Matheson Holdings
6925 & 6981 E. 54th Place

PRELIMINARY DRAINAGE REPORT

COMMERCE CITY, COLORADO

September, 2024

Prepared for:

Matheson Holdings
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Certifications

"I hereby certify that this preliminary study for the Matheson Holdings Development Project was prepared by me (or under my direct supervision) in accordance with the provisions of the City of Commerce City's Storm Drainage Design and Technical Criteria Manual for the owners thereof."

_____

Joe C. Coco, P.E.
Registered Professional Engineer
State of Colorado No. 33392
For and on behalf of CKE Engineering Inc

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I. GENERAL LOCATION AND DESCRIPTION:

Location:

The Matheson Holdings Development Project is located in the northeast ¼ of Section 17, Township 3 South, Range 67 West of the Sixth Principal Meridian, City of Commerce City, County of Adams, State of Colorado (ref: Vicinity Map located in Appendix A). The site encompasses Tract 18 Kemp Subdivision, and approximately 19' of the east perimeter of Tract 17 Kemp Subdivision. The site is bounded by BC Concrete, and Cargo RX industrial sites to the north; Suntec Concrete industrial site to the east, E. 54th Place to the south, and the existing Matheson Industrial facility site to the west.

There are no major drainage ways, drainage and/or water quality facilities on or adjacent to this site. Additionally, there are no drainage and/or water quality facilities that serve this site.

Property Description:

The site is approximately 1.15 acres in size and currently developed. The site is currently fenced and used to park semi-trucks and/ or equipment for the adjacent Matheson Industrial site to the west.

There is sparse vegetation along the north and east perimeter of the property, with the remainder of the site being bare ground. There are no trees or shrubs on-site.

There are no major or minor drainageways located on or adjacent to this site.

Proposed Project:

The proposed project is to provide an outdoor storage yard on-site and construct a water quality/ stormwater detention pond to serve the improvements. As part of the project, the proposed surface for the outdoor storage yard and site access points is road base or gravel. The drainage calculations provided in this report have been determined with the access points and outdoor storage yard under paved conditions. This will ensure the site and the water quality/ stormwater detention facility and conveyance elements on-site are properly sized in the event the site is paved in the future.

On-site Soils are predominantly Truckton Sandy Loam (0%-3%), and Truckton Sandy Loam (5%-9%) as determined by U.S. Department of Agriculture Soil Conservation Service. The existing on-site soils are sandy loams. These soils exhibit properties characteristic of Hydrologic Type A soils. Refer to the SCS Soils Map located in Appendix A.

Groundwater was not reached in the project soil borings. Infiltration based stormwater practices will not used as part of this project.

There are no irrigation facilities located on or adjacent to the site.

The existing site does not have a history of flooding. Additionally, the site in not located in the 100-year floodplain (Zone X) of Sand Creek as designated by the FEMA FIRM Flood Insurance Rate Map 08001C0616H dated March 5, 2007.

Existing easements on-site consist of utility easements along the property boundary of Tract 18 as noted on the Drainage Map. A Drainage easement will be provided for the proposed water quality/ stormwater detention facility on-site.

There are not any contaminated soils on or adjacent to this property.

There are no wetlands located on-site.

II. DRAINAGE BASINS AND SUB-BASINS:

Major Drainage Basins

The site is located in the Sand Creek Major Drainage Basin. Sand Creek is located approximately 2000 feet southwest of the site.

The Sand Creek Basin captures predominantly residential and industrial properties in the local Commerce City area. Sand Creek extends southeast through Denver, the City of Aurora, and Arapahoe and Douglas Counties.

The site is not located in the Flood Area Delineation Report (FHAD) for Sand Creek.

The small magnitude of the proposed project has no impact on the Major Drainageway Planning Studies for Sand Creek.

There are no irrigation facilities with 100 feet of the property, and there are no outfalls to Sand Creek on or adjacent to this site.

Sub-Basins

In general, the site slopes from east to west at approximately 2%-3%, with maximum slopes of 25% at the north and east perimeters of the site. A small portion of the north perimeter of the site drains off-site to the north. The majority of the site drains off-site into the Matheson Industrial Building site to the west where flows are captured by storm sewer and conveyed to the E. 54th Place storm sewer system. The southerly 1/3 of the site drains west and south via overland flow into E. 54th Place where flows are captured at an existing inlet in the north curb of E. 54th Place. Flows are then conveyed west in the E. 54th Place storm sewer system. Refer to the existing basin descriptions in the Drainage Facilities Design section of this report for specific details.

Proposed drainage patterns will follow the same general drainage patterns discussed under existing conditions. Dus to grading constraints, a portion of the northern perimeter of the site will continue to drain off-site to the north. The majority of the site will drain from northeast to southwest and conveyed into the proposed water quality/ stormwater detention facility adjacent to E. 54th Place. A portion of the 54th Place frontage will continue to drain south into E. 54th Place. Due to the addition of a water quality/ stormwater detention facility on-site, the impacts of development will be minimal. Refer to the proposed basin descriptions in the Drainage Facilities Design section of this report for specific details.

Water quality and stormwater detention will be provided on-site in the form of full spectrum detention. As such, exemptions for stormwater detention, and conditions for the 20/10 rule do not apply.

Off-site Basins

There are not any off-site basins that drain on-site.

III. DRAINAGE DESIGN CRITERIA:

Development Criteria and Constraints

There not any existing Drainage Reports or Studies that have been located for this property.

There are not any impacts to the drainage with respect to streets, utilities, ditches, existing structures, and the proposed site plan.

Regulations

The basis for this Drainage Study is the City of Commerce City Storm Drainage Design and Technical Criteria Manual, August 2024 (CCSDDTCM), and the most recent Mile High Flood District's (MHFD) Storm Drainage Criteria Manual.

Hydrologic Criteria

Rainfall data for the minor 5-year storm event and the major 100-year storm event were used in the calculations. One hour point rainfall depth (P1) of 1.12 inches for the 5-year storm event and 2.43 inches for the 100-year storm event were used per Table 5-3 of the City of Commerce City Storm Drainage Design and Technical Criteria Manual.

On-site soils exhibit the characteristics of Hydrologic Type A soils.

Imperviousness for all basins was calculated based on the Mile High Flood District's (MHFD) Storm Drainage Criteria Manual.

Peak runoff flows for all basins (existing and developed) was calculated using the Rational Method.

Full spectrum detention and detention discharge were determined based on the Mile High

Flood District's (MHFD) Storm Drainage Criteria Manual.

Refer to the drainage basin descriptions in the Drainage Facilities Design section of this report for specific results and peak discharge rates for each sub-basin.

Hydraulic Criteria

Open channel flow and flow characteristics were analyzed utilizing the Manning's Formula.

Storm sewer will be sized based on full flowing conditions per the Manning's Formula.

Refer to the storm sewer descriptions in the Drainage Facilities Design section of this report for specific results.

Stormwater Quality

The project will have its own storm sewer outfall to the E 54th Place storm sewer system satisfying the MS4 permit.

Water quality will be achieved within the proposed full spectrum EDB on-site. This will satisfy the MS4 post-construction requirements.

There is not a building, asphalt, or concrete being constructed as part of this project. As such, the project meets MDCIA requirements.

IV. DRAINAGE FACILITY DESIGN:

General Concepts

The general drainage concepts and typical drainage patterns are described in the Sub-Basin Descriptions in the Drainage Basins and Sub-Basins section of this report.

There are no off-site runoff considerations as part of this project.

Specific Details - Basin Descriptions

Basins EX1, EX2, and EX3 are existing on-site basins described as follows.

Basin EX1 is the majority of the existing site which flows via overland flow west into the Mattheson Industrial site to the west (Design Point 3). Runoff is captured by storm sewer on the adjacent site and conveyed to the E.54th Place storm sewer. Basin EX1 is approximately 0.65 acres, 2% impervious, and has a time of concentration T(c) of 5.0 minutes. Basin EX1 has a peak runoff of 0.01 cfs in the 5-year storm event and 0.68 cfs in the 100-year storm event.

Basin EX2 is the southerly portion of the existing site which flows via overland flow west and south into E. 54th Place and captured by the existing storm inlet in E. 54th Place (Design Point 1). Basin EX2 is approximately 0.44 acres, 4% impervious, and has a time of concentration T(c) of 5.0 minutes. Basin EX2 has a peak runoff of 0.03 cfs in the 5-year storm event and 0.52 cfs in the 100-year storm event.
EX3 is the northern perimeter of the site which flows off-site to the north (Design Point 4. Basin EX3 is approximately 0.05 acres, 2% impervious, and has a time of concentration T(c) of 5.0 minutes. Basin EX3 has a peak runoff of 0.00 cfs in the 5-year storm event and 0.05 cfs in the 100-year storm event.

Basins A-D are proposed on-site basins described as follows.

Basin A is the majority of the site encompassing the storage yard and the water quality/ stormwater detention facility. The site drains via overland flow from northeast to southwest to the water quality/ stormwater detention facility at Design Point 2 where runoff is treated and detained. Discharge from the water quality/ stormwater detention facility drains via storm sewer to the back of the existing inlet in the north curb of E. 54th Place at Design Point 1. Basin A is approximately 0.98 acres, 81% impervious, and has a time of concentration T(c) of 5.0 minutes. Basin A has a peak runoff of 2.44 cfs in the 5-year storm event and 5.98 cfs in the 100-year storm event.

Basin B is the east site access from E. 54th Place, and the southerly perimeter of the site that drains directly into E. 54th Place. Runoff from Basin B is conveyed south via overland flow into E. 54th Place, and is conveyed in the north curb of E. 54th Place to the existing storm sewer inlet at Design Point 1. Basin B is approximately 0.09 acres, 62% impervious, and has a time of concentration T(c) of 5.0 minutes. Basin B has a peak runoff of 0.17 cfs in the 5-year storm event and 0.46 cfs in the 100-year storm event.

Basin C is the west landscape perimeter and the west access into the site from the existing Matheson Industrial Building site to the west. Runoff is conveyed via overland flow west to the existing storm inlets in the Matheson Industrial Building site (Design Point 3) and is conveyed by storm sewer to the E. 54th Place storm sewer system. Basin C is approximately 0.05 acres, 35% impervious, and has a time of concentration T(c) of 5.0 minutes. Basin C has a peak runoff of 0.04 cfs in the 5-year storm event and 0.16 cfs in the 100-year storm event.

Basin D is the north landscape perimeter of the site that drains off-site to the property to the north. Runoff is conveyed via overland flow off-site at Design Point 4. Basin D is approximately 0.02 acres, 2% impervious, and has a time of concentration T(c) of 5.0 minutes. Basin D has a peak runoff of 0.00 cfs in the 5-year storm event and 0.02 cfs in the 100-year storm event.

Discharge from the Site:

The overall discharge from the existing site is 0.04 cfs in the 5-year storm event and 1.25 cfs in the 100-year storm event (Basins EX1, EX2, EX3). The overall discharge under proposed conditions is 0.21 cfs in the 5-year storm event and 1.14 cfs in the 100-year storm event (Basins B, C, D, and Detention Pond Release). This results in an increase of 0.17 cfs in the 5-year storm event and a decrease of 0.11 cfs in the 100-year storm event.

North:

Basin EX3 is the existing basin that discharges off-site to the north. Basin EX3 results in a 5-year runoff of 0.00 cfs and a 100- year runoff of 0.05 cfs. Basin D is the proposed basin that discharges off-site to the north. Basin D results in 0.00 cfs in the 5-year storm event and 0.02 cfs in the 100-year storm event. This result in no change in the 5-year storm event, and a reduction in runoff of 0.02 cfs in the 100-year storm event.

South:

Basin EX2 is the existing basin that discharges off-site into E. 54th Place to the south. Basin EX2 results in a 5-year runoff of 0.03 cfs and a 100- year runoff of 0.52 cfs. Basin B is the proposed basin that discharges off-site into E. 54th Place to the south. Basin B results in 0.17 cfs in the 5-year storm event and 0.46 cfs in the 100-year storm event. This result in an

increase in runoff of 0.14 cfs in the 5-year storm event, and a reduction in runoff of 0.06 cfs in the 100-year storm event.

West:
Basin EX1 is the existing basin that discharges off-site into the Matheson Industrial Building site to the west. Basin EX1 results in a 5-year runoff of 0.01 cfs and a 100- year runoff of 0.68 cfs. Basin C is the proposed basin that discharges off-site into the Matheson Industrial Building site to the west. Basin C results in 0.04 cfs in the 5-year storm event and 0.16 cfs in the 100-year storm event. This result in an increase in runoff of 0.03 cfs in the 5-year storm event, and a reduction in runoff of 0.52 cfs in the 100-year storm event.

Stormwater Detention/Water Quality
A full spectrum detention facility is being provided at Design Point 2 at the low point of the site adjacent to E. 54th Place. Basin A drains to this facility to be treated and detained. Basin A is 0.98 acres in size and 81% impervious. The proposed project is to provide road base or gravel in the outdoor storage yard. The proposed full spectrum facility has been sized in the event that the outdoor storage yard is paved in the future.

The proposed Water Quality Capture Volume is 0.027 ac-ft. The EURV + Water Quality Volume results in 0.105 ac-ft and the 100-year Volume results in a total of 0.131 ac-ft. The resulting EURV and 100-year stage in the proposed facility is 5222.64 and 5222.93 respectively. The Outlet structure has been set above the anticipated EURV storage volume at an elevation of 5222.80 and the emergency overflow weir has been set above the anticipated 100-year storage volume at an elevation of 5223.20. These freeboards have been provided to account for construction tolerance of the outlet structure as well as the proposed facility to provide the required storage volumes in the as-built facility.

The 100-year release from the proposed water quality/ detention facility is 0.5 cfs as determined by the Mile High Flood District's Detention Basin Design Spreadsheet.

This facility will discharge to the back of the existing storm sewer inlet in the north curb of E. 54th Place (Design Point 1).

Please refer to the Hydrologic Calculations in Appendix B.

Emergency Overflow

Emergency overflow has been provided at the detention facility in the form of a weir and riprap spillway on the south side of the facility. The weir has been sized to pass the 100-year developed inflow from the tributary area of the facility, plus 0.5 feet of freeboard above the water surface flowing over the weir. Flows discharge over the emergency overflow weir down a riprap spillway to the existing storm sewer inlet in the north curb of E. 54th Place at Design Point 1.

The weir has been sized to pass 5.98 cfs with a weir length of 10'. The emergency overflow weir has been set above the anticipated 100-year storage volume at an elevation of 5223.20. The resulting water surface over the emergency overflow weir is 5023.50, and the minimum top of bank elevation for the facility is 5224.00.

Swales

Swale A is located on the west side of the site conveying runoff from Basin A to the water quality/ stormwater detention facility at Design Point 2. Swale A conveys a maximum of 5.98 cfs in the 100-year storm event. Please refer to the Swale Calculations in Appendix C.

Inlets and Storm Sewer

All storm sewer and inlets have been sized to capture and convey the 100-year storm event without flooding.

Storm Sewer Line A is the detention pond outfall storm sewer at Design Point 2 to the site outfall at Design Point 1. Storm Sewer Line A is 18" RCP and conveys 0.50 cfs in the 100-year storm event.

Please refer to the storm sewer calculations located in Appendix C of this report.

Access and Maintenance

The proposed full spectrum detention must be maintained regularly including but not limited to mowing of the facility, removing debris, verifying the outlet structure operates properly, repairing and/or replacing broken or non-working features of the facility. Please refer to the Operations and Maintenance Manual for the specific maintenance/ inspection

operations and frequencies for the proposed drainage facilities on-site.

NOTE: AT A MINIMUM, ANNUAL INSPECTIONS OF STORMWATER MANAGEMENT FACILITIES WILL BE CONDUCTED AND THE PROPERTY OWNER (MATHESON INDUSTRIAL) SHALL CONDUCT THESE INSPECTIONS.

THE OWNER SHALL MAINTAIN THE STORMWATER MANAGEMENT FACILITY RECORDS FOR A MINIMUM OF THREE (3) YEARS.

Maintenance of the on-site drainage facilities (storm sewer, water quality/ detention pond, etc.) is the responsibility of the property owner. However, a drainage easement will be dedicated to Commerce City to access and inspect these facilities in the event of emergency or lack of maintenance by the property owner.

VI. SUMMARY AND CONCLUSIONS:

Compliance with Standards

The purpose of this Drainage Report was to develop a stormwater management system for the proposed site. This report is in compliance with the City of Commerce City Storm Drainage Design and Technical Criteria Manual, August 2024 (CCSDDTCM), and the most recent Mile High Flood District's (MHFD) Storm Drainage Criteria Manual.

This proposed project complies with the Commerce City's Colorado Discharge Permit System (CDPS) MS4 permit through the use of the full spectrum detention facility on-site.

The proposed project is in compliance with Commerce City and Federal Emergency Management Agency (FEMA) floodplain rules and regulations.

Drainage Concept

The drainage design will control damage from stormwater runoff utilizing structural BMP's and mechanisms to safely convey runoff from the designed storm events to the full spectrum detention facility and to the site outfall while providing water quality and stormwater detention on-site.

The proposed stormwater management plan for this project complies with the FHAD, Outfall System Plans (OSP), and Master Drainage Plans for the Sand Creek Basin.

The drainage impact of the proposed development on upstream and downstream properties will be reduced. Due to grading activities, less area is draining off-site on to adjacent properties. With the addition of the full spectrum detention facility on-site, the overall release from the site has been reduced improving the impact on the existing downstream infrastructure.

Water Quality

The project tis in compliance with the construction and post-construction requirements in Commerce City's MS4 Permit. A Stormwater Management Plan (SWMP) is required for this project for construction activities for stormwater discharge. With the addition of a full spectrum detention facility on-site, improving water quality, an operations and Maintenance Manual is required for the structural permanent BPM's on site.

VII. REFERENCES

1. City of Commerce City Storm Drainage Design and Technical Criteria Manual 2024, Commerce City, Colorado.

2. Mile High Flood District Storm Drainage Criteria Manuals, Mile High Flood District (latest edition).

3. FEMA FIRM Flood Insurance Rate Map, Map No 08001C0616H dated March 5, 2007.

4. Web Soil Survey, Soil Survey of the Adams County Area, NRCS, US Department of Agriculture.

APPENDIX A

VICINITY MAP
SCS SOILS MAP
FAME FIRM MAP

VICINITY MAP

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

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

Custom Soil Resource Report for Adams County Area, Parts of Adams and Denver Counties, Colorado

September 13, 2024

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require

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Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Map Scale: 1:528 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 5 10 20 30

Feet
0 25 50 100 150

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

MAP LEGEND

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

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

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

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

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: Adams County Area, Parts of Adams and Denver Counties, Colorado
Survey Area Data: Version 20, Aug 24, 2023

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

Date(s) aerial images were photographed: Mar 1, 2023—Sep 1, 2023

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background

MAP LEGEND

MAP INFORMATION

imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
TuB	Truckton sandy loam, 0 to 3 percent slopes	0.2	19.7%
TuD	Truckton sandy loam, 5 to 9 percent slopes	1.0	80.3%
Totals for Area of Interest		**1.2**	**100.0%**

Map Unit Descriptions

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

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

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

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however,

onsite investigation is needed to define and locate the soils and miscellaneous areas.

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

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

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

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

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

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

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

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

Adams County Area, Parts of Adams and Denver Counties, Colorado

TuB—Truckton sandy loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2yvrf
Elevation: 4,600 to 6,100 feet
Mean annual precipitation: 12 to 17 inches
Mean annual air temperature: 46 to 52 degrees F
Frost-free period: 125 to 155 days
Farmland classification: Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60

Map Unit Composition

Truckton and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Truckton

Setting

Landform: Interfluves, terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Wind re-worked alluvium derived from arkose

Typical profile

A - 0 to 6 inches: sandy loam
Bt1 - 6 to 10 inches: sandy loam
Bt2 - 10 to 16 inches: sandy loam
C - 16 to 80 inches: loamy coarse sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 1 percent
Maximum salinity: Nonsaline to very slightly saline (0.1 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 4.6 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: A
Ecological site: R067BY024CO - Sandy Plains
Hydric soil rating: No

Minor Components

Bresser

Percent of map unit: 4 percent
Landform: Interfluves, terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R067BY024CO - Sandy Plains
Hydric soil rating: No

Vona

Percent of map unit: 4 percent
Landform: Dunes, hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex, linear
Across-slope shape: Convex, linear
Ecological site: R067BY015CO - Deep Sand
Hydric soil rating: No

Blakeland

Percent of map unit: 3 percent
Landform: Interfluves, hills
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Convex, linear
Ecological site: R067BY015CO - Deep Sand
Hydric soil rating: No

Pleasant, frequently ponded

Percent of map unit: 2 percent
Landform: Closed depressions
Down-slope shape: Concave, linear
Across-slope shape: Concave
Ecological site: R067BY010CO - Closed Depression
Hydric soil rating: Yes

Urban land

Percent of map unit: 2 percent
Hydric soil rating: No

TuD—Truckton sandy loam, 5 to 9 percent slopes

Map Unit Setting

National map unit symbol: 2yvrh
Elevation: 4,700 to 6,100 feet
Mean annual precipitation: 12 to 17 inches
Mean annual air temperature: 46 to 52 degrees F

Frost-free period: 125 to 155 days
Farmland classification: Not prime farmland

Map Unit Composition

Truckton and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Truckton

Setting

Landform: Hills, interfluves
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex, linear
Across-slope shape: Linear
Parent material: Wind re-worked alluvium derived from arkose

Typical profile

A - 0 to 6 inches: sandy loam
Bt1 - 6 to 10 inches: sandy loam
Bt2 - 10 to 16 inches: sandy loam
C - 16 to 80 inches: loamy coarse sand

Properties and qualities

Slope: 5 to 9 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 1 percent
Maximum salinity: Nonsaline to very slightly saline (0.1 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 4.6 inches)

Interpretive groups

Land capability classification (irrigated): 6e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: A
Ecological site: R067BY024CO - Sandy Plains
Hydric soil rating: No

Minor Components

Vona

Percent of map unit: 5 percent
Landform: Dunes, hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex, linear
Across-slope shape: Convex, linear
Ecological site: R067BY015CO - Deep Sand
Hydric soil rating: No

Blakeland

Percent of map unit: 5 percent
Landform: Hills, interfluves
Landform position (two-dimensional): Shoulder, backslope, summit
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Convex, linear
Ecological site: R067BY015CO - Deep Sand
Hydric soil rating: No

Bresser

Percent of map unit: 3 percent
Landform: Interfluves
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R067BY024CO - Sandy Plains
Hydric soil rating: No

Urban land

Percent of map unit: 1 percent
Hydric soil rating: No

Pleasant, frequently ponded

Percent of map unit: 1 percent
Landform: Closed depressions
Down-slope shape: Concave, linear
Across-slope shape: Concave
Ecological site: R067BY010CO - Closed Depression
Hydric soil rating: Yes

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National Flood Hazard Layer FIRMette

FEMA

104°54'45"W 39°48'N

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

1:6,000

104°54'8"W 39°47'32"N

Basemap Imagery Source: USGS National Map 2023

Legend

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

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 / 17.5 Cross Sections with 1% Annual Chance / Water Surface Elevation
- Coastal Transect
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

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

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 9/13/2024 at 5:30 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

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

APPENDIX B

HYDROLOGIC COMPUTATIONS

RUNOFF CALCULATIONS

WEIGHTED C-VALUE CALCULATIONS

JOB NO: XXXXXXX
PROJECT: Matheson E. 54th Pl
DATE: 9/13/2024

Soil Type (A-D): **Soil Type: A**

BASIN	TOTAL AREA (AC)	TOTAL AREA (SF)	AREA LANDSCAPE (SF)	AREA PAVEMENT (SF)	AREA GRAVEL (SF)	AREA Roof Top (SF)	C2	C5	C10	C100	I (%)
A	0.98	42732	8369	34363	0	0	0.64	0.66	0.67	0.74	81%
B	0.09	4107	1574	2533	0	0	0.45	0.47	0.49	0.60	62%
C	0.05	2139	1415	724	0	0	0.22	0.23	0.24	0.38	35%
D	0.02	997	997	0	0	0	0.01	0.01	0.01	0.13	2%
Total	**1.15**	49975	12355	37620	0	0	0.59	0.60	0.62	0.70	76%
Exist Site											
EX1	0.65	28513	28513	0	0	0	0.01	0.01	0.01	0.13	2%
EX2	0.44	19251	18821	430	0	0	0.01	0.02	0.02	0.14	4%
EX3	0.05	2211	2211	0	0	0	0.01	0.01	0.01	0.13	2%
Total	**1.15**	49975	49545	430	0	0	0.01	0.01	0.01	0.13	3%

Surface	i
landscape	2%
gravel	40%
roof	90%
pavement	100%

STANSARD FORM SF-2

TIME OF CONCENTRATION

SUBDIVISION: The Workshop

CALCULATED BY: JCC DATE: 4/20/2016

SUB-BASIN DATA			INITIAL/OVERLAND TIME (t_i)			TRAVEL TIME (t_t)					t_c CHECK (URBANIZED BASINS)			FINAL t_c	REMARKS
DESIG:	C_5	AREA	LENGTH	SLOPE	t_i	LENGTH	SLOPE	K	VEL.	t_t	COMP.	TOT. LENGTH	tc=(L/180)+10		
		Ac	Ft	%	Min	Ft	%		FPS	Min	t_c	Ft	Min	Min	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	
A	0.66	0.98	23	6.0	2.1	313	2.6	20.0	3.22	1.6	3.7	336	11.9	5.0	
B	0.47	0.09	18	5.5	2.7	110	3.7	20.0	3.85	0.5	3.2	128	10.7	5.0	
C	0.23	0.05	20	5.0	4.1	0	0.0	20.0	0.00	0.0	4.1	20	10.1	5.0	
D	0.01	0.02	8	25.0	1.9	0	0.0	20.0	0.00	0.0	1.9	8	10.0	5.0	
EX1	0.01	0.65	9	12.0	2.6	212	2.6	10.0	1.61	2.2	4.8	221	11.2	5.0	
EX2	0.02	0.44	12	16.2	2.7	195	2.4	10.0	1.55	2.1	4.8	207	11.2	5.0	
EX3	0.01	0.05	15	5.0	4.5	11	2.2	10.0	1.48	0.1	4.6	26	10.1	5.0	

Conveyance Factors, K	
Heavy Meadow	2.5
Tillage/ Field	5
Short Pasture and Lawns	7
Nearly Bare Ground	10
Grassed Waterway	15
Paved Areas and Shallow Paved Swales	20

CALCULATED BY : JC
DATE: 9/13/2024
CHECKED BY: JC

STANDARD FORM SF-3
STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)

JOB NO: XXXXXXX
PROJECT: Matheson E. 54th Pl
DESIGN STORM: 5 Year

P1 = 1.12

BASIN	DESIGN POINT	DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
		AREA DESIGN	AREA (AC)	RUNOFF COEFF	t_c (MIN)	C * A (AC)	I IN/HR	Q (CFS)	t_c (MIN)	Σ (C * A) (AC)	I (IN/HR)	Q (CFS)	SLOPE (%)	STREET FLOW (CFS)	DESIGN FLOW (CFS)	SLOPE (%)	PIPE SIZE	LENGTH (FT)	VELOCITY (FPS)	t_t (MIN)	
	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
													X X	X X	X X	X X	X X	X X	X X	X X	XXXXX
A	2		0.98	0.66	5.0	0.64	3.80	2.44													
B	1		0.09	0.47	5.0	0.04	3.80	0.17													
C	3		0.05	0.23	5.0	0.01	3.80	0.04													
D	4		0.02	0.01	5.0	0.00	3.80	0.00													
EX1	3		0.65	0.01	5.0	0.00	3.80	0.01													
EX2	1		0.44	0.02	5.0	0.01	3.80	0.03													
EX3	4		0.05	0.01	5.0	0.00	3.80	0.00													

CALCULATED BY : JC
DATE: 9/13/2024
CHECKED BY: JC

STANDARD FORM SF-3
STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)

JOB NO: XXXXXXX
PROJECT: Matheson E. 54th Pl
DESIGN STORM: 100 Year

P1 = 2.43

BASIN	DESIGN POINT	DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
		AREA DESIGN	AREA (AC)	RUNOFF COEFF	t_c (MIN)	C * A (AC)	I IN/HR	Q (CFS)	t_c (MIN)	Σ (C * A) (AC)	I (IN/HR)	Q (CFS)	SLOPE (%)	STREET FLOW (CFS)	DESIGN FLOW (CFS)	SLOPE (%)	PIPE SIZE	LENGTH (FT)	VELOCITY (FPS)	t_t (MIN)	
	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
													X X	X X	X X	X X	X X	X X	X X	X X	XXXXX
A	2		0.98	0.74	5.0	0.73	8.24	5.98													
B	1		0.09	0.60	5.0	0.06	8.24	0.46													
C	3		0.05	0.38	5.0	0.02	8.24	0.16													
D	4		0.02	0.13	5.0	0.00	8.24	0.02													
EX1	3		0.65	0.13	5.0	0.08	8.24	0.68													
EX2	1		0.44	0.14	5.0	0.06	8.24	0.52													
EX3	4		0.05	0.13	5.0	0.01	8.24	0.05													

DETENTION POND IMPERVIOUS PERCENTAGE CALCULATIONS

DETENTION POND IMPERVIOUS CALCULATIONS

JOB NO: XXXXXXX
PROJECT: Matheson E. 54th Pl
DATE: 9/13/2024

Soil Type (A-D):

BASIN	TOTAL AREA (AC)	TOTAL AREA (SF)	AREA LANDSCAPE (SF)	AREA PAVEMENT (SF)	AREA GRAVEL (SF)	AREA Roof Top (SF)	C2	C5	C10	C100	I (%)
A	0.98	42732	8369	34363	0	0					81%

Surface	i
landscape	2%
gravel	40%
roof	90%
pavement	100%

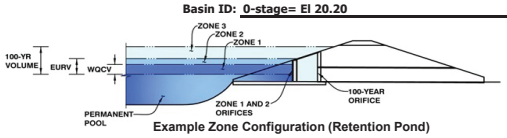
DETENTION POND CALCULATIONS

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: Matheson

Basin ID: 0-stage= El 20.20



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	**EDB**	
Watershed Area =	0.98	acres
Watershed Length =	298	ft
Watershed Length to Centroid =	150	ft
Watershed Slope =	0.025	ft/ft
Watershed Imperviousness =	81.00%	percent
Percentage Hydrologic Soil Group A =	100.0%	percent
Percentage Hydrologic Soil Group B =	0.0%	percent
Percentage Hydrologic Soil Groups C/D =	0.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	Commerce City - Civic Center	

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

			Optional User Overrides
Water Quality Capture Volume (WQCV) =	0.027	acre-feet	acre-feet
Excess Urban Runoff Volume (EURV) =	0.105	acre-feet	acre-feet
2-yr Runoff Volume (P1 = 0.84 in.) =	0.048	acre-feet	inches
5-yr Runoff Volume (P1 = 1.12 in.) =	0.066	acre-feet	inches
10-yr Runoff Volume (P1 = 1.37 in.) =	0.082	acre-feet	inches
25-yr Runoff Volume (P1 = 1.75 in.) =	0.109	acre-feet	inches
50-yr Runoff Volume (P1 = 2.08 in.) =	0.133	acre-feet	inches
100-yr Runoff Volume (P1 = 2.43 in.) =	0.161	acre-feet	inches
500-yr Runoff Volume (P1 = 3.35 in.) =	0.234	acre-feet	inches
Approximate 2-yr Detention Volume =	0.049	acre-feet	
Approximate 5-yr Detention Volume =	0.067	acre-feet	
Approximate 10-yr Detention Volume =	0.084	acre-feet	
Approximate 25-yr Detention Volume =	0.111	acre-feet	
Approximate 50-yr Detention Volume =	0.128	acre-feet	
Approximate 100-yr Detention Volume =	0.144	acre-feet	

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.027	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.077	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.039	acre-feet
Total Detention Basin Volume =	0.144	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	

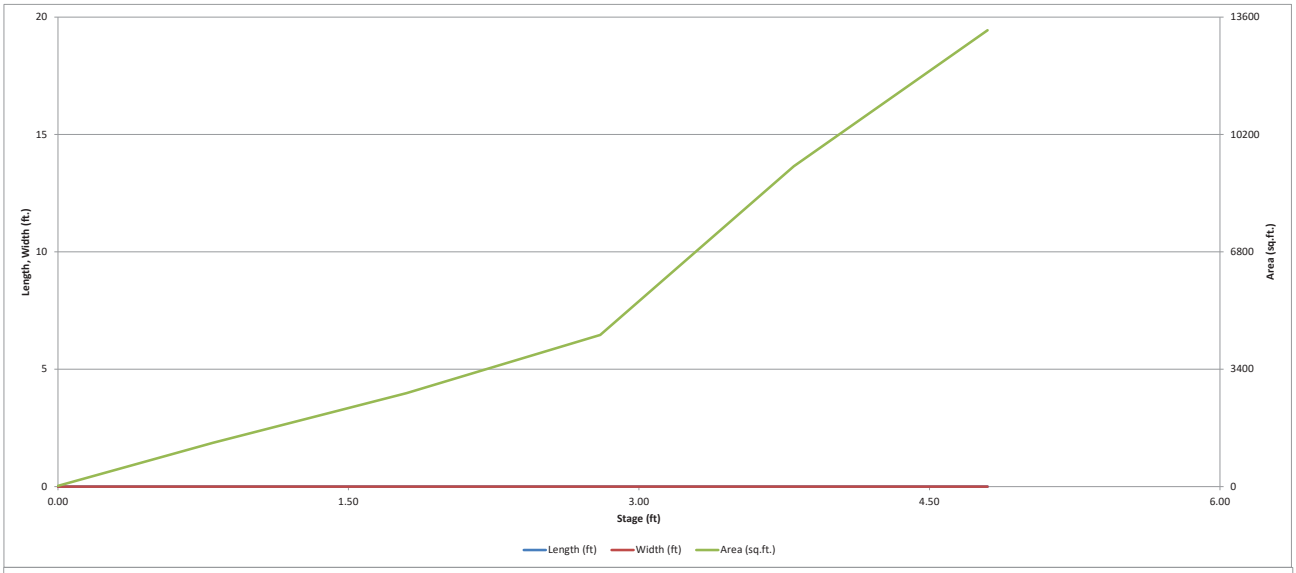
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user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

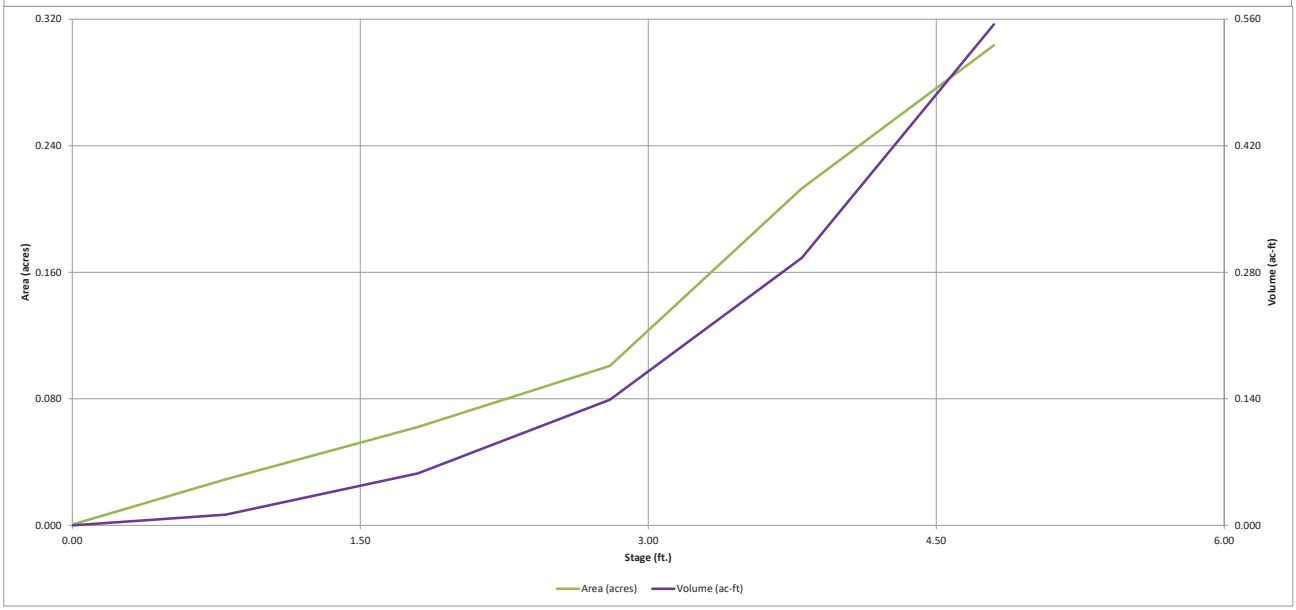
Depth Increment = 0.10 ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	22	0.001		
	--	0.80	--	--	--	1,270	0.029	517	0.012
	--	1.80	--	--	--	2,708	0.062	2,506	0.058
	--	2.80	--	--	--	4,392	0.101	6,056	0.139
	--	3.80	--	--	--	9,279	0.213	12,891	0.296
	--	4.80	--	--	--	13,220	0.303	24,141	0.554

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)



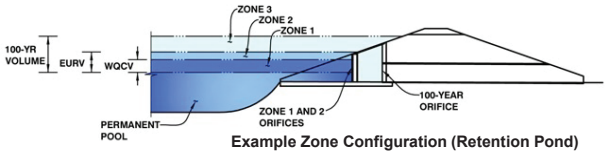


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: Matheson

Basin ID: 0-stage= El 20.20



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	1.23	0.027	Orifice Plate
Zone 2 (EURV)	2.44	0.077	Orifice Plate
Zone 3 (100-year)	2.85	0.039	Weir&Pipe (Restrict)
Total (all zones)		0.144	

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

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

Calculated Parameters for Underdrain

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

Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	1.806E-03	ft^2
Depth at top of Zone using Orifice Plate =	2.60	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	10.40	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	0.26	sq. inches (diameter = 9/16 inch)	Elliptical Slot Area =	N/A	ft^2

Calculated Parameters for Plate

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	0.90	1.80					
Orifice Area (sq. inches)	0.26	0.26	0.26					

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

User Input: Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected			Not Selected	Not Selected	
Invert of Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	N/A	N/A	ft^2
Depth at top of Zone using Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	N/A	N/A	feet
Vertical Orifice Diameter =	N/A	N/A	inches				

Calculated Parameters for Vertical Orifice

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

	Zone 3 Weir	Not Selected			Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	2.60	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	3.33	N/A	feet
Overflow Weir Front Edge Length =	8.00	N/A	feet	Overflow Weir Slope Length =	3.01	N/A	feet
Overflow Weir Grate Slope =	4.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	299.79	N/A	
Horiz. Length of Weir Sides =	2.92	N/A	feet	Overflow Grate Open Area w/o Debris =	19.05	N/A	ft^2
Overflow Grate Type =	Close Mesh Grate	N/A		Overflow Grate Open Area w/ Debris =	9.52	N/A	ft^2
Debris Clogging % =	50%	N/A	%				

Calculated Parameters for Overflow Weir

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

	Zone 3 Restrictor	Not Selected			Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	0.50	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	0.06	N/A	ft^2
Outlet Pipe Diameter =	18.00	N/A	inches	Outlet Orifice Centroid =	0.07	N/A	feet
Restrictor Plate Height Above Pipe Invert =	1.40		inches	Half-Central Angle of Restrictor Plate on Pipe =	0.57	N/A	radians

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	3.00	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.21	feet
Spillway Crest Length =	10.00	feet	Stage at Top of Freeboard =	4.21	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	0.25	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	0.39	acre-ft

Calculated Parameters for Spillway

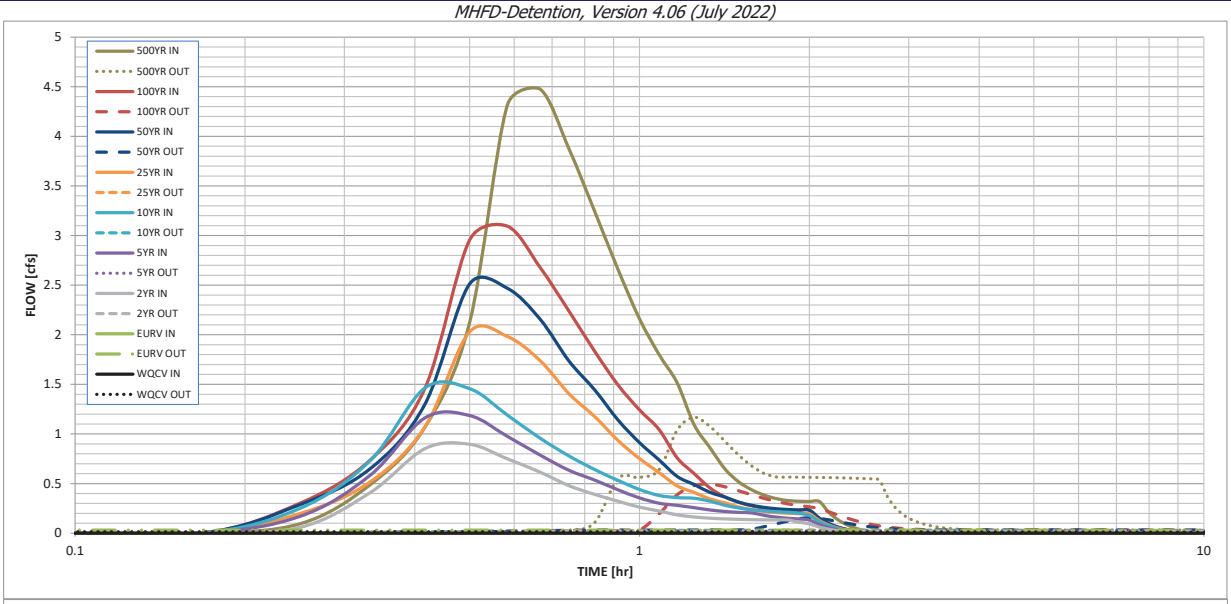
Routed Hydrograph Results

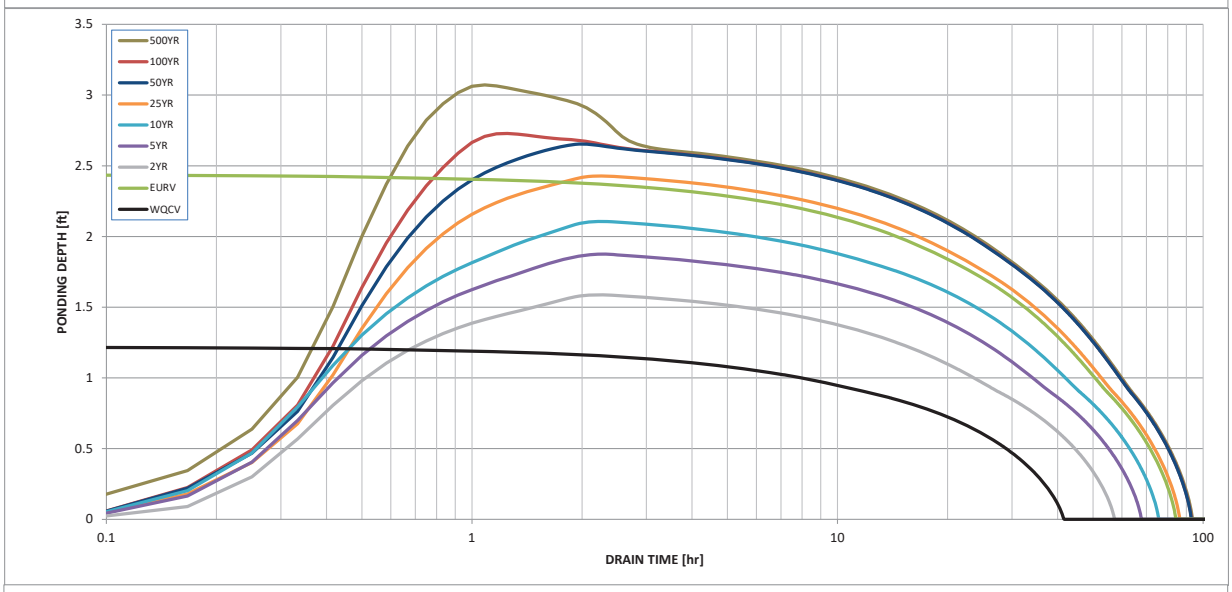
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

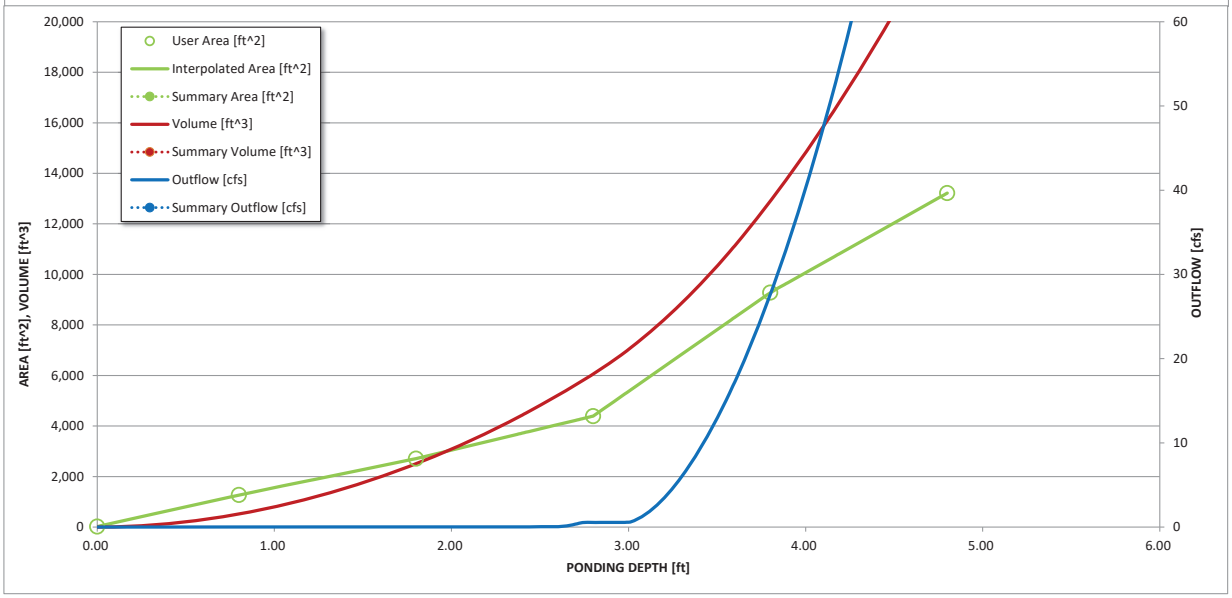
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	0.84	1.12	1.37	1.75	2.08	2.43	3.35
CUHP Runoff Volume (acre-ft) =	0.027	0.105	0.048	0.066	0.082	0.109	0.133	0.161	0.234
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.048	0.066	0.082	0.109	0.133	0.161	0.234
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.0	0.0	0.0	0.0	0.3	0.6	1.3
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.00	0.01	0.01	0.03	0.26	0.57	1.34
Peak Inflow Q (cfs) =	N/A	N/A	0.9	1.2	1.5	2.0	2.5	3.1	4.5
Peak Outflow Q (cfs) =	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.5	1.2
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	4.6	2.4	1.2	0.6	0.9	0.9
Structure Controlling Flow =	Plate	Plate	Plate	Plate	Plate	Plate	Overflow Weir 1	Outlet Plate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	0.0	0.0	0.0
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	75	52	61	68	77	82	80	77
Time to Drain 99% of Inflow Volume (hours) =	**40**	80	55	65	72	82	88	87	86
Maximum Ponding Depth (ft) =	1.22	2.44	1.59	1.87	2.11	2.43	2.65	2.73	3.07
Area at Maximum Ponding Depth (acres) =	0.04	0.09	0.05	0.06	0.07	0.09	0.10	0.10	0.13
Maximum Volume Stored (acre-ft) =	0.027	0.105	0.045	0.062	0.078	0.103	0.124	0.131	0.170

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)







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

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename:

Inflow Hydrographs

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

	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09
	0:15:00	0.00	0.00	0.06	0.17	0.25	0.20	0.29	0.30	0.49
	0:20:00	0.00	0.00	0.41	0.58	0.73	0.52	0.65	0.74	1.07
	0:25:00	0.00	0.00	0.85	1.16	1.46	1.07	1.30	1.46	2.12
	0:30:00	0.00	0.00	0.90	1.19	1.46	2.03	2.51	2.95	4.31
	0:35:00	0.00	0.00	0.75	0.98	1.19	1.98	2.47	3.09	4.48
	0:40:00	0.00	0.00	0.62	0.79	0.96	1.74	2.16	2.68	3.87
	0:45:00	0.00	0.00	0.48	0.63	0.78	1.41	1.74	2.24	3.24
	0:50:00	0.00	0.00	0.39	0.54	0.64	1.17	1.44	1.83	2.66
	0:55:00	0.00	0.00	0.32	0.44	0.53	0.93	1.14	1.49	2.16
	1:00:00	0.00	0.00	0.26	0.36	0.44	0.75	0.91	1.24	1.80
	1:05:00	0.00	0.00	0.22	0.30	0.38	0.61	0.74	1.04	1.51
	1:10:00	0.00	0.00	0.18	0.28	0.36	0.48	0.57	0.76	1.09
	1:15:00	0.00	0.00	0.16	0.26	0.35	0.41	0.49	0.60	0.86
	1:20:00	0.00	0.00	0.15	0.23	0.32	0.35	0.41	0.46	0.65
	1:25:00	0.00	0.00	0.14	0.22	0.28	0.31	0.36	0.37	0.52
	1:30:00	0.00	0.00	0.14	0.21	0.25	0.26	0.31	0.31	0.44
	1:35:00	0.00	0.00	0.14	0.20	0.24	0.24	0.28	0.27	0.38
	1:40:00	0.00	0.00	0.13	0.18	0.22	0.22	0.26	0.25	0.35
	1:45:00	0.00	0.00	0.13	0.16	0.22	0.21	0.25	0.24	0.33
	1:50:00	0.00	0.00	0.13	0.15	0.21	0.20	0.24	0.23	0.32
	1:55:00	0.00	0.00	0.11	0.14	0.20	0.20	0.23	0.23	0.32
	2:00:00	0.00	0.00	0.10	0.13	0.18	0.20	0.23	0.23	0.32
	2:05:00	0.00	0.00	0.06	0.09	0.12	0.13	0.15	0.15	0.21
	2:10:00	0.00	0.00	0.04	0.05	0.07	0.08	0.10	0.10	0.13
	2:15:00	0.00	0.00	0.02	0.03	0.05	0.05	0.06	0.06	0.08
	2:20:00	0.00	0.00	0.01	0.02	0.03	0.03	0.04	0.04	0.05
	2:25:00	0.00	0.00	0.01	0.01	0.02	0.02	0.02	0.02	0.03
	2:30:00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01
	2:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Summary Stage-Area-Volume-Discharge Relationships

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

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

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

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

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

Matheson Commerce City

9/19/2024

DETENTION POND EMERGENCY OVERFLOW WEIR CALCULATIONS

Weir Input

$Q_{100\ Peak\ Inflow}$ = 5.98 cfs

Weir Length =	8.0	ft
Side Slopes (Z) =	4	:1 (H:V)
Weir Invert =	5223.20	
Water Surface =	5223.50	
Bldg FF Elev =	N/A	

Discharge over the weir

$Q = C*L*H^{3/2} + 2*(2/5*Cw*Z*H^{2.5})$

C:	3.32	
L_{Weir} =	10	Ft
H:	0.30	Ft
Cw:	3.367	
Z:	4	:1

Q: 5.99 cfs

5.99 cfs > 5.98 cfs

Weir passes 100-year inflow at elevation 5223.50

APPENDIX C

HYDRAULIC COMPUTATIONS

SWALE CALCULATIONS

Swale A - 100-Yr Storm Event

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.030
Channel Slope	0.020 ft/ft
Left Side Slope	4.000 H:V
Right Side Slope	4.000 H:V
Discharge	5.39 cfs

Basin A 100-Yr Storm Event

Results	
Normal Depth	0.6 ft
Flow Area	1.7 ft²
Wetted Perimeter	5.3 ft
Hydraulic Radius	0.3 ft
Top Width	5.17 ft
Critical Depth	0.6 ft
Critical Slope	0.020 ft/ft
Velocity	3.23 ft/s
Velocity Head	0.16 ft
Specific Energy	0.81 ft
Froude Number	1.001
Flow Type	Supercritical

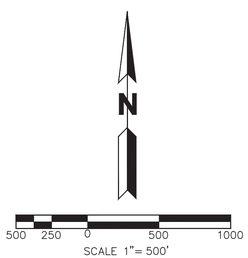
GVF Input Data	
Downstream Depth	0.0 ft
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.6 ft
Critical Depth	0.6 ft
Channel Slope	0.020 ft/ft
Critical Slope	0.020 ft/ft

MATHESON INDUSTRIAL

PART OF THE NE 1/4 OF SECTION 17, TOWNSHIP 3 SOUTH,
RANGE 67 WEST OF THE 6TH P.M.
1.15 ACRES

GENERAL LOCATION MAP



CKE ENGINEERING, INC.
14257 W. EVANS CIRCLE
LAKEWOOD, CO. 80228
(303) 917-1757

MATHESON INDUSTRIAL

6925 & 6981 E. 54TH PLACE

GENERAL LOCATION MAP

No.	Description of Revisions	Date	Name
1	1ST SUBMITTAL	09/23/24	JC

Date: SEPTEMBER 2024
Job Number:
Design By: J. COCO
Drawn By: J. COCO
Checked By: J. COCO

Sheet Number:

D0

MATHESON INDUSTRIAL

PART OF THE NE 1/4 OF SECTION 17, TOWNSHIP 3 SOUTH, RANGE 67 WEST OF THE 6TH P.M.

1.15 ACRES

DRAINAGE MAP

DESIGN POINT SUMMARY

DESIGN POINT	BASINS	AREA (AC)	Q5 (CFS)	Q100 (CFS)
1	BASIN B, POND OUTFALL	1.07	0.17	0.96
2	BASIN A	0.98	2.44	5.98
3	BASIN C	0.05	0.04	0.16
4	BASIN D	0.02	0.00	0.02

BASIN SUMMARY

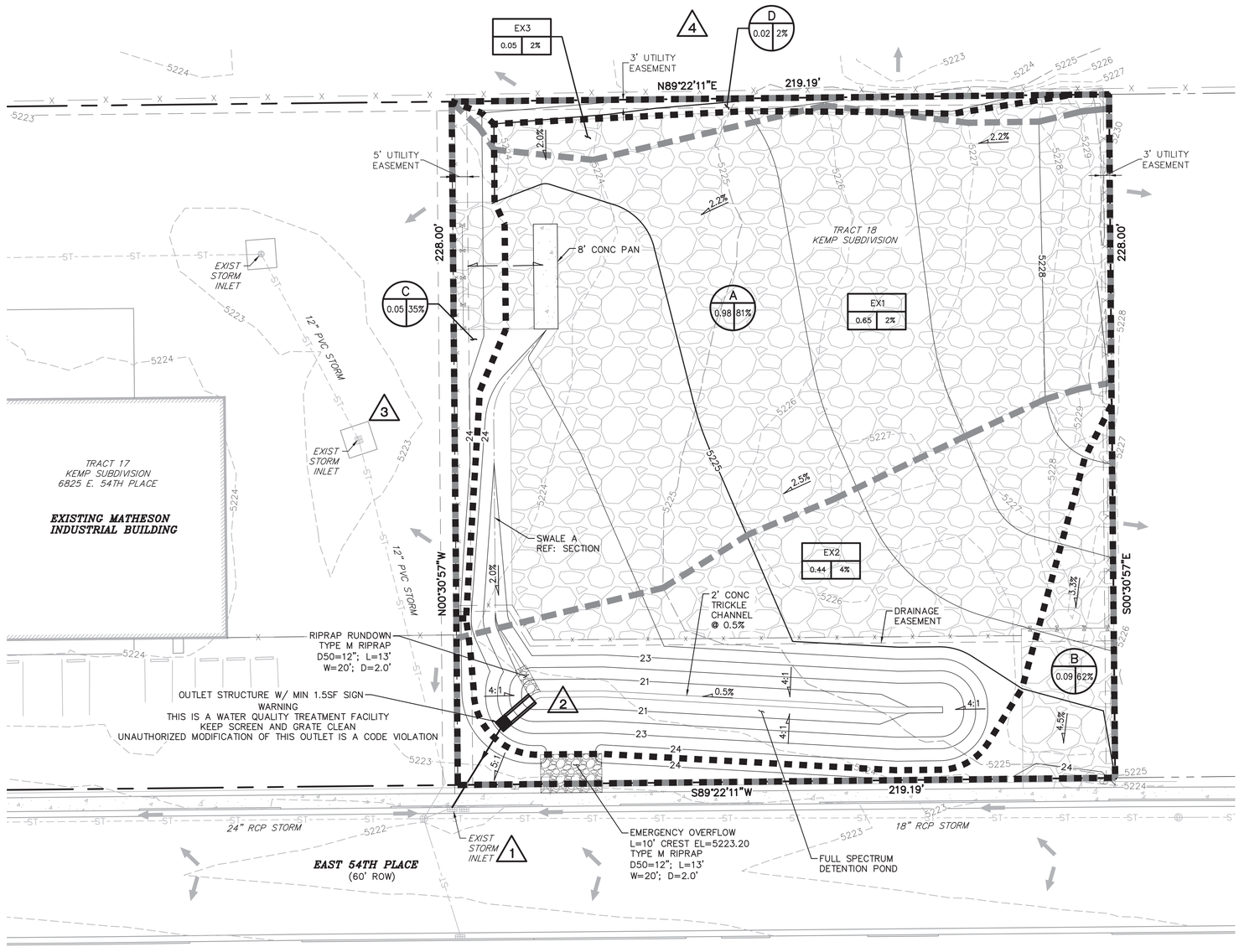
BASIN	AREA (ACRES)	C5	C100	Q5 (CFS)	Q100 (CFS)
A	0.98	0.66	0.74	2.44	5.980
B	0.09	0.47	0.60	0.17	0.46
C	0.05	0.23	0.38	0.04	0.16
D	0.02	0.01	0.13	0.00	0.02
EX1	0.65	0.01	0.13	0.01	0.68
EX2	0.44	0.02	0.14	0.03	0.52
EX3	0.05	0.01	0.13	0.00	0.05

DETENTION POND SUMMARY

DESIGN VOLUME	WATER SURFACE ELEVATION (FEET)	VOLUME (AC-FT)	MAXIMUM RELEASE RATE (CFS)
WATER QUALITY CAPTURE VOLUME	5221.42	0.027	0.0
EXCESS URBAN RUNOFF VOLUME	5222.64	0.105	0.0
100-YEAR STORAGE VOLUME	5222.93	0.131	0.5

LEGEND

EXISTING		PROPOSED
	PROPERTY LINE	
	RIGHT-OF-WAY	
	EASEMENT	
	CURB AND GUTTER	
5500	CONTOUR	5500
SAN	SANITARY SEWER	
ST	STORM SEWER	
WAT	WATER LINE	
ELE	UNDERGROUND ELECTRIC	
COM	COMMUNICATIONS	
FO	FIBER OPTICS	
GAS	GAS LINE	
	FIRE HYDRANT	
SS	SANITARY MANHOLE	
D	STORM MANHOLE	
	LIGHT POLE	
X	FENCE	X X
	SIGN	
	FIRE LANE SIGN	
	PROPERTY PIN	
	CONCRETE	



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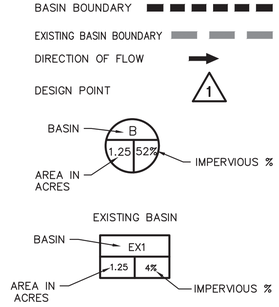
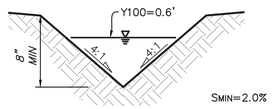
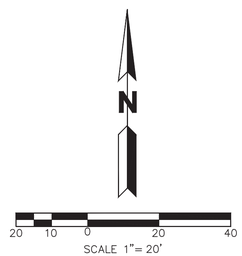




SWALE A
(N.T.S.)



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DRAINAGE MAP

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