Phase II Drainage Report

Douglas County Elections Expansion

(JN: 26016)

125 Stephanie Place
Castle Rock, CO 80109

June 9, 2026

Prepared for:

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Castle Rock Project No: SDP26-00XX

Certification

ENGINEER CERTIFICATION OF DRAINAGE REPORT

I affirm that this report (plan) for the Phase II Drainage design of Douglas County Elections Expansion was prepared by me or under my direct supervision in accordance with the provisions of the Town of Castle Rock Storm Drainage Design and Technical Criteria Manual for the owners thereof. I understand that Castle Rock does not and will not assume liability for drainage facilities designed by others.

_____

Registered Professional Engineer
State of Colorado PE No. 50682
For and on behalf of Proof Civil Co.

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I. Introduction

This phase II drainage report for the Douglas County Elections Office will address the on-site stormwater conveyance and treatment for the development in accordance with criteria set forth by applicable governing agencies as well as the Phase III Drainage Report for Castle Park South, by David E. Archer & Associates, Inc. in January of 2005 (Castle Park Report).

II. General Location and Description

A. Project Location

The proposed site is located at Lots 1-3, Castle Park South Subdivision, located is the northwest quarter of the northwest quarter of Section 11, Township 8 South, Range 67 West of the 6th Principal Meridian, in Douglas County. The lot is to the east of Park Street and north of 5th Street, to the west of Plum Creek and I-25. The site is bounded by a mobile home park to the north.

B. Project Description

The proposed development accounts for 4.30 acres and currently features the existing Douglas County Elections office building on the north side of the side, with associated parking to the south and west. There is a spill-over lot to the south along with an existing detention pond on the far southern end of the lot. There is a single connection to Park Street at the center of the site.

The proposed development will include an addition to the northwest of the existing building which will connect directly to the existing parking lot, as well as expanded parking lots to the east and south of the site. The existing detention pond will be redesigned in accordance with current Castle Rock and Mile High Flood District requirements.

There is an existing culvert running through the south on the southern end to the north of the existing pond. Otherwise, there are no major drainageways, wetlands or irrigation facilities onsite.

C. Floodplain Information

According to FEMA Flood Insurance Rate Map Panel #08035C0188G, the subject site is located within flood hazard area Zone X. Zone X is defined as area outside the 0.2-percent-chance (or 500-year) flood. Refer to Appendix A for the applicable FEMA flood map.

D. Soils Description

According to the United States Department of Agriculture Natural Resources Conservation Service (NRCS) National Cooperative Soil Survey, onsite soils are identified as 5.1% Newlin gravelly sandy loam which is classified as Hydrologic Soil Group B, and Sandy wet alluvial land which is classified ad hydrologic Soil Group D. Group B is silt loam or loam. It has a moderate infiltration rate when thoroughly wetted and consists chiefly or moderately deep to deep, moderately well to well drained soils with moderately fine to moderately coarse textures. While Group D soils are clay loam, silty clay loam, sandy clay, silty clay or clay. They have very low infiltration rates when thoroughly wetted and consist chiefly of clay soils with a high swelling potential, soils with a permanent high water table, soils with a claypan or clay layer at or near the surface and shallow soils over nearly impervious material.

This report will assume all soils are type D to provide a conservative design. NRCS Soil maps have been included within Appendix A of this report.

III. Historic Drainage

A. Existing Drainage Pattern

The site generally drains from the northwest to southeast at a general slope of 5%. The current site has existing storm infrastructure including a 5-foot type R inlet (existing DP1) to the southwest of the existing building and a 10-foot type R (existing DP2) to the southeast of the existing building. Both inlets are tributary to the existing pond to the south. The existing overflow lot will drain east to a swale which conveys flows south to the existing pond. The existing pond currently outfalls at the southern corner of the existing site.

B. Existing Basins

The existing site is divided into four basins within the Castle Park Report which will be considered the existing basins for the purposes of this report. Basin D-1 represents the northeastern corner of the site which is currently vacant. The Castle Park Report calls for a future detention pond to be constructed within this basin at the time of the parking expansion to the south of the existing building. Basin D-2 represents the existing building and parking lot which is tributary to the existing drainage infrastructure and pond. Basin D-3 represents the existing overflow lot to the south of the existing building and existing detention pond. Finally, basin D-4 represents the southeastern boundary of the site which is very steep and slopes down to Plum Creek.

IV. Drainage Criteria

A. Regulation

Methods described in the UDFCD Urban Storm Drainage Criteria Manual and in the Town of Castle Rock Storm Drainage Design and Technical Criteria Manual were used for the drainage design of the Site.

B. Drainage Studies, Outfall Systems Plans and Site Constraints

This phase II drainage report has been written in compliance with the Castle Park, by David E. Archer & Associates, Inc.

Runoff generated within the proposed site will be detained by the existing regional detention pond which will be expanded with the proposed expansion project. Relevant portions of the Castle Park report have been provided in Appendix A of this report.

The site grading was constrained by existing grades of surrounding improvements adjacent to the site, including the existing stormsewer locations.

C. Hydrology

The Rational Method analysis, utilizing the Intensity-Duration-Frequency curves established for the Town of Castle Rock was used to determine the on-site runoff generated for the 5-year (minor), and 100-year (major) storm events. Runoff coefficients were based on the type of proposed development outlined in the MHFD manual. Runoff coefficients used in the analysis were weighted according to the existing and proposed land uses in each basin or sub-basin and the time of concentration values have been calculated for each of the basins or sub-basins per Town of Castle Rock criteria. Detention storage and release rate have been calculated using the UDFCD full-spectrum design criteria. Hydrologic calculations can be found in Appendix B.

D. Hydraulics

Conveyance of on-site generated and tributary off-site flows has been calculated using Manning's equation in accordance with the UDFCD Urban Storm Drainage Criteria Manual and the Town of Castle Rock Storm Drainage Design and Technical Criteria Manual.

A. General Concept

The proposed site maintains the existing drainage patterns, with runoff continuing to flow from the northwest corner of the property toward the southeast corner. Stormwater will be collected via proposed curb and gutter and conveyed to the existing inlet located along the southeast side of the lot. This inlet connects to and existing storm line that runs south along the eastern portion of the existing site to the existing pond in the southern corner of the property. In the proposed condition, the new parking lot in the northeast corner will surface drain to the existing inlet at DP3. Runoff within the proposed new parking lot to the south of the existing building will surface flow to two curb openings in the southeast corner of the lot at DP's 4 and 5. Runoff passing through these curb openings will flow through riprap rundowns to the existing detention pond.

The existing pond was sized for the future buildout of the site, and the existing volume has been verified for the proposed imperviousness. The Castle Park Report utilized a future impervious percentage of 95% for the site which is substantially above the proposed imperviousness percentage of 67%. The pond itself will not be regraded, however the outlet structure will be retrofitted to lower the top of the structure and replace the orifice plates.

B. Proposed Drainage Basins

The improved site is divided into drainage basins described as follows:

a. Basin A1

Basin A1 is 0.22 acres and represents the proposed addition in the northwest corner of the proposed site. Runoff from this basin will fall on the building roof and drain to roofdrains which will connect to the existing storm infrastructure within the site. Anticipated runoff rates for the minor and major storm events are 0.6 and 1.5 cfs, respectively.

b. Basin A2

Basin A2 is 1.47 acres and represents the existing parking lots for the Douglas County Elections building. Runoff from this basin will flow overland to the exiting inlets at DP 2 and 3 and will be conveyed to the existing detention pond by the existing stormsewer onsite. Anticipated runoff rates for the minor and major storm events are 3.3 and 8.3 cfs, respectively.

c. Basin A3

Basin A3 is 0.52 acres and represents the proposed parking lot to the east of the existing building in the northeast corner of the site. This basin will convey flows along the proposed curb and gutter to the existing inlet at DP3. Anticipated runoff rates for the minor and major storm events are 1.1 and 2.7 cfs, respectively.

d. Basin A4

Basin A4 represents the northeast portion of the proposed southern parking lot addition to the south of the existing building. Runoff will flow through the parking lot to a 2-foot curb opening at DP4 and enter into a proposed riprap rundown to the existing pond. Anticipated runoff rates from this basin are 1.9 and 4.7 cfs, respectively.

e. Basin A5

Basin A5 is 0.22 acres and represents the southwestern portion of the proposed parking lot to the south of the existing building. Runoff will flow through the parking lot and pass through the 2-foot curb opening at DP5. After passing through the curb opening runoff will flow through a proposed riprap rundown and flow to the exiting detention pond. Runoff rates from this basin are anticipated to be 0.6 and 1.5 cfs in the minor and major storm events, respectively.

f. Basin A6

Basin A6 is 0.37 acres and represents the existing detention pond to the south of the proposed southern parking lot. The pond will not be improved besides a retrofitted outlet structure and additional riprap rundowns from the proposed parking lot. Runoff rates from this basin are anticipated to be 0.3 and 1.5 cfs in the minor and major storm events, respectively.

g. Basin B1

Basin B1 represents the boundary portion of the site to the north and east which flows offsite and cannot be conveyed to the proposed detention pond. Runoff rates from this basin are anticipated to be 0.5 and 3.0 cfs in the minor and major storm events, respectively.

h. Basin B2

Basin B2 represents the boundary portion of the site to the southwest which flows offsite and cannot be conveyed to the proposed detention pond. Runoff rates from this basin are anticipated to be 0.0 and 0.2 cfs in the minor and major storm events, respectively.

C. Site Specific Hydraulic Design

Onsite generated runoff will be collected on proposed building roofs and piped via PVC leaders to proposed storm sewer. Proposed hardscape and landscape will be graded to sheet flow to curb and gutter. Curb inlets have been designed at designated low points to convey flows to the proposed storm sewer system. The proposed onsite storm sewer will connect to the existing stormsewer designed in the Castle Park Report, which conveys flows to the existing detention pond. Hydraulic calculations can be found in Appendix C.

D. Storage and Water Quality Treatment

The water quality and 100-year storage volumes for the proposed site are provided within the existing detention pond on the south end of the site. The existing outlet structure will be retrofitted to lower the top grate height and the water quality and 100-year orifice plates will be replaced. The 100-year release rate for the proposed pond will be restricted to account for offsite flows from basins B1 and B2, which account for 3.2 cfs in the 100-year event. The 100-tear release will be lowered from 6.9 cfs which represents the 0.9 ratio of peak to predevelopment outflow, to 3.7 cfs. This will raise the 100-year detention depth from 3.84-feet to 4.20-feet. The resulting WQCV is 0.094 acre-feet with a ponding depth of 1.74-feet and a EURV of 0.280 acre-feet and a ponding depth of 3.28 feet. The 100-year water surface elevation is calculated to be 6185.20. The existing spillway has an elevation of 6187.82 and a width of 45-feet. The emergency overflow flow depth will be 0.23-feet. The existing spillway will not be updated as part of this project.

E. Stormwater Quality Four Step Process

1) Reduce Runoff Volume to the Maximum Extent Practicable

   The preliminary site plan has been developed to provide limited amounts of impervious area only as necessary for site operations. As shown in the paragraph above, the total onsite imperviousness is significantly below the anticipated imperviousness for the overall development.

2) Provide Water Quality Capture Volume and Flood Control Detention Via Full-Spectrum Detention

   Water quality capture volume has been provided for the site in a regional water quality and 100-year full-spectrum detention pond that has been sized for the proposed site.

3) Utilize Stream Channel Stabilization Techniques

Stream stabilization within Plum Creek is not proposed as part of this project. Runoff from the site is conveyed to the Regional Pond which will regulate the outfall to East Plum Creek

4) Undertake Source Control

Significant sources of water pollution are not anticipated for the proposed site. However, non-structural BMPs that pertain to the site are discussed below:

Illicit Discharge Controls – The sanitary sewer should be regularly cleaned and inspected to prevent possible waste from entering the storm sewer system.

Use of Pesticides Herbicides and Fertilizers and Landscaped Maintenance - Areas shall be designed and maintained to require as little fertilizers and chemicals as possible.

Snow and Ice Management – Deicing chemicals that are considered safer to use around plants include calcium magnesium acetate (CMA) or calcium chloride shall be used and kept to minimum to allow for operations and safety. Snow storage shall be placed in landscape areas for infiltration and water quality.

Storm Sewer System Cleaning – The onsite private storm sewer system shall be regularly cleaned of sediment, trash, and debris to keep downstream waters clean and prevent the storm sewer system from overflowing.

F. Operations and Maintenance

The operations and maintenance for the onsite stormwater infrastructure shall be the responsibility of Douglas County Elections, while the maintenance of the offsite stormsewer and water quality and detention pond shall be the responsibility of the Landlord for the proposed site. The onsite stormsewer shall inspected and maintained on a yearly basis at a minimum. Ownership shall work to prevent pollutants from entering into the onsite facilities to the greatest extent possible through activities such as reducing onsite pollutants, sediment, trash and debris, chemicals, dog waste and other illicit discharges.

G. Groundwater Management

No groundwater impacts are anticipated at this time.

V. Conclusion

A. Compliance with Standards

This report presents the description and calculations for the drainage analysis and design of the Douglas County Elections Office Expansion. The drainage system was designed in accordance with the Town of Castle Rock Storm Drainage Design and Technical Criteria Manual and the UDFCD Urban Storm Drain Criteria Manual.

B. Variances from Criteria

No variances from applicable criteria are being requested as a part of this drainage design.

VI. References

(2018, August). *Urban Storm Drainage Criteria Manual Volumes 1, 2, and 3.* Mile High Flood Disrict.
(2019, June) *Storm Drainage Design and Technical Criteria Manual.* Town of Castle Rock.

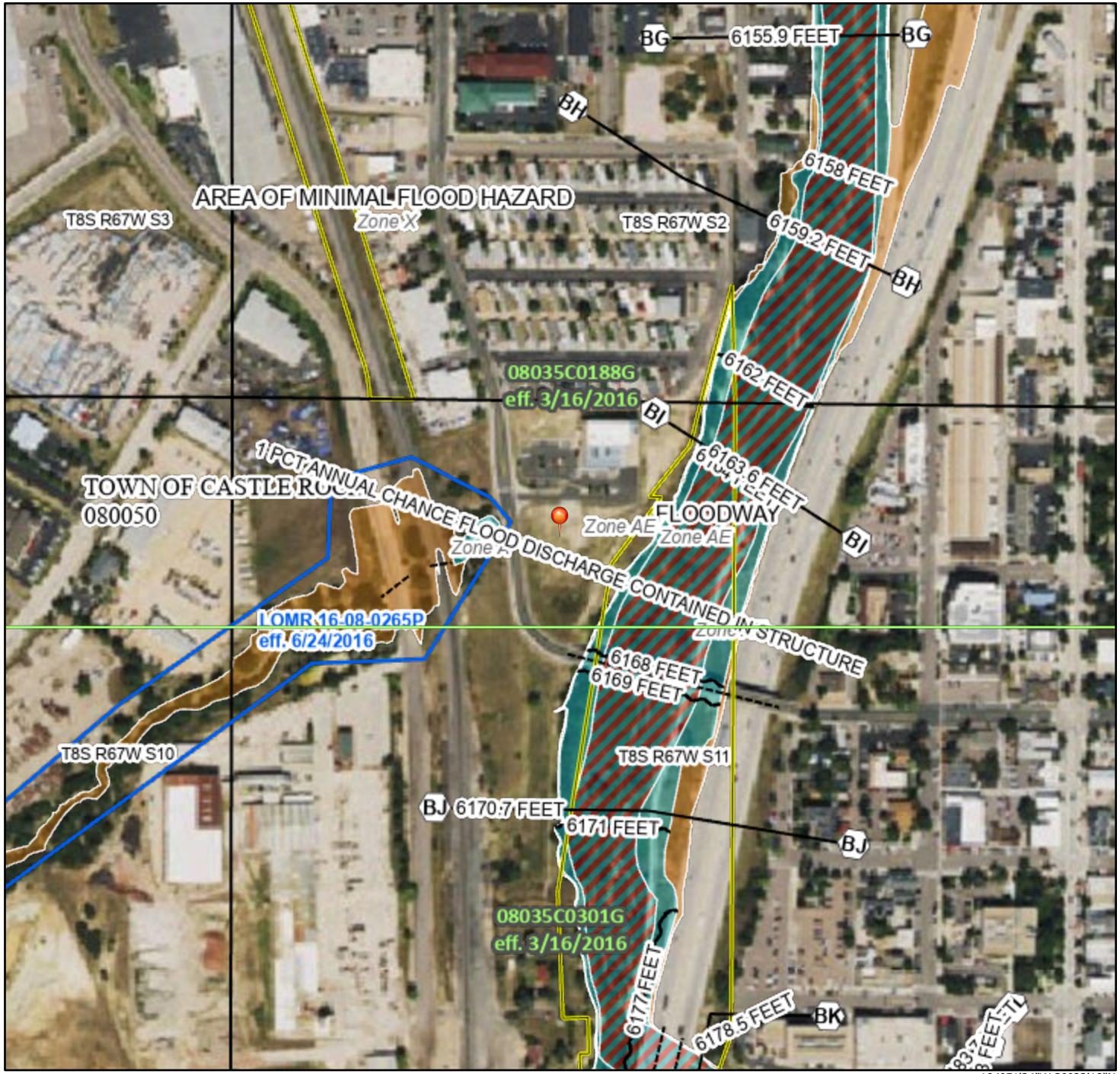
APPENDIX A

- FEMA FIRM MAPS
- WEB SOIL SURVEY RESULTS
- NOAA PRECIPITATION RESULTS
- REFERENCE MATERIAL

National Flood Hazard Layer FIRMette

FEMA

104°52'12"W 39°22'46"N



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

1:6,000

104°51'34"W 39°22'18"N

Basemap Imagery Source: USGS National Map 2023

Legend

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

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

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

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

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

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

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 5/26/2026 at 5:08 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

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

Project: **Project #:** **Applicant:**

Section	Question	Response	Instructions
1	**Non-applicable Sites**		
1.1	Will the project result in a temporary disturbance of greater than one acre?	◉ No ○ Yes	Proceed to section 1.2. 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 ○ Yes	Proceed to section 1.3. Proceed to section 2.
1.3	Is the project within the Cherry Creek Watershed?	○ Yes ○ No	Permanent water quality control measures may be required. Refer to Water Qualtiy Control Regulation 72.7 for details and allowable exclusions. Permanent water quality control measures are not required.

Section	Question	Response	Instructions
2	**Applicable Site Types and Exclusions by Variance**		
2.1	Does the project have more than 35% impervious area on the existing site?	○ No ◉ Yes	Project is an applicable Development Site. Proceed to section 3. Proceed to 2.2.
2.2	Does the project have greater than 75% impervious area on the existing site?	◉ No ○ Yes	Project is an applicable Redevelopment Site. Proceed to section 3. 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	No further action required. Proceed to 2.4.
2.4	Do any other water quality exclusions apply to the site?	○ No ○ Yes	Portions of the project are excluded. Proceed with design in accordance with Constrained Redevelopment standards and apply for **variance** for Constrained Redevelopment Sites. 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.

Section	Question	Response	Instructions
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 ◉ No	Proceed to next line. Proceed to 3.1.2.
	Is the trail for a roadway?	○ Yes ○ No	Proceed to 3.1.2. 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 ○ No	This exclusion does not apply. Permanent water quality is required. Proceed to 3.1.3.
3.1.3	Does the project add impervious area?	○ No ○ Yes	Project is excluded. Submit **variance** for Pavement Management Sites Excluded from Permanent Water Quality Requirements. Proceed to 3.1.4.
3.1.4	Does the project add more than 8.25 feet of paved width at any location to the existing roadway?	○ No ○ Yes	Project is excluded. Submit **variance** for Roadway Redevelopment Sites Excluded from Permanent Water Quality Requirements. Proceed to next line.
	Does the project add more than one acre of paved area per mile to an existing roadway?	○ No ○ Yes	Project is excluded. Submit **variance** for Roadway Redevelopment Sites Excluded from Permanent Water Quality Requirements. Proceed to next line.
	Does the project increase the width by two times or more, on average, of the original roadway area?	○ No ○ Yes	Existing areas of site are excluded only. Submit **variance** for Existing Roadway Surfaces Only Excluded from Permanent Water Quality Requirements. 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 ○ No	Project is excluded. Submit **variance** for Oil and Gas Exploration Sites Excluded from Permanent Water Quality Requirements. Proceed to 3.2.2.
3.2.2	Is the project for stream stabilization?	○ Yes ○ No	Project is excluded. Submit **variance** for Stream Stabilization Sites Excluded from Permanent Water Quality Requirements. 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 ○ No	Project is excluded. Submit **variance** for Aboveground and Underground Utilities Excluded from Permanent Water Quality Requirements. 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 ○ No	Project is excluded. Submit **variance** for Sites with Land Disturbances to Undeveloped Land that will Remain Undeveloped Excluded from Permanent Water Quality Requirements. 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 ○ Yes	Project is excluded. Submit **study** along with **variance** for Non-residential and Non-commercial Infiltration Conditions Excluded from Permanent Water Quality Requirements. This exclusion does not apply. Permanent water quality is required.

Section	Question	Response	Instructions
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 ● No	Proceed to next line. Proceed to 3.3.2.
	Is the project site greater than 10% impervious?	○ No ○ Yes	Project is excluded. Submit **variance** for Large Lot Single Family Sites Excluded from Permanent Water Quality Requirements. Proceed to next line.
	Is the project site greater than 20% impervious?	○ Yes ○ No	This exclusion does not apply. Permanent water quality is required. Proceed to next line.
	Will the post-project condition result in surface water discharge during the 80th percentile storm runoff event?	○ No ○ Yes	Project is excluded. Submit **study** along with **variance** for Large Lot Single Family Sites Excluded from Permanent Water Quality Requirements. This exclusion does not apply. Permanent water quality is required.
3.3.2	Will 100% of the runoff from the residential or commercial site be captured?	○ Yes ● No	This exclusion does not apply. Permanent water quality is required. Proceed to next line.
	Is all or a portion of the site undeveloped or will it remain undeveloped after construction?	○ Yes ● No	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. Proceed to next line.
	Is the remaining untreated impervious area greater than 20% of the site?	● Yes ○ No	This exclusion does not apply. Permanent water quality is required. Proceed to next line.
	Is the remaining untreated impervious area greater than one acre?	○ Yes ○ No	This exclusion does not apply. Permanent water quality is required. Proceed to next line.
	Is it practicable to capture runoff from portions of the site that will not drain to a control measure?	○ No ○ Yes	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. This exclusion does not apply. Permanent water quality is required.



Map Scale: 1:1,110 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 15 30 60 90

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 18, Aug 29, 2025

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

Date(s) aerial images were photographed: Mar 1, 2023—Sep 1, 2023

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
NeE	Newlin gravelly sandy loam, 8 to 30 percent slopes	0.2	5.1%
Se	Sandy wet alluvial land	3.8	94.9%
Totals for Area of Interest		**4.0**	**100.0%**

Castle Rock Area, Colorado

NeE—Newlin gravelly sandy loam, 8 to 30 percent slopes

Map Unit Setting

National map unit symbol: jqzg
Elevation: 5,500 to 6,600 feet
Mean annual precipitation: 15 to 19 inches
Mean annual air temperature: 49 to 51 degrees F
Frost-free period: 120 to 135 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Newlin

Setting

Landform: Rolling to moderately steep terraces, Mesas, Plateaus
Landform position (three-dimensional): Riser
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Unconformable sandy and gravelly and/or mixed source alluvium

Typical profile

H1 - 0 to 8 inches: gravelly sandy loam
H2 - 8 to 17 inches: gravelly sandy clay loam
H3 - 17 to 22 inches: gravelly sandy loam
H4 - 22 to 60 inches: very gravelly sand

Properties and qualities

Slope: 8 to 30 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 3.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: B
Ecological site: R049XY214CO - Gravelly Foothill
Hydric soil rating: No

Minor Components

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

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

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

Aquic haplustolls
Percent of map unit: 2 percent
Landform: Swales
Hydric soil rating: Yes

Data Source Information

Soil Survey Area: Castle Rock Area, Colorado
Survey Area Data: Version 18, Aug 29, 2025

Castle Rock Area, Colorado

Se—Sandy wet alluvial land

Map Unit Setting

National map unit symbol: jr04
Elevation: 5,500 to 6,600 feet
Mean annual precipitation: 15 to 19 inches
Mean annual air temperature: 48 to 50 degrees F
Frost-free period: 120 to 135 days
Farmland classification: Not prime farmland

Map Unit Composition

Sandy wet alluvial land: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Sandy Wet Alluvial Land

Setting

Landform: Major drainageways, Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Weathered alluvium derived from arkose

Typical profile

H1 - 0 to 6 inches: coarse sand
H2 - 6 to 60 inches: stratified coarse sand to sandy loam

Properties and qualities

Slope: 1 to 4 percent
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): High to very high (6.00 to 20.00 in/hr)
Depth to water table: About 0 to 24 inches
Frequency of flooding: Frequent
Available water supply, 0 to 60 inches: Very low (about 2.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8w
Hydrologic Soil Group: D
Hydric soil rating: No

Minor Components

Loamy wet alluvial land

Percent of map unit: 9 percent
Hydric soil rating: No

Sandy alluvial land

Percent of map unit: 9 percent

Hydric soil rating: No

Fluventic haplaquolls

Percent of map unit: 2 percent
Landform: Terraces
Hydric soil rating: Yes

Data Source Information

Soil Survey Area: Castle Rock Area, Colorado
Survey Area Data: Version 18, Aug 29, 2025

NOAA Atlas 14, Volume 8, Version 2
Location name: Castle Rock, Colorado, USA*
Latitude: 39.376°, Longitude: -104.8645°
Elevation: 6193 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Deborah Martin, Sandra Pavlovic, Ishani Roy, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Michael Yekta, Geoffery Bonnin

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.229** (0.192-0.276)	**0.291** (0.244-0.352)	**0.395** (0.331-0.479)	**0.483** (0.402-0.588)	**0.607** (0.485-0.767)	**0.705** (0.548-0.903)	**0.805** (0.601-1.06)	**0.908** (0.646-1.22)	**1.05** (0.713-1.45)	**1.16** (0.763-1.62)
10-min	**0.335** (0.281-0.404)	**0.426** (0.358-0.515)	**0.578** (0.484-0.701)	**0.708** (0.588-0.861)	**0.889** (0.710-1.12)	**1.03** (0.802-1.32)	**1.18** (0.880-1.55)	**1.33** (0.946-1.79)	**1.53** (1.04-2.13)	**1.69** (1.12-2.38)
15-min	**0.408** (0.343-0.493)	**0.520** (0.436-0.628)	**0.705** (0.590-0.855)	**0.863** (0.717-1.05)	**1.08** (0.866-1.37)	**1.26** (0.979-1.61)	**1.44** (1.07-1.89)	**1.62** (1.15-2.19)	**1.87** (1.27-2.59)	**2.06** (1.36-2.90)
30-min	**0.537** (0.451-0.648)	**0.685** (0.575-0.828)	**0.931** (0.779-1.13)	**1.14** (0.947-1.39)	**1.43** (1.14-1.80)	**1.66** (1.29-2.12)	**1.89** (1.41-2.48)	**2.13** (1.52-2.87)	**2.46** (1.67-3.40)	**2.70** (1.78-3.80)
60-min	**0.684** (0.575-0.825)	**0.850** (0.714-1.03)	**1.13** (0.948-1.37)	**1.38** (1.15-1.68)	**1.74** (1.39-2.20)	**2.02** (1.58-2.60)	**2.32** (1.74-3.06)	**2.64** (1.88-3.57)	**3.07** (2.09-4.27)	**3.42** (2.26-4.80)
2-hr	**0.831** (0.702-0.996)	**1.02** (0.857-1.22)	**1.34** (1.12-1.61)	**1.62** (1.35-1.96)	**2.04** (1.65-2.58)	**2.39** (1.88-3.06)	**2.76** (2.08-3.61)	**3.14** (2.26-4.24)	**3.69** (2.54-5.11)	**4.13** (2.74-5.77)
3-hr	**0.939** (0.796-1.12)	**1.12** (0.952-1.34)	**1.46** (1.23-1.75)	**1.76** (1.47-2.12)	**2.22** (1.80-2.81)	**2.60** (2.05-3.33)	**3.02** (2.29-3.95)	**3.46** (2.50-4.66)	**4.10** (2.83-5.66)	**4.62** (3.08-6.42)
6-hr	**1.15** (0.977-1.36)	**1.35** (1.15-1.60)	**1.73** (1.46-2.06)	**2.07** (1.74-2.48)	**2.60** (2.13-3.28)	**3.06** (2.43-3.89)	**3.55** (2.71-4.62)	**4.08** (2.97-5.46)	**4.85** (3.37-6.66)	**5.47** (3.67-7.56)
12-hr	**1.38** (1.18-1.63)	**1.64** (1.40-1.94)	**2.10** (1.79-2.48)	**2.51** (2.13-2.99)	**3.13** (2.57-3.90)	**3.65** (2.91-4.60)	**4.20** (3.22-5.42)	**4.80** (3.50-6.35)	**5.64** (3.94-7.67)	**6.31** (4.27-8.67)
24-hr	**1.65** (1.42-1.94)	**1.97** (1.69-2.31)	**2.52** (2.15-2.95)	**2.99** (2.55-3.53)	**3.69** (3.03-4.54)	**4.25** (3.40-5.30)	**4.85** (3.73-6.19)	**5.47** (4.02-7.18)	**6.34** (4.46-8.56)	**7.04** (4.79-9.60)
2-day	**1.95** (1.69-2.27)	**2.31** (2.00-2.69)	**2.92** (2.51-3.40)	**3.44** (2.94-4.03)	**4.18** (3.46-5.09)	**4.78** (3.84-5.90)	**5.40** (4.18-6.83)	**6.05** (4.46-7.86)	**6.93** (4.90-9.27)	**7.63** (5.23-10.3)
3-day	**2.12** (1.84-2.46)	**2.51** (2.18-2.91)	**3.17** (2.73-3.68)	**3.72** (3.19-4.34)	**4.51** (3.73-5.46)	**5.14** (4.14-6.30)	**5.78** (4.48-7.26)	**6.44** (4.77-8.33)	**7.34** (5.21-9.77)	**8.04** (5.54-10.9)
4-day	**2.26** (1.96-2.60)	**2.67** (2.32-3.08)	**3.35** (2.90-3.88)	**3.93** (3.38-4.58)	**4.75** (3.94-5.73)	**5.40** (4.36-6.60)	**6.06** (4.71-7.60)	**6.75** (5.01-8.70)	**7.68** (5.46-10.2)	**8.39** (5.80-11.3)
7-day	**2.60** (2.27-2.99)	**3.03** (2.65-3.49)	**3.76** (3.27-4.33)	**4.38** (3.78-5.07)	**5.26** (4.38-6.30)	**5.95** (4.83-7.24)	**6.67** (5.21-8.31)	**7.41** (5.53-9.50)	**8.42** (6.02-11.1)	**9.20** (6.39-12.3)
10-day	**2.91** (2.55-3.33)	**3.36** (2.94-3.85)	**4.12** (3.59-4.73)	**4.77** (4.13-5.50)	**5.68** (4.75-6.79)	**6.42** (5.23-7.77)	**7.17** (5.62-8.90)	**7.95** (5.95-10.2)	**9.02** (6.47-11.8)	**9.84** (6.86-13.1)
20-day	**3.81** (3.35-4.33)	**4.34** (3.82-4.94)	**5.23** (4.58-5.96)	**5.98** (5.20-6.84)	**7.02** (5.89-8.30)	**7.84** (6.41-9.40)	**8.66** (6.83-10.7)	**9.51** (7.16-12.0)	**10.6** (7.69-13.9)	**11.5** (8.09-15.3)
30-day	**4.55** (4.01-5.14)	**5.18** (4.57-5.86)	**6.21** (5.45-7.04)	**7.05** (6.16-8.04)	**8.22** (6.90-9.64)	**9.11** (7.47-10.9)	**9.99** (7.90-12.2)	**10.9** (8.22-13.7)	**12.1** (8.73-15.6)	**12.9** (9.12-17.1)
45-day	**5.47** (4.84-6.16)	**6.24** (5.52-7.03)	**7.47** (6.58-8.44)	**8.46** (7.41-9.61)	**9.79** (8.24-11.4)	**10.8** (8.87-12.8)	**11.8** (9.31-14.3)	**12.7** (9.63-15.9)	**13.9** (10.1-17.9)	**14.8** (10.5-19.5)
60-day	**6.24** (5.54-7.01)	**7.14** (6.33-8.02)	**8.56** (7.56-9.64)	**9.69** (8.50-11.0)	**11.2** (9.41-13.0)	**12.3** (10.1-14.5)	**13.3** (10.6-16.1)	**14.3** (10.9-17.8)	**15.6** (11.4-20.0)	**16.5** (11.7-21.6)

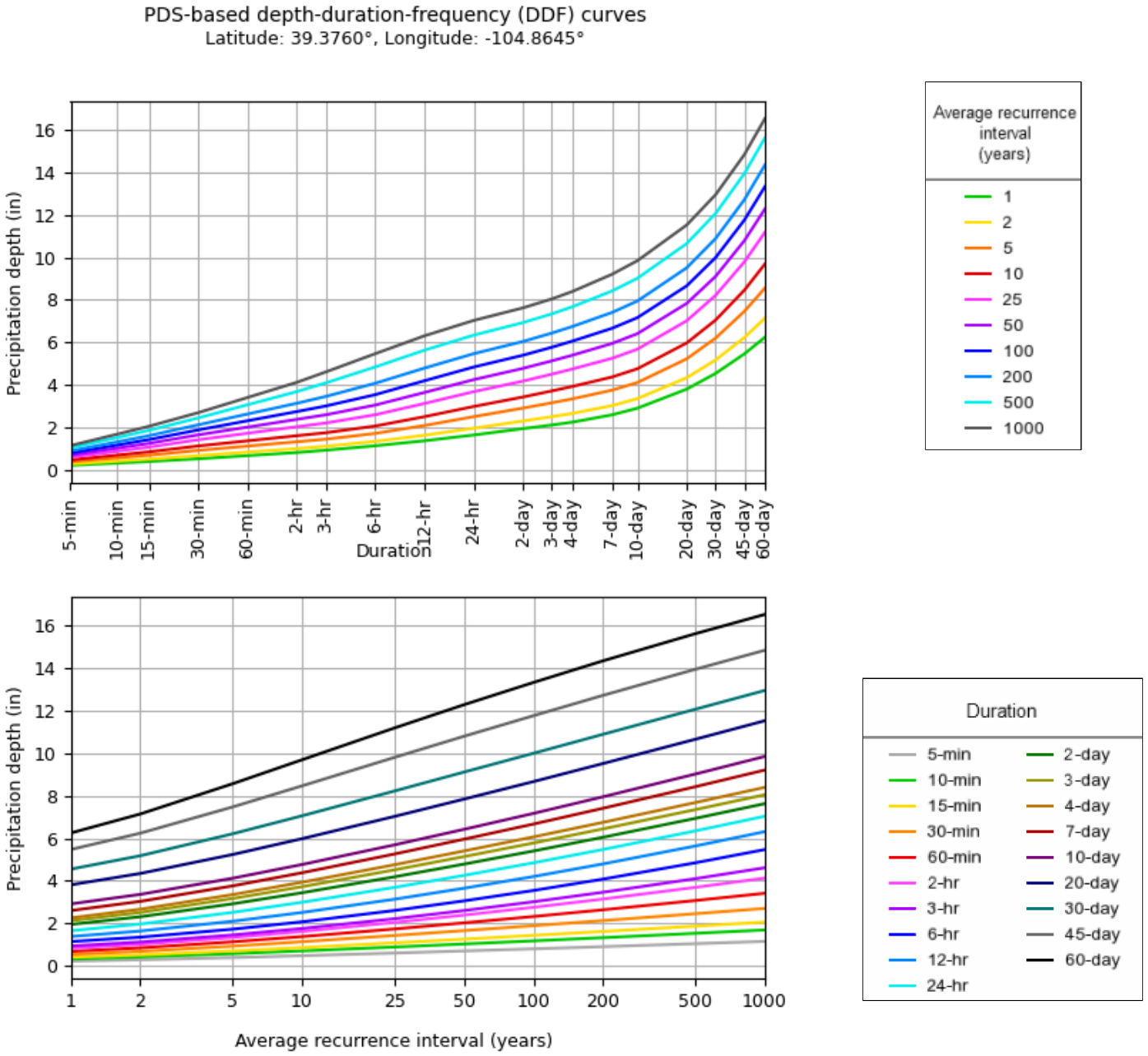
[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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PF graphical



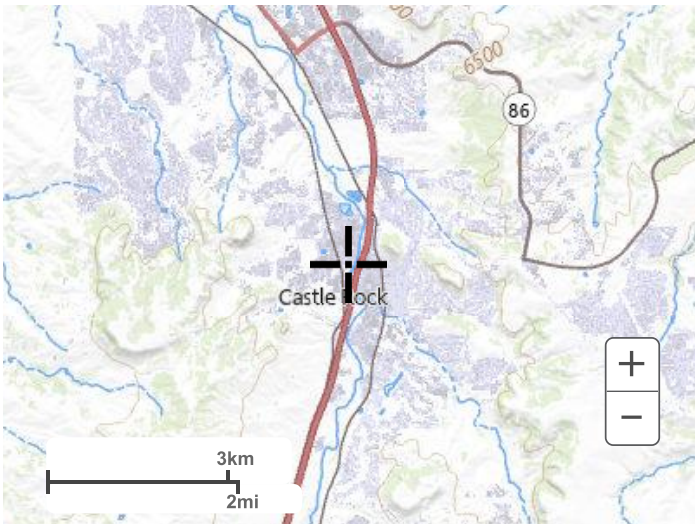
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Maps & aerials

Small scale terrain



Large scale terrain



Large scale map



Large scale aerial



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US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

Disclaimer

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PHASE III DRAINAGE REPORT

CASTLE PARK SOUTH

Prepared for
Castle Park Inc.
#2 Darren St
Castle Rock, CO 80104

Prepared by
David E. Archer & Associates, Inc.
105 North Wilcox Street
Castle Rock, Colorado 80104

Project No. 96-0467
May 20, 2003
Rev: June 24, 2003
Rev: July 7, 2003
Rev: April 5, 2004
Rev: April 25, 2004
Rev: Jan 5, 2005

DAVID E. ARCHER & ASSOCIATES, INC.
LAND DEVELOPMENT CONSULTING
SURVEYING & ENGINEERING
PHONE (303) 688-4642
105 WILCOX ST., CASTLE ROCK, COLORADO 80104

Date: May 20, 2003
Rev: June 24, 2003,July 7, 2003, April 5, 2004, April 25, 2004, January 5, 2005
Project Name: Castle Park South
Project No.: 96-0467

ENGINEER'S STATEMENT

The enclosed drainage report, and exhibits were prepared by me, or under my direct supervision and are correct to the best of my knowledge and belief. Said drainage report has been prepared in accordance with applicable Town of Castle Rock criteria and is in conformance with the master plan of drainage for the affected area. I accept liability caused by negligent acts, errors or omissions on by part in preparing this report.

SIGNATURE: _____

Kevin E. Archer, P.E.
State of Colorado No. 26309

DEVELOPER'S CERTIFICATION

As Owner/Developer of land identified within this report: I agree to proceed, implement and comply with all recommendations and requirements outlined herein.

Castle Park, Inc.

_____
Gerald Hall
Authorized Signature

TOWN OF CASTLE ROCK APPROVALS

_____ 3/8/05
Engineering Division Date

Approved
Development Services

MAR 09 2005

_____ _____
Development Services Director Date

Town of Castle Rock

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I. GENERAL LOCATION AND DESCRIPTION

A. Location
1. The area of the development is 4.30 acres.
2. The legal description is: NW ¼ Section 11, T8S, R67W, 6th P. M., Douglas County, Colorado.
3. The site is located completely with in the Town of Castle Rock, local streets are: Park Street located to the west, 5th Street to the south and I-25 R.O.W. located to the east.
4. Castle Park, a mobile home development is located to the north.

B. Description of Property
1. The ground cover at the site consists of dry land grasses and bare ground.
2. There is a major drainage facility that passes underneath the site. This facility is a 96" culvert that passes offsite flows to Plum Creek and will have no impact upon the drainage design for this site.
3. This site will be used for office space and parking.

C. No irrigation facilities are located within the property.

D. Currently, the site is used for storage and proposed land use will be a commercial development.

II. DRAINAGE BASINS AND SUB-BASINS

A. Major Basin Description
1. The major upstream drainage that used to cross the property is now passed below the property through a storm sewer system, installed by the Colorado Department of Transportation and the Town of Castle Rock and a letter of map revision has not been prepared for the modifications made to the flood plain made by the installation of the 96" RCP by the Colorado Department of Transportation and the Town of Castle Rock. The 100-year flood plain limits indicated on the site per FIRM Panel No. 080050 0188 C are prior to these modifications and have not been revised. The 100-yr flood event now passes under the site via a 96" diameter culvert located along the south side of the property, per the drainage report prepared by CDOT, and approved by the Town, see Appendix C. The flood plain shown on the FIRM panel is completely contained in Lot 3, and does not impact the developed portion of the site.
2. Historically the site is divided into three distinct drainage basins. Basin H-1 drains predominantly in a northeastern direction and the basin H-2 drains in a predominantly eastern direction. Basin H-3 drains primarily in southern direction. Currently, the site is used for storage. Proposed land use will be office space and parking. Historic flows are listed below.

Basin	100-yr flow rate
H-1	2.93 CFS
H-2	3.35 CFS
H-3	2.60 CFS

3. Soils for the site are predominately NeE (Newlin Gravelly Sandy Loam) type "B" soils based on the SCS Soils Survey of Castle Rock Area, Colorado

B. Sub Basin Description
1. The proposed project site consists of four sub basins. Basin D-1 consists of lot 2 and a portion of Lot 1 including some area north of the proposed building and drains predominately in an eastern direction. Pond A will be developed to detain the flows from Basin D-1. Basin D-2 consists of the remainder of Lot 1 andLot 3. This basin drains in an southeastern direction. Flows from Basin D-2 will be conveyed to Pond B via a private storm sewer.

Basin D-3, consists of Lot 3 and is the southernmost section of the property. Basin D-4 consists of the remainder of the property along the eastern edge and is the existing bank. This area will remain undeveloped and undetained. D-3 is the basin that drains directly into Detention Pond B, and it will remain vegetated. A new Phase III Drainage study will be required when Lot 3 is developed. Historically, the on site discharges leave the site at the northeast corner of the property and along the east property line. The water then flows into Plum Creek.

2. Offsite flows from the West had once traveled across the property, but are now passed below the property through a storm sewer system, installed by the Colorado Department of Transportation, and the Town of Castle Rock. Storm water from the north that flows in the existing curb does not enter the property, but flows to the south where it is released through existing offsite storm drainage facilities. No other offsite basins impact the development.

III. DRAINAGE DESIGN CRITERIA

A. Regulations

1. The proposed storage and parking area are designed to comply with the CRITERIA.

B. Development Criteria Reference and Constraints

1. A site plan and Phase III Drainage report has not previously been prepared for this site. This report has been developed in accordance with the Town of Castle Rock Public Works Regulations (TCRPWR), February 1999.
2. There are no offsite basins that contribute flows to the site.
3. Detention and water quality are proposed for the site. The site is large enough to handle the detention and water quality requirements with a sharp-crested weir structure to control the 100-year flow.

C. Hydrologic Criteria

1. The design rainfall for this project is per Zone I, Chapter 10, Section 4 Rainfall, TCRPWR.
2. The rational formula was used to calculate all site runoff when necessary.
3. The detention calculation method used to design the storage facility is outlined in chapter 10.13 of the TCRPWR.
4. Only TCRPWR methods were used to prepare this report.

D. Hydraulic Criteria

1. Haestad CulvertMaster, and FlowMaster were used to calculate the various flow rates and capacities
2. Only TCRPWR methods were used to prepare this report.

E. Variances from Criteria

1. No variances from TCRPWR are required for this project.

IV. DRAINAGE FACILITY DESIGN

A. General Concept

1. All existing drainage patterns will remain similar to historic patterns with the exception of basin D-4 which will remain Historic. The runoff from the increased impervious areas will be detained on site and will be released from the detention facilities at or below historic rates. Upon completion of development the site will be divided into four distinct drainage basins. Basin D-1 will consist of part of Lot 1 and all of Lot 2. The cover of this basin will be gravel and landscaping. A small detention facility (Pond A) is proposed for this basin. Basin D-2 consists of the remainder of Lot 1 and part of Lot 3. The developed cover for this basin will be asphalt parking, the proposed building, landscaped areas and reseeded disturbed ground. A detention facility (Pond B) is proposed for this basin. Basin D-3 will consist of Lot 3. This basin contains the largest of the two detention ponds, holding runoff from Basins D-2, D-3. Basin D-4 consists of the undevelopable eastern edge of the property, and will remain undetained.

2. Off site flow from the adjacent properties to the west are conveyed beneath the site via an existing storm drainage system. No other off site runoff impacts the site.
3. All tables and charts used in this report follow the Town of Castle Rock Public Works Regulations.
4. The increased developed runoff rates will be detained and release at or below the historic runoff rates. Basin D-4, will remain undetained.
5. Storm water quality enhancement is proposed for this site.

B. Specific Details

1. The storm drainage plan for the site is normal and no particular problems were encountered in its development. Developed runoff will be allowed to release below historic rates from Basin D-1 via an outlet structure in Pond A leading to an existing concrete flume that drains to Plum Creek. Developed flows from basins D-2 and D-3 will be routed through Detention Pond B and released below historic rates into an existing 66" storm sewer that runs underneath the site. The remainder of the site will remain undisturbed and will therefore be allowed to flow in an undetained manner. The following volumes and release rates were calculated for the site.

Summed Volumes and Release rates for Detention facilities

Pond	Basins Drained	WQ Vol (Ft^3)	10-yr + WQ Vol (Ft^3)	100-yr + WQ Vol (Ft^3)	10-yr Release Rate (CFS)	100-yr Release Rate (CFS)
A	D-1	313	970	1,506	0.16	0.58
B	D-2, D-3	6,087	19,672	31,286	0.81	3.00

(Basin D-4 will remain undeveloped and undetained)

2. The detention facilities and outlet structures were sized using only UDFCD methods.
3. All detention ponds shall be contained within drainage easements, and readily accessible via an access drive, or sufficient pond bank sizing for maintenance equipment to travel. Maintenance of the drainage facility will be the owner's responsibility.
4. No variances from the CRITERIA are required.

V. CONCLUSIONS

A. Compliance with Standards

1. This report complies with the TCRPWR.
2. There are no major drainage ways planning studies that are impacted by the development of this site.
3. When developed, this project will be consistent with the requirements of the Manual

B. Drainage Concepts

1. The drainage design will not damage downstream properties. The runoff will be limited to historic rates, and will flow through existing drainage ways prior to leaving the site.
2. The proposed drainage plan will not influence any major drainage ways.

VI. REFERENCES

- US Department of Agriculture, Soil Conservation Service (November 1974) "Soil Survey of Castle Rock Area"
- Town of Castle Rock Public Works Regulations, (February, 1999)
- WRC Engineering, Inc. (January 1986) "Douglas County Storm Drainage Design and Technical Criteria"

David E. Archer & Associates

PEAK FLOW BY THE RATIONAL METHOD

PROJECT NUMBER:	96-0467
PROJECT NAME:	Castle Park South
DATE:	27-Dec-02
COMPLETED BY:	SCB

HISTORIC CONDITIONS ANALYSIS

BASIN: H-1

AREA =	1.44	ACRES		
LENGTH =	500	FEET	DELTA L =	200 FEET
SLOPE =	5.00	PERCENT		

DEVELOPED COVER: Grass and Bare Ground "@5% Impervious"

VEL =	3.50	FT/SEC
C2 =	0.04	
C5 =	0.10	
C10 =	0.19	
C100 =	0.38	

TIME OF CONCENTRATION

Ti = [1.8 x (1.1 - C5) x L^0.5]/S^1/3 ***** MAX L = 300 FT *****

Tt = L/(60 x V)

Tc = Ti + Tt (MINIMUM OF 5 MINUTES)

Ti =	18.2	MINUTES		
Tt =	1.0	MINUTES		
Tc =	19.2	MINUTES	*****	19.2

PROJECTED RAINFALL INTENSITY

I2 =	2.16	INCHES/HOUR
I5 =	2.91	INCHES/HOUR
I10 =	3.40	INCHES/HOUR
I100 =	5.35	INCHES/HOUR

PROJECTED DEVELOPED PEAK FLOWS BY RATIONAL METHOD

Q2 =	**0.12**	**CFS**
Q5 =	**0.42**	**CFS**
Q10 =	**0.93**	**CFS**
Q100 =	**2.93**	**CFS**

David E. Archer & Associates

PEAK FLOW BY THE RATIONAL METHOD

PROJECT NUMBER: 96-0467
PROJECT NAME: Castle Park South
DATE: 27-Dec-02
COMPLETED BY: SCB

HISTORIC CONDITIONS ANALYSIS

BASIN: H-2

AREA =	1.70	ACRES		
LENGTH =	400	FEET	DELTA L =	100 FEET
SLOPE =	3.75	PERCENT		

DEVELOPED COVER: Grass and Bare Ground "@5% Impervious"

VEL = 4.00 FT/SEC

C2 =	0.04
C5 =	0.10
C10 =	0.19
C100 =	0.38

TIME OF CONCENTRATION

Ti = [1.8 x (1.1 - C5) x L^0.5]/S^1/3 ***** MAX L = 300 FT *****
Tt = L/(60 x V)
Tc = Ti + Tt (MINIMUM OF 5 MINUTES)

Ti =	20.1	MINUTES		
Tt =	0.4	MINUTES		
Tc =	20.5	MINUTES	*****	20.5

PROJECTED RAINFALL INTENSITY

I2 =	2.09	INCHES/HOUR
I5 =	2.82	INCHES/HOUR
I10 =	3.29	INCHES/HOUR
I100 =	5.18	INCHES/HOUR

PROJECTED DEVELOPED PEAK FLOWS BY RATIONAL METHOD

Q2 =	**0.14**	**CFS**
Q5 =	**0.48**	**CFS**
Q10 =	**1.06**	**CFS**
Q100 =	**3.35**	**CFS**

David E. Archer & Associates

PEAK FLOW BY THE RATIONAL METHOD

PROJECT NUMBER:	96-0467
PROJECT NAME:	Castle Park South
DATE:	27-Dec-02
COMPLETED BY:	SCB

HISTORIC CONDITIONS ANALYSIS

BASIN: H-3

AREA =	1.24	ACRES		
LENGTH =	350	FEET	DELTA L =	50 FEET
SLOPE =	5.50	PERCENT		

DEVELOPED COVER: Short Grass Pasture and Lawns "@5% Impervious"

VEL =	2.50	FT/SEC
C2 =	0.04	
C5 =	0.10	
C10 =	0.19	
C100 =	0.38	

TIME OF CONCENTRATION

Ti = [1.8 x (1.1 - C5) x L^0.5]/S^1/3 ***** MAX L = 300 FT *****

Tt = L/(60 x V)

Tc = Ti + Tt (MINIMUM OF 5 MINUTES)

Ti =	17.7	MINUTES		
Tt =	0.3	MINUTES		
Tc =	18.0	MINUTES	*****	18

PROJECTED RAINFALL INTENSITY

I2 =	2.23	INCHES/HOUR
I5 =	3.00	INCHES/HOUR
I10 =	3.50	INCHES/HOUR
I100 =	5.52	INCHES/HOUR

PROJECTED DEVELOPED PEAK FLOWS BY RATIONAL METHOD

Q2 =	**0.11**	**CFS**
Q5 =	**0.37**	**CFS**
Q10 =	**0.83**	**CFS**
Q100 =	**2.60**	**CFS**

David E. Archer & Associates, Inc.

UDFCD DETENTION & DISCHARGE VALUES

PROJECT NUMBER:	196-0467
PROJECT NAME:	Castle Park South
DATE:	25-Apr-04
COMPLETED BY:	KEA

BASINS D-2 and D-3 (POND B)

DETERMINING THE AMOUNT OF IMPERVIOUS AREA

D-2	78,844	SQ FT	=	1.81 ACRES
D-3	74,923	SQ FT	=	1.72 ACRES
TOTAL	**153,767**	**SQ FT**	=	**3.53 ACRES**

PERCENT IMPERVIOUS = 95.0 From Table RO-3 Business-Commercial

DETERMINING THE K FACTORS

$K100 = (1.78I - 0.002I^2 - 3.56)/900 =$ 0.164

$K10 = (0.95I - 1.90)/1000 =$ 0.088

$K5 = 36.57I + 0.008/I - 78.58 =$ 3396

Existing soils are predominately Se: wet alluvial land
Hydrologic "C" soils, vegetative cover is grass

RELEASE RATES FOR "B" TYPE SOILS

Q100 =	0.85	CFS/ACRE
Q10 =	0.23	CFS/ACRE

EVALUATING DETENTION AND RELEASE RATES

$V100 = K100 \times A =$	0.58	AF	=	**25,199**	**CU FT**
Q100 =0.85*3.53	**3.00**	**CFS**			
$V10 = K10 \times A =$	0.31	AF	=	**13,585**	**CU FT**
Q10 = 0.23*3.53	**0.81**	**CFS**			
$Vwq = IA/2400 =$	**0.14**	AF	=	**6,087**	**CU FT**

V10+ Vwq =	**19,672**	**CU FT**
V100+ Vwq =	**31,286**	**CU FT**

APPENDIX B

- HYDROLOGIC CALCULATIONS

Project : Douglas County Elections Expansion
Project No. : 26016

Date : 5/26/2026
By : MDS

Drainage Basin Imperviousness

Soil Type : **C or D**

	Roof	Concrete	Asphalt	Landscape	EDB	Gravel	Undeveloped							
Imperviousness :	95%	95%	95%	20%	25%	40%	5%	Total Area (ac.)	Total Area (sq.ft.)	Composite % Imp.	Runoff Coefficients			
Basin Name	Areas (sq.ft.)										C_2	C_5	C_{10}	C_{100}
A1	9,458							0.22	9,458	95%	0.79	0.81	0.83	0.87
A2	14,045	9,193	30,491	10,475				1.47	64,204	83%	0.67	0.71	0.74	0.82
A3		229	18,059	4,164				0.52	22,452	81%	0.66	0.70	0.73	0.82
A4			26,243	6,426				0.75	32,669	80%	0.65	0.69	0.72	0.81
A5			9,110	1,443				0.24	10,553	85%	0.69	0.73	0.75	0.83
A6				15,110		795		0.37	15,905	21%	0.14	0.21	0.29	0.57
B1				30,268				0.69	30,268	20%	0.14	0.20	0.28	0.57
B2				1,833				0.04	1,833	20%	0.14	0.20	0.28	0.57
Site	23,503	9,422	83,903	69,719	0	795	0	4.30	187,342	67%	0.53	0.58	0.62	0.76

Project : Douglas County Elections Expansion
Project No. : 26016

Date : 5/26/2026
By : MDS

SF2 - Time of Concentration

				Initial/Overland Time			Travel Time					Time of Concentration		Final
Basin ID	Area (ac.)	Area (sq.ft.)	C_5	L_i (ft.)	S (%)	T_i (min.)	L_t (ft.)	S (%)	Conveyance Factor	Vel (fps)	T_t (min.)	Comp. T_C (min.)	Regional T_C (Min.)	T_C (Min.)
A1	0.22	9,458	0.81	25	1.00	2.6	25	1.0	20	2.0	0.2	2.8	10.0	5.0
A2	1.47	64,204	0.71	219	3.90	6.7	144	2.1	20	2.9	0.8	7.5	12.7	7.5
A3	0.52	22,452	0.70	150	2.00	7.1	168	1.0	20	2.0	1.4	8.5	13.6	8.5
A4	0.75	32,669	0.69	28	4.90	2.3	63	1.0	20	2.0	0.5	2.8	12.9	5.0
A5	0.24	10,553	0.73	177	4.90	5.3	26	4.0	20	4.0	0.1	5.4	11.7	5.4
A6	0.37	15,905	0.21	78	14.10	6.0	52	1.0	20	2.0	0.4	6.4	23.2	6.4
B1	0.69	30,268	0.20	10	10.00	2.4	20	10.0	7	2.2	0.2	2.6	22.7	5.0
B2	0.04	1,833	0.20	10	5.00	3.0	2	5.0	7	1.6	0.0	3.0	22.6	5.0

Project : Douglas County Elections Expansion
Project No. : 26016

Date : 5/26/2026
By : MDS

SF3 - Minor Storm

1-hr Point Rainfall **1.06** in. (5-year Event)

		Direct Runoff							Total Runoff				Street		Travel Time			
Description	Design Point	Area (ac.)	Area (sq.ft.)	C_5	Tc (min.)	CA (ac.)	I (in/hr)	Q (cfs)	Tc (min.)	CA (ac.)	I (in/hr)	Q (cfs)	Slope (%)	Flow (cfs)	Length (ft)	Vel. (fps)	tt (min.)	Comments
A1	1	0.22	9,458	0.81	5.0	0.18	3.60	0.6										Runoff from Basin A1 to DP1
A2	3	1.47	64,204	0.71	7.5	1.05	3.19	3.3										Runoff from Basin A2 to DP3
A3	3	0.52	22,452	0.70	8.5	0.36	3.05	1.1	8.5	1.40	3.05	4.3						Combined runoff to DP3
A4	4	0.75	32,669	0.69	5.0	0.52	3.60	1.9										Runoff from Basin A4 to DP4
A5	5	0.24	10,553	0.73	5.4	0.18	3.52	0.6										Runoff from Basin A5 to DP5
A6	6	0.37	15,905	0.21	6.4	0.08	3.35	0.3										Existing Pond
B1	7	0.69	30,268	0.20	5.0	0.14	3.60	0.5										Runoff from Basin B1 offsite
B2	8	0.04	1,833	0.20	5.0	0.01	3.60	0.0										Runoff from Basin B2 offsite

Project : Douglas County Elections Expansion
Project No. : 26016

Date : 5/26/2026
By : MDS

SF3 - Major Storm

1-hr Point Rainfall **2.27** in. (100-year Event)

		Direct Runoff							Total Runoff				Street		Travel Time			
Description	Design Point	Area (ac.)	Area (sq.ft.)	C_{100}	Tc (min.)	CA (ac.)	I (in/hr)	Q (cfs)	Tc (min.)	CA (ac.)	I (in/hr)	Q (cfs)	Slope (%)	Flow (cfs)	Length (ft)	Vel. (fps)	tt (min.)	Comments
A1	1	0.22	9,458	0.87	5.0	0.19	7.70	1.5										Runoff from Basin A1 to DP1
A2	3	1.47	64,204	0.82	7.5	1.21	6.83	8.3										Runoff from Basin A2 to DP3
A3	3	0.52	22,452	0.82	8.5	0.42	6.53	2.7	8.5	1.63	6.53	10.7						Combined runoff to DP3
A4	4	0.75	32,669	0.81	5.0	0.61	7.70	4.7										Runoff from Basin A4 to DP4
A5	5	0.24	10,553	0.83	5.4	0.20	7.53	1.5										Runoff from Basin A5 to DP5
A6	6	0.37	15,905	0.57	6.4	0.21	7.18	1.5										Existing Pond
B1	7	0.69	30,268	0.57	5.0	0.39	7.70	3.0										Runoff from Basin B1 offsite
B2	8	0.04	1,833	0.57	5.0	0.02	7.70	0.2										Runoff from Basin B2 offsite

APPENDIX C

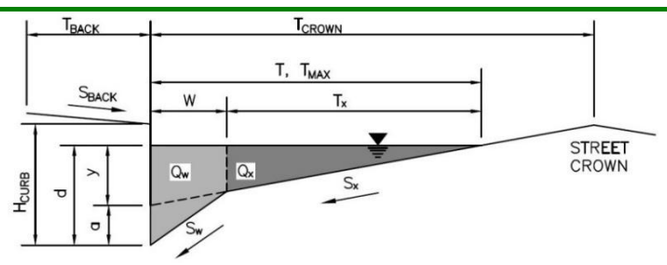
- HYDRAULIC CALCULATIONS

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

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

Project: **DCG Elections Office**

Inlet ID: **DP3**



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	5.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.050	ft/ft
Warning 01 Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.030	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	36.0	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} =	0.012	

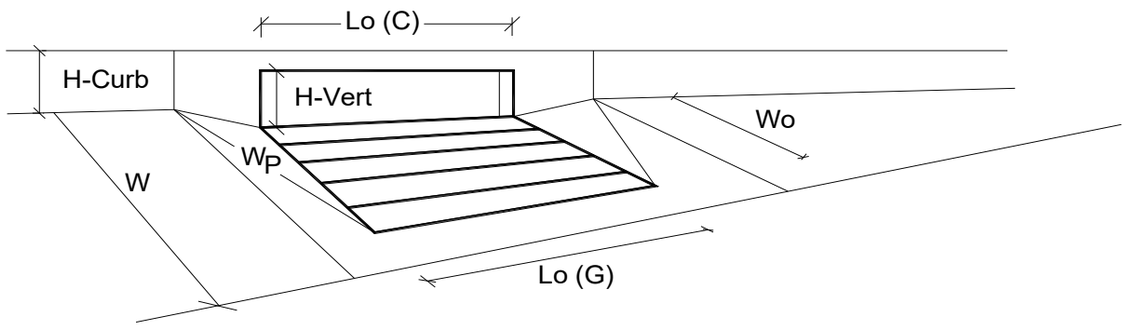
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	36.0	36.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	9.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is not applicable to Sump Condition				
MAJOR STORM Allowable Capacity is not applicable to Sump Condition	**Q_{allow} =**	**SUMP**	**SUMP**	**cfs**

Warning 01: Manning's n-value does not meet the USDCM recommended design range.

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 6.00 (August 2025)



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 =	6.0	9.0	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} =	0.33	0.58	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 =**	**5.4**	**10.7**	**cfs**
WARNING: Inlet Capacity < Q Peak for Major Storm	$Q_{PEAK\ REQUIRED}$ =	4.3	10.7	cfs

Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, Jun 5 2026

DP4 CURB OPENING - 100-YR

Rectangular

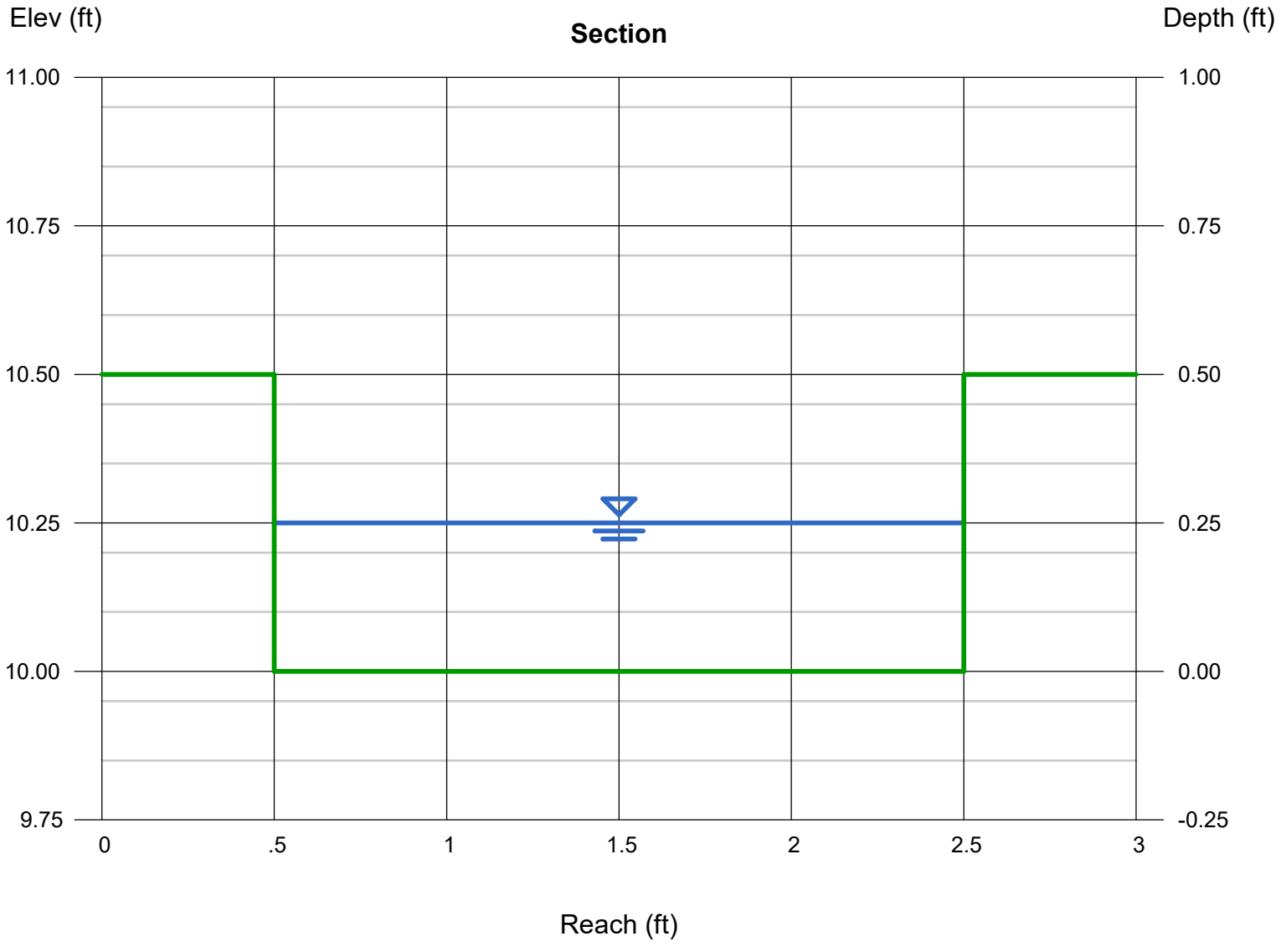
Bottom Width (ft)	= 2.00
Total Depth (ft)	= 0.50
Invert Elev (ft)	= 10.00
Slope (%)	= 5.00
N-Value	= 0.012

Calculations

Compute by:	Known Q
Known Q (cfs)	= 4.70

Highlighted

Depth (ft)	= 0.25
Q (cfs)	= 4.700
Area (sqft)	= 0.50
Velocity (ft/s)	= 9.40
Wetted Perim (ft)	= 2.50
Crit Depth, Yc (ft)	= 0.50
Top Width (ft)	= 2.00
EGL (ft)	= 1.62



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, Jun 5 2026

DP5 CURB OPENING - 100-YR

Rectangular

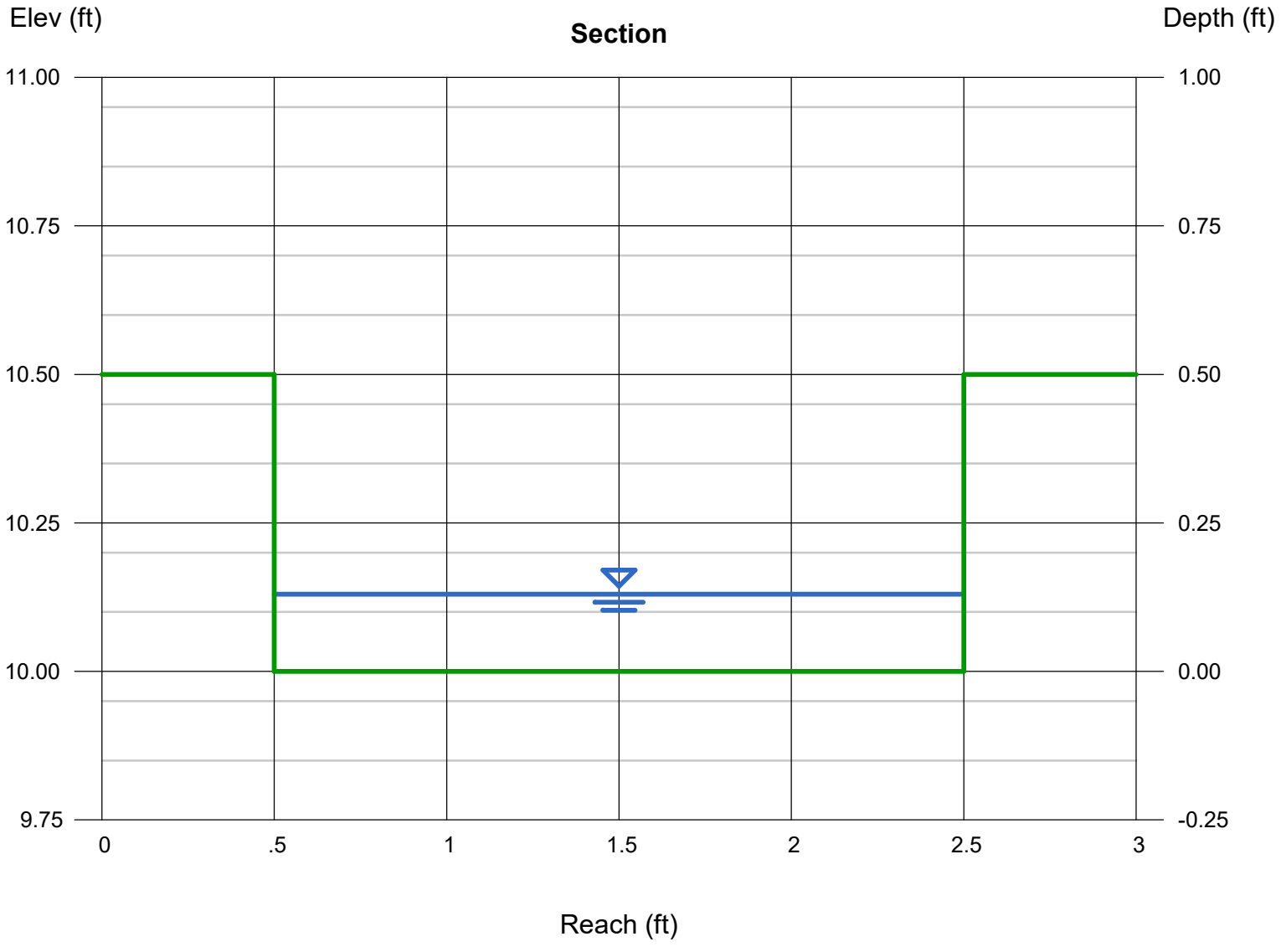
Bottom Width (ft)	= 2.00
Total Depth (ft)	= 0.50
Invert Elev (ft)	= 10.00
Slope (%)	= 5.00
N-Value	= 0.012

Calculations

Compute by:	Known Q
Known Q (cfs)	= 1.50

Highlighted

Depth (ft)	= 0.13
Q (cfs)	= 1.500
Area (sqft)	= 0.26
Velocity (ft/s)	= 5.77
Wetted Perim (ft)	= 2.26
Crit Depth, Yc (ft)	= 0.26
Top Width (ft)	= 2.00
EGL (ft)	= 0.65



APPENDIX D

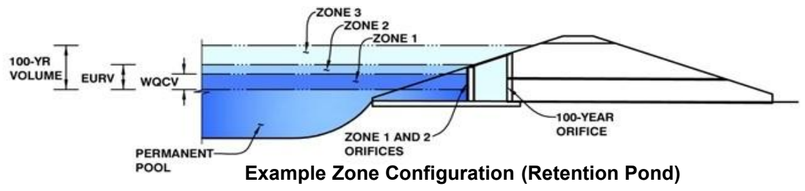
- DETENTION CALCULATIONS
- DETENTION DETAILS

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.07 (June 2025)

Project: **Douglas County Elections Expansion**

Basin ID: **Ex. Pond**



Example Zone Configuration (Retention Pond)

Watershed Information

Selected SCM Type =	**EDB**	
Watershed Area =	4.30	acres
Watershed Length =	552	ft
Watershed Length to Centroid =	205	ft
Watershed Slope =	0.050	ft/ft
Watershed Imperviousness =	67.00%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	0.0%	percent
Percentage Hydrologic Soil Groups C/D =	100.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	Castle Pines - City Office	

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

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	0.094	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	0.279	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 1.02 in.) =	0.222	acre-feet	1.02	inches
5-yr Runoff Volume (P1 = 1.13 in.) =	0.254	acre-feet	1.13	inches
10-yr Runoff Volume (P1 = 1.38 in.) =	0.333	acre-feet	1.38	inches
25-yr Runoff Volume (P1 = 1.74 in.) =	0.464	acre-feet	1.74	inches
50-yr Runoff Volume (P1 = 2.02 in.) =	0.559	acre-feet	2.02	inches
100-yr Runoff Volume (P1 = 2.32 in.) =	0.670	acre-feet	2.32	inches
500-yr Runoff Volume (P1 = 3.07 in.) =	0.932	acre-feet	3.07	inches
Approximate 2-yr Detention Volume =	0.214	acre-feet		
Approximate 5-yr Detention Volume =	0.265	acre-feet		
Approximate 10-yr Detention Volume =	0.318	acre-feet		
Approximate 25-yr Detention Volume =	0.373	acre-feet		
Approximate 50-yr Detention Volume =	0.396	acre-feet		
Approximate 100-yr Detention Volume =	0.442	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.094	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.185	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.163	acre-feet
Total Detention Basin Volume =	0.442	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	**user**	acre-feet

Depth Increment = 0.10 ft

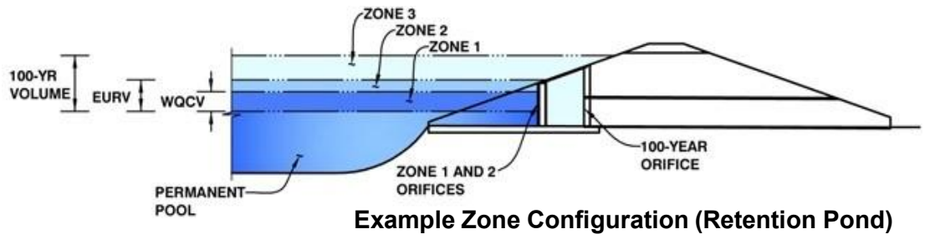
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	0	0.000		
	--	1.00	--	--	--	2,983	0.068	1,491	0.034
	--	2.00	--	--	--	4,460	0.102	5,213	0.120
	--	3.00	--	--	--	6,027	0.138	10,456	0.240
	--	4.00	--	--	--	7,486	0.172	17,213	0.395
	--	5.00	--	--	--	9,179	0.211	25,545	0.586
	--		--	--	--				
	--		--	--	--				
	--		--	--	--			

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.07 (June 2025)

Project: **Douglas County Elections Expansion**

Basin ID: **Ex. Pond**



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	1.74	0.094	Orifice Plate
Zone 2 (EURV)	3.28	0.185	Orifice Plate
Zone 3 (100-year)	4.27	0.163	Weir&Pipe (Restrict)
Total (all zones)		0.442	

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

Underdrain Orifice Invert Depth = ft (distance below the filtration media surface)

Underdrain Orifice Diameter = inches

Calculated Parameters for Underdrain

Underdrain Orifice Area = ft^2

Underdrain Orifice Centroid = feet

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

Centroid of Lowest Orifice = 0.00 ft (relative to basin bottom at Stage = 0 ft)

Depth at top of Zone using Orifice Plate = 3.28 ft (relative to basin bottom at Stage = 0 ft)

Orifice Plate: Orifice Vertical Spacing = 13.10 inches

Orifice Plate: Orifice Area per Row = 0.72 sq. inches (diameter = 15/16 inch)

Calculated Parameters for Plate

WQ Orifice Area per Row = 5.000E-03 ft^2

Elliptical Half-Width = N/A feet

Elliptical Slot Centroid = N/A feet

Elliptical Slot Area = N/A ft^2

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.09	2.19					
Orifice Area (sq. inches)	0.72	0.72	0.72					

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

User Input: Vertical Orifice (Circular or Rectangular)

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

Calculated Parameters for Vertical Orifice

	Not Selected	Not Selected	
Vertical Orifice Area =	N/A	N/A	ft^2
Vertical Orifice Centroid =	N/A	N/A	feet

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

	Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	3.28	N/A	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	3.00	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V
Horiz. Length of Weir Sides =	3.00	N/A	feet
Overflow Grate Type =	Type C Grate	N/A	
Debris Clogging % =	50%	N/A	%

Calculated Parameters for Overflow Weir

	Zone 3 Weir	Not Selected	
Height of Grate Upper Edge, H_t =	3.28	N/A	feet
Overflow Weir Slope Length =	3.00	N/A	feet
Grate Open Area / 100-yr Orifice Area =	16.09	N/A	
Overflow Grate Open Area w/o Debris =	6.26	N/A	ft^2
Overflow Grate Open Area w/ Debris =	3.13	N/A	ft^2

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

	Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	0.00	N/A	ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter =	18.00	N/A	inches
Restrictor Plate Height Above Pipe Invert =	4.90		inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 3 Restrictor	Not Selected	
Outlet Orifice Area =	0.39	N/A	ft^2
Outlet Orifice Centroid =	0.24	N/A	feet
Half-Central Angle of Restrictor Plate on Pipe =	1.10	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage= 6.00 ft (relative to basin bottom at Stage = 0 ft)

Spillway Crest Length = 45.00 feet

Spillway End Slopes = 4.00 H:V

Freeboard above Max Water Surface = 1.00 feet

Calculated Parameters for Spillway

Spillway Design Flow Depth= 0.23 feet

Stage at Top of Freeboard = 7.23 feet

Basin Area at Top of Freeboard = 0.21 acres

Basin Volume at Top of Freeboard = 0.59 acre-ft

Routed Hydrograph Results

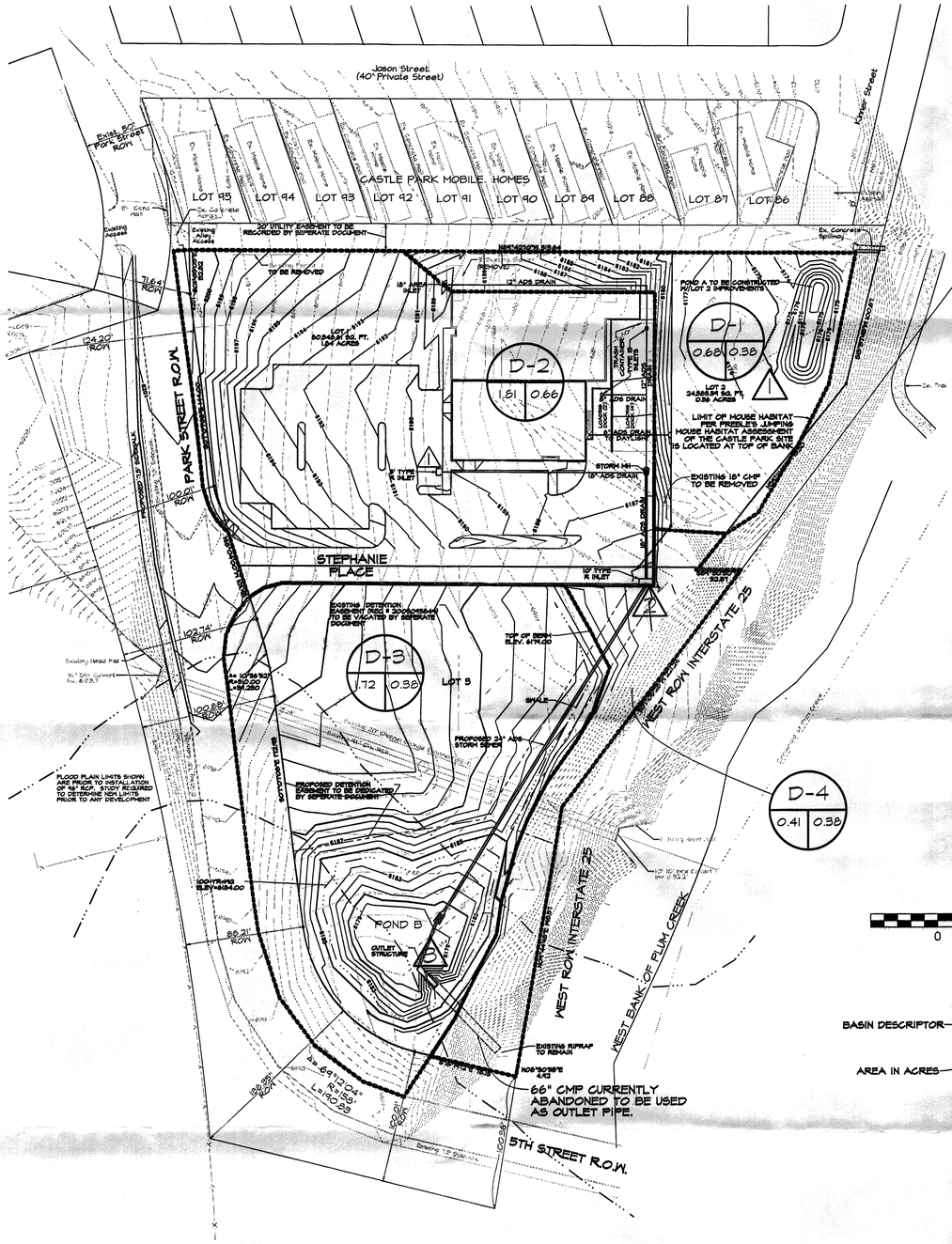
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.02	1.13	1.38	1.74	2.02	2.32	3.07
CUHP Runoff Volume (acre-ft) =	0.094	0.279	0.222	0.254	0.333	0.464	0.559	0.670	0.932
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.222	0.254	0.333	0.464	0.559	0.670	0.932
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.6	0.9	2.0	4.4	5.8	7.5	11.2
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.13	0.21	0.46	1.02	1.34	1.74	2.61
Peak Inflow Q (cfs) =	N/A	N/A	4.9	5.6	7.4	10.8	13.2	15.3	21.1
Peak Outflow Q (cfs) =	0.1	0.1	0.1	0.1	0.7	2.9	3.5	3.7	4.1
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.1	0.3	0.7	0.6	0.5	0.4
Structure Controlling Flow =	Plate	Overflow Weir 1	Plate	Plate	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Outlet Plate 1	N/A
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	0.1	0.4	0.5	0.6	0.6
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	63	58	61	65	62	61	59	55
Time to Drain 99% of Inflow Volume (hours) =	**40**	68	62	66	70	69	68	67	66
Maximum Ponding Depth (ft) =	1.74	3.28	2.78	3.00	3.37	3.55	3.77	4.20	5.00
Area at Maximum Ponding Depth (acres) =	0.09	0.15	0.13	0.14	0.15	0.16	0.16	0.18	0.21
Maximum Volume Stored (acre-ft) =	0.094	0.280	0.209	0.240	0.294	0.321	0.355	0.430	0.586

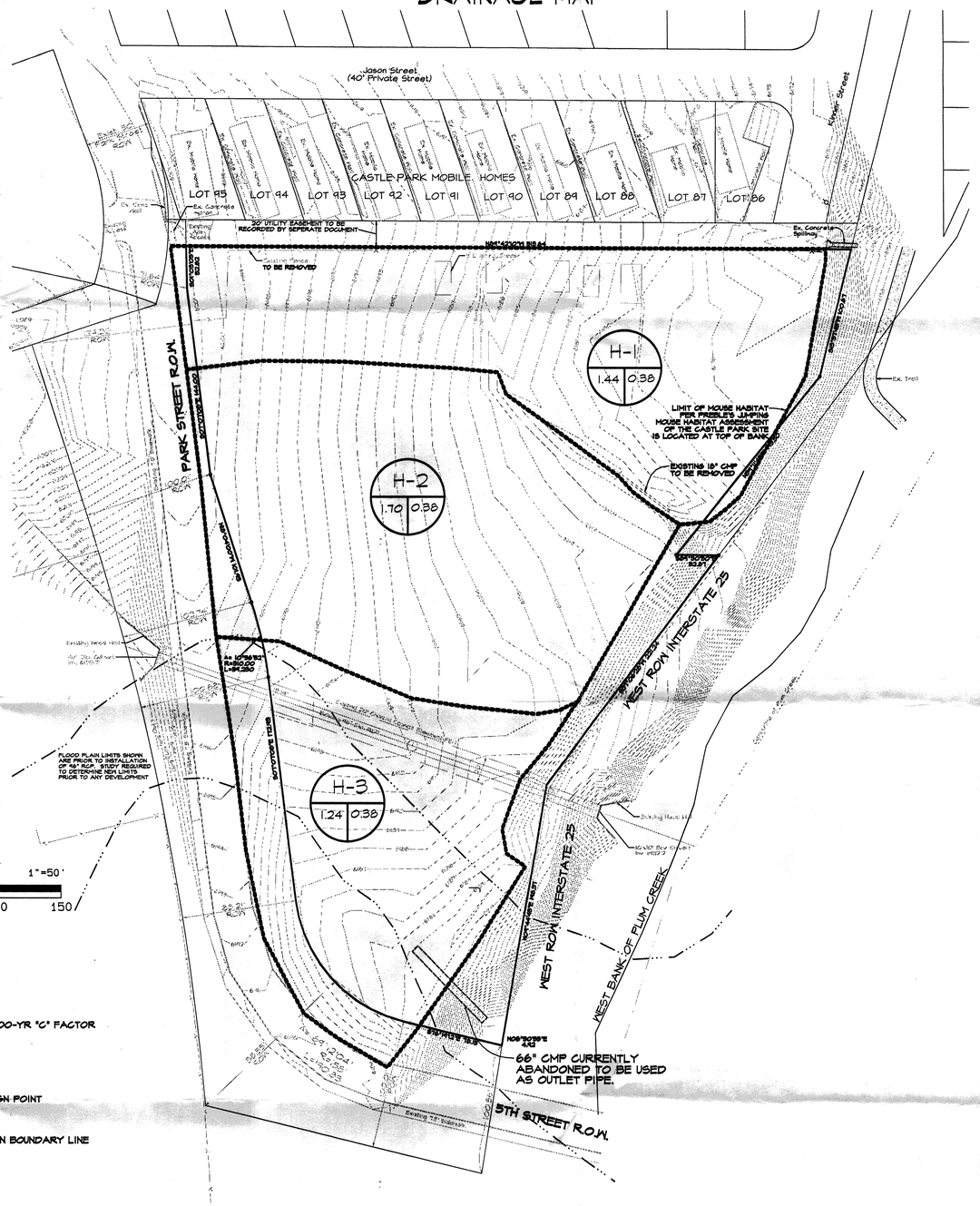
APPENDIX E

- DRAINAGE MAPS

DEVELOPED CONDITIONS DRAINAGE MAP



HISTORIC CONDITIONS DRAINAGE MAP



DEVELOPED FLOW SUMMARY

DESIGN POINT	10-YR FLOW	100-YR FLOW
1 (D-1)	0.74 CFS	1.80 CFS
2 (D-2)	4.17 CFS	7.48 CFS
3 (D-3)	4.17 CFS	7.30 CFS
TOTAL FLOW TO POND (D-2 + D-3)	8.34 CFS	14.78 CFS

POND A

	VOLUME REQUIRED		VOLUME PROVIDED		ELEVATION
	CF	AC-FT	CF	AC-FT	
WATER QUALITY	313	0.01	N/A	N/A	N/A
10-YEAR	657	0.02	N/A	N/A	N/A
10-YEAR +WQ	970	0.03	N/A	N/A	N/A
100-YEAR	1,193	0.03	N/A	N/A	N/A
100-YEAR+WQ	1,506	0.04	N/A	N/A	N/A

NOTE: POND A FILL BE CONSTRUCTED WITH THE DEVELOPMENT OF LOT 2

POND B

	VOLUME REQUIRED		VOLUME PROVIDED		ELEVATION
	CF	AC-FT	CF	AC-FT	
WATER QUALITY	6,057	0.14	6,548	0.15	6180.8
10-YEAR	13,565	0.31	14,322	0.33	N/A
10-YEAR +WQ	19,672	0.45	20,870	0.47	6182.8
100-YEAR	25,199	0.58	26,648	0.61	N/A
100-YEAR+WQ	31,286	0.72	32,991	0.76	6184.0

HISTORIC FLOW SUMMARY

BASIN	100-YR FLOW RATE
H-1	2.93 CFS
H-2	3.35 CFS
H-3	2.60 CFS

DAVID E. ARCHER & ASSOCIATES, INC.
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110 WILCOX STREET, CASTLE ROCK, COLORADO 80104

REVISIONS
9/18/02 OPEN SPACE
TOWN REVIEW 1
TOWN REVIEW 2
TOWN REVIEW 5

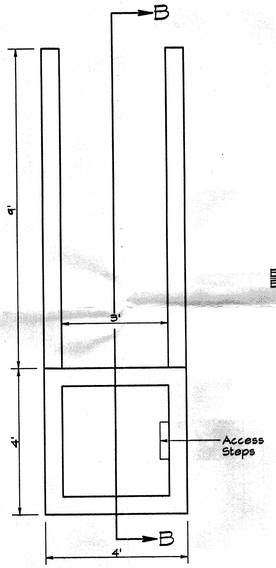
CASTLE PARK SOUTH FILING 1

HISTORIC AND DEVELOPED DRAINAGE MAP

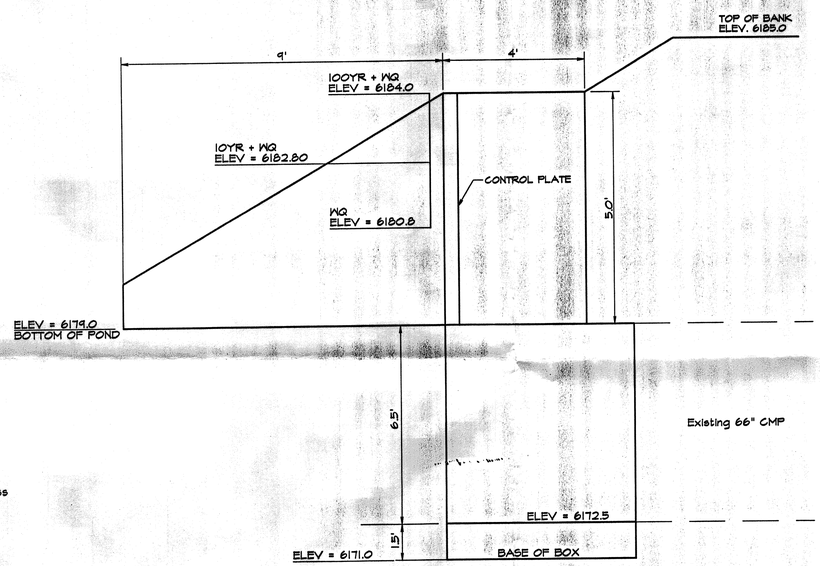
CASTLE PARK, INC.
2 DARREN CASTLE ROCK, CO. 80104
(303) 688-4796

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Drawn By CH | Designed By CH
Checked By KEA | Approved By KEA
JOB NUMBER 96-0467
SHEET 1 OF 2

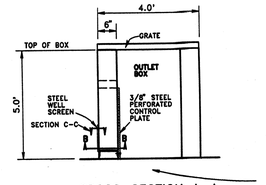
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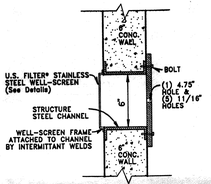
PLAN VIEW



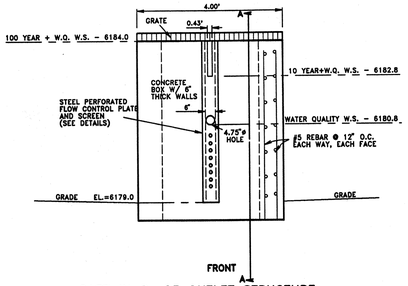
SECTION B–B (SHT 4A)



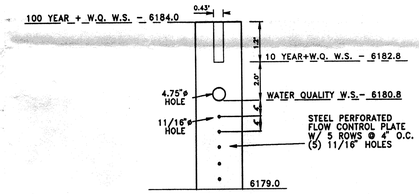
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N.T.S.



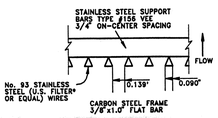
CROSS–SECTION B–B
N.T.S.



CAST IN PLACE OUTLET STRUCTURE



CONTROL PLATE DETAIL
N.T.S.



CROSS–SECTION C–C
STEEL WELL–SCREEN
N.T.S.

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105 WILCOX STREET, CASTLE ROCK, COLORADO 80104

REVISIONS

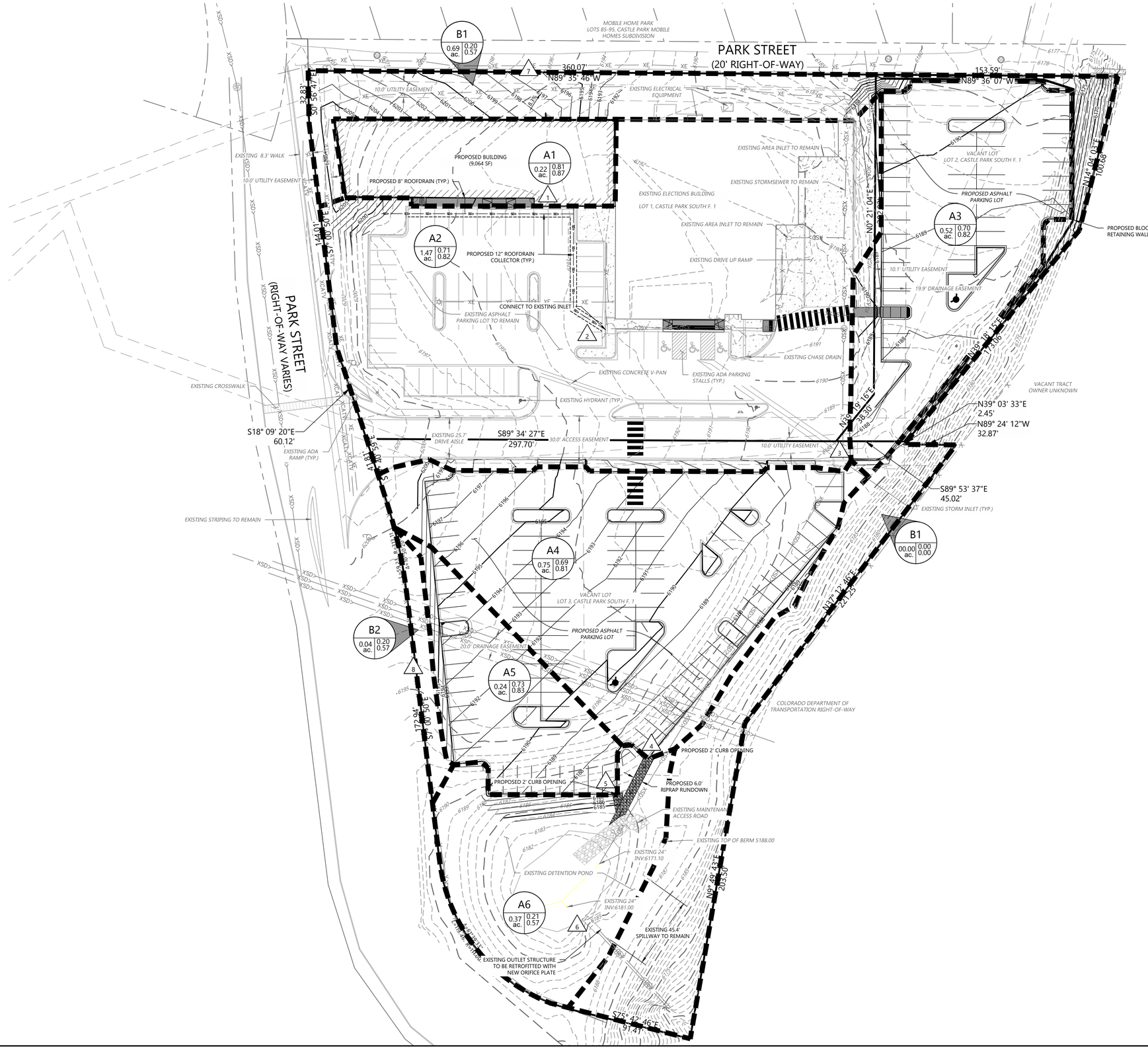
CASTLE PARK SOUTH

DETENTION STRUCTURE DETAILS

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(303) 688-4196

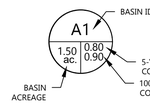
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Designed By	GM
Checked By	KEA
Approved By	KEA
JOB NUMBER	96-0467
SHEET	2 OF 2

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Mon Feb 28 14:41:20 2005



LEGEND:

- PROPERTY LINE
- PROPOSED BUILDING
- EXISTING BUILDING
- PROPOSED EASEMENT
- EXISTING EASEMENT
- PROPOSED BASIN BOUNDARY
- HISTORICAL BASIN BOUNDARY
- 5400 — PROPOSED 5' CONTOUR
- 5401 — PROPOSED 1' CONTOUR
- 5400 — EXISTING 5' CONTOUR
- 5401 — EXISTING 1' CONTOUR
- SD> — PROPOSED STORM LINE W/F.E.S.
- XSD> — EXISTING STORM LINE W/F.E.S.
- PROPOSED SAWCUT
- PROPOSED STORM INLET
- EXISTING STORM INLET
- FLOW DIRECTION
- OVERFLOW PATH
- 25.25 — PROPOSED SPOT GRADE
- 25.25 — EXISTING SPOT GRADE
- 2.00% — SLOPE AND DIRECTION
- HP — HIGH POINT
- LP — LOW POINT
- GB — GRADE BREAK



BASIN IDENTIFICATION TAG

PROOFCIVIL
consulting engineers
1531 Market Street | Denver, CO

SEAL:

FOR AND ON BEHALF OF PROOF CIVIL CO.

REVISIONS

NO.	DATE	DESCRIPTION

PROJ. NO.: 26016
DATE: 4/17/2026
DRAWN BY: MDS
CHECKED BY: JGD

DRAINAGE PLAN

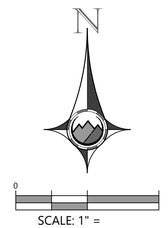
DOUGLAS COUNTY ELECTIONS OFFICE CO

CASTLE ROCK

DRAWING NO.

DR1

1 OF 1



SITE DEVELOPMENT PLAN
LOTS 1-3, CASTLE PARK SOUTH, FILING NO. 1
TOWN OF CASTLE ROCK PROJECT #SDP26-00XX