EMK CONSULTANTS, INC. LAND DEVELOPMENT
ENGINEERING SURVEYING SERVICES AND SOLUTIONS
7006 S. Alton Way, Building F Centennial, Colorado 80112-2019 (303)694-1520 www.EMKC.com

PHASE III DRAINAGE REPORT
FOR
DAWSON TRAILS – FILING 2, AMENDMENT 5

Castle Rock, Colorado
Town of Castle Rock Project CD26-0004

January 22, 2025 (drainage letter)
Revised: January 28, 2026
Revised: April 13, 2026
Revised: May 21, 2026

EMK Job. No. 13477

Prepared For:
ACM Dawson Trails VIII JV LLC
4100 East Mississippi Avenue – Suite 500
Denver, CO 80246
Attention: Lawrence Jacobson
303-748-5466
ljacobson@westsideinv.com

Prepared By:
EMK Consultants, Inc.
7006 S. Alton Way, Bldg F
Centennial, CO 80112
Contact: Eric R. McDaniel
Phone: (303) 694-1520

TABLE OF CONTENTS

LIST OF APPENDICES

Appendix A – Hydrologic Calculations

Site Location Map
NRCS Soil Map
FEMA FIRM Panel
Rational Method Calculations

Appendix B – Hydraulic Calculations

Inlet Calculations
Hydraulic Grade Line Calculations

Appendix C – Water Quality Enhancement Control

Water Quality Certification Forms

Appendix D – Referenced Information

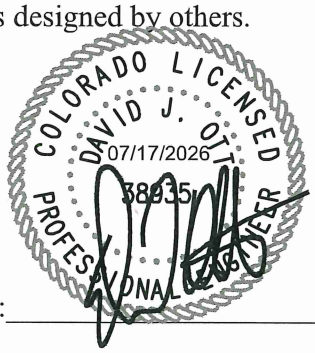
Checklist
Pond C1 Design (by others)
Variance Request

Map Pocket (paper copy) or Electronic Plan Layouts

Developed Layout

CERTIFICATION STATEMENT

I affirm that this report and plan for the Phase III drainage design of Dawson Trails, Filing 2, Amendment 5 was prepared by me (or under my direct supervision) in accordance with the provisions of the Town of Castle Rock Drainage Design and Technical Criteria for the owners thereof. I understand that the Town of Castle Rock does not and will not assume liability for drainage facilities designed by others.



SIGNATURE: _____
David J. Ott
Registered Professional Engineer
State of Colorado No. 38935
For and on behalf of EMK Consultants, Inc.

ACM Dawson Trails VIII JV LLC hereby certifies that the drainage facilities for Dawson Trails Filing 2, Amendment 5 shall be constructed according to the design presented in this report. I understand that the Town of Castle Rock does not and will not assume liability for the drainage facilities designed and/or certified by my engineer, and that the Town of Castle Rock reviews drainage plans pursuant to the Municipal Code; but cannot, on behalf of Dawson Trails Filing 2, Amendment 5, guarantee that final drainage design review will absolve ACM Dawson Trails VIII JV LLC and/or their successors and/or assigns of future liability for improper design."

_____
ACM Dawson Trails VIII JV LLC

_____
Authorized Signature

TOWN OF CASTLE ROCK COLORADO

DEVELOPMENT SERVICES
APPROVED
By jkirkpatrick
on 08/20/2026
APPROVED-CD26-0004-Ph III Drn Rpt.pdf
Record Document on File

I. General Location and Description

The purpose of this drainage report is to document drainage design calculations and decision making for Dawson Trails – Filing 2, Amendment 5 (herein referred to as the site).

A. Site Location

Filing 2, Amendment 5 of Dawson Trails is located west of Interstate 25, just south of the proposed Crystal Valley Interchange. More specifically, it is located in the southwest quarter of Section 22 and northwest Quarter of Section 27, Township 8 South, Range 67 West of the 6th Principal Meridian in the Town of Castle Rock. A site location map is included in Appendix A.

B. Description of Property

The site covers approximately 8.4 acres. Native grasses cover the area which drains to the east towards Plum Creek. NRCS soil maps indicate that the site is covered by Fondis-Kutch soil (HSG C) on the western portions and Sampson Loam (HSG B) on the eastern side. No floodplains or significant geologic features exist on the site.

The proposed land use consists of approximately 100 townhomes and associated amenity space. A sitewide imperviousness of 70% is used for all calculations.

II. Drainage Basins and Sub Basins

A. Major Drainage Basins

The stormwater facilities in this area of Dawson Trails area were previously studied by a Town of Castle Rock in a master plan. The master plan is:

- *Gambel Ridge and Douglas Lane Tributary Watersheds Master Plan,* prepared by RESPEC 2013.

An updated study covering all the overall site drainage is currently being prepared (Castle Rock project number CD23-0045). The Phase III Drainage Report for Dawson Trails Filing No. 2 has been reviewed to aid in the creation of this report.

All runoff from the site discharges to the Gambel Ridge Tributary. Runoff from the site passes through a regional full spectrum Extended Detention Basin (EDB) named Pond C1, constructed in a separate project before discharging into the Gambel Ridge drainage. The Filing 2 Drainage Report (CD23-0045) lists the project area as Basin C1.0 (and in some cases C-1). This basin's peak runoff increases from Q100 = 58.5 cfs without development to Q100 = 137 cfs with development. Basin C1.0 covers 35.2 acres.

B. Minor Drainage Basins

Streets and lots will create minor basins that will be captured in storm sewer. Runoff from the site will be directed via storm sewer towards Pond C1 northeast of the site, which will discharge north into the Gambel Ridge tributary. The drainage map at the end of the report includes peak discharge summaries for each

minor basin. Detailed minor basin descriptions are included in Section V.A – Stormwater Management Facility Design. See Appendix A for hydrologic calculations.

III. Drainage Design Criteria

A. Regulations

Drainage improvements were designed in accordance with the Town of Castle Rock Storm Drainage Design and Technical Criteria Manual (SDDTCM), February 2025. The Mile High Flood District's (MHFD) Urban Storm Drainage Criteria Manual (USDCM), March 2024, was used.

B. Drainage Studies, Master Plans, Site Constraints

The Phase III Drainage Report for Dawson Trails Filing 2 covers the overall site design for this project. This project fits within the framework of Filing 2. In addition, the Filing 2 Amendment 3 project constructs drainage improvements that tie into this project. These improvements are discussed further in section IV.A of this report.

The stormwater facilities in the Dawson Trails area were previously studied by a Town of Castle Rock a master plan. The master plan is:

- *Gambel Ridge and Douglas Lane Tributary Watersheds Master Plan,* prepared by RESPEC 2013.

C. Hydrology

Runoff for the storm sewer design was calculated using the Rational Method. The 5-year storm was used as the minor storm and the 100-yr storm was evaluated for the major storm. See Appendix A for hydrologic calculations. A sitewide imperviousness of 75.3% was calculated using the latest land plan and the latest USDCM imperviousness documentation.

D. Hydraulics

Inlet capacities were calculated using the latest MHFD-Inlet software and nomographs from the SDDTCM.

Storm sewer was designed per section 9.1 of the SDDTCM. Area inlets were placed to intercept street and open space flow as required. A Type 13 inlet is proposed in the street pan at one location to capture trickle flows and prevent icing. No surcharging is allowed during the 5-yr storm. For the 100-yr storm, the 100-yr HGL is maintained a minimum of 1-foot below the surface.

Due to the type of townhome housing product proposed on this site, an inverted crown with pan is proposed. Analysis and explanation included in the appendix shows that these alley type streets meet SDDTCM requirements.

E. Storage and Water Quality Enhancement

Detention and water quality for the site are provided by an extended detention basin (EDB). Regional water quality and detention infrastructure were developed for this area as part of the Crystal Valley Interchange Project. Pond C1 is a full spectrum EDB which will provide water quality, EURV and 100-yr volume.

Water quality Attachment G indicates that permanent water quality is required.

Water quality enhancement can be thought of as a four-step process.

Step 1: Water quality enhancement starts with runoff reduction.

The project will try to reduce imperviousness area as much as possible. This project includes areas designated for parks and greenbelts.

Step 2: Provide detention for water quality capture volume and flood control via full spectrum detention.

Full-spectrum detention helps reduce the negative effects of urban development on flooding and stream degradation by capturing excess urban runoff and slowly releasing it. This helps reduce runoff peaks, improves water quality, and mimics historic runoff rates. This project drains to a full-spectrum detention pond.

Step 3: Implementation of stream stabilization.

This project does not utilize any stream stabilization as there are no streams within the project limits

Step 4: The final step is undertaking source control

This project does not plan on utilizing any source control techniques.

Future residents and management authorities (homeowner's association) will be responsible for implementing water quality control measures. Examples of typical structural and non-structural source control measures to improve water quality are described below.

Structural source control measures can include, but are not limited to:

- Permanent covering of outdoor storage areas
- Spill containment and control (secondary containment, curbing, diking, etc.)
- Proper sanitary sewer connections
- Provision of designated storage and material handling areas
- Provision of proper waste receptacles

Non-structural source controls consist of implementing behaviors to reduce or prevent contamination. Non-structural control measures which may provide a significant benefit to water quality include:

- General good housekeeping practices (proper material storage, clean and orderly work areas)
- Preventative maintenance
- Recycling programs
- Spill prevention and response

- Proper fertilizer application
- Disposal of leaves and clippings
- Proper disposal of pet waste
- Car washing considerations
- Snow and ice management

IV. Stormwater Management Facility Design

A. Stormwater Conveyance Facilities

Storm sewer will start in the central portion of the project at an area inlet. Two additional sets of inlets will capture runoff near the northeastern corner of the site. This storm sewer will tie in into storm sewer constructed with Filing 2, Amendment 3 near the intersection of Pat Haven Street and Quandary Peak Drive. An interceptor swale along with an associated inlet and piping will capture runoff along the western fringe of the project.

The Filing 2, Amendment 3 Drainage Report (F2A3 Report) analyzed the downstream discharge path capacity and assumptions to ensure conformance with the Filing 2 Drainage Report. The F2A3 report found a similar flowrate at design point 13E as compared to Filing 2 at design point 4C in the SWMM model. The imperviousness calculated with this report of 75.3% is accounted for in the F2A3 report.

Peak discharge summary tables are included below. Specific basin summaries follow the tables.

PEAK DISCHARGE SUMMARY

Developed Conditions - Pipe Flow

Design Point	**Catchment(s)**	**5-Year** (cfs)	**100-Year** (cfs)
8E	E8	0.6	7.7
1T	T1	1.6	5.6
3T	T3	2.0	2.6
4T	T1+T2+T3+T4	16.9	37.9
11E	E11	1.8	3.4
11Eb	E11b	0.7	1.5

PEAK DISCHARGE SUMMARY

Developed Conditions - Direct Runoff

Catchment	**Tributary Area** (acres)	**5-Year** (cfs)	**100-Year** (cfs)
E8	2.5	0.6	7.7
T1	1.2	1.6	5.6
T2	2.7	7.0	15.3

T3	1.6	5.7	9.9
T4	1.6	5.7	11.2
E11	0.7	1.8	4.3
E11b	0.3	0.7	1.7

Basin T1 covers the central portion of the townhome development. An area inlet captures runoff from the central landscape area. Emergency overflow is via an open space northeast into Tract G, which is the street.

Basin T2 covers the northern portion of the townhome development. A Type D inlet will capture runoff at design point 4T. Emergency overflow is to the northeast into Loopty Loop and Quandary Peak Drive.

Basin T3 covers the southwestern portion of the townhome development. A Type 13 on grade inlet will capture trickle runoff at design point 3T. Most runoff will continue north and east to design point 4T. Emergency overflow is to the northeast via Loopty Loop.

Basin T4 covers the northeastern portion of the townhome development. A Type D inlet will capture runoff at design point 4T. Emergency overflow is to the northeast into Quandary Peak Drive

Basin E8 covers town open space areas to the west. A concrete interceptor swale is proposed along the western fringe of the site to capture runoff from Basin E8. Emergency overflow is to the east via a swale that runs along the southern fringe of the property.

Basins E11 and E11b capture runoff from the eastern portion of the townhome development. Details for these inlets are contained in the Filing 2 Amendment 3 Drainage Report.

B. Stormwater Storage Facilities

All runoff from the site is conveyed to full spectrum EDB Pond C1. A Pond C1 was designed and constructed with the Crystal Valley Interchange project by Jacobs Engineering Group. Runoff from Pond C1 discharges into the Gambel Ridge Tributary.

All runoff from the site is conveyed to full spectrum EDB Pond C1. Pond C1 is a 29 ac-ft storage facility (100-yr release rate =115 cfs) that treats runoff for all basins in this project. Pond C1 was designed and constructed with the Crystal Valley Interchange project, by Jacobs Engineering Group. Construction of Pond C1is required prior to or concurrent with development of Filing 2, Amendment 3.

Pond C1 is a full spectrum EDB that will discharge north into the Gambel Ridge Tributary. The design parameters for Pond C1 have been an item of close and continued coordination between EMK Consultants and Jacobs Engineering Group.

C. Water Quality Enhancement Control Measures

The site will drain to the proposed EURV and water quality pond and regional detention. Water quality enhancements have been included in the EDB designed in the Cristal Valley Interchange Project for Pond C1. The pond was designed to incorporate an outlet structure releases flows for the water quality capture

volume (WQCV), excess urban runoff volume (EURV), and the 100-year storm event. The design of this structures can be found in the drainage report currently under development. This project is the *Crystal Valley Interchange Project Package 2* (CIP23-0004, approved October 2023).

D. Floodplain Modification

The site is not covered by any regulatory floodplains. Refer to project number CD23-0045 drainage report for information regarding the North Dawson Tributary south of this project.

E. Geotechnical Investigation and Sub-surface Collection System Design

A document titled *Soils and Foundation Investigation, Dawson Trails, Multi-Family Townhomes (Parcel E2)* dated 4/21/2025 was produced for the site. In the section titled "Subsurface Drainage" of this documents, no additional sitewide subsurface underdrain recommended in the report. No subsurface underdrain is proposed.

F. Operation and Maintenance

Maintenance of all ponds will be the responsibility of a metro district or homeowner's association. Excerpts from the Town of Castle Rock's Stormwater Management Facility Operation and Maintenance (O&M) General Guidelines was used to develop the Extended Detention Basin (EDB) operation and maintenance. Dawson Trails Filing 2 and the CVI project (Pond C1) details the O&M requirements for ponds accepting runoff from this project.

EDBs have low to moderate maintenance requirements on a routine basis, but may require significant maintenance once every 15 to 25 years.

Inspection: Inspect the EDB at least twice annually, observing the amount of sediment in the forebay and checking for debris at the outlet structure.

Debris and Litter Removal: Remove debris and litter from the detention area as required to minimize clogging of the outlet.

Mowing and Plant Care: Mowing should be done as needed to maintain appropriate height and control weeds.

Aeration: Aeration should be performed at least once per year when the ground is not frozen.

Mosquito Control: The Town provides annual mosquito control for all public and private facilities. For questions regarding the Town's mosquito control program, please contact the Utilities Department Stormwater Division at 720-733-6011.

Irrigation: Irrigation may be required to establish initial vegetation. Native grass and other drought tolerant plantings should not require irrigation after establishment. Check for broken sprinkler heads and repair them, as needed. Completely drain the irrigation system before the first winter freeze each year.

Upon reactivation of the irrigation system in the spring, inspect all components and replace damaged parts, as needed.

Sediment Removal: Remove sediment from the forebay and trickle channel annually. If portions of the watershed are not developed or if roadway or landscaping projects are taking place in the watershed, the required frequency of sediment removal in the forebay may be as often as after each storm event. The forebay should be maintained in such a way that it does not provide a significant source of resuspended sediment in the stormwater runoff. Sediment removal from the micropool is required about once every one to four years, and should occur when the depth of the pool has been reduced to approximately 18 inches. Small micropools may be vacuumed and larger pools may need to be pumped in order to remove all sediment from the micropool bottom. Removing sediment from the micropool will benefit mosquito control. Ensure that the sediment is disposed of properly and not placed elsewhere in the basin. Remove sediment from the bottom of the basin when accumulated sediment occupies about 20% of the water quality design volume or when sediment accumulation results in poor drainage within the basin. The required frequency may be every 15 to 25 years or more frequently in basins where construction activities are occurring.

Erosion and Structural Repairs: Repair basin inlets, outlets, trickle channels, and all other structural components required for the basin to operate as intended. Repair and vegetate eroded areas as needed following inspection.

G. Additional Permitting Requirements

There are no other permitting requirements for this project known at this time.

H. General

Pond C1 was designed as part of the CVI project and relevant excerpts are included in Appendix D.

V. Conclusions

A. Compliance With Standards

The proposed design complies with the Town's SDDTCM, and Chatfield Reservoir Control Regulation No. 73.

B. Variances

A variance is requested from section 8.7.3 of the town's SDDTCM. More than a triple inlet is required in two locations. There is not adequate room in the street cross section for storm sewer.

C. Drainage Concept

The proposed concept captures site runoff into inlets and pipes and safely conveys it to an existing major drainage system without damage to downstream properties.

VI. References

1. Town of Castle Rock Storm Drainage Design and Technical Criteria Manual, February 2025.

2. Town of Castle Rock Transportation Design Criteria Manual, December 2018.

3. Town of Castle Rock Stormwater Management Facility Operation and Maintenance (O&M) General Guidelines, December 2012. Accessed online at www.crgov.com/1796/Stormwater-Facility-Maintenance

4. Urban Storm Drainage Criteria Manual, Volumes 1-3, accessed online at www.mhfd.org, March 2024.

5. Stormwater Management Facility Operation and Maintenance (O&M) General Guidelines, Town of Castle Rock, 2012.

6. Dawson Trails Filing 2 Phase III Drainage Report, prepared by EMK Consultants, Inc. 2025.

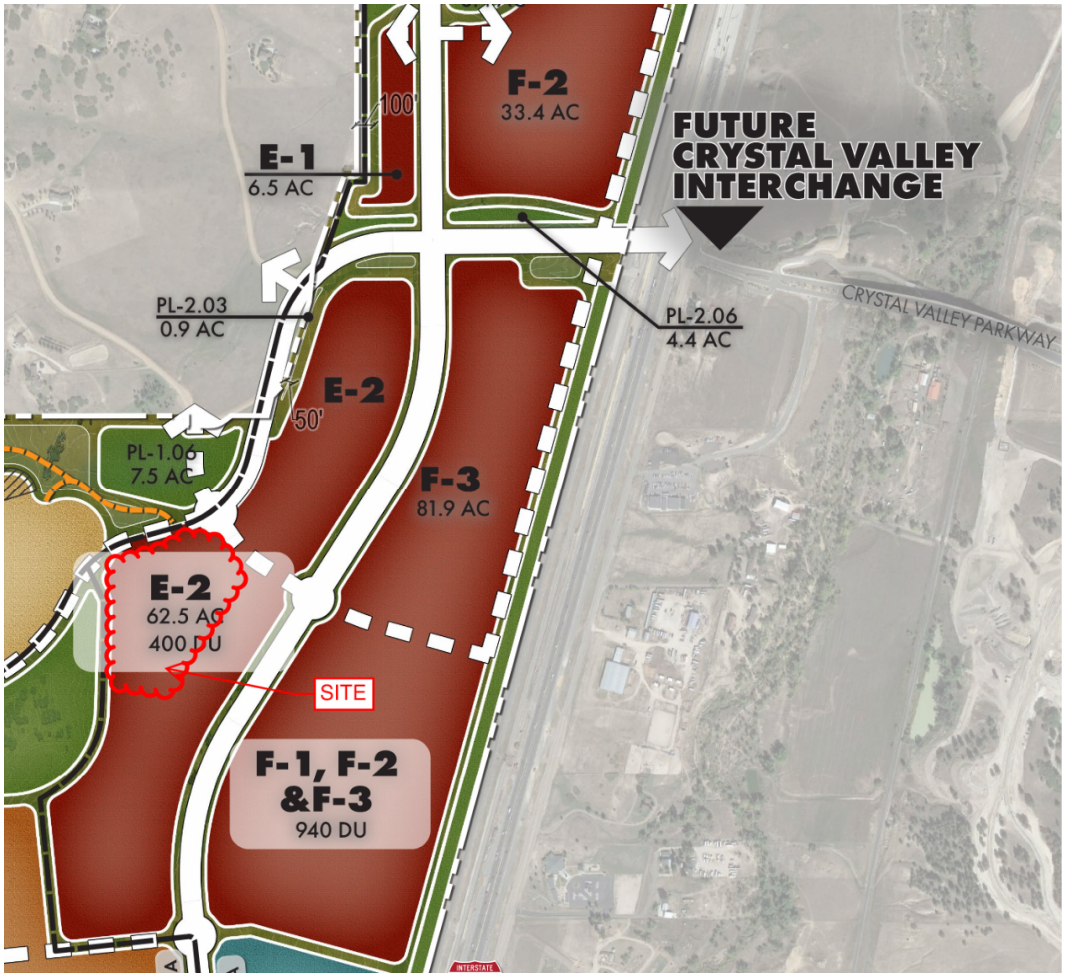
7. Dawson Trails Filing 2 Amendment 3 Phase III Drainage Report, prepared by EMK Consultants, Inc, 2025.

8. Crystal Valley Interchange Package 2 Phase III Drainage Report, prepared by Jacobs Engineering Group, 2023.

9. Gambel Ridge and Douglas Lane Tributary Watershed Master Plan, prepared by RESPEC, August 2014.

DRAINAGE REPORT
for
DAWSON TRAILS - FILING 2, AMENDMENT 5

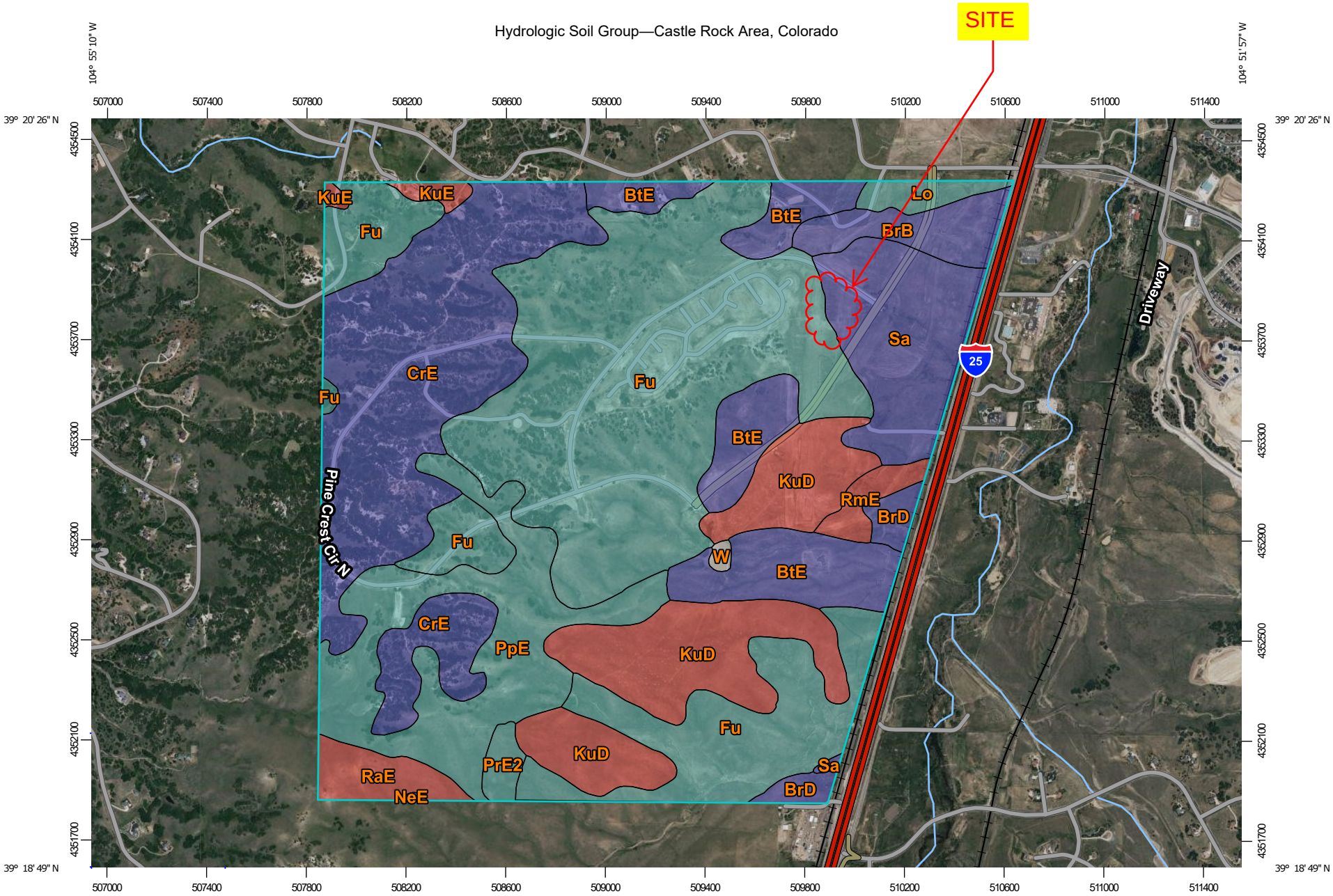
APPENDIX A
Hydrologic Computations



DAWSON TRAILS - FILING 2, AMENDMENT 5
SITE LOCATION MAP

(NTS)

Hydrologic Soil Group—Castle Rock Area, Colorado



MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Lines

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Points

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

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

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: Castle Rock Area, Colorado
Survey Area Data: Version 15, Sep 1, 2022

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

Date(s) aerial images were photographed: Jun 9, 2021—Jun 12, 2021

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
BrB	Bresser sandy loam, cool, 1 to 3 percent slopes	B	36.3	2.5%
BrD	Bresser sandy loam, cool, 5 to 9 percent slopes	B	17.0	1.2%
BtE	Bresser-Truckton sandy loams, 5 to 25 percent slopes	B	118.7	8.0%
CrE	Crowfoot-Tomah sandy loams, 5 to 25 percent slopes	B	270.2	18.3%
Fu	Fondis-Kutch association	C	544.7	36.8%
KuD	Kutch clay loam, 4 to 8 percent slopes	D	167.0	11.3%
KuE	Kutch clay loam, 8 to 20 percent slopes	D	7.8	0.5%
Lo	Loamy alluvial land	C	13.8	0.9%
NeE	Newlin gravelly sandy loam, 8 to 30 percent slopes	B	0.6	0.0%
PpE	Peyton-Pring-Crowfoot sandy loams, 5 to 25 percent slopes	C	152.6	10.3%
PrE2	Peyton-Pring-Crowfoot complex, 3 to 15 percent slopes, eroded	C	9.8	0.7%
RaE	Razor clay, 3 to 25 percent slopes	D	24.9	1.7%
RmE	Renohill-Buick complex, 5 to 25 percent slopes	D	14.5	1.0%
Sa	Sampson loam	B	99.2	6.7%
W	Water		2.3	0.2%
Totals for Area of Interest			**1,479.5**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

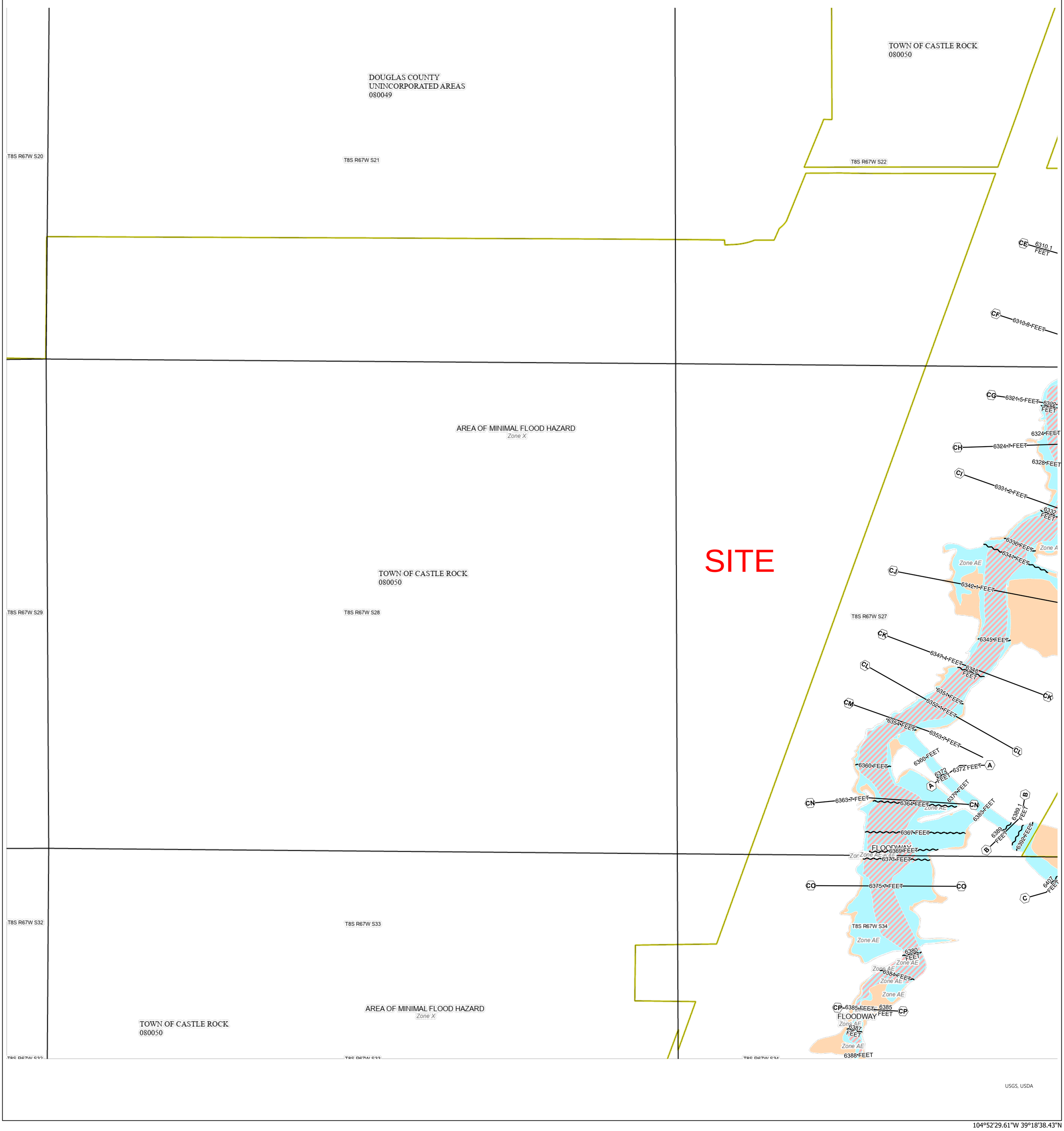
Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

104°54'22.96"W 39°20'44.11"N



104°52'29.61"W 39°18'38.43"N

FLOOD HAZARD INFORMATION

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

SPECIAL FLOOD HAZARD AREAS

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

OTHER AREAS OF FLOOD HAZARD

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

OTHER AREAS

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

GENERAL STRUCTURES

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

OTHER FEATURES

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

NOTES TO USERS

For information and questions about this Flood Insurance Rate Map (FIRM), available products associated with this FIRM, including historic versions, the current map date for each FIRM panel, how to order products, or the National Flood Insurance Program (NFIP) in general, please call the FEMA Map Information eXchange at 1-877-FEMA-MAP (1-877-336-2627) or visit the FEMA Flood Map Service Center website at https://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the website.

Communities annexing land on adjacent FIRM panels must obtain a current copy of the adjacent panel as well as the current FIRM Index. These may be ordered directly from the Flood Map Service Center at the number listed above.

For community and countywide map dates, refer to 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 1-800-638-6620.

Basemap information shown on this FIRM was provided in digital format by the United States Geological Survey (USGS). The basemap shown is the USGS National Map: Orthoimagery. Last refreshed October, 2020.

This map was exported from FEMA's National Flood Hazard Layer (NFHL) on **8/23/2023 4:14 PM** and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time. For additional information, please see the Flood Hazard Mapping Updates Overview Fact Sheet at https://www.fema.gov/media-library/assets/documents/118418

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards. This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date.

SCALE

Map Projection:
GCS, Geodetic Reference System 1980;
Vertical Datum: NAVD88
For information about the specific vertical datum for elevation features, datum conversions, or vertical monuments used to create this map, please see the Flood Insurance Study (FIS) Report for your community at https://msc.fema.gov

N

1 inch = 500 feet 1:6,000

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

0 50 100 200 300 400 Meters

NATIONAL FLOOD INSURANCE PROGRAM

FLOOD INSURANCE RATE MAP

PANEL **284** OF **461**

Panel Contains:

COMMUNITY	NUMBER	PANEL
TOWN OF CASTLE ROCK	080050	0284
DOUGLAS COUNTY	080049	0284

MAP NUMBER
08035C0284G
EFFECTIVE DATE
March 16, 2016

PERCENT IMPERVIOUS CALCULATIONS
PROPOSED CONDITIONS - DAWSON TRAILS - FILING 2, AMENDMENT 3/5

Basin	Total Area	Paving, Driveways and Roofs	Commercial - Medium to High Density	MFH - High Density MFH (>20 du/ac)	SFH - High-density (5-20 du/ac) and Commercial - Low-density	SFH - Low & Medium-density (5-20 du/ac)	Community Parks	Lawns, Landscaping, Gravel, Mulch	Neighborhood Parks	Open Space - Undisturbed Native Grass	Composite Percent Impervious
%IMP	(acres)	95% (acres)	80% (acres)	70% (acres)	65% (acres)	55% (acres)	25% (acres)	20% (acres)	15% (acres)	5% (acres)	
E1	4.90			4.90							70.0%
E2	2.52				2.52						65.0%
E3	3.93			3.93							70.0%
E4	0.10			0.10							70.0%
E5	0.09		0.09								80.0%
E6	1.19			1.19							70.0%
E6b	0.95			0.95							70.0%
E0	2.45				0.11					2.34	7.7%
E7	8.69				5.07					3.62	40.0%
E7b	0.05				0.05						65.0%
E8	2.53									2.53	5.0%
E9	1.96									1.96	5.0%
E10	0.33		0.33								80.0%
E11	0.72			0.72							70.0%
E11b	0.25			0.25							70.0%
E12	0.42		0.42								80.0%
E12b	0.17		0.17								80.0%
E13	4.27		4.27								80.0%
T1	1.24	0.30					0.94				41.9%
T2	2.65	2.04						0.61			77.7%
T3	1.64	1.26						0.38			77.6%
T4	1.58	1.58									95.0%

TABLE 6-3. RECOMMENDED IMPERVIOUSNESS BY SURFACE TYPES

SURFACE TYPES		IMPERVIOUSNESS
Roadways and Paved Streets		95%
Concrete Driveways and Walks		95%
Roofs		95%
Gravel	No Traffic (Pedestrian Use)	40%
	Low-traffic Areas (Maintenance Paths and Substations)	60%
	High-traffic Areas (Roadways and Parking)	80%
Disturbed Soil (Including Lawns, Managed/Active Turf, Landscaped Areas with Water-Wise Vegetation, and Uncompacted Gravel/Mulch Planting Beds)		20%
Undisturbed or Decompacted Soil (Native Grasses and Open Space Areas)		5%
Artificial Turfs[1]	Landscape Applications (without Subgrade Drainage Layer)	25% – 45%
	Sport Fields (with Underdrain Pipe System)	60% – 80%
Water Surfaces (Lakes/Reservoirs/Irrigation Ponds)		100%
Solar Fields[2]	Grass Cover (Varies with Panel Orientation Relative to Ground Contours)	10% – 45%
	Gravel Cover (Varies with Panel Orientation Relative to Ground Contours)	50% – 75%
Historic Flow Analysis, Greenbelts, Agricultural		5%
Newly Graded Areas		65%
Stormwater Control Measures[3]	Retention Ponds & Constructed Wetland Ponds	100%
	Rooftop Systems – Blue Roofs	95%
	Rooftop Systems – Green Roofs (extensive)	65%
	Rooftop Systems – Green Roofs (intensive)	50%
	Permeable Pavement – CGP/PGP/RGP	55%
	Permeable Pavement – PICP	45%
	Extended Detention Basins	25%
	Receiving Pervious Areas (incl. Grass Buffers & Grass Swales)	20%
	Bioretention & Sand Filters	10%

[1] Consult with the manufacturer to get a recommended value.

[2] Assumes 1:1 ratio of panels to aisles. See MHFD's technical memorandum regarding *Determination of Solar Panel Field Runoff Coefficients and Imperviousness Values* for additional information on procedures for determining percent imperviousness based on panel width, panel spacing, and panel orientation relative to ground contours and how to reflect other impervious areas such as roads and pads that may be part of a solar field and layouts with wider inter-panel spacing.

[3] See MHFD's technical memorandum regarding *Evaluation of Percent Imperviousness for Stormwater Control Measures* for background information.

TABLE 6-2. RECOMMENDED IMPERVIOUSNESS BY LAND USE

LAND USE/DENSITY	IMPERVIOUSNESS
Residential	
Single-family Housing (SFH) – Rural (0 – 3 du/ac)	35%
SFH – Low & Medium-density (3 – 5 du/ac)	55%
SFH – High-density (5 - 20 du/ac)	65%
Manufactured Housing (>= 10 du/ac)	65%
Multi-family Housing (MFH) – Medium-density (5 – 20 du/ac)	65%
MFH – High-density MFH (>20 du/ac)	70%
Commercial	
Commercial – Low-density	65%
Commercial – Medium- to High-density	80%
Commercial – Urban Core	90%
Industrial/Institutional	
Schools	55%
Office/institutional	65%
Industrial Areas	75%
Solar Fields, Gravel Cover[1,2]	60%
Solar Fields, Grass Cover[1,2]	45%
Parks and Open Space	
Open Space, Undisturbed Native Grasses	5%
Community Parks	25%
Neighborhood Parks	15%
Golf Courses	30%
Cemeteries	25%

Note: Recommended imperviousness values shown in the table are the minimum imperviousness values for a specific land use. It is the engineer's responsibility to select imperviousness values that appropriately reflect the actual density of the proposed development.

[1] Use these values at the master planning scale or when the specific layout of panels is not known. Use values from the surface type (Table 6-3) at the site planning and design stage when panel width, panel spacing, and panel orientation relative to contours are known.

[2] Assumes 1:1 ratio of panels to aisles. See MHFD's technical memorandum regarding *Determination of Solar Panel Field Runoff Coefficients and Imperviousness Values* for additional information on procedures to reflect other impervious areas such as roads and pads that may be part of a solar field and layouts with wider inter-panel spacing.

Calculation of Peak Runoff using Rational Method

Designer: David Ott
Company: EMK Consultants
Date: 5/21/2026
Project: Dawson Trails - Filing 2, Amendment 3/5
Location: Castle Rock, CO

Version 2.00 released May 2017

Cells of this color are for required user-input
Cells of this color are for optional override values
Cells of this color are for calculated results based on overrides

$$t_i = \frac{0.395(1.1 - C_5)\sqrt{L_i}}{S_i^{0.33}}$$

$$t_t = \frac{L_t}{60K\sqrt{S_t}} = \frac{L_t}{60V_t}$$

Computed $t_c = t_i + t_t$

Regional $t_c = (26 - 17i) + \frac{L_t}{60(14i + 9)\sqrt{S_t}}$

$t_{minimum} = 5$ (urban)
$t_{minimum} = 10$ (non-urban)

Selected $t_c = \max\{t_{minimum}, \min(\text{Computed } t_c, \text{Regional } t_c)\}$

Select UDFCD location for NOAA Atlas 14 Rainfall Depths from the pulldown list OR enter your own depths obtained from the NOAA website (click this link)

	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	500-yr
1-hour rainfall depth, P1 (in) =	1.06	1.43	1.66	2.00	2.26	2.60	3.20
	a	b	c				
Rainfall Intensity Equation Coefficients =	28.50	10.00	0.786				

$$I(in/hr) = \frac{a * P_1}{(b + t_c)^c}$$

$$Q(cfs) = CIA$$

Subcatchment Name	Area (ac)	NRCS Hydrologic Soil Group	Percent Imperviousness	Runoff Coefficient, C							Overland (Initial) Flow Time					Channelized (Travel) Flow Time								Time of Concentration			Rainfall Intensity, I (in/hr)							Peak Flow, Q (cfs)						
				2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	500-yr	Overland Flow Length L_i (ft)	U/S Elevation (ft) (Optional)	D/S Elevation (ft) (Optional)	Overland Flow Slope S_i (ft/ft)	Overland Flow Time t_i (min)	Channelized Flow Length L_t (ft)	U/S Elevation (ft) (Optional)	D/S Elevation (ft) (Optional)	Channelized Flow Slope S_t (ft/ft)	NRCS Conveyance Factor K	Channelized Flow Velocity V_t (ft/sec)	Channelized Flow Time t_t (min)	Computed t_c (min)	Regional t_c (min)	Selected t_c (min)	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	500-yr	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	500-yr
E1	4.90	C	70.0	0.56	0.61	0.65	0.71	0.74	0.77	0.81	300.00	6452.37	6441.06	0.038	9.98	468.00	6441.06	6434.01	0.015	20	2.45	3.18	13.16	17.48	13.16	2.56	3.45	4.00	4.82	5.45	6.27	7.72	7.00	10.23	12.68	16.80	19.73	23.66	30.56
E2	2.52	B	65.0	0.50	0.54	0.58	0.66	0.69	0.73	0.77	300.00	6492.93	6459.49	0.111	7.95	280.00	6459.49	6451.09	0.030	20	3.46	1.35	9.30	16.44	9.30	2.95	3.98	4.62	5.56	6.29	7.23	8.90	3.75	5.38	6.77	9.21	10.94	13.27	17.36
E3	3.93	C	70.0	0.56	0.61	0.65	0.71	0.74	0.77	0.81	300.00	6451.20	6440.64	0.035	10.21	526.00	6440.64	6431.41	0.018	20	2.65	3.31	13.52	17.62	13.52	2.52	3.41	3.95	4.76	5.38	6.19	7.62	5.55	8.11	10.05	13.31	15.63	18.75	24.22
E4	0.10	C	70.0	0.56	0.61	0.65	0.71	0.74	0.77	0.81	20.00			0.020	3.18	100.00	6432.61	6429.89	0.027	20	3.30	0.51	3.68	14.64	5.00	3.60	4.85	5.63	6.78	7.67	8.82	10.85	0.20	0.29	0.36	0.48	0.57	0.68	0.88
E5	0.09	B	80.0	0.64	0.67	0.70	0.75	0.77	0.80	0.83	20.00			0.020	2.75	100.00	6432.61	6429.89	0.027	20	3.30	0.51	3.25	12.90	5.00	3.60	4.85	5.63	6.78	7.67	8.82	10.85	0.21	0.29	0.36	0.46	0.53	0.63	0.81
E6	1.19	C	70.0	0.56	0.61	0.65	0.71	0.74	0.77	0.81	20.00			0.020	3.18	1063.00	6456.04	6431.33	0.023	20	3.05	5.81	8.99	20.28	8.99	2.99	4.03	4.68	5.64	6.37	7.33	9.02	1.99	2.90	3.60	4.77	5.60	6.72	8.68
E7	8.69	C	40.0	0.30	0.36	0.43	0.54	0.59	0.65	0.71	300.00	6555.55	6517.32	0.127	9.98	1202.00	6517.32	6431.29	0.072	20	5.35	3.74	13.72	24.33	13.72	2.51	3.38	3.93	4.73	5.35	6.15	7.57	6.51	10.62	14.55	22.34	27.46	34.64	47.00
E8	2.53	C	5.0	0.03	0.08	0.17	0.35	0.42	0.50	0.60	137.00	6471.14	6441.80	0.214	7.87	367.00	6441.80	6441.00	0.002	20	0.93	6.55	14.42	38.66	14.42	2.45	3.31	3.84	4.62	5.23	6.01	7.40	0.18	0.63	1.64	4.06	5.52	7.67	11.30
E9	1.96	C	5.0	0.03	0.08	0.17	0.35	0.42	0.50	0.60	300.00	6538.05	6493.43	0.149	13.14	543.00	6493.43	6431.11	0.115	20	6.78	1.34	14.48	27.90	14.48	2.45	3.30	3.83	4.62	5.22	6.00	7.39	0.14	0.49	1.27	3.14	4.27	5.93	8.74
E10	0.33	B	80.0	0.64	0.67	0.70	0.75	0.77	0.80	0.83	102.00			0.020	6.20	107.00	6432.19	6431.17	0.010	20	1.96	0.91	7.12	13.30	7.12	3.24	4.37	5.08	6.12	6.91	7.95	9.78	0.69	0.97	1.18	1.52	1.77	2.09	2.68
E11	0.72	B	70.0	0.55	0.58	0.62	0.69	0.72	0.75	0.79	43.00			0.020	4.88	447.00			0.025	20	3.16	2.36	7.24	16.61	7.24	3.22	4.35	5.05	6.08	6.87	7.90	9.73	1.28	1.82	2.26	3.01	3.55	4.28	5.55
E12	0.42	B	80.0	0.64	0.67	0.70	0.75	0.77	0.80	0.83	20.00			0.020	2.75	421.00			0.025	20	3.16	2.22	4.97	14.60	5.00	3.60	4.85	5.63	6.78	7.67	8.82	10.85	0.97	1.37	1.66	2.14	2.49	2.96	3.78
E13	4.27	B	80.0	0.64	0.67	0.70	0.75	0.77	0.80	0.83	267.00	6433.12	6424.35	0.033	8.52	349.00	6424.35	6416.66	0.022	20	2.97	1.96	10.48	14.34	10.48	2.81	3.80	4.41	5.31	6.00	6.90	8.50	7.73	10.90	13.22	17.04	19.84	23.52	30.07
T1	1.24	B	41.9	0.30	0.33	0.40	0.51	0.56	0.62	0.69	102.00	6437.41	6431.67	0.056	7.91	254.00	6431.67	6425.24	0.025	20	3.18	1.33	9.24	20.66	9.24	2.96	3.99	4.63	5.58	6.30	7.25	8.93	1.11	1.65	2.27	3.54	4.39	5.58	7.63
T2	2.65	B	77.7	0.62	0.65	0.68	0.74	0.76	0.79	0.82	80.00			0.020	5.76	640.00	6437.75	6420.00	0.028	20	3.33	3.20	8.96	16.01	8.96	2.99	4.03	4.68	5.64	6.38	7.33	9.03	4.93	6.97	8.49	11.02	12.87	15.31	19.63
T3	1.64	C	77.6	0.63	0.67	0.70	0.75	0.78	0.80	0.83	80.00			0.020	5.55	354.00	6437.75	6433.75	0.011	20	2.13	2.78	8.33	15.60	8.33	3.07	4.14	4.81	5.79	6.55	7.53	9.27	3.16	4.54	5.54	7.16	8.34	9.90	12.66
E6b	0.95	C	70.0	0.56	0.61	0.65	0.71	0.74	0.77	0.81	200.00			0.032	8.60	160.00			0.020	20	2.83	0.94	9.54	15.10	9.54	2.92	3.94	4.57	5.51	6.23	7.16	8.82	1.55	2.27	2.81	3.72	4.37	5.24	6.77
E7b	0.05	C	65.0	0.51	0.56	0.61	0.68	0.71	0.75	0.79	20.00			0.020	3.44	20.00			0.020	20	2.83	0.12	3.56	15.08	5.00	3.60	4.85	5.63	6.78	7.67	8.82	10.85	0.09	0.14	0.17	0.23	0.27	0.33	0.43
E11b	0.25	B	70.0	0.55	0.58	0.62	0.69	0.72	0.75	0.79	35.00			0.020	4.41	120.00			0.025	20	3.16	0.63	5.04	14.77	5.04	3.59	4.84	5.62	6.77	7.65	8.80	10.83	0.49	0.70	0.87	1.17	1.37	1.65	2.15
E12b	0.17	B	80.0	0.64	0.67	0.70	0.75	0.77	0.80	0.83	20.00			0.020	2.75	160.00			0.025	20	3.16	0.84	3.59	13.23	5.00	3.60	4.85	5.63	6.78	7.67	8.82	10.85	0.39	0.55	0.67	0.87	1.01	1.20	1.53
E0	2.45	C	7.7	0.05	0.10	0.19	0.36	0.43	0.52	0.61	300.00	6515.45	6476.72	0.129	13.48	425.00	6476.72	6452.83	0.056	20	4.74	1.49	14.97	27.66	14.97	2.41	3.25	3.77	4.54	5.14	5.91	7.27	0.28	0.78	1.74	4.04	5.43	7.47	10.92
T4	1.58	C	95.0	0.79	0.81	0.83	0.85	0.86	0.87	0.89	67.00			0.020	3.42	580.00	6431.57	6418.31	0.023	20	3.02	3.20	6.61	12.72	6.61	3.32	4.48	5.20	6.26	7.07	8.14	10.02	4.13	5.72	6.82	8.42	9.64	11.22	14.04

JOB NO: 13301.00
PROJECT: Dawson Trails - Filing 2, Amendment 3/5
DSGN STRM: 5-year
CALC BY: DJO

RATIONAL METHOD
(5-YEAR DEVELOPED CONDITION)

DATE: 5/21/26

I=28.5*P1/(10+T)^0.786

		1 HR STORM=	*1.43*		Direct RUNOFF				TOTAL RUNOFF				TRAVEL TIME				STREET FLOW		INLET	INLET INTERCEPT		CARRYOVER FLOW		DP CAPTURING CARRYOVER FLOW	PIPE FLOW		
Design Point	Basin			C	Tc	A*C	I	Q	Tc	A*C	I	Q	Length	Vel.	Time	From	A*C	Q		A*C	Q	A*C	Q		A*C	Q	
		Ac					IN/HR	CFS			IN/HR	CFS		fps	(Min.)	To		CFS			CFS		CFS			CFS	Notes
1E	E1	4.90	0.61		13.16	2.97	3.4	**10.2**									3.0	10.2	1E	3.0	10.2				2.97	10.2	DIRECT/ INLET INTERCEPT
2E	E2	2.52	0.54		9.30	1.35	4.0	**5.4**									1.4	5.4	2E	1.4	5.4				1.35	5.4	DIRECT/ INLET INTERCEPT
3E	E3	3.93	0.61		13.52	2.38	3.4	**8.1**									2.4	8.1	3E	2.4	8.1				2.38	8.1	DIRECT/ INLET INTERCEPT
	E4	0.10	0.61		5.00	0.06	4.9	**0.3**									0.1	0.3	4E	0.06	0.29						DIRECT/ INLET INTERCEPT
4E	DP 3E + 4E								13.5	2.44	3.4	**8.3**													2.44	8.3	COMBINED
5E	E5	0.09	0.67		5.00	0.06	4.9	**0.3**									0.1	0.3	5E	0.06	0.29				0.06	0.3	DIRECT/ INLET INTERCEPT
5Ea	E5 + DP 4E								13.5	2.50	3.4	**8.5**													2.50	8.5	COMBINED
0E	E0	2.45	0.10		14.97	0.24	3.2	**0.8**					308	10	0.5	0E to 7E	0.2	0.8	0E	0.24	0.78				0.24	0.8	DIRECT/ INLET INTERCEPT
	E7	8.69	0.36		13.72	3.14	3.4	**10.6**					175	10	0.3	7E to10E.a	3.1	10.6	7E	2.30	7.79	0.84	2.84	DP 7Eb			DIRECT/ INLET INTERCEPT
7E	DP 0E + E7								15.5	2.54	3.2	**8.1**													2.54	8.1	COMBINED
6E	E6	1.19	0.61		8.99	0.72	4.0	**2.9**									0.7	2.9	6E	0.67	2.69	0.05	0.22	DP 6Eb	0.67	2.7	DIRECT/ INLET INTERCEPT
7Ea	DP 6E + DP 7E								15.5	3.21	3.2	**10.3**													3.21	10.3	COMBINED
6Eb	E6b	0.95	0.61		9.54	0.58	3.9	**2.3**									0.6	2.5	6Eb	0.63	2.48				0.63	2.5	INLET INTERCEPT/ PIPE FLOW
7Eb	E7b	0.05	0.56		5.00	0.03	4.9	**0.1**									0.9	3.0	7Eb	0.87	2.97				0.87	3.0	INLET INTERCEPT/ PIPE FLOW
7Ec	DP 7Ea + DP 6Eb + DP 7Eb								15.5	4.70	3.2	**15.0**													4.70	15.0	COMBINED
7Ee	DP 7Ec + Dp 5Ea								15.5	7.20	3.2	**23.0**													7.20	23.0	COMBINED
9E	E9	1.96	0.08		14.48	0.15	3.3	**0.5**									0.1	3.3	9E	0.15	3.33				0.15	3.3	DIRECT/ INLET INTERCEPT
10E	E10	0.33	0.67		7.12	0.22	4.4	**1.0**									0.2	1.0	10E	0.22	0.97				0.22	1.0	DIRECT/ INLET INTERCEPT
10Ea	DP 7Ec + DP 9E + DP 10E								15.8	7.57	3.2	**24.0**													7.57	24.0	COMBINED
8E	E8	2.53	0.08		14.42	0.19	3.3	**0.6**									0.2	0.6	8E	0.2	0.6				0.19	0.6	DIRECT/ INLET INTERCEPT
10E.b	DP 10Ea + E8								15.8	7.77	3.2	**24.6**	430	10	0.7	10E.c to 12E.a									7.77	24.6	COMBINED
1T	T1	1.24	0.33		9.24	0.41	4.0	**1.6**					190	10	0.3	1T to 3T	0.4	1.6	1T	0.4	1.6				0.41	1.6	DIRECT/ INLET INTERCEPT
2T	T2	2.65	0.65		8.96	1.73	4.0	**7.0**																			DIRECT
3T	T3	1.64	0.67		8.33	1.09	4.1	**4.5**					590	4	2.5	3T to 4T			3T		2.00					2.0	DIRECT/ INLET INTERCEPT
	T4	1.58	0.81		6.61	1.28	4.5	**5.7**																			DIRECT
	T2+T3 +T4								10.8	4.10	3.8	**15.4**	68	10	0.1	4T to 11E	4.10	15.39	4T	4.10	15.39						COMBINED/ INLET INTERCEPT
4T	T1+T2+T3+T4								10.8	4.51	3.8	**16.9**													4.51	16.9	PIPE FLOW
11E	E11	0.72	0.58		7.24	0.42	4.3	**1.8**									0.4	1.8	11E	0.41	1.77	0.01	0.05	11Eb	0.41	1.8	DIRECT/ INLET INTERCEPT
12E	E12	0.42	0.67		5.00	0.28	4.9	**1.4**									0.3	1.4	12E	0.28	1.37			12Eb	0.28	1.4	DIRECT/ INLET INTERCEPT
12Ea	DP 11E + DP 12E								16.5	8.45	3.1	**26.2**	180	10	0.3	12E.a 12E.c									8.45	26.2	COMBINED
11Eb	E11b	0.25	0.58		5.04	0.15	4.8	**0.7**									0.15	0.7	11Eb	0.15	0.70				0.15	0.7	DIRECT/ INLET INTERCEPT
12Ec	DP 12Ea + DP 11Eb								16.8	8.60	3.1	**26.4**													8.60	26.4	COMBINED
	E12b	0.17	0.67		5.00	0.11	4.9	**0.6**									0.11	0.6	12Eb	0.11	0.55				0.11	0.6	DIRECT/ INLET INTERCEPT
12Ed	DP 12Ec + DP 4T								16.8	13.11	3.1	**40.3**													13.11	40.3	COMBINED
12Eb	DP 12Ed + E12b								16.8	13.23	3.1	**40.7**													13.23	40.7	COMBINED
	E13	4.27	0.67		10.48	2.87	3.8	**10.9**																			DIRECT/ INLET INTERCEPT
13E	DP 12Eb + E13								16.8	16.10	3.1	**49.5**													16.10	49.5	COMBINED

JOB NO: 13301.00
PROJECT: Dawson Trails - Filing 2, Amendment 3/5
DSGN STRM: 100-year
CALC BY: DJO

RATIONAL METHOD
(100-YEAR DEVELOPED CONDITION)

DATE: 5/21/26

I=28.5*P1/(10+T)^0.786

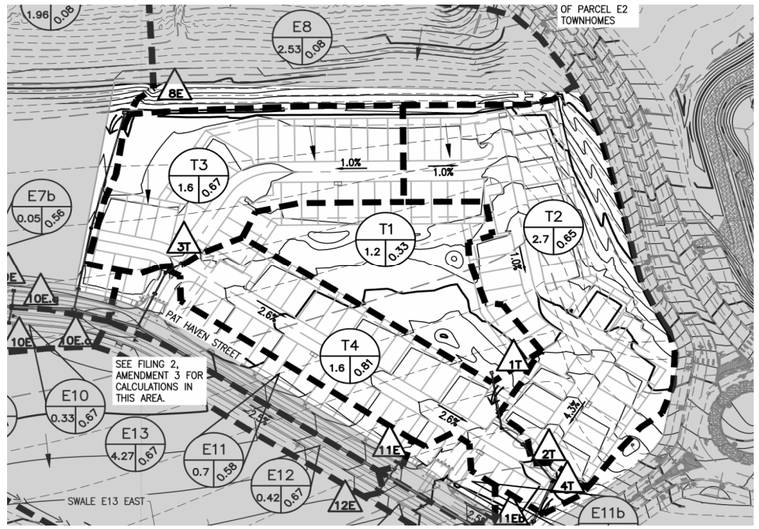
	1 HR STORM=	*2.60*		DIRECT RUNOFF				TOTAL RUNOFF				TRAVEL TIME				STREET FLOW		INLET	INLET INTERCEPT		CARRYOVER FLOW		DP CAPTURING CARRYOVER FLOW	PIPE FLOW		
Design Point	Basin			Tc	A*C	I	Q	Tc	A*C	I	Q	Length	Vel.	Time	From	A*C	Q		A*C	Q	A*C	Q		A*C	Q	
		Ac	C			IN/HR	CFS			IN/HR	CFS			(Min.)	To		CFS			CFS		CFS			CFS	Notes
1E	E1	4.90	0.77	13.16	3.77	6.3	**23.7**									3.8	23.7	1E	3.8	23.7				3.77	23.7	DIRECT/ INLET INTERCEPT
2E	E2	2.52	0.73	9.30	1.84	7.2	**13.3**									1.8	13.3	2E	1.8	13.3				1.84	13.3	DIRECT/ INLET INTERCEPT
3E	E3	3.93	0.77	13.52	3.03	6.2	**18.7**									3.0	18.7	3E	3.0	18.7				3.03	18.7	DIRECT/ INLET INTERCEPT
	E4	0.10	0.77	5.00	0.08	8.8	**0.7**									0.1	0.7	4E	0.08	0.68						DIRECT/ INLET INTERCEPT
4E	DP 3E + 4E							13.5	3.10	6.2	**19.2**													3.10	19.2	COMBINED
5E	E5	0.09	0.80	5.00	0.07	8.8	**0.6**									0.1	0.6	5E	0.07	0.63				0.07	0.6	DIRECT/ INLET INTERCEPT
5Ea	E5 + DP 4E							13.5	3.18	6.2	**19.7**													3.18	19.7	COMBINED
0E	E0	2.45	0.52	14.97	1.26	5.9	**7.5**					308	10	0.5	0E to 7E	1.3	7.5	0E	1.26	7.47				1.26	7.5	DIRECT/ INLET INTERCEPT
	E7	8.69	0.65	13.72	5.63	6.2	**34.6**					175	10	0.3	7E to10E.a	5.6	34.6	7E	2.73	16.80	2.90	17.83	DP 7Eb			DIRECT/ INLET INTERCEPT
7E	DP 0E + E7							15.5	4.00	5.8	**23.2**													4.00	23.2	COMBINED
6E	E6	1.19	0.77	8.99	0.92	7.3	**6.7**									0.9	6.7	6E	0.69	5.09	0.22	1.63	DP 6Eb	0.69	5.1	DIRECT/ INLET INTERCEPT
7Ea	DP 6E + DP 7E							15.5	4.69	5.8	**27.3**													4.69	27.3	COMBINED
6Eb	E6b	0.95	0.77	9.54	0.73	7.2	**5.2**									1.0	6.9	6Eb	0.95	6.87				0.95	6.9	INLET INTERCEPT/ PIPE FLOW
7Eb	E7b	0.05	0.75	5.00	0.04	8.8	**0.3**									2.9	18.2	7Eb	2.94	18.16				2.94	18.2	INLET INTERCEPT/ PIPE FLOW
7Ec	DP 7Ea + DP 6Eb + DP 7Eb							15.5	8.58	5.8	**49.9**													8.58	49.9	COMBINED
7Ee	DP 7Ec + Dp 5Ea							15.5	11.76	5.8	**68.4**													11.76	68.4	COMBINED
9E	E9	1.96	0.50	14.48	0.99	6.0	**5.9**									1.0	5.9	9E	0.99	5.93				0.99	5.9	DIRECT/ INLET INTERCEPT
10E	E10	0.33	0.80	7.12	0.26	7.9	**2.1**									0.3	2.1	10E	0.26	2.09				0.26	2.1	DIRECT/ INLET INTERCEPT
10Ea	DP 7Ec + DP 9E + DP 10E							15.8	13.01	5.8	**75.0**													13.01	75.0	COMBINED
8E	E8	2.53	0.50	14.42	1.28	6.0	**7.7**									1.3	7.7	8E	1.3	7.7				1.28	7.7	DIRECT/ INLET INTERCEPT
10E.b	DP 10Ea + E8							15.8	14.29	5.8	**82.3**	430	10	0.7	10E.c to 12E.a									14.29	82.3	COMBINED
1T	T1	1.24	0.62	9.24	0.77	7.3	**5.6**					190	10	0.3	1T to 3T	0.8	5.6	1T	0.8	5.6				0.77	5.6	DIRECT/ INLET INTERCEPT
2T	T2	2.65	0.79	8.96	2.09	7.3	**15.3**																			DIRECT
3T	T3	1.64	0.80	8.33	1.31	7.5	**9.9**					590	4	2.5	3T to 4T			3T		2.60					2.6	DIRECT/ INLET INTERCEPT
	T4	1.58	0.87	6.61	1.38	8.1	**11.2**																			DIRECT
	T2+T3 +T4							10.8	4.78	6.8	**32.6**	68	10	0.1	4T to 11E	4.78	32.62	4T	4.78	32.62				4.78	32.6	COMBINED/ INLET INTERCEPT
4T	T1+T2+T3+T4							10.8	5.55	6.8	**37.9**													5.55	37.9	PIPE FLOW
11E	E11	0.72	0.75	7.24	0.54	7.9	**4.3**			12.1						0.5	4.3	11E	0.43	3.41	0.11	0.87	11Eb	0.43	3.4	DIRECT/ INLET INTERCEPT
12E	E12	0.42	0.80	5.00	0.34	8.8	**3.0**									0.3	3.0	12E	0.29	2.59	0.04	0.37	12Eb	0.29	2.6	DIRECT/ INLET INTERCEPT
12Ea	DP 11E + DP 12E							16.5	15.01	5.6	**84.7**	180	10	0.3	12E.a 12E.c									15.01	84.7	COMBINED
11Eb	E11b	0.25	0.75	5.04	0.19	8.8	**1.7**									0.19	1.7	11Eb	0.17	1.50	0.02	0.2		0.17	1.5	DIRECT/ INLET INTERCEPT
12Ec	DP 12Ea + DP 11Eb							16.8	15.18	5.6	**84.9**													15.18	84.9	COMBINED
	E12b	0.17	0.80	5.00	0.14	8.8	**1.2**									0.14	1.2	12Eb	0.13	1.15	0.01	0.0		0.13	1.1	DIRECT/ INLET INTERCEPT
12Ed	DP 12Ec + DP 4T							16.8	20.73	5.6	**115.9**													20.73	115.9	COMBINED
12Eb	DP 12Ed + E12b							16.8	20.86	5.6	**116.6**													20.86	116.6	COMBINED
	E13	4.27	0.80	10.48	3.41	6.9	**23.5**																			DIRECT/ INLET INTERCEPT
13E								16.8	24.27	5.6	**135.7**													24.27	135.7	COMBINED

DRAINAGE REPORT
for
DAWSON TRAILS - FILING 2, AMENDMENT 5

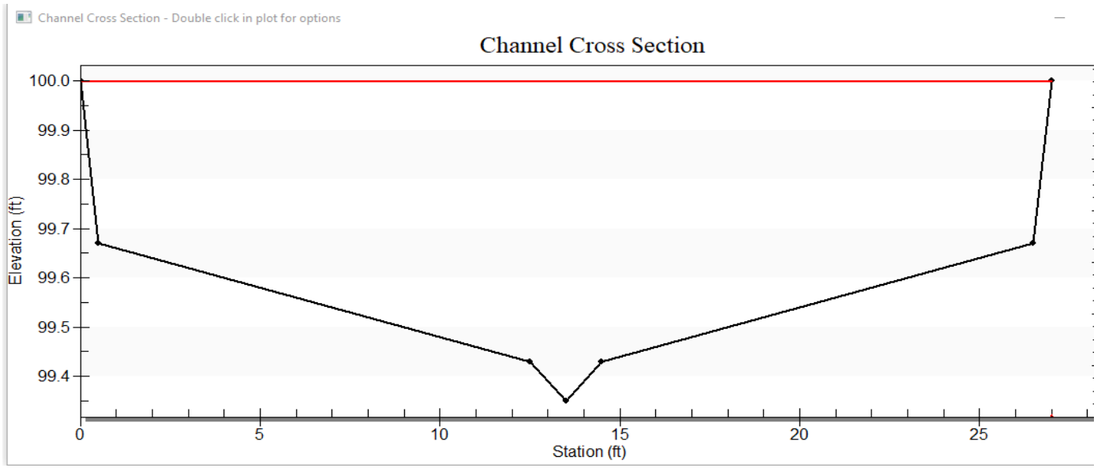
APPENDIX B
Hydraulic Computations

Alley Section Capacity Analysis

Area	Alley Minimum Slope	Q5 (cfs)	D5 (ft)	Q100 (cfs)	D100 (ft)	Q500 (cfs)	D500 (ft)
T2	1.0%	7.0	0.29	15.3	0.36	18.8	0.38
T3	1.0%	5.7	0.27	9.9	0.32	12.2	0.34
T4	2.6%	5.7	0.23	11.2	0.32	13.8	0.30
T2+T3+T4	2.6%	15.4	0.31	32.6	0.39	40.1	0.41



Typical Alley Cross Section below



Alley Cross Section Notes:
1. 4-in mountable curb on each side.
2. 2' wide, 1" deep pan in the middle
3. 12' wide section between pan and curb at 2%.
4. 0.65' of available depth before curb overtopping.
5. An alley at 0.5% and 0.65' deep (top of curb) can convey 57.6 cfs.
6. Manning's n = 0.013.
7. Calcs performed with FHWA hydraulic toolbox.

EMK CONSULTANTS, INC. LAND DEVELOPMENT
ENGINEERING SURVEYING SERVICES AND SOLUTIONS
7006 S. Alton Way, Building F Centennial, Colorado 80112-2019 (303)694-1520 www.EMKC.com

April 8, 2026

Mr. David Van Dellen, P.E.
c/o Castle Rock Water
175 Kellogg Ct.
Castle Rock, CO 80109

Re: Dawson Trails Filing 2 – Amendment 5 – DRB Townhomes &
Section 7.5.3 One-Foot Freeboard to finished floor of structures.

Mr. Van Dellen,

As you know, we have been seeking to design and redesign the DRB Townhome site pursuant to Section 7.5.3 of the Storm Drainage Design and Technical Criteria Manual (SDDTCM). We have revised the street section within the Townhome community to an inverted crown section with a 2-foot-wide trickle pan in the valley. We have also pushed the residential structure as far back from the alley section as possible to increase the elevation of the garage opening. As shown in the attached detailed grading plan, for B lots the top of foundation elevation is 1.7 feet above the high lot corner making the finished floor elevation of the residences 2.5 feet above the high lot corner. For A lots, the top of foundation elevation is set 2.3 feet above the high lot corner making the finished floor elevation 3.1 feet above the high lot corner. In making these revisions to the plan we believe we are meeting the spirit and intent of Section 7.5.3 of the SDDTCM. Per the Code of Federal Regulations, the *Lowest Floor* means the lowest floor of the lowest enclosed area (including basement). An unfinished or flood resistant enclosure, usable solely for parking of vehicles, building access or storage in an area other than a basement area is not considered a building's lowest floor; *Provided,* that such enclosure is not built so as to render the structure in violation of the applicable non-elevation design requirements of § 60.3 (Code of Federal Regulations). As this site is in Zone X per Flood Insurance Rate Map 0800500284G the garage opening does not violate the non-elevation design requirements therefore we believe that we are in compliance. Lastly, as an FYI, we have also attached the hydraulic analysis of the roadway which shows that the 100-year flood event results in a depth of 0.37’ in the roadway and the 500-year event at a depth of 0.40' in the roadway. With these depths of flows within the roadway, we are revising the inlet configuration to only have one type D inlet at the end of the private drive in the Northeast corner of the project. This will eliminate the need for the twin-triple Type 16 inlets.

Sincerely,
EMK Consultants, Inc.

Gary A. Walter, P.E., CFM
Vice-President – Senior Project Manager

MHFD-Inlet, Version 5.03 (August 2023)

INLET MANAGEMENT

Worksheet Protected

INLET NAME	3T
Site Type (Urban or Rural)	URBAN
Inlet Application (Street or Area)	STREET
Hydraulic Condition	On Grade
Inlet Type	CDOT/Denver 13 Valley Grate

USER-DEFINED INPUT

User-Defined Design Flows

Minor Q_{Known} (cfs)	5.7
Major Q_{Known} (cfs)	9.9

Bypass (Carry-Over) Flow from Upstream Inlets must be organized from upstream (le

Receive Bypass Flow from:	No Bypass Flow Received
Minor Bypass Flow Received, Q_b (cfs)	0.0
Major Bypass Flow Received, Q_b (cfs)	0.0

Watershed Characteristics

Subcatchment Area (acres)	
Percent Impervious	
NRCS Soil Type	

Watershed Profile

Overland Slope (ft/ft)	
Overland Length (ft)	
Channel Slope (ft/ft)	
Channel Length (ft)	

Minor Storm Rainfall Input

Design Storm Return Period, T_r (years)	
One-Hour Precipitation, P_1 (inches)	

Major Storm Rainfall Input

Design Storm Return Period, T_r (years)	
One-Hour Precipitation, P_1 (inches)	

CALCULATED OUTPUT

Minor Total Design Peak Flow, Q (cfs)	**5.7**
Major Total Design Peak Flow, Q (cfs)	**9.9**
Minor Flow Bypassed Downstream, Q_b (cfs)	3.7
Major Flow Bypassed Downstream, Q_b (cfs)	7.3

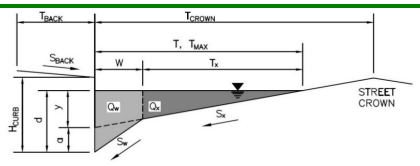
MHFD-Inlet, Version 5.03 (August 2023)

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: **Dawson Trails - Filing 2, Amendment 5**

Inlet ID: **3T**



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	0.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	15.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.026	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	15.0	15.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☐	

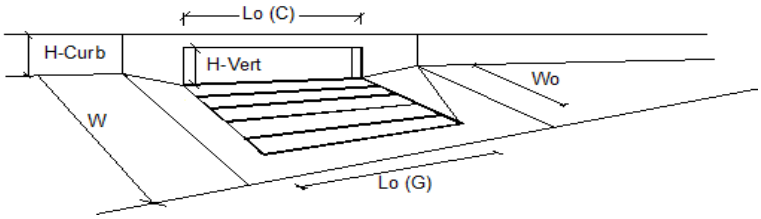
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	**Q_{allow} =**	**12.9**	**12.9**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 5.70 cfs on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design peak flow of 9.90 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)

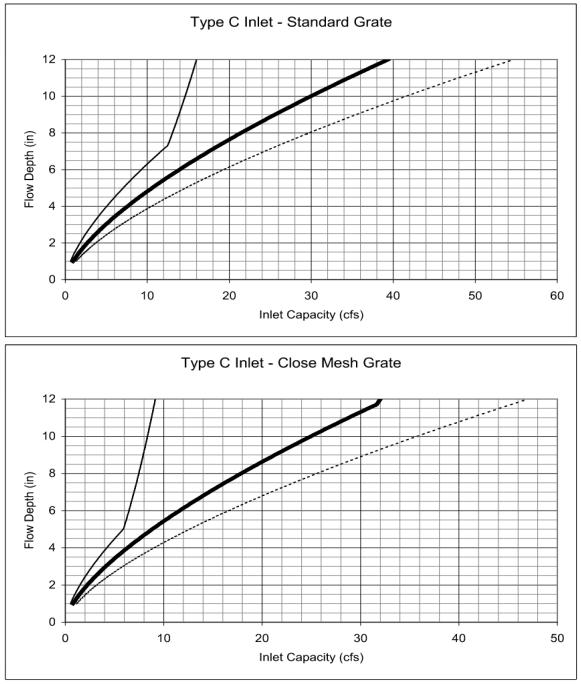


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT/Denver 13 Valley Grate		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	2.0	2.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	3.00	3.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	1.73	1.73	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f (G) =	0.50	0.50	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f (C) =	N/A	N/A	
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**2.0**	**2.6**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**3.7**	**7.3**	**cfs**
Capture Percentage = Q_a/Q_o	**C% =**	**35**	**26**	**%**

Area Inlets in Sump

Inlet	Type	Q5 (cfs)	Q100 (cfs)	D100 req'd (ft)	D available (ft)
8E	Type C Close Mesh	0.6	7.7	0.68	1.0
1T	Type C Close Mesh	1.6	5.6	0.40	1.0
4T	Type D Close Mesh	15.4	32.6	1.08	1.25

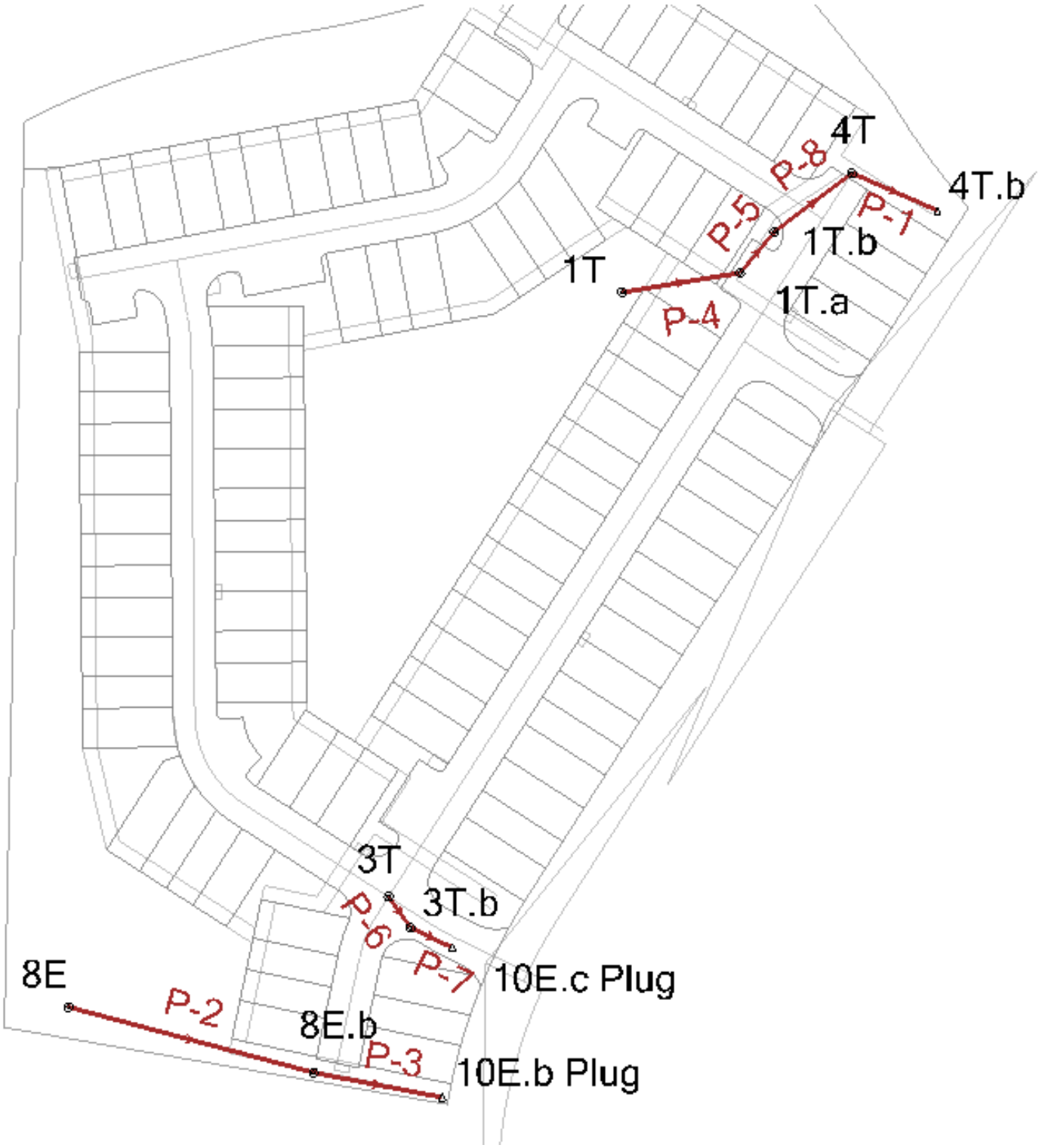
FIGURE 8-1, INLET CAPACITY CHART SUMP CONDITIONS
AREA (TYPE C) INLET



Notes:
1. The Town of Castle Rock standard inlet parameters must apply to use these charts.

8.5.4 Type C and D Inlets. The inlet capacity curve for a Type C inlet is provided. To determine the capacity of a Type D inlet in a sump, the capacity curve for a two grate Type C inlet shall be used. The capacity curves provided at the end of this chapter include a 50 percent reduction factor for a standard grate and a 75 percent reduction factor for a close mesh grate. If a Type C or D inlet is placed in an area with pedestrian traffic, a close mesh grate shall be used.

STORMCAD SCHEMATIC



Scenario: 100 Year
Current Time Step: 0.000 h
FlexTable: Conduit Table

Label	Start Node	Stop Node	Invert (Start) (ft)	Invert (Stop) (ft)	Slope (Calculated) (ft/ft)	Length (Scaled) (ft)	Manning's n	Flow (cfs)	Diameter (in)	Velocity (ft/s)
P-1	4T	4T.b	6,412.71	6,411.42	0.020	64.6	0.013	37.90	30.0	12.59
P-2	8E	8E.b	6,434.15	6,430.59	0.020	176.0	0.013	7.70	18.0	8.52
P-3	8E.b	10E.b Plug	6,430.39	6,427.21	0.035	90.7	0.013	7.70	18.0	10.44
P-4	1T	1T.a	6,420.15	6,417.65	0.030	83.0	0.013	5.60	18.0	9.06
P-5	1T.a	1T.b	6,417.40	6,416.66	0.020	37.1	0.013	5.60	18.0	7.82
P-6	3T	3T.b	6,429.51	6,428.99	0.020	26.3	0.013	2.60	18.0	6.32
P-7	3T.b	10E.c Plug	6,427.99	6,427.03	0.030	32.1	0.013	2.60	18.0	7.30
P-8	1T.b	4T	6,416.41	6,413.71	0.040	67.4	0.013	5.60	18.0	10.06

Scenario: 100 Year
Current Time Step: 0.000 h
FlexTable: Manhole Table

Label	Elevation (Rim) (ft)	Elevation (Invert) (ft)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Headloss Method	Headloss (ft)	Velocity (Out) (ft/s)
1T	6,424.57	6,420.15	6,421.06	6,421.06	HEC-22 Energy (Second Edition)	0.00	4.97
1T.a	6,421.98	6,417.40	6,418.48	6,418.32	HEC-22 Energy (Second Edition)	0.16	4.97
1T.b	6,421.37	6,416.41	6,417.42	6,417.33	HEC-22 Energy (Second Edition)	0.09	4.97
3T	6,433.64	6,429.51	6,430.12	6,430.12	HEC-22 Energy (Second Edition)	0.00	3.84
3T.b	6,433.97	6,427.99	6,428.66	6,428.60	HEC-22 Energy (Second Edition)	0.06	3.84
4T	6,418.31	6,412.71	6,415.54	6,414.79	HEC-22 Energy (Second Edition)	0.75	8.68
8E	6,438.81	6,434.15	6,435.23	6,435.23	HEC-22 Energy (Second Edition)	0.00	5.68
8E.b	6,435.53	6,430.39	6,431.54	6,431.47	HEC-22 Energy (Second Edition)	0.07	5.68

J:\13477 Dawson E2 Brightland\StormCAD\E2 Townhomes StormCAD.stsw

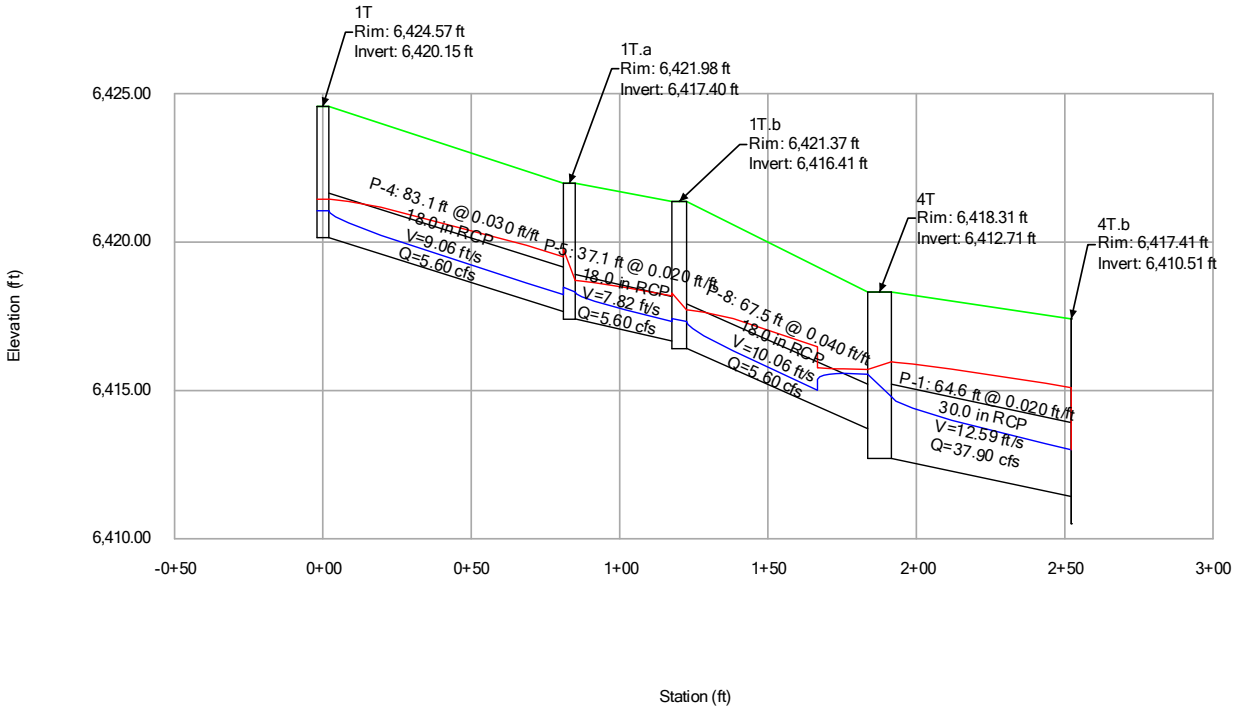
LEGEND FOR ALL PROFILES

ENERGY GRADE LINE

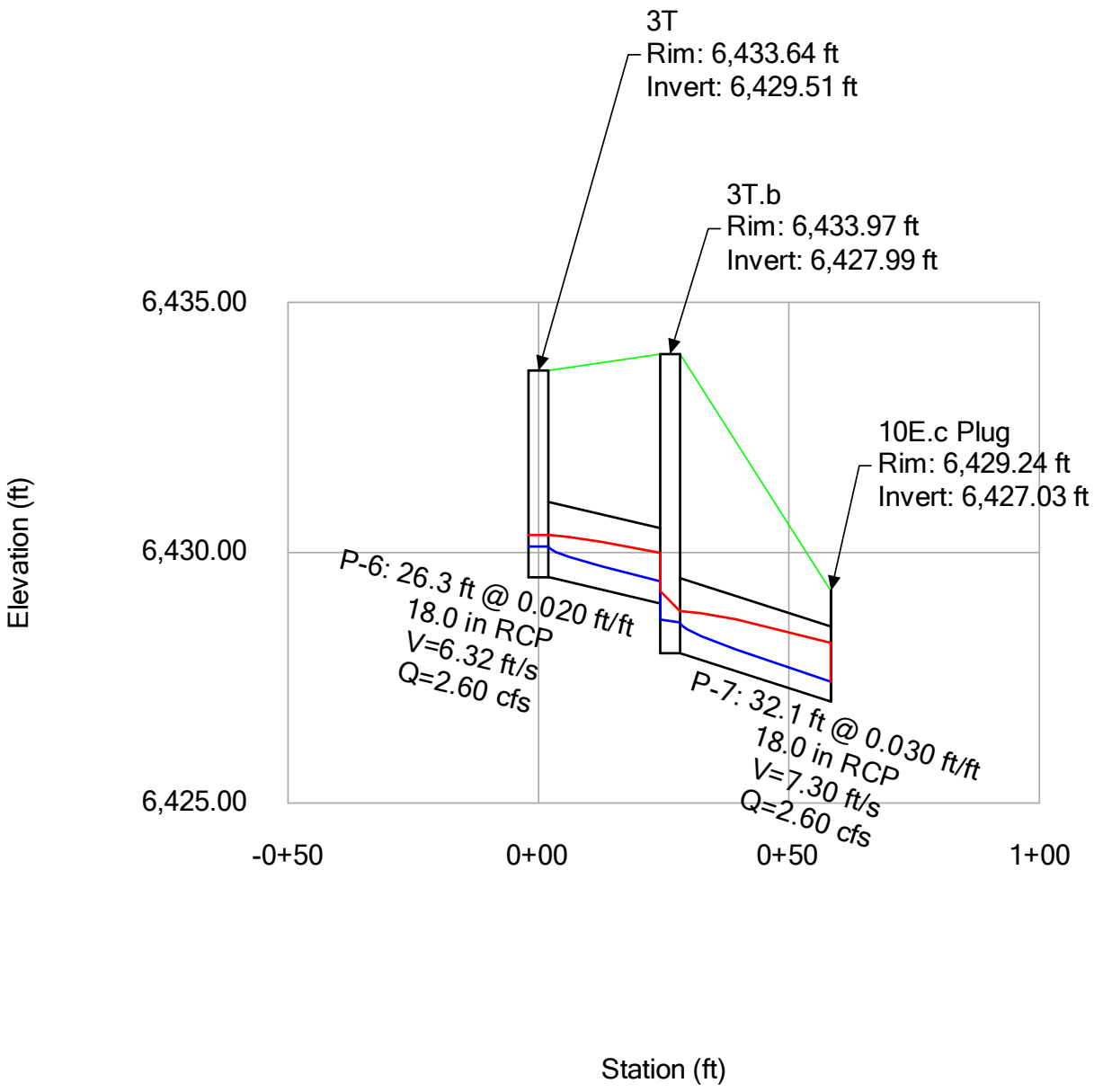
HYDRAULIC GRADE LINE

FINISHED GRADE

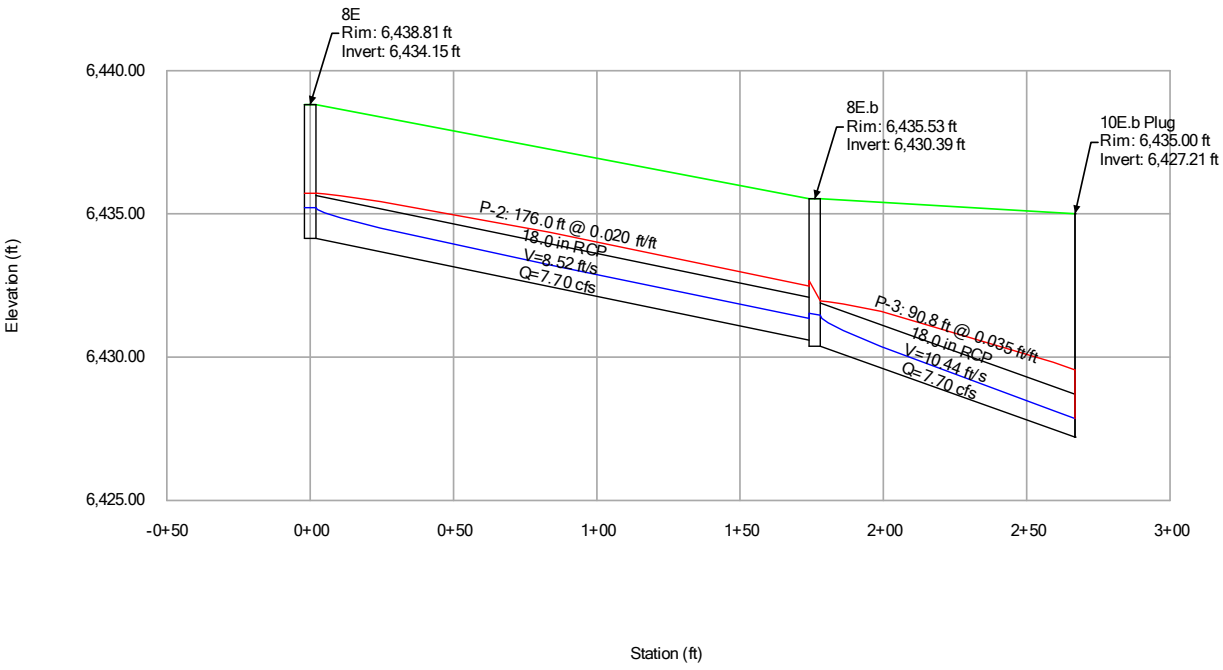
Active Scenario: 100 Year



Active Scenario: 100 Year



Active Scenario: 100 Year



Scenario: 5 Year
Current Time Step: 0.000 h
FlexTable: Conduit Table

Label	Start Node	Stop Node	Invert (Start) (ft)	Invert (Stop) (ft)	Slope (Calculated) (ft/ft)	Length (Scaled) (ft)	Manning's n	Flow (cfs)	Diameter (in)	Velocity (ft/s)
P-1	4T	4T.b	6,412.71	6,411.42	0.020	64.6	0.013	16.90	30.0	10.25
P-2	8E	8E.b	6,434.15	6,430.59	0.020	176.0	0.013	0.60	18.0	4.13
P-3	8E.b	10E.b Plug	6,430.39	6,427.21	0.035	90.7	0.013	0.60	18.0	4.99
P-4	1T	1T.a	6,420.15	6,417.65	0.030	83.0	0.013	1.60	18.0	6.34
P-5	1T.a	1T.b	6,417.40	6,416.66	0.020	37.1	0.013	1.60	18.0	5.49
P-6	3T	3T.b	6,429.51	6,428.99	0.020	26.3	0.013	2.00	18.0	5.86
P-7	3T.b	10E.c Plug	6,427.99	6,427.03	0.030	32.1	0.013	2.00	18.0	6.77
P-8	1T.b	4T	6,416.41	6,413.71	0.040	67.4	0.013	1.60	18.0	7.03

Scenario: 5 Year
Current Time Step: 0.000 h
FlexTable: Manhole Table

Label	Elevation (Rim) (ft)	Elevation (Invert) (ft)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Headloss Method	Headloss (ft)	Velocity (Out) (ft/s)
1T	6,424.57	6,420.15	6,420.62	6,420.62	HEC-22 Energy (Second Edition)	0.00	3.33
1T.a	6,421.98	6,417.40	6,417.93	6,417.88	HEC-22 Energy (Second Edition)	0.05	3.33
1T.b	6,421.37	6,416.41	6,416.92	6,416.89	HEC-22 Energy (Second Edition)	0.03	3.33
3T	6,433.64	6,429.51	6,430.05	6,430.05	HEC-22 Energy (Second Edition)	0.00	3.55
3T.b	6,433.97	6,427.99	6,428.57	6,428.52	HEC-22 Energy (Second Edition)	0.05	3.55
4T	6,418.31	6,412.71	6,414.39	6,414.10	HEC-22 Energy (Second Edition)	0.29	6.03
8E	6,438.81	6,434.15	6,434.44	6,434.44	HEC-22 Energy (Second Edition)	0.00	2.54
8E.b	6,435.53	6,430.39	6,430.68	6,430.68	HEC-22 Energy (Second Edition)	0.01	2.54

J:\13477 Dawson E2 Brightland\StormCAD\E2 Townhomes StormCAD.stsw

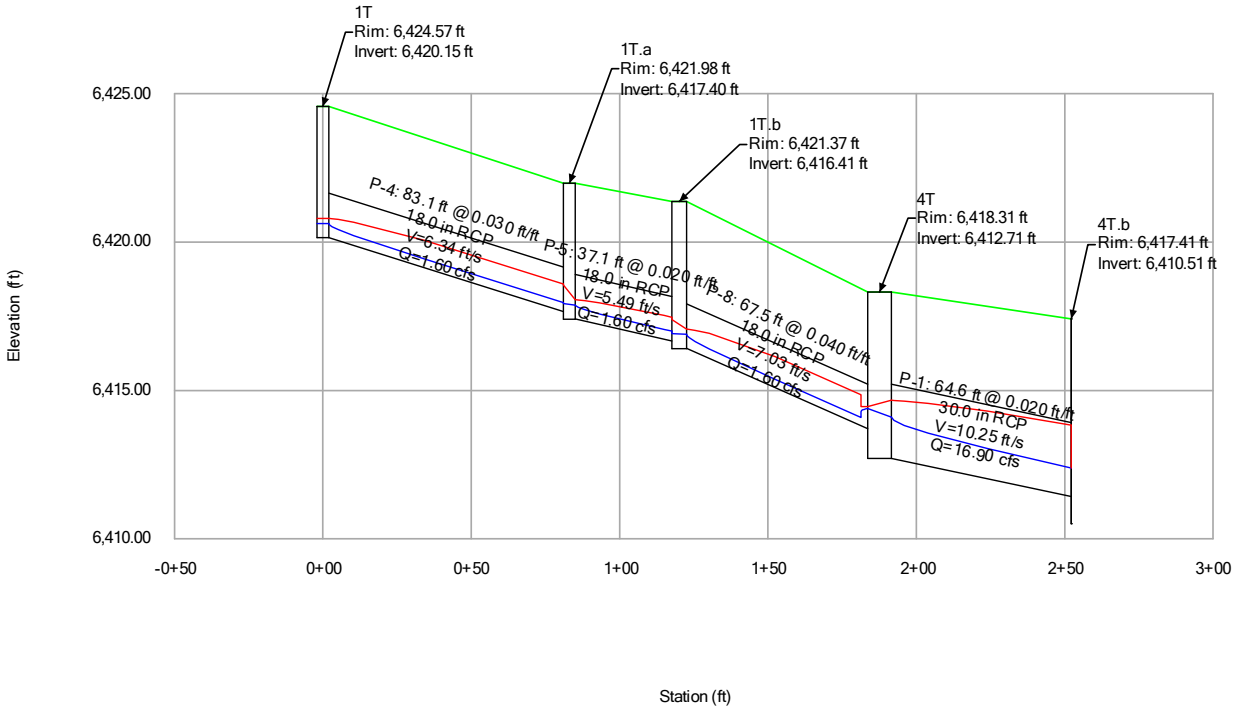
LEGEND FOR ALL PROFILES

ENERGY GRADE LINE

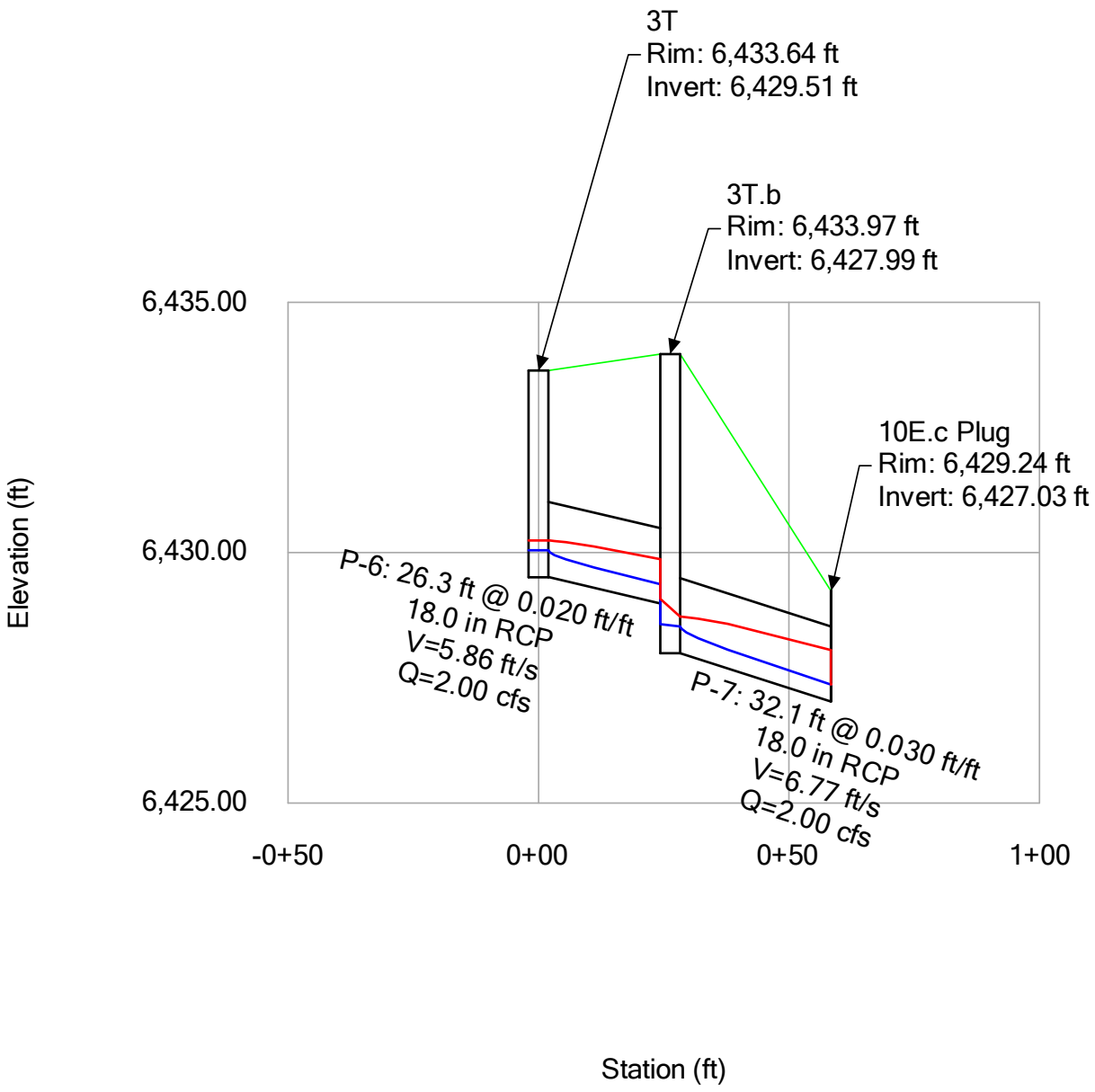
HYDRAULIC GRADE LINE

FINISHED GRADE

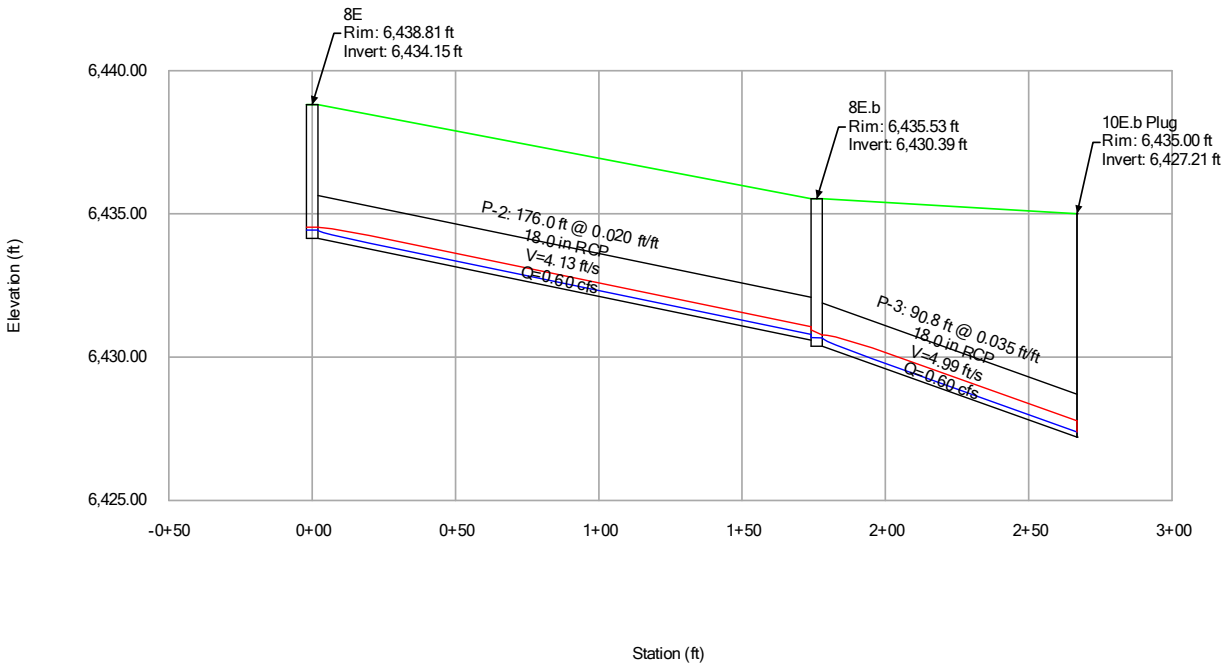
Active Scenario: 5 Year



Active Scenario: 5 Year



Active Scenario: 5 Year



DRAINAGE REPORT
for
DAWSON TRAILS - FILING 2, AMENDMENT 5

APPENDIX C
Water Quality Enhancement Control Measures

Summary of Water Quality Conformance to MS4 Permit

The purpose of this worksheet is to document conformance with the Town of Castle Rock's MS4 permit with regard to permanent water quality on land disturbance projects.

Project Name Dawson Trails Filing 2, Amendment 5

Project Owner ACM Dawson Trails JV LLC

Project Location Southwest of the new Crystal Valley Interchange

ToCR Project Number CD23-0045

Total Site Area 8.4 **acres**

Total Size of Common Plan of Development 445 +/- **acres**

Check all that apply:

- ☑ **Project within Plum Creek Basin**
- ☐ **Project within Cherry Creek Basin**

Estimated construction completion date December 2026

---

1. The water quality control measure(s) for applicable development sites shall meet one of the following base design standards as per the SDDTCM Section 14.4. Please select all design standards that were applied to meet conformance with the MS4 on this site.

   - ☑ WQCV standard
   - ☐ Pollutant removal standard
   - ☐ Runoff reduction standard
   - ☐ Applicable site draining to regional WQVC control measure (accepts drainage prior to discharging to WOTS)
   - ☐ Applicable site draining to regional WQVC control facility (with receiving pervious area control measure upstream of WOTS)
   - ☐ Constrained redevelopment sites standard
     - Imperviousness of existing site _____/_____(Imp. Ac/Site Ac) =____%
     - Variance required TCV No. _____
   - ☐ Existing control measure with WQCV per previous criteria standards
     - Reference Construction Permit No. _____
   - ☐ Cherry Creek Basin only, choose one: ☐ Tier 1 ☐ Tier 2 ☐ Tier 3
   - ☐ No control measures provided (See Permanent WQ Worksheet for applicability)

Attachment G

Permanent Water Quality Determination Worksheet (Taken from 2019 SDDTCM Sections 13.1.4 and 13.1.5)

Project:		**Project#**		**Applicant:**
Section	**Questions**	**Response**	**Check those that apply**	**Instructions**
1	**Non-applicable Sites**			
1.1	Will the project result in a temporary disturbance of greater than one acre?	No	☐	Proceed to section 1.2.
		Yes	☑	Proceed to section 2.
1.2	Is the project part of a larger common plan of development or sale where multiple separate and distinct construction activities may be taking place at different times on different schedules, but remain related and are within 1/4 mile of each other? (A common plan of development will generally be documented on a site development plan, master plan, or equivalent, for the property/project)	No	☐	Proceed to section 1.3.
		Yes	☐	Proceed to section 2.
1.3	Is the project within the Cherry Creek Watershed?	Yes	☐	Permanent water quality control measures may be required. Refer to Water Qualtiy Control Regulation 72.7 for details and allowable exclusions.
		No	☐	Permanent water quality control measures are not required.
2	**Applicable Site Types and Exclusions by Variance**			
2.1	Does the project have more than 35% impervious area on the existing site?	No	☐	Project is an applicable Development Site. Proceed to section 3.
		Yes	☑	Proceed to 2.2.
2.2	Does the project have greater than 75% impervious area on the existing site?	No	☑	Project is an applicable Redevelopment Site. Proceed to section 3.
		Yes	☐	Project is an applicable Constrainted Redevelopment Site. Proceed to 2.3.
2.3	Will 100% of the runoff from the existing and proposed site be captured and treated using one or more of the allowable design standards for permanent water quality?	Yes	☐	No further action required.
		No	☐	Proceed to 2.4.
2.4	Do any other water quality exclusions apply to the site?	No	☐	Portions of the project are excluded. Proceed with design in accordance with Constrained Redevelopment standards and apply for **variance** for Constrained Redevelopment Sites.
		Yes	☐	Proceed to section 3. Following approval of other exclusions, design remaining site in accordance with Constrained Redevelopment standards and apply for **variance** for Constrained Redevelopment Sites.
3	**Applicable Sites with Other Exclusions by Variance**			
3.1	**Category 1: Roadways, bridges and trails only**			
3.1.1	Is the project a bike or pedestrian trail?	Yes	☐	Proceed to next line.
		No	☐	Proceed to 3.1.2.
	Is the trail for a roadway?	Yes	☐	Proceed to 3.1.2.
		No	☐	Project is excluded. Submit **variance** for Trails Excluded from Permanent Water Quality Requirements.
3.1.2	Is the project primarily used for parking or access to parking?	Yes	☐	This exclusion does not apply. Permanent water quality is required.
		No	☐	Proceed to 3.1.3.
3.1.3	Does the project add impervious area?	No	☐	Project is excluded. Submit **variance** for Pavement Management Sites Excluded from Permanent Water Quality Requirements.
		Yes	☐	Proceed to 3.1.4.

Section	Questions	Response	Check those that apply	Instructions
3.1.4	Does the project add more than 8.25 feet of paved width at any location to the existing roadway?	No	☐	Project is excluded. Submit **variance** for Roadway Redevelopment Sites Excluded from Permanent Water Quality Requirements.
		Yes	☐	Proceed to next line.
	Does the project add more than one acre of paved area per mile to an existing roadway?	No	☐	Project is excluded. Submit **variance** for Roadway Redevelopment Sites Excluded from Permanent Water Quality Requirements.
		Yes	☐	Proceed to next line.
	Does the project increase the width by two times or more, on average, of the original roadway area?	No	☐	Existing areas of site are excluded only. Submit **variance** for Existing Roadway Surfaces Only Excluded from Permanent Water Quality Requirements.
		Yes	☐	This exclusion does not apply. Permanent water quality is required.
3.2	**Category 2: Non-residential and non-commercial projects only**			
3.2.1	Is the project associated with oil and gas exploration, production, processing, or treatment operations or transmission facilities, including activities necessary to prepare a site for drilling and the movement and placement of drilling equipment?	Yes	☐	Project is excluded. Submit **variance** for Oil and Gas Exploration Sites Excluded from Permanent Water Quality Requirements.
		No	☐	Proceed to 3.2.2.
3.2.2	Is the project for stream stabilization?	Yes	☐	Project is excluded. Submit **variance** for Stream Stabilization Sites Excluded from Permanent Water Quality Requirements.
		No	☐	Proceed to 3.2.3.
3.2.3	Is the project for installation or maintenance of aboveground or underground utilities or infrastructure that does not permanently alter the terrain, ground cover, or drainage patterns from those present prior to the construction activity including activities to install, replace or maintain utilities under roadways or other paved areas that return the surface to the same condition?	Yes	☐	Project is excluded. Submit **variance** for Aboveground and Underground Utilities Excluded from Permanent Water Quality Requirements.
		No	☐	Proceed to 3.2.4.
3.2.4	Is the project on undeveloped land (land with no human-made structures such as buildings or pavement) that will remain undeveloped after the project?	Yes	☐	Project is excluded. Submit **variance** for Sites with Land Disturbances to Undeveloped Land that will Remain Undeveloped Excluded from Permanent Water Quality Requirements.
		No	☐	Proceed to 3.2.5.
3.2.5	Will the post-project condition result in surface water discharge during the 80th percentile storm runoff event?	No	☐	Project is excluded. Submit **study** along with **variance** for Non-residential and Non-commercial Infiltration Conditions Excluded from Permanent Water Quality Requirements.
		Yes	☐	This exclusion does not apply. Permanent water quality is required.
3.3	**Category 3: Residential, Agricultural and Commercial projects**			
3.3.1	Is the project a single-family residential lot, or agricultural zoned lands, greater than or equal to 2.5 acres in size per dwelling unit?	Yes	☐	Proceed to next line.
		No	☑	Proceed to 3.3.2.
	Is the project site greater than 10% impervious?	No	☐	Project is excluded. Submit **variance** for Large Lot Single Family Sites Excluded from Permanent Water Quality Requirements.
		Yes	☐	Proceed to next line.
	Is the project site greater than 20% impervious?	Yes	☐	This exclusion does not apply. Permanent water quality is required.
		No	☐	Proceed to next line.
	Will the post-project condition result in surface water discharge during the 80th percentile storm runoff event?	No	☐	Project is excluded. Submit **study** along with **variance** for Large Lot Single Family Sites Excluded from Permanent Water Quality Requirements.
		Yes	☐	This exclusion does not apply. Permanent water quality is required.

Section	Questions	Response	Check those that apply	Instructions
3.3.2	Will 100% of the runoff from the residential or commercial site be captured?	Yes	☑	This exclusion does not apply. Permanent water quality is required.
		No	☐	Proceed to next line.
	Is all or a portion of the site undeveloped or will it remain undeveloped after construction?	Yes	☐	This portion of the project is excluded. Submit **variance** for Sites with Land Disturbance to Undeveloped Land that will Remain Undeveloped Excluded from Permanent Water Quality Requirements. Proceed to next line.
		No	☐	Proceed to next line.
	Is the remaining untreated impervious area greater than 20% of the site?	Yes	☐	This exclusion does not apply. Permanent water quality is required.
		No	☐	Proceed to next line.
	Is the remaining untreated impervious area greater than one acre?	Yes	☐	This exclusion does not apply. Permanent water quality is required.
		No	☐	Proceed to next line.
	Is it practicable to capture runoff from portions of the site that will not drain to a control measure?	No	☐	Document justification demonstrating that it is not practicable to capture runoff from this portion of the site in the **drainage report**. No further action is needed.
		Yes	☐	This exclusion does not apply. Permanent water quality is required.

DRAINAGE REPORT
for
DAWSON TRAILS - FILING 2, AMENDMENT 5

APPENDIX D
Referenced Information

Castle Rock Water
175 Kellogg Court, Castle Rock CO 80109
720-733-6000

Phase II Drainage Report Checklist

The Phase II Drainage Report must be in conformance with the latest Town of Castle Rock Storm Drainage Design and Technical Criteria Manual available on the Town's website.

The Phase II Drainage Report must be signed and sealed by a Professional Engineer licensed in the State of Colorado. The purpose of the Phase II Drainage Report is to identify and refine conceptual stormwater management solutions to the challenges that may be present or occur on-site and off-site.

The preparer should contact and work with the Town Stormwater Engineering Staff regarding any design, master planning and existing system questions (720-733-6000). The following outline sets forth the **required minimum** content to be provided in the Phase II Drainage Report that shall be submitted with the Planned Development Plan or Straight Zoning documents. A copy of this checklist must be submitted with the Phase II Drainage Report.

Please see Chapter 4 of the Town of Castle Rock Storm Drainage Design and Technical Criteria Manual for additional details and information. Please check off the following items to assure your report is complete. Appropriate notations shall be provided with the checklist. For example, if a specific item is not addressed or not applicable, an explanation needs to be provided.

Included	N/A	
✓		**I. COVER SHEET**
✓		A. Name of Project, including legal name of development
	✓	B. Address
✓		C. Owner
✓		D. Developer
✓		E. Engineer
✓		F. Submittal date and revision dates as applicable
✓		**II. GENERAL LOCATION AND DESCRIPTION**
✓		A. Site Location
✓		B. Description of Property and Land Use
✓		**III. DRAINAGE BASIN AND SUB-BASINS**
✓		A. Major Drainage Basins
✓		B. Minor Drainage Basins
✓		**IV. DRAINAGE DESIGN CRITERIA**
✓		A. Regulations
✓		B. Drainage Studies, Master Plans, Site Constraints
✓		C. Hydrology
✓		D. Hydraulics
✓		E. Water Quality Enhancement

Phase II Drainage Report Checklist

Included	N/A	
✓		**V. STORMWATER MANAGEMENT FACILITY DESIGN**
✓		A. Stormwater Conveyance Facilities
✓		B. Stormwater Storage Facilities
✓		C. Water Quality Enhancement Best Management Practices
✓		D. Floodplain Modification
✓		E. Additional Permitting Requirements
✓		F. General
✓		**VI. CONCLUSIONS**
✓		A. Compliance with Standards
✓		B. Variances
✓		C. Drainage Concept
✓		**VII. REFERENCES**
✓		**VIII. APPENDICES**
✓		A. Hydrologic Computations
	✓	B. Hydraulic Computations (If known at this time—not required)
✓		C. Water Quality Enhancement Best Management Practices
✓		D. Referenced Information
✓		**OVERALL DRAINAGE PLAN (IN POCKET)**
✓		**DETAILED DRAINAGE PLANS (IN POCKET)** Same sheet - One sheet only

Notes/Comments:

Crystal Valley Interchange Project
Package 2:
Phase III Drainage Report

NHPP M185-016

CIP23-0004

October 2023

Prepare For:

Town of Castle Rock – Public Works

4175 North Castleton Court

Castle Rock, Colorado 80104

Prepared By:

Jacobs Engineering Group

6312 South Fiddlers Green Circle

Suite 300 N

Denver, Colorado 80111

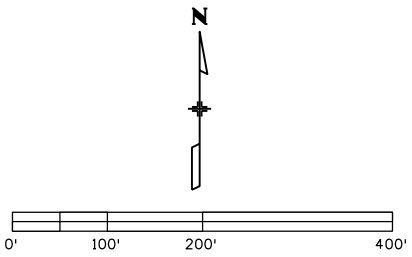
T +1 719.477.4942

Contact:

Troy D. Slocum, PE, CFM

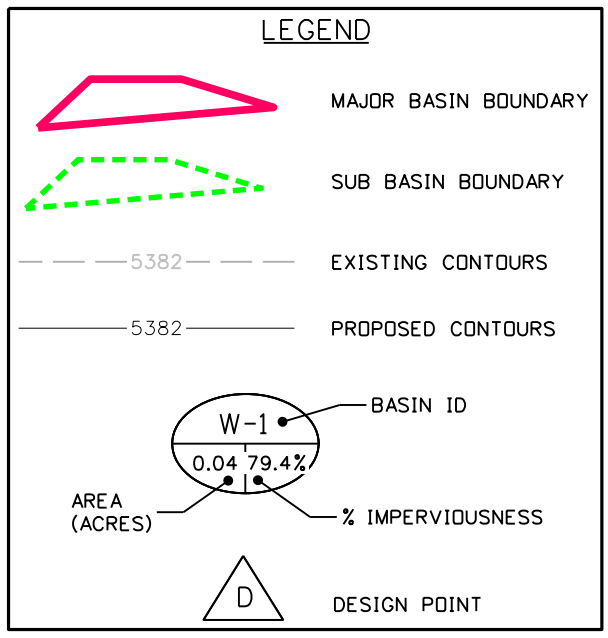
Troy.Slocum@Jacobs.com

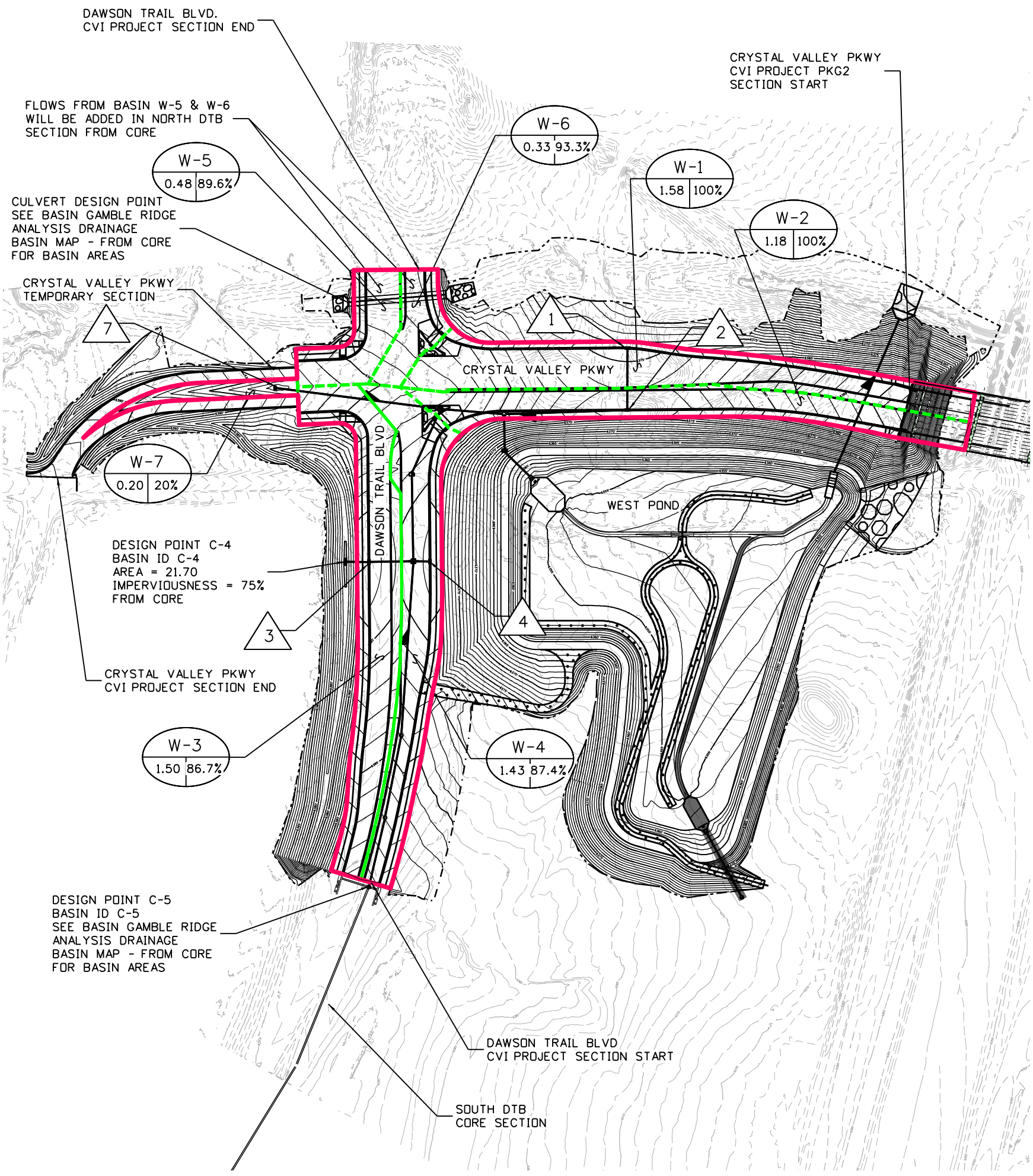
T +1 719.477.4942



NOTES

1. ALL PROPOSED BASIN & FLOWS AT ROAD TIE IN POINTS ARE TAKEN FROM GAMBLE RIDGE ANALYSIS DRAINAGE MAP PROVIDED BY CORE CONSULTANT.





PRLIMINARY DESIGN - NOT FOR CONSTRUCTION

Print Date: 9/28/2023	
File Name: 24262_HYD-DRNBASIN01_PKG2_SHR.dgn	
Horiz. Scale: 1:202.181	Vert. Scale: As Noted
Unit Information	Unit Leader Initials

shrewsberry

TOWN OF CASTLE ROCK COLORADO

PUBLIC WORKS DEPT.
4175 NORTH CASTLETON CT.
CASTLE ROCK, CO 80109
PHONE 303 660-1020
FAX 303 660-1025

CRYSTAL VALLEY INTERCHANGE

PACKAGE 2
PROPOSED DRAINAGE
BASIN MAP

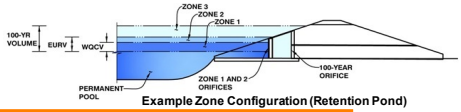
Project No./Code	
NHPP M185-0116	
25846	
Exhibit Number	01

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: CVI Package 2 - West of I-25

Basin ID: Public Regional Extended Detention Basin C-1



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	185.18	acres
Watershed Length =	5,405	ft
Watershed Length to Centroid =	2,222	ft
Watershed Slope =	0.037	ft/ft
Watershed Imperviousness =	76.90%	percent
Percentage Hydrologic Soil Group A =	7.0%	percent
Percentage Hydrologic Soil Group B =	36.0%	percent
Percentage Hydrologic Soil Groups C/D =	57.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

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

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	4.783	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	14.917	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 1.06 in.) =	12.378	acre-feet	1.06	inches
5-yr Runoff Volume (P1 = 1.43 in.) =	18.026	acre-feet	1.43	inches
10-yr Runoff Volume (P1 = 1.66 in.) =	21.644	acre-feet	1.66	inches
25-yr Runoff Volume (P1 = 1.69 in.) =	22.485	acre-feet		inches
50-yr Runoff Volume (P1 = 2.26 in.) =	31.745	acre-feet	2.26	inches
100-yr Runoff Volume (P1 = 2.6 in.) =	37.598	acre-feet	2.60	inches
500-yr Runoff Volume (P1 = 3.14 in.) =	46.569	acre-feet		inches
Approximate 2-yr Detention Volume =	11.140	acre-feet		
Approximate 5-yr Detention Volume =	16.084	acre-feet		
Approximate 10-yr Detention Volume =	19.000	acre-feet		
Approximate 25-yr Detention Volume =	18.170	acre-feet		
Approximate 50-yr Detention Volume =	22.359	acre-feet		
Approximate 100-yr Detention Volume =	24.420	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	4.783	acre-feet
Zone 2 Volume (EURV - Zone 1) =	10.135	acre-feet
Zone 3 (100yr + 1 / 2 WQCV - Zones 1 & 2) =	11.894	acre-feet
Total Detention Basin Volume =	26.811	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio (R_{LW}) =	user	
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	**user**	acre-feet

Watershed and Hydrology parameters coordinated with 04/19/2023 Correspondence between CORE and Jacobs

Depth Increment = ft

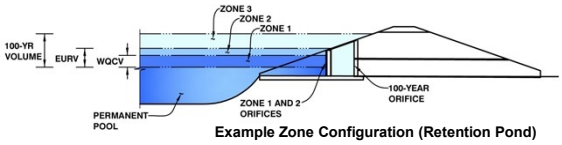
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	285	0.007		
	--	0.50	--	--	--	5,066	0.116	1,338	0.031
	--	1.00	--	--	--	16,821	0.386	6,809	0.156
	--	1.50	--	--	--	36,415	0.836	20,118	0.462
	--	2.00	--	--	--	56,637	1.300	43,381	0.996
	--	2.50	--	--	--	81,959	1.882	78,030	1.791
	--	3.00	--	--	--	108,317	2.487	125,599	2.883
	--	3.50	--	--	--	133,314	3.060	186,007	4.270
	--	4.00	--	--	--	156,307	3.588	258,412	5.932
	--	4.50	--	--	--	178,205	4.091	342,040	7.852
	--	5.00	--	--	--	196,635	4.514	435,750	10.003
	--	5.50	--	--	--	211,079	4.846	537,678	12.343
	--	6.00	--	--	--	220,190	5.055	645,496	14.819
	--	6.50	--	--	--	225,070	5.167	756,811	17.374
	--	7.00	--	--	--	229,901	5.278	870,554	19.985
	--	7.50	--	--	--	234,773	5.390	986,722	22.652
	--	8.00	--	--	--	239,738	5.504	1,105,350	25.375
	--	8.50	--	--	--	244,731	5.618	1,226,467	28.156
	--	9.00	--	--	--	249,923	5.737	1,350,131	30.995
	--	9.50	--	--	--	255,255	5.860	1,476,425	33.894
	--	10.00	--	--	--	260,537	5.981	1,605,374	36.854
	--	10.50	--	--	--	265,832	6.103	1,736,966	39.875
	--	11.00	--	--	--	271,982	6.244	1,871,419	42.962

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: CVI Package 2 - West of I-25

Basin ID: Public Regional Extended Detention Basin C-1



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.67	4.783	Orifice Plate
Zone 2 (EURV)	6.02	10.135	Orifice Plate
'3 (100+1/2WQCV)	8.26	11.894	Weir&Pipe (Restrict)
Total (all zones)		26.811	

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

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

Calculated Parameters for Underdrain

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

Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	N/A	ft^2
Depth at top of Zone using Orifice Plate =	6.02	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	24.10	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	N/A	sq. inches	Elliptical Slot Area =	N/A	ft^2

Calculated Parameters for Plate

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	2.01	4.01					
Orifice Area (sq. inches)	20.55	20.55	42.60					

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

User Input: Vertical Orifice (Circular or Rectangular)

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

Calculated Parameters for Vertical Orifice

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

	Zone 3 Weir	Not Selected			Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	6.10	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	8.90	N/A	feet
Overflow Weir Front Edge Length =	12.00	N/A	feet	Overflow Weir Slope Length =	14.28	N/A	feet
Overflow Weir Grate Slope =	5.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	15.55	N/A	
Horiz. Length of Weir Sides =	14.00	N/A	feet	Overflow Grate Open Area w/o Debris =	135.52	N/A	ft^2
Overflow Grate Type =	Close Mesh Grate	N/A		Overflow Grate Open Area w/ Debris =	67.76	N/A	ft^2
Debris Clogging % =	50%	N/A	%				

Calculated Parameters for Overflow Weir

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

	Zone 3 Restrictor	Not Selected			Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	0.00	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	8.72	N/A	ft^2
Outlet Pipe Diameter =	84.00	N/A	inches	Outlet Orifice Centroid =	1.14	N/A	feet
Restrictor Plate Height Above Pipe Invert =	23.32		inches	Half-Central Angle of Restrictor Plate on Pipe =	1.11	N/A	radians

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	9.22	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	1.93	feet
Spillway Crest Length =	71.00	feet	Stage at Top of Freeboard =	11.65	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	6.24	acres
Freeboard above Max Water Surface =	0.50	feet	Basin Volume at Top of Freeboard =	42.96	acre-ft

Calculated Parameters for Spillway

Routed Hydrograph Results

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

Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.06	1.43	1.66	1.69	2.26	2.60	3.14
CUHP Runoff Volume (acre-ft) =	4.783	14.917	12.378	18.026	21.644	22.485	31.745	37.598	46.569
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	12.378	18.026	21.644	22.485	31.745	37.598	46.569
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	5.4	45.5	70.5	98.1	177.4	233.8	312.1
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.03	0.25	0.38	0.53	0.96	1.26	1.69
Peak Inflow Q (cfs) =	N/A	N/A	201.0	293.3	346.1	370.5	525.9	620.9	765.9
Peak Outflow Q (cfs) =	2.2	5.1	4.5	8.7	21.7	24.9	74.1	115.0	172.1
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.2	0.3	0.3	0.4	0.5	0.6
Structure Controlling Flow =	Plate	Plate	Plate	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	0.0	0.1	0.1	0.5	0.8	0.8
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	67	62	72	73	73	70	69	67
Time to Drain 99% of Inflow Volume (hours) =	**40**	71	66	78	79	79	79	78	78
Maximum Ponding Depth (ft) =	3.67	6.02	5.36	6.43	6.95	7.04	8.00	8.65	9.60
Area at Maximum Ponding Depth (acres) =	3.24	5.06	4.75	5.15	5.27	5.29	5.50	5.65	5.88
Maximum Volume Stored (acre-ft) =	4.806	14.920	11.671	17.013	19.722	20.196	25.375	28.945	34.422

Storage and Release Rate parameters coordinated with 04/19/2023 Correspondence between CORE and Jacobs

CVI - Package 2 *8/10/2023*

West Pond Analysis Results

	New Iteration
Watershed Area (acres)	185.18
% Imperviousness	76.90
100 Year Inflow (cfs)	620.90
Release Rate (cfs)	115.00
Total 100-Year Detention Volume Required with restriction (acre-feet)	**28.945**
Total Detention Volume Provided (acre-feet)	**32.263**
Extra Storage Provided (acre-feet)	**3.318**
RCP Outfall Pipe Size (inches)	84.00
Emergency Spillway Crest Elevation (ft)	6360.22
Emergency Spillway Length (ft)	**71.00**
Spillway Freeboard Used (ft) - See Note 4	**0.50**
Minimum depth required for the spillway (including freeboard) based on inflow	**1.78**
100 Year WSEL stage (ft)	8.65
WSEL at 100% clogging factor (required spillway invert stage)	9.08
Provided spillway invert stage (ft)	9.22
Extra-depth provided between crest of spillway & top of third chamber (ft)	**0.57**
Extra-depth between crest of spillway & top of third chamber (inches)	**6.84**
Third chamber size (B feet x W feet)	12 x 10
Outfall pipe capacity at 100 yr storm requested by Town (cfs)	**345.00**
Third chamber inflow calculated using Orifice Discharge Equation - See Note 5 & Reference	229.02
Total incoming flow in outfall pipe from 3rd chamber & restriction plate	344.02
Outfall Pipe (84" RCP) Capacity Provided - Includes 115 cfs restricted flow (cfs) - See Note 7	**411.50**
Slip-Lined Outfall Pipe Capacity (76") Provided - Includes 115 cfs restricted flow (cfs) - See Note 6 & 7	**396.96**

Notes:

1. Overall pond grading/footprint remained same based on a meeting with Jacobs/Developer/Town/CORE on April 17th.

2. Pond Top Elevation = 6362.00

3. Pond Bottom Elevation = 6351.00

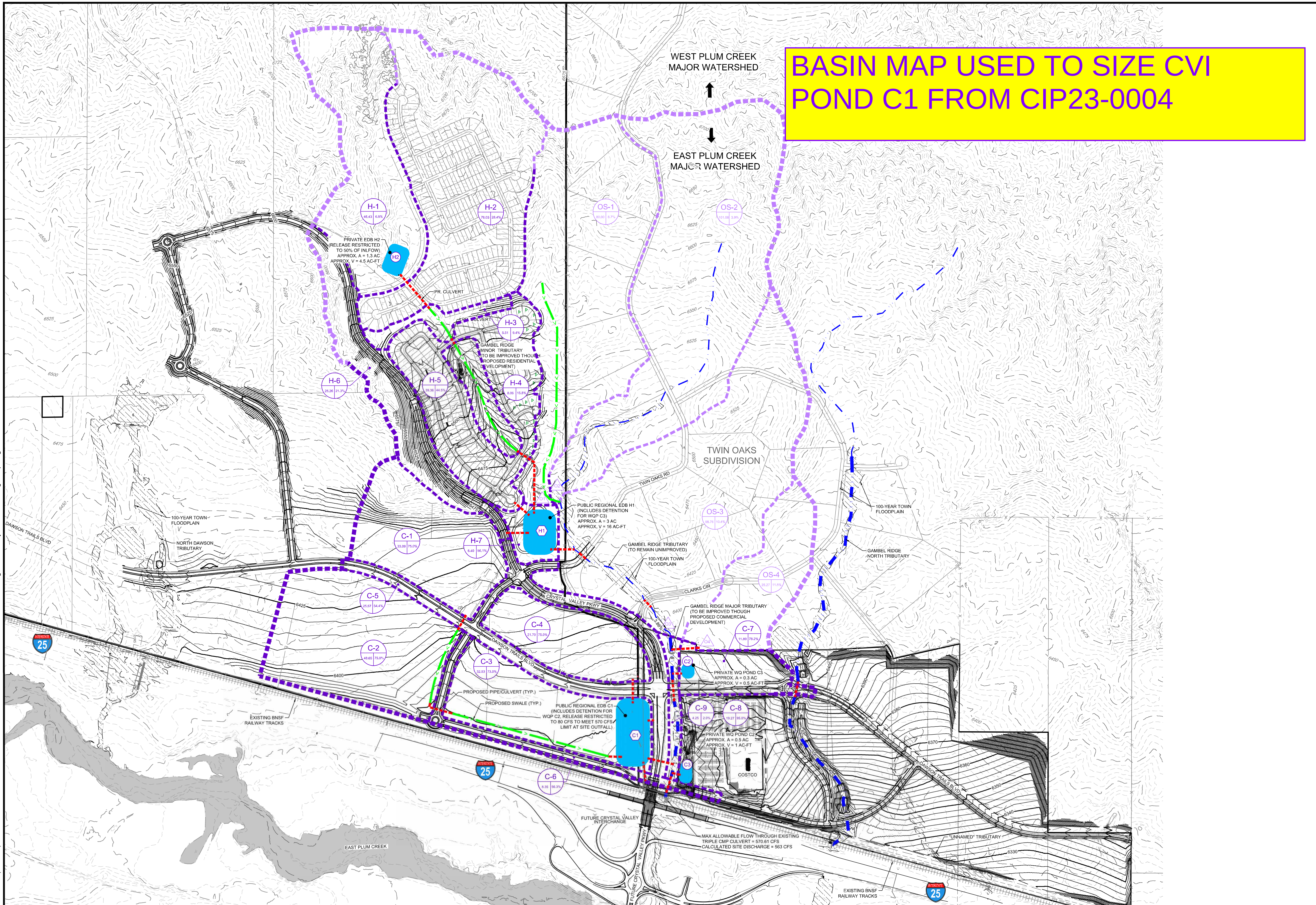
4. Need variance from Town for 0.5 feet freeboard requirement

5. Assumed 25% Clogging, 0.7 open area factor for 3rd chamber

6. Assumed 2" (1" walls) of slip lining for the pipe

7. Outfall pipe analysis performed in HY-8 for the pressure condition flow using depth (9.22) above 3rd chamber

BASIN MAP USED TO SIZE CVI POND C1 FROM CIP23-0004


WEST PLUM CREEK
MAJOR WATERSHED
EAST PLUM CREEK
MAJOR WATERSHED
H-1
H-2
H-3
H-4
H-5
H-6
H-7
OS-1
OS-2
OS-3
OS-4
C-1
C-2
C-3
C-4
C-5
C-6
C-7
C-8
C-9
PRIVATE EDB H2
(RELEASE RESTRICTED
TO 50% OF INFLOW)
APPROX. A = 1.3 AC
APPROX. V = 4.5 AC-FT
PR. CULVERT
GAMBEL RIDGE
MINOR TRIBUTARY
(TO BE IMPROVED THOUGH
PROPOSED RESIDENTIAL
DEVELOPMENT)
TWIN OAKS
SUBDIVISION
TWIN OAKS RD
PUBLIC REGIONAL EDB H1
(INCLUDES DETENTION
FOR WQP C3)
APPROX. A = 3 AC
APPROX. V = 16 AC-FT
GAMBEL RIDGE TRIBUTARY
(TO REMAIN UNIMPROVED)
100-YEAR TOWN
FLOODPLAIN
NORTH DAWSON
TRIBUTARY
DAWSON TRAILS BLVD
CRYSTAL VALLEY PKWY
CLARKS CIR
GAMBEL RIDGE MAJOR TRIBUTARY
(TO BE IMPROVED THOUGH
PROPOSED COMMERCIAL
DEVELOPMENT)
GAMBEL RIDGE
NORTH TRIBUTARY
PRIVATE WQ POND C3
APPROX. A = 0.3 AC
APPROX. V = 0.5 AC-FT
PROPOSED PIPE/CULVERT (TYP.)
PROPOSED SWALE (TYP.)
PUBLIC REGIONAL EDB C1
(INCLUDES DETENTION FOR
WQP C2, RELEASE RESTRICTED
TO 80 CFS TO MEET 570 CFS
LIMIT AT SITE OUTFALL)
PRIVATE WQ POND C2
APPROX. A = 0.5 AC
APPROX. V = 1 AC-FT
COSTCO
EXISTING BNSF
RAILWAY TRACKS
FUTURE CRYSTAL VALLEY
INTERCHANGE
FUTURE CRYSTAL VALLEY PKWY
MAX ALLOWABLE FLOW THROUGH EXISTING
TRIPLE CMP CULVERT = 570.61 CFS
CALCULATED SITE DISCHARGE = 563 CFS
EAST PLUM CREEK
"UNNAMED" TRIBUTARY
25

0 400'
1 inch = 400 ft.

LAND DEVELOPMENT
ENERGY
PUBLIC INFRASTRUCTURE

CORE CONSULTANTS, INC.
3473 S. BROADWAY
ENGLEWOOD, CO 80113
303.703.4444
LIVEYOURCORE.COM

CORE

GAMBEL RIDGE POND ANALYSIS
DRAINAGE MAP

DAWSON TRAILS

DATE: 11/4/2022
CREATED BY: DJB
JOB NO. 20-224
SHEET 1

X:\20-224 Dawson\Civil\CAD\Exhibits\CVI\2023-01-17 Gambel Ridge Pond Analysis Drainage Map.dwg
Justin Keller
2021-09-11 (4:25 PM)

footprint. Since the West Pond is sized for the ultimate future conditions and works in conjunction with other ponds in the development, the total watershed area and % imperviousness of the development area to size the pond were provided by CORE Consultants. A total watershed area of 185.18 acres with 76.90% imperviousness was used to size the West Pond. Note that the total CVI Package 2 proposed drainage basin area west of I-25 of 28.4 acres is included within the total watershed area used to size the West Pond.

The developer will be responsible for any changes to the development plan including changes to development densities or approach to meeting the water quality and detention requirements that would result in changes to flow rates provided during the project design. This may include additional FSD Ponds or modification to the pond constructed by this project west of I-25 to ensure the flow rate at the existing culvert under the railroad does not increase.

CVI CIP23-0004 Excerpt. Basin map also included which shows 75% impervious.

2.3 Minor Drainage Basins

Minor drainage basins were delineated using existing and proposed topogra
drainage patterns will remain the same; however, new storm drainage structures will be sized and placed to accommodate proposed roadway modifications.

Regional Minor Basins

CORE Consultants provided a Regional Proposed Drainage Basin Map (**Appendix A**), which states the maximum existing flow through the existing triple barrel CMPA culvert under the railroad was 570.61 cfs. The Regional Proposed Drainage Basin Map **(Appendix A**) was prepared by CORE Consultants, which includes future proposed sub-basins and is only used to size West Pond within the CVI Package 2 project. In the Overall Proposed Gambel Ridge Pond Analysis Basin Map provided by CORE Consultants, Pond C1 (called West Pond in the CVI project) accepts flow from the future proposed sub-basins. Basin areas from Basin C-1 to Basin C-6 were used to size Pond C1. The detention for future private Water Quality (WQ) Pond located west of north DTB is also added to Pond C1. Therefore, Basin C-7 was added to the tributary area to size Pond C1. Flows from basins C-1 & C-2, and C-3 will be conveyed to Pond C1 through a future proposed open channel. Basin C-4, C-5, and C-6 will carry flows from future proposed roadways/development and will be conveyed to Pond C1 through the proposed underground storm sewer system, which will be tied into the proposed storm sewer system within the CVI Package 2 project. All flows at tie-in points coming to the CVI Project were provided by CORE Consultants and used for the analysis.

CVI Project Minor Basins

The proposed construction area has been split into minor basins as identified in the Basin Map (**Appendix A**). Stormwater generated in the project will be collected and conveyed to FSD ponds or sand filter basins located south of the proposed Crystal Valley Parkway and southbound ramps before outfalling to Gambel Ridge and ultimately into East Plum Creek.

See **Appendix A** for the Drainage Basin Map.

Flows from Basin OS-3 will enter the Gamble Ridge Tributary just west of the project boundary and CVI project area. Drainage patterns from OS-3 will generally remain unchanged from historic conditions. Hydrology of OS-3 is analyzed by CUHP method and results can be found in **Appendix B** of this report. Basin OS-3 is outside of the Town limits and there are no planning documents that anticipate further development.

Basin OS-4 *(25.3 acres | 11.5% Impervious | Q100 = 39.8 cfs)*
Basin OS-4 contains rural residential areas in Gambel Ridge Tributary's main stem.
Flows from Basin OS-4 will enter the Gamble Ridge Tributary just west of the project boundary and CVI project area. Drainage patterns from OS-4 will generally remain unchanged from historic conditions. Hydrology of OS-4 is analyzed by CUHP method and results can be found in **Appendix B** of this report. Basin OS-4 is outside of the Town limits and there are no planning documents that anticipate further development.

Lower Gambel Ridge Tributary Watershed (Watershed C)

Filing 2, Amendment 4 is included in Basin C-1

The Lower Gambel Ridge Watershed includ
Development that drain to the Gambel Ri
re-enters the development boundary. Thes
for Dawson Trails Boulevard and Crystal Val
and F3. In the context of the Filing 2 projec
Channel, Planning Areas E1 and F2, and Re
improvements by separate plans. However, the separately proposed infrastructure of these off-site areas is integral to the drainage design for the northwest portion of Filing 2 and is analyzed in this report as appropriate. More details on specific drainage components of off-site projects are included in Section III.B of this report.

Lower Gambel Watershed: Onsite Basins used in CUHP/SWMM Analysis: [Proposed Overall SWMM Map 2; Proposed Detailed Drainage Maps 6-8, 11-12]

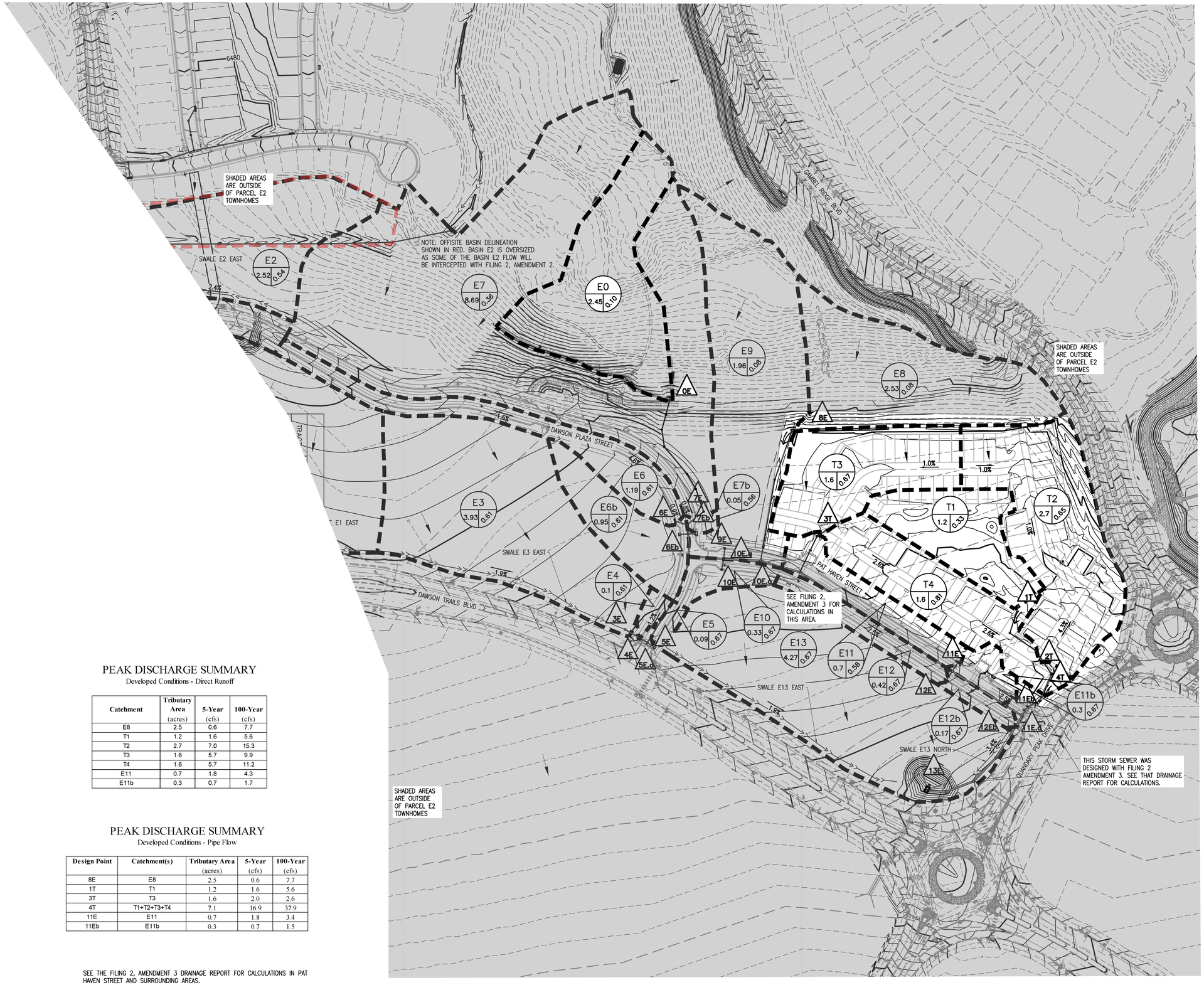
Basin C-1 *(35.2 acres | 2.0% Impervious | Q100 = 114 cfs)*
Major Basin C-1 is bounded by Dawson Trails Boulevard on the east, Arterial A on the west, and Quandary Peak Drive on the north. It is designated within Planning area E2 in the development plan. Non-residential and residential uses are permitted within the development parcel, with a specific anticipation of commercial oriented use. The area is assigned a build-out imperviousness of 75% for hydrologic analysis. This basin is tributary to the Regional Pond C1 and has been accounted for in its sizing.

Basin C-2 *(47.2 acres | 2.0% Impervious | Q100 = 139 cfs)*
Major Basin C-2 is bounded by Dawson Trails Boulevard on the west, the BNSF rail right-of-way on the east, and Quandary Peak Drive on the north. It is designated within Planning area F3 in the development plan. Non-residential and residential uses are permitted within the development parcel, with a specific anticipation of commercial oriented use. The area is assigned a build-out imperviousness of 75% for hydrologic analysis. This basin is tributary to the Regional Pond C1 and has been accounted for in its sizing.

Basin C-3 *(33.2 acres | 2.0% Impervious | Q100 = 75.7 cfs)*
Major Basin C-3 is bounded by Dawson Trails Boulevard on the west, Crystal Valley Parkway on the north, Ike Street on the east, and Quandary Peak Drive on the South. It is designated within Planning area F3 in the development plan. Non-residential and residential uses are permitted within the development parcel, with a specific anticipation

DRAINAGE REPORT
for
DAWSON TRAILS - FILING 2, AMENDMENT 5

APPENDIX E - DRAWINGS



PEAK DISCHARGE SUMMARY

Developed Conditions - Direct Runoff

Catchment	Tributary Area (acres)	5-Year (cfs)	100-Year (cfs)
E8	2.5	0.6	7.7
T1	1.2	1.6	5.6
T2	2.7	7.0	15.3
T3	1.6	5.7	9.9
T4	1.6	5.7	11.2
E11	0.7	1.8	4.3
E11b	0.3	0.7	1.7

PEAK DISCHARGE SUMMARY

Developed Conditions - Pipe Flow

Design Point	Catchment(s)	Tributary Area (acres)	5-Year (cfs)	100-Year (cfs)
8E	E8	2.5	0.6	7.7
1T	T1	1.2	1.6	5.6
3T	T3	1.6	2.0	2.6
4T	T1+T2+T3+T4	7.1	16.9	37.9
11E	E11	0.7	1.8	3.4
11Eb	E11b	0.3	0.7	1.5

SEE THE FILING 2, AMENDMENT 3 DRAINAGE REPORT FOR CALCULATIONS IN PAT HAVEN STREET AND SURROUNDING AREAS.

LEGEND

- C3 / 341.8 / 0.45 — BASIN DESIGNATION; 5-YR DEVELOPED RATIONAL COEFFICIENT; BASIN AREA IN ACRES
- X — DESIGN POINT–RATIONAL METHOD
- BASIN BOUNDARY
- FLOW DIRECTION ARROW
- EXISTING 2-FT CONTOUR
- 5510 EXISTING 10-FT CONTOUR
- PROPOSED 2-FT CONTOUR
- 5510 PROPOSED 10-FT CONTOUR
- STORM SEWER AND INLET, MANHOLE, FLARED END SECTION
- 100-YR EMERGENCY OVERFLOW PATH
- SHADED AREAS INDICATE OUTSIDE LIMITS THIS PROJECT
- SWALE

GRAPHIC SCALE
0 50 100 200 300
1 INCH = 100 FEET

EMK CONSULTANTS, INC.
LAND DEVELOPMENT
ENGINEERING ■ SURVEYING
7006 SOUTH ALTON WAY, BLDG. F
CENTENNIAL, COLORADO 80112-2019
(303)694-1520
WWW.EMKCO.COM

SCALE VERIFICATION BAR IS 1 INCH ON ORIGINAL DRAWING
0 1"
ADJUST SCALES ACCORDINGLY IF NOT ONE INCH ON THIS SHEET.

Know what's below. Call before you dig. 811

REVISIONS

NO.	DESCRIPTION	DATE	BY

DESIGNED BY: DJO
DRAWN BY: DJO
CHECKED BY: CAW
APPROVED BY: ERM

DAWSON TRAILS

FILING 2 AMENDMENT 5 PROPOSED DRAINAGE PLAN

DATE: 05/21/2026
JOB NO: 13296.00
SCALE HORIZONTAL 1" = 50'

1 of 1