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**Preliminary Drainage Report
Meadow Lake Industrial Filing No. 1
El Paso County, Colorado**

August, 2023

HR Green Project No: 2202774

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PCD File No. TBD



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I. General Purpose, Location and Description

a. Purpose

The purpose of the Preliminary Drainage Report (PDR) for Meadow Lake Industrial Filing No. 1 is to describe the onsite and offsite drainage patterns, size drainage infrastructure to safely capture and convey developed runoff to water quality and detention facilities, and to safely route detained stormwater to adequate outfalls.

b. Location

Meadow Lake Industrial Filing No. 1, referred to as 'the site' herein, is 254 acres of undeveloped land. A 51.3 acre portion of the site will be developed as an industrial subdivision, Filing No. 1, and the remaining area will be undeveloped. The site lies within a part of the east half of Section 9, Township 13 South, Range 64 West of the 6th P.M., El Paso County, Colorado. The site is bound to the north and west by undeveloped land, to the east by Curtis Road, and to the south by Falcon Highway. A vicinity map is presented in Appendix A.

c. Description of Property

The property is currently undeveloped and unplatted. The developed site will plat 27 industrial lots and two drainage tracts on approximately 51.3 acres. The site is generally bisected by a ridge that directs stormwater east towards Curtis Road and west towards an unnamed tributary. The unnamed tributary runs north-south through the site, however; all development will occur east of the tributary. There are no existing utilities on the site. Onsite vegetation consists primarily of native grasses and weeds. Per a NRCS web soil survey, the site's soil is comprised of Type A soils: Blakeland loamy sand, Truckton loamy sand and Columbine gravelly sandy loam, Type B soil Stapleton sandy loam, and Type D soil Fluvaquentic Haplaquolls. A NRCS soil survey is presented in Appendix A.

d. Floodplain Statement

Based on FEMA FIRM 08041C0558G & 08041C0566G, revised December 7, 2018, there are no floodplains (Zone A or Zone X) within the Filing No. 1 boundary. Zone A areas determined to be within the 1.0% annual chance flood but do not have base flood elevations established. Zone X are areas determined to be outside the 0.2% annual chance flood. The FIRM is presented in Appendix A.

II. Drainage Design Criteria

a. Drainage Criteria

Hydrologic data and calculations were performed using the El Paso County Drainage Criteria Manual Volume 1 & 2 (EPCDCM), with current revisions.

Onsite drainage improvements are designed for the 5-year storm (minor event) and 100-year storm (major event) using rainfall values from CCSDCM Table 6-2. Runoff was calculated per CCSDCM Section 6.3.0 - Rational Method. Full spectrum pond design was completed using the latest version of Mile High Flood District's (MHFD) UD-Detention per CCSDCM Section 13.3.2.1. The detention pond allowable release rate will be limited to less than historic rates.

Return Period (yr)	5	100
1-hr Rainfall Depth (in)	1.50	2.52

Inlets were sized per the methods described in EPCDCM Section III Chapter 7 – Street Drainage and Storm Water Inlets. Storm sewer was sized per the methods described in EPCDCM Section III Chapter 8 – Storm Drains and Appurtenances.

III. Drainage Basins and Subbasins

a. Previous Drainage Studies

The site is primarily located within the Solberg Ranch Drainage Basin. Solberg Ranch does not have a Drainage Basin Planning Study (DBPS) on file with El Paso County.

b. Existing Subbasin Description

Basin EX1 is 200.66 acres of undeveloped area. Stormwater ($Q_5 = 18.9$ cfs $Q_{100} = 126.8$ cfs) flows south in the unnamed tributary to DP1.

Basin EX2 is 45.17 acres of undeveloped area. Stormwater ($Q_5 = 5.1$ cfs $Q_{100} = 26.7$ cfs) flows south in a roadside ditch adjacent to Curtis Road to DP2.

Basin EX3 is 8.49 acres of undeveloped area. Stormwater ($Q_5 = 1.5$ cfs $Q_{100} = 9.8$ cfs) flows north in a roadside ditch adjacent to Curtis Road to DP3.

c. Proposed Subbasin Description

Basin A is 4.79 acres of roadway and undeveloped area. Stormwater ($Q_5 = 5.3$ cfs $Q_{100} = 14.1$ cfs) is captured at DP1 in a public 10' Type R sump inlet. In the event of inlet failure at DP1, an overflow path is provided in Greenfield Avenue to Pond A. Basin A will be detained in Pond A.

Basin B is 1.68 acres of roadway and undeveloped area. Stormwater ($Q_5 = 5.7$ cfs $Q_{100} = 10.4$ cfs) is captured at DP2 in a public 5' Type R sump inlet. In the event of inlet failure at DP2, an overflow path is provided in Greenfield Avenue to Pond A. Basin B will be detained in Pond A.

Basin C is 2.93 acres of industrial lots and roadway. Stormwater ($Q_5 = 6.8$ cfs $Q_{100} = 13.5$ cfs) is captured at DP3 in a private 20' Type R on-grade inlet in Wild Iris Way. Basin C will be detained in Pond A. In the event of inlet failure at DP3, an overflow path is provided in Wild Iris Way to Pond A.

Basin D is 2.92 acres of industrial lots and roadway. Stormwater ($Q_5 = 7.0$ cfs $Q_{100} = 14.0$ cfs) is captured at DP4 in a private 20' Type R on-grade inlet in Wild Iris Way. Basin D will be detained in Pond A. In the event of inlet failure at DP3, an overflow path is provided in Wild Iris Way to Pond A.

Basin E is 3.54 acres of industrial lots and roadway. Stormwater ($Q_5 = 8.5$ cfs $Q_{100} = 16.9$ cfs) is captured at DP5 in a private 15' Type R sump inlet in Wild Iris Way. Basin E will be detained in Pond A. In the event of inlet failure at DP3, an overflow path is provided in Wild Iris Way to Pond A by overtopping the curb and gutter at the knuckle.

Basin F is 1.70 acres of industrial lots and roadway. Stormwater ($Q_5 = 4.7$ cfs $Q_{100} = 8.7$ cfs) is captured at DP6 in a private 15' Type R sump inlet in Wild Iris Way. Basin F will be detained in Pond A. In the event of inlet failure at DP3, an overflow path is provided in Wild Iris Way to Pond A by overtopping the curb and gutter at the knuckle.

Basin G is 9.87 acres of industrial lots and undeveloped area. Stormwater ($Q_5 = 14.9$ cfs $Q_{100} = 30.3$ cfs) is captured at DP7 and conveyed in a swale to Pond A. Basin G will be detained in Pond A.

Basin H is 2.33 acres of industrial lots and undeveloped area. Stormwater ($Q_5 = 4.6$ cfs $Q_{100} = 9.6$ cfs) is captured at DP8 and conveyed in a swale to Pond A. Basin H will be detained in Pond A.

Basin I is 1.25 acres of industrial lots and undeveloped area. Stormwater ($Q_5 = 2.5$ cfs $Q_{100} = 5.2$ cfs) is captured at DP9 and conveyed in a swale to Pond A. Basin G will be detained in Pond A.

Basin J is 3.00 acres and contains Pond A. Stormwater ($Q_5 = 2.7$ cfs $Q_{100} = 8.6$ cfs) sheet flows directly to Pond A. Basin J will be detained in Pond A.

Basin K is 0.42 acres of roadway. Stormwater ($Q_5 = 1.8$ cfs $Q_{100} = 3.3$ cfs) is captured at DP11 in a public 5' Type R sump inlet in Sagebrush Street. In the event of inlet failure at DP11, an overflow path is provided in Swale B to Pond B. Basin K will be detained in Pond B.

Basin L is 0.42 acres of roadway. Stormwater ($Q_5 = 1.8$ cfs $Q_{100} = 3.3$ cfs) is captured at DP12 in a public 5' Type R sump inlet in Sagebrush Street. In the event of inlet failure at DP12, an overflow path is provided in Swale B to Pond B. Basin L will be detained in Pond B.

Basin M and DP14 have been omitted as they are an old basin and design point that have been removed. In order to keep all calculations consistent within this report, the proceeding basin designations and design points have not changed and remain sequential.

Basin N is 6.01 acres of industrial lots and roadway. Stormwater ($Q_5 = 14.4$ cfs $Q_{100} = 28.6$ cfs) is captured at DP15 in a public 15' Type R on-grade inlet in Mariposa Lily Court. Basin N will be detained in Pond B. In the event of inlet failure at DP15, an overflow path is provided in within the adjacent public roadway and access road that drain due south directly to Pond B.

Basin O is 3.04 acres of industrial lots and roadway. Stormwater ($Q_5 = 7.2$ cfs $Q_{100} = 14.2$ cfs) is captured at DP16 in a private 10' Type R on-grade inlet in Wildflower Court. Basin O will be detained in Pond B. In the event of inlet failure at DP16, an overflow path is provided in within the adjacent public roadway and access road that drain due south directly to Pond B.

Basin P is 3.20 acres of industrial lots and roadway. Stormwater ($Q_5 = 7.8$ cfs $Q_{100} = 15.5$ cfs) is captured at DP17 in a private 10' Type R on-grade inlet in Wildflower Court. Basin P will be detained in Pond B. In the event of inlet failure at DP17, an overflow path is provided in within the adjacent public roadway and access road that drain due south directly to Pond B.

Basin Q is 1.01 acres of roadway. Stormwater ($Q_5 = 4.0$ cfs $Q_{100} = 7.6$ cfs) is captured at DP18 in a public 5' Type R sump inlet in Greenfield Avenue. In the event of inlet failure at DP18, flows will overtop the sump and flow to Pond B along the maintenance access road. Basin Q will be detained in Pond B. In the event of inlet failure at DP18, an overflow path is provided in within the public roadway and access road that drain due south directly to Pond B.

Basin R is 1.11 acres of roadway. Stormwater ($Q_5 = 3.2$ cfs $Q_{100} = 6.2$ cfs) is captured at DP19 in a public 10' Type R sump inlet in Greenfield Avenue. In the event of inlet failure at DP19, flows will overtop the sump and flow to Pond B along the maintenance access road. Basin R will be detained in Pond B. In the event of inlet failure at DP19, an overflow path is provided in within the public roadway and access road that drain due south directly to Pond B.

Basin S is 0.85 acres of grass swale. Stormwater ($Q_5 = 0.3$ cfs $Q_{100} = 1.7$ cfs) is captured at DP21 and conveyed in a swale to Pond B. Basin S will be detained in Pond B.

Basin T is 1.19 acres and contains Pond B. Stormwater ($Q_5 = 0.4$ cfs $Q_{100} = 2.4$ cfs) sheet flows directly to Pond B. Basin T will be detained in Pond B.

IV. Drainage Facility Design

a. General Concept

Meadow Lake Industrial storm water will be collected and conveyed by a series of inlets, swales and storm sewer to two full spectrum water quality and detention ponds. The full spectrum water quality and detention ponds will discharge at less than historic rates.

b. Water Quality & Detention

Pond A

Water quality and detention for Basins A - J is provided in a full spectrum water quality and detention pond: Pond A. Pond A is located in Tract A. A total of 34.01 acres at 68% imperviousness will be detained in the pond. The WQCV is 0.755 ac-ft, the EURV is 2.133 ac-ft, and the 100-year volume is 4.274 ac-ft. The WQCV, EURV and 100-year storms are released in 40, 72 and 74 hours, respectively. A forebay is located at the outfall into the pond and a 2.0' trickle channel conveys flow towards the outlet structure. A 10' access and maintenance road is provided to the bottom of the pond to facilitate future maintenance. A 50' emergency overflow spillway is provided that conveys the developed, peak 100-yr flow rate with 1.0' of freeboard towards Curtis Road. The spillway will be lined with Type L riprap. Pond design calculations are presented in Appendix D.

Pond B

Water quality and detention for Basins K - T is provided in a full spectrum water quality and detention pond: Pond B. Pond B is located in Tract B. A total of 17.81 acres at 74% imperviousness will be detained in the pond. The WQCV is 0.437 ac-ft, the EURV is 1.247 ac-ft, and the 100-year volume is 2.447 ac-ft. The WQCV, EURV and 100-year storms are released in 40, 72 and 73 hours, respectively. A forebay is located at the outfall into the pond and a 2.0' trickle channel conveys flow towards the outlet structure. A 10' access and maintenance road is provided to the bottom of the pond to facilitate future maintenance. An 18' emergency overflow spillway is provided that conveys the developed, peak 100-yr flow rate with 1.0' of freeboard towards Curtis Road. The spillway will be lined with Type L riprap. Pond design calculations are presented in Appendix D.

c. Inspection and Maintenance

The private detention ponds are to be owned and maintained by a metropolitan district, to be established with the project. Maintenance access for the full spectrum detention facilities will be provided through private drainage easements and tracts.

d. Four Step Method to Minimize Adverse Impacts of Urbanization

Step 1 – Reducing Runoff Volumes: Low impact development (LID) practices are utilized to reduce runoff at the source. In general, stormwater discharges are routed across pervious areas prior to capture in storm sewer. This practice promotes infiltration and reduces peak runoff rates.

Step 2 – Treat and slowly release the WQCV: This step utilizes full spectrum water quality and detention to capture the WQCV and slowly release runoff from the site. Onsite full spectrum detention pond provides water quality treatment for the site. The WQCV is released over a period of 40 hours.

Step 3 – Stabilize stream channels: This step establishes practices to stabilize drainageways and provide scour protection at stormwater outfalls. Erosion protection is provided at all concentrated stormwater discharge points in the form of riprap pads.

Step 4 – Consider the need for source controls: Source controls will be required at the time of development for the industrial lots. Source control descriptions are discussed in the Stormwater Management Report for this project.

e. Drainage and Bridge Fees

Drainage basin and bridge fees for Meadow Lake Industrial are presented below. Drainage fees will be paid prior to the time of platting.

Solberg Ranch - 2023 Drainage Basin Fees				
Fee/Impervious Acre	Site Acreage	Site Impervious	Impervious Acres	Drainage Fee
\$23,078.00	51.3	77%	39.50	\$911,581.00

f. Opinion of Probable Cost

An engineer’s opinion of probable cost is presented will be provided with a subsequent Final Drainage Report submittal.

g. Hydraulic Grade Line Analysis

A hydraulic grade line analysis of the proposed storm will be provided with a subsequent Final Drainage Report submittal.

V. Summary

Meadow Lake Industrial lies within the Solberg Ranch Drainage Basin. Water quality and detention for the site is provided in full spectrum water quality and detention ponds. The water quality and detention ponds will be owned and maintained by a metropolitan district, to be established with the project. All drainage facilities were sized per the El Paso County Drainage Criteria Manuals.

VI. Drawings

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

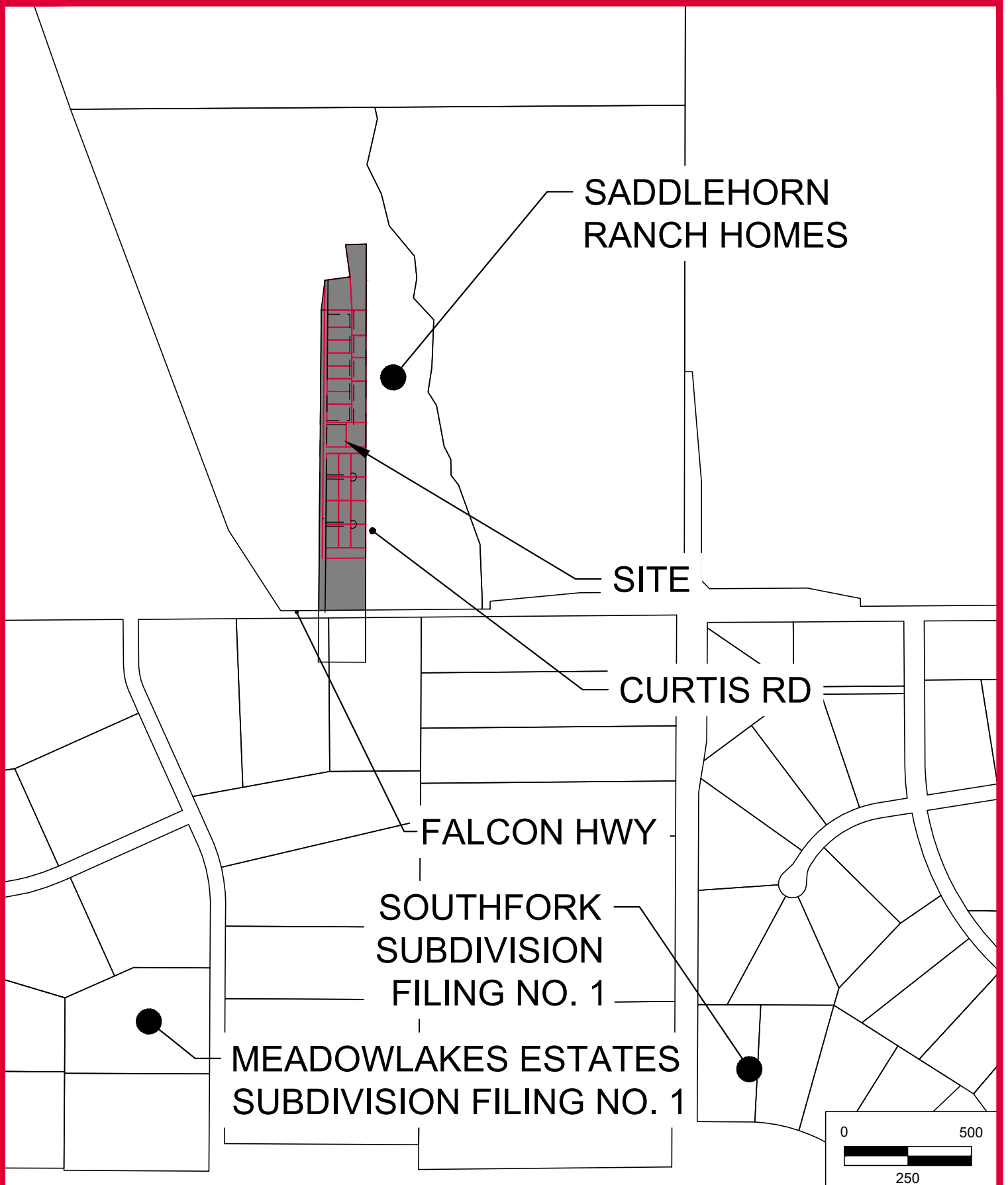
VII. References

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



APPENDIX A – VICINITY MAP, SOIL MAP, FEMA MAP

Xrefs: EPC_Parcels; 8.5x11_Titleblock



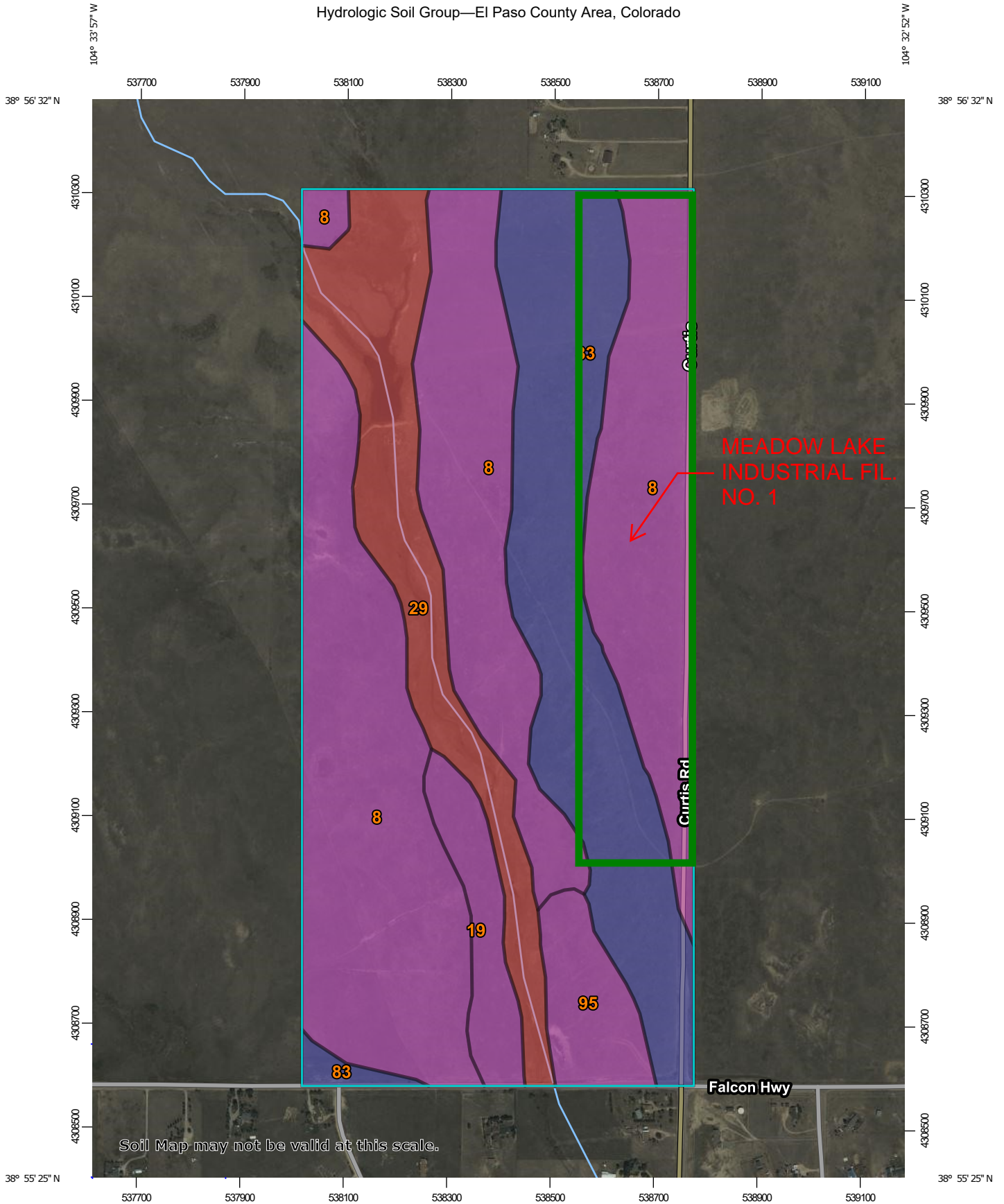
HRGreen.com



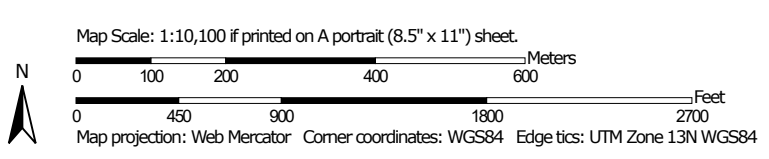
SHEET
VICINITY MAP

SCALE: 1"=500'
DATE: 06/08/2023

































Hydrologic Soil Group—El Paso County Area, Colorado



Soil Map may not be valid at this scale.



MAP LEGEND

- Area of Interest (AOI)**
 -  Area of Interest (AOI)
- Soils**
 - Soil Rating Polygons**
 -  A
 -  A/D
 -  B
 -  B/D
 -  C
 -  C/D
 -  D
 -  Not rated or not available
 - Soil Rating Lines**
 -  A
 -  A/D
 -  B
 -  B/D
 -  C
 -  C/D
 -  D
 -  Not rated or not available
 - Soil Rating Points**
 -  A
 -  A/D
 -  B
 -  B/D
- Water Features**
 -  Streams and Canals
- Transportation**
 -  Rails
 -  Interstate Highways
 -  US Routes
 -  Major Roads
 -  Local Roads
- Background**
 -  Aerial Photography
- Other**
 -  C
 -  C/D
 -  D
 -  Not rated or not available

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: El Paso County Area, Colorado
 Survey Area Data: Version 20, Sep 2, 2022

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

Date(s) aerial images were photographed: Sep 11, 2018—Oct 20, 2018

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
8	Blakeland loamy sand, 1 to 9 percent slopes	A	174.3	53.7%
19	Columbine gravelly sandy loam, 0 to 3 percent slopes	A	13.3	4.1%
29	Fluvaquentic Haplaquolls, nearly level	D	47.2	14.5%
83	Stapleton sandy loam, 3 to 8 percent slopes	B	75.9	23.4%
95	Truckton loamy sand, 1 to 9 percent slopes	A	14.0	4.3%
Totals for Area of Interest			324.7	100.0%

Description

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

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

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

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

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

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

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

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The community map repository should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where Base Flood Elevations (BFEs) and/or Floodways have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only to landward of 0' North American Vertical Datum of 1988 (NAVD88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the floodways were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by flood control structures. Refer to section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The projection used in the preparation of this map was Universal Transverse Mercator (UTM) zone 13. The horizontal datum was NAD83, GRS80 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988 (NAVD88). These flood elevations must be compared to structure and ground elevations referenced to the same vertical datum. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at <http://www.ngs.noaa.gov/> or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, NGS12
National Geodetic Survey
SSM/C-3, #5002
1315 East-West Highway
Silver Spring, MD 20910-3282

To obtain current elevation, description, and/or location information for bench marks shown on this map, please contact the Information Services Branch of the National Geodetic Survey at (301) 713-3242 or visit its website at <http://www.ngs.noaa.gov/>.

Base Map information shown on this FIRM was provided in digital format by El Paso County, Colorado Springs Utilities, and Anderson Consulting Engineers, Inc. These data are current as of 2008.

This map reflects more detailed and up to date stream channel configurations and floodplain delineations than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables in the Flood Insurance Study Report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map. The profile baselines depicted on this map represent the hydraulic modeling baselines that match the flood profiles and Floodway Data Tables if applicable, in the FIS report. As a result, the profile baselines may deviate significantly from the new base map channel representation and may appear outside of the floodplain.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to incorporations or dis-incorporations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed Map Index for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community, as well as a listing of the panels on which each community is located.

Contact FEMA Map Service Center (MSC) via the FEMA Map Information eXchange (FMIX) 1-877-336-2627 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. The MSC may also be reached by Fax at 1-800-358-9620 and its website at <http://www.fema.gov/>.

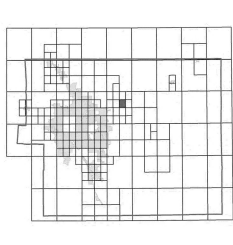
If you have questions about this map or questions concerning the National Flood Insurance Program in general, please call 1-877-FEMA MAP (1-877-336-2627) or visit the FEMA website at <http://www.fema.gov/business/firm/>.

El Paso County Vertical Datum Offset Table

Flooding Source	Vertical Datum Offset (ft)

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

Panel Location Map



MEADOW LAKE INDUSTRIAL FIL. NO. 1



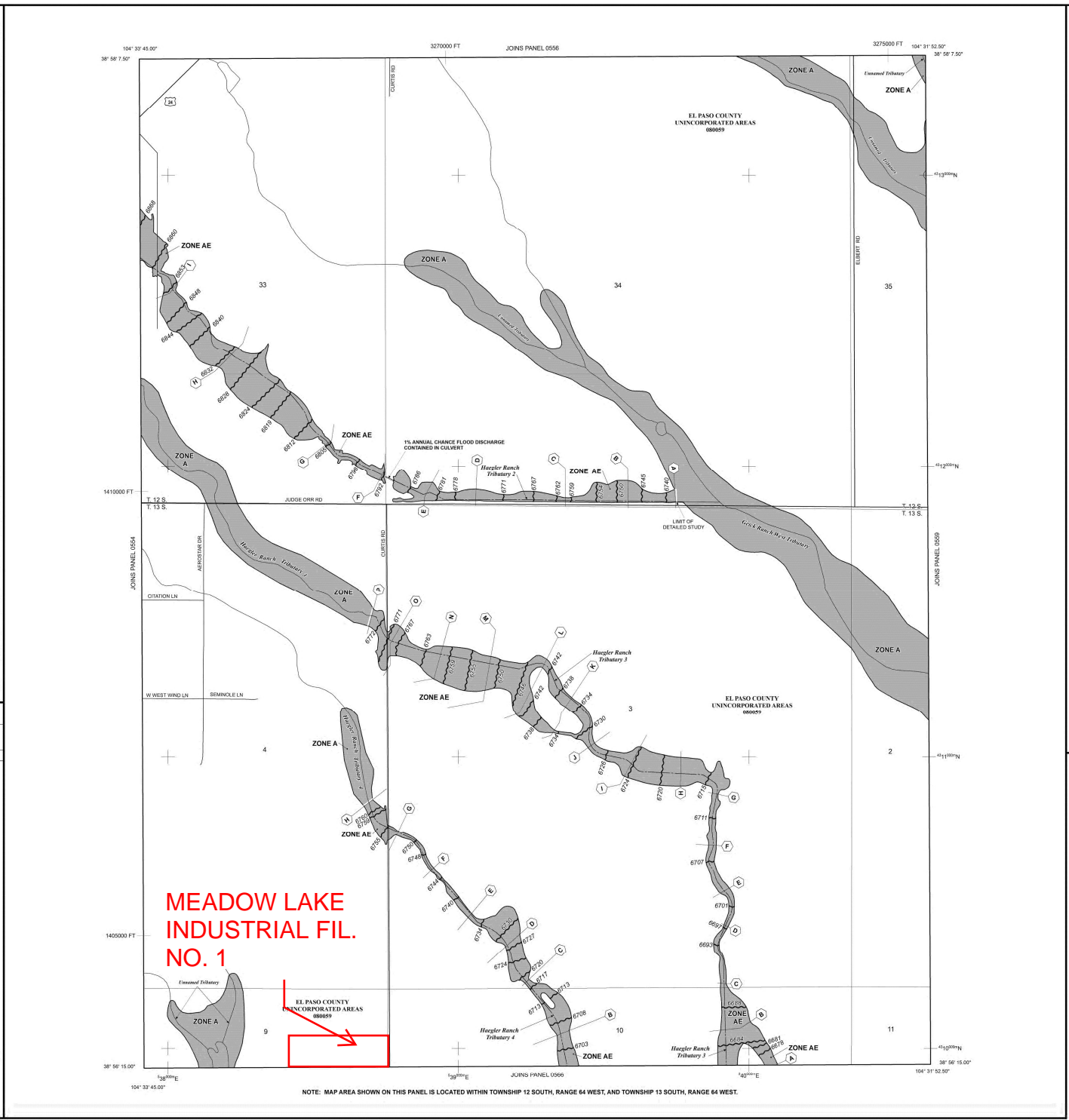
This Digital Flood Insurance Rate Map (DFIRM) was produced through a Cooperating Technical Partner (CTP) agreement between the State of Colorado Water Conservation Board (CWCB) and the Federal Emergency Management Agency (FEMA).



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



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



LEGEND

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

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

ZONE A No Base Flood Elevations determined.

ZONE AE Base Flood Elevations determined.

ZONE AH Flood depths of 1 to 3 feet (usually areas of ponding). Base Flood Elevation determined.

ZONE AO Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of shallow fan flooding, velocities also determined.

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

ZONE AR9 Areas to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.

ZONE AV Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.

ZONE VE Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachments, or else the 1% annual chance flood can be carried without substantial increase in flood heights.

OTHER FLOOD AREAS

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

OTHER AREAS

ZONE X Areas determined to be outside the 0.2% annual chance floodplain.

ZONE D Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

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

Floodplain boundary
Floodway boundary
Zone D boundary
CBRS and OPA boundary

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

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

— A — A —
Cross section line

23 — 23 —
Transect line

97° 07' 30.00"
32° 22' 30.00"
429° 00' 00"
1000-meter Universal Transverse Mercator grid ticks, zone 13

6000000 FT
5000-foot grid ticks: Colorado State Plane coordinate system, central zone 13
Lambert Conformal Conic Projection

DX5510
Bench mark (see explanation in Notes to Users section of this FIRM panel)

M1.5
River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

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

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

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

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

MAP SCALE 1" = 500'

0 500 1000
0 500 1000
0 100 200
METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0558G

FIRM
FLOOD INSURANCE RATE MAP
EL PASO COUNTY,
COLORADO
AND INCORPORATED AREAS

PANEL 558 OF 1300
(SEE MAP INDEX FOR FIRM LAYOUT)

CONTAINS:
COMMUNITY NUMBER PANEL SUFFIX
EL PASO COUNTY 0558G 0

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

MAP NUMBER
08401C0558G

MAP REVISED
DECEMBER 7, 2018

Federal Emergency Management Agency

NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 12 SOUTH, RANGE 64 WEST, AND TOWNSHIP 13 SOUTH, RANGE 64 WEST.

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The community map repository should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations (BFEs)** and/or **Floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded, whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations tables of the Flood Insurance Study. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the floodways were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by flood control structures. Refer to section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The projection used in the preparation of this map was Universal Transverse Mercator (UTM) zone 13. The horizontal datum was NAD83, GRS80 spheroid. Differences in datum, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of the FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988 (NAVD88). These flood elevations must be compared to structure and ground elevations referenced to the same vertical datum. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at <http://www.ngs.noaa.gov> or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, NNGS12
National Geodetic Survey
SSM/C-3, #5022
1315 East-West Highway
Silver Spring, MD 20910-3282

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at (301) 713-3242 or visit its website at <http://www.ngs.noaa.gov>.

Base Map information shown on this FIRM was provided in digital format by El Paso County, Colorado Springs Utilities, and Anderson Consulting Engineers, Inc. These data are current as of 2008.

This map reflects more detailed and up to date stream channel configurations and floodplain delineations than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables in the Flood Insurance Study Report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map. The profile baselines depicted on this map represent the hydraulic modeling baselines that match the flood profiles and Floodway Data Tables if applicable, in the FIS report. As a result, the profile baselines may deviate significantly from the new base map channel representation and may appear outside of the floodplain.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

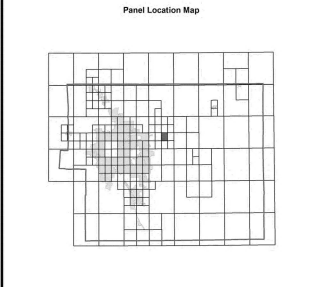
Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

Contact **FEMA Map Service Center (MSC)** via the FEMA Map Information eXchange (FMIX) 1-877-336-2627 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. The MSC may also be reached by Fax at 1-800-358-9620 and its website at <http://www.fema.gov>.

If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call 1-877-FEMA MAP (1-877-336-2627) or visit the FEMA website at <http://www.fema.gov/business/inf>.

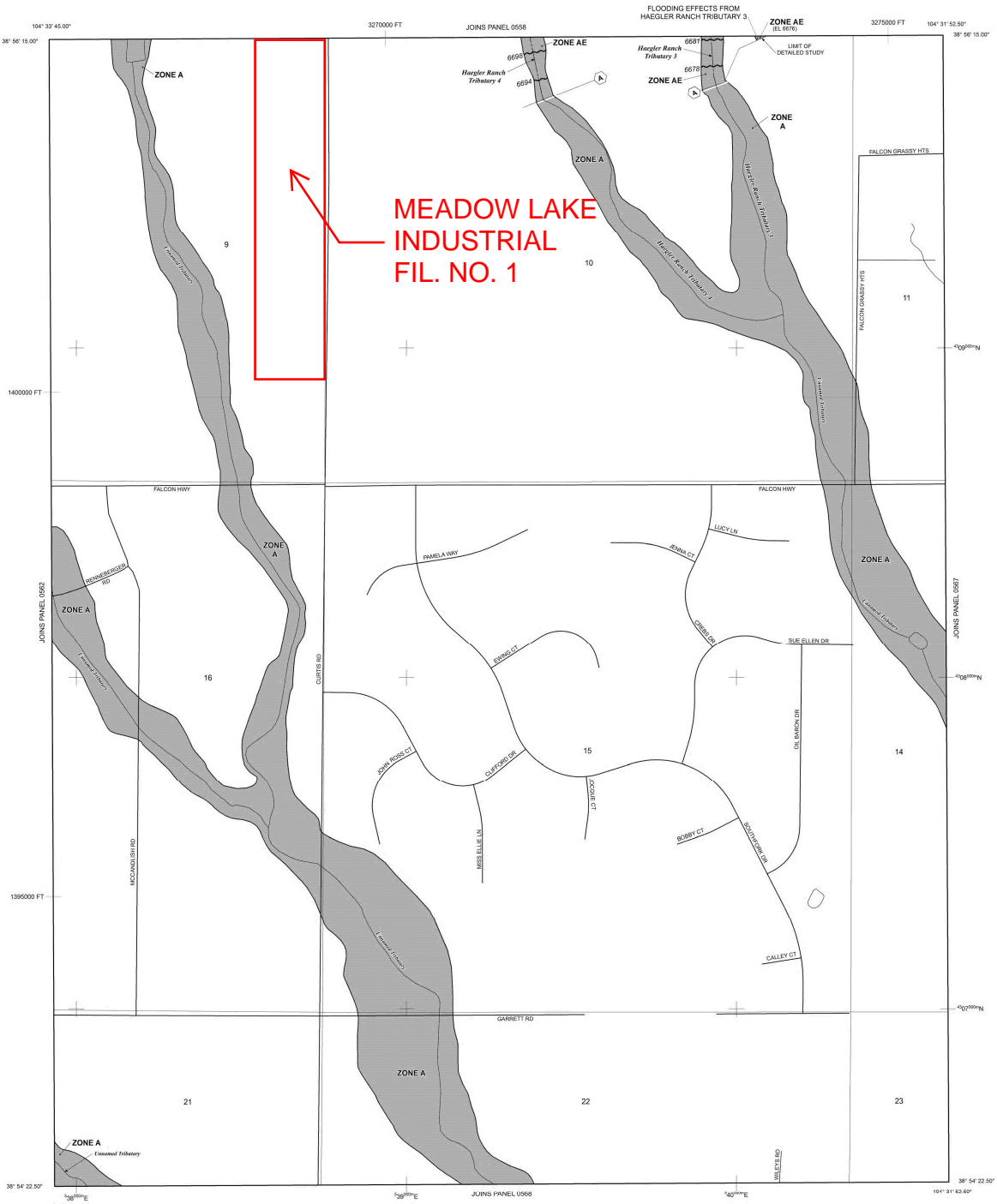
El Paso County Vertical Datum Offset Table

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



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

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



MEADOW LAKE INDUSTRIAL FIL. NO. 1

NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 13 SOUTH, RANGE 64 WEST.

LEGEND

- SPECIAL FLOOD HAZARD AREAS (SFHAS) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD**
- ZONE A** The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zone A, AE, AH, AO, AR, AV, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.
- ZONE AE** No Base Flood Elevations determined.
- ZONE AH** Base Flood Elevations determined.
- ZONE AO** Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of shallow fan flooding, velocities also determined.
- ZONE AR** Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently destroyed. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
- ZONE AV** Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
- ZONE VE** Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.
- FLOODWAY AREAS IN ZONE AE**
- OTHER FLOOD AREAS**
- OTHER AREAS**
- ZONE X** Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot in all zone areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.
- ZONE X** Areas determined to be outside the 0.2% annual chance floodplain. Areas in which flood hazards are undetermined, but possible.
- ZONE D** Areas determined to be outside the 0.2% annual chance floodplain. Areas in which flood hazards are undetermined, but possible.
- COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS**
- OTHERWISE PROTECTED AREAS (OPAs)**
- CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.
- Floodplain boundary
- Floodway boundary
- Zone D boundary
- CBRS and OPA boundary
- Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities
- Base Flood Elevation line and value, elevation in feet*
- Base Flood Elevation value where uniform within zone; elevation in feet*
- * Referenced to the North American Vertical Datum of 1988 (NAVD 88)
- Cross section line
- Transsect line
- Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
- 1000-meter Universal Transverse Mercator grid ticks, zone 13
- 5000-foot grid ticks: Colorado State Plane coordinate system, central zone 10 (PROJCODE 005).
- Lambert Conformal Conic Projection
- Bench mark (see explanation in Notes to Users section of this FIRM panel)
- 1:1.5 River Mile
- MAP REPOSITORIES**
- Refer to Map Repositories list on Map Index
- EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP**
- MARCH 17, 1997
- EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL**
- DECEMBER 7, 2018. To update corporate limits, to change Base Flood Elevations and Special Flood Hazard Areas, to update map format, to add roads and road names, and to incorporate previously issued Letters of Map Revision.

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0566G

FIRM
FLOOD INSURANCE RATE MAP
EL PASO COUNTY,
COLORADO
AND INCORPORATED AREAS

PANEL 566 OF 1300
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS	COMMUNITY	NUMBER	PANEL	SUFFIX
	EL PASO COUNTY	0566	0566	G

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

MAP NUMBER
08041C0566G

MAP REVISED
DECEMBER 7, 2018

Federal Emergency Management Agency




APPENDIX B – HYDROLOGIC CALCULATIONS




MEADOWLAKE INDUSTRIAL	Calc'd by:	NQJ
EXISTING CONDITIONS	Checked by:	CM
EL PASO COUNTY, CO	Date:	6/6/2023

SUMMARY RUNOFF TABLE				
BASIN	AREA (ac)	% IMPERVIOUS	Q ₅ (cfs)	Q ₁₀₀ (cfs)
EX1	200.66	2	18.9	126.8
EX2	45.17	6	5.1	26.7
EX3	8.49	2	1.5	9.8

DESIGN POINT SUMMARY TABLE			
DESIGN POINT	CONTRIBUTING BASINS	ΣQ ₅ (cfs)	ΣQ ₁₀₀ (cfs)
1	EX1	18.9	126.8
2	EX2	5.1	26.7
3	EX3	1.5	9.8

	MEADOWLAKE INDUSTRIAL								Calc'd by:	NQJ			
	EXISTING CONDITIONS								Checked by:	CM			
	EL PASO COUNTY, CO								Date:	6/6/2023			
COMPOSITE 'C' FACTORS													
BASIN	UNDEVELOPED	PAVED	TOTAL	SOIL TYPE	UNDEVELOPED			PAVED			COMPOSITE IMPERVIOUSNESS & C		
	ACRES				%I	C ₅	C ₁₀₀	%I	C ₅	C ₁₀₀	%I	C ₅	C ₁₀₀
EX1	200.66	0.00	200.66	A/B	2	0.09	0.36	100	0.90	0.96	2	0.09	0.36
EX2	43.31	1.86	45.17	A/B	2	0.09	0.36	100	0.90	0.96	6	0.12	0.38
EX3	8.49	0.00	8.49	A/B	2	0.09	0.36	100	0.90	0.96	2	0.09	0.36
Total			254.32										

	MEADOWLAKE INDUSTRIAL	Calc'd by:	NQJ
	EXISTING CONDITIONS	Checked by:	CM
	EL PASO COUNTY, CO	Date:	6/6/2023

TIME OF CONCENTRATION

BASIN DATA			OVERLAND TIME (T _i)			TRAVEL TIME (T _t)					TOTAL
DESIGNATION	C _s	AREA (ac)	LENGTH (ft)	SLOPE %	t _i (min)	C _v	LENGTH (ft)	SLOPE %	V (ft/s)	t _t (min)	t _c (min)
EX1	0.09	200.66	300	3.1	22.0	10	4252	1.6	1.3	56.0	78.0
EX2	0.12	45.17	300	2.1	24.2	10	4000	1.2	1.1	60.9	85.1
EX3	0.09	8.49	300	2.6	23.3	10	960	0.6	0.8	20.7	44.0

FORMULAS:

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

Table 6-7. Conveyance Coefficient, C_v

Type of Land Surface	C _v
Heavy meadow	2.5
Tillage/field	5
Riprap (not buried)*	6.5
Short pasture and lawns	7
Nearly bare ground	10
Grassed waterway	15
Paved areas and shallow paved swales	20

*For buried riprap, select C_v value based on type of vegetative cover.



MEADOWLAKE INDUSTRIAL

Calc'd by:

NQJ

EXISTING CONDITIONS

Checked by:

CM

DESIGN STORM: 5-YEAR

Date:

6/6/2023

STREET	DESIGN POINT	BASIN ID	DIRECT RUNOFF						TOTAL RUNOFF				SURFACE			PIPE			TRAVEL TIME			REMARKS
			AREA (ac)	C _s	t _c (min)	C _s *A (ac)	I (in./hr.)	Q (cfs)	t _c (min)	C _s *A (ac)	I (in./hr.)	Q (cfs)	Q _{street} (cfs)	C _s *A (ac)	SLOPE %	Q _{pipe} (cfs)	C _s *A (ac)	SLOPE %	PIPE SIZE (in)	LENGTH (FT)	VEL. (FPS)	
	1	EX1	200.7	0.09	78.0	18.06	1.05	18.9														BASIN EX1 FLOW @ DP1
	2	EX2	45.17	0.12	85.1	5.57	0.92	5.1														BASIN EX2 FLOW @ DP2
	3	EX3	8.49	0.09	44.0	0.76	1.91	1.5														BASIN EX3 FLOW @ DP3



MEADOWLAKE INDUSTRIAL
PROPOSED CONDITIONS
EL PASO COUNTY, CO

Calc'd by:
Checked by:
Date:


DH/AB
NQJ
8/15/2023

SUMMARY RUNOFF TABLE

BASIN	AREA (ac)	% IMPERVIOUS	Q ₅ (cfs)	Q ₁₀₀ (cfs)
A	4.79	33	5.3	14.1
B	1.68	97	5.7	10.4
C	2.93	80	6.8	13.5
D	2.92	80	7.0	14.0
E	3.54	80	8.5	16.9
F	1.70	93	4.7	8.7
G	9.87	76	14.9	30.3
H	2.33	70	4.6	9.6
I	1.25	68	2.5	5.2
J	3.00	26	2.7	8.6
K	0.42	90	1.8	3.3
L	0.42	90	1.8	3.3
N	6.01	80	14.4	28.6
O	3.04	80	7.2	14.2
P	3.20	80	7.8	15.5
Q	1.01	96	4.0	7.6
R	1.11	96	3.2	6.2
S	0.85	2	0.3	1.7
T	1.19	4	0.4	2.4


DESIGN POINT SUMMARY TABLE

DESIGN POINT	CONTRIBUTING BASINS	ΣQ ₅ (cfs)	ΣQ ₁₀₀ (cfs)
1	A	5.3	14.1
2	B	5.7	10.4
2.1	DP1,DP2	9.9	22.2
3	C	6.8	13.5
4	D	7.0	14.0
4.1	DP3,DP4	13.2	24.8
5	E	8.5	16.9
5.1	DP2.1,DP5	16.0	32.6
5.2	DP4.1,5.1	26.5	51.6
6	F	4.7	8.7
6.1	DP5.2,DP6	30.6	58.3
7	G	14.9	30.3
8	DP7,H	15.9	32.5
9	I,DP8	16.7	34.1
10	DP6.1,J	32.9	64.9
11	K	1.8	3.3
12	L	1.8	3.3
13	OS1	1.6	6.1
15	N	14.4	28.6
16	O	7.2	14.2
17	P	7.8	15.5
17.1	DP16,DP17	13.5	22.7
18	Q	4.0	7.6
19	DP15,DP16,R	6.3	17.1
21	DP12.1,S	2.5	59.6
22	DP20.1,DP21,T	30.3	68.9

	MEADOWLAKE INDUSTRIAL					Calc'd by:					DH/AB
	PROPOSED CONDITIONS					Checked by:					NQJ
	EL PASO COUNTY, CO					Date:					8/15/2023

COMPOSITE 'C' FACTORS

BASIN	UNDEVELOPED	INDUSTRIAL	PAVED	TOTAL	SOIL TYPE	UNDEVELOPED			INDUSTRIAL			PAVED			COMPOSITE IMPERVIOUSNESS & C		
	ACRES					%I	C ₅	C ₁₀₀	%I	C ₅	C ₁₀₀	%I	C ₅	C ₁₀₀	%I	C ₅	C ₁₀₀
A	3.27	0.00	1.52	4.79	A/B	2	0.09	0.36	80	0.59	0.70	100	0.90	0.96	33	0.35	0.55
B	0.00	0.23	1.45	1.68	A/B	2	0.09	0.36	80	0.59	0.70	100	0.90	0.96	97	0.86	0.92
C	0.00	2.93	0.00	2.93	A/B	2	0.09	0.36	80	0.59	0.70	100	0.90	0.96	80	0.59	0.70
D	0.00	2.92	0.00	2.92	A/B	2	0.09	0.36	80	0.59	0.70	100	0.90	0.96	80	0.59	0.70
E	0.00	3.54	0.00	3.54	A/B	2	0.09	0.36	80	0.59	0.70	100	0.90	0.96	80	0.59	0.70
F	0.00	0.57	1.13	1.70	A/B	2	0.09	0.36	80	0.59	0.70	100	0.90	0.96	93	0.80	0.87
G	0.50	9.37	0.00	9.87	A/B	2	0.09	0.36	80	0.59	0.70	100	0.90	0.96	76	0.56	0.68
H	0.30	2.03	0.00	2.33	A/B	2	0.09	0.36	80	0.59	0.70	100	0.90	0.96	70	0.53	0.66
I	0.19	1.06	0.00	1.25	A/B	2	0.09	0.36	80	0.59	0.70	100	0.90	0.96	68	0.51	0.65
J	2.06	0.94	0.00	3.00	A/B	2	0.09	0.36	80	0.59	0.70	100	0.90	0.96	26	0.25	0.47
K	0.04	0.00	0.38	0.42	A/B	2	0.09	0.36	80	0.59	0.70	100	0.90	0.96	90	0.82	0.90
L	0.04	0.00	0.38	0.42	A/B	2	0.09	0.36	80	0.59	0.70	100	0.90	0.96	90	0.82	0.90
OS1	2.81	0.00	0.40	3.21	A/B	2	0.09	0.36	80	0.59	0.70	100	0.90	0.96	14	0.19	0.43
N	0.00	6.01	0.00	6.01	A/B	2	0.09	0.36	80	0.59	0.70	100	0.90	0.96	80	0.59	0.70
O	0.00	3.04	0.00	3.04	A/B	2	0.09	0.36	80	0.59	0.70	100	0.90	0.96	80	0.59	0.70
P	0.00	3.20	0.00	3.20	A/B	2	0.09	0.36	80	0.59	0.70	100	0.90	0.96	80	0.59	0.70
Q	0.20	0.20	0.81	1.01	A/B	2	0.09	0.36	80	0.59	0.70	100	0.90	0.96	96	0.86	0.98
R	0.22	0.22	0.89	1.11	A/B	2	0.09	0.36	80	0.59	0.70	100	0.90	0.96	96	0.86	0.98
S	0.85	0.00	0.00	0.85	A/B	2	0.09	0.36	80	0.59	0.70	100	0.90	0.96	2	0.09	0.36
T	1.17	0.00	0.02	1.19	A/B	2	0.09	0.36	80	0.59	0.70	100	0.90	0.96	4	0.10	0.37
Total				54.47											39		
North Pond				31.01											72		
South Pond				21.85											62		

	MEADOWLAKE INDUSTRIAL	Calc'd by:	DH/AB
	PROPOSED CONDITIONS	Checked by:	NQJ
	EL PASO COUNTY, CO	Date:	8/15/2023

TIME OF CONCENTRATION

BASIN DATA			OVERLAND TIME (T _i)			TRAVEL TIME (T _t)					TOTAL
DESIGNATION	C _s	AREA (ac)	LENGTH (ft)	SLOPE %	t _i (min)	C _v	LENGTH (ft)	SLOPE %	V (ft/s)	t _t (min)	t _c (min)
A	0.35	4.79	100	1.9	11.1	20	1360	2.2	3.0	7.6	18.8
B	0.86	1.68	100	1.9	3.6	20	1330	2.2	3.0	7.5	11.1
C	0.59	2.93	100	2.0	7.4	20	665	1.9	2.8	4.0	11.4
D	0.59	2.92	100	2.0	7.4	20	425	1.5	2.4	2.9	10.3
E	0.59	3.54	100	2.0	7.4	20	470	1.6	2.5	3.1	10.5
F	0.80	1.70	100	1.9	4.5	20	1680	1.7	2.6	10.7	15.2
G	0.56	9.87	100	4.0	6.2	15	1200	0.4	1.0	20.1	26.3
H	0.53	2.33	100	2.0	8.4	15	665	2.4	2.3	4.7	13.1
I	0.51	1.25	100	2.0	8.5	15	360	1.1	1.6	3.8	12.3
J	0.25	3.00	100	2.0	12.4	20	140	0.9	1.9	1.2	13.6
K	0.82	0.42	15	2.0	1.6	20	390	1.5	2.4	2.7	5.0
L	0.82	0.42	15	2.0	1.6	20	390	1.5	2.4	2.7	5.0
OS1	0.19	3.21	70	5.0	8.2	10	1490	1.6	1.3	19.6	27.8
N	0.59	6.01	100	2.0	7.4	20	460	1.5	2.4	3.1	10.6
O	0.59	3.04	100	2.0	7.4	20	525	1.5	2.4	3.6	11.0
P	0.59	3.20	40	2.0	4.7	20	1100	3.0	3.5	5.3	10.0
Q	0.86	1.01	100	2.0	3.6	20	550	1.5	2.4	3.7	7.3
R	0.86	1.11	17	25.0	0.6	10	1160	1.5	1.2	15.8	16.4
S	0.09	0.85	100	2.0	14.7	20	505	2.5	3.2	2.7	17.4
T	0.10	1.19	100	2.0	14.5	20	540	2.5	3.2	2.8	17.3

FORMULAS:

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

Table 6-7. Conveyance Coefficient, C_v

Type of Land Surface	C _v
Heavy meadow	2.5
Tillage/field	5
Riprap (not buried)*	6.5
Short pasture and lawns	7
Nearly bare ground	10
Grassed waterway	15
Paved areas and shallow paved swales	20

*For buried riprap, select C_v value based on type of vegetative cover.



**MEADOWLAKE INDUSTRIAL
PROPOSED CONDITIONS
DESIGN STORM: 5-YEAR**

Calc'd by:
Checked by:
Date:

DH/AB
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8/15/2023

			DIRECT RUNOFF						TOTAL RUNOFF				STREET			PIPE				TRAVEL TIME			REMARKS	
STREET	DESIGN POINT	BASIN ID	AREA (ac)	C _s	f _c (min)	C _s *A (ac)	I (in./hr.)	Q (cfs)	f _c (min)	C _s *A (ac)	I (in./hr.)	Q (cfs)	Q _{street} (cfs)	C _s *A (ac)	SLOPE %	Q _{PIPE} (cfs)	C _s *A (ac)	SLOPE %	PIPE SIZE (FT)	LENGTH (FT)	VEL. (FPS)	TRAVEL TIME (min)		
	1	A	4.79	0.35	18.8	1.66	3.18	5.3								5.3	1.66	1.2	1.5	40	6.5	0.10	DP1 CAPTURED W/ 10' TYPE R SUMP INELT, PIPE TO DP2.1	
	2	B	1.68	0.86	11.1	1.44	3.98	5.7								5.7	1.44	0.5	1.5	89	4.2	0.35	DP2 CAPTURED W/ 5' TYPE R SUMP INLET, PIPE TO DP2.1	
	2.1							18.9	3.10	3.18	9.9				9.9	3.10	0.5	1.5	305	4.2	1.21		DP2.1 FLOW, PIPE TO DP5.1	
	3	C	2.93	0.59	11.4	1.73	3.93	6.8							6.8	1.73	2.0	1.5	427	8.4	0.85		DP3 CAPTURED W/ 20' TYPE R INLET, PIPE TO DP4.1	
	4	D	2.92	0.59	10.3	1.72	4.08	7.0							7.0	1.72	1.0	1.5	6	5.9	0.02		DP4 CAPTURED W/ 20' TYPE R INLET, PIPE TO DP4.1	
	4.1							12.3	3.45	3.82	13.2				13.2	3.45	2.0	1.5	500	8.4	0.99		DP4.1 FLOW, PIPE TO DP5.1	
	5	E	3.54	0.59	10.5	2.09	4.05	8.5							8.5	2.09	3.0	1.5	6	10.3	0.01		DP5 CAPTURED W/ 15' TYPE R SUMP INLET, PIPE TO DP5.1	
	5.1							20.1	5.19	3.08	16.0				16.0	5.19	0.4	2.0	50	4.6	0.18		DP5.1 FLOW, PIPE TO DP5.2	
	5.2							20.3	8.64	3.07	26.5				26.5	8.64	0.8	2.0	36	6.2	0.10		DP5.2 FLOW, PIPE TO DP6.1	
	6	F	1.7	0.80	15.2	1.35	3.50	4.7							4.7	1.35	1.0	2.0	12	7.2	0.03		DP6 CAPTURED IN 15' TYPE R SUMP INLET, PIPE TO DP6.1	
	6.1							20.4	10.00	3.06	30.6													DP6.1, PIPE TO POND A SWALE TO BASIN H
	7	G	9.87	0.56	26.3	5.57	2.68	14.9				14.9	5.57	0.7						665	1.7	6.62		SWALE TO BASIN H
	8	H	2.33	0.53	13.1	1.22	3.72	4.6	32.9	6.80	2.34	15.9	32.9	6.80	1.7					360	2.6	2.30		SWALE TO BASIN I
	9	I	1.25	0.51	12.3	0.64	3.81	2.5	35.2	7.44	2.24	16.7												SWALE TO DET POND A
	10	J	3	0.25	13.6	0.74	3.66	2.7	20.4	10.74	3.06	32.9												DP10 FLOW, TOTAL FLOW ENTERING POND A



MEADOWLAKE INDUSTRIAL
PROPOSED CONDITIONS
DESIGN STORM: 5-YEAR

Calc'd by:
 Checked by:
 Date:

DH/AB
 NQJ
 8/15/2023

			DIRECT RUNOFF							TOTAL RUNOFF				STREET			PIPE				TRAVEL TIME			REMARKS
STREET	DESIGN POINT	BASIN ID	AREA (ac)	C ₅	f _c (min)	C ₅ *A (ac)	f (in./hr.)	Q (cfs)	f _c (min)	C ₅ *A (ac)	f (in./hr.)	Q (cfs)	Q _{street} (cfs)	C ₅ *A (ac)	SLOPE %	Q _{PIPE} (cfs)	C ₅ *A (ac)	SLOPE %	PIPE SIZE (FT)	LENGTH (FT)	VEL. (FPS)	TRAVEL TIME (min)		
	11	K	0.42	0.82	5.0	0.34	5.17	1.8								1.8	0.34	2.0	1.5	25	2.8	0.15	DP11 CAPTURED W/ 5' TYPE R SUMP INLET, PIPE TO DP12.1	
	12	L	0.42	0.82	5.0	0.34	5.17	1.8								1.8	0.34	2.0	1.5	25	2.8	0.15	DP12 CAPTURED W/ 5' TYPE R SUMP INLET, PIPE TO DP12.1	
	12.1								5.1	0.69	5.13	3.5	3.5	0.69	1.0					1150	2.0	9.58	DP12.1 SWALE FLOW TO DP21	
	13	OS1	3.21	0.19	27.8	0.61	2.60	1.6															DP13 FLOWS TO PR CULVERT, FOLLOW HISTORIC DRAINAGE PATTERNS SOUTH ALONG CURTIS ROAD UNDER ACCESS ROAD NORTH	
	15	N	6.01	0.59	10.6	3.55	4.05	14.4					2.6	0.63	3.0	11.8	2.91	3.6	1.5	550	3.5	2.65	DP15 BYPASS TO DP19	
	16	O	3.04	0.59	11.0	1.79	3.99	7.2					1.2	0.29	3.0	6.0	1.50	1.0	1.5	60	3.5	0.29	DP15 CAPTURED IN 15' TYPE R INLET, PIPE TO DP15.1	
	17	P	3.2	0.59	10.0	1.89	4.13	7.8								7.8	1.89	2.0	1.5	10	5.9	0.03	DP16 BYPASS TO DP19	
	17.1								11.0	3.39	3.98	13.5				6.0	1.50	1.0	1.5	27	8.4	0.05	DP16 CAPTURED IN 10' TYPE R INLET, PIPE TO DP17.1	
	18	Q	1.01	0.86	7.3	0.86	4.60	4.0								7.8	1.89	2.0	1.5	27	8.4	0.05	DP17 BYPASS OFFSITE	
	19	R	1.11	0.86	16.4	0.95	3.39	3.2	16.4	1.87	3.39	6.3				4.0	0.86	0.5	1.5	50	4.2	0.20	DP17 CAPTURED IN 20' TYPE R INLET, PIPE TO DP17.1	
	19.1								16.4	5.65	3.38	19.1				3.2	0.95	1.0	1.5	6	5.9	0.02	DP17.1 FLOW, PIPE TO DP20.1	
	20.1								16.4	9.04	3.38	30.6				11.8	2.91	3.6	1.5	32	11.3	0.05	DP18 BYPASS OFFSITE	
	21	S	0.85	0.09	17.4	0.08	3.30	0.3	17.4	0.76	3.30	2.5				6.0	1.50	1.0	1.5	10	5.9	0.03	DP18 CAPTURED IN 5' TYPE R SUMP INLET, PIPE TO DP19.1	
	22	T	1.19	0.10	17.3	0.12	3.30	0.4	17.4	9.17	3.30	30.3				3.2	0.95	1.0	1.5	6	5.9	0.02	DP19 CAPTURED IN 10' TYPE R SUMP INLET, PIPE TO DP19.1	
																17.4	0.76	4.0	2.0	151	14.4	0.17	DP19.1 FLOW, PIPE TO DP20.1	
																30.6	9.04	0.5	2.5	370	5.9	1.04	DP20.1 PIPE FLOW TO POND B	
																17.4	0.76	4.0	2.0	151	14.4	0.17	DP21 SWALE FLOW TO POND B	
																							TOTAL FLOW ENTERING POND B	



**MEADOWLAKE INDUSTRIAL
PROPOSED CONDITIONS
DESIGN STORM: 100-YEAR**

Calc'd by:
Checked by:
Date:

DH/AB
NQJ
8/15/2023

STREET	DESIGN POINT	BASIN ID	DIRECT RUNOFF						TOTAL RUNOFF				STREET			PIPE				TRAVEL TIME			REMARKS	
			AREA (ac)	C ₁₀₀	t _c (min)	C ₁₀₀ *A (ac)	I (in./hr.)	Q (cfs)	t _c (min)	C ₁₀₀ *A (ac)	I (in./hr.)	Q (cfs)	Q _{street} (cfs)	C ₁₀₀ *A (ac)	SLOPE %	Q _{PIPE} (cfs)	C ₁₀₀ *A (ac)	SLOPE %	PIPE SIZE (ft)	LENGTH (ft)	VEL. (ft/s)	TRAVEL TIME (min)		
	1	A	4.79	0.55	18.8	2.64	5.34	14.1							14.1	2.64	1.2	1.5	40	2.2	0.30	DP1 CAPTURED W/ 10' TYPE R SUMP INELT, PIPE TO DP2.1		
	2	B	1.68	0.92	11.1	1.55	6.68	10.4							10.4	1.55	0.5	1.5	89	1.4	1.05	DP2 CAPTURED W/ 5' TYPE R SUMP INLET, PIPE TO DP2.1		
	2.1								19.1	4.19	5.30	22.2			22.2	4.19	0.5	1.5	305	1.4	3.59	DP2.1 FLOW, PIPE TO DP5.1		
	3	C	2.93	0.70	11.4	2.05	6.59	13.5					0.4	0.06	2.0	13.1	1.99	2.0	1.5	427	2.8	0.00	DP3 CAPTURED W/ 20' TYPE R INLET, PIPE TO DP4.1	
	4	D	2.92	0.70	10.3	2.04	6.85	14.0	11.4	2.10	6.59	13.9	0.2	0.03	1.6	13.7	2.07	1.0	1.5	6	2.5	0.00	DP4 CAPTURED W/ 20' TYPE R INLET, PIPE TO DP4.1	
	4.1								14.0	4.06	6.09	24.8				24.8	4.06	2.0	1.5	500	2.8	2.95	DP4.1 FLOW, PIPE TO DP5.1	
	5	E	3.54	0.70	10.5	2.48	6.81	16.9	10.5	2.51	6.81	17.1				17.1	2.51	3.0	1.5	6	3.5	0.03	DP5 CAPTURED W/ 15' TYPE R SUMP INLET, PIPE TO DP5.1	
	5.1								22.7	6.70	4.87	32.6				32.6	6.70	0.4	2.0	50	1.3	0.66	DP5.1 FLOW, PIPE TO DP5.2	
	5.2								23.3	10.76	4.80	51.6				51.6	10.76	0.8	2.0	36	1.7	0.35	DP5.2 FLOW, PIPE TO DP6.1	
	6	F	1.7	0.87	15.2	1.48	5.87	8.7								8.7	1.48	1.0	2.0	12	2.0	0.10	DP6 CAPTURED IN 15' TYPE R SUMP INLET, PIPE TO DP6.1	
	6.1								23.7	12.25	4.76	58.3											DP6.1, PIPE TO POND A	
	7	G	9.87	0.68	26.3	6.74	4.50	30.3					30.3	6.74	0.7						665	1.7	6.62	SWALE TO BASIN H
	8	H	2.33	0.66	13.1	1.53	6.25	9.6	32.9	8.27	3.93	32.5	32.5	8.27	1.7						360	2.6	2.30	SWALE TO BASIN I
	9	I	1.25	0.65	12.3	0.81	6.40	5.2	35.2	9.08	3.76	34.1											SWALE TO DET POND A	
	10	J	3	0.47	13.6	1.40	6.15	8.6	23.7	13.65	4.76	64.9											DP10 FLOW, TOTAL FLOW ENTERING POND A	



**MEADOWLAKE INDUSTRIAL
PROPOSED CONDITIONS
DESIGN STORM: 100-YEAR**

Calc'd by:
Checked by:
Date:

DH/AB
NQJ
8/15/2023

			DIRECT RUNOFF						TOTAL RUNOFF				STREET			PIPE				TRAVEL TIME			REMARKS
STREET	DESIGN POINT	BASIN ID	AREA (ac)	C ₁₀₀	t _c (min)	C ₁₀₀ *A (ac)	I (in./hr.)	Q (cfs)	t _c (min)	C ₁₀₀ *A (ac)	I (in./hr.)	Q (cfs)	Q _{street} (cfs)	C ₁₀₀ *A (ac)	SLOPE %	Q _{PIPE} (cfs)	C ₁₀₀ *A (ac)	SLOPE %	PIPE SIZE (ft)	LENGTH (ft)	VEL. (ft/s)	TRAVEL TIME (min)	
	11	K	0.42	0.90	5.0	0.38	8.68	3.3								3.3	0.38	2.0	1.5	25	8.4	0.05	DP11 CAPTURED W/ 5' TYPE R SUMP INLET, PIPE TO DP12.1
	12	L	0.42	0.90	5.0	0.38	8.68	3.3								3.3	0.38	2.0	1.5	25	8.4	0.05	DP12 CAPTURED W/ 5' TYPE R SUMP INLET, PIPE TO DP12.1
	12.1								5.0	0.76	8.65	6.5	6.5	0.76	1.0					1150	2.0	9.58	DP12.1 SWALE FLOW TO DP21
	13	OS1	3.21	0.43	27.8	1.40	4.36	6.1															DP13 FLOWS TO PR CULVERT, FOLLOW HISTORIC DRAINAGE PATTERNS SOUTH ALONG CURTIS ROAD UNDER ACCESS ROAD NORTH
	15	N	6.01	0.70	10.6	4.21	6.80	28.6				11.7	1.72	3.0		16.9	2.49	3.6	1.5	550	3.5	2.65	DP15 BYPASS TO DP19
												5.6	0.84	3.0		60	3.5	0.29		32	11.3	0.05	DP15 CAPTURED IN 15' TYPE R INLET, PIPE TO DP19.1
	16	O	3.04	0.70	11.0	2.13	6.69	14.2								8.6	1.28	1.0	1.5	60	3.5	0.29	DP16 BYPASS TO DP19
												0.9	0.14	3.0		10	5.9	0.03		10	5.9	0.03	DP16 CAPTURED IN 10' TYPE R INLET, PIPE TO DP17.1
	17	P	3.2	0.70	10.0	2.24	6.94	15.5								14.6	2.10	2.0	1.5	27	8.4	0.05	DP17 BYPASS, FLOW TO POND B
																							DP17 CAPTURED IN 10' TYPE R INLET, PIPE TO DP17.1
	17.1								11.0	3.39	6.69	22.7				22.7	3.39	3.6	2.0	42	13.7	0.05	DP17.1 FLOW, PIPE TO DP21
													0.1	0.02	3.0								DP18 BYPASS OFFSITE
	18	Q	1.01	0.98	7.3	0.99	7.73	7.6								7.5	0.97	0.5	1.5	50	4.2	0.20	DP18 CAPTURED IN 5' TYPE R INLET, PIPE TO DP19.1
	19	R	1.11	0.98	16.4	1.09	5.68	6.2	24.5	3.65	4.68	17.1				6.2	1.09	1.0	1.5	6	5.9	0.02	DP19 CAPTURED IN 10' TYPE R SUMP INLET, PIPE TO DP19.1
	19.1								16.4	7.11	5.68	40.4				40.4	7.11	0.5	2.0	42	5.1	0.14	DP19.1 FLOW, PIPE TO DP20.1
	20.1								24.5	3.65	4.68	17.1				17.1	3.65	0.5	2.5	370	5.9	1.04	DP20.1 PIPE FLOW TO POND B
	21	S	0.85	0.36	17.4	0.31	5.54	1.7	16.4	10.50	5.68	59.6				59.6	10.50	0.5	2.5	370	5.9	1.04	DP21 SWALE FLOW TO POND B
	22	T	1.19	0.37	17.3	0.44	5.54	2.4	24.5	14.73	4.68	68.9											TOTAL FLOW ENTERING POND B



APPENDIX C – HYDRAULIC CALCULATIONS

INLET MANAGEMENT

Worksheet Protected

INLET NAME	DP1	DP2	DP3	DP4
Site Type (Urban or Rural)	URBAN	URBAN	URBAN	URBAN
Inlet Application (Street or Area)	STREET	STREET	STREET	STREET
Hydraulic Condition	In Sump	In Sump	On Grade	On Grade
Inlet Type	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type R Curb Opening

USER-DEFINED INPUT

User-Defined Design Flows

Minor Q_{known} (cfs)	5.3	5.7	6.8	7.0
Major Q_{known} (cfs)	14.1	10.4	13.5	12.6

Bypass (Carry-Over) Flow from Upstream Inlets must be organized from upstream (left) to downstream (right) in order for bypass flows to be linked.

Receive Bypass Flow from:	No Bypass Flow Received	No Bypass Flow Received	No Bypass Flow Received	No Bypass Flow Received
Minor Bypass Flow Received, Q_b (cfs)		0.0	0.0	0.0
Major Bypass Flow Received, Q_b (cfs)		0.0	0.0	0.0

Watershed Characteristics

Subcatchment Area (acres)				
Percent Impervious				
NRCS Soil Type				

Watershed Profile

Overland Slope (ft/ft)				
Overland Length (ft)				
Channel Slope (ft/ft)				
Channel Length (ft)				

Minor Storm Rainfall Input

Design Storm Return Period, T_r (years)				
One-Hour Precipitation, P_1 (inches)				
C_1				
C_2				
C_3				
User-defined C				
User-defined 5-yr C_5				
User-defined T_c				

Major Storm Rainfall Input

Design Storm Return Period, T_r (years)				
One-Hour Precipitation, P_1 (inches)				
C_1				
C_2				
C_3				
User-defined C				
User-defined 5-yr C_5				
User-defined T_c				

CALCULATED OUTPUT

Minor Total Design Peak Flow, Q (cfs)	5.3	5.7	6.8	7.0
Major Total Design Peak Flow, Q (cfs)	14.1	10.4	13.5	12.6
Minor Flow Bypassed Downstream, Q_b (cfs)	N/A	N/A	0.0	0.0
Major Flow Bypassed Downstream, Q_b (cfs)	N/A	N/A	2.2	0.2

INLET MANAGEMENT

Worksheet Protected

INLET NAME	DP5	DP6	DP15	DP16	DP17
Site Type (Urban or Rural)	URBAN	URBAN	URBAN	URBAN	URBAN
Inlet Application (Street or Area)	STREET	STREET	STREET	STREET	STREET
Hydraulic Condition	In Sump	In Sump	On Grade	On Grade	On Grade
Inlet Type	CDOT Type R Curb Opening		CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type R Curb Opening

USER-DEFINED INPUT

User-Defined Design Flows					
Minor Q_{known} (cfs)	8.5	4.7	14.4	7.2	7.8
Major Q_{known} (cfs)	17.5	8.7	28.6	14.2	15.5

Bypass (Carry-Over) Flow from Upstream

Receive Bypass Flow from:	No Bypass Flow Received	No Bypass Flow Received	No Bypass Flow Received	No Bypass Flow Received	No Bypass Flow Received
Minor Bypass Flow Received, Q_b (cfs)	0.0	0.0	0.0	0.0	0.0
Major Bypass Flow Received, Q_b (cfs)	0.0	0.0	0.0	0.0	0.0

Watershed Characteristics

Subcatchment Area (acres)					
Percent Impervious					
NRCS Soil Type					

Watershed Profile

Overland Slope (ft/ft)					
Overland Length (ft)					
Channel Slope (ft/ft)					
Channel Length (ft)					

Minor Storm Rainfall Input

Design Storm Return Period, T_r (years)					
One-Hour Precipitation, P_1 (inches)					
C_1					
C_2					
C_3					
User-defined C					
User-defined 5-yr C_5					
User-defined T_c					

Major Storm Rainfall Input

Design Storm Return Period, T_r (years)					
One-Hour Precipitation, P_1 (inches)					
C_1					
C_2					
C_3					
User-defined C					
User-defined 5-yr C_5					
User-defined T_c					

CALCULATED OUTPUT

Minor Total Design Peak Flow, Q (cfs)	8.5	4.7	14.4	7.2	7.8
Major Total Design Peak Flow, Q (cfs)	17.5	8.7	28.6	14.2	15.5
Minor Flow Bypassed Downstream, Q_b (cfs)	N/A	N/A	2.6	1.2	0.0
Major Flow Bypassed Downstream, Q_b (cfs)	N/A	N/A	11.7	5.6	0.9

INLET MANAGEMENT

Worksheet Protected

INLET NAME	DP18	DP19
Site Type (Urban or Rural)	URBAN	URBAN
Inlet Application (Street or Area)	STREET	STREET
Hydraulic Condition	On Grade	On Grade
Inlet Type		

USER-DEFINED INPUT

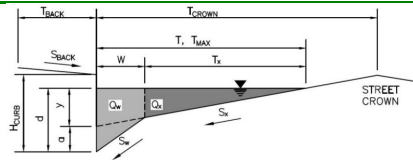
User-Defined Design Flows		
Minor Q_{known} (cfs)	4.0	3.2
Major Q_{known} (cfs)	7.6	19.1
Bypass (Carry-Over) Flow from Upstream		
Receive Bypass Flow from:	No Bypass Flow Received	No Bypass Flow Received
Minor Bypass Flow Received, Q_b (cfs)	0.0	0.0
Major Bypass Flow Received, Q_b (cfs)	0.0	0.0
Watershed Characteristics		
Subcatchment Area (acres)		
Percent Impervious		
NRCS Soil Type		
Watershed Profile		
Overland Slope (ft/ft)		
Overland Length (ft)		
Channel Slope (ft/ft)		
Channel Length (ft)		
Minor Storm Rainfall Input		
Design Storm Return Period, T_r (years)		
One-Hour Precipitation, P_1 (inches)		
C_1		
C_2		
C_3		
User-defined C		
User-defined 5-yr C_5		
User-defined T_c		
Major Storm Rainfall Input		
Design Storm Return Period, T_r (years)		
One-Hour Precipitation, P_1 (inches)		
C_1		
C_2		
C_3		
User-defined C		
User-defined 5-yr C_5		
User-defined T_c		

CALCULATED OUTPUT

Minor Total Design Peak Flow, Q (cfs)	4.0	3.2
Major Total Design Peak Flow, Q (cfs)	7.6	19.1
Minor Flow Bypassed Downstream, Q_b (cfs)		
Major Flow Bypassed Downstream, Q_b (cfs)		

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)
 (Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: **MEADOWLAKE INDUSTRIAL**
 Inlet ID: **DP1**

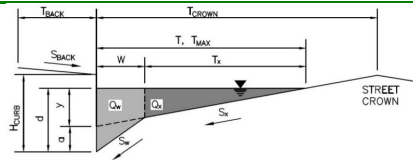


Gutter Geometry:	
Maximum Allowable Width for Spread Behind Curb	$T_{BACK} = 13.5$ ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	$S_{BACK} = 0.020$ ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	$n_{BACK} = 0.020$
Height of Curb at Gutter Flow Line	$H_{CURB} = 6.00$ inches
Distance from Curb Face to Street Crown	$T_{CROWN} = 26.0$ ft
Gutter Width	$W = 2.50$ ft
Street Transverse Slope	$S_x = 0.020$ ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	$S_w = 0.083$ ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	$S_o = 0.022$ ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	$n_{STREET} = 0.016$
Max. Allowable Spread for Minor & Major Storm	$T_{MAX} = \begin{matrix} \text{Minor Storm} & \text{Major Storm} \\ 26.0 & 26.0 \end{matrix}$ ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	$d_{MAX} = \begin{matrix} \text{Minor Storm} & \text{Major Storm} \\ 6.0 & 9.5 \end{matrix}$ inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)	<input type="checkbox"/> <input type="checkbox"/>
MINOR STORM Allowable Capacity is based on Depth Criterion	
MAJOR STORM Allowable Capacity is based on Spread Criterion	
Minor storm max. allowable capacity GOOD - greater than the design peak flow of 5.30 cfs on sheet 'Inlet Management'	
Major storm max. allowable capacity GOOD - greater than the design peak flow of 14.10 cfs on sheet 'Inlet Management'	
	$Q_{allow} = \begin{matrix} \text{Minor Storm} & \text{Major Storm} \\ 16.5 & 50.5 \end{matrix}$ cfs

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

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

Project: MEADOWLAKE INDUSTRIAL
Inlet ID: DP2.0

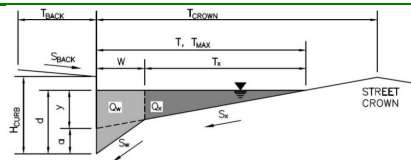


Gutter Geometry:							
Maximum Allowable Width for Spread Behind Curb	$T_{BACK} = 13.5$ ft						
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	$S_{BACK} = 0.020$ ft/ft						
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	$n_{BACK} = 0.020$						
Height of Curb at Gutter Flow Line	$H_{CURB} = 6.00$ inches						
Distance from Curb Face to Street Crown	$T_{CROWN} = 26.0$ ft						
Gutter Width	$W = 2.50$ ft						
Street Transverse Slope	$S_x = 0.020$ ft/ft						
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	$S_w = 0.083$ ft/ft						
Street Longitudinal Slope - Enter 0 for sump condition	$S_o = 0.022$ ft/ft						
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	$n_{STREET} = 0.016$						
Max. Allowable Spread for Minor & Major Storm	<table border="1" style="display: inline-table; border-collapse: collapse;"> <thead> <tr> <th style="padding: 2px 5px;">Minor Storm</th> <th style="padding: 2px 5px;">Major Storm</th> <th style="padding: 2px 5px;">ft</th> </tr> </thead> <tbody> <tr> <td style="text-align: center; padding: 2px 5px;">26.0</td> <td style="text-align: center; padding: 2px 5px;">26.0</td> <td></td> </tr> </tbody> </table>	Minor Storm	Major Storm	ft	26.0	26.0	
Minor Storm	Major Storm	ft					
26.0	26.0						
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	<table border="1" style="display: inline-table; border-collapse: collapse;"> <thead> <tr> <th style="padding: 2px 5px;">Minor Storm</th> <th style="padding: 2px 5px;">Major Storm</th> <th style="padding: 2px 5px;">inches</th> </tr> </thead> <tbody> <tr> <td style="text-align: center; padding: 2px 5px;">6.0</td> <td style="text-align: center; padding: 2px 5px;">9.5</td> <td></td> </tr> </tbody> </table>	Minor Storm	Major Storm	inches	6.0	9.5	
Minor Storm	Major Storm	inches					
6.0	9.5						
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)	<table border="1" style="display: inline-table; border-collapse: collapse;"> <thead> <tr> <th style="padding: 2px 5px;">Minor Storm</th> <th style="padding: 2px 5px;">Major Storm</th> </tr> </thead> <tbody> <tr> <td style="text-align: center; padding: 2px 5px;"><input type="checkbox"/></td> <td style="text-align: center; padding: 2px 5px;"><input type="checkbox"/></td> </tr> </tbody> </table>	Minor Storm	Major Storm	<input type="checkbox"/>	<input type="checkbox"/>		
Minor Storm	Major Storm						
<input type="checkbox"/>	<input type="checkbox"/>						
MINOR STORM Allowable Capacity is based on Depth Criterion							
MAJOR STORM Allowable Capacity is based on Spread Criterion							
Minor storm max. allowable capacity GOOD - greater than the design peak flow of 4.50 cfs on sheet 'Inlet Management'							
Major storm max. allowable capacity GOOD - greater than the design peak flow of 8.70 cfs on sheet 'Inlet Management'							
Q_{allow} =	<table border="1" style="display: inline-table; border-collapse: collapse;"> <thead> <tr> <th style="padding: 2px 5px;">Minor Storm</th> <th style="padding: 2px 5px;">Major Storm</th> <th style="padding: 2px 5px;">cfs</th> </tr> </thead> <tbody> <tr> <td style="text-align: center; padding: 2px 5px;">16.5</td> <td style="text-align: center; padding: 2px 5px;">50.5</td> <td></td> </tr> </tbody> </table>	Minor Storm	Major Storm	cfs	16.5	50.5	
Minor Storm	Major Storm	cfs					
16.5	50.5						

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

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

Project: MEADOWLAKE INDUSTRIAL
 Inlet ID: DP5



Gutter Geometry:
 Maximum Allowable Width for Spread Behind Curb
 Side Slope Behind Curb (leave blank for no conveyance credit behind curb)
 Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line
 Distance from Curb Face to Street Crown
 Gutter Width
 Street Transverse Slope
 Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)
 Street Longitudinal Slope - Enter 0 for sump condition
 Manning's Roughness for Street Section (typically between 0.012 and 0.020)

Max. Allowable Spread for Minor & Major Storm
 Max. Allowable Depth at Gutter Flowline for Minor & Major Storm
 Allow Flow Depth at Street Crown (check box for yes, leave blank for no)

MINOR STORM Allowable Capacity is based on Depth Criterion
 MAJOR STORM Allowable Capacity is based on Depth Criterion

WARNING: MINOR STORM max. allowable capacity is less than the design peak flow of 8.50 cfs on sheet 'Inlet Management'
Major storm max. allowable capacity GOOD - greater than the design peak flow of 17.50 cfs on sheet 'Inlet Management'

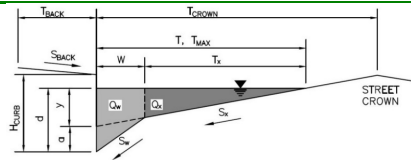
T _{BACK} =	2.5	ft	
S _{BACK} =	0.020	ft/ft	
n _{BACK} =	0.020		
H _{CURB} =	6.00	inches	
T _{CROWN} =	15.0	ft	
W =	2.50	ft	
S _x =	0.020	ft/ft	
S _w =	0.083	ft/ft	
S _o =	0.016	ft/ft	
n _{STREET} =	0.016		
T _{MAX} =	Minor Storm: 15.0	Major Storm: 15.0	ft
d _{MAX} =	Minor Storm: 4.8	Major Storm: 6.6	inches
	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Q _{allow} =	Minor Storm: 6.7	Major Storm: 20.1	cfs

NOTE: IGNORE MINOR & MAJOR STREET CAPACITY WARNINGS. BASIN FLOWS ARE DIVIDED BETWEEN TWO SEPARATE STREETS.

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

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

Project: MEADOWLAKE INDUSTRIAL
Inlet ID: DP6



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb
 Side Slope Behind Curb (leave blank for no conveyance credit behind curb)
 Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

T_{BACK} =	2.5	ft
S_{BACK} =	0.020	ft/ft
n_{BACK} =	0.020	

Height of Curb at Gutter Flow Line
 Distance from Curb Face to Street Crown
 Gutter Width
 Street Transverse Slope
 Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)
 Street Longitudinal Slope - Enter 0 for sump condition
 Manning's Roughness for Street Section (typically between 0.012 and 0.020)

H_{CURB} =	6.00	inches
T_{CROWN} =	15.0	ft
W =	2.50	ft
S_x =	0.020	ft/ft
S_w =	0.083	ft/ft
S_o =	0.017	ft/ft
n_{STREET} =	0.016	

Max. Allowable Spread for Minor & Major Storm
 Max. Allowable Depth at Gutter Flowline for Minor & Major Storm
 Allow Flow Depth at Street Crown (check box for yes, leave blank for no)

	Minor Storm	Major Storm	
T_{MAX} =	15.0	15.0	ft
d_{MAX} =	4.8	6.6	inches
	<input type="checkbox"/>	<input checked="" type="checkbox"/>	

MINOR STORM Allowable Capacity is based on Depth Criterion
 MAJOR STORM Allowable Capacity is based on Depth Criterion

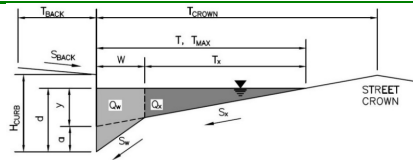
	Minor Storm	Major Storm	
Q_{allow} =	6.9	19.7	cfs

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 4.70 cfs on sheet 'Inlet Management'
Major storm max. allowable capacity GOOD - greater than the design peak flow of 8.70 cfs on sheet 'Inlet Management'

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

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

Project: MEADOWLAKE INDUSTRIAL
Inlet ID: DP11



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb
 Side Slope Behind Curb (leave blank for no conveyance credit behind curb)
 Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

T_{BACK}	13.5	ft
S_{BACK}	0.020	ft/ft
n_{BACK}	0.020	

Height of Curb at Gutter Flow Line
 Distance from Curb Face to Street Crown
 Gutter Width
 Street Transverse Slope
 Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)
 Street Longitudinal Slope - Enter 0 for sump condition
 Manning's Roughness for Street Section (typically between 0.012 and 0.020)

H_{CURB}	6.00	inches
T_{CROWN}	24.0	ft
W	2.50	ft
S_x	0.020	ft/ft
S_w	0.083	ft/ft
S_o	0.015	ft/ft
n_{STREET}	0.016	

Max. Allowable Spread for Minor & Major Storm
 Max. Allowable Depth at Gutter Flowline for Minor & Major Storm
 Allow Flow Depth at Street Crown (check box for yes, leave blank for no)

	Minor Storm	Major Storm	
T_{MAX}	24.0	24.0	ft
d_{MAX}	6.0	9.5	inches
	<input type="checkbox"/>	<input type="checkbox"/>	

MINOR STORM Allowable Capacity is based on Depth Criterion
 MAJOR STORM Allowable Capacity is based on Spread Criterion

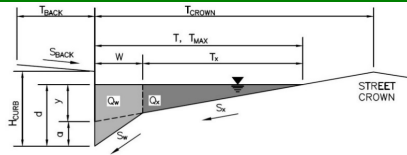
	Minor Storm	Major Storm	
Q_{allow}	14.1	33.1	cfs

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 1.80 cfs on sheet 'Inlet Management'
Major storm max. allowable capacity GOOD - greater than the design peak flow of 3.30 cfs on sheet 'Inlet Management'

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

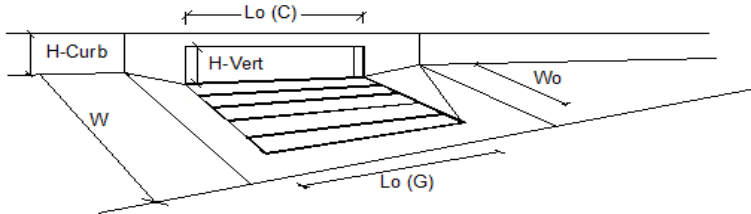
(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: MEADOWLAKE INDUSTRIAL
Inlet ID: DP14



Gutter Geometry:					
Maximum Allowable Width for Spread Behind Curb	$T_{BACK} = 7.5$ ft				
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	$S_{BACK} = 0.020$ ft/ft				
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	$n_{BACK} = 0.020$				
Height of Curb at Gutter Flow Line	$H_{CURB} = 6.00$ inches				
Distance from Curb Face to Street Crown	$T_{CROWN} = 16.2$ ft				
Gutter Width	$W = 2.50$ ft				
Street Transverse Slope	$S_X = 0.020$ ft/ft				
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	$S_W = 0.083$ ft/ft				
Street Longitudinal Slope - Enter 0 for sump condition	$S_O = 0.022$ ft/ft				
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	$n_{STREET} = 0.016$				
Max. Allowable Spread for Minor & Major Storm	<table border="1" style="display: inline-table; border-collapse: collapse;"> <tr> <th style="padding: 2px;">Minor Storm</th> <th style="padding: 2px;">Major Storm</th> </tr> <tr> <td style="padding: 2px;">$T_{MAX} = 16.2$</td> <td style="padding: 2px;">16.2</td> </tr> </table> ft	Minor Storm	Major Storm	$T_{MAX} = 16.2$	16.2
Minor Storm	Major Storm				
$T_{MAX} = 16.2$	16.2				
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	<table border="1" style="display: inline-table; border-collapse: collapse;"> <tr> <th style="padding: 2px;">Minor Storm</th> <th style="padding: 2px;">Major Storm</th> </tr> <tr> <td style="padding: 2px;">$d_{MAX} = 5.6$</td> <td style="padding: 2px;">7.8</td> </tr> </table> inches	Minor Storm	Major Storm	$d_{MAX} = 5.6$	7.8
Minor Storm	Major Storm				
$d_{MAX} = 5.6$	7.8				
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)	<table border="1" style="display: inline-table; border-collapse: collapse;"> <tr> <th style="padding: 2px;">Minor Storm</th> <th style="padding: 2px;">Major Storm</th> </tr> <tr> <td style="padding: 2px;"><input type="checkbox"/></td> <td style="padding: 2px;"><input checked="" type="checkbox"/></td> </tr> </table>	Minor Storm	Major Storm	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Minor Storm	Major Storm				
<input type="checkbox"/>	<input checked="" type="checkbox"/>				
MINOR STORM Allowable Capacity is based on Depth Criterion					
MAJOR STORM Allowable Capacity is based on Depth Criterion					
Minor storm max. allowable capacity GOOD - greater than the design peak flow of 2.60 cfs on sheet 'Inlet Management'					
Major storm max. allowable capacity GOOD - greater than the design peak flow of 5.10 cfs on sheet 'Inlet Management'					
$Q_{allow} =$	<table border="1" style="display: inline-table; border-collapse: collapse;"> <tr> <th style="padding: 2px;">Minor Storm</th> <th style="padding: 2px;">Major Storm</th> </tr> <tr> <td style="padding: 2px;">13.9</td> <td style="padding: 2px;">31.9</td> </tr> </table> cfs	Minor Storm	Major Storm	13.9	31.9
Minor Storm	Major Storm				
13.9	31.9				

INLET ON A CONTINUOUS GRADE

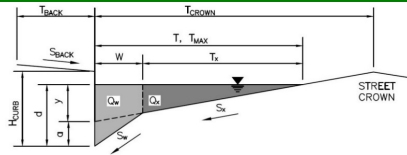


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	CDOT Type R Curb Opening	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')		$a_{LOCAL} = 3.0$	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		$N_o = 2$	2	
Length of a Single Unit Inlet (Grate or Curb Opening)		$L_o = 5.00$	5.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)		$W_o = N/A$	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)		$C_f (G) = N/A$	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		$C_f (C) = 0.10$	0.10	
Street Hydraulics: OK - $Q < Q_{allow}$ Allowable Street Capacity				
Total Inlet Interception Capacity		$Q = 2.6$	4.8	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)		$Q_o = 0.0$	0.3	cfs
Capture Percentage = Q_o/Q_a		$C\% = 100$	94	%

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

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

Project: MEADOWLAKE INDUSTRIAL
Inlet ID: DP15



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb
 Side Slope Behind Curb (leave blank for no conveyance credit behind curb)
 Manning's Roughness Behind Curb (typically between 0.012 and 0.020)
 Height of Curb at Gutter Flow Line
 Distance from Curb Face to Street Crown
 Gutter Width
 Street Transverse Slope
 Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)
 Street Longitudinal Slope - Enter 0 for sump condition
 Manning's Roughness for Street Section (typically between 0.012 and 0.020)

T _{BACK} =	7.5	ft
S _{BACK} =	0.020	ft/ft
n _{BACK} =	0.020	
H _{CURB} =	6.00	inches
T _{CROWN} =	16.2	ft
W =	2.50	ft
S _X =	0.020	ft/ft
S _W =	0.083	ft/ft
S _O =	0.022	ft/ft
n _{STREET} =	0.016	

Max. Allowable Spread for Minor & Major Storm
 Max. Allowable Depth at Gutter Flowline for Minor & Major Storm
 Allow Flow Depth at Street Crown (check box for yes, leave blank for no)

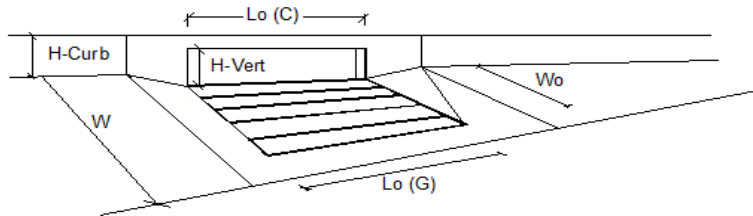
T _{MAX} =	Minor Storm	Major Storm	ft
d _{MAX} =	16.2	16.2	
	5.6	7.8	inches
	<input type="checkbox"/>	<input checked="" type="checkbox"/>	

MINOR STORM Allowable Capacity is based on Depth Criterion
 MAJOR STORM Allowable Capacity is based on Depth Criterion

Q _{allow} =	Minor Storm	Major Storm	cfs
	13.6	31.9	

WARNING: MINOR STORM max. allowable capacity is less than the design peak flow of 14.40 cfs on sheet 'Inlet Management'
Major storm max. allowable capacity GOOD - greater than the design peak flow of 28.60 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE



Design Information (Input)

Type of Inlet: CDOT Type R Curb Opening
 Local Depression (additional to continuous gutter depression 'a')
 Total Number of Units in the Inlet (Grate or Curb Opening)
 Length of a Single Unit Inlet (Grate or Curb Opening)
 Width of a Unit Grate (cannot be greater than W, Gutter Width)
 Clogging Factor for a Single Unit Grate (typical min. value = 0.5)
 Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)

	MINOR	MAJOR	
Type =	CDOT Type R Curb Opening		
a _{LOCAL} =	3.0	3.0	inches
No =	3	3	
L _o =	5.00	5.00	ft
W _o =	N/A	N/A	ft
C _f (G) =	N/A	N/A	
C _f (C) =	0.10	0.10	

Street Hydraulics: WARNING: Q > ALLOWABLE Q FOR MINOR & MAJOR STORM

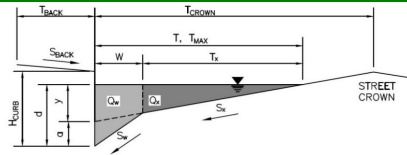
Total Inlet Interception Capacity
 Total Inlet Carry-Over Flow (flow bypassing inlet)
 Capture Percentage = Q_i/Q_a

	MINOR	MAJOR	
Q =	11.8	16.9	cfs
Q _o =	2.6	11.7	cfs
C% =	82	59	%

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

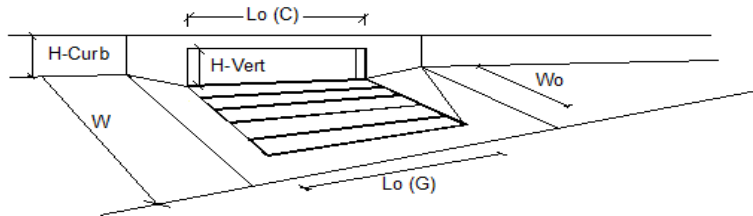
(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: MEADOWLAKE INDUSTRIAL
Inlet ID: DP16



Gutter Geometry:					
Maximum Allowable Width for Spread Behind Curb	$T_{BACK} = 7.5$ ft				
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	$S_{BACK} = 0.020$ ft/ft				
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	$n_{BACK} = 0.020$				
Height of Curb at Gutter Flow Line	$H_{CURB} = 6.00$ inches				
Distance from Curb Face to Street Crown	$T_{CROWN} = 16.2$ ft				
Gutter Width	$W = 2.50$ ft				
Street Transverse Slope	$S_X = 0.020$ ft/ft				
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	$S_W = 0.083$ ft/ft				
Street Longitudinal Slope - Enter 0 for sump condition	$S_O = 0.030$ ft/ft				
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	$n_{STREET} = 0.016$				
Max. Allowable Spread for Minor & Major Storm	<table border="1" style="display: inline-table; border-collapse: collapse;"> <tr> <th style="padding: 2px;">Minor Storm</th> <th style="padding: 2px;">Major Storm</th> </tr> <tr> <td style="padding: 2px; text-align: center;">16.2</td> <td style="padding: 2px; text-align: center;">16.2</td> </tr> </table> ft	Minor Storm	Major Storm	16.2	16.2
Minor Storm	Major Storm				
16.2	16.2				
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	<table border="1" style="display: inline-table; border-collapse: collapse;"> <tr> <th style="padding: 2px;">Minor Storm</th> <th style="padding: 2px;">Major Storm</th> </tr> <tr> <td style="padding: 2px; text-align: center;">5.6</td> <td style="padding: 2px; text-align: center;">7.8</td> </tr> </table> inches	Minor Storm	Major Storm	5.6	7.8
Minor Storm	Major Storm				
5.6	7.8				
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)	<table border="1" style="display: inline-table; border-collapse: collapse;"> <tr> <th style="padding: 2px;">Minor Storm</th> <th style="padding: 2px;">Major Storm</th> </tr> <tr> <td style="padding: 2px; text-align: center;"><input type="checkbox"/></td> <td style="padding: 2px; text-align: center;"><input checked="" type="checkbox"/></td> </tr> </table>	Minor Storm	Major Storm	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Minor Storm	Major Storm				
<input type="checkbox"/>	<input checked="" type="checkbox"/>				
MINOR STORM Allowable Capacity is based on Depth Criterion					
MAJOR STORM Allowable Capacity is based on Depth Criterion					
Minor storm max. allowable capacity GOOD - greater than the design peak flow of 7.20 cfs on sheet 'Inlet Management'					
Major storm max. allowable capacity GOOD - greater than the design peak flow of 14.20 cfs on sheet 'Inlet Management'					
$Q_{allow} =$	<table border="1" style="display: inline-table; border-collapse: collapse;"> <tr> <th style="padding: 2px;">Minor Storm</th> <th style="padding: 2px;">Major Storm</th> </tr> <tr> <td style="padding: 2px; text-align: center;">15.0</td> <td style="padding: 2px; text-align: center;">29.1</td> </tr> </table> cfs	Minor Storm	Major Storm	15.0	29.1
Minor Storm	Major Storm				
15.0	29.1				

INLET ON A CONTINUOUS GRADE

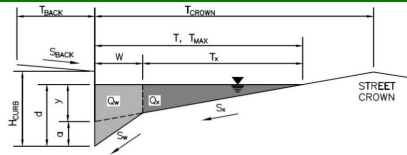


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	CDOT Type R Curb Opening	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	$a_{LOCAL} = 3.0$	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	$N_u = 2$	2	2	
Length of a Single Unit Inlet (Grate or Curb Opening)	$L_u = 5.00$	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	$W_u = N/A$	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	$C_f (G) = N/A$	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	$C_f (C) = 0.10$	0.10	0.10	
Street Hydraulics: OK - $Q < Q_{allow}$ Allowable Street Capacity				
Total Inlet Interception Capacity	$Q = 6.0$	6.0	8.6	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)	$Q_o = 1.2$	1.2	5.6	cfs
Capture Percentage = Q_o/Q_{allow}	$C\% = 84$	84	61	%

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

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

Project: MEADOWLAKE INDUSTRIAL
Inlet ID: DP17



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb
 Side Slope Behind Curb (leave blank for no conveyance credit behind curb)
 Manning's Roughness Behind Curb (typically between 0.012 and 0.020)
 Height of Curb at Gutter Flow Line
 Distance from Curb Face to Street Crown
 Gutter Width
 Street Transverse Slope
 Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)
 Street Longitudinal Slope - Enter 0 for sump condition
 Manning's Roughness for Street Section (typically between 0.012 and 0.020)

T _{BACK} =	7.5	ft
S _{BACK} =	0.020	ft/ft
n _{BACK} =	0.020	

H _{CURB} =	6.00	inches
T _{CROWN} =	16.2	ft
W =	2.50	ft
S _X =	0.020	ft/ft
S _W =	0.083	ft/ft
S _O =	0.030	ft/ft
n _{STREET} =	0.016	

Max. Allowable Spread for Minor & Major Storm
 Max. Allowable Depth at Gutter Flowline for Minor & Major Storm
 Allow Flow Depth at Street Crown (check box for yes, leave blank for no)

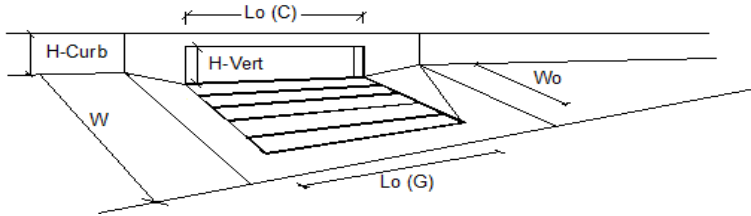
T _{MAX} =	Minor Storm	Major Storm	
	16.2	16.2	ft
d _{MAX} =	5.6	7.8	inches
	<input type="checkbox"/>	<input checked="" type="checkbox"/>	

MINOR STORM Allowable Capacity is based on Depth Criterion
 MAJOR STORM Allowable Capacity is based on Depth Criterion

Q _{allow} =	Minor Storm	Major Storm	
	15.0	29.1	cfs

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 7.80 cfs on sheet 'Inlet Management'
Major storm max. allowable capacity GOOD - greater than the design peak flow of 15.50 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE



Design Information (Input)

Type of Inlet: CDOT Type R Curb Opening
 Local Depression (additional to continuous gutter depression 'a')
 Total Number of Units in the Inlet (Grate or Curb Opening)
 Length of a Single Unit Inlet (Grate or Curb Opening)
 Width of a Unit Grate (cannot be greater than W, Gutter Width)
 Clogging Factor for a Single Unit Grate (typical min. value = 0.5)
 Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)

	MINOR	MAJOR	
Type =	CDOT Type R Curb Opening		
a _{LOCAL} =	3.0	3.0	inches
No =	4	4	
L _o =	5.00	5.00	ft
W _o =	N/A	N/A	ft
C _f (G) =	N/A	N/A	
C _f (C) =	0.10	0.10	

Street Hydraulics: OK - Q < Allowable Street Capacity

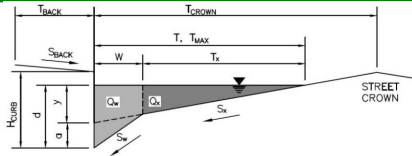
Total Inlet Interception Capacity
 Total Inlet Carry-Over Flow (flow bypassing inlet)
 Capture Percentage = Q_i/Q_a

	MINOR	MAJOR	
Q =	7.8	14.6	cfs
Q _o =	0.0	0.9	cfs
C% =	100	94	%

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

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

Project: MEADOWLAKE INDUSTRIAL
Inlet ID: DP18 - STREET CAPACITY

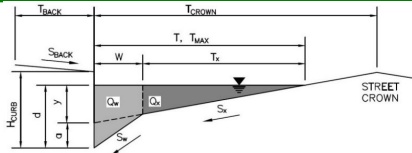


Gutter Geometry:													
Maximum Allowable Width for Spread Behind Curb	$T_{BACK} = 13.5$ ft												
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	$S_{BACK} = 0.020$ ft/ft												
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	$n_{BACK} = 0.020$												
Height of Curb at Gutter Flow Line	$H_{CURB} = 6.00$ inches												
Distance from Curb Face to Street Crown	$T_{CROWN} = 20.0$ ft												
Gutter Width	$W = 2.50$ ft												
Street Transverse Slope	$S_x = 0.020$ ft/ft												
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	$S_w = 0.083$ ft/ft												
Street Longitudinal Slope - Enter 0 for sump condition	$S_o = 0.040$ ft/ft												
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	$n_{STREET} = 0.016$												
Max. Allowable Spread for Minor & Major Storm	<table style="width: 100%; border: none;"> <tr> <td style="width: 50%;"></td> <td style="text-align: center;">Minor Storm</td> <td style="text-align: center;">Major Storm</td> <td style="width: 10%;"></td> </tr> <tr> <td>$T_{MAX} =$</td> <td style="border: 1px solid black; text-align: center;">20.0</td> <td style="border: 1px solid black; text-align: center;">20.0</td> <td>ft</td> </tr> </table>		Minor Storm	Major Storm		$T_{MAX} =$	20.0	20.0	ft				
	Minor Storm	Major Storm											
$T_{MAX} =$	20.0	20.0	ft										
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	<table style="width: 100%; border: none;"> <tr> <td style="width: 50%;"></td> <td style="text-align: center;">Minor Storm</td> <td style="text-align: center;">Major Storm</td> <td style="width: 10%;"></td> </tr> <tr> <td>$d_{MAX} =$</td> <td style="border: 1px solid black; text-align: center;">6.0</td> <td style="border: 1px solid black; text-align: center;">9.2</td> <td>inches</td> </tr> <tr> <td></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> <td></td> </tr> </table>		Minor Storm	Major Storm		$d_{MAX} =$	6.0	9.2	inches		<input type="checkbox"/>	<input checked="" type="checkbox"/>	
	Minor Storm	Major Storm											
$d_{MAX} =$	6.0	9.2	inches										
	<input type="checkbox"/>	<input checked="" type="checkbox"/>											
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)	<input type="checkbox"/>												
MINOR STORM Allowable Capacity is based on Depth Criterion													
MAJOR STORM Allowable Capacity is based on Depth Criterion													
Minor storm max. allowable capacity GOOD - greater than the design peak flow of 4.00 cfs on sheet 'Inlet Management'													
Major storm max. allowable capacity GOOD - greater than the design peak flow of 7.60 cfs on sheet 'Inlet Management'													
	<table style="width: 100%; border: none;"> <tr> <td style="width: 50%;"></td> <td style="text-align: center;">Minor Storm</td> <td style="text-align: center;">Major Storm</td> <td style="width: 10%;"></td> </tr> <tr> <td>$Q_{allow} =$</td> <td style="border: 1px solid black; text-align: center;">13.8</td> <td style="border: 1px solid black; text-align: center;">48.3</td> <td>cfs</td> </tr> </table>		Minor Storm	Major Storm		$Q_{allow} =$	13.8	48.3	cfs				
	Minor Storm	Major Storm											
$Q_{allow} =$	13.8	48.3	cfs										

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

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

Project: **MEADOWLAKE INDUSTRIAL**
 Inlet ID: **DP19 - STREET CAPACITY**



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb
 Side Slope Behind Curb (leave blank for no conveyance credit behind curb)
 Manning's Roughness Behind Curb (typically between 0.012 and 0.020)
 Height of Curb at Gutter Flow Line
 Distance from Curb Face to Street Crown
 Gutter Width
 Street Transverse Slope
 Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)
 Street Longitudinal Slope - Enter 0 for sump condition
 Manning's Roughness for Street Section (typically between 0.012 and 0.020)

$T_{BACK} = 13.5$ ft
 $S_{BACK} = 0.020$ ft/ft
 $n_{BACK} = 0.020$

$H_{CURB} = 6.00$ inches
 $T_{CROWN} = 20.0$ ft
 $W = 2.50$ ft
 $S_x = 0.020$ ft/ft
 $S_w = 0.083$ ft/ft
 $S_o = 0.040$ ft/ft
 $n_{STREET} = 0.016$

Max. Allowable Spread for Minor & Major Storm
 Max. Allowable Depth at Gutter Flowline for Minor & Major Storm
 Allow Flow Depth at Street Crown (check box for yes, leave blank for no)

	Minor Storm	Major Storm	
$T_{MAX} =$	20.0	20.0	ft
$d_{MAX} =$	6.0	9.2	inches
	<input type="checkbox"/>	<input checked="" type="checkbox"/>	

[MINOR STORM Allowable Capacity is based on Depth Criterion](#)
[MAJOR STORM Allowable Capacity is based on Depth Criterion](#)

$Q_{allow} =$

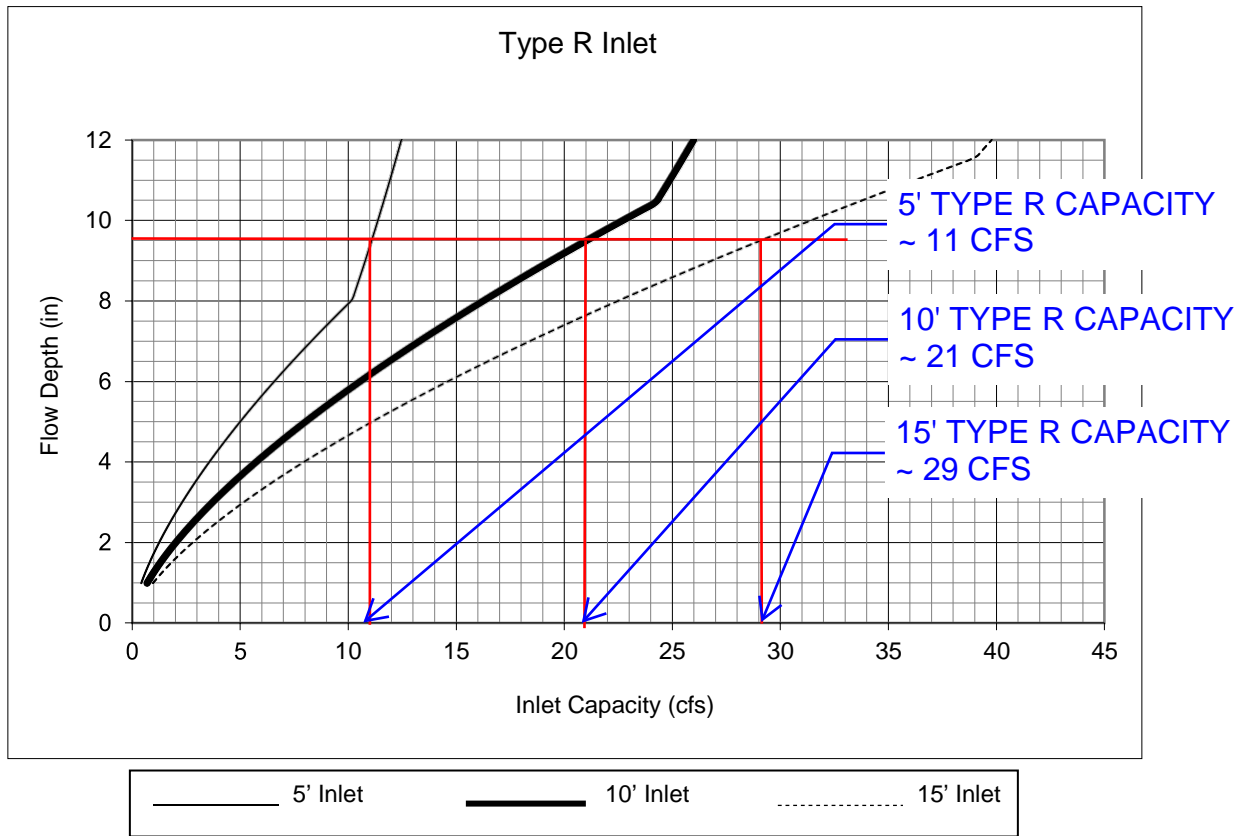
Minor Storm	Major Storm
13.8	48.3

 cfs

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 3.20 cfs on sheet 'Inlet Management'
Major storm max. allowable capacity GOOD - greater than the design peak flow of 19.10 cfs on sheet 'Inlet Management'

SUMP INLETS ON PRIVATE INDUSTRIAL ROADS
(80' ROW, 48' PAVED WIDTH)

Figure 8-11. Inlet Capacity Chart Sump Conditions , Curb Opening (Type R) Inlet



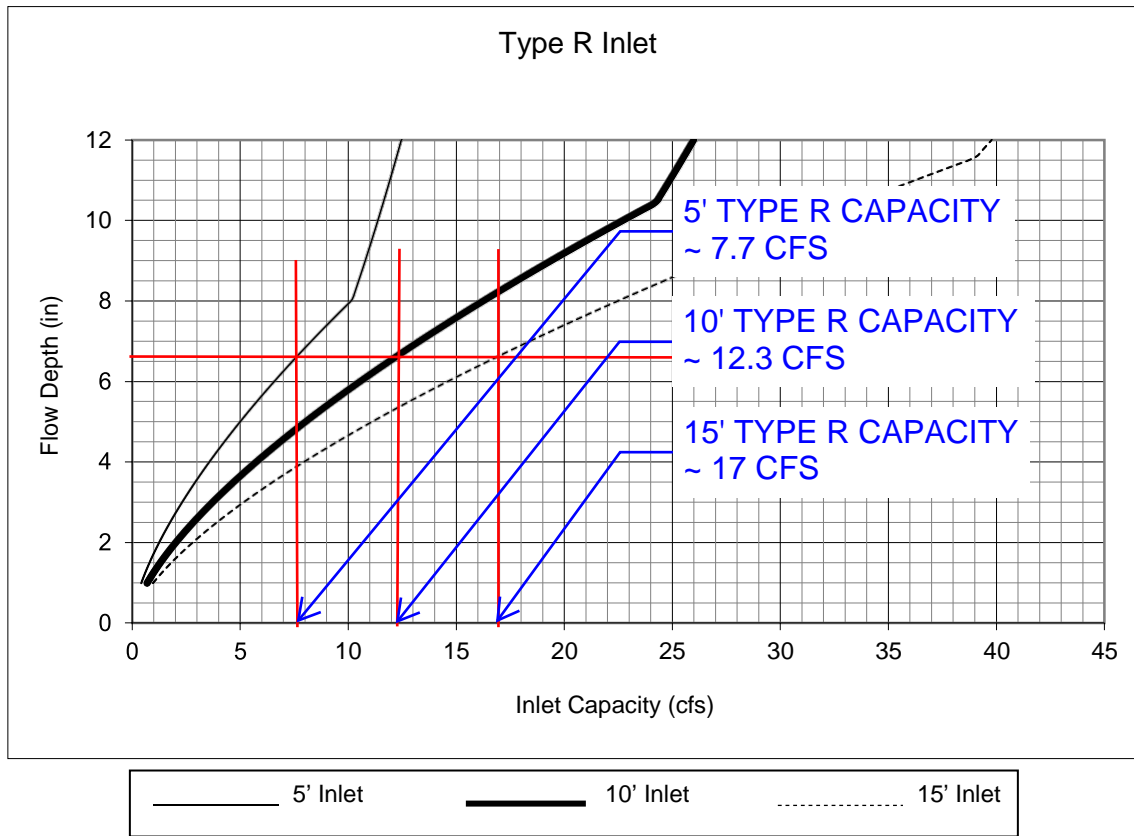
DP1 Q100 = 14.1 CFS -> 10' TYPE R SUMP INLET
 DP2 Q100 = 10.4 CFS -> 5' TYPE R SUMP INLET
 DP11 Q100 = 3.3 CFS -> 5' TYPE R SUMP INLET
 DP12 Q100 = 3.3 CFS -> 5' TYPE R SUMP INLET
 DP18 Q100 = 7.6 CFS -> 5' TYPE R SUMP INLET
 DP19 Q100 = 17.1 CFS -> 10' TYPE R SUMP INLET

Notes:

1. The standard inlet parameters must apply to use this chart.

SUMP INLETS ON PRIVATE ROADS
(50' EASEMENT, 30' PAVED WIDTH)

Figure 8-11. Inlet Capacity Chart Sump Conditions , Curb Opening (Type R) Inlet



DP5 Q100 = 17.1 CFS -> 15' TYPE R SUMP INLET
 DP6 Q100 = 8.7 CFS -> 10' TYPE R SUMP INLET

Notes:

1. The standard inlet parameters must apply to use this chart.

Channel Report

BASIN G SWALE A (Q100 = DP7 = 30.3 cfs)

Trapezoidal

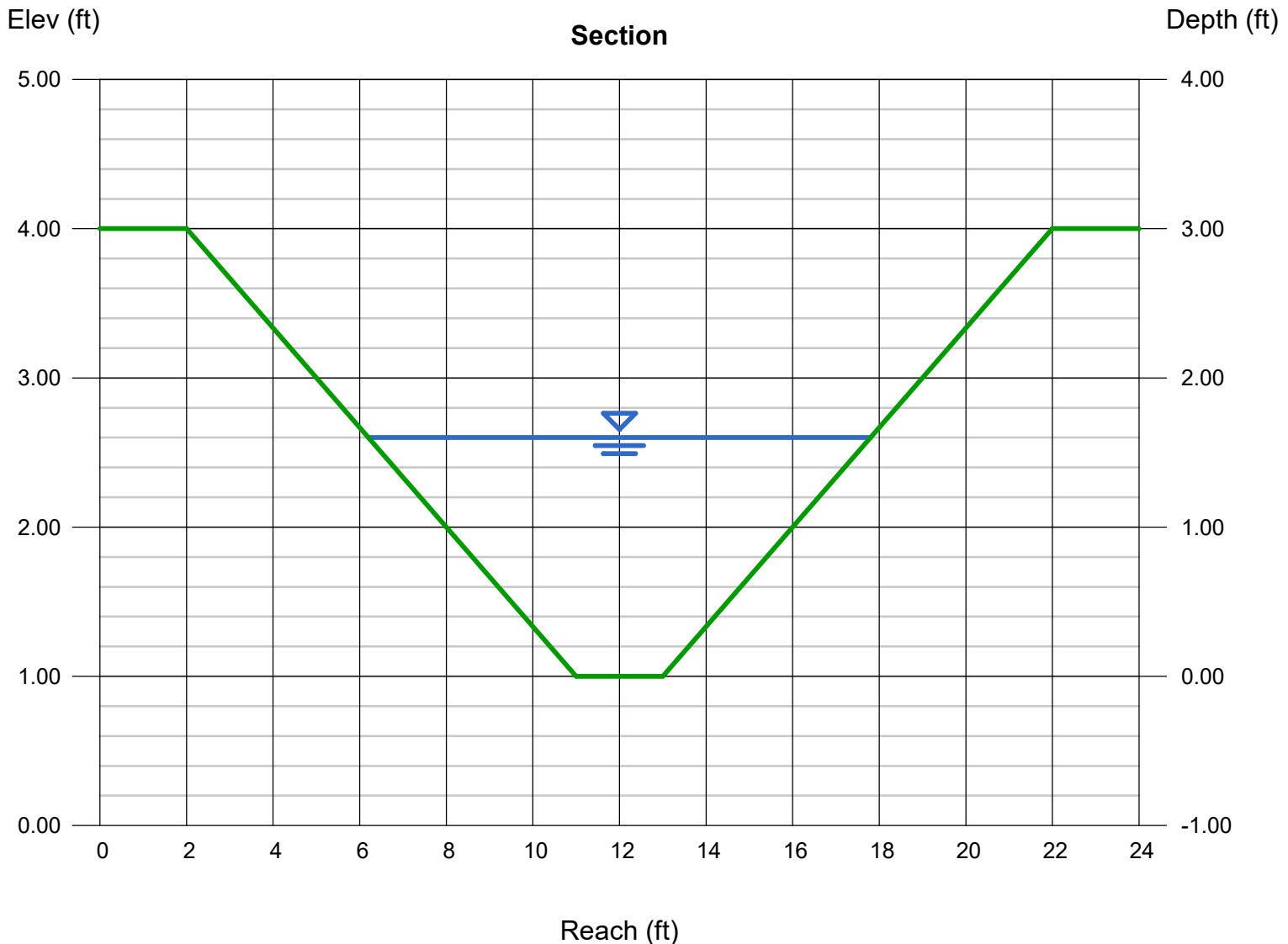
Bottom Width (ft) = 2.00
Side Slopes (z:1) = 3.00, 3.00
Total Depth (ft) = 3.00
Invert Elev (ft) = 1.00
Slope (%) = 0.50
N-Value = 0.035

Highlighted

Depth (ft) = 1.60
Q (cfs) = 30.30
Area (sqft) = 10.88
Velocity (ft/s) = 2.78
Wetted Perim (ft) = 12.12
Crit Depth, Yc (ft) = 1.16
Top Width (ft) = 11.60
EGL (ft) = 1.72

Calculations

Compute by: Known Q
Known Q (cfs) = 30.30



Channel Report

BASIN H SWALE A (Q100 = DP7 = 30.3 cfs)

Trapezoidal

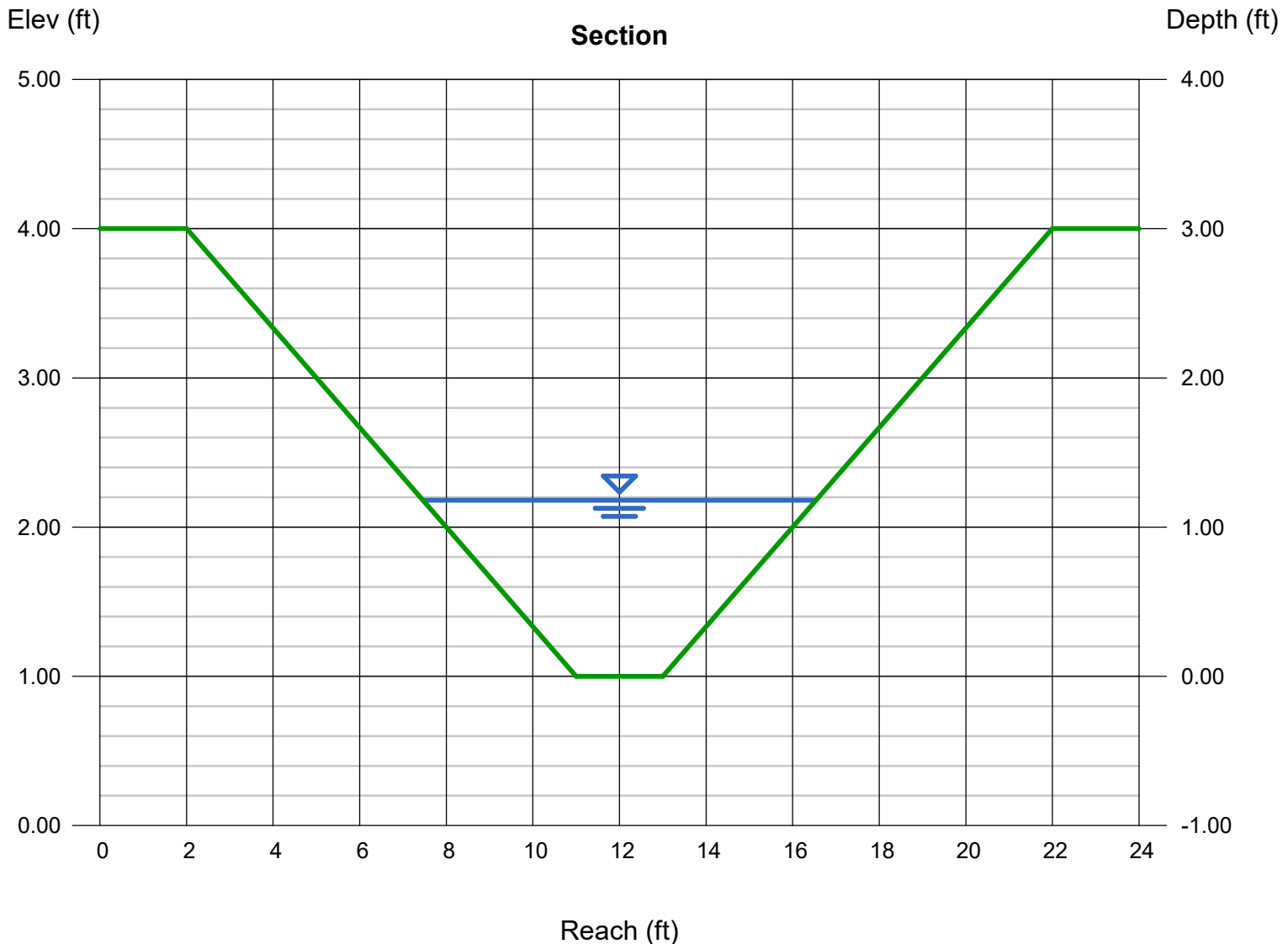
Bottom Width (ft) = 2.00
Side Slopes (z:1) = 3.00, 3.00
Total Depth (ft) = 3.00
Invert Elev (ft) = 1.00
Slope (%) = 2.25
N-Value = 0.035

Highlighted

Depth (ft) = 1.18
Q (cfs) = 32.50
Area (sqft) = 6.54
Velocity (ft/s) = 4.97
Wetted Perim (ft) = 9.46
Crit Depth, Yc (ft) = 1.20
Top Width (ft) = 9.08
EGL (ft) = 1.56

Calculations

Compute by: Known Q
Known Q (cfs) = 32.50



Channel Report

BASIN I SWALE A (Q100 = DP7 = 30.3 cfs)

Trapezoidal

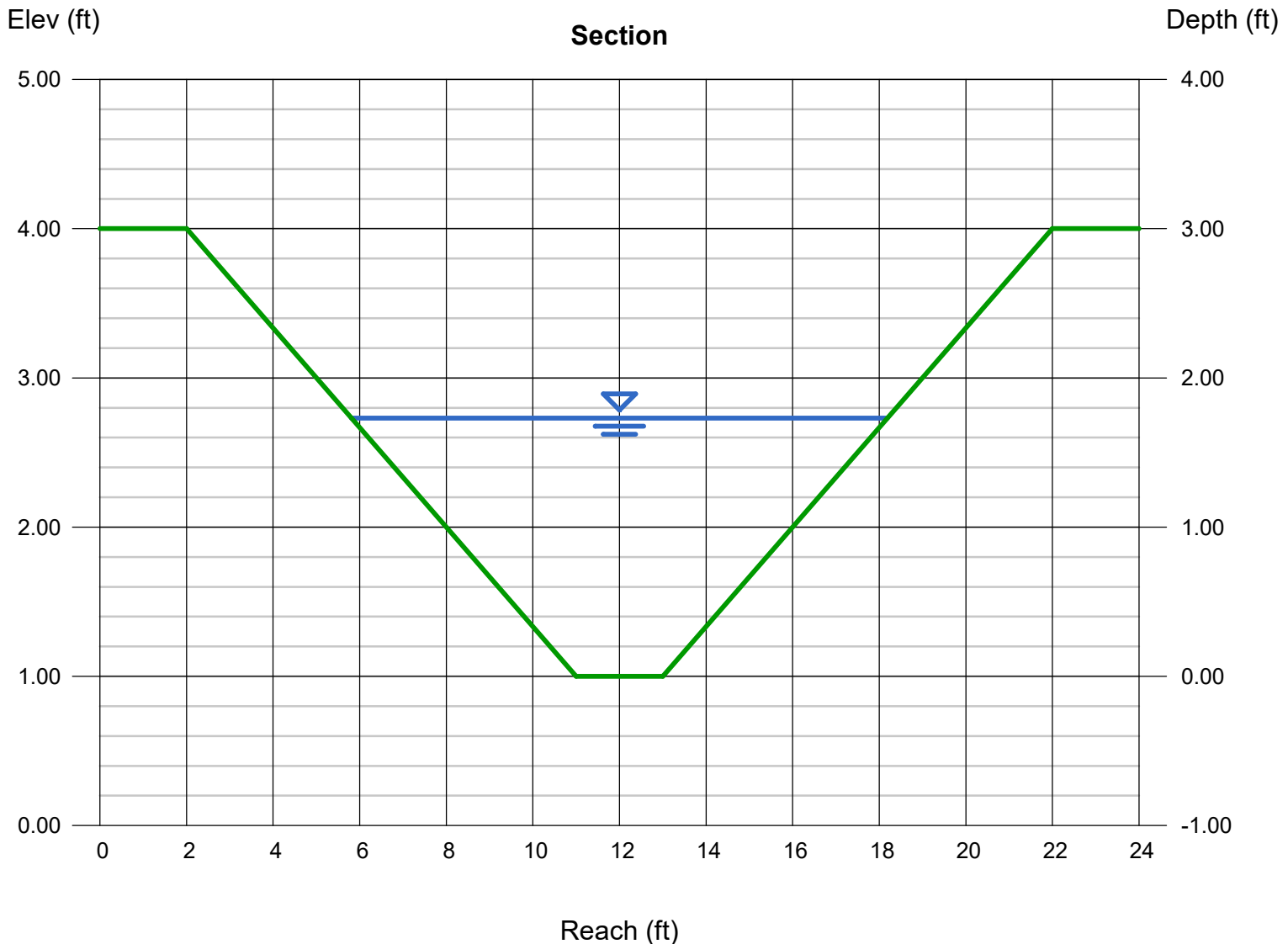
Bottom Width (ft) = 2.00
Side Slopes (z:1) = 3.00, 3.00
Total Depth (ft) = 3.00
Invert Elev (ft) = 1.00
Slope (%) = 0.44
N-Value = 0.035

Highlighted

Depth (ft) = 1.73
Q (cfs) = 34.10
Area (sqft) = 12.44
Velocity (ft/s) = 2.74
Wetted Perim (ft) = 12.94
Crit Depth, Yc (ft) = 1.23
Top Width (ft) = 12.38
EGL (ft) = 1.85

Calculations

Compute by: Known Q
Known Q (cfs) = 34.10



Channel Report

BASIN S SWALE B (Q100 = 5.9 CFS)

Trapezoidal

Bottom Width (ft)	= 2.00
Side Slopes (z:1)	= 3.00, 3.00
Total Depth (ft)	= 2.64
Invert Elev (ft)	= 5.00
Slope (%)	= 0.87
N-Value	= 0.030

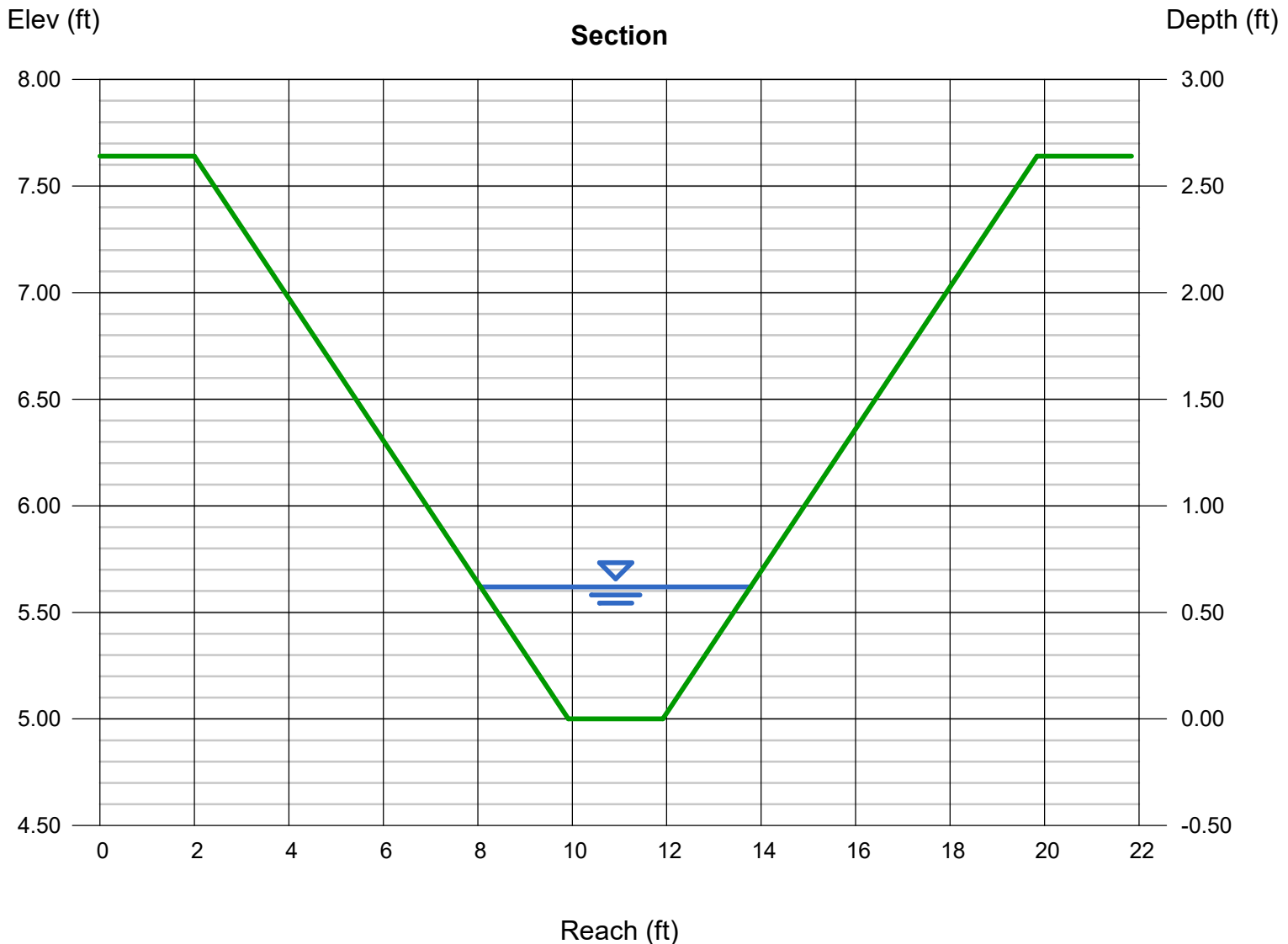
Highlighted

Depth (ft)	= 0.62
Q (cfs)	= 5.900
Area (sqft)	= 2.39
Velocity (ft/s)	= 2.47
Wetted Perim (ft)	= 5.92
Crit Depth, Yc (ft)	= 0.51
Top Width (ft)	= 5.72
EGL (ft)	= 0.71

Calculations

Compute by:	Known Q
Known Q (cfs)	= 5.90

$$Fr = 2.74 / (\sqrt{32.17 * 0.62}) = 0.61 < 0.9$$



Culvert Report

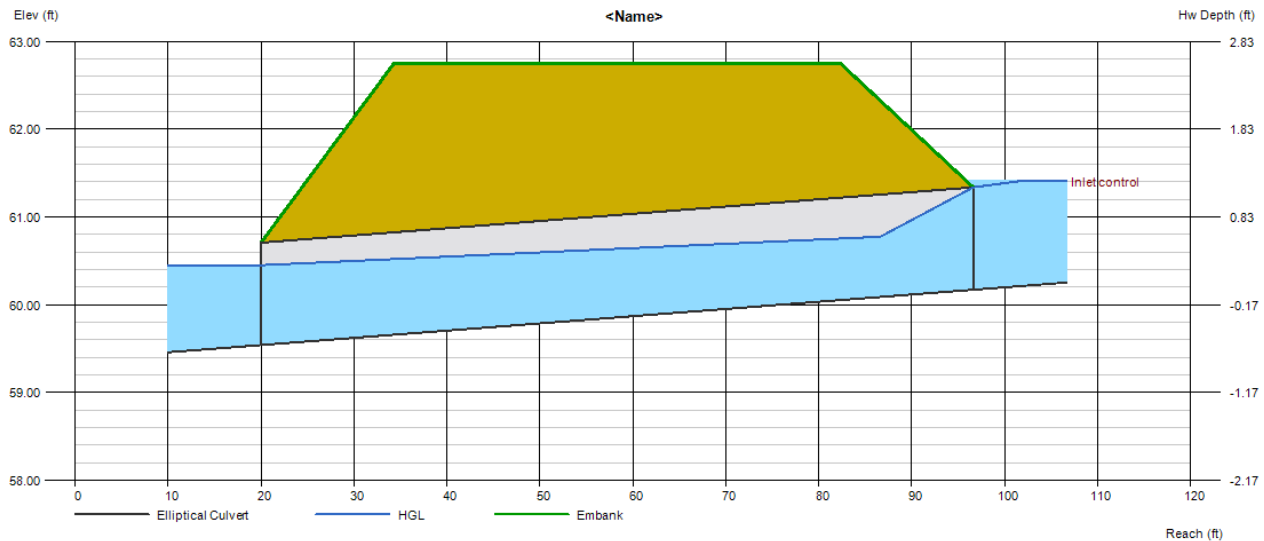
Basin OS1 Culvert

Invert Elev Dn (ft)	= 59.54
Pipe Length (ft)	= 76.61
Slope (%)	= 0.82
Invert Elev Up (ft)	= 60.17
Rise (in)	= 14.0
Shape	= Elliptical
Span (in)	= 23.0
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)	= 62.75
Top Width (ft)	= 48.00
Crest Width (ft)	= 50.00

Calculations	
Qmin (cfs)	= 1.60
Qmax (cfs)	= 6.10
Tailwater Elev (ft)	= (dc+D)/2

Highlighted	
Qtotal (cfs)	= 6.10
Qpipe (cfs)	= 5.73
Qovertop (cfs)	= 0.37
Veloc Dn (ft/s)	= 3.75
Veloc Up (ft/s)	= 5.57
HGL Dn (ft)	= 60.45
HGL Up (ft)	= 60.82
Hw Elev (ft)	= 61.41
Hw/D (ft)	= 1.06
Flow Regime	= Inlet Control



Riprap Sizing - Pond A Spillway				
q (cfs/ft)	S (ft/ft)	C_f	n	D_{50} min. (in)
1.62	0.33	2	0	7.41

Type L Riprap ($D_{50} = 9"$) will be utilized for the spillway protection

Riprap Sizing - Pond B Spillway				
q (cfs/ft)	S (ft/ft)	C_f	n	D_{50} min. (in)
2.97	0.33	2	0	10.41

Type M Riprap ($D_{50} = 12"$) will be utilized for the spillway protection

Riprap Sizing - Pond A Outfall							
Pipe Dia (ft)	q (cfs/ft)	S (ft/ft)	C_f	n	D_{50} min. (in)	Length (ft, = 3x Pipe Dia)	Width (ft, = 3x Pipe Dia)
1.5	53.87	0.005	2	0	8.71	4.5	4.5

Type L Riprap ($D_{50} = 9"$) will be utilized for the outfall protection

Riprap Sizing - Pond B Outfall							
Pipe Dia (ft)	q (cfs/ft)	S (ft/ft)	C_f	n	D_{50} min. (in)	Length (ft, = 3x Pipe Dia)	Width (ft, = 3x Pipe Dia)
1.5	35.60	0.005	2	0	6.91	4.5	4.5

Type L Riprap ($D_{50} = 9"$) will be utilized for the outfall protection

$$D_{50} = 5.23 S^{0.43} (1.35 C_f q)^{0.56}$$

Equation 13-9

Where:

- D_{50} = median rock size (in)
- S = longitudinal slope (ft/ft)
- C_f = concentration factor (1.0 to 3.0)
- q = unit discharge (cfs/ft)

When:

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



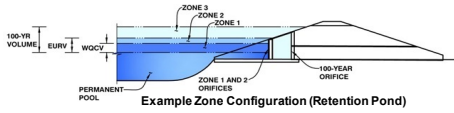
APPENDIX D – WATER QUALITY & DETENTION

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: Meadowlake Industrial F1

Basin ID: North Pond



Watershed Information

Selected BMP Type =	EDB
Watershed Area =	34.01 acres
Watershed Length =	2,185 ft
Watershed Length to Centroid =	1,100 ft
Watershed Slope =	0.015 ft/ft
Watershed Imperviousness =	68.00% percent
Percentage Hydrologic Soil Group A =	95.0% percent
Percentage Hydrologic Soil Group B =	5.0% percent
Percentage Hydrologic Soil Groups C/D =	0.0% percent
Target WQCV Drain Time =	40.0 hours
Location for 1-hr Rainfall Depths =	User Input

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

Water Quality Capture Volume (WQCV) =	0.755	acre-feet
Excess Urban Runoff Volume (EURV) =	2.888	acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	2.145	acre-feet
5-yr Runoff Volume (P1 = 1.5 in.) =	2.803	acre-feet
10-yr Runoff Volume (P1 = 1.75 in.) =	3.330	acre-feet
25-yr Runoff Volume (P1 = 2 in.) =	4.040	acre-feet
50-yr Runoff Volume (P1 = 2.25 in.) =	4.703	acre-feet
100-yr Runoff Volume (P1 = 2.52 in.) =	5.508	acre-feet
500-yr Runoff Volume (P1 = 3.14 in.) =	7.275	acre-feet
Approximate 2-yr Detention Volume =	1.898	acre-feet
Approximate 5-yr Detention Volume =	2.482	acre-feet
Approximate 10-yr Detention Volume =	2.994	acre-feet
Approximate 25-yr Detention Volume =	3.572	acre-feet
Approximate 50-yr Detention Volume =	3.917	acre-feet
Approximate 100-yr Detention Volume =	4.274	acre-feet

Optional User Overrides

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

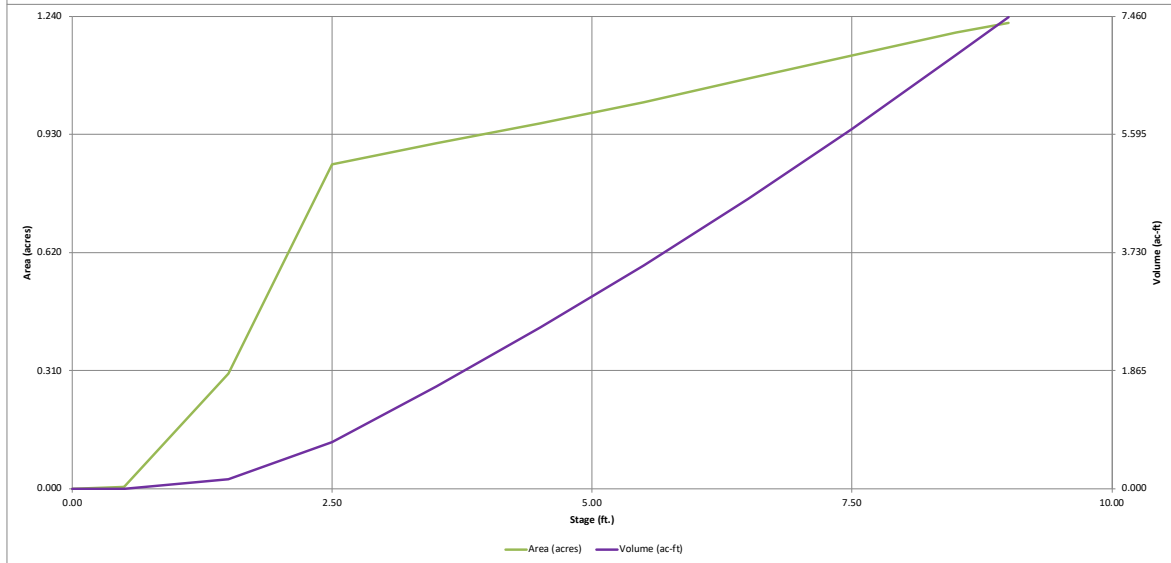
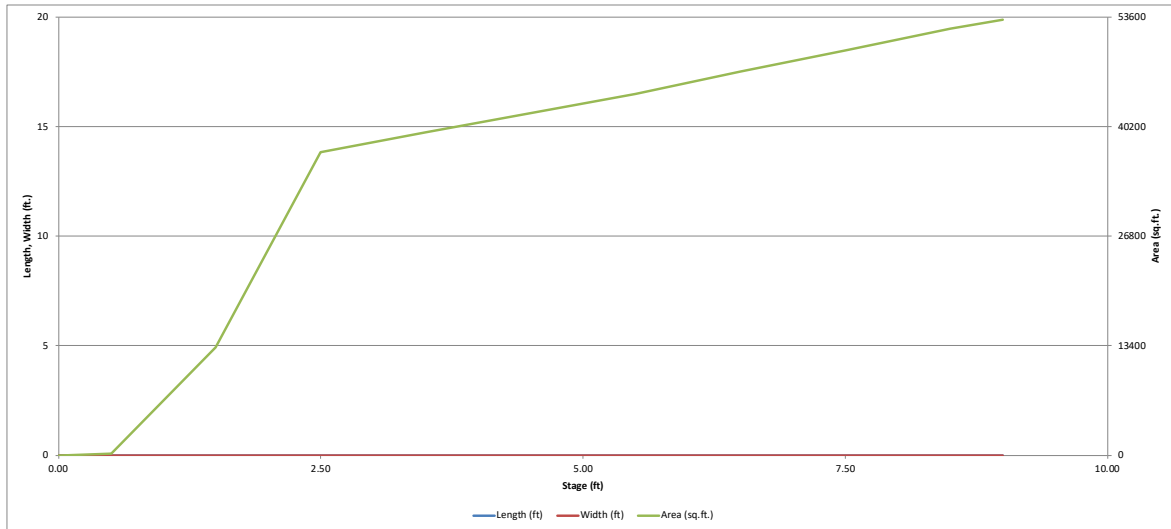
Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.755	acre-feet
Zone 2 Volume (EURV - Zone 1) =	2.133	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	1.386	acre-feet
Total Detention Basin Volume =	4.274	acre-feet
Initial Surge Volume (ISV) =	user	ft ³
Initial Surge 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 _{LW}) =	user	
Initial Surge Area (A _{ISV}) =	user	ft ²
Surge Volume Length (L _{ISV}) =	user	ft
Surge 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

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)
6759.5 Top of Micropool	--	0.00	--	--	--	11	0.000		
6760	--	0.50	--	--	--	215	0.005	56	0.001
6761	--	1.50	--	--	--	13,184	0.303	6,756	0.155
6762	--	2.50	--	--	--	37,092	0.852	31,893	0.732
6763	--	3.50	--	--	--	39,470	0.906	70,174	1.611
6764	--	4.50	--	--	--	41,805	0.960	110,812	2.544
6765	--	5.50	--	--	--	44,176	1.014	153,802	3.531
6766	--	6.50	--	--	--	46,929	1.077	199,355	4.577
6767	--	7.50	--	--	--	49,516	1.137	247,577	5.684
6768	--	8.50	--	--	--	52,190	1.198	298,430	6.851
6768.5	--	9.00	--	--	--	53,285	1.223	324,799	7.456

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

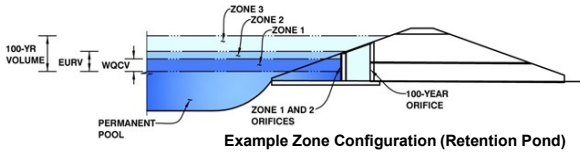


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD- Detention, Version 4.06 (July 2022)

Project: Meadowlake Industrial F1

Basin ID: North Pond



	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.53	0.755	Orifice Plate
Zone 2 (EURV)	4.86	2.133	Orifice Plate
Zone 3 (100-year)	6.22	1.386	Weir&Pipe (Restrict)
Total (all zones)		4.274	

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

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

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

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

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

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

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	0.50	2.38					
Orifice Area (sq. inches)	2.65	2.65	12.00					

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

User Input: Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected	
Invert of Vertical Orifice =	<input type="text" value="N/A"/>	<input type="text" value="N/A"/>	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =	<input type="text" value="N/A"/>	<input type="text" value="N/A"/>	ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter =	<input type="text" value="N/A"/>	<input type="text" value="N/A"/>	inches

Calculated Parameters for Vertical Orifice

	Not Selected	Not Selected	
Vertical Orifice Area =	<input type="text" value="N/A"/>	<input type="text" value="N/A"/>	ft ²
Vertical Orifice Centroid =	<input type="text" value="N/A"/>	<input type="text" value="N/A"/>	feet

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

	Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	<input type="text" value="4.50"/>	<input type="text" value="N/A"/>	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	<input type="text" value="3.00"/>	<input type="text" value="N/A"/>	feet
Overflow Weir Gate Slope =	<input type="text" value="0.00"/>	<input type="text" value="N/A"/>	H:V
Horiz. Length of Weir Sides =	<input type="text" value="3.00"/>	<input type="text" value="N/A"/>	feet
Overflow Gate Type =	<input type="text" value="Type C Gate"/>	<input type="text" value="N/A"/>	
Debris Clogging % =	<input type="text" value="50%"/>	<input type="text" value="N/A"/>	%

Calculated Parameters for Overflow Weir

	Zone 3 Weir	Not Selected	
Height of Gate Upper Edge, H _g =	<input type="text" value="4.50"/>	<input type="text" value="N/A"/>	feet
Overflow Weir Slope Length =	<input type="text" value="3.00"/>	<input type="text" value="N/A"/>	feet
Gate Open Area / 100-yr Orifice Area =	<input type="text" value="6.21"/>	<input type="text" value="N/A"/>	
Overflow Gate Open Area w/o Debris =	<input type="text" value="6.26"/>	<input type="text" value="N/A"/>	ft ²
Overflow Gate Open Area w/ Debris =	<input type="text" value="3.13"/>	<input type="text" value="N/A"/>	ft ²

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

	Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	<input type="text" value="0.50"/>	<input type="text" value="N/A"/>	ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter =	<input type="text" value="18.00"/>	<input type="text" value="N/A"/>	inches
Restrictor Plate Height Above Pipe Invert =	<input type="text" value="10.00"/>	<input type="text" value="N/A"/>	inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 3 Restrictor	Not Selected	
Outlet Orifice Area =	<input type="text" value="1.01"/>	<input type="text" value="N/A"/>	ft ²
Outlet Orifice Centroid =	<input type="text" value="0.48"/>	<input type="text" value="N/A"/>	feet
Half-Central Angle of Restrictor Plate on Pipe =	<input type="text" value="1.68"/>	<input type="text" value="N/A"/>	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage =	<input type="text" value="7.20"/>	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	<input type="text" value="27.00"/>	feet
Spillway End Slopes =	<input type="text" value="4.00"/>	H:V
Freeboard above Max Water Surface =	<input type="text" value="1.00"/>	feet

Calculated Parameters for Spillway

Spillway Design Flow Depth =	<input type="text" value="0.93"/>	feet
Stage at Top of Freeboard =	<input type="text" value="9.13"/>	feet
Basin Area at Top of Freeboard =	<input type="text" value="1.22"/>	acres
Basin Volume at Top of Freeboard =	<input type="text" value="7.46"/>	acre-ft

Routed Hydrograph Results

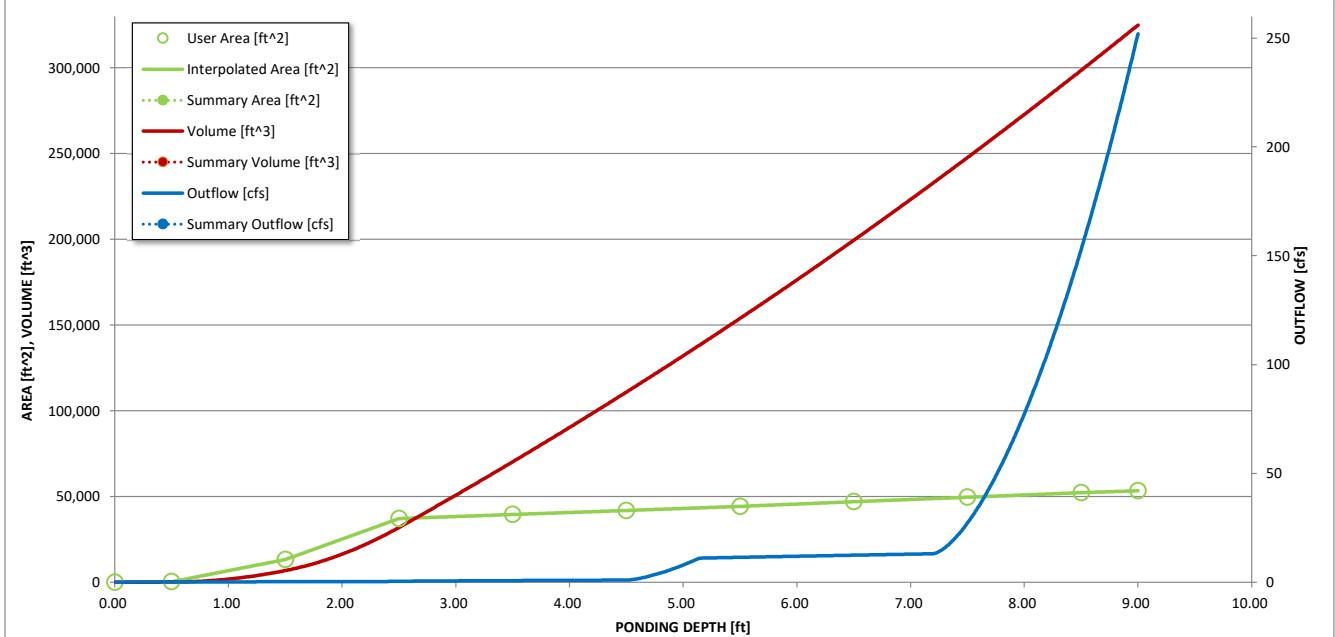
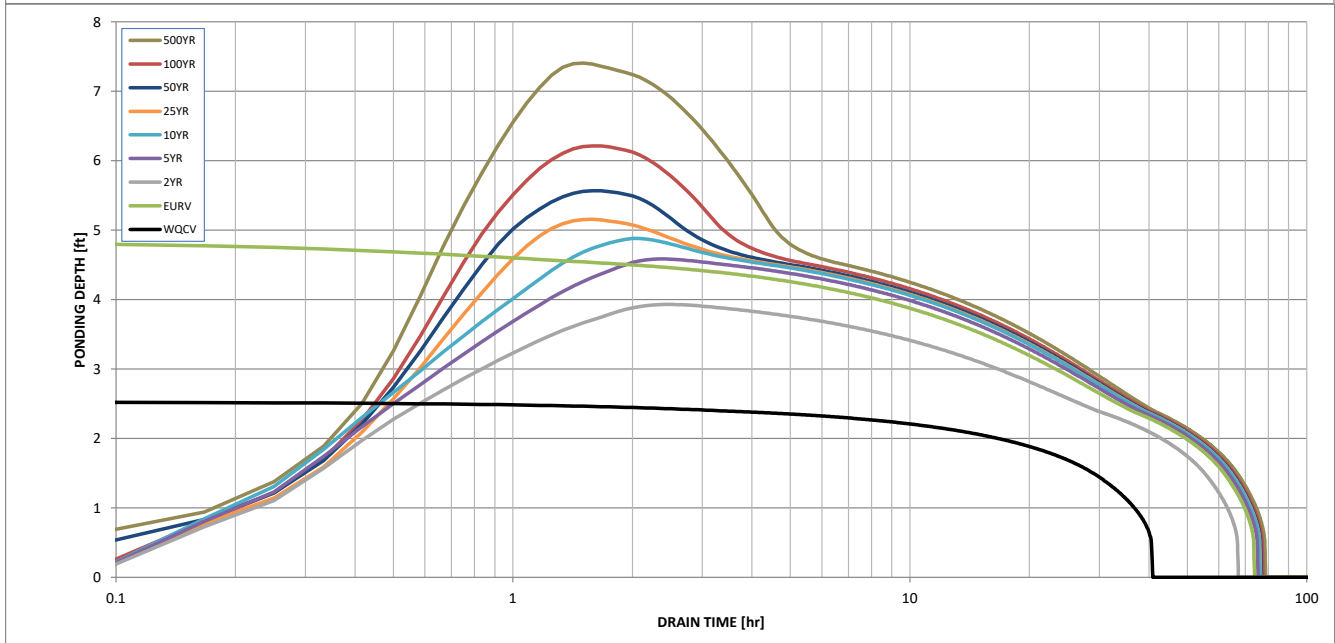
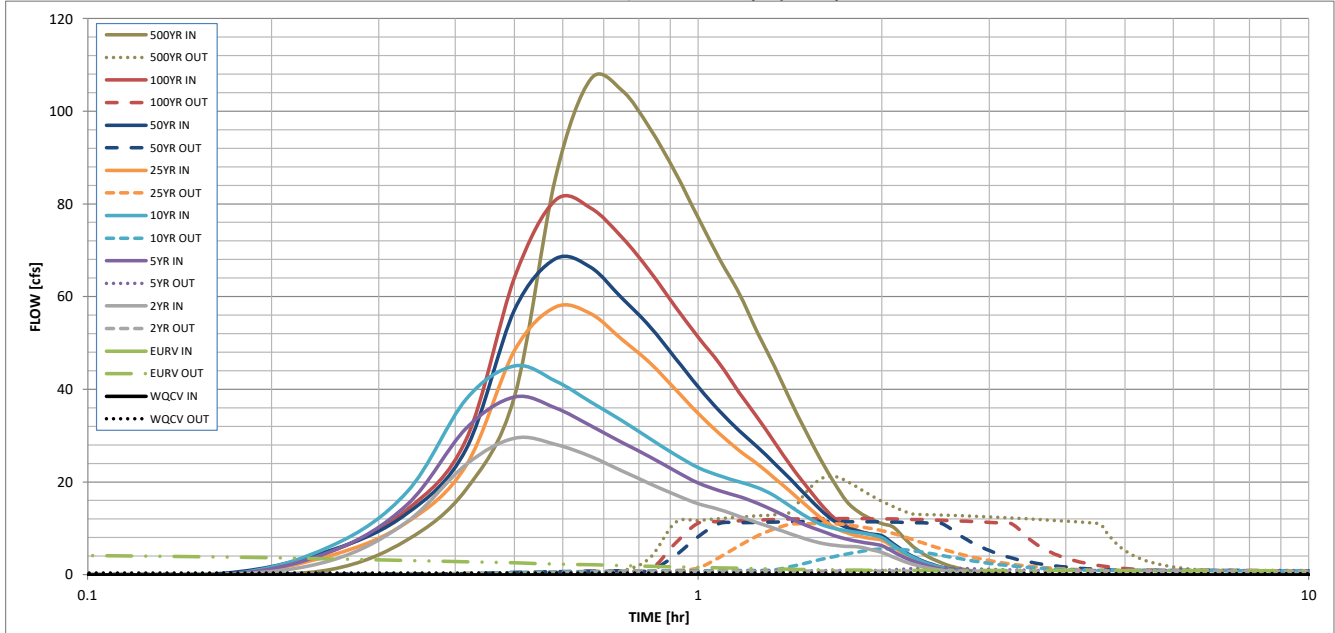
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Design Storm Return Period =									
One-Hour Rainfall Depth (in) =	<input type="text" value="N/A"/>	<input type="text" value="N/A"/>	1.19	1.50	1.75	2.00	2.25	2.52	3.14
CUHP Runoff Volume (acre-ft) =	0.755	2.888	2.145	2.803	3.330	4.040	4.703	5.508	7.275
Inflow Hydrograph Volume (acre-ft) =	<input type="text" value="N/A"/>	<input type="text" value="N/A"/>	2.145	2.803	3.330	4.040	4.703	5.508	7.275
CUHP Predevelopment Peak Q (cfs) =	<input type="text" value="N/A"/>	<input type="text" value="N/A"/>	0.2	0.4	0.5	5.9	10.6	17.0	30.1
OPTIONAL Override Predevelopment Peak Q (cfs) =	<input type="text" value="N/A"/>	<input type="text" value="N/A"/>	1.4	3.8	7.8	13.4	18.1	23.3	
Predevelopment Unit Peak Flow, q (cfs/acre) =	<input type="text" value="N/A"/>	<input type="text" value="N/A"/>	0.04	0.11	0.23	0.39	0.53	0.68	0.89
Peak Inflow Q (cfs) =	<input type="text" value="N/A"/>	<input type="text" value="N/A"/>	29.5	38.4	45.1	57.8	68.2	80.8	107.0
Peak Outflow Q (cfs) =	<input type="text" value="0.4"/>	<input type="text" value="4.8"/>	0.8	1.5	5.6	11.1	11.5	12.1	21.2
Ratio Peak Outflow to Predevelopment Q =	<input type="text" value="N/A"/>	<input type="text" value="N/A"/>	N/A	0.4	0.7	0.8	0.6	0.5	0.7
Structure Controlling Flow =	Plate	Overflow Weir 1	Plate	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Outlet Plate 1	Outlet Plate 1	Spillway
Max Velocity through Gate 1 (fps) =	<input type="text" value="N/A"/>	0.67	N/A	0.1	0.7	1.6	1.7	1.7	1.9
Max Velocity through Gate 2 (fps) =	<input type="text" value="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) =	38	66	61	68	68	67	66	65	63
Time to Drain 99% of Inflow Volume (hours) =	40	71	65	72	73	72	72	72	72
Maximum Ponding Depth (ft) =	2.53	4.86	3.93	4.59	4.88	5.16	5.57	6.22	7.41
Area at Maximum Ponding Depth (acres) =	0.85	0.98	0.93	0.96	0.98	1.00	1.02	1.06	1.13
Maximum Volume Stored (acre-ft) =	0.758	2.893	2.006	2.621	2.913	3.179	3.602	4.267	5.570

PREDEVELOPMENT PEAK FLOWS WERE CALCULATED FOR THE DEVELOPED CONDITIONS TRIBUTARY BASINS FOR POND A WITH EXISTING CONDITIONS LAND USES TO MORE ACCURATELY CALCULATE THE 'RATIO PEAK OUTFLOW TO PREDEVELOPMENT Q'. COLORADO SPRINGS DCM VOL. 1 IDF CURVE AND EL PASO COUNTY LAND USE COEFFICIENTS WERE USED.

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)



DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename: _____

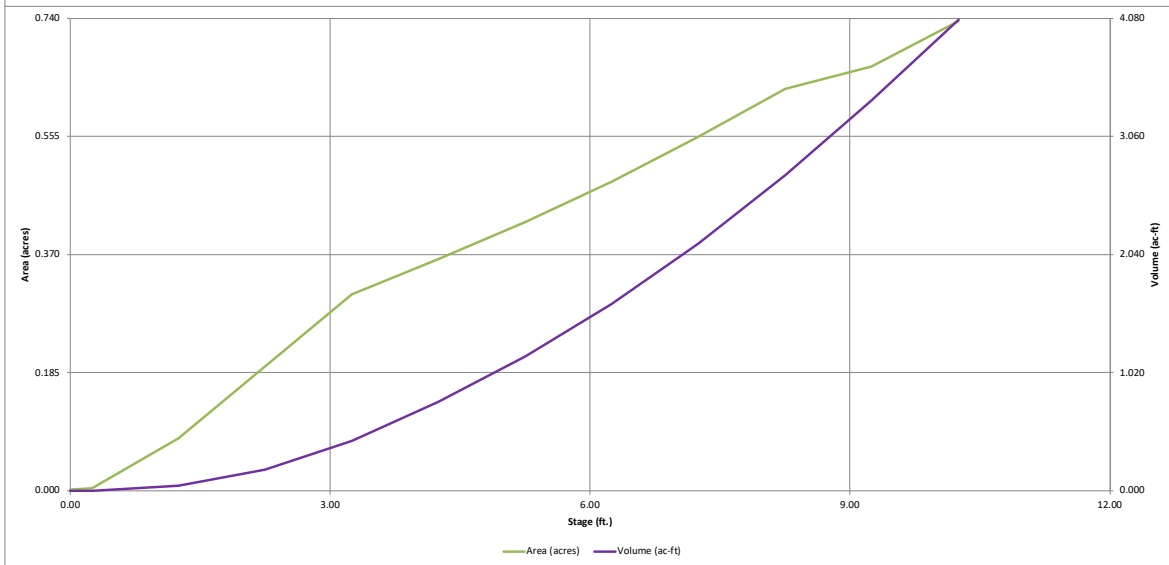
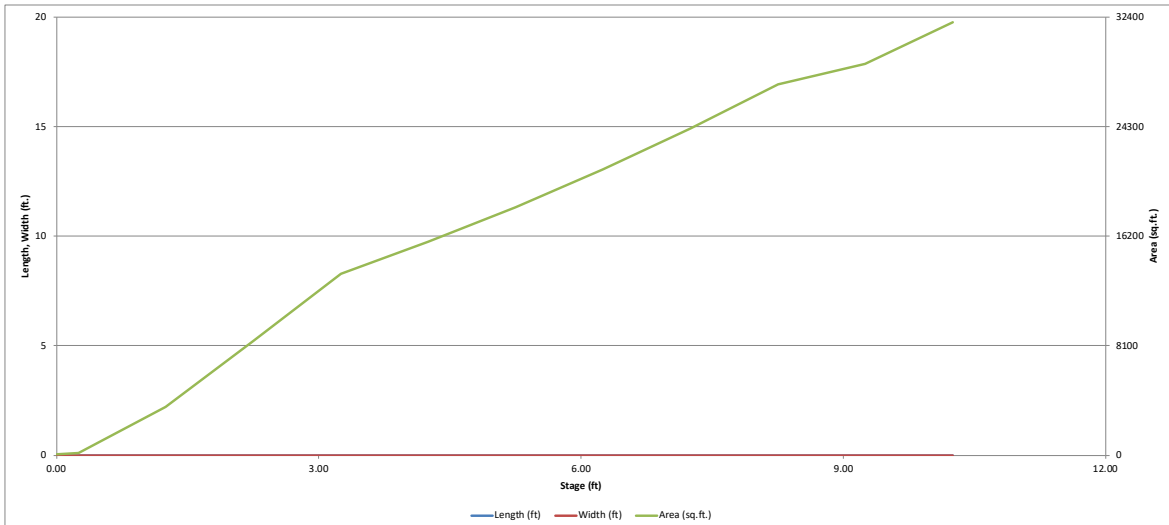
Inflow Hydrographs

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

Time Interval	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00_min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.35	0.03	1.12
	0:15:00	0.00	0.00	3.08	5.01	6.21	4.18	5.26	5.10	7.49
	0:20:00	0.00	0.00	11.42	15.11	17.83	11.29	13.20	14.07	18.43
	0:25:00	0.00	0.00	23.83	31.62	37.90	23.57	27.14	29.15	38.43
	0:30:00	0.00	0.00	29.48	38.37	45.06	48.36	57.15	64.09	85.59
	0:35:00	0.00	0.00	28.15	35.99	41.85	57.78	68.19	80.80	107.03
	0:40:00	0.00	0.00	25.54	32.15	37.29	56.30	66.32	79.13	104.54
	0:45:00	0.00	0.00	22.44	28.54	33.24	50.79	59.68	72.84	96.35
	0:50:00	0.00	0.00	19.66	25.46	29.38	45.74	53.59	65.48	86.90
	0:55:00	0.00	0.00	17.28	22.42	25.93	40.08	46.82	57.94	76.96
	1:00:00	0.00	0.00	15.34	19.80	23.09	34.77	40.50	51.23	68.10
	1:05:00	0.00	0.00	14.06	18.12	21.35	30.40	35.32	45.57	60.77
	1:10:00	0.00	0.00	12.63	16.89	20.06	26.84	31.11	39.34	52.33
	1:15:00	0.00	0.00	11.25	15.43	18.82	23.91	27.61	33.94	44.90
	1:20:00	0.00	0.00	10.02	13.77	17.03	20.86	24.02	28.54	37.57
	1:25:00	0.00	0.00	8.83	12.14	14.72	17.94	20.59	23.58	30.91
	1:30:00	0.00	0.00	7.73	10.71	12.62	15.04	17.19	19.26	25.11
	1:35:00	0.00	0.00	6.87	9.58	10.98	12.40	14.10	15.44	19.99
	1:40:00	0.00	0.00	6.38	8.49	10.04	10.28	11.62	12.33	15.85
	1:45:00	0.00	0.00	6.15	7.69	9.48	9.06	10.22	10.56	13.51
	1:50:00	0.00	0.00	6.01	7.14	9.08	8.30	9.35	9.47	12.04
	1:55:00	0.00	0.00	5.41	6.72	8.65	7.82	8.80	8.73	11.04
	2:00:00	0.00	0.00	4.81	6.26	7.99	7.46	8.40	8.20	10.32
	2:05:00	0.00	0.00	3.84	5.02	6.40	6.02	6.77	6.51	8.15
	2:10:00	0.00	0.00	2.95	3.84	4.90	4.58	5.14	4.87	6.08
	2:15:00	0.00	0.00	2.26	2.95	3.74	3.49	3.92	3.66	4.56
	2:20:00	0.00	0.00	1.73	2.24	2.83	2.65	2.97	2.78	3.46
	2:25:00	0.00	0.00	1.31	1.68	2.11	1.99	2.23	2.10	2.60
	2:30:00	0.00	0.00	0.98	1.24	1.56	1.47	1.65	1.56	1.94
	2:35:00	0.00	0.00	0.72	0.90	1.16	1.08	1.20	1.15	1.43
	2:40:00	0.00	0.00	0.52	0.65	0.86	0.81	0.90	0.86	1.07
	2:45:00	0.00	0.00	0.36	0.46	0.60	0.58	0.65	0.62	0.76
	2:50:00	0.00	0.00	0.23	0.31	0.39	0.39	0.43	0.41	0.51
	2:55:00	0.00	0.00	0.13	0.19	0.23	0.23	0.26	0.25	0.30
	3:00:00	0.00	0.00	0.06	0.09	0.11	0.12	0.13	0.12	0.15
	3:05:00	0.00	0.00	0.02	0.03	0.04	0.04	0.04	0.04	0.05
	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 4.06 (July 2022)

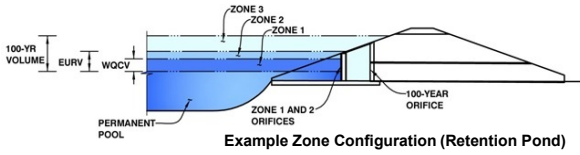


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-*Detention*, Version 4.06 (July 2022)

Project: Meadowlake Industrial F1

Basin ID: Pond B



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.27	0.437	Orifice Plate
Zone 2 (EURV)	6.40	1.247	Orifice Plate
Zone 3 (100-year)	7.80	0.763	Weir&Pipe (Restrict)
Total (all zones)		2.447	

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

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

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

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

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

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

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	0.50	3.00					
Orifice Area (sq. inches)	1.40	1.40	6.00					

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

User Input: Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected	
Invert of Vertical Orifice =	<input type="text" value="N/A"/>	<input type="text" value="N/A"/>	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =	<input type="text" value="N/A"/>	<input type="text" value="N/A"/>	ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter =	<input type="text" value="N/A"/>	<input type="text" value="N/A"/>	inches

Calculated Parameters for Vertical Orifice

	Not Selected	Not Selected	
Vertical Orifice Area =	<input type="text" value="N/A"/>	<input type="text" value="N/A"/>	ft ²
Vertical Orifice Centroid =	<input type="text" value="N/A"/>	<input type="text" value="N/A"/>	feet

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

	Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	6.40	N/A	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	3.00	N/A	feet
Overflow Weir Gate Slope =	0.00	N/A	H:V
Horiz. Length of Weir Sides =	3.00	N/A	feet
Overflow Gate Type =	Type C Gate	N/A	
Debris Clogging % =	50%	N/A	%

Calculated Parameters for Overflow Weir

	Zone 3 Weir	Not Selected	
Height of Gate Upper Edge, H ₁ =	6.40	N/A	feet
Overflow Weir Slope Length =	3.00	N/A	feet
Grate Open Area / 100-yr Orifice Area =	7.63	N/A	
Overflow Gate Open Area w/o Debris =	6.26	N/A	ft ²
Overflow Gate Open Area w/ Debris =	3.13	N/A	ft ²

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

	Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	2.50	N/A	ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter =	18.00	N/A	inches
Restrictor Plate Height Above Pipe Invert =	8.50		inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 3 Restrictor	Not Selected	
Outlet Orifice Area =	0.82	N/A	ft ²
Outlet Orifice Centroid =	0.41	N/A	feet
Half-Central Angle of Restrictor Plate on Pipe =	1.52	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage =	7.50	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	18.00	feet
Spillway End Slopes =	4.00	H:V
Freeboard above Max Water Surface =	1.00	feet

Calculated Parameters for Spillway

Spillway Design Flow Depth =	0.89	feet
Stage at Top of Freeboard =	9.39	feet
Basin Area at Top of Freeboard =	0.67	acres
Basin Volume at Top of Freeboard =	3.46	acre-ft

Routed Hydrograph Results

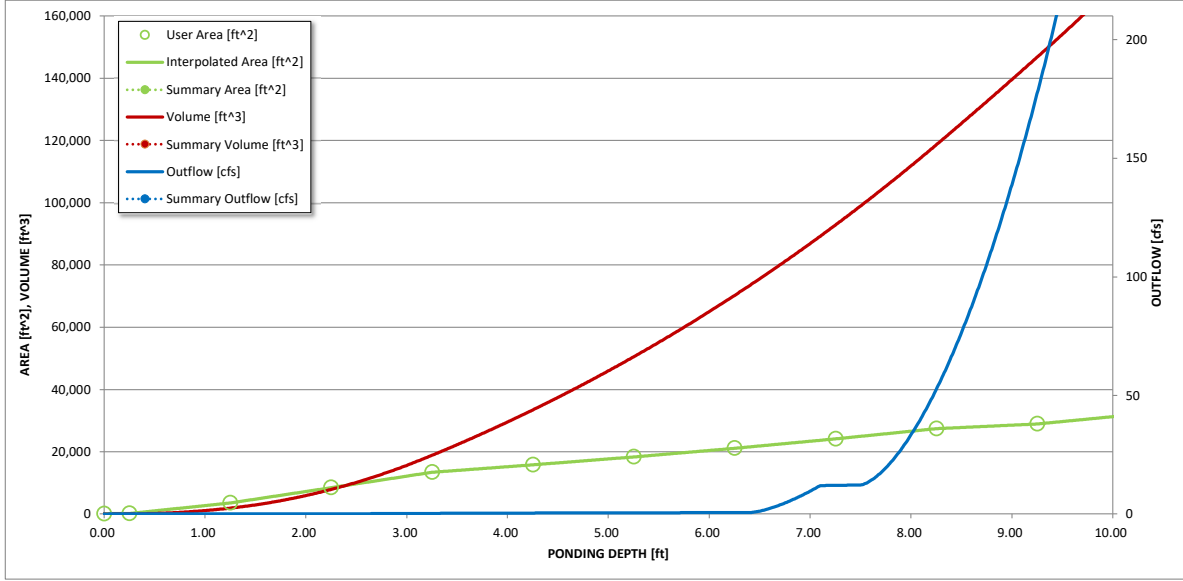
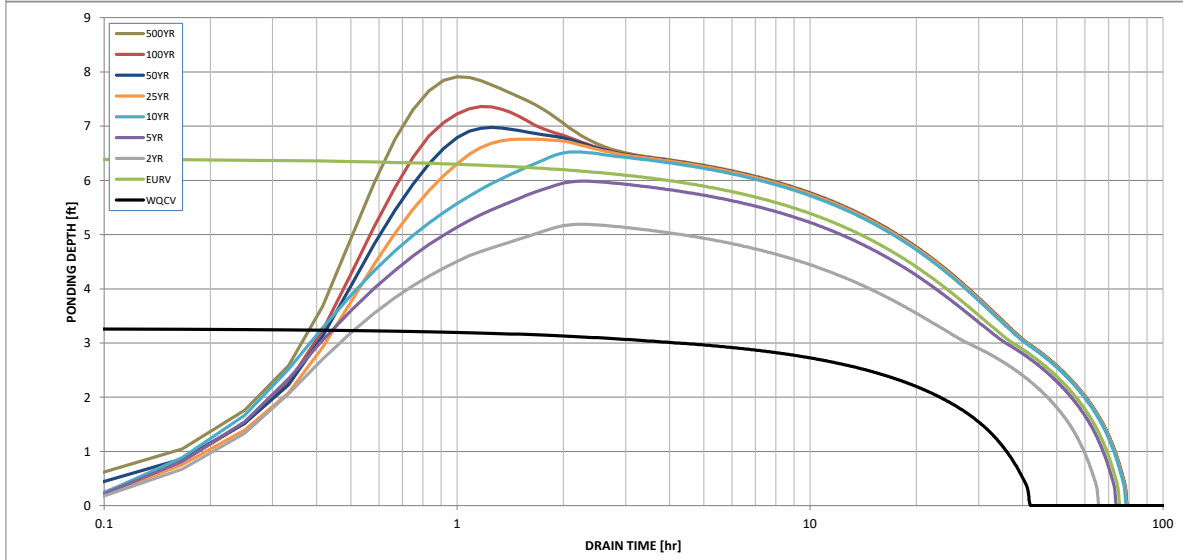
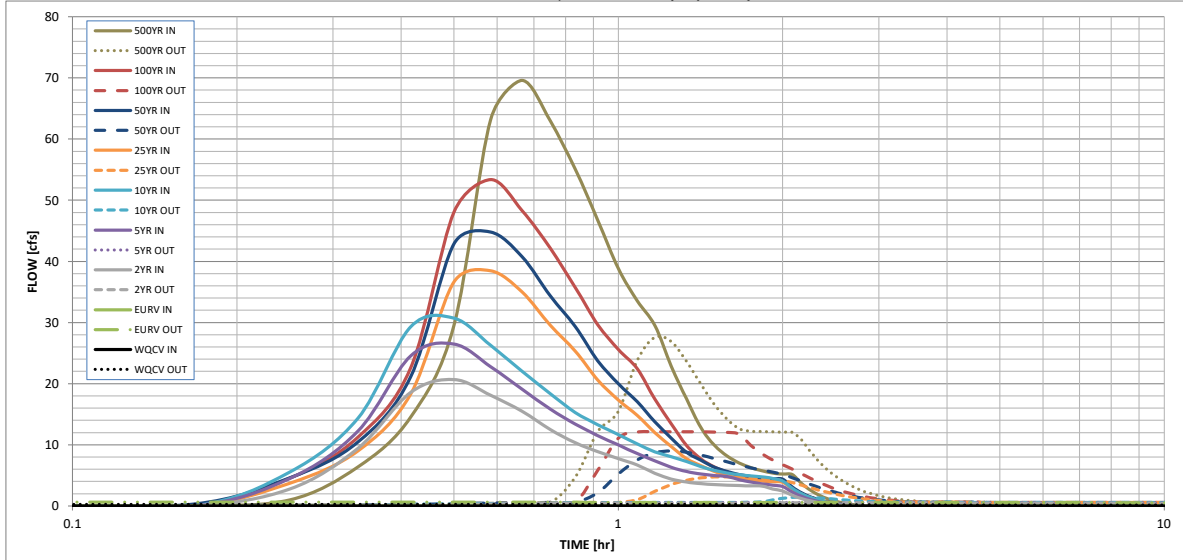
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Design Storm Return Period =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.14
One-Hour Rainfall Depth (in) =	N/A	N/A	1.208	1.572	1.863	2.233	2.582	2.997	3.911
CUHP Runoff Volume (acre-ft) =	0.437	1.684	1.208	1.572	1.863	2.233	2.582	2.997	3.911
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	1.208	1.572	1.863	2.233	2.582	2.997	3.911
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.1	0.3	0.4	4.1	7.3	11.3	19.9
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A	1.1	2.9	5.9	10.1	13.7	17.6	
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.06	0.16	0.33	0.57	0.77	0.99	1.12
Peak Inflow Q (cfs) =	N/A	N/A	20.7	26.5	30.7	38.4	44.8	53.4	69.6
Peak Outflow Q (cfs) =	0.3	0.6	0.5	0.6	1.4	4.7	9.0	12.2	27.5
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.2	0.2	0.5	0.7	0.7	1.4
Structure Controlling Flow =	Plate	Overflow Weir 1	Plate	Plate	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Spillway
Max Velocity through Gate 1 (fps) =	N/A	N/A	N/A	N/A	0.1	0.7	1.3	1.8	1.9
Max Velocity through Gate 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) =	38	66	58	65	69	68	66	65	62
Time to Drain 99% of Inflow Volume (hours) =	40	71	62	69	74	73	73	72	71
Maximum Ponding Depth (ft) =	3.27	6.40	5.19	5.98	6.52	6.76	6.97	7.36	7.91
Area at Maximum Ponding Depth (acres) =	0.31	0.49	0.42	0.47	0.50	0.52	0.53	0.56	0.60
Maximum Volume Stored (acre-ft) =	0.438	1.685	1.130	1.483	1.745	1.862	1.978	2.187	2.507

PREDEVELOPMENT PEAK FLOWS WERE CALCULATED FOR THE DEVELOPED CONDITIONS TRIBUTARY BASINS FOR POND A WITH EXISTING CONDITIONS LAND USES TO MORE ACCURATELY CALCULATE THE 'RATIO PEAK OUTFLOW TO PREDEVELOPMENT Q'. COLORADO SPRINGS DCM VOL. 1 IDF CURVE AND EL PASO COUNTY LAND USE COEFFICIENTS WERE USED. 500-YEAR EVENT RATIO CAN BE IGNORED AS THERE ARE NO IDF PARAMETERS FOR 500-YEAR EVENTS.

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)



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

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename: _____

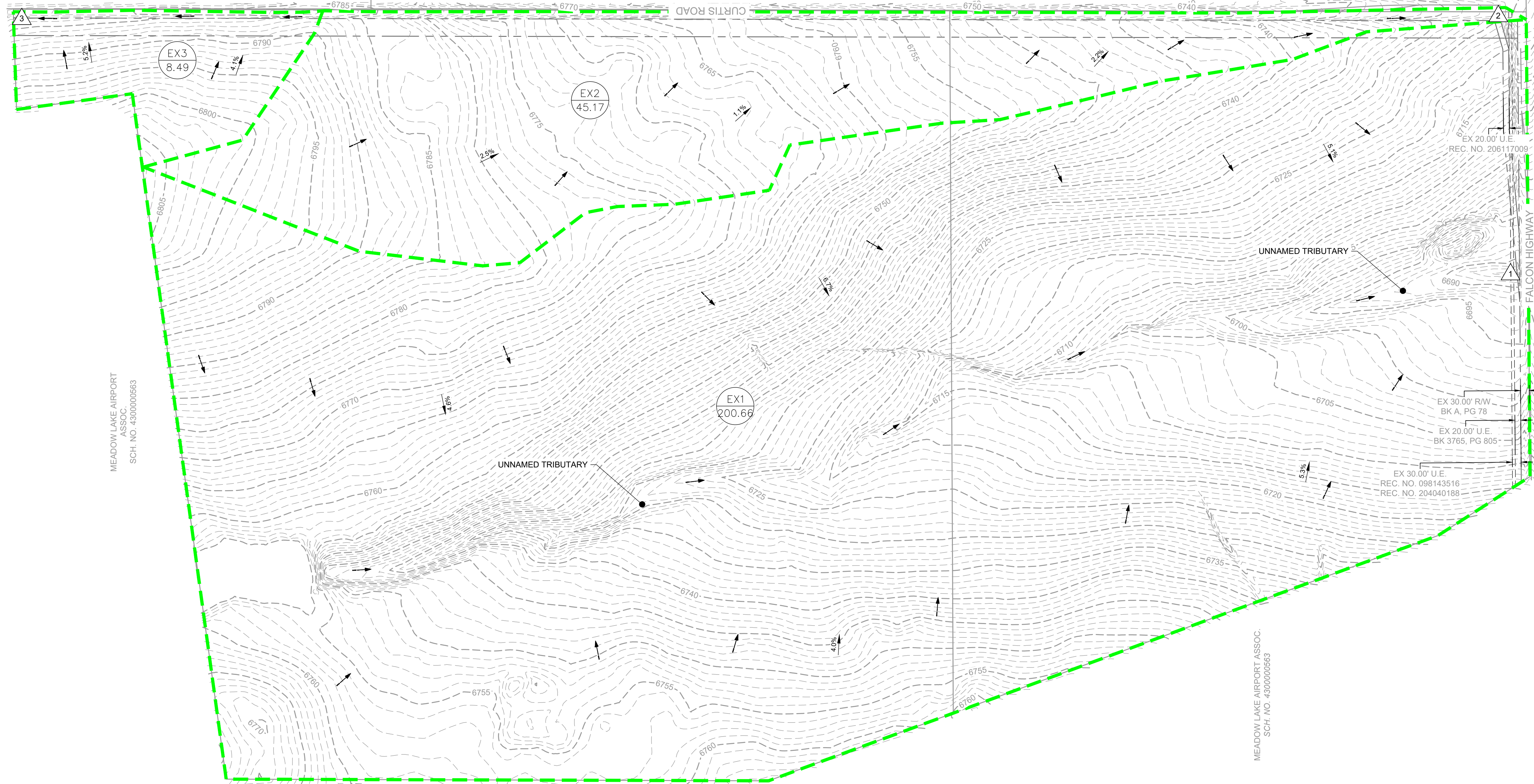
Inflow Hydrographs

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

Time Interval	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.31	0.03	1.00
	0:15:00	0.00	0.00	2.75	4.48	5.55	3.72	4.60	4.53	6.38
	0:20:00	0.00	0.00	9.43	12.25	14.35	9.01	10.45	11.24	14.55
	0:25:00	0.00	0.00	18.57	24.55	29.30	18.32	21.11	22.60	29.52
	0:30:00	0.00	0.00	20.69	26.47	30.70	36.61	42.87	48.03	63.23
	0:35:00	0.00	0.00	18.09	22.77	26.25	38.43	44.78	53.38	69.60
	0:40:00	0.00	0.00	15.47	19.11	22.00	34.98	40.75	48.31	62.98
	0:45:00	0.00	0.00	12.52	15.84	18.38	29.58	34.37	42.19	55.10
	0:50:00	0.00	0.00	10.33	13.41	15.30	25.34	29.35	35.76	46.79
	0:55:00	0.00	0.00	8.89	11.50	13.30	20.60	23.77	29.67	38.82
	1:00:00	0.00	0.00	7.75	9.97	11.66	17.34	19.98	25.60	33.55
	1:05:00	0.00	0.00	6.69	8.57	10.13	14.79	17.03	22.45	29.53
	1:10:00	0.00	0.00	5.35	7.39	8.86	12.00	13.76	17.46	22.84
	1:15:00	0.00	0.00	4.40	6.32	8.04	9.72	11.08	13.46	17.50
	1:20:00	0.00	0.00	3.91	5.63	7.28	7.74	8.78	9.89	12.80
	1:25:00	0.00	0.00	3.64	5.24	6.42	6.60	7.47	7.71	9.92
	1:30:00	0.00	0.00	3.49	4.97	5.83	5.63	6.35	6.38	8.14
	1:35:00	0.00	0.00	3.40	4.80	5.40	4.98	5.62	5.53	7.02
	1:40:00	0.00	0.00	3.33	4.28	5.11	4.55	5.13	4.96	6.25
	1:45:00	0.00	0.00	3.28	3.90	4.90	4.28	4.81	4.58	5.74
	1:50:00	0.00	0.00	3.25	3.62	4.76	4.08	4.59	4.32	5.39
	1:55:00	0.00	0.00	2.78	3.42	4.51	3.96	4.45	4.18	5.21
	2:00:00	0.00	0.00	2.43	3.17	4.06	3.88	4.36	4.13	5.15
	2:05:00	0.00	0.00	1.72	2.25	2.87	2.75	3.09	2.93	3.65
	2:10:00	0.00	0.00	1.19	1.55	1.99	1.91	2.15	2.05	2.55
	2:15:00	0.00	0.00	0.81	1.06	1.37	1.32	1.48	1.42	1.76
	2:20:00	0.00	0.00	0.54	0.69	0.91	0.88	0.99	0.95	1.18
	2:25:00	0.00	0.00	0.34	0.45	0.59	0.58	0.65	0.62	0.77
	2:30:00	0.00	0.00	0.20	0.29	0.37	0.37	0.42	0.40	0.50
	2:35:00	0.00	0.00	0.11	0.16	0.20	0.21	0.24	0.23	0.28
	2:40:00	0.00	0.00	0.04	0.07	0.09	0.10	0.11	0.10	0.13
	2:45:00	0.00	0.00	0.01	0.02	0.02	0.03	0.03	0.03	0.03
	2:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
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	3:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
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	3:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
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	4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
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	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
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	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
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	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
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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 – DRAINAGE MAPS



BASIN	AREA (ac)	% IMPERVIOUS	Q _s (cfs)	Q ₁₀₀ (cfs)
EX1	200.66	2	18.9	126.8
EX2	45.17	6	5.1	26.7
EX3	8.49	2	1.5	9.8

DESIGN POINT	CONTRIBUTING BASINS	ΣQ _s (cfs)	ΣQ ₁₀₀ (cfs)
1	EX1	18.9	126.8
2	EX2	5.1	26.7
3	EX3	1.5	9.8

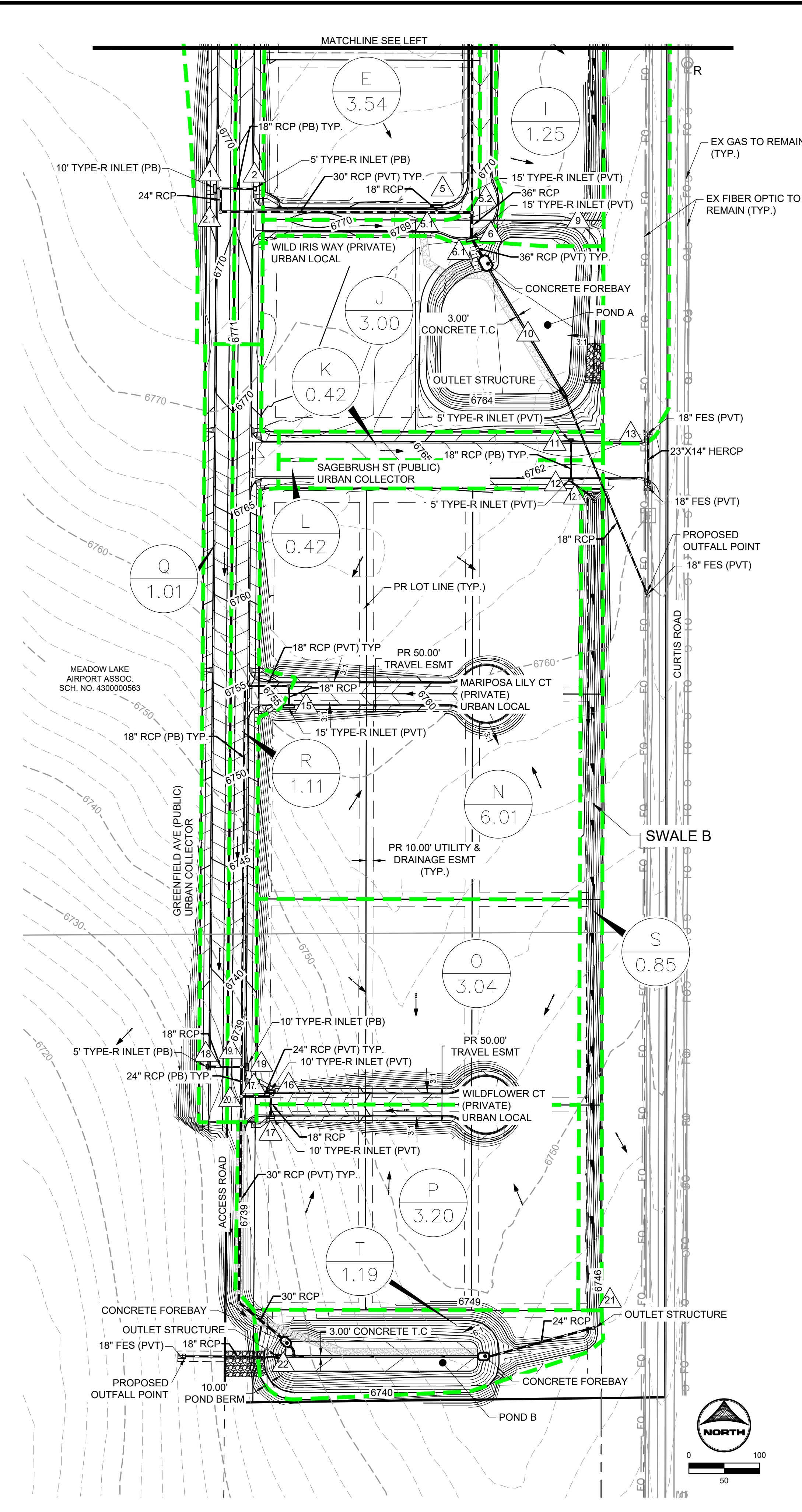
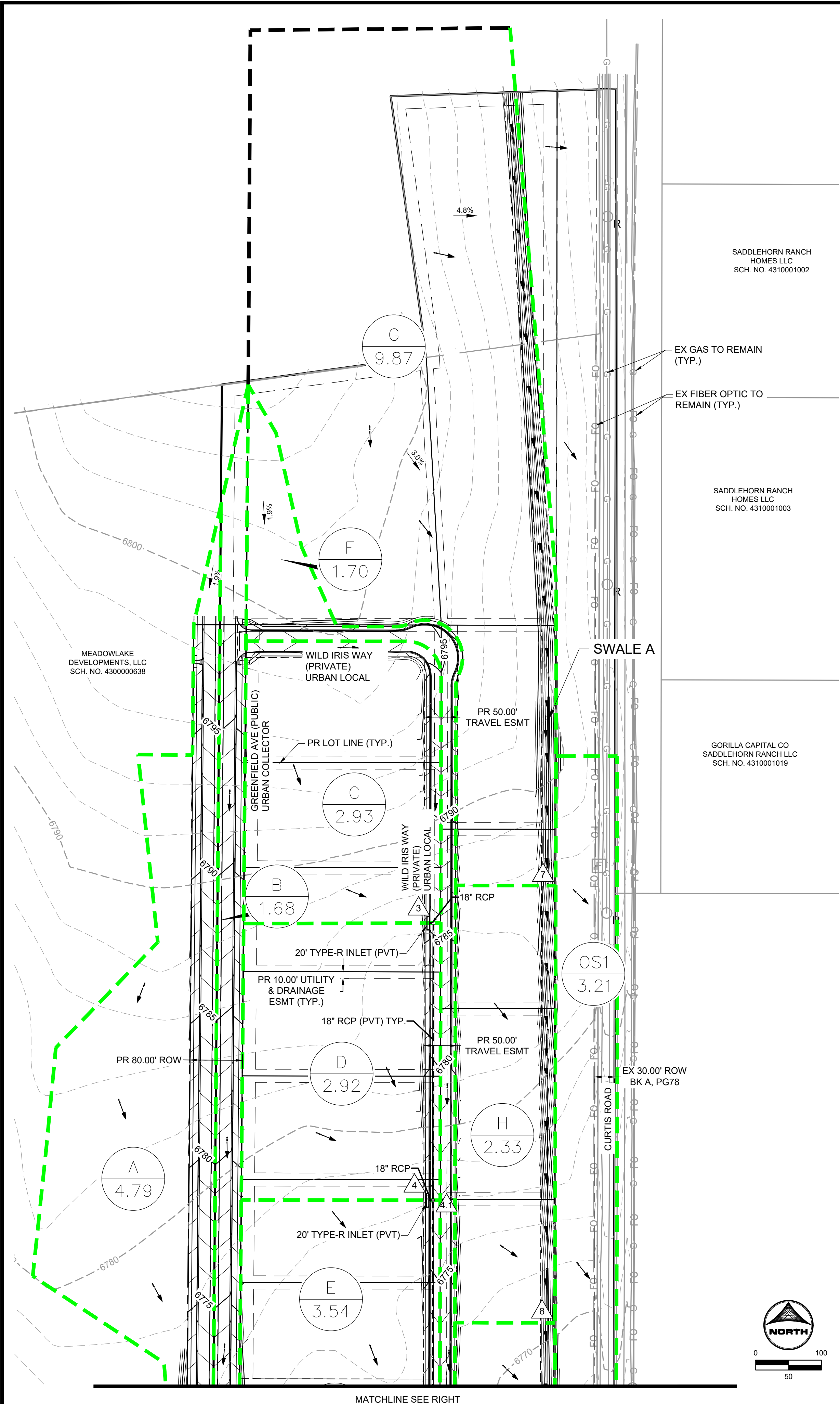
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BOBCAT MEADOWS PUBLIC FACILITIES TRUST SCH. NO. 4316001031	JEANNEL & CONNIE L WARNER SCH. NO. 4316000004	GARY L HANEY SCH. NO. 4316001012	MIGUELE & ANA P. GUERRA SCH. NO. 4316001034
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MEADOW LAKE INDUSTRIAL FILING NO. 1

Job No.: 2202774
Prepared By: NQJ
Date: 8/24/2023

EX DRAINAGE MAP

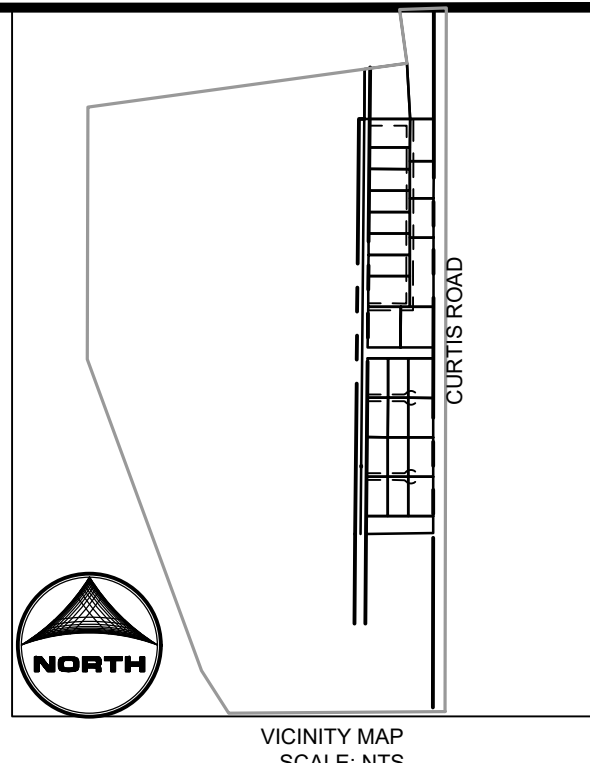


SUMMARY RUNOFF TABLE				
BASIN	AREA (ac)	% IMPERVIOUS	Q ₅ (cfs)	Q ₁₀₀ (cfs)
A	4.79	33	5.3	14.1
B	1.68	97	5.7	10.4
C	2.93	80	6.8	13.5
D	2.92	80	7.0	14.0
E	3.54	80	8.5	16.9
F	1.70	93	4.7	8.7
G	9.87	76	14.9	30.3
H	2.33	70	4.6	9.6
I	1.25	68	2.5	5.2
J	3.00	26	2.7	8.6
K	0.42	90	1.8	3.3
L	0.42	90	1.8	3.3
N	6.01	80	14.4	28.6
O	3.04	80	7.2	14.2
P	3.20	80	7.8	15.5
Q	1.01	96	4.0	7.6
R	1.11	96	3.2	6.2
S	0.85	2	0.3	1.7
T	1.19	4	0.4	2.4

DESIGN POINT SUMMARY TABLE			
DESIGN POINT	CONTRIBUTING BASINS	ΣQ ₅ (cfs)	ΣQ ₁₀₀ (cfs)
1	A	5.3	14.1
2	B	5.7	10.4
2.1	DP1,DP2	9.9	22.2
3	C	6.8	13.5
4	D	7.0	14.0
4.1	DP3,DP4	13.2	24.8
5	E	8.5	16.9
5.1	DP2.1,DP5	16.0	32.6
5.2	DP4.1,5.1	26.5	51.6
6	F	4.7	8.7
6.1	DP5.2,DP6	30.6	58.3
7	G	14.9	30.3
8	DP7,H	15.9	32.5
9	I,DP8	16.7	34.1
10	DP6.1,J	32.9	64.9
11	K	1.8	3.3
12	L	1.8	3.3
13	OS1	1.6	6.1
15	N	14.4	28.6
16	O	7.2	14.2
17	P	7.8	15.5
17.1	DP16,DP17	13.5	22.7
18	Q	4.0	7.6
19	DP15,DP16,R	6.3	17.1
21	DP12.1,S	2.5	59.6
22	DP20.1,DP21,T	30.3	68.9

LEGEND:

- PROPOSED MAJOR CONTOUR
- PROPOSED MINOR CONTOUR
- EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- PROPOSED STORM SEWER
- EXISTING DRAINAGE SWALE
- PROPOSED DRAINAGE SWALE
- PROPOSED FLOW DIRECTION
- EXISTING FLOW DIRECTION
- PROPOSED DRAINAGE BASIN
- PROPOSED BASIN LABEL
- DESIGN POINT



DRAWN BY: AB/DH JOB DATE: 8/25/2023 BAR IS ONE INCH ON OFFICIAL DRAWINGS.
 APPROVED: CM JOB NUMBER: 2202774 0" = 1"
 CAD DATE: 8/25/2023 IF NOT ONE INCH, ADJUST SCALE ACCORDINGLY.
 CAD FILE: J:\2022\2202774\CAD\DWG\CIDrainage\Pr_Drainage_Map

NO.	DATE	BY	REVISION DESCRIPTION

HRGreen
 HR GREEN - COLORADO SPRINGS
 1975 RESEARCH PARKWAY SUITE 230
 COLORADO SPRINGS, CO 80920
 PHONE: 719.384.2440
 FAX: 719.965.0044

MEADOW LAKE INDUSTRIAL FILING NO. 1
 MEADOWLAKE DEVELOPMENTS, LLC
 EL PASO COUNTY, CO

DRAINAGE MAPS
 PROPOSED DRAINAGE MAP