



PHASE II DRAINAGE REPORT
FOR
DAWSON TRAILS TRACT F

PREPARED FOR:

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MAY 2026

Approval Blocks

ENGINEER'S STATEMENT:

"I affirm that this report and plan for the Phase II drainage design of Dawson Trails Tract F 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."

Martin Metsker, P.E.
Colorado Professional Engineer
License #41743

OWNER/DEVELOPER'S STATEMENT:

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

The Garrett Companies, LLC

TOWN OF CASTLE ROCK APPROVALS:

Utilities Department Date

Development Services	Date
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terracina design

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I. GENERAL LOCATION AND DESCRIPTION

A. Site Location

This Phase II Drainage Report provides remediation for changes in the drainage patterns resulting from the development of the proposed Dawson Trails Tract F, from here on known as "Site". The Site is a proposed residential development that is approximately 12.67 acres within the Dawson Trails Filing 2 development.

This drainage report will modify a portion of the existing drainage basins delineated within the "Phase III Drainage Report for Dawson Trails Filing No.2" by EMK Consultants, approved October 2025. The Site is bound on the north by Blanca Peak Parkway, on the east by Dawson Plaza, on the west by Dawson Trails Blvd, and on the south by North Dawson Tributary. The Site is in the northwest quarter of Section 27, and the northeast quarter of Section 28, Township 8 South, Range 67 West of the Sixth Principal Meridian, County of Douglas, State of Colorado. A vicinity map for the site can be found in Appendix A.

B. Description of Property

The Site is currently undeveloped with existing native vegetation, and the land uses according to the approved PD are Mixed Use. The Site has naturally occurring slopes ranging from 1 to 30 percent.

The soils within the Site include Bresser sandy loam and Newlin gravelly sandy loam, and the soil primarily consists of hydrologic soil group C/D. A soils map has been provided and can be found in Appendix A.

The Site is not adjacent to an existing floodplain, and lies within Zone X, "Areas determined to be outside the 0.2% annual chance floodplain," as depicted on the FIRM Map 08035C0284G found in Appendix A. The Site will not propose modifications or improvements to the floodplain. The Site drainage will not adversely impact the surrounding existing drainage infrastructure.

Historically, discharge from the Site sheet flows generally following the patterns described in the master drainage study. Ultimately, all runoff generated within the Site will be conveyed into the regional flood control **Pond A1** to the east. The intent of this project is to construct the necessary infrastructure to begin development of the Site. This report details the general drainage patterns that the Site will follow in the final developed conditions.

DRAINAGE BASINS AND SUB-BASINS

C. Major Drainage Basins

The Site lies within the basins analyzed in the "Phase III Drainage Report for Dawson Trails Filing No.2" by EMK Consultants, approved October 2025. Runoff generated within the Site will generally follow the drainage patterns set forth in said report. Runoff will be conveyed via existing and proposed pipe networks to the existing water quality and detention ponds before being discharged into the **Regional Flood Control Pond A1** to the east. Please see the Proposed Drainage Map found in Appendix E of this report for basins flow information.

The Site falls within Zone X, as shown on the FIRM Map 08035C0284G. The development will have no effect on the Zone X designation, where there are "Areas determined to be outside the 0.2% annual chance floodplain." The development will not have an effect on the Zone X designation and will remain the same. A FIRM map can be found in Appendix A.

There is a master drainage study for the area associated with the Site. The relevant drainage information from the master drainage study created by EMK Consultants titled "Phase III Drainage Report for Dawson Trails Filing No.2", approved October 2025, can be found in Appendix D.

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D. Minor Drainage Basin

Minor Drainage Basins for the Site and adjacent lots have been delineated using the existing and proposed grading. The developed minor basins will include overland flow and storm sewer collection systems which will direct stormwater to the existing detention ponds. The site drainage will not be impacted by any irrigation facilities. Minor basins have been established for the site, and are described below:

Basin A1

Basin A1 encompasses the north landscape area and is comprised of Landscape area. Runoff generated from this basin will flow east toward a proposed Sump Nyloplast dome inlet at Design Point A1. Flows will be conveyed through existing and proposed infrastructure to Pond D1 and ultimately into the regional flood control Pond A1.

Basin A2

Basin A2 encompasses the northwest landscape area and is comprised of roofs and landscape area. Runoff generated from this basin will flow north toward a proposed Sump Nyloplast dome inlet at Design Point A2. Flows will be conveyed through existing and proposed infrastructure to Pond D1 and ultimately into the regional flood control Pond A1.

Basin A3

Basin A3 encompasses the northwest landscape area and is comprised of roofs and landscape area. Runoff generated from this basin will flow south toward a proposed Sump Nyloplast dome inlet at Design Point A3. Flows will be conveyed through existing and proposed infrastructure to Pond D1 and ultimately into the regional flood control Pond A1.

Basin A4

Basin A4 encompasses the northwest drive aisle and is comprised of paved area, landscape area, and walks. Runoff generated from this basin will flow east toward a proposed Sump Type 16 Combination at Design Point A4. Flows will be conveyed through existing and proposed infrastructure to Pond D1 and ultimately into the regional flood control Pond A1.

Basin A5

Basin A5 encompasses the northwest drive aisle and is comprised of paved area, landscape area, and walks. Runoff generated from this basin will flow south toward a proposed Sump Type 16 Combination Inlet at Design Point A5. Flows will be conveyed through existing and proposed infrastructure to Pond D1 and ultimately into the regional flood control Pond A1.

Basin A6

Basin A6 encompasses the northwest drive aisle and is comprised of paved area, landscape area, and walks. Runoff generated from this basin will flow south toward a proposed Sump Type 16 Combination Inlet at Design Point A6. Flows will be conveyed through existing and proposed infrastructure to Pond D1 and ultimately into the regional flood control Pond A1.

Basin A7

Basin A7 encompasses the west drive aisle and is comprised of paved area, landscape area, and walks. Runoff generated from this basin will flow south toward a proposed Sump Type 16 Combination Inlet at Design Point A7. Flows will be conveyed through existing and proposed infrastructure to Pond D1 and ultimately into the regional flood control Pond A1.

Basin A8

Basin A8 encompasses the central drive aisle and is comprised of paved area, landscape area, and walks. Runoff generated from this basin will flow north toward a proposed Sump

Type 13 Valley Grate at Design Point A8. Flows will be conveyed through existing and proposed infrastructure to Pond D1 and ultimately into the regional flood control Pond A1.

Basin A9

Basin A9 encompasses the central drive aisle and is comprised of paved area, landscape area, and walks. Runoff generated from this basin will flow south toward a proposed Sump Type 16 Combination Inlet at Design Point A9. Flows will be conveyed through existing and proposed infrastructure to Pond D1 and ultimately into the regional flood control Pond A1.

Basin A10

Basin A10 encompasses the northeast drive aisle and is comprised of paved area, landscape area, and walks. Runoff generated from this basin will flow south toward a proposed Sump Type 13 Valley Grate at Design Point A10. Flows will be conveyed through existing and proposed infrastructure to Pond D1 and ultimately into the regional flood control Pond A1.

Basin A11

Basin A11 encompasses the northeast drive aisle and is comprised of paved area, landscape area, and walks. Runoff generated from this basin will flow south toward a proposed Sump Type 13 Valley Grate at Design Point A11. Flows will be conveyed through existing and proposed infrastructure to Pond D1 and ultimately into the regional flood control Pond A1.

Basin A12

Basin A12 encompasses the east drive aisle and is comprised of paved area, landscape area, and walks. Runoff generated from this basin will flow south toward a proposed Sump Type 13 Valley Grate at Design Point A12. Flows will be conveyed through existing and proposed infrastructure to Pond D1 and ultimately into the regional flood control Pond A1.

Basin A13

Basin A13 encompasses the southeast drive aisle and is comprised of paved area, landscape area, and walks. Runoff generated from this basin will flow south toward a proposed Sump Type 13 Valley Grate at Design Point A13. Flows will be conveyed through existing and proposed infrastructure to Pond D1 and ultimately into the regional flood control Pond A1.

Basin A14

Basin A14 encompasses the southeast drive aisle and is comprised of paved area, landscape area, and walks. Runoff generated from this basin will flow south toward a proposed Sump Type 16 Combination at Design Point A14. Flows will be conveyed through existing and proposed infrastructure to Pond D1 and ultimately into the regional flood control Pond A1.

Basin A15

Basin A15 encompasses the east landscape area and is comprised of landscape area. Runoff generated from this basin will flow east toward a proposed Sump Nyloplast dome inlet at Design Point A15. Flows will be conveyed through existing and proposed infrastructure to Pond D1 and ultimately into the regional flood control Pond A1.

Basin A16

Basin A16 encompasses the east landscape area and is comprised of landscape area. Runoff generated from this basin will flow toward a proposed Sump Type C Inlet at Design Point A16. Flows will be conveyed through existing and proposed infrastructure to Pond D1 and ultimately into the regional flood control Pond A1.

Basin A17

Basin A17 encompasses the central drive aisle and is comprised of paved area, landscape area, and walks. Runoff generated from this basin will flow north toward a proposed Sump Type 16 Combination Inlet at Design Point A17. Flows will be conveyed through existing and proposed infrastructure to Pond D1 and ultimately into the regional flood control Pond A1.

Basin B1

Basin B1 encompasses the west drive aisle and is comprised of paved area and walks. Runoff generated from this basin will flow east toward a proposed on-grade Type R Inlet at Design Point B1. Flows will be conveyed through existing and proposed infrastructure to Pond D1 and ultimately into the regional flood control Pond A1.

Basin B2

Basin B2 encompasses the west drive aisle and is comprised of paved area and walks. Runoff generated from this basin will flow east toward a proposed on-grade Type R Inlet at Design Point B2. Flows will be conveyed through existing and proposed infrastructure to Pond D1 and ultimately into the regional flood control Pond A1.

Basin B3

Basin B3 encompasses the landscape area to the south of the west drive aisle and is comprised of landscape area. Runoff generated from this basin will flow south toward a Sump Nyloplast Dome Inlet at Design Point B3. Flows will be conveyed through existing and proposed infrastructure to Pond D1 and ultimately into the regional flood control Pond A1.

Basin B4

Basin B4 encompasses the west drive aisle and is comprised of paved area. Runoff generated from this basin will flow south toward a Sump Type 13 Valley Grate at Design Point B4. Flows will be conveyed through existing and proposed infrastructure to Pond D1 and ultimately into the regional flood control Pond A1.

Basin B5

Basin B5 encompasses the west drive aisle and is comprised of paved area. Runoff generated from this basin will flow east toward a Sump Type 16 Combination Inlet at Design Point B5. Flows will be conveyed through existing and proposed infrastructure to Pond D1 and ultimately into the regional flood control Pond A1.

Basin B6

Basin B6 encompasses the west drive aisle and is comprised of paved area. Runoff generated from this basin will flow south toward a Sump Type 16 Combination Inlet at Design Point B6. Flows will be conveyed through existing and proposed infrastructure to Pond D1 and ultimately into the regional flood control Pond A1.

Basin B7

Basin B7 encompasses the west drive aisle and is comprised of paved area. Runoff generated from this basin will flow east toward a Sump Type 16 Combination Inlet at Design Point B7. Flows will be conveyed through existing and proposed infrastructure to Pond D1 and ultimately into the regional flood control Pond A1.

Basin B8

Basin B8 encompasses the west drive aisle and is comprised of paved area. Runoff generated from this basin will flow east toward a Sump Type 13 Valley Grate at Design Point B8. Flows will be conveyed through existing and proposed infrastructure to Pond D1 and ultimately into the regional flood control Pond A1.

Basin B9

Basin B9 encompasses the west drive aisle and is comprised of paved area. Runoff generated from this basin will flow south toward a Sump Type 13 Valley Grate at Design Point B9. Flows will be conveyed through existing and proposed infrastructure to Pond D1 and ultimately into the regional flood control Pond A1.

Basin B10

Basin B10 encompasses the west drive aisle and is comprised of paved area. Runoff generated from this basin will flow south toward a Sump Type 13 Valley Grate at Design Point B10. Flows will be conveyed through existing and proposed infrastructure to Pond D1 and ultimately into the regional flood control Pond A1.

Basin B11

Basin B11 encompasses the central drive aisle and is comprised of paved area. Runoff generated from this basin will flow south toward a Sump Type 13 Valley Grate at Design Point B11. Flows will be conveyed through existing and proposed infrastructure to Pond D1 and ultimately into the regional flood control Pond A1.

Basin B12

Basin B12 encompasses the central drive aisle and is comprised of paved area. Runoff generated from this basin will flow south toward a Sump Type 16 Combination Inlet at Design Point B12. Flows will be conveyed through existing and proposed infrastructure to Pond D1 and ultimately into the regional flood control Pond A1.

Basin B13

Basin B13 encompasses the central drive aisle and is comprised of paved area. Runoff generated from this basin will flow south toward a Sump Type 13 Valley Grate at Design Point B13. Flows will be conveyed through existing and proposed infrastructure to Pond D1 and ultimately into the regional flood control Pond A1.

Basin B14

Basin B14 encompasses the central drive aisle and the west side of Dawson Trails Boulevard and is comprised of paved area. Runoff generated from this basin will flow south toward a Sump Type R Inlet at Design Point B14. Flows will be conveyed through existing and proposed infrastructure to Pond D1 and ultimately into the regional flood control Pond A1.

Basin B15

Basin B15 encompasses the site amenities and landscape area. Runoff generated from this basin will flow north toward a Sump Nyloplast dome inlet at Design Point B15. Flows will be conveyed through existing and proposed infrastructure to Pond D1 and ultimately into the regional flood control Pond A1.

Basin B16

Basin B16 encompasses the southern drive aisle and consists of paved area and landscape areas. Runoff generated from this basin will flow northeast toward an on-grade Type R Inlet at Design Point B16. Flows will be conveyed through existing and proposed infrastructure to Pond D1 and ultimately into the regional flood control Pond A1.

Basin B17

Basin B17 encompasses the southern drive aisle and consists of paved area, walks, and landscape areas. Runoff generated from this basin will flow east towards a Sump Type 13 Valley Grate at Design Point B17. Flows will be conveyed through existing and proposed infrastructure to Pond D1 and ultimately into the regional flood control Pond A1.

Basin B18

Basin B18 encompasses the maintenance building and landscape area and consists of paved area, walks, and landscape areas. Runoff generated from this basin will flow northeast towards a Sump Type R Inlet at Design Point B18. Flows will be conveyed through existing and proposed infrastructure to Pond D1 and ultimately into the regional flood control Pond A1.

Basin C1

Basin C1 encompasses the southwest landscape area and is comprised of roofs, paved area, landscape area, and walks. Runoff generated from this basin will flow south toward a proposed Sump Nyloplast dome inlet at Design Point C1. Flows will be conveyed through existing and proposed infrastructure to Pond D3 and ultimately into the regional flood control Pond A1.

Basin C2

Basin C2 encompasses the southwest landscape area and is comprised of roofs, paved area, landscape area, and walks. Runoff generated from this basin will flow east toward a proposed Sump Nyloplast dome inlet at Design Point C2. Flows will be conveyed through existing and proposed infrastructure to Pond D3 and ultimately into the regional flood control Pond A1.

Basin C3

Basin C3 encompasses the southwest landscape area and is comprised of roofs, paved area, landscape area, and walks. Runoff generated from this basin will flow south toward a proposed Sump Nyloplast dome inlet at Design Point C3. Flows will be conveyed through existing and proposed infrastructure to Pond D3 and ultimately into the regional flood control Pond A1.

Basin C4

Basin C4 encompasses the southwest drive aisle and is comprised of paved area, landscape area, and walks. Runoff generated from this basin will flow west toward a proposed Sump Nyloplast Dome Inlet at Design Point C4. Flows will be conveyed through existing and proposed infrastructure to Pond D3 and ultimately into the regional flood control Pond A1.

Basin C5

Basin C5 encompasses the southwest drive aisle and is comprised of paved area, landscape area, and walks. Runoff generated from this basin will flow west toward a proposed Sump Type 13 Valley Grate at Design Point C5. Flows will be conveyed through existing and proposed infrastructure to Pond D3 and ultimately into the regional flood control Pond A1.

Basin C6

Basin C6 encompasses the southwest drive aisle and is comprised of paved area, landscape area, and walks. Runoff generated from this basin will flow west toward a proposed Sump Type 13 Valley Grate at Design Point C6. Flows will be conveyed through existing and proposed infrastructure to Pond D3 and ultimately into the regional flood control Pond A1.

Basin C7

Basin C7 encompasses the southwest drive aisle and is comprised of paved area, landscape area, and walks. Runoff generated from this basin will flow south toward a proposed Sump Type 13 Valley Grate at Design Point C7. Flows will be conveyed through existing and proposed infrastructure to Pond D3 and ultimately into the regional flood control Pond A1.

Basin C8

Basin C8 encompasses the southwest drive aisle and is comprised of paved area, landscape area, and walks. Runoff generated from this basin will flow south toward a proposed Sump

Type 16 Combination Inlet at Design Point C8. Flows will be conveyed through existing and proposed infrastructure to Pond D3 and ultimately into the regional flood control Pond A1.

Basin C9

Basin C9 encompasses the southwest drive aisle and is comprised of paved area, landscape area, and walks. Runoff generated from this basin will flow south toward a proposed Sump Type 16 Combination Inlet at Design Point C9. Flows will be conveyed through existing and proposed infrastructure to Pond D3 and ultimately into the regional flood control Pond A1.

Basin OS1

Basin OS1 encompasses the north landscape area and is comprised of roofs, paved area, landscape area, and walks. Runoff generated from this basin will flow east toward a proposed Sump 10' Type R Inlet at Design Point OS1. Flows will be conveyed through existing and proposed infrastructure to Pond D1 and ultimately into the regional flood control Pond A1.

Basin OS2

Basin OS2 encompasses the south landscape area and is comprised of roofs, paved area, landscape area, and walks. Runoff generated from this basin will sheet flow south directly into Pond D3 at Design Point OS2. Flows will be conveyed through existing and proposed infrastructure to Pond D3 and ultimately into the regional flood control Pond A1.

Basin R1

Basin R1 encompasses the southwest roof and is comprised of roof area. Runoff generated from this basin will be directed through roof drains into the proposed storm infrastructure at Design Point R1. The runoff will then discharge into Pond D3, which ultimately discharges into the regional flood control Pond A1.

Basins R2 & R10

Basins R2 & R10 encompass two of the southern roofs and are comprised of roof area. Runoff generated from these basins will be directed through roof drains into the proposed storm infrastructure at their respective design points. The runoff will then be conveyed south to Design Point B18 via proposed infrastructure before being discharged into Pond D1, which ultimately discharges into the regional flood control Pond A1.

Basins R3-R9

Basins R3-R9 encompass roofs on the north and east side of the Site and they are comprised of roof area. Runoff generated from these basins will be directed through roof drains into the proposed storm infrastructure at their respective design points. The runoff will then be conveyed south to Design Point A16 via proposed infrastructure before being discharged into Pond D1, which ultimately discharges into the regional flood control Pond A1.

Basin EX A4.1

Existing basin A4.1 is a portion of the A4 subbasin delineated in the "Phase III Drainage Report for Dawson Trails Filing No.2" by EMK Consultants, which was approved in October 2025. The basin sheet flows through open space and discharges into Pond D3, which ultimately discharges into the regional flood control Pond A1.

Basin EX A3.1

Existing basin A3.1 is a portion of the A3 subbasin delineated in the "Phase III Drainage Report for Dawson Trails Filing No.2" by EMK Consultants, which was approved in October 2025. The basin sheet flows through open space until reaching the existing storm infrastructure, which discharges into Pond D1. Ultimately, the runoff discharges into the regional flood control Pond A1.

Basin EX A3.2

Existing basin A3.2 is a portion of the A3 subbasin delineated in the "Phase III Drainage Report for Dawson Trails Filing No.2" by EMK Consultants, which was approved in October 2025. The basin sheet flows through open space until reaching the existing storm infrastructure, which discharges into Pond D1. Ultimately, the runoff discharges into the regional flood control Pond A1.

II. DRAINAGE DESIGN CRITERIA

A. Regulations

This Phase II Drainage Report is in accordance with the Town of Castle Rock Storm Drainage Design and Technical Criteria Manual (Ref. F), and the Mile High Flood District (MHFD) Storm Drainage Criteria Manual (Ref. C, D, and E). These manuals were used as a basis of design for the site. All applicable figures, tables, and graphs from these manuals have been included in Appendix D. The report will analyze the minor (5-year) and major (100-year) storm events.

B. Drainage Studies, Master Plans, and Site Constraints

The "Phase III Drainage Report for Dawson Trails Filing No.2" by EMK Consultants, was approved in October 2025. This report was developed for the area within Dawson Trails Filing No.2 to the North of North Dawson Tributary and provides a more detailed drainage plan for the Dawson Trails Filing No.2 area. The report provides information on the existing topography and infrastructure that were created in anticipation of the full development of Dawson Trails Filing No.2. The proposed improvements conform with the approved report.

C. Hydrological Criteria

The Site and subsequent drainage sub-basins are less than 160 acres, so the Rational Method was used to determine the flow rates for the site. The sub-basins were delineated based on the existing and proposed topography developed for the project. Flow rates for each basin can be found in Appendix B.

The intensity-frequency curves used in the Rational Method calculations were taken from the Town of Castle Rock's Storm Drainage Design and Technical Criteria Manual. All drainage facilities were analyzed and designed for both the minor (5-year) and major (100-year) storm events. Time of concentration calculations were used to determine the rainfall intensity. These calculations can also be found in Appendix B.

D. Hydraulic Criteria

Hydraulic calculations for street and inlet capacity will be performed with final plat submittals and based on the design charts in Chapter 8 of the Town's Drainage Criteria, and design spreadsheets provided by the Town. Hydraulic Grade Lines (HGL) will be calculated in subsequent reports and will conform to the Town of Castle Rock Storm Drainage Design and Technical Criteria Manual (Ref. F), and the Mile High Flood District (MHFD) Storm Drainage Criteria Manuals (Ref. C, D, and E).

Hydraulic calculations for pond sizing and outlet structure design were based on the MHFD detention spreadsheet. These calculations were used to verify the existing pond infrastructure in Pond D1 and D3 can still function after the development of the Site. The output files from these worksheets have been included in Appendix C.

E. Water Quality Enhancements

Water quality measures were included in the "Phase III Drainage Report for Dawson Trails Filing No.2" by EMK Consultants, which was approved in October 2025 (Ref. A). The EDBs were designed with sufficient capacity to handle the addition of our proposed site. These pond calculations were replicated to verify the existing pond infrastructure can still function after the development of the Site. Updated pond imperviousness calculations have been included in Appendix C, and these imperviousness values were what were used in the MHFD detention spreadsheets used to verify the ponds will still be able to function. The existing pond infrastructure is sufficient to treat the runoff generated within the Site, and no modifications to these ponds are required.

Step 1: Reduce Runoff Volume to the Maximum Extent Practicable

A portion of the roof runoff will be directed to areas around the building that include different types of permeable surfaces to allow infiltration before the runoff reaches the proposed storm network.

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

Water Quality Capture Volume (WQCV) and flood control detention are provided for the site through a comprehensive three-pond system designed by EMK Consultants in the "Phase III Drainage Report for Dawson Trails Filing No.2," approved October 2025 (Ref. A). Runoff from the western and central portions of the site (Basins A, B, OS1, and R2-R10) is conveyed to Pond D1, while runoff from the eastern and perimeter portions (Basins C, OS2, and R1) is conveyed to Pond D3. Both ponds provide initial water quality treatment and detention before discharging into the Regional Flood Control Pond A1. The proposed site improvements result in runoff characteristics that are consistent with the intended drainage patterns in the approved master drainage study. The design spreadsheets for ponds D1 and D3 have been updated to account for the developed Site, and both ponds function as intended in the approved master drainage study. No additional water quality or detention infrastructure is required.

Step 3: Utilize Stream Channel Stabilization Techniques

This project will not utilize any channel stabilization techniques, but a brief description of channel stabilization has been included. Natural stream stabilization is the practice of stabilizing a channel against erosion without lining a channel with concrete. The main goal of natural stream stabilization is to create streams and floodplains that are stable, well-vegetated, and mimic its natural state. This goal is just as important as improving the water quality of runoff flowing off a development site and into a receiving stream.

Step 4: Undertake Source Control.

To protect water quality, source control measures are implemented to prevent potential pollutants from entering the drainage ways. For this multi-family development, future residents and the management authority (Homeowner's Association or HOA) will be responsible for understanding and implementing these water quality control measures. Educating the community on these practices is an essential step in minimizing stormwater pollution.

Structural Source Controls: Structural source control measures implemented on-site may include, but are not limited to:

- Provision of designated storage and material handling areas, including permanent covering of outdoor storage areas.
- Spill containment and control (e.g., secondary containment, curbing).

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- Provision of proper waste receptacles, including strategically placed pet waste stations.
- Proper sanitary sewer connections.

Non-Structural Source Controls (HOA and Resident Education): Non-structural controls consist of implementing everyday behaviors and practices to reduce or prevent contamination. Key practices for the HOA, property management, and residents include:

- Pet Waste Management
- Proper Landscaping Practices
- Vehicle Washing Considerations
- Carpet Cleaning Waste Disposal
- General Good Housekeeping

F. Variances from Criteria

No variances are being requested at this time.

III. STORMWATER MANAGEMENT FACILITY DESIGN

A. Stormwater Conveyance Facilities

Low Impact Development (LID) practices and strategies have been applied to the comprehensive land planning and engineering design approach to managing stormwater runoff. The primary objective of the Project is the preservation of the natural features of the property by arranging the development to minimize site grading, impacts to existing vegetation and wetlands, as well as providing large open space areas. The drainage design will generally maintain the historic drainage patterns and release rates for the Site.

The site will generally follow the historic drainage patterns for the site with some minor rerouting due to the development of our site. Runoff generated from our site will drain towards the North Dawson Tributary. The proposed storm systems will tie into the existing storm system and outfall into the existing pond system located on the west and east sides of Dawson Trails Boulevard. The existing ponds will outfall into the Regional Flood Control Pond A1.

B. Stormwater Storage Facilities

The Site will utilize the existing pond system located on the west (Pond D3) and east (Pond D1) sides of Dawson Trails Boulevard. Both ponds provide initial water quality treatment and detention as intended in the approved master drainage study (Ref. A) before discharging into the Regional Flood Control Pond A1. The existing pond system calculations according to the master drainage study by EMK Consultants (Ref. A) can be found in Appendix D. The watershed area and imperviousness for Ponds D1 and D3 will change due to the development of the Site. These pond calculations have been updated to reflect changes in the area and imperviousness draining to each pond. These calculations can be found in Appendix C. The existing pond infrastructure is sufficient to treat the runoff generated within the Site, and no modifications to these ponds are required.

C. Water Quality Enhancement Best Management Practices

Water quality measures are included in the comprehensive three-pond system designed by EMK Consultants in the master drainage study (Ref. A). The pond calculations can be found in Appendix C. Temporary sediment trap(s) or other approved BMPs will be used to treat flows in the interim condition until the future roadways are buildout.

D. Floodplain Modification

The proposed improvements are not located within a floodplain, as defined by the FEMA FIRM map panel number 08035C0284G dated May 16, 2016. A copy of the FIRM map can be found in Appendix A. East Plum Creek has a regulatory Zone AE floodplain with a floodway delineated in the project area as shown on the Federal Emergency Management Agency's (FEMA) Flood Insurance Rate Map (FIRM) number 08035C0284G effective May 16, 2016. There are no proposed modifications to the floodplain with this development.

E. Additional Permitting Requirements

No additional permits are needed with this development.

F. General

All applicable tables, figures, and charts from the referenced reports and criteria manuals used in the drainage design of the site can be found in Appendix D. Additionally, excerpts from the referenced report have been included in the same Appendix D.

G. Operation and Maintenance

The Owner will be the responsible party for the operation and maintenance of the stormwater management facilities. EDBs have low to moderate maintenance requirements on a routine basis but may require significant maintenance once every 15 to 25 years.

IV. CONCLUSIONS

A. Compliance with Standards

The drainage design for Dawson Trails Tract F conforms to the Town of Castle Rock's Storm Drainage Design and Technical Criteria Manual (Ref. F), the Mile High Flood Districts' Drainage Criteria Manuals (Ref. C, D, and E), and the "Phase III Drainage Report for Dawson Trails Filing No.2" by EMK Consultants (Ref. A), where applicable. The drainage design is in conformance with the abovementioned drainage study.

B. Variances

No variances are being requested at this moment.

C. Drainage Concept

The Rational Method was used to determine the developed runoff values for the minor drainage basins throughout the site. These basins were delineated based on the natural site topography and the developed site plan. Once the runoff values were identified, storm sewer pipes and other drainage conveyances were designed to capture and transport runoff towards the existing detention pond. The storm sewer system has been designed to capture the minor (5-year) and major (100-year) storm events. The proposed development will not have any negative impacts to the downstream channel.

t e r r a c i n a d e s i g n

Landscape Architecture, Planning & Engineering
10200 E. Girard Avenue, A-314. Denver, CO 80231 PH: 303.632.8867

V. REFERENCES

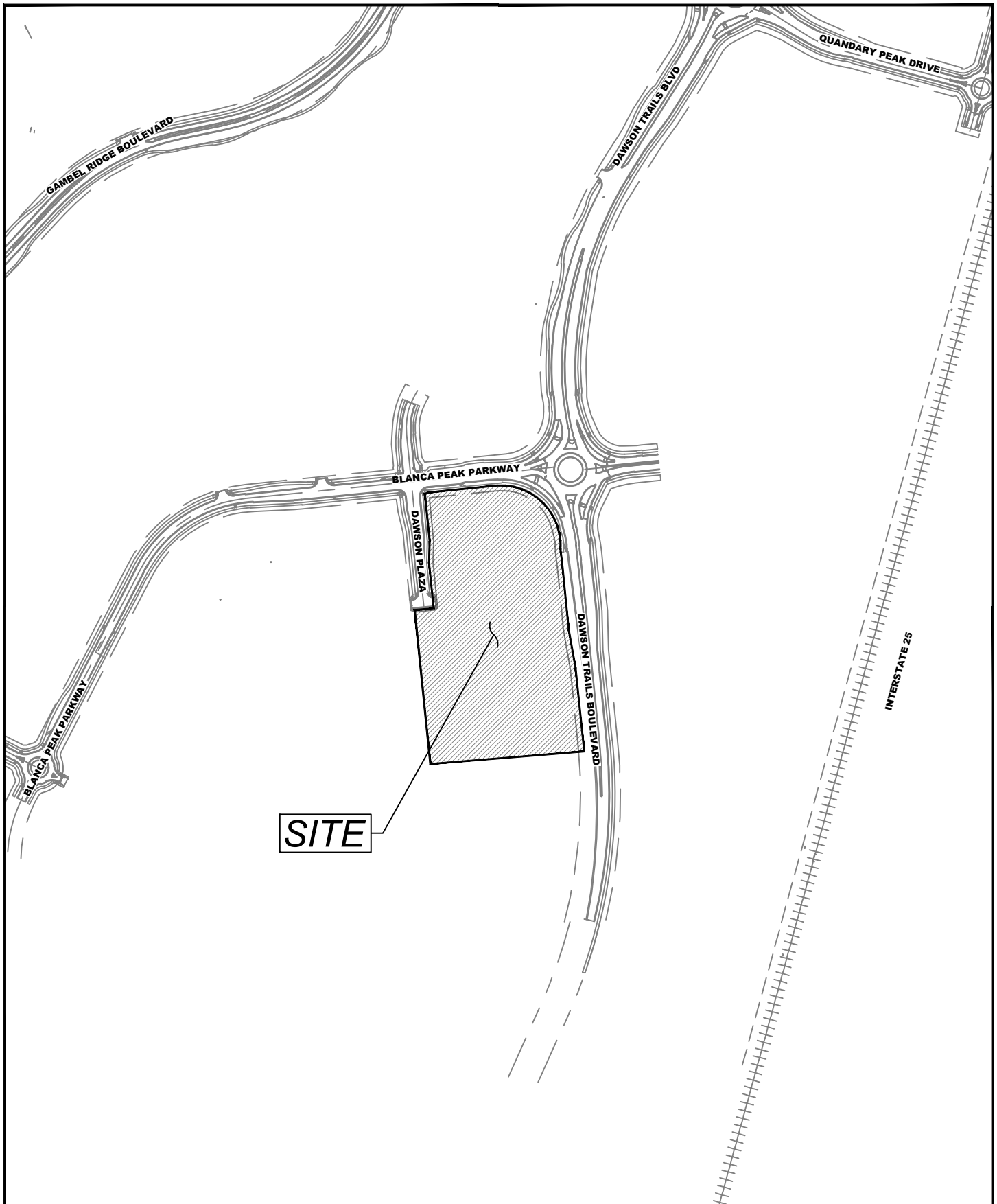
- A. EMK Consultants. "Phase III Drainage Report for Dawson Trails Filing No.2." October 2025.
- B. EMK Consultants "Public Improvement Construction Plans for Dawson Trails Filing 2 Infrastructure." April 2025.
- C. MHFD (Mile High Flood District). "Urban Storm Drainage Criteria Manual. Volume 1: Management, Hydrology and Hydraulics." 1969. Revised March 2024. <https://mhfd.org/resources/criteria-manual>.
- D. MHFD. "Urban Storm Drainage Criteria Manual. Volume 2: Structures, Storage and Recreation." 1969. Revised January 2016. <https://mhfd.org/resources/criteria-manual>.
- E. MHFD. "Urban Storm Drainage Criteria Manual. Volume 3: Stormwater Best Management Practices." 1992. Revised March 2024. <https://mhfd.org/resources/criteria-manual>.
- F. Town of Castle Rock. "Storm Drainage Design and Technical Criteria Manual." February 18, 2025. <https://www.crgov.com/DocumentCenter/View/23927/Storm-Drainage-Design-and-Technical-Criteria-Manual-PDF>

APPENDIX A

MAPS

Vicinity Map
Soil Map
Firm Map

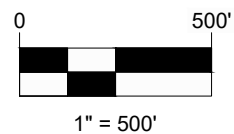
2/9/2026 12:55 PM ; X:\GARRETT - DAWSON TRAIL\DOCUMENTS\REPORTS\DRAINAGE\00 - PHASE 2\1 - MAPS (VIC-FEMA-SOILS)\VICINITYMAP.DWG;



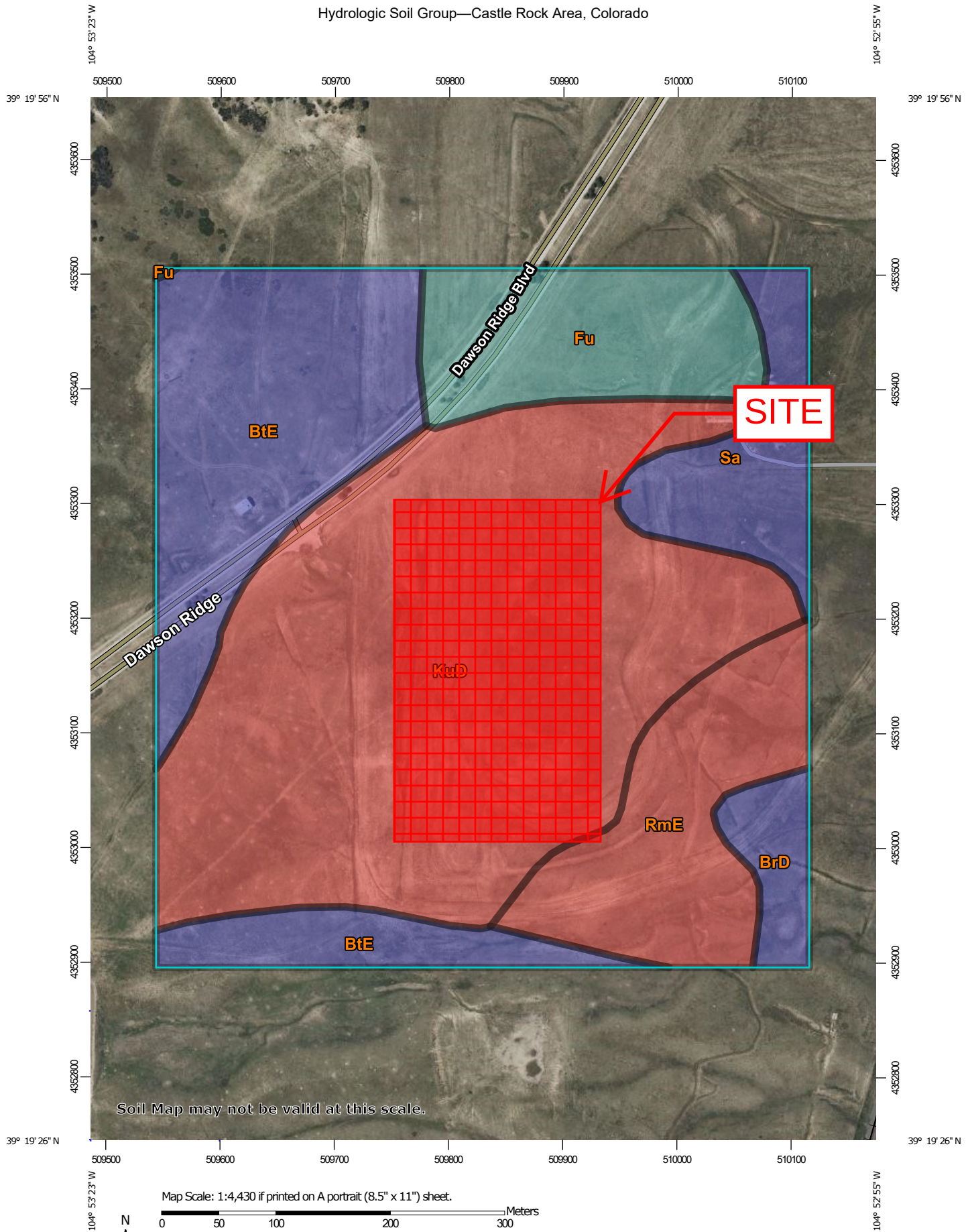
td terracina
design
10200 E. Girard Ave, A-314
Denver, CO 80231
ph: 303.632.8867

DAWSON TRAIL
VICINITY MAP

TOWN OF CASTLE ROCK DATE: 2/9/2026



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.

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

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

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

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

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

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

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

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

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

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
BrD	Bresser sandy loam, cool, 5 to 9 percent slopes	B	2.4	2.7%
BtE	Bresser-Truckton sandy loams, 5 to 25 percent slopes	B	18.5	21.4%
Fu	Fondis-Kutch association	C	8.7	10.1%
KuD	Kutch clay loam, 4 to 8 percent slopes	D	41.3	47.7%
RmE	Renohill-Buick complex, 5 to 25 percent slopes	D	10.0	11.5%
Sa	Sampson loam	B	5.6	6.5%
Totals for Area of Interest			86.5	100.0%

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

NOTES TO USERS

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

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

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

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

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

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

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

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

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

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

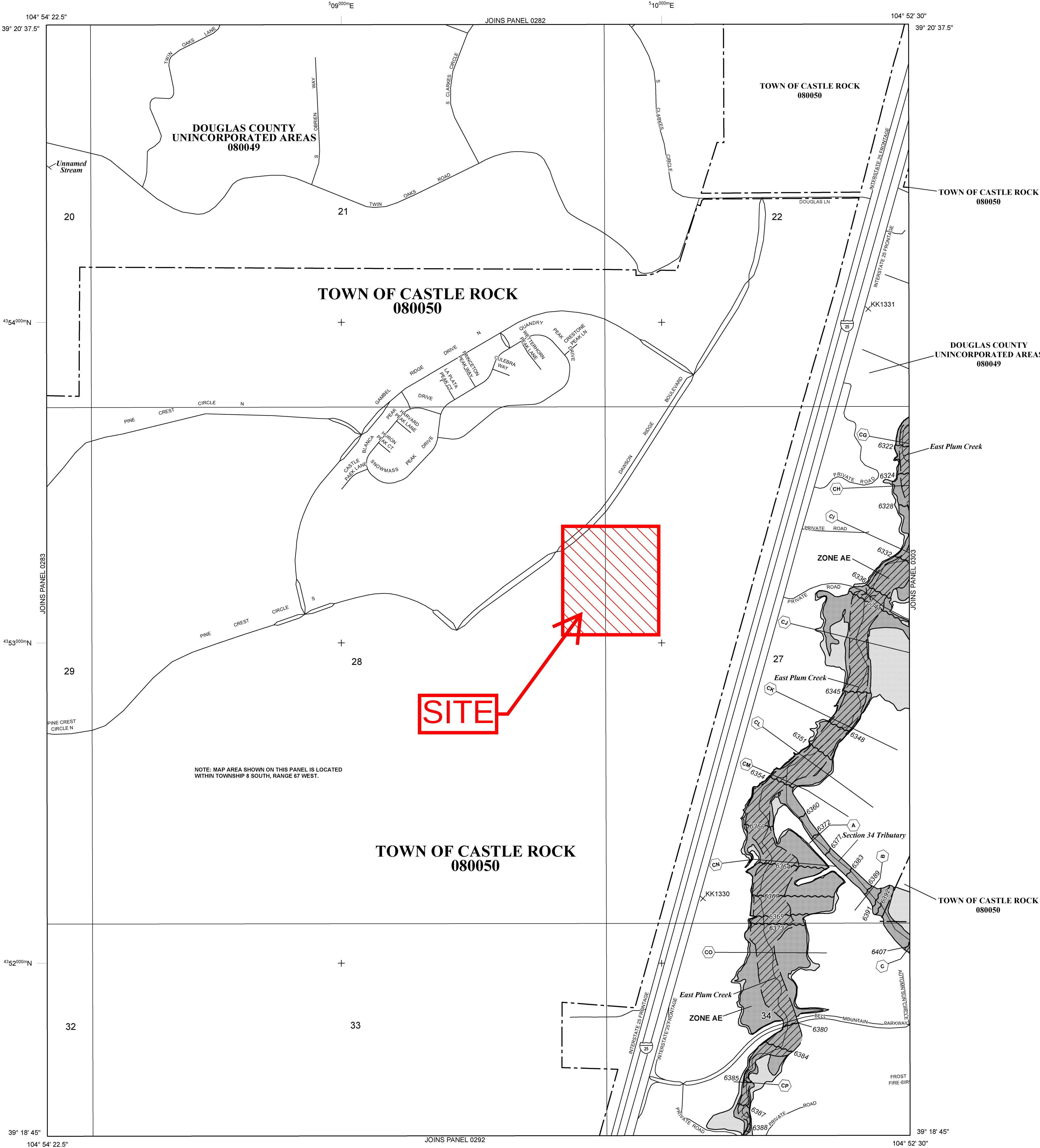
Based on updated topographic information, this map reflects more detailed and up-to-date **stream channel configurations** and **floodplain delineations** than those shown on the previous FIRM for this jurisdiction. As a result, the Flood Profiles and Floodway Data tables for multiple streams in the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

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

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

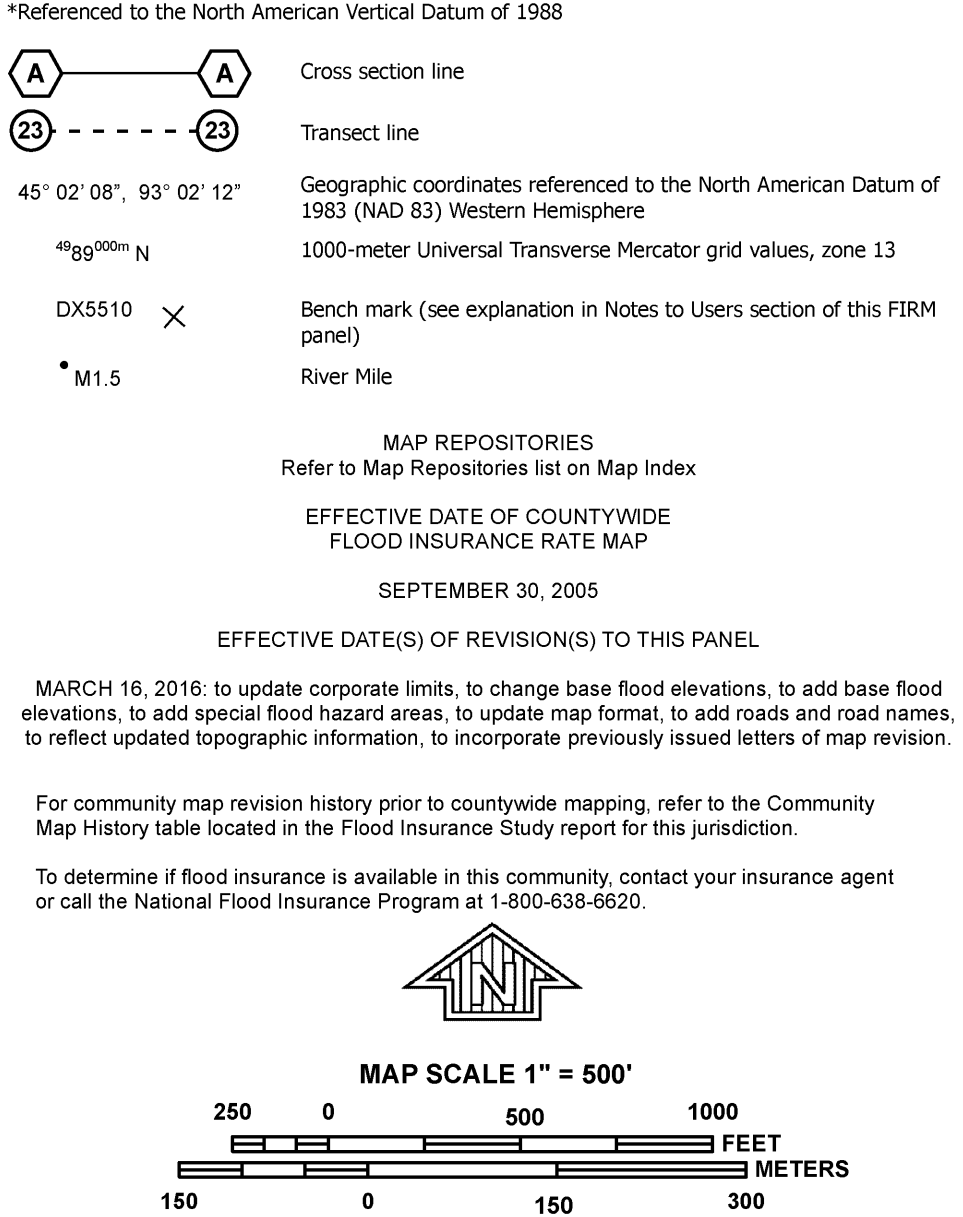
For information on available products associated with this FIRM visit the **Map Service Center (MSC)** website at <http://msc.fema.gov>. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the MSC website.

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



LEGEND

- SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD**
The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equalled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.
- ZONE A** No Base Flood Elevations determined.
ZONE AE Base Flood Elevations determined.
ZONE AH Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR Special Flood Hazard Areas formerly protected from the 1% annual chance flood by a flood control system that was subsequently deteriorated. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99 Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.
- FLOODWAY AREAS IN ZONE AE**
- The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.
- OTHER FLOOD AREAS**
- ZONE X** Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.
OTHER AREAS
ZONE X Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D Areas in which flood hazards are undetermined, but possible.
- COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS**
OTHERWISE PROTECTED AREAS (OPAs)
- CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.
1% Annual Chance Floodplain Boundary
0.2% Annual Chance Floodplain Boundary
Floodway boundary
Zone D boundary
CBRS and OPA boundary
Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths, or flood velocities.
Base Flood Elevation line and value; elevation in feet*
Base Flood Elevation value where uniform within zone; elevation in feet*



NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0284G

FIRM
FLOOD INSURANCE RATE MAP
DOUGLAS COUNTY, COLORADO
AND INCORPORATED AREAS

PANEL 284 OF 495
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
CASTLE ROCK, TOWN OF	080050	0284	G
DOUGLAS COUNTY	080049	0284	G

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

MAP NUMBER
08035C0284G
MAP REVISED
MARCH 16, 2016
Federal Emergency Management Agency

APPENDIX B

HYDROLOGIC COMPUTATIONS

Percent Imperviousness
Runoff Coefficient
Time of Concentration
Minor Storm Rational Method
Major Storm Rational Method

Project Name: Dawson Trails

Prepared By: SC

Percent Impervious Calculations

Basin Id	Design Point	Basin Area (Ac)	Historic Flow Area	Paved Street, Roof, Drives, Walks Area	Newly Graded Areas Area	Weighted % Impervious
			5%	95%	20%	
A1	A1	0.12			0.12	20.0%
A10	A10	0.20		0.19	0.01	89.7%
A11	A11	0.23		0.22	0.01	92.0%
A12	A12	0.19		0.19		95.0%
A13	A13	0.12		0.11	0.01	89.2%
A14	A14	0.13		0.12	0.01	88.5%
A15	A15	0.10		0.08	0.02	80.6%
A16	A16	0.10			0.10	20.0%
A17	A17	0.50		0.49	0.01	93.6%
A2	A2	0.20		0.10	0.11	56.0%
A3	A3	0.29		0.10	0.19	45.3%
A4	A4	0.20		0.15	0.05	77.4%
A5	A5	0.42		0.36	0.07	83.3%
A6	A6	0.23		0.21	0.02	87.5%
A7	A7	0.18		0.17	0.02	88.6%
A8	A8	0.25		0.24	0.01	91.7%
A9	A9	0.05		0.05		95.0%
B1	B1	0.10		0.08	0.02	77.5%
B10	B10	0.10		0.10	0.00	95.0%
B11	B11	0.25		0.24	0.02	90.3%
B12	B12	0.63		0.51	0.12	80.8%
B13	B13	0.14		0.14	0.00	94.1%
B14	B14	2.33		1.30	1.04	61.6%
B15	B15	0.24		0.10	0.14	51.7%
B16	B16	0.33		0.22	0.11	69.2%
B17	B17	0.16		0.16	0.00	95.0%
B18	B18	0.79		0.38	0.41	56.3%
B2	B2	0.11		0.08	0.04	70.2%
B3	B3	0.03			0.03	20.0%
B4	B4	0.38		0.33	0.04	86.2%
B5	B5	0.15		0.12	0.03	79.8%
B6	B6	0.06		0.05	0.01	87.8%
B7	B7	0.12		0.12	0.01	91.2%
B8	B8	0.14		0.14	0.00	93.4%
B9	B9	0.11		0.10	0.01	89.8%
C1	C1	0.10		0.02	0.08	34.1%
C2	C2	0.18		0.11	0.07	64.5%
C3	C3	0.53		0.26	0.26	57.5%
C4	C4	0.42		0.15	0.27	47.5%
C5	C5	0.17		0.16	0.01	89.3%
C6	C6	0.13		0.12	0.01	88.6%
C7	C7	0.12		0.11	0.01	88.5%
C8	C8	0.16		0.09	0.07	63.4%
C9	C9	0.12		0.08	0.05	66.9%
OS1	OS1	0.56		0.20	0.35	47.1%
OS2	OS2	0.73		0.11	0.63	31.0%
R1	R1	0.17		0.17		95.0%
R10	R10	0.06		0.06		95.0%
R2	R2	0.19		0.19	0.00	95.0%
R3	R3	0.04		0.04		95.0%
R4	R4	0.04		0.04		95.0%
R5	R5	0.18		0.18	0.00	95.0%
R6	R6	0.04		0.04	0.00	95.0%
R7	R7	0.04		0.04		95.0%
R8	R8	0.23		0.23		95.0%
R9	R9	0.19		0.19	0.00	95.0%

Project Name: Dawson Trails
Prepared By: SC

Runoff Coefficient (C)

Runoff Coefficient calculations based on MHFD Volume 1: Chapter 6, Table 6-4 equations

Basin Id	Weighted % Impervious	i	Soil Type	Soil Type Area	Basin Area (Ac)	Runoff Coefficients, C							Weighted Coefficients, C						
						5-Year	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year	5-Year	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
A1	20.0%	0.20	A	0.00	0.12	0.11	0.10	0.11	0.12	0.14	0.20	0.27	0.20	0.14	0.20	0.28	0.43	0.49	0.57
			B	0.00		0.15	0.13	0.15	0.22	0.37	0.44	0.52							
			C/D	0.12		0.20	0.14	0.20	0.28	0.43	0.49	0.57							
A10	89.7%	0.90	A	0.00	0.20	0.75	0.73	0.75	0.76	0.78	0.79	0.81	0.77	0.74	0.77	0.79	0.82	0.84	0.85
			B	0.00		0.76	0.73	0.76	0.78	0.81	0.83	0.84							
			C/D	0.20		0.77	0.74	0.77	0.79	0.82	0.84	0.85							
A11	92.0%	0.92	A	0.00	0.23	0.77	0.75	0.77	0.79	0.80	0.81	0.83	0.78	0.76	0.78	0.81	0.83	0.85	0.86
			B	0.00		0.78	0.76	0.78	0.80	0.83	0.84	0.85							
			C/D	0.23		0.78	0.76	0.78	0.81	0.83	0.85	0.86							
A12	95.0%	0.95	A	0.00	0.19	0.81	0.79	0.81	0.82	0.83	0.84	0.85	0.81	0.79	0.81	0.83	0.85	0.86	0.87
			B	0.00		0.81	0.79	0.81	0.82	0.85	0.86	0.87							
			C/D	0.19		0.81	0.79	0.81	0.83	0.85	0.86	0.87							
A13	89.2%	0.89	A	0.00	0.12	0.74	0.72	0.74	0.76	0.78	0.79	0.80	0.76	0.73	0.76	0.79	0.82	0.83	0.85
			B	0.00		0.76	0.73	0.76	0.78	0.81	0.83	0.84							
			C/D	0.12		0.76	0.73	0.76	0.79	0.82	0.83	0.85							
A14	88.5%	0.89	A	0.00	0.13	0.74	0.72	0.74	0.75	0.77	0.78	0.80	0.76	0.73	0.76	0.78	0.81	0.83	0.85
			B	0.00		0.75	0.72	0.75	0.77	0.80	0.82	0.84							
			C/D	0.13		0.76	0.73	0.76	0.78	0.81	0.83	0.85							
A15	80.6%	0.81	A	0.00	0.10	0.65	0.63	0.65	0.67	0.69	0.71	0.74	0.69	0.66	0.69	0.72	0.77	0.79	0.81
			B	0.00		0.68	0.65	0.68	0.71	0.76	0.78	0.80							
			C/D	0.10		0.69	0.66	0.69	0.72	0.77	0.79	0.81							
A16	20.0%	0.20	A	0.00	0.10	0.11	0.10	0.11	0.12	0.14	0.20	0.27	0.20	0.14	0.20	0.28	0.43	0.49	0.57
			B	0.00		0.15	0.13	0.15	0.22	0.37	0.44	0.52							
			C/D	0.10		0.20	0.14	0.20	0.28	0.43	0.49	0.57							
A17	93.6%	0.94	A	0.00	0.50	0.79	0.77	0.79	0.80	0.82	0.82	0.84	0.80	0.77	0.80	0.82	0.84	0.86	0.87
			B	0.00		0.80	0.77	0.80	0.81	0.84	0.85	0.86							
			C/D	0.50		0.80	0.77	0.80	0.82	0.84	0.86	0.87							
A2	56.0%	0.56	A	0.00	0.20	0.41	0.40	0.41	0.43	0.46	0.50	0.55	0.49	0.44	0.49	0.54	0.63	0.67	0.71
			B	0.00		0.46	0.42	0.46	0.51	0.60	0.64	0.69							
			C/D	0.20		0.49	0.44	0.49	0.54	0.63	0.67	0.71							
A3	45.3%	0.45	A	0.00	0.29	0.31	0.30	0.31	0.33	0.36	0.41	0.46	0.40	0.34	0.40	0.47	0.57	0.62	0.67
			B	0.00		0.36	0.33	0.36	0.42	0.53	0.58	0.64							
			C/D	0.29		0.40	0.34	0.40	0.47	0.57	0.62	0.67							
A4	77.4%	0.77	A	0.00	0.20	0.62	0.60	0.62	0.64	0.66	0.69	0.71	0.67	0.63	0.67	0.70	0.75	0.78	0.80
			B	0.00		0.65	0.62	0.65	0.68	0.73	0.76	0.79							
			C/D	0.20		0.67	0.63	0.67	0.70	0.75	0.78	0.80							
A5	83.3%	0.83	A	0.00	0.42	0.68	0.66	0.68	0.70	0.72	0.74	0.76	0.71	0.68	0.71	0.74	0.79	0.80	0.82
			B	0.00		0.70	0.67	0.70	0.73	0.77	0.79	0.81							
			C/D	0.42		0.71	0.68	0.71	0.74	0.79	0.80	0.82							
A6	87.5%	0.87	A	0.00	0.23	0.73	0.71	0.73	0.74	0.76	0.77	0.79	0.75	0.72	0.75	0.77	0.81	0.83	0.84
			B	0.00		0.74	0.71	0.74	0.76	0.80	0.82	0.83							
			C/D	0.23		0.75	0.72	0.75	0.77	0.81	0.83	0.84							

Project Name: Dawson Trails
Prepared By: SC

Runoff Coefficient (C)

Runoff Coefficient calculations based on MHFD Volume 1: Chapter 6, Table 6-4 equations

Basin Id	Weighted % Impervious	i	Soil Type	Soil Type Area	Basin Area (Ac)	Runoff Coefficients, C							Weighted Coefficients, C						
						5-Year	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year	5-Year	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
A7	88.6%	0.89	A	0.00	0.18	0.74	0.72	0.74	0.75	0.77	0.78	0.80	0.76	0.73	0.76	0.78	0.82	0.83	0.85
			B	0.00		0.75	0.72	0.75	0.77	0.81	0.82	0.84							
			C/D	0.18		0.76	0.73	0.76	0.78	0.82	0.83	0.85							
A8	91.7%	0.92	A	0.00	0.25	0.77	0.75	0.77	0.78	0.80	0.81	0.82	0.78	0.76	0.78	0.81	0.83	0.85	0.86
			B	0.00		0.78	0.75	0.78	0.80	0.83	0.84	0.85							
			C/D	0.25		0.78	0.76	0.78	0.81	0.83	0.85	0.86							
A9	95.0%	0.95	A	0.00	0.05	0.81	0.79	0.81	0.82	0.83	0.84	0.85	0.81	0.79	0.81	0.83	0.85	0.86	0.87
			B	0.00		0.81	0.79	0.81	0.82	0.85	0.86	0.87							
			C/D	0.05		0.81	0.79	0.81	0.83	0.85	0.86	0.87							
B1	77.5%	0.78	A	0.00	0.10	0.62	0.60	0.62	0.64	0.66	0.69	0.71	0.67	0.63	0.67	0.70	0.75	0.78	0.80
			B	0.00		0.65	0.62	0.65	0.68	0.74	0.76	0.79							
			C/D	0.10		0.67	0.63	0.67	0.70	0.75	0.78	0.80							
B10	95.0%	0.95	A	0.00	0.10	0.81	0.79	0.81	0.82	0.83	0.84	0.85	0.81	0.79	0.81	0.83	0.85	0.86	0.87
			B	0.00		0.81	0.79	0.81	0.82	0.85	0.86	0.87							
			C/D	0.10		0.81	0.79	0.81	0.83	0.85	0.86	0.87							
B11	90.3%	0.90	A	0.00	0.25	0.76	0.74	0.76	0.77	0.79	0.80	0.81	0.77	0.74	0.77	0.80	0.82	0.84	0.85
			B	0.00		0.77	0.74	0.77	0.79	0.82	0.83	0.85							
			C/D	0.25		0.77	0.74	0.77	0.80	0.82	0.84	0.85							
B12	80.8%	0.81	A	0.00	0.63	0.66	0.64	0.66	0.67	0.70	0.71	0.74	0.69	0.66	0.69	0.73	0.77	0.79	0.81
			B	0.00		0.68	0.65	0.68	0.71	0.76	0.78	0.80							
			C/D	0.63		0.69	0.66	0.69	0.73	0.77	0.79	0.81							
B13	94.1%	0.94	A	0.00	0.14	0.80	0.78	0.80	0.81	0.83	0.83	0.84	0.80	0.78	0.80	0.82	0.85	0.86	0.87
			B	0.00		0.80	0.78	0.80	0.82	0.84	0.85	0.86							
			C/D	0.14		0.80	0.78	0.80	0.82	0.85	0.86	0.87							
B14	61.6%	0.62	A	0.00	2.33	0.46	0.45	0.46	0.48	0.51	0.55	0.59	0.54	0.48	0.54	0.59	0.66	0.70	0.74
			B	0.00		0.51	0.47	0.51	0.55	0.64	0.67	0.71							
			C/D	2.33		0.54	0.48	0.54	0.59	0.66	0.70	0.74							
B15	51.7%	0.52	A	0.00	0.24	0.37	0.36	0.37	0.39	0.42	0.47	0.51	0.46	0.40	0.46	0.51	0.61	0.65	0.70
			B	0.00		0.42	0.39	0.42	0.47	0.57	0.62	0.67							
			C/D	0.24		0.46	0.40	0.46	0.51	0.61	0.65	0.70							
B16	69.2%	0.69	A	0.00	0.33	0.54	0.52	0.54	0.55	0.58	0.62	0.65	0.60	0.55	0.60	0.64	0.71	0.73	0.77
			B	0.00		0.57	0.54	0.57	0.62	0.68	0.71	0.75							
			C/D	0.33		0.60	0.55	0.60	0.64	0.71	0.73	0.77							
B17	95.0%	0.95	A	0.00	0.16	0.81	0.79	0.81	0.82	0.83	0.84	0.85	0.81	0.79	0.81	0.83	0.85	0.86	0.87
			B	0.00		0.81	0.79	0.81	0.82	0.85	0.86	0.87							
			C/D	0.16		0.81	0.79	0.81	0.83	0.85	0.86	0.87							
B18	56.3%	0.56	A	0.00	0.79	0.41	0.40	0.41	0.43	0.46	0.51	0.55	0.49	0.44	0.49	0.55	0.63	0.67	0.71
			B	0.00		0.46	0.43	0.46	0.51	0.60	0.64	0.69							
			C/D	0.79		0.49	0.44	0.49	0.55	0.63	0.67	0.71							
B2	70.2%	0.70	A	0.00	0.11	0.55	0.53	0.55	0.56	0.59	0.62	0.66	0.61	0.56	0.61	0.65	0.71	0.74	0.77
			B	0.00		0.58	0.55	0.58	0.62	0.69	0.72	0.75							
			C/D	0.11		0.61	0.56	0.61	0.65	0.71	0.74	0.77							

Project Name: Dawson Trails
Prepared By: SC

Runoff Coefficient (C)

Runoff Coefficient calculations based on MHFD Volume 1: Chapter 6, Table 6-4 equations

Basin Id	Weighted % Impervious	i	Soil Type	Soil Type Area	Basin Area (Ac)	Runoff Coefficients, C							Weighted Coefficients, C						
						5-Year	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year	5-Year	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
B3	20.0%	0.20	A	0.00	0.03	0.11	0.10	0.11	0.12	0.14	0.20	0.27	0.20	0.14	0.20	0.28	0.43	0.49	0.57
			B	0.00		0.15	0.13	0.15	0.22	0.37	0.44	0.52							
			C/D	0.03		0.20	0.14	0.20	0.28	0.43	0.49	0.57							
B4	86.2%	0.86	A	0.00	0.38	0.71	0.69	0.71	0.73	0.75	0.76	0.78	0.74	0.71	0.74	0.77	0.80	0.82	0.84
			B	0.00		0.73	0.70	0.73	0.75	0.79	0.81	0.83							
			C/D	0.38		0.74	0.71	0.74	0.77	0.80	0.82	0.84							
B5	79.8%	0.80	A	0.00	0.15	0.65	0.63	0.65	0.66	0.69	0.71	0.73	0.69	0.65	0.69	0.72	0.77	0.79	0.81
			B	0.00		0.67	0.64	0.67	0.70	0.75	0.77	0.80							
			C/D	0.15		0.69	0.65	0.69	0.72	0.77	0.79	0.81							
B6	87.8%	0.88	A	0.00	0.06	0.73	0.71	0.73	0.74	0.76	0.78	0.79	0.75	0.72	0.75	0.78	0.81	0.83	0.84
			B	0.00		0.74	0.72	0.74	0.77	0.80	0.82	0.83							
			C/D	0.06		0.75	0.72	0.75	0.78	0.81	0.83	0.84							
B7	91.2%	0.91	A	0.00	0.12	0.77	0.75	0.77	0.78	0.80	0.80	0.82	0.78	0.75	0.78	0.80	0.83	0.84	0.86
			B	0.00		0.78	0.75	0.78	0.79	0.82	0.84	0.85							
			C/D	0.12		0.78	0.75	0.78	0.80	0.83	0.84	0.86							
B8	93.4%	0.93	A	0.00	0.14	0.79	0.77	0.79	0.80	0.82	0.82	0.84	0.80	0.77	0.80	0.82	0.84	0.85	0.87
			B	0.00		0.80	0.77	0.80	0.81	0.84	0.85	0.86							
			C/D	0.14		0.80	0.77	0.80	0.82	0.84	0.85	0.87							
B9	89.8%	0.90	A	0.00	0.11	0.75	0.73	0.75	0.77	0.78	0.79	0.81	0.77	0.74	0.77	0.79	0.82	0.84	0.85
			B	0.00		0.76	0.74	0.76	0.78	0.81	0.83	0.84							
			C/D	0.11		0.77	0.74	0.77	0.79	0.82	0.84	0.85							
C1	34.1%	0.34	A	0.00	0.10	0.22	0.21	0.22	0.23	0.26	0.32	0.38	0.31	0.25	0.31	0.38	0.51	0.56	0.62
			B	0.00		0.27	0.24	0.27	0.33	0.46	0.52	0.58							
			C/D	0.10		0.31	0.25	0.31	0.38	0.51	0.56	0.62							
C2	64.5%	0.64	A	0.00	0.18	0.49	0.47	0.49	0.51	0.54	0.58	0.61	0.56	0.51	0.56	0.61	0.68	0.71	0.75
			B	0.00		0.53	0.50	0.53	0.58	0.65	0.69	0.73							
			C/D	0.18		0.56	0.51	0.56	0.61	0.68	0.71	0.75							
C3	57.5%	0.58	A	0.00	0.53	0.43	0.41	0.43	0.44	0.48	0.52	0.56	0.50	0.45	0.50	0.55	0.64	0.68	0.72
			B	0.00		0.47	0.44	0.47	0.52	0.61	0.65	0.69							
			C/D	0.53		0.50	0.45	0.50	0.55	0.64	0.68	0.72							
C4	47.5%	0.48	A	0.00	0.42	0.33	0.32	0.33	0.35	0.38	0.43	0.48	0.42	0.36	0.42	0.48	0.59	0.63	0.68
			B	0.00		0.38	0.35	0.38	0.44	0.55	0.59	0.65							
			C/D	0.42		0.42	0.36	0.42	0.48	0.59	0.63	0.68							
C5	89.3%	0.89	A	0.00	0.17	0.75	0.73	0.75	0.76	0.78	0.79	0.81	0.76	0.73	0.76	0.79	0.82	0.83	0.85
			B	0.00		0.76	0.73	0.76	0.78	0.81	0.83	0.84							
			C/D	0.17		0.76	0.73	0.76	0.79	0.82	0.83	0.85							
C6	88.6%	0.89	A	0.00	0.13	0.74	0.72	0.74	0.75	0.77	0.78	0.80	0.76	0.73	0.76	0.78	0.82	0.83	0.85
			B	0.00		0.75	0.72	0.75	0.77	0.81	0.82	0.84							
			C/D	0.13		0.76	0.73	0.76	0.78	0.82	0.83	0.85							
C7	88.5%	0.89	A	0.00	0.12	0.74	0.72	0.74	0.75	0.77	0.78	0.80	0.76	0.73	0.76	0.78	0.81	0.83	0.85
			B	0.00		0.75	0.72	0.75	0.77	0.80	0.82	0.84							
			C/D	0.12		0.76	0.73	0.76	0.78	0.81	0.83	0.85							

Project Name: Dawson Trails
Prepared By: SC

Runoff Coefficient (C)

Runoff Coefficient calculations based on MHFD Volume 1: Chapter 6, Table 6-4 equations

Basin Id	Weighted % Impervious	i	Soil Type	Soil Type Area	Basin Area (Ac)	Runoff Coefficients, C							Weighted Coefficients, C						
						5-Year	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year	5-Year	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
C8	63.4%	0.63	A	0.00	0.16	0.48	0.46	0.48	0.50	0.53	0.57	0.60	0.55	0.50	0.55	0.60	0.67	0.71	0.74
			B	0.00		0.52	0.49	0.52	0.57	0.65	0.68	0.72							
			C/D	0.16		0.55	0.50	0.55	0.60	0.67	0.71	0.74							
C9	66.9%	0.67	A	0.00	0.12	0.52	0.50	0.52	0.53	0.56	0.60	0.63	0.58	0.53	0.58	0.62	0.69	0.72	0.76
			B	0.00		0.55	0.52	0.55	0.60	0.67	0.70	0.74							
			C/D	0.12		0.58	0.53	0.58	0.62	0.69	0.72	0.76							
OS1	47.1%	0.47	A	0.00	0.56	0.33	0.31	0.33	0.35	0.38	0.43	0.48	0.42	0.36	0.42	0.48	0.58	0.63	0.68
			B	0.00		0.38	0.35	0.38	0.44	0.54	0.59	0.64							
			C/D	0.56		0.42	0.36	0.42	0.48	0.58	0.63	0.68							
OS2	31.0%	0.31	A	0.00	0.73	0.19	0.18	0.19	0.21	0.24	0.29	0.35	0.29	0.22	0.29	0.36	0.49	0.55	0.61
			B	0.00		0.24	0.21	0.24	0.31	0.44	0.50	0.57							
			C/D	0.73		0.29	0.22	0.29	0.36	0.49	0.55	0.61							
R1	95.0%	0.95	A	0.00	0.17	0.81	0.79	0.81	0.82	0.83	0.84	0.85	0.81	0.79	0.81	0.83	0.85	0.86	0.87
			B	0.00		0.81	0.79	0.81	0.82	0.85	0.86	0.87							
			C/D	0.17		0.81	0.79	0.81	0.83	0.85	0.86	0.87							
R10	95.0%	0.95	A	0.00	0.06	0.81	0.79	0.81	0.82	0.83	0.84	0.85	0.81	0.79	0.81	0.83	0.85	0.86	0.87
			B	0.00		0.81	0.79	0.81	0.82	0.85	0.86	0.87							
			C/D	0.06		0.81	0.79	0.81	0.83	0.85	0.86	0.87							
R2	95.0%	0.95	A	0.00	0.19	0.81	0.79	0.81	0.82	0.83	0.84	0.85	0.81	0.79	0.81	0.83	0.85	0.86	0.87
			B	0.00		0.81	0.79	0.81	0.82	0.85	0.86	0.87							
			C/D	0.19		0.81	0.79	0.81	0.83	0.85	0.86	0.87							
R3	95.0%	0.95	A	0.00	0.04	0.81	0.79	0.81	0.82	0.83	0.84	0.85	0.81	0.79	0.81	0.83	0.85	0.86	0.87
			B	0.00		0.81	0.79	0.81	0.82	0.85	0.86	0.87							
			C/D	0.04		0.81	0.79	0.81	0.83	0.85	0.86	0.87							
R4	95.0%	0.95	A	0.00	0.04	0.81	0.79	0.81	0.82	0.83	0.84	0.85	0.81	0.79	0.81	0.83	0.85	0.86	0.87
			B	0.00		0.81	0.79	0.81	0.82	0.85	0.86	0.87							
			C/D	0.04		0.81	0.79	0.81	0.83	0.85	0.86	0.87							
R5	95.0%	0.95	A	0.00	0.18	0.81	0.79	0.81	0.82	0.83	0.84	0.85	0.81	0.79	0.81	0.83	0.85	0.86	0.87
			B	0.00		0.81	0.79	0.81	0.82	0.85	0.86	0.87							
			C/D	0.18		0.81	0.79	0.81	0.83	0.85	0.86	0.87							
R6	95.0%	0.95	A	0.00	0.04	0.81	0.79	0.81	0.82	0.83	0.84	0.85	0.81	0.79	0.81	0.83	0.85	0.86	0.87
			B	0.00		0.81	0.79	0.81	0.82	0.85	0.86	0.87							
			C/D	0.04		0.81	0.79	0.81	0.83	0.85	0.86	0.87							
R7	95.0%	0.95	A	0.00	0.04	0.81	0.79	0.81	0.82	0.83	0.84	0.85	0.81	0.79	0.81	0.83	0.85	0.86	0.87
			B	0.00		0.81	0.79	0.81	0.82	0.85	0.86	0.87							
			C/D	0.04		0.81	0.79	0.81	0.83	0.85	0.86	0.87							
R8	95.0%	0.95	A	0.00	0.23	0.81	0.79	0.81	0.82	0.83	0.84	0.85	0.81	0.79	0.81	0.83	0.85	0.86	0.87
			B	0.00		0.81	0.79	0.81	0.82	0.85	0.86	0.87							
			C/D	0.23		0.81	0.79	0.81	0.83	0.85	0.86	0.87							
R9	95.0%	0.95	A	0.00	0.19	0.81	0.79	0.81	0.82	0.83	0.84	0.85	0.81	0.79	0.81	0.83	0.85	0.86	0.87
			B	0.00		0.81	0.79	0.81	0.82	0.85	0.86	0.87							
			C/D	0.19		0.81	0.79	0.81	0.83	0.85	0.86	0.87							

Project Name: Dawson Trails
Prepared By: SC

Time of Concentration Calculations (T_c)

Sub-Basin Data			Initial or Overland Flow Time				Channelized Flow Time				T _c Check (Urbanized Basins)					
Basin Id	Basin Area (Ac)	C(5)	Length (ft)	Elev Change	Slope (%)	T _i (min)	Length (ft)	Elev Change	Slope (%)	NRCS Coeff. K	Velocity (FPS)	T _t (min)	Comp. T _c	Percent Imperv.	MHFD Eq. 6.5	Final T _c (min)
A1	0.12	0.20	50	0	0.5	14.48	50	1	1.7	20.0	2.61	0.3	14.8	20.0%	23.1	14.8
A10	0.20	0.77	50	0	0.5	5.36	50	1	1.7	20.0	2.61	0.3	5.7	89.7%	11.1	5.7
A11	0.23	0.78	50	0	0.5	5.06	50	1	1.7	20.0	2.61	0.3	5.4	92.0%	10.7	5.4
A12	0.19	0.81	50	0	0.5	4.67	50	1	1.7	20.0	2.61	0.3	5.0	95.0%	10.1	5.0
A13	0.12	0.76	50	0	0.5	5.42	50	1	1.7	20.0	2.61	0.3	5.7	89.2%	11.1	5.7
A14	0.13	0.76	50	0	0.5	5.52	50	1	1.7	20.0	2.61	0.3	5.8	88.5%	11.3	5.8
A15	0.10	0.69	50	0	0.5	6.55	50	1	1.7	20.0	2.61	0.3	6.9	80.6%	12.6	6.9
A16	0.10	0.20	50	0	0.5	14.48	50	1	1.7	20.0	2.61	0.3	14.8	20.0%	23.1	14.8
A17	0.50	0.80	30	0	0.3	4.29	100	1	1.0	20.0	2.00	0.8	5.1	93.6%	10.8	5.1
A2	0.20	0.49	50	0	0.5	9.76	50	1	1.7	20.0	2.61	0.3	10.1	56.0%	16.9	10.1
A3	0.29	0.40	50	0	0.5	11.16	50	1	1.7	20.0	2.61	0.3	11.5	45.3%	18.7	11.5
A4	0.20	0.67	50	0	0.5	6.97	50	1	1.7	20.0	2.61	0.3	7.3	77.4%	13.2	7.3
A5	0.42	0.71	50	0	0.5	6.19	50	1	1.7	20.0	2.61	0.3	6.5	83.3%	12.1	6.5
A6	0.23	0.75	50	0	0.5	5.65	50	1	1.7	20.0	2.61	0.3	6.0	87.5%	11.4	6.0
A7	0.18	0.76	50	0	0.5	5.50	50	1	1.7	20.0	2.61	0.3	5.8	88.6%	11.2	5.8
A8	0.25	0.78	50	0	0.5	5.09	50	1	1.7	20.0	2.61	0.3	5.4	91.7%	10.7	5.4
A9	0.05	0.81	50	0	0.5	4.67	50	1	1.7	20.0	2.61	0.3	5.0	95.0%	10.1	5.0
B1	0.10	0.67	30	0	0.3	6.16	100	1	1.0	20.0	2.00	0.8	7.0	77.5%	13.7	7.0
B10	0.10	0.81	30	0	0.3	4.13	100	1	1.0	20.0	2.00	0.8	5.0	95.0%	10.6	5.0
B11	0.25	0.77	30	0	0.3	4.67	100	1	1.0	20.0	2.00	0.8	5.5	90.3%	11.4	5.5
B12	0.63	0.69	30	0	0.3	5.78	100	1	1.0	20.0	2.00	0.8	6.6	80.8%	13.1	6.6
B13	0.14	0.80	30	0	0.3	4.24	100	1	1.0	20.0	2.00	0.8	5.1	94.1%	10.8	5.1
B14	2.33	0.54	30	0	0.3	8.00	100	1	1.0	20.0	2.00	0.8	8.8	61.6%	16.5	8.8
B15	0.24	0.46	30	0	0.3	9.15	100	1	1.0	20.0	2.00	0.8	10.0	51.7%	18.2	10.0
B16	0.33	0.60	30	0	0.3	7.12	100	1	1.0	20.0	2.00	0.8	8.0	69.2%	15.1	8.0
B17	0.16	0.81	30	0	0.3	4.13	100	1	1.0	20.0	2.00	0.8	5.0	95.0%	10.6	5.0
B18	0.79	0.49	30	0	0.3	8.61	100	1	1.0	20.0	2.00	0.8	9.4	56.3%	17.4	9.4
B2	0.11	0.61	30	0	0.3	7.00	100	1	1.0	20.0	2.00	0.8	7.8	70.2%	15.0	7.8
B3	0.03	0.20	30	0	0.3	12.82	100	1	1.0	20.0	2.00	0.8	13.7	20.0%	24.0	13.7
B4	0.38	0.74	30	0	0.3	5.16	100	1	1.0	20.0	2.00	0.8	6.0	86.2%	12.1	6.0
B5	0.15	0.69	30	0	0.3	5.90	100	1	1.0	20.0	2.00	0.8	6.7	79.8%	13.3	6.7
B6	0.06	0.75	30	0	0.3	4.96	100	1	1.0	20.0	2.00	0.8	5.8	87.8%	11.9	5.8
B7	0.12	0.78	30	0	0.3	4.57	100	1	1.0	20.0	2.00	0.8	5.4	91.2%	11.3	5.4
B8	0.14	0.80	30	0	0.3	4.31	100	1	1.0	20.0	2.00	0.8	5.1	93.4%	10.9	5.1
B9	0.11	0.77	30	0	0.3	4.73	100	1	1.0	20.0	2.00	0.8	5.6	89.8%	11.5	5.6
C1	0.10	0.31	30	0	0.3	11.18	100	1	1.0	20.0	2.00	0.8	12.0	34.1%	21.4	12.0
C2	0.18	0.56	30	0	0.3	7.66	100	1	1.0	20.0	2.00	0.8	8.5	64.5%	16.0	8.5
C3	0.53	0.50	30	0	0.3	8.47	100	1	1.0	20.0	2.00	0.8	9.3	57.5%	17.2	9.3
C4	0.42	0.42	30	0	0.3	9.63	100	1	1.0	20.0	2.00	0.8	10.5	47.5%	19.0	10.5
C5	0.17	0.76	30	0	0.3	4.79	100	1	1.0	20.0	2.00	0.8	5.6	89.3%	11.6	5.6
C6	0.13	0.76	30	0	0.3	4.87	100	1	1.0	20.0	2.00	0.8	5.7	88.6%	11.7	5.7
C7	0.12	0.76	30	0	0.3	4.88	100	1	1.0	20.0	2.00	0.8	5.7	88.5%	11.7	5.7
C8	0.16	0.55	30	0	0.3	7.79	100	1	1.0	20.0	2.00	0.8	8.6	63.4%	16.1	8.6
C9	0.12	0.58	30	0	0.3	7.39	100	1	1.0	20.0	2.00	0.8	8.2	66.9%	15.5	8.2
OS1	0.56	0.42	50	0	0.2	14.80	100	1	1.0	20.0	2.00	0.8	15.6	47.1%	19.1	15.6
OS2	0.73	0.29	30	0	0.3	11.54	100	1	1.0	20.0	2.00	0.8	12.4	31.0%	22.0	12.4
R1	0.17	0.81	30	0	0.3	4.13	100	1	1.0	20.0	2.00	0.8	5.0	95.0%	10.6	5.0
R10	0.06	0.81	30	0	0.3	4.13	100	1	1.0	20.0	2.00	0.8	5.0	95.0%	10.6	5.0
R2	0.19	0.81	30	0	0.3	4.13	100	1	1.0	20.0	2.00	0.8	5.0	95.0%	10.6	5.0
R3	0.04	0.81	30	0	0.3	4.13	100	1	1.0	20.0	2.00	0.8	5.0	95.0%	10.6	5.0
R4	0.04	0.81	30	0	0.3	4.13	100	1	1.0	20.0	2.00	0.8	5.0	95.0%	10.6	5.0
R5	0.18	0.81	30	0	0.3	4.13	100	1	1.0	20.0	2.00	0.8	5.0	95.0%	10.6	5.0
R6	0.04	0.81	30	0	0.3	4.13	100	1	1.0	20.0	2.00	0.8	5.0	95.0%	10.6	5.0
R7	0.04	0.81	30	0	0.3	4.13	100	1	1.0	20.0	2.00	0.8	5.0	95.0%	10.6	5.0
R8	0.23	0.81	30	0	0.3	4.13	100	1	1.0	20.0	2.00	0.8	5.0	95.0%	10.6	5.0
R9	0.19	0.81	30	0	0.3	4.13	100	1	1.0	20.0	2.00	0.8	5.0	95.0%	10.6	5.0

Project Name: Dawson Trails

Prepared By: SC

Peak Runoff Rational Method (5-Year)

Rainfall Depth-Duration-Frequency (1-hr) =							1.43
Design Point	Basin ID	Basin Area (Ac)	Runoff Coeff (5-Year)	T_c (min)	C X A	I (in/hr)	Q (cfs)
A1	A1	0.12	0.20	14.8	0.02	3.27	0.08
A10	A10	0.20	0.77	5.7	0.16	4.68	0.73
A11	A11	0.23	0.78	5.4	0.18	4.76	0.85
A12	A12	0.19	0.81	5.0	0.15	4.85	0.74
A13	A13	0.12	0.76	5.7	0.09	4.67	0.43
A14	A14	0.13	0.76	5.8	0.10	4.65	0.45
A15	A15	0.10	0.69	6.9	0.07	4.42	0.31
A16	A16	0.10	0.20	14.8	0.02	3.27	0.06
A17	A17	0.50	0.80	5.1	0.40	4.82	1.93
A2	A2	0.20	0.49	10.1	0.10	3.86	0.39
A3	A3	0.29	0.40	11.5	0.12	3.66	0.43
A4	A4	0.20	0.67	7.3	0.13	4.34	0.57
A5	A5	0.42	0.71	6.5	0.30	4.50	1.36
A6	A6	0.23	0.75	6.0	0.17	4.62	0.79
A7	A7	0.18	0.76	5.8	0.14	4.65	0.64
A8	A8	0.25	0.78	5.4	0.20	4.75	0.93
A9	A9	0.05	0.81	5.0	0.04	4.85	0.20
B1	B1	0.10	0.67	7.0	0.07	4.40	0.29
B10	B10	0.10	0.81	5.0	0.08	4.85	0.39
B11	B11	0.25	0.77	5.5	0.20	4.73	0.93
B12	B12	0.63	0.69	6.6	0.44	4.48	1.96
B13	B13	0.14	0.80	5.1	0.11	4.83	0.56
B14	B14	2.33	0.54	8.8	1.25	4.06	5.09
B15	B15	0.24	0.46	10.0	0.11	3.87	0.42
B16	B16	0.33	0.60	8.0	0.20	4.21	0.83
B17	B17	0.16	0.81	5.0	0.13	4.85	0.61
B18	B18	0.79	0.49	9.4	0.39	3.95	1.54
B2	B2	0.11	0.61	7.8	0.07	4.23	0.30
B3	B3	0.03	0.20	13.7	0.01	3.39	0.02
B4	B4	0.38	0.74	6.0	0.28	4.61	1.29
B5	B5	0.15	0.69	6.7	0.10	4.45	0.46
B6	B6	0.06	0.75	5.8	0.04	4.66	0.19
B7	B7	0.12	0.78	5.4	0.09	4.75	0.45
B8	B8	0.14	0.80	5.1	0.11	4.81	0.54
B9	B9	0.11	0.77	5.6	0.08	4.71	0.39
C1	C1	0.10	0.31	12.0	0.03	3.59	0.11
C2	C2	0.18	0.56	8.5	0.10	4.11	0.42
C3	C3	0.53	0.50	9.3	0.27	3.98	1.06
C4	C4	0.42	0.42	10.5	0.18	3.80	0.68
C5	C5	0.17	0.76	5.6	0.13	4.70	0.61
C6	C6	0.13	0.76	5.7	0.10	4.68	0.45
C7	C7	0.12	0.76	5.7	0.09	4.68	0.41
C8	C8	0.16	0.55	8.6	0.09	4.09	0.36
C9	C9	0.12	0.58	8.2	0.07	4.16	0.29
OS1	OS1	0.56	0.42	15.6	0.23	3.18	0.74
OS2	OS2	0.73	0.29	12.4	0.21	3.54	0.75
R1	R1	0.17	0.81	5.0	0.14	4.85	0.67
R10	R10	0.06	0.81	5.0	0.05	4.85	0.25
R2	R2	0.19	0.81	5.0	0.15	4.85	0.75
R3	R3	0.04	0.81	5.0	0.03	4.85	0.15
R4	R4	0.04	0.81	5.0	0.03	4.85	0.15
R5	R5	0.18	0.81	5.0	0.14	4.85	0.69
R6	R6	0.04	0.81	5.0	0.03	4.85	0.15
R7	R7	0.04	0.81	5.0	0.03	4.85	0.15
R8	R8	0.23	0.81	5.0	0.19	4.85	0.92
R9	R9	0.19	0.81	5.0	0.15	4.85	0.74

Project Name: Dawson Trails

Prepared By: SC

Peak Runoff Rational Method (100-Year)

Rainfall Depth-Duration-Frequency (1-hr) =							2.60
Design Point	Basin ID	Basin Area (Ac)	Runoff Coeff (100-Year)	T_c (min)	C X A	I (in/hr)	Q (cfs)
A1	A1	0.12	0.57	14.8	0.07	5.94	0.39
A10	A10	0.20	0.85	5.7	0.17	8.52	1.47
A11	A11	0.23	0.86	5.4	0.20	8.65	1.70
A12	A12	0.19	0.87	5.0	0.16	8.82	1.45
A13	A13	0.12	0.85	5.7	0.10	8.49	0.87
A14	A14	0.13	0.85	5.8	0.11	8.45	0.92
A15	A15	0.10	0.81	6.9	0.08	8.04	0.66
A16	A16	0.10	0.57	14.8	0.06	5.94	0.33
A17	A17	0.50	0.87	5.1	0.44	8.76	3.82
A2	A2	0.20	0.71	10.1	0.14	7.01	1.02
A3	A3	0.29	0.67	11.5	0.19	6.65	1.29
A4	A4	0.20	0.80	7.3	0.16	7.89	1.24
A5	A5	0.42	0.82	6.5	0.35	8.18	2.86
A6	A6	0.23	0.84	6.0	0.19	8.39	1.62
A7	A7	0.18	0.85	5.8	0.15	8.46	1.29
A8	A8	0.25	0.86	5.4	0.22	8.63	1.86
A9	A9	0.05	0.87	5.0	0.04	8.82	0.40
B1	B1	0.10	0.80	7.0	0.08	8.00	0.63
B10	B10	0.10	0.87	5.0	0.09	8.82	0.76
B11	B11	0.25	0.85	5.5	0.22	8.59	1.87
B12	B12	0.63	0.81	6.6	0.51	8.14	4.19
B13	B13	0.14	0.87	5.1	0.12	8.79	1.09
B14	B14	2.33	0.74	8.8	1.72	7.38	12.67
B15	B15	0.24	0.70	10.0	0.17	7.04	1.17
B16	B16	0.33	0.77	8.0	0.25	7.66	1.94
B17	B17	0.16	0.87	5.0	0.14	8.82	1.20
B18	B18	0.79	0.71	9.4	0.56	7.19	4.04
B2	B2	0.11	0.77	7.8	0.09	7.70	0.68
B3	B3	0.03	0.57	13.7	0.02	6.17	0.12
B4	B4	0.38	0.84	6.0	0.32	8.39	2.66
B5	B5	0.15	0.81	6.7	0.12	8.09	0.99
B6	B6	0.06	0.84	5.8	0.05	8.47	0.40
B7	B7	0.12	0.86	5.4	0.10	8.64	0.90
B8	B8	0.14	0.87	5.1	0.12	8.75	1.08
B9	B9	0.11	0.85	5.6	0.09	8.57	0.79
C1	C1	0.10	0.62	12.0	0.06	6.52	0.40
C2	C2	0.18	0.75	8.5	0.14	7.48	1.01
C3	C3	0.53	0.72	9.3	0.38	7.23	2.75
C4	C4	0.42	0.68	10.5	0.29	6.91	1.98
C5	C5	0.17	0.85	5.6	0.15	8.54	1.24
C6	C6	0.13	0.85	5.7	0.11	8.51	0.92
C7	C7	0.12	0.85	5.7	0.10	8.50	0.83
C8	C8	0.16	0.74	8.6	0.12	7.44	0.87
C9	C9	0.12	0.76	8.2	0.09	7.57	0.70
OS1	OS1	0.56	0.68	15.6	0.38	5.79	2.17
OS2	OS2	0.73	0.61	12.4	0.45	6.44	2.88
R1	R1	0.17	0.87	5.0	0.15	8.82	1.31
R10	R10	0.06	0.87	5.0	0.06	8.82	0.49
R2	R2	0.19	0.87	5.0	0.17	8.82	1.47
R3	R3	0.04	0.87	5.0	0.03	8.82	0.30
R4	R4	0.04	0.87	5.0	0.03	8.82	0.30
R5	R5	0.18	0.87	5.0	0.15	8.82	1.35
R6	R6	0.04	0.87	5.0	0.03	8.82	0.29
R7	R7	0.04	0.87	5.0	0.03	8.82	0.29
R8	R8	0.23	0.87	5.0	0.20	8.82	1.80
R9	R9	0.19	0.87	5.0	0.16	8.82	1.45

APPENDIX C

DETENTION BASIN/ WATER QUALITY ENHANCEMENT BMP'S

Pond Percent Imperviousness Calculations

Pond D1 Verification – MHFD-Detention_v4.07

Pond D3 Verification – MHFD-Detention_v4.07

Project Name: Dawson Trails
Prepared By: SC

Percent Impervious Calculations

Basin Id	Design Point	Basin Area (Ac)	Paved Street, Roof, Drives, Walks Area	Newly Graded Areas Area	Weighted % Impervious
			95%	20%	
Pond D1 (Excluding Site)		15.24	See Phase III Drainage Report for Dawson Trails Filing No. 2 by EMK Consultants		70.8%
A1	A1	0.12		0.12	20.0%
A2	A2	0.20	0.10	0.11	56.0%
A3	A3	0.29	0.10	0.19	45.3%
A4	A4	0.20	0.15	0.05	77.4%
A5	A5	0.42	0.36	0.07	83.3%
A6	A6	0.23	0.21	0.02	87.5%
A7	A7	0.18	0.17	0.02	88.6%
A8	A8	0.25	0.24	0.01	91.7%
A9	A9	0.05	0.05		95.0%
A10	A10	0.20	0.19	0.01	89.7%
A11	A11	0.23	0.22	0.01	92.0%
A12	A12	0.19	0.19		95.0%
A13	A13	0.12	0.11	0.01	89.2%
A14	A14	0.13	0.12	0.01	88.5%
A15	A15	0.10	0.08	0.02	80.6%
A16	A16	0.10		0.10	20.0%
A17	A17	0.50	0.49	0.01	93.6%
B1	B1	0.10	0.08	0.02	77.5%
B2	B2	0.11	0.08	0.04	70.2%
B3	B3	0.03		0.03	20.0%
B4	B4	0.38	0.33	0.04	86.2%
B5	B5	0.15	0.12	0.03	79.8%
B6	B6	0.06	0.05	0.01	87.8%
B7	B7	0.12	0.12	0.01	91.2%
B8	B8	0.14	0.14	0.00	93.4%
B9	B9	0.11	0.10	0.01	89.8%
B10	B10	0.10	0.10	0.00	95.0%
B11	B11	0.25	0.24	0.02	90.3%
B12	B12	0.63	0.51	0.12	80.8%
B13	B13	0.14	0.14	0.00	94.1%
B14	B14	2.33	1.30	1.04	61.6%
B15	B15	0.24	0.10	0.14	51.7%
B16	B16	0.33	0.22	0.11	69.2%
B17	B17	0.16	0.16	0.00	95.0%
B18	B18	0.79	0.38	0.41	56.3%
R2	R2	0.19	0.19	0.00	95.0%
R3	R3	0.04	0.04		95.0%
R4	R4	0.04	0.04		95.0%
R5	R5	0.18	0.18	0.00	95.0%
R6	R6	0.04	0.04	0.00	95.0%
R7	R7	0.04	0.04		95.0%
R8	R8	0.23	0.23		95.0%
R9	R9	0.19	0.19	0.00	95.0%
R10	R10	0.06	0.06		95.0%
OS1	OS1	0.56	0.20	0.35	47.1%
Pond D1		26.50			72.2%

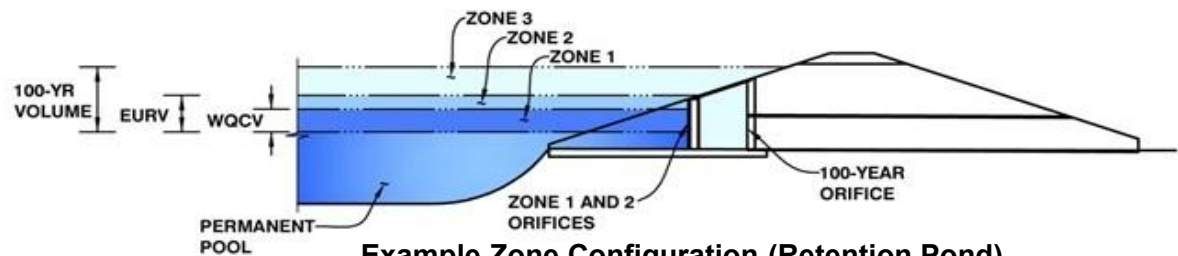
Pond D3 (Excluding Site)		86.96	See Phase III Drainage Report for Dawson		47.6%
C1	C1	0.10	0.02	0.08	34.1%
C2	C2	0.18	0.11	0.07	64.5%
C3	C3	0.53	0.26	0.26	57.5%
C4	C4	0.42	0.15	0.27	47.5%
C5	C5	0.17	0.16	0.01	89.3%
C6	C6	0.13	0.12	0.01	88.6%
C7	C7	0.12	0.11	0.01	88.5%
C8	C8	0.16	0.09	0.07	63.4%
C9	C9	0.12	0.08	0.05	66.9%
OS2	OS2	0.73	0.11	0.63	31.0%
R1	R1	0.17	0.17		95.0%
Pond D3		89.79			47.9%

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.07 (June 2025)

Project: Dawson Trails

Basin ID: Pond D1 Verification



Example Zone Configuration (Retention Pond)

Watershed Information

Selected SCM Type =	EDB	
Watershed Area =	26.50	acres
Watershed Length =	1,731	ft
Watershed Length to Centroid =	715	ft
Watershed Slope =	0.016	ft/ft
Watershed Imperviousness =	72.20%	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) =	0.630	acre-feet
Excess Urban Runoff Volume (EURV) =	1.864	acre-feet
2-yr Runoff Volume (P1 = 1.06 in.) =	1.693	acre-feet
5-yr Runoff Volume (P1 = 1.43 in.) =	2.500	acre-feet
10-yr Runoff Volume (P1 = 1.66 in.) =	3.021	acre-feet
25-yr Runoff Volume (P1 = 2 in.) =	3.846	acre-feet
50-yr Runoff Volume (P1 = 2.26 in.) =	4.454	acre-feet
100-yr Runoff Volume (P1 = 2.6 in.) =	5.292	acre-feet
500-yr Runoff Volume (P1 = 3.2 in.) =	6.704	acre-feet
Approximate 2-yr Detention Volume =	1.495	acre-feet
Approximate 5-yr Detention Volume =	2.220	acre-feet
Approximate 10-yr Detention Volume =	2.534	acre-feet
Approximate 25-yr Detention Volume =	2.839	acre-feet
Approximate 50-yr Detention Volume =	2.927	acre-feet
Approximate 100-yr Detention Volume =	3.230	acre-feet

Optional User Overrides

	acre-feet
	acre-feet
1.06	inches
1.43	inches
1.66	inches
2.00	inches
2.26	inches
2.60	inches
3.20	inches

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.630	acre-feet
Zone 2 Volume (EURV - Zone 1) =	1.234	acre-feet
Select Zone 3 Storage Volume (Optional) =		acre-feet
Total Detention Basin Volume =	1.864	acre-feet
Initial Surcharge Volume (ISV) =	user	ft ³
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	

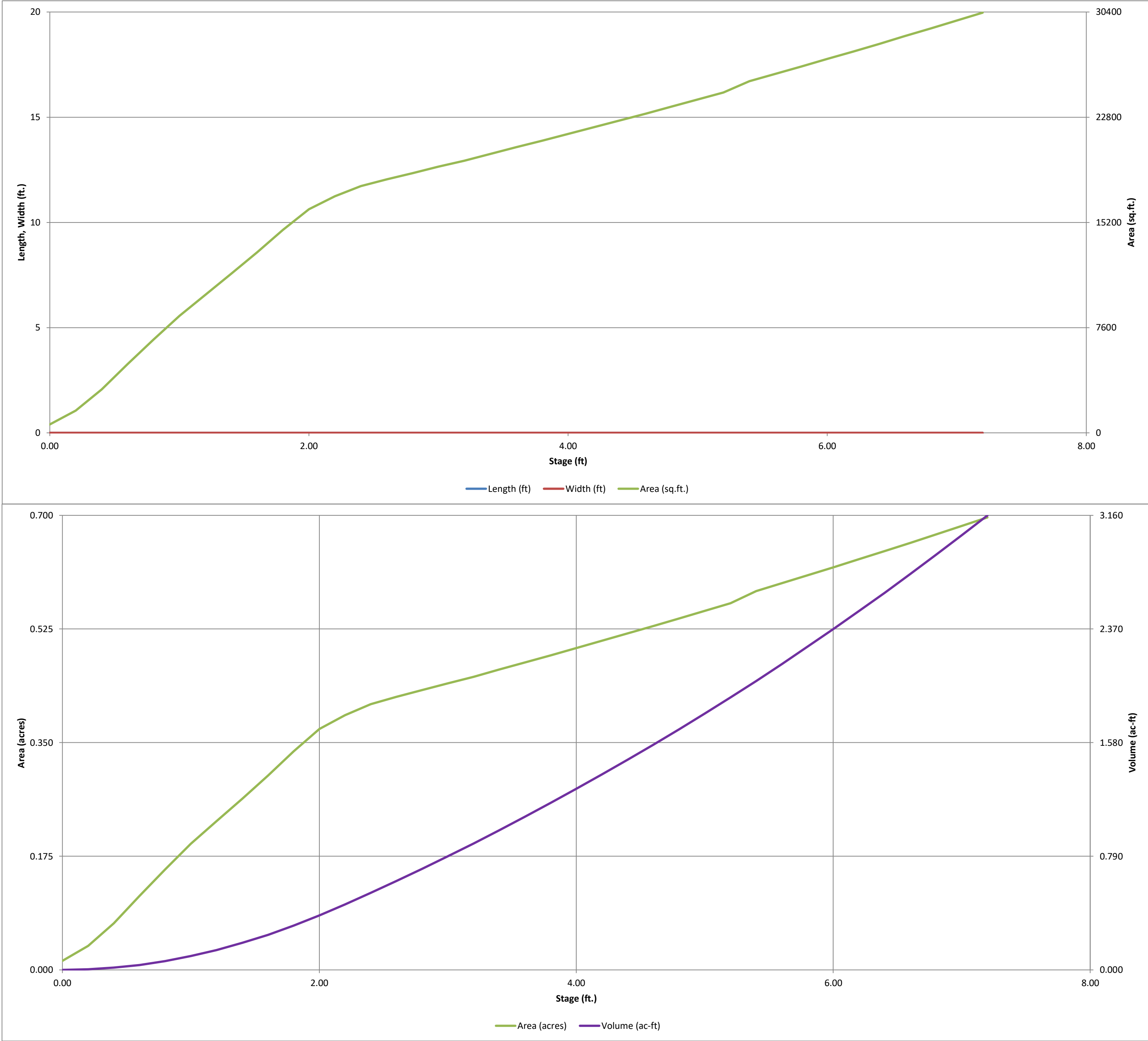
Total detention volume is less than 100-year volume.

Initial Surcharge Area (A_{ISV}) =	user	ft ²
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft ²
Volume of Basin Floor (V_{FLOOR}) =	user	ft ³
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft ²
Volume of Main Basin (V_{MAIN}) =	user	ft ³
Calculated Total Basin Volume (V_{total}) =	user	acre-feet

[illegible]

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.07 (June 2025)

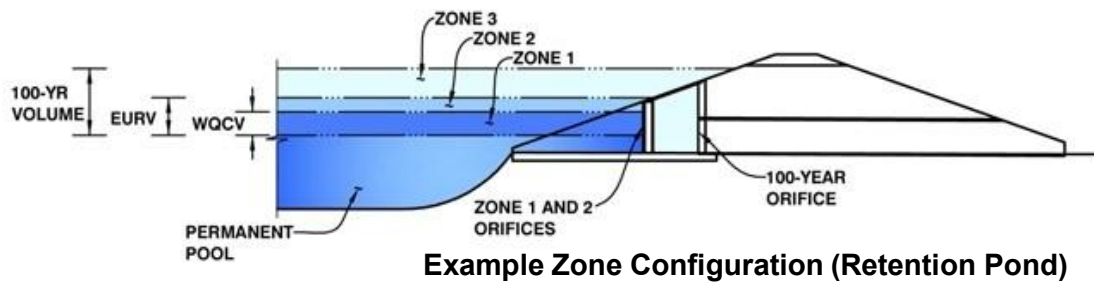


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.07 (June 2025)

Project: Dawson Trails

Basin ID: Pond D1 Verification



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.63	0.630	Orifice Plate
Zone 2 (EURV)	5.15	1.234	Orifice Plate
Zone 3			
Total (all zones)		1.864	

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

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

Calculated Parameters for Underdrain

Underdrain Orifice Area = N/A ft²
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 SCM)

Centroid of Lowest Orifice = 0.00 ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate = 5.17 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

Calculated Parameters for Plate

WQ Orifice Area per Row = N/A ft²
Elliptical Half-Width = N/A feet
Elliptical Slot Centroid = N/A feet
Elliptical Slot Area = N/A ft²

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	2.50						
Orifice Area (sq. inches)	4.00	9.00						

	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)

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

Calculated Parameters for Vertical Orifice

Vertical Orifice Area = Not Selected Not Selected ft²
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)

Overflow Weir Front Edge Height, H_o = Not Selected Not Selected ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length = Not Selected Not Selected feet
Overflow Weir Grate Slope = Not Selected Not Selected H:V
Horiz. Length of Weir Sides = Not Selected Not Selected feet
Overflow Grate Type = Not Selected Not Selected
Debris Clogging % = Not Selected Not Selected %

Calculated Parameters for Overflow Weir

Height of Grate Upper Edge, H_u = Not Selected Not Selected feet
Overflow Weir Slope Length = Not Selected Not Selected feet
Grate Open Area / 100-yr Orifice Area = Not Selected Not Selected
Overflow Grate Open Area w/o Debris = Not Selected Not Selected ft²
Overflow Grate Open Area w/ Debris = Not Selected Not Selected ft²

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

Depth to Invert of Outlet Pipe = Not Selected Not Selected ft (distance below basin bottom at Stage = 0 ft)
Circular Orifice Diameter = 18.00 Not Selected inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

Outlet Orifice Area = 1.77 Not Selected ft²
Outlet Orifice Centroid = 0.75 Not Selected feet
Half-Central Angle of Restrictor Plate on Pipe = N/A N/A radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage = 5.20 ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length = 27.00 feet
Spillway End Slopes = 10.00 H:V
Freeboard above Max Water Surface = 1.00 feet

Calculated Parameters for Spillway

Spillway Design Flow Depth = 0.91 feet
Stage at Top of Freeboard = 7.11 feet
Basin Area at Top of Freeboard = 0.69 acres
Basin Volume at Top of Freeboard = 3.10 acre-ft

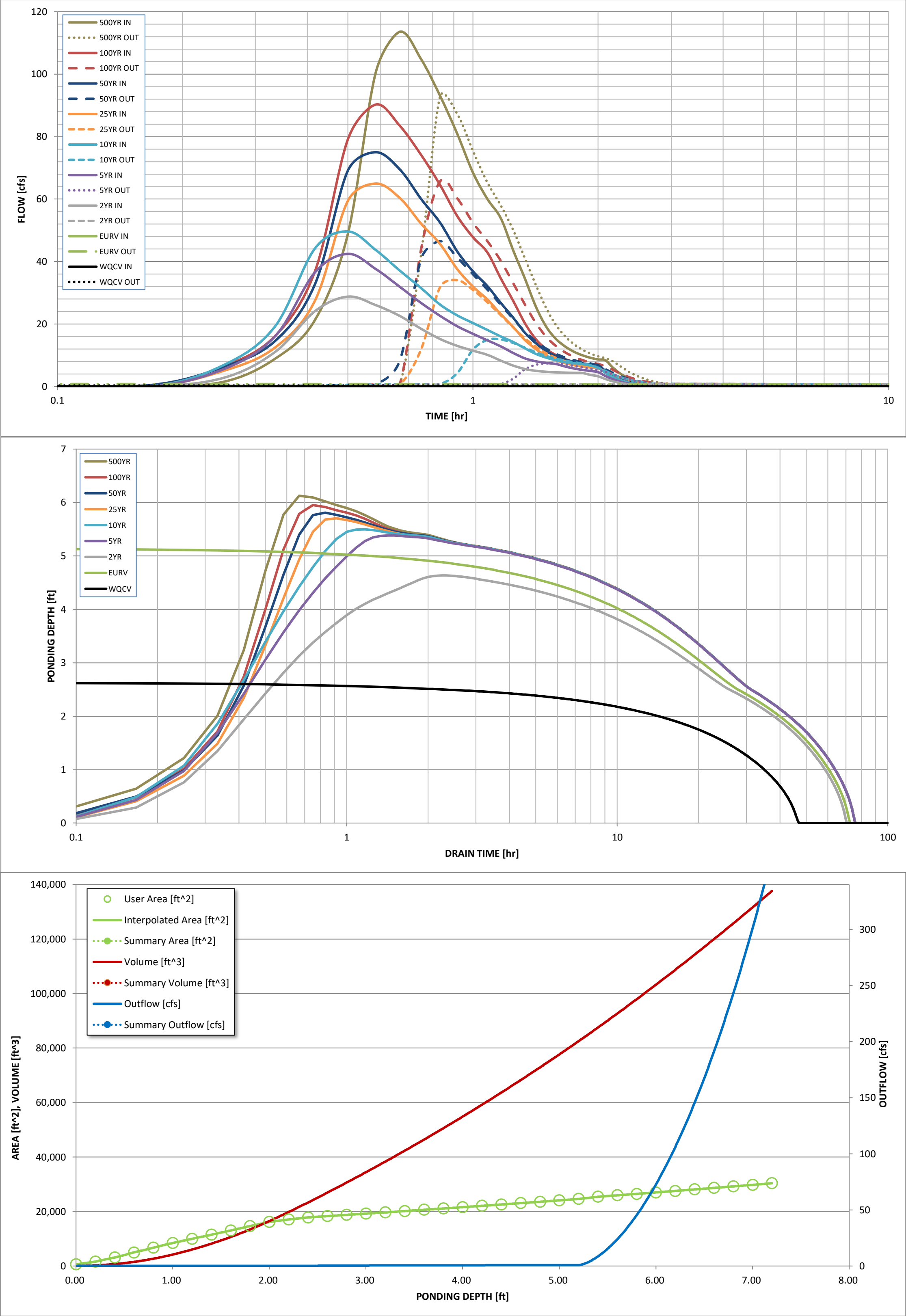
Routed Hydrograph Results

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	2.00	2.26	2.60	3.20
One-Hour Rainfall Depth (in) =	0.630	1.864	1.693	2.500	3.021	3.846	4.454	5.292	6.704
CUHP Runoff Volume (acre-ft) =	N/A	N/A	1.693	2.500	3.021	3.846	4.454	5.292	6.704
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	3.0	9.7	13.3	23.3	28.8	37.4	50.2
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	0.11	0.37	0.50	0.88	1.09	1.41	1.90
Peak Inflow Q (cfs) =	N/A	N/A	28.8	42.5	49.6	65.0	75.0	90.3	113.6
Peak Outflow Q (cfs) =	0.3	0.8	0.7	7.4	15.1	34.1	46.5	65.7	92.9
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.8	1.1	1.5	1.6	1.8	1.8
Structure Controlling Flow =	Plate	Plate	Plate	Spillway	Spillway	Spillway	Spillway	Spillway	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
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) =	43	65	63	66	64	62	61	59	55
Time to Drain 99% of Inflow Volume (hours) =	45	69	67	71	71	70	69	68	67
Maximum Ponding Depth (ft) =	2.63	5.15	4.64	5.38	5.50	5.70	5.81	5.95	6.13
Area at Maximum Ponding Depth (acres) =	0.42	0.56	0.53	0.58	0.59	0.60	0.61	0.62	0.63
Maximum Volume Stored (acre-ft) =	0.630	1.866	1.582	1.997	2.061	2.186	2.253	2.339	2.444

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.07 (June 2025)



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.

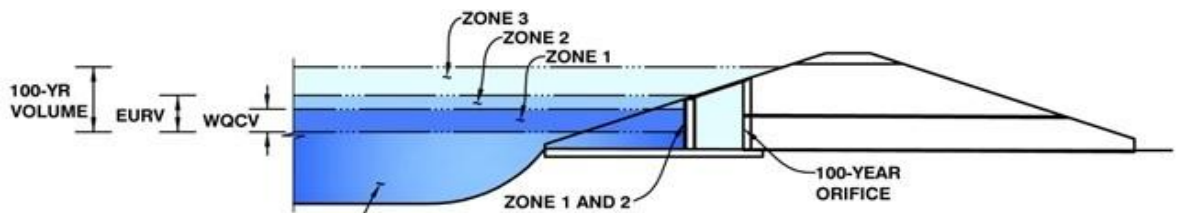
	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0	0.00	0.00	0.00	0.00	0.00	0.44	0.21	1.44
	0:15:00	0	0.00	2.69	5.44	6.72	4.94	6.18	6.34	8.80
	0:20:00	0	0.00	10.95	15.92	19.08	12.37	14.44	16.03	21.29
	0:25:00	0	0.00	24.11	36.53	44.21	27.47	32.72	36.87	48.84
	0:30:00	0	0.00	28.77	42.46	49.64	59.44	69.12	79.11	100.45
	0:35:00	0	0.00	26.06	37.63	43.72	64.97	75.01	90.26	113.57
	0:40:00	0	0.00	22.59	31.91	37.11	60.36	69.52	83.48	104.84
	0:45:00	0	0.00	18.49	26.76	31.52	52.17	60.06	74.18	93.08
	0:50:00	0	0.00	15.20	22.62	26.23	45.63	52.47	64.53	80.91
	0:55:00	0	0.00	13.01	19.28	22.77	37.57	43.25	54.56	68.47
	1:00:00	0	0.00	11.47	16.87	20.32	31.99	36.86	47.81	60.03
	1:05:00	0	0.00	10.13	14.77	18.11	27.87	32.13	42.92	53.89
	1:10:00	0	0.00	8.28	12.84	16.02	23.18	26.77	34.62	43.56
	1:15:00	0	0.00	6.68	10.72	14.24	19.04	22.03	27.40	34.58
	1:20:00	0	0.00	5.60	9.01	12.23	14.90	17.22	20.27	25.61
	1:25:00	0	0.00	5.02	8.08	10.44	11.99	13.87	15.14	19.19
	1:30:00	0	0.00	4.71	7.55	9.25	9.82	11.37	12.01	15.24
	1:35:00	0	0.00	4.55	7.20	8.42	8.41	9.73	10.08	12.81
	1:40:00	0	0.00	4.44	6.40	7.83	7.46	8.63	8.75	11.12
	1:45:00	0	0.00	4.36	5.76	7.43	6.83	7.90	7.86	10.00
	1:50:00	0	0.00	4.30	5.31	7.14	6.41	7.41	7.23	9.20
	1:55:00	0	0.00	3.73	4.98	6.71	6.11	7.07	6.81	8.66
	2:00:00	0	0.00	3.26	4.59	6.00	5.92	6.85	6.60	8.39
	2:05:00	0	0.00	2.39	3.36	4.35	4.35	5.02	4.85	6.16
	2:10:00	0	0.00	1.69	2.37	3.06	3.06	3.53	3.43	4.35
	2:15:00	0	0.00	1.18	1.66	2.15	2.15	2.49	2.43	3.09
	2:20:00	0	0.00	0.82	1.13	1.49	1.50	1.73	1.70	2.15
	2:25:00	0	0.00	0.55	0.74	1.01	1.01	1.17	1.14	1.45
	2:30:00	0	0.00	0.36	0.50	0.67	0.69	0.80	0.78	0.99
	2:35:00	0	0.00	0.21	0.32	0.42	0.44	0.51	0.50	0.63
	2:40:00	0	0.00	0.11	0.18	0.22	0.25	0.29	0.28	0.36
	2:45:00	0	0.00	0.04	0.08	0.09	0.11	0.13	0.12	0.16
	2:50:00	0	0.00	0.01	0.02	0.02	0.03	0.03	0.03	0.04
	2:55:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:00:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:05:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:10:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:15:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:20:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:25:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:30:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:35:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:40:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:45:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:50:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:55:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:00:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:05:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.07 (June 2025)

Project: Dawson Trails

Basin ID: Pond D3 Verification



Example Zone Configuration (Retention Pond)

Watershed Information

Selected SCM Type =	EDB	
Watershed Area =	89.79	acres
Watershed Length =	3,991	ft
Watershed Length to Centroid =	2,182	ft
Watershed Slope =	0.047	ft/ft
Watershed Imperviousness =	47.90%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	25.0%	percent
Percentage Hydrologic Soil Groups C/D =	75.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths = User Input		

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) =	1.501	acre-feet
Excess Urban Runoff Volume (EURV) =	4.187	acre-feet
2-yr Runoff Volume (P1 = 1.06 in.) =	3.841	acre-feet
5-yr Runoff Volume (P1 = 1.43 in.) =	6.285	acre-feet
10-yr Runoff Volume (P1 = 1.66 in.) =	7.948	acre-feet
25-yr Runoff Volume (P1 = 2 in.) =	10.851	acre-feet
50-yr Runoff Volume (P1 = 2.26 in.) =	12.861	acre-feet
100-yr Runoff Volume (P1 = 2.6 in.) =	15.814	acre-feet
500-yr Runoff Volume (P1 = 3.2 in.) =	20.570	acre-feet
Approximate 2-yr Detention Volume =	3.152	acre-feet
Approximate 5-yr Detention Volume =	4.966	acre-feet
Approximate 10-yr Detention Volume =	5.852	acre-feet
Approximate 25-yr Detention Volume =	6.716	acre-feet
Approximate 50-yr Detention Volume =	7.011	acre-feet
Approximate 100-yr Detention Volume =	8.203	acre-feet

Optional User Overrides	
	acre-feet
	acre-feet
1.06	inches
1.43	inches
1.66	inches
2.00	inches
2.26	inches
2.60	inches
3.20	inches

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	1.501	acre-feet
Zone 2 Volume (EURV - Zone 1) =	2.686	acre-feet
Select Zone 3 Storage Volume (Optional) =		acre-feet
Total Detention Basin Volume =	4.187	acre-feet
Initial Surcharge Volume (ISV) =	user	ft ³
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H _{total}) =	user	ft
Depth of Trickle Channel (H _{TC}) =	user	ft
Slope of Trickle Channel (S _{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S _{main}) =	user	H:V
Basin Length-to-Width Ratio (R _{L/W}) =	user	

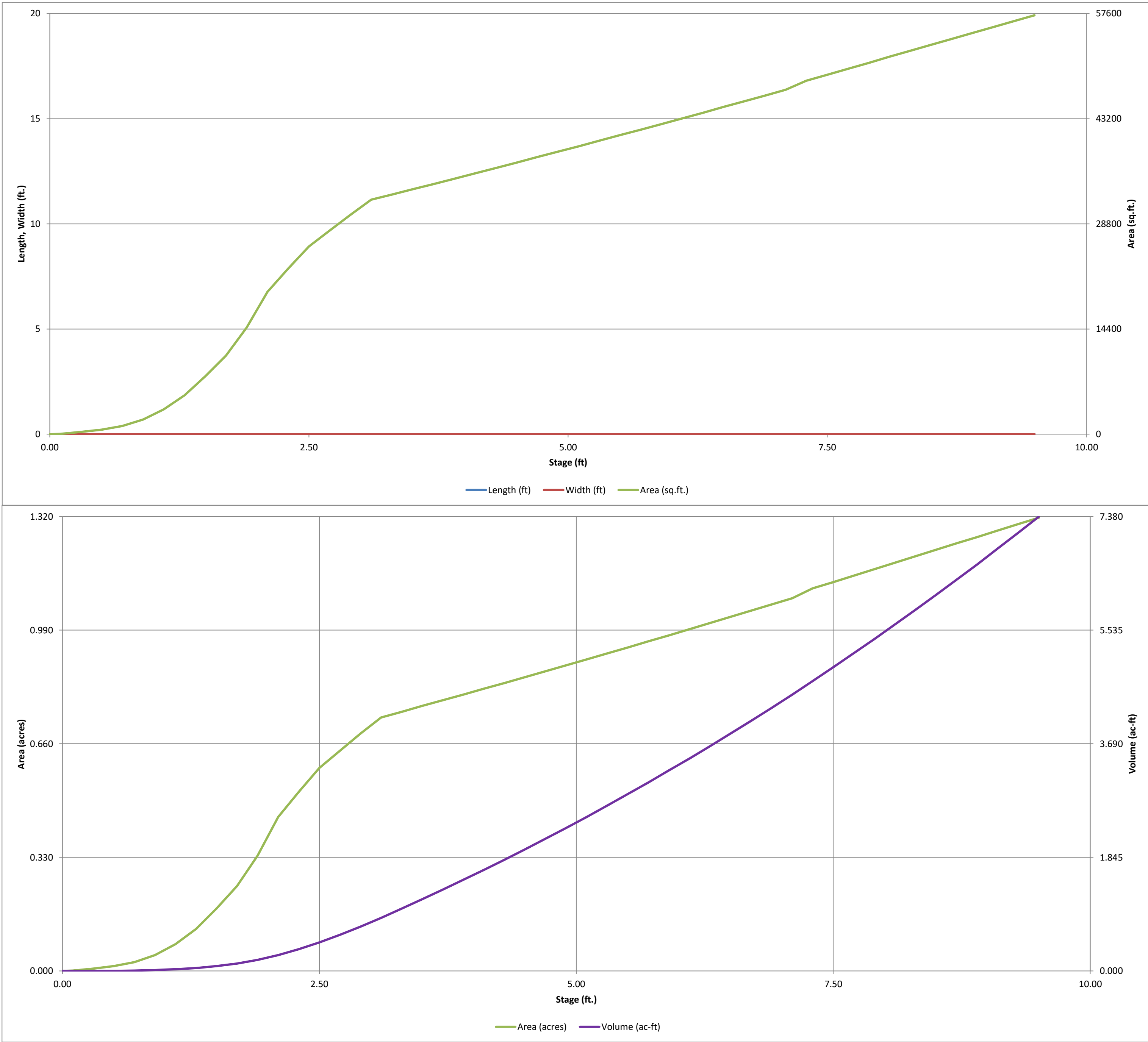
Initial Surcharge Area (A_{ISV}) =	user	ft ²
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft ²
Volume of Basin Floor (V_{FLOOR}) =	user	ft ³
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft ²
Volume of Main Basin (V_{MAIN}) =	user	ft ³
Calculated Total Basin Volume (V_{total}) =	user	acre-feet

Total detention volume is less than 100-year volume:

Depth Increment =		ft							
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft ²)	Optional Override Area (ft ²)	Area (acre)	Volume (ft ³)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	1	0.000		
	--	0.10	--	--	--	29	0.001	1	0.000
	--	0.30	--	--	--	297	0.007	34	0.001
	--	0.50	--	--	--	605	0.014	124	0.003
	--	0.70	--	--	--	1,106	0.025	295	0.007
	--	0.90	--	--	--	2,020	0.046	608	0.014
	--	1.10	--	--	--	3,380	0.078	1,148	0.026
	--	1.30	--	--	--	5,328	0.122	2,019	0.046
	--	1.50	--	--	--	7,896	0.181	3,341	0.077
	--	1.70	--	--	--	10,745	0.247	5,205	0.119
	--	1.90	--	--	--	14,586	0.335	7,738	0.178
	--	2.10	--	--	--	19,487	0.447	11,146	0.256
	--	2.30	--	--	--	22,649	0.520	15,359	0.353
	--	2.50	--	--	--	25,687	0.590	20,193	0.464
	--	2.70	--	--	--	27,857	0.640	25,547	0.586
	--	2.90	--	--	--	30,033	0.689	31,336	0.719
	--	3.10	--	--	--	32,093	0.737	37,549	0.862
	--	3.30	--	--	--	32,807	0.753	44,039	1.011
	--	3.50	--	--	--	33,525	0.770	50,672	1.163
	--	3.70	--	--	--	34,248	0.786	57,449	1.319
	--	3.90	--	--	--	34,974	0.803	64,371	1.478
	--	4.10	--	--	--	35,704	0.820	71,439	1.640
	--	4.30	--	--	--	36,439	0.837	78,654	1.806
	--	4.50	--	--	--	37,178	0.853	86,015	1.975
	--	4.70	--	--	--	37,921	0.871	93,525	2.147
	--	4.90	--	--	--	38,688	0.888	101,186	2.323
	--	5.10	--	--	--	39,419	0.905	108,997	2.502
	--	5.30	--	--	--	40,174	0.922	116,956	2.685
	--	5.50	--	--	--	40,934	0.940	125,067	2.871
	--	5.70	--	--	--	41,698	0.957	133,330	3.061
	--	5.90	--	--	--	42,466	0.975	141,746	3.254
	--	6.10	--	--	--	43,239	0.993	150,317	3.451
	--	6.30	--	--	--	44,015	1.010	159,042	3.651
	--	6.50	--	--	--	44,796	1.028	167,923	3.855
	--	6.70	--	--	--	45,582	1.046	176,961	4.062
	--	6.90	--	--	--	46,371	1.065	186,157	4.274
	--	7.10	--	--	--	47,166	1.083	195,510	4.488
	--	7.30	--	--	--	48,415	1.111	205,068	4.708
	--	7.50	--	--	--	49,218	1.130	214,832	4.932
	--	7.70	--	--	--	50,027	1.148	224,756	5.160
	--	7.90	--	--	--	50,843	1.167	234,843	5.391
	--	8.10	--	--	--	51,661	1.186	245,093	5.627
	--	8.30	--	--	--	52,481	1.205	255,508	5.866
	--	8.50	--	--	--	53,302	1.224	266,086	6.108
	--	8.70	--	--	--	54,115	1.242	276,828	6.355
	--	8.90	--	--	--	54,925	1.261	287,732	6.605
	--	9.10	--	--	--	55,735	1.279	298,798	6.859
	--	9.30	--	--	--	56,545	1.298	310,026	7.117
	--	9.50	--	--	--	57,355	1.317	321,416	7.379
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DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-*Detention*, Version 4.07 (June 2025)

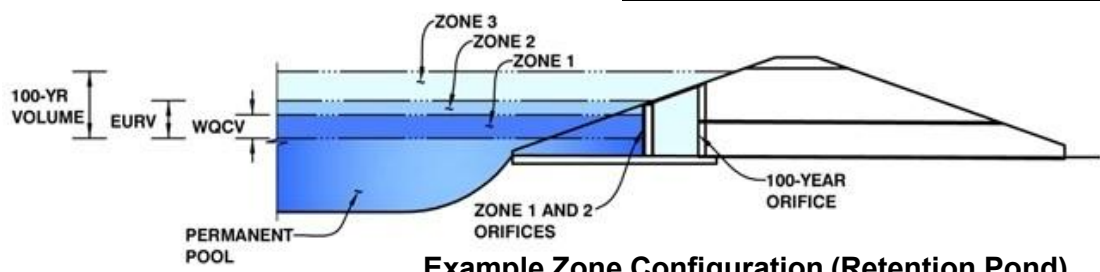


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.07 (June 2025)

Project: Dawson Trails

Basin ID: Pond D3 Verification



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.93	1.501	Orifice Plate
Zone 2 (EURV)	6.82	2.686	Rectangular Orifice
Zone 3			
Total (all zones)		4.187	

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

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

Calculated Parameters for Underdrain

Underdrain Orifice Area = N/A ft²
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 SCM)

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 = 6.49 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 ft²
Elliptical Half-Width = N/A feet
Elliptical Slot Centroid = N/A feet
Elliptical Slot Area = N/A ft²

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							
Orifice Area (sq. inches)	7.00							
	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 = 3.48 ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice = 6.49 ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Height = 8.00 inches
Vertical Orifice Width = 8.00 inches

Zone 2 Rectangular Not Selected
Vertical Orifice Area = 0.44 ft²
Vertical Orifice Centroid = 0.33 feet

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

Calculated Parameters for Overflow Weir

Overflow Weir Front Edge Height, H_o = 7.00 ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length = feet
Overflow Weir Gate Slope = H:V
Horiz. Length of Weir Sides = feet
Overflow Gate Type =
Debris Clogging % = %

Not Selected Not Selected
Height of Gate Upper Edge, H_g = feet
Overflow Weir Slope Length = feet
Gate Open Area / 100-yr Orifice Area =
Overflow Gate Open Area w/o Debris = ft²
Overflow Gate Open Area w/ Debris = ft²

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

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

Depth to Invert of Outlet Pipe = Not Selected ft (distance below basin bottom at Stage = 0 ft)
Circular Orifice Diameter = Not Selected inches

Not Selected Not Selected
Outlet Orifice Area = ft²
Outlet Orifice Centroid = 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 = 7.25 ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length = 50.00 feet
Spillway End Slopes = 10.00 H:V
Freeboard above Max Water Surface = 1.00 feet

Spillway Design Flow Depth = 1.15 feet
Stage at Top of Freeboard = 9.40 feet
Basin Area at Top of Freeboard = 1.31 acres
Basin Volume at Top of Freeboard = 7.25 acre-ft

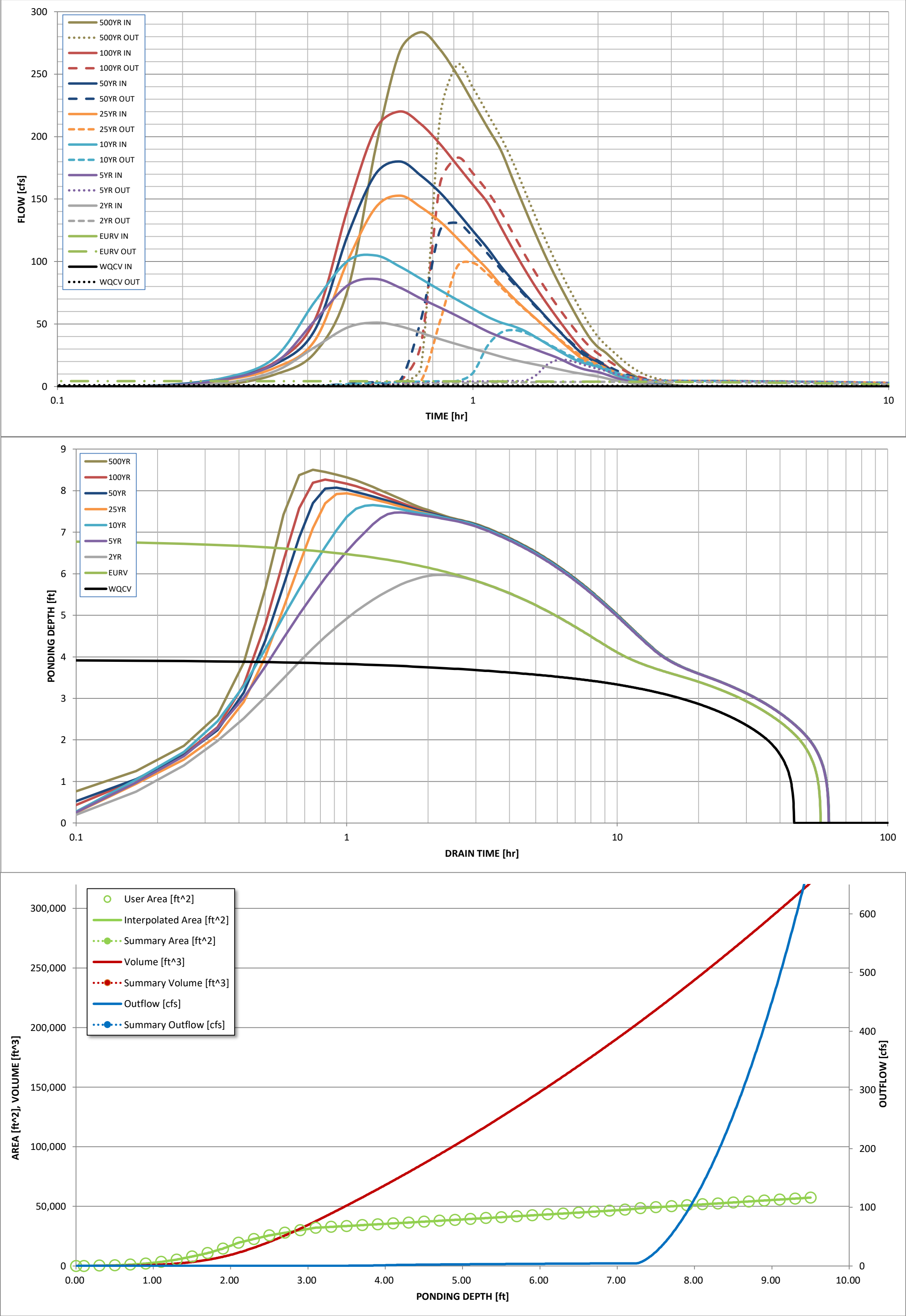
Routed Hydrograph Results

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	2.00	2.26	2.60	3.20
One-Hour Rainfall Depth (in) =	1.501	4.187	3.841	6.285	7.948	10.851	12.861	15.814	20.570
CUHP Runoff Volume (acre-ft) =	N/A	N/A	3.841	6.285	7.948	10.851	12.861	15.814	20.570
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	7.4	27.1	38.7	71.1	88.1	115.1	155.6
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	0.30	0.43	0.79	0.98	1.28	1.73
Peak Inflow Q (cfs) =	N/A	N/A	51.1	86.1	104.9	152.7	180.1	220.1	283.6
Peak Outflow Q (cfs) =	1.1	4.3	3.7	21.3	45.2	98.9	130.9	183.0	257.6
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.8	1.2	1.4	1.5	1.6	1.7
Structure Controlling Flow =	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Spillway	Spillway	Spillway	Spillway	Spillway	Spillway
Max Velocity through Gate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
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) =	43	51	51	52	51	47	45	43	38
Time to Drain 99% of Inflow Volume (hours) =	44	54	54	57	57	55	55	54	52
Maximum Ponding Depth (ft) =	3.93	6.82	5.97	7.48	7.65	7.93	8.07	8.26	8.50
Area at Maximum Ponding Depth (acres) =	0.81	1.06	0.98	1.13	1.14	1.17	1.18	1.20	1.22
Maximum Volume Stored (acre-ft) =	1.502	4.189	3.323	4.898	5.091	5.426	5.579	5.818	6.108

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.07 (June 2025)



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	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0	0.00	0.00	0.00	0.00	0.00	0.43	0.21	1.44
	0:15:00	0	0.00	2.64	5.37	6.65	4.91	6.38	6.42	9.54
	0:20:00	0	0.00	12.12	18.52	23.03	14.84	17.64	19.26	27.02
	0:25:00	0	0.00	31.50	52.91	68.02	36.96	45.37	53.53	77.62
	0:30:00	0	0.00	47.32	81.00	100.58	100.81	121.29	142.61	190.76
	0:35:00	0	0.00	51.14	86.08	104.87	143.26	170.13	206.18	268.18
	0:40:00	0	0.00	48.25	79.17	96.00	152.75	180.09	220.12	283.61
	0:45:00	0	0.00	42.91	70.34	86.12	143.43	168.70	209.90	269.74
	0:50:00	0	0.00	37.89	63.13	77.14	132.01	155.17	194.09	249.32
	0:55:00	0	0.00	33.77	56.41	69.32	118.64	139.63	177.03	227.56
	1:00:00	0	0.00	30.20	49.95	62.22	105.65	124.53	161.41	207.51
	1:05:00	0	0.00	27.02	44.06	55.84	93.84	110.73	147.22	189.24
	1:10:00	0	0.00	23.91	39.61	51.23	81.39	96.32	127.81	164.88
	1:15:00	0	0.00	21.35	36.12	48.26	71.06	84.50	109.64	142.33
	1:20:00	0	0.00	19.30	32.73	44.46	62.20	74.05	93.51	121.66
	1:25:00	0	0.00	17.52	29.45	39.47	54.37	64.63	79.41	103.24
	1:30:00	0	0.00	15.87	26.38	34.43	46.83	55.58	67.18	87.22
	1:35:00	0	0.00	14.24	23.47	29.78	39.75	47.13	56.30	72.98
	1:40:00	0	0.00	12.64	20.08	25.55	33.23	39.36	46.32	59.96
	1:45:00	0	0.00	11.19	16.74	21.83	27.26	32.25	37.23	48.13
	1:50:00	0	0.00	10.11	14.17	19.13	22.05	26.09	29.49	38.24
	1:55:00	0	0.00	9.00	12.65	17.34	18.37	21.83	24.08	31.49
	2:00:00	0	0.00	7.99	11.58	15.69	16.18	19.29	20.73	27.26
	2:05:00	0	0.00	6.66	9.74	13.14	13.30	15.88	16.74	22.06
	2:10:00	0	0.00	5.34	7.75	10.46	10.35	12.35	12.76	16.84
	2:15:00	0	0.00	4.22	6.08	8.22	7.95	9.49	9.55	12.62
	2:20:00	0	0.00	3.34	4.78	6.42	6.14	7.31	7.13	9.43
	2:25:00	0	0.00	2.62	3.75	4.97	4.71	5.60	5.32	7.03
	2:30:00	0	0.00	2.05	2.89	3.79	3.59	4.27	4.02	5.31
	2:35:00	0	0.00	1.60	2.20	2.86	2.72	3.22	3.05	4.01
	2:40:00	0	0.00	1.23	1.66	2.16	2.05	2.43	2.33	3.06
	2:45:00	0	0.00	0.94	1.25	1.65	1.57	1.86	1.80	2.37
	2:50:00	0	0.00	0.70	0.93	1.24	1.19	1.41	1.37	1.80
	2:55:00	0	0.00	0.50	0.66	0.90	0.87	1.03	1.00	1.31
	3:00:00	0	0.00	0.33	0.45	0.61	0.60	0.71	0.69	0.90
	3:05:00	0	0.00	0.20	0.29	0.37	0.39	0.45	0.44	0.57
	3:10:00	0	0.00	0.10	0.16	0.20	0.22	0.25	0.24	0.31
	3:15:00	0	0.00	0.04	0.07	0.08	0.09	0.11	0.10	0.13
	3:20:00	0	0.00	0.01	0.02	0.02	0.02	0.02	0.02	0.03
	3:25:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:30:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:35:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:40:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:45:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:50:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:55:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:00:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:05:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
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	6:00:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

APPENDIX D

REFERENCES

Excerpts from "Public Improvement Construction Plans for Dawson Trails Filing 2 Infrastructure" By EMK Consultants, dated April 2025.

Excerpts from "Phase III Drainage Report for Dawson Trails Filing No.2" by EMK Consultants, approved October 2025

PUBLIC IMPROVEMENT CONSTRUCTION PLANS

DAWSON TRAILS FILING 2 INFRASTRUCTURE

LOCATED IN PORTIONS OF SECTIONS 21, 22, 27 AND 28, TOWNSHIP 8 SOUTH,

RANGE 67 WEST OF THE 6TH PRINCIPAL MERIDIAN, TOWN OF CASTLE ROCK, COUNTY OF DOUGLAS, STATE OF COLORADO.

TOWN OF CASTLE ROCK PROJECT NO. CD23-0045

CONTACTS

DEVELOPER / OWNER
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TOWN OF CASTLE ROCK
DEVELOPMENT SERVICES DEPARTMENT
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CASTLE ROCK, CO 80104
(720) 733-2200

UTILITY SERVICE PROVIDERS

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CASTLE ROCK, CO 80104
PHONE: (720) 733-6000
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DENVER, CO 80202
PHONE: (800) 244-1111

GAS

BLACK HILLS ENERGY
1515 WYNKOOP ST., 5TH FLOOR
DENVER, CO 80202
PHONE (888) 890-5554

NOTES

- CONTRACTOR TO VERIFY LOCATION OF EXISTING UTILITIES PRIOR TO CONSTRUCTION.
- CONTRACTOR SHALL FIELD VERIFY THE LOCATION AND DEPTH OF ALL UTILITY CROSSINGS PRIOR TO CONSTRUCTION. CONTRACTOR SHALL NOTIFY THE DESIGN ENGINEER OF ANY CONFLICTS OR DISCREPANCIES WHICH WOULD IMPACT THE CONSTRUCTION OF THE PROPOSED UTILITIES PRIOR TO THE START OF CONSTRUCTION.

Sheet List Table

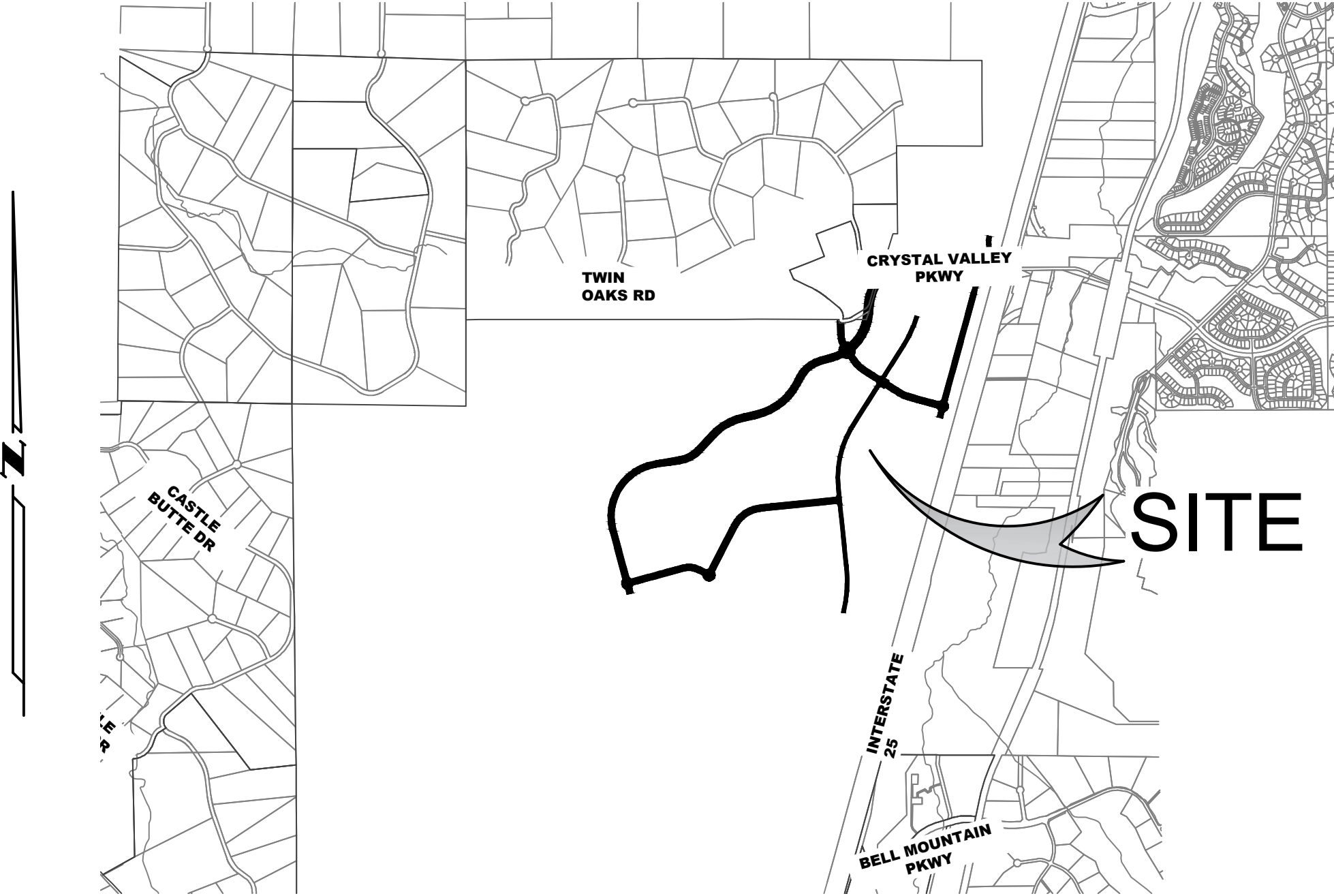
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3	GENERAL NOTES
4	ROAD SECTIONS
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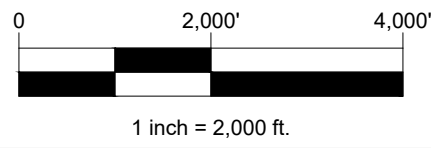
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185	SIGNAGE & STRIPING (8 OF 15)
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187	SIGNAGE & STRIPING (10 OF 15)
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VICINITY MAP



VARIANCE REQUESTS

Variance No.	Description	Approval Date
TCV24-0044	HORIZONTAL SEPARATION BETWEEN SANITARY SEWER AND STORM SEWER LESS THAN 10' ALONG BLANCA PEAK	
TCV24-0043	INTERSECTION SPACING ALONG BLANCA PEAK PARKWAY BETWEEN DAWSON TRAILS BLVD AND DAWSON PLAZA LESS THAN 660'.	10/4/2024
TCV25-0001	HORIZONTAL SEPARATION BETWEEN SANITARY SEWER AND STORM SEWER LESS THAN 10' ALONG GAMBEL RIDGE DRIVE	
TCV25-0002	INTERSECTION SPACING ALONG QUANDARY PEAK DRIVER LESS THAN 660'.	2/12/2025

INDEMNIFICATION AND ADHERENCE TO STANDARDS STATEMENT

THESE PLANS HAVE BEEN REVIEWED BY THE TOWN OF CASTLE ROCK FOR CONCEPT ONLY. THE REVIEW DOES NOT IMPLY RESPONSIBILITY BY THE REVIEWING DEPARTMENT, THE TOWN ENGINEER, OR THE TOWN OF CASTLE ROCK FOR ACCURACY AND CORRECTNESS OF THE CALCULATIONS. FURTHERMORE, THE REVIEW DOES NOT IMPLY THAT QUANTITIES OF ITEMS ON THE PLANS ARE THE FINAL QUANTITIES REQUIRED. THE REVIEW SHALL NOT BE CONSTRUED FOR ANY REASON AS ACCEPTANCE OF FINANCIAL RESPONSIBILITY BY THE TOWN FOR ADDITIONAL QUANTITIES OF ITEMS SHOWN THAT MAY BE REQUIRED DURING THE CONSTRUCTION PHASE.

ALL WORK SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE TOWN OF CASTLE ROCK MUNICIPAL CODE, TECHNICAL MANUALS, AND/OR OTHER TOWN-APPROVED APPLICABLE STANDARDS.

BENCHMARK:

THE ELEVATION AND CONTOURS SHOWN HEREON ARE BASED UPON NGS STATION X 396 (PD KK1331). BEING A STANDARD NGS STEEL DEEPCD, WITH A PUNCHMARK, IN A STANDARD NGS LOGO CAP SET IN A CONCRETE SLEEVE, FLUSH TO THE GROUND. MONUMENT LIES 0.25 MI SOUTH OF THE INTERSECTION OF DOUGLAS LANE LEADING EAST, 121.1 FT EAST OF THE CENTERLINE OF THE NORTHBOUND LANES OF INTERSTATE 25, 86.6 FT SOUTH OF THE CENTER OF A PRIVATE DRIVE LEADING EAST TO A FRAME HOUSE, 38.1 FT EAST OF THE CENTERLINE OF THE EAST FRONTAGE ROAD OF INTERSTATE 25, 5.6 FT NORTH OF A UTILITY POLE, ABOUT LEVEL WITH THE HIGHWAY, AND 1 FT WEST OF A FIBERGLASS WITNESS POST AND SHEEP FENCE. PUBLISHED ELEVATION = 6355.09' NAVD88

BASIS OF COORDINATES:

BASIS OF COORDINATES: PROJECT COORDINATES (GROUND) ARE DERIVED FROM A MODIFIED NAD83 (2011) COLORADO STATE PLANE CENTRAL ZONE COORDINATES (0502) IN U.S. SURVEY FEET, COMBINED SCALE FACTOR = 1.0003644180 AND IS SCALED FROM THE MAPPING ZONE ORIGIN (N: 0FT, E: 0FT)

BASIS OF BEARING:

BEARINGS FOR THIS DESCRIPTION ARE BASED UPON THE NORTH LINE OF THE SOUTHEAST QUARTER OF THE SOUTHEAST QUARTER OF SECTION 21, TOWNSHIP 8 SOUTH, RANGE 67 WEST OF THE SIXTH PRINCIPAL MERIDIAN, BEING ASSUMED TO BEAR N 89°55'56" W, FROM THE SOUTH SIXTEENTH CORNER COMMON TO SECTIONS 21 & 22, BEING MONUMENTED BY A 1" DIAMETER PIPE WITH A 2" DIAMETER ALUMINUM CAP STAMPED "LS 6935 1988", TO THE SOUTHEAST SIXTEENTH CORNER OF SAID SECTION 21, BEING MONUMENTED BY A #5 REBAR WITH A 1-1/2 INCH DIAMETER ALUMINUM CAP STAMPED "LS 10377", WITH ALL BEARINGS CONTAINED HEREIN RELATIVE THERETO.

PROFESSIONAL ENGINEER CERTIFICATION

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

GARY A. WALTER
STATE OF COLORADO # 42246

DATE

TOWN APPROVAL BLOCK

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

APPROVED BY:

DRAWN BY: DL

CHECKED BY: GAW

DEVELOPMENT SERVICES

DATE

DAWSON TRAILS - FILING 2 INFRASTRUCTURE

CASTLE ROCK, COLORADO

CONSTRUCTION DOCUMENTS

COVER SHEET

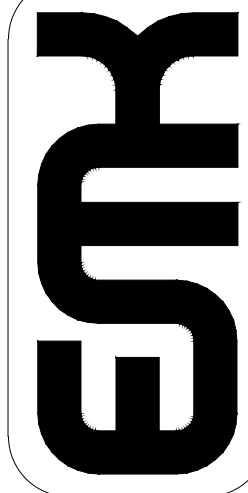


DESIGNED BY: DO
DRAWN BY: DL
CHECKED BY: GAW

JOB NO.
13466.00

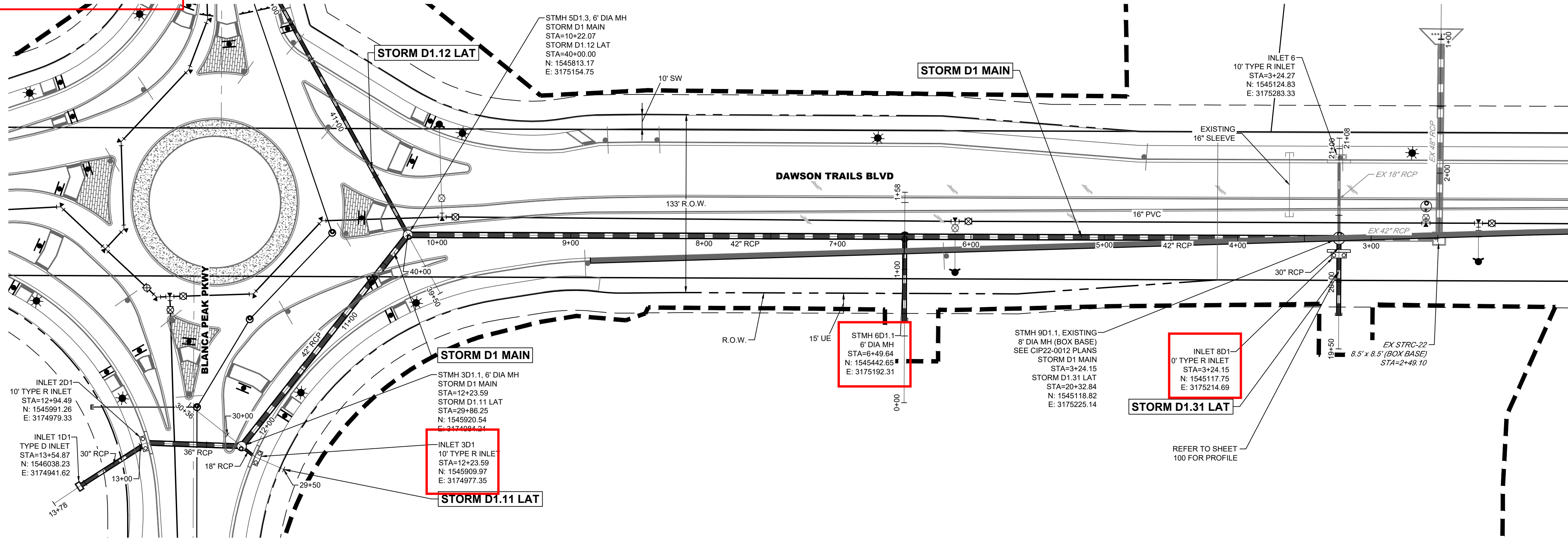
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1 OF 301

EMK CONSULTANTS, INC.
ENGINEERING/SURVEYING
LAND DEVELOPMENT
SERVICES AND SOLUTIONS
7006 S. ALTON WAY, BLDG. F
CENTENNIAL, COLORADO 80112-2019
(303) 694-1520
WWW.EMKC.COM

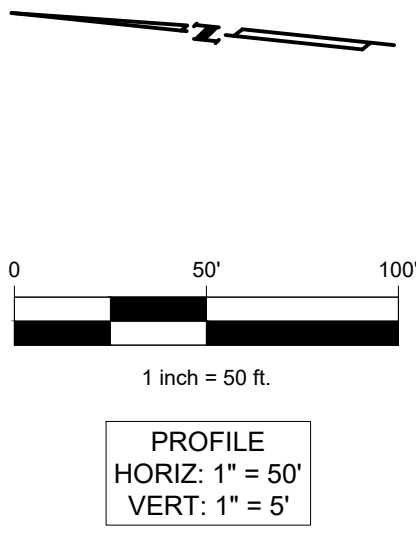
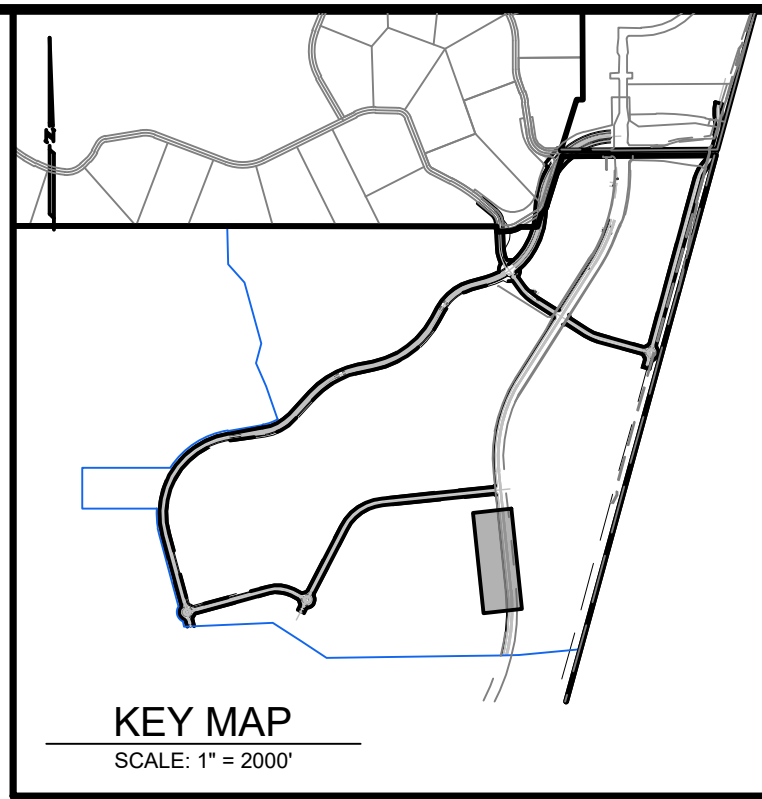
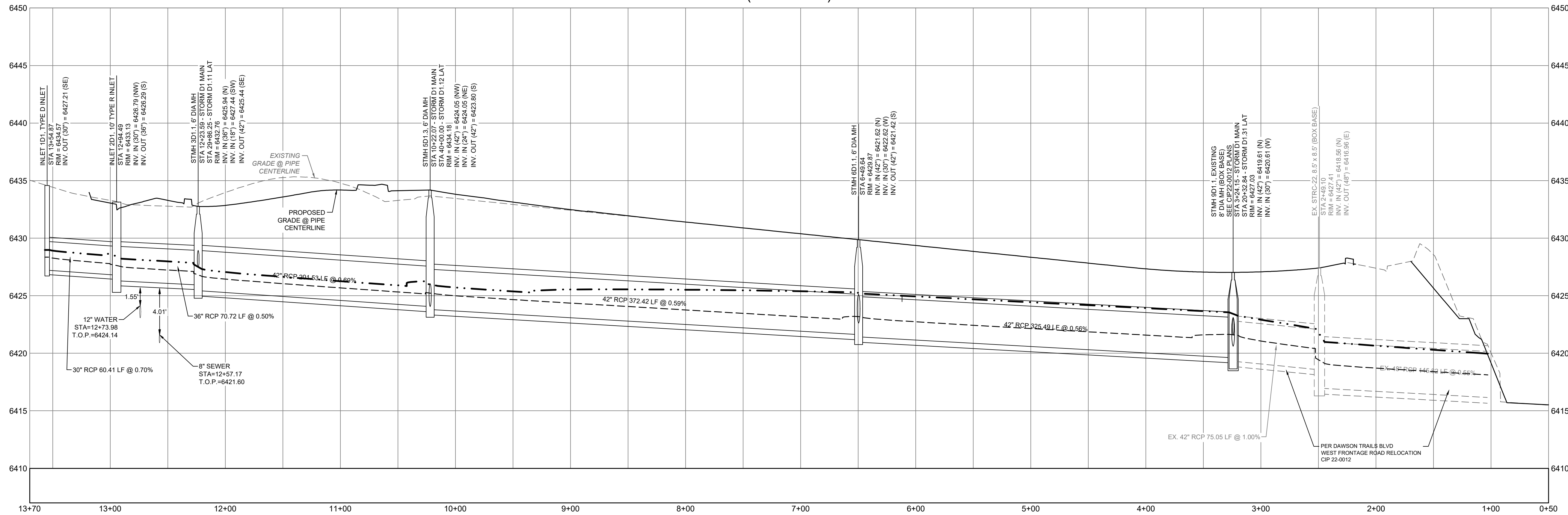


#	REVISION DESCRIPTION	DATE	BY
1	1ST SUBMITTAL	10/31/23	JF
2	2ND SUBMITTAL	8/23/24	BG
3	3RD SUBMITTAL	12/20/24	GW
4	4TH SUBMITTAL	4/30/25	GW

EXCERPTS FROM "PUBLIC IMPROVEMENT CONSTRUCTION PLANS FRO
DAWSON TRAILS FILING 2 INFRASTRUCTURE" BY EMK CONSULTANTS
DATED 04/30/2025.



STORM D1 MAIN (13+70-0+50)



LEGEND			
---	EASEMENT		
---	RIGHT OF WAY (R.O.W.)		
---	CENTERLINE		
---	LIMITS OF CONSTRUCTION		
---	PROPOSED CURB & GUTTER		
---	PROPOSED SANITARY & STUB OUT		
---	EXISTING SANITARY & STUB OUT		
---	SANITARY SERVICE		
---	WATER SERVICE		
---	PROPOSED WATER & STUB OUT		
---	EXISTING WATER & STUB OUT		
---	PROPOSED STORM & STUB OUT		
---	EXISTING STORM & STUB OUT		
---	FUTURE STORM & STUB OUT		
---	STORM MAJOR HGL		
---	STORM MINOR HGL		
---	STORM UNDERDRAIN		
---	EXISTING		
---	PROPOSED		
---	STORM MANHOLES		
---	STORM INLETS		
---	FES, FOREBAY, & TRICKLE CHANNEL		
---	OUTLET STRUCTURE		
---	CRUSHER FINES		
---	MAINTENANCE ACCESS		
---	RIPRAP		
---	BLOCK NUMBER		
---	100 YEAR FLOODPLAIN		
---	WETLAND		

BASIS OF BEARINGS
SEE COVER SHEET FOR BASIS OF BEARINGS & BENCHMARK.

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

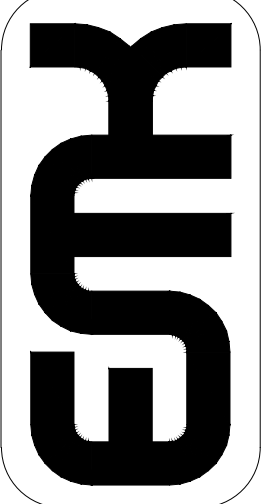
GARY A. WALTER
STATE OF COLORADO # 42246

TOWN APPROVAL BLOCK
TOWN OF CASTLE ROCK APPROVAL
PLANS ARE HEREBY APPROVED FOR ONE YEAR FROM
DATE OF DEVELOPMENT SERVICES APPROVAL.

APPROVED BY:
DESIGNED BY: DO
DRAWN BY: DL
CHECKED BY: GAW

DEVELOPMENT SERVICES
DATE

EMK CONSULTANTS, INC.
ENGINEERING/SURVEYING
LAND DEVELOPMENT
SERVICES AND SOLUTIONS
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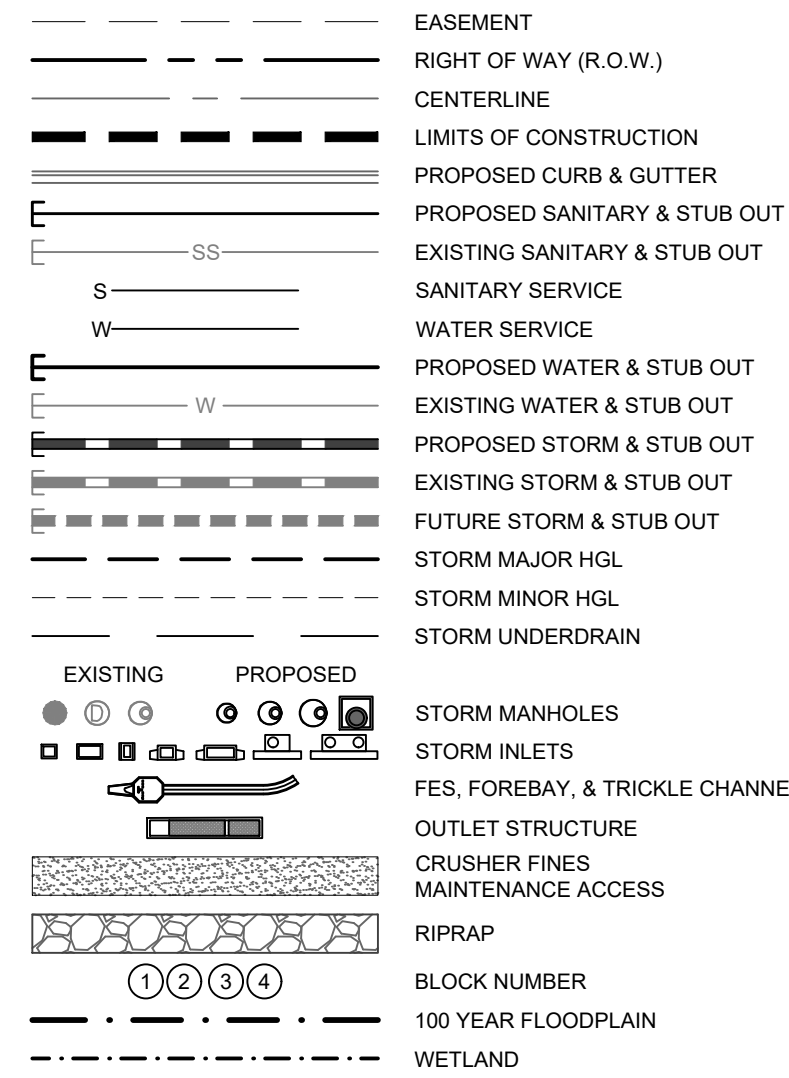
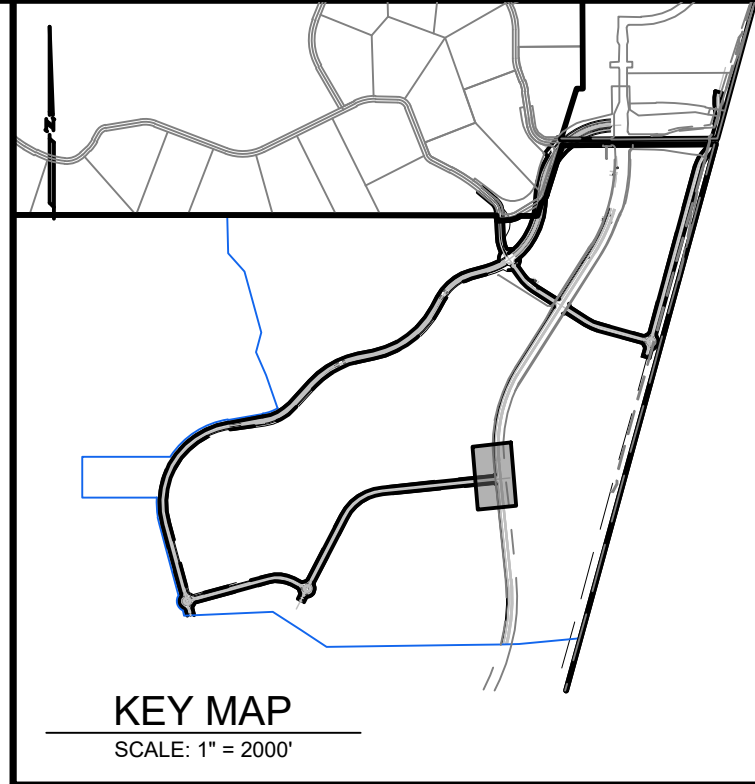
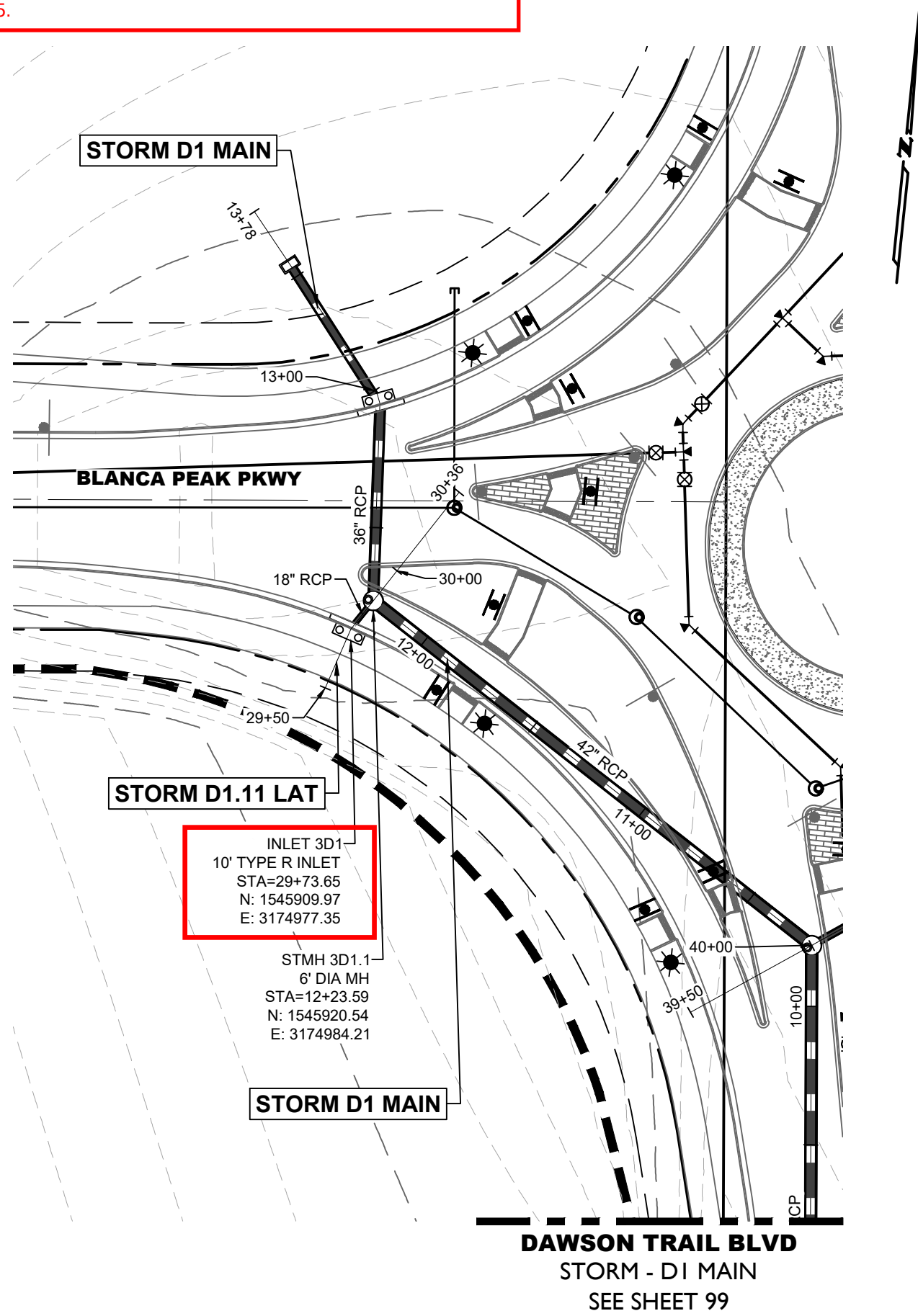
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3	3RD SUBMITTAL	12/20/24	GW
4	4TH SUBMITTAL	4/30/25	GW

DAWSON TRAILS - FILING 2 INFRASTRUCTURE
CASTLE ROCK, COLORADO
CONSTRUCTION DOCUMENTS
STORM P&P (12 OF 19)



DESIGNED BY: DO
DRAWN BY: DL
CHECKED BY: GAW

JOB NO.
13466.00
SHEET
99 OF 301



BASIS OF BEARINGS

SEE COVER SHEET FOR BASIS OF BEARINGS & BENCHMARK

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GARY A. WALTER
STATE OF COLORADO

TOWN APPROVAL BLOCK

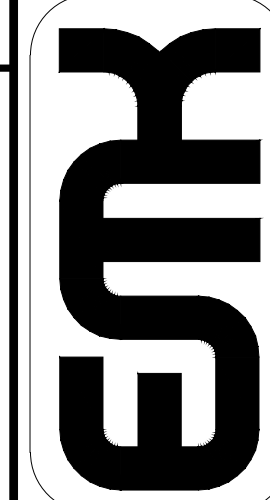
TOWN OF CASTLE ROCK APPROVAL
PLANS ARE HEREBY APPROVED FOR ONE YEAR FROM
DATE OF DEVELOPMENT SERVICES APPROVAL.

APPROVED BY

DEVELOPMENT SERVICES

DATE _____

EMK CONSULTANTS, INC.
ENGINEERING SURVEYING
LAND DEVELOPMENT
SERVICES AND SOLUTIONS
 70706 SOUTH ALTON WAY, BLDG. F
 CENTENNIAL, COLORADO 80112-2019
 (303) 694-1520 www.EMKCo.com



Know what's below.



#	REVISION DESCRIPTION	DATE	BY
1	1ST SUBMITTAL	10/31/23	JF
2	2ND SUBMITTAL	8/23/24	BG
3	3RD SUBMITTAL	12/20/24	GW
4	4TH SUBMITTAL	4/30/25	GW

DAWSON TRAILS - FILING 2 INFRASTRUCTURE

CASTLE ROCK, COLORADO

CONSTRUCTION DOCUMENTS

STORM P&P (13 OF 19)



DESIGNED BY: DO
DRAWN BY: DL
CHECKED BY: GAW

JOB NO.
13466.00

SHEET
100 OF 3

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

September 9, 2025



will be detained to historic flowrates before exiting the project site via existing storm conveyance elements beneath the BNSF Railroad and eventually drain to East Plum Creek.

Basin A-2 (23.4 acre | 48% Impervious | Q100 = 35.5 cfs)

Major Basin A-2 is bounded by development parcels to the north, the future Regional Flood Control Pond E1 to the west, future development parcels to the south, and Dawson Trails Boulevard to the east. Major Basin A-2 contains the North Dawson Tributary drainageway and associated open space. Basin A-2 is located within the planning area OSP-3 in the development plan. This area has an anticipated use of open space and landscape features. The area is assigned a build out imperviousness of 48% for hydrologic analysis. Flows from this basin will exit to the east and drain to the proposed Regional Flood Control Pond A1.

Basin A-3 (47.0 acre | 87% Impervious | Q100 = 179 cfs)

Major Basin A-3 is bounded by development parcels to the north, future development parcels to the west, the Regional Flood Control Pond A1 to the south and the BNSF railroad to the east. Major Basin A-3 contains roadway right-of-way, future single family, multifamily, and commercial land use. Basin A-3 is located within the planning area D and G-1 in the development plan. The area is assigned a build out imperviousness of 87% for hydrologic analysis. Flows from this basin will be treated in a private Water Quality (WQ) and Excess Urban Runoff Volume (EURV) pond before discharging into the Regional Flood Control Pond A1.

Basin A-4 (89.1 acre | 68% Impervious | Q100 = 326 cfs)

Major Basin A-4 is bounded by development parcels to the north, future development parcels to the west, the North Dawson Tributary drainageway to the south and Dawson Trails Boulevard to the east. Major Basin A-4 contains roadway right-of-way, future single family, and multifamily land use. Basin A-4 is located within the planning area D in the development plan. The area is assigned a build out imperviousness of 68% for hydrologic analysis. Flows from this basin will be treated in a private Water Quality (WQ) and Excess Urban Runoff Volume (EURV) pond before discharging into the North Dawson Tributary immediately south.

Basin A-5 (28.2 acre | 60% Impervious | Q100 = 90.3 cfs)

Major Basin A-5 is bounded by development parcels to the north, future development parcels to the west, the North Dawson Tributary drainageway to the south and future development parcels to the east. Major Basin A-5 contains roadway right-of-way, future single family, and multifamily land use. Basin A-5 is located within the planning area D and C-2 in the development plan. The area is assigned a build out imperviousness of 60% for hydrologic analysis. Flows from this basin will be treated in a private Water Quality (WQ) and Excess Urban Runoff Volume (EURV) pond before discharging into the North Dawson Tributary immediately south.

Basin A-6 (8.36 acre | 60% Impervious | Q100 = 30.3 cfs)

Major Basin A-6 is bounded by development parcels to the north, future development parcels to the west, the North Dawson Tributary drainageway to the south and future development parcels to the east. Major Basin A-6 contains roadway right-of-way, future single family, and multifamily land use. Basin A-6 is located within the planning area C-1 and C-2 in the development plan. The area is assigned a build out imperviousness of 60% for hydrologic analysis. Flows from this basin will be treated in a private Water Quality

PERCENT IMPERVIOUS CALCULATIONS
PROPOSED CONDITIONS - DAWSON TRAILS - FILING 2 - POND D1

Note: Dawson Trails Filing 2 is grandfathered into the previous MHFD impervious values (pre June 2024). In some instances the new, higher values have been used to match surrounding filings.

Basin	Total Area	Asphalt/ Poned Water	Roof/ Concrete	Commercial - Medium to High Density	MFH - High Density MFH (>20 du/ac)	SFH - High-density (5-20 du/ac) and Commercial - Low-density	SFH - Low & Medium-density (5-20 du/ac)	Community Parks/ Extended Detention Basins	Neighborhood Parks	Open Space - Undisturbed Native Grass, Landscaping	Composite Percent Impervious
%IMP	(acres)	100% (acres)	90% (acres)	80% (acres)	70% (acres)	65% (acres)	55% (acres)	25% (acres)	15% (acres)	2% (acres)	
D1-1	5.11				5.11						70.0%
D1-2	1.36	0.94	0.20							0.22	82.7%
D1-3	0.73	0.50	0.10							0.13	81.2%
D1-4	1.17	0.79	0.15							0.23	79.5%
D1-5	0.41	0.05	0.29							0.07	76.2%
D1-6	4.79				4.79						70.0%
D1-7	5.87				5.87						70.0%
D1-8a	1.43	0.91	0.20							0.32	76.7%
D1-8b	0.54	0.29	0.10							0.15	70.9%
D1-9a	1.43	0.90	0.20							0.33	76.0%
D1-9b	0.56	0.29	0.10							0.17	68.5%
D1-10	0.85							0.85			75.0%
Pond D1	24.25	4.67	1.34		15.77			0.85		1.62	70.8%

RunoffChapter 6

Table 6-3. Recommended percentage imperviousness values	
Land Use or Surface Characteristics	Percentage Imperviousness (%)
Business:	
Downtown Areas	95
Suburban Areas	75
Residential lots (lot area only):	
Single-family	
2.5 acres or larger	12
0.75 – 2.5 acres	20
0.25 – 0.75 acres	30
0.25 acres or less	45
Apartments	75
Industrial:	
Light areas	80
Heavy areas	90
Parks, cemeteries	10
Playgrounds	25
Schools	55
Railroad yard areas	50
Undeveloped Areas:	
Historic flow analysis	2
Greenbelts, agricultural	2
Off-site flow analysis (when land use not defined)	45
Streets:	
Paved	100
Gravel (packed)	40
Drive and walks	90
Roofs	90
Lawns, sandy soil	2
Lawns, clayey soil	2

TABLE 6-2. RECOMMENDED IMPERVIOUSNESS BY LAND USE

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

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

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

² Assumes 1:1 ratio of panels to aisles. See MHFD's technical memorandum regarding Determination of Solar Panel Field Runoff Coefficients and Imperviousness Values for additional information on procedures to reflect other impervious areas such as roads and pads that may be part of a solar field and layouts with wider inter-panel spacing.

TABLE 6-3. RECOMMENDED IMPERVIOUSNESS BY SURFACE TYPES

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

¹ Consult with the manufacturer to get a recommended value.

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

³ See MHFD's technical memorandum regarding Evaluation of Percent Imperviousness for Stormwater Control Measures for background information.

JOB NO: 13301.00
PROJECT: Dawson Trails - Filing 2, Pond D1
DSGN STRM: 5-year
CALC BY: DJO

RATIONAL METHOD
(5-YEAR DEVELOPED CONDITION)

DATE: 4/25/25 $I=28.5 \cdot P^{.1} / ((10+T)^{.0.786})$

1 HR STORM= 1.43				Direct RUNOFF				TOTAL RUNOFF				TRAVEL TIME				PIPE FLOW		Notes
Design Point	Basin	Ac	C	Tc	A°C	I	Q	Tc	A°C	I	Q	Length	Vel.	Time	From	A°C	Q	
1D1	D1-1	5.11	0.61	10.29	3.09	3.8	11.8					60	10	0.1	1D1 TO 2D1	3.09	11.8	DIRECT/ PIPE FLOW
	D1-2	1.36	0.71	5.91	0.96	4.6	4.5											DIRECT
2D1	DP 1D1 + D1-2							10.4	4.06	3.8	15.5	60	10	0.1	2D1 TO 3D1.1	4.06	15.5	COMBINED
3D1	D1-3	0.73	0.70	5.00	0.51	4.9	2.5									0.51	2.5	DIRECT/ PIPE FLOW
3D1.1	DP 2D1 + DP 3D1							10.5	4.57	3.8	17.3	200	10	0.3	3D1.1 TO 5D1.2	4.57	17.3	COMBINED
4D1	D1-4	1.17	0.68	7.44	0.80	4.3	3.4									0.80	3.4	DIRECT/ PIPE FLOW
5D1	D1-5	0.41	0.66	5.00	0.27	4.9	1.3									0.27	1.3	DIRECT/ PIPE FLOW
5D1.1	DP 4D1 + DP 5D1							7.4	1.07	4.3	4.6					1.07	4.6	COMBINED
5D1.3	DP 5D1.1 + DP 3D1.1							10.8	5.63	3.7	21.1	370	10	0.6	5D1.3 TO 6D1.1	5.63	21.1	COMBINED
6D1	D1-6	4.79	0.61	10.71	2.90	3.8	10.9									2.90	10.9	DIRECT/ PIPE FLOW
6D1.1	DP 5D1.3 + DP 6D1							11.4	8.53	3.7	31.3	330	10	0.6	6D1.1 TO 9D1.1	8.53	31.3	COMBINED
7D1	D1-7	5.87	0.61	9.65	3.55	3.9	13.9									3.55	13.9	DIRECT/ PIPE FLOW
	D1-8a	1.43	0.66	6.66	0.94	4.0	3.6											DIRECT
	D1-8b	0.54	0.61	5.54	0.33	4.7	1.6											DIRECT
	D1-8a + D1-8b							8.9	1.27	4.0	5.2							DIRECT
8D1	DP 7D1+D1-8a+D1-8b							9.6	4.83	3.9	18.9					4.83	18.9	COMBINED
	D1-9a	1.43	0.65	8.91	0.94	4.0	3.8											DIRECT
	D1-9b	0.56	0.59	5.66	0.33	4.7	1.6											DIRECT
9D1	D1-9a + D1-9b							8.9	1.27	4.0	5.1					1.27	5.1	COMBINED
9D1.1	DP 6D1.1 + DP 8D1 + DP 9D1							12.0	14.63	3.6	52.5					14.63	52.5	COMBINED

JOB NO: 13301.00

PROJECT: Dawson Trails - Filing 2, Pond D1

DSGN STRM: 100-year

CALC BY: DJO

RATIONAL METHOD (100-YEAR DEVELOPED CONDITION)

DATE: 4/25/25

$$I=28.5 \cdot P1 / (10+T)^{0.786}$$

1 HR STORM= 2.60				DIRECT RUNOFF				TOTAL RUNOFF				TRAVEL TIME				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	
1D1	D1-1	5.11	0.77	10.29	3.94	7.0	27.4									3.94	27.4	DIRECT/ PIPE FLOW
	D1-2	1.36	0.82	5.91	1.12	8.4	9.4											DIRECT
2D1	DP 1D1 + D1-2							10.3	5.05	7.0	35.2					5.05	35.2	COMBINED
3D1	D1-3	0.73	0.82	5.00	0.60	8.8	5.3									0.60	5.3	DIRECT/ PIPE FLOW
3D1.1	DP 2D1 + DP 3D1							10.3	5.65	7.0	39.3	600	10	1.0	2D3 TO 3D3	5.65	39.3	COMBINED
4D1	D1-4	1.17	0.81	7.44	0.95	7.8	7.4									0.95	7.4	DIRECT/ PIPE FLOW
5D1	D1-5	0.41	0.80	5.00	0.33	8.8	2.9					100	10	0.2	3D3 TO 4D3	0.33	2.9	DIRECT/ PIPE FLOW
5D1.1	DP 4D1 + DP 5D1							7.4	1.27	7.8	10.0					1.27	10.0	COMBINED
5D1.3	DP 5D1.1 + DP 3D1.1							11.3	6.92	6.7	46.4					6.92	46.4	COMBINED
6D1	D1-6	4.79	0.77	10.71	3.69	6.8	25.2					80	10	0.13	4D3 TO 5D3	3.69	25.2	DIRECT/ PIPE FLOW
6D1.1	DP 5D1.3 + DP 6D1							11.3	10.61	6.7	71.1					10.61	71.1	COMBINED
7D1	D1-7	5.87	0.77	9.65	4.52	7.1	32.3					290	10	0.483	5D3 TO 6D3	4.52	32.3	DIRECT/ PIPE FLOW
	D1-8a	1.43	0.80	8.88	1.14	7.4	8.4											DIRECT
	D1-8b	0.54	0.77	5.54	0.42	8.6	3.6											DIRECT
	D1-8a + D1-8b							8.9	1.56	7.4	11.5	80	10	0.13	6D3 TO 7D3			DIRECT
8D1	DP 7D1+D1-8a+D1-8b							9.6	6.08	7.1	43.4					6.08	43.4	COMBINED
	D1-9a	1.43	0.79	8.91	1.14	7.4	8.4					140	10	0.2	7D3 TO 8D3			DIRECT
	D1-9b	0.56	0.76	5.66	0.43	8.5	3.6											DIRECT
9D1	D1-9a + D1-9b							8.9	1.56	7.4	11.5					1.56	11.5	COMBINED
9D1.1	DP 6D1.1 + DP 8D1 + DP 9D1							11.3	18.26	6.7	122.3	105	10	0.2	8D3 TO 9D3	18.26	122.3	COMBINED

PERCENT IMPERVIOUS CALCULATIONS
PROPOSED CONDITIONS - DAWSON TRAILS - FILING 2 - POND D3

Note: Dawson Trails Filing 2 is grandfathered into the previous MHFD impervious values (pre June 2024). In some instances the new, higher values have been used to match surrounding filings.

Basin	Total Area	Asphalt/ Poned Water	Roof/ Concrete	Commercial - Medium to High Density	MFH - High Density MFH (>20 du/ac)	SFH - High-density (5-20 du/ac) and Commercial - Low-density	SFH - Low & Medium-density (5-20 du/ac)	Community Parks/ Extended Detention Basins	Neighborhood Parks	Open Space - Undisturbed Native Grass, Landscaping	Composite Percent Impervious
%IMP	(acres)	100% (acres)	90% (acres)	80% (acres)	70% (acres)	65% (acres)	55% (acres)	25% (acres)	15% (acres)	2% (acres)	
D3.0	12.30				7.50					4.80	43.5%
D3.10	0.67	0.33	0.09							0.25	62.1%
D3.11	0.64	0.29	0.13							0.22	64.3%
D3.12	3.03	0.29	0.14							2.60	15.4%
D3.13	0.62	0.28	0.13							0.21	64.7%
D3.15	0.83	0.28	0.07							0.48	42.5%
D3.16	0.50	0.14	0.07							0.29	41.8%
D3.18	0.32	0.15	0.07							0.10	67.2%
D3.19	1.12	0.15	0.07							0.90	20.6%
D3.20	0.47	0.32								0.15	68.7%
D3.21	0.55	0.25								0.30	46.5%
D3.22	0.25	0.25									100.0%
D3.2a	11.70									11.70	2.0%
D3.2b	3.00					3.00					65.0%
D3.2c	7.61					7.61					65.0%
D3.2d	2.90									2.90	2.0%
D3.2e	1.70					1.70					65.0%
D3.2f	1.10			1.10							80.0%
D3.3a	26.07					26.07					65.0%
D3.3b	7.89					7.89					65.0%
D3.4	2.90					2.90					65.0%
D3.6	4.45							4.45			25.0%
D3.2d + D3.2e	4.60					1.70				2.90	25.3%
Pond D3	90.62	2.73	0.77	1.10	7.50	49.17		4.45	0.00	24.90	47.6%

Runoff

Chapter 6

Table 6-3. Recommended percentage imperviousness values	
Land Use or Surface Characteristics	Percentage Imperviousness (%)
Business:	
Downtown Areas	95
Suburban Areas	75
Residential lots (lot area only):	
Single-family	
2.5 acres or larger	12
0.75 – 2.5 acres	20
0.25 – 0.75 acres	30
0.25 acres or less	45
Apartments	75
Industrial:	
Light areas	80
Heavy areas	90
Parks, cemeteries	10
Playgrounds	25
Schools	55
Railroad yard areas	50
Undeveloped Areas:	
Historic flow analysis	2
Greenbelts, agricultural	2
Off-site flow analysis (when land use not defined)	45
Streets:	
Paved	100
Gravel (packed)	40
Drive and walks	90
Roofs	90
Lawns, sandy soil	2
Lawns, clayey soil	2

TABLE 6-2. RECOMMENDED IMPERVIOUSNESS BY LAND USE

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

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

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

² Assumes 1:1 ratio of panels to aisles. See MHFD's technical memorandum regarding Determination of Solar Panel Field Runoff Coefficients and Imperviousness Values for additional information on procedures to reflect other impervious areas such as roads and pads that may be part of a solar field and layouts with wider inter-panel spacing.

TABLE 6-3. RECOMMENDED IMPERVIOUSNESS BY SURFACE TYPES

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

¹ Consult with the manufacturer to get a recommended value.

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

³ See MHFD's technical memorandum regarding Evaluation of Percent Imperviousness for Stormwater Control Measures for background information.

MHFD-Inlet, Version 5.02 (August 2022)

INLET MANAGEMENT

Worksheet Protected

INLET NAME	INLET 2D1-Sump	INLET 3D1-Sump	INLET 4D1	INLET 5D1	INLET 8D1-Sump
Site Type (Urban or Rural)	URBAN	URBAN	URBAN	URBAN	URBAN
Inlet Application (Street or Area)	STREET	STREET	STREET	STREET	STREET
Hydraulic Condition	In Sump	In Sump	On Grade	On Grade	In Sump
Inlet Type	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type R Curb Opening

USER-DEFINED INPUT

D1-2

D1-3

D1-4

D1-5

User-Defined Design Flows

D1-8a + D1-8b

Minor Q_{Known} (cfs)	4.5	2.5	3.4	1.3	5.2
Major Q_{Known} (cfs)	9.4	5.3	7.4	2.9	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	No Bypass Flow Received	No Bypass Flow Received
Minor Bypass Flow Received, Q_b (cfs)	0.0	0.0	0.0	0.0	0.0
Major Bypass Flow Received, Q_b (cfs)	0.0	0.0	0.0	0.0	0.0

Watershed Characteristics

Subcatchment Area (acres)					
Percent Impervious					
NRCS Soil Type					

Watershed Profile

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

Minor Storm Rainfall Input

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

Major Storm Rainfall Input

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

CALCULATED OUTPUT

Minor Total Design Peak Flow, Q (cfs)	4.5	2.5	3.4	1.3	5.2
Major Total Design Peak Flow, Q (cfs)	9.4	5.3	7.4	2.9	11.5
Minor Flow Bypassed Downstream, Q_b (cfs)	N/A	N/A	0.0	0.0	N/A
Major Flow Bypassed Downstream, Q_b (cfs)	N/A	N/A	1.5	0.0	N/A

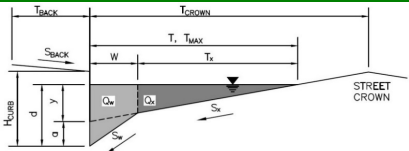
MHFD-Inlet, Version 5.02 (August 2022)

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

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

Project:

Inlet ID: INLET 3D1-Sump



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} = 18.0 ft
S_{BACK} = 0.020 ft/ft
n_{BACK} = 0.020

H_{CURB} = 6.00 inches
T_{CROWN} = 17.0 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 & Major Storm

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

Check boxes are not applicable in SUMP conditions

Minor Storm Major Storm
T_{MAX} = 12.0 17.0 ft
d_{MAX} = 6.0 10.3 inches
☐ ☐

Maximum Capacity for 1/2 Street based On Allowable Spread

Water Depth without Gutter Depression (T * S_x * 12)

Vertical Depth between Gutter Lip and Gutter Flowline (W * S_w * 12)

Gutter Depression (d_c - (W * S_x * 12))

Water Depth at Gutter Flowline (y + a)

Allowable Spread for Discharge outside the Gutter Section (T - W)

Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)

Discharge outside the Gutter Section, carried in Section T_x

Discharge within the Gutter Section (Q_T - Q_x - Q_{BACK})

Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)

Maximum Flow Based On Allowable Spread

Flow Velocity within the Gutter Section

V*d Product: Flow Velocity times Gutter Flowline Depth

Minor Storm Major Storm
y = 2.88 4.08 inches
d_c = 2.0 2.0 inches
a = 1.51 1.51 inches
d = 4.39 5.59 inches
T_x = 10.0 15.0 ft
E_o = 0.491 0.350
Q_x = 0.0 0.0 cfs
Q_w = 0.0 0.0 cfs
Q_{BACK} = 0.0 0.0 cfs
Q_T = SUMP SUMP cfs
V = 0.0 0.0 fps
V*d = 0.0 0.0

Maximum Capacity for 1/2 Street based on Allowable Depth

Theoretical Water Spread

Theoretical Spread for Discharge outside the Gutter Section (T - W)

Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)

Theoretical Discharge outside the Gutter Section, carried in Section T_{x TH}

Actual Discharge outside the Gutter Section, (limited by distance T_{CROWN})

Discharge within the Gutter Section (Q_d - Q_x)

Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)

Total Discharge for Major & Minor Storm (Pre-Safety Factor)

Average Flow Velocity Within the Gutter Section

V*d Product: Flow Velocity Times Gutter Flowline Depth

Slope-Based Safety Factor for Minor/Major Storm depth reduction, d ≥ 6"

Max Flow based on Allowable Depth (Safety Factor Applied)

Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)

Resultant Flow Depth at Street Crown (Safety Factor Applied)

Minor Storm Major Storm
T_{TH} = 18.7 36.6 ft
T_{x TH} = 16.7 34.6 ft
E_o = 0.318 0.157
Q_{x TH} = 0.0 0.0 cfs
Q_x = 0.0 0.0 cfs
Q_w = 0.0 0.0 cfs
Q_{BACK} = 0.0 0.0 cfs
Q = SUMP SUMP cfs
V = 0.0 0.0 fps
V*d = 0.0 0.0
R = SUMP SUMP
Q_d = SUMP SUMP cfs
d = inches
d_{CROWN} = inches

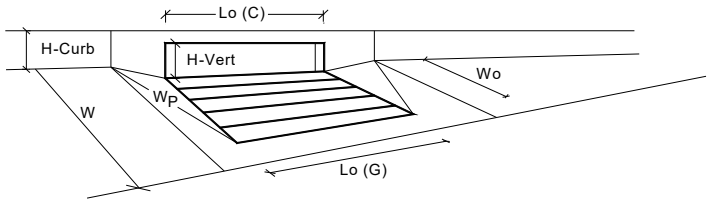
MINOR STORM Allowable Capacity is not applicable to Sump Condition

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 5.02 (August 2022)



Design Information (Input)	
Type of Inlet	CDOT Type R Curb Opening
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)	
Grate Information	
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)	
Curb Opening Information	
Length of a Unit Curb Opening	
Height of Vertical Curb Opening in Inches	
Height of Curb Orifice Throat in Inches	
Angle of Throat (see USDCM Figure ST-5)	
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)	
Low Head Performance Reduction (Calculated)	
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	
Total Inlet Interception Capacity (assumes clogged condition)	
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)	

	MINOR	MAJOR	
Type =	CDOT Type R Curb Opening		
a _{local} =	3.00	3.00	inches
No =	1	1	
Ponding Depth =	4.4	5.6	inches
	MINOR	MAJOR	Override Depths
L _o (G) =	N/A	N/A	feet
W _o =	N/A	N/A	feet
A _{ratio} =	N/A	N/A	
C _f (G) =	N/A	N/A	
C _w (G) =	N/A	N/A	
C _o (G) =	N/A	N/A	
	MINOR	MAJOR	
L _o (C) =	10.00	10.00	feet
H _{vert} =	6.00	6.00	inches
H _{throat} =	6.00	6.00	inches
Theta =	63.40	63.40	degrees
W _p =	2.00	2.00	feet
C _f (C) =	0.10	0.10	
C _w (C) =	3.60	3.60	
C _o (C) =	0.67	0.67	
	MINOR	MAJOR	
d _{Grate} =	N/A	N/A	ft
d _{Curb} =	0.20	0.30	ft
RF _{Grate} =	N/A	N/A	
RF _{Curb} =	0.82	0.91	
RF _{Combination} =	N/A	N/A	
	MINOR	MAJOR	
Q _s =	3.4	6.9	cfs
Q _{PEAK REQUIRED} =	2.5	5.3	cfs

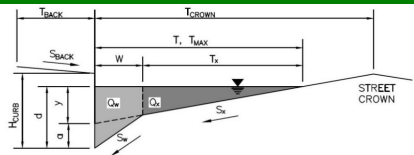
MHFD-Inlet, Version 5.02 (August 2022)

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

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

Project:

Inlet ID: INLET 8D1-Sump



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)

Max. Allowable Spread for Minor & Major Storm

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

Check boxes are not applicable in SUMP conditions

MINOR STORM Allowable Capacity is not applicable to Sump Condition

MAJOR STORM Allowable Capacity is not applicable to Sump Condition

T_{BACK} = 21.0 ft
S_{BACK} = 0.020 ft/ft
n_{BACK} = 0.020

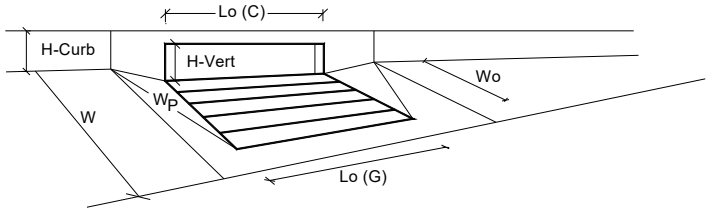
H_{CURB} = 6.00 inches
T_{CROWN} = 34.0 ft
W = 2.00 ft
S_x = 0.020 ft/ft
S_w = 0.083 ft/ft
S_o = 0.000 ft/ft
n_{STREET} = 0.016

Minor Storm Major Storm
T_{MAX} = 18.7 34.0 ft
d_{MAX} = 6.0 11.0 inches
☐ ☐

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

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.02 (August 2022)

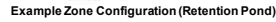


Design Information (Input)	
Type of Inlet	CDOT Type R Curb Opening
Local Depression (additional to continuous gutter depression 'a' from above)	
Number of Unit Inlets (Grate or Curb Opening)	
Water Depth at Flowline (outside of local depression)	
Grate Information	
Length of a Unit Grate	
Width of a 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)	
Curb Opening Information	
Length of a Unit Curb Opening	
Height of Vertical Curb Opening in Inches	
Height of Curb Orifice Throat in Inches	
Angle of Throat (see USDCM Figure ST-5)	
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)	
Low Head Performance Reduction (Calculated)	
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	
Total Inlet Interception Capacity (assumes clogged condition)	
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)	

	MINOR	MAJOR	
Type =	CDOT Type R Curb Opening		
a _{local} =	3.00	3.00	inches
No =	1	1	
Ponding Depth =	6.0	9.7	inches
	MINOR	MAJOR	☐ Override Depths
L _o (G) =	N/A	N/A	feet
W _o =	N/A	N/A	feet
A _{ratio} =	N/A	N/A	
C _f (G) =	N/A	N/A	
C _w (G) =	N/A	N/A	
C _o (G) =	N/A	N/A	
	MINOR	MAJOR	
L _o (C) =	10.00	10.00	feet
H _{vert} =	6.00	6.00	inches
H _{throat} =	6.00	6.00	inches
Theta =	63.40	63.40	degrees
W _p =	2.00	2.00	feet
C _f (C) =	0.10	0.10	
C _w (C) =	3.60	3.60	
C _o (C) =	0.67	0.67	
	MINOR	MAJOR	
d _{Grate} =	N/A	N/A	ft
d _{Curb} =	0.33	0.64	ft
RF _{Grate} =	N/A	N/A	
RF _{Curb} =	0.93	1.00	
RF _{Combination} =	N/A	N/A	
	MINOR	MAJOR	
Q _s =	8.3	21.6	cfs
Q _{PEAK REQUIRED} =	5.2	11.5	cfs

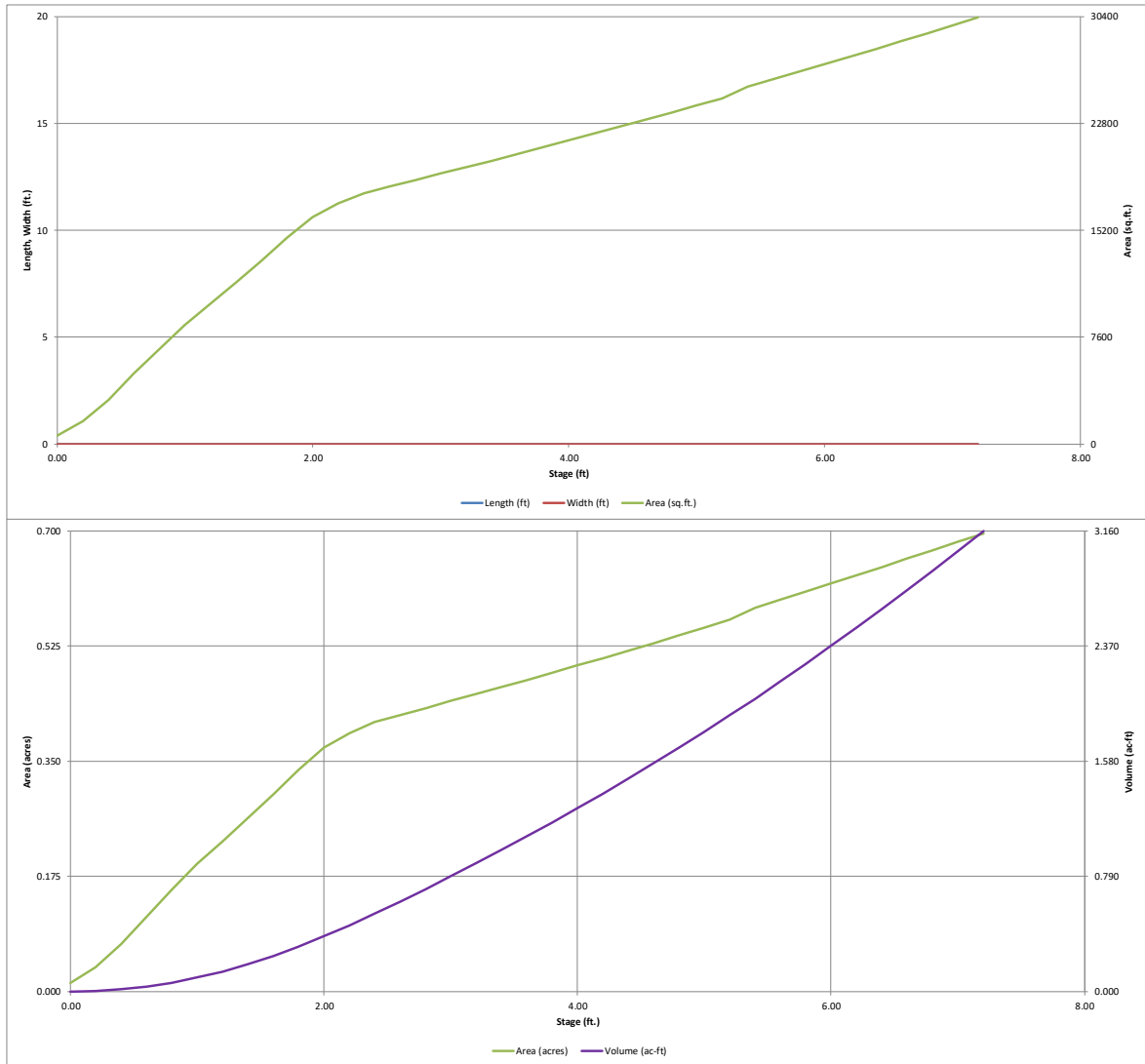
MHFD-Detention, Version 4.06 (July 2022)

Basin ID: Pond D1 (Stage 0.00 = 6414.80)



DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)



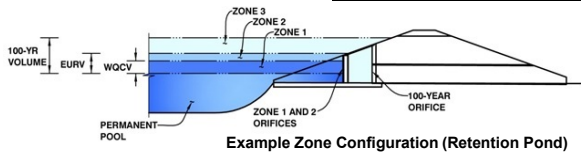
EXCERPTS FROM "PHASE III DRAINAGE REPORT FOR DAWSON TRAILS
FILING NO. 2" BY EMK CONSULTANTS APPROVED 10/21/2025.

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: Dawson Trails Filing 2

Basin ID: Pond D1 (Stage 0.00 = 6414.80)



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.48	0.564	Orifice Plate
Zone 2 (EURV)	4.81	1.109	Orifice Plate
Zone 3			
Total (all zones)		1.674	

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

Calculated Parameters for Underdrain
Underdrain Orifice Area = N/A ft²
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 = 0.00 ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate = 4.81 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

Calculated Parameters for Plate
WQ Orifice Area per Row = N/A ft²
Elliptical Half-Width = N/A feet
Elliptical Slot Centroid = N/A feet
Elliptical Slot Area = N/A ft²

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	2.50						
Orifice Area (sq. inches)	4.00	9.00						

	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)

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

Calculated Parameters for Vertical Orifice
Vertical Orifice Area = Not Selected ft²
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, H_o = Not Selected ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length = Not Selected feet
Overflow Weir Gate Slope = Not Selected H:V
Horiz. Length of Weir Sides = Not Selected feet
Overflow Gate Type = Not Selected
Debris Clogging % = Not Selected %

Calculated Parameters for Overflow Weir
Height of Gate Upper Edge, H_u = Not Selected feet
Overflow Weir Slope Length = Not Selected feet
Gate Open Area / 100-yr Orifice Area = Not Selected
Overflow Gate Open Area w/o Debris = Not Selected ft²
Overflow Gate Open Area w/ Debris = Not Selected ft²

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

Depth to Invert of Outlet Pipe = 0.39 ft (distance below basin bottom at Stage = 0 ft)
Circular Orifice Diameter = 18.00 inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate
Outlet Orifice Area = 1.77 ft²
Outlet Orifice Centroid = 0.75 feet
Half-Central Angle of Restrictor Plate on Pipe = N/A radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

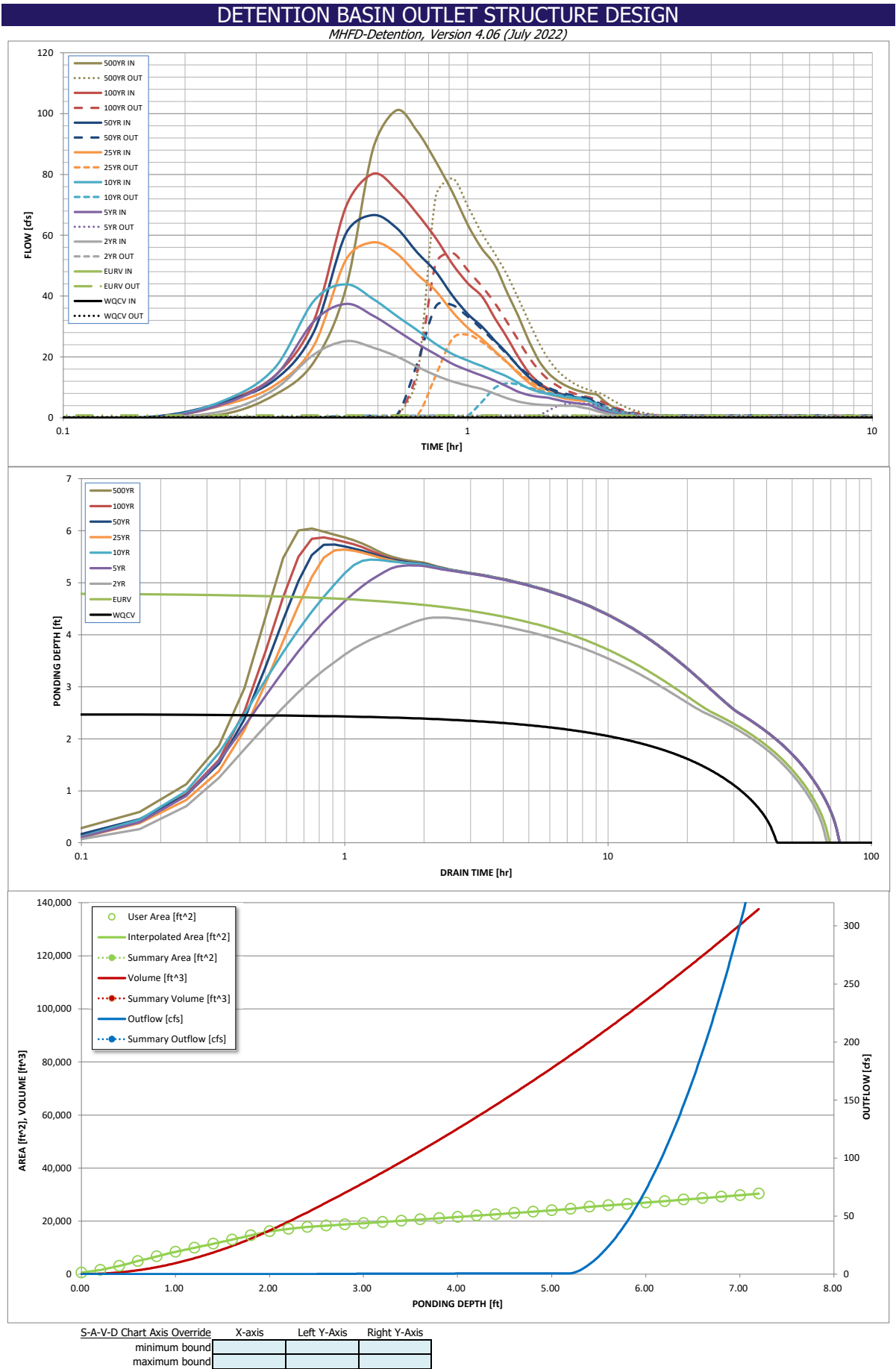
Spillway Invert Stage = 5.20 ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length = 27.00 feet
Spillway End Slopes = 10.00 H:V
Freeboard above Max Water Surface = 1.00 feet

Calculated Parameters for Spillway
Spillway Design Flow Depth = 0.85 feet
Stage at Top of Freeboard = 7.05 feet
Basin Area at Top of Freeboard = 0.69 acres
Basin Volume at Top of Freeboard = 3.06 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	2.00	2.26	2.60	3.20
One-Hour Rainfall Depth (in) =	N/A	N/A	1.06	1.43	1.66	2.00	2.26	2.60	3.20
CUHP Runoff Volume (acre-ft) =	0.564	1.674	1.527	2.264	2.742	3.501	4.059	4.830	6.126
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	1.527	2.264	2.742	3.501	4.059	4.830	6.126
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	2.2	8.1	11.4	20.2	25.2	32.8	44.3
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.09	0.33	0.47	0.83	1.04	1.35	1.82
Peak Inflow Q (cfs) =	N/A	N/A	25.2	37.4	43.9	57.7	66.7	80.2	101.1
Peak Outflow Q (cfs) =	0.2	0.7	0.7	4.8	11.3	27.3	37.0	54.2	78.8
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.6	1.0	1.3	1.5	1.7	1.8
Structure Controlling Flow =	Plate	Plate	Plate	Spillway	Spillway	Spillway	Spillway	Spillway	Spillway
Max Velocity through Gate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
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) =	41	62	61	67	65	63	62	60	57
Time to Drain 99% of Inflow Volume (hours) =	42	66	65	72	71	70	70	69	67
Maximum Ponding Depth (ft) =	2.48	4.81	4.33	5.33	5.44	5.64	5.73	5.87	6.04
Area at Maximum Ponding Depth (acres) =	0.41	0.54	0.51	0.58	0.59	0.60	0.60	0.61	0.62
Maximum Volume Stored (acre-ft) =	0.568	1.678	1.420	1.962	2.032	2.145	2.205	2.290	2.388



DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename:

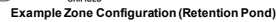
Inflow Hydrographs

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

Time Interval	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
	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	0.37	0.18	1.23
	0:15:00	0.00	0.00	2.29	4.63	5.72	4.21	5.28	5.40	7.53
	0:20:00	0.00	0.00	9.37	13.65	16.39	10.64	12.43	13.76	18.34
	0:25:00	0.00	0.00	20.81	31.72	38.48	23.73	28.34	32.01	42.58
	0:30:00	0.00	0.00	25.17	37.42	43.86	51.98	60.56	69.38	88.29
	0:35:00	0.00	0.00	23.07	33.55	39.06	57.66	66.67	80.21	101.08
	0:40:00	0.00	0.00	20.19	28.73	33.48	54.10	62.38	74.96	94.25
	0:45:00	0.00	0.00	16.77	24.39	28.79	47.15	54.36	67.11	84.33
	0:50:00	0.00	0.00	13.95	20.87	24.27	41.72	48.05	59.08	74.18
	0:55:00	0.00	0.00	11.92	17.75	20.97	34.83	40.14	50.56	63.52
	1:00:00	0.00	0.00	10.55	15.59	18.81	29.61	34.17	44.25	55.65
	1:05:00	0.00	0.00	9.44	13.86	17.00	26.00	30.02	39.94	50.23
	1:10:00	0.00	0.00	7.89	12.22	15.22	21.94	25.38	32.79	41.33
	1:15:00	0.00	0.00	6.46	10.31	13.58	18.35	21.26	26.47	33.45
	1:20:00	0.00	0.00	5.33	8.51	11.47	14.56	16.85	20.01	25.27
	1:25:00	0.00	0.00	4.66	7.46	9.65	11.51	13.31	14.82	18.76
	1:30:00	0.00	0.00	4.31	6.90	8.50	9.30	10.76	11.56	14.68
	1:35:00	0.00	0.00	4.12	6.56	7.73	7.86	9.11	9.58	12.18
	1:40:00	0.00	0.00	4.02	5.84	7.18	6.94	8.04	8.26	10.51
	1:45:00	0.00	0.00	3.95	5.26	6.78	6.30	7.29	7.35	9.36
	1:50:00	0.00	0.00	3.89	4.85	6.51	5.88	6.81	6.72	8.56
	1:55:00	0.00	0.00	3.39	4.55	6.12	5.58	6.46	6.27	7.99
	2:00:00	0.00	0.00	2.97	4.19	5.49	5.38	6.23	5.99	7.64
	2:05:00	0.00	0.00	2.21	3.11	4.04	4.01	4.64	4.47	5.69
	2:10:00	0.00	0.00	1.60	2.23	2.88	2.86	3.31	3.20	4.06
	2:15:00	0.00	0.00	1.14	1.59	2.06	2.05	2.37	2.31	2.94
	2:20:00	0.00	0.00	0.81	1.12	1.46	1.46	1.68	1.65	2.10
	2:25:00	0.00	0.00	0.56	0.76	1.01	1.01	1.16	1.14	1.45
	2:30:00	0.00	0.00	0.37	0.51	0.69	0.70	0.80	0.79	1.00
	2:35:00	0.00	0.00	0.24	0.34	0.45	0.47	0.54	0.53	0.67
	2:40:00	0.00	0.00	0.13	0.20	0.26	0.29	0.33	0.32	0.41
	2:45:00	0.00	0.00	0.06	0.10	0.13	0.15	0.17	0.17	0.21
	2:50:00	0.00	0.00	0.02	0.04	0.04	0.05	0.06	0.06	0.08
	2:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01
	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

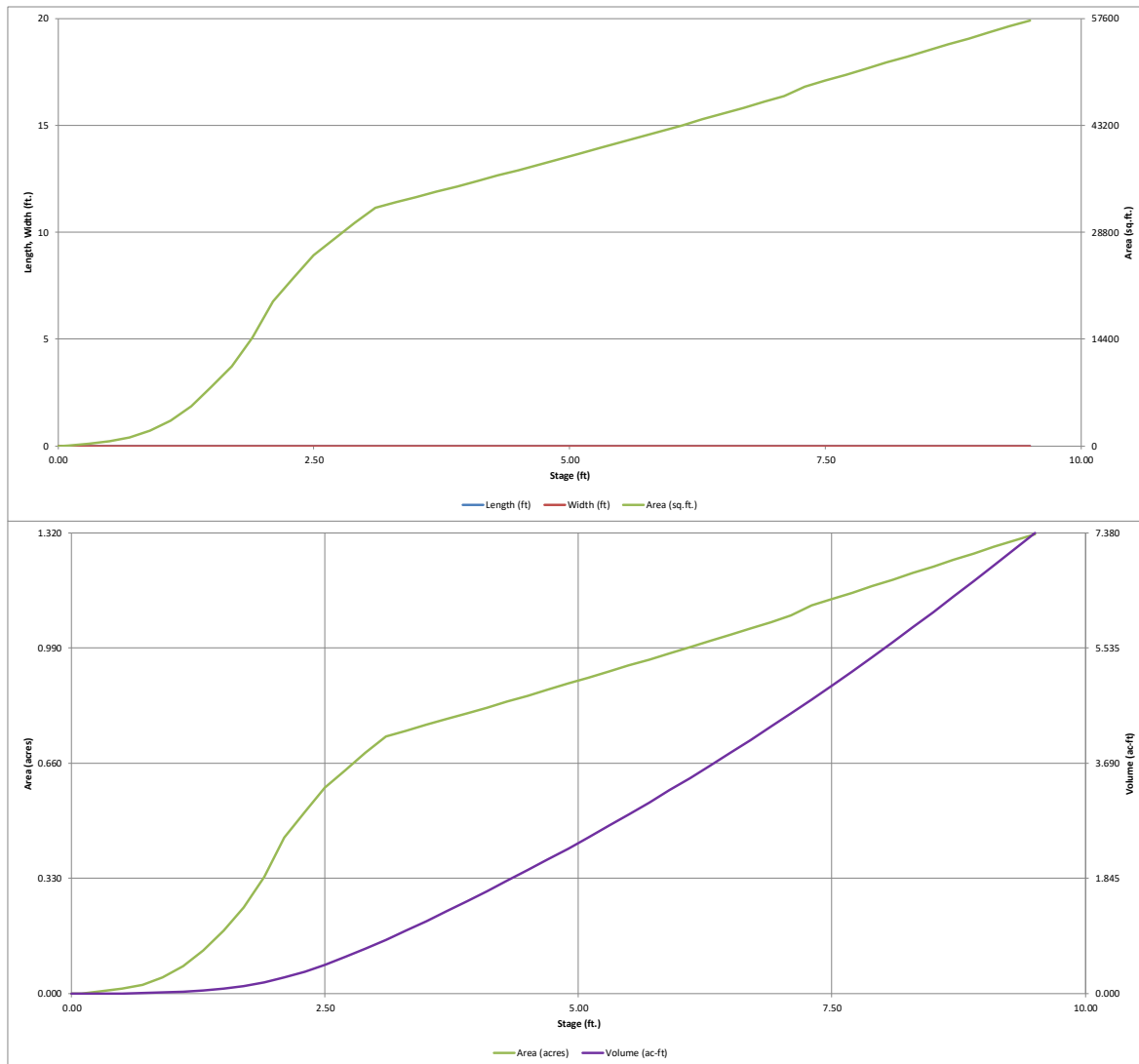
MHFD-Detention, Version 4.06 (July 2022)

Basin ID: Pond D3 (Stage 0.00 = 6417.50, 100-yr crest = 6424.75', 100-yr WS = 6425.91, top of berm = 6427.00')



DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)



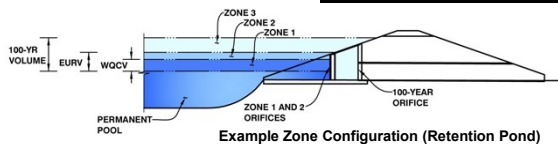
EXCERPTS FROM "PHASE III DRAINAGE REPORT FOR DAWSON TRAILS
FILING NO. 2" BY EMK CONSULTANTS APPROVED 10/21/2025.

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: Pond D3

Basin ID: Pond D3 (Stage 0.00 = 6417.50, 100-yr crest = 6424.75', 100-yr WS = 6425.91, top of berm = 6427.00')



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.95	1.512	Orifice Plate
Zone 2 (EURV)	6.84	2.693	Rectangular Orifice
Zone 3			
Total (all zones)		4.205	

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 = ft²
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)

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

Calculated Parameters for Plate
WQ Orifice Area per Row = ft²
Elliptical Half-Width = feet
Elliptical Slot Centroid = feet
Elliptical Slot Area = ft²

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							
Orifice Area (sq. inches)	7.00							

	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)

Zone 2 Rectangular ☐ Not Selected ☐
Invert of Vertical Orifice = ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice = ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Height = inches
Vertical Orifice Width = inches

Calculated Parameters for Vertical Orifice
Zone 2 Rectangular ft²
Vertical Orifice Centroid = feet

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

Not Selected ☐ Not Selected ☐
Overflow Weir Front Edge Height, H_o = ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length = feet
Overflow Weir Grate Slope = H:V
Horiz. Length of Weir Sides = feet
Overflow Grate Type =
Debris Clogging % = %

Calculated Parameters for Overflow Weir
Not Selected ☐ Not Selected ☐
Height of Grate Upper Edge, H_g = feet
Overflow Weir Slope Length = feet
Grate Open Area / 100-yr Orifice Area =
Overflow Grate Open Area w/o Debris = ft²
Overflow Grate Open Area w/ Debris = ft²

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

Not Selected ☐ Not Selected ☐
Depth to Invert of Outlet Pipe = ft (distance below basin bottom at Stage = 0 ft)
Circular Orifice Diameter = inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate
Not Selected ☐ Not Selected ☐
Outlet Orifice Area = ft²
Outlet Orifice Centroid = feet
Half-Central Angle of Restrictor Plate on Pipe = radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

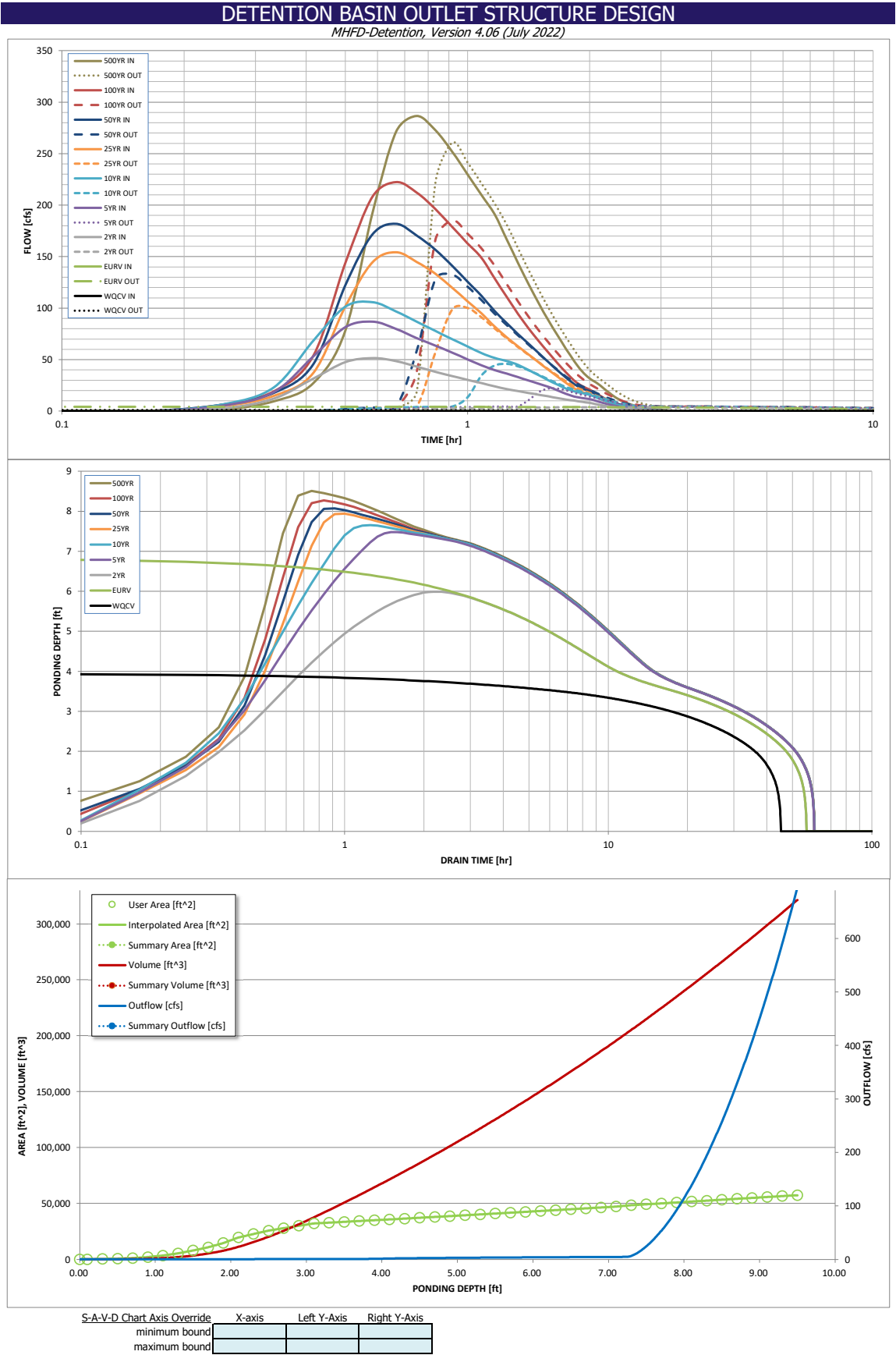
Spillway Invert Stage = ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length = feet
Spillway End Slopes = H:V
Freeboard above Max Water Surface = feet

Calculated Parameters for Spillway
Spillway Design Flow Depth = feet
Stage at Top of Freeboard = feet
Basin Area at Top of Freeboard = acres
Basin Volume at Top of Freeboard = 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	2.00	2.26	2.60	3.20
One-Hour Rainfall Depth (in)	N/A	N/A	3.861	6.329	8.009	10.945	12.978	15.965	20.773
CUHP Runoff Volume (acre-ft)	N/A	N/A	3.861	6.329	8.009	10.945	12.978	15.965	20.773
Inflow Hydrograph Volume (acre-ft)	N/A	N/A	5.8	25.8	37.6	70.5	87.7	115.1	156.3
CUHP Predevelopment Peak Q (cfs)	N/A	N/A	0.06	0.28	0.41	0.78	0.97	1.27	1.72
OPTIONAL Override Predevelopment Peak Q (cfs)	N/A	N/A	51.4	86.8	105.8	154.2	181.9	222.4	286.6
Predevelopment Unit Peak Flow, q (cfs/acre)	N/A	N/A	3.7	21.9	45.8	100.2	132.5	185.3	260.6
Peak Inflow Q (cfs)	1.1	4.3	3.7	21.9	45.8	100.2	132.5	185.3	260.6
Peak Outflow Q (cfs)	N/A	N/A	N/A	0.8	1.2	1.4	1.5	1.6	1.7
Ratio Peak Outflow to Predevelopment Q	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Spillway	Spillway	Spillway	Spillway	Spillway	Spillway
Structure Controlling Flow	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Max Velocity through Grate 1 (fps)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Max Velocity through Grate 2 (fps)	43	51	51	52	50	47	45	42	38
Time to Drain 97% of Inflow Volume (hours)	44	54	54	57	57	55	55	54	52
Time to Drain 99% of Inflow Volume (hours)	3.95	6.84	5.99	7.48	7.65	7.94	8.08	8.27	8.51
Maximum Ponding Depth (ft)	0.81	1.06	0.98	1.13	1.14	1.17	1.18	1.20	1.22
Area at Maximum Ponding Depth (acres)	1.518	4.210	3.342	4.898	5.102	5.426	5.591	5.829	6.121
Maximum Volume Stored (acre-ft)									



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.

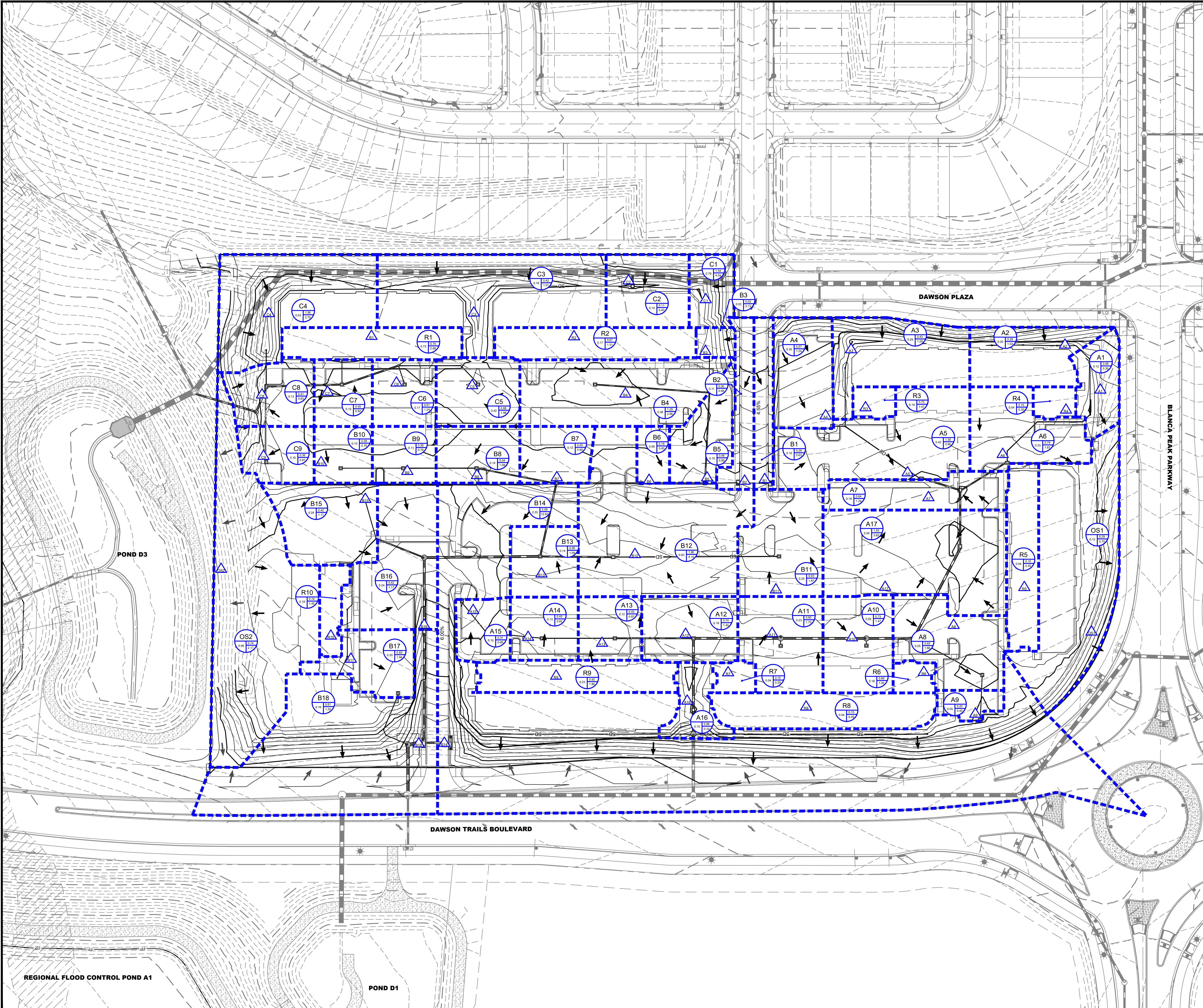
Time Interval	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.44	0.21	1.45
	0:15:00	0.00	0.00	2.65	5.38	6.67	4.92	6.39	6.44	9.57
	0:20:00	0.00	0.00	12.14	18.57	23.10	14.88	17.68	19.32	27.12
	0:25:00	0.00	0.00	31.62	53.21	68.47	37.12	45.59	53.84	78.17
	0:30:00	0.00	0.00	47.56	81.61	101.42	101.60	122.30	143.87	192.56
	0:35:00	0.00	0.00	51.44	86.80	105.80	144.60	171.78	208.25	270.96
	0:40:00	0.00	0.00	48.54	79.84	96.85	154.25	181.91	222.42	286.64
	0:45:00	0.00	0.00	43.17	70.92	86.87	144.84	170.41	212.09	272.63
	0:50:00	0.00	0.00	38.11	63.63	77.81	133.30	156.73	196.11	251.98
	0:55:00	0.00	0.00	33.97	56.85	69.90	119.80	141.03	178.86	229.98
	1:00:00	0.00	0.00	30.37	50.33	62.74	106.66	125.76	163.07	209.70
	1:05:00	0.00	0.00	27.17	44.38	56.30	94.73	111.82	148.72	191.22
	1:10:00	0.00	0.00	24.04	39.89	51.64	82.15	97.24	129.09	166.60
	1:15:00	0.00	0.00	21.46	36.36	48.64	71.69	85.29	110.72	143.78
	1:20:00	0.00	0.00	19.39	32.94	44.80	62.74	74.73	94.42	122.89
	1:25:00	0.00	0.00	17.61	29.64	39.77	54.83	65.21	80.16	104.26
	1:30:00	0.00	0.00	15.94	26.54	34.68	47.21	56.06	67.80	88.05
	1:35:00	0.00	0.00	14.30	23.61	29.99	40.07	47.52	56.80	73.66
	1:40:00	0.00	0.00	12.69	20.19	25.71	33.48	39.67	46.72	60.49
	1:45:00	0.00	0.00	11.24	16.82	21.96	27.46	32.49	37.53	48.53
	1:50:00	0.00	0.00	10.15	14.23	19.23	22.19	26.26	29.70	38.54
	1:55:00	0.00	0.00	9.03	12.70	17.43	18.47	21.96	24.24	31.71
	2:00:00	0.00	0.00	8.02	11.62	15.77	16.26	19.39	20.86	27.44
	2:05:00	0.00	0.00	6.68	9.78	13.20	13.37	15.96	16.83	22.20
	2:10:00	0.00	0.00	5.36	7.78	10.51	10.40	12.42	12.82	16.94
	2:15:00	0.00	0.00	4.24	6.10	8.25	7.99	9.54	9.60	12.69
	2:20:00	0.00	0.00	3.35	4.80	6.45	6.16	7.35	7.16	9.48
	2:25:00	0.00	0.00	2.63	3.76	4.99	4.73	5.63	5.34	7.06
	2:30:00	0.00	0.00	2.05	2.91	3.80	3.61	4.28	4.03	5.33
	2:35:00	0.00	0.00	1.60	2.21	2.87	2.73	3.23	3.06	4.03
	2:40:00	0.00	0.00	1.24	1.67	2.17	2.06	2.44	2.33	3.07
	2:45:00	0.00	0.00	0.94	1.26	1.66	1.57	1.86	1.81	2.38
	2:50:00	0.00	0.00	0.71	0.93	1.25	1.20	1.41	1.38	1.81
	2:55:00	0.00	0.00	0.50	0.66	0.90	0.88	1.04	1.01	1.32
	3:00:00	0.00	0.00	0.33	0.45	0.61	0.61	0.72	0.69	0.90
	3:05:00	0.00	0.00	0.20	0.29	0.37	0.39	0.45	0.44	0.57
	3:10:00	0.00	0.00	0.10	0.16	0.20	0.22	0.25	0.24	0.31
	3:15:00	0.00	0.00	0.04	0.07	0.08	0.09	0.11	0.10	0.13
	3:20:00	0.00	0.00	0.01	0.02	0.02	0.02	0.02	0.02	0.03
	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

APPENDIX E

DRAINAGE MAPS

Proposed Drainage Map
Existing Drainage Map

9/31/2021 1:15 PM X:\GARRETT - DAWSON TRAIL\CAD\XREF\RAINAGE\PRDR.DWG JOSH SHARPE



4880

PROPOSED MAJOR CONTOUR

4879

PROPOSED MINOR CONTOUR

4880

PROPOSED MAJOR CONTOUR

4879

PROPOSED MINOR CONTOUR

PROPOSED DRAINAGE BASIN MAJOR

PROPOSED DRAINAGE BASIN MINOR

EXISTING DRAINAGE BASIN MAJOR

EXISTING DRAINAGE BASIN MINOR

STORM (FES, MH, & INLET)

EXISTING

PROPOSED

EX-1

AREA
X.XX
(AC)

0.XX

0.XX

PR-1

AREA
X.XX
(AC)

0.XX

0.XX

BASIN DESIGNATION

MINOR RUNOFF (CFS)

MAJOR RUNOFF (CFS)

DIRECTIONAL FLOW ARROW

DESIGN POINT

EMERGENCY OVERFLOW ROUTE

RUNOFF SUMMARY TABLE				
Basin ID	Design Point	Basin Area (Ac)	5-Year Runoff (CFS)	100-Year Runoff (CFS)
A1	A1	0.12	0.08	0.39
A2	A2	0.20	0.39	1.02
A3	A3	0.29	0.43	1.29
A4	A4	0.20	0.57	1.24
A5	A5	0.42	1.36	2.86
A6	A6	0.23	0.79	1.62
A7	A7	0.18	0.64	1.29
A8	A8	0.25	0.93	1.86
A9	A9	0.05	0.20	0.40
A10	A10	0.20	0.73	1.47
A11	A11	0.23	0.85	1.70
A12	A12	0.19	0.74	1.45
A13	A13	0.12	0.43	0.87
A14	A14	0.13	0.45	0.92
A15	A15	0.10	0.31	0.66
A16	A16	0.10	0.06	0.33
A17	A17	0.50	1.93	3.82
B1	B1	0.10	0.29	0.63
B2	B2	0.11	0.30	0.68
B3	B3	0.03	0.02	0.12
B4	B4	0.38	1.29	2.66
B5	B5	0.15	0.46	0.99
B6	B6	0.06	0.19	0.40
B7	B7	0.12	0.45	0.90
B8	B8	0.14	0.54	1.08
B9	B9	0.11	0.39	0.79
B10	B10	0.10	0.39	0.76
B11	B11	0.25	0.93	1.87
B12	B12	0.63	1.96	4.19
B13	B13	0.14	0.56	1.09
B14	B14	2.33	5.09	12.67
B15	B15	0.24	0.42	1.17
B16	B16	0.33	0.83	1.94
B17	B17	0.16	0.61	1.20
B18	B18	0.79	1.54	4.04
C1	C1	0.10	0.11	0.40
C2	C2	0.18	0.42	1.01
C3	C3	0.53	1.06	2.75
C4	C4	0.42	0.68	1.98
C5	C5	0.17	0.61	1.24
C6	C6	0.13	0.45	0.92
C7	C7	0.12	0.41	0.83
C8	C8	0.16	0.36	0.87
C9	C9	0.12	0.29	0.70
OS1	OS1	0.56	0.74	2.17
OS2	OS2	0.73	0.75	2.88
R1	R1	0.17	0.67	1.31
R2	R2	0.19	0.75	1.47
R3	R3	0.04	0.15	0.30
R4	R4	0.04	0.15	0.30
R5	R5	0.18	0.69	1.35
R6	R6	0.04	0.15	0.29
R7	R7	0.04	0.15	0.29
R8	R8	0.23	0.92	1.80
R9	R9	0.19	0.74	1.45
R10	R10	0.06	0.25	0.49

terrachina
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td
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PROPOSED DRAINAGE MAP

DAWSON TRAIL

0 50'
1" = 50'

05/07/2026

1 OF 1