

**PHASE III DRAINAGE REPORT  
FOR  
LOT 6-A-1A-1,  
THE MEADOWS FILING NO. 17, AREA NO. 4,  
LIMELIGHT CENTER AT THE MEADOWS**

**Castle Rock, Colorado**

Prepared for:

**Westbridge Development**  
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Prepared by:



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RLEG NO. 240701  
TOWN NO. SDP25-0024

**TABLE OF CONTENTS**

|                                                                            |    |
|----------------------------------------------------------------------------|----|
| CERTIFICATIONS .....                                                       | ii |
| 1. GENERAL LOCATION AND DESCRIPTION.....                                   | 1  |
| A. Site Location.....                                                      | 1  |
| B. Description of Property.....                                            | 1  |
| 2. DRAINAGE BASINS AND SUB-BASINS .....                                    | 1  |
| A. Major Basin Description.....                                            | 1  |
| B. Sub-Basin Description .....                                             | 2  |
| 3. DRAINAGE DESIGN CRITERIA .....                                          | 2  |
| A. Regulations .....                                                       | 2  |
| B. Development Criteria.....                                               | 2  |
| C. Hydrologic Criteria .....                                               | 3  |
| D. Hydraulic Criteria .....                                                | 3  |
| 4. DRAINAGE FACILITY DESIGN .....                                          | 4  |
| A. General Concept .....                                                   | 4  |
| B. Specific Details .....                                                  | 4  |
| C. Compliance with Master Study.....                                       | 5  |
| 5. ENVIRONMENTAL PROTECTION CRITERIA.....                                  | 6  |
| 6. CONCLUSIONS.....                                                        | 7  |
| 7. REFERENCES.....                                                         | 7  |
| APPENDIX A – Maps .....                                                    | A  |
| APPENDIX B – Tables and Figures .....                                      | B  |
| APPENDIX C – Hydrology.....                                                | C  |
| APPENDIX D – Hydraulics .....                                              | D  |
| APPENDIX E – Drainage Plan.....                                            | E  |
| APPENDIX F – Master Report Basin Drainage Plan .....                       | F  |
| APPENDIX G – Summary of Water Quality Conformance to MS4 Permit Form ..... | G  |

**CERTIFICATIONS**

**Professional Engineer Certification**

"I affirm that this report and plan for the Phase II drainage design of **Limelight Center at The Meadows** was prepared by me (or under my direct supervision) in accordance with the provisions of the Town of Castle Rock Drainage Design and Technical Criteria for the owners thereof. I understand that the Town of Castle Rock does not and will not assume liability for drainage facilities designed by others."

Kevin S. Roth  
Registered Professional Engineer  
State of Colorado No. 35704

**Owner/Developer's Statement:**

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

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Owner/Applicant Date

**Town of Castle Rock Approvals:**

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Engineering Division Date

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Development Services Date

## **1. GENERAL LOCATION AND DESCRIPTION**

### **A. Site Location**

Limelight Center at The Meadows (hereafter referred to as The Site) is in the Northeast quarter of section 34, township 7 south, range 67 west of the 6<sup>th</sup> principal meridian, Town of Castle Rock, Douglas County, State of Colorado. Please, refer to the Vicinity Map in Appendix A.

The site is bounded to the north by Meadows Parkway, to the south and west by the existing Meadows Commercial development, and to the east by the Atchison, Topeka and Santa Fe Railroad.

### **B. Description of Property**

The area of The Site is 4.25 acres. The Site has been previously overlot graded. There is an existing ridge that runs west to east that splits the drainage patterns of the site. North and east of the ridge, slopes are typically 3:1 (horizontal:vertical). South of the ridge, slopes range from 2% to 6%. Generally, surface water flows across this area from southwest to northeast.

The existing soil conditions are as follows. The soil, as detailed in the USDA NRCS Soil Map of the Castle Rock area (Appendix A) includes Bresser Sandy Loam, classified as Hydrologic Soil Group B across the entirety of the site.

The proposed development includes: a 11,955 SF mixed-use building and a 7,500 medical/dental office building.

## **2. DRAINAGE BASINS AND SUB-BASINS**

### **A. Major Basin Description**

There are no known major drainage way planning studies or flood hazard area delineations that influence the site.

The Site is not within a FEMA regulated floodplain as depicted on the FIRMette map in Appendix A. There are no proposals with this project to request a Letter of Map Revision (LOMR).

The Site was considered within the Phase 3 Drainage Report for Lot 6G, the Meadows Filing No. 17 ("Master Report"), prepared by C2C Engineering Inc, November 15, 2012.

Calculations from the original Phase 3 Drainage Report for Filing No. 17, Lots 5 and 6 prepared by CVL Consultants of Colorado, February 15, 2005 were also considered with this report ("Original Report").

Runoff from this site is directed into the existing storm sewer to the south. These flows are conveyed to the Filing 17 Regional Detention Pond which outlets to East Plum Creek.

## **B. Sub-Basin Description**

The following is a description of the historic drainage patterns of The Site. The site is split into two sub-basins (Basins LD and a portion of LB) from the Master Study. Flows from Basin LD, generally south of the aforementioned ridgeline, drain southeast to an existing temporary sediment basin. Flows from Basin LB, generally south of the ridgeline, drain southeast to the same temporary basin.

There are no major drainage ways or drainage patterns onto The Site.

## **3. DRAINAGE DESIGN CRITERIA**

### **A. Regulations**

This project complies with the Town's floodplain ordinance. No regulated flood plains were found adjacent to The Site and will not be requesting Mile High Flood District maintenance eligibility review.

The runoff from this project is conveyed via roadway and storm sewer to the existing regional detention pond. There are no new or additional impacts to any stream preservation areas with this development and project is not within a Stream Buffer area.

### **B. Development Criteria**

The drainage design for the proposed site has been prepared following the regulations outlined in the Town of Castle Rock Storm Drainage Design and Technical Criteria Manual (SDDTCM), revised 2025, and Volumes 1, 2 and 3 of the Urban Storm Drainage Criteria Manual (USDCM) from the Mile High Flood District.

This report references the previously mentioned Master Report. The findings represented herein comply with the previous study of this area. As shown in this study water quality and detention will not be required for Lot 6-A-1A-1, since the Master Report and the associated construction drawings have already incorporated the design of a

water quality pond east of the site. Per the Town of Castle Rock SDDTCM Section 13.1.5, an exclusion to water quality is being applied for land disturbance for land to remain undeveloped. This excluded impervious area is 2.15 acres that is part of basins D1 and D2 (see Appendix E). There is also an additional 0.11 acres (2.6% of the site) of excluded developed area that is also part of these two basins. This exclusion is provided in the Town of Castle Rock Summary of Water Quality Conformance to MS4 Permit form that has been attached in Appendix G.

### **C. Hydrologic Criteria**

One-hour point rainfall values were obtained from Table 6-1 of the SDDTCM. For the 5-year storm,  $P1 = 1.43$  inches and for the 100-year storm  $P1 = 2.60$  inches.

The peak discharges were determined by the Rational Method, due to drainage areas in The Site containing less than 90 acres. All calculations were performed using the Rational Method Formula. Runoff "C" coefficients for hydrologic soil group B were taken from Table 6-5 (USDCM) and utilized in the composite impervious calculations. The recommended percentage of imperviousness values were taken from Table 6-3 (USDCM).

Hydrologic calculations have been prepared for the 5-year (minor) and 100-year (major) storm events.

This project does not require onsite water quality or detention as it was provided for regionally.

### **D. Hydraulic Criteria**

Street capacity references are to the local standard although no public streets are impacted.

All storm sewers have been designed to convey the runoff from the 100-year storm event.

There are no detention pond structures, outfalls or open channels that will require hydraulic analysis.

There are no variances from the criteria requested with this project.

## **4. DRAINAGE FACILITY DESIGN**

### **A. General Concept**

The Master report sub-basins LB and LD and the assumptions made therein have been directly compared to the calculated values for this project, reference Appendix (F). Calculations were made using MHFD and Town Criteria. The composite imperviousness of all on-site Basins is 54.0%. Runoff generated from the site will be conveyed to the existing detention pond via a series of RCP and PVC. These pipes have been sized per the requirements in the SDDTCM.

The site will develop into two commercial buildings with requisite parking, drive aisles, and landscaping. The drainage patterns anticipated in previous studies will be followed with this development with some minor exceptions explained below.

Appendices C and D include applicable exhibits of the hydrology and hydraulics that were used in the development of this site.

### **B. Specific Details**

Sub-Basin A1 (0.20-acres) consists of parking area, drive, and landscaped area. Surface runoff will be collected by two No. 16 combo inlets at design point 1 (DP 1). Storm runoff will be conveyed by a proposed 15-inch RCP from DP 1 to DP 2.

Direct Runoff:             $Q_5 = 0.67 \text{ cfs}$              $Q_{100} = 1.42 \text{ cfs}$

Sub-Basin A2 (0.06-acres) consists of parking area, drive, and landscaped area. Surface runoff will be conveyed by gutter flow to a No. 16 combo inlet at DP 2. Storm runoff will be conveyed by existing 24-inch RCP from DP 2 to DP 5.

Direct Runoff:             $Q_5 = 0.20 \text{ cfs}$              $Q_{100} = 0.43 \text{ cfs}$

Sub-Basin B1 (0.27-acres) consists of roof area of building A (restaurant/retail). Runoff will be conveyed to the site storm sewer via a series of roof drains to the manhole at DP 3. The roof drains have been sized for 3 times the anticipated flows.

Direct Runoff:             $Q_5 = 1.08 \text{ cfs}$              $Q_{100} = 2.10 \text{ cfs}$

Sub-Basin B2 (0.17-acres) consists of roof area of building B (medical office building). Runoff will be conveyed to the site storm sewer via a series of roof drains to the inlet at DP 4. The roof drains have been sized for 3 times the anticipated flows.

Direct Runoff:  $Q_5 = 0.68$  cfs  $Q_{100} = 1.32$  cfs

Sub-Basin B3 (0.33-acres) consists of sidewalk, parking area, and landscaping. Surface runoff will be conveyed on the surface and via curb and gutter to a Type R inlet at DP 4. Storm runoff will be conveyed by a proposed 15-inch RCP from DP 4 to DP 5.

Direct Runoff:  $Q_5 = 1.18$  cfs  $Q_{100} = 2.41$  cfs

Sub-Basin B4 (0.62-acres) consists of sidewalk, parking area, and landscaping. Surface runoff will be conveyed on the surface and via curb and gutter to a triple No. 16 area inlet at DP 5. Storm runoff will be conveyed by a proposed 15-inch RCP from DP 5 to DP 6.

Direct Runoff:  $Q_5 = 2.11$  cfs  $Q_{100} = 4.35$  cfs

Sub-Basin C1 (0.34-acres) consists of sidewalk, parking area, and landscaping. Surface runoff will be conveyed on the surface and via curb and gutter to a No. 16 inlet at DP 7. Storm runoff will be then be conveyed by existing 30-inch RCP to the regional pond.

Direct Runoff:  $Q_5 = 1.24$  cfs  $Q_{100} = 2.50$  cfs

Sub-Basin D1 (1.28 -acres) consists of some sidewalk and predominantly landscaping/grassy area. Runoff will drain on the surface to existing inlets on Meadows Parkway.

Direct Runoff:  $Q_5 = 0.92$  cfs  $Q_{100} = 5.14$  cfs

Sub-Basin D2 (0.98-acres) consists of some sidewalk and predominantly landscaping/grassy area. Runoff will drain on the surface to existing inlets on Meadows Parkway.

Direct Runoff:  $Q_5 = 0.77$  cfs  $Q_{100} = 4.11$  cfs

### **C. Compliance with Master Study**

Master Report Basin LB: The table below provides a summary of the proposed areas being routed to the existing detention pond as they relate to the assumptions made in the Master Study. The “Proposed Basins” are: all of basins A1 and A2 as well as portions of basins B1 and D1. The majority of this basin was previously developed with another project. The portion of the basin that falls within this project shows a reduction in imperviousness. Due to the overall reduction in imperviousness, no adverse impacts to the storm system are expected.

|                 | Area | C5   | C100 |
|-----------------|------|------|------|
| Proposed Basin  | 0.40 | 0.53 | 0.74 |
| Master Basin LB | 1.38 | 0.81 | 0.88 |

Master Report Basin LD: The table below provides a summary of the proposed areas being routed to the existing detention pond as they relate to the assumptions made in the Master Study. The “Proposed Basins” are: basins B2, B3, B4, and C1 as well as the remaining portion of Basins B1 and portions of basins D1 and D2. This project results in a reduction in imperviousness than what was originally assumed. The proposed storm line has been sized to accommodate these flows. A portion of master basin LD that was previously assumed to be routed to the detention pond as improved area is now proposed landscape and sidewalk area that will sheet flow to Meadows Parkway. This exchange in area is negligible and due to the overall reduction in imperviousness, no adverse impacts to the storm system are anticipated.

|                 | Area | C5   | C100 |
|-----------------|------|------|------|
| Proposed Basin  | 2.36 | 0.64 | 0.79 |
| Master Basin LD | 2.36 | 0.81 | 0.88 |

## **5. ENVIRONMENTAL PROTECTION CRITERIA**

The site will include disturbance of approximately 4.25 acres. The soils on site belong to hydrologic group B. The Site consists of overlot grading and an existing driveway, sidewalk and landscaping. The construction plans will include detailed Construction BMP Plans to mitigate and prevent erosion and sediment transportation.

The erosion control measures are placed on The Site to reduce the on-site erosion, prevent sediment from entering the storm sewer system, and to eliminate sediment deposit off-site. Vehicle tracking control pads will be placed at the entrances to The Site. Silt fences and straw bale barriers will be used in swales and around The Site. Gravel protection will be constructed around all inlets. Surface roughening will be used on all slopes 4:1 and greater. All disturbed areas not being covered by asphalt, concrete, or landscaping will be reseeded with an approved seeding mixture as soon as practical after grading. All erosion control measures shall be maintained and repaired by the

contractor during construction. The contractor shall inspect and repair all erosion control measures as needed following each heavy precipitation or snowmelt.

## **6. CONCLUSIONS**

This Drainage Report complies with the technical criteria set forth in the Town of Castle Rock Storm Drainage Design and Technical Criteria Manual as well as the Storm Drainage Criteria Manual from the Mile High Flood District.

The storm system has been designed to effectively intercept and convey flows up to and including the 100-year storm away from structures and to the downstream system.

Conveyed flows will be treated and attenuated for flood control at the existing water quality and detention pond. Therefore, this project should create no adverse impact to upstream or downstream developments or infrastructure if constructed as proposed.

The storm system is a private system located within proposed easements. The maintenance responsibility of the on-site storm system will be the burden of the landowner for this proposed system.

The Sediment and Erosion Concept is designed to prevent soil transport and if transported, soil must be detained before leaving The Site.

## **7. REFERENCES**

Mile High Flood District, Urban Storm Drainage Criteria Manual., Volumes 1, Partially Updated March 2024, Volume 2, Revised January 2016, and Volume 3, Partially Updated March 2024.

Phase 3 Drainage Report for Lot 6G, The Meadows Filing No. 17 November 15, 2012 by C2C Engineering LLC.

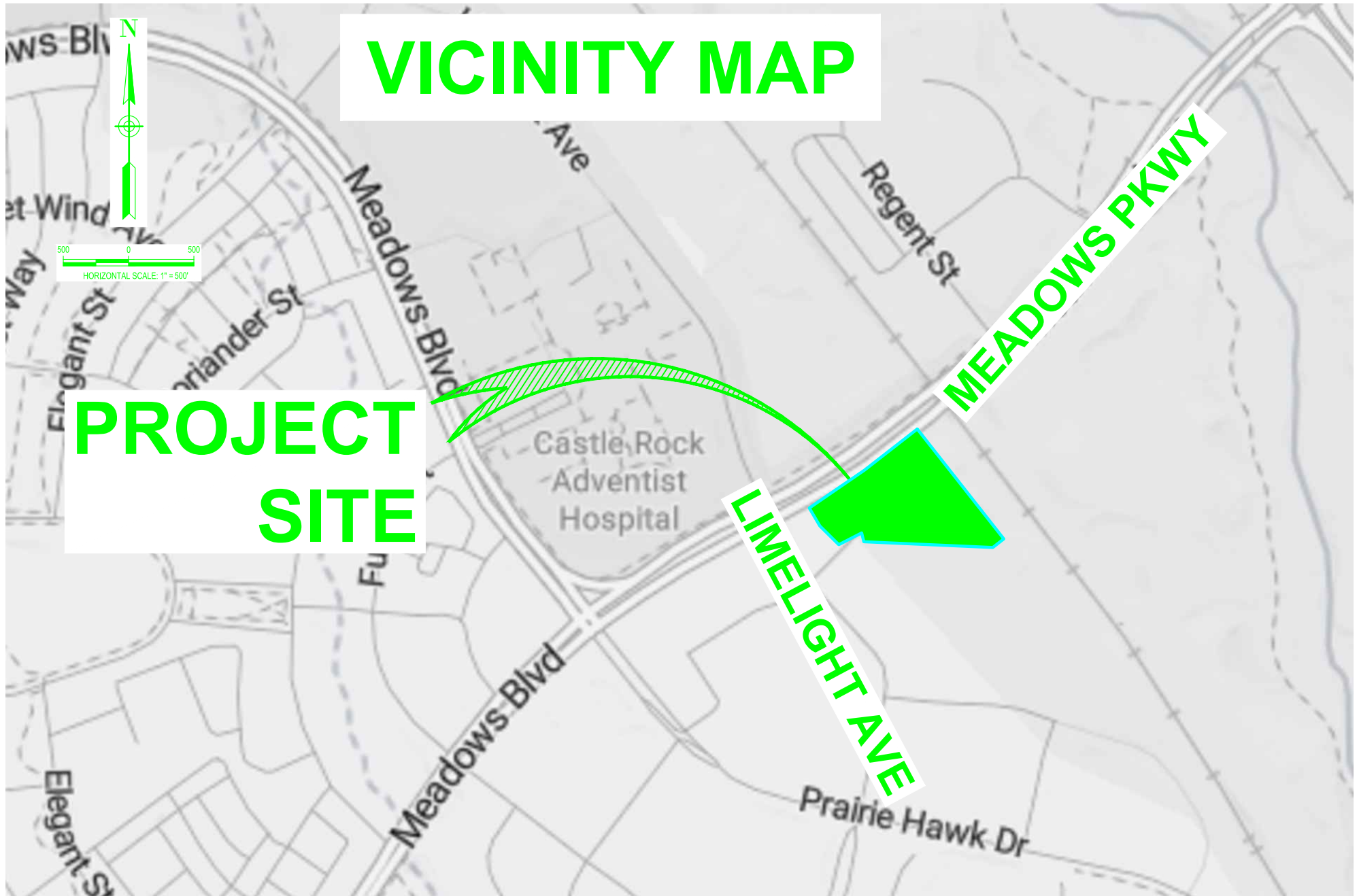
Phase 3 Drainage Report for The Meadows Filing No. 17, Lots 5 and 6 February 15, 2005 by CVL Consultants of Colorado Inc.

Town of Castle Rock, Town of Castle Rock Storm Drainage Design and Technical Criteria Manual. Revised and Adopted February 2019.

## **APPENDIX A – Maps**

# VICINITY MAP

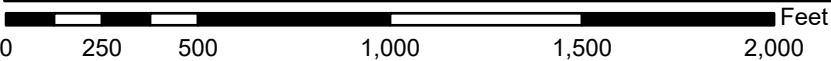
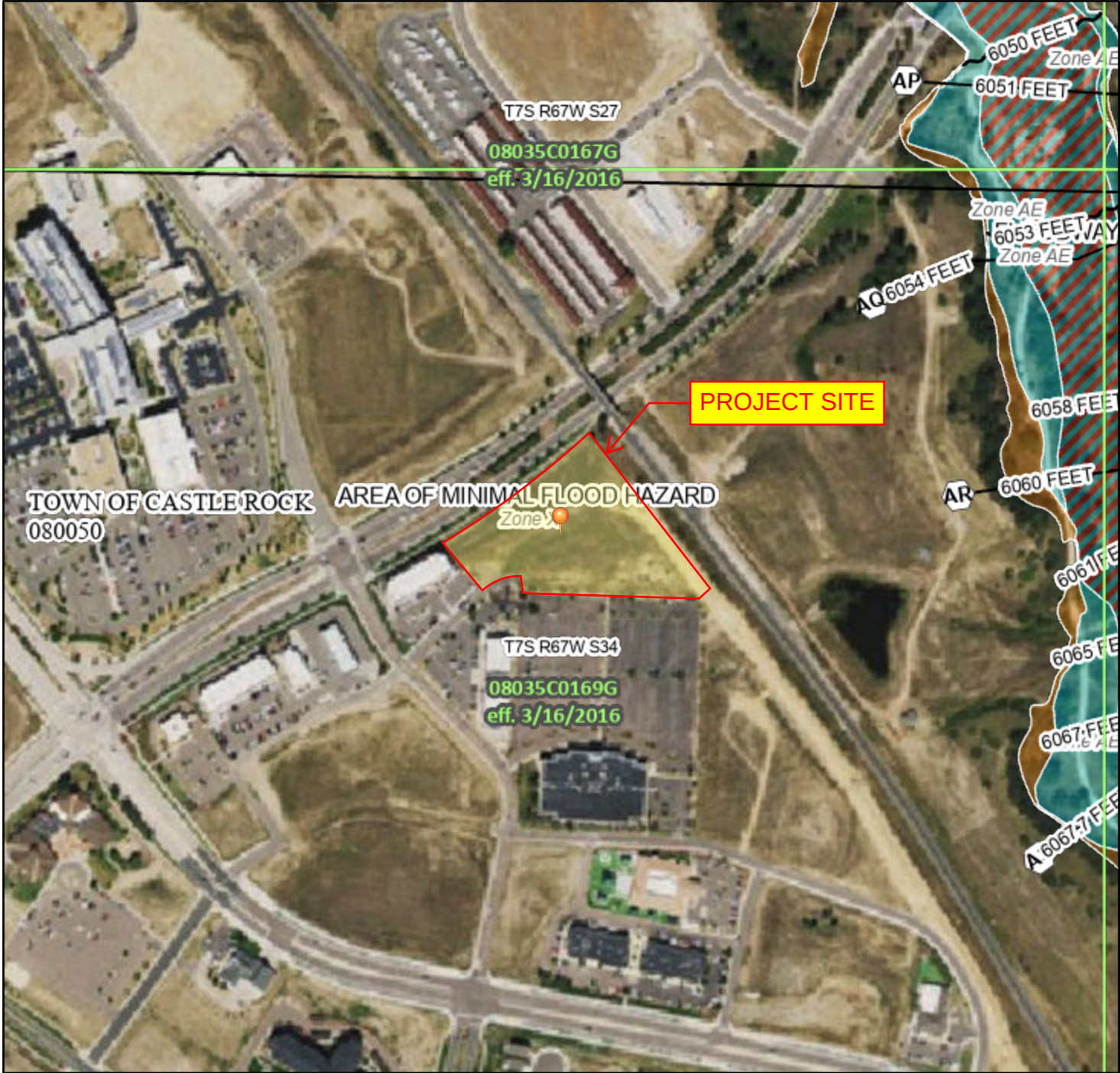
**PROJECT  
SITE**



# National Flood Hazard Layer FIRMette



104°53'7"W 39°24'27"N



1:6,000

104°52'30"W 39°23'59"N

Basemap Imagery Source: USGS National Map 2023

## Legend

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

|                             |  |                                                                                                                                                                   |
|-----------------------------|--|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SPECIAL FLOOD HAZARD AREAS  |  | Without Base Flood Elevation (BFE)<br>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                                                                                                                                                   |
| GENERAL STRUCTURES          |  | Area of Undetermined Flood Hazard Zone D                                                                                                                          |
|                             |  | Channel, Culvert, or Storm Sewer                                                                                                                                  |
|                             |  | Levee, Dike, or Floodwall                                                                                                                                         |
| OTHER FEATURES              |  | 20.2 Cross Sections with 1% Annual Chance Water Surface Elevation                                                                                                 |
|                             |  | 17.5 Cross Sections with 1% Annual Chance Water Surface Elevation                                                                                                 |
|                             |  | Coastal Transect                                                                                                                                                  |
|                             |  | Base Flood Elevation Line (BFE)                                                                                                                                   |
|                             |  | Limit of Study                                                                                                                                                    |
|                             |  | Jurisdiction Boundary                                                                                                                                             |
| MAP PANELS                  |  | Coastal Transect Baseline                                                                                                                                         |
|                             |  | Profile Baseline                                                                                                                                                  |
|                             |  | Hydrographic Feature                                                                                                                                              |
| MAP PANELS                  |  | Digital Data Available                                                                                                                                            |
|                             |  | No Digital Data Available                                                                                                                                         |
|                             |  | Unmapped                                                                                                                                                          |

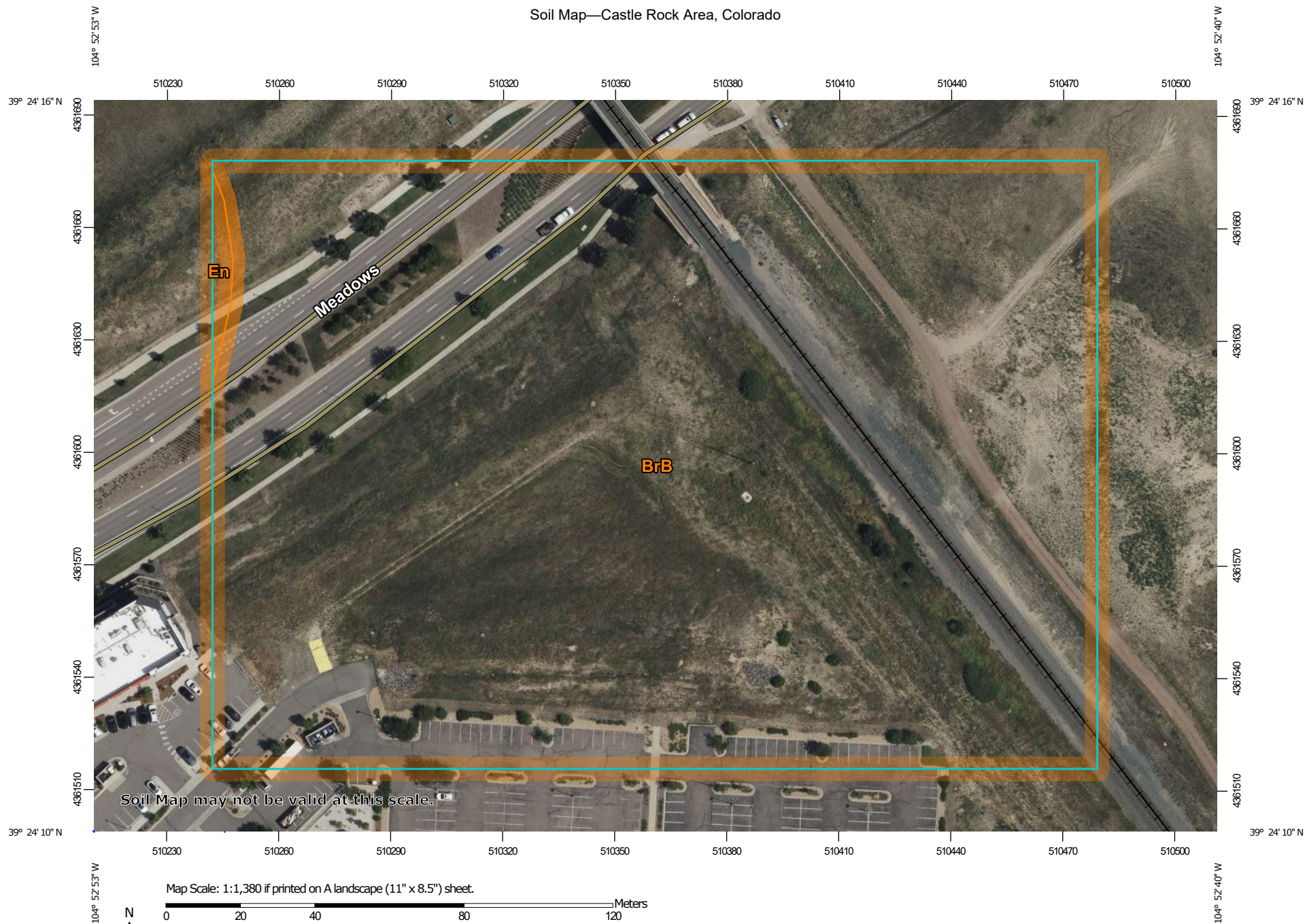
The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

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 **1/3/2025 at 6:38 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.

# Soil Map—Castle Rock Area, Colorado



Soil Map may not be valid at this scale.

Map Scale: 1:1,380 if printed on A landscape (11" x 8.5") sheet.



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



**Natural Resources  
Conservation Service**

Web Soil Survey  
National Cooperative Soil Survey

1/3/2025  
Page 1 of 3

## 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 17, Aug 29, 2024

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

Date(s) aerial images were photographed: 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 |
|------------------------------------|-------------------------------------------------|--------------|----------------|
| BrB                                | Bresser sandy loam, cool, 1 to 3 percent slopes | 9.5          | 99.5%          |
| En                                 | Englewood clay loam                             | 0.0          | 0.5%           |
| <b>Totals for Area of Interest</b> |                                                 | <b>9.5</b>   | <b>100.0%</b>  |

## **APPENDIX B – Tables and Figures**

TABLE 6-3. RECOMMENDED IMPERVIOUSNESS BY SURFACE TYPES

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

<sup>1</sup> Consult with the manufacturer to get a recommended value.

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

<sup>3</sup> See MHFD's technical memorandum regarding *Evaluation of Percent Imperviousness for Stormwater Control Measures* for background information.

4.5 RAINFALL INTENSITY

The calculated rainfall intensity,  $I$ , is the average rainfall rate in inches per hour over a duration equal to  $t_c$ . Obtain 1-hour point precipitation depths from National Oceanic and Atmospheric Administration (NOAA) Atlas 14 for the average return periods of interest and apply Equation 5-1 in the *Rainfall* chapter using  $t_c$  as the storm duration,  $t_d$ . Use the centroid of the catchment to determine the 1-hour point precipitation depths. The MHFD-Rational and MHFD-Inlet Excel workbooks automatically calculate rainfall intensity based on 1-hour point precipitation depths for a specified location.

4.6 RUNOFF COEFFICIENTS

Any watershed can be conceptualized as a combination of pervious and impervious surfaces. Pervious surfaces allow water to infiltrate into the ground, while impervious surfaces do not allow for infiltration. In urban hydrology, the relationships between pervious and impervious surfaces is important. Urbanization increases impervious area, causing rainfall-runoff relationships to change significantly. In the absence of stormwater management controls that infiltrate or detain runoff, urbanization increases peak runoff rates, volumes, and frequency of runoff and decreases the time to peak.

When analyzing a catchment for planning or design purposes, estimates of the existing and probable future imperviousness of the drainage area are needed. In some cases, the pre-development (i.e., historic) condition also must be analyzed. Table 6-2 provides recommended imperviousness values based on land use types and is appropriate for master planning analysis and conceptual design. Note that the land use classifications in Table 6-2 incorporate roads that are included within the land use. Table 6-3 provides recommended imperviousness values for different surface types and is appropriate for use during later stages of design when the layout of different types of impervious and pervious areas on the site is known and the area of each surface type can be quantified.

The runoff coefficient,  $C$ , represents the integrated effects of infiltration, evaporation, depression storage, and interception, all of which affect the rate and volume of runoff. Determining representative runoff coefficients requires judgment based on the experience and expertise of the engineer.

Volume-based runoff coefficients were derived to improve consistency between CUHP and the Rational Method for peak flow predictions (Guo 2013; Guo and Urbonas 2013). The coefficients developed by Dr. Guo were recalibrated using CUHP Version 2.0.0 (Rapp et al. 2017). Using imperviousness, expressed as a decimal, and the Natural Resources Conservation Service (NRCS) Hydrologic Soil Group (HSG), the equations in Table 6-5 can be used to calculate runoff coefficients for design storm return periods for the Rational Method.

TABLE 6-5. RUNOFF COEFFICIENT EQUATIONS BASED ON NRCS HSG AND STORM RETURN PERIOD

| NRCS<br>HSG | STORM RETURN PERIOD        |                            |                            |                            |                            |                            |                            |
|-------------|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|
|             | WQE &<br>2-Year            | 5-Year                     | 10-Year                    | 25-Year                    | 50-Year                    | 100-Year                   | 500-Year                   |
| A           | $C_A = 0.840I^{1.302}$     | $C_A = 0.861I^{1.276}$     | $C_A = 0.873I^{1.232}$     | $C_A = 0.884I^{1.124}$     | $C_A = 0.854I + 0.025$     | $C_A = 0.779I + 0.110$     | $C_A = 0.645I + 0.254$     |
| B           | $C_B = 0.835I^{1.169}$     | $C_B = 0.857I^{1.088}$     | $C_B = 0.807I + 0.057$     | $C_B = 0.628I + 0.249$     | $C_B = 0.558I + 0.328$     | $C_B = 0.465I + 0.426$     | $C_B = 0.366I + 0.536$     |
| C/D         | $C_{C/D} = 0.834I^{1.122}$ | $C_{C/D} = 0.815I + 0.035$ | $C_{C/D} = 0.735I + 0.132$ | $C_{C/D} = 0.560I + 0.319$ | $C_{C/D} = 0.494I + 0.393$ | $C_{C/D} = 0.409I + 0.484$ | $C_{C/D} = 0.315I + 0.588$ |

## **APPENDIX C – Hydrology**

## DEVELOPED CONDITIONS

| SUB-BASIN      | PROPOSED LAND USE <sup>a</sup> (sf) |                  |        |         |   | TOTAL AREA<br>(sf) | TOTAL AREA<br>(acres) | WEIGHTED AVG.<br>PERCENT<br>IMPERVIOUS (j) | RUNOFF COEFFICIENTS <sup>b</sup><br>HYDROLOGIC SOIL GROUP B |                           |                            |                            | NOTES |
|----------------|-------------------------------------|------------------|--------|---------|---|--------------------|-----------------------|--------------------------------------------|-------------------------------------------------------------|---------------------------|----------------------------|----------------------------|-------|
|                | PAVED                               | DRIVE &<br>WALKS | ROOF   | LAWN    |   |                    |                       |                                            | C <sub>2</sub>                                              | C <sub>5</sub>            | C <sub>10</sub>            | C <sub>100</sub>           |       |
| A1             | -                                   | 7,240            | -      | 1,402   | - | 8,642              | 0.20                  | 82.83%                                     | 0.67                                                        | 0.70                      | 0.73                       | 0.81                       |       |
| A2             | -                                   | 2,161            | -      | 474     | - | 2,635              | 0.06                  | 81.50%                                     | 0.66                                                        | 0.69                      | 0.71                       | 0.80                       |       |
| B1             | -                                   | -                | 11,955 | -       | - | 11,955             | 0.27                  | 95.00%                                     | 0.79                                                        | 0.81                      | 0.82                       | 0.87                       |       |
| B2             | -                                   | -                | 7,500  | -       | - | 7,500              | 0.17                  | 95.00%                                     | 0.79                                                        | 0.81                      | 0.82                       | 0.87                       |       |
| B3             | -                                   | 12,888           | -      | 1,360   | - | 14,248             | 0.33                  | 87.84%                                     | 0.72                                                        | 0.74                      | 0.77                       | 0.83                       |       |
| B4             | -                                   | 23,879           | -      | 3,192   | - | 27,071             | 0.62                  | 86.16%                                     | 0.70                                                        | 0.73                      | 0.75                       | 0.83                       |       |
| C1             | -                                   | 13,556           | -      | 1,112   | - | 14,668             | 0.34                  | 89.31%                                     | 0.73                                                        | 0.76                      | 0.78                       | 0.84                       |       |
| D1             | -                                   | 2,363            | -      | 53,513  | - | 55,876             | 1.28                  | 23.17%                                     | 0.15                                                        | 0.17                      | 0.24                       | 0.53                       |       |
| D2             | -                                   | 2,468            | -      | 40,198  | - | 42,666             | 0.98                  | 24.34%                                     | 0.16                                                        | 0.18                      | 0.25                       | 0.54                       |       |
| On-Site Total  | -                                   | 64,555           | 19,455 | 101,251 | - | 185,261            | 4.25                  | 54.01%                                     | 0.41                                                        | 0.44                      | 0.49                       | 0.68                       |       |
| Off-Site Total | -                                   | -                | -      | -       | - | -                  | -                     | 0.00%                                      | -                                                           | -                         | 0.06                       | 0.43                       |       |
|                |                                     |                  |        |         |   |                    |                       |                                            | 2-Year                                                      | 5-year                    | 10-year                    | 100-year                   |       |
|                |                                     |                  |        |         |   |                    |                       | C <sub>B</sub>                             | 0.835/ <sup>i</sup> 1.169                                   | 0.857/ <sup>i</sup> 1.088 | 0.807/ <sup>i</sup> +0.057 | 0.465/ <sup>i</sup> +0.426 |       |

NOTES: a. Mile High Flood District "Urban Storm Drainage Criteria Manual: Volume 1" (Table 6-3)  
b. Mile High Flood District "Urban Storm Drainage Criteria Manual: Volume 1" (Table 6-5)

## DEVELOPED CONDITIONS

| BASIN DATA |              |                | INITIAL/OVERLAND TIME ( $t_i$ ) <sup>a</sup> |                     |                 | TRAVEL TIME ( $t_t$ ) <sup>b</sup> |                     |                                    |                       |                 | TIME OF CONC. ( $t_c$ ) <sup>e, f</sup> | FIRST DESIGN POINT TIME OF CONC. IN URBAN CATCHMENT ( $t_c$ ) <sup>e</sup> |                          |                 | FINAL ( $t_c$ ) <sup>f</sup> | CONVEYANCE REMARKS |
|------------|--------------|----------------|----------------------------------------------|---------------------|-----------------|------------------------------------|---------------------|------------------------------------|-----------------------|-----------------|-----------------------------------------|----------------------------------------------------------------------------|--------------------------|-----------------|------------------------------|--------------------|
| SUB-BASIN  | AREA (acres) | C <sub>5</sub> | LENGTH $L_i$ (ft)                            | SLOPE $S_o$ (ft/ft) | $t_i$ (minutes) | LENGTH $L_t$ (ft)                  | SLOPE $S_t$ (ft/ft) | CONVEYANCE FACTOR $K$ <sup>c</sup> | VELOCITY $V_t$ (ft/s) | $t_t$ (minutes) | $t_c$ <sup>d</sup> (minutes)            | LENGTH $L_i$ (ft)                                                          | IMPERVIOUS $i$ (decimal) | $t_c$ (minutes) | $t_c$ (minutes)              |                    |
| A1         | 0.20         | 0.70           | 80                                           | 0.030               | 4.5             | 20                                 | 0.020               | 20                                 | 2.83                  | 0.12            | 5.0                                     | 20                                                                         | 0.828                    | 12.03           | 5.0                          |                    |
| A2         | 0.06         | 0.69           | 20                                           | 0.040               | 2.1             | 30                                 | 0.020               | 20                                 | 2.83                  | 0.18            | 5.0                                     | 30                                                                         | 0.815                    | 12.32           | 5.0                          |                    |
| B1         | 0.27         | 0.81           | 125                                          | 0.020               | 4.6             | -                                  | -                   | -                                  | -                     | -               | 5.0                                     | -                                                                          | 0.950                    | -               | 5.0                          |                    |
| B2         | 0.17         | 0.81           | 70                                           | 0.020               | 3.5             | -                                  | -                   | -                                  | -                     | -               | 5.0                                     | -                                                                          | 0.950                    | -               | 5.0                          |                    |
| B3         | 0.33         | 0.74           | 70                                           | 0.025               | 4.0             | 100                                | 0.010               | 20                                 | 2.00                  | 0.83            | 5.0                                     | 100                                                                        | 0.878                    | 11.85           | 5.0                          |                    |
| B4         | 0.62         | 0.73           | 100                                          | 0.025               | 5.0             | 100                                | 0.010               | 20                                 | 2.00                  | 0.83            | 5.8                                     | 100                                                                        | 0.862                    | 12.14           | 5.8                          |                    |
| C1         | 0.34         | 0.76           | 100                                          | 0.040               | 3.9             | 90                                 | 0.030               | 20                                 | 3.46                  | 0.43            | 5.0                                     | 90                                                                         | 0.893                    | 11.22           | 5.0                          |                    |
| D1         | 1.28         | 0.17           | 240                                          | 0.300               | 8.4             | -                                  | -                   | -                                  | -                     | -               | 8.4                                     | -                                                                          | 0.232                    | -               | 8.4                          |                    |
| D2         | 0.98         | 0.18           | 200                                          | 0.300               | 7.6             | -                                  | -                   | -                                  | -                     | -               | 7.6                                     | -                                                                          | 0.243                    | -               | 7.6                          |                    |

NOTES:

- a. MHFD, USDCM Volume 1, Equation 6-3:  $t_i = (0.395 * (1.1 - C_5) * \sqrt{L_i}) / S_o^{0.33}$
- b. MHFD, USDCM Volume 1, Equation 6-4:  $t_t = L_t / (60 * K * \sqrt{S_t}) = L_t / (60 * V_t)$
- c. MHFD, USDCM Volume 1, Table 6-4: Heavy Meadow = 2.5, Tillage/Field = 5, Short Pasture & Lawns = 7, Nearly Bare Ground = 10, Grassed Waterway = 15, Paved Areas & Shallow Paved Swales = 20
- d. MHFD, USDCM Volume 1, Equation 6-2:  $t_c = t_i + t_t$
- e. MHFD, USDCM Volume 1, Equation 6-5:  $t_c = (26 - 17i) + (L_t / (60 * (14i + 9) * \sqrt{S_t}))$
- f. MHFD, USDCM Volume 1, Section 4.4.3, "The time of concentration shall be the lesser of the values calculated by Equation 6-2 and Equation 6-5."
- f. MHFD, USDCM Volume 1, Section 4.4.4, "Use a minimum  $t_c$  value of 5 minutes for urbanized areas."

**STORM DRAINAGE SYSTEM DESIGN  
RATIONAL METHOD PROCEDURE  
5-YEAR STORM**

| DEVELOPED CONDITIONS |              |               |              |                      |               |                |                          |                      |                      |               |             |         |           |                   |                   |           |                |             |         |                                          |
|----------------------|--------------|---------------|--------------|----------------------|---------------|----------------|--------------------------|----------------------|----------------------|---------------|-------------|---------|-----------|-------------------|-------------------|-----------|----------------|-------------|---------|------------------------------------------|
| MASTER BASIN         | DESIGN POINT | DIRECT RUNOFF |              |                      |               |                |                          |                      | TOTAL RUNOFF         |               |             |         | STREET    |                   | PIPE              |           | TRAVEL TIME    |             | REMARKS |                                          |
|                      |              | AREA (acres)  | RUNOFF COEFF | T <sub>c</sub> (min) | C * A (acres) | P <sup>a</sup> | I <sup>b</sup> (in/hour) | Q (cfs) <sup>c</sup> | T <sub>c</sub> (min) | C * A (acres) | I (in/hour) | Q (cfs) | SLOPE (%) | STREET FLOW (cfs) | DESIGN FLOW (cfs) | SLOPE (%) | PIPE SIZE (in) | LENGTH (ft) |         | VELOCITY (fps)                           |
|                      |              |               |              |                      |               |                |                          |                      |                      |               |             |         |           |                   |                   |           |                |             |         |                                          |
| A1                   | 1            | 0.20          | 0.70         | 5.0                  | 0.14          | 1.43           | 4.85                     | 0.67                 |                      |               |             |         |           |                   |                   |           |                |             |         |                                          |
| A2                   | 2            | 0.06          | 0.69         | 5.0                  | 0.04          | 1.43           | 4.85                     | 0.20                 |                      |               |             |         |           | 0.67              | 0.5               | 15        | 72             | 2.58        | 0.47    | Routed from DP-1 Inlet to DP-2 Inlet     |
|                      | 2            |               |              |                      |               |                |                          |                      | 5.5                  | 0.18          | 4.74        | 0.85    |           |                   |                   |           |                |             |         |                                          |
|                      |              |               |              |                      |               |                |                          |                      |                      |               |             |         |           |                   |                   |           |                |             |         | Total flow at DP-2 Inlet                 |
| B1                   | 3            | 0.27          | 0.81         | 5.0                  | 0.22          | 1.43           | 4.85                     | 1.08                 |                      |               |             |         |           | 0.85              | 0.4               | 24        | 21             | 2.48        | 0.14    | Routed from DP-2 Inlet to DP-3 Manhole   |
|                      | 3            |               |              |                      |               |                |                          |                      | 5.6                  | 0.40          | 4.70        | 1.89    |           | 1.08              | 0.5               | 6         | 75             | 3.22        | 0.39    | Routed from B1 Roofdrain to DP-3 Manhole |
|                      |              |               |              |                      |               |                |                          |                      |                      |               |             |         |           |                   |                   |           |                |             |         | Total flow at DP-3 Manhole               |
| B2                   | 4            | 0.17          | 0.81         | 5.0                  | 0.14          | 1.43           | 4.85                     | 0.68                 |                      |               |             |         |           | 1.89              | 0.04              | 24        | 238            | 3.13        | 1.27    | Routed from DP-3 Manhole to DP-6 Manhole |
| B3                   | 4            | 0.33          | 0.74         | 5.0                  | 0.24          | 1.43           | 4.85                     | 1.18                 |                      |               |             |         |           | 0.68              | 0.5               | 6         | 80             | 2.86        | 0.47    | Routed from B2 Roofdrain to DP-4 Inlet   |
|                      | 4            |               |              |                      |               |                |                          |                      | 5.5                  | 0.38          | 4.74        | 1.81    |           |                   |                   |           |                |             |         |                                          |
|                      |              |               |              |                      |               |                |                          |                      |                      |               |             |         |           |                   |                   |           |                |             |         | Total flow at DP-4 Inlet                 |
| B4                   | 5            | 0.62          | 0.73         | 5.8                  | 0.45          | 1.43           | 4.66                     | 2.11                 |                      |               |             |         |           | 1.81              | 0.5               | 15        | 95             | 3.46        | 0.46    | Routed from DP-4 Inlet to DP-5 Inlet     |
|                      | 5            |               |              |                      |               |                |                          |                      | 5.8                  | 0.84          | 4.66        | 3.89    |           |                   |                   |           |                |             |         |                                          |
|                      |              |               |              |                      |               |                |                          |                      | 6.9                  | 1.24          | 4.42        | 5.48    |           | 3.89              | 0.5               | 15        | 18             | 4.16        | 0.07    | Total flow at DP-5 Inlet                 |
|                      | 6            |               |              |                      |               |                |                          |                      |                      |               |             |         |           |                   |                   |           |                |             |         | Routed from DP-5 Inlet to DP-6 Manhole   |
|                      |              |               |              |                      |               |                |                          |                      |                      |               |             |         |           |                   |                   |           |                |             |         | Total flow at DP-6 Manhole               |
| C1                   | 7            | 0.34          | 0.76         | 5.0                  | 0.26          | 1.43           | 4.85                     | 1.24                 |                      |               |             |         |           | 5.48              | 0.4               | 24        | 172            | 4.21        | 0.68    | Routed from DP-6 Manhole to DP-7 Inlet   |
|                      | 7            |               |              |                      |               |                |                          |                      | 7.6                  | 1.49          | 4.29        | 6.40    |           |                   |                   |           |                |             |         |                                          |
|                      |              |               |              |                      |               |                |                          |                      |                      |               |             |         |           |                   |                   |           |                |             |         | Total flow at DP-7 Inlet                 |
| D1                   | -            | 1.28          | 0.17         | 8.4                  | 0.22          | 1.43           | 4.13                     | 0.92                 |                      |               |             |         |           |                   |                   |           |                |             |         |                                          |
|                      |              |               |              |                      |               |                |                          |                      |                      |               |             |         |           |                   |                   |           |                |             |         |                                          |
| D2                   | -            | 0.98          | 0.18         | 7.6                  | 0.18          | 1.43           | 4.28                     | 0.77                 |                      |               |             |         |           |                   |                   |           |                |             |         |                                          |
|                      |              |               |              |                      |               |                |                          |                      |                      |               |             |         |           |                   |                   |           |                |             |         |                                          |

NOTES:

- a. Castle Rock Storm Drainage Design and Technical Criteria Manual: 5-year (P<sub>1</sub> = 1.43 in.), 100-year (P<sub>1</sub> = 2.60 in.)
- b. MHFD, USDCM Volume 1, Equation 5-1:  $I = (28.5 * P_1) / (10 + T_c)^{0.786}$
- c. MHFD, USDCM Volume 1, Equation 6-1:  $Q = CIA$

**STORM DRAINAGE SYSTEM DESIGN  
RATIONAL METHOD PROCEDURE  
100-YEAR STORM**

| DEVELOPED CONDITIONS |              |               |              |                      |               |                             |                          |                      |                      |               |             |         |           |                   |                   |           |                |             |         |                                                                        |
|----------------------|--------------|---------------|--------------|----------------------|---------------|-----------------------------|--------------------------|----------------------|----------------------|---------------|-------------|---------|-----------|-------------------|-------------------|-----------|----------------|-------------|---------|------------------------------------------------------------------------|
| MASTER BASIN         | DESIGN POINT | DIRECT RUNOFF |              |                      |               |                             |                          |                      | TOTAL RUNOFF         |               |             |         | STREET    |                   | PIPE              |           | TRAVEL TIME    |             | REMARKS |                                                                        |
|                      |              | AREA (acres)  | RUNOFF COEFF | T <sub>c</sub> (min) | C * A (acres) | P <sub>1</sub> <sup>a</sup> | I <sup>b</sup> (in/hour) | Q (cfs) <sup>c</sup> | T <sub>c</sub> (min) | C * A (acres) | I (in/hour) | Q (cfs) | SLOPE (%) | STREET FLOW (cfs) | DESIGN FLOW (cfs) | SLOPE (%) | PIPE SIZE (in) | LENGTH (ft) |         | VELOCITY (fps)                                                         |
|                      |              |               |              |                      |               |                             |                          |                      |                      |               |             |         |           |                   |                   |           |                |             |         |                                                                        |
| A1                   | 1            | 0.20          | 0.81         | 5.0                  | 0.16          | 2.60                        | 8.82                     | 1.42                 |                      |               |             |         |           |                   |                   |           |                |             |         |                                                                        |
| A2                   | 2            | 0.06          | 0.80         | 5.0                  | 0.05          | 2.60                        | 8.82                     | 0.43                 |                      |               |             |         |           | 1.42              | 0.5               | 15        | 72             | 3.25        | 0.37    | Routed from DP-1 Inlet to DP-2 Inlet                                   |
|                      | 2            |               |              |                      |               |                             |                          |                      | 5.4                  | 0.21          | 8.65        | 1.81    |           |                   |                   |           |                |             |         |                                                                        |
| B1                   | 3            | 0.27          | 0.87         | 5.0                  | 0.24          | 2.60                        | 8.82                     | 2.10                 |                      |               |             |         |           | 1.81              | 0.4               | 24        | 21             | 3.11        | 0.11    | Total flow at DP-2 Inlet<br>Routed from DP-2 Inlet to DP-3 Manhole     |
|                      | 3            |               |              |                      |               |                             |                          |                      | 5.5                  | 0.45          | 8.60        | 3.85    |           | 2.10              | 0.5               | 6         | 75             | 3.81        | 0.33    | Routed from B1 Roofdrain to DP-3 Manhole<br>Total flow at DP-3 Manhole |
| B2                   | 4            | 0.17          | 0.87         | 5.0                  | 0.15          | 2.60                        | 8.82                     | 1.32                 |                      |               |             |         |           | 3.85              | 0.04              | 24        | 238            | 3.83        | 1.04    | Routed from DP-3 Manhole to DP-6 Manhole                               |
| B3                   | 4            | 0.33          | 0.83         | 5.0                  | 0.27          | 2.60                        | 8.82                     | 2.41                 |                      |               |             |         |           | 1.32              | 0.5               | 6         | 80             | 3.43        | 0.39    | Routed from B2 Roofdrain to DP-4 Inlet                                 |
|                      | 4            |               |              |                      |               |                             |                          |                      | 5.4                  | 0.42          | 8.64        | 3.65    |           |                   |                   |           |                |             |         |                                                                        |
| B4                   | 5            | 0.62          | 0.83         | 5.8                  | 0.51          | 2.60                        | 8.47                     | 4.35                 |                      |               |             |         |           | 3.65              | 0.5               | 15        | 95             | 4.1         | 0.39    | Total flow at DP-4 Inlet<br>Routed from DP-4 Inlet to DP-5 Inlet       |
|                      | 5            |               |              |                      |               |                             |                          |                      | 5.8                  | 0.94          | 8.47        | 7.93    |           |                   |                   |           |                |             |         |                                                                        |
|                      | 6            |               |              |                      |               |                             |                          |                      | 6.5                  | 1.38          | 8.18        | 11.31   |           | 7.93              | 0.5               | 15        | 18             | 4.7         | 0.06    | Total flow at DP-5 Inlet<br>Routed from DP-5 Inlet to DP-6 Manhole     |
| C1                   | 7            | 0.34          | 0.84         | 5.0                  | 0.28          | 2.60                        | 8.82                     | 2.50                 |                      |               |             |         |           | 11.31             | 0.4               | 24        | 172            | 5.05        | 0.57    | Total flow at DP-6 Manhole<br>Routed from DP-6 Manhole to DP-7 Inlet   |
|                      | 7            |               |              |                      |               |                             |                          |                      | 7.1                  | 1.67          | 7.96        | 13.27   |           |                   |                   |           |                |             |         |                                                                        |
| D1                   | -            | 1.28          | 0.53         | 8.4                  | 0.68          | 2.60                        | 7.50                     | 5.14                 |                      |               |             |         |           |                   |                   |           |                |             |         |                                                                        |
| D2                   | -            | 0.98          | 0.54         | 7.6                  | 0.53          | 2.60                        | 7.77                     | 4.11                 |                      |               |             |         |           |                   |                   |           |                |             |         |                                                                        |

NOTES:

- a. Castle Rock Storm Drainage Design and Technical Criteria Manual: 5-year (P<sub>1</sub> = 1.43 in.), 100-year (P<sub>1</sub> = 2.60 in.)
- b. MHFD, USDCM Volume 1, Equation 5-1:  $I = (28.5 * P_1) / (10 + T_c)^{0.786}$
- c. MHFD, USDCM Volume 1, Equation 6-1:  $Q = CIA$

## **APPENDIX D – Hydraulics**

**INLET MANAGEMENT**

Worksheet Protected

| INLET NAME                         | DP 1                      | DP 2                      | DP 4                     | DP 5                       | DP 7                      |
|------------------------------------|---------------------------|---------------------------|--------------------------|----------------------------|---------------------------|
| Site Type (Urban or Rural)         | URBAN                     | URBAN                     | URBAN                    | URBAN                      | URBAN                     |
| Inlet Application (Street or Area) | STREET                    | STREET                    | STREET                   | STREET                     | STREET                    |
| Hydraulic Condition                | In Sump                   | In Sump                   | In Sump                  | In Sump                    | In Sump                   |
| Inlet Type                         | Denver No. 16 Combination | Denver No. 16 Combination | CDOT Type R Curb Opening | Denver No. 16 Valley Grate | Denver No. 16 Combination |

**USER-DEFINED INPUT****User-Defined Design Flows**

|                        |     |     |     |     |     |
|------------------------|-----|-----|-----|-----|-----|
| Minor $Q_{down}$ (cfs) | 0.7 | 0.2 | 1.2 | 2.1 | 1.2 |
| Major $Q_{down}$ (cfs) | 1.4 | 0.4 | 2.4 | 4.4 | 2.5 |

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

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

**Watershed Characteristics**

|                           |  |  |  |  |  |
|---------------------------|--|--|--|--|--|
| Subcatchment Area (acres) |  |  |  |  |  |
| Percent Impervious        |  |  |  |  |  |
| NRCS Soil Type            |  |  |  |  |  |

**Watershed Profile**

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

**Minor Storm Rainfall Input**

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

**Major Storm Rainfall Input**

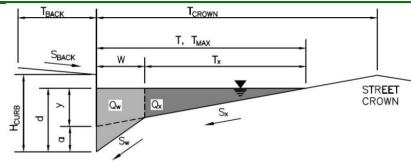
|                                           |  |  |  |  |  |
|-------------------------------------------|--|--|--|--|--|
| Design Storm Return Period, $T_r$ (years) |  |  |  |  |  |
| One-Hour Precipitation, $P_1$ (inches)    |  |  |  |  |  |

**CALCULATED OUTPUT**

|                                                           |            |            |            |            |            |
|-----------------------------------------------------------|------------|------------|------------|------------|------------|
| <b>Minor Total Design Peak Flow, <math>Q</math> (cfs)</b> | <b>0.7</b> | <b>0.2</b> | <b>1.2</b> | <b>2.1</b> | <b>1.2</b> |
| <b>Major Total Design Peak Flow, <math>Q</math> (cfs)</b> | <b>1.4</b> | <b>0.4</b> | <b>2.4</b> | <b>4.4</b> | <b>2.5</b> |
| Minor Flow Bypassed Downstream, $Q_b$ (cfs)               | N/A        | N/A        | N/A        | N/A        | N/A        |
| Major Flow Bypassed Downstream, $Q_b$ (cfs)               | N/A        | N/A        | N/A        | N/A        | N/A        |

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

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

Project: **Limelight Center at The Meadows**Inlet ID: **DP 1****Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

|            |   |       |       |
|------------|---|-------|-------|
| $T_{BACK}$ | = | 5.5   | ft    |
| $S_{BACK}$ | = |       | ft/ft |
| $n_{BACK}$ | = | 0.020 |       |

|              |   |       |        |
|--------------|---|-------|--------|
| $H_{CURB}$   | = | 6.00  | inches |
| $T_{CROWN}$  | = | 12.0  | ft     |
| $W$          | = | 2.00  | ft     |
| $S_X$        | = | 0.040 | ft/ft  |
| $S_W$        | = | 0.083 | ft/ft  |
| $S_D$        | = | 0.000 | ft/ft  |
| $n_{STREET}$ | = | 0.020 |        |

Max. Allowable Spread for Minor &amp; Major Storm

Max. Allowable Depth at Gutter Flowline for Minor &amp; Major Storm

Check boxes are not applicable in SUMP conditions

|           | Minor Storm              | Major Storm              |        |
|-----------|--------------------------|--------------------------|--------|
| $T_{MAX}$ | 12.0                     | 12.0                     | ft     |
| $d_{MAX}$ | 6.0                      | 6.0                      | inches |
|           | <input type="checkbox"/> | <input type="checkbox"/> |        |

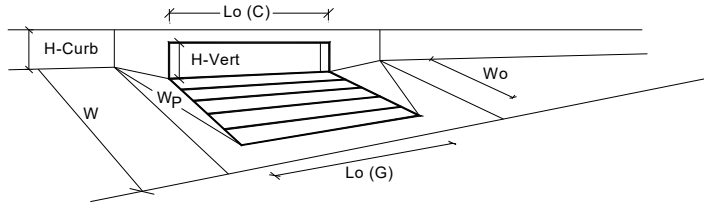
MINOR STORM Allowable Capacity is not applicable to Sump Condition

MAJOR STORM Allowable Capacity is not applicable to Sump Condition

|             | Minor Storm | Major Storm |     |
|-------------|-------------|-------------|-----|
| $Q_{allow}$ | SUMP        | SUMP        | cfs |

# INLET IN A SUMP OR SAG LOCATION

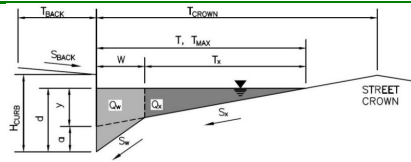
MHFD-Inlet, Version 5.03 (August 2023)



| Design Information (Input)                                                   |                           | MINOR                        |                           | MAJOR |                                          |
|------------------------------------------------------------------------------|---------------------------|------------------------------|---------------------------|-------|------------------------------------------|
| Type of Inlet                                                                | Denver No. 16 Combination | Type =                       | Denver No. 16 Combination |       |                                          |
| Local Depression (additional to continuous gutter depression 'a' from above) |                           | a <sub>local</sub> =         | 2.00                      | 2.00  | inches                                   |
| Number of Unit Inlets (Grate or Curb Opening)                                |                           | No =                         | 2                         | 2     |                                          |
| Water Depth at Flowline (outside of local depression)                        |                           | Ponding Depth =              | 6.0                       | 6.0   | inches                                   |
| <b>Grate Information</b>                                                     |                           |                              | MINOR                     | MAJOR | <input type="checkbox"/> Override Depths |
| Length of a Unit Grate                                                       |                           | L <sub>o</sub> (G) =         | 3.00                      | 3.00  | feet                                     |
| Width of a Unit Grate                                                        |                           | W <sub>o</sub> =             | 1.73                      | 1.73  | feet                                     |
| Open Area Ratio for a Grate (typical values 0.15-0.90)                       |                           | A <sub>ratio</sub> =         | 0.31                      | 0.31  |                                          |
| Clogging Factor for a Single Grate (typical value 0.50 - 0.70)               |                           | C <sub>f</sub> (G) =         | 0.50                      | 0.50  |                                          |
| Grate Weir Coefficient (typical value 2.15 - 3.60)                           |                           | C <sub>w</sub> (G) =         | 3.60                      | 3.60  |                                          |
| Grate Orifice Coefficient (typical value 0.60 - 0.80)                        |                           | C <sub>o</sub> (G) =         | 0.60                      | 0.60  |                                          |
| <b>Curb Opening Information</b>                                              |                           |                              | MINOR                     | MAJOR |                                          |
| Length of a Unit Curb Opening                                                |                           | L <sub>o</sub> (C) =         | 3.00                      | 3.00  | feet                                     |
| Height of Vertical Curb Opening in Inches                                    |                           | H <sub>vert</sub> =          | 6.50                      | 6.50  | inches                                   |
| Height of Curb Orifice Throat in Inches                                      |                           | H <sub>throat</sub> =        | 5.25                      | 5.25  | inches                                   |
| Angle of Throat                                                              |                           | Theta =                      | 0.00                      | 0.00  | degrees                                  |
| Side Width for Depression Pan (typically the gutter width of 2 feet)         |                           | W <sub>p</sub> =             | 2.00                      | 2.00  | feet                                     |
| Clogging Factor for a Single Curb Opening (typical value 0.10)               |                           | C <sub>f</sub> (C) =         | 0.10                      | 0.10  |                                          |
| Curb Opening Weir Coefficient (typical value 2.3-3.7)                        |                           | C <sub>w</sub> (C) =         | 3.70                      | 3.70  |                                          |
| Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)                 |                           | C <sub>o</sub> (C) =         | 0.66                      | 0.66  |                                          |
| <b>Low Head Performance Reduction (Calculated)</b>                           |                           |                              | MINOR                     | MAJOR |                                          |
| Depth for Grate Midwidth                                                     |                           | d <sub>Grate</sub> =         | 0.52                      | 0.52  | ft                                       |
| Depth for Curb Opening Weir Equation                                         |                           | d <sub>Curb</sub> =          | 0.33                      | 0.33  | ft                                       |
| Grated Inlet Performance Reduction Factor for Long Inlets                    |                           | RF <sub>Grate</sub> =        | 0.71                      | 0.71  |                                          |
| Curb Opening Performance Reduction Factor for Long Inlets                    |                           | RF <sub>Curb</sub> =         | N/A                       | N/A   |                                          |
| Combination Inlet Performance Reduction Factor for Long Inlets               |                           | RF <sub>Combination</sub> =  | 0.71                      | 0.71  |                                          |
| <b>Total Inlet Interception Capacity (assumes clogged condition)</b>         |                           |                              | MINOR                     | MAJOR |                                          |
| <b>Inlet Capacity IS GOOD for Minor and Major Storms (&gt;Q Peak)</b>        |                           | Q <sub>a</sub> =             | 7.7                       | 7.7   | cfs                                      |
|                                                                              |                           | Q <sub>PEAK REQUIRED</sub> = | 0.7                       | 1.4   | cfs                                      |

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

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

Project: **Limelight Center at The Meadows**Inlet ID: **DP 2****Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

|            |   |       |       |
|------------|---|-------|-------|
| $T_{BACK}$ | = | 4.0   | ft    |
| $S_{BACK}$ | = | 0.020 | ft/ft |
| $n_{BACK}$ | = | 0.020 |       |

|              |   |       |        |
|--------------|---|-------|--------|
| $H_{CURB}$   | = | 6.00  | inches |
| $T_{CROWN}$  | = | 12.0  | ft     |
| $W$          | = | 2.00  | ft     |
| $S_x$        | = | 0.020 | ft/ft  |
| $S_y$        | = | 0.083 | ft/ft  |
| $S_o$        | = | 0.000 | ft/ft  |
| $n_{STREET}$ | = | 0.020 |        |

Max. Allowable Spread for Minor &amp; Major Storm

Max. Allowable Depth at Gutter Flowline for Minor &amp; Major Storm

Check boxes are not applicable in SUMP conditions

|           | Minor Storm              | Major Storm              |        |
|-----------|--------------------------|--------------------------|--------|
| $T_{MAX}$ | 12.0                     | 12.0                     | ft     |
| $d_{MAX}$ | 6.0                      | 6.0                      | inches |
|           | <input type="checkbox"/> | <input type="checkbox"/> |        |

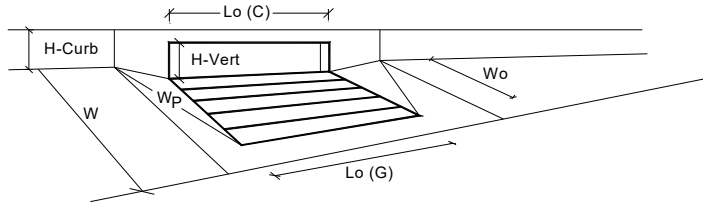
MINOR STORM Allowable Capacity is not applicable to Sump Condition

MAJOR STORM Allowable Capacity is not applicable to Sump Condition

|             | Minor Storm | Major Storm |     |
|-------------|-------------|-------------|-----|
| $Q_{allow}$ | SUMP        | SUMP        | cfs |

# INLET IN A SUMP OR SAG LOCATION

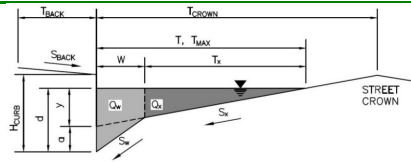
MHFD-Inlet, Version 5.03 (August 2023)



| Design Information (Input)                                                   |                           | MINOR                        |                           | MAJOR |                                          |
|------------------------------------------------------------------------------|---------------------------|------------------------------|---------------------------|-------|------------------------------------------|
| Type of Inlet                                                                | Denver No. 16 Combination | Type =                       | Denver No. 16 Combination |       |                                          |
| Local Depression (additional to continuous gutter depression 'a' from above) |                           | a <sub>local</sub> =         | 2.00                      | 2.00  | inches                                   |
| Number of Unit Inlets (Grate or Curb Opening)                                |                           | No =                         | 1                         | 1     |                                          |
| Water Depth at Flowline (outside of local depression)                        |                           | Ponding Depth =              | 4.4                       | 4.4   | inches                                   |
| <b>Grate Information</b>                                                     |                           |                              | MINOR                     | MAJOR | <input type="checkbox"/> Override Depths |
| Length of a Unit Grate                                                       |                           | L <sub>o</sub> (G) =         | 3.00                      | 3.00  | feet                                     |
| Width of a Unit Grate                                                        |                           | W <sub>o</sub> =             | 1.73                      | 1.73  | feet                                     |
| Open Area Ratio for a Grate (typical values 0.15-0.90)                       |                           | A <sub>ratio</sub> =         | 0.31                      | 0.31  |                                          |
| Clogging Factor for a Single Grate (typical value 0.50 - 0.70)               |                           | C <sub>f</sub> (G) =         | 0.50                      | 0.50  |                                          |
| Grate Weir Coefficient (typical value 2.15 - 3.60)                           |                           | C <sub>w</sub> (G) =         | 3.60                      | 3.60  |                                          |
| Grate Orifice Coefficient (typical value 0.60 - 0.80)                        |                           | C <sub>o</sub> (G) =         | 0.60                      | 0.60  |                                          |
| <b>Curb Opening Information</b>                                              |                           |                              | MINOR                     | MAJOR |                                          |
| Length of a Unit Curb Opening                                                |                           | L <sub>o</sub> (C) =         | 3.00                      | 3.00  | feet                                     |
| Height of Vertical Curb Opening in Inches                                    |                           | H <sub>vert</sub> =          | 6.50                      | 6.50  | inches                                   |
| Height of Curb Orifice Throat in Inches                                      |                           | H <sub>throat</sub> =        | 5.25                      | 5.25  | inches                                   |
| Angle of Throat                                                              |                           | Theta =                      | 0.00                      | 0.00  | degrees                                  |
| Side Width for Depression Pan (typically the gutter width of 2 feet)         |                           | W <sub>p</sub> =             | 2.00                      | 2.00  | feet                                     |
| Clogging Factor for a Single Curb Opening (typical value 0.10)               |                           | C <sub>f</sub> (C) =         | 0.10                      | 0.10  |                                          |
| Curb Opening Weir Coefficient (typical value 2.3-3.7)                        |                           | C <sub>w</sub> (C) =         | 3.70                      | 3.70  |                                          |
| Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)                 |                           | C <sub>o</sub> (C) =         | 0.66                      | 0.66  |                                          |
| <b>Low Head Performance Reduction (Calculated)</b>                           |                           |                              | MINOR                     | MAJOR |                                          |
| Depth for Grate Midwidth                                                     |                           | d <sub>Grate</sub> =         | 0.39                      | 0.39  | ft                                       |
| Depth for Curb Opening Weir Equation                                         |                           | d <sub>Curb</sub> =          | 0.20                      | 0.20  | ft                                       |
| Grated Inlet Performance Reduction Factor for Long Inlets                    |                           | RF <sub>Grate</sub> =        | 0.69                      | 0.69  |                                          |
| Curb Opening Performance Reduction Factor for Long Inlets                    |                           | RF <sub>Curb</sub> =         | N/A                       | N/A   |                                          |
| Combination Inlet Performance Reduction Factor for Long Inlets               |                           | RF <sub>Combination</sub> =  | 0.69                      | 0.69  |                                          |
| <b>Total Inlet Interception Capacity (assumes clogged condition)</b>         |                           |                              | MINOR                     | MAJOR |                                          |
| <b>Inlet Capacity IS GOOD for Minor and Major Storms (&gt;Q Peak)</b>        |                           | Q <sub>a</sub> =             | 2.4                       | 2.4   | cfs                                      |
|                                                                              |                           | Q <sub>PEAK REQUIRED</sub> = | 0.2                       | 0.4   | cfs                                      |

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

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

Project: **Limelight Center at The Meadows**Inlet ID: **DP 4****Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

|            |   |       |       |
|------------|---|-------|-------|
| $T_{BACK}$ | = | 10.0  | ft    |
| $S_{BACK}$ | = | 0.200 | ft/ft |
| $n_{BACK}$ | = | 0.020 |       |

|              |   |       |        |
|--------------|---|-------|--------|
| $H_{CURB}$   | = | 6.00  | inches |
| $T_{CROWN}$  | = | 60.0  | ft     |
| $W$          | = | 1.00  | ft     |
| $S_x$        | = | 0.020 | ft/ft  |
| $S_w$        | = | 0.083 | ft/ft  |
| $S_o$        | = | 0.000 | ft/ft  |
| $n_{STREET}$ | = | 0.020 |        |

Max. Allowable Spread for Minor &amp; Major Storm

Max. Allowable Depth at Gutter Flowline for Minor &amp; Major Storm

Check boxes are not applicable in SUMP conditions

|           | Minor Storm              | Major Storm              |        |
|-----------|--------------------------|--------------------------|--------|
| $T_{MAX}$ | 20.0                     | 20.0                     | ft     |
| $d_{MAX}$ | 6.0                      | 6.0                      | inches |
|           | <input type="checkbox"/> | <input type="checkbox"/> |        |

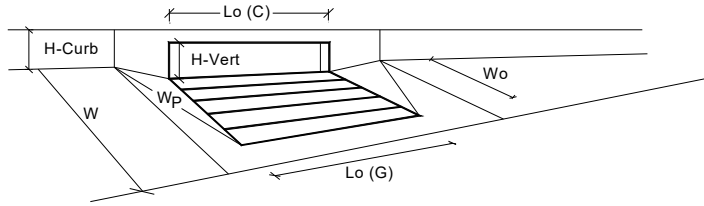
MINOR STORM Allowable Capacity is not applicable to Sump Condition

MAJOR STORM Allowable Capacity is not applicable to Sump Condition

|             | Minor Storm | Major Storm |     |
|-------------|-------------|-------------|-----|
| $Q_{allow}$ | SUMP        | SUMP        | cfs |

# INLET IN A SUMP OR SAG LOCATION

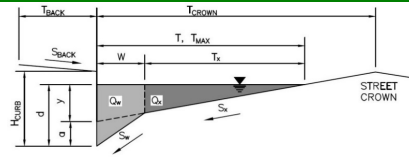
MHFD-Inlet, Version 5.03 (August 2023)



| Design Information (Input)                                                   |                          | MINOR                 |                          | MAJOR |                                          |
|------------------------------------------------------------------------------|--------------------------|-----------------------|--------------------------|-------|------------------------------------------|
| Type of Inlet                                                                | CDOT Type R Curb Opening | Type =                | CDOT Type R Curb Opening |       |                                          |
| Local Depression (additional to continuous gutter depression 'a' from above) |                          | $a_{local}$ =         | 3.00                     | 3.00  | inches                                   |
| Number of Unit Inlets (Grate or Curb Opening)                                |                          | No =                  | 1                        | 1     |                                          |
| Water Depth at Flowline (outside of local depression)                        |                          | Ponding Depth =       | 5.6                      | 5.6   | inches                                   |
| <b>Grate Information</b>                                                     |                          |                       | MINOR                    | MAJOR | <input type="checkbox"/> Override Depths |
| Length of a Unit Grate                                                       |                          | $L_o$ (G) =           | N/A                      | N/A   | feet                                     |
| Width of a Unit Grate                                                        |                          | $W_o$ =               | N/A                      | N/A   | feet                                     |
| Open Area Ratio for a Grate (typical values 0.15-0.90)                       |                          | $A_{ratio}$ =         | N/A                      | N/A   |                                          |
| Clogging Factor for a Single Grate (typical value 0.50 - 0.70)               |                          | $C_f$ (G) =           | N/A                      | N/A   |                                          |
| Grate Weir Coefficient (typical value 2.15 - 3.60)                           |                          | $C_w$ (G) =           | N/A                      | N/A   |                                          |
| Grate Orifice Coefficient (typical value 0.60 - 0.80)                        |                          | $C_o$ (G) =           | N/A                      | N/A   |                                          |
| <b>Curb Opening Information</b>                                              |                          |                       | MINOR                    | MAJOR |                                          |
| Length of a Unit Curb Opening                                                |                          | $L_o$ (C) =           | 5.00                     | 5.00  | feet                                     |
| Height of Vertical Curb Opening in Inches                                    |                          | $H_{vert}$ =          | 6.00                     | 6.00  | inches                                   |
| Height of Curb Orifice Throat in Inches                                      |                          | $H_{throat}$ =        | 6.00                     | 6.00  | inches                                   |
| Angle of Throat                                                              |                          | Theta =               | 63.40                    | 63.40 | degrees                                  |
| Side Width for Depression Pan (typically the gutter width of 2 feet)         |                          | $W_p$ =               | 1.00                     | 1.00  | feet                                     |
| Clogging Factor for a Single Curb Opening (typical value 0.10)               |                          | $C_f$ (C) =           | 0.10                     | 0.10  |                                          |
| Curb Opening Weir Coefficient (typical value 2.3-3.7)                        |                          | $C_w$ (C) =           | 3.60                     | 3.60  |                                          |
| Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)                 |                          | $C_o$ (C) =           | 0.67                     | 0.67  |                                          |
| <b>Low Head Performance Reduction (Calculated)</b>                           |                          |                       | MINOR                    | MAJOR |                                          |
| Depth for Grate Midwidth                                                     |                          | $d_{Grate}$ =         | N/A                      | N/A   | ft                                       |
| Depth for Curb Opening Weir Equation                                         |                          | $d_{Curb}$ =          | 0.38                     | 0.38  | ft                                       |
| Grated Inlet Performance Reduction Factor for Long Inlets                    |                          | $RF_{Grate}$ =        | N/A                      | N/A   |                                          |
| Curb Opening Performance Reduction Factor for Long Inlets                    |                          | $RF_{Curb}$ =         | 1.00                     | 1.00  |                                          |
| Combination Inlet Performance Reduction Factor for Long Inlets               |                          | $RF_{Combination}$ =  | N/A                      | N/A   |                                          |
| Total Inlet Interception Capacity (assumes clogged condition)                |                          |                       | MINOR                    | MAJOR |                                          |
| <b>Inlet Capacity IS GOOD for Minor and Major Storms (&gt;Q Peak)</b>        |                          | $Q_a$ =               | 5.2                      | 5.2   | cfs                                      |
|                                                                              |                          | $Q_{PEAK REQUIRED}$ = | 1.2                      | 2.4   | cfs                                      |

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

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

Project: **Limelight Center at The Meadows**Inlet ID: **DP 5****Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

|            |   |       |       |
|------------|---|-------|-------|
| $T_{BACK}$ | = | 0.0   | ft    |
| $S_{BACK}$ | = |       | ft/ft |
| $n_{BACK}$ | = | 0.020 |       |

|              |   |       |        |
|--------------|---|-------|--------|
| $H_{CURB}$   | = | 6.00  | inches |
| $T_{CROWN}$  | = | 30.0  | ft     |
| $W$          | = | 2.00  | ft     |
| $S_X$        | = | 0.020 | ft/ft  |
| $S_W$        | = | 0.083 | ft/ft  |
| $S_O$        | = | 0.000 | ft/ft  |
| $n_{STREET}$ | = | 0.020 |        |

Max. Allowable Spread for Minor &amp; Major Storm

Max. Allowable Depth at Gutter Flowline for Minor &amp; Major Storm

Check boxes are not applicable in SUMP conditions

|           | Minor Storm              | Major Storm              |        |
|-----------|--------------------------|--------------------------|--------|
| $T_{MAX}$ | 30.0                     | 30.0                     | ft     |
| $d_{MAX}$ | 6.0                      | 6.0                      | inches |
|           | <input type="checkbox"/> | <input type="checkbox"/> |        |

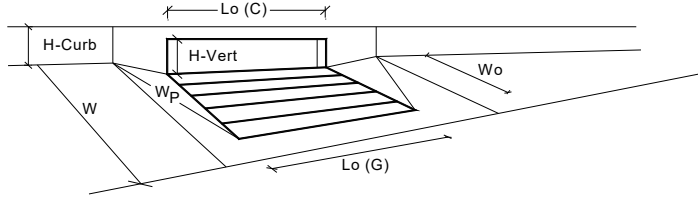
MINOR STORM Allowable Capacity is not applicable to Sump Condition

MAJOR STORM Allowable Capacity is not applicable to Sump Condition

|             | Minor Storm | Major Storm |     |
|-------------|-------------|-------------|-----|
| $Q_{allow}$ | SUMP        | SUMP        | cfs |

# INLET IN A SUMP OR SAG LOCATION

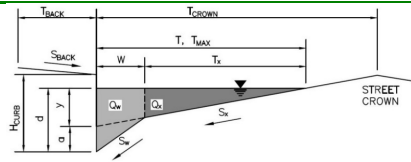
MHFD-Inlet, Version 5.03 (August 2023)



| Design Information (Input)                                                   |                            | MINOR                 |                            | MAJOR |         |
|------------------------------------------------------------------------------|----------------------------|-----------------------|----------------------------|-------|---------|
| Type of Inlet                                                                | Denver No. 16 Valley Grate | Type =                | Denver No. 16 Valley Grate |       |         |
| Local Depression (additional to continuous gutter depression 'a' from above) |                            | $a_{local}$ =         | 2.00                       | 2.00  | inches  |
| Number of Unit Inlets (Grate or Curb Opening)                                |                            | No =                  | 3                          | 3     |         |
| Water Depth at Flowline (outside of local depression)                        |                            | Ponding Depth =       | 6.0                        | 6.0   | inches  |
| <u>Grate Information</u>                                                     |                            | MINOR                 |                            | MAJOR |         |
| Length of a Unit Grate                                                       |                            | $L_o$ (G) =           | 3.00                       | 3.00  | feet    |
| Width of a Unit Grate                                                        |                            | $W_o$ =               | 1.73                       | 1.73  | feet    |
| Open Area Ratio for a Grate (typical values 0.15-0.90)                       |                            | $A_{ratio}$ =         | 0.31                       | 0.31  |         |
| Clogging Factor for a Single Grate (typical value 0.50 - 0.70)               |                            | $C_f$ (G) =           | 0.50                       | 0.50  |         |
| Grate Weir Coefficient (typical value 2.15 - 3.60)                           |                            | $C_w$ (G) =           | 3.60                       | 3.60  |         |
| Grate Orifice Coefficient (typical value 0.60 - 0.80)                        |                            | $C_o$ (G) =           | 0.60                       | 0.60  |         |
| <u>Curb Opening Information</u>                                              |                            | MINOR                 |                            | MAJOR |         |
| Length of a Unit Curb Opening                                                |                            | $L_o$ (C) =           | N/A                        | N/A   | feet    |
| Height of Vertical Curb Opening in Inches                                    |                            | $H_{vert}$ =          | N/A                        | N/A   | inches  |
| Height of Curb Orifice Throat in Inches                                      |                            | $H_{throat}$ =        | N/A                        | N/A   | inches  |
| Angle of Throat                                                              |                            | Theta =               | N/A                        | N/A   | degrees |
| Side Width for Depression Pan (typically the gutter width of 2 feet)         |                            | $W_p$ =               | N/A                        | N/A   | feet    |
| Clogging Factor for a Single Curb Opening (typical value 0.10)               |                            | $C_f$ (C) =           | N/A                        | N/A   |         |
| Curb Opening Weir Coefficient (typical value 2.3-3.7)                        |                            | $C_w$ (C) =           | N/A                        | N/A   |         |
| Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)                 |                            | $C_o$ (C) =           | N/A                        | N/A   |         |
| <u>Low Head Performance Reduction (Calculated)</u>                           |                            | MINOR                 |                            | MAJOR |         |
| Depth for Grate Midwidth                                                     |                            | $d_{Grate}$ =         | 0.52                       | 0.52  | ft      |
| Depth for Curb Opening Weir Equation                                         |                            | $d_{Curb}$ =          | N/A                        | N/A   | ft      |
| Grated Inlet Performance Reduction Factor for Long Inlets                    |                            | $RF_{Grate}$ =        | 0.57                       | 0.57  |         |
| Curb Opening Performance Reduction Factor for Long Inlets                    |                            | $RF_{Curb}$ =         | N/A                        | N/A   |         |
| Combination Inlet Performance Reduction Factor for Long Inlets               |                            | $RF_{Combination}$ =  | N/A                        | N/A   |         |
| Total Inlet Interception Capacity (assumes clogged condition)                |                            | MINOR                 |                            | MAJOR |         |
| <b>Inlet Capacity IS GOOD for Minor and Major Storms (&gt;Q Peak)</b>        |                            | $Q_s$ =               | 5.0                        | 5.0   | cfs     |
|                                                                              |                            | $Q_{PEAK REQUIRED}$ = | 2.1                        | 4.4   | cfs     |

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

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

Project: **Limelight Center at The Meadows**Inlet ID: **DP 7****Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

$T_{BACK} =$  0.0 ft  
 $S_{BACK} =$  ft/ft  
 $n_{BACK} =$  0.020

$H_{CURB} =$  6.00 inches  
 $T_{CROWN} =$  20.0 ft  
 $W =$  2.00 ft  
 $S_x =$  0.040 ft/ft  
 $S_y =$  0.083 ft/ft  
 $S_o =$  0.000 ft/ft  
 $n_{STREET} =$  0.020

Max. Allowable Spread for Minor &amp; Major Storm

Max. Allowable Depth at Gutter Flowline for Minor &amp; Major Storm

Check boxes are not applicable in SUMP conditions

|             | Minor Storm              | Major Storm              |        |
|-------------|--------------------------|--------------------------|--------|
| $T_{MAX} =$ | 10.0                     | 10.0                     | ft     |
| $d_{MAX} =$ | 6.0                      | 6.0                      | inches |
|             | <input type="checkbox"/> | <input type="checkbox"/> |        |

MINOR STORM Allowable Capacity is not applicable to Sump Condition

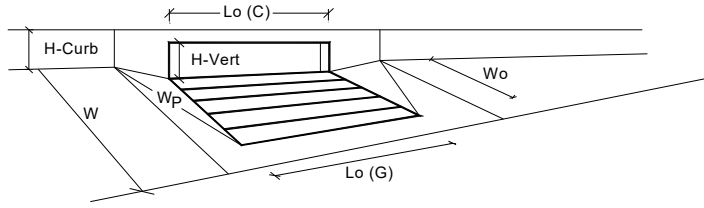
MAJOR STORM Allowable Capacity is not applicable to Sump Condition

$Q_{allow} =$ 

| Minor Storm | Major Storm |     |
|-------------|-------------|-----|
| SUMP        | SUMP        | cfs |

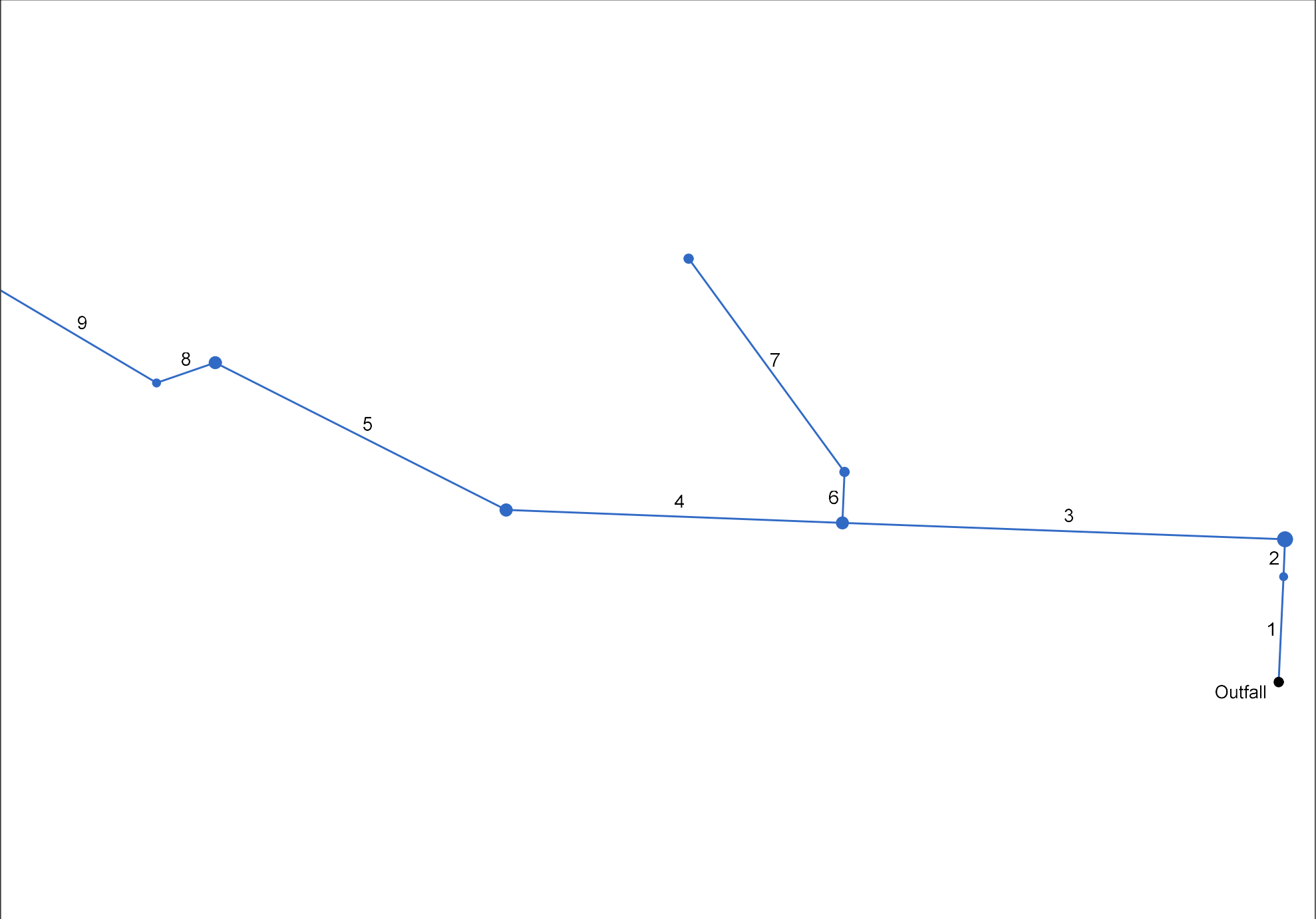
# INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.03 (August 2023)



| Design Information (Input)                                                   |                           | MINOR                 |                           | MAJOR |         |
|------------------------------------------------------------------------------|---------------------------|-----------------------|---------------------------|-------|---------|
| Type of Inlet                                                                | Denver No. 16 Combination | Type =                | Denver No. 16 Combination |       |         |
| Local Depression (additional to continuous gutter depression 'a' from above) |                           | $a_{local}$ =         | 2.00                      | 2.00  | inches  |
| Number of Unit Inlets (Grate or Curb Opening)                                |                           | $N_o$ =               | 1                         | 1     |         |
| Water Depth at Flowline (outside of local depression)                        |                           | Ponding Depth =       | 5.8                       | 5.8   | inches  |
| <b>Grate Information</b>                                                     |                           | MINOR                 |                           | MAJOR |         |
| Length of a Unit Grate                                                       |                           | $L_o (G)$ =           | 3.00                      | 3.00  | feet    |
| Width of a Unit Grate                                                        |                           | $W_o$ =               | 1.73                      | 1.73  | feet    |
| Open Area Ratio for a Grate (typical values 0.15-0.90)                       |                           | $A_{ratio}$ =         | 0.31                      | 0.31  |         |
| Clogging Factor for a Single Grate (typical value 0.50 - 0.70)               |                           | $C_f (G)$ =           | 0.50                      | 0.50  |         |
| Grate Weir Coefficient (typical value 2.15 - 3.60)                           |                           | $C_w (G)$ =           | 3.60                      | 3.60  |         |
| Grate Orifice Coefficient (typical value 0.60 - 0.80)                        |                           | $C_o (G)$ =           | 0.60                      | 0.60  |         |
| <b>Curb Opening Information</b>                                              |                           | MINOR                 |                           | MAJOR |         |
| Length of a Unit Curb Opening                                                |                           | $L_o (C)$ =           | 3.00                      | 3.00  | feet    |
| Height of Vertical Curb Opening in Inches                                    |                           | $H_{vert}$ =          | 6.50                      | 6.50  | inches  |
| Height of Curb Orifice Throat in Inches                                      |                           | $H_{throat}$ =        | 5.25                      | 5.25  | inches  |
| Angle of Throat                                                              |                           | Theta =               | 0.00                      | 0.00  | degrees |
| Side Width for Depression Pan (typically the gutter width of 2 feet)         |                           | $W_p$ =               | 2.00                      | 2.00  | feet    |
| Clogging Factor for a Single Curb Opening (typical value 0.10)               |                           | $C_f (C)$ =           | 0.10                      | 0.10  |         |
| Curb Opening Weir Coefficient (typical value 2.3-3.7)                        |                           | $C_w (C)$ =           | 3.70                      | 3.70  |         |
| Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)                 |                           | $C_o (C)$ =           | 0.66                      | 0.66  |         |
| <b>Low Head Performance Reduction (Calculated)</b>                           |                           | MINOR                 |                           | MAJOR |         |
| Depth for Grate Midwidth                                                     |                           | $d_{Grate}$ =         | 0.51                      | 0.51  | ft      |
| Depth for Curb Opening Weir Equation                                         |                           | $d_{Curb}$ =          | 0.32                      | 0.32  | ft      |
| Grated Inlet Performance Reduction Factor for Long Inlets                    |                           | $RF_{Grate}$ =        | 0.91                      | 0.91  |         |
| Curb Opening Performance Reduction Factor for Long Inlets                    |                           | $RF_{Curb}$ =         | N/A                       | N/A   |         |
| Combination Inlet Performance Reduction Factor for Long Inlets               |                           | $RF_{combination}$ =  | 0.91                      | 0.91  |         |
| <b>Total Inlet Interception Capacity (assumes clogged condition)</b>         |                           | MINOR                 |                           | MAJOR |         |
| <b>Inlet Capacity IS GOOD for Minor and Major Storms (&gt;Q Peak)</b>        |                           | $Q_a$ =               | 5.3                       | 5.3   | cfs     |
|                                                                              |                           | $Q_{PEAK REQUIRED}$ = | 1.2                       | 2.5   | cfs     |

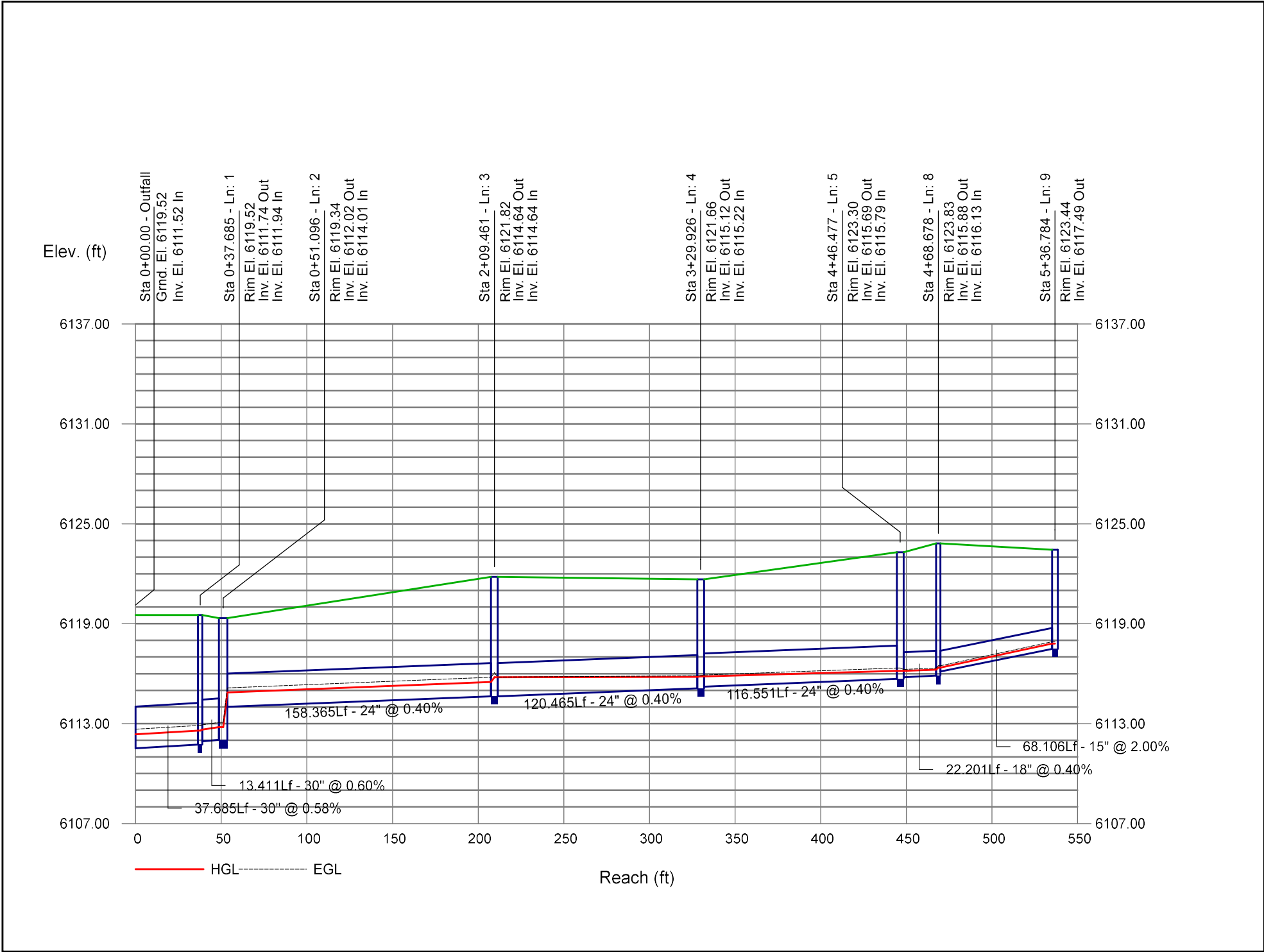
# Hydraflow Storm Sewers Extension for Autodesk® Civil 3D® Plan



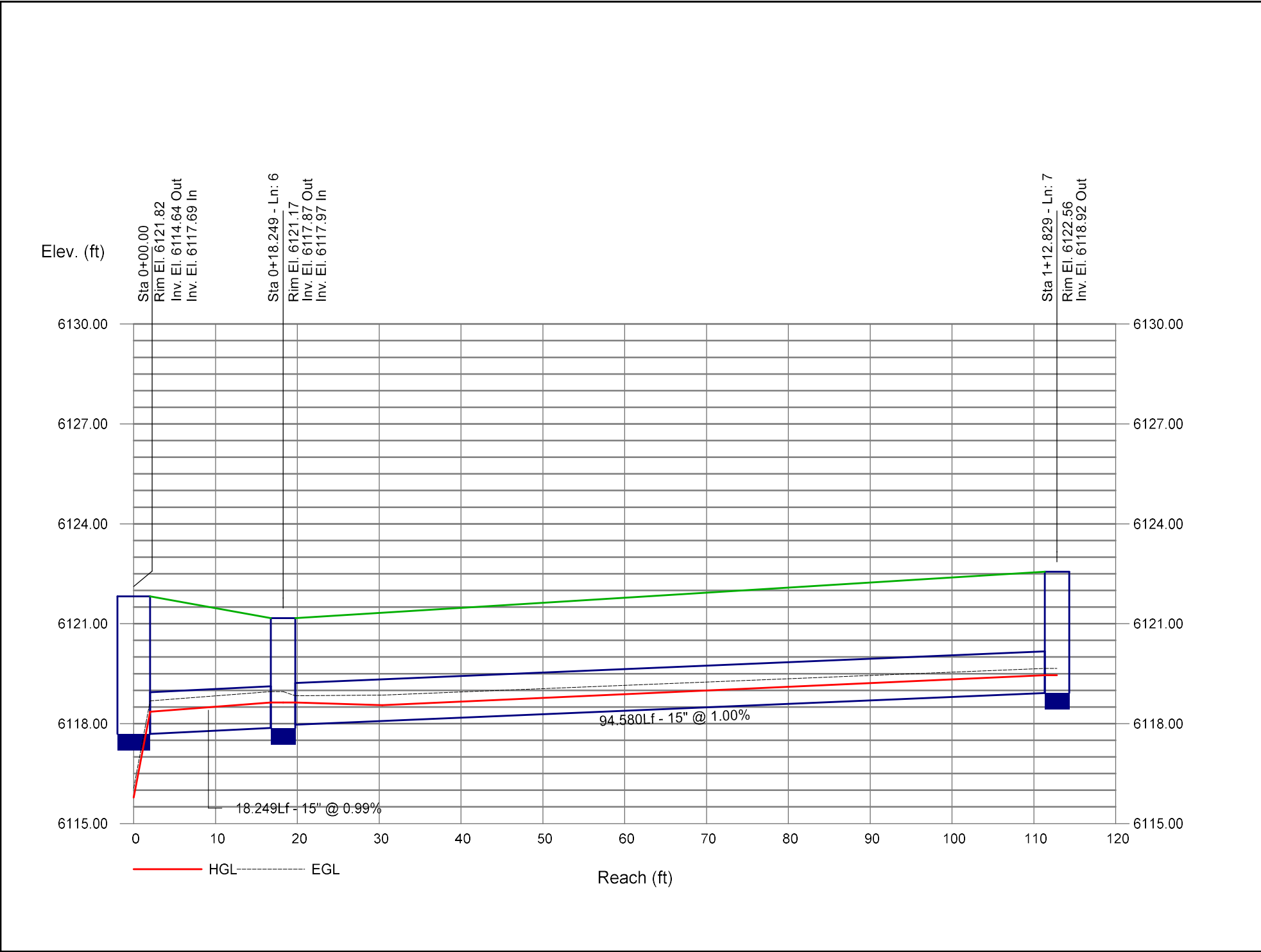
# Hydraulic Grade Line Computations

| Line                                                                                              | Size | Q     | Downstream             |                     |               |                |               |                     |                     |           | Len     | Upstream               |                     |                    |                |               |                     |                     |                     | Check            |                       | JL<br>coeff | Minor<br>loss |
|---------------------------------------------------------------------------------------------------|------|-------|------------------------|---------------------|---------------|----------------|---------------|---------------------|---------------------|-----------|---------|------------------------|---------------------|--------------------|----------------|---------------|---------------------|---------------------|---------------------|------------------|-----------------------|-------------|---------------|
|                                                                                                   |      |       | Invert<br>elev<br>(ft) | HGL<br>elev<br>(ft) | Depth<br>(ft) | Area<br>(sqft) | Vel<br>(ft/s) | Vel<br>head<br>(ft) | EGL<br>elev<br>(ft) | Sf<br>(%) |         | Invert<br>elev<br>(ft) | HGL<br>elev<br>(ft) | Depth<br>(ft)      | Area<br>(sqft) | Vel<br>(ft/s) | Vel<br>head<br>(ft) | EGL<br>elev<br>(ft) | Sf<br>(%)           | Ave<br>Sf<br>(%) | Enrgy<br>loss<br>(ft) |             |               |
|                                                                                                   | (in) | (cfs) |                        |                     |               |                |               |                     |                     |           | (ft)    |                        |                     |                    |                |               |                     |                     |                     |                  |                       | (K)         | (ft)          |
| 1                                                                                                 | 30   | 6.40  | 6111.52                | 6112.36             | 0.84          | 1.44           | 4.44          | 0.31                | 6112.66             | 0.000     | 37.685  | 6111.74                | 6112.58             | 0.84**             | 1.44           | 4.44          | 0.31                | 6112.88             | 0.000               | 0.000            | n/a                   | 0.50        | n/a           |
| 2                                                                                                 | 30   | 5.48  | 6111.94                | 6112.64             | 0.70*         | 1.13           | 4.84          | 0.28                | 6112.92             | 0.000     | 13.411  | 6112.02                | 6112.79             | 0.77**             | 1.29           | 4.25          | 0.28                | 6113.07             | 0.000               | 0.000            | n/a                   | 1.00        | n/a           |
| 3                                                                                                 | 24   | 5.48  | 6114.01                | 6114.87             | 0.86*         | 1.29           | 4.24          | 0.28                | 6115.15             | 0.397     | 158.365 | 6114.64                | 6115.50             | 0.86               | 1.29           | 4.24          | 0.28                | 6115.78             | 0.398               | 0.397            | 0.629                 | 1.00        | 0.28          |
| 4                                                                                                 | 24   | 1.89  | 6114.64                | 6115.78             | 1.14          | 1.85           | 1.02          | 0.02                | 6115.80             | 0.018     | 120.465 | 6115.12                | 6115.81             | 0.69               | 0.96           | 1.97          | 0.06                | 6115.87             | 0.107               | 0.063            | 0.076                 | 0.47        | 0.03          |
| 5                                                                                                 | 24   | 1.89  | 6115.22                | 6115.84             | 0.62          | 0.57           | 2.29          | 0.08                | 6115.92             | 0.163     | 116.551 | 6115.69                | 6116.17             | 0.48**             | 0.57           | 3.30          | 0.17                | 6116.34             | 0.452               | 0.308            | n/a                   | 0.76        | n/a           |
| 6                                                                                                 | 15   | 3.59  | 6117.69                | 6118.36             | 0.67*         | 0.67           | 5.38          | 0.32                | 6118.68             | 0.000     | 18.249  | 6117.87                | 6118.63             | 0.76**             | 0.79           | 4.57          | 0.32                | 6118.96             | 0.000               | 0.000            | n/a                   | 1.01        | n/a           |
| 7                                                                                                 | 15   | 1.81  | 6117.97                | 6118.63             | 0.66          | 0.50           | 2.73          | 0.20                | 6118.84             | 0.000     | 94.580  | 6118.92                | 6119.45 j           | 0.53**             | 0.50           | 3.62          | 0.20                | 6119.66             | 0.000               | 0.000            | n/a                   | 1.00        | n/a           |
| 8                                                                                                 | 18   | 0.85  | 6115.79                | 6116.17             | 0.38          | 0.35           | 2.45          | 0.09                | 6116.26             | 0.346     | 22.201  | 6115.88                | 6116.24             | 0.36               | 0.32           | 2.65          | 0.11                | 6116.35             | 0.432               | 0.389            | 0.086                 | 1.20        | 0.13          |
| 9                                                                                                 | 15   | 0.67  | 6116.13                | 6116.37             | 0.24          | 0.16           | 4.14          | 0.11                | 6116.48             | 0.000     | 68.106  | 6117.49                | 6117.81             | 0.32**             | 0.25           | 2.71          | 0.11                | 6117.92             | 0.000               | 0.000            | n/a                   | 1.00        | n/a           |
| Project File: 5-YR STORM.stm                                                                      |      |       |                        |                     |               |                |               |                     |                     |           |         |                        |                     | Number of lines: 9 |                |               |                     |                     | Run Date: 3/12/2026 |                  |                       |             |               |
| Notes: * depth assumed; ** Critical depth.; j-Line contains hyd. jump ; c = cir e = ellip b = box |      |       |                        |                     |               |                |               |                     |                     |           |         |                        |                     |                    |                |               |                     |                     |                     |                  |                       |             |               |

Storm Sewer Profile



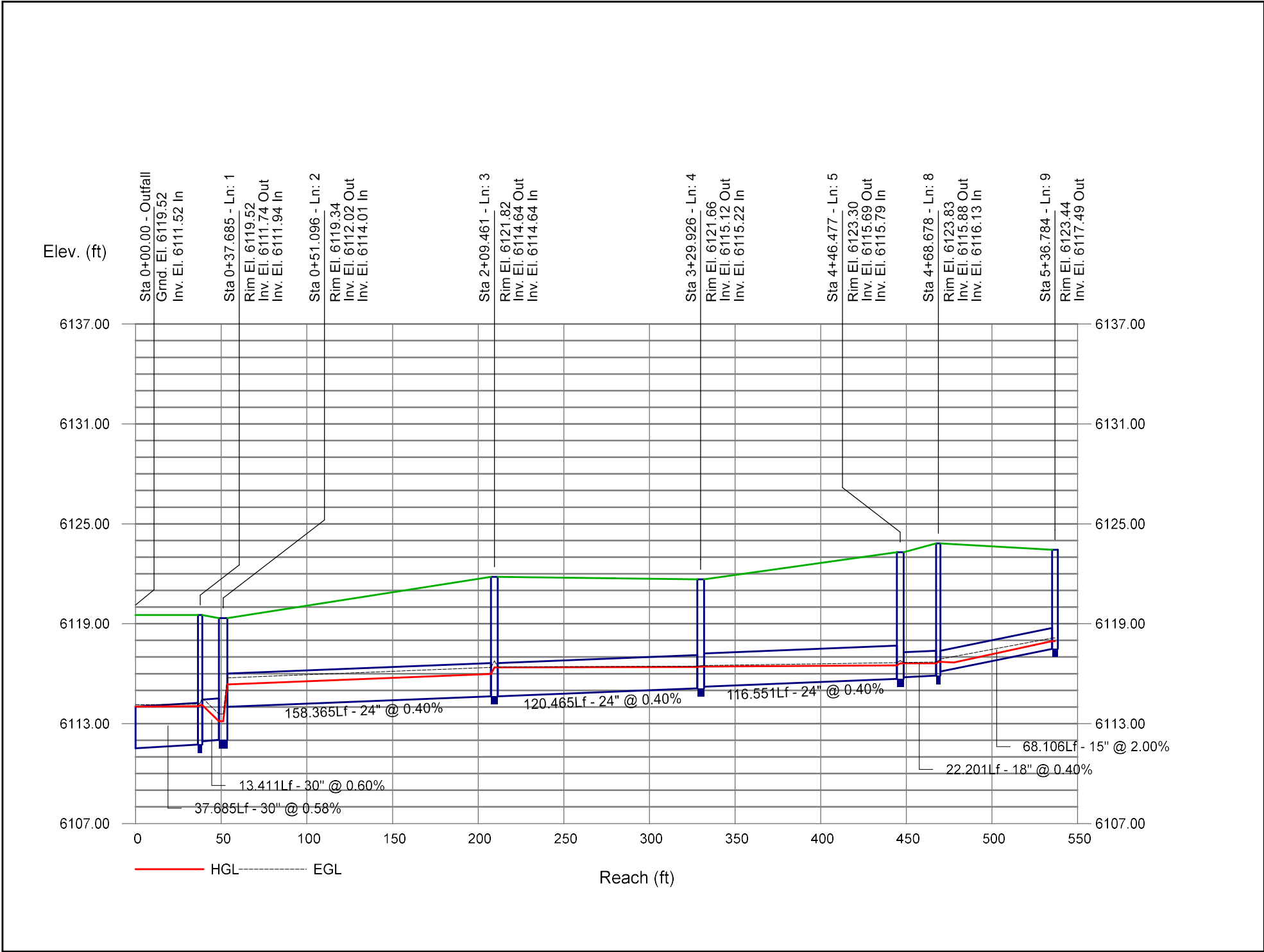
# Storm Sewer Profile



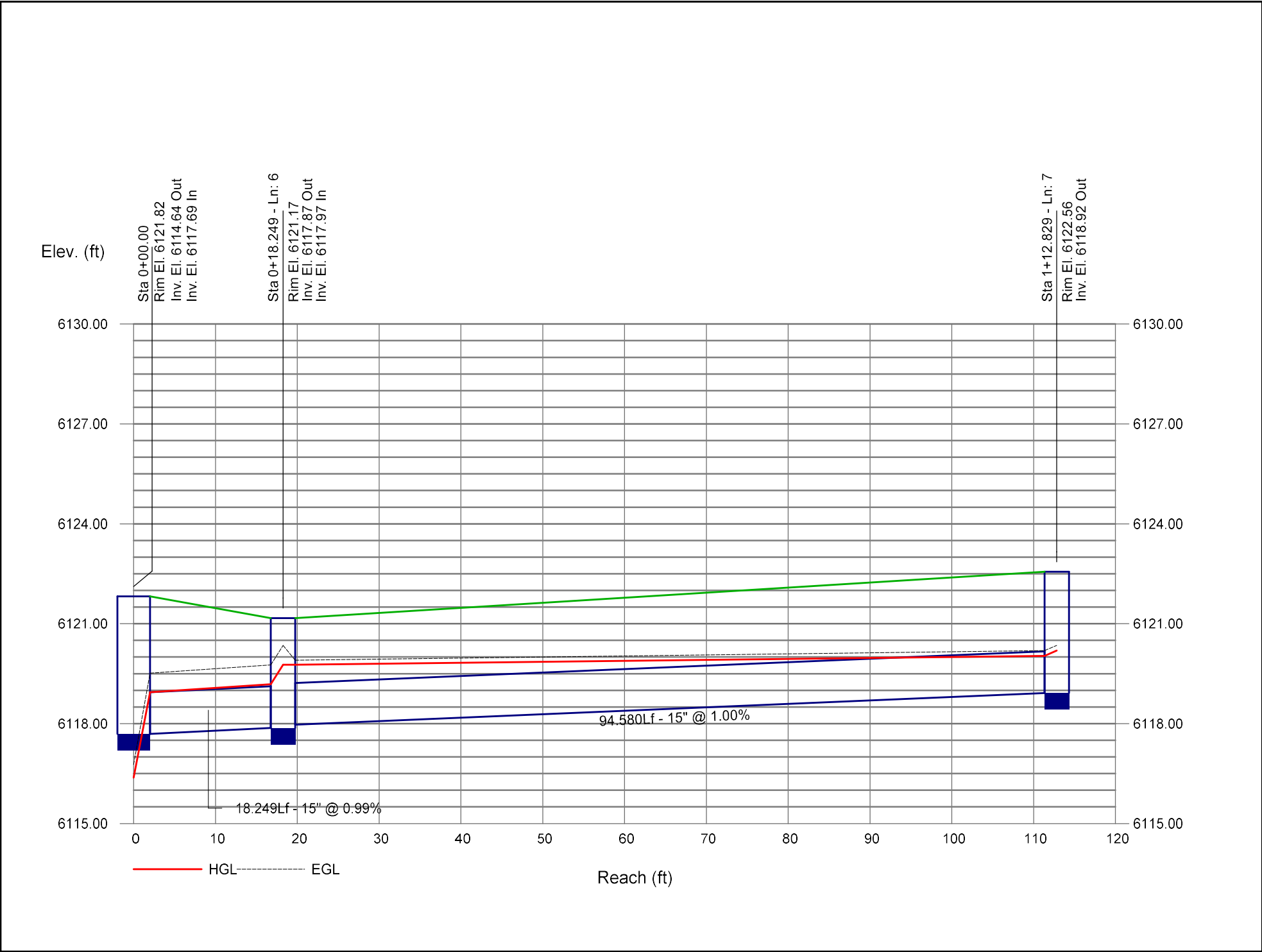
# Hydraulic Grade Line Computations

| Line                                                                                              | Size | Q     | Downstream             |                     |               |                |               |                     |                     |           | Len     | Upstream               |                     |                    |                |               |                     |                     |                     |                  | Check                 |      | JL<br>coeff | Minor<br>loss |
|---------------------------------------------------------------------------------------------------|------|-------|------------------------|---------------------|---------------|----------------|---------------|---------------------|---------------------|-----------|---------|------------------------|---------------------|--------------------|----------------|---------------|---------------------|---------------------|---------------------|------------------|-----------------------|------|-------------|---------------|
|                                                                                                   |      |       | Invert<br>elev<br>(ft) | HGL<br>elev<br>(ft) | Depth<br>(ft) | Area<br>(sqft) | Vel<br>(ft/s) | Vel<br>head<br>(ft) | EGL<br>elev<br>(ft) | Sf<br>(%) |         | Invert<br>elev<br>(ft) | HGL<br>elev<br>(ft) | Depth<br>(ft)      | Area<br>(sqft) | Vel<br>(ft/s) | Vel<br>head<br>(ft) | EGL<br>elev<br>(ft) | Sf<br>(%)           | Ave<br>Sf<br>(%) | Enrgy<br>loss<br>(ft) | (K)  |             |               |
| 1                                                                                                 | 30   | 13.27 | 6111.52                | 6114.02             | 2.50          | 4.91           | 2.70          | 0.11                | 6114.13             | 0.105     | 37.685  | 6111.74                | 6114.05             | 2.31               | 4.74           | 2.80          | 0.12                | 6114.17             | 0.091               | 0.098            | 0.037                 | 0.50 | 0.06        |               |
| 2                                                                                                 | 30   | 11.31 | 6111.94                | 6114.11             | 2.17          | 2.14           | 2.50          | 0.43                | 6114.54             | 0.000     | 13.411  | 6112.02                | 6113.15             | 1.13**             | 2.14           | 5.28          | 0.43                | 6113.58             | 0.000               | 0.000            | n/a                   | 1.00 | 0.43        |               |
| 3                                                                                                 | 24   | 11.31 | 6114.01                | 6115.35             | 1.34*         | 2.25           | 5.04          | 0.39                | 6115.75             | 0.398     | 158.365 | 6114.64                | 6115.99             | 1.34               | 2.25           | 5.03          | 0.39                | 6116.38             | 0.397               | 0.398            | 0.630                 | 1.00 | 0.39        |               |
| 4                                                                                                 | 24   | 3.83  | 6114.64                | 6116.38             | 1.74          | 2.90           | 1.32          | 0.03                | 6116.41             | 0.026     | 120.465 | 6115.12                | 6116.40             | 1.28               | 2.13           | 1.80          | 0.05                | 6116.45             | 0.052               | 0.039            | 0.047                 | 0.47 | 0.02        |               |
| 5                                                                                                 | 24   | 3.83  | 6115.22                | 6116.43             | 1.20          | 1.98           | 1.94          | 0.06                | 6116.48             | 0.063     | 116.551 | 6115.69                | 6116.50             | 0.81               | 1.19           | 3.21          | 0.16                | 6116.66             | 0.240               | 0.152            | 0.177                 | 0.76 | 0.12        |               |
| 6                                                                                                 | 15   | 7.48  | 6117.69                | 6118.94             | 1.25*         | 1.23           | 6.10          | 0.58                | 6119.52             | 1.342     | 18.249  | 6117.87                | 6119.19             | 1.25               | 1.23           | 6.10          | 0.58                | 6119.76             | 1.342               | 1.342            | 0.245                 | 1.01 | 0.58        |               |
| 7                                                                                                 | 15   | 3.65  | 6117.97                | 6119.77             | 1.25          | 1.23           | 2.97          | 0.14                | 6119.91             | 0.320     | 94.580  | 6118.92                | 6120.04             | 1.12               | 1.16           | 3.15          | 0.15                | 6120.19             | 0.283               | 0.301            | 0.285                 | 1.00 | 0.15        |               |
| 8                                                                                                 | 18   | 1.81  | 6115.79                | 6116.62             | 0.83          | 1.01           | 1.80          | 0.05                | 6116.67             | 0.084     | 22.201  | 6115.88                | 6116.63             | 0.75               | 0.88           | 2.05          | 0.07                | 6116.69             | 0.119               | 0.102            | 0.023                 | 1.20 | 0.08        |               |
| 9                                                                                                 | 15   | 1.42  | 6116.13                | 6116.71             | 0.58          | 0.42           | 2.56          | 0.18                | 6116.88             | 0.000     | 68.106  | 6117.49                | 6117.96 j           | 0.47**             | 0.42           | 3.36          | 0.18                | 6118.14             | 0.000               | 0.000            | n/a                   | 1.00 | n/a         |               |
| Project File: 100-YR STORM.stm                                                                    |      |       |                        |                     |               |                |               |                     |                     |           |         |                        |                     | Number of lines: 9 |                |               |                     |                     | Run Date: 3/12/2026 |                  |                       |      |             |               |
| Notes: * depth assumed; ** Critical depth.; j-Line contains hyd. jump ; c = cir e = ellip b = box |      |       |                        |                     |               |                |               |                     |                     |           |         |                        |                     |                    |                |               |                     |                     |                     |                  |                       |      |             |               |

Storm Sewer Profile



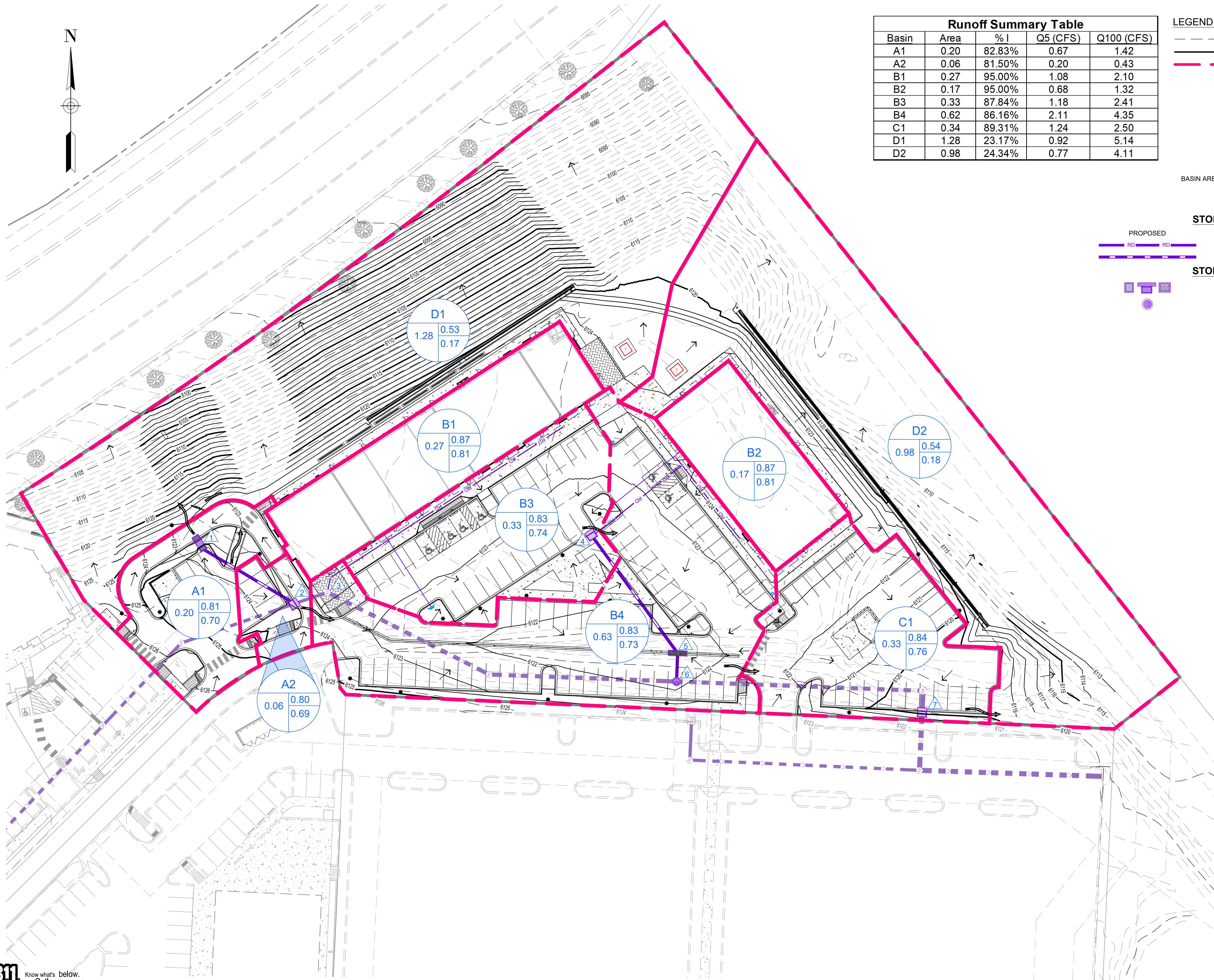
Storm Sewer Profile



**APPENDIX E – Drainage Plan**

File Name: S:\\_Projects\240701 - LimeLight\CAD\Sheet Sets\Drainage\Final Drainage Plan.dwg  
Plotted by: Jacob Husek Date: 3/12/2025 10:53 AM

**811** Know what's below.  
Call before you dig.  
CALL 2-BUSINESS DAYS IN  
ADVANCE BEFORE YOU DIG.  
GRADE OR EXCAVATE FOR THE  
MARKING OF UNDERGROUND  
MEMBER UTILITIES.



| Runoff Summary Table |      |        |          |            |
|----------------------|------|--------|----------|------------|
| Basin                | Area | % I    | Q5 (CFS) | Q100 (CFS) |
| A1                   | 0.20 | 82.83% | 0.67     | 1.42       |
| A2                   | 0.06 | 81.50% | 0.20     | 0.43       |
| B1                   | 0.27 | 95.00% | 1.08     | 2.10       |
| B2                   | 0.17 | 95.00% | 0.68     | 1.32       |
| B3                   | 0.33 | 87.84% | 1.18     | 2.41       |
| B4                   | 0.62 | 86.16% | 2.11     | 4.35       |
| C1                   | 0.34 | 89.31% | 1.24     | 2.50       |
| D1                   | 1.28 | 23.17% | 0.92     | 5.14       |
| D2                   | 0.98 | 24.34% | 0.77     | 4.11       |

**LEGEND:**

--- 5280 --- EXISTING CONTOUR  
--- 5280 --- PROPOSED CONTOUR  
--- BASIN BOUNDARY  
--- EMERGENCY OVERFLOW PATH  
△ DESIGN POINT  
← FLOW DIRECTION

**BASIN DESIGNATION**

BASIN AREA:  $\frac{B}{A} \frac{M}{m}$   
MAJOR RUNOFF COEFFICIENT: B  
MINOR RUNOFF COEFFICIENT: M

**STORM LINETYPE LEGEND**

PROPOSED: RD (Red Dashed), RD (Red Solid)  
EXISTING: --- (Black Dashed)

**STORM SYMBOLS LEGEND**

ROOF DRAIN: [Symbol]  
STORM SEWER: [Symbol]  
STORM INLET: [Symbol]  
STORM MANHOLE: [Symbol]

**ROTH LANG**  
ENGINEERING GROUP, LLC  
6855 S. HAVANA STREET, SUITE 600  
CENTENNIAL, CO 80112  
PHONE: 303-941-9965

**LIMELIGHT COMMERCIAL**  
FINAL DRAINAGE PLAN

**WESTBRIDGE DEVELOPMENT**

ISSUE DATE: 8/18/2025

| DATE | REVISIONS | BY |
|------|-----------|----|
|      |           |    |
|      |           |    |
|      |           |    |

DESIGNED BY: KSR  
DRAWN BY: JIH  
JOB NUMBER: 240701

30 0 30  
HORIZONTAL SCALE: 1" = 30'

**PRELIMINARY**  
**NOT FOR**  
**CONSTRUCTION**

SHEET NUMBER:  
**D1.01**

PREPARED FOR:

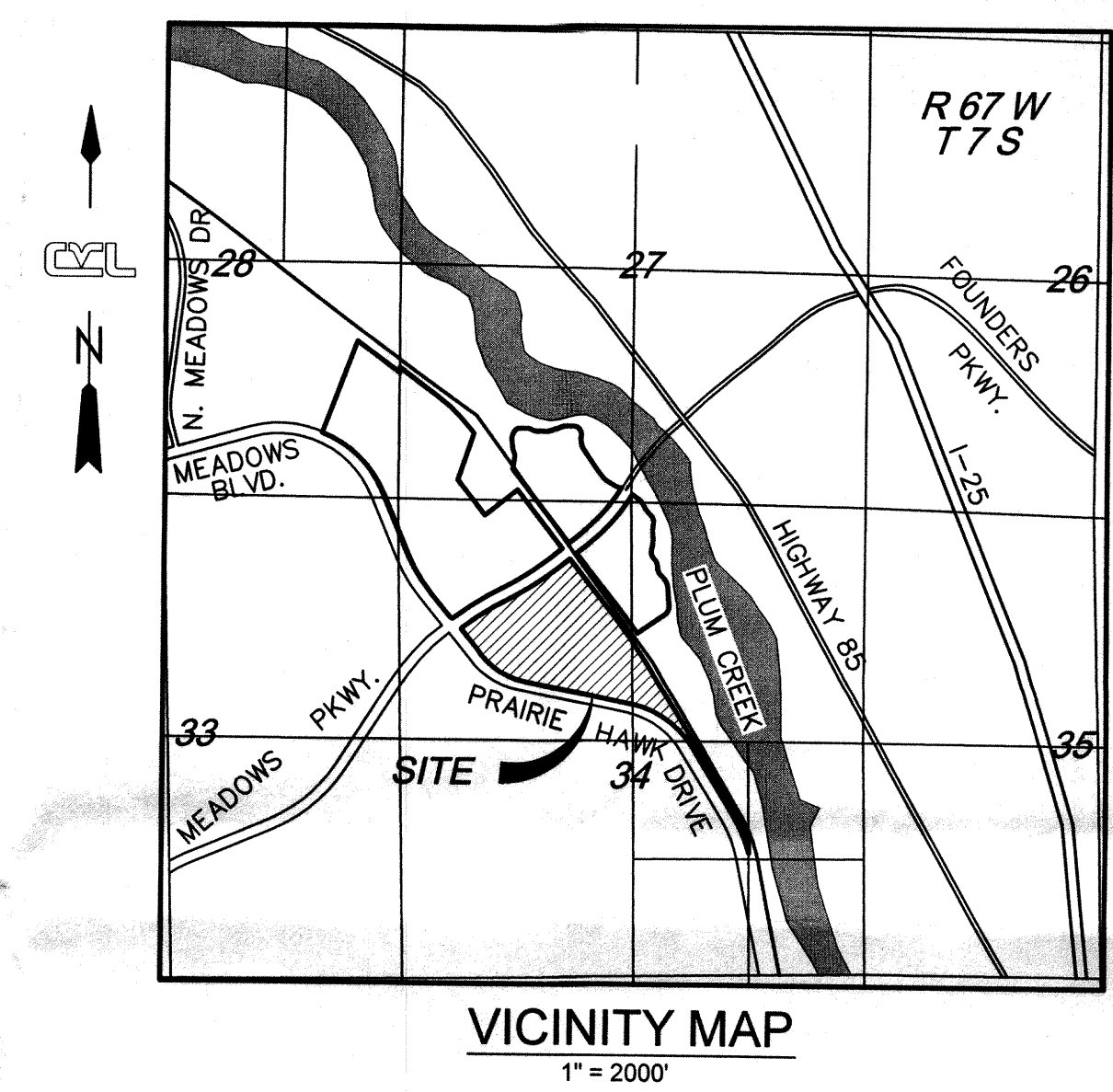
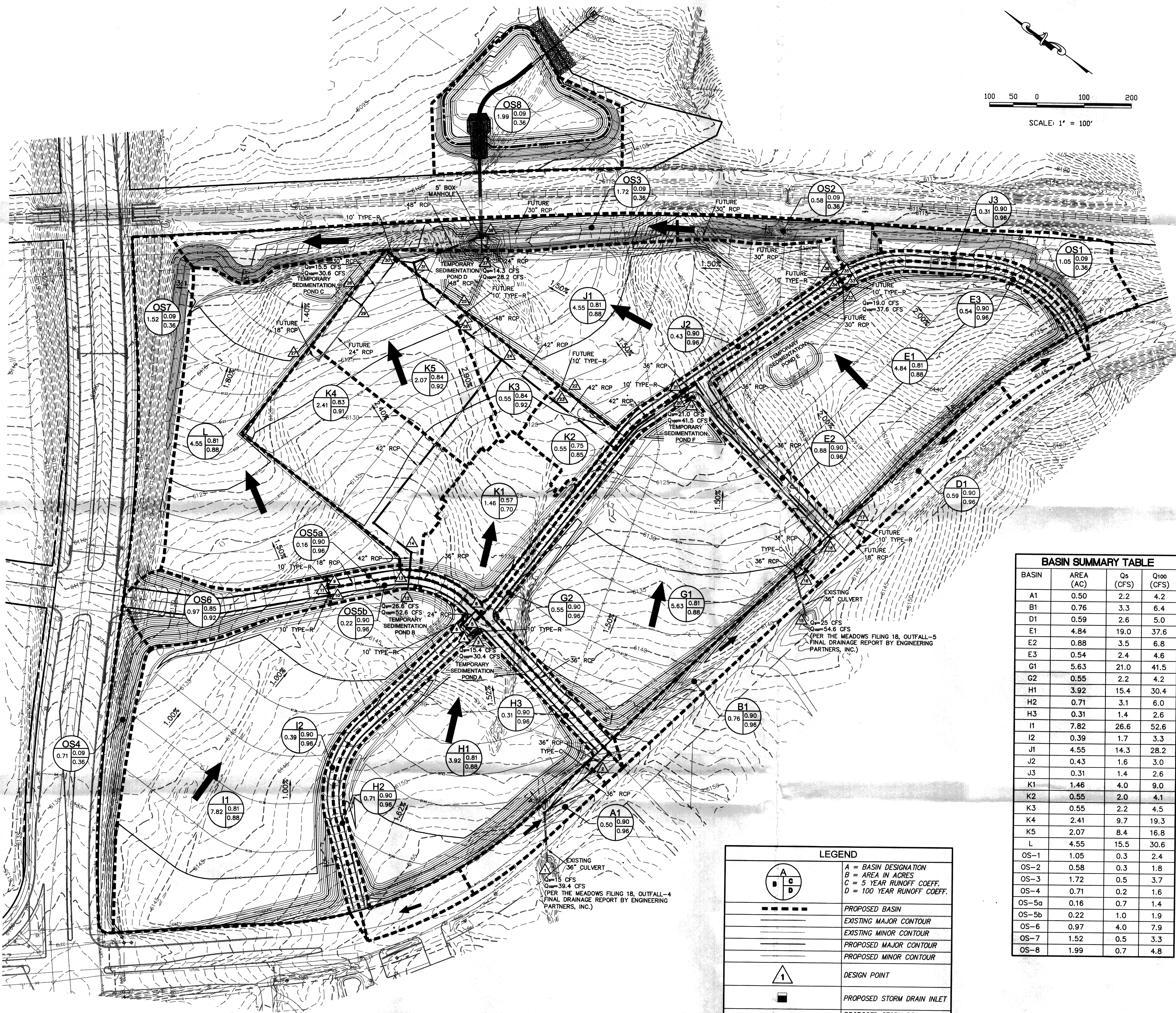
**APPENDIX F – Master Report Basin Drainage Plan**

N:\2012 Projects\12-07051 Meadows Marketplace In\dwg\3 Final\Construction\Phase III Developed Drainage Map.dwg



| Revisions |       | No.   |      |
|-----------|-------|-------|------|
| Date      | Init. | Appr. | Date |
|           |       |       |      |
|           |       |       |      |
|           |       |       |      |
|           |       |       |      |

|                                                                                                           |                                                                                        |                                                                                  |                    |                          |
|-----------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|--------------------|--------------------------|
| C2C ENGINEERING, LLC<br>6551 S. Revere Parkway, Suite 140<br>Centennial, Colorado 80121<br>www.c2ceng.com | CASTLE ROCK DEVELOPMENT CO.<br>3033 E. 1ST AVENUE, SUITE 401<br>DENVER, COLORADO 80206 | THE MEADOWS FILING 17<br>LOT 6G-1<br>CASTLE ROCK, COLORADO<br>FINAL DRAINAGE MAP | SCALE:<br>CT       | AS SHOWN                 |
|                                                                                                           |                                                                                        |                                                                                  | CHECKED BY:<br>KAL | FILE NO:<br>12-07051     |
| C2C ENGINEERING, LLC<br>CIVIL ENGINEERING • WATER RESOURCES • LAND PLANNING                               |                                                                                        | DRAWN BY:<br>CT                                                                  |                    | DATE:<br>AUGUST 31, 2012 |
|                                                                                                           |                                                                                        | SHEET NUMBER                                                                     |                    | 1                        |



| SUMMARY RUNOFF TABLE |                         |          |            |                                   |
|----------------------|-------------------------|----------|------------|-----------------------------------|
| DESIGN POINT         | CONTRIBUTING AREA (AC)  | Qs (CFS) | Q100 (CFS) | CONTRIBUTING BASIN(S)             |
| 1                    | OFFSITE                 | 15.0     | 39.4       | OS                                |
| 2                    | 0.50                    | 17.2     | 43.6       | A1, OS                            |
| 3                    | 3.92                    | 15.4     | 30.4       | H1                                |
| 4                    | 1.02                    | 4.5      | 8.6        | H2, H3                            |
| 5                    | 4.94                    | 19.9     | 39.1       | H1, H2, H3                        |
| 6                    | 0.39                    | 1.7      | 3.3        | I2                                |
| 7                    | DESIGN POINT 7 NOT USED |          |            |                                   |
| 8                    | 5.33                    | 38.7     | 86.0       | H1-H3, I2, OS                     |
| 9                    | 0.16                    | 0.7      | 1.4        | OS5a                              |
| 10                   | 0.22                    | 1.0      | 1.9        | OS5b                              |
| 11                   | 0.38                    | 1.7      | 3.2        | OS5a, OS5b                        |
| 12                   | 7.82                    | 26.6     | 52.6       | I1                                |
| 13                   | 13.53                   | 63.6     | 135.1      | H1-H3, I1, I2, OS5a, OS5b, OS     |
| 14                   | 14.99                   | 67.1     | 143.0      | H1-H3, I1, I2, OS5a, OS5b, OS, K1 |
| 15                   | OFFSITE                 | 25.0     | 54.6       | OS                                |
| 16                   | 0.76                    | 28.3     | 61.0       | B1, OS                            |
| 17                   | 0.59                    | 2.6      | 5.0        | D1                                |
| 18                   | 1.35                    | 30.9     | 66.0       | B1, D1, OS                        |
| 19                   | 5.63                    | 21.0     | 41.5       | G1                                |
| 20                   | 6.18                    | 22.2     | 43.8       | G1, G2                            |
| 21                   | 7.53                    | 52.6     | 108.8      | B1, D1, G1, G2, OS                |
| 22                   | 0.55                    | 2.0      | 4.1        | K2                                |
| 23                   | 8.08                    | 53.1     | 110.0      | B1, D1, G1, G2, K2, OS            |
| 24                   | 23.07                   | 116.9    | 246.3      | BASINS FOR D.P.'S 14 AND 23       |
| 25                   | 0.55                    | 2.2      | 4.5        | K3                                |
| 26                   | 23.62                   | 118.7    | 250.0      | BASINS FOR D.P. 24, K3            |
| 27                   | 2.41                    | 9.7      | 19.3       | K4                                |
| 28                   | 4.55                    | 15.5     | 30.6       | L                                 |
| 29                   | 6.96                    | 23.9     | 47.4       | K4, L                             |
| 30                   | 9.03                    | 31.2     | 61.9       | K4, K5, L                         |
| 31                   | 32.65                   | 108.6    | 215.3      | BASINS FOR D.P.'S 30 AND 26       |
| 32                   | 4.84                    | 19.0     | 37.6       | E1                                |
| 33                   | 1.42                    | 5.6      | 10.9       | E2, E3                            |
| 34                   | 6.26                    | 22.9     | 44.9       | E1, E2, E3                        |
| 35                   | 0.74                    | 2.7      | 5.2        | J2, J3                            |
| 36                   | 7.0                     | 23.6     | 46.4       | E1, E2, E3, J2, J3                |
| 37                   | 4.55                    | 14.3     | 28.2       | J1                                |
| 38                   | 44.2                    | 141.3    | 279.5      | BASINS FOR D.P.'S 31, 36 AND 37   |

| BASIN SUMMARY TABLE |           |          |            |
|---------------------|-----------|----------|------------|
| BASIN               | AREA (AC) | Qs (CFS) | Q100 (CFS) |
| A1                  | 0.50      | 2.2      | 4.2        |
| B1                  | 0.76      | 3.3      | 6.4        |
| D1                  | 0.59      | 2.6      | 5.0        |
| E1                  | 4.84      | 19.0     | 37.6       |
| E2                  | 0.88      | 3.5      | 6.8        |
| E3                  | 0.54      | 2.4      | 4.6        |
| G1                  | 5.63      | 21.0     | 41.5       |
| G2                  | 0.55      | 2.2      | 4.2        |
| H1                  | 3.92      | 15.4     | 30.4       |
| H2                  | 0.71      | 3.1      | 6.0        |
| H3                  | 0.31      | 1.4      | 2.6        |
| I1                  | 7.82      | 26.6     | 52.6       |
| I2                  | 0.39      | 1.7      | 3.3        |
| J1                  | 4.55      | 14.3     | 28.2       |
| J2                  | 0.43      | 1.6      | 3.0        |
| J3                  | 0.31      | 1.4      | 2.6        |
| K1                  | 1.46      | 4.0      | 9.0        |
| K2                  | 0.55      | 2.0      | 4.1        |
| K3                  | 0.55      | 2.2      | 4.5        |
| K4                  | 2.41      | 9.7      | 19.3       |
| K5                  | 2.07      | 8.4      | 16.8       |
| L                   | 4.55      | 15.5     | 30.6       |
| OS-1                | 1.05      | 0.3      | 2.4        |
| OS-2                | 0.58      | 0.3      | 1.8        |
| OS-3                | 1.72      | 0.5      | 3.7        |
| OS-4                | 0.71      | 0.2      | 1.6        |
| OS-5a               | 0.16      | 0.7      | 1.4        |
| OS-5b               | 0.22      | 1.0      | 1.9        |
| OS-6                | 0.97      | 4.0      | 7.9        |
| OS-7                | 1.52      | 0.5      | 3.3        |
| OS-8                | 1.99      | 0.7      | 4.8        |

| LEGEND |                                                                                                      |
|--------|------------------------------------------------------------------------------------------------------|
|        | A = BASIN DESIGNATION<br>B = AREA IN ACRES<br>C = 5 YEAR RUNOFF COEFF.<br>D = 100 YEAR RUNOFF COEFF. |
|        | PROPOSED BASIN                                                                                       |
|        | EXISTING MAJOR CONTOUR                                                                               |
|        | EXISTING MINOR CONTOUR                                                                               |
|        | PROPOSED MAJOR CONTOUR                                                                               |
|        | PROPOSED MINOR CONTOUR                                                                               |
|        | DESIGN POINT                                                                                         |
|        | PROPOSED STORM DRAIN INLET                                                                           |
|        | PROPOSED STORM DRAIN                                                                                 |
|        | FLOW ARROW                                                                                           |

I HEREBY AFFIRM THAT THESE FINAL CONSTRUCTION PLANS WERE PREPARED UNDER MY DIRECT SUPERVISION, IN ACCORDANCE WITH ALL APPLICABLE TOWN OF CASTLE ROCK AND STATE OF COLORADO STANDARDS AND STATUTES, RESPECTIVELY; AND THAT I AM FULLY RESPONSIBLE FOR ALL DESIGN AND REVISIONS RELATIVE TO SAID PLANS.

KURT A. LANG, COLORADO PROFESSIONAL ENGINEER DATE \_\_\_\_\_

TOWN OF CASTLE ROCK APPROVALS  
THESE PLANS ARE HEREBY APPROVED FOR ONE YEAR FROM DATE OF DEVELOPMENT SERVICES DIRECTOR APPROVAL

RECOMMEND APPROVAL BY: \_\_\_\_\_ DATE \_\_\_\_\_

ENGINEERING DIVISION \_\_\_\_\_ DATE \_\_\_\_\_

APPROVED BY: \_\_\_\_\_ DATE \_\_\_\_\_

DEVELOPMENT SERVICES DIRECTOR \_\_\_\_\_ DATE \_\_\_\_\_

|                                                                                              |          |              |      |
|----------------------------------------------------------------------------------------------|----------|--------------|------|
| ISSUED FOR CONSTRUCTION                                                                      | DATE     | APPROVED     | DATE |
| 9/21/2024                                                                                    | KAL      |              |      |
| 7901 E. Bellevue Avenue<br>Englewood, CO 80111<br>Tel: (720) 482-9526<br>Fax: (720) 482-9546 |          |              |      |
| CASTLE ROCK LAND COMPANY<br>3033 EAST 1ST AVENUE, #410<br>DENVER, CO 80206                   |          |              |      |
| THE MEADOWS FILING 17<br>LOT 5 AND 6<br>DEVELOPED DRAINAGE MAP                               |          |              |      |
| SCALE: AS SHOWN                                                                              | FILE NO. | DATE         |      |
| AMZ                                                                                          | 0481401  | FEB 15, 2024 |      |
| SHEET NUMBER                                                                                 | 1        |              |      |

**APPENDIX G – Summary of Water Quality Conformance to MS4 Permit Form**



## Summary of Water Quality Conformance to MS4 Permit

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

**Project Name** \_\_\_\_\_

**Project Owner** \_\_\_\_\_

**Project Location** \_\_\_\_\_

**ToCR Project Number** \_\_\_\_\_

**Total Site Area** \_\_\_\_\_ acres

**Total Size of Common Plan of Development** \_\_\_\_\_ acres

**Check all that apply:**

☐ **Project within Plum Creek Basin**

☐ **Project within Cherry Creek Basin**

**Estimated construction completion date** \_\_\_\_\_

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

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

## Summary of Water Quality Conformance to MS4 Permit

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

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

☐ Pavement management site

Excluded impervious area: \_\_\_\_\_ acres

☐ Excluded roadway redevelopment

Excluded impervious area: \_\_\_\_\_ acres

☐ Excluded existing roadway areas

Excluded impervious area: \_\_\_\_\_ acres

☐ Above ground and below ground utilities

☐ Large lot single family home

☐ Non-residential and non-commercial infiltration

Excluded impervious area: \_\_\_\_\_ acres

☐ Land disturbance for land to remain undeveloped

Excluded impervious area: \_\_\_\_\_ acres

☐ Stream Stabilization Sites

Excluded impervious area: \_\_\_\_\_ acres

☐ Trails

Excluded impervious area: \_\_\_\_\_ acres

☐ Oil and Gas Exploration

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

If yes, complete the following:

Excluded area: \_\_\_\_\_ acres

Total Site area: \_\_\_\_\_ acres, \_\_\_\_\_ % site excluded

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

If yes, complete the following:

Excluded area: \_\_\_\_\_ acres

Excluded impervious area: \_\_\_\_\_ acres

Total Site area: \_\_\_\_\_ acres, \_\_\_\_\_ % site excluded

Total Impervious area: \_\_\_\_\_ acres, \_\_\_\_\_ % impervious excluded