Ph: 970-871-6772 · Fax: 970-879-8023 · P.O. Box 775966 · Steamboat Springs, Colorado 80477

Draft Drainage Study & Stormwater Quality Plan for Steamboat Airpark Preliminary Plat

Address: TBD

Draft: 4/25/2022
Revised: 8/24/2022

Prepared by: Walter Magill, P.E.
Four Points Surveying & Engineering

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NOTE

City of Steamboat Springs plan review and approval is only for general conformance with City design criteria and City code. The City is not responsible for the accuracy and adequacy of the design, dimensions, and elevations that shall be confirmed and correlated at this job site. The City of Steamboat Springs assumes no responsibility for the completeness or accuracy of this document.

CERTIFICATION

I hereby affirm that this Drainage Report for the (name of project) was prepared by me (or under my direct supervision) for the owners thereof and is, to the best of my knowledge, in accordance with the provisions of the City of Steamboat Springs Storm Drainage Criteria and approved variances. I understand that the City of Steamboat Springs does not and will not assume liability for drainage facilities designed by others.

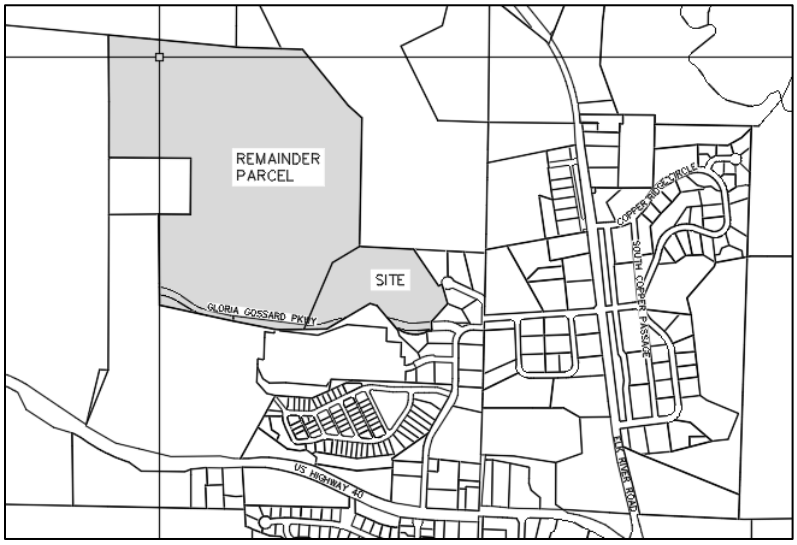
_____
Walter Magill, P.E.
State of Colorado No. 0033743

1.0 Introduction

This report provides a detailed analysis of existing and proposed post-development drainage conditions and proposed water quality facilities at Lot 1 West Acres Ranch Subdivision. The conditional improvements associated with the plat include a 24-foot access road, a detached sidewalk along Gloria Gossard Parkway, earth retainage, and stormwater drainage infrastructure (Project). This report includes all data, engineering methods, assumptions, and calculations used by Four Points Surveying and Engineering (Four Points) to design the stormwater drainage system for the Project. Four Points prepared this report and performed engineering for the Project in accordance with the most recent version of the City of Steamboat Springs Drainage Criteria and Engineering Standards.

A. Location

Figure 1: Site Vicinity Map – Lot 1 West Acres Ranch Subdivision



B. Owner/Developer

Ken Marsh

C. Drainage Reports for Adjacent Developments

1. Joe Wiedemeier, P.E. Four Points Surveying and Engineering (March 2020) Final Drainage Study for Overlook Park Subdivision.

D. Stormwater Quality Purpose, Goal, and Special Requirements

The purpose of the stormwater quality plan is to design a conveyance and treatment system that fits with the proposed Project and provides both functionality and aesthetics. The goal is to treat stormwater runoff from the proposed road impervious surfaces per City standards.

2.0 Drainage Criteria and Methodology Used

A. Design Rainfall and Storm Frequency

Design rainfall: NOAA Atlas 14, Volume 8, Version 2 for Steamboat Springs, CO.

- Minor Event (5-year) 24-hour rainfall depth: 1.59 inches
- Major Event (100-year) 24-hour rainfall depth: 2.91 inches

B. Runoff Calculation Methodology

Runoff calculation method: Small basin peak flow runoff was analyzed using the Rational Method, shown in Eq-1.

Rational Method: **Q = CiA** (Eq-1)

Where: Q = runoff, CFS
C = runoff coefficient, dimensionless
i = rainfall intensity, inches per hour
A = basin area, acres

C. Stormwater Quality Design Standard

Proposed permanent stormwater treatment facilities will meet water quality capture volume (WQCV) design standards. WQCV calculations were performed for combined detention pond and sand filter per City drainage engineering standards.

3.0 Existing Conditions

A. Ground Cover, Imperviousness, Topography and Size

- Vacant undeveloped lot with mountainous terrain
- Gloria Gossard Boulevard (Paved Road)
- Rough cut access road and a two-track trail
- Temporary 12”-18” culverts installed on the rough cut road
- 2% imperviousness
- Moderate to steep sloping terrain rugged terrain
- Total lot size: 131.5 acres (Lot 1 and Lot 1 Remainder Parcel)

B. Existing Stormwater Systems

See existing conditions drainage exhibit, DR1, to view the existing conditions and existing drainage basin designations.

- Existing basin (EB) EB1 drains west and into the Overlook Park Subdivision.
- EB2 drains south-southwest and into a ditch and travels west into the Overlook Park Subdivision as concentrated flow. Gloria Gossard Parkway borders the southern portion of the Lot 1/Lot remainder parcel and is public right-of-way. A high point on Gloria Gossard Parkway divides EB2 and EB3.
- EB3 drains to two parallel 30” culverts conveying concentrated flows under Gloria Gossard.
- EB4 drains south and into an existing ditch along Gloria Gossard that flows east into a public storm sewer.
- EB5 drains to an existing cutoff ditch and detention pond that outfalls into the Overlook Park Subdivision.

C. Site Outfall and Ultimate Outfall Locations

EB1, EB2, and EB5 outfall into the Overlook Park Subdivision which feeds into Slate Creek and ultimately the Yampa River. EB3 and EB4 outfall into existing stormwater infrastructure and ultimately the Yampa River.

D. USDA NRCS Soil Type

A USDA NRCS Web Soil Survey was performed to determine basic soil characteristics within the Lot 1. Soil types include:

- Eckmanpark clay → Hydrologic Soil Group Rating: D
- Eckmanpark clay loam → Hydrologic Soil Group Rating: D
- Impass silty clay loam → Hydrologic Soul Group Rating: C

E. Existing Easements

See existing conditions drainage exhibit for existing easement locations. A 40-foot wide construction and slope maintenance easement on the north side of Gloria Gossard.

4.0 Proposed Conditions

A. Proposed Stormwater Systems

See proposed conditions drainage exhibit, DR2. Proposed conditions will maintain historic outfall points but drainage patterns will be changed with the proposed access road, sidewalk, and other drainage improvements. The new sidewalk will increase impervious surface area by 0.80 acres. The new road will increase impervious surface area by 1.40 acres. Drainage infrastructure additions include standard drainage curb and gutter installed along the north side of Gloria Gossard Parkway, 12-foot-wide drainage ditches, culverts (18" and 24" for the Airpark Access Road), stormwater inlets (Denver Type 16), storm sewer piping and pervious sidewalk shoulder and French drains along portions of the proposed 8-foot wide sidewalk that abuts the steep slopes along the north side of Gloria Gossard Blvd.

Design points (DP's) were used to identify the historic and proposed major outfall points identify points where gutter/roadway capacity, drainage ditch capacity, inlet capacity, and culvert capacity were analyzed. Design points are identified on the drainage exhibits, DR1 and DR2.

B. Ground Cover, Imperviousness, Topography and Size

- Total area of development is approximately 6.50 acres.
- Finished ground cover will consist of undeveloped area and paving.
- Runoff from the Airpark Access Road will be collected and routed via drainage ditches to the proposed bypass culverts and inlets feeding into the detention and water quality pond.
- Airpark Access Road Impervious area: 0.75 acres
- Airpark Access Road Impervious area to be treated: 0.60 acres

C. Outlets: Historic and Proposed Flow

Historic outfall points will be maintained under the proposed conditions.

D. Hydraulic Calculations

- Inlet capacity was analyzed using UD-Inlet version 4.05 design spreadsheet.
- Roadway curb and gutter, Storm sewer piping, drainage swales and culvert crossings were analyzed using AutoCAD Hydroflow Express software.

E. Major and Minor Flow Summary Table

Existing and proposed drainage was analyzed by dividing the lot into existing basins (e.g. EB1) for the existing conditions analysis and sub-basins (e.g. SB1) for the proposed conditions analysis. Major and minor flows for each basin are summarized in Table 1, see following page.

Table 1: Major and Minor Flow Summary Table

Basin ID	Area (acres)	Impervious Area (%)	Runoff	
			Q_5 (cfs)	Q_{100} (cfs)
EB1	13.70	2%	3.18	21.73
EB2	24.75	3%	6.40	42.36
EB3	25.75	4%	7.28	46.89
EB4	1.92	12%	1.37	7.24
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SB7	2.78	9%	1.63	9.23
SB8	0.28	2%	0.16	1.10
SB9	4.35	4%	1.63	10.41
SB12	0.65	85%	1.65	4.16
SB13	0.54	96%	1.56	3.71
SB14	0.23	100%	0.77	1.79
SB15	0.47	75%	0.97	2.61
SB16	0.17	100%	0.57	1.33
SB17	0.17	100%	0.57	1.33

F. Proposed Easements

A drainage easement is proposed for the detention pond and sand filter permanent stormwater facility

G. Off Site Flows

No significant off-site flows exist.

H. Impacts to Downstream Properties

There are no anticipated impacts to downstream properties due to the proposed development.

I. Potential Site Contaminants

- Sediment, sand, grit, and salts,
- Vehicular pollutants (Oils, antifreeze, carbon deposits, etc.),

J. On-Site Stormwater Flows

On site flows will originate primarily from the Airpark access road, Gloria Gossard road and, the Gloria Gossard sidewalk and the remaining undisturbed native landscape.

K. Water Quality Design Standards

WQCV for the sand filter in the detention pond.

L. Channels: Ditches and Curb and Gutter

Roadside drainage ditches shall convey surface runoff along the Airpark Access Road and Gloria Gossard Parkway. All roadside drainage ditches shall be capable of conveying the major event peak flow rate. The SB2 cutoff shall be capable of conveying the minor event.

Table 2: Ditch Capacity

Design Point #	Minor Storm Flow (cfs)	Major Storm Flow (cfs)	Minor Event Velocity (ft/sec)	Major Event Velocity (ft/sec)
2	6.61	45.13	6.38	N/A

Curb and gutter installations along the northern side of Gloria Gossard Parkway will convey flow into the proposed drainage ditches. Gutter conveyance and associated gutter and roadway capacity were analyzed to ensure street spread flow requirements were met. Flows were calculated using AutoCAD Hydraflow Express for the street hydraulic capacity evaluation. Gloria Gossard road is 32 feet wide, which leaves 8 feet of street spread flow available. This leaves the required 12 feet of lane in each direction open. Design point 5 was evaluated for curb/gutter and roadway capacity with 8 feet of spread flow into the street. All gutters and roadways will effectively convey both the minor and major storm events within the inundation limit and within the required velocity of 8 feet per second or less.

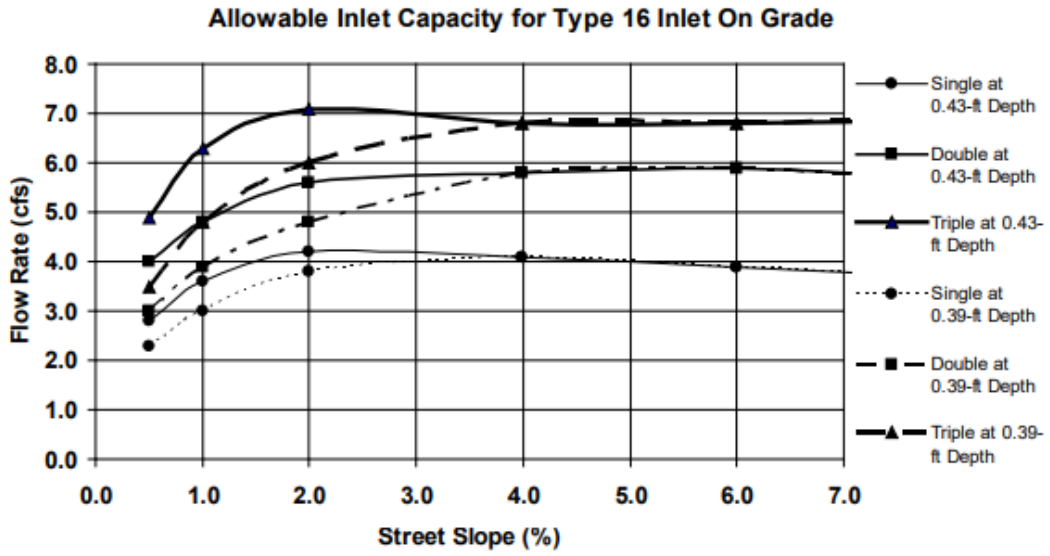
Table 3: Roadway Curb & Gutter Capacity

Design Point #	Roadway/Gutter Capacity (cfs)	Minor Storm Flow (cfs)	Major Storm Flow (cfs)	Major Event Velocity (ft/sec)
5	5.0	1.56	3.71	5.55

M. Inlets

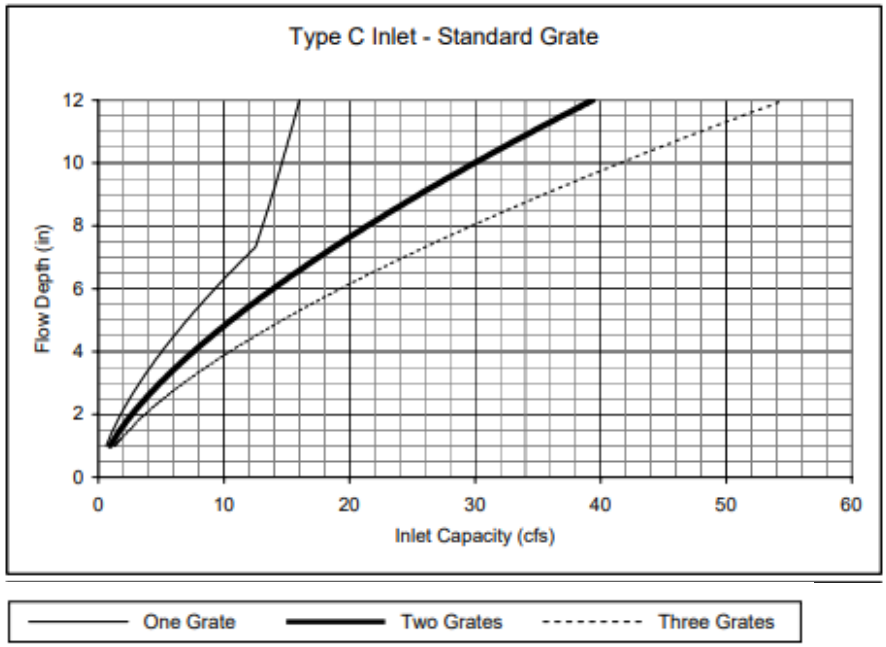
Two Type 16 inlets (see plan for locations) will be installed along Gloria Gossard Parkway. A type C inlet is proposed to be installed at the 30" culvert inlet at Design Point No. 11. Figure 1 Denver Type 16 capacity chart was used to approximate inlet capacity at approximately 5.16 inches of depth. Figure 2 is for a CDOT Type C inlet. The Type 16 inlets will effectively handle the minor and major storm events at a flow depth of 12.0 inches. The Type C inlet will handle the minor event without surcharging, however, surcharging would likely occur with the major event.

Figure 1: Denver Type 16 Inlet Capacity Chart



Source: City and County of Denver Storm Drainage Design and Technical Criteria, January 2006

Figure 2: Denver Type C Inlet Capacity Chart



Source: City and County of Denver Storm Drainage Design and Technical Criteria, January 2006

Table 4: Inlet Capacity

Design Point #	No. of Inlets	Type of Inlet	Inlet Capacity (cfs)	Minor Storm Flow (cfs)	Major Storm Flow (cfs)
7	1	Denver Type 16	4.0	1.44	3.35
11	1	Type C	13.0	3.42	23.31

N. Culverts and Storm Sewers

A culvert for the access road is proposed. It effectively conveys the minor and major storms without surcharging. Capacity was evaluated under a culvert scenario for design points No. 1 and No. 11. At design point No. 11, the major event flow is controlled by the Type-C inlet capacity.

Table 5: Culvert Capacity

Design Point #	Diameter (in)	Flow Regime	Minor Storm Flow (cfs)	Major Storm Flow (cfs)	Major Event Velocity (ft/sec)
7	18”	Inlet Control	2.23	13.67	7.85
8	(2) 30”	Outlet Control	8.53	52.39	5.90
11	30”	Inlet Control	3.40	13.0	8.50

O. Sidewalk Drainage

Portions of sidewalk are proposed to be installed along the steep slopes on the North side of Gloria Gossard. Stormwater runoff from the slopes must be managed to avoid conveyance over the sidewalk surface. As opposed to excavating into the hillside to construct a cutoff ditch, Four Points proposes installing a 6” PVC French along the northern shoulder of the sidewalk from design point No. 6 to design point No. 7 and design point No. 8 to design point No. 9. The French drain is proposed to outfall within the proposed 12-foot roadside ditch, a proposed Denver Type 16 inlet, and the existing dual-culvert crossing extension basin. Cleanouts should be installed every 100-feet to facilitate maintenance. Geotextile fabric should separate the gravel bedding to inhibit vegetation intrusion. The primary concern in this instance is icing from snow melt along the hillside. Therefore it is not anticipated that capacity of the French drain system will need to be very great. 6” PVC capacity calcs were performed for the sidewalk slopes of 4.75% and 7%, the respective slopes for the aforementioned stations. This does not include calculation of the additional flow capacity within the gravel medium of the French drain. The pipe capacity should facilitate the intended use. A large rainfall event may inundate the French drain and overflow into the street but this has been accounted for with the minor and major peak flow inundation determined for street flow.

P. Stormwater Detention

The detention pond is proposed to be constructed to manage the future stormwater for the conceptual Copper Ridge Apartments project. Therefore, it would be oversized for the proposed Airpark access road but the outlet structure would be modified as needed to discharge runoff at historical rates. It’s most practical to design a detention facility for future improvements versus one that just manages flows for the access road.

5.0 Construction Stormwater Management

Temporary erosion and sediment control during construction is the responsibility of the general contractor. This responsibility includes acquisition of any required permits. The contractor and owner shall be required to obtain a state general permit for the discharge of construction site stormwater associated with the approximate 10.0 acres of development. The contractor shall be responsible for obtaining this permit prior to construction.

A detailed stormwater management plan prepared by a Colorado professional engineer shall be required. The stormwater management plan should take into account the changing topography and conditions of the site throughout the construction process. All stormwater control measures shall conform to jurisdictional standards.

6.0 Post Construction Stormwater Management

See Operation and Maintenance Plans provided in the appendices.

7.0 Concluding General Summary

In conclusion, the development of an access road, sidewalk, retaining walls and associated drainage infrastructure along Gloria Gossard Parkway as part of the Steamboat Airpark Preliminary Plat will not substantially impact existing drainage conditions. All proposed drainage infrastructure has been thoroughly evaluated and design of such is within the Steamboat Springs Drainage Criteria standards. Westerly flows off-site are accounted for in the Overlook Park Final Drainage Report.

A. Compliance

The proposed stormwater drainage system complies with City Drainage Criteria.

B. Historic and Proposed Site Flows

Peak proposed flows for design points No. 1 and No. 2 will be about the same as that of historic peak flows. This is due primarily to the decrease in tributary area from the proposed access road. However, flows to design point No. 8 will increase due to the subsequent increase in drainage area. Increased peak flow at design point No. 8 is not substantial however and detention is not required.

C. Proposed New Stormwater System Requirements

The proposed stormwater system shall effectively convey and treat all flows on site with proper installation and maintenance.

8.0 References

Joe Wiedemeier, P.E. Four Points Surveying and Engineering (March 2020) Final Drainage Study for Overlook Park Subdivision.

Urban Drainage and Flood Control District Criteria Manual, 2018.

NOAA Precipitation Frequency Server. NOAA Atlas 14, Volume 8, Version 2. www.NOAA.com

City of Steamboat Springs Engineering Drainage Criteria, Latest Version.

9.0 Appendices

A. Existing Conditions Drainage Exhibit, DR1
B. Proposed Conditions Drainage Exhibit, DR2
C. USDA NRCS Web Soil Survey
D. Basin Runoff Calculations
E. BMP Design Calculations for Sand Filter
F. Channel Flow Calculations (Ditches, curb and gutter, French drains)
G. Inlet Capacity Curves and Calculations
H. Culvert and Storm Sewer Capacity Calculations
I. Standard forms No. 3, 4, & 5
J. Project Design Sheets
K. Detention Pond Design Calculations and O&M Plan

Appendix A: Existing Conditions Drainage Exhibit, DR1

DRAINAGE PLAN LEGEND

- 2' CONTOUR
- 10' CONTOUR
- DRAINAGE BASIN BOUNDARY
- FLOW PATH, SHEET FLOW/OVERLAND FLOW
- FLOW PATH, CONCENTRATED
- DITCH/SWALE CENTERLINE
- 1 — DESIGN POINT DESIGNATION
- A / B | C — A: BASIN DESIGNATION; B: BASIN AREA (ACRES); C: % IMPERVIOUS

DESIGN POINTS:

1. EB2 FLOWS CONTINUE INTO OVERLOOK PARK CONSTRUCTION AREA AND FLOW TO THE SEDIMENTATION BASIN DOWNSTREAM.
2. EB3 OUTFALLS FROM (2) PARALLEL 30" CMP CULVERTS CROSSING GLORIA GOSSARD BLVD.

Drainage Basin Summary Table

Basin ID	Area (acres)	Impervious Area (%)	Runoff	
			Q_5 (cfs)	Q_{100} (cfs)
EB1	13.70	2%	3.18	21.73
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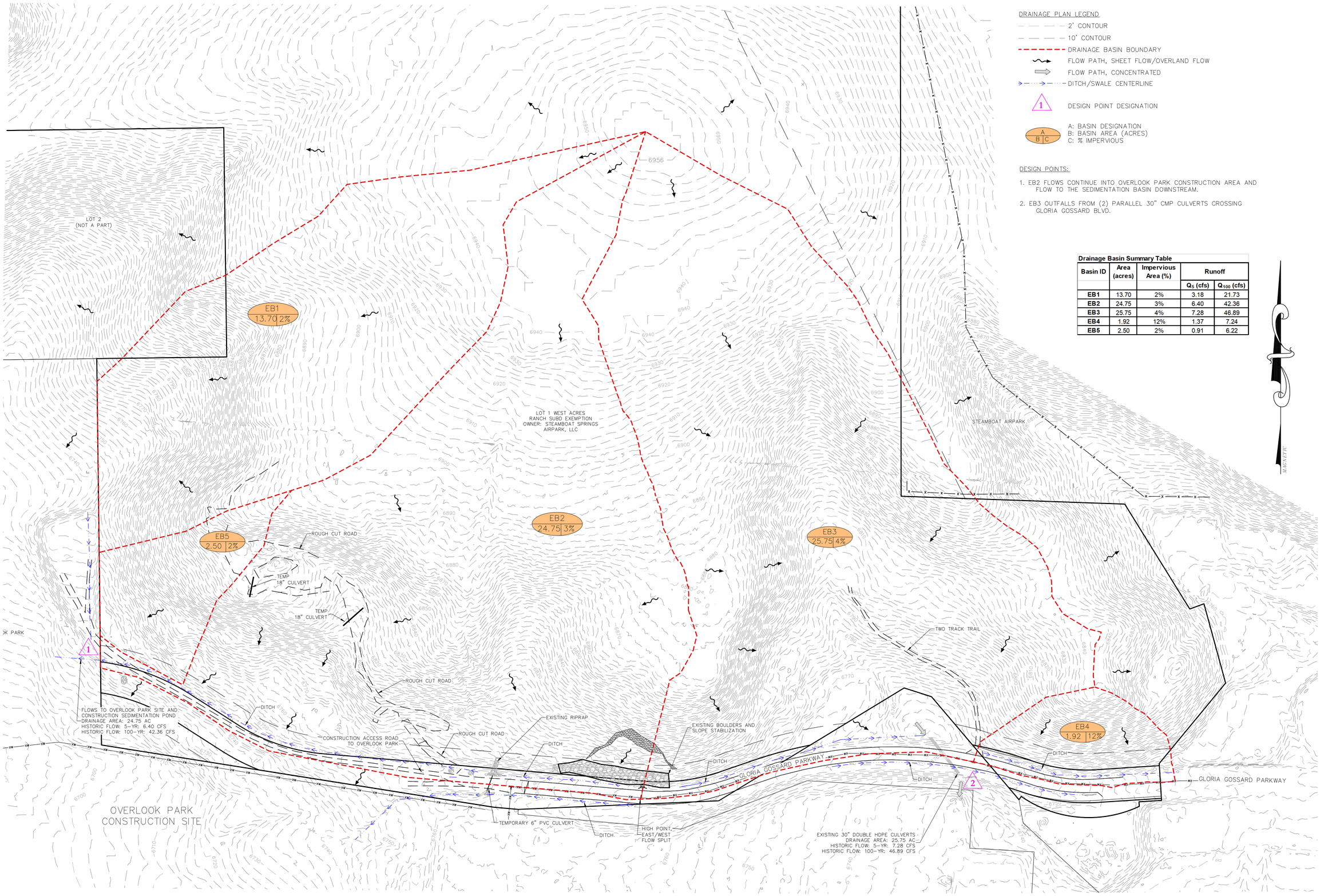

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No.	DATE	REVISIONS	INT
1	8/15/22	PER DRT COMMENTS FROM 06/10/2022	JLW

STEAMBOAT AIRPARK PRELIMINARY PLAT
STEAMBOAT SPRINGS, CO 80487

Horizontal Scale

0 100' 200'

SCALE: 1" = 100'

Contour Interval = 2 ft

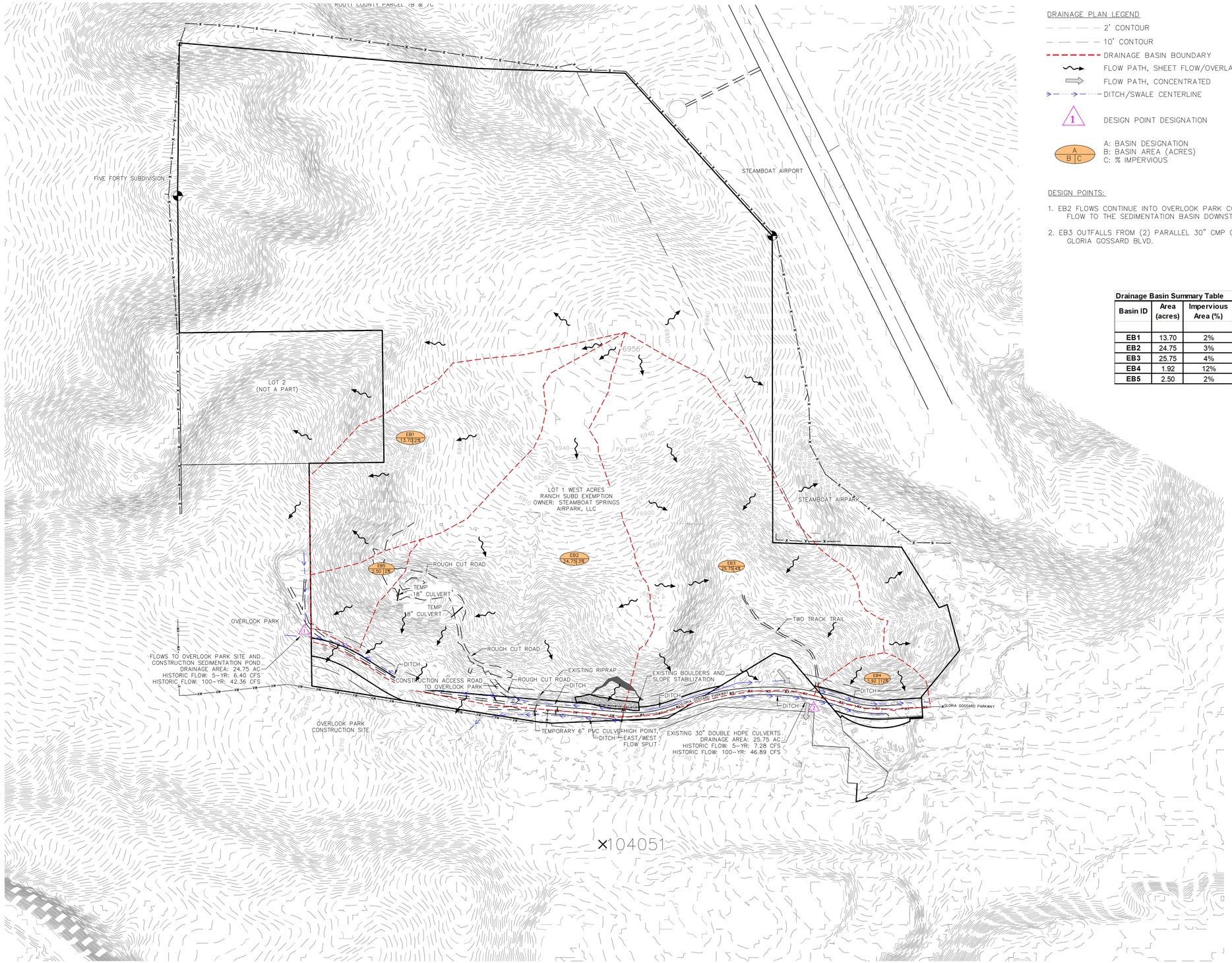
DATE: 4/21/22
JOB #: 1670-001
DRAWN BY: MDM
DESIGN BY: MDM
REVIEW BY: WNM

IF THIS DRAWING IS PRESENTED IN A FORMAT OTHER THAN 24" X 36", THE GRAPHIC SCALE SHOULD BE UTILIZED.

DRAWING: EXISTING CONDITIONS DRAINAGE

SHEET #

DR1



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MAGNETIC

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DRAWING:

EXISTING CONDITIONS DRAINAGE EXPANDED VIEW

SHEET #

DR1.1

Appendix B: Proposed Conditions Drainage Exhibit, DR2

DRAINAGE PLAN LEGEND

- 2' CONTOUR
- 10' CONTOUR
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- DITCH/SWALE CENTERLINE
- 1 — DESIGN POINT DESIGNATION
- A / B | C — A: BASIN DESIGNATION; B: BASIN AREA (ACRES); C: % IMPERVIOUS

DESIGN POINTS:

1. OUTFALL POINT FOR SB10, SB11, SB12, AND SB13. DRAINAGE AREA = 1.20 AC, OUTFALLS INTO THE OVERLOOK PARK STORMWATER COLLECTION NETWORK.
2. OUTFALL POINT FOR THE CUTOFF DITCH TO DB1. OUTFALLS INTO THE OVERLOOK PARK CUTOFF DITCH.
3. N/A
4. N/A
5. CATCH CURB/GUTTER, SB13.
6. N/A
7. INLET FOR SB4, SB5, AND SB14 DRAINAGE AREA.
8. OUTFALL FOR (2) PARALLEL 30" CMP CULVERTS CROSSING GLORIA GOSSARD (SB3 – SB9 DRAINAGE AREA).
9. CATCH CURB/GUTTER, SB17.
10. DETENTION POND AND BYPASS CULVERT OUTFALL.
11. 30" TEMPORARY BYPASS CULVERT SERVING SB3 DRAINAGE AREA.

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REVIEW BY: WNM

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SHEET #

DR2

Appendix C: USDA NRCS Web Soil Survey

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 Routt Area, Colorado, Parts of Rio Blanco and Routt Counties

April 25, 2022

Custom Soil Resource Report
Soil Map

Map Scale: 1:5,350 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 50 100 200 300

Feet
0 250 500 1000 1500

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: Routt Area, Colorado, Parts of Rio Blanco and Routt Counties
Survey Area Data: Version 11, Sep 2, 2021

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

Date(s) aerial images were photographed: May 8, 2012—Oct 5, 2017

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
89	Eckmanpark clay, 6 to 25 percent slopes	61.7	46.1%
120	Eckmanpark clay loam, 25 to 65 percent slopes	62.5	46.7%
C10	Impass silty clay loam, 3 to 12 percent slopes	9.7	7.3%
Totals for Area of Interest		**134.0**	**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.

Routt Area, Colorado, Parts of Rio Blanco and Routt Counties

89—Eckmanpark clay, 6 to 25 percent slopes

Map Unit Setting

National map unit symbol: k0ht
Elevation: 6,560 to 8,530 feet
Mean annual precipitation: 20 to 24 inches
Mean annual air temperature: 38 to 41 degrees F
Frost-free period: 30 to 70 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Eckmanpark

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Slope alluvium and/or colluvium over residuum weathered from shale

Typical profile

A - 0 to 2 inches: clay
Bss1 - 2 to 9 inches: clay
Bss2 - 9 to 17 inches: clay
Bk - 17 to 32 inches: clay
Cr - 32 to 36 inches: bedrock

Properties and qualities

Slope: 6 to 25 percent
Depth to restrictive feature: 28 to 37 inches to paralithic bedrock
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately high (0.00 to 0.21 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Gypsum, maximum content: 2 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 5.4 inches)

Interpretive groups

Land capability classification (irrigated): 6e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: D
Ecological site: R048AY244CO - Mountain Shale
Hydric soil rating: No

120—Eckmanpark clay loam, 25 to 65 percent slopes

Map Unit Setting

National map unit symbol: k0jp
Elevation: 6,560 to 8,690 feet
Mean annual precipitation: 20 to 24 inches
Mean annual air temperature: 38 to 41 degrees F
Frost-free period: 30 to 70 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Eckmanpark

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Concave
Parent material: Colluvium over residuum weathered from shale

Typical profile

A - 0 to 1 inches: clay loam
Bss - 1 to 10 inches: clay
Bk - 10 to 26 inches: clay
Cr - 26 to 35 inches: bedrock

Properties and qualities

Slope: 25 to 65 percent
Depth to restrictive feature: 20 to 33 inches to paralithic bedrock
Drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately high (0.00 to 0.21 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Gypsum, maximum content: 1 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 4.7 inches)

Interpretive groups

Land capability classification (irrigated): 7e
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: D
Ecological site: R048BY296CO - Claypan

Hydric soil rating: No

Minor Components

Routt

Percent of map unit: 5 percent
Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: F048AY449CO - Aspen Woodland
Hydric soil rating: No

C10—Impass silty clay loam, 3 to 12 percent slopes

Map Unit Setting

National map unit symbol: k0ky
Elevation: 6,560 to 7,870 feet
Mean annual precipitation: 20 to 24 inches
Mean annual air temperature: 38 to 41 degrees F
Frost-free period: 30 to 70 days
Farmland classification: Not prime farmland

Map Unit Composition

Impass and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Impass

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Slope alluvium derived from sandstone and shale

Typical profile

A - 0 to 4 inches: silty clay loam
Bss - 4 to 18 inches: silty clay
Bkss - 18 to 25 inches: silty clay
Bk1 - 25 to 45 inches: silty clay
Bk2 - 45 to 60 inches: silty clay

Properties and qualities

Slope: 3 to 12 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 low to moderately high (0.07 to 0.21 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Gypsum, maximum content: 2 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: High (about 10.2 inches)

Interpretive groups

Land capability classification (irrigated): 6c
Land capability classification (nonirrigated): 6c
Hydrologic Soil Group: C
Ecological site: R048BY296CO - Claypan
Hydric soil rating: No

Minor Components

Gourley

Percent of map unit: 10 percent
Landform: Hills
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Side slope
Down-slope shape: Concave
Across-slope shape: Concave
Ecological site: R048AY247CO - Deep Clay Loam
Hydric soil rating: No

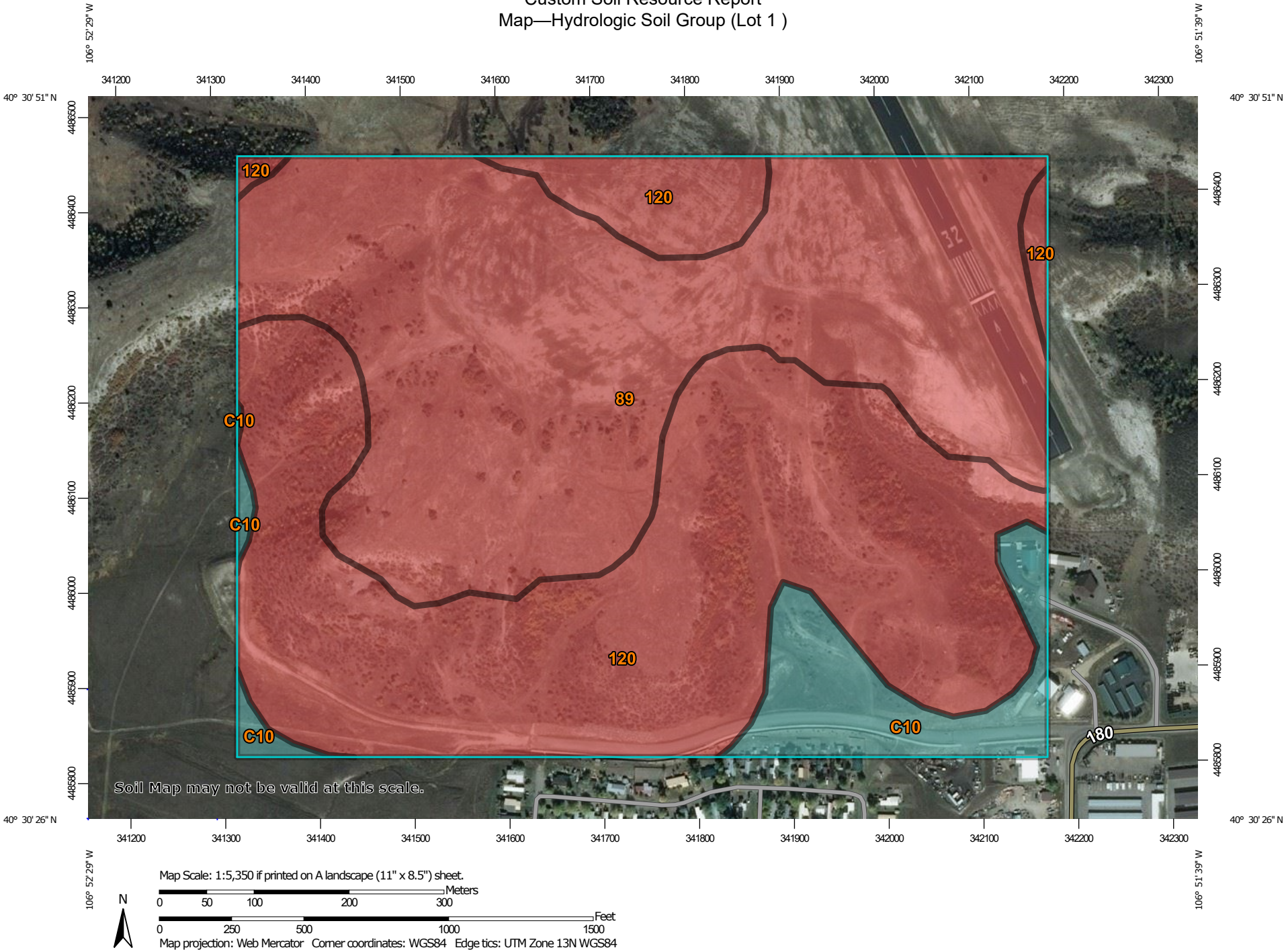
Routtskin

Percent of map unit: 5 percent
Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R048AY247CO - Deep Clay Loam
Hydric soil rating: No

Eckmanpark

Percent of map unit: 5 percent
Landform: Hills
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Concave
Ecological site: R048BY296CO - Claypan
Hydric soil rating: No

Custom Soil Resource Report
Map—Hydrologic Soil Group (Lot 1)



Map Scale: 1:5,350 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 50 100 200 300

Feet
0 250 500 1000 1500

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

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Lines

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Points

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

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

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: Routt Area, Colorado, Parts of Rio Blanco and Routt Counties
Survey Area Data: Version 11, Sep 2, 2021

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

Date(s) aerial images were photographed: May 8, 2012—Oct 5, 2017

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

Table—Hydrologic Soil Group (Lot 1)

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
89	Eckmanpark clay, 6 to 25 percent slopes	D	61.7	46.1%
120	Eckmanpark clay loam, 25 to 65 percent slopes	D	62.5	46.7%
C10	Impass silty clay loam, 3 to 12 percent slopes	C	9.7	7.3%
Totals for Area of Interest			**134.0**	**100.0%**

Rating Options—Hydrologic Soil Group (Lot 1)

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Appendix D: Basin Runoff Calculations

RATIONAL METHOD RUNOFF ANALYSIS

Job #	1670-001	Date:	April 22, 2022
Job Name	Copper Ridge Village	Revised:	
Designed by:	JLW		

Existing Basin 1 (EB1)

BASIN CHARACTERISTICS				TIME OF CONCENTRATION							RESULTS				
	Area, ac	% imp	Soil Type	Overland Flow - Surface Type 1		Overland Flow - Surface Type 2		Channel Flow		Tc, min	Event	C	*i*, in/hr	A, acres	Q, cfs
Landscape	13.70	2%	C	Surface Imperviousness	0.02	Surface Imperviousness	0.02	Land Surface	Grassed Waterways	Minimum	1.25 YR	0.06	0.7	13.70	0.50
Asphalt Parking & Walkways	0.00	100%		Length, ft	300	Length, ft	300	Length, ft	850	Tc, min	2-YR	0.06	1.0	13.70	0.72
Roof	0.00	90%	P2	Slope, percent	5.0000	Slope, percent	10.0000	Slope, ft/ft	0.2000	5.0	5-YR	0.16	1.4	13.70	3.18
Gravel	0.00	40%	1.4	Runoff Coefficient	0.162	Runoff Coefficient	0.162	Conveyance Coefficient	15	Final	10-YR	0.26	1.8	13.70	6.51
Other	0.00	0%						Velocity, ft/s	6.7	Tc, min	25-YR	0.38	2.3	13.70	12.15
	13.70	2%		Ti, min=	17.1	Ti, min=	13.6	Tt, min=	2.1	**32.8**	**100-YR**	**0.51**	**3.1**	**13.70**	**21.73**

Existing Basin 2 (EB2)

BASIN CHARACTERISTICS				TIME OF CONCENTRATION							RESULTS				
	Area, ac	% imp	Soil Type	Overland Flow - Surface Type 1		Overland Flow - Surface Type 2		Channel Flow		Tc, min	Event	C	*i*, in/hr	A, acres	Q, cfs
Landscape	24.50	2%	C	Surface Imperviousness	0.02	Surface Imperviousness	0.02	Land Surface	Paved Areas and Shallow Swales	Minimum	1.25 YR	0.06	0.7	24.75	1.10
Asphalt Parking & Walkways	0.25	100%		Length, ft	300	Length, ft	300	Length, ft	2200	Tc, min	2-YR	0.06	1.0	24.75	1.59
Roof	0.00	90%	P2	Slope, percent	10.0000	Slope, percent	20.0000	Slope, ft/ft	0.1000	5.0	5-YR	0.17	1.5	24.75	6.40
Gravel	0.00	0%	1.4	Runoff Coefficient	0.162	Runoff Coefficient	0.162	Conveyance Coefficient	20	Final	10-YR	0.27	1.9	24.75	12.87
Other	0.00	0%						Velocity, ft/s	6.3	Tc, min	25-YR	0.38	2.5	24.75	23.82
	24.75	3%		Ti, min=	13.6	Ti, min=	10.8	Tt, min=	5.8	**30.1**	**100-YR**	**0.51**	**3.4**	**24.75**	**42.36**

Existing Basin 3 (EB3)

BASIN CHARACTERISTICS				TIME OF CONCENTRATION							RESULTS				
	Area, ac	% imp	Soil Type	Overland Flow - Surface Type 1		Overland Flow - Surface Type 2		Channel Flow		Tc, min	Event	C	*i*, in/hr	A, acres	Q, cfs
Landscape	25.25	2%	C	Surface Imperviousness	0.02	Surface Imperviousness	0.02	Land Surface	Grassed Waterways	Minimum	1.25 YR	0.07	0.8	25.75	1.34
Asphalt Parking & Walkways	0.50	100%		Length, ft	300	Length, ft	300	Length, ft	1200	Tc, min	2-YR	0.07	1.1	25.75	1.93
Roof	0.00	90%	P2	Slope, percent	10.0000	Slope, percent	20.0000	Slope, ft/ft	0.1300	5.0	5-YR	0.18	1.6	25.75	7.28
Gravel	0.00	0%	1.4	Runoff Coefficient	0.162	Runoff Coefficient	0.162	Conveyance Coefficient	15	Final	10-YR	0.27	2.1	25.75	14.42
Other	0.00	0%						Velocity, ft/s	5.4	Tc, min	25-YR	0.39	2.7	25.75	26.49
	25.75	4%		Ti, min=	13.6	Ti, min=	10.8	Tt, min=	3.7	**28.0**	**100-YR**	**0.51**	**3.5**	**25.75**	**46.89**

Existing Basin 4 (EB4)

BASIN CHARACTERISTICS				TIME OF CONCENTRATION							RESULTS				
	Area, ac	% imp	Soil Type	Overland Flow - Surface Type 1		Overland Flow - Surface Type 2		Channel Flow		Tc, min	Event	C	*i*, in/hr	A, acres	Q, cfs
Landscape	1.72	2%	C	Surface Imperviousness	0.1	Surface Imperviousness	0	Land Surface	Grassed Waterways	Minimum	1.25 YR	0.12	1.5	1.92	0.36
Asphalt Parking & Walkways	0.20	100%		Length, ft	200	Length, ft	0	Length, ft	200	Tc, min	2-YR	0.12	2.2	1.92	0.51
Roof	0.00	90%	P2	Slope, percent	40.0000	Slope, percent	1.0000	Slope, ft/ft	0.0500	5.0	5-YR	0.22	3.2	1.92	1.37
Gravel	0.00	0%	1.4	Runoff Coefficient	0.21	Runoff Coefficient	0.15	Conveyance Coefficient	15	Final	10-YR	0.31	4.1	1.92	2.45
Other	0.00	0%						Velocity, ft/s	3.4	Tc, min	25-YR	0.42	5.3	1.92	4.24
	1.92	12%		Ti, min=	6.6	Ti, min=	0.0	Tt, min=	1.0	**7.6**	**100-YR**	**0.54**	**7.0**	**1.92**	**7.24**

Existing Basin 5 (EB5)

BASIN CHARACTERISTICS				TIME OF CONCENTRATION							RESULTS				
	Area, ac	% imp	Soil Type	Overland Flow - Surface Type 1		Overland Flow - Surface Type 2		Channel Flow		Tc, min	Event	C	*i*, in/hr	A, acres	Q, cfs
Landscape	2.50	2%	C	Surface Imperviousness	0.02	Surface Imperviousness	0	Land Surface	Grassed Waterways	Minimum	1.25 YR	0.06	1.0	2.50	0.14
Asphalt Parking & Walkways	0.00	100%		Length, ft	300	Length, ft	250	Length, ft	0	Tc, min	2-YR	0.06	1.5	2.50	0.21

RATIONAL METHOD RUNOFF ANALYSIS

Job #	1670-001	Date:	April 22, 2022
Job Name	Copper Ridge Village	Revised:	
Designed by:	JLW		

Roof	0.00	90%	P2	Slope, percent	35.0000	Slope, percent	40.0000	Slope, ft/ft	0.0100	5.0	5-YR	0.16	2.2	2.50	0.91
Gravel	0.00	0%	1.4	Runoff Coefficient	0.162	Runoff Coefficient	0.15	Conveyance Coefficient	15	Final	10-YR	0.26	2.8	2.50	1.86
Other	0.00	0%						Velocity, ft/s	1.5	Tc, min	25-YR	0.38	3.7	2.50	3.48
	2.50	2%		Ti, min=	8.9	Ti, min=	7.9	Tt, min=	0.0	**16.8**	**100-YR**	**0.51**	**4.9**	**2.50**	**6.22**

Sub Basin 1 (SB1)

BASIN CHARACTERISTICS				TIME OF CONCENTRATION								RESULTS			
	Area, ac	% imp	Soil Type	Overland Flow - Surface Type 1		Overland Flow - Surface Type 2		Channel Flow		Tc, min	Event	C	*i*, in/hr	A, acres	Q, cfs
Landscape	11.50	2%	C	Surface Imperviousness	0.02	Surface Imperviousness	0.02	Land Surface	Grassed Waterways	Minimum	1.25 YR	0.06	0.7	11.50	0.42
Asphalt Parking & Walkways	0.00	100%		Length, ft	300	Length, ft	300	Length, ft	850	Tc, min	2-YR	0.06	1.0	11.50	0.61
Roof	0.00	90%	P2	Slope, percent	5.0000	Slope, percent	10.0000	Slope, ft/ft	0.2000	5.0	5-YR	0.16	1.4	11.50	2.67
Gravel	0.00	0%	1.4	Runoff Coefficient	0.162	Runoff Coefficient	0.162	Conveyance Coefficient	15	Final	10-YR	0.26	1.8	11.50	5.46
Other	0.00	0%						Velocity, ft/s	6.7	Tc, min	25-YR	0.38	2.3	11.50	10.20
	11.50	2%		Ti, min=	17.1	Ti, min=	13.6	Tt, min=	2.1	**32.8**	**100-YR**	**0.51**	**3.1**	**11.50**	**18.24**

Sub Basin 2 (SB2)

BASIN CHARACTERISTICS				TIME OF CONCENTRATION								RESULTS			
	Area, ac	% imp	Soil Type	Overland Flow - Surface Type 1		Overland Flow - Surface Type 2		Channel Flow		Tc, min	Event	C	*i*, in/hr	A, acres	Q, cfs
Landscape	28.20	2%	C	Surface Imperviousness	0.02	Surface Imperviousness	0.02	Land Surface	Grassed Waterways	Minimum	1.25 YR	0.06	0.7	28.20	1.05
Asphalt Parking & Walkways	0.00	100%		Length, ft	300	Length, ft	300	Length, ft	1725	Tc, min	2-YR	0.06	1.0	28.20	1.50
Roof	0.00	90%	P2	Slope, percent	8.0000	Slope, percent	25.0000	Slope, ft/ft	0.0600	5.0	5-YR	0.16	1.4	28.20	6.61
Gravel	0.00	0%	1.4	Runoff Coefficient	0.162	Runoff Coefficient	0.162	Conveyance Coefficient	15	Final	10-YR	0.26	1.8	28.20	13.52
Other	0.00	0%						Velocity, ft/s	3.7	Tc, min	25-YR	0.38	2.4	28.20	25.24
	28.20	2%		Ti, min=	14.6	Ti, min=	10.0	Tt, min=	7.8	**32.4**	**100-YR**	**0.51**	**3.2**	**28.20**	**45.13**

Sub Basin 3 (SB3)

BASIN CHARACTERISTICS				TIME OF CONCENTRATION								RESULTS			
	Area, ac	% imp	Soil Type	Overland Flow - Surface Type 1		Overland Flow - Surface Type 2		Channel Flow		Tc, min	Event	C	*i*, in/hr	A, acres	Q, cfs
Landscape	12.40	2%	C	Surface Imperviousness	0.02	Surface Imperviousness	0.1	Land Surface	Grassed Waterways	Minimum	1.25 YR	0.06	0.8	12.40	0.54
Asphalt Parking & Walkways	0.00	100%		Length, ft	300	Length, ft	300	Length, ft	850	Tc, min	2-YR	0.06	1.1	12.40	0.78
Roof	0.00	90%	P2	Slope, percent	10.0000	Slope, percent	25.0000	Slope, ft/ft	0.0800	5.0	5-YR	0.16	1.7	12.40	3.42
Gravel	0.00	0%	1.4	Runoff Coefficient	0.162	Runoff Coefficient	0.21	Conveyance Coefficient	15	Final	10-YR	0.26	2.2	12.40	6.98
Other	0.00	0%						Velocity, ft/s	4.2	Tc, min	25-YR	0.38	2.8	12.40	13.04
	12.40	2%		Ti, min=	13.6	Ti, min=	9.5	Tt, min=	3.3	**26.4**	**100-YR**	**0.51**	**3.7**	**12.40**	**23.31**

Sub Basin 4 (SB4)

BASIN CHARACTERISTICS				TIME OF CONCENTRATION								RESULTS			
	Area, ac	% imp	Soil Type	Overland Flow - Surface Type 1		Overland Flow - Surface Type 2		Channel Flow		Tc, min	Event	C	*i*, in/hr	A, acres	Q, cfs
Landscape	2.00	2%	C	Surface Imperviousness	0.02	Surface Imperviousness	0.02	Land Surface	Paved Areas and Shallow Swales	Minimum	1.25 YR	0.06	1.3	2.00	0.14
Asphalt Parking & Walkways	0.00	100%		Length, ft	300	Length, ft	0	Length, ft	200	Tc, min	2-YR	0.06	1.9	2.00	0.21
Roof	0.00	90%	P2	Slope, percent	25.0000	Slope, percent	15.0000	Slope, ft/ft	0.0500	5.0	5-YR	0.16	2.8	2.00	0.91
Gravel	0.00	0%	1.4	Runoff Coefficient	0.162	Runoff Coefficient	0.162	Conveyance Coefficient	20	Final	10-YR	0.26	3.5	2.00	1.86
Other	0.00	0%						Velocity, ft/s	4.5	Tc, min	25-YR	0.38	4.6	2.00	3.47
	2.00	2%		Ti, min=	10.0	Ti, min=	0.0	Tt, min=	0.7	**10.7**	**100-YR**	**0.51**	**6.1**	**2.00**	**6.20**

RATIONAL METHOD RUNOFF ANALYSIS

Job #	1670-001	Date:	April 22, 2022
Job Name	Copper Ridge Village	Revised:	
Designed by:	MDM		

Sub Basin 5 (SB5)

BASIN CHARACTERISTICS				TIME OF CONCENTRATION							RESULTS			
	Area, ac	% imp	Soil Type	Overland Flow - Surface Type 1		Overland Flow - Surface Type 2		Channel Flow		Tc, min	Event	C	*i*, in/hr	A, acres	Q, cfs
Landscape	0.00	2%	C	Surface Imperviousness	1	Surface Imperviousness	0	Land Surface	Paved Areas and Shallow Swales	Minimum	1.25 YR	0.89	1.7	0.20	0.31
Asphalt Parking & Walkways	0.20	100%		Length, ft	20	Length, ft	0	Length, ft	300	Tc, min	2-YR	0.89	2.5	0.20	0.44
Roof	0.00	90%	P2	Slope, percent	2.0000	Slope, percent	5.0000	Slope, ft/ft	0.0700	5.0	5-YR	0.90	3.7	0.20	0.67
Gravel	0.00	0%	1.4	Runoff Coefficient	0.9	Runoff Coefficient	0.15	Conveyance Coefficient	20	Final	10-YR	0.92	4.7	0.20	0.87
Other	0.00	0%						Velocity, ft/s	5.3	Tc, min	25-YR	0.94	6.1	0.20	1.14
	0.20	100%		Ti, min=	1.3	Ti, min=	0.0	Tt, min=	0.9	**5.0**	**100-YR**	**0.96**	**8.2**	**0.20**	**1.56**

Sub Basin 6 (SB6)

BASIN CHARACTERISTICS				TIME OF CONCENTRATION							RESULTS			
	Area, ac	% imp	Soil Type	Overland Flow - Surface Type 1		Overland Flow - Surface Type 2		Channel Flow		Tc, min	Event	C	*i*, in/hr	A, acres	Q, cfs
Landscape	0.00	2%	C	Surface Imperviousness	1	Surface Imperviousness	0.02	Land Surface	Paved Areas and Shallow Swales	Minimum	1.25 YR	0.89	1.7	0.47	0.72
Asphalt Parking & Walkways	0.47	100%		Length, ft	20	Length, ft	0	Length, ft	700	Tc, min	2-YR	0.89	2.5	0.47	1.04
Roof	0.00	90%	P2	Slope, percent	2.0000	Slope, percent	35.0000	Slope, ft/ft	0.0600	5.0	5-YR	0.90	3.7	0.47	1.57
Gravel	0.00	0%	1.4	Runoff Coefficient	0.9	Runoff Coefficient	0.162	Conveyance Coefficient	20	Final	10-YR	0.92	4.7	0.47	2.04
Other	0.00	0%						Velocity, ft/s	4.9	Tc, min	25-YR	0.94	6.1	0.47	2.68
	0.47	100%		Ti, min=	1.3	Ti, min=	0.0	Tt, min=	2.4	**5.0**	**100-YR**	**0.96**	**8.2**	**0.47**	**3.66**

Sub Basin 7(SB7)

BASIN CHARACTERISTICS				TIME OF CONCENTRATION							RESULTS			
	Area, ac	% imp	Soil Type	Overland Flow - Surface Type 1		Overland Flow - Surface Type 2		Channel Flow		Tc, min	Event	C	*i*, in/hr	A, acres	Q, cfs
Landscape	2.58	2%	C	Surface Imperviousness	0.1	Surface Imperviousness	0.05	Land Surface	Grassed Waterways	Minimum	1.25 YR	0.10	1.3	2.78	0.39
Asphalt Parking & Walkways	0.20	100%		Length, ft	225	Length, ft	0	Length, ft	650	Tc, min	2-YR	0.10	1.9	2.78	0.56
Roof	0.00	90%	P2	Slope, percent	35.0000	Slope, percent	20.0000	Slope, ft/ft	0.0700	5.0	5-YR	0.21	2.9	2.78	1.63
Gravel	0.00	0%	1.4	Runoff Coefficient	0.21	Runoff Coefficient	0.18	Conveyance Coefficient	15	Final	10-YR	0.30	3.6	2.78	3.02
Other	0.00	0%						Velocity, ft/s	4.0	Tc, min	25-YR	0.41	4.7	2.78	5.34
	2.78	9%		Ti, min=	7.3	Ti, min=	0.0	Tt, min=	2.7	**10.1**	**100-YR**	**0.53**	**6.3**	**2.78**	**9.23**

Sub Basin 8 (SB8)

BASIN CHARACTERISTICS				TIME OF CONCENTRATION							RESULTS			
	Area, ac	% imp	Soil Type	Overland Flow - Surface Type 1		Overland Flow - Surface Type 2		Channel Flow		Tc, min	Event	C	*i*, in/hr	A, acres	Q, cfs
Landscape	0.28	2%	C	Surface Imperviousness	0.02	Surface Imperviousness	0.1	Land Surface	Grassed Waterways	Minimum	1.25 YR	0.06	1.7	0.28	0.03
Asphalt Parking & Walkways	0.00	100%		Length, ft	100	Length, ft	0	Length, ft	0	Tc, min	2-YR	0.06	2.4	0.28	0.04
Roof	0.00	90%	P2	Slope, percent	25.0000	Slope, percent	20.0000	Slope, ft/ft	0.0700	5.0	5-YR	0.16	3.5	0.28	0.16
Gravel	0.00	0%	1.4	Runoff Coefficient	0.162	Runoff Coefficient	0.21	Conveyance Coefficient	15	Final	10-YR	0.26	4.5	0.28	0.33
Other	0.00	0%						Velocity, ft/s	4.0	Tc, min	25-YR	0.38	5.8	0.28	0.62
	0.28	2%		Ti, min=	5.8	Ti, min=	0.0	Tt, min=	0.0	**5.8**	**100-YR**	**0.51**	**7.8**	**0.28**	**1.10**

Sub Basin 9 (SB9)

BASIN CHARACTERISTICS				TIME OF CONCENTRATION							RESULTS			
	Area, ac	% imp	Soil Type	Overland Flow - Surface Type 1		Overland Flow - Surface Type 2		Channel Flow		Tc, min	Event	C	*i*, in/hr	A, acres	Q, cfs
Landscape	4.25	2%	C	Surface Imperviousness	0.02	Surface Imperviousness	0.05	Land Surface	Grassed Waterways	Minimum	1.25 YR	0.07	1.0	4.35	0.31
Asphalt Parking & Walkways	0.10	100%		Length, ft	300	Length, ft	150	Length, ft	100	Tc, min	2-YR	0.07	1.4	4.35	0.44
Roof	0.00	90%	P2	Slope, percent	15.0000	Slope, percent	35.0000	Slope, ft/ft	0.0500	5.0	5-YR	0.18	2.1	4.35	1.63

RATIONAL METHOD RUNOFF ANALYSIS

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Designed by:	MDM		

Gravel	0.00	0%	1.4	Runoff Coefficient	0.162	Runoff Coefficient	0.18	Conveyance Coefficient	15	Final	10-YR	0.27	2.7	4.35	3.22
Other	0.00	0%						Velocity, ft/s	3.4	Tc, min	25-YR	0.39	3.5	4.35	5.89
	4.35	4%		Ti, min=	11.9	Ti, min=	6.2	Tt, min=	0.5	**18.6**	**100-YR**	**0.51**	**4.6**	**4.35**	**10.41**

Sub Basin 12 (SB12)

BASIN CHARACTERISTICS				TIME OF CONCENTRATION								RESULTS			
	Area, ac	% imp	Soil Type	Overland Flow - Surface Type 1		Overland Flow - Surface Type 2		Channel Flow		Tc, min	Event	C	*i*, in/hr	A, acres	Q, cfs
Landscape	0.10	2%	C	Surface Imperviousness	0.85	Surface Imperviousness	0.02	Land Surface	Paved Areas and Shallow Swales	Minimum	1.25 YR	0.66	1.7	0.65	0.74
Asphalt Parking & Walkways	0.55	100%		Length, ft	20	Length, ft	0	Length, ft	220	Tc, min	2-YR	0.66	2.5	0.65	1.06
Roof	0.00	90%	P2	Slope, percent	2.0000	Slope, percent	1.0000	Slope, ft/ft	0.0500	5.0	5-YR	0.68	3.7	0.65	1.65
Gravel	0.00	0%	1.4	Runoff Coefficient	0.68	Runoff Coefficient	0.162	Conveyance Coefficient	20	Final	10-YR	0.71	4.7	0.65	2.19
Other	0.00	0%						Velocity, ft/s	4.5	Tc, min	25-YR	0.75	6.1	0.65	2.97
	0.65	85%		Ti, min=	2.7	Ti, min=	0.0	Tt, min=	0.8	**5.0**	**100-YR**	**0.78**	**8.2**	**0.65**	**4.16**

Sub Basin 13 (SB13)

BASIN CHARACTERISTICS				TIME OF CONCENTRATION								RESULTS			
	Area, ac	% imp	Soil Type	Overland Flow - Surface Type 1		Overland Flow - Surface Type 2		Channel Flow		Tc, min	Event	C	*i*, in/hr	A, acres	Q, cfs
Landscape	0.02	2%	C	Surface Imperviousness	0.95	Surface Imperviousness	0.02	Land Surface	Paved Areas and Shallow Swales	Minimum	1.25 YR	0.82	1.6	0.54	0.72
Asphalt Parking & Walkways	0.52	100%		Length, ft	20	Length, ft	0	Length, ft	750	Tc, min	2-YR	0.82	2.3	0.54	1.03
Roof	0.00	90%	P2	Slope, percent	2.0000	Slope, percent	1.0000	Slope, ft/ft	0.0200	5.0	5-YR	0.84	3.5	0.54	1.56
Gravel	0.00	0%	1.4	Runoff Coefficient	0.82	Runoff Coefficient	0.162	Conveyance Coefficient	20	Final	10-YR	0.86	4.4	0.54	2.04
Other	0.00	0%						Velocity, ft/s	2.8	Tc, min	25-YR	0.88	5.7	0.54	2.71
	0.54	96%		Ti, min=	1.8	Ti, min=	0.0	Tt, min=	4.4	**6.2**	**100-YR**	**0.91**	**7.6**	**0.54**	**3.71**

Sub Basin 14 (SB14)

BASIN CHARACTERISTICS				TIME OF CONCENTRATION								RESULTS			
	Area, ac	% imp	Soil Type	Overland Flow - Surface Type 1		Overland Flow - Surface Type 2		Channel Flow		Tc, min	Event	C	*i*, in/hr	A, acres	Q, cfs
Landscape	0.00	2%	C	Surface Imperviousness	1	Surface Imperviousness	0.02	Land Surface	Paved Areas and Shallow Swales	Minimum	1.25 YR	0.89	1.7	0.23	0.35
Asphalt Parking & Walkways	0.23	100%		Length, ft	20	Length, ft	0	Length, ft	320	Tc, min	2-YR	0.89	2.5	0.23	0.51
Roof	0.00	90%	P2	Slope, percent	2.0000	Slope, percent	1.0000	Slope, ft/ft	0.0700	5.0	5-YR	0.90	3.7	0.23	0.77
Gravel	0.00	0%	1.4	Runoff Coefficient	0.9	Runoff Coefficient	0.162	Conveyance Coefficient	20	Final	10-YR	0.92	4.7	0.23	1.00
Other	0.00	0%						Velocity, ft/s	5.3	Tc, min	25-YR	0.94	6.1	0.23	1.31
	0.23	100%		Ti, min=	1.3	Ti, min=	0.0	Tt, min=	1.0	**5.0**	**100-YR**	**0.96**	**8.2**	**0.23**	**1.79**

Sub Basin 15 (SB15)

BASIN CHARACTERISTICS				TIME OF CONCENTRATION								RESULTS			
	Area, ac	% imp	Soil Type	Overland Flow - Surface Type 1		Overland Flow - Surface Type 2		Channel Flow		Tc, min	Event	C	*i*, in/hr	A, acres	Q, cfs
Landscape	0.12	2%	C	Surface Imperviousness	0.75	Surface Imperviousness	0.02	Land Surface	Grassed Waterways	Minimum	1.25 YR	0.54	1.7	0.47	0.42
Asphalt Parking & Walkways	0.35	100%		Length, ft	25	Length, ft	0	Length, ft	450	Tc, min	2-YR	0.54	2.4	0.47	0.61
Roof	0.00	90%	P2	Slope, percent	2.0000	Slope, percent	1.0000	Slope, ft/ft	0.0700	5.0	5-YR	0.58	3.6	0.47	0.97
Gravel	0.00	0%	1.4	Runoff Coefficient	0.58	Runoff Coefficient	0.162	Conveyance Coefficient	15	Final	10-YR	0.62	4.6	0.47	1.32
Other	0.00	0%						Velocity, ft/s	4.0	Tc, min	25-YR	0.66	5.9	0.47	1.82
	0.47	75%		Ti, min=	3.7	Ti, min=	0.0	Tt, min=	1.9	**5.6**	**100-YR**	**0.71**	**7.8**	**0.47**	**2.61**

Sub Basin 16 (SB16)

BASIN CHARACTERISTICS				TIME OF CONCENTRATION								RESULTS			
	Area, ac	% imp	Soil Type	Overland Flow - Surface Type 1		Overland Flow - Surface Type 2		Channel Flow		Tc, min	Event	C	*i*, in/hr	A, acres	Q, cfs
Landscape	0.00	2%	C	Surface Imperviousness	1	Surface Imperviousness	0.02	Land Surface	Paved Areas and Shallow Swales	Minimum	1.25 YR	0.89	1.7	0.17	0.26
Asphalt Parking & Walkways	0.17	100%		Length, ft	20	Length, ft	0	Length, ft	240	Tc, min	2-YR	0.89	2.5	0.17	0.38
Roof	0.00	90%	P2	Slope, percent	2.0000	Slope, percent	1.0000	Slope, ft/ft	0.0700	5.0	5-YR	0.90	3.7	0.17	0.57
Gravel	0.00	0%	1.4	Runoff Coefficient	0.9	Runoff Coefficient	0.162	Conveyance Coefficient	20	Final	10-YR	0.92	4.7	0.17	0.74

RATIONAL METHOD RUNOFF ANALYSIS

Job #	1670-001	Date:	April 22, 2022
Job Name	Copper Ridge Village	Revised:	
Designed by:	MDM		

Other	0.00	0%					Velocity, ft/s	5.3	Tc, min	25-YR	0.94	6.1	0.17	0.97
	0.17	100%		Ti, min=	1.3	Ti, min=	0.0	Tt, min=	0.8	**5.0**	**100-YR**	**0.96**	**8.2**	**0.17**	**1.33**

Sub Basin 17 (SB17)

BASIN CHARACTERISTICS				TIME OF CONCENTRATION								RESULTS			
	Area, ac	% imp	Soil Type	Overland Flow - Surface Type 1		Overland Flow - Surface Type 2		Channel Flow		Tc, min	Event	C	*i*, in/hr	A, acres	Q, cfs
Landscape	0.00	2%	C	Surface Imperviousness	1	Surface Imperviousness	0.02	Land Surface	Paved Areas and Shallow Swales	Minimum	1.25 YR	0.89	1.7	0.17	0.26
Asphalt Parking & Walkways	0.17	100%		Length, ft	20	Length, ft	0	Length, ft	240	Tc, min	2-YR	0.89	2.5	0.17	0.38
Roof	0.00	90%	P2	Slope, percent	2.0000	Slope, percent	1.0000	Slope, ft/ft	0.0700	5.0	5-YR	0.90	3.7	0.17	0.57
Gravel	0.00	0%	1.4	Runoff Coefficient	0.9	Runoff Coefficient	0.162	Conveyance Coefficient	20	Final	10-YR	0.92	4.7	0.17	0.74
Other	0.00	0%						Velocity, ft/s	5.3	Tc, min	25-YR	0.94	6.1	0.17	0.97
	0.17	100%		Ti, min=	1.3	Ti, min=	0.0	Tt, min=	0.8	**5.0**	**100-YR**	**0.96**	**8.2**	**0.17**	**1.33**

Appendix E: BMP Design Calculations for Sand Filter

Design Procedure Form: Sand Filter (SF)

UD-BMP (Version 3.07, March 2018)

Designer: FPSE
Company: Four Points
Date: April 14, 2021
Project: Copper Ridge
Location: Gloria Gossard Blvd

1. Basin Storage Volume

A) Effective Imperviousness of Tributary Area, I_a (100% if all paved and roofed areas upstream of sand filter): I_a = 44.0 %

B) Tributary Area's Imperviousness Ratio ($i = I_a/100$): i = 0.440

C) Water Quality Capture Volume (WQCV) Based on 12-hour Drain Time
$WQCV = 0.8 * (0.91 * i^3 - 1.19 * i^2 + 0.78 * i)$: WQCV = 0.15 watershed inches

D) Contributing Watershed Area (including sand filter area): Area = 385,000 sq ft

E) Water Quality Capture Volume (WQCV) Design Volume
$V_{WQCV} = WQCV / 12 * Area$: V_{WQCV} = cu ft

F) For Watersheds Outside of the Denver Region, Depth of Average Runoff Producing Storm: d_6 = 0.34 in

G) For Watersheds Outside of the Denver Region, Water Quality Capture Volume (WQCV) Design Volume: $V_{WQCV\ OTHER}$ = 3,863 cu ft

H) User Input of Water Quality Capture Volume (WQCV) Design Volume (Only if a different WQCV Design Volume is desired): $V_{WQCV\ USER}$ = cu ft

2. Basin Geometry

A) WQCV Depth: D_{WQCV} = 4.0 ft

B) Sand Filter Side Slopes (Horizontal distance per unit vertical, 4:1 or flatter preferred). Use "0" if sand filter has vertical walls.: Z = 4.00 ft / ft

C) Minimum Filter Area (Flat Surface Area): A_{Min} = 2118 sq ft

D) Actual Filter Area: A_{Actual} = 2150 sq ft

E) Volume Provided: V_T = 20700 cu ft

3. Filter Material

Choose One
- (●) 18" CDOT Class B or C Filter Material
- ( ) Other (Explain):

4. Underdrain System

A) Are underdrains provided?

Choose One
- (●) YES
- ( ) NO

B) Underdrain system orifice diameter for 12 hour drain time

i) Distance From Lowest Elevation of the Storage Volume to the Center of the Orifice: y = 4.0 ft

ii) Volume to Drain in 12 Hours: Vol_{12} = 3,863 cu ft

iii) Orifice Diameter, 3/8" Minimum: D_O = 1 1/4 in

Design Procedure Form: Sand Filter (SF)

Designer: MDM
Company: Four Points
Date: April 14, 2021
Project: Copper Ridge
Location: Gloria Gossard Blvd

5. Impermeable Geomembrane Liner and Geotextile Separator Fabric

   A) Is an impermeable liner provided due to proximity of structures or groundwater contamination?

Choose One
○ YES ◉ NO

6. Inlet / Outlet Works

   A) Describe the type of energy dissipation at inlet points and means of conveying flows in excess of the WQCV through the outlet

Notes:

Appendix F: Channel Flow Calculations

Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, Aug 23 2022

Drainage Ditch DP No. 2 - Minor Event - 10% slope

Triangular

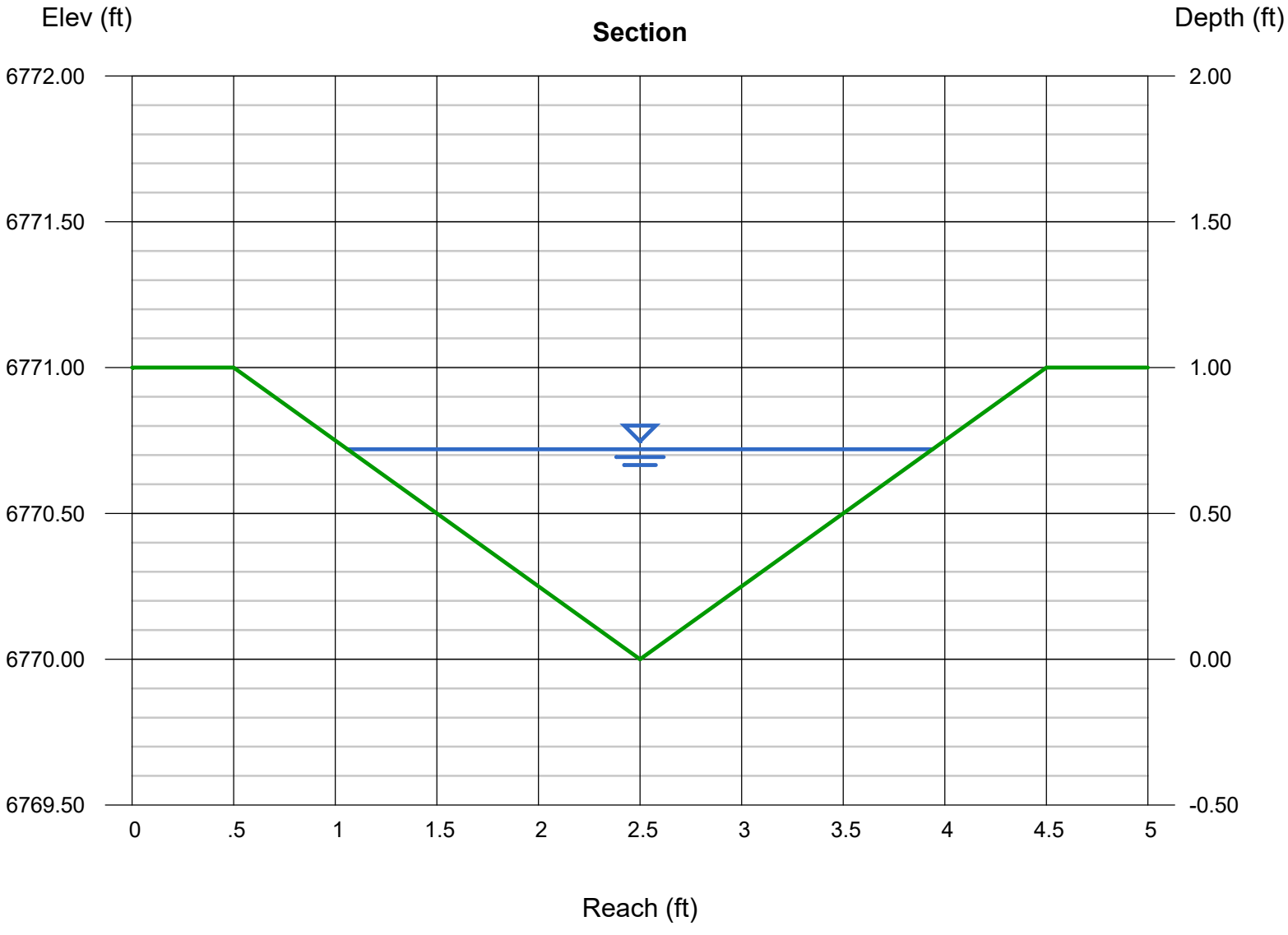
Side Slopes (z:1)	= 2.00, 2.00
Total Depth (ft)	= 1.00
Invert Elev (ft)	= 6770.00
Slope (%)	= 10.50
N-Value	= 0.035

Calculations

Compute by:	Known Q
Known Q (cfs)	= 6.61

Highlighted

Depth (ft)	= 0.72
Q (cfs)	= 6.610
Area (sqft)	= 1.04
Velocity (ft/s)	= 6.38
Wetted Perim (ft)	= 3.22
Crit Depth, Yc (ft)	= 0.93
Top Width (ft)	= 2.88
EGL (ft)	= 1.35



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, Aug 23 2022

Drainage Ditch DP No. 2 - Minor Event

Triangular

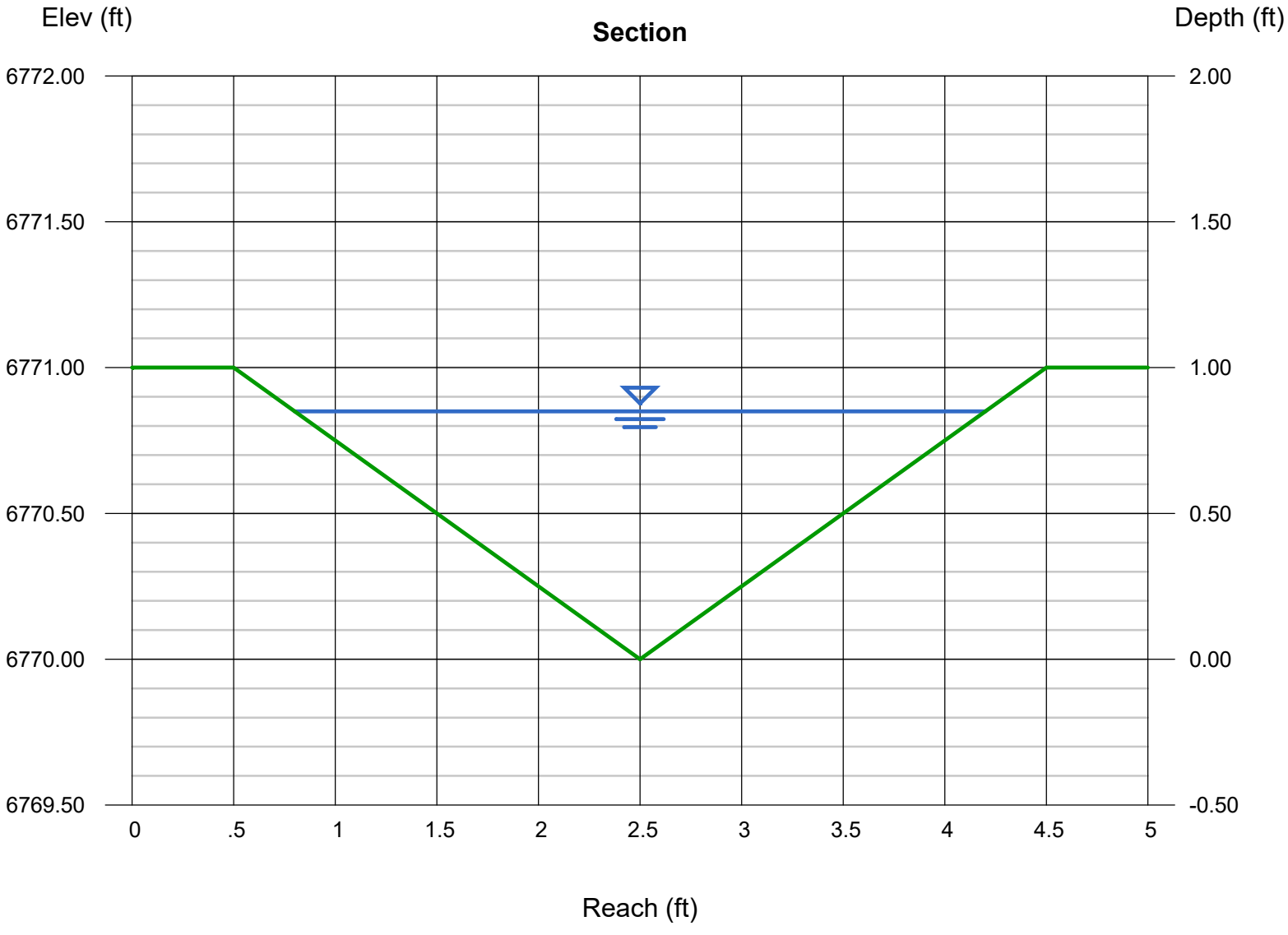
Side Slopes (z:1)	= 2.00, 2.00
Total Depth (ft)	= 1.00
Invert Elev (ft)	= 6770.00
Slope (%)	= 4.40
N-Value	= 0.035

Calculations

Compute by:	Known Q
Known Q (cfs)	= 6.61

Highlighted

Depth (ft)	= 0.85
Q (cfs)	= 6.610
Area (sqft)	= 1.44
Velocity (ft/s)	= 4.57
Wetted Perim (ft)	= 3.80
Crit Depth, Yc (ft)	= 0.93
Top Width (ft)	= 3.40
EGL (ft)	= 1.18



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, Aug 23 2022

Design Point No. 5 Spread Flow Capacity

Gutter

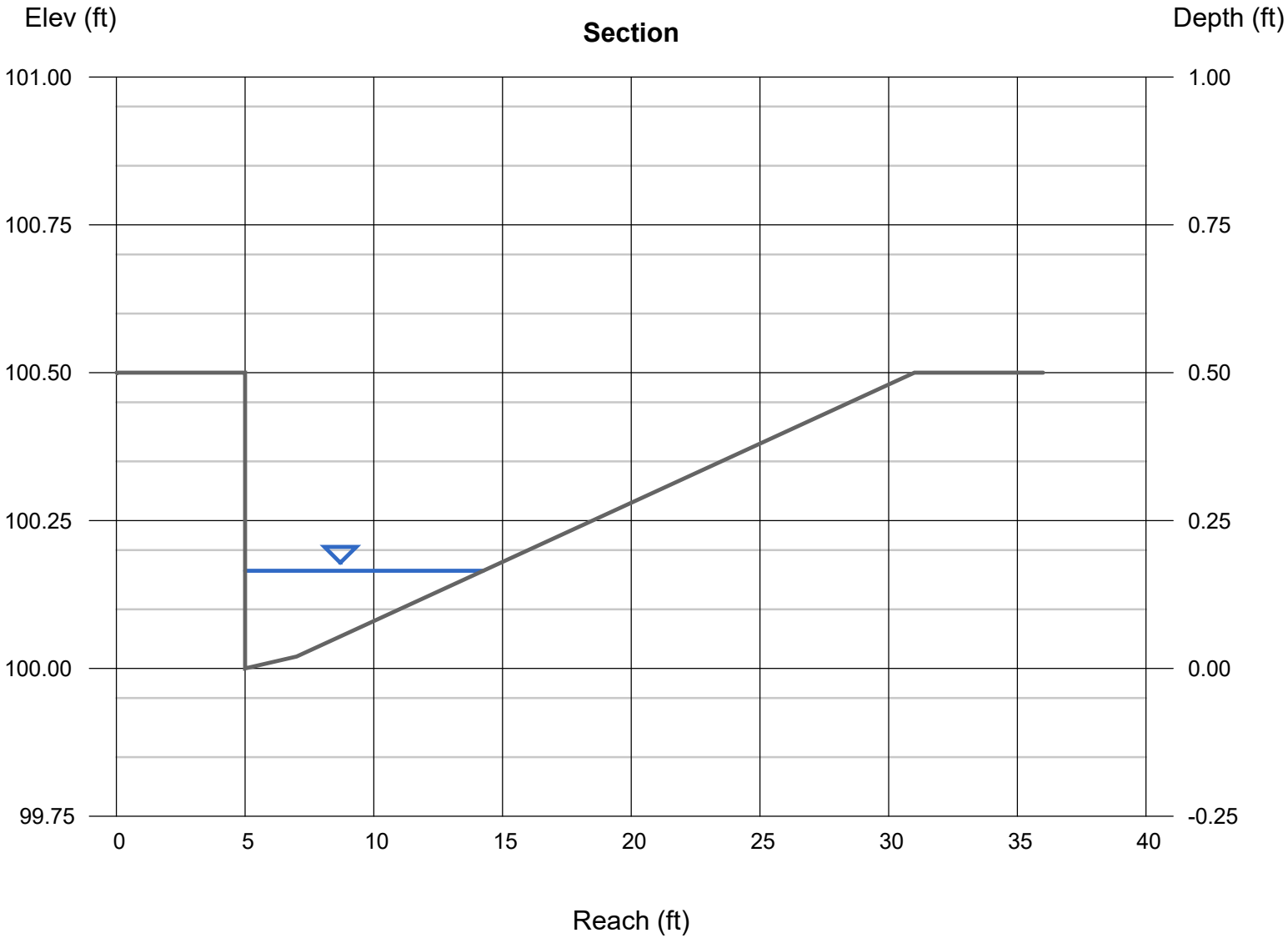
Cross Sl, Sx (ft/ft)	= 0.020
Cross Sl, Sw (ft/ft)	= 0.010
Gutter Width (ft)	= 2.00
Invert Elev (ft)	= 100.00
Slope (%)	= 5.00
N-Value	= 0.013

Calculations

Compute by:	Known Q
Known Q (cfs)	= 5.00

Highlighted

Depth (ft)	= 0.17
Q (cfs)	= 5.000
Area (sqft)	= 0.84
Velocity (ft/s)	= 5.98
Wetted Perim (ft)	= 9.42
Crit Depth, Yc (ft)	= 0.29
Spread Width (ft)	= 9.25
EGL (ft)	= 0.72



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, Aug 23 2022

Design Point No. 5 Spread Flow Major Event

Gutter

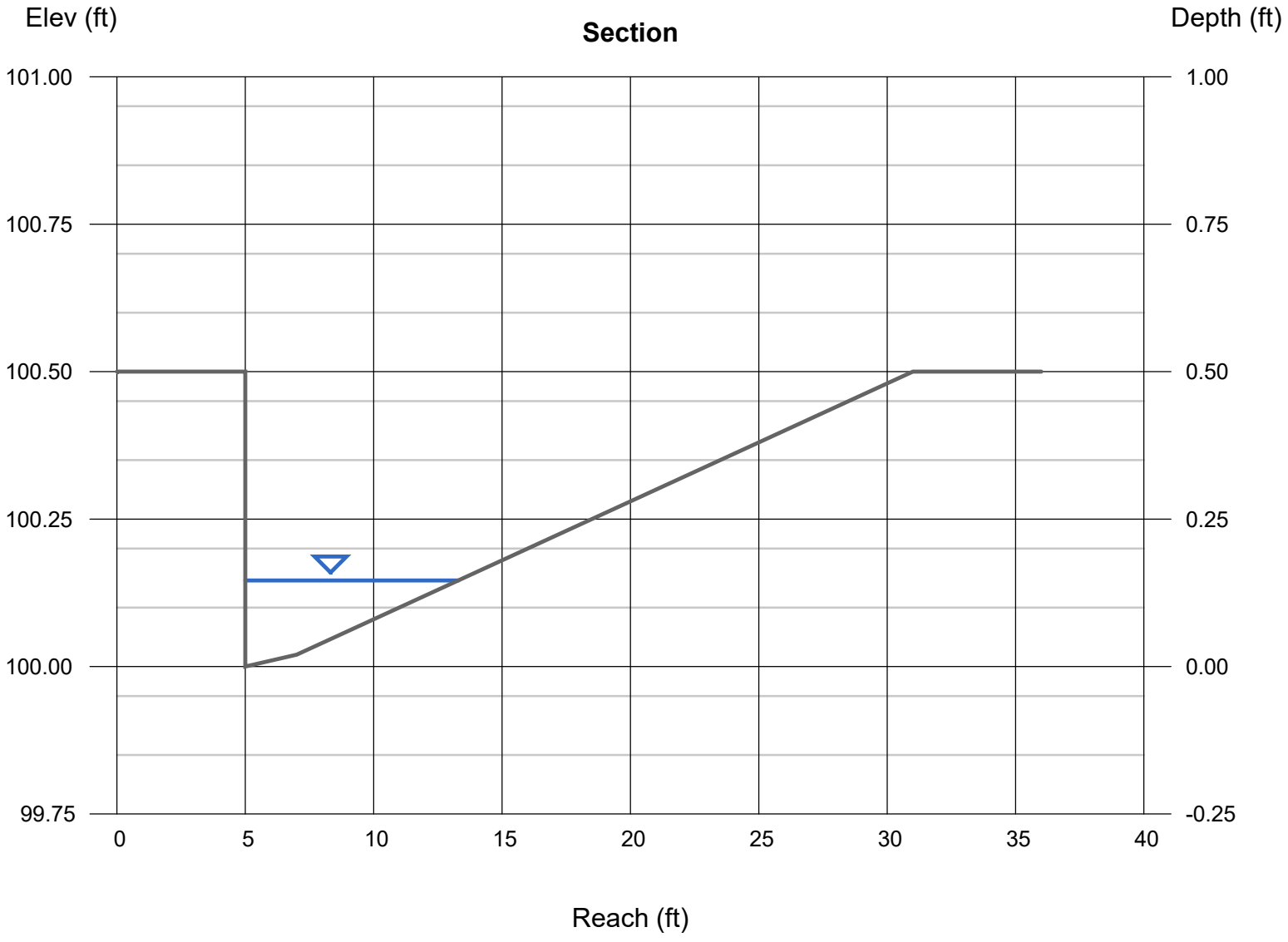
Cross Sl, Sx (ft/ft)	= 0.020
Cross Sl, Sw (ft/ft)	= 0.010
Gutter Width (ft)	= 2.00
Invert Elev (ft)	= 100.00
Slope (%)	= 5.00
N-Value	= 0.013

Calculations

Compute by:	Known Q
Known Q (cfs)	= 3.71

Highlighted

Depth (ft)	= 0.15
Q (cfs)	= 3.710
Area (sqft)	= 0.67
Velocity (ft/s)	= 5.55
Wetted Perim (ft)	= 8.45
Crit Depth, Yc (ft)	= 0.25
Spread Width (ft)	= 8.30
EGL (ft)	= 0.62



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, Aug 23 2022

Design Point No. 5 Spread Flow Minor Event

Gutter

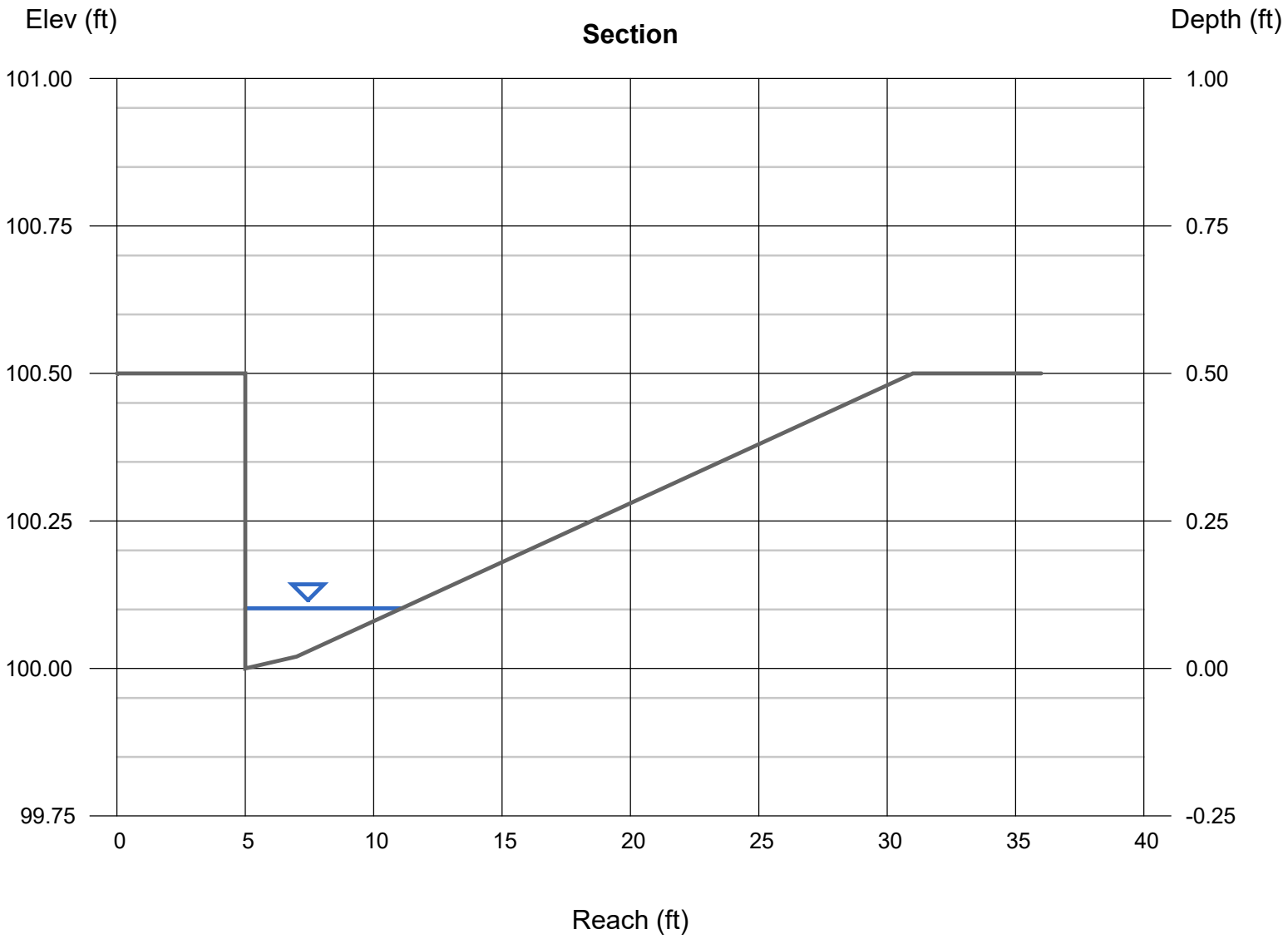
Cross Sl, Sx (ft/ft)	= 0.020
Cross Sl, Sw (ft/ft)	= 0.010
Gutter Width (ft)	= 2.00
Invert Elev (ft)	= 100.00
Slope (%)	= 5.00
N-Value	= 0.013

Calculations

Compute by:	Known Q
Known Q (cfs)	= 1.56

Highlighted

Depth (ft)	= 0.10
Q (cfs)	= 1.560
Area (sqft)	= 0.35
Velocity (ft/s)	= 4.43
Wetted Perim (ft)	= 6.20
Crit Depth, Yc (ft)	= 0.18
Spread Width (ft)	= 6.10
EGL (ft)	= 0.41



Appendix G: Inlet Capacity Curves

Appendix H: Culvert and Storm Sewer Capacity Calculations

Culvert Report

30-in Bypass Culvert - Interior Corrugation - SB3 - Minor Event

Invert Elev Dn (ft)	=	6778.00
Pipe Length (ft)	=	140.00
Slope (%)	=	5.00
Invert Elev Up (ft)	=	6785.00
Rise (in)	=	30.0
Shape	=	Circular
Span (in)	=	30.0
No. Barrels	=	1
n-Value	=	0.024
Culvert Type	=	Circular Culvert
Culvert Entrance	=	Smooth tapered inlet throat
Coeff. K,M,c,Y,k	=	0.534, 0.555, 0.0196, 0.9, 0.2

Embankment

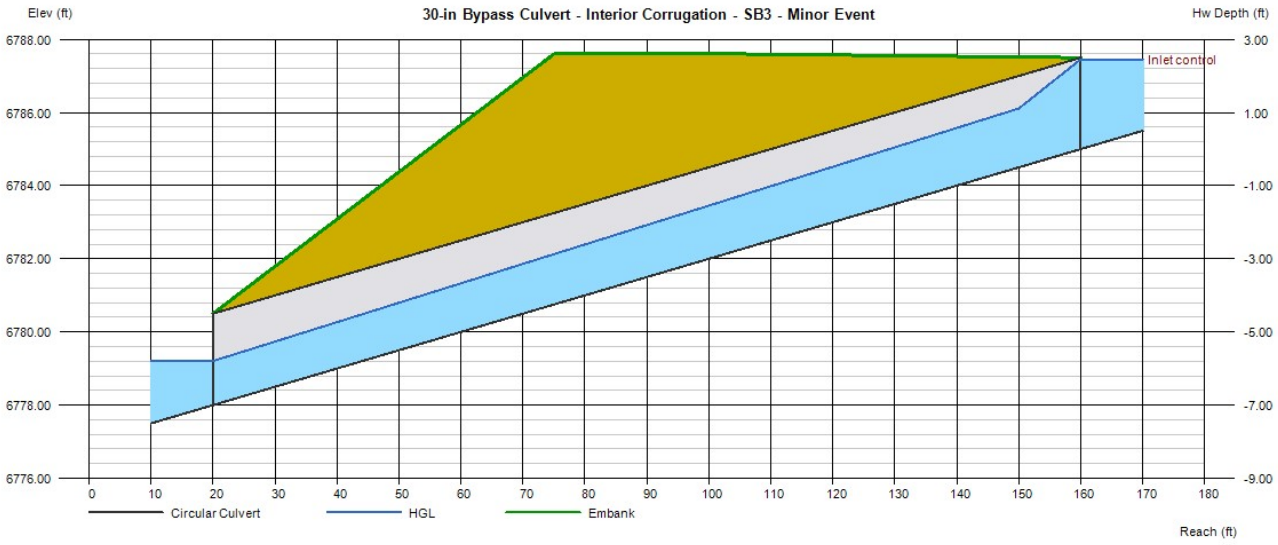
Top Elevation (ft)	=	6787.60
Top Width (ft)	=	30.00
Crest Width (ft)	=	10.00

Calculations

Qmin (cfs)	=	0.00
Qmax (cfs)	=	23.30
Tailwater Elev (ft)	=	Critical

Highlighted

Qtotal (cfs)	=	23.30
Qpipe (cfs)	=	23.30
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	9.95
Veloc Up (ft/s)	=	6.82
HGL Dn (ft)	=	6779.21
HGL Up (ft)	=	6786.64
Hw Elev (ft)	=	6787.46
Hw/D (ft)	=	0.98
Flow Regime	=	Inlet Control



Culvert Report

30-in Bypass Culvert - Interior Corrugation - SB3 - Minor Event

Invert Elev Dn (ft)	=	6778.00
Pipe Length (ft)	=	140.00
Slope (%)	=	5.00
Invert Elev Up (ft)	=	6785.00
Rise (in)	=	30.0
Shape	=	Circular
Span (in)	=	30.0
No. Barrels	=	1
n-Value	=	0.024
Culvert Type	=	Circular Culvert
Culvert Entrance	=	Smooth tapered inlet throat
Coeff. K,M,c,Y,k	=	0.534, 0.555, 0.0196, 0.9, 0.2

Embankment

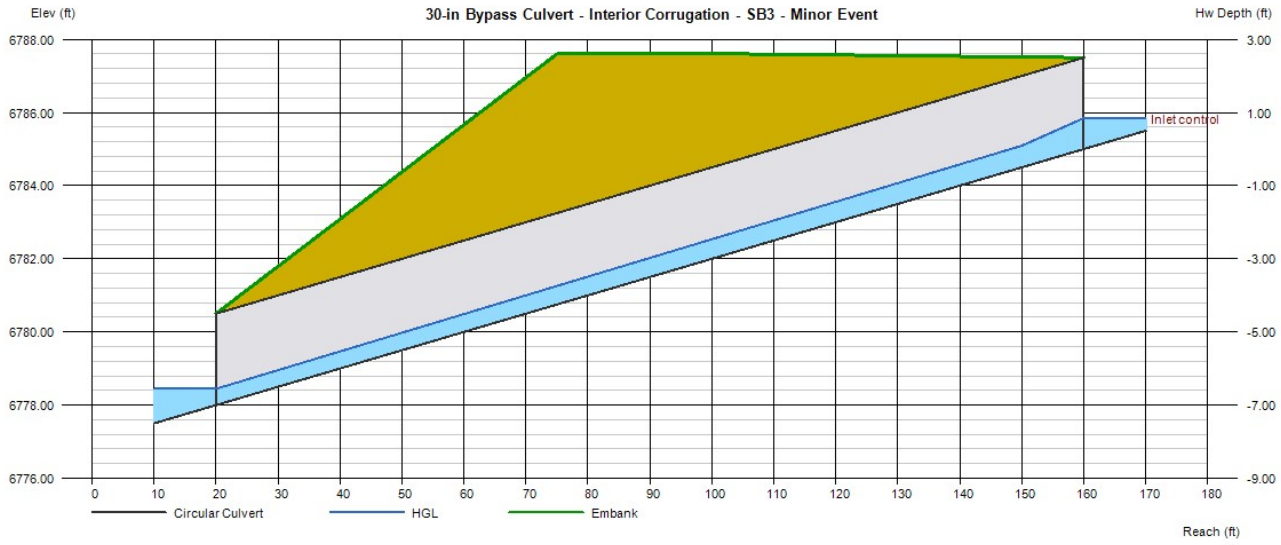
Top Elevation (ft)	=	6787.60
Top Width (ft)	=	30.00
Crest Width (ft)	=	10.00

Calculations

Qmin (cfs)	=	0.00
Qmax (cfs)	=	3.40
Tailwater Elev (ft)	=	Critical

Highlighted

Qtotal (cfs)	=	3.40
Qpipe (cfs)	=	3.40
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	5.77
Veloc Up (ft/s)	=	3.71
HGL Dn (ft)	=	6778.44
HGL Up (ft)	=	6785.60
Hw Elev (ft)	=	6785.84
Hw/D (ft)	=	0.34
Flow Regime	=	Inlet Control



Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, Apr 26 2022

Gloria Gossard Dual 30-inch Culvert Crossing - Major Event for Proposed Conditions

Invert Elev Dn (ft)	=	6749.70
Pipe Length (ft)	=	130.00
Slope (%)	=	0.69
Invert Elev Up (ft)	=	6750.60
Rise (in)	=	30.0
Shape	=	Circular
Span (in)	=	30.0
No. Barrels	=	2
n-Value	=	0.024
Culvert Type	=	Circular Corrugate Metal Pipe
Culvert Entrance	=	Mitered to slope (C)
Coeff. K,M,c,Y,k	=	0.021, 1.33, 0.0463, 0.75, 0.7

Embankment

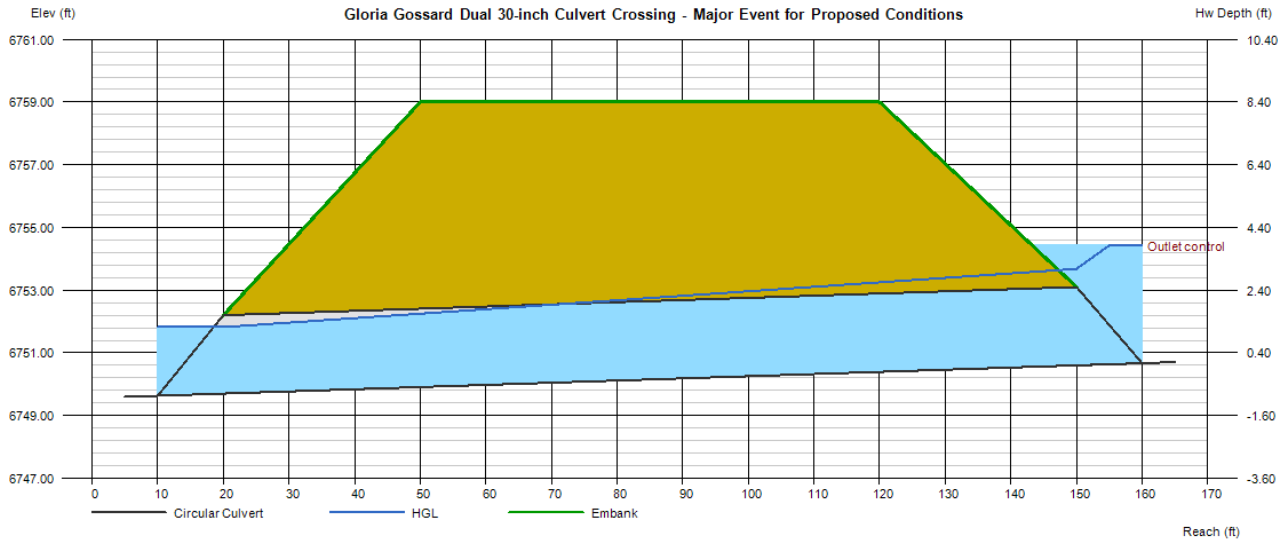
Top Elevation (ft)	=	6759.00
Top Width (ft)	=	70.00
Crest Width (ft)	=	10.00

Calculations

Qmin (cfs)	=	52.39
Qmax (cfs)	=	52.39
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	52.39
Qpipe (cfs)	=	52.39
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	5.90
Veloc Up (ft/s)	=	5.34
HGL Dn (ft)	=	6751.82
HGL Up (ft)	=	6753.68
Hw Elev (ft)	=	6754.43
Hw/D (ft)	=	1.53
Flow Regime	=	Outlet Control



Culvert Report

Culvert - DP No. 7 - Capacity

Invert Elev Dn (ft)	=	6763.50
Pipe Length (ft)	=	55.00
Slope (%)	=	1.00
Invert Elev Up (ft)	=	6764.05
Rise (in)	=	18.0
Shape	=	Circular
Span (in)	=	18.0
No. Barrels	=	1
n-Value	=	0.013
Culvert Type	=	Circular Culvert
Culvert Entrance	=	Smooth tapered inlet throat
Coeff. K,M,c,Y,k	=	0.534, 0.555, 0.0196, 0.9, 0.2

Embankment

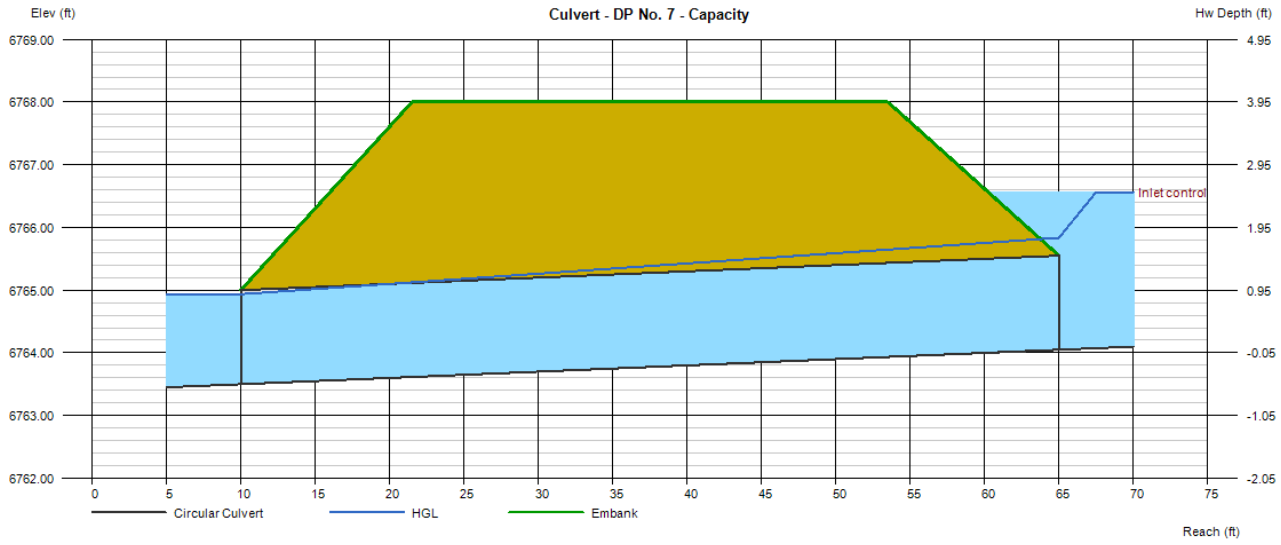
Top Elevation (ft)	=	6768.00
Top Width (ft)	=	32.00
Crest Width (ft)	=	10.00

Calculations

Qmin (cfs)	=	13.67
Qmax (cfs)	=	13.67
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	13.67
Qpipe (cfs)	=	13.67
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	7.85
Veloc Up (ft/s)	=	7.74
HGL Dn (ft)	=	6764.94
HGL Up (ft)	=	6765.84
Hw Elev (ft)	=	6766.57
Hw/D (ft)	=	1.68
Flow Regime	=	Inlet Control



Appendix I: Standard forms No. 3, 4, & 5

Standard Form No. 5 Drainage and Stormwater Treatment Scope Approval Form

Prior to starting a development plan and before the first drainage submittal, a Drainage and Stormwater Treatment Scope Approval Form must be submitted for review and signed by the City Engineer. A signed form shall also be included in every drainage submittal as Attachment A. This Scope Approval Form is for City requirements only. Values may be approximate. The City encourages supporting calculations and figures to be attached.

Project Information	
Project name:	West Acres Exemption Plan
Project location:	Lot 1 West Acres Ranch Subdivision Exemption
Developer name/contact info:	Bob Zibell, 785-845-3709
Drainage engineer name/contact info:	Matthew McLeod, PE 248-444-3268
Application Type:	Preliminary Plat
Proposed Land Use:	Subdividing lot for future developments

Project Site Parameters	
Total parcel area (acres):	134
Disturbed area (acres):	~3
Existing impervious area (acres, if applicable):	N/A
Proposed new impervious area (acres):	~1
Proposed total impervious area (acres):	~1
Proposed number of project outfalls:	Two, along the north side of Goria Gossard on each (west and east) end of the project site.
Number of additional parking spaces:	0
Description and site percentage of existing cover/land use(s):	Site is currently vacant with a portion of Gloria Gossard Parkway construction along the front of the lot.
Description and site percentage of proposed cover/land use(s):	Gloria Gossard Parkway will be completed to the west property line adjacent to Overlook Park with new sidewalk installed along the north side. A new public street will be included within the proposed platted ROW through proposed Lot 1 & Lot 2, ending at the remainder parcel for future connection.
Expected maximum proposed conveyance gradient (%):	33-50% on proposed cut and fill slopes
Description of size (acres) and cover/land use(s) of offsite areas draining to the site	Nothing is expected.

Type of Study Required:

- [x] Drainage Letter
- [ ] Final Drainage Study
- [x] Conceptual Drainage Study
- [ ] Stormwater Quality Plan

Required

Hydrologic Evaluation:

- [x] Rational Method
- [ ] CUHP/SWMM
- [ ] HEC-HMS
- [ ] Other_____

Project Drainage	
Number of subbasins to be evaluated:	~9, could increase as development progresses
Presence of pass through flow (circle): Minor flow from adjacent site	YES (NO)
Description of proposed stormwater conveyance on site:	Sheet flow, storm culvert system, curbs, valley pans and ditches will collect flow.
Project includes roadway conveyance as part of design evaluation (circle):	(YES) NO
Description of conveyance of site runoff downstream of site, identify any infrastructure noted in Stormwater Master Plan noted as lacking capacity for minor or major storm event:	There are two 30 inch culverts located near the middle of the site to the south which carry flow through Gloria Gossard road and eventually out to the Yampa River.
Detention expected onsite (circle):	(YES) NO
Presence of Floodway or Floodplain on site (circle):	YES (NO)
Anticipated modification of Floodway or Floodplain proposed (circle):	YES (NO)
Describe culvert or storm sewer conveyance evaluative method:	mannings HW/D

Permanent Stormwater Treatment Facility Design Standard (check all that apply with only one standard per tributary basin):

- [x] WQCV Standard
- [ ] TSS Standard
- [ ] Infiltration Standard
- [ ] Constrained Redevelopment WQCV Standard
- [ ] Constrained Redevelopment TSS Standard
- [ ] Constrained Redevelopment Infiltration Standard
- [ ] Does not Require Permanent Stormwater Treatment (attach Exclusion Tracking Form)

Project Permanent Stormwater Treatment	
Justification of choice of proposed design standard, including how the site meets the constrained redevelopment standard, infiltration test results, etc.:	The site is currently vacant so all flow from the proposed public street will need to be treated.
Concept-level permanent stormwater treatment facility design details (type, location of facilities, proprietary structure selection, treatment train concept, etc.):	Water quality porous landscape detention pond will be designed as a part of the drainage study.
Proposed LID measures to reduce runoff volume:	Grass lined water quality swales, reveg
Will treatment evaluation include off-site, pass through flow (circle):	YES (NO)

Approvals

Matthew McLeod, PE Four Points Engineering	3/21/2022	248-444-3268
Prepared By: (Insert drainage engineer name & firm)	Date	Phone number

Approved By:

Printed Name:
City Engineer

Date

APPROVED
to be generally in
accordance with
CITY ENGINEERING
STANDARDS

03/28/2022

Standard Form No. 3 Final Drainage Study Checklist

Instructions:

1. The applicant shall identify with a "check mark" if information is provided with letter. If applicant believes information is not required, indicate with "N/A" and attach separate sheet with explanation.
2. The reviewer will determine if information labeled "N/A" is required and whether additional information must be submitted.

I. General

x A. Report typed and legible in 8½" x 11" format.
x B. Report bound (comb, spiral, or staple – no notebook).
x C. Drawings that are 8½ x 11 or 11 x 17 bound within report, larger drawings (up to 24 x 36) included in a pocket attached to the report. Drawings shall be at an appropriate size and scale to be legible and include project area.

II. Cover

x A. Report Type – Final Drainage Study.
x B. Project Name, Subdivision, Original Date, Revision Date.
x C. Preparer's name, firm, address, phone number.
x D. "DRAFT" for 1st submittal and revisions; "FINAL" once approved.

III. Title Sheet

x A. Table of Contents.
____ B. Certification, PE Stamp, signature, and date from licensed Colorado PE.
x C. Note: City of Steamboat Springs plan review and approval is only for general conformance with City design criteria and the City code. The City is not responsible for the accuracy and adequacy of the design, dimensions, and elevations that shall be confirmed and correlated at the job site. The City of Steamboat Springs assumes no responsibility for the completeness or accuracy of this document.

IV. Introduction

x A. Description of site location, size in acres, existing and proposed land use, and any pertinent background info.
x B. Reference planning application type and plan set date and preparer.
x C. Identify drainage reports for adjacent development.

V. Drainage Criteria and Methodology Used

x A. Identify design rainfall and storm frequency.
x B. Identify the runoff calculation method used.
x C. Identify culvert and storm sewer design methodology.
x D. Identify detention discharge and storage methodology.
n/a E. Discuss HEC-HMS methodologies and parameters, if HEC-HMS is used.

VI. Existing Conditions (Pre-Development/Historic)

x A. Indicate ground cover, imperviousness, topography, and size of site (acres).
x B. Describe existing stormwater system (sizes, materials, etc.).
x C. Describe other notable features (canals, major utilities, etc.).
x D. Note site outfall locations and ultimate outfall location (typically Yampa River).
x E. Note capacity of existing system and identify any constraints.
x F. Identify NRCS soil type.
x G. Discuss any existing easements.
n/a H. Identify the FEMA Map reviewed, if site is in floodplain/way, and zone designation.

VII. Proposed Conditions

x A. Indicate ground cover, imperviousness, topography, and disturbed area (acres).
x B. Describe proposed stormwater system (sizes, materials, etc.).
x C. Describe proposed outlets and indicate historic and proposed flow for each.
x D. Include calculations for all culverts, ditches, ponds, etc. in appendix.
x E. Include a summary table for the 5- and 100-year events showing historic flow and proposed flow for total site and each basin.
n/a F. Discuss proposed easements.
x G. Describe off-site flows to be passed thru site.
x H. Summarize any impacts to downstream properties or indicate none. Reference CLOMR/LOMR and impacts.

I. Detention Ponds.
n/a 1. Indicate pond volume and area (size and depth) requirement.
n/a 2. Indicate release rates.
n/a 3. Discuss outfall design, location, and overflow location.
n/a 4. Discuss maintenance requirements.

J. Curb and Gutter
x 1. Indicate gutter capacity.
x 2. Indicate curb capacity.
x 3. Indicate design velocity
x 4. Indicate design depth of flow in street.

K. Culverts
x 1. Indicate whether each culvert is under inlet or outlet control.
x 2. Show that headwater is less than the maximum allowable.
x 3. Indicate design velocity.
x 4. Indicate required and provided flow rates.
x 5. Discuss whether outlet protection is required and what will be used.

L. Inlets
x 1. Indicate inlet capacity.
x 2. Indicate the type of inlet(s) used.

M. Channels
x 1. Indicate design velocity (and type of dissipation if required).
x 2. Indicate required and provided flow capacity.
x 3. Show critical cross-section(s) including water surface.

N. Site Discharge
x 1. Discuss use and design of detention to ensure discharge is less than or equal to historic flow.
x 2. Provide documentation that downstream facilities are adequate and no adverse impacts to downstream property owners (i.e. no rise certification)

VIII. Post Construction Stormwater Management

x A. Discuss in general terms which permanent BMP practices will be used to control pollutant and sediment discharge after construction is complete. Exhibit A, Storm Water Quality Plan shall be attached that will give details (see separate checklist)

IX. Conclusions

x A. Provide general summary.
x B. Note if site complies with criteria and any variances to criteria.
x C. Indicate if peak proposed flow is less than, equal to, or greater than peak historic flow for each outfall, design point, and for the total site.
x D. List proposed new stormwater system requirements.

X. References

x A. Provide a reference list of all criteria, master plans, drainage reports and technical information used.

XI. Tables

x A. Include a copy of all tables prepared for the study.

XII. Figures

x A. Vicinity Map.
x B. Site Plan (include the horizontal and vertical datum used and all benchmarks).
C. Existing conditions.
X 1. Delineate existing basin boundaries.
X 2. Delineate offsite basins impacting the site.
X 3. Show existing and proposed topography at an interval of at least 2-ft.
X 4. Show existing runoff flow arrows.
X 5. Show existing stormwater features (structures, sizes, materials, etc.).
N/A 6. Show floodplain limits and information.
X 7. For each basin show bubble with basin number, acreage and % impervious.
X 8. For each outlet show bubble with acreage and historic flow and proposed flow or provide information in summary table on figure.
D. Proposed Conditions
x 1. Delineate proposed basin boundaries.
x 2. Show proposed runoff flow arrows.
x 3. Show existing and proposed topography at an interval of at least 2-ft.
x 4. For each basin show bubble with basin number, acreage and percent impervious or provide a summary table or figure.
x 5. For each outlet show bubble with acreage, historic flow, and proposed flow or provide a summary table or figure.
x 6. Show floodplain limits and information.
n/a 7. Show proposed building footprints and FFE for commercial and multi-family
x 8. Show property lines and easements (existing and proposed).
x 9. Label public and private facilities. A general note can be placed on the plans in lieu of labeling all facilities, if applicable.

XIII. Appendices

x A. Runoff Calculations.
x B. Culvert Calculations.
n/a C. Pond Calculations.
x D. Other Calculations.

Acknowledgements

Standard Form No. 3 was prepared by: Joe Wiedemeier 4-26-2022
Date

Include Attachment A – Scope Approval Form (see Standard Form No. 5)
Include Attachment B – Storm Water Quality Plan (see Standard Form No. 4)

VII F. Easements will be established for all proposed permanent water quality features with the final draft.

Standard Form No. 4 Stormwater Quality Plan Checklist

This list is not an exhaustive list of every possible item that may be required or requested in a Stormwater Quality Plan but provides a general guideline for preparation of the Stormwater Quality Plan.

Instructions:

1. The applicant shall identify with a "check mark" if information is provided within the Stormwater Quality Plan. If applicant believes information is not required, indicate with "N/A" and attach separate sheet with explanation. If information is included with the associated drainage letter or study, indicated with a "D."
2. The reviewer will determine if information labeled "N/A" is required and whether additional information must be submitted.

I. General

x A. Report typed and legible in 8½" x 11" format.
x B. Report bound (comb, spiral, or staple – no notebook) and in digital PDF format.
x C. Drawings that are 11" x 17" bound within letter, larger drawings (up to 24" x 36") included in a pocket attached to the letter, and a digital PDF copy. Drawings shall be at an appropriate size and scale to be legible and include project area.

II. Cover

x A. Report Type – Stormwater Quality Plan.
x B. Project Name, Subdivision or Development, Original Date, Revision Date.
x C. Preparer's name, firm, address, and phone number.
x D. "DRAFT" for 1st submittal and revisions; "FINAL" once approved.

III. Title Sheet

x A. Table of Contents.
x B. Certification, PE Stamp, signature and date from licensed Colorado PE (for Final).
x C. Note: City of Steamboat Springs plan review and approval is only for general conformance with City design criteria and City code. The City is not responsible for the accuracy and adequacy of the design, dimensions, and elevations that shall be confirmed and correlated at the job site. The City of Steamboat Springs assumes no responsibility for the completeness or accuracy of this document.

IV. Introduction and Background

x A. Description of site location, study limits, size in acres, existing and proposed land use, soil data, permeability of the site, drainage patterns, and any pertinent background info.
x B. State purpose and goal of Stormwater Quality Plan and report along with any special requirements of the desired outcome.
x C. List any project stakeholders and/or requestors.
x D. Describe the background of the flooding source and any previous studies.

V. Design Criteria and Methodology Used

X A. Identify design rainfall and storm frequency used to design permanent stormwater treatment facilities.

X B Identify the runoff calculation method used to design permanent stormwater treatment facilities.

X C. Identify the standard the design will meet and the means and methodologies by which it will use to meet the standard.

X D. Provide all details supporting the use of the selected design standard.

VI. Proposed Conditions

X A. Identify total site area, total site imperviousness, area to be treated, and impervious area to be treated. Include justification for treating less than the total site area.

X B. Describe potential site contaminant sources including sediment.

x C. Identify source and quantity of on-site and off-site stormwater flows that need to be managed and how they will be managed.

X D. For each permanent treatment facility, identify the design standard, MDCIA level (if applicable), area treated (& percentage of total), imperviousness of area treated, C values of area treated, soil types, and all pertinent data for design.

X E. Volume based facilities: Provide total storage pond volume, WQCV, drain time, release rate, sediment storage, outlet & overflow structures, area and depth of pond, micropool, forebays, etc. (include all calculations in the appendix).

X F. Flow based facilities: Provide design flow rate and all treatment calculations and how flows larger than the water quality design flow rate will be handled. If proprietary facilities are proposed, provide the justification and sizing requirements from manufacturer.

n/a G. If stormwater detention is provided, discuss how water quality is provided within the detention facility. No underground detention is allowed.

VII. Operation and Maintenance Plan Requirements

See template O&M plan and guidance document.

_____ A. Describe general project information, facility description, ROW and access information, vegetation management, hydraulic design parameters, environmental permitting, snow and ice control, and additional pertinent information in the notes.

_____ B. Indicate, describe, and detail the permanent stormwater treatment facilities.

_____ C Include section details where necessary of the permanent treatment facilities.

_____ D. Provide an inspection and maintenance schedule and procedure of permanent treatment facilities and who is responsible for them.

_____ E. Identify design specifications for construction.

Acknowledgements

Standard Form No. 4 prepared by: Matthew McLeod 4-26-2022
Date

Include appropriate Project Sheet(s) and Design Checklist(s) (See Section 5.12)
Include this form as part of the Stormwater Quality Plan.

Appendix J: Project Design Sheets

PROJECT SHEET – BASE DESIGN STANDARDS (Site is not constrained)

Complete a Project Sheet for each project that includes Permanent Stormwater Treatment Facilities.

SITE INFORMATION

Project Name: Steamboat Airpark Preliminary Plat	
Project Location: North of Gloria Gossard Parkway	
Submitted Date: 4/26/2022	Submitted By:
Acreage Disturbed: 7.0 acres	
Existing Impervious: 2% (no imperviousness) except for GG paving	New Net Impervious: 5%
Review Date:	Reviewed By:

Preparer	City	Requirements
		Design Details are included for all Treatment Facilities
		List or include a description of any source controls or other non-structural practices:

DESIGN STANDARDS

Multiple Design Standards may be used on a site, as necessary, to meet the requirements, but only one Design Standard may be used for each treatment facility's tributary area. Evaluation of suitability of permanent stormwater treatment facilities is based on meeting the specified Design Standard and ease of long-term maintenance. Facilities must be designed in accordance with the most current versions of the City's Engineering Standards and Volume 3 of the USDCM and meet the specific requirements for each Design Standard used.

1. Indicate below, which Design Standard(s) will be used for the project, and
2. Complete a separate, corresponding Design Standards checklist for each facility (e.g., WQCV)

Design Standard	*Quantity*	*Tributary Area*	*Location/Identifying information*
WQCV	1	3.25 acres	See proposed conditions drainage exhibit DR2, north of GG Blvd
Pollutant Removal			
Runoff Reduction			

DESIGN CHECKLIST – Water Quality Capture Volume (WQCV) Standard

WQCV STANDARD Criteria

Treatment facilities must be designed to provide treatment and/or infiltration of the WQCV for 100% of the site. Under certain conditions, up to 20% of the site may be excluded, not to exceed 1 acre. This may apply if it is not practicable to capture runoff from portions of the site and where it is not practicable to construct a separate treatment facility for those same portions of the site.

Complete checklist if using the WQCV Standard to meet Design Standard requirements.

Project Name: Steamboat Airpark Preliminary Plat			
Preparer	**City**	**Requirements**	
		Facilities provide treatment and/or infiltration of the WQCV for 100% of the site	
		% of site treated: 80%, paved access road	
		Facility Type: Sand Filter	Facility Location: See exhibit DR2
		See Drainage Report section: 4	

If less than 100% of the site is treated, complete the following:

Preparer	**City**	**Requirements**	
		% of site not treated by control measures (not to exceed 20% or 1 acre):	
		80 %	0.65 Size (acres)
		Provide explanation of why the excluded area is impractical to treat: The excluded impervious area not treated is that of the roadway and sidewalk downstream of the inlets leading into the detention and sand filter facility.	
		Provide explanation of why another facility is not practicable for the untreated area: This area is just access road into the lot and will not have very high pollutant loads and it's not economical to install permanent facilities for treatment.	

Appendix K: Detention Design Calculations

Design Procedure Form: 5 Year Detention Pond Calculations

	Designer:	**MDM**								
	Company:	**FOUR POINTS**								
	Date:	**4/13/2021**								
	Project:	**Copper Ridge**								
	Location:	**Gloria Gossard Blvd**								
		5 Year Detention Pond								
			Area	**8.61**	acres					
			Allowable Release Rate Major Storm							
			(0.10 cfs/acre) * A		=	0.861	(from table 5.11.1)			
			C_5	**0.59**			(from table 5.6.1)			
			i_5	**2.3**			(from table 5.5.1)			
			Tc (dev)	**15.8**						
			Equation 5.11.1							
			Volume In							
			V= C*I*A*Tc(dev)*60		11076.21		(from equation 5.11.1)			
					11076	ft^3				
			Equation 5.11.2							
			Volume Out							
			V=Qallow*Tc(ex)*(60)		816.228		(from equation 5.11.2)			
					816	ft^3				
			Pond Volume							
			Volume In - Volume Out							
			10260	ft^3	0.2355	acre-ft				
			Depth	**2**	ft					
			Area	5129.993	5130	sq-ft				
			Minor Storm Water Surface=		**6658**	ft				

Design Procedure Form: 100 Year Detention Pond Calculations

	Designer:									
	Company:									
	Date:									
	Project:									
	Location:									
		100 Year Detention Pond								
			Area	**8.61**	acres					
			Allowable Release Rate Major Storm							
			(0.54 cfs/acre) * A		=	4.6494	(from table 5.11.1)			
			C_{100}	**0.59**			(from table 5.6.1)			
			i_{100}	**5.1**			(from table 5.5.1)			
			Tc (dev)	**15.8**						
			Equation 5.11.1							
			Volume In							
			V= C*I*A*Tc(dev)*60		24560.3		(from equation 5.11.1)			
					24560	ft^3				
			Equation 5.11.2							
			Volume Out							
			V=Qallow*Tc(ex)*(60)		4407.631		(from equation 5.11.2)			
					4408	ft^3				
			Pond Volume							
			Volume In - Volume Out							
			20153	ft^3	0.4626	acre-ft				
			Depth	**4**	ft					
			Area	5038.167	5038	sq-ft				
			Width	41	ft					
			Length	123	ft					

Discharge Rates for Major and Minor Storms

Designer: **MDM**
Company: **Four Points**
Date: **4/13/2021**
Project: **Copper Ridge Village**
Location:

Oriface Plate Size for Minor Storm

Area of Orifice Plate=	0.081	sq-ft
C_d	**0.65**	
Diameter of Opening	0.320	ft
	0.59	**in**
Depth of surface(major)	4.2	ft
Flow line of Orifice Plate	6653.80	

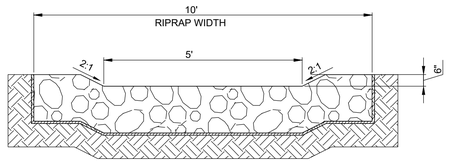
Discharge for Minor Storm Headwater

Q=CdA(2gh)^(1/2)	0.86	cfs
Q_{wier}	3.79	cfs

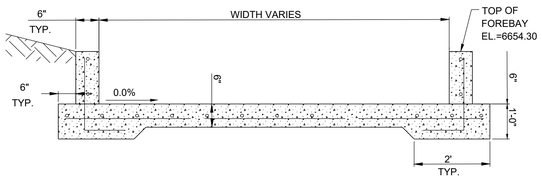
Oriface Plate Size for Major Storm

Area of Orifice Plate=	0.43	sq-ft
Diameter of Opening	0.744	ft
	8.93	**in**

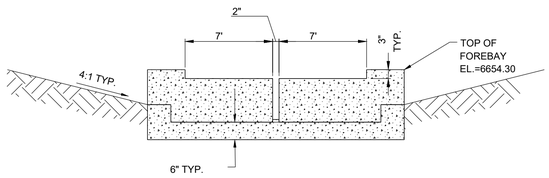
POROUS LANDSCAPE DETENTION POND FOR COPPER RIDGE VILLAGE OWNERSHIP AND MAINTENANCE PLAN



EMERGENCY OVERFLOW
N.T.S.



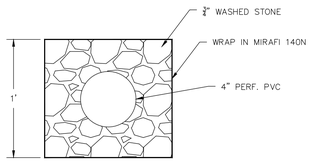
FOREBAY SECTION A–A
N.T.S.



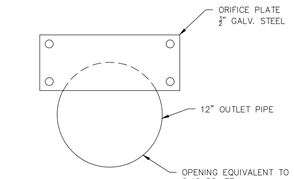
FOREBAY SECTION B–B
N.T.S.

TYPE C INLET CLOSE MESH GRATE
N.T.S.

MODIFIED TYPE C INLET FRONT VIEW
N.T.S.



4" PERFORATED PVC PIPE
N.T.S.



12" OUTLET PIPE ORIFICE PLATE DETAIL
1"=1'

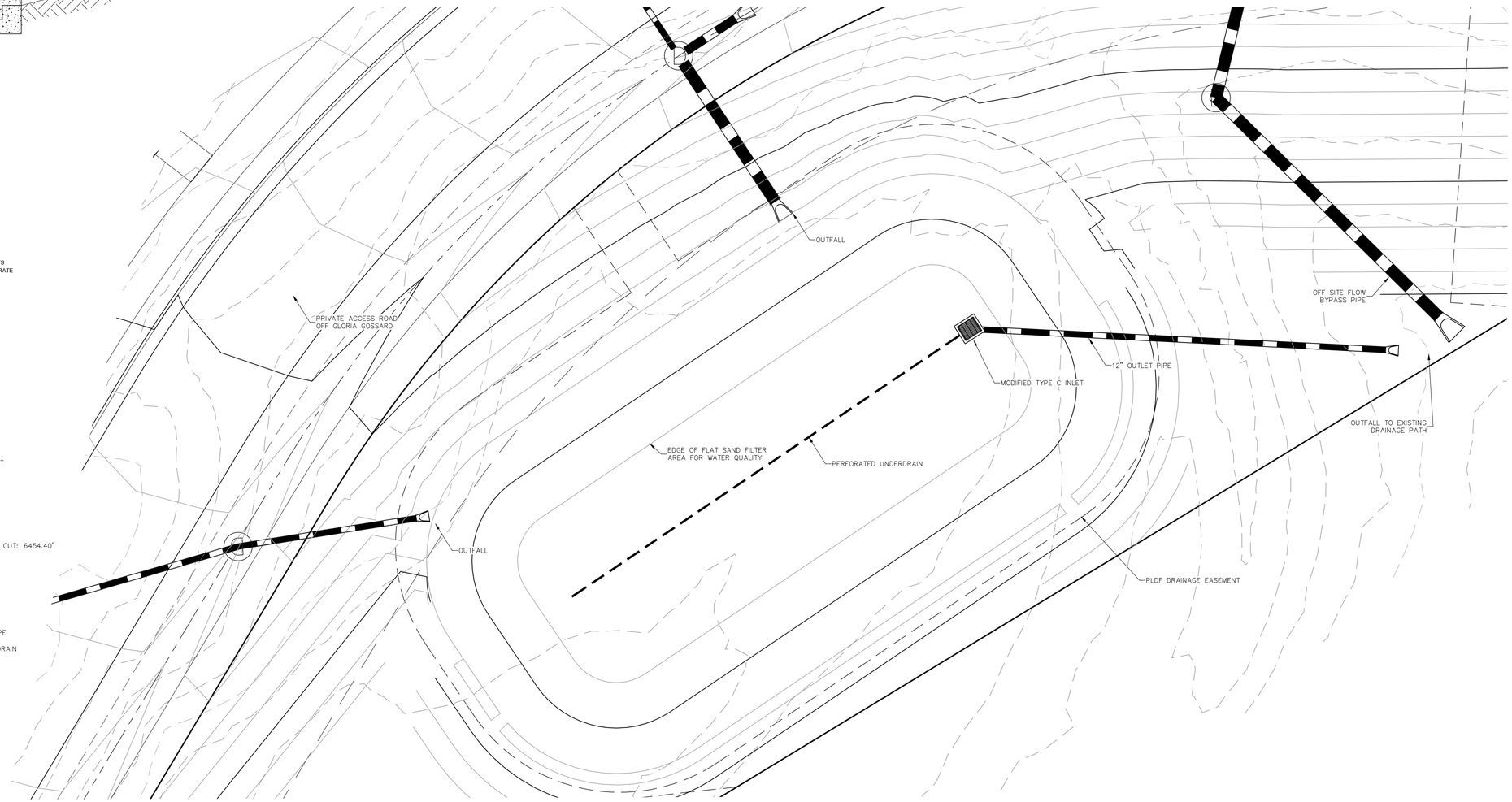
DETENTION POND CROSS SECTION DETAIL: (1"=20')
(TO BE COMPLETED FOR FINAL PLAN SUBMITTAL)

DESIGN VOLUME SPECIFICATIONS:

WQCV: 3,958 CU. FT.

5-YEAR VOL: 6,336 CU. FT.

100-YEAR VOL: 21,487 CU. FT.



FOUR POINTS SURVEYING ENGINEERING

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Steamboat Springs, CO 80487
(970)-871-6772
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No.	DATE	REVISIONS
INT		

COPPER RIDGE VILLAGE
ADDRESS TBD
STEAMBOAT SPRINGS, CO 80487

Horizontal Scale
10' 0 5' 10'
1" = 10'

DATE: 4/13/2021
JOB #: 1992-001
DRAWN BY: MDM
DESIGN BY: MDM
REVIEW BY: WNM

IF THIS DRAWING IS PRESENTED IN A FORMAT OTHER THAN 24" X 36", THE GRAPHIC SCALE SHOULD BE UTILIZED.

DRAWING:
OWNERSHIP & MAINTENANCE PLAN

SHEET #
WQ1

POROUS LANDSCAPE DETENTION POND FOR COPPER RIDGE VILLAGE
OWNERSHIP AND MAINTENANCE PLAN

1. GENERAL PROJECT INFORMATION

A. CORE TRAIL APARTMENTS, LOT 1 STEAMBOAT AIRPARK, LOCATED IN THE NORTHEAST 1/4 OF SECTION 1, TOWNSHIP 6 NORTH, RANGE 85 WEST OF THE 6TH PRINCIPAL MERIDIAN, STEAMBOAT SPRINGS, ROUTT COUNTY, COLORADO

2. GENERAL FACILITY DESCRIPTION

THIS FACILITY IS A FULL SPECTRUM POROUS LANDSCAPE DETENTION POND THAT IS CAPABLE OF CONTROLLING RUNOFF INCREASE FROM THE DEVELOPMENT OF THE COPPER RIDGE VILLAGE SITE. THE FACCOPPER RIDGE VILLAGE PROJECT. IT WILL RECEIVE RUNOFF FROM 9.20 ACRES AND WILL OCCUPY A PARCEL OF APPROXIMATELY 0.15 ACRES THAT WILL BE USED TO TREAT AND RELEASE EXCESS RUNOFF GENERATED BY THE DEVELOPMENT OF THE SITE.

3. INSPECTION & MAINTENANCE FREQUENCY & PROCEDURE

THE FOLLOWING TABLE PROVIDES A MAINTENANCE SCHEDULE FOR THE PROPOSED DETENTION AND WATER QUALITY FACILITY:

REQUIRED ACTION	MAINTENANCE OBJECTIVE	FREQUENCY OF ACTION
DEBRIS & LITTER REMOVAL	REMOVE DEBRIS AND LITTER FROM THE FOREBAY AND POND TO MINIMIZE OUTLET CLOGGING AND IMPROVE AESTHETICS	ROUTINE – INCLUDING JUST BEFORE ANNUAL STORM SEASONS (THAT IS APRIL AND MAY) AND FOLLOWING SIGNIFICANT RAINFALL EVENTS
SEDIMENT REMOVAL	REMOVE ACCUMULATED SEDIMENT FROM THE FOREBAY AND POND	ROUTINE – THE SEDIMENT ACCUMULATIONS WILL NEED TO E CLEANED OUT EVERY ONE TO THREE YEARS
NUISANCE CONTROL	ADDRESS ODOR, INSECTS, AND OVERGROWTH ISSUES ASSOCIATED WITH STAGNANT OR STANDING WATER IN THE BOTTOM ZONE	NONROUTINE – HANDLE AS NECESSARY PER INSPECTION OR LOCAL COMPLAINTS
EROSION & SEDIMENT CONTROL	REPAIR AND REVEGETATE ERODED AREAS IN THE BASIN AND CHANNELS	NONROUTINE – PERIODIC AND REPAIR AS NECESSARY BASED ON INSPECTION
STRUCTURAL	REPAIR POND INLETS, OUTLETS, FOREBAYS, LOW FLOW CHANNEL LINERS AND ENERGY DISSIPATERS	NONROUTINE – REPAIR AS NEEDED BASED ON REGULAR INSPECTIONS
INSPECTIONS	INSPECT BASINS TO ENSURE THAT THE BASIN CONTINUES TO FUNCTION AS INITIALLY INTENDED. EXAMINE THE OUTLET FOR CLOGGING, EROSION, SLUMPING, EXCESSIVE SEDIMENTATION LEVELS, OVERGROWTH, EMBANKMENT AND SPILLWAY INTEGRITY AND DAMAGE TO ANY STRUCTURAL ELEMENT	ROUTINE – ANNUAL INSPECTION OF HYDRAULIC AND STRUCTURAL FACILITIES. ALSO CHECK FOR OBVIOUS PROBLEMS DURING ROUTINE MAINTENANCE VISITS, ESPECIALLY FOR PLUGGING OF OUTLETS

4. EQUIPMENT, STAFFING AND VEGETATION MANAGEMENT

A. GENERAL LANDSCAPING TOOLS SUCH AS LAWNMOWER, WEED WHACKER, TRIMMERS

B. STAFFING: TBD BY OWNER

C. SEEDING: FOLLOWING COMPLETION OF CONSTRUCTION, A SEED MIX SHALL BE APPLIED TO THE DISTURBED AREAS PER THE LANDSCAPE DESIGNER. THE INLET OF THE LOW FLOW CHANNEL SHOULD BE UNDISTURBED. THE INVERT OF THE LOW FLOW CHANNEL SHOULD REMAIN UNDISTURBED. THE SEED MIXES USED ARE AS FOLLOWS:

BOTANICAL NAME	COMMON NAME	PURE LIVE SEED (LBS/ACRE)
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX

D. MOWING: VEGETATION HEALTH SHOULD BE MAINTAINED IN THE POND AREA WITH REGULAR MOWING AND/OR WEEDEATING. THE REQUIRED MOW AREA POST–CONSTRUCTION WAS ESTIMATED TO BE 0.05 ACRES.

E. UNDESIRABLE VEGETATION AND WEEDS: UNDESIRABLE VEGETATION AND NOXIOUS WEED SHOULD BE REMOVED REGULARLY BY THE LANDSCAPING STAFF. WEEDS SHOULD BE MOWED OR REMOVED.

5. SNOW AND ICE CONTROL

THE DETENTION POND WILL SERVE AS A SNOW STORAGE AREA DURING THE WINTER MONTHS. SNOW CAN BE PLOWED INTO THE POND VIA THE PAVED ACCESS POINT. PLOW OPERATORS SHALL TAKE CARE NOT TO DAMAGE THE POND FEATURES INCLUDING THE FOREBAY, CLEANOUT, AND INLET STRUCTURE.

6. RIGHT–OF–WAY, ADJACENT OWNERSHIP & ACCESS

A. RIGHT–OF–WAY DESCRIPTION: GLORIA GOSSARD BLVD

B. ADJACENT OWNERSHIP: STEAMBOAT SPRINGS AIRPARK LLC TO THE WEST, CITY OF STEAMBOAT SPRINGS TO THE SOUTH, RRJLC INVESTMENTS LLC TO THE EAST, CLOW, RONAL B. & ROBIN D. PECK TO THE EAST.

C. ACCESS INFORMATION AND DETAILS: ACCESS VIA THE MAIN ENTRANCE TO COPPER RIDGE VILLAGE. THE FACILITY IS LOCATED IMMEDIATELY ON THE RIGHT.

D. MAINTENANCE OPERATIONS SHOULD NOT IMPACT OR OBSTRUCT RIGHT–OF–WAY AND A RIGHT–OF–WAY PERMIT SHOULD NOT BE REQUIRED. THE OWNER IS RESPONSIBLE FOR OBTAINING THE NECESSARY PERMITS SHOULD THEY BE NEEDED FOR ANY MAINTENANCE ACTIONS.

7. HYDRAULIC DESIGN

FLOW RATES	PEAK INFLOW	PEAK OUTFLOW
WQ EVENT	2.94	0.46
5–YEAR	7.72	0.65
100–YEAR	27.41	0.97

DEPTH AND ELEV	VOLUME (CFS)	WSEL (FT)	DEPTH (FT)
WQ EVENT	1,345	6454.40	0.9
5–YEAR	2,633	6455.00	1.5
100–YEAR	3,885	6455.50	2.0

8. SENSITIVE AREA, WETLANDS & PERMITS

NO WETLAND AREAS WERE IDENTIFIED.

9. MISCELLANEOUS INFORMATION

A. PROJECT SURVEY:
AN EXISTING CONDITIONS TOPOGRAPHIC SURVEY WAS PREPARED BY FOUR POINTS SURVEYING & ENGINEERING.

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REVISIONS

No.	DATE
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COPPER RIDGE VILLAGE
8888 GLORIA GOSSARD
STEAMBOAT SPRINGS, CO 80487

DATE: 4/13/2021
JOB #: 1992-001
DRAWN BY: MDM
DESIGN BY: MDM
REVIEW BY: RL

IF THIS DRAWING IS PRESENTED IN A FORMAT OTHER THAN 24" X 36", THE GRAPHIC SCALE SHOULD BE UTILIZED.

DRAWING: OWNERSHIP & MAINTENANCE PLAN

SHEET #
OM2