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 II DRAINAGE REPORT
FOR
CRYSTAL VALLEY RANCH FIILNG 18 – TRACT C

Southeast Corner of Crystal Valley Parkway and Loop Road West
Castle Rock, Colorado
Town of Castle Rock Project SDP22-0057

July 19, 2022
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Revised: March 16, 2026

EMK Job. No. 13296.00

Prepared For:
Kauffman Homes
1845 N. Eloisa Ln. Thatcher, AZ 85552
Contact: Dan Kauffman
602-361-3607
dan@kauffmanhomes.com

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

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Map Pocket (paper copy) or Electronic Plan Layouts

Developed Layout – Overall and Detailed on one sheet

CERTIFICATION STATEMENT

I affirm that this report and plan for the Phase II drainage design of Crystal Valley Ranch Filing 18, Tract C, 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.

COLORADO LICENSED
DAVID J. OTT
03/16/2026
38935
PROFESSIONAL ENGINEER

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

Kauffman Homes hereby certifies that the drainage facilities for Crystal Valley Ranch Filing 18, Tract C, 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 Crystal Valley Ranch Filing 18, Tract C, guarantee that final drainage design review will absolve Kauffman Homes and/or their successors and/or assigns of future liability for improper design."

Jacob Kauffman 3/16/26
Kauffman Homes

Authorized Signature

I. General Location and Description

The purpose of this drainage report is to document drainage design calculations and decision making for Crystal Valley Ranch Filing 18 – Tract C (herein referred to as the site).

A. Site Location

Tract C of Filing 18 is located in the southeast corner of the intersection of Crystal Valley Parkway and Loop Road West. More specifically, it is located in the south half of section 24, Township 8 South, Range 67 West of the 6th Principal Meridian in the Town of Castle Rock. Crystal Valley Ranch Filing 11 is located west of the site and other portions of Filing 18 are located south and east of the site. Rhyolite Regional Park and Crystal Valley Ranch Detention Pond 512 exist north of the site. A site location map is included in Appendix A. The entire site is located outside of the floodplain in Zone X. The FEMA FIRM map, Panel 304 of 495, map number 08035C0304G revised March 16, 2016, is included in Appendix A.

B. Description of Property

Tract C of Filing 18 covers approximately 4.0 acres. NRCS soil maps indicate that the site is covered primarily by Kutch Sandy Loam, which falls under hydrologic soil group D. Existing drainage from Crystal Valley Ranch Filing 11 is captured into piping on the western edge of the site and discharged through twin 48-inch RCPs crossing Crystal Valley Parkway. No floodplains, irrigation features or significant geologic features exist on the site.

The proposed land use consists of approximately 29 duplex units. In addition, a commercial building is proposed for the southwestern portion of the site along Loop Road.

II. Drainage Basins and Sub Basins

A. Major Drainage Basins

The *Master Drainage Report for Crystal Valley Ranch* (herein referred to as MDR, prepared by JR Engineering, 2007) was prepared to cover the overall conceptual drainage layout for Crystal Valley Ranch. The site is located primarily in basin 82 of the MDR, with some of the southern areas being in basin 73. The MDR basin delineation within Filing 18 was further clarified in the Filing 18 drainage report. Offsite flow from basin 81 of the MDR passes through the site via storm sewer piping. Areas offsite that discharge through the site are covered by residential single-family detached land use. The site is proposed to consist of townhomes along with office and retail space. Piping that exists across the site is proposed to be used to convey onsite runoff to Detention Pond 512 on the north side of Crystal Valley Parkway.

B. Minor Drainage Basins

The site is currently undeveloped and covered by prairie grasses. Duplexes and office/retail development are proposed. Most onsite runoff will be captured by inlets and conveyed north into Pond 512. The northern and western portion of the site drains towards Crystal Valley Parkway and Loop Road. The

existing inlets in Crystal Valley Parkway and Loop Road appear to be adequate to accept these flows as demonstrated by the hydrology and inlet calculations in the Appendix. Minor amounts of runoff will discharge east into residential areas of Filing 18. No adverse impacts are anticipated to offsite areas under fully developed conditions.

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). The Mile High Flood District's (MHFD) Urban Storm Drainage Criteria Manual (USDCM) was used.

B. Drainage Studies, Master Plans, Site Constraints

This site was previously studied in multiple reports. The most current and relevant study is the *Phase III Drainage Study for Crystal Valley Ranch Filing No. 18* (herein referred to as the "Filing 18 Report" prepared by WSB, approved 2/13/20), covers the entirety of Filing 18, including the *site*. The *Master Drainage Report for Crystal Valley Ranch* as previously mentioned was prepared to cover the overall conceptual drainage layout for Crystal Valley Ranch. Improvements to the piping across the site were implemented with the Filing 11 plans and drainage report (*Phase III Drainage Study for Crystal Valley Ranch Filing No. 11,* herein referred to as the "Filing 11 Report" prepared by Legacy Engineering, approved 4/06/18).

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.

D. Hydraulics

Inlet capacities were calculated using the latest MHFD-Inlet software. StormCAD was used to evaluate storm sewer hydraulics.

E. Storage and Water Quality Enhancement

Detention and water quality for the site are provided by Pond 512. The previously approved Filing 18 drainage report provides calculations showing that the site is in compliance with the MDR and the Castle Rock SDDTCM.

The *Permanent Water Quality Determination Worksheet* (also known as Attachment G, included in Appendix C) was filled out to determine whether exclusions apply. The results indicate that no permanent water quality exclusions apply.

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 impervious 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.

Step 3: Implementation of stream stabilization.

Step 4: The final step is undertaking source control.

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

Runoff from the majority of Tract C will be captured in storm sewer and conveyed to an existing manhole at the northwest corner of the site. Adequate storm sewer piping exists from this existing manhole to Pond 512. Capacity analysis for the storm sewer to Pond 512 was completed with the overall Filing 18 drainage report. Runoff from the eastern edge of Tract C will be conveyed to Pond 511 via existing residential

streets. Calculations from the Filing 18 Report are contained in Appendix D. See section IV.B for more detail on the sizing of storage facilities.

A peak discharge summary table is included below.

PEAK DISCHARGE SUMMARY

Developed Conditions

Design Point	**Catchment(s)**	**Tributary Area** (acres)	**5-Year** (cfs)	**100-Year** (cfs)
1	1	1.04	2.6	6.2
	2	0.92	2.2	5.2
2	1 + 2	1.96	4.6	11.0
	3	0.79	1.9	4.5
	OS-A.2.4	1.25	4.6	9.1
3	3 + OS-A.2.4	2.04	6.1	12.7
	4	0.97	2.3	5.6
	OS-4	0.50	2.0	3.8
4	4 + OS-4	1.47	4.0	8.9
5	5	0.41	0.8	2.0

Runoff from basin 1 will collect into a sump inlet on the southeast corner of Perro Derado Trail at design point 1. Discharge from design point 1 is northwest via storm sewer to design point 2. Emergency overflow overtops the road to the north west and continues via the trail to the northwest through Tract B towards the intersection of Loop Road and Crystal Valley Parkway.

Runoff from basin 2 is collected into a sump inlet at design point 2 along with incoming piped runoff from design point 1. From here, runoff is piped northwest via a storm sewer to an existing box base manhole. Emergency overflow is via the trail to the northwest through Tract B towards the intersection of Loop Road and Crystal Valley Parkway.

Inlet calculations for Inlet 1 (DP 1) and Inlet 2 (DP 2) indicate that ponding above the top of curb will be required during the 100-yr storm. Currently this required ponding depth is 6-inches per the inlet calculations in the appendix. The sidewalk around the sump locations will be graded as to develop this flow depth before allowing overtopping into the emergency overflow path to the northwest.

Basin 3 collects runoff from grassy slopes adjacent to Loop Road on the western fringe of Tract A. Discharge from basin 3 will collect at design point 3 where a Type R curb inlet exists. Emergency overflow is north into Crystal Valley Parkway.

Basin 4 collects runoff from back of lots and grassy slopes adjacent to Crystal Valley Parkway on the northern fringe of Tract B. Discharge from basin 4 will collect at design point 5 where a Type R curb inlet exists. Emergency overflow is north into Pond 512.

Basin 5 includes grass buffers and lot area on the southern and eastern edge of Tract C. Runoff from Basin 5 will collect into gutters along Dawkins Drive. The Filing 18 drainage report accounts for this area in basin 73G of that report.

B. Stormwater Storage Facilities

All runoff from the site is conveyed to existing Pond 511 and Pond 512. These existed prior to Filing 18 being approved, and were evaluated with the overall Filing 18 Report. Pond 511 has a 100-yr stored volume of 21.2 ac-ft and Pond 512 has a 100-yr stored volume of 13.4 ac-ft. It appears these ponds were sized by adding the full water quality capture volume to the calculated 100-yr volume, which is more conservative than the current sizing methodology. Sitewide imperviousness has been calculated at 65% for the entirety of this portion of CVR 18. This compares to Basin 82A in the approved Filing 18 Report which assumes this area is 90% impervious. The proposed basin delineations and site imperviousness in this report conforms to assumptions the Filing 18 drainage report.

C. Water Quality Enhancement Control Measures

The 4 step process as previously outlined in this document was considered when addressing water quality for the site. The site will make use of existing detention and water quality ponds 511 and 512. Detailed calculations are provided in the overall Filing 18 drainage report.

D. Floodplain Modification

The site is not covered by any regulatory floodplains.

E. Geotechnical Investigation and Sub-surface Collection System Design

No subsurface collection systems are planned.

F. Operation and Maintenance

Maintenance of all storm sewer will be the responsibility of the Crystal Valley Ranch Master Association. Ponds 511 and 512 will be maintained by the Town of Castle Rock to the Town of Castle Rock's Stormwater Management Facility Operation and Maintenance (O&M) General Guidelines.

G. Additional Permitting Requirements

There an no other permitting requirements for this project know at this time.

H. General

Relevant excerpts from the Filing 18 drainage report, including the drainage plan and Pond 512 imperviousness, are included in Appendix D.

V. Conclusions

A. Compliance With Standards

The proposed design complies with the Town's SDDTCM, the 2007 Crystal Valley Ranch Master Drainage Plan and Chatfield Reservoir Control Regulation No. 73. This report proposes no changes to the site discharges from the approved Filing 18 Report.

B. Variances

No variances are requested at this time.

C. Drainage Concept

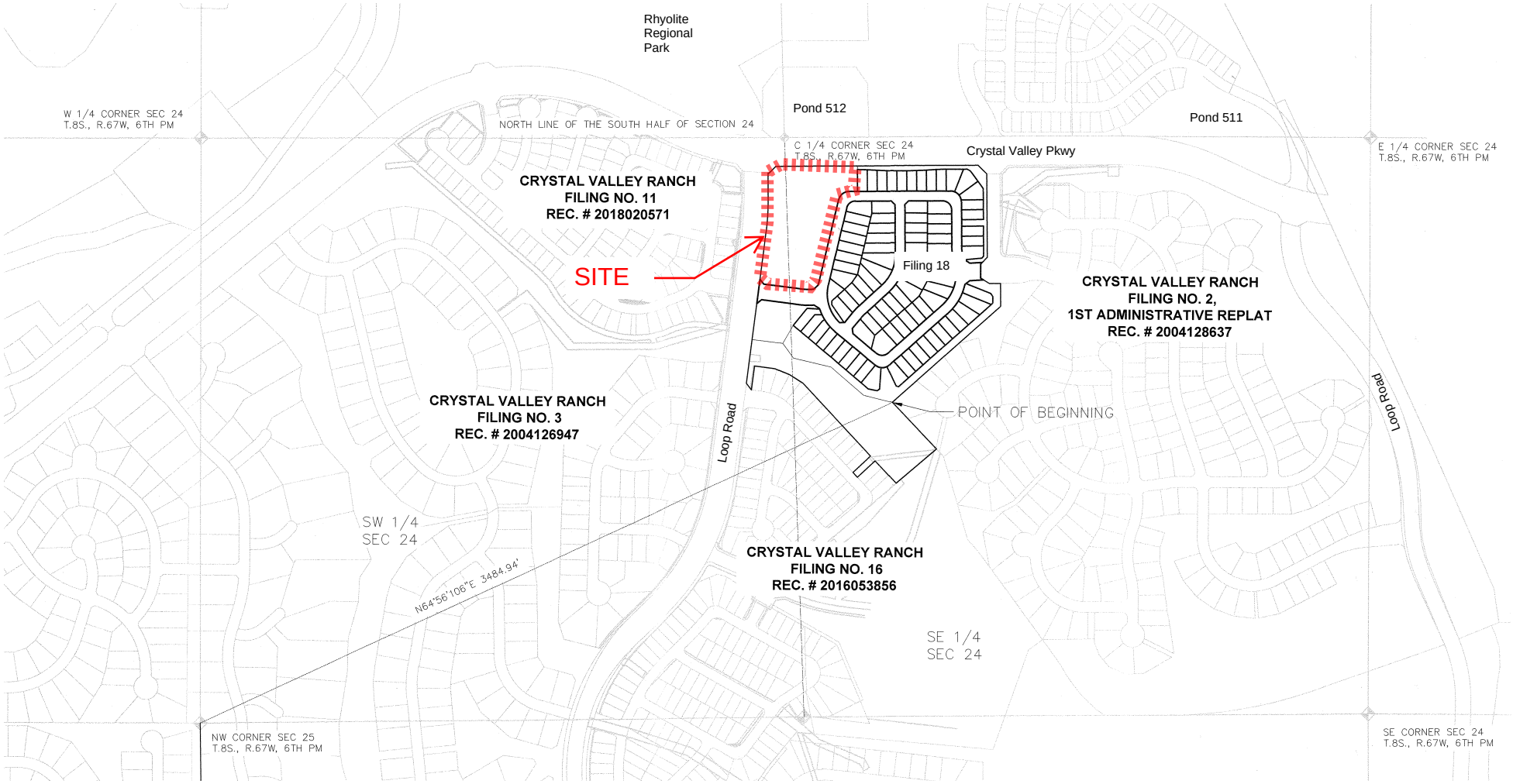
The proposed concept captures site runoff into inlets and pipes, and safely conveys it to an existing major drainage system without damage to downstream properties.

VI. References

1. Crystal Valley Ranch Master Drainage Report, prepared by JR Engineering, 2007.
2. Phase III Drainage Study for Crystal Valley Ranch Filing 18, prepared by WSB, Approved 02/14/2020.
3. Phase III Drainage Study for Crystal Valley Ranch Filing 11, prepared by Legacy Engineering, Approved 04/06/2018.
4. Town of Castle Rock Storm Drainage Design and Technical Criteria Manual, February 2025.
5. Town of Castle Rock Transportation Design Criteria Manual, December 2018.
6. Urban Storm Drainage Criteria Manual, Volumes 1-3, accessed online at www.mhfd.org.
7. Stormwater Management Facility Operation and Maintenance (O&M) General Guidelines, Town of Castle Rock, 2012.

DRAINAGE REPORT
for
CRYSTAL VALLEY RANCH FILING 18 - TRACT C

APPENDIX A
Hydrologic Computations

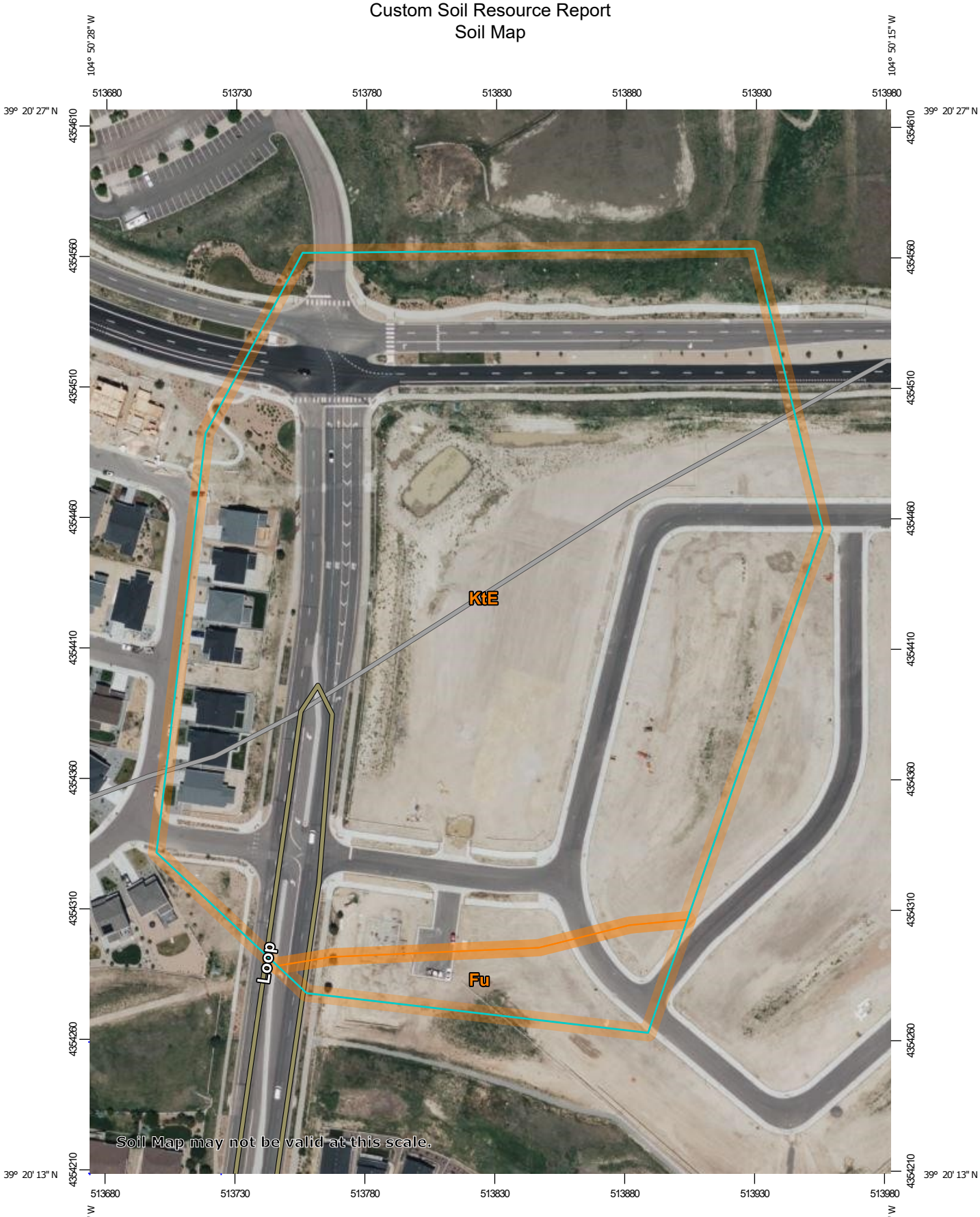


CRYSTAL VALLEY RANCH FILING 18, TRACT C - SITE LOCATION MAP

(NTS)

N

Custom Soil Resource Report
Soil Map



Map Scale: 1:1,990 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 25 50 100 150

Feet: 0 50 100 200 300

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

MAP LEGEND

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

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

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

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Castle Rock Area, Colorado
Survey Area Data: Version 14, Aug 31, 2021

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

Date(s) aerial images were photographed: 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.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
Fu	Fondis-Kutch association	0.9	6.0%
KtE	Kutch sandy loam, 5 to 20 percent slopes	14.3	94.0%
Totals for Area of Interest		**15.2**	**100.0%**

Map Unit Descriptions

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

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

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

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

onsite investigation is needed to define and locate the soils and miscellaneous areas.

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

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

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

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

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

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

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

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

Castle Rock Area, Colorado

Fu—Fondis-Kutch association

Map Unit Setting

National map unit symbol: jqyq
Elevation: 5,500 to 6,800 feet
Mean annual precipitation: 15 to 19 inches
Mean annual air temperature: 47 to 50 degrees F
Frost-free period: 120 to 135 days
Farmland classification: Not prime farmland

Map Unit Composition

Fondis and similar soils: 50 percent
Kutch and similar soils: 35 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Fondis

Setting

Landform: Valley sides, draws
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Eolian deposits over coarse-silty outwash derived from arkose

Typical profile

H1 - 0 to 7 inches: loam
H2 - 7 to 24 inches: clay
H3 - 24 to 60 inches: sandy clay loam

Properties and qualities

Slope: 5 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: High (about 9.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C
Ecological site: R049XB208CO - Clayey Foothill
Hydric soil rating: No

Description of Kutch

Setting

Down-slope shape: Linear

Across-slope shape: Linear
Parent material: Fine-textured residuum weathered from calcareous shale

Typical profile

H1 - 0 to 6 inches: sandy loam
H2 - 6 to 32 inches: clay
H3 - 32 to 36 inches: weathered bedrock

Properties and qualities

Slope: 5 to 40 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
Drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Gypsum, maximum content: 2 percent
Maximum salinity: Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 5.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: D
Ecological site: R049XB208CO - Clayey Foothill
Hydric soil rating: No

Minor Components

Bresser

Percent of map unit: 5 percent
Hydric soil rating: No

Newlin

Percent of map unit: 5 percent
Hydric soil rating: No

Hilly gravelly land

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

Aquic haplustolls

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

KtE—Kutch sandy loam, 5 to 20 percent slopes

Map Unit Setting

National map unit symbol: jqz5
Elevation: 5,500 to 6,800 feet
Mean annual precipitation: 15 to 19 inches
Mean annual air temperature: 47 to 50 degrees F
Frost-free period: 120 to 135 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Kutch

Setting

Landform: Valley sides, alluvial fans, drainageways
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Calcareous fine-loamy clayey shale

Typical profile

H1 - 0 to 6 inches: sandy loam
H2 - 6 to 32 inches: clay
H3 - 32 to 36 inches: weathered bedrock

Properties and qualities

Slope: 5 to 20 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Gypsum, maximum content: 2 percent
Maximum salinity: Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 5.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: D
Ecological site: R049XB210CO - Sandy Foothill
Hydric soil rating: No

Minor Components

Newlin

Percent of map unit: 7 percent
Hydric soil rating: No

Bresser

Percent of map unit: 7 percent
Hydric soil rating: No

Aquic haplustolls

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

NOTES TO USERS

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

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

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

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) zone 13. The **horizontal datum** was NAD 83, GRS 1980 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

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

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

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

Base map information shown on this FIRM was provided by the Douglas County GIS Department and the Town of Castle Rock GIS Department. Additional input was provided by the City of Lone Tree and Town of Parker. These data are current as of 2010.

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

The **profile baselines** depicted on this map represent the hydraulic modeling baselines that match the flood profiles in the FIS report. As a result of improved topographic data, the **profile baseline**, in some cases, may deviate significantly from the channel centerline or appear outside the SFHA.

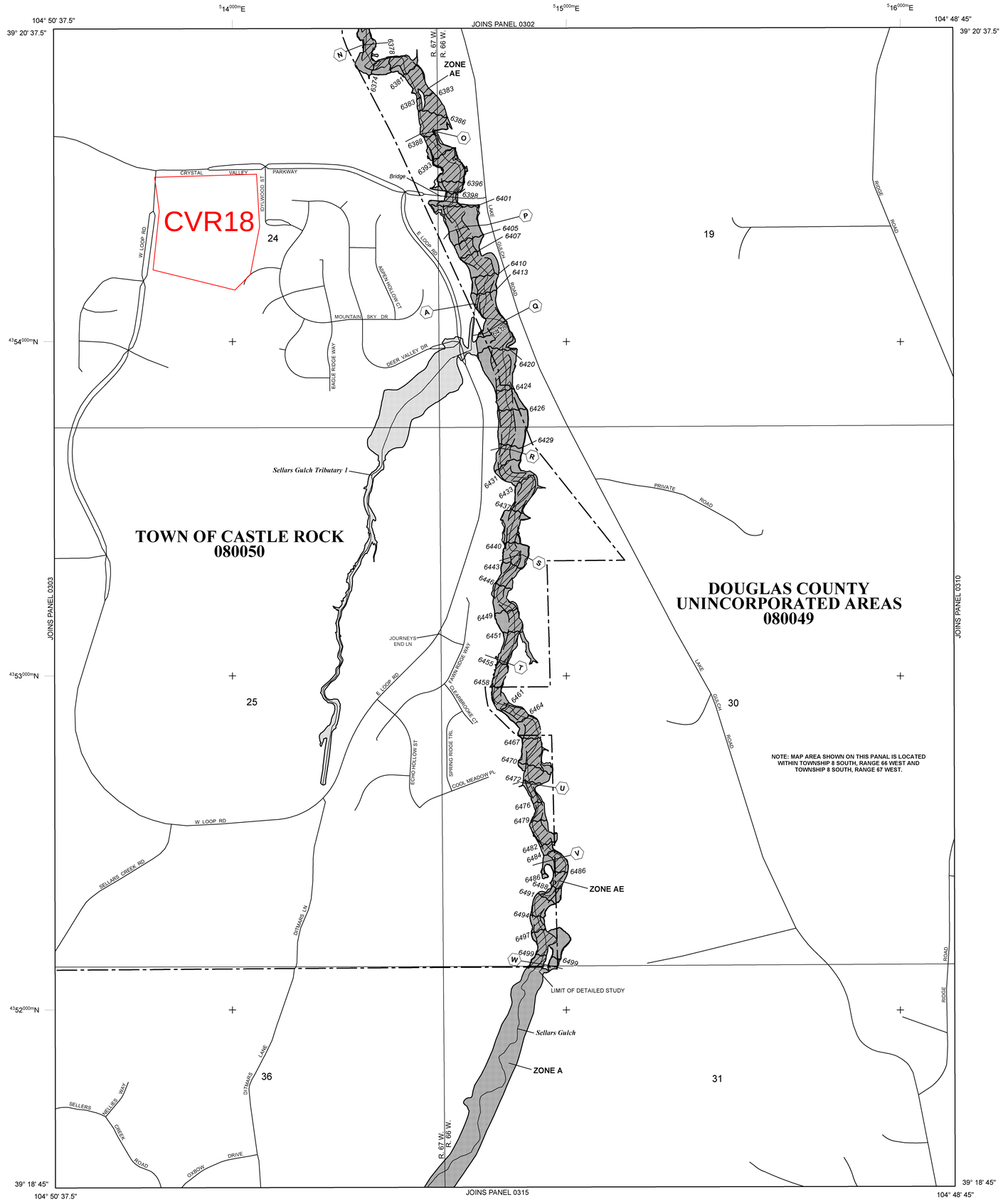
Based on updated topographic information, this map reflects more detailed and up-to-date **stream channel configurations and floodplain delineations** than those shown on the previous FIRM for this jurisdiction. As a result, the Flood Profiles and Floodway Data tables for multiple streams in the Flood Insurance Study Report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on the map. Also, the road to floodplain relationships for unrevised streams may differ from what is shown on previous maps.

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

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

For information on available products associated with this FIRM visit the **Map Service Center (MSC)** website at http://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 MSC website.

If you have **questions about this map,** how to order products, or the National Flood Insurance Program in general, please call the **FEMA Map Information eXchange (FMIX)** at **1-877-FEMA-MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/business/nfip.



LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

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

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Areas formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

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

OTHER FLOOD AREAS

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

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

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

	1% Annual Chance Floodplain Boundary
	0.2% Annual Chance Floodplain Boundary
	Floodway boundary
	Zone D boundary
	CBRS and OPA boundary
	Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths, or flood velocities.
513	Base Flood Elevation line and value; elevation in feet*
(EL 987)	Base Flood Elevation value where uniform within zone; elevation in feet*

*Referenced to the North American Vertical Datum of 1988

A — A	Cross section line
23 — 23	Transect line
45° 02' 08", 93° 02' 12"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83) Western Hemisphere
4989000mN	1000-meter Universal Transverse Mercator grid values, zone 13
DX5510 ×	Bench mark (see explanation in Notes to Users section of this FIRM panel)
M1.5	River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP

SEPTEMBER 30, 2005

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

MARCH 16, 2016: to update corporate limits, to change base flood elevations, to add base flood elevations, to add special flood hazard areas, to update map format, to add roads and road names, to reflect updated topographic information, to incorporate previously issued letters of map revision.

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

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 500'

250 0 500 1000 FEET
150 0 150 300 METERS

NFIP

PANEL 0304G

FIRM

FLOOD INSURANCE RATE MAP

DOUGLAS COUNTY, COLORADO AND INCORPORATED AREAS

PANEL 304 OF 495
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
CASTLE ROCK, TOWN OF	080050	0304	G
DOUGLAS COUNTY	080049	0304	G

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

MAP NUMBER
08035C0304G
MAP REVISED
MARCH 16, 2016

Federal Emergency Management Agency

MAP REVISED PROPOSED DISCONTINUED FLOOD INSURANCE RATE MAP

PERCENT IMPERVIOUS CALCULATIONS
PROPOSED CONDITIONS - CVR 18 TRACT C

Basin %IMP	Total Area (acres)	Multi-family Housing (MFH) - Medium - density MFH (5-20 du/ac) 65% (acres)	Roadways and Paved Streets 95% (acres)	Commercial - Medium to high density 80% (acres)	Composite Percent Impervious
1	1.04	1.04			65.0%
2	0.92	0.72		0.2	68.3%
3	0.79	0.79			65.0%
OS-A.2.4	1.25		1.25		95.0%
4	0.97	0.97			65.0%
OS-4	0.50		0.5		95.0%
5	0.41	0.41			65.0%

Notes:
Ref 1 - MHFD Table 6-2 and Table 6-3

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.

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.

Calculation of Peak Runoff using Rational Method

Designer: David Ott
Company: EMK Consultants
Date: 3/13/2026
Project: CVR 18 - Tract C
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)

1-hour rainfall depth, P1 (in) =	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	500-yr
	1.06	1.43	1.66	2.00	2.26	2.60	3.20

Rainfall Intensity Equation Coefficients =	a	b	c
	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
1	1.04	D	65.0	0.51	0.56	0.61	0.68	0.71	0.75	0.79	55.00			0.020	5.70	375.00	6489.06	6472.20	0.045	20	4.24	1.47	7.18	16.58	7.18	3.23	4.36	5.06	6.10	6.89	7.93	9.76	1.73	2.57	3.22	4.35	5.13	6.20	8.07
2	0.92	D	68.3	0.54	0.59	0.63	0.70	0.73	0.76	0.80	96.00			0.020	7.15	356.00	6488.06	6472.04	0.045	20	4.24	1.40	8.55	15.90	8.55	3.04	4.10	4.76	5.74	6.49	7.46	9.18	1.52	2.23	2.78	3.70	4.36	5.24	6.79
3	0.79	D	65.0	0.51	0.56	0.61	0.68	0.71	0.75	0.79	77.00	6490.40	6488.67	0.022	6.49	460.00	6488.67	6464.53	0.052	20	4.58	1.67	8.17	16.80	8.17	3.09	4.17	4.84	5.84	6.59	7.59	9.34	1.25	1.85	2.32	3.13	3.70	4.47	5.82
4	1.25	D	65.0	0.51	0.56	0.61	0.68	0.71	0.75	0.79	115.00	6470.42	6463.31	0.062	5.68	243.00	6463.31	6461.48	0.008	20	1.74	2.33	8.01	17.53	8.01	3.11	4.20	4.88	5.87	6.64	7.64	9.40	2.00	2.97	3.72	5.02	5.93	7.16	9.31
5	0.97	D	65.0	0.51	0.56	0.61	0.68	0.71	0.75	0.79	100.00	6490.63	6489.33	0.013	8.86	674.00	6489.33	6469.92	0.029	20	3.39	3.31	12.17	18.61	12.17	2.64	3.57	4.14	4.99	5.64	6.49	7.98	1.32	1.96	2.45	3.31	3.91	4.72	6.14
OS-A.2.4	1.25	D	95.0	0.79	0.81	0.83	0.85	0.86	0.87	0.89	150.00			0.056	3.64	697.00			0.056	20	4.73	2.45	6.10	12.05	6.10	3.40	4.59	5.33	6.42	7.25	8.34	10.27	3.35	4.64	5.53	6.83	7.82	9.10	11.39
OS-4	0.50	D	95.0	0.79	0.81	0.83	0.85	0.86	0.87	0.89	20.00			0.020	1.87	290.00			0.010	20	2.00	2.42	4.28	12.02	5.00	3.60	4.85	5.63	6.78	7.67	8.82	10.85	1.42	1.96	2.34	2.89	3.31	3.85	4.82

JOB NO: 13296.00
PROJECT: CVR 18 - Tract C
DSGN STRM: 5-year
CALC BY: DJO

RATIONAL METHOD
(5-YEAR DEVELOPED CONDITION)

DATE: 3/13/26

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

		1 HR STORM=	*1.43*		Direct RUNOFF				TOTAL RUNOFF				TRAVEL TIME				PIPE FLOW		
Design Point	Basin			C	Tc	A*C	I	Q	Tc	A*C	I	Q	Length	Vel.	Time	From	A*C	Q	
		Ac					IN/HR	CFS			IN/HR	CFS		fps	(Min.)	To		CFS	Notes
1	1	1.04	0.56	7.18	0.59	4.4	**2.6**										0.59	2.6	Direct
	2	0.92	0.59	8.55	0.54	4.1	**2.2**						40	8.0	0.1	1 to 2	0.54	2.2	Direct
2	1 + 2							8.6	1.13	4.1	**4.6**						1.13	4.6	Combined
	3	0.79	0.56	8.17	0.44	4.2	**1.9**										0.44	1.9	Direct
	OS-A.2.4	1.25	0.81	6.10	1.01	4.6	**4.6**												
3	3 + OS-A.2.4							8.2	1.46	4.2	**6.1**								
	4	0.97	0.56	8.01	0.55	4.2	**2.3**										0.55	2.3	Direct
	OS-4	0.50	0.81	5.00	0.40	4.9	**2.0**												
4	4 + OS-4							8.0	0.95	4.2	**4.0**								
5	5	0.41	0.56	12.17	0.23	3.6	**0.8**										0.23	0.8	Direct

JOB NO: 13296.00
PROJECT: CVR 18 - Tract C
DSGN STRM: 100-year
CALC BY: DJO

RATIONAL METHOD
(100-YEAR DEVELOPED CONDITION)

DATE: 3/13/26

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

		1 HR STORM=	*2.60*		DIRECT RUNOFF				TOTAL RUNOFF				TRAVEL TIME				PIPE FLOW		
Design Point	Basin				Tc	A*C	I	Q	Tc	A*C	I	Q	Length	Vel.	Time	From	A*C	Q	
		Ac		C			IN/HR	CFS			IN/HR	CFS			(Min.)	To		CFS	Notes
1	1	1.04		0.75	7.18	0.78	7.9	**6.2**									0.78	6.2	Direct
	2	0.92		0.76	8.55	0.70	7.5	**5.2**					40	8.0	0.1	1 to 2	0.70	5.2	Direct
2	1 + 2								8.6	1.48	7.4	**11.0**					1.48	11.0	Combined
	3	0.79		0.75	8.17	0.59	7.6	**4.5**									0.59	4.5	Direct
	OS-A.2.4	1.25		0.87	6.10	1.09	8.3	**9.1**											
3	3 + OS-A.2.4								8.2	1.68	7.6	**12.7**							
	4	0.97		0.75	8.01	0.73	7.6	**5.6**									0.73	5.6	Direct
	OS-4	0.50		0.87	5.00	0.44	8.8	**3.8**											
4	4 + OS-4								8.0	1.16	7.6	**8.9**							
5	5	0.41		0.75	12.17	0.31	6.5	**2.0**									0.31	2.0	Direct

DRAINAGE REPORT
for
CRYSTAL VALLEY RANCH FILING 18 - TRACT C

APPENDIX B
Hydraulic Computations

MHFD-Inlet, Version 5.03 (August 2023)

INLET MANAGEMENT

Worksheet Protected

INLET NAME	Inlet 1	Inlet 2	Inlet 3
Site Type (Urban or Rural)	URBAN	URBAN	URBAN
Inlet Application (Street or Area)	STREET	STREET	STREET
Hydraulic Condition	In Sump	In Sump	On Grade
Inlet Type	Denver No. 16 Combination	Denver No. 16 Combination	CDOT Type R Curb Opening

USER-DEFINED INPUT

User-Defined Design Flows

Minor Q_{Known} (cfs)	2.6	2.2	6.1
Major Q_{Known} (cfs)	6.2	5.2	12.7

Bypass (Carry-Over) Flow from Upstream Inlets must be organized from upstream (left) to downstream (right) in order for bypass flows to be linked.

Receive Bypass Flow from:	No Bypass Flow Received	No Bypass Flow Received	No Bypass Flow Received
Minor Bypass Flow Received, Q_b (cfs)	0.0	0.0	0.0
Major Bypass Flow Received, Q_b (cfs)	0.0	0.0	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)	**2.6**	**2.2**	**6.1**
Major Total Design Peak Flow, Q (cfs)	**6.2**	**5.2**	**12.7**
Minor Flow Bypassed Downstream, Q_b (cfs)	N/A	N/A	0.0
Major Flow Bypassed Downstream, Q_b (cfs)	N/A	N/A	1.9

MHFD-Inlet, Version 5.03 (August 2023)

INLET MANAGEMENT

Worksheet Protected

INLET NAME	Inlet 4
Site Type (Urban or Rural)	URBAN
Inlet Application (Street or Area)	STREET
Hydraulic Condition	In Sump
Inlet Type	CDOT Type R Curb Opening

USER-DEFINED INPUT

User-Defined Design Flows

Minor Q_{Known} (cfs)	4.0
Major Q_{Known} (cfs)	8.9

Bypass (Carry-Over) Flow from Upstream

Receive Bypass Flow from:	Inlet 3
Minor Bypass Flow Received, Q_b (cfs)	0.0
Major Bypass Flow Received, Q_b (cfs)	1.9

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)	**4.0**
Major Total Design Peak Flow, Q (cfs)	**10.8**
Minor Flow Bypassed Downstream, Q_b (cfs)	N/A
Major Flow Bypassed Downstream, Q_b (cfs)	N/A

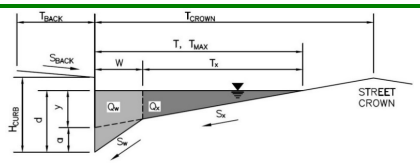
MHFD-Inlet, Version 5.03 (August 2023)

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

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

Project: **Crystal Valley Ranch Filing 18 - Tract C**

Inlet ID: **Inlet 1**



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} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	16.0	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 =	0.000	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} =	16.0	16.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	12.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

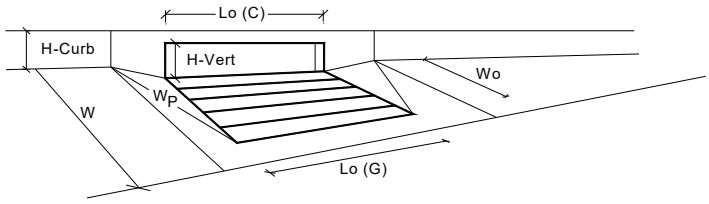
MINOR STORM Allowable Capacity is not applicable to Sump Condition

MAJOR STORM Allowable Capacity is not applicable to Sump Condition

	Minor Storm	Major Storm	
Q_{allow} =	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.03 (August 2023)



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	Denver No. 16 Combination		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	2.00	2.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	3	3	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	4.0	6.0	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	3.00	3.00	feet
Width of a Unit Grate	W_o =	1.73	1.73	feet
Open Area Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	0.31	0.31	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	0.50	0.50	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	3.60	3.60	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	0.60	0.60	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	3.00	3.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	4.50	4.50	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	5.25	5.25	inches
Angle of Throat	Theta =	0.00	0.00	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.70	3.70	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.66	0.66	

Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	0.36	0.52	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.17	0.33	ft
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	0.38	0.57	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	N/A	N/A	
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.38	0.57	

		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**2.7**	**8.7**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)	$Q_{PEAK\ REQUIRED}$ =	2.6	6.2	cfs

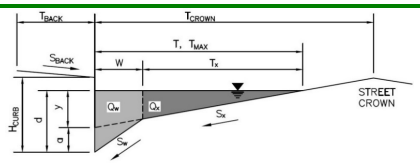
MHFD-Inlet, Version 5.03 (August 2023)

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

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

Project: **Crystal Valley Ranch Filing 18 - Tract C**

Inlet ID: **Inlet 2**



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} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	16.0	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 =	0.000	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} =	16.0	16.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	12.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

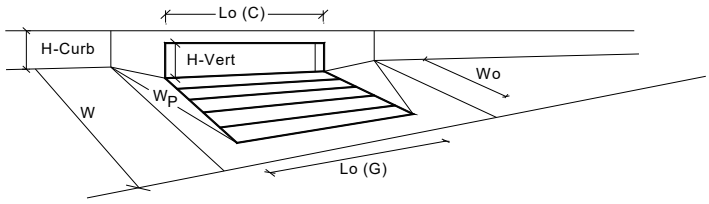
MINOR STORM Allowable Capacity is not applicable to Sump Condition

MAJOR STORM Allowable Capacity is not applicable to Sump Condition

	Minor Storm	Major Storm	
Q_{allow} =	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.03 (August 2023)



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	Denver No. 16 Combination		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	2.00	2.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	2	2	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	4.0	6.0	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	3.00	3.00	feet
Width of a Unit Grate	W_o =	1.73	1.73	feet
Open Area Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	0.31	0.31	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	0.50	0.50	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	3.60	3.60	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	0.60	0.60	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	3.00	3.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	4.50	4.50	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	5.25	5.25	inches
Angle of Throat	Theta =	0.00	0.00	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.70	3.70	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.66	0.66	

Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	0.36	0.52	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.17	0.33	ft
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	0.47	0.71	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	N/A	N/A	
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.47	0.71	

		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**2.3**	**7.7**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)	$Q_{PEAK\ REQUIRED}$ =	2.2	5.2	cfs

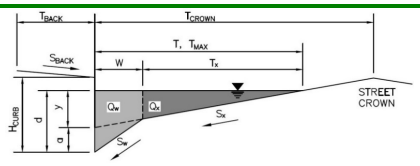
MHFD-Inlet, Version 5.03 (August 2023)

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

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

Project: **Crystal Valley Ranch Filing 18 - Tract C**

Inlet ID: **Inlet 3**



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} =	50.0	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 =	0.035	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} =	40.0	40.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	12.0	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☐	

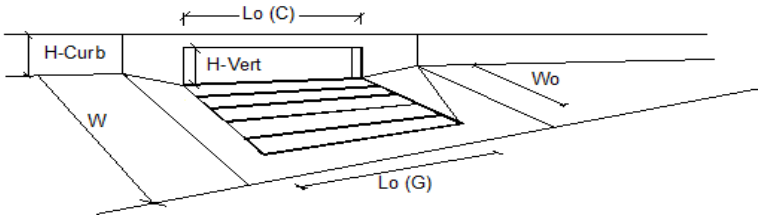
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**17.0**	**123.7**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 6.10 cfs on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design peak flow of 12.70 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 Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	3.0	3.0	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 =	15.00	15.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f (G) =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f (C) =	0.10	0.10	

Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**6.1**	**10.8**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**1.9**	**cfs**
Capture Percentage = Q_a/Q_o	**C% =**	**100**	**85**	**%**

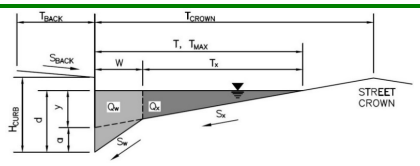
MHFD-Inlet, Version 5.03 (August 2023)

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

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

Project: **Crystal Valley Ranch Filing 18 - Tract C**

Inlet ID: **Inlet 4**



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} =	27.0	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 =	0.000	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} =	18.0	18.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	12.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

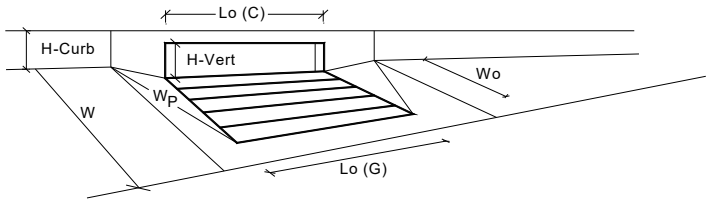
MINOR STORM Allowable Capacity is not applicable to Sump Condition

MAJOR STORM Allowable Capacity is not applicable to Sump Condition

	Minor Storm	Major Storm	
Q_{allow} =	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.03 (August 2023)



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	5.8	12.0	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Open Area Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.32	0.83	ft
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	1.00	1.00	
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**5.0**	**12.3**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)	$Q_{PEAK\ REQUIRED}$ =	4.0	10.8	cfs

DRAINAGE REPORT
for
CRYSTAL VALLEY RANCH FILING 18 - TRACT C

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 Crystal Valley Ranch Filing 18, Tract C

Project Owner Kauffman Homes

Project Location Tract C, Crystal Valley Ranch Filing 18 (Crystal Valley Parkway & Loop Road)

ToCR Project Number SDP22-0057

Total Site Area 4.006 **acres**

Total Size of Common Plan of Development 4.006 **acres**

Check all that apply:

- [x] **Project within Plum Creek Basin**
- [ ] **Project within Cherry Creek Basin**

Estimated construction completion date December, 2026

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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. CD15-0001 & CD15-0015
   - ❒ Cherry Creek Basin only, choose one: ☐ Tier 1 ☐ Tier 2 ☐ Tier 3
   - ❒ No control measures provided (See Permanent WQ Worksheet for applicability)

Summary of Water Quality Conformance to MS4 Permit

2. Was an exclusion to water quality applied as per SDDTCM Section 13.1.5? ☐ Yes ☑ No

   i. If yes, please select all that apply, provide total excluded impervious area(s) and submit variance, as applicable: TCV No. _____

   - ❒ Pavement management site
     Excluded impervious area: _____ acres
   - ❒ Excluded roadway redevelopment
     Excluded impervious area: _____ acres
   - ❒ Excluded existing roadway areas
     Excluded impervious area: _____ acres
   - ❒ Above ground and below ground utilities
   - ❒ Large lot single family home
   - ❒ Non-residential and non-commercial infiltration
     Excluded impervious area: _____ acres
   - ❒ Land disturbance for land to remain undeveloped
     Excluded impervious area: _____ acres
   - ❒ Stream Stabilization Sites
     Excluded impervious area: _____ acres
   - ❒ Trails
     Excluded impervious area: _____ acres
   - ❒ Oil and Gas Exploration

3. For Development and Redevelopment sites, following any exclusions claimed above, was any portion of the site excluded up to 20% of the site and not to exceed one acre? ☐ Yes ☑ No

   If yes, complete the following:

   Excluded area: _____ acres

   Total Site area: _____ acres, _____ % site excluded

4. For Constrained sites, was any portion of the site excluded up to 50% of the site and not to exceed 50% of the impervious area? ☐ Yes ☑ No

   If yes, complete the following:

   Excluded area: _____ acres

   Excluded impervious area: _____ acres

   Total Site area: _____ acres, _____ % site excluded

   Total Impervious area: _____ acres, _____ % impervious excluded

Attachment G

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

Project:	Crystal Valley Ranch Filing 18, Tract C	**Project#**	SDP22-0057	**Applicant:** Kauffman Homes
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
CRYSTAL VALLEY RANCH FILING 18 - TRACT C

APPENDIX D
Referenced Information

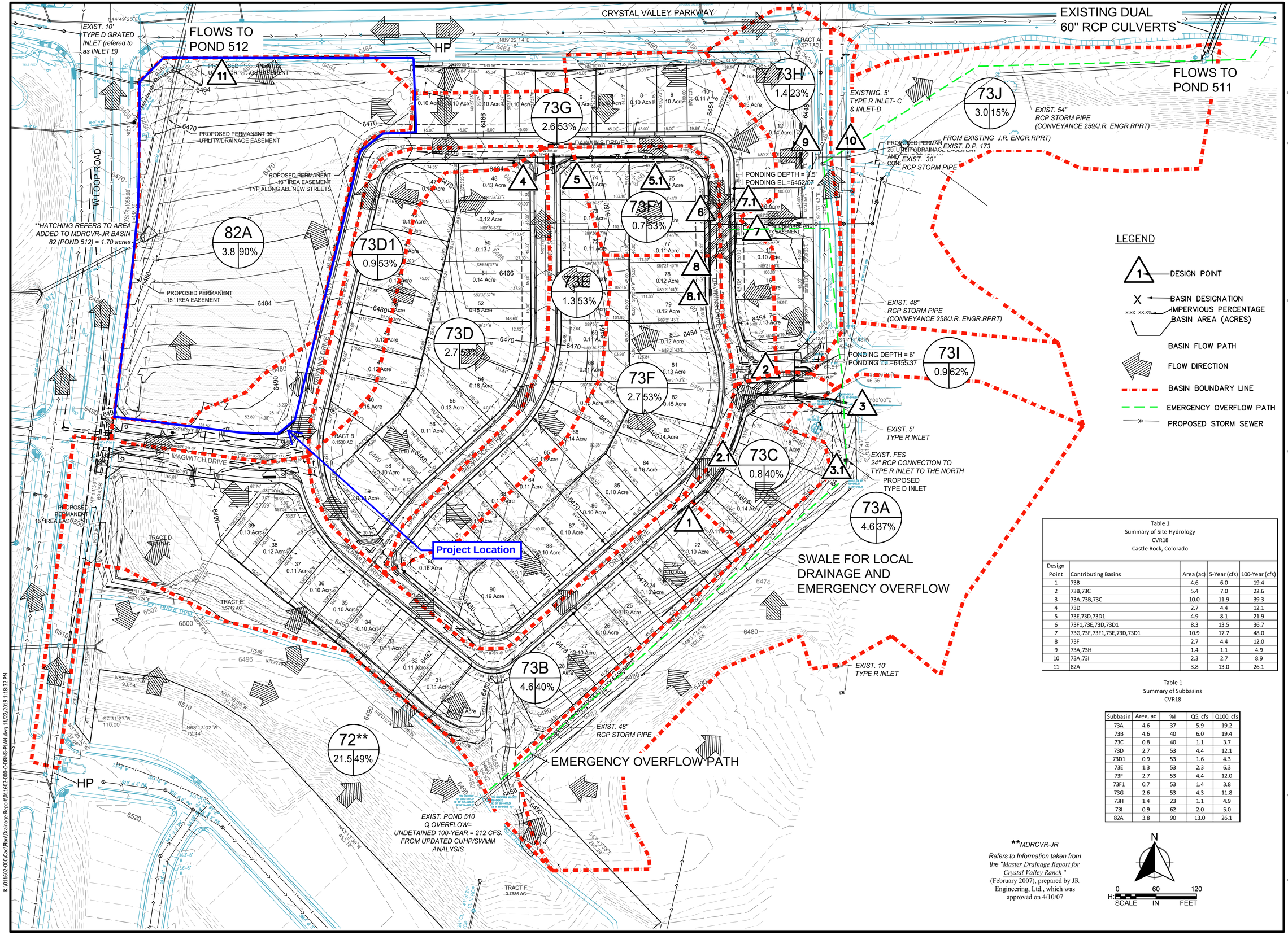

Table 1
Summary of Site Hydrology
CVR18
Castle Rock, Colorado

Design Point	Contributing Basins	Area (ac)	5-Year (cfs)	100-Year (cfs)
1	73B	4.6	6.0	19.4
2	73B,73C	5.4	7.0	22.6
3	73A,73B,73C	10.0	11.9	39.3
4	73D	2.7	4.4	12.1
5	73E,73D,73D1	4.9	8.1	21.9
6	73F1,73E,73D,73D1	8.3	13.5	36.7
7	73G,73F,73F1,73E,73D,73D1	10.9	17.7	48.0
8	73F	2.7	4.4	12.0
9	73A,73H	1.4	1.1	4.9
10	73A,73I	2.3	2.7	8.9
11	82A	3.8	13.0	26.1

Table 1
Summary of Subbasins
CVR18

Subbasin	Area, ac	%I	Q5, cfs	Q100, cfs
73A	4.6	37	5.9	19.2
73B	4.6	40	6.0	19.4
73C	0.8	40	1.1	3.7
73D	2.7	53	4.4	12.1
73D1	0.9	53	1.6	4.3
73E	1.3	53	2.3	6.3
73F	2.7	53	4.4	12.0
73F1	0.7	53	1.4	3.8
73G	2.6	53	4.3	11.8
73H	1.4	23	1.1	4.9
73I	0.9	62	2.0	5.0
82A	3.8	90	13.0	26.1

**MDRCVR-JR

Refers to Information taken from the "Master Drainage Report for Crystal Valley Ranch" (February 2007), prepared by JR Engineering, Ltd., which was approved on 4/10/07

N

0 60 120
H: SCALE IN FEET

wsb

WSB PROJECT NO.:
011602-000

SCALE: 1" = 60'
DESIGN BY: JYC
PLAN BY: CDM
CHECK BY: JJM

REVISIONS

NO.	DATE	DESCRIPTION
2	5/2/19	SECOND SUBMITTAL

I HEREBY CERTIFY THAT THIS PLAN, SPECIFICATION, OR REPORT WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF COLORADO.

JAMES I. MILL
LIC. NO. 29256
DATE: -

CRYSTAL VALLEY RANCH
FILING NO. 18

DRAINAGE MAP

SHEET
1
OF
1

K:\011602-000\Cad\Plan\Drainage Report\011602-000-C-DRNG-PLAN.dwg 11/22/2019 1:18:32 PM

BASIN 82 CVP
31.03 AC
13.72~I=100%
I=44%
AVG SLOPE ON
CVP FOR 3014'=4.3%
LENGTH TO CENTROID = 1446'
L TO CENTROID INC CVR11 = 1129'
LENGTH FROM CENTROID TO DP=1738'
Subbasin 82
Area = 31.0 acres
Imperviousness = 44%
RHYOLITE REGIONAL PARK
PLD SCHOOL
PARK SITE
54.9 AC
REGIONAL
POND 512
'NORTH POND'
PLD/UD
3.8 AC.
BASIN 81
TO EXIST 54" CULVERT
49.9 AC
I=40% (MAX)
31.07 ac
BASIN 82? OR 81? CVR11
TO EXIST 24 AT NORTH
END OF LOOP ROAD
12.07 AC
I=42%
P. A. 4
R-MF-24
25.2 AC.
11.51 DU/AC.
290 UNITS
Subbasin 81
Area = 61.9 acres
Imperviousness = 41%
CVR18 Subbasin 82A
Area = 3.5 acres
Imperviousness = 90%
Project Location
SCALE: 1" = 100'
CRYSTAL VALLEY RANCH FILING NO. 1 REC. NO. 2005067570
P. A. 5
R-SF-6
16.0 AC.
3.25 DU/AC.
52 UNITS
CRYSTAL VALLEY RANCH FILING NO. 3 REC. NO. 2004128647
P. A. 15
(NW)
R-SF-
53.0 AC
1.14 DU/AC.
60 UNITS
P. A. 6
R-MF-24
CVR POND 512
CUHP AREAS AND DATA
Legacy Engineering Inc.
JOB NO. CVR7N
SCALE
HORIZONTAL 1" = 100'
VERTICAL N/A
REVISIONS
NO. DESCRIPTION DATE BY
DESIGNED BY: JYC
DRAWN BY: JJM
CHECKED BY: JJM/JYC
APPROVED BY: GJM
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1 of 1

B. DETENTION FACILITIES

As built available volume

The site will make use of the existing sub-regional detention and water quality ponds 511 and 512. We updated the CUHP/SWMM models prepared as part of the 2015 Phase III Drainage Studies for Ponds 511 [illegible]e CVR18 site design. Calculations and supporting information are in the Appendix, and summarized in the Tables below.

100-yr volume

Pond 511 - Subwatershed 7

Drainage Report	Area, ac	% Imp	Qin, cfs	Qout, cfs	cfs/acre	Vwq, af	V100, af	Vtotal, af
Approved 2015 Phase III Drainage Study	168.4	52	504	109	0.65	3.9	18.89	22.79
CVR18	168.5	47	561	115	0.68	3.4	17.9	21.3
Approved As-Builts	--	--	--	--	--	3.9	21.2	25.1
Difference	0.1	-5	57	6	0.035	0.5	3.3	3.8

Pond 512 - Subwatershed 8

Drainage Report	Area, ac	% Imp	Qin, cfs	Qout, cfs	cfs/acre	Vwq, af	V100, af	Vtotal, af
Approved 2015 Phase III Drainage Study	92.9	42	283	91	0.98	1.4	9.6	11
CVR18	96.4	44	431	95	0.99	1.4	9.9	11.3
approved As-Builts	--	--	--	--	--	1.5	13.4	14.9
Difference	3.5	2	148	4	0.006	0.1	3.5	3.6

Excerpt from Approved CVR Filing 18 Drainage Report showing Pond 511 and 512 volumes.

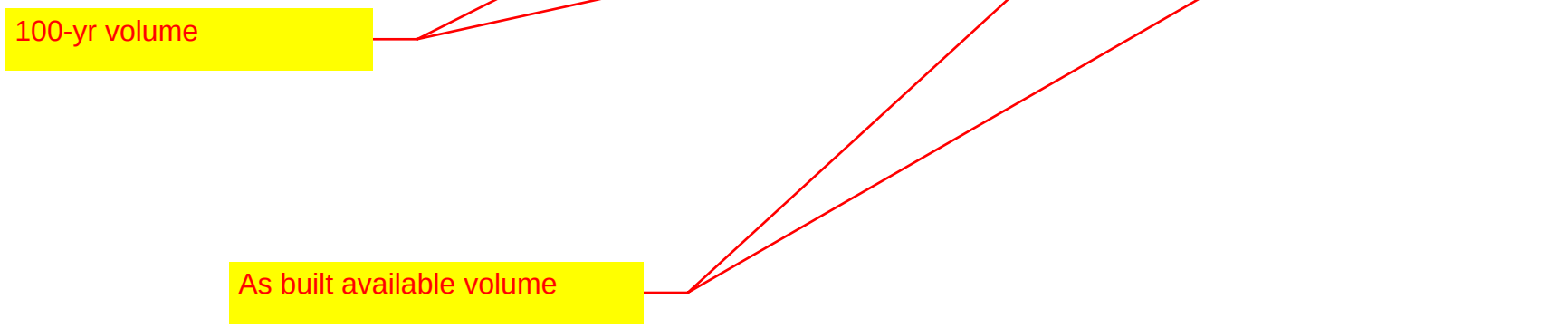
Table 4
Detention Pond Comparison Table - 100-Year Event
CRV18

Pond 511 - Subwatershed 7

Drainage Report	Area, ac	% Imp	Qin, cfs	Qout, cfs	cfs/acre	Vwq, af	V100, af	Vtotal, af
Approved Phase III Drainage Study, February 2015, CD15-0001	168.4	52	504	109	0.65	3.9	18.89	22.79
CVR18	168.5	47	561	115	0.68	3.4	17.9	21.3
Approved As-Builts	--	--	--	--	--	3.9	21.2	25.1
Difference	0.1	-5	57	6	0.035	0.5	3.3	3.8

Pond 512 - Subwatershed 8

Drainage Report	Area, ac	% Imp	Qin, cfs	Qout, cfs	cfs/acre	Vwq, af	V100, af	Vtotal, af
Approved Phase III Drainage Study, June 2015, CD15-0015	92.9	42	283	91	0.98	1.4	9.6	11
CVR18	96.4	44	431	95	0.99	1.4	9.9	11.3
approved As-Builts	--	--	--	--	--	1.5	13.4	14.9
Difference	3.5	2	148	4	0.006	0.1	3.5	3.6



PHASE III DRAINAGE STUDY

FOR

CRYSTAL VALLEY RANCH FILING 11

CD17-0012

Castle Rock, Colorado

Friday, March 03, 2017
(Revised Thursday, May 11, 2017)
(Revised Wednesday, June 28, 2017)
(Revised Thursday, December 28, 2017)

PREPARED FOR

CRYSTAL VALLEY RANCH DEVELOPMENT COMPANY, LLC

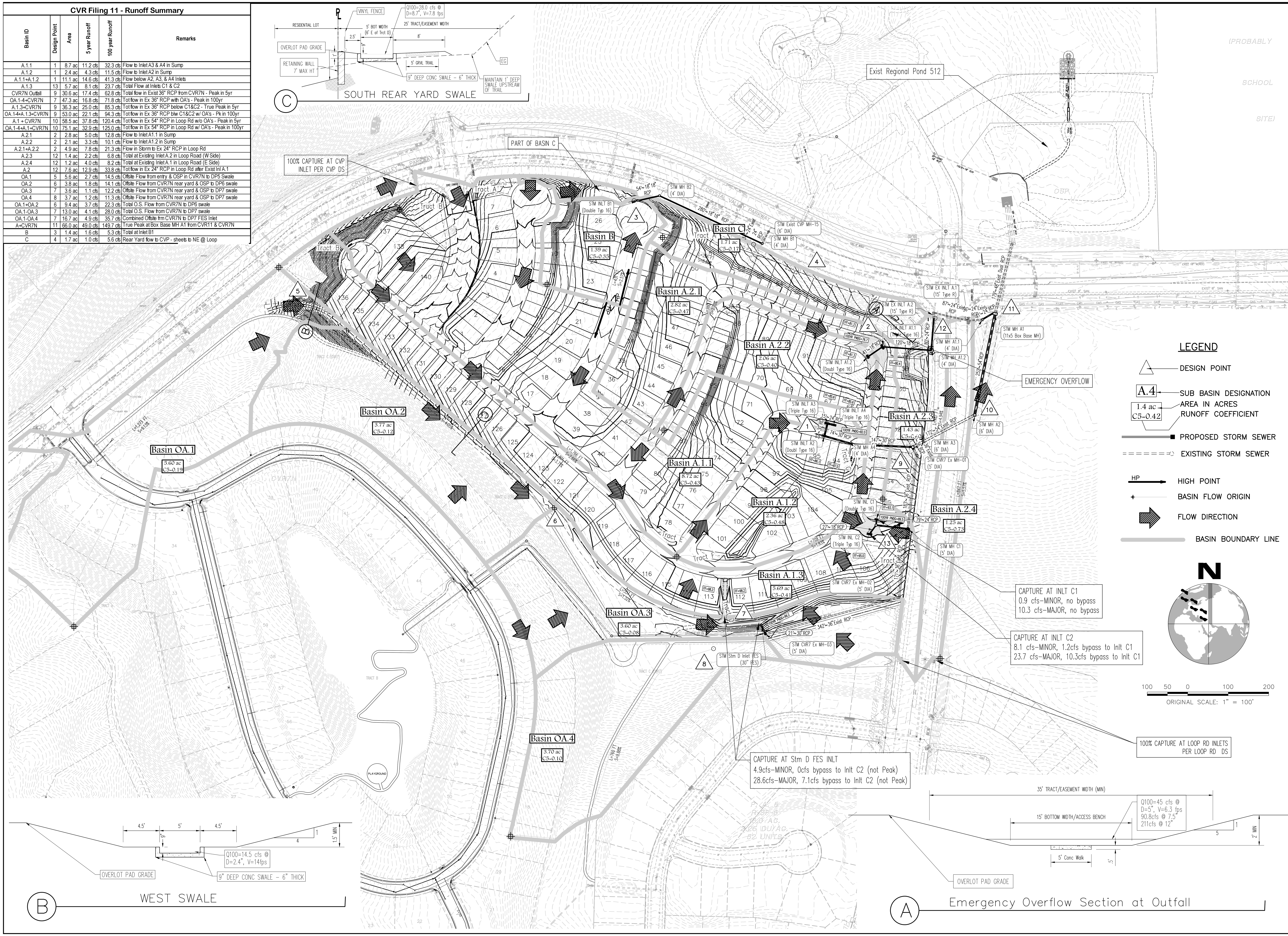
1175 East Crystal Valley Parkway
Castle Rock Co 80104-9624
(303) 663-1990

PREPARED BY

Legacy Engineering, Inc.
1626 Thatch Circle
Castle Rock, CO 80109
(720) 200-4577

CVR Filing 11 - Runoff Summary

Basin ID	Design Point	Area	5 year Runoff	100 year Runoff	Remarks
A.1.1	1	8.7 ac	11.2 cfs	32.3 cfs	Flow to Inlet A3 & A4 in Sump
A.1.2	1	2.4 ac	4.3 cfs	11.5 cfs	Flow to Inlet A2 in Sump
A.1.1+A.1.2	1	11.1 ac	14.6 cfs	41.3 cfs	Flow below A2, A3, & A4 Inlets
A.1.3	13	5.7 ac	8.1 cfs	23.7 cfs	Total Flow at Inlets C1 & C2
CVR7N Outfall	9	30.6 ac	17.4 cfs	62.8 cfs	Total flow in Exist 36" RCP from CVR7N - Peak in 5yr
OA.1-4+CVR7N	7	47.3 ac	16.8 cfs	71.8 cfs	Tot flow in Ex 36" RCP with OA's - Peak in 100yr
A.1.3+CVR7N	9	36.3 ac	25.0 cfs	85.3 cfs	Tot flow in Ex 36" RCP below C1&C2 - True Peak in 5yr
OA.1-4+A.1.3+CVR7N	9	53.0 ac	22.1 cfs	94.3 cfs	Tot flow in Ex 36" RCP blw C1&C2 w/ OA's - Pk in 100yr
A.1 + CVR7N	10	58.5 ac	37.8 cfs	120.4 cfs	Tot flow in Ex 54" RCP in Loop Rd w/o OA's - Peak in 5yr
OA.1-4+A.1+CVR7N	10	75.1 ac	32.9 cfs	125.0 cfs	Tot flow in Ex 54" RCP in Loop Rd w/ OA's - Peak in 100yr
A.2.1	2	2.8 ac	5.0 cfs	12.8 cfs	Flow to Inlet A1.1 in Sump
A.2.2	2	2.1 ac	3.3 cfs	10.1 cfs	Flow to Inlet A1.2 in Sump
A.2.1+A.2.2	2	4.9 ac	7.8 cfs	21.3 cfs	Flow in Storm to Ex 24" RCP in Loop Rd
A.2.3	12	1.4 ac	2.2 cfs	6.8 cfs	Total at Existing Inlet A.2 in Loop Road (W Side)
A.2.4	12	1.2 ac	4.0 cfs	8.2 cfs	Total at Existing Inlet A.1 in Loop Road (E Side)
A.2	12	7.6 ac	12.9 cfs	33.8 cfs	Tot flow in Ex 24" RCP in Loop Rd after Exist Inl A.1
OA.1	5	5.6 ac	2.7 cfs	14.5 cfs	Offsite Flow from entry & OSP in CVR7N to DP5 Swale
OA.2	6	3.8 ac	1.8 cfs	14.1 cfs	Offsite Flow from CVR7N rear yard & OSP to DP6 swale
OA.3	7	3.6 ac	1.1 cfs	12.2 cfs	Offsite Flow from CVR7N rear yard & OSP to DP7 swale
OA.4	8	3.7 ac	1.2 cfs	11.3 cfs	Offsite Flow from CVR7N rear yard & OSP to DP7 swale
OA.1+OA.2	6	9.4 ac	3.7 cfs	22.3 cfs	Total O.S. Flow from CVR7N to DP6 swale
OA.1-OA.3	7	13.0 ac	4.1 cfs	28.0 cfs	Total O.S. Flow from CVR7N to DP7 swale
OA.1-OA.4	7	16.7 ac	4.9 cfs	35.7 cfs	Combined Offsite frm CVR7N to DP7 FES Inlet
A+CVR7N	11	66.0 ac	49.0 cfs	149.7 cfs	True Peak at Box Base MH A1 from CVR11 & CVR7N
B	3	1.4 ac	1.6 cfs	5.3 cfs	Total at Inlet B1
C	4	1.7 ac	1.0 cfs	5.6 cfs	Rear Yard flow to CVP - sheets to NE @ Loop



CVR FILING 11

Phase III Drainage Plan

Legacy Engineering Inc.

JOB NO. <JOB NUMBER>

SCALE: HORIZONTAL 1" = 100'; VERTICAL N/A

DESIGNED BY: JJM | DRAWN BY: JJM | CHECKED BY: JYC | APPROVED BY: JJM

REVISIONS: NO | DESCRIPTION | DATE | BY

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1 of 1

Proposed Drainage Basins
Standard Form SF-2
Storm Drainage System Design
(Time of Concentration)

Project:	CVR Filing 11																		
Calculated by:	JJM																		
Revised by:	12/28/2017														**Date:**	12/28/2017			
					Ti	*Ti*			*Tt*	*Tt*	*Tt*	*Tt*		*Ti+Tt*		Urbanized?	Urbanized Check		*Notes*
	AREA	C(5)	*C(100)*	*i*	LENGTH	SLOPE	*Ti*		LENGTH	SLOPE	SWALE	VEL	*Tt*	COMP	TOTAL			FINAL	
Basin	Ac				Ft	%	Min	*L-total*	Ft	%	CODE*	FPS	Min	Tc	LENGTH			Tc	
A.1.1	8.72	0.43	*0.68*	0.49	125	3.0%	9.5	*1766*	1641	2.7%	20.0	3.3	8.4	17.9	1766	y	29.2	17.9	
A.1.2	2.36	0.48	*0.71*	0.54	50	2.0%	6.4	*709*	659	1.8%	20.0	2.7	4.1	10.4	709	y	22.0	10.4	
A.1.3	5.69	0.42	*0.68*	0.47	100	25.0%	4.3	*1801*	1701	2.3%	20.0	3.0	9.3	13.6	1801	y	30.8	13.6	
A.2.1	2.82	0.52	*0.72*	0.59	150	3.0%	9.1	*980*	830	2.7%	20.0	3.3	4.2	13.3	980	y	21.8	13.3	
A.2.2	2.06	0.40	*0.67*	0.44	30	2.0%	5.6	*725*	695	3.0%	20.0	3.5	3.3	8.9	725	y	23.1	8.9	
~~A.2.3~~	~~1.45~~	~~0.40~~	~~*0.67*~~	~~0.44~~	~~150~~	~~5.8%~~	~~8.8~~	~~*487*~~	~~337~~	~~4.9%~~	~~20.0~~	~~4.4~~	~~1.3~~	~~10.0~~	~~487~~	~~y~~	~~20.9~~	~~10.0~~	
A.2.4	1.24	0.73	*0.83*	0.85	150	5.6%	4.7	*847*	697	5.6%	20.0	4.7	2.5	7.1	847	y	14.5	7.1	
~~B~~	~~1.39~~	~~0.35~~	~~*0.64*~~	~~0.39~~	~~150~~	~~2.0%~~	~~13.3~~	~~*430*~~	~~280~~	~~2.6%~~	~~20.0~~	~~3.2~~	~~1.5~~	~~14.8~~	~~430~~	~~y~~	~~22.5~~	~~14.8~~	
C	1.72	0.17	*0.55*	0.16	100	8.0%	13.3	*236*	136	8.9%	5.0	1.5	1.5	14.8	236	y	24.4	14.8	
OA.1	5.60	0.19	*0.56*	0.19	100	3.0%	11.5	*1273*	1173	9.1%	5.0	1.5	12.9	24.5	1273	**n**	28.7	24.5	
OA.2	3.77	0.12	*0.53*	0.11	50	5.0%	7.4	*675*	625	4.1%	20.0	4.0	2.6	10.0	675	n	29.4	10.0	
OA.3	3.60	0.08	*0.51*	0.06	50	5.0%	7.7	*557*	507	1.3%	20.0	2.3	3.7	11.4	557	n	33.3	11.4	
OA.4	3.70	0.10	*0.52*	0.08	50	5.0%	7.6	*760*	710	9.9%	5.0	1.6	7.5	15.1	760	n	28.6	15.1	
OA.1-OA.4	16.67			0.12			11.5		2305	6.0%			19.2	30.8	2505	n	39.9	30.8	*2*
A.1.3 short									486	1.0%	20.0	2.0	4.1						*3*
A.1.3shrt+OA.1-4	22.4						11.5		2791	5.2%			23.3	34.8	2991	y	50.4	34.8	*4*

*SWALE CODES ARE:

MEADOW AND FORREST	2.50
TILLAGE	5.00
LAWN	7.00
BARE GROUND	10.00
GRASSED WATERWAY	15.00
PAVED WATERWAY	20.00

Regional Time of Concentration

$$T_i = 0.395\left[\frac{(1.1-C_5)\sqrt{L}}{\sqrt[3]{S}}\right] \qquad t_t = \frac{L_t}{60K\sqrt{S_o}} = \frac{L_t}{60V_t}$$

Urbanized Time of Concentration (RO-5)

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

Notes:

2 This Tc combines the travel time of OA.2 & 3 with Ti & Tc of OA.1

3 This is a calculation of the Tt of only the portion of A.1.3 that is downstream of OA.1-4

4 This Tc combines the Ti & Tc of OA.1, OA.2 & OA.3 with the downstream Tt of A.1.3. This calculates the longest Tc when combining the OA.1-4 with all onsite basins.

FIGURE 7.04

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

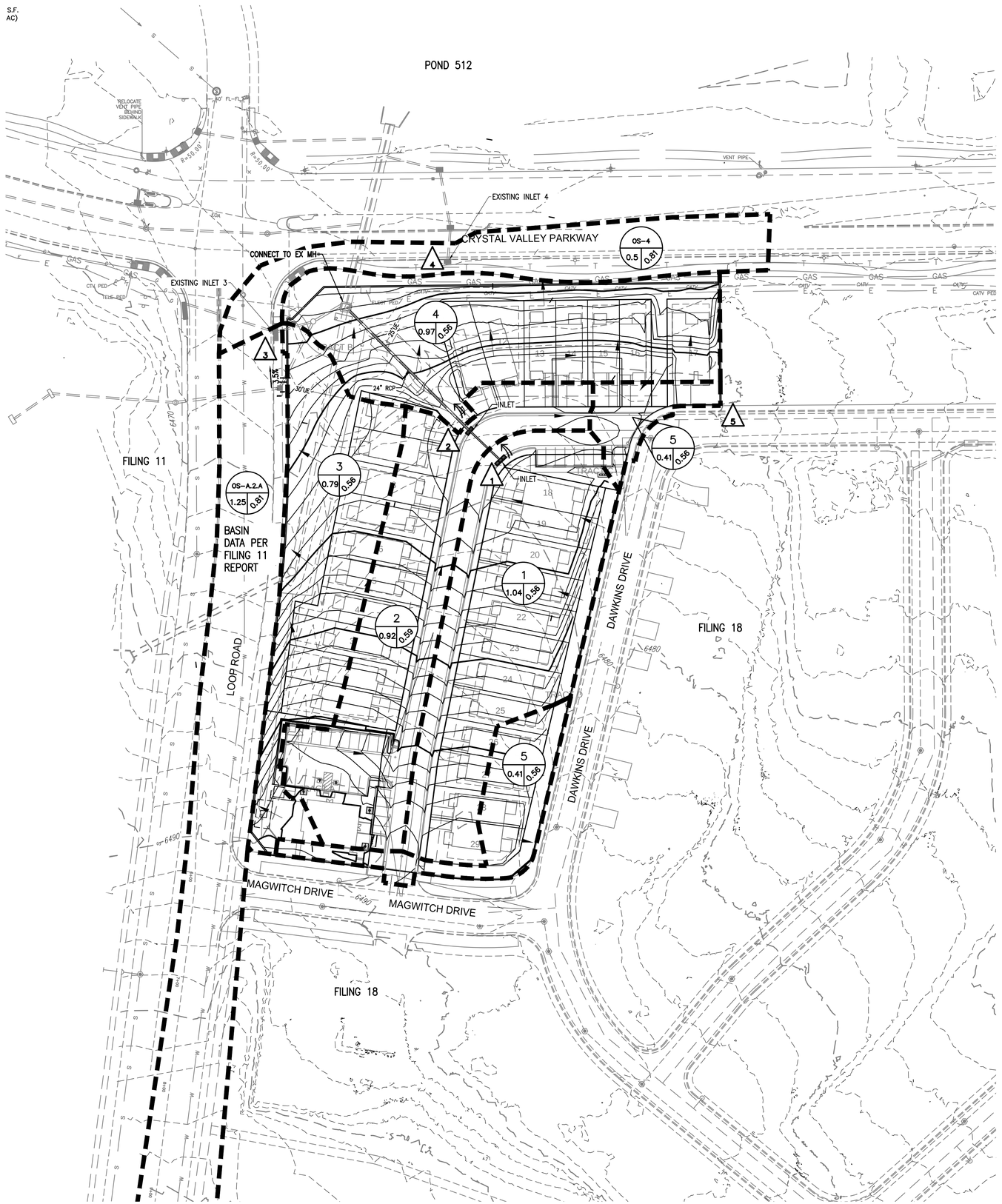
Included	N/A	
✓		**V. STORMWATER MANAGEMENT FACILITY DESIGN**
✓		A. Stormwater Conveyance Facilities
✓		B. Stormwater Storage Facilities
✓		C. Water Quality Enhancement Best Management Practices
✓		D. Floodplain Modification
✓		E. Additional Permitting Requirements
✓		F. General
✓		**VI. CONCLUSIONS**
✓		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) HGL calcs will be provided in PH 3
✓		C. Water Quality Enhancement Best Management Practices
✓		D. Referenced Information
✓		**OVERALL DRAINAGE PLAN (IN POCKET)** same sheet
✓		**DETAILED DRAINAGE PLANS (IN POCKET)** same sheet

Notes/Comments:

DRAINAGE REPORT
for
CRYSTAL VALLEY RANCH FILING 18 - TRACT C

DRAWING

S.F.
AC)

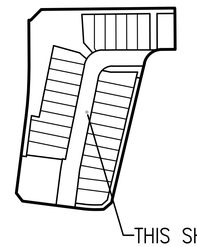


PEAK DISCHARGE SUMMARY

Developed Conditions

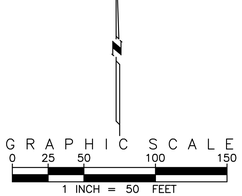
Design Point	Catchment(s)	Tributary Area (acres)	5-Year (cfs)	100-Year (cfs)
1	1	1.04	2.6	6.2
	2	0.92	2.1	5.1
2	1 + 2	1.97	4.5	10.8
	3	0.79	1.9	4.5
	OS-A.2.4	1.25	4.6	9.1
3	3 + OS-A.2.4	2.04	6.1	12.7
	4	0.97	2.3	5.6
	OS-4	0.50	2.0	3.8
4	4 + OS-4	1.47	4.0	8.9
5	5	0.41	0.8	2.0

KEY MAP
SCALE:1" = 200'



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



EMK CONSULTANTS, INC.
LAND DEVELOPMENT
ENGINEERING ■ SURVEYING
7006 SOUTH ALTON WAY, BLDG. F
CENTENNIAL, COLORADO 80112-2019
(303)694-1520
WWW.EMKC.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: GAW
APPROVED BY: ERM

CRYSTAL VALLEY RANCH

FILING 18 – TRACT C
PROPOSED DRAINAGE PLAN

DATE: 03/13/2026
JOB NO: 13296.00
SCALE
HORIZONTAL
1" = 50'

1 of 1