PHASE III DRAINAGE REPORT
FOR
DXD CASTLE ROCK STORAGE
TOWN OF CASTLE ROCK PROJECT NO. CD26-0014

PREPARED FOR:

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JULY 2026

Approval Blocks

ENGINEER'S STATEMENT:

"I affirm that this report and plan for the Phase II drainage design of DXD Castle Rock Storage 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.

Scott Hughes

Digitally signed by Scott Hughes
DN: C=US, E=scott@dxd.capital, O=DXD Capital, OU=Managing Director, CN=Scott Hughes
Date: 2026.08.14 08:38:18-04'00'

_____

OWNER

TOWN OF CASTLE ROCK APPROVALS:

DEVELOPMENT SERVICES
APPROVED
By jkirkpatrick
on 08/17/2026
APPROVED-CD26-0014 PhIII Drn Rpt.pdf
Record Document on File

_____

Utilities Department Date

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Development Services Date

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I. GENERAL LOCATION AND DESCRIPTION

A. Site Location

This Phase III Drainage Report provides remediation for changes in the drainage patterns resulting from the development of the proposed DXD Castle Rock Storage, from here on known as "Site". The Site is a proposed commercial development that is approximately 3.95 acres within the Meadows Filing No. 19 Lot 2 North development. This drainage report will modify a portion of the existing drainage basins delineated within the "Phase III Drainage Report for The Meadows, Filing No. 19 Lot 2 North" by Terracina Design, dated May 2022. The site is bound on the north by East Plum Creek, on the south by the Timber Mill Parkway, on the west by an existing residential development, and on the east by open space. The Site is situated in the North half of Section 28, Township 7 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 Commercial Office and Industrial (COI). The Site has naturally occurring slopes ranging from 1 to 30 percent, generally slopes from the south to the north towards East Plum Creek. The soils within the Site include Bresser sandy loam and Newlin gravelly sandy loam, and the soil primarily consists of hydrologic soil group B. 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 08035C0167G 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 north towards an existing swale that conveys runoff west into the existing Pond A. Ultimately, all runoff generated within the Site will be conveyed into Pond A to the northwest and then discharged into East Plum Creek.

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.

II. DRAINAGE BASINS AND SUB-BASINS

A. Major Drainage Basins

The Site lies within basin A6 from the "Phase III Drainage Report for The Meadows, Filing No. 19 Lot 2 North" by Terracina Design, dated May 2022. Runoff generated within the Site will generally follow the drainage patterns set forth in said report. Runoff will generally be conveyed to the north west via existing and proposed pipe networks and existing swales to the existing pond before being discharged towards East Plum Creek. 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 08035C0167G. 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 Terracina Design titled "Phase III Drainage Report for The Meadows Filing No. 19 Lot 2 North", dated May 2022, can be found in Appendix D.

B. Minor Drainage Basin

Minor Drainage Basins for DXD Castle Rock Storage 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 western portion of the site and is comprised of paved areas, roofs, walks, and landscaped areas. Runoff generated from this basin will flow north via concrete pans within the alleys toward a proposed inlet at design point (DP) A1. Flows will be conveyed through the proposed and existing storm systems to the existing Pond A to the north of the site, and ultimately into East Plum Creek. Should the inlet at (DP) A1 become plugged, flows will overflow north to (DP) OS1 and eventually into Pond A.

Basin A2
Basin A2 encompasses the southwestern portion of the site and is comprised of paved areas, roofs, walks, and landscaped areas. Runoff generated from this basin will flow north via concrete pans within the alleys toward proposed basin A1 and enter the proposed storm network through a Type 13 inlet at design point (DP) A2. Flows will be conveyed through the proposed and existing storm system to the existing Pond A to the north of the site, and ultimately into East Plum Creek.

Basin A3
Basin A3 encompasses the southwestern portion of the site and is comprised of paved areas, roofs, and walks. Runoff generated from this basin will flow north via concrete pans within the alleys toward proposed basin A2 and enter the proposed storm network through a Type 13 inlet at design point (DP) A3. Flows will be conveyed through the proposed and existing storm system to the existing Pond A to the north of the site, and ultimately into East Plum Creek.

Basin A4
Basin A4 encompasses the southwestern portion of the site and is comprised of paved areas, roofs, walks, and landscaped areas. Runoff generated from this basin will flow north via curb and gutter near the entrance and enter the proposed storm network through a Type R inlet at design point (DP) A4. Flows will be conveyed through the proposed and existing storm system to the existing Pond A to the north of the site, and ultimately into East Plum Creek.

Basin A5
Basin A5 encompasses the western portion of the site and is comprised of paved areas, roofs, walks, and landscaped areas. Runoff generated from this basin will flow north via concrete pans within the alleys toward a proposed inlet at design point (DP) A5. Flows will be conveyed through the proposed and existing storm systems to the existing Pond A to the north of the site, and ultimately into East Plum Creek. Should the inlet at (DP) A5 become plugged, flows will overflow north to (DP) OS1 and eventually into Pond A.

Basin OS1
Basin OS1 encompasses the northern edge of the site and is all open space. Runoff generated from this basin will sheet flow toward the center of the basin and will be collected in a swale that conveys the runoff to the existing pond to the northwest. Flows will be conveyed through the existing system to the existing Pond A to the north of the site, and ultimately into East Plum Creek.

Basin OS2
Basin OS2 encompasses the western landscape buffer and is comprised of landscaped areas. Runoff generated from this basin will sheet flow northwest, then travel through the existing curb and gutter to an existing Type R inlet located within the adjacent site to the west. The existing inlet was analyzed in the "Final Drainage Report UDG Meadowmark, Meadows Filing No. 19 Lot 2 North Parcel D2A", prepared by Ware Malcomb and has sufficient capacity to take on the additional flow (Appendix D). Flows will be conveyed through the existing system to the existing Pond A to the north of the site, and ultimately into East Plum Creek.

Basin OS3
Basin OS3 encompasses a portion of the disturbed soils on the west side of the proposed building and is composed of landscaped areas. Runoff generated from this basin will sheet flow northwest to the existing curb and gutter and then to an existing Type R inlet located within the adjacent site to the west. The existing inlet was analyzed in the "Final Drainage Report UDG Meadowmark, Meadows Filing No. 19 Lot 2 North Parcel D2A", prepared by Ware Malcomb, and has sufficient capacity to take on the additional flow (Appendix D). Flows will be conveyed through the existing system to the existing Pond A to the north of the site, and ultimately into East Plum Creek.

Basin OS4
Basin OS4 encompasses a portion of the disturbed soils on the south side of the proposed building and is composed of landscaped areas. Runoff generated from this basin will sheet flow southeast to the existing curb and gutter and then flow east to an existing Type R inlet within Timber Mill Parkway. The existing inlet was analyzed in the "Phase III Drainage Report for The Meadows, Filing No. 19 Lot 2 North" by Terracina Design and has sufficient capacity to take on the additional flow (Appendix D). Flows will be conveyed through the existing system to the existing Pond A to the north of the site, and ultimately into East Plum Creek. Should the existing inlet be unable to capture the additional flows, we have determined that the downstream Type R sump inlet has sufficient capacity to handle any bypass flows (Appendix B).

III. 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 (Reference A), and the Mile High Flood District (MHFD) Storm Drainage Criteria Manual (Reference B). 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 I Master Drainage Design Report for The Meadows, Castle Rock prepared by Rocky Mountain Consultants, Inc approved in March 2002. This Report was developed for the entire Meadows planning area and provides a general drainage plan for the COI use area that includes Filing 19 lots. The report provides very general information and mentions the possibility of different locations of ponds depending on the individual site's development and topography. The proposed improvements conform with the approved report.

The Phase III Drainage Report for The Meadows, Filing No. 19 Lot 2 North, prepared by Terracina Design, approved May 2022. This report was developed for the area within Filing No. 19 Lot 2 to the North of Timber Mill Parkway and provides a more detailed drainage plan for the Filing No. 19 Lot 2

area. The report provides information on the existing topography and infrastructure that were created in anticipation of the full development of Filing No. 19 Lot 2 North. The proposed improvements conform with the approved report.

The Final Drainage Report UDG Meadowmark, Meadows Filing No. 19 Lot 2 North Parcel D2A, prepared by Ware Malcomb, approved April 2023. This report was prepared for the development of a multifamily building within Filing No. 19 Lot 2 North, which is north of Timber Mill Parkway and provides a more detailed drainage plan for the adjacent property. The Site is utilizing an existing inlet located within the development described within The Final Drainage Report UDG Meadowmark, Meadows Filing No. 19 Lot 2 North Parcel D2A, prepared by Ware Malcomb, approved April 2023. We have analyzed the existing inlet receiving minimal stormwater runoff from our site, and it has capacity as shown in Appendix D. 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 A.

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 A.

D. Hydraulic Criteria

Hydraulic calculations for street and inlet capacity were based on the design charts in Chapter 8 of the Town's Drainage Criteria, and design spreadsheets provided by the Town.

Hydraulic grade lines and storm pipe capacities were designed and modeled using StormCAD. StormCAD uses the routed hydrograph method and the Manning's equation to compute the hydraulic grade line throughout a pipe network. Existing flows were determined based on output from "Final Drainage Report UDG Meadowmark, Meadows Filing No. 19 Lot 2 North Parcel D2A", prepared by Ware Malcomb, April 2023 (Appendix D). See Appendix C for the StormCAD Output Tables and keymap. Hydraulic grade lines and storm pipe capacities were designed and will conform to the Town of Castle Rock Storm Drainage Design and Technical Criteria Manual, and the Mile High Flood District (MHFD) Storm Drainage Criteria Manual.

E. Water Quality Enhancements

Water quality measures were included in the "Phase III Drainage Report for The Meadows, Filing No. 19 Lot 2 North", prepared by Terracina Design, approved May 2022. The EDB was designed with sufficient capacity to handle the addition of our proposed site. The overall imperviousness of our site is less than what was anticipated in the "Phase III Drainage Report for The Meadows, Filing No. 19 Lot 2 North", prepared by Terracina Design, approved May 2022. According to the "Phase III Drainage Report for The Meadows, Filing No. 19 Lot 2 North", prepared by Terracina Design, the area concerning the Site was accounted for using an imperviousness of 90% (Appendix D), while our current analysis of the proposed Site shows that the actual imperviousness will be 76.7% (Appendix A). Therefore, no further water quality enhancements will be necessary.

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

A full-spectrum detention pond with an additional 0.5 times the 100-year detention volume as water quality capture volume is provided for the site in Pond A designed by Terracina Design, Phase III Drainage Report for the Meadows Filing No. 19 Lot 2 North (CD21-0042), dated May 2022. All flows from the site will enter Pond A so no additional water quality/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.

This project will not utilize any source control techniques, but a brief description of source control has been included. The implementation of source control measures on a development is used to stop potential pollutants from making it into our drainage ways. If the development has the potential for chemicals, oils, fertilizers, or other pollutants, additional measures shall be provided.

F. Variances from Criteria

No variances are being requested at this time.

IV. STORMWATER MANAGEMENT FACILITY DESIGN

A. Stormwater Conveyance Facilities

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 East Plum Creek. The proposed storm systems will tie into the existing storm system and outfall into the existing detention pond located on the south side of East Plum Creek. The existing pond will outfall into East Plum Creek.

B. Stormwater Storage Facilities

The Site will utilize the existing full-spectrum detention pond located south of East Plum Creek. The proposed site is fully accommodated by the existing pond in the approved "Phase III Drainage Report for The Meadows, Filing No. 19 Lot 2 North" (Terracina Design, May 2022). The existing detention pond has ample capacity, as the proposed site's imperviousness is only 76.7% (Appendix A)—well below the 90% imperviousness originally assumed in the master report (Appendix D). Because the runoff volume will be less than anticipated, no further stormwater storage enhancements are required.

The existing detention pond calculations can be found in Appendix D, as detailed in the “Phase III Drainage Report for The Meadows, Filing No. 19 Lot 2 North”, prepared by Terracina Design, approved May 2022.

C. Water Quality Enhancement Best Management Practices

Water quality measures are included in the existing full-spectrum detention ponds. The detention pond calculations can be found in Appendix D. 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 08035C0167G 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 08035C0167G 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 C. Additionally, excerpts from the referenced report have been included in the same Appendix.

G. Operation and Maintenance

The Owner will be the responsible party for 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.

V. CONCLUSIONS

A. Compliance with Standards

The drainage design for DXD Castle Rock Storage conforms to the Town of Castle Rock's Storm Drainage Design and Technical Criteria Manual, the Mile High Flood Districts' Drainage Criteria Manual, and "The Meadows, Filing No. 19 Lot 2 North", prepared by Terracina Design, approved May 2022, 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.

VI. REFERENCES

A. Town of Castle Rock Storm Drainage Design and Technical Criteria Manual, September 2007, Revised February 2025.

B. Drainage Criteria Manual, Volumes 1, 2, & 3, Urban Drainage and Flood Control District, Volumes 1 – Originally Published September 1969, Updated March 2024; Volumes 2 – Originally Published

September 1969, Updated September 2017; Volume 3 – Originally published September 1992, Updated April 2018.

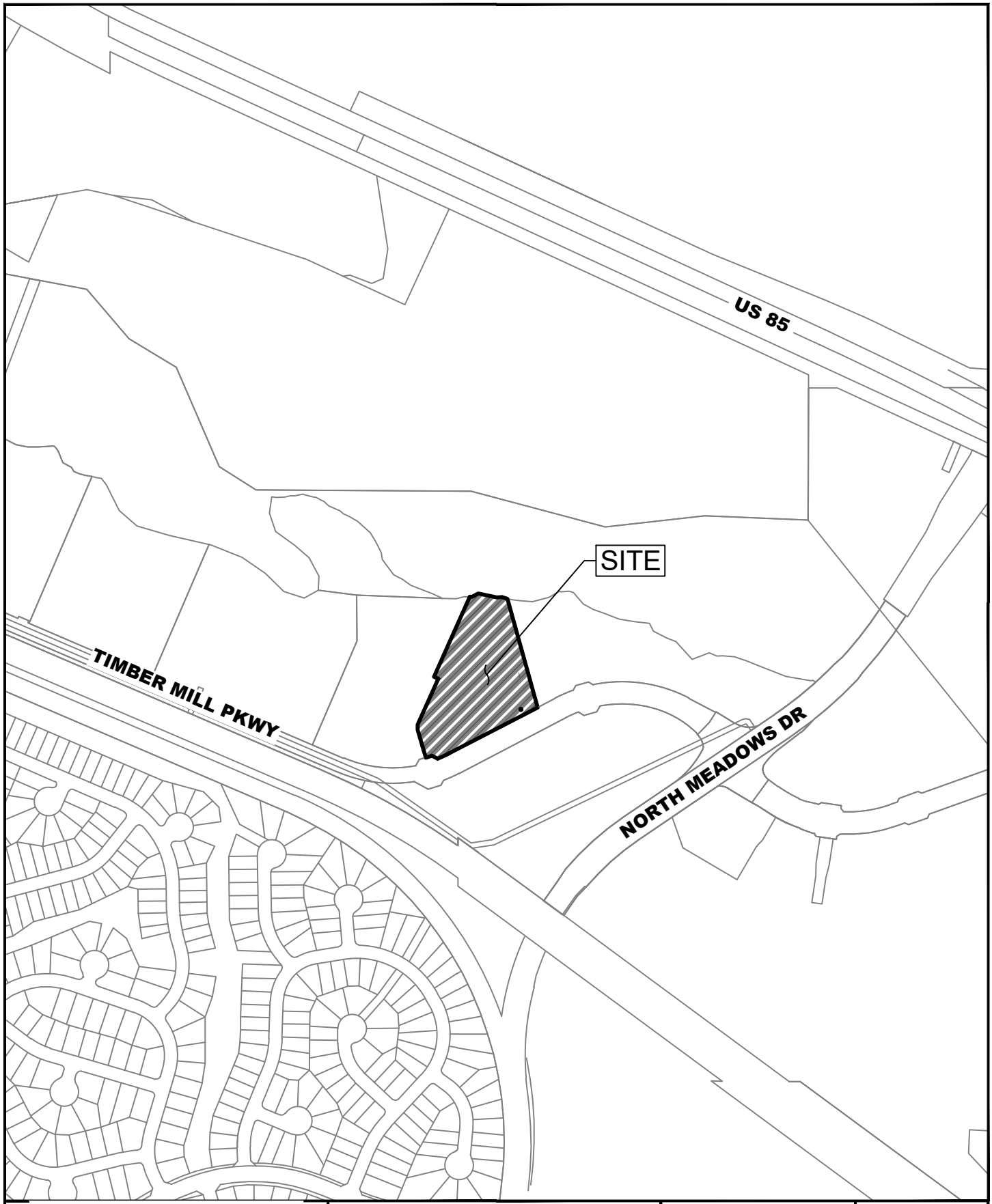
C. Phase I Master Drainage Report for The Meadows, Castle Rock, Rocky Mountain Consultants, Inc., May 2002.

D. Phase III Drainage Report for The Meadows, Filing No. 19 Lot 2 North, prepared by Terracina Design, May 2022.

E. Final Drainage Report UDG Meadowmark, Meadows Filing No. 19 Lot 2 North Parcel D2A, prepared by Ware Malcomb, April 2023

APPENDIX A
GENERAL MAPS

Vicinity Map
Soil Map
Firm Map



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MEADOWS STORAGE
VICINITY MAP

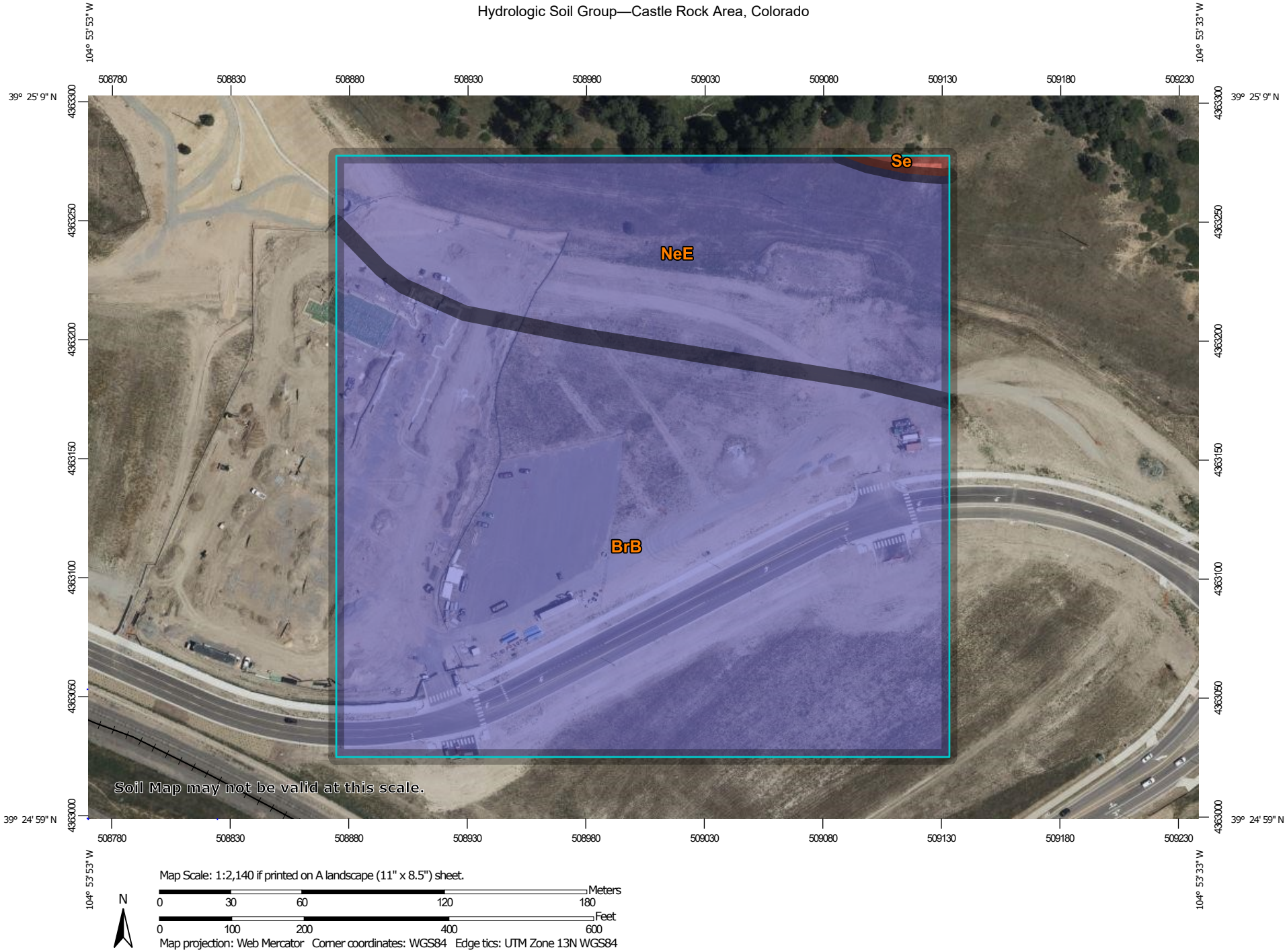
CASTLE ROCK, CO DATE: 1/12/2023

0 500'

1" = 500'

N

11/25/2025 11:51 AM ; X:\DXD CAPITAL - MEADOWS STORAGE\DOCUMENTS\REPORTS\DRAINAGE\00 - OVERALL\A1 - MAPS (VIC-FEMA-SOILS)\VICINITY MAP.DWG;



Map Scale: 1:2,140 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 30 60 120 180

Feet
0 100 200 400 600

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

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil 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
BrB	Bresser sandy loam, cool, 1 to 3 percent slopes	B	11.3	69.4%
NeE	Newlin gravelly sandy loam, 8 to 30 percent slopes	B	4.9	30.2%
Se	Sandy wet alluvial land	D	0.1	0.4%
Totals for Area of Interest			**16.2**	**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.

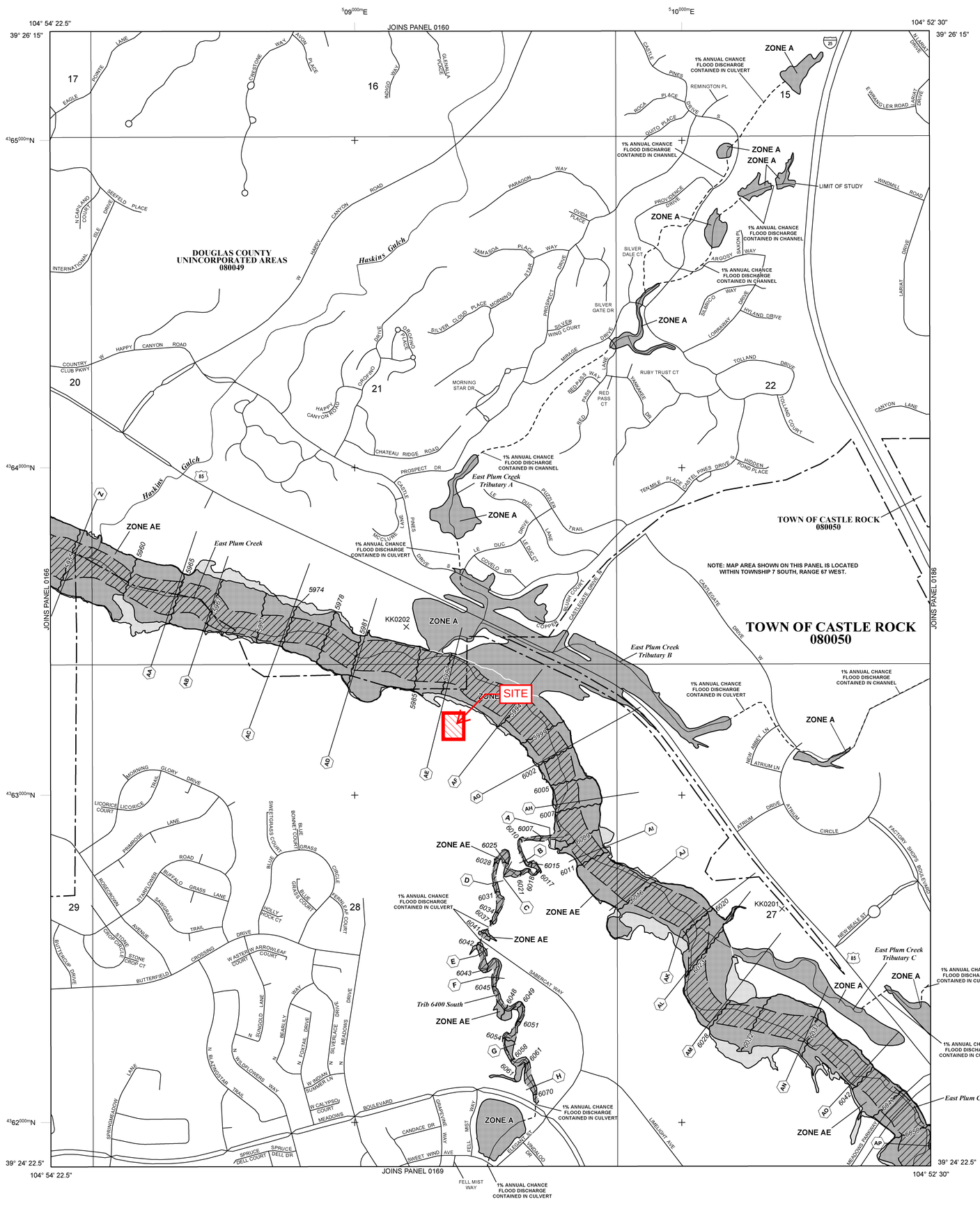
Based on updated topographic information, this map reflects more detailed and up-to-date **stream channel configurations and floodplain delineations** than those shown on the previous FIRM for this jurisdiction. As a result, the Flood Profiles and Floodway Data tables for multiple streams in the Flood 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/nfip.



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 equaled 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 decertified. 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.
513	Base Flood Elevation line and value; elevation in feet*
(EL 987)	Base Flood Elevation value where uniform within zone; elevation in feet*

*Referenced to the North American Vertical Datum of 1988

A ⟷ A	Cross section line
23 ⟷ 23	Transect line
45° 02' 08", 93° 02' 12"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83) Western Hemisphere
4989000mN	1000-meter Universal Transverse Mercator grid values, zone 13
DX5510 ×	Bench mark (see explanation in Notes to Users section of this FIRM panel)
M1.5	River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP

SEPTEMBER 30, 2005

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

MARCH 16, 2016: to update corporate limits, to change base flood elevations, to add base flood elevations, to add special flood hazard areas, to update map format, to add roads and road names, to reflect updated topographic information, to incorporate previously issued letters of map revision.

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

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

MAP SCALE 1" = 500'

250 0 500 1000 FEET
150 0 150 300 METERS

NFIP NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0167G

FIRM

FLOOD INSURANCE RATE MAP

DOUGLAS COUNTY, COLORADO AND INCORPORATED AREAS

PANEL 167 OF 495
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
CASTLE ROCK, TOWN OF	080050	0167	G
DOUGLAS COUNTY	080049	0167	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
08035C0167G
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

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

Project Name: DXD STORAGE
Prepared By: SC

Percent Impervious Calculations

Basin Id	Design Point	Basin Area (Ac)	Historic Flow Area	Paved Street, Roof, Drives, Walks Area	Disturbed Soil Area	Weighted % Impervious
			5%	95%	20%	
A1	A1	0.23	0.00	0.22	0.01	92.8%
A2	A2	0.26	0.00	0.25	0.01	93.0%
A3	A3	0.71	0.00	0.71		95.0%
A4	A4	0.79	0.00	0.66	0.13	82.8%
A5	A5	1.16	0.00	1.04	0.13	86.9%
OS1	OS1	0.31				20.0%
OS2	OS2	0.07	0.00		0.07	20.0%
OS3	OS3	0.13			0.13	20.0%
OS4	OS4	0.16			0.16	20.0%
Overall	Overall	3.81	0.00	2.88	0.93	76.7%

terracina design
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Denver, CO 80231
ph. 303.632.8867

Project Name: DXD STORAGE
Prepared By: SC

Runoff Coefficent (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	92.8%	0.93	A	0.00	0.23	0.78	0.76	0.78	0.80	0.81	0.82	0.83	0.79	0.77	0.79	0.81	0.84	0.85	0.86
			B	0.00		0.79	0.76	0.79	0.81	0.83	0.85	0.86							
			C/D	0.23		0.79	0.77	0.79	0.81	0.84	0.85	0.86							
A2	93.0%	0.93	A	0.00	0.26	0.78	0.76	0.78	0.80	0.81	0.82	0.83	0.79	0.77	0.79	0.82	0.84	0.85	0.86
			B	0.00		0.79	0.77	0.79	0.81	0.83	0.85	0.86							
			C/D	0.26		0.79	0.77	0.79	0.82	0.84	0.85	0.86							
A3	95.0%	0.95	A	0.00	0.71	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	0.71		0.81	0.79	0.81	0.83	0.85	0.86	0.87							
A4	82.8%	0.83	A	0.00	0.79	0.68	0.66	0.68	0.69	0.72	0.73	0.76	0.71	0.68	0.71	0.74	0.78	0.80	0.82
			B	0.00		0.70	0.67	0.70	0.73	0.77	0.79	0.81							
			C/D	0.79		0.71	0.68	0.71	0.74	0.78	0.80	0.82							
A5	86.9%	0.87	A	0.00	1.16	0.72	0.70	0.72	0.73	0.76	0.77	0.79	0.74	0.71	0.74	0.77	0.81	0.82	0.84
			B	0.00		0.74	0.71	0.74	0.76	0.80	0.81	0.83							
			C/D	1.16		0.74	0.71	0.74	0.77	0.81	0.82	0.84							
OS1	20.0%	0.20	A	0.00	0.31	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	0.31		0.20	0.14	0.20	0.28	0.43	0.49	0.57							
OS2	20.0%	0.20	A	0.00	0.07	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	0.07		0.20	0.14	0.20	0.28	0.43	0.49	0.57							
OS3	20.0%	0.20	A	0.00	0.13	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	0.13		0.20	0.14	0.20	0.28	0.43	0.49	0.57							
OS4	20.0%	0.20	A	0.00	0.16	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	0.16		0.20	0.14	0.20	0.28	0.43	0.49	0.57							

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

Project Name: DXD STORAGE
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	0.23	0.79	55	1	2.4	3.09	134	3	2.4	20.0	3.12	0.7	3.8	92.8%	10.9	5.0
A2	0.26	0.79	20	4	18.1	0.95	300	13	4.2	20.0	4.10	1.2	2.2	93.0%	11.3	5.0
A3	0.71	0.81	201	7	3.6	4.89	111	1	1.3	20.0	2.25	0.8	5.7	95.0%	10.6	5.7
A4	0.79	0.71	100	3	3.2	4.81	100	2	1.7	20.0	2.63	0.6	5.4	82.8%	12.5	5.4
A5	1.16	0.74	60	1	1.7	4.21	400	4	1.0	20.0	2.00	3.3	7.5	86.9%	14.4	7.5
OS1	0.31	0.20	20	1	5.0	4.28	100	1	1.0	20.0	2.00	0.8	5.1	20.0%	24.0	5.1
OS2	0.07	0.20	20	1	5.0	4.28	100	1	1.0	20.0	2.00	0.8	5.1	20.0%	24.0	5.1
OS3	0.13	0.20	20	1	5.0	4.28	100	1	1.0	20.0	2.00	0.8	5.1	20.0%	24.0	5.1
OS4	0.16	0.20	20	1	5.0	4.28	100	1	1.0	20.0	2.00	0.8	5.1	20.0%	24.0	5.1

terracina design
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Denver, CO 80231
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Project Name: DXD STORAGE

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	0.23	0.79	5.0	0.18	4.85	0.88
A2	A2	0.26	0.79	5.0	0.20	4.85	0.99
A3	A3	0.71	0.81	5.7	0.57	4.68	2.69
A4	A4	0.79	0.71	5.4	0.56	4.74	2.65
A5	A5	1.16	0.74	7.5	0.87	4.29	3.71
OS1	OS1	0.31	0.20	5.1	0.06	4.82	0.29
OS2	OS2	0.07	0.20	5.1	0.01	4.82	0.07
OS3	OS3	0.13	0.20	5.1	0.02	4.82	0.12
OS4	OS4	0.16	0.20	5.1	0.03	4.82	0.15

terracina design
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Project Name: DXD STORAGE

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	0.23	0.86	5.0	0.20	8.82	1.75
A2	A2	0.26	0.86	5.0	0.22	8.82	1.96
A3	A3	0.71	0.87	5.7	0.62	8.50	5.27
A4	A4	0.79	0.82	5.4	0.65	8.62	5.58
A5	A5	1.16	0.84	7.5	0.98	7.80	7.62
OS1	OS1	0.31	0.57	5.1	0.17	8.77	1.53
OS2	OS2	0.07	0.57	5.1	0.04	8.77	0.36
OS3	OS3	0.13	0.57	5.1	0.07	8.77	0.62
OS4	OS4	0.16	0.57	5.1	0.09	8.77	0.79

APPENDIX C
HYDRAULIC CALCULATIONS

Inlet Management
Inlet Calculations
Alley Calculations

StormCAD Keymap
StormCAD Output Tables

MHFD-Inlet, Version 6.00 (August 2025)

INLET MANAGEMENT

Project: DXD Castle Rock Storage
Minor: 5-year
Major: 100-year

Worksheet Protected

INLET NAME	Inlet A4	Inlet A3	Inlet A2	Inlet A1	Ex Inlet A9	Ex Inlet A4	Ex Inlet-A3.1 - DP6
Inlet Application (Street or Area)	STREET	STREET	STREET	STREET	STREET	STREET	STREET
Hydraulic Condition	In Sump	On Grade	On Grade	In Sump	On Grade	In Sump	In Sump
Inlet Type	CDOT Type R Curb Opening	CDOT/Denver 13 Valley Grate	CDOT/Denver 13 Valley Grate	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type R Curb Opening	Denver No. 16 Combination
Number of Inlet Units	2	1	1	2	2	1	1

USER-DEFINED INPUT

User-Defined Peak Flows

Minor Peak Flow, Q (cfs)	2.65	2.69	0.99	5.08	1.65	1.70	3.37
Major Peak Flow, Q (cfs)	5.58	5.27	1.96	10.37	4.09	3.50	7.16

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	Inlet A3	Inlet A2	No Bypass Flow Received	Ex Inlet A9	No Bypass Flow Received
Bypass Flow Description (Optional):							
Minor Bypass Flow Received, Q_b (cfs)	0.00	0.00	1.34	1.09	0.00	0.00	0.00
Major Bypass Flow Received, Q_b (cfs)	0.00	0.00	3.32	3.33	0.00	0.09	0.00

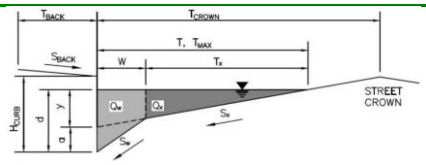
CALCULATED OUTPUT

Minor Total Design Peak Flow, Q (cfs)	2.65	2.69	2.33	6.17	1.65	1.70	3.37
Major Total Design Peak Flow, Q (cfs)	5.58	5.27	5.28	13.70	4.09	3.59	7.16
Minor Inlet Interception Capacity, Q_a (cfs)	8.28	1.35	1.24	6.56	1.65	5.04	5.56
Major Inlet Interception Capacity, Q_a (cfs)	8.28	1.95	1.95	16.26	4.00	5.04	8.99
Minor Flow Bypassed Downstream, Qb (cfs)	N/A	1.34	1.09	N/A	0.00	N/A	N/A
Major Flow Bypassed Downstream, Qb (cfs)	N/A	3.32	3.33	N/A	0.09	N/A	N/A
Minor Flow Capture Percentage, C%	100%	50%	53%	100%	100%	100%	100%
Major Flow Capture Percentage, C%	100%	37%	37%	100%	98%	100%	100%

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

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

Project: **DXD Castle Rock Storage**
Inlet ID: **Inlet A4**



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	12.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	12.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.035	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.013	

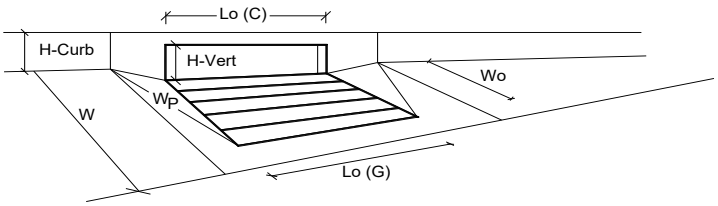
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	12.0	12.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

MINOR STORM Allowable Capacity is not applicable to Sump Condition
MAJOR STORM Allowable Capacity is not applicable to Sump Condition

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

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 6.00 (August 2025)

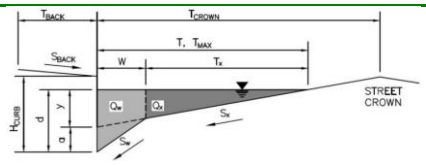


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	2	2	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	6.0	inches
Grate Information		MINOR	MAJOR	☐ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Open Area Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.33	0.33	ft
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.93	0.93	
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**8.3**	**8.3**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)	$Q_{PEAK\ REQUIRED}$ =	2.7	5.6	cfs

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

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

Project: **DXD Castle Rock Storage**
Inlet ID: **Inlet A3**



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	12.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	12.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.010	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.013	

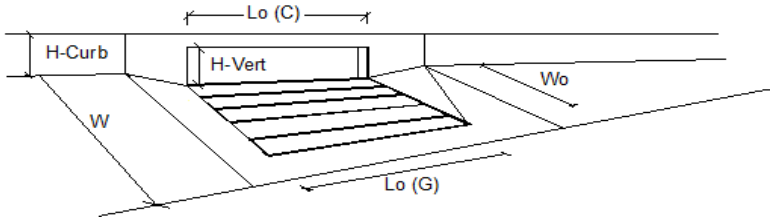
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	12.0	12.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☑	☑	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**15.9**	**15.9**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 2.69 cfs on sheet 'Inlet Management'
Major storm max. allowable capacity GOOD - greater than the design peak flow of 5.27 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 6.00 (August 2025)



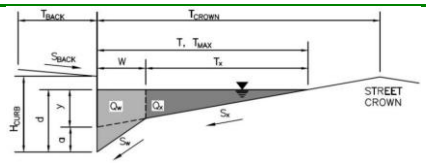
Design Information (Input)		MINOR	MAJOR	
Type of Inlet (CDOT/Denver 13 Valley Grate)	Type =	CDOT/Denver 13 Valley Grate		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	2.0	2.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	3.00	3.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	1.73	1.73	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f (G) =	0.50	0.50	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f (C) =	N/A	N/A	

Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q_a =**	**1.3**	**2.0**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**1.3**	**3.3**	**cfs**
Capture Percentage = Q_a/Q_o	**C% =**	**50**	**37**	**%**

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

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

Project: **DXD Castle Rock Storage**
Inlet ID: **Inlet A2**



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	12.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	12.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.010	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.013	

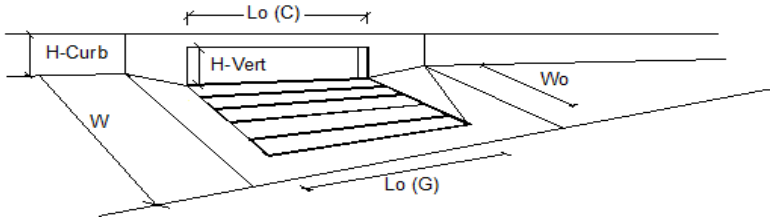
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	12.0	12.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☑	☑	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**15.9**	**15.9**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 2.33 cfs on sheet 'Inlet Management'
Major storm max. allowable capacity GOOD - greater than the design peak flow of 5.28 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 6.00 (August 2025)



Design Information (Input)		MINOR	MAJOR	
Type of Inlet (CDOT/Denver 13 Valley Grate)	Type =	CDOT/Denver 13 Valley Grate		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	2.0	2.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	3.00	3.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	1.73	1.73	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f (G) =	0.50	0.50	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f (C) =	N/A	N/A	

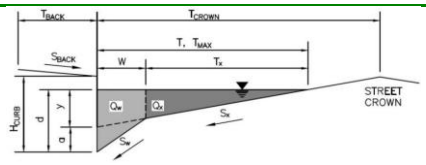
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q_a =**	**1.2**	**2.0**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**1.1**	**3.3**	**cfs**
Capture Percentage = Q_a/Q_o	**C% =**	**53**	**37**	**%**

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

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

Project: **DXD Castle Rock Storage**

Inlet ID: **Inlet A1**



Gutter Geometry:

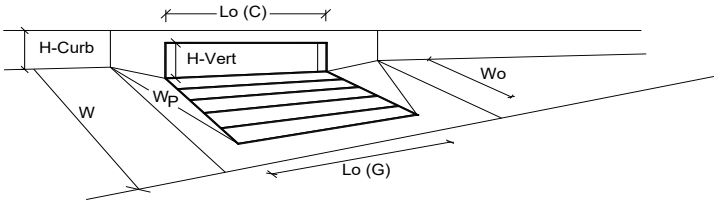
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	12.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	12.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.030	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.013	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	12.0	12.0	ft
Warning 02 Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	10.0	10.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 6.00 (August 2025)

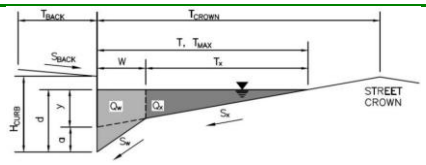


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	2	2	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	5.5	8.0	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Open Area Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.29	0.50	ft
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.90	1.00	
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**6.6**	**16.3**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)	$Q_{PEAK\ REQUIRED}$ =	6.2	13.7	cfs

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

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

Project: **DXD Castle Rock Storage**
Inlet ID: **Ex Inlet A9**



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	10.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	18.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.012	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

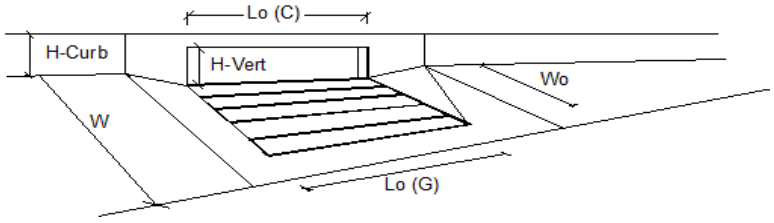
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	18.0	18.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☐	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	**Q_{allow} =**	**13.7**	**13.7**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 1.65 cfs on sheet 'Inlet Management'
Major storm max. allowable capacity GOOD - greater than the design peak flow of 4.09 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 6.00 (August 2025)



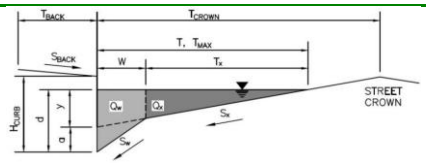
Design Information (Input)		MINOR	MAJOR	
Type of Inlet (CDOT Type R Curb Opening)	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	2	2	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f (G) =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f (C) =	0.10	0.10	

Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q_a =**	**1.7**	**4.0**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.1**	**cfs**
Capture Percentage = Q_a/Q_o	**C% =**	**100**	**98**	**%**

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

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

Project: **DXD Castle Rock Storage**
Inlet ID: **Ex Inlet A4**



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	10.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	18.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

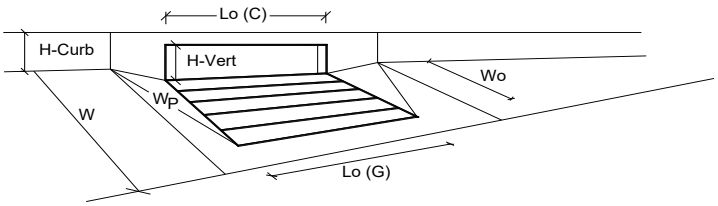
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	18.0	18.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

MINOR STORM Allowable Capacity is not applicable to Sump Condition
MAJOR STORM Allowable Capacity is not applicable to Sump Condition

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

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 6.00 (August 2025)

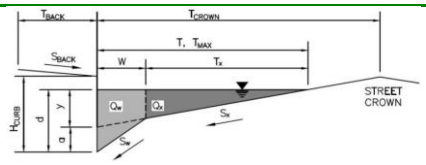


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	5.8	5.8	inches
Grate Information		MINOR	MAJOR	☐ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Open Area Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.32	0.32	ft
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	1.00	1.00	
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**5.0**	**5.0**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)	$Q_{PEAK\ REQUIRED}$ =	1.7	3.6	cfs

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

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

Project: **DXD Castle Rock Storage**
Inlet ID: **Ex Inlet-A3.1 - DP6**



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	5.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	42.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.013	

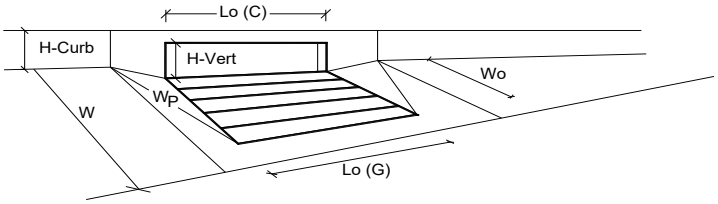
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	42.0	42.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	12.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

MINOR STORM Allowable Capacity is not applicable to Sump Condition
MAJOR STORM Allowable Capacity is not applicable to Sump Condition

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

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 6.00 (August 2025)



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	Denver No. 16 Combination		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	2.00	2.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	11.6	inches
Grate Information		MINOR	MAJOR	☐ Override Depths
Length of a Unit Grate	L_o (G) =	3.00	3.00	feet
Width of a Unit Grate	W_o =	1.73	1.73	feet
Open Area Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	0.31	0.31	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	0.50	0.50	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	3.60	3.60	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	0.60	0.60	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	3.00	3.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.50	6.50	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	5.25	5.25	inches
Angle of Throat	Theta =	0.00	0.00	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.70	3.70	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.66	0.66	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	0.52	0.99	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.33	0.80	ft
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	0.94	1.00	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	N/A	N/A	
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.94	1.00	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**5.6**	**9.0**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)	$Q_{PEAK\ REQUIRED}$ =	3.4	7.2	cfs

Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Wednesday, Mar 11 2026

Alley 1

User-defined

Invert Elev (ft)	= 6021.49
Slope (%)	= 1.00
N-Value	= Composite

Calculations

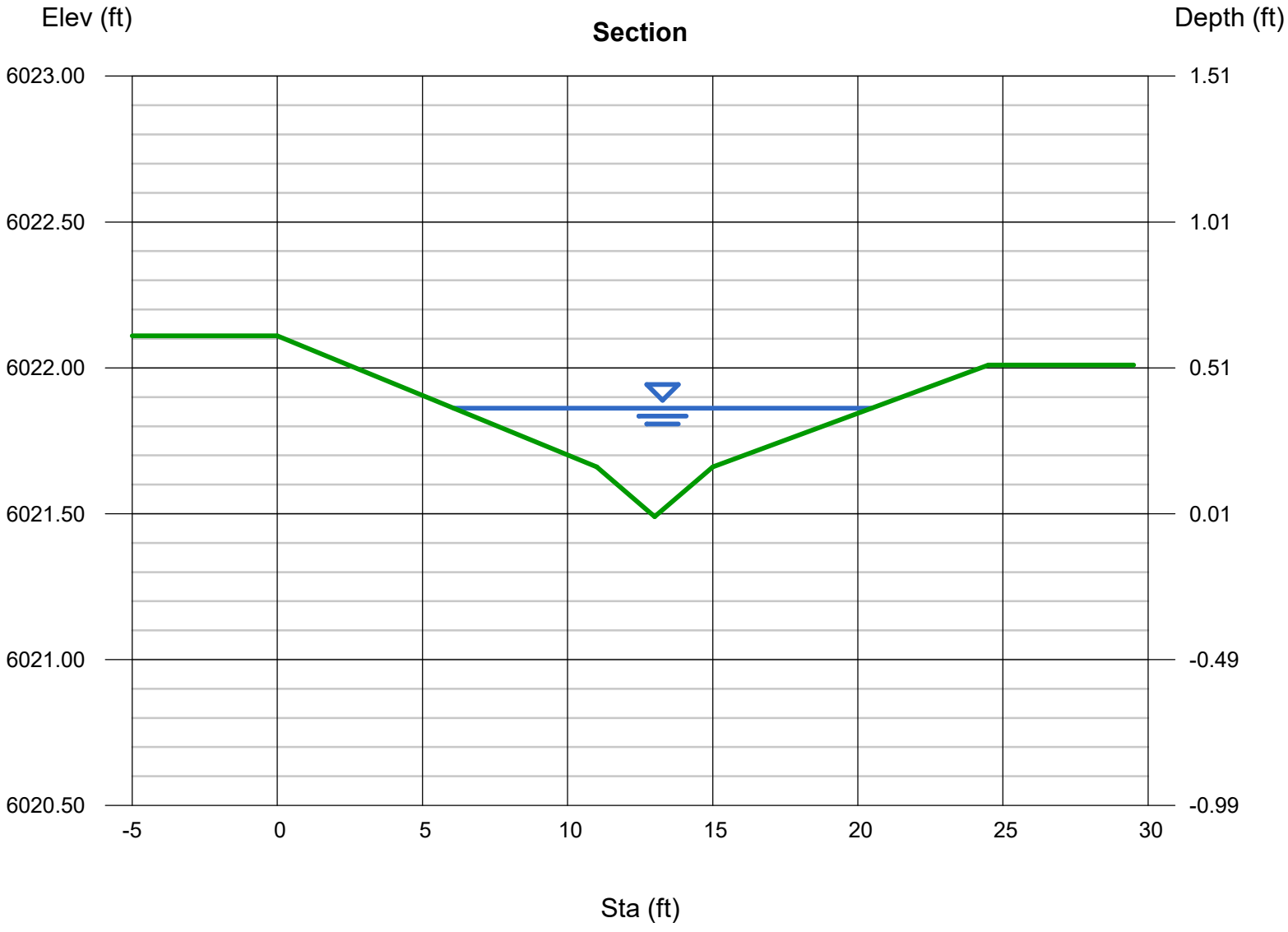
Compute by:	Q vs Depth
No. Increments	= 10

Highlighted

Depth (ft)	= 0.37
Q (cfs)	= 7.167
Area (sqft)	= 2.20
Velocity (ft/s)	= 3.26
Wetted Perim (ft)	= 14.43
Crit Depth, Yc (ft)	= 0.43
Top Width (ft)	= 14.41
EGL (ft)	= 0.54

(Sta, El, n)-(Sta, El, n)...

(0.00, 6022.11)-(11.00, 6021.66, 0.013)-(13.00, 6021.49, 0.013)-(15.00, 6021.66, 0.013)-(24.50, 6022.01, 0.013)



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Wednesday, Mar 11 2026

Alley 2

User-defined

Invert Elev (ft)	= 6022.55
Slope (%)	= 1.00
N-Value	= Composite

Calculations

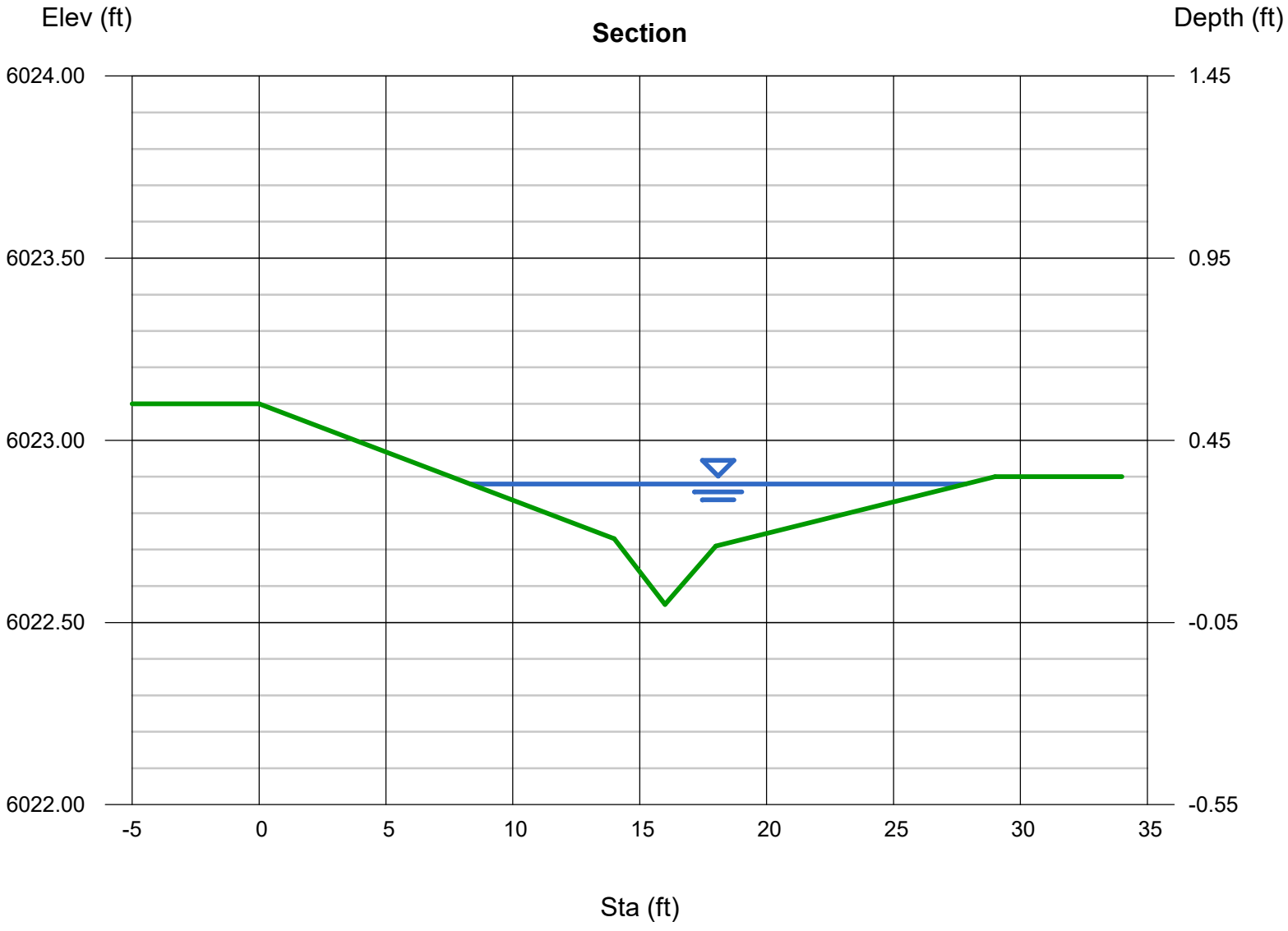
Compute by:	Q vs Depth
No. Increments	= 10

Highlighted

Depth (ft)	= 0.33
Q (cfs)	= 6.058
Area (sqft)	= 2.24
Velocity (ft/s)	= 2.70
Wetted Perim (ft)	= 19.53
Crit Depth, Yc (ft)	= 0.37
Top Width (ft)	= 19.51
EGL (ft)	= 0.44

(Sta, El, n)-(Sta, El, n)...

(0.00, 6023.10)-(14.00, 6022.73, 0.013)-(16.00, 6022.55, 0.013)-(18.00, 6022.71, 0.013)-(29.00, 6022.90, 0.013)



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Wednesday, Mar 11 2026

Alley 3

User-defined

Invert Elev (ft)	= 6022.07
Slope (%)	= 1.00
N-Value	= Composite

Calculations

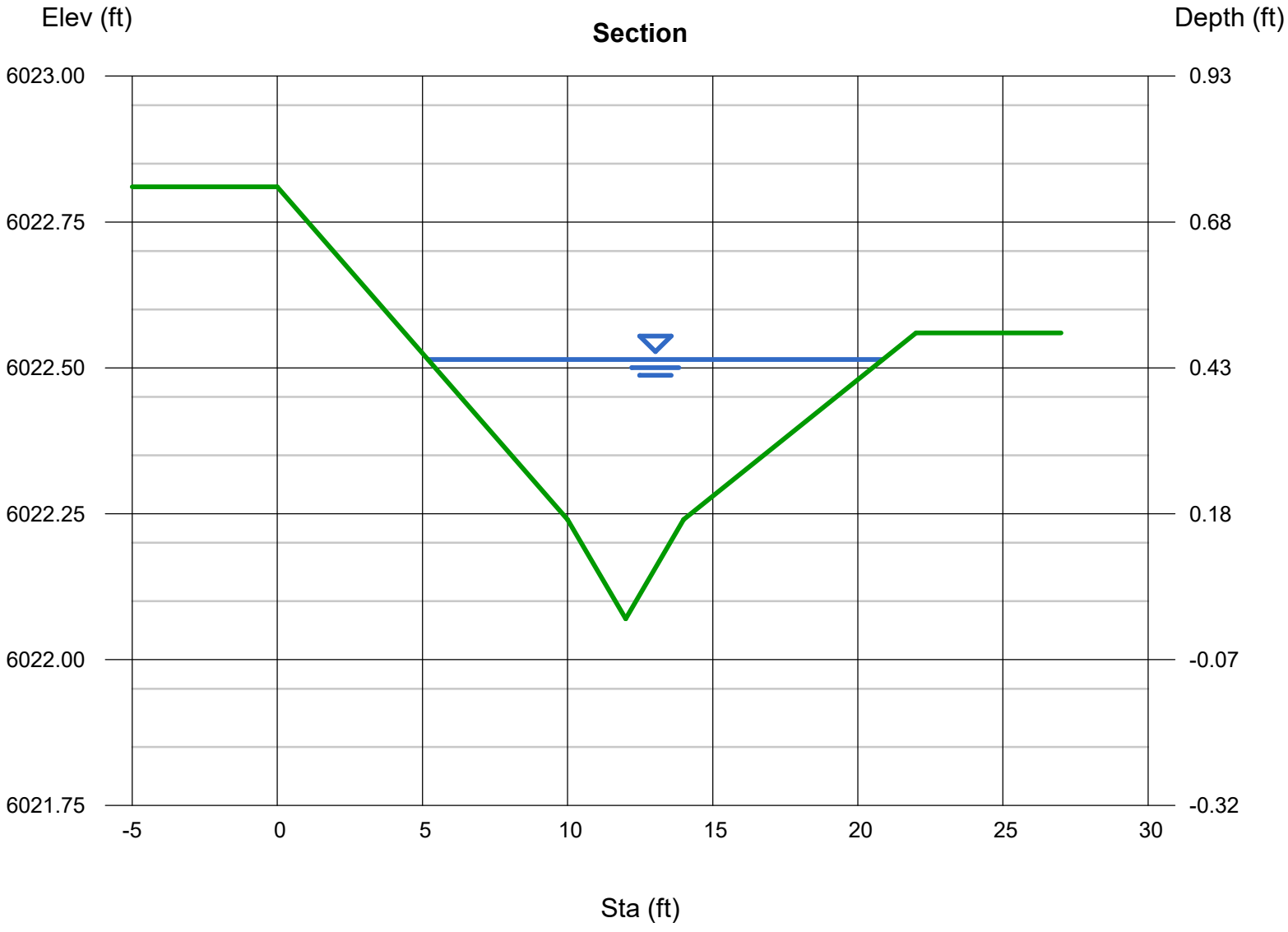
Compute by:	Q vs Depth
No. Increments	= 10

Highlighted

Depth (ft)	= 0.44
Q (cfs)	= 11.61
Area (sqft)	= 3.03
Velocity (ft/s)	= 3.83
Wetted Perim (ft)	= 15.69
Crit Depth, Yc (ft)	= 0.52
Top Width (ft)	= 15.66
EGL (ft)	= 0.67

(Sta, El, n)-(Sta, El, n)...

(0.00, 6022.81)-(10.00, 6022.24, 0.013)-(12.00, 6022.07, 0.013)-(14.00, 6022.24, 0.013)-(22.00, 6022.56, 0.013)



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Wednesday, Mar 11 2026

Alley 4

User-defined

Invert Elev (ft)	= 6023.06
Slope (%)	= 2.00
N-Value	= Composite

Calculations

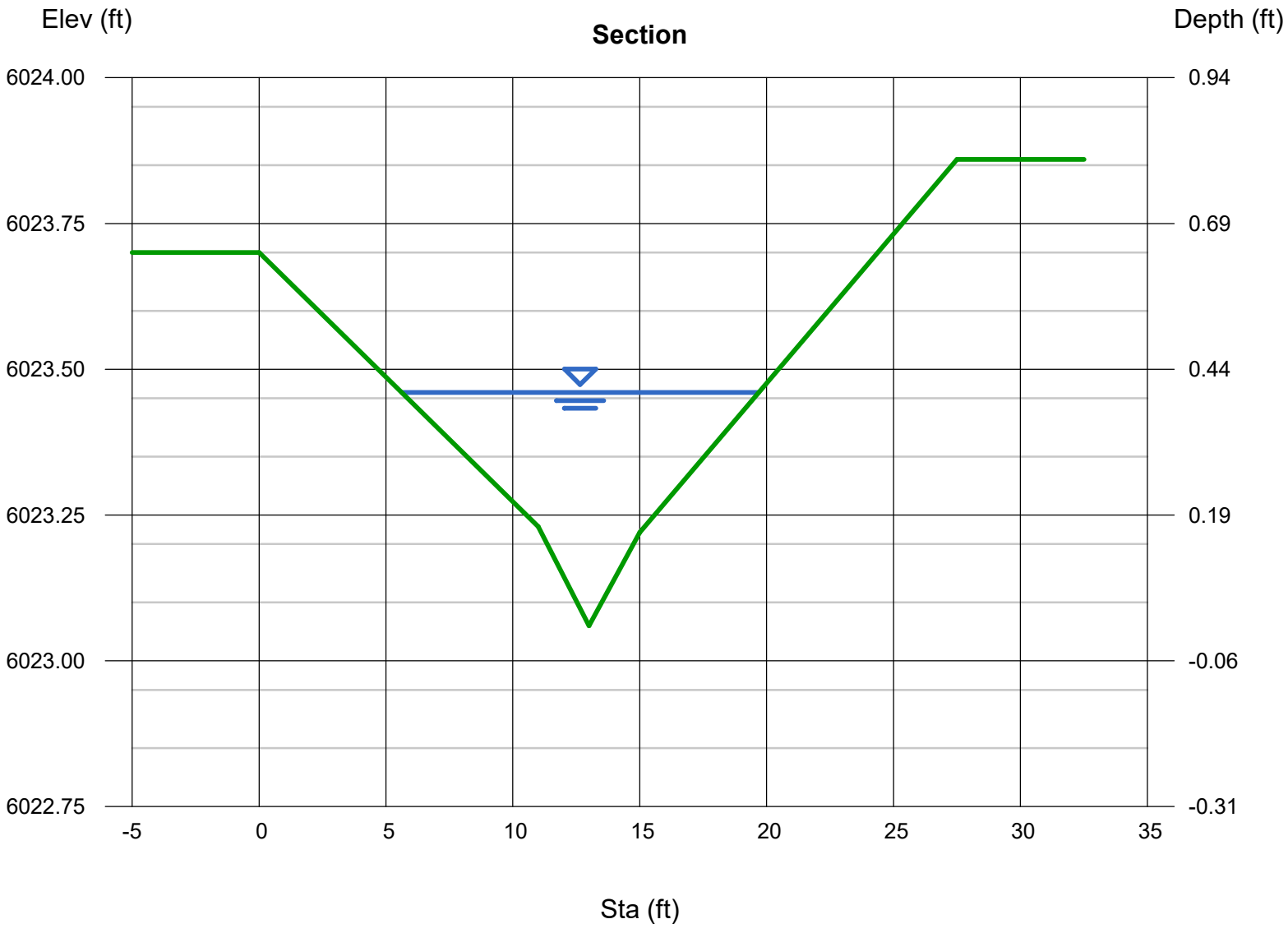
Compute by:	Q vs Depth
No. Increments	= 10

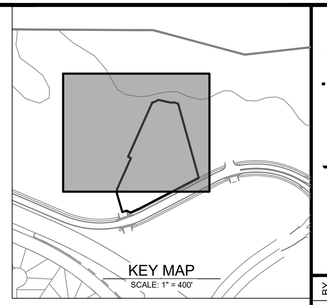
Highlighted

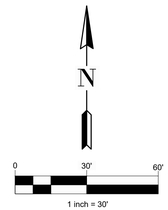
Depth (ft)	= 0.40
Q (cfs)	= 12.36
Area (sqft)	= 2.45
Velocity (ft/s)	= 5.04
Wetted Perim (ft)	= 14.09
Crit Depth, Yc (ft)	= 0.53
Top Width (ft)	= 14.07
EGL (ft)	= 0.80

(Sta, El, n)-(Sta, El, n)...

(0.00, 6023.70)-(11.00, 6023.23, 0.013)-(13.00, 6023.06, 0.013)-(15.00, 6023.22, 0.013)-(27.50, 6023.86, 0.013)







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

#	REVISION DESCRIPTION	DATE	BY
1	1ST SUBMITTAL	04/17/2026	MM

NOT FOR CONSTRUCTION

DXD CASTLE ROCK STORAGE
CASTLE ROCK, COLORADO

PHASE III DRAINAGE REPORT
STORMCAD KEYMAP

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

4/17/2026 9:09 AM X:\DXD CAPITAL - MEADOWS STORAGE\DOCUMENTS\REPORTS\DRAINAGE\01 - FINAL CD\SB3 - STORM CAD STORMCAD KEYMAP.DWG 1

STORMCAD OUTPUT TABLES

DXD Storm - 5-Year

Catchment Table - Time: 0.00 hours

Label	Outflow Element	Area (acres)	Runoff Coeff.	Time of C (min)	Catchment CA (acres)	Intensity (in/h)	Flow (cfs)
A1	INLET-23	0.230	0.790	5.000	0.182	3.799	0.70
A2	INLET-22	0.260	0.790	5.000	0.205	3.799	0.79
A3	INLET-21	0.710	0.810	5.700	0.575	3.665	2.12
A4	INLET-20	0.790	0.710	5.400	0.561	3.721	2.10
A5	INLET-23	1.160	0.740	7.500	0.858	3.365	2.91

Catch Basin Table - Time: 0.00 hours

Label	Rim (ft)	Invert (ft)	Flow (cfs)	HGL (In) (ft)	HGL (Out) (ft)	Inlet Location	Notes
INLET-20	6,022.65	6,015.47	2.10	6,016.09	6,016.09	In Sag	10' TYPE R INLET
INLET-21	6,022.48	6,013.42	4.17	6,014.20	6,014.20	In Sag	TYPE 13 INLET
INLET-22	6,021.44	6,012.55	4.84	6,013.40	6,013.40	In Sag	TYPE 13 INLET
INLET-23	6,020.62	6,011.52	8.08	6,012.70	6,012.70	In Sag	10' TYPE R INLET

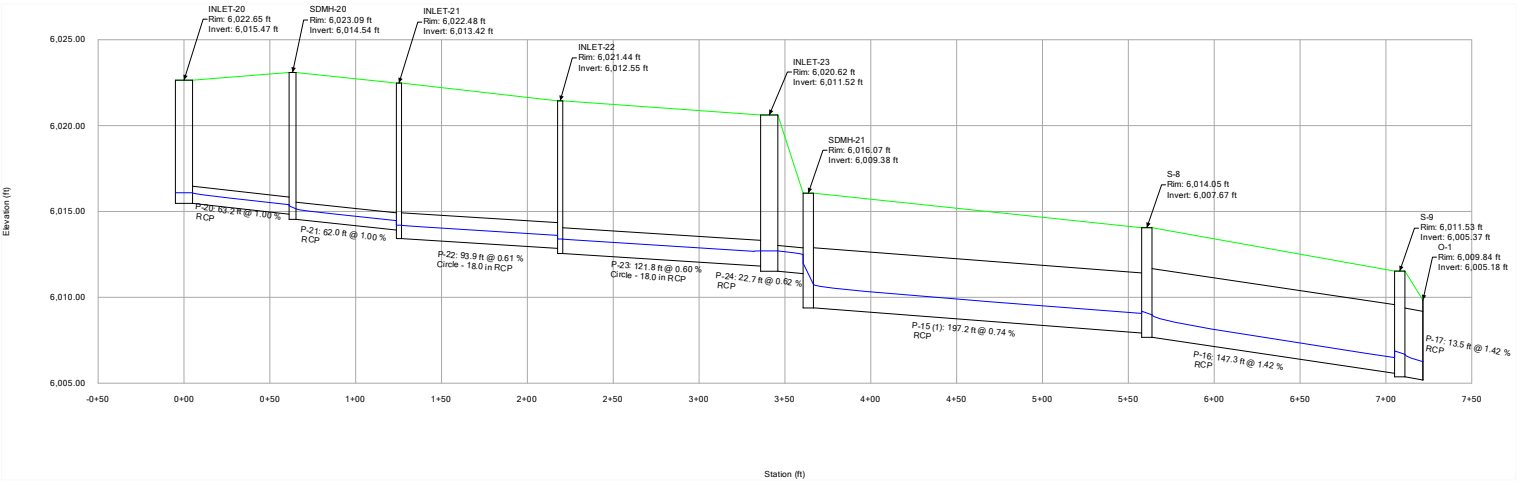
Conduit Table - Time: 0.00 hours

Label	Start Node	Stop Node	Invert (Start) (ft)	Invert (Stop) (ft)	Length (ft)	Slope (%)	Dia (in)	Mann.	Flow (cfs)	Velo. (ft/s)	Depth (ft)	Capacity (cfs)	Froude Number	HGL (In) (ft)	HGL (Out) (ft)
P-15	S-59	SDMH-21	6,011.73	6,009.39	315.0	0.74	42.0	0.013	11.89	6.32	1.05	86.77	1.414	6,012.78	6,011.99
P-15 (1)	SDMH-21	S-8	6,009.39	6,007.92	197.2	0.74	42.0	0.013	19.94	7.32	1.37	86.77	1.417	6,010.76	6,009.06
P-16	S-8	S-9	6,007.67	6,005.57	147.3	1.42	48.0	0.013	19.78	9.10	1.31	171.42	1.994	6,008.98	6,006.49
P-17	S-9	O-1	6,005.37	6,005.18	13.5	1.42	48.0	0.013	19.69	9.08	1.31	171.42	1.994	6,006.68	6,006.26
P-20	INLET-20	SDMH-20	6,015.47	6,014.84	63.2	1.00	12.0	0.013	2.10	4.72	0.62	3.56	1.242	6,016.09	6,015.39
P-21	SDMH-20	INLET-21	6,014.54	6,013.92	62.0	1.00	12.0	0.013	2.08	4.71	0.62	3.56	1.247	6,015.16	6,014.47
P-22	INLET-21	INLET-22	6,013.42	6,012.85	93.9	0.61	18.0	0.013	4.17	4.65	0.78	8.18	1.062	6,014.20	6,013.61
P-23	INLET-22	INLET-23	6,012.55	6,011.82	121.8	0.60	18.0	0.013	4.84	4.80	0.85	8.13	1.029	6,013.40	6,012.70
P-24	INLET-23	SDMH-21	6,011.52	6,011.38	22.7	0.62	18.0	0.013	8.08	5.32	1.10	8.24	0.832	6,012.70	6,012.48

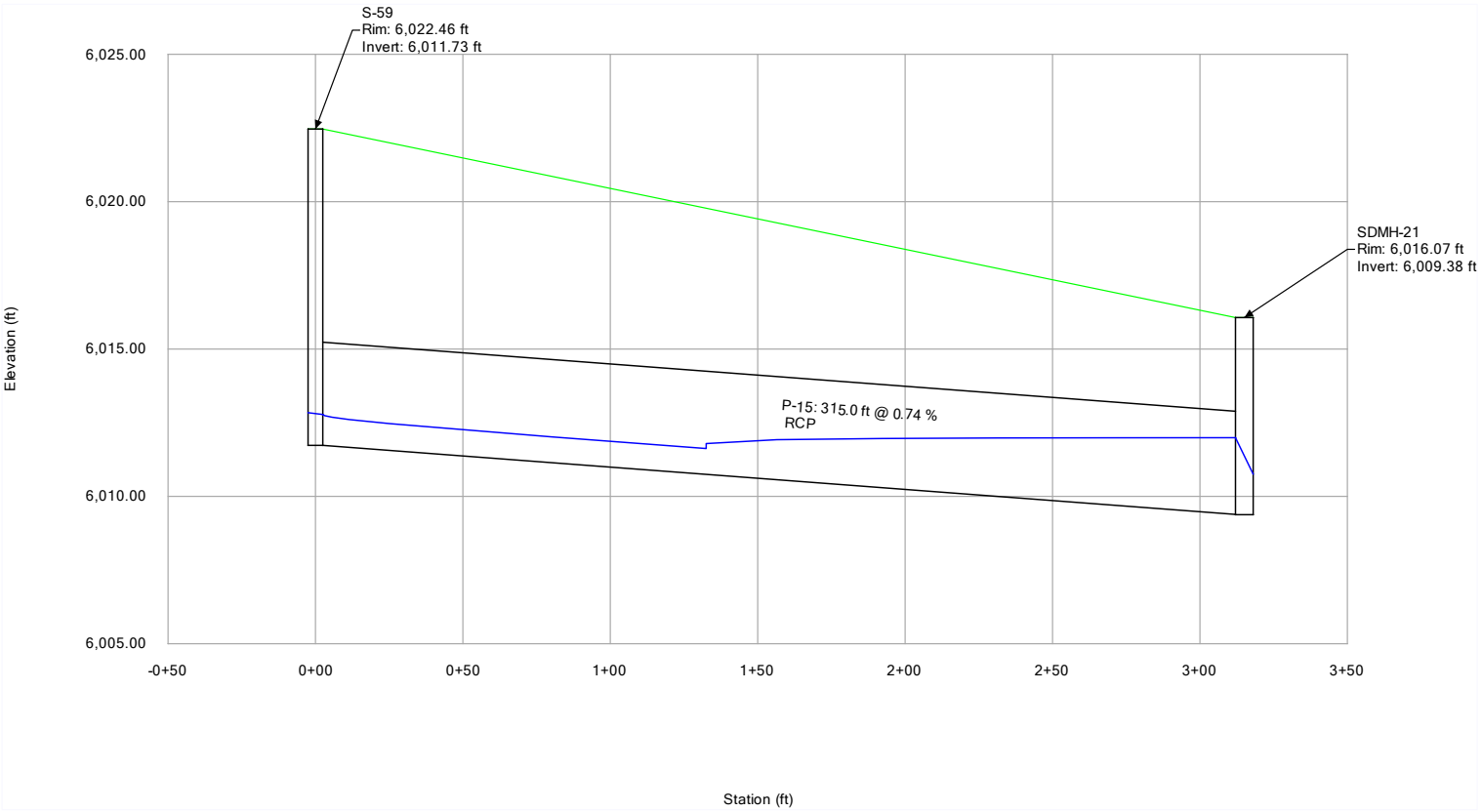
Manhole Table - Time: 0.00 hours

Label	Flow (cfs)	Headloss (ft)	Elevation (Rim) (ft)	HGL (In) (ft)	HGL (Out) (ft)	Notes	Headloss Method	AASHTO Shaping Method
S-8	19.78	0.21	6,014.05	6,009.19	6,008.98	6' DIA MH FLAT TOP	AASHTO	Full
S-9	19.69	0.20	6,011.53	6,006.88	6,006.68	6' DIA MH FLAT TOP	AASHTO	Full
S-59	11.89	0.06	6,022.46	6,012.84	6,012.78	6' DIA MH	AASHTO	Full
SDMH-20	2.08	0.17	6,023.09	6,015.32	6,015.16	4' DIA MH FLAT TOP	AASHTO	Full
SDMH-21	19.94	1.24	6,016.07	6,011.99	6,010.76	6' DIA MH FLAT TOP	AASHTO	Full

STORMCAD OUTPUT TABLES
DXD Storm - 5-Year



STORMCAD OUTPUT TABLES
DXD Storm - 5-Year



STORMCAD OUTPUT TABLES

DXD Storm - 100-Year

Catchment Table - Time: 0.00 hours

Label	Outflow Element	Area (acres)	Runoff Coeff.	Time of C (min)	Catchment CA (acres)	Intensity (in/h)	Flow (cfs)
A1	INLET-23	0.230	0.860	5.000	0.198	8.242	1.64
A2	INLET-22	0.260	0.860	5.000	0.224	8.242	1.86
A3	INLET-21	0.710	0.870	5.700	0.618	7.952	4.95
A4	INLET-20	0.790	0.820	5.400	0.648	8.073	5.27
A5	INLET-23	1.160	0.840	7.500	0.974	7.302	7.17

Catch Basin Table - Time: 0.00 hours

Label	Rim (ft)	Invert (ft)	Flow (cfs)	HGL (In) (ft)	HGL (Out) (ft)	Inlet Location	Notes
INLET-20	6,022.65	6,015.47	5.27	6,019.69	6,019.69	In Sag	10' TYPE R INLET
INLET-21	6,022.48	6,013.42	10.14	6,016.69	6,016.69	In Sag	TYPE 13 INLET
INLET-22	6,021.44	6,012.55	11.77	6,015.81	6,015.81	In Sag	TYPE 13 INLET
INLET-23	6,020.62	6,011.52	19.59	6,014.28	6,014.28	In Sag	10' TYPE R INLET

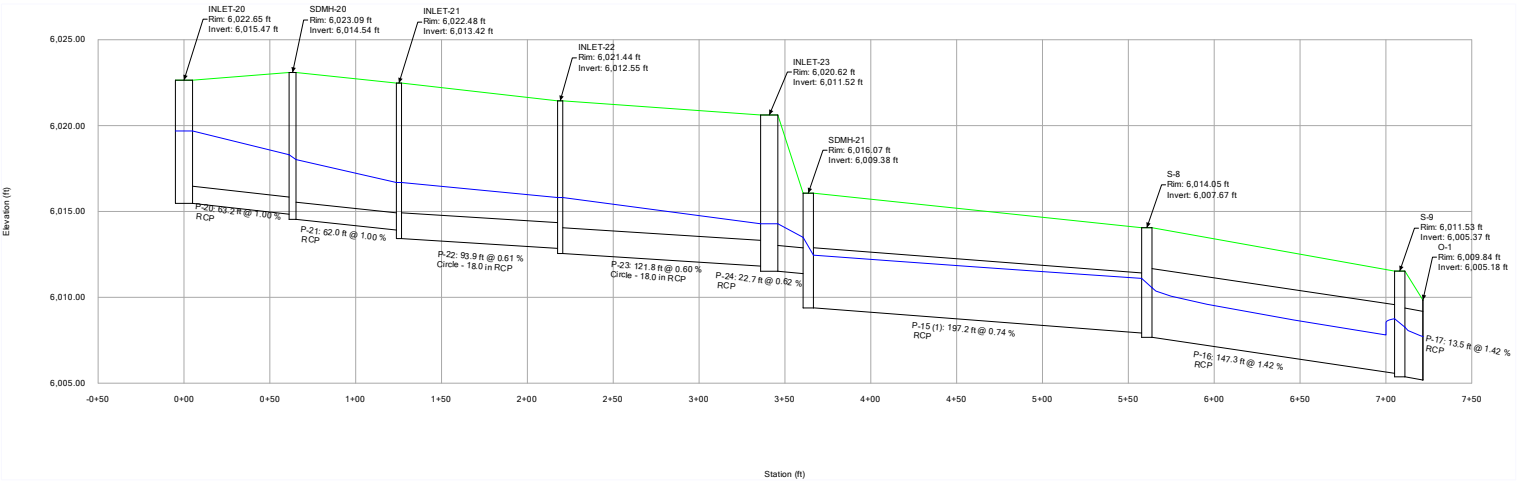
Conduit Table - Time: 0.00 hours

Label	Start Node	Stop Node	Invert (Start) (ft)	Invert (Stop) (ft)	Length (ft)	Slope (%)	Dia (in)	Mann.	Flow (cfs)	Velo. (ft/s)	Depth (ft)	Capacity (cfs)	Froude Number	HGL (In) (ft)	HGL (Out) (ft)
P-15	S-59	SDMH-21	6,011.73	6,009.39	315.0	0.74	42.0	0.013	71.50	10.07	2.65	86.77	1.198	6,015.01	6,013.49
P-15 (1)	SDMH-21	S-8	6,009.39	6,007.92	197.2	0.74	42.0	0.013	91.06	10.22	2.96	86.77	0.921	6,012.46	6,011.10
P-16	S-8	S-9	6,007.67	6,005.57	147.3	1.42	48.0	0.013	90.78	13.84	2.89	171.42	1.904	6,010.56	6,008.75
P-17	S-9	O-1	6,005.37	6,005.18	13.5	1.42	48.0	0.013	90.63	13.83	2.89	171.42	1.905	6,008.26	6,007.72
P-20	INLET-20	SDMH-20	6,015.47	6,014.84	63.2	1.00	12.0	0.013	5.27	6.71	0.93	3.56	1.183	6,019.69	6,018.30
P-21	SDMH-20	INLET-21	6,014.54	6,013.92	62.0	1.00	12.0	0.013	5.23	6.66	0.93	3.56	1.174	6,018.02	6,016.69
P-22	INLET-21	INLET-22	6,013.42	6,012.85	93.9	0.61	18.0	0.013	10.14	5.74	1.23	8.18	0.826	6,016.69	6,015.81
P-23	INLET-22	INLET-23	6,012.55	6,011.82	121.8	0.60	18.0	0.013	11.77	6.66	1.30	8.13	0.959	6,015.81	6,014.28
P-24	INLET-23	SDMH-21	6,011.52	6,011.38	22.7	0.62	18.0	0.013	19.59	11.08	1.46	8.24	1.596	6,014.28	6,013.49

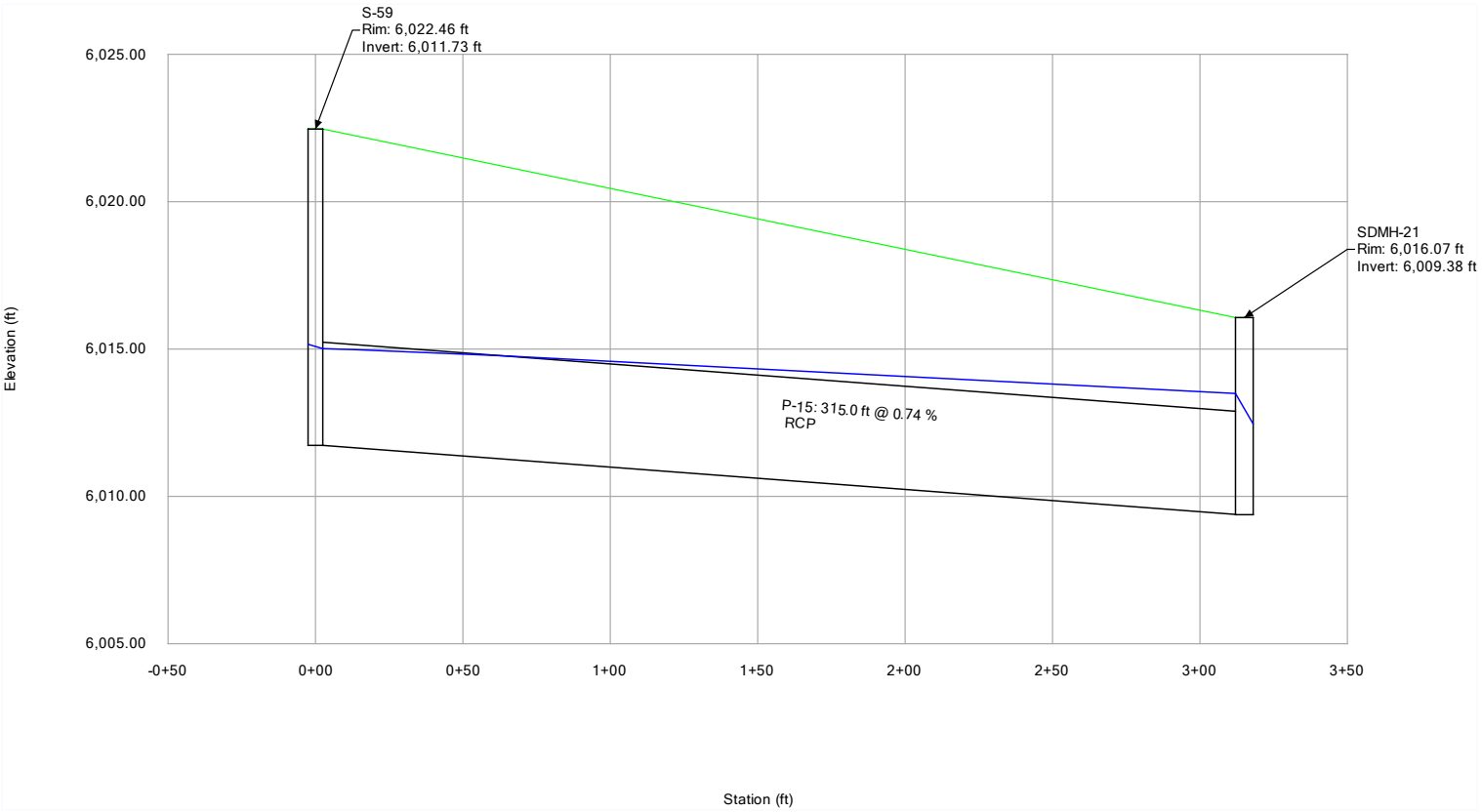
Manhole Table - Time: 0.00 hours

Label	Flow (cfs)	Headloss (ft)	Elevation (Rim) (ft)	HGL (In) (ft)	HGL (Out) (ft)	Notes	Headloss Method	AASHTO Shaping Method
S-8	90.78	0.54	6,014.05	6,011.10	6,010.56	6' DIA MH FLAT TOP	AASHTO	Full
S-9	90.63	0.49	6,011.53	6,008.75	6,008.26	6' DIA MH FLAT TOP	AASHTO	Full
S-59	71.50	0.15	6,022.46	6,015.16	6,015.01	6' DIA MH	AASHTO	Full
SDMH-20	5.23	0.28	6,023.09	6,018.30	6,018.02	4' DIA MH FLAT TOP	AASHTO	Full
SDMH-21	91.06	1.04	6,016.07	6,013.49	6,012.46	6' DIA MH FLAT TOP	AASHTO	Full

STORMCAD OUTPUT TABLES
DXD Storm - 100-Year



STORMCAD OUTPUT TABLES
DXD Storm - 100-Year



APPENDIX D
REFERENCES

Phase 1 Master Drainage Report for The Meadows, Castle Rock, Rocky Mountain Consultants, Inc., March 2002.

Phase III Drainage Report for The Meadows, Filing No. 19 Lot 2 North, prepared by Terracina Design, May 2022.

Final Drainage Report UDG Meadowmark, Meadows Filing No. 19 Lot 2 North Parcel D2A, prepared by Ware Malcomb, April 2023

Excerpts from the " Phase III Drainage Report for The Meadows Filing No. 19 Lot 2 North" by Terracina Design, Approved May 2022

PHASE III DRAINAGE REPORT
FOR
The Meadows Filing No. 19 Lot 2 North
Castle Rock, CO
Project No. CD21-0042

PREPARED FOR:

CASTLE ROCK DEVELOPMENT CO.
3033 E. 1ST AVE. #310
DENVER, COLORADO 80206
303-394-5500
CONTACT: R.C HANISCH

PREPARED BY:

TERRACINA DESIGN, LLC
10200 E. GIRARD AVENUE
BUILDING A, SUITE 314
DENVER, CO 80231
PHONE: 303-632-8867
CONTACT: MARTIN METSKER, PE
PROJECT NUMBER: 14-003

MAY 2022

BASIN A4

Basin A4 encompasses an eastern portion of the Timber Mill Pkwy. and includes a small portion of the N. Meadows Blvd. roundabout and landscape area. Runoff generated from this basin will drain generally north and west towards a proposed sump inlet at DP A4. Once captured by the inlet, runoff will be conveyed in the proposed storm sewer system, to proposed detention pond A. Should the inlet at design point A4 become plugged it will top the curb and be sheet flow north across undeveloped land to a temporary swale and eventually to pond A.

BASIN A5

Basin A5 encompasses an eastern portion of the site north of the collector road and is all open space. At this time there is no proposed development in Basin A5 and, runoff generated from this basin will sheet flow north into a temporary swale that will discharge into an area inlet at DP A5 that discharges into pond A. This basin is to be eventually developed and has been preliminarily designed with a conservative impervious value.

BASIN A6

Basin A6 encompasses an eastern portion of the site north of Timber Mill Pkwy. and is all open space. Currently there is no proposed development in Basin A6. Runoff generated from this basin will sheet flow north into a swale that discharge into inlets, then conveyed to pond A via the proposed storm sewer system. This basin is to be eventually developed and has been preliminarily designed with a conservative impervious value.

BASIN A7

Basin A7 encompasses an eastern portion of the site north of Timber Mill Pkwy. and is all open space. At this time there is no proposed development in Basin A7 and, runoff generated from this basin will sheet flow north into two temporary swales that will discharge into an area inlet at DP A7 that discharges into pond A. This basin is to be eventually developed and has been preliminarily designed with a conservative impervious value.

BASIN A8

Basin A8 encompasses pond A and native grass area that will remain undeveloped. The detention pond is sized to receive all flows from basins A1-A7 for proposed interim and future conditions. Should the pond overflow or the outlet become plugged, overflows will be conveyed from the pond to East Plum Creek via a hardened emergency overflow.

BASIN A9

Basin A9 encompasses an eastern portion of the Timber Mill Pkwy. Runoff generated from this basin will drain generally north and west towards a proposed on-grade inlet at DP A9. Once captured by the inlet, runoff will be conveyed in the proposed storm sewer system, to proposed detention pond A. Should the inlet at design point A9 become plugged, flows will continue north and west to the sump inlet located at DP A4 and eventually to pond A.

BASIN A10

Basin A10 encompasses an eastern portion of Timber Mill Pkwy. and includes a small portion of the N. Meadows Blvd. roundabout and landscape area. Runoff generated from this basin will

Excerpts from the " Phase III Drainage Report for The Meadows Filing No. 19 Lot 2 North" by Terracina Design, Approved May 2022

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

Project Name: Meadows Filing 19 Lot 2 North
Prepared By: MJG

Percent Impervious Calculations

					Streets		
		Total	Historic	Roof	Paved	Gravel	
			2%	90%	100%	40%	
Basin Id	Design Point	Total Basin Area	Area	Area	Area	Area	Weighted % Impervious
A01	A01	2.22	0.00	2.22			90.0%
A02	A02	6.71	0.00	6.71			90.0%
A03	A03	0.48	0.08		0.40		83.2%
A04	A04	0.69	0.13		0.56		82.1%
A05	A05	2.65	0.00	2.65			90.0%
A06	A06	9.73	0.00	9.73			90.0%
A07	A07	7.59	0.00	7.59			90.0%
A08	A08	2.08	2.08				2.0%
A09	A09	0.49	0.12		0.37		76.4%
A10	A10	0.73	0.13		0.60		82.0%
B1	B1	7.75	0.00	7.75			90.0%
C1	C1	0.58	0.21		0.37		63.9%
C2	C2	0.82	0.19		0.64		77.9%
C3	C3	1.91	0.00	1.91			90.0%
C4	C4	2.00	0.00	2.00			90.0%
C5	C5	4.76	0.00	4.76			90.0%
C6	C6	0.95	0.00	0.28		0.68	54.5%
C7	C7	0.74	0.74				2.0%
C8	C8	1.35	0.34		1.00		75.0%
C9	C9	1.36	0.62		0.74		55.1%
CO1	CO1	4.56	2.49			2.07	19.3%
CO2	CO2	3.79	2.22			1.56	17.7%
D1	D1	4.80	0.66		0.37	3.77	39.4%
C10	C10	0.14	0.05		0.09		64.6%
C11	C11	0.09	0.03		0.06		65.5%

Excerpts from the " Phase III Drainage Report for The Meadows Filing No. 19 Lot 2 North" by Terracina Design, Approved May 2022

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

Project Name: Meadows Filing 19 Lot 2 North
Prepared By: MJG

Runoff Coefficent (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	Runoff Coefficients, C		Weighted Runoff Coefficients, C	
						5-Year	100-Year	5-Year	100-Year
A01	90.0%	0.90	A	0.00	2.22	0.75	0.81	0.77	0.85
			B	0.00		0.77	0.85		
			C/D	2.22		0.77	0.85		
A02	90.0%	0.90	A	0.00	6.71	0.75	0.81	0.77	0.85
			B	0.00		0.77	0.85		
			C/D	6.71		0.77	0.85		
A03	83.2%	0.83	A	0.00	0.48	0.68	0.76	0.72	0.83
			B	0.00		0.70	0.82		
			C/D	0.48		0.72	0.83		
A04	82.1%	0.82	A	0.00	0.69	0.67	0.75	0.71	0.82
			B	0.00		0.69	0.81		
			C/D	0.69		0.71	0.82		
A05	90.0%	0.90	A	0.00	2.65	0.75	0.81	0.77	0.85
			B	0.00		0.77	0.85		
			C/D	2.65		0.77	0.85		
A06	90.0%	0.90	A	0.00	9.73	0.75	0.81	0.77	0.85
			B	0.00		0.77	0.85		
			C/D	9.73		0.77	0.85		
A07	90.0%	0.90	A	0.00	7.59	0.75	0.81	0.77	0.85
			B	0.00		0.77	0.85		
			C/D	7.59		0.77	0.85		
A08	2.0%	0.02	A	0.00	2.08	0.01	0.13	0.05	0.49
			B	0.00		0.01	0.44		
			C/D	2.08		0.05	0.49		
A09	76.4%	0.76	A	0.00	0.49	0.61	0.71	0.66	0.80
			B	0.00		0.64	0.79		
			C/D	0.49		0.66	0.80		
A10	82.0%	0.82	A	0.00	0.73	0.67	0.75	0.71	0.82
			B	0.00		0.69	0.81		
			C/D	0.73		0.71	0.82		
B1	90.0%	0.90	A	0.00	7.75	0.75	0.81	0.77	0.85
			B	0.00		0.77	0.85		
			C/D	7.75		0.77	0.85		
C1	63.9%	0.64	A	0.00	0.58	0.49	0.61	0.56	0.75
			B	0.00		0.53	0.73		
			C/D	0.58		0.56	0.75		
C2	77.9%	0.78	A	0.00	0.82	0.63	0.72	0.67	0.80
			B	0.00		0.66	0.79		
			C/D	0.82		0.67	0.80		
C3	90.0%	0.90	A	0.00	1.91	0.75	0.81	0.77	0.85
			B	0.00		0.77	0.85		
			C/D	1.91		0.77	0.85		
C4	90.0%	0.90	A	0.00	2.00	0.75	0.81	0.77	0.85
			B	0.00		0.77	0.85		
			C/D	2.00		0.77	0.85		
C5	90.0%	0.90	A	0.00	4.76	0.75	0.81	0.77	0.85
			B	0.00		0.77	0.85		
			C/D	4.76		0.77	0.85		
C6	54.5%	0.55	A	0.00	0.95	0.40	0.54	0.48	0.71
			B	0.00		0.44	0.68		
			C/D	0.95		0.48	0.71		
C7	2.0%	0.02	A	0.00	0.74	0.01	0.13	0.05	0.49
			B	0.00		0.01	0.44		
			C/D	0.74		0.05	0.49		
C8	75.0%	0.75	A	0.00	1.35	0.60	0.69	0.65	0.79
			B	0.00		0.63	0.78		
			C/D	1.35		0.65	0.79		
C9	55.1%	0.55	A	0.00	1.36	0.40	0.54	0.49	0.71
			B	0.00		0.45	0.69		
			C/D	1.36		0.49	0.71		
CO1	19.3%	0.19	A	0.00	4.56	0.11	0.26	0.19	0.56
			B	0.00		0.14	0.52		
			C/D	4.56		0.19	0.56		
CO2	17.7%	0.18	A	0.00	3.79	0.09	0.25	0.18	0.56
			B	0.00		0.13	0.51		
			C/D	3.79		0.18	0.56		
D1	39.4%	0.39	A	0.00	4.80	0.26	0.42	0.36	0.65
			B	0.00		0.31	0.61		
			C/D	4.80		0.36	0.65		
C10	64.6%	0.65	A	0.00	0.14	0.49	0.61	0.56	0.75
			B	0.00		0.53	0.73		
			C/D	0.14		0.56	0.75		
C11	65.5%	0.66	A	0.00	0.09	0.50	0.62	0.57	0.75
			B	0.00		0.54	0.73		
			C/D	0.09		0.57	0.75		

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ph. 303.632.8867

Project Name: Meadows Filing 19 Lot 2 North
Prepared By: MJG

Time of Concentration Calculations (T_C)

Sub-Basin Data			Initial or Overland Flow Time				Channelized Flow Time				T_c Check (Urbanized Basins)					
Basin Id	Total Basin	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)
A01	2.22	0.77	300	19	6.3	5.56	92	3	3.4	20.0	3.68	0.4	6.0	90.0%	11.1	6.0
A02	6.71	0.77	300	33	11.0	4.63	723	12	1.7	20.0	2.58	4.7	9.3	90.0%	15.0	9.3
A03	0.48	0.72	19	1	5.3	1.74	466	8	1.7	20.0	2.62	3.0	4.7	83.2%	14.7	5.0
A04	0.69	0.71	300	2	0.7	14.01	75	0	0.2	20.0	0.95	1.3	15.3	82.1%	13.3	13.3
A05	2.65	0.77	300	5	1.7	8.64	364	5	1.4	20.0	2.34	2.6	11.2	90.0%	13.1	11.2
A06	9.73	0.77	300	7	2.3	7.73	705	7	1.0	20.0	1.99	5.9	13.6	90.0%	16.2	13.6
A07	7.59	0.77	300	10	3.3	6.91	535	12	2.2	20.0	3.00	3.0	9.9	90.0%	13.5	9.9
A08	2.08	0.05	300	11	3.8	21.13	377	1	0.3	15.0	0.77	8.1	29.3	2.0%	38.8	29.3
A09	0.49	0.66	19	1	5.3	1.99	478	6	1.2	20.0	2.17	3.7	5.7	76.4%	16.7	5.7
A10	0.73	0.71	300	11	3.6	8.06	197	2	1.2	20.0	2.16	1.5	9.6	82.0%	13.5	9.6
B1	7.75	0.77	300	3	1.0	10.16	521	7	1.4	20.0	2.39	3.6	13.8	90.0%	14.1	13.8
C1	0.58	0.56	13	2	12.0	1.52	321	6	2.0	20.0	2.84	1.9	3.4	63.9%	17.2	5.0
C2	0.82	0.67	25	1	4.0	2.44	670	8	1.1	20.0	2.14	5.2	7.7	77.9%	18.0	7.7
C3	1.91	0.77	10	2	20.0	0.69	10	2	15.0	20.0	7.75	0.0	0.7	90.0%	10.7	5.0
C4	2.00	0.77	10	2	24.3	0.65	10	1	11.8	20.0	6.87	0.0	0.7	90.0%	10.7	5.0
C5	4.76	0.77	10	1	11.8	0.83	10	6	60.0	20.0	15.49	0.0	0.8	90.0%	10.7	5.0
C6	0.95	0.48	300	3	1.0	19.17	311	3	1.0	20.0	2.02	2.6	21.7	54.5%	19.8	19.8
C7	0.74	0.05	226	11	4.7	17.12	10	1	10.0	20.0	6.32	0.0	17.1	2.0%	25.7	17.1
C8	1.35	0.65	29	1	2.2	3.39	1469	21	1.5	20.0	2.42	10.1	13.5	75.0%	23.7	13.5
C9	1.36	0.49	110	4	3.6	7.58	1307	19	1.5	20.0	2.41	9.0	16.6	55.1%	27.4	16.6
CO1	4.56	0.19	300	32	10.7	12.99	2385	36	1.5	15.0	1.85	21.4	34.4	19.3%	50.2	34.4
CO2	3.79	0.18	300	2	0.7	32.89	1746	31	1.8	15.0	2.00	14.6	47.5	17.7%	42.0	42.0
D1	4.80	0.36	300	5	1.7	19.59	509	11	2.2	15.0	2.21	3.8	23.4	39.4%	23.3	23.3
C10	0.14	0.56	10	1	7.8	1.55	133	2	1.2	20.0	2.21	1.0	2.6	64.6%	16.1	5.0
C11	0.09	0.57	1	1	50.0	0.26	133	3	1.9	20.0	2.74	0.8	1.1	65.5%	15.8	5.0

Excerpts from the " Phase III Drainage Report for The Meadows Filing No. 19 Lot 2 North" by Terracina Design, Approved May 2022

terracina design
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Denver, CO 80231
ph. 303.632.8867

Project Name: Meadows Filing 19 Lot 2 North

Prepared By: MJG

Peak Runoff Rational Method (5-Year Event)

				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)**
A01	A01	2.22	0.77	6.0	1.71	4.62	7.91
A02	A02	6.71	0.77	9.3	5.18	3.98	20.61
A03	A03	0.48	0.72	5.0	0.35	4.85	1.68
A04	A04	0.69	0.71	13.3	0.49	3.43	1.67
A05	A05	2.65	0.77	11.2	2.05	3.69	7.56
A06	A06	9.73	0.77	13.6	7.52	3.39	25.54
A07	A07	7.59	0.77	9.9	5.87	3.89	22.81
A08	A08	2.08	0.05	29.3	0.11	2.28	0.24
A09	A09	0.49	0.66	5.7	0.33	4.69	1.53
A10	A10	0.73	0.71	9.6	0.52	3.93	2.04
B1	B1	7.75	0.77	13.8	5.99	3.38	20.23
C1	C1	0.58	0.56	5.0	0.32	4.85	1.57
C2	C2	0.82	0.67	7.7	0.56	4.27	2.37
C3	C3	1.91	0.77	5.0	1.48	4.85	7.17
C4	C4	2.00	0.77	5.0	1.54	4.85	7.48
C5	C5	4.76	0.77	5.0	3.68	4.85	17.83
C6	C6	0.95	0.48	19.8	0.46	2.83	1.30
C7	C7	0.74	0.05	17.1	0.04	3.04	0.12
C8	C8	1.35	0.65	13.5	0.87	3.41	2.98
C9	C9	1.36	0.49	16.6	0.66	3.09	2.04
CO1	CO1	4.56	0.19	34.4	0.88	2.07	1.82
CO2	CO2	3.79	0.18	42.0	0.68	1.82	1.24
D1	D1	4.80	0.36	23.3	1.72	2.59	4.47
C10	C10	0.14	0.56	5.0	0.08	4.85	0.37
C11	C11	0.09	0.57	5.0	0.05	4.85	0.24

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Project Name: Meadows Filing 19 Lot 2 North

Prepared By: MJG

Peak Runoff Rational Method (100-Year Event)

						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)**
A01	A01	2.22	0.85	6.0	1.89	8.39	15.87
A02	A02	6.7054	0.85300	9.3100	5.72	7.23	41.36
A03	A03	0.48	0.83	5.0	0.40	8.82	3.51
A04	A04	0.69	0.82	13.3	0.56	6.23	3.51
A05	A05	2.65	0.85	11.2	2.26	6.71	15.17
A06	A06	9.73	0.85	13.6	8.30	6.17	51.23
A07	A07	7.59	0.85	9.9	6.48	7.07	45.76
A08	A08	2.08	0.49	29.3	1.02	4.14	4.24
A09	A09	0.49	0.80	5.7	0.39	8.52	3.34
A10	A10	0.73	0.82	9.6	0.60	7.15	4.31
B1	B1	7.75	0.85	13.8	6.61	6.14	40.58
C1	C1	0.58	0.75	5.0	0.43	8.82	3.82
C2	C2	0.82	0.80	7.7	0.66	7.76	5.14
C3	C3	1.91	0.85	5.0	1.63	8.82	14.38
C4	C4	2.00	0.85	5.0	1.70	8.82	15.01
C5	C5	4.76	0.85	5.0	4.06	8.82	35.77
C6	C6	0.95	0.71	19.8	0.67	5.14	3.46
C7	C7	0.74	0.49	17.1	0.37	5.53	2.02
C8	C8	1.35	0.79	13.5	1.07	6.19	6.60
C9	C9	1.36	0.71	16.6	0.96	5.62	5.41
CO1	CO1	4.56	0.56	34.4	2.57	3.76	9.64
CO2	CO2	3.79	0.56	42.0	2.11	3.32	6.99
D1	D1	4.80	0.65	23.3	3.10	4.72	14.63
C10	C10	0.14	0.75	5.0	0.10	8.82	0.90
C11	C11	0.09	0.75	5.0	0.07	8.82	0.58

Excerpts from the " Phase III Drainage Report for The Meadows Filing No. 19 Lot 2 North" by Terracina Design, Approved May 2022

MHFD-Inlet, Version 5.01 (April 2021)

INLET MANAGEMENT

Worksheet Protected

INLET NAME	Inlet A3 - OG	Inlet A4 - Sump	Inlet A5 - Sump Area	Inlet A9 - OG	Inlet 10 - Sump
Site Type (Urban or Rural)					
Inlet Application (Street or Area)	STREET	STREET	AREA	STREET	STREET
Hydraulic Condition	On Grade	In Sump	Swale	On Grade	In Sump
Inlet Type	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type C	CDOT Type R Curb Opening	CDOT Type R Curb Opening

USER-DEFINED INPUT

User-Defined Design Flows

Minor Q_{Known} (cfs)	1.7	1.7	7.6	1.5	2.0
Major Q_{Known} (cfs)	3.5	3.5	15.2	3.3	4.3

Bypass (Carry-Over) Flow from Upstream

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)					
Major Bypass Flow Received, Q_b (cfs)					

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)	**1.7**	**1.7**	**7.6**	**1.5**	**2.0**
Major Total Design Peak Flow, Q (cfs)	**3.5**	**3.5**	**15.2**	**3.3**	**4.3**
Minor Flow Bypassed Downstream, Q_b (cfs)	0.0	N/A	0.0	0.0	N/A
Major Flow Bypassed Downstream, Q_b (cfs)	0.0	N/A	0.0	0.0	N/A

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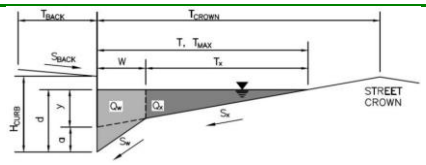
MHFD-Inlet, Version 5.01 (April 2021)

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

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

Project: **Meadows Filing 19 Lot 2 North**
Inlet ID: **Inlet A9 - OG**



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	10.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	18.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.012	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	18.0	18.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☐	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	**Q_{allow} =**	**13.6**	**13.6**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'
Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

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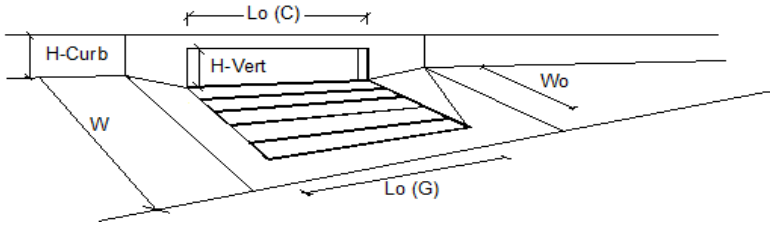
INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.01 (April 2021)



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	2	2	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	

Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**1.5**	**3.3**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.0**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**100**	**%**

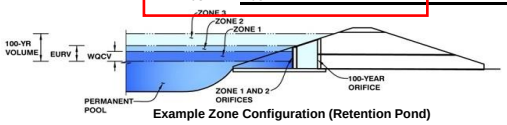
Excerpts from the " Phase III Drainage Report for The Meadows Filing No. 19 Lot 2 North" by Terracina Design, Approved May 2022

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)

Project: Filing 19 Lot 2 North Master

Basin ID: Basin A



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	33.36	acres
Watershed Length =	2,155	ft
Watershed Length to Centroid =	803	ft
Watershed Slope =	0.019	ft/ft
Watershed Imperviousness =	89.40%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	100.0%	percent
Percentage Hydrologic Soil Groups C/D =	0.0%	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.

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	1.102	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	3.340	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 1.06 in.) =	2.580	acre-feet	1.06	inches
5-yr Runoff Volume (P1 = 1.43 in.) =	3.643	acre-feet	1.43	inches
10-yr Runoff Volume (P1 = 1.66 in.) =	4.310	acre-feet	1.66	inches
25-yr Runoff Volume (P1 = 2 in.) =	5.341	acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.26 in.) =	6.112	acre-feet	2.26	inches
100-yr Runoff Volume (P1 = 2.6 in.) =	7.143	acre-feet	2.60	inches
500-yr Runoff Volume (P1 = 3 in.) =	8.334	acre-feet	3.00	inches
Approximate 2-yr Detention Volume =	2.385	acre-feet		
Approximate 5-yr Detention Volume =	3.332	acre-feet		
Approximate 10-yr Detention Volume =	4.063	acre-feet		
Approximate 25-yr Detention Volume =	4.590	acre-feet		
Approximate 50-yr Detention Volume =	4.785	acre-feet		
Approximate 100-yr Detention Volume =	5.108	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	1.102	acre-feet
Zone 2 Volume (EURV - Zone 1) =	2.238	acre-feet
Zone 3 (100yr + 1 / 2 WQCV - Zones 1 & 2) =	2.319	acre-feet
Total Detention Basin Volume =	5.659	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	

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

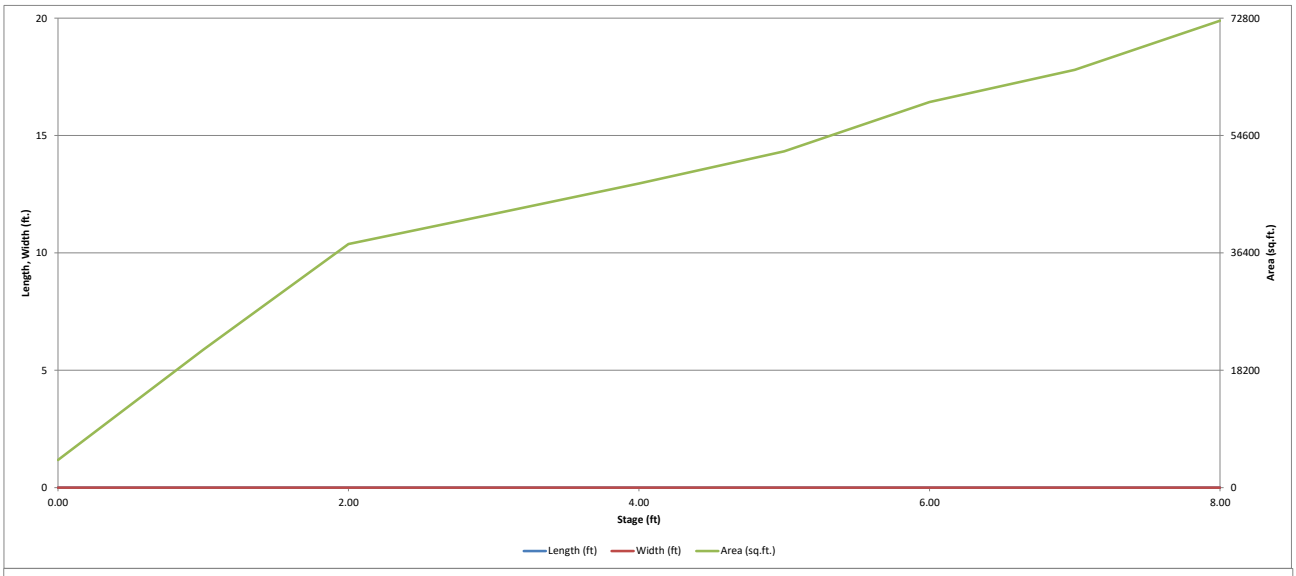
Depth Increment = 1.00 ft

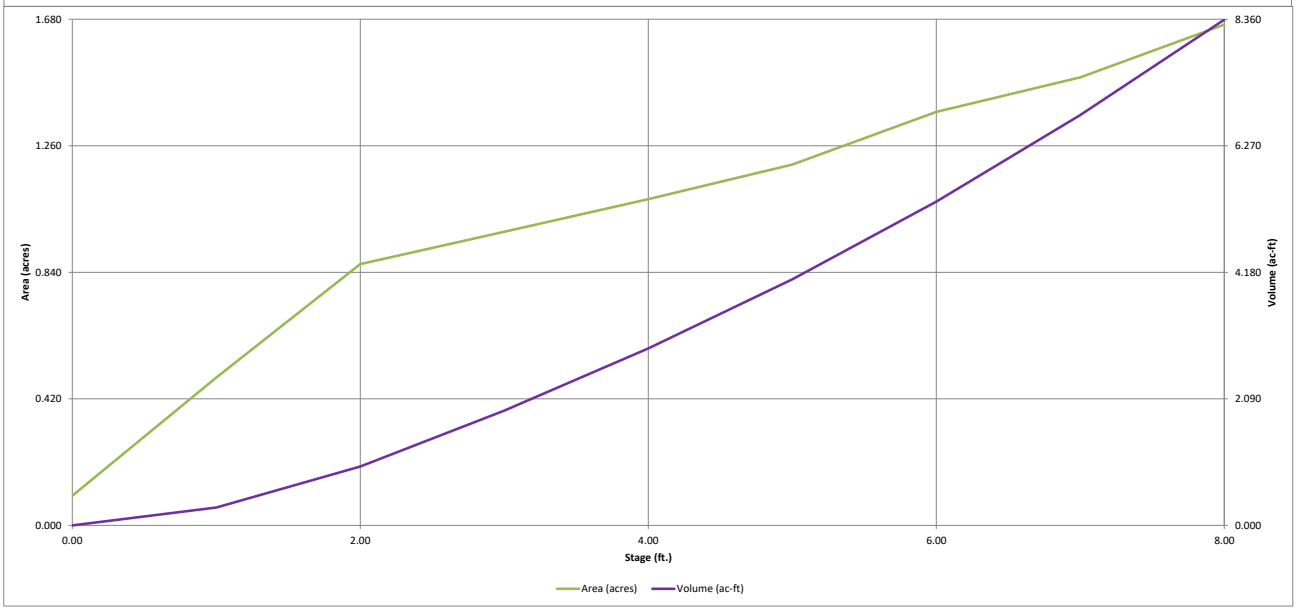
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	4,289	0.098		
6004	--	1.00	--	--	--	21,389	0.491	12,839	0.295
6005	--	2.00	--	--	--	37,772	0.867	42,420	0.974
6006	--	3.00	--	--	--	42,445	0.974	82,529	1.895
6007	--	4.00	--	--	--	47,169	1.083	127,336	2.923
6008	--	5.00	--	--	--	52,154	1.197	176,998	4.063
6009	--	6.00	--	--	--	59,782	1.372	232,966	5.348
6010	--	7.00	--	--	--	64,782	1.487	295,248	6.778
6011	--	8.00	--	--	--	72,401	1.662	363,839	8.353

Excerpts from the " Phase III Drainage Report for The Meadows Filing No. 19 Lot 2 North" by Terracina Design, Approved May 2022

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)



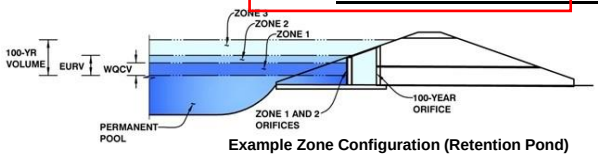


Excerpts from the " Phase III Drainage Report for The Meadows Filing No. 19 Lot 2 North" by Terracina Design, Approved May 2022

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)

Project: Filing 19 Lot 2 North Master
Basin ID: Basin A



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.15	1.102	Orifice Plate
Zone 2 (EURV)	4.38	2.238	Rectangular Orifice
3 (100+1/2WQCV)	6.23	2.319	Weir&Pipe (Restrict)
Total (all zones)		5.659	

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 Area =	N/A	ft²
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

Calculated Parameters for Underdrain

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)

Invert of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	4.167E-02	ft²
Depth at top of Zone using Orifice Plate =	2.15	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	8.60	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	6.00	sq. inches (use rectangular openings)	Elliptical Slot Area =	N/A	ft²

Calculated Parameters for Plate

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	0.72	1.43					
Orifice Area (sq. inches)	6.00	6.00	6.00					

	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		Zone 2 Rectangular	Not Selected	
Invert of Vertical Orifice =	2.30	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	0.17	N/A	ft²
Depth at top of Zone using Vertical Orifice =	4.50	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	0.08	N/A	feet
Vertical Orifice Height =	2.00	N/A	inches				
Vertical Orifice Width =	12.00		inches				

Calculated Parameters for Vertical Orifice

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

	Zone 3 Weir	Not Selected		Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	4.50	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	6.00	N/A	feet
Overflow Weir Front Edge Length =	4.00	N/A	feet	Overflow Weir Slope Length =	6.18	N/A	feet
Overflow Weir Grate Slope =	4.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	6.15	N/A	
Horiz. Length of Weir Sides =	6.00	N/A	feet	Overflow Grate Open Area w/o Debris =	17.22	N/A	ft²
Overflow Grate Type =	Type C Grate	N/A		Overflow Grate Open Area w/ Debris =	17.22	N/A	ft²
Debris Clogging % =	0%	N/A	%				

Calculated Parameters for Overflow Weir

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

	Zone 3 Restrictor	Not Selected		Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	0.00	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	2.80	N/A	ft²
Outlet Pipe Diameter =	24.00	N/A	inches	Outlet Orifice Centroid =	0.90	N/A	feet
Restrictor Plate Height Above Pipe Invert =	20.00		inches	Half-Central Angle of Restrictor Plate on Pipe =	2.30	N/A	radians

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	6.00	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.97	feet
Spillway Crest Length =	40.00	feet	Stage at Top of Freeboard =	7.97	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	1.66	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	8.30	acre-ft

Calculated Parameters for Spillway

Routed Hydrograph Results

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

Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.06	1.43	1.66	2.00	2.26	2.60	3.00
CUHP Runoff Volume (acre-ft) =	1.102	3.340	2.580	3.643	4.310	5.341	6.112	7.143	8.334
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	2.580	3.643	4.310	5.341	6.112	7.143	8.334
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.5	7.6	11.8	25.2	31.8	42.3	52.5
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.23	0.35	0.75	0.95	1.27	1.57
Peak Inflow Q (cfs) =	N/A	N/A	45.1	62.3	71.5	90.8	103.7	123.7	143.7
Peak Outflow Q (cfs) =	0.7	2.3	1.8	2.3	4.3	10.3	16.4	28.7	47.0
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.3	0.4	0.4	0.5	0.7	0.9
Structure Controlling Flow =	Plate	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	0.1	0.4	0.8	1.5	1.6
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	50	48	51	52	50	49	48	46
Time to Drain 99% of Inflow Volume (hours) =	**41**	56	54	58	60	59	59	58	57
Maximum Ponding Depth (ft) =	2.15	4.38	3.45	4.36	4.85	5.28	5.56	5.95	6.26
Area at Maximum Ponding Depth (acres) =	0.88	1.13	1.02	1.12	1.18	1.24	1.29	1.36	1.40
Maximum Volume Stored (acre-ft) =	1.105	3.343	2.334	3.320	3.885	4.393	4.748	5.266	5.695

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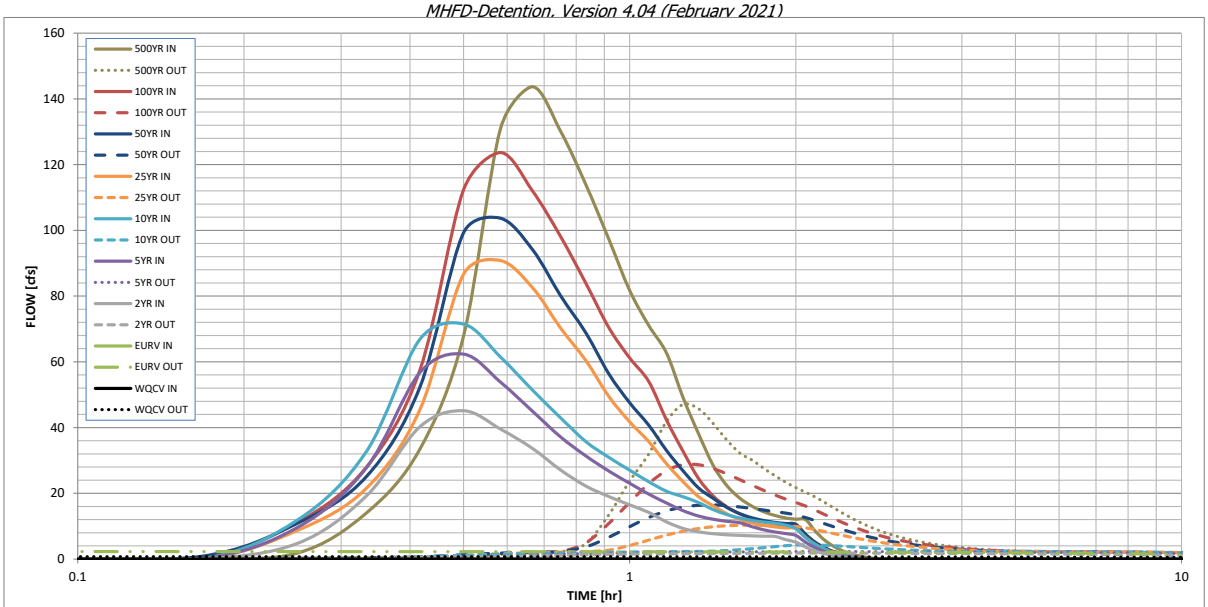
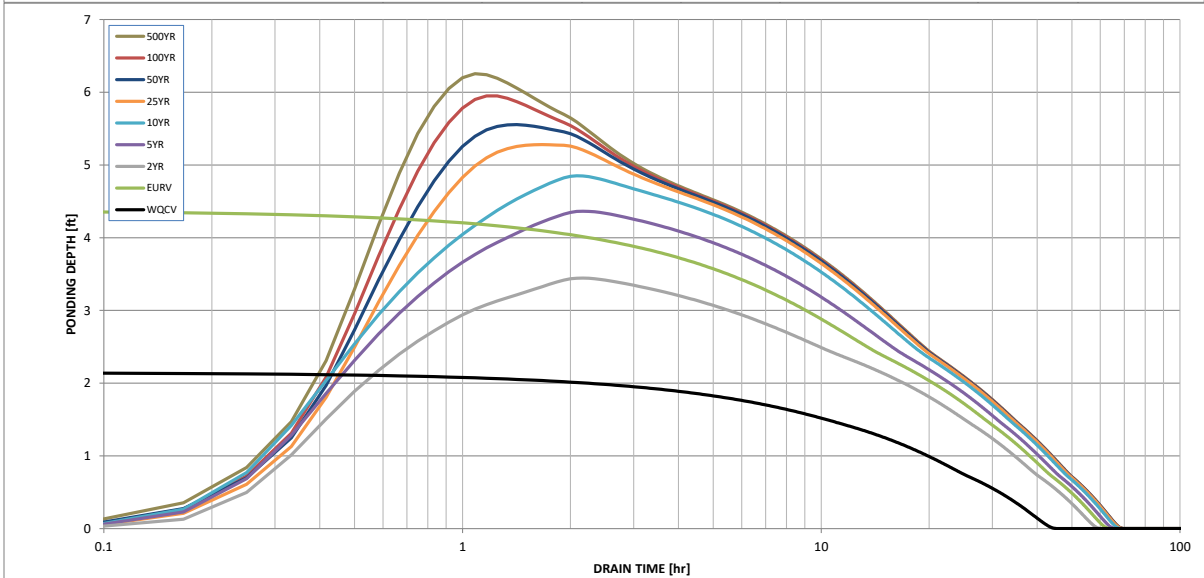
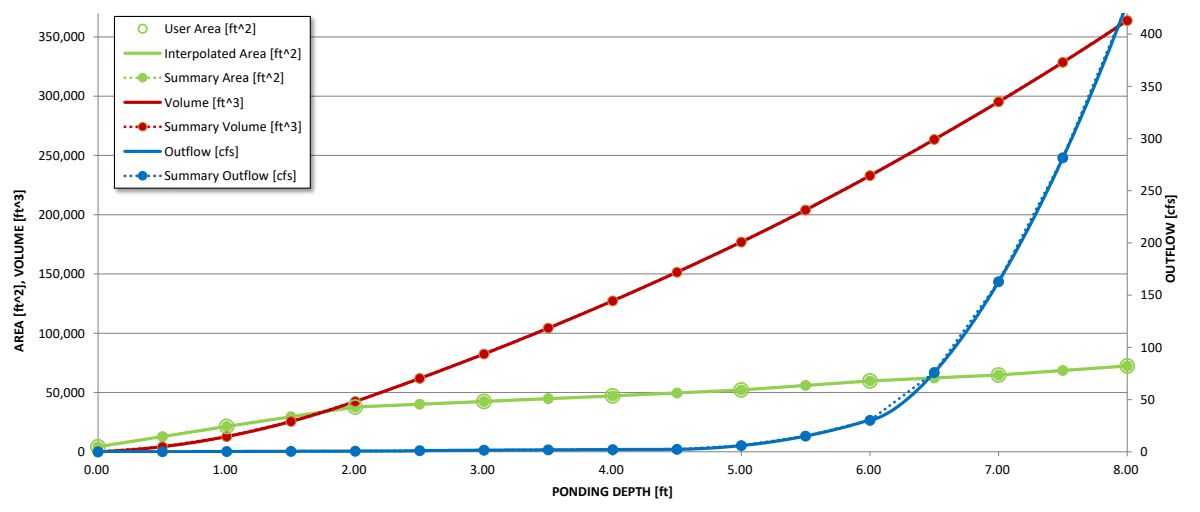
DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)







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

Excerpts from the " Phase III Drainage Report for The Meadows Filing No. 19 Lot 2 North" by Terracina Design, Approved May 2022

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename: _____

Inflow Hydrographs

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

	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.77	0.36	1.82
	0:15:00	0.00	0.00	4.76	9.60	11.85	8.71	10.87	11.14	13.98
	0:20:00	0.00	0.00	19.17	27.72	32.67	21.49	25.04	27.91	33.38
	0:25:00	0.00	0.00	40.22	56.71	66.83	45.36	52.21	57.40	67.79
	0:30:00	0.00	0.00	45.12	62.34	71.51	86.64	99.24	112.31	130.88
	0:35:00	0.00	0.00	39.54	53.85	61.49	90.82	103.70	123.68	143.72
	0:40:00	0.00	0.00	33.65	44.98	51.42	82.58	94.17	112.03	130.11
	0:45:00	0.00	0.00	27.07	37.11	42.93	70.24	80.07	98.09	113.87
	0:50:00	0.00	0.00	22.19	31.35	35.71	60.36	68.78	83.87	97.34
	0:55:00	0.00	0.00	19.01	26.78	30.93	49.48	56.36	70.43	81.74
	1:00:00	0.00	0.00	16.48	23.05	27.04	41.74	47.56	61.19	71.02
	1:05:00	0.00	0.00	14.17	19.74	23.49	35.70	40.69	53.97	62.64
	1:10:00	0.00	0.00	11.27	17.04	20.61	28.95	33.00	42.23	49.06
	1:15:00	0.00	0.00	9.30	14.70	18.94	23.51	26.81	32.74	38.09
	1:20:00	0.00	0.00	8.27	13.08	17.17	18.95	21.61	24.47	28.50
	1:25:00	0.00	0.00	7.71	12.11	15.04	16.20	18.47	19.18	22.35
	1:30:00	0.00	0.00	7.38	11.47	13.53	13.75	15.69	15.89	18.52
	1:35:00	0.00	0.00	7.19	11.05	12.48	12.08	13.78	13.77	16.05
	1:40:00	0.00	0.00	7.05	9.83	11.75	10.99	12.54	12.33	14.37
	1:45:00	0.00	0.00	6.94	8.89	11.25	10.27	11.71	11.37	13.25
	1:50:00	0.00	0.00	6.88	8.23	10.90	9.77	11.14	10.72	12.50
	1:55:00	0.00	0.00	5.90	7.75	10.30	9.46	10.80	10.40	12.12
	2:00:00	0.00	0.00	5.13	7.18	9.25	9.27	10.58	10.27	11.97
	2:05:00	0.00	0.00	3.64	5.10	6.53	6.62	7.55	7.36	8.58
	2:10:00	0.00	0.00	2.47	3.47	4.47	4.52	5.16	5.06	5.90
	2:15:00	0.00	0.00	1.67	2.33	3.04	3.09	3.52	3.47	4.04
	2:20:00	0.00	0.00	1.09	1.51	2.00	2.05	2.33	2.30	2.68
	2:25:00	0.00	0.00	0.68	0.96	1.28	1.32	1.51	1.49	1.73
	2:30:00	0.00	0.00	0.40	0.61	0.79	0.85	0.96	0.95	1.10
	2:35:00	0.00	0.00	0.20	0.34	0.42	0.47	0.54	0.53	0.62
	2:40:00	0.00	0.00	0.08	0.14	0.17	0.21	0.24	0.23	0.27
	2:45:00	0.00	0.00	0.02	0.03	0.04	0.05	0.06	0.06	0.07
	2:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Excerpts from the " Phase III Drainage Report for The Meadows Filing No. 19 Lot 2 North" by Terracina Design, Approved May 2022

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)

Summary Stage-Area-Volume-Discharge Relationships

The user can create a summary S-A-V-D by entering the desired stage increments and the remainder of the table will populate automatically.
The user should graphically compare the summary S-A-V-D table to the full S-A-V-D table in the chart to confirm it captures all key transition points.

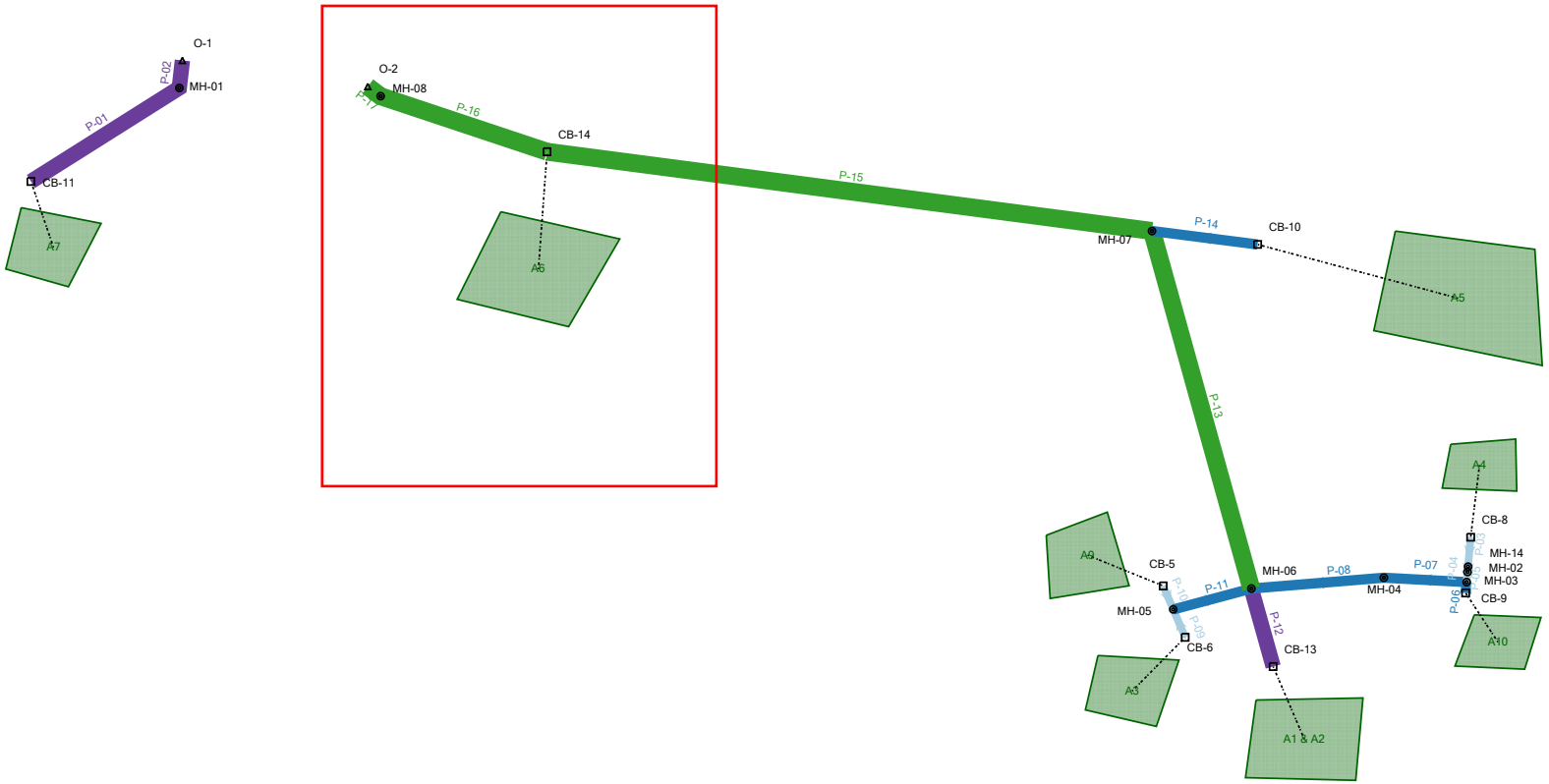
Stage - Storage Description	Stage [ft]	Area [ft^2]	Area [acres]	Volume [ft^3]	Volume [ac-ft]	Total Outflow [cfs]
Micropool	0.00	4,289	0.098	0	0.000	0.00
6003.5	0.50	12,839	0.295	4,282	0.098	0.14
6004	1.00	21,389	0.491	12,839	0.295	0.31
6004.5	1.50	29,581	0.679	25,582	0.587	0.48
6005	2.00	37,772	0.867	42,420	0.974	0.66
6005.5	2.50	40,109	0.921	61,891	1.421	1.07
6006	3.00	42,445	0.974	82,529	1.895	1.53
6006.5	3.50	44,807	1.029	104,342	2.395	1.85
6007	4.00	47,169	1.083	127,336	2.923	2.11
6007.5	4.50	49,662	1.140	151,544	3.479	2.33
6008	5.00	52,154	1.197	176,998	4.063	5.93
6008.5	5.50	55,968	1.285	204,029	4.684	15.05
6009	6.00	59,782	1.372	232,966	5.348	30.12
6009.5	6.50	62,282	1.430	263,482	6.049	75.99
6010	7.00	64,782	1.487	295,248	6.778	162.86
6010.5	7.50	68,591	1.575	328,591	7.543	281.51
6011	8.00	72,401	1.662	363,839	8.353	429.60

For best results, include the stages of all grade slope changes (e.g. ISV and Floor) from the S-A-V table on Sheet 'Basin'.

Also include the inverts of all outlets (e.g. vertical orifice, overflow grate, and spillway, where applicable).

Excerpts from the " Phase III Drainage Report for The Meadows Filing No. 19 Lot 2 North" by Terracina Design, Approved May 2022

Scenario: 100-Year



Excerpts from the " Phase III Drainage Report for The Meadows Filing No. 19 Lot 2 North" by Terracina Design, Approved May 2022

STORMCAD OUTPUT TABLES

Storm Line A - 5 year

Catchment Table - Time: 0.00 hours

ID	Label	Outflow Element	Area (User Defined) (acres)	Runoff Coefficient (Rational)	Time of Concentration (min)	Flow (Total Out) (cfs)	Catchment Intensity (in/h)	Catchment Flow Time (min)
675	A1	CB-13	2.220	0.400	6.000	4.13	4.610	6.000
674	A3	CB-6	0.480	0.720	5.000	1.69	4.850	5.000
678	A4	CB-8	0.690	0.710	13.300	1.69	3.431	13.300
672	A5	CB-10	2.650	0.400	11.200	3.95	3.696	11.200
671	A6	CB-14	9.730	0.400	13.600	13.33	3.397	13.600
670	A7	CB-11	7.590	0.400	9.900	11.89	3.884	9.900
673	A9	CB-5	0.490	0.660	5.700	1.53	4.680	5.700
679	A10	CB-9	0.730	0.710	9.600	2.05	3.931	9.600

Catch Basin Table - Time: 0.00 hours

ID	Headloss Coefficient (Standard)	Label	Elevation (Ground) (ft)	Set Rim to Ground Elevation ?	Elevation (Rim) (ft)	Elevation (Invert) (ft)	Length (ft)	Width (ft)	Inlet Type	Flow (Captured) (cfs)	Hydraulic Grade Line (In) (ft)
646	0.000	CB-5	6,029.11	True	6,029.11	6,025.11	10.00	3.00	Full Capture	1.53	6,025.57
647	0.000	CB-6	6,029.11	True	6,029.11	6,024.71	10.00	3.00	Full Capture	1.69	6,025.20
649	0.000	CB-8	6,026.32	True	6,026.32	6,022.34	10.00	3.00	Full Capture	1.69	6,023.71
650	0.000	CB-9	6,026.32	True	6,026.32	6,021.65	5.00	3.00	Full Capture	2.05	6,022.49
651	0.000	CB-10	6,019.77	True	6,019.77	6,013.51	2.92	2.92	Full Capture	3.95	6,014.24
652	0.000	CB-11	6,010.91	True	6,010.91	6,006.99	2.92	2.92	Full Capture	11.89	6,008.09
657	0.000	CB-13	6,029.34	True	6,029.34	6,017.51	3.00	3.00	Full Capture	3.56	6,018.10
658	0.000	CB-14	6,014.05	True	6,014.05	6,007.67	3.00	3.00	Full Capture	13.33	6,009.11

Conduit Table - Time: 0.00 hours

Label	Start Node	Stop Node	Invert (Start) (ft)	Invert (Stop) (ft)	Slope (%)	Diameter (in)	n Value	Flow (cfs)	Velocity (ft/s)	Depth (Out) (ft)	Capacity (Full Flow) (cfs)	Flow / Capacity (Design) (%)	HGL (In) (ft)	HGL (Out) (ft)
P-01	CB-11	MH-01	6,006.99	6,006.26	0.50	36.0	0.013	11.89	5.56	1.38	47.16	25.2	6,008.09	6,007.64
P-02	MH-01	O-1	6,006.06	6,005.84	0.92	36.0	0.013	11.68	6.89	0.92	64.01	18.3	6,007.14	6,006.76
P-03	CB-8	MH-14	6,022.44	6,022.32	0.50	18.0	0.013	1.69	3.40	1.39	7.43	22.8	6,023.71	6,023.70
P-04	MH-02	MH-14	6,022.22	6,022.19	0.50	18.0	0.013	1.69	0.95	0.98	7.43	22.7	6,023.20	6,023.20
P-05	MH-03	MH-02	6,022.09	6,022.05	0.50	18.0	0.013	1.68	0.95	0.49	7.43	22.7	6,022.70	6,022.58
P-06	CB-9	MH-03	6,021.65	6,021.55	1.09	24.0	0.013	2.05	4.61	0.95	23.62	8.7	6,022.49	6,022.50
P-07	MH-03	MH-04	6,021.35	6,018.45	4.16	24.0	0.013	3.45	8.62	1.15	46.13	7.5	6,022.00	6,019.60
P-08	MH-04	MH-06	6,018.45	6,017.63	0.73	24.0	0.013	3.43	4.65	0.57	19.37	17.7	6,019.10	6,018.20
P-09	CB-6	MH-05	6,024.71	6,024.45	1.00	18.0	0.013	1.69	4.37	0.41	10.52	16.1	6,025.20	6,024.86
P-10	CB-5	MH-05	6,025.11	6,024.45	3.05	18.0	0.013	1.53	6.29	0.30	18.33	8.3	6,025.57	6,024.75
P-11	MH-05	MH-06	6,021.48	6,017.63	5.65	24.0	0.013	3.15	9.35	0.33	53.79	5.8	6,022.09	6,017.96
P-12	CB-13	MH-06	6,017.51	6,016.63	1.29	36.0	0.013	3.56	5.48	0.89	75.72	4.7	6,018.10	6,017.52
P-13	MH-06	MH-07	6,016.13	6,011.93	1.35	42.0	0.013	8.62	7.10	1.35	116.77	7.4	6,017.02	6,013.28
P-14	CB-10	MH-07	6,013.51	6,013.18	0.37	24.0	0.013	3.95	3.77	0.70	13.68	28.9	6,014.24	6,013.88
P-15	MH-07	CB-14	6,011.73	6,007.92	0.74	42.0	0.013	11.89	6.32	1.19	86.77	13.7	6,012.78	6,009.11
P-16	CB-14	MH-08	6,007.67	6,006.57	0.75	48.0	0.013	23.66	7.62	1.18	124.39	19.0	6,009.11	6,007.75
P-17	MH-08	O-2	6,005.44	6,005.30	0.99	48.0	0.013	23.44	8.38	1.24	142.75	16.4	6,006.86	6,006.54

Excerpts from the " Phase III Drainage Report for The Meadows Filing No. 19 Lot 2 North" by Terracina Design, Approved May 2022

STORMCAD OUTPUT TABLES

Storm Line A - 100-Year

Catchment Table - Time: 0.00 hours

ID	Label	Outflow Element	Area (User Defined) (acres)	Runoff Coefficient (Rational)	Time of Concentration (min)	Flow (Total Out) (cfs)	Catchment Intensity (in/h)	Catchment Flow Time (min)
675	A1	CB-13	2.220	0.850	6.000	15.94	8.383	6.000
674	A3	CB-6	0.480	0.830	5.000	3.54	8.819	5.000
678	A4	CB-8	0.690	0.820	13.300	3.56	6.238	13.300
672	A5	CB-10	2.650	0.850	11.200	15.26	6.719	11.200
671	A6	CB-14	9.730	0.850	13.600	51.49	6.176	13.600
670	A7	CB-11	7.590	0.850	9.900	45.92	7.062	9.900
673	A9	CB-5	0.490	0.800	5.700	3.36	8.508	5.700
679	A10	CB-9	0.730	0.820	9.600	4.31	7.147	9.600

Catch Basin Table - Time: 0.00 hours

ID	Headloss Coefficient (Standard)	Label	Elevation (Ground) (ft)	Set Rim to Ground Elevation ?	Elevation (Rim) (ft)	Elevation (Invert) (ft)	Length (ft)	Width (ft)	Inlet Type	Flow (Captured) (cfs)	Hydraulic Grade Line (In) (ft)
646	0.000	CB-5	6,029.11	True	6,029.11	6,025.11	10.00	3.00	Full Capture	3.36	6,026.31
647	0.000	CB-6	6,029.11	True	6,029.11	6,024.71	10.00	3.00	Full Capture	3.54	6,025.93
649	0.000	CB-8	6,026.32	True	6,026.32	6,022.34	10.00	3.00	Full Capture	3.56	6,024.50
650	0.000	CB-9	6,026.32	True	6,026.32	6,021.65	5.00	3.00	Full Capture	4.31	6,023.29
651	0.000	CB-10	6,019.77	True	6,019.77	6,013.51	2.92	2.92	Full Capture	15.26	6,015.92
652	0.000	CB-11	6,010.91	True	6,010.91	6,006.99	2.92	2.92	Full Capture	45.92	6,009.98
657	0.000	CB-13	6,029.34	True	6,029.34	6,017.51	3.00	3.00	Full Capture	55.46	6,021.15
658	0.100	CB-14	6,014.05	True	6,014.05	6,007.67	3.00	3.00	Full Capture	51.49	6,011.45

Conduit Table - Time: 0.00 hours

Label	Start Node	Stop Node	Invert (Start) (ft)	Invert (Stop) (ft)	Slope (%)	Diameter (in)	n Value	Flow (cfs)	Velocity (ft/s)	Depth (Out) (ft)	Capacity (Full Flow) (cfs)	Flow / Capacity (Design) (%)	HGL (In) (ft)	HGL (Out) (ft)
P-01	CB-11	MH-01	6,006.99	6,006.26	0.50	36.0	0.013	45.92	7.60	2.66	47.16	97.4	6,009.48	6,008.92
P-02	MH-01	O-1	6,006.06	6,005.84	0.92	36.0	0.013	45.35	9.82	1.98	64.01	70.8	6,008.25	6,007.82
P-03	CB-8	MH-14	6,022.44	6,022.32	0.50	18.0	0.013	3.56	2.01	1.66	7.43	47.9	6,024.00	6,023.97
P-04	MH-02	MH-14	6,022.22	6,022.19	0.50	18.0	0.013	3.53	2.00	1.25	7.43	47.6	6,023.47	6,023.46
P-05	MH-03	MH-02	6,022.09	6,022.05	0.50	18.0	0.013	3.53	2.00	0.72	7.43	47.5	6,022.96	6,022.81
P-06	CB-9	MH-03	6,021.65	6,021.55	1.09	24.0	0.013	4.31	5.72	1.26	23.62	18.3	6,022.79	6,022.80
P-07	MH-03	MH-04	6,021.35	6,018.45	4.16	24.0	0.013	7.25	10.70	2.33	46.13	15.7	6,022.30	6,020.78
P-08	MH-04	MH-06	6,018.45	6,017.63	0.73	24.0	0.013	7.22	5.72	2.54	19.37	37.3	6,020.28	6,020.18
P-09	CB-6	MH-05	6,024.71	6,024.45	1.00	18.0	0.013	3.54	5.37	0.61	10.52	33.7	6,025.43	6,025.06
P-10	CB-5	MH-05	6,025.11	6,024.45	3.05	18.0	0.013	3.36	7.90	0.47	18.33	18.3	6,025.81	6,024.92
P-11	MH-05	MH-06	6,021.48	6,017.63	5.65	24.0	0.013	6.76	11.70	2.54	53.79	12.6	6,022.40	6,020.18
P-12	CB-13	MH-06	6,017.51	6,016.63	1.29	36.0	0.013	55.46	7.85	3.54	75.72	73.2	6,020.65	6,020.18
P-13	MH-06	MH-07	6,016.13	6,011.93	1.35	42.0	0.013	58.68	12.15	3.13	116.77	50.2	6,018.53	6,015.06
P-14	CB-10	MH-07	6,013.51	6,013.18	0.37	24.0	0.013	15.26	4.86	1.88	13.68	111.5	6,015.42	6,015.06
P-15	MH-07	CB-14	6,011.73	6,007.92	0.74	42.0	0.013	71.50	10.07	3.53	86.77	82.4	6,014.38	6,011.45
P-16	CB-14	MH-08	6,007.67	6,006.57	0.75	48.0	0.013	118.32	11.27	3.12	124.39	95.1	6,010.95	6,009.69

Excerpts from the " Phase III Drainage Report for The Meadows Filing No. 19 Lot 2 North" by Terracina Design, Approved May 2022

D.P. 11 Meadows Blvd.	192	837	189	696

*) Design flows per Filing 11 boundary... Physical constraints by existing development
**) Design flows per Filing 11 culvert

Basin 500

Basin 500 occupies area between Meadows Boulevard and the western property line. The 6400 West Fork tributary crosses the property from south to west, collecting discharge from the relatively long and narrow area of 450 acres. Approximately 3000 feet of steep channel with rocky slopes will remain in its natural state before entering into a residential neighborhood. Two detention ponds will control increased runoff from proposed single family development that is planned on both side of West Meadows Drive. Since Pond 1005 that is constructed along the road's south embankment will detain excessive flows from development south of West Meadows Drive, the natural channel between West Meadows Drive and a local street "A" will also remain undisturbed. Storage volume in detention pond 1004 was increased to compensate for increased runoff from sub-basin 503.

TABLE 5

Location	1986 Historic Peak Flows 100-year (cfs)	10-year (cfs)	Developed Release Rates 100-year (cfs)	10-year (cfs)	100-year (cfs)
D.P.50 (confluence)	1286	1848	1207		
D.P. 51 Below Fil.6	N.A.	198	660	190	648
D.P. 52 6400 West Fork	320	166	512	122	505

Basin 600

Eight small sub-basins along East Plum Creek constitute Basin 600. Industrial and commercial development is planned on a total of 275 acres. For detention planning purposes, each of the eight planned areas was defined as a sub-basin, with on- site detention storage volume and allowable release rates determined by the Empirical formula. (See Table 9). However, based on each site's topography and phasing of development, there could be several local detention ponds with prorated storage and release rate.

Basin 700

Basin 700 covers 108 acres in the southwestern corner of the Meadows property. The three small sub-basins (less than 90 acres each) historically drain west. For the proposed residential development, on-site detention storage volumes and allowable release rates were determined using the empirical formula. The historic peak flows were calculated for comparison only. As the following summary shows, the allowable release rates based on the empirical formula are much lower that the historic flows.

TABLE 7

Location	Historic Peak Flows 10-year Storm (cfs)	100-year Storm (cfs)	Developed Release Rates 10-year Storm (cfs)	100-year Storm (cfs)
D.P. 71	26	98	10	33
D.P. 72	9	35	3	10
D.P. 73	47	167	20	65

Excerpts from the " Phase III Drainage Report for The Meadows Filing No. 19 Lot 2 North" by Terracina Design, Approved May 2022

Basin 600

Seven storage volumes and allowable release rates, each for a corresponding planning area were determined for development along East Plum Creek. However, based on each site's topography and phasing of development, several smaller local detention ponds can satisfy the prorated required storage volume for each planned area.

Basin 700

Detention Ponds 1016,1017 and 1018 will each be constructed at the property line. Table 12 shows required storage and allowable release rates.

Basin 800

Detention pond 1019 will provide 4.0 acre-feet storm water storage volume and 1.0 ac-ft storage for water quality treatment. Allowable release rates will be 44 cfs and 140 cfs for the 10-year and 100-year storm frequencies.

C) Water Quality Sedimentation Basins

The current Town of Castle Rock Drainage Criteria requires that the Best Management Practices as outlined in the TOC Drainage design and Technical Criteria, Chapter 10, Sub-chapter 14 shall be applied to all new development. Extended detention basins enhance stormwater runoff quality and reduce peak stormwater runoff rates. The water quality capture volume necessary to collect runoff from the contributing developed basins was established by following the design procedures described in the referenced Criteria, Chapter 10.14, Equation 1401. The Structural BMP recommends a drain time of 40 hours to remove a significant portion of fine particular pollutant. Water quality ponds will be constructed within proposed regional detention ponds. Tables 12 and 13 summarize the required capture volume for water quality basins as they apply to each local or regional pond.

D) Culverts and Storm Sewers

Two existing culverts, one under Meadows Boulevard near the existing middle school, the second at an intersection of West Meadows Drive and Meadows Boulevard, could be utilized for pedestrian crossing. An elevated walk with a hand rail would provide safe pedestrian passage even during frequent storm events. However, both of the culverts would be flooded up to eight foot depth during a major storm.

Storm sewers delineated on the improvement map depict large pipes designated to carry 100-year storm discharge.

CONCLUSION

The Phase 1 Master Drainage Report was prepared in compliance with the Town of Castle Rock Criteria. Regional detention ponds in seven major drainage basins were designed to reduce the channels' flows leaving the property to their historic levels. Because of different methodologies (empirical formula vs. computer modeling) and existing physical constraints, peak flows crossing the Meadows property were either significantly reduced or maintained at their historic rates. Developed discharge from basin 100, 600 and 700 would be reduced below historic rates and developed discharge from basin 200 and 500 matches its historic values . Discharge from basins 300 and 400 will also be lesser than the historic rates.

Excerpts from the " Phase III Drainage Report for The Meadows Filing No. 19 Lot 2 North" by Terracina Design, Approved May 2022

TABLE 12

STORAGE VOLUME FOR BASIN$ 100, 600 AND 700

POND NO.	BASIN AREA	PROPOSED DEVELOPMENT	DEVELOPED IMPERVIOUSNESS	DETENTION VOLUME 10-Year	DETENTION VOLUME 100-Year	WATER QUALITY CAPTURE VOLUME	TOTAL STORAGE
	(acre)		%	(ac-ft)	(ac-ft)	(ac-ft)	(ac-ft)
101	19.1	School/Fire	2	N/A	N/A	N/A	**0.0**
102	37.7	Low Single Family/com.	60	2.08	3.62	0.94	**4.6**
103	46.2	Low Single Family	40	1.67	2.98	0.77	**3.7**
105	25.8	Low Single Family	40	0.93	1.66	0.43	**2.1**
107	23.5	Low Single Family	40	0.85	1.51	0.39	**1.9**
109	12.0	Low Single Family	40	0.43	0.77	0.20	**1.0**
110	6.0	Low Single Family	40	0.22	0.39	0.10	**0.5**
112	2.3	Low Single Family	40	0.08	0.15	0.04	**0.2**
113	44.7	Low Single Family	40	1.61	2.88	0.75	**3.6**
601	19.6	Office	70	1.27	2.18	0.57	**2.8**
602	30.8	Office	70	1.99	3.43	0.90	**4.3**
603	26.5	Industrial	80	1.96	3.34	0.88	**4.2**
604	102.0	Industrial	80	7.56	12.86	3.40	**16.3**
605	57.3	Industrial	80	4.25	7.22	1.91	**9.1**
606	11.1	Industrial	80	0.82	1.40	0.37	**1.8**
607	7.7	Industrial	80	0.57	0.97	0.26	**1.2**
608	26.0	Industrial	80	1.93	3.28	0.87	**4.1**
701	32.3	Low Multi Family	40	1.17	2.08	0.54	**2.6**
702	9.8	Low Single Family	40	0.35	0.63	0.16	**0.8**
703	64.7	LSF/LMF	40	2.34	4.17	1.08	**5.2**
800	61.3	Low Multi Family	40	2.21	3.95	1.02	**5.0**

Required Volume: $V = kA$

$k10=(0.95*I - 1.90)$

$k100 = (1.78 I - 0.002 I^2 -3.56)/1000$

V = Storage volume in ac-ft
A = Area in acres
I = Imperviousness

Excerpts from the " Phase III Drainage Report for The Meadows Filing No. 19 Lot 2 North" by Terracina Design. Approved May 2022

THE MEADOWS BOUNDARY
6400 WEST FORK
6400 EAST FORK
CONFLUENCE OF 6400 EAST AND 6400 WEST FORKS
THE MEADOWS FILING 6
THE MEADOWS FILING 5
THE MEADOWS FILING 9
THE MEADOWS FILING 7
THE MEADOWS FILING 2
THE MEADOWS FILING 1
THE MEADOWS FILING 11
THE MEADOWS FILING 4
THE MEADOWS FILING 8
FLOODPLAIN LIMITS OF 6400- EAST FORK
FOOTHILLS DRIVE
FOOTHILLS BOWL
CHEROKEE DRIVE
BUFFALO CROSSING DR.
WEST MEADOWS DRIVE
MEADOWS BOULEVARD
FUTURE ROADWAY
COACHLINE ROAD
RED HAWK
MEADOWS PARKWAY
MEADOWS BLVD.
PRAIRIE HAWK DR.
WOLFENSBERGER RD.
EAST PLUM CREEK
HIGHWAY 83

501 86.8
503 80.8
504 192.0
405 110.7
404 202.8
403 73.5
401 211.7
402 96.6
800 61.8
201 55.0
202 109.7
203 62.7
502 111.0
414 94.5
415 26.3
416 52.0
413 47.9
411 145.3
412 40.9
407 70.2
406 75.8
408 38.4
409 41.6
410 121.2
206 112.9
207 232.1
204 69.6
205 51.7
208 39.0
209 55.3
101 19.1
102 37.7
103 46.2
104 75.5
105 82.0
106 29.8
107 23.5
109 12.0
111 8.6
112 2.3
110 5.9
113 44.7
801 19.6
607 7.7
606 11.1
602 30.8
608 26.0
605 57.3
604 102.0
603 26.5
308 161.9
305 35.6
306 16.0
304 47.0
303 19.0
301 83.2
302 12.8
307 13.7

LEGEND

- BASIN BOUNDARY
- SUBBASIN BOUNDARY
- 406 / 75.8 — SUBBASIN DESIGNATION / AREA IN ACRES
- 13 — DESIGN POINT
- CHANNEL

500 250 0 500 1000

SCALE: 1" = 500'

BASIN MAP
FIGURE 4

ROCKY MOUNTAIN CONSULTANTS, INC.
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Englewood, CO 80111
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FAX (303) 741-6106

Revised: MARCH 2002
Date: AUGUST 2000
Job No. 3572.033.00

L:\3572_033_00\Dwg\MasterBasin map.dwg, 04/08/02 10:35:06 AM, dbancroft

Excerpts from the " Phase III Drainage Report for The Meadows Filing No. 19 Lot 2 North" by Terracina Design, Approved May 2022

Project Name: Meadows Filing 19 Lot 2 North
Prepared By: MJG

Runoff Summary Table

Design Point	Basin ID	Basin Area	5-YEAR Runoff (CFS)	100-YEAR Runoff (CFS)
A01	A01	2.22	7.91	15.87
A02	A02	6.71	20.61	41.36
A03	A03	0.48	1.68	3.51
A04	A04	0.69	1.67	3.51
A05	A05	2.65	7.56	15.17
A06	A06	9.73	25.54	51.23
A07	A07	7.59	22.81	45.76
A08	A08	2.08	0.24	4.24
A09	A09	0.49	1.53	3.34
A10	A10	0.73	2.04	4.31
B1	B1	7.75	20.23	40.58
C1	C1	0.58	1.57	3.82
C2	C2	0.82	2.37	5.14
C3	C3	1.91	7.17	14.38
C4	C4	2.00	7.48	15.01
C5	C5	4.76	17.83	35.77
C6	C6	0.95	1.30	3.46
C7	C7	0.74	0.12	2.02
C8	C8	1.35	2.98	6.60
C9	C9	1.36	2.04	5.41
CO1	CO1	4.56	1.82	9.64
CO2	CO2	3.79	1.24	6.99
D1	D1	4.80	4.47	14.63
C10	C10	0.14	0.37	0.90
C11	C11	0.09	0.24	0.58

EAST PLUM CREEK
100 YEAR FLOODPLAIN
POND A
TYPE C INLET
HCP BOUNDARY
10' TYPE R INLET
15' TYPE R INLET
EX. 15' TYPE R INLET
EX. 5' TYPE R INLET
EX. 10' TYPE R INLET
EX. TYPE D INLET
TIMBER MILL PKWY
N. MEADOWS DR
MEADOWS FILING 8

0 100' 200'
1 inch = 100 ft.

LEGEND:

- PROPERTY BOUNDARY LINE
- PROPOSED EASEMENT
- EXISTING HCP BOUNDARY

GRADING
- EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- PROPOSED MAJOR CONTOUR
- PROPOSED MINOR CONTOUR

STORM DRAIN
- MANHOLE and PIPE
- INLET
- FLARED END SECTION

DRAINAGE
- EX BASIN DESIGNATION FROM REFERENCED REPORT
- BASIN DESIGNATION
- 5 YEAR COEFFICIENTS
- 100 YEAR COEFFICIENTS
- BASIN BOUNDARY
- DIRECTIONAL FLOW ARROW
- EMERGENCY OVERFLOW PATH
- DESIGN POINT

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

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

TERRACINA ASSUMES NO RESPONSIBILITY FOR EXISTING UTILITY LOCATIONS (HORIZONTAL AND VERTICAL). THE CONTRACTOR SHALL FIELD VERIFY ALL UTILITY LOCATIONS AS PLOTTED FROM THE BEST AVAILABLE INFORMATION. IT IS, HOWEVER, THE RESPONSIBILITY OF THE CONTRACTOR TO KNOW THE EXACT LOCATION OF ALL UTILITIES PRIOR TO THE COMMENCEMENT OF ANY CONSTRUCTION ACTIVITIES.

#	REVISION DESCRIPTION	DATE	BY

THE MEADOWS
TOWN OF CASTLE ROCK, COLORADO

MEADOWS FILING 19 LOT 2 NORTH
DRAINAGE PLAN

DESIGNED BY: DB
DRAWN BY: DB
CHECKED BY: MM

JOB NO. 14-003

SHEET 1 OF 2

3/28/2022 3:05 PM - X:\14-003 MEADOWS\DOCUMENTS\FILING 19\DRAINAGE REPORT - LOT 2 NORTH\1 - DRAINAGE MAP.DWG

Excerpts from the "Phase I Master Drainage Design Report for The Meadows, Castle Rock" prepared by Rocky Mountain Consultants, Inc approved in March 2002.

#1086

PHASE 1 MASTER DRAINAGE REPORT

THE MEADOWS

VOLUME I OF II

CASTLE ROCK DEVELOPMENT COMPANY

MARCH 2002

ROCKY MOUNTAIN CONSULTANTS, INC.
A TETRA TECH COMPANY

Excerpts from the "Phase I Master Drainage Design Report for The Meadows, Castle Rock" prepared by Rocky Mountain Consultants, Inc approved in March 2002.

PHASE 1 MASTER DRAINAGE REPORT

FOR

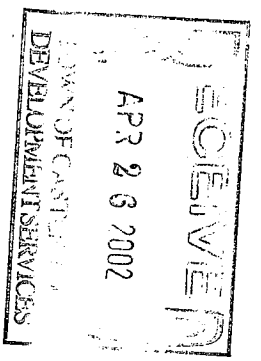
THE MEADOWS, CASTLE ROCK
VOLUME I of II

Prepared For:

CASTLE ROCK DEVELOPMENT
3033 East 1st Avenue, Suite 840
Denver, Colorado 80206
(303) 394-5500

Prepared By:

ROCKY MOUNTAIN CONSULTANTS, INC.
8301 E. Prentice Avenue, Suite 101
Greenwood Village, Colorado 80111



Revised March 2002
Revised August 2001
August 2000
RMC Reference No. 22-3572.033.00

Excerpts from the "Phase I Master Drainage Design Report for The Meadows, Castle Rock" prepared by Rocky Mountain Consultants, Inc approved in March 2002.

D.P. 11 Meadows Blvd.	192	837	189	696

*) Design flows per Filing 11 boundary... Physical constraints by existing development
**) Design flows per Filing 11 culvert

Basin 500

Basin 500 occupies area between Meadows Boulevard and the western property line. The 6400 West Fork tributary crosses the property from south to west, collecting discharge from the relatively long and narrow area of 450 acres. Approximately 3000 feet of steep channel with rocky slopes will remain in its natural state before entering into a residential neighborhood. Two detention ponds will control increased runoff from proposed single family development that is planned on both side of West Meadows Drive. Since Pond 1005 that is constructed along the road's south embankment will detain excessive flows from development south of West Meadows Drive, the natural channel between West Meadows Drive and a local street "A" will also remain undisturbed. Storage volume in detention pond 1004 was increased to compensate for increased runoff from sub-basin 503.

TABLE 5

Location	1986 Historic Peak Flows 100-year (cfs)	10-year (cfs)	Developed Release Rates 100-year (cfs)	10-year (cfs)	100-year (cfs)
D.P.50 (confluence)	1286	1848	1207		
D.P. 51 Below Fil.6	N.A.	198	660	190	648
D.P. 52 6400 West Fork	320	166	512	122	505

Basin 600

Eight small sub-basins along East Plum Creek constitute Basin 600. Industrial and commercial development is planned on a total of 275 acres. For detention planning purposes, each of the eight planned areas was defined as a sub-basin, with on- site detention storage volume and allowable release rates determined by the Empirical formula. (See Table 9). However, based on each site's topography and phasing of development, there could be several local detention ponds with prorated storage and release rate.

Basin 700

Basin 700 covers 108 acres in the southwestern corner of the Meadows property. The three small sub-basins (less than 90 acres each) historically drain west. For the proposed residential development, on-site detention storage volumes and allowable release rates were determined using the empirical formula. The historic peak flows were calculated for comparison only. As the following summary shows, the allowable release rates based on the empirical formula are much lower that the historic flows.

TABLE 7

Location	Historic Peak Flows 10-year Storm (cfs)	100-year Storm (cfs)	Developed Release Rates 10-year Storm (cfs)	100-year Storm (cfs)
D.P. 71	26	98	10	33
D.P. 72	9	35	3	10
D.P. 73	47	167	20	65

Excerpts from the "Phase I Master Drainage Design Report for The Meadows, Castle Rock" prepared by Rocky Mountain Consultants, Inc approved in March 2002.

Basin 600

Seven storage volumes and allowable release rates, each for a corresponding planning area were determined for development along East Plum Creek. However, based on each site's topography and phasing of development, several smaller local detention ponds can satisfy the prorated required storage volume for each planned area.

Basin 700

Detention Ponds 1016,1017 and 1018 will each be constructed at the property line. Table 12 shows required storage and allowable release rates.

Basin 800

Detention pond 1019 will provide 4.0 acre-feet storm water storage volume and 1.0 ac-ft storage for water quality treatment. Allowable release rates will be 44 cfs and 140 cfs for the 10-year and 100-year storm frequencies.

C) Water Quality Sedimentation Basins

The current Town of Castle Rock Drainage Criteria requires that the Best Management Practices as outlined in the TOC Drainage design and Technical Criteria, Chapter 10, Sub-chapter 14 shall be applied to all new development. Extended detention basins enhance stormwater runoff quality and reduce peak stormwater runoff rates. The water quality capture volume necessary to collect runoff from the contributing developed basins was established by following the design procedures described in the referenced Criteria, Chapter 10.14, Equation 1401. The Structural BMP recommends a drain time of 40 hours to remove a significant portion of fine particular pollutant. Water quality ponds will be constructed within proposed regional detention ponds. Tables 12 and 13 summarize the required capture volume for water quality basins as they apply to each local or regional pond.

D) Culverts and Storm Sewers

Two existing culverts, one under Meadows Boulevard near the existing middle school, the second at an intersection of West Meadows Drive and Meadows Boulevard, could be utilized for pedestrian crossing. An elevated walk with a hand rail would provide safe pedestrian passage even during frequent storm events. However, both of the culverts would be flooded up to eight foot depth during a major storm.

Storm sewers delineated on the improvement map depict large pipes designated to carry 100-year storm discharge.

CONCLUSION

The Phase 1 Master Drainage Report was prepared in compliance with the Town of Castle Rock Criteria. Regional detention ponds in seven major drainage basins were designed to reduce the channels' flows leaving the property to their historic levels. Because of different methodologies (empirical formula vs. computer modeling) and existing physical constraints, peak flows crossing the Meadows property were either significantly reduced or maintained at their historic rates. Developed discharge from basin 100, 600 and 700 would be reduced below historic rates and developed discharge from basin 200 and 500 matches its historic values . Discharge from basins 300 and 400 will also be lesser than the historic rates.

Excerpts from the "Phase I Master Drainage Design Report for The Meadows, Castle Rock" prepared by Rocky Mountain Consultants, Inc approved in March 2002.

TABLE 12

STORAGE VOLUME FOR BASIN$ 100, 600 AND 700

POND NO.	BASIN AREA (acre)	PROPOSED DEVELOPMENT	DEVELOPED IMPERVIOUSNESS %	DETENTION VOLUME 10-Year (ac-ft)	DETENTION VOLUME 100-Year (ac-ft)	WATER QUALITY CAPTURE VOLUME (ac-ft)	TOTAL STORAGE (ac-ft)
101	19.1	School/Fire	2	N/A	N/A	N/A	**0.0**
102	37.7	Low Single Family/com.	60	2.08	3.62	0.94	**4.6**
103	46.2	Low Single Family	40	1.67	2.98	0.77	**3.7**
105	25.8	Low Single Family	40	0.93	1.66	0.43	**2.1**
107	23.5	Low Single Family	40	0.85	1.51	0.39	**1.9**
109	12.0	Low Single Family	40	0.43	0.77	0.20	**1.0**
110	6.0	Low Single Family	40	0.22	0.39	0.10	**0.5**
112	2.3	Low Single Family	40	0.08	0.15	0.04	**0.2**
113	44.7	Low Single Family	40	1.61	2.88	0.75	**3.6**
601	19.6	Office	70	1.27	2.18	0.57	**2.8**
602	30.8	Office	70	1.99	3.43	0.90	**4.3**
603	26.5	Industrial	80	1.96	3.34	0.88	**4.2**
604	102.0	Industrial	80	7.56	12.86	3.40	**16.3**
605	57.3	Industrial	80	4.25	7.22	1.91	**9.1**
606	11.1	Industrial	80	0.82	1.40	0.37	**1.8**
607	7.7	Industrial	80	0.57	0.97	0.26	**1.2**
608	26.0	Industrial	80	1.93	3.28	0.87	**4.1**
701	32.3	Low Multi Family	40	1.17	2.08	0.54	**2.6**
702	9.8	Low Single Family	40	0.35	0.63	0.16	**0.8**
703	64.7	LSF/LMF	40	2.34	4.17	1.08	**5.2**
800	61.3	Low Multi Family	40	2.21	3.95	1.02	**5.0**

Required Volume: $V = kA$

$k10 = (0.95 * I - 1.90)$

$k100 = (1.78 I - 0.002 I^2 - 3.56)/1000$

V = Storage volume in ac-ft
A = Area in acres
I = Imperviousness

Excerpts from the "Phase I Master Drainage Design Report for The Meadows, Castle Rock" prepared by Rocky Mountain Consultants, Inc approved in March 2002.

THE MEADOWS BOUNDARY
6400 WEST FORK
6400 EAST FORK
CONFLUENCE OF 6400 EAST AND 6400 WEST FORKS
THE MEADOWS FILING 6
THE MEADOWS FILING 5
THE MEADOWS FILING 9
THE MEADOWS FILING 7
THE MEADOWS FILING 2
THE MEADOWS FILING 1
THE MEADOWS FILING 11
THE MEADOWS FILING 4
THE MEADOWS FILING 8
FLOODPLAIN LIMITS OF 6400- EAST FORK
FOOTHILLS DRIVE
FUTURE ROADWAY
MEADOWS BOULEVARD
CHEROKEE DRIVE
WEST MEADOWS DRIVE
BUFFALO CROSSING DR.
MEADOWS PARKWAY
MEADOWS BLVD.
PRAIRIE HAWK DR.
COACHLINE ROAD
WOLFENSBERGER RD.
RED HAWK
EAST PLUM CREEK
HIGHWAY 85

501 86.8	502 111.0
503 80.8	504 192.0
401 211.7	402 96.6
403 73.5	404 202.8
405 110.7	406 75.8
407 70.2	408 38.4
409 41.6	410 121.2
411 145.3	412 40.9
413 47.9	414 94.5
415 26.3	416 52.0
301 8.2	302 12.8
303 19.0	304 4.0
305 35.6	306 6.0
307 4.7	308 161.9
201 55.0	202 109.7
203 62.7	204 69.6
205 51.7	206 112.9
207 232.1	208 39.0
209 55.3	101 19.1
102 37.7	103 46.2
104 75.5	105 82.0
106 29.8	107 23.5
109 12.0	111 8.6
112 2.3	110 5.9
113 44.7	602 30.8
603 26.5	604 102.0
605 57.3	606 11.1
607 7.7	608 26.0
800 61.8	801 19.6

LEGEND

- BASIN BOUNDARY
- SUBBASIN BOUNDARY
- 406 / 75.8 — SUBBASIN DESIGNATION / AREA IN ACRES
- 13 — DESIGN POINT
- CHANNEL

500 250 0 500 1000

SCALE: 1" = 500'

BASIN MAP
FIGURE 4

ROCKY MOUNTAIN CONSULTANTS, INC.
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Revised: MARCH 2002
Date: AUGUST 2000
Job No. 3572.033.00

L:\3572_033_000\dwg\MasterBasin map.dwg, 04/08/02 10:35:06 AM, dbancroft

Excerpts from "The Final Drainage Report UDG Meadowmark, Meadows Filing No. 19 Lot 2 North Parcel D2A, prepared by Ware Malcomb, approved April 2023.

WARE MALCOMB
ARCHITECTURE | PLANNING | INTERIORS
BRANDING | CIVIL ENGINEERING

FINAL DRAINAGE REPORT

UDG Meadowmark

Meadows Filing No. 19, Lot 2 North Parcel D2A
Town of Castle Rock, County of Douglas, State of Colorado
CD22-0041

JN: DCS22-4026
10/12/2022
Rev: 01/12/2023
Rev: 03/03/2023
Rev: 03/21/2023

Prepared for:
Castle Rock Development Company
3033 E 1st Ave., Suite 410
Denver, CO 80206

Developer:
Ulysses Development Group
210 University Blvd.
Denver, CO 80206

Prepared by:
Ware Malcomb
900 South Broadway, Ste. 320
Denver, CO 80209
P: 303.561.3333
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DEVELOPMENT SERVICES
APPROVED
Town of Castle Rock Colorado
By Carson Byerhof
on 04/27/2023
APPROVED-CD22-0041 Phase III Drainage Report.pdf
Record Document on File

Excerpts from "The Final Drainage Report UDG Meadowmark, Meadows Filing No. 19 Lot 2 North Parcel D2A, prepared by Ware Malcomb, approved April 2023.

Basin A2:
Basin A2 is approximately 0.282 acres and has a weighted imperviousness of 83%. The basin includes proposed walks, asphalt, roof, and landscaped areas. Runoff from Basin A2 will enter the proposed storm network through a single Type '16' curb combo inlet at Design Point 3. Flows from Basin A2 will combine with flows from Basins A0 and A1 at an 18" x 18" tee at Design Point 4.

Basin OS1:
Basin OS1 is approximately 0.136 acres and has a weighted imperviousness of 100%. The basin includes only asphalt area. Runoff from Basin OS1 will be conveyed via curb and gutter to Basin A3 (Design Point 5) and enter the proposed storm network through a single Type '16' curb combo inlet at Design Point 6.

Basin A3:
Basin A3 is approximately 0.841 acres and has a weighted imperviousness of 86%. The basin includes proposed walks, asphalt, roof, and landscaped areas. Runoff from Basin A3 will enter the proposed storm network through a single Type '16' curb combo inlet at Design Point 6. Flows from Basin A3 will combine with flows from Basins OS1 at Design Point 6, and then with A0, A1, and A2 at a 4' manhole at Design Point 7. This combined flow will then flow to the existing storm pipe at Design Point 8.

Basin B1:
Basin B1 is approximately 0.106 acres and has a weighted imperviousness of 47%. The basin includes proposed roof and landscaped areas. Runoff from Basin B1 will be conveyed via small swale and enter the proposed storm network through a single 24" nyloplast inlet at Design Point 9.

Basin B2:
Basin B2 is approximately 0.442 acres and has a weighted imperviousness of 53%. The basin includes proposed walks, roof, and landscaped areas. Runoff from Basin B2 will enter the proposed storm network through a single 24" nyloplast inlet at Design Point 10.

Basin B3:
Basin B3 is approximately 0.086 acres and has a weighted imperviousness of 46%. The basin includes proposed walks, roof, and landscaped areas. Runoff from Basin B3 will enter the proposed storm network through a single 24" nyloplast inlet at Design Point 11, combining with flows from Basin B2 and then combining with flows from Basin B1 at a 12" x 18" tee at Design Point 12.

Basin B4:
Basin B4 is approximately 0.830 acres and has a weighted imperviousness of 89%. The basin includes proposed walks, asphalt, roof, and landscaped areas. Runoff from Basin B4 will enter the proposed storm network through a single Type '16' curb combo inlet at Design Point 13.

Excerpts from "The Final Drainage Report UDG Meadowmark, Meadows Filing No. 19 Lot 2 North Parcel D2A, prepared by Ware Malcomb, approved April 2023.

Flows from Basin B4 will combine with flows from Basins B1, B2, and B3 at an 18" x 18" tee at Design Point 14.

Basin B5:

Basin B5 is approximately 0.460 acres and has a weighted imperviousness of 42%. The basin includes proposed walks, roof, and landscaped areas. Runoff from Basin B5 will enter the proposed storm network through a single 24" nyloplast inlet at Design Point 15. Flows from Basin B5 will combine with flows from Basins B1, B2, B3, and B4 at a 4' manhole at Design Point 16.

Basin B6:

Basin B5 is approximately 1.270 acres and has a weighted imperviousness of 66%. The basin includes proposed walks, roof, asphalt and landscaped areas. Runoff from Basin B6 will enter the proposed storm network through a double Type '16' curb combo inlet at Design Point 17 combining with flows from Basins B1, B2, B3, B4, and B5. Combined flows will then flow to the existing storm pipe at Design Point 18.

RUNOFF SUMMARY

BASIN LABEL	DESIGN POINT	AREA	LOCAL (CFS)		ACCUMULATIVE (CFS)	
			Q5	Q100	Q5	Q100
A0	0	0.84	1.74	4.53		
A1	1	0.32	1.00	2.21		
	2				2.6	6.4
A2	3	0.28	0.91	1.92		
	4				3.4	8.2
OS1	5	0.14	0.57	1.07		
A3	6	0.84	2.79	5.76	3.3	6.8
	7				6.5	14.4
	8				6.5	14.4
B1	9	0.11	0.17	0.52		
B2	10	0.44	0.74	2.13		
B3	11	0.09	0.14	0.44	0.9	2.5
	12				1.0	3.0
B4	13	0.83	2.93	5.94		
	14				3.5	8.0
B5	15	0.46	0.70	2.35		
	16				4.1	10.1

Excerpts from "The Final Drainage Report UDG Meadowmark, Meadows Filing No. 19 Lot 2 North Parcel D2A, prepared by Ware Malcomb, approved April 2023.

PROJECT: The Meadowmark
JOB NO.: DCS22-4026
CALC. BY: ICA
DATE: 1/11/2023

WARE MALCOMB
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Impervious Percentages - from Urban Drainage Table 6-3

Roof	90%
Paved	100%
Drive and Walks	90%
Lawns	2%

Land Use 5	0%
Land Use 6	0%
Land Use 7	0%
Land Use 8	0%

SOIL TYPE: B (use equation from Table 6-4)

= FORMULA CELLS
= USER INPUT CELLS

PROPOSED COMPOSITE IMPERVIOUSNESS

		Weighted Impervious and C Values					Areas (ac)							
Basin	**Area (ac)**	**Imp.**	**C_2**	**C_5**	**C_{10}**	**C_{100}**	**Roof**	**Paved**	**Drive and Walks**	**Lawns**	**Land Use 5**	**Land Use 6**	**Land Use 7**	**Land Use 8**
A0	0.841	60%	0.46	0.49	0.54	0.71	0.05	0.41	0.04	0.33				
A1	0.317	78%	0.62	0.65	0.68	0.79	0.08	0.15	0.02	0.06				
A2	0.282	83%	0.68	0.71	0.73	0.82	0.13	0.12	0.002	0.03				
A3	0.841	86%	0.71	0.73	0.76	0.83	0.18	0.53	0.04	0.09				
OS1	0.136	100%	0.84	0.86	0.87	0.90	0.00	0.14	0.00	0.00				
B1	0.106	47%	0.35	0.38	0.44	0.65	0.05	0.00	0.00	0.05				
B2	0.442	53%	0.40	0.43	0.48	0.67	0.20	0.00	0.05	0.19				
B3	0.086	46%	0.33	0.37	0.43	0.64	0.04	0.00	0.00	0.04				
B4	0.830	89%	0.73	0.76	0.78	0.84	0.18	0.53	0.05	0.07				
B5	0.460	42%	0.31	0.34	0.40	0.62	0.19	0.00	0.02	0.25				
B6	1.270	66%	0.52	0.55	0.59	0.74	0.18	0.60	0.08	0.41				
Total	5.611	70%	0.56	0.59	0.63	0.76	1.28	2.48	0.31	1.54				

Excerpts from "The Final Drainage Report UDG Meadowmark, Meadows Filing No. 19 Lot 2 North Parcel D2A, prepared by Ware Malcomb, approved April 2023.

WARE MALCOMB
ARCHITECTURE | PLANNING | INTERIORS
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Calculated By: ICA
Date: 1/11/2023

STANDARD FORM SF-2

TIME OF CONCENTRATION SUMMARY

Project: The Meadowmark
Job No.: DCS22-4026
Checked By: TLS

SUB-BASIN DATA				INITIAL/OVERLAND TIME (t_i)			TRAVEL TIME (t_t)					t_c CHECK (URBANIZED BASINS)				FINAL t_c	REMARKS
Basin	i	C_5	AREA	LENGTH	SLOPE	t_i	LENGTH	Cv	SLOPE	VEL.	t_t	COMP.	L_t	S_t	tc (Equation 6-5)		
			Ac	Ft	%	Min	Ft		%	FPS	Min	t_c	Ft	%	Min	Min	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)		(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	
A0	0.60	0.49	0.84	91	3.8	6.73	174	20	1.1	2.09	1.38	8.1	174	1.09	17.4	8.12	
A1	0.78	0.65	0.32	103	6.8	4.35	72	20	2.5	3.18	0.38	4.7	72	2.52	13.2	5.00	
A2	0.83	0.71	0.28	94	2.0	5.47	86	20	1.1	2.1	0.7	6.2	86	1.12	12.5	6.15	
A3	0.86	0.73	0.84	73	5.4	3.23	542	20	2.1	2.9	3.2	6.4	542	2.05	14.3	6.39	
OS1	1.00	0.86	0.14	43	5.9	1.58	588	20	1.9	2.8	3.5	5.1	588	1.94	12.1	5.10	
B1	0.47	0.38	0.11	56	2.0	7.70	68	15	2.0	2.1	0.5	8.2	68	2.01	18.5	8.24	
B2	0.53	0.43	0.44	95	2.0	9.39	41	15	2.9	2.6	0.3	9.7	41	2.93	17.3	9.65	
B3	0.46	0.37	0.09	40	2.0	6.69	14	15	3.1	2.6	0.1	6.8	14	3.06	18.4	6.78	
B4	0.89	0.76	0.83	72	3.2	3.57	375	20	2.0	2.8	2.2	5.8	375	2.03	12.9	5.76	
B5	0.42	0.34	0.46	32	2.0	6.22	33	15	2.0	2.1	0.3	6.5	33	2.00	19.1	6.48	
B6	0.66	0.55	1.27	160	3.3	8.51	90	20	1.4	2.4	0.6	9.1	90	1.40	15.5	9.15	

Equation 6-3 $t_i=((0.395(1.1-C_5)SQRT(L))/(S_o\text{^}0.33))$

Equation 6-5 $t_c=(26-17i)+(L_t/(60(14i+9)SQRT(S_o)))$

= FORMULA CELLS
= USER INPUT CELLS

NRCS Conveyance Factor K Table - Cv Value	
Heavy Meadow	2.5
Tillage/Field	5
Short Pasture and Lawns	7
Nearly Bare Ground	10
Grassed Waterway	15
Paved Areas and Shallow Paved Swales	20

Excerpts from "The Final Drainage Report UDG Meadowmark, Meadows Filing No. 19 Lot 2 North Parcel D2A, prepared by Ware Malcomb, approved April 2023.

Calculated By: ICA
Date: 1/11/2023
Checked By: TLS
5-Year 1-hour rainfall= 1.43

STANDARD FORM SF-3

STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)

Project: The Meadowmark
Job No.: DCS22-4026
Design Storm: 5-Year

= FORMULA CELLS
= USER INPUT CELLS

BASIN	DIRECT RUNOFF								TOTAL RUNOFF				STREET		PIPE						REMARKS
	DESIGN POINT	AREA DESIGN	AREA (AC)	RUNOFF COEFF	(MIN) t_c	C * A (AC)	I (IN/HR)	Q (CFS)	t_c (MIN)	S (C * A) (CA)	I (IN/HR)	Q (CFS)	SLOPE (%)	STREET FLOW	DESIGN FLOW (CFS)	SLOPE (%)	PIPE DIAM. (IN.)	LENGTH (FT)	VELOCITY (FPS)	t_t (MIN)	
	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
A0	0		0.84	0.49	8.1	0.42	4.18	**1.7**													A0 local flow to DP0
A1	1		0.32	0.65	5.0	0.21	4.85	**1.0**													A1 local flow to DP1
	2								8.1	0.6	4.18	**2.6**									A0 & A1 combined flow at DP2
A2	3		0.28	0.71	6.2	0.20	4.58	**0.9**													A2 local flow to DP3
	4								8.1	0.8	4.18	**3.4**									A0, A1, & A2 combined flow at DP4
OS1	5		0.14	0.86	5.1	0.12	4.82	**0.6**													OS1 local flow to DP5, entering A3
A3	6		0.84	0.73	6.4	0.62	4.53	**2.8**	6.4	0.7	4.53	**3.3**									A3 local flow to DP6
	7								8.1	1.6	4.18	**6.5**									A0 - A3 & OS1 combined flow at DP7
	8								8.1	1.6	4.18	**6.5**									A0 - A3 & OS1 to existing storm at DP8 (see StormCAD model for routing)
B1	9		0.11	0.38	8.2	0.04	4.16	**0.2**													B1 local flow to DP9
B2	10		0.44	0.43	9.7	0.19	3.92	**0.7**													B2 local flow to DP10
B3	11		0.09	0.37	6.8	0.03	4.44	**0.1**	9.7	0.2	3.92	**0.9**									B2 & B3 combined flow at DP11
	12								9.7	0.3	3.92	**1.0**									B1, B2, & B3 combined flow at DP12
B4	13		0.83	0.76	5.8	0.63	4.66	**2.9**													B4 local flow at DP13
	14								9.7	0.9	3.92	**3.5**									B1 - B4 combined flow at DP14
B5	15		0.46	0.34	6.5	0.16	4.50	**0.7**													B5 local flow at DP15
	16								9.7	1.0	3.92	**4.1**									B1 - B5 combined flow at DP16
B6	17		1.27	0.55	9.1	0.69	4.00	**2.8**	9.7	1.7	3.92	**6.8**									B1 - B6 combined flow at DP17
	18								9.7	3.3	3.92	**12.9**									Total flow into existing storm (see StormCAD model for routing)

Excerpts from "The Final Drainage Report UDG Meadowmark, Meadows Filing No. 19 Lot 2 North Parcel D2A, prepared by Ware Malcomb, approved April 2023.

Calculated By: ICA
Date: 1/11/2023
Checked By: TLS
100-Year 1-hour rainfall= 2.60

STANDARD FORM SF-3

STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)

Project: The Meadowmark
Job No.: DCS22-4026
Design Storm: 100-Year

= FORMULA CELLS
= USER INPUT CELLS

BASIN	DIRECT RUNOFF								TOTAL RUNOFF				STREET		PIPE			LENGTH (FT)	VELOCITY (FPS)	t_t (MIN)	REMARKS
	DESIGN POINT	AREA DESIGN	AREA (AC)	RUNOFF COEFF	t_c (MIN)	C * A (AC)	I (IN/HR)	Q (CFS)	t_c (MIN)	S (C * A) (CA)	I (IN/HR)	Q (CFS)	SLOPE (%)	STREET FLOW	DESIGN FLOW (CFS)	SLOPE (%)	PIPE DIAM. (IN.)				
	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
A0	0		0.84	0.71	8.1	0.60	7.60	**4.5**													A0 local flow to DP0
A1	1		0.32	0.79	5.0	0.25	8.82	**2.2**													A1 local flow to DP1
	2								8.1	0.8	7.60	**6.4**									A0 & A1 combined flow at DP2
A2	3		0.28	0.82	6.2	0.23	8.32	**1.9**													A2 local flow to DP3
	4								8.1	1.1	7.60	**8.2**									A0, A1, & A2 combined flow at DP4
OS1	5		0.14	0.90	5.1	0.12	8.77	**1.1**													OS1 local flow to DP5, entering A3
A3	6		0.84	0.83	6.4	0.70	8.23	**5.8**	6.4	0.8	8.23	**6.8**									A3 local flow to DP6
	7								8.1	1.9	7.60	**14.4**									A0 - A3 & OS1 combined flow at DP7
	8								8.1	1.9	7.60	**14.4**									A0 - A3 & OS1 to existing storm at DP8 (see StormCAD model for routing)
B1	9		0.11	0.65	8.2	0.07	7.56	**0.5**													B1 local flow to DP9
B2	10		0.44	0.67	9.7	0.30	7.13	**2.1**													B2 local flow to DP10
B3	11		0.09	0.64	6.8	0.06	8.07	**0.4**	9.7	0.4	7.13	**2.5**									B2 & B3 combined flow at DP11
	12								9.7	0.4	7.13	**3.0**									B1, B2, & B3 combined flow at DP12
B4	13		0.83	0.84	5.8	0.70	8.48	**5.9**													B4 local flow at DP13
	14								9.7	1.1	7.13	**8.0**									B1 - B4 combined flow at DP14
B5	15		0.46	0.62	6.5	0.29	8.19	**2.4**													B5 local flow at DP15
	16								9.7	1.4	7.13	**10.1**									B1 - B5 combined flow at DP16
B6	17		1.27	0.74	9.1	0.93	7.28	**6.8**	9.7	2.3	7.13	**16.7**									B1 - B6 combined flow at DP17
	18								9.7	4.2	7.13	**30.3**									Total flow into existing storm (see StormCAD model for routing)

Excerpts from "The Final Drainage Report UDG Meadowmark, Meadows Filing No. 19 Lot 2 North Parcel D2A, prepared by Ware Malcomb, approved April 2023.

PROJECT: The Meadowmark
JOB NO.: DCS22-4026
CALC. BY: ICA
DATE: 1/11/2023

WARE MALCOMB
ARCHITECTURE | PLANNING | INTERIORS
BRANDING | CIVIL ENGINEERING

RUNOFF SUMMARY

BASIN LABEL	DESIGN POINT	AREA	LOCAL (CFS)		ACCUMULATIVE (CFS)	
			Q5	Q100	Q5	Q100
A0	0	0.84	1.74	4.53		
A1	1	0.32	1.00	2.21		
	2				2.6	6.4
A2	3	0.28	0.91	1.92		
	4				3.4	8.2
OS1	5	0.14	0.56	1.07		
A3	6	0.84	2.79	5.76	3.3	6.8
	7				6.5	14.4
	8				6.5	14.4
B1	9	0.11	0.17	0.52		
B2	10	0.44	0.74	2.13		
B3	11	0.09	0.14	0.44	0.9	2.5
	12				1.0	3.0
B4	13	0.83	2.93	5.94		
	14				3.5	8.0
B5	15	0.46	0.70	2.35		
	16				4.1	10.1
B6	17	1.27	2.78	6.81	6.8	16.7
	18				12.9	30.3

= FORMULA CELLS
= USER INPUT CELLS

Excerpts from "The Final Drainage Report UDG Meadowmark, Meadows Filing No. 19 Lot 2 North Parcel D2A, prepared by Ware Malcomb, approved April 2023.

MHFD-Inlet, Version 5.01 (April 2021)

INLET MANAGEMENT

Worksheet Protected

INLET NAME	SD-INLET-A6.1 - DP1	SD-INLET-A5.1 - DP3	SD-INLET-A3.1 - DP6
Site Type (Urban or Rural)	URBAN	URBAN	URBAN
Inlet Application (Street or Area)	STREET	STREET	STREET
Hydraulic Condition	In Sump	In Sump	In Sump
Inlet Type	Denver No. 16 Combination	Denver No. 16 Combination	Denver No. 16 Combination

USER-DEFINED INPUT

User-Defined Design Flows

Minor Q_{Known} (cfs)	1.0	0.9	3.3
Major Q_{Known} (cfs)	2.2	1.9	6.8

Bypass (Carry-Over) Flow from Upstream

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

Watershed Characteristics

Subcatchment Area (acres)			
Percent Impervious			
NRCS Soil Type			

Watershed Profile

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

Minor Storm Rainfall Input

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

Major Storm Rainfall Input

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

CALCULATED OUTPUT

Minor Total Design Peak Flow, Q (cfs)	**1.0**	**0.9**	**3.3**
Major Total Design Peak Flow, Q (cfs)	**2.2**	**1.9**	**6.8**
Minor Flow Bypassed Downstream, Q_b (cfs)	N/A	N/A	N/A
Major Flow Bypassed Downstream, Q_b (cfs)	N/A	N/A	N/A

Excerpts from "The Final Drainage Report UDG Meadowmark, Meadows Filing No. 19 Lot 2 North Parcel D2A, prepared by Ware Malcomb, approved April 2023.

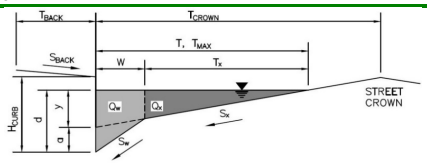
MHFD-Inlet, Version 5.01 (April 2021)

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

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

Project: Castle View Apartments

Inlet ID: SD-INLET-A3.1 - DP6



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	5.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	42.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.013	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	42.0	42.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	12.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

MINOR STORM Allowable Capacity is based on Depth Criterion

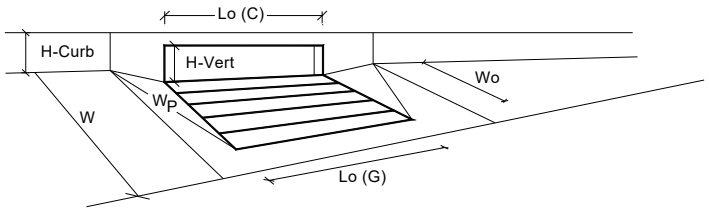
MAJOR STORM Allowable Capacity is based on Depth Criterion

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

Excerpts from "The Final Drainage Report UDG Meadowmark, Meadows Filing No. 19 Lot 2 North Parcel D2A, prepared by Ware Malcomb, approved April 2023.

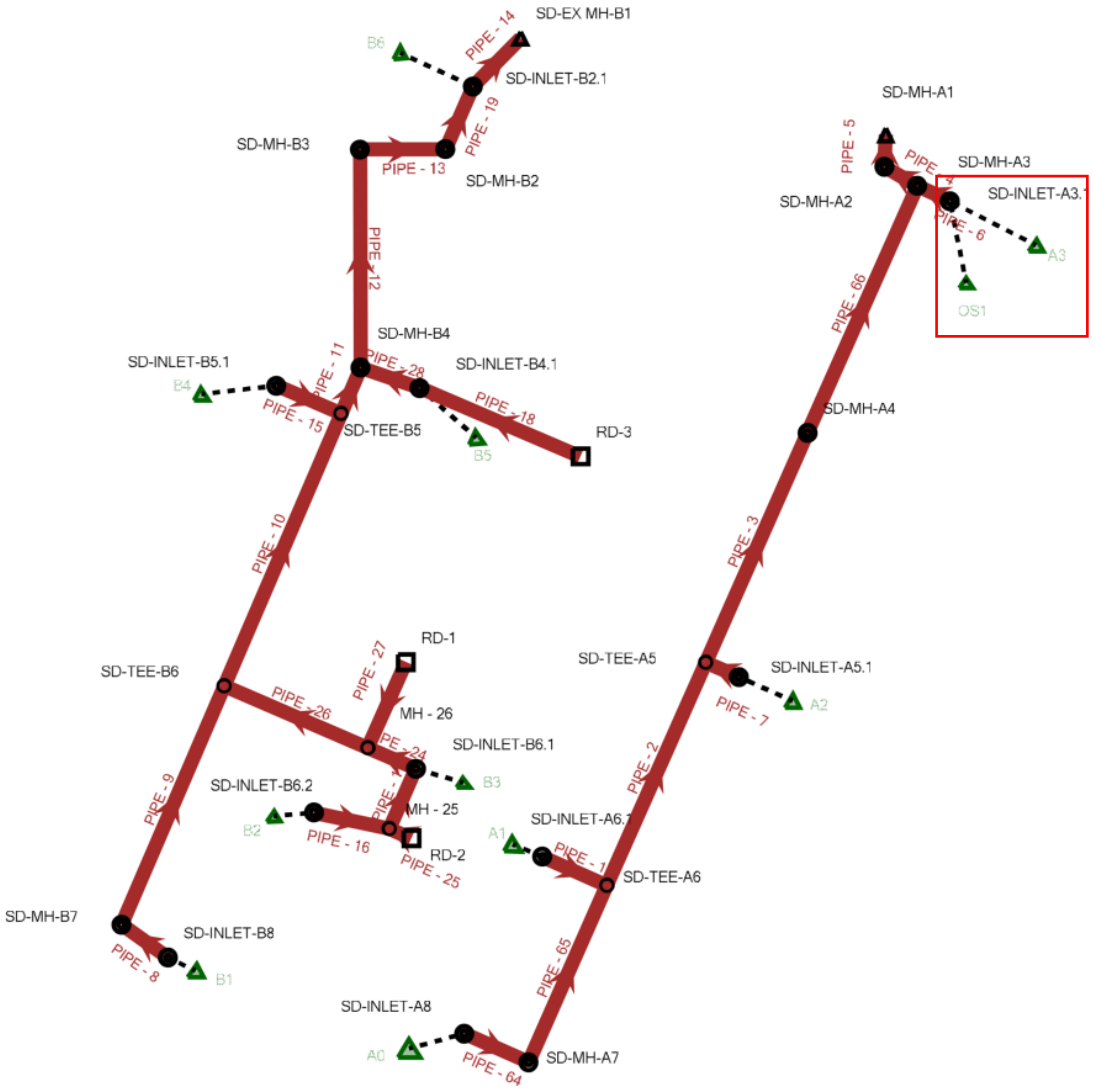
INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)



Design Information (Input)	Denver No. 16 Combination			
		MINOR	MAJOR	
Type of Inlet	Type =	Denver No. 16 Combination		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	2.00	2.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	11.6	☐ Override Depths
Grate Information		MINOR	MAJOR	
Length of a Unit Grate	L_o (G) =	3.00	3.00	feet
Width of a Unit Grate	W_o =	1.73	1.73	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	0.31	0.31	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	0.50	0.50	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	3.60	3.60	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	0.60	0.60	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	3.00	3.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.50	6.50	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	5.25	5.25	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	0.00	0.00	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.70	3.70	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.66	0.66	
Grate Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	1.00	1.00	
Clogging Factor for Multiple Units	Clog =	0.50	0.50	
Grate Capacity as a Weir (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	6.0	16.7	cfs
Interception with Clogging	Q_{wa} =	3.0	8.3	cfs
Grate Capacity as a Orifice (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	5.6	7.7	cfs
Interception with Clogging	Q_{oa} =	2.8	3.9	cfs
Grate Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	5.2	10.2	cfs
Interception with Clogging	Q_{ma} =	2.6	5.1	cfs
Resulting Grate Capacity (assumes clogged condition)	**Q_{Grate} =**	**2.6**	**3.9**	**cfs**
Curb Opening Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	1.00	1.00	
Clogging Factor for Multiple Units	Clog =	0.17	0.17	
Curb Opening as a Weir (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	2.0	7.9	cfs
Interception with Clogging	Q_{wa} =	1.7	6.6	cfs
Curb Opening as an Orifice (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	5.7	7.4	cfs
Interception with Clogging	Q_{oa} =	4.7	6.2	cfs
Curb Opening Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	2.9	6.6	cfs
Interception with Clogging	Q_{ma} =	2.4	5.5	cfs
Resulting Curb Opening Capacity (assumes clogged condition)	**Q_{Curb} =**	**1.7**	**5.5**	**cfs**
Resultant Street Conditions		MINOR	MAJOR	
Total Inlet Length	L =	3.00	3.00	feet
Resultant Street Flow Spread (based on street geometry from above)	T =	18.7	42.0	ft
Resultant Flow Depth at Street Crown	d_{CROWN} =	0.0	0.0	inches
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	0.523	0.989	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.33	0.80	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.94	1.00	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	0.94	1.00	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**3.9**	**8.4**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	3.3	6.8	cfs

Excerpts from "The Final Drainage Report UDG Meadowmark, Meadows Filing No. 19 Lot 2 North Parcel D2A, prepared by Ware Malcomb, approved April 2023.



Excerpts from "The Final Drainage Report UDG Meadowmark, Meadows Filing No. 19 Lot 2 North Parcel D2A, prepared by Ware Malcomb, approved April 2023.

FlexTable: Conduit Table

Active Scenario: 5 YEAR

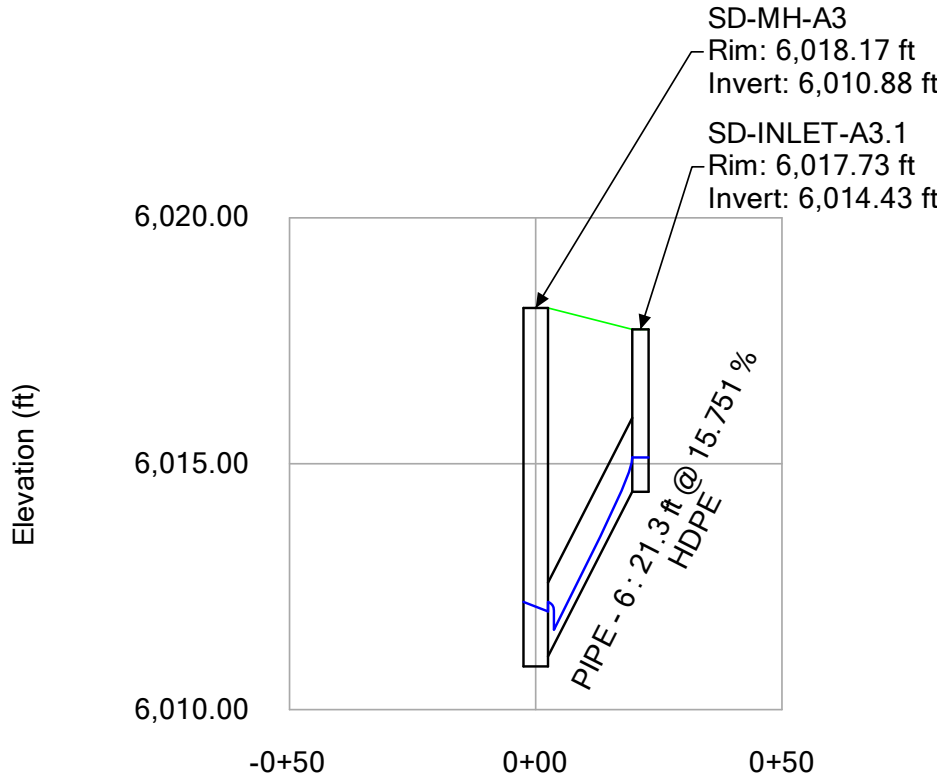
ID	Label	Start Node	Invert (Start) (ft)	Stop Node	Invert (Stop) (ft)	Length (User Defined) (ft)	Slope (Calculated) (%)	Diameter (in)	Manning's n	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)
63	PIPE - 18	RD-3	6,017.61	SD-INLET-B4.1	6,014.75	101.8	2.809	3.0	0.013	6,017.81	6,014.91
64	PIPE - 25	RD-2	6,019.61	MH - 25	6,019.28	14.2	2.311	3.0	0.013	6,019.97	6,019.79
65	PIPE - 27	RD-1	6,018.61	MH - 26	6,018.17	54.5	0.803	3.0	0.013	6,019.49	6,018.73
66	PIPE - 64	SD-INLET-A8	6,014.46	SD-MH-A7	6,014.26	41.0	0.487	18.0	0.012	6,014.96	6,014.74
67	PIPE - 65	SD-MH-A7	6,014.06	SD-TEE-A6	6,013.50	112.4	0.498	18.0	0.012	6,014.55	6,014.26
68	PIPE - 8	SD-INLET-B8	6,020.34	SD-MH-B7	6,019.63	33.2	2.136	12.0	0.012	6,020.51	6,019.75
69	PIPE - 9	SD-MH-B7	6,019.13	SD-TEE-B6	6,015.45	151.1	2.432	18.0	0.012	6,019.28	6,015.96
70	PIPE - 17	MH - 25	6,019.28	SD-INLET-B6.1	6,018.78	38.2	1.300	12.0	0.012	6,019.66	6,019.32
71	PIPE - 24	SD-INLET-B6.1	6,018.79	MH - 26	6,018.18	30.4	2.000	12.0	0.012	6,019.20	6,018.73
72	PIPE - 1	SD-INLET-A6.1	6,013.71	SD-TEE-A6	6,013.50	41.0	0.500	18.0	0.012	6,014.26	6,014.26
73	PIPE - 7	SD-INLET-A5.1	6,017.93	SD-TEE-A5	6,012.79	21.6	23.840	18.0	0.012	6,018.29	6,013.66
74	PIPE - 16	SD-INLET-B6.2	6,019.86	MH - 25	6,019.28	44.7	1.300	12.0	0.012	6,020.23	6,019.79
75	PIPE - 3	SD-TEE-A5	6,012.79	SD-MH-A4	6,012.06	145.7	0.501	18.0	0.012	6,013.48	6,012.73
76	PIPE - 66	SD-MH-A4	6,011.86	SD-MH-A3	6,011.07	157.3	0.502	18.0	0.012	6,012.54	6,012.19
77	PIPE - 26	MH - 26	6,018.18	SD-TEE-B6	6,015.70	91.0	2.719	12.0	0.012	6,018.61	6,015.98
78	PIPE - 28	SD-INLET-B4.1	6,014.00	SD-MH-B4	6,011.66	36.3	6.444	12.0	0.012	6,014.38	6,012.04
79	PIPE - 4	SD-MH-A3	6,010.88	SD-MH-A2	6,010.77	22.0	0.500	18.0	0.015	6,012.00	6,011.88
80	PIPE - 5	SD-MH-A2	6,010.58	SD-MH-A1	6,010.48	18.7	0.500	18.0	0.015	6,011.64	6,011.42
81	PIPE - 6	SD-INLET-A3.1	6,014.43	SD-MH-A3	6,011.08	21.3	15.751	18.0	0.012	6,015.13	6,012.19
82	PIPE - 11	SD-TEE-B5	6,011.74	SD-MH-B4	6,011.16	29.0	1.981	18.0	0.012	6,012.46	6,012.04
83	PIPE - 12	SD-MH-B4	6,010.97	SD-MH-B3	6,010.36	126.8	0.476	18.0	0.012	6,011.76	6,011.19
84	PIPE - 15	SD-INLET-B5.1	6,013.64	SD-TEE-B5	6,011.73	41.0	4.659	18.0	0.012	6,014.30	6,012.65
87	PIPE - 10	SD-TEE-B6	6,015.45	SD-TEE-B5	6,011.73	172.4	2.157	18.0	0.012	6,015.86	6,012.65
88	PIPE - 2	SD-TEE-A6	6,013.50	SD-TEE-A5	6,012.79	141.9	0.500	18.0	0.012	6,014.10	6,013.66
90	PIPE - 13	SD-MH-B3	6,010.16	SD-MH-B2	6,009.87	49.6	0.575	18.0	0.012	6,010.94	6,010.70
91	PIPE - 19	SD-MH-B2	6,009.67	SD-INLET-B2.1	6,008.67	39.9	2.499	18.0	0.015	6,010.45	6,009.77
92	PIPE - 14	SD-INLET-B2.1	6,008.47	SD-EX MH-B1	6,008.18	39.5	0.750	18.0	0.015	6,009.54	6,009.18

Excerpts from "The Final Drainage Report UDG Meadowmark, Meadows Filing No. 19 Lot 2 North Parcel D2A, prepared by Ware Malcomb, approved April 2023.

Profile Report

Engineering Profile - A3 (DCS22-4026_StormCAD.stsw)

Active Scenario: 5 YEAR



Excerpts from "The Final Drainage Report UDG Meadowmark, Meadows Filing No. 19 Lot 2 North Parcel D2A, prepared by Ware Malcomb, approved April 2023.

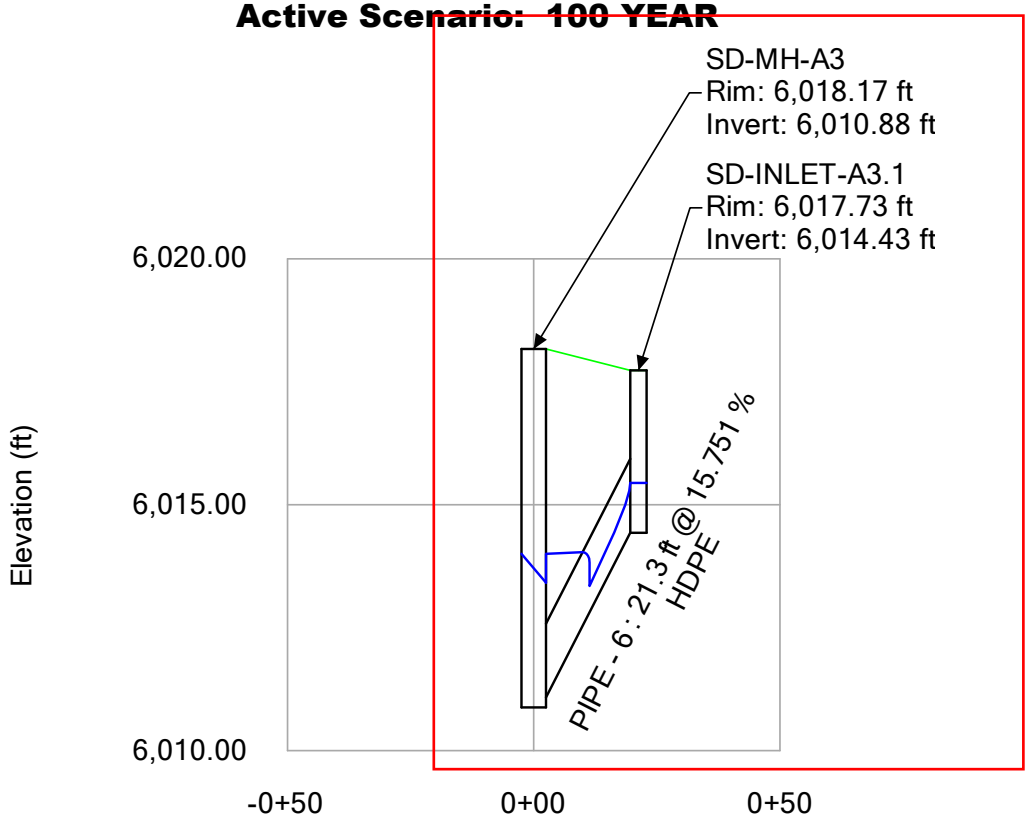
FlexTable: Conduit Table

Active Scenario: 100 YEAR

ID	Label	Start Node	Invert (Start) (ft)	Stop Node	Invert (Stop) (ft)	Length (User Defined) (ft)	Slope (Calculated) (%)	Diameter (in)	Manning's n	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)
63	PIPE - 18	RD-3	6,017.61	SD-INLET-B4.1	6,014.75	101.8	2.809	3.0	0.013	6,017.81	6,014.96
64	PIPE - 25	RD-2	6,019.61	MH - 25	6,019.28	14.2	2.311	3.0	0.013	6,020.34	6,020.16
65	PIPE - 27	RD-1	6,018.61	MH - 26	6,018.17	54.5	0.803	3.0	0.013	6,019.87	6,019.11
66	PIPE - 64	SD-INLET-A8	6,014.46	SD-MH-A7	6,014.26	41.0	0.487	18.0	0.012	6,016.60	6,016.53
67	PIPE - 65	SD-MH-A7	6,014.06	SD-TEE-A6	6,013.50	112.4	0.498	18.0	0.012	6,016.45	6,016.27
68	PIPE - 8	SD-INLET-B8	6,020.34	SD-MH-B7	6,019.63	33.2	2.136	12.0	0.012	6,020.64	6,019.84
69	PIPE - 9	SD-MH-B7	6,019.13	SD-TEE-B6	6,015.45	151.1	2.432	18.0	0.012	6,019.40	6,016.31
70	PIPE - 17	MH - 25	6,019.28	SD-INLET-B6.1	6,018.78	38.2	1.300	12.0	0.012	6,019.92	6,019.73
71	PIPE - 24	SD-INLET-B6.1	6,018.79	MH - 26	6,018.18	30.4	2.000	12.0	0.012	6,019.48	6,019.11
72	PIPE - 1	SD-INLET-A6.1	6,013.71	SD-TEE-A6	6,013.50	41.0	0.500	18.0	0.012	6,016.29	6,016.27
73	PIPE - 7	SD-INLET-A5.1	6,017.93	SD-TEE-A5	6,012.79	21.6	23.840	18.0	0.012	6,018.46	6,015.71
74	PIPE - 16	SD-INLET-B6.2	6,019.86	MH - 25	6,019.28	44.7	1.300	12.0	0.012	6,020.49	6,020.16
75	PIPE - 3	SD-TEE-A5	6,012.79	SD-MH-A4	6,012.06	145.7	0.501	18.0	0.012	6,015.51	6,014.84
76	PIPE - 66	SD-MH-A4	6,011.86	SD-MH-A3	6,011.07	157.3	0.502	18.0	0.012	6,014.69	6,014.00
77	PIPE - 26	MH - 26	6,018.18	SD-TEE-B6	6,015.70	91.0	2.719	12.0	0.012	6,018.88	6,016.16
78	PIPE - 28	SD-INLET-B4.1	6,014.00	SD-MH-B4	6,011.66	36.3	6.444	12.0	0.012	6,014.86	6,014.75
79	PIPE - 4	SD-MH-A3	6,010.88	SD-MH-A2	6,010.77	22.0	0.500	18.0	0.015	6,013.42	6,012.97
80	PIPE - 5	SD-MH-A2	6,010.58	SD-MH-A1	6,010.48	18.7	0.500	18.0	0.015	6,012.30	6,011.87
81	PIPE - 6	SD-INLET-A3.1	6,014.43	SD-MH-A3	6,011.08	21.3	15.751	18.0	0.012	6,015.44	6,014.00
82	PIPE - 11	SD-TEE-B5	6,011.74	SD-MH-B4	6,011.16	29.0	1.981	18.0	0.012	6,014.89	6,014.75
83	PIPE - 12	SD-MH-B4	6,010.97	SD-MH-B3	6,010.36	126.8	0.476	18.0	0.012	6,014.30	6,013.32
84	PIPE - 15	SD-INLET-B5.1	6,013.64	SD-TEE-B5	6,011.73	41.0	4.659	18.0	0.012	6,015.22	6,015.11
87	PIPE - 10	SD-TEE-B6	6,015.45	SD-TEE-B5	6,011.73	172.4	2.157	18.0	0.012	6,016.13	6,015.11
88	PIPE - 2	SD-TEE-A6	6,013.50	SD-TEE-A5	6,012.79	141.9	0.500	18.0	0.012	6,016.14	6,015.71
90	PIPE - 13	SD-MH-B3	6,010.16	SD-MH-B2	6,009.87	49.6	0.575	18.0	0.012	6,012.93	6,012.55
91	PIPE - 19	SD-MH-B2	6,009.67	SD-INLET-B2.1	6,008.67	39.9	2.499	18.0	0.015	6,012.17	6,011.71
92	PIPE - 14	SD-INLET-B2.1	6,008.47	SD-EX MH-B1	6,008.18	39.5	0.750	18.0	0.015	6,010.91	6,009.61

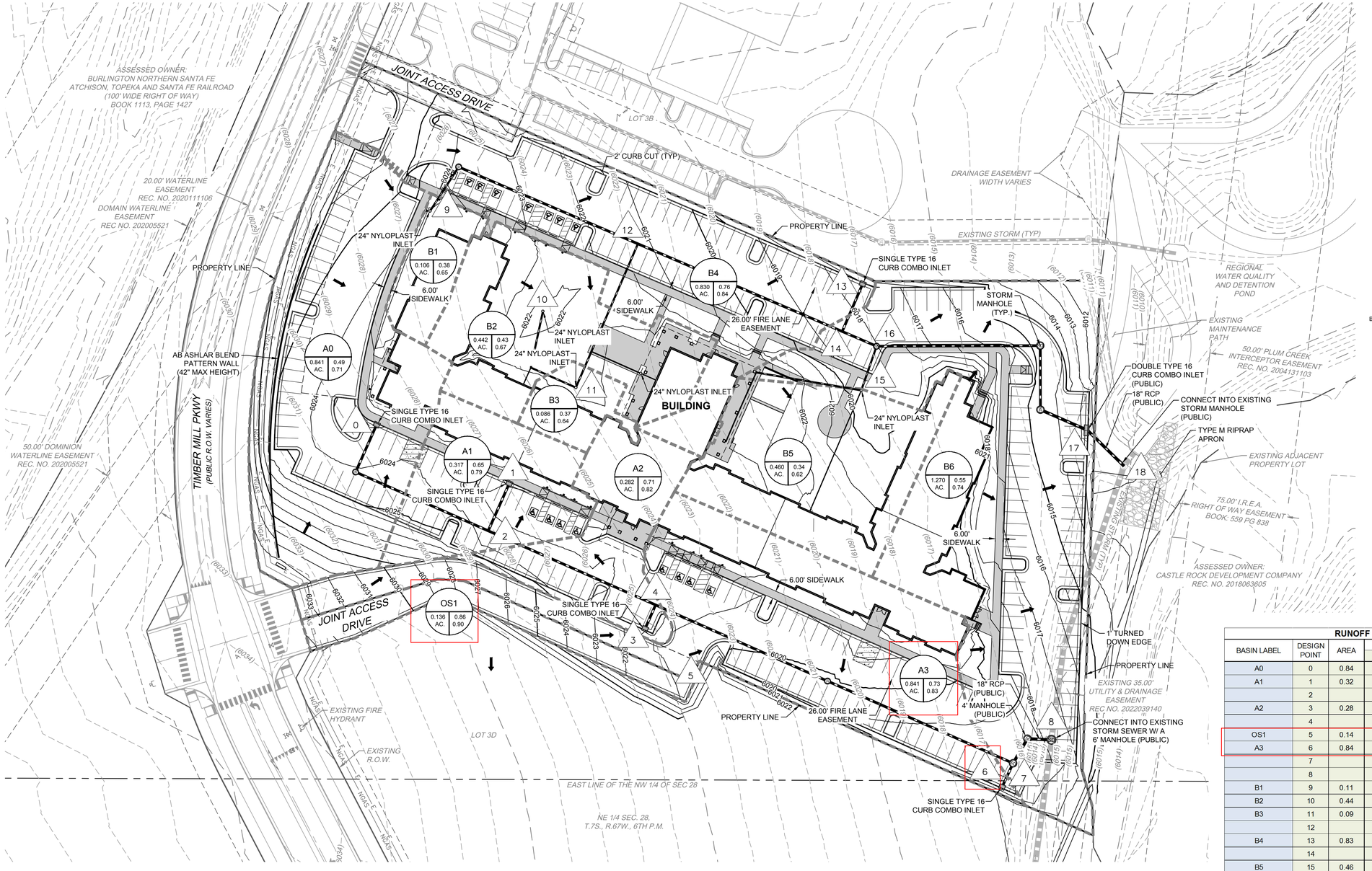
Excerpts from "The Final Drainage Report UDG Meadowmark, Meadows Filing No. 19 Lot 2 North Parcel D2A, prepared by Ware Malcomb, approved April 2023.

Profile Report
Engineering Profile - A3 (DCS22-4026_StormCAD.stsw)
Active Scenario: 100 YEAR



Excerpts from "The Final Drainage Report UDG Meadowmark, Meadows Filing No. 19 Lot 2 North Parcel D2A, prepared by Ware Malcomb, approved April 2023.

CAUTION: IF THIS SHEET IS NOT 24"x36" IT IS A REDUCED PRINT



RUNOFF SUMMARY

BASIN LABEL	DESIGN POINT	AREA	LOCAL (CFS)		ACCUMULATIVE (CFS)	
			Q5	Q100	Q5	Q100
A0	0	0.84	1.74	4.53		
A1	1	0.32	1.00	2.21		
	2				2.6	6.4
A2	3	0.28	0.91	1.92		
	4				3.4	8.2
OS1	5	0.14	0.56	1.07		
A3	6	0.84	2.79	5.76	3.3	6.8
	7				6.5	14.4
	8				6.5	14.4
B1	9	0.11	0.17	0.52		
B2	10	0.44	0.74	2.13		
B3	11	0.09	0.14	0.44	0.9	2.5
	12				1.0	3.0
B4	13	0.83	2.93	5.94		
	14				3.5	8.0
B5	15	0.46	0.70	2.35		
	16				4.1	10.1
B6	17	1.27	2.78	6.81	6.8	16.7
	18				12.9	30.3

SCALE: 1" = 40'
ORIGINAL GRAPHIC SCALE

WARE MALCOMB assumes no responsibility for utility locations. The utilities shown on this drawing have been plotted from the best available information. It is, however, the contractors responsibility to field verify the location of all utilities prior to the commencement of any construction.

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

DEVELOPMENT SERVICES DATE

WARE MALCOMB
CIVIL ENGINEERING & SURVEYING
900 south broadway
suite 320
denver, co 80209
p. 303.561.3333
waremalcomb.com

FOR AND ON BEHALF OF WARE MALCOMB

UDG MEADOWMARK
PUBLIC IMPROVEMENT CONSTRUCTION PLANS
TIMBER MILL PARKWAY & N. MEADOWS DR.
CASTLE ROCK, CO 80109

DRAINAGE PLAN

NO.	DATE	REMARKS
1	10/12/2022	1ST CD SUBMITTAL
2	01/12/2023	2ND CD SUBMITTAL
3	03/03/2023	3RD CD SUBMITTAL
4	03/21/2023	4TH CD SUBMITTAL

JOB NO.:	DCS22-4026
PA / PM:	T. SWAN
DESIGNED:	I.CONTRERAS
DATE:	08/15/2022
PLOT DATE:	03/21/23

SHEET
DR1

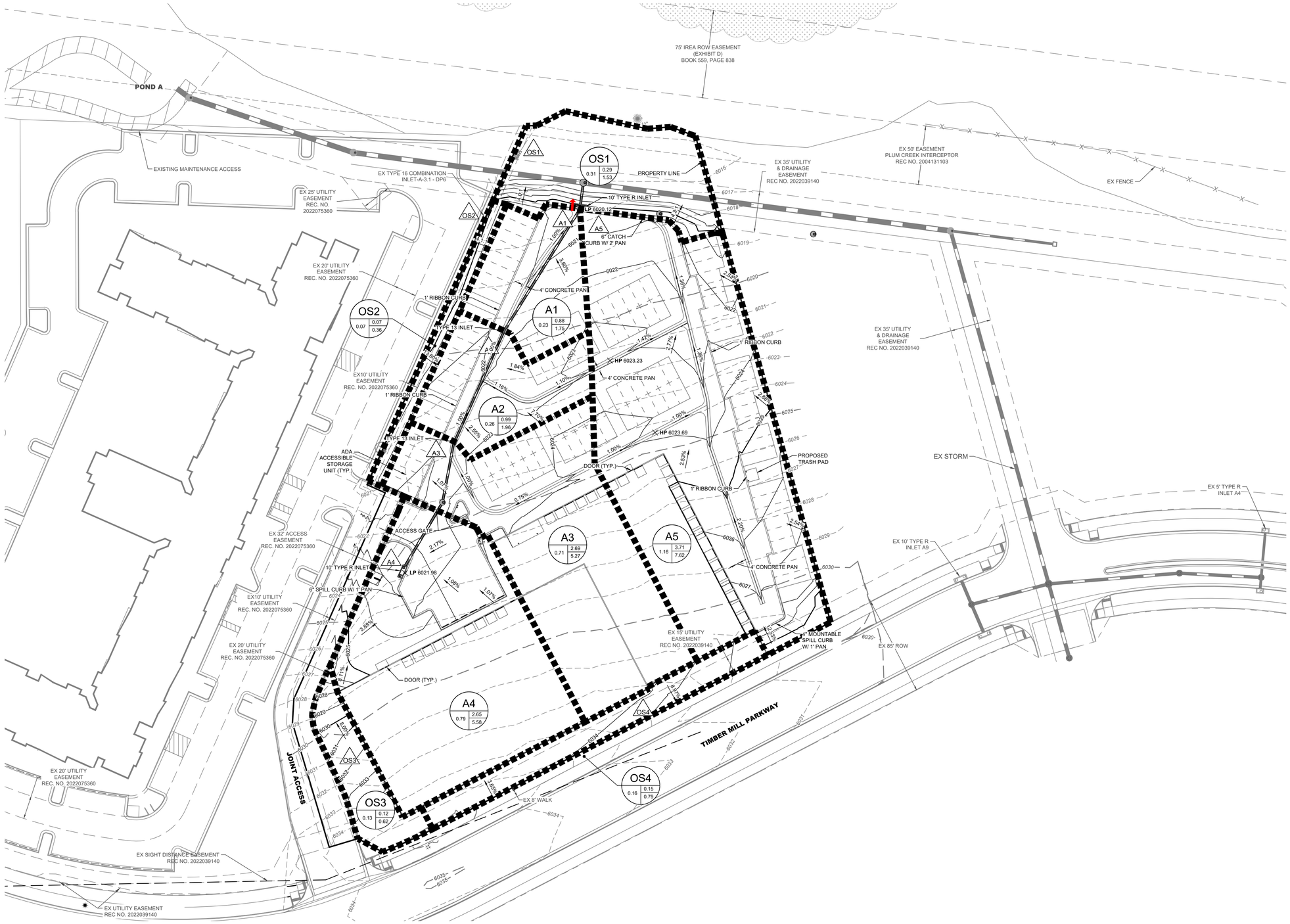
THESE DRAWINGS AND SPECIFICATIONS ARE THE PROPERTY AND COPYRIGHT OF WARE MALCOMB AND SHALL NOT BE USED ON ANY OTHER WORK EXCEPT BY AGREEMENT WITH WARE MALCOMB. WRITTEN DIMENSIONS SHALL TAKE PRECEDENCE OVER SCALED DIMENSIONS AND SHALL BE VERIFIED ON THE JOB SITE. ANY DISCREPANCY SHALL BE BROUGHT TO THE NOTICE OF WARE MALCOMB PRIOR TO THE COMMENCEMENT OF ANY WORK.
NOT FOR CONSTRUCTION

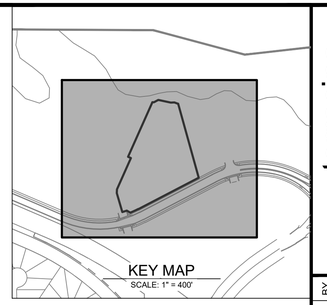
APPENDIX E
DRAINAGE MAPS

PROPOSED DRAINAGE MAP

SITE DEVELOPMENT PLAN
DXD CASTLE ROCK STORAGE

A PORTION OF LOT 3D, THE MEADOWS FILING NO. 19 - PARCEL 2N, AMENDMENT NO. 1
A PORTION OF SECTION 28, TOWNSHIP 7 SOUTH, RANGE 67 WEST
TOWN OF CASTLE ROCK, COUNTY OF DOUGLAS, STATE OF COLORADO





N

0 40' 80'

1 inch = 40'

LEGEND

- PROPOSED MAJOR CONTOUR (4880)
- PROPOSED MINOR CONTOUR (4879)
- PROPOSED MAJOR CONTOUR (4880)
- PROPOSED MINOR CONTOUR (4879)
- PROPOSED DRAINAGE BASIN MAJOR
- PROPOSED DRAINAGE BASIN MINOR
- EXISTING DRAINAGE BASIN MAJOR
- EXISTING DRAINAGE BASIN MINOR
- STORM (FES, MH, & INLET) — EXISTING / PROPOSED
- BASIN DESIGNATION — EX-1 (AREA X.XX (AC)) / PR-1 (AREA X.XX (AC))
- MINOR RUNOFF (CFS) 0.XX
- MAJOR RUNOFF (CFS) 0.XX
- DIRECTIONAL FLOW ARROW
- DESIGN POINT — EX-1 / PR-1
- EMERGENCY OVERFLOW ROUTE

RUNOFF SUMMARY TABLE

Basin ID	Design Point	Basin Area (Ac)	5-Year Runoff (CFS)	100-Year Runoff (CFS)
A1	A1	0.23	0.88	1.75
A2	A2	0.26	0.99	1.96
A3	A3	0.71	2.69	5.27
A4	A4	0.79	2.65	5.58
A5	A5	1.16	3.71	7.62
OS1	OS1	0.31	0.29	1.53
OS2	OS2	0.07	0.07	0.36
OS3	OS3	0.13	0.12	0.62
OS4	OS4	0.16	0.15	0.79

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

#	REVISION DESCRIPTION	DATE	BY
1	1ST SUBMITTAL	02/04/2026	MM
2	2ND SUBMITTAL	03/16/2026	MM

NOT FOR CONSTRUCTION

DXD CASTLE ROCK STORAGE
CASTLE ROCK, COLORADO

SITE DEVELOPMENT PLAN
DRAINAGE PLAN

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

MEADOWS STORAGE
SITE DEVELOPMENT PLAN
PROJECT # SDP26-0001

3/11/2026 12:26 PM X:\DXD CAPITAL - MEADOWS STORAGE\DOCUMENTS\REPORTS\DRAINAGE\00 - OVERALL\E - DRAINAGE MAPS DRAINAGE MAP.DWG A