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

Draft Drainage Study & Water Quality Plan for Village Drive Apartments Lots A & B Mountain Office Park Subdivision

Address: 2955 Village Drive

Original Draft Drainage Report: 4-8-2024
Revised: 5-27-2024

Prepared by: Matthew McLeod, P.E.
Four Points Surveying & Engineering

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Steamboat Springs, Colorado 80477
(970) 871-6772

Table of Contents

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 Village Drive Apartments 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.

_____

Matthew McLeod, P.E.

State of Colorado No. 0044949

Date:----------

1.0 Introduction

This report provides a detailed analysis of the existing drainage conditions and proposed post-development drainage conditions for a commercial warehouse on what is currently known as Lots 21-29 of the Miller-Frazier Subdivision. The property shall be re-platted into a single lot for the proposed development. 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 calculations 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: Vicinity Map

The project site is located on the southwest corner of Walton Creek Road and Captain Village Drive at 2955 Village Drive, Steamboat Springs, Colorado. Legal Description: LOTS A AND B MOUNTAIN OFFICE PARK SUBDIVISION. Existing land use is a includes a commercial office building with access on the north and south sides..

B. Planning Application

This drainage study is for a development plan application for the proposed Project and was prepared by Four Points Surveying and Engineering on behalf of the Owner, Sunscope, LLC.

C. Drainage Reports for Adjacent Developments

No drainage reports for adjacent developments were reviewed as part of this drainage study.

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.

- WQCV Event (1.25-year) 24-hour rainfall depth: 1.25 inches
- 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: $\mathbf{Q = CiA}$ (Eq-1)

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

C. Storm Sewer Design Methodology

Sizing calculations for culverts and drainage pipes was performed using AutoCAD Hydroflow Express which utilizes Manning's "n" equation for open channel flow and the Darcey formula for surcharged flow conditions.

D. Discharge and Storage Methodology

Stormwater detention volume and release rate calculations were performed using the Urban Drainage and Flood Control District (UDFCD) detention basin design workbook design spreadsheet *UD_DetentionV3.07*. This design spreadsheet meets City of Steamboat Springs standards for detention and provides detailed information and design details for the outlet structure.

E. Water Quality Treatment Design Methodology

The stormwater treatment facility will meet water quality capture volume (WQCV) design standards. WQCV calculations were performed for proposed sand filter within the detention facility. The design components for the sand filter were determined using the UDFCD stormwater best management practice design workbook spreadsheet *UD-BMPv3.07*. The design spreadsheet meets City of Steamboat Springs standards for water quality. The proposed detention facility utilizes an 12-inch thick sand-peat filter and perforated underdrain component to serve as water quality treatment.

3.0 Existing Conditions

A. Ground Cover, Imperviousness, Topography and Size

- Existing buildings with paved access on the north and south
- 30% imperviousness (due to gravel surfaces)
- Gradients ranging from 2-50% draining northeasterly
- Total lot size: 1.29 acres
- Development area size: ~0.9 acres

B. Existing Stormwater Systems

- Mild swales along Village Drive and Walton Creek Road
- One 12" CMP culverts across south access.
- Offsite swale south of property at Design Point (DP)1.

C. Site Outfall and Ultimate Outfall Locations

South property line and west in existing swale.

D. Existing System Capacity

There is no established notable stormwater drainage infrastructure on the site in which to analyze capacity that will be affected.

E. NRCS Soil Type

Per the USDA NRCS Web Soil Survey completed on April 17, 2020.

- Routt Loam
    - Soils are classified as Hydraulic Group C.

F. Existing Easements

- Zoning related public access and utility easements along property lines.
- There are no dedicated drainage easements.

G. FEMA Map Reviewal

FEMA flood map No. 08107C0833D was reviewed. The entire lot is located in Zone X, area of minimal flood hazard.

4.0 Proposed Conditions

A. Ground Cover, Imperviousness, Pollutant Sources, Topography and Size

The total area of proposed development is approximately 0.80 acres, denoted as development basin 1 (DB1). DB1 consists of sub-basin SB1 area to include in detention volume calculations. Proposed final ground cover will consist primarily of asphalt, buildings, landscaping and gravel road base. The assumed impervious area for DB1 under a full buildout scenario is 60%. The proposed grading scheme will cause drainage to generally follow historic paths, from southwest to northeast and ultimately discharge at design point No. 1.

B. Proposed Water Quality Conditions

The existing paved accesses will be removed and repaved with a connecting loop around the west side of the existing building to serve the new development around the perimeter of the site.

The parking lot and number of parking spaces prompt permanent water quality treatment. Contaminants to be treated will consist primarily of sediment and potentially pollutants associated with motor vehicles including oil, fluids, and carbon deposits. All flows that will be managed will be on-site flows. Stormwater runoff will be treated via the sand filter component of the detention facility. A small grass buffer will be installed along northwest property line for snow storage treatment in that area.

C. Proposed Stormwater Systems

- Flows from SB1 shall be conveyed into the detention pond and sand filter treatment facility by sheet flow, pans, swales and curbs.
- An 18-inch culvert crossing will be installed across south access.
- Developed flows will collect in porous landscape detention pond for treatment and release.
- An inlet with 12-inch culvert to pond to break up valley pan

D. Outlets: Historic and Proposed Flow

The historic outlet point occurs as DP1 as shown on the existing conditions drainage plan. The proposed outfall from the detention pond will discharge into the drainage ditch and ultimately outfall from the lot at DP1.

E. Hydraulic Calculations

Hydraulic calculations were performed for the following:

- 18” access culvert crossing

F. Major and Minor Flow Summary Table

The existing and proposed drainage was analyzed by subdividing the lot into existing basins (EB), development basins (DB) and sub-basins (SB). Major and minor flows for the basins is summarized in the following table. Basin calculations are provided in the appendices.

Table 1: Basin Characteristics and Peak Flow Summary Table

Basin Condition	Area (acres)	Impervious Area (%)	Runoff	
			Q_5 (cfs)	Q_{100} (cfs)
EB1	1.29	30%	1.20	4.88
ESB1	0.52	42%	0.53	1.90
ESB2	0.77	34%	0.75	2.94
DB1	1.29	60%	2.18	6.64
SB1	0.87	73%	1.81	4.94
SB2	0.40	34%	0.48	1.87

G. Proposed Easements

- A drainage easement is proposed for the permanent detention and water quality facility.

H. Off Site Flows

Off site flow to the site appears to be negligible.

I. Impacts to Downstream Properties

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

J. Detention Pond

There is one permeant detention facility located in the southwest corner of the lot (DP2). The facility will serve as both detention and water quality treatment. Design calculations and specifications for the pond sizing and outlet structure can be found in the appendices. The pond was designed to account for the ultimate future development which could include additional development on the south side of the lot. The pond will outfall at DP1 on the drainage exhibit. Maintenance requirements are outlined in the O&M exhibits.

K. Culverts

There is a 18" CMP culvert proposed replacing the existing 12" CMP culvert across the south access point, DP3. Capacity calculations were provided however this culvert serves a very small drainage area and 18" is the minimum required size for driveway crossings per City standards. Velocity, flow, and capacity calculations can be found in the appendices. The culvert inlet and outlet will be outfitted with flared end sections and rip-rap.

L. Drainage Channels

The drainage channels are designed to handle the 100-year flow rate. Velocity, flow, and capacity calculations can be found in the appendices.

M. Site Discharge

The stormwater discharge point for the site is indicated as DP1 on the drainage plan. The detention pond volume and modified Type C inlet will ensure volumetric detention requirements and WQCV drain time will be met. No adverse downstream impacts are anticipated.

5.0 Post Construction Stormwater Management

The permanent detention pond and sand filter facility will serve as the primary stormwater management for the lot. There will also be a grass buffer installed in the northwest corner of the site to manage and treat snow storage runoff in that area. See O&M Plan in the appendices.

6.0 Conclusions

A. General Summary

Existing drainage patterns will be maintained relatively unchanged under the proposed conditions. The proposed drainage for the Project conveys development area flows to a combined detention pond and sand filter facility, providing both detention and water quality in one.

B. Compliance

The proposed stormwater drainage system, detention and water quality features comply with City Drainage Criteria. No variances to the engineering Criteria or Standards are requested.

C. Historic and Proposed Site Flows

Peak proposed flow rates will be greater than peak historic flows from the Project site. The proposed detention facility will discharge flows at less than historic rates at DP1. The drainage associated with the Project will not have an adverse impact on adjacent or downstream properties.

D. Proposed New Stormwater System Requirements

The new stormwater system will need to be maintained periodically and as needed to ensure the system functions and operates as is was designed. This includes ensuring all surface drainage from the developed portion of the lot is directed to the detention pond. The sand filter shall be kept free of excess debris and sediment, and keeping the proposed 18" storm pipe free of debris and sediment buildup. See water quality O&M plan for the detention pond and sand filter facility.

7.0 Water Quality Operation and Maintenance (O&M) Plan

See appendices.

8.0 References

Urban Drainage and Flood Control District Criteria Manual, 2018.

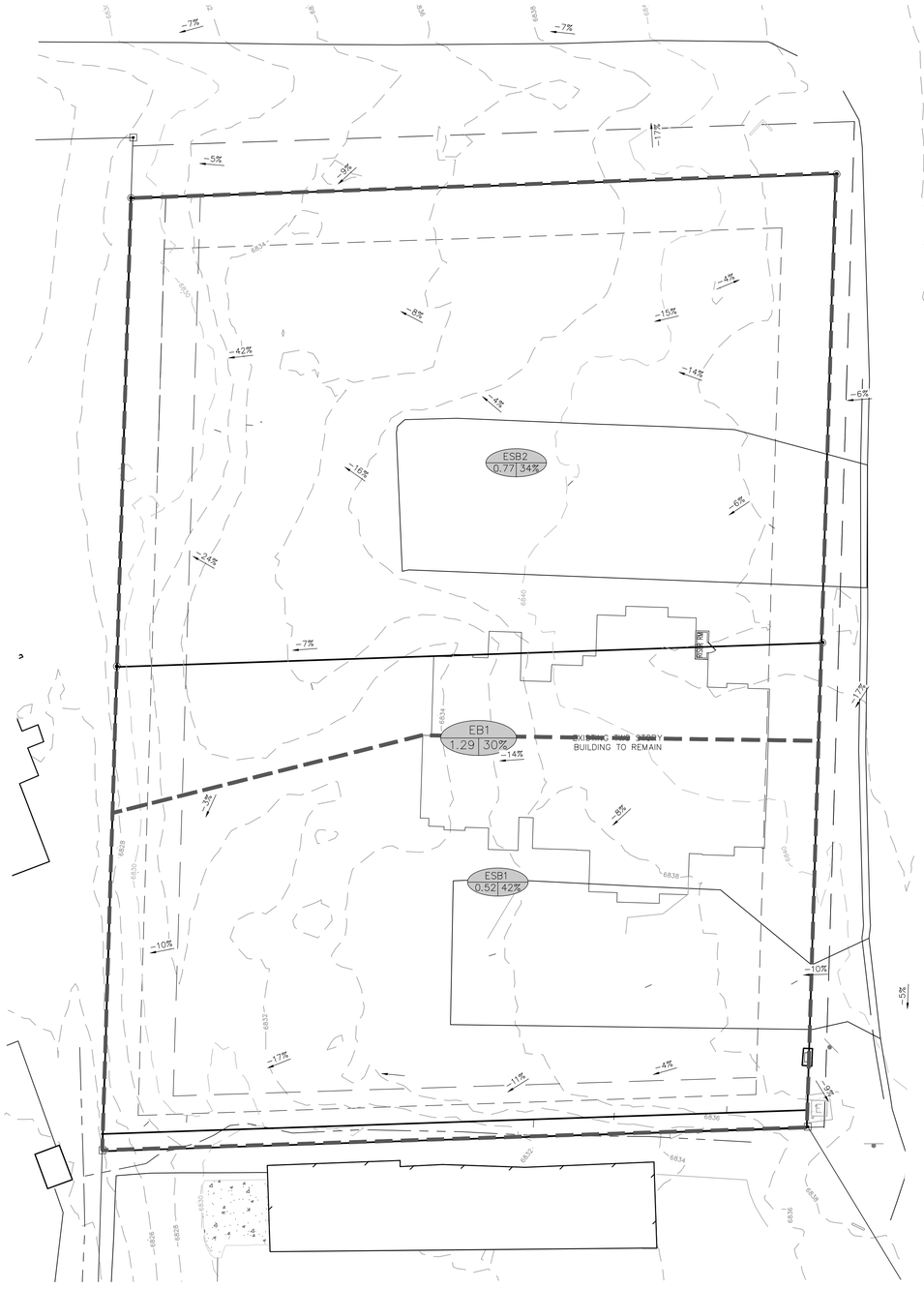
NOAA Precipitation Frequency Server. NOAA Atlas 14, Volume 8, Version 2. www.NOAA.com

City of Steamboat Springs Engineering Drainage Criteria, Latest Version.

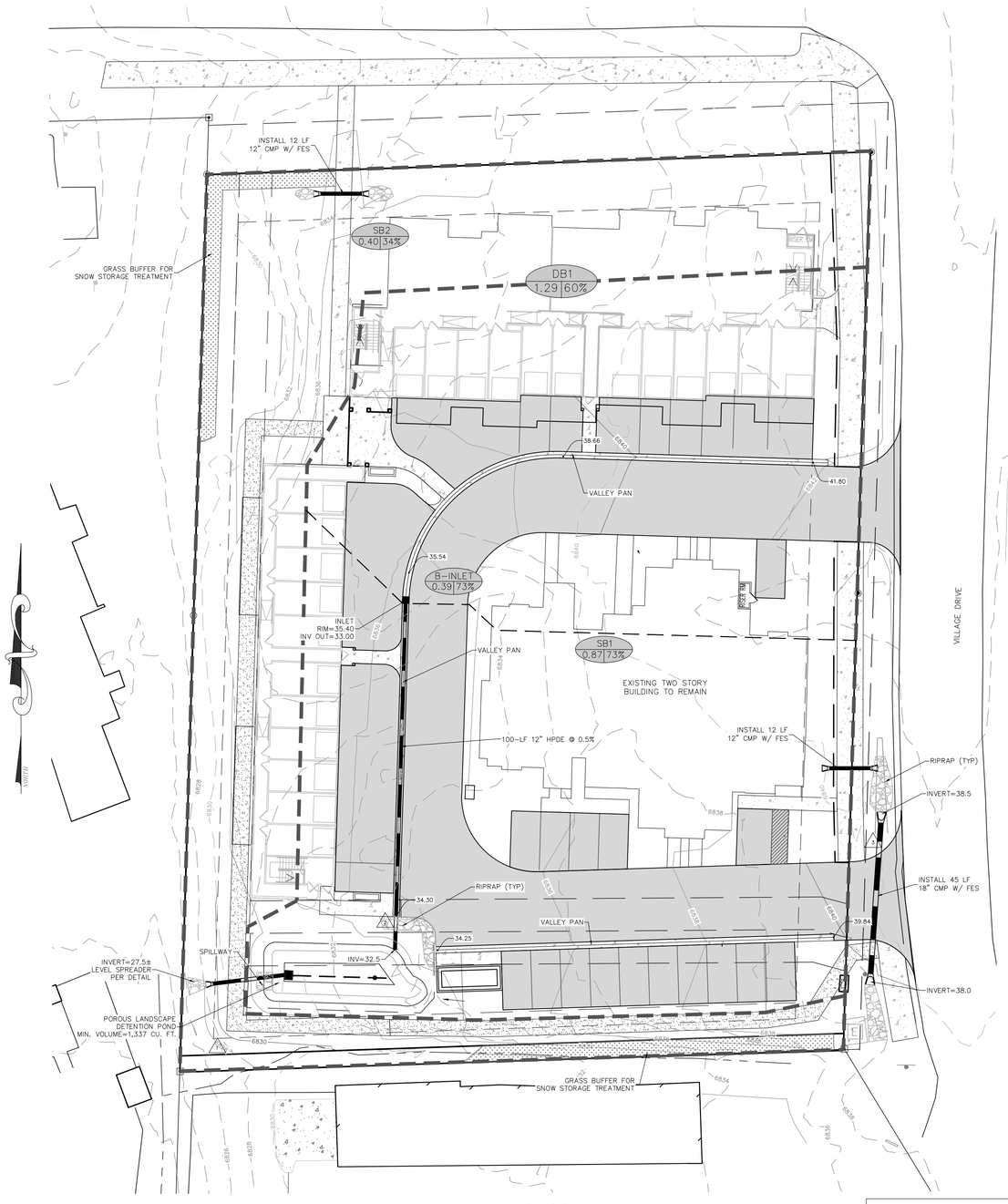
8.0 Appendices

A. Existing and Proposed Conditions Drainage Exhibit
B. Basin Runoff Calculations and USDA Web Soil Survey
C. Detention Calculations
D. Culvert Calculations
E. Water Quality - Sand Filter Calculations
F. Water Quality O&M Plans
G. Standard Forms No. 3 & No. 4 – Drainage Report and Water Quality Plan Checklists
H. Project Sheets – Base Design Standards & WQCV Standard
I. Standard Form No. 5 - Scope Approval Form

Appendix A: Existing and Proposed Conditions Drainage Exhibit

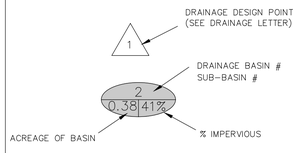


EXISTING DRAINAGE



PROPOSED DRAINAGE

LEGEND



PROPOSED BASIN BOUNDARY

EXISTING BASIN BOUNDARY

INLET SUB-BASIN BOUNDARY

FOUR POINTS SURVEYING ENGINEERING
440 S. Lincoln Ave, Suite 4A
P.O. Box 775966
Steamboat Springs, CO 80487
(970)-871-6772
www.fourpointsse.com

No.	DATE	REVISIONS	INT
1	5/28/24	DRT REVIEW AND RESPONSE	MDM

VILLAGE DRIVE APARTMENTS
2955 VILLAGE DRIVE
LOT A AND LOT B
MT. OFFICE PARK
SUBDIVISION

Horizontal Scale

0 20' 40'

SCALE: 1" = 20'

Contour Interval = 2 ft

DATE: 3-28-2024
JOB #: 2033-004
DRAWN BY: MDM
DESIGN BY: WNM/MDM
REVIEW BY: FPSE

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

DRAWING: DRAINAGE EXHIBIT

SHEET #

DR1

Appendix B: Basin Runoff Calculations, FEMA Flood Map and USDA Web Soil Survey

RATIONAL METHOD RUNOFF ANALYSIS

Job #	2033-004	Date:	April 4, 2024
Job Name	Village Drive Apartments	Revised:	
Designed by:	MDM		

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	0.89	2%	C	Surface Imperviousness	1	Surface Imperviousness	0.02	Land Surface	Grassed Waterways	Minimum	1.25 YR	0.23	1.4	1.29	0.41
Asphalt Parking & Walkways	0.24	100%		Length, ft	75	Length, ft	80	Length, ft	0	Tc, min	2-YR	0.23	2.0	1.29	0.60
Roof	0.14	90%	P2	Slope, percent	3.0000	Slope, percent	12.0000	Slope, ft/ft	1.0000	5.0	5-YR	0.31	3.0	1.29	1.20
Gravel	0.02	40%	1.4	Runoff Coefficient	0.9	Runoff Coefficient	0.162	Conveyance Coefficient	15	Final	10-YR	0.38	3.9	1.29	1.90
Other	0.00	0%						Velocity, ft/s	15.0	Tc, min	25-YR	0.47	5.0	1.29	3.03
	1.29	30%		Ti, min=	2.2	Ti, min=	6.6	Tt, min=	0.0	**8.8**	**100-YR**	**0.57**	**6.7**	**1.29**	**4.88**

Existing Sub-Basin 1 (ESB1)

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	0.29	2%	C	Surface Imperviousness	1	Surface Imperviousness	0.02	Land Surface	Paved Areas and Shallow Swales	Minimum	1.25 YR	0.29	1.3	0.52	0.20
Asphalt Parking & Walkways	0.10	100%		Length, ft	88	Length, ft	105	Length, ft	0	Tc, min	2-YR	0.29	1.9	0.52	0.29
Roof	0.12	90%	P2	Slope, percent	3.5000	Slope, percent	10.0000	Slope, ft/ft	1.0000	5.0	5-YR	0.36	2.8	0.52	0.53
Gravel	0.01	40%	1.4	Runoff Coefficient	0.9	Runoff Coefficient	0.162	Conveyance Coefficient	20	Final	10-YR	0.42	3.6	0.52	0.80
Other	0.00	0%						Velocity, ft/s	20.0	Tc, min	25-YR	0.50	4.7	0.52	1.22
	0.52	42%		Ti, min=	2.2	Ti, min=	8.0	Tt, min=	0.0	**10.3**	**100-YR**	**0.59**	**6.2**	**0.52**	**1.90**

Existing Sub-Basin 2 (ESB2)

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	0.50	2%	C	Surface Imperviousness	1	Surface Imperviousness	0.02	Land Surface	Paved Areas and Shallow Swales	Minimum	1.25 YR	0.25	1.4	0.77	0.27
Asphalt Parking & Walkways	0.14	100%		Length, ft	75	Length, ft	80	Length, ft	0	Tc, min	2-YR	0.25	2.0	0.77	0.39
Roof	0.12	90%	P2	Slope, percent	3.0000	Slope, percent	12.0000	Slope, ft/ft	1.0000	5.0	5-YR	0.32	3.0	0.77	0.75
Gravel	0.01	40%	1.4	Runoff Coefficient	0.9	Runoff Coefficient	0.162	Conveyance Coefficient	20	Final	10-YR	0.39	3.9	0.77	1.18
Other	0.00	0%						Velocity, ft/s	20.0	Tc, min	25-YR	0.48	5.0	0.77	1.84
	0.77	34%		Ti, min=	2.2	Ti, min=	6.6	Tt, min=	0.0	**8.8**	**100-YR**	**0.57**	**6.7**	**0.77**	**2.94**

Developed Basin 1 (DB1)

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	0.45	2%	C	Surface Imperviousness	1	Surface Imperviousness	0.02	Land Surface	Paved Areas and Shallow Swales	Minimum	1.25 YR	0.40	1.7	1.29	0.90
Asphalt Parking & Walkways	0.34	100%		Length, ft	26	Length, ft	0	Length, ft	215	Tc, min	2-YR	0.40	2.5	1.29	1.30
Roof	0.44	90%	P2	Slope, percent	3.5000	Slope, percent	1.0000	Slope, ft/ft	0.0310	5.0	5-YR	0.45	3.7	1.29	2.18
Gravel	0.06	40%	1.4	Runoff Coefficient	0.9	Runoff Coefficient	0.162	Conveyance Coefficient	20	Final	10-YR	0.51	4.7	1.29	3.09
Other	0.00	0%						Velocity, ft/s	3.5	Tc, min	25-YR	0.57	6.1	1.29	4.46
	1.29	60%		Ti, min=	1.2	Ti, min=	0.0	Tt, min=	1.0	**5.0**	**100-YR**	**0.63**	**8.2**	**1.29**	**6.64**

Developed 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	0.19	2%	C	Surface Imperviousness	1	Surface Imperviousness	0.02	Land Surface	Paved Areas and Shallow Swales	Minimum	1.25 YR	0.52	1.7	0.87	0.79

RATIONAL METHOD RUNOFF ANALYSIS

Job #	2033-004	Date:	April 4, 2024
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Designed by:	MDM		

Asphalt Parking & Walkways	0.36	100%	C	Length, ft	26	Length, ft	0	Length, ft	250	Tc, min	2-YR	0.52	2.5	0.87	1.13
Roof	0.29	90%	P2	Slope, percent	3.5000	Slope, percent	1.0000	Slope, ft/ft	0.0310	5.0	5-YR	0.56	3.7	0.87	1.81
Gravel	0.03	40%	1.4	Runoff Coefficient	0.9	Runoff Coefficient	0.162	Conveyance Coefficient	20	Final	10-YR	0.60	4.7	0.87	2.47
Other	0.00	0%						Velocity, ft/s	3.5	Tc, min	25-YR	0.65	6.1	0.87	3.43
	0.87	73%		Ti, min=	1.2	Ti, min=	0.0	Tt, min=	1.2	**5.0**	**100-YR**	**0.70**	**8.2**	**0.87**	**4.94**

Developed 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	0.24	2%	C	Surface Imperviousness	0.02	Surface Imperviousness	0.02	Land Surface	Heavy Meadow	Minimum	1.25 YR	0.25	1.7	0.40	0.17
Asphalt Parking & Walkways	0.02	100%		Length, ft	42	Length, ft	0	Length, ft	0	Tc, min	2-YR	0.25	2.5	0.40	0.25
Roof	0.11	90%	P2	Slope, percent	13.0000	Slope, percent	1.0000	Slope, ft/ft	1.0000	5.0	5-YR	0.32	3.7	0.40	0.48
Gravel	0.03	40%	1.4	Runoff Coefficient	0.162	Runoff Coefficient	0.162	Conveyance Coefficient	2.5	Final	10-YR	0.39	4.7	0.40	0.75
Other	0.00	0%						Velocity, ft/s	2.5	Tc, min	25-YR	0.48	6.1	0.40	1.17
	0.40	34%		Ti, min=	4.7	Ti, min=	0.0	Tt, min=	0.0	**5.0**	**100-YR**	**0.57**	**8.2**	**0.40**	**1.87**

Inlet Sub-basin (B-INLET)

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	0.07	2%	C	Surface Imperviousness	1	Surface Imperviousness	0.02	Land Surface	Paved Areas and Shallow Swales	Minimum	1.25 YR	0.56	1.7	0.39	0.38
Asphalt Parking & Walkways	0.17	100%		Length, ft	26	Length, ft	0	Length, ft	135	Tc, min	2-YR	0.56	2.5	0.39	0.55
Roof	0.14	90%	P2	Slope, percent	3.5000	Slope, percent	1.0000	Slope, ft/ft	0.0700	5.0	5-YR	0.60	3.7	0.39	0.87
Gravel	0.01	40%	1.4	Runoff Coefficient	0.9	Runoff Coefficient	0.162	Conveyance Coefficient	20	Final	10-YR	0.64	4.7	0.39	1.17
Other	0.00	0%						Velocity, ft/s	5.3	Tc, min	25-YR	0.68	6.1	0.39	1.61
	0.39	77%		Ti, min=	1.2	Ti, min=	0.0	Tt, min=	0.4	**5.0**	**100-YR**	**0.72**	**8.2**	**0.39**	**2.30**

NOTES TO USERS

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

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

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

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

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

The **projection** used in the preparation of this map is Universal Tranverse Mercator (UTM) zone 13. The **horizontal datum** is NAD83, GRS1980 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of the FIRM.

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

Spatial Reference System Division
National Geodetic Survey, NOAA
Silver Spring Metro Center
1315 East-West Highway
Silver Spring, Maryland 20910
(301) 713-3191

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

Base map information shown on this FIRM was provided in digital format by Routt County GIS Department.

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

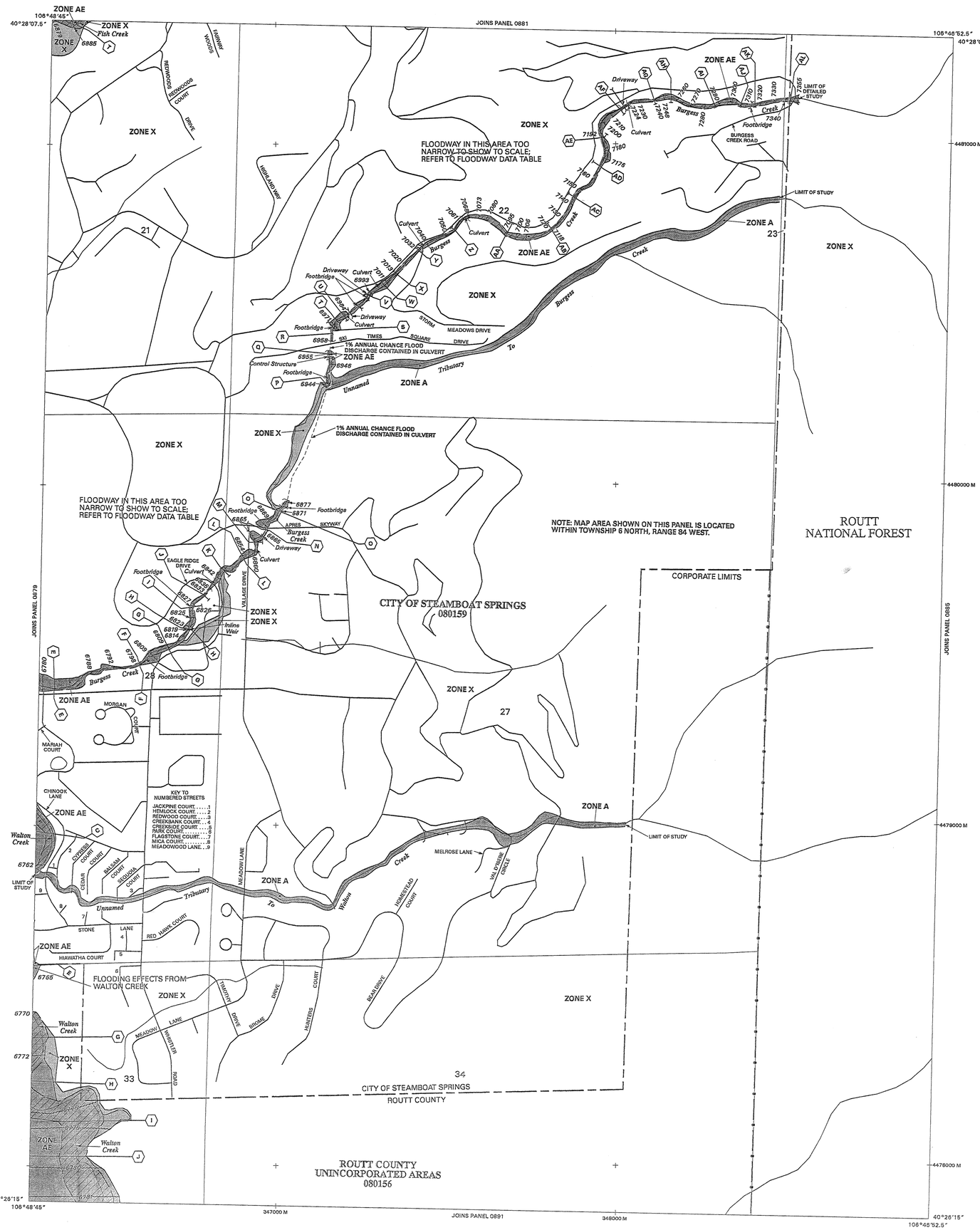
Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which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

An accompanying Flood Insurance Study report, Letters of Map Revision or Letters of Map Amendment revising portions of this panel, and digital versions of this PANEL may be available. Contact the **FEMA Map Service Center** at the following phone numbers and Internet address for infomation on all related products available from FEMA;

Phone: 800-358-9616
FAX: 800-358-9620
www.fema.gov/msc

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

This map reflects more detailed and up-to-date stream channel configurations than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables in the Flood Insurance Study report may reflect stream channel distances that differ from what is shown on this map.



LEGEND

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD EVENT

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water surface elevation of the 1% annual chance flood.

ZONE A No base flood elevations determined.

ZONE AE Base flood elevations determined.

ZONE AH Flood depths of 1 to 3 feet (usually areas of ponding); base flood elevations determined.

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

ZONE AR Area of special flood hazard formerly protected from the 1% annual chance flood event by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood event.

ZONE A99 Area to be protected from 1% annual chance flood event by a Federal flood protection system under construction; no base flood elevations determined.

ZONE V Coastal flood zone with velocity hazard (wave action); no base flood elevations determined.

ZONE VE Coastal flood zone with velocity hazard (wave action); base flood elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

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

OTHER AREAS

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

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

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

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

- Floodplain boundary
- Floodway boundary
- Zone D boundary
- CBRS and OPA boundary
- Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or velocities.
- 513 — Base Flood Elevation line and value; elevation in feet*
- (EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*

*Referenced to the North American Vertical Datum of 1988

- A — A — Cross Section Line
- 23 — 23 — Transect Line
- 97°07'30", 32°22'30" — Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
- 4276000M — 1000-meter Universal Transverse Mercator grid values, zone 13
- 600000 FT — 5000-foot grid ticks
- DX5510 × — Bench mark (see explanation in Notes to Users section of this FIRM panel).
- M1.5 — River Mile

MAP REPOSITORY
Refer to Repository Listing on Index Map

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
FEBRUARY 4, 2005

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

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

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

MAP SCALE 1" = 500'

250 0 500 1000 FEET
150 0 150 300 METERS

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0883D

FIRM
FLOOD INSURANCE RATE MAP
ROUTT COUNTY,
COLORADO
AND INCORPORATED AREAS

PANEL 883 OF 1475

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
ROUTT COUNTY,			
UNINCORPORATED AREAS	080158	0883	D
STEAMBOAT SPRINGS, CITY OF	080159	0883	D

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

MAP NUMBER
08107C0883D

EFFECTIVE DATE:
FEBRUARY 4, 2005

Federal Emergency Management Agency

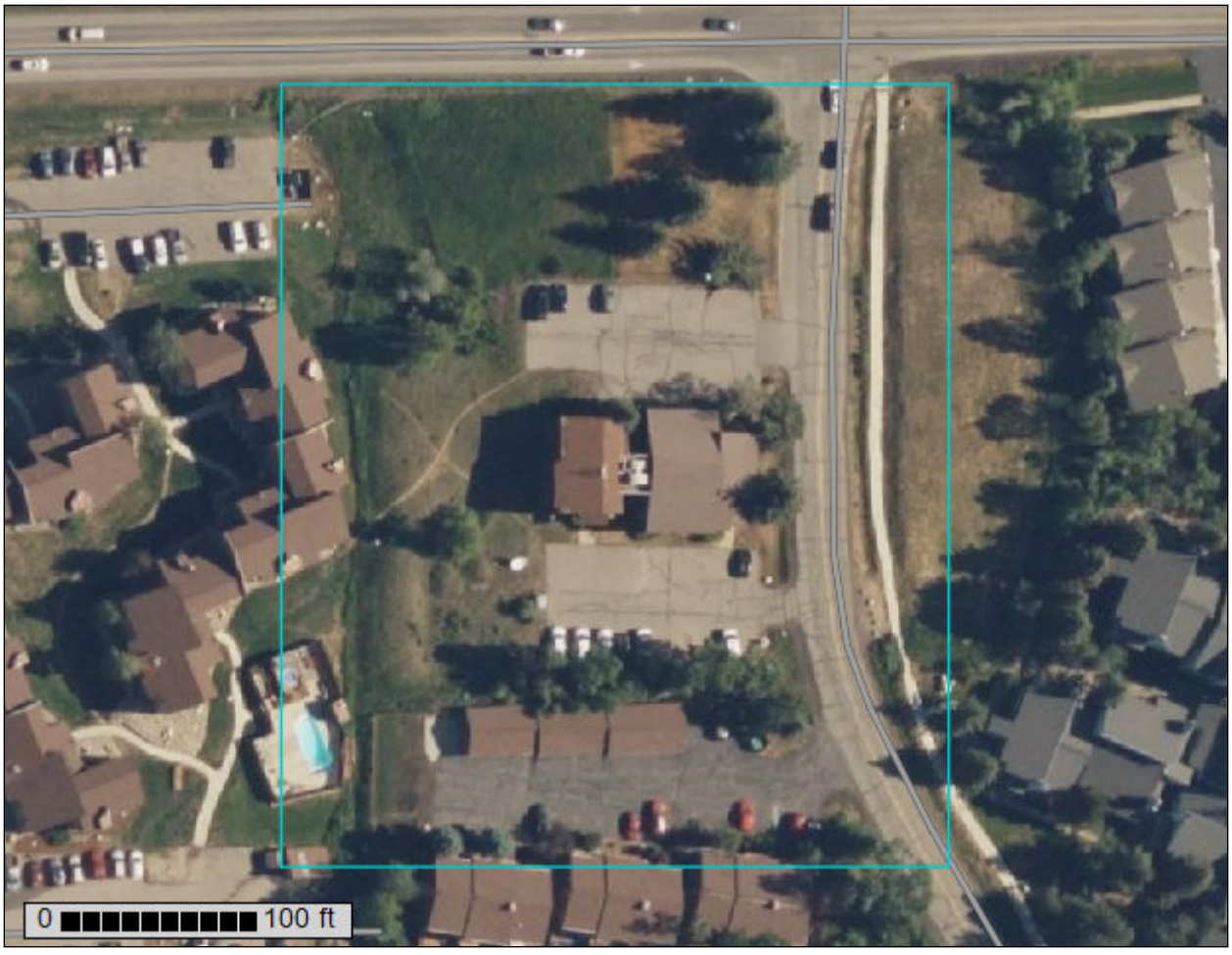
United States Department of Agriculture

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 8, 2024

Preface

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

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

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

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

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

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

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

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Contents

How Soil Surveys Are Made

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

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

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

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

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

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

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

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

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

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

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

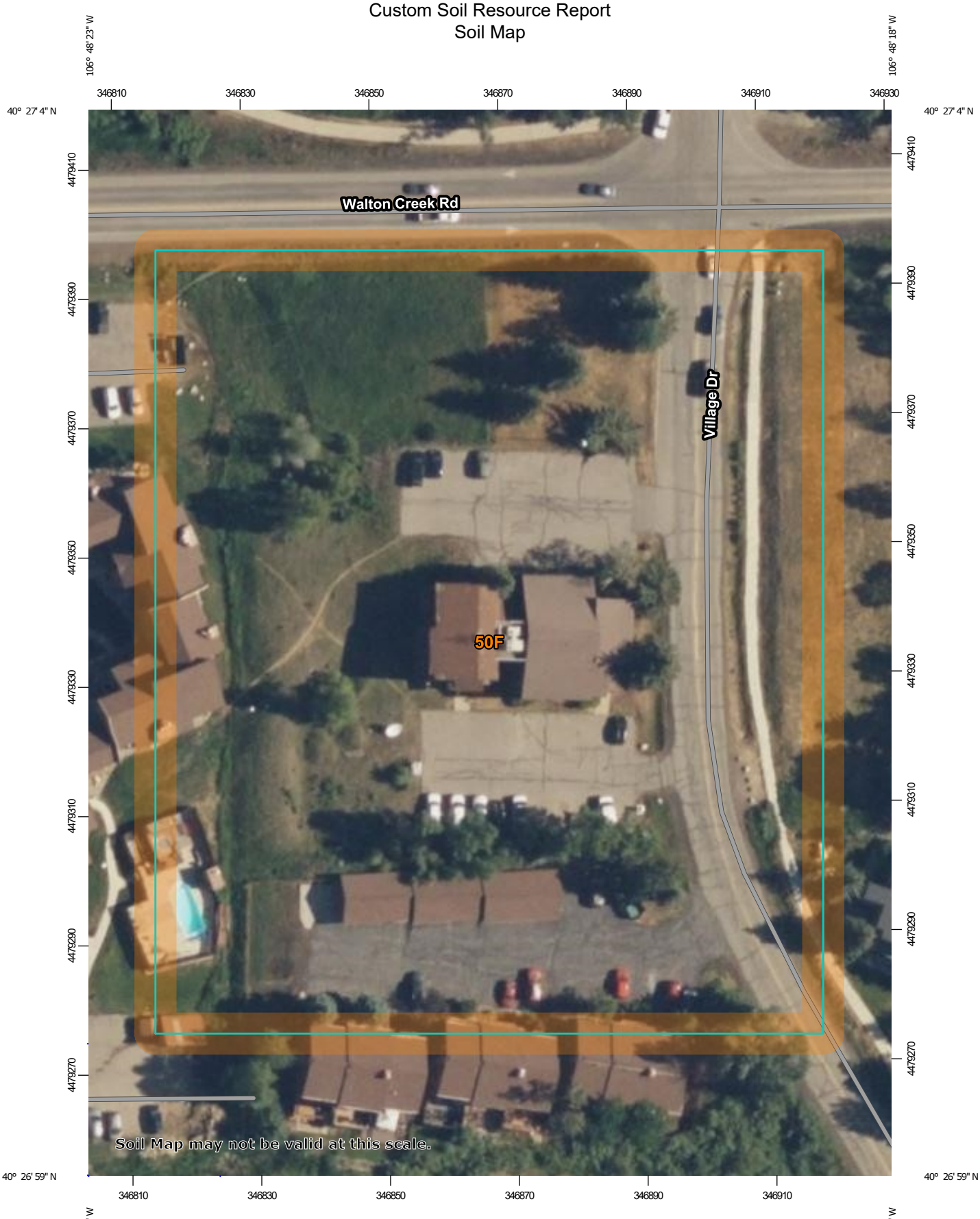
After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

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

Soil Map

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

Custom Soil Resource Report
Soil Map



Map Scale: 1:804 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 10 20 40 60

Feet
0 35 70 140 210

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 13, Aug 23, 2023

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

Date(s) aerial images were photographed: Jul 2, 2021—Aug 25, 2021

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

MAP LEGEND

MAP INFORMATION

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
50F	Routt loam, 25 to 65 percent slopes, very stony	3.1	100.0%
Totals for Area of Interest		**3.1**	**100.0%**

Map Unit Descriptions

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

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

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

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

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

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

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

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

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

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

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

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

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

50F—Routt loam, 25 to 65 percent slopes, very stony

Map Unit Setting

National map unit symbol: k0gc
Elevation: 6,890 to 8,200 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

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

Description of Routt, Very Stony

Setting

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

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material
A1 - 1 to 12 inches: loam
A2 - 12 to 22 inches: loam
A3 - 22 to 27 inches: loam
B/E - 27 to 29 inches: clay loam
B/E - 29 to 31 inches: loam
Bt1 - 31 to 46 inches: clay
Bt2 - 46 to 65 inches: clay

Properties and qualities

Slope: 25 to 65 percent
Surface area covered with cobbles, stones or boulders: 1.0 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Very high
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
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: High (about 10.6 inches)

Interpretive groups

Land capability classification (irrigated): 7e
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: C

Ecological site: F048AY449CO - Aspen Woodland
Hydric soil rating: No

Minor Components

Impass

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: R048BY296CO - Claypan
Hydric soil rating: No

Venable

Percent of map unit: 5 percent
Landform: Drainageways
Down-slope shape: Linear
Across-slope shape: Concave
Ecological site: R048AY241CO - Mountain Meadow
Hydric soil rating: Yes

Slater

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: F048AY449CO - Aspen Woodland
Other vegetative classification: ASPEN (null_3)
Hydric soil rating: No

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Appendix C: Detention Calculations

Design Procedure Form: 5 Year Detention Pond Calculations

	Designer:	**Matthew McLeod**								
	Company:	**Four Points Surveying and Engineering**								
	Date:	**4/4/2024**								
	Project:	**Mountain Village Apartments**								
	Location:	**Walton Creek Road**								
		5 Year Detention Pond								
			Area	0.87	acres					
			Allowable Releas	.						
			(0.10 cfs/acre) * A		=	0.087	(from table 5.11.1)			
			C_5	0.55			(from table 5.6.1)			
			i_5	3.7			(from table 5.5.1)			
			Tc (dev)	5						
			Equation 5.11.1							
			Volume In							
			V= C*I*A*Tc(dev)*60		531.135		(from equation 5.11.1)			
					531	ft^3				
			Equation 5.11.2							
			Volume Out							
			V=Qallow*Tc(ex)*(60)		26.1		(from equation 5.11.2)			
					26	ft^3				
			Pond Volume							
			Volume In - Volume Out							
			505	ft^3	0.0116	acre-ft				
			Depth	2	ft					
			Area	252.5175	253	sq-ft				
			Minor Storm Water Surface=		6658	ft				

Design Procedure Form: 100 Year Detention Pond Calculations

	Designer:	**Matthew McLeod**								
	Company:	**Four Points Surveying and Engineering**								
	Date:	**4/4/2024**								
	Project:	**Mountain Village Apartments**								
	Location:	**Walton Creek Road**								
		100 Year Detention Pond								
			Area	0.87	acres					
			Allowable Release Rate Major Storm							
			(0.54 cfs/acre) * A		=	0.4698	(from table 5.11.1)			
			C_{100}	0.69			(from table 5.6.1)			
			i_{100}	8.2			(from table 5.5.1)			
			Tc (dev)	5						
			Equation 5.11.1							
			Volume In							
			V= C*I*A*Tc(dev)*60		1476.738		(from equation 5.11.1)			
					1477	ft^3				
			Equation 5.11.2							
			Volume Out							
			V=Qallow*Tc(ex)*(60)		140.94		(from equation 5.11.2)			
					141	ft^3				
			Pond Volume							
			Volume In - Volume Out							
			1336	ft^3	0.0307	acre-ft				
				1336	ft^3					
			Depth	2	ft					
			Area	668	668	sq-ft				

Appendix D: Culvert Calculations

Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, Apr 12 2024

18 INCH CULVERT SOUTH ACCESS

Invert Elev Dn (ft)	=	6837.80
Pipe Length (ft)	=	50.00
Slope (%)	=	1.40
Invert Elev Up (ft)	=	6838.50
Rise (in)	=	18.0
Shape	=	Circular
Span (in)	=	18.0
No. Barrels	=	1
n-Value	=	0.025
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

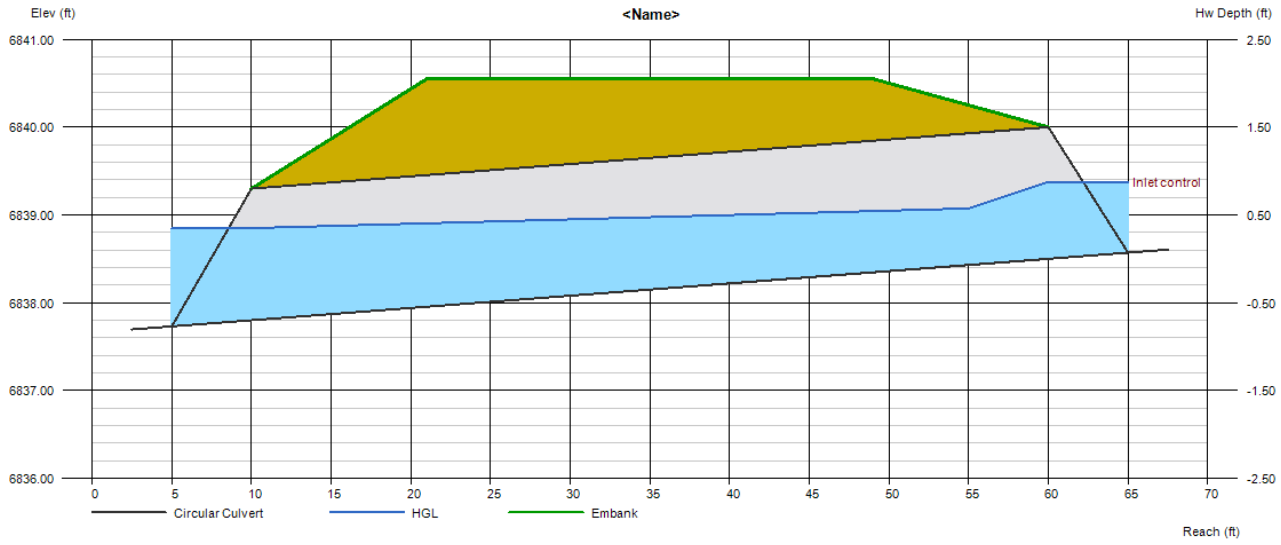
Top Elevation (ft)	=	6840.55
Top Width (ft)	=	28.00
Crest Width (ft)	=	0.00

Calculations

Qmin (cfs)	=	0.00
Qmax (cfs)	=	5.00
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	2.50
Qpipe (cfs)	=	2.50
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	1.89
Veloc Up (ft/s)	=	3.80
HGL Dn (ft)	=	6838.85
HGL Up (ft)	=	6839.10
Hw Elev (ft)	=	6839.38
Hw/D (ft)	=	0.58
Flow Regime	=	Inlet Control



Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, Apr 12 2024

18 INCH CULVERT SOUTH ACCESS

Invert Elev Dn (ft)	=	6837.80
Pipe Length (ft)	=	50.00
Slope (%)	=	1.40
Invert Elev Up (ft)	=	6838.50
Rise (in)	=	18.0
Shape	=	Circular
Span (in)	=	18.0
No. Barrels	=	1
n-Value	=	0.025
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

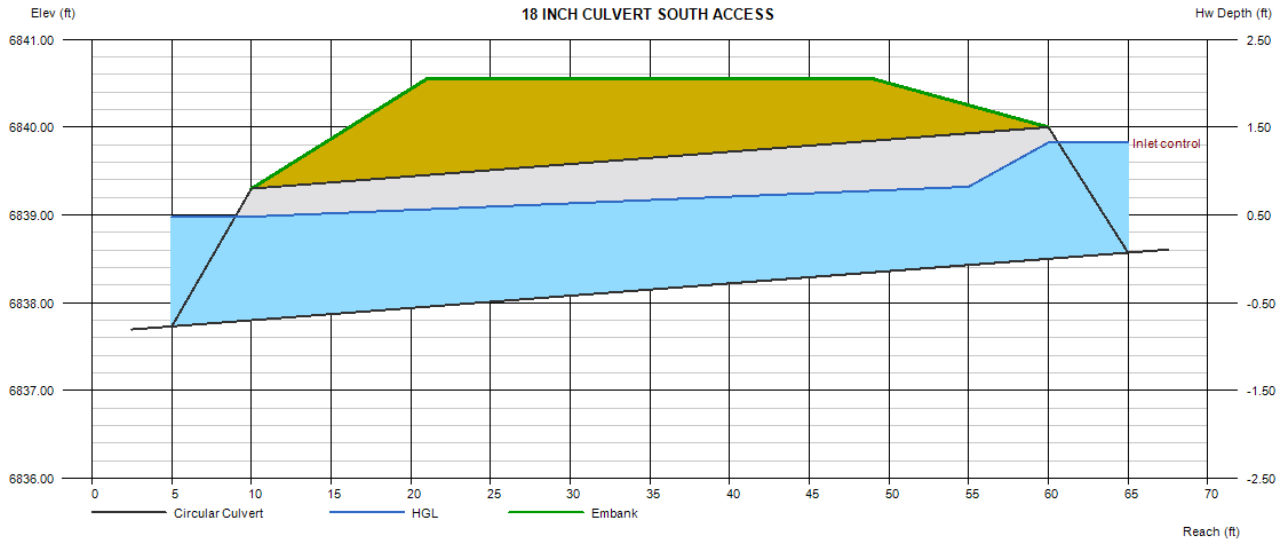
Top Elevation (ft)	=	6840.55
Top Width (ft)	=	28.00
Crest Width (ft)	=	0.00

Calculations

Qmin (cfs)	=	0.00
Qmax (cfs)	=	5.00
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	5.00
Qpipe (cfs)	=	5.00
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	3.35
Veloc Up (ft/s)	=	4.77
HGL Dn (ft)	=	6838.98
HGL Up (ft)	=	6839.36
Hw Elev (ft)	=	6839.83
Hw/D (ft)	=	0.88
Flow Regime	=	Inlet Control



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, May 28 2024

12inch culvert to pond

Circular

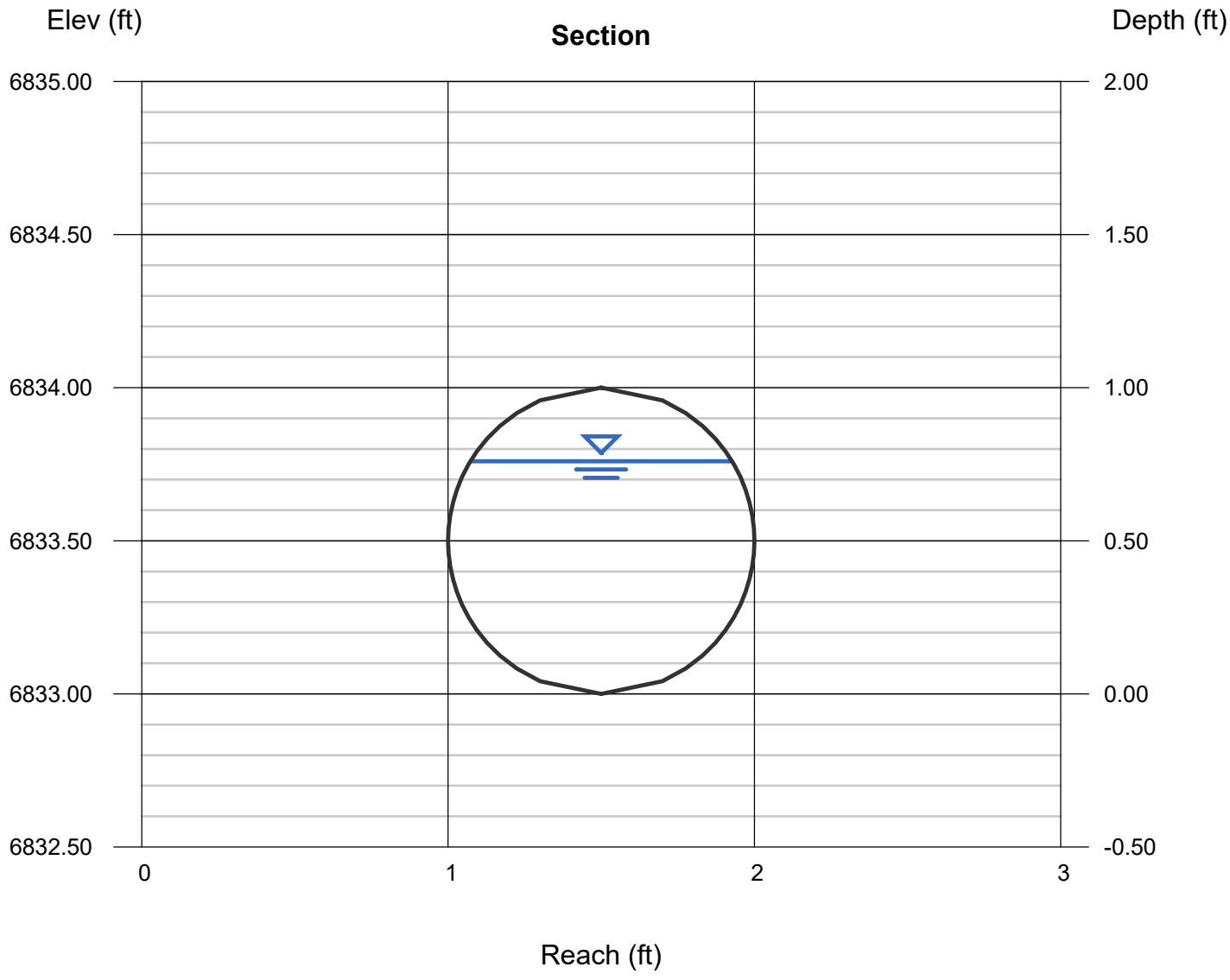
Diameter (ft)	= 1.00
Invert Elev (ft)	= 6833.00
Slope (%)	= 0.50
N-Value	= 0.013

Calculations

Compute by:	Known Q
Known Q (cfs)	= 2.30

Highlighted

Depth (ft)	= 0.76
Q (cfs)	= 2.300
Area (sqft)	= 0.64
Velocity (ft/s)	= 3.59
Wetted Perim (ft)	= 2.12
Crit Depth, Yc (ft)	= 0.65
Top Width (ft)	= 0.85
EGL (ft)	= 0.96



Appendix E: Water Quality - Sand Filter Calculations

Design Procedure Form: Sand Filter (SF)

UD-BMP (Version 3.07, March 2018)

Designer:	**Matthew McLeod, P.E.**
Company:	**Four Points Surveying and Engineering**
Date:	**April 12, 2024**
Project:	**Village Drive Apartments**
Location:	**Steamboat Springs, CO**

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 = 73.0 %

B) Tributary Area's Imperviousness Ratio ($i = I_a/100$): i = 0.730

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 = 0.23 watershed inches

D) Contributing Watershed Area (including sand filter area): Area = 37,000 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: $V_{WQCV\ OTHER}$ = cu ft

H) User Input of Water Quality Capture Volume (WQCV) Design Volume (Only if a different WQCV Design Volume is desired): $V_{WQCV\ USER}$ = 1,300 cu ft

2. Basin Geometry

A) WQCV Depth: D_{WQCV} = 2.0 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 = 3.00 ft / ft
DIFFICULT TO MAINTAIN, INCREASE WHERE POSSIBLE

C) Minimum Filter Area (Flat Surface Area): A_{Min} = 338 sq ft

D) Actual Filter Area: A_{Actual} = 338 sq ft

E) Volume Provided: V_T = 1337 cu ft

3. Filter Material

Choose One
- ○ 18" CDOT Class B or C Filter Material
- ◉ Other (Explain): 12" provided based on site constraints

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 = 1.5 ft

ii) Volume to Drain in 12 Hours: Vol_{12} = 1,300 cu ft

iii) Orifice Diameter, 3/8" Minimum: D_O = 7/8 in

Design Procedure Form: Sand Filter (SF)

Designer: Matthew McLeod, P.E.
Company: Four Points Surveying and Engineering
Date: April 12, 2024
Project: Village Drive Apartments
Location: Steamboat Springs, CO

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: Water Quality O&M Plans

POND AND GRASS BUFFER WATER QUALITY FEATURES FOR VILLAGE DRIVE APARTMENTS OWNERSHIP AND MAINTENANCE PLAN

1. GENERAL PROJECT INFORMATION

A. 2955 VILLAGE DRIVE, STEAMBOAT SPRINGS, ROUTT COUNTY, COLORADO.

2. GENERAL FACILITY DESCRIPTION

THIS FACILITY IS POROUS LANDSCAPE DETENTION POND WATER QUALITY AND GRASS BUFFER (WQ) FEATURES THAT ARE CAPABLE OF TREATING RUNOFF AND OTHER POLLUTANTS THAT COMMONLY ORIGINATE FROM VEHICLES AND MOTORIZED EQUIPMENT.

3. INSPECTION & MAINTENANCE FREQUENCY & PROCEDURE

THE FOLLOWING TABLE PROVIDES A MAINTENANCE SCHEDULE FOR THE PROPOSED POROUS LANDSCAPE DETENTION POND:

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

INSPECTION & MAINTENANCE FREQUENCY & PROCEDURE

THE FOLLOWING TABLE PROVIDES A MAINTENANCE SCHEDULE FOR THE PROPOSED GRASS BUFFER:

Grass Swale, Grass Buffer	
Activity	Required Frequency
Inspection for uniform cover, sediment accumulation, rill and gully development, and impacts from foot or vehicle traffic; maintain as necessary. Debris and litter removal.	Twice annually
Aeration	Annually
Mowing	As needed to maintain ~6" height
Irrigation and application of fertilizer, herbicide, and pesticide	As needed to maintain vegetative health

4. EQUIPMENT, STAFFING AND VEGETATION MANAGEMENT

A. GENERAL LANDSCAPING TOOLS SUCH AS LAWNMOWER, WEED WHACKER

B. STAFFING: TBD BY OWNER

C. SEEDING: TBD

D. MOWING: VEGETATION HEALTH SHOULD BE MAINTAINED IN THE BUFFER AREA WITH REGULAR MOWING AND/OR WEEDEATING. THE REQUIRED MOW AREA POST-CONSTRUCTION WAS ESTIMATED TO BE 0.03 ACRES.

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

5. SNOW AND ICE CONTROL

THE POROUS LANDSCAPE DETENTION POND AND GRASS BUFFER MAY SERVE AS A SNOW STORAGE AREA DURING THE WINTER MONTHS. SNOW CAN BE PLOWED INTO THE WQ FEATURES. PLOW OPERATORS SHALL TAKE CARE NOT TO DAMAGE THE POND.

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

A. ACCESS INFORMATION AND DETAILS: ACCESS FROM VILLAGE DRIVE.

B. A RIGHT-OF-WAY PERMIT SHOULD NOT BE REQUIRED FOR TEMPORARY OBSTRUCTIONS. MAINTENANCE CREWS SHOULD PLACE MUTCD APPROVED TRAFFIC CONTROL DEVICES (ORANGE CONES AND/OR BARRICADES) AROUND ALL VEHICLES AND EQUIPMENT THAT ARE TEMPORARILY WITHIN THE RIGHT OF WAY.

7. HYDRAULIC DESIGN

A. FLOWRATES (CFS)

A.A.	MINOR EVENT (5-YEAR)	1.81	CFS
A.B.	MAJOR EVENT (100-YEAR)	4.94	CFS

8. SENSITIVE AREA, WETLANDS & PERMITS

A. WETLANDS ARE NOT PRESENT AT THE SITE AND OFFSITE.

9. MISCELLANEOUS INFORMATION

A. –

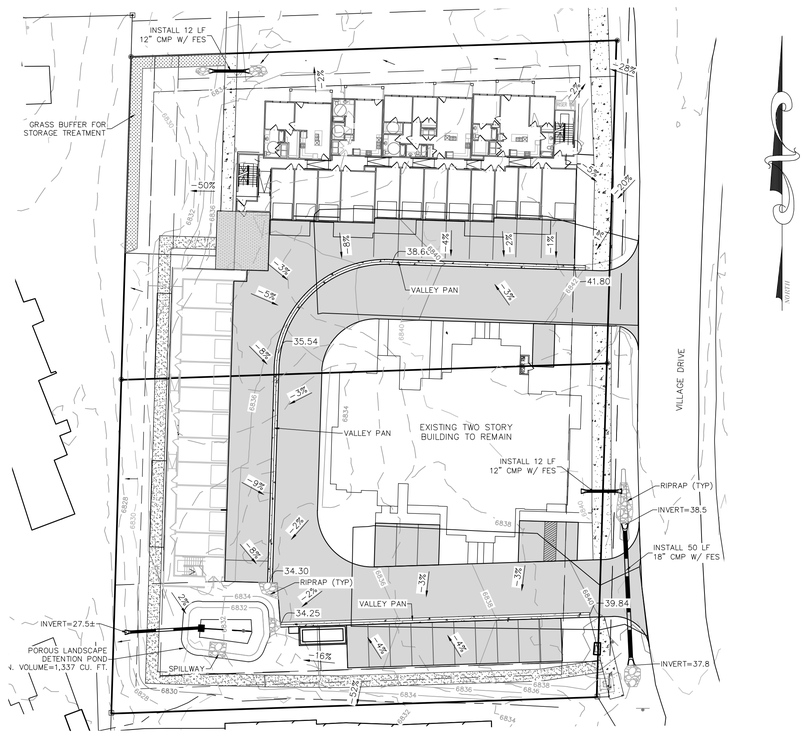
MAINTENANCE NOTES

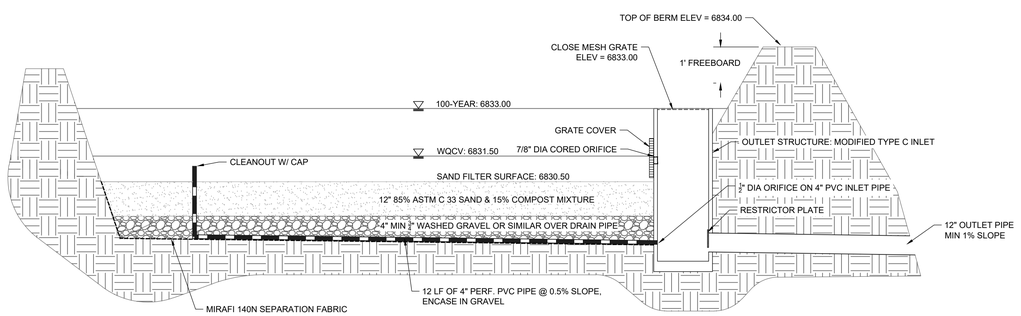
PROTECTION

SUGGESTED O&M: PROTECT POND FROM FUTURE CONSTRUCTION ACTIVITIES. KEEP FREE OF OBSTRUCTIONS AND EXCESSIVE USE.

NOTE:

THE PROPERTY OWNER OR MANAGER SHALL BE RESPONSIBLE FOR OPERATION AND MAINTENANCE ACTIVITIES.





POROUS LANDSCAPE DETENTION POND
N.T.S.

FOUR POINTS SURVEYING ENGINEERING
440 S. Lincoln Ave, Suite 4A
P.O. Box 775966
Steamboat Springs, CO 80487
(970)-871-6772
www.fourpointsse.com

No.	DATE	REVISIONS
INT		

VILLAGE DRIVE APARTMENTS
2955 VILLAGE DRIVE
LOT A AND LOT B
MT. OFFICE PARK
SUBDIVISION

Horizontal Scale
0 20' 40'
SCALE: 1" = 20'

Contour Interval = 2 ft

DATE: 3-28-2024
JOB #: 2033-004
DRAWN BY: MDM
DESIGN BY: WNM/MDM
REVIEW BY: FPSE

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

DRAWING: OPERATION & MAINTENANCE PLAN

SHEET #

O&M

Appendix G: Standard Forms No. 3 & No. 4

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.
x 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.
x 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.
x 1. Indicate pond volume and area (size and depth) requirement.
x 2. Indicate release rates.
x 3. Discuss outfall design, location, and overflow location.
x 4. Discuss maintenance requirements.

J. Curb and Gutter
x 1. Indicate gutter capacity.
n/a 2. Indicate curb capacity.
n/a 3. Indicate design velocity
n/a 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
n/a 1. Indicate inlet capacity.
n/a 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.
n/a 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.
_____ 7. For each basin show bubble with basin number, acreage and % impervious.
_____ 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.
_____ 4. For each basin show bubble with basin number, acreage and percent impervious or provide a summary table or figure.
_____ 5. For each outlet show bubble with acreage, historic flow, and proposed flow or provide a summary table or figure.
n/a 6. Show floodplain limits and information.
x 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.
x C. Pond Calculations.
x D. Other Calculations.

Acknowledgements

Standard Form No. 3 was prepared by: Matthew McLeod, PE 4-12-2024
Date

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

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.
_____ 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.
n/a 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.

X 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.

X 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.

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

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

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

X E. Identify design specifications for construction.

Acknowledgements

Standard Form No. 4 prepared by: Matthew McLeod PE 4-12-2024
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 H: Project Sheets – Base Design Standards & WQCV Standard

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: Village Drive Apartements	
Project Location: 2955 Village Drive, Steamboat Springs, CO	
Submitted Date: 4-12-2024	Submitted By: Four Points Surveying & Engineering
Acreage Disturbed: 0.90	
Existing Impervious: 30%	New Net Impervious: 60%
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: - Porous Landscape Detention Pond - Grass Buffer for snow storage area

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	1337 cu. ft.	0.80 acres	See drainage exhibit. SW corner of property.
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: Village Drive Apartments			
Preparer	**City**	**Requirements**	
		Facilities provide treatment and/or infiltration of the WQCV for 100% of the site	
		% of site treated: 100% of the parking lot and gravel area.	
		Facility Type: Sand Filter	Facility Location: SW Corner of Lot
		See Drainage Report section: Water Quality	

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):	
		6%	Size = 0.05 acres
		Provide explanation of why the excluded area is impractical to treat: Perimeter of site on other patterns.	
		Provide explanation of why another facility is not practicable for the untreated area: There is no room for it with proposed and existing infrastructure.	

Appendix I: Scope Approval Form

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:	Village Drive Apartments
Project location:	Lots A and B, Mountain Office Park
Developer name/contact info:	Sunscope, LLC, 1897 Hunters Drive, Steamboat Springs, CO
Drainage engineer name/contact info:	Walter Magill, Four Points Surveying and Engineering, 970-819-1161, walterm@fourpoints.com
Application Type:	Development Plan
Proposed Land Use:	Apartments

Project Site Parameters	
Total parcel area (acres):	554949 sq ft, 1.28 acres
Disturbed area (acres):	1.1
Existing impervious area (acres, if applicable):	0.45
Proposed new impervious area (acres):	0.65
Proposed total impervious area (acres):	1.10
Proposed number of project outfalls:	1-southwest
Number of additional parking spaces:	26
Description and site percentage of existing cover/land use(s):	The KFMU building is located on the site with access on the north and south sides, 30%
Description and site percentage of proposed cover/land use(s):	The existing building will remain and new apartments will be constructed with a garage for the existing building, 60%
Expected maximum proposed conveyance gradient (%):	10%
Description of size (acres) and cover/land use(s) of offsite areas draining to the site	No offsite areas appear to drain to the site.

Type of Study Required:

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

Hydrologic Evaluation:

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

Project Drainage	
Number of subbasins to be evaluated:	2
Presence of pass through flow (circle):	YES (NO)
Description of proposed stormwater conveyance on site:	Sheet flow over the pavement areas and out into the existing and proposed swales.
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:	Flow will end up leaving the site to the southwest, same as the existing drainage patterns
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

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.:	Water quality will be handled by porous landscape detention pond
Concept-level permanent stormwater treatment facility design details (type, location of facilities, proprietary structure selection, treatment train concept, etc.):	Pond per city standards
Proposed LID measures to reduce runoff volume:	None
Will treatment evaluation include off-site, pass through flow (circle):	YES NO N/A

Approvals

Walter Magill, PE Four Points Engineering	4-12-2024	970-819-1161
Prepared By: (Insert drainage engineer name & firm)	Date	Phone number

Approved By:

Printed Name: City Engineer	Date

May 02, 2024

Walter Magill
1769 BROME DRIVE
STEAMBOAT SPRINGS, CO 80487

RE: Approval Letter for Preconsultation - Drainage Scope Approval Form or Waiver Request for Village Drive Apartments (PL20240080)

Dear Walter Magill,

The following are approved:

1. Drainage & Stormwater Treatment Scope Approval Form

If you have any questions or concerns please contact me at (970) 871-7019 or via email at acamano@steamboatsprings.net.

Sincerely,

Adan Camano
Staff Engineer