Final Drainage Report – Early Grading Permit

Waterview East Commercial
El Paso County, Colorado

Prepared for:
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Project #: 196195000

PCD Filing No.: SP-22-009

Prepared: July 5, 2023

Kimley»Horn

CERTIFICATION

DESIGN ENGINEER'S STATEMENT

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

SIGNATURE (Affix Seal): _____

Jessica McCallum, P.E.
Colorado P.E. No. 59054 Date

OWNER/DEVELOPER'S STATEMENT

I, the developer, have read and will comply with all the requirements specified in this Drainage Report and Plan.

_____
Name of Developer

_____
Authorized Signature Date

_____
Printed Name

_____
Title

_____
Address:

EL PASO COUNTY

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

_____ _____
Josh Palmer, P.E. Date
County Engineer/ ECM Administrator

Conditions:

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INTRODUCTION

PURPOSE AND SCOPE OF STUDY

The purpose of this Final Drainage Report – Early Grading Permit (FDR) is to provide the drainage design calculations and drainage exhibit for the early grading permit development for the Waterview East Subdivision ("the Project") for Waterview Commercial Investors, LLC. The finalized hydraulic design, including storm sewer and associated calculations will be provided with the Final Drainage Report. The Project is located within the jurisdictional limits of El Paso County ("the County"). Therefore, the hydrologic and grading design is based on the County's criteria which is described in further detail within the report.

LOCATION

The Project is located within part of the West ½ of Section 9, Township 15 South, Range 65 West of the 6th Principal Meridian, County of El Paso, State of Colorado ("the Site"). The Site is bounded by Powers Boulevard (Highway 21) on the west, The Trails at Aspen Ridge Filing No. 1 to the east and to the south, and Bradley Road to the north. A vicinity map has been provided in the **Appendix A** of this report.

The Site is currently owned by Waterview East Development, LLC. The site is currently unplatted.

DESCRIPTION OF PROPERTY

The Site is approximately 22.1 acres consisting of undeveloped land with native vegetation and is characterized primarily by prairie grasses along with some area of scrub brush and a limited occurrence of small oaks. The Site does not currently provide water quality or detention for the Project area. The existing land use is undeveloped vacant land. There are no existing irrigation ditches on the Site.

The existing topography consists of slopes ranging from 1% to 33%.

According to NRCS soil mapping data, USCS Type A and B soils are the primary soil type within the site. Soils present at the Site consist mainly of "Blakeland loamy sand" which represent a moderate hazard for erosion. **Appendix B** contains detailed NRCS soil data.

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The development of this site will include commercial developments, including convenience store, restaurants, storage units and retail stores. Roadway improvements to the site will include mowing, clearing, and grubbing, weed control, paved access road construction, roadway grading, three onsite extended detention basins, native seeding, and water quality features. Permanent improvements outside of the scope of early grading will be evaluated under the ~~Preliminary~~ Drainage Report included with the final plat application.

A Topographic field survey was completed and updated for the Project by Ridgeline Land Surveying dated ~~February~~ 7th, 2023 and is the basis for design for the drainage improvements.

Final

DRAINAGE BASINS

MAJOR BASIN DESCRIPTIONS

The western half of the Property lies within the Big Johnson drainage basin, and the eastern half of the Property lies within the West Fork of Jimmy Camp Creek drainage basin. The watershed is generally located in the central portion of El Paso County. Refer to **Appendix A** for the Flood Insurance Rate Map (FIRM) number 08041C0768G effective date, December 7, 2018. There was a Drainage Basin Planning Study conducted for the Big Johnson basin in February 1992; however, there has not been one conducted for the Sand Creek basin. Please see reference in the **Appendix**.

MASTER DRAINAGE REPORT STUDY

The Waterview East commercial development project is part of the "Master Development Drainage Plan Amendment for Waterview East & Preliminary Drainage Plan for Trails at Aspen Ridge" Prepared by: Matrix Design Group September 2019. As outlined in the Master Drainage Plan, the "East Pond" was sized to include flows from the future "Commercial Lot south of Bradley Road and West of Legacy Drive". In these watershed calculations a weighted imperviousness value of 95% was used. This value is higher than the calculated impervious value of 2% in early grading permit conditions.

As noted in the Master Drainage Plan, the eastern portion of the Site which is part of the West Fork Jimmy Camp Creek drainage basin will require on site detention. As noted in the Master Drainage Plan, the western portion of the Site which is part of the Big Johnson Reservoir drainage basin for future development of this lot "…On-site detention will be required and must discharge to the Powers Boulevard ditch." This report sizes temporary sediment basins for the early grading permit phase of the development. The Preliminary Drainage Report provides sizing of permanent full spectrum detention ponds in compliance with the above-mentioned Master Drainage Plan. Offsite flows are addressed in the existing sub-basin descriptions below.

Excerpts from "Master Development Drainage Plan Amendment for Waterview East & Preliminary Drainage Plan for Trails at Aspen Ridge" Prepared by: Matrix Design Group June 2019 have been provided in **Appendix E**.

EXISTING SUB-BASIN DESCRIPTIONS

Historically, runoff from the Site is split almost directly down the center. With the eastern portion of the Site heading east and the western portion of the site heading west. The site has been divided into three existing onsite subbasins, EX-1, EX-2, and EX-3, and one offsite basin, OS-1.

Sub-Basin EX-1
The on-site sub-basin EX-1 is undeveloped consisting of native grasses and shrubs with an area of 10.36 acres comprising the eastern half of the property. Drainage flows overland from west to the east at slopes ranging from 1-33%. Flows are collected in the existing curb and gutter along Legacy Drive and are conveyed to an existing 10' Type R curb inlet at the intersection of Legacy Drive and Frontside Drive. Flows are then carried through existing storm

infrastructure into East Pond as outlined in the "Master Development Drainage Plan Amendment for Waterview East & Preliminary Drainage Plan for Trails at Aspen Ridge" Prepared by: Matrix Design Group September 2019. Runoff during the 5-year and 100-year events are 3.54 cfs and 24.73 cfs respectively.

Sub-Basin EX-2
The on-site sub-basin EX-2 is undeveloped consisting of native grasses and shrubs with an area of 11.50 acres comprising the western half of the property. Drainage flows overland from northeast to southwest at slopes ranging from 1-33%. Flows are collected in the existing roadside ditch along Powers Blvd and travel south where they are conveyed west through an existing 60" CMP under Powers Blvd and into Big Johnson Reservoir. Runoff during the 5-year and 100-year events are 2.62 cfs and 22.34 cfs respectively.

Sub-Basin EX-3
The on-site sub-basin EX-3 is undeveloped, consisting of native grasses and shrubs, with an area of 0.26 acres comprising a portion of the eastern site boundary. Drainage flows overland from west to east at slopes ranging from 1-25%. Flows are collected in the existing Frontside Drive curb and gutter and travels south where they are conveyed to existing storm infrastructure into the East Pond as outlined in the "Master Development Drainage Plan Amendment for Waterview East & Preliminary Drainage Plan for Trails at Aspen Ridge" Prepared by: Matrix Design Group September 2019. Runoff during the 5-year and 100-year events are 0.21 cfs and 0.91 cfs respectively.

Sub-Basin OS-1
The off-site sub-basin OS-1 is undeveloped consisting of native grasses and shrubs with an area of 0.66 acres comprising the northern boundary of the Site. Drainage flows overland from north to south at slopes ranging from 5-33%. Flows convey though Basin EX-1 and are ultimately collected via existing curb and gutter along Legacy Drive, which are conveyed to an existing 10' Type R curb inlet at the intersection of Legacy Drive and Frontside Drive. Flows are then carried through existing storm infrastructure into East Pond as outlined in the "Master Development Drainage Plan Amendment for Waterview East & Preliminary Drainage Plan for Trails at Aspen Ridge" Prepared by: Matrix Design Group September 2019. Runoff during the 5-year and 100-year events are 0.19 cfs and 1.61 cfs respectively.

Refer to **Appendix F** for the Existing Drainage Conditions Map.

PROPOSED SUB-BASIN DESCRIPTIONS

For the proposed condition, stormwater will generally maintain historic flow patterns for the east and west portions of the site. Proposed temporary drainage swales will convey flows to proposed temporary sediment basins. From there flows will outfall to existing historic drainage paths, which will ultimately outfall to existing natural drainage channels, a sub regional pond, or water quality features. The proposed project has been divided into 4 on-site sub-basins and 5 off-site sub-basins. **To satisfy the early grading permit requirements, these basins will be shown for reference, with only construction items associated with early grading to be shown. Construction of utility infrastructure as well as building footprints will not be constructed with this final drainage report - early grading permit and will be evaluated with the submittal of the final drainage report with the final plat.**

Sub-Basin A1

The on-site sub-basin A1 consists of native vegetation in the north portion of the site. The sub-basin has an area of 6.10 acres and a weighted imperviousness of 2%. Runoff in this basin will travel overland and into proposed drainage swales 1A and 1B and conveyed to the proposed Temporary Sediment Basin 1 (Design Point 1). Runoff during the 5-year and 100-year events are 1.64 cfs and 14.02 cfs respectively.

Sub-Basin A2

The on-site sub-basin A2 consists of native vegetation in the central portion of the site. The sub-basin has an area of 5.02 acres and a weighted imperviousness of 2%. Runoff in this basin will travel overland into proposed drainage swale 2 which routes flows to the proposed Temporary Sediment Basin 2 (Design Point 2). Flows also overland flow directly into Temporary Sediment Basin 2. Runoff during the 5-year and 100-year events are 1.38 cfs and 11.77 cfs respectively.

Sub-Basin A3

The on-site sub-basin A3 consists of native vegetation in the south portion of the site. The sub-basin has an area of 3.92 acres and a weighted imperviousness of 2%. Runoff in this basin will travel overland into proposed drainage swale 3A and 3B and conveyed to proposed Temporary Sediment Basin 3 (Design Point 3). Runoff during the 5-year and 100-year events are 1.13 cfs and 9.61 cfs respectively.

Sub-Basin A4

The on-site sub-basin A4 consists of native vegetation in the northeast portion of the site. The sub-basin has an area of 1.71 acres and a weighted imperviousness of 2%. Runoff in this basin will travel overland into proposed drainage swale 4A and 4B and conveyed to proposed Temporary Sediment Basin 4 (Design Point 4). Runoff during the 5-year and 100-year events are 0.49 cfs and 4.21 cfs respectively.

Sub-Basin OS-1

The off-site sub-basin OS-1 consists of native vegetation along the north portion of the site. The sub-basin has an area of 0.62 acres and a weighted imperviousness of 2%. Runoff in this basin will flow offsite at DP OS1 directly into the curb and gutter in Legacy Hill Drive. Flows from this sub-basin will follow historic flow patterns. Runoff during the 5-year and 100-year events are 0.21 cfs and 1.77 cfs respectively.

Sub-Basin OS-2

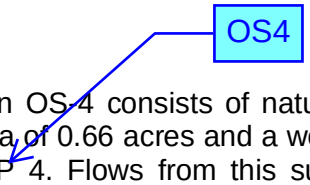
The off-site sub-basin OS-2 consists of native vegetation along the east property line. The sub-basin has an area of 2.65 acres and a weighted imperviousness of 2%. Runoff in this basin will flow offsite at DP OS2 and then directly into Legacy Hill Dr where it will be carried by curb and gutter into the existing storm water infrastructure. Flows from this sub-basin will follow existing flow patterns. Runoff during the 5-year and 100-year events are 0.90 cfs and 7.67 cfs respectively.

Sub-Basin OS-3

The off-site sub-basin OS-3 consists of natural vegetation at the southeast corner of the site. The sub-basin has an area of 0.41 acres and a weighted imperviousness of 2%. Runoff in this

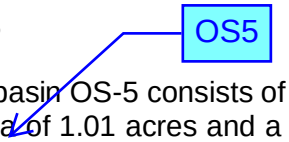
basin will flow offsite at DP OS3 directly into Frontside Dr where it will be carried south by curb and gutter into the existing storm water infrastructure. Flows from this sub-basin will follow existing flow patterns. Runoff during the 5-year and 100-year events are 0.15 cfs and 1.28 cfs respectively.

Sub-Basin OS-4



The off-site sub-basin OS-4 consists of natural vegetation along the south property line. The sub-basin has an area of 0.66 acres and a weighted imperviousness of 2%. Runoff in this basin will flow offsite at DP 4. Flows from this sub-basin will follow existing flow patterns. Runoff during the 5-year and 100-year events are 0.26 cfs and 2.23 cfs respectively.

Sub-Basin OS-5



The off-site sub-basin OS-5 consists of natural vegetation along the west property line. The sub-basin has an area of 1.01 acres and a weighted imperviousness of 2%. Runoff in this basin will flow offsite at DP 5 directly into Powers Blvd where it will be carried west into the existing Powers Ditch. Flows from this sub-basin will follow existing flow patterns. Runoff during the 5-year and 100-year events are 0.37 cfs and 3.19 cfs respectively.

The majority of this basin is landscaping. According to the El Paso County Engineering Criteria Manual, Section I.7.1.B.7, This area classifies as “Land Disturbance to Undeveloped Land that will Remain Undeveloped.” This area will follow native drainage patterns and remain undeveloped with no buildings or pavement and therefore classifies as an exclusion.

Per the MDDP, the flows entering the Powers Blvd Ditch in the 100-year condition is 11.7 cfs. In the combined condition, Sub-Basin OS-5 will release into the Powers ditch at 4.46 cfs and per historic flow, respectively, which will be lower than the flows designated per the MDDP.

Refer to **Appendix F** for the Proposed Drainage Conditions Map.

DRAINAGE DESIGN CRITERIA

DEVELOPMENT CRITERIA REFERENCE

The proposed storm facilities are designed to be in compliance with the El Paso County Drainage Criteria Manual, Volumes 1 and 2 (The “CRITERIA”) and the Urban Storm Drainage Criteria Manual (the “MANUAL”). Site drainage is not significantly impacted by such constraints as utilities or existing development.

HYDROLOGIC SOIL GROUP

According to NRCS soil mapping data, USCS Type A and B soils are the primary soil type within the site. Soils present at the Site consist mainly of “Blakeland loamy sand” which represent a moderate hazard for erosion. **Appendix B** contains detailed NRCS soil data.

HYDROLOGIC CRITERIA

The 5-year and 100-year design storm events were used in determining rainfall and runoff for the proposed drainage analysis per chapter 5 of the CRITERIA. Design runoff was calculated using the Rational Method for developed conditions as established in the CRITERIA and

MANUAL. Runoff coefficients for the proposed development were determined using Table 5-1 of the CRITERIA by calculating weighted impervious values for each specific site basin. Based upon this approach, the drainage design provided for the Site is conservative and in keeping with the zoning and historic drainage concept for the area.

HYDRAULIC CRITERIA

Hydraulic design of the sizing of the temporary swales is provided in **Appendix D**.

INLET AND PIPE SIZING

Inlet and pipe sizing will not be included or installed with this early grading permit. Final calculations will be provided with the Final Drainage Report with the Final Plat submittal.

TEMPORARY SEDIMENT POND SUMMARY

Preliminary detention pond and water quality calculations have been completed. A total of four proposed private temporary sediment basins have been designed per the MANUAL. The four temporary sediment basins are summarized below.

TSB	Upstream Drainage Basin	Required Volume (cubic-feet)	Provided Volume (cubic-feet)
1	A1	21,960	22,437
2	A2	18,072	58,546
3	A3	14,112	32,000
4	A4	6,156	6,588

Final calculations are not provided with this early grading permit. Hydraulic calculations will be provided with the Final Drainage Report for the Final Plat submittal. Please reference the associated Grading and Erosion Control Plan for implementation of the temporary sediment basins.

Final calculations for the sedimentation needs to be provided with this report as this is what they are being constructed with, not the final drainage report with the final plat.

DRAINAGE FACILITY DESIGN

GENERAL CONCEPT

The proposed development is for the early grading earthwork activities. The proposed drainage patterns will match historic patterns as much as possible and not significantly increase developed flows. Sub-basins A1-A4 will be captured with temporary swales and routed to the temporary sediment basins during these earthwork activities. There will be three (3) proposed Full Spectrum Detention Basins with the final build-out of the development. **These final calculations will be provided in the Final Drainage Report for the Final Plat submittal.**

Provided in **Appendix C** is the MANUAL Temporary Sediment Basin fact sheet that was utilized for sizing and design of the temporary sediment basins. Existing and proposed Drainage Maps can be found in **Appendix F**.

DRAINAGE FEE

The project is within the Big Johnson drainage basin, and the West Fork of Jimmy Camp Creek drainage basin which is a part of the El Paso County Drainage Basin Fee Program. Drainage and bridge fees will be finalized with the Final Drainage Report. Drainage fees shall be paid at the time of final plat recordation.

THE FOUR STEP PROCESS

The Project was designed in accordance with the four-step process to minimize adverse impacts of urbanization, as outlined in the El Paso County Engineering Manual for BMP selection as noted below:

Step 1. **Employ Runoff Reduction Practices** – Temporary drainage swales and temporary sediment basins are provided to help reduce runoff and promote infiltration.

Step 2. Implement BMPs That Provide a Water Quality Capture Volume with Slow Release – Permanent water quality measures and detention facilities will be necessary for the Project. Temporary water quality and erosion control measures will be provided during construction and for the early grading permit to prevent sediment laden water from discharging from the Site.

Step 3 Stabilize Drainageways– Stabilizing proposed roadside ditches, swales, and channels by designing them with slopes that control the flow rates. Placement of riprap upstream and downstream of culverts to help reduce erosion of the roadside ditches. Check dams will be used in areas with steeper grades to slow the runoff. We anticipate this will minimize erosion. Existing drainage ways will be graded to reduce the velocity of the water to minimize erosion.

Step 4. Implement Site Specific and Other Source Control BMPs – The erosion control construction BMPs of the Project were designed to reduce contamination. Source control BMPs include the use of vehicle tracking control, culvert protection, stockpile management, and stabilized staging areas.

SUMMARY

This report has been prepared in accordance with El Paso County stormwater criteria. It outlines the Site design for the 5-year and 100-year storm events drainage system. The drainage design presented within this report conforms to the criteria presented in the CRITERIA and the MANUAL Additionally, the Site runoff and storm drain facilities will not adversely affect the downstream and surrounding developments.

REFERENCES

1. El Paso County “Engineering Criteria Manual” Volumes 1 & 2, dated October 31, 2018

2. Natural Resources Conservation Service, Web Soil Survey, dated April 29, 2022.

3. Flood Insurance Rate Map, El Paso County, Colorado and Incorporated Areas, Map Number 08041C0768G, Effective Date December 7, 2018, prepared by the Federal Emergency Management Agency (FEMA).

4. Master Development Drainage Plan Amendment for Waterview East & Preliminary Drainage Plan for Trails at Aspen Ridge” Prepared by: Matrix Design Group September 2019.

APPENDIX

APPENDIX A – VICINITY MAP

Waterview East Commercial
Vicinity Map
(Not to Scale)

APPENDIX B – FEMA FIRM PANEL AND SOILS MAP

National Flood Hazard Layer FIRMette

FEMA

104°41'3"W 38°45'44"N

104°40'25"W 38°45'16"N

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

1:6,000

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

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 4/29/2022 at 2:29 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.

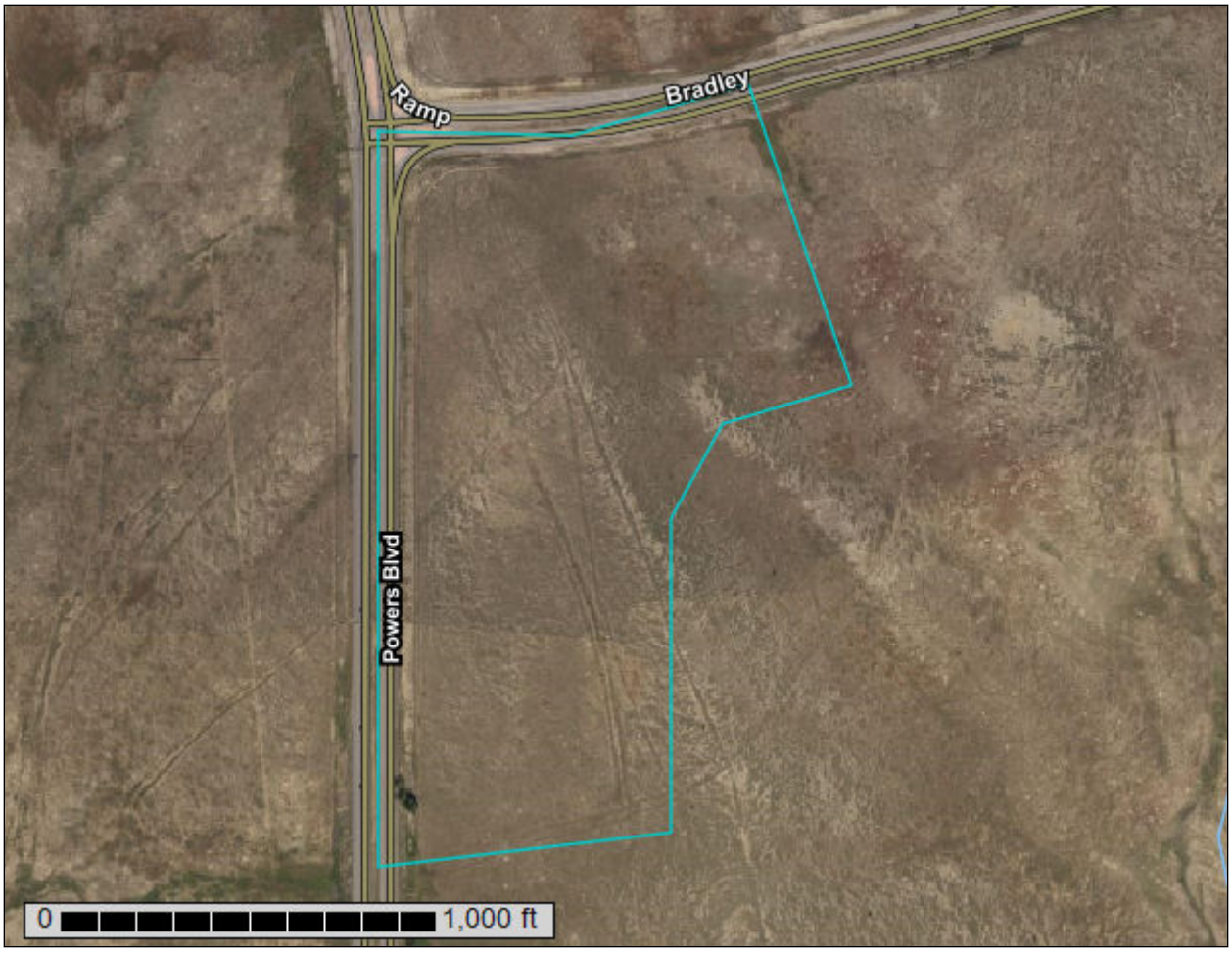
United States Department of Agriculture

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 El Paso County Area, Colorado



April 29, 2022

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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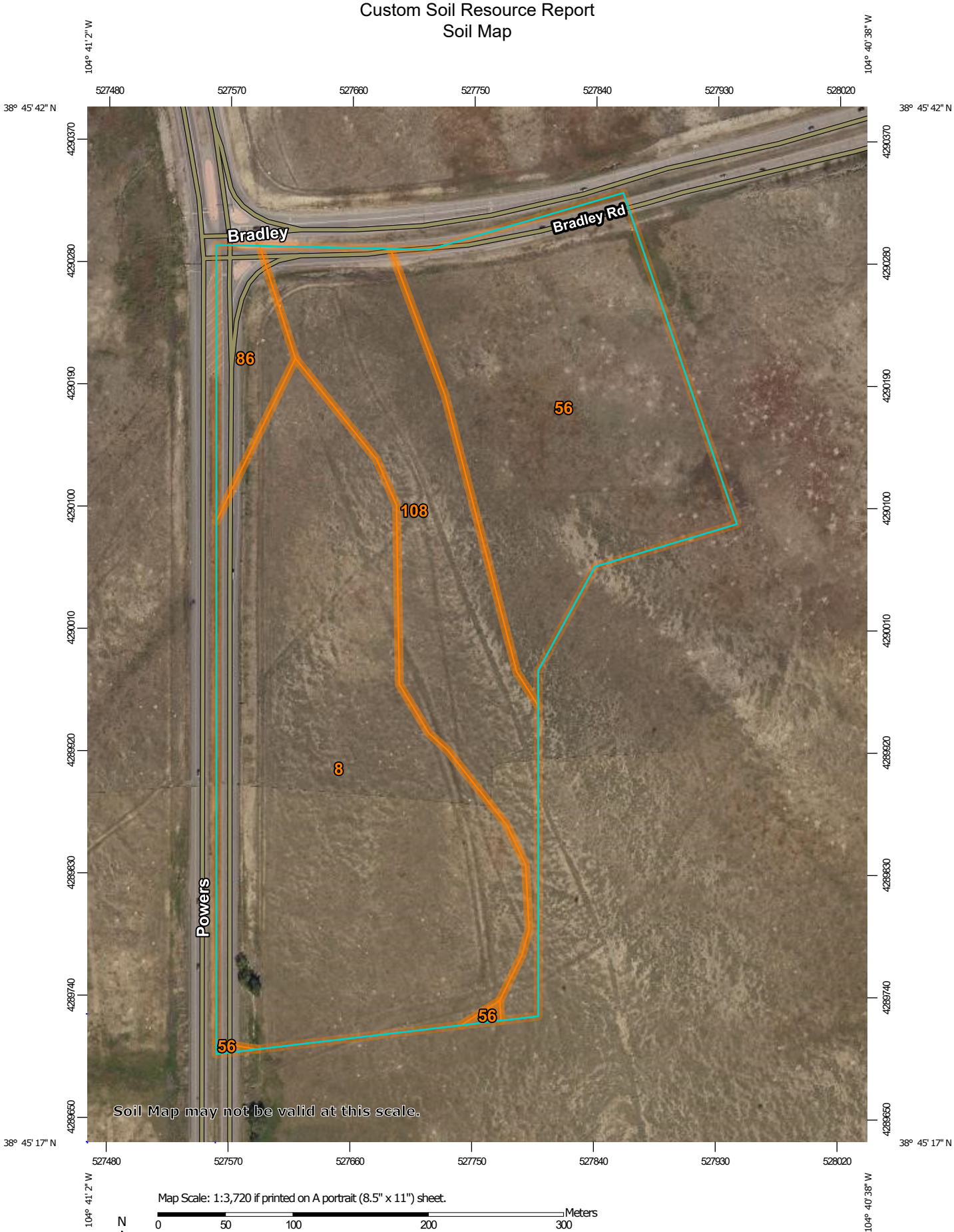
Soil Map

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.

Custom Soil Resource Report
Soil Map



Map Scale: 1:3,720 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 50 100 200 300

Feet: 0 150 300 600 900

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 1:24,000.

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 19, Aug 31, 2021

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

Date(s) aerial images were photographed: Aug 14, 2018—Sep 23, 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.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
8	Blakeland loamy sand, 1 to 9 percent slopes	19.2	45.9%
56	Nelson-Tassel fine sandy loams, 3 to 18 percent slopes	12.2	29.3%
86	Stoneham sandy loam, 3 to 8 percent slopes	1.8	4.3%
108	Wiley silt loam, 3 to 9 percent slopes	8.6	20.5%
Totals for Area of Interest		**41.8**	**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.

El Paso County Area, Colorado

8—Blakeland loamy sand, 1 to 9 percent slopes

Map Unit Setting

National map unit symbol: 369v
Elevation: 4,600 to 5,800 feet
Mean annual precipitation: 14 to 16 inches
Mean annual air temperature: 46 to 48 degrees F
Frost-free period: 125 to 145 days
Farmland classification: Not prime farmland

Map Unit Composition

Blakeland and similar soils: 98 percent
Minor components: 2 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Blakeland

Setting

Landform: Hills, flats
Landform position (three-dimensional): Side slope, talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from sedimentary rock and/or eolian deposits derived from sedimentary rock

Typical profile

A - 0 to 11 inches: loamy sand
AC - 11 to 27 inches: loamy sand
C - 27 to 60 inches: sand

Properties and qualities

Slope: 1 to 9 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Available water supply, 0 to 60 inches: Low (about 4.5 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: A
Ecological site: R049XB210CO - Sandy Foothill
Hydric soil rating: No

Minor Components

Other soils

Percent of map unit: 1 percent

Hydric soil rating: No

Pleasant

Percent of map unit: 1 percent
Landform: Depressions
Hydric soil rating: Yes

56—Nelson-Tassel fine sandy loams, 3 to 18 percent slopes

Map Unit Setting

National map unit symbol: 3690
Elevation: 5,600 to 6,400 feet
Mean annual precipitation: 12 to 14 inches
Mean annual air temperature: 48 to 52 degrees F
Frost-free period: 135 to 155 days
Farmland classification: Not prime farmland

Map Unit Composition

Nelson and similar soils: 55 percent
Tassel and similar soils: 40 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Nelson

Setting

Landform: Hills
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Calcareous residuum weathered from interbedded sedimentary rock

Typical profile

A - 0 to 5 inches: fine sandy loam
Ck - 5 to 23 inches: fine sandy loam
Cr - 23 to 27 inches: weathered bedrock

Properties and qualities

Slope: 3 to 12 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.06 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Very low (about 2.8 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: B
Ecological site: R067BY045CO - Shaly Plains
Other vegetative classification: SHALY PLAINS (069AY046CO)
Hydric soil rating: No

Description of Tassel

Setting

Landform: Hills
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Calcareous slope alluvium over residuum weathered from sandstone

Typical profile

A - 0 to 4 inches: fine sandy loam
C - 4 to 10 inches: fine sandy loam
Cr - 10 to 14 inches: weathered bedrock

Properties and qualities

Slope: 3 to 18 percent
Depth to restrictive feature: 6 to 20 inches to paralithic bedrock
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Available water supply, 0 to 60 inches: Very low (about 1.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: D
Ecological site: R067BY045CO - Shaly Plains
Other vegetative classification: SHALY PLAINS (069AY046CO)
Hydric soil rating: No

Minor Components

Other soils

Percent of map unit: 4 percent
Hydric soil rating: No

Pleasant

Percent of map unit: 1 percent
Landform: Depressions
Hydric soil rating: Yes

86—Stoneham sandy loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 36b2
Elevation: 5,100 to 6,500 feet
Mean annual precipitation: 13 to 15 inches
Mean annual air temperature: 48 to 52 degrees F
Frost-free period: 135 to 155 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Stoneham

Setting

Landform: Hills
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Calcareous loamy alluvium

Typical profile

A - 0 to 4 inches: sandy loam
Bt - 4 to 8 inches: sandy clay loam
Btk - 8 to 11 inches: sandy clay loam
Ck - 11 to 60 inches: loam

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: High (about 9.5 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Ecological site: R067BY024CO - Sandy Plains

Other vegetative classification: SANDY PLAINS (069AY026CO)
Hydric soil rating: No

Minor Components

Other soils
Percent of map unit: 4 percent
Hydric soil rating: No

Pleasant
Percent of map unit: 1 percent
Landform: Depressions
Hydric soil rating: Yes

108—Wiley silt loam, 3 to 9 percent slopes

Map Unit Setting
National map unit symbol: 367b
Elevation: 5,200 to 6,200 feet
Mean annual precipitation: 12 to 14 inches
Mean annual air temperature: 48 to 52 degrees F
Frost-free period: 135 to 155 days
Farmland classification: Not prime farmland

Map Unit Composition
Wiley and similar soils: 95 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Wiley

Setting
Landform: Hills
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Calcareous silty eolian deposits

Typical profile
A - 0 to 4 inches: silt loam
Bt - 4 to 16 inches: silt loam
Bk - 16 to 60 inches: silt loam

Properties and qualities
Slope: 3 to 9 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches

Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: High (about 11.5 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: B
Ecological site: R067BY002CO - Loamy Plains
Other vegetative classification: LOAMY PLAINS (069AY006CO)
Hydric soil rating: No

Minor Components

Other soils

Percent of map unit: 4 percent
Hydric soil rating: No

Pleasant

Percent of map unit: 1 percent
Landform: Depressions
Hydric soil rating: Yes

Soil Information for All Uses

Suitabilities and Limitations for Use

The Suitabilities and Limitations for Use section includes various soil interpretations displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each interpretation.

Land Management

Land management interpretations are tools designed to guide the user in evaluating existing conditions in planning and predicting the soil response to various land management practices, for a variety of land uses, including cropland, forestland, hayland, pastureland, horticulture, and rangeland. Example interpretations include suitability for a variety of irrigation practices, log landings, haul roads and major skid trails, equipment operability, site preparation, suitability for hand and mechanical planting, potential erosion hazard associated with various practices, and ratings for fencing and waterline installation.

Erosion Hazard (Road, Trail)

The ratings in this interpretation indicate the hazard of soil loss from unsurfaced roads and trails. The ratings are based on soil erosion factor K, slope, and content of rock fragments.

The ratings are both verbal and numerical. The hazard is described as "slight," "moderate," or "severe." A rating of "slight" indicates that little or no erosion is likely; "moderate" indicates that some erosion is likely, that the roads or trails may require occasional maintenance, and that simple erosion-control measures are needed; and "severe" indicates that significant erosion is expected, that the roads or trails require frequent maintenance, and that costly erosion-control measures are needed.

Numerical ratings indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the specified aspect of forestland management (1.00) and the point at which the soil feature is not a limitation (0.00).

The map unit components listed for each map unit in the accompanying Summary by Map Unit table in Web Soil Survey or the Aggregation Report in Soil Data Viewer are determined by the aggregation method chosen. An aggregated rating class is shown for each map unit. The components listed for each map unit are only those that have the same rating class as listed for the map unit. The percent composition of each component in a particular map unit is presented to help the user better understand the percentage of each map unit that has the rating presented.

Other components with different ratings may be present in each map unit. The ratings for all components, regardless of the map unit aggregated rating, can be viewed by generating the equivalent report from the Soil Reports tab in Web Soil Survey or from the Soil Data Mart site. Onsite investigation may be needed to validate these interpretations and to confirm the identity of the soil on a given site.

Custom Soil Resource Report
Map—Erosion Hazard (Road, Trail)

Map Scale: 1:3,720 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 50 100 200 300

Feet: 0 150 300 600 900

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

MAP LEGEND

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

Soils

Soil Rating Polygons
- Very severe
- Severe
- Moderate
- Slight
- Not rated or not available

Soil Rating Lines
- Very severe
- Severe
- Moderate
- Slight
- Not rated or not available

Soil Rating Points
- Very severe
- Severe
- Moderate
- Slight
- Not rated or not available

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

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

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 19, Aug 31, 2021

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

Date(s) aerial images were photographed: Aug 14, 2018—Sep 23, 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.

Tables—Erosion Hazard (Road, Trail)

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
8	Blakeland loamy sand, 1 to 9 percent slopes	Moderate	Blakeland (98%)	Slope/erodibility (0.50)	19.2	45.9%
56	Nelson-Tassel fine sandy loams, 3 to 18 percent slopes	Moderate	Nelson (55%)	Slope/erodibility (0.50)	12.2	29.3%
86	Stoneham sandy loam, 3 to 8 percent slopes	Moderate	Stoneham (95%)	Slope/erodibility (0.50)	1.8	4.3%
108	Wiley silt loam, 3 to 9 percent slopes	Moderate	Wiley (95%)	Slope/erodibility (0.50)	8.6	20.5%
Totals for Area of Interest					**41.8**	**100.0%**

Rating	Acres in AOI	Percent of AOI
Moderate	41.8	100.0%
Totals for Area of Interest	**41.8**	**100.0%**

Rating Options—Erosion Hazard (Road, Trail)

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

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APPENDIX C – HYDROLOGIC CALCULATIONS

$$I = \frac{28.5\ P_1}{(10+T_D)^{0.786}}$$

Where:

I = rainfall intensity (inches per hour)

P_1 = one-hour rainfall depth (inches) from NOAA Atlas 14 Point Precipitation Frequency Estimates, Colorado Springs, CO

T_C = storm duration (minutes)

	2-yr	5-yr	10-yr	100-yr
P_1 =	1.01	1.29	1.56	2.75

Time Intensity Frequency Tabulation

TIME	2 YR	5 YR	10 YR	100 YR
5	3.43	4.38	5.29	9.33
10	2.73	3.49	4.22	7.44
15	2.29	2.93	3.54	6.24
30	1.58	2.02	2.45	4.31
60	1.02	1.30	1.58	2.78
120	0.63	0.80	0.97	1.71

Weighted Imperviousness Calculations - Existing Conditions

SUB-BASIN	AREA (SF)	AREA (Acres)	ROOF AREA	ROOF IMPERVIOUSNESS	ROOF C2	ROOF C5	ROOF C10	ROOF C100	LANDSCAPE AREA	LANDSCAPE IMPERVIOUSNESS	LANDSCAPE C2	LANDSCAPE C5	LANDSCAPE C10	LANDSCAPE C100	PAVEMENT AREA	PAVEMENT IMPERVIOUSNESS	PAVEMENT C2	PAVEMENT C5	PAVEMENT C10	PAVEMENT C100	WEIGHTED IMPERVIOUSNESS	WEIGHTED COEFFICIENTS C2	WEIGHTED COEFFICIENTS C5	WEIGHTED COEFFICIENTS C10	WEIGHTED COEFFICIENTS C100
EX-1	451188	10.36	0	90%	0.71	0.73	0.75	0.81	10.03	2%	0.03	0.09	0.17	0.36	0.33	100%	0.89	0.90	0.92	0.96	5%	0.06	0.12	0.19	0.38
EX-2	501101	11.50	0	90%	0.71	0.73	0.75	0.81	11.50	2%	0.03	0.09	0.17	0.36	0.00	100%	0.89	0.90	0.92	0.96	2%	0.03	0.09	0.17	0.36
EX-3	11114	0.26	0	90%	0.71	0.73	0.75	0.81	0.21	2%	0.03	0.09	0.17	0.36	0.04	100%	0.89	0.90	0.92	0.96	18%	0.17	0.22	0.29	0.46
OS-1	28574	0.66	0	90%	0.71	0.73	0.75	0.81	0.66	2%	0.03	0.09	0.17	0.36	0.00	100%	0.89	0.90	0.92	0.96	2%	0.03	0.09	0.17	0.36
TOTAL	963,403	22.77	0.00	90%	0.71	0.73	0.75	0.81	22.41	2%	0.03	0.09	0.17	0.36	0.37	100%	0.89	0.90	0.92	0.96	4%	0.04	0.10	0.18	0.37

Waterview East Commercial
Existing Runoff Calculations
Time of Concentration

Watercourse Coefficient

Forest & Meadow	2.50	Short Grass Pasture & Lawns	7.00
Fallow or Cultivation	5.00	Nearly Bare Ground	10.00
Grassed Waterway	15.00		
Paved Area & Shallow Gutter	20.00		

	SUB-BASIN DATA				INITIAL / OVERLAND TIME			TRAVEL TIME T(t)					T(c) CHECK (URBANIZED BASINS)			FINAL T(c)
DESIGN POINT	DRAIN BASIN	AREA sq. ft.	AREA ac.	C(5)	Length ft.	Slope %	T(i) min	Length ft.	Slope %	Coeff.	Velocity fps	T(t) min.	COMP. T(c)	TOTAL LENGTH	L/180+10	min.
1	EX-1	451,188	10.36	0.12	100	3.4%	12.1	742	9.7%	7.00	2.2	5.7	17.8	842	14.7	14.7
2	EX-2	501,101	11.50	0.09	100	2.8%	13.1	1710	5.6%	7.00	1.7	17.2	30.3	1810	20.1	20.1
3	EX-3	11,114	0.26	0.22	100	9.6%	7.6	40	0.6%	7.00	0.5	1.2	8.8	140	10.8	8.8
4	OS-1	28,574	0.66	0.09	34	33.0%	3.4	625	2.8%	7.00	1.2	8.9	12.3	659	13.7	12.3

Waterview East Commercial
Existing Runoff Calculations
(Rational Method Procedure)

Design Storm 5 Year

BASIN INFORMATION				DIRECT RUNOFF				CUMULATIVE RUNOFF				NOTES
DESIGN POINT	DRAIN BASIN	AREA ac.	RUNOFF COEFF	T(c) min	C x A	I in/hr	Q cfs	T(c) min	C x A	I in/hr	Q cfs	
1	EX-1	10.36	0.12	14.7	1.20	2.96	3.54				3.73	EX-1 and OS-1 flows
2	EX-2	11.50	0.09	20.1	1.04	2.53	2.62				2.62	
3	EX-3	0.26	0.22	8.8	0.06	3.66	0.21				0.21	
4	OS-1	0.66	0.09	12.3	0.06	3.20	0.19				0.19	

Waterview East Commercial
Existing Runoff Calculations
(Rational Method Procedure)

Design Storm *100 Year*

BASIN INFORMATION				DIRECT RUNOFF				CUMULATIVE RUNOFF				NOTES
DESIGN POINT	DRAIN BASIN	AREA ac.	RUNOFF COEFF	T(c) min	C x A	I in/hr	Q cfs	T(c) min	C x A	I in/hr	Q cfs	
1	EX-1	10.36	0.38	14.7	3.92	6.30	24.73				26.35	EX-1 and OS-1 flows
2	EX-2	11.50	0.36	20.1	4.14	5.40	22.34				22.34	
3	EX-3	0.26	0.46	8.8	0.12	7.80	0.91				0.91	
4	OS-1	0.66	0.36	12.3	0.24	6.83	1.61				1.61	

Waterview East Commercial
Existing Runoff Calculations *Design Storm* *10 Year*
(Rational Method Procedure)

BASIN INFORMATION				DIRECT RUNOFF				CUMMULATIVE RUNOFF				NOTES
DESIGN POINT	DRAIN BASIN	AREA ac.	RUNOFF COEFF	T(c) min	C x A	I in/hr	Q cfs	T(c) min	C x A	I in/hr	Q cfs	
1	EX-1	10.36	0.19	14.7	2.01	3.58	7.17					
2	EX-2	11.5	0.17	20.1	1.96	3.06	5.99					
3	EX-3	0.255	0.29	8.8	0.07	4.43	0.33					

SUMMARY - EXISTING RUNOFF TABLE						
DESIGN POINT	BASIN DESIGNATION	BASIN AREA (ACRES)	DIRECT 5-YR RUNOFF (CFS)	DIRECT 100-YR RUNOFF (CFS)	CUMULATIVE 5-YR RUNOFF (CFS)	CUMULATIVE 100-YR RUNOFF (CFS)
1	EX-1	10.36	3.54	24.73	3.73	26.35
2	EX-2	11.50	2.62	22.34	2.62	22.34
3	EX-3	0.26	0.21	0.91	0.21	0.91

Table 6-6. Runoff coefficient equations based on NRCS soil group and storm return period

NRCS Soil Group	Storm Return Period					
	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
A	$C_A = 0.89i$	$C_A = 0.93i$	$C_A = 0.94i$	$C_A = 0.944i$	$C_A = 0.95i$	$C_A = 0.81i + 0.154$
B	$C_B = 0.89i$	$C_B = 0.93i$	$C_B = 0.81i + 0.125$	$C_B = 0.70i + 0.23$	$C_B = 0.59i + 0.364$	$C_B = 0.49i + 0.454$
C/D	$C_{C/D} = 0.89i$	$C_{C/D} = 0.87i + 0.052$	$C_{C/D} = 0.74i + 0.2$	$C_{C/D} = 0.64i + 0.31$	$C_{C/D} = 0.54i + 0.418$	$C_{C/D} = 0.45i + 0.508$

ROOF						
NRCS Soil Group	Storm Return Period					
	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
A	0.80	0.84	0.85	0.85	0.86	0.88
B						
C/D						

LANDSCAPE						
NRCS Soil Group	Storm Return Period					
	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
A	0.02	0.02	0.02	0.02	0.02	0.17
B						
C/D						

PAVEMENT						
NRCS Soil Group	Storm Return Period					
	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
A	0.89	0.93	0.94	0.94	0.95	0.96
B						
C/D						

I (%)	
ROOF	90.00%
LANDSCAPE	2.00%
PAVEMENT	100.00%

Soil Type
A
B
C/D

$$I = \frac{28.5\ P_1}{(10+T_D)^{0.786}}$$

Where:

I = rainfall intensity (inches per hour)

P_1 = one-hour rainfall depth (inches) from NOAA Atlas 14 Point Precipitation Frequency Estimates, Colorado Springs, CO

T_C = storm duration (minutes)

	2-yr	5-yr	10-yr	100-yr
P_1 =	1.01	1.29	1.56	2.75

Time Intensity Frequency Tabulation

TIME	2 YR	5 YR	10 YR	100 YR
5	3.43	4.38	5.29	9.33
10	2.73	3.49	4.22	7.44
15	2.29	2.93	3.54	6.24
30	1.58	2.02	2.45	4.31
60	1.02	1.30	1.58	2.78
120	0.63	0.80	0.97	1.71

Weighted Imperviousness Calculations

SUB-BASIN	AREA (SF)	AREA (Acres)	ROOF AREA	ROOF IMPERVIOUSNESS	ROOF				LANDSCAPE AREA	LANDSCAPE IMPERVIOUSNESS	LANDSCAPE				PAVEMENT AREA	PAVEMENT IMPERVIOUSNESS	PAVEMENT				WEIGHTED IMPERVIOUSNESS	WEIGHTED COEFFICIENTS			
					C2	C5	C10	C100			C2	C5	C10	C100			C2	C5	C10	C100		C2	C5	C10	C100
A1	265683	6.10	-	90%	0.71	0.73	0.75	0.81	6.10	2%	0.03	0.09	0.17	0.36	-	100%	0.89	0.90	0.92	0.96	2%	0.03	0.09	0.17	0.36
A2	218673	5.02	-	90%	0.71	0.73	0.75	0.81	5.02	2%	0.03	0.09	0.17	0.36	-	100%	0.89	0.90	0.92	0.96	2%	0.03	0.09	0.17	0.36
A3	170843	3.92	-	90%	0.71	0.73	0.75	0.81	3.92	2%	0.03	0.09	0.17	0.36	-	100%	0.89	0.90	0.92	0.96	2%	0.03	0.09	0.17	0.36
A4	74606	1.71	-	90%	0.71	0.73	0.75	0.81	1.71	2%	0.03	0.09	0.17	0.36	-	100%	0.89	0.90	0.92	0.96	2%	0.03	0.09	0.17	0.36
TOTAL	729,805	16.8	-	90%	0.71	0.73	0.75	0.81	16.75	2%	0.03	0.09	0.17	0.36	-	100%	0.89	0.90	0.92	0.96	2%	0.03	0.09	0.17	0.36

SUB-BASIN	AREA (SF)	AREA (Acres)	ROOF AREA	ROOF IMPERVIOUSNESS	ROOF				LANDSCAPE AREA	LANDSCAPE IMPERVIOUSNESS	LANDSCAPE				PAVEMENT AREA	PAVEMENT IMPERVIOUSNESS	PAVEMENT				WEIGHTED IMPERVIOUSNESS	WEIGHTED COEFFICIENTS			
					C2	C5	C10	C100			C2	C5	C10	C100			C2	C5	C10	C100		C2	C5	C10	C100
OS1	27155	0.62	-	90%	0.71	0.73	0.75	0.81	27155	2%	0.03	0.09	0.17	0.36	-	100%	0.89	0.9	0.92	0.96	2%	0.03	0.09	0.17	0.36
OS2	115619	2.65	-	90%	0.71	0.73	0.75	0.81	115619	2%	0.03	0.09	0.17	0.36	-	100%	0.89	0.9	0.92	0.96	2%	0.03	0.09	0.17	0.36
OS3	17962	0.41	-	90%	0.71	0.73	0.75	0.81	17962	2%	0.03	0.09	0.17	0.36	-	100%	0.89	0.9	0.92	0.96	2%	0.03	0.09	0.17	0.36
OS4	28864	0.66	-	90%	0.71	0.73	0.75	0.81	28864	2%	0.03	0.09	0.17	0.36	-	100%	0.89	0.9	0.92	0.96	2%	0.03	0.09	0.17	0.36
OS5	44189	1.01	-	90%	0.71	0.73	0.75	0.81	44189	2%	0.03	0.09	0.17	0.36	-	100%	0.89	0.9	0.92	0.96	2%	0.03	0.09	0.17	0.36
TOTAL	233789	5.37	-	90%	0.71	0.73	0.75	0.81	233789	2%	0.03	0.09	0.17	0.36	-	100%	0.89	0.90	0.92	0.96	2%	0.03	0.09	0.17	0.36

Waterview East Commercial - Drainage Report
Proposed Runoff Calculations
Time of Concentration

Watercourse Coefficient

Forest & Meadow	2.50	Short Grass Pasture & Lawns	7.00											Grassed Waterway		15.00
Fallow or Cultivation	5.00	Nearly Bare Ground	10.00											Paved Area & Shallow Gutter		20.00

	SUB-BASIN DATA				INITIAL / OVERLAND TIME			TRAVEL TIME T(t)					T(c) CHECK (URBANIZED BASINS)			FINAL T(c)
DESIGN POINT	DRAIN BASIN	AREA sq. ft.	AREA ac.	C(5)	Length ft.	Slope %	T(i) min	Length ft.	Slope %	Coeff.	Velocity fps	T(t) min.	COMP. T(c)	TOTAL LENGTH	L/180+10	min.
1	A1	265,683	6.10	0.09	100	10.5%	8.5	682	1.1%	10.00	1.0	11.0	19.5	782	14.3	14.3
2	A2	218,673	5.02	0.09	100	2.0%	14.8	574	2.1%	10.00	1.5	6.5	21.3	674	13.7	13.7
3	A3	170,843	3.92	0.09	100	1.7%	15.6	339	2.1%	10.00	1.4	3.9	19.5	439	12.4	12.4
4	A4	74,606	1.71	0.09	100	3.4%	12.3	318	3.4%	10.00	1.8	2.9	15.2	418	12.3	12.3
OS1	OS1	27,155	0.62	0.09	100	10.4%	8.5	6	10.3%	10.00	3.2	0.0	8.5	106	10.6	8.5
OS2	OS2	115,619	2.65	0.09	100	14.1%	7.7	84	9.9%	10.00	3.1	0.4	8.1	184	11.0	8.1
OS3	OS3	17,962	0.41	0.09	77	15.0%	6.6	0	1.0%	10.00	1.0	0.0	6.6	77	10.4	6.6
OS4	OS4	28,864	0.66	0.09	60	26.8%	4.8	0	0.0%	10.00	0.0	0.0	5.0	60	10.3	5.0
OS5	OS5	44,189	1.01	0.09	69	14.8%	6.3	0	0.0%	10.00	0.0	0.0	6.3	69	10.4	6.3

Waterview East Commercial - Drainage Report
Proposed Runoff Calculations *Design Storm 5 Year*
(Rational Method Procedure)

BASIN INFORMATION				DIRECT RUNOFF				CUMULATIVE RUNOFF				NOTES
DESIGN POINT	DRAIN BASIN	AREA ac.	RUNOFF COEFF	T(c) min	C x A	I in/hr	Q cfs	T(c) min	C x A	I in/hr	Q cfs	
1	A1	6.10	0.09	14.3	0.55	2.99	1.64				1.64	
2	A2	5.02	0.09	13.7	0.45	3.05	1.38				1.38	
3	A3	3.92	0.09	12.4	0.35	3.19	1.13				1.13	
4	A4	1.71	0.09	12.3	0.15	3.20	0.49				0.49	
OS1	OS1	0.62	0.09	8.5	0.06	3.71	0.21				0.21	
OS2	OS2	2.65	0.09	8.1	0.24	3.77	0.90				0.90	
OS3	OS3	0.41	0.09	6.6	0.04	4.04	0.15				0.15	
OS4	OS4	0.66	0.09	5.0	0.06	4.38	0.26				0.26	
OS5	OS5	1.01	0.09	6.3	0.09	4.10	0.37				0.37	

Waterview East Commercial - Drainage Report
Proposed Runoff Calculations *Design Storm* *100 Year*
(Rational Method Procedure)

BASIN INFORMATION				DIRECT RUNOFF				CUMULATIVE RUNOFF				NOTES
DESIGN POINT	DRAIN BASIN	AREA ac.	RUNOFF COEFF	T(c) min	C x A	I in/hr	Q cfs	T(c) min	C x A	I in/hr	Q cfs	
1	A1	6.10	0.36	14.3	2.20	6.38	14.02				14.02	
2	A2	5.02	0.36	13.7	1.81	6.51	11.77				11.77	
3	A3	3.92	0.36	12.4	1.41	6.81	9.61				9.61	
4	A4	1.71	0.36	12.3	0.62	6.83	4.21				4.21	
OS1	OS1	0.62	0.36	8.5	0.22	7.90	1.77				1.77	
OS2	OS2	2.65	0.36	8.1	0.96	8.03	7.67				7.67	
OS3	OS3	0.41	0.36	6.6	0.15	8.61	1.28				1.28	
OS4	OS4	0.66	0.36	5.0	0.24	9.33	2.23				2.23	
OS5	OS5	1.01	0.36	6.3	0.37	8.74	3.19				3.19	

SUMMARY - PROPOSED RUNOFF TABLE						
DESIGN POINT	BASIN DESIGNATION	BASIN AREA (ACRES)	DIRECT 5-YR RUNOFF (CFS)	DIRECT 100-YR RUNOFF (CFS)	CUMULATIVE 5-YR RUNOFF (CFS)	CUMULATIVE 100-YR RUNOFF (CFS)
1	A1	6.10	1.64	14.02	1.64	14.02
2	A2	5.02	1.38	11.77	1.38	11.77
3	A3	3.92	1.13	9.61	1.13	9.61
4	A4	1.71	0.49	4.21	0.49	4.21
OS1	OS1	0.62	0.21	1.77	0.21	1.77
OS2	OS2	2.65	0.90	7.67	0.90	7.67
OS3	OS3	0.41	0.15	1.28	0.15	1.28
OS4	OS4	0.66	0.26	2.23	0.26	2.23
OS5	OS5	1.01	0.37	3.19	0.37	3.19

Table 6-6. Runoff coefficient equations based on NRCS soil group and storm return period

NRCS Soil Group	Storm Return Period					
	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
A	$C_A = 0.89i$	$C_A = 0.93i$	$C_A = 0.94i$	$C_A = 0.944i$	$C_A = 0.95i$	$C_A = 0.81i + 0.154$
B	$C_B = 0.89i$	$C_B = 0.93i$	$C_B = 0.81i + 0.125$	$C_B = 0.70i + 0.23$	$C_B = 0.59i + 0.364$	$C_B = 0.49i + 0.454$
C/D	$C_{C/D} = 0.89i$	$C_{C/D} = 0.87i + 0.052$	$C_{C/D} = 0.74i + 0.2$	$C_{C/D} = 0.64i + 0.31$	$C_{C/D} = 0.54i + 0.418$	$C_{C/D} = 0.45i + 0.508$

ROOF						
NRCS Soil Group	Storm Return Period					
	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
A	0.80	0.84	0.85	0.85	0.86	0.88
B						
C/D						

LANDSCAPE						
NRCS Soil Group	Storm Return Period					
	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
A	0.02	0.02	0.02	0.02	0.02	0.17
B						
C/D						

PAVEMENT						
NRCS Soil Group	Storm Return Period					
	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
A	0.89	0.93	0.94	0.94	0.95	0.96
B						
C/D						

I (%)	
ROOF	90.00%
LANDSCAPE	2.00%
PAVEMENT	100.00%

Soil Type
A
B
C/D

APPENDIX D – HYDRAULIC CALCULATIONS

Unresolved Comment:
- Provide sizing calculations for TSB ponds.

Sediment Basin (SB) SC-7

Description

A sediment basin is a temporary pond built on a construction site to capture eroded or disturbed soil transported in storm runoff prior to discharge from the site. Sediment basins are designed to capture site runoff and slowly release it to allow time for settling of sediment prior to discharge. Sediment basins are often constructed in locations that will later be modified to serve as post-construction stormwater basins.

Photograph SB-1. Sediment basin at the toe of a slope. Photo courtesy of WWE.

Appropriate Uses

Most large construction sites (typically greater than 2 acres) will require one or more sediment basins for effective management of construction site runoff. On linear construction projects, sediment basins may be impractical; instead, sediment traps or other combinations of BMPs may be more appropriate.

Sediment basins should not be used as stand-alone sediment controls. Erosion and other sediment controls should also be implemented upstream.

When feasible, the sediment basin should be installed in the same location where a permanent post-construction detention pond will be located.

Design and Installation

The design procedure for a sediment basin includes these steps:

- **Basin Storage Volume**: Provide a storage volume of at least 3,600 cubic feet per acre of drainage area. To the extent practical, undisturbed and/or off-site areas should be diverted around sediment basins to prevent "clean" runoff from mixing with runoff from disturbed areas. For undisturbed areas (both on-site and off-site) that cannot be diverted around the sediment basin, provide a minimum of 500 ft^3/acre of storage for undeveloped (but stable) off-site areas in addition to the 3,600 ft^3/acre for disturbed areas. For stable, developed areas that cannot be diverted around the sediment basin, storage volume requirements are summarized in Table SB-1.

- **Basin Geometry:** Design basin with a minimum length-to-width ratio of 2:1 (L:W). If this cannot be achieved because of site space constraints, baffling may be required to extend the effective distance between the inflow point(s) and the outlet to minimize short-circuiting.

- **Dam Embankment**: It is recommended that embankment slopes be 4:1 (H:V) or flatter and no steeper than 3:1 (H:V) in any location.

Sediment Basins	
Functions	
Erosion Control	No
Sediment Control	Yes
Site/Material Management	No

- **Inflow Structure**: For concentrated flow entering the basin, provide energy dissipation at the point of inflow.

Table SB-1. Additional Volume Requirements for Undisturbed and Developed Tributary Areas Draining through Sediment Basins

Imperviousness (%)	Additional Storage Volume (ft^3) Per Acre of Tributary Area
Undeveloped	500
10	800
20	1230
30	1600
40	2030
50	2470
60	2980
70	3560
80	4360
90	5300
100	6460

- **Outlet Works**: The outlet pipe shall extend through the embankment at a minimum slope of 0.5 percent. Outlet works can be designed using one of the following approaches:

  - **Riser Pipe (Simplified Detail):** Detail SB-1 provides a simplified design for basins treating no more than 15 acres.

  - **Orifice Plate or Riser Pipe**: Follow the design criteria for Full Spectrum Detention outlets in the EDB Fact Sheet provided in Chapter 4 of this manual for sizing of outlet perforations with an emptying time of approximately 72 hours. In lieu of the trash rack, pack uniformly sized 1½ - to 2-inch gravel in front of the plate or surrounding the riser pipe. This gravel will need to be cleaned out frequently during the construction period as sediment accumulates within it. The gravel pack will need to be removed and disposed of following construction to reclaim the basin for use as a permanent detention facility. If the basin will be used as a permanent extended detention basin for the site, a trash rack will need to be installed once contributing drainage areas have been stabilized and the gravel pack and accumulated sediment have been removed.

  - **Floating Skimmer**: If a floating skimmer is used, install it using manufacturer's recommendations. Illustration SB-1 provides an illustration of a Faircloth Skimmer Floating Outlet™, one of the more commonly used floating skimmer outlets. A skimmer should be designed to release the design volume in no less than 48 hours. The use of a floating skimmer outlet can increase the sediment capture efficiency of a basin significantly. A floating outlet continually decants cleanest water off the surface of the pond and releases cleaner water than would discharge from a perforated riser pipe or plate.

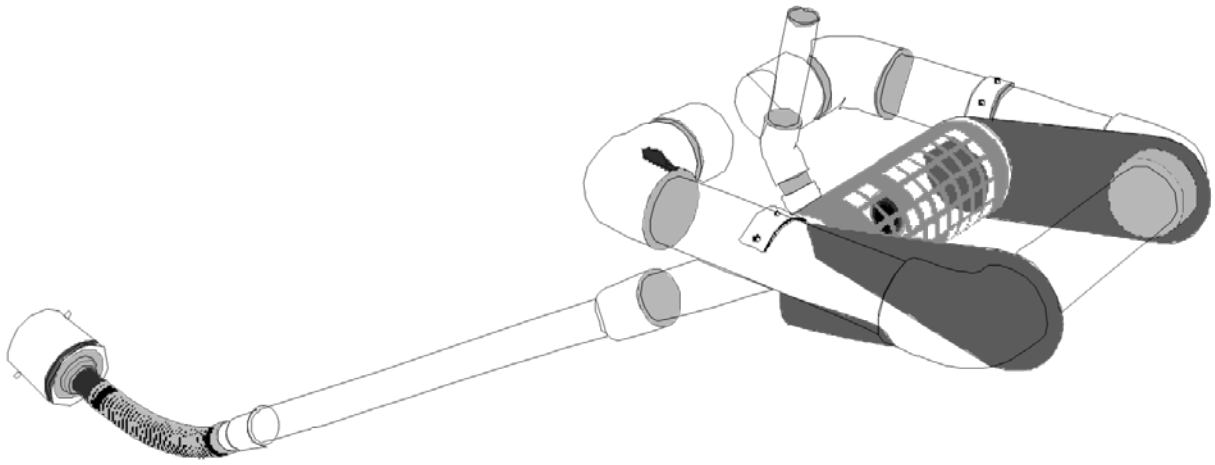

Illustration SB-1. Outlet structure for a temporary sediment basin - Faircloth Skimmer Floating Outlet. Illustration courtesy of J. W. Faircloth & Sons, Inc., FairclothSkimmer.com.

- **Outlet Protection and Spillway:** Consider all flow paths for runoff leaving the basin, including protection at the typical point of discharge as well as overtopping.
  - **Outlet Protection:** Outlet protection should be provided where the velocity of flow will exceed the maximum permissible velocity of the material of the waterway into which discharge occurs. This may require the use of a riprap apron at the outlet location and/or other measures to keep the waterway from eroding.
  - **Emergency Spillway:** Provide a stabilized emergency overflow spillway for rainstorms that exceed the capacity of the sediment basin volume and its outlet. Protect basin embankments from erosion and overtopping. If the sediment basin will be converted to a permanent detention basin, design and construct the emergency spillway(s) as required for the permanent facility. If the sediment basin will not become a permanent detention basin, it may be possible to substitute a heavy polyvinyl membrane or properly bedded rock cover to line the spillway and downstream embankment, depending on the height, slope, and width of the embankments.

Maintenance and Removal

Maintenance activities include the following:

- Dredge sediment from the basin, as needed to maintain BMP effectiveness, typically when the design storage volume is no more than one-third filled with sediment.
- Inspect the sediment basin embankments for stability and seepage.
- Inspect the inlet and outlet of the basin, repair damage, and remove debris. Remove, clean and replace the gravel around the outlet on a regular basis to remove the accumulated sediment within it and keep the outlet functioning.
- Be aware that removal of a sediment basin may require dewatering and associated permit requirements.
- Do not remove a sediment basin until the upstream area has been stabilized with vegetation.

Final disposition of the sediment basin depends on whether the basin will be converted to a permanent post-construction stormwater basin or whether the basin area will be returned to grade. For basins being converted to permanent detention basins, remove accumulated sediment and reconfigure the basin and outlet to meet the requirements of the final design for the detention facility. If the sediment basin is not to be used as a permanent detention facility, fill the excavated area with soil and stabilize with vegetation.

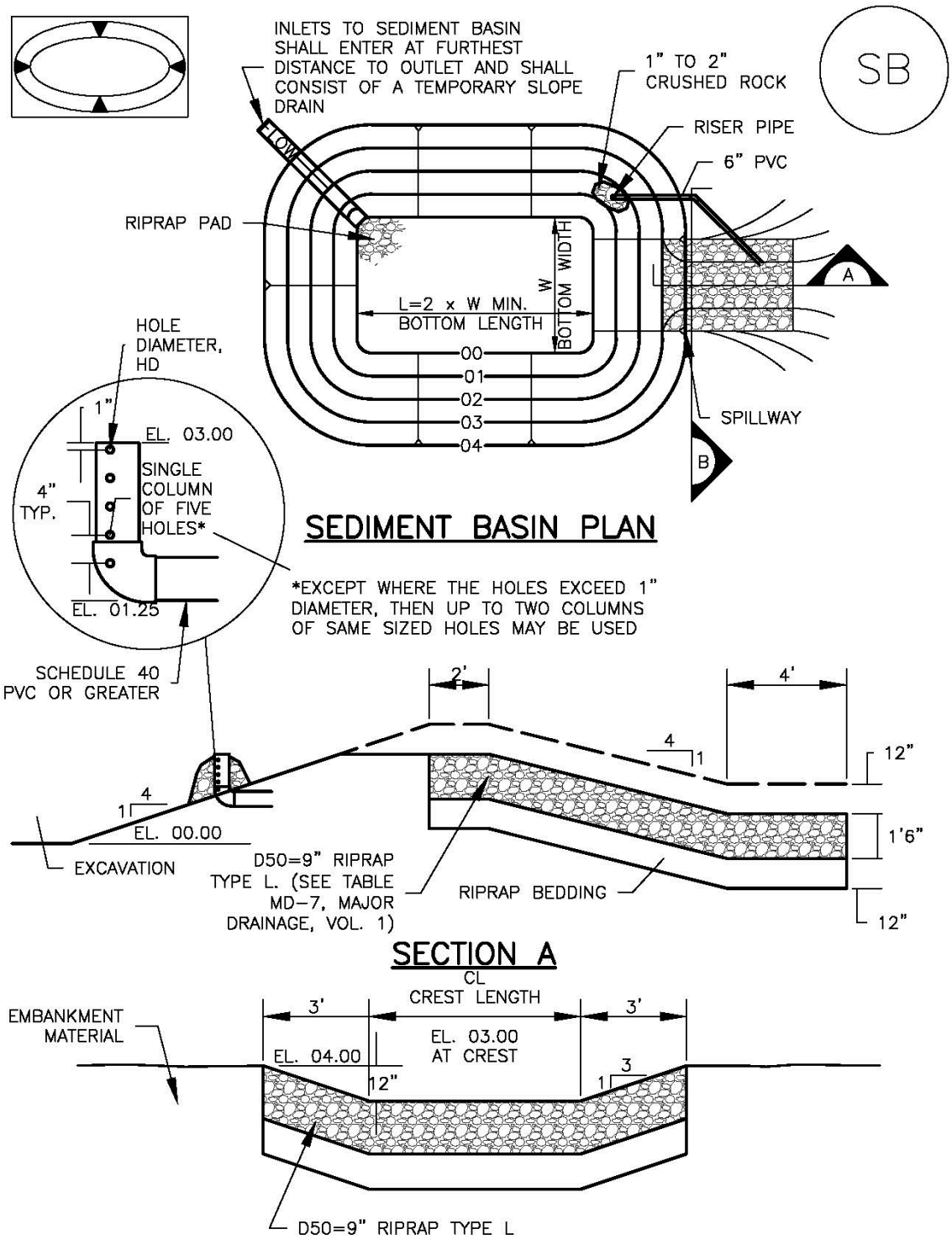
SB
INLETS TO SEDIMENT BASIN SHALL ENTER AT FURTHEST DISTANCE TO OUTLET AND SHALL CONSIST OF A TEMPORARY SLOPE DRAIN
FLOW
1" TO 2" CRUSHED ROCK
RISER PIPE
6" PVC
RIPRAP PAD
W BOTTOM WIDTH
L=2 x W MIN. BOTTOM LENGTH
00
01
02
03
04
A
B
SPILLWAY
HOLE DIAMETER, HD
1"
EL. 03.00
4" TYP.
SINGLE COLUMN OF FIVE HOLES*
EL. 01.25
SCHEDULE 40 PVC OR GREATER
SEDIMENT BASIN PLAN
*EXCEPT WHERE THE HOLES EXCEED 1" DIAMETER, THEN UP TO TWO COLUMNS OF SAME SIZED HOLES MAY BE USED
2'
4'
4
1
12"
4
1
EL. 00.00
1'6"
EXCAVATION
D50=9" RIPRAP TYPE L. (SEE TABLE MD-7, MAJOR DRAINAGE, VOL. 1)
RIPRAP BEDDING
12"
SECTION A
CL
CREST LENGTH
3'
3'
EMBANKMENT MATERIAL
EL. 04.00
EL. 03.00 AT CREST
12"
3
1
D50=9" RIPRAP TYPE L

TABLE SB–1. SIZING INFORMATION FOR STANDARD SEDIMENT BASIN			
Upstream Drainage Area (rounded to nearest acre), (ac)	Basin Bottom Width (W), (ft)	Spillway Crest Length (CL), (ft)	Hole Diameter (HD), (in)
1	12 ½	2	9/32
2	21	3	13/16
3	28	5	½
4	33 ½	6	9/16
5	38 ½	8	21/32
6	43	9	21/32
7	47 ¼	11	25/32
8	51	12	27/32
9	55	13	7/8
10	58 ¼	15	15/16
11	61	16	31/32
12	64	18	1
13	67 ½	19	1 1/16
14	70 ½	21	1 1/8
15	73 ¼	22	1 3/16

SEDIMENT BASIN INSTALLATION NOTES

1. SEE PLAN VIEW FOR:
   - –LOCATION OF SEDIMENT BASIN.
   - –TYPE OF BASIN (STANDARD BASIN OR NONSTANDARD BASIN).
   - –FOR STANDARD BASIN, BOTTOM WIDTH W, CREST LENGTH CL, AND HOLE DIAMETER, HD.
   - –FOR NONSTANDARD BASIN, SEE CONSTRUCTION DRAWINGS FOR DESIGN OF BASIN INCLUDING RISER HEIGHT H, NUMBER OF COLUMNS N, HOLE DIAMETER HD AND PIPE DIAMETER D.

2. FOR STANDARD BASIN, BOTTOM DIMENSION MAY BE MODIFIED AS LONG AS BOTTOM AREA IS NOT REDUCED.

3. SEDIMENT BASINS SHALL BE INSTALLED PRIOR TO ANY OTHER LAND–DISTURBING ACTIVITY THAT RELIES ON ON BASINS AS AS A STORMWATER CONTROL.

4. EMBANKMENT MATERIAL SHALL CONSIST OF SOIL FREE OF DEBRIS, ORGANIC MATERIAL, AND ROCKS OR CONCRETE GREATER THAN 3 INCHES AND SHALL HAVE A MINIMUM OF 15 PERCENT BY WEIGHT PASSING THE NO. 200 SIEVE.

5. EMBANKMENT MATERIAL SHALL BE COMPACTED TO AT LEAST 95 PERCENT OF MAXIMUM DENSITY IN ACCORDANCE WITH ASTM D698.

6. PIPE SCH 40 OR GREATER SHALL BE USED.

7. THE DETAILS SHOWN ON THESE SHEETS PERTAIN TO STANDARD SEDIMENT BASIN(S) FOR DRAINAGE AREAS LESS THAN 15 ACRES. SEE CONSTRUCTION DRAWINGS FOR EMBANKMENT, STORAGE VOLUME, SPILLWAY, OUTLET, AND OUTLET PROTECTION DETAILS FOR ANY SEDIMENT BASIN(S) THAT HAVE BEEN INDIVIDUALLY DESIGNED FOR DRAINAGE AREAS LARGER THAN 15 ACRES.

SEDIMENT BASIN MAINTENANCE NOTES

1. INSPECT BMPs EACH WORKDAY, AND MAINTAIN THEM IN EFFECTIVE OPERATING CONDITION. MAINTENANCE OF BMPs SHOULD BE PROACTIVE, NOT REACTIVE. INSPECT BMPs AS SOON AS POSSIBLE (AND ALWAYS WITHIN 24 HOURS) FOLLOWING A STORM THAT CAUSES SURFACE EROSION, AND PERFORM NECESSARY MAINTENANCE.

2. FREQUENT OBSERVATIONS AND MAINTENANCE ARE NECESSARY TO MAINTAIN BMPs IN EFFECTIVE OPERATING CONDITION. INSPECTIONS AND CORRECTIVE MEASURES SHOULD BE DOCUMENTED THOROUGHLY.

3. WHERE BMPs HAVE FAILED, REPAIR OR REPLACEMENT SHOULD BE INITIATED UPON DISCOVERY OF THE FAILURE.

4. SEDIMENT ACCUMULATED IN BASIN SHALL BE REMOVED AS NEEDED TO MAINTAIN BMP EFFECTIVENESS, TYPICALLY WHEN SEDIMENT DEPTH REACHES ONE FOOT (I.E., TWO FEET BELOW THE SPILLWAY CREST).

5. SEDIMENT BASINS ARE TO REMAIN IN PLACE UNTIL THE UPSTREAM DISTURBED AREA IS STABILIZED AND GRASS COVER IS ACCEPTED BY THE LOCAL JURISDICTION.

6. WHEN SEDIMENT BASINS ARE REMOVED, ALL DISTURBED AREAS SHALL BE COVERED WITH TOPSOIL, SEEDED AND MULCHED OR OTHERWISE STABILIZED AS APPROVED BY LOCAL JURISDICTION.

(DETAILS ADAPTED FROM DOUGLAS COUNTY, COLORADO)

NOTE: MANY JURISDICTIONS HAVE BMP DETAILS THAT VARY FROM UDFCD STANDARD DETAILS. CONSULT WITH LOCAL JURISDICTIONS AS TO WHICH DETAIL SHOULD BE USED WHEN DIFFERENCES ARE NOTED.

Worksheet for Temporary Swale 1A

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.030
Channel Slope	0.011 ft/ft
Left Side Slope	4.000 H:V
Right Side Slope	4.000 H:V
Discharge	14.02 cfs

Results	
Normal Depth	12.4 in
Flow Area	4.3 ft²
Wetted Perimeter	8.6 ft
Hydraulic Radius	6.0 in
Top Width	8.30 ft
Critical Depth	11.4 in
Critical Slope	0.018 ft/ft
Velocity	3.26 ft/s
Velocity Head	0.16 ft
Specific Energy	1.20 ft
Froude Number	0.797
Flow Type	Subcritical

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

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	12.4 in
Critical Depth	11.4 in
Channel Slope	0.011 ft/ft
Critical Slope	0.018 ft/ft

See comment for all swales.

Soil Types	Permissible Mean Channel Velocity (ft/sec)
Fine Sand (noncolloidal)	2.0
Coarse Sand (noncolloidal)	4.0
Sandy Loam (noncolloidal)	2.5
Silt Loam (noncolloidal)	3.0
Ordinary Firm Loam	3.5
Silty Clay	3.5
Fine Gravel	5.0

It does not appear you are seeding the swales. The soil map shows majority of area consisting of sandy loam soil. Per DCM Vol. 1 Section 3, Chapter 10 Table 10-3 the max velocity for a sandy loam soil swale is 2.5 ft/sec. Lining is recommended for swale.

Worksheet for Temporary Swale 1B

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data		
Roughness Coefficient	0.030	
Channel Slope	0.016	ft/ft
Left Side Slope	4.000	H:V
Right Side Slope	4.000	H:V
Discharge	14.02	cfs

Results		
Normal Depth	11.6	in
Flow Area	3.7	ft²
Wetted Perimeter	7.9	ft
Hydraulic Radius	5.6	in
Top Width	7.71	ft
Critical Depth	11.4	in
Critical Slope	0.018	ft/ft
Velocity	3.77	ft/s
Velocity Head	0.22	ft
Specific Energy	1.19	ft
Froude Number	0.958	
Flow Type	Subcritical	

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

GVF Output Data		
Upstream Depth	0.0	in
Profile Description	N/A	
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	11.6	in
Critical Depth	11.4	in
Channel Slope	0.016	ft/ft
Critical Slope	0.018	ft/ft

Worksheet for Temporary Swale 2

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data		
Roughness Coefficient	0.030	
Channel Slope	0.010	ft/ft
Left Side Slope	4.000	H:V
Right Side Slope	4.000	H:V
Discharge	11.77	cfs

Results		
Normal Depth	11.8	in
Flow Area	3.9	ft²
Wetted Perimeter	8.1	ft
Hydraulic Radius	5.7	in
Top Width	7.89	ft
Critical Depth	10.6	in
Critical Slope	0.018	ft/ft
Velocity	3.03	ft/s
Velocity Head	0.14	ft
Specific Energy	1.13	ft
Froude Number	0.760	
Flow Type	Subcritical	

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

GVF Output Data		
Upstream Depth	0.0	in
Profile Description	N/A	
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	11.8	in
Critical Depth	10.6	in
Channel Slope	0.010	ft/ft
Critical Slope	0.018	ft/ft

Worksheet for Temporary Swale 3A

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data		
Roughness Coefficient	0.030	
Channel Slope	0.010	ft/ft
Left Side Slope	4.000	H:V
Right Side Slope	4.000	H:V
Discharge	9.61	cfs

Results		
Normal Depth	11.0	in
Flow Area	3.3	ft²
Wetted Perimeter	7.5	ft
Hydraulic Radius	5.3	in
Top Width	7.31	ft
Critical Depth	9.8	in
Critical Slope	0.018	ft/ft
Velocity	2.88	ft/s
Velocity Head	0.13	ft
Specific Energy	1.04	ft
Froude Number	0.751	
Flow Type	Subcritical	

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

GVF Output Data		
Upstream Depth	0.0	in
Profile Description	N/A	
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	11.0	in
Critical Depth	9.8	in
Channel Slope	0.010	ft/ft
Critical Slope	0.018	ft/ft

Worksheet for Temporary Swale 3B

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data		
Roughness Coefficient	0.030	
Channel Slope	0.010	ft/ft
Left Side Slope	4.000	H:V
Right Side Slope	4.000	H:V
Discharge	9.61	cfs

Results		
Normal Depth	11.0	in
Flow Area	3.3	ft²
Wetted Perimeter	7.5	ft
Hydraulic Radius	5.3	in
Top Width	7.31	ft
Critical Depth	9.8	in
Critical Slope	0.018	ft/ft
Velocity	2.88	ft/s
Velocity Head	0.13	ft
Specific Energy	1.04	ft
Froude Number	0.751	
Flow Type	Subcritical	

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

GVF Output Data		
Upstream Depth	0.0	in
Profile Description	N/A	
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	11.0	in
Critical Depth	9.8	in
Channel Slope	0.010	ft/ft
Critical Slope	0.018	ft/ft

Worksheet for Temporary Swale 4A

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data		
Roughness Coefficient	0.030	
Channel Slope	0.034	ft/ft
Left Side Slope	4.000	H:V
Right Side Slope	4.000	H:V
Discharge	4.21	cfs

Results		
Normal Depth	6.4	in
Flow Area	1.1	ft²
Wetted Perimeter	4.4	ft
Hydraulic Radius	3.1	in
Top Width	4.26	ft
Critical Depth	7.0	in
Critical Slope	0.021	ft/ft
Velocity	3.71	ft/s
Velocity Head	0.21	ft
Specific Energy	0.75	ft
Froude Number	1.266	
Flow Type	Supercritical	

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

GVF Output Data		
Upstream Depth	0.0	in
Profile Description	N/A	
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	6.4	in
Critical Depth	7.0	in
Channel Slope	0.034	ft/ft
Critical Slope	0.021	ft/ft

Worksheet for Temporary Swale 4B

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data		
Roughness Coefficient	0.030	
Channel Slope	0.010	ft/ft
Left Side Slope	4.000	H:V
Right Side Slope	4.000	H:V
Discharge	4.21	cfs

Results		
Normal Depth	8.0	in
Flow Area	1.8	ft²
Wetted Perimeter	5.5	ft
Hydraulic Radius	3.9	in
Top Width	5.36	ft
Critical Depth	7.0	in
Critical Slope	0.021	ft/ft
Velocity	2.34	ft/s
Velocity Head	0.09	ft
Specific Energy	0.76	ft
Froude Number	0.713	
Flow Type	Subcritical	

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

GVF Output Data		
Upstream Depth	0.0	in
Profile Description	N/A	
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	8.0	in
Critical Depth	7.0	in
Channel Slope	0.010	ft/ft
Critical Slope	0.021	ft/ft

APPENDIX E – MASTER DEVELOPMENT DRAINAGE PLANS

b. The ***fully developed conditions*** for the site are as follows:

1. Big Johnson Reservoir:

Under proposed conditions, developed flows for the westernmost drainage basin (Big Johnson Reservoir) will be directed into a proposed full spectrum detention pond on the west side of the site approximately 2,030 feet south of the intersection of Bradley Road and Powers Boulevard. Sub-basins and Design Points within this major basin are summarized in Tables 3.3, 3.4, and 3.5 below:

Table 3.3
Trails at Aspen Ridge
Big Johnson Reservoir
Proposed Conditions - Sub-basin Summary

Basin	Area	Q5	Q100
	acres	cfs	cfs
Big Johnson Reservoir N	14.1	21.2	46.8
O	11.7	17.4	38.4
P	8.52	22.0	43.9
Q	2.4	4.2	8.8
OS-2	11.4	1.7	11.7

Table 3.4
Trails at Aspen Ridge
Big Johnson Reservoir
Proposed Design Point Summary

Design Point	Sub-Basins	Downstream Design Point	Total Area (ac.)	Q(5) (cfs)	Q(100) (cfs)
N	N	P	14.1	21.2	46.8
O	O	P	11.7	17.4	38.4
P (Into West Pond)	N, O, P	West Pond Discharge	34.7	47.6	101.5
West Pond Discharge (UD-Detention)	N, O, P	Powers Ditch		1.0	28.3
Q	Q	Powers Ditch	2.4	4.9	10.3
OS-2 (This sub-basin is just southeast of the Powers and Bradley intersection. Flows which might have flowed across TAR to the Powers ditch will be diverted to the ditch prior to entering the TAR property.)	OS-2	Powers Ditch	11.4	1.7	11.7

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Table 3.8
Trails at Aspen Ridge
West Fork - Jimmy Camp Creek
Proposed Design Point Flow Description

Design Point	Description
OS-1	- This design point is at the downstream end of the offsite sub-basin north of Bradley Road. Flows in this sub-basin will sheet flow to the road ditch running along Bradley and Powers Boulevard. Once channelized in the ditch flows will be directed to a proposed 24-inch RCP storm pipe sleeved into one of the existing 42-inch CMP cross road pipes and conveyed on to design point A. - Please note that approximately 7.3 acres of the area tributary to this design point have been diverted from the Big Johnson Reservoir by CDOT construction of Powers Boulevard. Future development of that portion of the tributary sub-basin must redirect these flows to the Big Johnson Reservoir to maintain compliance with the two relevant DBPS reports. - Development of the OS-1 Sub-basin will require onsite detention and an FDR.
A	- This design point is at the manhole (MH-3) receiving flows from DP OS-1 to the north and flows from Sub-basin A captured in the two pairs of inlets on Frontside Drive to the east and west of its intersection with Legacy Drive. These flows will be conveyed on via 30-inch storm pipe to design point B. - Flows from the required onsite detention from the two commercial lots on either side of Legacy Drive will be picked up in the back of the inlets. A 24-inch storm pipe will be stubbed out for the west commercial lot (Inlet 1-A) and an 18-inch will be stubbed out for the east commercial lot (Inlet 3-A).
B	- This design point is at a manhole (MH-108) just downstream of an on-grade inlet (1-B) capturing gutter flows from the west half of Legacy Drive reflected in Sub-basin B. These flows are carried downstream via 30-inch storm pipe to design point C.
C	- This design point is a manhole (MH-6) which combines storm sewer flows from design point B with storm sewer flows from Sub-basin C. Flows in Sub-basin C will sheet flow off the residential lots and into the street curb and gutter. The road gutters will convey these flows on to be captured in four pairs of sump inlets (1-C through 8-C) and conveyed to the design point. The combined flows will be conveyed downstream via 42-inch storm pipe to design point D.
D	- This design point is at a manhole (MH-117) just downstream of an at-grade inlet (1-D) capturing flows from Sub-basin D. Flows in Sub-basin D will sheet flow to the Legacy Road curb and gutter. These gutter flows are captured in the at-grade inlet and combined with storm sewer flows from design point C and carried on via 42-inch storm pipe to design point E.
E	- This design point is located at a manhole (MH-15) just downstream of a pair of sump inlets capturing flows from Sub-basin E. Flows in Sub-basin E will sheet flow across the park area until being captured in the curb and gutter along Falling Rock Drive. Concentrated gutter flows will then be captured by the sump inlets and conveyed on via storm sewer to the design point. These flows will be combined with flows from design point D and carried on via 48-inch storm pipe to design point G.

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Rational Method - Proposed Conditions

Project Name:	Trails at Aspen Ridge (Waterview II)
Project Location:	El Paso County, CO
Designer	JTS
Notes:	Proposed Condition

Average Channel Velocity	4	ft/s	(If specific channel vel is used, this will be ignored)
Average Slope for Initial Flow	0.04	ft/ft	(If Elevations are used, this will be ignored)

Channel Flow Type Key

Heavy Meadow	2
Tillage/Field	3
Short Pasture and Lawns	4
Nearly Bare Ground	5
Grassed Waterway	6
Paved Areas	7

		Area		Rational 'C' Values														Flow Lengths											Tc	Rainfall Intensity & Rational Flow Rate				SWMM Values	
				Surface Type 1 Residential 1/8 or less (65% Imp.)			Surface Type 2 Pavement (100% Imp.)			Surface Type 3 Park (7% Imp.)			Surface Type 4 Undeveloped (2% Imp.)			Composite		Percent Impervious	Initial	True Initial	Channel	True Channel	Average (decimal)	Initial	Average (%)	Channel Flow Type (See Key above)	Velocity	Channel	Total	i5	Q5	i100	Q100	Q5	Q100
Sub-basin	**Comments**	sf	acres	C5	C100	Area (SF)	C5	C100	Area (SF)	C5	C100	Area	C5	C100	Area	C5	C100		ft	Length ft	ft	Length ft	Slope	Tc (min)	Slope	Ground Type	(ft/s)	Tc (min)	(min)	in/hr	cfs	in/hr	cfs	cfs	cfs
West Fork-Jimmy Camp Creek OS-1	***- The most northwestern portion of this basin (7.268 Acres) outside of the proposed Trails at Aspen Ridge development was rerouted out of the Big Johnson Reservoir basin by CDOT construction of Powers Boulevard and Bradley Road. Future development of the rerouted area will require routing the flows back to the Big Johnson Reservoir to return the area to compliance with the relevant DBPS studies.***	853,954	19.60	0.45	0.59		0.90	0.96		0.65	0.80		0.09	0.36	853954	0.09	0.36	2.00	780.00	300.00	300.00	780.00	0.10	23.57	1.40	5	1.2	11.0	34.6	2.23	**4.0**	3.75	**26.7**	1.1	16.2
A	***-Drainage area is upstream of two pairs of inlets near roundabout at intersection of Frontside Dr. and Legacy Dr. -Development of adjacent commercial lots will require FDR and onsite detention. -Note: The Commercial development will have 95% impervious (per DCM), but since it is required to detain prior to discharging to storm sewer the C values reflect undeveloped commercial areas.***	804,622	18.47	0.45	0.59	22315	0.90	0.96	78609	0.65	0.80		0.09	0.36	703698	0.18	0.42	13.32	861.00	300.00	869.00	1430.00	0.06	26.77	1.10	7	2.1	11.4	38.1	2.10	**7.0**	3.54	**28.0**	5.0	34.6
B	***- At grade inlet approximately 400 feet downstream of roundabout.***	46,101	1.06	0.45	0.59	46101	0.90	0.96		0.65	0.80		0.09	0.36		0.45	0.59	65.00	185.00	185.00	400.00	400.00	0.04	9.86	3.40	7	3.7	1.8	11.7	3.86	**1.9**	6.48	**4.1**	2.5	7.0
C	***- Includes the area north of Moose Meadow Street and between Beartrack Point and Sidewinder Drive and four pairs of sump inlets***	648,154	14.88	0.45	0.59	627120	0.90	0.96	21034	0.65	0.80		0.09	0.36		0.46	0.60	66.14	162.00	162.00	822.00	822.00	0.05	8.51	3.29	7	3.6	3.8	12.3	3.77	**26.3**	6.34	**57.2**	19.5	58.9
D	***-drainage area upstream of at grade inlet approximately 575 feet south of Moose Meadow Street.***	96,065	2.21	0.45	0.59		0.90	0.96	14,978	0.65	0.80	81087	0.09	0.36		0.69	0.82	21.50	473.00	300.00	555.00	728.00	0.06	8.85	4.00	7	4.0	3.0	11.9	3.83	**5.9**	6.44	**11.8**	4.1	14.2
E	***- Located at a pair of sump inlets at the intersection of Sunday Gulch and Falling Rock Drive.***	373,189	8.57	0.45	0.59	49513	0.90	0.96	40601	0.65	0.80	283075	0.09	0.36		0.65	0.79	24.81	859.00	300.00	1450.00	2009.00	0.07	12.39	4.00	7	4.0	8.4	20.8	2.96	**16.6**	4.97	**33.9**	12.8	39.1
F	***-Represents area captured by at grade inlets on Lazy Ridge Drive and Wagon Hammer Drive, as well as sump inlets west of the intersection of Lookout Court and Sunday Gulch.***	569,234	13.07	0.45	0.59	569234	0.90	0.96		0.65	0.80		0.09	0.36		0.45	0.59	65.00	332.00	300.00	868.00	900.00	0.07	11.14	2.00	7	2.8	5.3	16.4	3.32	**19.7**	5.57	**43.3**	15.4	46.2
G	***-At grade inlet on the east side of Sunday Gulch near intersection with Lookout Court.***	48,227	1.11	0.45	0.59	48227	0.90	0.96		0.65	0.80		0.09	0.36		0.45	0.59	65.00	80.00	80.00	667.00	667.00	0.05	6.12	2.45	7	3.1	3.6	9.7	4.15	**2.1**	6.97	**4.6**	2.1	6.1
H	***-This represents the area draining to Buffalo Horn Drive with the exception any flow by from the at grade inlets in Sub-basin F.***	1,022,296	23.47	0.45	0.59	921233	0.90	0.96	39,492	0.65	0.80	61571	0.09	0.36		0.48	0.62	62.86	250.00	250.00	1074.00	1074.00	0.04	11.13	2.00	7	2.8	6.3	17.5	3.22	**36.6**	5.42	**79.1**	26.8	80.4

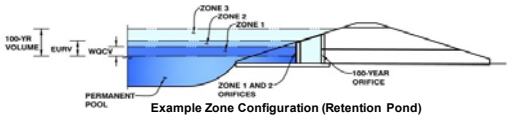
		Area		Rational 'C' Values														Flow Lengths										Tc	Rainfall Intensity & Rational Flow Rate				SWMM Values	
Sub-basin	Comments			Surface Type 1 Residential 1/8 or less (65% Imp.)			Surface Type 2 Pavement (100% Imp.)			Surface Type 3 Park (7% Imp.)			Surface Type 4 Undeveloped (2% Imp.)			Composite		Percent Impervious	Initial	True Initial	Channel	True Channel	Average (decimal)	Initial	Average (%)	Channel Flow Type (See Key above)	Velocity	Channel	Total	i5	Q5	i100	Q100	Q5	Q100
		sf	acres	C5	C100	Area (SF)	C5	C100	Area (SF)	C5	C100	Area	C5	C100	Area	C5	C100		ft	Length ft	ft	Length ft	Slope	Tc (min)	Slope	Ground Type	(ft/s)	Tc (min)	(min)	in/hr	cfs	in/hr	cfs	cfs	cfs
I	*-Represents area draining to the proposed sump inlet at the end of the cul-de-sac on Falling Rock Drive.*	344,236	7.90	0.45	0.59	305401	0.90	0.96	31104	0.65	0.80	7731	0.09	0.36		0.50	0.63	66.86	153.00	153.00	1104.00	1104.00	0.05	7.88	2.61	7	3.2	5.7	13.6	3.62	**14.3**	6.08	**30.4**	10.5	31.8
J	*-Represents drainage area tributary to sump inlets near intersection of Redshirt Point and Big Johnson Drive.*	229,049	5.26	0.45	0.59	70187	0.90	0.96	158,862	0.65	0.80		0.09	0.36		0.76	0.85	89.28	266.00	266.00	909.00	909.00	0.09	4.77	3.20	7	3.6	4.2	9.0	4.27	**17.2**	7.17	**32.2**	11.1	32.7
K	*-This sub-basin is tributary to the future sump inlets near the intersection of Big Johnson Drive and Roundhouse Drive.*	1,414,842	32.48	0.45	0.59	1414842	0.90	0.96		0.65	0.80		0.09	0.36		0.45	0.59	65.00	400.00	300.00	1400.00	1500.00	0.06	13.26	3.50	7	3.7	6.7	19.9	3.02	**44.5**	5.07	**98.0**	33.3	101.7
Marksheffel Tributary to Jimmy Camp Creek *L*	*-Represents entire drainage area to the Northeast Pond.*	330,836	7.59	0.45	0.59	259741	0.90	0.96		0.65	0.80	71095	0.09	0.36		0.49	0.64	52.54	290.00	290.00	490.00	490.00	0.05	10.88	5.40	7	4.6	1.8	12.6	3.73	**14.1**	6.27	**30.5**		
West Fork-Jimmy Camp Creek *M*	*Drainage area in and around East Full Spectrum Detention Pond*	447,971	10.29	0.45	0.59		0.90	0.96		0.65	0.80	447971	0.09	0.36		0.65	0.80	7.00	437.00	300.00	10.00	147.00	0.06	9.32	1.00	7	2.0	1.2	10.5	4.02	**27.1**	6.75	**56.0**	14.2	61.8
Big Johnson Reservoir *N*	*-Represents area upstream of sump inlets near intersection of Natural Bridge Trail and Blue Miner Street.*	614,283	14.10	0.45	0.59	614283	0.90	0.96		0.65	0.80		0.09	0.36		0.45	0.59	65.00	150.00	150.00	1229.00	1229.00	0.03	9.94	2.50	7	3.2	6.5	16.4	3.32	**21.2**	5.58	**46.8**		
O	*-Represents area upstream of sump inlet at intersection of Rainy Creek Trail and Triple Tree Loop*	510,492	11.72	0.45	0.59	510,492	0.90	0.96	0	0.65	0.80	0	0.09	0.36	0	0.45	0.59	65.00	104.00	104.00	1230.00	1230.00	0.02	9.47	1.40	7	2.4	8.7	18.1	3.17	**16.8**	5.32	**37.1**		
P	*-Drainage area in and around the West Pond.*	370,936	8.52	0.45	0.59		0.90	0.96	70,884	0.65	0.80	300052	0.09	0.36		0.70	0.83	24.77	560.00	300.00	378.00	638.00	0.06	9.43	2.00	7	2.8	3.8	13.2	3.67	**22.0**	6.16	**43.9**		
Q	*-This area is infeasible to detain and discharges to the Powers Boulevard Ditch* *-Less than one acre (0.31 Acres) of developed area is within the Big Johnson Reservoir Basin, therefore, compliance with the county's MS4 permit is maintained.*	106,017	2.43	0.45	0.59	38,063	0.90	0.96	0	0.65	0.80	67,954	0.09	0.36	0	0.58	0.72	27.82	143.00	143.00	687.00	687.00	0.06	6.08	3.35	4	1.3	9.0	15.1	3.45	**4.9**	5.80	**10.3**		
R	*-This area is infeasible to detain and discharges to the swale at the southeast corner of the property.* *-Less than one acre (0.67 Acres) of developed area is within the West Fork Jimmy Campr Creek Basin, therefore, compliance with the county's MS4 permit is maintained.*	81,300	1.87	0.45	0.59		0.90	0.96		0.65	0.80	81300	0.09	0.36		0.65	0.80	7.00	21.00	21.00	220.00	220.00	0.33	1.16	10.00	5	3.2	1.2	5.0	5.10	**6.2**	8.58	**12.9**	1.7	7.8
OS-2	*- Commercially zoned lot just southeast of the intersection of Bradley and Powers. This area will be required to provide its own detention which must discharge to the Powers Boulevard Ditch.*	498,467	11.44	0.45	0.59		0.90	0.96		0.65	0.80		0.09	0.36	498467	0.09	0.36	2.00	971.00	300.00	1411.00	2082.00	0.04	34.50	2.83	5	1.7	20.7	55.2	1.67	**1.7**	2.81	**11.7**		

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

UD-Detention, Version 3.07 (February 2017)

Project: Trails at Aspen Ridge

Basin ID: Approximated future detention for Commercial lot South of Bradley Road and West of Legacy Drive



Example Zone Configuration (Retention Pond)

Required Volume Calculation

Selected BMP Type =	EDB	
Watershed Area =	13.43	acres
Watershed Length =	894	ft
Watershed Slope =	0.070	ft/ft
Watershed Imperviousness =	95.00%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	100.0%	percent
Percentage Hydrologic Soil Groups C/D =	0.0%	percent
Desired WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	
Water Quality Capture Volume (WQCV) =	0.501	acre-feet
Excess Urban Runoff Volume (EURV) =	1.436	acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	1.234	acre-feet
5-yr Runoff Volume (P1 = 1.5 in.) =	1.600	acre-feet
10-yr Runoff Volume (P1 = 1.75 in.) =	1.926	acre-feet
25-yr Runoff Volume (P1 = 2 in.) =	2.252	acre-feet
50-yr Runoff Volume (P1 = 2.25 in.) =	2.517	acre-feet
100-yr Runoff Volume (P1 = 2.52 in.) =	2.867	acre-feet
500-yr Runoff Volume (P1 = 3.55 in.) =	4.110	acre-feet
Approximate 2-yr Detention Volume =	1.158	acre-feet
Approximate 5-yr Detention Volume =	1.504	acre-feet
Approximate 10-yr Detention Volume =	1.831	acre-feet
Approximate 25-yr Detention Volume =	1.964	acre-feet
Approximate 50-yr Detention Volume =	2.037	acre-feet
Approximate 100-yr Detention Volume =	2.102	acre-feet

Optional User Override 1-hr Precipitation	
1.19	inches
1.50	inches
1.75	inches
2.00	inches
2.25	inches
2.52	inches
3.55	inches

Stage-Storage Calculation

Zone 1 Volume (WQCV) =	0.501	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.935	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.666	acre-feet
Total Detention Basin Volume =	2.102	acre-feet
Initial Surcharge Volume (ISV) =	65	ft^3
Initial Surcharge Depth (ISD) =	0.33	ft
Total Available Detention Depth (H_{total}) =	4.00	ft
Depth of Trickle Channel (H_{TC}) =	0.50	ft
Slope of Trickle Channel (S_{TC}) =	0.005	ft/ft
Slopes of Main Basin Sides (S_{main}) =	4	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	2	
Initial Surcharge Area (A_{ISV}) =	198	ft^2
Surcharge Volume Length (L_{ISV}) =	14.1	ft
Surcharge Volume Width (W_{ISV}) =	14.1	ft
Depth of Basin Floor (H_{FLOOR}) =	1.22	ft
Length of Basin Floor (L_{FLOOR}) =	262.3	ft
Width of Basin Floor (W_{FLOOR}) =	135.8	ft
Area of Basin Floor (A_{FLOOR}) =	35,621	ft^2
Volume of Basin Floor (V_{FLOOR}) =	15,609	ft^3
Depth of Main Basin (H_{MAIN}) =	1.95	ft
Length of Main Basin (L_{MAIN}) =	278.0	ft
Width of Main Basin (W_{MAIN}) =	151.4	ft
Area of Main Basin (A_{MAIN}) =	42,086	ft^2
Volume of Main Basin (V_{MAIN}) =	75,793	ft^3
Calculated Total Basin Volume (V_{total}) =	**2.102**	acre-feet

Depth Increment = 0.1 ft

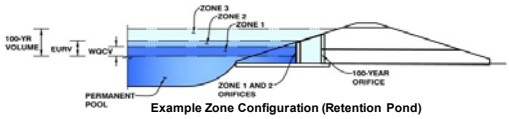
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	0.00		14.1	14.1	198		0.005		
ISV	0.33		14.1	14.1	198		0.005	63	0.001
	0.40		14.1	14.1	198		0.005	77	0.002
	0.50		14.1	14.1	198		0.005	97	0.002
	0.60		14.1	14.1	198		0.005	117	0.003
	0.70		14.1	14.1	198		0.005	137	0.003
	0.80		14.1	14.1	198		0.005	157	0.004
	0.90		26.3	20.1	528		0.012	186	0.004
	1.00		46.7	30.1	1,405		0.032	279	0.006
	1.10		67.1	40.1	2,690		0.062	480	0.011
	1.20		87.5	50.1	4,383		0.101	830	0.019
	1.30		107.9	60.1	6,484		0.149	1,370	0.031
	1.40		128.3	70.1	8,992		0.206	2,141	0.049
	1.50		148.7	80.1	11,909		0.273	3,182	0.073
	1.60		169.1	90.1	15,234		0.350	4,536	0.104
	1.70		189.5	100.1	18,967		0.435	6,243	0.143
	1.80		209.9	110.1	23,108		0.530	8,343	0.192
	1.90		230.3	120.1	27,656		0.635	10,878	0.250
	2.00		250.7	130.1	32,613		0.749	13,888	0.319
Floor	2.05		260.9	135.1	35,245		0.809	15,584	0.358
	2.10		262.8	136.2	35,790		0.822	17,724	0.407
	2.20		263.6	137.0	36,110		0.829	21,319	0.489
Zone 1 (WQCV)	2.22		263.7	137.2	36,174		0.830	22,042	0.506
	2.30		264.4	137.8	36,431		0.836	24,946	0.573
	2.40		265.2	138.6	36,753		0.844	28,605	0.657
	2.50		266.0	139.4	37,077		0.851	32,297	0.741
	2.60		266.8	140.2	37,402		0.859	36,021	0.827
	2.70		267.6	141.0	37,728		0.866	39,777	0.913
	2.80		268.4	141.8	38,056		0.874	43,566	1.000
	2.90		269.2	142.6	38,384		0.881	47,388	1.088
	3.00		270.0	143.4	38,715		0.889	51,243	1.176
	3.10		270.8	144.2	39,046		0.896	55,131	1.266
	3.20		271.6	145.0	39,378		0.904	59,053	1.356
Zone 2 (EURV)	3.29		272.3	145.7	39,679		0.911	62,610	1.437
	3.30		272.4	145.8	39,712		0.912	63,007	1.446
	3.40		273.2	146.6	40,048		0.919	66,995	1.538
	3.50		274.0	147.4	40,384		0.927	71,017	1.630
	3.60		274.8	148.2	40,722		0.935	75,072	1.723
	3.70		275.6	149.0	41,061		0.943	79,161	1.817
	3.80		276.4	149.8	41,401		0.950	83,284	1.912
	3.90		277.2	150.6	41,743		0.958	87,441	2.007
Zone 3 (100-year)	4.00		278.0	151.4	42,086		0.966	91,633	2.104
	4.10		278.8	152.2	42,430		0.974	95,858	2.201
	4.20		279.6	153.0	42,775		0.982	100,119	2.298
	4.30		280.4	153.8	43,122		0.990	104,413	2.397
	4.40		281.2	154.6	43,470		0.998	108,743	2.496
	4.50		282.0	155.4	43,819		1.006	113,107	2.597
	4.60		282.8	156.2	44,170		1.014	117,507	2.698
	4.70		283.6	157.0	44,521		1.022	121,941	2.799
	4.80		284.4	157.8	44,874		1.030	126,411	2.902
	4.90		285.2	158.6	45,229		1.038	130,916	3.005
	5.00		286.0	159.4	45,585		1.046	135,457	3.110
	5.10		286.8	160.2	45,941		1.055	140,033	3.215
	5.20		287.6	161.0	46,300		1.063	144,645	3.321
	5.30		288.4	161.8	46,659		1.071	149,293	3.427
	5.40		289.2	162.6	47,020		1.079	153,977	3.535
	5.50		290.0	163.4	47,382		1.088	158,697	3.643
	5.60		290.8	164.2	47,745		1.096	163,454	3.752
	5.70		291.6	165.0	48,110		1.104	168,246	3.862
	5.80		292.4	165.8	48,476		1.113	173,076	3.973
	5.90		293.2	166.6	48,843		1.121	177,942	4.085

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

UD-Detention, Version 3.07 (February 2017)

Project: Trails at Aspen Ridge

Basin ID: West Fork of Jimmy Camp Creek: East Pond(located in Sub-basin M)



Example Zone Configuration (Retention Pond)

Required Volume Calculation

Selected BMP Type =	EDB	
Watershed Area =	157.90	acres
Watershed Length =	3,742	ft
Watershed Slope =	0.030	ft/ft
Watershed Imperviousness =	45.40%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	87.0%	percent
Percentage Hydrologic Soil Groups C/D =	13.0%	percent
Desired WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	
Water Quality Capture Volume (WQCV) =	2.553	acre-feet
Excess Urban Runoff Volume (EURV) =	7.491	acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	6.103	acre-feet
5-yr Runoff Volume (P1 = 1.5 in.) =	8.512	acre-feet
10-yr Runoff Volume (P1 = 1.75 in.) =	11.664	acre-feet
25-yr Runoff Volume (P1 = 2 in.) =	16.728	acre-feet
50-yr Runoff Volume (P1 = 2.25 in.) =	20.230	acre-feet
100-yr Runoff Volume (P1 = 2.52 in.) =	24.794	acre-feet
500-yr Runoff Volume (P1 = 3.55 in.) =	38.509	acre-feet
Approximate 2-yr Detention Volume =	5.710	acre-feet
Approximate 5-yr Detention Volume =	7.997	acre-feet
Approximate 10-yr Detention Volume =	10.523	acre-feet
Approximate 25-yr Detention Volume =	11.595	acre-feet
Approximate 50-yr Detention Volume =	12.129	acre-feet
Approximate 100-yr Detention Volume =	13.732	acre-feet

Optional User Override 1-hr Precipitation

1.19	inches
1.50	inches
1.75	inches
2.00	inches
2.25	inches
2.52	inches
3.55	inches

Stage-Storage Calculation

Zone 1 Volume (WQCV) =	2.553	acre-feet
Zone 2 Volume (EURV - Zone 1) =	4.938	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	6.241	acre-feet
Total Detention Basin Volume =	13.732	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	user	acre-feet

Depth Increment = 1 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	--	--	--	50	0.001		
5817	--	1.00	--	--	--	1,795	0.041	905	0.021
5818	--	2.00	--	--	--	10,792	0.248	7,108	0.163
5819	--	3.00	--	--	--	33,227	0.763	29,225	0.671
5820	--	4.00	--	--	--	80,330	1.844	86,004	1.974
5821	--	5.00	--	--	--	143,075	3.285	197,706	4.539
5822	--	6.00	--	--	--	158,782	3.645	348,634	8.004
5823	--	7.00	--	--	--	164,044	3.766	510,047	11.709
5824	--	8.00	--	--	--	169,368	3.888	676,753	15.536
5825	--	9.00	--	--	--	174,764	4.012	848,819	19.486
5826	--	10.00	--	--	--	180,213	4.137	1,026,308	23.561

Know what's **below.** **Call** before you dig.

Trails at Aspen Ridge
Proposed Conditions - Sub-basin Summary

Basin	Area	Q5	Q100
	acres	cfs	cfs
West Fork-Jimmy Camp Creek			
West Fork-Jimmy Camp Creek OS-1	19.6	1.1	16.2
A	18.5	5.0	34.6
B	1.1	2.5	7.0
C	14.9	19.5	58.9
D	2.2	4.1	14.2
E	8.6	12.8	39.1
F	13.1	15.4	46.2
G	1.1	2.1	6.1
H	23.5	26.8	80.4
I	7.9	10.5	31.8
J	5.3	11.1	32.7
K	32.5	33.3	101.7
West Fork-Jimmy Camp Creek M	10.3	14.2	61.8
R	1.9	1.7	7.8
Big Johnson Reservoir			
Big Johnson Reservoir N	14.10	21.2	46.8
O	11.72	16.8	37.1
P	8.52	22.0	43.9
Q	2.43	4.9	10.3
OS-2	11.44	1.7	11.7
Marksheffel Tributary to Jimmy Camp Creek			
Marksheffel Tributary to Jimmy Camp Creek L	5.3	17.2	32.2
BR1	0.3	0.8	1.6
BR2	2.8	2.9	7.4

Trails at Aspen Ridge
Big Johnson Reservoir
Proposed Design Point Summary

Design Point	Sub-Basins	Downstream Design Point	Total Area (ac.)	Q(5) (cfs)	Q(100) (cfs)
N	N	P	14.1	21.2	46.8
O	O	P	11.7	16.8	37.1
P (Into West Pond)	N, O, P	West Pond Discharge	34.3	47.1	100.6
West Pond Discharge (UD-Detention)	N, O, P	Powers Ditch		1.0	28.3
Q	Q	Powers Ditch	2.4	4.9	10.3
OS-2	OS-2	Powers Ditch	11.4	1.7	11.7

Trails at Aspen Ridge
West Fork - Jimmy Camp Creek
Proposed Design Point Summary

Design Point	Sub-Basins	Downstream Design Point	Total Area (ac.)	Q(5) (cfs)	Q(100) (cfs)
OS-1	OS-1	A	19.6	4.0	26.7
A	OS-1 & A	B	38.1	11.6	57.5
B	OS-1, A, B	C	39.1	12.4	58.5
C	OS-1, A, B, C	D	54.0	27.3	90.3
D	OS-1, A, B, C, D	E	56.2	30.2	95.6
E	OS-1, A, B, C, D, E	F	64.8	39.3	111.6
F	F	G	13.1	19.7	43.3
G	OS-1, A, B, C, D, E, F, G	M	79.0	46.9	125.9
H	H	M	23.5	36.6	79.1
J	J	K	5.3	17.2	32.2
K	J, K	I	37.7	57.2	121.7
I	J, K, I	M	45.6	59.7	127.2
M (Into East Pond	OS-1, A, B, C, D, E, F, G, J, K, I, H, M	East Pond Discharge	158.4	122.6	287.5
East Pond Discharge (SWMM)	OS-1, A, B, C, D, E, F, G, J, K, I, H, M	Offsite Swale		21.1	127.4
R	R	Offsite Swale	1.9	6.2	12.9

Trails at Aspen Ridge
Marksheffel Tributary to Jimmy Camp Creek
Proposed Design Point Summary

Design Point	Sub-Basins	Downstream Design Point	Total Area (ac.)	Q(5) (cfs)	Q(100) (cfs)
L	L	Northeast Pond Discharge	7.6	14.1	30.5
Northeast Pond Discharge	L	Bradley Road Ditch		0.3	8
BR1	BR1	Bradley Road Ditch	0.3	0.8	1.6
BR2	BR2	Bradley Road Ditch	2.8	2.9	7.4

EX. 48-INCH CMP

BIG JOHNSON RESERVOIR TOTALS
DRAINAGE AREA = 47.9 ACRES
Q100 = 48.8 CFS
Q5 = 6.9 CFS

EX. 60-INCH CMP

POWERS BOULEVARD

POWERS BLVD. 210' R.O.W. (FREEWAY)

TRAILS AT ASPEN RIDGE PUD

WEST POND

EAST POND

NORTHEAST POND

FUTURE FDR REQUIRED FOR DEVELOPMENT OF THIS LOT. ON-SITE DETENTION WILL BE REQUIRED AND MUST DISCHARGE TO THE POWERS BOULEVARD DITCH.

OFFSITE COMMERCIAL DEVELOPMENT AN FDR & ON-SITE DETENTION WILL BE REQUIRED FOR DEVELOPMENT OF THESE LOTS.

FUTURE FDR REQUIRED FOR DEVELOPMENT OF THIS LOT. ON-SITE DETENTION WILL BE REQUIRED. ANTICIPATED DISCHARGE: SOUTHWEST COMMERCIAL Q100 = 19.4 CFS Q5 = 1.3 CFS

FUTURE FDR REQUIRED FOR DEVELOPMENT OF THIS LOT. ON-SITE DETENTION WILL BE REQUIRED. ANTICIPATED DISCHARGE: SOUTHEAST COMMERCIAL Q100 = 4.4 CFS Q5 = 0.3 CFS

FUTURE FDR REQUIRED FOR DEVELOPMENT OF THIS LOT. ON-SITE DETENTION WILL BE REQUIRED. ANTICIPATED DISCHARGE: NORTH COMMERCIAL Q100 = 16.1 CFS Q5 = 1.1 CFS NOTE: THE ABOVE FLOWS DO NOT INCLUDE FLOWS FROM THE AREA DIVERTED FROM BIG JOHNSON RESERVOIR.

COMMERCIAL DEVELOPMENT WILL NOT BE ALLOWED TO DISCHARGE ONTO RESIDENTIAL LOTS

THIS AREA WAS ORIGINALLY IN THE BIG JOHNSON RESERVOIR BASIN. IT WAS REROUTED INTO WEST FORK JIMMY CAMP CREEK BASIN BY THE CDOT POWERS BOULEVARD PROJECT.

Bradley Median Crossroad Culvert
DESIGN POINT BR1
DA= 0.31 Acres
Q100 = 1.61 cfs
Q5 = 0.82 cfs

Future Blackmer Street Crossroad Culvert
DESIGN POINT BR2
DA = 2.81 Acres
Q100 = 7.4 cfs
Q5 = 2.9 cfs

Worst Case Drainage Area: Future Blackmer Street Crossroad Culvert

WEST FORK - JIMMY CAMP CREEK TOTALS:
DRAINAGE AREA = 160.3 Acres
Q100 = 138.3 CFS
Q5 = 27.3 CFS

THESE OFFSITE FLOWS WILL BE DIVERTED TO THE SOUTH.

MARKSHEFFEL TRIBUTARY TO JIMMY CAMP CREEK TOTALS:
DRAINAGE AREA = 7.6 Acres
Q100 = 8.0 CFS
Q5 = 0.3 CFS

LEGEND
DESIGN POINT IDENTIFIER
BASIN IDENTIFICATION
BASIN FLOWS
BASIN AREA
BASIN BOUNDARY
DBPS BASIN BOUNDARY
EXISTING CONTOURS
PROPOSED CONTOURS

GRAPHIC SCALE
150' 0' 150' 300'
(IN FEET)
1 inch = 150 ft.

REFERENCE DRAWINGS
X-886-PR SITE_F1
X-886-PR SITE
10415-Storm Base-2017
X-886-PR STORM
X-Title(Drainage)
X-886-PR STORM_F1
886-PR Legacy Drive-Roundabout
886-PR Legacy Drive

NO.	DATE	DESCRIPTION	BY

REVISIONS

NAME: \\Eros\Projects\19.886.008 Trails at Aspen Ridge\200 Drainage\201 Drainage Reports\MDDP\DWG\2022-MDDP Basins_1_8325_2357.sv$.dwg
PCP: Matrix.ctb
PLOT DATE: Mon Sep 23, 2019 9:57am

BENCHMARK DATA(ELEV.) _____
(DATUM) _____
(DESCRIPTION/LOCATION) _____

VERTICAL BENCHMARK:

BASIS OF BEARING:

PREPARED UNDER MY DIRECT SUPERVISION, FOR AND ON BEHALF OF MATRIX DESIGN GROUP, INC.

Matrix DESIGN GROUP
2435 Research Parkway, Suite
300 Colorado Springs, CO 80920
Phone 719-575-0100
Fax 719-575-0208

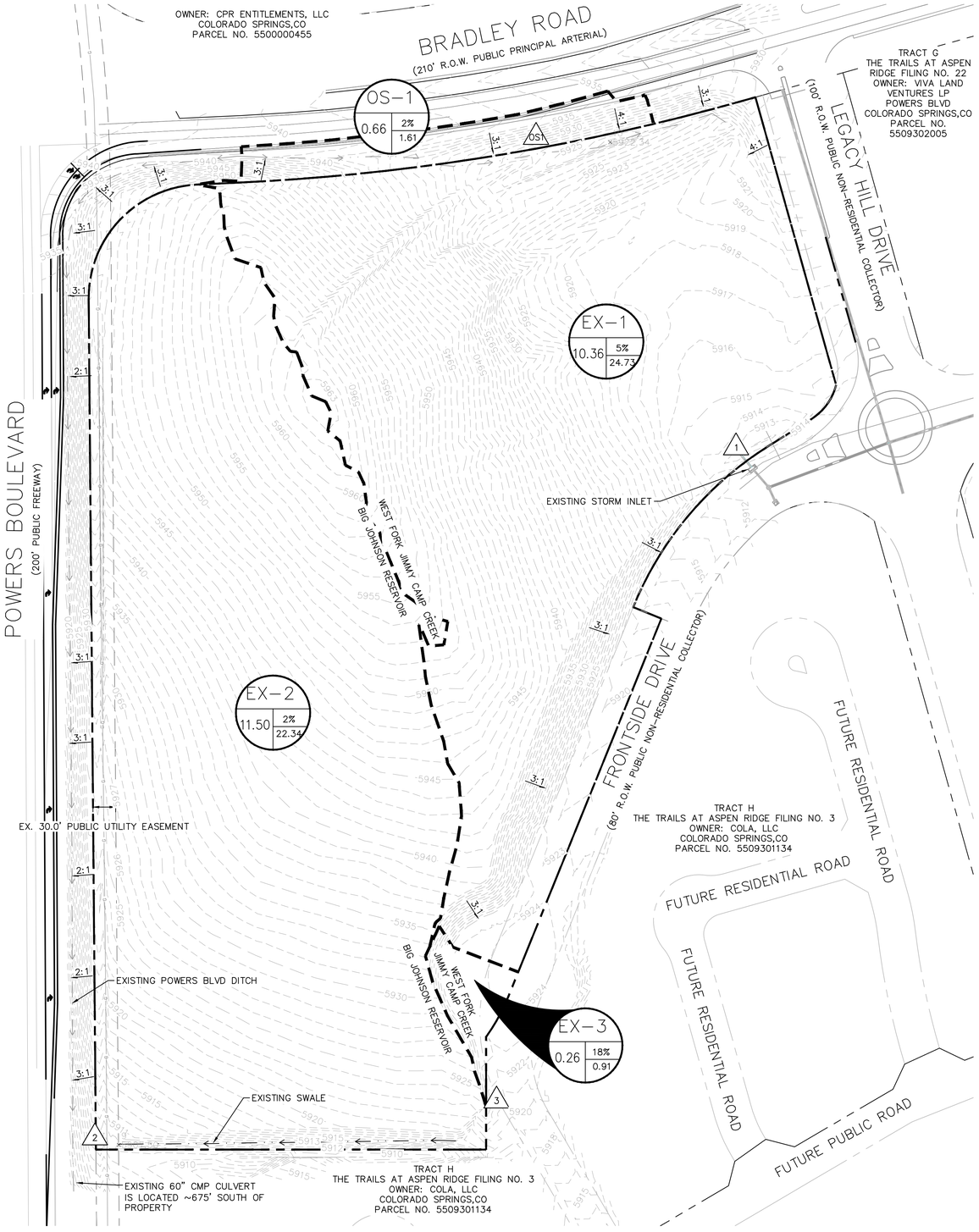
COLA, LLC.

TRAILS AT ASPEN RIDGE: FILING #1 & PUD
MDDP-AMENDMENT & PRELIMINARY DRAINAGE REPORT

DESIGNED BY: JTS
DRAWN BY: JTS
CHECKED BY:
SCALE
HORIZ:
VERT:
DATE ISSUED: September 2019
SHEET NO. 2 OF 2 SHEETS

DR-02

APPENDIX F – DRAINAGE EXHIBITS



LEGEND

A
B | C / D

A = BASIN DESIGNATION
B = AREA (ACRES)
C = BASIN IMPERVIOUSNESS
D = 100-YR DESIGN STORM RUNOFF (CFS)

- DESIGN POINT
- EXISTING FLOW DIRECTION
- DRAINAGE BASIN BOUNDARY
- PROPERTY LINE
- XXXX PROPOSED MAJOR CONTOUR
- XXXX PROPOSED MINOR CONTOUR
- XXXX EXISTING MAJOR CONTOUR
- XXXX EXISTING MAJOR CONTOUR
- SWALE FLOW DIRECTION

SUMMARY - EXISTING RUNOFF TABLE

DESIGN POINT	BASIN DESIGNATION	BASIN AREA (ACRES)	DIRECT 5-YR RUNOFF (CFS)	DIRECT 100-YR RUNOFF (CFS)	CUMULATIVE 5-YR RUNOFF (CFS)	CUMULATIVE 100-YR RUNOFF (CFS)
1	EX-1	10.36	3.54	24.73	3.73	26.35
2	EX-2	11.50	2.62	22.34	2.62	22.34
3	EX-3	0.26	0.21	0.91	0.21	0.91
4	OS-1	0.66	0.19	1.61	0.19	1.61

NORTH

GRAPHIC SCALE IN FEET
0 40 80 160

Know what's below. Call before you dig.

NO.	REVISION	BY	DATE	APPR.

Kimley»Horn
2022 KIMLEY-HORN AND ASSOCIATES, INC.
2 North Nevada Avenue, Suite 300
Colorado Springs, Colorado 80903 (719) 453-0180

DESIGNED BY: JAR
DRAWN BY: JAR
CHECKED BY: EJG
DATE: 05/06/2022

WATERVIEW EAST COMMERCIAL
CONSTRUCTION DOCUMENTS
EXISTING DRAINAGE MAP

PRELIMINARY
FOR REVIEW ONLY
NOT FOR CONSTRUCTION
Kimley»Horn
Kimley-Horn and Associates, Inc.

PROJECT NO.
196195000

SHEET
DR-EX

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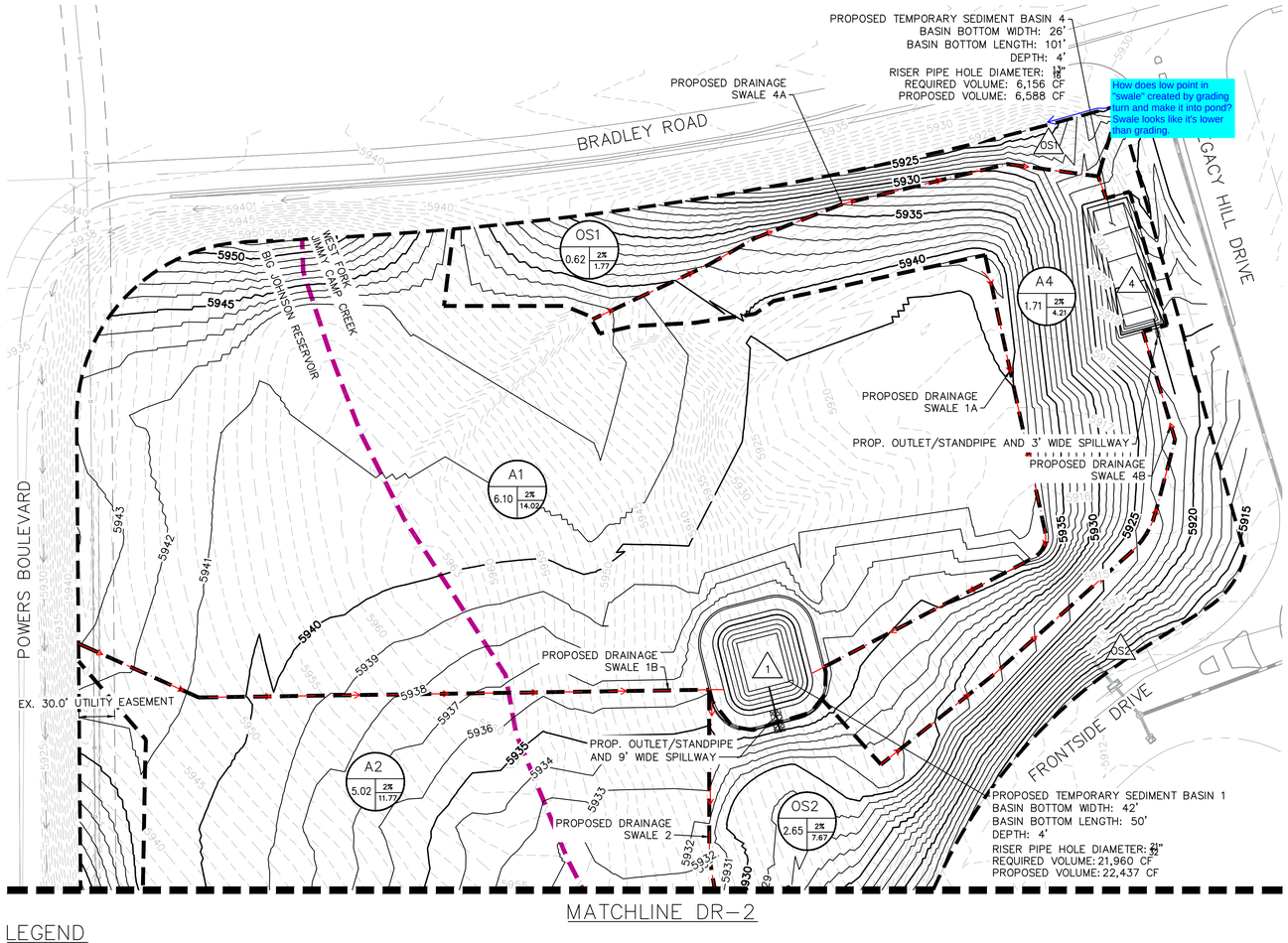


SUMMARY - PROPOSED RUNOFF TABLE						
DESIGN POINT	BASIN DESIGNATION	BASIN AREA (ACRES)	DIRECT 5-YR RUNOFF (CFS)	DIRECT 100-YR RUNOFF (CFS)	CUMULATIVE 5-YR RUNOFF (CFS)	CUMULATIVE 100-YR RUNOFF (CFS)
1	A1	6.10	1.64	14.02	1.64	14.02
2	A2	5.02	1.38	11.77	1.38	11.77
3	A3	3.92	1.13	9.61	1.13	9.61
4	A4	1.71	0.49	4.21	0.49	4.21
OS1	OS1	0.62	0.21	1.77	0.21	1.77
OS2	OS2	2.65	0.90	7.67	0.90	7.67
OS3	OS3	0.41	0.15	1.28	0.15	1.28
OS4	OS4	0.66	0.26	2.23	0.26	2.23
OS5	OS5	1.01	0.37	3.19	0.37	3.19

LEGEND

A
B | C D

A = BASIN DESIGNATION
B = AREA (ACRES)
C = BASIN IMPERVIOUSNESS
D = 100-YR DESIGN STORM RUNOFF (CFS)

- # — DESIGN POINT
- FLOW DIRECTION
- MAJOR DRAINAGE BASIN BOUNDARY
- DRAINAGE BASIN BOUNDARY
- DRAINAGE SWALE
- EXISTING DITCH
- PROPERTY LINE
- XXXX — PROPOSED MAJOR CONTOUR
- XXXX — PROPOSED MINOR CONTOUR
- XXXX — EXISTING MAJOR CONTOUR
- XXXX — EXISTING MAJOR CONTOUR
- EXISTING STORM SEWER
- ST — EXISTING STORM MANHOLE
- EXISTING STORM INLET

GRADING REFLECTS EARLY GRADING PERMIT. PROPOSED UTILITIES AND FINAL CONDITIONS TO BE EVALUATED WITH FINAL DRAINAGE REPORT FOR THE FINAL PLAT.

NORTH

GRAPHIC SCALE IN FEET
0 30 60 120

Know what's below. Call before you dig.

NO.	REVISION	BY	DATE	APPR.

Kimley»Horn
2022 KIMLEY-HORN AND ASSOCIATES, INC.
2 North Nevada Avenue, Suite 300
Colorado Springs, Colorado 80903 (719) 453-0180

DESIGNED BY: JAR
DRAWN BY: JAR
CHECKED BY: EJG
DATE: 05/06/2022

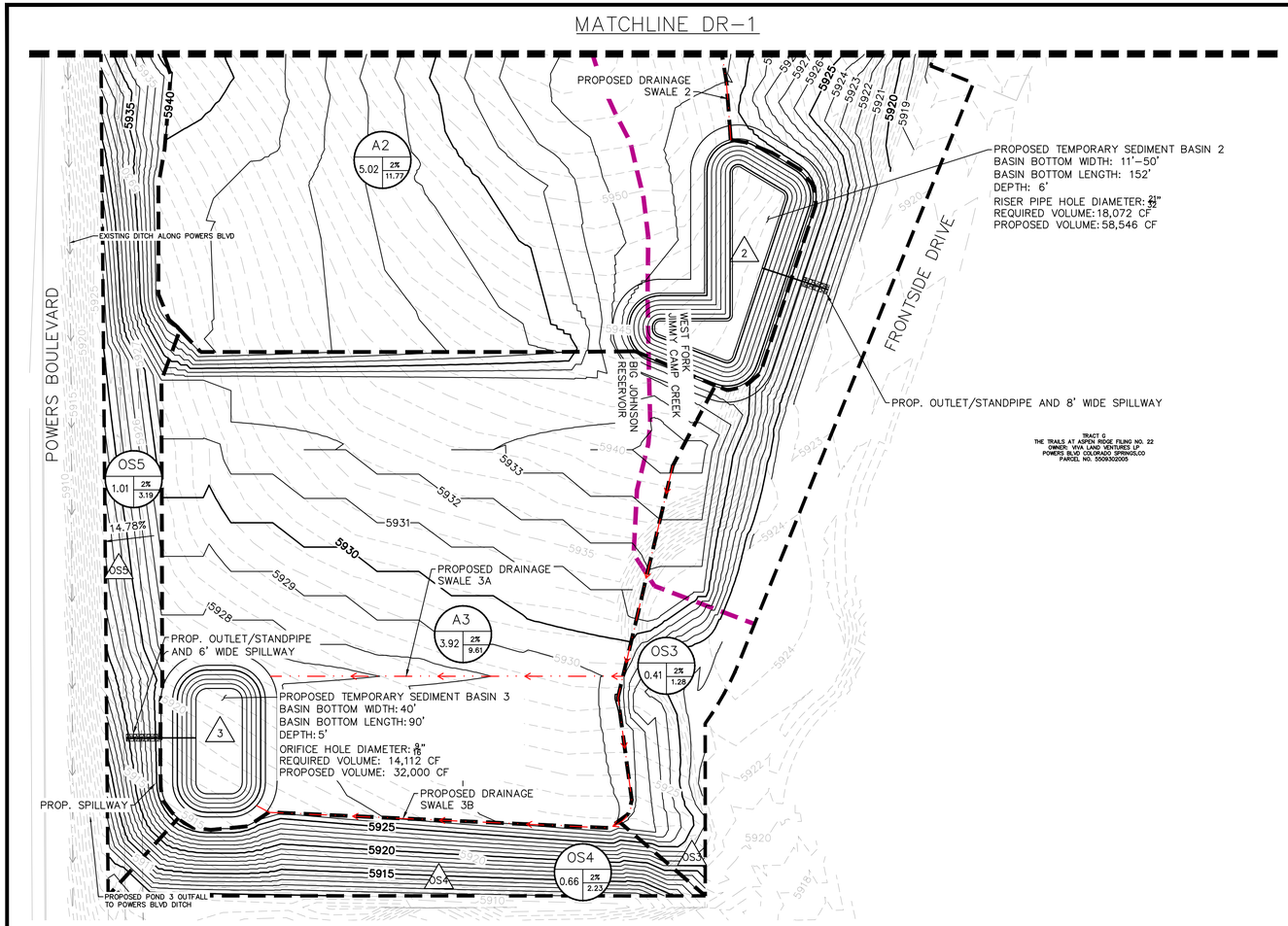
WATERVIEW EAST COMMERCIAL
CONSTRUCTION DOCUMENTS
PROPOSED DRAINAGE MAP

PRELIMINARY
FOR REVIEW ONLY
NOT FOR CONSTRUCTION
Kimley»Horn
Kimley-Horn and Associates, Inc.

PROJECT NO.
196195000

SHEET
DR-1

K:\COS_LA\196195000 - Waterview East Commercial\CADD\PlanSheets\CD_DR_EARLY GRADING.dwg McCollum, Jessica 7/5/2023 5:23 PM



SUMMARY - PROPOSED RUNOFF TABLE						
DESIGN POINT	BASIN DESIGNATION	BASIN AREA (ACRES)	DIRECT 5-YR RUNOFF (CFS)	DIRECT 100-YR RUNOFF (CFS)	CUMULATIVE 5-YR RUNOFF (CFS)	CUMULATIVE 100-YR RUNOFF (CFS)
1	A1	6.10	1.64	14.02	1.64	14.02
2	A2	5.02	1.38	11.77	1.38	11.77
3	A3	3.92	1.13	9.61	1.13	9.61
4	A4	1.71	0.49	4.21	0.49	4.21
OS1	OS1	0.62	0.21	1.77	0.21	1.77
OS2	OS2	2.65	0.90	7.67	0.90	7.67
OS3	OS3	0.41	0.15	1.28	0.15	1.28
OS4	OS4	0.66	0.26	2.23	0.26	2.23
OS5	OS5	1.01	0.37	3.19	0.37	3.19

LEGEND

A = BASIN DESIGNATION
B = AREA (ACRES)
C = 100-YR COMPOSITE RUNOFF COEFFICIENT
D = 100-YR DESIGN STORM RUNOFF (CFS)

- DESIGN POINT
- FLOW DIRECTION
- MAJOR DRAINAGE BASIN BOUNDARY
- DRAINAGE BASIN BOUNDARY
- DRAINAGE SWALE
- EXISTING DITCH
- PROPERTY LINE
- XXXX PROPOSED MAJOR CONTOUR
- XXXX PROPOSED MINOR CONTOUR
- XXXX EXISTING MAJOR CONTOUR
- XXXX EXISTING MAJOR CONTOUR
- EXISTING STORM SEWER
- EXISTING STORM MANHOLE
- EXISTING STORM INLET

GRADING REFLECTS EARLY GRADING PERMIT. PROPOSED UTILITIES AND FINAL CONDITIONS TO BE EVALUATED WITH FINAL DRAINAGE REPORT FOR THE FINAL PLAT.

NORTH

GRAPHIC SCALE IN FEET
0 30 60 120

Know what's below. Call before you dig.

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2 North Nevada Avenue, Suite 300
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DATE: 05/06/2022

WATERVIEW EAST COMMERCIAL
CONSTRUCTION DOCUMENTS
PROPOSED DRAINAGE MAP - EARLY GRADING

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Kimley»Horn
Kimley-Horn and Associates, Inc.

PROJECT NO.
196195000

SHEET
DR-2

K:\COS_LA\196195000 - Waterview East Commercial\CADD\PlanSheets\CD_DR_EARLY GRADING.dwg McCallum, Jessica 7/5/2023 5:23 PM