# PHASE III
# DRAINAGE REPORT

**FOR**

# Canyonside Filing No. 2, Lot 3. SIP-2026-001

SE Corner of Castle Pines Pkwy.
and Canyon Forge Dr.
City of Castle Pines
Douglas County, CO

**Prepared for:**
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## SEPTEMBER 2026

# Certification Statements:

“This report and plan for the Phase III drainage design of Canyonside Filing No. 2, Lot 3. SIP-2026-001 was prepared by me (or under my direct supervision) in accordance with the provisions of Douglas County Storm Drainage Design and Technical Criteria Manual for the owners thereof. I understand that the City of Castle Pines and Douglas County does not, and will not, assume liability for drainage facilities designed by others.”

_____

Ryan J. Humphrey P.E.
State of Colorado
No. 64927

“Portercare Adventist Health System hereby certifies that the drainage facilities for Canyonside Filing No. 2, Lot 3. SIP-2026-001 shall be constructed according to the design presented in this report. I understand that Douglas County does not and will not assume liability for the drainage facilities designed and/or certified by my engineer and that Douglas County reviews drainage plans pursuant to Colorado Revised Statutes, Title 30, Article 28; but cannot, on behalf of Canyonside Filing No. 2, Lot 3. SIP-2026-001, guarantee that final drainage design review will absolve Portercare Adventist Health System and/or their successors and/or assigns of future liability for improper design. I further understand that approval of the final plat does not imply approval of my engineer’s drainage design.”

_____

Portercare Adventist Health System

_____

Authorized Signature

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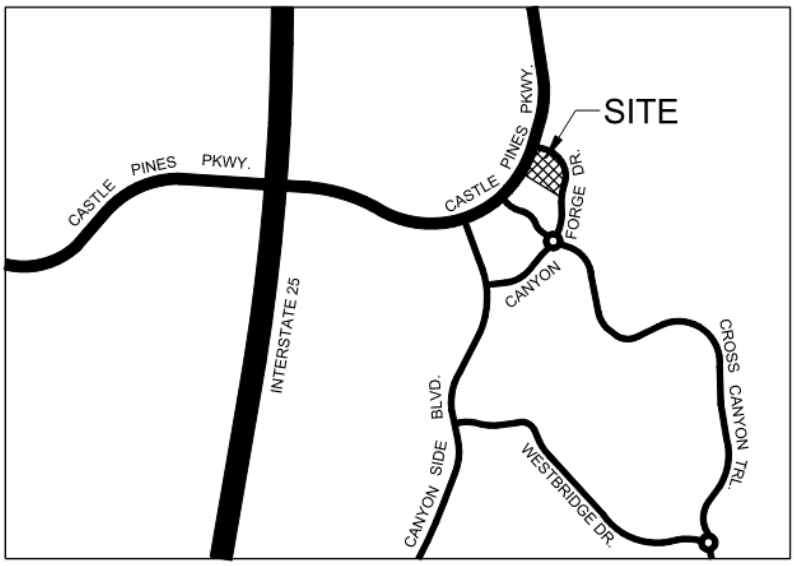
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# I. General Location And Description

## A. Site Location




VICINITY MAP

This Phase III Drainage Report is being prepared for the proposed “Canyonside Subdivision Filing number 2, lot 3”. Located inside a parcel in the northwest quarter & southwest quarter of section 2, township 7 south, range 67 west of the sixth principal meridian, in the City of Castle Pines, Douglas County, Colorado.

The site is on the southeast corner of Castle Pines Parkway and Canyon Forge Drive. It is approximately 3,000 feet east of I-25 at the Castle Pines Parkway exit. Bound to the north and east by Canyon Forge Drive, to the west by Castle Pines Parkway and to the south by Lots 1 & 2 of Filing 2.

The surrounding and adjacent developments are currently vacant. However, individual lots are under contract or sold. Lot 1A, Canyonside Filing No. 2, 2nd Amendment are under contract for an active adult multi-family. Open space is planned to the east on the other side of Canyon Forge Dr. Tract C to the north is being used for water quality and detention. Canyonside Filing No. 2, 3rd Amendment are under contract for residential use. To the west on the other side of Castle Pines Parkway is Filing 4 with some residential and commercial uses planned. See Appendix C for a surrounding uses breakdown, sheet number S100, which was included in the concept design package submitted to the DRC on December 5th, 2025.

## B. Description

The site is 5.78 acres (251,841 square feet).

Ground cover consists of sparsely vegetated undeveloped soil. The site generally slopes from southeast to northwest. Existing swales on west side of the lot and the adjacent Castle Pines Parkway ROW have rip rap check dams installed. The swales outfall to existing inlets. The site has been over lot graded in preparation for development with flatter grades on the north and west sides of the property and steeper grades (varying from 4:1 and 5:1, horizontal to vertical) on the south and east sides of the lot.

The hydrologic soil group is C/D. The Fondis-Kutch association is classified as sandy-clay with the approximately top 6 inches loam and sandy loam. As such, the infiltration of surface runoff is expected to be lower than hydrologic soils grouped A or B. Additionally the soils are noted as expansive and compressible on top of expansive bedrock per the Draft Geotechnical Investigation by CTL Thompson dated January 14, 2026. These soils are typical of the available developable land east of the Front Range. See the appendix for the relevant pages from the NRCS web soil survey

Major and minor drainageways adjacent to the site include Newlin Gulch approximately 1,300 feet east of the southeast corner of the property. The Parkway Tributary Major Drainageway exists north of the property. The existing Pond F2 outfalls to this Parkway Drainage way per the Phase III Drainage Report for Canyonside Subdivision Filing No. 2 prepared by Core Consultants, Inc. dated June 15, 2022, hereby referred to as the Master Report.

Floodplains delineated on the FEMA FIRM maps are shown in the appendix and the project site is Zone X. Map number 08035C0180G, revised September 4th, 2020. The previously mentioned Newline Gulch is the only nearby floodplain noted as Zone A. See the master drainage plan in the appendix of this report.

No known existing irrigation canals or ditches.

No known significant geologic features.

The proposed land use is healthcare for a Medical Office Building.

## II. DRAINAGE BASINS AND SUB-BASINS

### A. Major Drainage Basins

The site is in the Newlin Gulch Major Drainage Basin, according to the Master Report. See the following excerpt from page 5 of the Master Report for a description of the on-site and off-site major drainage basin characteristics and flow patterns and paths. “The watershed starts west I-25 and ends at Mainstreet in the Town of Parker. The basin drains northeast via Newlin Gulch and its tributaries through areas of Castle Pines, unincorporated Douglas County, Rueter-Hess Reservoir, and the Town of Parker. The gulch joins with Cherry Creek near Challenger Park in the Town of Parker.”

The basin is in mostly undeveloped areas with plans for future development with some scattered developed areas.

The Master Report discusses the previous studies and plans for this major drainage basin. There are no known updates from the time of this Master Report.

The proposed site discussed in this report for Lot 3 in Canyonside Subdivision Filing number 2 was planned for development and accounted for in the Master Report. As such, no plans for improvements are proposed to the existing channels adjacent to the site.

As this site’s development was accounted for in the Master Report, there are no known off-site flow patterns anticipated to impact downstream properties.

### B. Minor Drainage Basins

The proposed site conforms to the master drainage report. Therefore, the proposed development is anticipated to conform to the historic drainage patterns. The developed runoff will outfall to proposed and existing inlets which will be routed via proposed and existing pipes to the existing detention and water quality pond F2.

A small portion of the on-site flow will sheet flow into the existing swale on the west side of the property and outfall into the existing CDOT type D inlet A5. This area and subsequent flow which was planned in the existing A-4 basin will now be tributary to the A-5 basin. The revision from the

Master Plan basin's are shown in Figure 2 proposed vs. Master Plan Calculations verifying the capacity of the existing inlet and swale are included in the appendix of this report.

Minor drainage basin descriptions are as follows:

After entering the inlets or proposed swale (described more specifically per each basin below), stormwater will connect to the existing storm infrastructure via proposed pipes and manholes. This is ultimately routed north to the existing pond F2 where it will be treated and detained.

All proposed basins are within vacant, undeveloped land. The proposed land use is a parking lot, Medical Office Building, sidewalks and landscape islands.

All A4 basins & the R1 basin are within the Master Plan basin A4 which was designed with 85% imperviousness. As the proposed site falls under this 85% imperviousness (46.4% total) the developed condition proposed with this project is not anticipated to impact the off-site flow patterns. The existing storm infrastructure and downstream water quality and detention pond was designed with the fully developed condition considered. The design intent is to match the historic drainage patterns and follow the Master Plan drainage basins.

**BASIN A4.1**

Basin A4.1 is *0.23* acres and accounts for the northwestern edge of the parking lot. This basin has an impervious value of *89%* and generates 5-yr and 100-yr design flows of *0.66* and *1.51* cfs, respectively. Runoff is conveyed via sheet flow and then into the curb and gutter as channelized flow. This outfalls to the *proposed 5' type R inlet A-20 in sump*. In the event the inlet is clogged, stormwater will overtop the curb behind the street inlet and sheet flow to the existing swale and outfall to *existing inlet A5*.

There are *0.02* acres of landscaped area within the basin which are assumed to be irrigated. Any over watering of this area will match the stormwater drainage pattern and is not anticipated to impact the site drainage.

**BASIN A4.2**

Basin A4.2 is *0.46* acres and accounts for the northeastern edge of the parking lot. This basin has an impervious value of *89%* and generates 5-yr and 100-yr design flows of *1.32* and *3.04* cfs, respectively. Runoff is conveyed via sheet flow and then into the curb and gutter as channelized flow. This outfalls to the *proposed 5' type R inlet A-41 in sump*. In the event the inlet is clogged, stormwater will overtop the curb behind the street inlet and sheet flow to the Canyon Forge Drive and outfall to *existing inlet A6*.

There are *0.04* acres of landscaped area within the basin which are assumed to be irrigated. Any over watering of this area will match the stormwater drainage pattern and is not anticipated to impact the site drainage.

**BASIN A4.3**

Basin A4.3 is *0.79* acres and accounts for the eastern edge of the parking lot and the existing previous land west of the detached sidewalk on Canyon Forge Drive. This basin has an impervious value of *64%* and generates 5-yr and 100-yr design flows of *1.66* and *4.61* cfs, respectively. Runoff is conveyed via sheet flow and then into the curb and gutter as channelized flow. This outfalls to the *proposed 10' type R inlet A-50 on grade*. In the event the inlet is clogged, stormwater will bypass and continue channelized flow into the curb on Canyon Forge Drive and outfall to *existing inlet A6*.

There are *0.06* acres *(0.27 of the pervious acres are not expected to be irrigated)* of landscaped area within the basin which are assumed to be irrigated. Any over watering of this area will match the stormwater drainage pattern and is not anticipated to impact the site drainage.

**BASIN A4.4**

Basin A4.4 is *0.03* acres and accounts a landscaped area on the southeastern corner of the building. This basin has an impervious value of *36%* and generates 5-yr and 100-yr design flows of *0.04* and *0.16* cfs, respectively. Runoff is conveyed via sheet flow in the landscape area and outfalls to the *proposed 12" area inlet A-20 in sump*. In the event the inlet is clogged, stormwater will overtop the curb to the north and to the flush curb transition to the west follow the drainage patterns of proposed basins A4.3 and A4.4, respectively to the *proposed inlets A-50 and A-30*.

There are *0.03* acres of landscaped area within the basin which are assumed to be irrigated. Any over watering of this area will match the stormwater drainage pattern and is not anticipated to impact the site drainage.

**BASIN A4.5**

Basin A4.5 is *1.38* acres and accounts for the southern portion of the parking lot and the existing previous land west of the detached sidewalk on Canyon Forge Drive. This basin has an impervious value of *37%* and generates 5-yr and 100-yr design flows of *1.77* and *6.87* cfs, respectively. Runoff is conveyed via sheet flow and then into the curb and gutter as channelized flow. This outfalls to the *proposed 5' type R inlet A-30 in sump*. In the event the inlet is clogged, stormwater will overtop the curb behind the street inlet and channelized flow to the proposed swale in proposed basin A4.6. Which will ultimately outfall to the existing swale and into *existing inlet A5.*

There are *0.03* acres *(1.03 of the pervious acres are not expected to be irrigated)* of landscaped area within the basin which are assumed to be irrigated. Any over watering of this area will match the stormwater drainage pattern and is not anticipated to impact the site drainage.

**BASIN A4.6**

Basin A4.6 is *1.72* acres and accounts for the mostly undisturbed previous land south and west of the proposed building. This basin has an impervious value of *20%* and generates 5-yr and 100-yr design flows of *1.29* and *7.62* cfs, respectively. Runoff is conveyed via sheet flow and then into the proposed swale as channelized flow. This outfalls to the existing swale west of the project's disturbed area and outfalls to *the existing inlet A5 in sump*. In the event the inlet is clogged, stormwater will pond and sheet flow to the *existing inlet A6 in sump.*

There are *0* acres *(all 1.72 of the pervious acres are not expected to be irrigated)* of landscaped area within the basin which are assumed to be irrigated. Any over watering of this area will match the stormwater drainage pattern and is not anticipated to impact the site drainage.

**BASIN R1**

Basin R1 is *0.32* acres and accounts for the proposed building's roof area. This basin has an impervious value of *95%* and generates 5-yr and 100-yr design flows of *0.99* and *2.20* cfs, respectively. These flows have been split by 50% with one half of the flow routed north and the other half routed south of the building. Runoff is conveyed via gutters into the planned roof drain connection. These flows captured in the curbs and gutters outfall underground to the proposed storm infrastructure. In the event the roof drains are clogged, it is assumed stormwater will be collected via roof drain overflows and discharged at grade via lambstongue(s).

There are no known irrigated areas planned on the roof as such it is not anticipated to impact the site drainage.

# III. DRAINAGE DESIGN CRITERIA

## A. Regulations

This Drainage Report is based upon the criteria specified in the Storm Drainage Design and Technical Criteria Manual (Manual) from Douglas County. Where the Manual references the Urban Storm Drainage Criteria Manual (Urban Drainage), the report complies with both documents.

## B. Drainage Studies, Outfall Systems Plans, Site Constraints

This Drainage Report is also based upon the previously mentioned Master Report. The undeveloped Lot 3 which this project is located on was planned for future development and the existing storm infrastructure and pond were designed with an 85% imperviousness which is greater than the 46.4% imperviousness calculated with this MOB. As such, the proposed development complies with the Master Plan for Filing 2. The existing pond F2 has capacity for this proposed development based on this lower imperviousness and thus lower runoff.

Additionally, this Drainage Report has reviewed the *"Drainage Report for Life Time Castle Pines, Lot 1, Canyonside Subdivision No. 3, in City of Castle Pines, Colorado",* amended April 8, 2025 by Collins Engineers, Inc. Hereby referred to as the LT Report. This LT Report does not appear to have totaled the flows for; the existing upstream conditions, the offsite basins which will outfall into the existing infrastructure upstream of the proposed MOB, and the calculated proposed flows directly upstream of the Master Report's design point A9. As such, the master planned flows will need to govern the analysis of the expected flows when checking the capacity of the existing infrastructure for this MOB's change in flows. This is expected to result in a more conservative check of the existing infrastructure's capacity as the **LT report calculated a 62.75% imperviousness for Parcel 3 vs. the Master Report's assumed 85%** for high density mixed-use combined land use imperviousness. See Appendix C for additional markups and clarifications.

This drainage report has reviewed the *"Phase III Drainage Report for Canyonside Subdivision Filing No. 2, Lot 1 and Lot 2, Douglas County Castle Pines, Colorado"* amended June 9, 2025, by Kimley-Horn and Associates, Inc. Similar to the LT report the total flows at the connection to existing do not appear to have been included. As such, the master planned flows will continue to govern the analysis of the existing infrastructure's capacity. Again, this is expected to result in a more conservative check as **this report calculated a weighted imperviousness of 64.5% which is less than Master Report's 85%**. See Appendix C for additional markups and clarifications.

Lot 2 in Filing 2 south of this project, is upstream of this project. Development of this lot has also been accounted for within the Master Plan and those developed design flows have been included in Lot 3's StormCAD model to check capacity of the existing stormwater infrastructure. Additionally Filing 3, Lot 1 is upstream of this project southwest of Cross Canyon Trail was also accounted for in the Master Report with those developed design flows are also included in the StormCAD model. See the mark ups on the master drainage plan for further clarification.

There are no planned changes to UDFCD Outfall Systems Plans (OSP) with this development. Per the Master Report this site is in the Newlin Gulch watershed which was previously studied by Kiowa Engineering Corp. in 1993. A Major Drainageway Plan (MDP) for Newlin Gulch watershed is currently underway that will supersede the 1993 OSP, a draft was prepared by Muller in 2015. MHFD website states "A key goal of the study is to update hydrology based on the most current land use information for existing and future conditions and to assess impacts associated with Rueter-Hess Reservoir".

Due to Lot 3 being vacant and the site development being master planned, site constraints did not impact the stormwater management facility design.

### C. Hydrology

The design rainfall and runoff calculation method used is the Rational Method, for the 5-year and 100-year storm events. The hydrologic soil group in this area is Type C/D.

Table 1 - One-Hour Point Rainfall Depths (Castle Pines – City Office)

| Return Period | One-Hour Point Rainfall (inches) |
|---|---|
| 2-Year | 0.84 |
| 5-Year | 1.12 |
| 10-Year | 1.36 |
| 50-Year | 2.01 |
| 100-Year | 2.31 |

As the development has a lower calculated impervious percentage and lower runoff than the Master Plan designed for, no changes to the detention storage calculations or release rates are included.

### D. Hydraulics

StormCAD was used to determine the conveyance facility capacities.

The hydraulic grade line calculation method was the node analysis type based on StormCAD results and profiles. The loss coefficients are shown in the manhole tables in the appendix of this report. The standard head loss method was used and the resulting head loss in feet is shown in the appendix of this report on the manhole tables for the StormCAD output

StormCAD uses the step backwater calculation for the HGL profiles which provides the resulting water surface elevations at each of the nodes and inside the pipes. These are shown on the storm plan and profiles included in the appendix of this report.

No changes in the detention pond routing are proposed with this development.

### E. Water Quality Enhancement

No changes to the Best Management Practices (BMPs) or the design procedures used in the Master Report for water quality are proposed with this development.

## IV. STORMWATER MANAGEMENT FACILITY DESIGN

### A. Stormwater Conveyance Facilities

The proposed site drains to five (5) strategically placed inlets. The general intent is diverting water from the proposed building and connecting to the existing stormwater infrastructure to outfall to the existing water quality and detention pond. Emergency surface overflow paths in the events inlets are clogged are provided in the individual sub-basin descriptions.

The proposed drainage paths match the historic drainage pattern which generally slopes from southeast to northwest. Intentional high points and ridge lines have been provided to minimize tributary areas to each inlet.

Inlets have been provided on the south side of the building with an emergency surface overflow swale and a flush curb provided to route water west of the building for overflow. Most of the low points at inlets have been placed in sump with surface overflow paths planned to continue downstream. The pipes have been located to avoid the domestic water, fire service, and sanitary sewer service lines and crossings have been checked to provide vertical clearance from utility crossings. The peak flow rates at design points have been calculated conservatively to provide an

additional factor of safety. These conservative calculations use the minimum time of concentration of 5 minutes and to not account for routing through the pipes. Additionally, an impervious value of 20% for disturbed soils has been applied to all pervious surfaces even those that are not being disturbed by the proposed grading and earthwork efforts on the project. This factor of safety provides slightly higher flow rates to ensure pipe and inlet capacities are adequate. The HGLs have been checked and the corresponding pipe sizes and/or slopes have been upsized to provide the needed capacity or downsized to reduce material and costs.

The storm sewer will be outfalling to the existing pond and the previously approved and designed energy dissipation is anticipated to be adequate.

After water quality and detention are provided within the existing pond F2, the outfall is to the Parkway Tributary Major Drainageway just north of the pond below the 100-year predeveloped rate of 43.7 cfs, conforming to the historic drainage pattern, according to the Master Report.

The proposed emergency surface overflow swale also serves as the drainage path for the largely undisturbed and completely pervious area in the proposed basin A4.6. This swale has been modeled and has capacity for the tributary flow. See the Appendix B for the swale calculation.

Allowable street capacities are shown in the inlet calculations. See the appendix for the standard MHFD inlet calculations.

Maintenance for stormwater easements and facilities will be in accordance with Douglas County, the City of Castle Pines, and MHFD.

No off-site facilities are proposed.

## B. Stormwater Storage Facilities

No changes are proposed to the existing pond.

## C. Water Quality Enhancement Best Management Practices

No changes are proposed to the existing pond.

## D. Floodplain Modification

No floodplain modifications are proposed.

## E. Additional Permitting Requirements

There are no known additional permits required because of this proposed development.

## F. General

The relevant tables, calculations, software outputs, and figures used for this Phase III drainage design are shown in the appendices of this report.

## V. CONCLUSIONS

This drainage design for the AdventHealth Castle Pines Medical Office Building in the Canyonside Subdivision Filing No. 2, Lot 3 complies with the Douglas County Storm Drainage Design and Technical Criteria Manual (the adopted criteria for the City of Castle Pines) and Urban Drainage.

This drainage report conforms to the Master Plan and Report prepared by Core Consultants, Inc. dated June 15, 2022.

A variance from the maximum velocity of 18-fps criteria outlined Douglas County Storm Drainage Design and Technical Criteria Manual is proposed with this drainage design. Please see the appendix of this report for the detailed letter for the justification of this variance request.

The drainage concept prepared in this report effectively conveys the additional runoff generated by the proposed development to proposed and existing stormwater infrastructure. Where it will discharge to the existing pond F2 which was designed to treat and detain developed runoff of this and other adjacent properties.

## VI. REFERENCES

1. Douglas County, Colorado, *"Storm Drainage Design and Technical Criteria Manual",* Amended July 8, 2008
2. Mile High Flood District, *"Urban Storm Drainage Criteria Manual,"* revised 2016, partially updated March 2024.
3. Core Consulting, Inc., "*Phase III Drainage Report for Canyonside Subdivision Filing No. 2, Castle Pines, Colorado",* amended June 15, 2022.
4. Collins Engineers, Inc., *"Drainage Report for Life Time Castle Pines, Lot 1, Canyonside Subdivision No. 3, in City of Castle Pines, Colorado",* amended April 8, 2025.
5. Kimley-Horn and Associates, Inc., *"Phase III Drainage Report for Canyonside Subdivision Filing No. 2, Lot 1 and Lot 2, Douglas County Castle Pines, Colorado"* amended June 9, 2025.
6. Draft of Geotechnical Investigation, AdventHealth, Canyonside, Filing No. 2, Northeast of Cross Canyon Trail and Hess Road, Castle Pines, Colorado by CTL Thompson, dated January 14, 2026.
7. NRCS Soil Survey Staff, (Natural Resources Conservation Service). United States Department of Agriculture. Web Soil Survey. Available online at the following link: https://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx. Accessed February 26, 2026.
8. FEMA (Federal Emergency Management Agency) FIRM (Flood Insurance Rate Map)"*No. 08035C0180G".* Revised September 4, 2020. Available online at the following link: https://www.fema.gov/flood-maps/national-flood-hazard-layer. Accessed February 26, 2026.

# VII. APPENDIX

# Appendix A
# Hydrologic Computations

Composite C Coefficients Calculations
Runoff Calculations
Runoff Summary

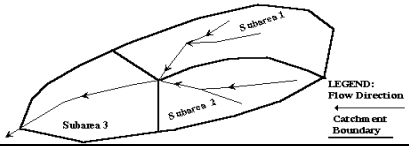
# Initial Runoff Calcs for inlet, pipe, and swale sizing

## Determination of Runoff Coefficients for Rational Method

**Designer:** MAB
**Company:** S. A. MIRO
**Date:** 8/28/2026
**Project:** AH CASTLE PINES MOB
**Location:** CASTLE PINES

*MHFD-Rational, Version 3.00 (August 2025)*

Cells of this color are for required user-input
Cells of this color are for optional override values




**Provide subcatchment names on the Rational Calcs worksheet to open up the table below.**

| Subcatchment Name | # of Subareas | Area (ac) | NRCS Hydrologic Soil Group | Percent Imperviousness | | | | Runoff Coefficient, C | | | | | | | (Optional) Override Runoff Coefficient, C | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Imperviousness Source | Imperviousness Category | Calculated Imperviousness | (Optional) Override Imperviousness | WQE & 2-yr | 5-yr | 10-yr | 25-yr | 50-yr | 100-yr | 500-yr | WQE & 2-yr | 5-yr | 10-yr | 25-yr | 50-yr | 100-yr | 500-yr |
| **R1** | **1** | **0.32** | **C/D** | | | **95.0%** | **95.0%** | **0.79** | **0.81** | **0.83** | **0.85** | **0.86** | **0.87** | **0.89** | **0.79** | **0.81** | **0.83** | **0.85** | **0.86** | **0.87** | **0.89** |
| | | 0.32 | C/D | Surface Type | Roofs | 95% | | 0.79 | 0.81 | 0.83 | 0.85 | 0.86 | 0.87 | 0.89 | | | | | | | |
| **A-4.1** | **2** | **0.23** | **C/D** | | | **88.8%** | **88.8%** | **0.73** | **0.76** | **0.78** | **0.82** | **0.83** | **0.85** | **0.87** | **0.73** | **0.76** | **0.78** | **0.82** | **0.83** | **0.85** | **0.87** |
| | | 0.02 | C/D | Surface Type | Disturbed Soil | 20% | | 0.14 | 0.20 | 0.28 | 0.43 | 0.49 | 0.57 | 0.65 | | | | | | | |
| | | 0.21 | C/D | Surface Type | Roadways and Paved Streets | 95% | | 0.79 | 0.81 | 0.83 | 0.85 | 0.86 | 0.87 | 0.89 | | | | | | | |
| **A-4.2** | **2** | **0.46** | **C/D** | | | **89.2%** | **89.2%** | **0.74** | **0.76** | **0.79** | **0.82** | **0.83** | **0.85** | **0.87** | **0.74** | **0.76** | **0.79** | **0.82** | **0.83** | **0.85** | **0.87** |
| | | 0.04 | C/D | Surface Type | Disturbed Soil | 20% | | 0.14 | 0.20 | 0.28 | 0.43 | 0.49 | 0.57 | 0.65 | | | | | | | |
| | | 0.42 | C/D | Surface Type | Roadways and Paved Streets | 95% | | 0.79 | 0.81 | 0.83 | 0.85 | 0.86 | 0.87 | 0.89 | | | | | | | |
| **A-4.3** | **2** | **0.79** | **C/D** | | | **63.6%** | **63.6%** | **0.52** | **0.55** | **0.60** | **0.68** | **0.71** | **0.74** | **0.79** | **0.52** | **0.55** | **0.60** | **0.68** | **0.71** | **0.74** | **0.79** |
| | | 0.33 | C/D | Surface Type | Disturbed Soil | 20% | | 0.14 | 0.20 | 0.28 | 0.43 | 0.49 | 0.57 | 0.65 | | | | | | | |
| | | 0.46 | C/D | Surface Type | Roadways and Paved Streets | 95% | | 0.79 | 0.81 | 0.83 | 0.85 | 0.86 | 0.87 | 0.89 | | | | | | | |
| **A-4.4** | **2** | **0.03** | **C/D** | | | **35.9%** | **35.9%** | **0.27** | **0.33** | **0.40** | **0.52** | **0.57** | **0.63** | **0.70** | **0.27** | **0.33** | **0.40** | **0.52** | **0.57** | **0.63** | **0.70** |
| | | 0.03 | C/D | Surface Type | Disturbed Soil | 20% | | 0.14 | 0.20 | 0.28 | 0.43 | 0.49 | 0.57 | 0.65 | | | | | | | |
| | | 0.01 | C/D | Surface Type | Concrete Driveways and Walks | 95% | | 0.79 | 0.81 | 0.83 | 0.85 | 0.86 | 0.87 | 0.89 | | | | | | | |
| **A-4.5** | **2** | **1.38** | **C/D** | | | **37.3%** | **37.3%** | **0.29** | **0.34** | **0.41** | **0.53** | **0.58** | **0.64** | **0.71** | **0.29** | **0.34** | **0.41** | **0.53** | **0.58** | **0.64** | **0.71** |
| | | 1.06 | C/D | Surface Type | Disturbed Soil | 20% | | 0.14 | 0.20 | 0.28 | 0.43 | 0.49 | 0.57 | 0.65 | | | | | | | |
| | | 0.32 | C/D | Surface Type | Roadways and Paved Streets | 95% | | 0.79 | 0.81 | 0.83 | 0.85 | 0.86 | 0.87 | 0.89 | | | | | | | |
| **A-4.6** | **1** | **1.72** | **C/D** | | | **20.0%** | **20.0%** | **0.14** | **0.20** | **0.28** | **0.43** | **0.49** | **0.57** | **0.65** | **0.14** | **0.20** | **0.28** | **0.43** | **0.49** | **0.57** | **0.65** |
| | | 1.72 | C/D | Surface Type | Disturbed Soil | 20% | | 0.14 | 0.20 | 0.28 | 0.43 | 0.49 | 0.57 | 0.65 | | | | | | | |
| **TOTAL** | **3** | **4.94** | **C/D** | | | **46.4%** | **46.4%** | **0.37** | **0.41** | **0.47** | **0.58** | **0.62** | **0.67** | **0.73** | **0.37** | **0.41** | **0.47** | **0.58** | **0.62** | **0.67** | **0.73** |
| | | 0.32 | C/D | Surface Type | Roofs | 95% | | 0.79 | 0.81 | 0.83 | 0.85 | 0.86 | 0.87 | 0.89 | | | | | | | |
| | | 1.42 | C/D | Surface Type | Roadways and Paved Streets | 95% | | 0.79 | 0.81 | 0.83 | 0.85 | 0.86 | 0.87 | 0.89 | | | | | | | |
| | | 3.20 | C/D | Surface Type | Disturbed Soil | 20% | | 0.14 | 0.20 | 0.28 | 0.43 | 0.49 | 0.57 | 0.65 | | | | | | | |

Initial Runoff Calcs for inlet, pipe, and swale sizing

# Calculation of Peak Runoff using Rational Method

**Designer:** MAB
**Company:** S. A. MIRO
**Date:** 8/28/2026
**Project:** AH CASTLE PINES MOB
**Location:** CASTLE PINES

*MHFD-Rational, Version 3.00 (August 2025)*

Cells of this color are for required user-input
Cells of this color are for optional override values

**Provide input for area, soil type, and imperviousness on the Runoff Coeffs worksheet.**

| Subcatchment Name | Area (ac) | NRCS Hydrologic Soil Group(s) | Imperviousness | Runoff Coefficient, C | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | WQE & 2-yr | 5-yr | 10-yr | 25-yr | 50-yr | 100-yr | 500-yr |
| R1 | 0.32 | C/D | 95.0% | 0.79 | 0.81 | 0.83 | 0.85 | 0.86 | 0.87 | 0.89 |
| A-4.1 | 0.23 | C/D | 88.8% | 0.73 | 0.76 | 0.78 | 0.82 | 0.83 | 0.85 | 0.87 |
| A-4.2 | 0.46 | C/D | 89.2% | 0.74 | 0.76 | 0.79 | 0.82 | 0.83 | 0.85 | 0.87 |
| A-4.3 | 0.79 | C/D | 63.6% | 0.52 | 0.55 | 0.60 | 0.68 | 0.71 | 0.74 | 0.79 |
| A-4.4 | 0.03 | C/D | 35.9% | 0.27 | 0.33 | 0.40 | 0.52 | 0.57 | 0.63 | 0.70 |
| A-4.5 | 1.38 | C/D | 37.3% | 0.29 | 0.34 | 0.41 | 0.53 | 0.58 | 0.64 | 0.71 |
| A-4.6 | 1.72 | C/D | 20.0% | 0.14 | 0.20 | 0.28 | 0.43 | 0.49 | 0.57 | 0.65 |
| TOTAL | 4.94 | C/D | 46.4% | 0.37 | 0.41 | 0.47 | 0.58 | 0.62 | 0.67 | 0.73 |
| | | | | | | | | | | |
| | | | | | | | | | | |

Initial Runoff Calcs for inlet, pipe, and swale sizing

# Composite C Calculations

***Project Information***

**Project Name:** **AH Castle Pines MOB**
**Miro Project No:** **25-060**
**Revised Date:** **3/2/2026**
**Calculated By:** **RJH**

***Coefficient Equations***

$C_{CD\ (2)}$ =0.834I^1.122
$C_{CD\ (5)}$ = 0.815i+0.035
$C_{CD\ (10)}$ = 0.735i+0.132
$C_{CD\ (100)}$ = 0.409i+0.484

*NOTE: $C_{CD}$ Equations from USDCM updated March 2024

| Basin Designation | $A_{Paved}$ ($ft^2$) | $A_{Roof}$ ($ft^2$) | $A_{Disturbed\ Soil}$ ($ft^2$) | $A_{total}$ | Impervious-ness | $C_{CD}$ | $C_{CD}$ | $C_{CD}$ | $C_{CD}$ |
|---|---|---|---|---|---|---|---|---|---|
| | 95% | 95% | 20% | (acres) | | 02 yr | 05 yr | 10 yr | 100 yr |
| Prev. A4 now A6 | | | 2,547 | 0.06 | 20% | 0.14 | 0.20 | 0.28 | 0.57 |
| Prev. A4 now A5 | | | 1,937 | 0.04 | 20% | 0.14 | 0.20 | 0.28 | 0.57 |

Revised Runoff Calcs for existing pipe velocity checks

# Composite C Calculations

***Project Information***

**Project Name:** **Canyonside Flg. 2, Lot 3. SIP-2026-001**
**Miro Project No:** **25-060**
**Revised Date:** **9/16/2026**
**Calculated By:** **SAF**

***Coefficient Equations***

$C_{CD\ (2)}$ =0.834I^1.122 $C_{CD\ (10)}$ = 0.735i+0.132
$C_{CD\ (5)}$ = 0.815i+0.035 $C_{CD\ (100)}$ = 0.409i+0.484

*NOTE: $C_{CD}$ Equations from USDCM updated March 2024

| Basin Designation | $A_{Paved}$ ($ft^2$) | $A_{Roof}$ ($ft^2$) | $A_{Disturbed\ Soil}$ ($ft^2$) | $A_{total}$ | Impervious-ness | $C_{CD}$ | $C_{CD}$ | $C_{CD}$ | $C_{CD}$ |
|---|---|---|---|---|---|---|---|---|---|
| | 95% | 95% | 20% | (acres) | | 02 yr | 05 yr | 10 yr | 100 yr |
| R1 | 0 | 14,043 | 0 | 0.32 | 95% | 0.79 | 0.81 | 0.83 | 0.87 |
| A-4.1 | 8,977 | 0 | 934 | 0.23 | 88% | 0.72 | 0.75 | 0.78 | 0.84 |
| A-4.2 | 18,732 | 0 | 1,151 | 0.46 | 91% | 0.75 | 0.77 | 0.80 | 0.85 |
| A-4.3 | 19,579 | 0 | 14,928 | 0.79 | 63% | 0.49 | 0.54 | 0.59 | 0.74 |
| A-4.4 | 292 | 0 | 1,104 | 0.03 | 36% | 0.26 | 0.33 | 0.39 | 0.63 |
| A-4.5 | 13,970 | 0 | 46,039 | 1.38 | 37% | 0.28 | 0.34 | 0.41 | 0.64 |
| A-4.6 | 0 | 0 | 74,911 | 1.72 | 20% | 0.14 | 0.20 | 0.28 | 0.57 |

Revised Runoff Calcs for existing pipe velocity checks

MIRO

## TIME OF CONCENTRATION

***Project Information***

| | |
|---|---|
| **Project Name:** | **Canyonside Flg. 2,** |
| **S.A. Project No:** | **25-060** |
| **Revised Date:** | **9/16/2026** |
| **Calculated By:** | **SAF** |

***Conveyance Coefficient Value***

| | |
|---|---|
| **Grassed Waterway** | **15** |
| **Heavy Meadow** | **2.5** |
| **Nearly Bare Ground** | **10** |
| **Paved Areas and Shallow Paved Swales** | **20** |
| **Short Pasture and Lawns** | **7** |
| **Tillage / Field** | **5** |

***Time of Concentration Equations***

$t_i = 0.395(1.1 - C_5)L^{1/2} / S^{1/3}$ $t_t = (L/v)/60$

$t_c$ check: $t_c = (26-17i) +(L/(60(14i+9)S^{1/2})$

*NOTE: Cv Values, $T_i$, $T_t$, & $T_c$ Equations from UDFCD Criteria Manual updated March 2017

| SUB-BASIN DATA | | | INITIAL/OVERLAND TIME ($t_i$) | | | TRAVEL TIME ($t_t$) | | | | | | $t_i + t_t$ | $t_c$ CHECK (urbanized basins) | | FINAL $t_c$ USED |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Basin Designation | Area (acres) | $C_{CD}$ 05 yr | length (ft) | slope % | $t_i$ (min) | length (ft) | slope % | Type of Land Surface | Conveyance Coefficient Cv | velocity (ft/sec) | $t_t$ (min) | $t_c$ (min) | Total Length (ft) | $t_c$ (min) | $t_c$ (min) |
| R1 | 0.32 | 0.81 | 44 | 1.00% | 3.54 | 115 | 1.00% | Paved areas and shallow paved swales | 20 | 2.00 | 0.96 | 4.49 | 159 | 11.04 | **5.00** |
| A-4.1 | 0.23 | 0.75 | 51 | 2.63% | 3.31 | 150 | 3.88% | Paved areas and shallow paved swales | 20 | 3.94 | 0.63 | 3.94 | 201 | 11.85 | **5.00** |
| A-4.2 | 0.46 | 0.77 | 82 | 2.69% | 3.89 | 29 | 1.50% | Paved areas and shallow paved swales | 20 | 2.45 | 0.20 | 4.09 | 111 | 11.29 | **5.00** |
| A-4.3 | 0.79 | 0.54 | 186 | 1.82% | 11.37 | 18 | 3.72% | Paved areas and shallow paved swales | 20 | 3.86 | 0.08 | 11.45 | 204 | 16.36 | **11.45** |
| A-4.4 | 0.03 | 0.33 | 48 | 2.55% | 7.20 | 78 | 4.07% | Paved areas and shallow paved swales | 20 | 4.03 | 0.32 | 7.52 | 126 | 20.67 | **7.52** |
| A-4.5 | 1.38 | 0.34 | 48 | 2.55% | 7.06 | 78 | 4.07% | Paved areas and shallow paved swales | 20 | 4.03 | 0.32 | 7.39 | 126 | 20.36 | **7.39** |
| A-4.6 | 1.72 | 0.20 | 72 | 1.50% | 12.26 | 0 | 0.00% | Paved areas and shallow paved swales | 20 | 0.06 | 0 | 12.26 | 72 | 54.76 | **12.26** |

# Initial Runoff Calcs for inlet, pipe, and swale sizing

## Calculation of Peak Runoff using Rational Method

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

Computed $t_c = t_i + t_t$

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

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

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

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

| Subcatchment Name | Overland (Initial) Flow Time | | | | | Channelized (Travel) Flow Time | | | | | | | Time of Concentration | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 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) | **(Optional)** Override $t_c$ (min) |
| R1 | 1.00 | | | 0.001 | 1.12 | 1.00 | | | 0.001 | 20 | 0.63 | 0.03 | 1.15 | 9.87 | 5.00 | 5.00 |
| A-4.1 | 1.00 | | | 0.001 | 1.32 | 1.00 | | | 0.001 | 20 | 0.63 | 0.03 | 1.35 | 10.94 | 5.00 | 5.00 |
| A-4.2 | 1.00 | | | 0.001 | 1.31 | 1.00 | | | 0.001 | 20 | 0.63 | 0.03 | 1.33 | 10.87 | 5.00 | 5.00 |
| A-4.3 | 1.00 | | | 0.001 | 2.11 | 1.00 | | | 0.001 | 20 | 0.63 | 0.03 | 2.14 | 15.21 | 5.00 | 5.00 |
| A-4.4 | 1.00 | | | 0.001 | 2.98 | 1.00 | | | 0.001 | 20 | 0.63 | 0.03 | 3.01 | 19.94 | 5.00 | 5.00 |
| A-4.5 | 1.00 | | | 0.001 | 2.94 | 1.00 | | | 0.001 | 20 | 0.63 | 0.03 | 2.96 | 19.69 | 5.00 | 5.00 |
| A-4.6 | 1.00 | | | 0.001 | 3.48 | 1.00 | | | 0.001 | 20 | 0.63 | 0.03 | 3.51 | 22.64 | 10.00 | 5.00 |

MINIMUM 5 MINUTE TIME OF CONCENTRATION APPLIED TO ALL BASINS FOR CONSERVATIVE DESIGN RATES.

Initial Runoff Calcs for inlet, pipe, and swale sizing

# Calculation of Peak Runoff using Rational Method

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

| | WQE | 2-yr | 5-yr | 10-yr | 25-yr | 50-yr | 100-yr | 500-yr |
|---|---|---|---|---|---|---|---|---|
| 1-hour rainfall depth, P1 (in) = | 0.60 | 0.84 | 1.12 | 1.36 | 1.72 | 2.01 | 2.31 | 3.07 |

| | a | b | c |
|---|---|---|---|
| Rainfall Intensity Equation Coefficients = | 28.50 | 10.00 | 0.786 |

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

$$Q(cfs) = CIA$$

| Subcatchment Name | Rainfall Intensity, I (in/hr) | | | | | | | | Peak Flow, Q (cfs) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | WQE | 2-yr | 5-yr | 10-yr | 25-yr | 50-yr | 100-yr | 500-yr | WQE | 2-yr | 5-yr | 10-yr | 25-yr | 50-yr | 100-yr | 500-yr |
| R1 | 2.04 | 2.86 | 3.80 | 4.61 | 5.83 | 6.82 | 7.84 | 10.41 | 0.52 | 0.73 | 0.99 | 1.23 | 1.60 | 1.89 | 2.20 | 2.97 |
| A-4.1 | 2.04 | 2.86 | 3.80 | 4.61 | 5.83 | 6.82 | 7.84 | 10.41 | 0.34 | 0.48 | 0.66 | 0.82 | 1.09 | 1.29 | 1.51 | 2.06 |
| A-4.2 | 2.04 | 2.86 | 3.80 | 4.61 | 5.83 | 6.82 | 7.84 | 10.41 | 0.68 | 0.96 | 1.32 | 1.66 | 2.18 | 2.59 | 3.04 | 4.13 |
| A-4.3 | 2.04 | 2.86 | 3.80 | 4.61 | 5.83 | 6.82 | 7.84 | 10.41 | 0.83 | 1.17 | 1.66 | 2.19 | 3.12 | 3.81 | 4.61 | 6.49 |
| A-4.4 | 2.04 | 2.86 | 3.80 | 4.61 | 5.83 | 6.82 | 7.84 | 10.41 | 0.02 | 0.02 | 0.04 | 0.06 | 0.10 | 0.12 | 0.16 | 0.23 |
| A-4.5 | 2.04 | 2.86 | 3.80 | 4.61 | 5.83 | 6.82 | 7.84 | 10.41 | 0.80 | 1.13 | 1.77 | 2.58 | 4.24 | 5.42 | 6.87 | 10.11 |
| A-4.6 | 2.04 | 2.86 | 3.80 | 4.61 | 5.83 | 6.82 | 7.84 | 10.41 | 0.48 | 0.67 | 1.29 | 2.21 | 4.32 | 5.76 | 7.62 | 11.65 |

Initial Runoff Calcs for inlet, pipe, and swale sizing

# Runoff Calculations (Rational Method)

***Project Information***

| | |
|---|---|
| **Project Name:** | **AH Castle Pines MOB** |
| **S.A. Project No:** | **25-060** |
| **Revised Date:** | **3/2/2026** |
| **Calculated By:** | **RJH** |

***Intensity Equation***

$I = 28.5\ (P_1)/(10+T_c)^{0.786}$

*NOTE: P & Intensity Equation from UDFCD Criteria Manual

| Basin Designation | Area (ac.) | 'c' | cA | $t_c$ (min) | $P_1$ | intensity (in/hr) | Q (cfs) | |
|---|---|---|---|---|---|---|---|---|
| **Prev. A4 now A6** | 0.06 | 0.14 | 0.01 | 5.00 | 0.84 | 2.85 | 0.02 | 02 YR |
| | | 0.20 | 0.01 | | 1.12 | 3.80 | 0.04 | 05 YR |
| | | 0.28 | 0.02 | | 1.36 | 4.61 | 0.08 | 10 YR |
| | | 0.57 | 0.03 | | 2.31 | 7.84 | 0.26 | 100 YR |
| **Prev. A4 now A5** | 0.04 | 0.14 | 0.01 | 5.00 | 0.84 | 2.85 | 0.02 | 02 YR |
| | | 0.20 | 0.01 | | 1.12 | 3.80 | 0.03 | 05 YR |
| | | 0.28 | 0.01 | | 1.36 | 4.61 | 0.06 | 10 YR |
| | | 0.57 | 0.03 | | 2.31 | 7.84 | 0.20 | 100 YR |

Revised Runoff Calcs for existing pipe velocity checks

# Runoff Calculations (Rational Method)

***Project Information***

| | |
|---|---|
| **Project Name:** | **Canyonside Flg. 2, Lot 3.** |
| **S.A. Project No:** | **25-060** |
| **Revised Date:** | **9/16/2026** |
| **Calculated By:** | **SAF** |

***Intensity Equation***

$I = 28.5\ (P_1)/(10+T_c)^{0.786}$

*NOTE: P & Intensity Equation from UDFCD Criteria Manual

| Basin Designation | Area (ac.) | 'c' | cA | $t_c$ (min) | $P_1$ | intensity (in/hr) | Q (cfs) | |
|---|---|---|---|---|---|---|---|---|
| **R1** | 0.32 | 0.79 | 0.25 | 5.00 | 0.83 | 2.82 | 0.71 | 02 YR |
| | | 0.81 | 0.26 | | 1.09 | 3.70 | 0.96 | 05 YR |
| | | 0.83 | 0.27 | | 1.33 | 4.51 | 1.21 | 10 YR |
| | | 0.87 | 0.28 | | 2.31 | 7.84 | 2.20 | 100 YR |
| **A-4.1** | 0.23 | 0.72 | 0.16 | 5.00 | 0.83 | 2.82 | 0.46 | 02 YR |
| | | 0.75 | 0.17 | | 1.09 | 3.70 | 0.63 | 05 YR |
| | | 0.78 | 0.18 | | 1.33 | 4.51 | 0.80 | 10 YR |
| | | 0.84 | 0.19 | | 2.31 | 7.84 | 1.50 | 100 YR |
| **A-4.2** | 0.46 | 0.75 | 0.34 | 5.00 | 0.83 | 2.82 | 0.96 | 02 YR |
| | | 0.77 | 0.35 | | 1.09 | 3.70 | 1.31 | 05 YR |
| | | 0.80 | 0.36 | | 1.33 | 4.51 | 1.64 | 10 YR |
| | | 0.85 | 0.39 | | 2.31 | 7.84 | 3.06 | 100 YR |
| **A-4.3** | 0.79 | 0.49 | 0.39 | 11.45 | 0.83 | 2.13 | 0.83 | 02 YR |
| | | 0.54 | 0.43 | | 1.09 | 2.79 | 1.20 | 05 YR |
| | | 0.59 | 0.47 | | 1.33 | 3.41 | 1.60 | 10 YR |
| | | 0.74 | 0.59 | | 2.31 | 5.92 | 3.47 | 100 YR |
| **A-4.4** | 0.03 | 0.26 | 0.01 | 7.52 | 0.83 | 2.49 | 0.02 | 02 YR |
| | | 0.33 | 0.01 | | 1.09 | 3.27 | 0.03 | 05 YR |
| | | 0.39 | 0.01 | | 1.33 | 3.99 | 0.05 | 10 YR |
| | | 0.63 | 0.02 | | 2.31 | 6.94 | 0.14 | 100 YR |
| **A-4.5** | 1.38 | 0.28 | 0.38 | 7.39 | 0.83 | 2.51 | 0.96 | 02 YR |
| | | 0.34 | 0.47 | | 1.09 | 3.29 | 1.54 | 05 YR |
| | | 0.41 | 0.56 | | 1.33 | 4.02 | 2.25 | 10 YR |
| | | 0.64 | 0.88 | | 2.31 | 6.98 | 6.12 | 100 YR |
| **A-4.6** | 1.72 | 0.14 | 0.24 | 12.26 | 0.83 | 2.06 | 0.49 | 02 YR |
| | | 0.20 | 0.34 | | 1.09 | 2.71 | 0.92 | 05 YR |
| | | 0.28 | 0.48 | | 1.33 | 3.31 | 1.59 | 10 YR |
| | | 0.57 | 0.97 | | 2.31 | 5.75 | 5.59 | 100 YR |

Initial Runoff Calcs for inlet, pipe, and swale sizing

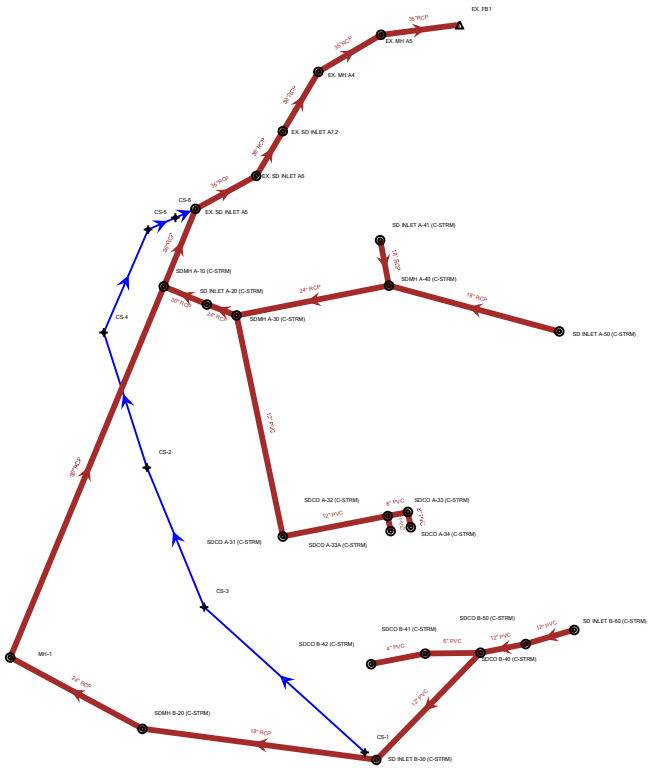
| RUNOFF SUMMARY | | | | | | |
|---|---|---|---|---|---|---|
| Design Point | Tributary Basin(s) | Tributary Area (ac.) | Direct Runoff (CFS/5-yr) | Total Runoff (CFS/5-yr) | Direct Runoff (CFS/100-yr) | Total Runoff (CFS/100-yr) |
| - | A-4.4 | 0.03 | 0.04 | - | 0.16 | - |
| - | 1/2 of R1 | 0.16 | 0.49 | - | 1.10 | - |
| 1 | A-4.4 & 1/2 of R1 | 0.19 | - | 0.53 | - | 1.26 |
| - | A-4.5 | 1.38 | 1.77 | - | 6.87 | - |
| 2 | DP1 & A-4.5 | 1.57 | - | 2.31 | - | 8.12 |
| - | Master Rpt Q (Ex DP's A9+A10+A11+A3) | 30.12 | 33.06 | - | 98.42 | - |
| 3 | DP2 & Master Rpt Q | 31.69 | - | 35.37 | - | 106.54 |
| - | A-4.3 | 0.79 | 1.66 | - | 4.61 | - |
| - | A-4.2 | 0.46 | 1.32 | - | 3.04 | - |
| 4 | A-4.3 & A-4.2 | 1.25 | - | 2.98 | - | 7.65 |
| - | 1/2 of R1 | 0.19 | 0.49 | - | 1.10 | - |
| 5 | DP 4 & 1/2 of R1 | 1.44 | - | 3.48 | - | 8.75 |
| - | A-4.1 | 0.23 | 0.66 | - | 1.51 | - |
| 6 | DP 5 & A-4.1 | 1.67 | - | 4.14 | - | 10.26 |
| 7 | DP 3 & DP 6 | 33.36 | - | 39.50 | - | 116.81 |
| - | A-4.6 | 1.72 | 1.29 | - | 7.62 | - |
| - | Added Flows to Ex A5 | 0.04 | 0.03 | - | 0.20 | - |
| - | Ex Flows to Ex A5 | 1.38 | 0.18 | - | 3.65 | - |
| 8 | DP 7 & A-4.6 & Total Flows to Ex A5 | 34.78 | - | 41.01 | - | 128.27 |
| - | Added Flows to Ex A6 | 0.06 | 0.04 | - | 0.26 | - |
| - | Ex Flows to Ex A6 | 0.89 | 1.68 | - | 4.67 | - |
| 9 | DP8 & Total Flows to Ex A6 | 35.73 | - | 42.73 | - | 133.20 |
| - | Ex A7.1 | 3.64 | 2.91 | - | 13.00 | - |
| - | Ex A7.2 | 0.09 | 0.24 | - | 0.57 | - |
| 10 | DP9 & Ex A7.1 & Ex A7.2 | 39.46 | - | 45.88 | - | 146.77 |

Revised Runoff Calcs for existing pipe velocity checks

| RUNOFF SUMMARY | | | | | | |
|---|---|---|---|---|---|---|
| Design Point | Tributary Basin(s) | Tributary Area (ac.) | Direct Runoff (CFS/5-yr) | Total Runoff (CFS/5-yr) | Direct Runoff (CFS/100-yr) | Total Runoff (CFS/100-yr) |
| - | A-4.4 | 0.03 | 0.03 | - | 0.14 | - |
| - | 1/2 of R1 | 0.16 | 0.48 | - | 1.10 | - |
| 1 | A-4.4 & 1/2 of R1 | 0.19 | - | 0.52 | - | 1.24 |
| - | A-4.5 | 1.38 | 1.54 | | 6.12 | |
| 2 | DP1 & A-4.5 | 1.57 | - | 2.06 | - | 7.37 |
| - | Master Rpt Q (StormCAD Output) | 30.12 | 27.08 | - | 83.71 | - |
| 3 | DP2 & Master Rpt Q | 31.69 | - | 29.14 | - | 91.08 |
| - | A-4.3 | 0.79 | 1.20 | - | 3.47 | - |
| - | A-4.2 | 0.46 | 1.31 | - | 3.06 | - |
| 4 | A-4.3 & A-4.2 | 1.25 | - | 2.51 | - | 6.52 |
| - | 1/2 of R1 | 0.16 | 0.48 | | 1.10 | |
| 5 | DP 4 & 1/2 of R1 | 1.41 | - | 2.99 | - | 7.63 |
| - | A-4.1 | 0.23 | 0.63 | | 1.50 | |
| 6 | DP 5 & A-4.1 | 1.64 | - | 3.63 | - | 9.13 |
| 7 | DP 3 & DP 6 | 33.33 | - | 32.76 | - | 100.21 |
| - | A-4.6 | 1.72 | 0.92 | | 5.59 | |
| - | Added Flows to Ex A5 | 0.04 | 0.03 | - | 0.18 | - |
| 8 | DP 7 & A-4.6 & Added Flows to Ex A5 | 35.09 | - | 33.72 | - | 105.98 |
| - | Added Flows to Ex A6 | 0.06 | 0.05 | - | 0.27 | - |
| 9 | DP8 & Added Flows to Ex A6 | 35.15 | - | 33.77 | - | 106.25 |
| 10 | DP9 | 35.15 | - | 33.77 | - | 106.25 |

**Appendix B**
**Hydraulic Computations**
StormCAD Plan View
Manhole Tables
Conduit Tables
Storm Plans & Profiles
Inlet Capacity Calculations
Swale Capacity Calculation

# STORMCAD PLAN VIEW



# MANHOLE TABLE 5-YEARS

***Project Information***

| | |
|---|---|
| **Project Name:** | **AdventHealth Castle Pines MOB** |
| **Miro Project No:** | **25060** |
| **Revised Date:** | **16/9/2026** |
| **Calculated By:** | **ATE** |

| Label | Elevation (Ground) (ft) | Elevation (Rim) (ft) | Elevation (Invert) (ft) | Flow (Total Out) (cfs) | Hydraulic Grade Line (In) (ft) | Hydraulic Grade Line (Out) (ft) | Notes | Headloss Method | Headloss Coefficient (Standard) | Headloss (ft) |
|---|---|---|---|---|---|---|---|---|---|---|
| SDCO B-50 (C-STRM) | 6,293.56 | 6,293.56 | 6,287.99 | 0.48 | 6,288.33 | 6,288.27 | ROOF DRAIN | Standard | 0.5 | 0.05 |
| SDMH B-20 (C-STRM) | 6,293.41 | 6,293.41 | 6,283.38 | 1.96 | 6,284.20 | 6,284.17 | 5' DIA. | Standard | 0.6 | 0.03 |
| SDCO B-40 (C-STRM) | 6,293.35 | 6,293.35 | 6,286.87 | 0.48 | 6,287.24 | 6,287.15 | ROOF DRAIN | Standard | 0.8 | 0.08 |
| SDCO A-31 (C-STRM) | 6,293.20 | 6,293.20 | 6,286.97 | 0.49 | 6,287.34 | 6,287.26 | ROOF DRAIN | Standard | 0.8 | 0.08 |
| SDCO B-41 (C-STRM) | 6,293.05 | 6,293.05 | 6,287.75 | 0 | 6,287.75 | 6,287.75 | ROOF DRAIN | Standard | 0.6 | 0 |
| SD INLET B-60 (C-STRM) | 6,293.05 | 6,293.05 | 6,289.21 | 0.04 | 6,289.29 | 6,289.29 | 12" NYLOPLAST DRAIN | Standard | 0 | 0 |
| SDCO A-33A (C-STRM) | 6,292.79 | 6,292.79 | 6,288.30 | 0 | 6,288.30 | 6,288.30 | ROOF DRAIN | Standard | 0 | 0 |
| SDCO A-34 (C-STRM) | 6,292.72 | 6,292.72 | 6,288.30 | 0.5 | 6,288.63 | 6,288.63 | ROOF DRAIN | Standard | 0 | 0 |
| SDCO A-32 (C-STRM) | 6,292.57 | 6,292.57 | 6,287.53 | 0.5 | 6,287.90 | 6,287.82 | CLEANOUT | Standard | 0.8 | 0.08 |
| SDCO B-42 (C-STRM) | 6,292.45 | 6,292.45 | 6,288.30 | 0 | 6,288.30 | 6,288.30 | ROOF DRAIN | Standard | 0 | 0 |
| SDCO A-33 (C-STRM) | 6,292.42 | 6,292.42 | 6,288.11 | 0.5 | 6,288.54 | 6,288.44 | CLEANOUT | Standard | 0.8 | 0.1 |
| SD INLET B-30 (C-STRM) | 6,291.46 | 6,291.46 | 6,285.85 | 2.01 | 6,286.50 | 6,286.38 | 5' TYPE R | Standard | 0.6 | 0.12 |
| SD INLET A-50 (C-STRM) | 6,287.60 | 6,287.60 | 6,282.15 | 1.25 | 6,282.57 | 6,282.57 | 10' TYPE R | Standard | 0 | 0 |
| SDMH A-30 (C-STRM) | 6,287.42 | 6,287.42 | 6,276.85 | 2.58 | 6,277.57 | 6,277.41 | 5' DIA. | Standard | 0.8 | 0.16 |
| SD INLET A-20 (C-STRM) | 6,286.98 | 6,286.98 | 6,275.70 | 3.06 | 6,276.40 | 6,276.32 | 5' TYPE R | Standard | 0.5 | 0.08 |
| SDMH A-40 (C-STRM) | 6,285.96 | 6,285.96 | 6,279.20 | 2.24 | 6,279.89 | 6,279.72 | 5' DIA. | Standard | 0.9 | 0.17 |
| SDMH A-10 (C-STRM) | 6,284.87 | 6,284.87 | 6,274.22 | 31.86 | 6,276.45 | 6,275.91 | 5' DIA. | Standard | 0.7 | 0.54 |
| SD INLET A-41 (C-STRM) | 6,284.78 | 6,284.78 | 6,280.03 | 1.35 | 6,280.46 | 6,280.46 | 5' TYPE R | Standard | 0 | 0 |
| MH-1 | 6,293.95 | 6,293.95 | 6,281.85 | 28.99 | 6,284.17 | 6,283.59 | Dummy Null Structure for LandXML purposes | Standard | 0.8 | 0.58 |
| EX. MH A5 | 6,256.04 | 6,256.04 | 6,245.19 | 32.15 | 6,248.59 | 6,247.99 | 5' DIA. | Absolute | | 0.6 |
| EX. MH A4 | 6,269.12 | 6,269.12 | 6,251.10 | 32.16 | 6,253.54 | 6,252.94 | 5' DIA. | Absolute | | 0.6 |
| EX. SD INLET A7.2 | 6,276.45 | 6,276.45 | 6,260.88 | 32.16 | 6,263.22 | 6,262.72 | 10' TYPE R | Absolute | | 0.5 |
| EX. SD INLET A6 | 6,275.69 | 6,275.69 | 6,266.81 | 32.17 | 6,268.97 | 6,268.37 | 10' TYPE R | Absolute | | 0.6 |
| EX. SD INLET A5 | 6,278.14 | 6,278.14 | 6,269.24 | 32.15 | 6,271.68 | 6,271.08 | CDOT TYPE D | Absolute | | 0.6 |

# MANHOLE TABLE 100-YEARS

***Project Information***

| | |
|---|---|
| **Project Name:** | **AdventHealth Castle Pines MOB** |
| **Miro Project No:** | **25060** |
| **Revised Date:** | **16/9/2026** |
| **Calculated By:** | **ATE** |

| Label | Elevation (Ground) (ft) | Elevation (Rim) (ft) | Elevation (Invert) (ft) | Flow (Total Out) (cfs) | Hydraulic Grade Line (In) (ft) | Hydraulic Grade Line (Out) (ft) | Notes | Headloss Method | Headloss Coefficient (Standard) | Headloss (ft) |
|---|---|---|---|---|---|---|---|---|---|---|
| SDCO B-50 (C-STRM) | 6,293.56 | 6,293.56 | 6,287.99 | 1.13 | 6,288.52 | 6,288.43 | ROOF DRAIN | Standard | 0.5 | 0.09 |
| SDMH B-20 (C-STRM) | 6,293.41 | 6,293.41 | 6,283.38 | 6.69 | 6,286.95 | 6,286.91 | 5' DIA. | Standard | 0.6 | 0.05 |
| SDCO B-40 (C-STRM) | 6,293.35 | 6,293.35 | 6,286.87 | 1.13 | 6,287.96 | 6,287.93 | ROOF DRAIN | Standard | 0.8 | 0.03 |
| SDCO A-31 (C-STRM) | 6,293.20 | 6,293.20 | 6,286.97 | 1.09 | 6,287.54 | 6,287.41 | ROOF DRAIN | Standard | 0.8 | 0.13 |
| SDCO B-41 (C-STRM) | 6,293.05 | 6,293.05 | 6,287.75 | 0 | 6,287.96 | 6,287.96 | ROOF DRAIN | Standard | 0.6 | 0 |
| SD INLET B-60 (C-STRM) | 6,293.05 | 6,293.05 | 6,289.21 | 0.14 | 6,289.37 | 6,289.37 | 12" NYLOPLAST DRAIN | Standard | 0 | 0 |
| SDCO A-33A (C-STRM) | 6,292.79 | 6,292.79 | 6,288.30 | 0 | 6,288.30 | 6,288.30 | ROOF DRAIN | Standard | 0 | 0 |
| SDCO A-34 (C-STRM) | 6,292.72 | 6,292.72 | 6,288.30 | 1.11 | 6,288.80 | 6,288.80 | ROOF DRAIN | Standard | 0 | 0 |
| SDCO A-32 (C-STRM) | 6,292.57 | 6,292.57 | 6,287.53 | 1.1 | 6,288.10 | 6,287.97 | CLEANOUT | Standard | 0.8 | 0.13 |
| SDCO B-42 (C-STRM) | 6,292.45 | 6,292.45 | 6,288.30 | 0 | 6,288.30 | 6,288.30 | ROOF DRAIN | Standard | 0 | 0 |
| SDCO A-33 (C-STRM) | 6,292.42 | 6,292.42 | 6,288.11 | 1.11 | 6,288.80 | 6,288.61 | CLEANOUT | Standard | 0.8 | 0.19 |
| SD INLET B-30 (C-STRM) | 6,291.46 | 6,291.46 | 6,285.85 | 6.92 | 6,287.87 | 6,287.72 | 5' TYPE R | Standard | 0.6 | 0.15 |
| SD INLET A-50 (C-STRM) | 6,287.60 | 6,287.60 | 6,282.15 | 3.52 | 6,282.87 | 6,282.87 | 10' TYPE R | Standard | 0 | 0 |
| SDMH A-30 (C-STRM) | 6,287.42 | 6,287.42 | 6,276.85 | 6.57 | 6,279.18 | 6,279.13 | 5' DIA. | Standard | 0.8 | 0.05 |
| SD INLET A-20 (C-STRM) | 6,286.98 | 6,286.98 | 6,275.70 | 7.65 | 6,279.11 | 6,279.09 | 5' TYPE R | Standard | 0.5 | 0.02 |
| SDMH A-40 (C-STRM) | 6,285.96 | 6,285.96 | 6,279.20 | 5.79 | 6,280.34 | 6,280.05 | 5' DIA. | Standard | 0.9 | 0.29 |
| SDMH A-10 (C-STRM) | 6,284.87 | 6,284.87 | 6,274.22 | 97.3 | 6,279.08 | 6,276.96 | 5' DIA. | Standard | 0.7 | 2.11 |
| SD INLET A-41 (C-STRM) | 6,284.78 | 6,284.78 | 6,280.03 | 3.07 | 6,280.69 | 6,280.69 | 5' TYPE R | Standard | 0 | 0 |
| MH-1 | 6,293.95 | 6,293.95 | 6,281.85 | 90.18 | 6,286.81 | 6,284.70 | Null Structure for LandXML | Standard | 0.8 | 2.11 |
| EX. MH A5 | 6,256.04 | 6,256.04 | 6,245.19 | 101.52 | 6,249.86 | 6,249.26 | 5' DIA. | Absolute | | 0.6 |
| EX. MH A4 | 6,269.12 | 6,269.12 | 6,251.10 | 101.55 | 6,254.60 | 6,254.00 | 5' DIA. | Absolute | | 0.6 |
| EX. SD INLET A7.2 | 6,276.45 | 6,276.45 | 6,260.88 | 101.56 | 6,264.28 | 6,263.78 | 10' TYPE R | Absolute | | 0.5 |
| EX. SD INLET A6 | 6,275.69 | 6,275.69 | 6,266.81 | 101.58 | 6,270.03 | 6,269.43 | 10' TYPE R | Absolute | | 0.6 |
| EX. SD INLET A5 | 6,278.14 | 6,278.14 | 6,269.24 | 101.43 | 6,272.74 | 6,272.14 | CDOT TYPE D | Absolute | | 0.6 |

# CONDUIT TABLE

**Scenario** | **5 - Years**

| | |
|---|---|
| **Project Name** | **AdventHealth Castle Pines MOB** |
| **S.A. Project No** | **25060** |
| **Revised Date** | **9/16/2026** |
| **Calculated By** | **ATE** |

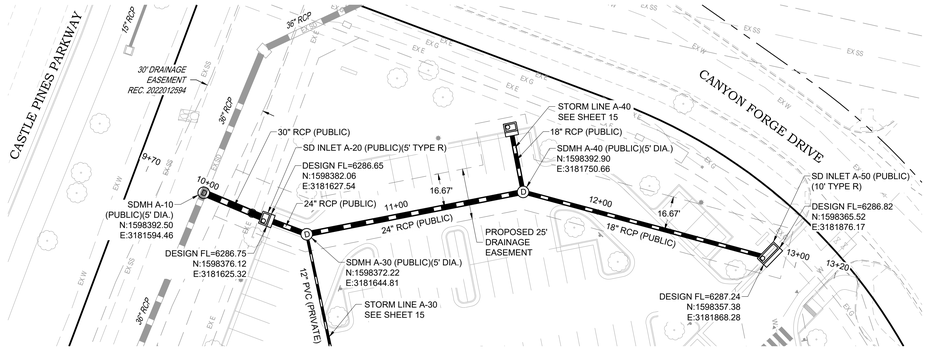
| Start Node | Invert (start) (ft) | Stop Node | Invert (Stop) (ft) | Length (User Defined) (ft) | Slope (Calculated) (%) | Diameter (in) | Manning's n | Flow (cfs) | Velocity (ft/s) | Capacity (Full Flow) (cfs) | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| EX. SD INLET A5 | 6,269.24 | EX. SD INLET A6 | 6,267.11 | 65.4 | 3.255 | 36 | 0.013 | 32.15 | 14.41 | 120.34 | 36''RCP |
| EX. SD INLET A7.2 | 6,260.88 | EX. MH A4 | 6,259.60 | 46.5 | 2.753 | 36 | 0.013 | 32.16 | 13.57 | 110.65 | 36''RCP |
| EX. MH A4 | 6,251.10 | EX. MH A5 | 6,249.30 | 65.4 | 2.752 | 36 | 0.013 | 32.16 | 13.56 | 110.65 | 36''RCP |
| EX. MH A5 | 6,245.19 | EX. FB1 | 6,243.54 | 60 | 2.75 | 36 | 0.013 | 32.15 | 13.56 | 110.6 | 36''RCP |
| EX. SD INLET A6 | 6,266.53 | EX. SD INLET A7.2 | 6,265.43 | 40.1 | 2.74 | 36 | 0.013 | 32.17 | 13.54 | 110.41 | 36''RCP |
| SDMH A-10 (C-STRM) | 6,274.08 | EX. SD INLET A5 | 6,272.14 | 70.7 | 2.745 | 36 | 0.013 | 31.86 | 13.52 | 110.5 | 36''RCP |
| MH-1 | 6,281.85 | SDMH A-10 (C-STRM) | 6,274.22 | 278.6 | 2.739 | 36 | 0.013 | 28.99 | 13.16 | 110.37 | 36''RCP |
| SD INLET A-20 (C-STRM) | 6,275.70 | SDMH A-10 (C-STRM) | 6,274.72 | 32.5 | 2.999 | 30 | 0.013 | 3.06 | 7.21 | 71.02 | 30" RCP |
| SDMH A-30 (C-STRM) | 6,276.85 | SD INLET A-20 (C-STRM) | 6,276.20 | 21.8 | 2.999 | 24 | 0.013 | 2.58 | 7.06 | 39.17 | 24" RCP |
| SDCO B-50 (C-STRM) | 6,287.99 | SDCO B-40 (C-STRM) | 6,286.87 | 32 | 3.498 | 12 | 0.01 | 0.48 | 5.93 | 8.66 | 12" PVC |
| SDMH A-40 (C-STRM) | 6,279.20 | SDMH A-30 (C-STRM) | 6,277.05 | 107.9 | 2 | 24 | 0.013 | 2.24 | 5.86 | 31.99 | 24" RCP |
| SDCO A-31 (C-STRM) | 6,286.97 | SDMH A-30 (C-STRM) | 6,282.27 | 156.6 | 2.999 | 12 | 0.01 | 0.49 | 5.65 | 8.02 | 12" PVC |
| SD INLET A-50 (C-STRM) | 6,282.15 | SDMH A-40 (C-STRM) | 6,279.70 | 122.5 | 2 | 18 | 0.013 | 1.25 | 5.1 | 14.85 | 18" RCP |
| SDCO A-34 (C-STRM) | 6,288.30 | SDCO A-33 (C-STRM) | 6,288.11 | 10.8 | 1.759 | 8 | 0.01 | 0.5 | 4.91 | 2.08 | 8" PVC |
| SDCO A-33 (C-STRM) | 6,288.11 | SDCO A-32 (C-STRM) | 6,287.86 | 14.3 | 1.759 | 8 | 0.01 | 0.5 | 4.91 | 2.08 | 8" PVC |
| SD INLET B-30 (C-STRM) | 6,285.85 | SDMH B-20 (C-STRM) | 6,283.88 | 163.8 | 1.203 | 18 | 0.013 | 2.01 | 4.9 | 11.52 | 18" RCP |
| SD INLET A-41 (C-STRM) | 6,280.03 | SDMH A-40 (C-STRM) | 6,279.70 | 32.2 | 1 | 18 | 0.013 | 1.35 | 4.09 | 10.5 | 18" RCP |
| SDCO A-32 (C-STRM) | 6,287.53 | SDCO A-31 (C-STRM) | 6,286.97 | 74.2 | 0.75 | 12 | 0.01 | 0.5 | 3.48 | 4.01 | 12" PVC |
| SDMH B-20 (C-STRM) | 6,283.38 | MH-1 | 6,282.86 | 104.2 | 0.497 | 24 | 0.013 | 1.96 | 3.45 | 15.95 | 24" RCP |
| SDCO B-40 (C-STRM) | 6,286.87 | SD INLET B-30 (C-STRM) | 6,286.35 | 103.6 | 0.5 | 12 | 0.01 | 0.48 | 2.98 | 3.27 | 12" PVC |
| SD INLET B-60 (C-STRM) | 6,289.21 | SDCO B-50 (C-STRM) | 6,287.99 | 35.1 | 3.498 | 12 | 0.01 | 0.04 | 2.72 | 8.66 | 12" PVC |
| SDCO B-41 (C-STRM) | 6,287.75 | SDCO B-40 (C-STRM) | 6,287.37 | 38.3 | 1 | 6 | 0.01 | 0 | 0 | 0.73 | 6" PVC |
| SDCO B-42 (C-STRM) | 6,288.30 | SDCO B-41 (C-STRM) | 6,287.92 | 38.4 | 1 | 4 | 0.01 | 0 | 0 | 0.25 | 4" PVC |
| SDCO A-33A (C-STRM) | 6,288.30 | SDCO A-32 (C-STRM) | 6,288.19 | 10.8 | 1 | 4 | 0.01 | 0 | 0 | 0.25 | 4" PVC |

# CONDUIT TABLE

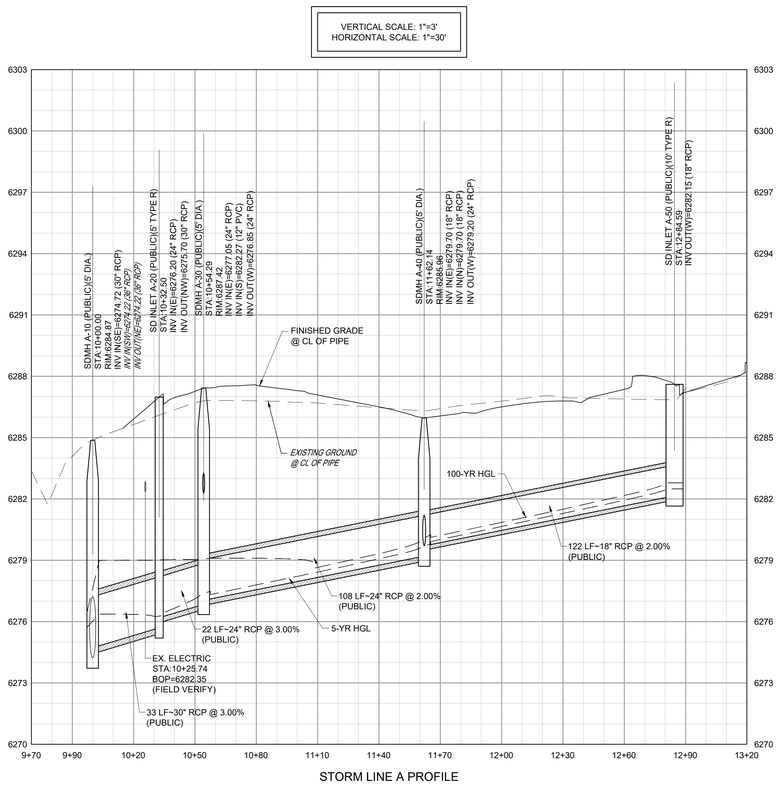
| Scenario | 100 - Year |
|---|---|

| | |
|---|---|
| Project Name | AdventHealth Castle Pines MOB |
| S.A. Project No | 25060 |
| Revised Date | 9/16/2026 |
| Calculated By | ATE |

| Start Node | Invert (start) (ft) | Stop Node | Invert (Stop) (ft) | Length (User Defined) (ft) | Slope (Calculated) (%) | Diameter (in) | Manning's n | Flow (cfs) | Velocity (ft/s) | Capacity (Full Flow) (cfs) | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| EX. SD INLET A5 | 6,269.24 | EX. SD INLET A6 | 6,267.11 | 65.4 | 3.255 | 36 | 0.013 | 101.43 | 19.08 | 120.34 | 36''RCP |
| EX. SD INLET A7.2 | 6,260.88 | EX. MH A4 | 6,259.60 | 46.5 | 2.753 | 36 | 0.013 | 101.56 | 17.76 | 110.65 | 36''RCP |
| EX. MH A4 | 6,251.10 | EX. MH A5 | 6,249.30 | 65.4 | 2.752 | 36 | 0.013 | 101.55 | 17.76 | 110.65 | 36''RCP |
| EX. SD INLET A6 | 6,266.53 | EX. SD INLET A7.2 | 6,265.43 | 40.1 | 2.74 | 36 | 0.013 | 101.58 | 17.72 | 110.41 | 36''RCP |
| SDMH A-10 (C-STRM) | 6,274.08 | EX. SD INLET A5 | 6,272.14 | 70.7 | 2.745 | 36 | 0.013 | 97.3 | 17.64 | 110.5 | 36''RCP |
| MH-1 | 6,281.85 | SDMH A-10 (C-STRM) | 6,274.22 | 278.6 | 2.739 | 36 | 0.013 | 90.18 | 17.41 | 110.37 | 36''RCP |
| EX. MH A5 | 6,245.19 | EX. FB1 | 6,243.54 | 60 | 2.75 | 36 | 0.013 | 101.52 | 14.36 | 110.6 | 36''RCP |
| SDMH A-40 (C-STRM) | 6,279.20 | SDMH A-30 (C-STRM) | 6,277.05 | 107.9 | 2 | 24 | 0.013 | 5.79 | 7.73 | 31.99 | 24" RCP |
| SDCO B-50 (C-STRM) | 6,287.99 | SDCO B-40 (C-STRM) | 6,286.87 | 32 | 3.498 | 12 | 0.01 | 1.13 | 7.62 | 8.66 | 12" PVC |
| SDCO A-31 (C-STRM) | 6,286.97 | SDMH A-30 (C-STRM) | 6,282.27 | 156.6 | 2.999 | 12 | 0.01 | 1.09 | 7.14 | 8.02 | 12" PVC |
| SD INLET A-50 (C-STRM) | 6,282.15 | SDMH A-40 (C-STRM) | 6,279.70 | 122.5 | 2 | 18 | 0.013 | 3.52 | 6.89 | 14.85 | 18" RCP |
| SDCO A-34 (C-STRM) | 6,288.30 | SDCO A-33 (C-STRM) | 6,288.11 | 10.8 | 1.759 | 8 | 0.01 | 1.11 | 6.06 | 2.08 | 8" PVC |
| SDCO A-33 (C-STRM) | 6,288.11 | SDCO A-32 (C-STRM) | 6,287.86 | 14.3 | 1.759 | 8 | 0.01 | 1.11 | 6.06 | 2.08 | 8" PVC |
| SD INLET A-41 (C-STRM) | 6,280.03 | SDMH A-40 (C-STRM) | 6,279.70 | 32.2 | 1 | 18 | 0.013 | 3.07 | 5.15 | 10.5 | 18" RCP |
| SDCO A-32 (C-STRM) | 6,287.53 | SDCO A-31 (C-STRM) | 6,286.97 | 74.2 | 0.75 | 12 | 0.01 | 1.1 | 4.36 | 4.01 | 12" PVC |
| SD INLET B-60 (C-STRM) | 6,289.21 | SDCO B-50 (C-STRM) | 6,287.99 | 35.1 | 3.498 | 12 | 0.01 | 0.14 | 4.13 | 8.66 | 12" PVC |
| SD INLET B-30 (C-STRM) | 6,285.85 | SDMH B-20 (C-STRM) | 6,283.88 | 163.8 | 1.203 | 18 | 0.013 | 6.92 | 3.92 | 11.52 | 18" RCP |
| SDMH B-20 (C-STRM) | 6,283.38 | MH-1 | 6,282.86 | 104.2 | 0.497 | 24 | 0.013 | 6.69 | 2.13 | 15.95 | 24" RCP |
| SDMH A-30 (C-STRM) | 6,276.85 | SD INLET A-20 (C-STRM) | 6,276.20 | 21.8 | 2.999 | 24 | 0.013 | 6.57 | 2.09 | 39.17 | 24" RCP |
| SD INLET A-20 (C-STRM) | 6,275.70 | SDMH A-10 (C-STRM) | 6,274.72 | 32.5 | 2.999 | 30 | 0.013 | 7.65 | 1.56 | 71.02 | 30" RCP |
| SDCO B-40 (C-STRM) | 6,286.87 | SD INLET B-30 (C-STRM) | 6,286.35 | 103.6 | 0.5 | 12 | 0.01 | 1.13 | 1.43 | 3.27 | 12" PVC |
| SDCO B-41 (C-STRM) | 6,287.75 | SDCO B-40 (C-STRM) | 6,287.37 | 38.3 | 1 | 6 | 0.01 | 0 | 0 | 0.73 | 6" PVC |
| SDCO B-42 (C-STRM) | 6,288.30 | SDCO B-41 (C-STRM) | 6,287.92 | 38.4 | 1 | 4 | 0.01 | 0 | 0 | 0.25 | 4" PVC |
| SDCO A-33A (C-STRM) | 6,288.30 | SDCO A-32 (C-STRM) | 6,288.19 | 10.8 | 1 | 4 | 0.01 | 0 | 0 | 0.25 | 4" PVC |




STORM LINE A PLAN




STORM LINE A PROFILE

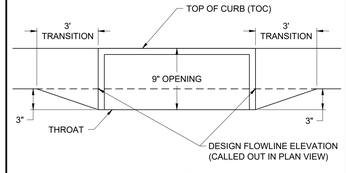
THIS LINE IS 1 INCH LONG WHEN PRINTED TO FULL SCALE

CITY CASE NUMBER - SIP-2026-001




NOTES:

1. SEE SHEET 02 FOR CIVIL NOTES AND LEGEND.
2. ALL EXISTING DRY UTILITIES ARE ASSUMED TO BE 3' DEEP TO TOP OF PIPE.
3. ALL EXISTING WATER LINES ARE ASSUMED TO BE 4.5' DEEP TO TOP OF PIPE.
4. THE CONTRACTOR SHALL POTHOLE ALL EXISTING UTILITY CROSSINGS PRIOR TO CONSTRUCTION AND NOTIFY THE ENGINEER OF ANY POTENTIAL CONFLICTS IMMEDIATELY.




TYPE R INLET ANNOTATION DETAIL

CITY DEVELOPMENT REVIEW ENGINEER

DATE

THESE CONSTRUCTION DRAWINGS HAVE BEEN REVIEWED BY THE CITY OF CASTLE PINES FOR * IMPROVEMENTS ONLY

* STREET AND DRAINAGE

PUBLIC WORKS ACCEPTANCE BLOCK


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303.499.7795

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Denver, CO 80237
303-741-3737
www.samiro.com


PROJECT 257483

**ADVENTHEALTH CASTLE PINES**

**CONSTRUCTION DOCUMENTS**

DATE 06/05/2026

REVISIONS

| | DESCRIPTION | DATE |
|---|---|---|

SHEET TITLE

STORM PLAN AND PROFILES

SHEET NUMBER

14


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ADVENTHEALTH CASTLE PINES


**DESIGN DEVELOPMENT PACKAGE**

DATE 07/17/2026

REVISIONS

| | DESCRIPTION | DATE |
|---|---|---|

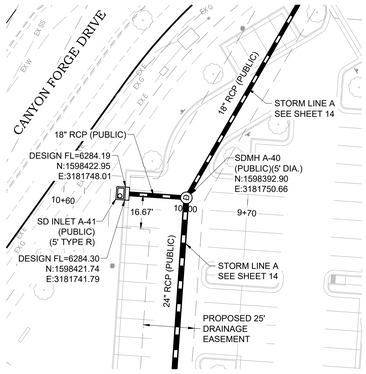

SHEET TITLE

STORM PLAN AND PROFILES

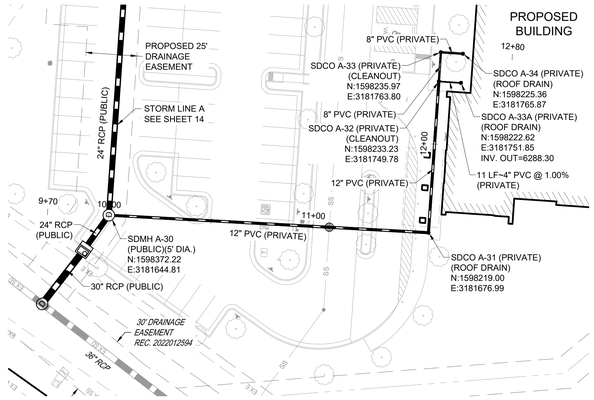

SHEET NUMBER

C-631

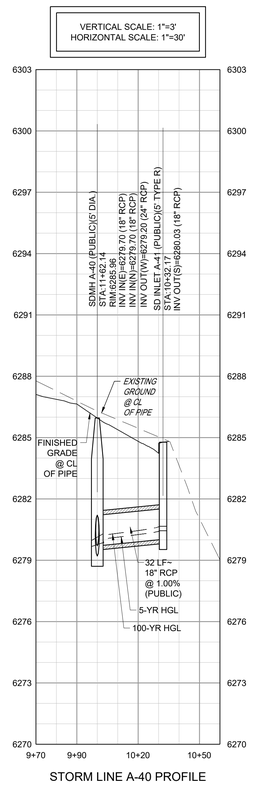

©BOULDER ASSOCIATES



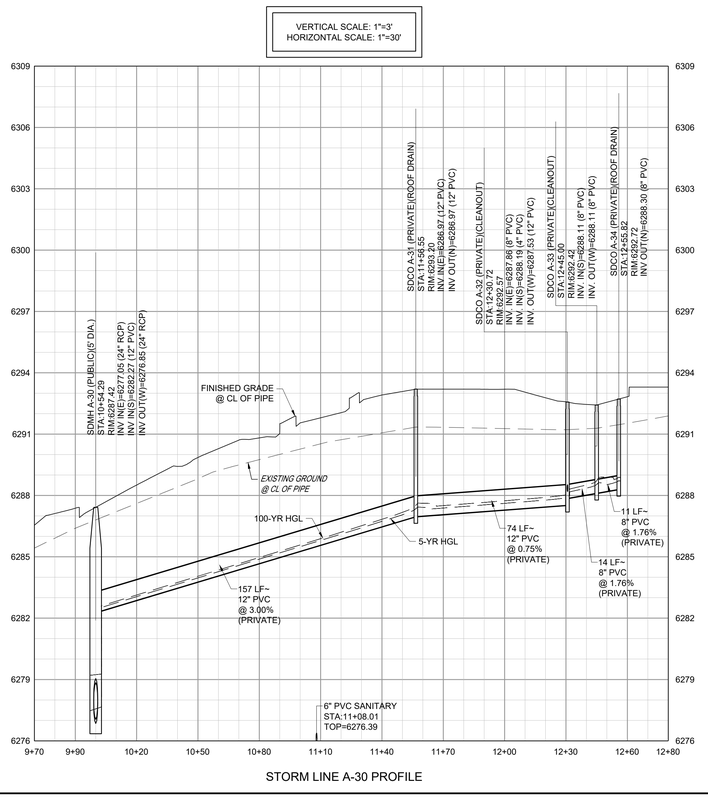

STORM LINE A-40 PLAN



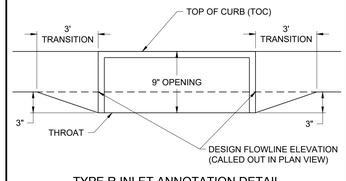

STORM LINE A-30 PLAN




STORM LINE A-40 PROFILE




STORM LINE A-30 PROFILE




TYPE R INLET ANNOTATION DETAIL




NOTES:

1. SEE SHEET 02 FOR CIVIL NOTES AND LEGEND.
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CITY CASE NUMBER - SIP-2026-001

CITY DEVELOPMENT REVIEW ENGINEER

DATE

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PROJECT 257483

**ADVENTHEALTH CASTLE PINES**

**CONSTRUCTION DOCUMENTS**

DATE 06/05/2026

REVISIONS

| # | DESCRIPTION | DATE |
|---|---|---|

SHEET TITLE

STORM PLAN AND PROFILES

SHEET NUMBER

15

PROJECT 257483

**ADVENTHEALTH CASTLE PINES**

**DESIGN DEVELOPMENT PACKAGE**

DATE 07/17/2026

REVISIONS

| # | DESCRIPTION | DATE |
|---|---|---|

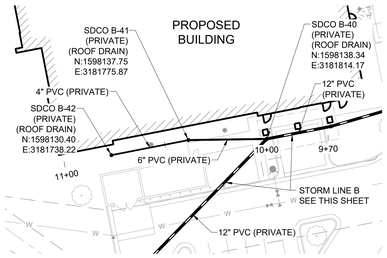
SHEET TITLE

STORM PLAN AND PROFILES

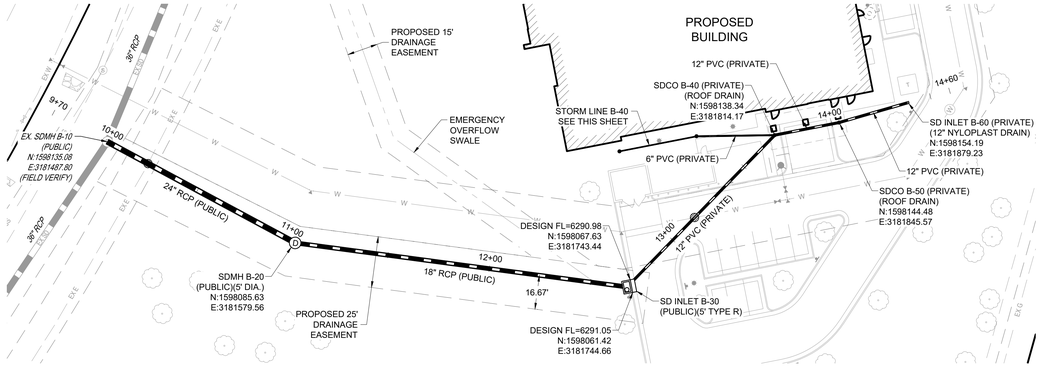
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C-632

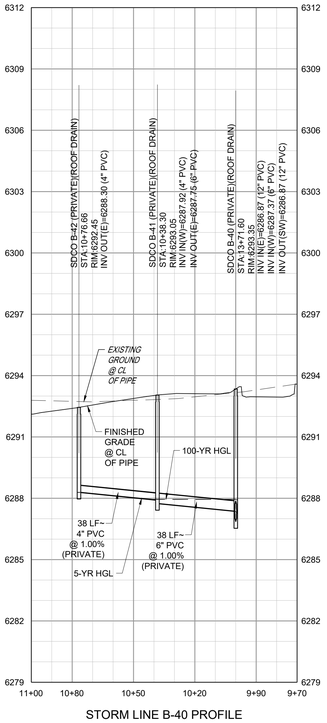
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@BOULDER ASSOCIATES



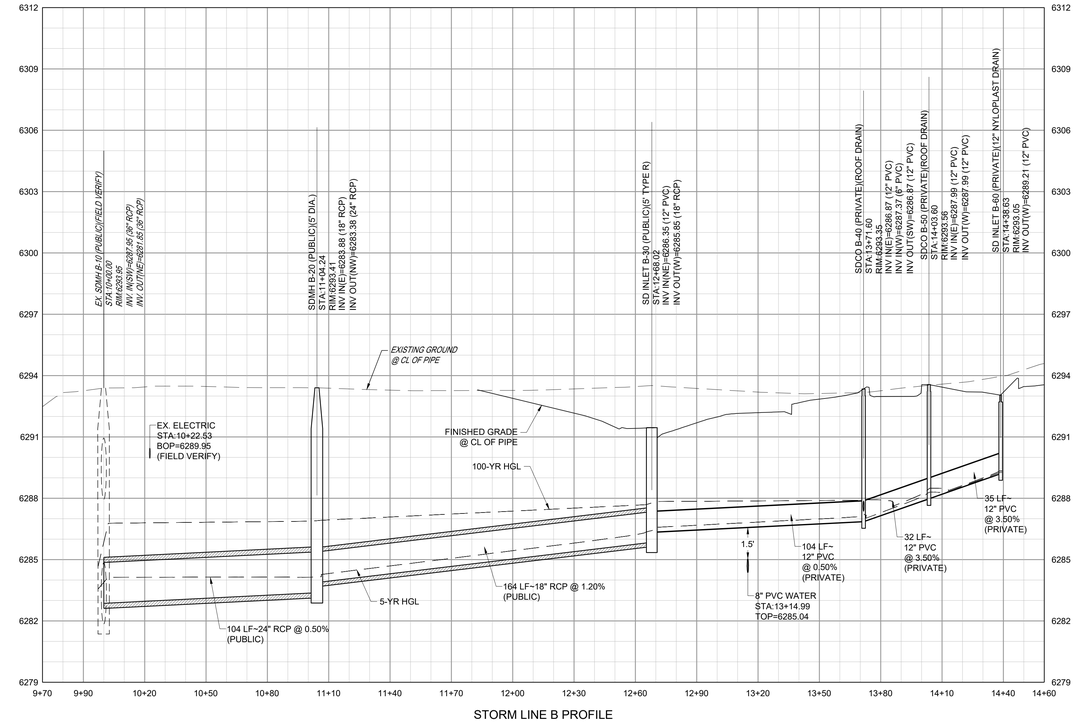

STORM LINE B-40 PLAN




STORM LINE B PLAN




STORM LINE B-40 PROFILE



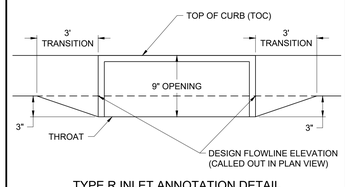

STORM LINE B PROFILE

CITY CASE NUMBER - SIP-2026-001




NOTES:

1. SEE SHEET 02 FOR CIVIL NOTES AND LEGEND.
2. ALL EXISTING DRY UTILITIES ARE ASSUMED TO BE 3' DEEP TO TOP OF PIPE.
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TYPE R INLET ANNOTATION DETAIL

CITY DEVELOPMENT REVIEW ENGINEER

DATE

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PROJECT 257483

**ADVENTHEALTH CASTLE PINES**

**CONSTRUCTION DOCUMENTS**

DATE 06/05/2026

REVISIONS

| # | DESCRIPTION | DATE |
|---|---|---|

SHEET TITLE

STORM PLAN AND PROFILES

SHEET NUMBER

16


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**ADVENTHEALTH CASTLE PINES**

**DESIGN DEVELOPMENT PACKAGE**

DATE 07/17/2026

REVISIONS

| # | DESCRIPTION | DATE |
|---|---|---|


SHEET TITLE

STORM PLAN AND PROFILES


SHEET NUMBER

C-633


THIS LINE IS 1 INCH LONG WHEN PRINTED TO FULL SCALE

©BOULDER ASSOCIATES

*MHFD-Inlet, Version 6.00 (August 2025)*

# INLET MANAGEMENT

**Project:** AdventHealth Castle Pines MOB
**Minor:** 5-year
**Major:** 100-year

Worksheet Protected

| **INLET NAME** | SD INLET A-20 | SD INLET A-41 |
|---|---|---|
| Inlet Application (Street or Area) | STREET | STREET |
| Hydraulic Condition | In Sump | In Sump |
| Inlet Type | CDOT Type R Curb Opening | CDOT Type R Curb Opening |
| Number of Inlet Units | 1 | 1 |

## USER-DEFINED INPUT

### User-Defined Peak Flows

| | | |
|---|---|---|
| Minor Peak Flow, Q (cfs) | 0.66 | 1.32 |
| Major Peak Flow, Q (cfs) | 1.51 | 3.04 |

### Bypass (Carry-Over) Flow from Upstream

Inlets must be organized from upstream (left) to downstream (right) in order for by

| | | |
|---|---|---|
| Receive Bypass Flow from: | | |
| Bypass Flow Description (Optional): | | |
| Minor Bypass Flow Received, $Q_b$ (cfs) | | |
| Major Bypass Flow Received, $Q_b$ (cfs) | | |

## CALCULATED OUTPUT

| | | |
|---|---|---|
| Minor Total Design Peak Flow, Q (cfs) | 0.66 | 1.32 |
| Major Total Design Peak Flow, Q (cfs) | 1.51 | 3.04 |
| Minor Inlet Interception Capacity, $Q_a$ (cfs) | 5.08 | 4.18 |
| Major Inlet Interception Capacity, $Q_a$ (cfs) | 12.22 | 11.57 |
| Minor Flow Bypassed Downstream, Qb (cfs) | N/A | N/A |
| Major Flow Bypassed Downstream, Qb (cfs) | N/A | N/A |
| Minor Flow Capture Percentage, C% | 100% | 100% |
| Major Flow Capture Percentage, C% | 100% | 100% |

*MHFD-Inlet, Version 6.00 (August 2025)*

# INLET MANAGEMENT

**Project:** AdventHealth Castle Pines MOB
**Minor:** 5-year
**Major:** 100-year

Worksheet Protected

| **INLET NAME** | SD INLET A-50 | SD INLET A-30 |
|---|---|---|
| Inlet Application (Street or Area) | STREET | STREET |
| Hydraulic Condition | On Grade | In Sump |
| Inlet Type | CDOT Type R Curb Opening | CDOT Type R Curb Opening |
| Number of Inlet Units | 1 | 1 |

**USER-DEFINED INPUT**

**User-Defined Peak Flows**

| | | |
|---|---|---|
| Minor Peak Flow, Q (cfs) | 1.66 | 1.77 |
| Major Peak Flow, Q (cfs) | 4.61 | 6.87 |

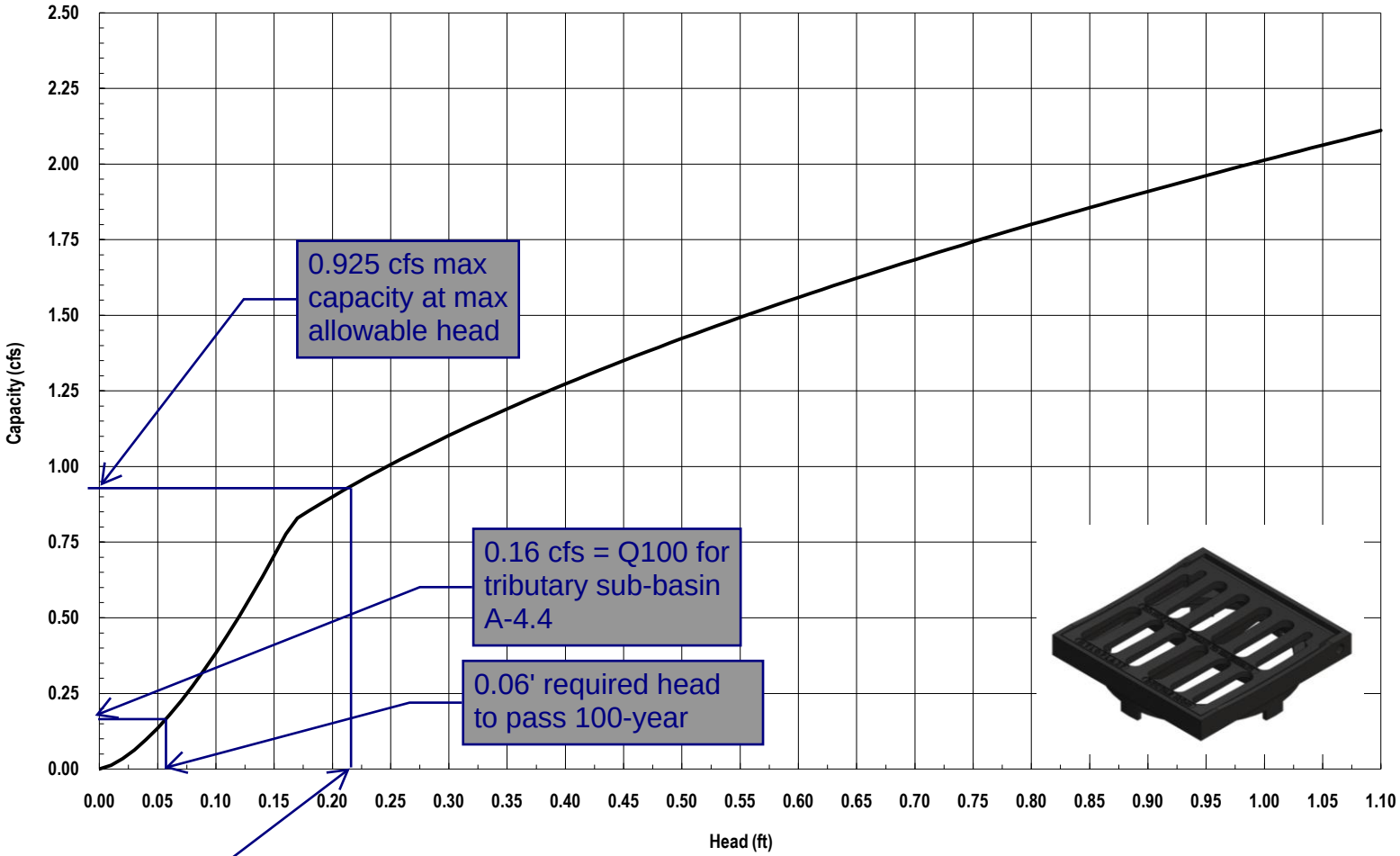
**Bypass (Carry-Over) Flow from Upstream** ypass flows to be linked.

| | | |
|---|---|---|
| Receive Bypass Flow from: | | |
| Bypass Flow Description (Optional): | | |
| Minor Bypass Flow Received, $Q_b$ (cfs) | | |
| Major Bypass Flow Received, $Q_b$ (cfs) | | |

**CALCULATED OUTPUT**

| | | |
|---|---|---|
| Minor Total Design Peak Flow, Q (cfs) | 1.66 | 1.77 |
| Major Total Design Peak Flow, Q (cfs) | 4.61 | 6.87 |
| Minor Inlet Interception Capacity, $Q_a$ (cfs) | 1.66 | 5.38 |
| Major Inlet Interception Capacity, $Q_a$ (cfs) | 4.56 | 11.52 |
| Minor Flow Bypassed Downstream, Qb (cfs) | 0.00 | N/A |
| Major Flow Bypassed Downstream, Qb (cfs) | 0.05 | N/A |
| Minor Flow Capture Percentage, C% | 100% | 100% |
| Major Flow Capture Percentage, C% | 99% | 100% |

# Nyloplast 12" Standard Grate Inlet Capacity Chart





Nyloplast®
3130 Verona Avenue • Buford, GA 30518
(866) 888-8479 / (770) 932-2443 • Fax: (770) 932-2490


© Nyloplast Inlet Capacity Charts June 2012

# Worksheet for Emergency Overflow Swale

| Project Description | |
|---|---|
| Friction Method | Manning Formula |
| Solve For | Normal Depth |

| Input Data | |
|---|---|
| Roughness Coefficient | 0.020 |
| Channel Slope | 0.52 % |
| Left Side Slope | 10.000 H:V |
| Right Side Slope | 10.000 H:V |
| Discharge | 7.62 cfs |

Q100 for sub-basin A-4.6

| Results | |
|---|---|
| Normal Depth | 6.9 in |
| Flow Area | 3.3 ft² |
| Wetted Perimeter | 11.5 ft |
| Hydraulic Radius | 3.4 in |
| Top Width | 11.46 ft |
| Critical Depth | 6.2 in |
| Critical Slope | 0.92 % |
| Velocity | 2.32 ft/s |
| Velocity Head | 0.08 ft |
| Specific Energy | 0.66 ft |
| Froude Number | 0.764 |
| Flow Type | Subcritical |

12' wide swale > wetted permiter

provides capacity greater than depth of flow

| GVF Input Data | |
|---|---|
| Downstream Depth | 0.0 in |
| Length | 0.0 ft |
| Number Of Steps | 0 |

| GVF Output Data | |
|---|---|
| Upstream Depth | 0.0 in |
| Profile Description | N/A |
| Profile Headloss | 0.00 ft |
| Downstream Velocity | 0.00 ft/s |
| Upstream Velocity | 0.00 ft/s |
| Normal Depth | 6.9 in |
| Critical Depth | 6.2 in |
| Channel Slope | 0.52 % |
| Critical Slope | 0.92 % |

**Appendix C**
**Referenced Information**
Surrounding Uses
FEMA Maps
Soil Survey
Douglas County Checklist
Subdivision Filing No. 2 (Master) Drainage Report Pages
Lot 1, Subdivision No. 3 (Life Time) Drainage Report Pages
Filing No. 2, Lot 1 and 2 (Greystar – Adult Living) Drainage Report Pages

## Filing No. 4

Preliminary Plan approved by City. Final Plat and other entitlements being processed. Developer expected to start construction on infrastructure by June 2024 and complete relocation by Q2 2025.

## For-Rent Affordable Housing

Owner: BMC Investments
Use: 100-unit affordable housing rental apartments.
Current Status: Plans to close in 2026.

## Service Station

Owner: Unknown
Use: Gas Station
Current Status: Expected to close in 2025.

## Havana Road

Road work ***north*** of Castle Pines Pkwy to commence in January 2025.

## Canyonside Marketplace

Master developer to submit preliminary plans (mixed-use development for 2 MSF) to the City for review by YE 2024.

## Life Time Fitness

Use: +/- 100,000 SF "Resort Style" fitness center
Current Status: Contractually obligated to break ground by Q4 2024

Lot back on the market.

## The Madison Apartments

Owner: BMC Investments
Use: 325-unit Conventional multifamily apartment community
Current Status: Delivered November 2022; in lease-up

## Filing 2: Lots 4 & 5

Under contract for single family detached for sale housing. Currently in the entitlement process with the City.

## Filing 2: Lot 3

Owner: Med Development
Use: Medical Office (+/- 80,000 SF)
Current Status: Land sold.

## Filing 2: Lots 1 & 2

Active construction for adult living facility.

## Filing 1: Lot 3

Owner: BMC Investments
Use: Build-to-rent (~86 units)
Current Status: Under contract; expected to close on land and start construction Q4 2024.

OPEN SPACE
LOT 2 3.8 AC 3.4 AC NET UNDER CONTRACT: AFFORDABLE MULTIFAMILY
TRACT C 3.5 AC DETENTION
LOT 1 3.7 AC 2.8 AC NET UNDER CONTRACT: GAS STATION
LOT 3 6.9 AC
LOT 4 2.1 AC 1.4 AC NET
LOT 6 2.4 AC 1.9 AC NET
Upstream point of existing stormwater infrastructure accounted for in master and proposed drainage report and calculations
CASTLE PINES PKWY
TRACT C 2.6 AC DETENTION
Proposed AH Castle Pines MOB site on Lot 3.
LOT 4 16.0 AC UNDER CONTRACT: RESIDENTIAL RENTAL
LOT 3 5.8 AC SOLD: MEDICAL OFFICE
OPEN SPACE 12.5 AC
LOT 2 2.1 AC UNDER CONTRACT: ACTIVE ADULT MULTI
LOT 1 2.6 AC UNDER CONTRACT: ACTIVE ADULT MULTI
CANYON FORGE
LOT 5 11.8 AC UNDER CONTRACT: RESIDENTIAL RENTAL
PA 2A-9 2.7 AC
PA 2A-8 1.6 AC
PA 2A-1 9.6 AC
PA 2A-10 1.8 AC
PA 2A-7 1.5 AC
CANYONSIDE BLVD
LOT 1 13.8 AC SOLD: LIFETIME FITNESS
PA 2A-13 6.6 AC
PA 2A-11 2.9 AC
PA 2A-6 2.7 AC
PA 2A-3 1.6 AC
PA 2A-2 3.4 AC
CANYON FORGE
PA 2A-12 1.8 AC
PA 2A-4 10.1 AC
0.8 AC PUBLIC SQUARE
PA 2A-5 2.5 AC
PA 2A-14 6.4 AC
PA 2A-15 2.6 AC
PA 2-B 11.7 AC
PARCEL 2-2 SUPERBLOCK NO.2 REPLAT
LOT 1 3.6 AC UNDER CONTRACT: FOOD HALL
OPEN SPACE 8.6 AC
CROSS CANYON TRAIL
LOT 3 17.6 AC UNDER CONTRACT: RESIDENTIAL RENTAL
LOT 2 17.3 AC SOLD: CANYONS APARTMENTS LLC
Newlin Gulch

LEGEND
- FILING 1
- FILING 2
- FILING 3
- FILING 4
- PLANNING AREA 2 (UNPLATTED)

canyonside™
CASTLE PINES · CO

BOULDER ASSOCIATES
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BOULDER, COLORADO 80302
303.499.7795

PROJECT 257483.00

# AH CASTLE PINES CANYONSIDE MOB

CONCEPT DESIGN PACKAGE

DATE 12/5/2025

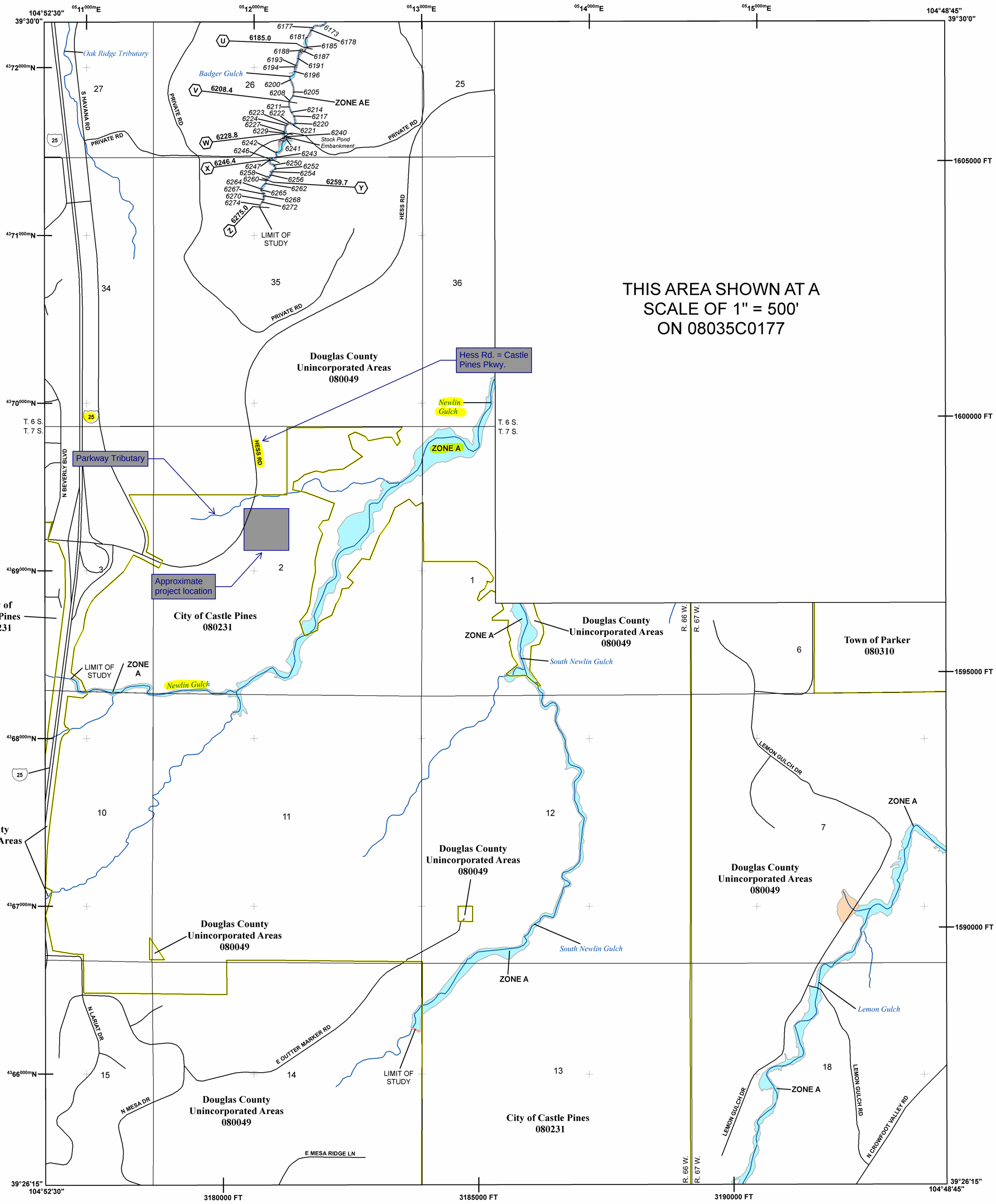
REVISIONS

| # | DESCRIPTION | DATE |
|---|---|---|

SHEET TITLE
**SURROUNDING USES**

SHEET NUMBER
**S100**

THIS DWG IS ARCHITECTURE MEASUREMENTS TO FULL SCALE
12/2/2025 12:44:23 PM
Autodesk Docs://257483.00 AdventHealth Castle Pines MOB R25/257483.00 A-Castle Pines Canyonside MOB - Core-Shell.rvt




## FLOOD HAZARD INFORMATION

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

THE INFORMATION DEPICTED ON THIS MAP AND SUPPORTING DOCUMENTATION ARE ALSO AVAILABLE IN DIGITAL FORMAT AT

HTTPS://MSC.FEMA.GOV

**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*

**OTHER AREAS**
- NO SCREEN — Areas of Minimal Flood Hazard *Zone X*
- Area of Undetermined Flood Hazard *Zone D*

**GENERAL STRUCTURES**
- Channel, Culvert, or Storm Sewer
- Accredited or Provisionally Accredited Levee, Dike, or Floodwall
- Non-accredited Levee, Dike, or Floodwall

**OTHER FEATURES**
- E 18.2 / 17.5 — Cross Sections with 1% Annual Chance Water Surface Elevation (BFE)
- 8 — Coastal Transect
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature
- 513 — Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary

## NOTES TO USERS

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

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

For community and countywide map dates refer to the Flood Insurance Study report for this jurisdiction.

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

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.

## SCALE

N

Map Projection:

NAD83 UTM Zone 13N
Western Hemisphere; Vertical Datum: NAVD88

1 inch = 1,000 feet 1:12,000

0 1,000 2,000 4,000 Feet

0 250 500 1,000 Meters

## PANEL LOCATOR







NATIONAL FLOOD INSURANCE PROGRAM
FLOOD INSURANCE RATE MAP

**DOUGLAS COUNTY, COLORADO**
And Incorporated Areas

PANEL 180 OF 495

FEMA

Panel Contains:

| COMMUNITY | NUMBER | PANEL | SUFFIX |
|---|---|---|---|
| CASTLE PINES, CITY OF | 080231 | 0180 | G |
| DOUGLAS COUNTY | 080049 | 0180 | G |
| PARKER, TOWN OF | 080310 | 0180 | G |

VERSION NUMBER
2.3.3.2

MAP NUMBER
08035C0180G

MAP REVISED
SEPTEMBER 4, 2020

# National Flood Hazard Layer FIRMette

FEMA

104°51'56"W 39°28'38"N




104°51'18"W 39°28'11"N

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

1:6,000

*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 2/27/2026 at 9:14 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

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.

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

# Custom Soil Resource Report for Castle Rock Area, Colorado




February 26, 2026

# Custom Soil Resource Report
## Soil Map




Map Scale: 1:1,370 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 20 40 80 120

Feet: 0 50 100 200 300

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

## MAP LEGEND

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

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

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

**Water Features**
- Streams and Canals

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

**Background**
- Aerial Photography

## MAP INFORMATION

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

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 |
|---|---|---|---|
| Fu | Fondis-Kutch association | 5.5 | 100.0% |
| **Totals for Area of Interest** | | **5.5** | **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
*Landscape:* Uplands
*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

*Landscape:* Uplands
*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

*Landscape:* Uplands
*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

# References

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## 4.4 Phase II Drainage Report and Plan

**4.4.1 Requirement for Phase II Drainage Report and Plan Submittal.** Submittal of a Phase II drainage report and plan is required with specific development or land use proposals, as generally outlined in Table 4-1. 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. All reports shall be prepared on 8-1/2"x11" paper and shall be bound. The drawings, figures, and tables shall be bound with the report or included in a pocket attached to the report. The report shall include a cover letter presenting the preliminary design for review and shall be certified by a Professional Engineer licensed in Colorado.

**4.4.2 Report Contents.** The Phase II drainage report generally consists of a narrative portion and appendices with supporting calculations and other pertinent information. The narrative shall lead the reader logically through the entire analysis and design process and provide a clear picture of all stormwater management issues. The narrative portion shall provide detailed discussion regarding the general location and description of the site, off-site and on-site drainage basins and sub-basins, drainage design criteria, stormwater management facility design, and conclusions, as provided in Sections II through V of the outline presented in this section. Discussion of methodology, assumptions, input, and a summary of results shall be provided in the narrative for all hydrologic or hydraulic modeling efforts. Peak flow rates, storage volumes, critical water surface elevations, and stormwater management facility sizes shall also be summarized or discussed in the report narrative. The appendices must provide the appropriate backup information and calculations, but the reader should not have to review information contained in the appendices to have a clear and thorough understanding of the project and the stormwater management analysis and facility designs.

The following is an outline of the **minimum** Phase II drainage report requirements:

I. COVER SHEET

A. Name of Project
B. Address
C. Owner
D. ~~Developer~~
E. Engineer
F. Submittal date and revision dates as applicable

Owner is the developer

II. GENERAL LOCATION AND DESCRIPTION

A. Site Location
   1. Site Vicinity Map
   2. Township, Range, Section, and ¼ Section

3. Existing and proposed streets, roadways, and highways adjacent to and within the proposed development, or within the area served by the proposed drainage improvements
4. Names of surrounding or adjacent developments, including land use or zoning information

B. Description of Property
   1. Area in Acres
   2. Ground cover, vegetation, site topography and slopes
   3. NRCS Soils Classification Map and discussion
   4. Major and minor drainageways
   5. Floodplains delineated by UDFCD FHAD studies or on FEMA FIRM Maps
   6. Existing irrigation canals or ditches
   7. Significant geologic features
   8. Proposed land use

III. DRAINAGE BASINS AND SUB-BASINS

A. Major Drainage Basins
   1. On-site and off-site major drainage basin characteristics and flow patterns and paths
   2. Existing and proposed land uses within the basins if known
   3. Discussion of all drainageway planning or floodplain delineation studies that affect the major drainageways, such as UDFCD FHAD Studies and Outfall System Planning studies
   4. Discussion of the condition of any channel within or adjacent to the development, including existing conditions, need for improvements, and impact on the proposed development
   5. Discussion of the impacts of the off-site flow patterns and paths, under fully developed conditions

B. Minor Drainage Basins
   1. On-site and off-site minor drainage basin characteristics and flow patterns and paths under historic and developed conditions
   2. Existing and proposed land uses within the basins
   3. Discussion of irrigation facilities that will influence or be impacted by the site drainage
   4. Discussion of the impacts of the off-site flow patterns and paths, under fully developed conditions

IV. DRAINAGE DESIGN CRITERIA

A. Regulations
   1. County criteria and optional provisions selected, when applicable
   2. *UDFCD Manual* criteria and optional provisions selected, when applicable

B. Drainage Studies, Outfall Systems Plans, Site Constraints
   1. Discuss previous drainage studies or master plans for the site or project that influence the stormwater facility design
   2. Discuss drainage studies for adjacent developments and how those developments affect the stormwater facility design
   3. Discuss UDFCD Outfall Systems Plans and how recommendations in those studies affect the design
   4. Discuss impacts to stormwater management facility design caused by site constraints, such as streets, utilities, light rail, rapid transit, existing structures, etc

C. Hydrology
   1. Runoff calculations method(s)
   2. Design storm recurrence intervals
   3. Design rainfall
   4. Detention storage calculation method(s)
   5. Detention storage release rate calculation method

D. Hydraulics
   1. Methods used to determine conveyance facility capacities
   2. Hydraulic grade line calculation method and discussion of loss coefficients
   3. Methods used to calculate water surface profile
   4. Detention pond routing

E. Water Quality Enhancement
   1. Discuss proposed Best Management Practices
   2. Identify design procedures

V. STORMWATER MANAGEMENT FACILITY DESIGN

A. Stormwater Conveyance Facilities
   1. Discuss general conveyance concepts
   2. Discuss proposed drainage paths and patterns
   3. Discuss storm sewer design, including inlet and pipe locations and sizes, tributary basins and areas, peak flow rates at design points, hydraulic grade lines, etc.
   4. Discuss storm sewer outfall locations and design, including method of energy dissipation
   5. Discuss how runoff is conveyed from all outfalls to the nearest major drainageway, including a discussion of the flow path and capacity downstream of the outfall to the nearest major drainageway
   6. Discuss open channel and swale designs, including dimensions, alignments, tributary basins and areas, peak flow rates at design points, stabilization and grade control improvements, low flow or trickle channel capacities, water surface elevations, etc
   7. Discuss allowable street capacities

8. Discuss maintenance aspects of the design and easements and tracts that are required for stormwater conveyance purposes
9. Discussion of the facilities needed off site for the conveyance of minor and major flows to the major drainageway

B. Stormwater Storage Facilities
   1. Discuss detention pond designs, including release rates, storage volumes and water surface elevations for the 2-year, 100-year and emergency overflow conditions, outlet structure design, emergency spillway design, etc
   2. Discuss pond outfall locations and design, including method of energy dissipation
   3. Discuss how runoff is conveyed from all pond outfalls and emergency spillways to the nearest major drainageway, including a discussion of the flow path and capacity downstream of the outfall to the nearest major drainageway
   4. Discuss maintenance aspects of the design and easements and tracts that are required for stormwater storage purposes

C. Water Quality Enhancement Best Management Practices
   1. Discuss the design of all structural water quality Best Management Practices, including tributary areas, sizing, treatment volumes, design features, etc
   2. Discuss how runoff is conveyed from all pond outfalls to the nearest major drainageway, including a discussion of the flow path and capacity downstream of the outfall to the nearest major drainageway
   3. Discuss the operation and maintenance aspects of the design and easements and tracts that are required for stormwater quality enhancement purposes

D. Floodplain Modification
   1. Discuss why the floodplain modifications are proposed
   2. Discuss the source of the floodplain information and level of detail (UDFCD Flood Hazard Area Delineation or FEMA Flood Insurance Rate Maps)
   3. Discuss details of floodplain modifications, including level of encroachment, velocities, depths, stabilization measures, water surface elevations, etc
   4. Discuss Conditional Letter or Map Revision (CLOMR) and Letter or Map Revision (LOMR) requirements
   5. Discuss County floodplain development regulations and Floodplain Development Permit

E. Additional Permitting Requirements
   1. Section 404 of the Clean Water Act
   2. The Endangered Species Act
   3. Other local, state, or federal requirements

F. General
   1. Discuss all tables, figures, charts, drawings, etc. that were used in design of stormwater management facilities and describe materials that are included in the appendix of the report

VI. CONCLUSIONS

A. Compliance with Standards
   1. Douglas County Criteria
   2. UDFCD Criteria
   3. Master Plans and UDFCD Outfall Systems Plans
   4. ~~Cherry Creek Reservoir Control Regulation No. 72~~
   5. ~~Chatfield Reservoir Control Regulation No. 73~~ N/A

B. Variances
   1. Identify provisions by section number for which a variance will be requested, or has been approved by the County (final version of Drainage Report). Additional information on variances is available in Chapter 1 General Provisions
   2. Provide justification for each variance request

C. Drainage Concept
   1. Discuss overall effectiveness of stormwater management design to properly convey, store and treat stormwater

VII. REFERENCES

Reference all criteria, master plans, reports or other technical information used in development of the concepts discussed in the drainage report

VIII. APPENDICES

A. Hydrologic Computations
   1. Determination of runoff coefficients and times of concentration
   2. Land use assumptions for off-site areas
   3. ~~Colorado Urban Hydrograph Procedure input parameter~~ determination N/A
   4. ~~UDSWM input parameter determination~~ N/A
   5. Peak flow rate calculations for the minor and major storms
   6. Rainfall information
   7. ~~CUHP/UDSWMM input and output~~ N/A
   8. Hydrograph data (if applicable)
   9. Connectivity diagram showing relationship/connectivity of basins, conveyance facilities, detention ponds, and design points

B. ~~Hydraulic Computations~~
   1. Culvert capacities N/A

2. Storm sewer capacities and hydraulic grade lines, including the loss coefficients
3. Street capacities
4. Inlet capacities
5. Open channel or swale capacities
6. ~~Low flow and trickle channels~~ N/A
7. ~~Stabilization and grade control improvements~~ N/A
8. Water surface profiles
9. ~~Stage-storage-discharge determination for detention ponds~~ N/A
10. ~~Detention pond routing calculations~~ N/A
11. ~~Emergency spillway sizing calculations~~
12. ~~Downstream/outfall capacity to the nearest major drainageway~~ N/A
13. ~~Energy dissipation at pipe outfalls~~ N/A

C. ~~Water Quality Enhancement Best Management Practices~~ N/A
   1. ~~Design and sizing~~ N/A

D. Referenced Information
   1. Copies of pertinent portions of all referenced materials or drainage reports

Note: Hydraulic computations will be required with the Phase II drainage report if the information necessary to perform the calculations is available. Availability of information will be determined by the Public Works Engineering staff, based on the level of detail contained in the application submitted to the Planning Division. Regardless of present availability, all hydraulic computations will be required in the Phase III drainage report.

**4.4.3 Certification Statement.** The report shall contain a certification page with the following statement:

"This report and plan for the Phase II drainage design of (Name of Development) was prepared by me (or under my direct supervision) in accordance with the provisions of Douglas County Drainage Design and Technical Criteria for the owners thereof. I understand that Douglas County does not and will not assume liability for drainage facilities designed by others."

SIGNATURE: _____
Registered Professional Engineer State
Of Colorado No. _____
(Affix Seal)

**4.4.4 Standard Forms.** Use appropriate copies of the County's standard forms and UDFCD design spreadsheets applicable to the design. When using County and UDFCD standard forms, charts, nomographs, etc., the form must be annotated as necessary to depict the specific information pertinent to the site. The engineer is required to show the appropriate information relative to the design and provide the lines, notes, etc. to depict how the design information was

arrived at. For example, when using street gutter capacity charts, a separate chart for each street section shall be submitted, with the specific street criteria highlighted and the final result circled. Forms that are copied out of the book without the appropriate annotations are not adequate.

**4.4.5 Checklists.** Design or report checklists as referenced in the individual sections of this ***Criteria***, and as available on the Douglas County website, must be completed and submitted with the drainage report. Appropriate notations shall be provided with the checklist to assist the reviewer in determining whether the design is complete (i.e., if a specific item is not addressed, an explanation should be provided). All design or report checklists that have been developed will be available on the Douglas County website. New and/or revised checklists will be added as they are developed.

**4.4.6 Phase II Drainage Plan Requirements.** The following is an outline of the **minimum** Phase II drainage plan requirements. All plans must be bound:

I. OVERALL DRAINAGE PLAN

A. 24" x 36" or 22" x 34" are acceptable size
B. Title block and legend
C. Show boundaries of entire development or project
D. Existing or proposed streets, roadways, or highways
E. Show limits of all major basins, including off-site basins where feasible
F. General drainage patterns and flow paths, including those entering and leaving the site
G. Topographic information with a 5-foot maximum contour interval
H. Identify existing and proposed stormwater management facilities, upstream, downstream, or within the site, which will provide a stormwater management function for the site
I. Overlay or figure showing layout of Detailed Drainage Plan sheets

II. DETAILED DRAINAGE PLANS

A. 24" x 36" or 22" x 34" are acceptable sizes
B. Title block and legend
C. Basin designations, design points, flow rates, volumes and release rates
D. Scale 1"=20' to 1"=100', as required to show sufficient detail
E. Existing (dashed or screened) and proposed (solid) contours with a 2-foot maximum contour interval. In terrain where the slope exceeds 15%, the maximum interval is 5-feet. Contours must extend a minimum of 100 feet beyond property lines and contour elevation labels must be included
F. Existing utilities and structures
G. All property lines and easements with type of easements noted
H. Adjacent developments or ownerships

I. Streets and roadways with Right-of-Way and flow line widths, type of curb and gutter or roadside swale, slopes flow directions, and crosspans
J. Drainage basin and sub-basin limits
K. Existing and proposed stormwater management facilities, including irrigation ditches, roadside swales, open channels and drainageways, storm sewer, culverts, detention ponds, water quality enhancement structures or features, etc. Information must be included regarding materials, sizes, shapes, and slopes
L. Proposed outfall points and existing or proposed facilities to convey runoff to the nearest major drainageway, without damage to downstream properties
M. Location and elevation of all existing and proposed 100-year floodplain boundaries, including the source of designation. All floodplain designations that exist for the site should be included (i.e. FEMA Flood Insurance Rate Maps, UDFCD Flood Hazard Area Delineation, and others) N/A
N. Summary runoff table

NOTE: The items listed above will be required with the Phase II drainage report or a written explanation as to why information cannot be provided.

**4.4.7 Master Plan of Drainage.** The Douglas County Subdivision Resolution makes reference to a Master Plan of Drainage in the Sketch Plan and Preliminary Plan discussion regarding procedures and submittal requirements, and that is reflected in Table 4-1. The Master Plan of Drainage shall be considered equivalent to a Phase I or Phase II drainage report for the Sketch Plan and Preliminary Plan submittals, respectively, and must meet those minimum requirements.

**4.4.8 "Transitional" Phase II Drainage Report.** The Phase II drainage report requirements may be reduced at the request of the applicant if there is uncertainty regarding the final developed characteristics of individual parcels, lots, or sites within the proposed development. There is frequently uncertainty with commercial and business park developments at the preliminary or final plat stage regarding the size and placement of buildings, the detailed lot or parcel grading, the extent of paved areas, and the location of local stormwater management facilities and detention facilities. As the individual lots or parcels develop, separate Phase III drainage reports are typically prepared as the site characteristics and layout, are determined. If a transitional Phase II drainage report is prepared for a development, the Phase II drainage report requirements shall be adhered to with the following exceptions or modifications:

1. Conservative assumptions may be made for areas where there is uncertainty regarding drainage factors related to the development of the site.
2. The level of detail may be reduced in the hydraulic and hydrologic analysis in areas where uncertainty exists.

# PHASE III DRAINAGE REPORT

FOR

## CANYONSIDE SUBDIVISION FILING NO. 2

## CASTLE PINES, COLORADO

PARCEL 4, THE CANYONS SUPERBLOCK PLAT NO. 2, A SUBDIVISION PLAT RECORDED AT RECEPTION NO. 2018040799, IN THE RECORDS OF THE DOUGLAS COUNTY CLERK AND RECORDER'S OFFICE, LYING WITHIN THE SOUTH HALF OF SECTION 2, TOWNSHIP 7 SOUTH, RANGE 67 WEST, OF THE SIXTH PRINCIPAL MERIDIAN,
CITY OF CASTLE PINES, COUNTY OF DOUGLAS, STATE OF COLORADO.

CASE NO. FLP-2021-002

Prepared for:

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CORE Project Number: 14-002-020

June 15, 2022

# APPROVAL BLOCKS

## ENGINEER'S STATEMENT:

This report and plan for the Phase III Drainage design of Canyonside Subdivision Filing No. 2 was prepared by me (or under my direct supervision) in accordance with the provisions of the City of Castle Pines Drainage Design and Technical Criteria for the owners thereof. I understand that the City of Castle Pines does not and will not assume liability for drainage facilities designed by others.

SIGNATURE: _____

Kevin Rohrbough, P.E.
Registered Professional Engineer
State of Colorado No. 48992

## OWNER/DEVELOPER'S STATEMENT:

North Canyons Development Company hereby certifies that the drainage facilities for Canyonside Subdivision Filing No. 2 shall be constructed according to the design presented in this report. I understand that the City of Castle Pines does not and will not assume liability for the drainage facilities designed and/or certified by my engineer and that The City of Castle Pines reviews drainage plans pursuant to Colorado Revised Statutes, Title 30, Article 28; but cannot, on behalf of Canyonside Subdivision Filing No. 2, guarantee that final drainage design review will absolve North Canyons Development Company and/or their successors and/or assigns of future liability for improper design. I further understand that approval for the final plat does not imply approval of my engineer's drainage design.

Lee Alpert
North Canyons Development Company, a Delaware limited liability company
By: Alpert Development Manager, LLC, its Manager
Authorized Signature

conveys flows to the north and discharges into proposed Pond F2. The pond releases into Parkway Tributary to the north.

Basin A-4 (area = 5.03 ac; 5-year runoff = 12.4 cfs; 100-year runoff = 29.1 cfs)

Consists of lot are. Runoff will surface flow to future internal storm sewer infrastructure and into the proposed storm sewer system at DP A4. The proposed storm sewer conveys flows to the north and discharges into proposed Pond F2. The pond releases into Parkway Tributary to the north.

Basin A-5 (area = 1.38 ac; 5-year runoff = 0.2 cfs; 100-year runoff = 3.7 cfs)

Consists of landscape area. Runoff will surface flow to a proposed grass lined swale that conveys flows to a Type C inlet in sump at DP A5. The proposed storm sewer conveys flows to the north and discharges into proposed Pond F2. The pond releases into Parkway Tributary to the north. In the event the inlet becomes clogged, overflow will overtop the curb to the north to the inlet at DP A6.

Basin A-6 (area = 0.89 ac; 5-year runoff = 1.7 cfs; 100-year runoff = 4.7 cfs)

Consists of roadway area and landscape area. Runoff will surface flow into the proposed roadway, where it is captured by a Type R inlet in sump at DP A6. The proposed storm sewer conveys flows to the north and discharges into proposed Pond F2. The pond releases into Parkway Tributary to the north. In the event the inlet becomes clogged, overflow will overtop the curb to the north to the inlet at DP A7.2.

Basin A-7.1 (area = 3.64 ac; 5-year runoff = 2.9 cfs; 100-year runoff = 13.0 cfs)

Consists of roadway area, landscape area, and open space. Runoff will surface flow into the proposed roadway, where it is captured by a Type R inlet on-grade at DP A7.1. In the 100-Year storm event, 3.0 cfs bypasses the on-grade inlet and is captured by a proposed Type R inlet in sump at DP 7.2, immediately downstream. The proposed storm sewer conveys flows to the north and discharges into proposed Pond F2. The pond releases into Parkway Tributary to the north.

Basin A-7.2 (area = 0.09 ac; 5-year runoff = 0.2 cfs; 100-year runoff = 0.6 cfs)

Consists of roadway area and landscape area. Runoff will surface flow into the proposed roadway, where it is captured by a Type R inlet in sump at DP A7.2. The proposed storm sewer conveys flows to the north and discharges into proposed Pond F2. The pond releases into Parkway Tributary to the north. In the event the inlet becomes clogged, overflow will overtop the curb to the north and surface drain into the proposed pond.

Basin A-8 (area = 4.94 ac; 5-year runoff = 6.9 cfs; 100-year runoff = 21.3 cfs)

Consists of gravel maintenance drive, concrete maintenance drive, and landscape area. The impervious calculations account for future commercial area and future roadway area.

# APPENDIX A

# HYDROLOGIC COMPUTATIONS

# CANYONSIDE SUBDIVISION FILING NO. 2

**CORE Project #:** 14-002-020

**Prepared By:** DJB

## PERCENT IMPERVIOUS CALCULATIONS

**-REFERENCE UDFCD Vol.1 RUNOFF Table 6-3**

| | | Combined Land Use Imperviousness | | | | Discrete Surface Material Imperviousness | | | | | Historic | | | Soil Type | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Mixed-Use | | | | Building/ Road | | | Landscape | | | | | | | |
| | | Maximum Density | High Density | Medium Density | Low Density | Roof/ Concrete Pavement | Asphalt/ Ponded Water | Gravel (Packed) | 2-7% Slope | >7% Slope | Open Space | | | Soil Type A Area | Soil Type B Area | Soil Type C Area |
| % Imperv. | | 95.00% | 85.00% | 75.00% | 65.00% | 90.00% | 100.00% | 40.00% | 2.00% | 2.00% | 2.00% | | | | | |
| | Design | | | | | | | | | | | Total | Percent | | | |
| BASIN | Point | Area | Area | Area | Area | Area | Area | Area | Area | Area | Area | Area | Impervious | Area | Area | |
| A-3 | A3 | - | 3.80 | - | - | - | - | - | - | - | - | 3.80 | 85.0% | - | - | 3.80 |
| A-4 | A4 | - | 5.03 | - | - | - | - | - | - | - | - | 5.03 | 85.0% | - | - | 5.03 |
| A-5 | A5 | - | - | - | - | - | - | - | 1.38 | - | - | 1.38 | 2.0% | - | - | 1.38 |
| A-6 | A6 | - | - | - | - | 0.17 | 0.40 | - | 0.32 | - | - | 0.89 | 62.7% | - | - | 0.89 |
| A-7.1 | A7.1 | - | 0.48 | - | - | 0.15 | 0.50 | - | 0.21 | - | 2.31 | 3.64 | 29.8% | - | - | 3.64 |
| A-7.2 | A7.2 | - | - | - | - | 0.02 | 0.06 | - | 0.02 | - | - | 0.09 | 80.8% | - | - | 0.09 |
| A-8 | A8 | - | 0.73 | - | - | 0.48 | 1.53 | - | 2.21 | - | - | 4.94 | 53.1% | - | - | 4.94 |
| A-9 | A9 | - | 12.05 | - | - | 0.30 | 1.64 | - | 11.46 | - | - | 25.44 | 48.6% | - | - | 25.44 |
| A-10 | A10 | - | - | - | - | 0.07 | 0.15 | - | 0.22 | - | - | 0.45 | 49.5% | - | - | 0.45 |
| A-11 | A11 | - | - | - | - | 0.07 | 0.15 | - | 0.21 | - | - | 0.43 | 51.3% | - | - | 0.43 |
| SUBTOTAL TO PROPOSED POND F2 | | - | 22.08 | - | - | 1.25 | 4.42 | - | 16.02 | - | 2.31 | 46.09 | 53.6% | - | - | 46.09 |
| | | | | | | | | | | | | | | | | |
| B-1 | B1 | - | - | - | - | 0.14 | 0.14 | - | 0.42 | - | - | 0.70 | 39.4% | - | - | 0.70 |
| E1A | 121 | - | - | - | - | 0.08 | 0.67 | - | 0.09 | - | 2.40 | 3.25 | 24.5% | - | - | 3.25 |
| E1C | 123 | - | - | - | - | 0.09 | 0.48 | - | 0.13 | - | 1.52 | 2.22 | 26.9% | - | - | 2.22 |
| SUBTOTAL TO EXISTING POND E1 | | - | - | - | - | 0.31 | 1.30 | - | 0.65 | - | 3.92 | 6.17 | 27.0% | - | - | 6.17 |
| FOR SEPARATE SYSTEM SIZING: Proposed condition: | | | | | | | | | | | | | | | | |
| A-8A | A8A | - | - | - | - | 0.01 | - | 0.06 | 0.37 | - | - | 0.44 | 8.5% | - | - | 0.44 |
| Future Condtion: | | | | | | | | | | | | | | | | |
| FU-8A | FU8A | - | - | - | - | 0.11 | 0.58 | - | 1.53 | - | - | 2.22 | 31.9% | - | - | 2.22 |
| Roadside Ditch: | | | | | | | | | | | | | | | | |
| OS-1 | O1 | - | - | - | - | - | - | - | 0.69 | - | - | 0.69 | 2.0% | - | - | 0.69 |

# CANYONSIDE SUBDIVISION FILING NO. 2

**CORE Project #:** 14-002-020

**Prepared By:** DJB

## *COMPOSITE DEVELOPED BASIN WEIGHTED "C" CALCULATIONS*

***-REFERENCE UDFCD Vol.1 RUNOFF Table 6-4***

*i* = % imperviousness/100 expressed as a decimal

$C_A$ = Runoff coefficient for NRCS HSG A soils

$C_B$ = Runoff coefficient for NRCS HSG B soils

$C_{CD}$ = Runoff coefficient for NRCS HSG C and D soils.

Natural Resource Conservation Service (NRCS)

**Table 6-4. Runoff coefficient equations based on NRCS soil group and storm return period**

| NRCS Soil Group | Storm Return Period | | | | | | |
|---|---|---|---|---|---|---|---|
| | 2-Year | 5-Year | 10-Year | 25-Year | 50-Year | 100-Year | 500-Year |
| A | $C_A = 0.84i^{1.302}$ | $C_A = 0.86i^{1.276}$ | $C_A = 0.87i^{1.232}$ | $C_A = 0.84i^{1.124}$ | $C_A = 0.85i+0.025$ | $C_A = 0.78i+0.110$ | $C_A = 0.65i+0.254$ |
| B | $C_B = 0.84i^{1.169}$ | $C_B = 0.86i^{1.088}$ | $C_B = 0.81i+0.057$ | $C_B = 0.63i+0.249$ | $C_B = 0.56i+0.328$ | $C_B = 0.47i+0.426$ | $C_B = 0.37i+0.536$ |
| C/D | $C_{C/D} = 0.83i^{1.122}$ | $C_{C/D} = 0.82i+0.035$ | $C_{C/D} = 0.74i+0.132$ | $C_{C/D} = 0.56i+0.319$ | $C_{C/D} = 0.49i+0.393$ | $C_{C/D} = 0.41i+0.484$ | $C_{C/D} = 0.32i+0.588$ |

| Total Weighted Runoff Coefficients, C | | | |
|---|---|---|---|
| 2-Year | 5-Year | 10-Year | 100-Year |
| 0.38 | 0.44 | 0.50 | 0.69 |

| Basin ID | % Imperv. | *i* | Soil Type | Runoff Coefficients, C | | | | Basin Area | Total Area | Weighted Runoff Coefficients, C | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 2-Year | 5-Year | 10-Year | 100-Year | | | 2-Year | 5-Year | 10-Year | 100-Year |
| A-3 | 85.0% | 0.85 | A | 0.68 | 0.70 | 0.71 | 0.77 | | 3.80 | 0.69 | 0.73 | 0.76 | 0.83 |
| | | | B | 0.69 | 0.72 | 0.75 | 0.83 | | | | | | |
| | | | C or D | 0.69 | 0.73 | 0.76 | 0.83 | 3.80 | | | | | |
| A-4 | 85.0% | 0.85 | A | 0.68 | 0.70 | 0.71 | 0.77 | | 5.03 | 0.69 | 0.73 | 0.76 | 0.83 |
| | | | B | 0.69 | 0.72 | 0.75 | 0.83 | | | | | | |
| | | | C or D | 0.69 | 0.73 | 0.76 | 0.83 | 5.03 | | | | | |
| A-5 | 2.0% | 0.02 | A | 0.01 | 0.01 | 0.01 | 0.13 | | 1.38 | 0.01 | 0.05 | 0.15 | 0.49 |
| | | | B | 0.01 | 0.01 | 0.07 | 0.44 | | | | | | |
| | | | C or D | 0.01 | 0.05 | 0.15 | 0.49 | 1.38 | | | | | |
| A-6 | 62.7% | 0.63 | A | 0.46 | 0.47 | 0.49 | 0.60 | | 0.89 | 0.49 | 0.55 | 0.60 | 0.74 |
| | | | B | 0.49 | 0.52 | 0.56 | 0.72 | | | | | | |
| | | | C or D | 0.49 | 0.55 | 0.60 | 0.74 | 0.89 | | | | | |
| A-7.1 | 29.8% | 0.30 | A | 0.17 | 0.18 | 0.20 | 0.34 | | 3.64 | 0.21 | 0.28 | 0.35 | 0.61 |
| | | | B | 0.20 | 0.23 | 0.30 | 0.57 | | | | | | |
| | | | C or D | 0.21 | 0.28 | 0.35 | 0.61 | 3.64 | | | | | |
| A-7.2 | 80.8% | 0.81 | A | 0.64 | 0.66 | 0.67 | 0.74 | | 0.09 | 0.65 | 0.70 | 0.73 | 0.82 |
| | | | B | 0.65 | 0.68 | 0.71 | 0.81 | | | | | | |
| | | | C or D | 0.65 | 0.70 | 0.73 | 0.82 | 0.09 | | | | | |
| A-8 | 53.1% | 0.53 | A | 0.37 | 0.38 | 0.40 | 0.52 | | 4.94 | 0.41 | 0.47 | 0.52 | 0.70 |
| | | | B | 0.40 | 0.43 | 0.49 | 0.68 | | | | | | |
| | | | C or D | 0.41 | 0.47 | 0.52 | 0.70 | 4.94 | | | | | |
| A-9 | 48.6% | 0.49 | A | 0.33 | 0.34 | 0.36 | 0.49 | | 25.44 | 0.37 | 0.43 | 0.49 | 0.68 |
| | | | B | 0.36 | 0.39 | 0.45 | 0.65 | | | | | | |
| | | | C or D | 0.37 | 0.43 | 0.49 | 0.68 | 25.44 | | | | | |

# CANYONSIDE SUBDIVISION FILING NO. 2

**CORE Project #:** 14-002-020

**Prepared By:** DJB

## *TIME OF CONCENTRATION CALCULATIONS*

***-REFERENCE UDFCD Vol.1 Section 2.4***

*NRCS Conveyance factors, K -REFERENCE UDFCD Vol.1 RUNOFF Table 6-2*

***SF-2***

| | | | | | |
|---|---|---|---|---|---|
| Heavy Meadow | 2.5 | Short Grass Pasture & Lawns | 7.0 | Grassed Waterway | 15.0 |
| Tillage/field | 5.0 | Nearly Bare Ground | 10.0 | Paved Area & Shallow Gutter | 20.0 |

| SUB-BASIN DATA | | | INITIAL / OVERLAND TIME | | | CHANNEL / TRAVEL TIME T(t) | | | | | | T(c) CHECK (URBANIZED BASINS) | | FINAL T(c) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DRAIN BASIN | AREA ac. | C(5) | Length ft. | Slope % | T(i) min | Length ft. | Slope % | Coeff. | Velocity fps | T(t) min. | COMP. T(c) | % IMPER-VIOUS | USDCM Eq . 6-5 | min. |
| A-3 | 3.80 | 0.73 | 50 | 9.0 | 2.3 | 936 | 3.5 | 20.0 | 3.8 | 4.2 | 6.4 | 85.0% | 15.5 | 6.4 |
| A-4 | 5.03 | 0.73 | 197 | 14.7 | 3.8 | 643 | 2.2 | 20.0 | 3.0 | 3.6 | 7.5 | 85.0% | 15.0 | 7.5 |
| A-5 | 1.38 | 0.05 | 75 | 17.3 | 6.4 | 686 | 4.2 | 7.0 | 1.4 | 7.9 | 14.3 | 2.0% | 31.7 | 14.3 |
| A-6 | 0.89 | 0.55 | 25 | 2.0 | 4.0 | 844 | 5.4 | 20.0 | 4.6 | 3.0 | 7.0 | 62.7% | 18.8 | 7.0 |
| A-7.1 | 3.64 | 0.28 | 209 | 17.2 | 8.4 | 893 | 5.3 | 20.0 | 4.6 | 3.2 | 11.6 | 29.8% | 25.8 | 11.6 |
| A-7.2 | 0.09 | 0.70 | 35 | 1.7 | 3.6 | 67 | 1.1 | 20.0 | 2.1 | 0.5 | 4.1 | 80.8% | 12.8 | 5.0 |
| A-8 | 4.94 | 0.47 | 300 | 8.7 | 9.7 | 140 | 22.1 | 7.0 | 3.3 | 0.7 | 10.4 | 53.1% | 17.3 | 10.4 |
| A-9 | 25.44 | 0.43 | 300 | 1.8 | 17.1 | 2000 | 5.0 | 20.0 | 4.5 | 7.5 | 24.5 | 48.6% | 27.2 | 24.5 |
| A-10 | 0.45 | 0.44 | 32 | 8.6 | 3.3 | 392 | 2.7 | 20.0 | 3.3 | 2.0 | 5.3 | 49.5% | 20.1 | 5.3 |
| A-11 | 0.43 | 0.46 | 23 | 2.1 | 4.3 | 394 | 2.8 | 20.0 | 3.4 | 2.0 | 6.3 | 51.3% | 19.7 | 6.3 |
| B-1 | 0.70 | 0.36 | 45 | 15.6 | 3.6 | 95 | 1.1 | 20.0 | 2.1 | 0.8 | 4.4 | 39.4% | 20.4 | 5.0 |
| E1A | 3.25 | 0.24 | 120 | 13.3 | 7.3 | 867 | 4.7 | 20.0 | 4.3 | 3.3 | 10.6 | 24.5% | 27.2 | 10.6 |
| E1C | 2.22 | 0.26 | 157 | 23.2 | 6.8 | 442 | 3.2 | 20.0 | 3.6 | 2.1 | 8.8 | 26.9% | 24.7 | 8.8 |
| A-8A | 0.44 | 0.11 | 168 | 16.1 | 9.3 | 120 | 7.1 | 10.0 | 2.7 | 0.8 | 10.1 | 8.5% | 25.3 | 10.1 |
| FU-8A | 2.22 | 0.30 | 300 | 8.7 | 12.3 | 307 | 2.0 | 20.0 | 2.8 | 1.8 | 14.1 | 31.9% | 23.3 | 14.1 |
| OS-1 | 0.69 | 0.05 | 35 | 11.4 | 5.0 | 700 | 4.3 | 7.0 | 1.4 | 8.1 | 13.1 | 2.0% | 31.7 | 13.1 |

# CANYONSIDE SUBDIVISION FILING NO. 2

**CORE Project #:** 14-002-020

**Prepared By:** DJB

## *RATIONAL METHOD PEAK RUNOFF*

**5-Year STORM** Rainfall Depth-Duration-Frequency (1-hr) = **1.12**

***SF-3***

*-REFERENCE UDFCD Vol.1 EQ 5-1 & EQ 6-1*

| BASIN INFORMATON | | | | DIRECT RUNOFF | | | |
|---|---|---|---|---|---|---|---|
| DESIGN POINT | DRAIN BASIN | AREA ac. | 5yr Runoff COEFF | T(c) min | C x A | I in/hr | Q cfs |
| A3 | A-3 | 3.80 | 0.73 | 6.4 | 2.78 | 3.54 | 9.84 |
| A4 | A-4 | 5.03 | 0.73 | 7.5 | 3.68 | 3.37 | 12.41 |
| A5 | A-5 | 1.38 | 0.05 | 14.3 | 0.07 | 2.60 | 0.18 |
| A6 | A-6 | 0.89 | 0.55 | 7.0 | 0.49 | 3.44 | 1.68 |
| A7.1 | A-7.1 | 3.64 | 0.28 | 11.6 | 1.02 | 2.85 | 2.91 |
| A7.2 | A-7.2 | 0.09 | 0.70 | 5.0 | 0.06 | 3.80 | 0.24 |
| A8 | A-8 | 4.94 | 0.47 | 10.4 | 2.32 | 2.99 | 6.93 |
| A9 | A-9 | 25.44 | 0.43 | 24.5 | 11.04 | 1.97 | 21.78 |
| A10 | A-10 | 0.45 | 0.44 | 5.3 | 0.20 | 3.74 | 0.74 |
| A11 | A-11 | 0.43 | 0.46 | 6.3 | 0.20 | 3.56 | 0.70 |
| B1 | B-1 | 0.70 | 0.36 | 5.0 | 0.25 | 3.80 | 0.95 |
| 121 | E1A | 3.25 | 0.24 | 10.6 | 0.76 | 2.96 | 2.26 |
| 123 | E1C | 2.22 | 0.26 | 8.8 | 0.57 | 3.18 | 1.80 |
| A8A | A-8A | 0.44 | 0.11 | 10.1 | 0.05 | 3.02 | 0.14 |
| FU8A | FU-8A | 2.22 | 0.30 | 14.1 | 0.66 | 2.61 | 1.7 |
| O1 | OS-1 | 0.69 | 0.05 | 13.1 | 0.04 | 2.71 | 0.1 |

# CANYONSIDE SUBDIVISION FILING NO. 2

**CORE Project #:** 14-002-020

**Prepared By:** DJB

## *RATIONAL METHOD PEAK RUNOFF*

## 100-YR STORM

***SF-3*** Rainfall Depth-Duration-Frequency (1-hr) = **2.31**

*-REFERENCE UDFCD Vol.1 EQ 5-1 & EQ 6-1*

| BASIN INFORMATON | | | | DIRECT RUNOFF | | | |
|---|---|---|---|---|---|---|---|
| DESIGN POINT | DRAIN BASIN | AREA ac. | 100YR RUNNOFF COEFF | T(c) min | C x A | I in/hr | Q cfs |
| A3 | A-3 | 3.80 | 0.83 | 6.4 | 3.16 | 7.29 | 23.08 |
| A4 | A-4 | 5.03 | 0.83 | 7.5 | 4.19 | 6.95 | 29.10 |
| A5 | A-5 | 1.38 | 0.49 | 14.3 | 0.68 | 5.36 | 3.65 |
| A6 | A-6 | 0.89 | 0.74 | 7.0 | 0.66 | 7.10 | 4.67 |
| A7.1 | A-7.1 | 3.64 | 0.61 | 11.6 | 2.21 | 5.88 | 13.00 |
| A7.2 | A-7.2 | 0.09 | 0.82 | 5.0 | 0.07 | 7.84 | 0.57 |
| A8 | A-8 | 4.94 | 0.70 | 10.4 | 3.46 | 6.16 | 21.34 |
| A9 | A-9 | 25.44 | 0.68 | 24.5 | 17.39 | 4.07 | 70.77 |
| A10 | A-10 | 0.45 | 0.69 | 5.3 | 0.31 | 7.72 | 2.37 |
| A11 | A-11 | 0.43 | 0.69 | 6.3 | 0.30 | 7.34 | 2.20 |
| B1 | B-1 | 0.70 | 0.65 | 5.0 | 0.45 | 7.84 | 3.53 |
| 121 | E1A | 3.25 | 0.58 | 10.6 | 1.90 | 6.11 | 11.58 |
| 123 | E1C | 2.22 | 0.59 | 8.8 | 1.32 | 6.55 | 8.66 |
| A8A | A-8A | 0.44 | 0.52 | 10.1 | 0.23 | 6.23 | 1.41 |
| FU8A | FU-8A | 2.22 | 0.61 | 14.1 | 1.36 | 5.39 | 7.35 |
| O1 | OS-1 | 0.69 | 0.49 | 13.1 | 0.34 | 5.59 | 1.91 |

# APPENDIX B

# HYDRAULIC COMPUTATIONS

AH MOB runoff summary table flow rate used these stormcad output tables

In lieu of previously applied drainage flows (pulled from drainage plan addition)

# STORMCAD OUTPUT TABLES

## 5-Year

### Conduit Table - Time: 0.00 hours

| Label | Start Node | Stop Node | Invert (Start) (ft) | Invert (Stop) (ft) | Length (ft) | Slope (ft/ft) | Diameter & Material | Manning's n | Flow (cfs) | Velocity (ft/s) | Hydraulic Grade Line (In) (ft) | Hydraulic Grade Line (Out) (ft) | Depth/Rise (%) | Is Culvert? | Ke |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P-101 | INL A11 | MH A2 | 6,304.51 | 6,301.33 | 106.0 | 0.030 | 36" RCP | 0.013 | 22.02 | 12.59 | 6,306.02 | 6,302.24 | 40.3 | False | 0.000 |
| P-102 | MH A2 | MH A3 | 6,296.47 | 6,288.22 | 294.8 | 0.028 | 36" RCP | 0.013 | 21.95 | 12.27 | 6,297.98 | 6,289.12 | 40.2 | False | 0.000 |
| P-105 | MH A3 | INL A5 | 6,282.06 | 6,272.13 | 354.8 | 0.028 | 36" RCP | 0.013 | 27.08 | 13.01 | 6,283.74 | 6,273.14 | 44.8 | False | 0.000 |
| P-108 | INL A5 | INL A6 | 6,268.73 | 6,266.73 | 71.3 | 0.028 | 36" RCP | 0.013 | 33.93 | 13.85 | 6,270.62 | 6,268.95 | 68.5 | False | 0.000 |
| P-111 | INL A7.1 | INL A7.2 | 6,267.95 | 6,266.93 | 34.1 | 0.030 | 18" RCP | 0.013 | 2.93 | 7.55 | 6,268.60 | 6,267.35 | 35.6 | False | 0.000 |
| P-114 | INL O1 | FES O1 | 6,275.51 | 6,273.94 | 157.2 | 0.010 | 15" RCP | 0.013 | 0.09 | 1.90 | 6,275.63 | 6,274.05 | 8.9 | False | 0.200 |
| P-109 | INL A6 | INL A7.2 | 6,266.53 | 6,265.43 | 40.1 | 0.027 | 36" RCP | 0.013 | 34.80 | 13.85 | 6,268.45 | 6,266.77 | 54.2 | False | 0.000 |
| P-110 | INL A7.2 | MH A4 | 6,260.88 | 6,259.60 | 46.5 | 0.028 | 36" RCP | 0.013 | 36.81 | 14.07 | | | 55.5 | False | 0.000 |
| P-112 | MH A4 | MH A5 | 6,251.10 | 6,249.30 | 65.4 | 0.028 | 36" RCP | 0.013 | 36.77 | 14.07 | | | 54.7 | False | 0.000 |
| P-113 | MH A5 | FB 1 | 6,245.19 | 6,243.54 | 60.0 | 0.028 | 36" RCP | 0.013 | 36.71 | 14.06 | | | 119.6 | False | 0.000 |
| P-65 | INL A8 | MH A6 | 6,248.26 | 6,247.11 | 95.7 | 0.012 | 18" RCP | 0.013 | 1.76 | 4.71 | 6,248.76 | 6,248.39 | 59.1 | False | 0.000 |
| P-66 | MH A6 | FB 2 | 6,246.91 | 6,242.88 | 114.5 | 0.035 | 18" RCP | 0.013 | 1.74 | 6.87 | 6,247.89 | 6,247.87 | 198.8 | False | 0.000 |
| P-84 | INL A9 | INL A10 | 6,309.26 | 6,307.35 | 63.7 | 0.030 | 36" RCP | 0.013 | 21.31 | 12.47 | 6,310.74 | 6,308.28 | 40.3 | True | 0.200 |
| P-85 | INL A10 | INL A11 | 6,306.35 | 6,305.34 | 33.5 | 0.030 | 36" RCP | 0.013 | 21.66 | 12.54 | 6,307.85 | 6,306.35 | 41.8 | False | 0.000 |
| P-115 | OS A1 | MH-A7 | 6,241.39 | 6,241.19 | 39.1 | 0.005 | 30" RCP | 0.013 | 0.70 | 2.50 | 6,241.66 | 6,241.46 | 10.7 | False | 0.000 |
| P-119 | MH-A7 | FES A2 | 6,236.50 | 6,236.32 | 36.9 | 0.005 | 30" RCP | 0.013 | 0.70 | 2.45 | 6,236.77 | 6,236.59 | 10.8 | False | 0.000 |

Higher than runoff summary table

**Outfall Table -** 8' drop in MH A4

| Label | Notes | Elevation (Invert) (ft) | Routed Flow (Total Out) (cfs) | Depth (ft) | Hydraulic Grade (ft) | System Flow Time (min) |
|---|---|---|---|---|---|---|
| FB 1 | FOREBAY | 6,243.54 | 36.65 | 4.33 | 6,247.87 | 26.903 |
| FB 2 | FOREBAY | 6,242.88 | 1.72 | 4.99 | 6,247.87 | 14.716 |
| FES A2 | 30" FES | 6,236.32 | 0.70 | 0.27 | 6,236.59 | 0.512 |
| FES O1 | 15" FES | 6,273.94 | 0.09 | 0.11 | 6,274.05 | 14.479 |

### Headwall Table - Time: 0.00 hours

| Label | Notes | Inlet Description | Local Rational Flow (cfs) | Hydraulic Grade Line (In) (ft) |
|---|---|---|---|---|
| INL A9 | 36" FES | Smooth tapered inlet throat | 21.31 | 6,311.43 |

# STORMCAD OUTPUT TABLES

## 100-Year

### Conduit Table - Time: 0.00 hours

| Label | Start Node | Stop Node | Invert (Start) (ft) | Invert (Stop) (ft) | Length (ft) | Slope (ft/ft) | Diameter & Material | Manning's n | Flow (cfs) | Velocity (ft/s) | Hydraulic Grade Line (In) (ft) | Hydraulic Grade Line (Out) (ft) | Depth/Rise (%) | Is Culvert? | Ke |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P-101 | INL A11 | MH A2 | 6,304.51 | 6,301.33 | 106.0 | 0.030 | 36" RCP | 0.013 | 71.80 | 17.22 | 6,307.19 | 6,303.18 | 75.5 | False | 0.000 |
| P-102 | MH A2 | MH A3 | 6,296.47 | 6,288.22 | 294.8 | 0.028 | 36" RCP | 0.013 | 71.64 | 16.75 | 6,299.15 | 6,289.97 | 73.8 | False | 0.000 |
| P-105 | MH A3 | INL A5 | 6,282.06 | 6,272.13 | 354.8 | 0.028 | 36" RCP | 0.013 | 83.71 | 17.33 | 6,284.86 | 6,276.32 | 116.5 | False | 0.000 |
| P-108 | INL A5 | INL A6 | 6,268.73 | 6,266.73 | 71.3 | 0.028 | 36" RCP | 0.013 | 102.23 | 14.46 | 6,275.02 | 6,273.34 | 215.0 | False | 0.000 |
| P-111 | INL A7.1 | INL A7.2 | 6,267.95 | 6,266.93 | 34.1 | 0.030 | 18" RCP | 0.013 | 13.17 | 7.45 | 6,271.53 | 6,270.99 | 254.7 | False | 0.000 |
| P-114 | INL O1 | FES O1 | 6,275.51 | 6,273.94 | 157.2 | 0.010 | 15" RCP | 0.013 | 1.90 | 4.58 | 6,2 | | 5 | False | 0.200 |
| P-109 | INL A6 | INL A7.2 | 6,266.53 | 6,265.43 | 40.1 | 0.027 | 36" RCP | 0.013 | 104.64 | 14.80 | 6,2 | | 5 | False | 0.000 |
| P-110 | INL A7.2 | MH A4 | 6,260.88 | 6,259.60 | 46.5 | 0.028 | 36" RCP | 0.013 | 113.57 | 17.81 | 6,2 | | | False | 0.000 |
| P-112 | MH A4 | MH A5 | 6,251.10 | 6,249.30 | 65.4 | 0.028 | 36" RCP | 0.013 | 113.46 | 17.81 | 6,254.04 | 6,252.02 | 94.2 | False | 0.000 |
| P-113 | MH A5 | FB 1 | 6,245.19 | 6,243.54 | 60.0 | 0.028 | 36" RCP | 0.013 | 113.31 | 17.82 | 6,248.13 | 6,246.26 | 94.3 | False | 0.000 |
| P-65 | INL A8 | MH A6 | 6,248.26 | 6,247.11 | 95.7 | 0.012 | 18" RCP | 0.013 | 7.37 | 6.91 | 6,249.31 | 6,248.46 | 80.0 | False | 0.000 |
| P-66 | MH A6 | FB 2 | 6,246.91 | 6,242.88 | 114.5 | 0.035 | 18" RCP | 0.013 | 7.31 | 10.32 | 6,247.96 | 6,243.51 | 56.0 | False | 0.000 |
| P-84 | INL A9 | INL A10 | 6,309.26 | 6,307.35 | 63.7 | 0.030 | 36" RCP | 0.013 | 69.51 | 17.09 | 6,311.91 | 6,309.25 | 75.9 | True | 0.200 |
| P-85 | INL A10 | INL A11 | 6,306.35 | 6,305.34 | 33.5 | 0.030 | 36" RCP | 0.013 | 70.66 | 17.18 | 6,309.02 | 6,307.40 | 78.7 | False | 0.000 |
| P-115 | OS A1 | MH-A7 | 6,241.39 | 6,241.19 | 39.1 | 0.005 | 30" RCP | 0.013 | 40.16 | 8.18 | 6,243.87 | 6,243.32 | 92.3 | False | 0.000 |
| P-119 | MH-A7 | FES A2 | 6,236.50 | 6,236.32 | 36.9 | 0.005 | 30" RCP | 0.013 | 40.16 | 8.18 | 6,238.98 | | | | 0.000 |

98.42cfs from runoff summary table addition

~15 cfs difference assumed due to pipe routing.

Higher than runoff summary table

~33cfs less than 1st and 2nd iteration of AH MOB's runoff summary table

pipe routing from this master report and from proposed plan utilized to reflect the more aggressive flow calculations

### Outfall Table - Time: 0.00 hours

| Label | Notes | Elevation (Invert) (ft) | Routed Flow (Total Out) (cfs) | Depth (ft) | Hydraulic Grade (ft) | System Flow Time (min) |
|---|---|---|---|---|---|---|
| FB 1 | FOREBAY | 6,243.54 | 113.18 | 2.72 | 6,246.26 | 26.560 |
| FB 2 | FOREBAY | 6,242.88 | 7.27 | 0.63 | 6,243.51 | 14.515 |
| FES A2 | 30" FES | 6,236.32 | 40.16 | 2.13 | 6,238.45 | 0.155 |
| FES O1 | 15" FES | 6,273.94 | 1.87 | 0.46 | 6,274.40 | 13.672 |

### Headwall Table - Time: 0.00 hours

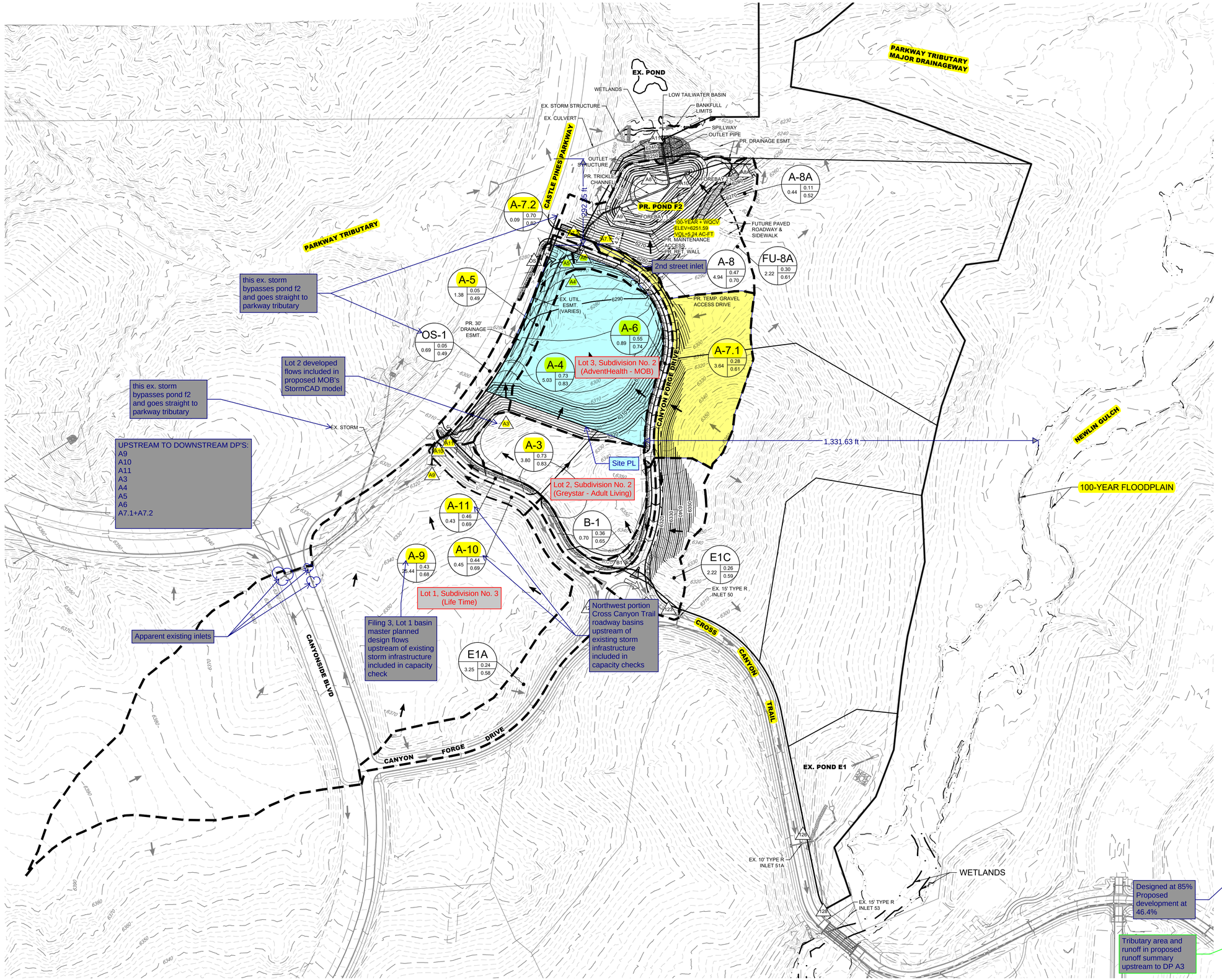
| Label | Notes | Inlet Description | Local Rational Flow (cfs) | Hydraulic Grade Line (In) (ft) |
|---|---|---|---|---|
| INL A9 | 36" FES | Smooth tapered inlet throat | 69.51 | 6,313.99 |

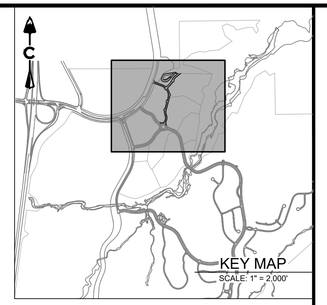
70.77cfs shown in runoff summary table

not clear where this delta is coming from.

# BACK POCKET

# PROPOSED DRAINAGE MAPS




0 150' 300'

1 inch = 150 ft.

## LEGEND

EXISTING / PROPOSED

- BASIN DESIGNATION
- 5 YEAR COEFFICIENTS / 100 YEAR COEFFICIENTS
- DESIGN POINT
- DIRECTIONAL FLOW ARROW
- EMERGENCY OVERFLOW ROUTE
- PROPOSED DRAINAGE BASIN
- EXISTING DRAINAGE BASIN
- PROPOSED MAJOR CONTOUR
- PROPOSED MINOR CONTOUR
- EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- EASEMENT
- RIGHT OF WAY (R.O.W.)
- CENTERLINE
- PROJECT BOUNDARY
- PROPOSED STORM & STUB OUT
- EXISTING STORM & STUB OUT
- STORM MANHOLES
- STORM INLETS
- FES, FOREBAY, & TRICKLE CHANNEL
- OUTLET STRUCTURE
- CRUSHER FINES MAINTENANCE ACCESS
- RIPRAP
- 100 YEAR FLOODPLAIN
- WETLAND
- LIMITS OF CONSTRUCTION
- RETAINING WALL
- DRAINAGE SWALE

## NOTES:

1. THE SITE DOES NOT CONTAIN THE 100-YEAR FLOODPLAIN.
2. ALL PROPOSED STORM IMPROVEMENTS ARE PRIVATE UNLESS OTHERWISE NOTED.
3. ALL PROPOSED STORM IMPROVEMENTS ARE DESIGNED FOR THE 5-YEAR (MINOR) AND 100-YEAR (MAJOR) STORM EVENTS UNLESS OTHERWISE NOTED.
4. STORM INFRASTRUCTURE IS SIZED TO ACCOUNT FOR THE FUTURE PAVED ROAD AND SIDEWALKS WITHIN BASIN A-8. THE FUTURE BASIN IS DESIGNATED FU-A8
5. BASIN A-8A IS A SUB-BASIN WITHIN BASIN A-8 BROKEN OUT TO SIZE THE TYP C INLET IN SUMP AT DP A8A.

**POND F2 SUMMARY TABLE**

| EVENT | WSE (FTMSL) | VOL (AC-FT) | MAX RELEASE (CFS) |
|---|---|---|---|
| WQCV | 6245.34 | 0.833 | 0.4 |
| EURV | 6247.97 | 2.352 | 0.7 |
| 100-YR | 6250.66 | 4.404 | 38.8 |

*AN EXTENDED DETENTION BASIN DESIGNED FOR FULL SPECTRUM DETENTION*

**RUNOFF SUMMARY TABLE**

DIRECT RUNOFF

| DESIGN POINT | BASIN | AREA (AC) | 5-Year RUNOFF (CFS) | 100-Year RUNOFF (CFS) |
|---|---|---|---|---|
| A3 | A-3 | 3.80 | 6.86 | 23.09 |
| A4 | A-4 | 5.03 | 12.41 | 29.10 |
| A5 | A-5 | 1.38 | 0.18 | 3.65 |
| A6 | A-6 | 0.89 | 1.68 | 4.67 |
| A7.1 | A-7.1 | 3.64 | 2.91 | 13.00 |
| A7.2 | A-7.2 | 0.09 | 0.24 | 0.57 |
| A8 | A-8 | 4.94 | 6.93 | 21.34 |
| A9 | A-9 | 26.44 | 21.73 | 76.77 |
| A10 | A-10 | 0.45 | 0.74 | 2.37 |
| A11 | A-11 | 0.43 | 0.70 | 2.26 |
| B1 | B-1 | 0.70 | 0.95 | 3.53 |
| 121 | E1A | 3.25 | 2.26 | 11.58 |
| 123 | E1C | 2.22 | 1.60 | 8.66 |
| A8A | A-8A | 0.44 | 0.14 | 1.41 |
| FU8A | FU-8A | 2.22 | 1.72 | 7.35 |
| O1 | OS-1 | 0.69 | 0.10 | 1.91 |


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| # | REVISION DESCRIPTION | DATE | BY |
|---|---|---|---|
| | ISSUED FOR APPROVAL | 06/14/22 | KR |

# CANYONSIDE SUBDIVISION FILING NO. 2

CASTLE PINES, COLORADO

PHASE III DRAINAGE REPORT
PROPOSED DRAINAGE MAP

NOT FOR CONSTRUCTION

DESIGNED BY: DJB
DRAWN BY: DJB
CHECKED BY: LAM

JOB NO. 14-002

SHEET 1 OF 1

6/14/2022 3:42 PM X:\14-002 CANYON FORGE EXTENSION\CIVIL\CAD\XREF\TITLERLOCKS24 X 36 TLB - DM.DWG

LT Report

# DRAINAGE REPORT

## FOR THE

## LIFE TIME - CASTLE PINES
## LOT 1
## CANYONSIDE SUBDIVISION NO. 3

## IN
## CITY OF CASTLE PINES, COLORADO

**Prepared For:**

**LTF REAL ESTATE COMPANY, INC.**
**2902 CORPORATE PLACE**
**CHANHASSEN, MN 55317**

**Prepared By:**

**COLLINS ENGINEERS, INC.**

**455 SHERMAN STREET, SUITE 160**
**DENVER, CO 80203**
**(303) 447-0090**
**ALEX SALTZGAVER**
**COLLINS JOB NO. 14504.04-25**

**January 10, 2025**
**Revised: February 12, 2025**
**April 8, 2025**

LT Report

LTF Real Estate Company, Inc. hereby certifies that the drainage facilities for the Life Time – Castle Pines site will be constructed according to the design presented in this report. I understand that the City of Castle Pines does not and shall not assume liability for the drainage facilities designed and/or certified by my engineer. I understand that the City of Castle Pines reviews drainage plans but cannot, on behalf of LTF Real Estate Company, Inc, guarantee that final drainage design review will absolve LTF Real Estate Company, Inc and/or their successors and/or assigns of future liability for improper design. I further understand that approval of the Plat and/or Development Permit does not imply approval of my engineer's drainage design.

Attest:

BROOKE L. BALLMAN
NOTARY PUBLIC
MINNESOTA
My Commission Expires Jan. 31, 2029

Brooke L Ballman
Notary Public

Christopher Ryan – Senior Associate General Counsel
Name of Responsible Party

Authorized Signature

ENGINEER'S CERTIFICATION

I hereby certify that this report (plan) for the final drainage design of Life Time – Castle Pines was prepared by me (or under my direct supervision) in accordance with the provisions of the City of Castle Pines Standards and Specifications for the Design and Construction of Public and Private Improvements for the Responsible Parties thereof. I understand that the City of Castle Pines does not and shall not assume liability for drainage facilities designed by others.

COLORADO LICENSED
ALEXANDER COX SALTZGAVER
48923
4/8/2025
PROFESSIONAL ENGINEER

Alex Saltzgaver, P.E.
Registered Professional Engineer
State of Colorado No. 48923

2. Existing soils were determined by the U.S. Department of Agriculture - Natural Resources Conservation Service. The soils have a rating of C and D, with 2.0% of the existing soil of the site being composed of Type D. Existing grades of the site are mainly moderately steep slopes ranging from 3 to 25%. Ground cover consists mostly of native grasses.

## II. DRAINAGE BASINS AND SUB-BASINS

### A. Major Drainage Basins

1. The project site is located in Flood Zone X: "Area of Minimal Flood Hazard" per FEMA Flood Map 08035C0180G.

2. On-Site Major Basins: The project site is part of two existing basins, F-2 and E-1, according to the Drainage Map from the Canyonside Preliminary Plan No. 1, Master Drainage Report (in Appendix E). Basin F-2 has been reassessed per the Canyonside Subdivision Filing No. 2, Phase III Drainage Report proposed drainage map and broken down into separate basins. The project site is now part of the proposed Basins A-9 and E1A per the Canyonside Subdivision Filing No. 2. A portion of the parcel to the west of the project site (Parcel 2) is also included in Basin A-9. This undeveloped portion of Basin A-9 currently flows to curb inlets in Canyonside Blvd, into the existing storm sewer under the road which outlets to the swale along the north portion of the Life Time site and ultimately to pond F-2. Capacity improvements for the storm sewer crossing Canyonside Blvd. have been completed by The Canyons. With future development this offsite area will likely continue to drain to the north under Castle Pines Parkway.

   Basin E1A includes the southern portion of the project site, according to the Drainage Map from the Canyonside Preliminary Plan No. 1, Master Drainage Report (in Appendix E). Runoff from this basin is collected in Pond E1.

   Parking and Access Drives, Landscaped Medians- Basin (A): Basin A consists of the paved parking lot, landscaped areas, and the access drives from Canyonside Boulevard, Canyon Forge Drive, and Cross Canyon Trail.

   Building and Pool Deck - Basin (B): Basin B consists of the proposed Life Time building, as well as the pool deck.

   Basins Flowing Off-site (O-1, O-2, O-3, O-4): The off-site basins consist of landscape and will not be picked up by the proposed on-site storm sewer conveyance system. Basins O-1 thru O-3 ultimately drain to pond F-2, while basin O-4 drains to pond E-1.

   Generally, the proposed stormwater drains from south to north across the site. Stormwater will be piped from the center of the proposed parking lot along the east access drive to the existing drainage swale located at the north of the site. From this drainage swale, stormwater will leave the project site through a modified impact stilling basin and into an existing area drain. This area drain connects to an existing 36" pipe that leads to Pond F2, located approximately 1300 feet northeast of the project site. This detention pond is designed as an

The below chart displays the allotted amount of imperviousness:

| Basin Name | Total Area in Basin: (ACRES) | Area of Project Site: (ACRES) | Allowable Imperviousness (Portion on project site): (%) | Proposed Imperviousness: (%) | Source: |
|---|---|---|---|---|---|
| A-9 | 26.25 | 12.05 | 85.0% | 67.93% | Canyonside Subdivision Filing No. 2 Phase III Drainage Report |
| **Basin Name** | **Total Area in Basin: (ACRES)** | **Area of Project Site: (ACRES)** | **Allowable Imperviousness (Overall Basin): (%)** | **Proposed Imperviousness: (%)** | **Source:** |
| E1A | 3.25 | 1.51 | 24.5% | 20.86% | Canyonside Subdivision Filing No. 2 Phase III Drainage Report |

A. Water Quality Enhancement Best Management Practices

Pond F-2 has been designed, constructed and approved to provide water quality enhancement and detention to the developed Life Time Site.

B. Floodplain Modification

No modifications have been made to the existing floodplain.

C. Additional Permitting Requirements

No additional permitting is required.

V. CONCLUSIONS

A. Compliance with Standards

The Final Drainage Report for the Life Time site was prepared in accordance with the Douglas County Storm Drainage Design and Technical Criteria Manual and Mile High Flood District's Urban Storm Drainage Criteria Manual.

This Drainage Report has discussed the on-site drainage improvements as well as offsite drainage facilities.

B. Variances

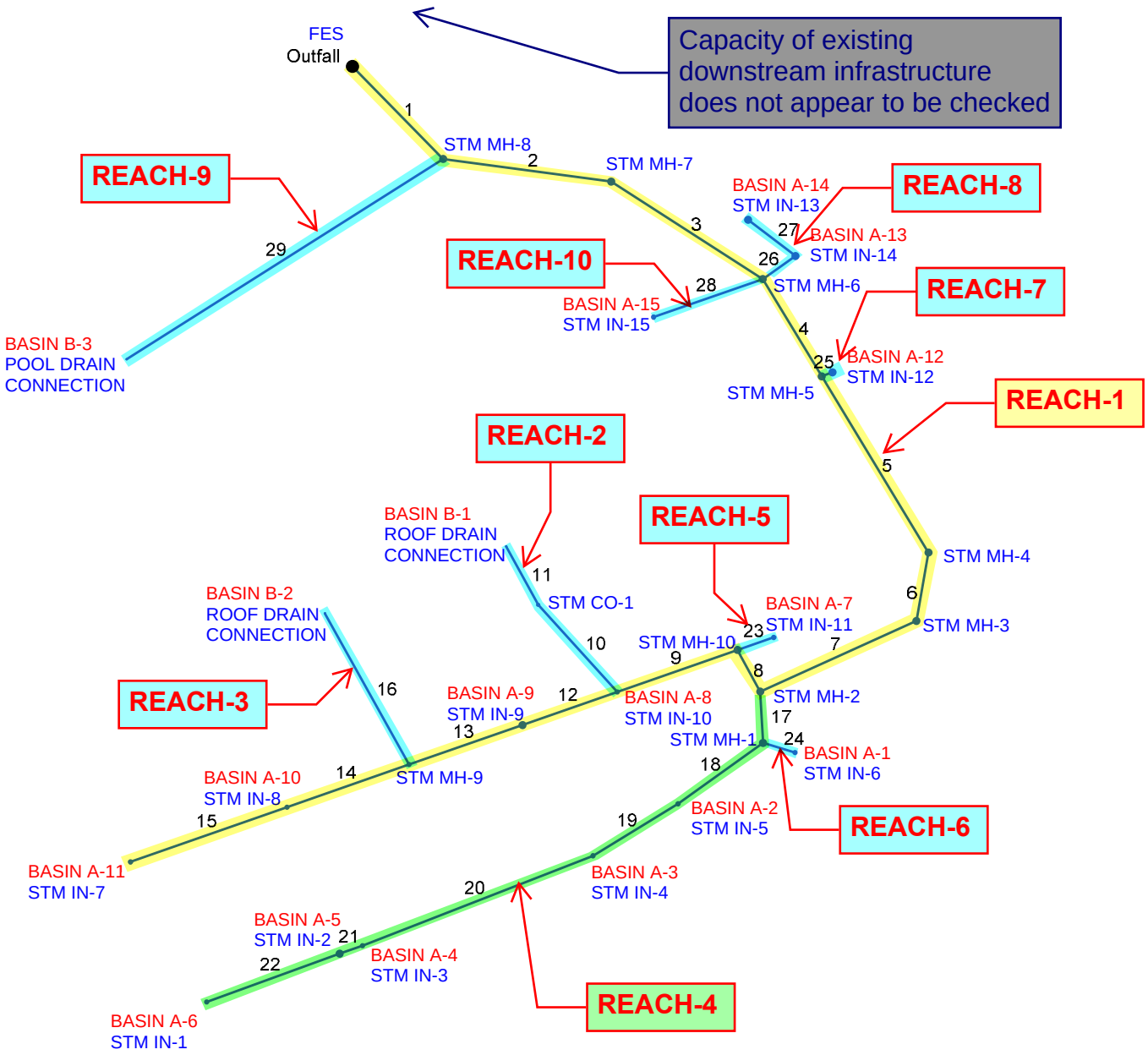
No variances are requested at this time.

APPENDIX C

**Hydraulic Computations**

# Hydraflow Storm Sewers Extension for Autodesk® Civil 3D® Plan

LT Report




| Project File: Castle Pines 2025 Hydraflow - 100YR_2025-01-09.stm | Number of lines: 29 | Date: 1/9/2025 |
|---|---|---|

APPENDIX D

**Final Drainage Map**

LT Report

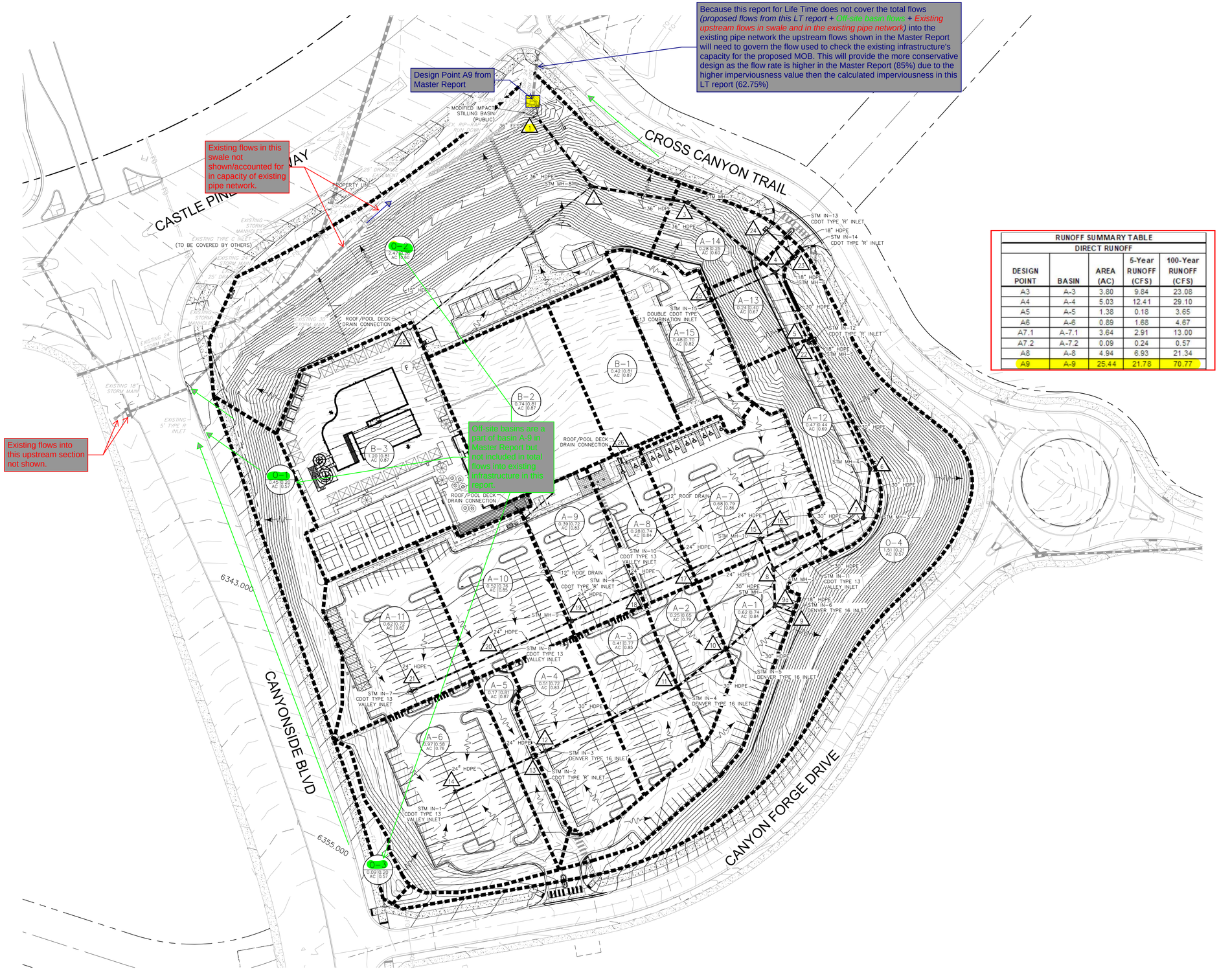
Because this report for Life Time does not cover the total flows *(proposed flows from this LT report + Off-site basin flows + Existing upstream flows in swale and in the existing pipe network)* into the existing pipe network the upstream flows shown in the Master Report will need to govern the flow used to check the existing infrastructure's capacity for the proposed MOB. This will provide the more conservative design as the flow rate is higher in the Master Report (85%) due to the higher imperviousness value then the calculated imperviousness in this LT report (62.75%)

Design Point A9 from Master Report

Existing flows in this swale not shown/accounted for in capacity of existing pipe network.

Existing flows into this upstream section not shown.

Off-site basins are a part of basin A-9 in Master Report but not included in total flows into existing infrastructure in this report.




| RUNOFF SUMMARY TABLE | | | | |
|---|---|---|---|---|
| DIRECT RUNOFF | | | | |
| DESIGN POINT | BASIN | AREA (AC) | 5-Year RUNOFF (CFS) | 100-Year RUNOFF (CFS) |
| A3 | A-3 | 3.80 | 9.84 | 23.08 |
| A4 | A-4 | 5.03 | 12.41 | 29.10 |
| A5 | A-5 | 1.38 | 0.18 | 3.65 |
| A6 | A-6 | 0.89 | 1.68 | 4.67 |
| A7.1 | A-7.1 | 3.64 | 2.91 | 13.00 |
| A7.2 | A-7.2 | 0.09 | 0.24 | 0.57 |
| A8 | A-8 | 4.94 | 6.93 | 21.34 |
| A9 | A-9 | 25.44 | 21.78 | 70.77 |

LEGEND

A = BASIN DESIGNATION
B = AREA IN ACRES
C = 5-YR "C"
100-YR "C"

DESIGN POINT DESIGNATION
PROPOSED BASIN BOUNDARY
EXISTING BASIN DELINEATION
PROPERTY LINE
EXISTING CONTOURS
PROPOSED CONTOURS
FLOW ARROW

| SUMMARY RUNOFF TABLE | | | |
|---|---|---|---|
| DESIGN POINT | AREA (AC) | TOTAL Q-5YR | TOTAL Q-100YR |
| 1 | – | 29.36 | 62.11 |
| 2 | – | 29.36 | 62.11 |
| 3 | – | 24.96 | 53.53 |
| 4 | – | 24.96 | 53.53 |
| 5 | – | 24.96 | 53.53 |
| 6 | – | 24.96 | 53.53 |
| 7 | – | 24.96 | 53.53 |
| 8 | – | 24.96 | 53.53 |
| 9 | 0.62 | 9.32 | 20.01 |
| 9a | – | 9.32 | 20.01 |
| 10 | 0.25 | 7.50 | 16.32 |
| 11 | 0.41 | 6.71 | 14.56 |
| 12 | 0.51 | 5.15 | 11.45 |
| 13 | 0.17 | 3.38 | 7.75 |
| 14 | 0.97 | 2.72 | 6.46 |
| 15 | – | 13.59 | 27.29 |
| 16 | 0.68 | 13.59 | 27.29 |
| 17 | 0.28 | 10.99 | 22.16 |
| 18 | 0.39 | 8.34 | 16.88 |
| 19 | – | 6.97 | 14.04 |
| 20 | 0.52 | 4.07 | 8.37 |
| 21 | 0.62 | 2.14 | 4.48 |
| 22 | 0.47 | 0.93 | 2.64 |
| 23 | 0.24 | 0.82 | 2.91 |
| 24 | 0.28 | 0.35 | 1.48 |
| 25 | 0.48 | 1.62 | 3.43 |
| 26 | 0.42 | 1.66 | 3.24 |
| 27 | 0.74 | 2.90 | 5.67 |
| 28 | 1.20 | 4.71 | 9.19 |

SCALE: 1" = 60'
60 40 30 20 10 0 20 40 60


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| REV. NO. | DATE | REVISIONS DESCRIPTION |
|---|---|---|

REVISIONS

LIFE TIME CASTLE PINES - DRAINAGE MAP

LIFE TIME - CASTLE PINES

CASTLE PINES, COLORADO

2024

drawn by: MAS
checked by: KNA
approved by:
QA/QC by:
project no.: 14504.04-25
drawing no.:
date: 11/14/2024


P:\25-CO\14504-Life Time\Work\04-Castle Pines (2024)\DWG\Plans\14504.04_Drainage Plan.dwg, 2/12/2025 3:32:47 PM, kelly.adams

APPENDIX E

**Previous Drainage Reports**

LT Report

Assumed 85% for parcel 3 per LT report markups on next sheet on the Master Drainage Plan.

Markups from LT report.

This is for undeveloped flows to the west.

## CANYONSIDE SUBDIVISION FILING NO. 2

**CORE Project #:** 14-002-020

**Prepared By:** DJB

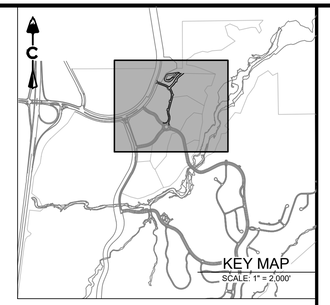
### PERCENT IMPERVIOUS CALCULATIONS

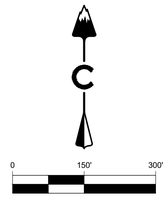
**-REFERENCE UDFCD Vol.1 RUNOFF Table 6-3**

| | | Combined Land Use Imperviousness | | | | Discrete Surface Material Imperviousness | | | | | Historic | | | Soil Type | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Mixed-Use | | | | Building/ Road | | | Landscape | | | | | | | |
| | | Maximum Density | High Density | Medium Density | Low Density | Roof/ Concrete Pavement | Asphalt/ Ponded Water | Gravel (Packed) | 2-7% Slope | >7% Slope | Open Space | | | Soil Type A Area | Soil Type B Area | Soil Type C Area |
| % Imperv. | | 95.00% | 85.00% | 75.00% | 65.00% | 90.00% | 100.00% | 40.00% | 2.00% | 2.00% | 2.00% | | | | | |
| | Design | | | | | | | | | | | Total | Percent | | | |
| BASIN | Point | Area | Area | Area | Area | Area | Area | Area | Area | Area | Area | Area | Impervious | Area | Area | |
| A-3 | A3 | - | 3.80 | - | - | - | - | - | - | - | - | 3.80 | 85.0% | - | - | 3.80 |
| A-4 | A4 | - | 5.03 | - | - | - | - | - | - | - | - | 5.03 | 85.0% | - | - | 5.03 |
| A-5 | A5 | - | - | - | - | - | - | - | 1.38 | - | - | 1.38 | 2.0% | - | - | 1.38 |
| A-6 | A6 | - | - | - | - | 0.17 | 0.40 | - | 0.32 | - | - | 0.89 | 62.7% | - | - | 0.89 |
| A-7.1 | A7.1 | - | 0.48 | - | - | 0.15 | 0.50 | - | 0.21 | - | 2.31 | 3.64 | 29.8% | - | - | 3.64 |
| A-7.2 | A7.2 | - | - | - | - | 0.02 | 0.06 | - | 0.02 | - | - | 0.09 | 80.8% | - | - | 0.09 |
| A-8 | A8 | - | 0.73 | - | - | 0.48 | 1.53 | - | 2.21 | - | - | 4.94 | 53.1% | - | - | 4.94 |
| A-9 | A9 | - | 12.05 | - | - | 0.30 | 1.64 | - | 11.46 | - | - | 25.44 | 48.6% | - | - | 25.44 |
| A-10 | A10 | - | - | - | - | 0.07 | 0.15 | - | 0.22 | - | - | 0.45 | 49.5% | - | - | 0.45 |
| A-11 | A11 | - | - | - | - | 0.07 | 0.15 | - | 0.21 | - | - | 0.43 | 51.3% | - | - | 0.43 |
| SUBTOTAL TO PROPOSED POND F2 | | - | 22.08 | - | - | 1.25 | 4.42 | - | 16.02 | - | 2.31 | 46.09 | 53.6% | - | - | 46.09 |
| | | | | | | | | | | | | | | | | |
| B-1 | B1 | - | - | - | - | 0.14 | 0.14 | - | 0.42 | - | - | 0.70 | 39.4% | - | - | 0.70 |
| E1A | 121 | - | - | - | - | 0.08 | 0.67 | - | 0.09 | - | 2.40 | 3.25 | 24.5% | - | - | 3.25 |
| E1C | 123 | - | - | - | - | 0.09 | 0.48 | - | 0.13 | - | 1.52 | 2.22 | 26.9% | - | - | 2.22 |
| SUBTOTAL TO EXISTING POND E1 | | - | - | - | - | 0.31 | 1.30 | - | 0.65 | - | 3.92 | 6.17 | 27.0% | - | - | 6.17 |
| | | | | | | | | | | | | | | | | |
| FOR SEPARATE SYSTEM SIZING: | | | | | | | | | | | | | | | | |
| Proposed condition: | | | | | | | | | | | | | | | | |
| A-8A | A8A | - | - | - | - | 0.01 | - | 0.06 | 0.37 | - | - | 0.44 | 8.5% | - | - | 0.44 |
| | | | | | | | | | | | | | | | | |
| Future Condtion: | | | | | | | | | | | | | | | | |
| FU-8A | FU8A | - | - | - | - | 0.11 | 0.58 | - | 1.53 | - | - | 2.22 | 31.9% | - | - | 2.22 |
| | | | | | | | | | | | | | | | | |
| Roadside Ditch: | | | | | | | | | | | | | | | | |
| OS-1 | O1 | - | - | - | - | - | - | - | 0.69 | - | - | 0.69 | 2.0% | - | - | 0.69 |

LT Report




## LEGEND

EXISTING / PROPOSED

- BASIN DESIGNATION
- 5 YEAR COEFFICIENTS / 100 YEAR COEFFICIENTS
- DESIGN POINT
- DIRECTIONAL FLOW ARROW
- EMERGENCY OVERFLOW ROUTE
- PROPOSED DRAINAGE BASIN
- EXISTING DRAINAGE BASIN
- PROPOSED MAJOR CONTOUR
- PROPOSED MINOR CONTOUR
- EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- EASEMENT
- RIGHT OF WAY (R.O.W.)
- CENTERLINE
- PROJECT BOUNDARY
- PROPOSED STORM & STUB OUT
- EXISTING STORM & STUB OUT
- STORM MANHOLES
- STORM INLETS
- FES, FOREBAY, & TRICKLE CHANNEL
- OUTLET STRUCTURE
- CRUSHER FINES MAINTENANCE ACCESS
- RIPRAP
- 100 YEAR FLOODPLAIN
- WETLAND
- LIMITS OF CONSTRUCTION
- RETAINING WALL
- DRAINAGE SWALE

## NOTES:

1. THE SITE DOES NOT CONTAIN THE 100-YEAR FLOODPLAIN.
2. ALL PROPOSED STORM IMPROVEMENTS ARE PRIVATE UNLESS OTHERWISE NOTED.
3. ALL PROPOSED STORM IMPROVEMENTS ARE DESIGNED FOR THE 5-YEAR (MINOR) AND 100-YEAR (MAJOR) STORM EVENTS UNLESS OTHERWISE NOTED.
4. STORM INFRASTRUCTURE IS SIZED TO ACCOUNT FOR THE FUTURE PAVED ROAD AND SIDEWALKS WITHIN BASIN A-8. THE FUTURE BASIN IS DESIGNATED FU-A8
5. BASIN A-8A IS A SUB-BASIN WITHIN BASIN A-8 BROKEN OUT TO SIZE THE TYP C INLET IN SUMP AT DP A8A.

| POND F2 SUMMARY TABLE | | | |
|---|---|---|---|
| EVENT | WSE (FT MSL) | VOL (AC-FT) | MAX RELEASE (CFS) |
| WQCV | 6245.34 | 0.833 | 0.4 |
| EURV | 6247.97 | 2.352 | 0.7 |
| 100-YR | 6251.16 | 4.844 | 40.16 |

***AN EXTENDED DETENTION BASIN DESIGNED FOR FULL SPECTRUM DETENTION***

| RUNOFF SUMMARY TABLE | | | | |
|---|---|---|---|---|
| DIRECT RUNOFF | | | | |
| DESIGN POINT | BASIN | AREA (AC) | 5-Year RUNOFF (CFS) | 100-Year RUNOFF (CFS) |
| A3 | A-3 | 3.80 | 9.84 | 23.08 |
| A4 | A-4 | 5.03 | 12.41 | 29.10 |
| A5 | A-5 | 1.38 | 0.18 | 3.65 |
| A6 | A-6 | 0.89 | 1.68 | 4.67 |
| A7.1 | A-7.1 | 3.64 | 2.91 | 13.00 |
| A7.2 | A-7.2 | 0.09 | 0.24 | 0.57 |
| A8 | A-8 | 4.94 | 6.93 | 21.34 |
| A9 | A-9 | 25.44 | 21.78 | 70.77 |
| A10 | A-10 | 0.45 | 0.74 | 2.37 |
| A11 | A-11 | 0.43 | 0.75 | 2.20 |
| B1 | B-1 | 0.70 | 0.95 | 3.53 |
| 121 | E1A | 3.25 | 2.26 | 11.58 |
| 123 | E1C | 2.22 | 1.60 | 8.66 |
| A8A | A-8A | 0.44 | 0.14 | 1.41 |
| FU8A | FU-8A | 2.22 | 1.72 | 7.35 |
| O1 | OS-1 | 0.69 | 0.10 | 1.91 |

Master Planned flow at most upstream point for underground pipe system which the proposed MOB will connect to.


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| # | REVISION DESCRIPTION | DATE | BY |
|---|---|---|---|
| 0 | ISSUED FOR APPROVAL | 04/06/22 | KR |

# CANYONSIDE SUBDIVISION FILING NO. 2

CASTLE PINES, COLORADO

PHASE III DRAINAGE REPORT
PROPOSED DRAINAGE MAP

NOT FOR CONSTRUCTION

DESIGNED BY: DJB
DRAWN BY: DJB
CHECKED BY: LAM

JOB NO. 14-002

SHEET 1 OF 1

4/6/2022 10:48 AM X:\14-002 CANYON FORGE EXTENSION\CIVIL\CAD\PLANS\DRAINAGE\PROPOSED DRAINAGE MAP.DWG

# PHASE III DRAINAGE REPORT

FOR

# Canyonside Subdivision Filing No. 2, Lot 1 and Lot 2 Douglas County, Castle Pines, Colorado

Prepared for:

**Greystar Development Central, LLC**
**Contact: Adam Lea**

Prepared by:

**Kimley-Horn and Associates, Inc.**
**2 North Nevada Avenue, Suite 900**
**Colorado Springs, Colorado 80903**
**Contact: Eric McDaniel, P.E.**

Kimley»Horn

Project #: 096433015
Prepared: March 25, 2025
Revised: June 9, 2925

## CERTIFICATION

### *ENGINEER'S CERTIFICATION STATEMENT*

I affirm that this report and plan for Canyonside Subdivision, Filing No. 2, Lot 1 and Lot 2 was prepared by me (or under my direct supervision) in accordance with the provisions of the City of Castle Pines Drainage Design and Technical Criteria for the owner thereof. I understand that the city of Castle Pines does not and will not assume liability for drainage facilities designed by others.




SIGNATURE: _____

Eric McDaniel, CO P.E. #58358 Date

### *DEVELOPER'S CERTIFICATION STATEMENT*

Greystar Development Central, LLC hereby certifies that the drainage facilities for Canyonside Subdivision, Filing No. 2, Lot 1 and Lot 2 shall be constructed according to the design presented in this report. I understand that Douglas County does not and will not assume liability for the drainage facilities designed and/or certified by my engineer and Douglas County reviews drainage plans pursuant to Colorado Revised Statues, Title 30, Article 28; but cannot, on behalf of Greystar Development Central, LLC, guarantee that final drainage design review will absolve Greystar Development Central, LLC and/or their successors and/or assigns of future liability for improper design. I further understand that approval of the final plat does not imply approval of my engineer's drainage design.

Greystar Development Central, LLC

Name of Developer

6/10/2025

Authorized Signature Date

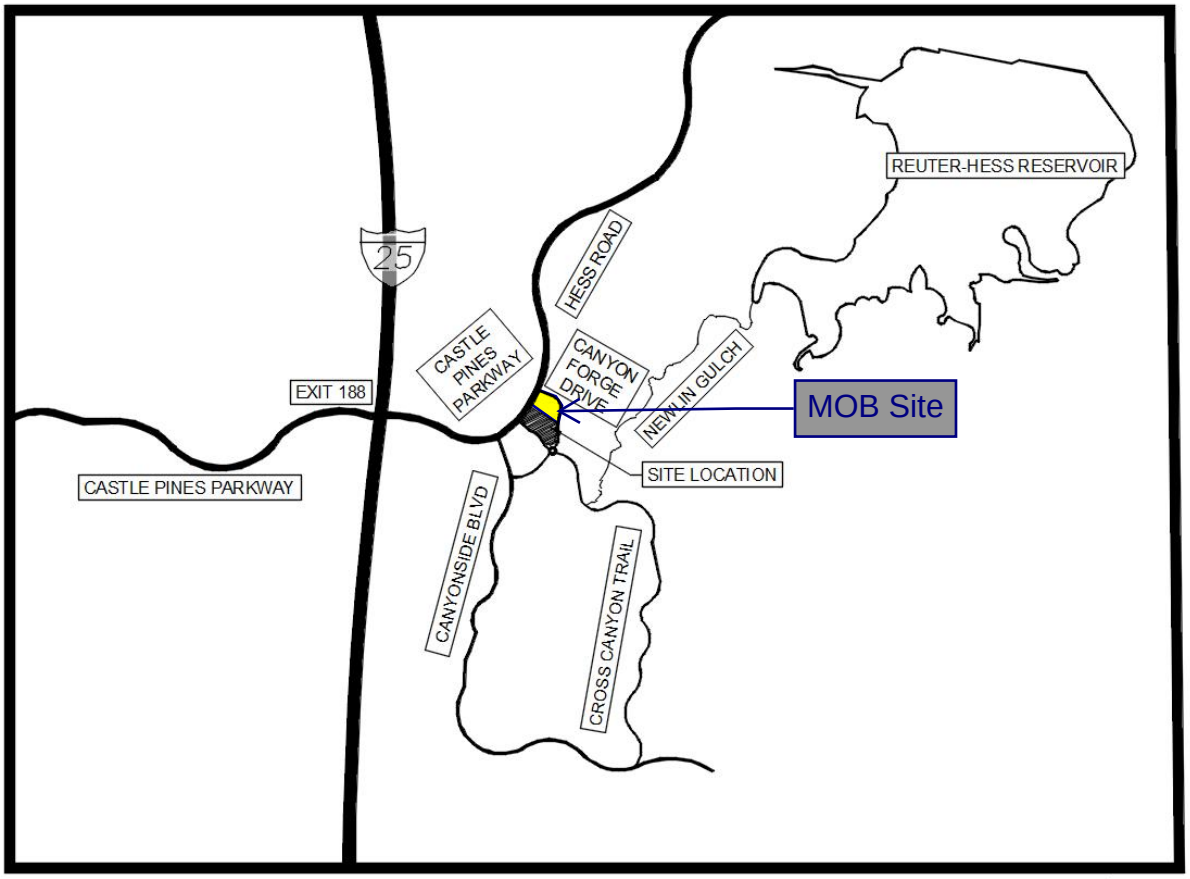
## GENERAL LOCATION AND DESCRIPTION

### *SITE LOCATION*

The purpose of this report is to outline the Phase III Drainage Report for a 164 unit multifamily apartment building for the 55+ community (the "Project") located in Lot 1 and Lot 2 of the Canyonside Subdivision, Filing No. 2 (the "Site"), City of Castle Pines (the "City"), Douglas County (the "County"), Colorado. The Project is located in the northwest 1/4 and southwest 1/4 of Section 2, Township 7 South, Range 67 West of the 6th PM.

The adjacent zoning land uses and roadways to the Project are listed below:

- North of Site: The Canyons Planned Development (PA3)
- West of Site: Castle Pines Parkway
- East of Site: Canyon Forge Drive
- South of Site: Cross Canyon Trail




VICINITY MAP

NOT TO SCALE

## DRAINAGE DESIGN CRITERIA

### *REGULATIONS*

The proposed storm facilities and drainage design follow the Douglas County Storm Drainage Design and Technical Criteria Manual (the "CRITERIA") and the Mile High Flood Control District Manual (the "MANUAL"). Site drainage is not significantly impacted by such constraints as utilities or existing development. Further detail regarding onsite drainage patterns is provided in the Stormwater Conveyance Facilities Section.

### *DRAINAGE STUDIES*

The Master Study and Master Drainage Report provide updated calculations for the downstream detention pond F2 and E1 and the tributary areas to these pond. The proposed drainage facilities for the Site are designed to follow the historic flow patterns of the Site as well as the intent of the original storm water design for the overall development. This Phase III Drainage Report is in general compliance with the Master Study and Master Drainage Report.

The Master Study calculated weighted percent impervious for the majority of the Site based on high-density mixed-use percent impervious values to account for future development of the Site. The Master Study weighted percent impervious for the tributary area (consisting mostly of Sub-basins A-3) to the extended basin F2 was 85.0%. The proposed project has a weighted imperviousness of 64.5% which is less than the calculated weighted imperviousness of the Master Study.

The Master Study proposed runoff coefficients for the tributary area (consisting mostly of Sub-basins A-3) to the extended detention basin F2 are 0.73 and 0.83 for the 5-year and 100-year, respectively. The proposed project runoff coefficients are 0.56 and 0.74 for the 5-year and 100-year respectively. This shows compliance with the Master Study.

Applicable portions of the Master Study and Master Drainage Report are included in the Appendix E for reference.

### *HYDROLOGIC CRITERIA*

The 5-year and 100-year design storm events were used in determining rainfall and runoff for the proposed drainage system per Chapter 6 of the CRITERIA. Table 6-1 of the CRITERIA is the source for rainfall data for the 5-year and 100-year design storm events. Design runoff was calculated using the Rational Method for developed conditions as established in the CRITERIA and MANUAL. Runoff coefficients for the proposed development were determined using Table 6-4 of the MANUAL by calculating weighted impervious values for each specific site basin. The 100-year detention and water quality capture volume are provided in the downstream detention basins F2 and E1. Based upon this approach, we feel that the drainage design provided for the Site is conservative and in keeping with the zoning and historic drainage concept for the area.

### *HYDRAULIC CRITERIA*

The proposed drainage facilities will be designed in accordance with the CRITERIA and MANUAL. Hydraulic calculations were computed using StormCAD and the Standard Step method and summarized in Appendix C. On-site runoff is routed to the existing detention basins

No DP where total flows join?

Appears to be in master basin A-5 but difference from master report isn't clear

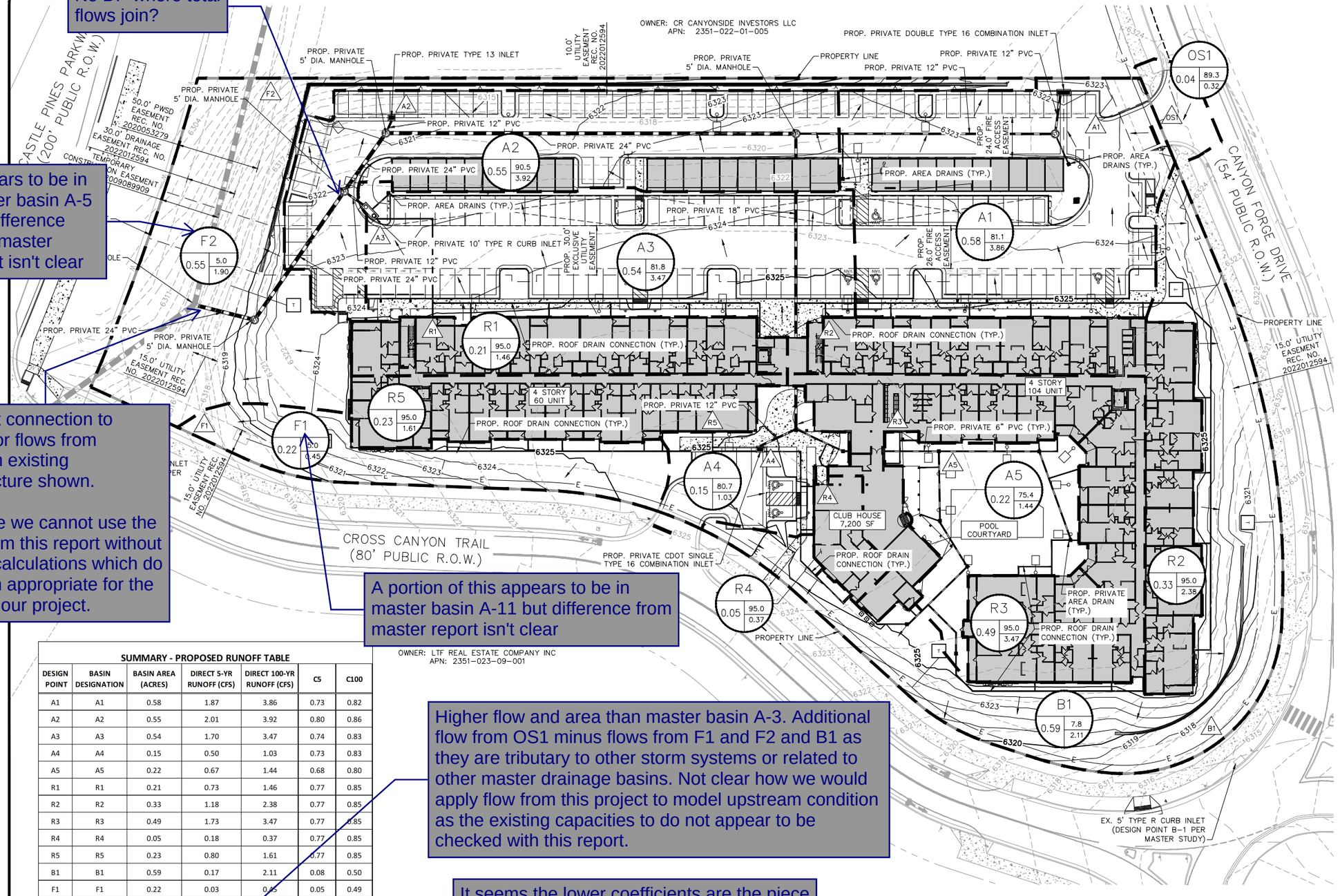
No DP at connection to existing or flows from upstream existing infrastructure shown.

Therefore we cannot use the runoff from this report without some recalculations which do not seem appropriate for the scope of our project.

A portion of this appears to be in master basin A-11 but difference from master report isn't clear

Higher flow and area than master basin A-3. Additional flow from OS1 minus flows from F1 and F2 and B1 as they are tributary to other storm systems or related to other master drainage basins. Not clear how we would apply flow from this project to model upstream condition as the existing capacities to do not appear to be checked with this report.

It seems the lower coefficients are the piece cited for compliance with the master report.




## LEGEND

- A = BASIN DESIGNATION
- B = AREA (ACRES)
- C = BASIN IMPERVIOUSNESS
- D = 100YR DESIGN STORM RUNOFF (CFS)
- EX# = # = DESIGN POINT
- FLOW DIRECTION
- PROPERTY BOUNDARY
- EASEMENT
- EXISTING STORM SEWER
- DRAINAGE BASIN BOUNDARY
- XXXX PROPOSED MAJOR CONTOUR
- XXXX PROPOSED MINOR CONTOUR
- XXXX EXISTING MAJOR CONTOUR
- XXXX EXISTING MINOR CONTOUR
- PROPOSED STORM SEWER
- PROPOSED CONCRETE PAN
- PROPOSED STORM INLET

## FEMA FLOODPLAIN STATEMENT

THE SUBJECT PROPERTY IS SITUATED IN FLOOD ZONE "X" ACCORDING TO FLOOD INSURANCE RATE MAP (FIRM) COMMUNITY PANEL NO. 08035C0180G WITH AN EFFECTIVE DATE OF SEPTEMBER 4, 2020.

**SUMMARY - PROPOSED RUNOFF TABLE**

| DESIGN POINT | BASIN DESIGNATION | BASIN AREA (ACRES) | DIRECT 5-YR RUNOFF (CFS) | DIRECT 100-YR RUNOFF (CFS) | C5 | C100 |
|---|---|---|---|---|---|---|
| A1 | A1 | 0.58 | 1.87 | 3.86 | 0.73 | 0.82 |
| A2 | A2 | 0.55 | 2.01 | 3.92 | 0.80 | 0.86 |
| A3 | A3 | 0.54 | 1.70 | 3.47 | 0.74 | 0.83 |
| A4 | A4 | 0.15 | 0.50 | 1.03 | 0.73 | 0.83 |
| A5 | A5 | 0.22 | 0.67 | 1.44 | 0.68 | 0.80 |
| R1 | R1 | 0.21 | 0.73 | 1.46 | 0.77 | 0.85 |
| R2 | R2 | 0.33 | 1.18 | 2.38 | 0.77 | 0.85 |
| R3 | R3 | 0.49 | 1.73 | 3.47 | 0.77 | 0.85 |
| R4 | R4 | 0.05 | 0.18 | 0.37 | 0.77 | 0.85 |
| R5 | R5 | 0.23 | 0.80 | 1.61 | 0.77 | 0.85 |
| B1 | B1 | 0.59 | 0.17 | 2.11 | 0.08 | 0.50 |
| F1 | F1 | 0.22 | 0.03 | 0.45 | 0.05 | 0.49 |
| F2 | F2 | 0.55 | 0.11 | 1.90 | 0.05 | 0.49 |
| OS1 | OS1 | 0.04 | 0.17 | 0.32 | 0.61 | 0.85 |
| Total | | 4.74 | 11.85 | 27.79 | 0.56 | 0.74 |

CANYONSIDE SUBDIVISION, FILING NO. 2, LOT 1 AND LOT 2
PROPOSED DRAINAGE MAP

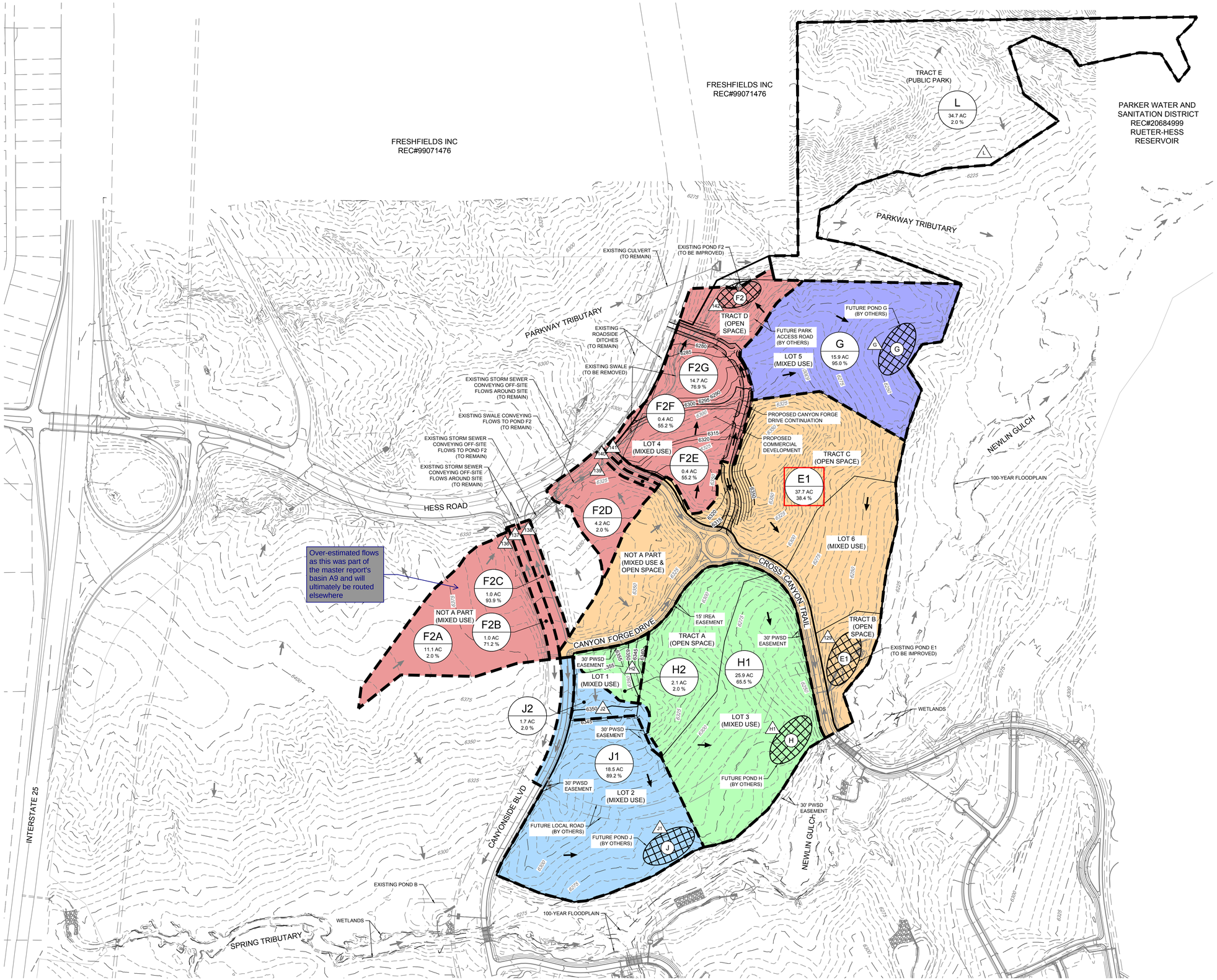
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PHONE: 719-453-0180

# BACK POCKET

## DRAINAGE MAP - INTERIM CONDITION – SHEET 1

## DRAINAGE MAP - FULL BUILD-OUT CONDITION – SHEET 2




0 250' 500'

1 inch = 250 ft.

## LEGEND

EXISTING / PROPOSED

- BASIN DESIGNATION
- AREA
- IMPERVIOUSNESS
- DESIGN POINT
- DIRECTIONAL FLOW ARROW
- EMERGENCY OVERFLOW ROUTE
- PROPOSED DRAINAGE BASIN
- EXISTING DRAINAGE BASIN
- 5280 PROPOSED MAJOR CONTOUR
- 5279 PROPOSED MINOR CONTOUR
- 5280 EXISTING MAJOR CONTOUR
- 5279 EXISTING MINOR CONTOUR
- EASEMENT
- RIGHT OF WAY (R.O.W.)
- CENTERLINE
- PROJECT BOUNDARY
- PROPOSED STORM & STUB OUT
- EXISTING STORM & STUB OUT
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- STORM INLETS
- FES, FOREBAY, & TRICKLE CHANNEL
- OUTLET STRUCTURE
- CRUSHER FINES MAINTENANCE ACCESS
- RIPRAP
- 100 YEAR FLOODPLAIN
- WETLAND
- LIMITS OF CONSTRUCTION
- RETAINING WALL
- DRAINAGE SWALE

## NOTES:

1. THE POND VOLUMES SHOWN ARE THE LARGER OF THE VALUES DETERMINED BY COMPARING THE INTERIM AND FULL BUILD-OUT CONDITION.
2. THE SITE DOES NOT CONTAIN THE 100-YEAR FLOODPLAIN.
3. THERE ARE NO ANTICIPATED IMPACTS TO THE 100-YEAR FLOODPLAIN OR DELINEATED WETLANDS.

POND SUMMARY TABLE

| POND | 100-YEAR VOLUME (AC-FT) | 100-YEAR MAX RELEASE (CFS) | DETERMINING CONDITION |
|---|---|---|---|
| E1 | 3.18 | 68.8 | INTERIM |
| F2 | 2.94 | 43.2 | FULL BUILD-OUT |
| G | 2.74 | 28.9 | NO CHANGE |
| H | 3.23 | 48.1 | INTERIM |
| J | 3.00 | 32.9 | INTERIM |


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| # | REVISION DESCRIPTION | DATE | BY |
|---|---|---|---|
| A | 1ST SUBMITTAL FOR REVIEW | 08/28/20 | KR |
| B | 2ND SUBMITTAL FOR REVIEW | 10/30/20 | KR |

**CANYONSIDE**
CITY OF CASTLE PINES, COLORADO

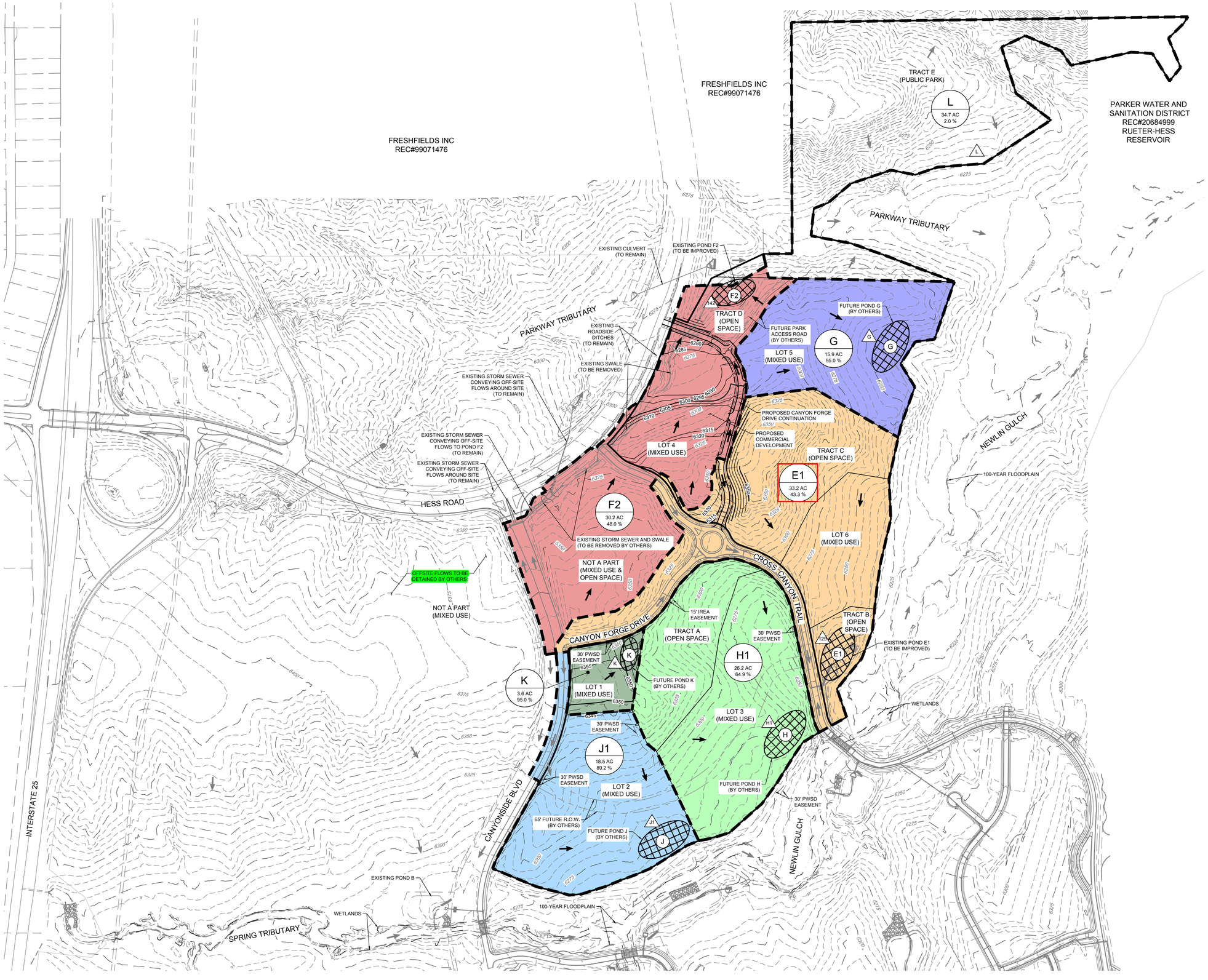
MASTER DRAINAGE REPORT
DRAINAGE MAP INTERIM

DESIGNED BY: DJB
DRAWN BY: DJB
CHECKED BY: KR

JOB NO.
14-002-020

SHEET
1 OF 2


10/30/2020 2:13 PM - X:\14-002 CANYONSIDE PRELIM PLAN\CIVIL\CAD\PLANS\DRAINAGE\MASTERDRAINAGE MAP INTERIM.DWG




0 250' 500'

1 inch = 250 ft.

## LEGEND

| EXISTING | PROPOSED | |
|---|---|---|
| X<br>XX.X AC<br>XX.X % | X<br>XX.X AC<br>XX.X % | BASIN DESIGNATION<br>AREA<br>IMPERVIOUSNESS |
| X | X | DESIGN POINT |
| | | DIRECTIONAL FLOW ARROW |
| | | EMERGENCY OVERFLOW ROUTE |
| | | PROPOSED DRAINAGE BASIN |
| | | EXISTING DRAINAGE BASIN |
| 5280 | | PROPOSED MAJOR CONTOUR |
| 5279 | | PROPOSED MINOR CONTOUR |
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| | | OUTLET STRUCTURE |
| | | CRUSHER FINES MAINTENANCE ACCESS |
| | | RIPRAP |
| | | 100 YEAR FLOODPLAIN |
| | | WETLAND |
| | | LIMITS OF CONSTRUCTION |
| | | RETAINING WALL |
| | | DRAINAGE SWALE |

## NOTES:

1. THE POND VOLUMES SHOWN ARE THE LARGER OF THE VALUES DETERMINED BY COMPARING THE INTERIM AND FULL BUILD-OUT CONDITION.
2. THE SITE DOES NOT CONTAIN THE 100-YEAR FLOODPLAIN.
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|---|---|---|---|
| POND | 100-YEAR VOLUME (AC-FT) | 100-YEAR MAX RELEASE (CFS) | DETERMINING CONDTION |
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| F2 | 2.94 | 43.2 | FULL BUILD-OUT |
| G | 2.74 | 28.9 | NO CHANGE |
| H | 3.23 | 48.1 | INTERIM |
| J | 3.00 | 32.9 | INTERIM |
| K | 0.62 | 6.3 | FULL BUILD-OUT |


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|---|---|---|---|
| A | 1ST SUBMITTAL FOR REVIEW | 08/28/20 | KR |
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# CANYONSIDE
CITY OF CASTLE PINES, COLORADO
MASTER DRAINAGE REPORT
DRAINAGE MAP FULL BUILDOUT

DESIGNED BY: DJB
DRAWN BY: DJB
CHECKED BY: KR

JOB NO.
14-002-020

SHEET
2 OF 2

10/30/2020 2:14 PM , X:\14-002 CANYONSIDE PRELIM PLAN\CIVIL\CAD\PLANS\DRAINAGE\MASTERDRAINAGE MAP FULL BUILDOUT.DWG;

# Appendix D
# Variance Request Letter

Civil
Structural
Integrated Services

September 16, 2026

City of Castle Pines Community Development
7437 Village Square Drive, Suite 200
Castle Pines, CO 80108

RE: **Variance Request**: Maximum Velocity in Pipe(s)
Project: Canyonside Filing No. 2, Lot 3. SIP-2026-001
Miro Project No. 25-060
CoCP Project No. SIP-2026-001

To Antonio Esposito:

We are requesting a variance from the Douglas County Storm Drainage Design & Technical Criteria Manual, hereby referred to as the *Criteria*, specifically section 9.8.1 maximum velocity in all storm sewers shall be limited to 18-fps. This project modeled the downstream existing off-site storm infrastructure to confirm adequate capacity. These existing pipes do have adequate capacity to convey the estimated flow, however one of the existing pipes has a velocity greater than 18-fps. The calculated hydraulic grade line for the major event does not rise past the elevation 1-foot below the final grade along the storm sewer system as is required in the Criteria. This variance reviewed all of the following Phase III drainage reports that covered this area including the Canyonside Subdivision Filing No. 2 report, hereby referred to as the *Master Report*, the Canyonside Subdivision Filing No. 2, Lot 1 and Lot 2 report, and the Lot 1, Canyonside Subdivision No. 3 report. These two additional reports do not appear to have analyzed the downstream infrastructure capacity nor provided the total flow into the existing infrastructure. As such, the flow rates upstream and downstream of this proposed project have been analyzed using the higher rates from the Master Report.

This project is located at the southeast corner of Castle Pines Parkway and Canyon Forge Drive. The address is unknown at this time. The site is bound by Canyon Forge Drive to the north and east, by Lots 1 and 2 to the south, and Castle Pines Parkway to the west. Additionally, north of this project is Tract C containing the existing pond where this site's stormwater runoff is conveyed for water quality treatment and detention. To the east lies Lot 4 and planned open space. To the south active construction for an adult living facility covered by the previously mentioned Lots 1 and 2 drainage report. Further south beyond Cross Canyon Trail is Lot 1 of Subdivision No. 3 which contains the furthest upstream point of the existing stormwater infrastructure system for which this project will connect. The existing 5.78-acre site is undeveloped and slopes from the southeast to the northwest with an approximate fall of 44-ft from corner to corner.

The proposed project consists of a 2-story medical office building. The proposed development has the following characteristics:

- The site is 251,841 SF (5.78-acres).
- The building footprint is 34,507 SF (0.79 acres) 13.7% of the site.
- Parking lot and sidewalk paving is 61,611 SF (1.41 acres) 24.5% of the site.
- Disturbed and undisturbed soils are the remaining 155,723 SF (3.57 acres) 61.8% of the site.
- The calculated imperviousness of master planned basin A4 **after this development is 46.4% vs. the master planned imperviousness of 85%**. The **corresponding runoff coefficients are 0.41 and 0.67 developed vs. the planned 0.73 and 0.83** for minor, 5-year and major, 100-year design storm events

The current design includes adequately sized and sloped pipes below the maximum velocity for all proposed pipes and only the existing pipe between existing inlets A5 and A6 downstream of the project has exceeded the maximum of 18-fps. The modeled flow is approximately the same from this report when compared to the Master Report however the surveyed slope has increased from the designed 2.8% to 3.25% and thus the resulting velocity has increased.

**Conclusion**

In conclusion, we believe that this is an existing condition and due to multiple factors, no remedy is needed for this project and request variance approval. These factors include but are not limited to:

1) The flow rates used in this model are conservative and overestimate the expected actual flow. This provides an additional factor of safety when sizing proposed inlets, pipes, and swales but does not accurately reflect the total flows in the existing system.
    a) This project and the projects upstream feeding into the existing storm system have lower impervious values, composite C coefficients, and flow rates than designed to the Master Report.
    b) This project has applied a higher impervious value to all pervious area by using disturbed soils at 20% where a significant portion of the site will remain undisturbed and lower runoff.
    c) Modeled flows in this report include the entirety of the Master Report's basin A-9 (25.44-acres). A portion of this basin (west of Canyonside Boulevard, approximately 10-acres) will ultimately route developed flows north to a future regional pond per notes on Lot 1 Canyonside subdivision No.3's Phase III Drainage Report.
2) The increased slope (vs. what was designed) of this existing pipe is an as-built condition outside the scope of this project. Other drainage reports referenced do not appear to have analyzed the downstream infrastructure capacity. Therefore, this project, on the downstream end of the existing infrastructure, was not able to feasibility analyze the actual developed flows.

The actual velocity due to lower flow rates than modeled is expected to be lower than the 18-fps maximum allowed by the Criteria.

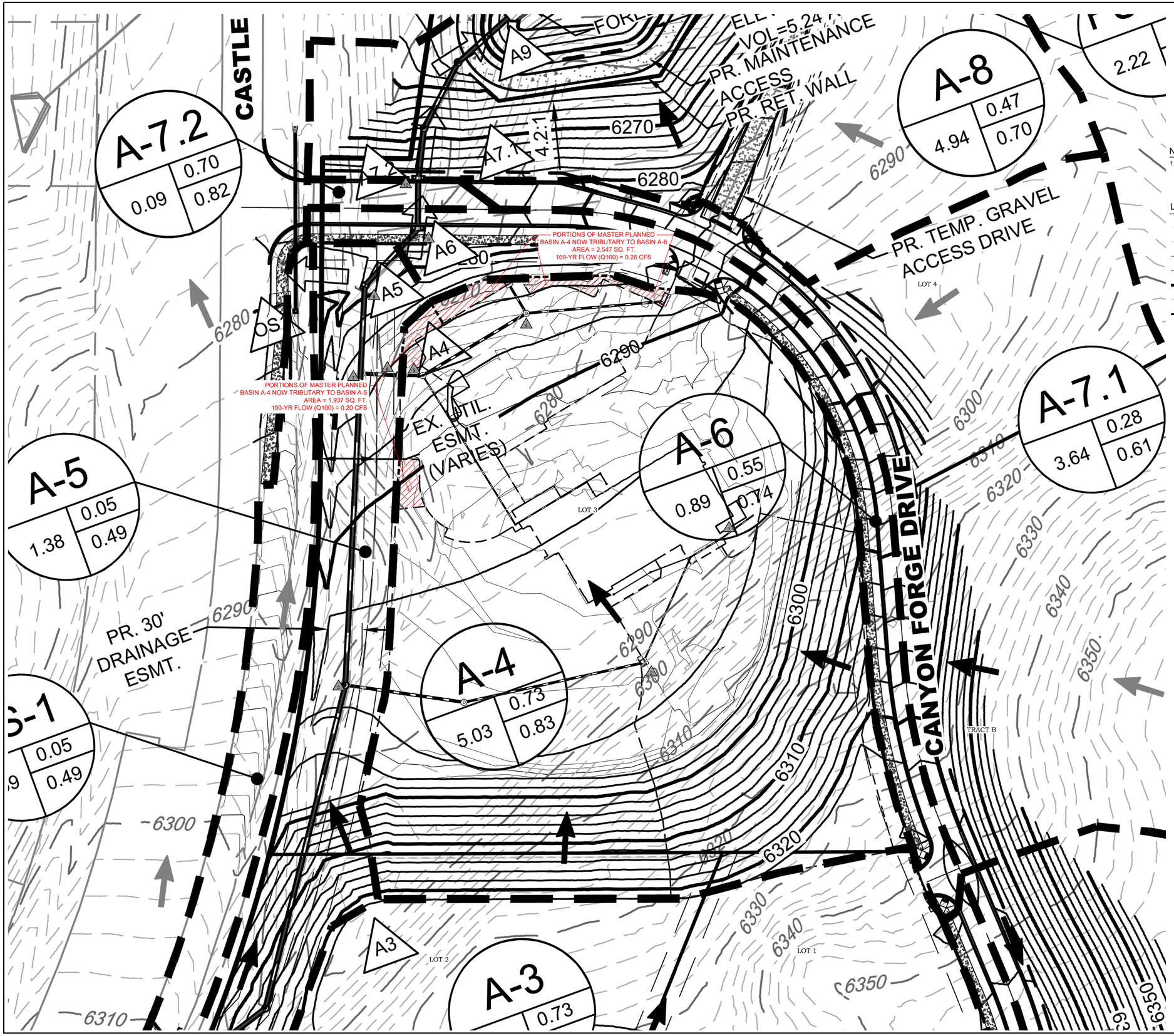
Please let me know if you have any questions or require any additional information. We appreciate your consideration in this matter.

Respectfully,

Ryan J. Humphrey, P.E.
Project Engineer

# Appendix E
# Proposed Drainage Plan

Figure 1 – Proposed vs Master Drainage Plan
Figure 2 – Proposed Drainage Plan




40 0 40

SCALE: 1" = 40'

NOTES:

1. THE MASTER DRAINAGE PLAN IS OVERLAID ON THE PROPOSED PROJECT FOR REFERENCE. THIS FIGURE 1 PLAN COMPARES THE MASTER PLANNED BASINS TO THE PROPOSED BASINS TO SHOW WHERE THE PROPOSED MOB BASINS VARY FROM THE MASTER PLAN.

LEGEND:

- 43 — EXISTING MINOR CONTOURS
- 45 — EXISTING MAJOR CONTOUR
- 43 — PROPOSED MINOR CONTOURS
- 45 — PROPOSED MAJOR CONTOURS
- PROPOSED STORM SEWER
- EX SD — EXISTING STORM SEWER
- BASIN BOUNDARY
- D — PROPOSED MANHOLE
- PROPOSED INLETS


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PROJECT 257483

# ADVENTHEALTH CASTLE PINES

**CONSTRUCTION DOCUMENTS**

DATE 06/05/2026

REVISIONS

| # | DESCRIPTION | DATE |
|---|---|---|

CITY DEVELOPMENT REVIEW ENGINEER

DATE

THESE CONSTRUCTION DRAWINGS HAVE BEEN REVIEWED BY THE CITY OF CASTLE PINES FOR * IMPROVEMENTS ONLY

* STREET AND DRAINAGE

PUBLIC WORKS ACCEPTANCE BLOCK

SHEET TITLE

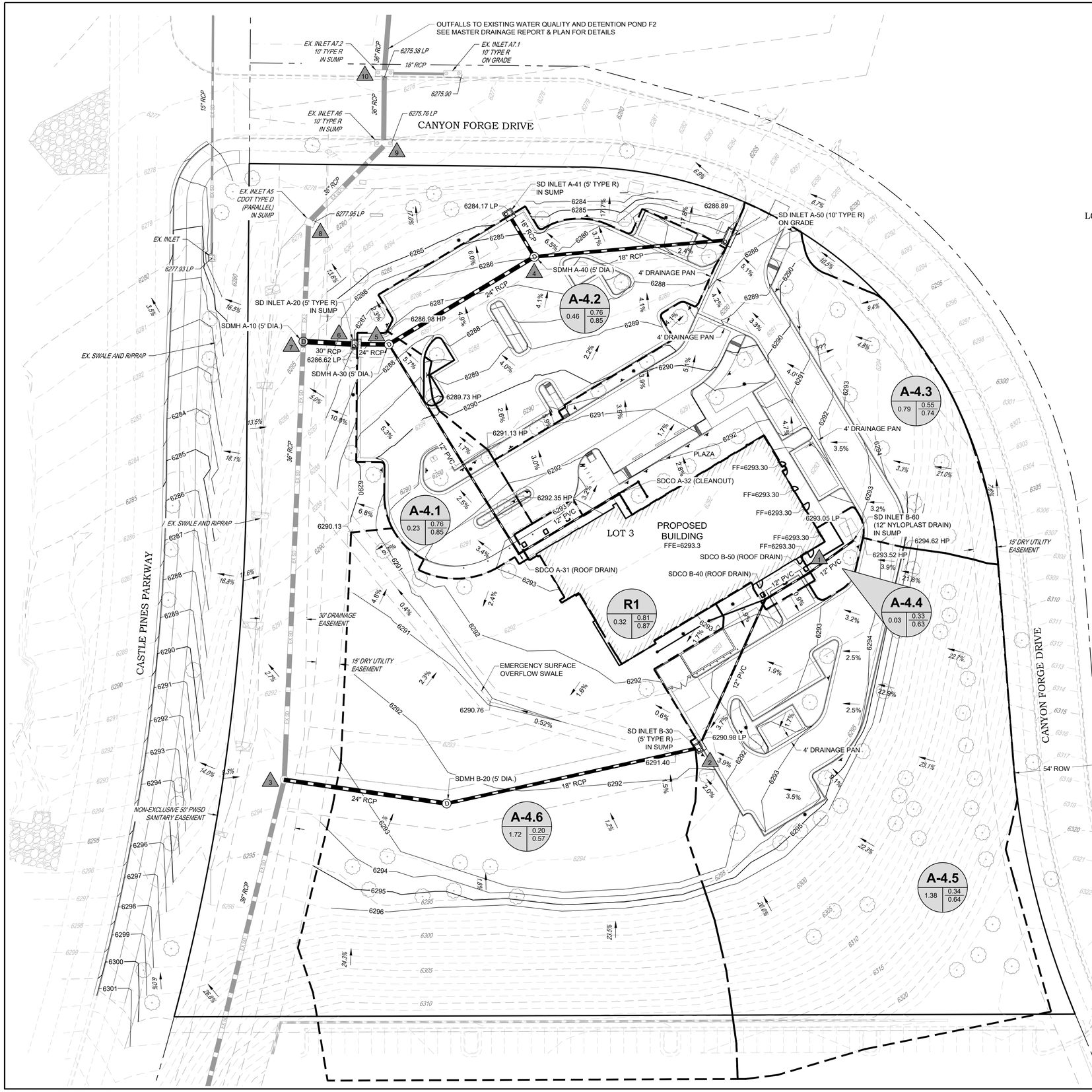
PROPOSED VS. MASTER DRAINAGE PLAN

SHEET NUMBER

FIG. 1

THIS LINE IS 1 INCH LONG WHEN PRINTED TO FULL SCALE

CITY CASE NUMBER - SIP-2026-001




30 0 30

SCALE: 1" = 30'

NOTES:

1. THE ROOF BASIN'S CALCULATED RUNOFF HAS BEEN DIVIDED BY 2 TO ACCOUNT FOR THE ROOF DRAIN CONNECTIONS ON BOTH THE NORTH AND SOUTH SIDES OF THE BUILDING.

LEGEND:

- 43 — EXISTING MINOR CONTOURS
- 45 — EXISTING MAJOR CONTOUR
- 43 — PROPOSED MINOR CONTOURS
- 45 — PROPOSED MAJOR CONTOURS
- PROPOSED STORM SEWER
- EX.SD — EXISTING STORM SEWER
- BASIN BOUNDARY
- (D) — PROPOSED MANHOLE
- PROPOSED INLETS
- 9.5% 4.8% — FLOW DIRECTION ARROW
- XX — DESIGN POINT DESIGNATION
- B — BASIN DESIGNATION
- 0.52 — BASIN AREA (ACRES)
- 0.73 — INTERMEDIATE YEAR COMPOSITE C
- 0.82 — 100 YEAR COMPOSITE C

**RUNOFF SUMMARY**

| Design Point | Tributary Basin(s) | Tributary Area (ac.) | Direct Runoff (CFS/5-yr) | Total Runoff (CFS/5-yr) | Direct Runoff (CFS/100-yr) | Total Runoff (CFS/100-yr) |
|---|---|---|---|---|---|---|
| - | A-4.4 | 0.03 | 0.03 | - | 0.14 | - |
| - | 1/2 of R1 | 0.16 | 0.48 | - | 1.10 | - |
| 1 | A-4.4 & 1/2 of R1 | 0.19 | - | 0.52 | - | 1.24 |
| - | A-4.5 | 1.38 | 1.54 | | 6.12 | |
| 2 | DP1 & A-4.5 | 1.57 | - | 2.06 | - | 7.37 |
| - | Master Rpt Q (StormCAD Output) | 30.12 | 27.08 | - | 83.71 | - |
| 3 | DP2 & Master Rpt Q | 31.69 | - | 29.14 | - | 91.08 |
| - | A-4.3 | 0.79 | 1.20 | - | 3.47 | - |
| - | A-4.2 | 0.46 | 1.31 | - | 3.06 | - |
| 4 | A-4.3 & A-4.2 | 1.25 | - | 2.51 | - | 6.52 |
| - | 1/2 of R1 | 0.16 | 0.48 | | 1.10 | |
| 5 | DP 4 & 1/2 of R1 | 1.41 | - | 2.99 | - | 7.63 |
| - | A-4.1 | 0.23 | 0.63 | | 1.50 | |
| 6 | DP 5 & A-4.1 | 1.64 | - | 3.63 | - | 9.13 |
| 7 | DP 3 & DP 6 | 33.33 | - | 32.76 | - | 100.21 |
| - | A-4.6 | 1.72 | 0.92 | | 5.59 | |
| - | Added Flows to Ex A5 | 0.04 | 0.03 | - | 0.18 | - |
| 8 | DP 7 & A-4.6 & Added Flows to Ex A5 | 35.09 | - | 33.72 | - | 105.98 |
| - | Added Flows to Ex A6 | 0.06 | 0.05 | - | 0.27 | - |
| 9 | DP8 & Added Flows to Ex A6 | 35.15 | - | 33.77 | - | 106.25 |
| 10 | DP9 | 35.15 | - | 33.77 | - | 106.25 |


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PROPOSED DRAINAGE PLAN

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FIG. 2

THIS LINE IS 1 INCH LONG WHEN PRINTED TO FULL SCALE

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