Drainage Conformance Letter

GT Sanders Building
Lot 1, Sanders Business Park
(JN: 26003)
Castle Rock, CO

SDP26-0008 / CD26-0019

February 13, 2026
Revised June 9, 2026

Prepared for:

Intergroup Architects
Attn: Bill Smith
2000 W Littleton Blvd
Littleton, CO 80120
303.738.8877

Owner:

GT Sanders

Prepared by:

Proof Civil
Mathew A. Adams, PE
1531 Market Street
Denver, CO 80202
303.325.5709

Certification Page

Engineer's Statement

"I affirm that this Drainage Conformance Letter and plan for the final drainage design of GT Sanders Building was prepared by me (or under my direct supervision) in accordance with the provisions of 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."

Mathew A. Adams, PE
State of Colorado No. 42628
For and on behalf of Proof Civil Co.

Owner/Developer's Statement:

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

Reed White

Name of Developer

Reed White

Authorized Signature

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February 13, 2026

Town of Castle Rock
100 N. Wilcox Street
Castle Rock, CO 80104

This Drainage Conformance Letter for the GT Sanders Building will address the on-site stormwater conveyance and treatment for the development in accordance with criteria set forth by applicable governing agencies and demonstrate general conformance to the approved *Phase III Drainage Report for the GT Sanders, Lot 1, Sanders Business Center* prepared by Proof Civil, approved June 30, 2005, hereafter referred to as the Report, along with the *Drainage Amendment Letter* to that Phase III Drainage report, prepared by Proof Civil, approved August 10, 2023.

I. Site Location and Description

The proposed GT Sanders Building is located in the Sanders Industrial Park at Castle Rock at 2770 S Wilcox Street in Castle Rock, Colorado. The property is located in the northeast quarter of Section 22, Township 8 South, Range 67 West of the 6th P.M., Town of Castle Rock, Douglas County, Colorado. Interstate 25 frontage road (South Wilcox) runs along the western side of the site. An existing detention pond is located to the east of the site. The Plum Creek Church is located to the north, and a storage unit complex is located to the south and southeast. A vicinity map is included in Appendix A.

The site is currently mostly vacant and is approximately 2.49 acres in size and was part of a previous subdivision process which dedicated public land to the Town of Castle Rock and right of way along the western property line. The site was overlot graded as part of a previous overall development and has slopes of 1-3% on most of the site with steeper slopes of 4:1 on the west side of the site. The site will be developed with a new metal building with associated parking, drives, and landscaped areas.

Runoff from the site shall be conveyed to an existing full spectrum detention pond, located east of the site and along the west side of Plumb Creek. The pond was designed to accept developed runoff from the full subdivision. Conveyance from the site to the detention pond will be via existing storm infrastructure in previously installed within the site, along with new storm sewer extensions for roof drain connections.

The floodplain for Plum Creek does not extend into the site and no work within the floodplain is proposed. According to FEMA Flood Insurance Rate Map Panel #08035C0301G, effective March 16, 2016, the subject site is located within flood hazard area Zone X. Zone X is defined as an area of minimal flood hazard. Refer to Appendix A for the applicable FEMA flood map.

According to the United States Department of Agriculture Natural Resources Conservation Service (NRCS) National Cooperative Soil Survey, onsite soils are identified as Bresser sandy loam, Newlin gravelly sandy loam, and Sandy west alluvial land and are classified as Hydrologic Soil Group B, B, and D, respectively. The area proposed for development consists primarily of the Bresser sandy loam and Newlin gravelly sandy loam soils. A copy of the NRCS Soil Resource Report is included in Appendix A.

There are no known or identified existing irrigation ditches or canals within the project site. There are no other known significant geological features within the project site.

II. Drainage Basins and Sub-Basins

A. Major Drainage Basins

B. The subject property is tributary to Plum Creek via outfall from the existing detention pond east of the site. Runoff from Wilcox along the west side of the site is conveyed to the detention pond via existing storm sewer. Further development of lands to the west is not anticipated to impact the subject property due to the existing infrastructure in place to convey runoff from those properties.

C. Minor Drainage Basins

Runoff from the proposed onsite drainage basins shall be conveyed to the proposed detention pond via sheet flow, curb and gutter, and onsite storm sewer systems. A small portion of the site along the north property line cannot feasibly be conveyed to the detention pond, however this area will not contain impervious improvements and will follow historic drainage patterns to the existing ditch along the north side of the property. All proposed basins and drainage patterns generally follow the design from the original report, with minor modifications based on the updated, reduced site improvements. MHFD has also updated impervious values for the various surfaces, increasing most. Therefore, even though the amount of impervious area has been reduced, the overall calculated imperviousness for the site has slightly increased.

The minor basins have been divided into multiple sub-basins that are described below. Basin naming and design points follow the naming conventions used in the original drainage report.

a. Basin A1 (DP 1A, 0.87 ac, Imp. = 44%, Q5 = 1.5 cfs, Q100 = 4.5 cfs)

The basin is located on the west and north side of the site and is comprised of asphalt drives, concrete sidewalk and a sloped landscape area adjacent to the west property line. Runoff generated by this basin is conveyed to the existing storm sewer system via curb and gutter to existing inlet 1 on the northeast side of the basin. If this inlet becomes clogged flow will be diverted to inlet 2 south of this inlet or overtop and flow into the detention pond to the east of this inlet. When compared to the original final drainage report area for this basin has increased from 0.72 acres to 0.87 acres, imperviousness has decreased from 53% to 44%, runoff rate for the 5-year event is unchanged at 1.5 cfs, and runoff rate for the 100-year event has increased from 4.0 cfs to 4.5 cfs. Inlet sizing has been calculated to verify capacity for the new runoff rates and has been found to be adequate.

b. Basin A2 (DP 2A, 1.08 ac, Imp. = 91%, Q5 = 3.8 cfs, Q100 = 7.6 cfs)

The basin is located in the eastern part of site and is comprised of the concrete loading dock area, asphalt drives and a few landscape islands. Runoff generated by this basin is conveyed to the existing storm sewer system via curb and gutter to existing inlet 2 and then piped to the existing pond forebay. If this inlet becomes clogged flow will overtop and flow into the detention pond to the northeast of this inlet. When compared to the original final drainage report area for this basin has increased from 1.03 acres to 1.08 acres, imperviousness is unchanged at 91%, runoff rate for the 5-year event is increased from 3.7 cfs to 3.8 cfs, and runoff rate for the 100-year event has increased from 7.4 cfs to 7.6 cfs. Inlet sizing has been calculated to verify capacity for the new runoff rates and has been found to be adequate.

c. Basin A3 (DP 3A, 0.31 ac, Imp. = 72%, Q5 = 0.9 cfs, Q100 = 1.9 cfs)

The basin is located on the southern portion of the site and is comprised of asphalt drives, concrete sidewalk and a small amount of landscape area. Runoff generated by this basin is conveyed to the existing storm sewer system via curb and gutter to existing inlet 3 and piped to the existing pond forebay. If this inlet becomes clogged flow will bypass the inlet and flow to Basin A2 and enter the storm system through existing inlet 2. When compared to the original final drainage report area for this basin has increased from 0.26 acres to 0.31 acres, imperviousness is reduced from 86% to 72%, runoff rate for the 5-year event is unchanged at 0.9 cfs, and runoff rate for the 100-year event is unchanged at 1.9 cfs. Inlet sizing has been calculated to verify capacity for the new runoff rates and has been found to be adequate.

d. Basin A4 (DP 4A, 0.33 ac, Imp. = 95%, Q5 = 1.3 cfs, Q100 = 2.6 cfs)

The basin is comprised of the proposed building roof. Runoff generated by this basin is conveyed off the roof through proposed roof drains on the north side of the building and then flows west to the

existing storm sewer system and piped to the existing pond forebay. When compared to the original final drainage report area for this basin has decreased from 0.48 acres to 0.33 acres, imperviousness has increased from 90% to 95% (purely due to new MHFD values), runoff rate for the 5-year event is decreased from 1.8 cfs to 1.3 cfs, and runoff rate for the 100-year event has decreased from 3.6 cfs to 2.6 cfs.

III. Proposed Drainage Design

Proposed on-site drainage design will generally follow previously designated drainage patterns. Runoff from developed area shall be directed via sheet flow, roof drains, curb and gutter and storm sewer to the existing detention pond located east of the site.

Per the previous reports for the site, the area and imperviousness for the site improvements (total A basins), tributary to the existing detention pond is 2.52 acres and 79 % impervious. The currently proposed site plan proposes an area and imperviousness, tributary to the detention pond of 2.59 acres and 73 % impervious. The slight increase in area within A basins is due to the new site layout capturing slightly more of the uncontrolled basin along the north side of the site. Overall, the impervious area has been reduced. When factoring in the increased impervious values from MHFD, the overall site imperviousness has been decreased, which would result in a lower water quality and detention volume requirement. Therefore, the proposed site improvements will not adversely impact the existing detention pond or require revisions to the pond sizing.

The changes to the planned site improvements result in minor changes to the originally calculated surface runoff to existing inlets 1, 2, and 3. Updated inlet and storm sewer capacity calculations are provided in Appendix C and show that existing infrastructure has adequate capacity. Therefore no adverse impacts to existing downstream storm infrastructure are anticipated.

Conveyance of on-site generated and tributary off-site flows has been calculated using Manning's equation in accordance with the UDFCD Urban Storm Drainage Criteria Manual and the Town of Castle Rock Storm Drainage Design and Technical Criteria Manual. UDFCD spreadsheets have been used to calculate inlet capacities. StormCAD has been used to size the storm sewer system. The storm sewer system has been sized to convey the minor storm event without surcharging and convey the major storm event with the hydraulic grade line a minimum of 1-foot below finished grade.

IV. Storage and Water Quality Enhancement

The project approach for achieving the four-step process for water quality best management practices are:

1) The site plan has been developed to provide limited amounts of impervious area only as necessary for site operations. By limiting the amount of proposed impervious area the total runoff volume is limited to extents possible.

2) The existing detention pond provides water quality capture volume and detention. The pond will improve water quality of runoff by releasing the runoff over an extended period of time to allow for sediment to settle within the pond prior to discharging to Plum Creek.

3) Runoff from the site is not directly tributary to Plum Creek therefore stream channel stabilization is not relevant for this development.

4) Significant sources of water pollution are not anticipated for the proposed site. However, landscaped areas shall be designed and maintained to require as little fertilizers and chemicals as possible, with runoff from landscaped areas also directed through the existing full spectrum pond. Snow storage shall be placed along the eastern and western landscape areas for infiltration and water quality and to minimize direct runoff.

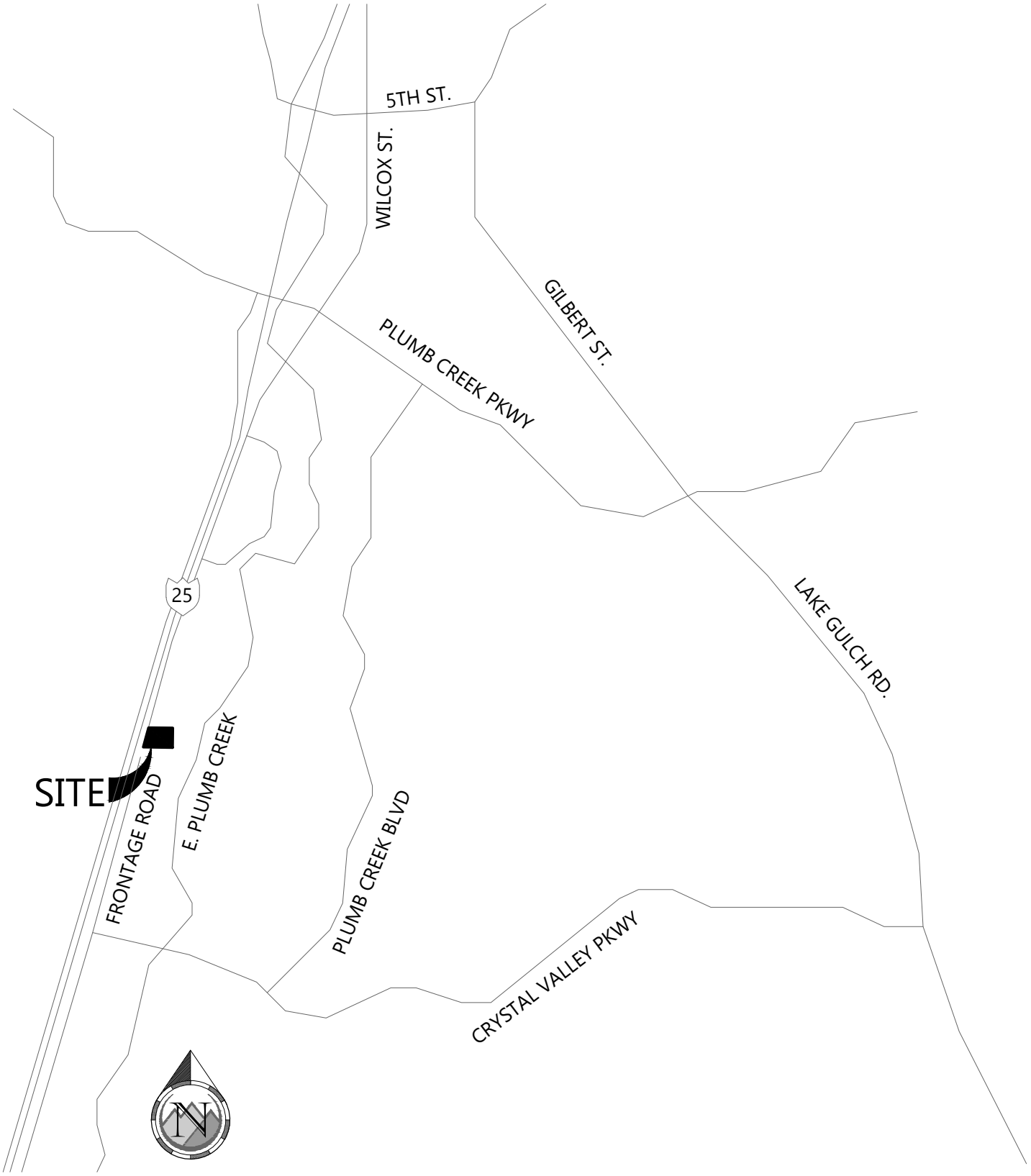
V. Conclusion

This Drainage Conformance Letter presents the description and calculations for the drainage analysis and design of the GT Sanders Building project. The drainage system has been designed in accordance with the Town of Castle Rock Storm Drainage Design and Technical Criteria Manual. The site complies with the previously approved master drainage report for the overall development. Site imperviousness is less than the maximum allowable for areas tributary to the existing detention pond and runoff rates have been calculated to show that existing infrastructure has adequate capacity for the developed flows. No variances are required or being applied for as part of the drainage design.

VI. References

1. *Urban Storm Drainage Criteria Manual Volumes 1, 2, and 3*, Urban Flood Control District, June, 2016.
2. *Storm Drainage Design and Technical Criteria Manual*, Town of Castle Rock, June, 2019.
3. *Phase III Drainage Report for the GT Sanders, Lot 1, Sanders Business Center*, Proof Civil, June 30, 2022
4. *Drainage Amendment Letter for GT Sanders, Lot 1, Sanders Business Center*, Proof Civil, August 10, 2023

- APPENDIX A- Reference Materials



PROOFCIVIL
consulting engineers
1531 Market Street | Denver, CO

VICINITY MAP

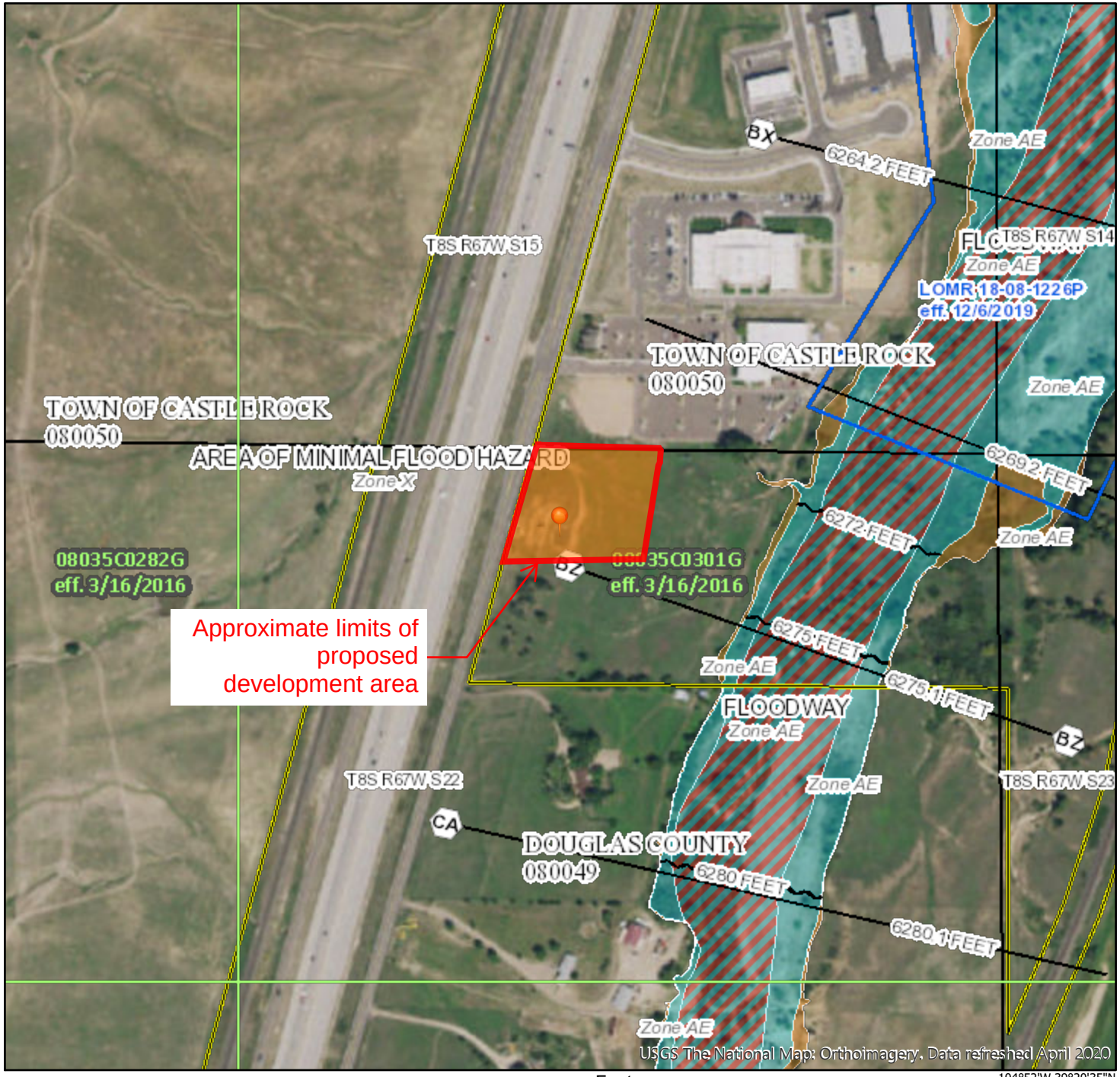
SANDERS BUSINESS PARK

REF. NO.:	SCALE:	DRAWING NO.
26003	1" = 2000'	V-1
DATE: 1/21/2026	DRAWN BY: WBP	

National Flood Hazard Layer FIRMette

FEMA

104°52'38"W 39°21'3"N



104°52'W 39°20'35"N

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

1:6,000

Legend

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

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

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

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

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

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 6/29/2020 at 2:56 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

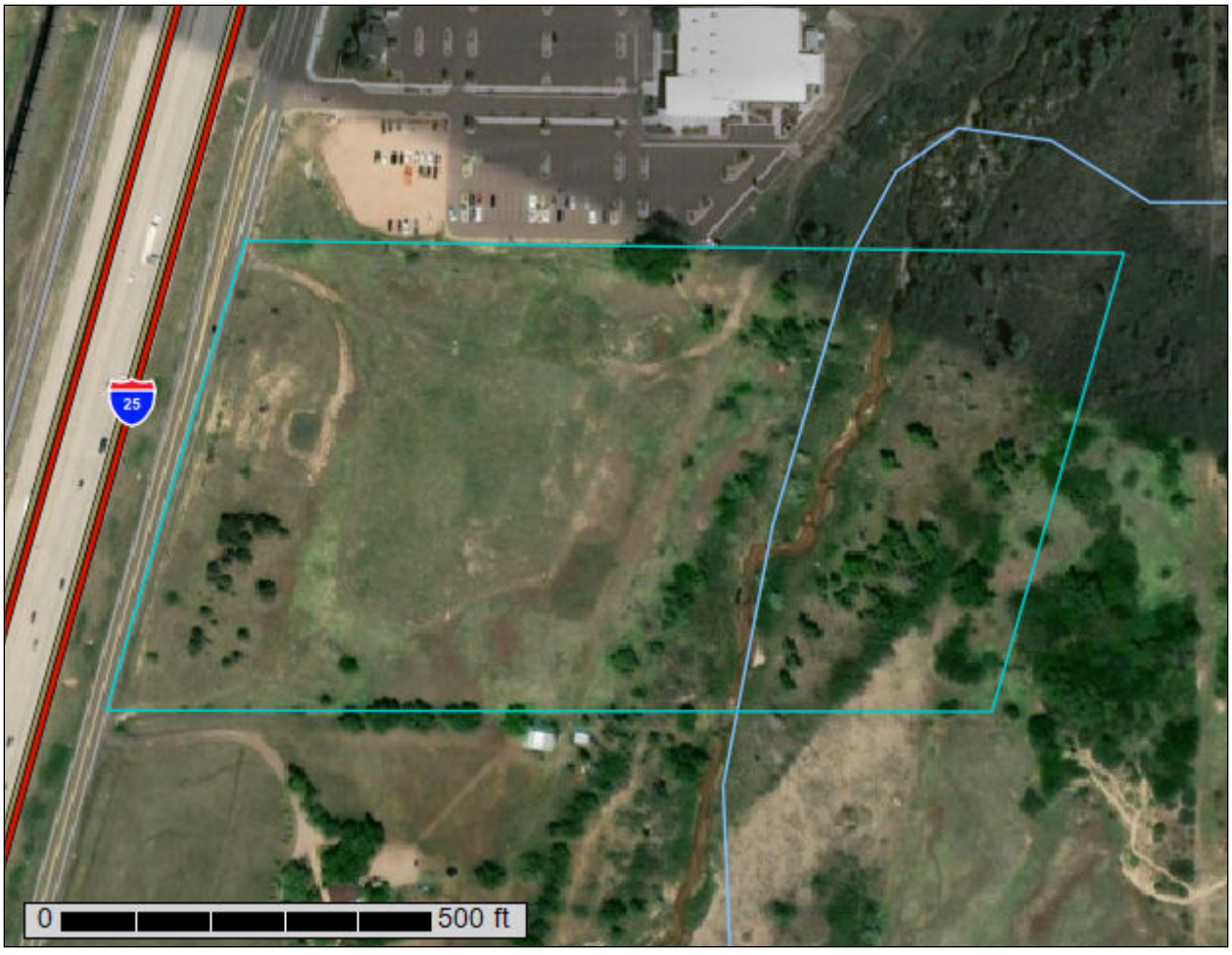
United States Department of Agriculture

NRCS

Natural Resources Conservation Service

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

Custom Soil Resource Report for Castle Rock Area, Colorado



June 29, 2020

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require

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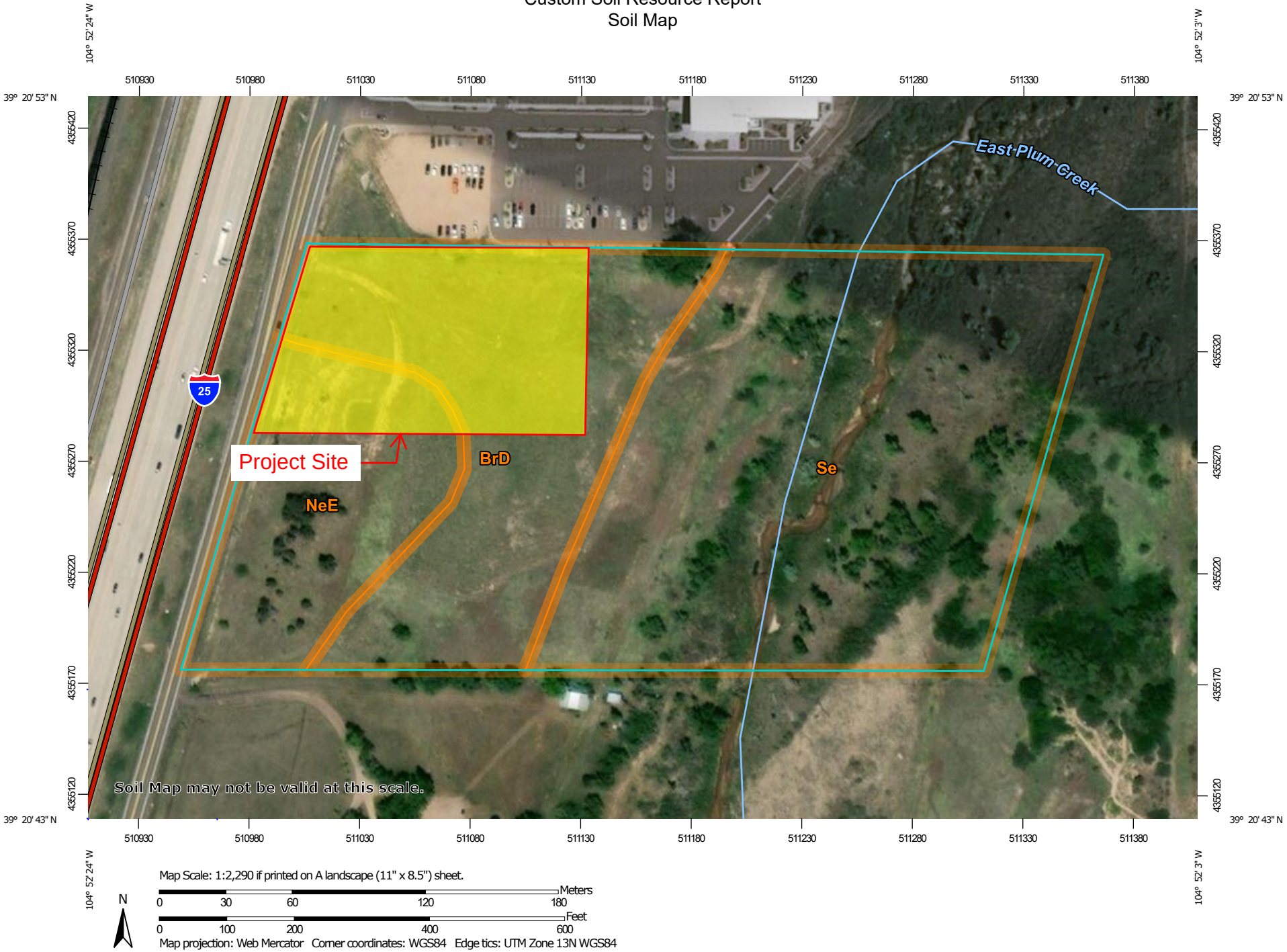
Contents

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map



Map Scale: 1:2,290 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 Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

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

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: Castle Rock Area, Colorado
Survey Area Data: Version 12, Sep 13, 2019

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

Date(s) aerial images were photographed: Jul 4, 2010—Nov 19, 2018

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
BrD	Bresser sandy loam, cool, 5 to 9 percent slopes	5.1	29.9%
NeE	Newlin gravelly sandy loam, 8 to 30 percent slopes	2.9	16.9%
Se	Sandy wet alluvial land	9.1	53.2%
Totals for Area of Interest		**17.1**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The

delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Castle Rock Area, Colorado

BrD—Bresser sandy loam, cool, 5 to 9 percent slopes

Map Unit Setting

National map unit symbol: 2tlpk
Elevation: 5,500 to 6,960 feet
Mean annual precipitation: 15 to 19 inches
Mean annual air temperature: 48 to 52 degrees F
Frost-free period: 100 to 130 days
Farmland classification: Not prime farmland

Map Unit Composition

Bresser, cool, and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Bresser, Cool

Setting

Landform: Interfluves
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Tertiary aged alluvium derived from arkose

Typical profile

Ap - 0 to 5 inches: sandy loam
Bt1 - 5 to 8 inches: sandy loam
Bt2 - 8 to 27 inches: sandy clay loam
Bt3 - 27 to 36 inches: sandy loam
C - 36 to 80 inches: loamy coarse sand

Properties and qualities

Slope: 5 to 9 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 5 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.1 to 2.0 mmhos/cm)
Available water storage in profile: Low (about 5.4 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Ecological site: Sandy Foothill (R049BY210CO)
Hydric soil rating: No

Minor Components

Ascalon

Percent of map unit: 10 percent
Landform: Interfluves
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Sandy Foothill (R049BY210CO)
Hydric soil rating: No

Truckton

Percent of map unit: 5 percent
Landform: Interfluves
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Sandy Foothill (R049BY210CO)
Hydric soil rating: No

NeE—Newlin gravelly sandy loam, 8 to 30 percent slopes

Map Unit Setting

National map unit symbol: jqzg
Elevation: 5,500 to 6,600 feet
Mean annual precipitation: 15 to 19 inches
Mean annual air temperature: 49 to 51 degrees F
Frost-free period: 120 to 135 days
Farmland classification: Not prime farmland

Map Unit Composition

Newlin and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Newlin

Setting

Landform: Terraces, mesas, plateaus
Landform position (three-dimensional): Riser
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Unconformable sandy and gravelly and/or mixed source alluvium

Typical profile

H1 - 0 to 8 inches: gravelly sandy loam
H2 - 8 to 17 inches: gravelly sandy clay loam
H3 - 17 to 22 inches: gravelly sandy loam

H4 - 22 to 60 inches: very gravelly sand

Properties and qualities

Slope: 8 to 30 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: B
Ecological site: Gravelly Foothill (R049BY214CO)
Hydric soil rating: No

Minor Components

Bresser

Percent of map unit: 5 percent
Hydric soil rating: No

Stapleton

Percent of map unit: 4 percent
Hydric soil rating: No

Satanta

Percent of map unit: 4 percent
Hydric soil rating: No

Aquic haplustolls

Percent of map unit: 2 percent
Landform: Swales
Hydric soil rating: Yes

Se—Sandy wet alluvial land

Map Unit Setting

National map unit symbol: jr04
Elevation: 5,500 to 6,600 feet
Mean annual precipitation: 15 to 19 inches
Mean annual air temperature: 48 to 50 degrees F
Frost-free period: 120 to 135 days
Farmland classification: Not prime farmland

Map Unit Composition

Sandy wet alluvial land: 80 percent

Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Sandy Wet Alluvial Land

Setting

Landform: Drainageways, flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Weathered alluvium derived from arkose

Typical profile

H1 - 0 to 6 inches: coarse sand
H2 - 6 to 60 inches: stratified coarse sand to sandy loam

Properties and qualities

Slope: 1 to 4 percent
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): High to very high (6.00 to 20.00 in/hr)
Depth to water table: About 0 to 24 inches
Frequency of flooding: Frequent
Available water storage in profile: Very low (about 2.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8w
Hydrologic Soil Group: D
Hydric soil rating: No

Minor Components

Loamy wet alluvial land

Percent of map unit: 9 percent
Hydric soil rating: No

Sandy alluvial land

Percent of map unit: 9 percent
Hydric soil rating: No

Fluventic haplaquolls

Percent of map unit: 2 percent
Landform: Terraces
Hydric soil rating: Yes

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set of one hour design point rainfall values, indicated in Table 6-1, apply to the Town.

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

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

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

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

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

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

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

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

- APPENDIX B- Hydrologic Calculations

Project : GT Sanders at Sanders Business Park
Project No. : 26003

Date : 2/13/2026
By : jkc

Drainage Basin Imperviousness

Soil Type : **C or D**

	Roof	Concrete	Asphalt	Landscape	EDB	Gravel	Future						
Imperviousness :	95%	95%	95%	5%	25%	60%	75%	Total Area	Composite	Runoff Coefficients			
Basin Name	**Areas (sq.ft.)**							**(sq.ft.)**	**% Imp.**	**C_2**	**C_5**	**C_{10}**	**C_{100}**
A1		1,011	15,415	21,472				37,898	44%	0.33	0.40	0.46	0.66
A2		21,191	23,817	2,183				47,191	91%	0.75	0.78	0.80	0.86
A3		1,456	8,449	3,465				13,370	72%	0.57	0.62	0.66	0.78
A4	14,525							14,525	95%	0.78	0.81	0.84	0.87
Total A	14,525	23,658	47,681	27,120				112,984	73%	0.59	0.64	0.68	0.78
B		340		6,269	26,734	2,703		36,046	25%	0.17	0.24	0.32	0.59
Phase 1 to pond	14,525	23,998	47,681	33,389	26,734	2,703		149,030	62%	0.48	0.54	0.59	0.74
UCA				4,910				4,910	5%	0.03	0.08	0.17	0.50
***Lot 2**													
PH2A								155,553	74%				
PH2B								10,934	95%				
PH2C								9,888	15%				
Phase 2 to pond								176,374	72%				
PH2OS								34,500	2%				

Project : GT Sanders at Sanders Business Park
Project No. : 26003

Date : 2/13/2026
By : jkc

SF2 - Time of Concentration

			Initial/Overland Time			Travel Time					Time of Concentration		Final
Basin ID	Area (AC.)	C_5	L_i (ft.)	S (%)	T_i (min.)	L_t (ft.)	S (%)	Conveyance Factor	Vel (fps)	T_t (min.)	Comp. T_C (min.)	Regional T_C (Min.)	T_C (Min.)
A1	0.87	0.40	150	25.00	5.4	400	2.0	20	2.8	2.4	7.7	21.6	7.7
A2	1.08	0.78	130	2.50	4.9	180	1.0	20	2.0	1.5	6.4	11.9	6.4
A3	0.31	0.62	55	2.00	5.1	200	1.0	20	2.0	1.7	6.8	15.6	6.8
A4	0.33	0.81	70	1.00	4.3	0	0.0	20	0.2	0.0	4.3	9.9	5.0
B	0.83	0.24	35	25.00	3.2	300	2.0	10	1.4	3.5	6.7	24.6	6.7
UCA	0.11	0.08	22	10.00	4.1	220	2.0	7	1.0	3.7	7.8	27.8	7.8
OS-1	0.32	0.81	45	2.00	2.8	700	1.0	10	1.0	11.7	14.5	15.3	14.5
OS-2	1.45	0.46	45	2.00	6.1	700	1.0	10	1.0	11.7	17.8	24.3	17.8
PH2A	3.57												8.4
PH2B	0.25												5.0
PH2C	0.23												7.5
PH2OS	0.79												19.9

Project : GT Sanders at Sanders Business
Project No. : 26003

Date : 2/13/2026
By : jkc

SF3 - Minor Storm

1-hr Point Rainfall **1.43** in. (5-year Event)

		Direct Runoff						Total Runoff				Street		Travel Time			
Description	Design Point	Area (ac.)	C_5	Tc (min.)	CA (ac.)	I (in/hr)	Q (cfs)	Tc (min.)	CA (ac.)	I (in/hr)	Q (cfs)	Slope (%)	Flow (cfs)	Length (ft)	Vel. (fps)	tt (min.)	Comments
A1	1A	0.87	0.40	7.7	0.3	4.25	1.5	7.7	0.3	4.3	1.1	2.0	1.14	17.0	2.8	0.1	To inlet 1
A2	2A	1.08	0.78	6.4	0.8	4.53	3.8	6.4	0.9	4.5	4.2						To inlet 2
	2A							6.4	1.1	4.5	5.1						Total at inlet 2
A3	3A	0.31	0.62	6.8	0.2	4.45	0.9					3.6	0.85	78.6	3.8	0.3	To inlet 3
	5							9.4	3.6	4.0	14.1	0.5	14.10	137.7	1.4	1.6	To manhole 2
A4	4A	0.33	0.81	5.0	0.3	4.85	1.3										north roof drains
	7							32.1	1.7	2.2	3.6	3.8	3.64	113.2	3.9	0.5	To manhole 3
	6							32.6	5.5	2.1	11.8						To manhole 1
B	1B	0.83	0.24	6.7	0.2	4.45	0.9										To swale and pond
UCA		0.11	0.08	7.8	0.0	4.25	0.0										Offsite to the north to Plum Creek
PH2A	1	3.57		8.4	2.2	4.13	9.3					0.8	9.25	112.9	1.8	1.0	Lot 2 Basins A, B, C, D, E, H (To stub)
PH2B	2	0.25		5.0	0.2	4.85	1.0										Lot 2 Basin F (To Stub)
PH2C	3	0.23	0.00	7.5	0.0	4.30	0.1										Lot 2 Basin J (To Pond)
PH2OS	4	0.79	0.00	19.9	0.0	2.82	0.0										Lot 2 Basin G & I (Offsite)

Project : GT Sanders at Sanders Business
Project No. : 26003

Date : 2/13/2026
By : jkc

SF3 - Major Storm

1-hr Point Rainfall **2.6** in. (100-year Event)

		Direct Runoff						Total Runoff				Street		Travel Time			
Description	Design Point	Area (ac.)	C_{100}	Tc (min.)	CA (ac.)	I (in/hr)	Q (cfs)	Tc (min.)	CA (ac.)	I (in/hr)	Q (cfs)	Slope (%)	Flow (cfs)	Length (ft)	Vel. (fps)	tt (min.)	Comments
A1	1A	0.87	0.66	7.7	0.6	7.73	4.5	7.7	0.3	7.7	2.1	2.0	2.07	17.0	2.8	0.1	To inlet 1
A2	2A	1.08	0.86	6.4	0.9	8.23	7.6	6.4	1.3	8.2	10.4						To inlet 2
	2A							6.4	1.5	8.2	12.2						Total at inlet 2
A3	3A	0.31	0.78	6.8	0.2	8.09	1.9					3.6	1.93	78.6	3.8	0.3	To inlet 3
	5							9.4	4.5	7.2	32.3	0.5	32.31	137.7	1.4	1.6	To manhole 2
A4	4A	0.33	0.87	5.0	0.3	8.82	2.6										north roof drains
	7							32.1	3.6	3.9	14.3	3.8	14.29	113.2	3.9	0.5	To manhole 3
	6							32.6	8.4	3.9	32.6						To manhole 1
B	1B	0.83	0.59	6.7	0.5	8.10	3.9										To swale and pond
UCA		0.11	0.50	7.8	0.1	7.72	0.4										Offsite to the north to Plum Creek
PH2A	1	3.57		8.4	2.8	7.51	20.8					0.8	20.80	112.9	1.8	1.0	Lot 2 Basins A, B, C, D, E, H (To stub)
PH2B	2	0.25		5.0	0.2	8.82	1.9										Lot 2 Basin F (To Stub)
PH2C	3	0.23		7.5	0.1	7.81	1.0										Lot 2 Basin J (To Pond)
PH2OS	4	0.79		19.9	0.4	5.13	1.8										Lot 2 Basin G & I (Offsite)

- APPENDIX C- Hydraulic Calculations

MHFD-Inlet, Version 6.00 (August 2025)

INLET MANAGEMENT

Project: GT Sanders Building
Minor:
Major:

Worksheet Protected

INLET NAME	Ex. Inlet 1	Ex. Inlet 2	Ex. Inlet 3
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
Number of Inlet Units	1	2	1

USER-DEFINED INPUT

User-Defined Peak Flows

Minor Peak Flow, Q (cfs)	1.50	3.80	0.90
Major Peak Flow, Q (cfs)	4.50	7.60	1.90

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:			
Bypass Flow Description (Optional):			
Minor Bypass Flow Received, Q_b (cfs)			
Major Bypass Flow Received, Q_b (cfs)			

CALCULATED OUTPUT

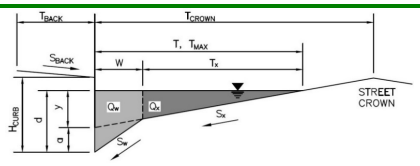
Minor Total Design Peak Flow, Q (cfs)	1.50	3.80	0.90
Major Total Design Peak Flow, Q (cfs)	4.50	7.60	1.90
Minor Inlet Interception Capacity, Q_a (cfs)	5.56	7.68	5.56
Major Inlet Interception Capacity, Q_a (cfs)	5.56	7.68	5.56
Minor Flow Bypassed Downstream, Qb (cfs)	N/A	N/A	N/A
Major Flow Bypassed Downstream, Qb (cfs)	N/A	N/A	N/A
Minor Flow Capture Percentage, C%	100%	100%	100%
Major Flow Capture Percentage, C%	100%	100%	100%

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

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

Project: **GT Sanders Building**

Inlet ID: **Ex. Inlet 1**



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	0.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	35.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.026	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} =	0.015	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	35.0	35.0	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		☐	☐	

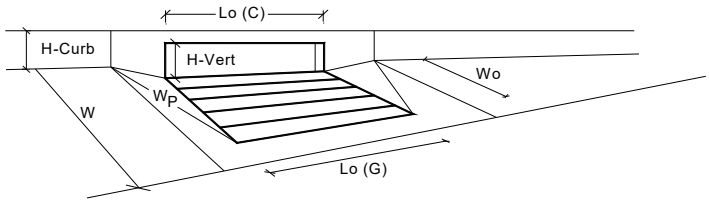
MINOR STORM Allowable Capacity is not applicable to Sump Condition

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 (Denver No. 16 Combination)	Type =	Denver No. 16 Combination		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	2.00	2.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
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) =	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	0.52	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.33	0.33	ft
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	0.94	0.94	
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	0.94	

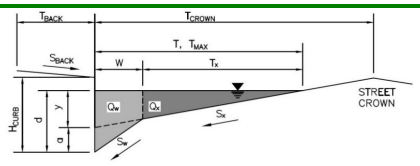
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**5.6**	**5.6**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)	$Q_{PEAK\ REQUIRED}$ =	1.5	4.5	cfs

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

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

Project: **GT Sanders Building**

Inlet ID: **Ex. Inlet 2**



Gutter Geometry:

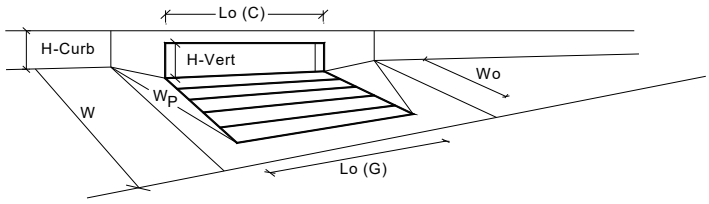
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	0.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	48.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.048	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} =	0.015	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	48.0	48.0	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	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 (Denver No. 16 Combination)	Type =	Denver No. 16 Combination		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	2.00	2.00	inches
Number of Unit Inlets (Grate or Curb Opening)	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) =	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	0.52	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.33	0.33	ft
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	0.71	0.71	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	N/A	N/A	
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.71	0.71	

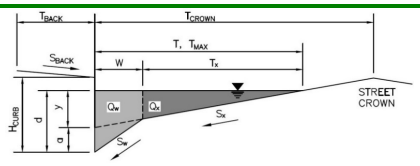
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**7.7**	**7.7**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)	$Q_{PEAK\ REQUIRED}$ =	3.8	7.6	cfs

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

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

Project: **GT Sanders Building**

Inlet ID: **Ex. Inlet 3**



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	0.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	15.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.034	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} =	0.015	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	15.0	15.0	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		☐	☐	

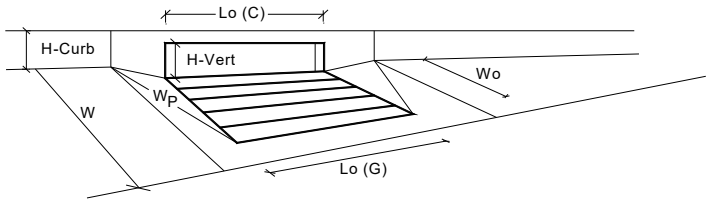
MINOR STORM Allowable Capacity is not applicable to Sump Condition

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)

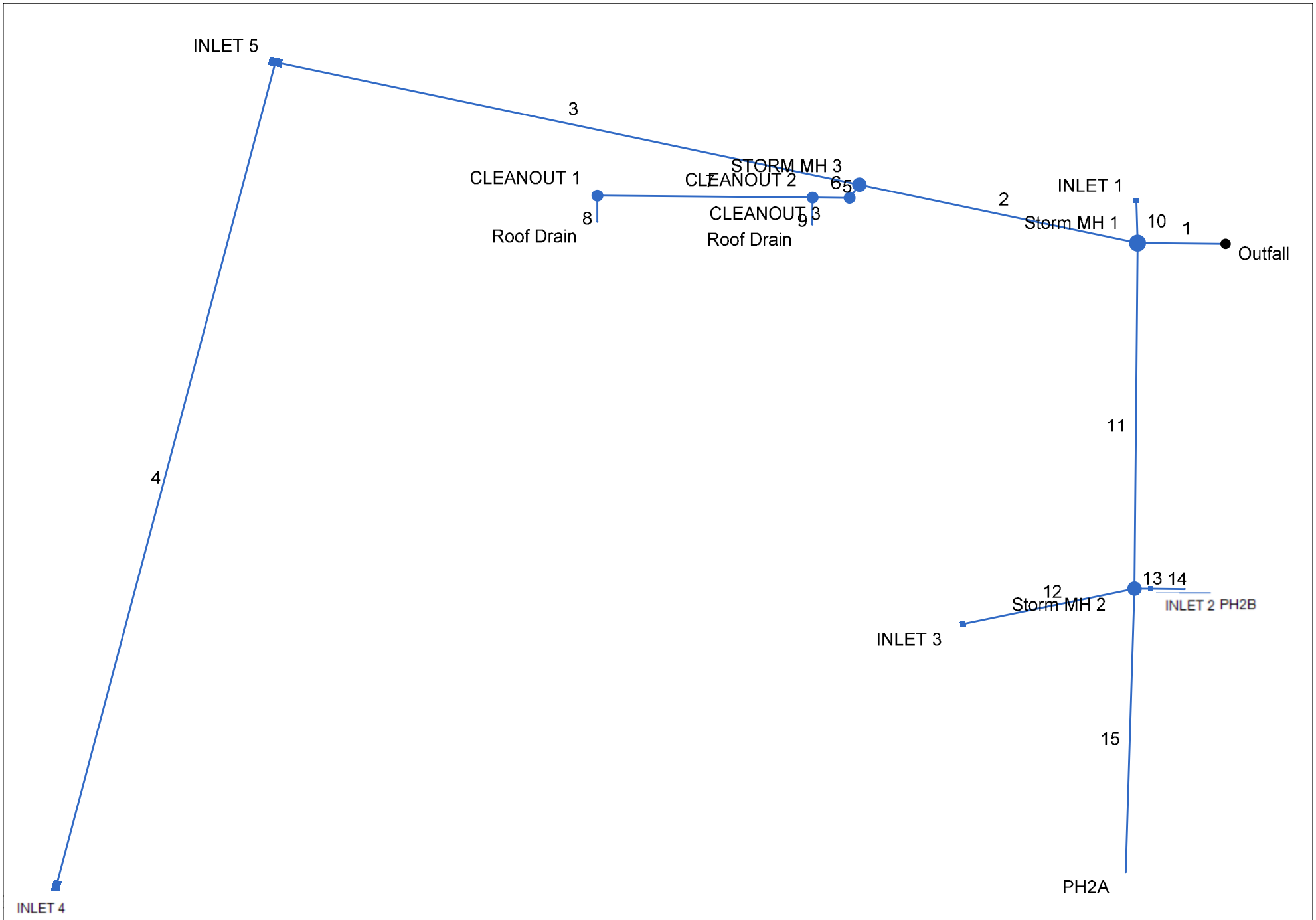


Design Information (Input)		MINOR	MAJOR	
Type of Inlet (Denver No. 16 Combination)	Type =	Denver No. 16 Combination		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	2.00	2.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (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) =	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	0.52	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.33	0.33	ft
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	0.94	0.94	
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	0.94	

		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**5.6**	**5.6**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)	$Q_{PEAK\ REQUIRED}$ =	0.9	1.9	cfs

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



Project File: 26003 100Yr.stm	Number of lines: 15	Date: 2/13/2026

HGL Rep.

Line No.	Line ID	Inlet ID	Capac Full (cfs)	Flow Rate (cfs)	Vel Up (ft/s)	Vel Dn (ft/s)	HGL Up (ft)	HGL Dn (ft)	Gnd/Rim El Up (ft)	Gnd/Rim El Dn (ft)	Line Size (in)	
1	Ex. Pipe - 1	Storm MH 1	29.39	11.80	5.35	5.66	6277.14	6276.91	6287.63	6279.35	30	
2	Ex. Pipe - 2	STORM MH 3	44.02	3.60	3.95	4.06	6281.44	6277.14	6290.33	6287.63	24	
3	Ex. Pipe - 3	INLET 5	52.51	2.90	3.72	8.97	6294.84	6281.76	6305.87	6290.33	24	
4	Ex. Pipe - 4	INLET 4	21.81	2.60	3.60	4.67	6303.35	6300.10	6307.74	6305.87	24	
5	Pr. Pipe - 5	CLEANOUT 3	6.75	1.30	3.47	6.64	6287.58	6287.20	6291.11	6290.33	12	
6	Pr. Pipe - 6	CLEANOUT 2	6.67	1.30	3.47	3.47	6288.02	6287.58	6291.62	6291.11	12	
7	Pr. Pipe - 7	CLEANOUT 1	5.46	0.65	2.81	1.74	6289.60 j	6288.02	6292.79	6291.62	12	
8	Pr. Pipe - 8	Roof Drain	1.86	0.65	3.17	4.84	6290.18	6289.86	6294.50	6292.79	8	
9	Pr. Pipe - 9	Roof Drain	3.72	0.65	3.17	8.02	6289.12	6288.06	6294.50	6291.62	8	
10	Ex. Pipe - 10	INLET 1	7.21	1.50	3.24	3.22	6283.70	6283.63	6288.17	6287.63	18	
11	Ex. Pipe - 11	Storm MH 2	29.03	14.10	5.67	5.87	6278.04	6277.32	6286.67	6287.63	30	
12	Ex. Pipe - 12	INLET 3	23.49	0.90	2.84	6.39	6286.32	6282.68	6289.47	6286.67	18	
13	Ex. Pipe - 13	INLET 2	7.27	4.80	4.40	4.39	6278.70	6278.67	6286.89	6286.67	18	
14	Ex. Pipe - 14	PH2B	32.37	1.00	2.92	0.86	6279.58 j	6278.85	6284.00	6286.89	18	
15	Ex. Pipe - 15	PH2A	27.51	9.30	5.32	7.90	6280.04	6278.08	6289.80	6286.67	24	

Project File: 26003 5Yr.stm | Number of lines: 15 | Date: 2/13/2026

NOTES: ** Critical depth

HGL Rep.

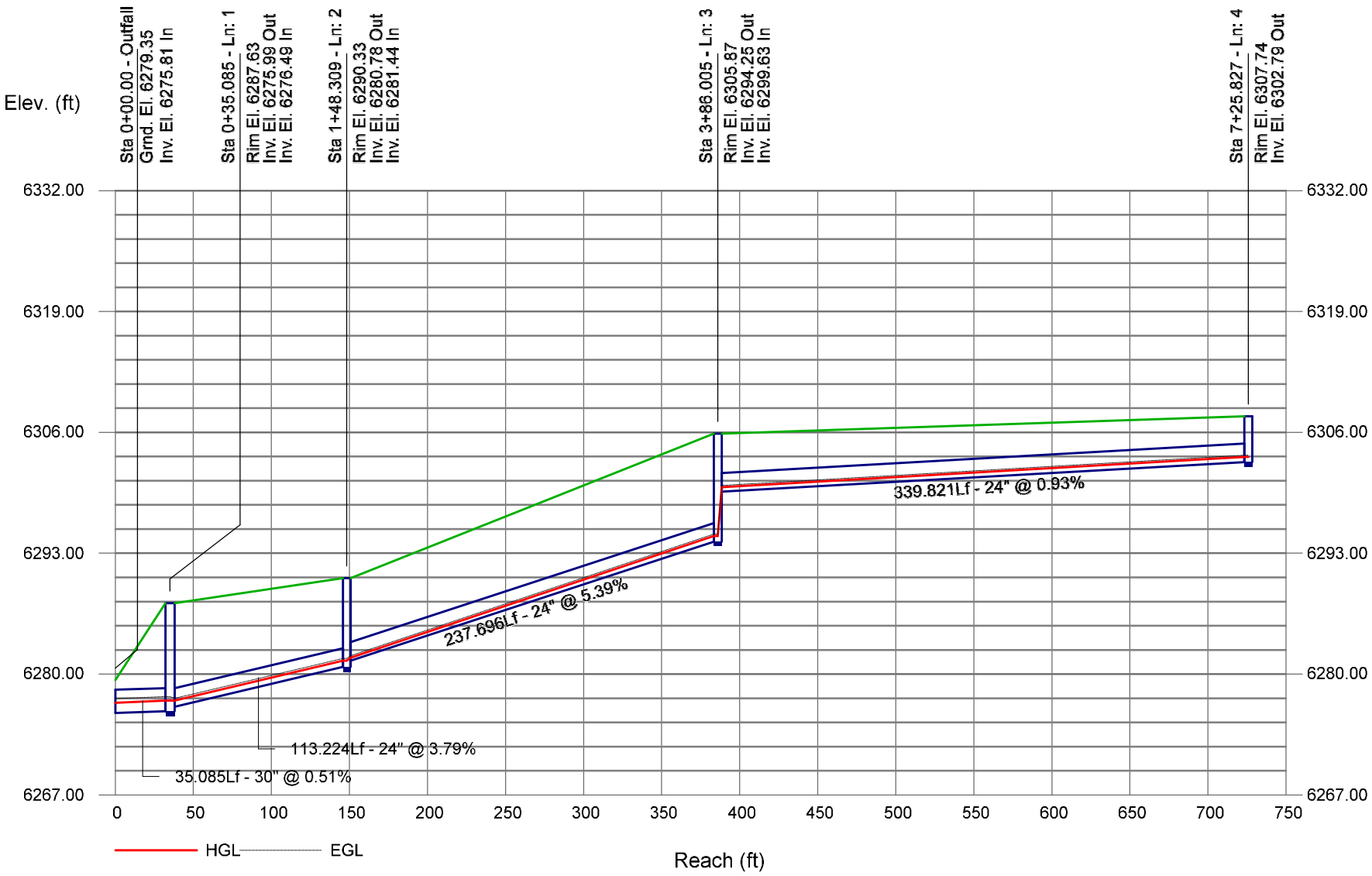
Line No.	Line ID	Inlet ID	Capac Full (cfs)	Flow Rate (cfs)	Vel Up (ft/s)	Vel Dn (ft/s)	HGL Up (ft)	HGL Dn (ft)	Gnd/Rim El Up (ft)	Gnd/Rim El Dn (ft)	Line Size (in)	
1	Ex. Pipe - 1	Storm MH 1	29.39	32.60	7.23	7.97	6278.15	6277.75	6287.63	6279.35	30	
2	Ex. Pipe - 2	STORM MH 3	44.02	14.30	6.28	4.55	6282.14 j	6278.96	6290.33	6287.63	24	
3	Ex. Pipe - 3	INLET 5	52.51	13.00	6.03	13.24	6295.55	6282.14	6305.87	6290.33	24	
4	Ex. Pipe - 4	INLET 4	21.81	13.10	6.05	7.26	6304.09	6300.75	6307.74	6305.87	24	
5	Pr. Pipe - 5	CLEANOUT 3	6.75	1.30	3.47	6.64	6287.58	6287.20	6291.11	6290.33	12	
6	Pr. Pipe - 6	CLEANOUT 2	6.67	2.60	4.50	6.95	6288.23	6287.58	6291.62	6291.11	12	
7	Pr. Pipe - 7	CLEANOUT 1	5.46	1.30	3.47	2.25	6289.74 j	6288.23	6292.79	6291.62	12	
8	Pr. Pipe - 8	Roof Drain	1.86	1.30	4.31	5.75	6290.34	6290.00	6294.50	6292.79	8	
9	Pr. Pipe - 9	Roof Drain	3.72	1.30	4.31	6.75	6289.28	6288.23	6294.50	6291.62	8	
10	Ex. Pipe - 10	INLET 1	7.21	4.50	4.31	4.30	6284.10	6284.02	6288.17	6287.63	18	
11	Ex. Pipe - 11	Storm MH 2	29.03	32.30	6.58	6.58	6279.82	6278.96	6286.67	6287.63	30	
12	Ex. Pipe - 12	INLET 3	23.49	1.90	3.50	7.98	6286.49	6282.77	6289.47	6286.67	18	
13	Ex. Pipe - 13	INLET 2	7.27	9.50	5.38	5.38	6280.54	6280.49	6286.89	6286.67	18	
14	Ex. Pipe - 14	PH2B	32.37	1.90	1.08	1.08	6280.77	6280.77	6284.00	6286.89	18	
15	Ex. Pipe - 15	PH2A	27.51	20.80	6.62	6.62	6281.45	6280.49	6289.80	6286.67	24	

Project File: 26003 100Yr.stm | Number of lines: 15 | Date: 2/13/2026

NOTES: ** Critical depth

Storm Sewer Profile

Proj. file: 26003 5Yr.stm



Storm Sewer Profile

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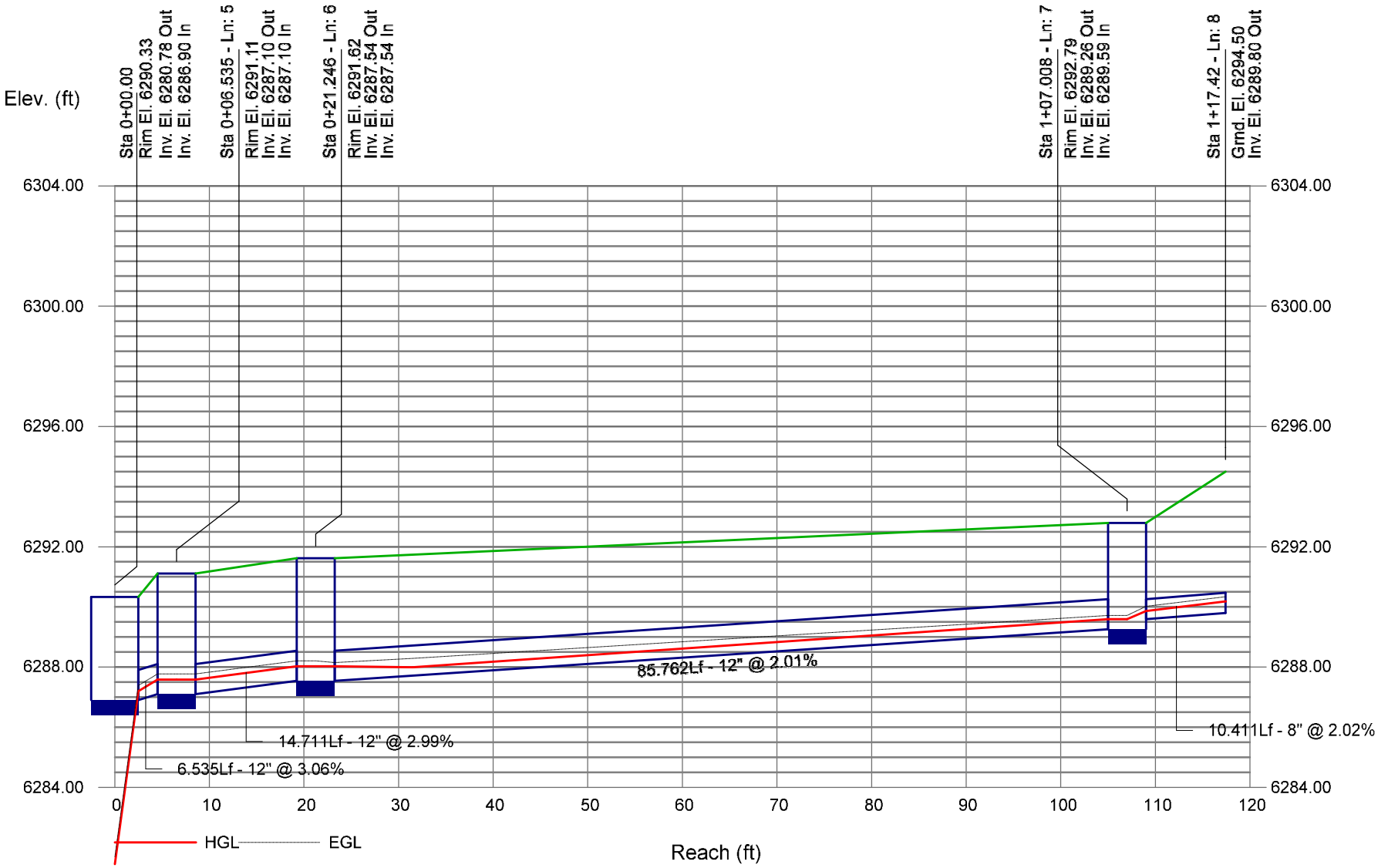

Storm Sewer Profile

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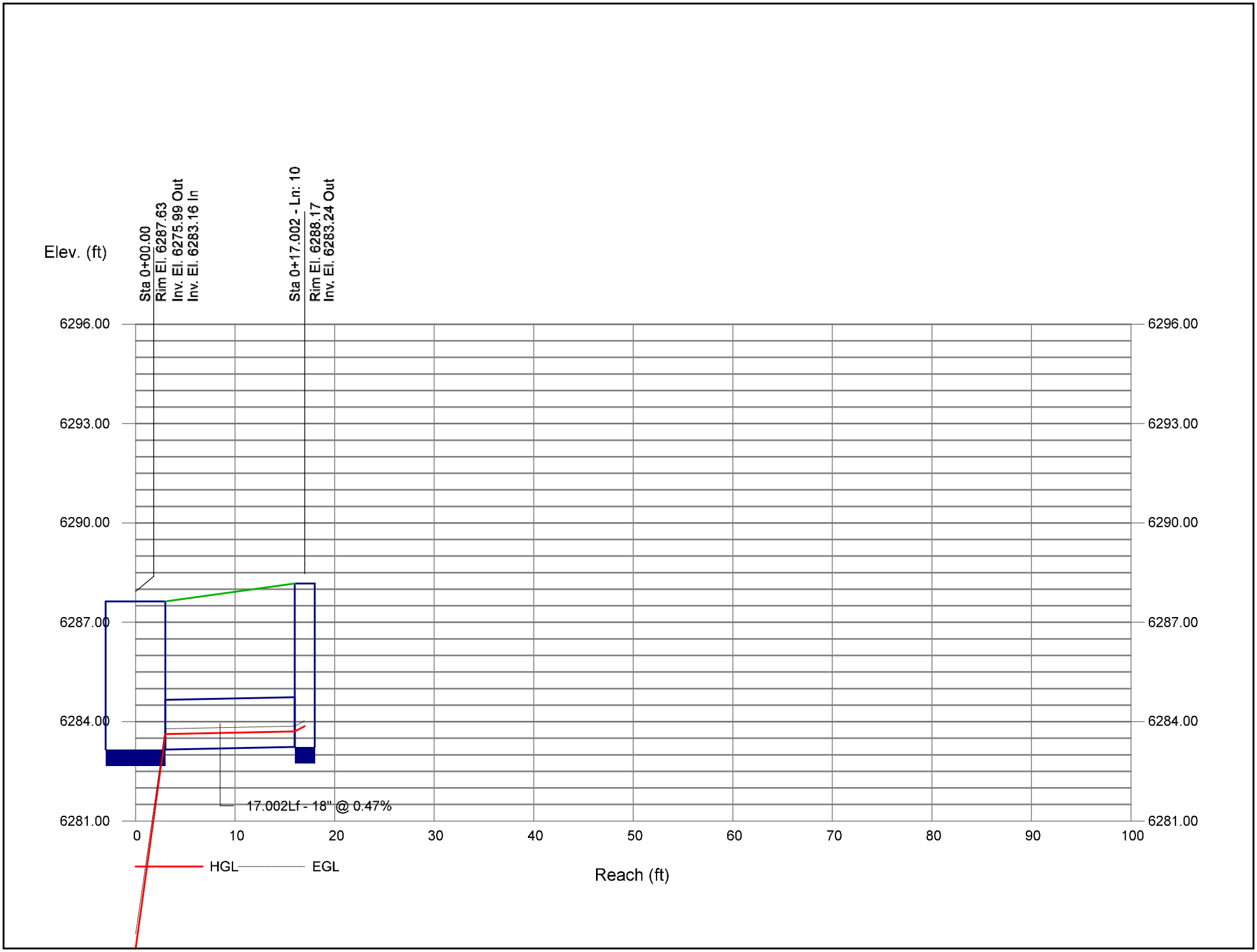

Storm Sewer Profile

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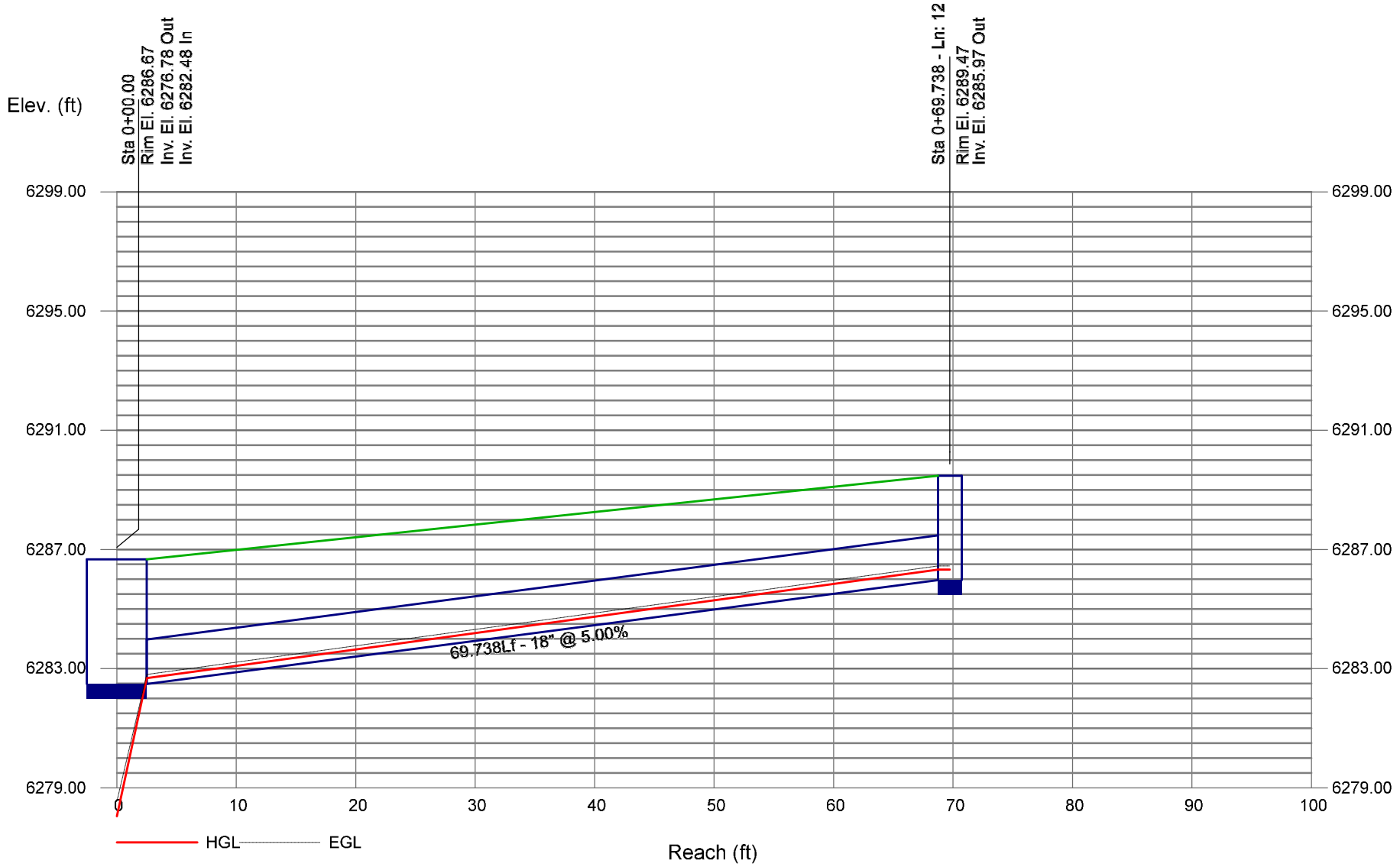

Storm Sewer Profile

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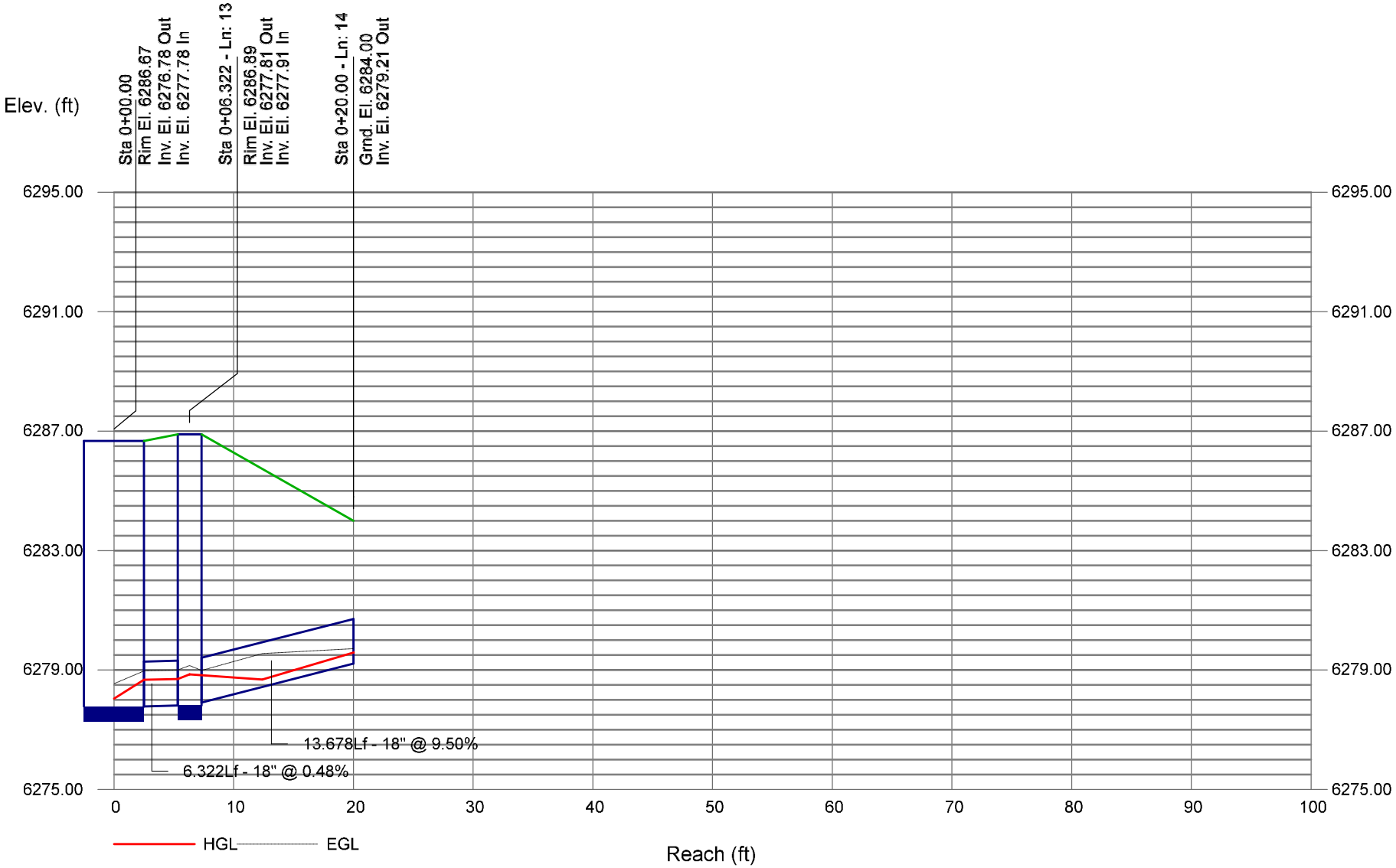

Storm Sewer Profile

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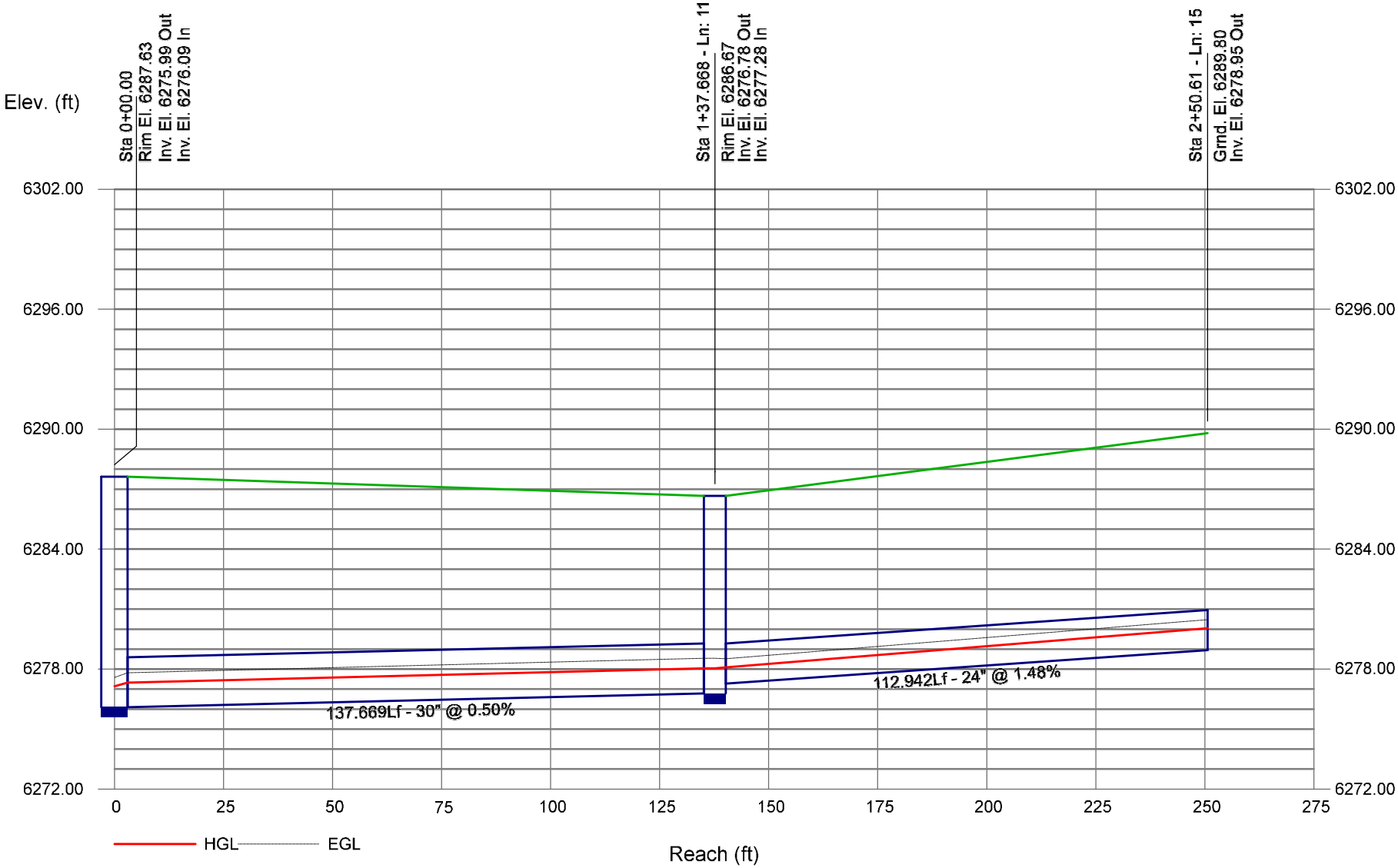

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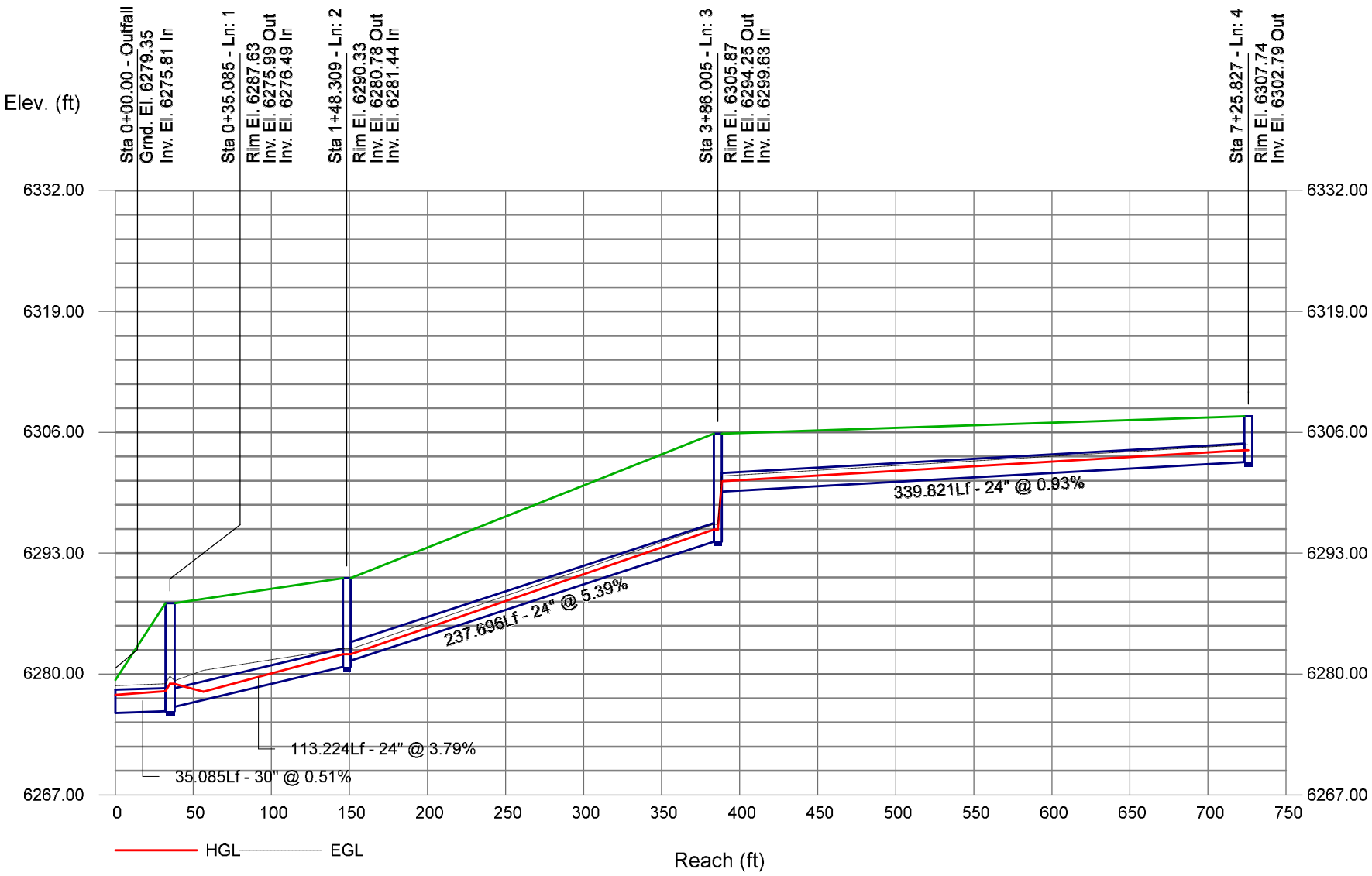

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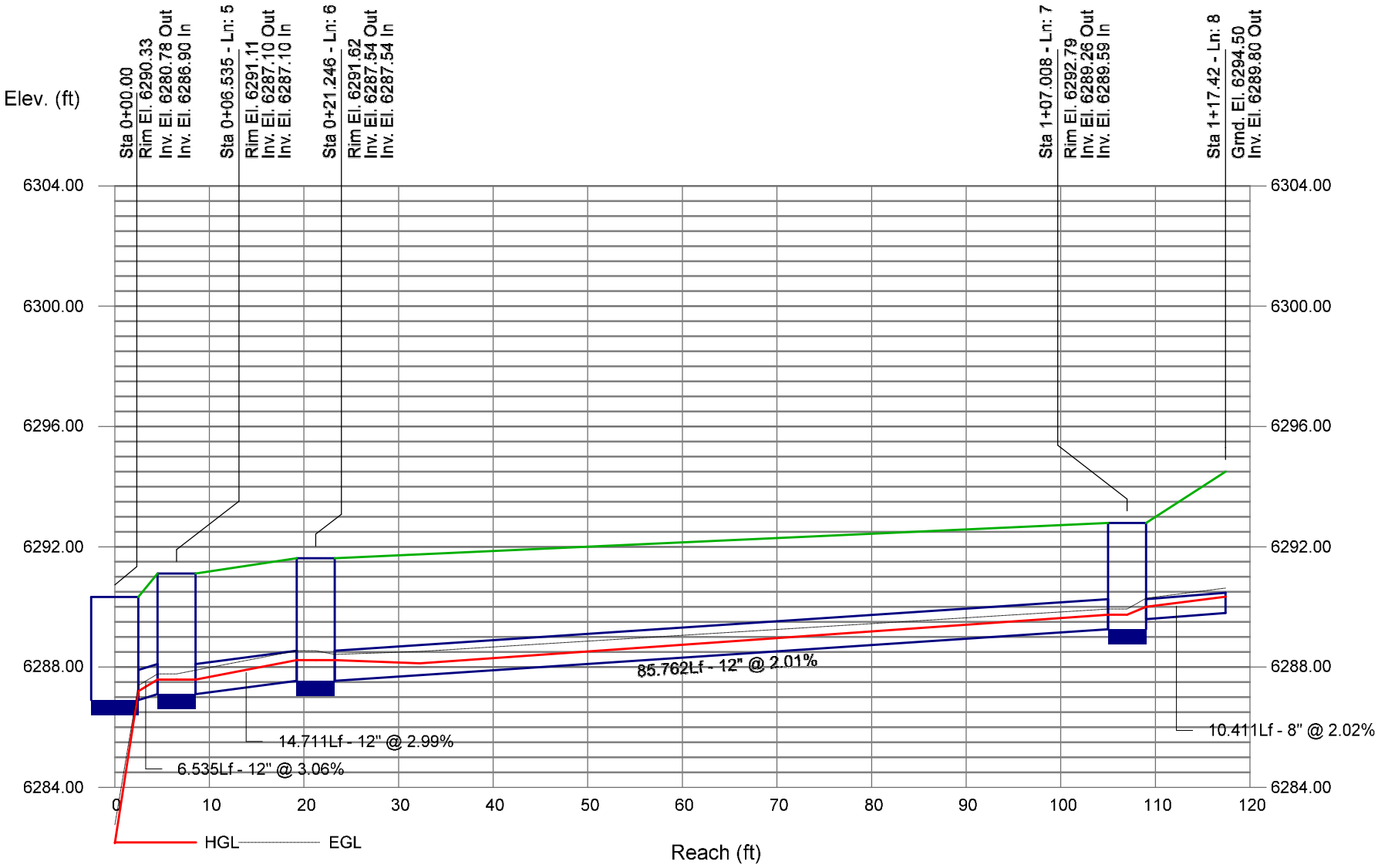

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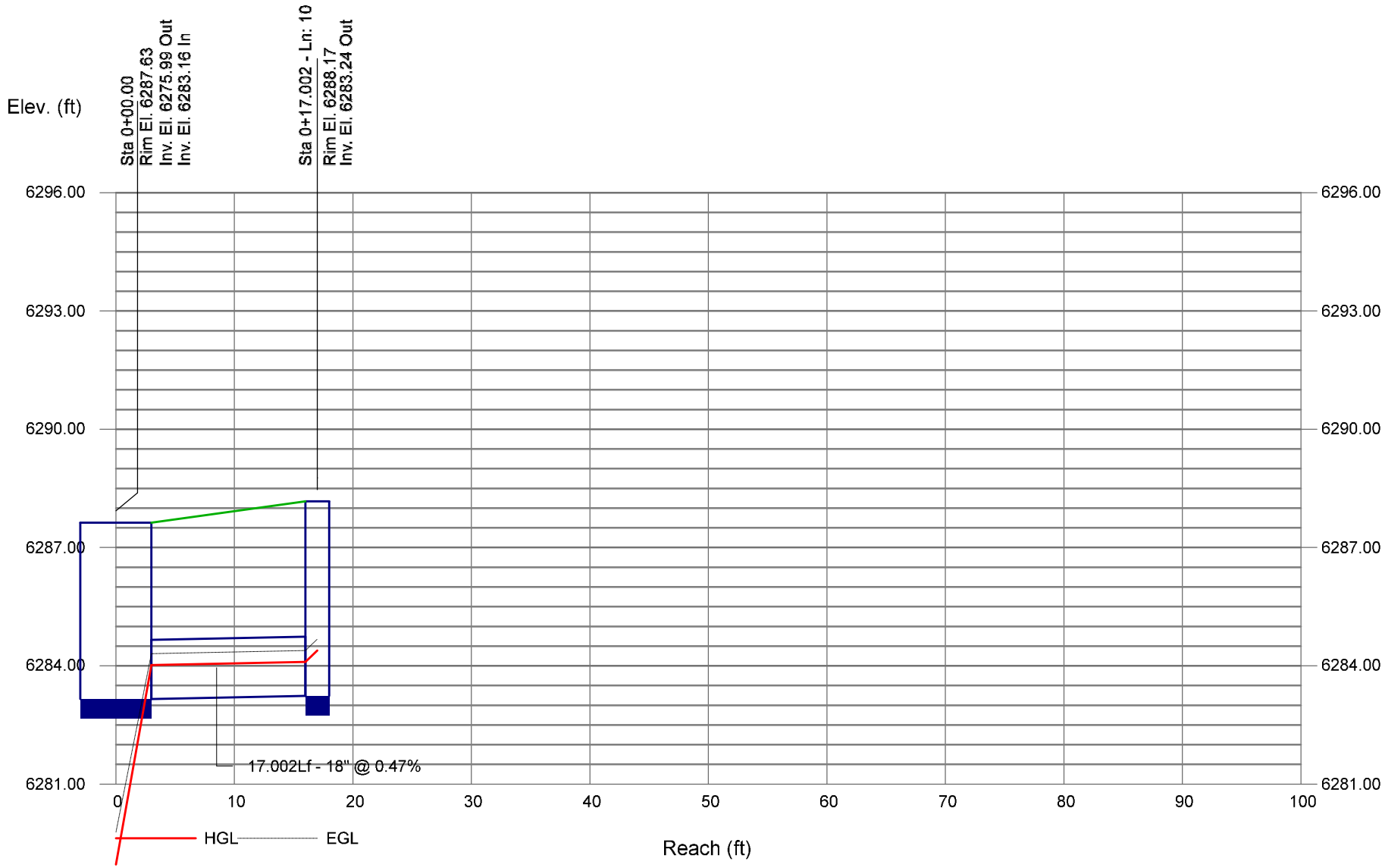

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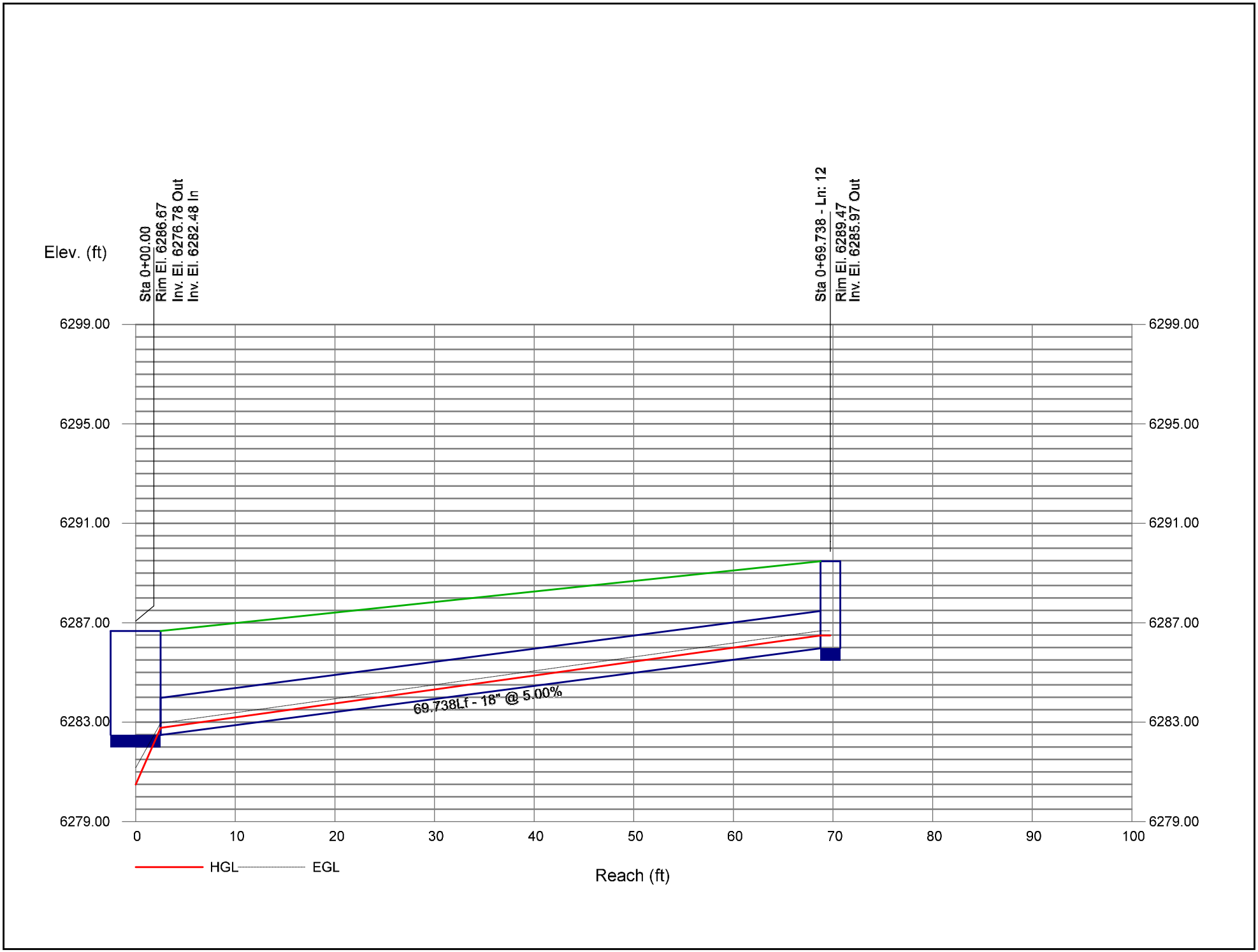

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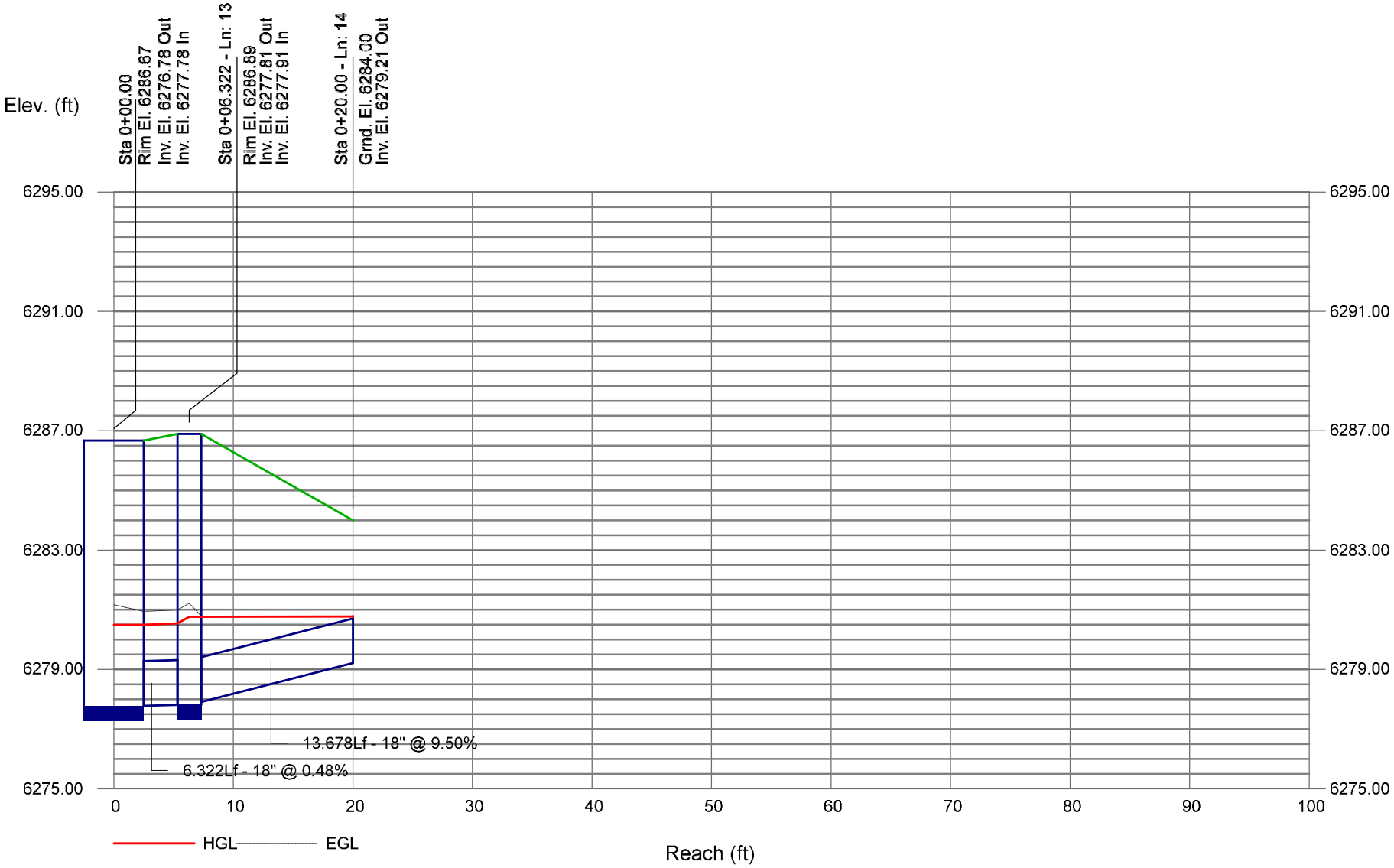

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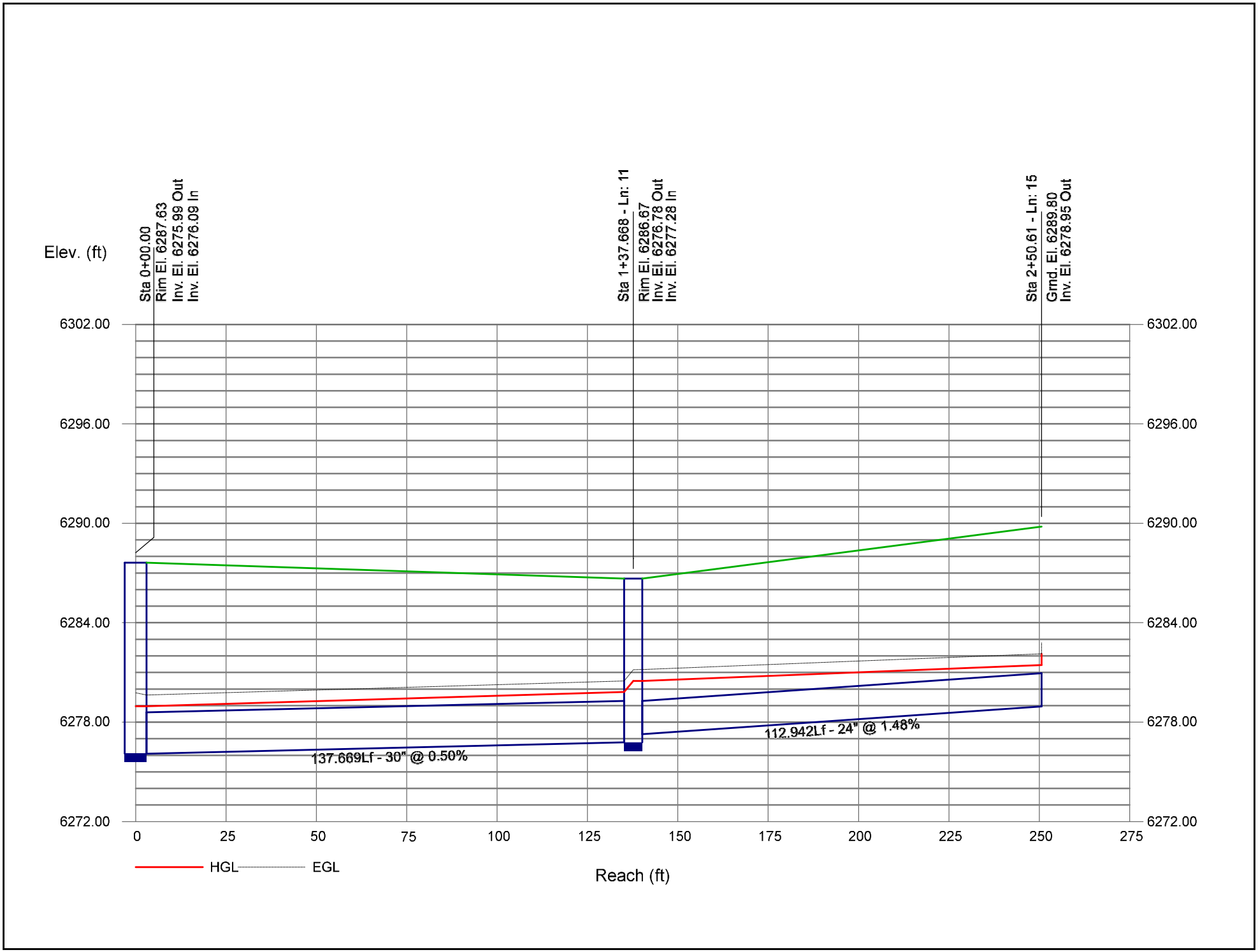

- APPENDIX D- MS4 Worksheets

Attachment G

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

Project: **CRW#** **Applicant:**

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

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

3.3.2	Will 100% of the runoff from the residential or commercial site be captured?	Yes	□	This exclusion does not apply. Permanent water quality is required.
		No	X	Proceed to next line.
	Is all or a portion of the site undeveloped or will it remain undeveloped after construction?	Yes	X	This portion of the project is excluded. Submit **variance** for Sites with Land Disturbance to Undeveloped Land that will Remain Undeveloped Excluded from Permanent Water Quality Requirements. Proceed to next line.
		No	□	Proceed to next line.
	Is the remaining untreated impervious area greater than 20% of the site?	Yes	□	This exclusion does not apply. Permanent water quality is required.
		No	X	Proceed to next line.
	Is the remaining untreated impervious area greater than one acre?	Yes	□	This exclusion does not apply. Permanent water quality is required.
		No	X	Proceed to next line.
	Is it practicable to capture runoff from portions of the site that will not drain to a control measure?	No	X	Document justification demonstrating that it is not practicable to capture runoff from this portion of the site in the **drainage report**. No further action is needed.
		Yes	□	This exclusion does not apply. Permanent water quality is required.

Summary of Water Quality Conformance to MS4 Permit

The purpose of this worksheet is to verify that proposed site plan is in conformance with the Town of Castle Rock's MS4 permit and to track any exclusions made.

Project Name GT Sanders Building

Project Owner G.T. Sanders

Project Location 2770 S Wilcox Street, Castle Rock, Colorado

ToCR Project Number SDP26-00__

Total Size of Site 2.48 **acres**

Total Size of Common Plan of Development 13.7 **acres**

Check all that apply:

- ☑ **Project within Plum Creek Basin**
- ☐ **Project within Cherry Creek Basin**

Estimated construction completion date Fall 2026

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

   - ☑ WQCV standard
   - ☐ Pollutant removal standard
   - ☐ Runoff reduction standard
   - ☑ Applicable site draining to regional WQVC control measure (accepts drainage prior to discharging to WOTS)
   - ☐ Applicable site draining to regional WQVC control facility (with receiving pervious area control measure upstream of WOTS)
   - ☐ Constrained redevelopment sites standard
     - Imperviousness of existing site _____/_____(Imp. Ac/Site Ac) =____%
     - Variance required TCV No. _____
   - ☐ Existing control measure with WQCV per previous criteria standards
     - Reference Construction Permit No. _____
   - ☐ No control measures provided (See Permanent WQ Worksheet for applicability)

Summary of Water Quality Conformance to MS4 Permit

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

   i. If yes, please select all that apply, provide total excluded area(s) and submit variance, as applicable:

❒ Pavement management site

Excluded area: _____ acres

Variance required TCV No. _____

❒ Excluded roadway redevelopment

Excluded area: _____ acres

Variance required TCV No. _____

❒ Excluded existing roadway areas

Excluded area: _____ acres

Variance required TCV No. _____

❒ Above ground and below ground utilities

❒ Large lot single family home

❒ Non-residential and non-commercial infiltration

Excluded area: _____ acres

Variance required TCV No. _____

❒ Land disturbance for land to remain undeveloped

Excluded area: _____ acres

Variance required TCV No. _____

❒ Stream Stabilization Sites

Excluded area: _____ acres

Variance required TCV No. _____

❒ Trails

Excluded area: _____ acres

Variance required TCV No. _____

❒ Oil and Gas Exploration

3. For Development and Redevelopment sites, following any exclusions claimed above, was any portion of the site excluded up to 20% of the site and not to exceed one acre? If so, how much?

Excluded area: 0.13 acres

Total Site area: 2.48 acres, 5 %

4. For Constrained sites, following any exclusions claimed above, was any portion of the site excluded up to 50% of the site? If so, how much?

Excluded area: _____ acres

Total Site area: _____ acres, _____ %

Castle Rock Water

175 Kellogg Court, Castle Rock CO 80109
720-733-6000

Phase III Drainage Report Checklist

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

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

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

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

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

Phase III Drainage Report Checklist

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

Notes/Comments:

This is a drainage conformance letter. The public infrastructure and pond were completed as part of the first phase of this project. Some of the items in the above checklist are referenced in the report as part of the original approval. The subject site, Lot 1, has a reduced building size and lower imperviousness than was shown in the original plan set reviewed by the city. That set was reduced to a public infrastructure package with the private site and private infrastructure omitted. This drainage letter and plan set are associated with the reduced building, Lot 1 site.

- APPENDIX E- Referenced Reports

Phase III Drainage Report

GT Sanders
Lot 1, Sanders Business Center
(JN: 20039)
1004 South Interstate 25
Castle Rock, CO

CD22-0003

January 7, 2022
Revised: June 22, 2022

Prepared for:

Intergroup Architects
Attn: Bill Smith
2000 W Littleton Blvd
Littleton, CO 80120
303.738.8877

Owner:

GT Sanders

Prepared by:

Proof Civil
Mathew A. Adams, PE
600 Grant Street, Ste. 210
Denver, CO 80203
303.325.5709

III. Drainage Basins and Sub-Basins

A. Major Drainage Basins

The subject property is directly tributary to Plum Creek. Runoff from properties to the west is blocked by Interstate 25, which has culverts to pass runoff from west to east. There is an existing box culvert to the north of the site which conveys runoff from the west along the north side of the property to Plum Creek. A portion of runoff from the adjacent right-of-way to the west is conveyed via roadside ditch, inlet, and storm sewer to the same ditch along the north side of the property. Further development of lands to the west is not anticipated to impact the subject property due to existing infrastructure in place to convey runoff from those properties.

B. Minor Drainage Basins

The proposed development of the site has been divided into multiple sections, the initial development of the GT Sanders building, area of future development which will be tributary to the pond, and future development of the rest of the developable area within the property. The GT Sanders building and associated improvements have been designated Basin A, with a calculated imperviousness of 79% and an area of 2.5 acres. Basin A has been divided into sub-basins, as shown below and on the drainage plan, for onsite storm sewer sizing. The proposed detention pond area pond has been designated Basin B, with imperviousness of 6% for the area of 0.8 acres. Lot 2 basins are designated as PH2. The basins were delineated from the Phase 2 Drainage Report for Castle Rock Flex prepared by HERE Civil Consultants, LLC which is currently under review. Refer to supporting sheets from this report in Appendix E. The future lot 2 development area which will connect to the proposed onsite storm sewer system or overland flow to the pond are designated as basins PH2A, PH2B, and PH2c. The future lot 2 development which will overland flow to Plum Creek is designated as PH2OS. The proposed sub-regional detention pond is located within Basin B and has been sized to account for full build-out of Lots 1 and 2 and offsite runoff from I-25 and S. Wilcox. Future development within Basins B and PH2 will require conformance to the imperviousness and pond design presented here or modified with a full report and re-design. Offsite basins that collect runoff from I-25 and South Wilcox are designated as OS.

These drainage basins are described below in further detail:

a. Basin A1 (DP 1A, 0.72 ac, Imp. = 53%, Q5 = 1.5 cfs, Q100 = 4.0 cfs)

The basin is located on the west and north side of the site and is comprised of asphalt drives, concrete sidewalk and a sloped landscape area with retaining walls adjacent to the west property line. Runoff generated by this basin is conveyed to the proposed storm sewer system via curb and gutter to inlet 1 on the northeast side of the basin. If this inlet becomes clogged flow will be diverted to inlet 2 south of this inlet or overtop and flow into the detention pond to the east of this inlet.

b. Basin A2 (DP 2A, 1.05 ac, Imp. = 91%, Q5 = 3.7 cfs, Q100 = 7.4 cfs)

The basin is located in the middle part of site is comprised of the concrete loading dock area, asphalt drives and a few landscape islands. Runoff generated by this basin is conveyed to the proposed storm sewer system via curb and gutter to inlet 2 and then piped to pond forebay. If this inlet becomes clogged flow will overtop and flow into the detention pond to the northeast of this inlet.

c. Basin A3 (DP 3A, 0.26 ac, Imp. = 86%, Q5 = 0.9 cfs, Q100 = 1.9 cfs)

The basin is comprised of asphalt drives, concrete sidewalk and a small amount of landscape area. Runoff generated by this basin is conveyed to the proposed storm sewer system via curb and gutter to inlet 3 and piped to the pond forebay. If this inlet becomes clogged flow will bypass the inlet and flow to Basin A2 and enter the storm system through inlet 2.

d. Basin A4 (DP 4A, 0.48 ac, Imp. = 90%, Q5 = 1.8 cfs, Q100 = 3.6 cfs)

The basin is comprised of the proposed building roof. Runoff generated by this basin is conveyed off the roof through roof drains on the north side of the building and then flows west to the proposed storm sewer system and piped to the pond forebay.

e. Basin B (DP 1B, 0.83 ac, Imp. = 6%, Q5 = 0.3 cfs, Q100 = 3.3 cfs)

The basin is comprised of landscape and a proposed water quality and detention pond. Runoff is conveyed to a pond outlet structure located at the northeast corner of the basin via overland flow and a concrete channel. If the outlet structure becomes plugged an emergency overflow weir will convey runoff to Plum Creek.

f. Basin UCA (0.13 ac, Imp. = 2%, Q5 = 0.0 cfs, Q100 = 0.5 cfs)

This small portion of the site is along the north property line and cannot feasibly be conveyed to the detention pond. This area does not contain impervious improvements and will follow historic drainage patterns to flow uncontrolled to the existing ditch along the north side of the property with final outfall to Plum Creek.

g. Basin OS-1 (DP 1OS, 0.32 ac, Imp. = 97%, Q5 = 0.9 cfs, Q100 = 1.7 cfs)

This offsite basin is located southwest of the site and collects runoff from I-25 and South Wilcox. Runoff will be collected by a proposed storm sewer system that will outfall to the proposed onsite detention pond.

h. Basin OS-2 (DP 2OS, 1.45 ac, Imp. = 51%, Q5 = 1.9 cfs, Q100 = 5.4 cfs)

This basin lies south of basin OS-1 and receives runoff from I-25 and South Wilcox. This basin delineation has been estimated by using aerial images and site investigation. Runoff is conveyed to a proposed culvert via an existing and proposed roadside ditch. Runoff from the culvert will now connect to the proposed storm sewer system via a proposed manhole and will outfall into the proposed onsite detention pond.

i. Basin OS-3 (DP 3OS, 0.25 ac, Imp. = 97%, Q5 = 1.0 cfs, Q100 = 2.0 cfs)

This offsite basin is located west of the site and collects runoff from I-25 and South Wilcox. Runoff will be collected by a proposed storm sewer system that will outfall to the proposed onsite detention pond.

j. Basin OS-4 (DP 4OS, 3.80 ac, Imp. = 2%, Q5 = 0.5 cfs, Q100 = 8.4 cfs)

This basin is comprised of undeveloped area west of I-25. This basin delineation has been estimated by using aerial images and site investigation. Runoff from this basin is conveyed to an existing culvert that runs under I-25 and S. Wilcox. The culvert will be connected to a proposed manhole and conveyed to the proposed onsite detention pond via a proposed storm sewer system.

k. PH2A (DP 1, 3.57 ac, Imp. = 74%, Q5 = 9.3 cfs, Q100 = 20.8 cfs)

This basin is located offsite south of the development in Lot 2. The basin is comprised of basins A, B, C, D, E, and H which are described in the Phase 2 Drainage Report for Castle Rock Flex prepared by HERE Civil Consultants, LLC. Runoff from this basin will be conveyed to the proposed storm sewer stub located at the northeast corner of the basin at design point 1.

l. PH2B (DP 2, 0.25 ac, Imp. = 95%, Q5 = 1.0 cfs, Q100 = 1.9 cfs)

This basin is located offsite southeast of the development in Lot 2. The basin is basin F which is further described in the Phase 2 Drainage Report for Castle Rock Flex prepared by HERE Civil

Consultants, LLC. Runoff from this basin will be conveyed to the proposed storm sewer stub located on the west side of the basin at design point 2.

m. PH2C (DP 3, 0.23 ac, Imp. = 15%, Q5 = 0.1 cfs, Q100 = 1.0 cfs)

This basin is located offsite southeast of the development in Lot 2. The basin is basin J which is further described in the Phase 2 Drainage Report for Castle Rock Flex prepared by HERE Civil Consultants, LLC. Runoff from this basin will be conveyed to the proposed detention pond via surface flow at design point 3.

n. PH2OS (DP 4, 0.79 ac, Imp. = 2%, Q5 = 0.0 cfs, Q100 = 1.8 cfs)

This basin is located offsite south of the development in Lot 2. The basin is comprised of basins G and I which is further described in the Phase 2 Drainage Report for Castle Rock Flex prepared by HERE Civil Consultants, LLC. Runoff from this basin will be conveyed to the proposed detention pond via surface flow at design point 4.

IV. Drainage Design Criteria

A. Regulations

Methods described in the UDFCD Urban Storm Drainage Criteria Manual and in the Storm Drainage Design and Technical Criteria Manual for the Town of Castle Rock were used for the drainage design of the Site.

B. Drainage Studies, Master Plans, Site Constraints

There are no known master drainage studies or master drainage plans which apply to the site. The site drainage has been designed to meet requirements of the applicable criteria manuals. The site grading and drainage is constrained by the existing grades of surrounding properties as well as Plum Creek which runs through the site and has a floodplain. All proposed improvements and site grading have been designed to be outside of the limits of floodplain.

C. Hydrology

The Rational Method analysis, utilizing the Intensity-Duration-Frequency curves established for the Town of Castle Rock was used to determine the on-site runoff generated for the 5-year (minor), and 100-year (major) storm events. Runoff coefficients were based on the type of proposed development outlined in the UDFCD and Town of Castle Rock manuals. Runoff coefficients used in the analysis were weighted according to the existing and proposed land uses in each basin or sub-basin and the time of concentration values have been calculated for each of the basins or sub-basins per Town criteria. One-hour rainfall values of 1.43 and 2.60 inches for the 5-year and 100-year storms, respectively, were used to calculate runoff rates. Detention storage and release rate have been calculated using the UDFCD full-spectrum design criteria. Hydrologic calculations can be found in Appendix B.

D. Hydraulics

Conveyance of on-site generated and tributary off-site flows has been calculated using Manning's equation in accordance with the UDFCD Urban Storm Drainage Criteria Manual and the Town of Castle Rock Storm Drainage Design and Technical Criteria Manual. UDFCD spreadsheets have been used to calculate inlet capacities. StormCAD has been used to size the storm sewer system.

E. Storage and Water Quality Enhancement

Sub-regional detention and water quality are proposed for the site to serve the first phase of development along with future development of the northeast parcel within the overall development and tributary runoff from I-25 and S. Wilcox. The pond storage and release rate have been calculated using the UDFCD full-spectrum design criteria.

The project approach for achieving the four-step process for water quality best management practices are:

1) The site plan has been developed to provide limited amounts of impervious area only as necessary for site operations. By limiting the amount of proposed impervious area the total runoff volume is limited to extents possible.

2) A water quality and detention pond is proposed to provide the water quality capture volume in order to improve water quality of runoff leaving the site by releasing the runoff over an extended period of time to allow for sediment to settle within the pond.

3) Stream stabilization within Plum Creek is not proposed as part of this project. Based on discussions with Town Staff, the adjacent stretch of Plum Creek is not slated for improvements such as drop structures at this time. Stabilization of the adjacent drainage ditch shall be provided at the pond outfall point along with bank protection. Future potential outfall connections to Plum Creek shall include stabilization measures.

4) Significant sources of water pollution are not anticipated for the proposed site. However, landscaped areas shall be designed and maintained to require as little fertilizers and chemicals as possible, with runoff from landscaped areas also directed through the proposed water quality pond.

V. Stormwater Management Facility Design

A. Stormwater Conveyance Facilities

Proposed on-site drainage design will generally follow historical drainage patterns. Runoff from developed areas shall be directed to the proposed detention pond via sheet flow, channelized gutter flow, roof drains, curb and gutter and storm sewer. Outfall from the proposed detention pond is anticipated to discharge to the existing ditch located along the northern side of the site, which then conveys runoff to Plum Creek. The pond outfall shall be designed to keep all improvements outside of the limits of the existing floodplain. A detention pond for the development shall be located near the northeast corner of the site, adjacent to the existing ditch and Plum Creek floodplain. The pond has been designed to provide detention for the full build out of Lots 1 and 2 and portions of I-25 and S. Wilcox. The offsite basins will be conveyed to an outfall north of the site via a proposed storm sewer system. From the outfall offsite runoff will be conveyed to Plum Creek via an existing channel.

B. Stormwater Storage Facilities

Due to increased impervious area in the developed condition, a proposed full spectrum detention and water quality pond will be constructed on site per Town of Castle Rock and UDFCD criteria. The storage calculations show required capture volumes of 0.22 ac-ft, 0.44 ac-ft, and 0.68 ac-ft for the water quality capture volume, EURV, and 100-year plus ½ WQ volume, respectively. The proposed detention pond will be regional and will serve the immediate development of the GT Sanders building as well as future development within Lot 2, and and portions of I-25 and S. Wilcox. The area tributary to the pond will be 13.21 acres at an imperviousness of 48%.

C. Water Quality Enhancement

Water quality shall be provided for the developed areas of the site by use of an extended detention basin with a water quality capture volume included. The outlet structure restricts release of the water quality capture volume over a 40-hour time period to allow sediment to settle inside the pond. The water quality capture volume is included with the detention storage volumes per design criteria. Runoff patterns for the minor storms follows the same patterns as the major storms, with all site runoff conveyed to the pond via sheet flow, curb and gutter, and storm sewer. The release from the pond is connected to an existing drainage ditch which conveys runoff to Plum Creek. The pond maintenance shall be the responsibility of the property owner.

- APPENDIX B- Hydrologic Calculations

Project : GT Sanders at Sanders Business Park
Project No. : 20039

Date : 10/21/2021
By : maa

Drainage Basin Imperviousness

Soil Type : **C or D**

	Roof	Concrete	Asphalt	Landscape	Playground	Gravel	Future			Runoff Coefficients			
Imperviousness :	90%	90%	100%	2%	10%	40%	75%	Total Area	Composite				
Basin Name	Areas (sq ft)							(sq ft)	% Imp	C_2	C_5	C_{10}	C_{100}
A1		1,011	15,415	15,143				31,569	53%	0.40	0.47	0.52	0.70
A2		21,191	22,289	2,183				45,663	91%	0.74	0.78	0.80	0.86
A3		1,456	8,449	1,540				11,445	86%	0.70	0.74	0.77	0.83
A4	21,074							21,074	90%	0.74	0.77	0.80	0.85
Total A	21,074	23,658	46,153	18,866				109,751	79%	0.64	0.68	0.72	0.81
B		340		32,969		2,703		36,012	6%	0.03	0.08	0.17	0.51
Phase 1 to pond	21,074	23,998	46,153	51,835		2,703		145,763	61%	0.48	0.53	0.58	0.73
UCA				5,450				5,450	2%	0.01	0.05	0.15	0.49
***Lot 2**													
PH2A								155,553	74%				
PH2B								10,934	95%				
PH2C								9,888	15%				
Phase 2 to pond								176,374	72%				
PH2OS								34,500	2%				
Phase 2 bypass pond								34,500	2%				
S. WILCOX													
OS-1		3,176	10,418	159				13,753	97%	0.80	0.83	0.85	0.88
OS-2		16,500	16,500	30,000				63,000	51%	0.39	0.45	0.51	0.69
OS-3		2,591	8,345	117				11,053	97%	0.80	0.83	0.85	0.88
OS-4				165,373				165,373	2%	0.01	0.05	0.15	0.49
S. Wilcox to Pond		22,267	35,263	195,649				253,179	23%	0.16	0.23	0.31	0.58
Total to Pond								**575,316**	**48%**				

*Values from the Phase II Drainage Report for Castle Rock Flex Lot 2, Sanders Buisness Center by HERE Civil Consultants, LLC. Report is currently under review.

PROOFCIVIL consulting engineers

Project : GT Sanders at Sanders Business Park
Project No. : 20039

Date : 11/30/2020
By : maa

SF2 - Time of Concentration

			Initial/Overland Time			Travel Time					Time of Concentration		Final
Basin ID	Area (AC.)	C	L_i (ft.)	S_i (%)	T_i (min.)	L_t (ft.)	S_t (%)	Conveyance Factor	Vel (fps)	T_t (min.)	Comp. T_C (min.)	Regional T_C (Min.)	T_C (Min.)
A1	0.72	0.47	150	25.00	4.8	400	2.0	20	2.8	2.4	7.2	19.9	7.2
A2	1.05	0.78	130	2.50	4.9	180	1.0	20	2.0	1.5	6.4	12.0	6.4
A3	0.26	0.74	55	2.00	3.9	200	1.0	20	2.0	1.7	5.5	13.0	5.5
A4	0.48	0.77	70	1.00	4.9	0	0.0	20	0.2	0.0	4.9	10.7	5.0
B	0.83	0.08	35	25.00	3.8	300	2.0	10	1.4	3.5	7.3	28.6	7.3
UCA	0.13	0.05	22	10.00	4.2	220	2.0	7	1.0	3.7	7.9	28.5	7.9
OS-1	0.32	0.83	45	2.00	2.6	700	1.0	10	1.0	11.7	14.3	14.8	14.3
OS-2	1.45	0.45	45	2.00	6.3	700	1.0	10	1.0	11.7	17.9	24.6	17.9
PH2A	3.57												8.4
PH2B	0.25												5.0
PH2C	0.23												7.5
PH2OS	0.79												19.9
OS-1	0.32	0.83	50	2.00	2.8	280	1.4	20	2.4	2.0	4.7	11.3	5.0
OS-2	1.45	0.45	45	2.00	6.3	700	1.0	10	1.0	11.7	17.9	24.6	17.9
OS-3	0.25	0.83	50	2.00	2.8	227	1.4	20	2.4	1.6	4.4	11.0	5.0
OS-4	3.80	0.05	300	3.50	21.7	400	3.5	10	1.9	3.6	25.3	29.5	25.3

Project : GT Sanders at Sanders Business I
Project No. : 20039

Date : 11/30/2020
By : maa

SF3 - Minor Storm

1-hr Point Rainfall **1.43** in. (5-year Event)

		Direct Runoff						Total Runoff				Street		Travel Time			
Description	Design Point	Area (ac.)	C_r	Tc (min.)	CA (ac.)	I (in/hr)	Q (cfs)	Tc (min.)	CA (ac.)	I (in/hr)	Q (cfs)	Slope (%)	Flow (cfs)	Length (ft)	Vel. (fps)	tt (min.)	Comments
A1	1A	0.72	0.47	7.2	0.3	4.36	1.5	7.2	0.3	4.4	1.2	2.0	1.17	17.0	2.8	0.1	To inlet 1 (0.3cfs bypassed to inlet 2)
A2	2A	1.05	0.78	6.4	0.8	4.52	3.7	6.4	0.9	4.5	4.0						To inlet 2
	2A							6.4	1.1	4.5	5.0						Total at inlet 2
A3	3A	0.26	0.74	5.5	0.2	4.72	0.9					3.6	0.91	78.6	3.8	0.3	To inlet 3
	5							9.4	3.5	4.0	14.0	0.5	13.97	137.7	1.4	1.6	To manhole 2
A4	4A	0.48	0.77	5.0	0.4	4.85	1.8										north roof drains
	7							32.6	1.7	2.1	3.6	3.8	3.61	113.2	3.9	0.5	To manhole 3
	6							33.1	5.5	2.1	11.6						To manhole 1
B	1B	0.83	0.08	7.3	0.1	4.34	0.3										To swale and pond
UCA		0.13	0.05	7.9	0.0	4.23	0.0										Offsite to the north to Plum Creek
PH2A	1	3.57		8.4	2.2	4.13	9.3					0.8	9.25	112.9	1.8	1.0	Lot 2 Basins A, B, C, D, E, H (To stub)
PH2B	2	0.25		5.0	0.2	4.85	1.0										Lot 2 Basin F (To Stub)
PH2C	3	0.23	0.00	7.5	0.0	4.30	0.1										Lot 2 Basin J (To Pond)
PH2OS	4	0.79	0.00	19.9	0.0	2.82	0.0										Lot 2 Basin G & I (Offsite)
OS-1	1OS	0.32	0.83	14.3	0.3	3.32	0.9	28.4	1.1	2.3	2.6	0.7	2.57	339.8	1.7	3.4	To inlet 4
OS-2	2OS	1.45	0.45	17.9	0.7	2.98	1.9					1.8	1.94	50.9	2.7	0.3	FES C1.0
OS-3	3OS	0.25	0.83	5.0	0.2	4.85	1.0	31.8	1.3	2.2	2.9	5.7	2.86	237.7	4.8	0.8	Total at inlet 5
OS-4	4OS	3.80	0.05	25.3	0.2	2.48	0.5	25.3	0.8	2.5	2.1	0.7	2.10	314.5	1.7	3.1	Total at manhole 4

Project : GT Sanders at Sanders Business I
Project No. : 20039

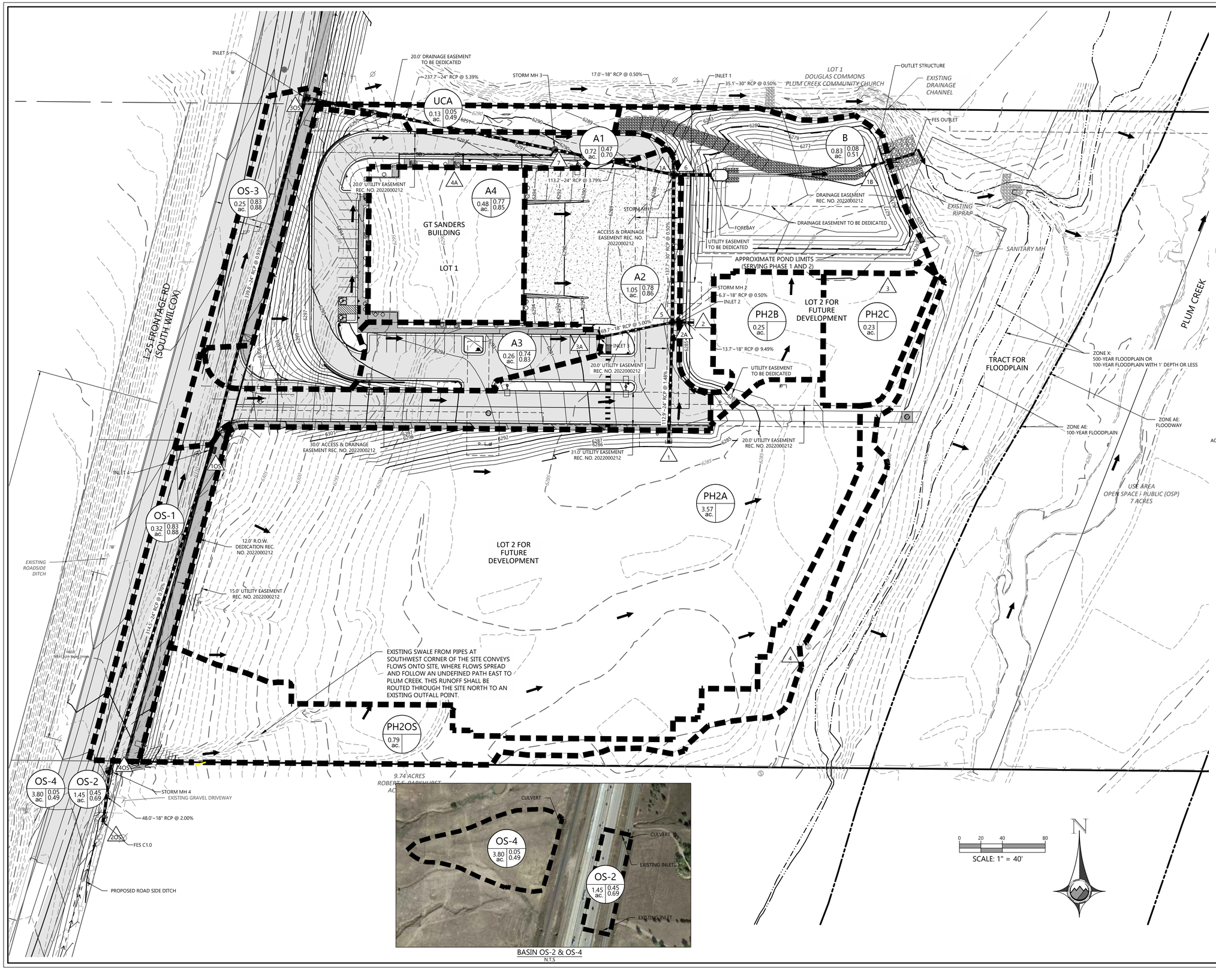
Date : 10/20/2020
By : maa

SF3 - Major Storm

1-hr Point Rainfall **2.6** in. (100-year Event)

		Direct Runoff						Total Runoff				Street		Travel Time			
Description	Design Point	Area (ac.)	C_{100}	Tc (min.)	CA (ac.)	I (in/hr)	Q (cfs)	Tc (min.)	CA (ac.)	I (in/hr)	Q (cfs)	Slope (%)	Flow (cfs)	Length (ft)	Vel. (fps)	tt (min.)	Comments
A1	1A	0.72	0.70	7.2	0.5	7.92	4.0	7.2	0.3	7.9	2.1	2.0	2.12	17.0	2.8	0.1	To inlet 1 (1.9cfs bypassed to inlet 2)
A2	2A	1.05	0.86	6.4	0.9	8.23	7.4	6.4	1.2	8.2	9.6						To inlet 2
	2A							6.4	1.4	8.2	11.4						Total at inlet 2
A3	3A	0.26	0.83	5.5	0.2	8.58	1.9					3.6	1.88	78.6	3.8	0.3	To inlet 3
	5							9.4	4.4	7.2	31.5	0.5	31.47	137.7	1.4	1.6	To manhole 2
A4	4A	0.48	0.85	5.0	0.4	8.82	3.6										north roof drains
	7							32.6	3.7	3.9	14.4	3.8	14.41	113.2	3.9	0.5	To manhole 3
	6							33.1	8.4	3.8	32.1						To manhole 1
B	1B	0.83	0.51	7.3	0.4	7.88	3.3										To swale and pond
UCA		0.13	0.49	7.9	0.1	7.69	0.5										Offsite to the north to Plum Creek
PH2A	1	3.57		8.4	2.8	7.51	20.8					0.8	20.80	112.9	1.8	1.0	Lot 2 Basins A, B, C, D, E, H (To stub)
PH2B	2	0.25		5.0	0.2	8.82	1.9										Lot 2 Basin F (To Stub)
PH2C	3	0.23		7.5	0.1	7.81	1.0										Lot 2 Basin J (To Pond)
PH2OS	4	0.79		19.9	0.4	5.13	1.8										Lot 2 Basin G & I (Offsite)
OS-1	1OS	0.32	0.88	14.3	0.3	6.04	1.7	14.3	0.3	6.0	1.5						To inlet 4 (0.2cfs bypassed to inlet 2)
	1OS							28.4	3.1	4.2	13.1	0.7	13.14	339.8	1.7	3.4	Total at inlet 4
OS-2	2OS	1.45	0.69	17.9	1.0	5.41	5.4					1.8	5.42	50.9	2.7	0.3	FES C1.0
OS-3	3OS	0.25	0.88	5.0	0.2	8.82	2.0	5.0	0.2	8.8	1.6						To inlet 5 (0.4cfs bypassed)
								31.8	3.3	3.9	13.0	5.7	13.01	237.7	4.8	0.8	Total at inlet 5
OS-4	4OS	3.80	0.49	25.3	1.9	4.51	8.4	25.3	2.9	4.5	12.9	0.7	12.93	314.5	1.7	3.1	Total at manhole 4

- APPENDIX F- Drainage Plan



PROOFCIVIL
consulting engineers
600 Grant Street | Suite 210 | Denver, CO

SEAL:
COLORADO LICENSED MATTHEW AVERY ADAMS 42628 6-22-2022 PROFESSIONAL ENGINEER
FOR AND ON BEHALF OF PROOF CIVIL CO.

REVISIONS

NO.	DATE	DESCRIPTION
	6/22/2022	CITY COMMENTS

PROJ. NO.: 20039
DATE: 7/16/2020
DRAWN BY: MAA
CHECKED BY: PC

PHASE III DRAINAGE PLAN

SANDERS INDUSTRIAL PARK AT CASTLE ROCK
PLANNED DEVELOPMENT PLAN
CASTLE ROCK COLORADO

DRAWING NO.
DR1

PROOFCIVIL
consulting engineers

Drainage Amendment Letter

FCO23-0021

June 23, 2023

Town of Castle Rock
Development Services
100 North Wilcox Street
Castle Rock, CO 80104

Dear Reviewing Engineer,

This Drainage Amendment Letter has been written to describe the revisions to the *Phase III Drainage Report for GT Sanders Lot 1, Sanders Business Center* approved June 30, 2022.

The proposed site improvements will be separated into two phases. The first phase includes construction of a shared access, regional detention pond and expansion of Wilcox Street. Phase 1 will also include installation of all onsite utilities, including storm lines and structures, sanitary mains, water mains and services. The second phase includes construction of a building with associated parking and drive aisles and extending utility services to the building. As described in the Phase III Drainage Report the detention pond located at the northeastern corner of the site will serve both phases within this project area, the area to the south - currently under construction, and Wilcox Street.

The on-site minor drainage basins for Phase 1 are described below:

a. Basin A1 (DP 1A, 0.36 ac, Imp. = 7%, Q5 = 0.1 cfs, Q100 = 1.2 cfs)

The basin is located at the center of the site and is comprised of landscape and a pond maintenance path. Runoff generated by this basin is conveyed to the proposed detention pond via overland flow at design point 1A.

b. Basin A2 (DP 2A, 0.94 ac, Imp. = 4%, Q5 = 0.2 cfs, Q100 = 3.3 cfs)

The basin is located along the south side of the site and is comprised of landscape and a pond maintenance path. Runoff generated by this basin is conveyed to Inlet 2 at design point 2A via overland flow and conveyance swale B. From Inlet 2 runoff is conveyed to the detention pond via proposed storm infrastructure. In the event Inlet 2 clogs runoff will overtop conveyance swale B and flow into the detention pond.

c. Basin A3 (DP 3A, 0.47 ac, Imp. = 99%, Q5 = 1.9 cfs, Q100 = 3.6 cfs)

The basin is located along the south side of the site and is comprised of the shared access. Runoff generated by this basin is conveyed to the basin PH2B at design point 3A via overland flow and curb and gutter. Basin PH2B is Basin F in the *Phase 3 Drainage Report for Castle Rock Flex Lot 2, Sander Business Center* prepared by HERE Civil Consultants, LLC dated February 1, 2022. A 5' Type R Inlet within Basin PH2B will collect runoff from Basin A3 and PH2B and proposed storm infrastructure will convey the runoff to the detention pond. In the event the 5' Type R Inlet clogs runoff will overtop the curb and gutter and flow to the detention pond. Based on correspondence with the adjacent development the 5' Type R Inlet and surface improvements to convey runoff to the inlet have been constructed.

d. Basin A4 (DP 4A, 0.97 ac, Imp. = 2%, Q_5 = 0.2 cfs, Q100 = 2.8 cfs)

The basin is located along the northwest side of the site and is comprised of landscape. Runoff generated by this basin is conveyed to the detention pond via overland flow and conveyance swale A to design point 4A.

e. Basins B, UCA, OS-1, OS-2, OS-3, OS-4, PH2A, PH2B, PH2C, and PH2OS

These basins are described in the approved Phase III Drainage Report for the site. The basins will remain the same for both phases of construction.

The storm infrastructure was designed to convey runoff from the fully developed condition. The quantity of runoff tributary to the storm infrastructure was analyzed to determine if it has capacity to convey runoff to the detention pond after Phase 1 improvements are completed. Below is a table comparing the quantity of runoff to storm infrastructure after Phase 1 and 2 improvements:

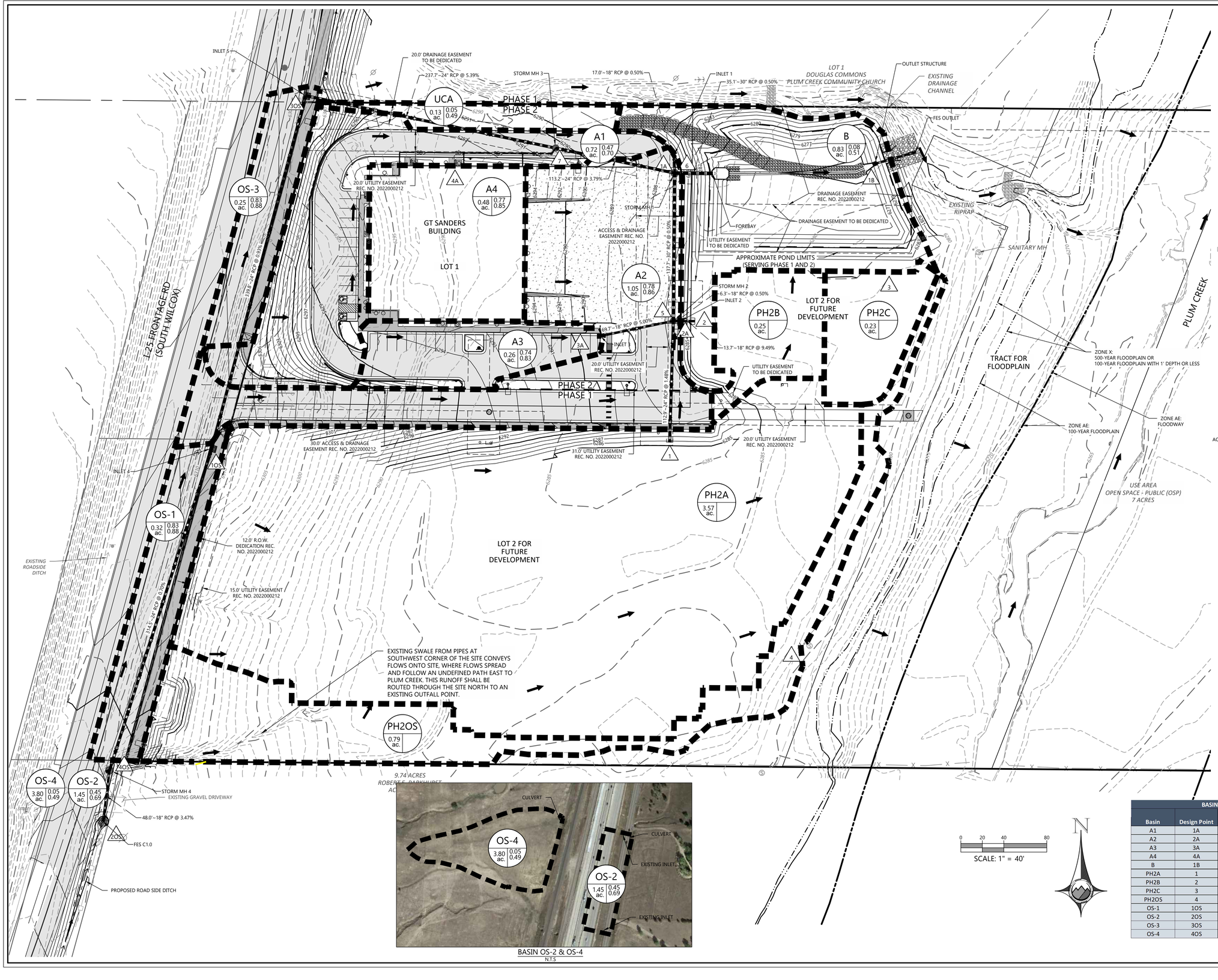
Runoff Comparison Table

Strucutre	Phase 1 Q_5 Total (cfs)	Phase 2 Q_5 Total (cfs)	Phase 1 Q_{100} Total (cfs)	Phase 2 Q_{100} Total (cfs)
Inlet 1	Runoff bypasses to pond	1.2	Runoff bypasses to pond	2.1
Inlet 2	2.6	5.0	8.0	11.4
Inlet 3	Runoff bypasses to inlet 2	0.9	Runoff bypasses to inlet 2	1.9
Inlet 4	2.6	2.6	13.1	13.1
Inlet 5	2.9	2.9	13.0	13.0
Manhole 1	9.0	11.6	27.7	32.1
Manhole 2	11.2	14.0	27.3	31.5
Manhole 3	2.8	3.6	12.8	14.4
Manhole 4	2.1	2.1	12.9	12.9
FES C1.0	1.9	1.9	5.4	5.4
PH2B Inlet DP6	2.9	1.0	5.8	1.9

The quantity of runoff is increased after Phase 1 construction to the inlet within the PH2B basin. The capacity of the inlet was determined in the HERE Drainage Report to be 5.9cfs which is above the 5.8cfs tributary during the 100yr storm event. The storm sewer connected to the inlet has capacity for the additional runoff as shown in the calculations provided within this letter.

The detention pond was designed to provide WQCV, EURV, and 100yr detention for the fully developed condition. The imperviousness of the area tributary to the pond is 48% in the fully developed condition and 36% percent after Phase I construction therefore the pond will have capacity for the interim condition. To meet required WQCV, 5yr, and 100yr detention pond drain times a Phase 1 orifice plate will need to be constructed. After Phase 2 improvements are completed the Phase 1 orifice plate will need to be removed and replaced.

- APPENDIX D – DRAINAGE PLANS



BASIN OS-2 & OS-4
N.T.S

BASIN SUMMARY TABLE - PHASE 2					
				Direct Runoff	
Basin	Design Point	Area (ac.)	Imp. %	5-yr (cfs)	100-yr (cfs)
A1	1A	0.72	53%	1.5	4.0
A2	2A	1.05	91%	3.7	7.4
A3	3A	0.26	86%	0.9	1.9
A4	4A	0.48	90%	1.8	3.6
B	1B	0.83	6%	0.3	3.3
PH2A	1	3.57	74%	9.3	20.8
PH2B	2	0.25	95%	1.0	1.9
PH2C	3	0.23	15%	0.1	1.0
PH2OS	4	0.79	2%	0.0	1.8
OS-1	1OS	0.32	97%	0.9	1.7
OS-2	2OS	1.45	51%	1.9	5.4
OS-3	3OS	0.25	97%	1.0	2.0
OS-4	4OS	3.80	2%	0.5	8.4

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consulting engineers
600 Grant Street | Suite 210 | Denver, CO

SEAL:
COLORADO LICENSED
MATTHEW AVERY ADAMS
42628
PROFESSIONAL ENGINEER
7-7-2021
FOR AND ON BEHALF OF PROOF CIVIL CO.

REVISIONS

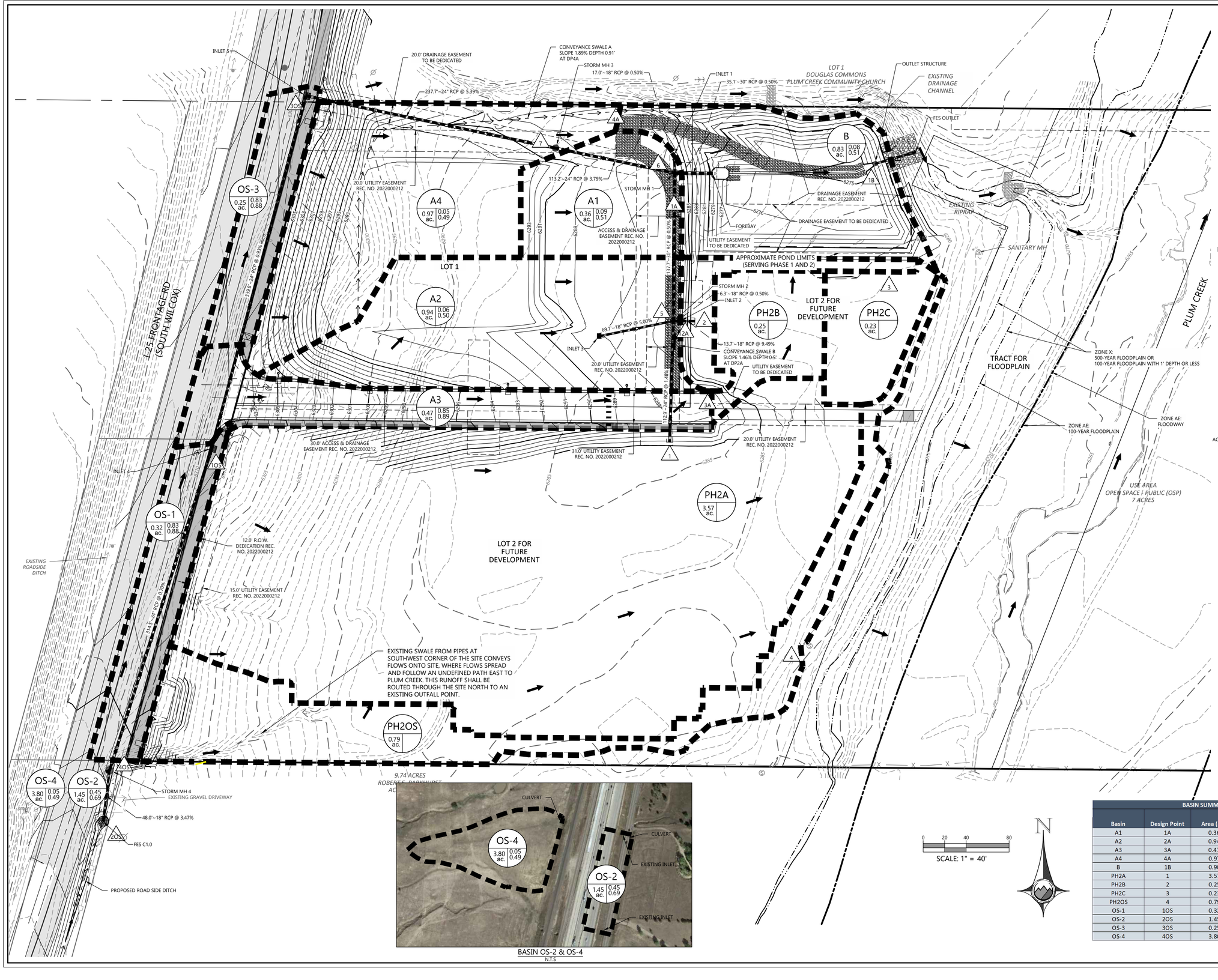
NO.	DATE	DESCRIPTION
1	6/22/2022	CITY COMMENTS
2	3/7/2023	FC023-0021 APPROVED

PROJ. NO. 20039
DATE 7/16/2020
DRAWN BY: MAA
CHECKED BY: PC

PHASE III DRAINAGE PLAN
PHASE 2

SANDERS INDUSTRIAL PARK AT CASTLE ROCK
PLANNED DEVELOPMENT PLAN
CASTLE ROCK COLORADO

DRAWING NO.
DR1



BASIN OS-2 & OS-4
N.T.S

BASIN SUMMARY TABLE - PHASE 1					
				Direct Runoff	
Basin	Design Point	Area (ac.)	Imp. %	5-yr (cfs)	100-yr (cfs)
A1	1A	0.36	7%	0.1	1.2
A2	2A	0.94	4%	0.2	3.3
A3	3A	0.47	99%	1.9	3.6
A4	4A	0.97	2%	0.2	2.8
B	1B	0.90	5%	0.3	3.6
PH2A	1	3.57	74%	9.3	20.8
PH2B	2	0.25	95%	1.0	1.9
PH2C	3	0.23	15%	0.1	1.0
PH2OS	4	0.79	2%	0.0	1.8
OS-1	1OS	0.32	97%	0.9	1.7
OS-2	2OS	1.45	51%	1.9	5.4
OS-3	3OS	0.25	97%	1.0	2.0
OS-4	4OS	3.80	2%	0.5	8.4

PROOFCIVIL
consulting engineers
600 Grant Street | Suite 210 | Denver, CO

SEAL:
COLORADO LICENSED
MATTHEW A. AVERY
42628
7-7-2023
PROFESSIONAL ENGINEER
FOR AND ON BEHALF OF PROOF CIVIL CO.

REVISIONS

NO.	DATE	DESCRIPTION
1	6/22/2022	CITY COMMENTS
2	3/7/2023	FC023-002: APPROVED

PROJ. NO: 20039
DATE: 7/16/2020
DRAWN BY: MAA
CHECKED BY: PC

PHASE III DRAINAGE PLAN
PHASE 1

SANDERS INDUSTRIAL PARK AT CASTLE ROCK
PLANNED DEVELOPMENT PLAN
CASTLE ROCK COLORADO

DRAWING NO.
DR2

October 9, 2023
Town of Castle Rock
100 N. Wilcox St.
Castle Rock, CO 80104

Re: GT Sanders – Lot 1, Sanders Business Center
Pond Volume Certification

To Whom it may concern:

Proof Civil was provided the following information regarding the construction of the water quality and detention pond for the GT Sanders development:

- *AutoCAD file 1613400EX-POND-AB-20221214.dwg* by JR Engineering, Received 4/3/2023.

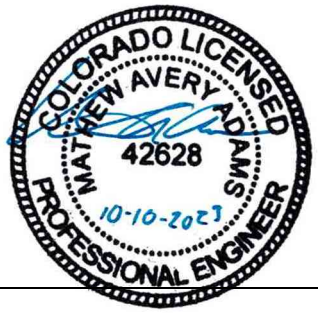
Based on my review of this document water quality capture volume, EURV, and 100yr detention are provided by the as-built pond in the interim and full build out conditions. The site has not been completely developed therefore an interim water quality/EURV plate has been attached to the outlet structure to provide the required 40-hour WQCV drain time. When the site has been fully developed the interim water quality/EURV plate will be removed and replaced with a plate that matches the approved construction plans.

The hydraulics of the as-built condition of the pond has been analyzed and the results are in general conformance with the approved drainage report approved on June 30, 2022. The hydraulics of the as-built condition of the pond and a comparison of the designed pond versus the as-built pond have been attached to this letter. The hydraulics of the pond in the as-built condition comply with Town of Castle Rock requirements.

Should you have any questions regarding this letter, please feel free to contact me at 303.325.5709.

Sincerely,
Mathew A. Adams
Principal
PROOF CIVIL CO.

I hereby certify that the stormwater management facility identified above meets or exceeds the design requirements as approved in the Phase III Drainage Report for GT Sanders. I understand that the Town of Castle Rock does not and will not assume liability for drainage facilities designed, constructed and/or certified by others.



SIGNATURE:_____

Registered Professional Engineer State of Colorado No. 42628

Project : GT Sanders
Project No. : 23013

Calculated By : KYS
Date : 10/9/2023

Pond Volume Comparison (Full Build Out)

Detention	Required Volumes per Approved Drainage Report (ft^3)	As-built Volumes MHFD Routed Hydrograph Results (ft^3)	Percent Volume Provided
WQCV	9,627	9,627	100%
EURV	28,750	28,750	100%
100-yr	53,579	79,880	149%

Pond Drain Time (Full Build Out)

Design Storm Return Period	As-built Time to 97% of Inflow Volumes Drain (hours)[1]	As-built Time to 99% of Inflow Volumes Drain (hours)[2]
5yr	71	77
100yr	61	73

1) 97% of the 5-year storm must drain within 72-hours

2) 99% of the 100-year storm must drain within 120-hours

Outlet Structure/Pond Design

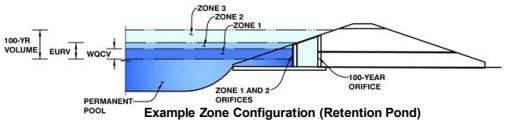
	Design	As-built	Difference	Notes
Top of Berm	6281.65	6281.86	0.21	
Bottom of Pond	6274.55	6274.50	-0.05	
Spillway Elevation	6279.86	6281.00	1.14	
100-yr WSEL	6279.77	6279.90	0.13	
Top of Structure	6278.15	6278.20	0.05	
EURV WSEL	6277.97	6278.07	0.10	
WQCV WSEL	6276.47	6276.53	0.06	
WQCV/ EURVOrifice Hole Diameter	1-5/16" (Two) 1-9/16" (One)	1-1/4" (Two) 1-9/16" (One)		An interim plate was constructed to provide a water quality drain time of 40 hours.
100-yr Restrictor Plate Height Above Pipe Invert	0.75'	0.75'	0.00	
Outlet Pipe Invert	6274.53	6274.48	-0.05	

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.02 (February 2020)

Project: **Sanders Industrial Park at Castle Rock**

Basin ID: **Full Site Pond (Full Build Out)**



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	**EDB**	
Watershed Area =	13.21	acres
Watershed Length =	1,700	ft
Watershed Length to Centroid =	850	ft
Watershed Slope =	0.020	ft/ft
Watershed Imperviousness =	48.00%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	80.0%	percent
Percentage Hydrologic Soil Groups C/D =	20.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	Castle Pines - City Office	

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) =	0.221	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	0.660	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 1.06 in.) =	0.534	acre-feet	1.06	inches
5-yr Runoff Volume (P1 = 1.43 in.) =	0.875	acre-feet	1.43	inches
10-yr Runoff Volume (P1 = 1.66 in.) =	1.104	acre-feet	1.66	inches
25-yr Runoff Volume (P1 = 1.72 in.) =	1.238	acre-feet		inches
50-yr Runoff Volume (P1 = 2.26 in.) =	1.831	acre-feet	2.26	inches
100-yr Runoff Volume (P1 = 2.6 in.) =	2.261	acre-feet	2.60	inches
500-yr Runoff Volume (P1 = 3.07 in.) =	2.802	acre-feet		inches
Approximate 2-yr Detention Volume =	0.456	acre-feet		
Approximate 5-yr Detention Volume =	0.683	acre-feet		
Approximate 10-yr Detention Volume =	0.878	acre-feet		
Approximate 25-yr Detention Volume =	0.872	acre-feet		
Approximate 50-yr Detention Volume =	1.063	acre-feet		
Approximate 100-yr Detention Volume =	1.230	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.221	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.439	acre-feet
Zone 3 (100yr + 1 / 2 WQCV - Zones 1 & 2) =	0.680	acre-feet
Total Detention Basin Volume =	1.341	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	

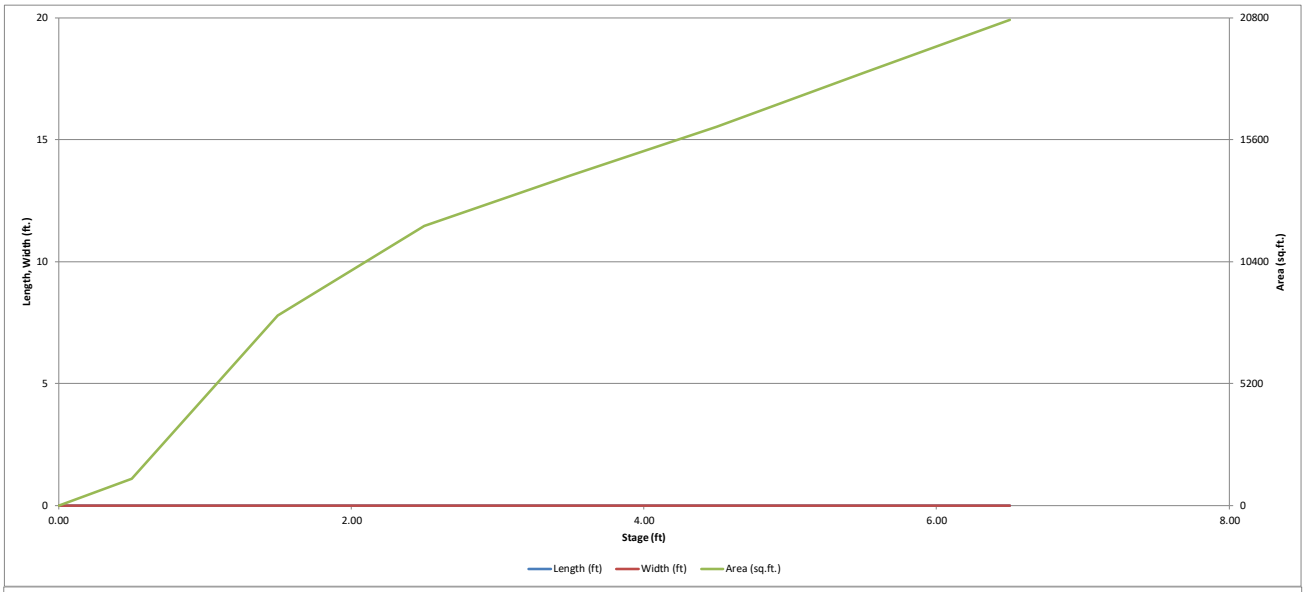
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	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

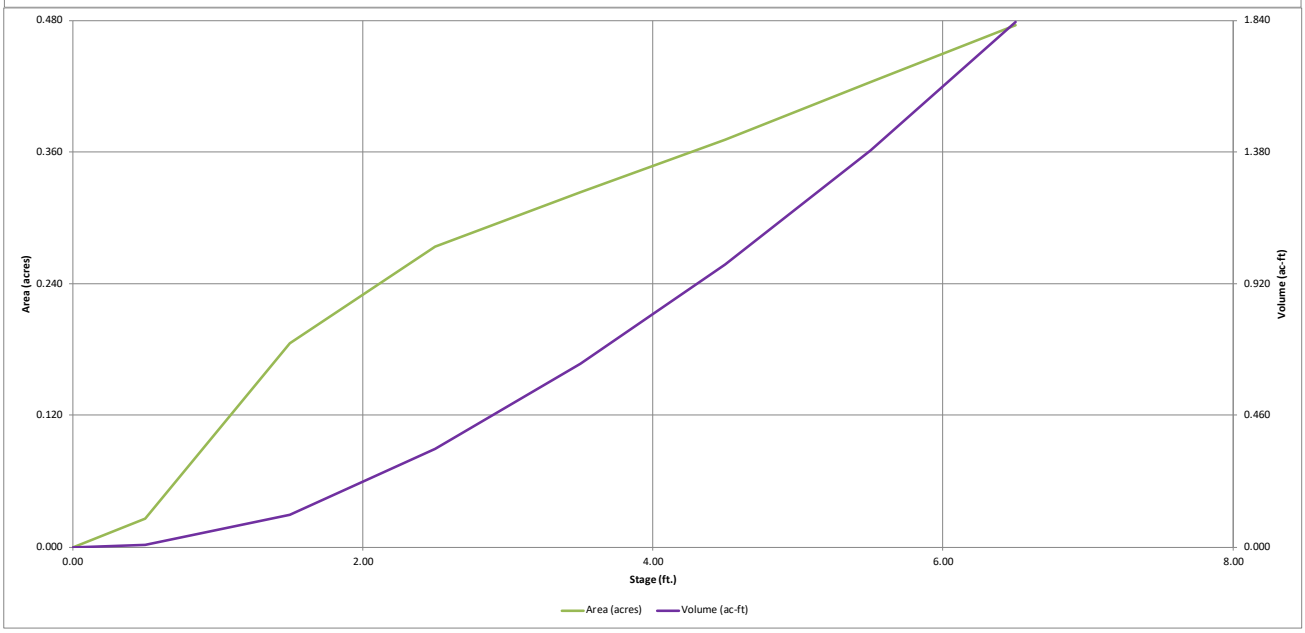
Depth Increment = 1.00 ft

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	--	--	--	0	0.000		
75	--	0.50	--	--	--	1,132	0.026	283	0.006
76	--	1.50	--	--	--	8,088	0.186	4,893	0.112
77	--	2.50	--	--	--	11,914	0.274	14,894	0.342
78	--	3.50	--	--	--	14,074	0.323	27,888	0.640
79	--	4.50	--	--	--	16,153	0.371	43,001	0.987
80	--	5.50	--	--	--	18,440	0.423	60,298	1.384
81	--	6.50	--	--	--	20,725	0.476	79,880	1.834

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.02 (February 2020)



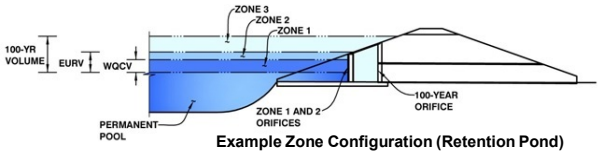


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.02 (February 2020)

Project: **Sanders Industrial Park at Castle Rock**

Basin ID: **Full Site Pond (Full Build Out)**



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.03	0.221	Orifice Plate
Zone 2 (EURV)	3.57	0.439	Orifice Plate
Z3 (100+1/2WQCV)	5.40	0.680	Weir&Pipe (Restrict)
Total (all zones)		1.341	

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 =	N/A	ft²
Depth at top of Zone using Orifice Plate =	3.57	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	13.70	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	N/A	inches	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	1.19	2.38					
Orifice Area (sq. inches)	1.37	1.37	2.00					

	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)

	Not Selected	Not Selected			Not Selected	Not Selected	
Invert of Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	N/A	N/A	ft²
Depth at top of Zone using Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	N/A	N/A	feet
Vertical Orifice Diameter =	N/A	N/A	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 =	3.70	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	3.70	N/A	feet
Overflow Weir Front Edge Length =	3.00	N/A	feet	Overflow Weir Slope Length =	3.00	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	7.13	N/A	
Horiz. Length of Weir Sides =	3.00	N/A	feet	Overflow Grate Open Area w/o Debris =	6.30	N/A	ft²
Overflow Grate Open Area % =	70%	N/A	%, grate open area/total area	Overflow Grate Open Area w/ Debris =	3.15	N/A	ft²
Debris Clogging % =	50%	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 =	0.88	N/A	ft²
Outlet Pipe Diameter =	18.00	N/A	inches	Outlet Orifice Centroid =	0.43	N/A	feet
Restrictor Plate Height Above Pipe Invert =	9.00		inches	Half-Central Angle of Restrictor Plate on Pipe =	1.57	N/A	radians

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	6.50	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.74	feet
Spillway Crest Length =	11.00	feet	Stage at Top of Freeboard =	8.24	feet
Spillway End Slopes =	5.00	H:V	Basin Area at Top of Freeboard =	0.48	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	1.83	acre-ft

Calculated Parameters for Spillway

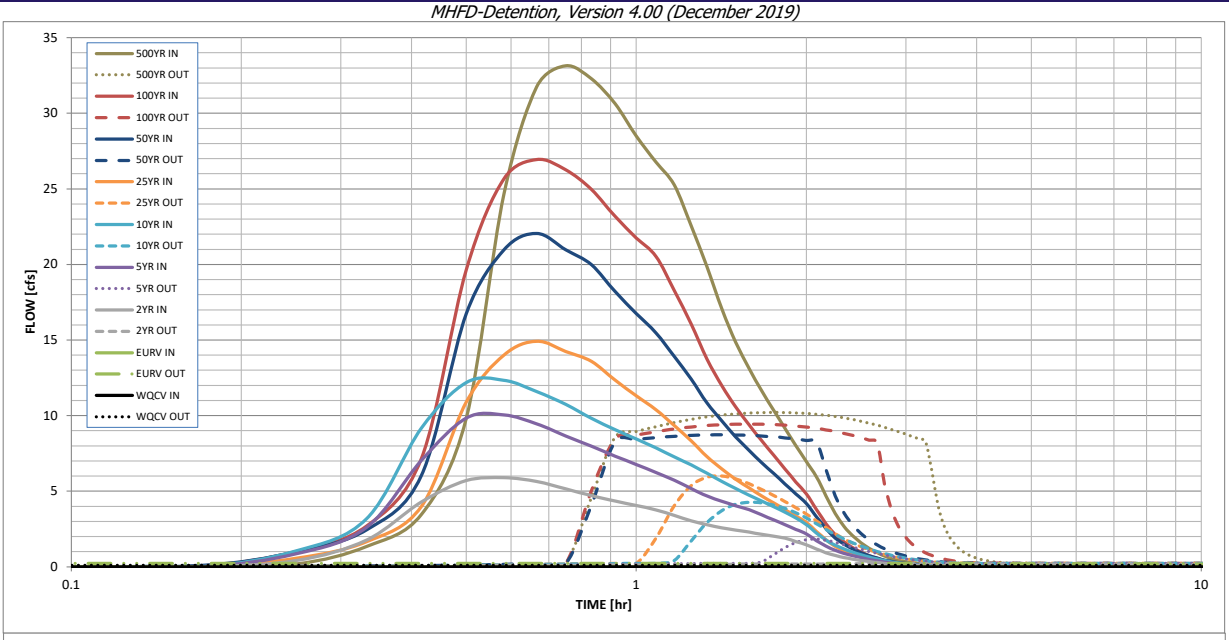
Routed Hydrograph Results

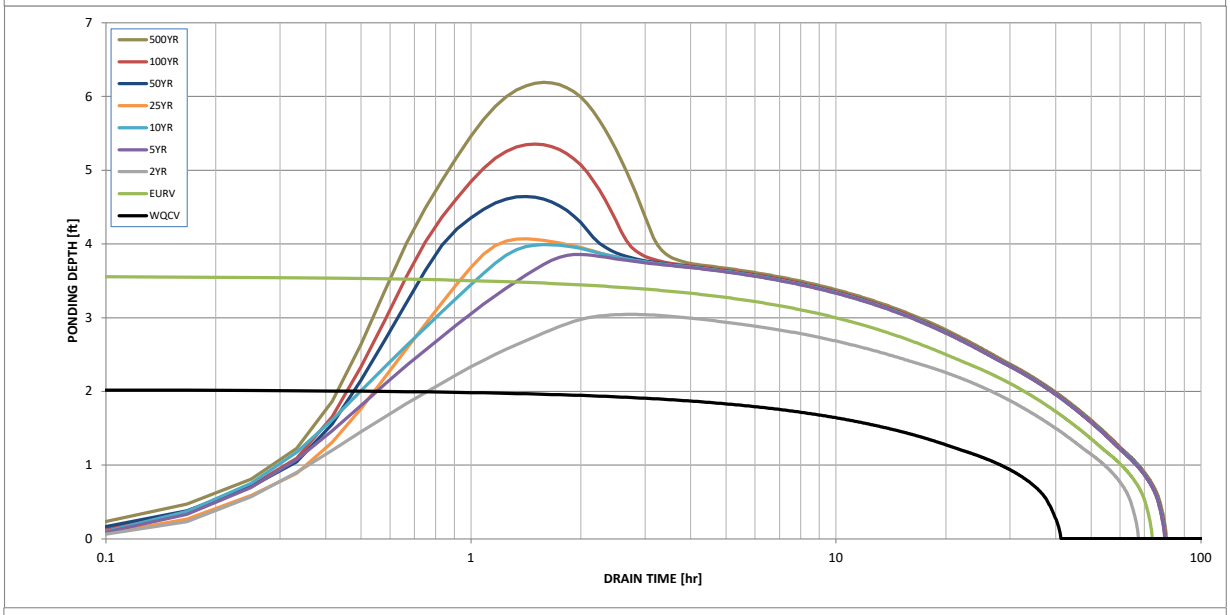
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

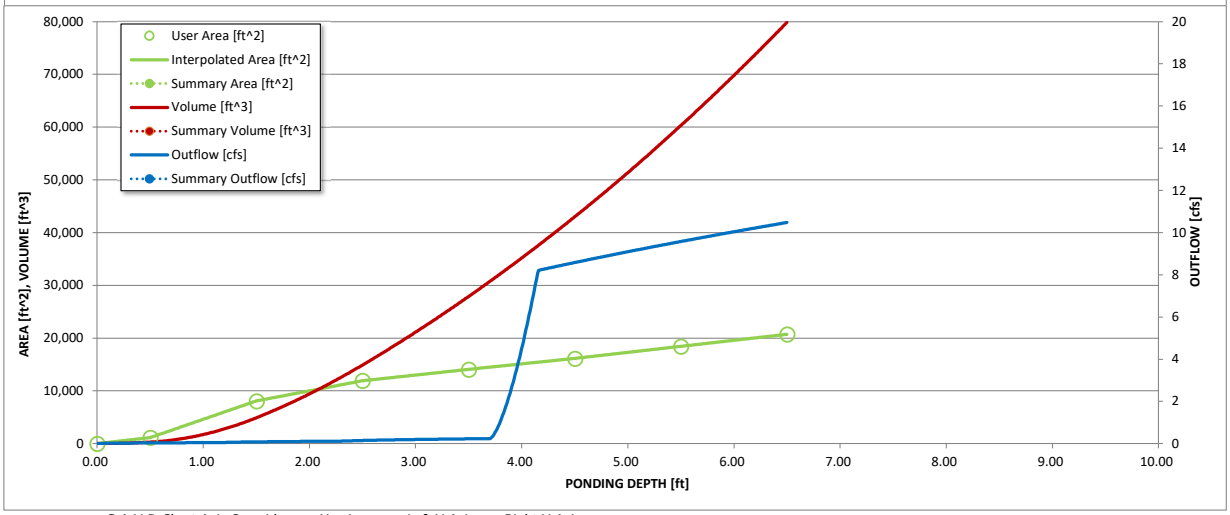
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.06	1.43	1.66	1.72	2.26	2.60	3.07
CUHP Runoff Volume (acre-ft) =	0.221	0.660	0.534	0.875	1.104	1.238	1.831	2.261	2.802
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.534	0.875	1.104	1.238	1.831	2.261	2.802
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.2	2.4	3.8	5.7	10.0	13.3	17.1
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.02	0.18	0.28	0.43	0.76	1.01	1.30
Peak Inflow Q (cfs) =	N/A	N/A	5.9	10.0	12.3	14.9	22.0	26.9	33.1
Peak Outflow Q (cfs) =	0.1	0.2	0.2	1.8	4.3	6.0	8.7	9.4	10.2
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.8	1.1	1.0	0.9	0.7	0.6
Structure Controlling Flow =	Plate	Plate	Plate	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Outlet Plate 1	Outlet Plate 1
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	0.3	0.6	0.9	1.3	1.4	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	66	61	70	68	67	63	60	58
Time to Drain 99% of Inflow Volume (hours) =	**40**	70	65	76	75	75	73	72	71
Maximum Ponding Depth (ft) =	2.03	3.57	3.04	3.86	3.99	4.07	4.64	5.35	6.19
Area at Maximum Ponding Depth (acres) =	0.23	0.33	0.30	0.34	0.35	0.35	0.38	0.42	0.46
Maximum Volume Stored (acre-ft) =	0.223	0.663	0.497	0.756	0.801	0.829	1.040	1.321	1.684

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.00 (December 2019)







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

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename:

Inflow Hydrographs

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

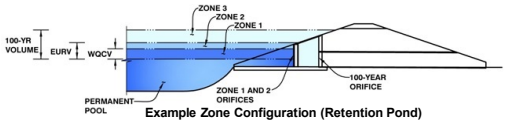
	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.03	0.19
	0:15:00	0.00	0.00	0.42	0.85	1.06	0.56	0.99	1.01	1.34
	0:20:00	0.00	0.00	1.78	2.62	3.19	1.67	2.46	2.71	3.47
	0:25:00	0.00	0.00	4.30	7.04	9.18	4.00	6.04	7.17	9.81
	0:30:00	0.00	0.00	5.71	9.83	12.18	10.89	16.73	19.64	24.66
	0:35:00	0.00	0.00	5.89	10.05	12.34	14.01	20.96	25.67	31.75
	0:40:00	0.00	0.00	5.65	9.45	11.58	14.92	22.04	26.94	33.14
	0:45:00	0.00	0.00	5.15	8.65	10.74	14.25	20.97	26.26	32.26
	0:50:00	0.00	0.00	4.71	7.97	9.82	13.59	19.97	24.95	30.64
	0:55:00	0.00	0.00	4.35	7.32	9.08	12.35	18.21	23.19	28.50
	1:00:00	0.00	0.00	4.05	6.77	8.46	11.31	16.76	21.76	26.77
	1:05:00	0.00	0.00	3.77	6.24	7.86	10.39	15.47	20.53	25.27
	1:10:00	0.00	0.00	3.40	5.73	7.28	9.34	13.93	18.29	22.55
	1:15:00	0.00	0.00	3.05	5.17	6.74	8.33	12.42	16.06	19.86
	1:20:00	0.00	0.00	2.78	4.68	6.18	7.29	10.84	13.76	17.05
	1:25:00	0.00	0.00	2.58	4.33	5.65	6.47	9.64	11.98	14.86
	1:30:00	0.00	0.00	2.43	4.04	5.17	5.79	8.60	10.57	13.12
	1:35:00	0.00	0.00	2.29	3.78	4.74	5.21	7.71	9.40	11.66
	1:40:00	0.00	0.00	2.16	3.44	4.34	4.69	6.90	8.34	10.35
	1:45:00	0.00	0.00	2.02	3.11	3.97	4.23	6.17	7.38	9.15
	1:50:00	0.00	0.00	1.89	2.79	3.61	3.78	5.48	6.47	8.02
	1:55:00	0.00	0.00	1.67	2.48	3.22	3.35	4.81	5.61	6.95
	2:00:00	0.00	0.00	1.46	2.17	2.79	2.93	4.18	4.81	5.96
	2:05:00	0.00	0.00	1.18	1.73	2.23	2.35	3.32	3.80	4.69
	2:10:00	0.00	0.00	0.93	1.36	1.76	1.80	2.52	2.86	3.54
	2:15:00	0.00	0.00	0.75	1.09	1.43	1.36	1.91	2.14	2.66
	2:20:00	0.00	0.00	0.62	0.89	1.18	1.06	1.49	1.64	2.05
	2:25:00	0.00	0.00	0.51	0.73	0.97	0.83	1.18	1.26	1.58
	2:30:00	0.00	0.00	0.42	0.60	0.79	0.66	0.93	0.97	1.22
	2:35:00	0.00	0.00	0.34	0.49	0.64	0.53	0.73	0.74	0.94
	2:40:00	0.00	0.00	0.28	0.40	0.51	0.42	0.58	0.56	0.71
	2:45:00	0.00	0.00	0.23	0.31	0.41	0.33	0.45	0.42	0.53
	2:50:00	0.00	0.00	0.18	0.25	0.32	0.26	0.35	0.33	0.41
	2:55:00	0.00	0.00	0.15	0.20	0.25	0.21	0.28	0.26	0.33
	3:00:00	0.00	0.00	0.12	0.16	0.20	0.16	0.22	0.21	0.26
	3:05:00	0.00	0.00	0.09	0.12	0.15	0.13	0.17	0.16	0.21
	3:10:00	0.00	0.00	0.07	0.09	0.12	0.10	0.13	0.13	0.16
	3:15:00	0.00	0.00	0.05	0.06	0.08	0.07	0.10	0.09	0.11
	3:20:00	0.00	0.00	0.03	0.04	0.06	0.05	0.07	0.06	0.08
	3:25:00	0.00	0.00	0.02	0.03	0.04	0.03	0.04	0.04	0.05
	3:30:00	0.00	0.00	0.01	0.02	0.02	0.02	0.02	0.02	0.03
	3:35:00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01
	3:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.02 (February 2020)

Project: **Sanders Industrial Park at Castle Rock (Phase 1)**

Basin ID: **Full Site Pond (Interim)**



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	**EDB**	
Watershed Area =	13.42	acres
Watershed Length =	1,700	ft
Watershed Length to Centroid =	850	ft
Watershed Slope =	0.020	ft/ft
Watershed Imperviousness =	36.00%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	80.0%	percent
Percentage Hydrologic Soil Groups C/D =	20.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	Castle Pines - City Office	

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) =	0.189	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	0.492	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 1.06 in.) =	0.394	acre-feet	1.06	inches
5-yr Runoff Volume (P1 = 1.43 in.) =	0.718	acre-feet	1.43	inches
10-yr Runoff Volume (P1 = 1.66 in.) =	0.941	acre-feet	1.66	inches
25-yr Runoff Volume (P1 = 1.72 in.) =	1.090	acre-feet		inches
50-yr Runoff Volume (P1 = 2.26 in.) =	1.683	acre-feet	2.26	inches
100-yr Runoff Volume (P1 = 2.6 in.) =	2.125	acre-feet	2.60	inches
500-yr Runoff Volume (P1 = 3.07 in.) =	2.669	acre-feet		inches
Approximate 2-yr Detention Volume =	0.330	acre-feet		
Approximate 5-yr Detention Volume =	0.512	acre-feet		
Approximate 10-yr Detention Volume =	0.685	acre-feet		
Approximate 25-yr Detention Volume =	0.700	acre-feet		
Approximate 50-yr Detention Volume =	0.859	acre-feet		
Approximate 100-yr Detention Volume =	1.028	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.189	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.302	acre-feet
Zone 3 (100yr + 1 / 2 WQCV - Zones 1 & 2) =	0.631	acre-feet
Total Detention Basin Volume =	1.123	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	

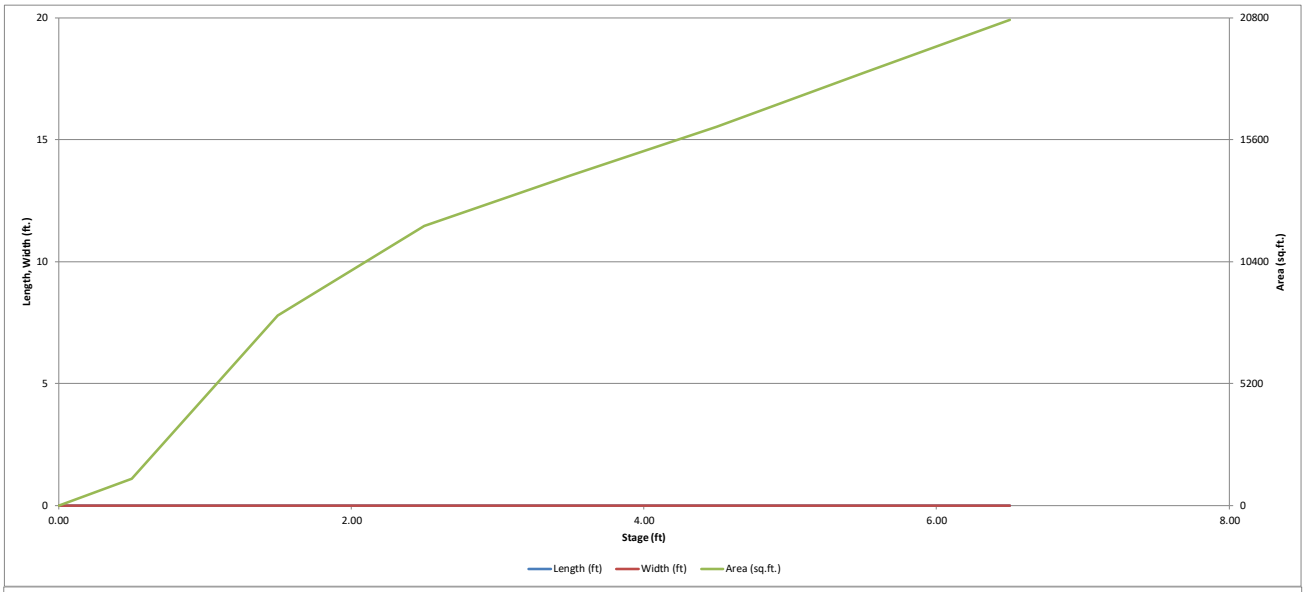
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	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

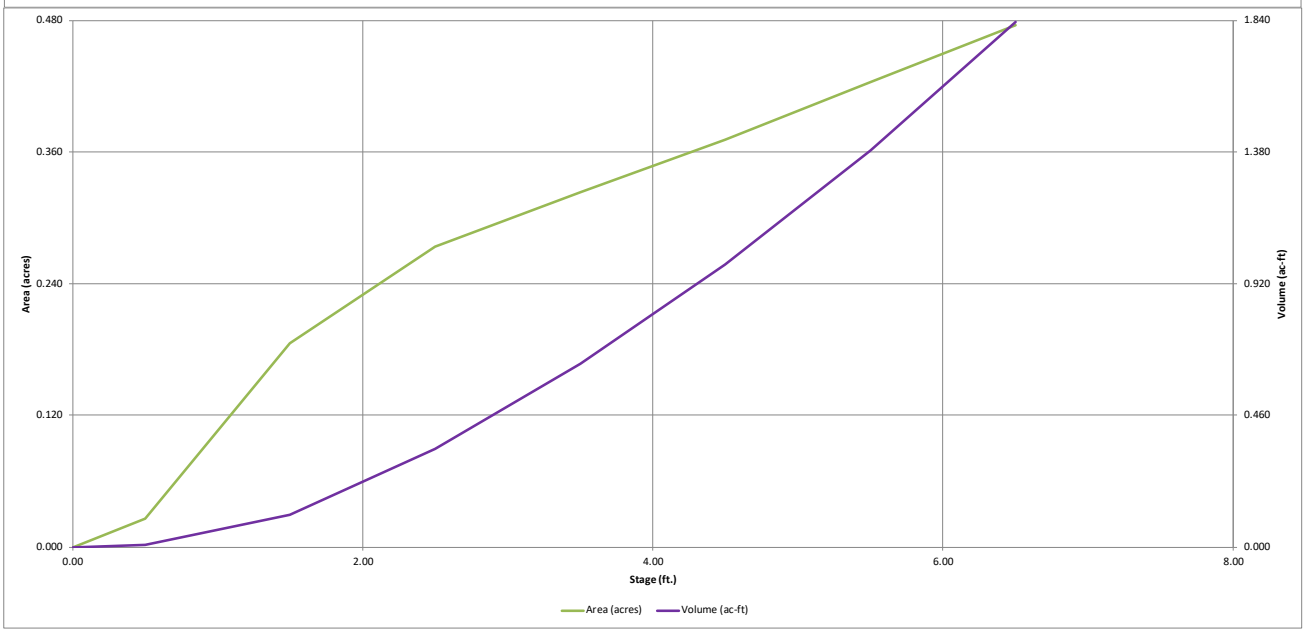
Depth Increment = 1.00 ft

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	--	--	--	0	0.000		
75	--	0.50	--	--	--	1,132	0.026	283	0.006
76	--	1.50	--	--	--	8,088	0.186	4,893	0.112
77	--	2.50	--	--	--	11,914	0.274	14,894	0.342
78	--	3.50	--	--	--	14,074	0.323	27,888	0.640
79	--	4.50	--	--	--	16,153	0.371	43,001	0.987
80	--	5.50	--	--	--	18,440	0.423	60,298	1.384
81	--	6.50	--	--	--	20,725	0.476	79,880	1.834

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.02 (February 2020)



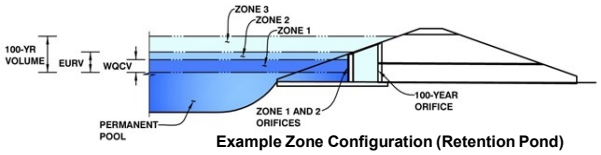


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.02 (February 2020)

Project: **Sanders Industrial Park at Castle Rock (Phase 1)**

Basin ID: **Full Site Pond (Interim)**



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	1.88	0.189	Orifice Plate
Zone 2 (EURV)	3.03	0.302	Orifice Plate
Z3 (100+1/2WQCV)	4.86	0.631	Weir&Pipe (Restrict)
Total (all zones)		1.123	

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

			Calculated Parameters for Underdrain		
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

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

			Calculated Parameters for Plate		
Invert of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	N/A	ft²
Depth at top of Zone using Orifice Plate =	3.42	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	N/A	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	N/A	inches	Elliptical Slot Area =	N/A	ft²

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.25	1.95					
Orifice Area (sq. inches)	1.25	1.25	2.00					

	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)

	Not Selected	Not Selected		Calculated Parameters for Vertical Orifice	Not Selected	Not Selected	
Invert of Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	N/A	N/A	ft²
Depth at top of Zone using Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	N/A	N/A	feet
Vertical Orifice Diameter =	N/A	N/A	inches				

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		Calculated Parameters for Overflow Weir	Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	3.70	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	3.70	N/A	feet
Overflow Weir Front Edge Length =	3.00	N/A	feet	Overflow Weir Slope Length =	3.00	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	7.13	N/A	
Horiz. Length of Weir Sides =	3.00	N/A	feet	Overflow Grate Open Area w/o Debris =	6.30	N/A	ft²
Overflow Grate Open Area % =	70%	N/A	%, grate open area/total area	Overflow Grate Open Area w/ Debris =	3.15	N/A	ft²
Debris Clogging % =	50%	N/A	%				

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

	Zone 3 Restrictor	Not Selected		Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate	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 =	0.88	N/A	ft²
Outlet Pipe Diameter =	18.00	N/A	inches	Outlet Orifice Centroid =	0.43	N/A	feet
Restrictor Plate Height Above Pipe Invert =	9.00		inches	Half-Central Angle of Restrictor Plate on Pipe =	1.57	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

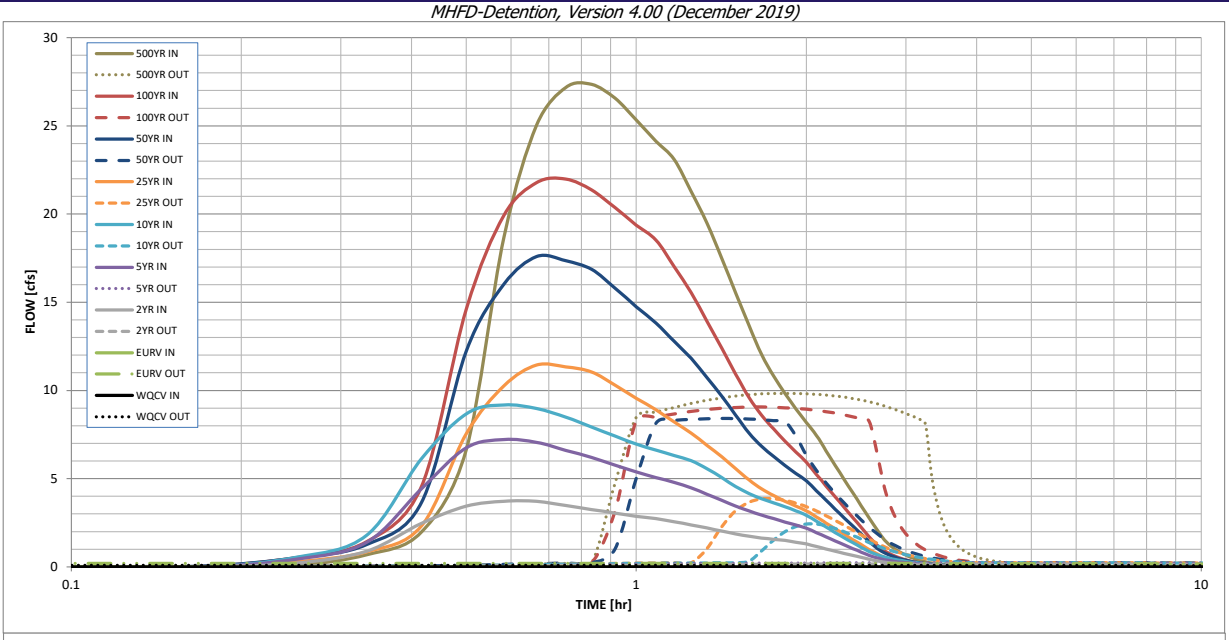
			Calculated Parameters for Spillway		
Spillway Invert Stage=	6.50	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.66	feet
Spillway Crest Length =	11.00	feet	Stage at Top of Freeboard =	8.16	feet
Spillway End Slopes =	5.00	H:V	Basin Area at Top of Freeboard =	0.48	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	1.83	acre-ft

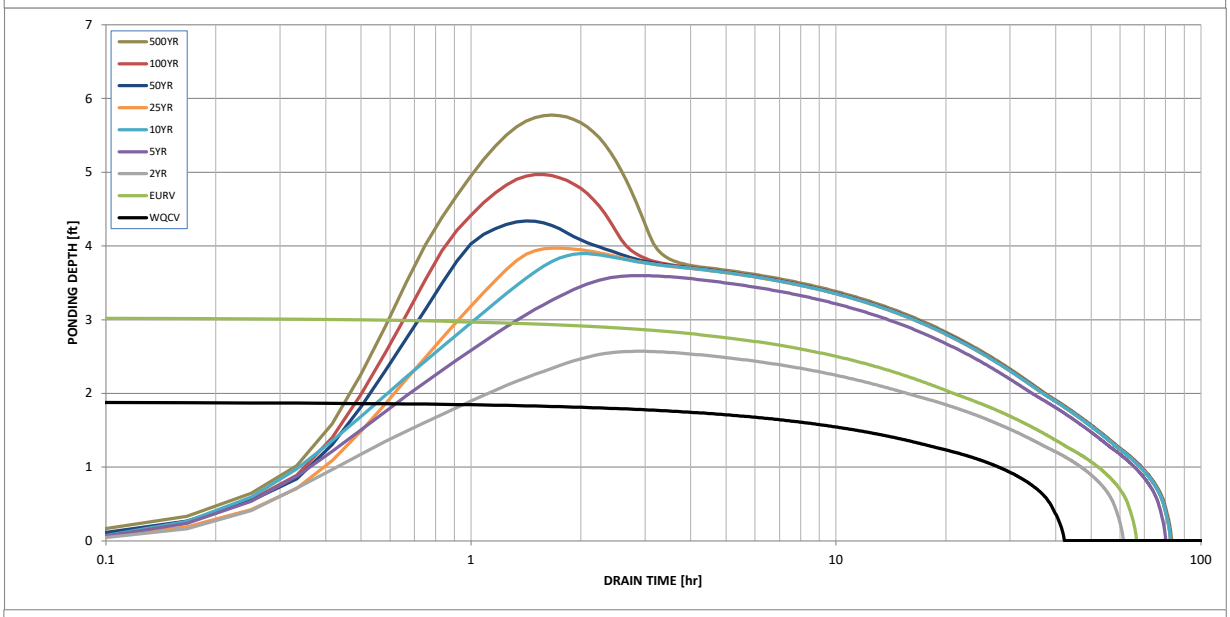
Routed Hydrograph Results — *The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).*

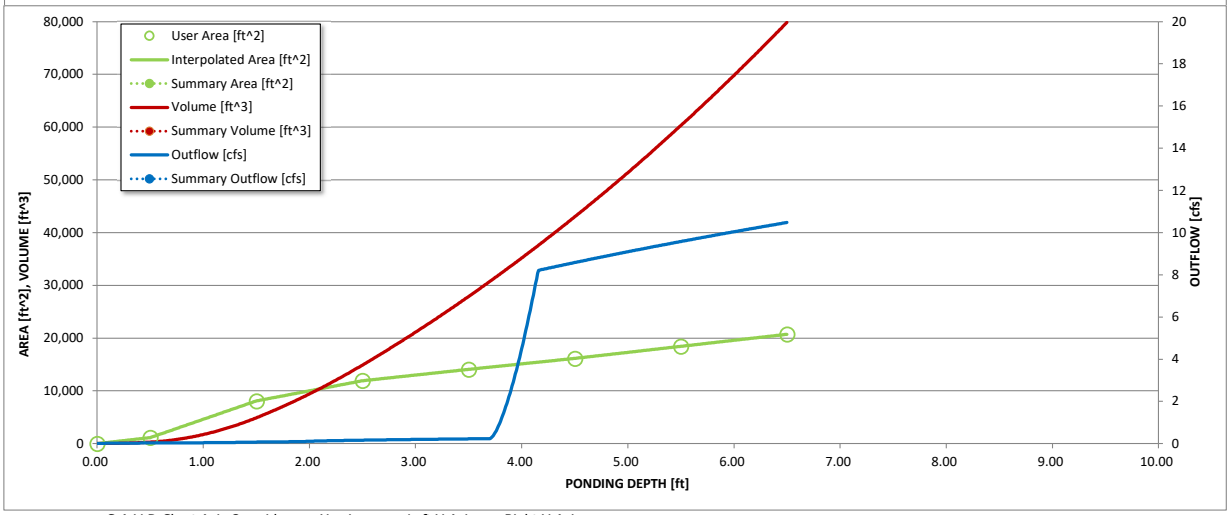
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.06	1.43	1.66	1.72	2.26	2.60	3.07
CUHP Runoff Volume (acre-ft) =	0.189	0.492	0.394	0.718	0.941	1.090	1.683	2.125	2.669
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.394	0.718	0.941	1.090	1.683	2.125	2.669
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.2	2.5	3.8	5.8	10.2	13.6	17.5
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.02	0.19	0.29	0.44	0.76	1.01	1.30
Peak Inflow Q (cfs) =	N/A	N/A	3.7	7.2	9.2	11.4	17.6	22.0	27.3
Peak Outflow Q (cfs) =	0.1	0.2	0.2	0.2	2.4	3.9	8.4	9.1	9.8
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.1	0.6	0.7	0.8	0.7	0.6
Structure Controlling Flow =	Plate	Plate	Plate	Plate	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Outlet Plate 1	Outlet Plate 1
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	0.3	0.6	1.3	1.4	1.5
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	39	60	56	71	72	70	65	62	58
Time to Drain 99% of Inflow Volume (hours) =	**41**	64	59	76	78	77	75	74	73
Maximum Ponding Depth (ft) =	1.88	3.03	2.57	3.60	3.89	3.97	4.34	4.97	5.77
Area at Maximum Ponding Depth (acres) =	0.22	0.30	0.28	0.33	0.34	0.35	0.36	0.39	0.44
Maximum Volume Stored (acre-ft) =	0.189	0.494	0.358	0.669	0.770	0.794	0.925	1.163	1.500

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.00 (December 2019)







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

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename:

Inflow Hydrographs

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

	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.02	0.10
	0:15:00	0.00	0.00	0.21	0.43	0.53	0.28	0.50	0.51	0.69
	0:20:00	0.00	0.00	0.89	1.38	1.79	0.85	1.26	1.42	1.97
	0:25:00	0.00	0.00	2.47	4.43	6.12	2.31	3.64	4.54	6.64
	0:30:00	0.00	0.00	3.44	6.75	8.67	7.53	12.22	14.60	18.70
	0:35:00	0.00	0.00	3.72	7.21	9.18	10.26	16.03	19.94	25.04
	0:40:00	0.00	0.00	3.71	7.06	8.97	11.43	17.59	21.79	27.18
	0:45:00	0.00	0.00	3.47	6.61	8.49	11.34	17.35	21.99	27.35
	0:50:00	0.00	0.00	3.25	6.20	7.93	11.05	16.86	21.36	26.57
	0:55:00	0.00	0.00	3.05	5.77	7.41	10.30	15.80	20.36	25.34
	1:00:00	0.00	0.00	2.87	5.38	6.96	9.56	14.75	19.38	24.13
	1:05:00	0.00	0.00	2.73	5.06	6.61	8.90	13.82	18.52	23.10
	1:10:00	0.00	0.00	2.55	4.79	6.31	8.21	12.78	17.01	21.28
	1:15:00	0.00	0.00	2.38	4.48	6.01	7.58	11.82	15.54	19.50
	1:20:00	0.00	0.00	2.20	4.12	5.57	6.89	10.73	13.92	17.47
	1:25:00	0.00	0.00	2.03	3.77	5.05	6.23	9.67	12.38	15.52
	1:30:00	0.00	0.00	1.86	3.44	4.55	5.56	8.59	10.92	13.68
	1:35:00	0.00	0.00	1.73	3.17	4.15	4.92	7.58	9.59	12.03
	1:40:00	0.00	0.00	1.64	2.93	3.87	4.42	6.84	8.60	10.81
	1:45:00	0.00	0.00	1.56	2.73	3.63	4.04	6.25	7.81	9.83
	1:50:00	0.00	0.00	1.50	2.54	3.41	3.72	5.74	7.12	8.97
	1:55:00	0.00	0.00	1.40	2.37	3.18	3.44	5.29	6.50	8.18
	2:00:00	0.00	0.00	1.30	2.19	2.92	3.18	4.87	5.93	7.46
	2:05:00	0.00	0.00	1.15	1.94	2.59	2.83	4.32	5.24	6.58
	2:10:00	0.00	0.00	1.01	1.70	2.25	2.49	3.78	4.58	5.74
	2:15:00	0.00	0.00	0.88	1.47	1.94	2.16	3.27	3.96	4.95
	2:20:00	0.00	0.00	0.76	1.25	1.64	1.85	2.78	3.37	4.20
	2:25:00	0.00	0.00	0.64	1.04	1.37	1.55	2.31	2.79	3.47
	2:30:00	0.00	0.00	0.53	0.84	1.11	1.26	1.86	2.24	2.76
	2:35:00	0.00	0.00	0.43	0.66	0.87	0.98	1.43	1.70	2.09
	2:40:00	0.00	0.00	0.34	0.50	0.68	0.73	1.05	1.23	1.52
	2:45:00	0.00	0.00	0.27	0.40	0.55	0.54	0.79	0.91	1.14
	2:50:00	0.00	0.00	0.22	0.33	0.46	0.41	0.61	0.69	0.87
	2:55:00	0.00	0.00	0.18	0.28	0.38	0.32	0.47	0.52	0.66
	3:00:00	0.00	0.00	0.15	0.23	0.31	0.25	0.37	0.39	0.50
	3:05:00	0.00	0.00	0.13	0.19	0.26	0.20	0.29	0.29	0.37
	3:10:00	0.00	0.00	0.11	0.16	0.21	0.16	0.23	0.22	0.28
	3:15:00	0.00	0.00	0.09	0.13	0.17	0.13	0.18	0.17	0.22
	3:20:00	0.00	0.00	0.08	0.10	0.14	0.10	0.15	0.13	0.17
	3:25:00	0.00	0.00	0.06	0.08	0.11	0.08	0.12	0.11	0.14
	3:30:00	0.00	0.00	0.05	0.06	0.08	0.06	0.09	0.09	0.11
	3:35:00	0.00	0.00	0.04	0.05	0.06	0.05	0.07	0.07	0.09
	3:40:00	0.00	0.00	0.03	0.04	0.05	0.04	0.05	0.05	0.06
	3:45:00	0.00	0.00	0.02	0.03	0.03	0.03	0.04	0.04	0.05
	3:50:00	0.00	0.00	0.01	0.02	0.02	0.02	0.03	0.02	0.03
	3:55:00	0.00	0.00	0.01	0.01	0.01	0.01	0.02	0.01	0.02
	4:00:00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	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
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	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
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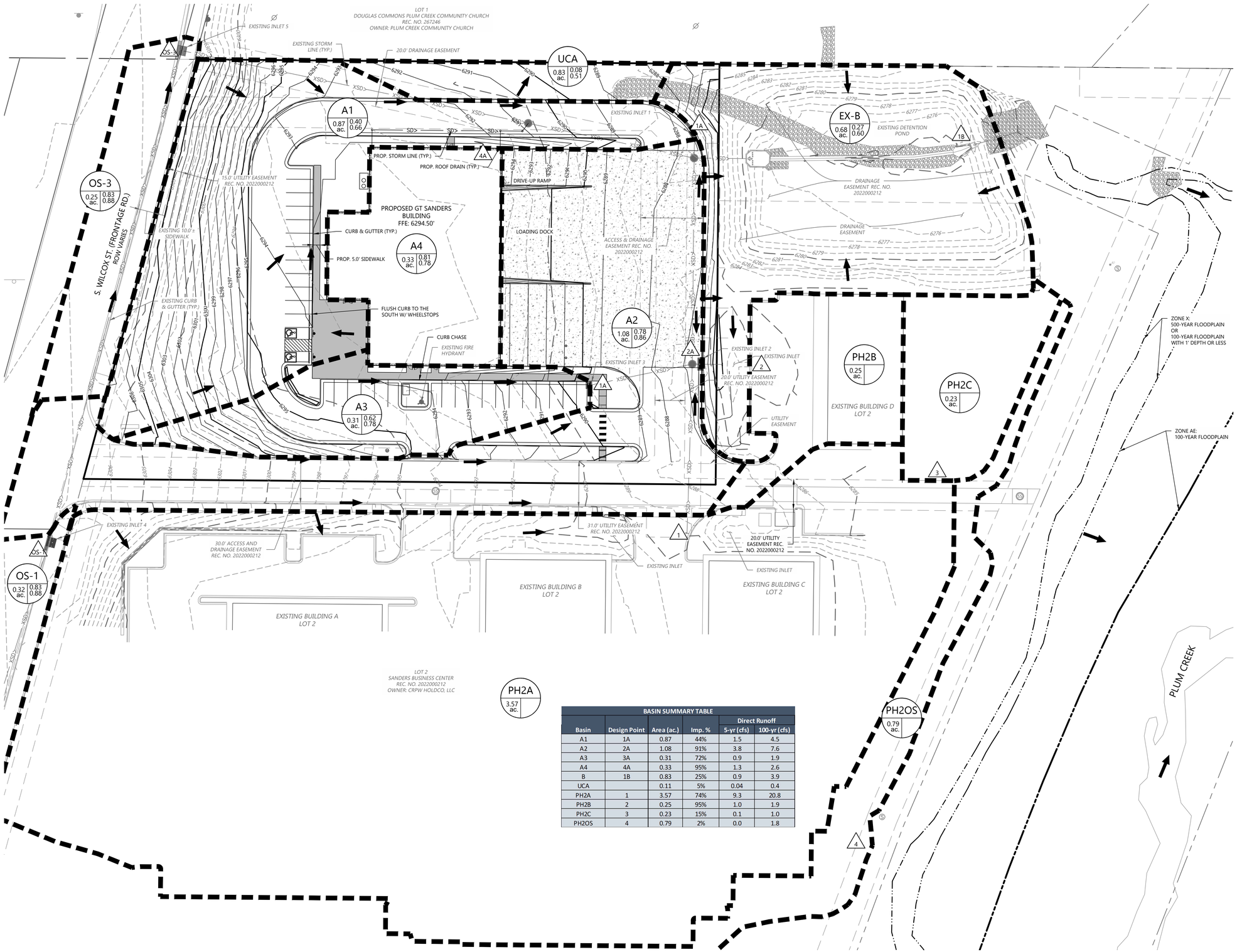
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

- APPENDIX F- Drainage Plan



BASIN SUMMARY TABLE					
				Direct Runoff	
Basin	Design Point	Area (ac.)	Imp. %	5-yr (cfs)	100-yr (cfs)
A1	1A	0.87	44%	1.5	4.5
A2	2A	1.08	91%	3.8	7.6
A3	3A	0.31	72%	0.9	1.9
A4	4A	0.33	95%	1.3	2.6
B	1B	0.83	25%	0.9	3.9
UCA		0.11	5%	0.04	0.4
PH2A	1	3.57	74%	9.3	20.8
PH2B	2	0.25	95%	1.0	1.9
PH2C	3	0.23	15%	0.1	1.0
PH2OS	4	0.79	2%	0.0	1.8

LEGEND:

- PROPERTY LINE
- PROPOSED BUILDING
- EXISTING BUILDING
- PROPOSED EASEMENT
- EXISTING EASEMENT
- PROPOSED BASIN BOUNDARY
- HISTORICAL BASIN BOUNDARY
- 5400 PROPOSED 5' CONTOUR
- 5401 PROPOSED 1' CONTOUR
- 5400 EXISTING 5' CONTOUR
- 5401 EXISTING 1' CONTOUR
- SD> PROPOSED STORM LINE W/F.E.S.
- XSD> EXISTING STORM LINE W/F.E.S.
- PROPOSED SAWCUT
- PROPOSED STORM INLET
- EXISTING STORM INLET
- FLOW DIRECTION
- OVERFLOW PATH
- 25.25 PROPOSED SPOT GRADE
- 25.25 EXISTING SPOT GRADE
- 2.00% SLOPE AND DIRECTION
- HP HIGH POINT
- LP LOW POINT
- GB GRADE BREAK

A1 — BASIN ID
1.50 ac. — BASIN ACREAGE
0.80 / 0.90 — BASIN IDENTIFICATION TAG
5-YR RUNOFF COEFFICIENT
100-YR RUNOFF COEFFICIENT

PROOFCIVIL
consulting engineers
1531 Market Street | Denver, CO

SEAL:
COLORADO LICENSED
MATTHEW A. AVERY
42628
PROFESSIONAL ENGINEER
11-9-2026
FOR AND ON BEHALF OF PROOF CIVIL CO.

REVISIONS

NO.	DESCRIPTION	DATE

PROJ. NO: 26003
DATE: 2/13/2026
DRAWN BY: JKC
CHECKED BY: MAA

PROPOSED DRINAGE PLAN

GT SANDERS
CASTLE ROCK CO

DRAWING NO.
DR1