



**PHASE II DRAINAGE REPORT  
FOR  
DAWSON TRAILS – TRACT O AND H**

Castle Rock, Colorado  
Town of Castle Rock Project SDP23-0040

September 8, 2023  
Revised: June 7, 2024  
November 27, 2024  
Revised: April 16, 2025

EMK Job. No. 13393

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

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

## TABLE OF CONTENTS

|      |                                                                           |    |
|------|---------------------------------------------------------------------------|----|
| I.   | General Location and Description .....                                    | 5  |
| A.   | Site Location .....                                                       | 5  |
| B.   | Description of Property .....                                             | 5  |
| II.  | Drainage Basins and Sub Basins .....                                      | 5  |
| A.   | Major Drainage Basins .....                                               | 5  |
| B.   | Minor Drainage Basins .....                                               | 6  |
| III. | Drainage Design Criteria .....                                            | 6  |
| A.   | Regulations .....                                                         | 6  |
| B.   | Drainage Studies, Master Plans, Site Constraints .....                    | 6  |
| C.   | Hydrology .....                                                           | 6  |
| D.   | Hydraulics .....                                                          | 7  |
| E.   | Storage and Water Quality Enhancement .....                               | 7  |
| IV.  | Stormwater Management Facility Design .....                               | 7  |
| A.   | Stormwater Conveyance Facilities .....                                    | 7  |
| B.   | Stormwater Storage Facilities .....                                       | 12 |
| C.   | Water Quality Enhancement Control Measures .....                          | 12 |
| D.   | Floodplain Modification .....                                             | 13 |
| E.   | Geotechnical Investigation and Sub-surface Collection System Design ..... | 13 |
| F.   | Operation and Maintenance .....                                           | 13 |
| G.   | Additional Permitting Requirements .....                                  | 14 |
| H.   | General .....                                                             | 14 |
| V.   | Conclusions .....                                                         | 14 |
| A.   | Compliance With Standards .....                                           | 14 |
| B.   | Variances .....                                                           | 14 |
| C.   | Drainage Concept .....                                                    | 14 |
| VI.  | References .....                                                          | 15 |

## **LIST OF APPENDICES**

### **Appendix A – Hydrologic Calculations**

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

### **Appendix B – Hydraulic Calculations**

Inlet Calculations  
Hydraulic Grade Line Calculations  
Swale Calculations

### **Appendix C – Water Quality Enhancement Control**

Water Quality Certification Forms

### **Appendix D – Referenced Information**

Pond D3 Design (by others)  
Checklist

### **Map Pocket (paper copy) or Electronic Plan Layouts**

Developed Layout – 3 sheets

### **CERTIFICATION STATEMENT**

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

SIGNATURE: \_\_\_\_\_

David J. Ott

Registered Professional Engineer

State of Colorado No. 38935

For and on behalf of EMK Consultants, Inc.

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

\_\_\_\_\_  
ACM Dawson Trails VIII JV LLC

\_\_\_\_\_  
Authorized Signature

## **I. General Location and Description**

The purpose of this drainage report is to document drainage design calculations and decision making for Dawson Trails – Tract O and H (herein referred to as the site).

### **A. Site Location**

Tract O and M of Dawson Trails is located west of Interstate 25, just south of the proposed Crystal Valley Interchange. More specifically, it is located in the east half of section 28, west half of section 27, Township 8 South, Range 67 West of the 6<sup>th</sup> Principal Meridian in the Town of Castle Rock. A site location map is included in Appendix A. Paved streets from a defunct development project in the 1980s exist in the area.

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

The site covers approximately 56 acres, distributed across a northern area and southern area. Native grasses and scrub oak cover the area, which drains to the east towards Plum Creek. NRCS soil maps indicate that the site is covered primarily by Kutch clay Loam, which falls under hydrologic soil group D; and Bresser-Truckton sandy loams, which falls under hydrologic soil group D. Some HSG C soils exist on the western fringe of the site. A major drainageway with an existing stock pond exists on the southern fringe of the site. No floodplains or significant geologic features exist on the site.

The proposed land use consists of approximately 267 single-family and attached lots.

## **II. Drainage Basins and Sub Basins**

### **A. Major Drainage Basins**

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

- *North and South Dawson Watershed Master Plan, prepared by CH2M Hill, September 2010.*

An updated study covering all the overall site drainage is currently being prepared, Castle Rock project number CA13-0045. The Phase III Drainage Report for Dawson Trails Filing 2 has been reviewed to aid in the creation of this report.

Areas west of the site, and in the southern portion of the site, are captured in the North Dawson Tributary. This tributary runs along the southern periphery of the site. A stock pond currently exists along this major drainageway. Re-grading of the major drainageway along with installation of a regional detention pond is proposed along the south side of the site, Castle Rock project number CA13-0045. Runoff from the site will discharge to an EURV and water quality pond, Pond D3, before entering the regional detention facility Pond A1.

Historically, all of the site drained to the North Dawson Tributary. When Dawson Ridge Boulevard was constructed, the northern portion of the site was directed the Gambel Ridge watershed. The proposed development return historic flows back to the North Dawson Tributary. The proposed development will

capture runoff from the northern portion of the site and direct it via storm sewer to an EURV and water quality pond, Pond D3, and regional detention facility, Pond A1, to the south.

## **B. Minor Drainage Basins**

Streets and lots will create minor basins that will be captured in storm sewer. Runoff will be directed via storm sewer to a water quality pond on the southeastern corner of the site. Discharge from the water quality pond will be into the regional detention pond. The drainage maps plansheet 2 and 3 at the end of the report include peak discharge summaries for each minor basin. See Appendix A for hydrologic calculations.

Runoff in the northern section of The site (indicated by the “N” design point designations, the southern basins will use “S”) will be conveyed to the proposed Blanca Peak Parkway located on the southern edge of the development area.

Basin DN collects runoff in inlets and directs them south to the storm sewer located in Blanca Peak Parkway designed with the CA13-0045 project. This storm sewer routes the flows to Pond D3. Basin DS collects runoff in inlets and directs them south and ties into the storm system designed with the CA13-0045 project at Langsam Street and Dawson Plaza. From here drainage is routed south to Pond D3. Pond D3 will release through an outfall pipe to the south into Regional Detention Pond A1 for the North Dawson Tributary.

## **III. Drainage Design Criteria**

### **A. Regulations**

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

### **B. Drainage Studies, Master Plans, Site Constraints**

An updated study covering all the overall site drainage is currently being prepared by CORE, Castle Rock project number CA13-0045. The Phase III Drainage Report for Dawson Trails Infrastructure 1 has been reviewed to aid in the creation of this report. Project teams will continue to coordinate throughout the design process.

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

- *North and South Dawson Watershed Master Plan, prepared by CH2M Hill, September 2010.*

### **C. Hydrology**

Runoff for the storm sewer design was calculated using the Rational Method. The 5-year storm was used as the minor storm and the 100-yr storm was evaluated for the major storm. See Appendix A for hydrologic calculations.

#### **D. Hydraulics**

Inlet capacities were calculated using the latest MHFD-Inlet software. Attached sidewalks are proposed as a part of this development, with flow in the 5-yr storm being allowed to spread to the back of walk.

Type 16 combination inlets are proposed for all inlets because all streets that are a part of the site development are drainage classification A streets. See Appendix B for hydraulic calculations.

#### **E. Storage and Water Quality Enhancement**

Detention and water quality for the site are provided by sub-regional water quality and regional detention infrastructure developed as part of a separate project (CA13-0045). Pond D3 will provide water quality and EURV volume for all of the site. Pond A1 is a regional detention facility designed to provide 100-yr peak flow attenuation.

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

Step 1: Water quality enhancement starts with runoff reduction.

The project will try to reduce imperviousness area as much as possible. This project includes areas designated for parks and greenbelts. The park area on the north and west sides of the site lowers the overall imperviousness.

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

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

Step 3: Implementation of stream stabilization.

This project does not utilize any stream stabilization as there is no streams within the project limits. Refer to project number CA13-0045 drainage report for information regarding the North Dawson Tributary immediately south of this project.

Step 4: The final step is undertaking source control

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

### **IV. Stormwater Management Facility Design**

#### **A. Stormwater Conveyance Facilities**

Runoff in the northern section of the site (indicated by the “N” design point designations, the southern basins will use “S”) will be conveyed to the proposed Blanca Peak Parkway located on the southern edge of the development area. The drainage maps plansheet 2 and 3 at the end of the report include peak discharge summaries for each minor basin.

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

## PEAK DISCHARGE SUMMARY

Developed Conditions - Pipe Flow

| <b>Design Point</b> | <b>Catchment(s)</b> | <b>Tributary Area<br/>(acres)</b> | <b>5-Year<br/>(cfs)</b> | <b>100-Year<br/>(cfs)</b> |
|---------------------|---------------------|-----------------------------------|-------------------------|---------------------------|
| 1S                  | DS1                 | 0.9                               | 1.7                     | 2.9                       |
| 2S                  | DS2                 | 2.0                               | 3.3                     | 6.1                       |
| 2.1S                | DS1+DS2             | 2.9                               | 4.9                     | 8.8                       |
| 3S                  | DS3                 | 2.5                               | 4.2                     | 7.8                       |
| 4S                  | DP3S+DS4            | 4.5                               | 8.0                     | 14.8                      |
| 5S                  | DP4S+DS5            | 6.1                               | 12.9                    | 26.0                      |
| 5.1S                | DP2.1S+DP5S         | 9.0                               | 17.8                    | 34.8                      |
| 6S                  | DP5.1S+ DS6         | 9.3                               | 21.1                    | 46.9                      |
| 7S                  | DS7                 | 1.8                               | 3.6                     | 7.0                       |
| 8S                  | DP7S+DS8            | 4.6                               | 9.7                     | 21.7                      |
| 9S                  | DP8S+DS9            | 7.0                               | 12.7                    | 28.2                      |
| 10S                 | DP9S+DS10           | 9.3                               | 17.0                    | 36.5                      |
| 11S                 | DS11                | 3.0                               | 4.5                     | 8.7                       |
| 11.1S               | DP10S+DP11S         | 12.3                              | 21.5                    | 45.1                      |
| 12S                 | DS12                | 1.4                               | 2.8                     | 5.6                       |
| 12.1S               | DP6S+DP11.1S+DP12S  | 23.0                              | 43.9                    | 94.2                      |
| 13S                 | DS13                | 0.8                               | 4.7                     | 19.3                      |
| 14S                 | DP12.1S+DP13S+DS14  | 26.0                              | 50.7                    | 122.7                     |
| 20S                 | DS20                | 2.3                               | 2.2                     | 3.3                       |
| 21S                 | DP20S+DS21          | 3.2                               | 6.4                     | 15.6                      |
| 22S                 | DP21S+DS22          | 4.8                               | 9.7                     | 23.8                      |
| 1N                  | DN1                 | 12.0                              | 3.0                     | 36.0                      |
| 2N                  | DN2                 | 1.4                               | 2.1                     | 3.5                       |
| 3N                  | DP2N+DN3            | 2.6                               | 5.5                     | 11.1                      |
| 4N                  | DP3N+D4N            | 2.7                               | 5.7                     | 11.6                      |
| 5N                  | DN5                 | 3.3                               | 4.3                     | 8.5                       |
| 6N                  | DP5N+DN6            | 6.0                               | 9.5                     | 19.0                      |
| 7N                  | DP6N+DN7            | 7.4                               | 11.5                    | 22.9                      |
| 8N                  | DN8                 | 2.9                               | 0.7                     | 8.3                       |

## PEAK DISCHARGE SUMMARY

Developed Conditions - Direct Runoff

| Catchment | Tributary Area<br>(acres) | 5-Year<br>(cfs) | 100-Year<br>(cfs) |
|-----------|---------------------------|-----------------|-------------------|
| DS1       | 0.9                       | 2.2             | 5.3               |
| DS2       | 2.0                       | 4.3             | 10.5              |
| DS3       | 2.5                       | 5.9             | 13.7              |
| DS4       | 1.9                       | 4.6             | 10.6              |
| DS5       | 1.6                       | 3.9             | 9.4               |
| DS6       | 0.3                       | 0.8             | 2.0               |
| DS7       | 1.8                       | 4.0             | 9.4               |
| DS8       | 2.7                       | 5.8             | 13.6              |
| DS9       | 2.5                       | 3.9             | 11.2              |
| DS10      | 2.3                       | 5.0             | 12.2              |
| DS11      | 3.0                       | 6.0             | 14.8              |
| DS12      | 1.4                       | 3.3             | 7.9               |
| DS13      | 0.8                       | 1.8             | 4.4               |
| DS14      | 2.2                       | 4.2             | 10.2              |
| DS20      | 2.3                       | 4.7             | 11.5              |
| DS21      | 0.8                       | 2.0             | 4.8               |
| DS22      | 1.7                       | 3.4             | 0.0               |
| DN1       | 12.0                      | 3.0             | 36.0              |
| DN2       | 1.4                       | 3.2             | 7.9               |
| DN3       | 1.2                       | 2.7             | 6.6               |
| DN4       | 0.1                       | 0.3             | 0.6               |
| DN5       | 3.3                       | 5.6             | 14.5              |
| DN6       | 2.8                       | 5.8             | 14.4              |
| DN7       | 1.3                       | 2.8             | 6.8               |
| DN8       | 2.9                       | 0.7             | 8.3               |

**Basin DN1** is future area with a proposed future park landuse. Runoff from this area will be captured in a concrete interceptor swale proposed at the western edge of the lots. This swale will convey runoff south to an area inlet at design point 1N north of Blanca Peak Parkway, west of Duquesne Street. Emergency overflow is south to Blanca Peak Parkway.

**Basin DN2** is comprised of local roadways and residential lots. Basin DN2 will capture runoff from the northern section of the site and convey it south via street flow to Type 16 on-grade inlets on Duquesne Street at design point 2N. Emergency overflow is south along Duquesne Street.

**Basin DN3** is comprised of local roadways and residential lots. Basin DN3 will capture runoff from the northern section of the site and convey it south via street flow to Type 16 on-grade inlets on Duquesne Street at design point 3N. Emergency overflow is south to Blanca Peak Parkway.

**Basin DN4** is local roadway. Basin DN4 will capture runoff and convey it south via street flow to Type 16 on-grade inlets on Duquesne Street at design point 4N. Emergency overflow is south to Blanca Peak Parkway.

**Basin DN5** is comprised of local roadways and residential lots. Basin DN5 will capture runoff from the northern section of the site and convey it south via street flow to Type 16 on-grade inlets near Juliet Street and Alleghany Street at design point 5N. Emergency overflow is south along Alleghany Street.

**Basin DN6** is comprised of local roadways and residential lots. Basin DN6 will capture runoff from the northern section of the site and convey it south via street flow to Type 16 on-grade inlets near Romeo Street and Alleghany Street at design point 6N. Emergency overflow is south along Alleghany Street.

**Basin DN7** is comprised of local roadways and residential lots. Basin DN7 will capture runoff from the northern section of the site and convey it south via street flow to Type 16 on-grade inlets near Blanca Peak Parkway and Alleghany Street at design point 7N. Emergency overflow is south along Alleghany Street.

**Basin DN8** is open space landuse. Runoff from this area will be captured in a concrete interceptor swale proposed at the northern edge of the lots. This swale will convey runoff south to an area inlet at design point 8N. Emergency overflow is east into Tract E-2.

**Basin DN9** captures back of lot runoff from Alleghany Street in an earthen swale. Runoff from this permanent swale will be captured in an area inlet along the eastern boundary of the site. Emergency overflow is east into Tract E-2.

**Basin DN10** captures back of lot runoff from Alleghany Street in an earthen swale. Runoff from this permanent swale will be captured in an area inlet along the eastern boundary of the site. Emergency overflow is east into Tract E-2.

**Basin DN11** captures back of lot runoff from Alleghany Street in an earthen swale. Runoff from this permanent swale will be captured in an area inlet along the eastern boundary of the site. Emergency overflow is east into Tract E-2.

**Basin DS1** is comprised of local roadways and residential lots. Basin DS1 will capture runoff from lots along Knievel Street and convey it northeast via street flow to Type 16 on-grade inlets at design point 1S. Emergency overflow is north to Unser Street.

**Basin DS2** is comprised of local roadways and residential lots. Basin DS2 will capture runoff from lots along Prudhomme Street and Unser Street and convey it northeast via street flow to Type 16 on-grade inlets south of Knievel Street, on the west side of Unser Street design point 2S. Emergency overflow is north on Unser Street.

**Basin DS3** is comprised of local roadways and attached homes. Basin DS3 is centrally located and will capture runoff from lots and convey it southeast via street flow to Type 16 on-grade inlets at design point 3S. Emergency overflow is east via Garlits Street.

**Basin DS4** is comprised of local roadways and attached homes. Basin DS4 captures runoff from lots and conveys it via street flow to Type 16 on-grade inlets at design point 4S. Emergency overflow is northeast via Knievel Street.

**Basin DS5** is comprised of local roadways and residential lots. Basin DS5 captures runoff from lots and conveys it via street flow to Type 16 on-grade inlets at design point 5S. Emergency overflow is north via Unser Street.

**Basin DS6** is comprised of local roadways and residential lots. Basin DS6 captures runoff from lots and conveys it via street flow to Type 16 on-grade inlets at design point 6S. Emergency overflow is east via Langsam Street.

**Basin DS7** is comprised of local roadways and attached homes. Basin DS7 captures runoff from lots and conveys it via street flow to Type 16 on-grade inlets at design point 7S. Emergency overflow is northeast via Andretti Street.

**Basin DS8** is comprised of local roadways and attached homes. Basin DS8 captures runoff from lots and conveys it via street flow to Type 16 on-grade inlets at design point 8S. Emergency overflow is northeast via Andretti Street.

**Basin DS9** is comprised of local roadways and residential lots. Basin DS9 captures runoff from lots and conveys it via street flow to Type 16 on-grade inlets at design point 9S. Emergency overflow is south via Unser Street.

**Basin DS10** is comprised of local roadways and residential lots. Basin DS10 captures runoff from lots and conveys it via street flow to Type 16 on-grade inlets at design point 10S. Emergency overflow is south via Unser Street.

**Basin DS11** is comprised of local roadways and residential lots. Basin DS11 captures runoff from lots and conveys it via street flow to Type 16 on-grade inlets at design point 11S. Emergency overflow is east via Langsam Street.

**Basin DS12** is comprised of local roadways and residential lots. Basin DS12 captures runoff from lots and conveys it via street flow to Type 16 on-grade inlets at design point 12S. Emergency overflow is east via Langsam Street.

**Basin DS13** is comprised of local roadways and residential lots. Basin DS13 captures runoff from lots and conveys it via street flow to Type 16 on-grade inlets at design point 13S. Emergency overflow is east into Dawson Plaza.

**Basin DS14** is comprised of local roadways and residential lots. Basin DS14 captures runoff from lots and conveys it via street flow to Type 16 on-grade inlets at design point 14S. Emergency overflow is east into Dawson Plaza.

**Basin DS20** is comprised of local roadways and attached homes. Basin DS20 captures runoff from lots and conveys it via street flow to Type 16 on-grade inlets at design point 20S. Emergency overflow is southeast into Knievel Street.

**Basin DS21** is comprised of local roadways and attached homes. Basin DS21 captures runoff from lots and conveys it via street flow to Type 16 sump inlets at design point 21S. Emergency overflow is south into the North Dawson Tributary.

**Basin DS22** is comprised of local roadways and residential lots. Basin DS22 captures runoff from lots and conveys it via street flow to Type 16 sump inlets at design point 22S. Emergency overflow is south into the North Dawson Tributary.

**Basin DS23a** is comprised of residential lots and park. Basin DS23a captures runoff from lots and conveys it via earthen swale to a Type C sump inlet at design point 23S. Emergency overflow is south into the North Dawson Tributary.

**Basin DS23b** is comprised of residential lots and park. Basin DS23b captures runoff from lots and conveys it via earthen swale to a Type C sump inlet at design point 23S. Emergency overflow is south into the North Dawson Tributary.

**Basin DS24a** is comprised of residential lots. Basin DS24a captures runoff from lots and conveys it via earthen swale to a Type C sump inlet at design point 24S. Emergency overflow is south into the North Dawson Tributary.

**Basin DS24b** is comprised of residential lots and park. Basin DS24b captures runoff from lots and conveys it via earthen swale to a Type C sump inlet at design point 24S. Emergency overflow is south into the North Dawson Tributary.

## **B. Stormwater Storage Facilities**

All runoff from the site is conveyed to water quality Pond D3, then a regional detention Pond A1. Runoff from back of lot areas is captured in swales and area inlets so that all areas of the site are discharged to EURV and water quality ponds. This stormwater infrastructure and ponds are being designed as part of a separate project (CA13-0045). Construction of Ponds A1 and D3 are required prior to or concurrent with development of Parcel D.

Pond D3 is an EURV and water quality pond. It will discharge into Pond A1, which is a regional detention pond. Pond A1 will provide end of line flood attenuation before release from the property across Dawson Trails Boulevard, the existing railroad, frontage road and interstate.

## **C. Water Quality Enhancement Control Measures**

The site will drain to the proposed EURV and water quality pond and regional detention. Water quality enhancements have been included in the EDB designed in project number CA13-0045. The ponds have been designed to incorporate an outlet structure that releases flows for the water quality capture volume (WQCV), excess urban runoff volume (EURV), and the 100-year storm event. The design of these structures can be found in the drainage report, Castle Rock project number CA13-0045. This design conforms to the assumptions and designs of the CA13-0045 drainage report (Dawson Trails Filing 2).

#### **D. Floodplain Modification**

The site is not covered by any regulatory floodplains. Refer to project number CA13-0045 drainage report for information regarding the North Dawson Tributary immediately south of this project.

#### **E. Geotechnical Investigation and Sub-surface Collection System Design**

Subsurface collection systems will be installed along the edge of road as required by the town.

#### **F. Operation and Maintenance**

Maintenance of all ponds will be the responsibility of a metro district or homeowner's association. Excerpts from the Town of Castle Rock's Stormwater Management Facility Operation and Maintenance (O&M) General Guidelines was used to develop the Extended Detention Basin (EDB) operation and maintenance.

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

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

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

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

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

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

**Irrigation:** Irrigation may be required to establish initial vegetation. Native grass and other drought tolerant plantings should not require irrigation after establishment. Check for broken sprinkler heads and repair them, as needed. Completely drain the irrigation system before the first winter freeze each year. Upon reactivation of the irrigation system in the spring, inspect all components and replace damaged parts, as needed.

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

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

#### **G. Additional Permitting Requirements**

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

#### **H. General**

Relevant excerpts from the Pond D3 design being prepared by CORE as part of a separate project (CA13-0045) are included in Appendix D.

### **V. Conclusions**

#### **A. Compliance With Standards**

The proposed design complies with the Town's SDDTCM, and Chatfield Reservoir Control Regulation No. 73. Future submittals will coordinate with the overall drainage report being prepared as part of a separate project (CA13-0045).

#### **B. Variances**

No variances are requested at this time.

#### **C. Drainage Concept**

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

## VI. References

1. Town of Castle Rock Storm Drainage Design and Technical Criteria Manual, February 2025.
2. Town of Castle Rock Transportation Design Criteria Manual, December 2018.
3. Town of Castle Rock Stormwater Management Facility Operation and Maintenance (O&M) General Guidelines, December 2012. Accessed online at [www.crgov.com/1796/Stormwater-Facility-Maintenance](http://www.crgov.com/1796/Stormwater-Facility-Maintenance)
4. Urban Storm Drainage Criteria Manual, Volumes 1-3, accessed online at [www.mhfd.org](http://www.mhfd.org), March 2024.
5. Stormwater Management Facility Operation and Maintenance (O&M) General Guidelines, Town of Castle Rock, 2012.
6. North and South Dawson Watershed Master Plan, prepared by CH2M Hill, September 2010.
7. Gambel Ridge and Douglas Lane Tributary Watershed Master Plan, prepared by RESPEC, August 2014.

**DRAINAGE REPORT**  
**for**  
**DAWSON TRAILS - TRACT O AND H**

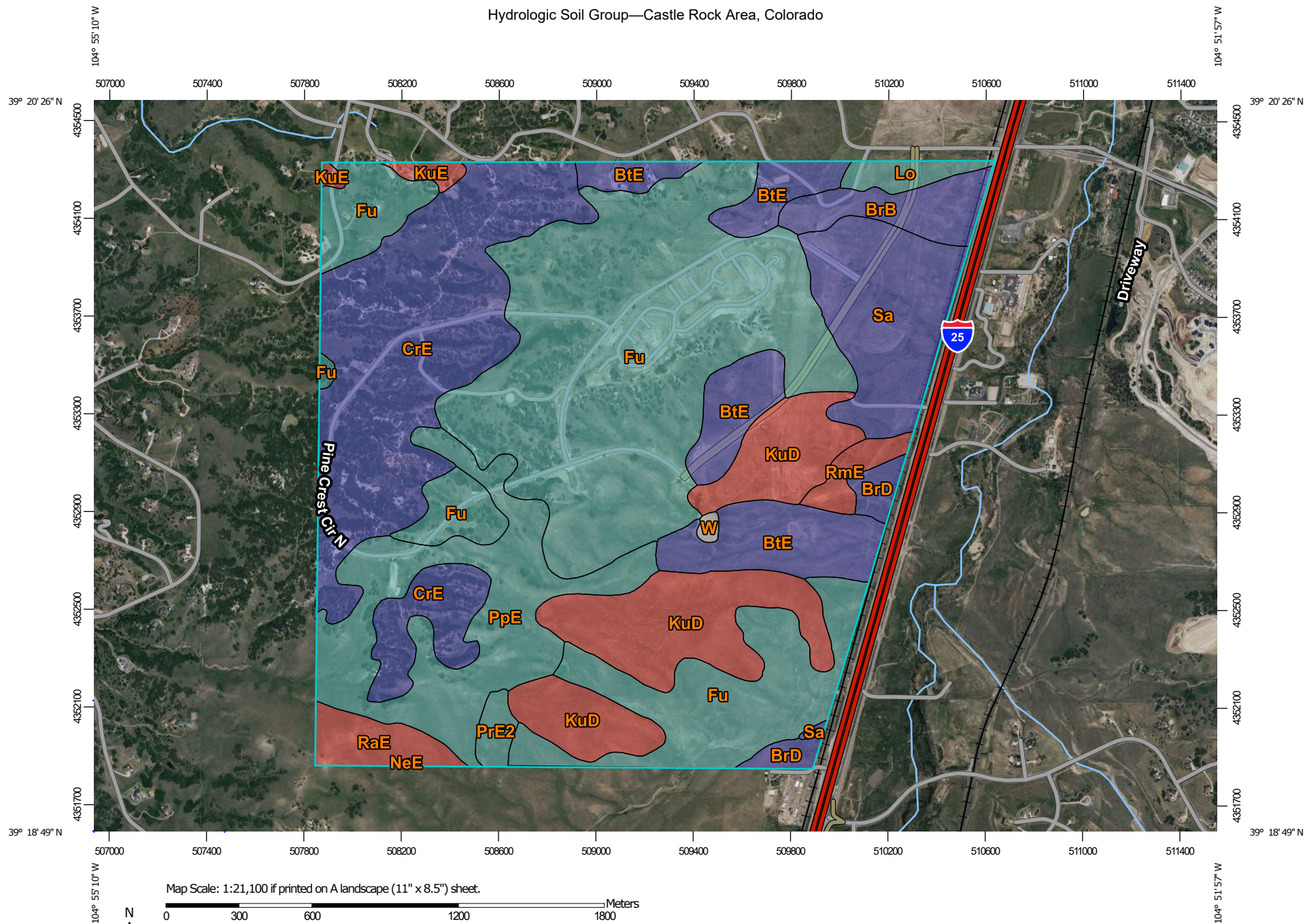
**APPENDIX A**  
Hydrologic Computations



DAWSON TRAILS - TRACT O AND H  
SITE LOCATION MAP  
(NTS)



# Hydrologic Soil Group—Castle Rock Area, Colorado



**MAP LEGEND****Area of Interest (AOI)**
 Area of Interest (AOI)
**Soils****Soil Rating Polygons**

-  A
-  A/D
-  B
-  B/D
-  C
-  C/D
-  D
-  Not rated or not available

**Soil Rating Lines**

-  A
-  A/D
-  B
-  B/D
-  C
-  C/D
-  D
-  Not rated or not available

**Soil Rating Points**

-  A
-  A/D
-  B
-  B/D

-  C
-  C/D
-  D
-  Not rated or not available

**Water Features**
 Streams and Canals
**Transportation**

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

**Background**
 Aerial Photography
**MAP INFORMATION**

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

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

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

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

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

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

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

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

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

## Hydrologic Soil Group

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

## Description

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

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

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

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

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

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

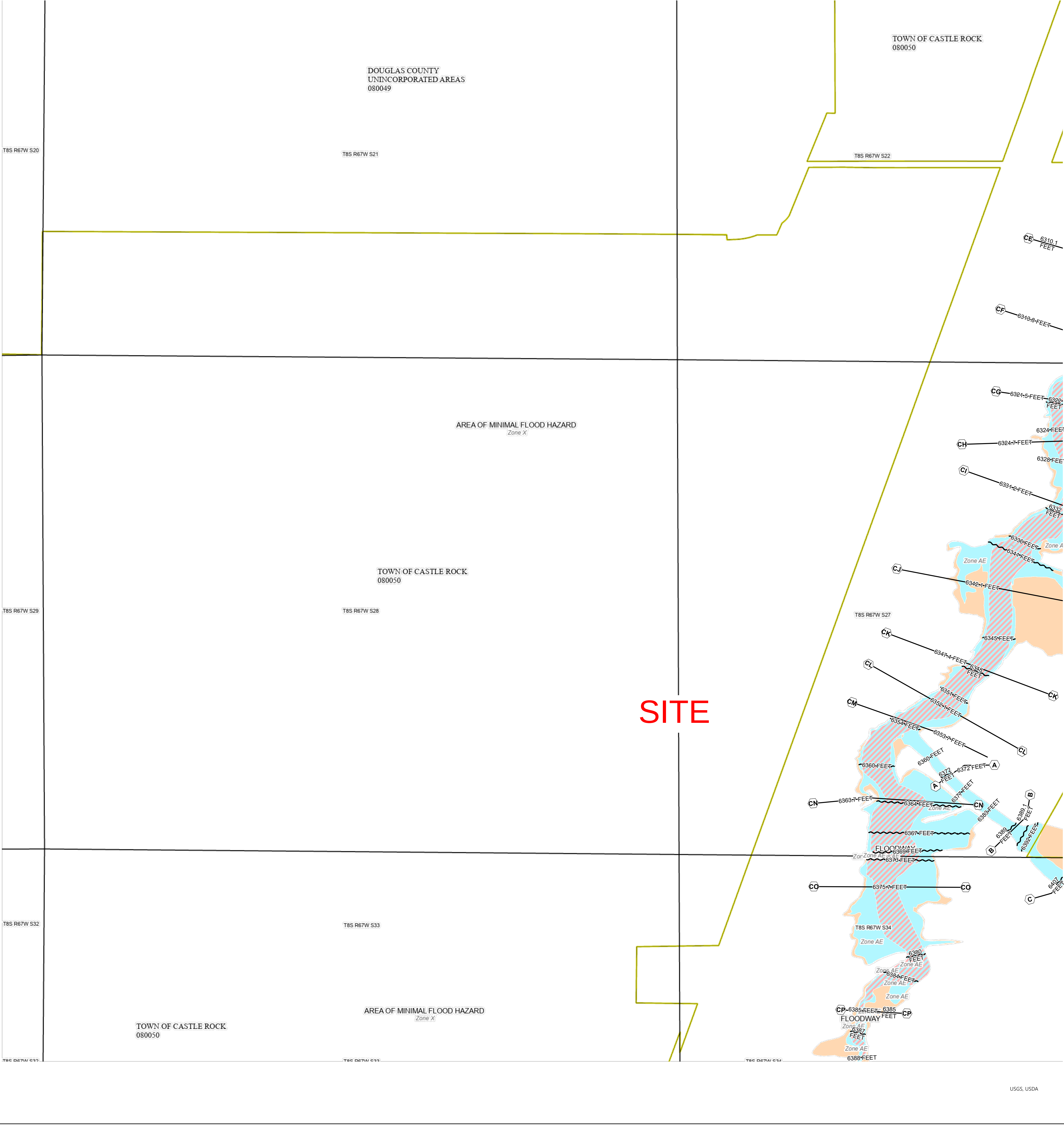
If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

## Rating Options

*Aggregation Method:* Dominant Condition

*Component Percent Cutoff:* None Specified

*Tie-break Rule:* Higher



USGS, USDA

FLOOD HAZARD INFORMATION

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

|                             |             |                                                                                                                                                                          |
|-----------------------------|-------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SPECIAL FLOOD HAZARD AREAS  | <div></div> | Without Base Flood Elevation (BFE)<br><i>Zone A, V, A99</i>                                                                                                              |
|                             | <div></div> | With BFE or Depth <i>Zone AE, AO, AH, VE, AR</i>                                                                                                                         |
|                             | <div></div> | Regulatory Floodway                                                                                                                                                      |
| OTHER AREAS OF FLOOD HAZARD | <div></div> | 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 <i>Zone X</i> |
|                             | <div></div> | Future Conditions 1% Annual Chance Flood Hazard <i>Zone X</i>                                                                                                            |
|                             | <div></div> | Area with Reduced Flood Risk due to Levee<br>See Notes <i>Zone X</i>                                                                                                     |
|                             | <div></div> | Area with Flood Risk due to Levee <i>Zone D</i>                                                                                                                          |
| OTHER AREAS                 | <div></div> | NO SCREEN Area of Minimal Flood Hazard <i>Zone X</i>                                                                                                                     |
|                             | <div></div> | Effective LOMRs                                                                                                                                                          |
|                             | <div></div> | Area of Undetermined Flood Hazard <i>Zone D</i>                                                                                                                          |
| GENERAL STRUCTURES          | <div></div> | Channel, Culvert, or Storm Sewer                                                                                                                                         |
|                             | <div></div> | Levee, Dike, or Floodwall                                                                                                                                                |
| OTHER FEATURES              | <div></div> | 20.2 Cross Sections with 1% Annual Chance                                                                                                                                |
|                             | <div></div> | 17.5 Water Surface Elevation                                                                                                                                             |
|                             | <div></div> | 8 Coastal Transect                                                                                                                                                       |
|                             | <div></div> | Coastal Transect Baseline                                                                                                                                                |
|                             | <div></div> | Profile Baseline                                                                                                                                                         |
|                             | <div></div> | Hydrographic Feature                                                                                                                                                     |
|                             | <div></div> | Base Flood Elevation Line (BFE)                                                                                                                                          |
|                             | <div></div> | Limit of Study                                                                                                                                                           |
|                             | <div></div> | Jurisdiction Boundary                                                                                                                                                    |

NOTES TO USERS

For information and questions about this Flood Insurance Rate Map (FIRM), available products associated with this FIRM, including historic versions, the current map date for each FIRM panel, how to order products, or the National Flood Insurance Program (NFIP) in general, please call the FEMA Map Information eXchange at 1-877-FEMA-MAP (1-877-336-6627) or visit the FEMA Flood Map Service Center website at <https://msc.fema.gov>. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the website.

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

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

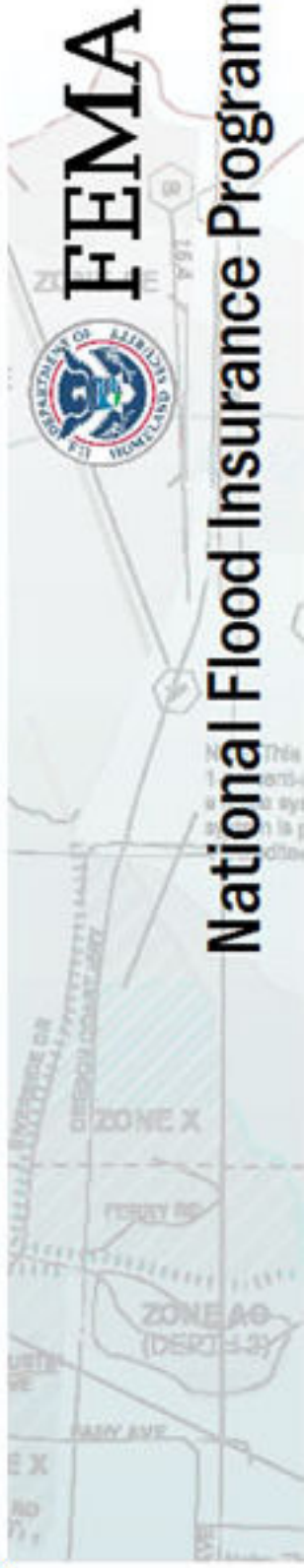
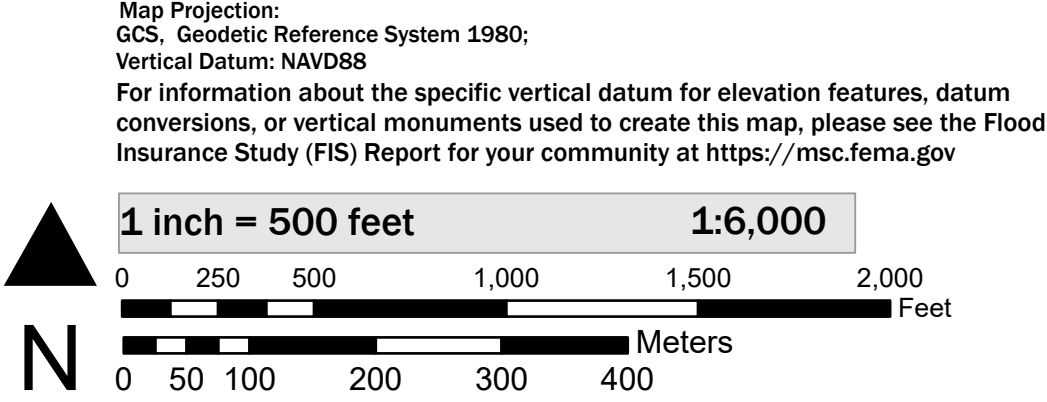
To determine if flood insurance is available in this community, contact your Insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

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

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

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

SCALE



NATIONAL FLOOD INSURANCE PROGRAM  
FLOOD INSURANCE RATE MAP

PANEL 284 OF 461

|                     |        |       |
|---------------------|--------|-------|
| Panel Contains:     |        |       |
| COMMUNITY           | NUMBER | PANEL |
| TOWN OF CASTLE ROCK | 080050 | 0284  |
| DOUGLAS COUNTY      | 080049 | 0284  |

PERCENT IMPERVIOUS CALCULATIONS  
PROPOSED CONDITIONS - DAWSON TRAILS TRACT D

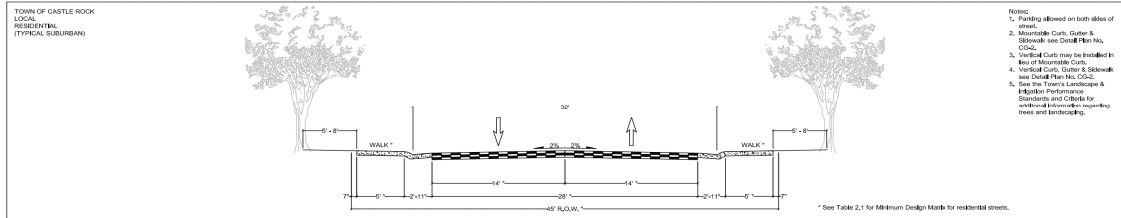
| Basin | Total Area | Pond WQCV      | Local Residential (4" mountable curb w attached sidewalk) - Drainage Classification A | Collector Residential (6" vertical curb w attached sidewalk) - Drainage Classification B | MFH - High-density MFH (>20 du/ac) | SFH - High-density (5-20 du/ac) | Disturbed Soil - Lawns, Landscaping | Open Space, Undisturbed Native Grass | Composite Percent Impervious |
|-------|------------|----------------|---------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|------------------------------------|---------------------------------|-------------------------------------|--------------------------------------|------------------------------|
| %IMP  | (acres)    | 100.0% (acres) | 93.3% (acres)                                                                         | 75.3% (acres)                                                                            | 70.0% (acres)                      | 65% (acres)                     | 20.0% (acres)                       | 5% (acres)                           |                              |
| DS1   | 0.92       |                |                                                                                       |                                                                                          |                                    | 0.92                            |                                     |                                      | 65.0%                        |
| DS2   | 1.96       |                |                                                                                       |                                                                                          |                                    | 1.96                            |                                     |                                      | 65.0%                        |
| DS3   | 2.51       |                |                                                                                       |                                                                                          | 2.51                               |                                 |                                     |                                      | 70.0%                        |
| DS4   | 1.94       |                |                                                                                       |                                                                                          | 1.63                               | 0.31                            |                                     |                                      | 69.2%                        |
| DS5   | 1.63       |                |                                                                                       |                                                                                          |                                    | 1.63                            |                                     |                                      | 65.0%                        |
| DS6   | 0.31       |                |                                                                                       |                                                                                          |                                    | 0.31                            |                                     |                                      | 65.0%                        |
| DS7   | 1.84       |                |                                                                                       |                                                                                          | 1.84                               |                                 |                                     |                                      | 70.0%                        |
| DS8   | 2.71       |                |                                                                                       |                                                                                          | 2.71                               |                                 |                                     |                                      | 70.0%                        |
| DS9   | 2.48       |                |                                                                                       |                                                                                          | 0.26                               | 1.55                            | 0.67                                |                                      | 53.4%                        |
| DS10  | 2.26       |                |                                                                                       |                                                                                          |                                    | 2.26                            |                                     |                                      | 65.0%                        |
| DS11  | 3.04       |                |                                                                                       |                                                                                          |                                    | 3.04                            |                                     |                                      | 65.0%                        |
| DS12  | 1.43       |                |                                                                                       |                                                                                          |                                    | 1.43                            |                                     |                                      | 65.0%                        |
| DS13  | 0.76       |                |                                                                                       |                                                                                          |                                    | 0.76                            |                                     |                                      | 65.0%                        |
| DS14  | 2.16       |                |                                                                                       |                                                                                          |                                    | 2.07                            | 0.09                                |                                      | 63.1%                        |
| DS20  | 2.34       |                |                                                                                       |                                                                                          | 2.00                               |                                 | 0.34                                |                                      | 62.7%                        |
| DS21  | 0.82       |                |                                                                                       |                                                                                          | 0.82                               |                                 |                                     |                                      | 70.0%                        |
| DS22  | 1.68       |                |                                                                                       |                                                                                          |                                    | 1.68                            |                                     |                                      | 65.0%                        |
| DN1   | 12.00      |                |                                                                                       |                                                                                          |                                    |                                 |                                     | 12.00                                | 5.0%                         |
| DN2   | 1.39       |                |                                                                                       |                                                                                          |                                    | 1.39                            |                                     |                                      | 65.0%                        |
| DN3   | 1.19       |                |                                                                                       |                                                                                          |                                    | 1.19                            |                                     |                                      | 65.0%                        |
| DN4   | 0.10       |                |                                                                                       |                                                                                          |                                    | 0.10                            |                                     |                                      | 65.0%                        |
| DN5   | 3.25       |                |                                                                                       |                                                                                          |                                    | 2.94                            | 0.31                                |                                      | 60.7%                        |
| DN6   | 2.79       |                |                                                                                       |                                                                                          |                                    | 2.79                            |                                     |                                      | 65.0%                        |
| DN7   | 1.33       |                |                                                                                       |                                                                                          |                                    | 1.33                            |                                     |                                      | 65.0%                        |
| DN8   | 2.87       |                |                                                                                       |                                                                                          |                                    |                                 |                                     | 2.87                                 | 5.0%                         |
|       |            |                |                                                                                       |                                                                                          |                                    |                                 |                                     |                                      |                              |

Notes  
Ref 1 - MHFD Table 6-3

Local Residential (4" mountable curb w attached sidewalk) - Drainage Classification A

|              |       |            |
|--------------|-------|------------|
| 45' ROW      |       |            |
| Section      | % Imp | Width (ft) |
| Paved Street | 95%   | 32         |
| Walk         | 95%   | 12         |
| Lawns        | 20%   | 1          |

Composite % Imp = 93.3%



| Slope % | 5-year Half Street (cfs) | 100-year Half Street (cfs) |
|---------|--------------------------|----------------------------|
| 0.5%    | 2.1                      | 62.1                       |
| 1.0%    | 3.4                      | 87.8                       |
| 1.5%    | 4.1                      | 107.5                      |
| 2.0%    | 4.8                      | 103.6                      |
| 2.5%    | 5.3                      | 96.9                       |
| 3.0%    | 5.9                      | 91.7                       |
| 3.5%    | 6.3                      | 87.6                       |
| 4.0%    | 6.8                      | 84.1                       |
| 4.5%    | 7.2                      | 81.2                       |
| 5.0%    | 7.6                      | 78.7                       |
| 5.5%    | 7.9                      | 76.5                       |
| 6.0%    | 8.3                      | 74.5                       |

Note that flow depth is 4", even with with attached sidewalk.

Chapter 7. Street Drainage

TABLE 7-2  
MINOR STORM ALLOWABLE FLOW DEPTH AND ROADWAY ENCROACHMENT FOR STREETS WITH CURB AND GUTTER

| Drainage Classification | Allowable Flow Depth in Gutter Flowline <sup>1</sup> | Maximum Roadway Encroachment                                                                                       |
|-------------------------|------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|
| Type A                  | No curb overtopping.                                 | Flow may spread to crown of street.                                                                                |
| Type B                  | No curb overtopping.                                 | Flow spread must leave at least one 10-foot lane free of water (5-feet either side of the street crown).           |
| Type C                  | No curb overtopping.                                 | Flow spread must leave at least two 10-foot lanes free of water (10-feet each side of the street crown or median). |

<sup>1</sup> If a 4-inch curb with an attached sidewalk is used (i.e., combination or rollover curb), the flow depth is limited to 4-inches.

TABLE 6-2. RECOMMENDED IMPERVIOUSNESS BY LAND USE

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

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

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

<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 to reflect other impervious areas such as roads and pads that may be part of a solar field and layouts with wider inter-panel spacing.

TABLE 6-3. RECOMMENDED IMPERVIOUSNESS BY SURFACE TYPES

| SURFACE TYPES                                                                                                                                  |                                                                          | IMPERVIOUSNESS |
|------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------|----------------|
| Roadways and Paved Streets                                                                                                                     |                                                                          | 95%            |
| Concrete Driveways and Walks                                                                                                                   |                                                                          | 95%            |
| Roofs                                                                                                                                          |                                                                          | 95%            |
| Gravel                                                                                                                                         | No Traffic (Pedestrian Use)                                              | 40%            |
|                                                                                                                                                | Low-traffic Areas (Maintenance Paths and Substations)                    | 60%            |
|                                                                                                                                                | High-traffic Areas (Roadways and Parking)                                | 80%            |
| Disturbed Soil (Including Lawns, Managed/Active Turf, Landscaped Areas with Water-Wise Vegetation, and Uncompacted Gravel/Mulch Planting Beds) |                                                                          | 20%            |
| Undisturbed or Decompacted Soil (Native Grasses and Open Space Areas)                                                                          |                                                                          | 5%             |
| Artificial Turfs <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.

|                                                  |  |
|--------------------------------------------------|--|
| Calculation of Peak Runoff using Rational Method |  |
|--------------------------------------------------|--|

$$Q(cfs) = CIA$$

JOB NO: 13301.00  
PROJECT: Dawson Trails - Tract D  
DSGN STRM: 5-year  
CALC BY: DJO

STORM DRAIN SYSTEM DESIGN  
(5-YEAR DEVELOPED CONDITION)

DATE: 2/13/25

$I=28.5 \cdot P^{.01} / (10+T)^{.0786}$

| 1 HR STORM= 1.43 |                    |       |      | Direct RUNOFF |      |     |     | TOTAL RUNOFF |       |     |      | TRAVEL TIME |          |             |         | STREET FLOW |     | INLET | INLET INTERCEPT |     | CARRYOVER FLOW |     | DP CAPTURING CARRYOVER FLOW | PIPE FLOW |      | Notes                              |
|------------------|--------------------|-------|------|---------------|------|-----|-----|--------------|-------|-----|------|-------------|----------|-------------|---------|-------------|-----|-------|-----------------|-----|----------------|-----|-----------------------------|-----------|------|------------------------------------|
| Design Point     | Basin              | Ac    | C    | Tc            | A°C  | I   | Q   | Tc           | A°C   | I   | Q    | Length      | Vel. fps | Time (Min.) | From To | A°C         | Q   |       | A°C             | Q   | A°C            | Q   |                             | A°C       | Q    |                                    |
| 1S               | DS1                | 0.92  | 0.56 | 8.05          | 0.52 | 4.2 | 2.2 |              |       |     |      |             |          |             |         | 0.5         | 2.2 | 1S    | 0.4             | 1.7 | 0.1            | 0.5 | 6S                          | 0.40      | 1.7  | DIRECT/ INLET INTERCEPT/ PIPE FLOW |
| 2S               | DS2                | 1.96  | 0.56 | 9.68          | 1.11 | 3.9 | 4.3 |              |       |     |      |             |          |             |         | 1.1         | 4.3 | 2S    | 0.9             | 3.3 | 0.3            | 1.0 | 6S                          | 0.85      | 3.3  | DIRECT/ INLET INTERCEPT/ PIPE FLOW |
| 2.1S             | DS1+DS2            |       |      |               |      |     |     | 9.7          | 1.25  | 3.9 | 4.9  |             |          |             |         |             |     |       |                 |     |                |     |                             | 1.25      | 4.9  | COMBINED                           |
| 3S               | DS3                | 2.51  | 0.61 | 9.75          | 1.52 | 3.9 | 5.9 |              |       |     |      |             |          |             |         | 1.5         | 5.9 | 3S    | 1.1             | 4.2 | 0.4            | 1.7 | 4S                          | 1.07      | 4.2  | DIRECT/ INLET INTERCEPT/ PIPE FLOW |
|                  | DS4                | 1.94  | 0.60 | 9.60          | 1.16 | 3.9 | 4.6 |              |       |     |      |             |          |             |         | 1.6         | 6.3 | 4S    | 1.0             | 3.9 | 0.6            | 2.5 | 5S                          |           |      | DIRECT/ INLET INTERCEPT            |
| 4S               | DP3S+DS4           |       |      |               |      |     |     | 9.7          | 2.06  | 3.9 | 8.0  |             |          |             |         |             |     |       |                 |     |                |     |                             | 2.06      | 8.0  | PIPE FLOW                          |
|                  | DS5                | 1.63  | 0.56 | 7.86          | 0.92 | 4.2 | 3.9 |              |       |     |      |             |          |             |         | 1.5         | 6.3 | 5S    | 1.2             | 5.1 | 0.3            | 1.2 | 6S                          |           |      | DIRECT/ INLET INTERCEPT            |
| 5S               | DP4S+DS5           |       |      |               |      |     |     | 9.7          | 3.31  | 3.9 | 12.9 |             |          |             |         |             |     |       |                 |     |                |     |                             | 3.31      | 12.9 | PIPE FLOW                          |
| 5.1S             | DP2.1S+DP5S        |       |      |               |      |     |     | 9.7          | 4.56  | 3.9 | 17.8 |             |          |             |         |             |     |       |                 |     |                |     |                             | 4.56      | 17.8 | PIPE FLOW                          |
|                  | DS6                | 0.31  | 0.56 | 5.84          | 0.18 | 4.6 | 0.8 |              |       |     |      |             |          |             |         | 0.8         | 3.5 | 6S    | 0.8             | 3.5 |                |     | 14S                         | 0.85      | 3.5  | DIRECT/ INLET INTERCEPT            |
| 6S               | DP5.1S+ DS6        |       |      |               |      |     |     | 9.7          | 5.40  | 3.9 | 21.1 |             |          |             |         |             |     |       |                 |     |                |     |                             | 5.40      | 21.1 | PIPE FLOW                          |
| 7S               | DS7                | 1.84  | 0.58 | 10.93         | 1.07 | 3.7 | 4.0 |              |       |     |      |             |          |             |         | 1.1         | 4.0 | 7S    | 1.0             | 3.6 | 0.1            | 0.4 | 8S                          | 0.96      | 3.6  | DIRECT/ INLET INTERCEPT            |
|                  | DS8                | 2.71  | 0.58 | 11.41         | 1.58 | 3.7 | 5.8 |              |       |     |      |             |          |             |         | 1.7         | 6.2 | 8S    | 1.7             | 6.2 |                |     | 9S                          |           |      | DIRECT/ INLET INTERCEPT            |
| 8S               | DP7S+DS8           |       |      |               |      |     |     | 11.4         | 2.65  | 3.7 | 9.7  |             |          |             |         |             |     |       |                 |     |                |     |                             | 2.65      | 9.7  | PIPE FLOW                          |
|                  | DS9                | 2.48  | 0.43 | 11.36         | 1.07 | 3.7 | 3.9 |              |       |     |      |             |          |             |         | 1.1         | 3.9 | 9S    | 0.8             | 3.0 | 0.2            | 0.9 | 13S                         |           |      | DIRECT/ INLET INTERCEPT            |
| 9S               | DP8S+DS9           |       |      |               |      |     |     | 11.4         | 3.47  | 3.7 | 12.7 |             |          |             |         |             |     |       |                 |     |                |     |                             | 3.47      | 12.7 | PIPE FLOW                          |
|                  | DS10               | 2.26  | 0.56 | 9.50          | 1.28 | 3.9 | 5.0 |              |       |     |      |             |          |             |         | 1.3         | 5.0 | 10S   | 1.2             | 4.5 | 0.1            | 0.5 | 13S                         |           |      | DIRECT/ INLET INTERCEPT            |
| 10S              | DP9S+DS10          |       |      |               |      |     |     | 11.4         | 4.62  | 3.7 | 17.0 |             |          |             |         |             |     |       |                 |     |                |     |                             | 4.62      | 17.0 | PIPE FLOW                          |
| 11S              | DS11               | 3.04  | 0.54 | 11.32         | 1.63 | 3.7 | 6.0 |              |       |     |      |             |          |             |         | 1.6         | 6.0 | 11S   | 1.2             | 4.5 | 0.4            | 1.5 | 13S                         | 1.23      | 4.5  | DIRECT/ INLET INTERCEPT/ PIPE FLOW |
| 11.1S            | DP10S+DP11S        |       |      |               |      |     |     | 11.4         | 5.86  | 3.7 | 21.5 |             |          |             |         |             |     |       |                 |     |                |     |                             | 5.86      | 21.5 | PIPE FLOW                          |
| 12S              | DS12               | 1.43  | 0.56 | 8.76          | 0.81 | 4.1 | 3.3 |              |       |     |      |             |          |             |         | 0.8         | 3.3 | 12S   | 0.7             | 2.8 | 0.1            | 0.4 | 14S                         | 0.70      | 2.8  | DIRECT/ INLET INTERCEPT/ PIPE FLOW |
| 12.1S            | DP6S+DP11.1S+DP12S |       |      |               |      |     |     | 11.4         | 11.96 | 3.7 | 43.9 |             |          |             |         |             |     |       |                 |     |                |     |                             | 11.96     | 43.9 | PIPE FLOW                          |
| 13S              | DS13               | 0.76  | 0.56 | 7.52          | 0.43 | 4.3 | 1.8 |              |       |     |      |             |          |             |         | 1.2         | 4.7 | 13S   | 1.2             | 4.7 |                |     | NONE                        | 1.20      | 4.7  | DIRECT/ INLET INTERCEPT/ PIPE FLOW |
|                  | DS14               | 2.16  | 0.55 | 12.66         | 1.19 | 3.5 | 4.2 |              |       |     |      |             |          |             |         | 1.3         | 4.6 | 14S   | 1.3             | 4.6 |                |     | NONE                        |           |      | DIRECT/ INLET INTERCEPT            |
| 14S              | DP12.1S+DP13S+DS14 |       |      |               |      |     |     | 12.7         | 14.45 | 3.5 | 50.7 |             |          |             |         |             |     |       |                 |     |                |     |                             | 14.45     | 50.7 | PIPE FLOW                          |
| 20S              | DS20               | 2.34  | 0.55 | 11.44         | 1.28 | 3.7 | 4.7 |              |       |     |      |             |          |             |         | 1.3         | 4.7 | 20S   | 0.6             | 2.2 | 0.7            | 2.5 | 21S                         | 0.59      | 2.2  | DIRECT/ INLET INTERCEPT/ PIPE FLOW |
|                  | DS21               | 0.82  | 0.58 | 7.73          | 0.48 | 4.3 | 2.0 |              |       |     |      |             |          |             |         | 1.2         | 4.6 | 21S   | 1.2             | 4.6 |                |     | NONE                        |           |      | DIRECT/ INLET INTERCEPT            |
| 21S              | DP20S+DS21         |       |      |               |      |     |     | 11.4         | 1.76  | 3.7 | 6.4  |             |          |             |         |             |     |       |                 |     |                |     |                             | 1.76      | 6.4  | PIPE FLOW                          |
|                  | DS22               | 1.68  | 0.54 | 10.46         | 0.90 | 3.8 | 3.4 |              |       |     |      |             |          |             |         | 0.9         | 3.4 | 22S   | 0.9             | 3.4 |                |     | NONE                        |           |      | COMBINED                           |
| 22S              | DP21S+DS22         |       |      |               |      |     |     | 11.4         | 2.66  | 3.7 | 9.7  |             |          |             |         |             |     |       |                 |     |                |     |                             | 2.66      | 9.7  | PIPE FLOW                          |
| 1N               | DN1                | 12.00 | 0.08 | 14.78         | 0.91 | 3.3 | 3.0 |              |       |     |      |             |          |             |         | 0.9         | 3.0 | 1N    |                 |     |                |     |                             | 0.91      | 3.0  | DIRECT/ INLET INTERCEPT/ PIPE FLOW |
| 2N               | DN2                | 1.39  | 0.54 | 7.47          | 0.75 | 4.3 | 3.2 |              |       |     |      |             |          |             |         | 0.7         | 3.2 | 2N    | 0.5             | 2.1 | 0.3            | 1.1 | 3N                          | 0.48      | 2.1  | DIRECT/ INLET INTERCEPT/ PIPE FLOW |
|                  | DN3                | 1.19  | 0.54 | 7.96          | 0.64 | 4.2 | 2.7 |              |       |     |      |             |          |             |         | 0.9         | 4.8 | 3N    | 0.8             | 4.3 | 0.1            | 0.5 | NONE                        |           |      | DIRECT/ INLET INTERCEPT            |
| 3N               | DP2N+DN3           |       |      |               |      |     |     | 8.0          | 1.30  | 4.2 | 5.5  |             |          |             |         |             |     |       |                 |     |                |     |                             | 1.30      | 5.5  | PIPE FLOW                          |
|                  | DN4                | 0.10  | 0.54 | 5.00          | 0.05 | 4.9 | 0.3 |              |       |     |      |             |          |             |         | 0.1         | 0.3 | 4N    | 0.1             | 0.3 |                |     | NONE                        |           |      | DIRECT/ INLET INTERCEPT            |
| 4N               | DP3N+D4N           |       |      |               |      |     |     | 8.0          | 1.35  | 4.2 | 5.7  |             |          |             |         |             |     |       |                 |     |                |     |                             | 1.35      | 5.7  | PIPE FLOW                          |
| 5N               | DN5                | 3.25  | 0.50 | 13.00         | 1.62 | 3.5 | 5.6 |              |       |     |      |             |          |             |         | 1.6         | 5.6 | 5N    | 1.2             | 4.3 | 0.4            | 1.3 | 6N                          | 1.25      | 4.3  | DIRECT/ INLET INTERCEPT/ PIPE FLOW |
|                  | DN6                | 2.79  | 0.54 | 9.74          | 1.50 | 3.9 | 5.8 |              |       |     |      |             |          |             |         | 1.5         | 5.8 | 6N    | 1.5             | 5.8 | 0.0            | 0.0 | NONE                        |           |      | DIRECT/ INLET INTERCEPT            |
| 6N               | DP5N+DN6           |       |      |               |      |     |     | 13.0         | 2.73  | 3.5 | 9.5  |             |          |             |         |             |     |       |                 |     |                |     |                             | 2.73      | 9.5  | PIPE FLOW                          |
|                  | DN7                | 1.33  | 0.54 | 10.00         | 0.71 | 3.9 | 2.8 |              |       |     |      |             |          |             |         | 0.7         | 2.8 | 7N    | 0.6             | 2.3 | 0.1            | 0.5 | NONE                        |           |      | DIRECT/ INLET INTERCEPT            |
| 7N               | DP6N+DN7           |       |      |               |      |     |     | 13.0         | 3.32  | 3.5 | 11.5 |             |          |             |         |             |     |       |                 |     |                |     |                             | 3.32      | 11.5 | PIPE FLOW                          |
| 8N               | DN8                | 2.87  | 0.08 | 16.01         | 0.22 | 3.1 | 0.7 |              |       |     |      |             |          |             |         | 0.2         | 0.7 | 8N    |                 |     |                |     |                             | 0.22      | 0.7  | DIRECT/ INLET INTERCEPT/ PIPE FLOW |
|                  |                    |       |      |               |      |     |     |              |       |     |      |             |          |             |         |             |     |       |                 |     |                |     |                             |           |      |                                    |
|                  |                    |       |      |               |      |     |     |              |       |     |      |             |          |             |         |             |     |       |                 |     |                |     |                             |           |      |                                    |

JOB NO: 13301.00  
PROJECT: Dawson Trails - Tract D  
DSGN STRM: 100-year  
CALC BY: DJO

STORM DRAIN SYSTEM DESIGN  
(100-YEAR DEVELOPED CONDITION)

DATE: 2/13/25

$I=28.5 \cdot P^1 / (10+T)^{0.786}$

| 1 HR STORM= 2.60 |                    |       |      | DIRECT RUNOFF |      |     |      | TOTAL RUNOFF |       |     |       | TRAVEL TIME |      |             |         | STREET FLOW |      | INLET | INLET INTERCEPT |      | CARRYOVER FLOW |     | DP CAPTURING CARRYOVER FLOW | PIPE FLOW |       | Notes                              |
|------------------|--------------------|-------|------|---------------|------|-----|------|--------------|-------|-----|-------|-------------|------|-------------|---------|-------------|------|-------|-----------------|------|----------------|-----|-----------------------------|-----------|-------|------------------------------------|
| Design Point     | Basin              | Ac    | C    | Tc            | A°C  | I   | Q    | Tc           | A°C   | I   | Q     | Length      | Vel. | Time (Min.) | From To | A°C         | Q    |       | A°C             | Q    | A°C            | Q   |                             | A°C       | Q     |                                    |
| 1S               | DS1                | 0.92  | 0.75 | 8.05          | 0.69 | 7.6 | 5.3  |              |       |     |       |             |      |             |         | 0.7         | 5.3  | 1S    | 0.4             | 2.9  | 0.3            | 2.4 | 6S                          | 0.38      | 2.9   | DIRECT/ INLET INTERCEPT/ PIPE FLOW |
| 2S               | DS2                | 1.96  | 0.75 | 9.68          | 1.47 | 7.1 | 10.5 |              |       |     |       |             |      |             |         | 1.5         | 10.5 | 2S    | 0.9             | 6.1  | 0.6            | 4.3 | 6S                          | 0.86      | 6.1   | DIRECT/ INLET INTERCEPT/ PIPE FLOW |
| 2.1S             | DS1+DS2            |       |      |               |      |     |      | 9.7          | 1.24  | 7.1 | 8.8   |             |      |             |         |             |      |       |                 |      |                |     |                             | 1.24      | 8.8   | COMBINED                           |
| 3S               | DS3                | 2.51  | 0.77 | 9.75          | 1.93 | 7.1 | 13.7 |              |       |     |       |             |      |             |         | 1.9         | 13.7 | 3S    | 1.1             | 7.8  | 0.8            | 6.0 | 4S                          | 1.09      | 7.8   | DIRECT/ INLET INTERCEPT/ PIPE FLOW |
|                  | DS4                | 1.94  | 0.77 | 9.60          | 1.49 | 7.1 | 10.6 |              |       |     |       |             |      |             |         | 2.3         | 16.6 | 4S    | 1.0             | 7.1  | 1.3            | 9.5 | 5S                          |           |       | DIRECT/ INLET INTERCEPT            |
| 4S               | DP3S+DS4           |       |      |               |      |     |      | 9.7          | 2.09  | 7.1 | 14.8  |             |      |             |         |             |      |       |                 |      |                |     |                             | 2.09      | 14.8  | PIPE FLOW                          |
|                  | DS5                | 1.63  | 0.75 | 7.86          | 1.22 | 7.7 | 9.4  |              |       |     |       |             |      |             |         | 2.6         | 18.9 | 5S    | 1.6             | 11.6 | 1.0            | 7.3 | 6S                          |           |       | DIRECT/ INLET INTERCEPT            |
| 5S               | DP4S+DS5           |       |      |               |      |     |      | 9.7          | 3.65  | 7.1 | 26.0  |             |      |             |         |             |      |       |                 |      |                |     |                             | 3.65      | 26.0  | PIPE FLOW                          |
| 5.1S             | DP2.1S+DP5S        |       |      |               |      |     |      | 9.7          | 4.89  | 7.1 | 34.8  |             |      |             |         |             |      |       |                 |      |                |     |                             | 4.89      | 34.8  | PIPE FLOW                          |
|                  | DS6                | 0.31  | 0.75 | 5.84          | 0.23 | 8.4 | 2.0  |              |       |     |       |             |      |             |         | 2.1         | 16.0 | 6S    | 1.7             | 12.7 | 0.4            | 3.3 | 14S                         | 1.71      | 12.7  | DIRECT/ INLET INTERCEPT            |
| 6S               | DP5.1S+ DS6        |       |      |               |      |     |      | 9.7          | 6.60  | 7.1 | 46.9  |             |      |             |         |             |      |       |                 |      |                |     |                             | 6.60      | 46.9  | PIPE FLOW                          |
| 7S               | DS7                | 1.84  | 0.75 | 10.93         | 1.38 | 6.8 | 9.4  |              |       |     |       |             |      |             |         | 1.4         | 9.4  | 7S    | 1.0             | 7.0  | 0.4            | 2.4 | 8S                          | 1.02      | 7.0   | DIRECT/ INLET INTERCEPT            |
|                  | DS8                | 2.71  | 0.75 | 11.41         | 2.04 | 6.7 | 13.6 |              |       |     |       |             |      |             |         | 2.4         | 16.0 | 8S    | 2.2             | 14.9 | 0.2            | 1.1 | 9S                          |           |       | DIRECT/ INLET INTERCEPT            |
| 8S               | DP7S+DS8           |       |      |               |      |     |      | 11.4         | 3.25  | 6.7 | 21.7  |             |      |             |         |             |      |       |                 |      |                |     |                             | 3.25      | 21.7  | PIPE FLOW                          |
|                  | DS9                | 2.48  | 0.67 | 11.36         | 1.67 | 6.7 | 11.2 |              |       |     |       |             |      |             |         | 1.8         | 12.3 | 9S    | 1.0             | 6.5  | 0.9            | 5.8 | 13S                         |           |       | DIRECT/ INLET INTERCEPT            |
| 9S               | DP8S+DS9           |       |      |               |      |     |      | 11.4         | 4.22  | 6.7 | 28.2  |             |      |             |         |             |      |       |                 |      |                |     |                             | 4.22      | 28.2  | PIPE FLOW                          |
|                  | DS10               | 2.26  | 0.75 | 9.50          | 1.69 | 7.2 | 12.2 |              |       |     |       |             |      |             |         | 1.7         | 12.2 | 10S   | 1.3             | 9.0  | 0.4            | 3.2 | 13S                         |           |       | DIRECT/ INLET INTERCEPT            |
| 10S              | DP9S+DS10          |       |      |               |      |     |      | 11.4         | 5.48  | 6.7 | 36.5  |             |      |             |         |             |      |       |                 |      |                |     |                             | 5.48      | 36.5  | PIPE FLOW                          |
| 11S              | DS11               | 3.04  | 0.73 | 11.32         | 2.21 | 6.7 | 14.8 |              |       |     |       |             |      |             |         | 2.2         | 14.8 | 11S   | 1.3             | 8.7  | 0.9            | 6.1 | 13S                         | 1.30      | 8.7   | DIRECT/ INLET INTERCEPT/ PIPE FLOW |
| 11.1S            | DP10S+DP11S        |       |      |               |      |     |      | 11.4         | 6.77  | 6.7 | 45.1  |             |      |             |         |             |      |       |                 |      |                |     |                             | 6.77      | 45.1  | PIPE FLOW                          |
| 12S              | DS12               | 1.43  | 0.75 | 8.76          | 1.07 | 7.4 | 7.9  |              |       |     |       |             |      |             |         | 1.1         | 7.9  | 12S   | 0.8             | 5.6  | 0.3            | 2.3 | 14S                         | 0.75      | 5.6   | DIRECT/ INLET INTERCEPT/ PIPE FLOW |
| 12.1S            | DP6S+DP11.1S+DP12S |       |      |               |      |     |      | 11.4         | 14.12 | 6.7 | 94.2  |             |      |             |         |             |      |       |                 |      |                |     |                             | 14.12     | 94.2  | PIPE FLOW                          |
| 13S              | DS13               | 0.76  | 0.75 | 7.52          | 0.57 | 7.8 | 4.4  |              |       |     |       |             |      |             |         | 2.8         | 19.6 | 13S   | 2.8             | 19.3 | 0.0            | 0.3 | NONE                        | 2.76      | 19.3  | DIRECT/ INLET INTERCEPT/ PIPE FLOW |
|                  | DS14               | 2.16  | 0.74 | 12.66         | 1.60 | 6.4 | 10.2 |              |       |     |       |             |      |             |         | 2.4         | 15.8 | 14S   | 2.4             | 15.8 |                |     | NONE                        |           |       | DIRECT/ INLET INTERCEPT            |
| 14S              | DP12.1S+DP13S+DS14 |       |      |               |      |     |      | 12.7         | 19.24 | 6.4 | 122.7 |             |      |             |         |             |      |       |                 |      |                |     |                             | 19.24     | 122.7 | PIPE FLOW                          |
| 20S              | DS20               | 2.34  | 0.74 | 11.44         | 1.73 | 6.7 | 11.5 |              |       |     |       |             |      |             |         | 1.7         | 11.5 | 20S   | 0.5             | 3.3  | 1.2            | 8.3 | 21S                         | 0.49      | 3.3   | DIRECT/ INLET INTERCEPT/ PIPE FLOW |
|                  | DS21               | 0.82  | 0.75 | 7.73          | 0.62 | 7.7 | 4.8  |              |       |     |       |             |      |             |         | 1.9         | 13.0 | 21S   | 1.9             | 13.0 |                |     | NONE                        |           |       | DIRECT/ INLET INTERCEPT            |
| 21S              | DP20S+DS21         |       |      |               |      |     |      | 11.4         | 2.35  | 6.7 | 15.6  |             |      |             |         |             |      |       |                 |      |                |     |                             | 2.35      | 15.6  | PIPE FLOW                          |
|                  | DS22               | 1.68  | 0.73 | 10.46         | 1.22 |     |      |              |       |     |       |             |      |             |         | 1.2         |      | 22S   | 1.2             |      |                |     | NONE                        |           |       | COMBINED                           |
| 22S              | DP21S+DS22         |       |      |               |      |     |      | 11.4         | 3.57  |     |       |             |      |             |         |             |      |       |                 |      |                |     |                             | 3.57      |       | PIPE FLOW                          |
| 1N               | DN1                | 12.00 | 0.50 | 14.78         | 6.05 | 5.9 | 36.0 |              |       |     |       |             |      |             |         | 6.1         | 36.0 | 1N    |                 |      |                |     |                             | 6.05      | 36.0  | DIRECT/ INLET INTERCEPT/ PIPE FLOW |
| 2N               | DN2                | 1.39  | 0.73 | 7.47          | 1.01 | 7.8 | 7.9  |              |       |     |       |             |      |             |         | 1.0         | 7.9  | 2N    | 0.4             | 3.5  | 0.6            | 4.5 | 3N                          | 0.44      | 3.5   | DIRECT/ INLET INTERCEPT/ PIPE FLOW |
|                  | DN3                | 1.19  | 0.73 | 7.96          | 0.87 | 7.7 | 6.6  |              |       |     |       |             |      |             |         | 1.4         | 10.1 | 3N    | 1.0             | 7.1  | 0.4            | 3.0 | NONE                        |           |       | DIRECT/ INLET INTERCEPT            |
| 3N               | DP2N+DN3           |       |      |               |      |     |      | 8.0          | 1.45  | 7.7 | 11.1  |             |      |             |         |             |      |       |                 |      |                |     |                             | 1.45      | 11.1  | PIPE FLOW                          |
|                  | DN4                | 0.10  | 0.73 | 5.00          | 0.07 | 8.8 | 0.6  |              |       |     |       |             |      |             |         | 0.1         | 0.6  | 4N    | 0.1             | 0.6  | 0.0            | 0.0 | NONE                        |           |       | DIRECT/ INLET INTERCEPT            |
| 4N               | DP3N+D4N           |       |      |               |      |     |      | 8.0          | 1.52  | 7.7 | 11.6  |             |      |             |         |             |      |       |                 |      |                |     |                             | 1.52      | 11.6  | PIPE FLOW                          |
| 5N               | DN5                | 3.25  | 0.71 | 13.00         | 2.30 | 6.3 | 14.5 |              |       |     |       |             |      |             |         | 2.3         | 14.5 | 5N    | 1.4             | 8.5  | 0.9            | 6.0 | 6N                          | 1.36      | 8.5   | DIRECT/ INLET INTERCEPT/ PIPE FLOW |
|                  | DN6                | 2.79  | 0.73 | 9.74          | 2.03 | 7.1 | 14.4 |              |       |     |       |             |      |             |         | 2.0         | 14.4 | 6N    | 1.7             | 11.8 | 0.4            | 2.6 | NONE                        |           |       | DIRECT/ INLET INTERCEPT            |
| 6N               | DP5N+DN6           |       |      |               |      |     |      | 13.0         | 3.02  | 6.3 | 19.0  |             |      |             |         |             |      |       |                 |      |                |     |                             | 3.02      | 19.0  | PIPE FLOW                          |
|                  | DN7                | 1.33  | 0.73 | 10.00         | 0.97 | 7.0 | 6.8  |              |       |     |       |             |      |             |         | 1.0         | 6.8  | 7N    | 0.6             | 4.3  | 0.4            | 2.5 | NONE                        |           |       | DIRECT/ INLET INTERCEPT            |
| 7N               | DP6N+DN7           |       |      |               |      |     |      | 13.0         | 3.63  | 6.3 | 22.9  |             |      |             |         |             |      |       |                 |      |                |     |                             | 3.63      | 22.9  | PIPE FLOW                          |
| 8N               | DN8                | 2.87  | 0.50 | 16.01         | 1.45 | 5.7 | 8.3  |              |       |     |       |             |      |             |         | 1.4         | 8.3  | 8N    |                 |      |                |     |                             | 1.45      | 8.3   | DIRECT/ INLET INTERCEPT/ PIPE FLOW |

**DRAINAGE REPORT**  
**for**  
**DAWSON TRAILS - TRACT O AND H**

**APPENDIX B**  
Hydraulic Computations

**INLET MANAGEMENT**

Worksheet Protected

| INLET NAME                         | DP 1S                     | DP 2S                     | DP 3S                     |
|------------------------------------|---------------------------|---------------------------|---------------------------|
| Site Type (Urban or Rural)         | URBAN                     | URBAN                     | URBAN                     |
| Inlet Application (Street or Area) | STREET                    | STREET                    | STREET                    |
| Hydraulic Condition                | On Grade                  | On Grade                  | On Grade                  |
| Inlet Type                         | Denver No. 16 Combination | Denver No. 16 Combination | Denver No. 16 Combination |

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

|                         |     |      |      |
|-------------------------|-----|------|------|
| Minor $Q_{Known}$ (cfs) | 2.2 | 4.3  | 5.9  |
| Major $Q_{Known}$ (cfs) | 5.3 | 10.5 | 11.5 |

**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 |
| Minor Bypass Flow Received, $Q_b$ (cfs) | 0.0                     | 0.0                     | 0.0                     |
| Major Bypass Flow Received, $Q_b$ (cfs) | 0.0                     | 0.0                     | 0.0                     |

**Watershed Characteristics**

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

**Watershed Profile**

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

**Minor Storm Rainfall Input**

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

**Major Storm Rainfall Input**

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

**CALCULATED OUTPUT**

|                                             |     |      |      |
|---------------------------------------------|-----|------|------|
| Minor Total Design Peak Flow, $Q$ (cfs)     | 2.2 | 4.3  | 5.9  |
| Major Total Design Peak Flow, $Q$ (cfs)     | 5.3 | 10.5 | 11.5 |
| Minor Flow Bypassed Downstream, $Q_b$ (cfs) | 0.5 | 1.0  | 1.7  |
| Major Flow Bypassed Downstream, $Q_b$ (cfs) | 2.4 | 4.4  | 5.0  |

1S

2S

3S

**INLET MANAGEMENT**

Worksheet Protected

| INLET NAME                         | DP 4S                     | DP 5S                     | DP 6S                     |
|------------------------------------|---------------------------|---------------------------|---------------------------|
| Site Type (Urban or Rural)         | URBAN                     | URBAN                     | URBAN                     |
| Inlet Application (Street or Area) | STREET                    | STREET                    | STREET                    |
| Hydraulic Condition                | On Grade                  | On Grade                  | On Grade                  |
| Inlet Type                         | Denver No. 16 Combination | Denver No. 16 Combination | Denver No. 16 Combination |

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

|                                |      |     |     |
|--------------------------------|------|-----|-----|
| Minor $Q_{\text{Known}}$ (cfs) | 4.6  | 3.9 | 0.8 |
| Major $Q_{\text{Known}}$ (cfs) | 10.6 | 9.4 | 2.0 |

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

|                                         |       |       |              |
|-----------------------------------------|-------|-------|--------------|
| Receive Bypass Flow from:               | DP 3S | DP 4S | User-Defined |
| Minor Bypass Flow Received, $Q_b$ (cfs) | 1.7   | 2.5   | 2.7          |
| Major Bypass Flow Received, $Q_b$ (cfs) | 5.0   | 8.9   | 13.9         |

**Watershed Characteristics**

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

**Watershed Profile**

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

**Minor Storm Rainfall Input**

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

**Major Storm Rainfall Input**

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

**CALCULATED OUTPUT**

|                                             |      |      |      |
|---------------------------------------------|------|------|------|
| Minor Total Design Peak Flow, $Q$ (cfs)     | 6.3  | 6.4  | 3.5  |
| Major Total Design Peak Flow, $Q$ (cfs)     | 15.6 | 18.3 | 15.9 |
| Minor Flow Bypassed Downstream, $Q_b$ (cfs) | 2.5  | 1.2  | 0.0  |
| Major Flow Bypassed Downstream, $Q_b$ (cfs) | 8.9  | 7.1  | 3.2  |

4S

5S

6S

**INLET MANAGEMENT**

Worksheet Protected

| INLET NAME                         | DP 7S                     | DP 8S                     | DP 9S                     |
|------------------------------------|---------------------------|---------------------------|---------------------------|
| Site Type (Urban or Rural)         | URBAN                     | URBAN                     | URBAN                     |
| Inlet Application (Street or Area) | STREET                    | STREET                    | STREET                    |
| Hydraulic Condition                | On Grade                  | On Grade                  | On Grade                  |
| Inlet Type                         | Denver No. 16 Combination | Denver No. 16 Combination | Denver No. 16 Combination |

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

|                                |     |      |      |
|--------------------------------|-----|------|------|
| Minor $Q_{\text{Known}}$ (cfs) | 4.0 | 5.8  | 3.9  |
| Major $Q_{\text{Known}}$ (cfs) | 9.4 | 13.6 | 11.2 |

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

|                                         |                         |       |       |
|-----------------------------------------|-------------------------|-------|-------|
| Receive Bypass Flow from:               | No Bypass Flow Received | DP 7S | DP 8S |
| Minor Bypass Flow Received, $Q_b$ (cfs) | 0.0                     | 0.4   | 0.0   |
| Major Bypass Flow Received, $Q_b$ (cfs) | 0.0                     | 2.4   | 1.1   |

**Watershed Characteristics**

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

**Watershed Profile**

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

**Minor Storm Rainfall Input**

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

**Major Storm Rainfall Input**

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

**CALCULATED OUTPUT**

|                                             |     |      |      |
|---------------------------------------------|-----|------|------|
| Minor Total Design Peak Flow, $Q$ (cfs)     | 4.0 | 6.2  | 3.9  |
| Major Total Design Peak Flow, $Q$ (cfs)     | 9.4 | 16.0 | 12.3 |
| Minor Flow Bypassed Downstream, $Q_b$ (cfs) | 0.4 | 0.0  | 0.9  |
| Major Flow Bypassed Downstream, $Q_b$ (cfs) | 2.4 | 1.1  | 5.8  |

7S

8S

9S

**INLET MANAGEMENT**

Worksheet Protected

| INLET NAME                         | DP 10S                    | DP 11S                    | DP 12S                    |
|------------------------------------|---------------------------|---------------------------|---------------------------|
| Site Type (Urban or Rural)         | URBAN                     | URBAN                     | URBAN                     |
| Inlet Application (Street or Area) | STREET                    | STREET                    | STREET                    |
| Hydraulic Condition                | On Grade                  | On Grade                  | On Grade                  |
| Inlet Type                         | Denver No. 16 Combination | Denver No. 16 Combination | Denver No. 16 Combination |

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

|                                |      |      |     |
|--------------------------------|------|------|-----|
| Minor $Q_{\text{Known}}$ (cfs) | 4.5  | 6.0  | 3.3 |
| Major $Q_{\text{Known}}$ (cfs) | 11.2 | 14.8 | 7.9 |

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

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

**Watershed Characteristics**

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

**Watershed Profile**

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

**Minor Storm Rainfall Input**

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

**Major Storm Rainfall Input**

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

**CALCULATED OUTPUT**

|                                             |      |      |     |
|---------------------------------------------|------|------|-----|
| Minor Total Design Peak Flow, $Q$ (cfs)     | 4.5  | 6.0  | 3.3 |
| Major Total Design Peak Flow, $Q$ (cfs)     | 11.2 | 14.8 | 7.9 |
| Minor Flow Bypassed Downstream, $Q_b$ (cfs) | 0.4  | 1.5  | 0.4 |
| Major Flow Bypassed Downstream, $Q_b$ (cfs) | 2.9  | 6.1  | 2.3 |

10S

11S

12S

**INLET MANAGEMENT**

Worksheet Protected

| INLET NAME                         | DP 13S                    | DP 14S                    | DP 20S                    |
|------------------------------------|---------------------------|---------------------------|---------------------------|
| Site Type (Urban or Rural)         | URBAN                     | URBAN                     | URBAN                     |
| Inlet Application (Street or Area) | STREET                    | STREET                    | STREET                    |
| Hydraulic Condition                | On Grade                  | On Grade                  | On Grade                  |
| Inlet Type                         | Denver No. 16 Combination | Denver No. 16 Combination | Denver No. 16 Combination |

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

|                                |     |      |      |
|--------------------------------|-----|------|------|
| Minor $Q_{\text{Known}}$ (cfs) | 1.8 | 4.2  | 4.7  |
| Major $Q_{\text{Known}}$ (cfs) | 4.5 | 10.2 | 11.5 |

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

|                                         |              |              |                         |
|-----------------------------------------|--------------|--------------|-------------------------|
| Receive Bypass Flow from:               | User-Defined | User-Defined | No Bypass Flow Received |
| Minor Bypass Flow Received, $Q_b$ (cfs) | 2.8          | 0.4          | 0.0                     |
| Major Bypass Flow Received, $Q_b$ (cfs) | 14.9         | 5.6          | 0.0                     |

**Watershed Characteristics**

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

**Watershed Profile**

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

**Minor Storm Rainfall Input**

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

**Major Storm Rainfall Input**

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

**CALCULATED OUTPUT**

|                                             |      |      |      |
|---------------------------------------------|------|------|------|
| Minor Total Design Peak Flow, $Q$ (cfs)     | 4.6  | 4.6  | 4.7  |
| Major Total Design Peak Flow, $Q$ (cfs)     | 19.4 | 15.8 | 11.5 |
| Minor Flow Bypassed Downstream, $Q_b$ (cfs) | 0.0  | 0.0  | 2.5  |
| Major Flow Bypassed Downstream, $Q_b$ (cfs) | 0.3  | 0.0  | 8.2  |

13S

14S

20S

**INLET MANAGEMENT**

Worksheet Protected

| INLET NAME                         | DP 21S                    | DP 22S                    | DP 2N                     |
|------------------------------------|---------------------------|---------------------------|---------------------------|
| Site Type (Urban or Rural)         | URBAN                     | URBAN                     | URBAN                     |
| Inlet Application (Street or Area) | STREET                    | STREET                    | STREET                    |
| Hydraulic Condition                | In Sump                   | In Sump                   | On Grade                  |
| Inlet Type                         | Denver No. 16 Combination | Denver No. 16 Combination | Denver No. 16 Combination |

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

|                                |     |     |     |
|--------------------------------|-----|-----|-----|
| Minor $Q_{\text{Known}}$ (cfs) | 2.0 | 3.4 | 3.2 |
| Major $Q_{\text{Known}}$ (cfs) | 4.8 | 8.5 | 7.9 |

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

|                                         |        |                         |                         |
|-----------------------------------------|--------|-------------------------|-------------------------|
| Receive Bypass Flow from:               | DP 20S | No Bypass Flow Received | No Bypass Flow Received |
| Minor Bypass Flow Received, $Q_b$ (cfs) | 2.5    | 0.0                     | 0.0                     |
| Major Bypass Flow Received, $Q_b$ (cfs) | 8.2    | 0.0                     | 0.0                     |

**Watershed Characteristics**

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

**Watershed Profile**

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

**Minor Storm Rainfall Input**

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

**Major Storm Rainfall Input**

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

**CALCULATED OUTPUT**

|                                             |      |     |     |
|---------------------------------------------|------|-----|-----|
| Minor Total Design Peak Flow, $Q$ (cfs)     | 4.5  | 3.4 | 3.2 |
| Major Total Design Peak Flow, $Q$ (cfs)     | 13.0 | 8.5 | 7.9 |
| Minor Flow Bypassed Downstream, $Q_b$ (cfs) | N/A  | N/A | 1.1 |
| Major Flow Bypassed Downstream, $Q_b$ (cfs) | N/A  | N/A | 4.4 |

21S

22S

2N

**INLET MANAGEMENT**

Worksheet Protected

| INLET NAME                         | DP 3N                     | DP 4N                     | DP 5N                     |
|------------------------------------|---------------------------|---------------------------|---------------------------|
| Site Type (Urban or Rural)         | URBAN                     | URBAN                     | URBAN                     |
| Inlet Application (Street or Area) | STREET                    | STREET                    | STREET                    |
| Hydraulic Condition                | On Grade                  | On Grade                  | On Grade                  |
| Inlet Type                         | Denver No. 16 Combination | Denver No. 16 Combination | Denver No. 16 Combination |

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

|                                |     |     |      |
|--------------------------------|-----|-----|------|
| Minor $Q_{\text{Known}}$ (cfs) | 2.7 | 0.3 | 5.6  |
| Major $Q_{\text{Known}}$ (cfs) | 6.6 | 0.6 | 14.5 |

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

|                                         |       |                         |                         |
|-----------------------------------------|-------|-------------------------|-------------------------|
| Receive Bypass Flow from:               | DP 2N | No Bypass Flow Received | No Bypass Flow Received |
| Minor Bypass Flow Received, $Q_b$ (cfs) | 1.1   | 0.0                     | 0.0                     |
| Major Bypass Flow Received, $Q_b$ (cfs) | 4.4   | 0.0                     | 0.0                     |

**Watershed Characteristics**

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

**Watershed Profile**

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

**Minor Storm Rainfall Input**

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

**Major Storm Rainfall Input**

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

**CALCULATED OUTPUT**

|                                             |      |     |      |
|---------------------------------------------|------|-----|------|
| Minor Total Design Peak Flow, $Q$ (cfs)     | 3.8  | 0.3 | 5.6  |
| Major Total Design Peak Flow, $Q$ (cfs)     | 11.0 | 0.6 | 14.5 |
| Minor Flow Bypassed Downstream, $Q_b$ (cfs) | 0.4  | 0.0 | 1.3  |
| Major Flow Bypassed Downstream, $Q_b$ (cfs) | 3.3  | 0.0 | 6.0  |

3N

4N

5N

**INLET MANAGEMENT**

Worksheet Protected

| INLET NAME                         | DP 6N                     | DP 7N                     |
|------------------------------------|---------------------------|---------------------------|
| Site Type (Urban or Rural)         | URBAN                     | URBAN                     |
| Inlet Application (Street or Area) | STREET                    | STREET                    |
| Hydraulic Condition                | On Grade                  | On Grade                  |
| Inlet Type                         | Denver No. 16 Combination | Denver No. 16 Combination |

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

|                                |      |     |
|--------------------------------|------|-----|
| Minor $Q_{\text{Known}}$ (cfs) | 5.9  | 2.8 |
| Major $Q_{\text{Known}}$ (cfs) | 14.4 | 6.8 |

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

|                                         |       |                         |
|-----------------------------------------|-------|-------------------------|
| Receive Bypass Flow from:               | DP 5N | No Bypass Flow Received |
| Minor Bypass Flow Received, $Q_b$ (cfs) | 1.3   | 0.0                     |
| Major Bypass Flow Received, $Q_b$ (cfs) | 6.0   | 0.0                     |

**Watershed Characteristics**

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

**Watershed Profile**

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

**Minor Storm Rainfall Input**

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

**Major Storm Rainfall Input**

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

**CALCULATED OUTPUT**

|                                             |      |     |
|---------------------------------------------|------|-----|
| Minor Total Design Peak Flow, $Q$ (cfs)     | 7.2  | 2.8 |
| Major Total Design Peak Flow, $Q$ (cfs)     | 20.4 | 6.8 |
| Minor Flow Bypassed Downstream, $Q_b$ (cfs) | 0.1  | 0.5 |
| Major Flow Bypassed Downstream, $Q_b$ (cfs) | 3.7  | 2.5 |

6N

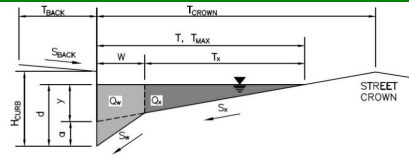
7N

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

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

Project: Dawson Trails Tract O and H (FKA Parcel D)

Inlet ID: DP 15

**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 |
| $n_{BACK}$ | = | 0.016 |       |

|              |   |       |        |
|--------------|---|-------|--------|
| $H_{CURB}$   | = | 4.00  | inches |
| $T_{CROWN}$  | = | 16.0  | ft     |
| $W$          | = | 2.00  | ft     |
| $S_X$        | = | 0.020 | ft/ft  |
| $S_W$        | = | 0.083 | ft/ft  |
| $S_O$        | = | 0.036 | ft/ft  |
| $n_{STREET}$ | = | 0.016 |        |

Max. Allowable Spread for Minor &amp; Major Storm

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

Allow Flow Depth at Street Crown (check box for yes, leave blank for no)

|           |             |                          |                                     |        |
|-----------|-------------|--------------------------|-------------------------------------|--------|
|           | Minor Storm | Major Storm              |                                     |        |
| $T_{MAX}$ | =           | 16.0                     | 16.0                                | ft     |
| $d_{MAX}$ | =           | 4.0                      | 12.0                                | inches |
|           |             | <input type="checkbox"/> | <input checked="" type="checkbox"/> |        |

MINOR STORM Allowable Capacity is based on Depth Criterion

MAJOR STORM Allowable Capacity is based on Depth Criterion

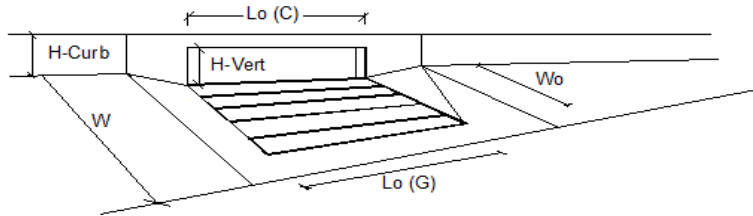
|             |             |             |      |     |
|-------------|-------------|-------------|------|-----|
|             | Minor Storm | Major Storm |      |     |
| $Q_{allow}$ | =           | 6.4         | 86.8 | cfs |

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 2.20 cfs on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design peak flow of 5.30 cfs on sheet 'Inlet Management'

# INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)



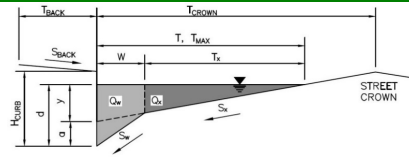
| Design Information (Input)                                                |                           | MINOR                |                           | MAJOR      |
|---------------------------------------------------------------------------|---------------------------|----------------------|---------------------------|------------|
| Type of Inlet                                                             | Denver No. 16 Combination | Type =               | Denver No. 16 Combination |            |
| Local Depression (additional to continuous gutter depression 'a')         |                           | a <sub>LOCAL</sub> = | 2.0                       | 2.0 inches |
| Total Number of Units in the Inlet (Grate or Curb Opening)                |                           | No =                 | 2                         | 2          |
| Length of a Single Unit Inlet (Grate or Curb Opening)                     |                           | L <sub>o</sub> =     | 3.00                      | 3.00 ft    |
| Width of a Unit Grate (cannot be greater than W, Gutter Width)            |                           | W <sub>o</sub> =     | 1.73                      | 1.73 ft    |
| Clogging Factor for a Single Unit Grate (typical min. value = 0.5)        |                           | C <sub>f</sub> (G) = | 0.50                      | 0.50       |
| Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1) |                           | C <sub>f</sub> (C) = | 0.10                      | 0.10       |
| Street Hydraulics: OK - Q < Allowable Street Capacity                     |                           |                      | MINOR                     | MAJOR      |
| Total Inlet Interception Capacity                                         |                           | Q =                  | 1.7                       | 2.9 cfs    |
| Total Inlet Carry-Over Flow (flow bypassing inlet)                        |                           | Q <sub>s</sub> =     | 0.5                       | 2.4 cfs    |
| Capture Percentage = Q <sub>i</sub> /Q <sub>a</sub>                       |                           | C% =                 | 76                        | 55 %       |

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

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

Project: Dawson Trails Tract O and H (FKA Parcel D)

Inlet ID: DP 25

**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 |
| $n_{BACK}$ | = | 0.016 |       |

|              |   |       |        |
|--------------|---|-------|--------|
| $H_{CURB}$   | = | 4.00  | inches |
| $T_{CROWN}$  | = | 16.0  | ft     |
| $W$          | = | 2.00  | ft     |
| $S_x$        | = | 0.020 | ft/ft  |
| $S_y$        | = | 0.083 | ft/ft  |
| $S_o$        | = | 0.030 | ft/ft  |
| $n_{STREET}$ | = | 0.016 |        |

Max. Allowable Spread for Minor &amp; Major Storm

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

Allow Flow Depth at Street Crown (check box for yes, leave blank for no)

|           |             |                          |                                     |        |
|-----------|-------------|--------------------------|-------------------------------------|--------|
|           | Minor Storm | Major Storm              |                                     |        |
| $T_{MAX}$ | =           | 16.0                     | 16.0                                | ft     |
| $d_{MAX}$ | =           | 4.0                      | 12.0                                | inches |
|           |             | <input type="checkbox"/> | <input checked="" type="checkbox"/> |        |

MINOR STORM Allowable Capacity is based on Depth Criterion

MAJOR STORM Allowable Capacity is based on Depth Criterion

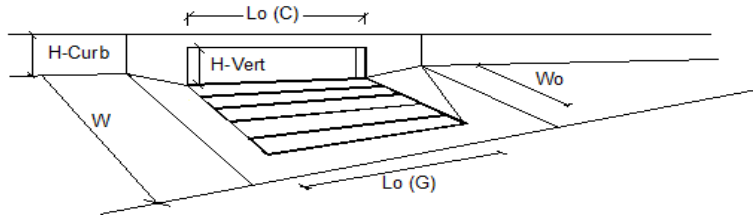
|             |             |             |      |     |
|-------------|-------------|-------------|------|-----|
|             | Minor Storm | Major Storm |      |     |
| $Q_{allow}$ | =           | 5.9         | 91.7 | cfs |

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 4.30 cfs on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design peak flow of 10.50 cfs on sheet 'Inlet Management'

# INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)



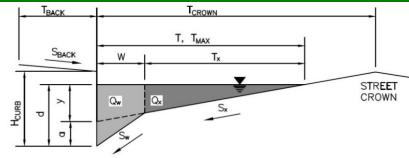
| Design Information (Input)                                                |                           | MINOR                |                           | MAJOR      |
|---------------------------------------------------------------------------|---------------------------|----------------------|---------------------------|------------|
| Type of Inlet                                                             | Denver No. 16 Combination | Type =               | Denver No. 16 Combination |            |
| Local Depression (additional to continuous gutter depression 'a')         |                           | a <sub>LOCAL</sub> = | 2.0                       | 2.0 inches |
| Total Number of Units in the Inlet (Grate or Curb Opening)                |                           | No =                 | 3                         | 3          |
| Length of a Single Unit Inlet (Grate or Curb Opening)                     |                           | L <sub>u</sub> =     | 3.00                      | 3.00 ft    |
| Width of a Unit Grate (cannot be greater than W, Gutter Width)            |                           | W <sub>u</sub> =     | 1.73                      | 1.73 ft    |
| Clogging Factor for a Single Unit Grate (typical min. value = 0.5)        |                           | C <sub>f</sub> (G) = | 0.50                      | 0.50       |
| Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1) |                           | C <sub>f</sub> (C) = | 0.10                      | 0.10       |
| Street Hydraulics: OK - Q < Allowable Street Capacity                     |                           |                      |                           |            |
| Total Inlet Interception Capacity                                         |                           | Q =                  | 3.3                       | 6.1 cfs    |
| Total Inlet Carry-Over Flow (flow bypassing inlet)                        |                           | Q <sub>s</sub> =     | 1.0                       | 4.4 cfs    |
| Capture Percentage = Q <sub>i</sub> /Q <sub>a</sub>                       |                           | C% =                 | 77                        | 58 %       |

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

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

Project: Dawson Trails Tract O and H (FKA Parcel D)

Inlet ID: DP 35

**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 |
| $n_{BACK}$ | = | 0.016 |       |

|              |   |       |        |
|--------------|---|-------|--------|
| $H_{CURB}$   | = | 4.00  | inches |
| $T_{CROWN}$  | = | 16.0  | ft     |
| $W$          | = | 2.00  | ft     |
| $S_X$        | = | 0.020 | ft/ft  |
| $S_W$        | = | 0.083 | ft/ft  |
| $S_O$        | = | 0.030 | ft/ft  |
| $n_{STREET}$ | = | 0.016 |        |

Max. Allowable Spread for Minor &amp; Major Storm

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

Allow Flow Depth at Street Crown (check box for yes, leave blank for no)

|           | Minor Storm | Major Storm              |                                     |        |
|-----------|-------------|--------------------------|-------------------------------------|--------|
| $T_{MAX}$ | =           | 16.0                     | 16.0                                | ft     |
| $d_{MAX}$ | =           | 4.0                      | 12.0                                | inches |
|           |             | <input type="checkbox"/> | <input checked="" type="checkbox"/> |        |

MINOR STORM Allowable Capacity is based on Depth Criterion

MAJOR STORM Allowable Capacity is based on Depth Criterion

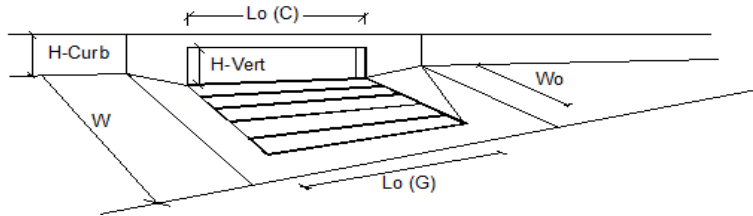
|             | Minor Storm | Major Storm |      |     |
|-------------|-------------|-------------|------|-----|
| $Q_{allow}$ | =           | 5.9         | 91.7 | cfs |

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 5.85 cfs on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design peak flow of 11.50 cfs on sheet 'Inlet Management'

# INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)



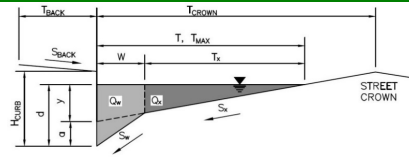
| Design Information (Input)                                                |                           | MINOR         |                           | MAJOR      |
|---------------------------------------------------------------------------|---------------------------|---------------|---------------------------|------------|
| Type of Inlet                                                             | Denver No. 16 Combination | Type =        | Denver No. 16 Combination |            |
| Local Depression (additional to continuous gutter depression 'a')         |                           | $a_{LOCAL}$ = | 2.0                       | 2.0 inches |
| Total Number of Units in the Inlet (Grate or Curb Opening)                |                           | $N_o$ =       | 3                         | 3          |
| Length of a Single Unit Inlet (Grate or Curb Opening)                     |                           | $L_o$ =       | 3.00                      | 3.00 ft    |
| Width of a Unit Grate (cannot be greater than W, Gutter Width)            |                           | $W_o$ =       | 1.73                      | 1.73 ft    |
| Clogging Factor for a Single Unit Grate (typical min. value = 0.5)        |                           | $C_f (G)$ =   | 0.50                      | 0.50       |
| Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1) |                           | $C_f (C)$ =   | 0.10                      | 0.10       |
| Street Hydraulics: OK - $Q < \text{Allowable Street Capacity}$            |                           |               | MINOR                     | MAJOR      |
| Total Inlet Interception Capacity                                         |                           | $Q$ =         | 4.1                       | 6.5 cfs    |
| Total Inlet Carry-Over Flow (flow bypassing inlet)                        |                           | $Q_s$ =       | 1.7                       | 5.0 cfs    |
| Capture Percentage = $Q_i/Q_o$                                            |                           | $C\%$ =       | 71                        | 57 %       |

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

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

Project: Dawson Trails Tract O and H (FKA Parcel D)

Inlet ID: DP 4S

**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 |
| $n_{BACK}$ | = | 0.016 |       |

|              |   |       |        |
|--------------|---|-------|--------|
| $H_{CURB}$   | = | 4.00  | inches |
| $T_{CROWN}$  | = | 16.0  | ft     |
| $W$          | = | 2.00  | ft     |
| $S_X$        | = | 0.020 | ft/ft  |
| $S_W$        | = | 0.083 | ft/ft  |
| $S_O$        | = | 0.050 | ft/ft  |
| $n_{STREET}$ | = | 0.016 |        |

Max. Allowable Spread for Minor &amp; Major Storm

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

Allow Flow Depth at Street Crown (check box for yes, leave blank for no)

|           | Minor Storm              | Major Storm                         |        |
|-----------|--------------------------|-------------------------------------|--------|
| $T_{MAX}$ | 16.0                     | 16.0                                | ft     |
| $d_{MAX}$ | 4.0                      | 12.0                                | inches |
|           | <input type="checkbox"/> | <input checked="" type="checkbox"/> |        |

MINOR STORM Allowable Capacity is based on Depth Criterion

MAJOR STORM Allowable Capacity is based on Depth Criterion

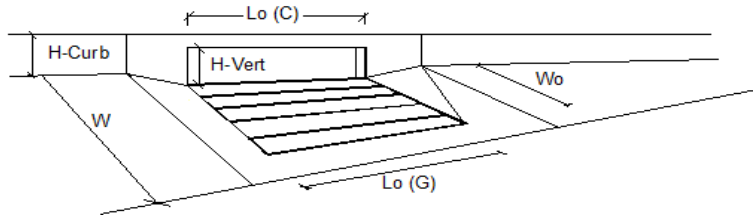
|             | Minor Storm | Major Storm |     |
|-------------|-------------|-------------|-----|
| $Q_{allow}$ | 7.6         | 78.7        | cfs |

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 6.32 cfs on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design peak flow of 15.59 cfs on sheet 'Inlet Management'

# INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)



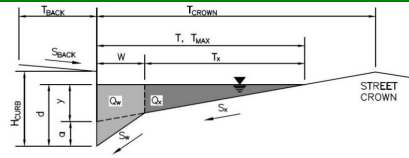
| Design Information (Input)                                                |                           | MINOR                |                           | MAJOR      |
|---------------------------------------------------------------------------|---------------------------|----------------------|---------------------------|------------|
| Type of Inlet                                                             | Denver No. 16 Combination | Type =               | Denver No. 16 Combination |            |
| Local Depression (additional to continuous gutter depression 'a')         |                           | a <sub>LOCAL</sub> = | 2.0                       | 2.0 inches |
| Total Number of Units in the Inlet (Grate or Curb Opening)                |                           | No =                 | 3                         | 3          |
| Length of a Single Unit Inlet (Grate or Curb Opening)                     |                           | L <sub>o</sub> =     | 3.00                      | 3.00 ft    |
| Width of a Unit Grate (cannot be greater than W, Gutter Width)            |                           | W <sub>o</sub> =     | 1.73                      | 1.73 ft    |
| Clogging Factor for a Single Unit Grate (typical min. value = 0.5)        |                           | C <sub>f</sub> (G) = | 0.50                      | 0.50       |
| Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1) |                           | C <sub>f</sub> (C) = | 0.10                      | 0.10       |
| Street Hydraulics: OK - Q < Allowable Street Capacity                     |                           |                      | MINOR                     | MAJOR      |
| Total Inlet Interception Capacity                                         |                           | Q =                  | 3.9                       | 6.7 cfs    |
| Total Inlet Carry-Over Flow (flow bypassing inlet)                        |                           | Q <sub>s</sub> =     | 2.5                       | 8.9 cfs    |
| Capture Percentage = Q <sub>i</sub> /Q <sub>a</sub>                       |                           | C% =                 | 61                        | 43 %       |

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

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

Project: Dawson Trails Tract O and H (FKA Parcel D)

Inlet ID: DP 55

**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 |
| $n_{BACK}$ | = | 0.016 |       |

|              |   |       |        |
|--------------|---|-------|--------|
| $H_{CURB}$   | = | 4.00  | inches |
| $T_{CROWN}$  | = | 16.0  | ft     |
| $W$          | = | 2.00  | ft     |
| $S_X$        | = | 0.020 | ft/ft  |
| $S_W$        | = | 0.083 | ft/ft  |
| $S_O$        | = | 0.036 | ft/ft  |
| $n_{STREET}$ | = | 0.016 |        |

Max. Allowable Spread for Minor &amp; Major Storm

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

Allow Flow Depth at Street Crown (check box for yes, leave blank for no)

|           | Minor Storm              | Major Storm                         |        |
|-----------|--------------------------|-------------------------------------|--------|
| $T_{MAX}$ | =                        | 16.0                                | ft     |
| $d_{MAX}$ | =                        | 4.0                                 | inches |
|           | <input type="checkbox"/> | <input checked="" type="checkbox"/> |        |

MINOR STORM Allowable Capacity is based on Depth Criterion

MAJOR STORM Allowable Capacity is based on Depth Criterion

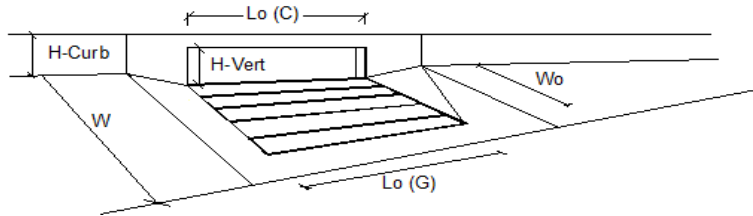
|             | Minor Storm | Major Storm |     |
|-------------|-------------|-------------|-----|
| $Q_{allow}$ | =           | 6.4         | cfs |
|             |             | 86.8        |     |

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 6.36 cfs on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design peak flow of 18.33 cfs on sheet 'Inlet Management'

# INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)



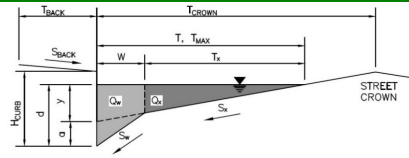
| Design Information (Input)                                                |                           | MINOR                |                           | MAJOR |        |
|---------------------------------------------------------------------------|---------------------------|----------------------|---------------------------|-------|--------|
| Type of Inlet                                                             | Denver No. 16 Combination | Type =               | Denver No. 16 Combination |       |        |
| Local Depression (additional to continuous gutter depression 'a')         |                           | a <sub>LOCAL</sub> = | 2.0                       | 2.0   | inches |
| Total Number of Units in the Inlet (Grate or Curb Opening)                |                           | No =                 | 4                         | 4     |        |
| Length of a Single Unit Inlet (Grate or Curb Opening)                     |                           | L <sub>u</sub> =     | 3.00                      | 3.00  | ft     |
| Width of a Unit Grate (cannot be greater than W, Gutter Width)            |                           | W <sub>u</sub> =     | 1.73                      | 1.73  | ft     |
| Clogging Factor for a Single Unit Grate (typical min. value = 0.5)        |                           | C <sub>f</sub> (G) = | 0.50                      | 0.50  |        |
| Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1) |                           | C <sub>f</sub> (C) = | 0.10                      | 0.10  |        |
| Street Hydraulics: OK - Q < Allowable Street Capacity                     |                           |                      |                           |       |        |
| Total Inlet Interception Capacity                                         |                           | Q =                  | 5.1                       | 11.2  | cfs    |
| Total Inlet Carry-Over Flow (flow bypassing inlet)                        |                           | Q <sub>s</sub> =     | 1.2                       | 7.1   | cfs    |
| Capture Percentage = Q <sub>i</sub> /Q <sub>a</sub>                       |                           | C% =                 | 81                        | 61    | %      |

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

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

Project: Dawson Trails Tract O and H (FKA Parcel D)

Inlet ID: DP 6S

**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 |
| $n_{BACK}$ | = | 0.016 |       |

|              |   |       |        |
|--------------|---|-------|--------|
| $H_{CURB}$   | = | 4.00  | inches |
| $T_{CROWN}$  | = | 16.0  | ft     |
| $W$          | = | 2.00  | ft     |
| $S_x$        | = | 0.020 | ft/ft  |
| $S_y$        | = | 0.083 | ft/ft  |
| $S_o$        | = | 0.015 | ft/ft  |
| $n_{STREET}$ | = | 0.016 |        |

Max. Allowable Spread for Minor &amp; Major Storm

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

Allow Flow Depth at Street Crown (check box for yes, leave blank for no)

|           | Minor Storm              | Major Storm                         |        |
|-----------|--------------------------|-------------------------------------|--------|
| $T_{MAX}$ | =                        | 16.0                                | ft     |
| $d_{MAX}$ | =                        | 4.0                                 | inches |
|           | <input type="checkbox"/> | <input checked="" type="checkbox"/> |        |

MINOR STORM Allowable Capacity is based on Depth Criterion

MAJOR STORM Allowable Capacity is based on Depth Criterion

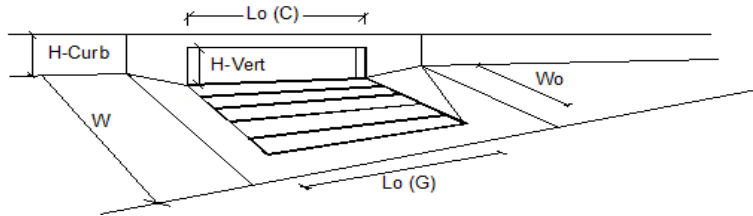
|             | Minor Storm | Major Storm |     |
|-------------|-------------|-------------|-----|
| $Q_{allow}$ | =           | 4.1         | cfs |
|             |             | 107.5       |     |

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 3.52 cfs on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design peak flow of 15.85 cfs on sheet 'Inlet Management'

# INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)



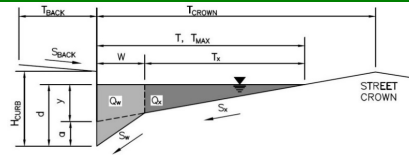
| Design Information (Input)                                                |                           | MINOR                |                           | MAJOR      |
|---------------------------------------------------------------------------|---------------------------|----------------------|---------------------------|------------|
| Type of Inlet                                                             | Denver No. 16 Combination | Type =               | Denver No. 16 Combination |            |
| Local Depression (additional to continuous gutter depression 'a')         |                           | a <sub>LOCAL</sub> = | 2.0                       | 2.0 inches |
| Total Number of Units in the Inlet (Grate or Curb Opening)                |                           | No =                 | 4                         | 4          |
| Length of a Single Unit Inlet (Grate or Curb Opening)                     |                           | L <sub>o</sub> =     | 3.00                      | 3.00 ft    |
| Width of a Unit Grate (cannot be greater than W, Gutter Width)            |                           | W <sub>o</sub> =     | 1.73                      | 1.73 ft    |
| Clogging Factor for a Single Unit Grate (typical min. value = 0.5)        |                           | C <sub>f</sub> (G) = | 0.50                      | 0.50       |
| Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1) |                           | C <sub>f</sub> (C) = | 0.10                      | 0.10       |
| Street Hydraulics: OK - Q < Allowable Street Capacity                     |                           |                      | MINOR                     | MAJOR      |
| Total Inlet Interception Capacity                                         |                           | Q =                  | 3.5                       | 12.6 cfs   |
| Total Inlet Carry-Over Flow (flow bypassing inlet)                        |                           | Q <sub>s</sub> =     | 0.0                       | 3.2 cfs    |
| Capture Percentage = Q <sub>i</sub> /Q <sub>a</sub>                       |                           | C% =                 | 100                       | 80 %       |

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

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

Project: Dawson Trails Tract O and H (FKA Parcel D)

Inlet ID: DP 75

**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 |
| $n_{BACK}$ | = | 0.016 |       |

|              |   |       |        |
|--------------|---|-------|--------|
| $H_{CURB}$   | = | 4.00  | inches |
| $T_{CROWN}$  | = | 16.0  | ft     |
| $W$          | = | 2.00  | ft     |
| $S_X$        | = | 0.020 | ft/ft  |
| $S_W$        | = | 0.083 | ft/ft  |
| $S_O$        | = | 0.035 | ft/ft  |
| $n_{STREET}$ | = | 0.016 |        |

Max. Allowable Spread for Minor &amp; Major Storm

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

Allow Flow Depth at Street Crown (check box for yes, leave blank for no)

|           |                          |                                     |      |        |
|-----------|--------------------------|-------------------------------------|------|--------|
|           | Minor Storm              | Major Storm                         |      |        |
| $T_{MAX}$ | =                        | 16.0                                | 16.0 | ft     |
| $d_{MAX}$ | =                        | 4.0                                 | 12.0 | inches |
|           | <input type="checkbox"/> | <input checked="" type="checkbox"/> |      |        |

MINOR STORM Allowable Capacity is based on Depth Criterion

MAJOR STORM Allowable Capacity is based on Depth Criterion

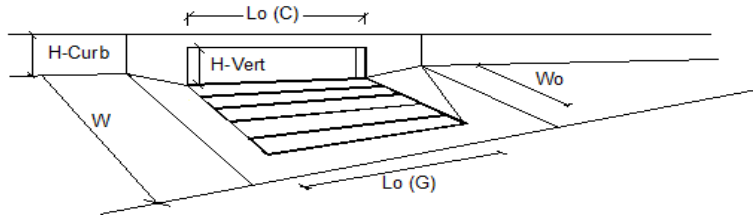
|             |             |             |      |     |
|-------------|-------------|-------------|------|-----|
|             | Minor Storm | Major Storm |      |     |
| $Q_{allow}$ | =           | 6.3         | 87.6 | cfs |

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 4.00 cfs on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design peak flow of 9.40 cfs on sheet 'Inlet Management'

# INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)



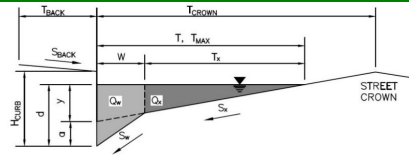
| Design Information (Input)                                                |                           | MINOR                |                           | MAJOR      |
|---------------------------------------------------------------------------|---------------------------|----------------------|---------------------------|------------|
| Type of Inlet                                                             | Denver No. 16 Combination | Type =               | Denver No. 16 Combination |            |
| Local Depression (additional to continuous gutter depression 'a')         |                           | a <sub>LOCAL</sub> = | 2.0                       | 2.0 inches |
| Total Number of Units in the Inlet (Grate or Curb Opening)                |                           | No =                 | 4                         | 4          |
| Length of a Single Unit Inlet (Grate or Curb Opening)                     |                           | L <sub>o</sub> =     | 3.00                      | 3.00 ft    |
| Width of a Unit Grate (cannot be greater than W, Gutter Width)            |                           | W <sub>o</sub> =     | 1.73                      | 1.73 ft    |
| Clogging Factor for a Single Unit Grate (typical min. value = 0.5)        |                           | C <sub>f</sub> (G) = | 0.50                      | 0.50       |
| Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1) |                           | C <sub>f</sub> (C) = | 0.10                      | 0.10       |
| Street Hydraulics: OK - Q < Allowable Street Capacity                     |                           |                      | MINOR                     | MAJOR      |
| Total Inlet Interception Capacity                                         |                           | Q =                  | 3.6                       | 7.0 cfs    |
| Total Inlet Carry-Over Flow (flow bypassing inlet)                        |                           | Q <sub>s</sub> =     | 0.4                       | 2.4 cfs    |
| Capture Percentage = Q <sub>i</sub> /Q <sub>a</sub>                       |                           | C% =                 | 90                        | 74 %       |

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

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

Project: Dawson Trails Tract O and H (FKA Parcel D)

Inlet ID: DP 85

**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 |
| $n_{BACK}$ | = | 0.016 |       |

|              |   |       |        |
|--------------|---|-------|--------|
| $H_{CURB}$   | = | 4.00  | inches |
| $T_{CROWN}$  | = | 16.0  | ft     |
| $W$          | = | 2.00  | ft     |
| $S_x$        | = | 0.020 | ft/ft  |
| $S_w$        | = | 0.083 | ft/ft  |
| $S_o$        | = | 0.035 | ft/ft  |
| $n_{STREET}$ | = | 0.016 |        |

Max. Allowable Spread for Minor &amp; Major Storm

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

Allow Flow Depth at Street Crown (check box for yes, leave blank for no)

|           | Minor Storm              | Major Storm              |        |
|-----------|--------------------------|--------------------------|--------|
| $T_{MAX}$ | 16.0                     | 16.0                     | ft     |
| $d_{MAX}$ | 4.0                      | 12.0                     | inches |
|           | <input type="checkbox"/> | <input type="checkbox"/> |        |

MINOR STORM Allowable Capacity is based on Depth Criterion

MAJOR STORM Allowable Capacity is based on Spread Criterion

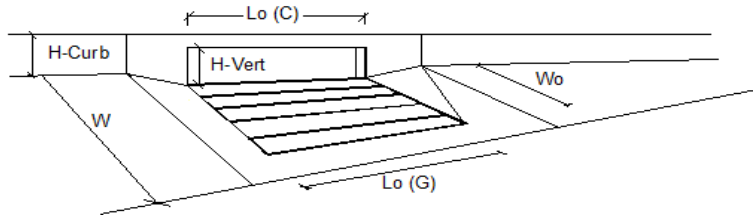
|             | Minor Storm | Major Storm |     |
|-------------|-------------|-------------|-----|
| $Q_{allow}$ | 6.3         | 17.5        | cfs |

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 6.21 cfs on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design peak flow of 16.03 cfs on sheet 'Inlet Management'

# INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)



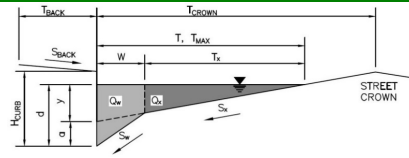
| Design Information (Input)                                                |                           | MINOR                |                           | MAJOR      |
|---------------------------------------------------------------------------|---------------------------|----------------------|---------------------------|------------|
| Type of Inlet                                                             | Denver No. 16 Combination | Type =               | Denver No. 16 Combination |            |
| Local Depression (additional to continuous gutter depression 'a')         |                           | a <sub>LOCAL</sub> = | 2.0                       | 2.0 inches |
| Total Number of Units in the Inlet (Grate or Curb Opening)                |                           | No =                 | 6                         | 6          |
| Length of a Single Unit Inlet (Grate or Curb Opening)                     |                           | L <sub>o</sub> =     | 3.00                      | 3.00 ft    |
| Width of a Unit Grate (cannot be greater than W, Gutter Width)            |                           | W <sub>o</sub> =     | 1.73                      | 1.73 ft    |
| Clogging Factor for a Single Unit Grate (typical min. value = 0.5)        |                           | C <sub>f</sub> (G) = | 0.50                      | 0.50       |
| Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1) |                           | C <sub>f</sub> (C) = | 0.10                      | 0.10       |
| Street Hydraulics: OK - Q < Allowable Street Capacity                     |                           |                      | MINOR                     | MAJOR      |
| Total Inlet Interception Capacity                                         |                           | Q =                  | 6.2                       | 14.9 cfs   |
| Total Inlet Carry-Over Flow (flow bypassing inlet)                        |                           | Q <sub>s</sub> =     | 0.0                       | 1.1 cfs    |
| Capture Percentage = Q <sub>i</sub> /Q <sub>a</sub>                       |                           | C% =                 | 100                       | 93 %       |

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

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

Project: Dawson Trails Tract O and H (FKA Parcel D)

Inlet ID: DP 9S

**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 |
| $n_{BACK}$ | = | 0.016 |       |

|              |   |       |        |
|--------------|---|-------|--------|
| $H_{CURB}$   | = | 4.00  | inches |
| $T_{CROWN}$  | = | 16.0  | ft     |
| $W$          | = | 2.00  | ft     |
| $S_X$        | = | 0.020 | ft/ft  |
| $S_W$        | = | 0.083 | ft/ft  |
| $S_O$        | = | 0.035 | ft/ft  |
| $n_{STREET}$ | = | 0.016 |        |

Max. Allowable Spread for Minor &amp; Major Storm

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

Allow Flow Depth at Street Crown (check box for yes, leave blank for no)

|           | Minor Storm              | Major Storm                         |        |
|-----------|--------------------------|-------------------------------------|--------|
| $T_{MAX}$ | 16.0                     | 16.0                                | ft     |
| $d_{MAX}$ | 4.0                      | 12.0                                | inches |
|           | <input type="checkbox"/> | <input checked="" type="checkbox"/> |        |

MINOR STORM Allowable Capacity is based on Depth Criterion

MAJOR STORM Allowable Capacity is based on Depth Criterion

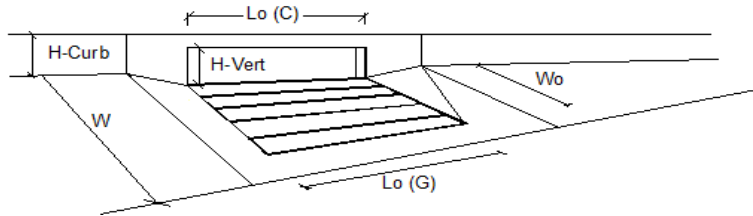
|             | Minor Storm | Major Storm |     |
|-------------|-------------|-------------|-----|
| $Q_{allow}$ | 6.3         | 87.6        | cfs |

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 3.90 cfs on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design peak flow of 12.32 cfs on sheet 'Inlet Management'

# INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)



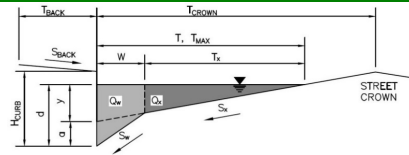
| Design Information (Input)                                                |                           | MINOR                |                           | MAJOR      |
|---------------------------------------------------------------------------|---------------------------|----------------------|---------------------------|------------|
| Type of Inlet                                                             | Denver No. 16 Combination | Type =               | Denver No. 16 Combination |            |
| Local Depression (additional to continuous gutter depression 'a')         |                           | a <sub>LOCAL</sub> = | 2.0                       | 2.0 inches |
| Total Number of Units in the Inlet (Grate or Curb Opening)                |                           | No =                 | 3                         | 3          |
| Length of a Single Unit Inlet (Grate or Curb Opening)                     |                           | L <sub>u</sub> =     | 3.00                      | 3.00 ft    |
| Width of a Unit Grate (cannot be greater than W, Gutter Width)            |                           | W <sub>u</sub> =     | 1.73                      | 1.73 ft    |
| Clogging Factor for a Single Unit Grate (typical min. value = 0.5)        |                           | C <sub>f</sub> (G) = | 0.50                      | 0.50       |
| Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1) |                           | C <sub>f</sub> (C) = | 0.10                      | 0.10       |
| Street Hydraulics: OK - Q < Allowable Street Capacity                     |                           |                      | MINOR                     | MAJOR      |
| Total Inlet Interception Capacity                                         |                           | Q =                  | 3.0                       | 6.5 cfs    |
| Total Inlet Carry-Over Flow (flow bypassing inlet)                        |                           | Q <sub>s</sub> =     | 0.9                       | 5.8 cfs    |
| Capture Percentage = Q <sub>i</sub> /Q <sub>a</sub>                       |                           | C% =                 | 77                        | 53 %       |

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

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

Project: Dawson Trails Tract O and H (FKA Parcel D)

Inlet ID: DP 10S

**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 |
| $n_{BACK}$ | = | 0.016 |       |

|              |   |       |        |
|--------------|---|-------|--------|
| $H_{CURB}$   | = | 4.00  | inches |
| $T_{CROWN}$  | = | 16.0  | ft     |
| $W$          | = | 2.00  | ft     |
| $S_X$        | = | 0.020 | ft/ft  |
| $S_W$        | = | 0.083 | ft/ft  |
| $S_O$        | = | 0.030 | ft/ft  |
| $n_{STREET}$ | = | 0.016 |        |

Max. Allowable Spread for Minor &amp; Major Storm

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

Allow Flow Depth at Street Crown (check box for yes, leave blank for no)

|           | Minor Storm              | Major Storm                         |        |
|-----------|--------------------------|-------------------------------------|--------|
| $T_{MAX}$ | 16.0                     | 16.0                                | ft     |
| $d_{MAX}$ | 4.0                      | 12.0                                | inches |
|           | <input type="checkbox"/> | <input checked="" type="checkbox"/> |        |

MINOR STORM Allowable Capacity is based on Depth Criterion

MAJOR STORM Allowable Capacity is based on Depth Criterion

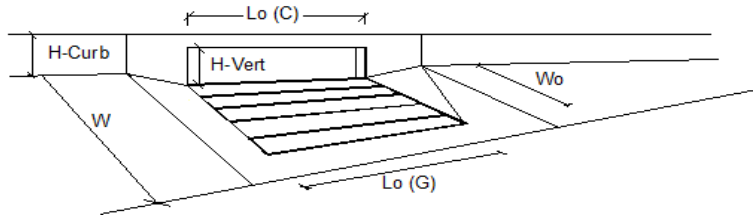
|             | Minor Storm | Major Storm |     |
|-------------|-------------|-------------|-----|
| $Q_{allow}$ | 5.9         | 91.7        | cfs |

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 4.50 cfs on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design peak flow of 11.20 cfs on sheet 'Inlet Management'

# INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)



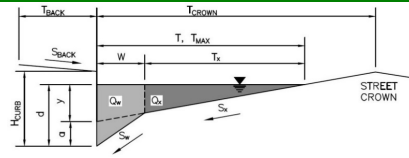
| Design Information (Input)                                                |                           | MINOR                |                           | MAJOR |        |
|---------------------------------------------------------------------------|---------------------------|----------------------|---------------------------|-------|--------|
| Type of Inlet                                                             | Denver No. 16 Combination | Type =               | Denver No. 16 Combination |       |        |
| Local Depression (additional to continuous gutter depression 'a')         |                           | a <sub>LOCAL</sub> = | 2.0                       | 2.0   | inches |
| Total Number of Units in the Inlet (Grate or Curb Opening)                |                           | No =                 | 4                         | 4     |        |
| Length of a Single Unit Inlet (Grate or Curb Opening)                     |                           | L <sub>u</sub> =     | 3.00                      | 3.00  | ft     |
| Width of a Unit Grate (cannot be greater than W, Gutter Width)            |                           | W <sub>u</sub> =     | 1.73                      | 1.73  | ft     |
| Clogging Factor for a Single Unit Grate (typical min. value = 0.5)        |                           | C <sub>f</sub> (G) = | 0.50                      | 0.50  |        |
| Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1) |                           | C <sub>f</sub> (C) = | 0.10                      | 0.10  |        |
| Street Hydraulics: OK - Q < Allowable Street Capacity                     |                           |                      |                           |       |        |
| Total Inlet Interception Capacity                                         |                           | Q =                  | 4.1                       | 8.3   | cfs    |
| Total Inlet Carry-Over Flow (flow bypassing inlet)                        |                           | Q <sub>s</sub> =     | 0.4                       | 2.9   | cfs    |
| Capture Percentage = Q <sub>i</sub> /Q <sub>a</sub>                       |                           | C% =                 | 90                        | 74    | %      |

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

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

Project: Dawson Trails Tract O and H (FKA Parcel D)

Inlet ID: DP 11S

**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 |
| $n_{BACK}$ | = | 0.016 |       |

|              |   |       |        |
|--------------|---|-------|--------|
| $H_{CURB}$   | = | 4.00  | inches |
| $T_{CROWN}$  | = | 16.0  | ft     |
| $W$          | = | 2.00  | ft     |
| $S_X$        | = | 0.020 | ft/ft  |
| $S_W$        | = | 0.083 | ft/ft  |
| $S_O$        | = | 0.050 | ft/ft  |
| $n_{STREET}$ | = | 0.016 |        |

Max. Allowable Spread for Minor &amp; Major Storm

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

Allow Flow Depth at Street Crown (check box for yes, leave blank for no)

|           | Minor Storm              | Major Storm                         |        |
|-----------|--------------------------|-------------------------------------|--------|
| $T_{MAX}$ | 16.0                     | 16.0                                | ft     |
| $d_{MAX}$ | 4.0                      | 12.0                                | inches |
|           | <input type="checkbox"/> | <input checked="" type="checkbox"/> |        |

MINOR STORM Allowable Capacity is based on Depth Criterion

MAJOR STORM Allowable Capacity is based on Depth Criterion

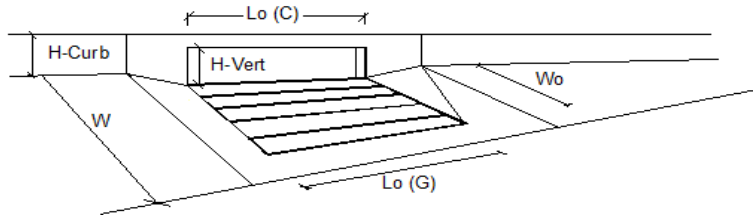
|             | Minor Storm | Major Storm |     |
|-------------|-------------|-------------|-----|
| $Q_{allow}$ | 7.6         | 78.7        | cfs |

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 6.00 cfs on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design peak flow of 14.80 cfs on sheet 'Inlet Management'

# INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)



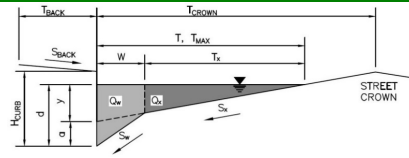
| Design Information (Input)                                                |                           | MINOR                |                           | MAJOR      |
|---------------------------------------------------------------------------|---------------------------|----------------------|---------------------------|------------|
| Type of Inlet                                                             | Denver No. 16 Combination | Type =               | Denver No. 16 Combination |            |
| Local Depression (additional to continuous gutter depression 'a')         |                           | a <sub>LOCAL</sub> = | 2.0                       | 2.0 inches |
| Total Number of Units in the Inlet (Grate or Curb Opening)                |                           | No =                 | 4                         | 4          |
| Length of a Single Unit Inlet (Grate or Curb Opening)                     |                           | L <sub>o</sub> =     | 3.00                      | 3.00 ft    |
| Width of a Unit Grate (cannot be greater than W, Gutter Width)            |                           | W <sub>o</sub> =     | 1.73                      | 1.73 ft    |
| Clogging Factor for a Single Unit Grate (typical min. value = 0.5)        |                           | C <sub>f</sub> (G) = | 0.50                      | 0.50       |
| Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1) |                           | C <sub>f</sub> (C) = | 0.10                      | 0.10       |
| Street Hydraulics: OK - Q < Allowable Street Capacity                     |                           |                      | MINOR                     | MAJOR      |
| Total Inlet Interception Capacity                                         |                           | Q =                  | 4.5                       | 8.7 cfs    |
| Total Inlet Carry-Over Flow (flow bypassing inlet)                        |                           | Q <sub>s</sub> =     | 1.5                       | 6.1 cfs    |
| Capture Percentage = Q <sub>i</sub> /Q <sub>a</sub>                       |                           | C% =                 | 76                        | 59 %       |

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

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

Project: Dawson Trails Tract O and H (FKA Parcel D)

Inlet ID: DP 12S

**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 |
| $n_{BACK}$ | = | 0.016 |       |

|              |   |       |        |
|--------------|---|-------|--------|
| $H_{CURB}$   | = | 4.00  | inches |
| $T_{CROWN}$  | = | 16.0  | ft     |
| $W$          | = | 2.00  | ft     |
| $S_x$        | = | 0.020 | ft/ft  |
| $S_y$        | = | 0.083 | ft/ft  |
| $S_o$        | = | 0.050 | ft/ft  |
| $n_{STREET}$ | = | 0.016 |        |

Max. Allowable Spread for Minor &amp; Major Storm

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

Allow Flow Depth at Street Crown (check box for yes, leave blank for no)

|           | Minor Storm              | Major Storm              |        |
|-----------|--------------------------|--------------------------|--------|
| $T_{MAX}$ | 16.0                     | 16.0                     | ft     |
| $d_{MAX}$ | 4.0                      | 12.0                     | inches |
|           | <input type="checkbox"/> | <input type="checkbox"/> |        |

MINOR STORM Allowable Capacity is based on Depth Criterion

MAJOR STORM Allowable Capacity is based on Spread Criterion

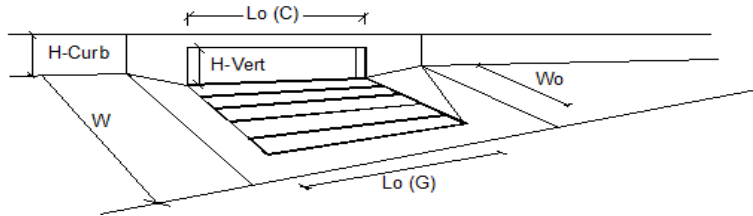
|             | Minor Storm | Major Storm |     |
|-------------|-------------|-------------|-----|
| $Q_{allow}$ | 7.6         | 20.9        | cfs |

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 3.30 cfs on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design peak flow of 7.90 cfs on sheet 'Inlet Management'

# INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)



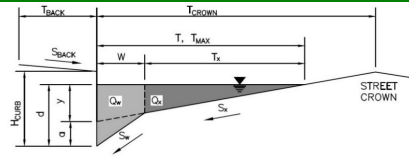
| Design Information (Input)                                                |                           | MINOR         |                           | MAJOR |        |
|---------------------------------------------------------------------------|---------------------------|---------------|---------------------------|-------|--------|
| Type of Inlet                                                             | Denver No. 16 Combination | Type =        | Denver No. 16 Combination |       |        |
| Local Depression (additional to continuous gutter depression 'a')         |                           | $a_{LOCAL}$ = | 2.0                       | 2.0   | inches |
| Total Number of Units in the Inlet (Grate or Curb Opening)                |                           | No =          | 4                         | 4     |        |
| Length of a Single Unit Inlet (Grate or Curb Opening)                     |                           | $L_u$ =       | 3.00                      | 3.00  | ft     |
| Width of a Unit Grate (cannot be greater than W, Gutter Width)            |                           | $W_u$ =       | 1.73                      | 1.73  | ft     |
| Clogging Factor for a Single Unit Grate (typical min. value = 0.5)        |                           | $C_f (G)$ =   | 0.50                      | 0.50  |        |
| Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1) |                           | $C_f (C)$ =   | 0.10                      | 0.10  |        |
| Street Hydraulics: OK - $Q < \text{Allowable Street Capacity}$            |                           |               |                           |       |        |
| Total Inlet Interception Capacity                                         |                           | $Q$ =         | 2.9                       | 5.6   | cfs    |
| Total Inlet Carry-Over Flow (flow bypassing inlet)                        |                           | $Q_s$ =       | 0.4                       | 2.3   | cfs    |
| Capture Percentage = $Q_i/Q_o$                                            |                           | $C\%$ =       | 87                        | 70    | %      |

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

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

Project: Dawson Trails Tract O and H (FKA Parcel D)

Inlet ID: DP 135

**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 |
| $n_{BACK}$ | = | 0.016 |       |

|              |   |       |        |
|--------------|---|-------|--------|
| $H_{CURB}$   | = | 4.00  | inches |
| $T_{CROWN}$  | = | 16.0  | ft     |
| $W$          | = | 2.00  | ft     |
| $S_x$        | = | 0.020 | ft/ft  |
| $S_w$        | = | 0.083 | ft/ft  |
| $S_o$        | = | 0.019 | ft/ft  |
| $n_{STREET}$ | = | 0.016 |        |

Max. Allowable Spread for Minor &amp; Major Storm

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

Allow Flow Depth at Street Crown (check box for yes, leave blank for no)

|           | Minor Storm              | Major Storm                         |        |
|-----------|--------------------------|-------------------------------------|--------|
| $T_{MAX}$ | 16.0                     | 16.0                                | ft     |
| $d_{MAX}$ | 4.0                      | 12.0                                | inches |
|           | <input type="checkbox"/> | <input checked="" type="checkbox"/> |        |

MINOR STORM Allowable Capacity is based on Depth Criterion

MAJOR STORM Allowable Capacity is based on Depth Criterion

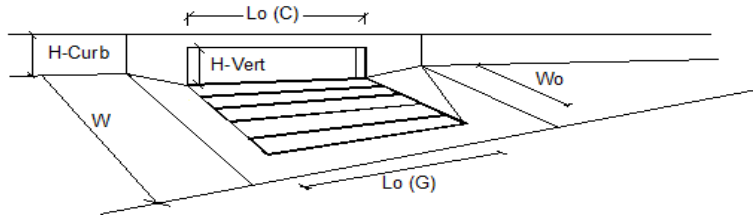
|             | Minor Storm | Major Storm |     |
|-------------|-------------|-------------|-----|
| $Q_{allow}$ | 4.7         | 105.2       | cfs |

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 4.59 cfs on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design peak flow of 19.38 cfs on sheet 'Inlet Management'

# INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)



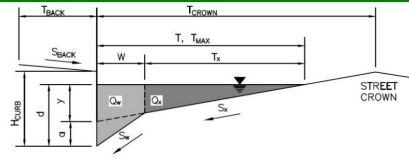
| Design Information (Input)                                                |                           | MINOR                     | MAJOR  |        |
|---------------------------------------------------------------------------|---------------------------|---------------------------|--------|--------|
| Type of Inlet                                                             | Denver No. 16 Combination | Denver No. 16 Combination |        |        |
| Local Depression (additional to continuous gutter depression 'a')         |                           | $a_{LOCAL} = 2.0$         | $2.0$  | inches |
| Total Number of Units in the Inlet (Grate or Curb Opening)                |                           | $N_o = 6$                 | $6$    |        |
| Length of a Single Unit Inlet (Grate or Curb Opening)                     |                           | $L_o = 3.00$              | $3.00$ | ft     |
| Width of a Unit Grate (cannot be greater than W, Gutter Width)            |                           | $W_o = 1.73$              | $1.73$ | ft     |
| Clogging Factor for a Single Unit Grate (typical min. value = 0.5)        |                           | $C_f (G) = 0.50$          | $0.50$ |        |
| Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1) |                           | $C_f (C) = 0.10$          | $0.10$ |        |
| Street Hydraulics: OK - $Q < \text{Allowable Street Capacity}$            |                           |                           |        |        |
| Total Inlet Interception Capacity                                         |                           | $Q = 4.6$                 | $19.1$ | cfs    |
| Total Inlet Carry-Over Flow (flow bypassing inlet)                        |                           | $Q_s = 0.0$               | $0.3$  | cfs    |
| Capture Percentage = $Q_o/Q_s$                                            |                           | $C\% = 100$               | $98$   | %      |

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

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

Project: Dawson Trails Tract O and H (FKA Parcel D)

Inlet ID: DP 14S

**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 |
| $n_{BACK}$ | = | 0.016 |       |

|              |   |       |        |
|--------------|---|-------|--------|
| $H_{CURB}$   | = | 4.00  | inches |
| $T_{CROWN}$  | = | 16.0  | ft     |
| $W$          | = | 2.00  | ft     |
| $S_x$        | = | 0.020 | ft/ft  |
| $S_w$        | = | 0.083 | ft/ft  |
| $S_o$        | = | 0.019 | ft/ft  |
| $n_{STREET}$ | = | 0.016 |        |

Max. Allowable Spread for Minor &amp; Major Storm

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

Allow Flow Depth at Street Crown (check box for yes, leave blank for no)

|           | Minor Storm              | Major Storm                         |        |
|-----------|--------------------------|-------------------------------------|--------|
| $T_{MAX}$ | 16.0                     | 16.0                                | ft     |
| $d_{MAX}$ | 4.0                      | 12.0                                | inches |
|           | <input type="checkbox"/> | <input checked="" type="checkbox"/> |        |

MINOR STORM Allowable Capacity is based on Depth Criterion

MAJOR STORM Allowable Capacity is based on Depth Criterion

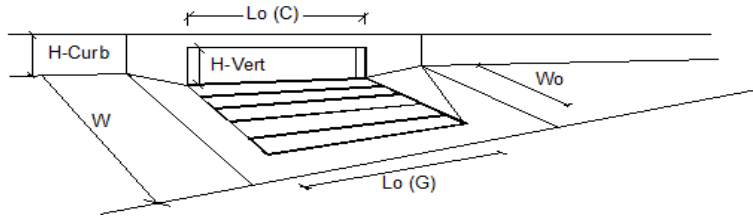
|             | Minor Storm | Major Storm |     |
|-------------|-------------|-------------|-----|
| $Q_{allow}$ | 4.7         | 105.2       | cfs |

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 4.64 cfs on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design peak flow of 15.77 cfs on sheet 'Inlet Management'

# INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)



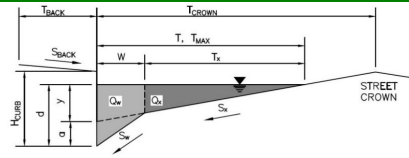
| Design Information (Input)                                                |                           | MINOR                |                           | MAJOR      |
|---------------------------------------------------------------------------|---------------------------|----------------------|---------------------------|------------|
| Type of Inlet                                                             | Denver No. 16 Combination | Type =               | Denver No. 16 Combination |            |
| Local Depression (additional to continuous gutter depression 'a')         |                           | a <sub>LOCAL</sub> = | 2.0                       | 2.0 inches |
| Total Number of Units in the Inlet (Grate or Curb Opening)                |                           | No =                 | 6                         | 6          |
| Length of a Single Unit Inlet (Grate or Curb Opening)                     |                           | L <sub>u</sub> =     | 3.00                      | 3.00 ft    |
| Width of a Unit Grate (cannot be greater than W, Gutter Width)            |                           | W <sub>u</sub> =     | 1.73                      | 1.73 ft    |
| Clogging Factor for a Single Unit Grate (typical min. value = 0.5)        |                           | C <sub>f</sub> (G) = | 0.50                      | 0.50       |
| Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1) |                           | C <sub>f</sub> (C) = | 0.10                      | 0.10       |
| Street Hydraulics: OK - Q < Allowable Street Capacity                     |                           |                      | MINOR                     | MAJOR      |
| Total Inlet Interception Capacity                                         |                           | Q =                  | 4.6                       | 15.8 cfs   |
| Total Inlet Carry-Over Flow (flow bypassing inlet)                        |                           | Q <sub>s</sub> =     | 0.0                       | 0.0 cfs    |
| Capture Percentage = Q <sub>i</sub> /Q <sub>a</sub>                       |                           | C% =                 | 100                       | 100 %      |

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

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

Project: Dawson Trails Tract O and H (FKA Parcel D)

Inlet ID: DP 205

**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 |
| $n_{BACK}$ | = | 0.016 |       |

|              |   |       |        |
|--------------|---|-------|--------|
| $H_{CURB}$   | = | 4.00  | inches |
| $T_{CROWN}$  | = | 16.0  | ft     |
| $W$          | = | 2.00  | ft     |
| $S_X$        | = | 0.020 | ft/ft  |
| $S_W$        | = | 0.083 | ft/ft  |
| $S_O$        | = | 0.030 | ft/ft  |
| $n_{STREET}$ | = | 0.016 |        |

Max. Allowable Spread for Minor &amp; Major Storm

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

Allow Flow Depth at Street Crown (check box for yes, leave blank for no)

|           | Minor Storm              | Major Storm              |        |
|-----------|--------------------------|--------------------------|--------|
| $T_{MAX}$ | 16.0                     | 16.0                     | ft     |
| $d_{MAX}$ | 4.0                      | 12.0                     | inches |
|           | <input type="checkbox"/> | <input type="checkbox"/> |        |

MINOR STORM Allowable Capacity is based on Depth Criterion

MAJOR STORM Allowable Capacity is based on Spread Criterion

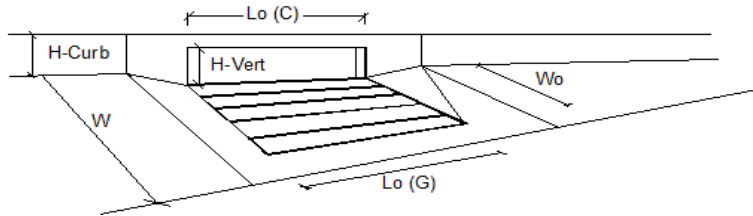
|             | Minor Storm | Major Storm |     |
|-------------|-------------|-------------|-----|
| $Q_{allow}$ | 5.9         | 16.2        | cfs |

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 4.70 cfs on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design peak flow of 11.50 cfs on sheet 'Inlet Management'

# INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)



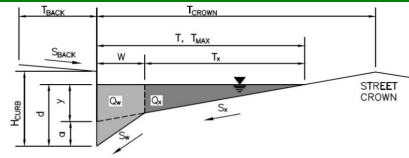
| Design Information (Input)                                                |                           | MINOR                |                           | MAJOR      |
|---------------------------------------------------------------------------|---------------------------|----------------------|---------------------------|------------|
| Type of Inlet                                                             | Denver No. 16 Combination | Type =               | Denver No. 16 Combination |            |
| Local Depression (additional to continuous gutter depression 'a')         |                           | a <sub>LOCAL</sub> = | 2.0                       | 2.0 inches |
| Total Number of Units in the Inlet (Grate or Curb Opening)                |                           | No =                 | 1                         | 1          |
| Length of a Single Unit Inlet (Grate or Curb Opening)                     |                           | L <sub>o</sub> =     | 3.00                      | 3.00 ft    |
| Width of a Unit Grate (cannot be greater than W, Gutter Width)            |                           | W <sub>o</sub> =     | 1.73                      | 1.73 ft    |
| Clogging Factor for a Single Unit Grate (typical min. value = 0.5)        |                           | C <sub>f</sub> (G) = | 0.50                      | 0.50       |
| Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1) |                           | C <sub>f</sub> (C) = | 0.10                      | 0.10       |
| Street Hydraulics: OK - Q < Allowable Street Capacity                     |                           |                      | MINOR                     | MAJOR      |
| Total Inlet Interception Capacity                                         |                           | Q =                  | 2.2                       | 3.3 cfs    |
| Total Inlet Carry-Over Flow (flow bypassing inlet)                        |                           | Q <sub>s</sub> =     | 2.5                       | 8.2 cfs    |
| Capture Percentage = Q <sub>i</sub> /Q <sub>a</sub>                       |                           | C% =                 | 46                        | 28 %       |

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

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

Project: Dawson Trails Tract O and H (FKA Parcel D)

Inlet ID: DP 215

**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 |
| $n_{BACK}$ | = | 0.016 |       |

|              |   |       |        |
|--------------|---|-------|--------|
| $H_{CURB}$   | = | 4.00  | inches |
| $T_{CROWN}$  | = | 16.0  | ft     |
| $W$          | = | 2.00  | ft     |
| $S_x$        | = | 0.020 | ft/ft  |
| $S_w$        | = | 0.083 | ft/ft  |
| $S_o$        | = | 0.000 | ft/ft  |
| $n_{STREET}$ | = | 0.016 |        |

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              |        |
|-----------|--------------------------|--------------------------|--------|
| $T_{MAX}$ | 16.0                     | 16.0                     | ft     |
| $d_{MAX}$ | 4.0                      | 12.0                     | inches |
|           | <input type="checkbox"/> | <input type="checkbox"/> |        |

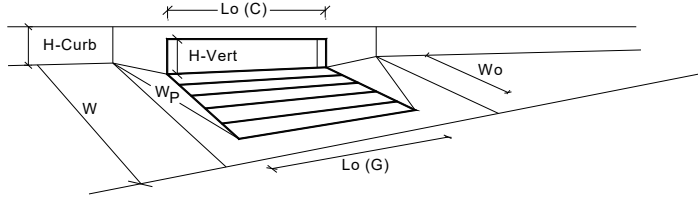
MINOR STORM Allowable Capacity is not applicable to Sump Condition

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

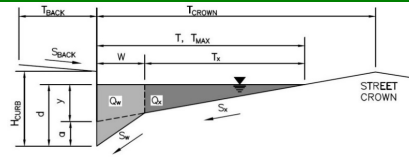
MHFD-Inlet, Version 5.03 (August 2023)



| Design Information (Input)                                                   |                           | MINOR                        |  | MAJOR                     |  |
|------------------------------------------------------------------------------|---------------------------|------------------------------|--|---------------------------|--|
| Type of Inlet                                                                | Denver No. 16 Combination |                              |  |                           |  |
| Local Depression (additional to continuous gutter depression 'a' from above) |                           |                              |  |                           |  |
| Number of Unit Inlets (Grate or Curb Opening)                                |                           |                              |  |                           |  |
| Water Depth at Flowline (outside of local depression)                        |                           |                              |  |                           |  |
| <b>Grate Information</b>                                                     |                           |                              |  |                           |  |
| Length of a Unit Grate                                                       |                           |                              |  |                           |  |
| Width of a Unit Grate                                                        |                           |                              |  |                           |  |
| Open Area Ratio for a Grate (typical values 0.15-0.90)                       |                           |                              |  |                           |  |
| Clogging Factor for a Single Grate (typical value 0.50 - 0.70)               |                           |                              |  |                           |  |
| Grate Weir Coefficient (typical value 2.15 - 3.60)                           |                           |                              |  |                           |  |
| Grate Orifice Coefficient (typical value 0.60 - 0.80)                        |                           |                              |  |                           |  |
| <b>Curb Opening Information</b>                                              |                           |                              |  |                           |  |
| Length of a Unit Curb Opening                                                |                           |                              |  |                           |  |
| Height of Vertical Curb Opening in Inches                                    |                           |                              |  |                           |  |
| Height of Curb Orifice Throat in Inches                                      |                           |                              |  |                           |  |
| Angle of Throat                                                              |                           |                              |  |                           |  |
| Side Width for Depression Pan (typically the gutter width of 2 feet)         |                           |                              |  |                           |  |
| Clogging Factor for a Single Curb Opening (typical value 0.10)               |                           |                              |  |                           |  |
| Curb Opening Weir Coefficient (typical value 2.3-3.7)                        |                           |                              |  |                           |  |
| Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)                 |                           |                              |  |                           |  |
| <b>Low Head Performance Reduction (Calculated)</b>                           |                           |                              |  |                           |  |
| Depth for Grate Midwidth                                                     |                           |                              |  |                           |  |
| Depth for Curb Opening Weir Equation                                         |                           |                              |  |                           |  |
| Grated Inlet Performance Reduction Factor for Long Inlets                    |                           |                              |  |                           |  |
| Curb Opening Performance Reduction Factor for Long Inlets                    |                           |                              |  |                           |  |
| Combination Inlet Performance Reduction Factor for Long Inlets               |                           |                              |  |                           |  |
| <b>Total Inlet Interception Capacity (assumes clogged condition)</b>         |                           |                              |  |                           |  |
| <b>Inlet Capacity IS GOOD for Minor and Major Storms (&gt;Q Peak)</b>        |                           |                              |  |                           |  |
|                                                                              |                           | MINOR                        |  | MAJOR                     |  |
|                                                                              |                           | Type =                       |  | Denver No. 16 Combination |  |
|                                                                              |                           | a <sub>local</sub> =         |  | 2.00 inches               |  |
|                                                                              |                           | No =                         |  | 6                         |  |
|                                                                              |                           | Ponding Depth =              |  | 4.0 inches                |  |
|                                                                              |                           | L <sub>o</sub> (G) =         |  | 3.00 feet                 |  |
|                                                                              |                           | W <sub>o</sub> =             |  | 1.73 feet                 |  |
|                                                                              |                           | A <sub>ratio</sub> =         |  | 0.31                      |  |
|                                                                              |                           | C <sub>f</sub> (G) =         |  | 0.50                      |  |
|                                                                              |                           | C <sub>w</sub> (G) =         |  | 3.60                      |  |
|                                                                              |                           | C <sub>o</sub> (G) =         |  | 0.60                      |  |
|                                                                              |                           | L <sub>o</sub> (C) =         |  | 3.00 feet                 |  |
|                                                                              |                           | H <sub>vert</sub> =          |  | 4.50 inches               |  |
|                                                                              |                           | H <sub>throat</sub> =        |  | 5.25 inches               |  |
|                                                                              |                           | Theta =                      |  | 0.00 degrees              |  |
|                                                                              |                           | W <sub>p</sub> =             |  | 2.00 feet                 |  |
|                                                                              |                           | C <sub>f</sub> (C) =         |  | 0.10                      |  |
|                                                                              |                           | C <sub>w</sub> (C) =         |  | 3.70                      |  |
|                                                                              |                           | C <sub>o</sub> (C) =         |  | 0.66                      |  |
|                                                                              |                           | d <sub>Grate</sub> =         |  | 0.36 ft                   |  |
|                                                                              |                           | d <sub>Curb</sub> =          |  | 0.17 ft                   |  |
|                                                                              |                           | RF <sub>Grate</sub> =        |  | 0.38                      |  |
|                                                                              |                           | RF <sub>Curb</sub> =         |  | N/A                       |  |
|                                                                              |                           | RF <sub>Combination</sub> =  |  | 0.38                      |  |
|                                                                              |                           | Q <sub>s</sub> =             |  | 5.2 cfs                   |  |
|                                                                              |                           | Q <sub>PEAK REQUIRED</sub> = |  | 4.5 cfs                   |  |

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

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

Project: **Dawson Trails Tract O and H (FKA Parcel D)**Inlet ID: **DP 225****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 |
| $n_{BACK}$ | = | 0.016 |       |

|              |   |       |        |
|--------------|---|-------|--------|
| $H_{CURB}$   | = | 4.00  | inches |
| $T_{CROWN}$  | = | 16.0  | ft     |
| $W$          | = | 2.00  | ft     |
| $S_X$        | = | 0.020 | ft/ft  |
| $S_W$        | = | 0.083 | ft/ft  |
| $S_O$        | = | 0.000 | ft/ft  |
| $n_{STREET}$ | = | 0.016 |        |

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              |        |
|-----------|--------------------------|--------------------------|--------|
| $T_{MAX}$ | 16.0                     | 16.0                     | ft     |
| $d_{MAX}$ | 4.0                      | 12.0                     | inches |
|           | <input type="checkbox"/> | <input type="checkbox"/> |        |

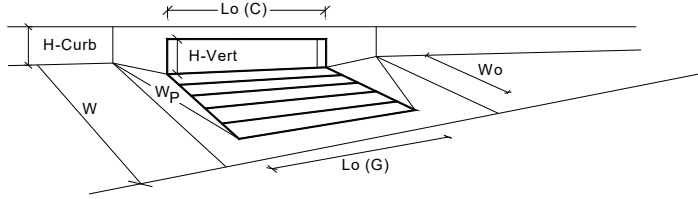
MINOR STORM Allowable Capacity is not applicable to Sump Condition

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)



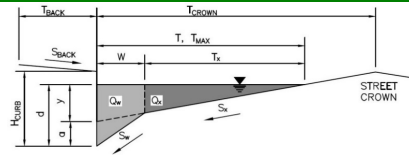
| Design Information (Input)                                                   |                           | MINOR                            |        | MAJOR     |  |
|------------------------------------------------------------------------------|---------------------------|----------------------------------|--------|-----------|--|
| Type of Inlet                                                                | Denver No. 16 Combination | Type = Denver No. 16 Combination |        |           |  |
| Local Depression (additional to continuous gutter depression 'a' from above) |                           | $a_{local} = 2.00$               | $2.00$ | inches    |  |
| Number of Unit Inlets (Grate or Curb Opening)                                |                           | $N_o = 4$                        | $4$    |           |  |
| Water Depth at Flowline (outside of local depression)                        |                           | Ponding Depth = $4.0$            | $12.0$ | 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                                    |                           | $H_{vert} = 4.50$                | $4.50$ | inches    |  |
| Height of Curb Orifice Throat in Inches                                      |                           | $H_{throat} = 5.25$              | $5.25$ | inches    |  |
| Angle of Throat                                                              |                           | $\Theta = 0.00$                  | $0.00$ | degrees   |  |
| Side Width for Depression Pan (typically the gutter width of 2 feet)         |                           | $W_p = 2.00$                     | $2.00$ | feet      |  |
| Clogging Factor for a Single Curb Opening (typical value 0.10)               |                           | $C_f (C) = 0.10$                 | $0.10$ |           |  |
| Curb Opening Weir Coefficient (typical value 2.3-3.7)                        |                           | $C_w (C) = 3.70$                 | $3.70$ |           |  |
| Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)                 |                           | $C_o (C) = 0.66$                 | $0.66$ |           |  |
| <b>Low Head Performance Reduction (Calculated)</b>                           |                           | MINOR                            |        | MAJOR     |  |
| Depth for Grate Midwidth                                                     |                           | $d_{Grate} = 0.36$               | $1.02$ | ft        |  |
| Depth for Curb Opening Weir Equation                                         |                           | $d_{Curb} = 0.17$                | $0.83$ | ft        |  |
| Grated Inlet Performance Reduction Factor for Long Inlets                    |                           | $RF_{Grate} = 0.38$              | $1.00$ |           |  |
| Curb Opening Performance Reduction Factor for Long Inlets                    |                           | $RF_{Curb} = N/A$                | $N/A$  |           |  |
| Combination Inlet Performance Reduction Factor for Long Inlets               |                           | $RF_{Combination} = 0.38$        | $1.00$ |           |  |
| Total Inlet Interception Capacity (assumes clogged condition)                |                           | MINOR                            |        | MAJOR     |  |
|                                                                              |                           | $Q_s = 3.5$                      | $47.0$ | cfs       |  |
| Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)                  |                           | $Q_{PEAK REQUIRED} = 3.4$        |        | $8.5$ cfs |  |

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

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

Project: Dawson Trails Tract O and H (FKA Parcel D)

Inlet ID: DP 2N

**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 |
| $n_{BACK}$ | = | 0.016 |       |

|              |   |       |        |
|--------------|---|-------|--------|
| $H_{CURB}$   | = | 4.00  | inches |
| $T_{CROWN}$  | = | 16.0  | ft     |
| $W$          | = | 2.00  | ft     |
| $S_X$        | = | 0.020 | ft/ft  |
| $S_W$        | = | 0.083 | ft/ft  |
| $S_O$        | = | 0.045 | ft/ft  |
| $n_{STREET}$ | = | 0.016 |        |

Max. Allowable Spread for Minor &amp; Major Storm

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

Allow Flow Depth at Street Crown (check box for yes, leave blank for no)

|           |             |                          |                                     |        |
|-----------|-------------|--------------------------|-------------------------------------|--------|
|           | Minor Storm | Major Storm              |                                     |        |
| $T_{MAX}$ | =           | 16.0                     | 16.0                                | ft     |
| $d_{MAX}$ | =           | 4.0                      | 12.0                                | inches |
|           |             | <input type="checkbox"/> | <input checked="" type="checkbox"/> |        |

MINOR STORM Allowable Capacity is based on Depth Criterion

MAJOR STORM Allowable Capacity is based on Depth Criterion

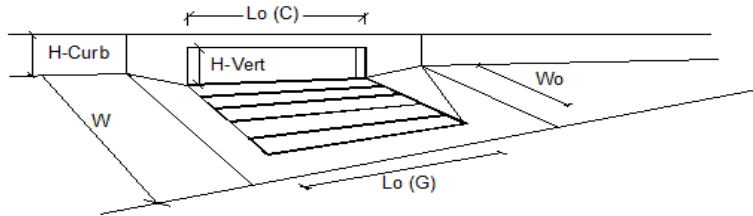
|             |             |             |      |     |
|-------------|-------------|-------------|------|-----|
|             | Minor Storm | Major Storm |      |     |
| $Q_{allow}$ | =           | 7.2         | 81.2 | cfs |

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 3.20 cfs on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design peak flow of 7.90 cfs on sheet 'Inlet Management'

# INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)



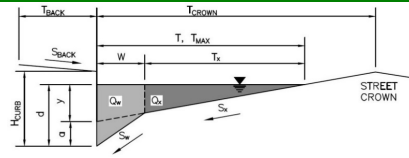
| Design Information (Input)                                                |                           | MINOR                |                           | MAJOR      |
|---------------------------------------------------------------------------|---------------------------|----------------------|---------------------------|------------|
| Type of Inlet                                                             | Denver No. 16 Combination | Type =               | Denver No. 16 Combination |            |
| Local Depression (additional to continuous gutter depression 'a')         |                           | a <sub>LOCAL</sub> = | 2.0                       | 2.0 inches |
| Total Number of Units in the Inlet (Grate or Curb Opening)                |                           | No =                 | 2                         | 2          |
| Length of a Single Unit Inlet (Grate or Curb Opening)                     |                           | L <sub>o</sub> =     | 3.00                      | 3.00 ft    |
| Width of a Unit Grate (cannot be greater than W, Gutter Width)            |                           | W <sub>o</sub> =     | 1.73                      | 1.73 ft    |
| Clogging Factor for a Single Unit Grate (typical min. value = 0.5)        |                           | C <sub>f</sub> (G) = | 0.50                      | 0.50       |
| Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1) |                           | C <sub>f</sub> (C) = | 0.10                      | 0.10       |
| Street Hydraulics: OK - Q < Allowable Street Capacity                     |                           |                      | MINOR                     | MAJOR      |
| Total Inlet Interception Capacity                                         |                           | Q =                  | 2.1                       | 3.5 cfs    |
| Total Inlet Carry-Over Flow (flow bypassing inlet)                        |                           | Q <sub>s</sub> =     | 1.1                       | 4.4 cfs    |
| Capture Percentage = Q <sub>i</sub> /Q <sub>a</sub>                       |                           | C% =                 | 65                        | 44 %       |

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

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

Project: Dawson Trails Tract O and H (FKA Parcel D)

Inlet ID: DP 3N

**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 |
| $n_{BACK}$ | = | 0.016 |       |

|              |   |       |        |
|--------------|---|-------|--------|
| $H_{CURB}$   | = | 4.00  | inches |
| $T_{CROWN}$  | = | 16.0  | ft     |
| $W$          | = | 2.00  | ft     |
| $S_X$        | = | 0.020 | ft/ft  |
| $S_W$        | = | 0.083 | ft/ft  |
| $S_O$        | = | 0.013 | ft/ft  |
| $n_{STREET}$ | = | 0.016 |        |

Max. Allowable Spread for Minor &amp; Major Storm

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

Allow Flow Depth at Street Crown (check box for yes, leave blank for no)

|           | Minor Storm              | Major Storm                         |        |
|-----------|--------------------------|-------------------------------------|--------|
| $T_{MAX}$ | =                        | 16.0                                | ft     |
| $d_{MAX}$ | =                        | 4.0                                 | inches |
|           | <input type="checkbox"/> | <input checked="" type="checkbox"/> |        |

MINOR STORM Allowable Capacity is based on Depth Criterion

MAJOR STORM Allowable Capacity is based on Depth Criterion

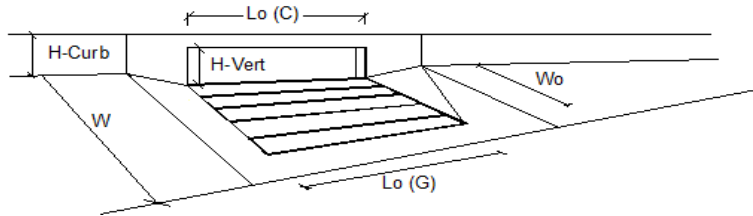
|             | Minor Storm | Major Storm |     |
|-------------|-------------|-------------|-----|
| $Q_{allow}$ | =           | 3.9         | cfs |
|             |             | 100.1       |     |

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 3.83 cfs on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design peak flow of 11.04 cfs on sheet 'Inlet Management'

# INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)



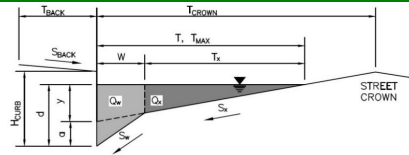
| Design Information (Input)                                                |                           | MINOR                |                           | MAJOR      |
|---------------------------------------------------------------------------|---------------------------|----------------------|---------------------------|------------|
| Type of Inlet                                                             | Denver No. 16 Combination | Type =               | Denver No. 16 Combination |            |
| Local Depression (additional to continuous gutter depression 'a')         |                           | a <sub>LOCAL</sub> = | 2.0                       | 2.0 inches |
| Total Number of Units in the Inlet (Grate or Curb Opening)                |                           | No =                 | 3                         | 3          |
| Length of a Single Unit Inlet (Grate or Curb Opening)                     |                           | L <sub>o</sub> =     | 3.00                      | 3.00 ft    |
| Width of a Unit Grate (cannot be greater than W, Gutter Width)            |                           | W <sub>o</sub> =     | 1.73                      | 1.73 ft    |
| Clogging Factor for a Single Unit Grate (typical min. value = 0.5)        |                           | C <sub>f</sub> (G) = | 0.50                      | 0.50       |
| Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1) |                           | C <sub>f</sub> (C) = | 0.10                      | 0.10       |
| Street Hydraulics: OK - Q < Allowable Street Capacity                     |                           |                      | MINOR                     | MAJOR      |
| Total Inlet Interception Capacity                                         |                           | Q =                  | 3.5                       | 7.7 cfs    |
| Total Inlet Carry-Over Flow (flow bypassing inlet)                        |                           | Q <sub>s</sub> =     | 0.4                       | 3.3 cfs    |
| Capture Percentage = Q <sub>i</sub> /Q <sub>a</sub>                       |                           | C% =                 | 90                        | 70 %       |

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

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

Project: Dawson Trails Tract O and H (FKA Parcel D)

Inlet ID: DP 4N

**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 |
| $n_{BACK}$ | = | 0.016 |       |

|              |   |       |        |
|--------------|---|-------|--------|
| $H_{CURB}$   | = | 4.00  | inches |
| $T_{CROWN}$  | = | 16.0  | ft     |
| $W$          | = | 2.00  | ft     |
| $S_X$        | = | 0.020 | ft/ft  |
| $S_W$        | = | 0.083 | ft/ft  |
| $S_O$        | = | 0.013 | ft/ft  |
| $n_{STREET}$ | = | 0.016 |        |

Max. Allowable Spread for Minor &amp; Major Storm

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

Allow Flow Depth at Street Crown (check box for yes, leave blank for no)

|           | Minor Storm              | Major Storm                         |        |
|-----------|--------------------------|-------------------------------------|--------|
| $T_{MAX}$ | 16.0                     | 16.0                                | ft     |
| $d_{MAX}$ | 4.0                      | 12.0                                | inches |
|           | <input type="checkbox"/> | <input checked="" type="checkbox"/> |        |

MINOR STORM Allowable Capacity is based on Depth Criterion

MAJOR STORM Allowable Capacity is based on Depth Criterion

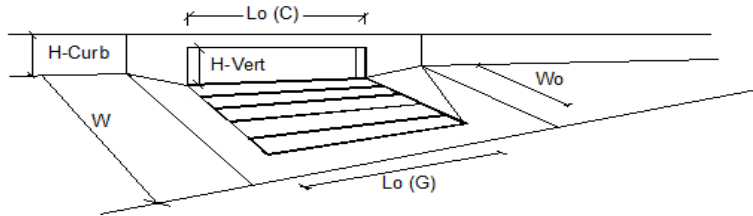
|             | Minor Storm | Major Storm |     |
|-------------|-------------|-------------|-----|
| $Q_{allow}$ | 3.9         | 100.1       | cfs |

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 0.30 cfs on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design peak flow of 0.60 cfs on sheet 'Inlet Management'

# INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)



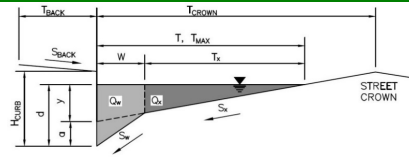
| Design Information (Input)                                                |                           | MINOR                |                           | MAJOR |        |
|---------------------------------------------------------------------------|---------------------------|----------------------|---------------------------|-------|--------|
| Type of Inlet                                                             | Denver No. 16 Combination | Type =               | Denver No. 16 Combination |       |        |
| Local Depression (additional to continuous gutter depression 'a')         |                           | a <sub>LOCAL</sub> = | 2.0                       | 2.0   | inches |
| Total Number of Units in the Inlet (Grate or Curb Opening)                |                           | No =                 | 1                         | 1     |        |
| Length of a Single Unit Inlet (Grate or Curb Opening)                     |                           | L <sub>o</sub> =     | 3.00                      | 3.00  | ft     |
| Width of a Unit Grate (cannot be greater than W, Gutter Width)            |                           | W <sub>o</sub> =     | 1.73                      | 1.73  | ft     |
| Clogging Factor for a Single Unit Grate (typical min. value = 0.5)        |                           | C <sub>f</sub> (G) = | 0.50                      | 0.50  |        |
| Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1) |                           | C <sub>f</sub> (C) = | 0.10                      | 0.10  |        |
| Street Hydraulics: OK - Q < Allowable Street Capacity                     |                           |                      |                           |       |        |
| Total Inlet Interception Capacity                                         |                           | Q =                  | 0.3                       | 0.6   | cfs    |
| Total Inlet Carry-Over Flow (flow bypassing inlet)                        |                           | Q <sub>s</sub> =     | 0.0                       | 0.0   | cfs    |
| Capture Percentage = Q <sub>i</sub> /Q <sub>a</sub>                       |                           | C% =                 | 100                       | 97    | %      |

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

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

Project: Dawson Trails Tract O and H (FKA Parcel D)

Inlet ID: DP 5N

**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 |
| $n_{BACK}$ | = | 0.016 |       |

|              |   |       |        |
|--------------|---|-------|--------|
| $H_{CURB}$   | = | 4.00  | inches |
| $T_{CROWN}$  | = | 16.0  | ft     |
| $W$          | = | 2.00  | ft     |
| $S_x$        | = | 0.020 | ft/ft  |
| $S_y$        | = | 0.083 | ft/ft  |
| $S_o$        | = | 0.050 | ft/ft  |
| $n_{STREET}$ | = | 0.016 |        |

Max. Allowable Spread for Minor &amp; Major Storm

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

Allow Flow Depth at Street Crown (check box for yes, leave blank for no)

|           | Minor Storm              | Major Storm                         |        |
|-----------|--------------------------|-------------------------------------|--------|
| $T_{MAX}$ | 16.0                     | 16.0                                | ft     |
| $d_{MAX}$ | 4.0                      | 12.0                                | inches |
|           | <input type="checkbox"/> | <input checked="" type="checkbox"/> |        |

MINOR STORM Allowable Capacity is based on Depth Criterion

MAJOR STORM Allowable Capacity is based on Depth Criterion

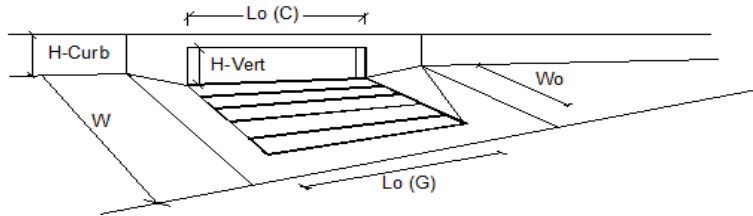
|             | Minor Storm | Major Storm |     |
|-------------|-------------|-------------|-----|
| $Q_{allow}$ | 7.6         | 78.7        | cfs |

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 5.60 cfs on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design peak flow of 14.50 cfs on sheet 'Inlet Management'

# INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)



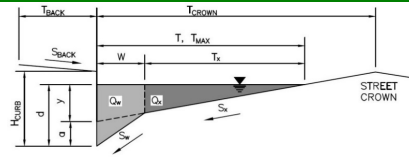
| Design Information (Input)                                                |                           | MINOR                |                           | MAJOR      |
|---------------------------------------------------------------------------|---------------------------|----------------------|---------------------------|------------|
| Type of Inlet                                                             | Denver No. 16 Combination | Type =               | Denver No. 16 Combination |            |
| Local Depression (additional to continuous gutter depression 'a')         |                           | a <sub>LOCAL</sub> = | 2.0                       | 2.0 inches |
| Total Number of Units in the Inlet (Grate or Curb Opening)                |                           | No =                 | 4                         | 4          |
| Length of a Single Unit Inlet (Grate or Curb Opening)                     |                           | L <sub>o</sub> =     | 3.00                      | 3.00 ft    |
| Width of a Unit Grate (cannot be greater than W, Gutter Width)            |                           | W <sub>o</sub> =     | 1.73                      | 1.73 ft    |
| Clogging Factor for a Single Unit Grate (typical min. value = 0.5)        |                           | C <sub>f</sub> (G) = | 0.50                      | 0.50       |
| Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1) |                           | C <sub>f</sub> (C) = | 0.10                      | 0.10       |
| Street Hydraulics: OK - Q < Allowable Street Capacity                     |                           |                      | MINOR                     | MAJOR      |
| Total Inlet Interception Capacity                                         |                           | Q =                  | 4.3                       | 8.5 cfs    |
| Total Inlet Carry-Over Flow (flow bypassing inlet)                        |                           | Q <sub>s</sub> =     | 1.3                       | 6.0 cfs    |
| Capture Percentage = Q <sub>i</sub> /Q <sub>a</sub>                       |                           | C% =                 | 77                        | 59 %       |

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

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

Project: Dawson Trails Tract O and H (FKA Parcel D)

Inlet ID: DP 6N

**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 |
| $n_{BACK}$ | = | 0.016 |       |

|              |   |       |        |
|--------------|---|-------|--------|
| $H_{CURB}$   | = | 4.00  | inches |
| $T_{CROWN}$  | = | 16.0  | ft     |
| $W$          | = | 2.00  | ft     |
| $S_x$        | = | 0.020 | ft/ft  |
| $S_y$        | = | 0.083 | ft/ft  |
| $S_o$        | = | 0.050 | ft/ft  |
| $n_{STREET}$ | = | 0.016 |        |

Max. Allowable Spread for Minor &amp; Major Storm

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

Allow Flow Depth at Street Crown (check box for yes, leave blank for no)

|           | Minor Storm              | Major Storm                         |        |
|-----------|--------------------------|-------------------------------------|--------|
| $T_{MAX}$ | =                        | 16.0                                | ft     |
| $d_{MAX}$ | =                        | 4.0                                 | inches |
|           | <input type="checkbox"/> | <input checked="" type="checkbox"/> |        |

MINOR STORM Allowable Capacity is based on Depth Criterion

MAJOR STORM Allowable Capacity is based on Depth Criterion

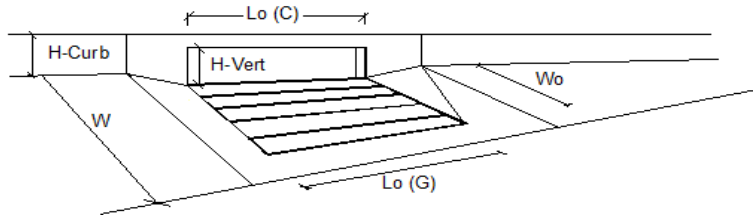
|             | Minor Storm | Major Storm |     |
|-------------|-------------|-------------|-----|
| $Q_{allow}$ | =           | 7.6         | cfs |
|             |             | 78.7        |     |

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 7.19 cfs on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design peak flow of 20.36 cfs on sheet 'Inlet Management'

# INLET ON A CONTINUOUS GRADE

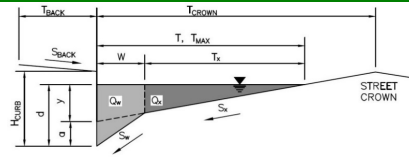
MHFD-Inlet, Version 5.03 (August 2023)



| Design Information (Input)                                                |                           | MINOR                |                           | MAJOR |        |
|---------------------------------------------------------------------------|---------------------------|----------------------|---------------------------|-------|--------|
| Type of Inlet                                                             | Denver No. 16 Combination | Type =               | Denver No. 16 Combination |       |        |
| Local Depression (additional to continuous gutter depression 'a')         |                           | a <sub>LOCAL</sub> = | 2.0                       | 2.0   | inches |
| Total Number of Units in the Inlet (Grate or Curb Opening)                |                           | No =                 | 6                         | 6     |        |
| Length of a Single Unit Inlet (Grate or Curb Opening)                     |                           | L <sub>u</sub> =     | 3.00                      | 3.00  | ft     |
| Width of a Unit Grate (cannot be greater than W, Gutter Width)            |                           | W <sub>u</sub> =     | 1.73                      | 1.73  | ft     |
| Clogging Factor for a Single Unit Grate (typical min. value = 0.5)        |                           | C <sub>f</sub> (G) = | 0.50                      | 0.50  |        |
| Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1) |                           | C <sub>f</sub> (C) = | 0.10                      | 0.10  |        |
| Street Hydraulics: OK - Q < Allowable Street Capacity                     |                           |                      |                           |       |        |
| Total Inlet Interception Capacity                                         |                           | Q =                  | 7.1                       | 16.7  | cfs    |
| Total Inlet Carry-Over Flow (flow bypassing inlet)                        |                           | Q <sub>s</sub> =     | 0.1                       | 3.7   | cfs    |
| Capture Percentage = Q <sub>i</sub> /Q <sub>a</sub>                       |                           | C% =                 | 99                        | 82    | %      |

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

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

Project: **Dawson Trails Tract O and H (FKA Parcel D)**Inlet ID: **DP 7N****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 |
| $n_{BACK}$ | = | 0.016 |       |

|              |   |       |        |
|--------------|---|-------|--------|
| $H_{CURB}$   | = | 4.00  | inches |
| $T_{CROWN}$  | = | 16.0  | ft     |
| $W$          | = | 2.00  | ft     |
| $S_x$        | = | 0.020 | ft/ft  |
| $S_w$        | = | 0.083 | ft/ft  |
| $S_o$        | = | 0.040 | ft/ft  |
| $n_{STREET}$ | = | 0.016 |        |

Max. Allowable Spread for Minor &amp; Major Storm

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

Allow Flow Depth at Street Crown (check box for yes, leave blank for no)

|           | Minor Storm              | Major Storm              |        |
|-----------|--------------------------|--------------------------|--------|
| $T_{MAX}$ | =                        | 16.0                     | ft     |
| $d_{MAX}$ | =                        | 4.0                      | inches |
|           | <input type="checkbox"/> | <input type="checkbox"/> |        |

MINOR STORM Allowable Capacity is based on Depth Criterion

MAJOR STORM Allowable Capacity is based on Spread Criterion

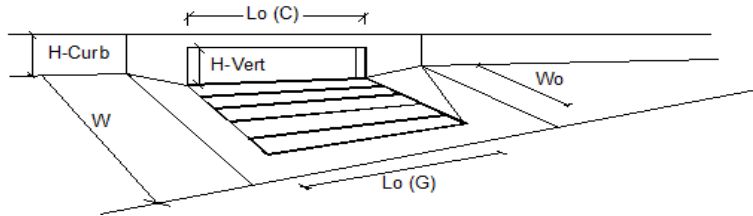
|             | Minor Storm | Major Storm |     |
|-------------|-------------|-------------|-----|
| $Q_{allow}$ | =           | 6.8         | cfs |
|             |             | 18.7        |     |

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 2.80 cfs on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design peak flow of 6.80 cfs on sheet 'Inlet Management'

# INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)



| Design Information (Input)                                                |                           | MINOR                |                           | MAJOR      |
|---------------------------------------------------------------------------|---------------------------|----------------------|---------------------------|------------|
| Type of Inlet                                                             | Denver No. 16 Combination | Type =               | Denver No. 16 Combination |            |
| Local Depression (additional to continuous gutter depression 'a')         |                           | a <sub>LOCAL</sub> = | 2.0                       | 2.0 inches |
| Total Number of Units in the Inlet (Grate or Curb Opening)                |                           | No =                 | 3                         | 3          |
| Length of a Single Unit Inlet (Grate or Curb Opening)                     |                           | L <sub>u</sub> =     | 3.00                      | 3.00 ft    |
| Width of a Unit Grate (cannot be greater than W, Gutter Width)            |                           | W <sub>u</sub> =     | 1.73                      | 1.73 ft    |
| Clogging Factor for a Single Unit Grate (typical min. value = 0.5)        |                           | C <sub>f</sub> (G) = | 0.50                      | 0.50       |
| Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1) |                           | C <sub>f</sub> (C) = | 0.10                      | 0.10       |
| Street Hydraulics: OK - Q < Allowable Street Capacity                     |                           | MINOR                |                           | MAJOR      |
| Total Inlet Interception Capacity                                         |                           | Q =                  | 2.3                       | 4.3 cfs    |
| Total Inlet Carry-Over Flow (flow bypassing inlet)                        |                           | Q <sub>s</sub> =     | 0.5                       | 2.5 cfs    |
| Capture Percentage = Q <sub>i</sub> /Q <sub>a</sub>                       |                           | C% =                 | 82                        | 63 %       |

**Scenario: 100-YR**  
**Current Time Step: 0.000 h**  
**FlexTable: Conduit Table**

| Label | Start Node     | Stop Node      | Invert<br>(Start) (ft) | Invert<br>(Stop) (ft) | Slope<br>(Calculated)<br>(ft/ft) | Length<br>(Scaled)<br>(ft) | Flow<br>(cfs) | Diameter<br>(in) | Manning's<br>n | Velocity<br>(ft/s) |
|-------|----------------|----------------|------------------------|-----------------------|----------------------------------|----------------------------|---------------|------------------|----------------|--------------------|
| P-1   | DTD-INLET 14S  | O-STMH 14.1S   | 6,443.36               | 6,442.20              | 0.025                            | 50.5                       | 122.70        | 36.0             | 0.013          | 17.36              |
| P-2   | DTD-INLET 21S  | DTD-INLET 22S  | 6,480.90               | 6,480.61              | 0.011                            | 26.8                       | 15.60         | 24.0             | 0.013          | 7.96               |
| P-3   | DTD-INLET 13S  | DTD-INLET 14S  | 6,447.14               | 6,446.49              | 0.025                            | 25.9                       | 19.30         | 24.0             | 0.013          | 6.14               |
| P-4   | DTD-STMH 6.1   | DTD-INLET 7N   | 6,462.72               | 6,460.03              | 0.042                            | 64.6                       | 19.00         | 24.0             | 0.013          | 13.97              |
| P-5   | DTD-INLET 3N   | DTD-STMH 3.1N  | 6,481.13               | 6,480.56              | 0.015                            | 38.9                       | 11.10         | 18.0             | 0.013          | 8.16               |
| P-6   | DTD-STMH 3.1N  | DTD-INLET 4N   | 6,480.36               | 6,479.32              | 0.020                            | 51.8                       | 11.10         | 18.0             | 0.013          | 9.22               |
| P-7   | DTD-INLET 5S   | DTD-STMH 5.1S  | 6,456.39               | 6,455.34              | 0.040                            | 26.3                       | 26.00         | 24.0             | 0.013          | 14.88              |
| P-8   | DTD-STMH 5.1S  | DTD-INLET 6S   | 6,455.14               | 6,451.11              | 0.023                            | 183.1                      | 34.80         | 24.0             | 0.013          | 12.49              |
| P-9   | DTD-INLET 6S   | DTD-STMH 12.1S | 6,449.87               | 6,449.14              | 0.014                            | 53.3                       | 46.90         | 36.0             | 0.013          | 6.63               |
| P-10  | DTD-STMH 12.1S | DTD-INLET 14S  | 6,448.94               | 6,445.82              | 0.023                            | 145.8                      | 94.20         | 36.0             | 0.013          | 16.41              |
| P-11  | DTD-INLET 1S   | DTD-STMH 2.1S  | 6,458.06               | 6,456.61              | 0.055                            | 26.4                       | 2.90          | 18.0             | 0.013          | 9.34               |
| P-12  | DTD-INLET 2S   | DTD-STMH 2.1S  | 6,457.22               | 6,456.61              | 0.021                            | 28.4                       | 6.10          | 18.0             | 0.013          | 8.17               |
| P-13  | DTD-STMH 2.1S  | DTD-STMH 5.1S  | 6,456.41               | 6,455.84              | 0.020                            | 28.6                       | 8.80          | 18.0             | 0.013          | 8.76               |
| P-14  | DTD-INLET 12S  | DTD-STMH 12.1S | 6,452.28               | 6,450.64              | 0.063                            | 26.1                       | 5.60          | 18.0             | 0.013          | 11.82              |
| P-15  | DTD-INLET 11S  | DTD-STMH 11.1S | 6,453.25               | 6,451.31              | 0.073                            | 26.3                       | 8.70          | 18.0             | 0.013          | 4.92               |
| P-16  | DTD-STMH 11.1S | DTD-STMH 12.1S | 6,450.11               | 6,449.64              | 0.016                            | 28.6                       | 45.10         | 30.0             | 0.013          | 9.19               |
| P-17  | DTD-INLET 10S  | DTD-STMH 11.1S | 6,451.44               | 6,450.31              | 0.010                            | 122.6                      | 36.50         | 30.0             | 0.013          | 7.44               |
| P-18  | DTD-STMH 22.2S | DTD-STMH 22.3S | 6,461.43               | 6,456.26              | 0.025                            | 206.8                      | 23.80         | 24.0             | 0.013          | 12.18              |
| P-19  | DTD-STMH 22.4S | O-STMH22.5S    | 6,436.92               | 6,433.36              | 0.015                            | 231.4                      | 23.80         | 24.0             | 0.013          | 10.02              |
| P-20  | DTD-STMH 22.3S | DTD-STMH 22.4S | 6,456.06               | 6,443.03              | 0.042                            | 310.3                      | 23.80         | 24.0             | 0.013          | 14.85              |
| P-21  | DTD-INLET 22S  | DTD-STMH 22.1S | 6,480.41               | 6,473.83              | 0.059                            | 110.6                      | 23.80         | 24.0             | 0.013          | 16.90              |
| P-22  | DTD-STMH 22.1S | DTD-STMH 22.2S | 6,472.42               | 6,461.63              | 0.060                            | 179.9                      | 23.80         | 24.0             | 0.013          | 16.95              |
| P-23  | DTD-INLET 4N   | O-STMH 4.1N    | 6,479.12               | 6,478.83              | 0.020                            | 14.5                       | 11.60         | 18.0             | 0.013          | 9.30               |
| P-24  | DTD-INLET 7N   | O-STMH 7.1N    | 6,459.83               | 6,459.23              | 0.034                            | 17.4                       | 22.90         | 24.0             | 0.013          | 13.63              |
| P-25  | DTD-STMH 8.1N  | DTD-STMH 8.2N  | 6,489.45               | 6,478.99              | 0.080                            | 130.8                      | 8.30          | 18.0             | 0.013          | 14.40              |
| P-26  | DTD-INLET 8N   | DTD-STMH 8.1N  | 6,491.94               | 6,489.65              | 0.100                            | 22.9                       | 8.30          | 18.0             | 0.013          | 15.59              |
| P-27  | DTD-STMH 8.4N  | O-STMH 8.5N    | 6,458.70               | 6,451.22              | 0.028                            | 267.0                      | 8.30          | 18.0             | 0.013          | 9.81               |
| P-28  | DTD-STMH 8.3N  | DTD-STMH 8.4N  | 6,470.37               | 6,458.90              | 0.071                            | 162.0                      | 8.30          | 18.0             | 0.013          | 13.78              |
| P-29  | DTD-STMH 8.2N  | DTD-STMH 8.3N  | 6,478.79               | 6,470.57              | 0.060                            | 137.0                      | 8.30          | 18.0             | 0.013          | 12.97              |
| P-30  | DTD-INLET 6N   | DTD-STMH 6.1   | 6,463.47               | 6,462.92              | 0.016                            | 35.0                       | 19.00         | 24.0             | 0.013          | 9.67               |
| P-31  | DTD-INLET 9S   | DTD-INLET 10S  | 6,456.65               | 6,452.24              | 0.032                            | 138.5                      | 28.20         | 24.0             | 0.013          | 13.89              |
| P-32  | DTD-INLET 7S   | DTD-INLET 8S   | 6,481.07               | 6,479.00              | 0.034                            | 74.1                       | 7.00          | 18.0             | 0.013          | 10.06              |
| P-33  | DTD-INLET 8S   | DTD-STMH 8.1S  | 6,478.04               | 6,474.56              | 0.033                            | 106.4                      | 21.70         | 24.0             | 0.013          | 13.22              |
| P-34  | DTD-STMH 8.1S  | DTD-STMH 8.2S  | 6,474.36               | 6,472.71              | 0.026                            | 63.6                       | 21.70         | 24.0             | 0.013          | 12.11              |
| P-35  | DTD-STMH 8.2S  | DTD-STMH 8.3S  | 6,472.51               | 6,469.67              | 0.035                            | 81.0                       | 21.70         | 24.0             | 0.013          | 13.56              |
| P-36  | DTD-STMH 8.3S  | DTD-STMH 8.4S  | 6,469.47               | 6,458.03              | 0.032                            | 357.3                      | 21.70         | 24.0             | 0.013          | 13.10              |
| P-37  | DTD-STMH 8.4S  | DTD-INLET 9S   | 6,457.83               | 6,456.85              | 0.025                            | 39.4                       | 21.70         | 24.0             | 0.013          | 6.91               |
| P-38  | DTD-INLET 3S   | DTD-STMH 3.1S  | 6,481.77               | 6,481.66              | 0.011                            | 9.4                        | 7.80          | 18.0             | 0.013          | 6.81               |
| P-39  | DTD-STMH 3.1S  | DTD-STMH 3.2S  | 6,481.46               | 6,475.99              | 0.027                            | 202.6                      | 7.80          | 18.0             | 0.013          | 9.52               |
| P-40  | DTD-STMH 3.2S  | DTD-INLET 4S   | 6,475.79               | 6,474.38              | 0.030                            | 47.5                       | 7.80          | 18.0             | 0.013          | 9.85               |
| P-41  | DTD-INLET 4S   | DTD-STMH 4.1S  | 6,474.18               | 6,467.71              | 0.051                            | 126.0                      | 14.80         | 18.0             | 0.013          | 14.19              |
| P-42  | DTD-STMH 4.1S  | DTD-STMH 4.2S  | 6,467.51               | 6,464.05              | 0.040                            | 86.4                       | 14.80         | 18.0             | 0.013          | 12.87              |
| P-43  | DTD-STMH 4.2S  | DTD-STMH 4.3S  | 6,463.85               | 6,459.87              | 0.045                            | 88.4                       | 14.80         | 18.0             | 0.013          | 13.48              |
| P-44  | DTD-STMH 4.3S  | DTD-INLET 5S   | 6,459.67               | 6,457.13              | 0.034                            | 84.1                       | 14.80         | 18.0             | 0.013          | 12.06              |
| P-45  | DTD-INLET 20S  | DTD-STMH 20.1S | 6,486.80               | 6,485.07              | 0.024                            | 70.6                       | 3.30          | 18.0             | 0.013          | 7.27               |
| P-46  | DTD-STMH 20.1S | DTD-STMH 20.2S | 6,484.87               | 6,483.32              | 0.030                            | 51.7                       | 3.30          | 18.0             | 0.013          | 7.82               |
| P-47  | DTD-STMH 20.2S | DTD-STMH 20.3S | 6,483.12               | 6,482.30              | 0.017                            | 48.2                       | 3.30          | 18.0             | 0.013          | 6.38               |
| P-48  | DTD-STMH 20.3S | DTD-INLET 21S  | 6,482.10               | 6,481.69              | 0.011                            | 49.1                       | 3.30          | 18.0             | 0.013          | 5.49               |
| P-49  | DTD-INLET 2N   | DTD-STMH 2.1N  | 6,490.27               | 6,488.39              | 0.030                            | 62.7                       | 3.50          | 18.0             | 0.013          | 7.95               |
| P-50  | DTD-STMH 2.1N  | DTD-STMH 2.2N  | 6,488.19               | 6,482.27              | 0.025                            | 236.8                      | 3.50          | 18.0             | 0.013          | 7.45               |
| P-51  | DTD-STMH 2.2N  | DTD-INLET 3N   | 6,482.07               | 6,481.33              | 0.014                            | 52.3                       | 3.50          | 18.0             | 0.013          | 6.06               |
| P-52  | DTD-INLET 5N   | DTD-STMH 5.1N  | 6,478.24               | 6,475.32              | 0.049                            | 59.8                       | 8.50          | 18.0             | 0.013          | 12.11              |
| P-53  | DTD-STMH 5.1N  | DTD-INLET 6N   | 6,475.12               | 6,464.51              | 0.050                            | 225.1                      | 8.50          | 18.0             | 0.013          | 12.21              |

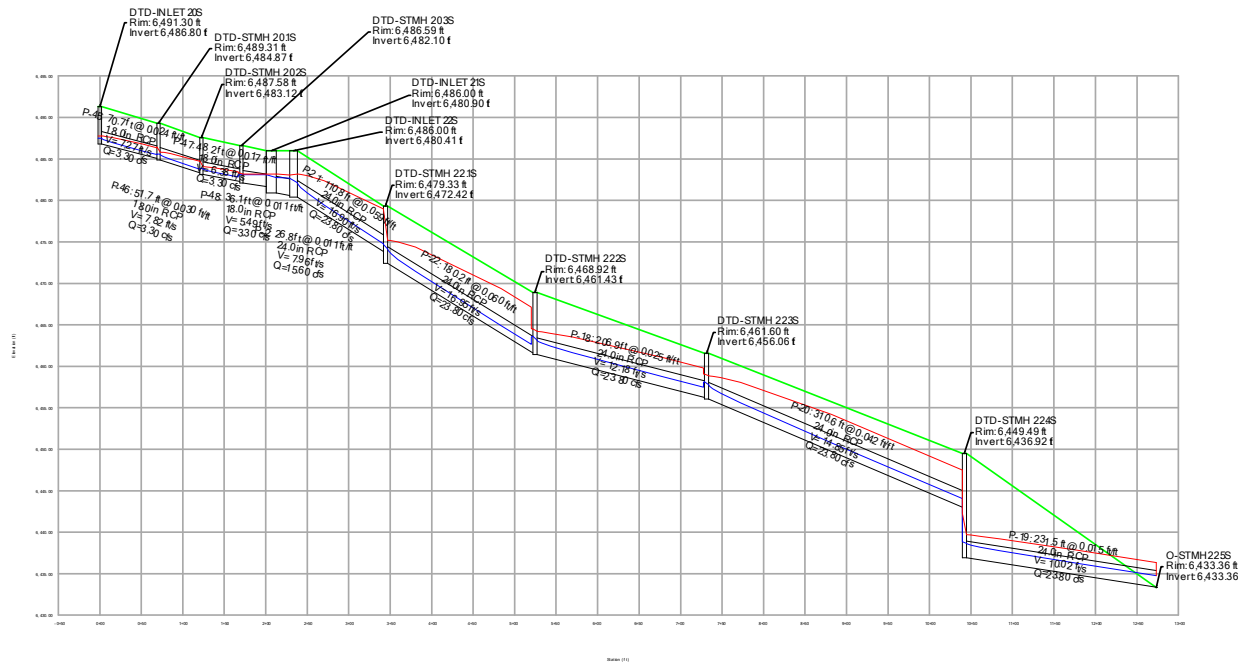
J:\13393 Dawson Trails Parcel D\Drainage\StormCAD\DTD-STORM.stsw

**Scenario: 100-YR**  
**Current Time Step: 0.000 h**  
**FlexTable: Manhole Table**

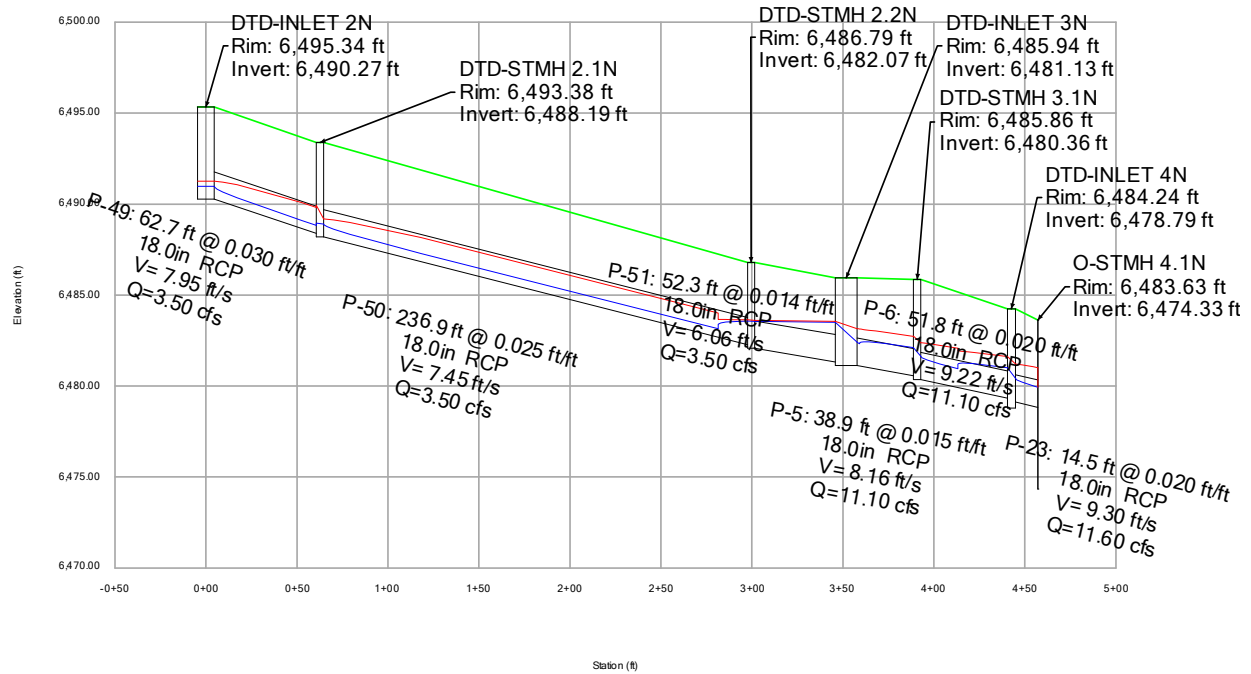
| Label          | Elevation<br>(Rim) (ft) | Elevation<br>(Invert) (ft) | Hydraulic<br>Grade Line<br>(In) (ft) | Hydraulic<br>Grade Line<br>(Out) (ft) | Headloss Method                | Headloss (ft) | Velocity<br>(Out) (ft/s) |
|----------------|-------------------------|----------------------------|--------------------------------------|---------------------------------------|--------------------------------|---------------|--------------------------|
| DTD-INLET 1S   | 6,461.88                | 6,458.06                   | 6,458.71                             | 6,458.71                              | HEC-22 Energy (Second Edition) | 0.00          | 3.98                     |
| DTD-INLET 2N   | 6,495.34                | 6,490.27                   | 6,490.98                             | 6,490.98                              | HEC-22 Energy (Second Edition) | 0.00          | 4.22                     |
| DTD-INLET 2S   | 6,462.07                | 6,457.22                   | 6,458.17                             | 6,458.17                              | HEC-22 Energy (Second Edition) | 0.00          | 5.14                     |
| DTD-INLET 3N   | 6,485.94                | 6,481.13                   | 6,483.49                             | 6,482.41                              | HEC-22 Energy (Second Edition) | 1.08          | 6.93                     |
| DTD-INLET 3S   | 6,486.31                | 6,481.77                   | 6,482.85                             | 6,482.85                              | HEC-22 Energy (Second Edition) | 0.00          | 5.71                     |
| DTD-INLET 4N   | 6,484.24                | 6,478.79                   | 6,481.00                             | 6,480.42                              | HEC-22 Energy (Second Edition) | 0.59          | 7.14                     |
| DTD-INLET 4S   | 6,478.81                | 6,474.18                   | 6,476.37                             | 6,475.58                              | HEC-22 Energy (Second Edition) | 0.78          | 8.62                     |
| DTD-INLET 5N   | 6,482.93                | 6,478.24                   | 6,479.37                             | 6,479.37                              | HEC-22 Energy (Second Edition) | 0.00          | 5.96                     |
| DTD-INLET 5S   | 6,461.52                | 6,456.39                   | 6,458.63                             | 6,458.35                              | HEC-22 Energy (Second Edition) | 0.28          | 8.31                     |
| DTD-INLET 6N   | 6,468.80                | 6,463.47                   | 6,465.60                             | 6,465.04                              | HEC-22 Energy (Second Edition) | 0.56          | 7.19                     |
| DTD-INLET 6S   | 6,456.92                | 6,449.87                   | 6,453.05                             | 6,452.94                              | HEC-22 Energy (Second Edition) | 0.11          | 6.63                     |
| DTD-INLET 7N   | 6,465.69                | 6,459.83                   | 6,462.80                             | 6,461.53                              | HEC-22 Energy (Second Edition) | 1.27          | 8.03                     |
| DTD-INLET 7S   | 6,485.83                | 6,481.07                   | 6,482.09                             | 6,482.09                              | HEC-22 Energy (Second Edition) | 0.00          | 5.44                     |
| DTD-INLET 8N   | 6,497.32                | 6,491.94                   | 6,493.05                             | 6,493.05                              | HEC-22 Energy (Second Edition) | 0.00          | 5.89                     |
| DTD-INLET 8S   | 6,483.25                | 6,478.04                   | 6,479.92                             | 6,479.71                              | HEC-22 Energy (Second Edition) | 0.21          | 7.76                     |
| DTD-INLET 9S   | 6,461.42                | 6,456.65                   | 6,460.01                             | 6,458.48                              | HEC-22 Energy (Second Edition) | 1.53          | 9.35                     |
| DTD-INLET 10S  | 6,457.76                | 6,451.54                   | 6,455.60                             | 6,455.39                              | HEC-22 Energy (Second Edition) | 0.20          | 7.44                     |
| DTD-INLET 11S  | 6,457.65                | 6,453.25                   | 6,455.88                             | 6,455.88                              | HEC-22 Energy (Second Edition) | 0.00          | 4.92                     |
| DTD-INLET 12S  | 6,457.64                | 6,452.28                   | 6,453.19                             | 6,453.19                              | HEC-22 Energy (Second Edition) | 0.00          | 4.97                     |
| DTD-INLET 13S  | 6,452.45                | 6,447.14                   | 6,451.18                             | 6,451.18                              | HEC-22 Energy (Second Edition) | 0.00          | 6.14                     |
| DTD-INLET 14S  | 6,452.70                | 6,443.36                   | 6,447.68                             | 6,446.77                              | HEC-22 Energy (Second Edition) | 0.91          | 17.36                    |
| DTD-INLET 20S  | 6,491.30                | 6,486.80                   | 6,487.49                             | 6,487.49                              | HEC-22 Energy (Second Edition) | 0.00          | 4.14                     |
| DTD-INLET 21S  | 6,486.00                | 6,480.90                   | 6,483.09                             | 6,482.75                              | HEC-22 Energy (Second Edition) | 0.34          | 5.13                     |
| DTD-INLET 22S  | 6,486.00                | 6,480.41                   | 6,482.66                             | 6,482.14                              | HEC-22 Energy (Second Edition) | 0.52          | 8.24                     |
| DTD-STMH 2.1N  | 6,493.38                | 6,488.19                   | 6,488.95                             | 6,488.90                              | HEC-22 Energy (Second Edition) | 0.05          | 4.22                     |
| DTD-STMH 2.1S  | 6,461.33                | 6,456.41                   | 6,457.66                             | 6,457.56                              | HEC-22 Energy (Second Edition) | 0.10          | 6.06                     |
| DTD-STMH 2.2N  | 6,486.79                | 6,482.07                   | 6,483.57                             | 6,483.55                              | HEC-22 Energy (Second Edition) | 0.02          | 1.99                     |
| DTD-STMH 3.1N  | 6,485.86                | 6,480.36                   | 6,482.12                             | 6,481.63                              | HEC-22 Energy (Second Edition) | 0.49          | 6.93                     |
| DTD-STMH 3.1S  | 6,486.36                | 6,481.46                   | 6,482.86                             | 6,482.54                              | HEC-22 Energy (Second Edition) | 0.31          | 5.71                     |
| DTD-STMH 3.2S  | 6,481.09                | 6,475.79                   | 6,477.21                             | 6,476.87                              | HEC-22 Energy (Second Edition) | 0.34          | 5.71                     |
| DTD-STMH 4.1S  | 6,472.79                | 6,467.51                   | 6,469.29                             | 6,468.91                              | HEC-22 Energy (Second Edition) | 0.38          | 8.62                     |
| DTD-STMH 4.2S  | 6,468.83                | 6,463.85                   | 6,465.69                             | 6,465.25                              | HEC-22 Energy (Second Edition) | 0.44          | 8.62                     |
| DTD-STMH 4.3S  | 6,464.98                | 6,459.67                   | 6,461.50                             | 6,461.08                              | HEC-22 Energy (Second Edition) | 0.42          | 8.62                     |
| DTD-STMH 5.1N  | 6,480.26                | 6,475.12                   | 6,476.36                             | 6,476.25                              | HEC-22 Energy (Second Edition) | 0.11          | 5.96                     |
| DTD-STMH 5.1S  | 6,460.62                | 6,455.14                   | 6,457.26                             | 6,457.06                              | HEC-22 Energy (Second Edition) | 0.20          | 11.23                    |
| DTD-STMH 6.1   | 6,468.47                | 6,462.72                   | 6,464.83                             | 6,464.29                              | HEC-22 Energy (Second Edition) | 0.54          | 7.19                     |
| DTD-STMH 8.1N  | 6,497.96                | 6,489.45                   | 6,490.72                             | 6,490.57                              | HEC-22 Energy (Second Edition) | 0.15          | 5.89                     |
| DTD-STMH 8.1S  | 6,479.86                | 6,474.36                   | 6,476.32                             | 6,476.03                              | HEC-22 Energy (Second Edition) | 0.29          | 7.76                     |
| DTD-STMH 8.2N  | 6,484.88                | 6,478.79                   | 6,480.03                             | 6,479.91                              | HEC-22 Energy (Second Edition) | 0.12          | 5.89                     |
| DTD-STMH 8.2S  | 6,477.82                | 6,472.51                   | 6,474.44                             | 6,474.17                              | HEC-22 Energy (Second Edition) | 0.27          | 7.76                     |
| DTD-STMH 8.3N  | 6,476.28                | 6,470.37                   | 6,471.55                             | 6,471.49                              | HEC-22 Energy (Second Edition) | 0.06          | 5.89                     |
| DTD-STMH 8.3S  | 6,475.22                | 6,469.47                   | 6,471.38                             | 6,471.13                              | HEC-22 Energy (Second Edition) | 0.25          | 7.76                     |
| DTD-STMH 8.4N  | 6,464.78                | 6,458.70                   | 6,459.87                             | 6,459.81                              | HEC-22 Energy (Second Edition) | 0.06          | 5.89                     |
| DTD-STMH 8.4S  | 6,462.84                | 6,457.83                   | 6,460.59                             | 6,460.37                              | HEC-22 Energy (Second Edition) | 0.22          | 6.91                     |
| DTD-STMH 11.1S | 6,456.32                | 6,450.11                   | 6,454.50                             | 6,454.31                              | HEC-22 Energy (Second Edition) | 0.19          | 9.19                     |
| DTD-STMH 12.1S | 6,456.32                | 6,448.94                   | 6,452.16                             | 6,451.81                              | HEC-22 Energy (Second Edition) | 0.35          | 13.53                    |
| DTD-STMH 20.1S | 6,489.31                | 6,484.87                   | 6,485.61                             | 6,485.57                              | HEC-22 Energy (Second Edition) | 0.05          | 4.14                     |
| DTD-STMH 20.2S | 6,487.58                | 6,483.12                   | 6,483.87                             | 6,483.81                              | HEC-22 Energy (Second Edition) | 0.05          | 4.14                     |
| DTD-STMH 20.3S | 6,486.59                | 6,482.10                   | 6,483.10                             | 6,483.08                              | HEC-22 Energy (Second Edition) | 0.02          | 2.69                     |
| DTD-STMH 22.1S | 6,479.33                | 6,472.42                   | 6,474.67                             | 6,474.15                              | HEC-22 Energy (Second Edition) | 0.52          | 8.24                     |
| DTD-STMH 22.2S | 6,468.92                | 6,461.43                   | 6,463.62                             | 6,463.16                              | HEC-22 Energy (Second Edition) | 0.46          | 8.24                     |
| DTD-STMH 22.3S | 6,461.60                | 6,456.06                   | 6,458.11                             | 6,457.79                              | HEC-22 Energy (Second Edition) | 0.32          | 8.24                     |
| DTD-STMH 22.4S | 6,449.49                | 6,436.92                   | 6,438.85                             | 6,438.65                              | HEC-22 Energy (Second Edition) | 0.19          | 8.24                     |

J:\13393 Dawson Trails Parcel D\Drainage\StormCAD\DTD-STORM.stsw

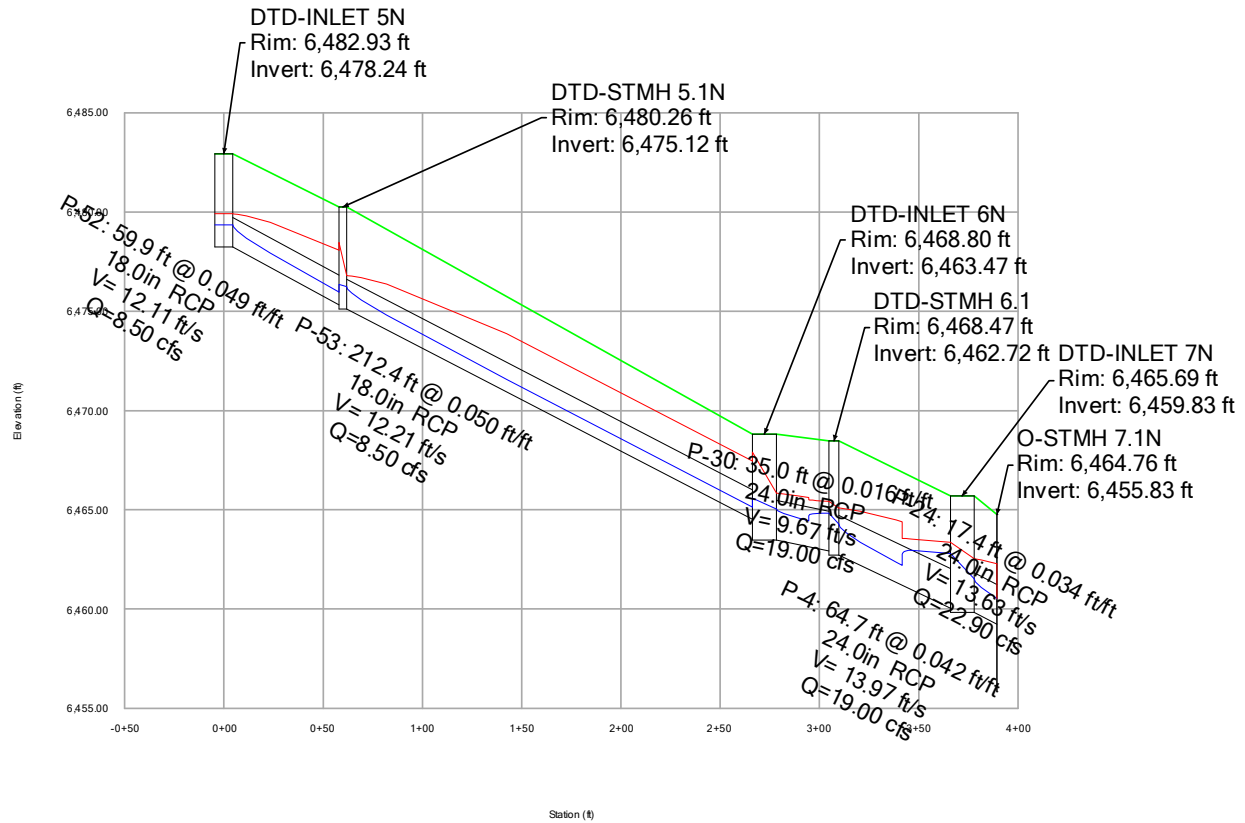
# Active Scenario: 100-YR



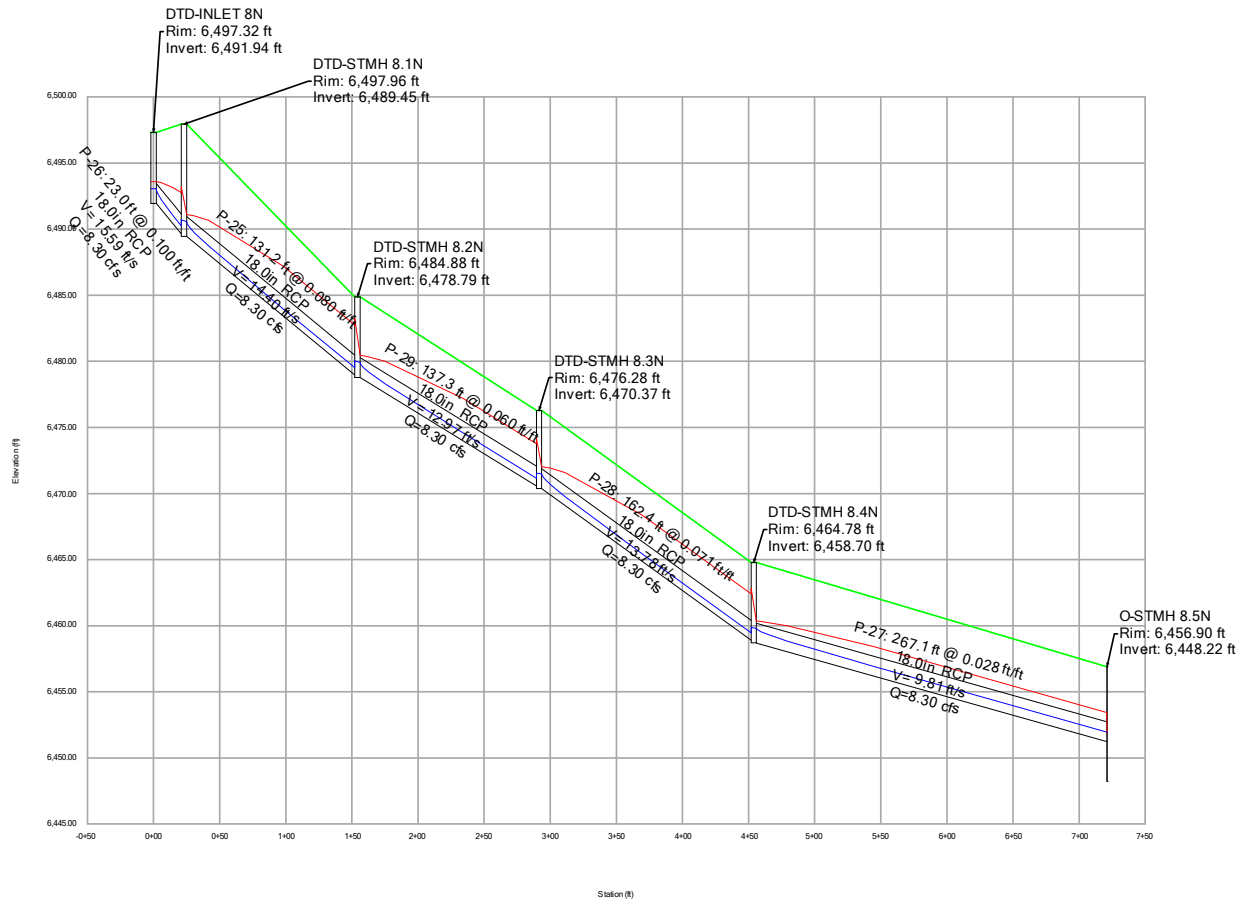
## Active Scenario: 100-YR



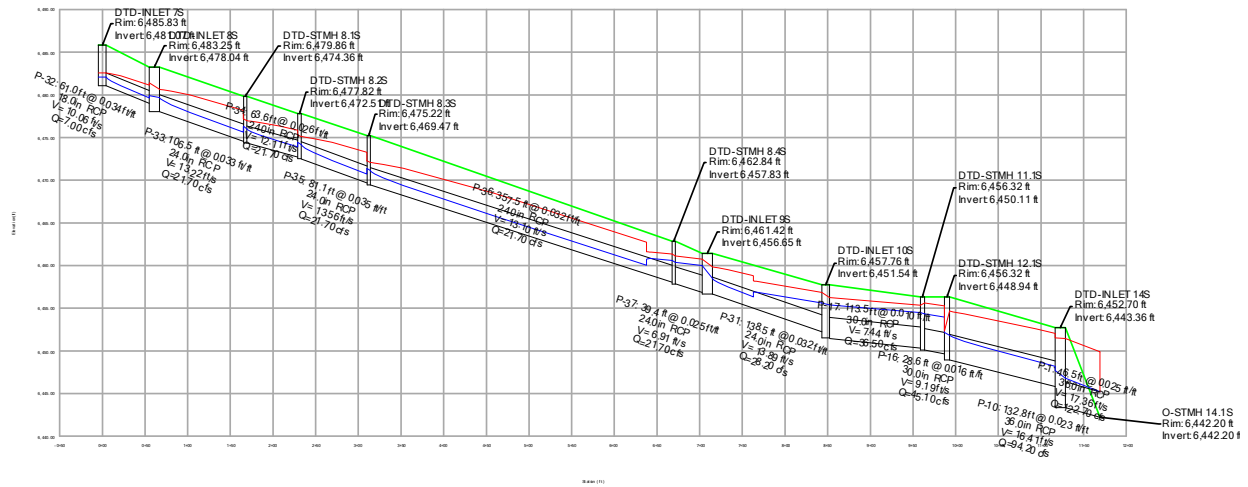
## Active Scenario: 100-YR



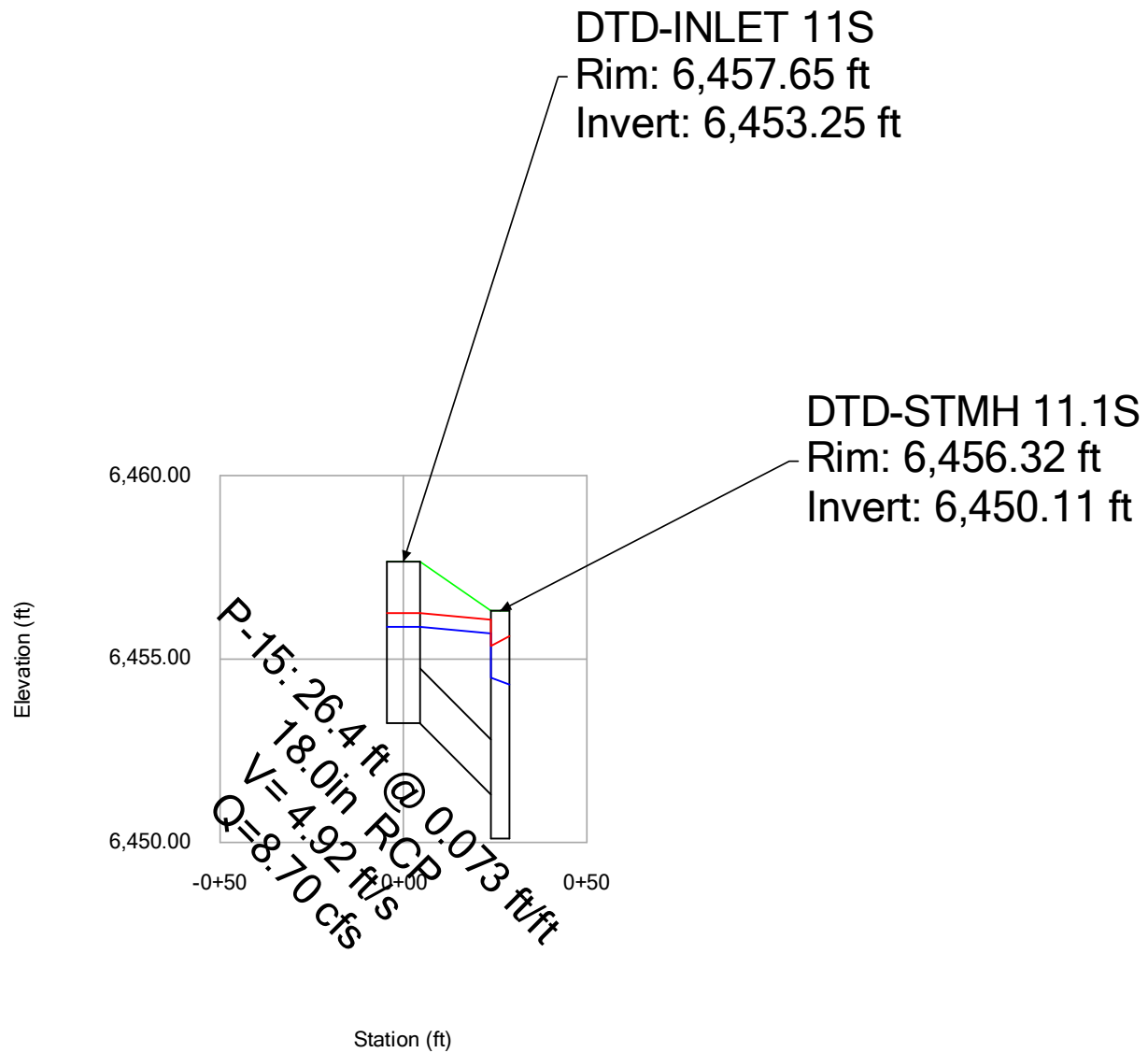
## Active Scenario: 100-YR



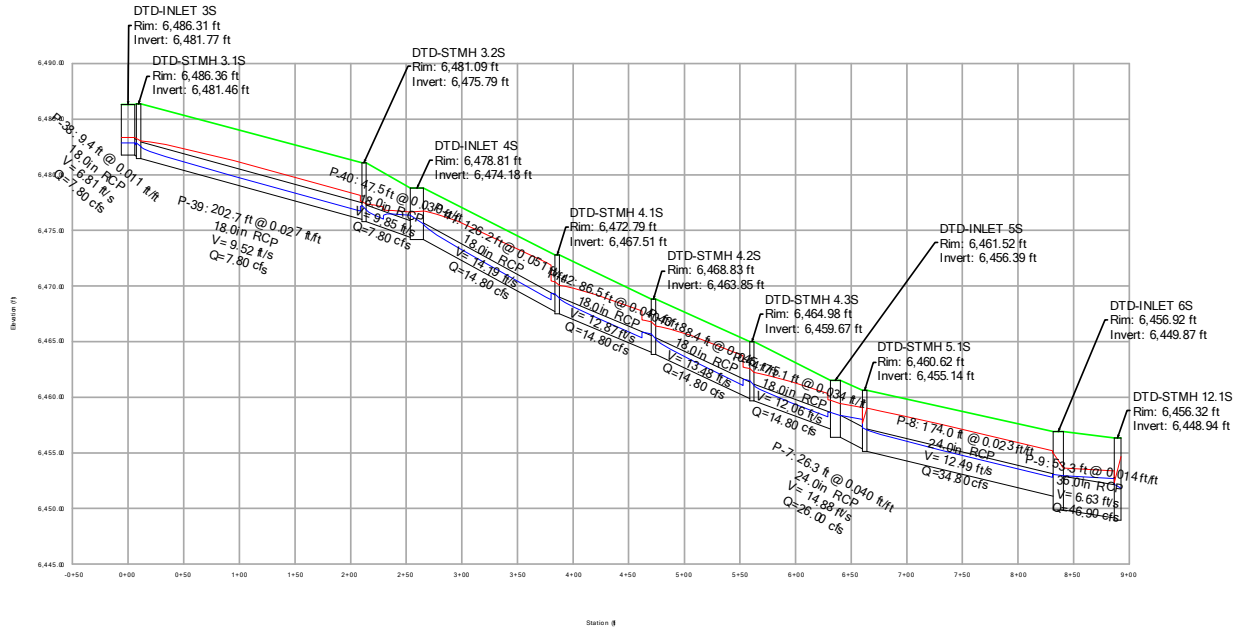
## Active Scenario: 100-YR



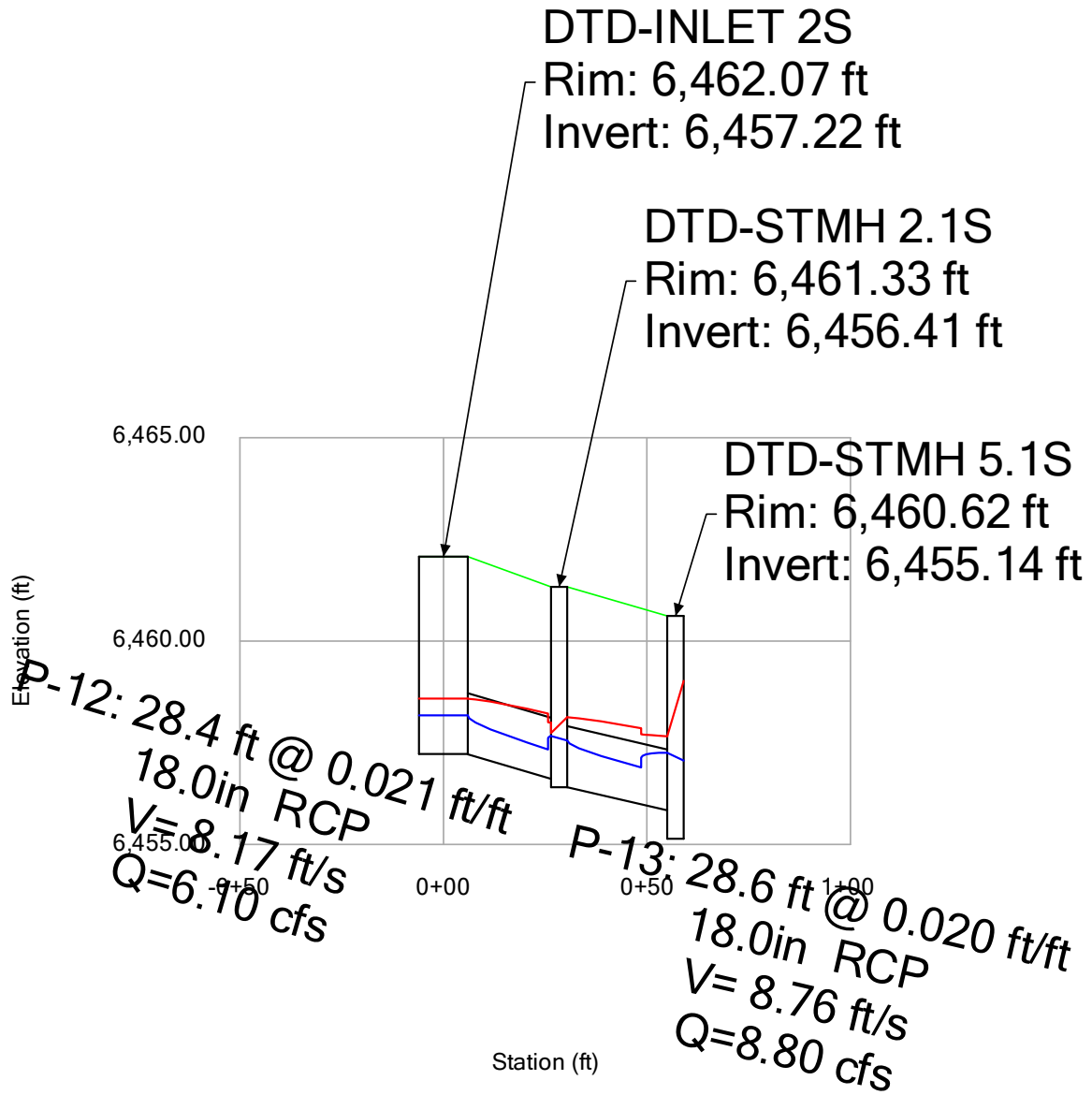
**Active Scenario: 100-YR**



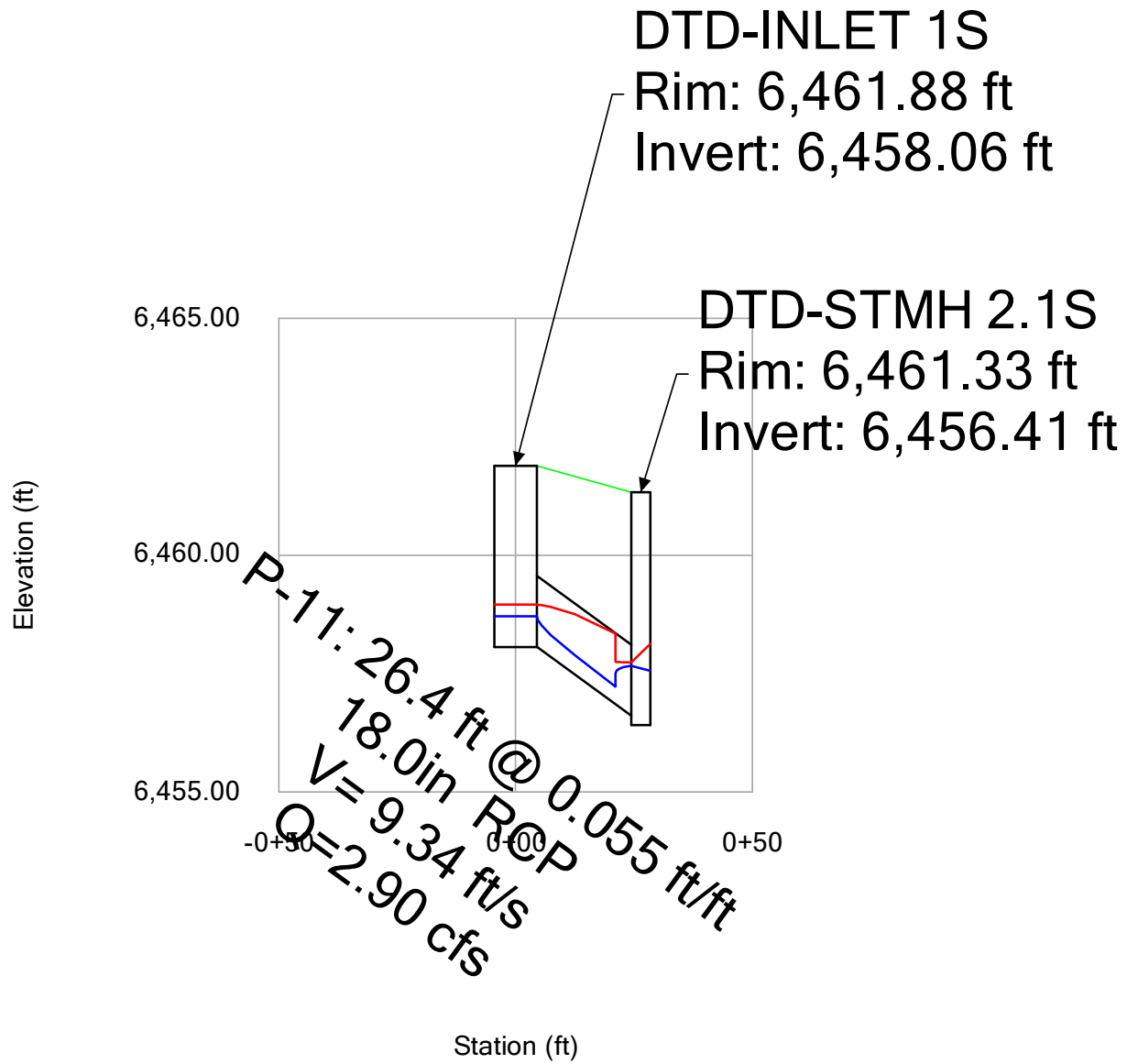
## Active Scenario: 100-YR



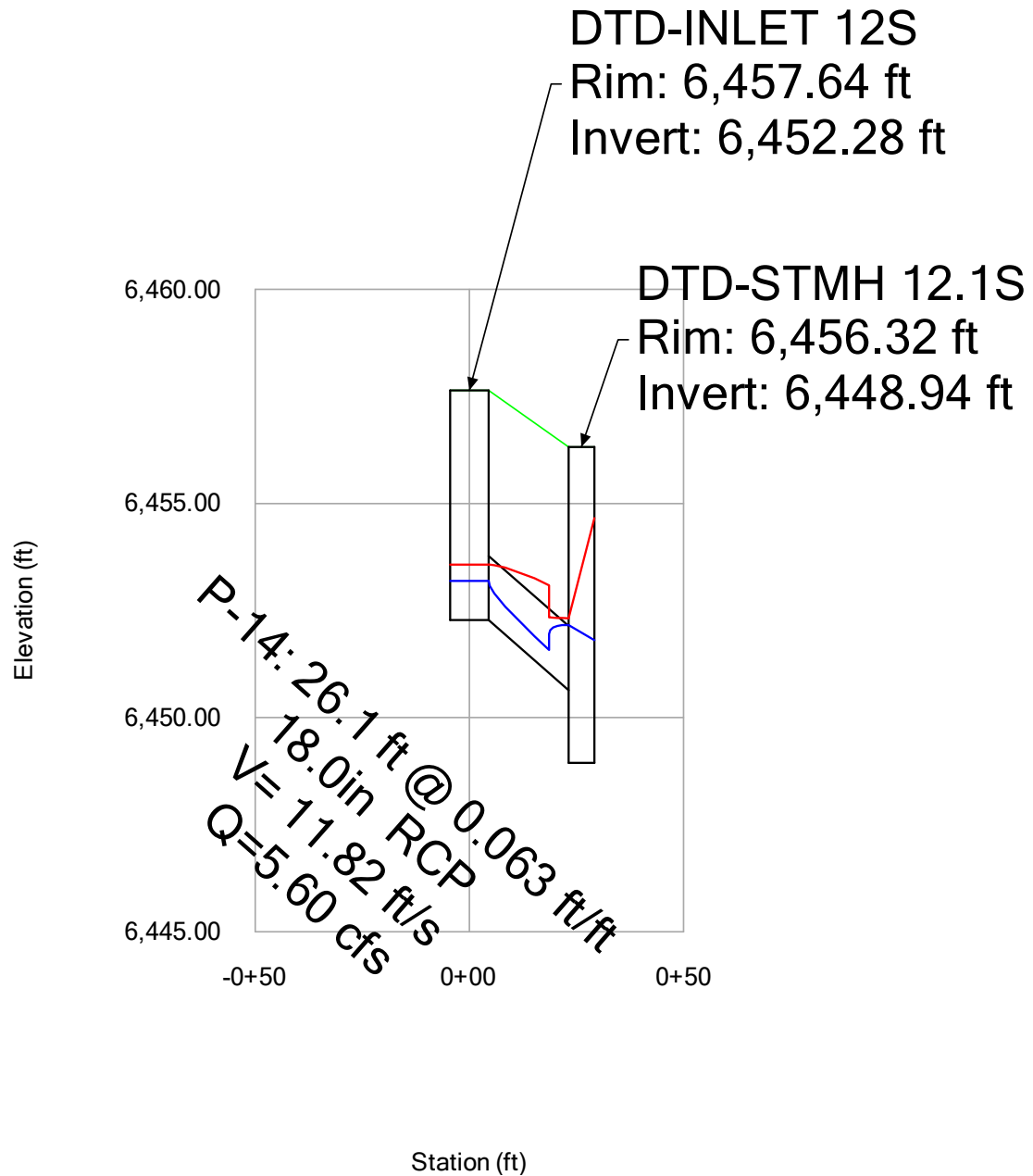
**Active Scenario: 100-YR**



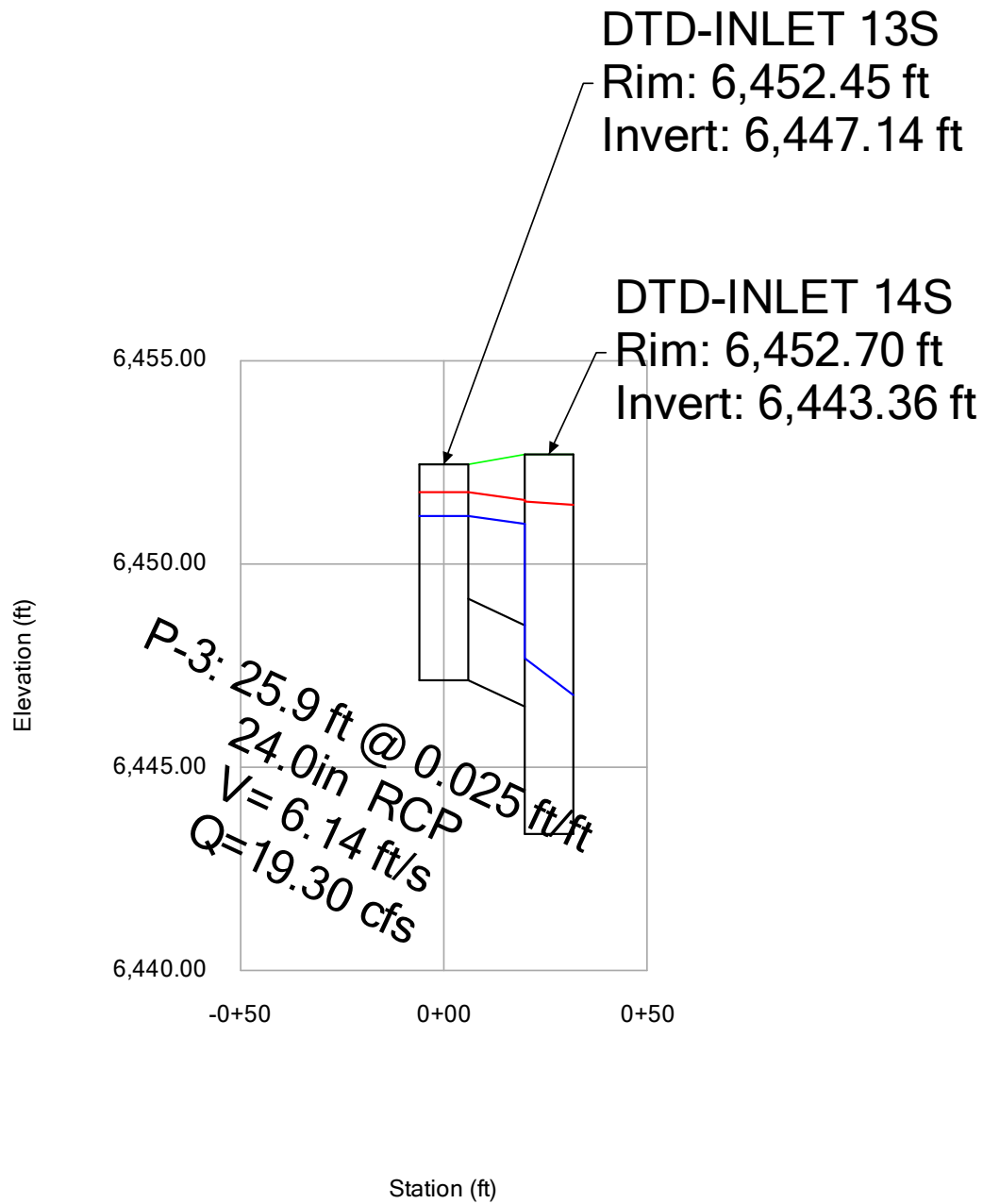
**Active Scenario: 100-YR**



**Active Scenario: 100-YR**



**Active Scenario: 100-YR**



**Scenario: 5-YR**  
**Current Time Step: 0.000 h**  
**FlexTable: Conduit Table**

| Label | Start Node     | Stop Node      | Invert<br>(Start) (ft) | Invert<br>(Stop) (ft) | Slope<br>(Calculated)<br>(ft/ft) | Length<br>(Scaled)<br>(ft) | Flow<br>(cfs) | Diameter<br>(in) | Manning's<br>n | Velocity<br>(ft/s) |
|-------|----------------|----------------|------------------------|-----------------------|----------------------------------|----------------------------|---------------|------------------|----------------|--------------------|
| P-1   | DTD-INLET 14S  | O-STMH 14.1S   | 6,443.36               | 6,442.20              | 0.025                            | 50.5                       | 50.70         | 36.0             | 0.013          | 14.75              |
| P-2   | DTD-INLET 21S  | DTD-INLET 22S  | 6,480.90               | 6,480.61              | 0.011                            | 26.8                       | 6.40          | 24.0             | 0.013          | 6.34               |
| P-3   | DTD-INLET 13S  | DTD-INLET 14S  | 6,447.14               | 6,446.49              | 0.025                            | 25.9                       | 4.70          | 24.0             | 0.013          | 7.88               |
| P-4   | DTD-STMH 6.1   | DTD-INLET 7N   | 6,462.72               | 6,460.03              | 0.042                            | 64.6                       | 9.50          | 24.0             | 0.013          | 11.56              |
| P-5   | DTD-INLET 3N   | DTD-STMH 3.1N  | 6,481.13               | 6,480.56              | 0.015                            | 38.9                       | 5.50          | 18.0             | 0.013          | 6.97               |
| P-6   | DTD-STMH 3.1N  | DTD-INLET 4N   | 6,480.36               | 6,479.32              | 0.020                            | 51.8                       | 5.50          | 18.0             | 0.013          | 7.78               |
| P-7   | DTD-INLET 5S   | DTD-STMH 5.1S  | 6,456.39               | 6,455.34              | 0.040                            | 26.3                       | 12.90         | 24.0             | 0.013          | 12.40              |
| P-8   | DTD-STMH 5.1S  | DTD-INLET 6S   | 6,455.14               | 6,451.11              | 0.023                            | 183.1                      | 17.80         | 24.0             | 0.013          | 11.05              |
| P-9   | DTD-INLET 6S   | DTD-STMH 12.1S | 6,449.87               | 6,449.14              | 0.014                            | 53.3                       | 21.10         | 36.0             | 0.013          | 9.38               |
| P-10  | DTD-STMH 12.1S | DTD-INLET 14S  | 6,448.94               | 6,445.82              | 0.023                            | 145.8                      | 43.90         | 36.0             | 0.013          | 13.91              |
| P-11  | DTD-INLET 1S   | DTD-STMH 2.1S  | 6,458.06               | 6,456.61              | 0.055                            | 26.4                       | 1.70          | 18.0             | 0.013          | 7.99               |
| P-12  | DTD-INLET 2S   | DTD-STMH 2.1S  | 6,457.22               | 6,456.61              | 0.021                            | 28.4                       | 3.30          | 18.0             | 0.013          | 6.91               |
| P-13  | DTD-STMH 2.1S  | DTD-STMH 5.1S  | 6,456.41               | 6,455.84              | 0.020                            | 28.6                       | 4.90          | 18.0             | 0.013          | 7.54               |
| P-14  | DTD-INLET 12S  | DTD-STMH 12.1S | 6,452.28               | 6,450.64              | 0.063                            | 26.1                       | 2.80          | 18.0             | 0.013          | 9.69               |
| P-15  | DTD-INLET 11S  | DTD-STMH 11.1S | 6,453.25               | 6,451.31              | 0.073                            | 26.3                       | 4.50          | 18.0             | 0.013          | 11.76              |
| P-16  | DTD-STMH 11.1S | DTD-STMH 12.1S | 6,450.11               | 6,449.64              | 0.016                            | 28.6                       | 21.50         | 30.0             | 0.013          | 10.17              |
| P-17  | DTD-INLET 10S  | DTD-STMH 11.1S | 6,451.44               | 6,450.31              | 0.010                            | 122.6                      | 17.00         | 30.0             | 0.013          | 7.95               |
| P-18  | DTD-STMH 22.2S | DTD-STMH 22.3S | 6,461.43               | 6,456.26              | 0.025                            | 206.8                      | 9.70          | 24.0             | 0.013          | 9.68               |
| P-19  | DTD-STMH 22.4S | O-STMH22.5S    | 6,436.92               | 6,433.36              | 0.015                            | 231.4                      | 9.70          | 24.0             | 0.013          | 8.11               |
| P-20  | DTD-STMH 22.3S | DTD-STMH 22.4S | 6,456.06               | 6,443.03              | 0.042                            | 310.3                      | 9.70          | 24.0             | 0.013          | 11.67              |
| P-21  | DTD-INLET 22S  | DTD-STMH 22.1S | 6,480.41               | 6,473.83              | 0.059                            | 110.6                      | 9.70          | 24.0             | 0.013          | 13.20              |
| P-22  | DTD-STMH 22.1S | DTD-STMH 22.2S | 6,472.42               | 6,461.63              | 0.060                            | 179.9                      | 9.70          | 24.0             | 0.013          | 13.26              |
| P-23  | DTD-INLET 4N   | O-STMH 4.1N    | 6,479.12               | 6,478.83              | 0.020                            | 14.5                       | 5.70          | 18.0             | 0.013          | 7.85               |
| P-24  | DTD-INLET 7N   | O-STMH 7.1N    | 6,459.83               | 6,459.23              | 0.034                            | 17.4                       | 11.50         | 24.0             | 0.013          | 11.37              |
| P-25  | DTD-STMH 8.1N  | DTD-STMH 8.2N  | 6,489.45               | 6,478.99              | 0.080                            | 130.8                      | 0.70          | 18.0             | 0.013          | 6.98               |
| P-26  | DTD-INLET 8N   | DTD-STMH 8.1N  | 6,491.94               | 6,489.65              | 0.100                            | 22.9                       | 0.70          | 18.0             | 0.013          | 7.55               |
| P-27  | DTD-STMH 8.4N  | O-STMH 8.5N    | 6,458.70               | 6,451.22              | 0.028                            | 267.0                      | 0.70          | 18.0             | 0.013          | 4.84               |
| P-28  | DTD-STMH 8.3N  | DTD-STMH 8.4N  | 6,470.37               | 6,458.90              | 0.071                            | 162.0                      | 0.70          | 18.0             | 0.013          | 6.69               |
| P-29  | DTD-STMH 8.2N  | DTD-STMH 8.3N  | 6,478.79               | 6,470.57              | 0.060                            | 137.0                      | 0.70          | 18.0             | 0.013          | 6.32               |
| P-30  | DTD-INLET 6N   | DTD-STMH 6.1   | 6,463.47               | 6,462.92              | 0.016                            | 35.0                       | 9.50          | 24.0             | 0.013          | 8.13               |
| P-31  | DTD-INLET 9S   | DTD-INLET 10S  | 6,456.65               | 6,452.24              | 0.032                            | 138.5                      | 12.70         | 24.0             | 0.013          | 11.38              |
| P-32  | DTD-INLET 7S   | DTD-INLET 8S   | 6,481.07               | 6,479.00              | 0.034                            | 74.1                       | 3.60          | 18.0             | 0.013          | 8.37               |
| P-33  | DTD-INLET 8S   | DTD-STMH 8.1S  | 6,478.04               | 6,474.56              | 0.033                            | 106.4                      | 9.70          | 24.0             | 0.013          | 10.66              |
| P-34  | DTD-STMH 8.1S  | DTD-STMH 8.2S  | 6,474.36               | 6,472.71              | 0.026                            | 63.6                       | 9.70          | 24.0             | 0.013          | 9.82               |
| P-35  | DTD-STMH 8.2S  | DTD-STMH 8.3S  | 6,472.51               | 6,469.67              | 0.035                            | 81.0                       | 9.70          | 24.0             | 0.013          | 10.92              |
| P-36  | DTD-STMH 8.3S  | DTD-STMH 8.4S  | 6,469.47               | 6,458.03              | 0.032                            | 357.3                      | 9.70          | 24.0             | 0.013          | 10.58              |
| P-37  | DTD-STMH 8.4S  | DTD-INLET 9S   | 6,457.83               | 6,456.85              | 0.025                            | 39.4                       | 9.70          | 24.0             | 0.013          | 9.68               |
| P-38  | DTD-INLET 3S   | DTD-STMH 3.1S  | 6,481.77               | 6,481.66              | 0.011                            | 9.4                        | 4.20          | 18.0             | 0.013          | 5.85               |
| P-39  | DTD-STMH 3.1S  | DTD-STMH 3.2S  | 6,481.46               | 6,475.99              | 0.027                            | 202.6                      | 4.20          | 18.0             | 0.013          | 8.06               |
| P-40  | DTD-STMH 3.2S  | DTD-INLET 4S   | 6,475.79               | 6,474.38              | 0.030                            | 47.5                       | 4.20          | 18.0             | 0.013          | 8.33               |
| P-41  | DTD-INLET 4S   | DTD-STMH 4.1S  | 6,474.18               | 6,467.71              | 0.051                            | 126.0                      | 8.00          | 18.0             | 0.013          | 12.14              |
| P-42  | DTD-STMH 4.1S  | DTD-STMH 4.2S  | 6,467.51               | 6,464.05              | 0.040                            | 86.4                       | 8.00          | 18.0             | 0.013          | 11.08              |
| P-43  | DTD-STMH 4.2S  | DTD-STMH 4.3S  | 6,463.85               | 6,459.87              | 0.045                            | 88.4                       | 8.00          | 18.0             | 0.013          | 11.56              |
| P-44  | DTD-STMH 4.3S  | DTD-INLET 5S   | 6,459.67               | 6,457.13              | 0.034                            | 84.1                       | 8.00          | 18.0             | 0.013          | 10.42              |
| P-45  | DTD-INLET 20S  | DTD-STMH 20.1S | 6,486.80               | 6,485.07              | 0.024                            | 70.6                       | 2.20          | 18.0             | 0.013          | 6.47               |
| P-46  | DTD-STMH 20.1S | DTD-STMH 20.2S | 6,484.87               | 6,483.32              | 0.030                            | 51.7                       | 2.20          | 18.0             | 0.013          | 6.96               |
| P-47  | DTD-STMH 20.2S | DTD-STMH 20.3S | 6,483.12               | 6,482.30              | 0.017                            | 48.2                       | 2.20          | 18.0             | 0.013          | 5.69               |
| P-48  | DTD-STMH 20.3S | DTD-INLET 21S  | 6,482.10               | 6,481.69              | 0.011                            | 49.1                       | 2.20          | 18.0             | 0.013          | 4.90               |
| P-49  | DTD-INLET 2N   | DTD-STMH 2.1N  | 6,490.27               | 6,488.39              | 0.030                            | 62.7                       | 2.10          | 18.0             | 0.013          | 6.86               |
| P-50  | DTD-STMH 2.1N  | DTD-STMH 2.2N  | 6,488.19               | 6,482.27              | 0.025                            | 236.8                      | 2.10          | 18.0             | 0.013          | 6.43               |
| P-51  | DTD-STMH 2.2N  | DTD-INLET 3N   | 6,482.07               | 6,481.33              | 0.014                            | 52.3                       | 2.10          | 18.0             | 0.013          | 5.25               |
| P-52  | DTD-INLET 5N   | DTD-STMH 5.1N  | 6,478.24               | 6,475.32              | 0.049                            | 59.8                       | 4.30          | 18.0             | 0.013          | 10.03              |
| P-53  | DTD-STMH 5.1N  | DTD-INLET 6N   | 6,475.12               | 6,464.51              | 0.050                            | 225.1                      | 4.30          | 18.0             | 0.013          | 10.12              |

J:\13393 Dawson Trails Parcel D\Drainage\StormCAD\DTD-STORM.stsw

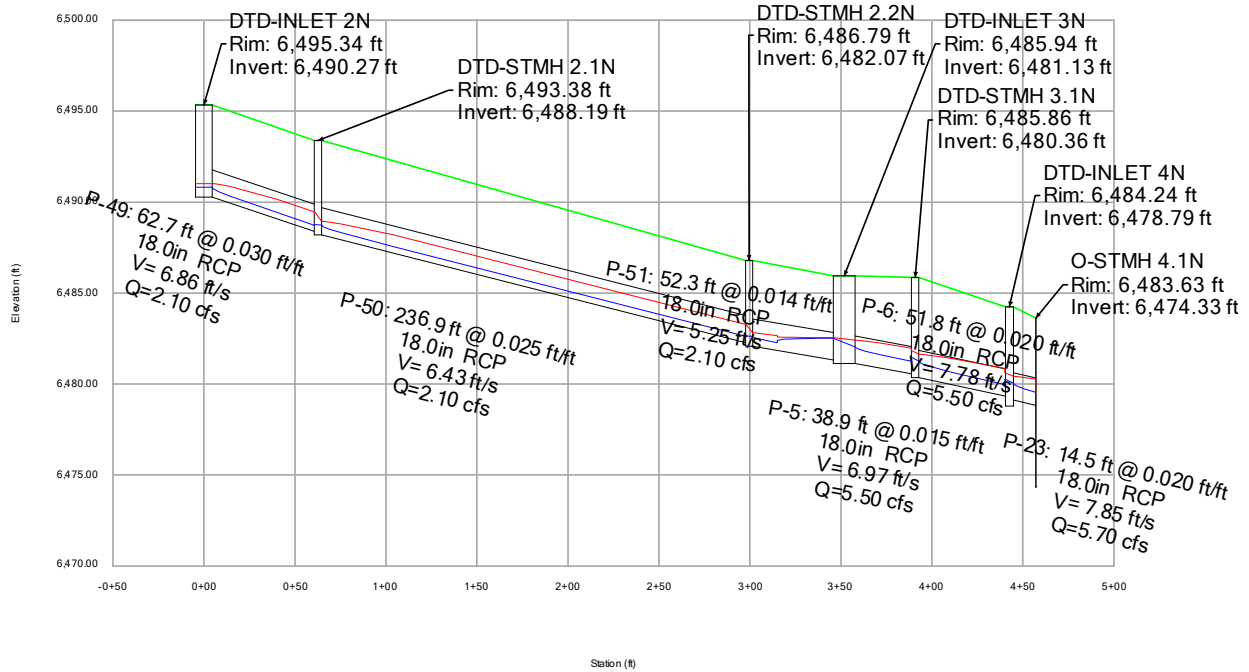
**Scenario: 5-YR**  
**Current Time Step: 0.000 h**  
**FlexTable: Manhole Table**

| Label          | Elevation<br>(Rim) (ft) | Elevation<br>(Invert) (ft) | Hydraulic<br>Grade Line<br>(In) (ft) | Hydraulic<br>Grade Line<br>(Out) (ft) | Headloss Method                | Headloss (ft) | Velocity<br>(Out) (ft/s) |
|----------------|-------------------------|----------------------------|--------------------------------------|---------------------------------------|--------------------------------|---------------|--------------------------|
| DTD-INLET 1S   | 6,461.88                | 6,458.06                   | 6,458.55                             | 6,458.55                              | HEC-22 Energy (Second Edition) | 0.00          | 3.39                     |
| DTD-INLET 2N   | 6,495.34                | 6,490.27                   | 6,490.82                             | 6,490.82                              | HEC-22 Energy (Second Edition) | 0.00          | 3.60                     |
| DTD-INLET 2S   | 6,462.07                | 6,457.22                   | 6,457.91                             | 6,457.91                              | HEC-22 Energy (Second Edition) | 0.00          | 4.14                     |
| DTD-INLET 3N   | 6,485.94                | 6,481.13                   | 6,482.52                             | 6,482.04                              | HEC-22 Energy (Second Edition) | 0.48          | 4.94                     |
| DTD-INLET 3S   | 6,486.31                | 6,481.77                   | 6,482.55                             | 6,482.55                              | HEC-22 Energy (Second Edition) | 0.00          | 4.48                     |
| DTD-INLET 4N   | 6,484.24                | 6,478.79                   | 6,480.28                             | 6,480.04                              | HEC-22 Energy (Second Edition) | 0.24          | 5.01                     |
| DTD-INLET 4S   | 6,478.81                | 6,474.18                   | 6,475.60                             | 6,475.28                              | HEC-22 Energy (Second Edition) | 0.32          | 5.78                     |
| DTD-INLET 5N   | 6,482.93                | 6,478.24                   | 6,479.03                             | 6,479.03                              | HEC-22 Energy (Second Edition) | 0.00          | 4.52                     |
| DTD-INLET 5S   | 6,461.52                | 6,456.39                   | 6,457.80                             | 6,457.68                              | HEC-22 Energy (Second Edition) | 0.11          | 6.01                     |
| DTD-INLET 6N   | 6,468.80                | 6,463.47                   | 6,464.82                             | 6,464.57                              | HEC-22 Energy (Second Edition) | 0.25          | 5.36                     |
| DTD-INLET 6S   | 6,456.92                | 6,449.87                   | 6,451.40                             | 6,451.35                              | HEC-22 Energy (Second Edition) | 0.06          | 6.09                     |
| DTD-INLET 7N   | 6,465.69                | 6,459.83                   | 6,461.61                             | 6,461.05                              | HEC-22 Energy (Second Edition) | 0.56          | 5.74                     |
| DTD-INLET 7S   | 6,485.83                | 6,481.07                   | 6,481.79                             | 6,481.79                              | HEC-22 Energy (Second Edition) | 0.00          | 4.26                     |
| DTD-INLET 8N   | 6,497.32                | 6,491.94                   | 6,492.25                             | 6,492.25                              | HEC-22 Energy (Second Edition) | 0.00          | 2.65                     |
| DTD-INLET 8S   | 6,483.25                | 6,478.04                   | 6,479.24                             | 6,479.16                              | HEC-22 Energy (Second Edition) | 0.08          | 5.39                     |
| DTD-INLET 9S   | 6,461.42                | 6,456.65                   | 6,458.47                             | 6,457.93                              | HEC-22 Energy (Second Edition) | 0.54          | 5.97                     |
| DTD-INLET 10S  | 6,457.76                | 6,451.54                   | 6,452.91                             | 6,452.84                              | HEC-22 Energy (Second Edition) | 0.07          | 6.04                     |
| DTD-INLET 11S  | 6,457.65                | 6,453.25                   | 6,454.06                             | 6,454.06                              | HEC-22 Energy (Second Edition) | 0.00          | 4.59                     |
| DTD-INLET 12S  | 6,457.64                | 6,452.28                   | 6,452.91                             | 6,452.91                              | HEC-22 Energy (Second Edition) | 0.00          | 3.93                     |
| DTD-INLET 13S  | 6,452.45                | 6,447.14                   | 6,447.90                             | 6,447.90                              | HEC-22 Energy (Second Edition) | 0.00          | 4.27                     |
| DTD-INLET 14S  | 6,452.70                | 6,443.36                   | 6,445.86                             | 6,445.68                              | HEC-22 Energy (Second Edition) | 0.18          | 8.65                     |
| DTD-INLET 20S  | 6,491.30                | 6,486.80                   | 6,487.36                             | 6,487.36                              | HEC-22 Energy (Second Edition) | 0.00          | 3.66                     |
| DTD-INLET 21S  | 6,486.00                | 6,480.90                   | 6,481.98                             | 6,481.79                              | HEC-22 Energy (Second Edition) | 0.18          | 4.70                     |
| DTD-INLET 22S  | 6,486.00                | 6,480.41                   | 6,481.71                             | 6,481.52                              | HEC-22 Energy (Second Edition) | 0.19          | 5.39                     |
| DTD-STMH 2.1N  | 6,493.38                | 6,488.19                   | 6,488.77                             | 6,488.74                              | HEC-22 Energy (Second Edition) | 0.03          | 3.60                     |
| DTD-STMH 2.1S  | 6,461.33                | 6,456.41                   | 6,457.32                             | 6,457.26                              | HEC-22 Energy (Second Edition) | 0.06          | 4.73                     |
| DTD-STMH 2.2N  | 6,486.79                | 6,482.07                   | 6,482.65                             | 6,482.62                              | HEC-22 Energy (Second Edition) | 0.03          | 3.60                     |
| DTD-STMH 3.1N  | 6,485.86                | 6,480.36                   | 6,481.47                             | 6,481.26                              | HEC-22 Energy (Second Edition) | 0.20          | 4.94                     |
| DTD-STMH 3.1S  | 6,486.36                | 6,481.46                   | 6,482.41                             | 6,482.25                              | HEC-22 Energy (Second Edition) | 0.16          | 4.48                     |
| DTD-STMH 3.2S  | 6,481.09                | 6,475.79                   | 6,476.75                             | 6,476.58                              | HEC-22 Energy (Second Edition) | 0.17          | 4.48                     |
| DTD-STMH 4.1S  | 6,472.79                | 6,467.51                   | 6,468.75                             | 6,468.60                              | HEC-22 Energy (Second Edition) | 0.15          | 5.78                     |
| DTD-STMH 4.2S  | 6,468.83                | 6,463.85                   | 6,465.12                             | 6,464.95                              | HEC-22 Energy (Second Edition) | 0.17          | 5.78                     |
| DTD-STMH 4.3S  | 6,464.98                | 6,459.67                   | 6,460.93                             | 6,460.77                              | HEC-22 Energy (Second Edition) | 0.16          | 5.78                     |
| DTD-STMH 5.1N  | 6,480.26                | 6,475.12                   | 6,475.97                             | 6,475.92                              | HEC-22 Energy (Second Edition) | 0.05          | 4.52                     |
| DTD-STMH 5.1S  | 6,460.62                | 6,455.14                   | 6,456.73                             | 6,456.66                              | HEC-22 Energy (Second Edition) | 0.07          | 6.95                     |
| DTD-STMH 6.1   | 6,468.47                | 6,462.72                   | 6,464.06                             | 6,463.82                              | HEC-22 Energy (Second Edition) | 0.24          | 5.36                     |
| DTD-STMH 8.1N  | 6,497.96                | 6,489.45                   | 6,489.77                             | 6,489.76                              | HEC-22 Energy (Second Edition) | 0.01          | 2.65                     |
| DTD-STMH 8.1S  | 6,479.86                | 6,474.36                   | 6,475.59                             | 6,475.48                              | HEC-22 Energy (Second Edition) | 0.11          | 5.39                     |
| DTD-STMH 8.2N  | 6,484.88                | 6,478.79                   | 6,479.11                             | 6,479.10                              | HEC-22 Energy (Second Edition) | 0.01          | 2.65                     |
| DTD-STMH 8.2S  | 6,477.82                | 6,472.51                   | 6,473.72                             | 6,473.62                              | HEC-22 Energy (Second Edition) | 0.10          | 5.39                     |
| DTD-STMH 8.3N  | 6,476.28                | 6,470.37                   | 6,470.69                             | 6,470.68                              | HEC-22 Energy (Second Edition) | 0.01          | 2.65                     |
| DTD-STMH 8.3S  | 6,475.22                | 6,469.47                   | 6,470.67                             | 6,470.58                              | HEC-22 Energy (Second Edition) | 0.09          | 5.39                     |
| DTD-STMH 8.4N  | 6,464.78                | 6,458.70                   | 6,459.01                             | 6,459.01                              | HEC-22 Energy (Second Edition) | 0.01          | 2.65                     |
| DTD-STMH 8.4S  | 6,462.84                | 6,457.83                   | 6,459.03                             | 6,458.95                              | HEC-22 Energy (Second Edition) | 0.08          | 5.39                     |
| DTD-STMH 11.1S | 6,456.32                | 6,450.11                   | 6,451.74                             | 6,451.69                              | HEC-22 Energy (Second Edition) | 0.05          | 6.59                     |
| DTD-STMH 12.1S | 6,456.32                | 6,448.94                   | 6,451.20                             | 6,451.10                              | HEC-22 Energy (Second Edition) | 0.11          | 8.06                     |
| DTD-STMH 20.1S | 6,489.31                | 6,484.87                   | 6,485.47                             | 6,485.43                              | HEC-22 Energy (Second Edition) | 0.03          | 3.66                     |
| DTD-STMH 20.2S | 6,487.58                | 6,483.12                   | 6,483.72                             | 6,483.68                              | HEC-22 Energy (Second Edition) | 0.04          | 3.66                     |
| DTD-STMH 20.3S | 6,486.59                | 6,482.10                   | 6,482.68                             | 6,482.66                              | HEC-22 Energy (Second Edition) | 0.03          | 3.66                     |
| DTD-STMH 22.1S | 6,479.33                | 6,472.42                   | 6,473.71                             | 6,473.54                              | HEC-22 Energy (Second Edition) | 0.17          | 5.39                     |
| DTD-STMH 22.2S | 6,468.92                | 6,461.43                   | 6,462.69                             | 6,462.54                              | HEC-22 Energy (Second Edition) | 0.15          | 5.39                     |
| DTD-STMH 22.3S | 6,461.60                | 6,456.06                   | 6,457.28                             | 6,457.18                              | HEC-22 Energy (Second Edition) | 0.11          | 5.39                     |
| DTD-STMH 22.4S | 6,449.49                | 6,436.92                   | 6,438.10                             | 6,438.04                              | HEC-22 Energy (Second Edition) | 0.06          | 5.39                     |

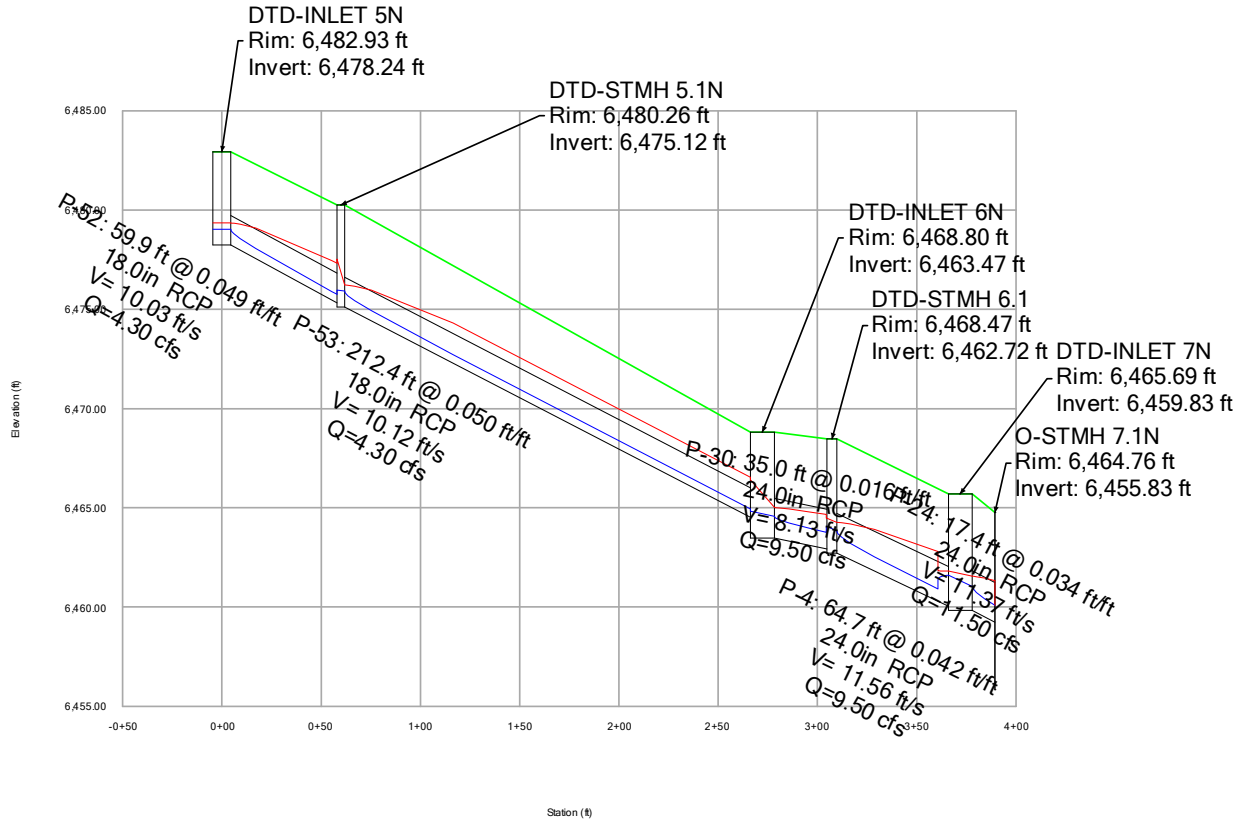
J:\13393 Dawson Trails Parcel D\Drainage\StormCAD\DTD-STORM.stsw



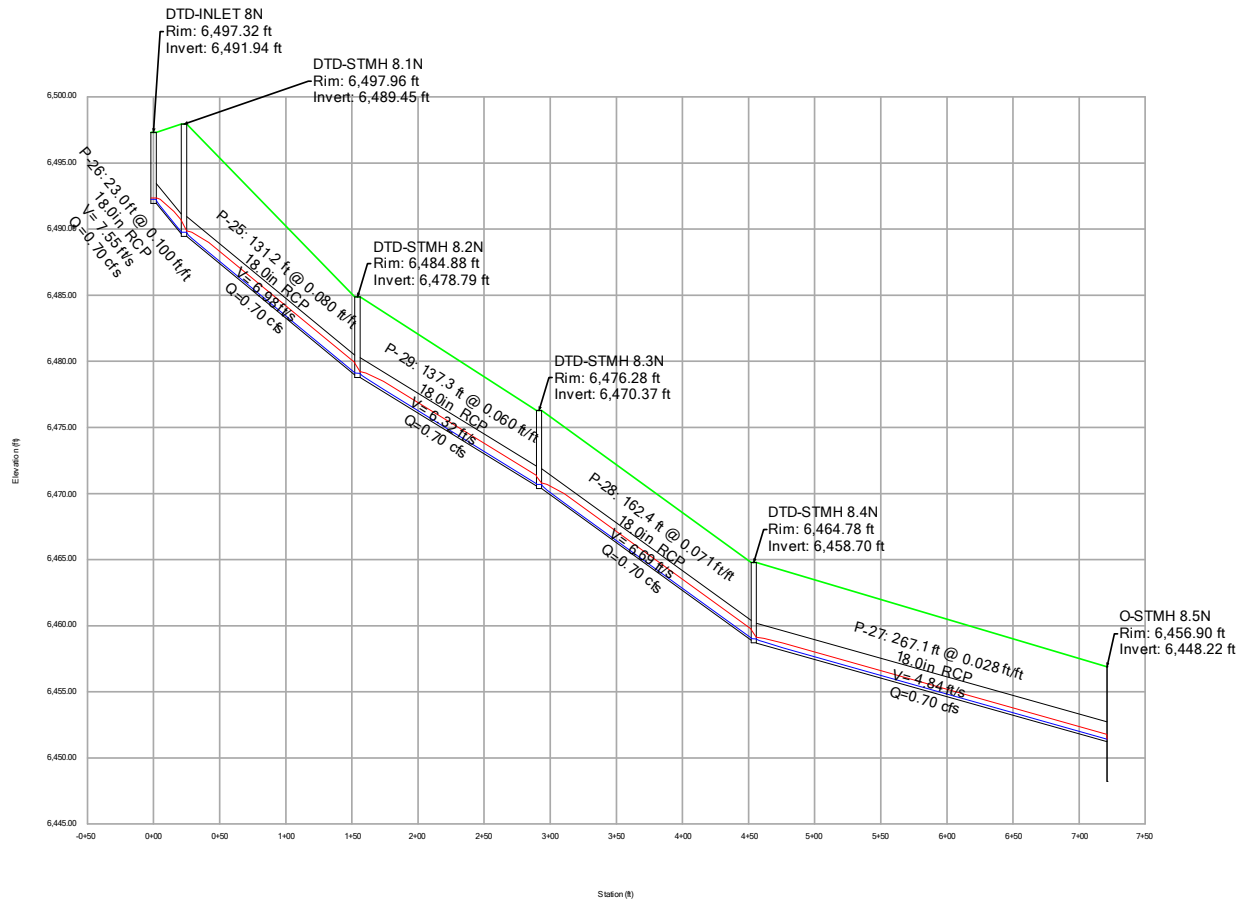
## Active Scenario: 5-YR



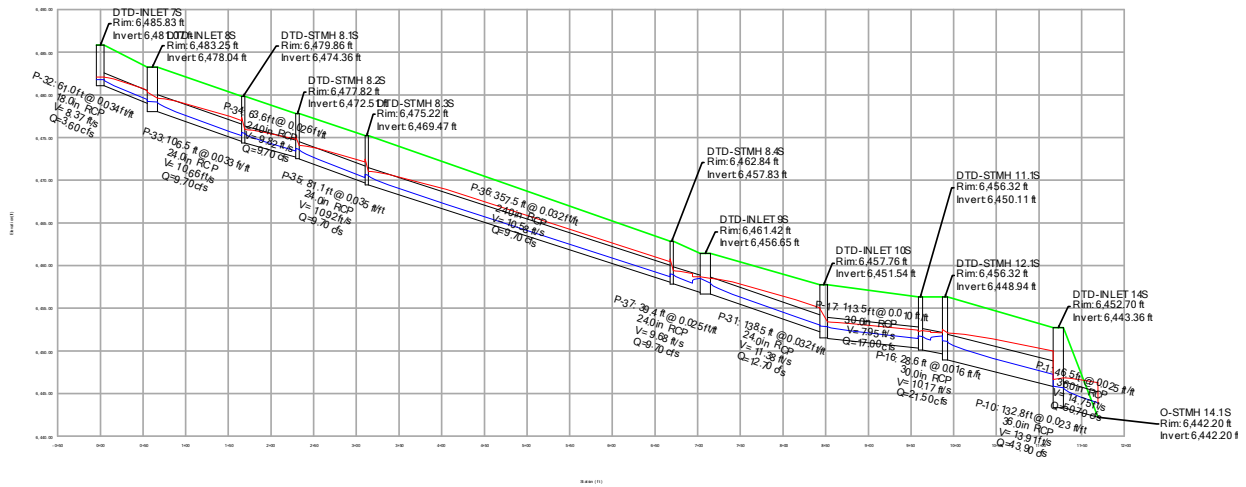
## Active Scenario: 5-YR



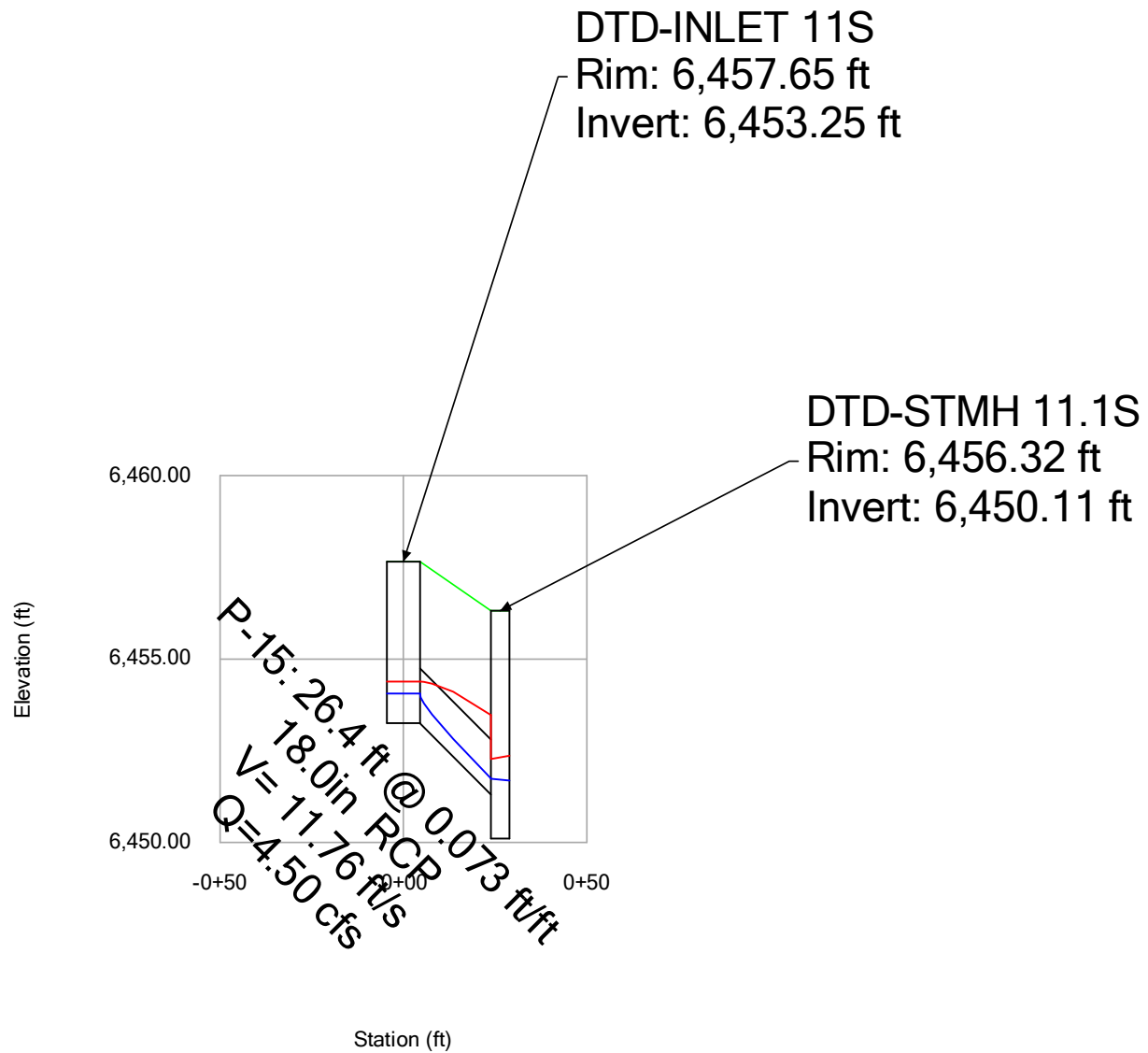
## Active Scenario: 5-YR



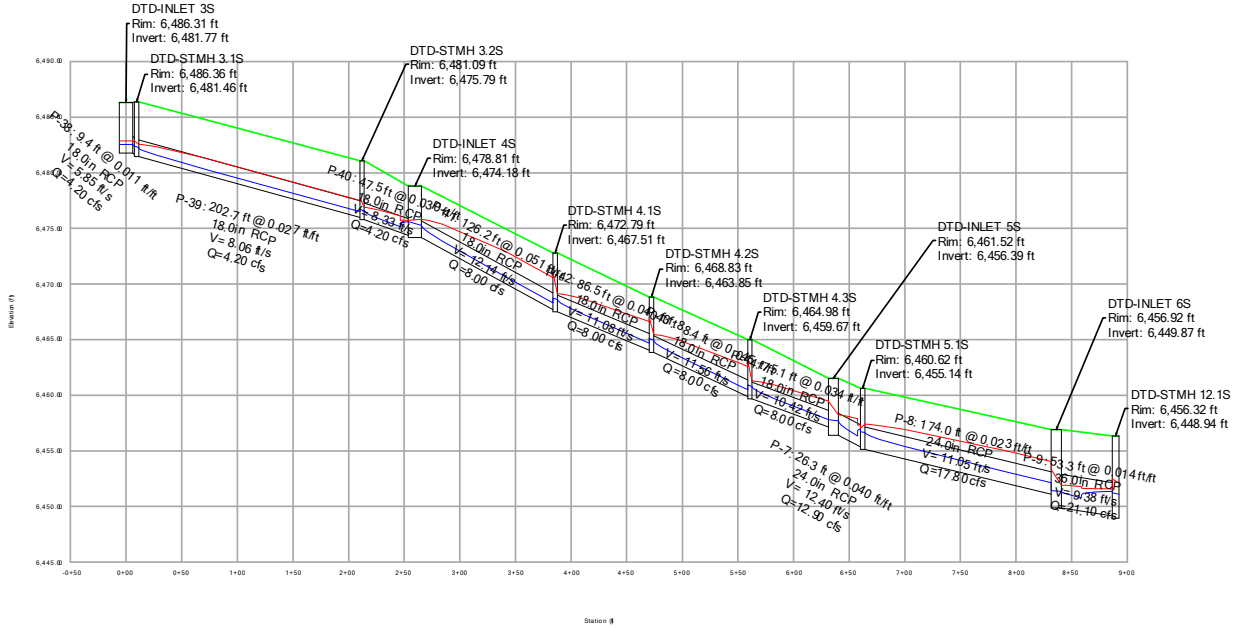
## Active Scenario: 5-YR



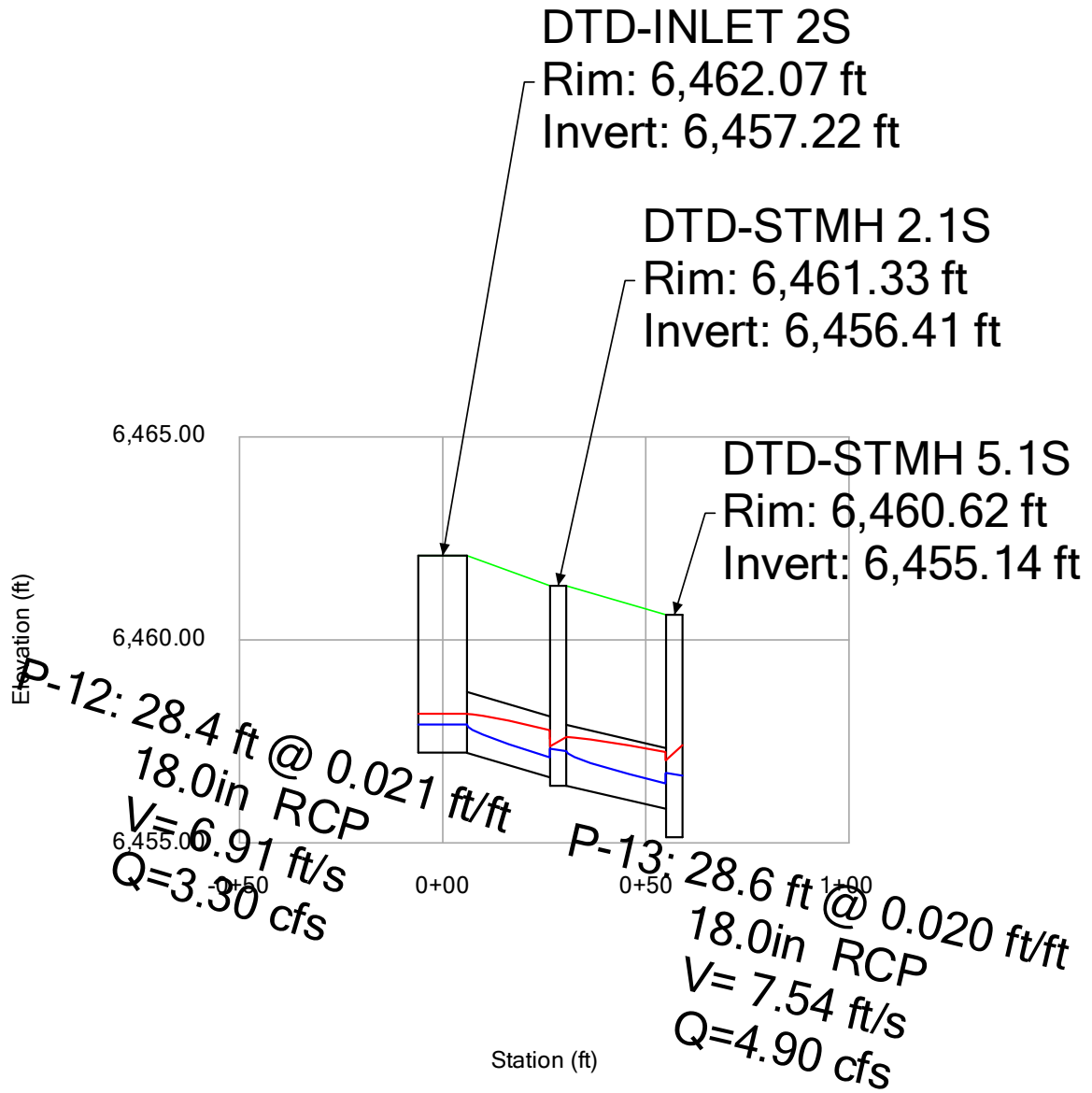
**Active Scenario: 5-YR**



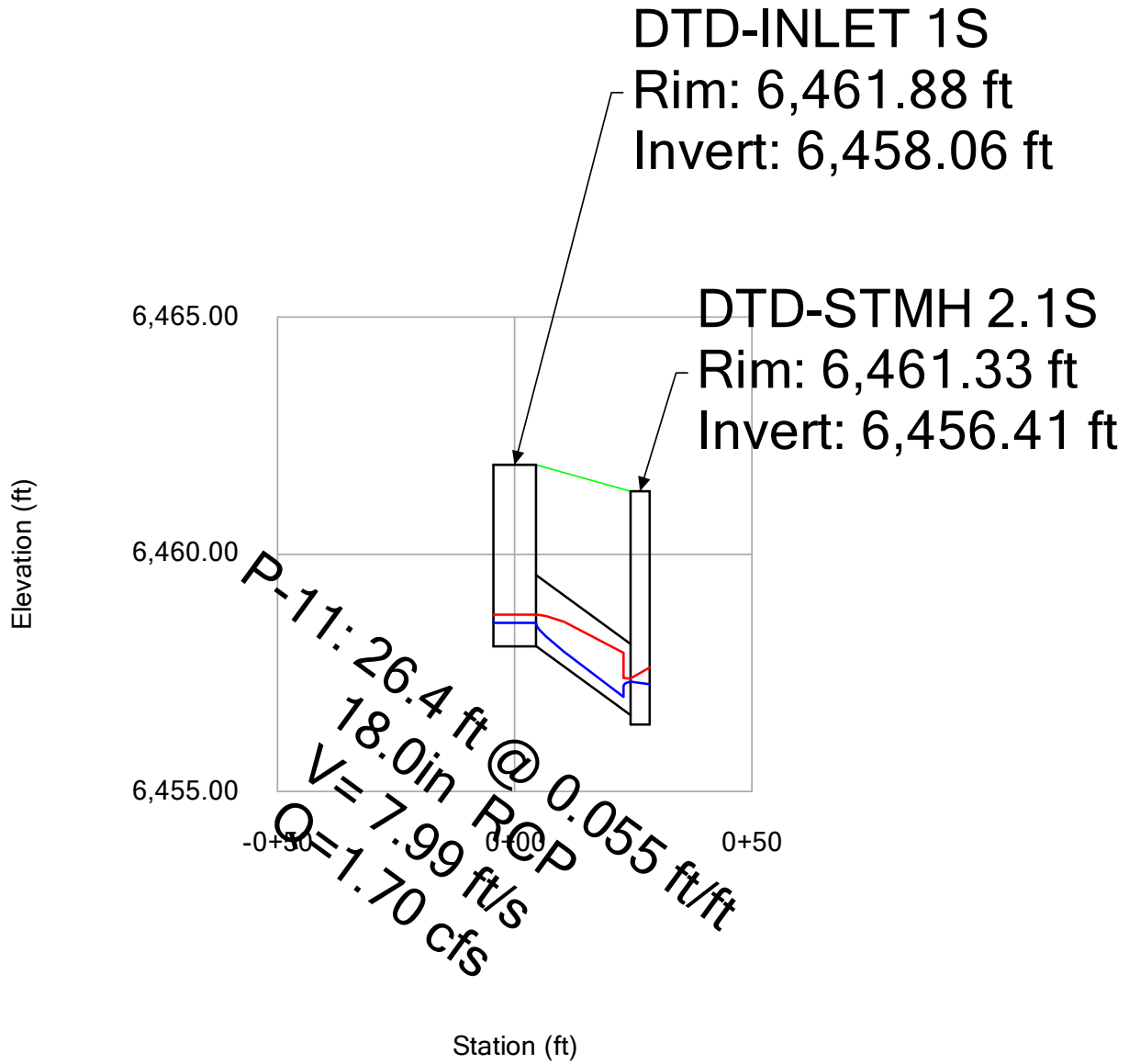
## Active Scenario: 5-YR



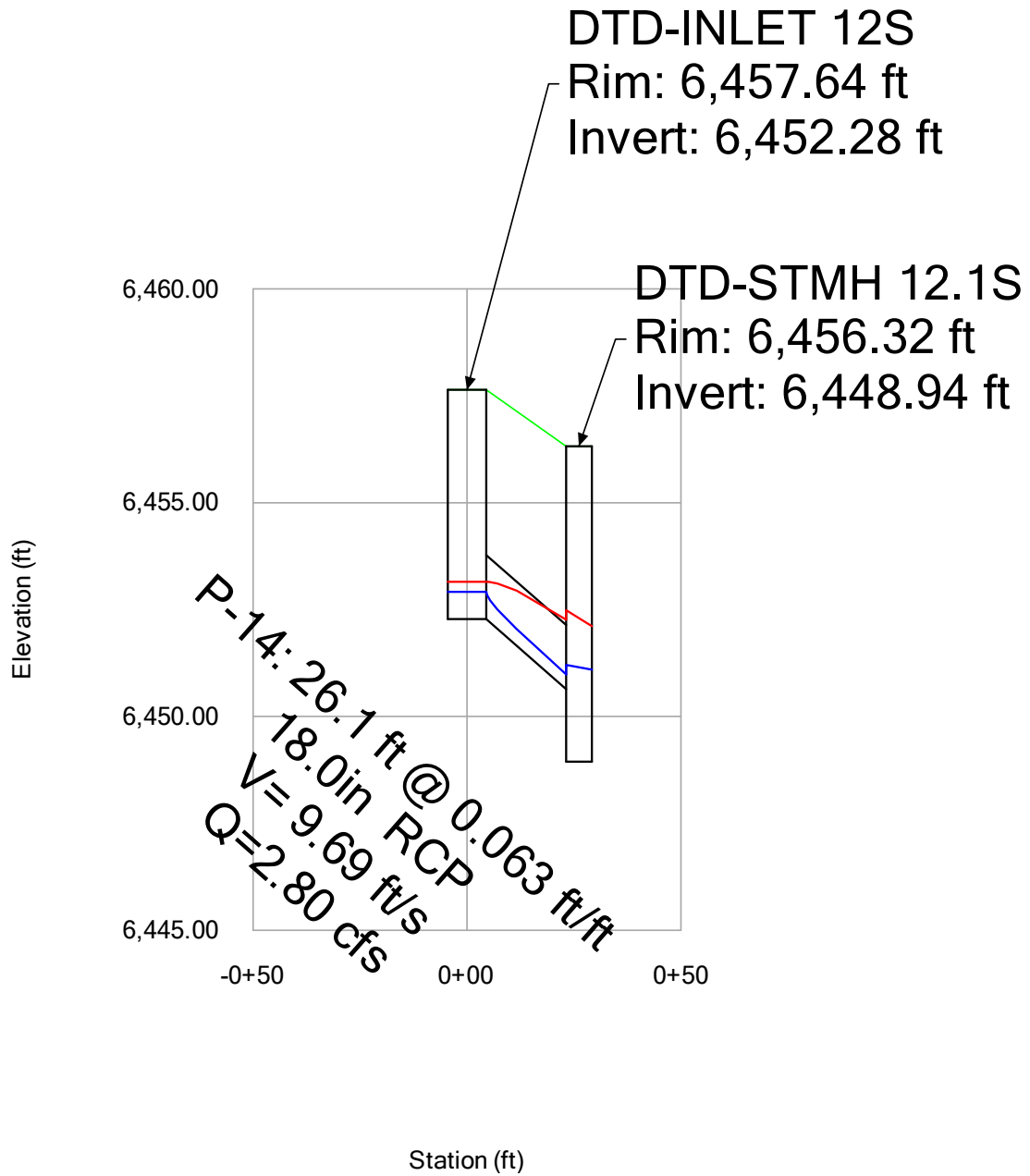
# Active Scenario: 5-YR



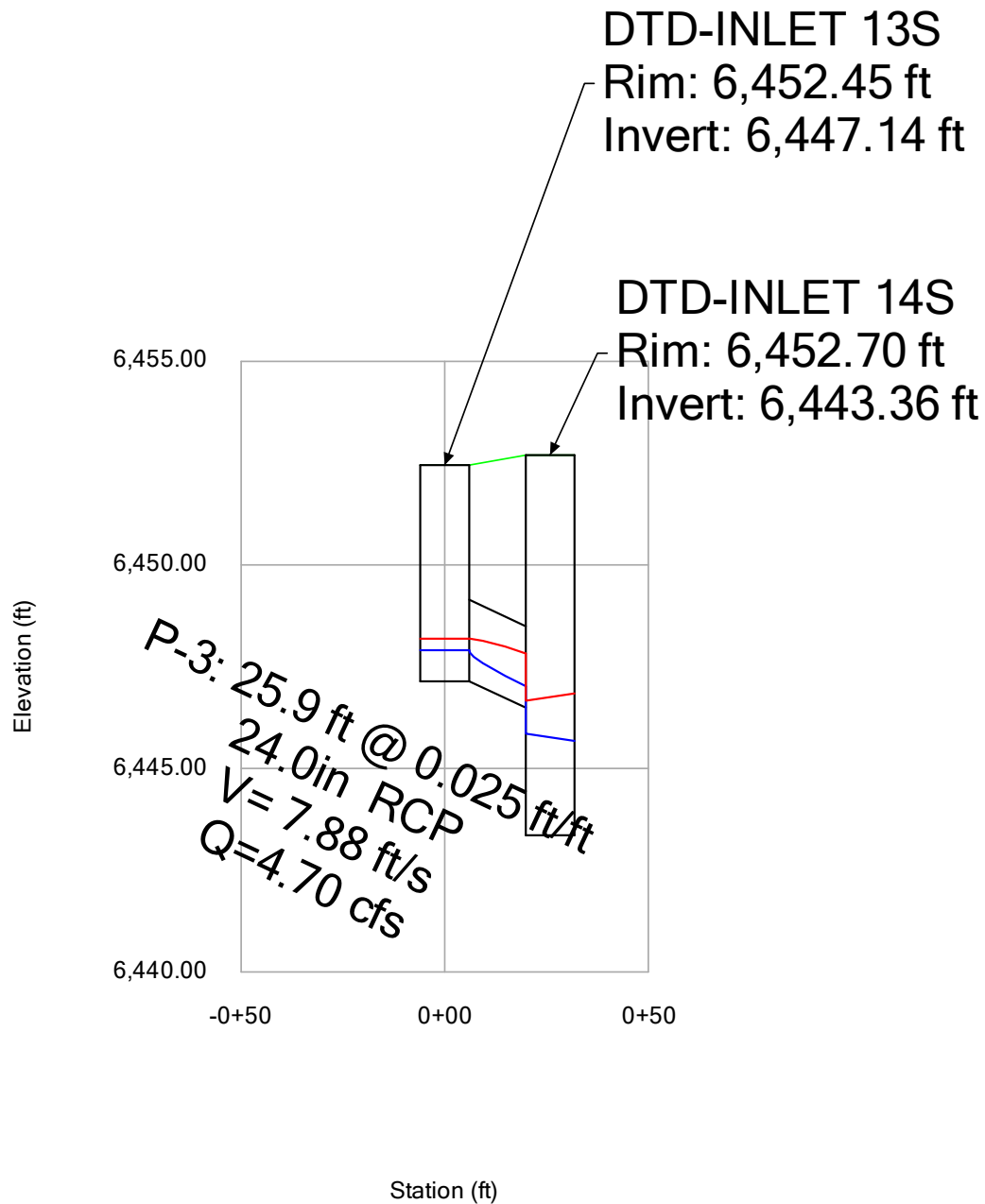
**Active Scenario: 5-YR**



**Active Scenario: 5-YR**



**Active Scenario: 5-YR**



## DP 8N Concrete Channel

|                       |                     |
|-----------------------|---------------------|
| Project Description   |                     |
| Friction Method       | Manning Formula     |
| Solve For             | Normal Depth        |
| Input Data            |                     |
| Roughness Coefficient | 0.013               |
| Channel Slope         | 0.50 %              |
| Left Side Slope       | 4.000 H:V           |
| Right Side Slope      | 4.000 H:V           |
| Bottom Width          | 2.00 ft             |
| Discharge             | 8.30 cfs            |
| Results               |                     |
| Normal Depth          | 0.5 ft              |
| Flow Area             | 2.1 ft <sup>2</sup> |
| Wetted Perimeter      | 6.3 ft              |
| Hydraulic Radius      | 0.3 ft              |
| Top Width             | 6.16 ft             |
| Critical Depth        | 0.6 ft              |
| Critical Slope        | 0.35 %              |
| Velocity              | 3.92 ft/s           |
| Velocity Head         | 0.24 ft             |
| Specific Energy       | 0.76 ft             |
| Froude Number         | 1.177               |
| Flow Type             | Supercritical       |
| GVF Input Data        |                     |
| Downstream Depth      | 0.0 ft              |
| Length                | 0.0 ft              |
| Number Of Steps       | 0                   |
| GVF Output Data       |                     |
| Upstream Depth        | 0.0 ft              |
| Profile Description   | N/A                 |
| Profile Headloss      | 0.00 ft             |
| Downstream Velocity   | Infinity ft/s       |
| Upstream Velocity     | Infinity ft/s       |
| Normal Depth          | 0.5 ft              |
| Critical Depth        | 0.6 ft              |
| Channel Slope         | 0.50 %              |
| Critical Slope        | 0.35 %              |

## DP 1N Concrete Channel

|                       |                     |
|-----------------------|---------------------|
| Project Description   |                     |
| Friction Method       | Manning Formula     |
| Solve For             | Normal Depth        |
| Input Data            |                     |
| Roughness Coefficient | 0.013               |
| Channel Slope         | 0.50 %              |
| Left Side Slope       | 4.000 H:V           |
| Right Side Slope      | 4.000 H:V           |
| Bottom Width          | 2.00 ft             |
| Discharge             | 36.00 cfs           |
| Results               |                     |
| Normal Depth          | 1.0 ft              |
| Flow Area             | 6.3 ft <sup>2</sup> |
| Wetted Perimeter      | 10.5 ft             |
| Hydraulic Radius      | 0.6 ft              |
| Top Width             | 10.21 ft            |
| Critical Depth        | 1.2 ft              |
| Critical Slope        | 0.29 %              |
| Velocity              | 5.74 ft/s           |
| Velocity Head         | 0.51 ft             |
| Specific Energy       | 1.54 ft             |
| Froude Number         | 1.292               |
| Flow Type             | Supercritical       |
| GVF Input Data        |                     |
| Downstream Depth      | 0.0 ft              |
| Length                | 0.0 ft              |
| Number Of Steps       | 0                   |
| GVF Output Data       |                     |
| Upstream Depth        | 0.0 ft              |
| Profile Description   | N/A                 |
| Profile Headloss      | 0.00 ft             |
| Downstream Velocity   | Infinity ft/s       |
| Upstream Velocity     | Infinity ft/s       |
| Normal Depth          | 1.0 ft              |
| Critical Depth        | 1.2 ft              |
| Channel Slope         | 0.50 %              |
| Critical Slope        | 0.29 %              |

**DRAINAGE REPORT**  
**for**  
**DAWSON TRAILS - TRACT O AND H**

**APPENDIX C**  
Water Quality Enhancement Control Measures



## Summary of Water Quality Conformance to MS4 Permit

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

**Project Name** Dawson Trails - Tract D

**Project Owner** Westside Investment Partners

**Project Location** W 1/2 Section 27, E 1/2 Section 28, T 8S, R 67W, 6th PM

**ToCR Project Number** SDP23-0040

**Total Site Area** 56 **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

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

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

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

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

**DRAINAGE REPORT**  
**for**  
**DAWSON TRAILS - TRACT O AND H**

**APPENDIX D**  
Referenced Information

# PHASE III DRAINAGE REPORT FOR

DAWSON TRAILS FILING NO. 2  
TOWN OF CASTLE ROCK, COLORADO  
PROJECT NO. CD23-0045

**Prepared for:**

ACM Dawson Trails JV LLC  
4100 Mississippi Ave, Ste 500  
Glendale, CO 80246  
Contact: Lawrence Jacobson  
Phone: 303-984-9800

**Prepared by:**

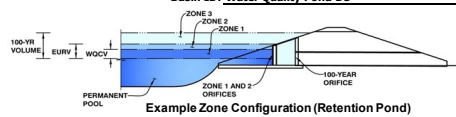


EMK Consultants, Inc.  
7006 S. Alton Way, Bldg F  
Centennial, CO 80112  
Contact: Eric R. McDaniel  
Phone: 303-694-1520  
EMK Job No 13466

December 16, 2024

MHFD-Detention, Version 4.06 (July 2022)

**Basin ID:** Water Quality Pond D3



### Example Zone Configuration (Retention Pond)

|                                                |            |         |
|------------------------------------------------|------------|---------|
| Selected BMP Type =                            | <b>EDB</b> |         |
| Watershed Area =                               | 91.71      | acres   |
| Watershed Length =                             | 2,070      | feet    |
| Watershed Length to Centroid =                 | 1,126      | feet    |
| Watershed Slope =                              | 0.040      | ft/ft   |
| Watershed Imperviousness =                     | 38.30%     | percent |
| Percentage Hydrologic Soil Group A =           | 0.0%       | percent |
| Percentage Hydrologic Soil Group B =           | 0.0%       | percent |
| Percentage Hydrologic Soil Groups C/D =        | 100.0%     | percent |
| Target WQCV Drain Time =                       | 40.0       | hours   |
| Location for 1-hr Rainfall Depths = User Input |            |         |

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

|                                                    |        |           |
|----------------------------------------------------|--------|-----------|
| Water Quality Capture Volume (WQCV) =              | 1,340  | acre-feet |
| Excess Urban Runoff Volume (EURV) =                | 3,253  | acre-feet |
| 2-yr Runoff Volume ( $P1 = 1.06 \text{ in.}$ ) =   | 3,258  | acre-feet |
| 5-yr Runoff Volume ( $P1 = 1.43 \text{ in.}$ ) =   | 5,706  | acre-feet |
| 10-yr Runoff Volume ( $P1 = 1.66 \text{ in.}$ ) =  | 7,391  | acre-feet |
| 25-yr Runoff Volume ( $P1 = 1.69 \text{ in.}$ ) =  | 7,967  | acre-feet |
| 50-yr Runoff Volume ( $P1 = 2.26 \text{ in.}$ ) =  | 12,385 | acre-feet |
| 100-yr Runoff Volume ( $P1 = 2.26 \text{ in.}$ ) = | 15,417 | acre-feet |
| 500-yr Runoff Volume ( $P1 = 3.14 \text{ in.}$ ) = | 19,726 | acre-feet |
| Approximate 2-yr Detention Volume =                | 2,521  | acre-feet |
| Approximate 5-yr Detention Volume =                | 4,257  | acre-feet |
| Approximate 10-yr Detention Volume =               | 4,854  | acre-feet |
| Approximate 25-yr Detention Volume =               | 4,768  | acre-feet |
| Approximate 50-yr Detention Volume =               | 5,905  | acre-feet |
| Approximate 100-yr Detention Volume =              | 7,178  | acre-feet |

|                                                          |       |                 |
|----------------------------------------------------------|-------|-----------------|
| Zone 1 Volume (WQCV) =                                   | 1.340 | acre-feet       |
| Zone 2 Volume (EURV - Zone 1) =                          | 1.913 | acre-feet       |
| Select Zone 3 Storage Volume (Optional) =                |       | acre-feet       |
| Total Detention Basin Volume =                           | 3.253 | acre-feet       |
| Initial Surge Volume (ISV) =                             | user  | ft <sup>3</sup> |
| Initial Surge Depth (ISD) =                              | user  | ft              |
| Total Available Detention Depth ( $H_{\text{total}}$ ) = | user  | ft              |
| Depth of Trickle Channel ( $H_{TC}$ ) =                  | user  | ft              |
| Slope of Trickle Channel ( $S_{TC}$ ) =                  | user  | ft/ft           |
| Slopes of Main Basin Sides ( $S_{\text{main}}$ ) =       | user  | H:V             |
| Basin Length-to-Width Ratio ( $R_{LW}$ ) =               | user  |                 |

### Optional User Overrides

|      |           |
|------|-----------|
|      | acre-feet |
|      | acre-feet |
| 1.06 | inches    |
| 1.43 | inches    |
| 1.66 | inches    |
|      | inches    |
| 2.26 | inches    |
| 2.60 | inches    |
|      | inches    |

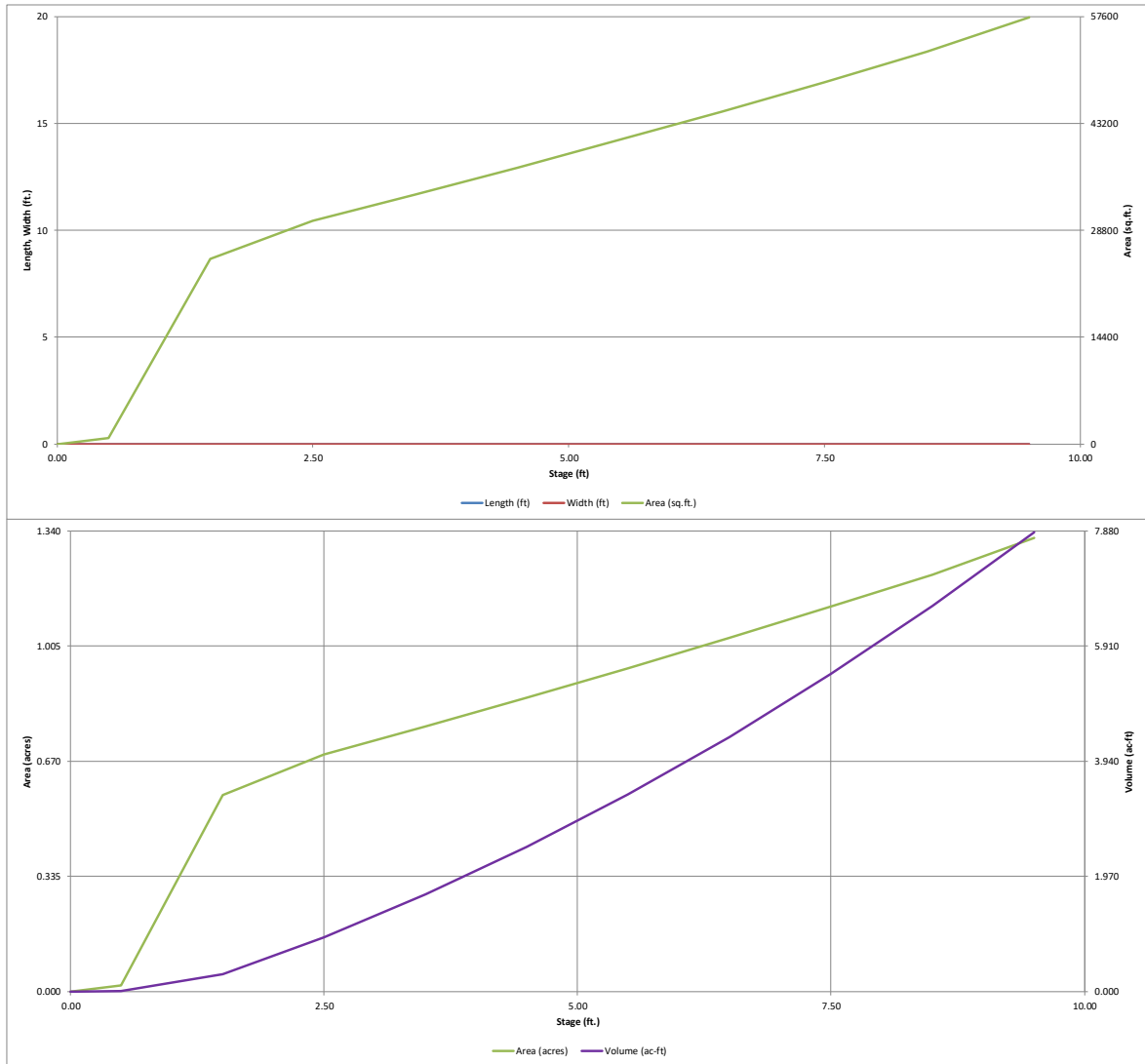
**Total detention volume is less than 100-year volume.**

|                                             |   |      |                 |
|---------------------------------------------|---|------|-----------------|
| Initial Surcharge Area ( $A_{SV}$ )         | = | user | ft <sup>2</sup> |
| Surcharge Volume Length ( $L_{SV}$ )        | = | user | ft              |
| Surcharge Volume Width ( $W_{SV}$ )         | = | user | ft              |
| Depth of Basin Floor ( $H_{1,LOC}$ )        | = | user | ft              |
| Length of Basin Floor ( $L_{1,LOC}$ )       | = | user | ft              |
| Width of Basin Floor ( $W_{1,LOC}$ )        | = | user | ft              |
| Area of Basin Floor ( $A_{1,LOC}$ )         | = | user | ft <sup>2</sup> |
| Volume of Basin Floor ( $V_{1,LOC}$ )       | = | user | ft <sup>3</sup> |
| Depth of Main Basin ( $H_{MB}$ )            | = | user | ft              |
| Length of Main Basin ( $L_{MB}$ )           | = | user | ft              |
| Width of Main Basin ( $W_{MB}$ )            | = | user | ft              |
| Area of Main Basin ( $A_{MB}$ )             | = | user | ft <sup>2</sup> |
| Volume of Main Basin ( $V_{MB}$ )           | = | user | ft <sup>3</sup> |
| Calculated Total Basin Volume ( $V_{TMB}$ ) | = | user | acre-feet       |

|            |                             |            |                              |             |            |                         |                                           |             |                           |                |
|------------|-----------------------------|------------|------------------------------|-------------|------------|-------------------------|-------------------------------------------|-------------|---------------------------|----------------|
| 6425.5     | Depth Increment =           | 1.00       | ft                           |             |            |                         |                                           |             |                           |                |
|            | Stage - Storage Description | Stage (ft) | Optional Override Stage (ft) | Length (ft) | Width (ft) | Area (ft <sup>2</sup> ) | Optional Override Area (ft <sup>2</sup> ) | Area (acre) | Volume (ft <sup>3</sup> ) | Volume (ac-ft) |
|            | Top of Micropool            | --         | 0.00                         | --          | --         | --                      | 4                                         | 0.000       |                           |                |
|            | 6418                        | --         | 0.50                         | --          | --         | --                      | 763                                       | 0.018       | 192                       | 0.004          |
|            | 6419                        | --         | 1.50                         | --          | --         | --                      | 24,918                                    | 0.572       | 13,032                    | 0.299          |
|            | 6420                        | --         | 2.50                         | --          | --         | --                      | 30,062                                    | 0.690       | 40,522                    | 0.930          |
|            | 6421                        | --         | 3.50                         | --          | --         | --                      | 33,591                                    | 0.771       | 72,348                    | 1.661          |
|            | 6422                        | --         | 4.50                         | --          | --         | --                      | 37,229                                    | 0.855       | 107,758                   | 2.474          |
|            | 6423                        | --         | 5.50                         | --          | --         | --                      | 40,973                                    | 0.941       | 146,859                   | 3.371          |
|            | 6424                        | --         | 6.50                         | --          | --         | --                      | 44,824                                    | 1.029       | 189,758                   | 4.356          |
| overrides  | 6425                        | --         | 7.50                         | --          | --         | --                      | 48,782                                    | 1.120       | 236,561                   | 5.431          |
|            | 6426                        | --         | 8.50                         | --          | --         | --                      | 52,847                                    | 1.213       | 287,375                   | 6.597          |
|            | 6427                        | --         | 9.50                         | --          | --         | --                      | 57,522                                    | 1.321       | 342,560                   | 7.864          |
|            |                             | --         |                              | --          | --         | --                      |                                           |             |                           |                |
|            |                             | --         |                              | --          | --         | --                      |                                           |             |                           |                |
|            |                             | --         |                              | --          | --         | --                      |                                           |             |                           |                |
|            | re-feet                     | --         |                              | --          | --         | --                      |                                           |             |                           |                |
|            | re-feet                     | --         |                              | --          | --         | --                      |                                           |             |                           |                |
|            | thes                        | --         |                              | --          | --         | --                      |                                           |             |                           |                |
|            | thes                        | --         |                              | --          | --         | --                      |                                           |             |                           |                |
| n than me. | thes                        | --         |                              | --          | --         | --                      |                                           |             |                           |                |
|            | thes                        | --         |                              | --          | --         | --                      |                                           |             |                           |                |
|            | thes                        | --         |                              | --          | --         | --                      |                                           |             |                           |                |
|            | thes                        | --         |                              | --          | --         | --                      |                                           |             |                           |                |
|            | thes                        | --         |                              | --          | --         | --                      |                                           |             |                           |                |
|            | thes                        | --         |                              | --          | --         | --                      |                                           |             |                           |                |
|            | thes                        | --         |                              | --          | --         | --                      |                                           |             |                           |                |
|            |                             | --         |                              | --          | --         | --                      |                                           |             |                           |                |
|            |                             | --         |                              | --          | --         | --                      |                                           |             |                           |                |
|            |                             | --         |                              | --          | --         | --                      |                                           |             |                           |                |
|            |                             | --         |                              | --          | --         | --                      |                                           |             |                           |                |
|            |                             | --         |                              | --          | --         | --                      |                                           |             |                           |                |
|            |                             | --         |                              | --          | --         | --                      |                                           |             |                           |                |
|            |                             | --         |                              | --          | --         | --                      |                                           |             |                           |                |
|            |                             | --         |                              | --          | --         | --                      |                                           |             |                           |                |
|            |                             | --         |                              | --          | --         | --                      |                                           |             |                           |                |
|            |                             | --         |                              | --          | --         | --                      |                                           |             |                           |                |
|            |                             | --         |                              | --          | --         | --                      |                                           |             |                           |                |
|            |                             | --         |                              | --          | --         | --                      |                                           |             |                           |                |
|            |                             | --         |                              | --          | --         | --                      |                                           |             |                           |                |
|            |                             | --         |                              | --          | --         | --                      |                                           |             |                           |                |
|            |                             | --         |                              | --          | --         | --                      |                                           |             |                           |                |
|            |                             | --         |                              | --          | --         | --                      |                                           |             |                           |                |
|            |                             | --         |                              | --          | --         | --                      |                                           |             |                           |                |
|            |                             | --         |                              | --          | --         | --                      |                                           |             |                           |                |
|            |                             | --         |                              | --          | --         | --                      |                                           |             |                           |                |
|            |                             | --         |                              | --          | --         | --                      |                                           |             |                           |                |
|            |                             | --         |                              | --          | --         | --                      |                                           |             |                           |                |
|            |                             | --         |                              | --          | --         | --                      |                                           |             |                           |                |
|            |                             | --         |                              | --          | --         | --                      |                                           |             |                           |                |
|            |                             | --         |                              | --          | --         | --                      |                                           |             |                           |                |
|            |                             | --         |                              | --          | --         | --                      |                                           |             |                           |                |
|            |                             | --         |                              | --          | --         | --                      |                                           |             |                           |                |
|            |                             | --         |                              | --          | --         | --                      |                                           |             |                           |                |
|            |                             | --         |                              | --          | --         | --                      |                                           |             |                           |                |
|            |                             | --         |                              | --          | --         | --                      |                                           |             |                           |                |
|            |                             | --         |                              | --          | --         | --                      |                                           |             |                           |                |
|            |                             | --         |                              | --          | --         | --                      |                                           |             |                           |                |
|            |                             | --         |                              | --          | --         | --                      |                                           |             |                           |                |
|            |                             | --         |                              | --          | --         | --                      |                                           |             |                           |                |
|            |                             | --         |                              | --          | --         | --                      |                                           |             |                           |                |
|            |                             | --         |                              | --          | --         | --                      |                                           |             |                           |                |
|            |                             | --         |                              | --          | --         | --                      |                                           |             |                           |                |
|            |                             | --         |                              | --          | --         | --                      |                                           |             |                           |                |
|            |                             | --         |                              | --          | --         | --                      |                                           |             |                           |                |
|            |                             | --         |                              | --          | --         | --                      |                                           |             |                           |                |
|            |                             | --         |                              | --          | --         | --                      |                                           |             |                           |                |
|            |                             | --         |                              | --          | --         | --                      |                                           |             |                           |                |
|            |                             | --         |                              | --          | --         | --                      |                                           |             |                           |                |
|            |                             | --         |                              | --          | --         | --                      |                                           |             |                           |                |
|            |                             | --         |                              | --          | --         | --                      |                                           |             |                           |                |
|            |                             | --         |                              | --          | --         | --                      |                                           |             |                           |                |
|            |                             | --         |                              | --          | --         | --                      |                                           |             |                           |                |
|            |                             | --         |                              | --          | --         | --                      |                                           |             |                           |                |
|            |                             | --         |                              | --          | --         | --                      |                                           |             |                           |                |
|            |                             | --         |                              | --          | --         | --                      |                                           |             |                           |                |
|            |                             | --         |                              | --          | --         | --                      |                                           |             |                           |                |
|            |                             | --         |                              | --          | --         | --                      |                                           |             |                           |                |
|            |                             | --         |                              | --          | --         | --                      |                                           |             |                           |                |
|            |                             | --         |                              | --          | --         | --                      |                                           |             |                           |                |
|            |                             | --         |                              | --          | --         | --                      |                                           |             |                           |                |
|            |                             | --         |                              | --          | --         | --                      |                                           |             |                           |                |
|            |                             | --         |                              | --          | --         | --                      |                                           |             |                           |                |
|            |                             | --         |                              | --          | --         | --                      |                                           |             |                           |                |
|            |                             | --         |                              | --          | --         | --                      |                                           |             |                           |                |
|            |                             | --         |                              | --          | --         | --                      |                                           |             |                           |                |
|            |                             | --         |                              | --          | --         | --                      |                                           |             |                           |                |
|            |                             | --         |                              | --          | --         | --                      |                                           |             |                           |                |
|            |                             | --         |                              | --          | --         | --                      |                                           |             |                           |                |
|            |                             | --         |                              | --          | --         | --                      |                                           |             |                           |                |

# DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

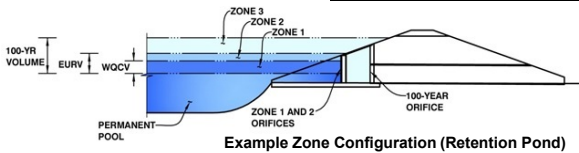


# DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: Dawson Trails INFRA-1

Basin ID: Water Quality Pond D3



Example Zone Configuration (Retention Pond)

|                   | Estimated Stage (ft) | Estimated Volume (ac-ft) | Outlet Type          |
|-------------------|----------------------|--------------------------|----------------------|
| Zone 1 (WQCV)     | 3.08                 | 1.340                    | Orifice Plate        |
| Zone 2 (EURV)     | 5.38                 | 1.913                    | Orifice Plate        |
| Zone 3            |                      |                          | Weir&Pipe (Circular) |
| Total (all zones) |                      | 3.253                    |                      |

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

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

Calculated Parameters for Underdrain

Underdrain Orifice Area =  ft<sup>2</sup>  
Underdrain Orifice Centroid =  feet

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

Calculated Parameters for Plate

Centroid of Lowest Orifice =  0.00 ft (relative to basin bottom at Stage = 0 ft)  
Depth at top of Zone using Orifice Plate =  5.38 ft (relative to basin bottom at Stage = 0 ft)  
Orifice Plate: Orifice Vertical Spacing =  24.00 inches  
Orifice Plate: Orifice Area per Row =  7.47 sq. inches (use rectangular openings)

WQ Orifice Area per Row =  5.188E-02 ft<sup>2</sup>  
Elliptical Half-Width =  N/A feet  
Elliptical Slot Centroid =  N/A feet  
Elliptical Slot Area =  N/A ft<sup>2</sup>

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

|                                | Row 1 (required) | Row 2 (optional) | Row 3 (optional) | Row 4 (optional) | Row 5 (optional) | Row 6 (optional) | Row 7 (optional) | Row 8 (optional) |
|--------------------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|
| Stage of Orifice Centroid (ft) | 0.00             | 2.00             | 4.00             |                  |                  |                  |                  |                  |
| Orifice Area (sq. inches)      | 7.47             | 7.47             | 7.47             |                  |                  |                  |                  |                  |

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

User Input: Vertical Orifice (Circular or Rectangular)

Calculated Parameters for Vertical Orifice

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

Vertical Orifice Area =  Not Selected  Not Selected ft<sup>2</sup>  
Vertical Orifice Centroid =  Not Selected  Not Selected feet

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

Calculated Parameters for Overflow Weir

|                                                   | Zone 3 Weir      | Not Selected |                                               | Zone 3 Weir      | Not Selected |
|---------------------------------------------------|------------------|--------------|-----------------------------------------------|------------------|--------------|
| Overflow Weir Front Edge Height, H <sub>o</sub> = | 5.40             | N/A          | ft (relative to basin bottom at Stage = 0 ft) | 5.40             | N/A          |
| Overflow Weir Front Edge Length =                 | 40.00            | N/A          | feet                                          | 40.00            | N/A          |
| Overflow Weir Grate Slope =                       | 0.00             | N/A          | H:V                                           | 0.00             | N/A          |
| Horiz. Length of Weir Sides =                     | 6.00             | N/A          | feet                                          | 6.00             | N/A          |
| Overflow Grate Type =                             | Close Mesh Grate | N/A          |                                               | Close Mesh Grate | N/A          |
| Debris Clogging % =                               | 50%              | N/A          | %                                             | 50%              | N/A          |

Height of Grate Upper Edge, H<sub>u</sub> =  5.40 feet  
Overflow Weir Slope Length =  6.00 feet  
Grate Open Area / 100-yr Orifice Area =  6.71  
Overflow Grate Open Area w/o Debris =  189.84 ft<sup>2</sup>  
Overflow Grate Open Area w/ Debris =  94.92 ft<sup>2</sup>

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

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

|                                  | Zone 3 Circular | Not Selected |                                                  | Zone 3 Circular | Not Selected |
|----------------------------------|-----------------|--------------|--------------------------------------------------|-----------------|--------------|
| Depth to Invert of Outlet Pipe = | 0.00            | N/A          | ft (distance below basin bottom at Stage = 0 ft) | 0.00            | N/A          |
| Circular Orifice Diameter =      | 72.00           | N/A          | inches                                           | 72.00           | N/A          |

Outlet Orifice Area =  28.27 ft<sup>2</sup>  
Outlet Orifice Centroid =  3.00 feet  
Half-Central Angle of Restrictor Plate on Pipe =  N/A radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Calculated Parameters for Spillway

Spillway Invert Stage =  6.90 ft (relative to basin bottom at Stage = 0 ft)  
Spillway Crest Length =  50.00 feet  
Spillway End Slopes =  4.00 H:V  
Freeboard above Max Water Surface =  1.00 feet

Spillway Design Flow Depth =  1.45 feet  
Stage at Top of Freeboard =  9.35 feet  
Basin Area at Top of Freeboard =  1.30 acres  
Basin Volume at Top of Freeboard =  7.67 acre-ft

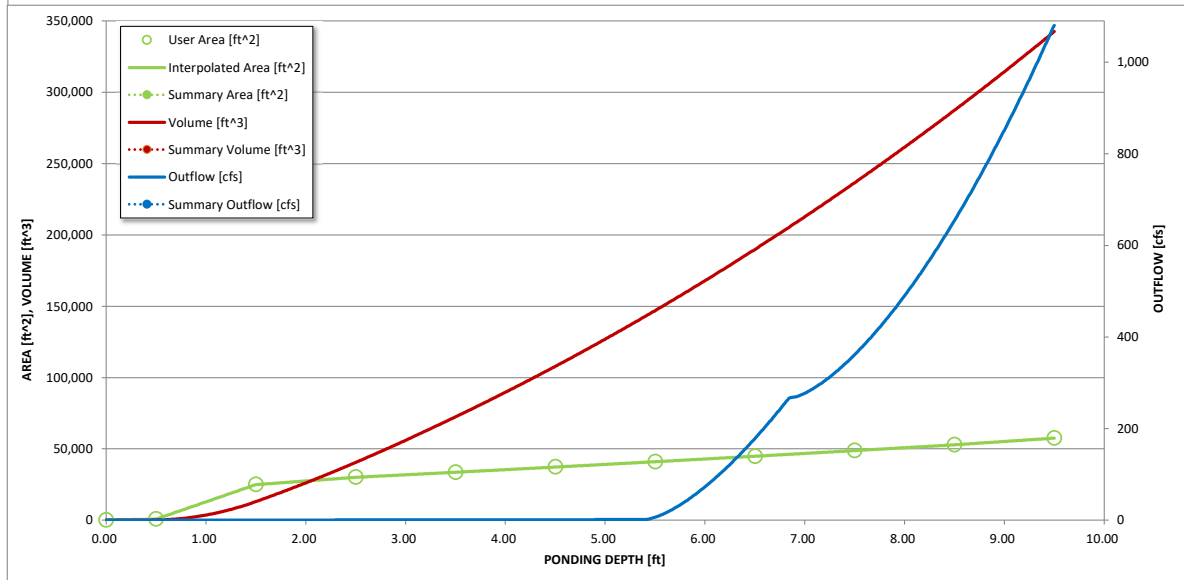
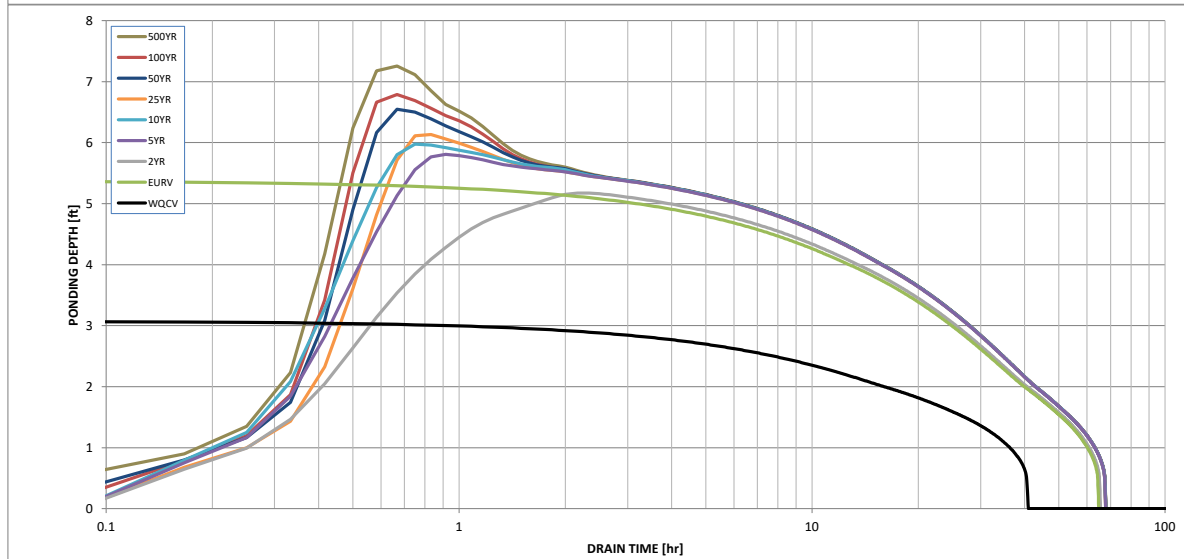
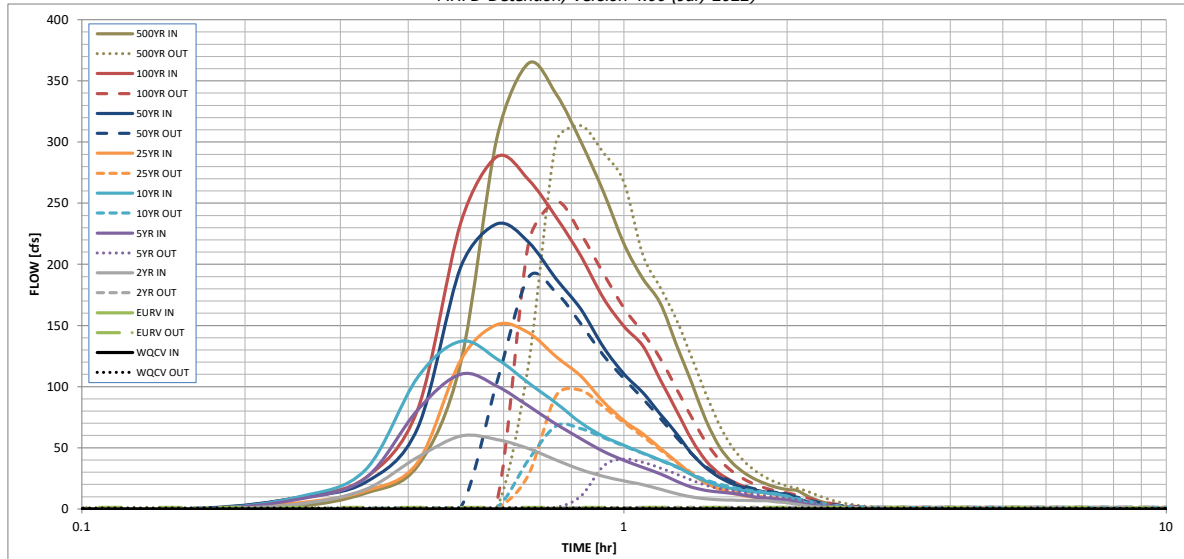
## Routed Hydrograph Results

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

|                                                 | WQCV  | EURV  | 2 Year | 5 Year          | 10 Year         | 25 Year         | 50 Year         | 100 Year        | 500 Year |
|-------------------------------------------------|-------|-------|--------|-----------------|-----------------|-----------------|-----------------|-----------------|----------|
| Design Storm Return Period =                    | N/A   | N/A   | 1.06   | 1.43            | 1.66            | 1.69            | 2.26            | 2.60            | 3.14     |
| One-Hour Rainfall Depth (in) =                  | N/A   | N/A   | 1.06   | 1.43            | 1.66            | 1.69            | 2.26            | 2.60            | 3.14     |
| CUHP Runoff Volume (acre-ft) =                  | 1.340 | 3.253 | 3.258  | 5.706           | 7.391           | 7.967           | 12.385          | 15.417          | 19.726   |
| Inflow Hydrograph Volume (acre-ft) =            | N/A   | N/A   | 3.258  | 5.706           | 7.391           | 7.967           | 12.385          | 15.417          | 19.726   |
| CUHP Predevelopment Peak Q (cfs) =              | N/A   | N/A   | 12.9   | 47.5            | 66.3            | 82.1            | 142.5           | 182.2           | 239.0    |
| OPTIONAL Override Predevelopment Peak Q (cfs) = | N/A   | N/A   |        |                 |                 |                 |                 |                 |          |
| Predevelopment Unit Peak Flow, q (cfs/acre) =   | N/A   | N/A   | 0.14   | 0.52            | 0.72            | 0.90            | 1.55            | 1.99            | 2.61     |
| Peak Inflow Q (cfs) =                           | N/A   | N/A   | 59.5   | 110.2           | 137.1           | 150.6           | 233.1           | 287.9           | 364.5    |
| Peak Outflow Q (cfs) =                          | 0.7   | 1.3   | 1.3    | 40.7            | 67.8            | 96.9            | 189.4           | 251.3           | 313.4    |
| Ratio Peak Outflow to Predevelopment Q =        | N/A   | N/A   | N/A    | 0.9             | 1.0             | 1.2             | 1.3             | 1.4             | 1.3      |
| Structure Controlling Flow =                    | Plate | Plate | Plate  | Overflow Weir 1 | Overflow Weir 1 | Overflow Weir 1 | Overflow Weir 1 | Overflow Weir 1 | Spillway |
| Max Velocity through Grate 1 (fps) =            | N/A   | N/A   | N/A    | 0.2             | 0.3             | 0.5             | 1.0             | 1.3             | 1.5      |
| Max Velocity through Grate 2 (fps) =            | N/A   | N/A   | N/A    | N/A             | N/A             | N/A             | N/A             | N/A             | N/A      |
| Time to Drain 97% of Inflow Volume (hours) =    | 39    | 60    | 60     | 59              | 57              | 56              | 51              | 48              | 43       |
| Time to Drain 99% of Inflow Volume (hours) =    | 40    | 63    | 64     | 65              | 64              | 63              | 61              | 60              | 58       |
| Maximum Ponding Depth (ft) =                    | 3.08  | 5.38  | 5.17   | 5.80            | 5.97            | 6.13            | 6.55            | 6.79            | 7.26     |
| Area at Maximum Ponding Depth (acres) =         | 0.74  | 0.93  | 0.91   | 0.97            | 0.98            | 1.00            | 1.03            | 1.05            | 1.10     |
| Maximum Volume Stored (acre-ft) =               | 1.344 | 3.259 | 3.066  | 3.658           | 3.823           | 3.982           | 4.397           | 4.648           | 5.154    |

# DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)



| S-A-V-D Chart Axis Override | X-axis | Left Y-Axis | Right Y-Axis |
|-----------------------------|--------|-------------|--------------|
| minimum bound               |        |             |              |
| maximum bound               |        |             |              |

# DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename: \_\_\_\_\_

## Inflow Hydrographs

The user can override the calculated inflow hydrographs from this workbook with inflow hydrographs developed in a separate program.

|               | SOURCE  | CUHP       | CUHP       | CUHP         | CUHP         | CUHP          | CUHP          | CUHP          | CUHP           | CUHP           |
|---------------|---------|------------|------------|--------------|--------------|---------------|---------------|---------------|----------------|----------------|
| Time Interval | TIME    | WQCV [cfs] | EURV [cfs] | 2 Year [cfs] | 5 Year [cfs] | 10 Year [cfs] | 25 Year [cfs] | 50 Year [cfs] | 100 Year [cfs] | 500 Year [cfs] |
| 5.00 min      | 0:00:00 | 0.00       | 0.00       | 0.00         | 0.00         | 0.00          | 0.00          | 0.00          | 0.00           | 0.00           |
|               | 0:05:00 | 0.00       | 0.00       | 0.00         | 0.00         | 0.00          | 0.00          | 0.00          | 0.00           | 0.00           |
|               | 0:10:00 | 0.00       | 0.00       | 0.00         | 0.00         | 0.00          | 0.00          | 0.64          | 0.30           | 1.93           |
|               | 0:15:00 | 0.00       | 0.00       | 3.85         | 7.83         | 9.72          | 4.88          | 9.06          | 9.28           | 12.69          |
|               | 0:20:00 | 0.00       | 0.00       | 15.97        | 25.07        | 31.73         | 14.57         | 21.76         | 25.33          | 35.23          |
|               | 0:25:00 | 0.00       | 0.00       | 42.44        | 81.14        | 107.75        | 38.11         | 66.46         | 81.62          | 119.58         |
|               | 0:30:00 | 0.00       | 0.00       | 59.47        | 110.20       | 137.06        | 121.67        | 197.67        | 233.78         | 303.18         |
|               | 0:35:00 | 0.00       | 0.00       | 56.83        | 100.42       | 122.70        | 150.56        | 233.09        | 287.93         | 364.50         |
|               | 0:40:00 | 0.00       | 0.00       | 49.28        | 84.07        | 102.96        | 144.02        | 218.11        | 269.24         | 339.20         |
|               | 0:45:00 | 0.00       | 0.00       | 39.90        | 69.37        | 86.56         | 124.48        | 187.97        | 238.64         | 300.12         |
|               | 0:50:00 | 0.00       | 0.00       | 32.08        | 57.31        | 70.32         | 108.45        | 163.09        | 206.56         | 259.25         |
|               | 0:55:00 | 0.00       | 0.00       | 26.55        | 46.98        | 59.28         | 87.50         | 132.22        | 172.35         | 216.88         |
|               | 1:00:00 | 0.00       | 0.00       | 22.84        | 39.73        | 52.01         | 72.13         | 110.47        | 149.34         | 188.46         |
|               | 1:05:00 | 0.00       | 0.00       | 19.87        | 33.91        | 45.80         | 61.47         | 95.06         | 133.30         | 168.35         |
|               | 1:10:00 | 0.00       | 0.00       | 16.02        | 28.63        | 39.93         | 49.57         | 77.68         | 105.84         | 134.29         |
|               | 1:15:00 | 0.00       | 0.00       | 12.47        | 22.78        | 34.62         | 38.75         | 61.70         | 80.57          | 102.97         |
|               | 1:20:00 | 0.00       | 0.00       | 9.80         | 17.85        | 28.04         | 28.58         | 45.31         | 56.59          | 72.55          |
|               | 1:25:00 | 0.00       | 0.00       | 8.27         | 15.14        | 22.61         | 21.15         | 33.69         | 39.45          | 50.97          |
|               | 1:30:00 | 0.00       | 0.00       | 7.52         | 13.73        | 19.05         | 16.06         | 25.80         | 29.02          | 37.75          |
|               | 1:35:00 | 0.00       | 0.00       | 7.14         | 12.84        | 16.63         | 12.85         | 20.69         | 22.68          | 29.60          |
|               | 1:40:00 | 0.00       | 0.00       | 6.93         | 11.14        | 14.92         | 10.78         | 17.29         | 18.32          | 23.97          |
|               | 1:45:00 | 0.00       | 0.00       | 6.76         | 9.74         | 13.77         | 9.45          | 15.11         | 15.41          | 20.22          |
|               | 1:50:00 | 0.00       | 0.00       | 6.64         | 8.76         | 12.93         | 8.58          | 13.63         | 13.36          | 17.56          |
|               | 1:55:00 | 0.00       | 0.00       | 5.78         | 8.04         | 11.85         | 8.00          | 12.62         | 12.04          | 15.83          |
|               | 2:00:00 | 0.00       | 0.00       | 5.03         | 7.30         | 10.27         | 7.65          | 11.99         | 11.43          | 15.01          |
|               | 2:05:00 | 0.00       | 0.00       | 3.75         | 5.41         | 7.43          | 5.70          | 8.86          | 8.47           | 11.09          |
|               | 2:10:00 | 0.00       | 0.00       | 2.65         | 3.78         | 5.15          | 3.96          | 6.13          | 5.90           | 7.71           |
|               | 2:15:00 | 0.00       | 0.00       | 1.86         | 2.63         | 3.60          | 2.78          | 4.29          | 4.16           | 5.43           |
|               | 2:20:00 | 0.00       | 0.00       | 1.30         | 1.78         | 2.49          | 1.92          | 2.96          | 2.88           | 3.75           |
|               | 2:25:00 | 0.00       | 0.00       | 0.87         | 1.17         | 1.68          | 1.30          | 1.99          | 1.93           | 2.51           |
|               | 2:30:00 | 0.00       | 0.00       | 0.57         | 0.77         | 1.11          | 0.88          | 1.35          | 1.31           | 1.70           |
|               | 2:35:00 | 0.00       | 0.00       | 0.34         | 0.49         | 0.68          | 0.57          | 0.86          | 0.83           | 1.07           |
|               | 2:40:00 | 0.00       | 0.00       | 0.18         | 0.28         | 0.36          | 0.32          | 0.48          | 0.46           | 0.59           |
|               | 2:45:00 | 0.00       | 0.00       | 0.07         | 0.12         | 0.15          | 0.14          | 0.21          | 0.20           | 0.25           |
|               | 2:50:00 | 0.00       | 0.00       | 0.02         | 0.03         | 0.03          | 0.04          | 0.05          | 0.04           | 0.05           |
|               | 2:55:00 | 0.00       | 0.00       | 0.00         | 0.00         | 0.00          | 0.00          | 0.00          | 0.00           | 0.00           |
|               | 3:00:00 | 0.00       | 0.00       | 0.00         | 0.00         | 0.00          | 0.00          | 0.00          | 0.00           | 0.00           |
|               | 3:05:00 | 0.00       | 0.00       | 0.00         | 0.00         | 0.00          | 0.00          | 0.00          | 0.00           | 0.00           |
|               | 3:10:00 | 0.00       | 0.00       | 0.00         | 0.00         | 0.00          | 0.00          | 0.00          | 0.00           | 0.00           |
|               | 3:15:00 | 0.00       | 0.00       | 0.00         | 0.00         | 0.00          | 0.00          | 0.00          | 0.00           | 0.00           |
|               | 3:20:00 | 0.00       | 0.00       | 0.00         | 0.00         | 0.00          | 0.00          | 0.00          | 0.00           | 0.00           |
|               | 3:25:00 | 0.00       | 0.00       | 0.00         | 0.00         | 0.00          | 0.00          | 0.00          | 0.00           | 0.00           |
|               | 3:30:00 | 0.00       | 0.00       | 0.00         | 0.00         | 0.00          | 0.00          | 0.00          | 0.00           | 0.00           |
|               | 3:35:00 | 0.00       | 0.00       | 0.00         | 0.00         | 0.00          | 0.00          | 0.00          | 0.00           | 0.00           |
|               | 3:40:00 | 0.00       | 0.00       | 0.00         | 0.00         | 0.00          | 0.00          | 0.00          | 0.00           | 0.00           |
|               | 3:45:00 | 0.00       | 0.00       | 0.00         | 0.00         | 0.00          | 0.00          | 0.00          | 0.00           | 0.00           |
|               | 3:50:00 | 0.00       | 0.00       | 0.00         | 0.00         | 0.00          | 0.00          | 0.00          | 0.00           | 0.00           |
|               | 3:55:00 | 0.00       | 0.00       | 0.00         | 0.00         | 0.00          | 0.00          | 0.00          | 0.00           | 0.00           |
|               | 4:00:00 | 0.00       | 0.00       | 0.00         | 0.00         | 0.00          | 0.00          | 0.00          | 0.00           | 0.00           |
|               | 4:05:00 | 0.00       | 0.00       | 0.00         | 0.00         | 0.00          | 0.00          | 0.00          | 0.00           | 0.00           |
|               | 4:10:00 | 0.00       | 0.00       | 0.00         | 0.00         | 0.00          | 0.00          | 0.00          | 0.00           | 0.00           |
|               | 4:15:00 | 0.00       | 0.00       | 0.00         | 0.00         | 0.00          | 0.00          | 0.00          | 0.00           | 0.00           |
|               | 4:20:00 | 0.00       | 0.00       | 0.00         | 0.00         | 0.00          | 0.00          | 0.00          | 0.00           | 0.00           |
|               | 4:25:00 | 0.00       | 0.00       | 0.00         | 0.00         | 0.00          | 0.00          | 0.00          | 0.00           | 0.00           |
|               | 4:30:00 | 0.00       | 0.00       | 0.00         | 0.00         | 0.00          | 0.00          | 0.00          | 0.00           | 0.00           |
|               | 4:35:00 | 0.00       | 0.00       | 0.00         | 0.00         | 0.00          | 0.00          | 0.00          | 0.00           | 0.00           |
|               | 4:40:00 | 0.00       | 0.00       | 0.00         | 0.00         | 0.00          | 0.00          | 0.00          | 0.00           | 0.00           |
|               | 4:45:00 | 0.00       | 0.00       | 0.00         | 0.00         | 0.00          | 0.00          | 0.00          | 0.00           | 0.00           |
|               | 4:50:00 | 0.00       | 0.00       | 0.00         | 0.00         | 0.00          | 0.00          | 0.00          | 0.00           | 0.00           |
|               | 4:55:00 | 0.00       | 0.00       | 0.00         | 0.00         | 0.00          | 0.00          | 0.00          | 0.00           | 0.00           |
|               | 5:00:00 | 0.00       | 0.00       | 0.00         | 0.00         | 0.00          | 0.00          | 0.00          | 0.00           | 0.00           |
|               | 5:05:00 | 0.00       | 0.00       | 0.00         | 0.00         | 0.00          | 0.00          | 0.00          | 0.00           | 0.00           |
|               | 5:10:00 | 0.00       | 0.00       | 0.00         | 0.00         | 0.00          | 0.00          | 0.00          | 0.00           | 0.00           |
|               | 5:15:00 | 0.00       | 0.00       | 0.00         | 0.00         | 0.00          | 0.00          | 0.00          | 0.00           | 0.00           |
|               | 5:20:00 | 0.00       | 0.00       | 0.00         | 0.00         | 0.00          | 0.00          | 0.00          | 0.00           | 0.00           |
|               | 5:25:00 | 0.00       | 0.00       | 0.00         | 0.00         | 0.00          | 0.00          | 0.00          | 0.00           | 0.00           |
|               | 5:30:00 | 0.00       | 0.00       | 0.00         | 0.00         | 0.00          | 0.00          | 0.00          | 0.00           | 0.00           |
|               | 5:35:00 | 0.00       | 0.00       | 0.00         | 0.00         | 0.00          | 0.00          | 0.00          | 0.00           | 0.00           |
|               | 5:40:00 | 0.00       | 0.00       | 0.00         | 0.00         | 0.00          | 0.00          | 0.00          | 0.00           | 0.00           |
|               | 5:45:00 | 0.00       | 0.00       | 0.00         | 0.00         | 0.00          | 0.00          | 0.00          | 0.00           | 0.00           |
|               | 5:50:00 | 0.00       | 0.00       | 0.00         | 0.00         | 0.00          | 0.00          | 0.00          | 0.00           | 0.00           |
|               | 5:55:00 | 0.00       | 0.00       | 0.00         | 0.00         | 0.00          | 0.00          | 0.00          | 0.00           | 0.00           |
|               | 6:00:00 | 0.00       | 0.00       | 0.00         | 0.00         | 0.00          | 0.00          | 0.00          | 0.00           | 0.00           |

## DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

### Summary Stage-Area-Volume-Discharge Relationships

The user can create a summary S-A-V-D by entering the desired stage increments and the remainder of the table will populate automatically.

The user should graphically compare the summary S-A-V-D table to the full S-A-V-D table in the chart to confirm it captures all key transition points.

[illegible]

### D3 FOREBAY - FOREBAY & TRICKLE CHANNEL CALCULATIONS

Project Name: Dawson Trails Infrastructure 1

Project No.: 20-224

Per MHFD USDCM Vol. 3, Ch. 3, S. 3.0 & Table EDB-4; Vol. 2, Ch. 12, S. 5.14.2; Vol. 1, & Ch. 8, S. 7.1. Based on an octagonal forebay typical of local installations.

#### Water Quality Capture Volume (WQCV)

$$WQCV = (\alpha(0.91I^3 - 1.19I^2 + 0.78I)/12)A$$

Water Quality Capture Volume (ac-ft); Equations 3-1 & 3-2 combined

$$\alpha = 1.0$$

BMP type coefficient; typ. 1.0 for 40 hr drain time; Table 3-2

$$I = 0.3830$$

Imperviousness (percent expressed as a decimal)

$$A = 91.71 \text{ ac}$$

watershed tributary area upstream

|                    |
|--------------------|
| WQCV = 1.340 ac-ft |
|--------------------|

#### Forebay Sizing

$$V = p(WQCV)43560/100$$

minimum forebay volume (ft<sup>3</sup>)

$$p = 3 \%$$

percentage of WQCV; Table EDB-4

|                             |
|-----------------------------|
| V = 1750.82 ft <sup>3</sup> |
|-----------------------------|

minimum forebay volume

$$A_R = V/D_F$$

minimum required forebay area (ft<sup>2</sup>)

|                          |
|--------------------------|
| D <sub>M</sub> = 2.50 ft |
|--------------------------|

maximum forebay depth (sidewall depth); Table EDB-4

|                          |
|--------------------------|
| D <sub>F</sub> = 2.25 ft |
|--------------------------|

forebay front edge depth (D<sub>M</sub> - 3"); Figure 14-8

$$A_R = 778.1 \text{ ft}^2$$

|                                        |
|----------------------------------------|
| A <sub>p</sub> = 792.0 ft <sup>2</sup> |
|----------------------------------------|

forebay area provided (must be ≥ A<sub>R</sub>);

determined by increasing the central longitudinal dimension shown on the typical forebay detail;  
see detail in construction drawings for complete forebay configuration and dimensions

#### Forebay Notch Sizing

$$Q_{100} = 264.00 \text{ cfs}$$

undetained peak discharge (from StormCAD calcs)

$$Q_{Rm} = 0.02 * Q_{100}$$

minimum forebay release (cfs); 2% of Q<sub>100</sub>; Table EDB-4

$$Q_{Rm} = 5.28 \text{ cfs}$$

|             |
|-------------|
| H = 2.25 ft |
|-------------|

notch depth = D<sub>F</sub>

$$L_{Nm} = Q_{Rm}/C_{BCW}H^{1.5}$$

minimum notch width (ft); (broad crested weir calculation); Equation 12-8; CBCW = 3.3

$$L_{Nm} = 0.47 \text{ ft}$$

|                          |
|--------------------------|
| L <sub>N</sub> = 0.92 ft |
|--------------------------|

notch width used for design;

(minimum notch width [L<sub>Nm</sub>] increased by 20% of notch depth [D<sub>F</sub>] for clogged condition  
per MHFD BMP Worksheet and rounded up to nearest whole inch)

|           |
|-----------|
| = 12.0 in |
|-----------|

#### Trickle Channel Sizing

$$Q_R = C_{BCW}L_NH^{1.5}$$

maximum forebay notch capacity (cfs); (broad crested weir calculation); Equation 12-8; CBCW = 3.3

$$Q_R = 10.29 \text{ cfs}$$

$$Q_T = (1.49/n)AR^{2/3}S^{1/2}$$

flow in trickle channel (cfs); (Manning's Equation for uniform open channel flow); Equation 8-7

$$n = 0.013$$

Manning's roughness coefficient for concrete

$$S = 0.005 \text{ ft/ft}$$

friction slope (approx. slope of trickle channel for normal flow); 0.4% - 1% recommended by MHFD

$$A = WH$$

cross-sectional area of flow in channel (ft<sup>2</sup>); assume channel flowing full

|            |
|------------|
| W = 4.0 ft |
|------------|

width of trickle channel bottom

|            |
|------------|
| H = 0.5 ft |
|------------|

height of trickle channel sides

$$A = 2.00 \text{ ft}^2$$

$$R = A/P$$

hydraulic radius (ft)

$$R = 0.40 \text{ ft}$$

$$P = W+2H$$

wetted perimeter (ft)

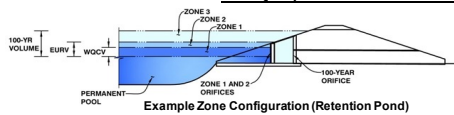
$$P = 5.00 \text{ ft}$$

|                           |
|---------------------------|
| Q <sub>T</sub> = 8.80 cfs |
|---------------------------|

maximum capacity of trickle channel (must be ≥ Q<sub>R</sub>)

MHFD-Detention, Version 4.06 (July 2022)

**Basin ID:** Water Quality Pond D4



### Example Zone Configuration (Retention Pond)

|                                                |        |         |
|------------------------------------------------|--------|---------|
| Selected BMP Type =                            | EDB    |         |
| Watershed Area =                               | 2.77   | acres   |
| Watershed Length =                             | 920    | ft      |
| Watershed Length to Centroid =                 | 650    | ft      |
| Watershed Slope =                              | 0.040  | ft/ft   |
| Watershed Imperviousness =                     | 63.00% | percent |
| Percentage Hydrologic Soil Group A =           | 0.0%   | percent |
| Percentage Hydrologic Soil Group B =           | 0.0%   | percent |
| Percentage Hydrologic Soil Groups C/D =        | 100.0% | percent |
| Target WQCV Drain Time =                       | 40.0   | hours   |
| Location for 1-hr Rainfall Depths = User Input |        |         |

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

|                                           |       |           |
|-------------------------------------------|-------|-----------|
| Water Quality Capture Volume (WQCV) =     | 0.057 | acre-feet |
| Excess Urban Runoff Volume (EURV) =       | 0.168 | acre-feet |
| 2-yr Runoff Volume ( $P1 = 1.06$ in.) =   | 0.154 | acre-feet |
| 5-yr Runoff Volume ( $P1 = 1.43$ in.) =   | 0.235 | acre-feet |
| 10-yr Runoff Volume ( $P1 = 1.66$ in.) =  | 0.288 | acre-feet |
| 25-yr Runoff Volume ( $P1 = 1.69$ in.) =  | 0.301 | acre-feet |
| 50-yr Runoff Volume ( $P1 = 2.26$ in.) =  | 0.436 | acre-feet |
| 100-yr Runoff Volume ( $P1 = 2.6$ in.) =  | 0.524 | acre-feet |
| 500-yr Runoff Volume ( $P1 = 3.14$ in.) = | 0.655 | acre-feet |
| Approximate 2-yr Detention Volume =       | 0.134 | acre-feet |
| Approximate 5-yr Detention Volume =       | 0.204 | acre-feet |
| Approximate 10-yr Detention Volume =      | 0.232 | acre-feet |
| Approximate 25-yr Detention Volume =      | 0.271 | acre-feet |
| Approximate 50-yr Detention Volume =      | 0.320 | acre-feet |
| Approximate 100-yr Detention Volume =     | 0.305 | acre-feet |

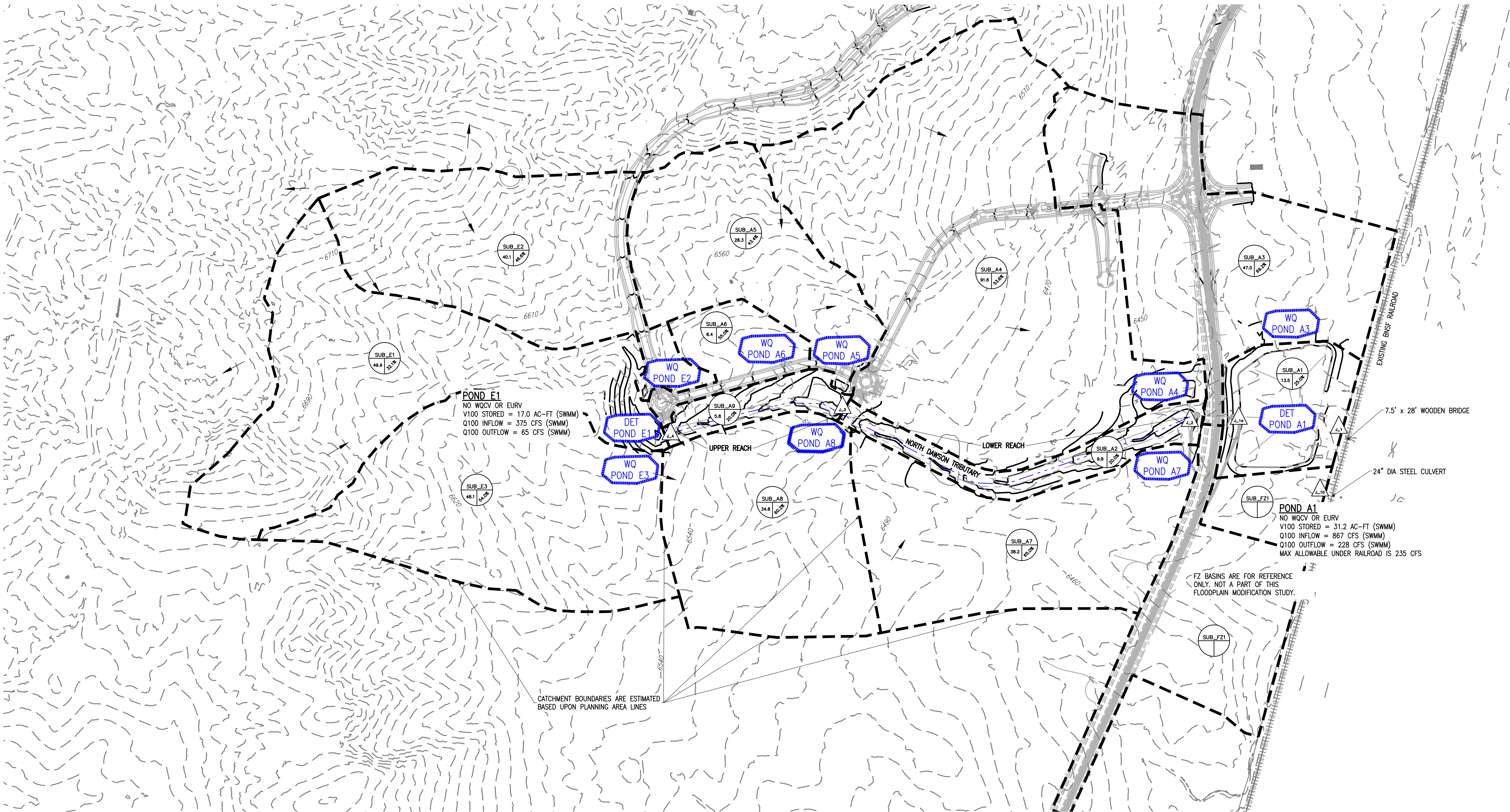
|                                                   |       |                 |
|---------------------------------------------------|-------|-----------------|
| Zone 1 Volume (WQCV) =                            | 0.057 | acre-feet       |
| Zone 2 Volume (EURV - Zone 1) =                   | 0.111 | acre-feet       |
| Select Zone 3 Storage Volume (Optional) =         |       | acre-feet       |
| Total Detention Basin Volume =                    | 0.168 | acre-feet       |
| Initial Surcharge Volume (ISV) =                  | user  | ft <sup>3</sup> |
| Initial Surcharge Depth (ISD) =                   | user  | ft              |
| Total Available Detention Depth ( $H_{total}$ ) = | user  | ft              |
| Depth of Trickle Channel ( $H_{trc}$ ) =          | user  | ft              |
| Slope of Trickle Channel ( $S_{trc}$ ) =          | user  | ft/ft           |
| Slopes of Main Basin Sides ( $S_{main}$ ) =       | user  | Ht/V            |
| Basin Length-to-Width Ratio ( $R_{L/W}$ ) =       | user  |                 |

|                                               |   |      |                 |
|-----------------------------------------------|---|------|-----------------|
| Initial Surcharge Area ( $A_{S1}$ )           | = | user | ft <sup>2</sup> |
| Surcharge Volume Length ( $L_{S1}$ )          | = | user | ft              |
| Surcharge Volume Width ( $W_{S1}$ )           | = | user | ft              |
| Depth of Basin Floor ( $H_{FLOOR}$ )          | = | user | ft              |
| Length of Basin Floor ( $L_{FLOOR}$ )         | = | user | ft              |
| Width of Basin Floor ( $W_{FLOOR}$ )          | = | user | ft              |
| Area of Basin Floor ( $A_{FLOOR}$ )           | = | user | ft <sup>2</sup> |
| Volume of Basin Floor ( $V_{FLOOR}$ )         | = | user | ft <sup>3</sup> |
| Depth of Main Basin ( $H_{MAIN}$ )            | = | user | ft              |
| Length of Main Basin ( $L_{MAIN}$ )           | = | user | ft              |
| Width of Main Basin ( $W_{MAIN}$ )            | = | user | ft              |
| Area of Main Basin ( $A_{MAIN}$ )             | = | user | ft <sup>2</sup> |
| Volume of Main Basin ( $V_{MAIN}$ )           | = | user | ft <sup>3</sup> |
| Calculated Total Basin Volume ( $V_{TOTAL}$ ) | = | user | acre-feet       |

|      |           |
|------|-----------|
|      | acre-feet |
|      | acre-feet |
| 1.06 | inches    |
| 1.43 | inches    |
| 1.66 | inches    |
|      | inches    |
| 2.26 | inches    |
| 2.60 | inches    |
|      | inches    |

**Total detention volume is less than 100-year volume.**

[illegible]

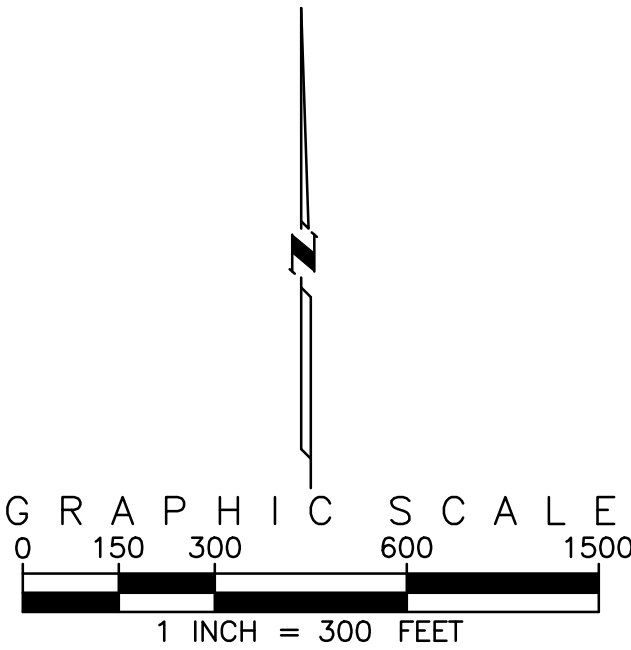


PEAK DISCHARGE SUMMARY  
Future Conditions

| Design Point   | Catchment(s)              | Tributary Area<br>(acres) | 5-Year<br>(cfs) | 100-Year<br>(cfs) |
|----------------|---------------------------|---------------------------|-----------------|-------------------|
|                | SUB_E3                    | 48.1                      | 68.2            | 163               |
|                | SUB_E2                    | 40.1                      | 39.3            | 101               |
|                | SUB_E1                    | 49.9                      | 38.6            | 114               |
| Pond E1 inflow | SUB_E3 + SUB_E2 + SUB_E1  | 138.1                     | 145             | 375               |
|                | SUB_A9                    | 5.8                       | 2.6             | 8.9               |
|                | SUB_A6                    | 8.4                       | 13.2            | 31.2              |
| J_4            | Pond E1 + SUB_A9 + SUB_A6 | 152.3                     | 40.0            | 79                |
|                | SUB_A8                    | 34.8                      | 55.6            | 128               |
|                | SUB_A5                    | 28.3                      | 32.0            | 83.3              |
|                | SUB_A2                    | 9.8                       | 2.6             | 11.2              |
| J_3            | DP J_4 + SUB_A8 + SUB_A5  | 225.1                     | 108             | 283               |
|                | SUB_A7                    | 38.2                      | 52.2            | 118               |
|                | SUB_A4                    | 91.6                      | 109             | 265               |
| J_2            | DP J_3 + SUB_A7 + SUB_A4  | 354.9                     | 258             | 655               |
|                | SUB_A3                    | 47.0                      | 90.5            | 195               |
|                | SUB_A1                    | 13.5                      | 10.7            | 38                |
| Pond A1 inflow | DP J_2 + SUB_A3 + SUB_A1  | 415.3                     | 346             | 867               |
| J_1            | Entire Pond A1 Catchment  | 415.3                     | 157             | 228               |

**LEGEND**

- XXX CATCHMENT DESIGNATION
- % IMPERVIOUS
- CATCHMENT AREA IN ACRES
- DESIGN POINT
- CATCHMENT BOUNDARY
- FLOW DIRECTION ARROW
- EXISTING 10-FT CONTOUR
- PROPOSED 10-FT CONTOUR



EMK CONSULTANTS, INC.  
LAND DEVELOPMENT  
ENGINEERING & SURVEYING  
7008 SOUTH ALTON WAY, BLDG. 1  
CENTENNIAL, COLORADO 80112-2019  
(303)694-1520  
WWW.EMKCO.COM

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

Know what's below.  
Call before you dig.

REUSE OF DOCUMENT  
THE IDEAS AND DESIGN INCORPORATED HEREON IS AN INSTRUMENT OF  
PROFESSIONAL SERVICE, ARE THE PROPERTY OF EMK CONSULTANTS,  
INC., AND ARE NOT TO BE USED FOR ANY OTHER PROJECT WITHOUT  
WRITTEN AUTHORIZATION OF EMK CONSULTANTS, INC.

| DESIGNED BY: | DRAWN BY: | CHECKED BY: | APPROVED BY: |
|--------------|-----------|-------------|--------------|
| DJO          | DJO       | ERM         | ERM          |

| NO. | DESCRIPTION | DATE | BY |
|-----|-------------|------|----|
|     |             |      |    |
|     |             |      |    |
|     |             |      |    |
|     |             |      |    |
|     |             |      |    |
|     |             |      |    |
|     |             |      |    |
|     |             |      |    |
|     |             |      |    |

DAWSON TRAILS  
NORTH DAWSON TRIBUTARY  
FUTURE CONDITIONS

DATE: 04/03/2025  
JOB NO: 13095.10

SCALE  
HORIZONTAL  
1" = 300'

3 of 3



## MILE HIGH FLOOD DISTRICT DETENTION BASIN DESIGN WORKBOOK

*MHFD-Detention, Version 4.06 (July 2022)*  
*Mile High Flood District*  
*Denver, Colorado*  
*[www.mhfd.org](http://www.mhfd.org)*

**Purpose:**

This workbook aids in the estimation of stormwater detention basin sizing and outlet routing based on the modified puls routing method for urban watersheds. Several different BMP types and various outlet configurations can be sized.

**Function:**

1. Approximates the stage-area-volume relationship for a detention basin based on watershed parameters and basin geometry parameters. Also evaluates existing user-defined basin stage-area relationships.
2. Sizes filtration media orifice, outlet orifices, elliptical slots, weirs, trash racks, and develops stage-discharge relationships. Uses the Modified Puls method to route a series of hydrographs (i.e., 2-, 5-, 10-, 25-, 50-, 100- and 500-year) and calibrates the peak discharge out of the basin to match the pre-development peak discharges for the watershed.

**Content:**

**This workbook consists of the following sheets:**

**Basin** Tabulates stage-area-volume relationship estimates based on watershed parameters

**Outlet Structure** Tabulates a stage-discharge relationship for the user-defined outlet structure (inlet control).

**Reference** Provides reference equations and figures.

**User Tips and Tools** Provides instructions and video links to assist in using this workbook. Includes a stage-area calculator.

**BMP Zone Images** Provides images of typical BMP zone configurations corresponding with Zone pulldown selections.

**Acknowledgements:** *Spreadsheet Development Team:*  
**Ken MacKenzie, P.E., Holly Piza, P.E.**  
 Mile High Flood District

**Derek N. Rapp, P.E.**  
 Peak Stormwater Engineering, LLC

**Dr. James C.Y. Guo, Ph.D., P.E.**  
 Professor, Department of Civil Engineering, University of Colorado at Denver

**Comments?**  
**Revisions?**

Direct all comments regarding this spreadsheet workbook to:  
 Check for revised versions of this or any other workbook at:

**[MHFD E-Mail](#)**  
**[Downloads](#)**

## DETENTION BASIN STAGE-STORAGE TABLE BUILDER

Project: Dawson Trails Filing 2

**Basin ID: Pond A1 (Stage 0.00 = 6401.00) 235 cfs is the max release rate under railroad**



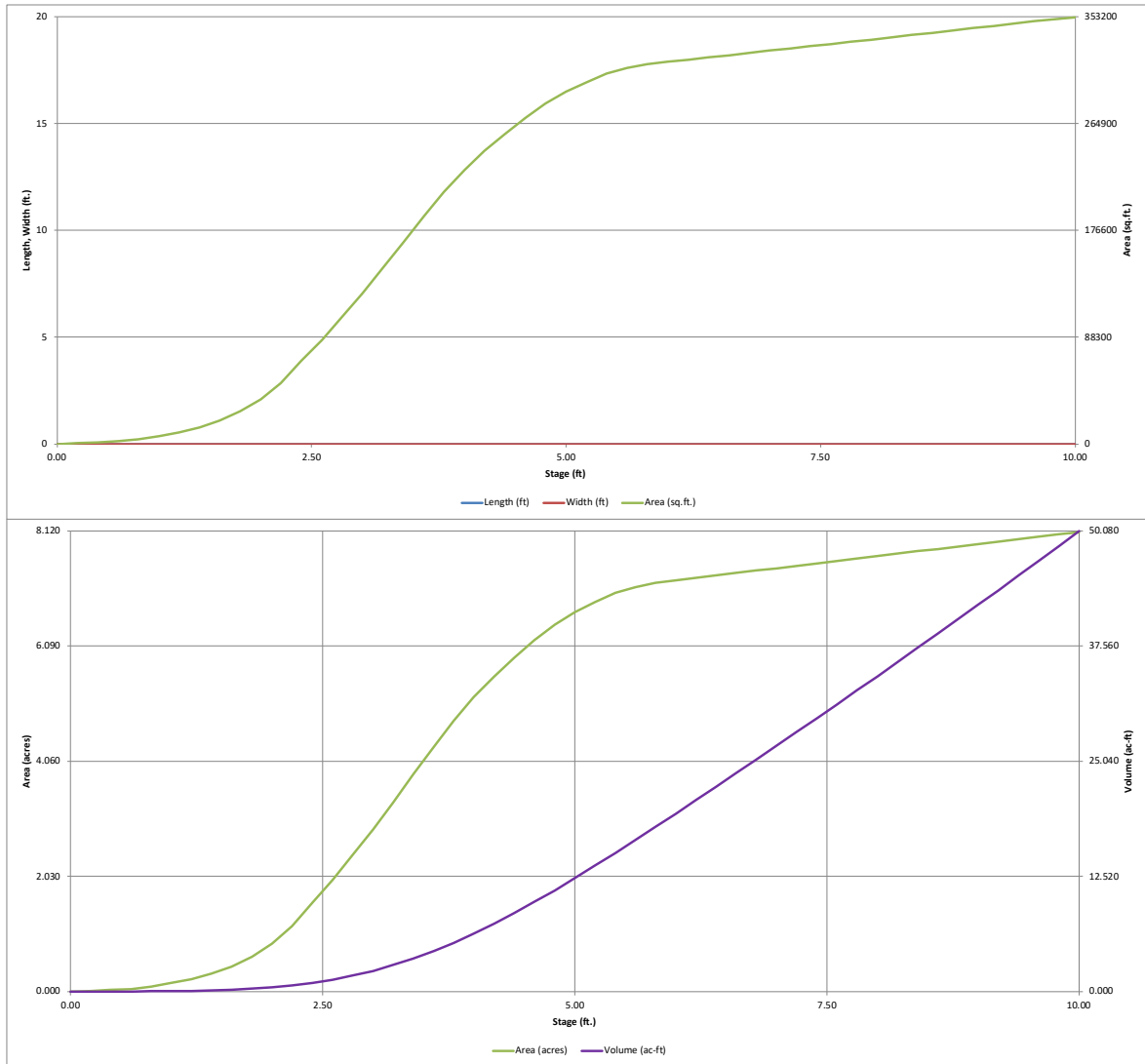
**Flood Control Only**

|                                                    |        |           |
|----------------------------------------------------|--------|-----------|
| Water Quality Capture Volume (WQCV) =              | 5,053  | acre-feet |
| Excess Urban Runoff Volume (EURV) =                | 14,928 | acre-feet |
| 2-yr Runoff Volume ( $P1 = 1.06 \text{ in.}$ ) =   | 13,332 | acre-feet |
| 5-yr Runoff Volume ( $P1 = 1.43 \text{ in.}$ ) =   | 21,073 | acre-feet |
| 10-yr Runoff Volume ( $P1 = 1.66 \text{ in.}$ ) =  | 26,261 | acre-feet |
| 25-yr Runoff Volume ( $P1 = 2.01 \text{ in.}$ ) =  | 35,407 | acre-feet |
| 50-yr Runoff Volume ( $P1 = 2.26 \text{ in.}$ ) =  | 41,409 | acre-feet |
| 100-yr Runoff Volume ( $P1 = 2.6 \text{ in.}$ ) =  | 50,447 | acre-feet |
| 500-yr Runoff Volume ( $P1 = 3.14 \text{ in.}$ ) = | 63,719 | acre-feet |
| Approximate 2-yr Detention Volume =                | 11,246 | acre-feet |
| Approximate 5-yr Detention Volume =                | 17,263 | acre-feet |
| Approximate 10-yr Detention Volume =               | 20,385 | acre-feet |
| Approximate 25-yr Detention Volume =               | 23,326 | acre-feet |
| Approximate 50-yr Detention Volume =               | 24,176 | acre-feet |
| Approximate 100-yr Detention Volume =              | 27,175 | acre-feet |

|                                                 |   |        |                 |
|-------------------------------------------------|---|--------|-----------------|
| Select Zone 1 Storage Volume (Required)         | = | 27.750 | acre-feet       |
| Select Zone 2 Storage Volume (Optional)         | = |        | acre-feet       |
| Select Zone 3 Storage Volume (Optional)         | = |        | acre-feet       |
| Total Detention Basin Volume                    | = | 27.750 |                 |
| Initial Storage Volume (ISV)                    | = | N/A    | ft <sup>3</sup> |
| Initial Surge Depth (ISD)                       | = | N/A    | ft              |
| Total Available Detention Depth ( $H_{total}$ ) | = | user   | ft              |
| Depth of Trickle Channel ( $H_{TC}$ )           | = | user   | ft              |
| Slope of Trickle Channel ( $S_{TC}$ )           | = | user   | ft/ft           |
| Slopes of Main Basin Sides ( $S_{main}$ )       | = | user   | ft/V            |
| Basin Length-to-Width Ratio ( $R_{L/W}$ )       | = | user   |                 |

|                                               |   |             |               |
|-----------------------------------------------|---|-------------|---------------|
| Initial Surcharge Area ( $A_{SV}$ )           | = | <b>user</b> | $\text{ft}^2$ |
| Surcharge Volume Length ( $L_{SV}$ )          | = | <b>user</b> | $\text{ft}$   |
| Surcharge Volume Width ( $W_{SV}$ )           | = | <b>user</b> | $\text{ft}$   |
| Depth of Basin Floor ( $H_{FLOOR}$ )          | = | <b>user</b> | $\text{ft}$   |
| Length of Basin Floor ( $L_{FLOOR}$ )         | = | <b>user</b> | $\text{ft}$   |
| Width of Basin Floor ( $W_{FLOOR}$ )          | = | <b>user</b> | $\text{ft}$   |
| Area of Basin Floor ( $A_{FLOOR}$ )           | = | <b>user</b> | $\text{ft}^2$ |
| Volume of Basin Floor ( $V_{FLOOR}$ )         | = | <b>user</b> | $\text{ft}^3$ |
| Depth of Main Basin ( $H_{MAIN}$ )            | = | <b>user</b> | $\text{ft}$   |
| Length of Main Basin ( $L_{MAIN}$ )           | = | <b>user</b> | $\text{ft}$   |
| Width of Main Basin ( $W_{MAIN}$ )            | = | <b>user</b> | $\text{ft}$   |
| Area of Main Basin ( $A_{MAIN}$ )             | = | <b>user</b> | $\text{ft}^2$ |
| Volume of Main Basin ( $V_{MAIN}$ )           | = | <b>user</b> | $\text{ft}^3$ |
| Calculated Total Basin Volume ( $V_{TOTAL}$ ) | = | <b>user</b> | acre-feet     |

# SPREADSHEET FOR SWMM RATING CURVE DEVELOPMENT



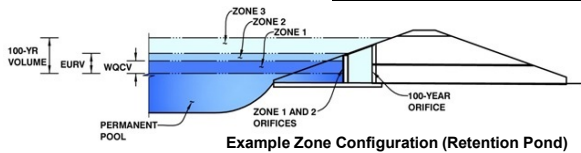
# SPREADSHEET FOR SWMM RATING CURVE DEVELOPMENT

## DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: Dawson Trails Filing 2

Basin ID: Pond A1 (Stage 0.00 = 6401.00) 235 cfs is the max release rate under railroad



Example Zone Configuration (Retention Pond)

|                   | Estimated Stage (ft) | Estimated Volume (ac-ft) | Outlet Type       |
|-------------------|----------------------|--------------------------|-------------------|
| Zone 1            | 7.14                 | 27.750                   | Weir&Pipe (Rect.) |
| Zone 2            |                      |                          |                   |
| Zone 3            |                      |                          |                   |
| Total (all zones) |                      | 27.750                   |                   |

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

Underdrain Orifice Invert Depth = N/A ft (distance below the filtration media surface)  
Underdrain Orifice Diameter = N/A inches

Underdrain Orifice Area = N/A ft<sup>2</sup>  
Underdrain Orifice Centroid = N/A feet

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

Centroid of Lowest Orifice = N/A ft (relative to basin bottom at Stage = 0 ft)  
Depth at top of Zone using Orifice Plate = N/A ft (relative to basin bottom at Stage = 0 ft)  
Orifice Plate: Orifice Vertical Spacing = N/A inches  
Orifice Plate: Orifice Area per Row = N/A sq. inches

WQ Orifice Area per Row = N/A ft<sup>2</sup>  
Elliptical Half-Width = N/A feet  
Elliptical Slot Centroid = N/A feet  
Elliptical Slot Area = N/A ft<sup>2</sup>

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

|                                | Row 1 (optional) | Row 2 (optional) | Row 3 (optional) | Row 4 (optional) | Row 5 (optional) | Row 6 (optional) | Row 7 (optional) | Row 8 (optional) |
|--------------------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|
| Stage of Orifice Centroid (ft) | N/A              | N/A              | N/A              | N/A              | N/A              | N/A              | N/A              | N/A              |
| Orifice Area (sq. inches)      | N/A              | N/A              | N/A              | N/A              | N/A              | N/A              | N/A              | N/A              |

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

User Input: Vertical Orifice (Circular or Rectangular)

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

Vertical Orifice Area = Not Selected ft<sup>2</sup>  
Vertical Orifice Centroid = Not Selected feet

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

Overflow Weir Front Edge Height, Ho = 0.00 ft (relative to basin bottom at Stage = 0 ft)  
Overflow Weir Front Edge Length = 12.00 feet  
Overflow Weir Gate Slope = 4.00 H:V  
Horiz. Length of Weir Sides = 16.00 feet  
Overflow Gate Type = Type C Gate  
Debris Clogging % = 50%

Height of Gate Upper Edge, H<sub>u</sub> = 4.00 feet  
Overflow Weir Slope Length = 16.49 feet  
Gate Open Area / 100-yr Orifice Area = 7.38  
Overflow Gate Open Area w/o Debris = 137.74 ft<sup>2</sup>  
Overflow Gate Open Area w/ Debris = 68.87 ft<sup>2</sup>

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

Depth to Invert of Outlet Pipe = 0.00 ft (distance below basin bottom at Stage = 0 ft)  
Rectangular Orifice Width = 96.00 inches  
Rectangular Orifice Height = 28.00 inches

Outlet Orifice Area = 18.67 ft<sup>2</sup>  
Outlet Orifice Centroid = 1.17 feet  
Half-Central Angle of Restrictor Plate on Pipe = N/A radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage = 8.00 ft (relative to basin bottom at Stage = 0 ft)  
Spillway Crest Length = 300.00 feet  
Spillway End Slopes = 4.00 H:V  
Freeboard above Max Water Surface = 1.00 feet

Spillway Design Flow Depth = 0.98 feet  
Stage at Top of Freeboard = 9.98 feet  
Basin Area at Top of Freeboard = 8.10 acres  
Basin Volume at Top of Freeboard = 49.90 acre-ft

### Routed Hydrograph Results

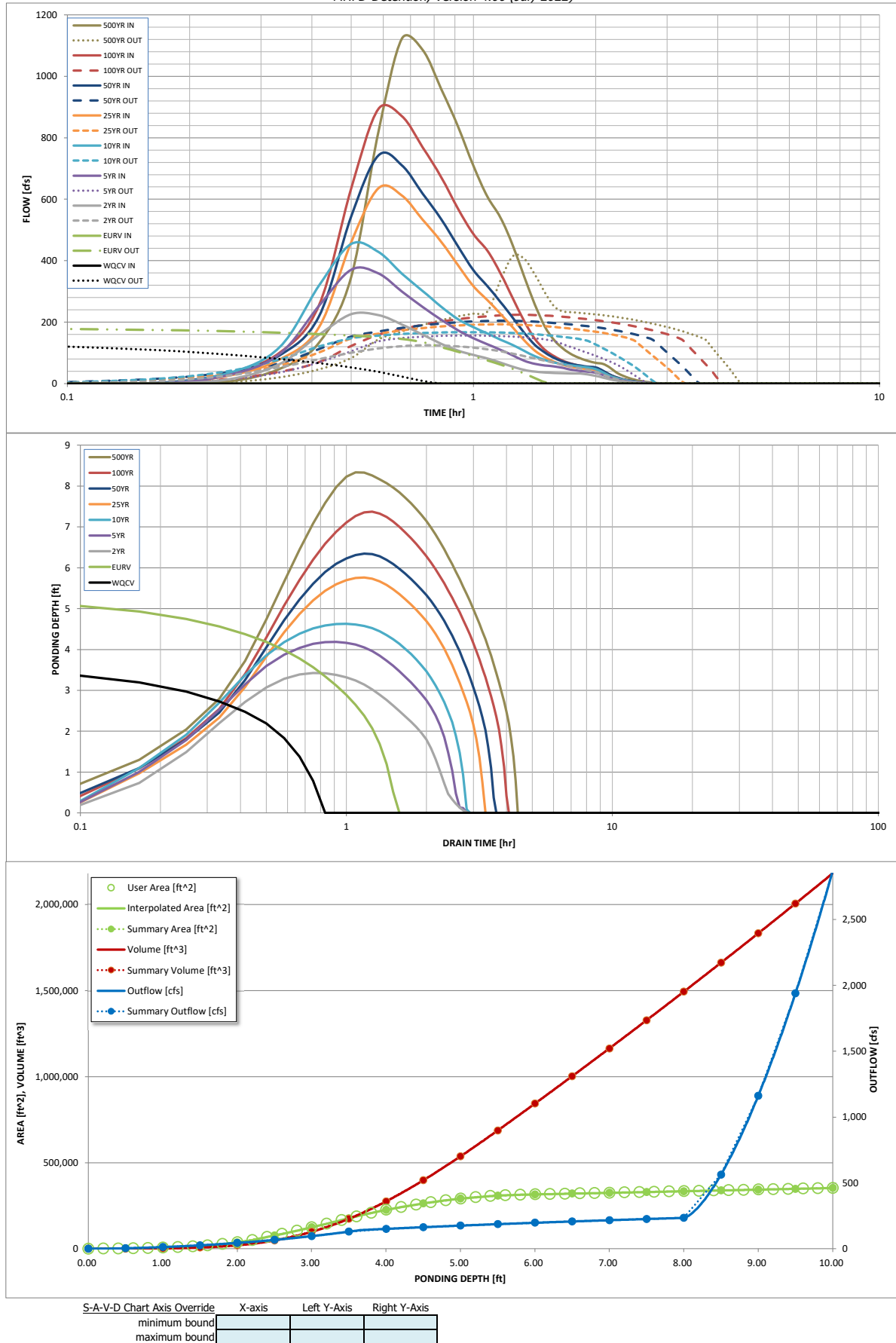
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

|                                                 | WQCV           | EURV           | 2 Year          | 5 Year         | 10 Year        | 25 Year        | 50 Year        | 100 Year       | 500 Year |
|-------------------------------------------------|----------------|----------------|-----------------|----------------|----------------|----------------|----------------|----------------|----------|
| Design Storm Return Period =                    | N/A            | N/A            | 1.06            | 1.43           | 1.66           | 2.01           | 2.26           | 2.60           | 3.14     |
| One-Hour Rainfall Depth (in) =                  | 5.053          | 14.928         | 13.332          | 21.073         | 26.261         | 35.407         | 41.409         | 50.447         | 63.719   |
| CUHP Runoff Volume (acre-ft) =                  | N/A            | N/A            | 13.332          | 21.073         | 26.261         | 35.407         | 41.409         | 50.447         | 63.719   |
| Inflow Hydrograph Volume (acre-ft) =            | N/A            | N/A            | 21.6            | 101.2          | 147.3          | 273.5          | 337.3          | 438.8          | 580.7    |
| CUHP Predevelopment Peak Q (cfs) =              | N/A            | N/A            |                 |                |                |                |                |                |          |
| OPTIONAL Override Predevelopment Peak Q (cfs) = | N/A            | N/A            |                 |                |                |                |                |                |          |
| Predevelopment Unit Peak Flow, q (cfs/acre) =   | N/A            | N/A            | 0.08            | 0.37           | 0.53           | 0.99           | 1.22           | 1.58           | 2.09     |
| Peak Inflow Q (cfs) =                           | N/A            | N/A            | 225.6           | 370.5          | 454.3          | 635.3          | 742.5          | 894.3          | 1122.5   |
| Peak Outflow Q (cfs) =                          | 140.3          | 182.5          | 124.4           | 156.1          | 167.1          | 192.6          | 204.5          | 223.8          | 414.4    |
| Ratio Peak Outflow to Predevelopment Q =        | N/A            | N/A            | N/A             | 1.5            | 1.1            | 0.7            | 0.6            | 0.5            | 0.7      |
| Structure Controlling Flow =                    | Outlet Plate 1 | Outlet Plate 1 | Overflow Weir 1 | Outlet Plate 1 | Outlet Plate 1 | Outlet Plate 1 | Outlet Plate 1 | Outlet Plate 1 | Spillway |
| Max Velocity through Gate 1 (fps) =             | 1.05           | 1.34           | 0.90            | 1.1            | 1.2            | 1.4            | 1.5            | 1.6            | 1.7      |
| Max Velocity through Gate 2 (fps) =             | N/A            | N/A            | N/A             | N/A            | N/A            | N/A            | N/A            | N/A            | N/A      |
| Time to Drain 97% of Inflow Volume (hours) =    | 1              | 1              | 2               | 2              | 3              | 3              | 3              | 4              | 4        |
| Time to Drain 99% of Inflow Volume (hours) =    | 1              | 1              | 2               | 2              | 3              | 3              | 3              | 4              | 4        |
| Maximum Ponding Depth (ft) =                    | 3.75           | 5.39           | 3.42            | 4.18           | 4.63           | 5.76           | 6.34           | 7.37           | 8.33     |
| Area at Maximum Ponding Depth (acres) =         | 4.66           | 7.02           | 3.87            | 5.52           | 6.22           | 7.19           | 7.32           | 7.54           | 7.74     |
| Maximum Volume Stored (acre-ft) =               | 5.081          | 14.994         | 3.672           | 7.277          | 9.863          | 17.554         | 21.837         | 29.415         | 36.827   |

# SPREADSHEET FOR SWMM RATING CURVE DEVELOPMENT

## DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)



# SPREADSHEET FOR SWMM RATING CURVE DEVELOPMENT

## DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename: \_\_\_\_\_

### Inflow Hydrographs

The user can override the calculated inflow hydrographs from this workbook with inflow hydrographs developed in a separate program.

|               | SOURCE  | CUHP       | CUHP       | CUHP         | CUHP         | CUHP          | CUHP          | CUHP          | CUHP           | CUHP           |
|---------------|---------|------------|------------|--------------|--------------|---------------|---------------|---------------|----------------|----------------|
| Time Interval | TIME    | WQCV [cfs] | EURV [cfs] | 2 Year [cfs] | 5 Year [cfs] | 10 Year [cfs] | 25 Year [cfs] | 50 Year [cfs] | 100 Year [cfs] | 500 Year [cfs] |
| 5.00 min      | 0:00:00 | 0.00       | 0.00       | 0.00         | 0.00         | 0.00          | 0.00          | 0.00          | 0.00           | 0.00           |
|               | 0:05:00 | 0.00       | 0.00       | 0.00         | 0.00         | 0.00          | 0.00          | 0.00          | 0.00           | 0.00           |
|               | 0:10:00 | 0.00       | 0.00       | 0.00         | 0.00         | 0.00          | 0.00          | 2.22          | 1.05           | 6.72           |
|               | 0:15:00 | 0.00       | 0.00       | 13.69        | 27.64        | 34.16         | 25.38         | 32.77         | 32.85          | 47.51          |
|               | 0:20:00 | 0.00       | 0.00       | 63.57        | 96.47        | 118.09        | 78.31         | 91.83         | 100.38         | 132.43         |
|               | 0:25:00 | 0.00       | 0.00       | 158.31       | 252.63       | 318.20        | 182.67        | 218.19        | 253.93         | 346.81         |
|               | 0:30:00 | 0.00       | 0.00       | 225.55       | 370.53       | 454.27        | 460.00        | 543.97        | 635.20         | 819.64         |
|               | 0:35:00 | 0.00       | 0.00       | 222.51       | 358.15       | 428.00        | 635.34        | 742.49        | 894.31         | 1122.50        |
|               | 0:40:00 | 0.00       | 0.00       | 192.13       | 299.66       | 357.89        | 611.98        | 710.58        | 870.48         | 1086.09        |
|               | 0:45:00 | 0.00       | 0.00       | 159.13       | 249.16       | 301.59        | 533.19        | 618.41        | 769.42         | 959.28         |
|               | 0:50:00 | 0.00       | 0.00       | 128.97       | 207.61       | 250.13        | 461.39        | 534.88        | 671.80         | 836.46         |
|               | 0:55:00 | 0.00       | 0.00       | 107.37       | 173.22       | 209.59        | 384.87        | 446.44        | 569.01         | 709.04         |
|               | 1:00:00 | 0.00       | 0.00       | 93.06        | 147.71       | 183.58        | 317.13        | 368.92        | 486.69         | 607.87         |
|               | 1:05:00 | 0.00       | 0.00       | 81.76        | 127.92       | 162.68        | 271.52        | 316.61        | 432.15         | 540.15         |
|               | 1:10:00 | 0.00       | 0.00       | 68.26        | 110.01       | 142.93        | 226.75        | 265.29        | 358.88         | 449.81         |
|               | 1:15:00 | 0.00       | 0.00       | 54.44        | 91.44        | 125.34        | 182.34        | 214.31        | 277.35         | 349.46         |
|               | 1:20:00 | 0.00       | 0.00       | 44.21        | 74.20        | 106.50        | 140.76        | 165.61        | 204.05         | 258.04         |
|               | 1:25:00 | 0.00       | 0.00       | 38.64        | 64.10        | 89.30         | 107.38        | 126.33        | 145.52         | 184.93         |
|               | 1:30:00 | 0.00       | 0.00       | 35.84        | 58.92        | 76.62         | 85.58         | 100.77        | 109.79         | 140.08         |
|               | 1:35:00 | 0.00       | 0.00       | 34.30        | 55.60        | 68.23         | 70.21         | 82.75         | 88.08          | 112.64         |
|               | 1:40:00 | 0.00       | 0.00       | 33.49        | 50.43        | 62.35         | 60.33         | 71.07         | 73.69          | 94.32          |
|               | 1:45:00 | 0.00       | 0.00       | 32.85        | 44.76        | 58.25         | 53.78         | 63.32         | 63.88          | 81.85          |
|               | 1:50:00 | 0.00       | 0.00       | 32.37        | 40.86        | 55.37         | 49.54         | 58.28         | 57.19          | 73.31          |
|               | 1:55:00 | 0.00       | 0.00       | 29.30        | 38.06        | 52.00         | 46.57         | 54.71         | 52.63          | 67.47          |
|               | 2:00:00 | 0.00       | 0.00       | 25.24        | 35.24        | 46.85         | 44.68         | 52.45         | 50.20          | 64.31          |
|               | 2:05:00 | 0.00       | 0.00       | 19.74        | 27.96        | 36.37         | 36.20         | 42.45         | 40.83          | 52.22          |
|               | 2:10:00 | 0.00       | 0.00       | 13.90        | 19.47        | 25.13         | 25.01         | 29.30         | 28.31          | 36.15          |
|               | 2:15:00 | 0.00       | 0.00       | 9.69         | 13.52        | 17.51         | 17.40         | 20.37         | 19.85          | 25.33          |
|               | 2:20:00 | 0.00       | 0.00       | 6.73         | 9.29         | 12.19         | 12.13         | 14.20         | 13.91          | 17.73          |
|               | 2:25:00 | 0.00       | 0.00       | 4.54         | 6.14         | 8.22          | 8.21          | 9.60          | 9.39           | 11.96          |
|               | 2:30:00 | 0.00       | 0.00       | 2.94         | 4.03         | 5.44          | 5.50          | 6.43          | 6.29           | 8.01           |
|               | 2:35:00 | 0.00       | 0.00       | 1.79         | 2.61         | 3.43          | 3.59          | 4.19          | 4.09           | 5.19           |
|               | 2:40:00 | 0.00       | 0.00       | 0.95         | 1.50         | 1.90          | 2.08          | 2.42          | 2.36           | 2.99           |
|               | 2:45:00 | 0.00       | 0.00       | 0.40         | 0.70         | 0.83          | 0.98          | 1.13          | 1.10           | 1.38           |
|               | 2:50:00 | 0.00       | 0.00       | 0.12         | 0.20         | 0.23          | 0.29          | 0.33          | 0.31           | 0.39           |
|               | 2:55:00 | 0.00       | 0.00       | 0.00         | 0.00         | 0.00          | 0.00          | 0.00          | 0.00           | 0.00           |
|               | 3:00:00 | 0.00       | 0.00       | 0.00         | 0.00         | 0.00          | 0.00          | 0.00          | 0.00           | 0.00           |
|               | 3:05:00 | 0.00       | 0.00       | 0.00         | 0.00         | 0.00          | 0.00          | 0.00          | 0.00           | 0.00           |
|               | 3:10:00 | 0.00       | 0.00       | 0.00         | 0.00         | 0.00          | 0.00          | 0.00          | 0.00           | 0.00           |
|               | 3:15:00 | 0.00       | 0.00       | 0.00         | 0.00         | 0.00          | 0.00          | 0.00          | 0.00           | 0.00           |
|               | 3:20:00 | 0.00       | 0.00       | 0.00         | 0.00         | 0.00          | 0.00          | 0.00          | 0.00           | 0.00           |
|               | 3:25:00 | 0.00       | 0.00       | 0.00         | 0.00         | 0.00          | 0.00          | 0.00          | 0.00           | 0.00           |
|               | 3:30:00 | 0.00       | 0.00       | 0.00         | 0.00         | 0.00          | 0.00          | 0.00          | 0.00           | 0.00           |
|               | 3:35:00 | 0.00       | 0.00       | 0.00         | 0.00         | 0.00          | 0.00          | 0.00          | 0.00           | 0.00           |
|               | 3:40:00 | 0.00       | 0.00       | 0.00         | 0.00         | 0.00          | 0.00          | 0.00          | 0.00           | 0.00           |
|               | 3:45:00 | 0.00       | 0.00       | 0.00         | 0.00         | 0.00          | 0.00          | 0.00          | 0.00           | 0.00           |
|               | 3:50:00 | 0.00       | 0.00       | 0.00         | 0.00         | 0.00          | 0.00          | 0.00          | 0.00           | 0.00           |
|               | 3:55:00 | 0.00       | 0.00       | 0.00         | 0.00         | 0.00          | 0.00          | 0.00          | 0.00           | 0.00           |
|               | 4:00:00 | 0.00       | 0.00       | 0.00         | 0.00         | 0.00          | 0.00          | 0.00          | 0.00           | 0.00           |
|               | 4:05:00 | 0.00       | 0.00       | 0.00         | 0.00         | 0.00          | 0.00          | 0.00          | 0.00           | 0.00           |
|               | 4:10:00 | 0.00       | 0.00       | 0.00         | 0.00         | 0.00          | 0.00          | 0.00          | 0.00           | 0.00           |
|               | 4:15:00 | 0.00       | 0.00       | 0.00         | 0.00         | 0.00          | 0.00          | 0.00          | 0.00           | 0.00           |
|               | 4:20:00 | 0.00       | 0.00       | 0.00         | 0.00         | 0.00          | 0.00          | 0.00          | 0.00           | 0.00           |
|               | 4:25:00 | 0.00       | 0.00       | 0.00         | 0.00         | 0.00          | 0.00          | 0.00          | 0.00           | 0.00           |
|               | 4:30:00 | 0.00       | 0.00       | 0.00         | 0.00         | 0.00          | 0.00          | 0.00          | 0.00           | 0.00           |
|               | 4:35:00 | 0.00       | 0.00       | 0.00         | 0.00         | 0.00          | 0.00          | 0.00          | 0.00           | 0.00           |
|               | 4:40:00 | 0.00       | 0.00       | 0.00         | 0.00         | 0.00          | 0.00          | 0.00          | 0.00           | 0.00           |
|               | 4:45:00 | 0.00       | 0.00       | 0.00         | 0.00         | 0.00          | 0.00          | 0.00          | 0.00           | 0.00           |
|               | 4:50:00 | 0.00       | 0.00       | 0.00         | 0.00         | 0.00          | 0.00          | 0.00          | 0.00           | 0.00           |
|               | 4:55:00 | 0.00       | 0.00       | 0.00         | 0.00         | 0.00          | 0.00          | 0.00          | 0.00           | 0.00           |
|               | 5:00:00 | 0.00       | 0.00       | 0.00         | 0.00         | 0.00          | 0.00          | 0.00          | 0.00           | 0.00           |
|               | 5:05:00 | 0.00       | 0.00       | 0.00         | 0.00         | 0.00          | 0.00          | 0.00          | 0.00           | 0.00           |
|               | 5:10:00 | 0.00       | 0.00       | 0.00         | 0.00         | 0.00          | 0.00          | 0.00          | 0.00           | 0.00           |
|               | 5:15:00 | 0.00       | 0.00       | 0.00         | 0.00         | 0.00          | 0.00          | 0.00          | 0.00           | 0.00           |
|               | 5:20:00 | 0.00       | 0.00       | 0.00         | 0.00         | 0.00          | 0.00          | 0.00          | 0.00           | 0.00           |
|               | 5:25:00 | 0.00       | 0.00       | 0.00         | 0.00         | 0.00          | 0.00          | 0.00          | 0.00           | 0.00           |
|               | 5:30:00 | 0.00       | 0.00       | 0.00         | 0.00         | 0.00          | 0.00          | 0.00          | 0.00           | 0.00           |
|               | 5:35:00 | 0.00       | 0.00       | 0.00         | 0.00         | 0.00          | 0.00          | 0.00          | 0.00           | 0.00           |
|               | 5:40:00 | 0.00       | 0.00       | 0.00         | 0.00         | 0.00          | 0.00          | 0.00          | 0.00           | 0.00           |
|               | 5:45:00 | 0.00       | 0.00       | 0.00         | 0.00         | 0.00          | 0.00          | 0.00          | 0.00           | 0.00           |
|               | 5:50:00 | 0.00       | 0.00       | 0.00         | 0.00         | 0.00          | 0.00          | 0.00          | 0.00           | 0.00           |
|               | 5:55:00 | 0.00       | 0.00       | 0.00         | 0.00         | 0.00          | 0.00          | 0.00          | 0.00           | 0.00           |
|               | 6:00:00 | 0.00       | 0.00       | 0.00         | 0.00         | 0.00          | 0.00          | 0.00          | 0.00           | 0.00           |

## SPREADSHEET FOR SWMM RATING CURVE DEVELOPMENT

## DETENTION BASIN OUTLET STRUCTURE DESIGN

*MHFD-Detention, Version 4.06 (July 2022)*

### Summary Stage-Area-Volume-Discharge Relationships

The user can create a summary S-A-V-D by entering the desired stage increments and the remainder of the table will populate automatically.

The user should graphically compare the summary S-A-V-D table to the full S-A-V-D table in the chart to confirm it captures all key transition points.

[illegible]

## 100-YR SWMM OUTPUT FOR POND A1 SIZING

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.2 (Build 5.2.4)

-----  
Future Conditions Hydrology for the North Dawson Tributary.

\*\*\*\*\*

### Analysis Options

\*\*\*\*\*

Flow Units ..... CFS

#### Process Models:

Rainfall/Runoff ..... NO

RDII ..... NO

Snowmelt ..... NO

Groundwater ..... NO

Flow Routing ..... YES

Ponding Allowed ..... NO

Water Quality ..... NO

Flow Routing Method ..... KINWAVE

Starting Date ..... 01/01/2005 00:00:00

Ending Date ..... 01/04/2005 06:00:00

Antecedent Dry Days ..... 0.0

Report Time Step ..... 00:05:00

Routing Time Step ..... 5.00 sec

| *****                      | Volume    | Volume   |
|----------------------------|-----------|----------|
| Flow Routing Continuity    | acre-feet | 10^6 gal |
| *****                      | -----     | -----    |
| Dry Weather Inflow .....   | 0.000     | 0.000    |
| Wet Weather Inflow .....   | 0.000     | 0.000    |
| Groundwater Inflow .....   | 0.000     | 0.000    |
| RDII Inflow .....          | 0.000     | 0.000    |
| External Inflow .....      | 74.272    | 24.203   |
| External Outflow .....     | 74.307    | 24.214   |
| Flooding Loss .....        | 0.000     | 0.000    |
| Evaporation Loss .....     | 0.000     | 0.000    |
| Exfiltration Loss .....    | 0.000     | 0.000    |
| Initial Stored Volume .... | 0.000     | 0.000    |
| Final Stored Volume .....  | 0.000     | 0.000    |
| Continuity Error (%) ..... | -0.048    |          |

\*\*\*\*\*

### Highest Flow Instability Indexes

\*\*\*\*\*

All links are stable.

\*\*\*\*\*

# Routing Time Step Summary

\*\*\*\*\*

Minimum Time Step : 5.00 sec  
Average Time Step : 5.00 sec  
Maximum Time Step : 5.00 sec  
% of Time in Steady State : 0.00  
Average Iterations per Step : 1.00  
% of Steps Not Converging : 0.00

\*\*\*\*\*

# Node Depth Summary

\*\*\*\*\*

| Node      | Type     | Average<br>Depth<br>Feet | Maximum<br>Depth<br>Feet | Maximum<br>HGL<br>Feet | Time of Max<br>Occurrence<br>days hr:min | Reported<br>Max Depth<br>Feet |
|-----------|----------|--------------------------|--------------------------|------------------------|------------------------------------------|-------------------------------|
| J_1       | JUNCTION | 0.00                     | 0.00                     | 6390.00                | 0 00:00                                  | 0.00                          |
| WQPOND_E3 | JUNCTION | 0.00                     | 0.00                     | 6560.00                | 0 00:00                                  | 0.00                          |
| J_E1      | JUNCTION | 0.00                     | 0.00                     | 6560.00                | 0 00:00                                  | 0.00                          |
| WQPOND_E2 | JUNCTION | 0.00                     | 0.00                     | 6560.00                | 0 00:00                                  | 0.00                          |
| J_4       | JUNCTION | 0.04                     | 0.58                     | 6534.58                | 0 00:51                                  | 0.58                          |
| WQPOND_A6 | JUNCTION | 0.00                     | 0.00                     | 6520.00                | 0 00:00                                  | 0.00                          |
| J_A9      | JUNCTION | 0.00                     | 0.00                     | 6551.00                | 0 00:00                                  | 0.00                          |
| J_3       | JUNCTION | 0.06                     | 1.36                     | 6491.36                | 0 00:37                                  | 1.35                          |
| WQPOND_A5 | JUNCTION | 0.00                     | 0.00                     | 6500.00                | 0 00:00                                  | 0.00                          |
| WQPOND_A8 | JUNCTION | 0.00                     | 0.00                     | 6500.00                | 0 00:00                                  | 0.00                          |
| J_2       | JUNCTION | 0.07                     | 2.74                     | 6417.74                | 0 00:39                                  | 2.74                          |
| J_1a      | JUNCTION | 0.07                     | 2.74                     | 6413.74                | 0 00:39                                  | 2.74                          |
| J_A2      | JUNCTION | 0.00                     | 0.00                     | 6495.00                | 0 00:00                                  | 0.00                          |
| WQPOND_A4 | JUNCTION | 0.00                     | 0.00                     | 6425.00                | 0 00:00                                  | 0.00                          |
| WQPOND_A7 | JUNCTION | 0.00                     | 0.00                     | 6425.00                | 0 00:00                                  | 0.00                          |
| WQPOND_A3 | JUNCTION | 0.00                     | 0.00                     | 6415.00                | 0 00:00                                  | 0.00                          |
| J_A1      | JUNCTION | 0.00                     | 0.00                     | 6415.00                | 0 00:00                                  | 0.00                          |
| ND_OUT    | OUTFALL  | 0.00                     | 0.00                     | 6350.00                | 0 00:00                                  | 0.00                          |
| SU_E1     | STORAGE  | 0.32                     | 6.67                     | 6541.67                | 0 01:35                                  | 6.67                          |
| SU_A1     | STORAGE  | 0.39                     | 7.59                     | 6408.59                | 0 01:26                                  | 7.59                          |

\*\*\*\*\*

# Node Inflow Summary

\*\*\*\*\*

| Node | Type | Maximum<br>Lateral<br>Inflow<br>CFS | Maximum<br>Total<br>Inflow<br>CFS | Time of Max<br>Occurrence<br>days hr:min | Lateral<br>Inflow<br>Volume<br>10^6 gal | Total<br>Inflow<br>Volume<br>10^6 gal | Flow<br>Balance<br>Error<br>Percent |
|------|------|-------------------------------------|-----------------------------------|------------------------------------------|-----------------------------------------|---------------------------------------|-------------------------------------|
|------|------|-------------------------------------|-----------------------------------|------------------------------------------|-----------------------------------------|---------------------------------------|-------------------------------------|

|           |          |        |        |   |       |       |       |       |
|-----------|----------|--------|--------|---|-------|-------|-------|-------|
| J_1       | JUNCTION | 0.00   | 227.76 | 0 | 01:26 | 0     | 24.2  | 0.000 |
| WQPOND_E3 | JUNCTION | 163.12 | 163.12 | 0 | 00:36 | 2.86  | 2.86  | 0.000 |
| J_E1      | JUNCTION | 113.63 | 113.63 | 0 | 00:40 | 2.61  | 2.61  | 0.000 |
| WQPOND_E2 | JUNCTION | 101.25 | 101.25 | 0 | 00:38 | 2.29  | 2.29  | 0.000 |
| J_4       | JUNCTION | 0.00   | 79.01  | 0 | 00:51 | 0     | 8.54  | 0.000 |
| WQPOND_A6 | JUNCTION | 31.15  | 31.15  | 0 | 00:35 | 0.502 | 0.502 | 0.000 |
| J_A9      | JUNCTION | 8.90   | 8.90   | 0 | 00:45 | 0.28  | 0.28  | 0.000 |
| J_3       | JUNCTION | 0.00   | 283.60 | 0 | 00:37 | 0     | 12.7  | 0.000 |
| WQPOND_A5 | JUNCTION | 83.27  | 83.27  | 0 | 00:36 | 1.58  | 1.58  | 0.000 |
| WQPOND_A8 | JUNCTION | 127.53 | 127.53 | 0 | 00:35 | 2.14  | 2.14  | 0.000 |
| J_2       | JUNCTION | 0.00   | 654.95 | 0 | 00:39 | 0     | 20.6  | 0.000 |
| J_1a      | JUNCTION | 0.00   | 654.95 | 0 | 00:39 | 0     | 20.6  | 0.000 |
| J_A2      | JUNCTION | 11.18  | 11.18  | 0 | 00:50 | 0.436 | 0.436 | 0.000 |
| WQPOND_A4 | JUNCTION | 265.12 | 265.12 | 0 | 00:38 | 5.44  | 5.44  | 0.000 |
| WQPOND_A7 | JUNCTION | 117.91 | 117.91 | 0 | 00:37 | 2.41  | 2.41  | 0.000 |
| WQPOND_A3 | JUNCTION | 195.47 | 195.47 | 0 | 00:35 | 3.03  | 3.03  | 0.000 |
| J_A1      | JUNCTION | 37.58  | 37.58  | 0 | 00:35 | 0.625 | 0.625 | 0.000 |
| ND_OUT    | OUTFALL  | 0.00   | 227.76 | 0 | 01:26 | 0     | 24.2  | 0.000 |
| SU_E1     | STORAGE  | 0.00   | 374.96 | 0 | 00:37 | 0     | 7.76  | 0.012 |
| SU_A1     | STORAGE  | 0.00   | 867.20 | 0 | 00:38 | 0     | 24.2  | 0.015 |

\*\*\*\*\*  
Node Flooding Summary  
\*\*\*\*\*

No nodes were flooded.

\*\*\*\*\*  
Storage Volume Summary  
\*\*\*\*\*

| Storage Unit | Average<br>Volume<br>1000 ft <sup>3</sup> | Avg<br>Pcnt<br>Full | Evap<br>Pcnt<br>Loss | Exfil<br>Pcnt<br>Loss | Maximum<br>Volume<br>1000 ft <sup>3</sup> | Max<br>Pcnt<br>Full | Time of Max<br>Occurrence<br>days hr:min | Maximum<br>Outflow<br>CFS |
|--------------|-------------------------------------------|---------------------|----------------------|-----------------------|-------------------------------------------|---------------------|------------------------------------------|---------------------------|
| SU_E1        | 33.696                                    | 2.8                 | 0.0                  | 0.0                   | 741.759                                   | 61.3                | 0 01:35                                  | 64.66                     |
| SU_A1        | 42.724                                    | 2.0                 | 0.0                  | 0.0                   | 1357.155                                  | 62.2                | 0 01:26                                  | 227.76                    |

\*\*\*\*\*  
Outfall Loading Summary  
\*\*\*\*\*

| Flow<br>Freq | Avg<br>Flow | Max<br>Flow | Total<br>Volume |
|--------------|-------------|-------------|-----------------|
|--------------|-------------|-------------|-----------------|

| Outfall Node | Pcnt  | CFS   | CFS    | 10^6 gal |
|--------------|-------|-------|--------|----------|
| ND_OUT       | 32.51 | 35.46 | 227.76 | 24.212   |
| System       | 32.51 | 35.46 | 227.76 | 24.212   |

\*\*\*\*\*  
Link Flow Summary  
\*\*\*\*\*

| Link   | Type    | Maximum<br> Flow <br>CFS | Time of Max<br>Occurrence<br>days hr:min | Maximum<br> Veloc <br>ft/sec | Max/<br>Full<br>Flow | Max/<br>Full<br>Depth |
|--------|---------|--------------------------|------------------------------------------|------------------------------|----------------------|-----------------------|
| D_J1   | DUMMY   | 227.76                   | 0 01:26                                  |                              |                      |                       |
| D_E1   | DUMMY   | 113.63                   | 0 00:40                                  |                              |                      |                       |
| D_WQE3 | DUMMY   | 163.12                   | 0 00:36                                  |                              |                      |                       |
| D_E2   | DUMMY   | 101.25                   | 0 00:38                                  |                              |                      |                       |
| D_A9   | DUMMY   | 8.90                     | 0 00:45                                  |                              |                      |                       |
| D_WQA6 | DUMMY   | 31.15                    | 0 00:35                                  |                              |                      |                       |
| D_WQA5 | DUMMY   | 83.27                    | 0 00:36                                  |                              |                      |                       |
| D_WQA8 | DUMMY   | 127.53                   | 0 00:35                                  |                              |                      |                       |
| C_J3   | CONDUIT | 78.99                    | 0 00:53                                  | 5.32                         | 0.00                 | 0.06                  |
| C_J2   | CONDUIT | 280.00                   | 0 00:41                                  | 8.26                         | 0.02                 | 0.13                  |
| D_A2   | DUMMY   | 11.18                    | 0 00:50                                  |                              |                      |                       |
| D_WQA4 | DUMMY   | 265.12                   | 0 00:38                                  |                              |                      |                       |
| D_WQA7 | DUMMY   | 117.91                   | 0 00:37                                  |                              |                      |                       |
| C_J_1a | CONDUIT | 654.95                   | 0 00:39                                  | 23.94                        | 0.22                 | 0.27                  |
| D_A1   | DUMMY   | 37.58                    | 0 00:35                                  |                              |                      |                       |
| D_J_1a | DUMMY   | 654.95                   | 0 00:39                                  |                              |                      |                       |
| D_WQA3 | DUMMY   | 195.47                   | 0 00:35                                  |                              |                      |                       |
| E1_OUT | DUMMY   | 64.66                    | 0 01:35                                  |                              |                      |                       |
| A1_OUT | DUMMY   | 227.76                   | 0 01:26                                  |                              |                      |                       |

\*\*\*\*\*  
Conduit Surge Summary  
\*\*\*\*\*

No conduits were surcharged.

Analysis begun on: Thu Apr 3 10:26:31 2025  
Analysis ended on: Thu Apr 3 10:26:31 2025  
Total elapsed time: < 1 sec

### Rainfall

**TABLE 6-1  
1-HOUR POINT RAINFALL VALUES FOR  
THE TOWN OF CASTLE ROCK (INCHES)**

| 2- YR | 5-YR | 10-YR | 50-YR | 100-YR |
|-------|------|-------|-------|--------|
| 1.06  | 1.43 | 1.66  | 2.26  | 2.60   |

The one-hour rainfall depths are the basis of the Town's intensity-duration rainfall curves and are used to formulate design storm distributions.

**6.1.2 Intensity-Duration Curves.** Rainfall intensity based on storm duration for a variety of storm return periods can be found on Figure 6-1 at the end of this chapter. These curves were developed using distribution factors provided in the NOAA Atlas and also provided in Table RA-4 of the MHFD Manual. These Intensity-Duration curves are based on Equation RA-3 in the Rainfall Section of the MHFD Manual.

**6.1.3 Six-hour Rainfall.** In order to use the Colorado Urban Hydrograph Procedure (CUHP), two, three or six-hour rainfall distributions are required, depending on watershed area. Table RA-1 in the MHFD Manual summarizes storm durations, area adjustments, and incremental rainfall depths to be used in CUHP based on watershed area. The UD-Raincurve Spreadsheet included in the MHFD Manual shall be used to generate the rainfall distribution curves necessary for a CUHP model. In order to generate these distribution curves, the one-hour and six-hour rainfall depths for the design return periods are necessary. Since the Town of Castle Rock is not located within MHFD boundaries, the rainfall depth-duration-frequency curves provided in the MHFD Manual do not provide rainfall values for the entire Town. Therefore these values are provided in these Criteria. The 1-hour point values can be found in Table 6-1 of this chapter. The six-hour point values are as follows:

**TABLE 6-2  
6-HOUR POINT RAINFALL VALUES FOR  
THE TOWN OF CASTLE ROCK (INCHES)**

| 2- YR | 5-YR | 10-YR | 50-YR | 100-YR |
|-------|------|-------|-------|--------|
| 1.5   | 2.0  | 2.2   | 3.0   | 3.4    |

The UD-Raincurve spreadsheet shall be used for all portions of the Town. Once the rainfall distribution curves are generated using the MHFD UD-Raincurve Spreadsheet, the CUHP model is to be set up following the procedures provided in the Runoff chapter in Volume 1 of the MHFD Manual.

## 6.2 Selecting a Method to Estimate Runoff

Two primary methods for estimating storm runoff, peak flow rates and total volumes are used in the Town.

- Rational Method

**TABLE 7-2**  
**MINOR STORM ALLOWABLE FLOW DEPTH AND ROADWAY**  
**ENCROACHMENT FOR STREETS WITH CURB AND GUTTER**

| Drainage Classification | Allowable Flow Depth in Gutter Flowline <sup>1</sup> | Maximum Roadway Encroachment                                                                                       |
|-------------------------|------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|
| Type A                  | No curb overtopping.                                 | Flow may spread to crown of street.                                                                                |
| Type B                  | No curb overtopping.                                 | Flow spread must leave at least one 10-foot lane free of water (5-feet either side of the street crown).           |
| Type C                  | No curb overtopping.                                 | Flow spread must leave at least two 10-foot lanes free of water (10-feet each side of the street crown or median). |

<sup>1</sup> If a 4-inch curb with an attached sidewalk is used (i.e., combination or rollover curb), the flow depth is limited to 4-inches.

### 7.4 Major (100-Year) Storm Allowable Street Flow

**7.4.1 Allowable Flow Depth for a Street with Curb and Gutter.** The Town allows the use of streets for drainage conveyance in the major storm with limitations on the depth of flow in the curb and gutter. Table 7-3 summarizes these limitations for each drainage classification. The maximum street capacity is based on the allowable depth at the gutter flowline.

**TABLE 7-3**  
**MAJOR STORM ALLOWABLE FLOW DEPTH**  
**FOR STREETS WITH CURB AND GUTTER**

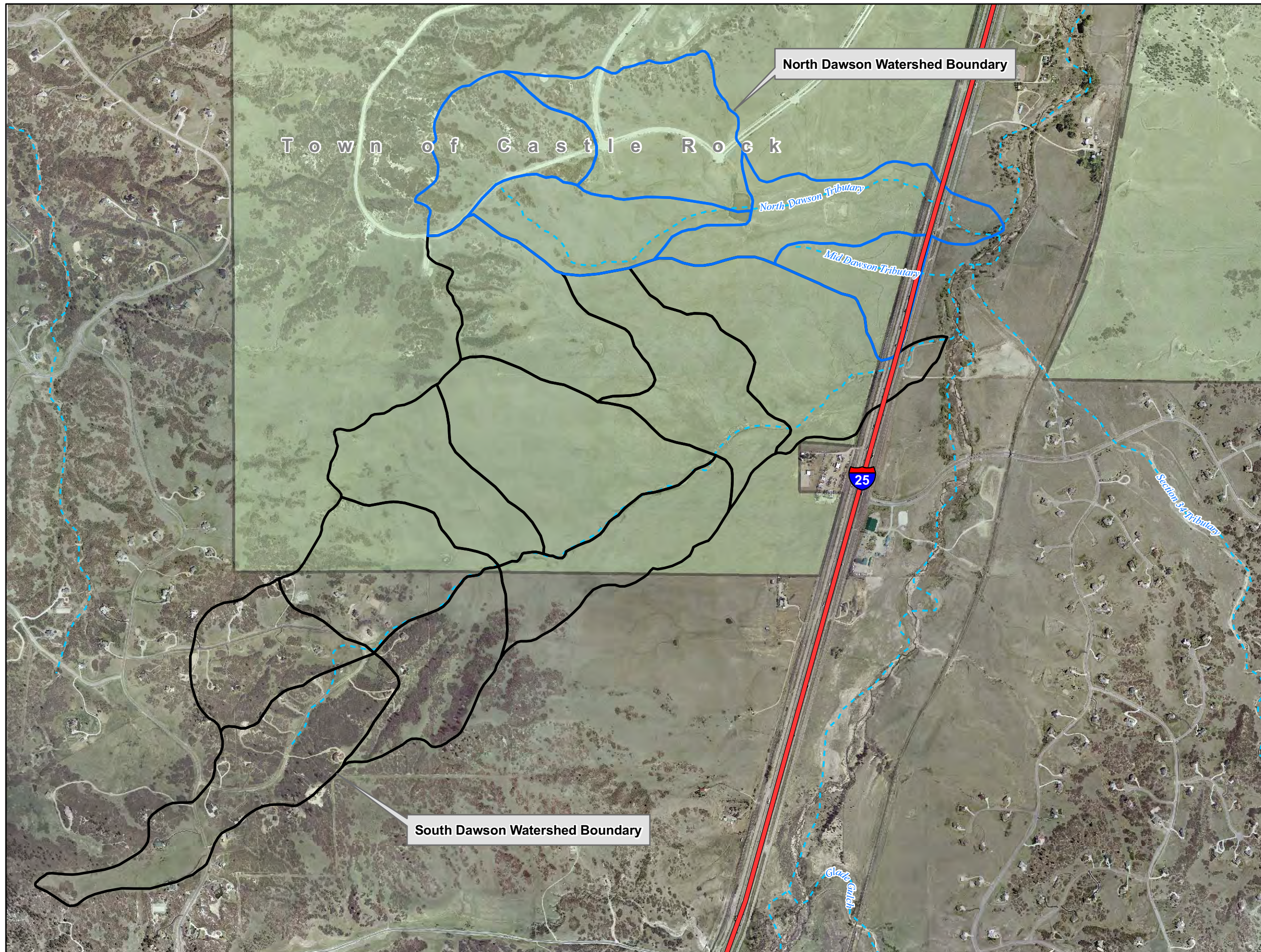
| Drainage Classification | Allowable Flow Depth                                                               |
|-------------------------|------------------------------------------------------------------------------------|
| Type A, B and C         | The depth of water at the gutter flowline shall not exceed 12-inches. <sup>1</sup> |

<sup>1</sup> See Section 7.5.3 for further information on allowable flow depth limits.

### 7.5 Hydraulic Evaluation of Street Capacity

Once the design discharge is calculated (see Chapter 6, Hydrology), hydraulic calculations are to be completed to determine the capacity of street gutters and the resulting encroachment onto the street section. All street capacity and encroachment calculations shall conform to the Streets/Inlets/Storm Sewers chapter in Volume 1 of the MHFD Manual unless otherwise noted herein. For more detailed information on the methodology used for the hydraulic evaluation of street capacity see Section 2.3 of Chapter 7 in Volume 1 of the MHFD Manual.

**7.5.1 Minor (5-year) Storm Street Capacity Worksheet.** The Streets/Inlets/Storm Sewers chapter in Volume 1 of the MHFD Manual provides an analysis tool used for determining the minor storm street capacity and flow encroachment. This tool



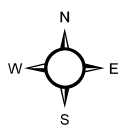
Watershed Location

**Legend**

**Sub Basins**

- North Dawson
- South Dawson
- Perennial Streams and Creeks
- Castle Rock Town Boundary

Master Plan overview of the area



0 600 1,200  
Feet

**Figure i-1**  
**North Dawson/South Dawson**  
**Watershed Master Plan**  
**Study Area**



## Phase III Drainage Report Checklist

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

The Phase III Drainage Report must be signed and sealed by a Professional Engineer licensed in the State of Colorado. The purpose of the Phase III Drainage Report is to update the concepts, and to present the design details on construction plans for the drainage facilities discussed in the Phase II Drainage Report.

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

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

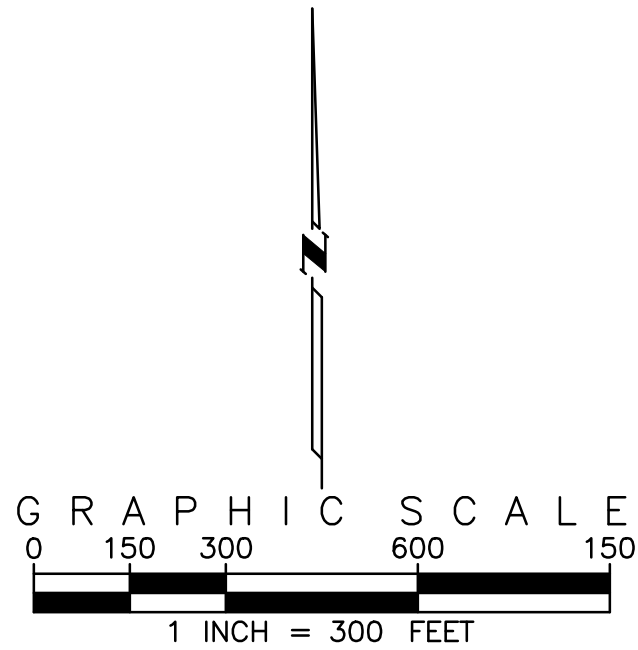
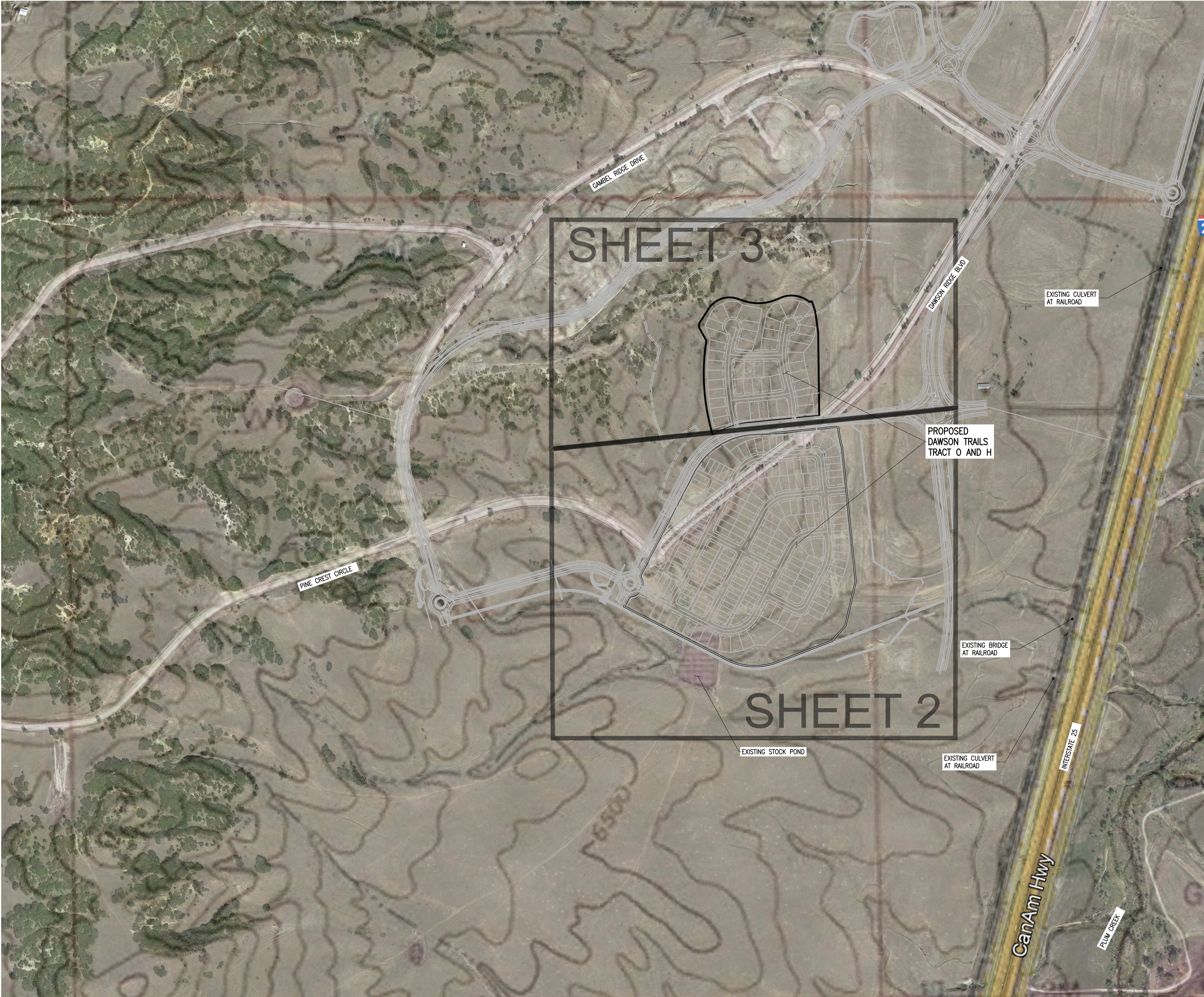
| Included | N/A |                                                         |
|----------|-----|---------------------------------------------------------|
| ✓        |     | <b>I. COVER SHEET</b>                                   |
| ✓        |     | A. Name of Project, including legal name of development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

## Phase III Drainage Report Checklist

| Included                                                                            | N/A |                                                        |
|-------------------------------------------------------------------------------------|-----|--------------------------------------------------------|
|    |     | <b>V. STORMWATER MANAGEMENT FACILITY DESIGN</b>        |
|    |     | A. Stormwater Conveyance Facilities                    |
|    |     | B. Stormwater Storage Facilities                       |
|    |     | C. Water Quality Enhancement Best Management Practices |
|    |     | D. Floodplain Modification                             |
|    |     | E. Additional Permitting Requirements                  |
|    |     | F. General                                             |
|    |     | <b>VI. CONCLUSIONS</b>                                 |
|    |     | A. Compliance with Standards                           |
|    |     | B. Variances                                           |
|    |     | C. Drainage Concept                                    |
|    |     | <b>VII. REFERENCES</b>                                 |
|   |     | <b>VIII. APPENDICES</b>                                |
|  |     | A. Hydrologic Computations                             |
|  |     | B. Hydraulic Computations                              |
|  |     | C. Water Quality Enhancement Best Management Practices |
|  |     | D. Referenced Information                              |
|  |     | <b>OVERALL DRAINAGE PLAN (IN POCKET)</b>               |
|  |     | <b>DETAILED DRAINAGE PLANS (IN POCKET)</b>             |

**Notes/Comments:**

**DRAINAGE REPORT**  
**for**  
**DAWSON TRAILS - TRACT O AND H**  
**DRAWINGS**



DAWSON TRAILS

TRACT O AND H  
OVERALL LAYOUT

DATE: 11/21/2024  
JOB NO: 13393.00

SCALE  
HORIZONTAL  
1" = 300'

1 of 3

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

| NO. | DESCRIPTION | DATE | BY |
|-----|-------------|------|----|
|     |             |      |    |
|     |             |      |    |
|     |             |      |    |
|     |             |      |    |
|     |             |      |    |
|     |             |      |    |
|     |             |      |    |
|     |             |      |    |
|     |             |      |    |

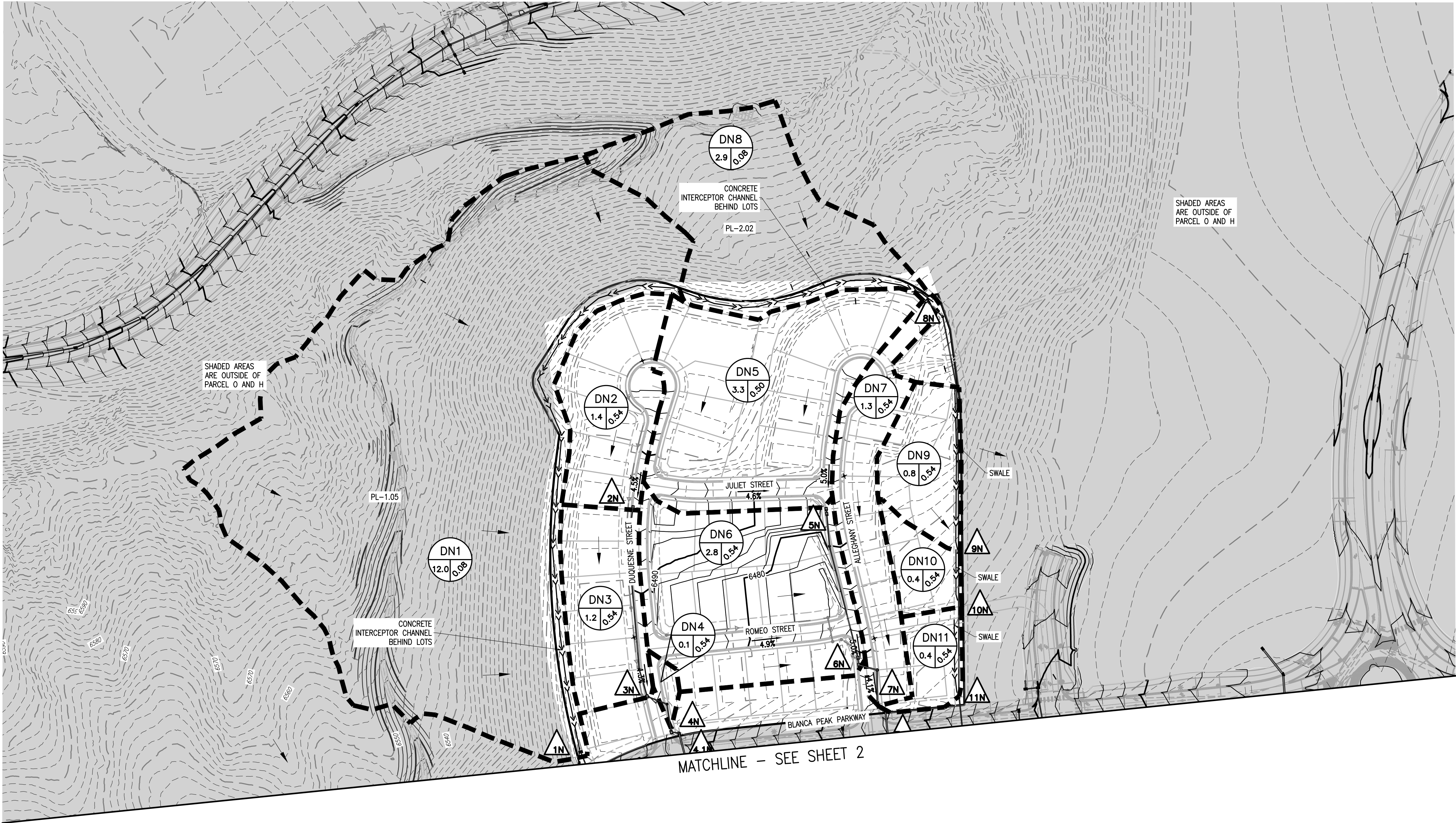
Know what's below.  
Call before you dig.

REUSE OF DOCUMENT

THE IDEAS AND DESIGN OF THIS DOCUMENT ARE THE PROPERTY OF EMK CONSULTANTS, INC., AND ARE NOT TO BE USED FOR ANY OTHER PROJECT WITHOUT WRITTEN AUTHORIZATION OF EMK CONSULTANTS, INC.

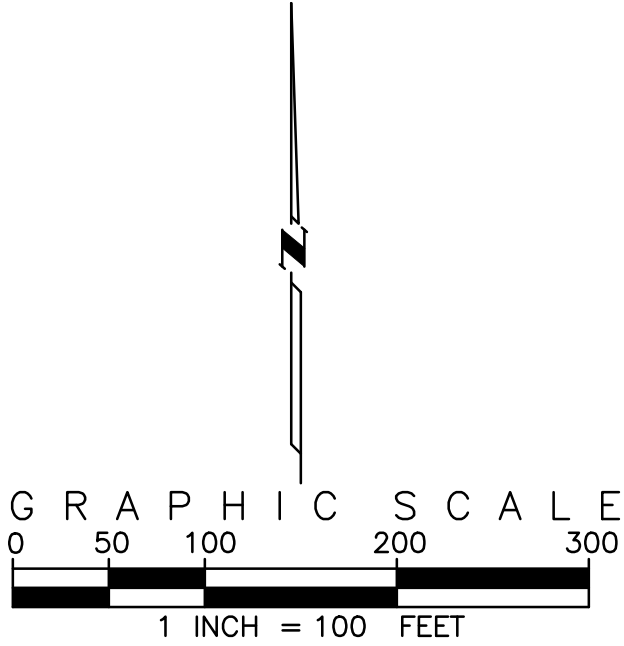
EMK CONSULTANTS, INC.  
LAND DEVELOPMENT  
ENGINEERING & SURVEYING  
7009 SOUTH ALTON WAY, BLDG. 1  
CENTENNIAL, COLORADO 80112-2019  
(303)694-1520  
WWW.EMKCO.COM





**LEGEND**

- BASIN DESIGNATION
- 5-YR DEVELOPED RATIONAL COEFFICIENT
- BASIN AREA IN ACRES
- DESIGN POINT—RATIONAL METHOD
- BASIN BOUNDARY
- FLOW DIRECTION ARROW
- EXISTING 2-FT CONTOUR
- EXISTING 10-FT CONTOUR
- PROPOSED 2-FT CONTOUR
- PROPOSED 10-FT CONTOUR
- STORM SEWER AND INLET, MANHOLE, FLARED END SECTION
- 100-YR EMERGENCY OVERFLOW PATH
- SHADED AREAS INDICATE OUTSIDE LIMITS OF TRACT D
- SWALE



**EMK CONSULTANTS, INC.**  
LAND DEVELOPMENT  
ENGINEERING & SURVEYING  
7008 SOUTH ALTON WAY, BLDG. F  
CENTENNIAL, COLORADO 80112-2019  
(303)694-1520  
WWW.EMKCO.COM

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

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

REUSE OF DOCUMENT  
THE IDEAS AND DESIGN INCORPORATED HEREON ARE AN INSTRUMENT OF PROFESSIONAL SERVICE, ARE THE PROPERTY OF EMK CONSULTANTS, INC., AND ARE NOT TO BE USED FOR ANY OTHER PROJECT WITHOUT WRITTEN AUTHORIZATION OF EMK CONSULTANTS, INC.

|                                         |              |                                 |     |  |       |  |
|-----------------------------------------|--------------|---------------------------------|-----|--|-------|--|
| DAWSON TRAILS                           | DESIGNED BY: | DJO                             | BY: |  | DATE: |  |
|                                         | DRAWN BY:    | DJO                             | BY: |  |       |  |
|                                         | CHECKED BY:  | CAW                             | BY: |  |       |  |
|                                         | APPROVED BY: | ERM                             | BY: |  |       |  |
| TRACT O AND H<br>PROPOSED DRAINAGE PLAN |              | DATE: 03/14/2025                |     |  |       |  |
|                                         |              | JOB NO: 13296.00                |     |  |       |  |
|                                         |              | SCALE<br>HORIZONTAL<br>1" = 50' |     |  |       |  |
| 3 of 3                                  |              |                                 |     |  |       |  |