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Draft Drainage Study & Water Quality Plan for Bridge Lane Condominiums 1940 and 1960 Bridge Lane, Steamboat Springs, CO

a.k.a. Future Expansion Parcel, Riverfront Park F2

Original Draft Drainage Report: 1/9/2025
Revised: 5/14/2025

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

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(970) 871-6772

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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 Future Expansion Parcel, Riverfront Park Filing No. 2 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. 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

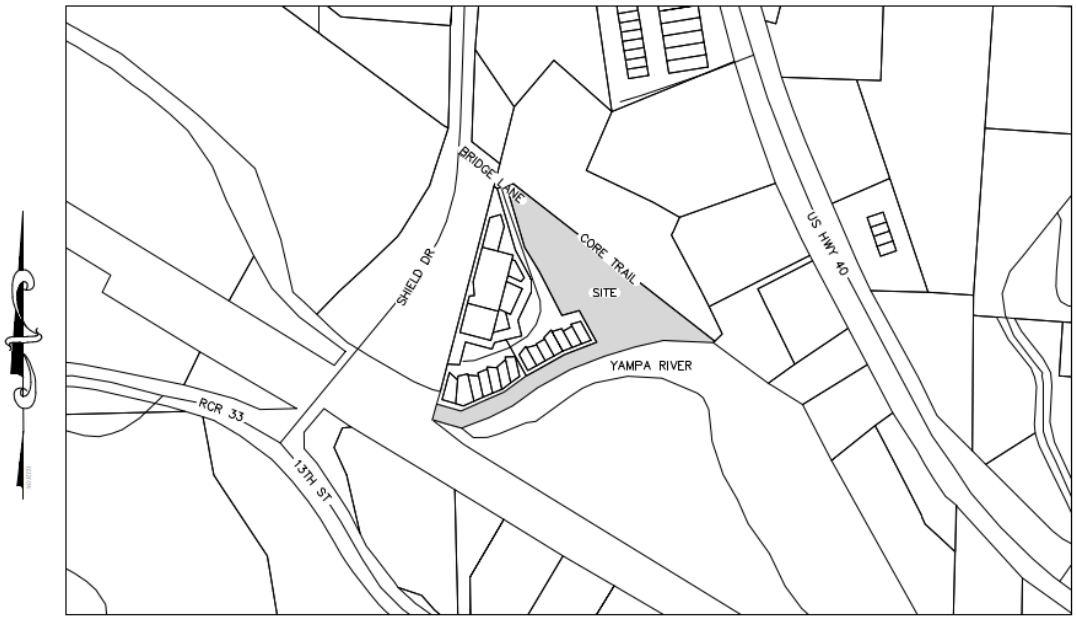
Date:----------

1.0 Introduction

This report provides a detailed analysis of the existing drainage conditions and proposed post-development drainage conditions for the construction of four (4) residential buildings to be known under the development plan as Bridge Lane Condominiums. The parcel is adjacent to the Yampa River with the Steamboat Springs Core Trail running along the northeast property line and is approximately 2.17 acres. An existing development exists to the west with residential and commercial use. This report includes all data, engineering methods, assumptions, and calculations used by Four Points Surveying and Engineering (Four Points) to design the stormwater drainage and water treatment systems 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



VICINITY MAP

Legal Description: Future Expansion Parcel, Riverfront Park located in the NW ½ of Section 7, Township 6 North, Range 84 West of the 6th P.m.

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, Bridge Lane Realty LLC.

C. Drainage Reports for Adjacent Developments

The following drainage reports for adjacent developments were reviewed as part of this drainage study.

1. *Riverfront Industrial Park (Lot 2 Petrillo Subdivision)* dated October 13th, 2005 and prepared by Civil Design Consultants (CDC)
2. *Planned Unit Development at Riverfront Park* dated September 25, 2023 and prepared by Four Points Surveying and Engineering

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. 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.

3.0 Existing Conditions

A. Ground Cover, Imperviousness, Topography and Size

- The site is currently vacant with the Steamboat Springs Core Trail running along the northeast property line.
- An existing development with residential and commercial units resides to the west.
- There are existing utilities (water, sewer, gas, etc.) running through the site.
- ~2% imperviousness
- Gradients ranging from 2-10% draining southeast with small portion northeast
- Development area size: ~1.1 acres

B. Existing Stormwater Systems

- The Yampa River runs along the southern property line, Design Point (DP) 1.
- A ditch flowing north along the northern portion of the Core Trail, terminating at an 18" culvert across the existing access to the site at DP2.

- There is an existing storm sewer on the adjacent Riverfront Industrial Park that was previously designed for the full buildout of the site. Proposed basin SB3 will drain to this system.
- There is an existing porous landscape detention pond (PLDP) at DP3 along the south side of the adjacent property, near the Yampa River, treating the adjacent development.

C. Site Outfall and Ultimate Outfall Locations

Flows from existing basin (EB) 1 generally sheet flow south to the Yampa River. A portion of the north (EB2) is routed via swale to an 18-inch CMP culvert at the existing access drive. The culvert flows west to a ditch (DP2). The culvert carries flow north of Agate Steet and ultimately into the Yampa River.

D. NRCS Soil Type

Per the USDA NRCS Web Soil Survey:

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

E. Existing Easements

- There are no dedicated drainage easements.

F. FEMA Map Reviewal

FEMA flood map No. 08107C0876D was reviewed. The south portion of the parcel is in Zone AE floodplain (see attached map for base flood elevations). The rest of the parcel is in Zone X, with a 0.2% Annual Chance Flood Hazard.

4.0 Proposed Conditions

A. Ground Cover, Imperviousness, and Topography

The proposed residential development consists of a new paved access serving four building with associated parking. Development Basin (DB) 1 consists of the entire development broken up into three Sub-Basins (SB). Pavement from SB1 drains to a proposed catch curb and grass lined trapezoidal swale at DP4 which then conveys the drainage to a proposed PLDP (DP6) and out to the Yampa River. SB2 will drain north to the existing ditch (DP2). The ditch will be updated to a grass lined water quality swale for treatment. SB3 will drain west to the existing storm system at DP5, which can accept the flow based on the referenced drainage reports.

B. Proposed Water Quality Conditions

- A PLDP will be constructed in the southeast corner of SB1.
- Grass lined swale in the north of SB2.

C. Proposed Stormwater Systems

- 1-foot-wide concrete catch curb.
- Trapezoidal grass lined swale to PLDP.

D. Outlets: Historic and Proposed Flow

The historic outfall of the Yampa River will be maintained due to its proximity to the river itself.

E. Hydraulic Calculations

Hydraulic calculations were performed for the following:

- Catch curb
- Grass lined swales

F. Major and Minor Flow Summary Table

Table 1: Basin Characteristics and Peak Flow Summary Table

Basin Condition	Area (acres)	Impervious Area (%)	Runoff	
			Q_5 (cfs)	Q_{100} (cfs)
EB1	1.04	4%	0.43	2.77
EB2	0.32	8%	0.17	0.96
DB1	1.17	58%	1.93	5.96
SB1	0.87	60%	1.48	4.49
SB2	0.16	42%	0.21	0.77
SB3	0.14	61%	0.24	0.73
DB2	0.20	2%	0.12	0.83

G. Proposed Easements

- A 20-foot-wide drainage access easement for the PLDP
- Drainage easement encompassing the PLDP.

H. Off Site Flows

There appear to be no offsite flow entering the site.

I. Impacts to Downstream Properties

There are no downstream properties so there will be no impact.

J. Detention Pond

There is one permanent detention facility, the PLDP, located in the southeast corner of the lot. The facility will serve as both detention and water quality treatment with a minimum volume of 1,207 cubic feet. The outlet structure will be a Type C inlet with an 18” pipe to the Yampa River. Overflow consists of a rip rap lined swale leading to the historic outfall. Design calculations and specifications for the pond sizing and outlet structure can be found in the appendices. The pond will outfall at DP1 on the drainage exhibit. Maintenance requirements are outlined in the O&M exhibit in the appendix.

K. Culverts

There is a 12" HDPE culvert proposed in the existing ditch along the core trail beneath the proposed sidewalk connection with the core trail. Velocity, flow, and capacity calculations can be found in the appendices. The culvert outlet will be outfitted with flared end sections and riprap.

L. Drainage Channels

The triangular swale at DP2 is designed to handle the 100-year flow rate. The swale will be grass lined and will be utilized for water quality for treatment of SB2. The trapezoidal swale at DP4 is designed to handle the 25-year flow rate and will convey drainage from SB1 to the PLDP. Velocity, flow, and capacity calculations can be found in the appendices.

5.0 Post Construction Stormwater Management

Post construction management will consist of regular maintenance of the existing system as outlined in the City of Steamboat Springs drainage criteria and the operation and maintenance (O&M) plan in this report.

6.0 Conclusions

A. General Summary

Flows originating from the proposed developed will be routed to a PLDP and grass lined swale as outlined in this report, relatively maintaining existing drainage patterns to the Yampa River, which is near the development. The swale at DP2 will act as treatment for SB2 where the slight increase in flow from EB2 will not require additional detention. The proposed PLDP will act as a combined detention pond and sand filter facility providing both detention and water quality in one for SB1. SB3 has minimal flows going into an existing storm system to the existing pond for treatment, previously designed for a larger buildout.

B. Compliance

The proposed stormwater drainage system meets City Drainage Criteria. No engineering variances required.

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 DP6. The drainage associated with the Project will not have an adverse impact on adjacent or downstream properties.

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*](http://www.NOAA.com)

City of Steamboat Springs Engineering Drainage Criteria, Latest Version.

8.0 Appendices

A. Drainage Exhibits DR1 and DR2, Proposed Site Plan
B. Basin Runoff Calculations and USDA Web Soil Survey
C. Detention Calculations
D. Drainage Channel and Culvert Calculations
E. Water Quality - Sand Filter and Grass Lined Swale Calculations
F. Water Quality O&M Plan
G. Standard Forms No. 3 & No. 4 – Final Drainage Study and Water Quality Plan Checklists
H. Project Sheets – Base Design Standards & WQCV Standard
I. Standard Form No. 5 - Scope Approval Form

Appendix A: Drainage Exhibits DR1 and DR2, Proposed Site Plan

LEGEND

- DRAINAGE DESIGN POINT (SEE DRAINAGE LETTER) — 4
- DRAINAGE BASIN # / SUB-BASIN # — 2
- ACREAGE OF BASIN — 0.38
- % IMPERVIOUS — 41%
- EX DRAINAGE BASIN BOUNDARY
- PR DRAINAGE BASIN BOUNDARY

NORTH

See Bridge Lane Condominiums development plans for existing and proposed utility information.

FOUR POINTS SURVEYING ENGINEERING

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www.fourpointsse.com

No.	DATE	REVISIONS	INT
1	5/28/25	PER DRT COMMENTS	CFB

FUTURE EXPANSION PARCEL
RIVERFRONT PARK FILING NO. 2
1940 BRIDGE LANE
STEAMBOAT SPRINGS, CO 80487

Horizontal Scale

0 20' 40'

SCALE: 1" = 20'

Contour Interval = 2 ft

DATE: 1-9-2025
JOB #: 2349-002
DRAWN BY: MDM
DESIGN BY: CFB
REVIEW BY: FPSE

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

DRAWING: PROPOSED DRAINAGE EXHIBIT

SHEET #

DR2

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Steamboat Springs, CO 80487
(970)-871-6772
www.fourpointsse.com

No.	DATE	REVISIONS	INT
1	5/28/25	PER DRT COMMENTS	CFB

FUTURE EXPANSION PARCEL RIVERFRONT PARK FILING NO. 2

1940 BRIDGE LANE
STEAMBOAT SPRINGS, CO 80487

Horizontal Scale

0 20' 40'

SCALE: 1" = 20'

Contour Interval = 2 ft

DATE: 12-30-2024
JOB #: 2349-002
DRAWN BY: MDM
DESIGN BY: CFB
REVIEW BY: FPSE

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

DRAWING:

EXISTING DRAINAGE EXHIBIT

SHEET #

DR1

PARKING CALCULATIONS:

CDC TABLE 300-1

MULTIFAMILY RESIDENTIAL PARKING REQUIREMENTG: <2,000 SF: 1.5 PER DWELLING UNIT

TOTAL DWELLING UNITS: 15

REQUIRED PARKING SPACES: 15*1.5 = **23 SPACES**

PROPOSED PARKING SPACES: **34 SPACES**

* PARKING ALONG BRIDGE LANE NOT INCLUDED. 24 SPACES MAINTAINED ALONG BRIDGE LANE.

FOUND NO. 5 REBAR 1FT BELOW GROUND

FOUND 1 ½" YELLOW PLASTIC CAP ON NO 4 REBAR, PLS 16394 FLUSH TO GROUND

L=7.90 R=60.00

L=24.69 R=60.00

L=19.86 R=60.00

TRAIL EASEMENT PER RECEPTION NO. 491870

18" CMP CULVERT

LANDSCAPE ROCK

IRRIGATION CONTROL VALVE

ELEC, TELE AND FIBER PEDS

AIRSPACE EASEMENT FOR THE FUTURE EXPANSION PARCELS PER RIVERFRONT PARK FILING NO. 2

(5) 10'X20 SPACES

S16° 15' 42"E 157.76

1" CURB STOP

UNIT 27 RIVERFRONT FILING NO. 3

RESTRIPE (7) 9'X20' SPACES

S31° 26' 51"E 70.20

6" SEWER SERVICE, TYP

HEATED EX CONC PAVING

DEMOLISH CONCRETE TO CREATE LANDSCAPING ISLAND, TYP

CORE TRAIL

SSMH

DITCH FL

SOUTH LINE OF SEWER EASEMENT PER BOOK 572 PAGE 384

SOUTH LINE OF TRAIL EASEMENT PER RECEPTION NO. 491870

CONC WALK CONNECTION W/ CORE TRAIL

N51° 56' 29"W 638.16

LOT 1 PETRILLO SUBDIVISION RECEPTION NO. 491870

MAIL CLUSTER BOX

BIKE RACK

VAN ACCESSIBLE ADA SPACE

(2) 3 YARD DUMPSTERS AND (2) 96 GALLONS BINS, 50% RECYCLING. SEE DETAIL FOR DUMSTER ENCLOSURE.

COVERED PARKING ROOF OVERHANG

RELOCATED BOILER BUILDING

NATURAL GAS METER

BOILER BUILDING FOR SNOWMELT SYSTEM

B1-1

B1-2

B1-3

B2-1

B2-2

B2-3

B2-4

B3-1

B3-2

B3-3

B3-4

B3-5

B4-1

B4-2

B4-3

FUTURE EXPANSION PARCEL, RIVERFRONT PARK FILING NO. 2 2.17 ACRES

(4) 9'X20' SPACES

(6) 9'X18' COVERED SPACES

(8) 9'X20' COVERED SPACES

CATCH CURB

ACCESS CL. SEE PROFILE C5

RELOCATED FH 154.C.4

RELOCATED MH 54A.4

6" SEWER SERVICE, TYP

8" SEWER MAIN

2" CURB STOP

ADA SPACE

4" FIRE SUPPRESSION LINE

(6) 9'X18' SPACES

REMOVE STRIPING (2) TANDEM PARKING SPACES

8" WATER MAIN

MH 54A.3

WATER QUALITY POND

CONC WALK

50' HIGH WATER SETBACK

ASPEN TREES, TYP

N28° 57' 02"W 90.55

S74° 14' 10"W 45.12

LCE 14

LCE 13

LCE 12

LCE 11

LCE 10

LCE 9

LCE 8

LCE 7

LCE 6

LCE 5

LCE 4

N12° 39' 47"W 40.09

N76° 10' 48"E 70.06

S74° 52' 53"E 68.95

N20° 54' 48"E 17.32

N69° 05' 35"E 86.55

N61° 02' 58"E 109.44

S68° 49' 50"W 91.62

S73° 18' 03"W 79.60

S77° 14' 03"W 72.91

N87° 34' 08"W 122.44

S47° 59' 22"W 6.45

S26° 45' 16"E 29.52

30.32

S47° 59'

OPEN SPACE AND PRIVATE USE ONLY RIVERFRONT PARK FILING NO. 1 (TO BE DEDICATED AS PUBLIC RIVER ACCESS)

8' WIDE TRAIL EASEMENT TO BE DEDICATED TO THE CITY OF STEAMBOAT SPRINGS BY GRANT OF EASEMENT

ORDINARY HIGH WATER LINE

FEMA FLOODWAY TO SOUTH AND EAST OF LINE PER PANEL 08107C0876D

YAMPA RIVER

UNIT 24 RIVERFRONT FILING NO. 3

UNIT 26 RIVERFRONT FILING NO. 3

UNIT 25 RIVERFRONT FILING NO. 3

UNIT 22 RIVERFRONT FILING NO. 3

UNIT 23 RIVERFRONT FILING NO. 3

BUILDING NO. 1 1955 BRIDGE LANE

COMMON AREA RIVERFRONT PARK FILING NO. 3 0.42 ACRES

COMMON AREA RIVERFRONT PARK FILING NO. 1 0.54 ACRES

COMMON AREA RIVERFRONT PARK FILING NO. 2 0.28 ACRES

FEMA FLOODWAY TO SOUTH AND EAST OF LINE PER PANEL 08107C0876D

18" HDPE STORM SEWER

15" HDPE STORM SEWER

6" FIRE SUPPRESSION LINE

INLET, TYP

EOC

EOA

IPA WIDTH

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No.	DATE	REVISIONS	INT

FUTURE EXPANSION PARCEL RIVERFRONT PARK FILING NO. 2

1940 BRIDGE LANE
STEAMBOAT SPRINGS , CO 80487

Horizontal Scale

0 20' 40'

SCALE: 1" = 20'

Contour Interval = 2 ft

DATE: 5-13-2025
JOB #: 2349-002
DRAWN BY: CFB
DESIGN BY: CFB
REVIEW BY:

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

DRAWING: SITE PLAN

SHEET #

C3

Appendix B: Basin Runoff Calculations and USDA Web Soil Survey

RATIONAL METHOD RUNOFF ANALYSIS

Job #	2349-002	Date:	December 12, 2024
Job Name	Riverfront Parrk	Revised:	May 14, 2025
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	1.02	2%	C	Surface Imperviousness	0.02	Surface Imperviousness	0	Land Surface	Paved Areas and Shallow Swales	Minimum	1.25 YR	0.07	1.1	1.04	0.08
Asphalt Parking & Walkways	0.02	100%		Length, ft	205	Length, ft	0	Length, ft	0	Tc, min	2-YR	0.07	1.6	1.04	0.11
Roof	0.00	90%	P2	Slope, percent	4.0000	Slope, percent	1.0000	Slope, ft/ft	1.0000	5.0	5-YR	0.18	2.4	1.04	0.43
Gravel	0.00	80%	1.4	Runoff Coefficient	0.162	Runoff Coefficient	0.15	Conveyance Coefficient	20	Final	10-YR	0.27	3.0	1.04	0.85
Other	0.00	0%						Velocity, ft/s	20.0	Tc, min	25-YR	0.39	3.9	1.04	1.56
	1.04	4%		Ti, min=	15.2	Ti, min=	0.0	Tt, min=	0.0	**15.2**	**100-YR**	**0.51**	**5.2**	**1.04**	**2.77**
	1.04														

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	0.30	2%	C	Surface Imperviousness	0.02	Surface Imperviousness	0	Land Surface	Grassed Waterways	Minimum	1.25 YR	0.10	1.2	0.32	0.04
Asphalt Parking & Walkways	0.02	100%		Length, ft	50	Length, ft	0	Length, ft	250	Tc, min	2-YR	0.10	1.7	0.32	0.05
Roof	0.00	90%	P2	Slope, percent	7.0000	Slope, percent	1.0000	Slope, ft/ft	0.0020	5.0	5-YR	0.20	2.6	0.32	0.17
Gravel	0.00	80%	1.4	Runoff Coefficient	0.162	Runoff Coefficient	0.15	Conveyance Coefficient	15	Final	10-YR	0.29	3.3	0.32	0.31
Other	0.00	0%						Velocity, ft/s	0.7	Tc, min	25-YR	0.41	4.3	0.32	0.55
	0.32	8%		Ti, min=	6.2	Ti, min=	0.0	Tt, min=	6.2	**12.5**	**100-YR**	**0.53**	**5.7**	**0.32**	**0.96**
	0.32														

Developed Basin 1 (DB1) - Developed

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	0.46	2%	C	Surface Imperviousness	1	Surface Imperviousness	1	Land Surface	Paved Areas and Shallow Swales	Minimum	1.25 YR	0.39	1.7	1.17	0.79
Asphalt Parking & Walkways	0.30	100%		Length, ft	90	Length, ft	0	Length, ft	90	Tc, min	2-YR	0.39	2.5	1.17	1.14
Roof	0.39	90%	P2	Slope, percent	0.8600	Slope, percent	1.0000	Slope, ft/ft	0.0050	5.0	5-YR	0.44	3.7	1.17	1.93
Gravel	0.02	80%	1.4	Runoff Coefficient	0.9	Runoff Coefficient	0.9	Conveyance Coefficient	20	Final	10-YR	0.50	4.7	1.17	2.75
Other	0.00	0%						Velocity, ft/s	1.4	Tc, min	25-YR	0.56	6.1	1.17	3.99
	1.17	58%		Ti, min=	3.6	Ti, min=	0.0	Tt, min=	1.1	**5.0**	**100-YR**	**0.63**	**8.2**	**1.17**	**5.96**

Sub-basin 1 (SB1) - Developed

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	0.32	2%	C	Surface Imperviousness	1	Surface Imperviousness	1	Land Surface	Paved Areas and Shallow Swales	Minimum	1.25 YR	0.41	1.7	0.87	0.62
Asphalt Parking & Walkways	0.24	100%		Length, ft	90	Length, ft	0	Length, ft	90	Tc, min	2-YR	0.41	2.5	0.87	0.89
Roof	0.29	90%	P2	Slope, percent	0.8600	Slope, percent	1.0000	Slope, ft/ft	0.0050	5.0	5-YR	0.46	3.7	0.87	1.48
Gravel	0.02	80%	1.4	Runoff Coefficient	0.9	Runoff Coefficient	0.9	Conveyance Coefficient	20	Final	10-YR	0.51	4.7	0.87	2.10
Other	0.00	0%						Velocity, ft/s	1.4	Tc, min	25-YR	0.57	6.1	0.87	3.02
	0.87	60%		Ti, min=	3.6	Ti, min=	0.0	Tt, min=	1.1	**5.0**	**100-YR**	**0.63**	**8.2**	**0.87**	**4.49**

Sub-basin 2 (SB2) - Developed

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	0.09	2%	C	Surface Imperviousness	1	Surface Imperviousness	0.02	Land Surface	Paved Areas and Shallow Swales	Minimum	1.25 YR	0.29	1.7	0.16	0.08
Asphalt Parking & Walkways	0.03	100%		Length, ft	24	Length, ft	18	Length, ft	0	Tc, min	2-YR	0.29	2.5	0.16	0.12

RATIONAL METHOD RUNOFF ANALYSIS

Job #	2349-002	Date:	December 12, 2024
Job Name	Riverfront Parrk	Revised:	May 14, 2025
Designed by:	MDM		

Roof	0.04	90%	P2	Slope, percent	2.0000	Slope, percent	12.0000	Slope, ft/ft	1.0000	5.0	5-YR	0.36	3.7	0.16	0.21
Gravel	0.00	80%	1.4	Runoff Coefficient	0.9	Runoff Coefficient	0.162	Conveyance Coefficient	20	Final	10-YR	0.43	4.7	0.16	0.32
Other	0.00	0%						Velocity, ft/s	20.0	Tc, min	25-YR	0.50	6.1	0.16	0.49
	0.16	42%		Ti, min=	1.4	Ti, min=	3.1	Tt, min=	0.0	**5.0**	**100-YR**	**0.59**	**8.2**	**0.16**	**0.77**

Sub-basin 3 (SB3) - Developed

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	0.05	2%	C	Surface Imperviousness	1	Surface Imperviousness	1	Land Surface	Paved Areas and Shallow Swales	Minimum	1.25 YR	0.41	1.7	0.14	0.10
Asphalt Parking & Walkways	0.03	100%		Length, ft	50	Length, ft	0	Length, ft	0	Tc, min	2-YR	0.41	2.5	0.14	0.14
Roof	0.06	90%	P2	Slope, percent	3.0000	Slope, percent	1.0000	Slope, ft/ft	1.0000	5.0	5-YR	0.46	3.7	0.14	0.24
Gravel	0.00	80%	1.4	Runoff Coefficient	0.9	Runoff Coefficient	0.9	Conveyance Coefficient	20	Final	10-YR	0.51	4.7	0.14	0.34
Other	0.00	0%						Velocity, ft/s	20.0	Tc, min	25-YR	0.57	6.1	0.14	0.49
	0.14	61%		Ti, min=	1.8	Ti, min=	0.0	Tt, min=	0.0	**5.0**	**100-YR**	**0.64**	**8.2**	**0.14**	**0.73**

Developed Basin 2 (DB2)

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	0.20	2%	C	Surface Imperviousness	0.02	Surface Imperviousness	1	Land Surface	Paved Areas and Shallow Swales	Minimum	1.25 YR	0.06	1.7	0.20	0.02
Asphalt Parking & Walkways	0.00	100%		Length, ft	50	Length, ft	0	Length, ft	0	Tc, min	2-YR	0.06	2.5	0.20	0.03
Roof	0.00	90%	P2	Slope, percent	16.0000	Slope, percent	1.0000	Slope, ft/ft	0.0050	5.0	5-YR	0.16	3.7	0.20	0.12
Gravel	0.00	80%	1.4	Runoff Coefficient	0.162	Runoff Coefficient	0.9	Conveyance Coefficient	20	Final	10-YR	0.26	4.7	0.20	0.25
Other	0.00	0%						Velocity, ft/s	1.4	Tc, min	25-YR	0.38	6.1	0.20	0.46
	0.20	2%		Ti, min=	4.7	Ti, min=	0.0	Tt, min=	0.0	**5.0**	**100-YR**	**0.51**	**8.2**	**0.20**	**0.83**

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

Future Expansion Parcel

December 16, 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.

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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: 1:1,540 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 20 40 80 120

Feet
0 50 100 200 300

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 14, Aug 29, 2024

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
49A	Slocum loam, gravelly substratum, 0 to 3 percent slopes	3.5	74.7%
W	Water	1.2	25.3%
Totals for Area of Interest		**4.6**	**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

49A—Slocum loam, gravelly substratum, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: k0g8
Elevation: 6,490 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

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

Description of Slocum, Gravelly Substratum

Setting

Landform: Flood plains
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Alluvium derived from igneous and sedimentary rock

Typical profile

Oi - 0 to 2 inches: slightly decomposed plant material
A - 2 to 23 inches: loam
Bw - 23 to 30 inches: loam
Cg - 30 to 35 inches: loamy fine sand
2C - 35 to 59 inches: extremely cobbly sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.71 to 2.13 in/hr)
Depth to water table: About 18 to 35 inches
Frequency of flooding: Rare
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: Moderate (about 7.0 inches)

Interpretive groups

Land capability classification (irrigated): 5c
Land capability classification (nonirrigated): 5c
Hydrologic Soil Group: B/D
Ecological site: R048AY241CO - Mountain Meadow
Hydric soil rating: No

Minor Components

Venable

Percent of map unit: 5 percent
Landform: Flood plains

Down-slope shape: Linear
Across-slope shape: Concave
Ecological site: R048AY241CO - Mountain Meadow
Hydric soil rating: Yes

W—Water

Map Unit Composition

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

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Appendix C: Detention Calculations

Design Procedure Form: 5 Year Detention Pond Calculations

	Designer:	**Matthew McLeod**								
	Company:	**FOUR POINTS**								
	Date:	**1/3/2025**								
	Revised:	**5/14/2025**								
	Project:	**Riverfront Park - East Side - 1940 Bridge Lane, Steamboat Springs**								
	Location:	**SB1**								
		5 Year Detention Pond								
			Area	0.87	acres					
			Allowable Release Rate Major Storm							
			(0.10 cfs/acre) * A		=	0.087	(from table 5.11.1)			
			C_5	0.46			(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		444.222		(from equation 5.11.1)			
					444	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							
			418	ft^3	0.0096	acre-ft				
			Depth	3	ft					
			Area	139.374	139	sq-ft				

Design Procedure Form: 100 Year Detention Pond Calculations

	Designer:	**MDM**								
	Company:	**FOUR POINTS**								
	Date:	**1/3/2025**								
	Revised	**5/14/2025**								
	Project:	**Riverfront Park - East Side - 1940 Bridge Lane, Steamboat Springs**								
	Location:	**SB1**								
		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}	0.63			(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		1348.326		(from equation 5.11.1)			
					1348	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							
			1207	ft^3	0.0277	acre-ft				
			Depth	3	ft					
			Area	402.462	402	sq-ft				
			Width	25	ft					
			Length	46	ft					

Discharge Rates for Major and Minor Storms

Designer: Matthew McLeod
Company: Four Points
Date: 1/3/2025
Revised: 5/14/2025
Project: Riverfront Park - East Side - 1940 Bridge Lane, Steamboat Springs
Location: SB1

Orifice Plate Size for Minor Storm

Area of Orifice Plate=	0.014	sq-ft
C_d	0.65	
Diameter of Opening	0.132	ft
	0.59	**in**
Depth of surface(major)	1.5	ft
Flow line of Orifice Plate	6667.11	
Discharge for Minor Storm Headwater		
Q=CdA(2gh)^(1/2)	0.09	cfs
Q_{wier}	0.38	cfs

Orifice Plate Size for Major Storm

Area of Orifice Plate=	0.07	sq-ft
Diameter of Opening	0.306	ft
	3.67	**in**

Appendix D: Drainage Channel and Culvert Calculations

Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, Jan 9 2025

Grass Lined Swale at DP2

Triangular

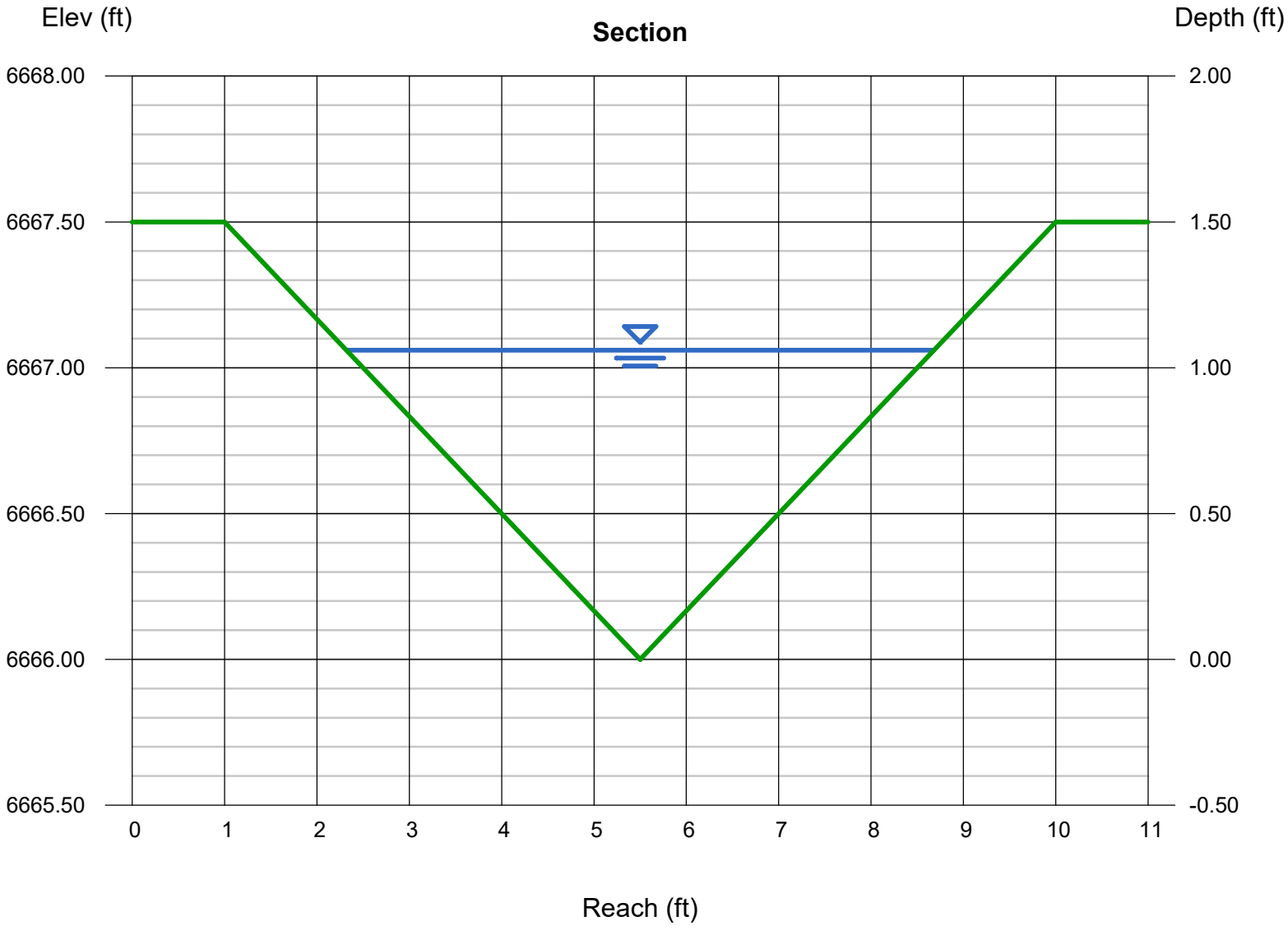
Side Slopes (z:1)	= 3.00, 3.00
Total Depth (ft)	= 1.50
Invert Elev (ft)	= 6666.00
Slope (%)	= 0.30
N-Value	= 0.220

Calculations

Compute by:	Known Q
Known Q (cfs)	= 0.77

Highlighted

Depth (ft)	= 1.06
Q (cfs)	= 0.770
Area (sqft)	= 3.37
Velocity (ft/s)	= 0.23
Wetted Perim (ft)	= 6.70
Crit Depth, Yc (ft)	= 0.34
Top Width (ft)	= 6.36
EGL (ft)	= 1.06



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Wednesday, May 7 2025

Grass Lined Swale at DP4

Trapezoidal

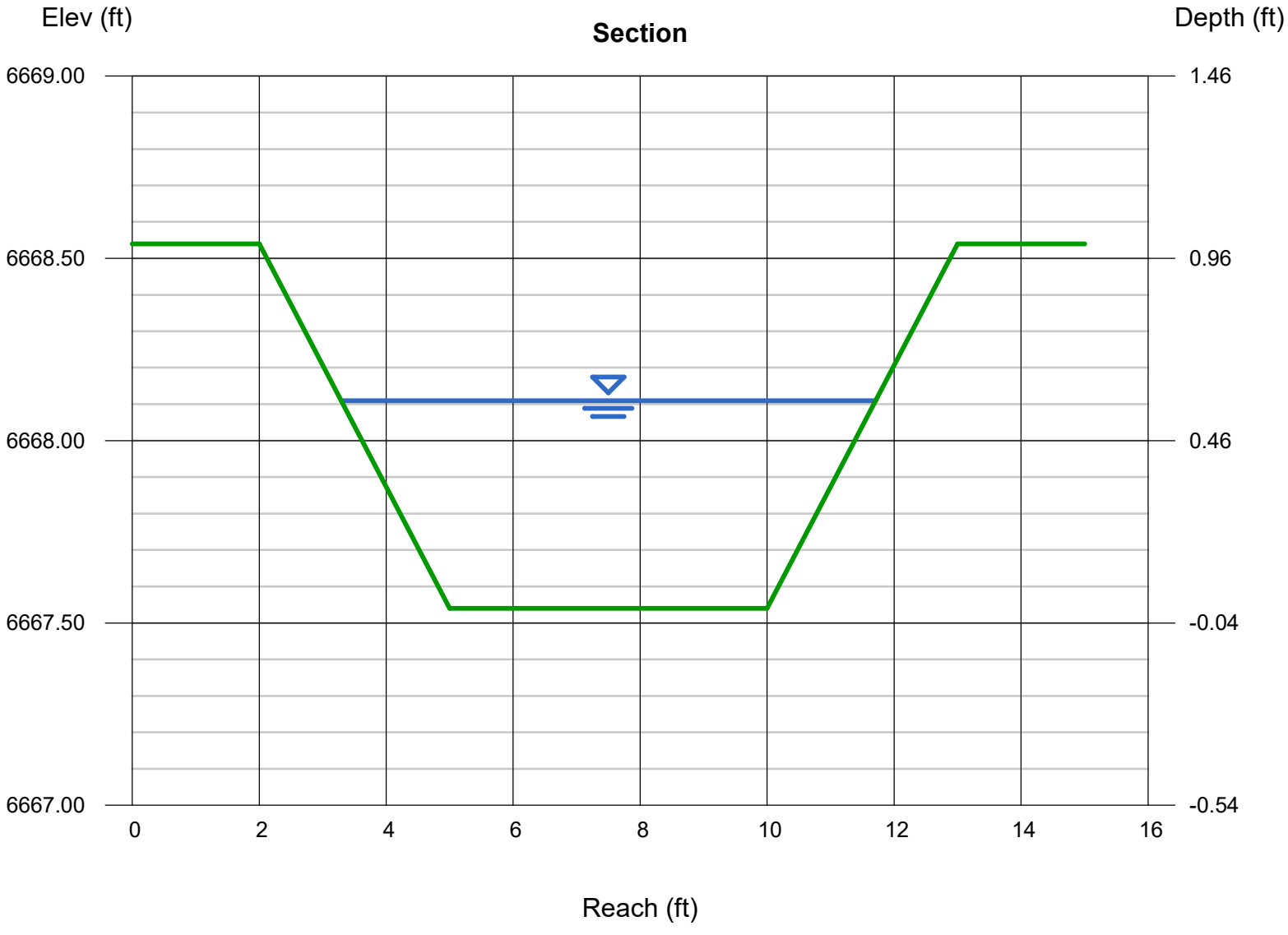
Bottom Width (ft)	= 5.00
Side Slopes (z:1)	= 3.00, 3.00
Total Depth (ft)	= 1.00
Invert Elev (ft)	= 6667.54
Slope (%)	= 1.00
N-Value	= 0.220

Calculations

Compute by:	Known Q
Known Q (cfs)	= 1.48

Highlighted

Depth (ft)	= 0.57
Q (cfs)	= 1.480
Area (sqft)	= 3.82
Velocity (ft/s)	= 0.39
Wetted Perim (ft)	= 8.60
Crit Depth, Yc (ft)	= 0.14
Top Width (ft)	= 8.42
EGL (ft)	= 0.57



Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, May 29 2025

Circular Culvert

Invert Elev Dn (ft)	=	6663.81
Pipe Length (ft)	=	58.77
Slope (%)	=	0.51
Invert Elev Up (ft)	=	6664.11
Rise (in)	=	18.0
Shape	=	Circular
Span (in)	=	18.0
No. Barrels	=	1
n-Value	=	0.012
Culvert Type	=	Circular Corrugate Metal Pipe
Culvert Entrance	=	Headwall
Coeff. K,M,c,Y,k	=	0.0078, 2, 0.0379, 0.69, 0.5

Embankment

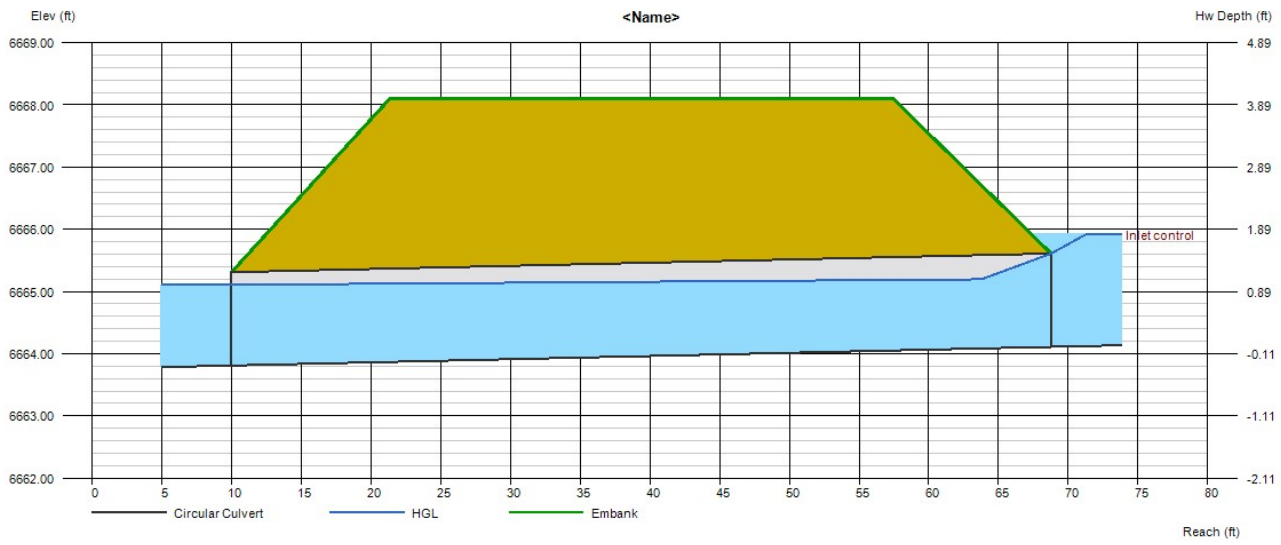
Top Elevation (ft)	=	6668.11
Top Width (ft)	=	36.00
Crest Width (ft)	=	10.80

Calculations

Qmin (cfs)	=	8.00
Qmax (cfs)	=	8.00
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	8.00
Qpipe (cfs)	=	8.00
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	4.92
Veloc Up (ft/s)	=	5.79
HGL Dn (ft)	=	6665.11
HGL Up (ft)	=	6665.21
Hw Elev (ft)	=	6665.92
Hw/D (ft)	=	1.21
Flow Regime	=	Inlet Control



Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, May 29 2025

12 IN CMP

Invert Elev Dn (ft)	=	6665.20
Pipe Length (ft)	=	10.00
Slope (%)	=	2.00
Invert Elev Up (ft)	=	6665.40
Rise (in)	=	12.0
Shape	=	Circular
Span (in)	=	12.0
No. Barrels	=	1
n-Value	=	0.012
Culvert Type	=	Circular Corrugate Metal Pipe
Culvert Entrance	=	Projecting
Coeff. K,M,c,Y,k	=	0.034, 1.5, 0.0553, 0.54, 0.9

Embankment

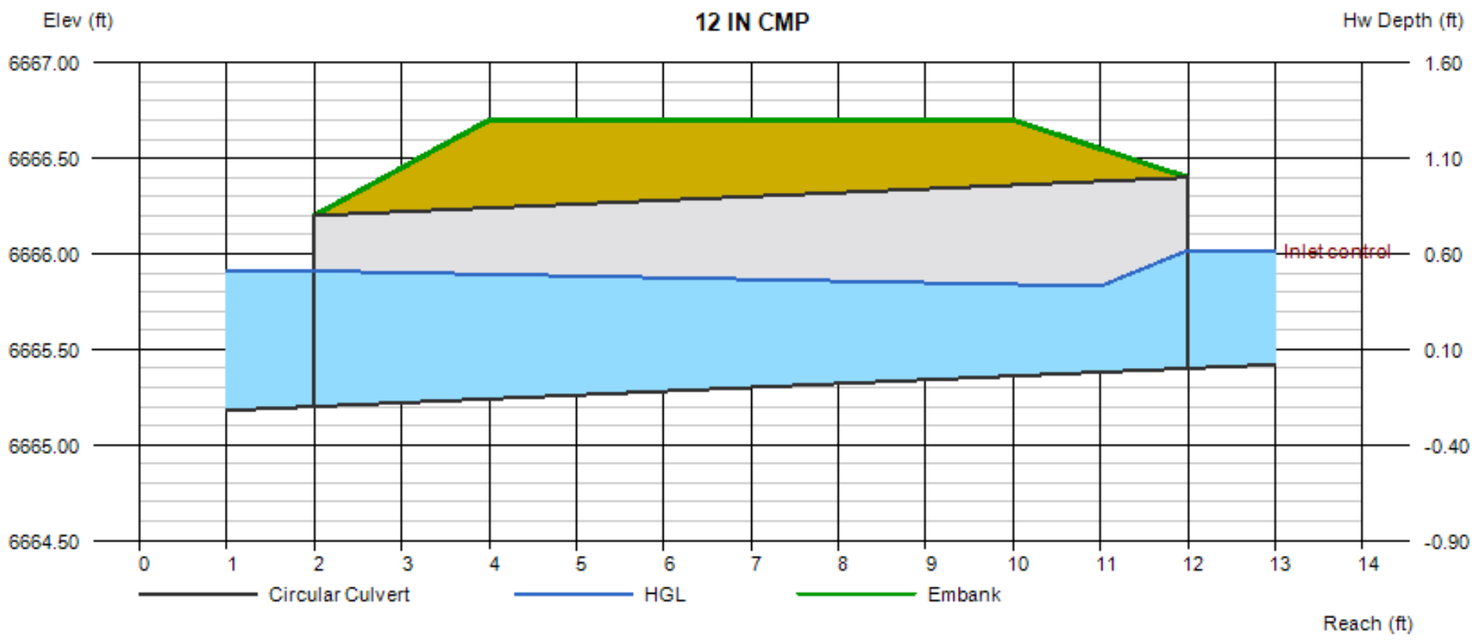
Top Elevation (ft)	=	6666.70
Top Width (ft)	=	6.00
Crest Width (ft)	=	2.00

Calculations

Qmin (cfs)	=	1.00
Qmax (cfs)	=	2.00
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	1.00
Qpipe (cfs)	=	1.00
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	1.68
Veloc Up (ft/s)	=	3.17
HGL Dn (ft)	=	6665.91
HGL Up (ft)	=	6665.82
Hw Elev (ft)	=	6666.02
Hw/D (ft)	=	0.62
Flow Regime	=	Inlet Control



Appendix E: Water Quality – Sand Filter Calculations

Design Procedure Form: Sand Filter (SF)

UD-BMP (Version 3.07, March 2018) **Sheet 1 of 2**

Designer:	**Matthew McLeod, PE**
Company:	**Four Points Surveying and Engineering**
Date:	**May 29, 2025**
Project:	**Bridge Lane Condominiums**
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 = 60.0 %

B) Tributary Area's Imperviousness Ratio ($i = I_a/100$): i = 0.600

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 = 0.19 watershed inches

D) Contributing Watershed Area (including sand filter area): Area = 38,000 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): $V_{WQCV\ USER}$ = 1,207 cu ft

2. Basin Geometry

A) WQCV Depth: D_{WQCV} = 3.0 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} = 285 sq ft

D) Actual Filter Area: A_{Actual} = 285 sq ft

E) Volume Provided: V_T = 1210 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} = 1,207 cu ft

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

Design Procedure Form: Sand Filter (SF)

Designer: Matthew McLeod, PE
Company: Four Points Surveying and Engineering
Date: May 29, 2025
Project: Bridge Lane Condominiums
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:

TSS Removal

BMP Designation SB2 Grass Lined Swale

Event Mean TSS Per Table 5.12.3

140 mg/L

Variable	Value	Unit	
n	3	-	(Turbulance Factor: 1=bad, 5=good)
V_s	0.0059	ft/sec	(Settling Velocity of Particles)
Q	0.14	ft^3/sec	(Applied Flow Rate, 1.25 Yr Peak Flow)
A	9500	ft^2	(Area of Treatment)
R	**1.00**	-	(Fraction of solids removed)

TSS Concentration After Treatment

0.00 mg/L Min 80% Removal of Event Mean TSS

Table 5.12.3. Event Mean TSS Concentrations in Urban Runoff by Land Use

Land Use	Event Mean TSS (mg/L)	Land Use	Event Mean TSS (mg/L)
High Density Residential*	140	Municipal	140
All Other Residential	120	Commercial	140
Transportation	135	Industrial	150
Open Space**	80	Institutional	120

*High Density Residential includes RR, MF, T4, T5, and any mixed use that includes residential

**Open Space value from query of results from International Stormwater Database Query Builder Tool for median value TSS (mg/L) from data points identified as open space from all EPA rain zones

$$R = 1 - \left[1 + \frac{1}{n} * \frac{V_s}{Q/A}\right]^{-n} \quad (2)$$

Where:

R = fraction of solids removed

V_s = settling velocity of particles

Q/A = rate of applied flow divided by surface area

n = turbulence parameter

The turbulence factor offers a way to factor in poor performance caused by turbulence and short circuiting, with n=1 representing very poor performance and n=5 or more indicating very good performance. With n equal to infinity, removal efficiency is linked to detention time. This equation is useful in areas without enough relief to drain a pond that could hold the entire WQCV, or to design basins in series or those receiving inflow that may have already been partially treated by a different type of upstream treatment facility.

Particle settling velocity is calculated as the submerged weight of a particle minus the drag. This calculation requires the minimum particle size of interest be specified. It also requires the viscosity of water, which varies with temperature. For the TSS design standard a spherical particle with a diameter of 60 microns may be assumed. A water temperature of 40 degrees Fahrenheit may be assumed, having a viscosity of 1.664×10^{5} ft^2/s.

Given the site effluent TSS concentration from Table 5.12.3, an appropriate treatment train composed of any types of permanent treatment facilities discussed herein may be designed using the equation above to achieve the TSS goal concentration of 30 mg/L. Grass buffers and grass swales are especially helpful at the upstream end of a treatment train. Each of the treatment facilities in the treatment train must include physical components in accordance with these standards and with the manufacturer's recommendations for permeable pavement, if applicable. An example calculation of a treatment train is included as Appendix B to this section.

Design Procedure Form: Grass Swale (GS)

UD-BMP (Version 3.07, March 2018) **Sheet 1 of 1**

Designer: Matthew McLeod, P.E.
Company: Four Points Surveying and Engineering
Date: May 29, 2025
Project: Bridge Lane Condominiums
Location: Grass Swale SB2

1. Design Discharge for 2-Year Return Period	Q_2 = 0.12 cfs
2. Hydraulic Residence Time	
A) : Length of Grass Swale	L_S = 240.0 ft
B) Calculated Residence Time (based on design velocity below)	T_{HR} = 4.4 minutes
3. Longitudinal Slope (vertical distance per unit horizontal)	
A) Available Slope (based on site constraints)	S_{avail} = 0.300 ft / ft
B) Design Slope	S_D = 0.300 ft / ft
4. Swale Geometry	
A) Channel Side Slopes (Z = 4 min., horiz. distance per unit vertical)	Z = 3.00 ft / ft **TOO STEEP (< 4)**
B) Bottom Width of Swale (enter 0 for triangular section)	W_B = 0.00 ft
5. Vegetation	Choose One: ○ Grass From Seed ◉ Grass From Sod
A) Type of Planting (seed vs. sod, affects vegetal retardance factor)	
6. Design Velocity (0.8 ft / s maximum for desirable 5-minute residence time)	V_2 = 0.91 ft / s
7. Design Flow Depth (1 foot maximum)	D_2 = 0.21 ft
A) Flow Area	A_2 = 0.1 sq ft
B) Top Width of Swale	W_T = 1.3 ft
C) Froude Number (0.50 maximum)	F = 0.49
D) Hydraulic Radius	R_H = 0.10
E) Velocity-Hydraulic Radius Product for Vegetal Retardance	VR = 0.09
F) Manning's n (based on SCS vegetal retardance curve D for sodded grass)	n = 0.200
G) Cumulative Height of Grade Control Structures Required	H_D = 0.00 ft
8. Underdrain (Is an underdrain necessary?)	Choose One: ○ YES ◉ NO
9. Soil Preparation (Describe soil amendment)	
10. Irrigation	Choose One: ◉ Temporary ○ Permanent

Notes:

Appendix F: Water Quality O&M Plan

PROPOSED WATER QUALITY FEATURES FOR BRIDGE LANE CONDOMINIUMS OWNERSHIP AND MAINTENANCE PLAN

1. GENERAL PROJECT INFORMATION

A. BRIDGE LANE CONDOMINIUMS, 1940 AND 1960 BRIDGE LANE, STEAMBOAT SPRINGS, ROUTT COUNTY, COLORADO.

2. GENERAL FACILITY DESCRIPTION

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

3. INSPECTION & MAINTENANCE FREQUENCY & PROCEDURE

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

REQUIRED ACTION	MAINTENANCE OBJECTIVE	FREQUENCY OF ACTION
DEBRIS & LITTER REMOVAL	REMOVE DEBRIS AND LITTER FROM THE FOREBAY, POND AND RIP RAP OVERFLOW SWALE 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, POND AND UNDERDRAIN	ROUTINE – THE SEDIMENT ACCUMULATIONS WILL NEED TO BE 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, UNDERDRAIN, LOW FLOW CHANNEL LINERS AND RIP RAP	NONROUTINE – REPAIR OR REPLACE 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

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

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 0.01 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 SWALE 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: CORE TRAIL AND BRIDGE LANE

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

FLOWRATES POND (CFS)

B.A.	DESIGN EVENT (1.25 YEAR)	0.62	CFS
B.B.	MINOR EVENT (5-YEAR)	1.48	CFS
B.C.	MAJOR EVENT (100-YEAR)	4.49	CFS

FLOWRATES SWALE (CFS)

B.A.	DESIGN EVENT (1.25 YEAR)	0.08	CFS
B.B.	MINOR EVENT (5-YEAR)	0.21	CFS
B.C.	MAJOR EVENT (100-YEAR)	0.77	CFS

8. SENSITIVE AREA, WETLANDS & PERMITS

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

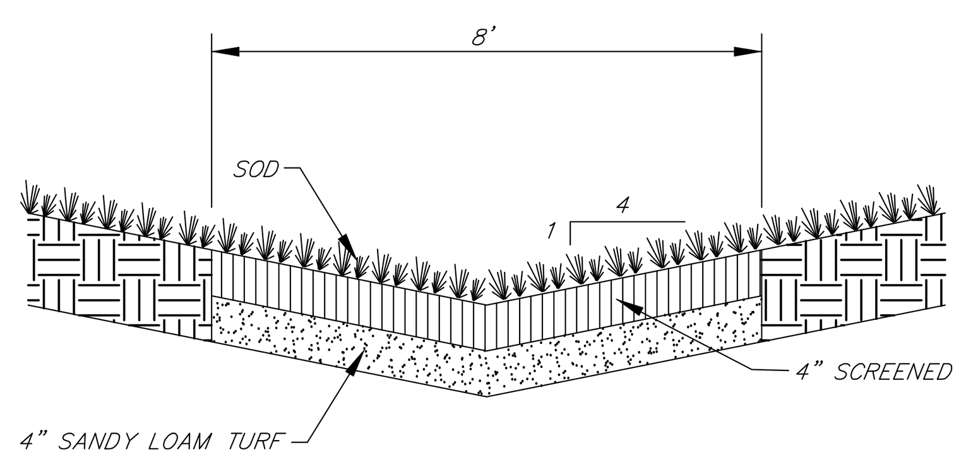
MAINTENANCE NOTES

PROTECTION

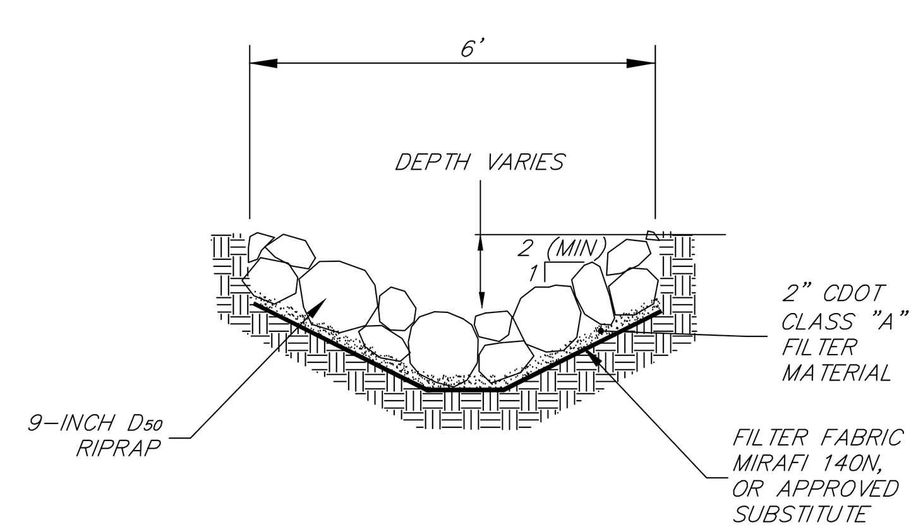
SUGGESTED O&M: PROTECT POND FROM FUTURE CONSTRUCTION ACTIVITIES. KEEP FREE OF OBSTRUCTIONS AND EXCESSIVE USE.

NOTE:

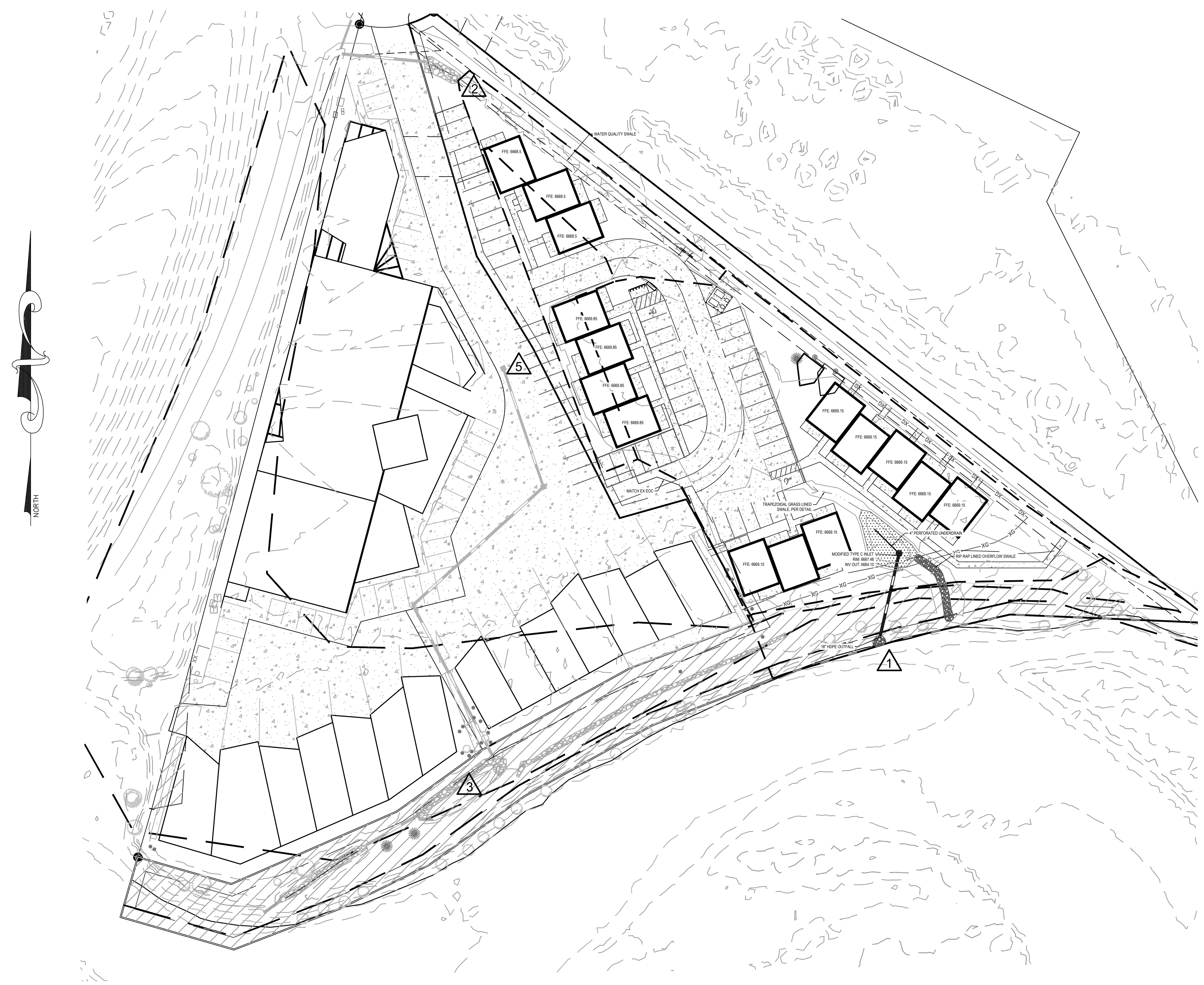
THE PROPERTY OWNER OR MANAGER SHALL BE RESPONSIBLE FOR OPERATION AND MAINTENANCE ACTIVITIES.



GRASS-LINED SWALE
N.T.S.



RIP-RAP LINED OVERFLOW SWALE SECTION DETAIL
N.T.S.



FOUR POINTS SURVEYING ENGINEERING
410 S. Lincoln Ave, Unit 15
P.O. Box 775966
Steamboat Springs, CO 80487
(970)-871-6772
www.fourpointsse.com

No.	DATE	REVISIONS	INT
1	5/14/25	PER DRT COMMENTS	CFB

FUTURE EXPANSION PARCEL RIVERFRONT PARK FILING NO. 2
1940 BRIDGE LANE
STEAMBOAT SPRINGS , CO 80487

Horizontal Scale
0 20' 40'
SCALE: 1" = 20'
Contour Interval = 2 ft
DATE: 1-9-2025
JOB #: 2349-002
DRAWN BY: MDM
DESIGN BY: CFB
REVIEW BY: FPSE

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

DRAWING: OPERATIONS AND 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.
__x__ 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
_n/a_ 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
__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

_n/a_ 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.
_n/a_ 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.).
__x__ 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.
__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, P.E._____ __1/3/25__
Date

Attach Exhibit A – 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.
n/a 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).

n/a 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 1-3-2024
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: Bridge Land Condominiums	
Project Location: 1940 and 1960 Bridge Lane, Steamboat Springs, CO	
Submitted Date: January 2025	Submitted By: Four Points Surveying and Engineering
Acreage Disturbed: ~1.2 acres	
Existing Impervious: 4%	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:

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	1230 cu. ft.	0.87 acres	See drainage exhibit. SE corner of property.
Pollutant Removal	min 80%	.22 acres	See drainage report. North side of property, replaces existing swale
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: Bridge Lane Condominiums			
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 (SF) and Grass Lined Swale	Facility Location: SF-Southeast corner of Lot, Swale-North side 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):	
		Provide explanation of why the excluded area is impractical to treat:	
		Provide explanation of why another facility is not practicable for the untreated area:	

Appendix I: Standard Form No. 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:	RFP Residential - East Side (final name TBD)
Project location:	1940 & 1960 Bridge Lane, Steamboat Springs, CO
Developer name/contact info:	SEAD, 970-871-9101
Drainage engineer name/contact info:	Walter Magill, PE 970-871-1161
Application Type:	Development Plan
Proposed Land Use:	Residential Housing

Project Site Parameters	
Total parcel area (acres):	2.17
Disturbed area (acres):	1.3
Existing impervious area (acres, if applicable):	~2.0
Proposed new impervious area (acres):	~0.7
Proposed total impervious area (acres):	~0.8
Proposed number of project outfalls:	2
Number of additional parking spaces:	±31
Description and site percentage of existing cover/land use(s):	The site has multiple live/work units and work spaces already constructed on the adjacent property. The existing site is vacant with the core trail along the northeast property line.
Description and site percentage of proposed cover/land use(s):	The development will propose residential units dispersed through four buildings with access drive, parking and infrastructure.
Expected maximum proposed conveyance gradient (%):	7%
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:

☐ Drainage Letter
☐ Conceptual Drainage Study
☒ Final Drainage Study
☒ Stormwater Quality Plan

Hydrologic Evaluation:

☒ Rational Method ☐ CUHP/SWMM ☐ HEC-HMS ☐ Other_____

Project Drainage	
Number of subbasins to be evaluated:	3-6
Presence of pass through flow (circle):	YES (NO)
Description of proposed stormwater conveyance on site:	Sheet flow, storm sewer and swales as needed to convey water to the proposed ponds and outfalls.
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:	Various grass swales and culverts, eventually out to Yampa River, which is in close proximity along the southern property line.
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):

☒ 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 through a porous landscape detention pond on site.
Concept-level permanent stormwater treatment facility design details (type, location of facilities, proprietary structure selection, treatment train concept, etc.):	To be determined with final report.
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	12/12/2024	970-819-1161
Prepared By: (Insert drainage engineer name & firm)	Date	Phone number

Approved By:

Printed Name: City Engineer	Date