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 competed 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 course 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_v4.060xlsm, 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.

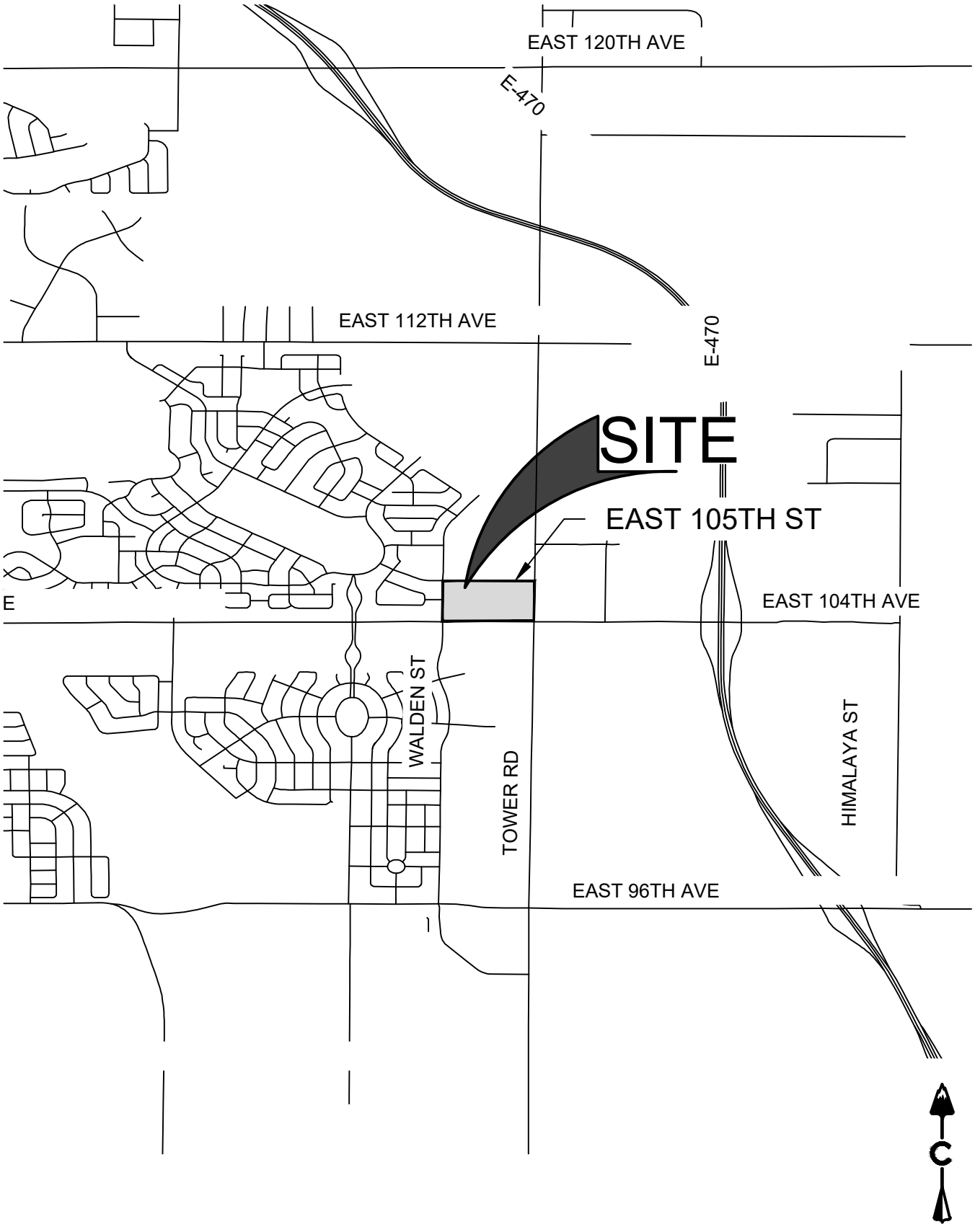
I. Amendment #2 to Preliminary Drainage Report for Reunion Center – Village 1; JR Engineering, November 6, 2023

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



CORE CONSULTANTS. INC.
LIVEYOURCORE.COM

0 2,000'

1 inch = 2,000 ft.

REUNION CENTER
VICINITY MAP

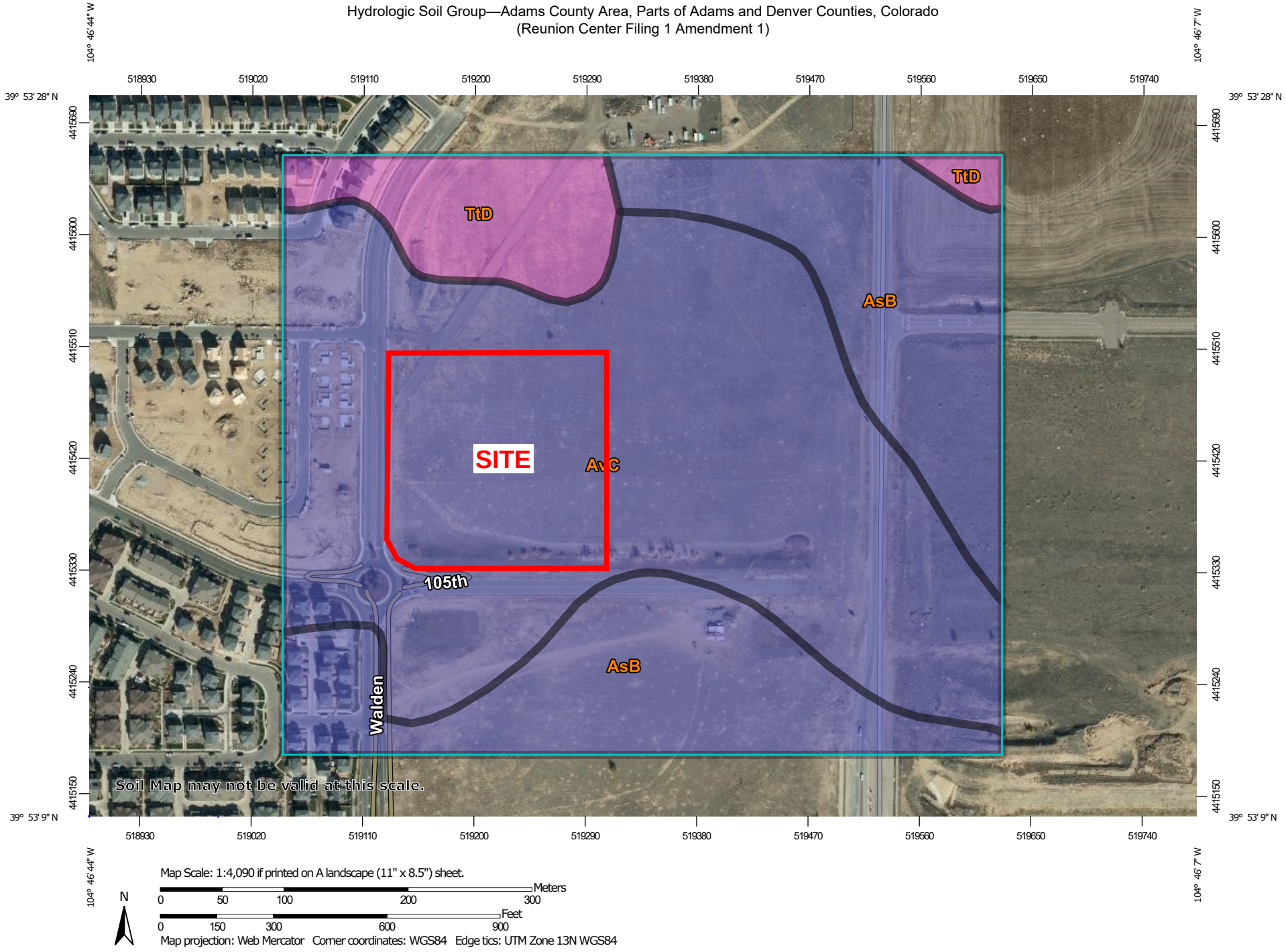
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SHEET NUMBER 1 OF 1 SHEETS

JOB NUMBER 18-004

3/10/2022 9:51 AM - X:\18-004 REUNION CENTER\CIVIL\CAD\EXHIBITS\FILING 1 - AMENDMENT 1\2022-03-10 - VICINITY MAP\REUNION CENTER VICINITY MAP - F2.DWG.

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



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

N

Meters
0 50 100 200 300

Feet
0 150 300 600 900

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

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

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

Soil Rating Lines

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

Soil Rating Points

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

Water Features

- Streams and Canals

Transportation

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

Background

- Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: 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

NOTES TO USERS

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

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

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

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

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

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) zone 13. The **horizontal datum** was NAD83, GRS1980 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

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

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC- 3, #9202
1315 East-West Highway
Silver Spring, MD 20910- 3282

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

Base map information shown on this FIRM was provided by the Adams County and Commerce City GIS departments. The coordinate system used for the production of the digital FIRM is Universe Transverse Mercator, Zone 13N, referenced to North American Datum of 1983 and the GRS 80 spheroid, Western Hemisphere.

This map reflects more detailed and up-to- date **stream channel configurations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables in the *Flood Insurance Study report (which contains authoritative hydraulic data)* may reflect stream channel distances that differ from what is shown on this map.

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

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

Contact the **FEMA Map Service Center** at 1- 800- 358- 9616 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a *Flood Insurance Study report*, and/or digital versions of this map. The FEMA Map Service Center may also be reached by Fax at 1- 800- 358- 9620 and its website at http://www.msc.fema.gov/.

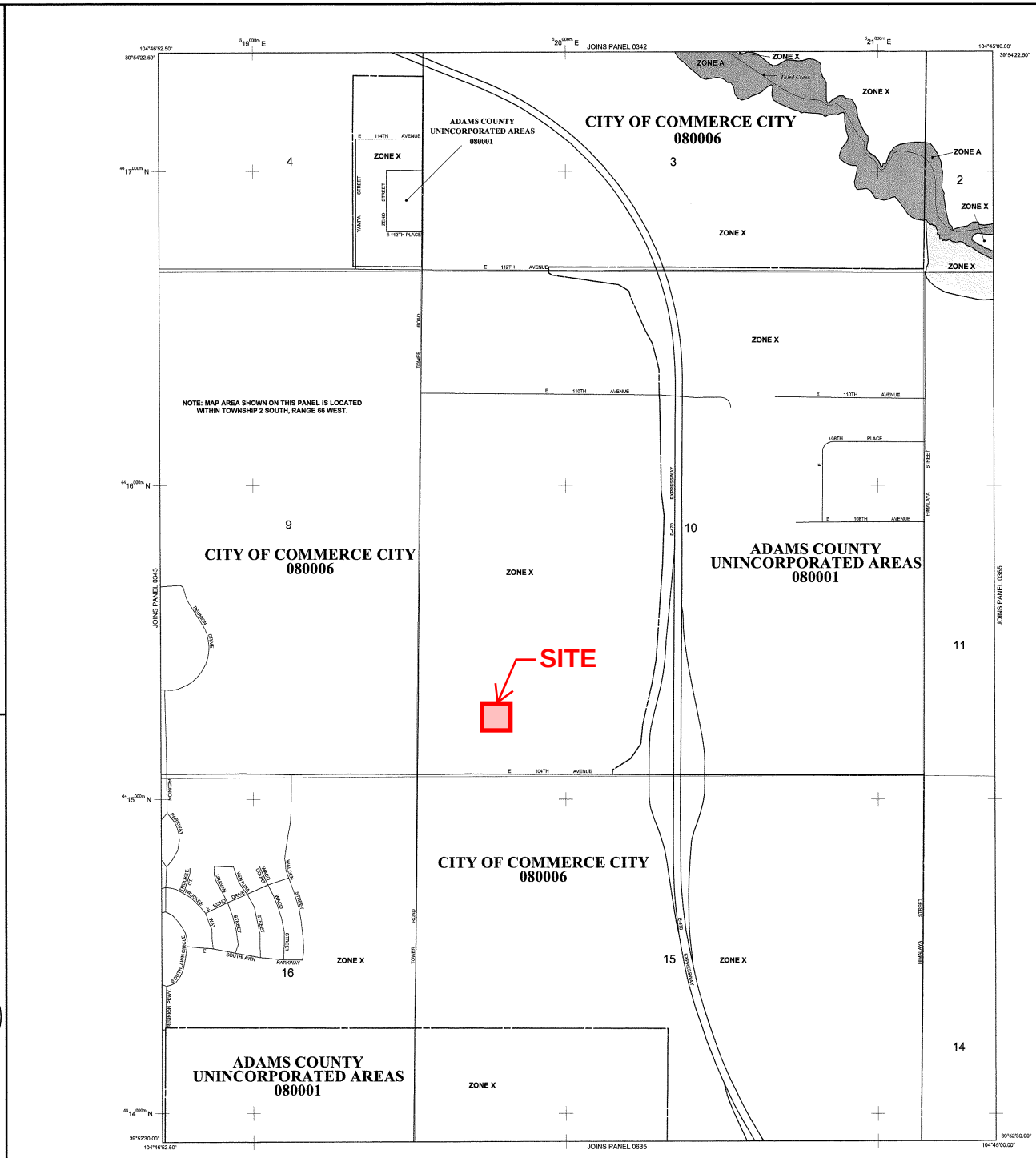
If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call **1- 877- FEMA MAP** (1- 877- 336- 2627) or visit the FEMA website at http://www.fema.gov/.

This digital Flood Insurance Rate Map (FIRM) was produced through a cooperative partnership between the State of Colorado Water Conservation Board, the Urban Drainage and Flood Control District, and the Federal Emergency Management Agency (FEMA). The State of Colorado Water Conservation Board and the Urban Drainage and Flood Control District have implemented a long-term approach of floodplain management to reduce the costs associated with flooding. As part of this effort, both the State of Colorado and the Urban Drainage and Flood Control District have joined in Cooperating Technical Partner agreements with FEMA to produce this digital FIRM.

Additional flood hazard information and resources are available from local communities, the Colorado Water Conservation Board, and the Urban Drainage and Flood Control District.







LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A No Base Flood Elevations determined.

ZONE AE Base Flood Elevations determined.

ZONE AH Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.

ZONE AO Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.

ZONE AR Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.

ZONE A99 Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.

ZONE V Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.

ZONE VE Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X Areas determined to be outside the 0.2% annual chance floodplain.

ZONE D Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

Floodplain boundary

Floodway boundary

Zone D boundary

CBRS and OPA boundary

Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.

513 — Base Flood Elevation line and value; elevation in feet*

(EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988 (NAVD 88)

A — A — Cross section line

23 — 23 — Transect line

97°07'30", 32°22'30" — Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)

4275000mN — 1000-meter Universal Transverse Mercator grid ticks, zone 13

6000000 M — 5000-foot grid ticks: Alabama State Plane coordinate system, east zone (FIPSZONE 0101), Transverse Mercator

DX5510 — Bench mark (see explanation in Notes to Users section of this FIRM panel)

M1.5 — River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
August 16, 1985

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
March 5, 2007 - to update map format.

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

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

MAP SCALE 1" = 500'

250 0 500 1000 FEET

150 0 150 300 METERS

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0344H

FIRM

FLOOD INSURANCE RATE MAP

ADAMS COUNTY, COLORADO AND INCORPORATED AREAS

PANEL 344 OF 1150

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
ADAMS COUNTY	080001	0344	H
COMMERCE CITY, CITY OF	080006	0344	H

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

MAP NUMBER
08001C0344H

MAP REVISED
MARCH 5, 2007

Federal Emergency Management Agency

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				Lawns					Soil Type		
		Duet Product	N/A	N/A	N/A	Asphalt	Roof/ Concrete	Gravel	2-7% Slope	>7% Slope	Historic			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

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	$C_{C/D} = 0.83i^{1.122}$	$C_{C/D} = 0.82i+0.035$	$C_{C/D} = 0.74i+0.132$	$C_{C/D} = 0.56i+0.319$	$C_{C/D} = 0.49i+0.393$	$C_{C/D} = 0.41i+0.484$	$C_{C/D} = 0.32i+0.588$

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)

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*	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*	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*	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(t)						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 INFORMATON				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 INFORMATON				DIRECT RUNOFF			
DESIGN POINT	DRAIN BASIN	AREA ac.	100YR RUNNOFF 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							Landscape Area					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.		45.00%	30.00%	12.00%	75.00%	90.00%	100.00%	40.00%	2.00%	2.00%	2.00%					
BASIN	Design Point	Area (ac)	Area (ac)	Area (ac)	Area (ac)	Area (ac)	Area (ac)	Area (ac)	Area (ac)	Area (ac)	Area (ac)	Total Area (ac)	Percent Impervious	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%**			

Reunion Center

CORE Project #: 14-004
Prepared By: -LH

COMPOSITE DEVELOPED BASIN WEIGHTED "C" CALCULATIONS

-REFERENCE UDFCD Vol.1 RUNOFF Table 6-4

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	$C_{C/D} = 0.83i^{1.122}$	$C_{C/D} = 0.82i+0.035$	$C_{C/D} = 0.74i+0.132$	$C_{C/D} = 0.56i+0.319$	$C_{C/D} = 0.49i+0.393$	$C_{C/D} = 0.41i+0.484$	$C_{C/D} = 0.32i+0.588$

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)

Total Weighted Runoff Coefficients, C			
2-Year	5-Year	10-Year	100-Year
0.01	0.05	0.15	0.49

Basin ID	% Imperv.	*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
H1	2.0%	0.02	A	0.01	0.01	0.01	0.13						
			B	0.01	0.01	0.07	0.44		5.85	0.01	0.05	0.15	0.49
			C or D	0.01	0.05	0.15	0.49	5.85					
H2	2.0%	0.02	A	0.01	0.01	0.01	0.13						
			B	0.01	0.01	0.07	0.44		11.52	0.01	0.05	0.15	0.49
			C or D	0.01	0.05	0.15	0.49	11.52					

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

SUB-BASIN DATA			INITIAL / OVERLAND TIME			CHANNEL / TRAVEL TIME T(t)						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.
H1	5.85	0.05	78	9.5	8.0	949	0.7	7	0.6	27.7	35.7	2.0%		35.7
H2	11.52	0.05	294	3.3	22.0	942	0.4	7	0.5	34.2	56.2	2.0%		56.2

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.1 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

MHFD-Inlet, Version 5.02 (August 2022)

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 Grate

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

MHFD-Inlet, Version 5.02 (August 2022)

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

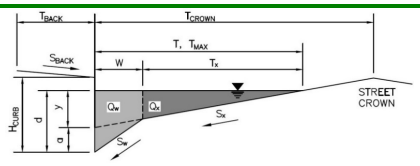
MHFD-Inlet, Version 5.02 (August 2022)

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

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

Project: **Reunion Center Filing 1 - Amendment 2 - Basins**

Inlet ID: **Inlet C1.1**



Gutter Geometry:

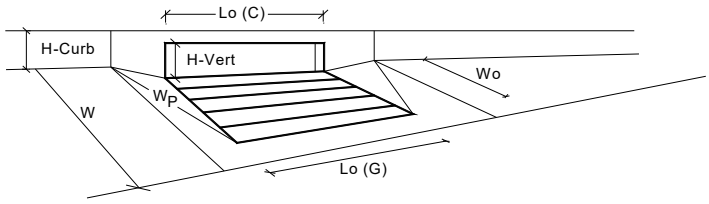
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =		ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =		
Height of Curb at Gutter Flow Line	H_{CURB} =	4.50	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	42.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.005	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	42.0	42.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.5	4.5	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.02 (August 2022)



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	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	Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Open Area Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (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	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**2.5**	**2.5**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)	$Q_{PEAK\ REQUIRED}$ =	0.8	2.1	cfs

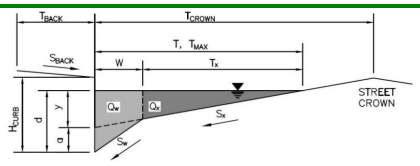
MHFD-Inlet, Version 5.02 (August 2022)

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

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

Project: **Reunion Center Filing 1 - Amendment 2 - Basins**

Inlet ID: **Inlet C2.1**



Gutter Geometry:

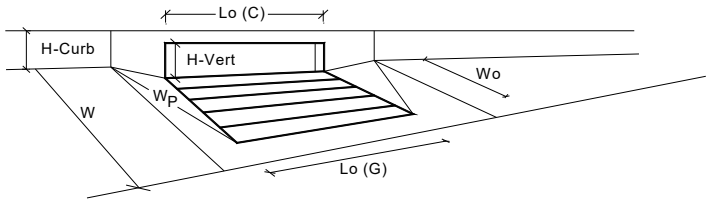
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =		ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =		
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	19.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	19.0	19.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.02 (August 2022)



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	6.0	inches
Grate Information		MINOR	MAJOR	☐ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Open Area Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (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	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**5.4**	**5.4**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)	$Q_{PEAK\ REQUIRED}$ =	0.4	1.2	cfs

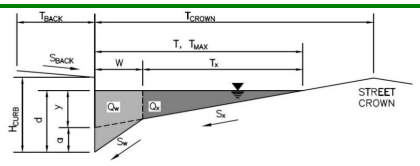
MHFD-Inlet, Version 5.02 (August 2022)

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

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

Project: **Reunion Center Filing 1 - Amendment 2 - Basins**

Inlet ID: **Inlet D1.1**



Gutter Geometry:

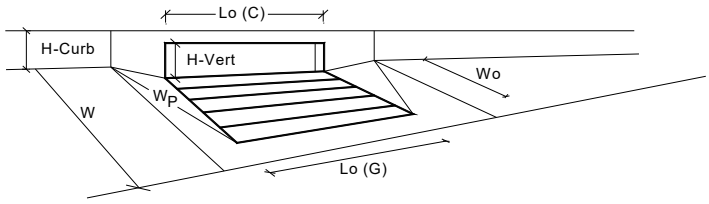
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	5.7	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.018	
Height of Curb at Gutter Flow Line	H_{CURB} =	4.50	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	12.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	12.0	12.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.5	4.5	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.02 (August 2022)



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	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	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**1.2**	**1.2**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)	$Q_{PEAK\ REQUIRED}$ =	0.2	0.4	cfs

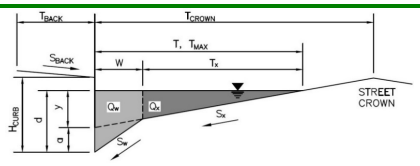
MHFD-Inlet, Version 5.02 (August 2022)

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

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

Project: Reunion Center Filing 1 - Amendment 2 - Basins

Inlet ID: Inlet D1.2



Gutter Geometry:

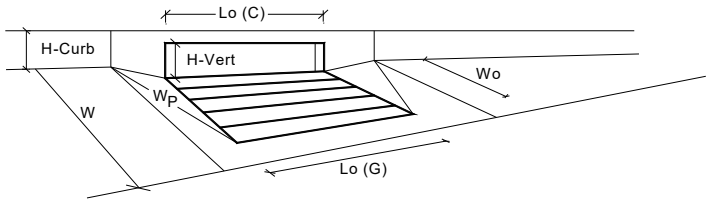
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	5.7	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.018	
Height of Curb at Gutter Flow Line	H_{CURB} =	4.50	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	12.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	12.0	12.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.5	4.5	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.02 (August 2022)



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	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	Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Open Area Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (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	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**2.5**	**2.5**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)	$Q_{PEAK\ REQUIRED}$ =	0.1	0.4	cfs

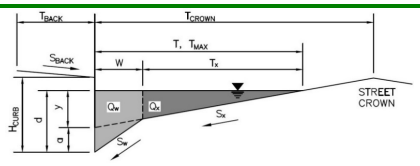
MHFD-Inlet, Version 5.02 (August 2022)

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

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

Project: Reunion Center Filing 1 - Amendment 2 - Basins

Inlet ID: Inlet A6.1



Gutter Geometry:

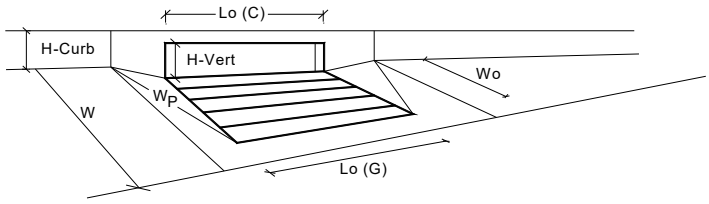
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	12.7	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.018	
Height of Curb at Gutter Flow Line	H_{CURB} =	4.50	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	12.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	12.0	12.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.5	6.2	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.02 (August 2022)



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	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	☑ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Open Area Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (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	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**2.5**	**3.5**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)	$Q_{PEAK\ REQUIRED}$ =	1.2	3.2	cfs

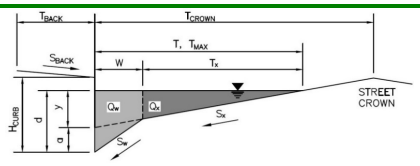
MHFD-Inlet, Version 5.02 (August 2022)

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

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

Project: **Reunion Center Filing 1 - Amendment 2 - Basins**

Inlet ID: **Inlet A5.1**



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.018	
Height of Curb at Gutter Flow Line	H_{CURB} =	4.50	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	12.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.010	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	12.0	12.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.5	6.2	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☑	

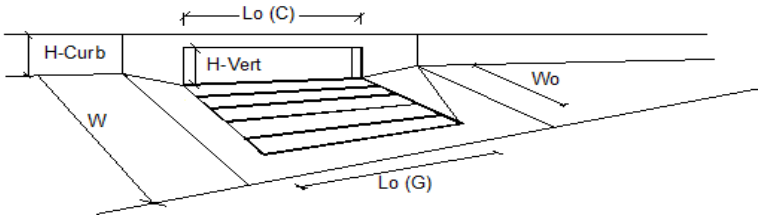
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**4.7**	**15.1**	**cfs**

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'

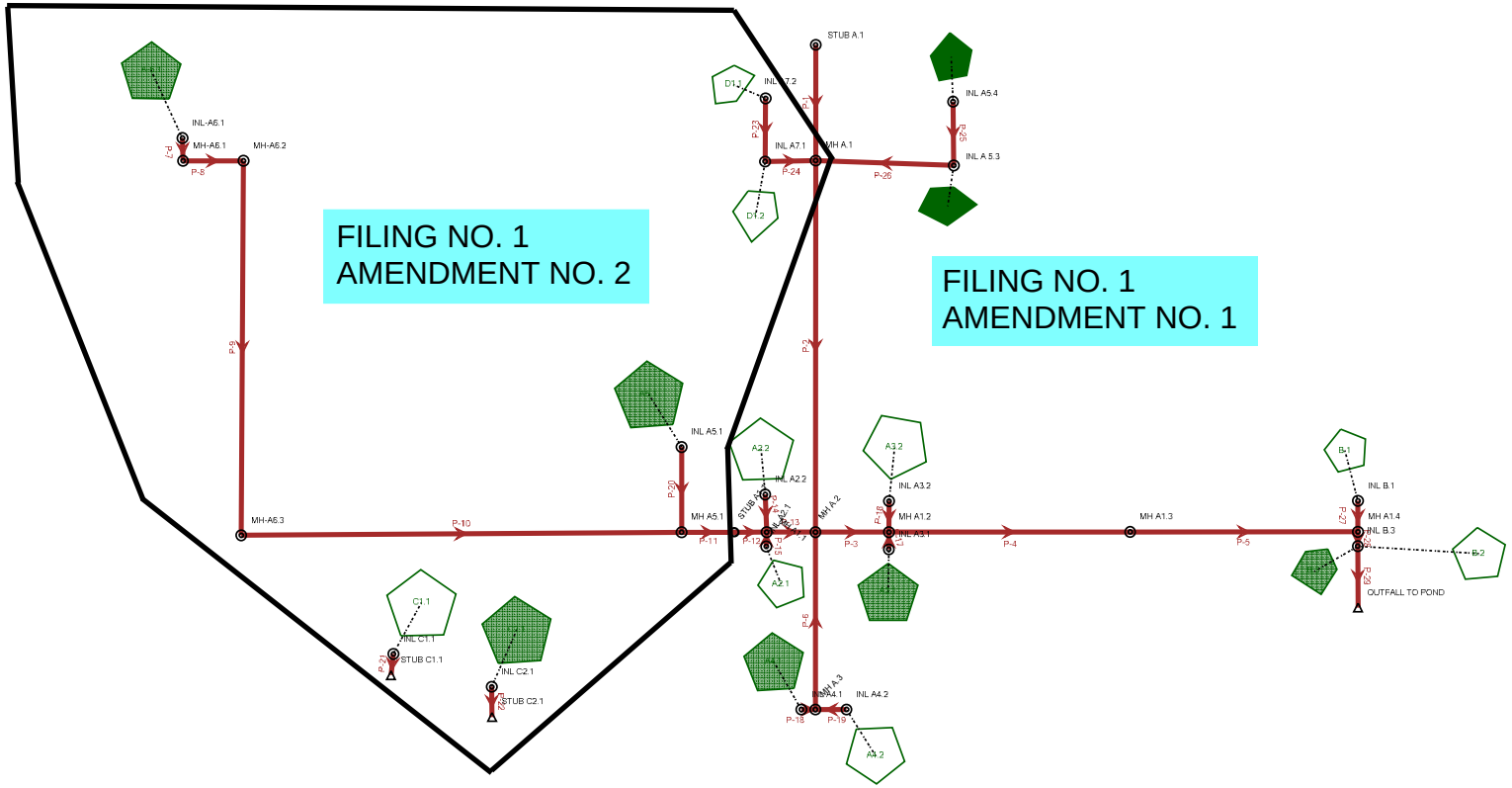
INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.02 (August 2022)



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	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'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**2.6**	**7.4**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.0**	**cfs**
Capture Percentage = Q_a/Q_o	**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

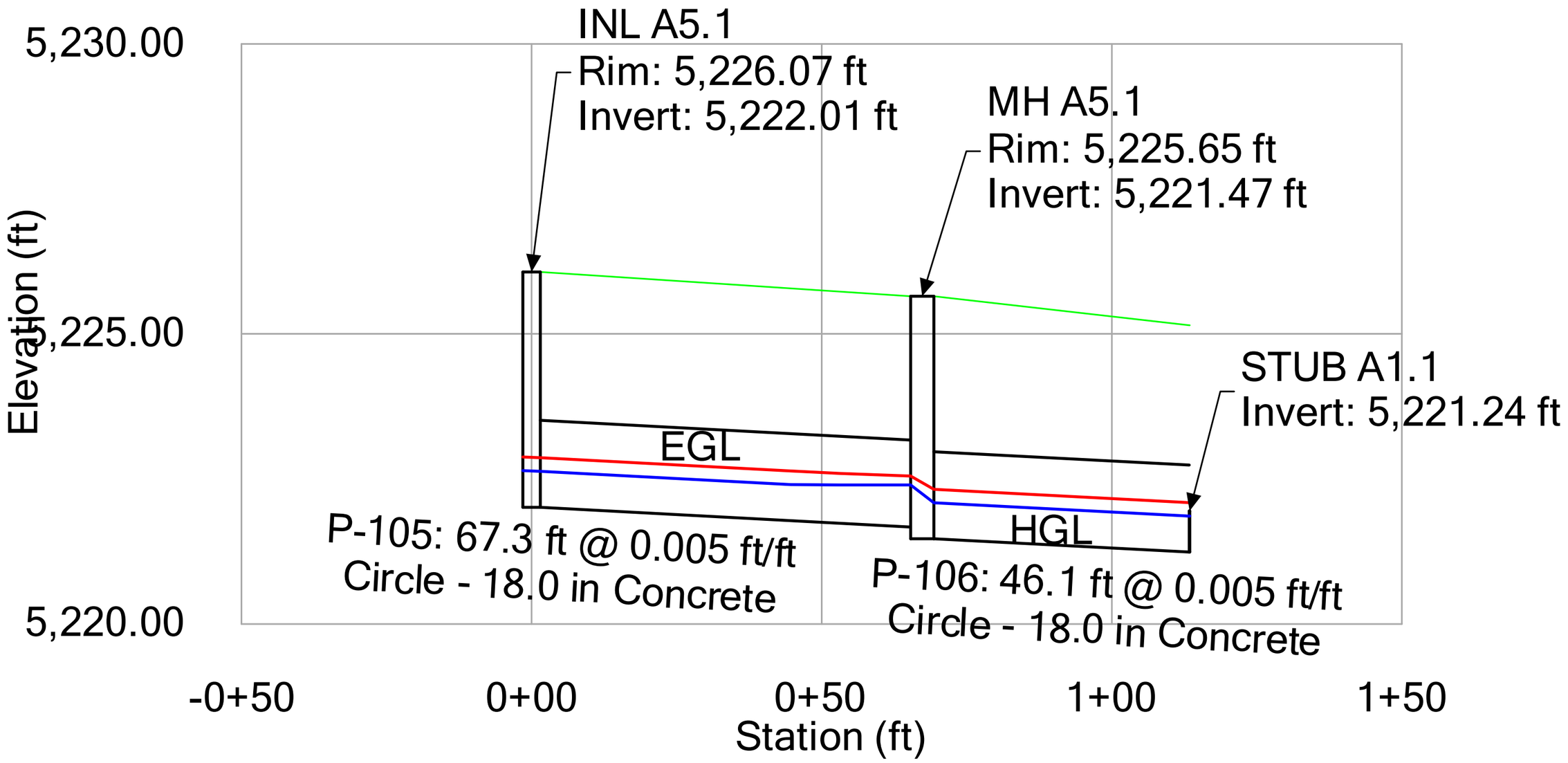
Manhole Table - Time: 0.00 hours

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

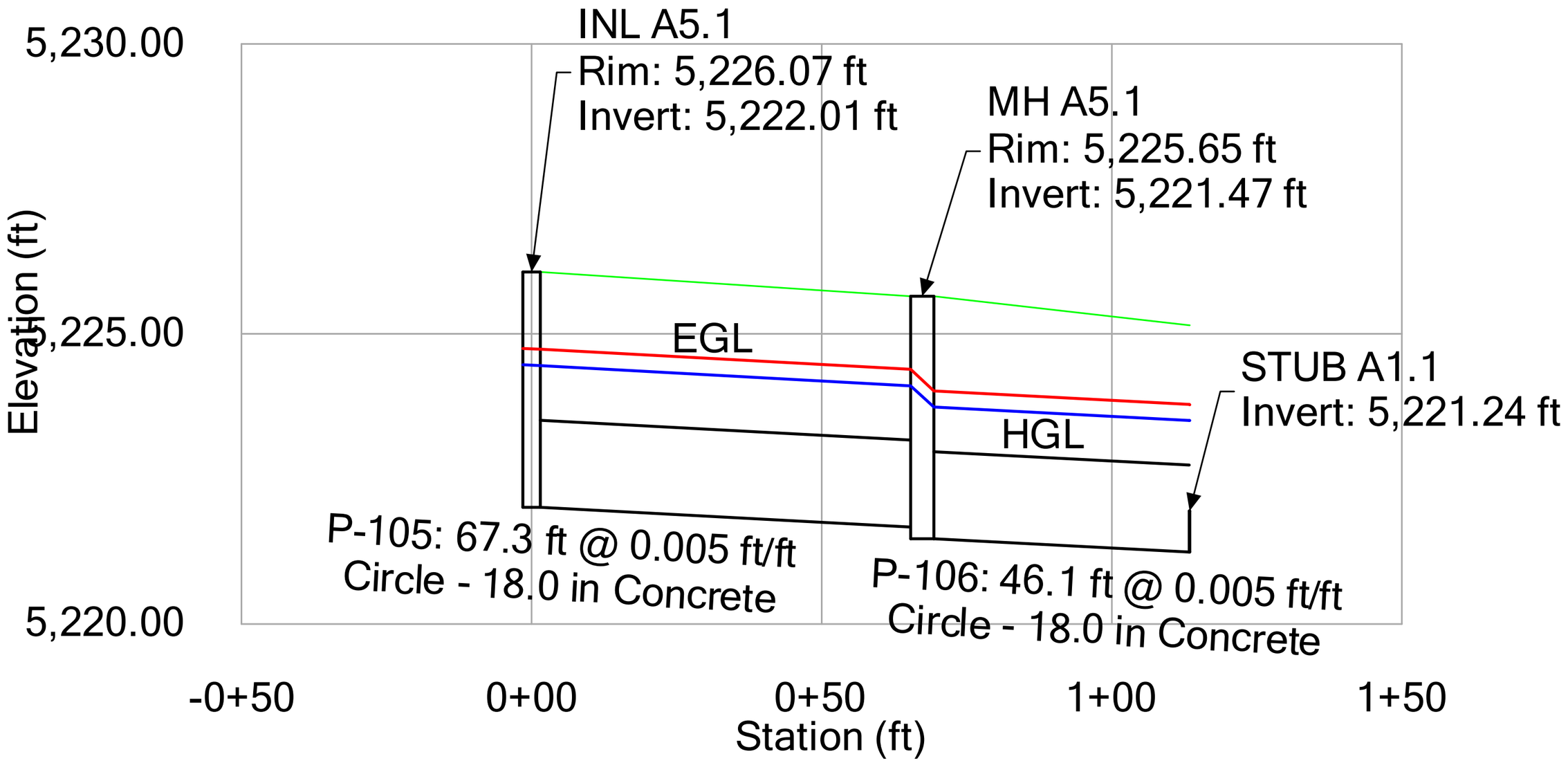
Outfall Table - Time: 0.00 hours

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

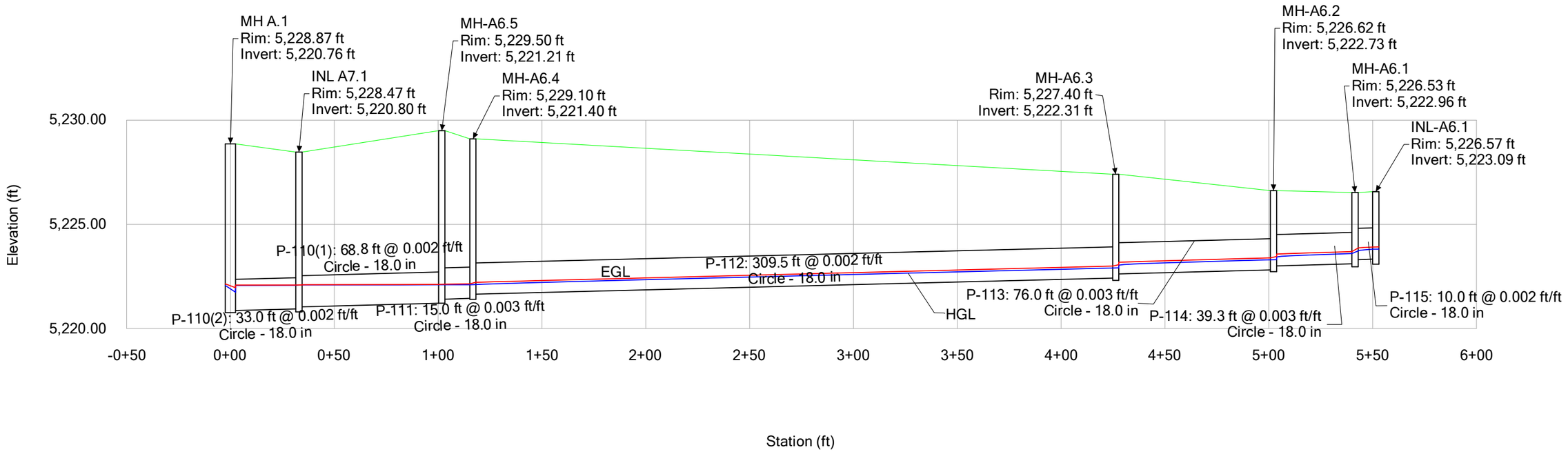
Profile Report
Engineering Profile - A5 (Reunion Center StormCAD Model ACJ.stsw)



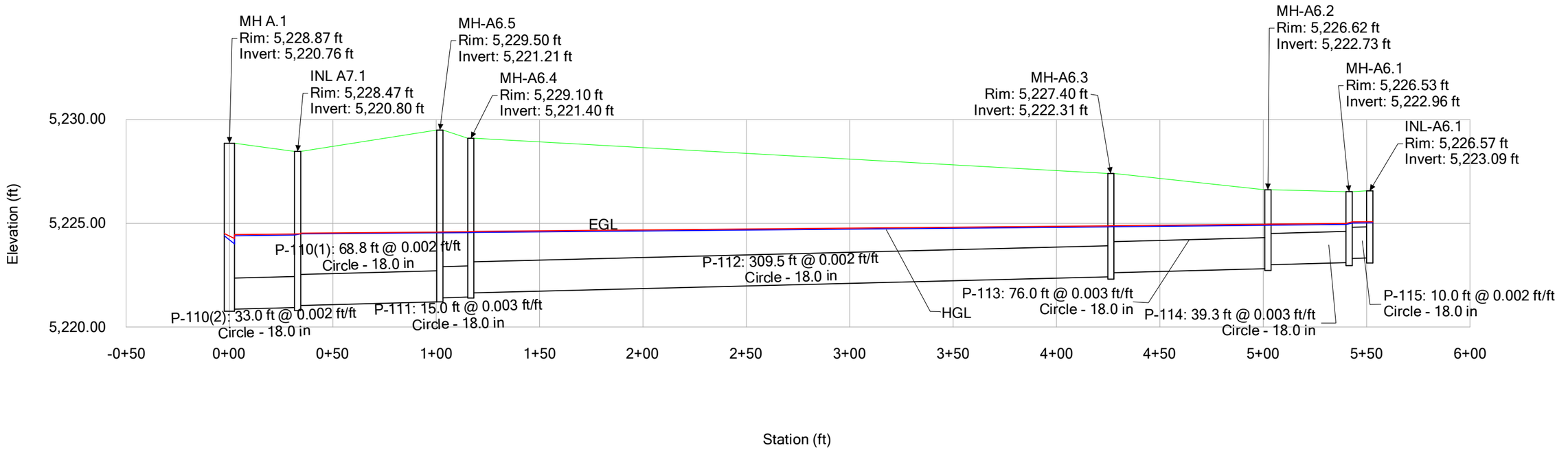
Profile Report
Engineering Profile - A5 (Reunion Center StormCAD Model ACJ.stsw)



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

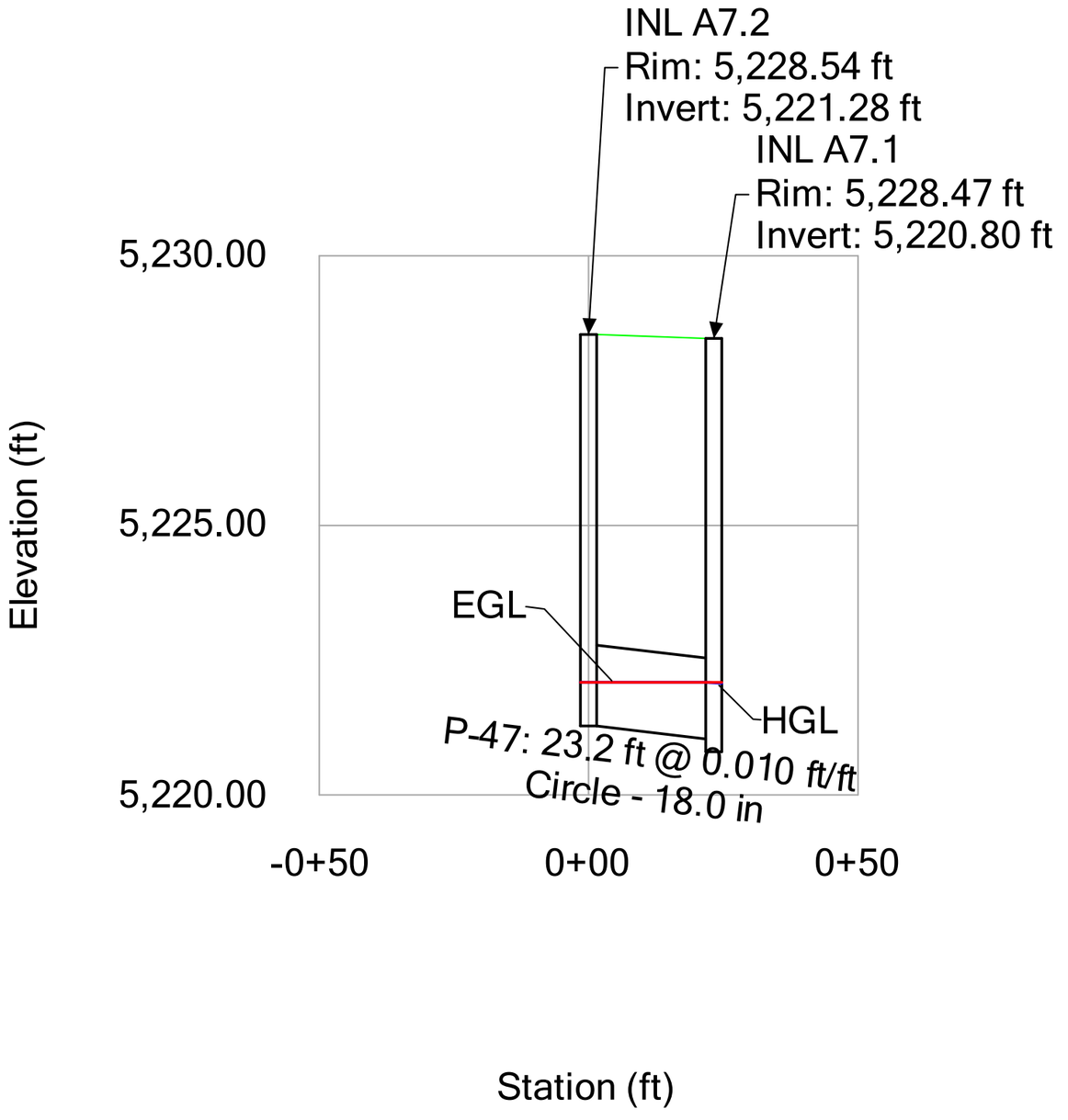


Profile Report
Engineering Profile - A6 (Reunion Center StormCAD Model ACJ.stsw)



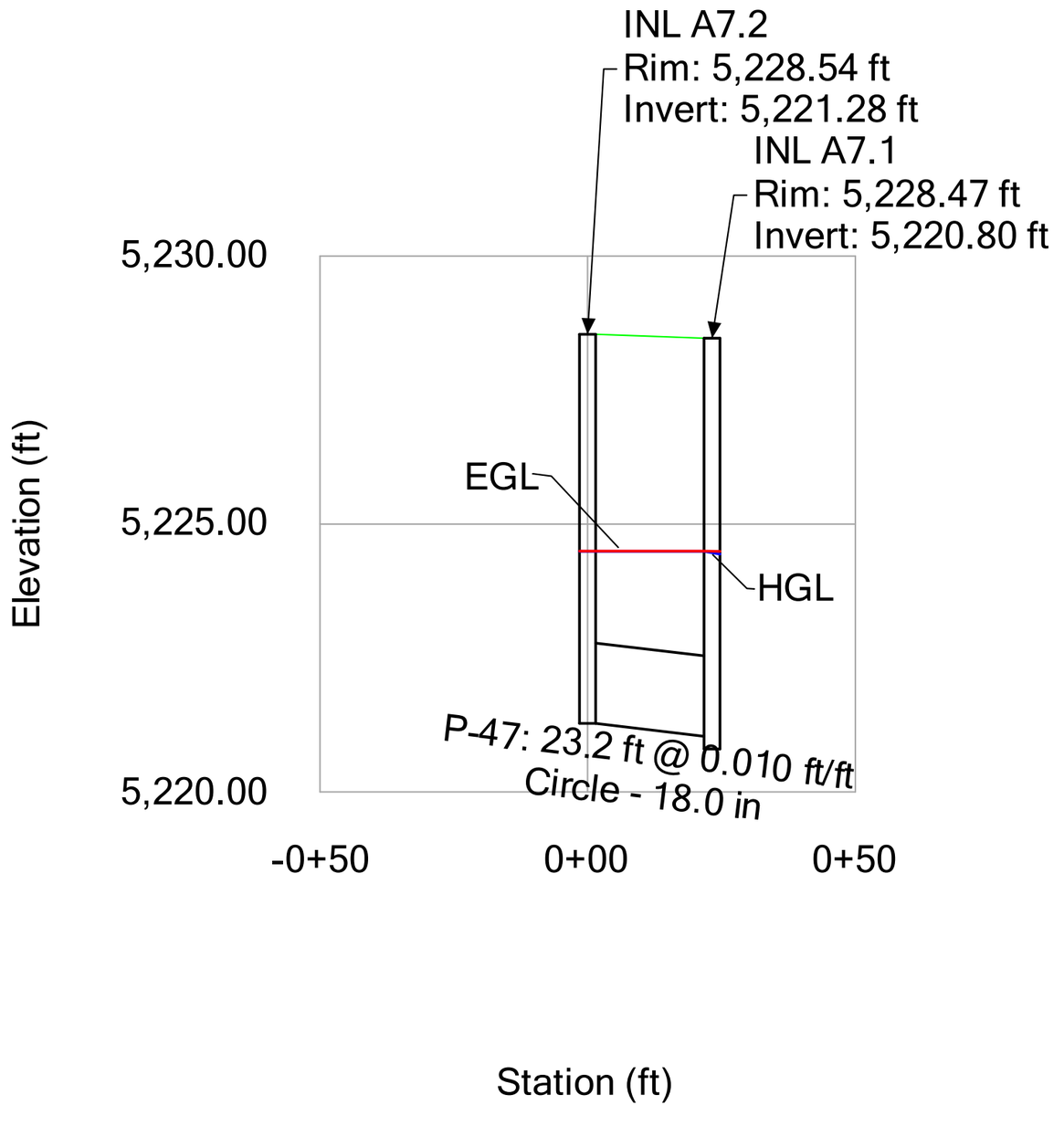
Profile Report

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



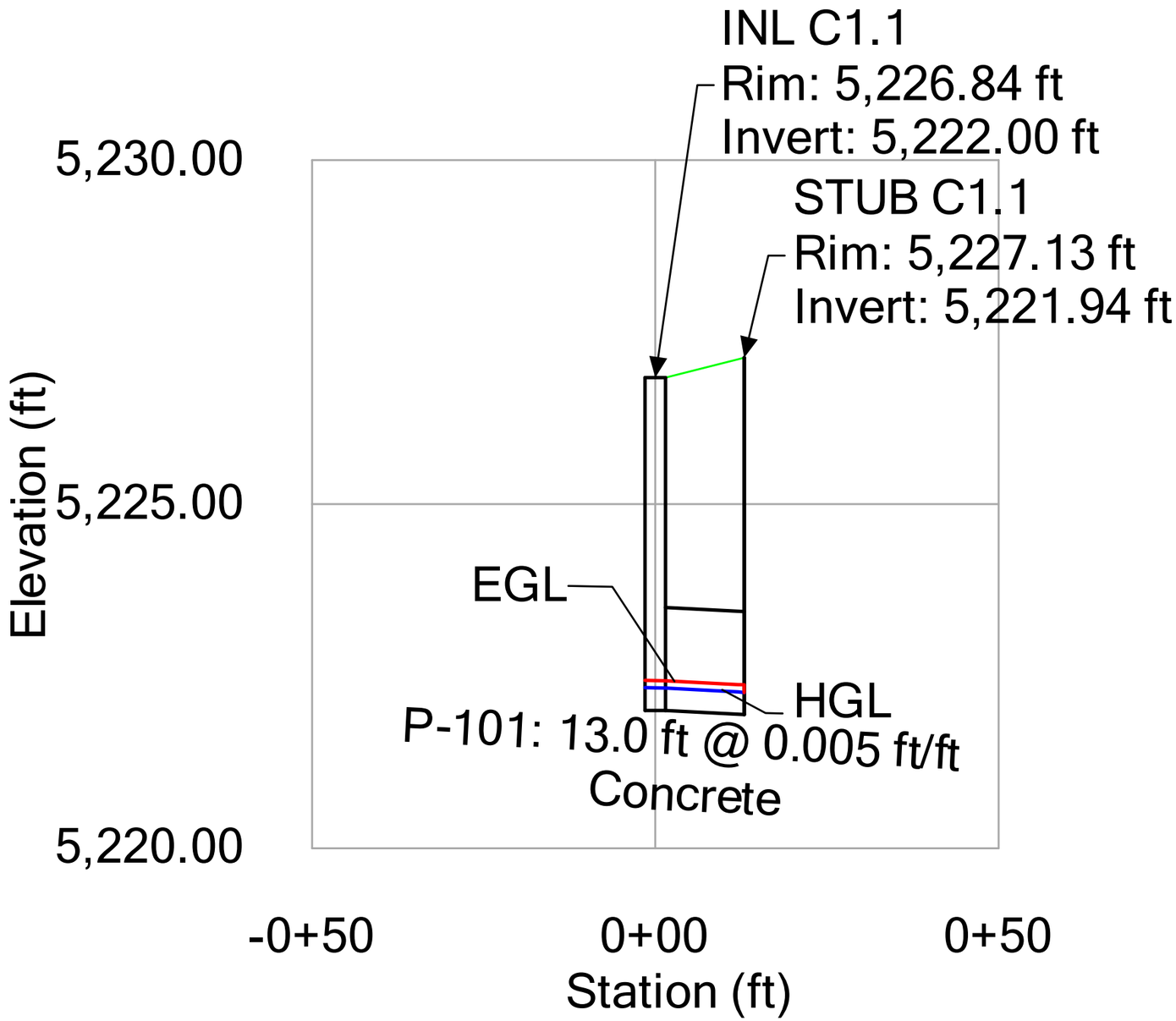
Profile Report

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



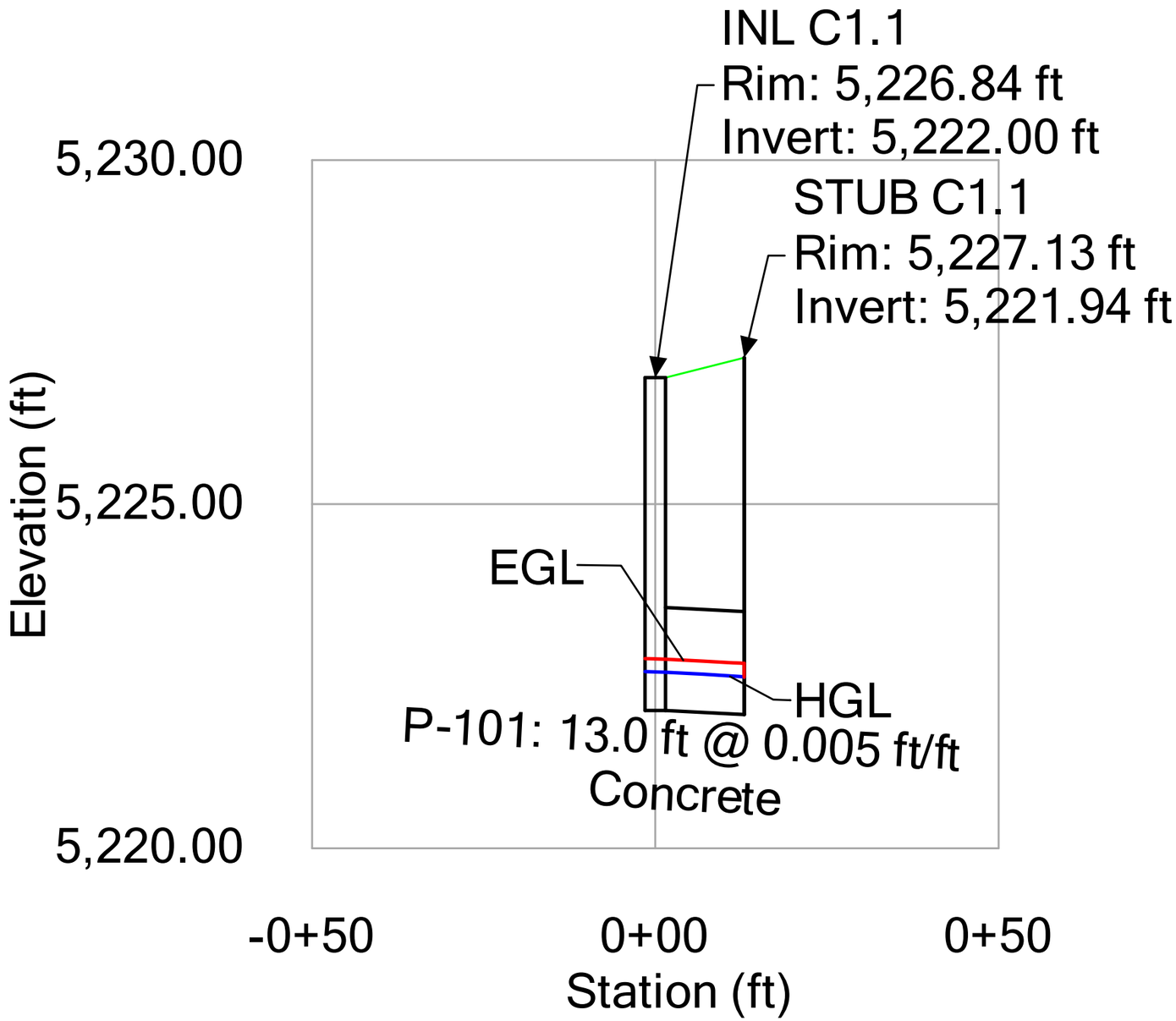
Profile Report

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



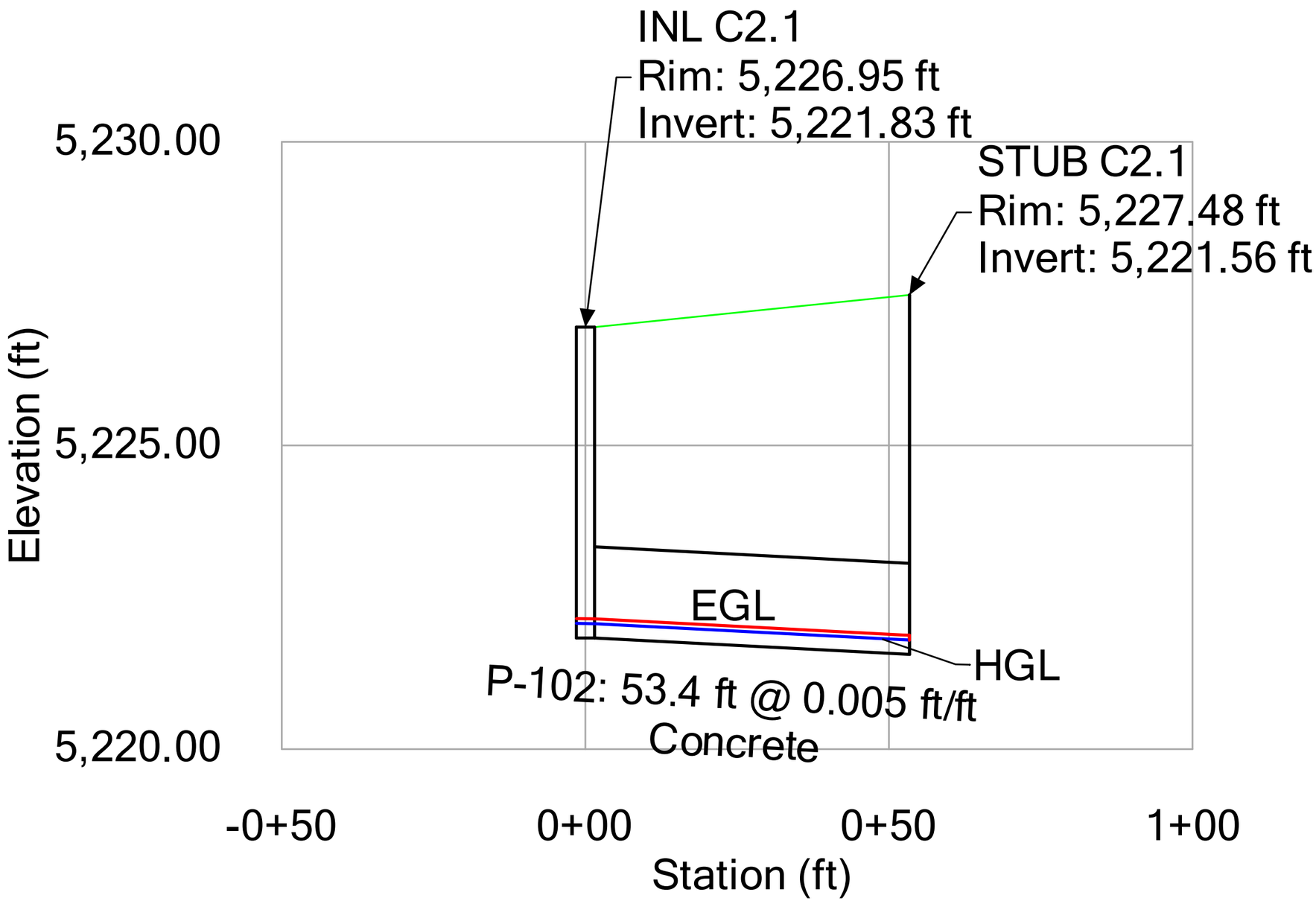
Profile Report

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



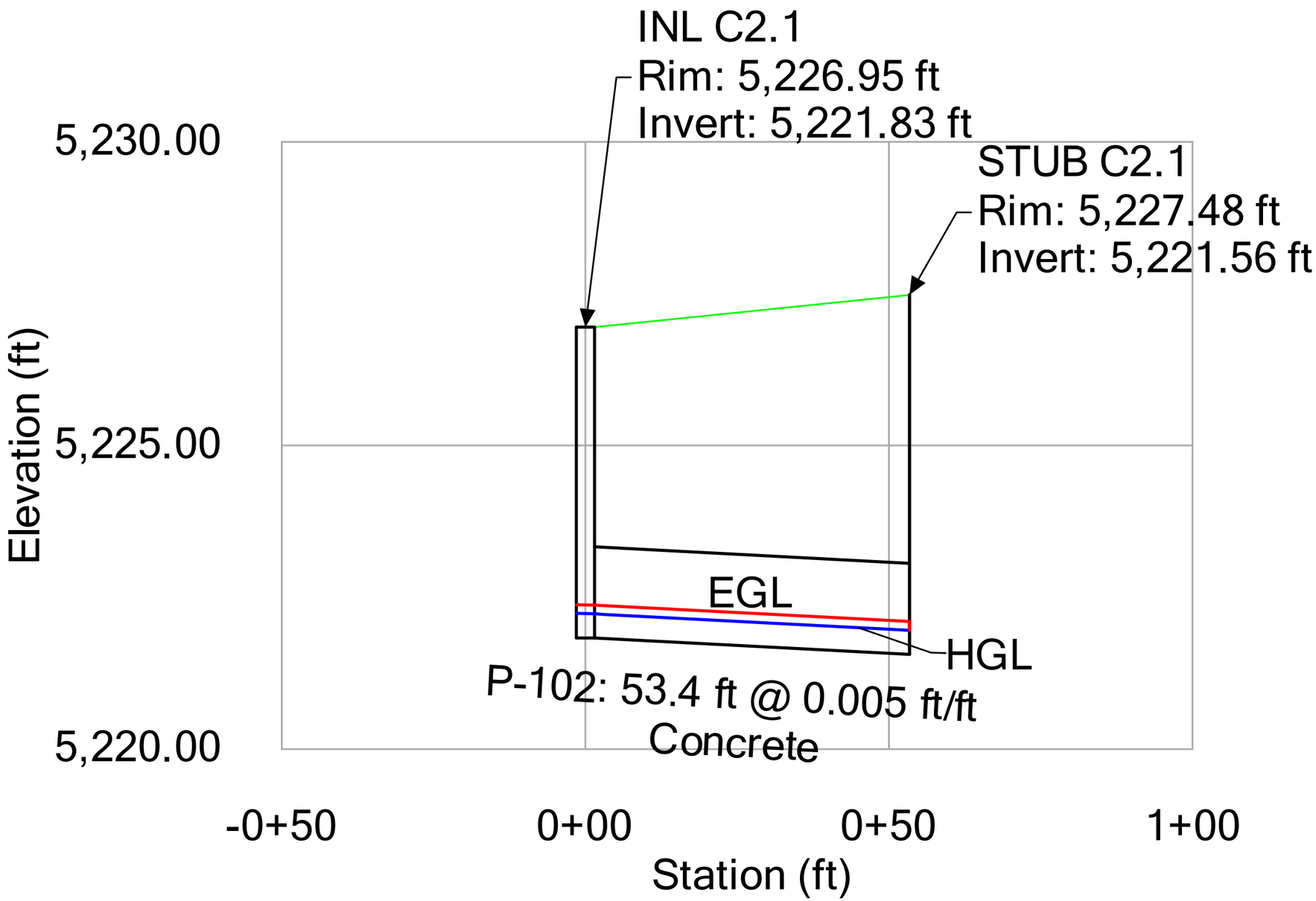
Profile Report

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

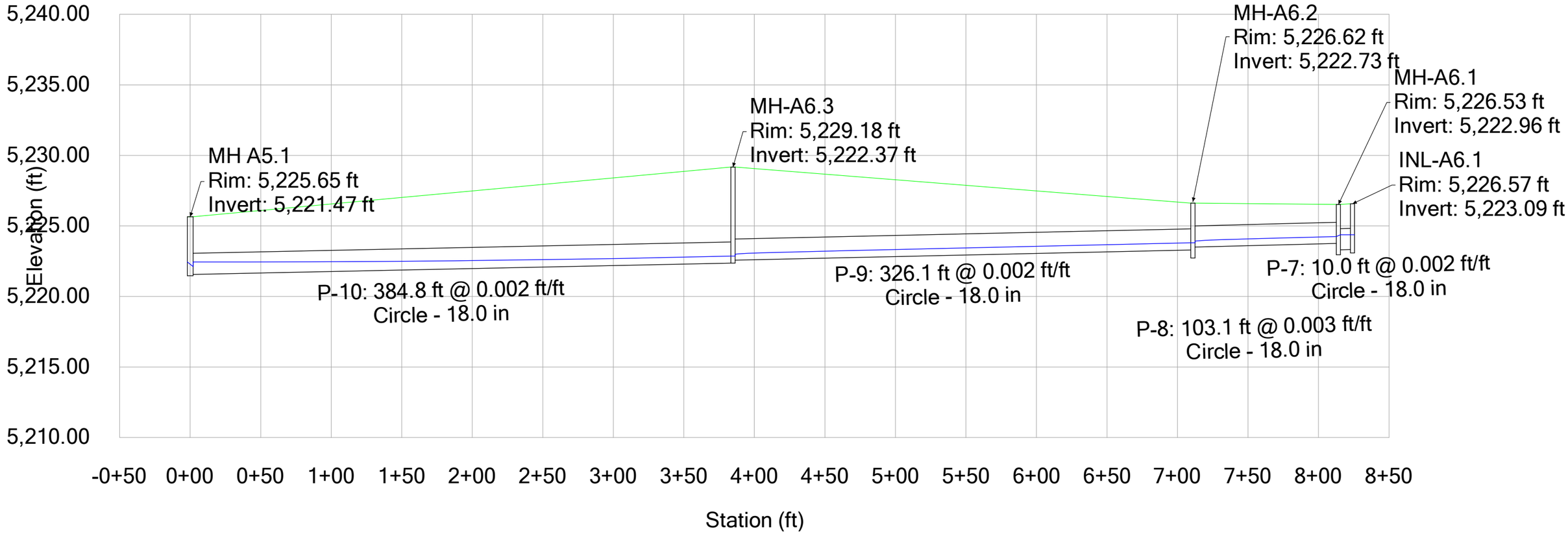


Profile Report

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

DocuSign Envelope ID: 73C2843A-1F06-465E-AF0C-4AE159CF9C54

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

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, Geoffery Bonnin

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

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 MINOR STORM	1.13 .878-1.45)	1.46 (1.12-1.99)	1.75 (1.30-2.40	2.06 MAJOR STORM	2.40 .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).

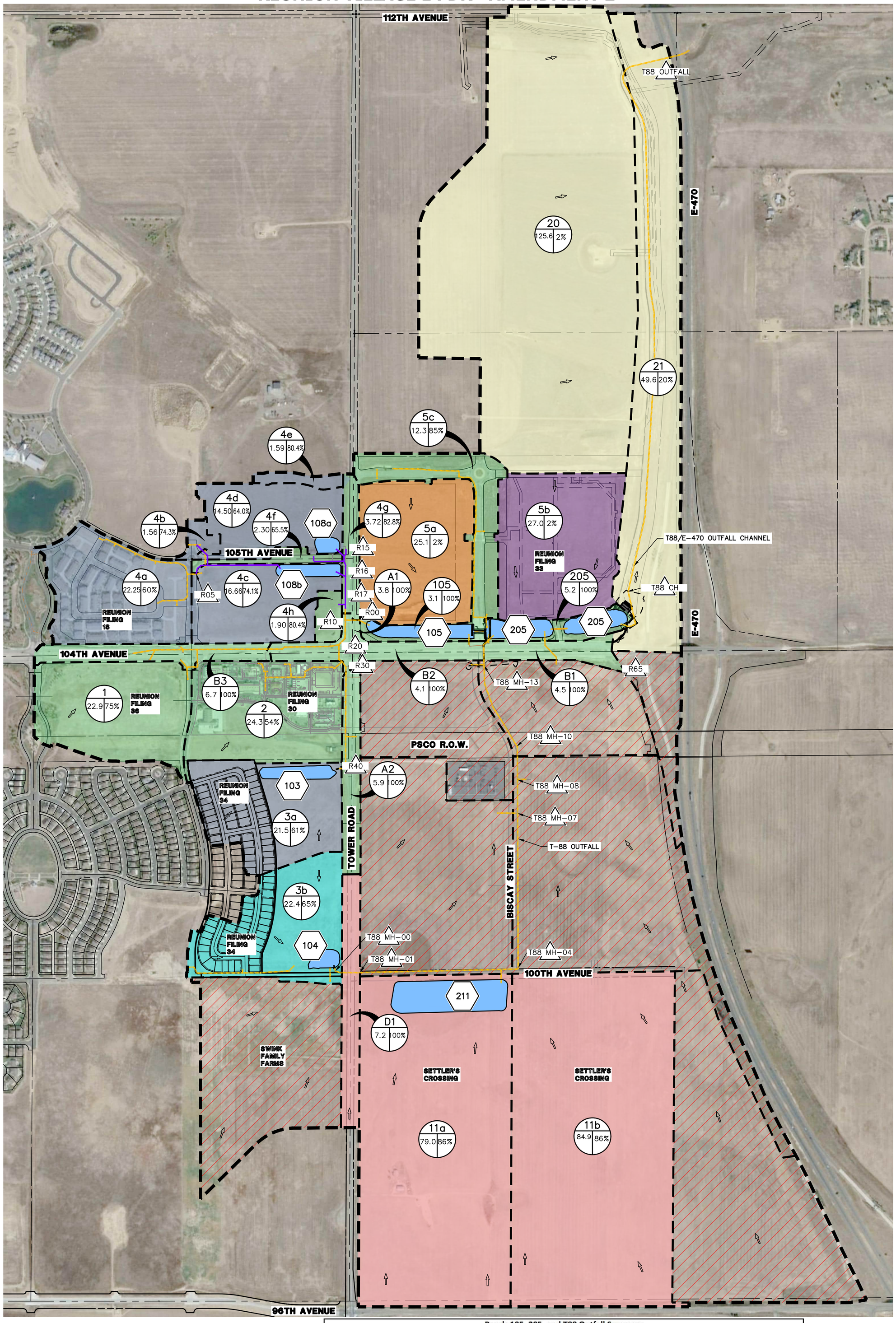
Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper 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)

210 — WQ POND / DETENTION POND / OVER-DETENTION POND

7 / 3.67 / 85% — DRAINAGE BASIN (AREA (AC); PERCENT IMPERVIOUS)

350 — 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

1. Per the original design from the *Final Drainage Report for Reunion District Infrastructure Conversion of 104th Avenue Retention Pond* by JR Engineering; July 2017
2. Current level of development. Future developments are excluded
3. 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

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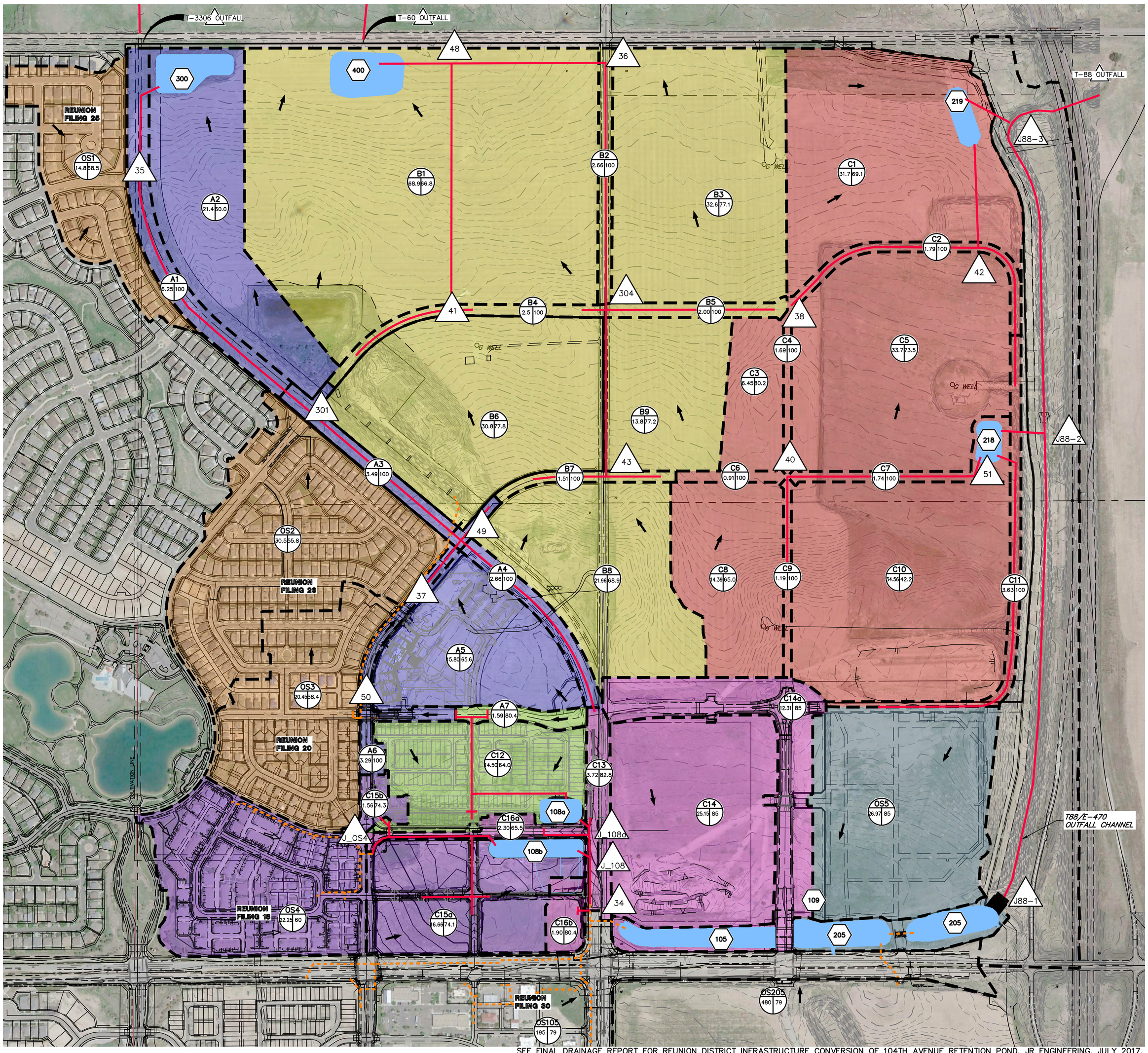
Centennial 303-740-9393 • Colorado Springs 719-593-2593
Fort Collins 970-491-9888 • www.jrengineering.com

X:\14400000.all\14421491\Drawings\Sheet Dwgs\Drainage\Drainage Report - Reunion Village 1 Preliminary Drainage Report Amendment #2\T88 Outfall Drainage Map\14421491 Village 1 PDR Amendment 2 - T-88 Outfall Drainage Map (Current Level of Development).dwg, 24x36 Title Portrait, 11/3/2023 8:38:31 AM, CiaccoA

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 DUETS BASINS - REUNION VILLAGE 1 PDR AMENDMENT 2

Overall Sub-Basin ID[1]	Duets Sub-Basin ID[2]	Total Area (acres)[2]	Basins Total Weighted % Imp.
A7	B1	0.67	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%
	B8	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%
	D9-F	0.88	91.1%
	TOTAL	**3.72**	**82.8%**
C15a	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%
	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%
	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%
	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 Duets Drainage Calcs*

SUB-BASIN SUMMARY TABLE

Sub-Basin	Total Area (ac)	Composite Percent Impervious	Q_5* (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_5 (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_5 (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}= 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

- 210 — WQ POND / DETENTION POND / OVER-DETENTION POND
- A1 6.25 100 (AREA (AC) — PERCENT IMPERVIOUS) — DRAINAGE BASIN
- 350 — DESIGN POINT
- 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) ($Q_{100,\ PEAK}$: 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

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X:\1440000.all\144214\9\Drawings\Sheet Dwgs\Drainage\Drainage Report - Reunion Village 1 Preliminary Drainage Report Amendment #2\144214\9DR01 Village 1 Preliminary Drainage Plan - Amendment 2.dwg, 24x36 Title Portrait, 11/3/2023 9:08:06 AM, CiaccoA

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 = $(0.91I^3 - 1.19I^2 + 0.78)$

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	Total WQCV in Pond 105 (ac-ft) based on Amendment 2 land use and drainage patterns.
Pond 105 Original Design		195.67	79.36%	0.324	5.289	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	Based on the Spillway Elev from Approved Pond 105 Pond Certification Letter; December 6, 2018. Field Surveyed June 19, 2018
Remaining WQCV:	1.340 ac-ft	

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	(from Final Drainage Report for Reunion District Infrastructure - Conversion of 104th Avenue Retention Pond; July 31 2017)
As-Built Water Quality	5.92	5212.76	7.66	(based on the Spillway Elev from Approved Pond 105 Pond Certification Letter; December 6, 2018. Field Surveyed June 19, 2018)
Amendment 2 Design Water Quality	4.58	5212.07	6.97	(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

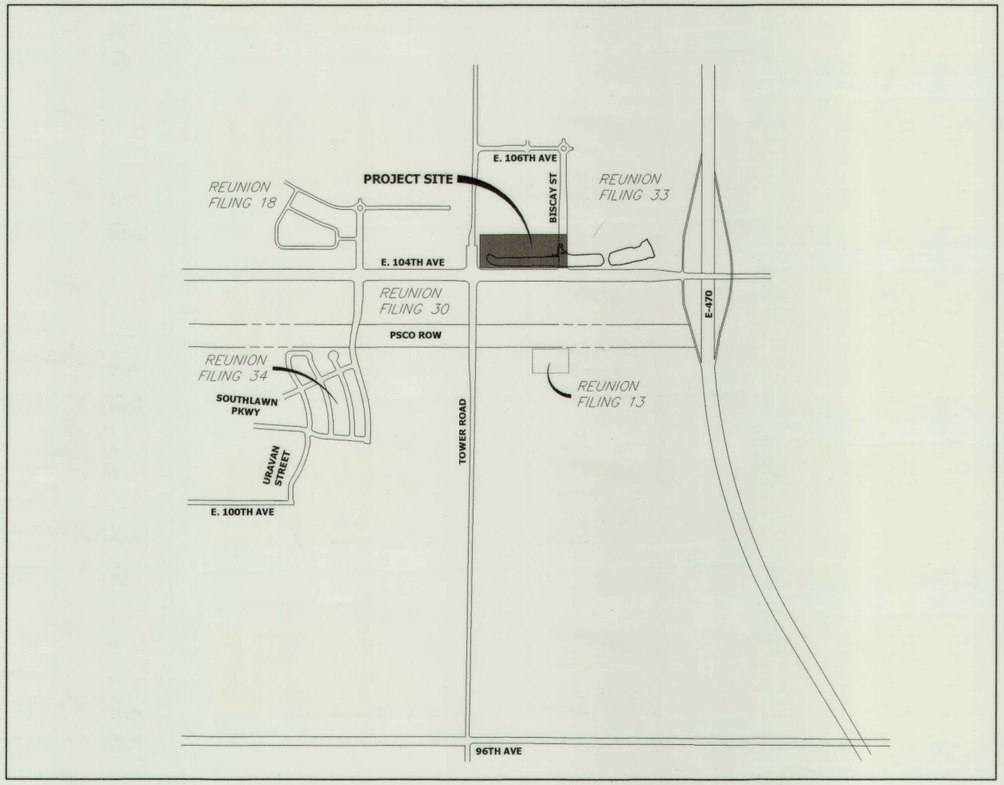
COMCAST
8490 NORTH UMATILLA STREET
FEDERAL HEIGHTS, CO 80260
ATTN: GLEN NELSON 303-603-6745

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: ZACHORIAH BALLARD 303-825-0777

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



PROJECT LOCATION MAP

SCALE: N.T.S.

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

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

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

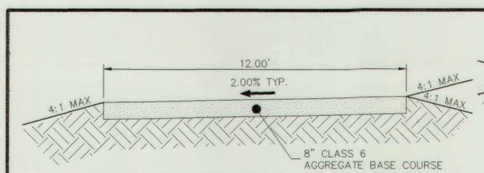
I HEREBY CERTIFY THAT THE PUBLIC IMPROVEMENTS FOR E. 104TH AVENUE WATER QUALITY POND HAVE BEEN CONSTRUCTED IN SUBSTANTIAL COMPLIANCE WITH THE CONSTRUCTION PLANS APPROVED BY THE CITY OF COMMERCE CITY.

COLORADO REGISTERED AARON LEE CLUTTER 36742 PROFESSIONAL ENGINEER

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

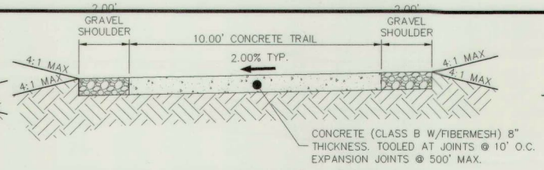
COVER SHEET
E. 104TH AVENUE WATER QUALITY POND
JOB NO. 14421.32
11/7/17
SHEET 1 OF 33

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



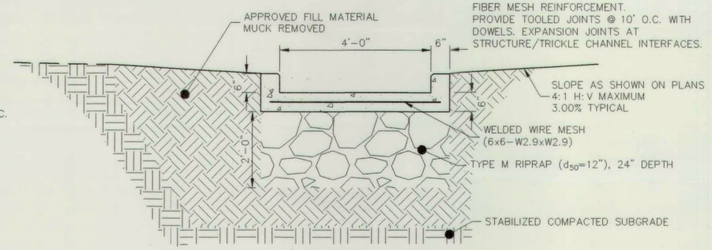
GRAVEL MAINTENANCE ACCESS ROAD
TYPICAL SECTION

N.T.S.



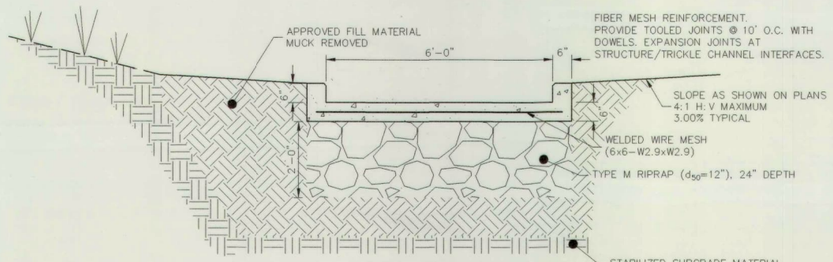
CONCRETE MAINTENANCE ACCESS ROAD
TYPICAL SECTION

N.T.S.



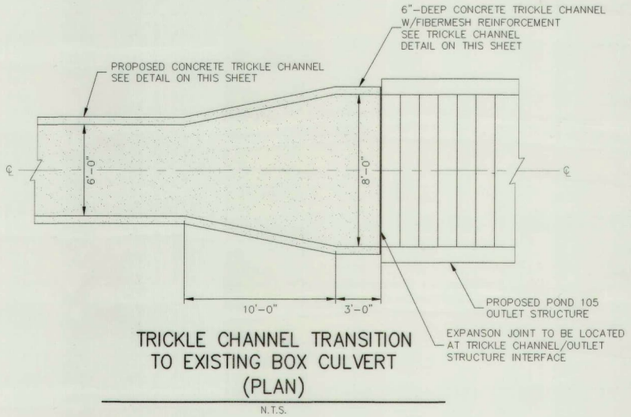
4' CONCRETE TRICKLE CHANNEL
TYPICAL SECTION

SCALE: 1"=2'



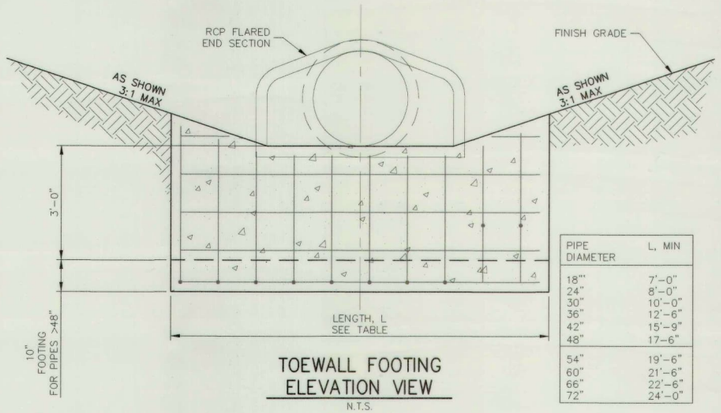
6' CONCRETE TRICKLE CHANNEL
TYPICAL SECTION

SCALE: 1"=2'



TRICKLE CHANNEL TRANSITION
TO EXISTING BOX CULVERT
(PLAN)

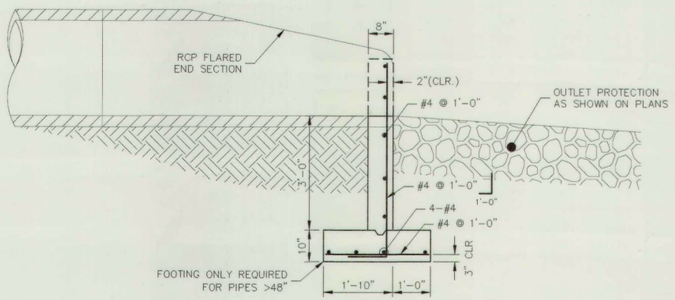
N.T.S.



PIPE DIAMETER	L, MIN
18"	7'-0"
24"	8'-0"
30"	10'-0"
36"	12'-6"
42"	15'-9"
48"	17-6"
54"	19'-6"
60"	21'-6"
66"	22'-6"
72"	24'-0"

TOEWALL FOOTING
ELEVATION VIEW

N.T.S.



TOEWALL FOOTING
PROFILE

N.T.S.

POND GRADING NOTES:

1. THE EXISTING E. 104TH AVENUE RETENTION POND IS AN ACTIVE REGIONAL DRAINAGE FACILITY WITH STORMWATER RUNOFF FROM ADJACENT DEVELOPMENT ENTERING THE POND.
2. CONTRACTOR SHALL ANTICIPATE STORMWATER INFLOWS TO THE EXISTING POND DURING CONSTRUCTION AND PROVIDE A MEANS OF CONVEYANCE/REMOVAL OF ANY CONTINUOUS INFLOWS TO THE POND.
3. DEWATERING.
   - 3.a. THE EXISTING RETENTION POND IS CURRENTLY IMPOUNDING WATER. DEWATERING OF THE EXISTING RETENTION POND SHALL OCCUR IN ADVANCE OF CONSTRUCTION ACTIVITIES.
   - 3.b. CONTRACTOR TO PHASE T88 OUTFALL CONSTRUCTION IN A MANNER TO FACILITATE CONSTRUCTION DEWATERING AND PROVIDE A MEANS OF REMOVAL OF CURRENTLY IMPOUNDED WATER. THE ESTIMATED QUANTITY OF DEWATERING FROM THE EXISTING RETENTION POND IS 30 ACRE-FEET.
   - 3.c. THE CONTRACTOR SHALL OBTAIN A CONSTRUCTION DEWATERING (CDW) PERMIT FROM CDPHE. ANYTIME GROUNDWATER, INCLUDING GROUNDWATER THAT IS COMMINGLED WITH STORMWATER OR SURFACE WATER, IS ENCOUNTERED DURING CONSTRUCTION ACTIVITIES AND THE GROUNDWATER OR COMMINGLED WATER NEEDS TO BE DISCHARGED TO SURFACE WATER.
   - 3.d. WATER FROM DEWATERING OPERATIONS SHALL NOT BE DIRECTLY DISCHARGED INTO ANY STATE WATERS, UNLESS ALLOWED BY A PERMIT.
   - 3.e. THE SWMP DESCRIBES AND LOCATES THE PRACTICES TO BE USED THAT WILL ENSURE THAT NO GROUNDWATER FROM CONSTRUCTION DEWATERING IS DISCHARGED FROM THE PROJECT BOUNDARY AS SURFACE RUNOFF OR TO SURFACE WATERS OR STORM SEWERS.
   - 3.f. GROUNDWATER IS NOT ANTICIPATED WITH THIS PROJECT. HOWEVER, THE CONTRACTOR SHALL BE PREPARED TO PROVIDE CONSTRUCTION DEWATERING FOR GROUNDWATER.
4. MUCK EXCAVATION.
   - 4.a. THE EXISTING POND BOTTOM IS ASSUMED TO BE UNSUITABLE MATERIAL. CONTRACTOR SHALL REMOVE ORGANIC MUCK MATERIAL FROM THE EXISTING POND BOTTOM TO THE DEPTH AS DETERMINED BY THE ENGINEER AND REPLACE THE EXCAVATED VOLUME WITH SUITABLE APPROVED FILL MATERIAL PRIOR TO CONSTRUCTION OF THE PROPOSED POND STRUCTURAL IMPROVEMENTS.
   - 4.b. MUCK EXCAVATION PAY ITEM SHALL CONSIST OF THE REMOVAL AND DISPOSAL OF MIXTURES OF SOILS AND ORGANIC MATERIAL NOT SUITABLE FOR FOUNDATION OR EMBANKMENT MATERIAL.
5. FILL MATERIAL SHALL BE APPROVED BY THE GEOTECHNICAL ENGINEER. ALL UNSUITABLE MATERIAL SHALL BE DISPOSED OF AS DIRECTED.
6. THE MAXIMUM SLOPE FOR EXCAVATION AND PLACEMENT OF FILL IS 4:1 HORIZONTAL:VERTICAL, UNLESS OTHERWISE SHOWN IN THE PLANS.
7. ALL EMBANKMENT FILL MATERIAL SHALL BE MOISTURE CONDITIONED PRIOR TO COMPACTION. FILL MATERIAL SHALL BE MOISTURE CONDITIONED TO WITHIN THE FOLLOWING OF OPTIMUM:
   - 7.a. BENEATH STRUCTURAL AREAS: -1 TO +3% (COHESIVE); -2 TO +2% (NON-COHESIVE)
   - 7.b. BENEATH NON-STRUCTURAL AREAS: -3 TO +3% (COHESIVE); -3 TO +3% (NON-COHESIVE)
8. THE FILL SHALL BE PLACED IN THIN, LOOSE LIFTS OF 8 INCHES OR LESS. FILL IS TO BE COMPACTED TO A MINIMUM OF:
   - 8.a. BENEATH STRUCTURAL AREAS: 95 PERCENT OF MAXIMUM DRY DENSITY
   - 8.b. BENEATH NON-STRUCTURAL AREAS: 90 PERCENT OF MAXIMUM DRY DENSITY; AND PER ASTM D 698 (COHESIVE SOILS) OR ASTM D 1557 (GRANULAR SOILS).
9. A COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT (CDPHE) WATER QUALITY DIVISION STORMWATER DISCHARGE PERMIT SHALL BE OBTAINED AND A COPY SHALL BE SUBMITTED TO THE CITY OF COMMERCE CITY DEPARTMENT OF PUBLIC WORKS.

FIBER MESH NOTES:

FIBROUS CONCRETE REINFORCEMENT SHALL CONSIST OF:
100% VIRGIN POLYPROPYLENE FIBRILLATED FIBERS SPECIFICALLY MANUFACTURED FOR USE AS CONCRETE REINFORCEMENT, CONTAINING NO REPROCESSED OLEFIN MATERIALS. FIBROUS CONCRETE REINFORCEMENT SHALL BE AS MANUFACTURED BY FIBERMESH COMPANY, BUCKEYE ULTRA FIBER 500, OR APPROVED EQUAL.
PHYSICAL CHARACTERISTICS:
- SPECIFIC GRAVITY = 0.905 GRAMS PER CUBIC CENTIMETER.
- TENSILE STRENGTH: 70 TO 110 PSI.

EXPANSION JOINT NOTES:

EXPANSION JOINTS SHALL BE LOCATED AT ABUTTING JUNCTIONS OF CONCRETE APRONS, CONCRETE TRICKLE CHANNELS @ 400' O.C., OUTLET STRUCTURES, GROUTED BOULDER STRUCTURES, ETC. EXPANSION JOINTS SHALL BE FILLED WITH ½ INCH THICK FULL DEPTH, PREFORMED EXPANSION JOINT FILLER. THE MEMBRANE SHALL BE FLASHED UP TO THE TOP OF THE JOINT AND SECURED WITH PRIMER.

EXPANSION JOINTS IN THE COMPLETED WORK SHALL BE LEFT CAREFULLY TOOLED AND FREE OF ALL MORTAR AND CONCRETE. THE JOINT FILLER SHALL BE LEFT EXPOSED FOR ITS FULL LENGTH WITH CLEAN AND TRUE EDGES.

BENCHMARK & HORIZONTAL DATUM

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

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

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

FOR INFORMATION ONLY

UNTIL SUCH TIME AS THESE DRAWINGS ARE APPROVED BY THE APPROPRIATE FOLLOWING AGENCIES, A JR ENGINEERING APPROVES THEIR USE ONLY FOR THE 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 Westrian Company
Centennial 303-740-9393 • Colorado Springs 719-593-2593
Fort Collins 970-491-9888 • www.jrengineering.com

No.	REVISION	BY	DATE
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H-SCALE	N/A		
V-SCALE	N/A		
DATE	11/7/17		
DESIGNED BY	TAB		
DRAWN BY	TAB		
CHECKED BY			

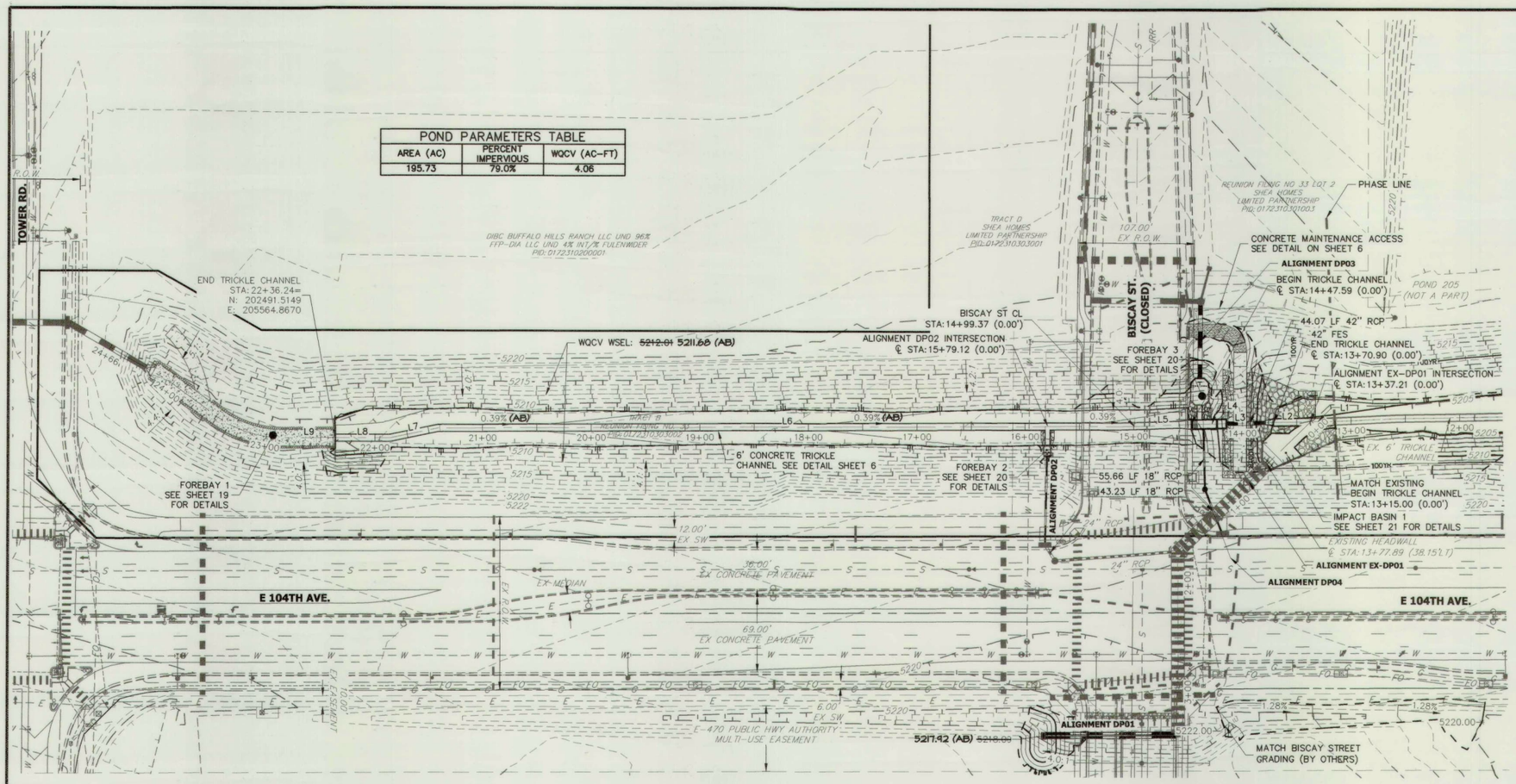
E. 104TH AVENUE WATER QUALITY POND

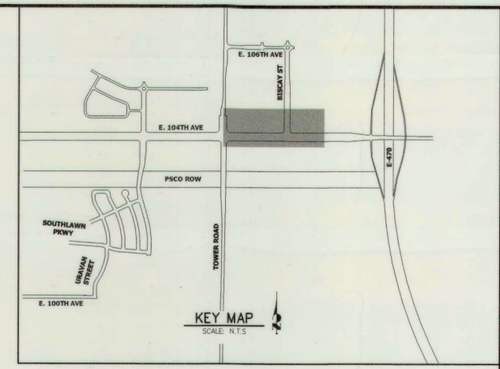
WATER QUALITY POND PLAN

SHEET 6 OF 33

JOB NO. 14421.32

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



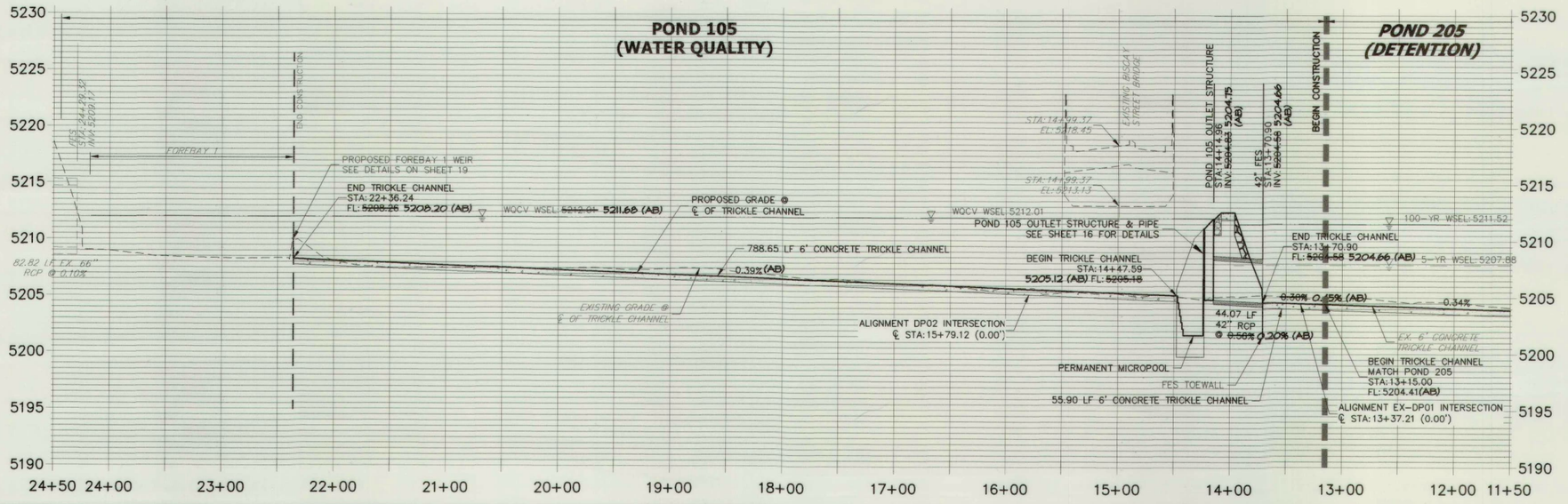


BENCHMARK & HORIZONTAL DATUM

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

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

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

60 30 0 60 120
HORIZONTAL ORIGINAL SCALE: 1" = 60'
VERTICAL ORIGINAL SCALE: 1" = 6'

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.

COLORADO REGISTERED AARON LEE CLUTTER 36742 PROFESSIONAL ENGINEER

Aaron L Clutter 12/5/18
AARON LEE CLUTTER, P.E. DATE
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 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 Westrian Company
Centennial 303-740-9393 • Colorado Springs 719-593-2593
Fort Collins 970-491-9888 • www.jrengineering.com

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

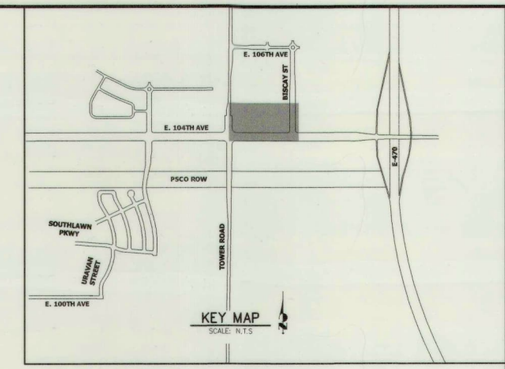
H-SCALE 1"=60' | V-SCALE 1"=6' | DATE 11/7/17 | DESIGNED BY AAM | DRAWN BY AAM | CHECKED BY

E. 104TH AVENUE WATER QUALITY POND

WATER QUALITY POND PLAN

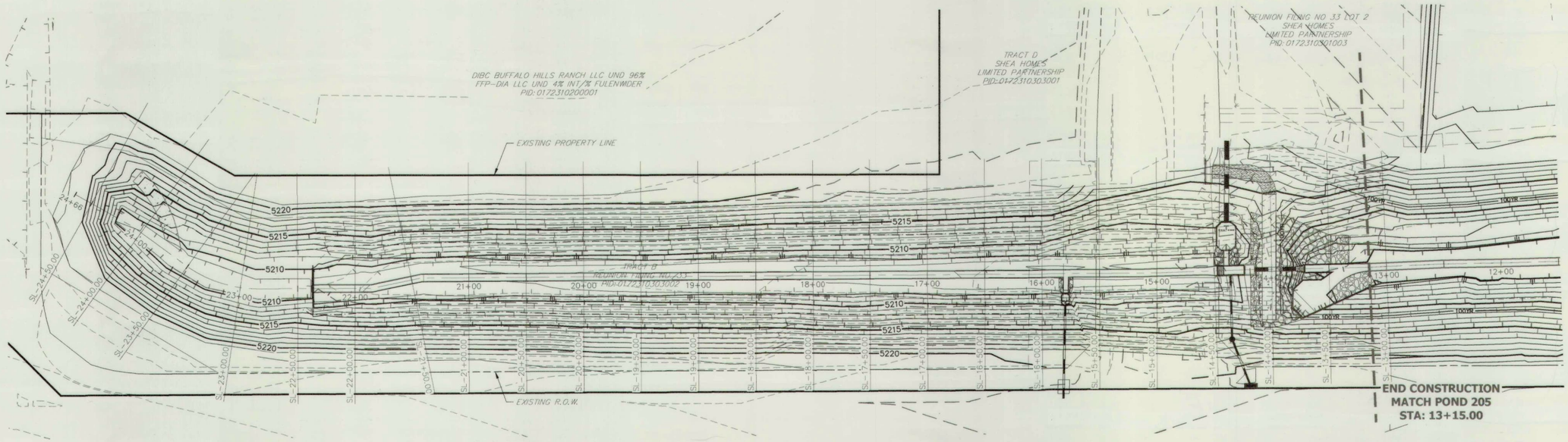
SHEET 7 OF 33

JOB NO. 14421.32



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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:

1. SEE SHEETS 9 & 10 FOR POND SECTIONS

50 25 0 50 100
ORIGINAL SCALE: 1" = 50'

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.

COLORADO REGISTERED AARON LEE CLUTTER 36742 PROFESSIONAL ENGINEER

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

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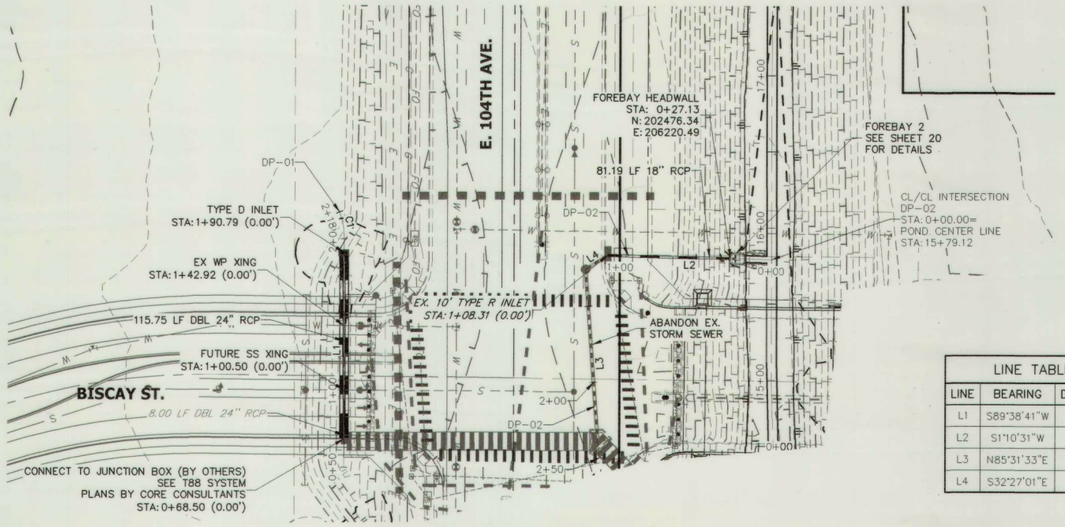
No.	REVISION	BY	DATE
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H-SCALE	1"=50'
V-SCALE	N/A
DATE	11/7/17
DESIGNED BY	TAB
DRAWN BY	AAM
CHECKED BY	

E. 104TH AVENUE WATER QUALITY POND

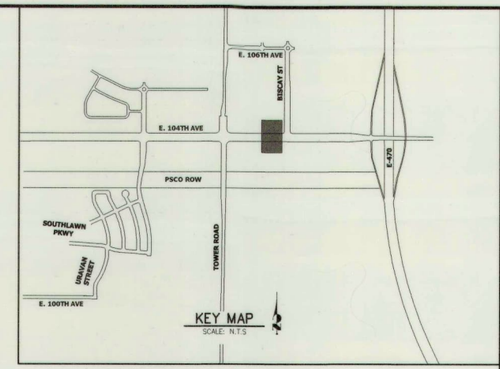
POND SECTIONS
PLAN VIEW

SHEET 8 OF 33
JOB NO. 14421.32

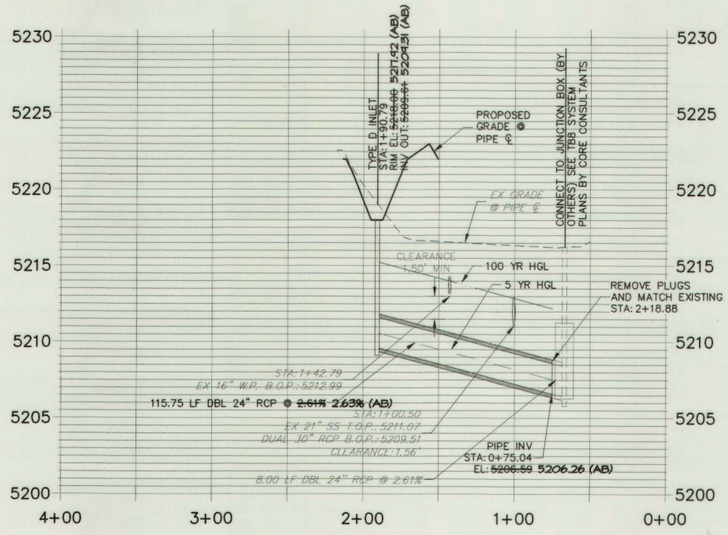


LINE TABLE		
LINE	BEARING	DISTANCE
L1	S89°38'41"W	153.08'
L2	S1°10'31"W	108.32'
L3	N85°31'33"E	124.35'
L4	S32°27'01"E	17.33'

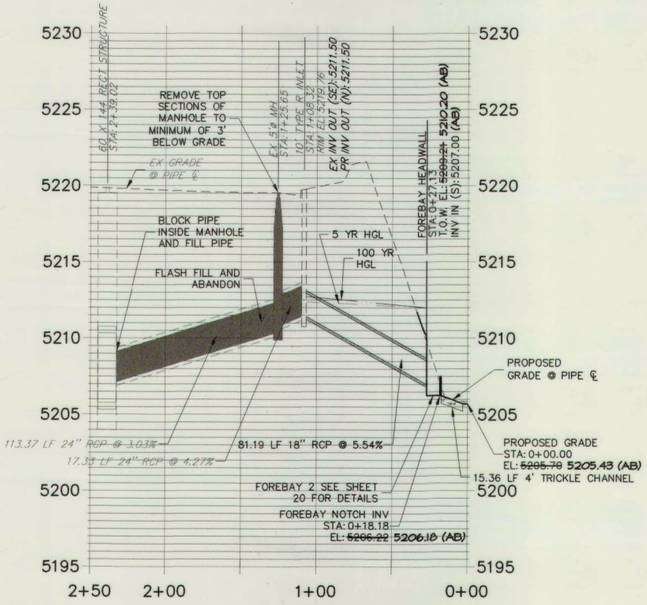
CURVE TABLE			
CURVE	DELTA	RADIUS	LENGTH
C1	17°56'01"	47.52'	14.87'



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

50 25 0 50 100
HORIZONTAL
ORIGINAL SCALE: 1" = 50'
VERTICAL
ORIGINAL SCALE: 1" = 5'

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' ø 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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Aaron L Clutter 12/5/18
AARON LEE CLUTTER, P.E. DATE
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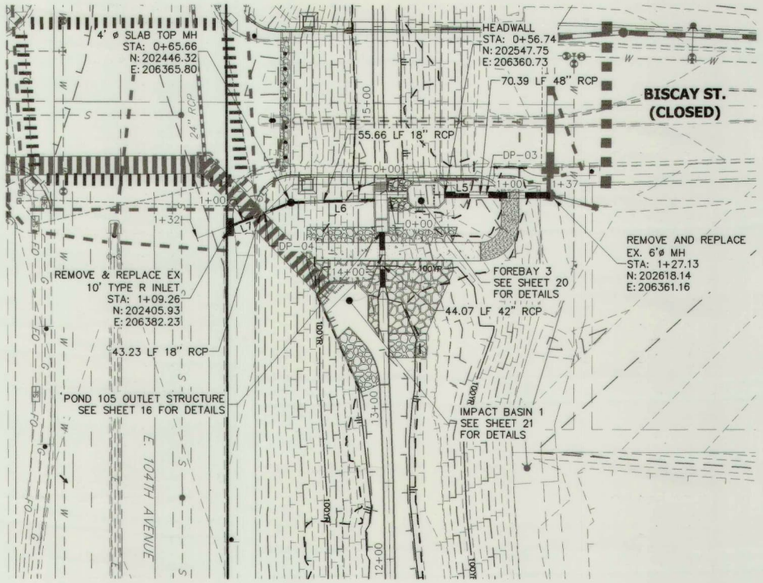
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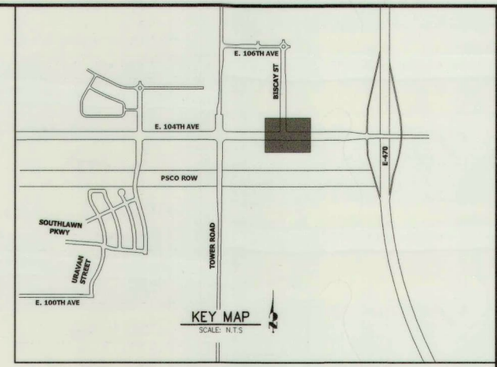
H-SCALE 1"=50' | V-SCALE 1"=5' | DATE 11/7/17 | DESIGNED BY REB | DRAWN BY AAM | CHECKED BY

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'



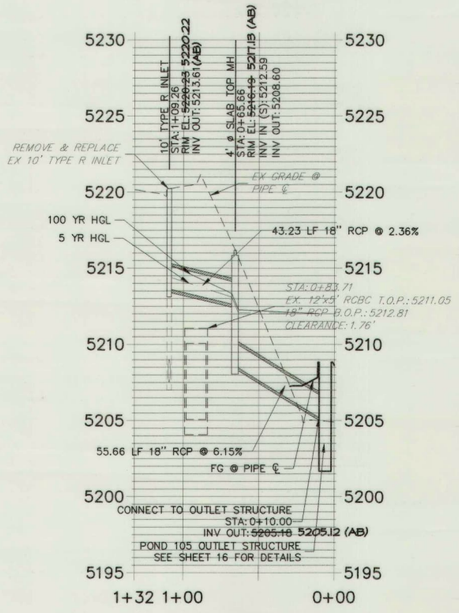
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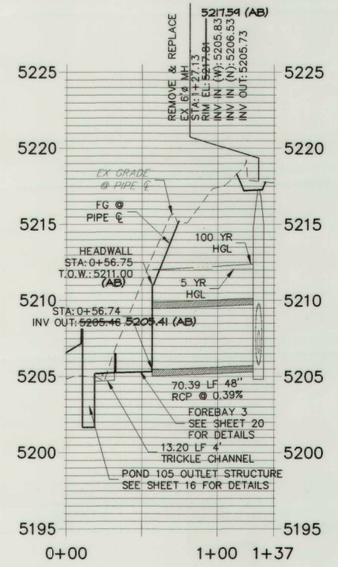
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DP-04 PROFILE
STA 0+00.00 TO 1+32.30



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



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

50 25 0 50 100
HORIZONTAL
ORIGINAL SCALE: 1" = 50'
VERTICAL
ORIGINAL SCALE: 1" = 5'

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.

COLORADO REGISTERED AARON LEE CLUTTER 36742 PROFESSIONAL ENGINEER

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

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

UNTIL SUCH TIME AS THESE DRAWINGS ARE PROPERLY REVIEWED, APPROPRIATE REVIEWING AGENCIES, JR ENGINEERING APPROVES THEIR USE ONLY FOR THE 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

J·R ENGINEERING
A Westrian Company
Centennial 303-740-9393 • Colorado Springs 719-593-2593
Fort Collins 970-491-9888 • www.jrengineering.com

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

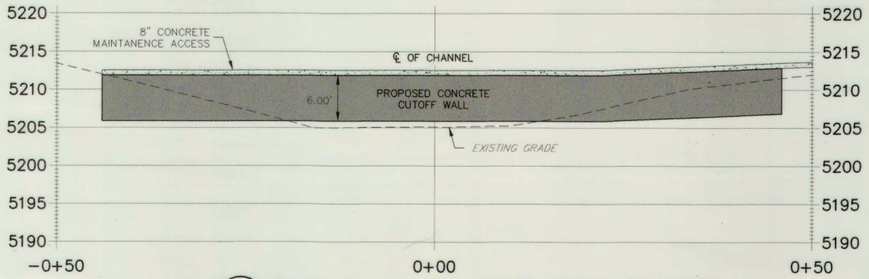
H-SCALE	1"=50'
V-SCALE	1"=5'
DATE	11/7/17
DESIGNED BY	REB
DRAWN BY	AAM
CHECKED BY	

E. 104TH AVENUE WATER QUALITY POND

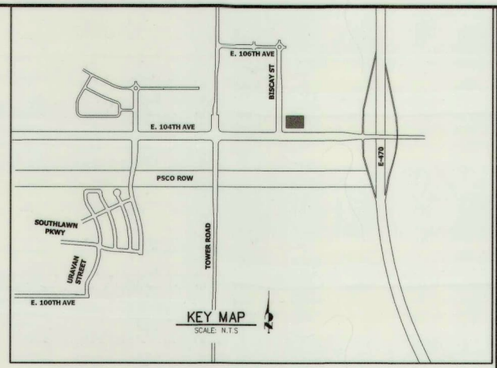
STORM SEWER PLAN AND PROFILE

SHEET 12 OF 33

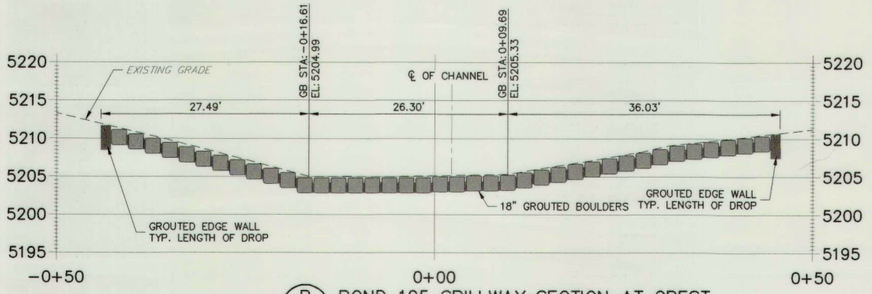
JOB NO. 14421.32



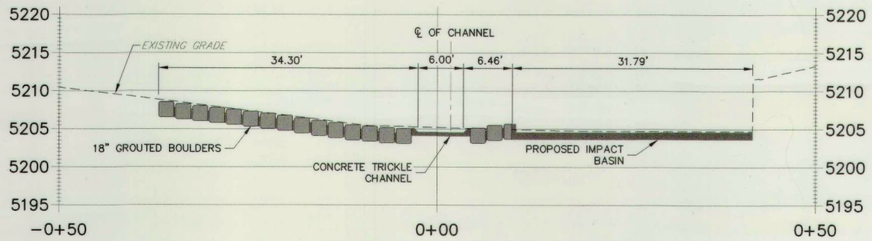
A POND 105 SPILLWAY SECTION AT CUTOFF WALL
1" = 10'



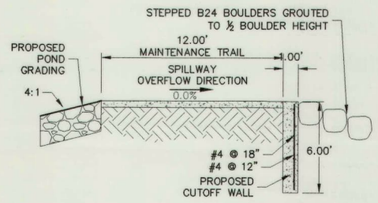
NOTE:
(AB) - INDICATES AS BUILT CONDITION
AS CONSTRUCTED
11/2018



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

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

10 5 0 10 20
HORIZONTAL
ORIGINAL SCALE: 1" = 10'
VERTICAL
ORIGINAL SCALE: 1" = 10'

FOR INFORMATION ONLY

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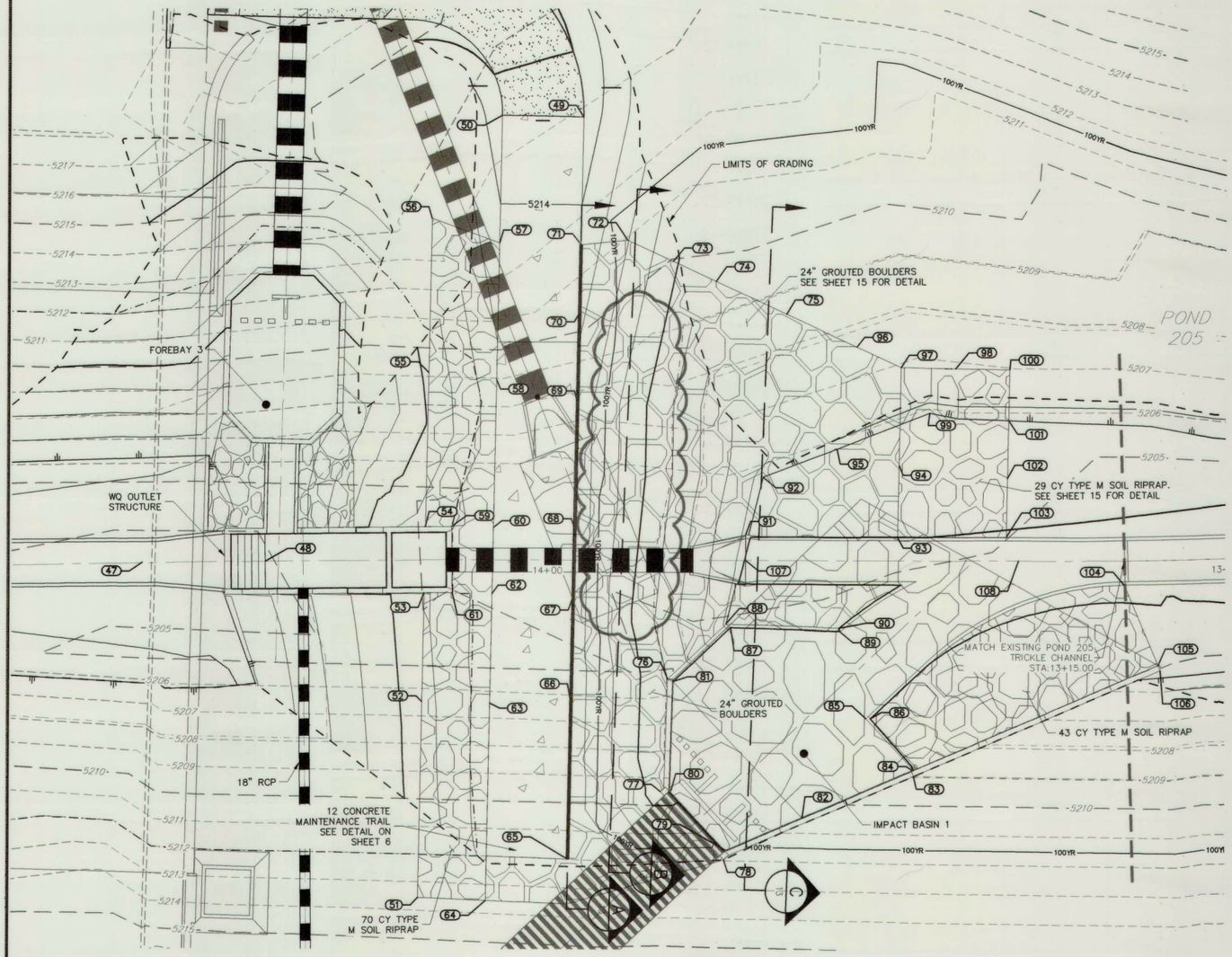
No.	REVISION	BY	DATE
1	AS-BUILT RECORD DRAWINGS	NAS	11/15/18

H-SCALE 1"=10'
V-SCALE 1"=10'
DATE 11/7/17
DESIGNED BY TAB
DRAWN BY AAM
CHECKED BY

E. 104TH AVENUE WATER QUALITY POND

SPILLWAY PLAN AND PROFILE

SHEET 13 OF 33
JOB NO. 14421.32



POND 105 SPILLWAY
1" = 10'

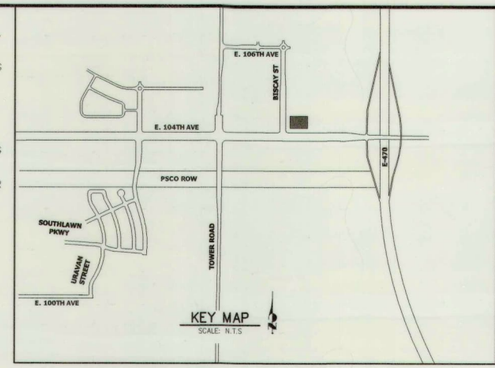
GROUTED BOULDER NOTES:

*QUANTITIES FOR INFORMATION PURPOSES ONLY

1. GROUTED SLOPING BOULDER DROPS (GSB) AND BOULDER STILLING BASIN CONSTRUCTION (LUMP SUM) INLCUDES THE FOLLOWING:
   - SUBGRADE PREPARATION AND STABILIZATION
   - 157CY 24" BOULDERS
   - 49CY GROUT, INCLUDING FIBER MESH WHERE NECESSARY
   - 10CY CONCRETE SEEPAGE CUTOFF WALL
   - WEEP 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

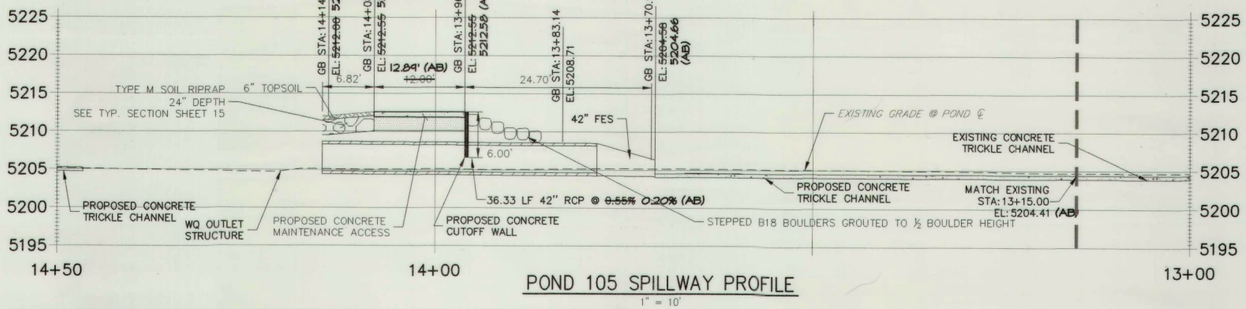
AS CONSTRUCTED
11/2018



POINT TABULATION					
ID NO.	DESCRIPTION	℄ STATION	OFFSET	ELEV	
47	CHANNEL CL	14+59.69	0.11	~~5205.23~~	5205.16 (AB)
48	CHANNEL CL	14+41.57	0.00	~~5201.66~~	5201.74 (AB)
49	EDGE OF CONCRETE	13+94.94	64.80	~~5214.64~~	5214.64 (AB)
50	EDGE OF CONCRETE	14+06.96	65.02	~~5214.63~~	5214.45 (AB)
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~~	5211.55 (AB)
54	EDGE OF RIPRAP	14+18.01	4.83	~~5211.63~~	5211.56 (AB)
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~~	5212.81 (AB)
59	EDGE OF RIPRAP	14+14.20	4.84	~~5211.99~~	5211.47 (AB)
60	EDGE OF CONCRETE	14+08.06	4.73	~~5212.55~~	5212.75 (AB)
61	EDGE OF RIPRAP	14+14.08	-4.82	~~5212.08~~	5211.95 (AB)
62	EDGE OF CONCRETE	14+08.21	-4.93	5212.55	
63	EDGE OF CONCRETE	14+08.50	-20.95	~~5212.55~~	5212.78 (AB)
64	EDGE OF CONCRETE	14+09.02	-49.83	~~5213.55~~	5212.52 (AB)
65	CONCRETE CUTOFF WALL	13+96.91	-43.81	5212.55	(AB)
66	CONCRETE CUTOFF WALL	13+96.50	-21.17	~~5212.55~~	5212.56 (AB)
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~~	5212.60 (AB)
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	~~5212.84~~	5213.60 (AB)
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	~~5209.08~~	5208.98 (AB)
77	EXISTING HEADWALL	13+83.32	-33.86	~~5209.51~~	5211.60 (AB)

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	~~5204.68~~	5204.58 (AB)
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	~~5204.83~~	5204.88 (AB)
85	EDGE OF CONCRETE	13+53.10	-23.10	5204.52	(AB)
86	EDGE OF RIPRAP	13+52.40	-23.11	5205.03	(AB)
87	EDGE OF CONCRETE	13+73.04	-9.94	~~5204.57~~	5204.61 (AB)
88	TOE	13+73.73	-9.24	~~5205.08~~	5205.86 (AB)
89	EDGE OF CONCRETE	13+56.95	-10.35	~~5204.52~~	5204.46 (AB)
90	NULL STRUCTURE	13+57.13	-9.85	~~5205.01~~	5205.00 (AB)
91	EDGE OF GROUTED BOULDERS	13+70.90	3.75	~~5205.08~~	5205.71 (AB)
92	TOE	13+68.37	12.16	5205.67	
93	EDGE OF GROUTED BOULDERS	13+48.53	3.47	~~5205.01~~	5205.21 (AB)
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~~	5207.30 (AB)
97	EDGE OF GROUTED BOULDERS	13+48.04	28.27	~~5206.92~~	5206.94 (AB)
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	~~5204.91~~	5204.96 (AB)
105	EDGE OF RIPRAP	13+10.40	-15.36	~~5205.59~~	5205.05 (AB)
106	EXISTING WINGWALL	13+10.09	-16.13	5205.65	
107	CHANNEL CL	13+70.90	0.00	~~5204.66~~	5204.66 (AB)
108	CHANNEL CL	13+30.71	0.00	~~5204.46~~	5204.53 (AB)

POND 105 SPILLWAY
STA 13+00.00 TO 14+50.00



POND 105 SPILLWAY PROFILE
1" = 10'

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.

10 5 0 10 20
ORIGINAL SCALE: 1" = 10'

CERTIFICATION STATEMENT

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COLORADO REGISTERED AARON LEE CLUTTER 36742 PROFESSIONAL ENGINEER

Aaron L Clutter 12/5/19
AARON LEE CLUTTER, P.E. DATE
COLORADO NO. 36742
FOR AND ON BEHALF OF JR ENGINEERING, LLC.

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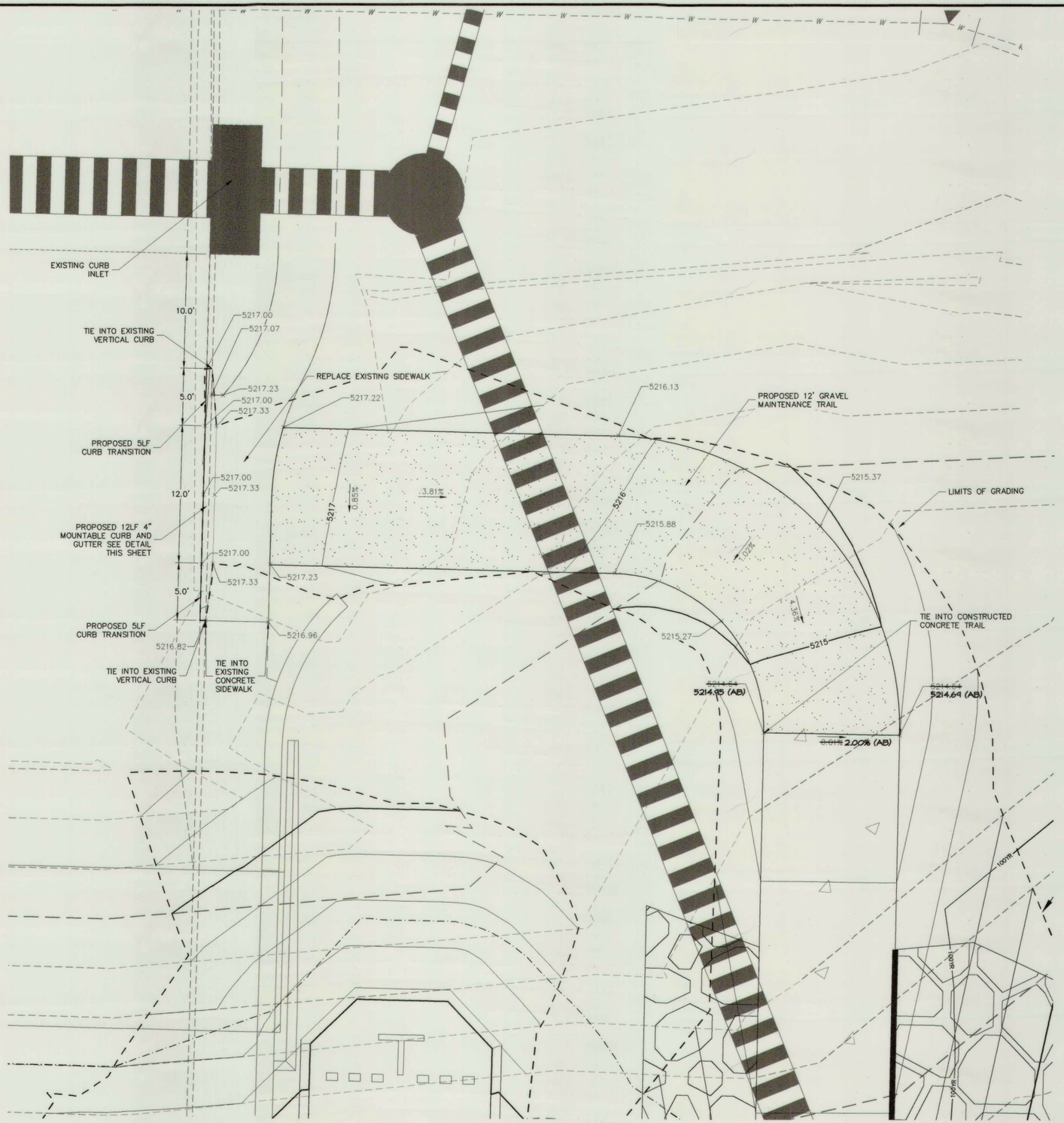
No.	REVISION	BY	DATE
1	AS-BUILT RECORD DRAWINGS	NAS	11/15/18

H-SCALE	1"=10'	DESIGNED BY	TAB
V-SCALE	1"=10'	DRAWN BY	AAM
DATE	11/7/17	CHECKED BY	

E. 104TH AVENUE WATER QUALITY POND

SPILLWAY PLAN AND PROFILE

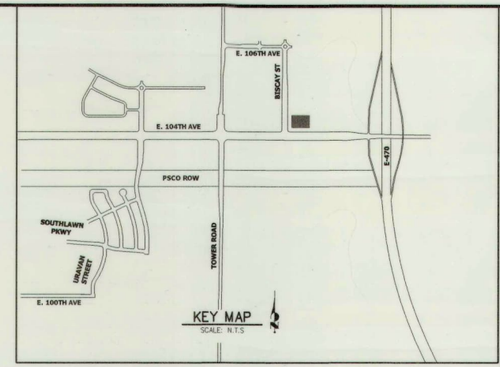
SHEET 14 OF 33
JOB NO. 14421.32

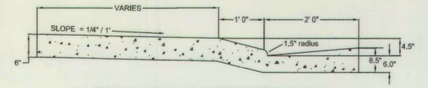


POND 105 MAINTANENCE TRAIL SPILLWAY
1" = 5'

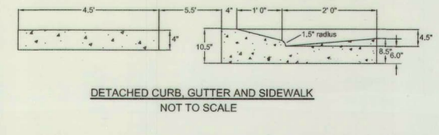
NOTE:
(AB) - INDICATES AS BUILT CONDITION

AS CONSTRUCTED
11/2018

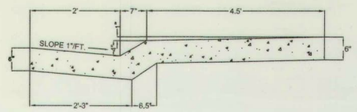




COMBINATION CURB, GUTTER AND SIDEWALK
NOT TO SCALE



DETACHED CURB, GUTTER AND SIDEWALK
NOT TO SCALE



COMBINATION CURB, GUTTER AND SIDEWALK
NOT TO SCALE

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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5 2.5 0 5 10
ORIGINAL SCALE: 1" = 5'

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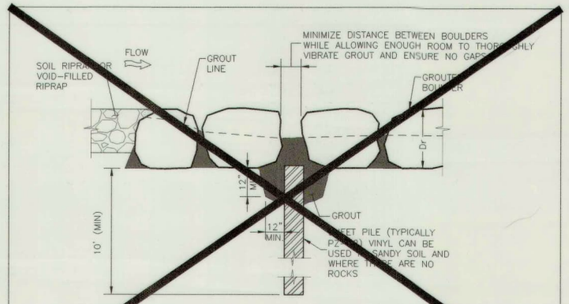
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No.	REVISION	BY	DATE
1	DCN 8 (NEW SHEET)	DJV	5/22/18
2	AS-BUILT RECORD DRAWINGS	NAS	11/15/18

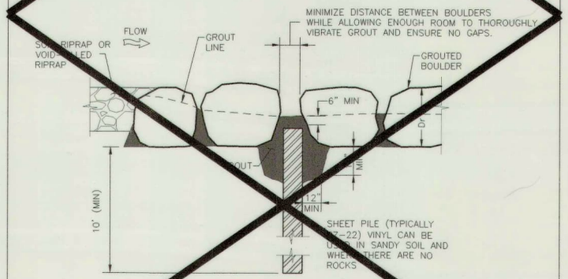
H-SCALE	1"=5'	DESIGNED BY	TAB
V-SCALE	N/A	DRAWN BY	AAM
DATE	11/7/17	CHECKED BY	

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

SHEET 14A OF 33
JOB NO. 14421.32

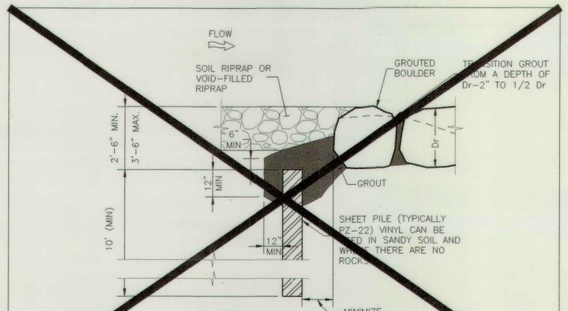


SHEET PILE CONNECTION BETWEEN BOULDERS (SMALLER THAN 24")

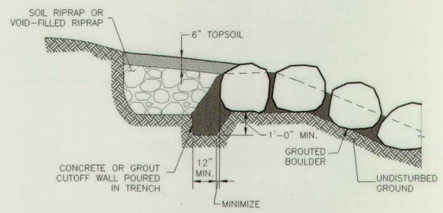


SHEET PILE CONNECTION BETWEEN BOULDERS (GREATER THAN 24")

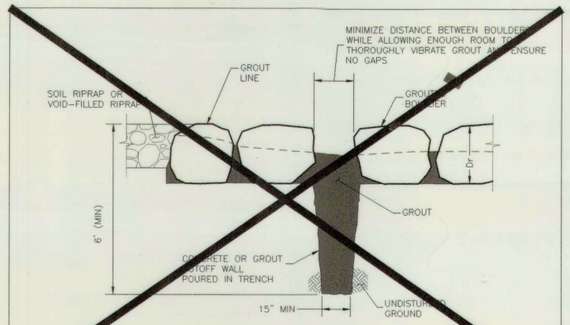
SHEET PILE CONNECTION BETWEEN BOULDERS



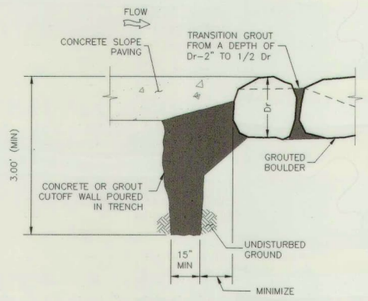
SHEET PILE CUTOFF CONNECTION (GSB)



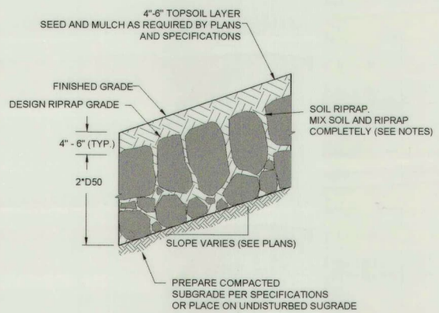
STRUCTURE EDGE WALL DETAIL (GSB)
NTS



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:

1. SOIL RIPRAP DETAILS ARE APPLICABLE TO AREAS. SLOPED REFER TO THE SITE PLAN ACTUAL LOCATION AND LIMITS.
2. MIX UNIFORMLY 65% RIPRAP BY WITH 35% OF APPROVED SOIL VOLUME BY VOLUME PRIOR TO PLACEMENT.
3. 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.
4. CRIMP OR TACKIFY MULCH OR USE APPROVED HYDROMULCH AS CALLED FOR IN THE PLANS AND SPECIFICATIONS.

TYPE L RIPRAP

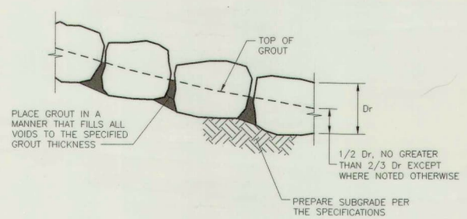
INTERMEDIATE ROCK DIMENSION (IN.)	PERCENT PASSING (%)
15	70-100
12	50-70
9	35-50
3	2-10

TYPE L RIPRAP D_{50}=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 D_{50}=12".

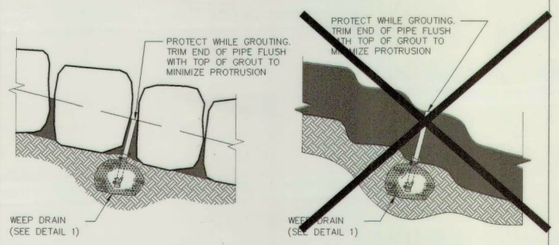


BOULDER PLACEMENT NOTES:
1. PLACE BOULDERS WITH THE REQUIRED BOULDER HEIGHT VERTICAL. PLACE BOULDERS AS TIGHTLY TOGETHER AS POSSIBLE (WITHOUT TOUCHING) WHILE PROVIDING ENOUGH ROOM BETWEEN THEM TO THOROUGHLY VIBRATE THE GROUT AND TO ENSURE NO GAPS IN THE GROUT. THE SMALL DIMENSION OF A 2X4 CAN BE USED AS A GUIDE TO CHECK MINIMUM SPACING.
2. 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.

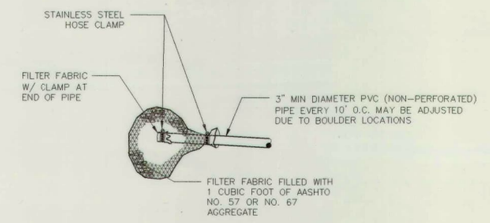
MATERIAL SPECIFICATIONS:
1. ALL GROUT SHALL HAVE A MINIMUM 28-DAY COMPRESSIVE STRENGTH EQUAL TO 3200 PSI.
2. ONE CUBIC YARD OF GROUT SHALL HAVE A MINIMUM OF SIX (6) SACKS OF TYPE II PORTLAND CEMENT.
3. A MAXIMUM OF 25% TYPE F FLY ASH MAY BE SUBSTITUTED FOR THE PORTLAND CEMENT.
4. THE AGGREGATE SHALL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

GROUT PLACEMENT SPECIFICATIONS:
1. 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.
2. GROUT SHALL BE DELIVERED BY MEANS OF A LOW PRESSURE (LESS THAN 10 PSI) GROUT PUMP USING A 2-INCH DIAMETER (MAXIMUM) NOZZLE.
3. 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.
4. ALL GROUT BETWEEN BOULDERS SHALL BE TREATED WITH A BROOM FINISH.
5. AFTER GROUT PLACEMENT, EXPOSED BOULDER FACES SHALL BE CLEANED AND FREE OF GROUT.
6. 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 WEEP DRAIN (1)

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:

1. BOULDERS USED FOR GROUTING SHOULD MEET ALL THE PROPERTIES OF ROCK FOR ORDINARY RIPRAP, AND ROCK OF UNIFORM SIZE SHOULD BE USED.
2. ROCK SHALL BE HARD, DURABLE, AND FREE FROM CRACKS, OVERBURDEN, SHALE, AND ORGANIC MATTER.
3. GROUTED BOULDERS SHALL BE PLACED DIRECTLY ON STABILIZED, COMPACTED SUBGRADE WITHOUT GRANULAR BEDDING.
4. THE TOP ONE-HALF OF THE BOULDERS SHALL BE LEFT UNGROUTED AND EXPOSED.
5. 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.
6. WEEP HOLES SHALL BE PROVIDED AT THE TOE OF CHANNEL SLOPES AND CHANNEL DROPS TO REDUCE UPLIFT FORCES ON THE GROUTED CHANNEL LINING.
7. 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.
8. 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

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

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(303)-288-5431

J&R ENGINEERING
A Westrian Company
Centennial 303-740-9393 • Colorado Springs 719-593-2593
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No.	REVISION	BY	DATE
1	AS-BUILT RECORD DRAWINGS	NAS	11/15/18

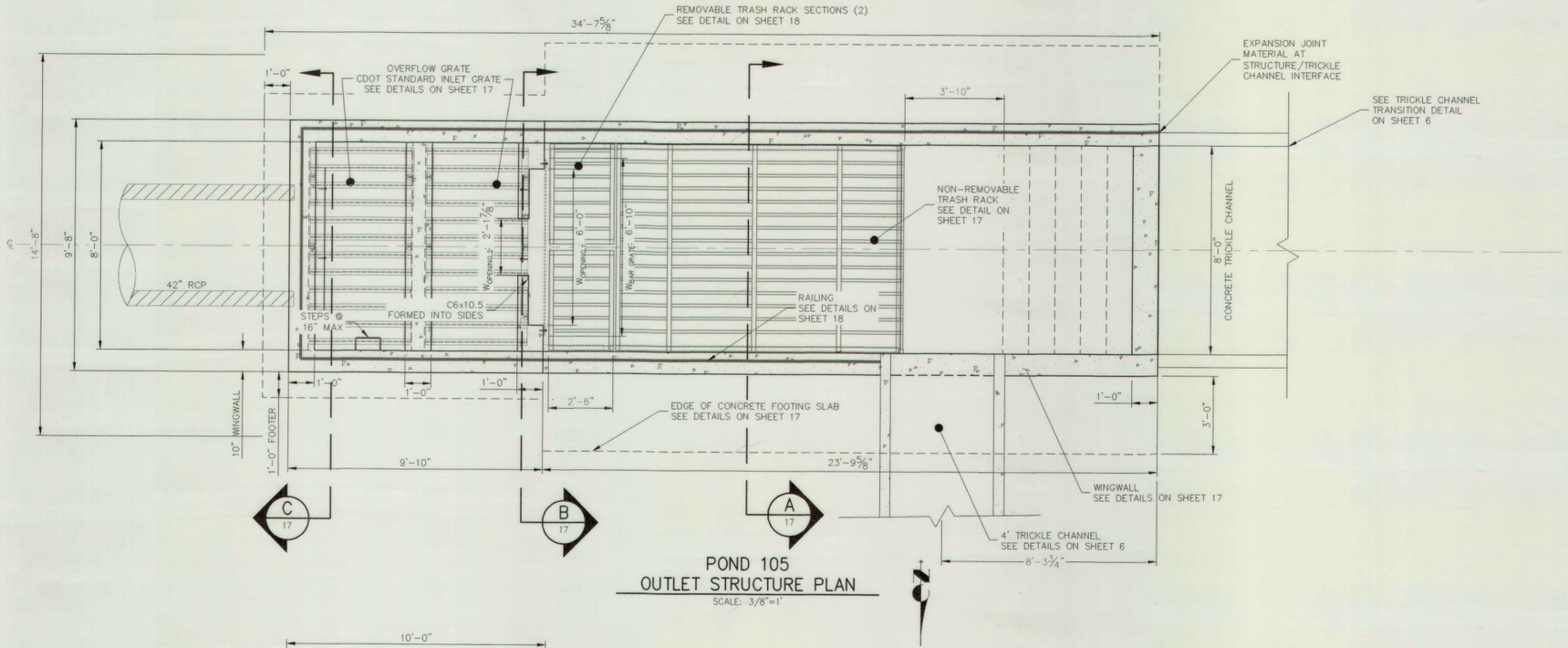
H-SCALE N/A | DESIGNED BY
V-SCALE N/A | DRAWN BY
DATE 11/7/17 | CHECKED BY

E. 104TH AVENUE WATER QUALITY POND

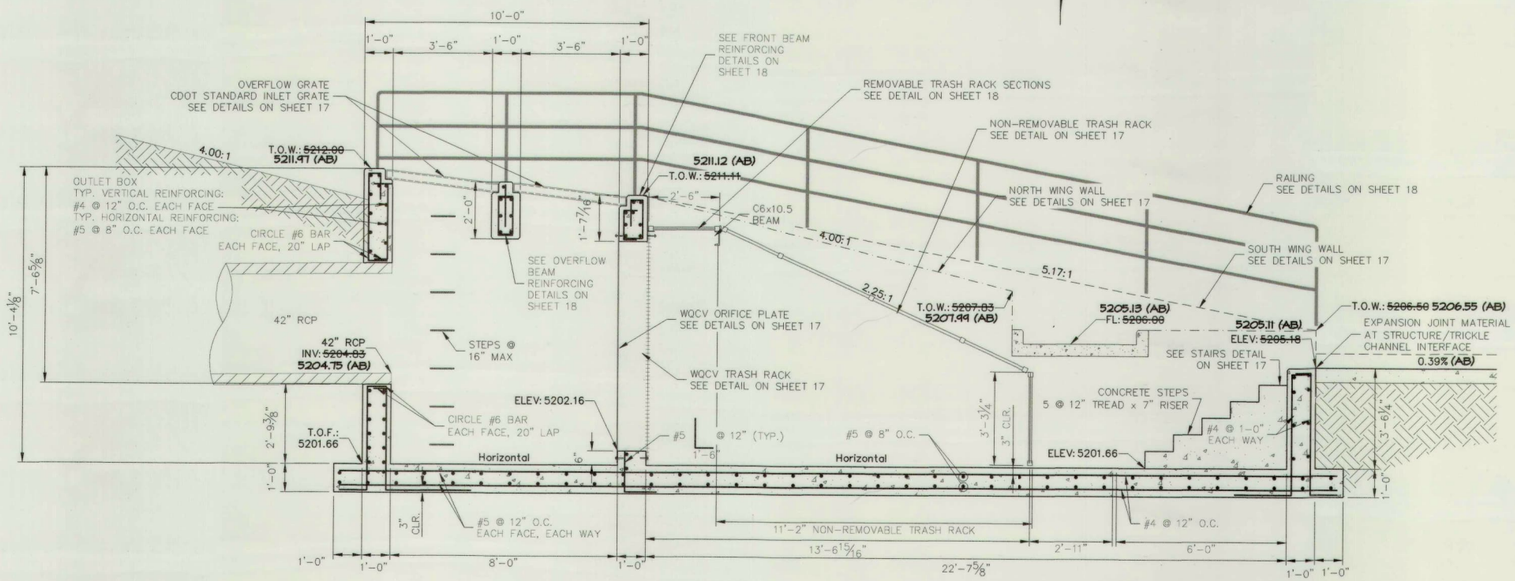
SPILLWAY PLAN AND PROFILE

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'

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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.

COLORADO REGISTERED AARON LEE CLUTTER 36742 PROFESSIONAL ENGINEER

Aaron L Clutter 12/5/18

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

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

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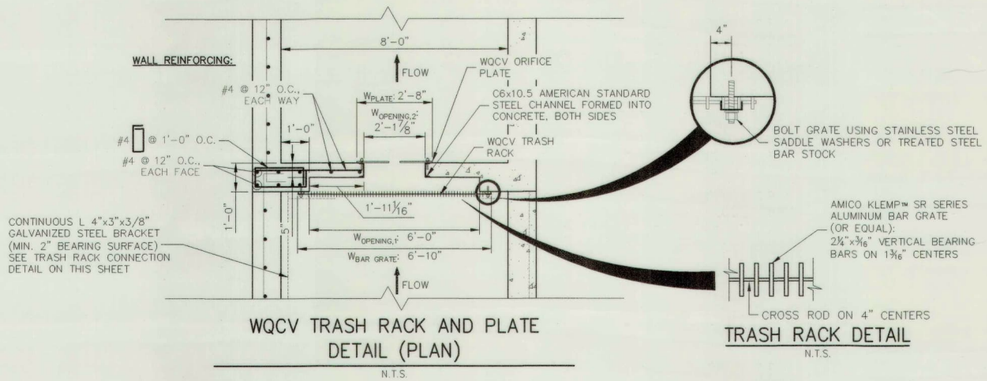
H-SCALE 3/8"=1' | DESIGNED BY TAB
V-SCALE 3/8"=1' | DATE 11/7/17 | DRAWN BY AAM | CHECKED BY

E. 104TH AVENUE WATER QUALITY POND

POND 105 OUTLET STRUCTURE DETAILS

SHEET 16 OF 33

JOB NO. 14421.32



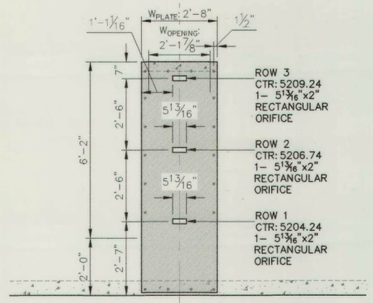
WQCV TRASH RACK AND PLATE DETAIL (PLAN)

N.T.S.

TRASH RACK DETAIL

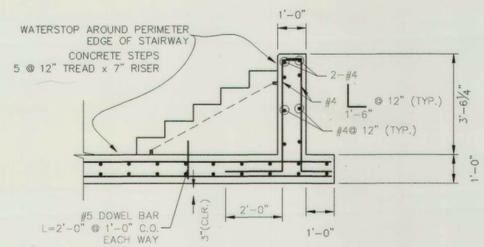
N.T.S.

WQCV ORIFICE PLATE:
6'-2" x 2'-8" x ½" THICK FLOW GALVANIZED STEEL FLOW CONTROL PLATE. PROVIDE CONTINUOUS NEOPRENE GASKET MATERIAL BETWEEN THE ORIFICE PLATE AND CONCRETE. BOLT PLATE TO CONCRETE @ 12" MAX O.C., 1½" FROM PLATE EDGE.



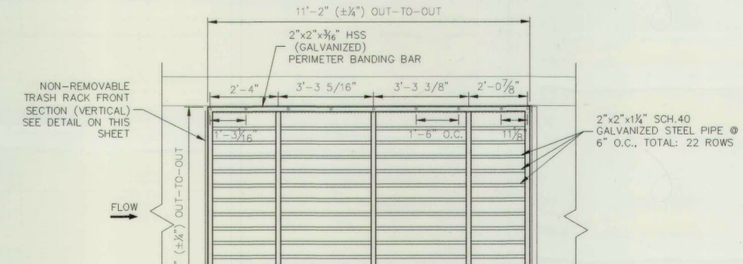
WQCV ORIFICE PLATE DETAIL

SCALE: 3/8"=1'



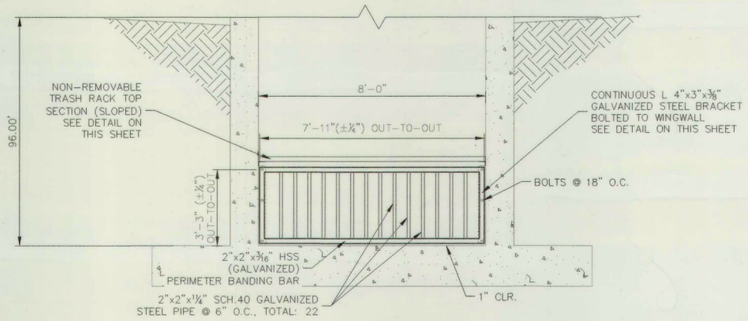
STAIRS DETAIL

SCALE: 3/8"=1'



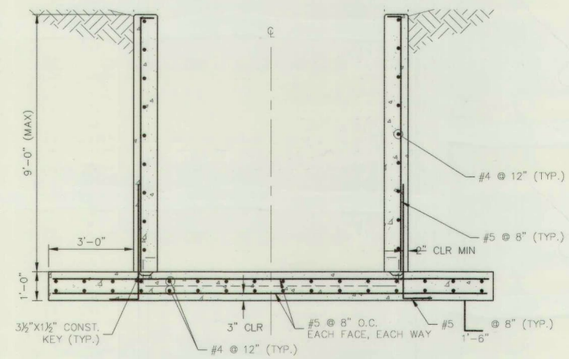
NON-REMOVABLE TRASH RACK DETAIL (PLAN)

N.T.S.



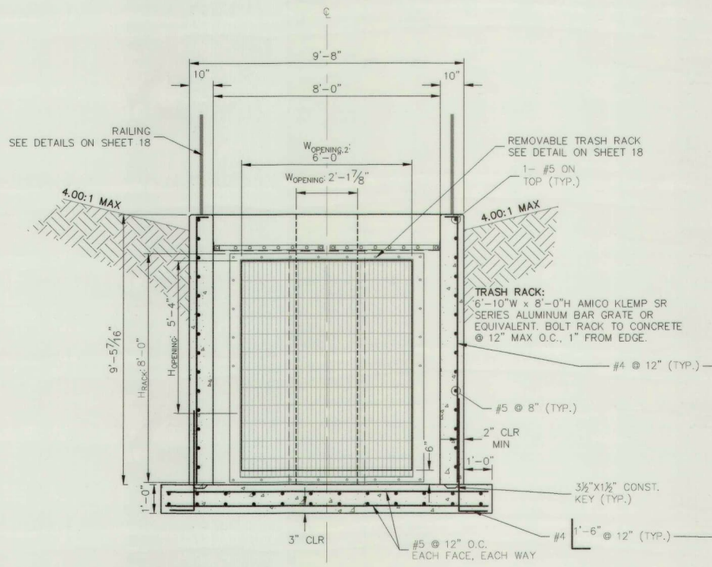
NON-REMOVABLE TRASH RACK DETAIL (FRONT SECTION)

N.T.S.



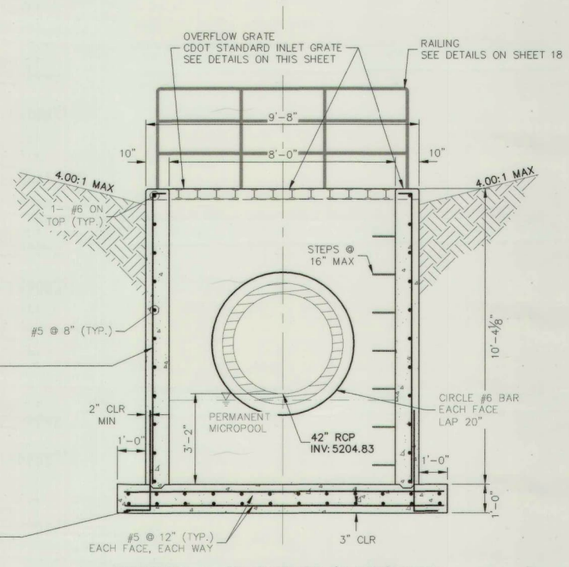
SECTION A AT STRUCTURE FRONT TYPICAL WINGWALL REINFORCING SHOWN

SCALE: 3/8"=1'



SECTION B AT ORIFICE (FRONT) WALL TYPICAL WINGWALL REINFORCING SHOWN

SCALE: 3/8"=1'



SECTION C AT OUTLET (BACK) WALL TYPICAL OUTLET BOX REINFORCING SHOWN

SCALE: 3/8"=1'

NOTE:
(AB) - INDICATES AS BUILT CONDITION

AS CONSTRUCTED 11/2018

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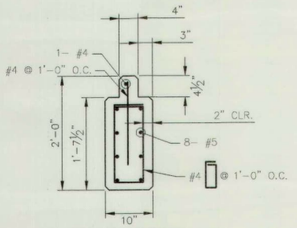
H-SCALE	AS SHOWN	DESIGNED BY	TAB
V-SCALE	AS SHOWN	DRAWN BY	AAM
DATE	11/7/17	CHECKED BY	

E. 104TH AVENUE WATER QUALITY POND

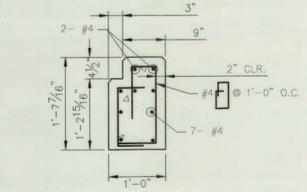
POND 105 OUTLET STRUCTURE DETAILS

SHEET 17 OF 33

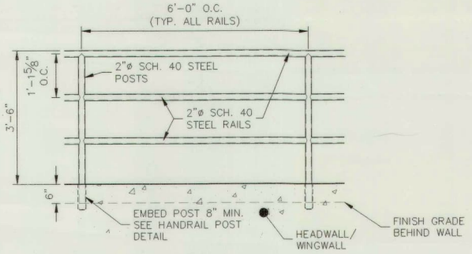
JOB NO. 14421.32



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



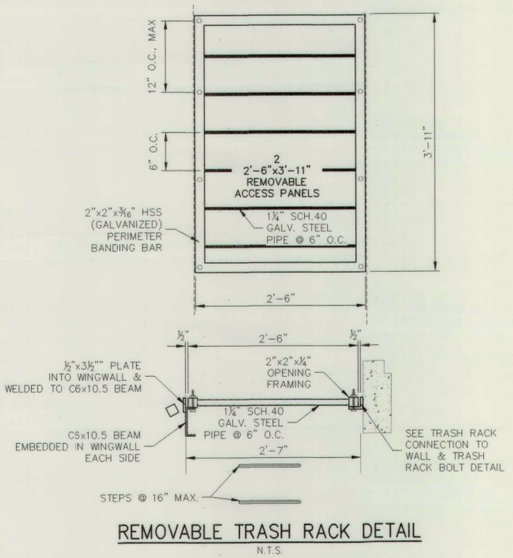
BEAM DETAIL
(FRONT OF BEAM)
SCALE: 3/4"=1'



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 CDOT STANDARD SPECIFICATION 509.24. ALL STEEL RAILING SHALL BE PAINTED USING A TWO-COAT SYSTEM WITH INORGANIC ZINC-RICH PRIMER (SHOP COAT) AND HIGH-BUILD URETHANE 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 2'-6" IN HEIGHT AND AT ALL 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.

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 ¾".
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:

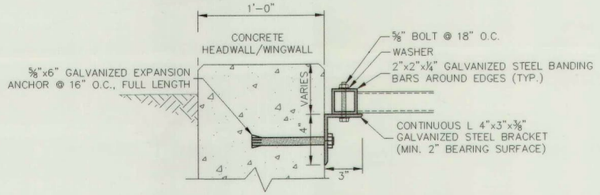
3. BAR GRATE TRASH RACKS SHALL BE ALUMINUM AND SHALL BE BOLTED USING STAINLESS STEEL HARDWARE.

TRASH RACKS:

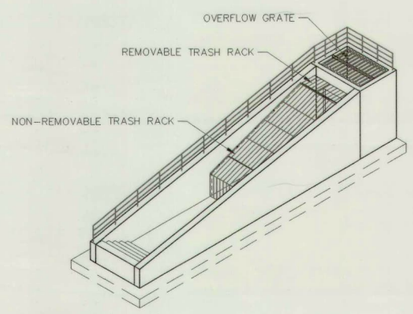
4. TRASH RACKS SHALL BE 1¼" SCH.40 STEEL PIPE, GALVANIZED, @ 6" CENTERS. SUPPORT BARS SHALL BE ¼"x2" STEEL RECTANGULAR BARS, GALVANIZED, @ 36". ALL TRASH RACKS SHALL BE MOUNTED USING STAINLESS STEEL HARDWARE AND PROVIDED WITH BOLTABLE ACCESS PANELS.
5. STEEL TRASH RACKS SHALL BE HOT DIP GALVANIZED AND 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:

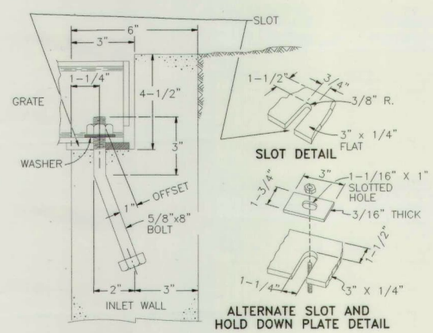
9. ALL OVERFLOW GRATES SHALL BE MOUNTED USING STAINLESS STEEL HARDWARE AND PROVIDED WITH HINGED & LOCKABLE OR BOLTABLE ACCESS PANELS AS SHOWN ON THE PLANS.
10. OVERFLOW GRATES SHALL BE HOT DIP GALVANIZED STEEL AND MAY BE HOT POWDER COATED AFTER GALVANIZING.



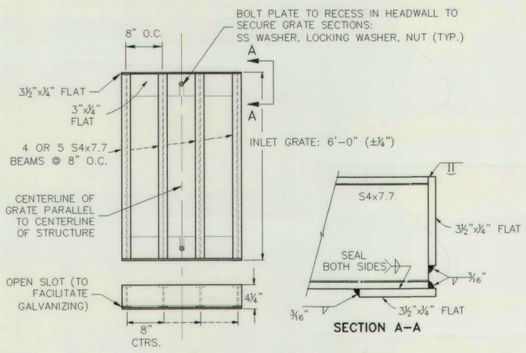
TRASH RACK CONNECTION TO WALLS
N.T.S.



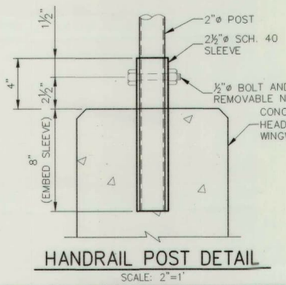
POND 105 OUTLET STRUCTURE
ISOMETRIC VIEW
N.T.S



OVERFLOW GRATE INSTALLATION
DETAIL
N.T.S.



OVERFLOW GRATE DETAILS
N.T.S.



HANDRAIL POST DETAIL
SCALE: 2"=1'

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

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

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

E. 104TH AVENUE WATER QUALITY POND

OUTLET STRUCTURE DETAILS

SHEET 18 OF 33

JOB NO. 14421.32

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:

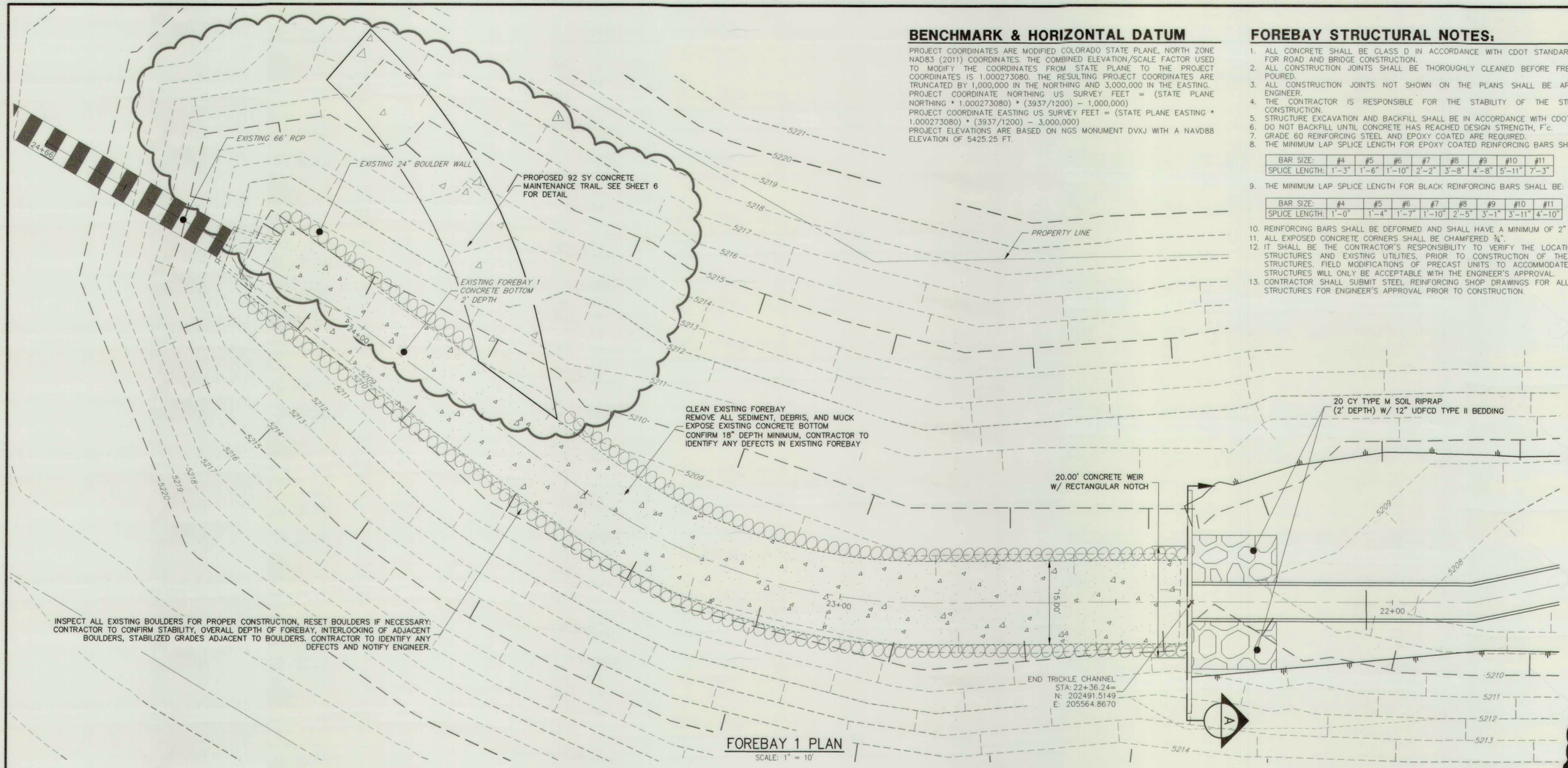
1. ALL CONCRETE SHALL BE CLASS D IN ACCORDANCE WITH CDOT STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION.
2. ALL CONSTRUCTION JOINTS SHALL BE THOROUGHLY CLEANED BEFORE FRESH CONCRETE IS POURED.
3. ALL CONSTRUCTION JOINTS NOT SHOWN ON THE PLANS SHALL BE APPROVED BY THE ENGINEER.
4. THE CONTRACTOR 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"

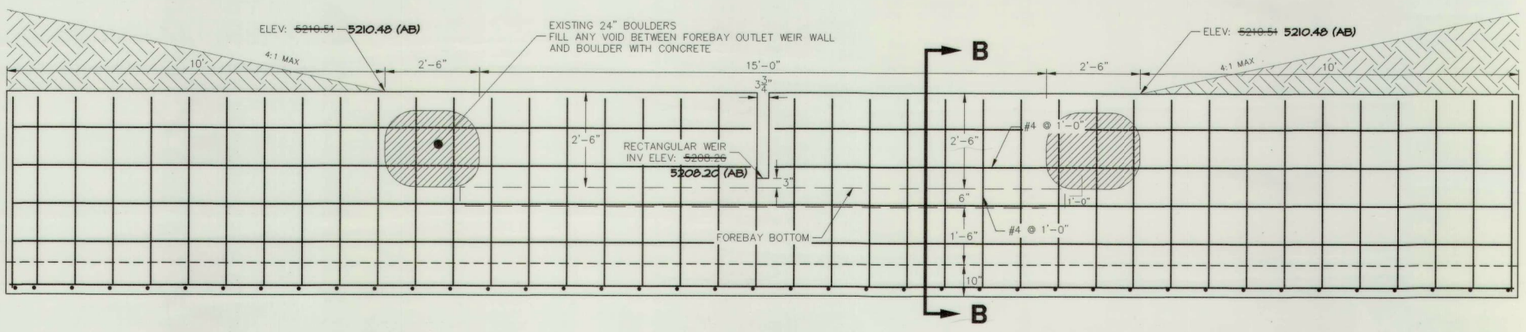
9. THE MINIMUM LAP SPLICE LENGTH FOR BLACK REINFORCING BARS SHALL BE:

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"

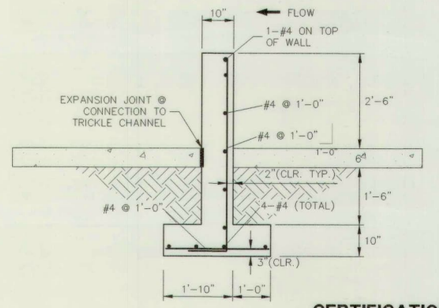
10. REINFORCING BARS SHALL BE DEFORMED AND SHALL HAVE A MINIMUM OF 2" CLEARANCE.
11. ALL EXPOSED CONCRETE CORNERS SHALL BE CHAMFERED ¾".
12. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO VERIFY THE LOCATIONS OF EXISTING STRUCTURES AND EXISTING UTILITIES, PRIOR TO CONSTRUCTION OF THE CAST-IN-PLACE STRUCTURES. 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.



FOREBAY 1 PLAN
SCALE: 1" = 10'



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



B–B
SCALE 1/2" = 1'

10 5 0 10 20
ORIGINAL SCALE: 1" = 10'

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.

COLORADO REGISTERED AARON LEE CLUTTER 36742 PROFESSIONAL ENGINEER

Aaron L Clutter 12/5/19
AARON LEE CLUTTER, P.E. DATE
COLORADO NO. 36742
FOR AND ON BEHALF OF JR ENGINEERING, LLC.

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

UNTIL SUCH TIME AS THESE DRAWINGS ARE APPROVED BY THE APPROPRIATE PERMITTING AGENCIES, J.R. ENGINEERING APPROVES THEIR USE ONLY FOR THE 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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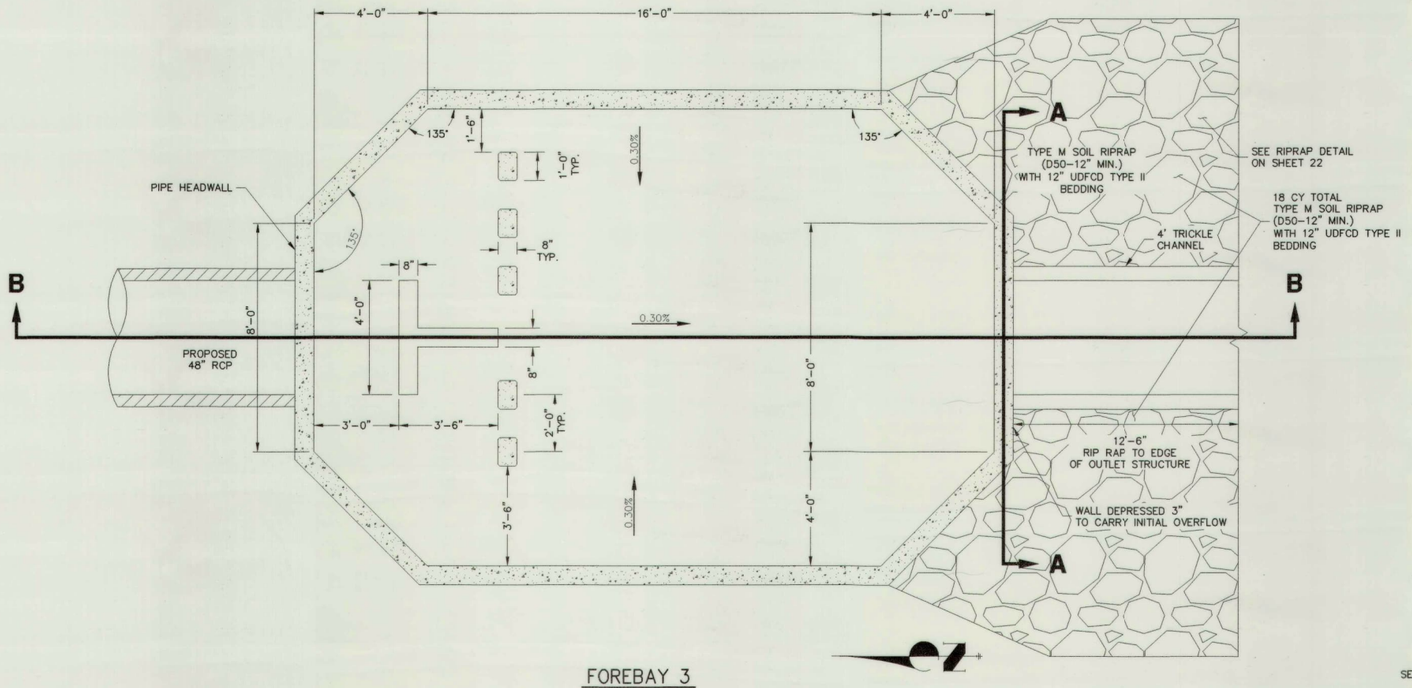
No.	REVISION	BY	DATE
1	DCN #5	DJV	4/16/18
2	AS-BUILT RECORD DRAWINGS	NAS	11/15/18

H-SCALE AS SHOWN | DESIGNED BY TAB
V-SCALE AS SHOWN | DRAWN BY TAB
DATE 11/7/17 | CHECKED BY

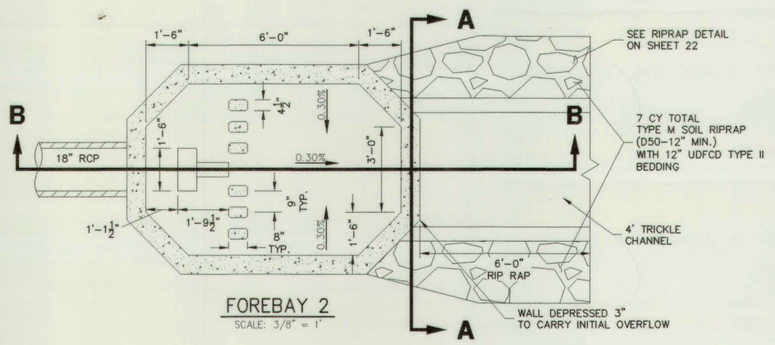
E. 104TH AVENUE WATER QUALITY POND

FOREBAY AND IMPACT BASIN DETAILS

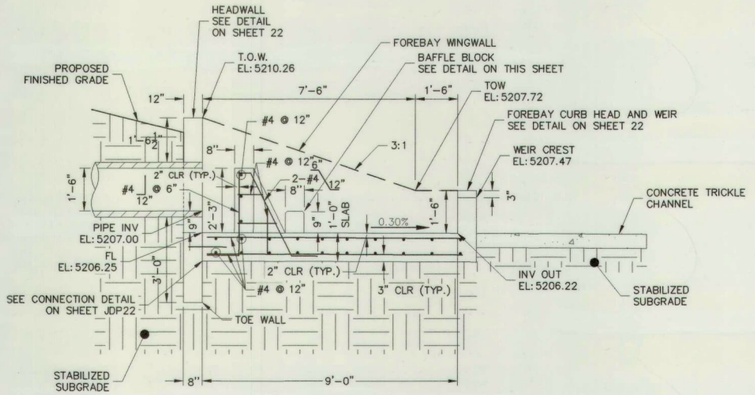
SHEET 19 OF 33
JOB NO. 14421.32



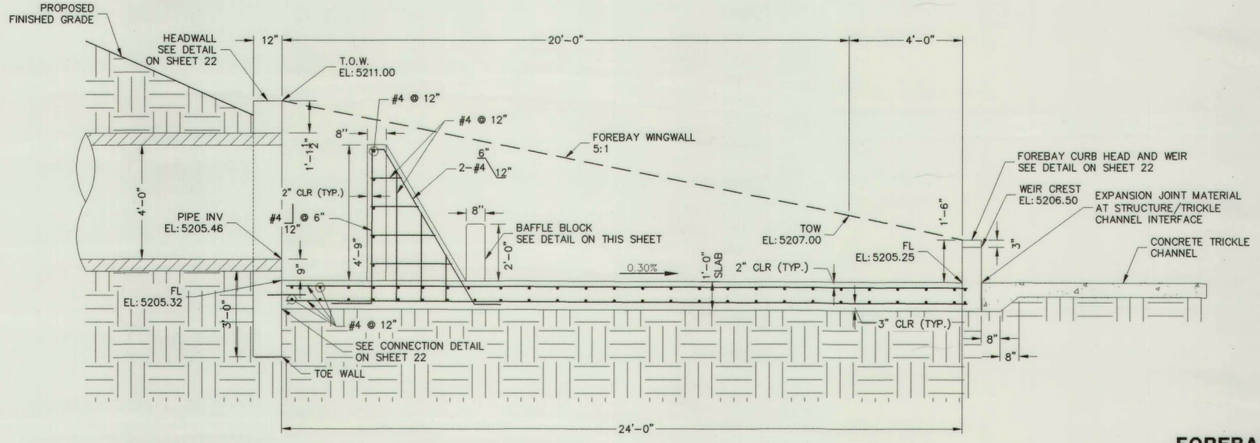
FOREBAY 3
SCALE: 3/8" = 1'



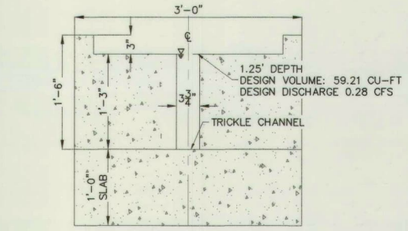
FOREBAY 2
SCALE: 3/8" = 1'



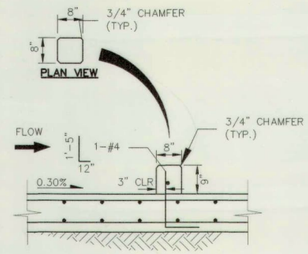
FOREBAY 2 SECTION B-B
SCALE: 3/8" = 1'



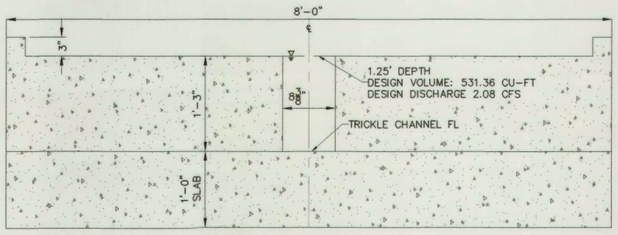
FOREBAY 3 SECTION B-B
SCALE: 3/8" = 1'



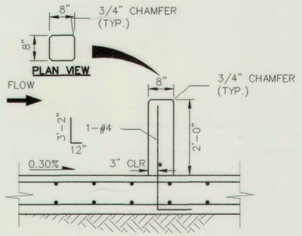
A FOREBAY 2
SCALE: 1" = 1'



FOREBAY BAFFLE BLOCK SECTION
SCALE: 1/2"=1'



A FOREBAY 3
SCALE: 1" = 1'



BAFFLE BLOCK SECTION
SCALE: 1/2"=1'

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

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

FOR INFORMATION ONLY

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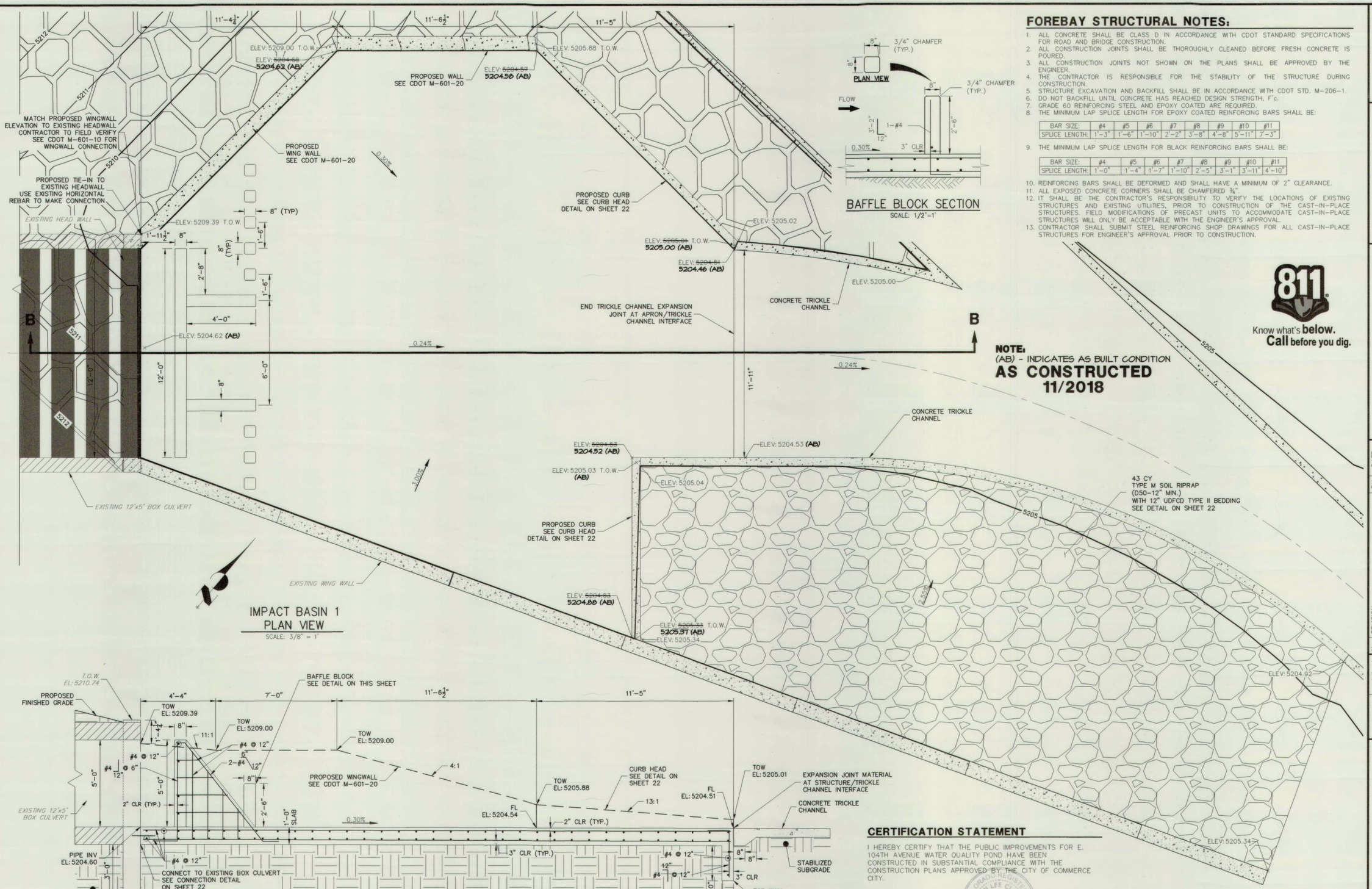
H-SCALE AS SHOWN
V-SCALE AS SHOWN
DATE 11/7/17
DESIGNED BY TAB
DRAWN BY AAM
CHECKED BY

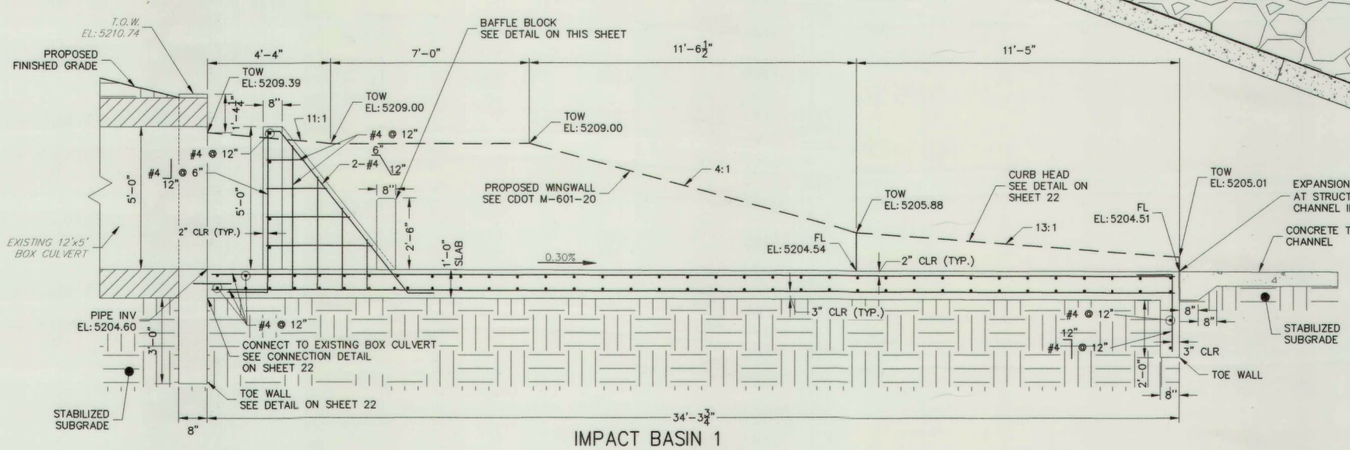
E. 104TH AVENUE WATER QUALITY POND

FOREBAY AND IMPACT BASIN DETAILS

SHEET 20 OF 33

JOB NO. 14421.32





IMPACT BASIN 1
PLAN VIEW
SCALE: 3/8" = 1'

IMPACT BASIN 1
SECTION VIEW
SCALE: 3/8" = 1'

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CERTIFICATION STATEMENT

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COLORADO REGISTERED AARON LEE CLUTTER 36742 PROFESSIONAL ENGINEER

Aaron L Clutter 12/5/18

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

WALL NOTES:

1. HEADWALLS FOR PIPES SHALL BE CONSTRUCTED IN ACCORDANCE WITH CDOT STANDARD PLAN M-601-10.
2. HEADWALLS FOR BOX CULVERT SHALL BE CONSTRUCTED IN ACCORDANCE WITH CDOT STANDARD PLAN M-603-3.
3. WINGWALLS SHALL BE CONSTRUCTED IN ACCORDANCE WITH CDOT STANDARD PLAN M-601-20.

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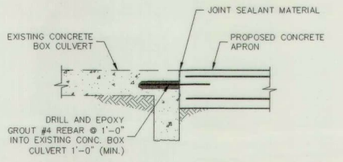
H-SCALE	3/8"=1'
V-SCALE	3/8"=1'
DATE	11/7/17
DESIGNED BY	TAB
DRAWN BY	AAM
CHECKED BY	

E. 104TH AVENUE WATER QUALITY POND

FOREBAY AND IMPACT BASIN DETAILS

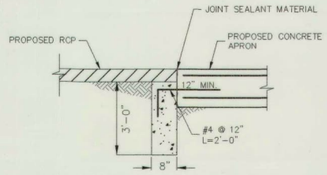
SHEET 21 OF 33

JOB NO. 14421.32



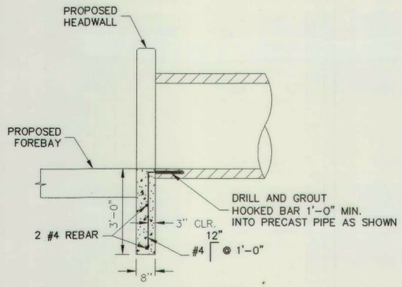
CONNECTION TO EXISTING BOX CULVERT

SCALE: N.T.S.



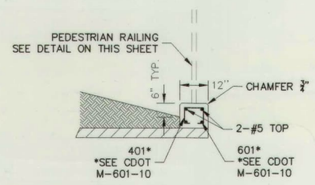
CONNECTION TO PROPOSED RCP TOEWALL

SCALE: N.T.S.



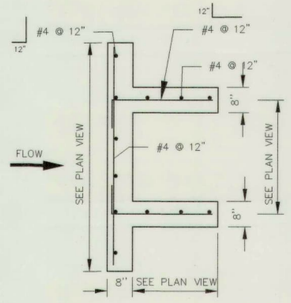
RCP TOEWALL

SCALE: N.T.S.



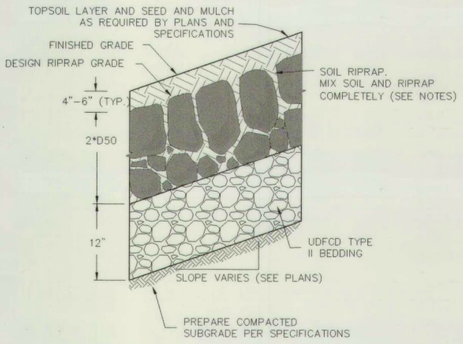
RCP HEADWALL

SCALE: N.T.S.



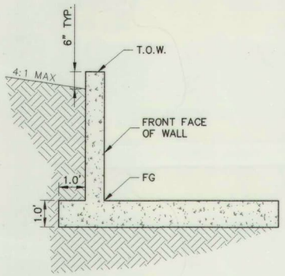
IMPACT BASIN 1
BAFFLE BLOCK PLAN

SCALE: N.T.S.



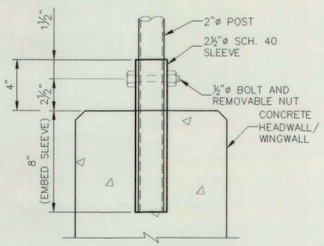
SOIL RIPRAP EMBANKMENT PROTECTION
WITH BEDDING TYP. SECTION

N.T.S.



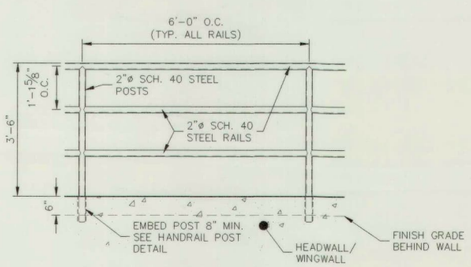
FOREBAY WALL
SECTION/LEGEND

SCALE: N.T.S.



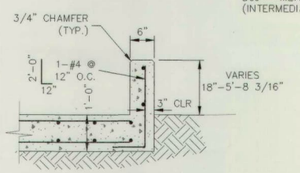
HANDRAIL POST DETAIL

SCALE: 2"=1'



PEDESTRIAN RAILING DETAIL

SCALE: 1/2"=1'



FOREBAY CURB HEAD AND
WEIR/WINGWALL REINFORCING DETAIL

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 D_{50}=12".
D_{50} = MEAN PARTICLE SIZE (INTERMEDIATE DIMENSION) BY WEIGHT.

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.

WALL NOTES:

1. HEADWALLS FOR PIPES SHALL BE CONSTRUCTED IN ACCORDANCE WITH CDOT STANDARD PLAN M–601–10.
2. HEADWALLS FOR BOX CULVERT SHALL BE CONSTRUCTED IN ACCORDANCE WITH CDOT STANDARD PLAN M–603–3.
3. WINGWALLS SHALL BE CONSTRUCTED IN ACCORDANCE WITH CDOT STANDARD PLAN M–601–20.

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

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

FOR INFORMATION ONLY

UNTIL SUCH TIME AS THESE DRAWINGS ARE APPROVED BY THE APPROPRIATE REVIEWING AGENCIES, JR ENGINEERING APPROVES THEIR USE ONLY FOR THE 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

J·R ENGINEERING
A Westrian Company
Centennial 303-740-9393 • Colorado Springs 719-593-2593
Fort Collins 970-491-9889 • www.jrengineering.com

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

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

E. 104TH AVENUE WATER QUALITY POND

FOREBAY & IMPACT BASIN STANDARD DETAILS

SHEET 22 OF 33

JOB NO. 14421.32

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_5 (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
		B6	0.22	78.75%	0.57	1.49
		B9	0.05	55.00%	0.07	0.24
	105th Avenue	B7	0.54	69.32%	0.98	2.81
	Off-Site Basins (Duets by Others)	B3	0.31	65.00%	0.57	1.68
		B4	0.64	69.06%	1.25	3.51
		B8	12.44	67.21%	16.10	46.52
	Pond 108a	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
	Commercial at Reunion Center (By Others)	C8	1.95	80.00%	3.39	8.78
		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
		C28	0.78	80.00%	1.77	4.58
	E. 104th Way	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
		C26	0.41	88.35%	1.21	2.89
	Pond 108b	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
		D8-F	1.17	82.47%	2.75	6.90
		D9-F	0.88	91.09%	2.35	5.63
	Off-Site Basins (Duets by Others)	D5	0.52	54.70%	0.68	2.31
	105th Avenue	D6	0.47	74.77%	1.05	2.90
		D7	1.31	66.54%	2.68	7.83
	E. 104th Avenue	D12	2.07	79.19%	3.68	9.57
		D13	1.30	89.10%	3.30	7.94
		D14	0.73	94.08%	1.96	4.54
	E. 104th Way	D10	0.40	81.85%	1.09	2.72
	Reunion Center (By Others)	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_5 (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

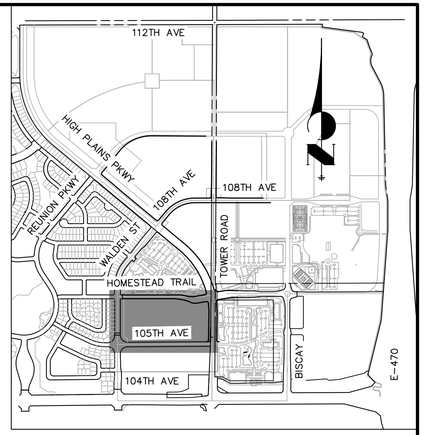
Design Point	Contributing Basins	Contributing Area (ac)	Q_5 (cfs)	Q_{100} (cfs)
201	Sub-Basin B1	0.67	1.27	3.32
202	Sub-Basins B2 and B3	0.87	1.66	4.44
203	DP 201 and DP 202	1.54	2.83	7.49
204	Sub-Basins B4 and B5	0.79	1.58	4.39
205	Sub Basins B6 and B9	0.27	0.63	1.68
206	DP 204 and DP 205	1.06	2.16	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	**16.69**	21.11	61.84
	Detained flows piped to DP 402		5.50	8.53

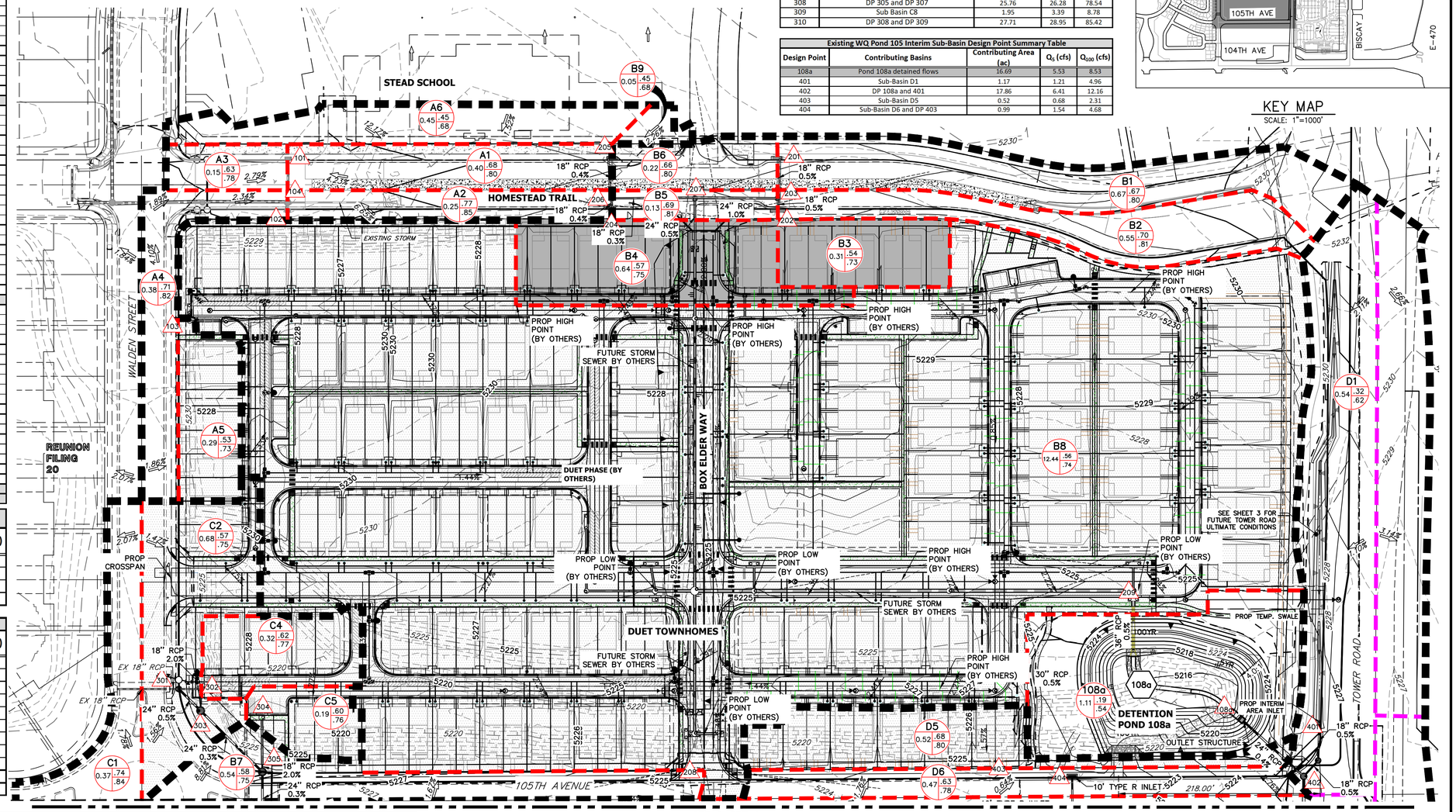
Proposed Detention Pond 108b Sub-Basin Design Point Summary Table

Design Point	Contributing Basins	Contributing Area (ac)	Q_5 (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

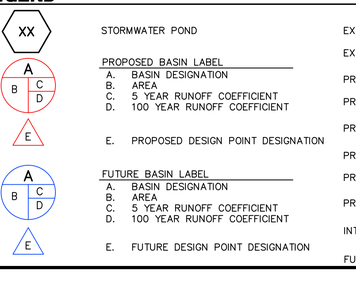
Existing WQ Pond 105 Interim Sub-Basin Design Point Summary Table

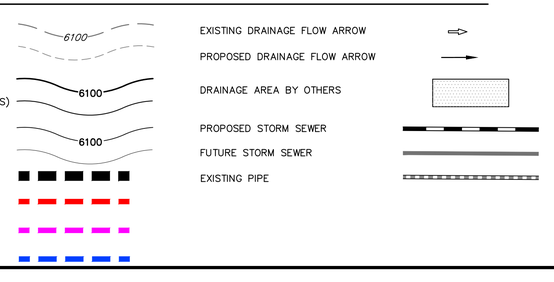
Design Point	Contributing Basins	Contributing Area (ac)	Q_5 (cfs)	Q_{100} (cfs)
108a	Pond 108a detained flows	16.69	5.53	8.53
401	Sub-Basin D1	1.17	1.21	4.96
402	DP 108a and 401	17.86	6.41	12.16
403	Sub-Basin D5	0.52	0.68	2.31
404	Sub-Basin D6 and DP 403	0.99	1.54	4.68

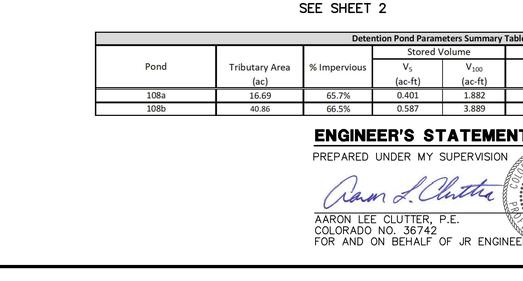




LEGEND







Detention Pond Parameters Summary Table

Pond	Tributary Area (ac)	% Impervious	Stored Volume V_5 (ac-ft)	Stored Volume V_{100} (ac-ft)	Stage d_5 (ft)	Stage d_{100} (ft)	Pond Release Rate Q_5 (cfs)	Pond Release Rate 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 7/10/24

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

COLORADO REGISTERED AARON LEE CLUTTER 36742 PROFESSIONAL ENGINEER

ORIGINAL SCALE: 1" = 60'

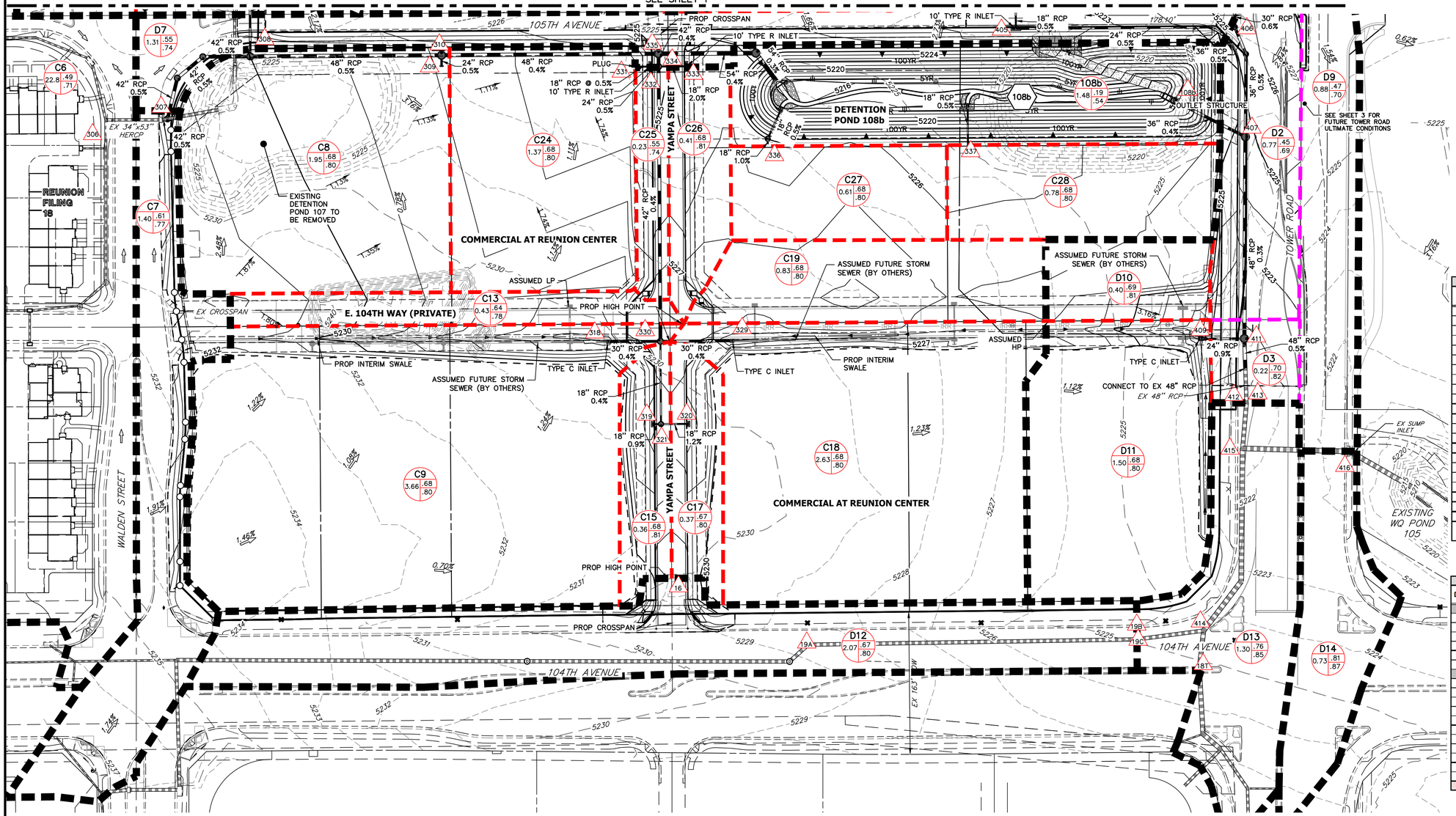
PROPOSED INTERIM CONDITIONS
DRAINAGE MAP
REUNION CENTER DUETS
JOB NO. 14421.49
7/10/24
SHEET 1 OF 3

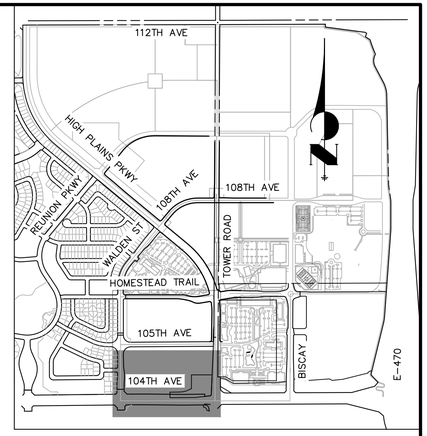
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REUNION CENTER-DUET & COMMERCIAL PHASE

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_5 (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	36.05	45.55	130.09
	Detained flows piped to DP 407		21.10	33.55

Existing WQ Pond 105 Interim Sub-Basin Design Point Summary Table				
Design Point	Contributing Basins	Contributing Area (ac)	Q_5 (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 D11 & 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 Biscay	---	61.10	114.90
414	Existing Offsite - Tower/104th & Biscay	---	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

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 — 6100
EX INTERMEDIATE CONTOUR
PROP INDEX CONTOUR (BY OTHERS)
PROP INTERMEDIATE CONTOUR (BY OTHERS) — 6100
PROP INDEX CONTOUR — 6100
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

Detention Pond Parameters Summary Table								
Pond	Tributary Area (ac)	% Impervious	Stored Volume V_5 (ac-ft)	Stored Volume V_{100} (ac-ft)	Stage d_5 (ft)	Stage d_{100} (ft)	Pond Release Rate Q_5 (cfs)	Pond Release Rate 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 — 7/10/24

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

COLORADO REGISTERED AARON LEE CLUTTER 36742 PROFESSIONAL ENGINEER

DATE

60 30 0 60 120

ORIGINAL SCALE: 1" = 60'

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

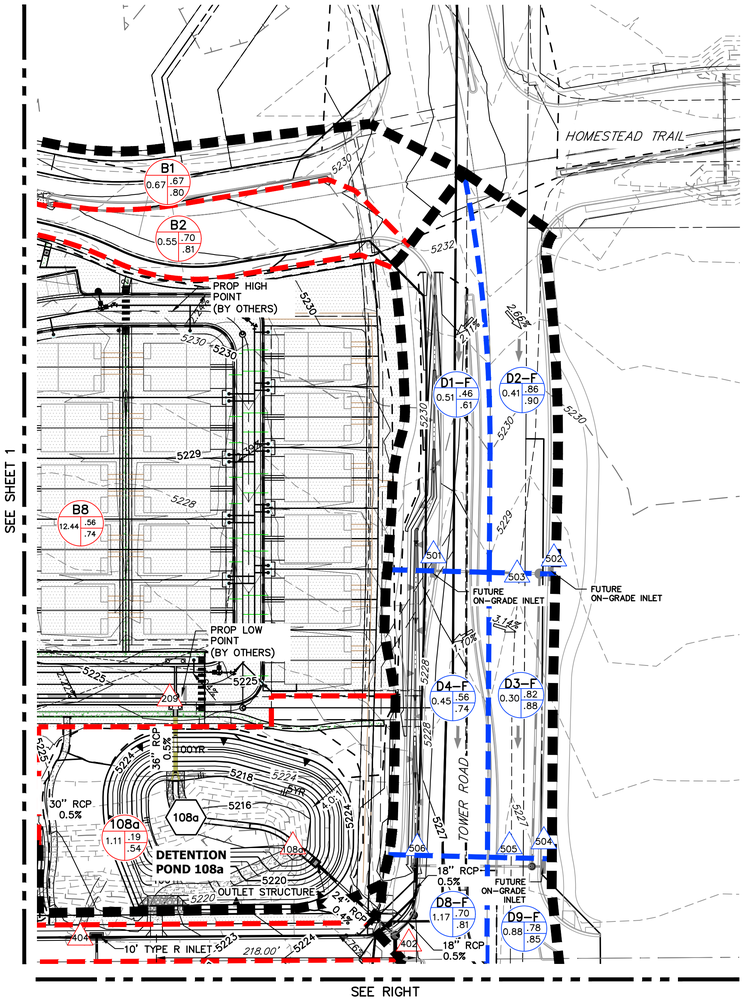
J·R ENGINEERING
A Westrian Company

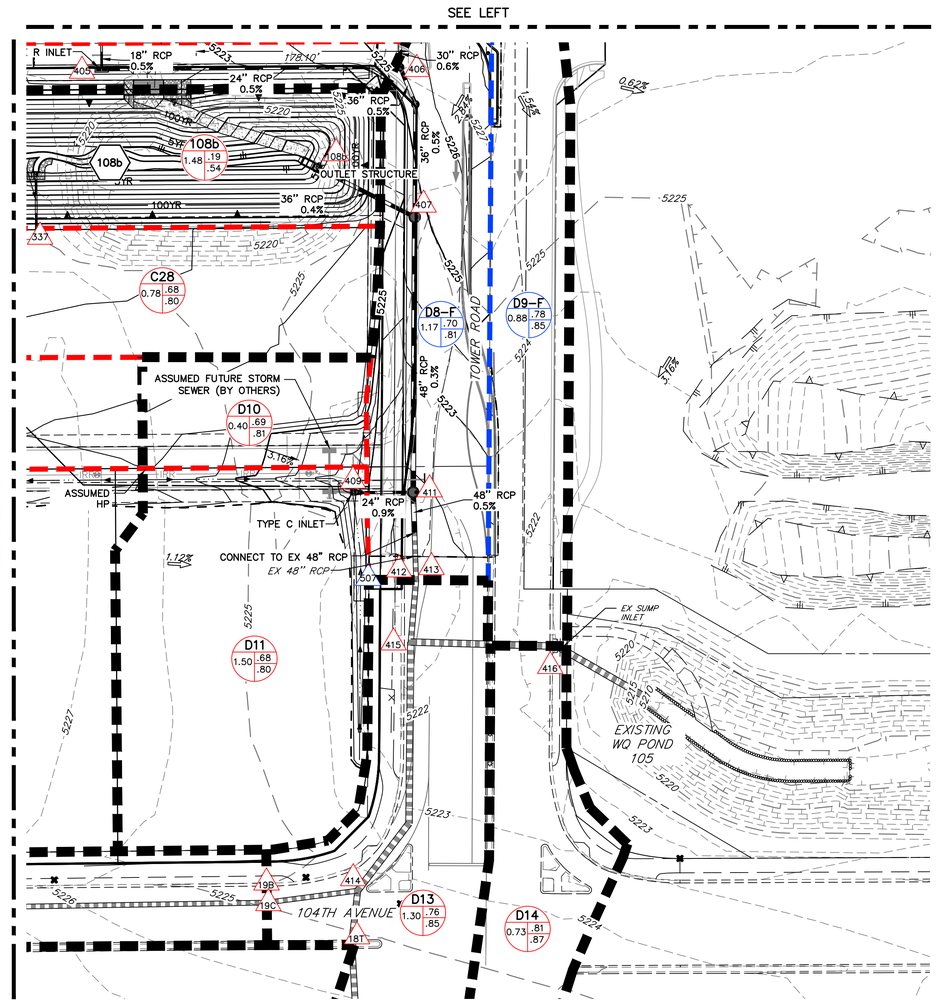
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Fort Collins 970-491-9888 • www.jrengineering.com

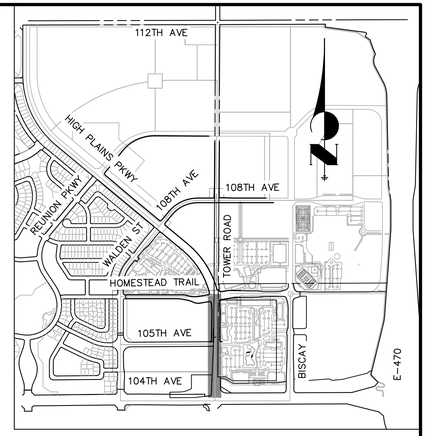
REUNION CENTER-DUET & COMMERCIAL PHASE

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_5 (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

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

A / B / C / D

E — E. PROPOSED DESIGN POINT DESIGNATION

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

A / B / C / D

E — E. FUTURE DESIGN POINT DESIGNATION

- EX INDEX CONTOUR (6100)
- EX INTERMEDIATE CONTOUR
- PROP INDEX CONTOUR (BY OTHERS)
- PROP INTERMEDIATE CONTOUR (BY OTHERS) (6100)
- PROP INDEX CONTOUR
- PROP INTERMEDIATE CONTOUR (6100)
- 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

Detention Pond Parameters Summary Table								
Pond	Tributary Area (ac)	% Impervious	Stored Volume V_5 (ac-ft)	Stored Volume V_{100} (ac-ft)	Stage d_5 (ft)	Stage d_{100} (ft)	Pond Release Rate Q_5 (cfs)	Pond Release Rate 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

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60 30 0 60 120
ORIGINAL SCALE: 1" = 60'

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

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Fort Collins 970-491-9888 • www.jrengineering.com

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)	Cumulative Volume (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)	Cumulative Volume (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 V_5 (ac-ft)	Stored Volume V_{100} (ac-ft)	Stage d_5 (ft)	Stage d_{100} (ft)	Pond Release Rate Q_5 (cfs)	Pond Release Rate 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%

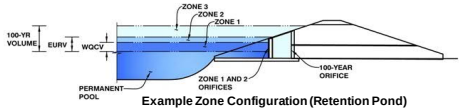
WQCV Drain Time (hr):	40
Coefficient, a (Table 3-2):	1.0
WQCV (in):	0.28
Updated WQCV (ac-ft) per this report:	1.363
Per the Preliminary Drainage Report for Reunion Center – Village 1 WQCV (ac-ft):	1.431

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: Reunion Duets Development

Basin ID: Pond 108a - Duets Site



Example Zone Configuration (Retention Pond)

Watershed Information

Flood Control Only

Selected BMP Type =	No BMP	
Watershed Area =	16.69	acres
Watershed Length =	900	ft
Watershed Length to Centroid =	350	ft
Watershed Slope =	0.03	ft/ft
Watershed Imperviousness =	65.7%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	100.0%	percent
Percentage Hydrologic Soil Groups C/D =	0.0%	percent
Target WQCV Drain Time =	N/A	hours
Location for 1-hr Rainfall Depths =	Commerce City - Civic Center	

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

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	0.357	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	1.199	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 0.84 in.) =	0.666	acre-feet		inches
5-yr Runoff Volume (P1 = 1.12 in.) =	0.941	acre-feet		inches
10-yr Runoff Volume (P1 = 1.37 in.) =	1.240	acre-feet		inches
25-yr Runoff Volume (P1 = 1.75 in.) =	1.787	acre-feet		inches
50-yr Runoff Volume (P1 = 2.08 in.) =	2.227	acre-feet		inches
100-yr Runoff Volume (P1 = 2.43 in.) =	2.741	acre-feet		inches
500-yr Runoff Volume (P1 = 3.35 in.) =	4.011	acre-feet		inches
Approximate 2-yr Detention Volume =	0.658	acre-feet		
Approximate 5-yr Detention Volume =	0.931	acre-feet		
Approximate 10-yr Detention Volume =	1.242	acre-feet		
Approximate 25-yr Detention Volume =	1.495	acre-feet		
Approximate 50-yr Detention Volume =	1.644	acre-feet		
Approximate 100-yr Detention Volume =	1.851	acre-feet		

Define Zones and Basin Geometry

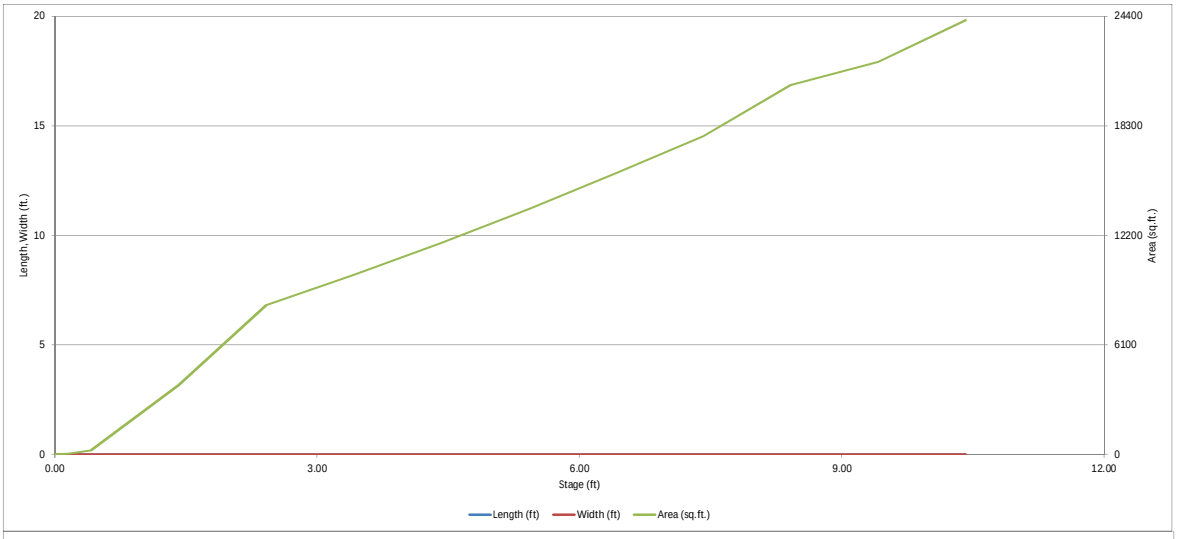
Zone 1 Volume (5-year) =	0.931	acre-feet
Zone 2 Volume (100-year - Zone 1) =	0.921	acre-feet
Select Zone 3 Storage Volume (Optional) =		acre-feet
Total Detention Basin Volume =	1.851	acre-feet
Initial Surcharge Volume (ISV) =	N/A	ft^3
Initial Surcharge Depth (ISD) =	N/A	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio (R_{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

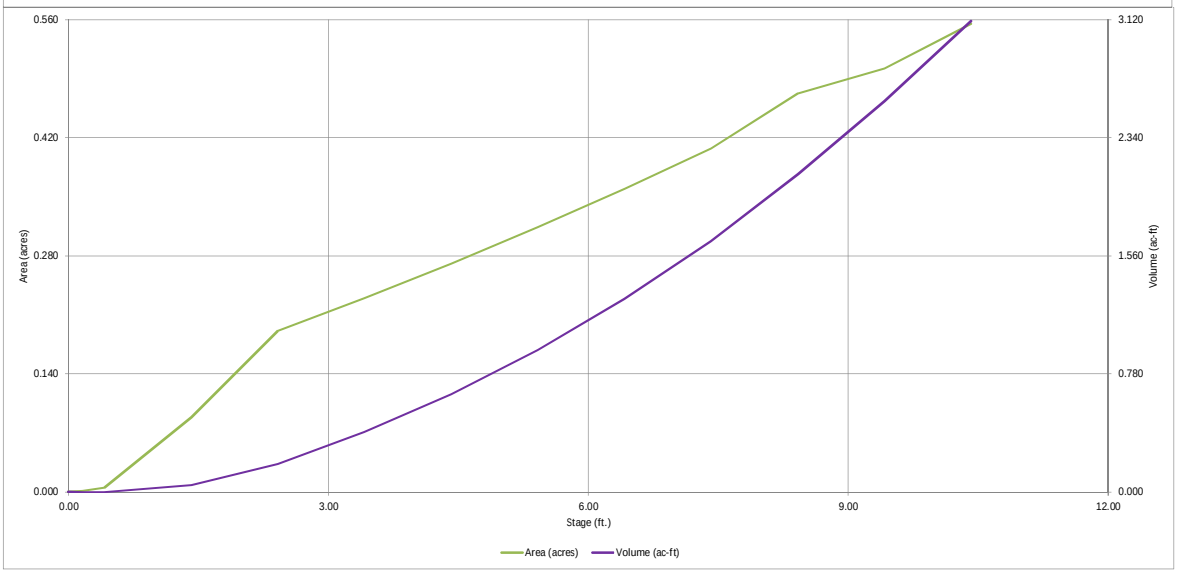
Depth Increment = 1.00 ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Media Surface	--	0.00	--	--	--	0	0.000		
5214.75	--	0.17	--	--	--	55	0.001	4	0.000
5215	--	0.42	--	--	--	217	0.005	37	0.001
5216	--	1.42	--	--	--	3,848	0.088	2,045	0.047
5217	--	2.42	--	--	--	8,328	0.191	8,103	0.186
5218	--	3.42	--	--	--	10,010	0.230	17,261	0.396
5219	--	4.42	--	--	--	11,786	0.271	28,147	0.646
5220	--	5.42	--	--	--	13,662	0.314	40,859	0.938
5221	--	6.42	--	--	--	15,649	0.359	55,501	1.274
5222	--	7.42	--	--	--	17,735	0.407	72,179	1.657
5223	--	8.42	--	--	--	20,578	0.472	91,517	2.101
5224	--	9.42	--	--	--	21,876	0.502	112,528	2.583
5225	--	10.42	--	--	--	24,187	0.555	135,544	3.112

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)



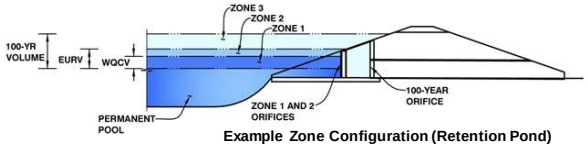


DETENTION BASIN OUTLET STRUCTURE DESIGN

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 Area =	N/A	ft^2
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

Calculated Parameters for Underdrain

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

Centroid of Lowest Orifice =	N/A	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	N/A	ft^2
Depth at top of Zone using Orifice Plate =	N/A	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	N/A	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	N/A	sq. inches	Elliptical Slot Area =	N/A	ft^2

Calculated Parameters for Plate

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		Calculated Parameters for Vertical Orifice	Zone 1 Circular	Not Selected	
Invert of Vertical Orifice =	0.00		ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	1.07		ft^2
Depth at top of Zone using Vertical Orifice =	5.60		ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	0.58		feet
Vertical Orifice Diameter =	14.00		inches				

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

	Zone 2 Weir	Not Selected		Calculated Parameters for Overflow Weir	Zone 2 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	4.00		ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	5.25		feet
Overflow Weir Front Edge Length =	5.00		feet	Overflow Weir Slope Length =	5.15		feet
Overflow Weir Grate Slope =	4.00		H:V	Grate Open Area / 100-yr Orifice Area =	28.22		
Horiz. Length of Weir Sides =	5.00		feet	Overflow Grate Open Area w/o Debris =	17.94		ft^2
Overflow Grate Type =	Type C Grate			Overflow Grate Open Area w/ Debris =	8.97		ft^2
Debris Clogging % =	50%		%				

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

	Zone 2 Restrictor	Not Selected		Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate	Zone 2 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	0.17		ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	0.64		ft^2
Outlet Pipe Diameter =	18.00		inches	Outlet Orifice Centroid =	0.34		feet
Restrictor Plate Height Above Pipe Invert =	7.00		inches	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 Design Flow Depth=		feet
Spillway Crest Length =		feet	Stage at Top of Freeboard =		feet
Spillway End Slopes =		H:V	Basin Area at Top of Freeboard =		acres
Freeboard above Max Water Surface =		feet	Basin Volume at Top of Freeboard =		acre-ft

Calculated Parameters for Spillway

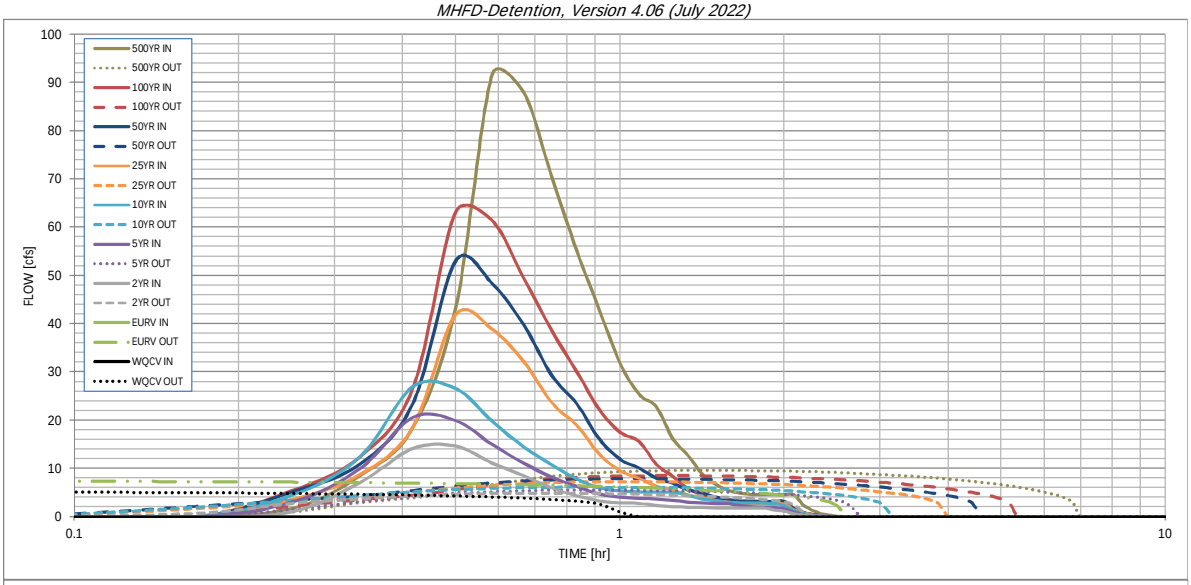
Routed Hydrograph Results

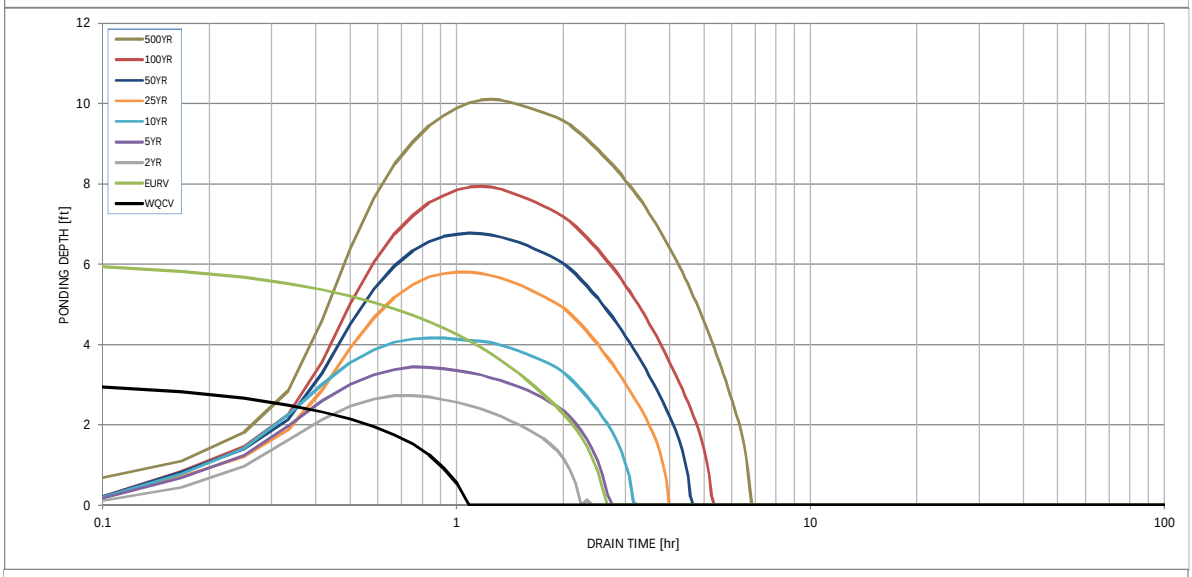
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

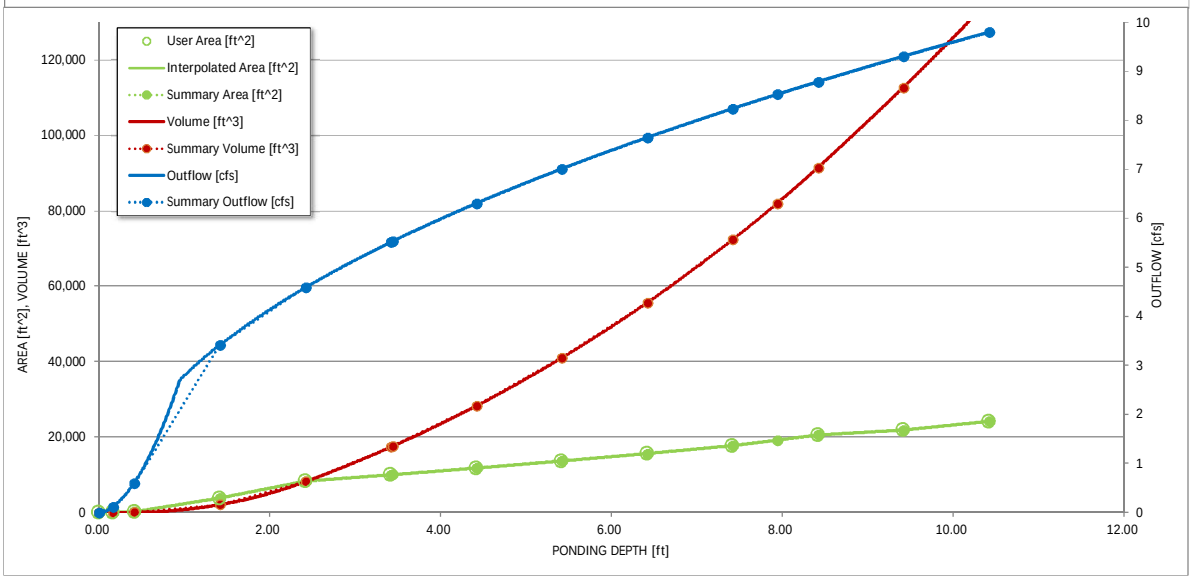
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	0.84	1.12	1.37	1.75	2.08	2.43	3.35
CUHP Runoff Volume (acre-ft) =	0.357	1.199	0.666	0.941	1.240	1.787	2.227	2.741	4.011
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.666	0.941	1.240	1.787	2.227	2.741	4.011
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.2	0.5	4.7	14.9	21.3	29.2	47.1
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
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 Grate 1 (fps) =	N/A	-0.26	N/A	N/A	-0.2	-0.3	-0.3	-0.3	-0.3
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	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.

	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	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
	2:25:00	0.00	0.00	0.02	0.03	0.04	0.05	0.06	0.06	0.08
	2:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	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
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	3:20:00	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
	3:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
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	4:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

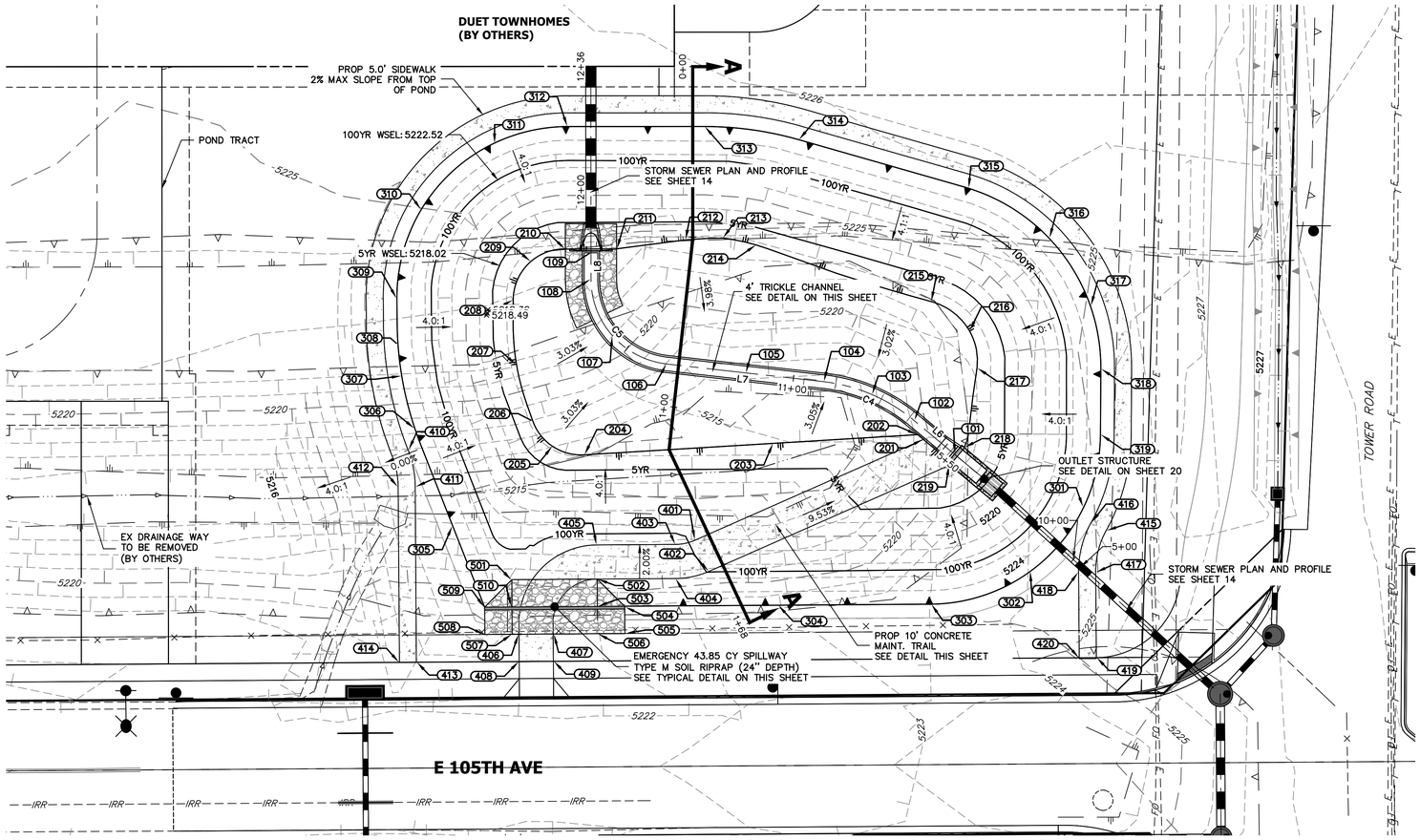
Summary Stage-Area-Volume-Discharge Relationships

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.

Stage - Storage Description	Stage [ft]	Area [ft²]	Area [acres]	Volume [ft³]	Volume [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

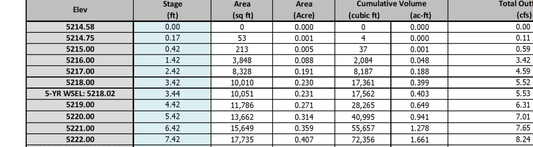
For best results, include the stages of all grade slope changes (e.g. ISV and Floor) from the S-A-V table on Sheet 'Basin'.

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

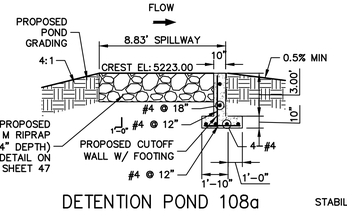


DETENTION POND 108a
PLAN VIEW
SCALE: 1"=20'

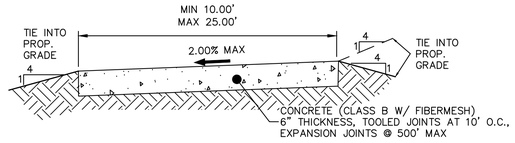
Detention Pond 108a Stage-Storage Table						
Elev	Stage (ft)	Area (sq ft)	Area (Acre)	Cumulative Volume (cubic ft)	Cumulative Volume (ac-ft)	Total Outflow (cfs)
5214.58	0.00	0	0.000	0	0.000	0.00
5214.75	0.17	53	0.001	4	0.000	0.11
5215.00	0.42	213	0.005	37	0.001	0.59
5216.00	1.42	3,848	0.088	2,084	0.048	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



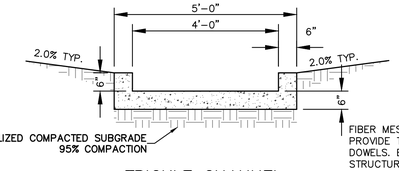
POND 108a EMERGENCY
OVERFLOW SPILLWAY
SCALE: 1"=10'



DETENTION POND 108a
PROPOSED CUTOFF WALL DETAIL
SCALE: 1'=5'



MAINTENANCE ACCESS ROAD
CONCRETE TYPICAL SECTION
SCALE: N.T.S.



TRICKLE CHANNEL
SCALE: 1"=2'

FIBER MESH REINFORCEMENT.
PROVIDE TOOLED JOINTS @ 10' O.C. WITH DOWELS. EXPANSION JOINTS AT STRUCTURE/TRICKLE CHANNEL INTERFACES.

LEGEND

MAINT. ACCESS – GRAVEL

MAINT. ACCESS – CONCRETE

NOTES

1. MAXIMUM SLOPE IS 3:1 UNLESS OTHERWISE NOTED. TYPICALLY MAXIMUM SLOPES ARE 4:1.
2. MINIMUM LONGITUDINAL GRADE IS 0.5%.
3. POND CROSS SLOPE GRADE IS 2.0%–3.0%.
4. MAXIMUM DRIVEWAY GRADE IS 10%.
5. ALL SOIL EMBANKMENT ON THE SITE SHALL BE CONSTRUCTED WITH MOISTURE AND DENSITY CONTROL. ALL EMBANKMENTS MUST BE COMPACTED TO 95% STANDARD PROCTOR COMPACTION.
6. PROVIDE JOINTS AT TEN FEET ON CENTER ALONG CONCRETE TRICKLE CHANNEL

LINE TABLE		
LINE	BEARING	DISTANCE
L6	S50°07'03"E	15.48'
L7	S83°33'36"E	46.14'
L8	S00°03'19"E	7.76'

CURVE TABLE			
CURVE	DELTA	RADIUS	LENGTH
C4	33°26'33"	50.00'	29.18'
C5	83°31'04"	25.00'	36.44'

POINT TABULATION				
ID NO.	DESCRIPTION	NORTHING	EASTING	ELEVATION
101	BEGIN TC	1749515.09	3204942.67	5214.75
102	PC	1749525.02	3204930.79	5214.83
103	CURVE–MP	1749532.62	3204918.39	5214.90
104	PC	1749536.34	3204904.34	5214.97
105	MP	1749538.92	3204881.41	5215.09
106	PC	1749541.51	3204858.49	5215.20
107	CURVE–MP	1749549.69	3204842.66	5215.29
108	PT	1749566.34	3204836.29	5215.38
109	END TC	1749574.09	3204836.29	5215.42
201	TOE/MAINT. TRAIL	1749519.42	3204933.59	5215.30
202	TOE	1749520.82	3204931.92	5215.31
203	TOE	1749518.26	3204889.70	5216.05
204	TOE	1749514.90	3204834.27	5216.67
205	TOE	1749517.38	3204825.07	5216.76
206	TOE	1749524.89	3204819.22	5216.74
207	TOE	1749541.38	3204814.49	5216.60
208	TOE	1749560.24	3204813.52	5216.49
209	TOE	1749571.58	3204818.73	5216.36
210	TOE	1749575.20	3204828.79	5216.08
211	TOE	1749575.24	3204843.79	5216.07
212	TOE	1749577.83	3204863.78	5216.78
213	TOE	1749578.39	3204874.75	5216.95
214	TOE	1749576.36	3204884.69	5216.94
215	TOE	1749559.75	3204936.04	5216.77
216	TOE	1749551.27	3204947.03	5216.65
217	TOE	1749540.32	3204949.27	5216.22
218	TOE	1749517.08	3204945.45	5215.27
219	TOE/MAINT. TRAIL	1749511.88	3204941.26	5215.27
301	TOP	1749499.62	3204980.46	5225.00
302	TOP	1749480.85	3204964.97	5225.00
303	TOP	1749471.17	3204935.73	5225.00
304	TOP	1749470.87	3204890.95	5225.00
305	TOP	1749494.05	3204795.82	5225.00
306	TOP	1749522.68	3204784.71	5225.00
307	TOP	1749538.01	3204780.94	5225.00
308	TOP	1749547.42	3204779.78	5225.00
309	TOP	1749560.71	3204779.49	5225.00
310	TOP	1749586.79	3204786.69	5225.00
311	TOP	1749606.12	3204807.84	5225.00
312	TOP	1749611.05	3204829.46	5225.00

POINT TABULATION				
ID NO.	DESCRIPTION	NORTHING	EASTING	ELEVATION
313	TOP	1749611.07	3204869.48	5225.00
314	TOP	1749607.22	3204897.04	5225.00
315	TOP	1749593.02	3204946.66	5225.00
316	TOP	1749578.38	3204970.34	5225.00
317	TOP	1749558.51	3204982.46	5225.00
318	TOP	1749540.09	3204985.52	5225.00
319	TOP	1749520.86	3204985.40	5225.00
401	MAINT. TRAIL	1749489.95	3204866.82	5222.36
402	MAINT. TRAIL	1749480.80	3204870.85	5222.48
403	MAINT. TRAIL	1749488.67	3204861.07	5222.80
404	MAINT. TRAIL	1749478.67	3204860.93	5223.00
405	MAINT. TRAIL	1749488.52	3204838.04	5222.80
406	MAINT. TRAIL /SPILLWAY CREST	1749462.36	3204815.22	5222.95
407	SPILLWAY CREST/ MAINT. TRAIL	1749462.43	3204825.22	5222.96
408	MAINT. TRAIL	1749454.36	3204815.27	5222.78
409	MAINT. TRAIL	1749454.43	3204825.27	5222.86
410	SW–PC	1749516.35	3204782.76	5225.00
411	SW–PT	1749505.57	3204784.84	5224.71
412	SW–PT	1749505.54	3204779.84	5224.70
413	MATCH SW	1749454.16	3204785.18	5222.65
414	MATCH SW	1749454.13	3204780.23	5222.64
415	SW–PC	1749492.75	3204987.10	5226.10
416	SW–PC	1749495.16	3204982.72	5226.00
417	SW–PT	1749480.54	3204984.01	5225.70
418	SW–PT	1749480.51	3204979.01	5225.50
419	MATCH SW	1749455.49	3204984.18	5225.07
420	MATCH SW	1749455.46	3204979.23	5225.00
501	SPILLWAY CREST	1749478.35	3204813.11	5223.00
502	SPILLWAY CREST /MAINT. TRAIL	1749478.52	3204838.11	5223.00
503	SPILLWAY CREST	1749470.52	3204838.17	5223.00
504	SPILLWAY/TOP	1749470.37	3204846.17	5225.00
505	SPILLWAY	1749462.57	3204846.22	5223.22
506	SPILLWAY CREST	1749462.52	3204838.22	5222.99
507	SPILLWAY CREST	1749462.35	3204813.22	5222.94
508	SPILLWAY	1749462.30	3204805.22	5224.21
509	SPILLWAY/TOP	1749470.29	3204805.17	5225.00
510	SPILLWAY CREST	1749470.35	3204813.17	5223.00



KEY MAP
SCALE: 1"=1000'

BASIS OF BEARING:

THE BASIS OF BEARINGS IS THE EAST LINE OF THE SOUTHEAST QUARTER OF SECTION 9, TOWNSHIP 2 SOUTH, RANGE 66 WEST OF THE 6TH PRINCIPAL MERIDIAN, MONUMENTED AT THE SOUTHEAST CORNER BY A 3.25" ALUMINUM CAP STAMPED "PLS 25645" AND AT THE EAST QUARTER CORNER BY A 3.25" ALUMINUM CAP STAMPED "PLS 23519", BEARING N00°21'33"E AS REFERENCED TO COLORADO STATE PLANE CENTRAL ZONE.

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).

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

20 10 0 20 40
ORIGINAL SCALE: 1" = 20'

ENGINEER'S STATEMENT

PREPARED

AARON [illegible] DATE
COLORADO
FOR AND ON BEHALF OF JR ENGINEERING, LLC

PRELIMINARY NOT FOR CONSTRUCTION

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

PREPARED FOR
REUNION METROPOLITAN DISTRICT
17910 E. PARKSIDE DRIVE NORTH
COMMERCE CITY, CO 80022
MATT URKOSKI
(303) 288-5431

J·R ENGINEERING
A Westrian Company
Centennial 303-740-9393 • Colorado Springs 719-593-2593
Fort Collins 970-491-9888 • www.jrengineering.com

No.	REVISION	BY	DATE

H-SCALE	1"=20'
V-SCALE	N/A
DATE	11/30/23
DESIGNED BY	NEO
DRAWN BY	NEO
CHECKED BY	

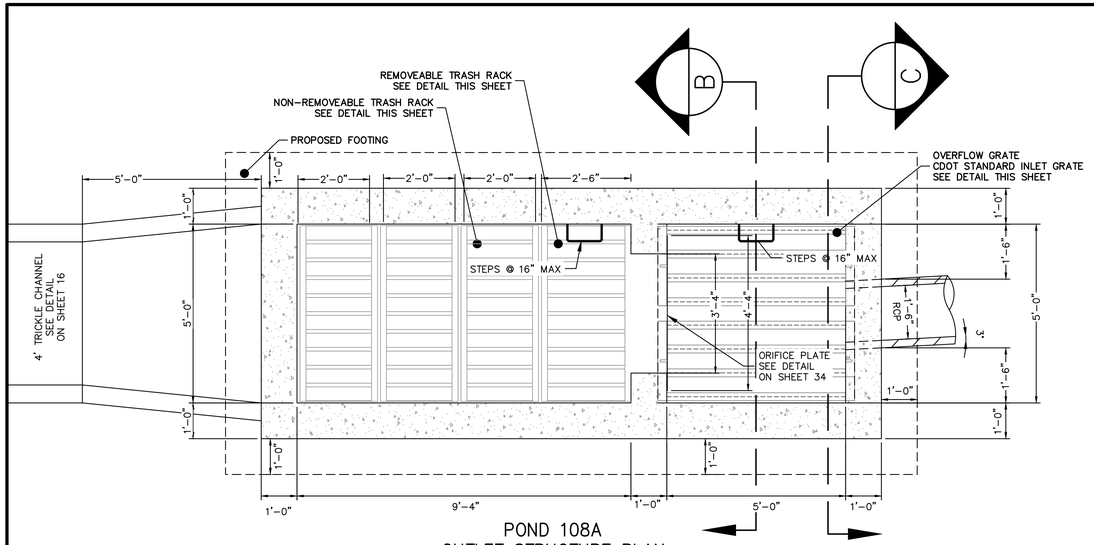
REUNION CENTER – DUET & COMMERCIAL PHASE
DISTRICT IMPROVEMENTS

POND PLANS

SHEET 16 OF 56

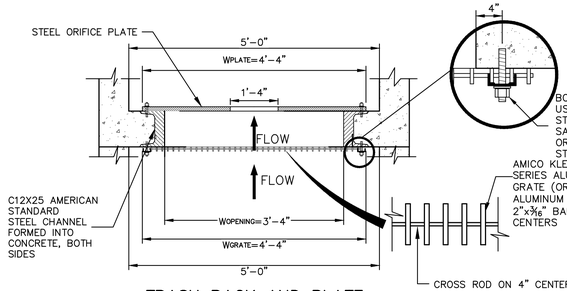
JOB NO. 14421.49

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POND 108A OUTLET STRUCTURE PLAN

SCALE: 1/2"=1'

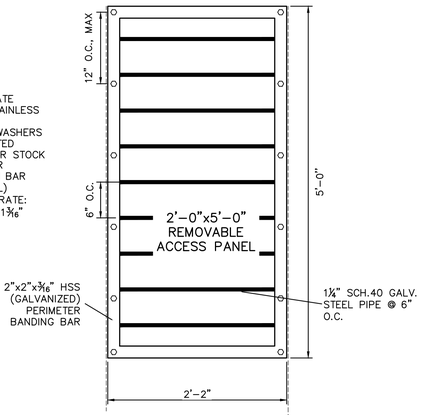


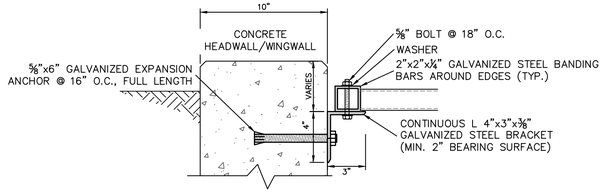
TRASH RACK AND PLATE DETAIL (PLAN)

N.T.S.

TRASH RACK DETAIL

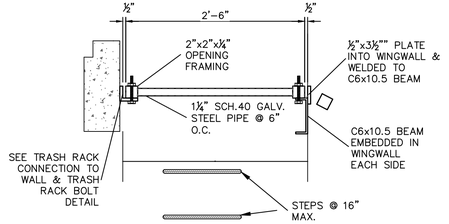
N.T.S.





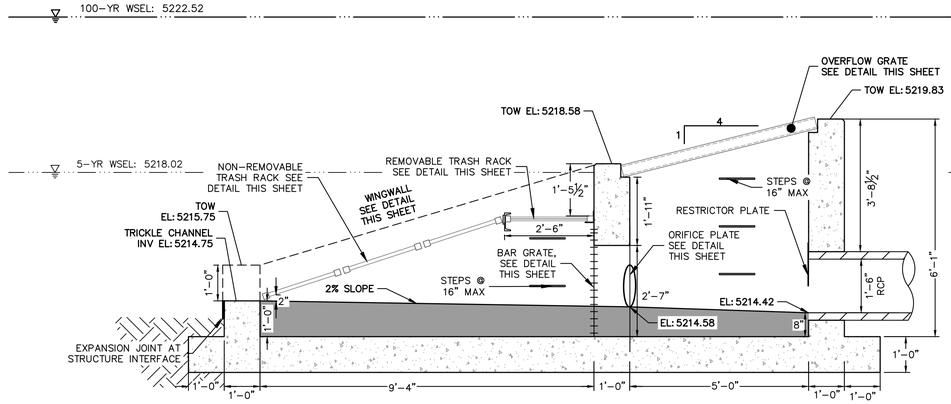
TRASH GRATE CONNECTION TO WALLS

N.T.S.



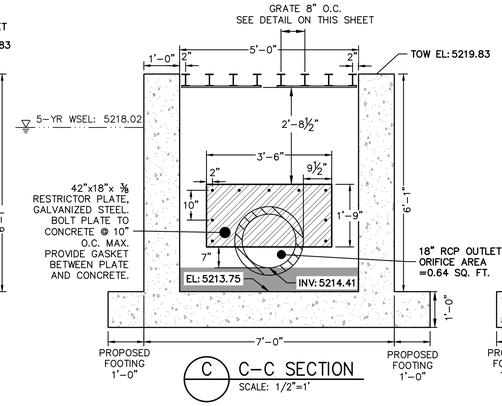
REMOVABLE TRASH GRATE DETAIL

N.T.S.



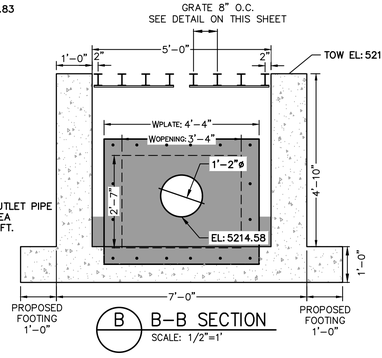
POND 108A OUTLET STRUCTURE PROFILE

SCALE: 1/2"=1'



C C–C SECTION

SCALE: 1/2"=1'



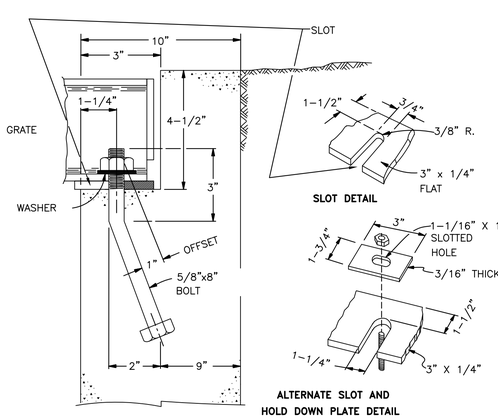
B B–B SECTION

SCALE: 1/2"=1'

⅜" THICK ORIFICE PLATE, GALVANIZED STEEL WITH ONE 1'4" DIAMETER CIRCULAR ORIFICE. BOLT PLATE TO CONCRETE @ 12" O.C. MAX. PROVIDE GASKET BETWEEN PLATE AND CONCRETE

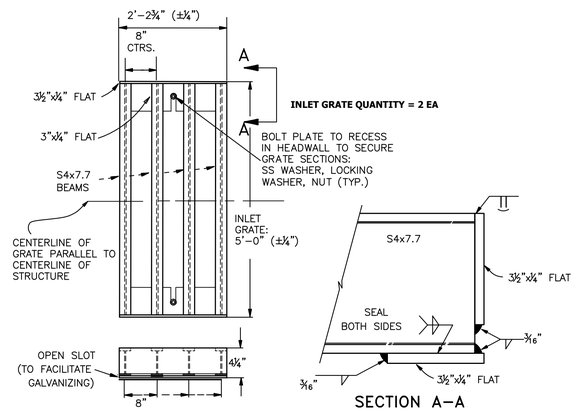
ORIFICE PLATE DETAIL

SCALE: 1/2"=1'



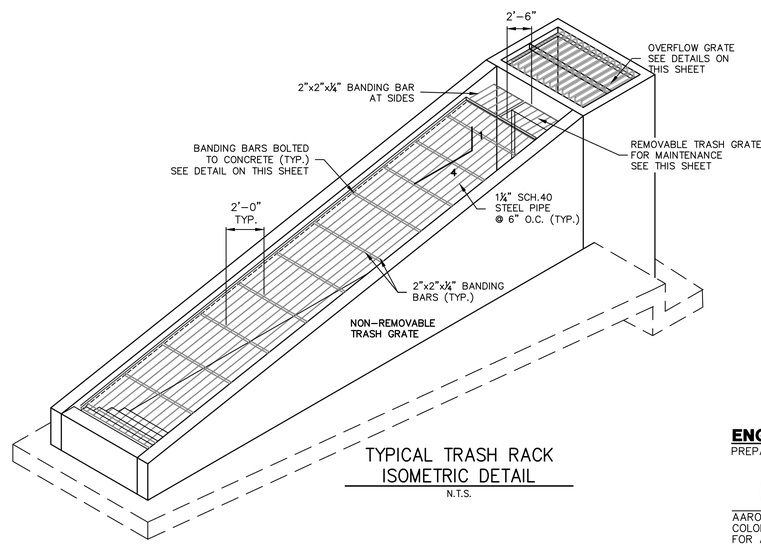
OVERFLOW GRATE INSTALLATION DETAIL

N.T.S.



OVERFLOW GRATE DETAILS

N.T.S.



TYPICAL TRASH RACK ISOMETRIC DETAIL

N.T.S.

ENGINEER'S STATEMENT

PREPARED

PRELIMINARY
NOT FOR
CONSTRUCTION

AARON
COLORADO
FOR AND ON BEHALF OF JR ENGINEERING, LLC

DATE

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

PREPARED FOR
REUNION METROPOLITAN DISTRICT
17910 E. PARKSIDE DRIVE NORTH
COMMERCE CITY, CO 80022
MATT URKOSKI
(303) 288-5431

J·R ENGINEERING
A Westrian Company
Centennial 303-740-9393 • Colorado Springs 719-593-2593
Fort Collins 970-491-9888 • www.jrengineering.com

No.	REVISION	BY	DATE

H-SCALE	1/2"=1'
V-SCALE	1/2"=1'
DATE	11/30/23
DESIGNED BY	KAU
DRAWN BY	WJL
CHECKED BY	

REUNION CENTER – DUET & COMMERCIAL PHASE

POND DETAILS

POND 108A

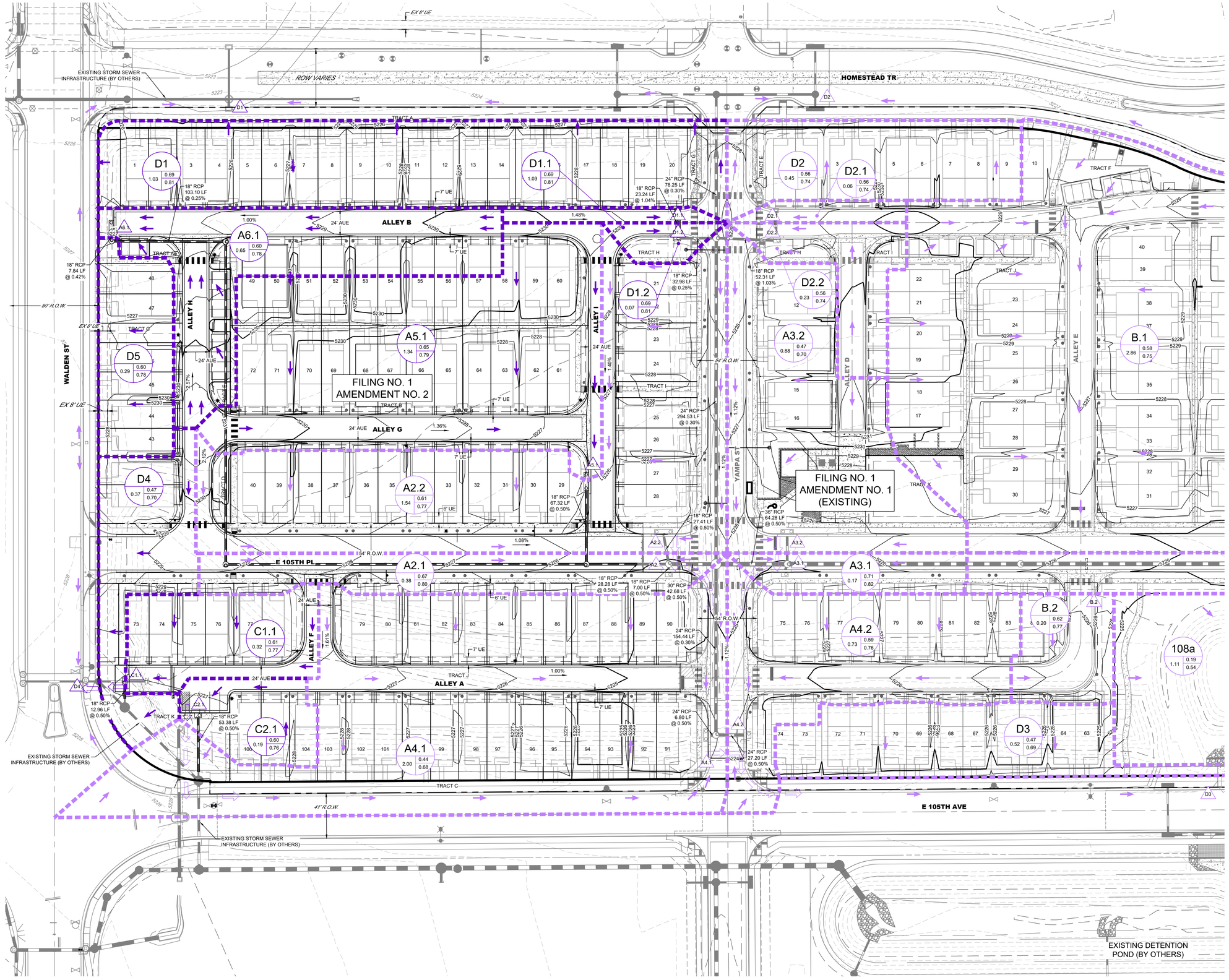
SHEET 20 OF 56

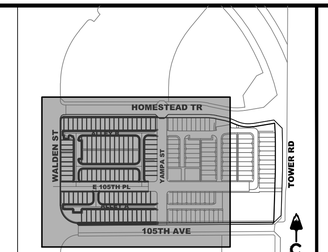
JOB NO. 14421.49

X:\14400\00.all\14421\Drawings\Sheet Dwgs\Construction Plans\Phase 1\Duet and Commercial\Pond Details\Ponds 108a and 108b Outlet Structures.dwg, 20 Pond 108A Outlet-D1701 - 12/4/2023 3:23:59 PM, FarrellK

BACK POCKET

DRAINAGE MAPS





KEY MAP
SCALE: 1" = 400'

0 40' 80'

1 inch = 40 ft.

LEGEND

EXISTING / PROPOSED

- BASIN DESIGNATION
- 5 YEAR COEFFICIENTS
- 100 YEAR COEFFICIENTS
- DESIGN POINT
- DIRECTIONAL FLOW ARROW
- EMERGENCY OVERFLOW 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
- RIPRAP
- 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

DESIGN POINT	BASIN	DIRECT RUNOFF AREA (AC)	DIRECT RUNOFF 5-Year RUNOFF (CFS)	DIRECT RUNOFF 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

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

LAND DEVELOPMENT
ENERGY
PUBLIC INFRASTUCTURE

CORE

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

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

FINAL DRAINAGE REPORT
DRAINAGE MAP

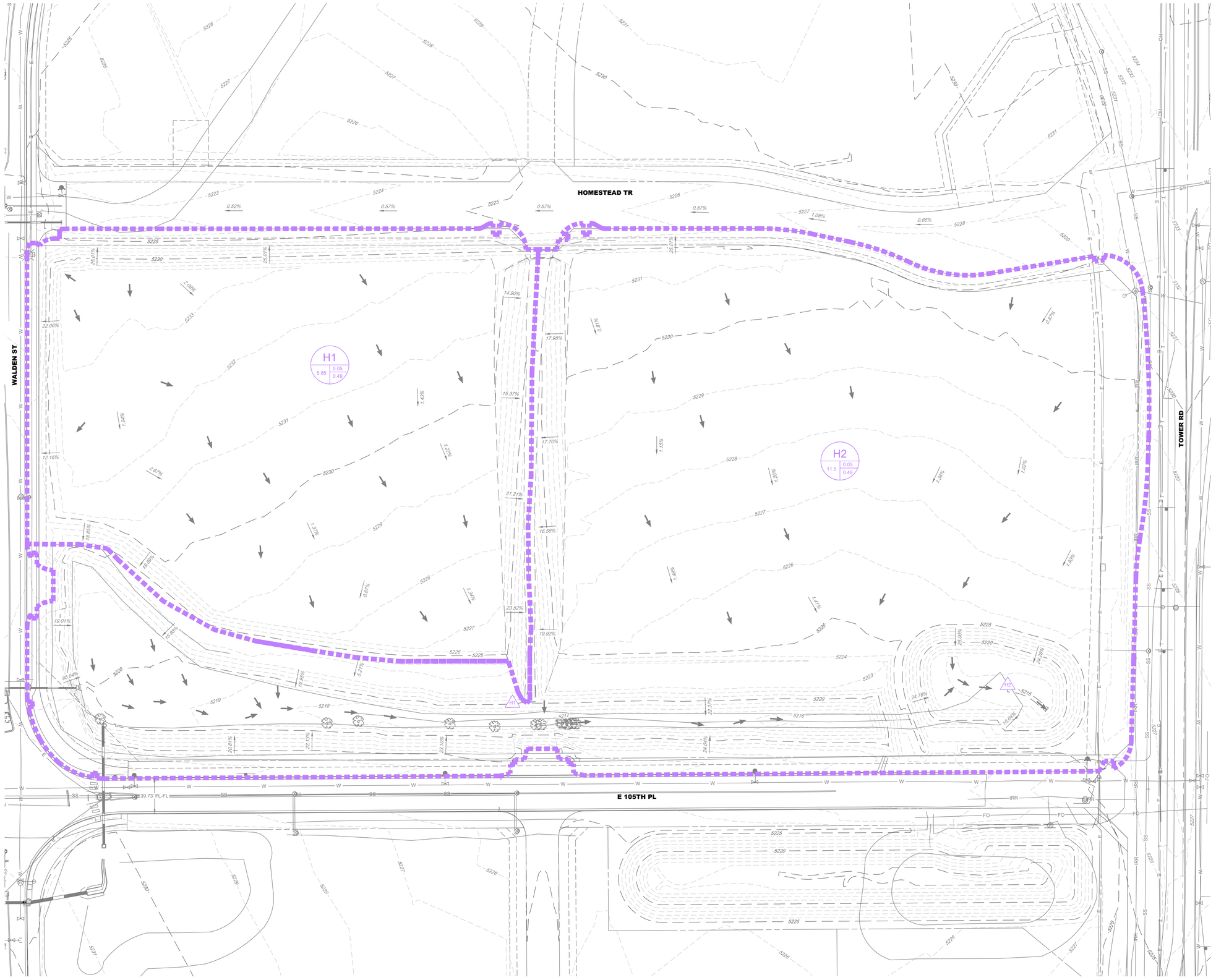
NOT FOR CONSTRUCTION

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

JOB NO.
18-004

SHEET
1 OF 1

7/26/2024 9:59 AM X:\18-004 REUNION CENTER\CIVIL\CAD\PLANS\FILING 1 - AMENDMENT 2\DRAINAGE\PROPOSED DRAINAGE MAP-F1A2.DWG



LEGEND

EXISTING	PROPOSED	
X	X	DESIGN POINT
AREA XX.X / 0.45 / 0.60	AREA XX.X / 0.45 / 0.60	BASIN DESIGNATION / 5 YEAR COEFFICIENTS / 100 YEAR COEFFICIENTS
		DIRECTIONAL FLOW ARROW
		EXISTING DRAINAGE BASIN
5280		EXISTING MAJOR CONTOUR
5279		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).

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

REUNION CENTER FILING NO.1 - AMENDMENT 1

COMMERCE CITY, COLORADO

FINAL DRAINAGE REPORT
HISTORICAL DRAINAGE MAP

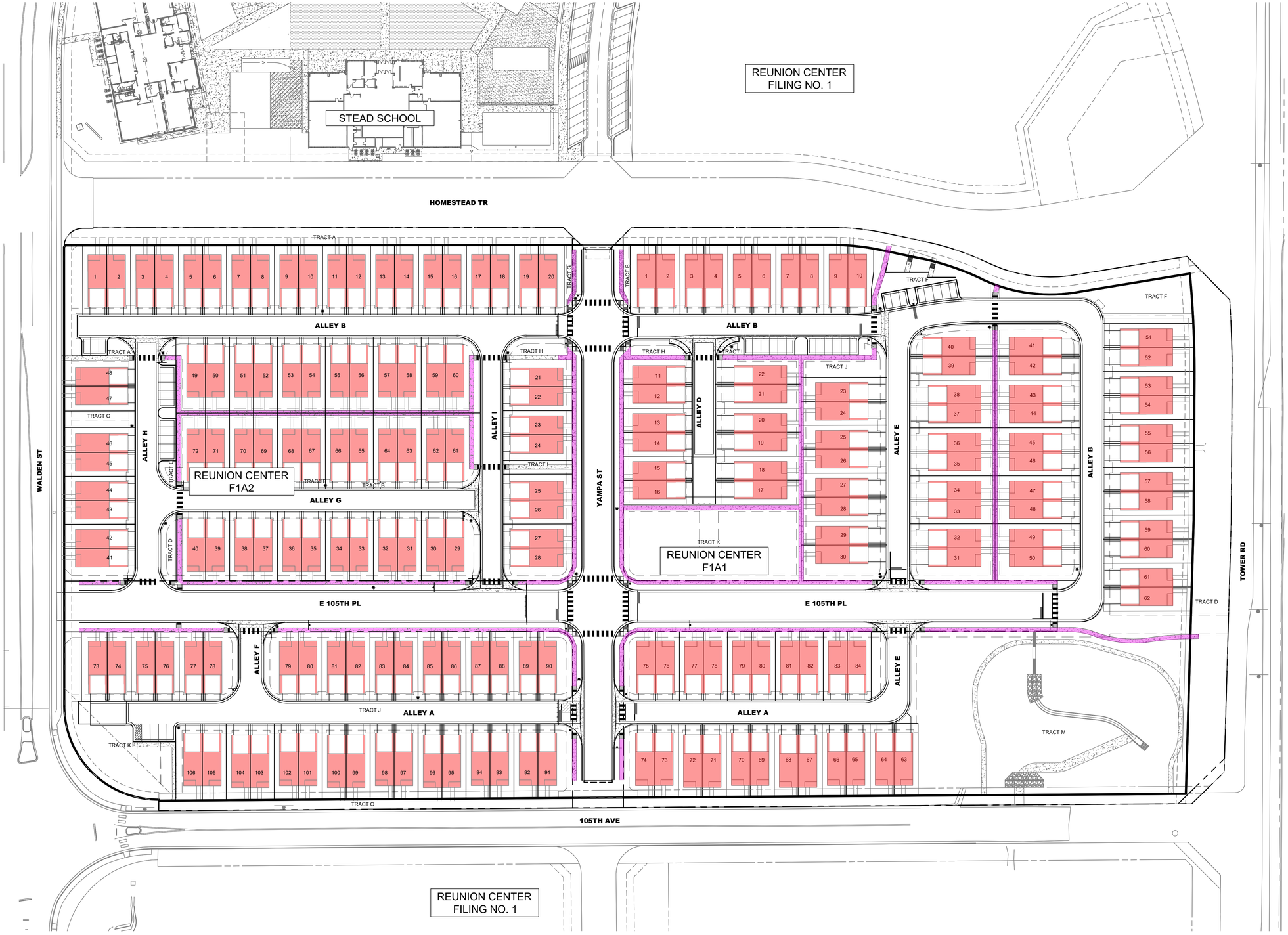
NOT FOR CONSTRUCTION

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

JOB NO. 18-004

SHEET 1 OF 1

7/6/2023 1:12 PM X:\18-004 REUNION CENTER\CIVIL\CAD\PLANS\FILING 1 - AMENDMENT 1\DRAINAGE\HISTORIC DRAINAGE MAP.DWG



LEGEND

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

N

0 50'

1 inch = 50 ft.

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

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LAND DEVELOPMENT
ENERGY
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DISCONNECTED IMPERVIOUSNESS OVERALL MAP

REUNION CENTER

DATE: 7/6/23

CREATED BY: JP

JOB NO. 18-004

SHEET 1

11:18 AM Jana Passafiume X:\18-004 Reunion Center\Civil\CAD\Plans DISCONNECTED IMPERVIOUSNESS OVERALL MAP.dwg