

FINAL DRAINAGE REPORT

FOR

REUNION CENTER FILING NO. 1, AMENDMENT NO. 2
CITY OF COMMERCE CITY, COLORADO

Prepared for:

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July 26, 2024

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Engineer's Statement:

I hereby certify that this final study for Reunion Center Filing No. 1, Amendment No. 2 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. I understand that the City of Commerce City does not, and will not, assume liability for drainage facilities designed by others.

Justin Simpson, P.E.
Registered Professional Engineer
State of Colorado No. 54251

I. GENERAL LOCATION AND DESCRIPTION

A. Location

Reunion Center Filing No. 1, Amendment No. 2 is in the SE 1/4 Of Section 09, Township 2 South, Range 66 West of the Sixth Principal Meridian, City of Commerce, County of Adams, State of Colorado. The project is a separate filing within the Reunion Village 1 overall development. The site is at the southwest corner of the intersection of Tower Road and Homestead Trail. The Site is bounded by Homestead Trail to the north, existing Reunion Center Filing No. 1, Amendment No. 1 to the east, Walden Street to the west, and E 105th Avenue to the south. Reunion Center Filing No. 1 Amendment No. 1 is currently in the design phase by the same developer and is anticipated to be constructed prior to Amendment No. 2. North of Homestead Trail is "The STEAD School" and an undeveloped parcel of Reunion Ridge Filing No. 1, to the south of East 105th Avenue is future commercial development site for in Reunion Ridge Filing No. 1, West of Walden Street is developed single family homes located within Reunion Ridge Filing 30. For additional information see Reunion Ridge – Duet and commercial Construction documents completed by JR Engineering. A vicinity map is included in Appendix A.

The site is located within the Third Creek Major Drainage Basin that is tributary to the South Platte River. The proposed storm system will connect to the existing storm infrastructure that surrounds the site that will be expanded by others. An existing detention and water quality pond, located within the southeastern portion of Amendment 1 that will be constructed by others prior to the development of Amendment 1 will receive developed flows from the site. Design for this pond (Pond 108a) is found in the *Final Drainage Report for Reunion Center – Duet & Commercial Phase* (Master Report) completed on November 30, 2023. Coordination with the engineers tasked with the design of the surrounding infrastructure is necessary to ensure the facilities are properly sized and connected.

B. Description of Property

The site is approximately +/- 7 acres, with slopes ranging from two to 25 percent, and is currently undeveloped.

According to information from the United States Department of Agriculture's (USDA) Natural Resource Conservation Service (NRCS), soils on-site are Ascalon-Vona sandy loam and Ascalon sandy loam (annotated AvC and AsB, respectively). These soils are further classified as belonging to Hydrologic Soil Groups (HSG) B. Group B soils have moderate infiltration rates when thoroughly wetted and consist chiefly of moderately deep to deep, moderately well to well drained soils with moderately fine to moderately coarse textures. Soils maps are included in Appendix A.

The site lies within Zone X (areas determined to be outside the 0.2% annual chance floodplain) on Flood Insurance Rate Map (FIRM) 08001C0344H, revised March 5, 2007, published by the Federal Emergency Management Agency (FEMA). There are no major drainageways within the site; however, an existing detention pond exists along the south property boundary that will be replaced by the Reunion Center Village 1 infrastructure construction by others. A floodplain map is included in Appendix A.

Existing ground cover consists of 100 percent tillage. Vegetation in the developed condition will include be short lawns, ornamental trees, and shrubs wherever buildings and hardscape are not proposed. A detention pond exists on-site along the south property boundary. This pond will be removed during construction; however, multiple other ponds will be built (by others) south of the site and within Filing 1 Amendment 1 that will store and treat developed runoff from the site.

An 8' Utility Easement (Rec. No. 2020000123227) is located along the North, West, and South along Homestead Trail, Walden St, and E 105th Ave respectively. A drainage Easement with a Rec. NO. 2020000123227 is in the Southwest corner of the site. On the East side of the site a 10' Utility Easement (Rec. No. 2020000123227) exists next to a 10' United Power Utility Easement (Rec No. 20050722000778740). Another 10' United Power Utility Easement (Rec. No. 20040630000553010) runs along the East side of the site on the South side until it breaks away and runs Northeast toward Tower Rd.

Proposed site improvements include 106 residential units, configured so that two units share a common wall, and associated roadway and utility infrastructure.

The Master Report has been conducted by JR Engineering and was approved by Commerce City on June 2, 2020. This report includes references and is consistent with previously done outfall studies including the *Third Creek and Barr Lake Drainage Outfall Planning Study* by Kiowa Engineering Corporation, dated July 1990, and the *Third Creek (Downstream of DIA) Outfall Systems Planning Study Update*, by Kiowa Engineering Corporation, dated September 2005. The Master Report also states it complies with the FHAD completed by Matrix Design Group in November of 2018.

The *Final Drainage Report for Reunion Center – Duets & Commercial Phase*, dated November 30, 2023 by JR Engineering, includes existing stormwater infrastructure calculations and calculations for the drainage facilities proposed with both Amendment No. 1 and Amendment No. 2 since both have the same Owner, have been designed together, and will be constructed at approximately the same time. The facilities associated with the separate amendments have been labeled as such throughout the report and Drainage Maps.

II. DRAINAGE BASINS AND SUB-BASINS

A. Major Basin Description

The site is located within the Third Creek Major Drainage Basin that is tributary to the South Platte River.

There are no regulatory floodplains within the site. There are no nearby irrigation facilities, to our knowledge, that will influence or be influenced by the local drainage.

B. Sub-Basin Description

Developed runoff from the site will surface drain to proposed storm infrastructure and will drain to existing detention and water quality pond (by others) within Filing 1 Amendment 1. No off-site flows will enter the site. Proposed hydrologic

calculations are included in Appendix A and a Proposed Drainage Map is included in the Back Pocket of this report.

Proposed sub-basin descriptions:

A5.1

Consists of lot area, roadway area, concrete walks, and landscape area. Runoff flows overland into the proposed roadway, where it is conveyed to a proposed Type R on-grade inlet at DP A5.1. The proposed storm sewer conveys flows to the south and outfalls into the detention pond (by others). Any flows bypassing the on-grade inlet will be conveyed south and east via curb and gutter to the proposed inlet at DP A2.2.

A6.1

Consists of lot area, roadway area, concrete walks, and landscape area. Runoff flows overland into the proposed roadway, where it is conveyed to a proposed Type R sump inlet at DP A6.1. The proposed storm sewer conveys flows to the east and connects to proposed storm sewer in Amendment 1. In the case of inlet clogging, emergency overflow from the sump inlet will overtop the curb and drain off-site to the north and west to the inlet at DP D1.

C1.1

Consists of lot area, roadway area, concrete walks, and landscape area. Runoff flows overland into the proposed roadway, where it is conveyed to a proposed Type R sump inlet at DP C1.1. The proposed storm sewer conveys flows to the south and outfalls into the detention pond (by others). In the case of inlet clogging, emergency overflow from the sump inlet will overtop the curb and drain off-site to the south and west to the inlet at DP D4.

C2.1

Consists of lot area, roadway area, concrete walks, and landscape area. Runoff flows overland into the proposed roadway, where it is conveyed to a proposed Type R sump inlet at DP C2.1. The proposed storm sewer conveys flows to the south and outfalls into the detention pond (by others). In the case of inlet clogging, emergency overflow from the sump inlet will overtop the curb and drain off-site to the south and east to the inlet at DP DA4.1.

D1

Consists of lot area, roadway area, concrete walks, and landscape area. Runoff flows overland off-site into the existing roadway, where it is conveyed to an existing Type R sump inlet at DP D1.

D4

Consists of lot area, roadway area, concrete walks, and landscape area. Runoff flows overland off-site into the existing roadway, where it is conveyed to an existing Type R sump inlet at DP D4.

D5

Consists of lot area, roadway area, concrete walks, and landscape area. Runoff flows overland off-site into the existing roadway, where it is conveyed to an existing Type R sump inlet at DP D1.

D1.1

Consists of lot area and roadway area. Runoff flows overland into the proposed roadway, where it is conveyed to a proposed Type 13 valley sump inlet at DP D1.1. The proposed storm sewer conveys flows to the south and outfalls into the detention pond (by others). In the case of inlet clogging, emergency overflow from the sump inlet will overtop the road crown and drain to the inlet at DP D1.2.

D1.2

Consists of lot area, roadway area, concrete walks, and landscape area. Runoff flows overland into the proposed roadway, where it is conveyed to a proposed Type R sump inlet at DP A1.2. The proposed storm sewer conveys flows to the south and outfalls into the detention pond (by others). In the case of inlet clogging, emergency overflow from the sump inlet will overtop the road crown and drain to the inlet at DP D1.1.

III. DRAINAGE DESIGN CRITERIA

A. Regulations

This Drainage Addendum is in accordance with the guidelines set forth by the Commerce City Drainage Manual and the Mile High Flood District (MHFD) Urban Storm Drainage Criteria Manual (USDCM). These manuals were used as a basis of design for the site.

B. Development Criteria Reference and Constraints

This report conforms to the *Amendment #2 to Preliminary Drainage Report for Reunion Center - Village 1* (Master Report), dated November 6, 2023, by JR Engineering and The *Final Drainage Report For Reunion Center – Duets & Commercial Phase*, dated November 30, 2023 by JR Engineering. These reports detail the drainage plan for the overall Reunion Center development. Excerpts from the Master Report are included in Appendix C.

Filing No. 1, Amendment No. 2 site and the adjacent Amendment No. 1 site as included in sub-basin B8 that drains to Pond 108a. The design for the receiving pond infrastructure accounts for all sub-basins at an imperviousness of approximately 72 percent (*Final Drainage Report For Reunion Center To Serve Reunion Duets District Infrastructure*). The combined imperviousness for the proposed Filing No. 1, Amendments No. 1 and 2 sites is approximately 66.3 percent; therefore, the site is in conformance with the above referenced report and will not adversely impact the downstream infrastructure.

The design of the proposed storm system was constrained by the need to connect to the relatively shallow existing storm infrastructure at the upstream end. Site grading was constrained by the lack of available fill material on-site. These two factors contributed to the challenge of maintaining adequate cover over the proposed storm pipes.

C. Hydrological Criteria

On-site hydrologic calculations were performed using a proprietary rational method workbook, developed by CORE in Microsoft Excel, to estimate peak overland runoff flows resulting from the minor (5-year) and major (100-year) storm events and hydrologic soil group B on the site. The workbook utilizes rainfall data provided the Master Report. Hydrologic soil group information are included in Appendix A.

D. Hydraulic Criteria

Streets within the proposed development have been classified as local roads and include 4.5-inch mountable curb and six-inch vertical curb. This traffic classification corresponds to drainage classification Type A, per the City Criteria. Street and Inlet capacities were determined using the MHFD workbook, UD-Inlet_v4.060xslm, with values based on the Type A drainage classification and curb type. Hydraulic analysis and stormwater routing of the proposed storm sewer was completed using StormCAD v10.03.01.08 software by Bentley, with junction losses modeled per Table 2 of the supplemental MHFD publication, *Modeling Hydraulic and Energy Gradients in Storm Sewers*, dated October 6, 2009 by AMEC. Hydraulic calculations are included in Appendix B.

E. Stormwater Quality

Runoff from the site is directed via proposed storm sewer to detention pond 108a located in the southeastern portion of Filing 1 Amendment 1. Flows will then travel via existing storm sewer in Tower Road to the existing water quality pond 105 located to the east of Tower Road. These ponds have been designed by others to provide water quality treatment and flood attenuation for the developed site; therefore, meeting MS4 requirements. The *Final Drainage Report For Reunion Center – Duet & Commercial Phase*, dated November 30, 2023 by JR Engineering and Amendment #2 to Preliminary Drainage Report for Reunion Center – Village 1, dated November 6, 2023 by JR Engineering contains calculations for the existing storm sewer infrastructure and pond design (See Appendix C).

IV. DRAINAGE FACILITY DESIGN

A. General Concept

Runoff from the proposed residential development generally surface drains into the proposed Type A roadway curb and gutter. These flows are captured by proposed storm sewer inlets and conveyed south to the existing detention and water quality pond that is located in Filing 1 Amendment 1.

B. Specific Details

The proposed storm sewer system will connect to the existing storm infrastructure of the overall Reunion Center - Village 1 development at the upstream end to the north and the downstream end will outfall into the existing detention pond. Developed runoff from the site will be detained and treated for water quality by ponds that are a part of the existing infrastructure (by others). The existing and proposed storm sewer infrastructure will be owned and maintained by the City.

V. CONCLUSIONS

A. Compliance with Standards

This report and associated calculations comply with the City of Commerce City "Storm Drainage Design and Technical Criteria Manual," the Mile High Flood District's "Urban Storm Drainage Criteria Manual," the "Amendment #2 to Preliminary Drainage Report for Reunion Center - Village 1" by JR Engineering, and the "Final Drainage Report for Reunion Center – Duet & Commercial Phase" by JR Engineering.

The project meets the requirements set forth within Chapter 14 of the City of Commerce City Storm Drainage Criteria Manual as it incorporates numerous methods to disconnect impervious areas. Methods include, but are not limited to, detached sidewalk within public ROW to provide water quality treatment of runoff prior to stormwater flows entering the public ROW, roof drains discharged to grass lined swales between the homes to reduce pollutants and provide additional imperviousness for stormwater runoff, offset and disconnected alleyways within the residential blocks, and storm water will discharge into a water quality pond adjacent to the site to provide additional stormwater treatment measures. The existing storm sewer and pond design is included in the *Final Drainage Report For Reunion Center – Duets & Commercial*, dated November 30, 2023 by JR Engineering.

The project meets the Municipal Separate Storm Sewer System (MS4) Permit design standards for the construction phase by as it incorporates numerous methods to minimize directly connected impervious areas (MDCIA) and reducing impervious areas and implementing the above structural and non-structural stormwater control measures.

B. Drainage Concept

The drainage plan for the overall Reunion Center - Village 1 development is set forth by the Master Report, which designates the maximum allowable imperviousness for this Filing No. 1, Amendment No. 2 site. Developed runoff from the site will be captured by the proposed storm sewer system that will connect to existing storm sewer infrastructure and be conveyed to Existing Detention and Water Quality Ponds (by others), per the Master Report. The imperviousness of the site is less than the maximum allowable set forth by the Master Report; therefore, flows will not adversely impact the downstream infrastructure.

VI. REFERENCES

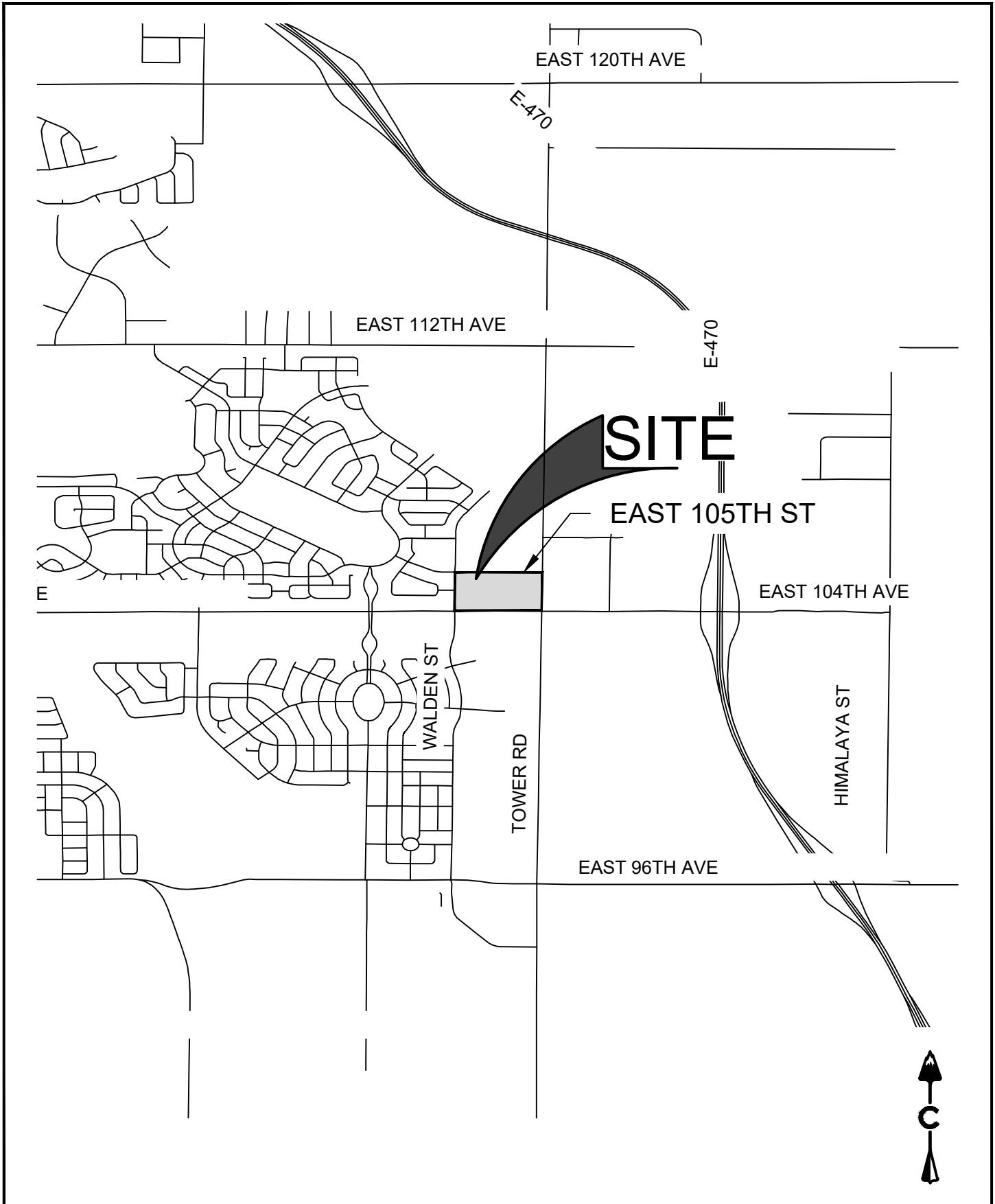
- A. Storm Drainage and Technical Criteria Manual; City of Commerce City Department of Public Works, February 2023.
- B. Urban Storm Drainage Criteria Manual (Volumes 1, 2, and 3); Urban Drainage and Flood Control District, January 2016 and latest revisions.
- C. Modeling Hydraulic and Energy Gradients in Storm Sewers; AMEC Earth & Environmental, Inc., October 6, 2009.
- D. Web Soil Survey, Soil Survey Staff (Natural Resources Conservation Service), United States Department of Agriculture. Available online at the following link: <https://websoilsurvey.sc.egov.usda.gov/>. Accessed April 5, 2021.
- E. Flood Insurance Rate Map (FIRM) No. 08001C0339H, Federal Emergency Management Agency, Revised March 16, 2016. Available online at the following link: <https://msc.fema.gov/portal/home>. Accessed April 5, 2021.
- F. Final Drainage Report for Reunion Center – Duet & Commercial Phase; JR Engineering, November 30, 2023
- G. Third Creek and Barr Lake Drainage Outfall Planning Study; Kiowa Engineering Corporation, July 1990.
- H. Third Creek (Downstream of DIA) Outfall Systems Planning Study Update; Kiowa Engineering Corporation, September 2005.
- I. Amendment #2 to Preliminary Drainage Report for Reunion Center – Village 1; JR Engineering, November 6, 2023

Computer Modeling Programs:

- A. StormCAD by Bentley Systems, Inc., Version 10.03.01.08.
- B. Inlet Management Version 5.02. MHFD. August 2022

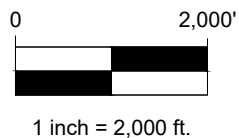
APPENDIX A

HYDROLOGIC COMPUTATIONS



3102023.9.51 AAL X18.004 REUNION CENTER CIVIL CAD/DMB/T9/FILING 1 - AMENDMENT 1/2023/03-10 - VICINITY MAP/REUNION CENTER VICINITY MAP - P22DWG.

CORE
CORE CONSULTANTS, INC.
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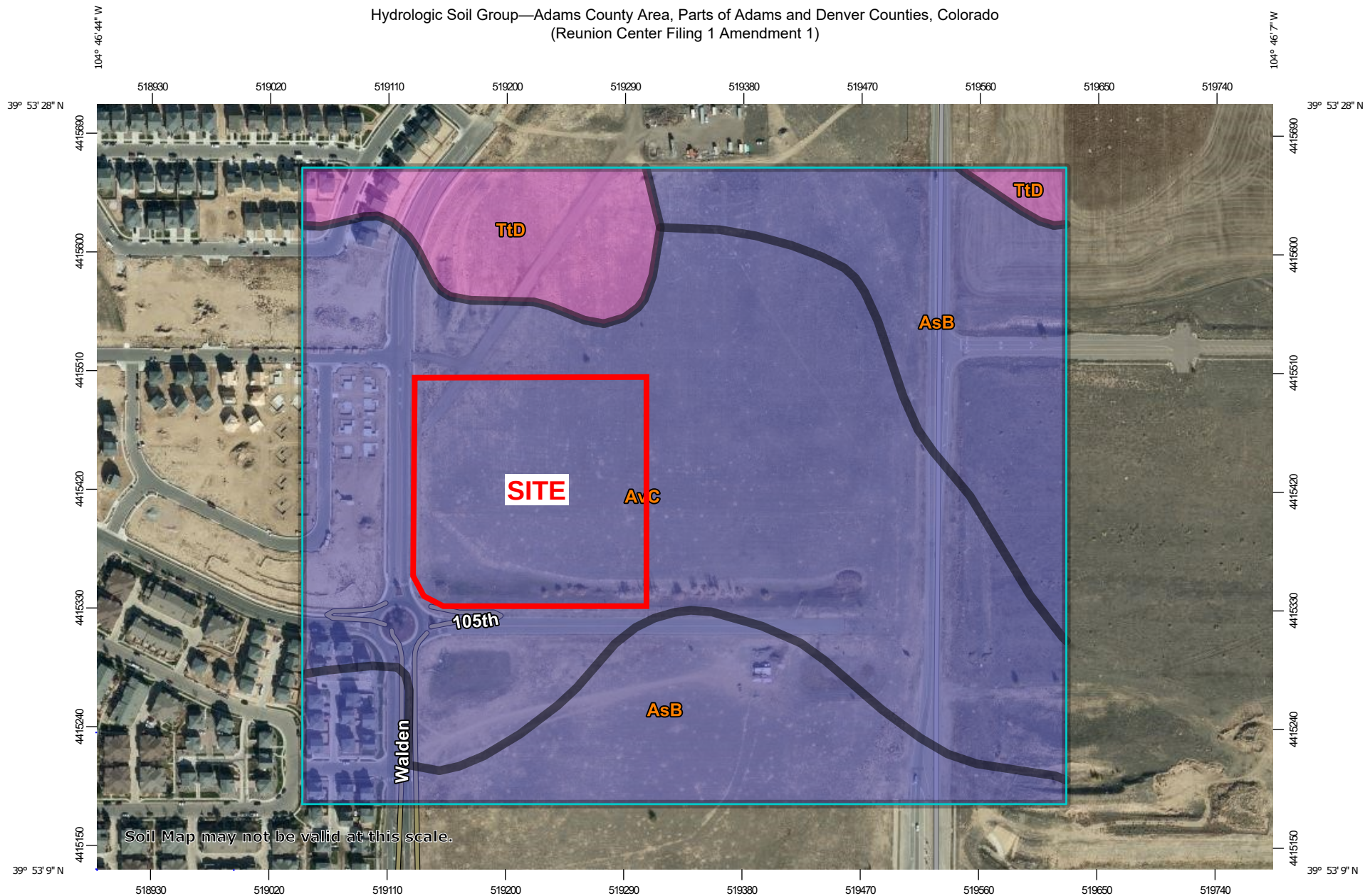
REUNION CENTER VICINITY MAP

CREATED BY: JOT

DATE: 03/11/22

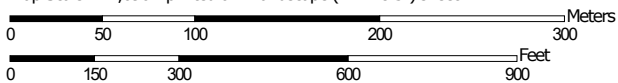
SHEET NUMBER
1
OF 1 SHEETS
JOB NUMBER
18-004

Hydrologic Soil Group—Adams County Area, Parts of Adams and Denver Counties, Colorado
(Reunion Center Filing 1 Amendment 1)



Soil Map may not be valid at this scale.

Map Scale: 1:4,090 if printed on A landscape (11" x 8.5") sheet.



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



Natural Resources
Conservation Service

Web Soil Survey
National Cooperative Soil Survey

4/5/2021
Page 1 of 4

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
AsB	Ascalon sandy loam, 0 to 3 percent slopes	B	22.9	32.9%
AvC	Ascalon-Vona sandy loams, 1 to 5 percent slopes	B	40.7	58.4%
TtD	Truckton loamy sand, 3 to 9 percent slopes	A	6.1	8.7%
Totals for Area of Interest			69.6	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.

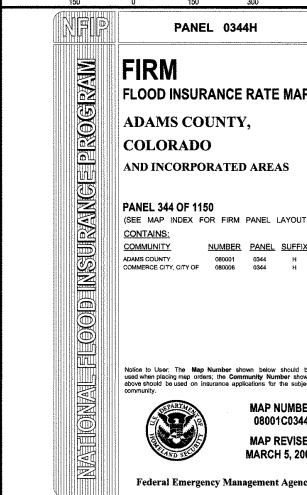
If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher



Reunion Center Filing No. 1, Amendment No. 1 & 2

CORE Project #: 18-004

Prepared By: ACJ

COMPOSITE BASIN - IMPERVIOUSNESS CALCULATIONS**-REFERENCE UDFCD Vol.1 RUNOFF Table 6-3**

		Residential			Other	Asphalt	Roof/ Concrete	Gravel	Lawns		Historic			Soil Type		
		Duet Product	N/A	N/A	N/A				2-7% Slope	>7% Slope				Soil Type A Area	Soil Type B Area	Soil Type C Area
% Imperv.		65.00%	55.00%	45.00%	85.00%	100.00%	90.00%	40.00%	2.00%	2.00%	2.00%					
	Design											Total	Percent			
BASIN	Point	Area	Area	Area	Area	Area	Area	Area	Area	Area	Area	Area	Impervious	Area	Area	
FILING NO.1, AMENDMENT NO. 1																
A2.1	A2.1	0.09	-	-	-	0.20	0.04	-	0.04	-	-	0.38	79.3%	-	0.38	-
A2.2	A2.2	0.85	-	-	-	0.45	0.09	-	0.08	-	-	1.48	73.9%	-	1.48	-
A3.1	A3.1	0.04	-	-	-	0.09	0.02	-	0.02	-	-	0.17	78.4%	-	0.17	-
A3.2	A3.2	0.28	-	-	-	0.20	0.07	-	0.33	-	-	0.88	51.5%	-	0.88	-
A4.1	A4.1	1.09	-	-	-	0.35	0.02	-	0.54	-	-	2.00	54.3%	-	2.00	-
A4.2	A4.2	0.40	-	-	-	0.25	0.02	-	0.06	-	-	0.73	71.9%	-	0.73	-
B1	B1	1.92	-	-	-	0.67	0.12	-	0.15	-	-	2.86	70.9%	-	2.86	-
B2	B2	0.06	-	-	-	0.08	-	-	0.06	-	-	0.20	62.4%	-	0.20	-
B3	B3	0.69	-	-	-	0.28	0.09	-	0.27	-	-	1.34	61.5%	-	1.34	-
D2	D2	0.38	-	-	-	0.04	0.01	-	0.03	-	-	0.45	64.6%	-	0.45	-
D3	D3	0.44	-	-	-	-	-	-	0.09	-	-	0.52	54.7%	-	0.52	-
D2.1	D2.1	0.02	-	-	-	0.05	-	-	0.00	-	-	0.06	89.6%	-	0.06	-
D2.2	D2.2	0.05	-	-	-	0.15	-	-	0.03	-	-	0.23	79.0%	-	0.23	-
SUBTOTAL		6.32	-	-	-	2.80	0.48	-	1.70	-	-	11.30	65.3%	-	11.30	-
		-	-	-	-	-	-	-	-	-	-	-		-	-	-
FILING NO. 1, AMENDMENT NO. 2																
A5.1	A5.1	1.00	-	-	-	0.32	0.01	-	0.00	-	-	1.34	73.6%	-	1.34	-
A6.1	A6.1	0.22	-	-	-	0.38	0.02	-	0.03	-	-	0.65	82.7%	-	0.65	-
C1.1	C1.1	0.22	-	-	-	0.10	-	-	0.01	-	-	0.32	73.7%	-	0.32	-
C2.1	C2.1	0.12	-	-	-	0.05	0.01	-	0.01	-	-	0.19	71.5%	-	0.19	-
D1	D1	0.95	-	-	-	-	0.03	-	0.06	-	-	1.03	61.8%	-	1.03	-
D4	D4	0.08	-	-	-	0.09	0.01	-	0.18	-	-	0.37	43.8%	-	0.37	-
D5	D5	0.27	-	-	-	-	0.01	-	0.01	-	-	0.29	64.1%	-	0.29	-
D1.1	D1.1	-	-	-	-	0.06	-	-	-	-	-	0.06	100.0%	-	0.06	-
D1.2	D1.2	-	-	-	-	0.04	0.01	-	0.02	-	-	0.07	63.1%	-	0.07	-
SUBTOTAL A2		2.86	-	-	-	1.03	0.09	-	0.34	-	-	4.32	69.0%	-	4.32	-
		-	-	-	-	-	-	-	-	-	-	-		-	-	-
TOTAL		9.18	-	-	-	3.83	0.58	-	2.03	-	-	15.62	66.3%	-	15.62	-

Reunion Center Filing No. 1, Amendment No. 1 & 2

CORE Project #: 18-004

Prepared By: ACJ

COMPOSITE DEVELOPED BASIN

WEIGHTED "C" CALCULATIONS

-REFERENCE UDFCD Vol.1 RUNOFF Table 6-4

i = % imperviousness/100 expressed as a decimal

C_A = Runoff coefficient for NRCS HSG A soils

C_B = Runoff coefficient for NRCS HSG B soils

C_{CD} = Runoff coefficient for NRCS HSG C and D soils.

Natural Resource Conservation Service (NRCS)

Table 6-4. Runoff coefficient equations based on NRCS soil group and storm return period

NRCS Soil Group	Storm Return Period						
	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year	500-Year
A	$C_A = 0.84i^{1.302}$	$C_A = 0.86i^{1.276}$	$C_A = 0.87i^{1.232}$	$C_A = 0.84i^{1.124}$	$C_A = 0.85i+0.025$	$C_A = 0.78i+0.110$	$C_A = 0.65i+0.254$
B	$C_B = 0.84i^{1.169}$	$C_B = 0.86i^{1.088}$	$C_B = 0.81i+0.057$	$C_B = 0.63i+0.249$	$C_B = 0.56i+0.328$	$C_B = 0.47i+0.426$	$C_B = 0.37i+0.536$
C/D	$C_{CD} = 0.83i^{1.122}$	$C_{CD} = 0.82i+0.035$	$C_{CD} = 0.74i+0.132$	$C_{CD} = 0.56i+0.319$	$C_{CD} = 0.49i+0.393$	$C_{CD} = 0.41i+0.484$	$C_{CD} = 0.32i+0.588$

Total Weighted Runoff Coefficients, C			
2-Year	5-Year	10-Year	100-Year
0.40	0.42	0.45	0.56

Basin ID	% Imperv.	<i>i</i>	Soil Type	Runoff Coefficients, C				Basin Area	Total Area	Weighted Runoff Coefficients, C			
				2-Year	5-Year	10-Year	100-Year			2-Year	5-Year	10-Year	100-Year
FILING NO.1, AMENDMENT NO. 1													
A2.1	79.3%	0.79	A B C or D	0.62 0.64 0.64	0.64 0.67 0.69	0.65 0.70 0.72	0.73 0.80 0.81	0.38	0.38	0.64	0.67	0.70	0.80
A2.2	73.9%	0.74	A B C or D	0.57 0.59 0.59	0.58 0.62 0.64	0.60 0.66 0.68	0.69 0.77 0.79	1.48	1.48	0.59	0.62	0.66	0.77
A3.1	78.4%	0.78	A B C or D	0.61 0.63 0.63	0.63 0.66 0.68	0.65 0.69 0.71	0.72 0.79 0.81	0.17	0.17	0.63	0.66	0.69	0.79
A3.2	51.5%	0.52	A B C or D	0.35 0.39 0.39	0.37 0.42 0.46	0.38 0.47 0.51	0.51 0.67 0.70	0.88	0.88	0.39	0.42	0.47	0.67
A4.1	54.3%	0.54	A B C or D	0.38 0.41 0.42	0.39 0.44 0.48	0.41 0.50 0.53	0.53 0.68 0.71	2.00	2.00	0.41	0.44	0.50	0.68
A4.2	71.9%	0.72	A B C or D	0.55 0.57 0.57	0.56 0.60 0.62	0.58 0.64 0.66	0.67 0.76 0.78	0.73	0.73	0.57	0.60	0.64	0.76

Basin ID	% Imperv.	<i>i</i>	Soil Type	Runoff Coefficients, C				Basin Area	Total Area	Weighted Runoff Coefficients, C			
				2-Year	5-Year	10-Year	100-Year			2-Year	5-Year	10-Year	100-Year
B1	70.9%	0.71	A	0.54	0.55	0.57	0.66	2.86	2.86	0.56	0.59	0.63	0.76
			B	0.56	0.59	0.63	0.76						
			C or D	0.56	0.62	0.66	0.77						
B2	62.4%	0.62	A	0.45	0.47	0.49	0.60	0.20	0.20	0.48	0.51	0.56	0.72
			B	0.48	0.51	0.56	0.72						
			C or D	0.49	0.55	0.59	0.74						
B3	61.5%	0.61	A	0.45	0.46	0.48	0.59	1.34	1.34	0.48	0.51	0.55	0.71
			B	0.48	0.51	0.55	0.71						
			C or D	0.48	0.54	0.59	0.74						
D2	64.6%	0.65	A	0.48	0.49	0.51	0.61	0.45	0.45	0.50	0.53	0.58	0.73
			B	0.50	0.53	0.58	0.73						
			C or D	0.51	0.57	0.61	0.75						
D3	54.7%	0.55	A	0.38	0.40	0.41	0.54	0.52	0.52	0.41	0.45	0.50	0.68
			B	0.41	0.45	0.50	0.68						
			C or D	0.42	0.48	0.54	0.71						
D2.1	89.6%	0.90	A	0.73	0.75	0.76	0.81	0.06	0.06	0.74	0.76	0.78	0.85
			B	0.74	0.76	0.78	0.85						
			C or D	0.73	0.77	0.79	0.85						
D2.2	79.0%	0.79	A	0.62	0.64	0.65	0.73	0.23	0.23	0.64	0.67	0.70	0.80
			B	0.64	0.67	0.70	0.80						
			C or D	0.64	0.68	0.72	0.81						
FILING NO. 1, AMENDMENT NO. 2													
A5.1	73.6%	0.74	A	0.56	0.58	0.60	0.68	1.34	1.34	0.59	0.62	0.65	0.77
			B	0.59	0.62	0.65	0.77						
			C or D	0.59	0.64	0.68	0.79						
A6.1	82.7%	0.83	A	0.66	0.68	0.69	0.76	0.65	0.65	0.67	0.70	0.73	0.81
			B	0.67	0.70	0.73	0.81						
			C or D	0.67	0.71	0.74	0.82						
C1.1	73.7%	0.74	A	0.56	0.58	0.60	0.69	0.32	0.32	0.59	0.62	0.65	0.77
			B	0.59	0.62	0.65	0.77						
			C or D	0.59	0.64	0.68	0.79						
C2.1	71.5%	0.72	A	0.54	0.56	0.58	0.67	0.19	0.19	0.57	0.60	0.64	0.76
			B	0.57	0.60	0.64	0.76						
			C or D	0.57	0.62	0.66	0.78						

Basin ID	% Imperv.	<i>i</i>	Soil Type	Runoff Coefficients, C				Basin Area	Total Area	Weighted Runoff Coefficients, C			
				2-Year	5-Year	10-Year	100-Year			2-Year	5-Year	10-Year	100-Year
D1	43.8%	0.44	A	0.29	0.30	0.31	0.45	1.03	1.03	0.32	0.35	0.41	0.63
			B	0.32	0.35	0.41	0.63						
			C or D	0.33	0.39	0.46	0.66						
D4	69.0%	0.69	A	0.64	0.54	0.65	0.71	0.37	0.37	0.64	0.57	0.71	0.79
			B	0.64	0.57	0.71	0.79						
			C or D	0.65	0.60	0.75	0.82						
D5	64.1%	0.64	A	0.47	0.49	0.50	0.61	0.29	0.29	0.50	0.53	0.58	0.73
			B	0.50	0.53	0.58	0.73						
			C or D	0.50	0.56	0.61	0.75						
D1.1	100.0%	1.00	A	0.84	0.86	0.87	0.89	0.06	0.06	0.84	0.86	0.87	0.90
			B	0.84	0.86	0.87	0.90						
			C or D	0.83	0.86	0.87	0.89						
D1.2	63.1%	0.63	A	0.46	0.48	0.49	0.60	0.07	0.07	0.49	0.52	0.57	0.72
			B	0.49	0.52	0.57	0.72						
			C or D	0.50	0.55	0.60	0.74						
SUBTOTAL A2	69.0%	0.69	A	0.52	0.54	0.55	0.65	4.32	4.32	0.54	0.57	0.62	0.75
			B	0.54	0.57	0.62	0.75						
			C or D	0.55	0.60	0.64	0.77						
										-	-	-	-
TOTAL	66.3%	0.66	A	0.49	0.51	0.52	0.63	15.62	15.62	0.52	0.55	0.59	0.74
			B	0.52	0.55	0.59	0.74						
			C or D	0.52	0.58	0.62	0.76						

Reunion Center Filing No. 1, Amendment No. 1 & 2

CORE Project #: 18-004

Prepared By: ACJ

TIME OF CONCENTRATION CALCULATIONS

-REFERENCE UDFCD Vol.1 Section 2.4

NRCS Conveyance factors, K -REFERENCE UDFCD Vol.1 RUNOFF Table 6-2

SF-2

Heavy Meadow 2.50 Short Grass Pasture & Lawns 7.00 Grassed Waterway 15.00
Tillage/field 5.00 Nearly Bare Ground 10.00 Paved Area & Shallow Gutter 20.00

SUB-BASIN DATA			INITIAL / OVERLAND TIME			CHANNEL / TRAVEL TIME T(ft)						T(c) CHECK (URBANIZED BASINS)		FINAL T(c)
DRAIN BASIN	AREA ac.	C(5)	Length ft.	Slope %	T(i) min	Length ft.	Slope %	Coeff.	Velocity fps	T(t) min.	COMP. T(c)	% IMPER-VIOUS	USDCM Eq . 6-5	min.
A2.1	0.38	0.67	17	2.0	2.6	422	0.9	20	1.9	3.6	6.2	79.3%	16.1	6.2
A2.2	1.48	0.62	28	2.6	3.4	478	1.1	20	2.1	3.8	7.2	73.9%	17.4	7.2
A3.1	0.17	0.66	17	2.0	2.6	166	1.0	20	2.0	1.4	4.0	78.4%	14.1	5.0
A3.2	0.88	0.42	57	2.0	7.4	280	1.3	20	2.3	2.1	9.5	51.5%	19.8	9.5
A4.1	2.00	0.44	70	0.7	11.0	574	0.7	20	1.7	5.6	16.6	54.3%	23.5	16.6
A4.2	0.73	0.60	66	2.0	5.8	248	0.7	20	1.7	2.4	8.2	71.9%	16.3	8.2
B1	2.86	0.59	76	0.8	8.6	596	0.7	20	1.6	6.1	14.8	70.9%	20.4	14.8
B2	0.20	0.51	63	2.0	6.7	75	1.2	20	2.2	0.6	7.2	62.4%	16.0	7.2
B3	1.34	0.51	94	2.0	8.3	385	1.3	20	2.3	2.8	11.1	61.5%	18.7	11.1
D2	0.45	0.53	87	2.0	7.6	162	0.6	20	1.5	1.8	9.4	64.6%	17.0	9.4
D3	0.52	0.45	78	2.0	8.3	358	0.7	20	1.7	3.5	11.8	54.7%	20.9	11.8
D2.1	0.06	0.76	8	2.0	1.4	120	1.4	20	2.4	0.8	2.2	89.6%	11.6	5.0
D2.2	0.23	0.67	20	2.0	2.8	203	1.4	20	2.4	1.4	4.2	79.0%	14.0	5.0
SUBTOTAL	11.30	0.00	0	0.0								65.3%		5.0
A5.1	1.34	0.62	27	1.3	4.2	553	1.1	20	2.1	4.4	8.6	73.6%	18.0	8.6
A6.1	0.65	0.70	32	0.1	10.5	359	1.2	20	2.2	2.7	13.2	82.7%	14.6	13.2
C1.1	0.32	0.62	18	2.0	2.9	239	0.7	20	1.6	2.4	5.4	73.7%	16.0	5.4
C2.1	0.19	0.60	66	2.0	5.9	102	0.7	20	1.7	1.0	6.9	71.5%	14.9	6.9
D1	1.03	0.35	64	2.0	8.6	995	0.8	20	1.8	9.0	17.7	61.8%	25.7	17.7
D4	0.37	0.57	31	1.0	5.3	498	1.0	20	2.0	4.1	9.3	43.8%	23.9	9.3
D5	0.29	0.53	31	1.0	5.7	498	1.0	20	2.0	4.1	9.8	64.1%	19.6	9.8
D1.1	0.06	0.86	1	2.0	0.3	159	1.0	20	2.0	1.3	1.7	100.0%	10.1	5.0
D1.2	0.07	0.52	26	2.0	4.2	40	1.0	20	2.0	0.3	4.6	63.1%	15.6	5.0
SUBTOTAL A2	4.32	0.57	0									69.0%		5.0
TOTAL	15.62	0.55	0									66.3%		5.0

Reunion Center Filing No. 1, Amendment No. 1 & 2

CORE Project #: 18-004

Prepared By: ACJ

RATIONAL METHOD PEAK RUNOFF

5-Year STORM

Rainfall Depth-Duration-Frequency (1-hr) = 1.12

SF-3

-REFERENCE UDFCD Vol.1 EQ 5-1 & EQ 6-1

BASIN INFORMATION				DIRECT RUNOFF			
DESIGN POINT	DRAIN BASIN	AREA ac.	5yr Runoff COEFF	T(c) min	C x A	I in/hr	Q cfs
A2.1	A2.1	0.38	0.67	6.2	0.25	3.58	0.90
A2.2	A2.2	1.48	0.62	7.2	0.92	3.41	3.13
A3.1	A3.1	0.17	0.66	5.0	0.11	3.80	0.42
A3.2	A3.2	0.88	0.42	9.5	0.37	3.10	1.14
A4.1	A4.1	2.00	0.44	16.6	0.88	2.42	2.14
A4.2	A4.2	0.73	0.60	8.2	0.44	3.26	1.43
B1	B1	2.86	0.59	14.8	1.69	2.56	4.34
B2	B2	0.20	0.51	7.2	0.10	3.41	0.35
B3	B3	1.34	0.51	11.1	0.68	2.91	1.97
D2	D2	0.45	0.53	9.4	0.24	3.11	0.75
D3	D3	0.52	0.45	11.8	0.23	2.83	0.66
D2.1	D2.1	0.06	0.76	5.0	0.05	3.80	0.19
D2.2	D2.2	0.23	0.67	5.0	0.15	3.80	0.58
	SUBTOTAL	11.30		5.0		3.80	0.00
	FILING NO. 1, AMENDMENT NO. 2						
A5.1	A5.1	1.34	0.62	8.6	0.82	3.21	2.64
A6.1	A6.1	0.65	0.70	13.2	0.45	2.69	1.22
C1.1	C1.1	0.32	0.62	5.4	0.20	3.73	0.75
C2.1	C2.1	0.19	0.60	6.9	0.12	3.46	0.40
D1	D1	1.03	0.35	17.7	0.36	2.35	0.85
D4	D4	0.37	0.57	9.3	0.21	3.11	0.67
D5	D5	0.29	0.53	9.8	0.15	3.06	0.47
D1.1	D1.1	0.06	0.86	5.0	0.05	3.80	0.19
D1.2	D1.2	0.07	0.52	5.0	0.03	3.80	0.13
	SUBTOTAL A2	4.32		5.0		3.80	0.00
	TOTAL	15.62		5.0		3.80	0.00

Reunion Center Filing No. 1, Amendment No. 1 & 2

CORE Project #: 18-004

Prepared By: ACJ

RATIONAL METHOD PEAK RUNOFF

100-YR STORM

SF-3

Rainfall Depth-Duration-Frequency (1-hr) = **2.53**

-REFERENCE UDFCD Vol.1 EQ 5-1 & EQ 6-1

BASIN INFORMATION				DIRECT RUNOFF			
DESIGN POINT	DRAIN BASIN	AREA ac.	100YR RUNOFF COEFF	T(c) min	C x A	I in/hr	Q cfs
A2.1	A2.1	0.38	0.80	6.18	0.302	8.086	2.44
A2.2	A2.2	1.48	0.77	7.18	1.143	7.714	8.82
A3.1	A3.1	0.17	0.79	5.00	0.133	8.581	1.14
A3.2	A3.2	0.88	0.67	9.45	0.590	6.995	4.13
A4.1	A4.1	2.00	0.68	16.59	1.360	5.472	7.44
A4.2	A4.2	0.73	0.76	8.24	0.558	7.360	4.10
B1	B1	2.86	0.76	14.76	2.174	5.788	12.58
B2	B2	0.20	0.72	7.24	0.144	7.692	1.11
B3	B3	1.34	0.71	11.10	0.955	6.563	6.27
D2	D2	0.45	0.73	9.38	0.330	7.016	2.32
D3	D3	0.52	0.68	11.82	0.357	6.392	2.28
D2.1	D2.1	0.06	0.85	5.00	0.055	8.581	0.47
D2.2	D2.2	0.23	0.80	5.00	0.183	8.581	1.57
	SUBTOTAL	11.30					
	FILING NO. 1, AMENDMENT NO. 2						
A5.1	A5.1	1.34	0.77	8.58	1.031	7.251	7.47
A6.1	A6.1	0.65	0.81	13.25	0.528	6.081	3.21
C1.1	C1.1	0.32	0.77	5.37	0.250	8.419	2.11
C2.1	C2.1	0.19	0.76	6.87	0.147	7.823	1.15
D1	D1	1.03	0.63	17.67	0.653	5.304	3.46
D4	D4	0.37	0.79	9.34	0.296	7.028	2.08
D5	D5	0.29	0.73	9.79	0.209	6.903	1.44
D1.1	D1.1	0.06	0.90	5.00	0.052	8.581	0.44
D1.2	D1.2	0.07	0.72	5.00	0.047	8.581	0.41
	SUBTOTAL A2	4.32					
	TOTAL	15.62					

RUNOFF SUMMARY TABLE				
DIRECT RUNOFF				
DESIGN POINT	BASIN	AREA (AC)	5-Year RUNOFF (CFS)	100-Year RUNOFF (CFS)
FILING NO. 1, AMENDMENT NO. 1				
A2.1	A2.1	0.38	0.90	2.44
A2.2	A2.2	1.48	3.13	8.82
A3.1	A3.1	0.17	0.42	1.14
A3.2	A3.2	0.88	1.14	4.13
A4.1	A4.1	2.00	2.14	7.44
A4.2	A4.2	0.73	1.43	4.10
B1	B1	2.86	4.34	12.58
B2	B2	0.20	0.35	1.11
B3	B3	1.34	1.97	6.27
D2	D2	0.45	0.75	2.32
D3	D3	0.52	0.66	2.28
D2.1	D2.1	0.06	0.19	0.47
D2.2	D2.2	0.23	0.58	1.57
SUBTOTAL		11.30	17.99	54.67
FILING NO. 1, AMENDMENT NO. 2				
A5.1	A5.1	1.34	2.64	7.47
A6.1	A6.1	0.65	1.22	3.21
C1.1	C1.1	0.32	0.75	2.11
C2.1	C2.1	0.19	0.40	1.15
D1	D1	1.03	0.85	3.46
D4	D4	0.37	0.67	2.08
D5	D5	0.29	0.47	1.44
D1.1	D1.1	0.06	0.19	0.44
D1.2	D1.2	0.07	0.13	0.41
SUBTOTAL A2		4.32	7.30	21.77

Reunion Center

CORE Project #: 14-004

Prepared By: -LH

IMPERVIOUS CALCULATIONS**-REFERENCE UDFCD Vol.1 RUNOFF Table 6-3**

		Residential & Commercial										Soil Type				
		Single Family			Multi-Family											
		0.25 acres or less	0.25 - 0.75 acres	2.5 acres or larger	Attached	Roof/ Concrete	Asphalt/ Ponded Water	Packed Gravel	2-7% Slope	>7% Slope	Historic	Soil Type A Area	Soil Type B Area	Soil Type C/D Area		
% Imperv.	Design Point	45.00%	30.00%	12.00%	75.00%	90.00%	100.00%	40.00%	2.00%	2.00%	2.00%	Total Area (ac)	Percent Impervious			
BASIN																
		Area (ac)	Area (ac)	Area (ac)	Area (ac)	Area (ac)	Area (ac)	Area (ac)	Area (ac)	Area (ac)	Area (ac)					
H1	H1	-	-	-	-	-	-	-	-	-	5.85	5.85	2.0%	-	-	5.85
H2	H2	-	-	-	-	-	-	-	-	-	11.52	11.52	2.0%	-	-	11.52
		-	-	-	-	-	-	-	-	-	-	-		-	-	-
TOTAL		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	17.37	17.37	2.0%			

[illegible]

Reunion Center

CORE Project #: 14-004

Prepared By: -LH

TIME OF CONCENTRATION CALCULATIONS | BASIN A

-REFERENCE UDFCD Vol.1 Section 2.4

NRCS Conveyance factors, K -REFERENCE UDFCD Vol.1 RUNOFF Table 6-2

SF-2	Heavy Meadow	3	Short Grass Pasture & Lawns	7	Grassed Waterway	15
	Tillage/field	5	Nearly Bare Ground	10	Paved Area & Shallow Gutter	20

[illegible]

Reunion Center

CORE Project #: 14-004

Prepared By: -LH

RATIONAL METHOD PEAK RUNOFF

5-Year STORM

Rainfall Depth-Duration-Frequency (1-hr) = 1.12

SF-3

-REFERENCE UDFCD Vol. I EQ 5-1 & EQ 6-1

BASIN INFORMATON				DIRECT RUNOFF			
DESIGN POINT	DRAIN BASIN	AREA ac.	5yr Runoff COEFF	T(c) min	C x A	I in/hr	Q cfs
H1	H1	5.85	0.05	35.7	0.30	1.58	0.48
H2	H2	11.52	0.05	56.2	0.59	1.18	0.70
	TOTAL	17.37	0.05		0.89		1.18

Reunion Center

CORE Project #: 14-004

Prepared By: -LH

RATIONAL METHOD PEAK RUNOFF

100-YR STORM

SF-3

Rainfall Depth-Duration-Frequency (1-hr) = 2.53

-REFERENCE UDFCD Vol.1 EQ 5-1 & EQ 6-1

BASIN INFORMATON				DIRECT RUNOFF			
DESIGN POINT	DRAIN BASIN	AREA ac.	100YR RUNNOFF COEFF	T(c) min	C x A	I in/hr	Q cfs
H1	H1	5.85	0.49	35.7	2.88	3.58	10.30
H2	H2	11.52	0.49	56.2	5.67	2.67	15.15
	TOTAL	17.37	0.49		8.55		25.45

RUNOFF SUMMARY TABLE				
DIRECT RUNOFF				
DESIGN POINT	BASIN	AREA (AC)	5-Year RUNOFF (CFS)	100-Year RUNOFF (CFS)
H1	H1	5.85	0.48	10.30
H2	H2	11.52	0.70	15.15
Total		17.37	1.18	25.45

APPENDIX B

HYDRAULIC COMPUTATIONS

INLET MANAGEMENT

Worksheet Protected

INLET NAME	Inlet C1.1	Inlet C2.1	Inlet D1.1
Site Type (Urban or Rural)	URBAN	URBAN	URBAN
Inlet Application (Street or Area)	STREET	STREET	STREET
Hydraulic Condition	In Sump	In Sump	In Sump
Inlet Type	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT/Denver 13 Valley Gate

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

Minor Q_{Known} (cfs)	0.8	0.4	0.2
Major Q_{Known} (cfs)	2.1	1.2	0.4

Bypass (Carry-Over) Flow from Upstream [Inlets must be organized from upstream \(left\) to downstream \(right\) in order for bypass flows to be linked.](#)

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

Watershed Characteristics

Subcatchment Area (acres)			
Percent Impervious			
NRCS Soil Type			

Watershed Profile

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

Minor Storm Rainfall Input

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

Major Storm Rainfall Input

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

CALCULATED OUTPUT

Minor Total Design Peak Flow, Q (cfs)	0.8	0.4	0.2
Major Total Design Peak Flow, Q (cfs)	2.1	1.2	0.4
Minor Flow Bypassed Downstream, Q_b (cfs)	N/A	N/A	N/A
Major Flow Bypassed Downstream, Q_b (cfs)	N/A	N/A	N/A

INLET MANAGEMENT

Worksheet Protected

INLET NAME	Inlet D1.2	Inlet A6.1	Inlet A5.1
Site Type (Urban or Rural)	URBAN	URBAN	URBAN
Inlet Application (Street or Area)	STREET	STREET	STREET
Hydraulic Condition	In Sump	In Sump	On Grade
Inlet Type	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type R Curb Opening

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

Minor Q_{Known} (cfs)	0.1	1.2	2.6
Major Q_{Known} (cfs)	0.4	3.2	7.5

Bypass (Carry-Over) Flow from Upstream

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

Watershed Characteristics

Subcatchment Area (acres)			
Percent Impervious			
NRCS Soil Type			

Watershed Profile

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

Minor Storm Rainfall Input

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

Major Storm Rainfall Input

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

CALCULATED OUTPUT

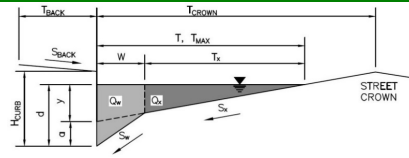
Minor Total Design Peak Flow, Q (cfs)	0.1	1.2	2.6
Major Total Design Peak Flow, Q (cfs)	0.4	3.2	7.5
Minor Flow Bypassed Downstream, Q_b (cfs)	N/A	N/A	0.0
Major Flow Bypassed Downstream, Q_b (cfs)	N/A	N/A	0.0

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

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

Project: Reunion Center Filing 1 - Amendment 2 - Basins

Inlet ID: Inlet C1.1

**Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

$T_{BACK} =$ ft
 $S_{BACK} =$ ft/ft
 $n_{BACK} =$

$H_{CURB} =$ inches
 $T_{CROWN} =$ ft
 $W =$ ft
 $S_x =$ ft/ft
 $S_w =$ ft/ft
 $S_o =$ ft/ft
 $n_{STREET} =$

Max. Allowable Spread for Minor & Major Storm

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

Check boxes are not applicable in SUMP conditions

	Minor Storm	Major Storm	
$T_{MAX} =$			ft
$d_{MAX} =$			inches

☐ ☐

MINOR STORM Allowable Capacity is not applicable to Sump Condition

MAJOR STORM Allowable Capacity is not applicable to Sump Condition

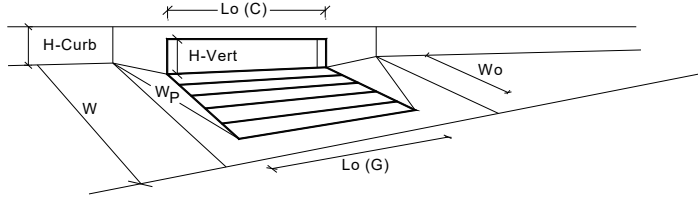
$Q_{allow} =$

Minor Storm	Major Storm
SUMP	SUMP

 cfs

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.02 (August 2022)



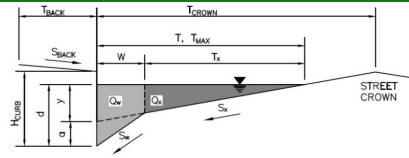
Design Information (Input)		MINOR		MAJOR	
Type of Inlet	CDOT Type R Curb Opening	CDOT Type R Curb Opening			
Local Depression (additional to continuous gutter depression 'a' from above)		a _{local} =	4.50	4.50	inches
Number of Unit Inlets (Grate or Curb Opening)		No =	1	1	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	4.4	4.4	inches
Grate Information		MINOR		MAJOR	
Length of a Unit Grate		L _o (G) =	N/A	N/A	feet
Width of a Unit Grate		W _o =	N/A	N/A	feet
Open Area Ratio for a Grate (typical values 0.15-0.90)		A _{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		C _f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)		C _w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)		C _o (G) =	N/A	N/A	
Curb Opening Information		MINOR		MAJOR	
Length of a Unit Curb Opening		L _o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches		H _{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches		H _{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)		Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W _p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)		C _f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)		C _w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)		C _o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR		MAJOR	
Depth for Grate Midwidth		d _{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation		d _{Curb} =	0.20	0.20	ft
Grated Inlet Performance Reduction Factor for Long Inlets		RF _{Grate} =	N/A	N/A	
Curb Opening Performance Reduction Factor for Long Inlets		RF _{Curb} =	1.00	1.00	
Combination Inlet Performance Reduction Factor for Long Inlets		RF _{Combination} =	N/A	N/A	
Total Inlet Interception Capacity (assumes clogged condition)		MINOR		MAJOR	
		Q _s =	2.5	2.5	cfs
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)		Q _{PEAK REQUIRED} =	0.8	2.1	cfs

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

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

Project: Reunion Center Filing 1 - Amendment 2 - Basins

Inlet ID: Inlet C2.1

**Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

$T_{BACK} =$ ft
 $S_{BACK} =$ ft/ft
 $n_{BACK} =$

$H_{CURB} =$ inches
 $T_{CROWN} =$ ft
 $W =$ ft
 $S_x =$ ft/ft
 $S_w =$ ft/ft
 $S_o =$ ft/ft
 $n_{STREET} =$

Max. Allowable Spread for Minor & Major Storm

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

Check boxes are not applicable in SUMP conditions

	Minor Storm	Major Storm	
$T_{MAX} =$			ft
$d_{MAX} =$			inches

☐ ☐

MINOR STORM Allowable Capacity is not applicable to Sump Condition

MAJOR STORM Allowable Capacity is not applicable to Sump Condition

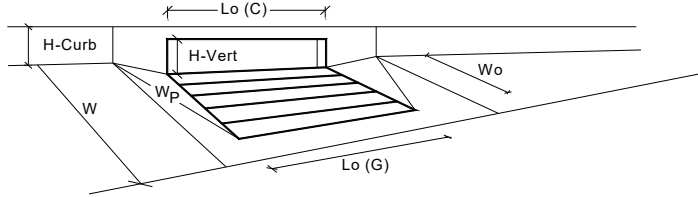
$Q_{allow} =$

Minor Storm	Major Storm
SUMP	SUMP

 cfs

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.02 (August 2022)



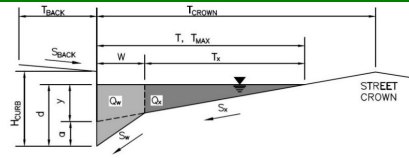
Design Information (Input)		MINOR		MAJOR	
Type of Inlet	CDOT Type R Curb Opening	Type = CDOT Type R Curb Opening			
Local Depression (additional to continuous gutter depression 'a' from above)		a _{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)		No =	1	1	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	6.0	6.0	inches
Grate Information		MINOR		MAJOR	
Length of a Unit Grate		L _o (G) =	N/A	N/A	feet
Width of a Unit Grate		W _o =	N/A	N/A	feet
Open Area Ratio for a Grate (typical values 0.15-0.90)		A _{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		C _f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)		C _w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)		C _o (G) =	N/A	N/A	
Curb Opening Information		MINOR		MAJOR	
Length of a Unit Curb Opening		L _o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches		H _{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches		H _{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)		Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W _p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)		C _f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)		C _w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)		C _o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR		MAJOR	
Depth for Grate Midwidth		d _{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation		d _{Curb} =	0.33	0.33	ft
Grated Inlet Performance Reduction Factor for Long Inlets		RF _{Grate} =	N/A	N/A	
Curb Opening Performance Reduction Factor for Long Inlets		RF _{Curb} =	1.00	1.00	
Combination Inlet Performance Reduction Factor for Long Inlets		RF _{Combination} =	N/A	N/A	
Total Inlet Interception Capacity (assumes clogged condition)		MINOR		MAJOR	
		Q _s =	5.4	5.4	cfs
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)		Q _{PEAK REQUIRED} =	0.4	1.2	cfs

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

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

Project: Reunion Center Filing 1 - Amendment 2 - Basins

Inlet ID: Inlet D1.1

**Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

T_{BACK}	=	5.7	ft
S_{BACK}	=	0.020	ft/ft
n_{BACK}	=	0.018	

H_{CURB}	=	4.50	inches
T_{CROWN}	=	12.0	ft
W	=	2.00	ft
S_X	=	0.020	ft/ft
S_W	=	0.083	ft/ft
S_0	=	0.000	ft/ft
n_{STREET}	=	0.016	

Max. Allowable Spread for Minor & Major Storm

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

Check boxes are not applicable in SUMP conditions

	Minor Storm	Major Storm	
T_{MAX}	12.0	12.0	ft
d_{MAX}	4.5	4.5	inches

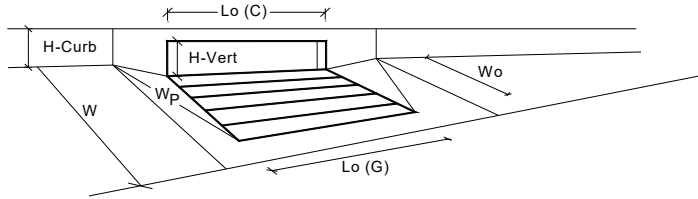
MINOR STORM Allowable Capacity is not applicable to Sump Condition

MAJOR STORM Allowable Capacity is not applicable to Sump Condition

	Minor Storm	Major Storm	
Q_{allow}	SUMP	SUMP	cfs

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.02 (August 2022)



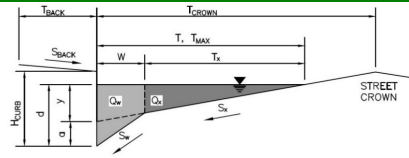
Design Information (Input)		MINOR		MAJOR	
Type of Inlet	CDOT/Denver 13 Valley Grate	Type =	CDOT/Denver 13 Valley Grate		
Local Depression (additional to continuous gutter depression 'a' from above)		a _{local} =	2.00	2.00	inches
Number of Unit Inlets (Grate or Curb Opening)		No =	1	1	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	4.4	4.4	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} =	0.43	0.43	
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) =	3.30	3.30	
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) =	N/A	N/A	feet
Height of Vertical Curb Opening in Inches		H _{vert} =	N/A	N/A	inches
Height of Curb Orifice Throat in Inches		H _{throat} =	N/A	N/A	inches
Angle of Throat (see USDCM Figure ST-5)		Theta =	N/A	N/A	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W _p =	N/A	N/A	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)		C _f (C) =	N/A	N/A	
Curb Opening Weir Coefficient (typical value 2.3-3.7)		C _w (C) =	N/A	N/A	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)		C _o (C) =	N/A	N/A	
Low Head Performance Reduction (Calculated)			MINOR	MAJOR	
Depth for Grate Midwidth		d _{Grate} =	0.39	0.39	ft
Depth for Curb Opening Weir Equation		d _{Curb} =	N/A	N/A	ft
Grated Inlet Performance Reduction Factor for Long Inlets		RF _{Grate} =	0.69	0.69	
Curb Opening Performance Reduction Factor for Long Inlets		RF _{Curb} =	N/A	N/A	
Combination Inlet Performance Reduction Factor for Long Inlets		RF _{Combination} =	N/A	N/A	
Total Inlet Interception Capacity (assumes clogged condition)		Q _s =	1.2	1.2	cfs
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)		Q _{PEAK REQUIRED} =	0.2	0.4	cfs

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

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

Project: Reunion Center Filing 1 - Amendment 2 - Basins

Inlet ID: Inlet D1.2

**Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

T_{BACK}	=	5.7	ft
S_{BACK}	=	0.020	ft/ft
n_{BACK}	=	0.018	

H_{CURB}	=	4.50	inches
T_{CROWN}	=	12.0	ft
W	=	2.00	ft
S_X	=	0.020	ft/ft
S_W	=	0.083	ft/ft
S_0	=	0.000	ft/ft
n_{STREET}	=	0.016	

Max. Allowable Spread for Minor & Major Storm

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

Check boxes are not applicable in SUMP conditions

	Minor Storm	Major Storm	
T_{MAX}	12.0	12.0	ft
d_{MAX}	4.5	4.5	inches
	☐	☐	

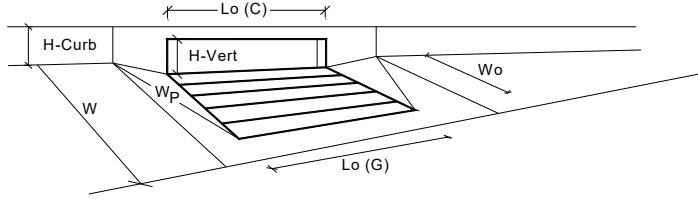
MINOR STORM Allowable Capacity is not applicable to Sump Condition

MAJOR STORM Allowable Capacity is not applicable to Sump Condition

	Minor Storm	Major Storm	
Q_{allow}	SUMP	SUMP	cfs

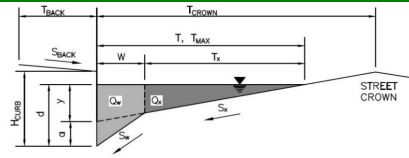
INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.02 (August 2022)



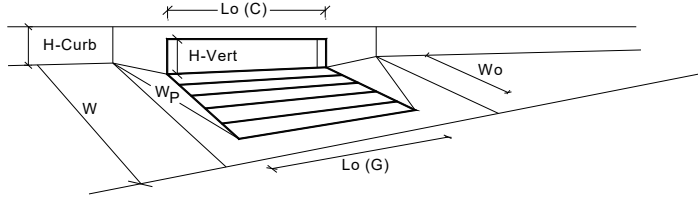
Design Information (Input)		MINOR		MAJOR	
Type of Inlet	CDOT Type R Curb Opening	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)		a _{local} =	4.50	4.50	inches
Number of Unit Inlets (Grate or Curb Opening)		No =	1	1	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	4.4	4.4	inches
Grate Information		MINOR		MAJOR	
Length of a Unit Grate		L _o (G) =	N/A	N/A	feet
Width of a Unit Grate		W _o =	N/A	N/A	feet
Open Area Ratio for a Grate (typical values 0.15-0.90)		A _{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		C _f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)		C _w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)		C _o (G) =	N/A	N/A	
Curb Opening Information		MINOR		MAJOR	
Length of a Unit Curb Opening		L _o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches		H _{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches		H _{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)		Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W _p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)		C _f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)		C _w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)		C _o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR		MAJOR	
Depth for Grate Midwidth		d _{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation		d _{Curb} =	0.20	0.20	ft
Grated Inlet Performance Reduction Factor for Long Inlets		RF _{Grate} =	N/A	N/A	
Curb Opening Performance Reduction Factor for Long Inlets		RF _{Curb} =	1.00	1.00	
Combination Inlet Performance Reduction Factor for Long Inlets		RF _{Combination} =	N/A	N/A	
Total Inlet Interception Capacity (assumes clogged condition)		MINOR		MAJOR	
		Q _s =	2.5	2.5	cfs
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)		Q _{PEAK REQUIRED} =	0.1	0.4	cfs

Inlet ID: Inlet A6.1


$$Q_{allow} = \begin{array}{c|c} \text{Minor Storm} & \text{Major Storm} \\ \hline \text{SUMP} & \text{SUMP} \end{array} \text{ cfs}$$

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.02 (August 2022)



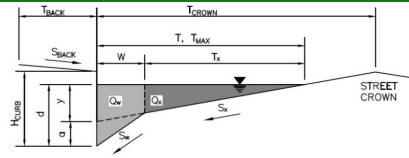
Design Information (Input)		MINOR		MAJOR	
Type of Inlet	CDOT Type R Curb Opening	CDOT Type R Curb Opening			
Local Depression (additional to continuous gutter depression 'a' from above)		a _{local} =	4.00	4.00	inches
Number of Unit Inlets (Grate or Curb Opening)		No =	1	1	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	4.4	5.0	inches
Grate Information		MINOR		MAJOR	
Length of a Unit Grate		L _o (G) =	N/A	N/A	feet
Width of a Unit Grate		W _o =	N/A	N/A	feet
Open Area Ratio for a Grate (typical values 0.15-0.90)		A _{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		C _f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)		C _w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)		C _o (G) =	N/A	N/A	
Curb Opening Information		MINOR		MAJOR	
Length of a Unit Curb Opening		L _o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches		H _{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches		H _{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)		Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W _p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)		C _f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)		C _w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)		C _o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR		MAJOR	
Depth for Grate Midwidth		d _{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation		d _{Curb} =	0.20	0.25	ft
Grated Inlet Performance Reduction Factor for Long Inlets		RF _{Grate} =	N/A	N/A	
Curb Opening Performance Reduction Factor for Long Inlets		RF _{Curb} =	1.00	1.00	
Combination Inlet Performance Reduction Factor for Long Inlets		RF _{Combination} =	N/A	N/A	
Total Inlet Interception Capacity (assumes clogged condition)		MINOR		MAJOR	
		Q _s =	2.5	3.5	cfs
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)		Q _{PEAK REQUIRED} =	1.2	3.2	cfs

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

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

Project: Reunion Center Filing 1 - Amendment 2 - Basins

Inlet ID: Inlet A5.1

**Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

T_{BACK}	=	7.0	ft
S_{BACK}	=	0.020	ft/ft
n_{BACK}	=	0.018	

H_{CURB}	=	4.50	inches
T_{CROWN}	=	12.0	ft
W	=	2.00	ft
S_x	=	0.020	ft/ft
S_y	=	0.083	ft/ft
S_o	=	0.010	ft/ft
n_{STREET}	=	0.016	

Max. Allowable Spread for Minor & Major Storm

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

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

	Minor Storm	Major Storm	
T_{MAX}	12.0	12.0	ft
d_{MAX}	4.5	6.2	inches
	☐	☒	

MINOR STORM Allowable Capacity is based on Spread Criterion

MAJOR STORM Allowable Capacity is based on Depth Criterion

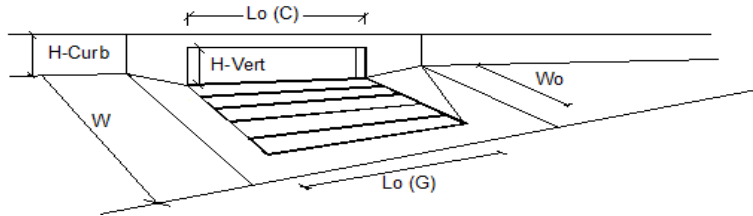
	Minor Storm	Major Storm	
Q_{allow}	4.7	15.1	cfs

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 2.64 cfs on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design peak flow of 7.47 cfs on sheet 'Inlet Management'

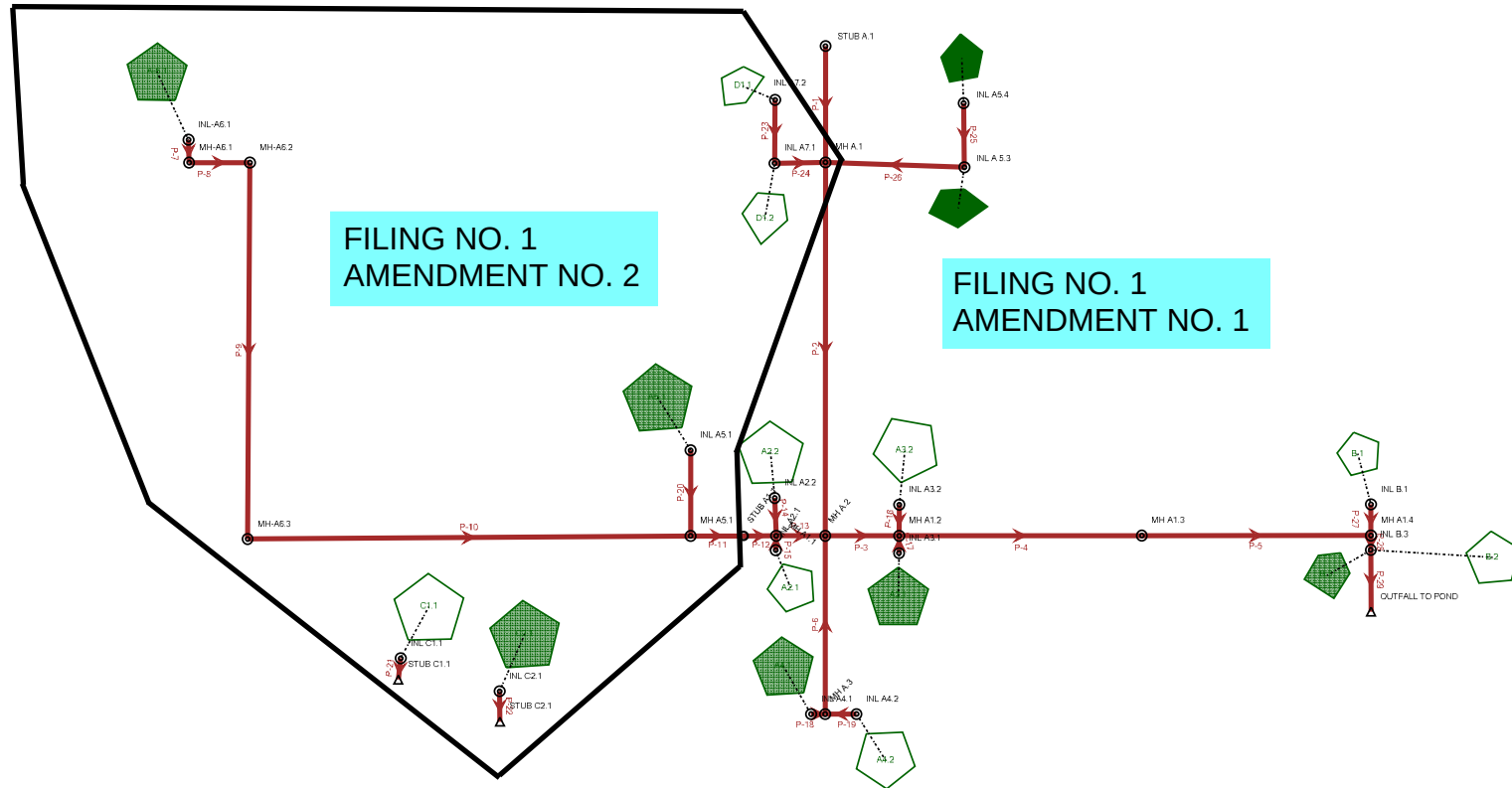
INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.02 (August 2022)



Design Information (Input)		MINOR		MAJOR	
Type of Inlet	CDOT Type R Curb Opening	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')		a _{LOCAL} =	4.0	4.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		No =	3	3	
Length of a Single Unit Inlet (Grate or Curb Opening)		L _o =	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)		W _o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)		C _f (G) =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		C _f (C) =	0.10	0.10	
Street Hydraulics: OK - Q < Allowable Street Capacity					
Total Inlet Interception Capacity		Q =	2.6	7.4	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)		Q _s =	0.0	0.0	cfs
Capture Percentage = Q _i /Q _a		C% =	100	99	%

Scenario: 100-Year



STORMCAD OUTPUT TABLES - REUNION CENTER FILING NO. 1, AMENDMENT NO. 2
5-Year Storm Event

Catchment Table - Time: 0.00 hours

Label	Outflow Element	Area (User Defined) (acres)	Runoff Coefficient (Rational)	Time of Concentration (min)	Catchment Intensity (in/h)	Catchment Rational Flow (cfs)
C1.1	INL C1.1	0.320	0.620	5.370	3.727	0.75
C2.1	INL C2.1	0.190	0.600	6.870	3.464	0.40
A5.1	INL A5.1	1.340	0.620	8.580	3.211	2.69
A-6.1	INL-A6.1	0.650	0.700	13.250	2.692	1.23
D1.1	INL A7.2	0.060	0.860	5.000	3.799	0.20
D1.2	INL A7.1	0.070	0.520	5.000	3.799	0.14

Conduit Table - Time: 0.00 hours

Label	Notes	Start Node	Stop Node	Invert (Start) (ft)	Invert (Stop) (ft)	Length (Scaled) (ft)	Slope (Calculated) (ft/ft)	Diameter (in)	Manning's n	Flow (cfs)	Velocity (ft/s)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Capacity (Full Flow) (cfs)	Energy Grade Line (In) (ft)	Energy Grade Line (Out) (ft)
P-7	18" RCP	INL-A6.1	MH-A6.1	5,223.33	5,223.31	19.8	0.002	18.0	0.013	1.23	2.24	5,224.38	5,224.37	4.70	5,224.39	5,224.39
P-8	18" RCP	MH-A6.1	MH-A6.2	5,223.76	5,223.50	52.8	0.003	18.0	0.013	1.23	2.43	5,224.25	5,223.92	5.27	5,224.35	5,224.06
P-9	18' RCP	MH-A6.2	MH-A6.3	5,223.30	5,222.57	326.1	0.002	18.0	0.013	1.20	2.32	5,223.80	5,222.98	4.97	5,223.89	5,223.13
P-10	18" RCP	MH-A6.3	MH A5.1	5,222.37	5,221.56	384.8	0.002	18.0	0.013	1.12	2.22	5,222.86	5,222.44	4.82	5,222.94	5,222.46
P-11	18" RCP	MH A5.1	STUB A1.1	5,221.47	5,221.24	46.1	0.005	18.0	0.013	2.91	3.94	5,222.12	5,221.89	7.42	5,222.36	5,222.13
P-20	18" RCP	INL A5.1	MH A5.1	5,222.01	5,221.67	74.2	0.005	18.0	0.013	2.69	3.88	5,222.63	5,222.44	7.46	5,222.87	5,222.58
P-21	18" RCP	INL C1.1	STUB C1.1	5,222.00	5,221.94	18.6	0.005	18.0	0.013	0.75	2.62	5,222.33	5,222.26	7.15	5,222.43	5,222.37
P-22	18" RCP	INL C2.1	STUB C2.1	5,221.83	5,221.56	26.3	0.005	18.0	0.013	0.40	2.24	5,222.07	5,221.79	7.47	5,222.14	5,221.87
P-23	18" RCP	INL A7.2	INL A7.1	5,221.28	5,221.04	54.9	0.010	18.0	0.013	0.20	2.34	5,221.98	5,221.98	10.67	5,221.98	5,221.98
P-24	18" RCP	INL A7.1	MH A.1	5,220.94	5,220.86	44.2	0.002	18.0	0.013	0.33	1.65	5,221.98	5,221.98	5.17	5,221.98	5,221.98

STORMCAD OUTPUT TABLES - REUNION CENTER FILING NO. 1, AMENDMENT NO. 2

5-Year Storm Event

Manhole Table - Time: 0.00 hours

Label	Elevation (Rim) (ft)	Elevation (Invert) (ft)	Flow (Local Surface) (cfs)	Flow (Local from Inflow Collection) (cfs)	Flow (Total Out) (cfs)	Hydraulic Grade Line (In) (ft)	Headloss Method	Headloss Coefficient (Standard)
INL A5.1	5,226.07	5,222.01	2.69	0.00	2.69	5,222.64	Standard	0.050
INL A7.1	5,228.47	5,220.80	0.14	0.00	0.33	5,221.98	Standard	1.020
INL A7.2	5,228.54	5,221.28	0.20	0.00	0.20	5,221.98	Standard	0.050
INL C1.1	5,226.84	5,222.00	0.75	0.00	0.75	5,222.33	Standard	0.050
INL C2.1	5,226.95	5,221.83	0.40	0.00	0.40	5,222.07	Standard	0.050
INL-A6.1	5,226.57	5,223.09	1.23	0.00	1.23	5,224.38	Standard	0.050
MH A5.1	5,225.65	5,221.47	0.00	0.00	2.91	5,222.44	Standard	1.320
MH-A6.1	5,226.53	5,222.96	0.00	0.00	1.23	5,224.37	Standard	1.320
MH-A6.2	5,226.62	5,222.73	0.00	0.00	1.20	5,223.81	Standard	0.100
MH-A6.3	5,229.18	5,222.37	0.00	0.00	1.12	5,222.86	Standard	0.010

Outfall Table - Time: 0.00 hours

Label	Notes	Elevation (Invert) (ft)	Flow (Total Out) (cfs)	Boundary Condition Type
STUB C1.1	CONNECT TO EX STUB	5,221.94	0.74	Free Outfall
STUB C2.1	CONNECT TO EX STUB	5,221.56	0.39	Free Outfall

STORMCAD OUTPUT TABLES - REUNION CENTER FILING NO. 1, AMENDMENT NO. 2
100-Year Storm Event

Catchment Table - Time: 0.00 hours

Label	Outflow Element	Area (User Defined) (acres)	Runoff Coefficient (Rational)	Time of Concentration (min)	Catchment Intensity (in/h)	Catchment Rational Flow (cfs)
C1.1	INL C1.1	0.320	0.770	5.400	8.406	2.09
C2.1	INL C2.1	0.190	0.760	6.870	7.824	1.14
A5.1	INL A5.1	1.340	0.770	8.580	7.253	7.54
A-6.1	INL-A6.1	0.650	0.810	13.250	6.081	3.23
D1.1	INL A7.2	0.060	0.900	5.000	8.581	0.47
D1.2	INL A7.1	0.070	0.720	5.000	8.581	0.44

Conduit Table - Time: 0.00 hours

Label	Notes	Start Node	Stop Node	Invert (Start) (ft)	Invert (Stop) (ft)	Length (Scaled) (ft)	Slope (Calculated) (ft/ft)	Diameter (in)	Manning's n	Flow (cfs)	Velocity (ft/s)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Capacity (Full Flow) (cfs)	Energy Grade Line (In) (ft)	Energy Grade Line (Out) (ft)
P-7	18" RCP	INL-A6.1	MH-A6.1	5,223.33	5,223.31	19.8	0.002	18.0	0.013	3.23	1.83	5,224.93	5,224.92	4.70	5,224.98	5,224.97
P-8	18" RCP	MH-A6.1	MH-A6.2	5,223.76	5,223.50	52.8	0.003	18.0	0.013	3.22	3.13	5,224.79	5,224.69	5.27	5,224.89	5,224.76
P-9	18' RCP	MH-A6.2	MH-A6.3	5,223.30	5,222.57	326.1	0.002	18.0	0.013	3.16	2.98	5,224.69	5,224.40	4.97	5,224.74	5,224.45
P-10	18" RCP	MH-A6.3	MH A5.1	5,222.37	5,221.56	384.8	0.002	18.0	0.013	2.98	1.69	5,224.40	5,224.09	4.82	5,224.44	5,224.13
P-11	18" RCP	MH A5.1	STUB A1.1	5,221.47	5,221.24	46.1	0.005	18.0	0.013	7.92	4.48	5,223.68	5,223.42	7.42	5,223.99	5,223.73
P-20	18" RCP	INL A5.1	MH A5.1	5,222.01	5,221.67	74.2	0.005	18.0	0.013	7.54	4.27	5,224.44	5,224.09	7.46	5,224.72	5,224.37
P-21	18" RCP	INL C1.1	STUB C1.1	5,222.00	5,221.94	18.6	0.005	18.0	0.013	2.09	3.51	5,222.56	5,222.49	7.15	5,222.75	5,222.69
P-22	18" RCP	INL C2.1	STUB C2.1	5,221.83	5,221.56	26.3	0.005	18.0	0.013	1.14	3.06	5,222.23	5,221.96	7.47	5,222.37	5,222.10
P-23	18" RCP	INL A7.2	INL A7.1	5,221.28	5,221.04	54.9	0.010	18.0	0.013	0.47	0.26	5,224.00	5,224.00	10.67	5,224.00	5,224.00
P-24	18" RCP	INL A7.1	MH A.1	5,220.94	5,220.86	44.2	0.002	18.0	0.013	0.84	0.47	5,224.00	5,224.00	5.17	5,224.00	5,224.00

STORMCAD OUTPUT TABLES - REUNION CENTER FILING NO. 1, AMENDMENT NO. 2
100-Year Storm Event

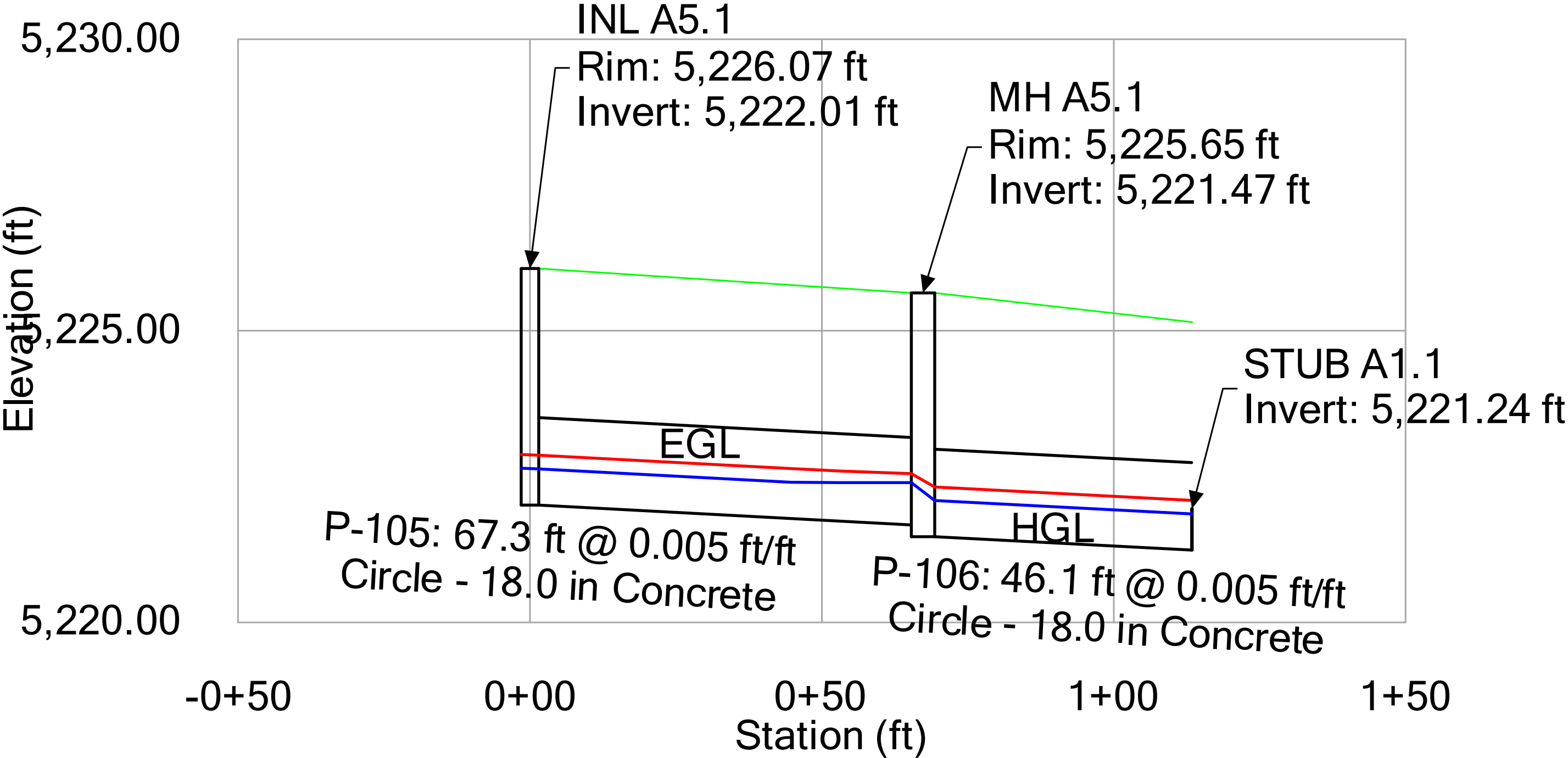
Manhole Table - Time: 0.00 hours

Label	Elevation (Rim) (ft)	Elevation (Invert) (ft)	Flow (Local Surface) (cfs)	Flow (Local from Inflow Collection) (cfs)	Flow (Total Out) (cfs)	Hydraulic Grade Line (In) (ft)	Headloss Method	Headloss Coefficient (Standard)
INL A5.1	5,226.07	5,222.01	7.54	0.00	7.54	5,224.45	Standard	0.050
INL A7.1	5,228.47	5,220.80	0.44	0.00	0.84	5,224.00	Standard	1.020
INL A7.2	5,228.54	5,221.28	0.47	0.00	0.47	5,224.00	Standard	0.050
INL C1.1	5,226.84	5,222.00	2.09	0.00	2.09	5,222.56	Standard	0.050
INL C2.1	5,226.95	5,221.83	1.14	0.00	1.14	5,222.24	Standard	0.050
INL-A6.1	5,226.57	5,223.09	3.23	0.00	3.23	5,224.93	Standard	0.050
MH A5.1	5,225.65	5,221.47	0.00	0.00	7.92	5,224.09	Standard	1.320
MH-A6.1	5,226.53	5,222.96	0.00	0.00	3.22	5,224.92	Standard	1.320
MH-A6.2	5,226.62	5,222.73	0.00	0.00	3.16	5,224.69	Standard	0.100
MH-A6.3	5,229.18	5,222.37	0.00	0.00	2.98	5,224.40	Standard	0.010

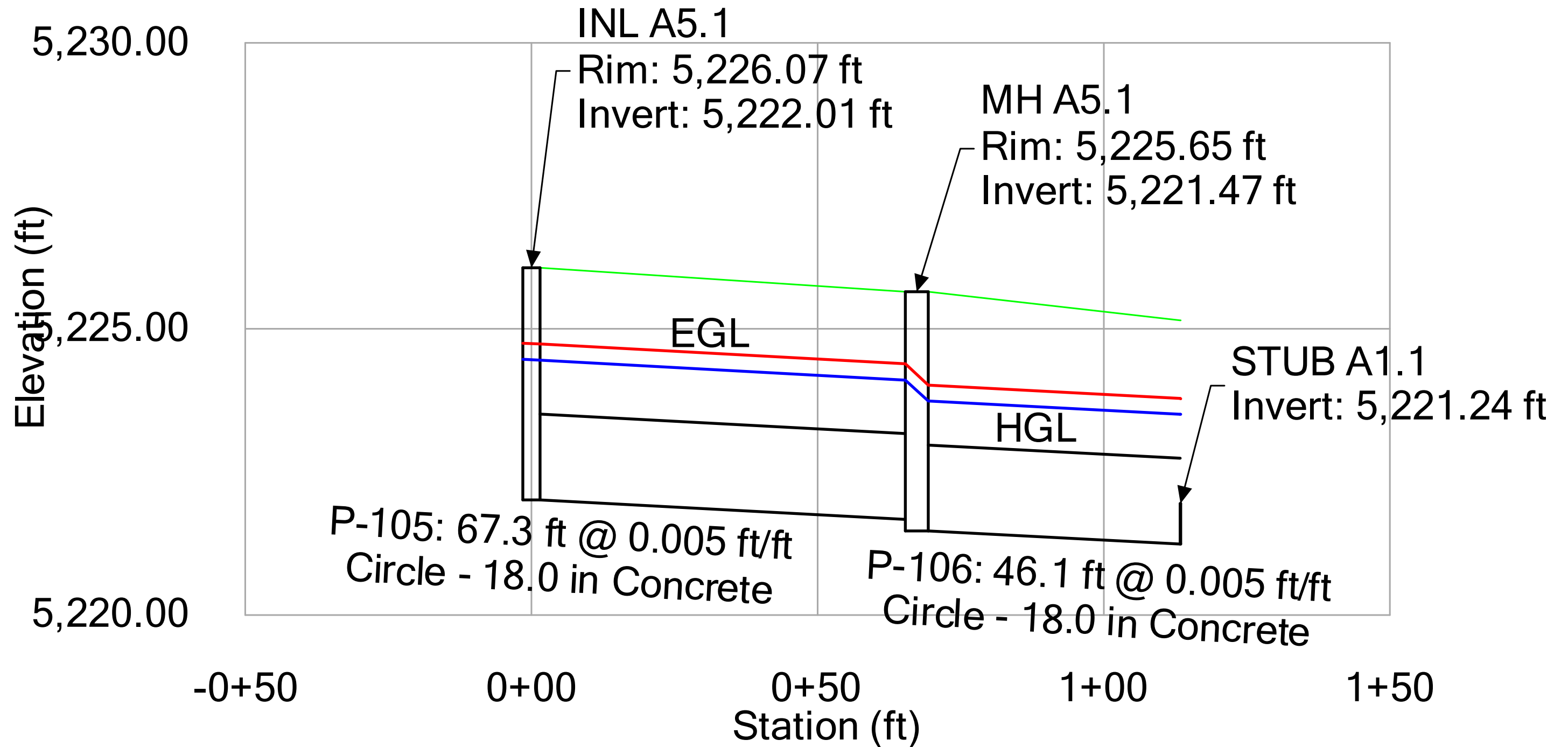
Outfall Table - Time: 0.00 hours

Label	Notes	Elevation (Invert) (ft)	Flow (Total Out) (cfs)	Boundary Condition Type
STUB C1.1	CONNECT TO EX STUB	5,221.94	2.08	Free Outfall
STUB C2.1	CONNECT TO EX STUB	5,221.56	1.12	Free Outfall

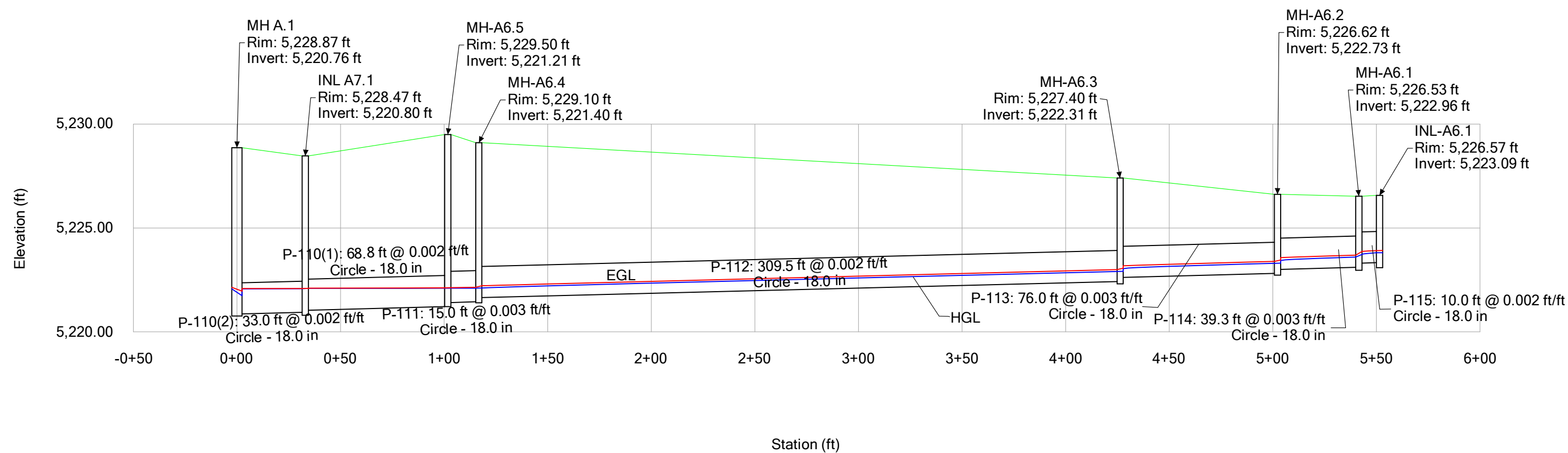
Profile Report
Engineering Profile - A5 (Reunion Center StormCAD Model ACJ.stsw)



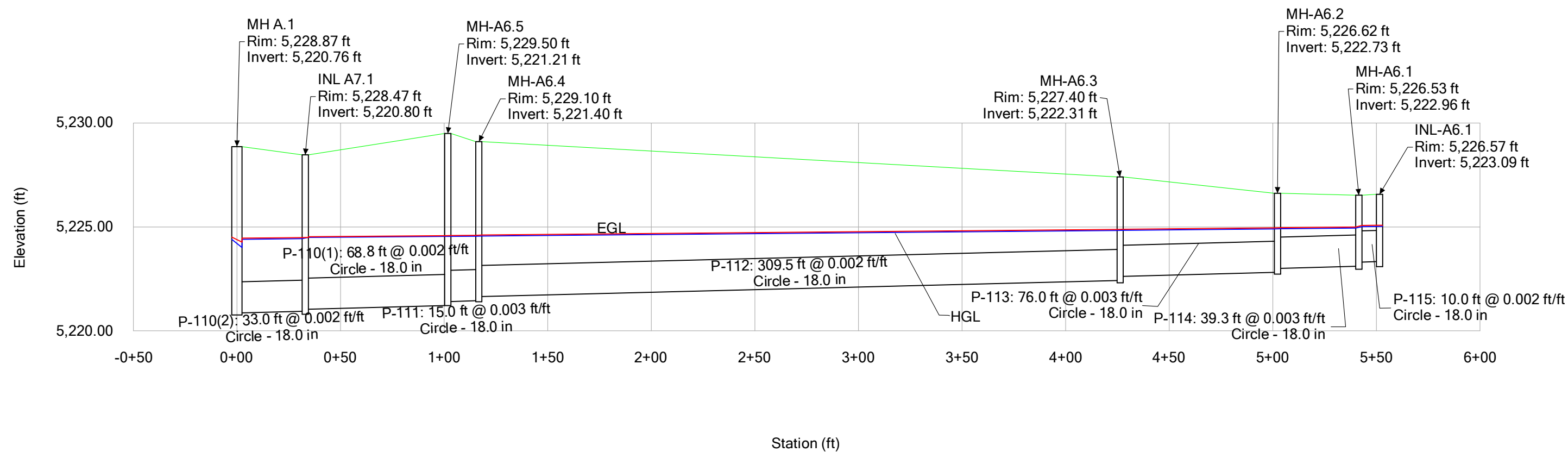
Profile Report
Engineering Profile - A5 (Reunion Center StormCAD Model ACJ.stsw)



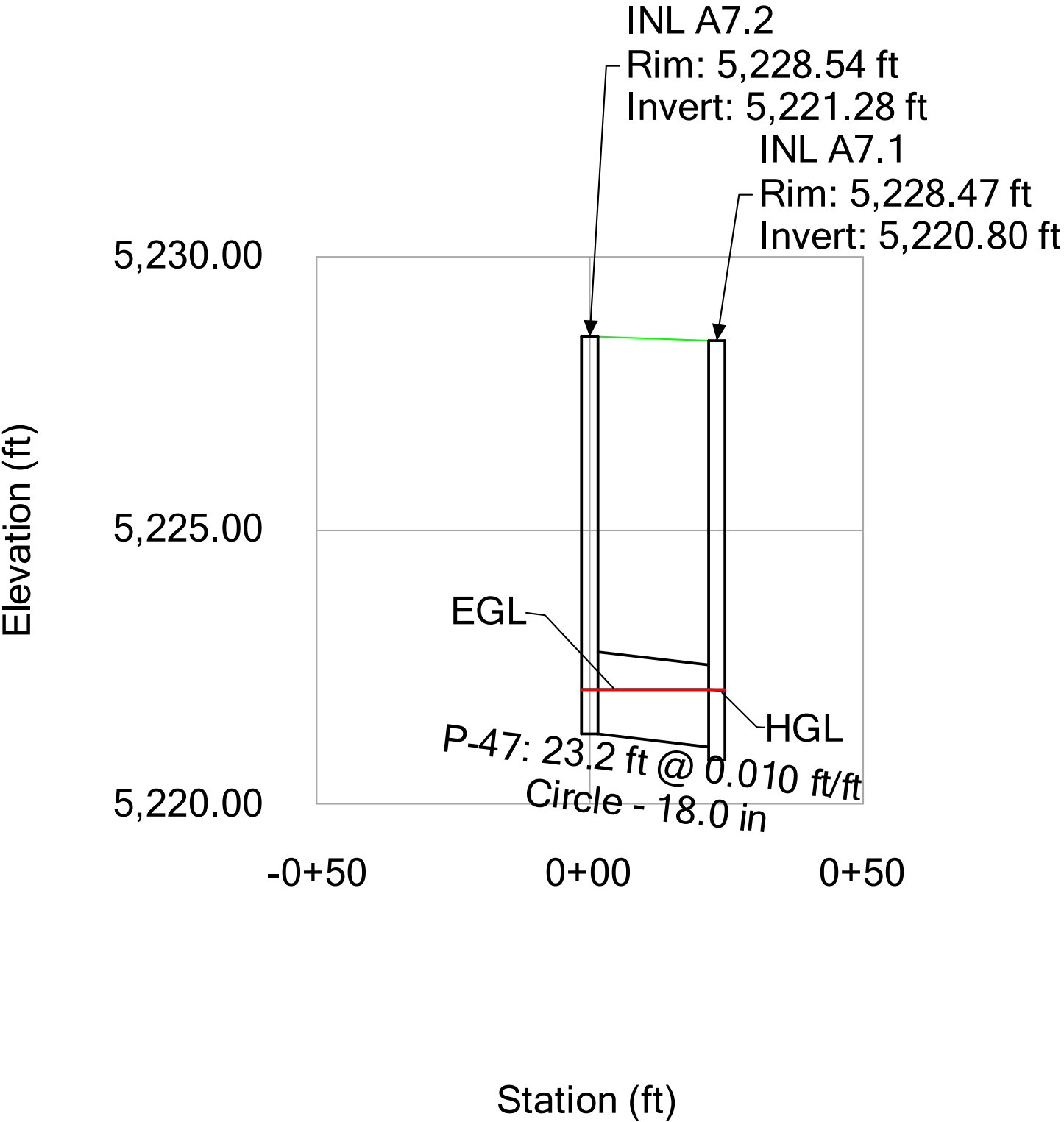
Profile Report
Engineering Profile - A6 (Reunion Center StormCAD Model ACJ.stsw)



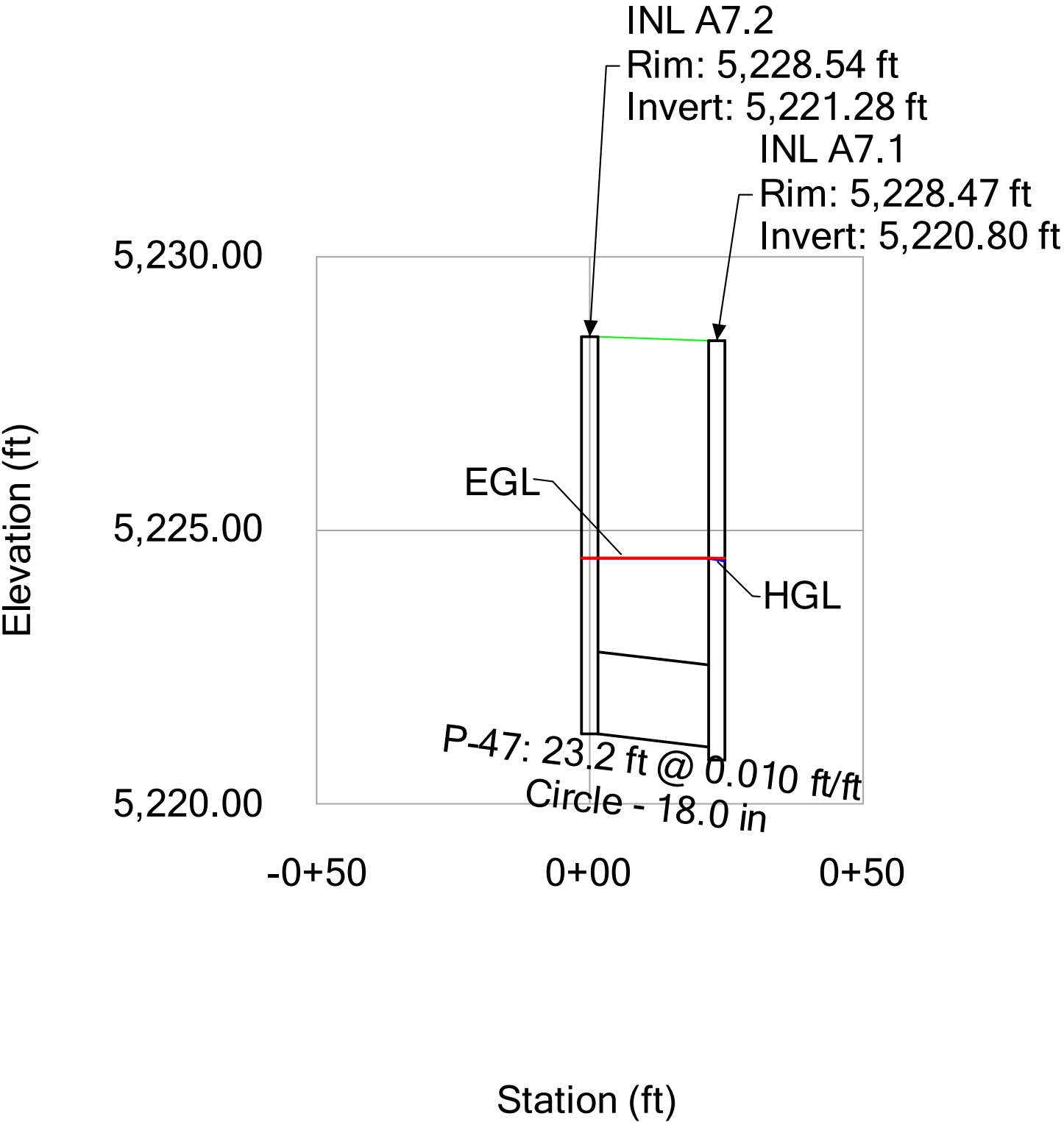
Profile Report
Engineering Profile - A6 (Reunion Center StormCAD Model ACJ.stsw)



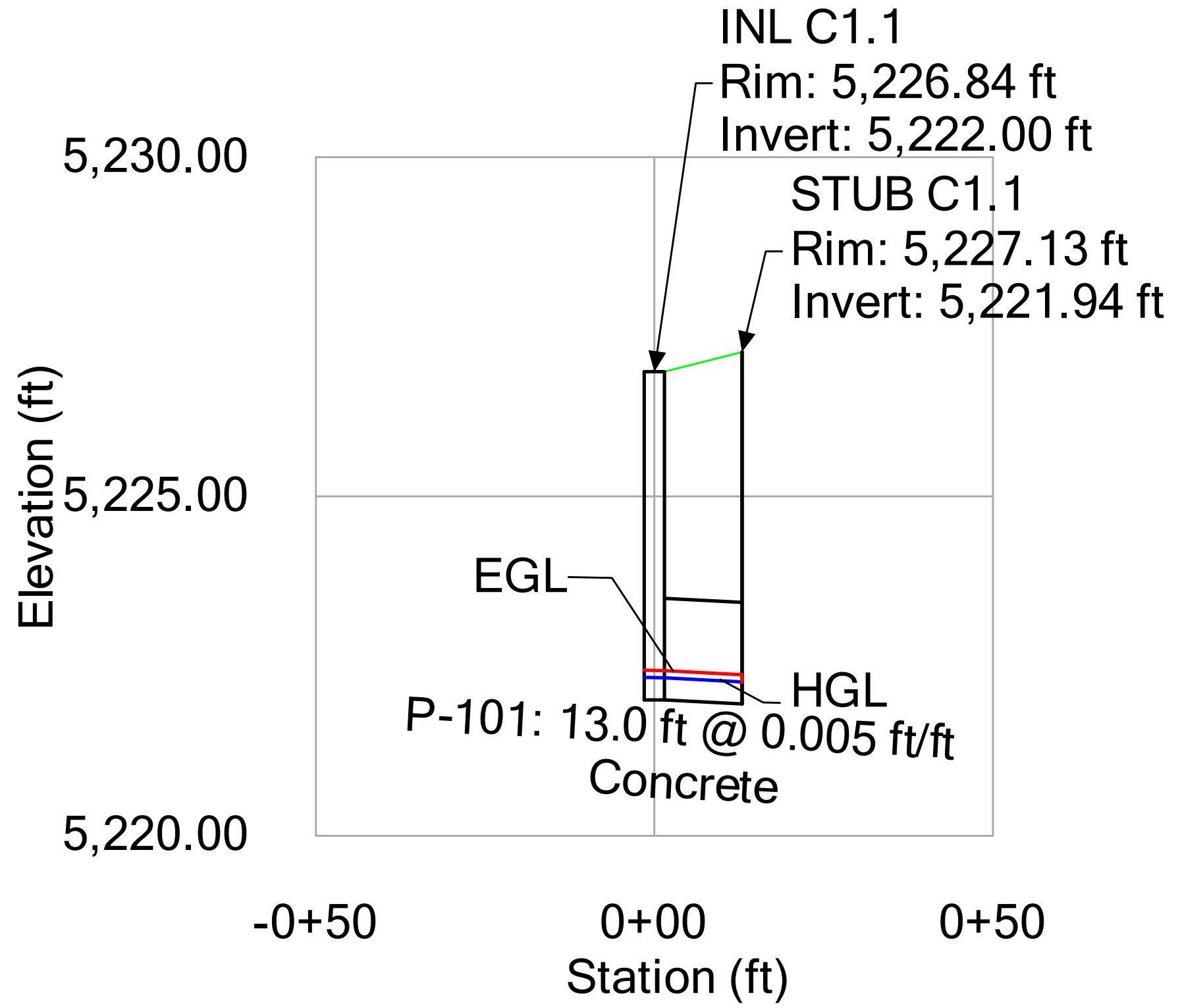
Profile Report
Engineering Profile - A7 (Reunion Center StormCAD Model ACJ.stsw)



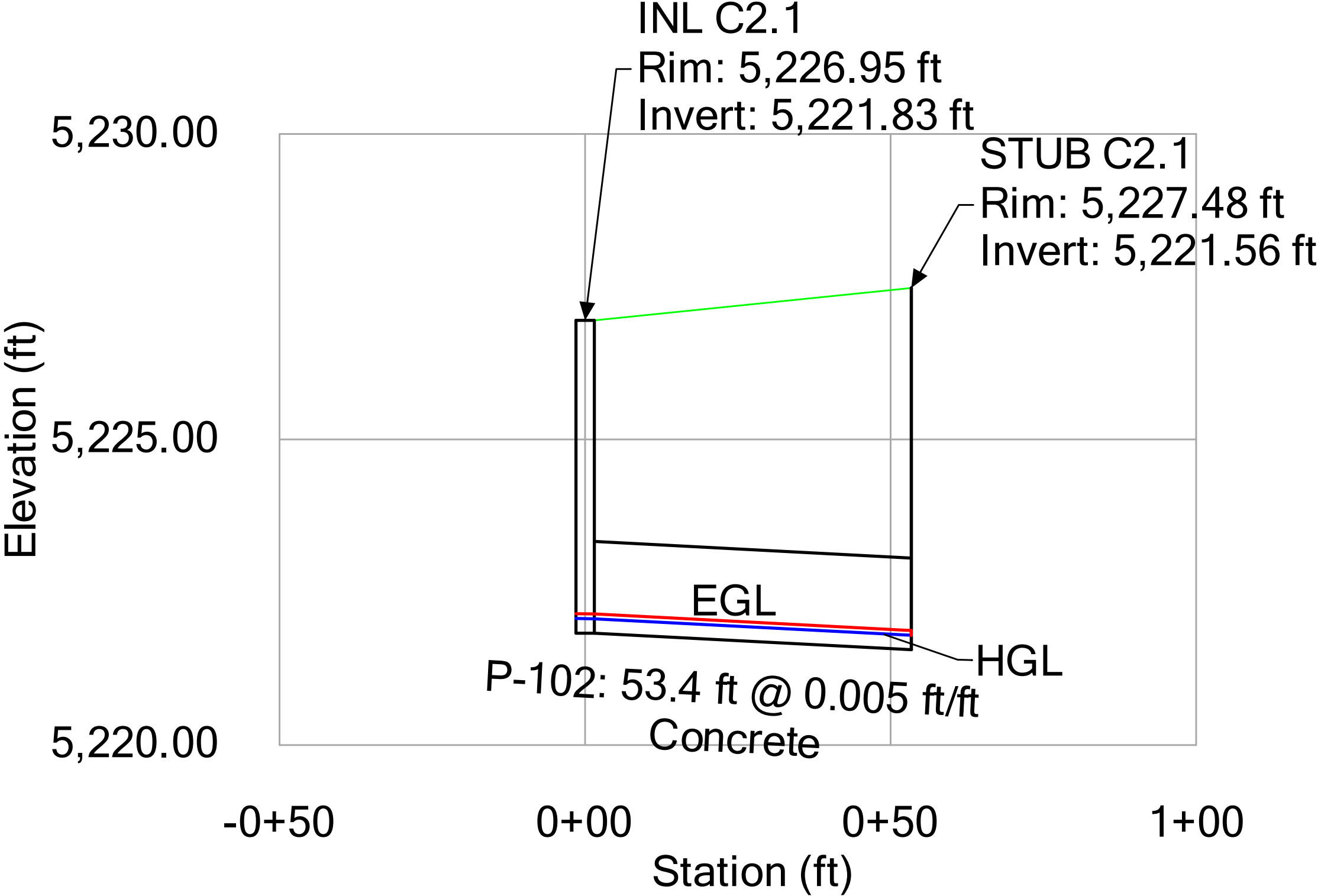
Profile Report
Engineering Profile - A7 (Reunion Center StormCAD Model ACJ.stsw)



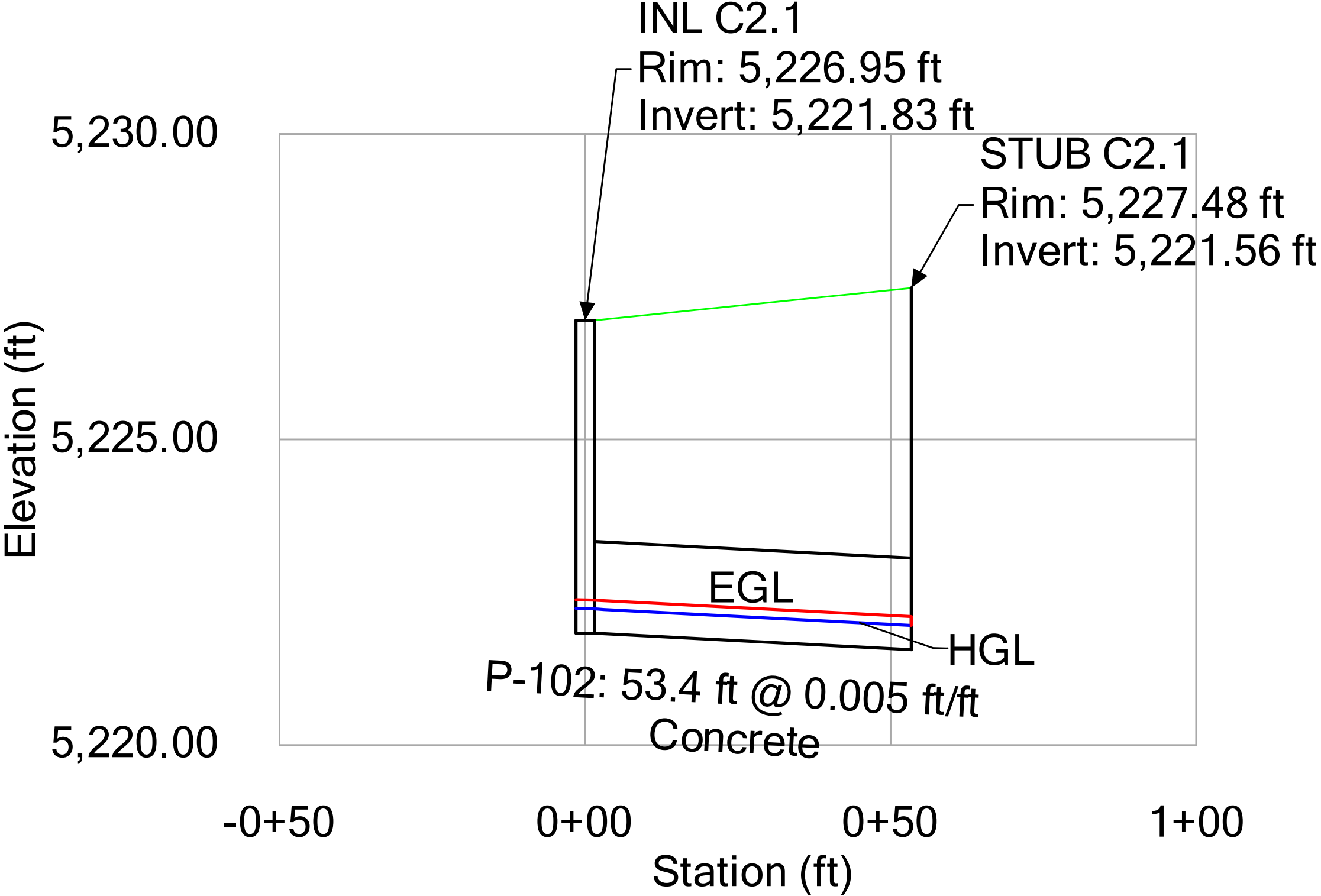
Profile Report
Engineering Profile - C1 (Reunion Center StormCAD Model ACJ.stsw)



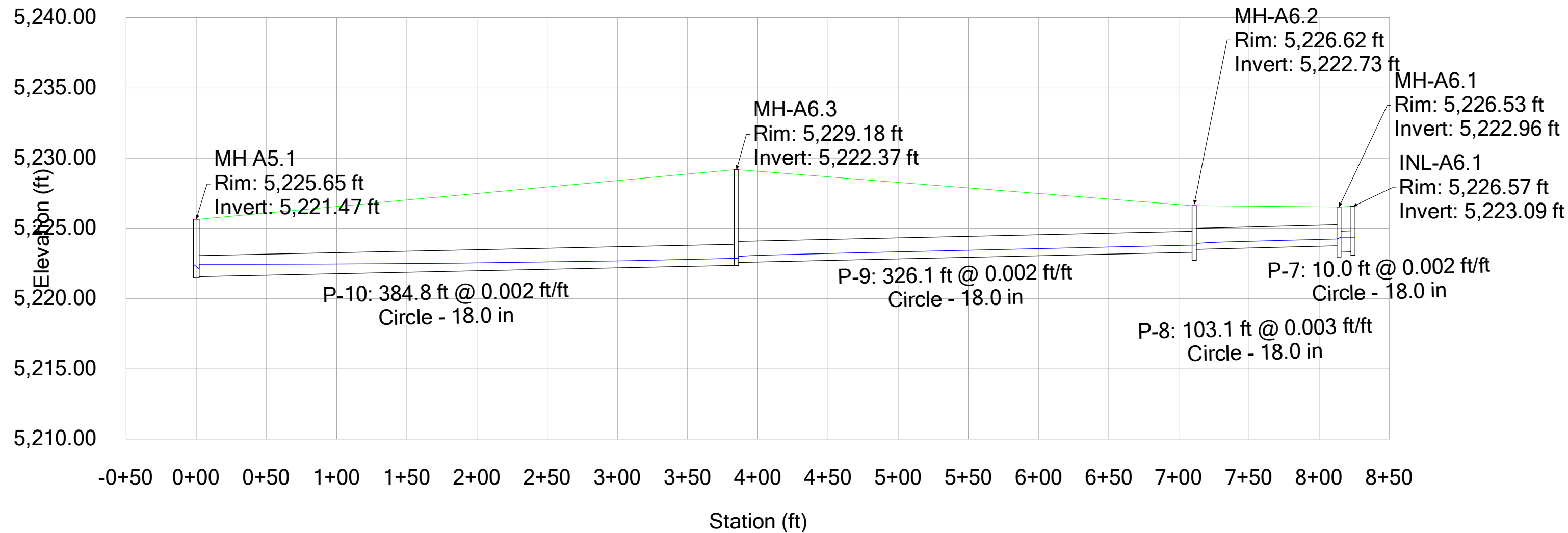
Profile Report
Engineering Profile - C2 (Reunion Center StormCAD Model ACJ.stsw)



Profile Report
Engineering Profile - C2 (Reunion Center StormCAD Model ACJ.stsw)



Profile Report
Engineering Profile - A1.1 (Reunion Center StormCAD Model MFW.stsw)



APPENDIX C

REFERENCE EXCERPTS

**AMENDMENT #2 TO
PRELIMINARY DRAINAGE REPORT
FOR
REUNION CENTER - VILLAGE 1**

November 6, 2023

Prepared For:
Reunion Metropolitan District
17910 East Parkside Drive North
Commerce City, Colorado 80022
Contact: Matt Urkoski

Prepared By:
JR ENGINEERING, LLC
7200 S Alton Way, Suite C400
Centennial, Colorado 80112
(303) 740-9393
Contact: Aaron Clutter, PE

Project No. 14421.49



NOAA Atlas 14, Volume 8, Version 2
Location name: Commerce City, Colorado, USA*
Latitude: 39.8942°, Longitude: -104.7702°
Elevation: 5209.73 ft**

* source: ESRI Maps

** source: USGS



POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Deborah Martin, Sandra Pavlovic, Ishani Roy, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Michael Yekta, Geoffrey Bonnin

NOAA, National Weather Service, Silver Spring, Maryland

[PF tabular](#) | [PF graphical](#) | [Maps & aerals](#)

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches) ¹										
Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.227 (0.178-0.290)	0.278 (0.218-0.355)	0.373 (0.292-0.478)	0.462 (0.359-0.594)	0.600 (0.458-0.817)	0.718 (0.533-0.985)	0.847 (0.607-1.19)	0.989 (0.680-1.42)	1.19 (0.789-1.76)	1.36 (0.871-2.02)
10-min	0.333 (0.261-0.424)	0.407 (0.320-0.520)	0.546 (0.427-0.699)	0.676 (0.526-0.870)	0.878 (0.671-1.20)	1.05 (0.781-1.44)	1.24 (0.889-1.74)	1.45 (0.996-2.09)	1.75 (1.16-2.58)	1.99 (1.28-2.95)
15-min	0.406 (0.319-0.517)	0.497 (0.390-0.635)	0.666 (0.521-0.853)	0.825 (0.642-1.06)	1.07 (0.818-1.46)	1.28 (0.952-1.76)	1.51 (1.09-2.12)	1.77 (1.22-2.54)	2.13 (1.41-3.15)	2.43 (1.56-3.60)
30-min	0.562 (0.442-0.718)	0.685 (0.538-0.875)	0.914 (0.718-1.14)	1.13 (0.878-1.45)	1.46 (1.12-1.99)	1.75 (1.30-2.40)	2.06 (1.51-2.81)	2.40 (1.65-3.46)	2.90 (1.92-4.28)	3.30 (2.12-4.90)
60-min	0.692 (0.544-0.884)	0.843 (0.661-1.08)	1.12 (0.878-1.44)	1.39 (1.08-1.78)	1.79 (1.37-2.44)	2.15 (1.59-2.94)	2.53 (1.81-3.55)	2.95 (2.03-4.25)	3.56 (2.36-5.26)	4.06 (2.60-6.02)
2-hr	0.823 (0.651-1.04)	1.00 (0.791-1.27)	1.33 (1.05-1.69)	1.64 (1.29-2.09)	2.13 (1.64-2.87)	2.54 (1.91-3.46)	3.00 (2.17-4.17)	3.50 (2.43-4.99)	4.22 (2.82-6.17)	4.82 (3.11-7.06)
3-hr	0.892 (0.710-1.12)	1.08 (0.860-1.36)	1.44 (1.14-1.81)	1.77 (1.39-2.24)	2.28 (1.77-3.07)	2.73 (2.05-3.69)	3.22 (2.34-4.44)	3.75 (2.62-5.31)	4.52 (3.04-6.57)	5.16 (3.35-7.51)
6-hr	1.06 (0.850-1.32)	1.27 (1.02-1.59)	1.66 (1.33-2.08)	2.03 (1.61-2.54)	2.59 (2.02-3.44)	3.08 (2.34-4.12)	3.61 (2.65-4.93)	4.19 (2.95-5.88)	5.04 (3.41-7.23)	5.72 (3.76-8.25)
12-hr	1.31 (1.06-1.62)	1.54 (1.25-1.91)	1.98 (1.59-2.45)	2.38 (1.90-2.96)	2.99 (2.35-3.92)	3.52 (2.69-4.64)	4.08 (3.02-5.51)	4.70 (3.34-6.50)	5.59 (3.82-7.92)	6.31 (4.18-8.99)
24-hr	1.57 (1.28-1.93)	1.87 (1.52-2.29)	2.38 (1.93-2.92)	2.83 (2.29-3.50)	3.51 (2.76-4.51)	4.06 (3.13-5.28)	4.65 (3.46-6.18)	5.28 (3.78-7.20)	6.17 (4.25-8.61)	6.87 (4.60-9.68)
2-day	1.81 (1.49-2.20)	2.18 (1.79-2.65)	2.79 (2.29-3.40)	3.32 (2.70-4.05)	4.06 (3.20-5.12)	4.64 (3.59-5.93)	5.24 (3.92-6.85)	5.86 (4.22-7.86)	6.71 (4.65-9.22)	7.36 (4.98-10.3)
3-day	1.98 (1.63-2.39)	2.35 (1.94-2.83)	2.97 (2.44-3.59)	3.50 (2.86-4.25)	4.25 (3.37-5.33)	4.84 (3.76-6.15)	5.45 (4.10-7.09)	6.09 (4.41-8.11)	6.96 (4.85-9.50)	7.63 (5.19-10.6)
4-day	2.11 (1.75-2.53)	2.47 (2.05-2.97)	3.09 (2.55-3.72)	3.62 (2.97-4.38)	4.37 (3.49-5.48)	4.98 (3.88-6.30)	5.60 (4.23-7.25)	6.25 (4.54-8.29)	7.14 (5.00-9.71)	7.84 (5.35-10.8)
7-day	2.40 (2.00-2.86)	2.78 (2.32-3.32)	3.43 (2.85-4.11)	3.99 (3.30-4.79)	4.78 (3.84-5.92)	5.40 (4.24-6.78)	6.04 (4.60-7.75)	6.71 (4.92-8.82)	7.62 (5.38-10.3)	8.33 (5.74-11.4)
10-day	2.65 (2.22-3.15)	3.06 (2.57-3.64)	3.75 (3.13-4.47)	4.33 (3.60-5.18)	5.15 (4.15-6.34)	5.79 (4.57-7.22)	6.45 (4.93-8.22)	7.13 (5.24-9.30)	8.04 (5.71-10.8)	8.75 (6.06-11.9)
20-day	3.39 (2.87-3.99)	3.87 (3.27-4.56)	4.65 (3.92-5.49)	5.30 (4.45-6.28)	6.20 (5.04-7.54)	6.90 (5.49-8.49)	7.60 (5.86-9.55)	8.31 (6.17-10.7)	9.25 (6.62-12.2)	9.97 (6.97-13.3)
30-day	3.99 (3.39-4.67)	4.54 (3.85-5.31)	5.42 (4.59-6.36)	6.15 (5.18-7.24)	7.14 (5.83-8.61)	7.90 (6.31-9.65)	8.65 (6.70-10.8)	9.41 (7.02-12.0)	10.4 (7.48-13.6)	11.1 (7.84-14.8)
45-day	4.71 (4.02-5.47)	5.36 (4.58-6.24)	6.42 (5.46-7.49)	7.27 (6.16-8.51)	8.42 (6.89-10.1)	9.28 (7.45-11.2)	10.1 (7.88-12.5)	11.0 (8.21-13.9)	12.0 (8.70-15.6)	12.8 (9.07-16.9)
60-day	5.29 (4.54-6.13)	6.06 (5.19-7.02)	7.28 (6.22-8.46)	8.27 (7.03-9.64)	9.57 (7.86-11.4)	10.5 (8.49-12.7)	11.5 (8.96-14.1)	12.4 (9.32-15.6)	13.6 (9.84-17.5)	14.4 (10.2-18.9)

¹ Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

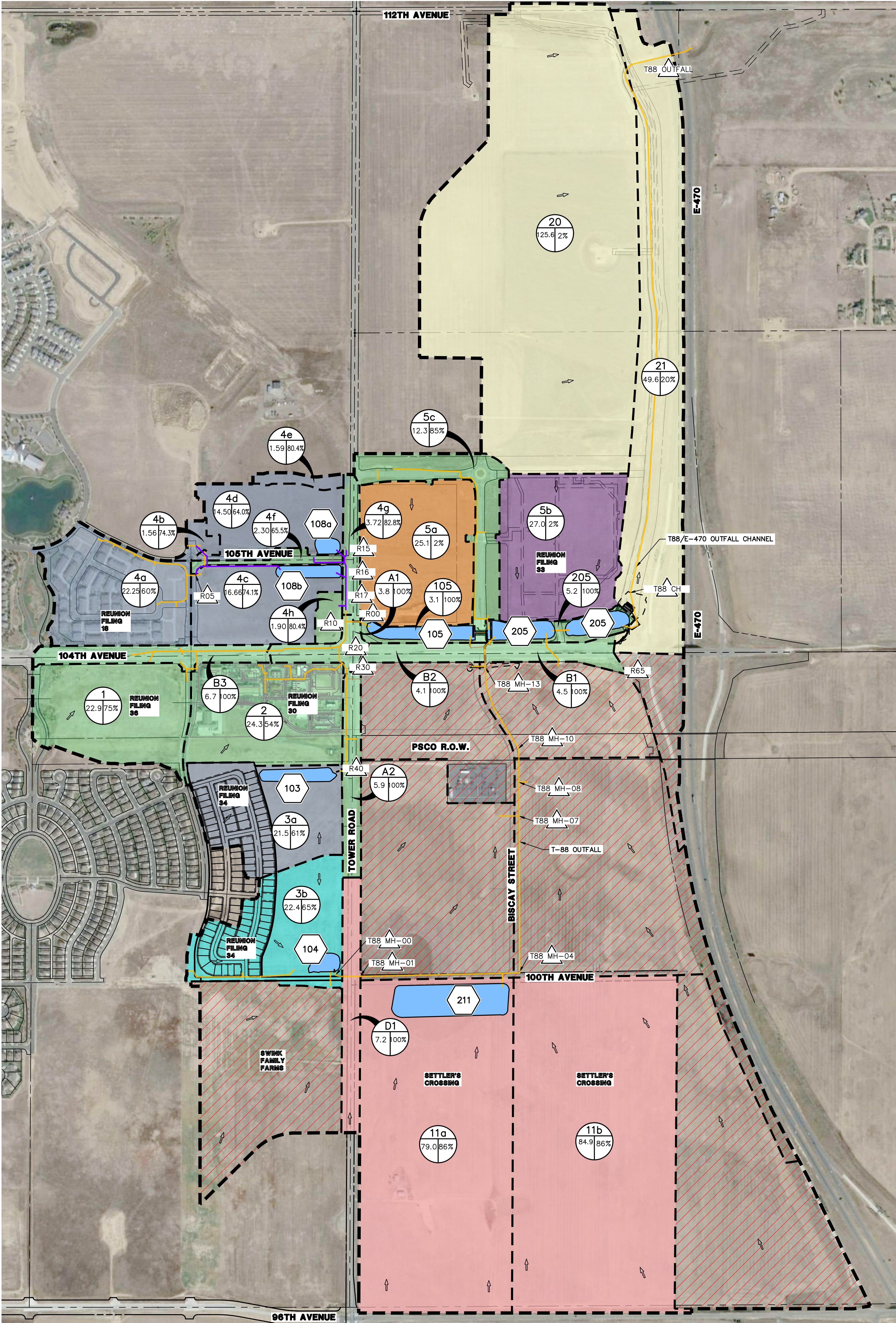
Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

[Back to Top](#)

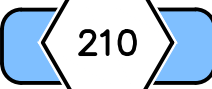
EX & PROP CONDITIONS T-88 OUTFALL DRAINAGE MAP

REUNION VILLAGE 1 PDR - AMENDMENT 2

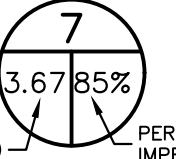


LEGEND

- REUNION DISTRICT AREAS: TRIBUTARY TO WQ POND 105
DIRECT DISCHARGE: WQ IN POND 105; EURV/100-YR IN POND 205
- REUNION DISTRICT AREAS: TRIBUTARY TO WQ POND 105
ONSITE DETENTION ONLY: WQ IN POND 105; EURV/100-YR IN POND 205
- REUNION DISTRICT AREAS: TRIBUTARY TO POND 205
ONSITE WQ; EURV/100-YR DETAINED ONSITE (WITH OVER-DETENTION)
- REUNION DISTRICT AREAS: EXISTING UNDEVELOPED AREAS TRIBUTARY TO POND 205
DIRECT DISCHARGE: EURV/100-YR IN POND 205
- REUNION DISTRICT AREAS: EXISTING UNDEVELOPED AREAS TRIBUTARY TO POND 105
DIRECT DISCHARGE: WQ IN POND 105; EURV/100-YR IN POND 205
- REUNION DISTRICT AREAS: EXISTING UNDEVELOPED AREAS TRIBUTARY TO T-88 OUTFALL CHANNEL
DIRECT DISCHARGE TO T-88 OUTFALL CHANNEL
- OFFSITE AREAS BY OTHERS: TRIBUTARY TO T88 OUTFALL
ONSITE WQ; EURV/100-YR DETAINED ONSITE (WITH OVER-DETENTION)
- OFFSITE AREAS BY OTHERS: TRIBUTARY TO T88 OUTFALL
ONSITE WQ; EURV/100-YR DETAINED ONSITE (WITH OVER-DETENTION)



WQ POND / DETENTION POND / OVER-DETENTION POND



DRAINAGE BASIN

AREA (AC) PERCENT IMPERVIOUS

DESIGN POINT

EXISTING STORM SEWER
PROPOSED STORM SEWER

Ponds 105, 205, and T88 Outfall Summary

	Pond 105	Pond 205		Design Point - T88 Outfall
	WQCV (ac-ft)	V ₁₀₀ (ac-ft)	Q ₁₀₀ (cfs)	Q ₁₀₀ (cfs)
Allowable ¹	5.289	13.20	478.35	521.90
Proposed ²	4.58	14.68	270.79	328.36

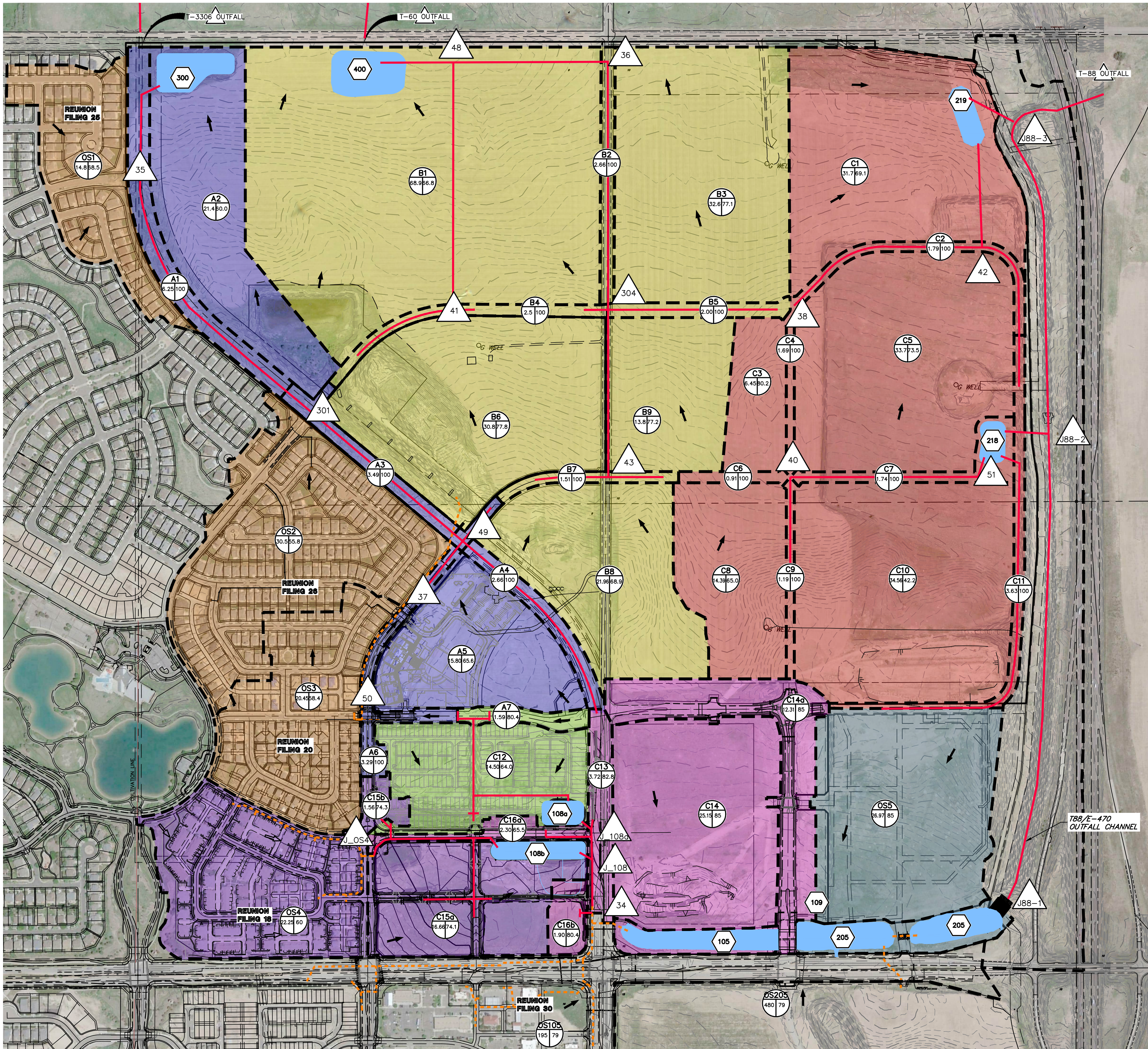
- Per the original design from the Final Drainage Report for Reunion District Infrastructure Conversion of 104th Avenue Retention Pond by JR Engineering, July 2017
- Current level of development. Future developments are excluded
- Refer to the Final Drainage Report for Reunion District Infrastructure Conversion of 104th Avenue Retention Pond report for the future pond parameters and over-detention considerations

EXISTING & PROPOSED
CONDITIONS T-88 OUTFALL
DRAINAGE MAP
REUNION VILLAGE 1 PDR - AMENDMENT 2
JOB NO. 14421.49
11/3/23
SHEET 1 OF 1

 **J-R ENGINEERING**
A Westrian Company

Centennial 303-740-9393 • Colorado Springs 719-593-2593
Fort Collins 970-491-9888 • www.jrengineering.com

REUNION VILLAGE 1
PRELIMINARY DRAINAGE REPORT - AMENDMENT #2
OVERALL DRAINAGE PLAN



SEE FINAL DRAINAGE REPORT FOR REUNION DISTRICT INFRASTRUCTURE CONVERSION OF 104TH AVENUE RETENTION POND, JR ENGINEERING, JULY 2017.

COMPOSITE % IMPERVIOUS CALCULATIONS FOR
PROPOSED DUES BASINS - REUNION VILLAGE 1
PDR AMENDMENT 2

Overall Sub-Basin ID ¹	Dues Sub-Basin ID ²	Total Area (acres) ²	Basins Total Weighted % Imp.
A7	B1	0.57	79.1%
	B2	0.55	82.4%
	B5	0.15	81.3%
	B6	0.22	78.7%
	TOTAL	1.59	80.4%
C12	B3	0.31	65.0%
	B4	0.64	69.1%
	B9	12.44	67.2%
	108a	1.11	25.0%
	TOTAL	14.50	64.0%
C13	D1-F	0.51	60.6%
	D2-F	0.41	100.0%
	D3-F	0.30	96.6%
	D4-F	0.45	67.7%
	D8-F	1.17	82.5%
C15a	D9-F	0.88	91.1%
	TOTAL	3.72	82.8%
C15b	C7	1.40	72.5%
	C8	1.95	80.0%
	C9	0.98	80.0%
	C10	0.98	80.0%
	C11	1.27	80.0%
C15a	C12	0.43	76.8%
	C13	0.43	76.2%
	C15	0.40	80.6%
	C17	0.41	79.7%
	C18	2.63	80.0%
C15b	C19	0.83	80.0%
	C24	1.37	80.0%
	C25	0.27	66.4%
	C26	0.45	80.5%
	C27	0.61	80.0%
C15a	C28	0.78	80.0%
	108b	1.48	25.0%
	TOTAL	16.66	74.1%
C15b	C1	0.37	87.3%
	C2	0.68	68.2%
	C4	0.32	73.7%
	C5	0.19	71.5%
	TOTAL	1.56	74.3%
C16a	D5	0.52	54.7%
	D6	0.47	74.8%
	D7	1.31	66.5%
	TOTAL	2.30	65.5%
C16b	D10	0.40	81.9%
	D11	1.50	80.0%
	TOTAL	1.90	80.4%

Notes:
¹ Overall Sub-Basin ID's from the Reunion Village 1 PDR - Amendment #2 Overall Drainage Plan Map
² Sub-Basin ID's and Areas from the proposed Reunion Center Dues Drainage Calc's

SUB-BASIN SUMMARY TABLE

Sub-Basin	Total Area (ac)	Composite Percent Impervious	Q _s * (cfs)	Q ₁₀₀ * (cfs)
A1	6.25	100.0%	5.32	13.42
A2	21.40	60.0%	12.22	43.47
A3	3.49	100.0%	2.25	5.82
A4	2.66	100.0%	2.50	6.24
A5	15.80	65.6%	16.01	51.23
A6	3.29	100.0%	2.78	7.01
A7	1.59	80.4%	1.48	4.12
B1	68.90	66.8%	62.62	196.84
B2	2.66	100.0%	2.20	5.55
B3	32.60	77.1%	35.24	100.08
B4	2.50	100.0%	2.52	6.22
B5	2.00	100.0%	3.30	7.84
B6	30.83	77.8%	38.44	108.50
B7	1.51	100.0%	1.67	4.08
B8	21.96	68.9%	21.00	65.44
B9	13.85	77.2%	16.20	46.33
C1	31.70	69.1%	31.94	96.28
C2	1.79	100.0%	2.06	5.02
C3	6.45	80.2%	6.87	19.22
C4	1.69	100.0%	1.88	4.60
C5	33.70	73.5%	36.80	108.99
C6	0.91	100.0%	0.89	2.20
C7	1.74	100.0%	1.27	3.24
C8	14.39	65.0%	10.96	35.49
C9	1.19	100.0%	0.84	2.15
C10	34.56	42.2%	15.67	72.65
C11	3.63	100.0%	2.52	6.49
C12	14.50	64.0%	10.90	34.54
C13	3.71	82.8%	2.80	7.81
C14	25.15	85.0%	30.95	82.44
C14a	12.31	85.0%	12.67	33.95
C15a	16.66	74.1%	17.81	52.70
C15b	1.56	74.3%	1.25	3.74
C16a	2.30	65.5%	1.02	3.51
C16b	1.90	80.4%	2.71	7.46
OS1	14.80	68.5%	16.01	48.47
OS2	30.50	55.8%	21.80	76.35
OS3	20.45	58.4%	18.37	64.85
OS4	22.25	60.0%	14.81	52.02
OS5	26.97	85.0%	36.08	96.17

Summary of Outfall Discharges
and Pond Discharges

Hydrograph Routing ¹			
Outfall	Q _s (cfs)	Q ₁₀₀ (cfs)	Max Q ₁₀₀ ² (cfs)
T-3306	1.74	63.30	63.31
T-60	7.42	85.27	87.62
Junction 108	27.62	48.91	---
Junction 34	28.67	51.47	75.26
¹ EPA SWMM 5.1 ² From previously approved studies, max allowable			
Pond Release Rate ¹			
Pond	Q _s (cfs)	Q ₁₀₀ (cfs)	Max Q ₁₀₀ ² (cfs)
Pond 105	184.40	266.78	537.70
Pond 108a	5.15	8.12	Pond 108 Max Q ₁₀₀ ² 52.14
Pond 108b	19.48	32.92	---
Pond OS 109	19.24	90.78	111.13
Pond 205	407.07	506.76	478.35
Pond 218	0.82	27.61	30.00
Pond 219	14.16	17.15	17.50
Pond 300	1.74	63.30	63.31
Pond 400	7.42	85.27	87.62
¹ EPA SWMM 5.1 ² From previously approved studies, max allowable			

Maximum Release Rates (cfs)	
Pond	Over-Detention*
205	478.35
218	30.0
219	17.5
(220)	(47.5)

* Over-Detention required for the T-88 North Basin per the Final Drainage Report for Reunion District Infrastructure Conversion of 104th Avenue Retention Pond by JR Engineering, July 31, 2017. Over-Detention in Pond 220 (release rate of 47.5 cfs) has been prorated among the two proposed Ponds 218 and 219.

LEGEND

- REUNION AREAS TRIBUTARY TO T88 OUTFALL.**
- REUNION DISTRICT AREAS: TRIBUTARY TO WQ POND 105
DIRECT DISCHARGE: WQ IN POND 105; EURV/100-YR IN POND 205
 - REUNION DISTRICT AREAS: TRIBUTARY TO WQ POND 105
PEAK ATTENUATION PROVIDED IN DETENTION POND 108a: WQ IN POND 105; EURV/100-YR IN POND 205
 - REUNION DISTRICT AREAS: TRIBUTARY TO WQ POND 105
PEAK ATTENUATION PROVIDED IN DETENTION POND 108b: WQ IN POND 105; EURV/100-YR IN POND 205
 - REUNION DISTRICT AREAS: TRIBUTARY TO T88 OUTFALL
ONSITE WQ; EURV/100-YR DETAINED ONSITE (WITH OVER-DETENTION)
 - OFFSITE AREAS: TRIBUTARY TO T88 OUTFALL
ROUTED THROUGH POND 105 AND/OR 205. SEE FINAL DRAINAGE REPORT REUNION DISTRICT INFRASTRUCTURE CONVERSION OF 104TH AVENUE RETENTION POND, JR ENGINEERING, JULY 2017.
- REUNION AREAS TRIBUTARY TO T-3306 OUTFALL.**
- REUNION DISTRICT AREAS: TRIBUTARY TO T-3306 OUTFALL
REGIONAL WQ/EURV/100-YR
 - REUNION DISTRICT AREAS (EXISTING FILINGS): TRIBUTARY TO T-3306 OUTFALL
REGIONAL WQ/EURV/100-YR
- REUNION AREAS TRIBUTARY TO T60 OUTFALL.**
- REUNION DISTRICT AREAS: TRIBUTARY TO T60 OUTFALL
SUB-REGIONAL WQ/EURV/100-YR
- WQ POND / DETENTION POND / OVER-DETENTION POND**
- 210
 - A1 6.25/100
- DRAINAGE BASIN**
- AREA (AC)
 - PERCENT IMPERVIOUS
- DESIGN POINT**
- 350
- DRAINAGE BASIN**
- PROPOSED/FUTURE STORM SEWER
 - EXISTING STORM SEWER
 - DRAINAGE ARROW

NOTE:

THIS PROPOSED DRAINAGE/LAND USE MAP HAS BEEN PREPARED TO SUMMARIZE THE ASSUMED FULL BUILD-OUT CONDITIONS FOR THIS MASTER DRAINAGE REPORT AND SHOULD NOT BE CONSTRUED AS A PLANNING DOCUMENT. THE LAND USES SHOWN HEREIN ARE SUBJECT TO CHANGE.

THE FUTURE STORMWATER DETENTION FACILITIES IN THE T-88 BASIN SHALL BE HELD TO THE OVER-DETENTION RELEASE RATES ESTABLISHED IN THE FINAL DRAINAGE REPORT FOR REUNION DISTRICT INFRASTRUCTURE CONVERSION OF 104TH AVENUE RETENTION POND (JR ENGINEERING, JULY 2017) (Q₁₀₀, PEAK: 50% OF HISTORIC DISCHARGE).



300 150 0 300 600
ORIGINAL SCALE: 1" = 300'

OVERALL DRAINAGE MAP
REUNION VILLAGE 1
PRELIMINARY DRAINAGE REPORT
AMENDMENT #2
JOB NO. 14421.49
11/3/2023
SHEET 1 OF 1

J-R ENGINEERING
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Fort Collins 970-491-9888 • www.jrengineering.com

Subdivision: Reunion
Project Name: Reunion Village 1 PDR - Amendment 2
Project No.: 14421.49
Calculated By: AHC
Date: 11/1/2023

The WQCV is relatively constant across the metropolitan Denver area, and is set at 0.60 inches.
For SWMM Routing, assume the WQCV total precipitation depth occurs over a period of one hour per UDFCD Vol 3.
 $WQCV = (0.91)^3 - 1.19I^2 + 0.78$

Water Quality Capture Volume Calculation - Pond 105

	Basin	Acreage (ac)	Percent Impervious	WQCV (in)	WQCV (ac-ft)
Pond 105 Tributary Area	1	22.93	75.0%	0.300	0.572
	2	24.26	54.5%	0.219	0.443
	3a	21.55	60.6%	0.238	0.428
	4a	22.80	73.8%	0.293	0.557
	4b	16.52	65.7%	0.257	0.354
	4c	17.93	66.2%	0.259	0.387
	4d	7.97	65.9%	0.258	0.171
	5a	25.15	2.0%	0.015	0.032
	5c	12.31	96.0%	0.457	0.469
	A1	3.76	100.0%	0.500	0.157
	A2	5.91	100.0%	0.500	0.246
	B1	4.50	100.0%	0.500	0.188
	B2	4.05	100.0%	0.500	0.169
	B3	6.67	100.0%	0.500	0.278
	105	3.12	100.0%	0.500	0.130
	TOTAL	199.43	64.50%	0.276	4.580
Pond 105 Original Design		195.67	79.36%	0.324	5.289

Total WQCV in Pond 105 (ac-ft) based on Amendment 2 land use and drainage patterns.

From Final Drainage Report for Reunion District Infrastructure - Conversion of 104th Avenue Retention Pond; July 31 2017

Legend:

Direct Discharge: WQCV in Pond 105

Onsite Detention for Peak Attenuation Only: WQCV provided in Pond 105

Pond 105 As-Built WQCV: 5.92 ac-ft
Remaining WQCV: 1.340 ac-ft

Based on the Spillway Elev from Approved Pond 105 Pond Certification Letter; December 6, 2018. Field Surveyed June 19, 2018

AS-BUILT POND 105 VOLUME CALCULATIONS

Subdivision: Reunion
Location: Commerce City

Project Name: Reunion Village 1 PDR - Amendment 2

Project No.: 14421.49

By: AHC

Checked By: _____

Date: 11/1/23

Volume=1/3 x Depth x (A+B+(A*B)^0.5)

A - Upper Surface

B - Lower Surface

As-Built Pond 105 - Volume Check

Stage	Stage Elevation	Stage Surface Area (square feet)	Stage Volume (cubic feet)	Cumulative Volume (cubic feet)	Cumulative Volume (acre feet)
0.00	5205.10	187	0	0	0.00
0.90	5206.00	2,790	1,110	1,110	0.03
1.90	5207.00	10,101	6,067	7,177	0.16
2.90	5208.00	21,002	15,223	22,400	0.51
3.90	5209.00	33,725	27,114	49,514	1.14
4.90	5210.00	43,172	38,351	87,865	2.02
5.90	5211.00	52,978	47,991	135,856	3.12
6.90	5212.00	62,903	57,870	193,726	4.45
7.65	5212.75	110,443	64,174	257,900	5.92

As-Built Spillway Elevation = 5212.75

	Volume (acre feet)	Water Surface Elevation	Stage (ft)
Original Design Water Quality	5.289	5212.43	7.33
As-Built Water Quality	5.92	5212.76	7.66
Amendment 2 Design Water Quality	4.58	5212.07	6.97

(from Final Drainage Report for Reunion District Infrastructure - Conversion of 104th Avenue Retention Pond; July 31 2017)

(based on the Spillway Elev from Approved Pond 105 Pond Certification Letter; December 6, 2018. Field Surveyed June 19, 2018)

(based on the Amendment 2 drainage basin updates contributing flows to WQ Pond 105. Amend. 2 Design WQCV = 4.58 ac-ft)



E. 104TH AVENUE WATER QUALITY POND

E-470 & E. 104TH AVENUE REGIONAL DETENTION POND CITY OF COMMERCE CITY, COUNTY OF ADAMS, STATE OF COLORADO PUBLIC IMPROVEMENT CONSTRUCTION PLANS REUNION METROPOLITAN DISTRICT

FROM: AMENDMENT #2 TO PRELIMINARY
DRAINAGE REPORT FOR REUNION
CENTER - VILLAGE 1,
JR ENGINEERING, NOVEMBER 6, 2023

KEY CONTACTS

OWNER
REUNION METROPOLITAN DISTRICT
17910 E. PARKSIDE DRIVE NORTH
COMMERCE CITY, CO 80022
ATTN: DENISE DENSLOW 303-288-5431

CITY
CITY OF COMMERCE CITY, ENGINEERING
8602 ROSEMARY STREET
COMMERCE CITY, CO 80022-5053
ATTN: MARIA D'ANDREA, PE 303-289-8156

CIVIL ENGINEER
JR ENGINEERING
7200 SOUTH ALTON WAY, SUITE C400
CENTENNIAL, CO 80112
ATTN: AARON CLUTTER, PE 303-740-9393

ELECTRIC UTILITY
UNITED POWER, INC.
500 COOPERATIVE WAY
BRIGHTON, CO 80603
ATTN: RANDY REESE 303-659-0551

GAS UTILITIES
XCEL ENERGY GAS DISTRIBUTION
1123 WEST 3RD AVENUE
DENVER, CO 80223
ATTN: TAMMY WRAY 303-425-3994

SANITARY SEWER & WATER AUTHORITIES
SOUTH ADAMS COUNTY WATER & SANITATION DISTRICT
10200 E 102ND AVENUE
HENDERSON, CO 80640
ATTN: ABEL MORENO 720-206-0590

TELECOMMUNICATION UTILITIES
CENTURY LINK
5325 ZUNI STREET, #728
DENVER, CO 80221
ATTN: MARK IVERSON 303-458-2048

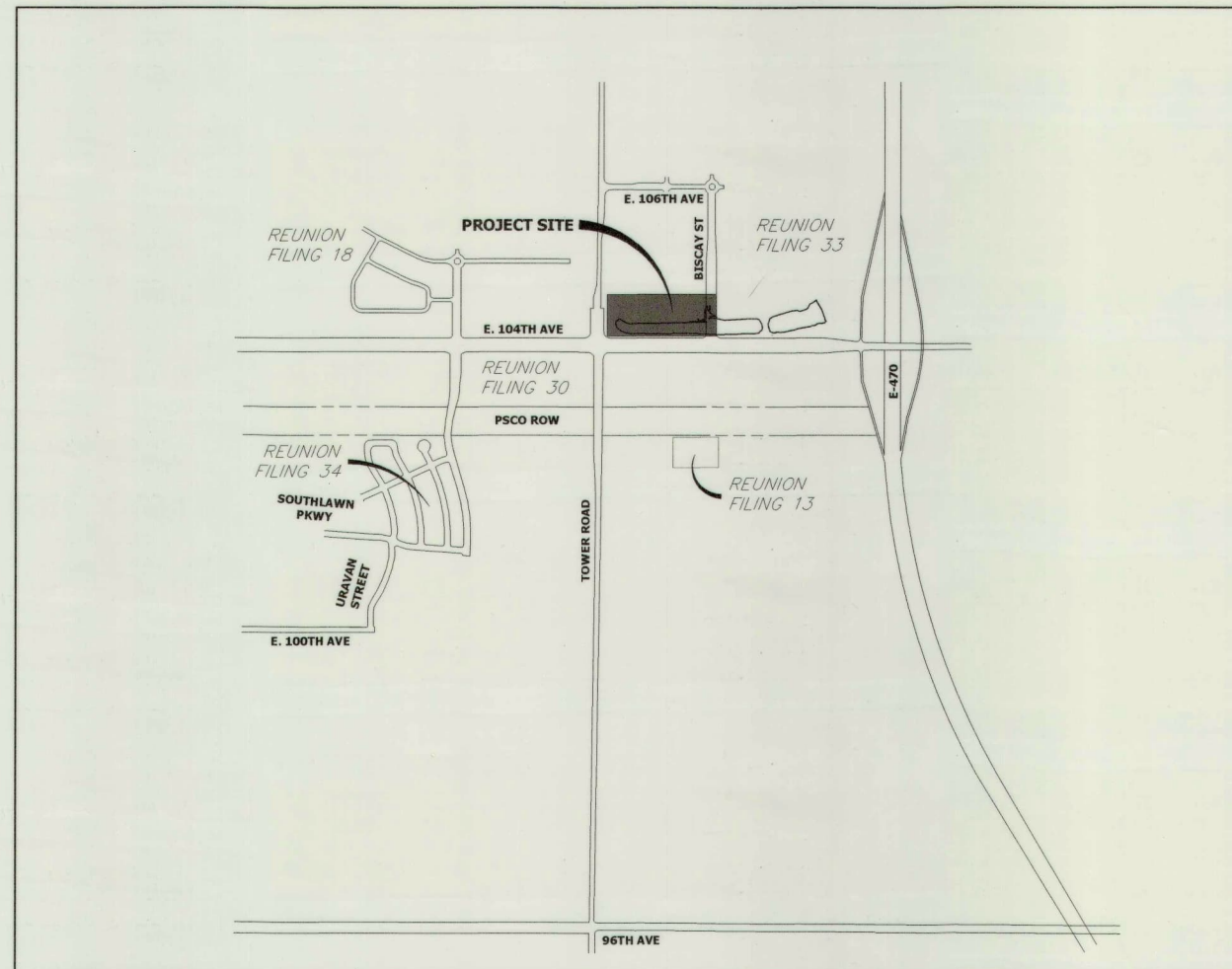
COMCAST
8490 NORTH UMATILLA STREET
FEDERAL HEIGHTS, CO 80260
ATTN: GLEN NELSON 303-603-6745

FIRE DISTRICT
SOUTH ADAMS FIRE PROTECTION DISTRICT
6550 EAST 72ND AVENUE
COMMERCE CITY, CO 80022-2006
ATTN: KEVIN VINCEL 303-288-4179

GEOTECHNICAL ENGINEER
CTL THOMPSON MATERIALS ENGINEERS INC.
22 LIPAN STREET
DENVER, CO 80223
ATTN: ZACHORIAN BALLARD 303-825-0777

BENCHMARK & HORIZONTAL DATUM

PROJECT COORDINATES ARE MODIFIED COLORADO STATE PLANE, NORTH ZONE NAD83 (2011) COORDINATES. THE COMBINED ELEVATION/SCALE FACTOR USED TO MODIFY THE COORDINATES FROM STATE PLANE TO THE PROJECT COORDINATES IS 1.000273080. THE RESULTING PROJECT COORDINATES ARE TRUNCATED BY 1,000,000 IN THE NORTHING AND 3,000,000 IN THE EASTING.
PROJECT COORDINATE NORTHING US SURVEY FEET = (STATE PLANE NORTHING * 1.000273080) * (3937/1200) - 1,000,000
PROJECT COORDINATE EASTING US SURVEY FEET = (STATE PLANE EASTING * 1.000273080) * (3937/1200) - 3,000,000
PROJECT ELEVATIONS ARE BASED ON NGS MONUMENT DVXJ WITH A NAVD88 ELEVATION OF 5425.25 FT.



PROJECT LOCATION MAP
SCALE: N.T.S.

SHEET INDEX

1	- COVER SHEET
2	- GENERAL NOTES
3	- LEGEND
4	- OVERALL EARTHWORK PLAN
5	- DEMOLITION PLAN
6-7	- WATER QUALITY POND PLAN (AB)
8-10	- POND SECTIONS
11-12	- STORM SEWER PLAN AND PROFILE (AB)
13-15	- SPILLWAY PLAN AND PROFILE (AB)
16-18	- OUTLET STRUCTURE DETAILS (AB)
19-22	- FOREBAY AND IMPACT BASIN DETAILS (AB)
23-29	- GESC PLANS
30-33	- SITE DETAILS



Know what's below.
Call before you dig.

NOTE:
(AB) - INDICATES AS BUILT CONDITION
AS CONSTRUCTED
11/2018

CERTIFICATION STATEMENT

I HEREBY CERTIFY THAT THE PUBLIC IMPROVEMENTS FOR E. 104TH AVENUE WATER QUALITY POND HAVE BEEN CONSTRUCTED IN SUBSTANTIAL COMPLIANCE WITH THE CONSTRUCTION PLANS APPROVED BY THE CITY OF COMMERCE CITY.

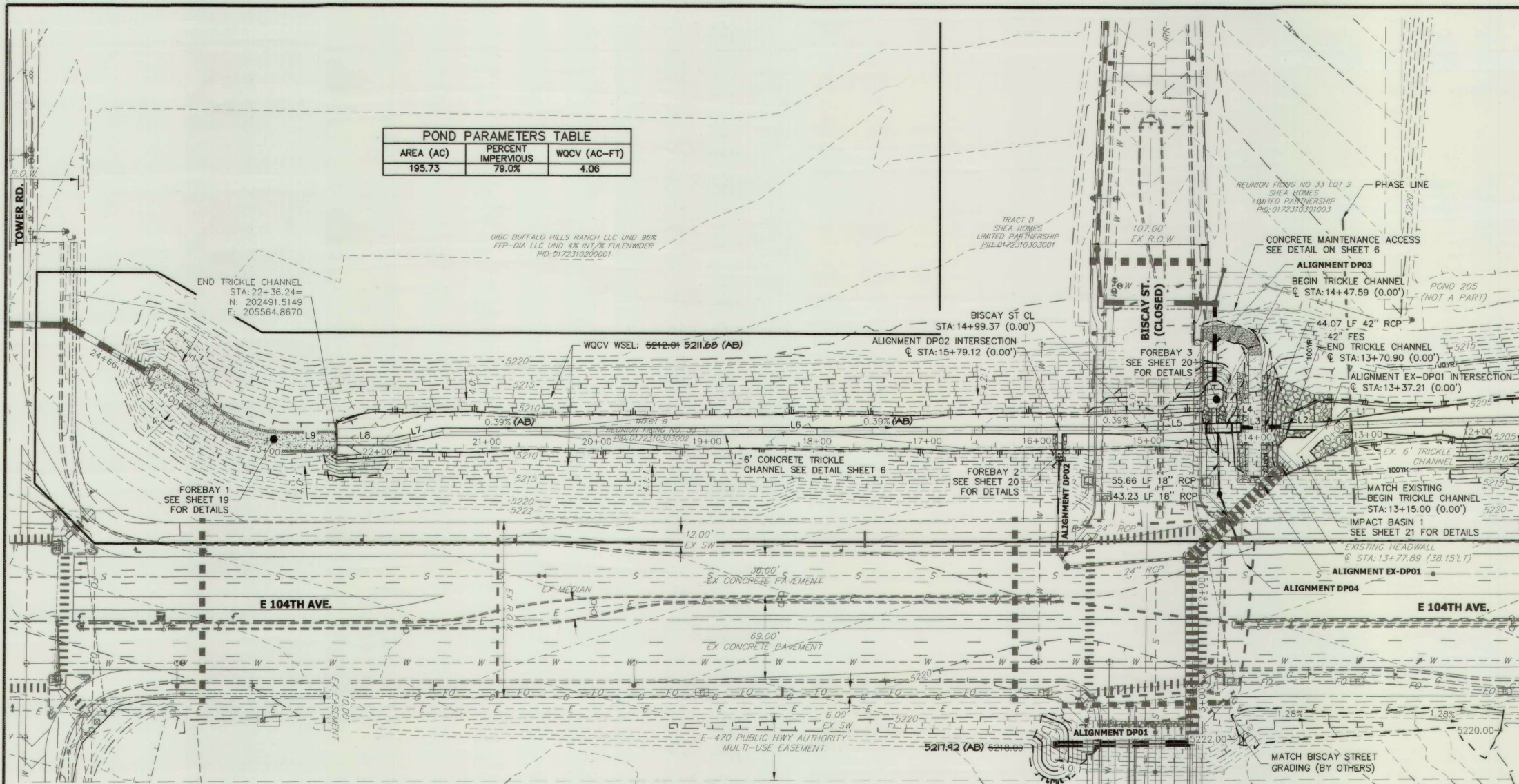
Aaron Lee Clutter
AARON LEE CLUTTER, P.E.
COLORADO NO. 36742
FOR AND ON BEHALF OF JR ENGINEERING, LLC.

DATE
12/5/18

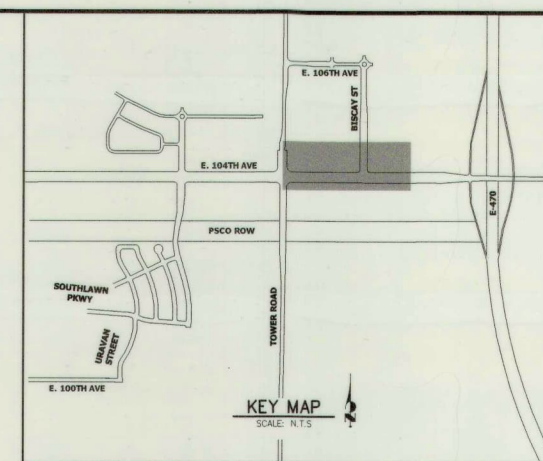
JR ENGINEERING
A Westrian Company

7200 S. Alton Way, Suite C100 • Centennial, CO 80112
303-740-9393 • Fax: 303-721-9019 • www.jrengineering.com

COVER SHEET
E. 104TH AVENUE WATER QUALITY POND
JOB NO. 14421.32
11/7/17
SHEET 1 OF 33



POND PARAMETERS TABLE		
AREA (AC)	PERCENT IMPERVIOUS	WQCV (AC-FT)
195.73	79.0%	4.06

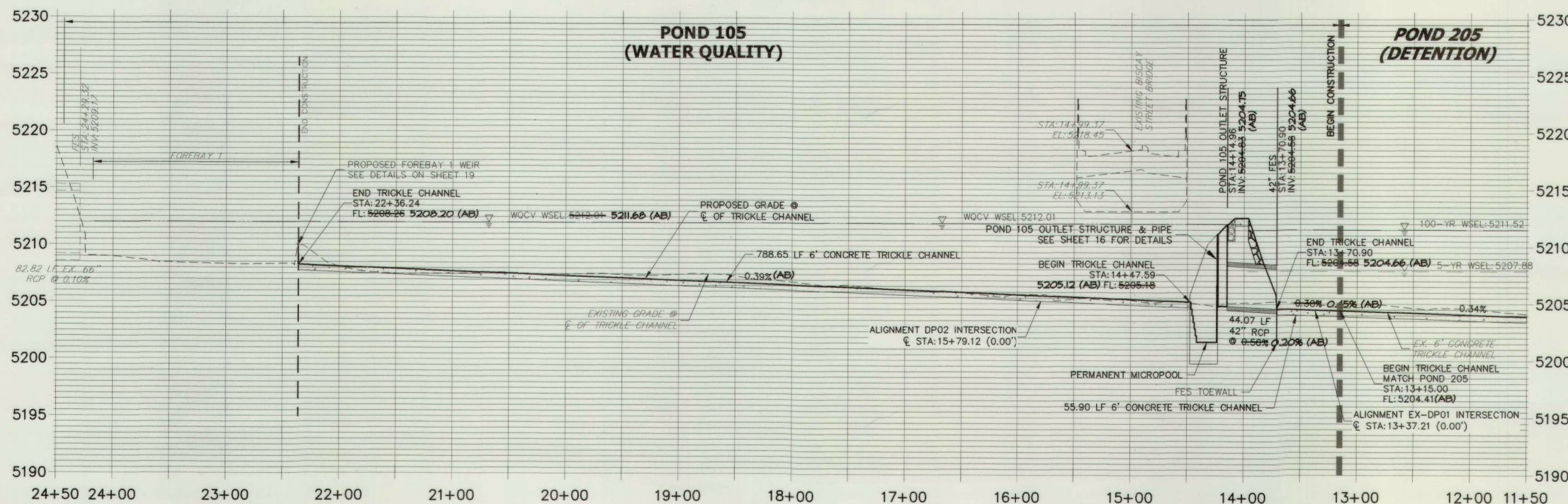


BENCHMARK & HORIZONTAL DATUM

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LINE TABLE		
LINE	BEARING	DISTANCE
L1	S88°52'01"W	30.76'
L2	S88°54'32"W	25.14'
L3	S88°57'46"W	44.07'
L4	S88°22'50"W	32.62'
L5	S87°52'23"W	50.58'
L6	S89°43'04"W	642.60'
L7	S78°18'33"W	44.69'
L8	S89°59'07"W	51.62'
L9	S89°42'21"W	46.81'

E. 104TH AVENUE POND CL PROFILE - 2 STA 11+50.00 TO 24+50.00



NOTE:
(AB) - INDICATES AS BUILT CONDITION
AS CONSTRUCTED
11/2018



Know what's below.
Call before you dig.

CERTIFICATION STATEMENT

I HEREBY CERTIFY THAT THE PUBLIC IMPROVEMENTS FOR E. 104TH AVENUE WATER QUALITY POND HAVE BEEN CONSTRUCTED IN SUBSTANTIAL COMPLIANCE WITH THE CONSTRUCTION PLANS APPROVED BY THE CITY OF COMMERCE CITY.



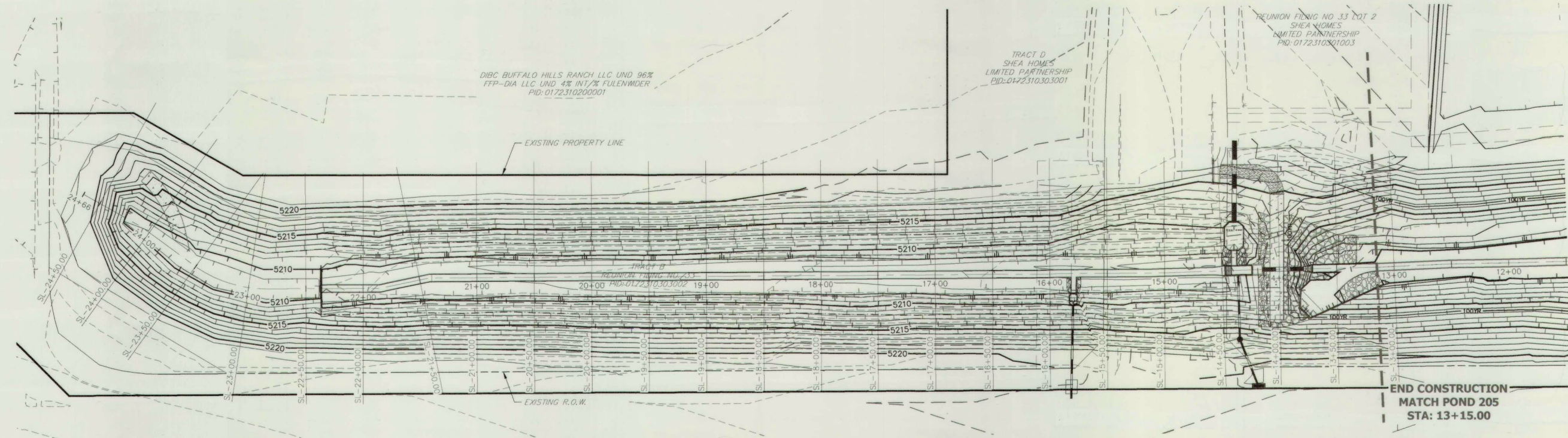
AARON LEE CLUTTER, P.E.
COLORADO NO. 36742
FOR AND ON BEHALF OF JR ENGINEERING, LLC.

UNTIL SUCH TIME AS THESE DRAWINGS ARE APPROVED BY THE APPROPRIATE REVIEWING AGENCIES, OR ENGINEERING APPROVES THEIR USE FOR ANY PURPOSES DESIGNATED BY WRITTEN AUTHORIZATION.

PREPARED FOR
REUNION METROPOLITAN DISTRICT
17910 E PARKSIDE DRIVE NORTH
COMMERCE CITY, CO 80022
ATTN: LIZ ALEXANDER
(303)-288-5431

JR ENGINEERING
A Western Company
Central 303-740-9333 • Colorado Springs 719-539-2563
Fort Collins 970-491-9888 • www.jrengineering.com

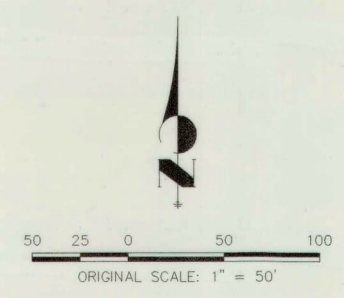
No.	REVISION	BY	DATE	H-SCALE	V-SCALE	DATE	DESIGNED BY	DRAWN BY	CHECKED BY
1	AS-BUILT RECORD DRAWINGS	NAS	11/15/18	1"=60'	1"=6'	11/7/17	AAM	AAM	



- LEGEND**
- EXISTING INTERMEDIATE CONTOUR
 - EXISTING INDEX CONTOUR
 - AS-BUILT INTERMEDIATE CONTOUR
 - AS-BUILT INDEX CONTOUR

NOTE:
(AB) - INDICATES AS BUILT CONDITION
AS CONSTRUCTED
11/2018

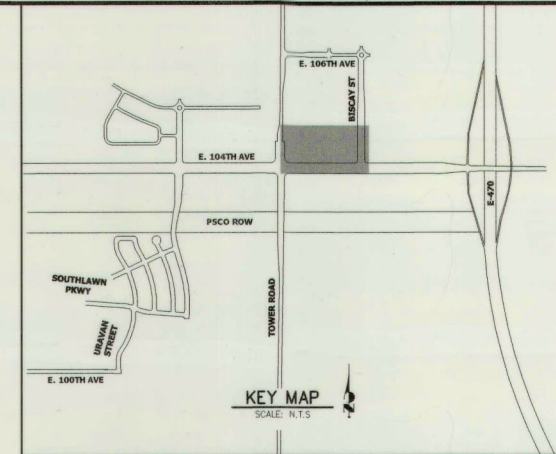
- NOTES:**
- SEE SHEETS 9 & 10 FOR POND SECTIONS



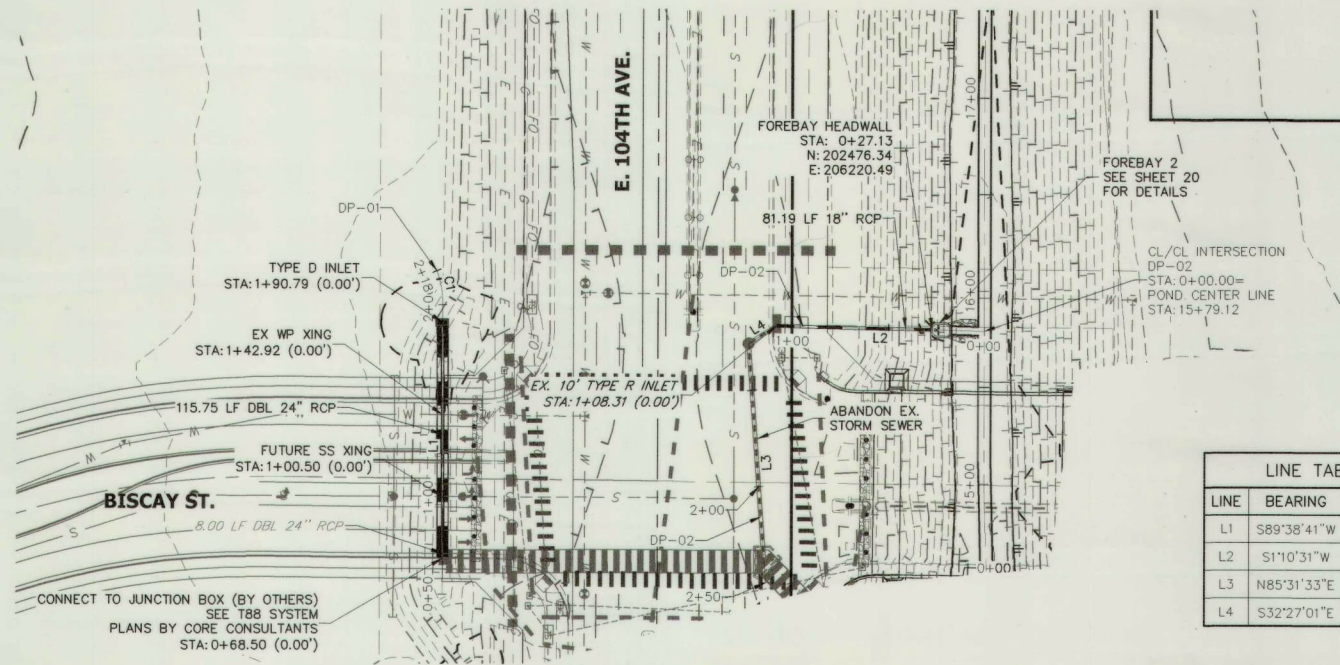
CERTIFICATION STATEMENT

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Aaron L Clutter
AARON LEE CLUTTER, P.E.
COLORADO NO. 36742
FOR AND ON BEHALF OF JR ENGINEERING, LLC.
DATE 12/5/18

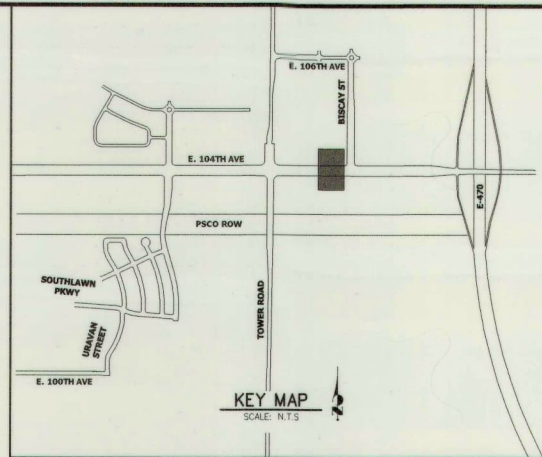


UNTIL SUCH TIME AS THESE DRAWINGS ARE APPROVED BY THE AGENCIES, JR ENGINEERING APPROVES THEIR USE FOR THE PROJECTS DESIGNATED BY WRITTEN AUTHORIZATION.	
PREPARED FOR REUNION METROPOLITAN DISTRICT 17910 E PARKSIDE DRIVE NORTH COMMERCE CITY, CO 80022 ATTN: LIZ ALEXANDER (303)-288-5431	
J.R. ENGINEERING A Western Company Central 303-740-9999 • Colorado Springs 719-593-2593 Fort Collins 970-491-9999 • www.jrengineering.com	
BY	DATE
NAS	11/15/18
No. REVISION	
1	AS-BUILT RECORD DRAWINGS
H-SCALE	1"=50'
V-SCALE	N/A
DATE	11/7/17
DESIGNED BY	TAB
DRAWN BY	AAM
CHECKED BY	
E. 104TH AVENUE WATER QUALITY POND	
POND SECTIONS PLAN VIEW	
SHEET	8 OF 33
JOB NO.	14421.32

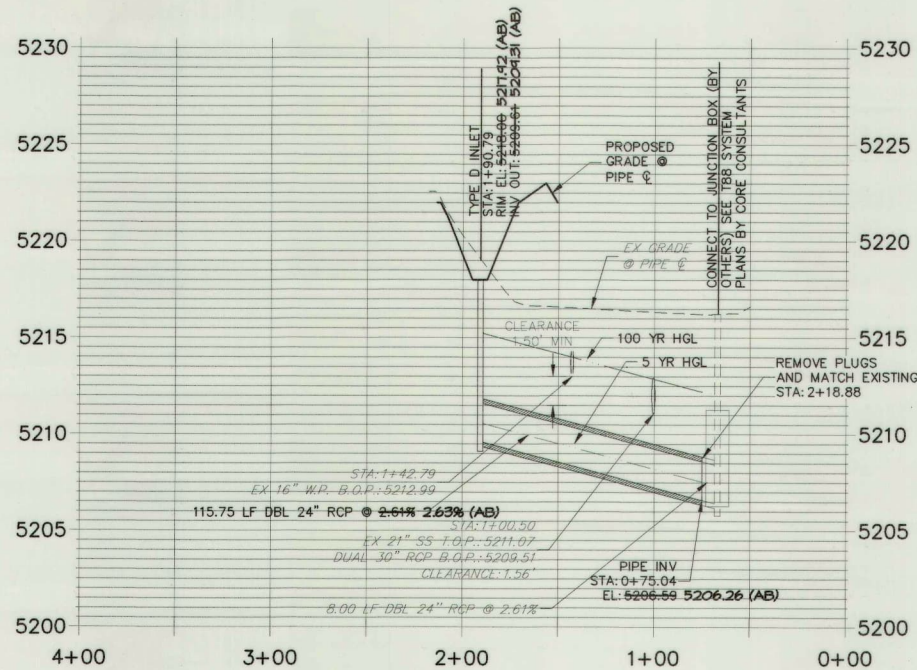


LINE TABLE		
LINE	BEARING	DISTANCE
L1	S89°38'41"W	153.08'
L2	S1°10'31"W	108.32'
L3	N85°31'33"E	124.35'
L4	S32°27'01"E	17.33'

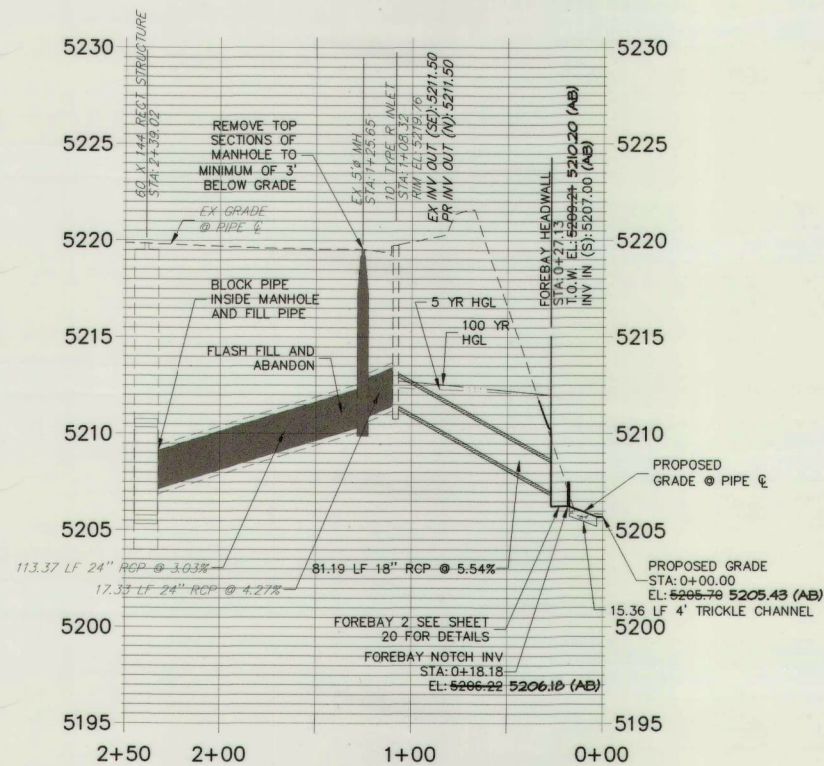
CURVE TABLE			
CURVE	DELTA	RADIUS	LENGTH
C1	17°56'01"	47.52'	14.87'



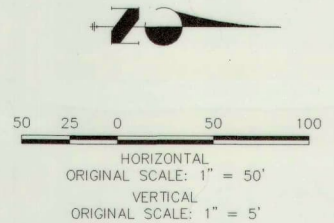
**DP-01 PROFILE
STA 0+00.00 TO 4+00.00**



**DP-02 PROFILE
STA 0+00.00 TO 2+50.00**



NOTE:
(AB) - INDICATES AS BUILT CONDITION
**AS CONSTRUCTED
11/2018**



STORM SEWER NOTES

1. ALL STATIONING IS PIPE CENTERLINE UNLESS OTHERWISE NOTED.
2. PIPE LENGTHS ARE FROM INSIDE INLET WALL TO INSIDE INLET WALL, FROM CENTER OF MANHOLE TO INSIDE INLET WALL, OR FROM CENTER OF MANHOLE TO CENTER OF MANHOLE. PIPE LENGTHS INCLUDE FES OR HEADWALL.
3. ALL ON-GRADE INLETS ARE TO MATCH TBC ELEVATIONS AT EACH END, FOLLOWING STREET GRADES.
4. ALL PIPES SHALL BE CLASS III RCP UNLESS OTHERWISE NOTED.
5. ALL MANHOLES SHALL BE 5' @ UNLESS OTHERWISE NOTED.
6. PIPE BEDDING SHALL CONFORM TO THE CITY OF COMMERCE CITY CONSTRUCTION STANDARDS AND SPECIFICATIONS. BEDDING FOR RCP PIPE SHALL BE AG7122 NO. 57/67 CRUSHED ROCK, SQUEEGEE OR MIXTURES CONTAINING SQUEEGEE SHALL NOT BE USED. BEDDING SHALL BE SIX TO EIGHT INCHES DEEP UNDER THE PIPE AND BACKFILLED TO THE SPRING LINE.
7. INLET STATIONING IS TO CENTER OF INLET.
8. PIPES SHALL HAVE JOINT RESTRAINTS ON LAST 3 JOINTS AT PIPE OUTFALL.

BENCHMARK & HORIZONTAL DATUM

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Know what's below.
Call before you dig.

CERTIFICATION STATEMENT

I HEREBY CERTIFY THAT THE PUBLIC IMPROVEMENTS FOR E. 104TH AVENUE WATER QUALITY POND HAVE BEEN CONSTRUCTED IN SUBSTANTIAL COMPLIANCE WITH THE CONSTRUCTION PLANS APPROVED BY THE CITY OF COMMERCE CITY.

Aaron L. Clutter, P.E.
 COLORADO NO. 36742
 FOR AND ON BEHALF OF JR ENGINEERING, LLC.
 DATE: 12/3/18

UNTIL SUCH TIME AS THESE DRAWINGS ARE APPROVED BY THE APPROPRIATE REVIEWING AGENCIES, JR ENGINEERING APPROVES THEIR USE FOR THE PROJECTS DESIGNATED BY WRITTEN AUTHORIZATION.

PREPARED FOR
REUNION METROPOLITAN DISTRICT
17910 E PARKSIDE DRIVE NORTH
COMMERCE CITY, CO 80022
ATTN: LIZ ALEXANDER
(303)-288-5431

J-R ENGINEERING
A Western Company
Central 303-740-9333 • Colorado Springs 719-583-2563
Fort Collins 970-491-9888 • www.jrengineering.com

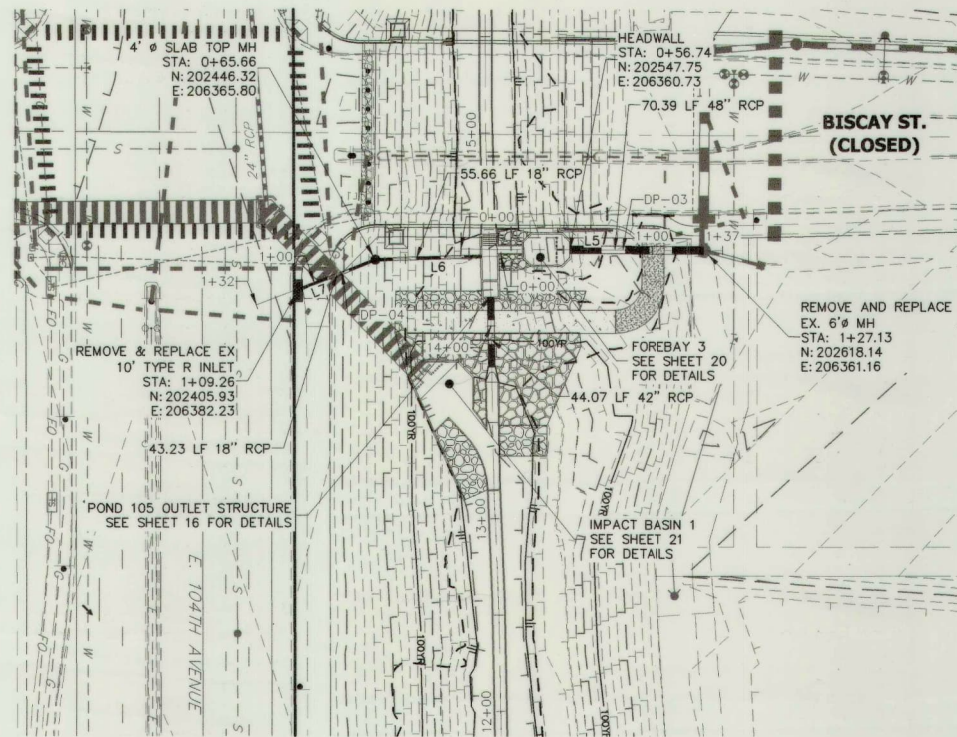
NO.	REVISION	BY	DATE
1	AS-BUILT RECORD DRAWINGS	NAS	11/15/18

H-SCALE	V-SCALE	DATE	DESIGNED BY	DRAWN BY	CHECKED BY
1"=50'	1"=5'	11/7/17	REB	AAM	

E. 104TH AVENUE WATER QUALITY POND

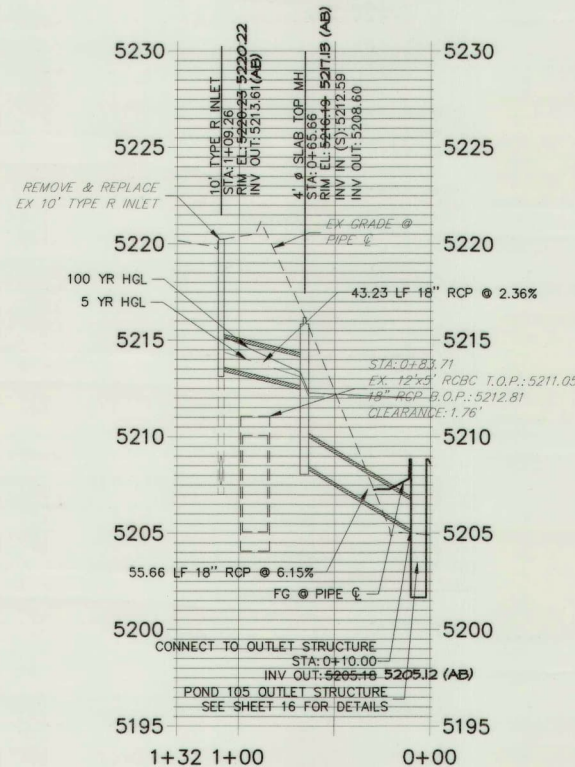
STORM SEWER PLAN AND PROFILE

SHEET 11 OF 33
 JOB NO. 14421.32

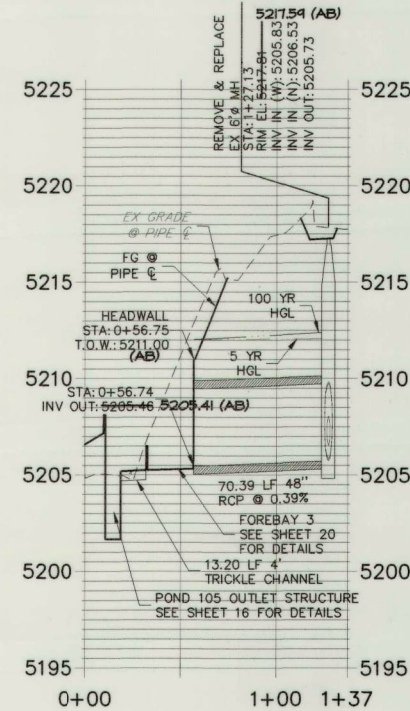


LINE TABLE		
LINE	BEARING	DISTANCE
L5	N0°20'40"E	137.13'
L6	S1°37'10"E	65.66'
L7	S20°54'25"E	66.64'

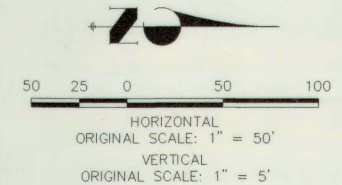
DP-04 PROFILE
STA 0+00.00 TO 1+32.30



DP-03 PROFILE
STA 0+00.00 TO 1+37.13



NOTE:
(AB) - INDICATES AS BUILT CONDITION
AS CONSTRUCTED
11/2018



CERTIFICATION STATEMENT

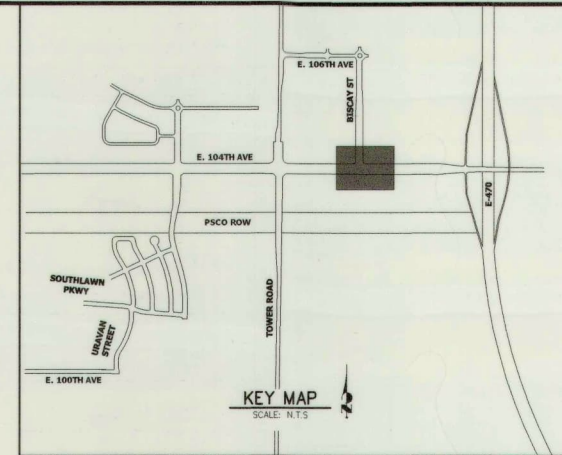
I HEREBY CERTIFY THAT THE PUBLIC IMPROVEMENTS FOR E. 104TH AVENUE WATER QUALITY POND HAVE BEEN CONSTRUCTED IN SUBSTANTIAL COMPLIANCE WITH THE CONSTRUCTION PLANS APPROVED BY THE CITY OF COMMERCE CITY.



Know what's below.
Call before you dig.

Aaron L. Clutter
AARON LEE CLUTTER, P.E.
COLORADO NO. 36742
FOR AND ON BEHALF OF JR ENGINEERING, LLC.

12/5/18
DATE



STORM SEWER NOTES

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PREPARED FOR
REUNION METROPOLITAN DISTRICT
17910 E PARKSIDE DRIVE NORTH
COMMERCE CITY, CO 80022
ATTN: LIZ ALEXANDER
(303)-288-5431

JR ENGINEERING
A Western Company

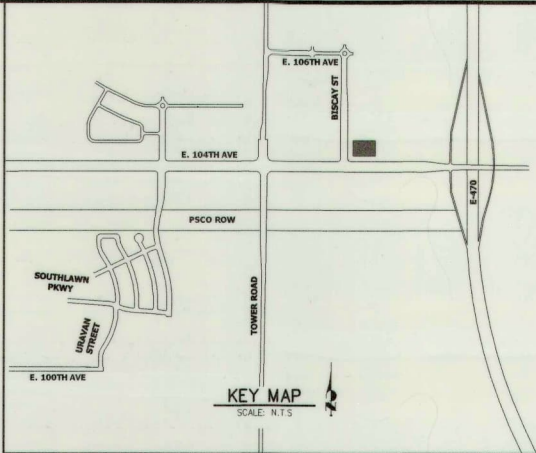


Centennial 303-740-9383 • Colorado Springs 719-593-2533
Fort Collins 970-491-9888 • www.jrengineering.com

BY	DATE	REVISION	No.	1"	5"	DATE	DESIGNED BY	DRAWN BY	CHECKED BY
		1	AS-BUILT RECORD DRAWINGS	11/7/17	11/7/17	11/7/17	REB	AAM	

E. 104TH AVENUE WATER QUALITY POND
STORM SEWER PLAN AND PROFILE

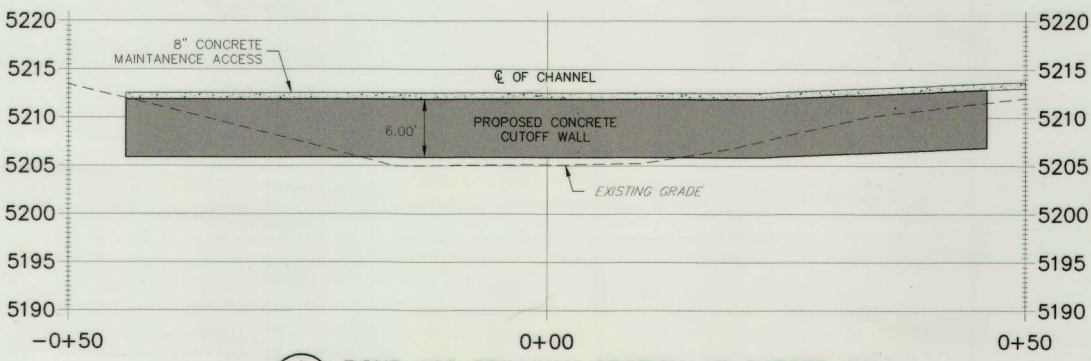
SHEET 12 OF 33
JOB NO. 14421.32



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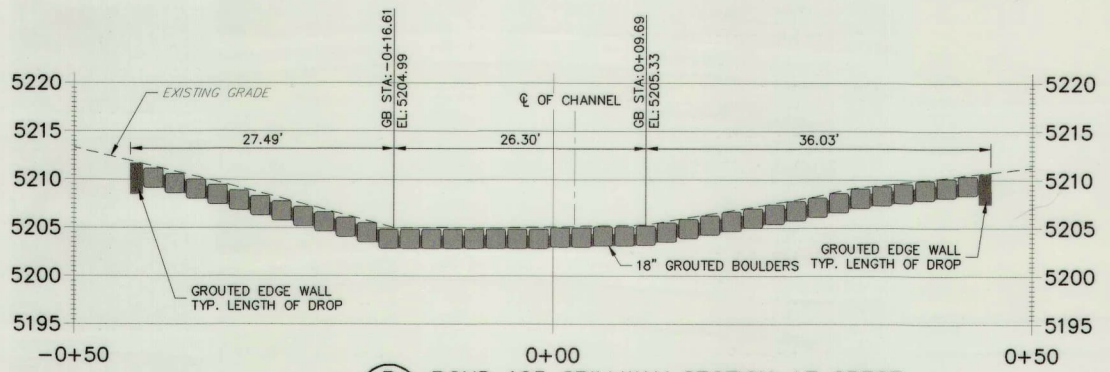
PREPARED FOR
REUNION METROPOLITAN DISTRICT
17910 E PARKSIDE DRIVE NORTH
COMMERCE CITY, CO 80022
ATTN: LIZ ALEXANDER
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J.R. ENGINEERING
A Western Company
Centennial 303-740-9383 • Colorado Springs 719-593-2583
Fort Collins 970-491-9888 • www.jrengineering.com

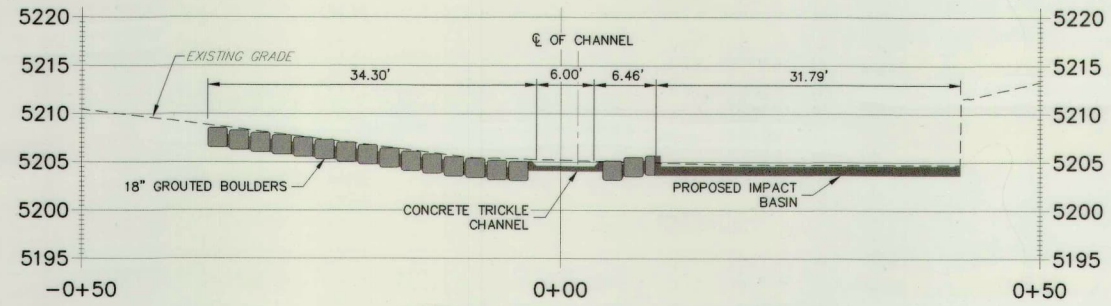


(A) POND 105 SPILLWAY SECTION AT CUTOFF WALL
1" = 10'

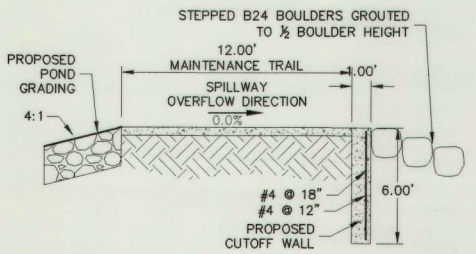
NOTE:
(AB) - INDICATES AS BUILT CONDITION
AS CONSTRUCTED
11/2018



(B) POND 105 SPILLWAY SECTION AT CREST
1" = 10'

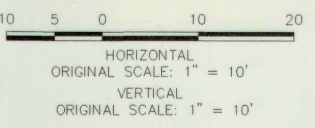


(C) POND 105 SPILLWAY SECTION AT TOE
1" = 10'



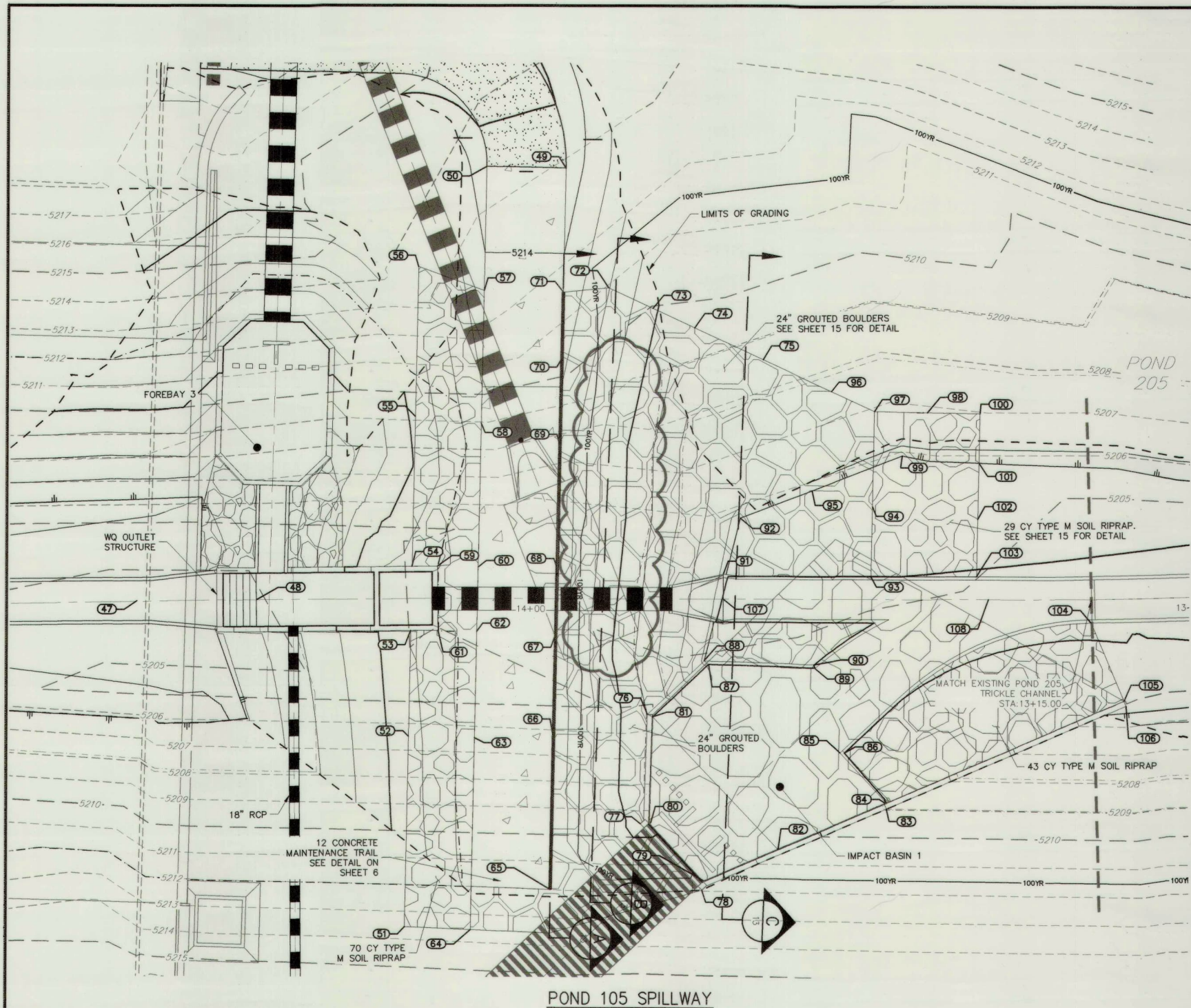
PROPOSED CUTOFF WALL DETAIL
SCALE: 1"=5'

NOTES:
1. SEE SHEET 14 FOR SECTION LOCATIONS



FOR INFORMATION ONLY

NO.	REVISION	BY	DATE
1	AS-BUILT RECORD DRAWINGS	NAS	11/15/18



GROUTED BOULDER NOTES:

*QUANTITIES FOR INFORMATION PURPOSES ONLY

1. GROUTED SLOPING BOULDER DROPS (GSB) AND BOULDER STILLING BASIN CONSTRUCTION (LUMP SUM) INCLUDES THE FOLLOWING:

- SUBGRADE PREPARATION AND STABILIZATION
- 157CY 24" BOULDERS
- 49CY GROUT, INCLUDING FIBER MESH WHERE NECESSARY
- 10CY CONCRETE SEEPAGE CUTOFF WALL
- WEED DRAIN SYSTEM, GEOTEXTILES, AND ALL APPURTENANCES
- 99CY TYPE M RIPRAP SHOWN IN DETAIL SHEET PLAN, INCLUDING BEDDING AND GEOTEXTILES, PER RIPRAP DETAILS

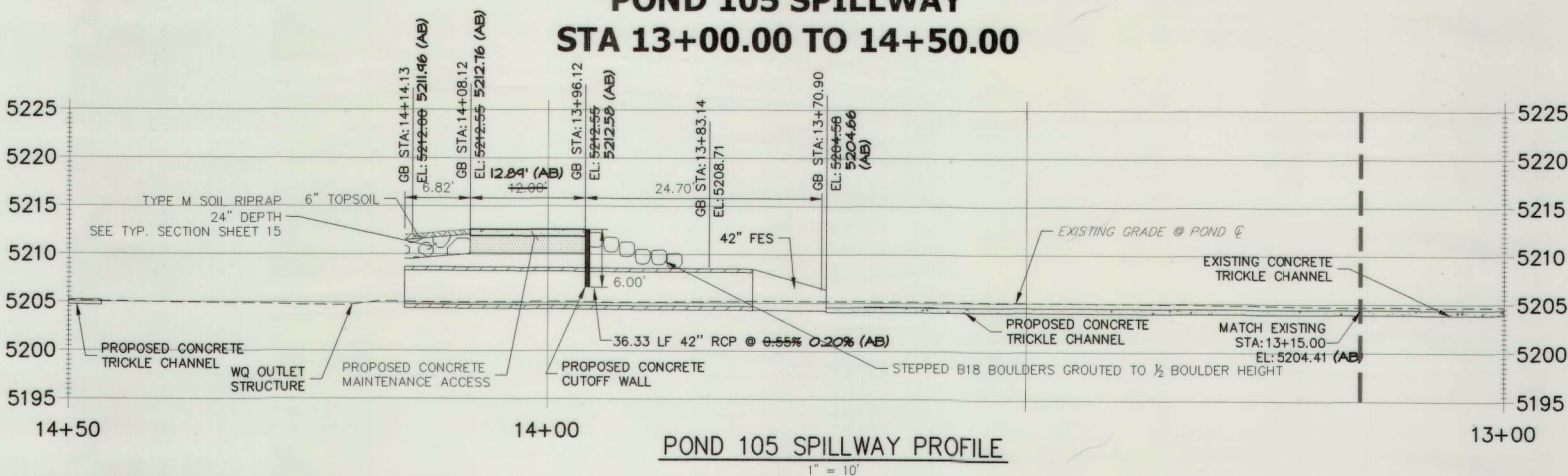
2. SEE SHEET 15 FOR URBAN DRAINAGE GROUTED SLOPING BOULDER DROP STRUCTURE DETAILS.

NOTE:
(AB) - INDICATES AS BUILT CONDITION
AS CONSTRUCTED
11/2018

POINT TABULATION				
ID NO.	DESCRIPTION	STATION	OFFSET	ELEV
47	CHANNEL CL	14+59.69	0.11	5205.23
48	CHANNEL CL	14+41.57	0.00	5201.66
49	EDGE OF CONCRETE	13+94.94	64.80	5214.64
50	EDGE OF CONCRETE	14+06.96	65.02	5214.65
51	EDGE OF RIPRAP	14+19.52	-49.40	5213.55
52	EDGE OF RIPRAP	14+18.71	-20.73	5210.62
53	EDGE OF RIPRAP	14+18.28	-4.83	5211.62
54	EDGE OF RIPRAP	14+18.01	4.83	5211.63
55	EDGE OF RIPRAP	14+17.35	27.39	5210.27
56	EDGE OF RIPRAP	14+16.73	49.96	5213.49
57	EDGE OF RIPRAP	14+07.28	46.36	5213.72
58	EDGE OF CONCRETE	14+07.66	26.45	5212.72
59	EDGE OF RIPRAP	14+14.20	4.84	5211.99
60	EDGE OF CONCRETE	14+08.06	4.73	5212.55
61	EDGE OF RIPRAP	14+14.08	-4.82	5212.06
62	EDGE OF CONCRETE	14+08.21	-4.93	5212.55
63	EDGE OF CONCRETE	14+08.50	-20.95	5212.55
64	EDGE OF CONCRETE	14+09.02	-49.83	5213.55
65	CONCRETE CUTOFF WALL	13+96.91	-43.81	5212.55
66	CONCRETE CUTOFF WALL	13+96.50	-21.17	5212.55
67	CONCRETE CUTOFF WALL	13+96.21	-5.15	5212.55
68	CONCRETE CUTOFF WALL	13+96.03	4.51	5212.55
69	CONCRETE CUTOFF WALL	13+95.70	22.88	5212.55
70	CONCRETE CUTOFF WALL	13+95.46	36.22	5213.21
71	CONCRETE CUTOFF WALL	13+95.28	46.14	5213.71
72	EDGE OF GROUTED BOULDERS	13+88.43	46.80	5212.64
73	EDGE OF GROUTED BOULDERS	13+81.71	43.72	5210.20
74	EDGE OF GROUTED BOULDERS	13+75.38	40.82	5209.62
75	EDGE OF GROUTED BOULDERS	13+64.93	36.04	5208.59
76	EXISTING WINGWALL	13+82.32	-17.38	5209.66
77	EXISTING HEADWALL	13+83.32	-33.86	5209.54

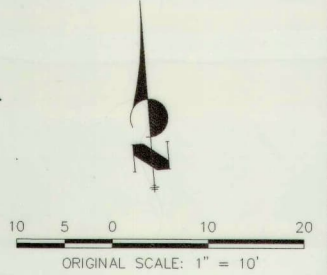
POINT TABULATION				
ID NO.	DESCRIPTION	STATION	OFFSET	ELEV
78	EXISTING HEADWALL	13+73.96	-43.81	5211.97
79	EDGE OF CONCRETE	13+73.75	-42.39	5204.60
80	EDGE OF CONCRETE	13+81.75	-33.72	5204.60
81	EDGE OF CONCRETE	13+81.50	-17.75	5204.66
82	EDGE OF CONCRETE	13+62.49	-37.69	5208.70
83	EXISTING WINGWALL	13+46.07	-31.54	5209.00
84	EDGE OF CONCRETE	13+46.35	-30.62	5204.66
85	EDGE OF CONCRETE	13+53.10	-23.10	5204.52
86	EDGE OF RIPRAP	13+52.40	-23.11	5205.03
87	EDGE OF CONCRETE	13+73.04	-9.94	5204.57
88	TOE	13+73.73	-9.24	5205.66
89	EDGE OF CONCRETE	13+56.95	-10.35	5204.52
90	NULL STRUCTURE	13+57.13	-9.85	5205.04
91	EDGE OF GROUTED BOULDERS	13+70.90	3.75	5205.66
92	TOE	13+68.37	12.16	5205.67
93	EDGE OF GROUTED BOULDERS	13+48.53	3.47	5205.04
94	EDGE OF GROUTED BOULDERS	13+48.31	13.96	5205.41
95	TOE	13+57.47	16.36	5205.67
96	EDGE OF GROUTED BOULDERS	13+54.57	31.27	5207.57
97	EDGE OF GROUTED BOULDERS	13+48.04	28.27	5206.92
98	EDGE OF RIPRAP	13+40.02	28.11	5206.86
99	TOE	13+43.82	21.60	5205.62
100	EDGE OF RIPRAP	13+32.04	27.96	5206.96
101	TOE	13+32.19	20.52	5205.50
102	EDGE OF RIPRAP	13+32.36	12.05	5205.24
103	EDGE OF RIPRAP	13+32.53	3.43	5204.97
104	EDGE OF RIPRAP	13+15.06	-3.51	5204.94
105	EDGE OF RIPRAP	13+10.40	-15.36	5205.59
106	EXISTING WINGWALL	13+10.09	-16.13	5205.65
107	CHANNEL CL	13+70.90	0.00	5204.66
108	CHANNEL CL	13+30.71	0.00	5204.46

POND 105 SPILLWAY
STA 13+00.00 TO 14+50.00



BENCHMARK & HORIZONTAL DATUM

PROJECT COORDINATES ARE MODIFIED COLORADO STATE PLANE, NORTH ZONE NAD83 (2011) COORDINATES. THE COMBINED ELEVATION/SCALE FACTOR USED TO MODIFY THE COORDINATES FROM STATE PLANE TO THE PROJECT COORDINATES IS 1.000273080. THE RESULTING PROJECT COORDINATES ARE TRUNCATED BY 1,000,000 IN THE NORTHING AND 3,000,000 IN THE EASTING. PROJECT COORDINATE NORTHING US SURVEY FEET = (STATE PLANE NORTHING * 1.000273080) * (3937/1200) - 1,000,000
PROJECT COORDINATE EASTING US SURVEY FEET = (STATE PLANE EASTING * 1.000273080) * (3937/1200) - 3,000,000
PROJECT ELEVATIONS ARE BASED ON NGS MONUMENT DVXJ WITH A NAVD88 ELEVATION OF 5425.25 FT.



CERTIFICATION STATEMENT

I HEREBY CERTIFY THAT THE PUBLIC IMPROVEMENTS FOR E. 104TH AVENUE WATER QUALITY POND HAVE BEEN CONSTRUCTED IN SUBSTANTIAL COMPLIANCE WITH THE CONSTRUCTION PLANS APPROVED BY THE CITY OF COMMERCE CITY.



UNTIL SUCH TIME AS THESE DRAWINGS ARE APPROVED BY THE AGENCIES, JR ENGINEERING APPROVES THEIR USE FOR ANY PURPOSES DESIGNATED BY WRITTEN AUTHORIZATION.

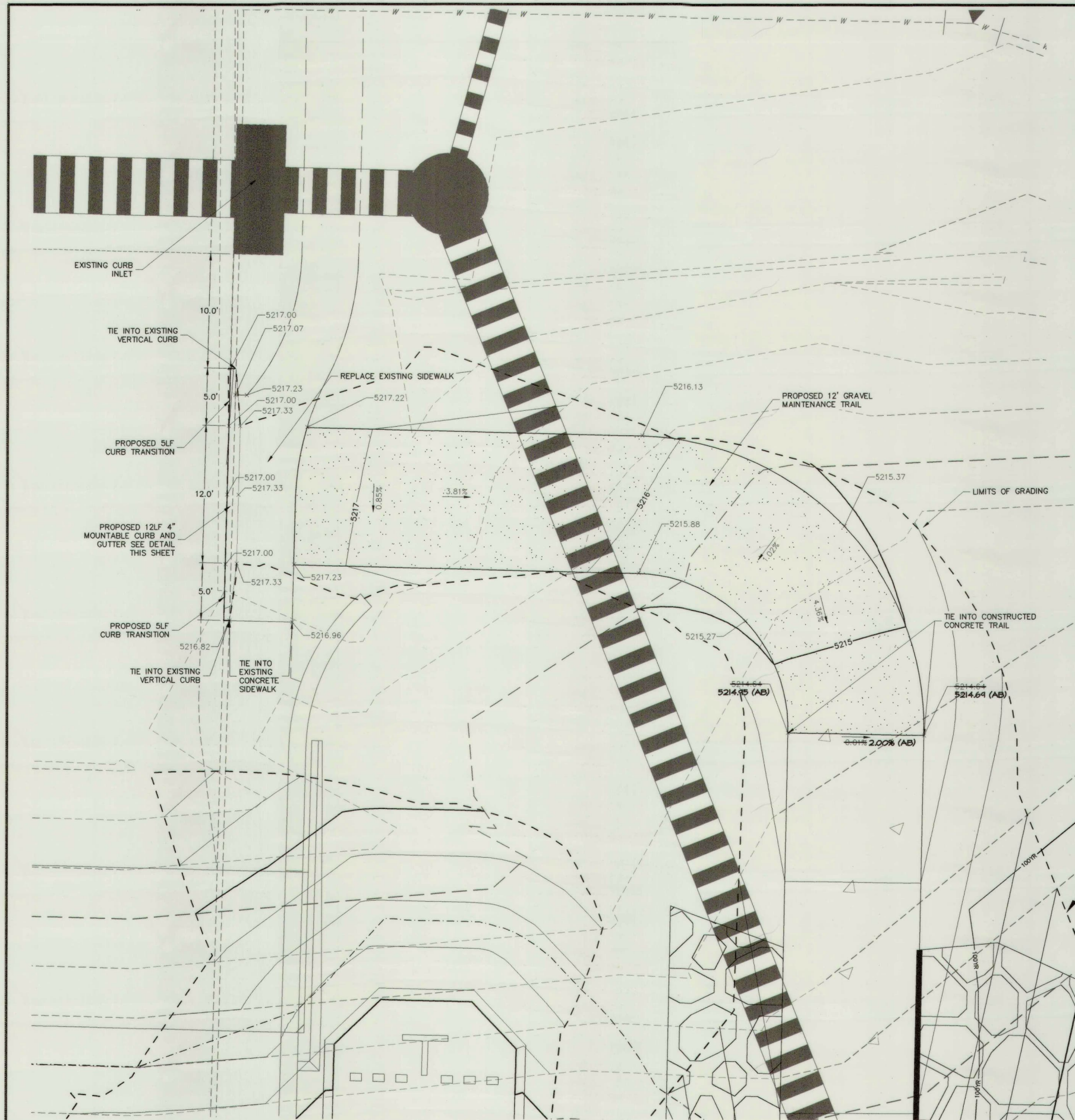
PREPARED FOR
REUNION METROPOLITAN DISTRICT
17910 E PARKSIDE DRIVE NORTH
COMMERCE CITY, CO 80022
ATTN: LIZ ALEXANDER
(303)-288-5431

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A Western Company
Central 303-740-9383 • Colorado Springs 719-559-2565
Fort Collins 970-491-9888 • www.jrengineering.com

BY	DATE	REVISION	NO.	DESCRIPTION
NAS	11/15/18	1	AS-BUILT RECORD DRAWINGS	

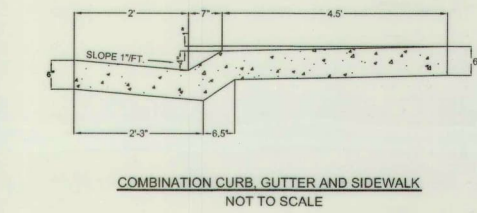
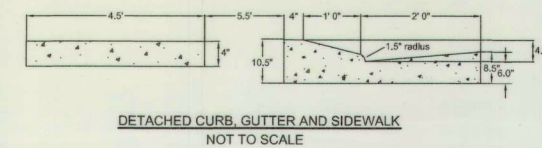
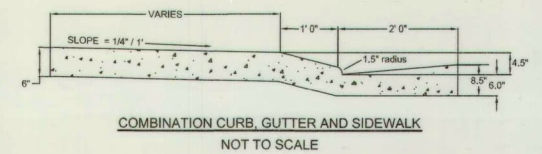
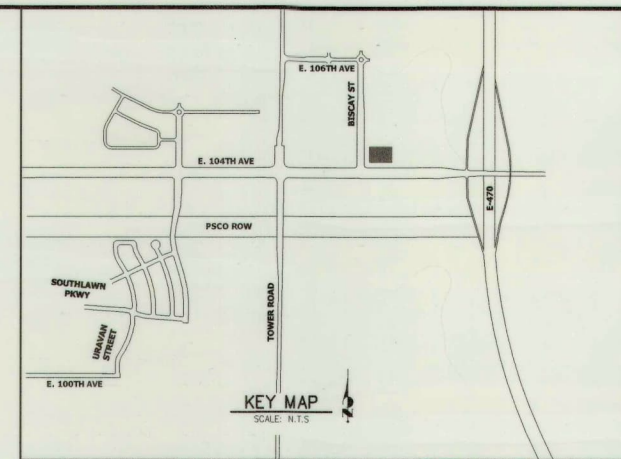
E. 104TH AVENUE WATER QUALITY POND
SPILLWAY PLAN AND PROFILE

SHEET 14 OF 33
JOB NO. 14421.32



POND 105 MAINTANENCE TRAIL SPILLWAY
1" = 5'

NOTE:
(AB) - INDICATES AS BUILT CONDITION
AS CONSTRUCTED
11/2018

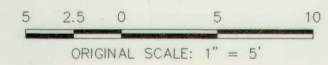


E:\Projects\104th Ave\104th Ave Spillway\104th Ave Spillway.dwg

COMMERCE CITY DEPARTMENT OF PUBLIC WORKS ENGINEERING CONSTRUCTION STANDARDS		APPROVAL: CITY ENGINEER	05-27-16 DATE
MOUNTABLE CURB SECTIONS		DETAIL NO. 308-06	

BENCHMARK & HORIZONTAL DATUM

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PROJECT ELEVATIONS ARE BASED ON NGS MONUMENT DVXJ WITH A NAVD88 ELEVATION OF 5425.25 FT.



CERTIFICATION STATEMENT

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Aaron L. Clutter
AARON LEE CLUTTER, P.E.
COLORADO NO. 36742
FOR AND ON BEHALF OF JR ENGINEERING, LLC.



12/5/18
DATE

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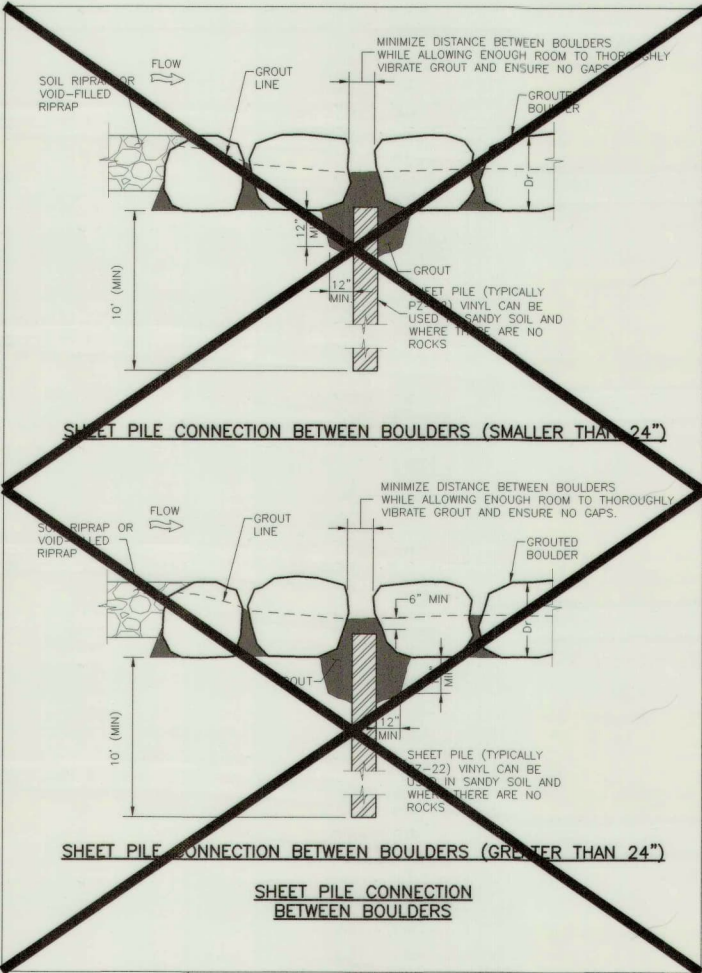
PREPARED FOR
REUNION METROPOLITAN DISTRICT
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COMMERCE CITY, CO 80022
ATTN: LIZ ALEXANDER
(303)-288-5431

J.R. ENGINEERING
A Western Company

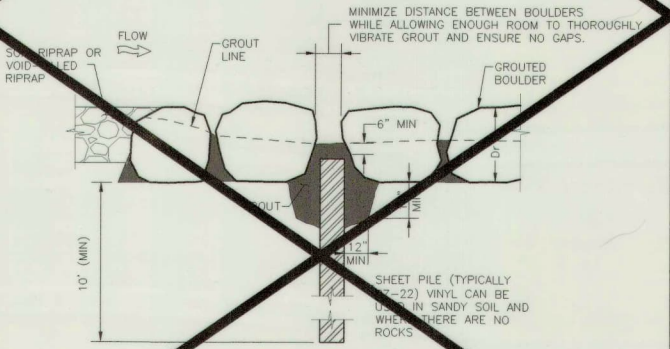
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BY	DATE
DIV 8 (NEW SHEET)	5/22/18
AS-BUILT RECORD DRAWINGS	11/15/18
DESIGNED BY	
DRAWN BY	
CHECKED BY	

E. 104TH AVENUE WATER QUALITY POND	SHEET 14A OF 33
SPILLWAY PLAN AND PROFILE	JOB NO. 14421.32

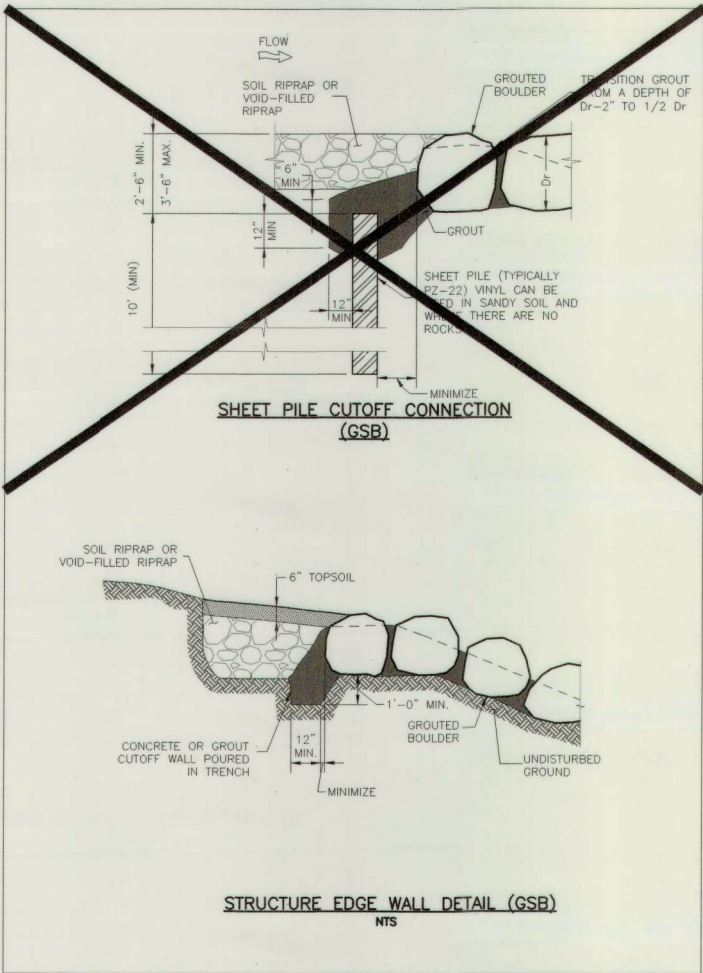


SHEET PILE CONNECTION BETWEEN BOULDERS (SMALLER THAN 24")

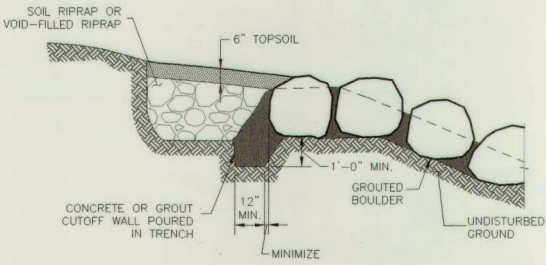


SHEET PILE CONNECTION BETWEEN BOULDERS (GREATER THAN 24")

SHEET PILE CONNECTION BETWEEN BOULDERS

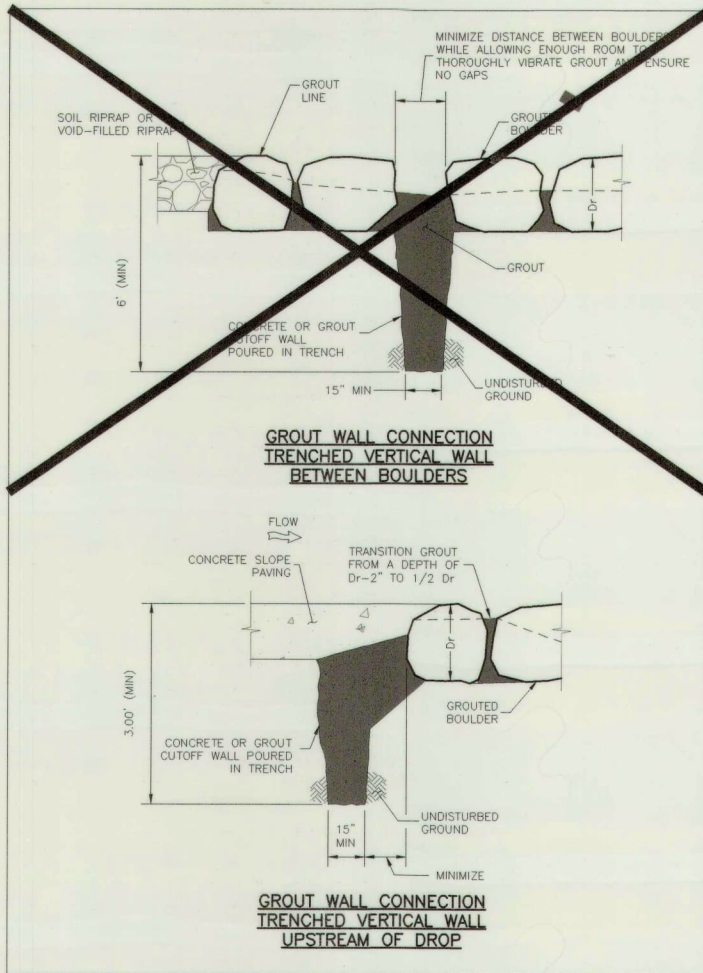


SHEET PILE CUTOFF CONNECTION (GSB)

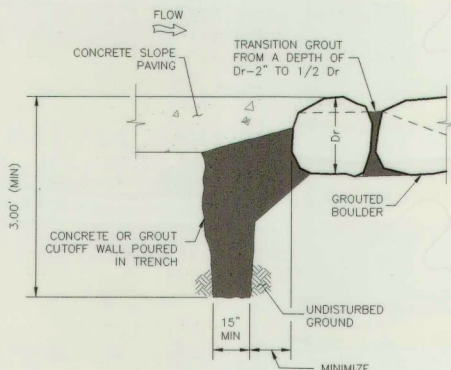


STRUCTURE EDGE WALL DETAIL (GSB)

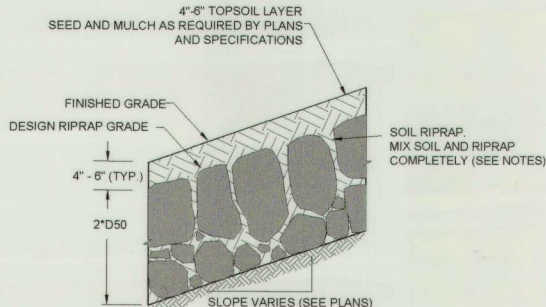
NTS



GROUT WALL CONNECTION TRENCHED VERTICAL WALL BETWEEN BOULDERS



GROUT WALL CONNECTION TRENCHED VERTICAL WALL UPSTREAM OF DROP



TYPICAL SECTION - SOIL RIPRAP WITH MULCH

RIPRAP NOTES:

- SOIL RIPRAP DETAILS ARE APPLICABLE TO AREAS. SLOPED REFER TO THE SITE PLAN ACTUAL LOCATION AND LIMITS.
- MIX UNIFORMLY 65% RIPRAP BY VOLUME WITH 35% OF APPROVED SOIL VOLUME BY VOLUME PRIOR TO PLACEMENT.
- PLACE STONE-SOIL MIX TO RESULT IN SECURELY INTERLOCKED ROCK AT THE DESIGN THICKNESS AND GRADE. COMPACT AND ALL LEVEL TO ELIMINATE VOIDS AND ROCKS PROJECTING DESIGN ABOVE RIPRAP TOP GRADE.
- CRIMP OR TACKIFY MULCH OR USE APPROVED HYDOMULCH AS CALLED FOR IN THE PLANS AND SPECIFICATIONS.

TYPE L RIPRAP

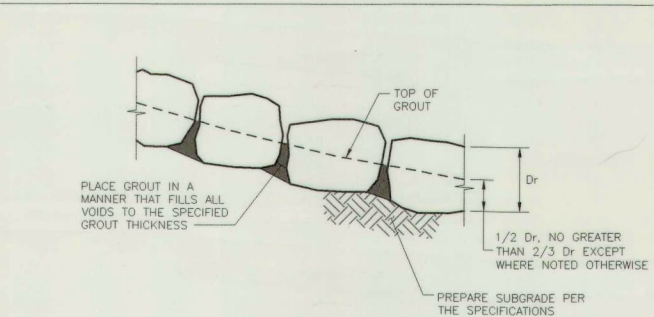
INTERMEDIATE ROCK DIMENSION (IN.)	PERCENT PASSING (%)
15	70-100
12	50-70
9	35-50
3	2-10

TYPE L RIPRAP D₅₀=9".

TYPE M RIPRAP

INTERMEDIATE ROCK DIMENSION (IN.)	PERCENT PASSING (%)
21	70-100
18	50-70
12	35-50
4	2-10

TYPE M RIPRAP D₅₀=12".



BOULDER PLACEMENT NOTES:

- PLACE BOULDERS WITH THE REQUIRED BOULDER HEIGHT VERTICAL. PLACE BOULDERS AS TIGHTLY TOGETHER AS POSSIBLE (WITHOUT TOUCHING) WHILE PROVIDING ENOUGH ROOM BETWEEN THEM TO THOROUGHLY VIBRATE THE GROUT AND TO ENSURE NO GAPS IN THE GROUT. THE SMALL DIMENSION OF A 2'x4' CAN BE USED AS A GUIDE TO CHECK MINIMUM SPACING.
- BEFORE GROUTING, CLEAN ALL DIRT AND MATERIAL FROM ROCK THAT COULD PREVENT THE GROUT FROM BINDING TO THE ROCK. KEEP BOULDERS FROM TOUCHING. AVOID SLIDING BOULDERS AGAINST SUBGRADE TO PROPERLY POSITION.

MATERIAL SPECIFICATIONS:

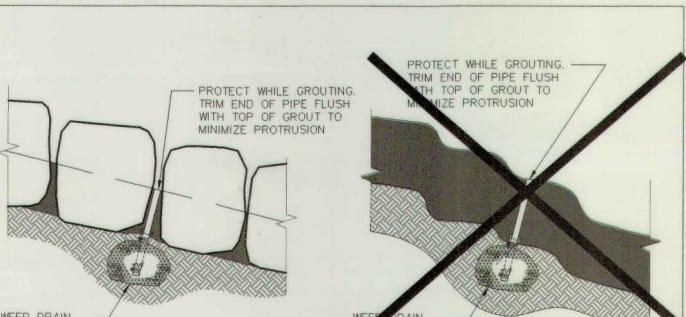
- ALL GROUT SHALL HAVE A MINIMUM 28-DAY COMPRESSIVE STRENGTH EQUAL TO 3200 PSI.
- ONE CUBIC YARD OF GROUT SHALL HAVE A MINIMUM OF SIX (6) SACKS OF TYPE II PORTLAND CEMENT.
- A MAXIMUM OF 25% TYPE F FLY ASH MAY BE SUBSTITUTED FOR THE PORTLAND CEMENT.
- THE AGGREGATE SHALL BE COMPRISED OF 70% NATURAL SAND (FINES) AND 30% 3/8-INCH ROCK (COARSE).
- THE GROUT SLUMP SHALL BE BETWEEN 4-INCHES TO 6-INCHES.
- AIR ENTRAINMENT SHALL BE BETWEEN 5.5% AND 7.5%.
- TO CONTROL SHRINKAGE AND CRACKING, 1.5 POUNDS OF FIBERMESH, OR EQUIVALENT, SHALL BE USED PER CUBIC YARD OF GROUT.
- COLOR ADDITIVE IN REQUIRED AMOUNTS SHALL BE USED WHEN SO SPECIFIED BY CONTRACT.

GROUT PLACEMENT SPECIFICATIONS:

- SPECIAL PROCEDURES SHALL BE REQUIRED FOR GROUT PLACEMENT WHEN THE AIR TEMPERATURES ARE LESS THAN 40°F OR GREATER THAN 90°F. CONTRACTOR SHALL OBTAIN PRIOR APPROVAL FROM THE DESIGN ENGINEER OF THE PROCEDURES TO BE USED FOR PROTECTING THE GROUT.
- GROUT SHALL BE DELIVERED BY MEANS OF A LOW PRESSURE (LESS THAN 10 PSI) GROUT PUMP USING A 2-INCH DIAMETER (MAXIMUM) NOZZLE.
- FULL DEPTH PENETRATION OF THE GROUT INTO THE BOULDER VOIDS SHALL BE ACHIEVED BY INJECTING GROUT STARTING WITH THE NOZZLE NEAR THE BOTTOM AND RAISING IT AS THE GROUT FILLS, WHILE VIBRATING GROUT INTO PLACE USING A PENCIL VIBRATOR.
- ALL GROUT BETWEEN BOULDERS SHALL BE TREATED WITH A BROOM FINISH.
- AFTER GROUT PLACEMENT, EXPOSED BOULDER FACES SHALL BE CLEANED AND FREE OF GROUT.
- ALL FINISHED GROUT SURFACES SHALL BE SPRAYED WITH A CLEAR LIQUID MEMBRANE CURING COMPOUND AS SPECIFIED IN ASTM C309.

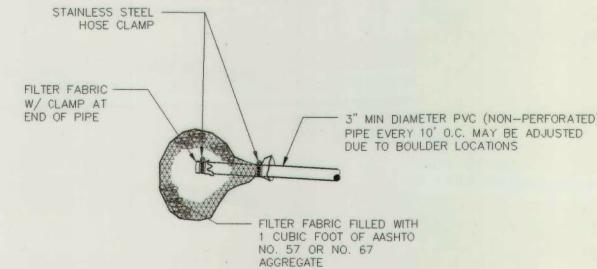
GRouted BOULDER PLACEMENT DETAIL

NTS



GRouted BOULDERS

SCULPTED CONCRETE



DETAIL 1
WEEP DRAIN

NOTE: INSTALL WEEP DRAINS FOR DROPS AND WALLS 5' AND GREATER AT 10' O.C. AT ELEVATIONS AND LOCATIONS SHOWN ON THE DRAWINGS

WEEP DRAINS

GRouted BOULDER NOTES:

- BOULDERS USED FOR GROUTING SHOULD MEET ALL THE PROPERTIES OF ROCK FOR ORDINARY RIPRAP, AND ROCK OF UNIFORM SIZE SHOULD BE USED.
- ROCK SHALL BE HARD, DURABLE, AND FREE FROM CRACKS, OVERBURDEN, SHALE, AND ORGANIC MATTER.
- GRouted BOULDERS SHALL BE PLACED DIRECTLY ON STABILIZED, COMPACTED SUBGRADE WITHOUT GRANULAR BEDDING.
- THE TOP ONE-HALF OF THE BOULDERS SHALL BE LEFT UNGROUTED AND EXPOSED.
- ROCK HAVING A MINIMUM SPECIFIC GRAVITY OF 2.65 IS PREFERRED; HOWEVER, IN NO CASE SHALL ROCK HAVE A SPECIFIC GRAVITY LESS THAN 2.50.
- WEEP HOLES SHALL BE PROVIDED AT THE TOE OF CHANNEL SLOPES AND CHANNEL DROPS TO REDUCE UPLIFT FORCES ON THE GRouted CHANNEL LINING.
- GRouted BOULDERS ON THE BANKS SHALL BE BURIED AND VEGETATED WITH DRY-LAND GRASSES AND SHRUBS. COVER GRouted BOULDERS WITH SLIGHTLY COMPACTED TOPSOIL, FILLING DEPRESSIONS AND COVERING THE TOP OF THE TALLEST ROCKS TO A HEIGHT OF NO LESS THAN 4-INCHES (6-INCHES OF MORE PREFERRED) TO ESTABLISH DRY-LAND VEGETATION.
- PLACEMENT AND GROUTING OF BOULDERS SHALL GENERALLY CONFORM TO THE SPECIFICATIONS AND DETAILS FOR GRouted BOULDER DROPS. SEE DETAILS AND NOTES FOR GRouted BOULDER DROPS ON THIS SHEET.

NOTE:
(AB) - INDICATES AS BUILT CONDITION
AS CONSTRUCTED
11/2018



Know what's below.
Call before you dig.

FOR
INFORMATION
ONLY

UNTIL SUCH TIME AS THESE DRAWINGS ARE APPROVED BY THE APPROPRIATE ENGINEERING AGENCIES, JR ENGINEERING APPROVES THEIR USE ONLY FOR THE PURPOSES SET FORTH BY WRITTEN AUTHORIZATION.

PREPARED FOR
REUNION METROPOLITAN DISTRICT
17910 E PARKSIDE DRIVE NORTH
COMMERCE CITY, CO 80022
ATTN: LIZ ALEXANDER
(303)-288-5431

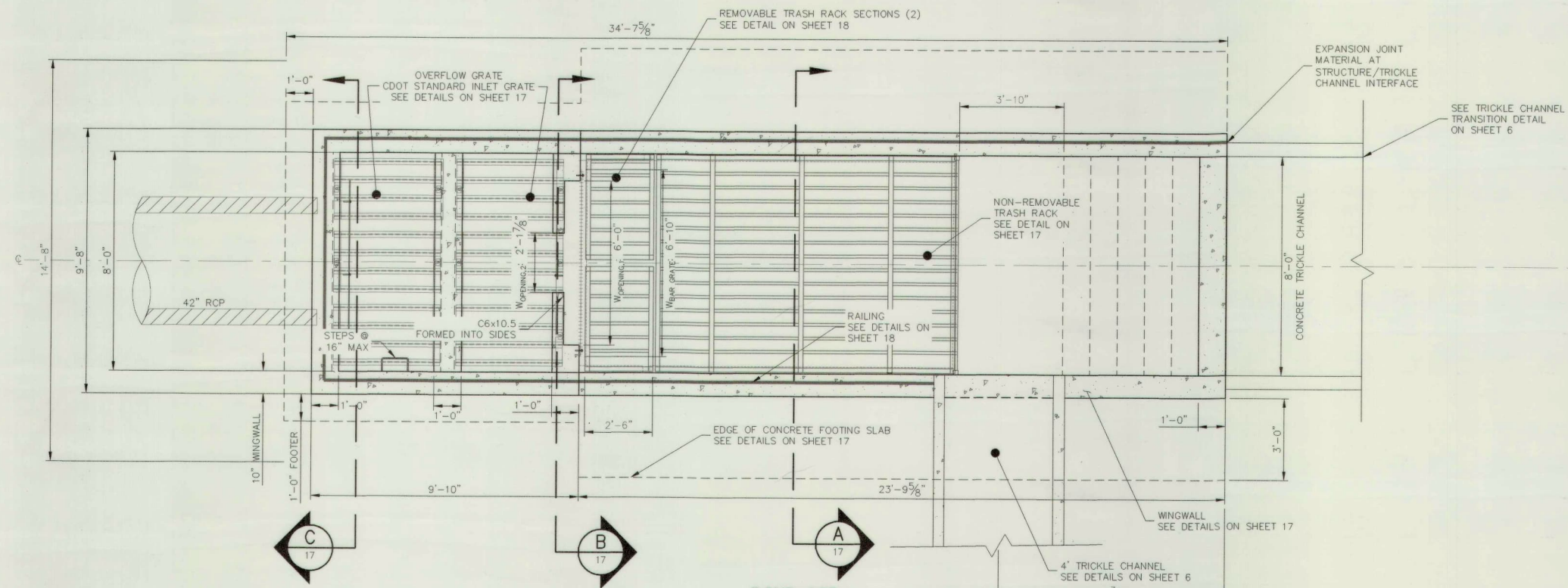
JR ENGINEERING
A Western Company
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BY	DATE	REVISION	NO.	N/A	N/A	DATE	DESIGNED BY	DRAWN BY	CHECKED BY
NAS	11/15/18	AS-BUILT RECORD DRAWINGS	1			11/7/17			

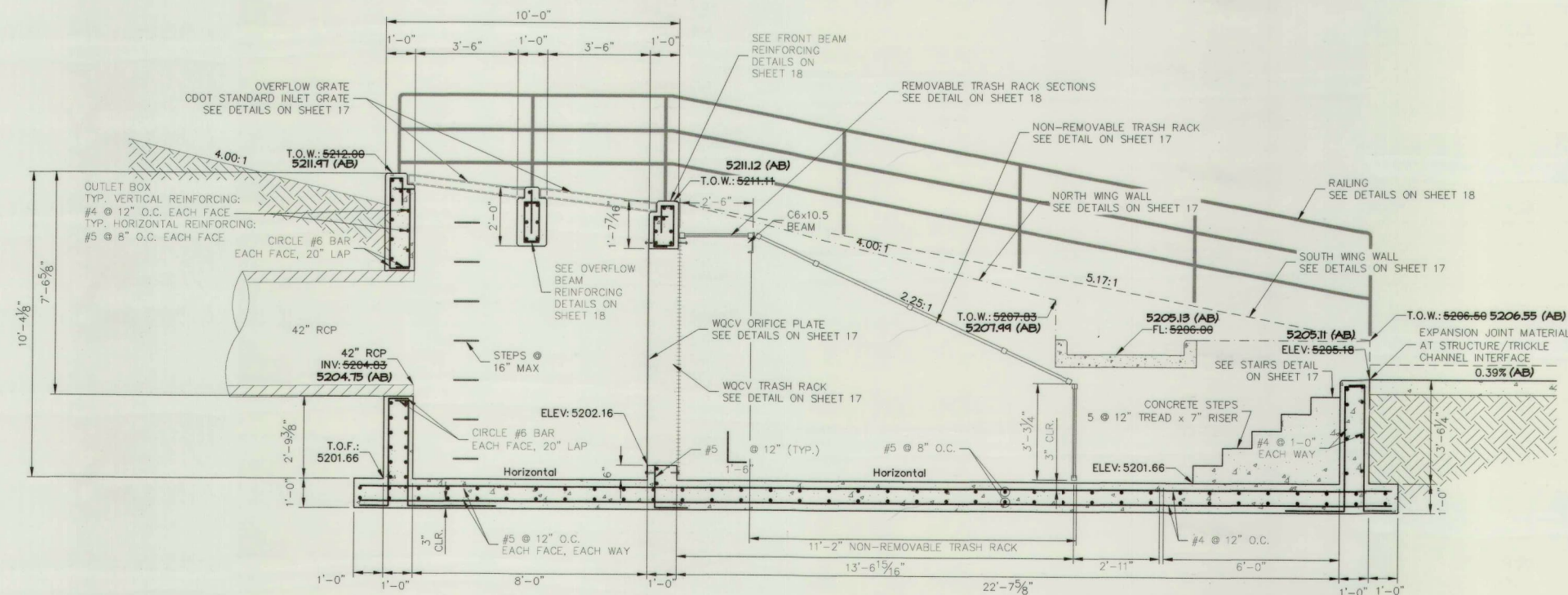
E. 104TH AVENUE WATER QUALITY POND
SPILLWAY PLAN AND PROFILE

SHEET 15 OF 33

JOB NO. 14421.32



POND 105
OUTLET STRUCTURE PLAN
SCALE: 3/8"=1'



POND 105
OUTLET STRUCTURE PROFILE
SCALE: 3/8"=1'



NOTE:
(AB) - INDICATES AS BUILT CONDITION
AS CONSTRUCTED
11/2018

CERTIFICATION STATEMENT

I HEREBY CERTIFY THAT THE PUBLIC IMPROVEMENTS FOR E. 104TH AVENUE WATER QUALITY POND HAVE BEEN CONSTRUCTED IN SUBSTANTIAL COMPLIANCE WITH THE CONSTRUCTION PLANS APPROVED BY THE CITY OF COMMERCE CITY.

Aaron L. Clutter
AARON LEE CLUTTER, P.E.
COLORADO NO. 36742
FOR AND ON BEHALF OF JR ENGINEERING, LLC.

12/5/18
DATE

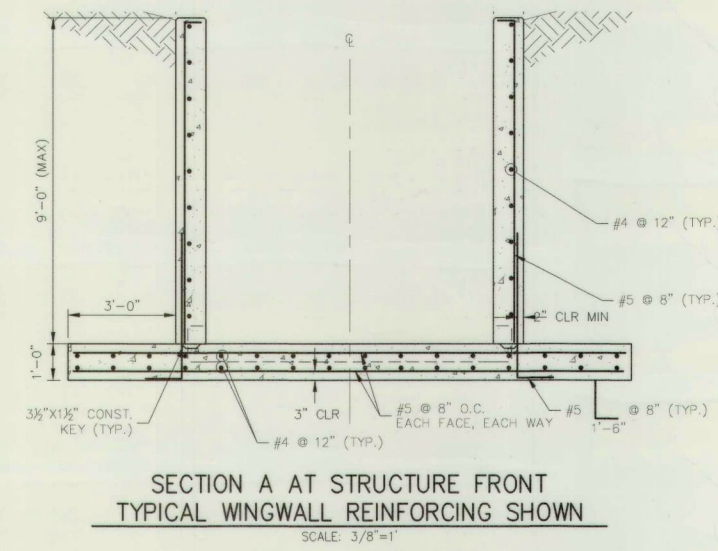
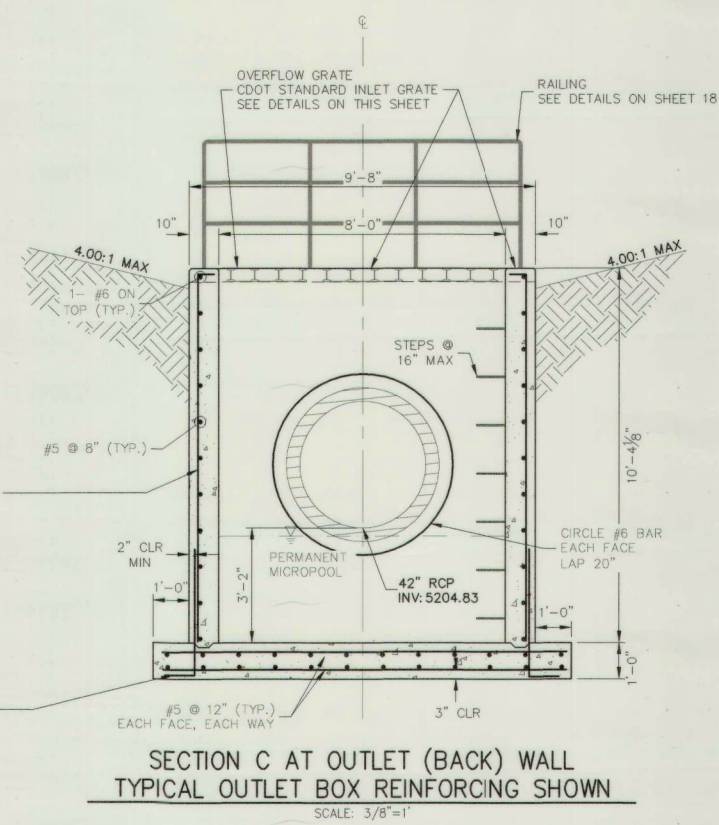
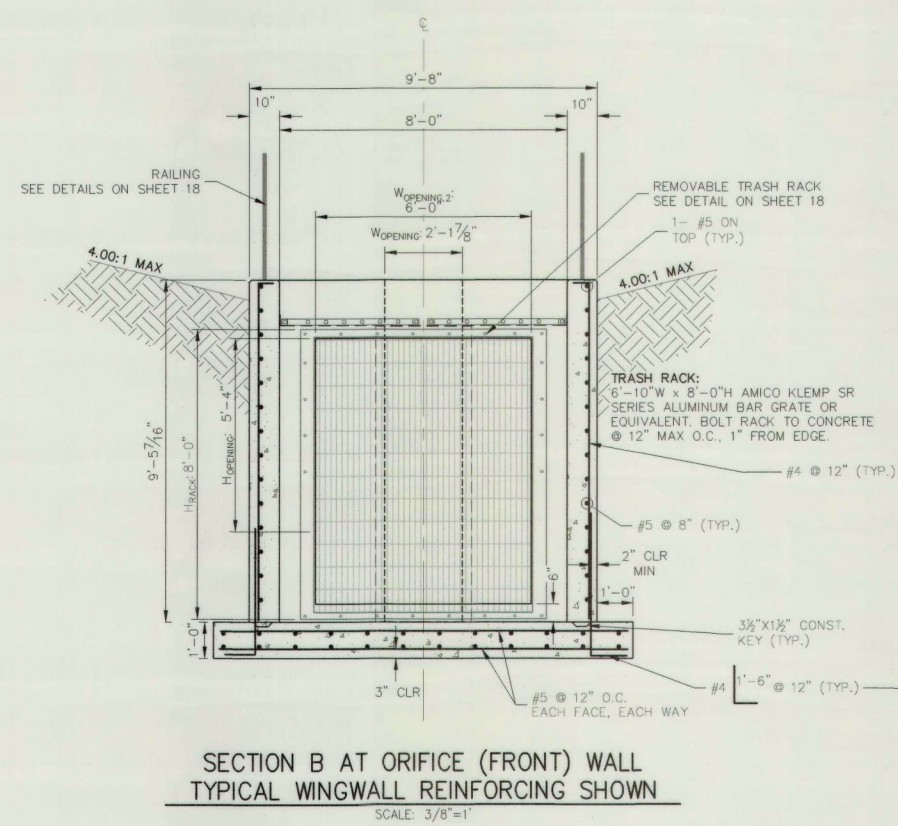
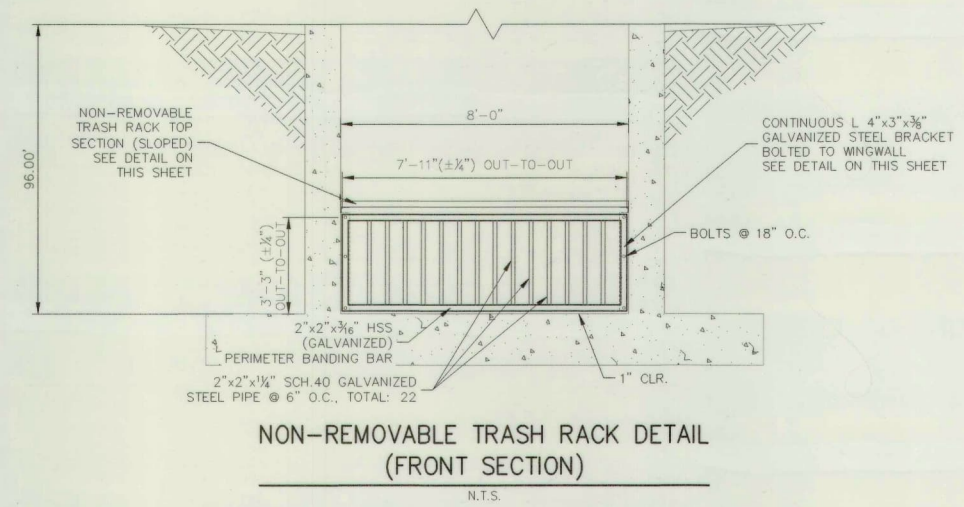
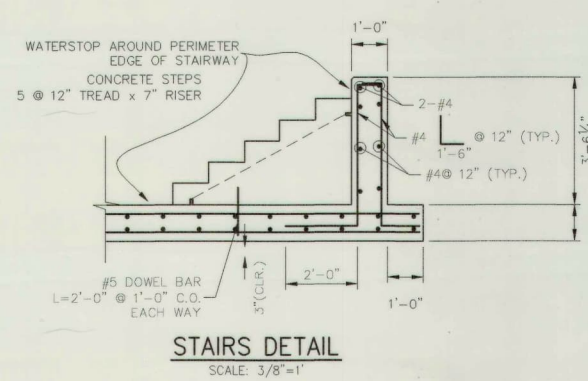
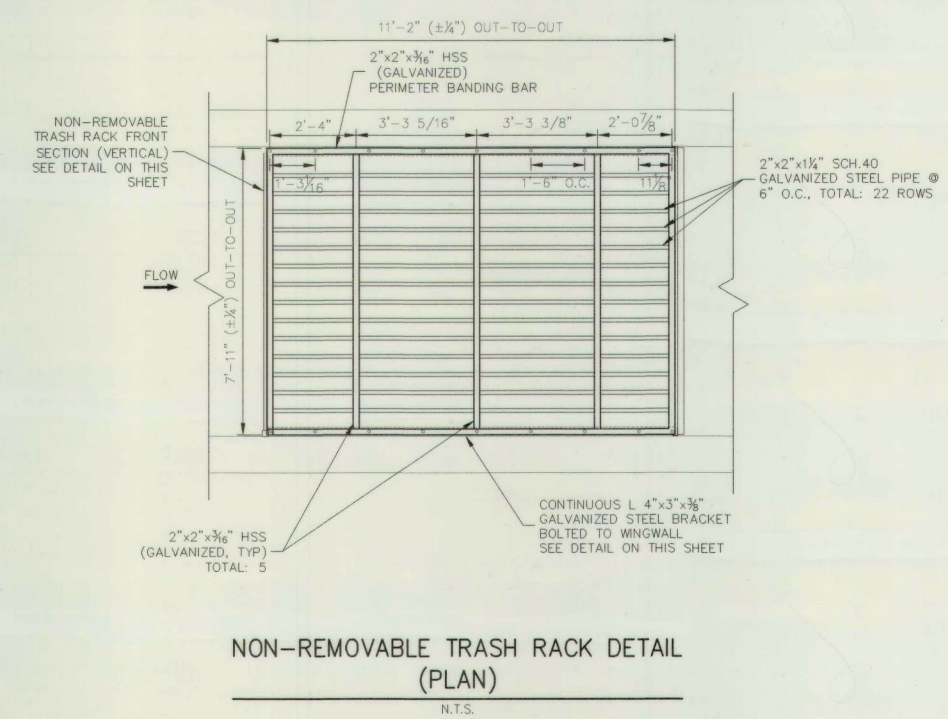
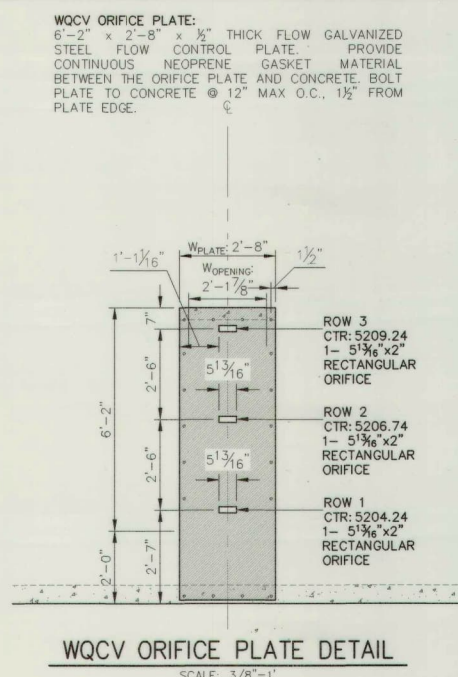
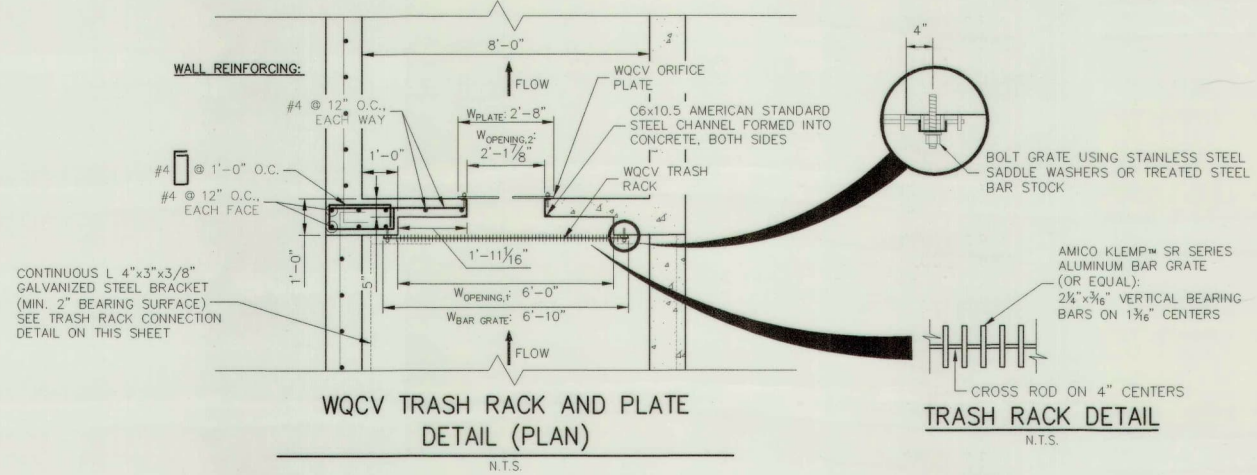
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PREPARED FOR
REUNION METROPOLITAN DISTRICT
17910 E PARKSIDE DRIVE NORTH
COMMERCE CITY, CO 80022
ATTN: LIZ ALEXANDER
(303)-288-5431

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NO.	REVISION	BY	DATE
1	AS-BUILT RECORD DRAWINGS	NAS	11/15/18

E. 104TH AVENUE WATER QUALITY POND	DESIGNED BY	TAB	DRAWN BY	AAM	CHECKED BY	
POND 105 OUTLET STRUCTURE DETAILS						
SHEET 16 OF 33						
JOB NO. 14421.32						



NOTE:
(AB) - INDICATES AS BUILT CONDITION
AS CONSTRUCTED
11/2018



FOR INFORMATION ONLY

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BY	DATE	REVISION
NAS	11/15/18	1 AS-BUILT RECORD DRAWINGS

H-SCALE	V-SCALE	DATE	DESIGNED BY	DRAWN BY	CHECKED BY
		11/7/17	TAB	AAM	

E. 104TH AVENUE WATER QUALITY POND
POND 105 OUTLET STRUCTURE DETAILS

SHEET 17 OF 33
JOB NO. 14421.32

BEAM DETAIL
(OVERFLOW GRATE)
SCALE: 3/4"=1'

BEAM DETAIL
(FRONT OF BEAM)

SCALE: $\frac{3}{4}"=1'$

TRASH RACK CONNECTION TO WALLS
N.T.S.

PEDESTRIAN RAILING DETAIL

SCALE: 1/2"=1'

PEDESTRIAN RAILING NOTES:

1. STEEL SHALL BE ASTM A 53 TYPES E OR S, GRADE A, BLACK, GRIND ALL WELDS SMOOTH.
2. HANDRAIL PAINT SHALL CONFORM TO CDDT STANDARD SPECIFICATION 509.24. ALL STEEL RAILING SHALL BE PAINTED USING A TWO-COAT SYSTEM WITH ORGANIC ZINC RICH PRIMER (COAT 1) AND POLYURETHANE TOP COAT. THE SHOP COAT SHALL HAVE A DRY FILM THICKNESS OF 3.0 MILS. THE TOP COAT SHALL HAVE A THICKNESS OF 3.0 MILS. COLOR: BLACK.
3. RAILING POSTS SHALL BE SET NORMAL TO GRADE. RAILS SHALL RUN PARALLEL TO THE SLOPES OF TOPS OF THE WALLS.
4. HANDRAIL SHALL BE REQUIRED AT ALL WALLS GREATER THAN 4 FEET HEIGHT AND LOCATIONS SHOWN ON THE PLANS.
5. CONTRACTOR SHALL SUBMIT HANDRAIL SHOP DRAWINGS TO ENGINEER OF RECORD FOR APPROVAL PRIOR TO FABRICATION.

REMOVABLE TRASH RACK DETAIL
N.T.S.

POND 105 OUTLET STRUCTURE
ISOMETRIC VIEW
N.T.S.

OVERFLOW GRATE INSTALLATION
DETAIL

N.T.S.

HANDRAIL POST DETAIL

OUTLET STRUCTURE STRUCTURAL NOTES:

1. ALL CONCRETE SHALL BE CLASS D IN ACCORDANCE WITH CDOT STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION.
2. ALL CONSTRUCTION JOINTS SHALL BE THOROUGHLY CLEANED BEFORE FRESH CONCRETE IS POURED.
3. ALL CONSTRUCTION JOINTS NOT SHOWN ON THE PLANS SHALL BE APPROVED BY THE ENGINEER.
4. THE CONTRACTOR IS RESPONSIBLE FOR THE STABILITY OF THE STRUCTURE DURING CONSTRUCTION.
5. STRUCTURE EXCAVATION AND BACKFILL SHALL BE IN ACCORDANCE WITH CDOT STD. M-206-1.
6. DO NOT BACKFILL UNTIL CONCRETE HAS REACHED DESIGN STRENGTH, F_c.
7. GRADE 60 REINFORCING STEEL AND EPOXY COATED ARE REQUIRED.
8. THE MINIMUM LAP SPLICE LENGTH FOR EPOXY COATED REINFORCING BARS SHALL BE:

BAR SIZE:	#4	#5	#6	#7	#8	#9	#10	#11
SPLICE LENGTH:	1'-3"	1'-6"	1'-10"	2'-2"	3'-8"	4'-8"	5'-11"	7'-3"

9. THE MINIMUM LAP SPLICE LENGTH FOR BLACK REINFORCING BARS SHALL BE:

BAR SIZE:	#4	#5	#6	#7	#8	#9	#10	#11
SPLICE LENGTH:	1'-0"	1'-4"	1'-7"	1'-10"	2'-5"	3'-1"	3'-11"	4'-10"

10. REINFORCING BARS SHALL BE DEFORMED AND SHALL HAVE A MINIMUM OF 2" CLEARANCE.
11. ALL EXPOSED CONCRETE CORNERS SHALL BE CHAMFERED $\frac{3}{4}$ ".
12. STEPS SHALL BE PROVIDED WHEN STRUCTURE INTERIOR HEIGHT EXCEEDS 3'-6" AND SHALL BE IN ACCORDANCE WITH AASHTO M 199.
13. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO VERIFY THE LOCATIONS OF EXISTING STRUCTURES AND EXISTING UTILITIES, PRIOR TO CONSTRUCTION OF THE CAST-IN-PLACE STRUCTURES. FIELD MODIFICATIONS OF PRECAST UNITS TO ACCOMMODATE CAST-IN-PLACE STRUCTURES WILL ONLY BE ACCEPTABLE WITH THE ENGINEER'S APPROVAL.
14. CONTRACTOR SHALL SUBMIT STEEL REINFORCING SHOP DRAWINGS FOR ALL CAST-IN-PLACE STRUCTURES FOR ENGINEER'S APPROVAL PRIOR TO CONSTRUCTION.

OUTLET STRUCTURE PLATE AND GRATING NOTES:

ORIFICE PLATE AND RESTRICTOR PLATE:

1. PROVIDE GASKET MATERIAL BETWEEN THE ORIFICE PLATE AND CONCRETE AND BETWEEN THE RESTRICTOR PLATE AND CONCRETE.
2. BOLT PLATE TO CONCRETE 12" MAX. ON CENTER.

EURV AND WQCV TRASH RACKS:

3. BAR GRATE TRASH RACKS SHALL BE ALUMINUM AND SHALL BE BOLTED USING STAINLESS STEEL HARDWARE.

TRASH RACKS:

4. TRASH RACKS SHALL BE 1X¹/₂" SCH.40 STEEL PIPE, GALVANIZED, @ 6" CENTERS. SUPPORT BARS SHALL BE 1/2"x2" STEEL RECTANGULAR BARS, GALVANIZED, @ 36". ALL TRASH RACKS SHALL BE MOUNTED USING STAINLESS STEEL HARDWARE AND PROVIDED WITH BOLTABLE ACCESS PANELS.
5. STEEL TRASH RACKS SHALL BE HOT DIP GALVANIZED AND MAY BE HOT POWDER COATED AFTER GALVANIZING.
6. STRUCTURAL STEEL FOR GRATES, ORIFICE PLATES, AND BARS SHALL BE GALVANIZED AND SHALL BE IN ACCORDANCE WITH CDOT STANDARD SPECIFICATIONS, SUBSECTION 712.06.
7. ALL HARDWARE, BOLTS, AND FASTENERS SHALL BE STAINLESS STEEL.
8. CONTRACTOR SHALL SUBMIT SHOP DRAWINGS FOR ALL PLATES AND GRATING FOR ENGINEER'S APPROVAL PRIOR TO CONSTRUCTION.

OVERFLOW GRATE

9. ALL OVERFLOW GRATES SHALL BE MOUNTED USING STAINLESS STEEL HARDWARE AND PROVIDED WITH HINGED & LOCKABLE OR BOLTABLE ACCESS PANELS AS SHOWN ON THE PLANS.
10. OVERFLOW GRATES SHALL BE HOT DIP GALVANIZED STEEL AND MAY BE HOT POWDER COATED AFTER GALVANIZING.

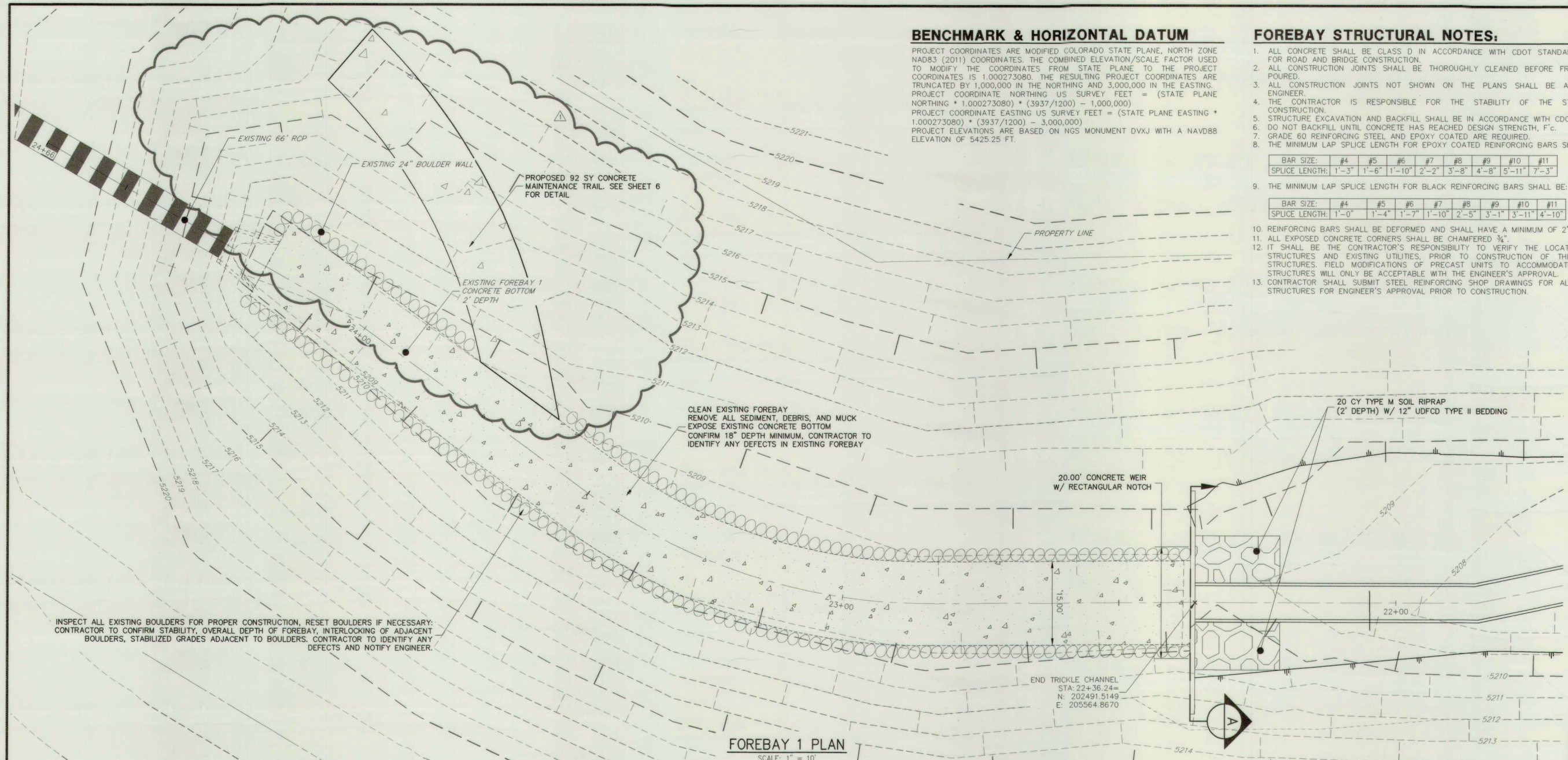
OVERFLOW GRATE DETAILS
N.T.S.



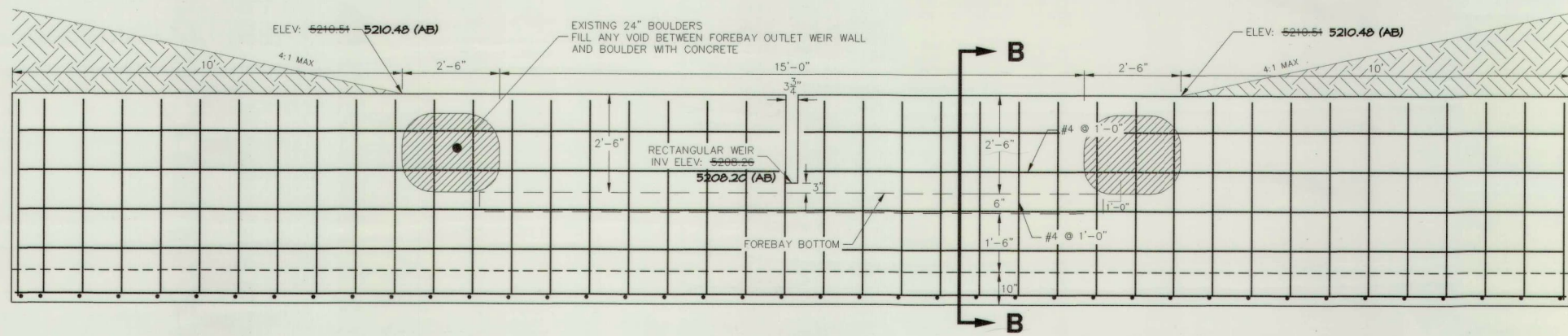
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NOTE:
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11/2018

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FOREBAY 1 PLAN
SCALE: 1" = 10'



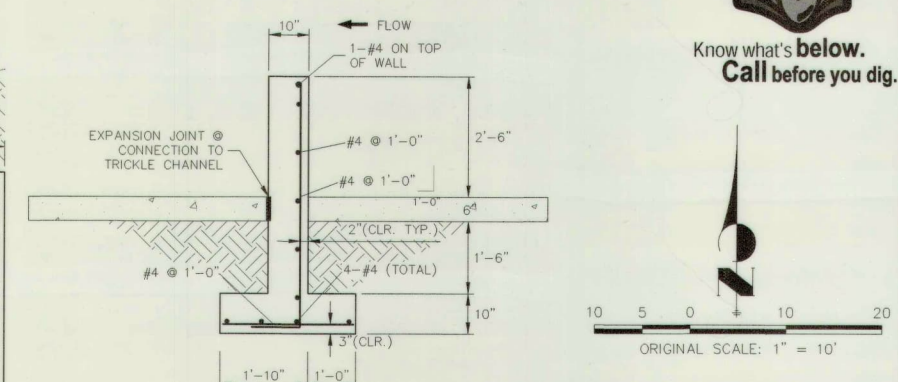
FOREBAY 1 - WEIR SECTION A
SCALE: 1/2" = 1'

BENCHMARK & HORIZONTAL DATUM
PROJECT COORDINATES ARE MODIFIED COLORADO STATE PLANE, NORTH ZONE NAD83 (2011) COORDINATES. THE COMBINED ELEVATION/SCALE FACTOR USED TO MODIFY THE COORDINATES FROM STATE PLANE TO THE PROJECT COORDINATES IS 1.000273080. THE RESULTING PROJECT COORDINATES ARE TRUNCATED BY 1,000,000 IN THE NORTHING AND 3,000,000 IN THE EASTING. PROJECT COORDINATE NORTHING US SURVEY FEET = (STATE PLANE NORTHING * 1.000273080) * (3937/1200) - 1,000,000
PROJECT COORDINATE EASTING US SURVEY FEET = (STATE PLANE EASTING * 1.000273080) * (3937/1200) - 3,000,000
PROJECT ELEVATIONS ARE BASED ON NGS MONUMENT DVXJ WITH A NAVD88 ELEVATION OF 5425.25 FT.

- FOREBAY STRUCTURAL NOTES:**
- ALL CONCRETE SHALL BE CLASS D IN ACCORDANCE WITH CDOT STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION.
 - ALL CONSTRUCTION JOINTS SHALL BE THOROUGHLY CLEANED BEFORE FRESH CONCRETE IS POURED.
 - ALL CONSTRUCTION JOINTS NOT SHOWN ON THE PLANS SHALL BE APPROVED BY THE ENGINEER.
 - THE CONTRACTOR IS RESPONSIBLE FOR THE STABILITY OF THE STRUCTURE DURING CONSTRUCTION.
 - STRUCTURE EXCAVATION AND BACKFILL SHALL BE IN ACCORDANCE WITH CDOT STD. M-206-1. DO NOT BACKFILL UNTIL CONCRETE HAS REACHED DESIGN STRENGTH, F_c.
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 - THE MINIMUM LAP SPlice LENGTH FOR EPOXY COATED REINFORCING BARS SHALL BE:

BAR SIZE:	#4	#5	#6	#7	#8	#9	#10	#11
SPlice LENGTH:	1'-3"	1'-6"	1'-10"	2'-2"	3'-8"	4'-8"	5'-11"	7'-3"
 - THE MINIMUM LAP SPlice LENGTH FOR BLACK REINFORCING BARS SHALL BE:

BAR SIZE:	#4	#5	#6	#7	#8	#9	#10	#11
SPlice LENGTH:	1'-0"	1'-4"	1'-7"	1'-10"	2'-5"	3'-1"	3'-11"	4'-10"
 - REINFORCING BARS SHALL BE DEFORMED AND SHALL HAVE A MINIMUM OF 2" CLEARANCE.
 - ALL EXPOSED CONCRETE CORNERS SHALL BE CHAMFERED 3/4".
 - IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO VERIFY THE LOCATIONS OF EXISTING STRUCTURES AND EXISTING UTILITIES, PRIOR TO CONSTRUCTION OF THE CAST-IN-PLACE STRUCTURES. FIELD MODIFICATIONS OF PRECAST UNITS TO ACCOMMODATE CAST-IN-PLACE STRUCTURES WILL ONLY BE ACCEPTABLE WITH THE ENGINEER'S APPROVAL.
 - CONTRACTOR SHALL SUBMIT STEEL REINFORCING SHOP DRAWINGS FOR ALL CAST-IN-PLACE STRUCTURES FOR ENGINEER'S APPROVAL PRIOR TO CONSTRUCTION.



B-B
SCALE 1/2" = 1'

CERTIFICATION STATEMENT
I HEREBY CERTIFY THAT THE PUBLIC IMPROVEMENTS FOR E. 104TH AVENUE WATER QUALITY POND HAVE BEEN CONSTRUCTED IN SUBSTANTIAL COMPLIANCE WITH THE CONSTRUCTION PLANS APPROVED BY THE CITY OF COMMERCE CITY.

811
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COLORED REGISTERED
AARON LEE CLUTTER
36742
12/5/19
DATE

AARON LEE CLUTTER, P.E.
COLORADO NO. 36742
FOR AND ON BEHALF OF JR ENGINEERING, LLC.

UNTIL SUCH TIME AS THESE DRAWINGS ARE APPROVED BY THE APPROPRIATE REVIEWING AGENCIES, JR ENGINEERING APPROVES THEIR USE ONLY FOR THE PURPOSES INDICATED ON THE WRITTEN AUTHORIZATION.

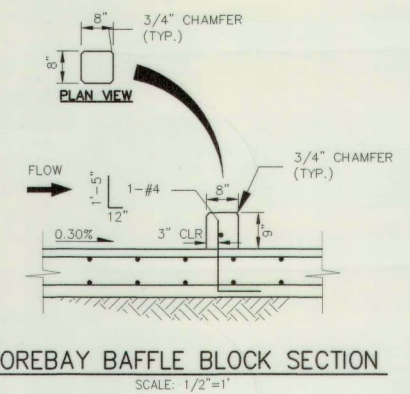
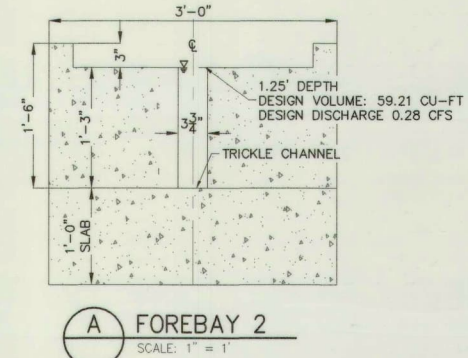
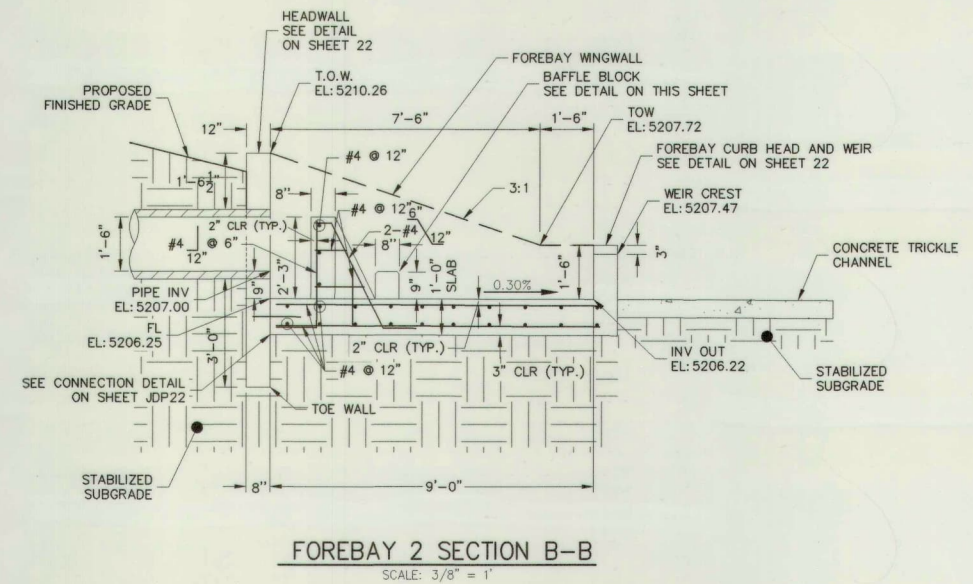
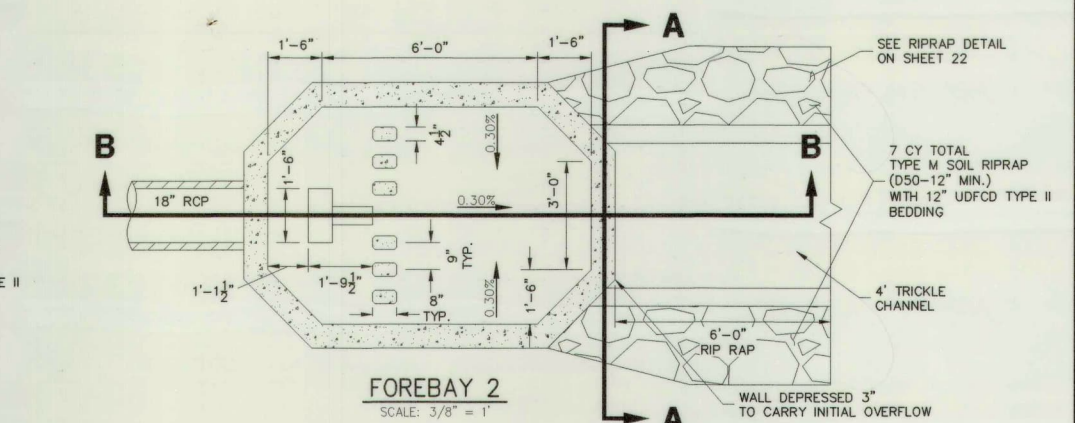
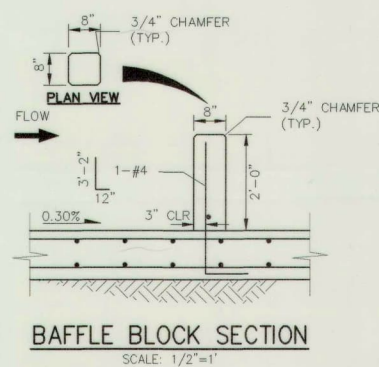
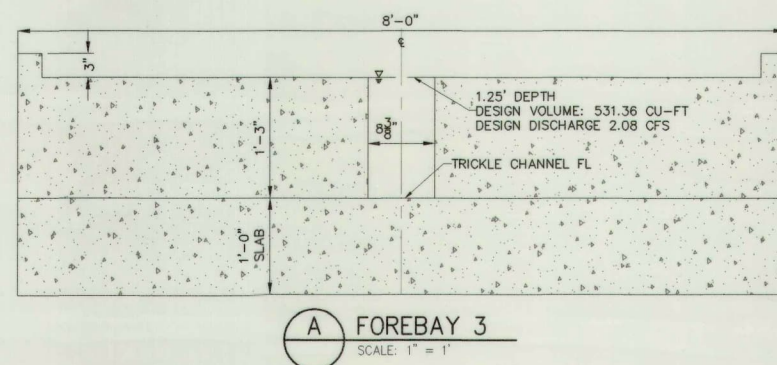
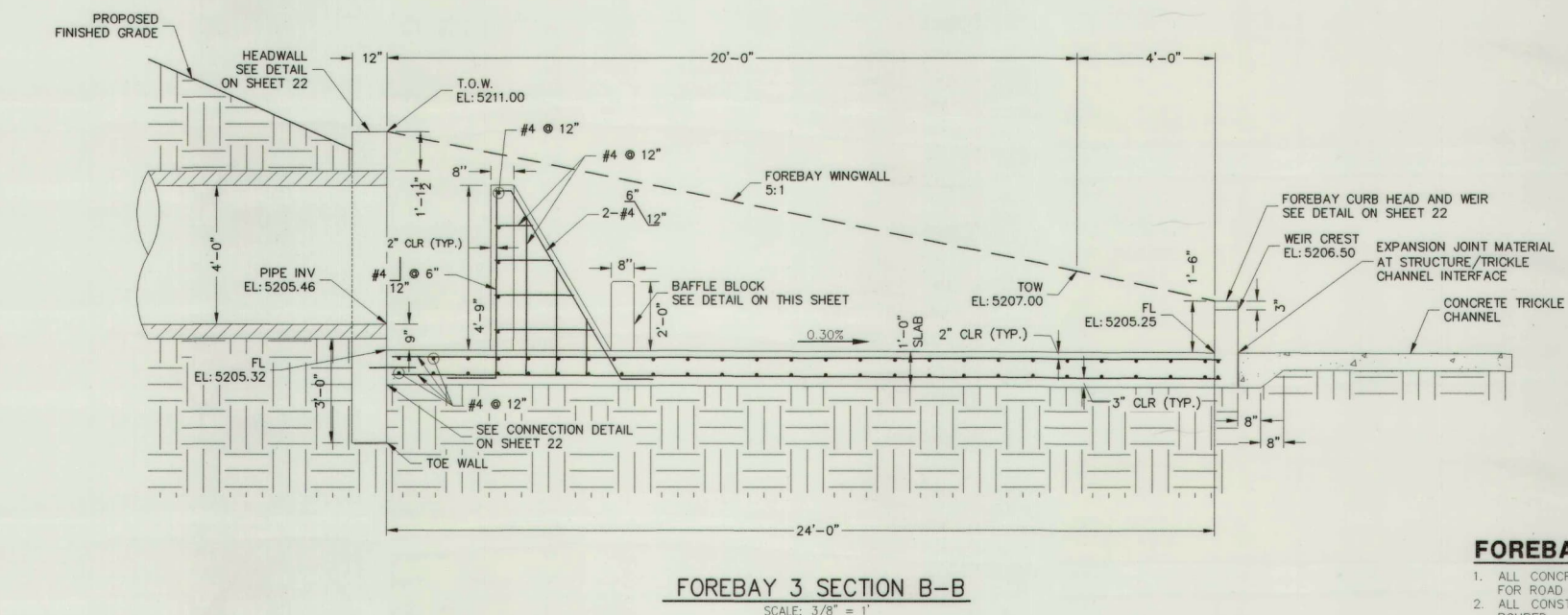
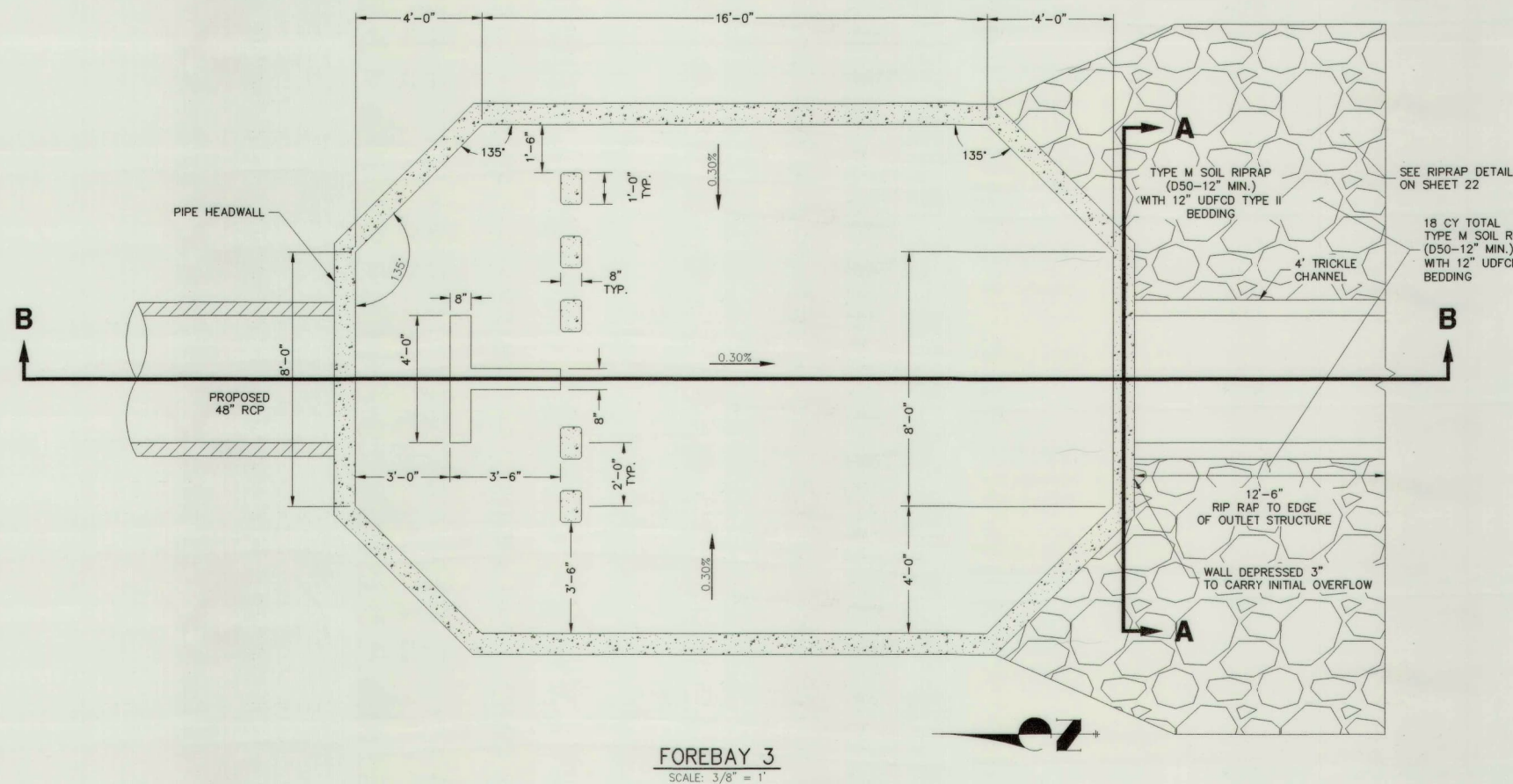
PREPARED FOR
REUNION METROPOLITAN DISTRICT
17910 E PARKSIDE DRIVE NORTH
COMMERCE CITY, CO 80022
ATTN: LIZ ALEXANDER
(303)-288-5431

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A Western Company
Central 303-740-9888 • Colorado Springs 761-569-5588
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BY	DATE	REVISION	NO.	AS SHOWN	AS SHOWN	DATE	DESIGNED BY	DRAWN BY	CHECKED BY
DIV	4/16/18	1	DCN #5	AS SHOWN	AS SHOWN	11/7/17	TAB	TAB	TAB
NAS	11/15/18	2	AS-BUILT RECORD DRAWINGS						

E. 104TH AVENUE WATER QUALITY POND
FOREBAY AND IMPACT BASIN DETAILS

SHEET 19 OF 33
JOB NO. 14421.32



FOREBAY STRUCTURAL NOTES:

1. ALL CONCRETE SHALL BE CLASS D IN ACCORDANCE WITH CDOT STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION.
2. ALL CONSTRUCTION JOINTS SHALL BE THOROUGHLY CLEANED BEFORE FRESH CONCRETE IS POURED.
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SPLICE LENGTH:	1'-3"	1'-6"	1'-10"	2'-2"	3'-8"	4'-8"	5'-11"	7'-3"

9. THE MINIMUM LAP SPLICE LENGTH FOR BLACK REINFORCING BARS SHALL BE:
- | BAR SIZE: | #4 | #5 | #6 | #7 | #8 | #9 | #10 | #11 |
|----------------|-------|-------|-------|--------|-------|-------|--------|--------|
| SPLICE LENGTH: | 1'-0" | 1'-4" | 1'-7" | 1'-10" | 2'-5" | 3'-1" | 3'-11" | 4'-10" |
10. REINFORCING BARS SHALL BE DEFORMED AND SHALL HAVE A MINIMUM OF 2" CLEARANCE.
11. ALL EXPOSED CONCRETE CORNERS SHALL BE CHAMFERED 3/4".
12. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO VERIFY THE LOCATIONS OF EXISTING STRUCTURES AND EXISTING UTILITIES PRIOR TO THE CONSTRUCTION OF THE CAST-IN-PLACE STRUCTURES. FIELD MODIFICATIONS OF PRECAST UNITS TO ACCOMMODATE CAST-IN-PLACE STRUCTURES WILL ONLY BE ACCEPTABLE WITH THE ENGINEER'S APPROVAL.
13. CONTRACTOR SHALL SUBMIT STEEL REINFORCING SHOP DRAWINGS FOR ALL CAST-IN-PLACE STRUCTURES FOR ENGINEER'S APPROVAL PRIOR TO CONSTRUCTION.

10. REINFORCING BARS SHALL BE DEFORMED AND SHALL HAVE A MINIMUM OF 2" CLEARANCE.
11. ALL PROPOSED CONCRETE CORNERS SHALL BE CHAMFERED 3".
12. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO VERIFY THE LOCATIONS OF EXISTING STRUCTURES AND EXISTING UTILITIES, PRIOR TO CONSTRUCTION OF THE CAST-IN-PLACE STRUCTURES. FIELD MODIFICATIONS OF PRECAST UNITS TO ACCOMMODATE CAST-IN-PLACE STRUCTURES WILL ONLY BE ACCEPTABLE WITH THE ENGINEER'S APPROVAL.
13. CONTRACTOR SHALL SUBMIT STEEL REINFORCING SHOP DRAWINGS FOR ALL CAST-IN-PLACE STRUCTURES FOR ENGINEER'S APPROVAL PRIOR TO CONSTRUCTION.

NOTE:
(AB) - INDICATES AS BUILT CONDITION
AS CONSTRUCTED
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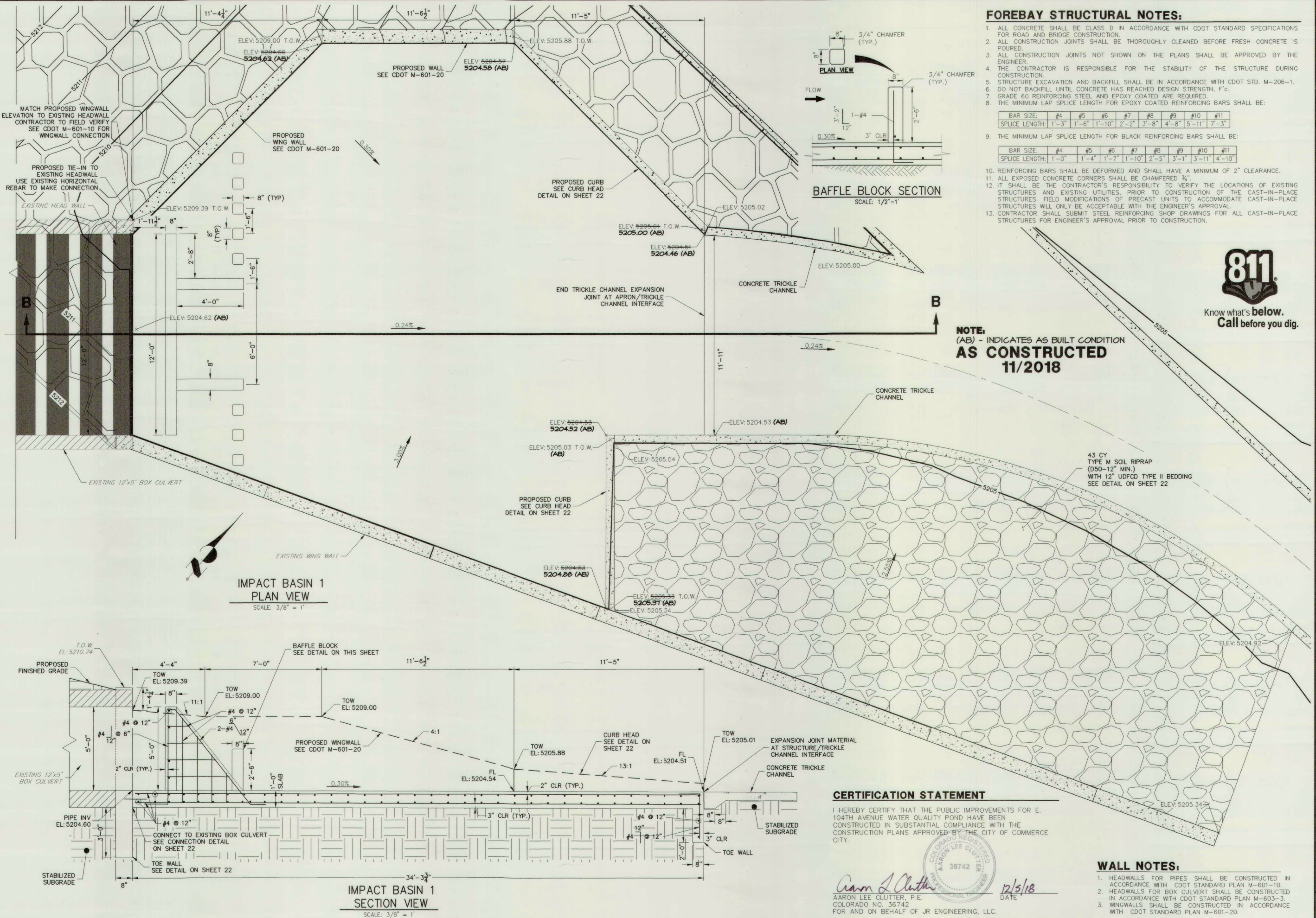
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	V-SCALE	AS SHOWN	1	AS-BUILT RECORD DRAWINGS	NAS 11/15/18
	DATE	11/7/17			
	DESIGNED BY	TAB			
	DRAWN BY	AAM			
	CHECKED BY				

FOREBAY AND IMPACT BASIN
DETAILS



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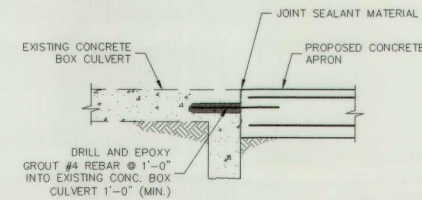
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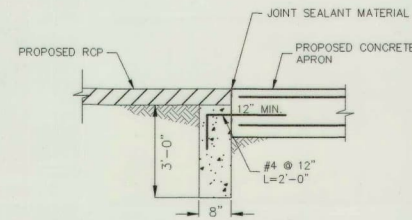
BY	DATE	REVISION	NO.
NAS	11/15/18	1	AS-BUILT RECORD DRAWINGS

E. 104TH AVENUE WATER QUALITY POND
FOREBAY AND IMPACT BASIN DETAILS

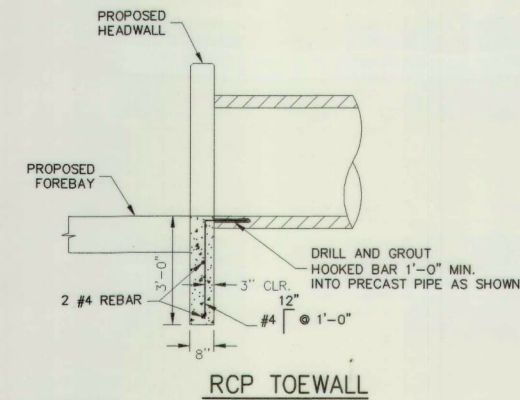
SHEET 21 OF 33
JOB NO. 14421.32



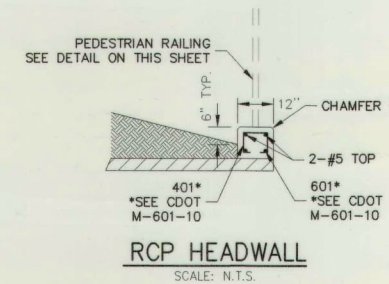
CONNECTION TO EXISTING BOX CULVERT
SCALE: N.T.S.



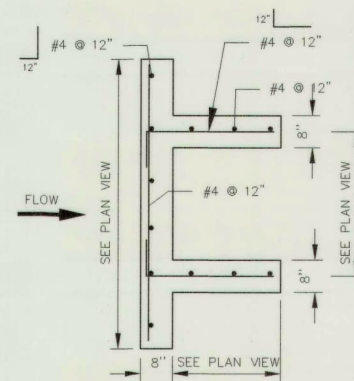
CONNECTION TO PROPOSED RCP TOEWALL
SCALE: N.T.S.



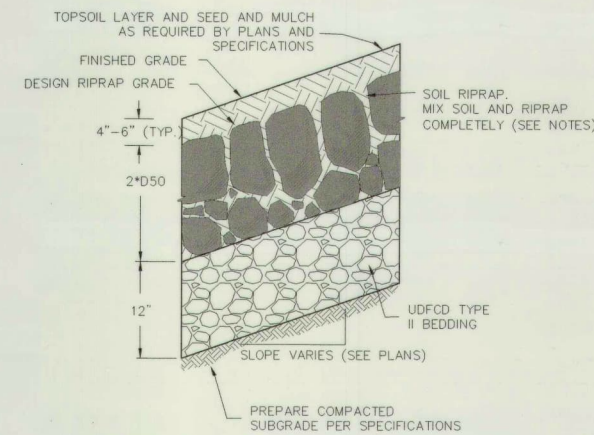
RCP TOEWALL
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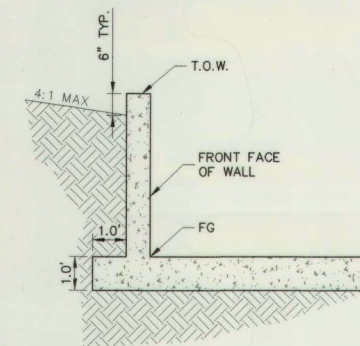
RCP HEADWALL
SCALE: N.T.S.



IMPACT BASIN 1
BAFFLE BLOCK PLAN
SCALE: N.T.S.



SOIL RIPRAP EMBANKMENT PROTECTION
WITH BEDDING TYP. SECTION
N.T.S.



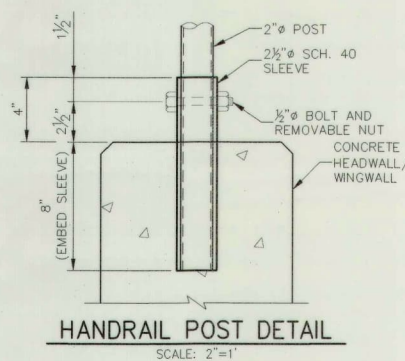
FOREBAY WALL
SECTION/LEGEND
SCALE: N.T.S.

TYPE M RIPRAP	
INTERMEDIATE ROCK DIMENSION (IN.)	PERCENT PASSING (%)
21	70-100
18	50-70
12	35-50
4	2-10

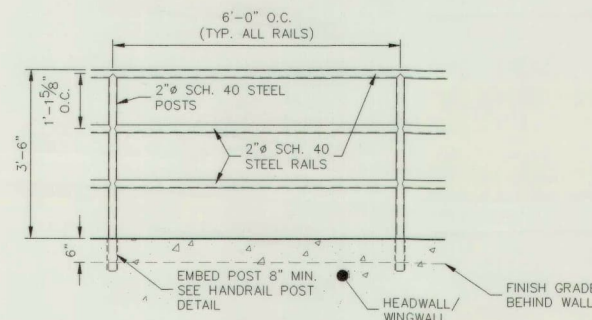
*TYPE M RIPRAP D₅₀=12\"/>

RIPRAP NOTES:

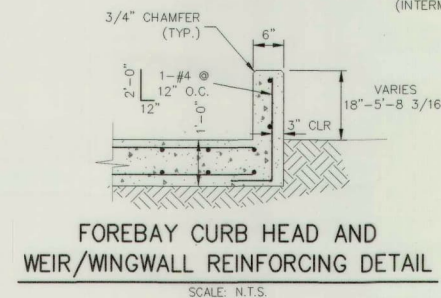
1. SOIL RIPRAP DETAILS ARE APPLICABLE TO SLOPED AREAS. REFER TO THE SITE PLAN ACTUAL LOCATION AND LIMITS.
2. MIX UNIFORMLY 65% RIPRAP BY VOLUME WITH 35% OF APPROVED SOIL BY VOLUME PRIOR TO PLACEMENT.
3. PLACE STONE-SOIL MIX TO RESULT IN SECURELY INTERLOCKED ROCK AT THE DESIGN THICKNESS AND GRADE. COMPACT AND LEVEL TO ELIMINATE ALL VOIDS AND ROCKS PROJECTING ABOVE DESIGN RIPRAP TOP GRADE.
4. CRIMP OR TACKIFY MULCH OR USE APPROVED HYDROMULCH AS CALLED FOR IN THE PLANS AND SPECIFICATIONS.
5. ROCK SHALL BE HARD, DURABLE, ANGULAR IN SHAPE, AND FREE FROM CRACKS, OVERBURDEN, SHALE, AND ORGANIC MATTER.
6. NEITHER BREADTH NOR THICKNESS OF A SINGLE STONE SHOULD BE LESS THAN ONE-THIRD ITS LENGTH, AND ROUNDED STONE SHOULD BE AVOIDED.
7. THE ROCK SHOULD SUSTAIN A LOSS OF NOT MORE THAN 40% AFTER 500 REVOLUTIONS IN AN ABRASION TEST (LOS ANGELES MACHINE ASTM C-535-69) AND SHOULD SUSTAIN A LOSS OF NOT MORE THAN 10% AFTER 12 CYCLES OF FREEZING AND THAWING (AASHTO TEST 103 FOR LEDGE ROCK PROCEDURE A).
8. ROCK HAVING A MINIMUM SPECIFIC GRAVITY OF 2.65 IS PREFERRED; HOWEVER, IN NO CASE SHOULD ROCK HAVE A SPECIFIC GRAVITY LESS THAN 2.50.



HANDRAIL POST DETAIL
SCALE: 2\"/>

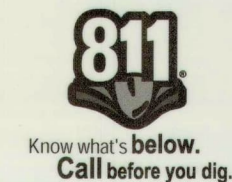


PEDESTRIAN RAILING DETAIL
SCALE: 1/2\"/>



FOREBAY CURB HEAD AND
WEIR/WINGWALL REINFORCING DETAIL
SCALE: N.T.S.

NOTE:
(AB) - INDICATES AS BUILT CONDITION
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11/2018



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BY	DATE	REVISION	AS SHOWN	AS BUILT	RECORD DRAWINGS
		No.	1	1	
		AS SHOWN	11/7/17		
		DESIGNED BY	AAM		
		DRAWN BY	AAM		
		CHECKED BY			

E. 104TH AVENUE WATER QUALITY
POND
FOREBAY & IMPACT BASIN
STANDARD DETAILS

**FINAL DRAINAGE REPORT
FOR
REUNION CENTER – DUET & COMMERCIAL PHASE
DISTRICT INFRASTRUCTURE**

July 10, 2024

Prepared For:
Reunion Metropolitan District
17910 East Parkside Drive North
Commerce City, Colorado 80022
Contact: Matt Urkoski

Prepared By:
JR ENGINEERING, LLC
7200 S Alton Way, Suite C400
Centennial, Colorado 80112
(303) 740-9393
Contact: Aaron Clutter, PE

REUNION CENTER-DUET & COMMERCIAL PHASE

DISTRICT IMPROVEMENTS FINAL DRAINAGE PLAN

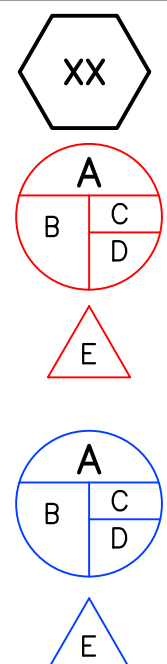
PROPOSED INTERIM CONDITIONS

BASIN SUMMARY TABLE						
		Sub-basin	Area (ac)	% Imp.	Q _s (cfs)	Q ₁₀₀ (cfs)
Off-Site Sub-Basins	Homestead Trail (Off-Site flows)	A1	0.40	80.36%	1.06	2.72
		A2	0.25	90.56%	0.73	1.76
		A3	0.15	75.65%	0.39	1.01
		A4	0.38	84.01%	0.98	2.44
		A5	0.29	64.10%	0.46	1.40
		A6	0.45	55.00%	0.63	2.13
Off-Site Sub-Basins Total			1.92	73.64%		
Proposed Detention Pond 108a Sub-Basins	Homestead Trail	B1	0.67	79.09%	1.27	3.32
		B2	0.55	82.40%	1.14	2.94
		B5	0.15	81.29%	0.39	1.02
	105th Avenue	B6	0.22	78.75%	0.57	1.49
		B9	0.05	55.00%	0.07	0.24
	Off-Site Basins (Duets by Others)	B7	0.54	69.32%	0.98	2.81
		B3	0.31	65.00%	0.57	1.68
		B4	0.64	69.06%	1.25	3.51
	Pond 108a	B8	12.44	67.21%	16.10	46.52
		108a	1.11	25.00%	0.70	4.33
Proposed Detention Pond 108a Sub-Basins Total			16.69	65.72%		
Proposed Pond 108b Sub-Basins	Walden Street Collection	C1	0.37	87.29%	1.06	2.63
		C2	0.68	68.23%	1.48	4.19
		C7	1.40	72.48%	2.09	5.70
	Off-Site Basins (Duets by Others)	C4	0.32	73.70%	0.76	2.05
		C5	0.19	71.50%	0.41	1.13
	Off-Site Basin (Filing 18)	C6	22.80	60.00%	22.70	70.69
		C8	1.95	80.00%	3.39	8.78
	Commercial at Reunion Center (By Others)	C9	3.65	79.59%	6.22	16.12
		C18	2.63	80.00%	6.68	17.15
		C24	1.37	80.00%	2.49	6.46
		C27	0.61	80.00%	1.28	3.31
	E. 104th Way	C28	0.78	80.00%	1.77	4.58
		C13	0.43	76.18%	0.99	2.60
		C19	0.83	80.00%	2.19	5.69
	Yampa Street	C15	0.36	90.45%	1.09	2.63
		C17	0.37	87.52%	1.09	2.63
		C25	0.23	76.50%	0.59	1.53
	Pond 108b	C26	0.41	88.35%	1.21	2.89
108b	1.48	25.00%	0.83	5.23		
Proposed Detention Pond 108b Sub-Basins Total			40.86	66.52%		
Existing WQ Pond 105 Sub-Basins	Off-Site Interim Basins (Tower Road)	D1	1.17	40.64%	1.21	4.96
		D2	0.78	55.10%	1.13	3.70
		D3	0.22	86.10%	0.63	1.53
		D9	0.88	57.68%	1.26	3.98
	Off-Site Future Basins (Tower Road)	D1-F	0.51	60.57%	0.81	2.26
		D2-F	0.41	100.00%	1.37	3.14
		D4-F	0.45	67.74%	0.85	2.44
		D3-F	0.30	96.61%	0.98	2.21
	Off-Site Basins (Duets by Others)	D8-F	1.17	82.47%	2.75	6.90
		D9-F	0.88	91.09%	2.35	5.63
	105th Avenue	D5	0.52	54.70%	0.68	2.31
		D6	0.47	74.77%	1.05	2.90
	E. 104th Avenue	D7	1.31	66.54%	2.68	7.83
		D12	2.07	79.19%	3.68	9.57
E. 104th Way	D13	1.30	89.10%	3.30	7.94	
	D14	0.73	94.08%	1.96	4.54	
Reunion Center (By Others)	D10	0.40	81.85%	1.09	2.72	
D11	1.50	80.00%	3.89	10.03		
Existing WQ Pond 105 Interim Sub-Basins Total			68.90	67.15%		
Existing WQ Pond 105 Ultimate Sub-Basins Total			69.57	68.63%		

Off-Site Sub-Basin Design Point Summary Table				
Design Point	Contributing Basins	Contributing Area (ac)	Q _s (cfs)	Q ₁₀₀ (cfs)
101	Sub-Basins A1, A3 and A6	1.00	1.81	5.16
102	Sub-Basins A2 and A4	0.63	1.87	4.09
103	Sub-Basin A5	0.29	0.46	1.40
104	DP 101 and DP 102	1.92	3.61	8.74

Proposed Detention Pond 108a Sub-Basin Design Point Summary Table				
Design Point	Contributing Basins	Contributing Area (ac)	Q _s (cfs)	Q ₁₀₀ (cfs)
201	Sub-Basin B1	0.67	1.27	3.32
202	Sub-Basins B2 and B3	0.87	1.66	4.44
203	DP 201 and DP 202	1.54	2.83	7.49
204	Sub-Basins B4 and B5	0.79	1.58	4.39
205	Sub-Basins B6 and B9	0.27	0.63	1.68
206	DP 204 and DP 205	1.06	2.16	5.93
207	DP 203 and DP 206	2.60	4.64	12.46
208	Sub Basin B7	0.54	0.98	2.81
209	Sub Basin B8, DP 207 and DP 208	15.58	20.62	58.82
108a	Sub Basin 108a and DP 209	21.11	21.11	61.84
	Detained flows piped to DP 402	16.69	5.50	8.53

LEGEND



STORMWATER POND

PROPOSED BASIN LABEL
A. BASIN DESIGNATION
B. AREA
C. 5 YEAR RUNOFF COEFFICIENT
D. 100 YEAR RUNOFF COEFFICIENT

E. PROPOSED DESIGN POINT DESIGNATION

FUTURE BASIN LABEL
A. BASIN DESIGNATION
B. AREA
C. 5 YEAR RUNOFF COEFFICIENT
D. 100 YEAR RUNOFF COEFFICIENT

E. FUTURE DESIGN POINT DESIGNATION

EX INDEX CONTOUR

EX INTERMEDIATE CONTOUR

PROP INDEX CONTOUR (BY OTHERS)

PROP INTERMEDIATE CONTOUR (BY OTHERS)

PROP INDEX CONTOUR

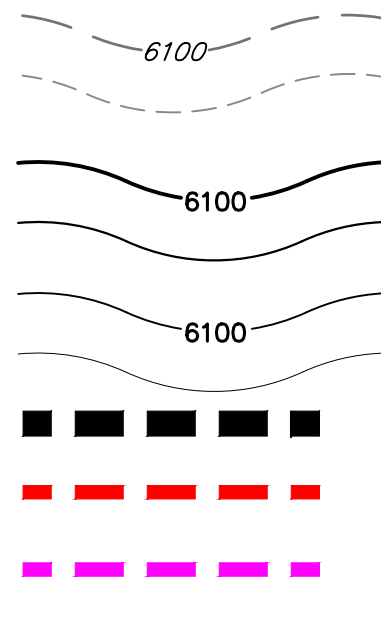
PROP INTERMEDIATE CONTOUR

PROPOSED MAJOR BASIN DELINEATION

PROPOSED MINOR BASIN DELINEATION

INTERIM DRAINAGE BASIN BOUNDARY

FUTURE DRAINAGE BASIN BOUNDARY



EXISTING DRAINAGE FLOW ARROW

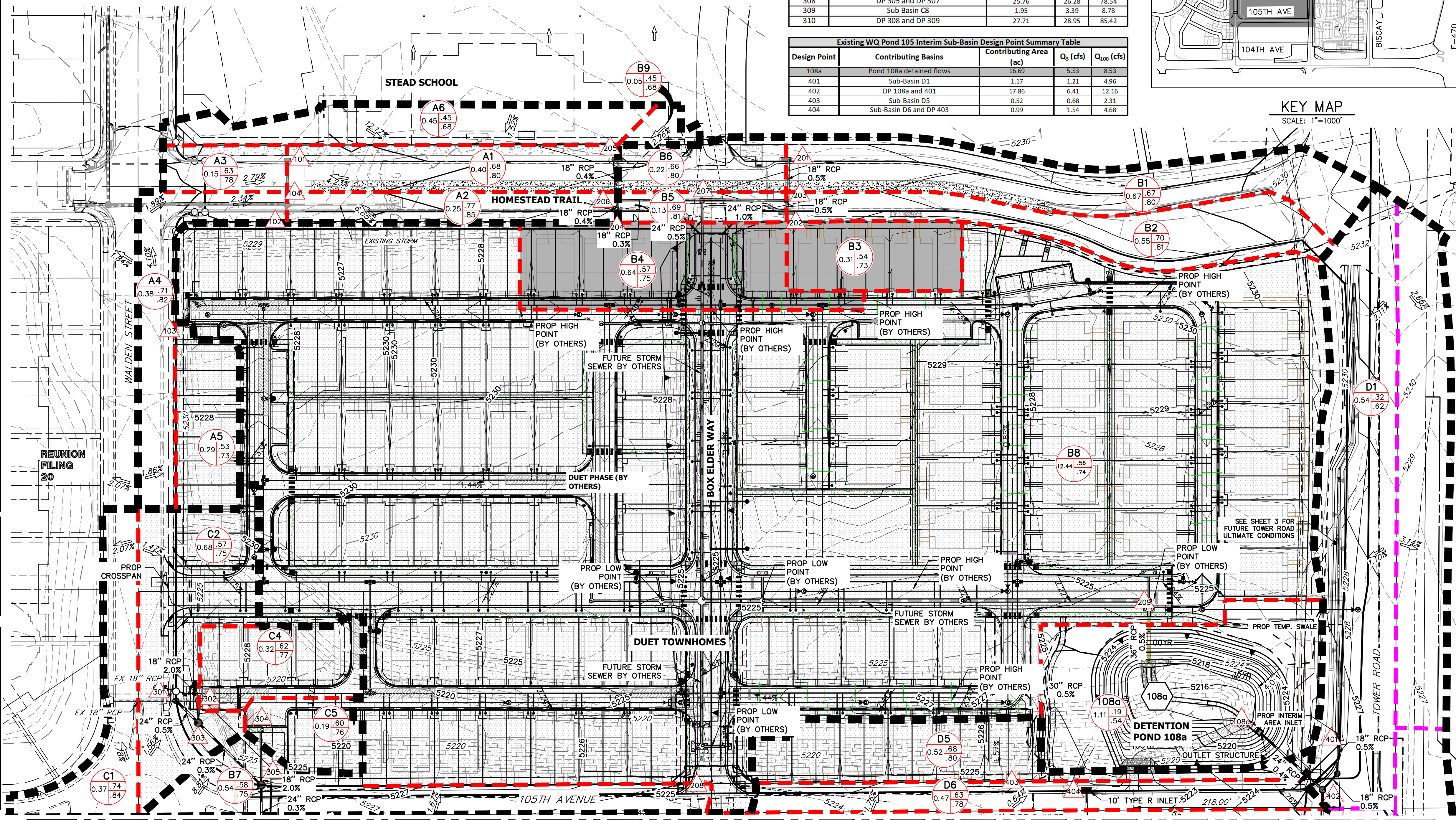
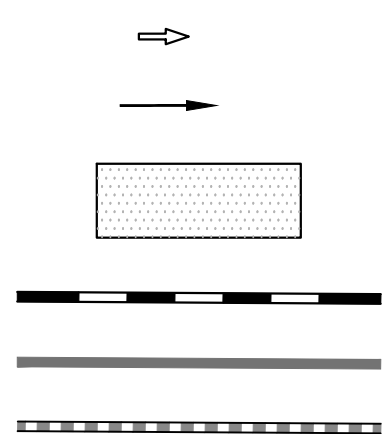
PROPOSED DRAINAGE FLOW ARROW

DRAINAGE AREA BY OTHERS

PROPOSED STORM SEWER

FUTURE STORM SEWER

EXISTING PIPE



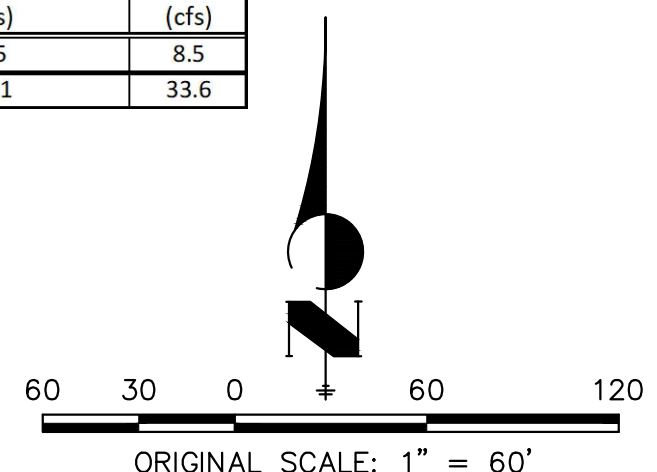
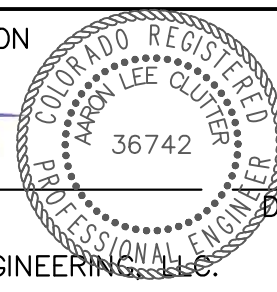
SEE SHEET 2

Detention Pond Parameters Summary Table							
Pond	Tributary Area (ac)	% Impervious	Stored Volume (ac-ft)	V ₁₀₀ (ac-ft)	Stage (ft)	d ₁₀₀ (ft)	Pond Release Rate (cfs)
108a	16.69	65.7%	0.401	1.882	3.44	7.94	5.5
108b	40.86	66.5%	0.587	3.889	3.86	8.95	21.1

ENGINEER'S STATEMENT

PREPARED UNDER MY SUPERVISION

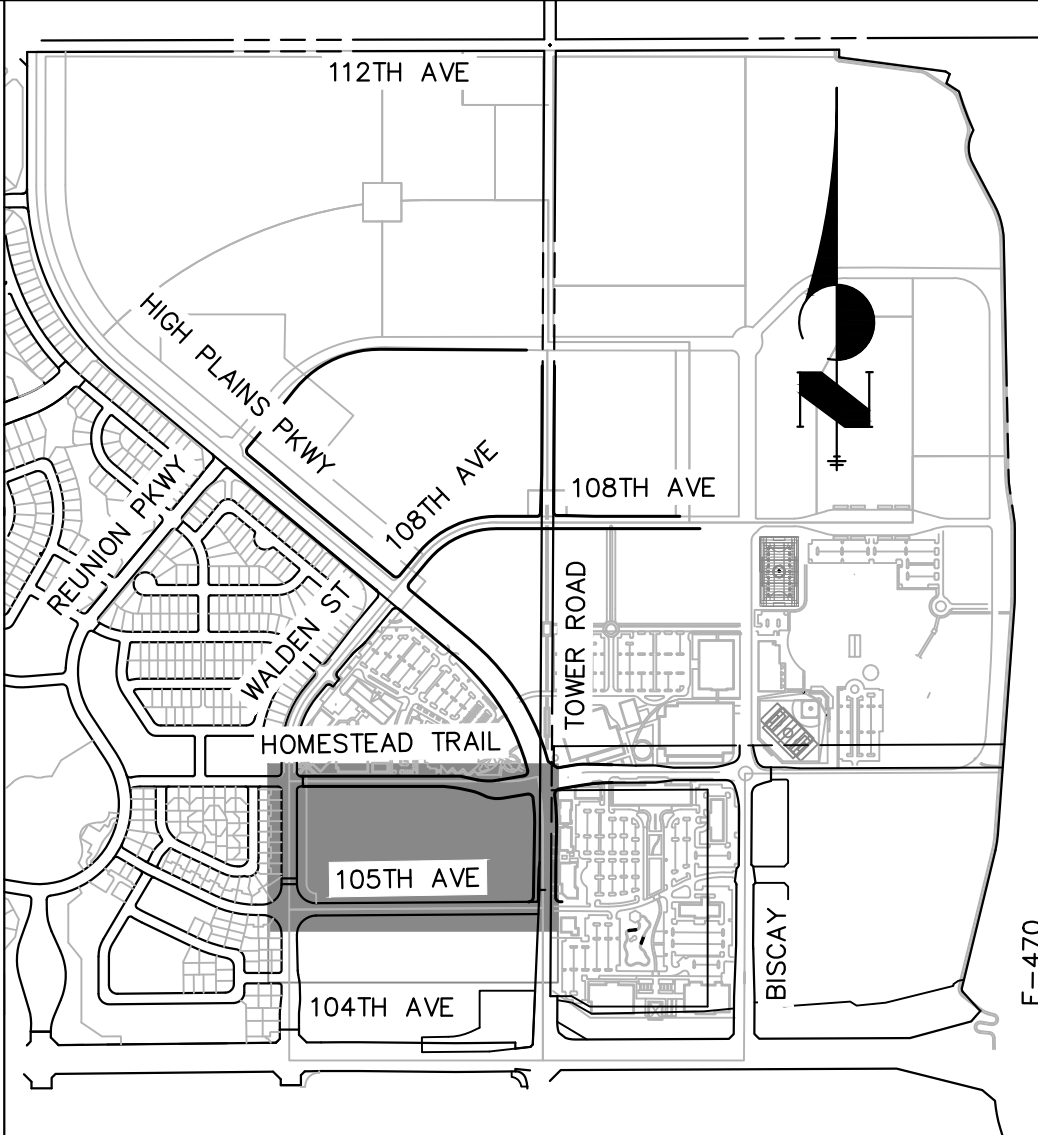
Aaron L. Clutter, P.E.
COLORADO NO. 36742
FOR AND ON BEHALF OF JR ENGINEERING, LLC



PROPOSED INTERIM CONDITIONS
DRAINAGE MAP
REUNION CENTER DUETS
JOB NO. 14421.49
7/10/24
SHEET 1 OF 3



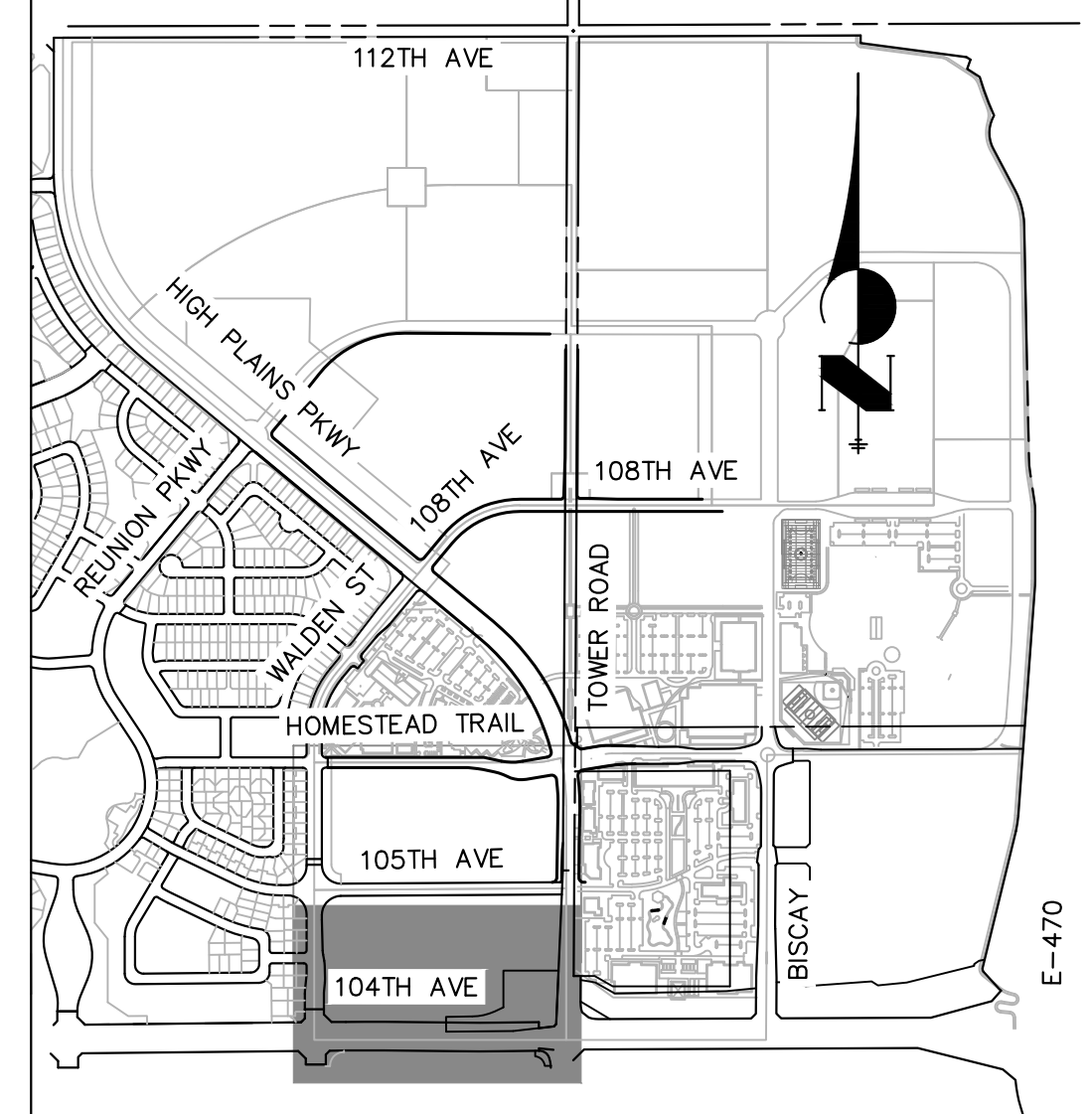
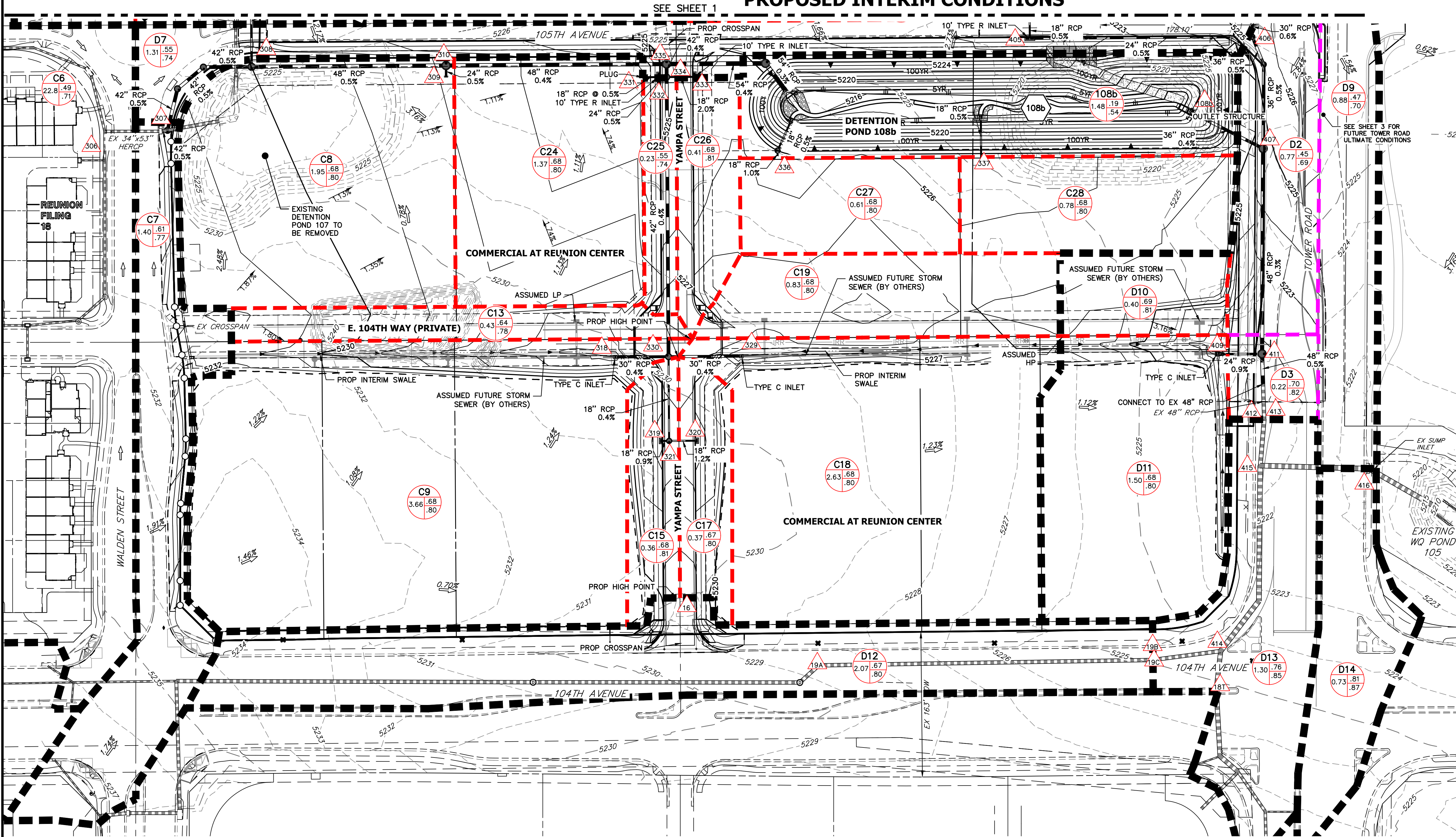
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REUNION CENTER-DUET & COMMERCIAL PHASE

DISTRICT IMPROVEMENTS FINAL DRAINAGE PLAN

PROPOSED INTERIM CONDITIONS



KEY MAP
SCALE: 1"=1000'

Proposed Detention Pond 108b Sub-Basin Design Point Summary Table				
Design Point	Contributing Basins	Contributing Area (ac)	Q _s (cfs)	Q ₁₀₀ (cfs)
301	Sub-Basins C1 and C2	1.05	2.50	6.74
302	Sub-Basin C4	0.32	0.76	2.05
303	DP 301 and DP 302	1.37	3.52	8.78
304	Sub Basin C5	0.19	0.41	1.13
305	DP 303 and DP 304	1.56	3.87	9.78
306	Sub Basin C6	22.80	22.70	70.69
307	Sub-Basin C7 and DP 306	24.20	24.18	73.24
308	DP 305 and DP 307	25.76	26.28	78.54
309	Sub Basin C8	1.95	3.39	8.78
310	DP 308 and DP 309	27.71	28.95	85.42
318	Sub Basins C9 and C13	4.08	6.93	18.00
319	Sub Basin C15	0.36	1.09	2.63
320	Sub Basin C17	0.37	1.09	2.63
329	Sub Basins C18 & C19	3.46	8.78	22.60
330	DP 318, DP 321 and DP 329	3.46	14.30	36.76
331	Sub Basin C24	1.37	2.49	6.46
332	Sub-Basin C25 and DP 24C	1.60	2.90	7.51
333	Sub Basin C26	0.41	1.21	2.89
334	DP 330, DP 332 and DP 333	5.47	17.81	45.71
335	DP 310 and DP 334	33.18	43.11	121.68
336	Sub Basin C27	0.61	1.28	3.31
337	Sub Basin C28	0.78	1.77	4.58
108b	Sub-Basin 108b, DP335, DP336, DP337 Detained flows piped to DP 407	36.05	45.55	130.09
			21.10	33.55

Existing WQ Pond 105 Interim Sub-Basin Design Point Summary Table				
Design Point	Contributing Basins	Contributing Area (ac)	Q _s (cfs)	Q ₁₀₀ (cfs)
108a	Pond 108a detained flows	16.69	5.53	8.53
401	Sub-Basin D1	1.17	1.21	4.96
402	DP 108a and 401	17.86	6.41	12.16
403	Sub-Basin D5	0.52	0.68	2.31
404	Sub-Basin D6 and DP 403	0.99	1.54	4.68
405	Sub-Basin D7 and DP 404	2.30	3.67	10.90
406	DP 402 and DP 405	20.16	9.29	20.73
108b	Pond 108b detained flows	36.05	21.11	33.55
407	DP 406 and DP 108b	56.21	29.20	51.56
409	Sub-Basins D13 & D12	1.90	4.97	12.71
411	DP 407 and DP 410	58.11	31.80	58.22
412	Sub-Basins D2 and D3	1.00	4.83	12.63
413	DP 411 and DP 412	59.11	31.80	66.15
19A	Existing off-site flows per Tower Report	---	40.90	77.00
19B	Basin D12	2.07	3.68	9.57
19C	DP 19B and 19A	---	36.82	81.10
18T	Existing off-site flows from Biscaya	---	61.10	114.90
414	Existing Offsite - Tower/104th & Biscaya	---	76.80	175.92
415	DP 413 and DP 414	---	101.69	221.50
416	Sub-basin D9 and DP 415	---	103.73	226.93

LEGEND

XX	STORMWATER POND	EX INDEX CONTOUR	EXISTING DRAINAGE FLOW ARROW
A B C D	PROPOSED BASIN LABEL A. BASIN DESIGNATION B. AREA C. 5 YEAR RUNOFF COEFFICIENT D. 100 YEAR RUNOFF COEFFICIENT	EX INTERMEDIATE CONTOUR	PROPOSED DRAINAGE FLOW ARROW
E	E. PROPOSED DESIGN POINT DESIGNATION	PROP INDEX CONTOUR (BY OTHERS)	DRAINAGE AREA BY OTHERS
A B C D	FUTURE BASIN LABEL A. BASIN DESIGNATION B. AREA C. 5 YEAR RUNOFF COEFFICIENT D. 100 YEAR RUNOFF COEFFICIENT	PROP INTERMEDIATE CONTOUR (BY OTHERS)	PROPOSED STORM SEWER
E	FUTURE DESIGN POINT DESIGNATION	PROP INDEX CONTOUR	FUTURE STORM SEWER
		PROP INTERMEDIATE CONTOUR	EXISTING PIPE
		PROPOSED MAJOR BASIN DELINEATION	
		PROPOSED MINOR BASIN DELINEATION	
		INTERIM DRAINAGE BASIN BOUNDARY	
		FUTURE DRAINAGE BASIN BOUNDARY	

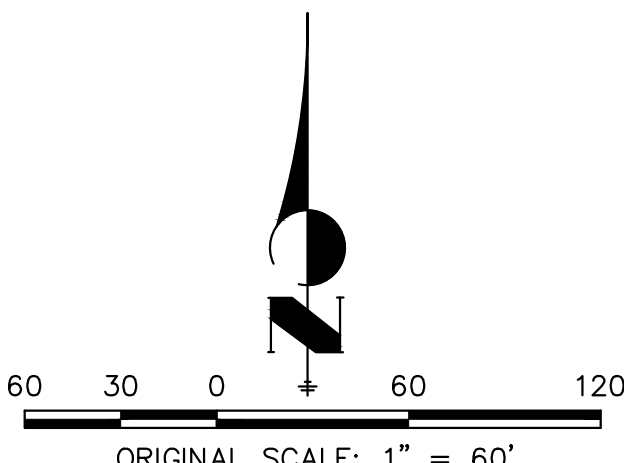
Detention Pond Parameters Summary Table								
Pond	Tributary Area (ac)	% Impervious	Stored Volume		Stage		Pond Release Rate	
			V _s (ac-ft)	V ₁₀₀ (ac-ft)	d _s (ft)	d ₁₀₀ (ft)	Q _s (cfs)	Q ₁₀₀ (cfs)
108a	16.69	65.7%	0.401	1.882	3.44	7.94	5.5	8.5
108b	40.86	66.5%	0.587	3.889	3.86	8.95	21.1	33.6

ENGINEER'S STATEMENT

PREPARED UNDER MY SUPERVISION

Aaron L. Clutter
AARON LEE CLUTTER, P.E.
COLORADO NO. 36742
FOR AND ON BEHALF OF JR ENGINEERING, LLC

7/10/24
DATE



PROPOSED INTERIM CONDITIONS
DRAINAGE MAP
REUNION CENTER DUETS
JOB NO. 14421.49
7/10/24
SHEET 2 OF 3

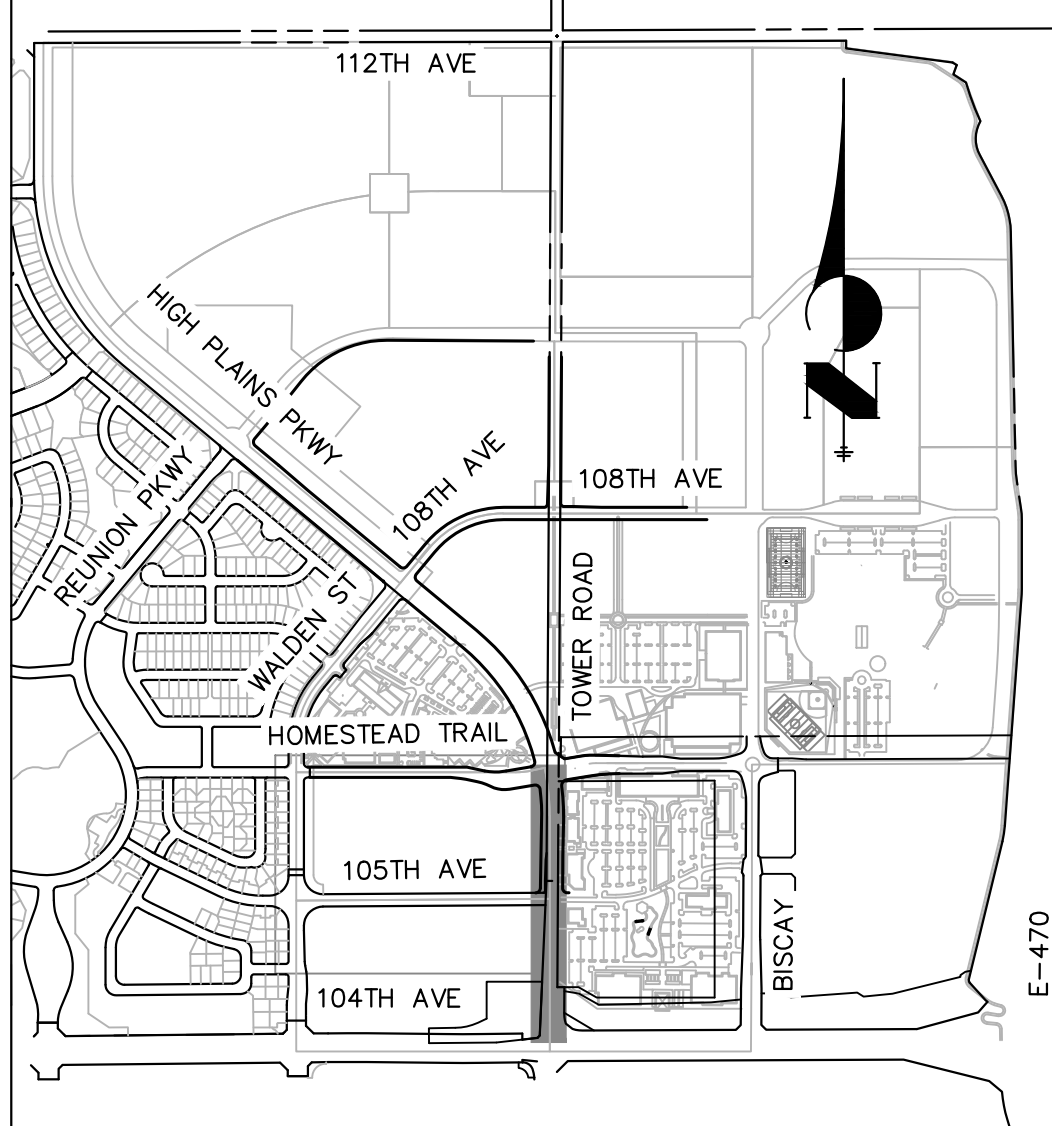
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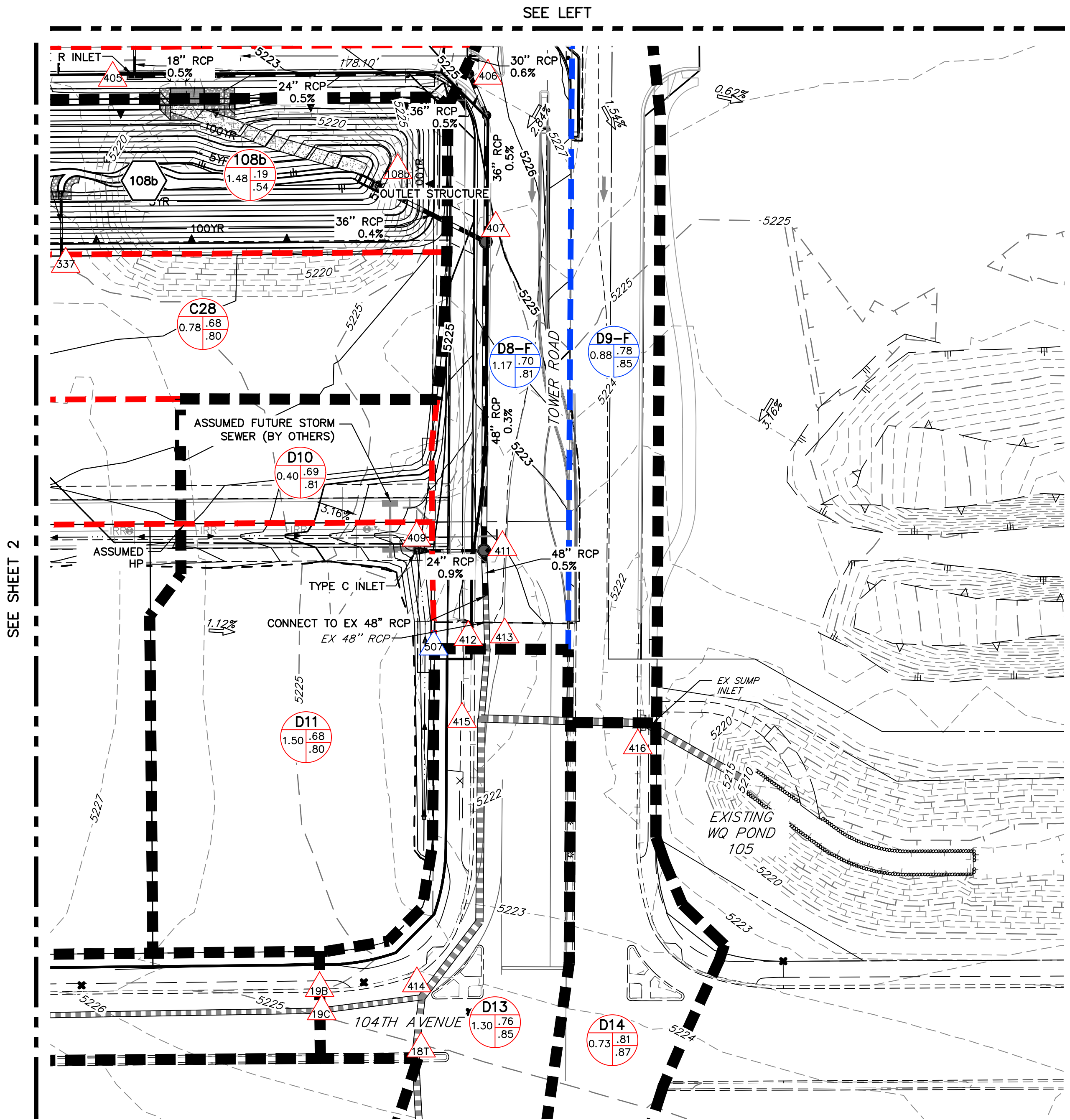
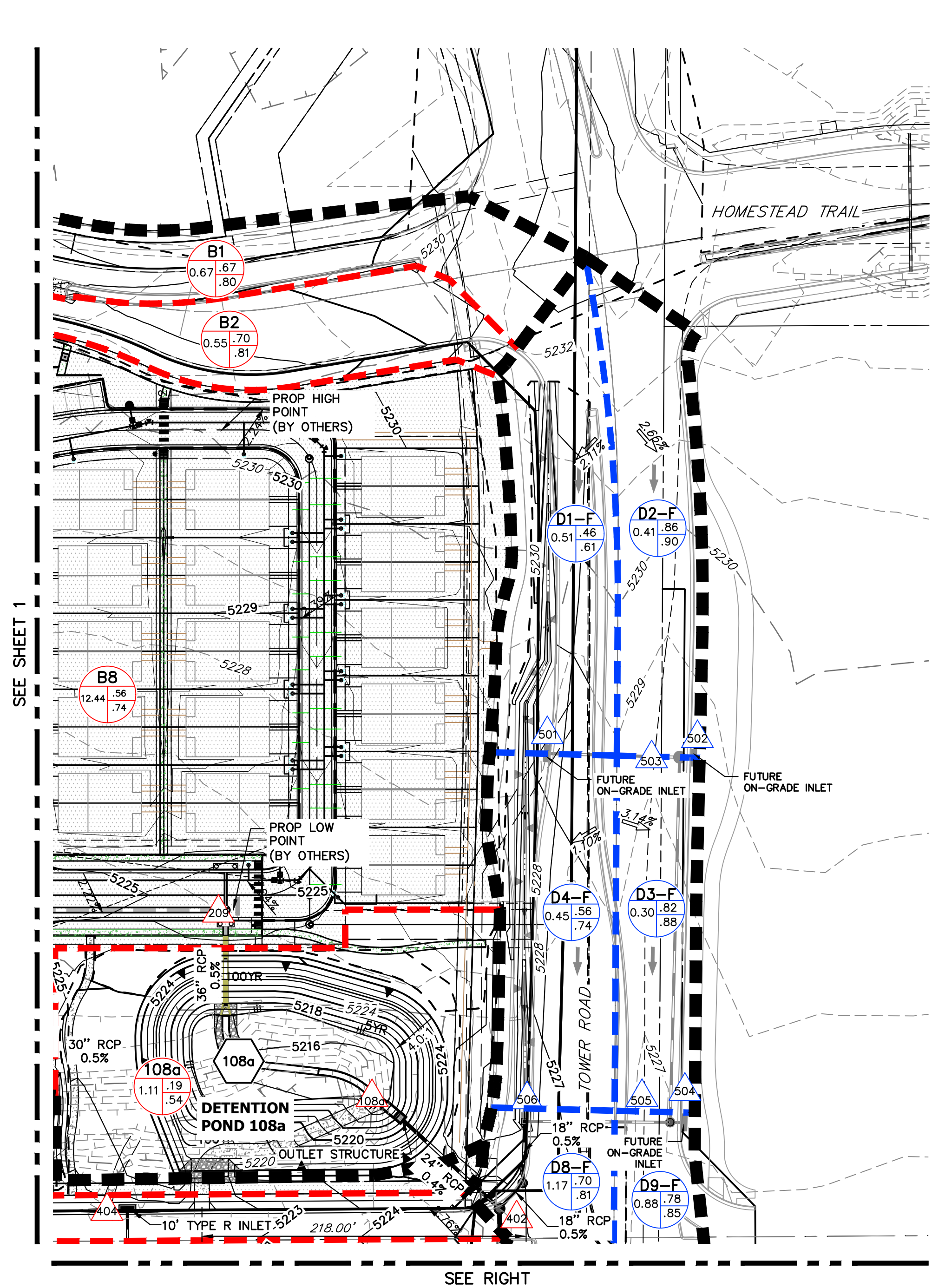
REUNION CENTER-DUET & COMMERCIAL PHASE

DISTRICT IMPROVEMENTS FINAL DRAINAGE PLAN

FUTURE CONDITIONS



KEY MAP
SCALE: 1"=1000'



Existing WQ Pond 105 Ultimate Sub-Basin Design Point Summary Table				
Design Point	Contributing Basins	Contributing Area (ac)	Q _s (cfs)	Q ₁₀₀ (cfs)
501	Sub-Basin D1-F	0.51	0.81	2.26
502	Sub-Basin D2-F	0.41	1.37	3.14
503	DP 501 and DP 502	0.92	1.98	4.96
504	Sub-Basin D3-F	0.30	0.98	2.21
505	DP 503 and DP 504	1.22	2.82	6.85
506	Sub-Basin D4-F and DP 505	1.67	3.66	9.26
108a	Pond 108a detained flows	16.69	0.00	0.00
402	DP 506 and DP 108a	18.36	6.41	12.16
403	Sub-Basin D5	0.52	0.68	2.31
404	Sub-Basin D6 and DP 403	0.99	1.54	4.68
405	Sub-Basin D7 and DP JD5	2.30	3.67	10.90
406	DP 402 and DP 405	20.66	9.29	20.73
108b	Pond 108b detained flows	36.05	0.00	0.00
407	DP 406 and DP 108b	56.71	29.20	51.56
409	Sub-Basin D10 & D11	1.90	4.97	12.71
411	DP 407 and DP 409	58.61	31.80	58.22
507	Sub-Basin D8-F	1.17	2.75	6.90
413	DP JD10 and DP 8DF	59.78	31.80	66.15
19A	Existing off-site flows per Tower Report	---	40.90	77.00
19B	Basin D12	2.07	3.68	9.57
19C	DP 19B and 19A	---	36.82	81.10
18T	Existing off-site flows from Biscay	---	61.10	114.90
414	Existing Offsite Flows	---	76.80	175.92
415	DP 413 and DP 414	---	101.69	221.50
416	Sub-Basin D9-F and DP 415	---	103.73	226.93

LEGEND

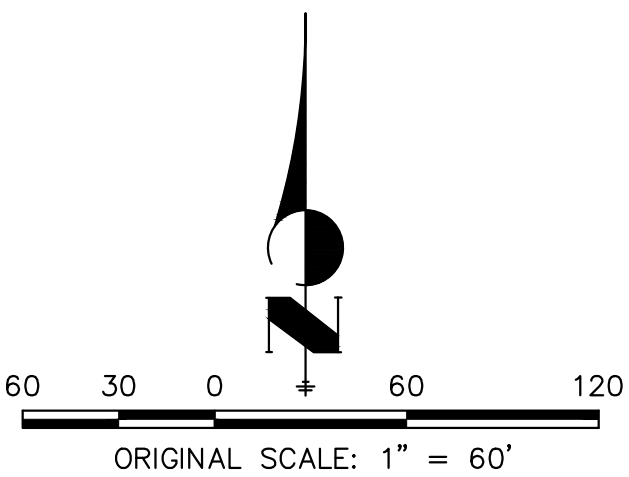
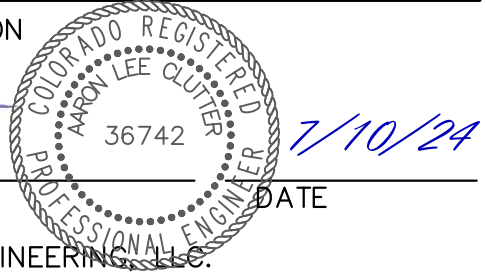
XX	STORMWATER POND	EX INDEX CONTOUR	EXISTING DRAINAGE FLOW ARROW
A B C D	PROPOSED BASIN LABEL A. BASIN DESIGNATION B. AREA C. 5 YEAR RUNOFF COEFFICIENT D. 100 YEAR RUNOFF COEFFICIENT	EX INTERMEDIATE CONTOUR	PROPOSED DRAINAGE FLOW ARROW
E	PROPOSED DESIGN POINT DESIGNATION	PROP INDEX CONTOUR (BY OTHERS)	DRAINAGE AREA BY OTHERS
A B C D	FUTURE BASIN LABEL A. BASIN DESIGNATION B. AREA C. 5 YEAR RUNOFF COEFFICIENT D. 100 YEAR RUNOFF COEFFICIENT	PROP INTERMEDIATE CONTOUR (BY OTHERS)	PROPOSED STORM SEWER
E	FUTURE DESIGN POINT DESIGNATION	PROP INDEX CONTOUR	FUTURE STORM SEWER
		PROP INTERMEDIATE CONTOUR	EXISTING PIPE
		PROPOSED MAJOR BASIN DELINEATION	
		PROPOSED MINOR BASIN DELINEATION	
		INTERIM DRAINAGE BASIN BOUNDARY	
		FUTURE DRAINAGE BASIN BOUNDARY	

Detention Pond Parameters Summary Table								
Pond	Tributary Area (ac)	% Impervious	Stored Volume		Stage		Pond Release Rate	
			V _s (ac-ft)	V ₁₀₀ (ac-ft)	d _s (ft)	d ₁₀₀ (ft)	Q _s (cfs)	Q ₁₀₀ (cfs)
108a	16.69	65.7%	0.401	1.882	3.44	7.94	5.5	8.5
108b	40.86	66.5%	0.587	3.889	3.86	8.95	21.1	33.6

ENGINEER'S STATEMENT

PREPARED UNDER MY SUPERVISION

Aaron L. Clutter, P.E.
COLORADO NO. 36742
FOR AND ON BEHALF OF JR ENGINEERING, LLC



FUTURE ULTIMATE CONDITIONS
DRAINAGE MAP
REUNION CENTER DUETS
JOB NO. 14421.49
7/10/24
SHEET 3 OF 3



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Pond Tributary Areas

Subdivision: Reunion Center
 Location: Commerce City

Project Name: Reunion Duets
 Project No.: 14421.49
 By: WJL
 Checked By: KAU
 Date: 11/28/23

Detention Pond 108a

Conceptual Pond Stage-Storage-Discharge from UD-Detention 4.06

Pond Imperviousness = 65.7%
 Pond Acreage = 16.69 ac

Detention Pond 108a Stage-Storage Table						
Elev	Stage (ft)	Area (sq ft)	Area (Acre)	Cumulative Volume (cubic ft) (ac-ft)		Total Outflow (cfs)
5214.58	0.00	0	0.000	0	0.000	0.00
5214.75	0.17	53	0.001	4	0.000	0.11
5215.00	0.42	213	0.005	37	0.001	0.59
5216.00	1.42	3,848	0.088	2,084	0.048	3.42
5217.00	2.42	8,328	0.191	8,187	0.188	4.59
5218.00	3.42	10,010	0.230	17,361	0.399	5.52
5-YR WSEL: 5218.02	3.44	10,051	0.231	17,562	0.403	5.53
5219.00	4.42	11,786	0.271	28,265	0.649	6.31
5220.00	5.42	13,662	0.314	40,995	0.941	7.01
5221.00	6.42	15,649	0.359	55,657	1.278	7.65
5222.00	7.42	17,735	0.407	72,356	1.661	8.24
100-YR WSEL: 5222.52	7.94	19,218	0.441	81,966	1.882	8.53
SPILLWAY CREST: 5223.00	8.42	20,578	0.472	91,517	2.101	8.79
5224.00	9.42	21,876	0.502	112,746	2.588	9.31
5225.00	10.42	24,187	0.555	135,786	3.117	9.80

Detention Pond 108b

Conceptual Pond Stage-Storage-Discharge from UD-Detention 4.06

Pond Imperviousness= 66.5%
 Pond Acreage= 40.86 ac

Detention Pond 108b Stage-Storage Table						
Elev	Stage [ft]	Area (sq ft)	Area (Acre)	Cumulative Volume (cubic ft) (ac-ft)		Total Outflow
5213.33	0.00	0	0.000	0	0.000	0.00
5213.50	0.17	55	0.001	5	0.000	0.21
5214.00	0.67	455	0.010	134	0.003	2.51
5215.00	1.67	3,624	0.083	2,186	0.050	12.31
5216.00	2.67	10,248	0.235	9,148	0.210	16.89
5217.00	3.67	16,223	0.372	22,407	0.514	20.47
5-YR WSEL: 5217.19	3.86	17,025	0.391	25,567	0.587	21.08
5218.00	4.67	20,358	0.467	40,714	0.935	23.51
5219.00	5.67	24,941	0.573	63,382	1.455	26.20
5220.00	6.67	29,368	0.674	90,554	2.079	28.64
5221.00	7.67	33,891	0.778	122,201	2.805	30.89
5222.00	8.67	38,502	0.884	158,416	3.637	32.98
100-YR WSEL: 5222.30	8.97	39,958	0.917	170,188	3.907	33.59
SPILLWAY CREST: 5222.28	8.95	39,814	0.914	168,991	3.879	33.53
5224.00	10.67	49,810	1.143	245,909	5.645	36.82
5225.00	11.67	55,019	1.263	298,344	6.849	38.59

Detention Pond Parameters Summary Table								
Pond	Tributary Area (ac)	% Impervious	Stored Volume		Stage		Pond Release Rate	
			V ₅ (ac-ft)	V ₁₀₀ (ac-ft)	d ₅ (ft)	d ₁₀₀ (ft)	Q ₅ (cfs)	Q ₁₀₀ (cfs)
108a	16.69	65.7%	0.401	1.882	3.44	7.94	5.5	8.5
108b	40.86	66.5%	0.587	3.889	3.86	8.95	21.1	33.6

Detention Pond Tributary Areas

Subdivision: Reunion Center

Location: Commerce City

Project Name: Reunion Duets

Project No.: 14421.49

Calculated By: WJL

Checked By: KAU

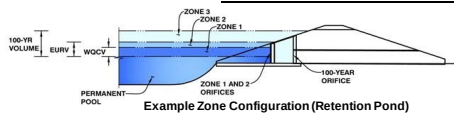
Date: 11/28/23

Basin	Area (ac)	% Imp.
Off-Site Sub-Basins Total	1.92	73.6%
Proposed Detention Pond 108a Sub-Basins Total	16.69	65.7%
Proposed Detention Pond 108b Sub-Basins Total	40.86	66.5%
Total	59.46	70.0%

WQCV Drain Time (hr):	40
Coefficient, a (Table 3-2):	1.0
WQCV (in):	0.28
Updated WQCV (ac-ft) per this report:	1.363
Per the Preliminary Drainage Report for Reunion Center – Village 1 WQCV (ac-ft):	1.431

MHFD-Detention, Version 4.06 (July 2022)

Basin ID: Pond 108a - Duets Site



Example Zone Configuration (Retention Pond)

Flood Control Only

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

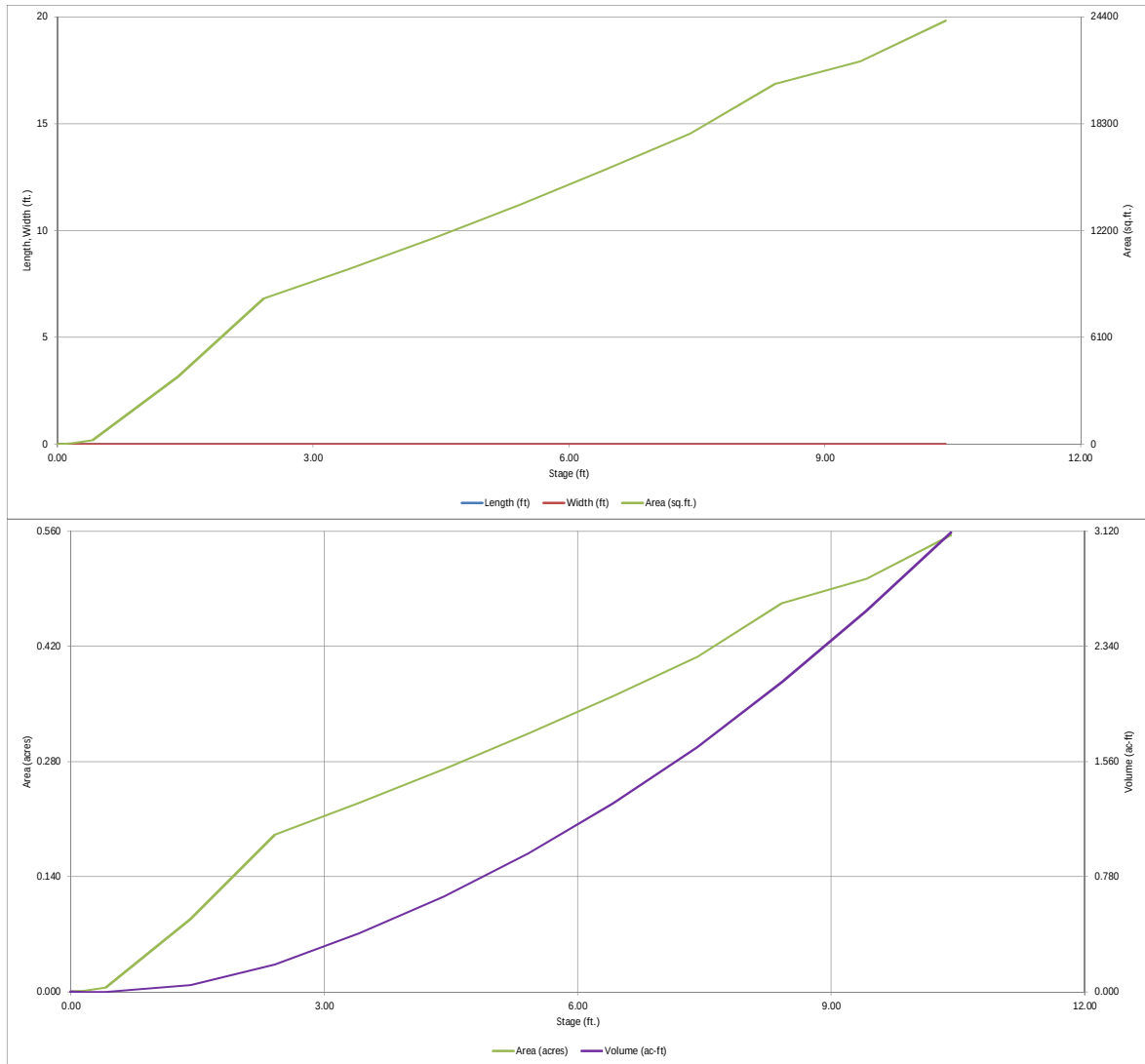
Optional User Overrides

Zone 1 Volume (5-year) =	0.931	acre-feet
Zone 2 Volume (100-year - Zone 1) =	0.923	acre-feet
Select Zone 3 Storage Volume (Optional) =		acre-feet
Total Detention Basin Volume =	1.851	acre-feet
Initial Surcharge Volume (ISV) =	N/A	ft ³
Initial Surcharge Depth (ISD) =	N/A	ft
Total Available Detention Volume (V_{total}) =	user	ft ³
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_{LW}) =	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

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DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

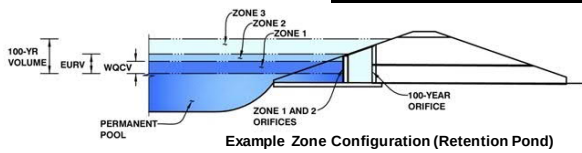


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: Reunion Duets Development

Basin ID: Pond 108a - Duets Site



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (5-year)	5.39	0.931	Circular Orifice
Zone 2 (100-year)	7.88	0.921	Weir&Pipe (Restrict)
Zone 3			
Total (all zones)		1.851	

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

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

Calculated Parameters for Underdrain	
Underdrain Orifice Area =	N/A ft ²
Underdrain Orifice Centroid =	N/A feet

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

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

Calculated Parameters for Plate	
WQ Orifice Area per Row =	N/A ft ²
Elliptical Half-Width =	N/A feet
Elliptical Slot Centroid =	N/A feet
Elliptical Slot Area =	N/A ft ²

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

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

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

User Input: Vertical Orifice (Circular or Rectangular)

	Zone 1 Circular	Not Selected	
Invert of Vertical Orifice =	0.00		ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =	5.60		ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter =	14.00		inches

Calculated Parameters for Vertical Orifice		
	Zone 1 Circular	Not Selected
Vertical Orifice Area =	1.07	
Vertical Orifice Centroid =	0.58	

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

	Zone 2 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	4.00		ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	5.00		feet
Overflow Weir Gate Slope =	4.00		H:V
Horiz. Length of Weir Sides =	5.00		feet
Overflow Gate Type =	Type C Gate		
Debris Clogging % =	50%		%

pe)		Calculated Parameters for Overflow Weir	
		Zone 2 Weir	Not Selected
ft)	Height of Gate Upper Edge, H_1 =	5.25	feet
	Overflow Weir Slope Length =	5.15	feet
	Gate Open Area / 100-yr Orifice Area =	28.22	
	Overflow Gate Open Area w/o Debris =	17.94	ft ²
	Overflow Gate Open Area w/ Debris =	8.97	ft ²

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

	Zone 2 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	0.17		ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter =	18.00		inches
Restrictor Plate Height Above Pipe Invert =	7.00		inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate				
		Zone 2 Restrictor	Not Selected	
at Stage = 0 ft)	Outlet Orifice Area =	0.64		ft ²
	Outlet Orifice Centroid =	0.34		feet
	Half-Central Angle of Restrictor Plate on Pipe =	1.35	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

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

Calculated Parameters for Spillway		
Spillway Design Flow Depth =		feet
Stage at Top of Freeboard =		feet
Basin Area at Top of Freeboard =		acres
Basin Volume at Top of Freeboard =		acre-ft

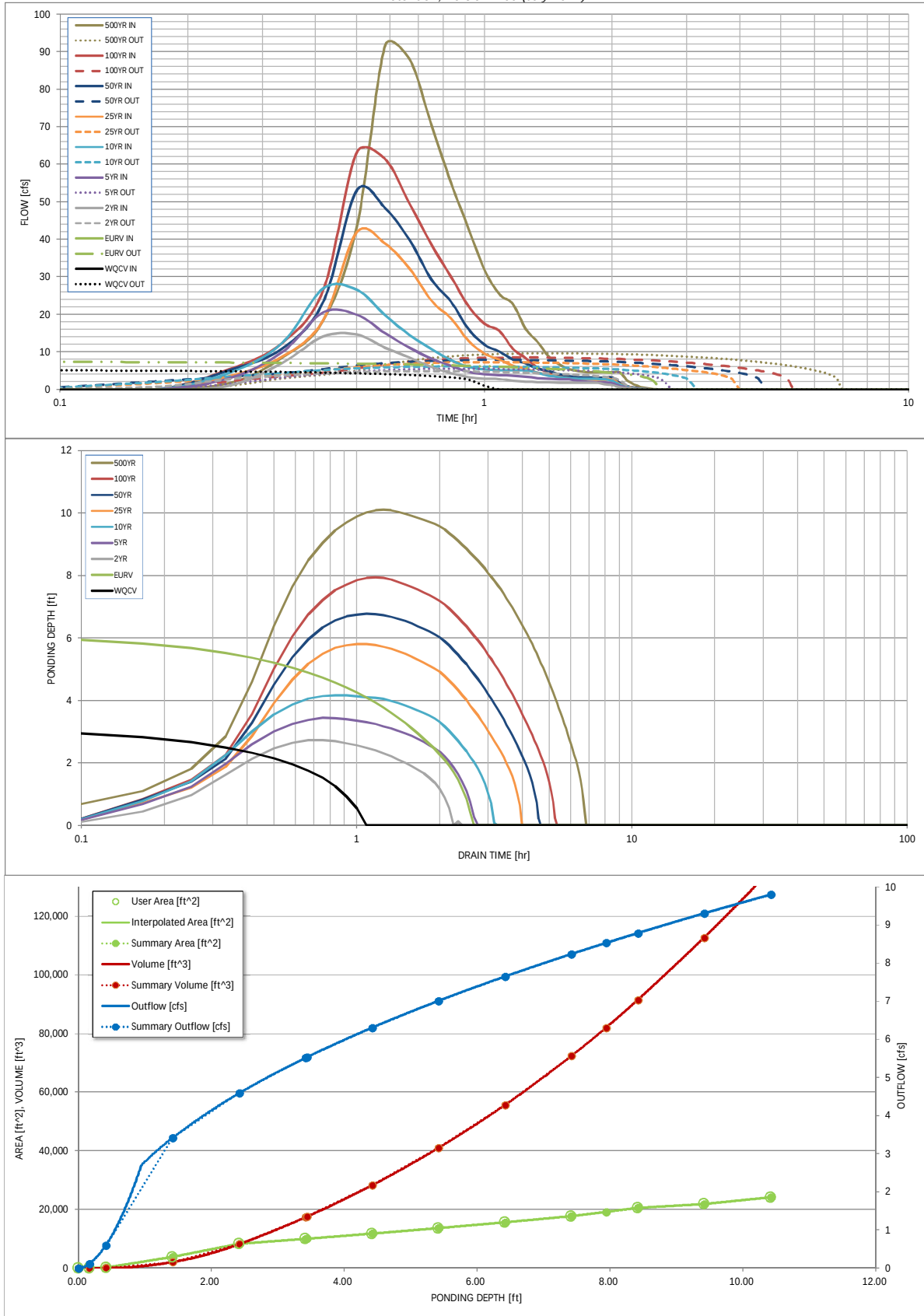
Routed Hydrograph Results

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

	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Design Storm Return Period =	N/A	N/A	0.84	1.12	1.37	1.75	2.08	2.43	3.35
One-Hour Rainfall Depth (in) =	0.357	1.199	0.666	0.941	1.240	1.787	2.227	2.741	4.011
CUHP Runoff Volume (acre-ft) =	N/A	N/A	0.666	0.941	1.240	1.787	2.227	2.741	4.011
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.2	0.5	4.7	14.9	21.3	29.2	47.1
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.01	0.03	0.28	0.89	1.28	1.75	2.82
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A	14.6	20.6	26.9	41.9	53.0	63.2	91.7
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.03	0.28	0.89	1.28	1.75	2.82
Peak Inflow Q (cfs) =	N/A	N/A	14.6	20.6	26.9	41.9	53.0	63.2	91.7
Peak Outflow Q (cfs) =	5.3	7.5	4.9	5.5	6.1	7.3	7.9	8.53	9.6
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	10.5	1.3	0.5	0.4	0.3	0.2
Structure Controlling Flow =	Outlet Plate 1	Outlet Plate 1	Outlet Plate 1	Outlet Plate 1	Outlet Plate 1	Outlet Plate 1	Outlet Plate 1	Outlet Plate 1	Outlet Plate 1
Max Velocity through Gate 1 (fps) =	N/A	-0.26	N/A	N/A	-0.2	-0.3	-0.3	-0.3	-0.3
Max Velocity through Gate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	1	2	2	3	3	4	4	5	6
Time to Drain 99% of Inflow Volume (hours) =	1	3	2	3	3	4	5	5	7
Maximum Ponding Depth (ft) =	3.24	6.20	2.74	3.44	4.17	5.80	6.77	7.94	10.11
Area at Maximum Ponding Depth (acres) =	0.22	0.35	0.20	0.23	0.26	0.33	0.38	0.44	0.54
Maximum Volume Stored (acre-ft) =	0.358	1.200	0.249	0.401	0.580	1.060	1.403	1.882	2.942

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)



S-A-V-D Chart Axis Override

	X-axis	Left Y-Axis	Right Y-Axis
minimum bound			
maximum bound			

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename: _____

Inflow Hydrographs

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

Time Interval	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.67
	0:15:00	0.00	0.00	1.02	2.98	4.41	3.49	5.08	5.34	8.46
	0:20:00	0.00	0.00	7.07	9.95	12.40	8.73	10.88	12.40	18.36
	0:25:00	0.00	0.00	14.13	20.59	26.89	18.49	23.35	26.49	43.39
	0:30:00	0.00	0.00	14.62	19.91	26.57	41.89	53.05	63.20	91.71
	0:35:00	0.00	0.00	11.11	14.98	19.76	38.85	48.30	61.39	87.92
	0:40:00	0.00	0.00	8.49	11.09	14.45	32.13	39.70	49.38	70.44
	0:45:00	0.00	0.00	5.98	8.21	10.79	23.67	29.25	38.62	55.19
	0:50:00	0.00	0.00	4.33	6.27	7.83	18.95	23.42	30.06	42.94
	0:55:00	0.00	0.00	3.30	4.67	6.02	12.95	16.09	22.24	31.88
	1:00:00	0.00	0.00	2.89	4.04	5.33	9.51	11.92	17.56	25.43
	1:05:00	0.00	0.00	2.75	3.80	5.13	7.97	10.09	15.62	22.76
	1:10:00	0.00	0.00	2.31	3.71	5.06	6.36	7.97	10.86	16.14
	1:15:00	0.00	0.00	2.08	3.38	5.05	5.55	6.90	8.39	12.71
	1:20:00	0.00	0.00	1.95	3.04	4.46	4.48	5.55	5.84	8.77
	1:25:00	0.00	0.00	1.87	2.85	3.71	3.96	4.89	4.50	6.69
	1:30:00	0.00	0.00	1.83	2.75	3.28	3.30	4.01	3.68	5.43
	1:35:00	0.00	0.00	1.81	2.69	3.03	2.95	3.56	3.31	4.85
	1:40:00	0.00	0.00	1.81	2.27	2.89	2.77	3.32	3.18	4.63
	1:45:00	0.00	0.00	1.81	2.06	2.81	2.68	3.20	3.13	4.55
	1:50:00	0.00	0.00	1.81	1.93	2.80	2.65	3.15	3.13	4.55
	1:55:00	0.00	0.00	1.40	1.86	2.66	2.63	3.13	3.13	4.55
	2:00:00	0.00	0.00	1.18	1.71	2.32	2.63	3.13	3.13	4.55
	2:05:00	0.00	0.00	0.64	0.93	1.27	1.43	1.70	1.70	2.47
	2:10:00	0.00	0.00	0.34	0.51	0.68	0.79	0.93	0.93	1.35
	2:15:00	0.00	0.00	0.16	0.26	0.34	0.40	0.47	0.47	0.68
	2:20:00	0.00	0.00	0.07	0.12	0.15	0.18	0.22	0.21	0.31
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	2:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
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	2:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
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	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
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	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

DETENTION BASIN OUTLET STRUCTURE DESIGN

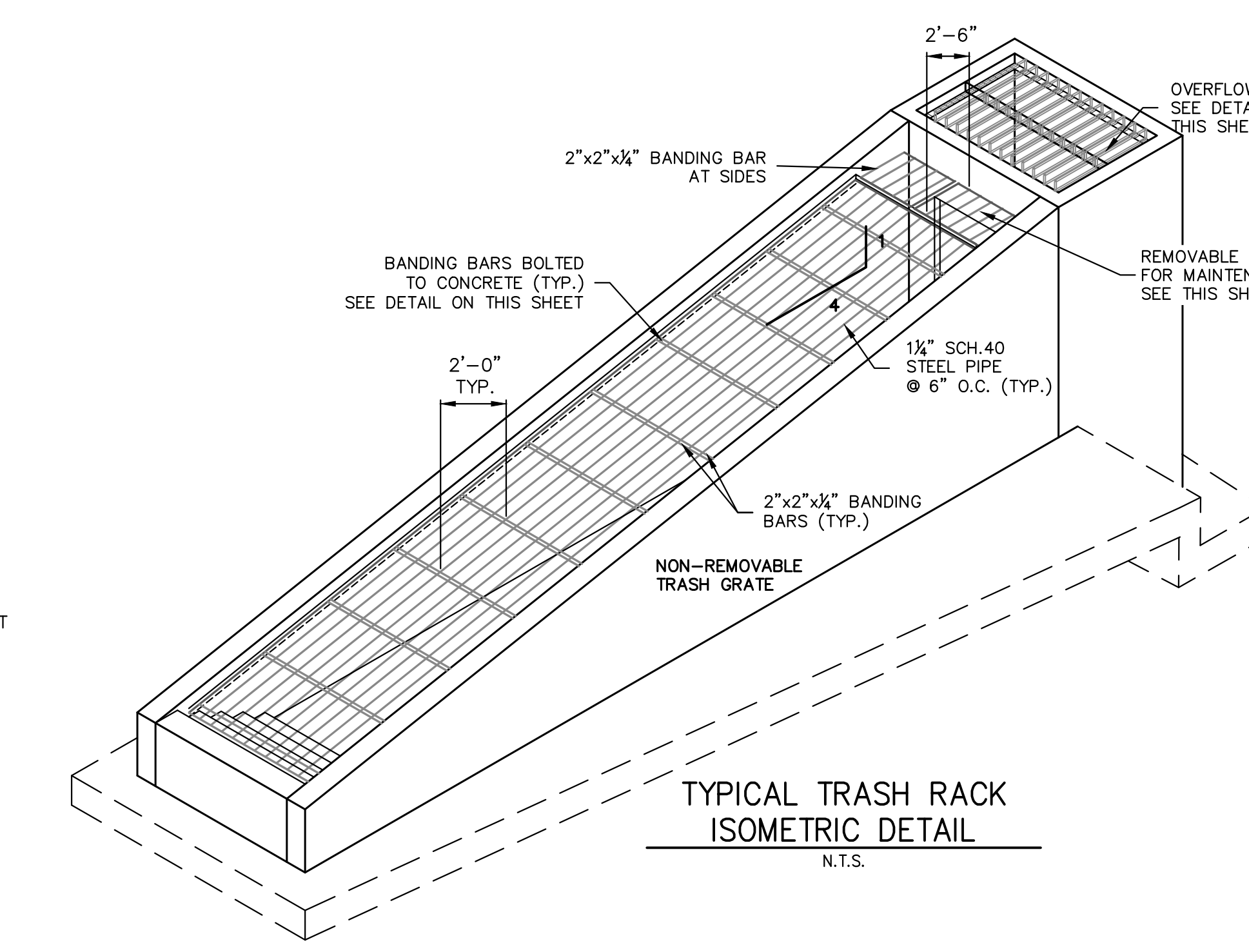
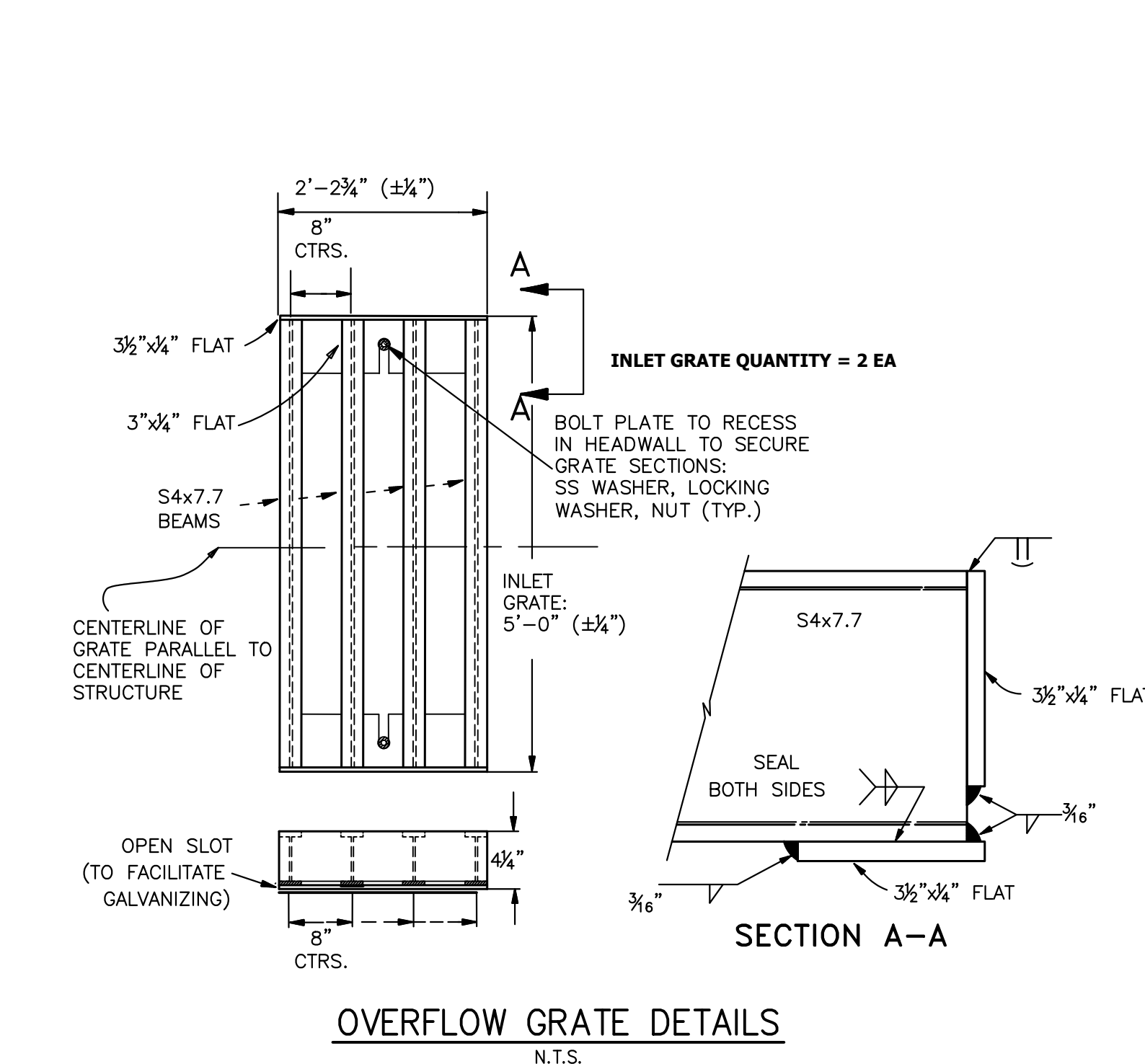
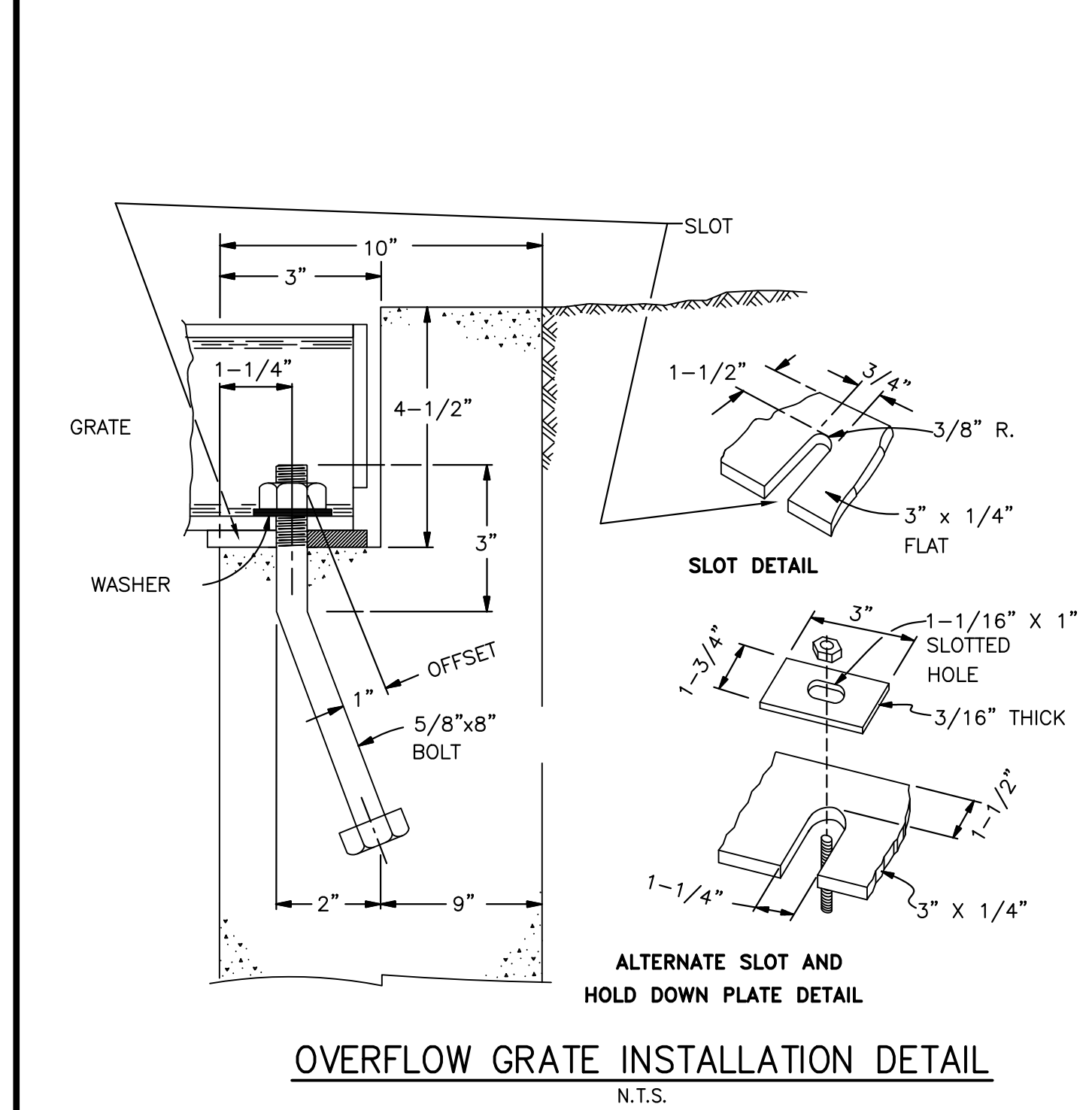
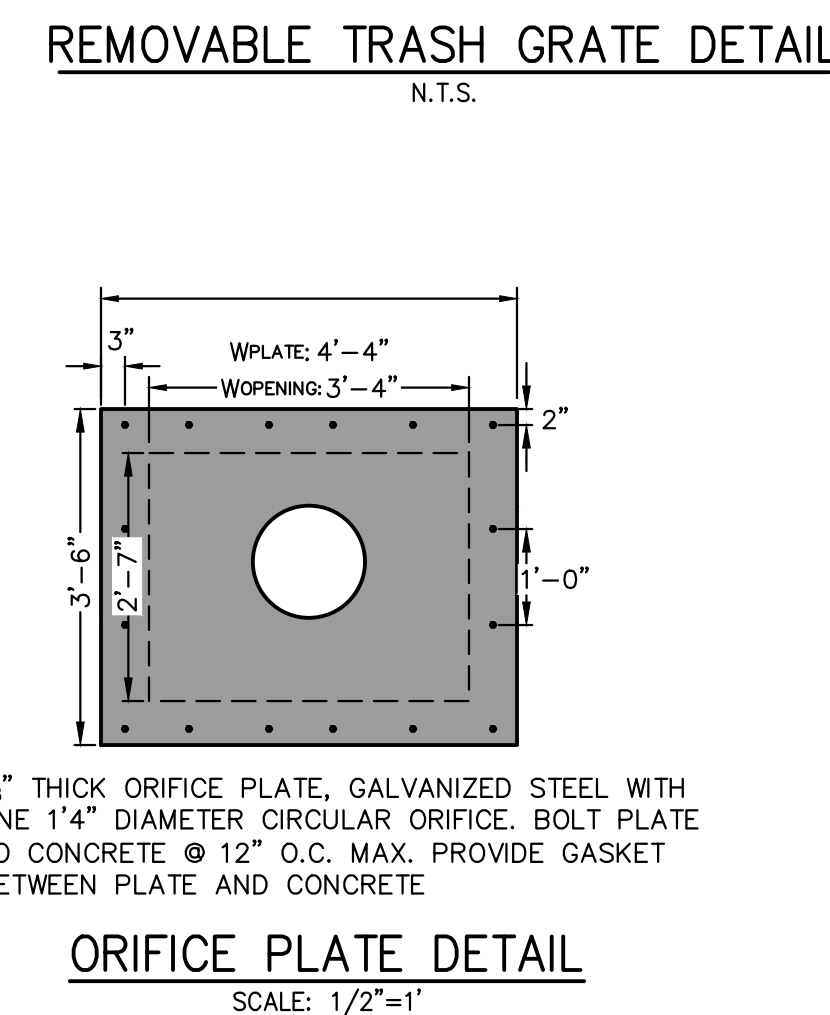
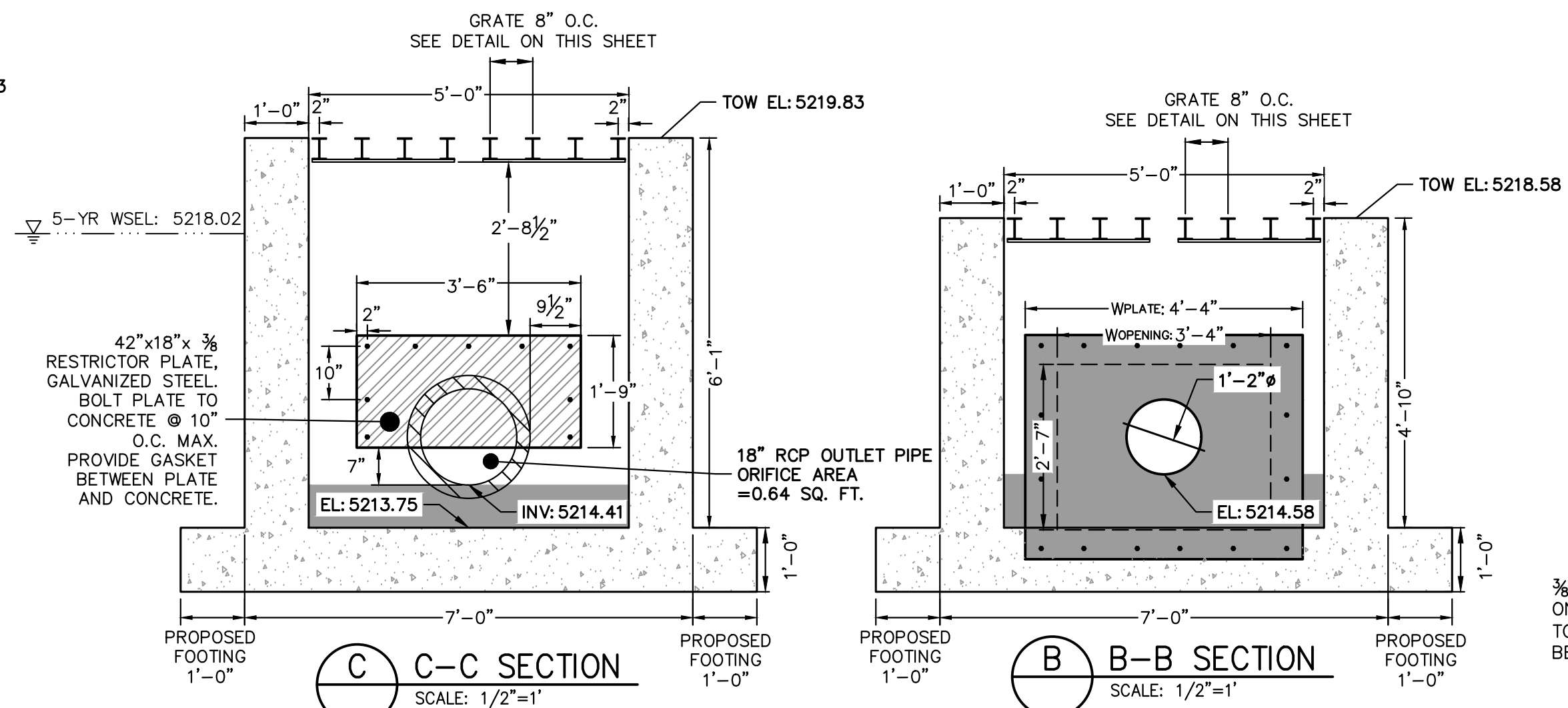
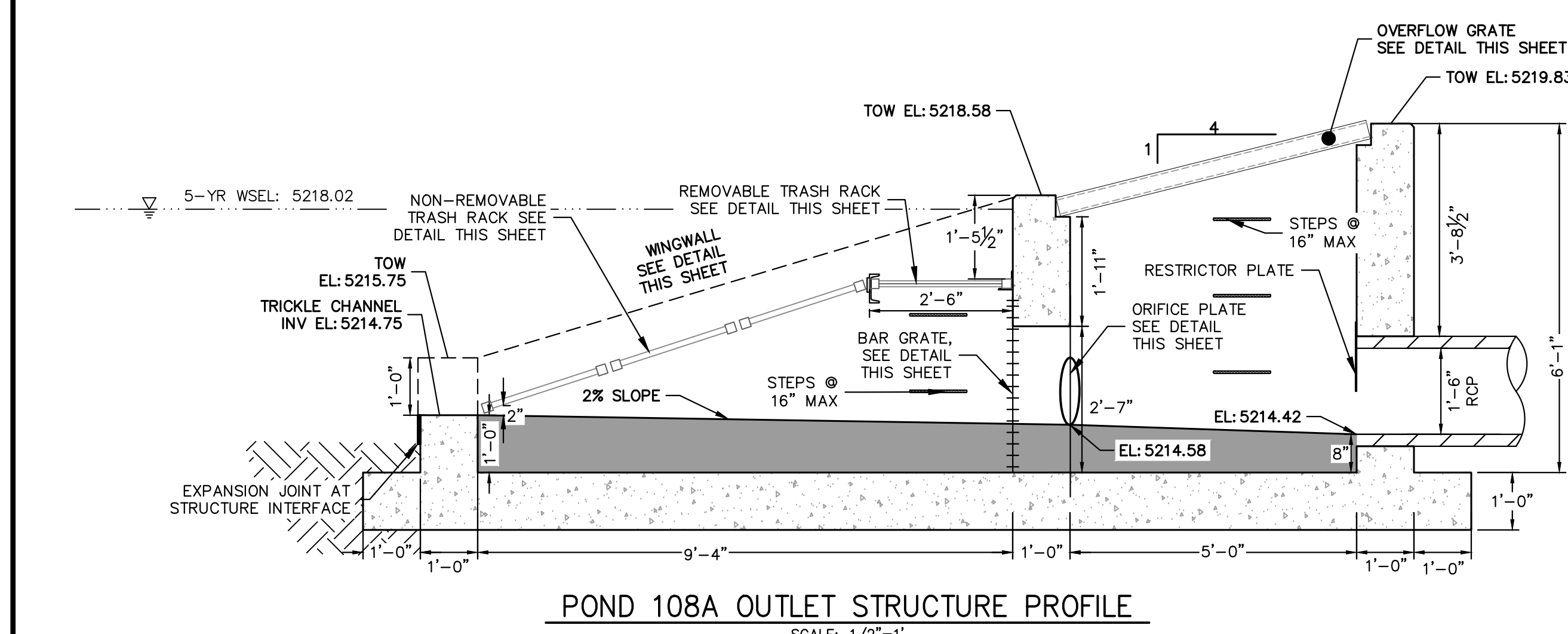
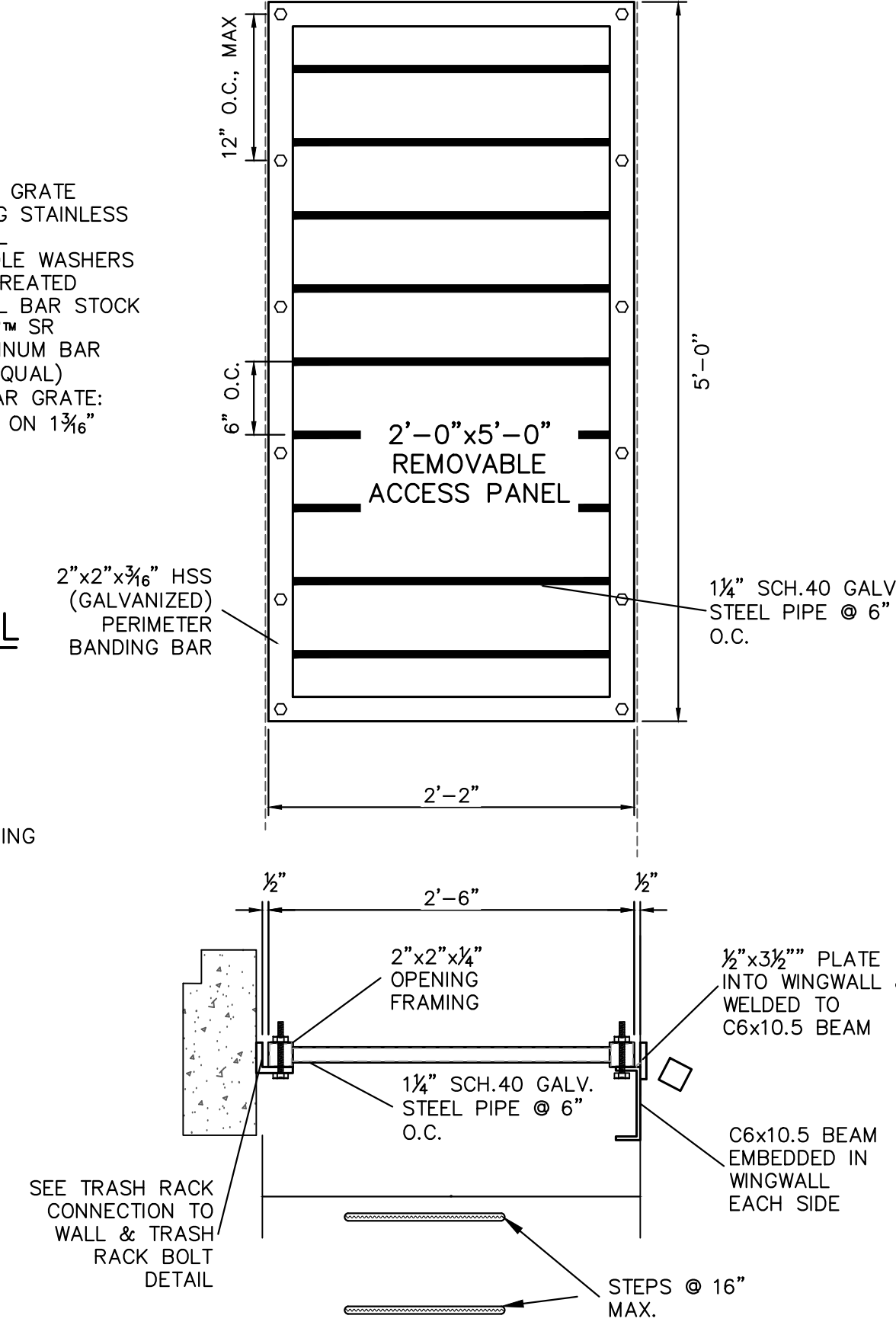
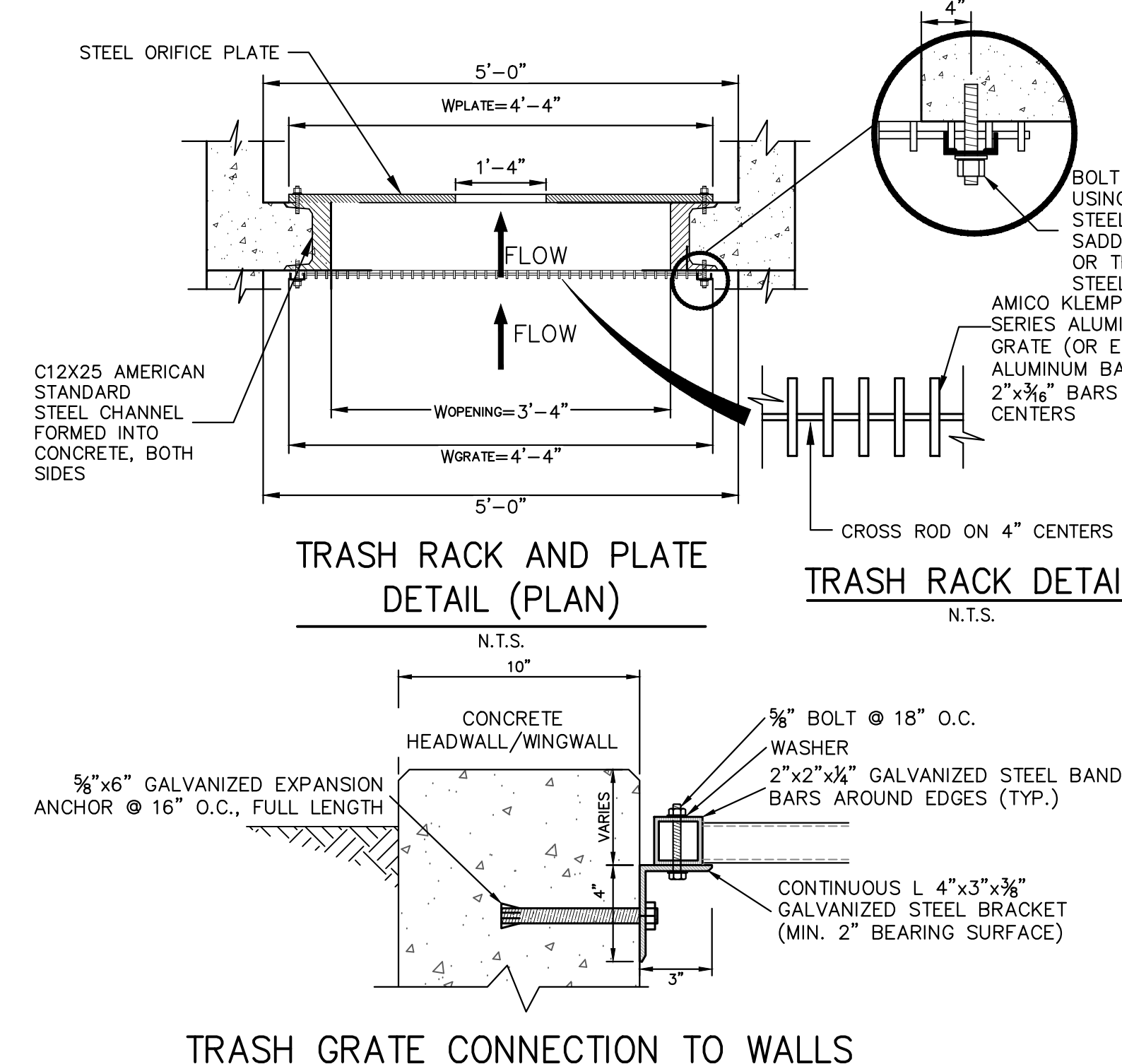
MHFD-Detention, Version 4.06 (July 2022)

Summary Stage-Area-Volume-Discharge Relationships

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

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

[illegible]



ENGINEER'S STATEMENT

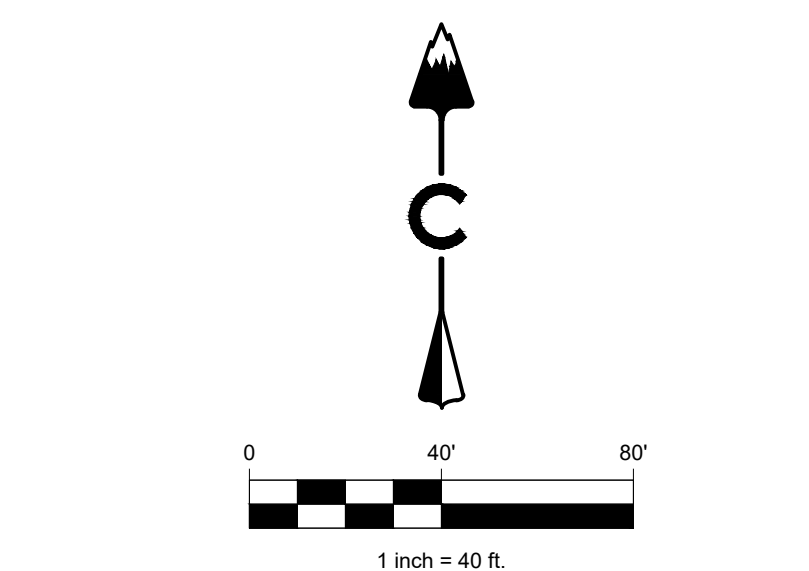
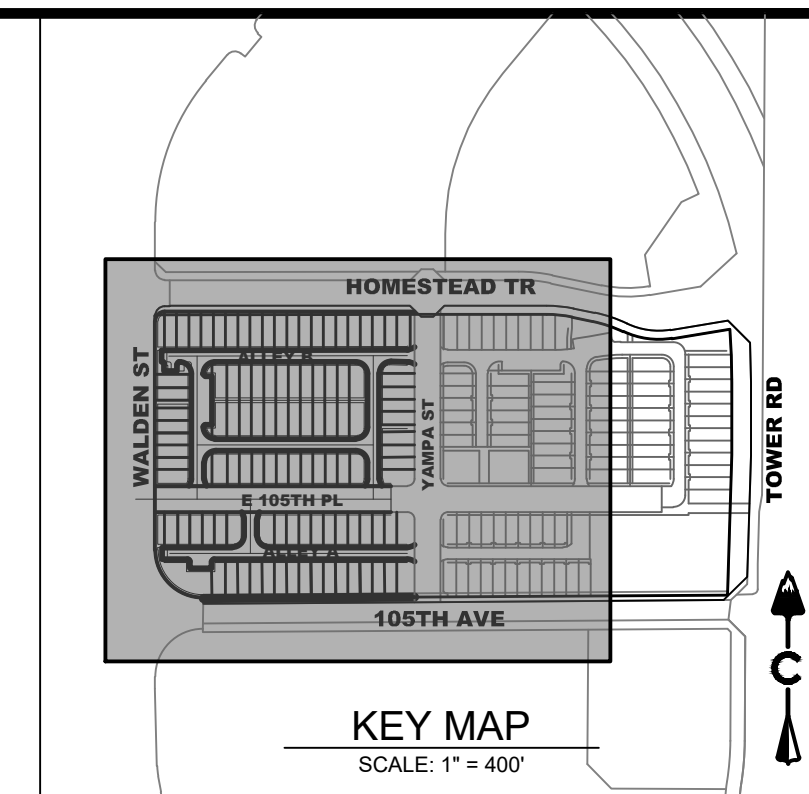
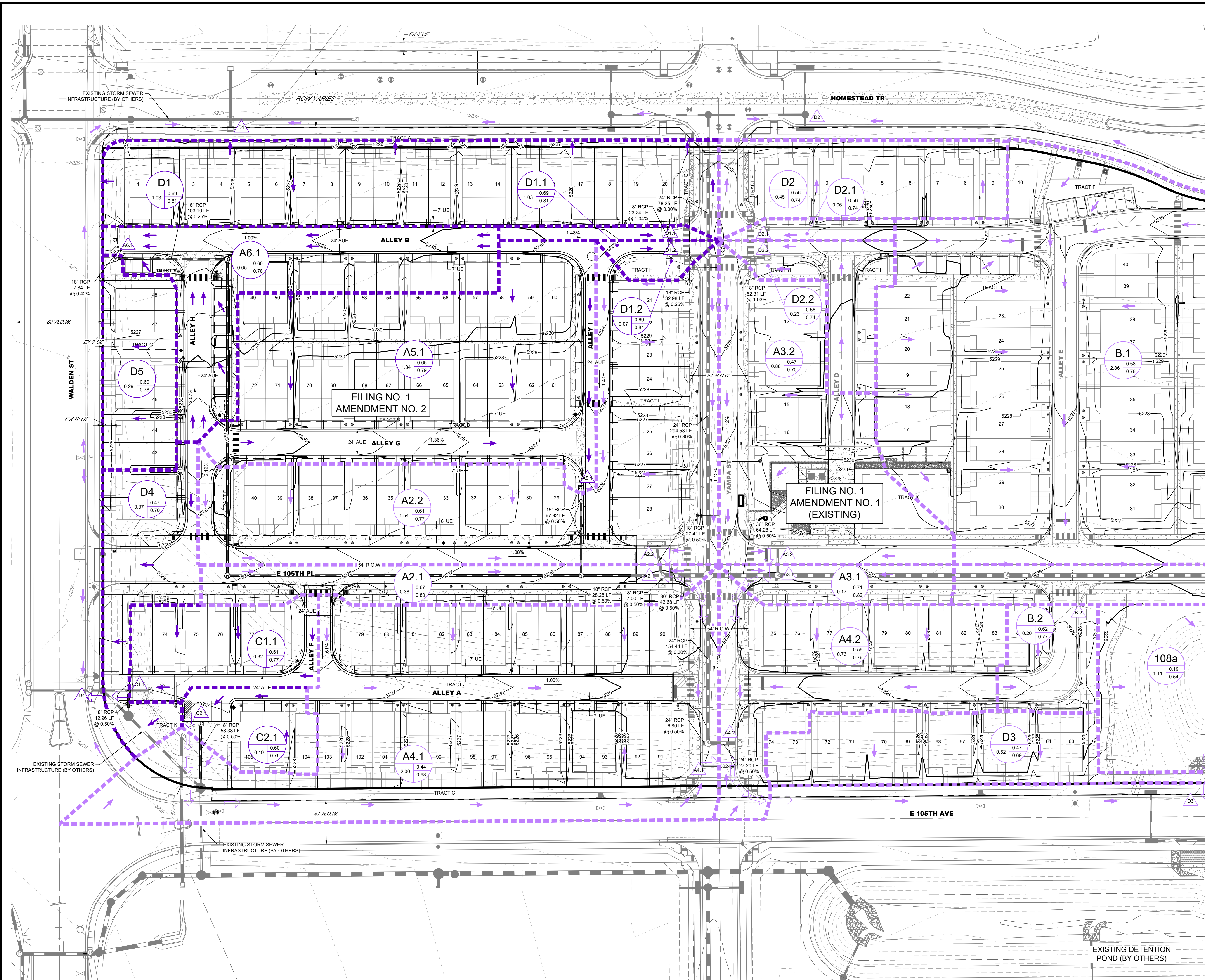
PREPARED BY _____ DATE _____

PRELIMINARY
NOT FOR
CONSTRUCTION

AARON L. HARRIS
COLORADO PROFESSIONAL ENGINEERING NO. 06789
FOR AND ON BEHALF OF J.R. ENGINEERING, LLC

SHEET 20 OF 56		REUNION CENTER – DUET & COMMERCIAL PHASE		H-SCALE 1/2"=1'	No.	REVISION	BY	DATE	 J·R ENGINEERING A Westrian Company Centennial 303-740-8888 • Colorado Springs 719-580-2688 Fort Collins 970-491-8888 • www.jrengineering.com	PREPARED FOR REUNION METROPOLITAN DISTRICT 17910 E. PARKSIDE DRIVE NORTH COMMERCE CITY, CO 80022 MATT URKOSKI (303) 288-5431	UNTIL SUCH TIME AS THESE DRAWINGS ARE APPROPRIATELY REVIEWING AGENCIES, J·R ENGINEERING APPROVES THEIR USE ONLY FOR THE PURPOSES DESIGNATED BY WRITTEN AUTHORIZATION.
POND DETAILS		V-SCALE 1/2"=1'									
		DATE	11/30/23								
		DESIGNED BY	KAU								
		DRAWN BY	WJL								
		CHECKED BY									
JOB NO. 14421.49		POND 108A									

BACK POCKET
DRAINAGE MAPS



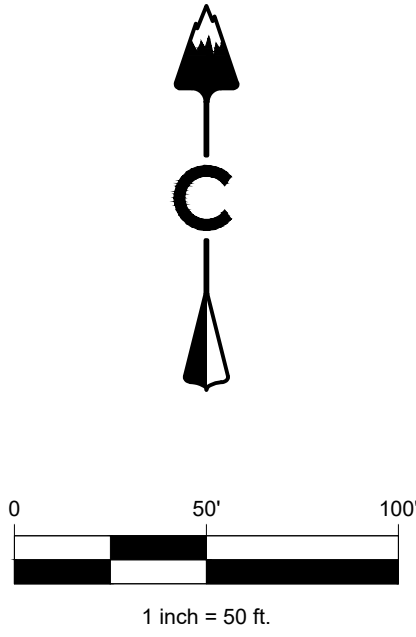
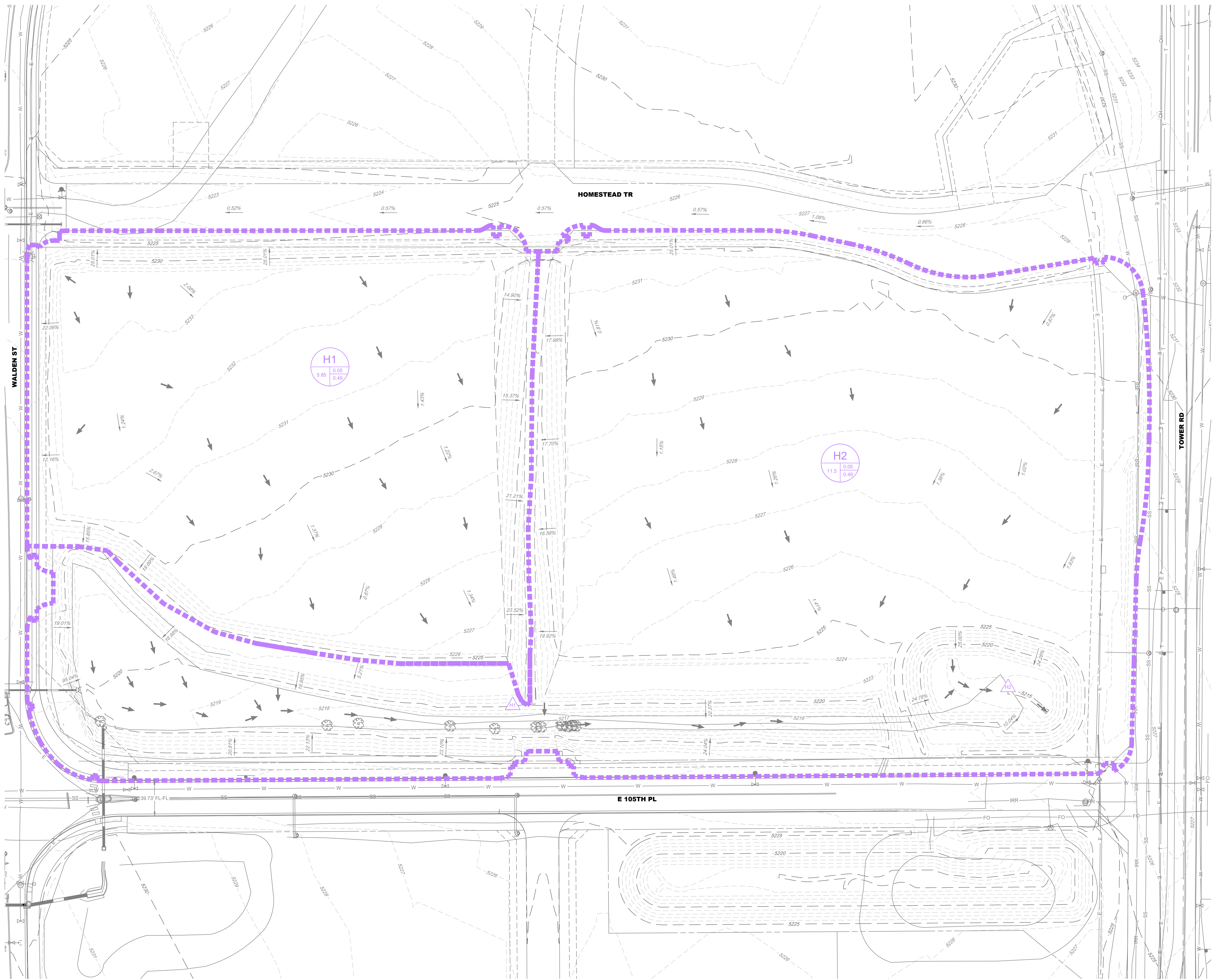
EXISTING	PROPOSED	
		BASIN DESIGNATION
		5 YEAR COEFFICIENTS
		100 YEAR COEFFICIENTS
		DESIGN POINT
		DIRECTIONAL FLOW ARROW
		EMERGENCY OVEFLOW ROUTE
		PROPOSED DRAINAGE BASIN
		EXISTING DRAINAGE BASIN
		PROPOSED MAJOR CONTOUR
		PROPOSED MINOR CONTOUR
		EXISTING MAJOR CONTOUR
		EXISTING MINOR CONTOUR
		EASEMENT
		RIGHT OF WAY (R.O.W.)
		CENTERLINE
		PROJECT BOUNDARY
		PROPOSED STORM & STUB OUT
		EXISTING STORM & STUB OUT
		STORM MANHOLES
		STORM INLETS
		FES, FOREBAY, & TRICKLE CHANNEL
		OUTLET STRUCTURE
		CRUSHER FINES
		MAINTENANCE ACCESS
		RIPPRAP
		100 YEAR FLOODPLAIN
		WETLAND
		LIMITS OF CONSTRUCTION
		RETAINING WALL
		DRAINAGE SWALE

NOTES:

1. DRAINAGE AREAS A2.1, A2.2, & A4.1 ARE INCLUDED IN THE FILING NO.1, AMENDMENT 1 DRAINAGE REPORT

RUNOFF SUMMARY TABLE				
DIRECT RUNOFF				
DESIGN POINT	BASIN	AREA (AC)	5-Year RUNOFF (CF5)	100-Year RUNOFF (CF100)
	FLING NO. 1	AMENDMENT NO. 1		
A2.1	A2.1	0.38	0.90	2.44
A2.2	A2.2	1.48	3.13	8.82
A3.1	A3.1	0.17	0.42	1.14
A3.2	A3.2	0.88	1.14	4.13
A4.1	A4.1	2.00	2.14	7.44
A4.2	A4.2	1.43	1.42	4.10
B1	B1	2.68	4.34	12.58
B2	B2	0.20	0.35	1.11
B3	B3	1.34	1.97	6.27
D2	D2	0.45	0.75	2.32
D3	D3	0.52	0.68	2.28
D2.1	D2.1	0.06	0.19	0.47
D2.2	D2.2	0.23	0.58	1.57
SUBTOTAL		11.30	17.99	54.67
	FLING NO. 2	AMENDMENT NO. 2		
A5.1	A5.1	1.34	2.64	7.47
A6.1	A6.1	0.65	1.22	3.21
C1.1	C1.1	0.32	0.75	2.11
C2.1	C2.1	0.19	0.40	1.15
D1	D1	1.03	0.85	3.46
D4	D4	0.37	0.67	2.08
D5	D5	0.29	0.47	1.44
D1.1	D1.1	0.06	0.19	0.44
D1.2	D1.2	0.01	0.13	0.41
SUBTOTAL A2		4.32	7.30	21.77

7/8/2023 1:12 PM X:\18-004 REUNION CENTER\CIVIL\CADD\PLANS\FILING - AMENDMENT 1\DRainage\HISTORIC DRAINAGE MAP.DWG



LEGEND

- EXISTING PROPOSED
- BASIN DESIGNATION
5 YEAR COEFFICIENTS
100 YEAR COEFFICIENTS
- DESIGN POINT
DIRECTIONAL FLOW ARROW
EXISTING DRAINAGE BASIN
EXISTING MAJOR CONTOUR
EXISTING MINOR CONTOUR
PROJECT BOUNDARY
EXISTING STORM & STUB OUT
STORM MANHOLES
STORM INLETS
FES, FOREBAY, & TRICKLE CHANNEL
OUTLET STRUCTURE

RUNOFF SUMMARY TABLE				
DIRECT RUNOFF				
DESIGN POINT	BASIN	AREA (AC)	5-Year RUNOFF (CFS)	100-Year RUNOFF (CFS)
H1	H1	5.85	0.48	10.30
H2	H2	11.52	0.70	15.15
Total		17.37	1.18	25.45

SITE BENCHMARK:
THE BENCHMARK USED FOR THIS SITE IS ADAMS COUNTY CONTROL POINT 95.0186, BEING A 3-1/4" ALUMINUM CAP STAMPED "95.0186 1995" SET IN CONCRETE, LOCATED NORTHWEST OF THE INTERSECTION OF CHAMBERS ROAD AND EAST 112TH AVENUE, 157' NORTH OF THE CENTER LINE OF EAST 112TH AVENUE, AND 30' WEST OF THE CENTER LINE OF CHAMBERS ROAD, WITH AN ELEVATION OF 5143.89 (NAVD 1988 USFT).

REUNION CENTER FILING NO.1 - AMENDMENT 1
COMMERCE CITY, COLORADO
FINAL DRAINAGE REPORT
HISTORICAL DRAINAGE MAP

NOT FOR CONSTRUCTION

DESIGNED BY: ACJ
DRAWN BY: ACJ
CHECKED BY: JRS

JOB NO.
18-004

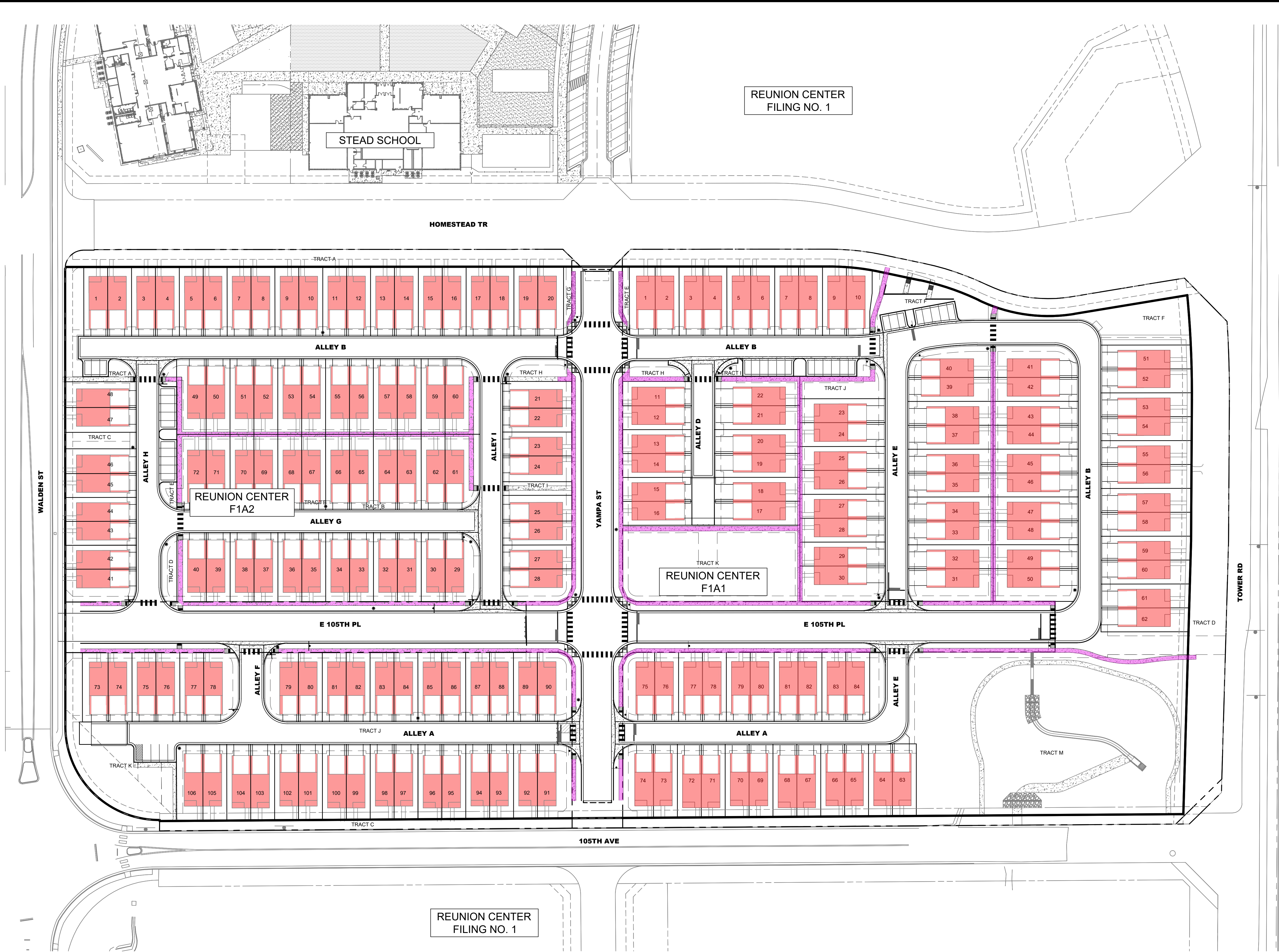
SHEET
1 OF 1

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

#	REVISION DESCRIPTION	DATE	BY
A	FOR REVIEW	09/15/21	AS
B	FOR REVIEW	04/25/23	JRS

CORE
CORE CONSULTANTS, INC.
3473 S. BROADWAY
DENVER, CO 80113
303.703.4444
LIVEYOURCORE.COM

LAND DEVELOPMENT
ENERGY
PUBLIC INFRASTRUCTURE



LEGEND

- PROPERTY BOUNDARY
- RIGHT-OF-WAY
- DISCONNECTED - ROOF TOPS
- DISCONNECTED - SIDEWALKS

050'
1 inch = 50 ft.

LAND DEVELOPMENT
ENERGY
PUBLIC INFRASTRUCTURE

CORE
CORE CONSULTANTS, INC.
3412 S. BROADWAY
DENVER, CO 80113
303.703.4444
LIVEYOURCORE.COM

DISCONNECTED IMPERVIOUSNESS OVERALL MAP

REUNION CENTER

DATE: 7/6/23
CREATED BY: JP
JOB NO. 18-004
SHEET 1

INDIRECT IMPERVIOUSNESS AREAS			
	F1A1	F1A2	TOTAL (SQ FT)
ROOF (SQ FT)	67194.45	84818.40	152012.85
SIDEWALK (SQ FT)	13388.58	6688.79	20077.37
TOTAL (SQ FT)	80583.03	91507.19	172090.22