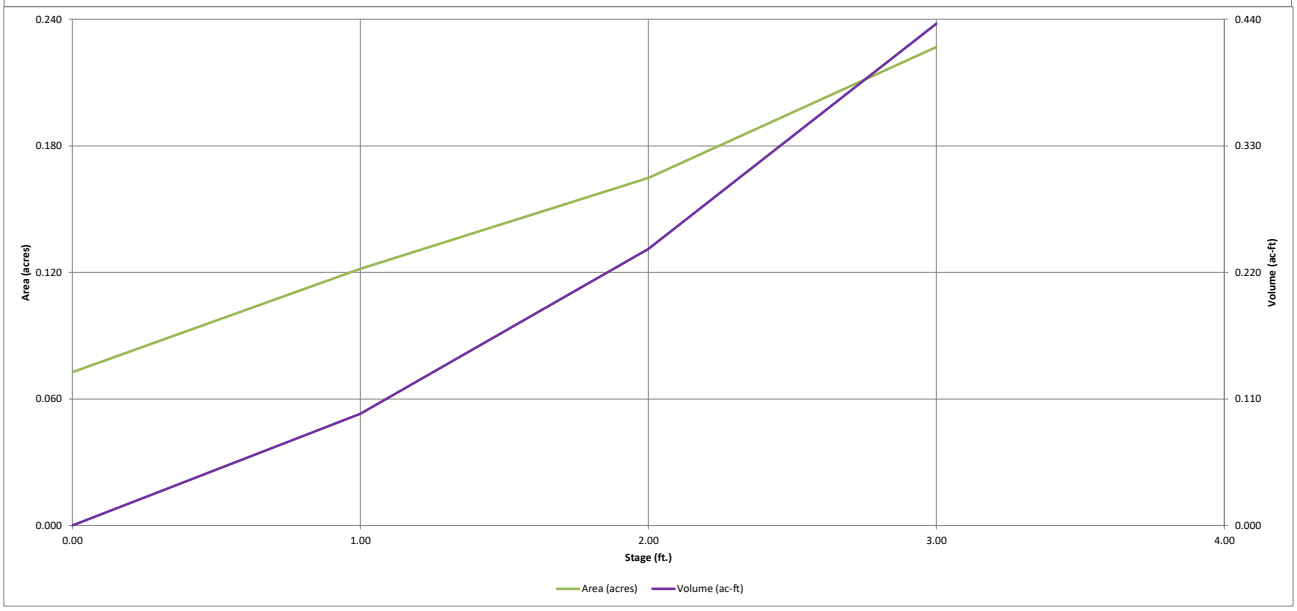
Depth Increment = 1.00 ft

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	--	--	--	3,167	0.073		
	--	1.00	--	--	--	5,300	0.122	4,233	0.097
	--	2.00	--	--	--	7,183	0.165	10,475	0.240
	--	3.00	--	--	--	9,884	0.227	19,008	0.436

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)



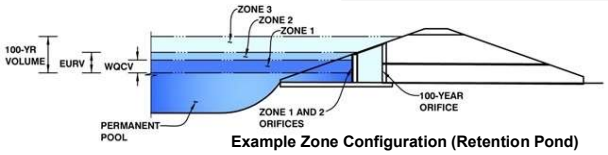


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)

Project: Village Camp

Basin ID: Subbasin 6 - Pond 3



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	1.26	0.129	Orifice Plate
Zone 2			Weir&Pipe (Circular)
Zone 3			
Total (all zones)		0.129	

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

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

Calculated Parameters for Underdrain

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

Invert of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	5.417E-03	ft²
Depth at top of Zone using Orifice Plate =	0.83	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	3.30	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	0.78	sq. inches (diameter = 1 inch)	Elliptical Slot Area =	N/A	ft²

Calculated Parameters for Plate

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

	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	0.28	0.55					
Orifice Area (sq. inches)	0.78	0.78	0.78					

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

User Input: Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected				
Invert of Vertical Orifice =			ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =		ft²
Depth at top of Zone using Vertical Orifice =			ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =		feet
Vertical Orifice Diameter =			inches			

Calculated Parameters for Vertical Orifice

Not Selected	Not Selected

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

	Zone 2 Weir	Not Selected				
Overflow Weir Front Edge Height, Ho =	1.00		ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	1.67	feet
Overflow Weir Front Edge Length =	2.00		feet	Overflow Weir Slope Length =	2.11	feet
Overflow Weir Grate Slope =	3.00		H:V	Grate Open Area / 100-yr Orifice Area =	3.74	
Horiz. Length of Weir Sides =	2.00		feet	Overflow Grate Open Area w/o Debris =	2.93	ft²
Overflow Grate Type =	Type C Grate			Overflow Grate Open Area w/ Debris =	1.47	ft²
Debris Clogging % =	50%		%			

Calculated Parameters for Overflow Weir

Zone 2 Weir	Not Selected
1.67	
2.11	
3.74	
2.93	
1.47	

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

	Zone 2 Circular	Not Selected				
Depth to Invert of Outlet Pipe =	1.25		ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	0.79	ft²
Circular Orifice Diameter =	12.00		inches	Outlet Orifice Centroid =	0.50	feet
				Half-Central Angle of Restrictor Plate on Pipe =	N/A	N/A radians

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

Zone 2 Circular	Not Selected
0.79	
0.50	
N/A	N/A

User Input: Emergency Spillway (Rectangular or Trapezoidal)

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

Calculated Parameters for Spillway

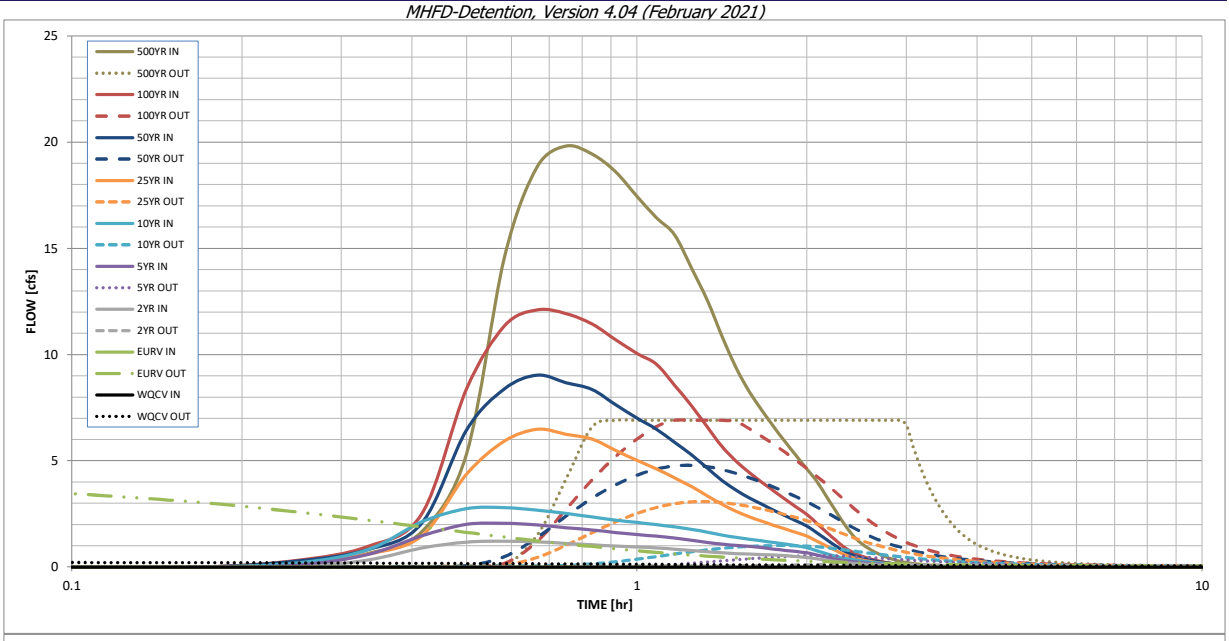
Routed Hydrograph Results

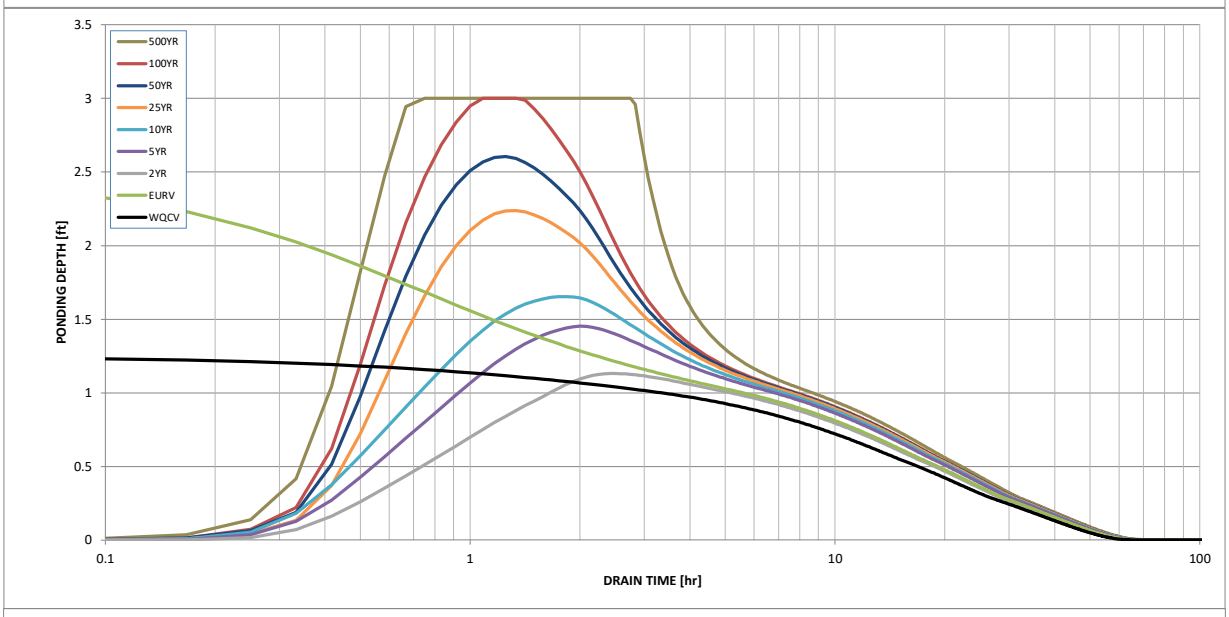
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

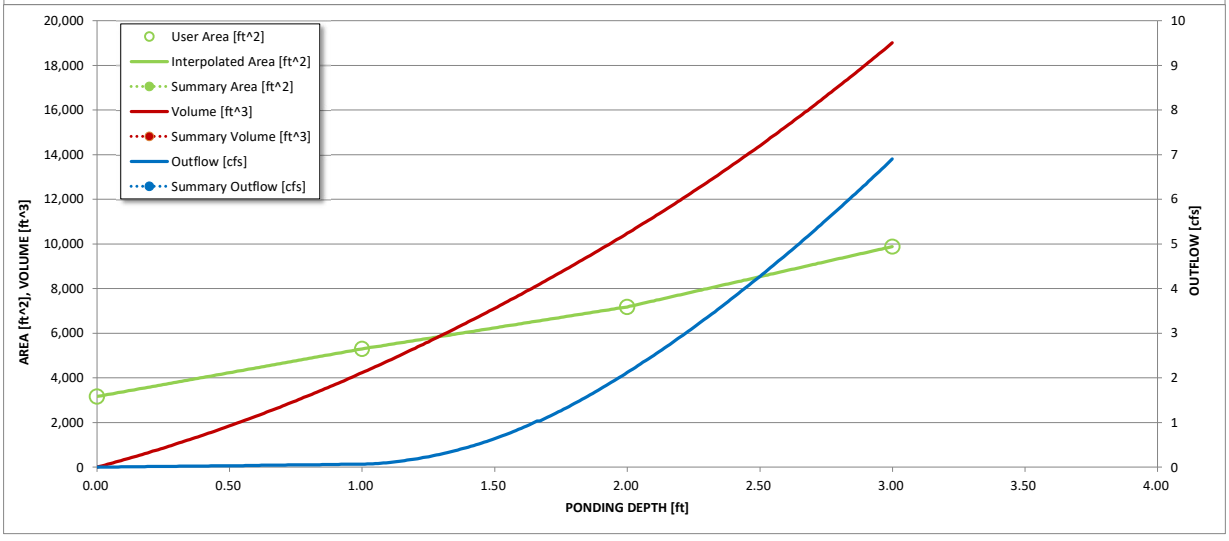
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	0.62	0.86	1.08	1.44	1.75	2.09	3.01
CUHP Runoff Volume (acre-ft) =	0.129	0.345	0.129	0.208	0.285	0.552	0.765	1.045	1.729
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.129	0.208	0.285	0.552	0.765	1.045	1.729
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.0	0.1	0.1	2.6	4.4	6.7	12.0
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.00	0.01	0.01	0.30	0.50	0.76	1.37
Peak Inflow Q (cfs) =	N/A	N/A	1.2	2.1	2.8	6.5	9.0	12.1	19.8
Peak Outflow Q (cfs) =	0.2	4.3	0.1	0.5	1.0	3.1	4.8	6.9	6.9
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	9.2	10.5	1.2	1.1	1.0	0.6
Structure Controlling Flow =	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	N/A	N/A
Max Velocity through Grate 1 (fps) =	0.06	1.55	0.02	0.2	0.3	1.0	1.6	2.3	2.3
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	50	42	51	49	46	37	31	26	19
Time to Drain 99% of Inflow Volume (hours) =	**56**	53	58	57	56	51	48	44	37
Maximum Ponding Depth (ft) =	1.26	2.58	1.13	1.45	1.65	2.24	2.61	3.00	3.00
Area at Maximum Ponding Depth (acres) =	0.13	0.20	0.13	0.14	0.15	0.18	0.20	0.23	0.23
Maximum Volume Stored (acre-ft) =	0.130	0.347	0.113	0.156	0.185	0.280	0.351	0.436	0.436

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)







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

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename:

Inflow Hydrographs

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

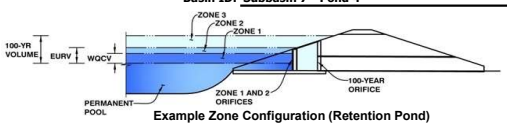
	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.08
	0:15:00	0.00	0.00	0.00	0.09	0.19	0.16	0.28	0.31	0.62
	0:20:00	0.00	0.00	0.33	0.58	0.80	0.60	0.81	0.96	1.66
	0:25:00	0.00	0.00	0.89	1.47	2.13	1.47	2.07	2.51	5.34
	0:30:00	0.00	0.00	1.17	2.01	2.75	4.38	6.45	8.39	14.58
	0:35:00	0.00	0.00	1.21	2.06	2.79	5.93	8.39	11.34	18.85
	0:40:00	0.00	0.00	1.18	1.98	2.67	6.48	9.03	12.10	19.81
	0:45:00	0.00	0.00	1.11	1.85	2.52	6.25	8.68	11.92	19.43
	0:50:00	0.00	0.00	1.05	1.74	2.36	6.02	8.35	11.44	18.61
	0:55:00	0.00	0.00	0.99	1.63	2.21	5.49	7.64	10.70	17.44
	1:00:00	0.00	0.00	0.94	1.53	2.10	5.02	7.01	10.06	16.45
	1:05:00	0.00	0.00	0.91	1.45	1.99	4.62	6.48	9.54	15.63
	1:10:00	0.00	0.00	0.84	1.36	1.89	4.19	5.87	8.56	14.07
	1:15:00	0.00	0.00	0.78	1.26	1.78	3.78	5.27	7.59	12.53
	1:20:00	0.00	0.00	0.71	1.16	1.63	3.34	4.64	6.57	10.83
	1:25:00	0.00	0.00	0.67	1.07	1.50	2.94	4.06	5.65	9.35
	1:30:00	0.00	0.00	0.63	1.02	1.40	2.61	3.61	4.97	8.24
	1:35:00	0.00	0.00	0.61	0.97	1.31	2.36	3.25	4.44	7.35
	1:40:00	0.00	0.00	0.58	0.91	1.23	2.15	2.94	3.98	6.57
	1:45:00	0.00	0.00	0.56	0.84	1.15	1.96	2.66	3.56	5.87
	1:50:00	0.00	0.00	0.54	0.78	1.08	1.78	2.41	3.18	5.22
	1:55:00	0.00	0.00	0.49	0.73	1.00	1.62	2.16	2.81	4.60
	2:00:00	0.00	0.00	0.45	0.67	0.91	1.45	1.93	2.47	4.02
	2:05:00	0.00	0.00	0.38	0.56	0.76	1.22	1.60	2.05	3.31
	2:10:00	0.00	0.00	0.32	0.47	0.63	0.99	1.29	1.64	2.63
	2:15:00	0.00	0.00	0.26	0.37	0.50	0.77	0.99	1.25	1.99
	2:20:00	0.00	0.00	0.21	0.30	0.41	0.58	0.73	0.91	1.46
	2:25:00	0.00	0.00	0.17	0.24	0.34	0.43	0.55	0.67	1.10
	2:30:00	0.00	0.00	0.14	0.20	0.28	0.34	0.43	0.51	0.84
	2:35:00	0.00	0.00	0.12	0.17	0.23	0.27	0.34	0.39	0.64
	2:40:00	0.00	0.00	0.10	0.14	0.19	0.21	0.26	0.30	0.49
	2:45:00	0.00	0.00	0.08	0.12	0.16	0.17	0.21	0.22	0.37
	2:50:00	0.00	0.00	0.07	0.10	0.13	0.13	0.16	0.16	0.27
	2:55:00	0.00	0.00	0.06	0.08	0.10	0.11	0.13	0.12	0.21
	3:00:00	0.00	0.00	0.05	0.06	0.08	0.09	0.10	0.10	0.16
	3:05:00	0.00	0.00	0.04	0.05	0.07	0.07	0.08	0.08	0.13
	3:10:00	0.00	0.00	0.03	0.04	0.05	0.05	0.07	0.06	0.10
	3:15:00	0.00	0.00	0.02	0.03	0.04	0.04	0.05	0.05	0.08
	3:20:00	0.00	0.00	0.02	0.02	0.03	0.03	0.04	0.04	0.06
	3:25:00	0.00	0.00	0.01	0.02	0.02	0.02	0.03	0.03	0.04
	3:30:00	0.00	0.00	0.01	0.01	0.02	0.02	0.02	0.02	0.03
	3:35:00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.02
	3:40:00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01
	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: Village Camp

Basin ID: Subbasin 7 - Pond 4



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	**EDB**	
Watershed Area =	0.64	acres
Watershed Length =	300	ft
Watershed Length to Centroid =	150	ft
Watershed Slope =	0.005	ft/ft
Watershed Imperviousness =	50.00%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	68.0%	percent
Percentage Hydrologic Soil Groups C/D =	32.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	Denver - Capitol Building	

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

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	0.011	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	0.033	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 0.62 in.) =	0.013	acre-feet	0.62	inches
5-yr Runoff Volume (P1 = 0.86 in.) =	0.020	acre-feet	0.86	inches
10-yr Runoff Volume (P1 = 1.08 in.) =	0.027	acre-feet	1.08	inches
25-yr Runoff Volume (P1 = 1.44 in.) =	0.046	acre-feet	1.44	inches
50-yr Runoff Volume (P1 = 1.75 in.) =	0.062	acre-feet	1.75	inches
100-yr Runoff Volume (P1 = 2.09 in.) =	0.082	acre-feet	2.09	inches
500-yr Runoff Volume (P1 = 3.01 in.) =	0.131	acre-feet	3.01	inches
Approximate 2-yr Detention Volume =	0.014	acre-feet		
Approximate 5-yr Detention Volume =	0.021	acre-feet		
Approximate 10-yr Detention Volume =	0.029	acre-feet		
Approximate 25-yr Detention Volume =	0.036	acre-feet		
Approximate 50-yr Detention Volume =	0.041	acre-feet		
Approximate 100-yr Detention Volume =	0.049	acre-feet		

Define Zones and Basin Geometry

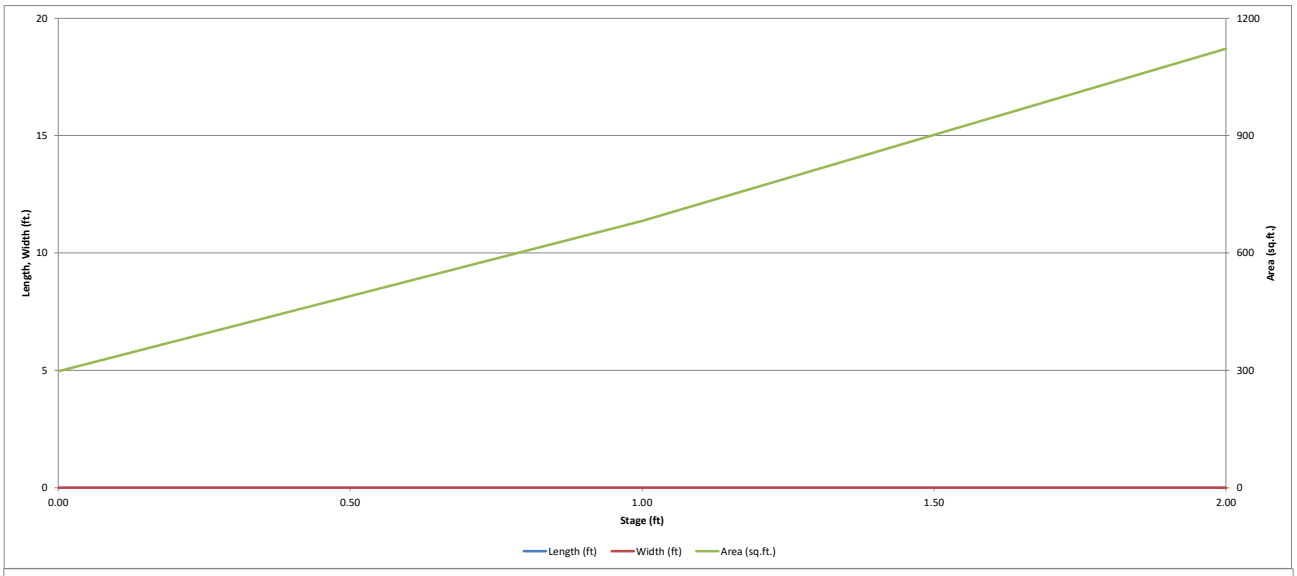
Select Zone 1 Storage Volume (Required) =		acre-feet
Select Zone 2 Storage Volume (Optional) =		acre-feet
Select Zone 3 Storage Volume (Optional) =		acre-feet
Total Detention Basin Volume =		acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	**user**	acre-feet

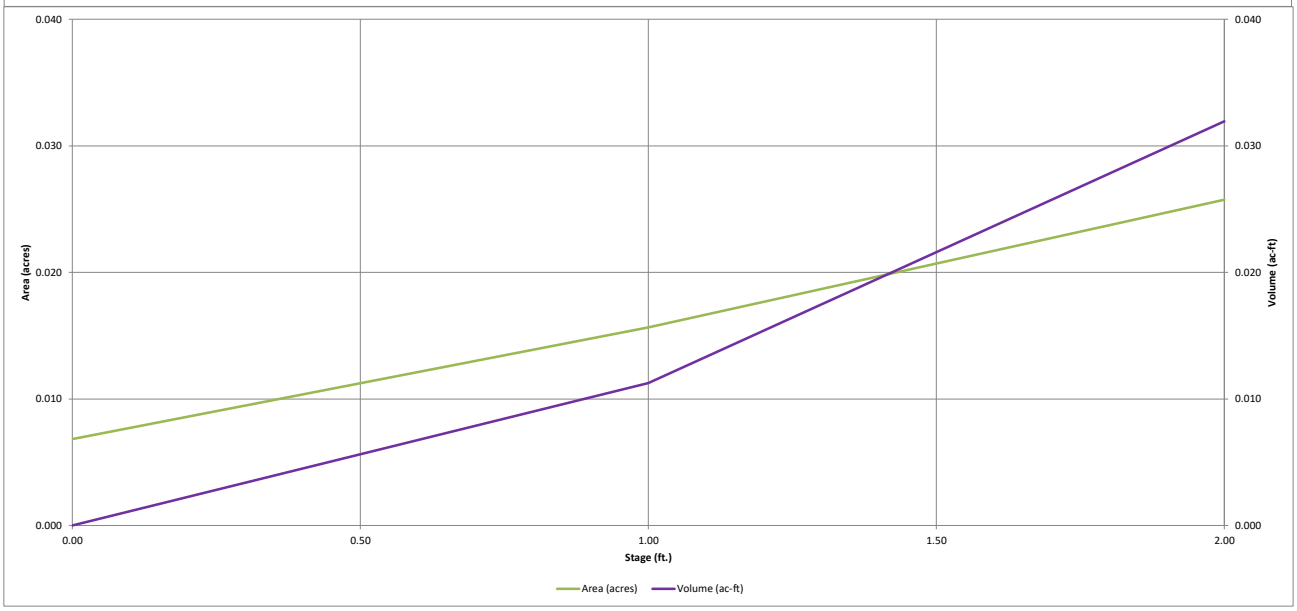
Depth Increment = 1.00 ft

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	--	--	--	298	0.007		
	--	1.00	--	--	--	682	0.016	490	0.011
	--	2.00	--	--	--	1,122	0.026	1,392	0.032

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)



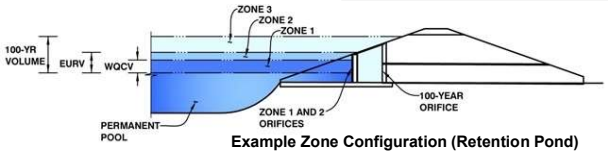


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)

Project: Village Camp

Basin ID: Subbasin 7 - Pond 4



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1	#N/A		Orifice Plate
Zone 2			Weir&Pipe (Circular)
Zone 3			
Total (all zones)			

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

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

Calculated Parameters for Underdrain

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

Invert of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	1.042E-03	ft²
Depth at top of Zone using Orifice Plate =	0.83	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	N/A	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	0.15	sq. inches (diameter = 7/16 inch)	Elliptical Slot Area =	N/A	ft²

Calculated Parameters for Plate

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

	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							
Orifice Area (sq. inches)	0.15							

	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 =			ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =			ft²
Depth at top of Zone using Vertical Orifice =			ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =			feet
Vertical Orifice Diameter =			inches				

Calculated Parameters for Vertical Orifice

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

	Zone 2 Weir	Not Selected					
Overflow Weir Front Edge Height, Ho =	1.75		ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	2.42		feet
Overflow Weir Front Edge Length =	2.00		feet	Overflow Weir Slope Length =	2.11		feet
Overflow Weir Grate Slope =	3.00		H:V	Grate Open Area / 100-yr Orifice Area =	14.95		
Horiz. Length of Weir Sides =	2.00		feet	Overflow Grate Open Area w/o Debris =	2.93		ft²
Overflow Grate Type =	Type C Grate			Overflow Grate Open Area w/ Debris =	1.47		ft²
Debris Clogging % =	50%		%				

Calculated Parameters for Overflow Weir

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

	Zone 2 Circular	Not Selected				
Depth to Invert of Outlet Pipe =	0.50		ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	0.20	ft²
Circular Orifice Diameter =	6.00		inches	Outlet Orifice Centroid =	0.25	feet
				Half-Central Angle of Restrictor Plate on Pipe =	N/A	radians

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

Zone 2 Circular	Not Selected
N/A	N/A

User Input: Emergency Spillway (Rectangular or Trapezoidal)

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

Calculated Parameters for Spillway

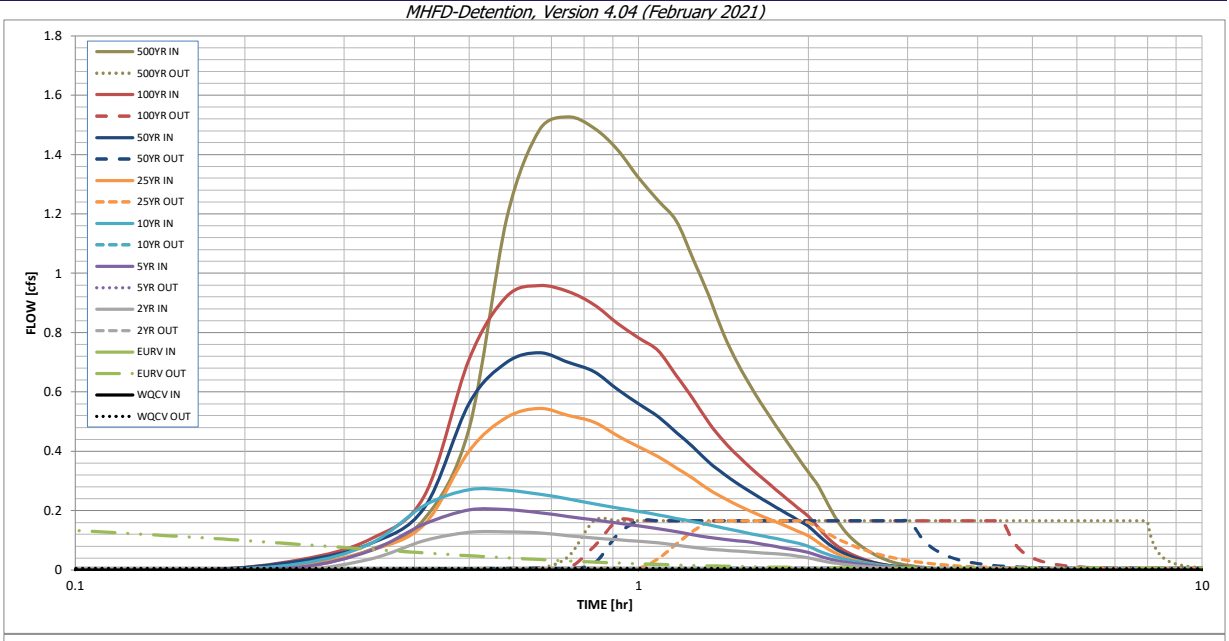
Routed Hydrograph Results

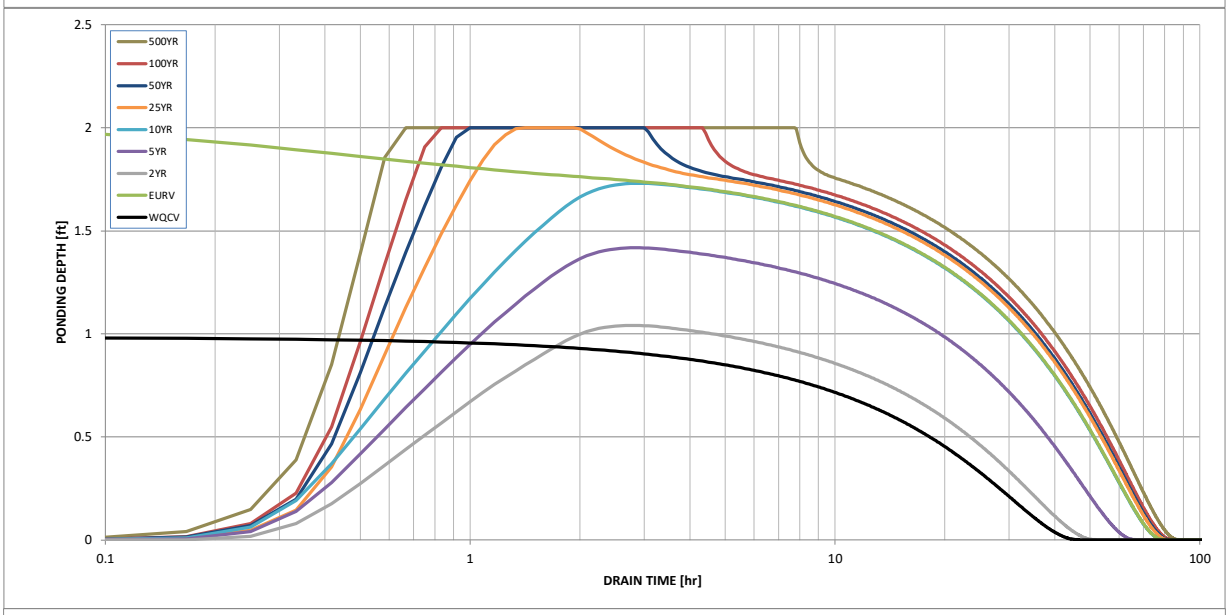
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

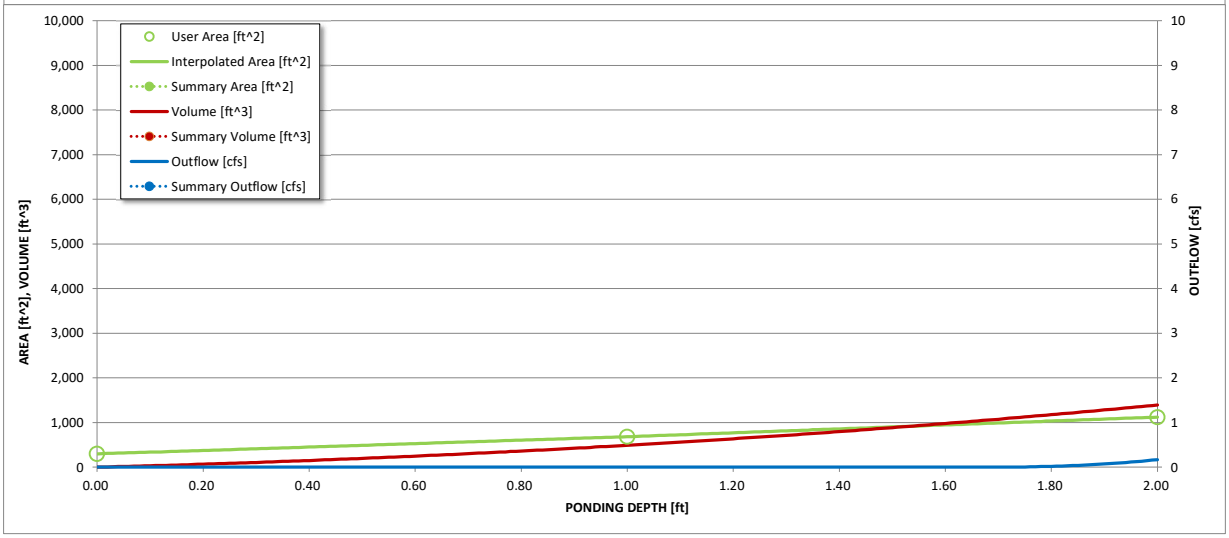
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	0.62	0.86	1.08	1.44	1.75	2.09	3.01
CUHP Runoff Volume (acre-ft) =	0.011	0.033	0.013	0.020	0.027	0.046	0.062	0.082	0.131
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.013	0.020	0.027	0.046	0.062	0.082	0.131
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.0	0.0	0.0	0.2	0.3	0.4	0.8
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.00	0.01	0.01	0.26	0.44	0.67	1.22
Peak Inflow Q (cfs) =	N/A	N/A	0.1	0.2	0.3	0.5	0.7	1.0	1.5
Peak Outflow Q (cfs) =	0.0	0.2	0.0	0.0	0.0	0.2	0.2	0.2	0.2
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	1.6	1.1	1.0	0.6	0.4	0.2
Structure Controlling Flow =	Plate	Overflow Weir 1	Plate	Plate	Plate	N/A	N/A	N/A	N/A
Max Velocity through Grate 1 (fps) =	N/A	0.05	N/A	N/A	N/A	0.1	0.1	0.1	0.1
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	39	67	44	57	68	67	65	64	61
Time to Drain 99% of Inflow Volume (hours) =	**42**	73	47	61	73	73	73	73	73
Maximum Ponding Depth (ft) =	0.99	1.98	1.04	1.42	1.73	2.00	2.00	2.00	2.00
Area at Maximum Ponding Depth (acres) =	0.02	0.03	0.02	0.02	0.02	0.03	0.03	0.03	0.03
Maximum Volume Stored (acre-ft) =	0.011	0.031	0.012	0.019	0.025	0.032	0.032	0.032	0.032

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)







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

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename:

Inflow Hydrographs

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

	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
	0:15:00	0.00	0.00	0.00	0.01	0.02	0.02	0.03	0.03	0.07
	0:20:00	0.00	0.00	0.04	0.06	0.09	0.07	0.09	0.10	0.17
	0:25:00	0.00	0.00	0.10	0.16	0.22	0.15	0.21	0.25	0.48
	0:30:00	0.00	0.00	0.13	0.20	0.27	0.40	0.56	0.71	1.18
	0:35:00	0.00	0.00	0.13	0.20	0.27	0.51	0.70	0.92	1.48
	0:40:00	0.00	0.00	0.12	0.19	0.26	0.54	0.73	0.96	1.53
	0:45:00	0.00	0.00	0.12	0.18	0.24	0.52	0.70	0.94	1.49
	0:50:00	0.00	0.00	0.11	0.17	0.22	0.50	0.67	0.89	1.42
	0:55:00	0.00	0.00	0.10	0.16	0.21	0.45	0.61	0.83	1.32
	1:00:00	0.00	0.00	0.10	0.15	0.20	0.42	0.56	0.78	1.24
	1:05:00	0.00	0.00	0.09	0.14	0.19	0.38	0.52	0.74	1.18
	1:10:00	0.00	0.00	0.08	0.13	0.17	0.34	0.46	0.66	1.05
	1:15:00	0.00	0.00	0.08	0.12	0.16	0.31	0.41	0.58	0.92
	1:20:00	0.00	0.00	0.07	0.11	0.15	0.27	0.36	0.49	0.79
	1:25:00	0.00	0.00	0.07	0.10	0.14	0.24	0.32	0.43	0.69
	1:30:00	0.00	0.00	0.06	0.10	0.13	0.22	0.29	0.38	0.62
	1:35:00	0.00	0.00	0.06	0.09	0.12	0.20	0.26	0.34	0.55
	1:40:00	0.00	0.00	0.06	0.09	0.11	0.18	0.24	0.31	0.49
	1:45:00	0.00	0.00	0.05	0.08	0.11	0.16	0.21	0.27	0.43
	1:50:00	0.00	0.00	0.05	0.07	0.10	0.15	0.19	0.24	0.38
	1:55:00	0.00	0.00	0.05	0.07	0.09	0.13	0.17	0.21	0.33
	2:00:00	0.00	0.00	0.04	0.06	0.08	0.12	0.15	0.18	0.28
	2:05:00	0.00	0.00	0.03	0.05	0.06	0.09	0.12	0.14	0.22
	2:10:00	0.00	0.00	0.03	0.04	0.05	0.07	0.09	0.11	0.17
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	2:20:00	0.00	0.00	0.02	0.03	0.04	0.04	0.05	0.06	0.10
	2:25:00	0.00	0.00	0.02	0.02	0.03	0.03	0.04	0.05	0.08
	2:30:00	0.00	0.00	0.01	0.02	0.02	0.03	0.03	0.04	0.06
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	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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	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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	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
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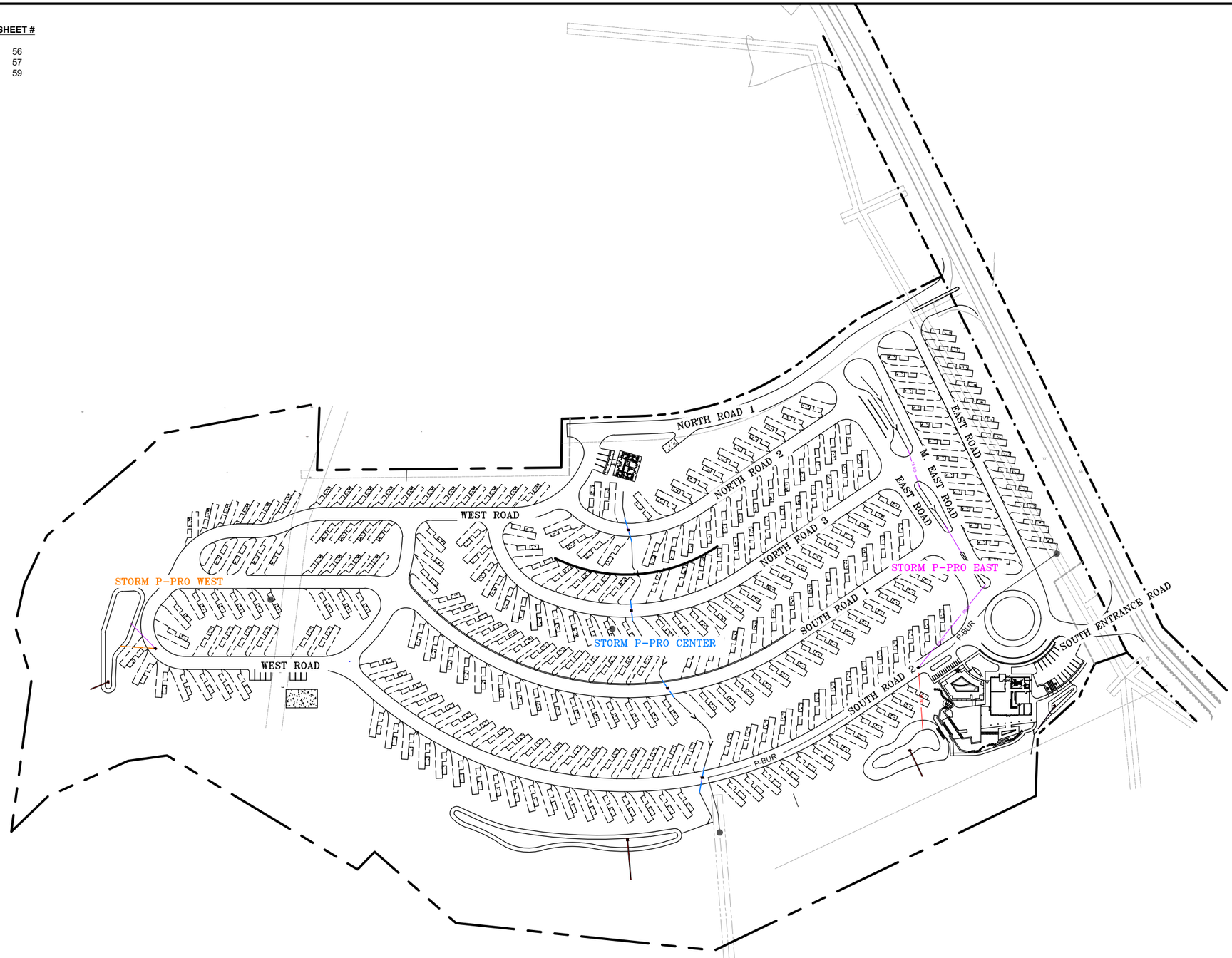
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Appendix E

Culvert and Swale Analysis, Storm P-Pros, and Outlet Structure Details

ALIGNMENT	SHEET #
STORM WEST 1	56
STORM CENTER	57
STORM EAST	59

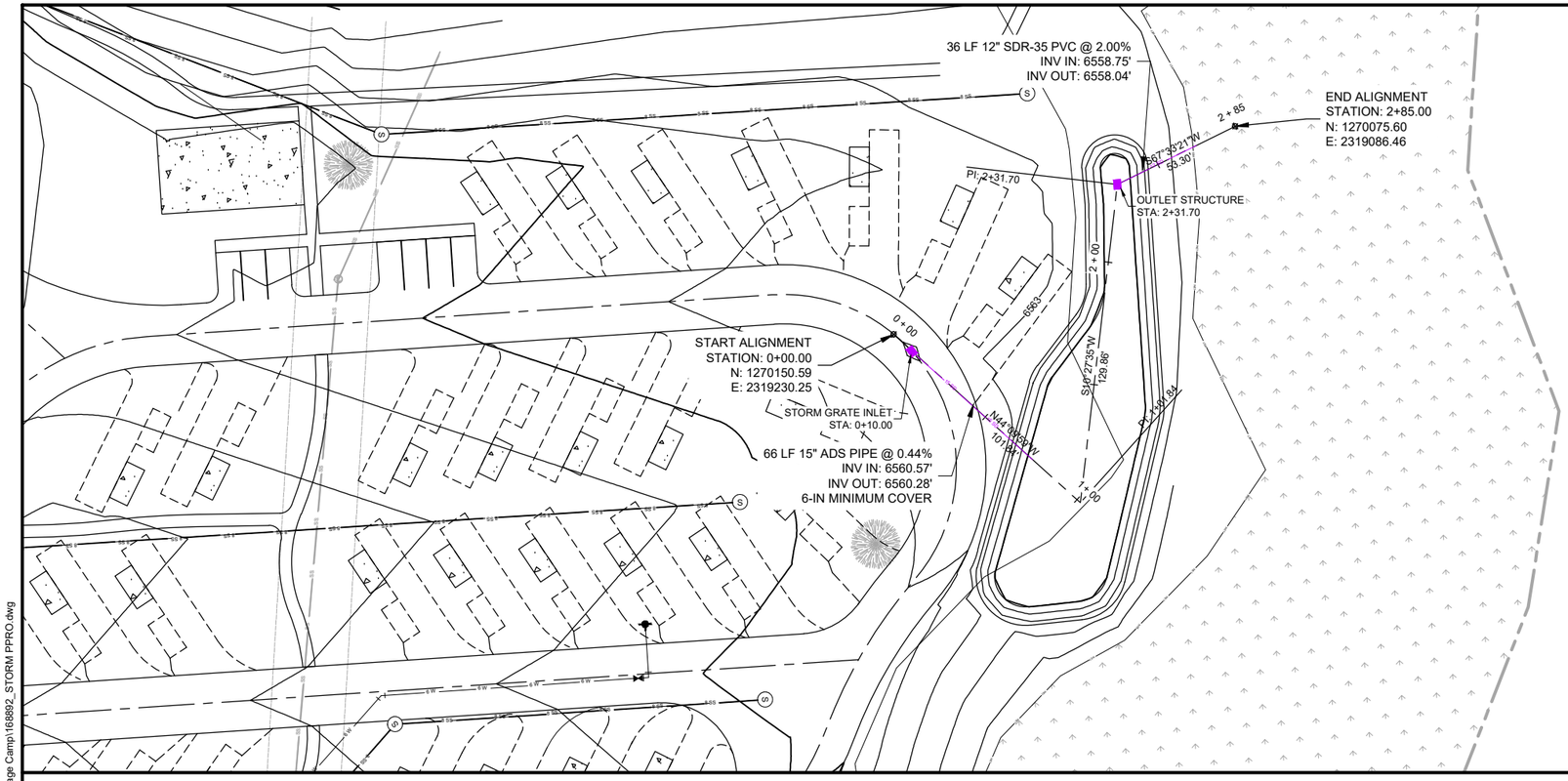


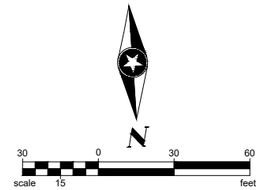
SEH Project	168892	Rev.#	Revision Issue Description	Date	Rev.#	Revision Issue Description	Date	I HEREBY CERTIFY THAT THIS PLAN WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF CO.
Drawn By	SC/CM							TRAVIS MOONEY
Designed By	TM							DATE 01/17/2025 LICENSE NO. 0051259
Checked By	SW							

VILLAGE CAMP DURANGO
DURANGO, COLORADO

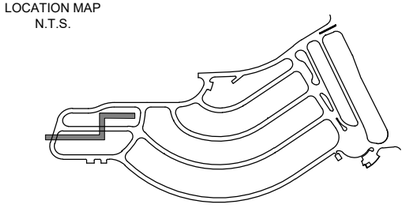
STORM KEY

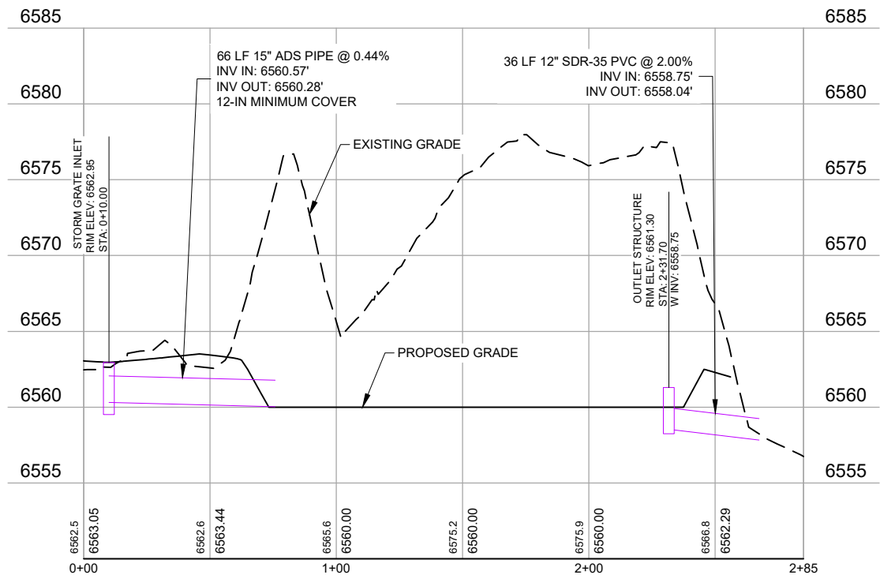
55
of 82





LOCATION MAP
N.T.S.





SEH Project	168892	Rev.#	Revision Issue Description	Date	Rev.#	Revision Issue Description	Date
Drawn By	SC/CM						
Designed By	TM						
Checked By	SW						

SEH

I HEREBY CERTIFY THAT THIS PLAN WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF CO.

TRAVIS MOONEY
DATE 01/17/2025 LICENSE NO. 0051259

VILLAGE CAMP DURANGO
DURANGO, COLORADO

STORM P-PRO WEST

22 LF 15" ADS PIPE @ 0.87%
INV IN: 6564.91'
INV OUT: 6564.72'
12-IN MINIMUM COVER

STORM GRATE INLET
STA: 0+72.35

23 LF 15" ADS PIPE @ 0.87%
INV IN: 6564.72'
INV OUT: 6564.52'
6-IN MINIMUM COVER

IGNMENT
N: 0+00.03
270448.35
320089.18

S12°00'13"E
26.82'

S02°48'24"W
28.02'

STORM GRATE INLET
STA: 2+31.93

STORM GRATE INLET
STA: 8+31.76

STORM GRATE INLET
STA: 6+06.65

19 LF 15" ADS PIPE @ 0.50%
INV IN: 6563.69'
INV OUT: 6563.60'
12-IN MINIMUM COVER

18 LF 15" ADS PIPE @ 0.50%
INV IN: 6563.60'
INV OUT: 6563.51'
6-IN MINIMUM COVER

17 LF 15" ADS PIPE @ 0.50%
INV IN: 6562.80'
INV OUT: 6562.72'
12-IN MINIMUM COVER

20 LF 15" ADS PIPE @ 0.50%
INV IN: 6562.72'
INV OUT: 6562.62'
6-IN MINIMUM COVER

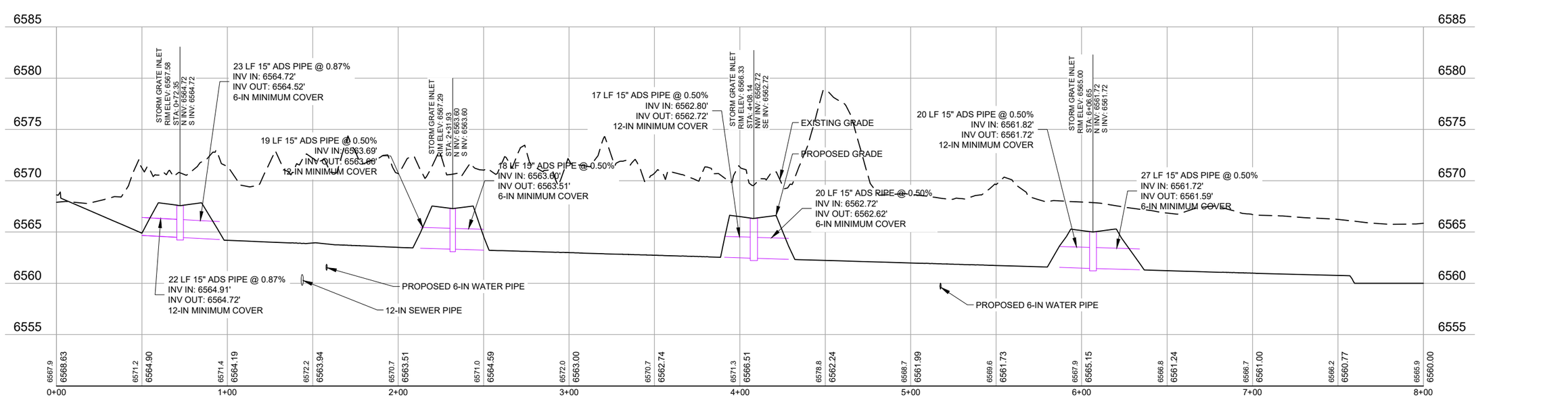
20 LF 15" ADS PIPE @ 0.50%
INV IN: 6561.82'
INV OUT: 6561.72'
12-IN MINIMUM COVER

27 LF 15" ADS PIPE @ 0.50%
INV IN: 6561.72'
INV OUT: 6561.59'
6-IN MINIMUM COVER

MATCH LINE STA: 8+00

scale 15 — 30 0 30 60 feet

LOCATION MAP
N.T.S.



SEH Project	168892
Drawn By	SC/CM
Designed By	TM
Checked By	SW

Rev.#	Revision Issue Description	Date

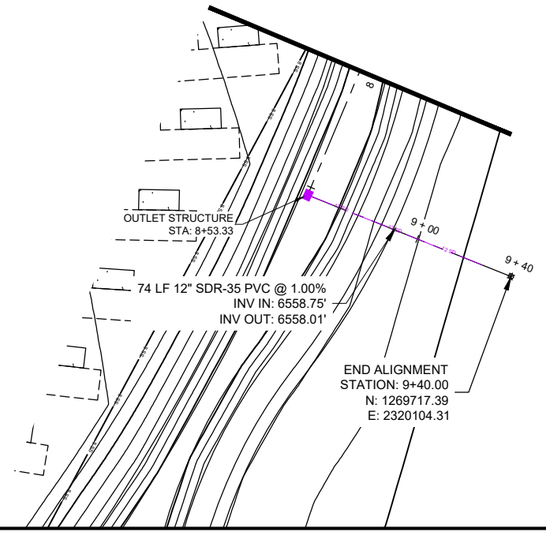
Rev.#	Revision Issue Description	Date

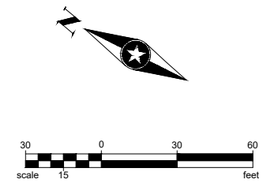
I HEREBY CERTIFY THAT THIS PLAN WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF CO.

TRAVIS MOONEY
DATE 01/17/2025 LICENSE NO. 0051259

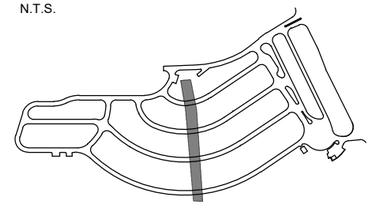
VILLAGE CAMP DURANGO
DURANGO, COLORADO

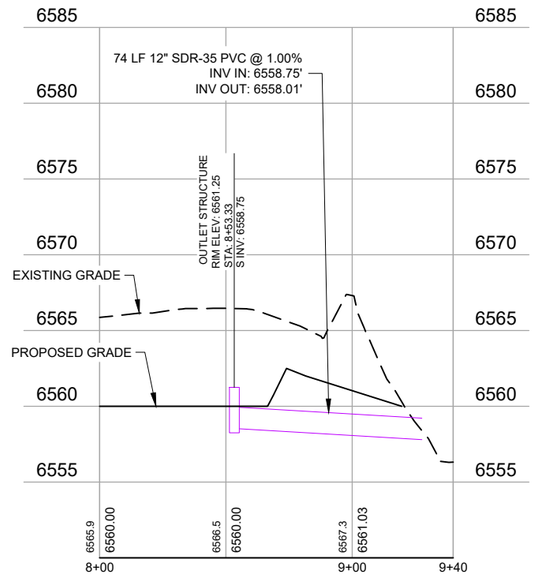
STORM P-PRO CENTER





LOCATION MAP
N.T.S.



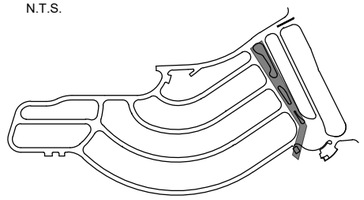


SEH Project	168892	Rev.#	Revision Issue Description	Date	Rev.#	Revision Issue Description	Date	SEH	I HEREBY CERTIFY THAT THIS PLAN WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF CO.
Drawn By	SC/CM								TRAVIS MOONEY
Designed By	TM								DATE 01/17/2025 LICENSE NO. 0051259
Checked By	SW								

VILLAGE CAMP DURANGO
DURANGO, COLORADO

STORM P-PRO CENTER (2)

LOCATION MAP
N.T.S.



START ALIGNMENT
STATION: 0+00.00
N: 1270675.19
E: 2320516.99

79 LF 15" ADS PIPE @ 0.50%
INV IN: 6565.98'
INV OUT: 6565.59'
6-IN MINIMUM COVER

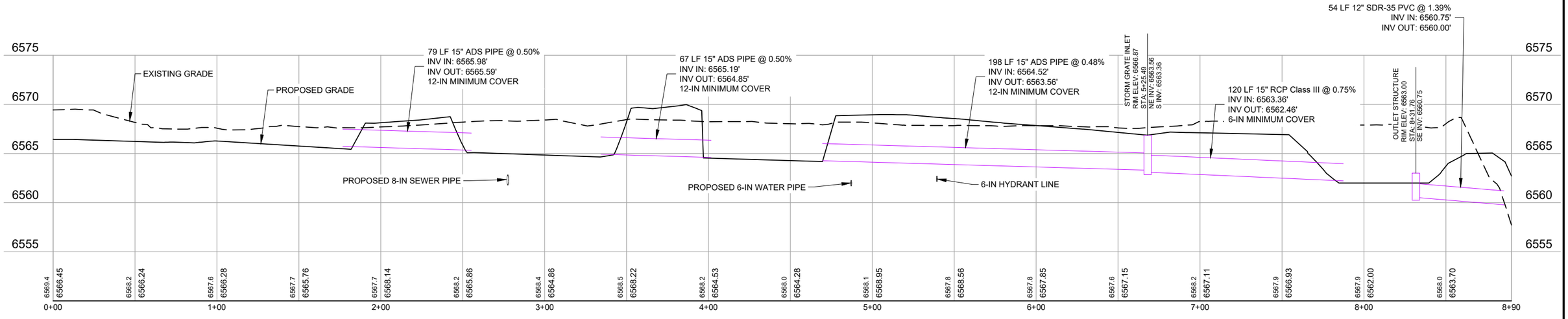
67 LF 15" ADS PIPE @ 0.50%
INV IN: 6565.19'
INV OUT: 6564.85'
6-IN MINIMUM COVER

198 LF 15" ADS PIPE @ 0.48%
INV IN: 6564.52'
INV OUT: 6563.56'
6-IN MINIMUM COVER

54 LF 12" SDR-35 PVC @ 1.39%
INV IN: 6560.75'
INV OUT: 6560.00'

END ALIGNMENT
STATION: 8+90.00
N: 1269917.09
E: 2320644.75

OUTLET STRUCTURE
STA: 8+31.76



SEH Project	168892
Drawn By	SC/CM
Designed By	TM
Checked By	SW

Rev.#	Revision Issue Description	Date

Rev.#	Revision Issue Description	Date

SEH

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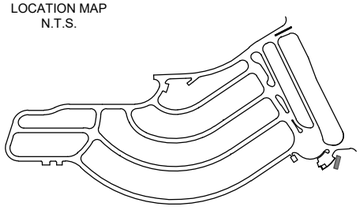
TRAVIS MOONEY
DATE 01/17/2025 LICENSE NO. 0051259

VILLAGE CAMP DURANGO
DURANGO, COLORADO

STORM P-PRO EAST

LOCATION MAP
N.T.S.



END ALIGNMENT
STATION: 0+65.00
N: 1270005.98
E: 2320854.93

52 LF 6" SDR-35 PVC @ 1.00%
INV IN: 6565.00'
INV OUT: 6564.48'

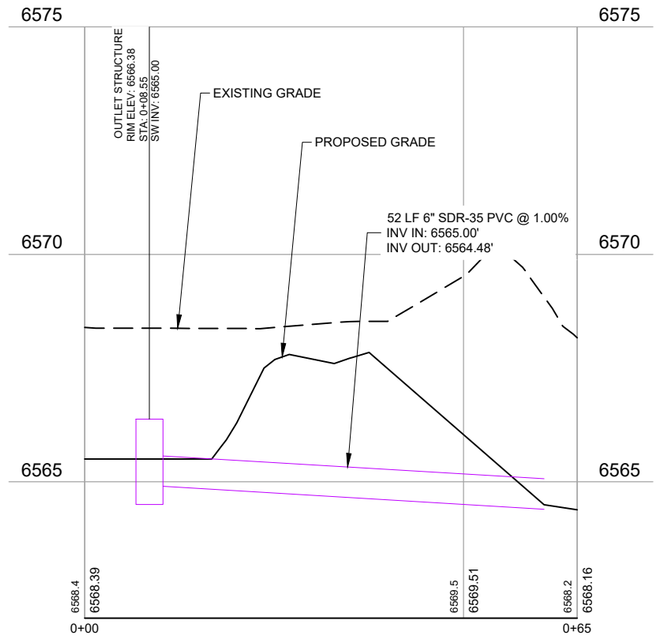
OUTLET STRUCTURE
STA: 0+08.55

START ALIGNMENT
STATION: 0+00.00
N: 1270058.61
E: 2320893.07

0 + 00

0 + 65

10 0 10 20
scale 5 feet



SEH Project	168892	Rev.#	Revision Issue Description	Date	Rev.#	Revision Issue Description	Date
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Designed By	TM						
Checked By	SW						

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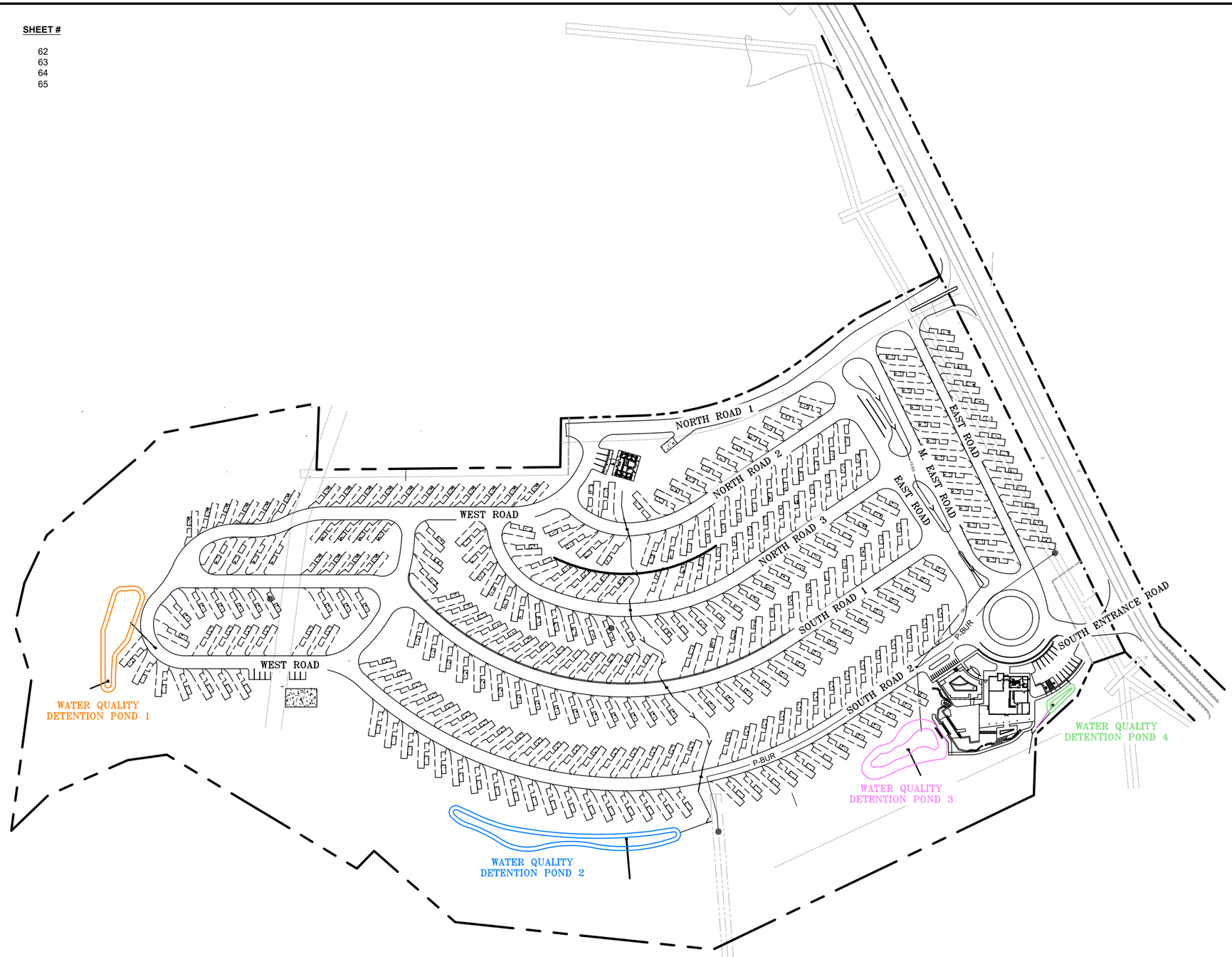
TRAVIS MOONEY
DATE 01/17/2025 LICENSE NO. 0051259

VILLAGE CAMP DURANGO
DURANGO, COLORADO

STORM P-PRO SOUTHEAST

POND	SHEET #
WATER QUALITY DETENTION POND 1	62
WATER QUALITY DETENTION POND 2	63
WATER QUALITY DETENTION POND 3	64
WATER QUALITY DETENTION POND 4	65



SEH Project	168892	Rev.#	Revision Issue Description	Date	Rev.#	Revision Issue Description	Date	SEH	I HEREBY CERTIFY THAT THIS PLAN WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF CO.
Drawn By	SC/CM								
Designed By	TM								TRAVIS MOONEY
Checked By	SW								DATE 01/17/2025 LICENSE NO. 0051259

VILLAGE CAMP DURANGO
DURANGO, COLORADO

POND KEY

61
of 82

PT #: 12
DES: TOP
ELEV: 6562.50
N: 1270247.30
E: 2319202.81

PT #: 11
DES: TOP
ELEV: 6562.50
N: 1270173.49
E: 2319176.57

PT #: 13
DES: TOP
ELEV: 6562.47
N: 1270271.89
E: 2319183.34

PT #: 90
DES: BOP
ELEV: 6560.00
N: 1270176.00
E: 2319169.51

PT #: 89
DES: BOP
ELEV: 6560.00
N: 1270172.03
E: 2319167.20

PT #: 93
DES: BOP
ELEV: 6560.00
N: 1270249.37
E: 2319195.59

PT #: 94
DES: BOP
ELEV: 6560.06
N: 1270264.39
E: 2319183.34

PT #: 97
DES: RP
N: 1270251.89
E: 2319183.34

PT #: 10
DES: TOP
ELEV: 6562.50
N: 1270167.13
E: 2319172.88

PT #: 138
DES: RP
N: 1270134.38
E: 2319171.06

PT #: 95
DES: BOP
ELEV: 6560.00
N: 1270263.54
E: 2319162.10

PT #: 20
DES: BOP
ELEV: 6560.00
N: 1270152.33
E: 2319150.22

PT #: 9
DES: TOP
ELEV: 6562.50
N: 1270147.43
E: 2319155.91

PT #: 18
DES: BOP
ELEV: 6560.00
N: 1270088.59
E: 2319142.09

PT #: 96
DES: RP
N: 1270251.05
E: 2319162.60

PT #: 98
DES: RP
N: 1270180.19
E: 2319157.73

PT #: 8
DES: TOP
ELEV: 6562.50
N: 1270135.46
E: 2319151.09

PT #: 105
DES: TOP
ELEV: 6562.50
N: 1270103.20
E: 2319149.34

PT #: 7
DES: TOP
ELEV: 6562.50
N: 1270088.30
E: 2319149.59

PT #: 92
DES: TOP
ELEV: 6562.50
N: 1270271.03
E: 2319161.80

PT #: 99
DES: RP
N: 1270186.98
E: 2319142.86

PT #: 19
DES: BOP
ELEV: 6560.00
N: 1270135.87
E: 2319143.60

PT #: 100
DES: RP
N: 1270089.33
E: 2319136.23

PT #: 137
DES: OUTLET STRUCTURE
N: 1270095.95
E: 2319135.72

PT #: 14
DES: BOP
ELEV: 6560.00
N: 1270254.73
E: 2319150.66

PT #: 3
DES: TOP
ELEV: 6562.50
N: 1270256.93
E: 2319143.49

PT #: 17
DES: BOP
ELEV: 6560.00
N: 1270088.63
E: 2319130.36

PT #: 6
DES: WEIR
ELEV: 6562.00
N: 1270088.28
E: 2319122.86

PT #: 15
DES: BOP
ELEV: 6560.00
N: 1270191.11
E: 2319131.06

PT #: 4
DES: TOP
ELEV: 6562.50
N: 1270193.43
E: 2319123.93

PT #: 5
DES: TOP
ELEV: 6562.50
N: 1270186.98
E: 2319122.86

PT #: 16
DES: BOP
ELEV: 6560.00
N: 1270186.98
E: 2319130.36

PT #: 103
DES: TOP
ELEV: 6562.50
N: 1270094.39
E: 2319122.86

PT #: 104
DES: TOP
ELEV: 6562.50
N: 1270086.89
E: 2319123.05

PT #: 101
DES: WEIR
ELEV: 6562.00
N: 1270093.39
E: 2319122.86

PT #: 102
DES: WEIR
ELEV: 6562.00
N: 1270087.89
E: 2319122.86

WATER QUALITY DETENTION POND 1
REQUIRED WQCV: 0.092 ACRE-FT
TOTAL VOLUME: 0.408 ACRE-FT
BOTTOM ELEV: 6560..00-FT
TOP ELEV: 6562.50-FT
WATER QUALITY ELEV: 6560.68-FT
INLET GRATE ELEV: 6561.30-FT
OVERFLOW WEIR ELEV: 6562.00-FT

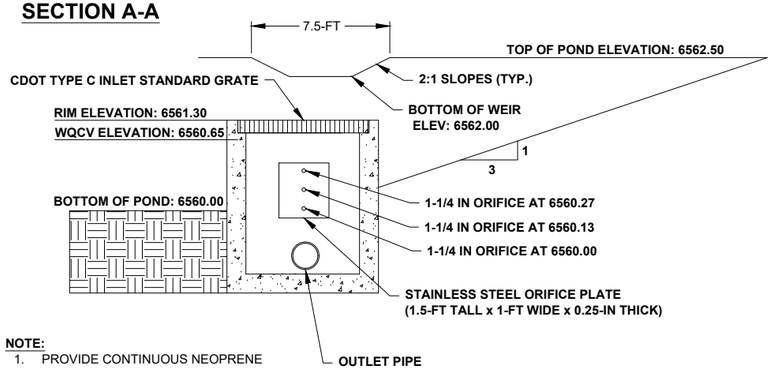
LEGEND:

TOP - TOP OF POND
BOP - BOTTOM OF POND
RP - RADIUS POINT

scale 10 5 0 10 20 feet

LOCATION MAP
N.T.S.

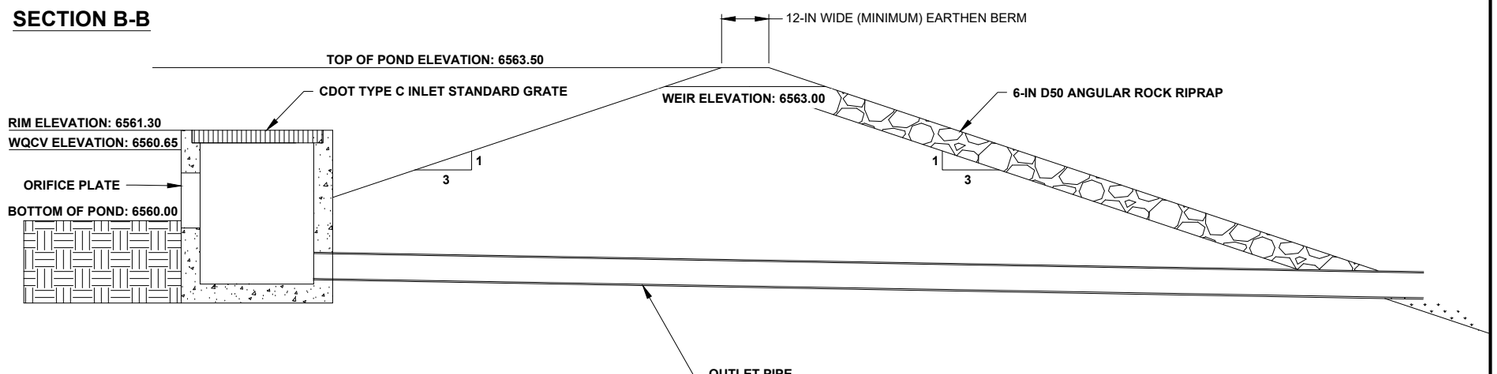
SECTION A-A



NOTE:

1. PROVIDE CONTINUOUS NEOPRENE GASKET MATERIAL BETWEEN THE STAINLESS STEEL PLATES AND CONCRETE.
2. INSTALL ORIFICE PLATES AFTER POND ELEVATIONS AND VOLUMES ARE VERIFIED.

SECTION B-B



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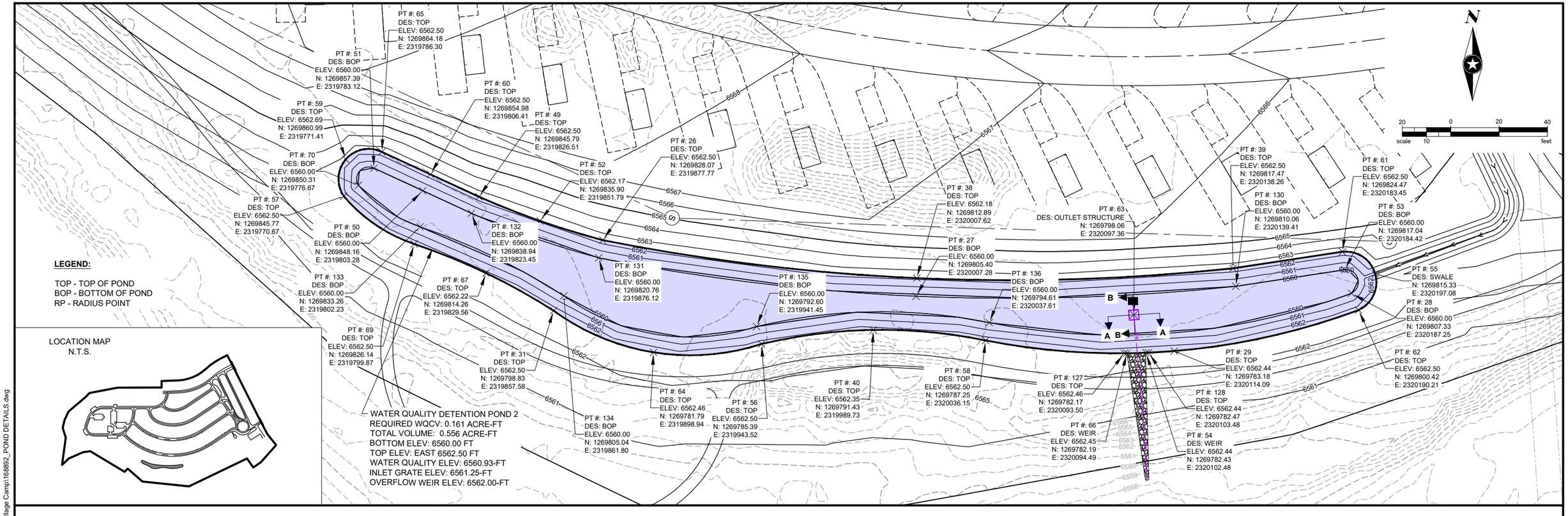
Drawn By	SC/CM							
Designed By	TM							TRAVIS MOONEY
Checked By	SW							DATE 01/17/2025 LICENSE NO. 0051259

VILLAGE CAMP DURANGO
DURANGO, COLORADO

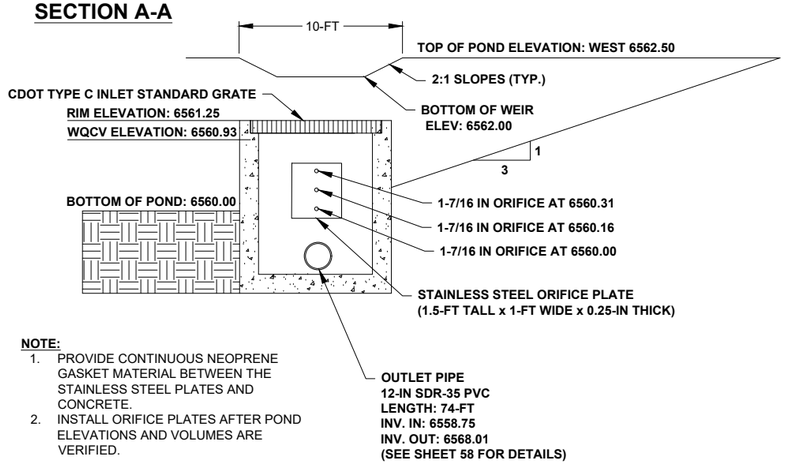
WATER QUALITY DETENTION POND 1

62
of 82

Save: 1/15/2025 12:50 PM cmolina Plot: 1/15/2025 2:19 PM \\sehinc.com\panzura\pzprojects\PTNROBRE\168892_POND DETAILS.dwg



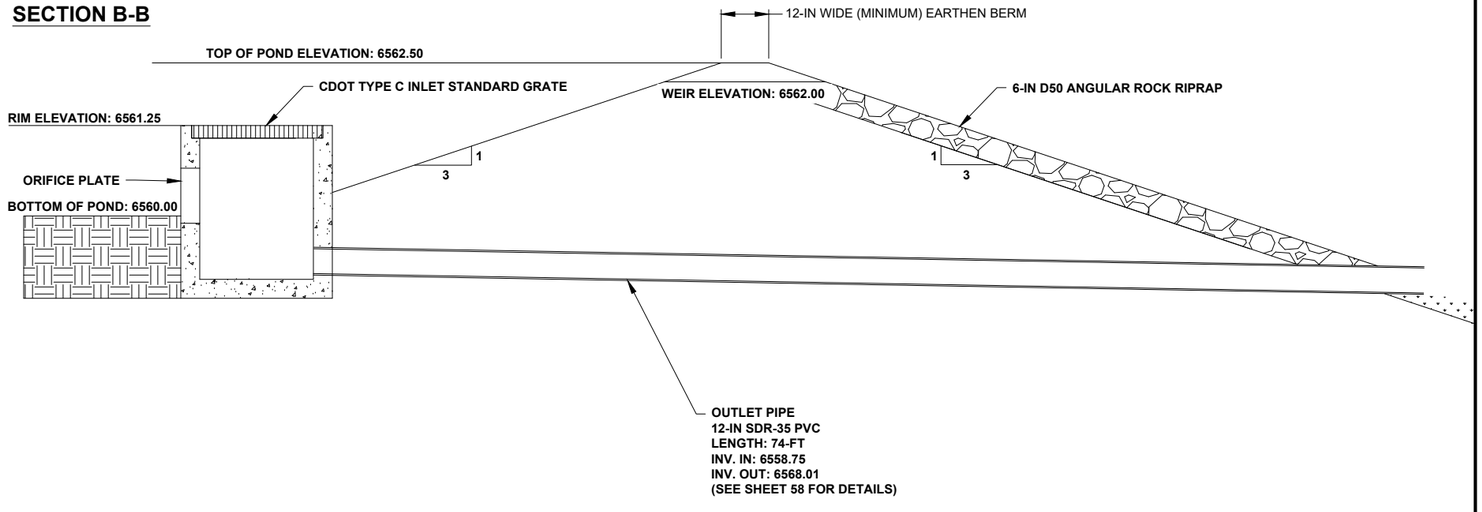
SECTION A-A



NOTE:

1. PROVIDE CONTINUOUS NEOPRENE GASKET MATERIAL BETWEEN THE STAINLESS STEEL PLATES AND CONCRETE.
2. INSTALL ORIFICE PLATES AFTER POND ELEVATIONS AND VOLUMES ARE VERIFIED.

SECTION B-B



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Drawn By	SC/CM							TRAVIS MOONEY DATE 01/17/2025 LICENSE NO. 0051259			of 82
Designed By	TM										
Checked By	SW										

LEGEND:

TOP - TOP OF POND
BOP - BOTTOM OF POND
RP - RADIUS POINT

PT #: 73
DES: BOP
ELEV: 6562.00
N: 1269948.81
E: 2320553.57

PT #: 87
DES: TOP
ELEV: 6565.00
N: 1269968.69
E: 2320556.15

PT #: 106
DES: TOP
ELEV: 6565.00
N: 1269976.57
E: 2320568.43

PT #: 118
DES: BOP
ELEV: 6562.00
N: 1269973.33
E: 2320595.63

PT #: 107
DES: TOP
ELEV: 6565.00
N: 1269980.28
E: 2320581.33

PT #: 108
DES: TOP
ELEV: 6565.00
N: 1269994.21
E: 2320597.50

PT #: 80
DES: TOP
ELEV: 6565.23
N: 1270012.47
E: 2320611.29

PT #: 109
DES: TOP
ELEV: 6565.00
N: 1270025.04
E: 2320644.21

PT #: 119
DES: BOP
ELEV: 6562.00
N: 1270007.97
E: 2320654.04

PT #: 110
DES: TOP
ELEV: 6565.00
N: 1270013.62
E: 2320671.80

PT #: 79
DES: TOP
ELEV: 6565.00
N: 1269946.48
E: 2320536.93

PT #: 116
DES: BOP
ELEV: 6562.00
N: 1269958.68
E: 2320565.22

PT #: 117
DES: BOP
ELEV: 6562.00
N: 1269961.19
E: 2320570.62

PT #: 74
DES: BOP
ELEV: 6562.00
N: 1269994.94
E: 2320627.86

PT #: 139
DES: OUTLET STRUCTURE
N: 1269971.34
E: 2320618.58

PT #: 120
DES: BOP
ELEV: 6562.00
N: 1270000.52
E: 2320666.99

PT #: 126
DES: BOP
ELEV: 6562.00
N: 1269946.39
E: 2320590.47

PT #: 125
DES: BOP
ELEV: 6562.00
N: 1269953.09
E: 2320605.19

PT #: 78
DES: TOP
ELEV: 6565.00
N: 1269922.07
E: 2320538.41

PT #: 121
DES: BOP
ELEV: 6562.00
N: 1269978.18
E: 2320675.38

PT #: 81
DES: TOP
ELEV: 6565.00
N: 1269992.49
E: 2320685.84

PT #: 72
DES: BOP
ELEV: 6562.00
N: 1269936.24
E: 2320558.69

PT #: 71
DES: BOP
ELEV: 6562.00
N: 1269937.45
E: 2320569.50

PT #: 88
DES: BOP
N: 1269938.85
E: 2320576.58

PT #: 124
DES: BOP
ELEV: 6562.00
N: 1269966.82
E: 2320629.44

PT #: 123
DES: BOP
ELEV: 6562.00
N: 1269970.45
E: 2320663.64

PT #: 86
DES: TOP
ELEV: 6565.00
N: 1269926.62
E: 2320592.19

PT #: 77
DES: TOP
ELEV: 6565.00
N: 1269915.02
E: 2320564.60

PT #: 129
DES: TOP
ELEV: 6564.98
N: 1269940.99
E: 2320629.18

PT #: 75
DES: TOP
ELEV: 6564.99
N: 1269943.05
E: 2320636.39

PT #: 85
DES: TOP
ELEV: 6565.00
N: 1269935.82
E: 2320613.37

PT #: 82
DES: TOP
ELEV: 6565.00
N: 1269954.29
E: 2320687.33

PT #: 76
DES: WEIR
ELEV: 6565.00
N: 1269942.92
E: 2320635.91

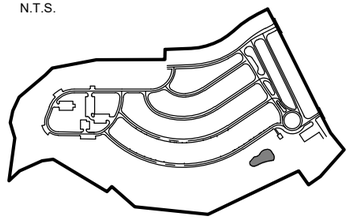
PT #: 84
DES: WEIR
ELEV: 6564.98
N: 1269941.14
E: 2320629.66

PT #: 83
DES: TOP
ELEV: 6565.00
N: 1269952.01
E: 2320683.88

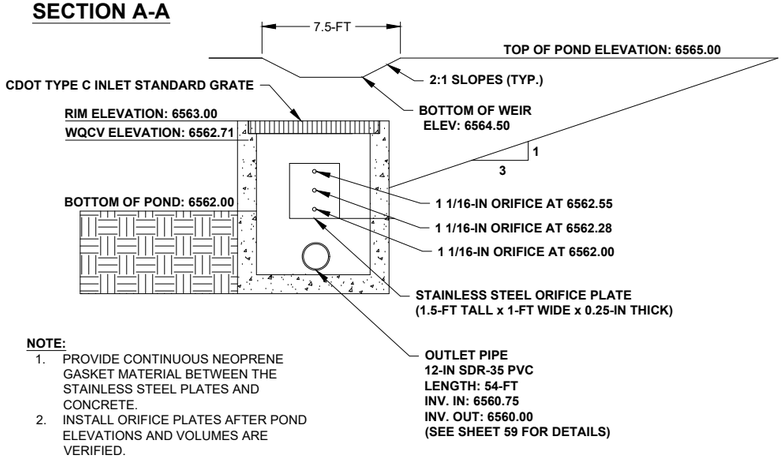
6567 6566 6565 6564 6563 6562 6562 6563 6564 6565 6568 6567 6566 6565 6564 6563 6562562 6561 6560 6559 6558 6557

scale 10 0 10 20 feet

LOCATION MAP
N.T.S.



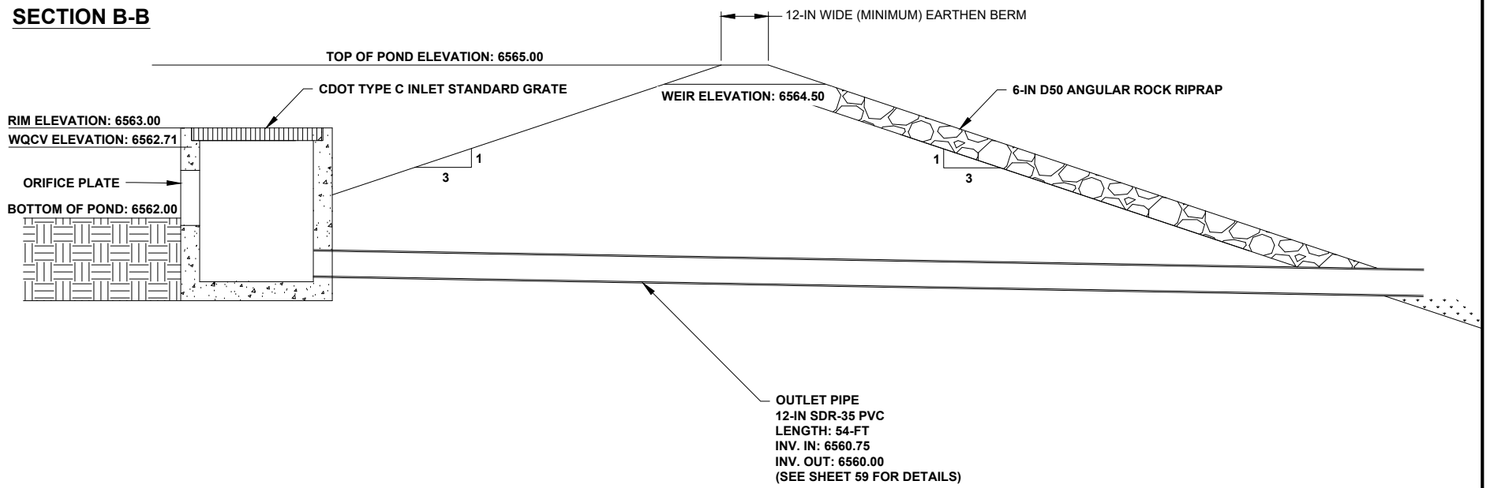
SECTION A-A



NOTE:

1. PROVIDE CONTINUOUS NEOPRENE GASKET MATERIAL BETWEEN THE STAINLESS STEEL PLATES AND CONCRETE.
2. INSTALL ORIFICE PLATES AFTER POND ELEVATIONS AND VOLUMES ARE VERIFIED.

SECTION B-B



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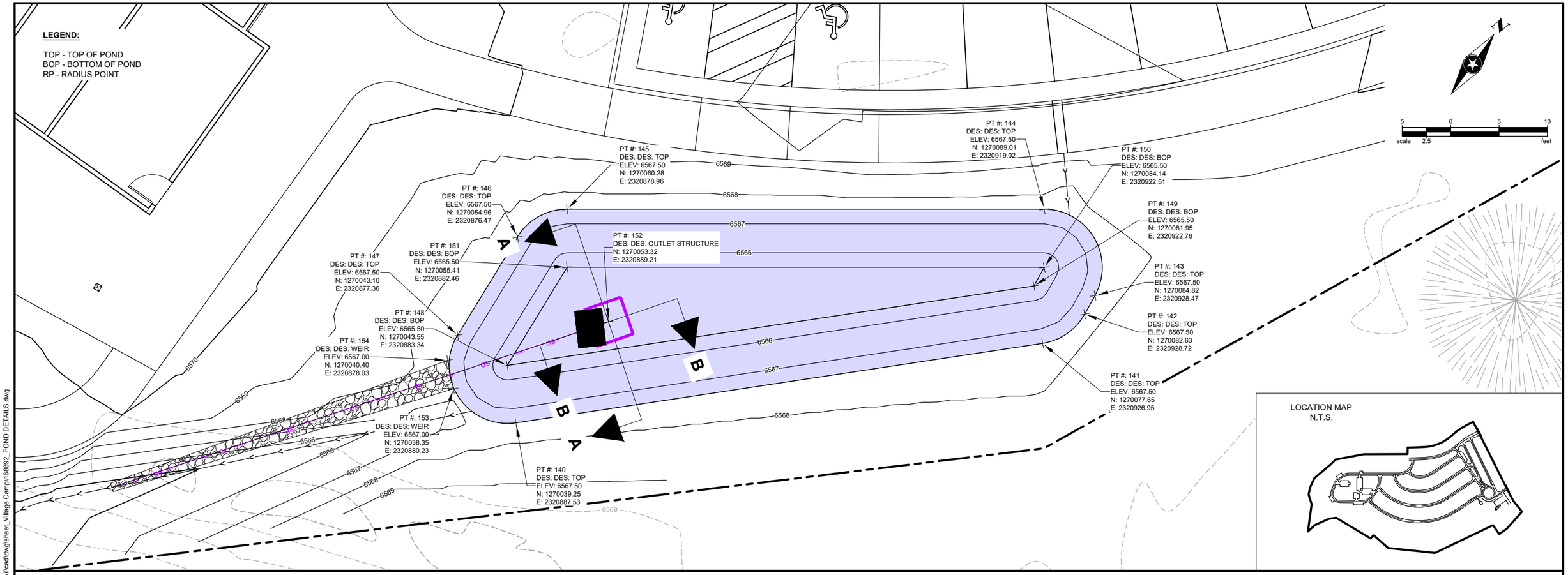
Drawn By	SC/CM										
Designed By	TM							TRAVIS MOONEY			
Checked By	SW							DATE 01/17/2025 LICENSE NO. 0051259			of 82

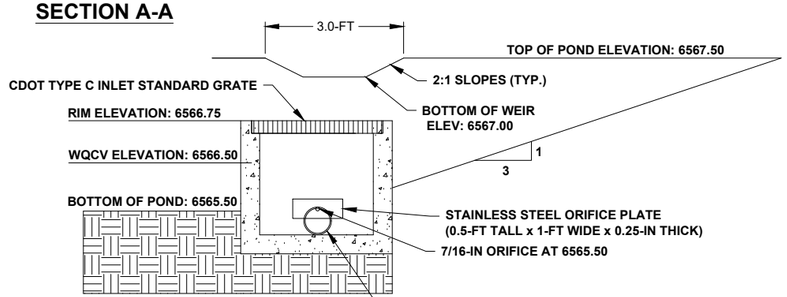
LEGEND:

TOP - TOP OF POND
BOP - BOTTOM OF POND
RP - RADIUS POINT



LOCATION MAP
N.T.S.

SECTION A-A



NOTE:

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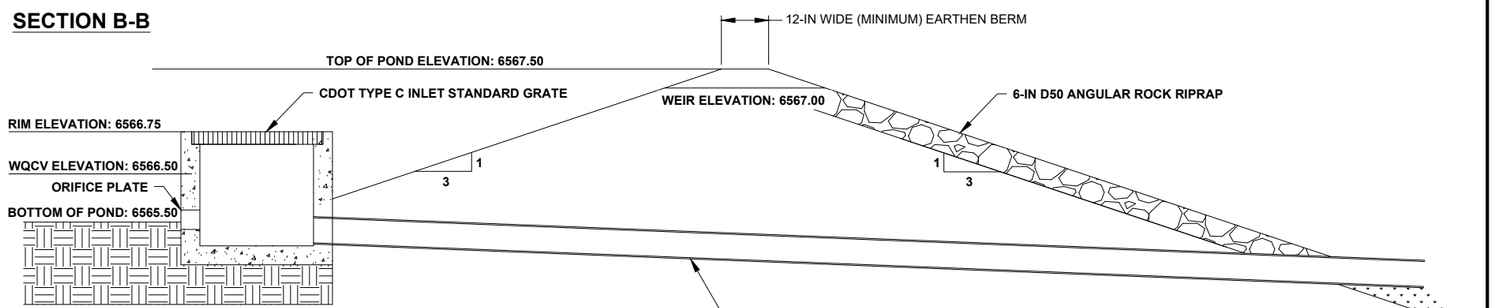
2. INSTALL ORIFICE PLATES AFTER POND ELEVATIONS AND VOLUMES ARE VERIFIED.

SECTION B-B



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Designed By	TM							
Checked By	SW							

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TRAVIS MOONEY
DATE 01/17/2025 LICENSE NO. 0051259

VILLAGE CAMP DURANGO
DURANGO, COLORADO

WATER QUALITY DETENTION POND 3

Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Wednesday, Dec 11 2024

SUBBASIN 1 - STORM PIPE #1

Invert Elev Dn (ft)	=	6560.36
Pipe Length (ft)	=	28.00
Slope (%)	=	1.00
Invert Elev Up (ft)	=	6560.64
Rise (in)	=	15.0
Shape	=	Elliptical
Span (in)	=	15.0
No. Barrels	=	1
n-Value	=	0.012
Culvert Type	=	Horizontal Ellipse Concrete
Culvert Entrance	=	Square edge w/headwall (H)
Coeff. K,M,c,Y,k	=	0.01, 2, 0.0398, 0.67, 0.5

Embankment

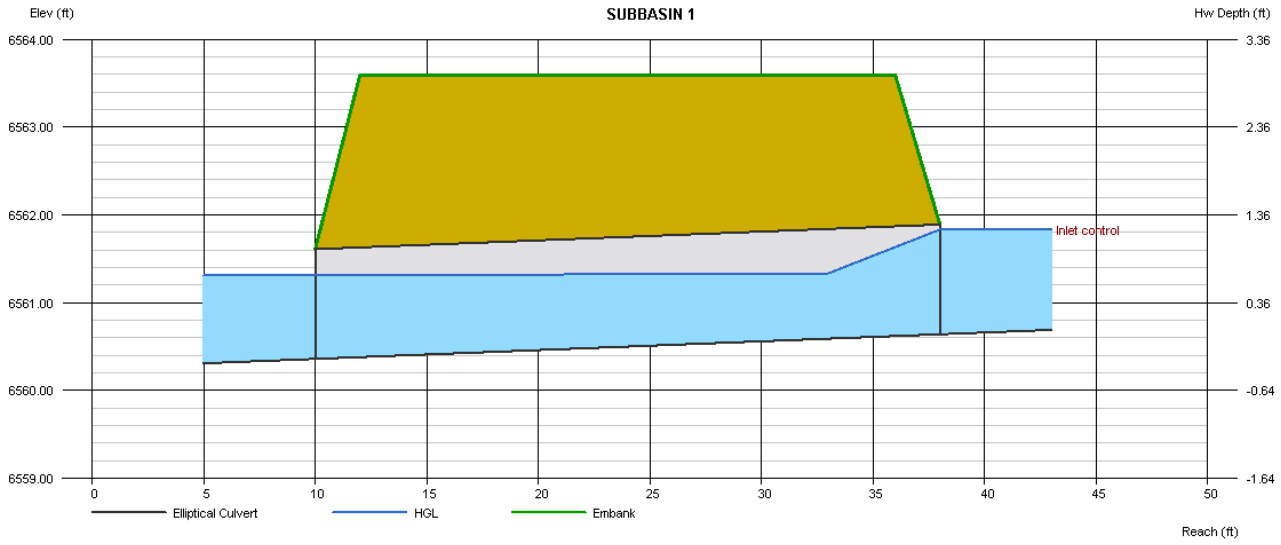
Top Elevation (ft)	=	6563.59
Top Width (ft)	=	24.00
Crest Width (ft)	=	24.00

Calculations

Qmin (cfs)	=	1.00
Qmax (cfs)	=	5.00
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	3.50
Qpipe (cfs)	=	3.50
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	3.28
Veloc Up (ft/s)	=	4.88
HGL Dn (ft)	=	6561.31
HGL Up (ft)	=	6561.34
Hw Elev (ft)	=	6561.83
Hw/D (ft)	=	0.95
Flow Regime	=	Inlet Control



Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Wednesday, Dec 11 2024

SUBBASIN 2,3,4, & 5 - STORM PIPE #2 - #9

Invert Elev Dn (ft)	=	6563.51
Pipe Length (ft)	=	40.00
Slope (%)	=	0.50
Invert Elev Up (ft)	=	6563.71
Rise (in)	=	15.0
Shape	=	Elliptical
Span (in)	=	15.0
No. Barrels	=	1
n-Value	=	0.012
Culvert Type	=	Horizontal Ellipse Concrete
Culvert Entrance	=	Square edge w/headwall (H)
Coeff. K,M,c,Y,k	=	0.01, 2, 0.0398, 0.67, 0.5

Embankment

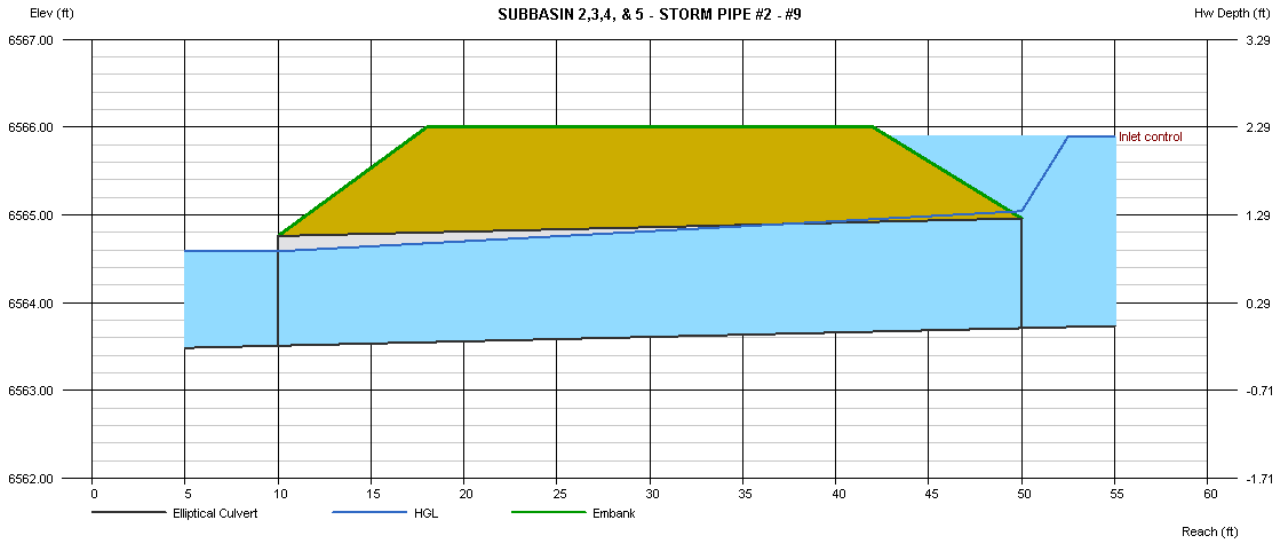
Top Elevation (ft)	=	6566.00
Top Width (ft)	=	24.00
Crest Width (ft)	=	24.00

Calculations

Qmin (cfs)	=	1.00
Qmax (cfs)	=	7.30
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	7.15
Qpipe (cfs)	=	7.15
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	6.23
Veloc Up (ft/s)	=	5.83
HGL Dn (ft)	=	6564.59
HGL Up (ft)	=	6565.04
Hw Elev (ft)	=	6565.90
Hw/D (ft)	=	1.75
Flow Regime	=	Inlet Control



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Wednesday, Dec 11 2024

SUBBASIN 2-5: SWALE SIZING ANALYSIS

Triangular

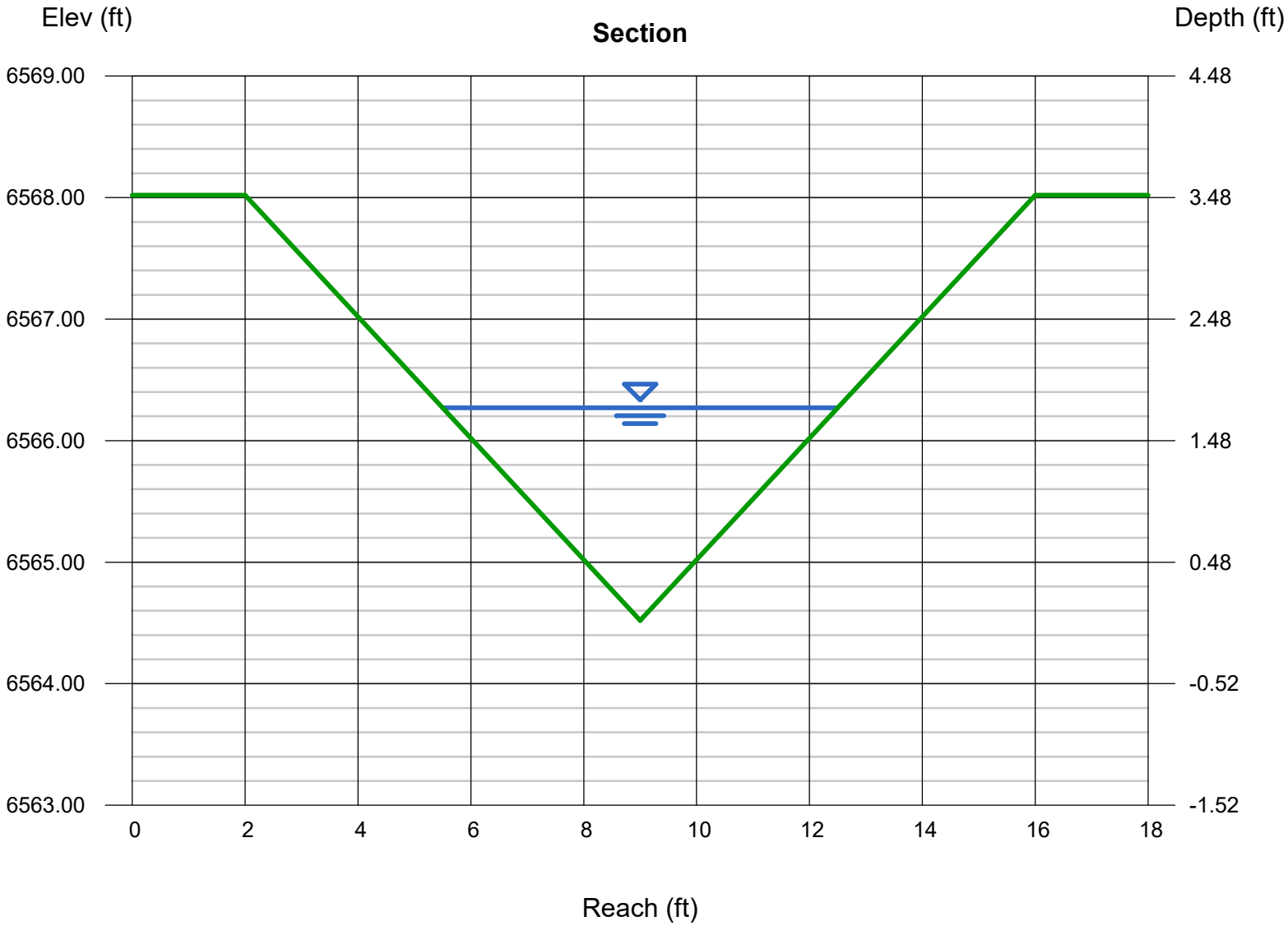
Side Slopes (z:1)	= 2.00, 2.00
Total Depth (ft)	= 3.50
Invert Elev (ft)	= 6564.52
Slope (%)	= 0.50
N-Value	= 0.026

Calculations

Compute by:	Q vs Depth
No. Increments	= 10

Highlighted

Depth (ft)	= 1.75
Q (cfs)	= 21.02
Area (sqft)	= 6.13
Velocity (ft/s)	= 3.43
Wetted Perim (ft)	= 7.83
Crit Depth, Yc (ft)	= 1.48
Top Width (ft)	= 7.00
EGL (ft)	= 1.93



Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Wednesday, Dec 11 2024

SUBBASIN 6 - STORM PIPE #10 - #13

Invert Elev Dn (ft)	=	6564.85
Pipe Length (ft)	=	67.00
Slope (%)	=	0.51
Invert Elev Up (ft)	=	6565.19
Rise (in)	=	15.0
Shape	=	Circular
Span (in)	=	15.0
No. Barrels	=	1
n-Value	=	0.012
Culvert Type	=	Circular Culvert
Culvert Entrance	=	Smooth tapered inlet throat
Coeff. K,M,c,Y,k	=	0.534, 0.555, 0.0196, 0.9, 0.2

Embankment

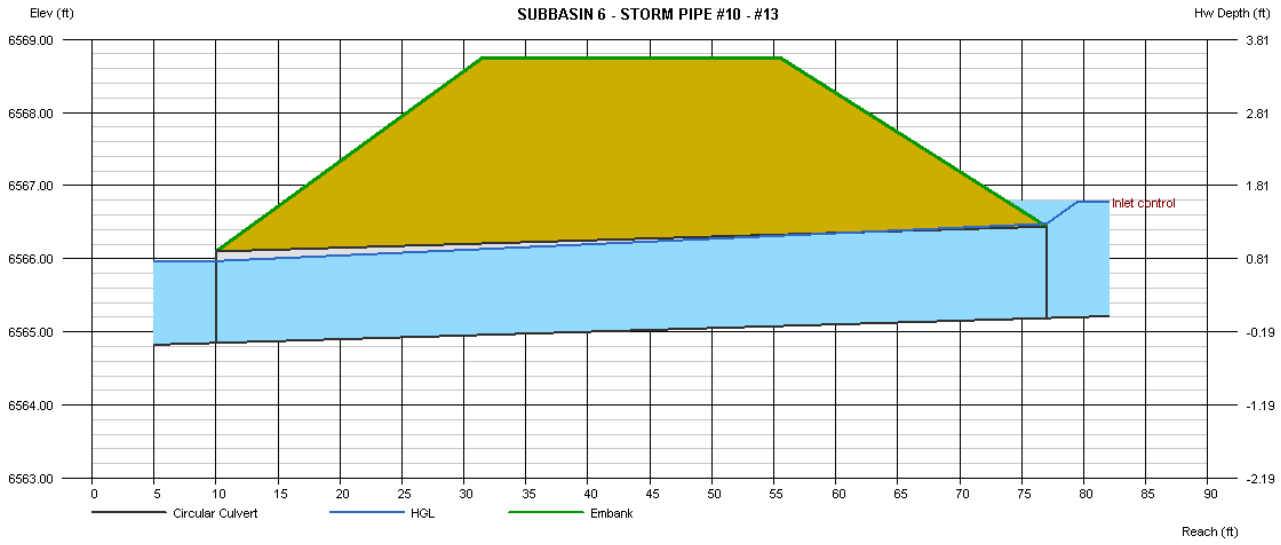
Top Elevation (ft)	=	6568.75
Top Width (ft)	=	24.00
Crest Width (ft)	=	24.00

Calculations

Qmin (cfs)	=	0.00
Qmax (cfs)	=	6.50
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	6.00
Qpipe (cfs)	=	6.00
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	5.18
Veloc Up (ft/s)	=	4.89
HGL Dn (ft)	=	6565.97
HGL Up (ft)	=	6566.48
Hw Elev (ft)	=	6566.78
Hw/D (ft)	=	1.27
Flow Regime	=	Inlet Control



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Wednesday, Dec 11 2024

SUBBASIN 6: SWALE SIZING ANALYSIS

Triangular

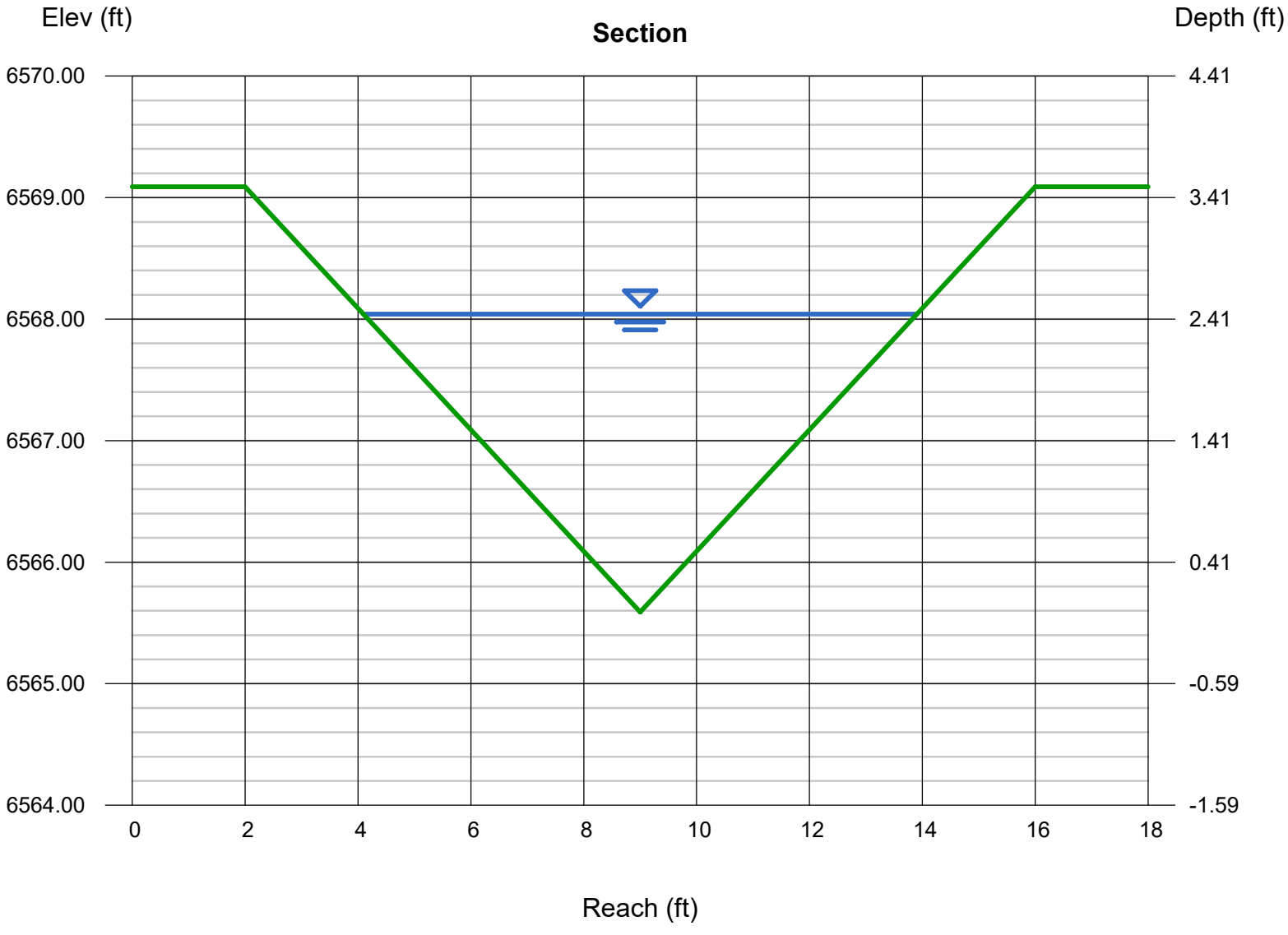
Side Slopes (z:1)	= 2.00, 2.00
Total Depth (ft)	= 3.50
Invert Elev (ft)	= 6565.59
Slope (%)	= 0.50
N-Value	= 0.026

Calculations

Compute by:	Q vs Depth
No. Increments	= 10

Highlighted

Depth (ft)	= 2.45
Q (cfs)	= 51.57
Area (sqft)	= 12.01
Velocity (ft/s)	= 4.30
Wetted Perim (ft)	= 10.96
Crit Depth, Yc (ft)	= 2.11
Top Width (ft)	= 9.80
EGL (ft)	= 2.74



Weir Report

WEIR ANALYSIS FOR POND 1 & 3

Trapezoidal Weir

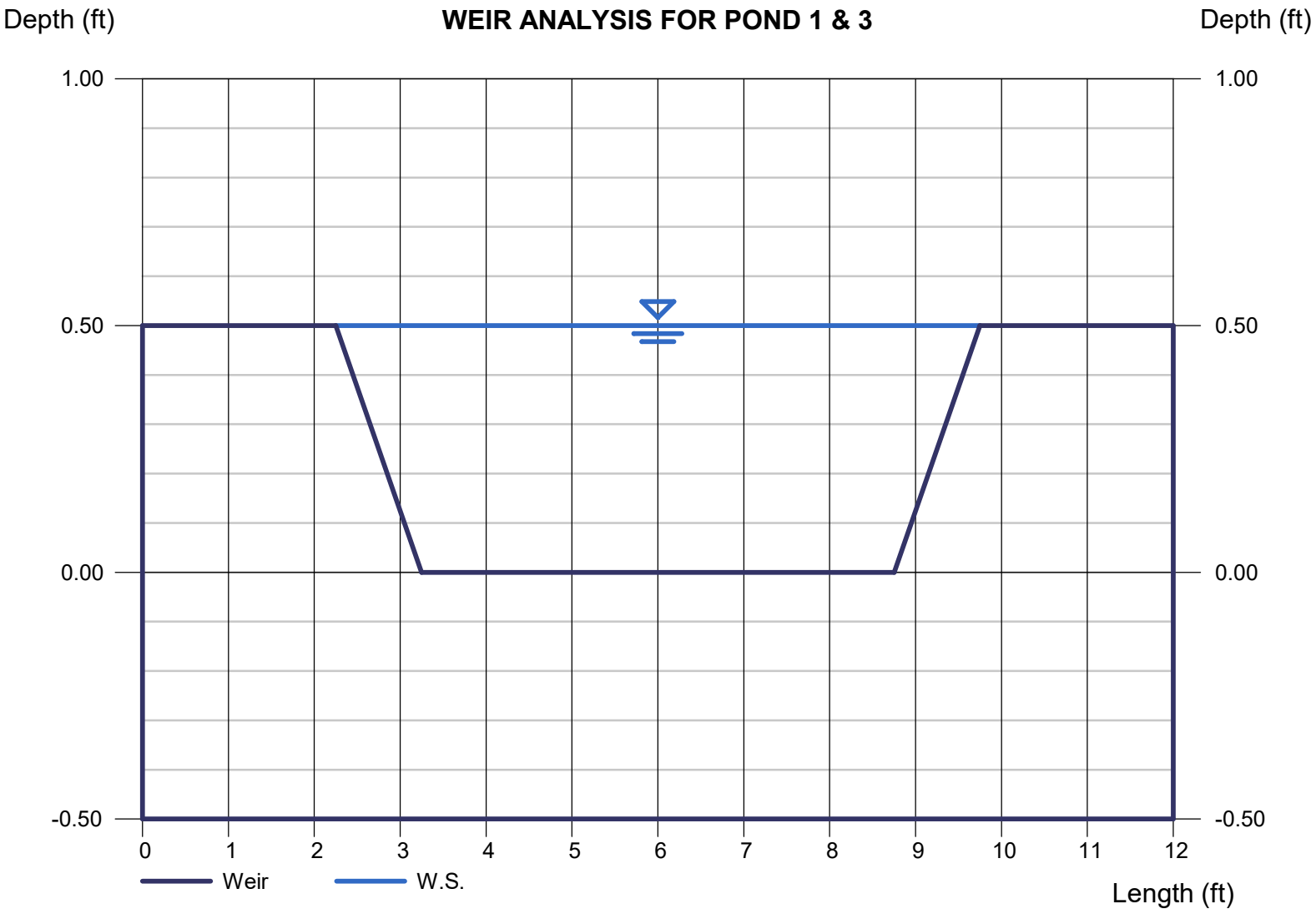
Crest	= Sharp
Bottom Length (ft)	= 5.50
Total Depth (ft)	= 0.50
Side Slope (z:1)	= 2.00

Calculations

Weir Coeff. Cw	= 3.10
Compute by:	Q vs Depth
No. Increments	= 9

Highlighted

Depth (ft)	= 0.50
Q (cfs)	= 6.905
Area (sqft)	= 3.25
Velocity (ft/s)	= 2.12
Top Width (ft)	= 7.50



Weir Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Wednesday, Dec 11 2024

WEIR ANALYSIS FOR POND 2

Trapezoidal Weir

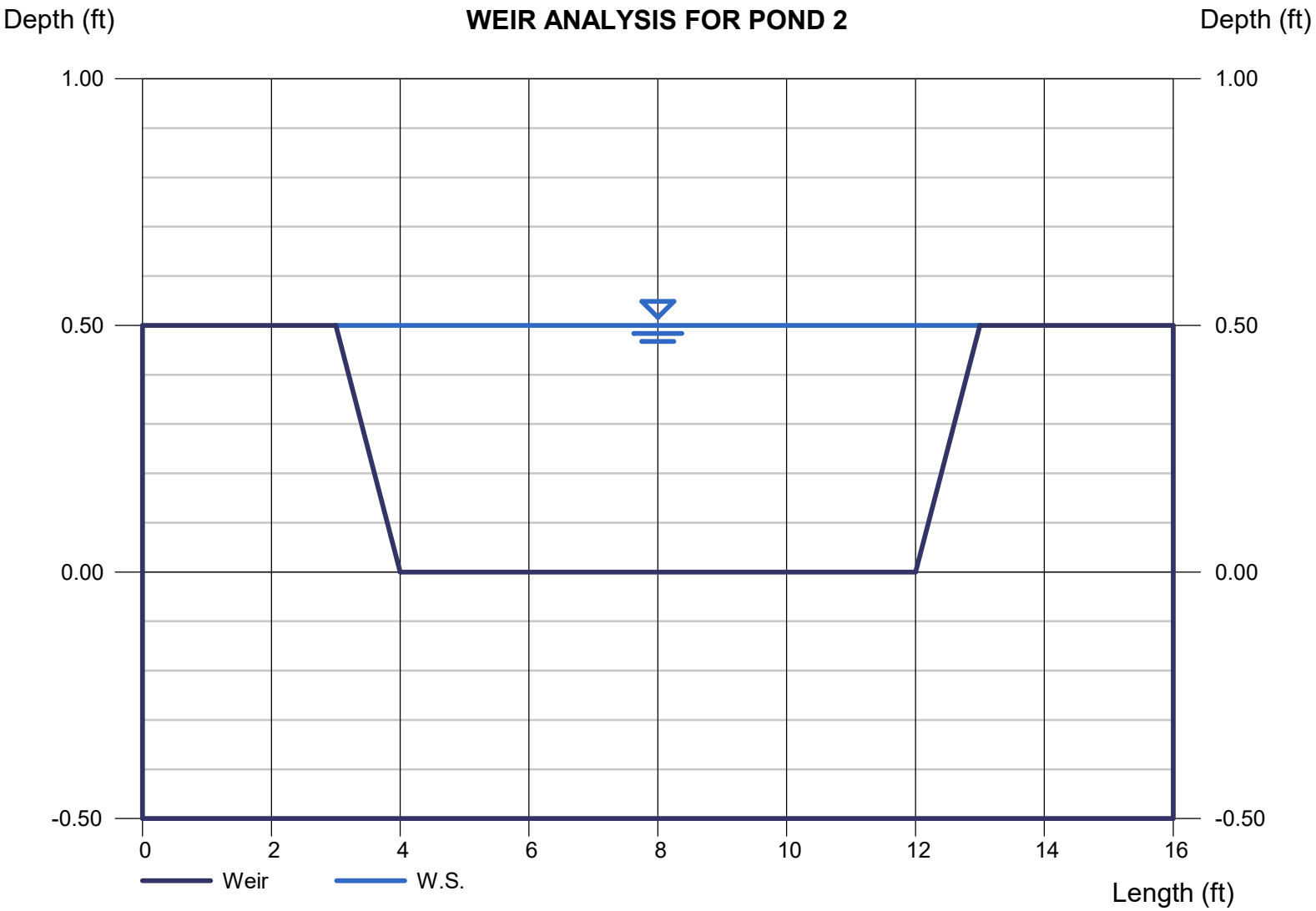
Crest	= Sharp
Bottom Length (ft)	= 8.00
Total Depth (ft)	= 0.50
Side Slope (z:1)	= 2.00

Calculations

Weir Coeff. Cw	= 3.10
Compute by:	Q vs Depth
No. Increments	= 9

Highlighted

Depth (ft)	= 0.50
Q (cfs)	= 9.645
Area (sqft)	= 4.50
Velocity (ft/s)	= 2.14
Top Width (ft)	= 10.00



Inlet Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Wednesday, Dec 11 2024

GRATE INLET CAPACITY ANALYSIS

Drop Grate Inlet

Location	= Sag
Curb Length (ft)	= -0-
Throat Height (in)	= -0-
Grate Area (sqft)	= 9.52
Grate Width (ft)	= 2.80
Grate Length (ft)	= 3.43

Gutter

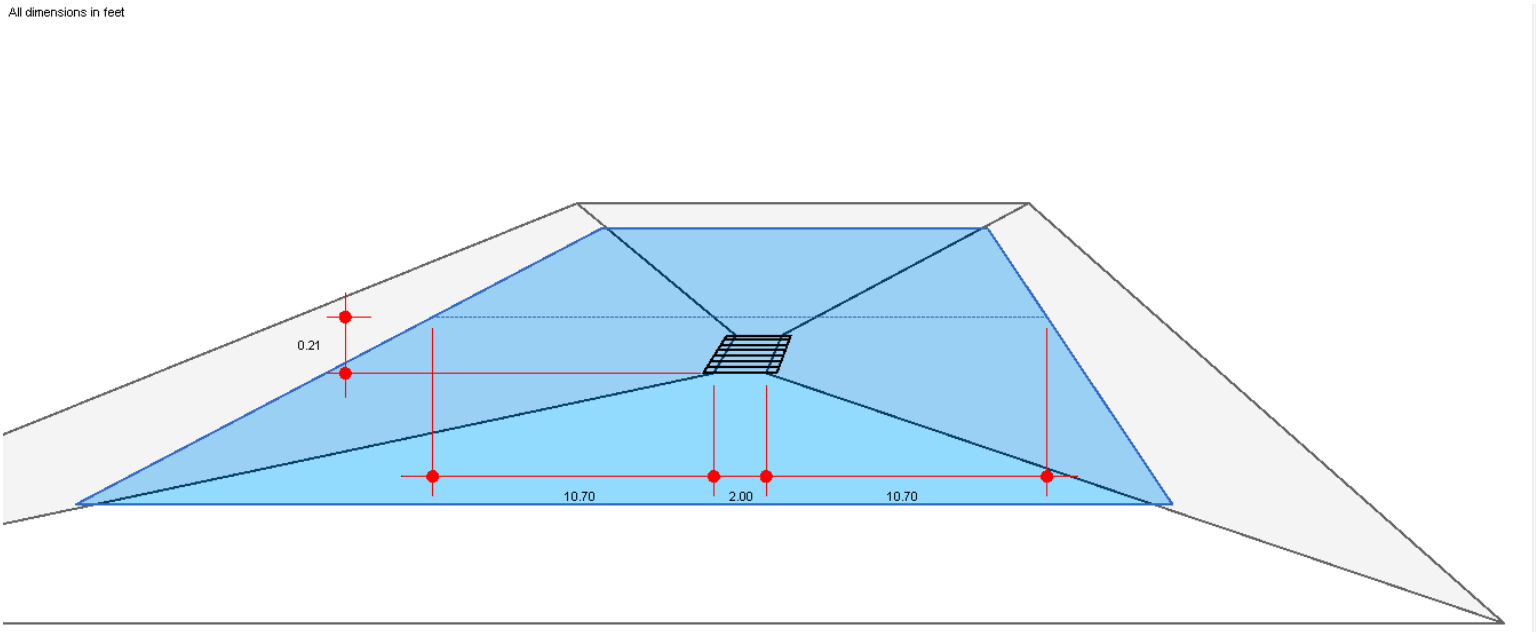
Slope, Sw (ft/ft)	= 0.020
Slope, Sx (ft/ft)	= 0.020
Local Depr (in)	= -0-
Gutter Width (ft)	= 2.00
Gutter Slope (%)	= -0-
Gutter n-value	= -0-

Calculations

Compute by:	Q vs Depth
Max Depth (in)	= 3

Highlighted

Q Total (cfs)	= 3.50
Q Capt (cfs)	= 3.50
Q Bypass (cfs)	= -0-
Depth at Inlet (in)	= 2.47
Efficiency (%)	= 100
Gutter Spread (ft)	= 23.40
Gutter Vel (ft/s)	= -0-
Bypass Spread (ft)	= -0-
Bypass Depth (in)	= -0-



Appendix F

Grading and Drainage Plan

100 YEAR FLOOD WAY

100 YEAR FLOOD PLAIN

LEGEND

SURFACE FLOW

PIPED FLOW

EXISTING 2-FT CONTOURS

PROPOSED 2-FT CONTOURS

NOTE: PARCEL NORTH OF THE PROJECT DRAINS INDEPENDENTLY TO THE WEST. DRAINAGE HAS BEEN DESIGNED AND INSTALLED BY OTHERS AFTER TOPOGRAPHIC SURVEY OF SUBJECT PARCEL WAS PERFORMED.

N

scale 50 100 0 100 200 feet

70-FT R.O.W (TYP.)

20-FT UTILITY EASEMENT (TYP.)

EXISTING 15-FT ACCESS, UTILITY & DRAINAGE EASEMENT

45-ACCESS EASEMENT

BATHHOUSE

COUNTY ROAD 252

NORTH ROAD 1

EAST ROAD

M. EAST ROAD

NORTH ROAD 2

NORTH ROAD 3

ANIMAS RIVER

PROPERTY LINE (TYP.)

DELINEATED WETLANDS

GRATE INLET & 15-IN CULVERT (SEE STORM P-PROS FOR DETAILS)

DETENTION POND 1
WQCV: 0.084 ACRE-FT
TOT VOL: 0.408 ACRE-FT
BOTTOM ELEV: 6560.00
TOP ELEV: 6562.50

RIPRAP CHANNEL

WEIR

WEST ROAD

15- IN CULVERT

15-IN CULVERTS (3)

SOUTH ROAD 1

(2) 15-IN CULVERTS

SOUTH ROAD 2

SOUTH ENTRANCE ROAD

30-FT UTILITY EASEMENT

TOP OF RIVER BANK LINES ARE APPROXIMATE AND NOT GIVEN BY SURVEYED DATA (TYP.)

DETENTION POND 2
WQCV: 0.166 ACRE-FT
TOT VOL: 0.373 ACRE-FT
BOTTOM ELEV: 6560.00
TOP ELEV: 6562.50

WEIR

RIPRAP CHANNEL

APPROXIMATE WATERLINE

DETENTION POND 3
WQCV: 0.129 ACRE-FT
TOT VOL: 0.440 ACRE-FT
BOTTOM ELEV: 6562.00
TOP ELEV: 6565.00

WEIR

RIPRAP CHANNEL

DETENTION POND 4
WQCV: 0.011 ACRE-FT
TOT VOL: 0.032 ACRE-FT
BOTTOM ELEV: 6565.50
TOP ELEV: 6567.50

CLUBHOUSE AREA OUTDOOR EGRESS TO BE COORDINATED AND DESIGNED FURTHER PRIOR TO CONSTRUCTION

Save: 1/14/2025 8:33 AM gfrizzell Plot: 1/15/2025 1:54 PM \\sehinc.com\panzura\pzprojects\PTHROBRE\168892\5-final-dsgn\51-drawings\10-Civil\cad\dwg\sheet_Village Camp\168892_GP.dwg

SEH Project	168892	Rev.#	Revision Issue Description	Date	Rev.#	Revision Issue Description	Date	I HEREBY CERTIFY THAT THIS PLAN WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF CO.	VILLAGE CAMP DURANGO DURANGO, COLORADO	GRADING AND DRAINAGE PLAN	9
Drawn By	SC/CM										
Designed By	TM							TRAVIS MOONEY			
Checked By	SW							DATE 01/17/2025 LICENSE NO. 0051259			of 82

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