



MASTER DRAINAGE REPORT

CanAm

Commerce City, Colorado

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Project #: 096888000
Prepared: November 12, 2021





CanAm

COMMERCE CITY, COLORADO

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NOVEMBER 12, 2021

Prepared by:

Kimley»»Horn

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ENGINEER'S STATEMENT

"I hereby certify that this Master Drainage Study for CanAm was prepared by me (or under my direct supervision) in accordance with the provisions of the City of Commerce City *Storm Drainage Design and Technical Criteria Manual* for the owners thereof."

Shelby Madrid, P.E.

Registered Professional Engineer
State of Colorado No. 51685

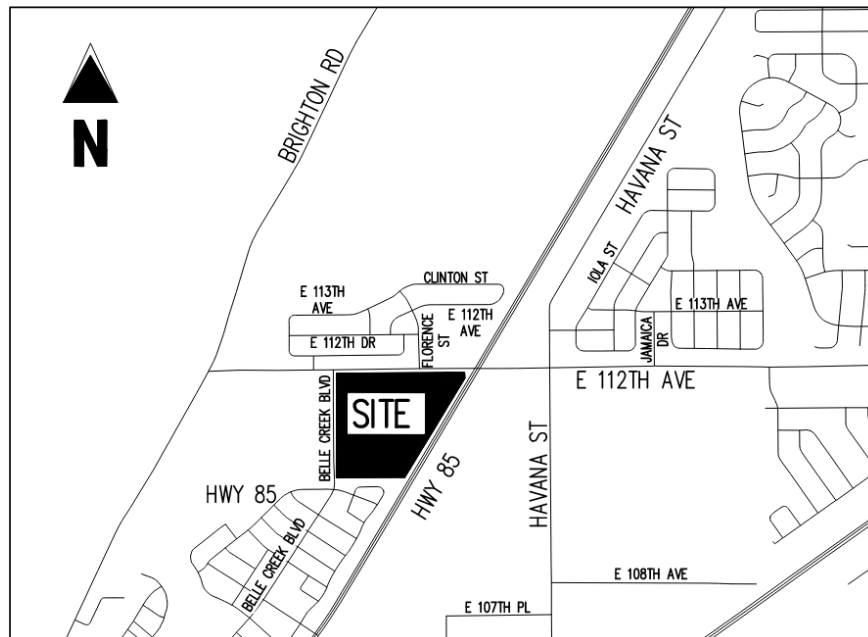
INTRODUCTION

The purpose of this Master Drainage report is to outline the drainage design for CanAm (“the Project”) located at the southwest corner of State Highway 85 and 112th Avenue in Commerce City, Colorado (the “Site”). The Master Drainage Report outlines the proposed Project Drainage, sub-basins, impervious area consistent with the *City of Commerce City Standards and Specifications* and *Mile High Flood District* (MHFD) requirements.

GENERAL LOCATION AND PROJECT DESCRIPTION

SITE LOCATION

The Site is located at the southwest corner of Highway 85 and 112th Avenue and currently consists of the Reisbeck Subdivision as well as a parcel of land located within Adams County (the “Overall Site”). More specifically, the Overall Site is located in the north half of the northeast quarter of Section 10, Township 2 South, Range 67 West of the Sixth Principal Meridian, City of Commerce City, County of Adams, State of Colorado. The Site is bounded by East 112th Avenue to the North, Highway 85 to the East, Belle Creek Blvd to the West and the Belle Creek Subdivision to the South. The Site totals ±35.85-acres. The ±35.85-acres is proposed to be re-platted into 1 Lot and 3 Tracts with the Florence Street and East 111th Avenue Right-of-Way extended throughout the property to serve the various Lots/Tracts. A vicinity map has been provided below for reference. There are no existing drainageways or drainage facilities on-site. There is an existing detention pond serving the Belle Creek Subdivision adjacent to the southwest corner of the site.



DESCRIPTION OF PROPERTY

Currently, the site is an overall ±35.85-acre parcel of undeveloped land. The Project is anticipated to consist of three (3) new tracts, one (1) lot with new public roadways to serve the new lots/tracts. Lot 1 and Tracts B & C are anticipated to consist of commercial and residential development. Due to the unknown design of

these lots/tracts, an assumed impervious value (consistent with the *City of Commerce City Land Development Code*) has been used to estimate runoff and detention volumes.

Roadway infrastructure proposed within the overall development adjacent to the Project will provide access from the Project to adjacent rights-of-way. Project access will be obtained through East 112th Avenue and Belle Creek Boulevard.

The existing vacant ground cover consists of sparse vegetation of native weeds and grasses. A review of the Natural Resource Conservation Service (NRCS) Web Soil Survey determined that the Site is made up of Vona Sandy Loam, consistent with an NRCS Soil Type A. Soil Type A has been utilized for calculations included within this report. The NRCS study is found in **Appendix A** of the report.

The existing topography of the ±35.85-acre site generally falls from northeast to the southwest with site elevations varying from a low of approximately 5055 feet to a high of approximately 5074 feet. Respective runoff sheet flows across the property from the northeast to southwest at slopes varying from 1.5% to 10%. There appears to be a swale that conveys flow westerly along the south property line, then turns northerly to a low point along Belle Creek Boulevard where runoff is conveyed through a culvert to the west side of Belle Creek Blvd. There is evidence that over time natural low points have started to be defined within the project site creating areas where stormwater may pond and infiltrate into the ground, however in general the site stormwater runoff in the existing conditions is conveyed to the existing culvert under Belle Creek Blvd.

A groundwater exploration near the northeast corner of the site was completed in July 2020. Groundwater was encountered at depth ranging from 17.5 feet to 19.5 feet below existing grade. Dewatering on-site during construction is not anticipated.

No geologic hazards have been identified within the proposed project site at this time.

DRAINAGE BASINS

MAJOR BASINS

The ±35.85-acre Site is historically located along the boundary of the First Creek and DFA 0053 Basins. Per the MHFD ArcGIS Database, the site is located within DFA 0053, however per the *DFA0053 Outfall Systems Planning Phase B (2004)* report, the Site is shown as located within First Creek Basin. Per the *First Creek Outfall Systems Planning (1988)*, the Site is shown as not located within the First Creek Basin. Per coordination with MHFD and Adams County, it was determined that the Site *could be* tributary to Pond 346 just northeast of Site. However, Pond 346 has not yet been completed to serve the upstream tributary areas, and thus would require improvements. Due to the lack of information available and the project Site being excluded from both adjacent Major Basins, on-site water quality and detention will be provided with this project independent of Pond 346. Relevant Excerpts from both the First Creek and DFA 0053 OSP have been included in **Appendix C** for reference.

The Site falls within the boundary of FEMA FIRM No. 08001C0338H dated March 3, 2007 and is noted to be within a Floodplain Zone X. Areas classified as Zone X are considered areas of minimal flood hazard, usually depicted by Flood Insurance Rate Maps as areas outside of the 500-year flood plain.

No known irrigation facilities lie within 100-feet of the property boundaries.

MINOR BASINS

The Project site (previously known as the Reisbeck Subdivision) has been identified to fall within Sub-Basin OS1 of the *Phase III Drainage Report for Belle Creek Filing No.2 Phase III* prepared by Carol and Lange Inc dated October 4, 2001. It is important to note that the Belle Creek drainage map excerpt included in this report denotes the Reisbeck Subdivision lots as Sub-Basin V1; it is believed that this area was intended to be denoted as OS1 to be consistent with the report. Per the *Belle Creek Report*, the existing storm sewer main near the southwest corner of the site within Belle Creek Blvd has been sized to convey storm water runoff from this project site.

The project site (overall Sub-Basin OS1) is proposed to be broken up into five separate sub-basins, which are described in more detail below. All basins noted below, except for Lot 1 and Florence Street (Basin L1) will be routed a Regional Detention and Water Quality Pond to be located in Tract A, the proposed “Regional Detention Pond”.

- Basin L1 is made up of the Lot 1 development, including the extension of Florence Street into the project site. Stormwater runoff from this basin will be treated and detained in a private detention facility, to be located on Lot 1. Lot 1 is anticipated to be a commercial use area with a convenience store with fuel sales, and is assumed to be no more than 85% impervious area (consistent with the City of Commerce City Zoning Criteria).
- Basin L2 is made up of the future residential development on Tract C. Stormwater from this basin will ultimately be routed to the Regional Detention Pond to be located in Tract A. Basin L2 is assumed to be no more than 75% impervious area (consistent with the City of Commerce City Zoning Criteria).
- Basin L3 is made up of the future residential development on Tract B. Stormwater from this basin will ultimately be routed to the Regional Detention Pond to be located in Tract A. Basin L3 is assumed to be no more than 75% impervious area (consistent with the City of Commerce City Zoning Criteria).
- Basin FS is made up of the proposed extension of East 111th Avenue Right-of-Way to be installed with future development. Stormwater from this basin will ultimately be routed via storm sewer to the regional detention pond. Basin FS is assumed to be 100% impervious area.
- Basin TA is made up of Tract A which will contain the future Regional Detention Pond to be sized for the overall development (*exclusive of Lot 1 and Florence Street*). Basin TA is assumed to be no more than 10% impervious area to accommodate for access roads and structures to be installed with the pond.

The Drainage Map detailing the sub-basins is provided in **Appendix A** and preliminary runoff calculations are included in **Appendix B**. A summary of each of the proposed sub-basins is included in **Table 1** below.

<i>Sub-Basin</i>	<i>Area (ac)</i>	<i>Impervious (%)</i>	<i>Q₅ (cfs)</i>	<i>Q₁₀₀ (cfs)</i>
L1	7.90	85%	17.41	41.68
L2	14.40	75%	30.02	79.69
L3	11.39	75%	17.42	46.72
FS	0.99	100%	3.06	6.91
TA	1.17	10%	0.37	3.57

DRAINAGE DESIGN CRITERIA

REGULATIONS

The Project will substantially comply with the currently adopted *Commerce City Storm Drainage Design and Technical Criteria Manual* (the Criteria) as well as the *Mile High Flood District Criteria Manual* (the Manual).

DEVELOPMENT CRITERIA REFERENCE AND CONSTRAINTS

As mentioned previously in the report, the Site does not fall within any Major Basin OSP, thus an on-site regional water quality and 100-year detention will be provided with the future development for all basins. All proposed right-of-way to be installed with this project will be tributary to the proposed Detention Ponds, which will be sized appropriately.

Consistent with the *Belle Creek Filing No.2 Drainage Report*, the on-site drainage facilities constructed in the future shall discharge to the existing storm sewer main at the southwest corner of the site in Belle Creek Blvd. The proposed discharge from the ponds shall be consistent with the *Belle Creek Filing No.2 Drainage Report* assumptions for the project site. It is understood that some assumptions may need to be adjusted for varying site conditions such as the Soil Type.

HYDROLOGICAL CRITERIA

Hydrologic design criteria utilized to analyze runoff conditions consists of the Rational Method as approved by the Criteria. Also, for sub-basins less than 160 acres in size, the Rational Method can be utilized as approved by the Manual. An overview of the Rational Method is outlined below with a brief synopsis of the relevant criteria which was utilized in design calculations.

Rational Method Discharge Equation

$$Q = CIA$$

- Q = Discharge in Cubic Feet per Second (CFS)
- C = Runoff Coefficient (Calculated on an individual basin weighted basis utilizing Percent Impervious values and Runoff Coefficients in accordance MHFD)
- I = Rainfall Intensity in Inches per Hour (In/Hr) (Calculated based on individual basin drainage conveyance methods, Time of Concentration and Rainfall Intensity Values in accordance with MHFD)
- A = Basin Area in Acres (Ac) (Determined based upon proposed site grading and drainage characteristics)

Table 2 Below provides a summary of the 1-hour rainfall values used for the project based on the MHFD UD-Detention v4.02 rainfall values for the City of Commerce City.

Table 2: 1-hour Rainfall Values					
<i>2-year</i>	<i>5-year</i>	<i>10-year</i>	<i>25-year</i>	<i>50-year</i>	<i>100-year</i>
0.84 in	1.12 in	1.37 in	1.75 in	2.08 in	2.43 in

Runoff conditions and the analysis utilized in the preparation of this Report consist of design intervals as outlined by the following:

Developed Runoff Conditions (Section 901.01 of the Criteria)

- Minor Storm: 5-year Storm Event
- Major Storm: 100-year Storm Event

Estimated runoff calculations are included in **Appendix B**.

HYDRAULIC CRITERIA

STORM SEWER PIPE HYDRAULICS

As no pipe infrastructure is proposed with this Master Drainage Report, no StormCAD or pipe calculations will be shown. All individual lots/tracts will be responsible for the design of storm infrastructure needed to serve the lot and convey stormwater to the applicable detention facility in compliance with the City of Commerce City Storm Drainage Design and Technical Criteria Manual and the *Belle Creek Phase III Drainage Report* as outlined below.

Per the as-built *Belle Creek plans* and *Phase III Drainage Report* (“*BCF2 Report*”) a drainage channel located downstream of the existing storm sewer system was sized to receive detained runoff from the Project Site at a rate of 1.0-cfs per acre (36-acres assumed), for a total of 36-cfs in the 100-year event. In addition, the channel was also sized for a 22.0-acre basin which has since been directed to the north and will no longer be contributing to this outfall location. Differing from the original approved plans, the drainage channel downstream of the storm sewer main was not installed. In place of the channel, a 30-inch storm sewer pipe was designed and installed to convey stormwater downstream. The Belle Creek As-Built Plans have been included in **Appendix C** of this report.

A total of 35.85-acres (*less than the assumed 36-acres*) is proposed to outfall to the existing storm sewer system. Compliant with the *BCF2 Report*, the site will be required to discharge at less than or equal to 1.0cfs/acre. Due to the reduce tributary area to the storm sewer system, it is anticipated that no improvements to the existing storm sewer main will be required as part of this project. Specific analysis and detailed calculations for compliance with the *BCF2 Report* assumptions and the existing storm sewer system will be provided with the site specific drainage report, as needed.

GUTTER CAPACITY AND INLET HYDRAULICS

As no infrastructure is proposed with this Master Drainage Report, no gutter capacity or inlet hydraulics will be shown. All individual developments will be responsible for the design of storm infrastructure in compliance with the City of Commerce City Storm Drainage Design and Technical Criteria Manual.

WATER QUALITY ENCHANCEMENT

Water quality will be provided on-site in the detention facilities that will each be detail designed with the site specific developments. Preliminary sizing for each of the ponds has been provided in **Appendix B**.

DRAINAGE FACILITY DESIGN

GENERAL CONCEPT

Overall, the majority of the ±35.85-acre Site (all basins except for the Lot 1 basin) will be tributary to the proposed Regional Detention Pond to be installed with a future development. Lot 1 will be responsible for providing on-site 100-year treatment and water quality for the proposed development of Lot 1 and future

Florence Street right-of-way only through the use of a private detention pond. All other lots/tracts, including future East 111th Avenue right-of-way, will be responsible for installing appropriate storm infrastructure to convey runoff to the Regional Detention Pond in Tract A.

Following existing drainage patterns, minimal runoff from off-site basins is anticipated to enter the site. Due to negligible run-on, off-site basin runoff is not anticipated to affect the size of the pond. This is to be verified by future development, and the pond sizing shall be updated accordingly.

A proposed drainage map is included in **Appendix A**, showing basin delineation, approximate future pond locations, and basin impervious values. Calculations for estimated basin imperviousness and runoff, as well as preliminary detention facility sizing are included in **Appendix B**.

SPECIFIC DETAILS

Per the Criteria, the Colorado Urban Hydrograph Procedure (CUHP) method was utilized to determine the preliminary detention requirements for the Project. At the time of future development, applicable design methods shall be utilized to size proposed detention facility, which includes the use of UD-Detention, v4.03 MHFD spreadsheet. Approximate footprints for each pond are shown in the proposed master drainage map included with **Appendix A**

Lot 1 Detention Pond

As a secondary fuel safety measure and in order to support the preferred timing of development, Lot 1 will drain to a private detention pond generally located along the southern boundary of Lot 1. Based on tributary area runoff, the Lot 1 Detention Pond is anticipated to detain approximately 1.67 acre-feet of runoff. The outfall from the Lot 1 Detention Pond will be piped via underground storm sewer to the end of the Florence Street Right-of-Way extension where it will open outfall (daylight) to grade in the interim condition. It is anticipated that in the future with the development of Tracts B and C and the extension of 111th Avenue, the temporary storm outfall will be picked up and connected to the Right-of-Way storm sewer system and conveyed as bypass flows to the pond in Tract A and ultimately convey stormwater flows to the existing storm sewer infrastructure in Belle Creek. Runoff will then follow existing drainage patterns and consistent with the assumptions made in the Belle Creek Filing No.2 Report and be conveyed downstream ultimately to First Creek. The exact alignment of the pond outfall will be further defined with the Site Specific Development Plans. At the time of Site Specific Development Plans, it shall be the responsibility of the Engineer to provide a preliminary storm sewer layout with elevations to verify that drainage from the Lot 1 pond can ultimately be conveyed to the Regional Detention Pond via underground storm sewer. The Regional Detention Pond shall be sized with a bypass for the Lot 1 Detention Pond flow. It is understood that some assumptions may need to be adjusted for varying site conditions such as the Soil Type. Deviations from assumptions made in the *BCF2 Report* shall be further detailed within the future site specific drainage report.

Regional Detention Pond

The Site generally slopes towards the proposed Regional Detention Pond location, no major drainage issues are anticipated for the Regional Detention Pond tributary areas. Based on tributary area runoff, the Regional Detention Pond is anticipated to detain 4.01 acre-feet of runoff. Consistent with the assumptions made in the Belle Creek Filing No.2 Report, the outlet from the Regional Detention Pond will discharge to the existing storm sewer located at the southwest corner of the project site and be conveyed downstream ultimately to First Creek. It is understood that some assumptions may need to be adjusted for varying site conditions such as the Soil Type. Deviations from assumptions made in the *BCF2 Report* shall be further detailed within the future site specific drainage report.

A proposed "Tract A" is being designated with this project to serve as the future location of the Regional Detention Pond. All other drainage easements will be evaluated with individual lot developments.

Calculations for the preliminary sizing of the private detention and regional detention ponds are provided in **Appendix B**.

FLOODPLAIN MODIFICATIONS

This site does not fall within a known FEMA floodplain and no floodplain modifications are required for this project.

ADDITIONAL PERMITTING REQUIREMENTS

No additional permitting requirements are required as part of this Drainage Report.

CONCLUSION

COMPLIANCE WITH STANDARDS

Proposed drainage designs associated with the Project have been designed in substantial accordance with applicable Commerce City Storm Drainage Design and Technical Criteria Manual and the Urban Drainage and Flood Control District Manual and are not anticipated to adversely affect the existing drainage facilities to which they discharge.

This Master Drainage Report outlines the preliminary drainage patterns and pond sizing to be used by future development to ensure drainage requirements can be met. It will be the responsibility of the future developers to fully design and construct all storm sewer infrastructure.

REFERENCES

Urban Drainage and Flood Control District, Urban Storm Drainage Criteria Manual, Volumes 1-3, Revised March 2017.

City of Commerce City Storm Drainage Design and Technical Criteria Manual; August 2021.

Flood Insurance Rate Map 08001C0338H, Federal Emergency Management Agency; March 5, 2007.

Second Creek and DFA 0053 Watersheds Outfall Systems Planning Study Update, Kiowa Engineering Corporation, August 2004

Alternative Report for Planning of First Creek, Irondale Gulch and DFA 0055 Outfall Systems, Wright Water Engineers, Inc, December 1988.

Phase III Drainage Report for the Belle Creek Filing No.2, Carroll and Lange, Inc, October 2001.

Belle Creek Filing No.2, Belle Creek Blvd Plan and Profile Record Document, Carroll and Lange, Inc, March 2002.

Natural Resources Conservation Service (NRCS), Web Soil Survey
<<https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm>>

APPENDIX A – MAPS

FIRM Map

NRCS Soil Map

Master Drainage Map



National Flood Hazard Layer FIRMette



Legend

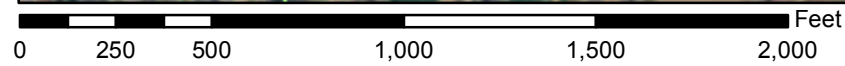
SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

- | | | |
|------------------------------------|--|---|
| 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 |
| GENERAL STRUCTURES | | Area of Undetermined Flood Hazard Zone D |
| | | Channel, Culvert, or Storm Sewer |
| | | Levee, Dike, or Floodwall |
| OTHER FEATURES | | 20.2 Cross Sections with 1% Annual Chance |
| | | 17.5 Water Surface Elevation |
| | | Coastal Transect |
| | | Base Flood Elevation Line (BFE) |
| | | Limit of Study |
| MAP PANELS | | Digital Data Available |
| | | No Digital Data Available |
| | | Unmapped |
| | | The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location. |



39°54'5.93"N

104°52'38.12"W



1:6,000

39°53'38.33"N

104°52'0.66"W

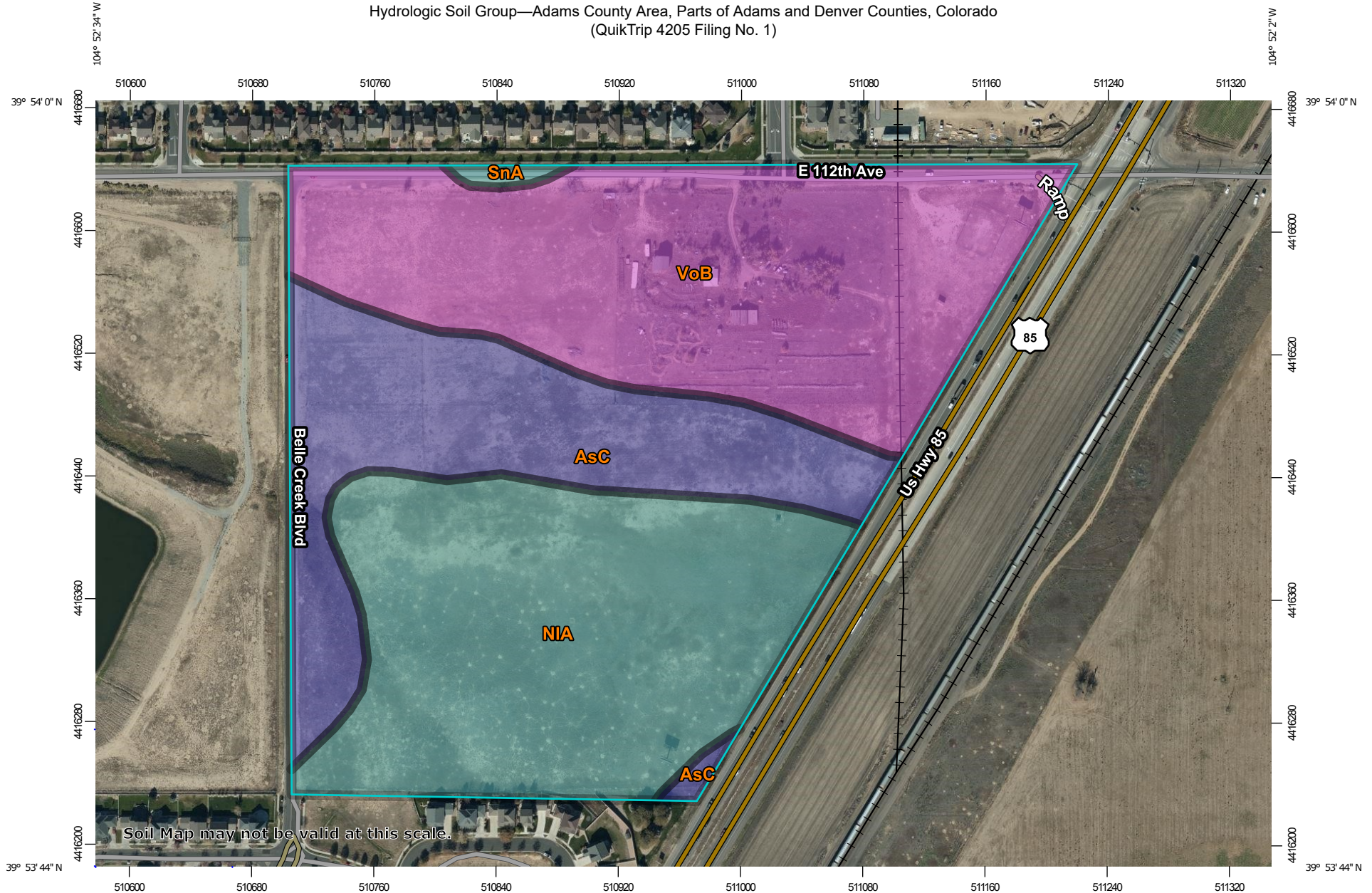
USGS The National Map: Orthoimagery. Data refreshed April, 2019.

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

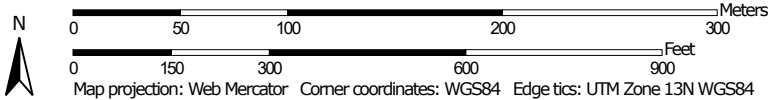
The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on **8/28/2019 at 12:24:34 PM** and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded 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.

Hydrologic Soil Group—Adams County Area, Parts of Adams and Denver Counties, Colorado
(QuikTrip 4205 Filing No. 1)




Map Scale: 1:3,520 if printed on A landscape (11" x 8.5") sheet.



MAP LEGEND

Area of Interest (AOI)









 Area of Interest (AOI)

Soils

Soil Rating Polygons





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

Soil Rating Lines


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

Soil Rating Points






 A
 A/D
 B
 B/D

 C
 C/D
 D
 Not rated or not available


Water Features

 Streams and Canals

Transportation

 Rails
 Interstate Highways
 US Routes
 Major Roads
 Local Roads

Background

 Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: Adams County Area, Parts of Adams and Denver Counties, Colorado
 Survey Area Data: Version 17, Jun 4, 2020

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

Date(s) aerial images were photographed: Oct 3, 2018—Dec 4, 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.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
AsC	Ascalon sandy loam, 3 to 5 percent slopes	B	9.5	23.8%
NIA	Nunn loam, 0 to 1 percent slopes	C	14.5	36.1%
SnA	Satanta loam, 0 to 1 percent slopes	C	0.2	0.5%
VoB	Vona sandy loam, 1 to 3 percent slopes	A	15.8	39.5%
Totals for Area of Interest			40.0	100.0%

Description

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

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

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

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

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

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

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

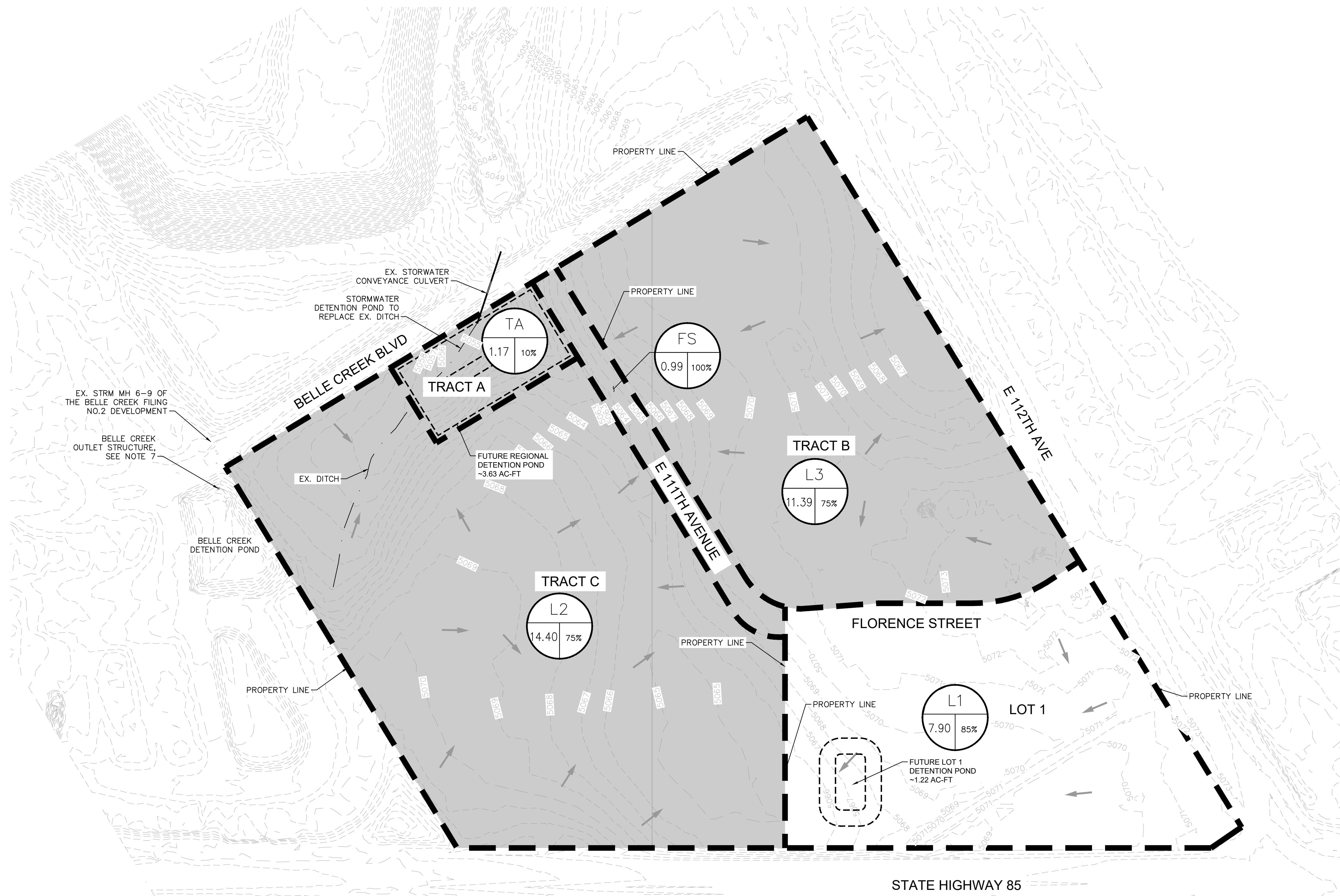
Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

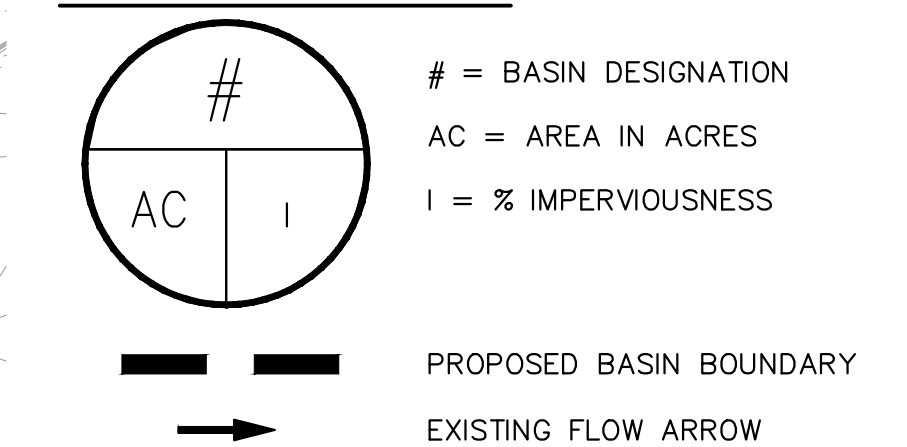
CanAm Master Drainage Map Commerce City, Colorado



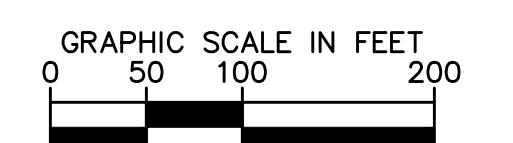
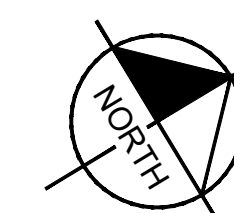
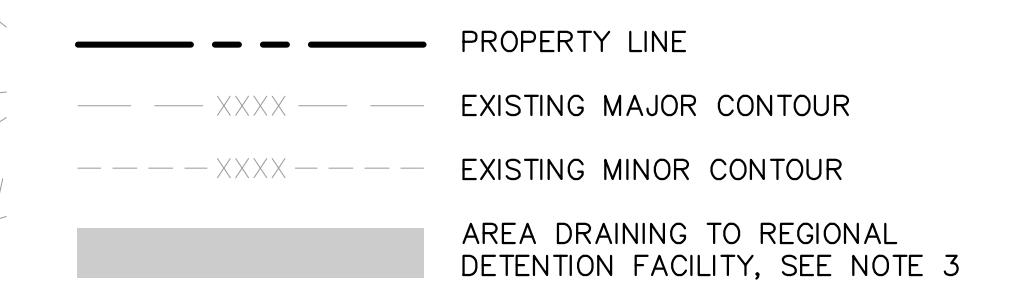
NOTES

1. DUE TO THE UNKNOWN SITE PLANS FOR LOT/TRACTS, RIGHTS-OF-WAY, AND TRACT A, AN IMPERVIOUS VALUE WAS ASSUMED FOR EACH LOT/TRACT BASED ON THE PROPOSED LAND USE CONSISTENT WITH THE CITY OF COMMERCE CITY LAND DEVELOPMENT CODE.
2. DUE TO THE UNKNOWN SITE PLANS FOR LOT/TRACTS, RIGHTS-OF-WAY, AND TRACT A, PROPOSED STORM SEWER, GRADING, AND OTHER INFRASTRUCTURE IS NOT SHOWN.
3. DUE TO THE LOCATION OF THE PROPOSED REGIONAL POND AND THE SLOPE OF THE SITE, IT IS ASSUMED THAT ALL SHADED LOTS WILL BE ABLE TO CONVEY RUNOFF TO THE POND VIA OVERLAND FLOW OR STORM SEWER.
4. ALL BASINS SHADED ARE PROPOSED TO DRAIN TO THE REGIONAL DETENTION FACILITY. THE FACILITY IS SIZED BASED OFF OF THE IMPERVIOUS VALUES AND AREAS SHOWN HEREON.
5. THE REGIONAL DETENTION FACILITY IS NOT SIZED FOR THE RUNOFF FROM LOT 1. LOT 1 IS RESPONSIBLE FOR PROVIDING STORMWATER TREATMENT FOR LOT 1 AND FLORENCE STREET ONLY.
6. THE REGIONAL DETENTION FACILITY SIZE IS SHOWN FOR REFERENCE ONLY. ACTUAL POND DESIGN IS TO BE COMPLETED AT THE TIME OF DEVELOPMENT OF TRACTS B & C.
7. IT HAS BEEN ASSUMED THAT THE EXISTING BELLE CREEK DETENTION POND OUTLET STRUCTURE DRAINS TO AN EXISTING STORM MAIN WITHIN BELLE CREEK BLVD AT THE SOUTHWEST CORNER OF THE SUBJECT SITE AND CONVEYS STORMWATER RUNOFF TO THE SOUTH.
8. DUE TO THE UNKNOWN SITE SPECIFIC DETAILS FOR LOT/TRACTS, RIGHTS-OF-WAY, AND TRACT A, THE SITE AREAS NOTED HAVE BEEN ESTIMATED AT THIS TIME AND SHALL BE FURTHER DEFINED WITH THE FORTHCOMING SITE SPECIFIC DEVELOPMENTS.
9. EXISTING CONTOURS SHOWN ON PLAN OUTSIDE OF THE PROJECT PROPERTY LINE AND ADJACENT RIGHTS-OF-WAY ARE PER THE 2013 DRCOG GIS CONTOURS AVAILABLE ONLINE AND HAVE NOT BEEN SURVEY VERIFIED.

DRAINAGE LEGEND



LEGEND



Kimley»Horn

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PHONE: 303-228-2300

APPENDIX B – HYDRAULIC COMPUTATIONS

Preliminary Runoff Calculations

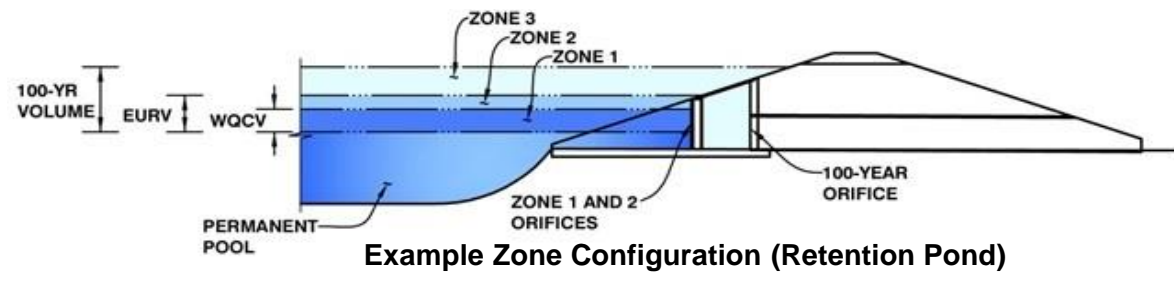
Preliminary Detention Facility Sizing



DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)

Project: CanAM
Basin ID: Regional Pond (preliminary Sizing)



Watershed Information

Selected BMP Type =	EDB
Watershed Area =	27.96 acres
Watershed Length =	1,260 ft
Watershed Length to Centroid =	450 ft
Watershed Slope =	0.016 ft/ft
Watershed Imperviousness =	80.00% percent
Percentage Hydrologic Soil Group A =	20.0% percent
Percentage Hydrologic Soil Group B =	30.0% percent
Percentage Hydrologic Soil Groups C/D =	50.0% percent
Target WQCV Drain Time =	40.0 hours
Location for 1-hr Rainfall Depths =	Commerce City - Civic Center

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

Water Quality Capture Volume (WQCV) =	0.765	acre-feet
Excess Urban Runoff Volume (EURV) =	2.432	acre-feet
2-yr Runoff Volume (P1 = 0.84 in.) =	1.422	acre-feet
5-yr Runoff Volume (P1 = 1.12 in.) =	1.981	acre-feet
10-yr Runoff Volume (P1 = 1.37 in.) =	2.532	acre-feet
25-yr Runoff Volume (P1 = 1.75 in.) =	3.459	acre-feet
50-yr Runoff Volume (P1 = 2.08 in.) =	4.239	acre-feet
100-yr Runoff Volume (P1 = 2.43 in.) =	5.111	acre-feet
500-yr Runoff Volume (P1 = 3.35 in.) =	7.325	acre-feet
Approximate 2-yr Detention Volume =	1.393	acre-feet
Approximate 5-yr Detention Volume =	1.967	acre-feet
Approximate 10-yr Detention Volume =	2.447	acre-feet
Approximate 25-yr Detention Volume =	2.975	acre-feet
Approximate 50-yr Detention Volume =	3.278	acre-feet
Approximate 100-yr Detention Volume =	3.627	acre-feet

Optional User Overrides

acre-feet	
acre-feet	
inches	
inches	
inches	
inches	
inches	
inches	
inches	

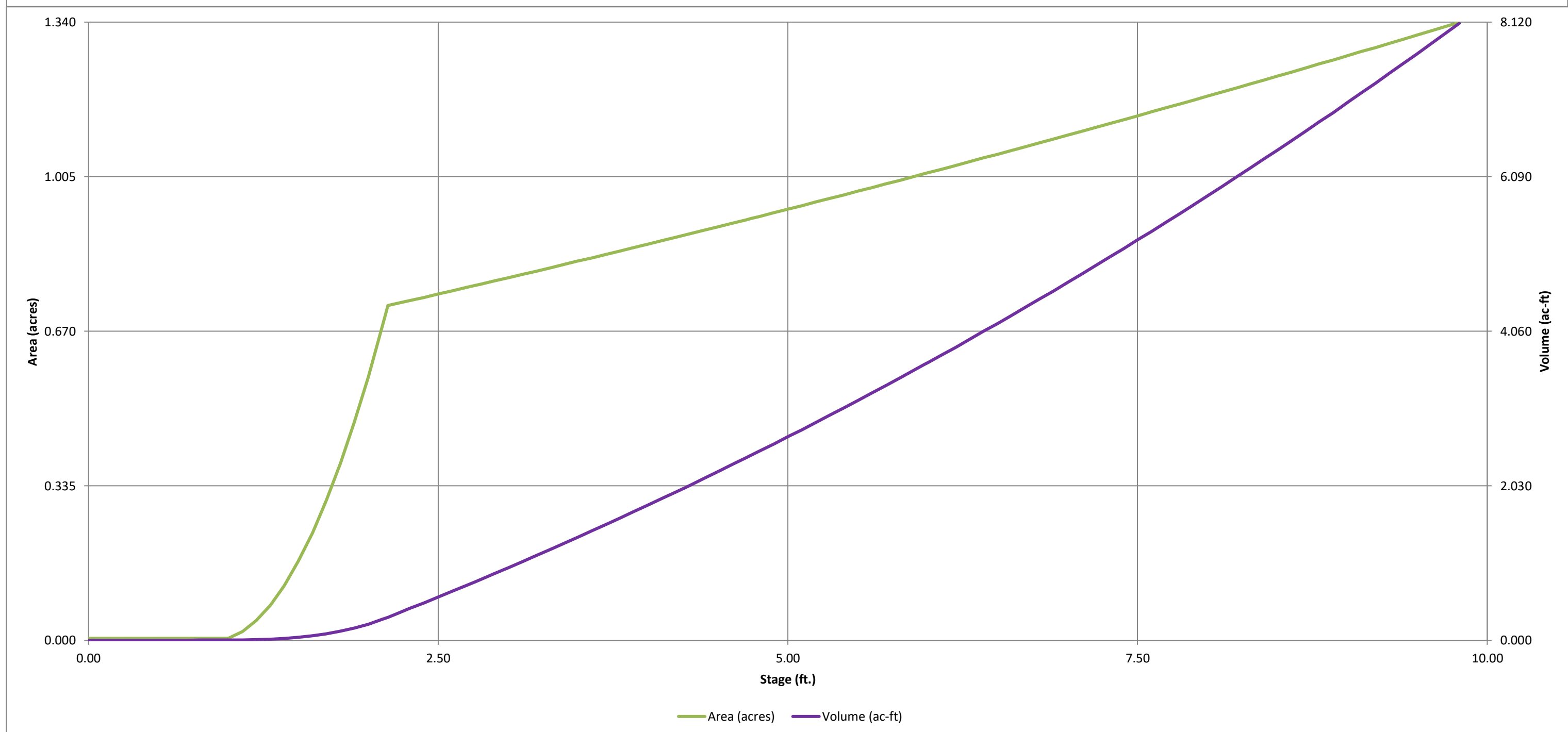
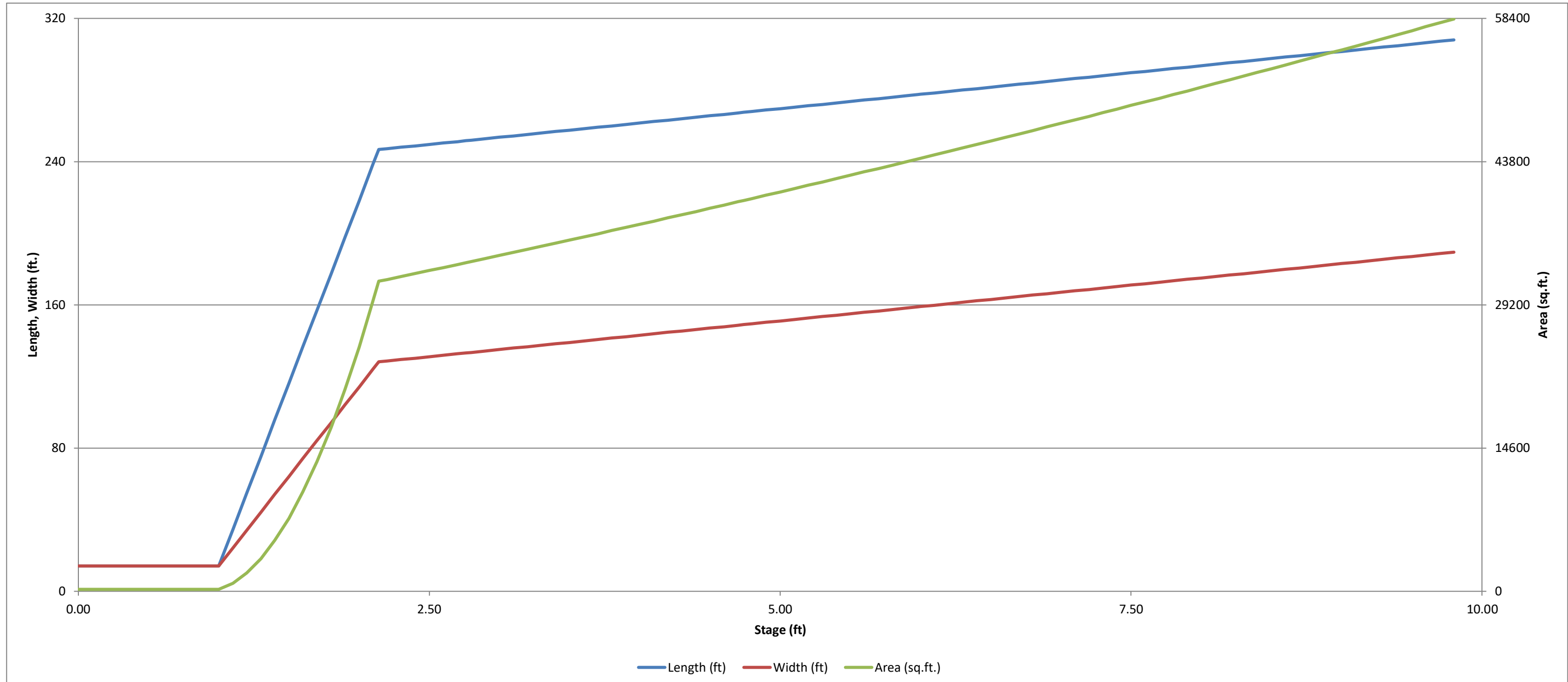
Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.765	acre-feet
Zone 2 Volume (EURV - Zone 1) =	1.667	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	1.195	acre-feet
Total Detention Basin Volume =	3.627	acre-feet
Initial Surcharge Volume (ISV) =	100	ft ³
Initial Surcharge Depth (ISD) =	0.50	ft
Total Available Detention Depth (H _{total}) =	6.00	ft
Depth of Trickle Channel (H _{TC}) =	0.50	ft
Slope of Trickle Channel (S _{TC}) =	0.005	ft/ft
Slopes of Main Basin Sides (S _{main}) =	4	H:V
Basin Length-to-Width Ratio (R _{L/W}) =	2	
Initial Surcharge Area (A _{ISV}) =	200	ft ²
Surcharge Volume Length (L _{ISV}) =	14.1	ft
Surcharge Volume Width (W _{ISV}) =	14.1	ft
Depth of Basin Floor (H _{FLOOR}) =	1.14	ft
Length of Basin Floor (L _{FLOOR}) =	246.7	ft
Width of Basin Floor (W _{FLOOR}) =	128.1	ft
Area of Basin Floor (A _{FLOOR}) =	31,612	ft ²
Volume of Basin Floor (V _{FLOOR}) =	13,044	ft ³
Depth of Main Basin (H _{MAIN}) =	3.86	ft
Length of Main Basin (L _{MAIN}) =	277.6	ft
Width of Main Basin (W _{MAIN}) =	159.0	ft
Area of Main Basin (A _{MAIN}) =	44,141	ft ²
Volume of Main Basin (V _{MAIN}) =	145,532	ft ³
Calculated Total Basin Volume (V _{total}) =	3.645	acre-feet

Depth Increment = 0.10 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		14.1	14.1	200		0.005		
ISV	0.50		14.1	14.1	200		0.005	100	0.002
	0.60		14.1	14.1	200		0.005	120	0.003
	0.70		14.1	14.1	200		0.005	140	0.003
	0.80		14.1	14.1	200		0.005	160	0.004
	0.90		14.1	14.1	200		0.005	180	0.004
	1.00		14.1	14.1	200		0.005	200	0.005
	1.10		34.5	24.1	834		0.019	248	0.006
	1.20		54.9	34.1	1,876		0.043	380	0.009
	1.30		75.3	44.1	3,325		0.076	637	0.015
	1.40		95.7	54.1	5,183		0.119	1,059	0.024
	1.50		116.1	64.1	7,449		0.171	1,687	0.039
	1.60		136.5	74.1	10,123		0.232	2,562	0.059
	1.70		156.9	84.1	13,205		0.303	3,725	0.086
	1.80		177.3	94.1	16,695		0.383	5,217	0.120
	1.90		197.7	104.1	20,593		0.473	7,078	0.162
	2.00		218.1	114.1	24,898		0.572	9,349	0.215
	2.10		238.5	124.1	29,612		0.680	12,071	0.277
Floor	2.14		246.7	128.1	31,612		0.726	13,296	0.305
	2.20		247.2	128.6	31,792		0.730	15,198	0.349
	2.30		248.0	129.4	32,094		0.737	18,392	0.422
	2.40		248.8	130.2	32,396		0.744	21,616	0.496
	2.50		249.6	131.0	32,700		0.751	24,871	0.571
	2.60		250.4	131.8	33,005		0.758	28,156	0.646
	2.70		251.2	132.6	33,311		0.765	31,472	0.723
Zone 1 (WQCV)	2.76		251.7	133.1	33,496		0.769	33,476	0.769
	2.80		252.0	133.4	33,619		0.772	34,819	0.799
	2.90		252.8	134.2	33,928		0.779	38,196	0.877
	3.00		253.6	135.0	34,238		0.786	41,604	0.955
	3.10		254.4	135.8	34,550		0.793	45,044	1.034
	3.20		255.2	136.6	34,863		0.800	48,514	1.114
	3.30		256.0	137.4	35,177		0.808	52,016	1.194
	3.40		256.8	138.2	35,492		0.815	55,550	1.275
	3.50		257.6	139.0	35,809		0.822	59,115	1.357
	3.60		258.4	139.8	36,127		0.829	62,712	1.440
	3.70		259.2	140.6	36,446		0.837	66,340	1.523
	3.80		260.0	141.4	36,766		0.844	70,001	1.607
	3.90		260.8	142.2	37,088		0.851	73,694	1.692
	4.00		261.6	143.0	37,411		0.859	77,419	1.777
	4.10		262.4	143.8	37,735		0.866	81,176	1.864
	4.20		263.2	144.6	38,061		0.874	84,966	1.951
	4.30		264.0	145.4	38,388		0.881	88,788	2.038
	4.40		264.8	146.2	38,716		0.889	92,643	2.127
	4.50		265.6	147.0	39,046		0.896	96,531	2.216
	4.60		266.4	147.8	39,376		0.904	100,452	2.306
	4.70		267.2	148.6	39,708		0.912	104,407	2.397
Zone 2 (EURV)	4.74		267.5	148.9	39,841		0.915	105,998	2.433
	4.80		268.0	149.4	40,042		0.919	108,394	2.488
	4.90		268.8	150.2	40,376		0.927	112,415	2.581
	5.00		269.6	151.0	40,712		0.935	116,469	2.674
	5.10		270.4	151.8	41,049		0.942	120,557	2.768
	5.20		271.2	152.6	41,387		0.950	124,679	2.862
	5.30		272.0	153.4	41,727		0.958	128,835	2.958
	5.40		272.8	154.2	42,068		0.966	133,025	3.054
	5.50		273.6	155.0	42,410		0.974	137,249	3.151
	5.60		274.4	155.8	42,754		0.981	141,507	3.249
	5.70		275.2	156.6	43,099		0.989	145,799	3.347
	5.80		276.0	157.4	43,445		0.997	150,127	3.446
	5.90		276.8	158.2	43,792		1.005	154,488	3.547
Zone 3 (100-year)	5.98		277.4	158.9	44,071		1.012	158,003	3.627
	6.00		277.6	159.0	44,141		1.013	158,885	3.647
	6.10		278.4	159.8	44,491		1.021	163,317	3.749
	6.20		279.2	160.6	44,842		1.029	167,783	3.852
	6.30		280.0	161.4	45,194		1.038	172,285	3.955
	6.40		280.8	162.2	45,548		1.046	176,822	4.059
	6.50		281.6	163.0	45,903		1.054	181,395	4.164
	6.60		282.4	163.8	46,259		1.062	186,003	4.270
	6.70		283.2	164.6	46,617		1.070	190,647	4.377
	6.80		284.0	165.4	46,976		1.078	195,326	4.484
	6.90		284.8	166.2	47,336		1.087	200,042	4.592
	7.00		285.6	167.0	47,698		1.095	204,793	4.701
	7.10		286.4	167.8	48,060		1.103	209,581	4.811
	7.20		287.2	168.6	48,424		1.112	214,406	4.922
	7.30		288.0	169.4	48,790		1.120	219,266	5.034
	7.40		288.8	170.2	49,156		1.128	224,164	5.146
	7.50		289.6	171.0	49,524		1.137	229,098	5.259
	7.60		290.4	171.8	49,893		1.145	234,068	5.373
	7.70		291.2	172.6	50,263		1.154	239,076	5.488
	7.80		292.0	173.4	50,635		1.162	244,121	5.604
	7.90		292.8	174.2	51,008		1.171	249,203	5.721
	8.00		293.6	175.0	51,382		1.180	254,323	5.838
	8.10		294.4	175.8	51,758		1.188	259,480	5.957
	8.20		295.2	176.6	52,135		1.197	264,674	6.076
	8.30		296.0	177.4	52,513		1.206	269,907	6.196
	8.40		296.8	178.2	52,892		1.214	275,177	6.317
	8.50		297.6	179.0	53,273		1.223	280,485	6.439
	8.60		298.4	179.8	53,655		1.232	285,832	6.562
	8.70		299.2	180.6	54,038		1.241	291,216	6.685
	8.80		300.0	181.4	54,422		1.249	296,639	6.810
	8.90		300.8	182.2	54,808		1.258	302,101	6.935
	9.00		301.6	183.0	55,195		1.267	307,601	7.062
	9.10		302.4	183.8	55,583		1.276	313,140	7.189
	9.20		303.2	184.6	55,973		1.285	318,718	7.317
	9.30		304.0	185.4	56,364		1.294	324,334	7.446
	9.40		304.8	186.2	56,756		1.303	329,990	7.576
	9.50		305.6	187.0	57,150		1.312	335,686	7.706
	9.60		306.4	187.8	57,544		1.321	341,420	7.838
	9.70		307.2	188.6	57,940		1.330	347,195	7.970
	9.80		308.0	189.4	58,338		1.339	353,008	8.104

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

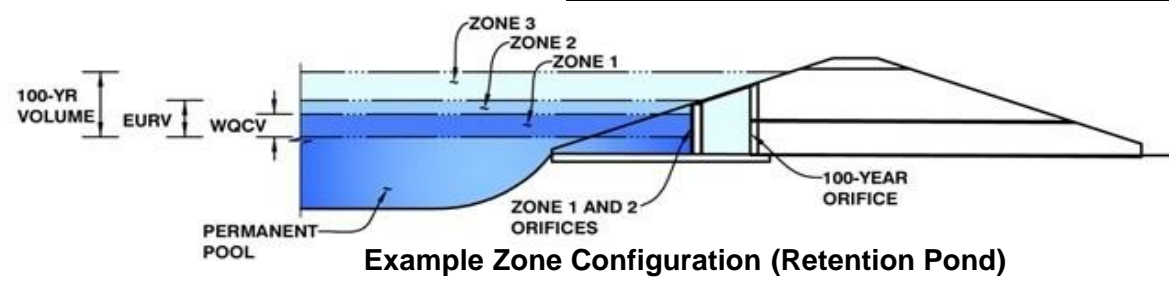
MHFD-Detention, Version 4.04 (February 2021)



DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.03 (May 2020)

Project: QuikTrip 4205 Filing No. 1
Basin ID: Lot 1 Pond (preliminary sizing)



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB
Watershed Area =	7.90 acres
Watershed Length =	900 ft
Watershed Length to Centroid =	375 ft
Watershed Slope =	0.008 ft/ft
Watershed Imperviousness =	85.00% percent
Percentage Hydrologic Soil Group A =	100.0% percent
Percentage Hydrologic Soil Group B =	0.0% percent
Percentage Hydrologic Soil Groups C/D =	0.0% percent
Target WQCV Drain Time =	40.0 hours
Location for 1-hr Rainfall Depths =	Commerce City - Civic Center

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

Water Quality Capture Volume (WQCV) =	0.238	acre-feet
Excess Urban Runoff Volume (EURV) =	0.898	acre-feet
2-yr Runoff Volume (P1 = 0.84 in.) =	0.424	acre-feet
5-yr Runoff Volume (P1 = 1.12 in.) =	0.583	acre-feet
10-yr Runoff Volume (P1 = 1.37 in.) =	0.731	acre-feet
25-yr Runoff Volume (P1 = 1.75 in.) =	0.962	acre-feet
50-yr Runoff Volume (P1 = 2.08 in.) =	1.174	acre-feet
100-yr Runoff Volume (P1 = 2.43 in.) =	1.410	acre-feet
500-yr Runoff Volume (P1 = 3.35 in.) =	2.022	acre-feet
Approximate 2-yr Detention Volume =	0.418	acre-feet
Approximate 5-yr Detention Volume =	0.573	acre-feet
Approximate 10-yr Detention Volume =	0.715	acre-feet
Approximate 25-yr Detention Volume =	0.946	acre-feet
Approximate 50-yr Detention Volume =	1.090	acre-feet
Approximate 100-yr Detention Volume =	1.221	acre-feet

Optional User Overrides

acre-feet	
acre-feet	
inches	
inches	
inches	
inches	
inches	
inches	

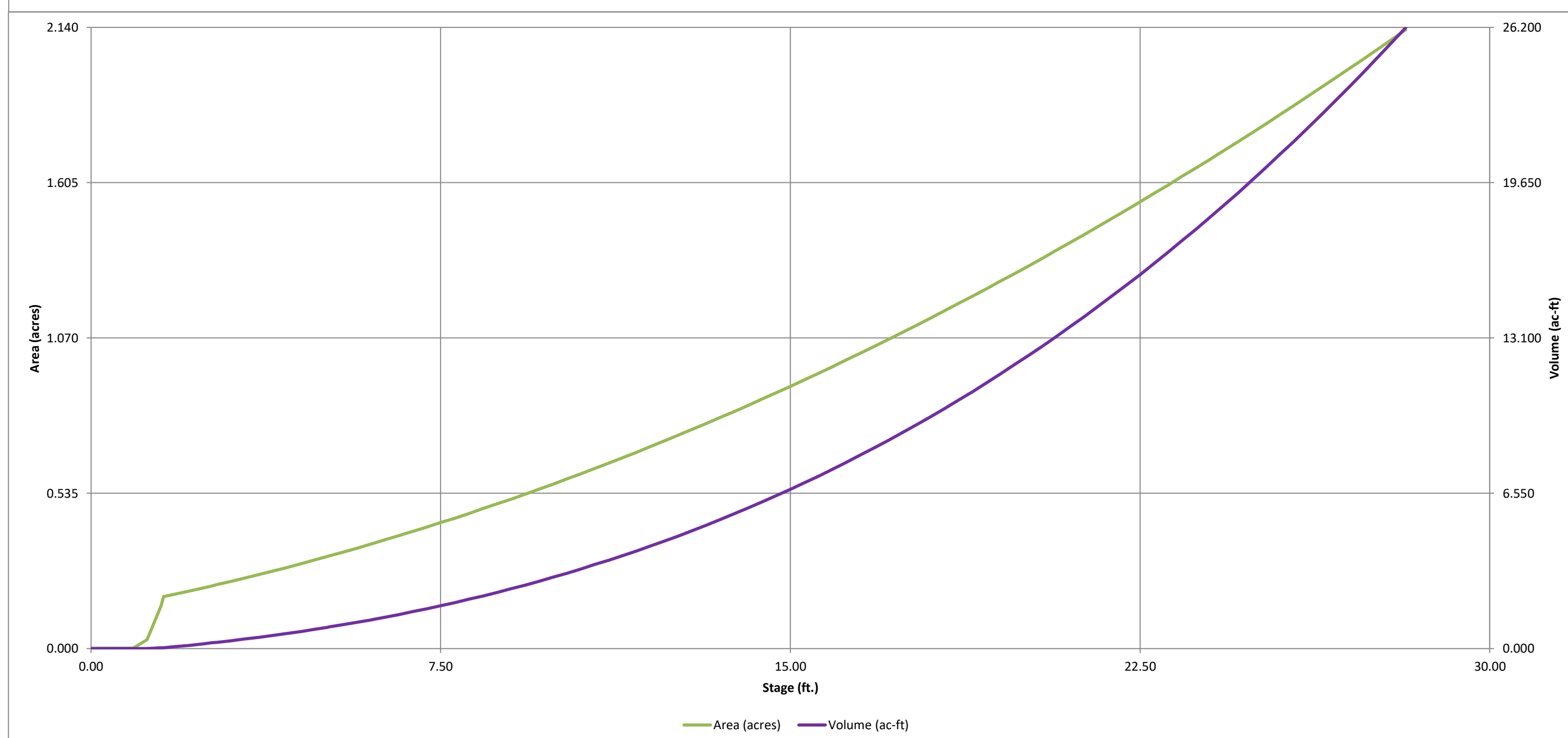
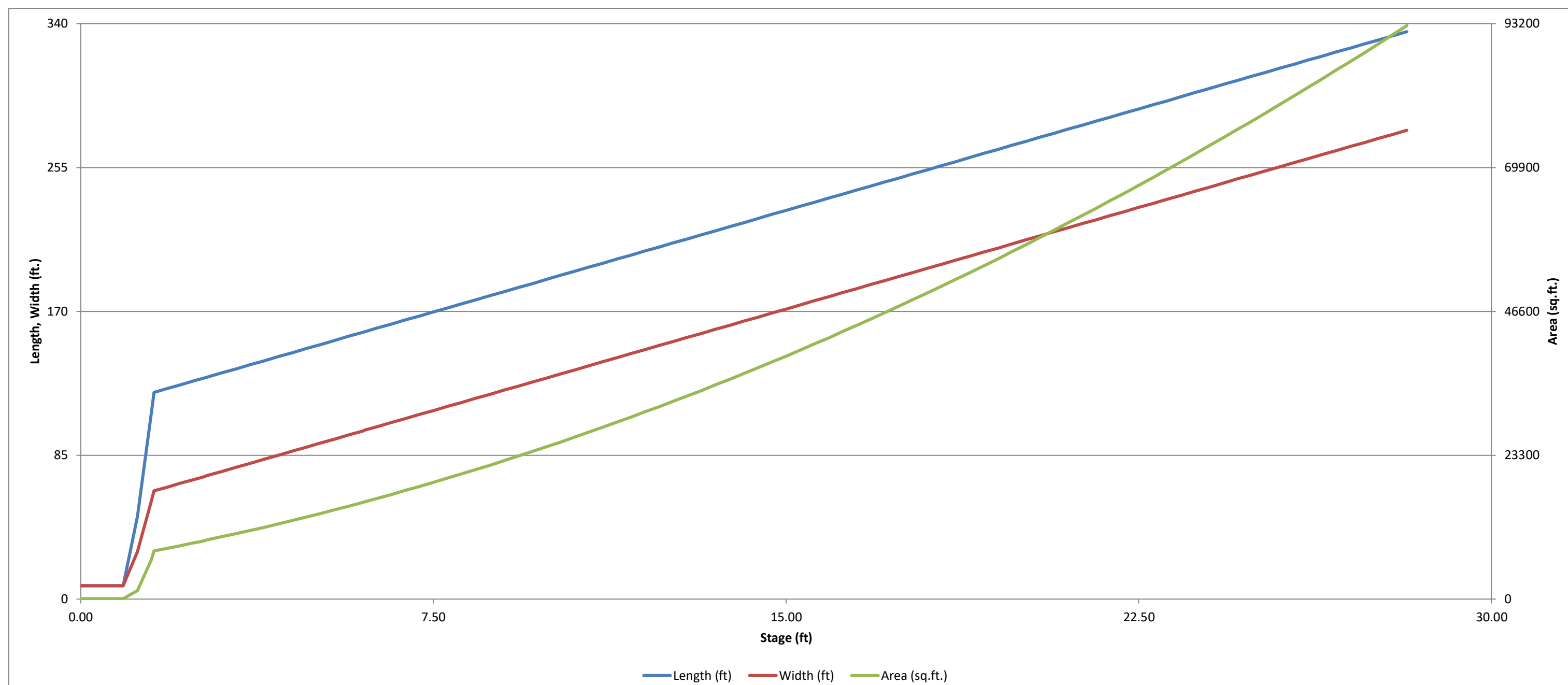
Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.238	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.660	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.322	acre-feet
Total Detention Basin Volume =	1.221	acre-feet
Initial Surcharge Volume (ISV) =	31	ft ³
Initial Surcharge Depth (ISD) =	0.50	ft
Total Available Detention Depth (H _{total}) =	6.00	ft
Depth of Trickle Channel (H _{TC}) =	0.50	ft
Slope of Trickle Channel (S _{TC}) =	0.005	ft/ft
Slopes of Main Basin Sides (S _{main}) =	4	H:V
Basin Length-to-Width Ratio (R _{L/W}) =	2	
Initial Surcharge Area (A _{ISV}) =	62	ft ²
Surcharge Volume Length (L _{ISV}) =	7.9	ft
Surcharge Volume Width (W _{ISV}) =	7.9	ft
Depth of Basin Floor (H _{FLOOR}) =	0.56	ft
Length of Basin Floor (L _{FLOOR}) =	122.1	ft
Width of Basin Floor (W _{FLOOR}) =	63.9	ft
Area of Basin Floor (A _{FLOOR}) =	7,803	ft ²
Volume of Basin Floor (V _{FLOOR}) =	1,598	ft ³
Depth of Main Basin (H _{MAIN}) =	4.44	ft
Length of Main Basin (L _{MAIN}) =	157.7	ft
Width of Main Basin (W _{MAIN}) =	99.4	ft
Area of Main Basin (A _{MAIN}) =	15,673	ft ²
Volume of Main Basin (V _{MAIN}) =	51,112	ft ³
Calculated Total Basin Volume (V _{total}) =	1.211	acre-feet

Depth Increment = 0.30 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		7.9	7.9	62		0.001		
ISV	0.50		7.9	7.9	62		0.001	31	0.001
	0.60		7.9	7.9	62		0.001	37	0.001
	0.90		7.9	7.9	62		0.001	56	0.001
	1.20		48.7	27.9	1,358		0.031	177	0.004
	1.50		109.9	57.9	6,362		0.146	1,243	0.029
Floor	1.56		122.1	63.9	7,803		0.179	1,668	0.038
	1.80		124.1	65.8	8,164		0.187	3,584	0.082
	2.10		126.5	68.2	8,626		0.198	6,102	0.140
	2.40		128.9	70.6	9,099		0.209	8,760	0.201
Zone 1 (WQCV)	2.58		130.3	72.1	9,388		0.216	10,424	0.239
	2.70		131.3	73.0	9,583		0.220	11,562	0.265
	3.00		133.7	75.4	10,079		0.231	14,511	0.333
	3.30		136.1	77.8	10,587		0.243	17,611	0.404
	3.60		138.5	80.2	11,106		0.255	20,864	0.479
	3.90		140.9	82.6	11,636		0.267	24,275	0.557
	4.20		143.3	85.0	12,178		0.280	27,847	0.639
	4.50		145.7	87.4	12,732		0.292	31,584	0.725
	4.80		148.1	89.8	13,297		0.305	35,488	0.815
Zone 2 (EURV)	5.07		150.2	92.0	13,816		0.317	39,148	0.899
	5.10		150.5	92.2	13,874		0.318	39,563	0.908
	5.40		152.9	94.6	14,462		0.332	43,813	1.006
	5.70		155.3	97.0	15,062		0.346	48,241	1.107
	6.00		157.7	99.4	15,673		0.360	52,851	1.213
Zone 3 (100-year)	6.03		157.9	99.7	15,735		0.361	53,322	1.224
	6.30		160.1	101.8	16,295		0.374	57,646	1.323
	6.60		162.5	104.2	16,930		0.389	62,630	1.438
	6.90		164.9	106.6	17,575		0.403	67,805	1.557
	7.20		167.3	109.0	18,233		0.419	73,176	1.680
	7.50		169.7	111.4	18,902		0.434	78,746	1.808
	7.80		172.1	113.8	19,582		0.450	84,518	1.940
	8.10		174.5	116.2	20,274		0.465	90,496	2.078
	8.40		176.9	118.6	20,977		0.482	96,684	2.220
	8.70		179.3	121.0	21,692		0.498	103,084	2.366
	9.00		181.7	123.4	22,418		0.515	109,700	2.518
	9.30		184.1	125.8	23,156		0.532	116,536	2.675
	9.60		186.5	128.2	23,906		0.549	123,595	2.837
	9.90		188.9	130.6	24,667		0.566	130,880	3.005
	10.20		191.3	133.0	25,439		0.584	138,396	3.177
	10.50		193.7	135.4	26,223		0.602	146,145	3.355
	10.80		196.1	137.8	27,019		0.620	154,131	3.538
	11.10		198.5	140.2	27,826		0.639	162,357	3.727
	11.40		200.9	142.6	28,644		0.658	170,828	3.922
	11.70		203.3	145.0	29,474		0.677	179,545	4.122
	12.00		205.7	147.4	30,316		0.696	188,513	4.328
	12.30		208.1	149.8	31,169		0.716	197,736	4.539
	12.60		210.5	152.2	32,034		0.735	207,216	4.757
	12.90		212.9	154.6	32,910		0.756	216,957	4.981
	13.20		215.3	157.0	33,798		0.776	226,963	5.210
	13.50		217.7	159.4	34,697		0.797	237,237	5.446
	13.80		220.1	161.8	35,607		0.817	247,782	5.688
	14.10		222.5	164.2	36,530		0.839	258,602	5.937
	14.40		224.9	166.6	37,463		0.860	269,701	6.191
	14.70		227.3	169.0	38,409		0.882	281,082	6.453
	15.00		229.7	171.4	39,366		0.904	292,747	6.721
	15.30		232.1	173.8	40,334		0.926	304,702	6.995
	15.60		234.5	176.2	41,314		0.948	316,949	7.276
	15.90		236.9	178.6	42,305		0.971	329,491	7.564
	16.20		239.3	181.0	43,308		0.994	342,333	7.859
	16.50		241.7	183.4	44,322		1.018	355,477	8.161
	16.80		244.1	185.8	45,348		1.041	368,928	8.469
	17.10		246.5	188.2	46,386		1.065	382,687	8.785
	17.40		248.9	190.6	47,435		1.089	396,760	9.108
	17.70		251.3	193.0	48,495		1.113	411,149	9.439
	18.00		253.7	195.4	49,567		1.138	425,858	9.776
	18.30		256.1	197.8	50,651		1.163	440,891	10.121
	18.60		258.5	200.2	51,746		1.188	456,250	10.474
	18.90		260.9	202.6	52,852		1.213	471,939	10.834
	19.20		263.3	205.0	53,970		1.239	487,962	11.202
	19.50		265.7	207.4	55,100		1.265	504,323	11.578
	19.80		268.1	209.8	56,241		1.291	521,024	11.961
	20.10		270.5	212.2	57,394		1.318	538,068	12.352
	20.40		272.9	214.6	58,558		1.344	555,461	12.752
	20.70		275.3	217.0	59,733		1.371	573,204	13.159
	21.00		277.7	219.4	60,921		1.399	591,302	13.574
	21.30		280.1	221.8	62,119		1.426	609,758	13.998
	21.60		282.5	224.2	63,330		1.454	628,575	14.430
	21.90		284.9	226.6	64,551		1.482	647,757	14.870
	22.20		287.3	229.0	65,785		1.510	667,307	15.319
	22.50		289.7	231.4	67,029		1.539	687,229	15.777
	22.80		292.1	233.8	68,286		1.568	707,526	16.243
	23.10		294.5	236.2	69,554		1.597	728,201	16.717
	23.40		296.9	238.6	70,833		1.626	749,259	17.200
	23.70		299.3	241.0	72,124		1.656	770,702	17.693
	24.00		301.7	243.4	73,426		1.686	792,535	18.194
	24.30		304.1	245.8	74,740		1.716	814,759	18.704
	24.60		306.5	248.2	76,066		1.746	837,380	19.224
	24.90		308.9	250.6	77,403		1.777	860,400	19.752
	25.20		311.3	253.0	78,751		1.808	883,823	20.290
	25.50		313.7	255.4	80,111		1.839	907,652	20.837
	25.80		316.1	257.8	81,483		1.871	931,890	21.393
	26.10		318.5	260.2	82,866		1.902	956,542	21.959
	26.40		320.9	262.6	84,260		1.934	981,611	22.535
	26.70		323.3	265.0	85,666		1.967	1,007,100	23.120
	27.00		325.7	267.4	87,084		1.999	1,033,012	23.715
	27.30		328.1	269.8	88,513		2.032	1,059,351	24.319
	27.60		330.5	272.2	89,954		2.065	1,086,121	24.934
	27.90		332.9	274.6	91,406		2.098	1,113,324	25.558
	28.20		335.3	277.0	92,869		2.132	1,140,965	26.193

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.03 (May 2020)



APPENDIX C – RELEVANT REPORT EXCERPTS

Relevant Drainage Report Excerpts



**BELLE CREEK FILING NO. 2
PHASE III DRAINAGE REPORT**

Page 3

Hydraulic grade line calculations will be prepared and presented on the storm sewer construction plans.

V. DRAINAGE FACILITY DESIGN

For purposes of this analysis, the site was separated into 33 developed basins. Basins B1, P, Q1, Q2, Q3, R, S, and T were analyzed as basins D1 and C1 in the final drainage report for Filing No. 1.

Sub-basin B1 generates flows that will exceed the street capacity, therefore, storm sewer is proposed to start at the upper end of the B1 and B2 basins.

The storm sewer is routed through basins E1 through L2 and inlets are sized and located to reduce gutter flows to below the allowable street capacity.

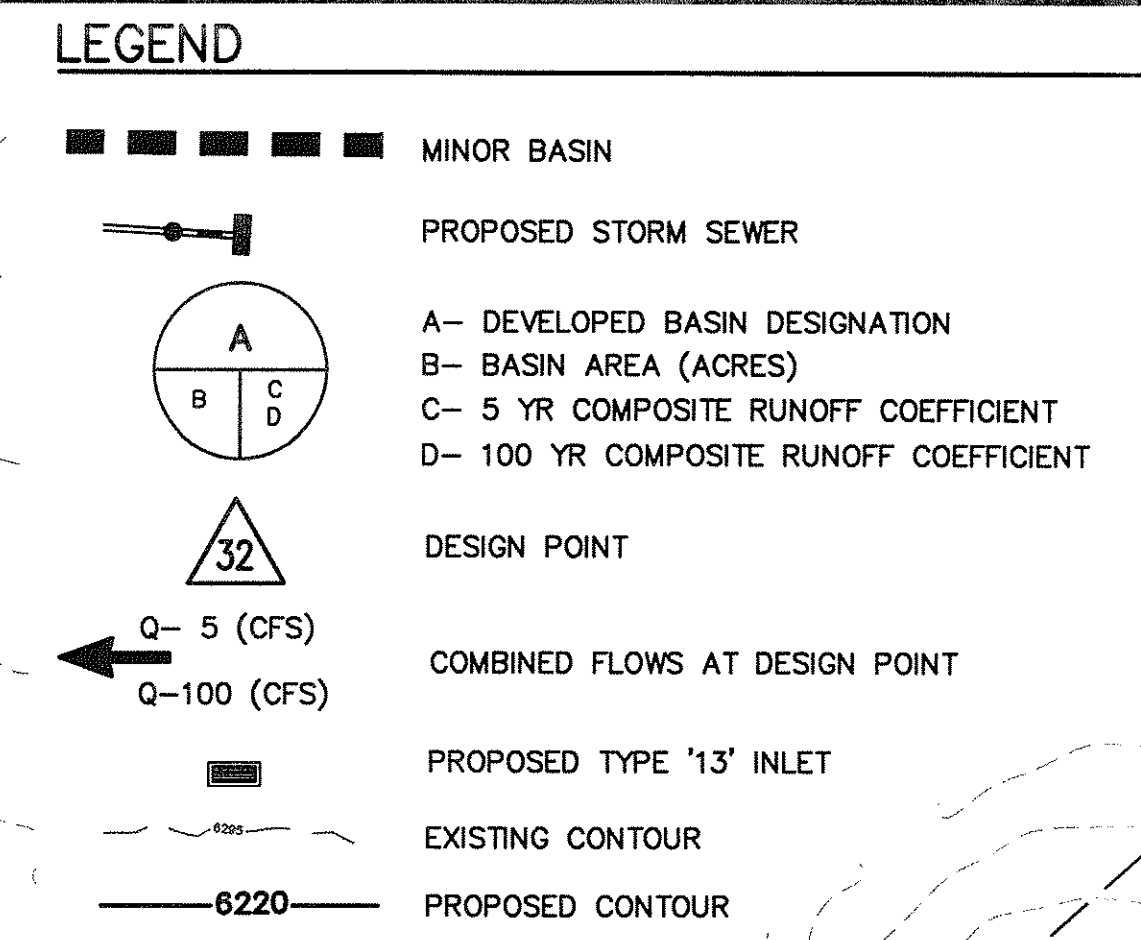
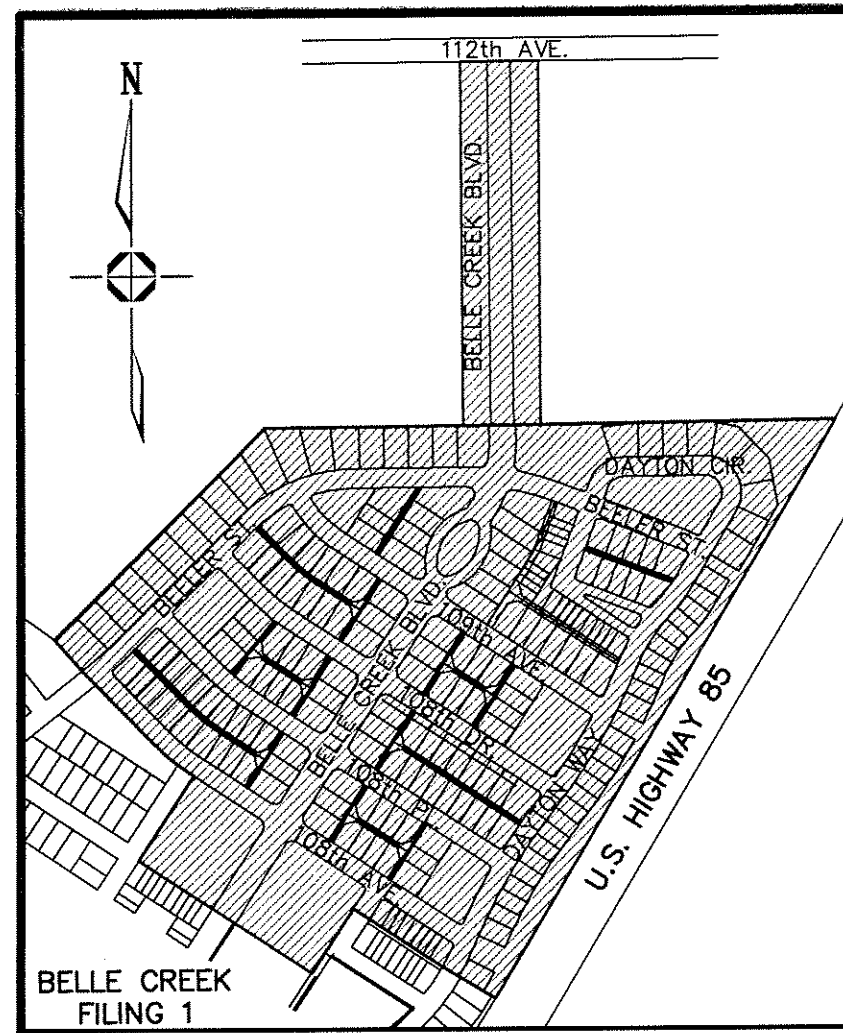
Sub-basins U1, U2, U3, O1, O2, N2, and H1 are tributary to Belle Creek Boulevard. Street capacities in Belle Creek Boulevard are reached at design point 21 on the east and design point 24 on the west. Storm sewer for Belle Creek Boulevard discharges into the proposed detention pond.

Sub-basins T and Q1 will be served by the Beeler Street storm sewer proposed in Filing No. 1. The storm sewer must be extended approximately one block into Filing No. 2 to reduce street flows to below gutter capacities.

The detention pond has been designed based on the empirical formula and tributary area. Both Tracts D and E will be utilized for the detention pond.

The pond outlets to a proposed storm channel and piping network that will be constructed on the properties west of Filing No. 2 and Filing No. 1 (Tanabe Gravel Pits). The storm drainage has been designed to convey the 100-year flows from Filing No. 2 and from upgradient sources (Reisbeck Subdivision and east of Highway 85). This basin is designated as Sub-basin OS1.

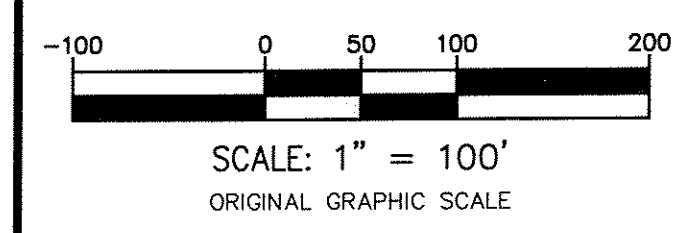
Based on the First Creek watershed boundary as shown in the *Lower First Creek and DFA 0055 Outfall Systems Planning Alternatives Report*



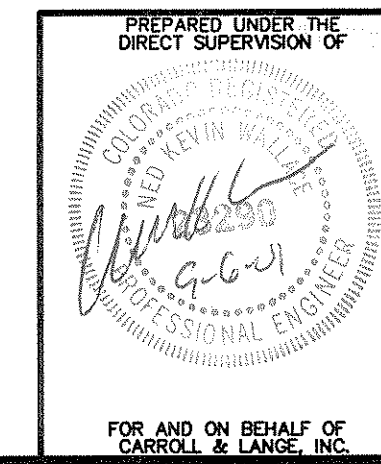
DRAINAGE DATA SUMMARY RUNOFF TABLE

BASIN	AREAS ACRES	Q 5-YR (CFS)	Q 100-YR (CFS)	BASIN	AREAS ACRES	Q 5-YR (CFS)	Q 100-YR (CFS)
A	1.53	2.3	6.0	N1	1.37	2.5	6.1
B1	2.52	6.9	15.5	N2	1.17	2.4	5.5
B2	1.30	3.5	7.8	O1	0.59	1.4	3.1
C	2.57	5.3	14.2	O2	1.11	2.5	5.6
D	2.60	3.6	10.0	P	1.95	3.8	9.1
E1	1.00	1.5	4.0	Q1	0.85	2.5	5.5
E2	0.85	1.6	4.0	Q2	2.18	4.2	9.5
F1	1.35	2.6	6.1	Q3	1.58	3.2	7.5
F2	0.36	0.9	2.0	R	1.61	3.0	7.3
G1	0.68	1.0	2.8	S	0.95	1.9	4.3
G2	1.02	1.4	4.0	T	2.31	6.1	13.6
H1	2.13	3.8	9.0	U1	1.46	3.6	8.3
H2	1.68	3.0	7.1	U2	1.17	6.4	14.1
I	1.59	3.0	6.9	U3	1.37	9.1	19.9
J	0.73	0.4	2.4	V1	42.0	12.6	42.0
K	0.49	2.1	4.1				
L1	1.64	1.8	6.1				
L2	0.28	1.2	2.3				
M	1.60	2.7	6.7				

we believe this is intended to be noted as OS1

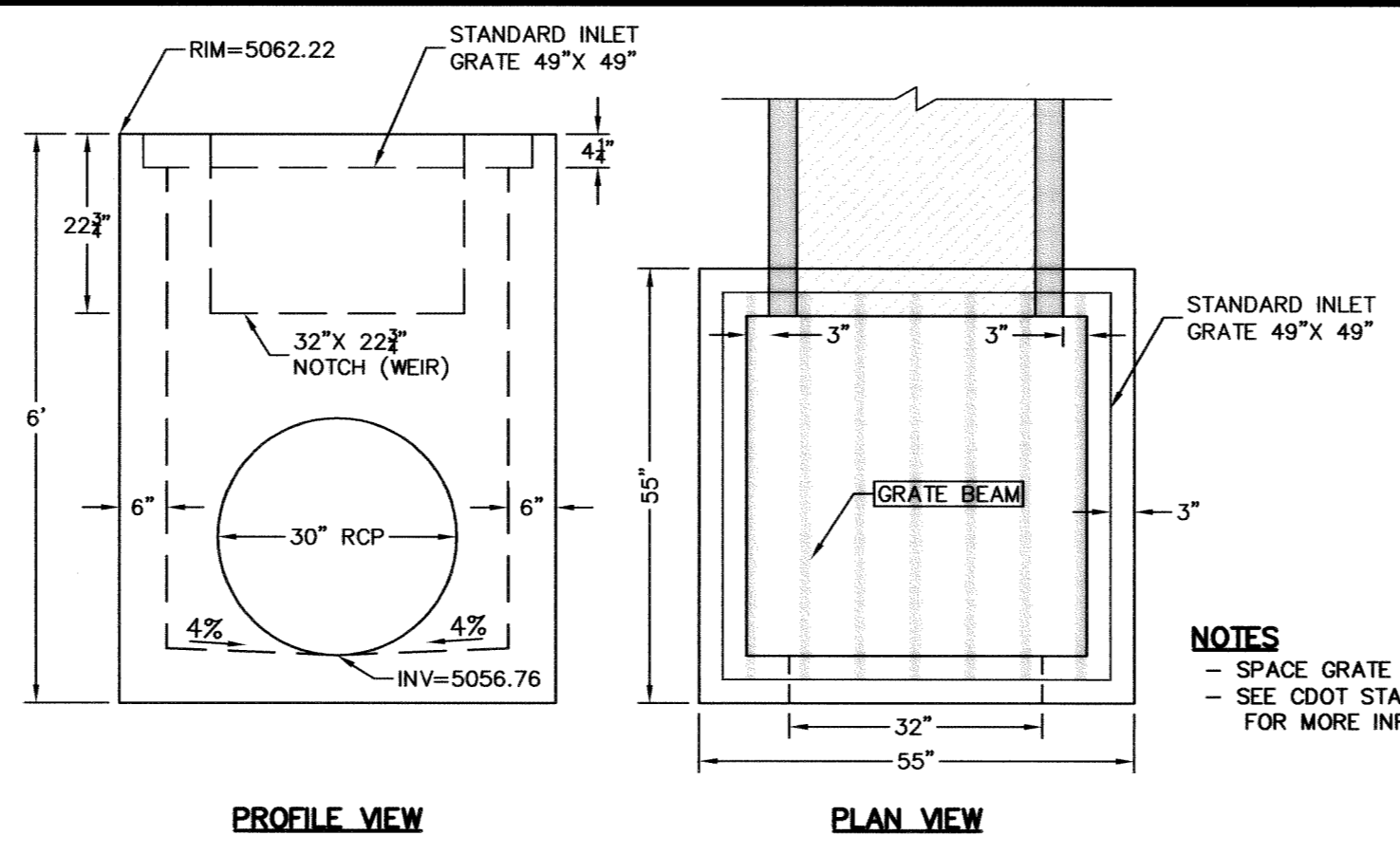
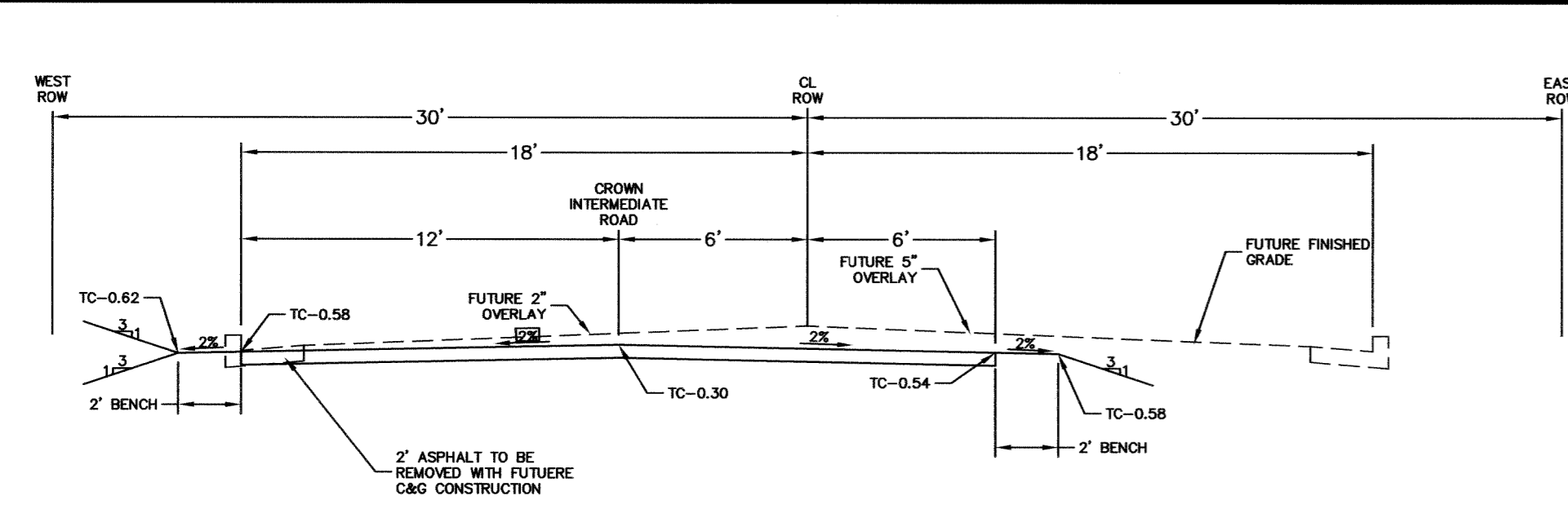


City of Commerce City Engineering
APPROVED
 OCT 31 2001
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 PRINTED
 SEP 06 2001



PREPARED UNDER THE DIRECT SUPERVISION OF <i>William G. Lange</i> PROFESSIONAL ENGINEER		Carroll & Lange Professional Engineers & Land Surveyors 165 South Union Blvd., Suite 156 Lakewood, Colorado 80226 (303) 980-0200	
Project: BELLE CREEK FILING No. 2			
Title: FINAL DRAINAGE PLAN			
3	REV. PER CITY COMMENTS	7-20-01	DRV
2	REV. PER CITY COMMENTS	6-18-01	DRV
1	DRAINAGE BASIN REVISIONS	2-06-01	DRV
No.	Revisions	Date	By Chk
Checked By:	Date: AUGUST 2000	File No. 2338DR01	Sheet 1 of 1 Job No. 2338

2338DRAINAGE2338R01.dwg, 09/05/01, 06:09:51 PM, E3-11, E3-HP/USDC.dwg, CARROLL & LANGE, INC.



FLOWLINE CURVE TABLE			
CURVE	RADIUS	DELTA	LENGTH
C64	30.00	82°45'01"	43.33
C65	30.00	89°08'17"	46.15
C78	30.00	90°03'07"	47.15
C79	30.00	89°46'17"	47.00

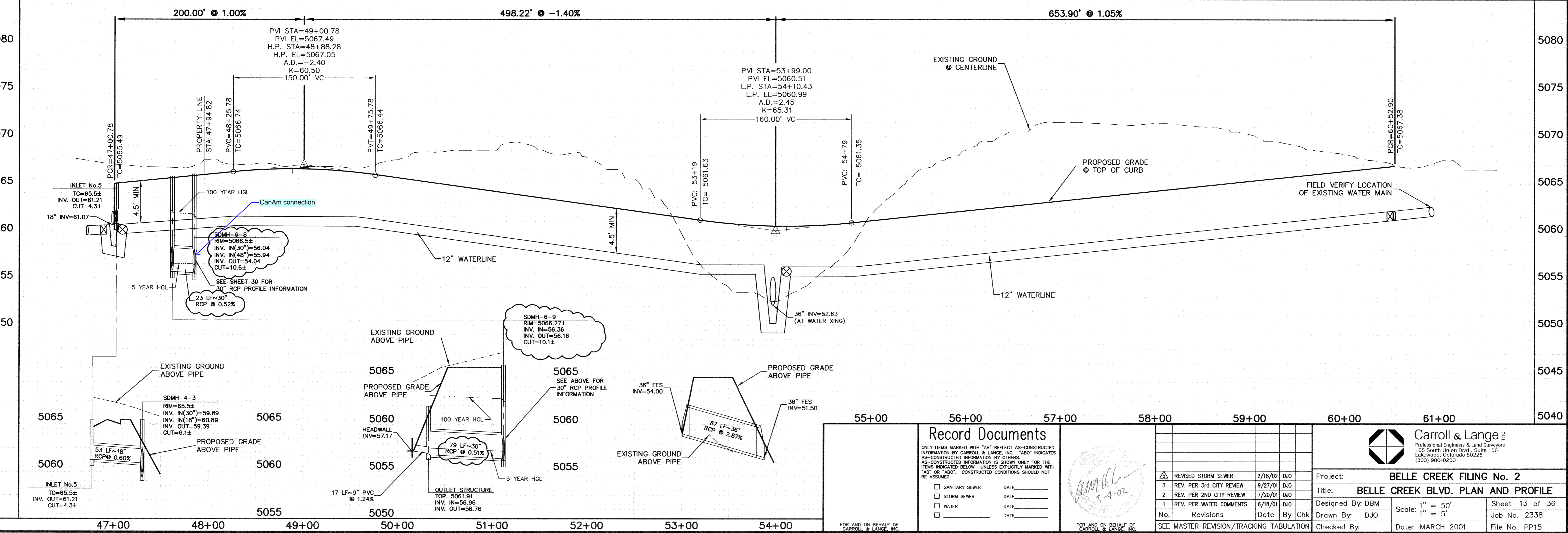
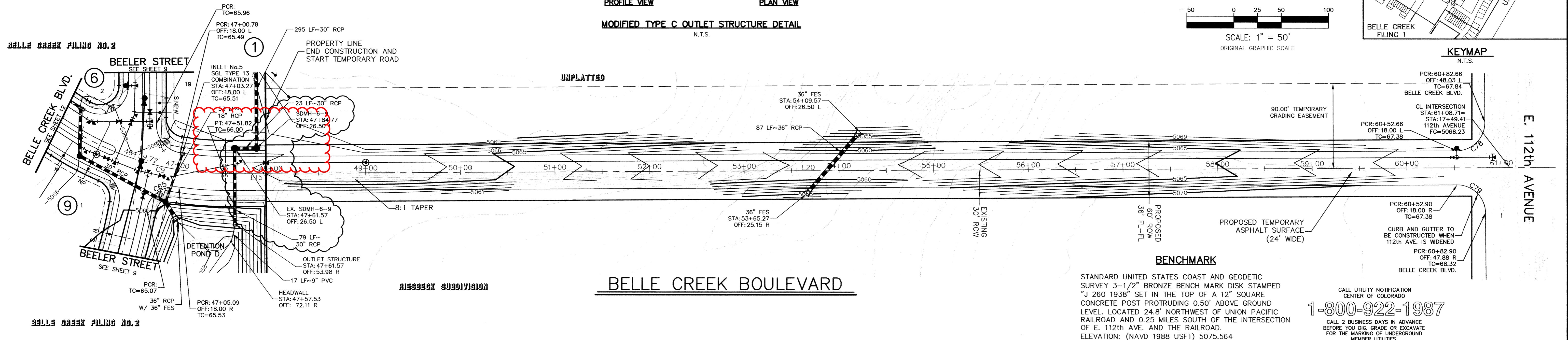
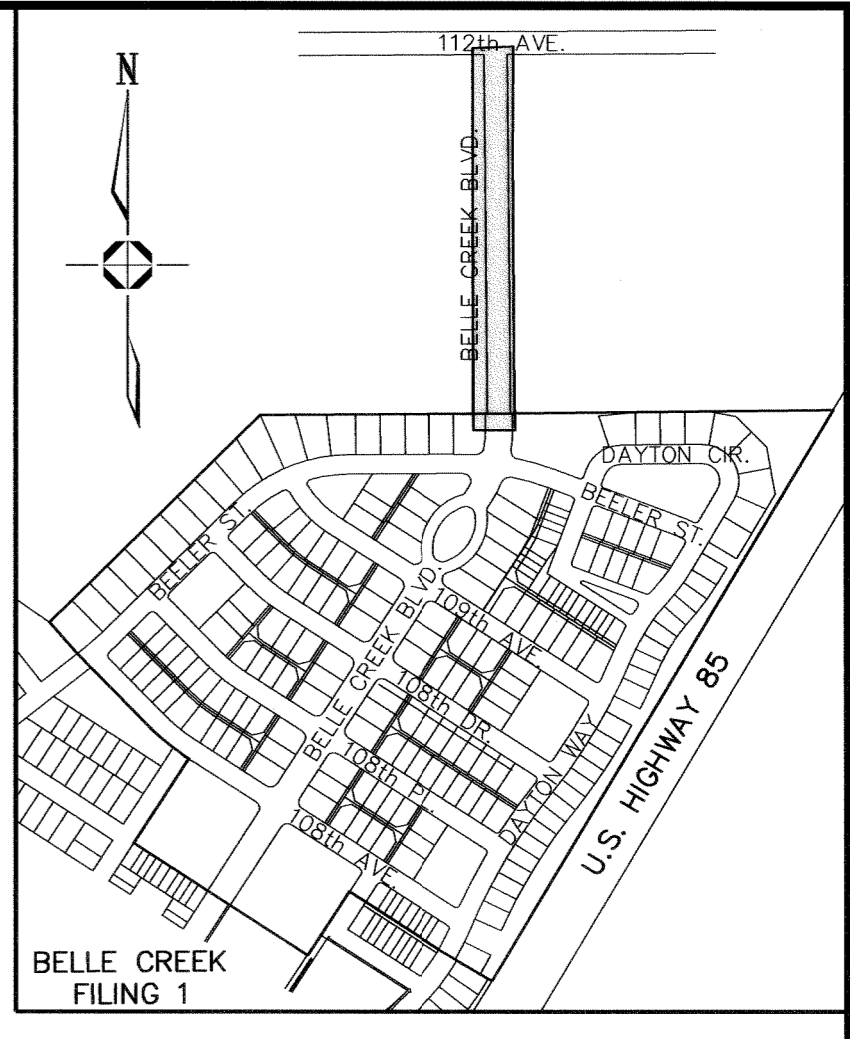
CENTERLINE CURVE TABLE			
CURVE	RADIUS	DELTA	LENGTH
C9	302.00	33°08'28"	174.68

CENTERLINE LINE TABLE		
LINE	BEARING	DISTANCE
L15	S00°18'39"E	43.00
L20	N00°18'39"W	1527.45

NOTES:

- ALL STATIONING IS ON CENTERLINE UNLESS OTHERWISE NOTED.
- SEE SHEET 28-30 FOR CHANNEL PLAN AND PROFILE.
- "TC" INDICATES TOP OF CURB FOR 6" VERTICAL CURB AND GUTTER.
- SEE STREET & STORM DETAIL SHEETS.
- PHASE 1 CURB AND GUTTER CONSTRUCTION ENDS AT STA: 47+94.82 (PROPERTY LINE).

SCALE: 1" = 50'
ORIGINAL GRAPHIC SCALE

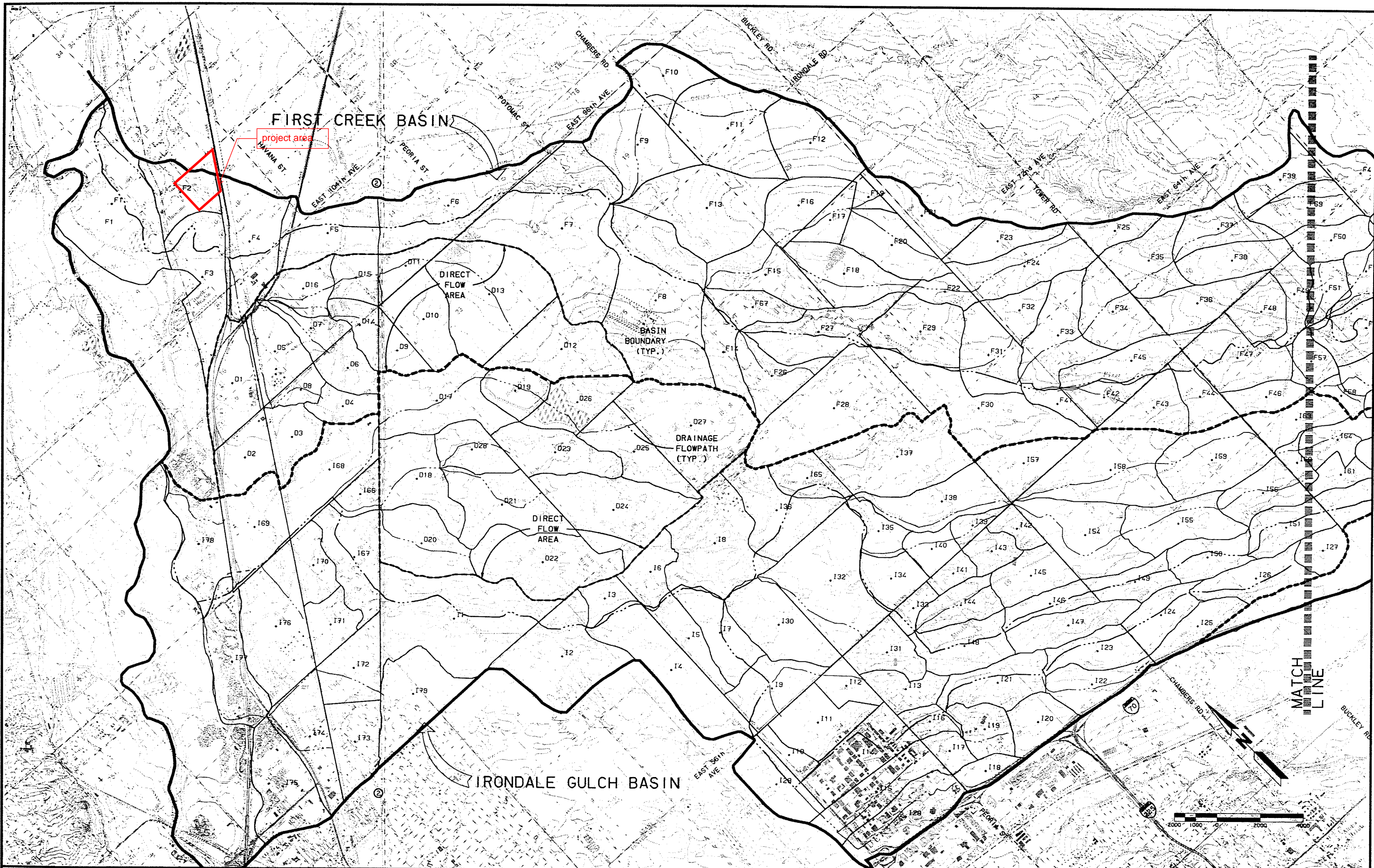


Record Documents			
<input type="checkbox"/>	SANITARY SEWER	DATE	
<input type="checkbox"/>	STORM SEWER	DATE	
<input type="checkbox"/>	WATER	DATE	
<input type="checkbox"/>		DATE	

No.	Revisions	Date	By	Chk
3	REV. PER 3rd CITY REVIEW	2/18/02	DJO	
2	REV. PER 2ND CITY REVIEW	9/27/01	DJO	
1	REV. PER WATER COMMENTS	7/20/01	DJO	
1	REV. PER WATER COMMENTS	6/18/01	DJO	

Project:	BELLE CREEK BLVD. FILING No. 2		
Title:	BELLE CREEK BLVD. PLAN AND PROFILE		
Designed By:	DBM	Scale:	1" = 50'
Drawn By:	DJO	Sheet:	13 of 36
Checked By:		Date:	MARCH 2001
		File No.:	PP15

P:\2338\CONSTRUCTION\Belle Creek Extension.dwg, 03/04/02 10:16:54 AM, Carroll & Lange, Inc.



BASE MAPS - U.S.G.S. QUADRANGLE SHEETS:
 BOX ELDER SCHOOL, BRIGHTON,
 COAL CREEK, COMMERCE CITY, EASTLAKE,
 FITZSIMONS, SABLE, WATKINS

WRIGHT WATER ENGINEERS, INC.
 2490 WEST 26th AVE. - SUITE 100A
 DENVER, COLORADO 80211
 (303) 480-1700

DESIGNED W.P.D.A. DATE 11/88
 DRAWN M.V.N. DATE 12/88
 CHECKED D.P.R. DATE 1/89
 REVISED _____ DATE _____

URBAN DRAINAGE AND FLOOD CONTROL DISTRICT
 ADAMS COUNTY, CITY AND COUNTY OF DENVER,
 CITIES OF AURORA, BRIGHTON, AND COMMERCE CITY

OUTFALL SYSTEMS PLANNING
 FIRST CREEK, IRONDALE GULCH,
 AND DFA 0055

SUB-BASIN MAP

SHEET
3A OF 15