Skydance

Master Utility Report – Amendment 1

October 25, 2024

City of Aurora Approval Block

Aurora Water	Date
City Engineer	Date
Fire Department	Date

PREPARED FOR:

Westside Investment Partners, Inc.
4100 E. Mississippi Avenue, Suite 500
Denver, Colorado 80246

PREPARED BY: Westwood

Westwood

MASTER UTILITY REPORT-AMENDMENT 1

Skydance

Adams County, Colorado

Prepared For:

Westside Investment Partners, Inc.
4100 E. Mississippi Ave., Suite 500
Denver, CO 80246
(303) 984-9800

Prepared By:

Craig Northam, P.E.
Westwood Professional Services
10333 E. Dry Creek Road, Suite 400
Englewood, CO
(720) 249-3576

Project Number: R0029250.01
Date: October 25, 2024

MASTER UTILITY REPORT

FOR

SKYDANCE-AMENDMENT 1

ENGINEER'S STATEMENT:

This utility study "Skydance – Master Utility Report-Amendment 1" was prepared under my direct supervision in accordance with the provisions of the City of Aurora Standards and Specifications Regarding Water, Sanitary Sewer and Storm Drainage Infrastructure. I understand that the City of Aurora does not and will not assume liability for facilities designed by others.

_____ _____

Craig Northam CO P.E. 30276 Date
Westwood Professional Services

Table of Contents

1 INTRODUCTION

1.1. General Description

The Skydance development is a mixed-use development and consists of a total of 151 acres. The project will be primarily residential and commercial development to include 885 residential units and 25.18 acres of commercial development. The 885 residential units consist of single-family detached homes, single family attached homes, and multi-family product type. The remaining improved areas will be for roadways, detention ponds, parks, streets, and open space located throughout the development.

1.2. Scope of Work

The purpose of this Master Utility Report is to update the design of the water distribution and sanitary sewer system as it relates to the Skydance Master Planned Community in support of the Framework Development Plan (FDP) Amendment. Several previous master utility reports will be referenced throughout including: ***310 West Master Utilities Report*** (Ref. 7) prepared by Calibre Engineering, ***Master Utilities Report for Highpoint at DIA*** (Ref. 8) prepared by S.A. Miro, Inc., and ***Everlea Master Utility Study***, (Ref. 11) prepared by PLX Engineering. The proposed water and sewer system must meet the criteria set forth by the guidelines of the ***Water, Sanitary Sewer and Storm Drainage Infrastructure Standards and Specifications*** (Ref. 3) manual prepared by the City of Aurora (COA) as well as the ***Master Utility Design Criteria for Water and Sanitary Sewer*** (Ref. 6). Westwood Professional Services (Westwood) will work in conjunction with the client and the COA to ensure that the water distribution and sanitary sewer systems are compatible with existing facilities and planned development.

1.3. Project Location

The 151-acre Skydance development is in the southwest quarter of Section 12, Township 3 South, Range 66 West of the 6th Principal Meridian, County of Adams, State of Colorado. The project is bounded on the north by future East 60th Avenue, on the south by East 56th Avenue, on the east by future Tibet Road, and on the west by Picadilly Road. Mapping of the location of this project can be found on the following Map Pages: 94Q, 94R, 95Q, 95R.

Currently there are several existing developments bounding the proposed site; to the west Painted Prairie, LLC, to the north, Everlea, to the south 310 West, and to the east is High Point at DIA. Figure-1 clearly depicts the project in context to the surrounding roadways and known developments.

FIGURE 1 – LOCATION MAP

1.4. Topographic Conditions

The proposed site encompasses approximately 151 acres of currently undeveloped land. The western portion of the site slopes from the east to the southwest, while the eastern portions drain to the northeast. The total elevation change in the southern portion is approximately 34 feet, dropping from 5464 feet above mean sea level (MSL) at the eastern boundary of the development to 5430 feet above MSL at the western portion of the development. The total elevation change in the eastern portion is approximately 29 feet, dropping from 5480 feet above mean sea level (MSL) at the eastern boundary to 5464 feet above MSL at the northwest corner of the development.

From the ***City of Aurora's Water Capital Improvement Plan (CIP),*** (Ref. 4), it is shown that the proposed development is within pressure Zone 3. Table 1 below presents the pressures provided for Zone 3. To separate the Zone 3 and Zone 3c pressure areas, pressure reducing valves have been installed on water line extensions coming off the existing 24" water line within Picadilly Road and E. 56th Avenue. Water mains in Picadilly Road and E. 56th will remain in Zone 3 as depicted in Appendix B. All the Skydance development will be in Zone 3.

Zone	Static Hydraulic Grade Line, (ft)	Service Elevation Range, (ft)	Static Pressure Range, (psig)
Zone 3	5720	5480-5600	50-130

Table 1 – City of Aurora Pressure Zones

The Skydance development consists of one major sanitary sewer basin.

The sanitary sewer basin will outfall at the northeast corner of the development at the future intersection of E. 60th Avenue and Tibet Road. The Skydance basin is downstream of a portion of 310 West from the south, and the Everlea development to the north. Sanitary sewer routing will take this inflow into consideration when developing the routing for the Skydance development.

See Appendix C for sanitary sewer routing and basin boundary information.

1.5. Planning Areas

The entire project site has been divided up into 27 Planning Areas. These planning areas include parks and open spaces (see appendix A). Planning Area 1 includes proposed Open Space in the northwest corner of the development. Planning Area 2 contains Single Family Detached Residential units in the northwest corner of the development. Planning Area 3 will be Open Space in the north portion of the development. Planning Area 4 will have Single Family Detached Residential units in the north portion of the development. Planning Area 5 will have Multi-Family Residential units in the north portion of the site. Planning Area 6 will be a Park in the north portion of the development. Planning Area 7 will have Multi-Family Residential units in the north portion of the site. Planning Area 8 will have Multi-Family Residential units in the northeast corner of the site. Planning Area 9 includes a proposed Detention area in the northeast corner of the site. Planning Area 10 is proposed Open Space in the northeast corner of the development.

Planning Area 11 includes Single Family Attached Residential in the east portion of the development. Planning Area 12 is a proposed Park in the east portion of the development. Planning Area 13 and Planning Area 14 will be Single Family Attached Residential in the central portion of the development. Planning Area 15 is proposed Open Space in the central portion of the development. Planning Area 16 is a proposed Park in the central portion of the site, Planning Area 17 will have Single Family Attached Residential units in the center of the site. Planning Area 18 will be Single Family Detached Residential in the west portion of the site. Planning Area 19 will be Open Space in the west portion of the development. Planning Area 20 and Planning Area 21 are Single Family Attached Residential in the central portion of the site.

Planning Area 22 will be Open Space in the southwest corner of the site. Planning Area 23 will contain the Detention Facility in the southwest corner of the site. Planning Area 24 will provide a combined use for Detention as well as Open Space within the southwest corner of the development. Planning Area 25 includes Single Family Attached Residential in the southwest portion of the site. Planning Area 26 and Planning Area 27 are dedicated for Commercial use in the south portion of the development.

2 WATER DISTRIBUTION SYSTEM

2.1. Land Use and Population

The Skydance development has a total of 27 Planning Areas (see the appendix A for map). A parcel-by acre tabulation of land use is shown in Table 2. Population estimates are based on 2.77 capita per dwelling unit for all residential units and 22 persons per acre for commercial parcels. This population density was adopted from the ***Master Utility Design Criteria for Water and Sanitary Sewer*** (Ref.6).

TABLE 2 – DEVELOPMENT AREA POPULATION ESTIMATES

PLANNING AREA	DESCRIPTION	AREA (AC)	PROPOSED UNITS	MAX ALLOWABLE DENSITY (DU/AC)	MAX ALLOWABLE UNITS
PA-1	OPEN SPACE	2.82			
PA-2	SINGLE FAMILY DETACHED	18.33	86		
PA-3	OPEN SPACE	2.87			
PA-4	SINGLE FAMILY DETACHED	4.66	22		
PA-5	MULTI-FAMILY	7.27	142	40	291
PA-6	PARK	1.22			
PA-7	MULTI-FAMILY	5.85	114	40	234
PA-8	MULTI-FAMILY	7.39	144	40	296
PA-9	POND	3.57			
PA-10	OPEN SPACE	1.85			
PA-11	SINGLE FAMILY ATTACHED	10.70	124		
PA-12	PARK	3.78			
PA-13	SINGLE FAMILY ATTACHED	2.27	20		
PA-14	SINGLE FAMILY ATTACHED	2.17	14		
PA-15	OPEN SPACE	0.44			
PA-16	PARK	7.48			
PA-17	SINGLE FAMILY ATTACHED	2.27	14		
PA-18	SINGLE FAMILY DETACHED	12.03	51		
PA-19	OPEN SPACE	1.63			
PA-20	SINGLE FAMILY ATTACHED	8.02	62		
PA-21	SINGLE FAMILY ATTACHED	5.23	34		
PA-22	OPEN SPACE	0.73			
PA-23	POND	4.59			
PA-24	POND/OPEN SPACE	2.80			
PA-25	SINGLE FAMILY ATTACHED	5.70	58		
PA-26	COMMERCIAL	5.40			
PA-27	COMMERCIAL	19.78			

Notes:

1. Density units depicted are per the Amended FDP Land Use Matrix.
2. Master Utility Analysis utilizes Max Allowable Units for Multi-Family Residential planning areas. All other planning areas utilize Proposed Units in analysis.

2.2. Water Design Criteria

This section describes the design criteria incorporated in developing the water distribution system for the proposed development. These Design criteria were adopted from the ***Water, Sanitary Sewer and Storm Drainage Infrastructure Standards and Specifications*** (Ref. 3) and the *approved* ***Painted Prairie Amendment Master Utility Report*** (Ref. 1)

2.3. Demands

The following is a list of criteria used to develop the water demands for the proposed site, per (Ref. 6):

- Residential Average Day Demand= 0.07 gpm/capita
- Commercial Average Day Demand = 1,500 gpd/acre
- Residential Max Day Factor = 2.8 x average day demand
- Residential Peak Hour Factor = 4.5 x average day demand
- School Max Day Factor = 2.8 x average day demand
- School Peak Hour Factor = 4.5 x average day demand
- Commercial Max Day Factor = 2.8 x average day demand
- Commercial Peak Hour Factor = 4.5 x average day demand

2.4. Pressures

The system has been analyzed to meet the maximum day plus fire flow demand with a residual pressure of no less than 20 psig at any point in the water distribution system. The system will maintain at a minimum 50 psig at any point in the distribution system during the Average Day Demand. Also, the Maximum Day residual water pressure shall not be less than 50 psig.

2.5. Distribution System

The following constraints in the max day + fire flow scenario will be used to model the water distribution system, per ***Master Utility Design Criteria for Water and Sanitary Sewer*** (Ref. 6):

- Max Hour Velocity for 6-inch line = 2.5 fps
- Max Hour Velocity for 8–12-inch line = 3 fps
- Max Hour Velocity for 16-24-inch and up = 4.5 fps
- Residential Fire Flow = 1500 gpm
- Commercial/Multi-family Fire Flow = 2500 gpm
- Hazen Williams Coefficient, C = 150
- Sufficient looping will be incorporated

2.6. Existing Infrastructure and Supply

Skydance is in the City of Aurora's service area. All potable water will be supplied by the City of Aurora's water distribution system. The proposed water distribution system will connect to the COA's system in several locations. See Appendix B for location of connections to existing City of Aurora water system. The Moffit/Skydance Development lies within the City of Aurora Water Pressure Zone 3. Pressure reducing valves have been installed within Picadilly Road to separate Zone 3 and Zone 3C which is to the west of the Skydance Development in the Painted Prairie site.

2.7. Water Demands

The summary of water demands calculated for the proposed water distribution system is presented in Appendix B. As stated previously within this report, the demands were determined using assumptions and requirements outlined in the ***Water, Sanitary Sewer and Storm Drainage Infrastructure Standards and Specifications*** (Ref. 3). The residential population was based on 2.77 persons per dwelling unit per ***Master Utility Design Criteria for Water and Sanitary Sewer*** (Ref. 6). Average day demands were calculated from developable acreage, population density, dwelling units per acre, and the average water demand rate. Maximum day and peak hour demands were calculated using peaking factors shown above. For more detailed demand calculations please refer to Appendix B.

2.8. Onsite Water Facilities

The study area is currently undeveloped and will require onsite water infrastructure to supply adequate water to the development. The distribution mains are sized to accommodate peak flow requirements for each planning area at full build-out based on the land use and population estimates described in this report. A preliminary water distribution system layout is shown in the appendix of this report. The minimum line sizes are based on this layout. If the distribution system is developed differently from that shown, line sizes may change, and an amendment to the MUR will need to be submitted to COA for approval. This Master Utility Report and accompanying WaterGEMS model should be updated if alignment/layouts/planning estimates change.

2.9. Water Network Analysis

The network analysis for the proposed development was analyzed using Bentley WaterCAD Edition by Bentley. The layout of the distribution system for the proposed development is shown in Appendix B as well as a network analysis. The base network skeleton and the set points for WaterCAD pressures were adapted from the ***City of Aurora's Water CIP map*** (Ref. 4).

2.10. Modeling Criteria

The modeling criteria incorporated in the water distribution system network analysis was adopted from ***Water, Sanitary Sewer and Storm Drainage Infrastructure Standards and Specifications*** (Ref. 3) and is shown in detail earlier in this report.

2.11. Network Analysis

Flows were allocated to each node (pipe junction of external demand) based on tributary areas mapped to each node within the site. Demands were then determined by land use and unit flows. The water supply connections were modeled as reservoirs (see map in appendix). The hydraulic grades for these reservoirs for different scenarios were taken from the ***City of Aurora's Water CIP Map*** (Ref. 4).

The model was analyzed, and several scenarios were computed to match the design criteria. Final pipe sizing was based on the results of this analysis. Changes were made to the layout based on the results of successive simulations as needed to meet the above criteria. Wherever possible, waterlines were internalized to maximize system efficiency and reduce construction costs. A roughness coefficient of 150 (Hazen-Williams C value) was used for all simulations. The residual fire flow (1,500 gpm) was assigned to every node servicing residential areas or known fire hydrants servicing residential areas and the system was evaluated for fire flow requirements as required by the COA. The commercial fire flows (2,500 gpm) were assigned to selected nodes based on the land use, and the system was evaluated for fire flow requirements. Output tables for each modeled scenario can be found in Appendix A.

Within the model, several cases were included to fully analyze how peak flows and fire demands will affect the system.

The general cases are as follows:

1. Average Day Demand
2. Maximum Day Demand
3. Maximum Hour Demand
4. Maximum Day Demand with coincident fire flow at all parcels

Input Parameters of the water distribution system modeled above include the following:

1. Pipe Diameters (inches)
2. Pipe Lengths (feet)
3. Node Elevations (feet)
4. System Demands (as outlined above)
5. Fire Flows (1,500 gpm, 2,500 gpm and 3,500 gpm)
6. Pipe Friction Coefficient, C = 150

Output Parameters Include:

1. Velocities (fps)
2. Pressure (psig)
3. Head Loss (feet)
4. Flow Rates (gpm)

2.12. Modeling Results

The results of the WaterCAD analysis for the proposed planning areas are presented in Appendix B. This analysis represents the proposed water distribution system, including node locations, pipe locations and pipe sizes that serve the project site.

3 SANITARY SEWER SYSTEM

3.1. Land Use and Population

The Skydance development has a total of 27 Planning Areas (see the appendix A for map). A parcel-by acre tabulation of land use is shown in Table 2. Population estimates are based on 2.77 capita per dwelling unit for all residential units. This population density was adopted from the ***Master Utility Design Criteria for Water and Sanitary Sewer*** (Ref.6).

The Skydance development consists of one major sanitary sewer basin. The sanitary sewer basin will outfall at the northeast corner of the development at the future intersection of E. 60th Avenue and Tibet Road. The Skydance basin is downstream of a portion of 310 West from the south, and the Everlea development to the north. Sanitary sewer routing will take these inflows into consideration when developing the routing for the Skydance development.

The sanitary sewer system for the Skydance development will outfall to the system designed with the High Point at DIA development (COA #220127). The sanitary sewer will gravity to the temporary Second Creek Lift station with limited capacity located near the future intersection of E. 68th Avenue and Denali Road. The Skydance site will ultimately be served via gravity with the Second Creek interceptor.

The ***Master Utility Report for High Point at DIA*** (Ref. 2) allocated an inflow of 2.17 cfs at the connection point at future E. 60th Avenue and Tibet Road. Because of the density of the Skydance development and the configurations of both the 310 West and a portion of the High Point sewerage systems passing through the site sewer system, this will be increased to 4.20 cfs. From the ***High Point at DIA-FDP***

Amendment No. 4- Master Utility Study Amendment (Ref. 5), there is additional capacity available that will not exceed the maximum capacities as defined in the standards and specifications manual. Appendix D details which pipes noted in the ***High Point at DIA-FDP Amendment No. 4- Master Utility Study Amendment*** (Ref. 5) have additional capacity for the increase in flows from the Skydance development.

3.2. Wastewater Design Criteria

This section describes the design criteria incorporated in developing the wastewater collection system for Skydance. These design criteria were adopted from the ***Master Utility Design Criteria for Water and Sanitary Sewer*** (Ref. 6) per discussion with City of Aurora, as well as ***Water, Sanitary Sewer and Storm Drainage Infrastructure Standards and Specifications*** (Ref. 3):

- Population –2.77 people per residential unit.
- Average Daily Flow – 68 gpcd for residential areas, 1,200 gallons per day/acre for schools, 188 gpd/unit for hotel and multifamily units, and 1,500 gallons per day/acre for commercial areas.
- Peaking Factor (PF) = $5 \div p^{0.167}$, where p = population in thousands and PF is no greater than 4.0 and no less than 1.7.
- The flow velocity shall not exceed ten (10) fps flowing full or ½ full using Manning's Formula and (n=0.011 for PVC or n=0.013 for RCP) minimum slope shall be 0.4% with a minimum velocity of two (2) fps at least once per day.
- Depth of flow in pipes should not exceed 75% of capacity for pipes 12 inches or smaller and 80% for pipes larger than 12 inches
- Minimum drop through a manhole from inlet to outlet or same diameter pipe shall be:
  1. 0.2 ft. on straight through run
  2. 0.3 ft. on deflected bends
- Minimum of 4-inch diameter pipe for service lines

3.3. Onsite Wastewater Demands

Average day wastewater generation rates per the ***Master Utility Design Criteria for Water and Sanitary Sewer*** (Ref. 6) table are based on 68 gallons per capita per day (gpcd) for residential areas and 1,500 gallons per day/acre for commercial areas. Peak Flow factors are based on population. Please refer to Appendix B for detailed wastewater generation calculations.

3.4. Existing Infrastructure

The Skydance Development basin will discharge into a 18" sanitary sewer pipe that connects to the High Point wastewater system near the intersection of E. 60th Avenue and Tibet Road (see ***High Point Master Utility Report***, Reference 2 for details). OS-1 refers to the inflows from the 310 West development to the south of Skydance. OS-2, OS-3, and OS-4 refer to the inflows from the Everlea development to the north of Skydance. Design point DP-AV1 in the ***Master Utility Report for High Point at DIA*** (Ref. 2) defines the outfall for the Skydance development. The downstream pipes have been evaluated for the additional density from Skydance, and can accept the additional flows within the standards outlined in the ***Water, Sanitary Sewer and Storm Drainage Infrastructure Standards and Specifications*** (Ref. 3):

3.5. Proposed Wastewater Facilities

3.5.1. Onsite Facilities

The proposed onsite wastewater collection infrastructure is designed to serve the Skydance Development. The collection system will consist of 8-inch to 15-inch gravity sewer lines running internal to the project development (See Exhibit SS1). Preliminary sewer design calculations are shown in Appendix B of this report.

3.5.2. Offsite Facilities

The offsite wastewater transmission/collection infrastructure is to be designed with the High Point at DIA development. Appendix D will show the routing of the offsite sanitary sewer to the eventual outfall at the existing Second Creek Lift Station.

This ultimate, full build-out condition for the Skydance Development project site will require coordination with High Point at DIA and City of Aurora to coordinate additional flows from the increased density from the Skydance Development and regarding alignment, depths, and easements.

4 CONCLUSION

The water distribution system will connect to the existing Zone 3 water system at several points in E.56th Avenue and Picadilly Road (See Appendix B). The results of the system analysis indicate that the proposed water system conforms to the ***Water, Sanitary Sewer and Storm Drainage Infrastructure Standards and Specifications*** (Ref. 3). Any subsequent changes to the proposed water distribution system as described within this report will require a reanalysis of the system. The Appendix contains the WaterCAD results and layout exhibit.

The sanitary sewer system for Skydance serves the entire Skydance development. The results of the system analysis indicate that the proposed sanitary sewer system conforms to the ***Water, Sanitary Sewer and Storm Drainage Infrastructure Standards and Specifications*** (Ref. 3), the ***Master Utility Design Criteria for Water and Sanitary Sewer*** (Ref. 6). The Appendix contains the anticipated sewer flow results and layout exhibit.

5 REFERENCES

1. **Painted Prairie Amendment to the Master Utility Report for Painted Prairie, LLC,** CVL Consultants of Colorado, Inc., February 2020, COA #220059MU-2017-3014 97S.

2. **Master Utility Report for High Point at DIA, J3 Engineering Consultants,** February 2017, COA #217021MU1-2004-0387 94P.

3. **Water, Sanitary Sewer and Storm Drainage Infrastructure Standards and Specifications,** City of Aurora, January 2022.

4. **Treated Water Distribution System 2025 Capital Improvement Plan,** City of Aurora, February 2009.

5. **High Point at DIA-FDP Amendment No. 4-Master Utility Study Amendment,** Martin/Martin, Inc., July 2020, 220127MU1-2004-3087 94P.

6. **Master Utility Design Criteria for Water and Sanitary Sewer,** City of Aurora, April 2018

7. **310 West Master Utility Report,** Dewberry and communications with Dewberry staff via email (Currently Under City Review).

8. **Master Utilities Report for Highpointe at DIA,** S. A. Miro, Inc., February 2005, COA #205047-2004-3087.

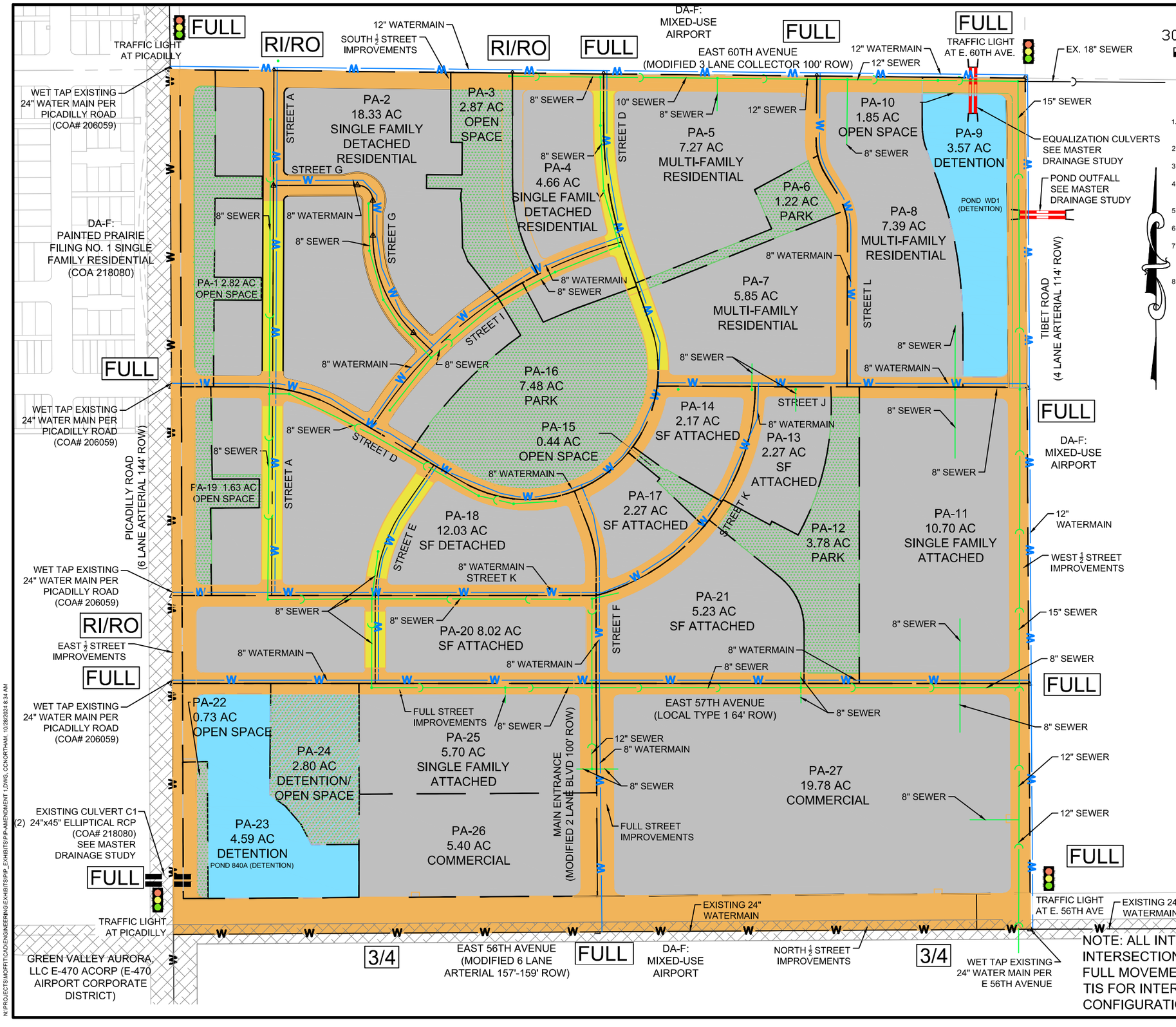
9. **Fulenwider-Master Utility Report**, Martin/Martin, Inc., July 2020

10. **Moffit/Skydance-Master Utility Report,** Westwood, Feb. 2023, COA #223035MU1-1900-ADAMS 95S

11. **Everlea Master Utility Study,** PLX Engineering, Nov. 22, 2023, COA #223281MU1-1900-ADAMS 95S

Appendix A

Development and Planning Area Map



NOTES:

1. MOFFITT/SKYDANCE RESERVES THE RIGHT TO SUBMIT PUBLIC IMPROVEMENT PLAN ADDENDUMS AS THE SITE DEVELOPS TO ADJUST TO MARKET CONDITIONS AND ENSURE ECONOMIC VIABILITY OF THE PROJECT.
2. POTENTIAL FUTURE SIGNALS SHALL BE IN CONFORMANCE TO THE TRAFFIC SIGNAL ESCROW PER CITY ORDINANCE.
3. REFER TO THE CITY OF AURORA TRAFFIC SIGNAL ESCROW ORDINANCE FOR ADDITIONAL INFORMATION ON INTERSECTION AND SIGNALIZATION CONTRIBUTION RESPONSIBILITIES.
4. ROADWAY IMPROVEMENTS MAY NEED TO BE EXTENDED BEYOND THE LIMITS OF ADJACENT CONSTRUCTION. THESE IMPROVEMENTS WILL BE ASSESSED IN FUTURE SITE PLAN SUBMITTALS.
5. ASPHALT CORING WILL BE CONDUCTED AS PART OF FUTURE SITE PLAN DESIGN TO DETERMINE ADEQUACY OF EXISTING ROADWAY PAVEMENT.
6. TRANSITIONS TO EXISTING ROADWAY SECTIONS WILL BE PROVIDED AT THE INTERFACE OF NEW CONSTRUCTION AS REQUIRED.
7. AN APPROVED FLOODPLAIN DEVELOPMENT PERMIT IS REQUIRED FOR ANY WORK WITHIN A MAPPED 100-YEAR FLOODPLAIN. AN APPROVED NO-RISE CERTIFICATION AND/OR CLOMR IS REQUIRED FOR ANY WORK WITHIN A MAPPED FLOODWAY. ADDITIONAL REQUIREMENTS MAY BE REQUIRED BY THE FLOODPLAIN ADMINISTRATOR.
8. DEVELOPMENT OF SIGNIFICANT AREAS COULD TRIGGER THE REQUIREMENT FOR CONSTRUCTION OF OFF-SITE CHANNEL OR DETENTION IMPROVEMENTS. THE NEED FOR OFF-SITE DRAINAGE IMPROVEMENTS SHALL BE EVALUATED BY THE CITY OF AURORA AND MHFD AT THE TIME THE PRELIMINARY DRAINAGE REPORT AND PLANS ARE BEING DEVELOPED. THE DEVELOPER IS ENCOURAGED TO COORDINATE WITH THE CITY AND MHFD AT THE EARLIEST POSSIBLE TIME ON REQUIRED DRAINAGE IMPROVEMENTS. IT IS RECOMMENDED THAT THIS COORDINATION OCCUR BEFORE MAKING THE FIRST SUBMITTAL OF A PRELIMINARY DRAINAGE REPORT.

NOTE: ALL INTERIOR INTERSECTIONS ARE FULL MOVEMENTS. SEE TIS FOR INTERSECTION CONFIGURATION/CONTROL.

LEGEND

- PROPOSED SANITARY SEWER
- EXISTING SANITARY SEWER
- PROPOSED WATER LINE
- EXISTING WATER LINE
- PLANING AREA BOUNDARY
- EXISTING STORM SEWER
- PROPOSED STORM SEWER
- PLANNING AREA
- DETENTION POND (DET.)
- INTERNAL LOCAL ROAD
- PROPOSED ROAD
- EXISTING ROAD
- OPEN SPACE/PARK
- ANTICIPATED TO BE SIGNALIZED INTERSECTION IN THE FUTURE
- FULL — FULL TURNING MOVEMENTS
- RI/RO — RIGHT IN - RIGHT OUT TURNING MOVEMENTS
- 3/4 — THREE-QUARTERS TURNING MOVEMENTS

No.	Revisions	Date	Init.	Appr.	Date

Westwood
10333 E DRY CREEK RD.
SUITE 400
ENGLEWOOD, CO 80112
TEL: 720.482.9526
Westwoodps.com
Westwood Professional Services, Inc.

EXHIBIT 1
OVERALL

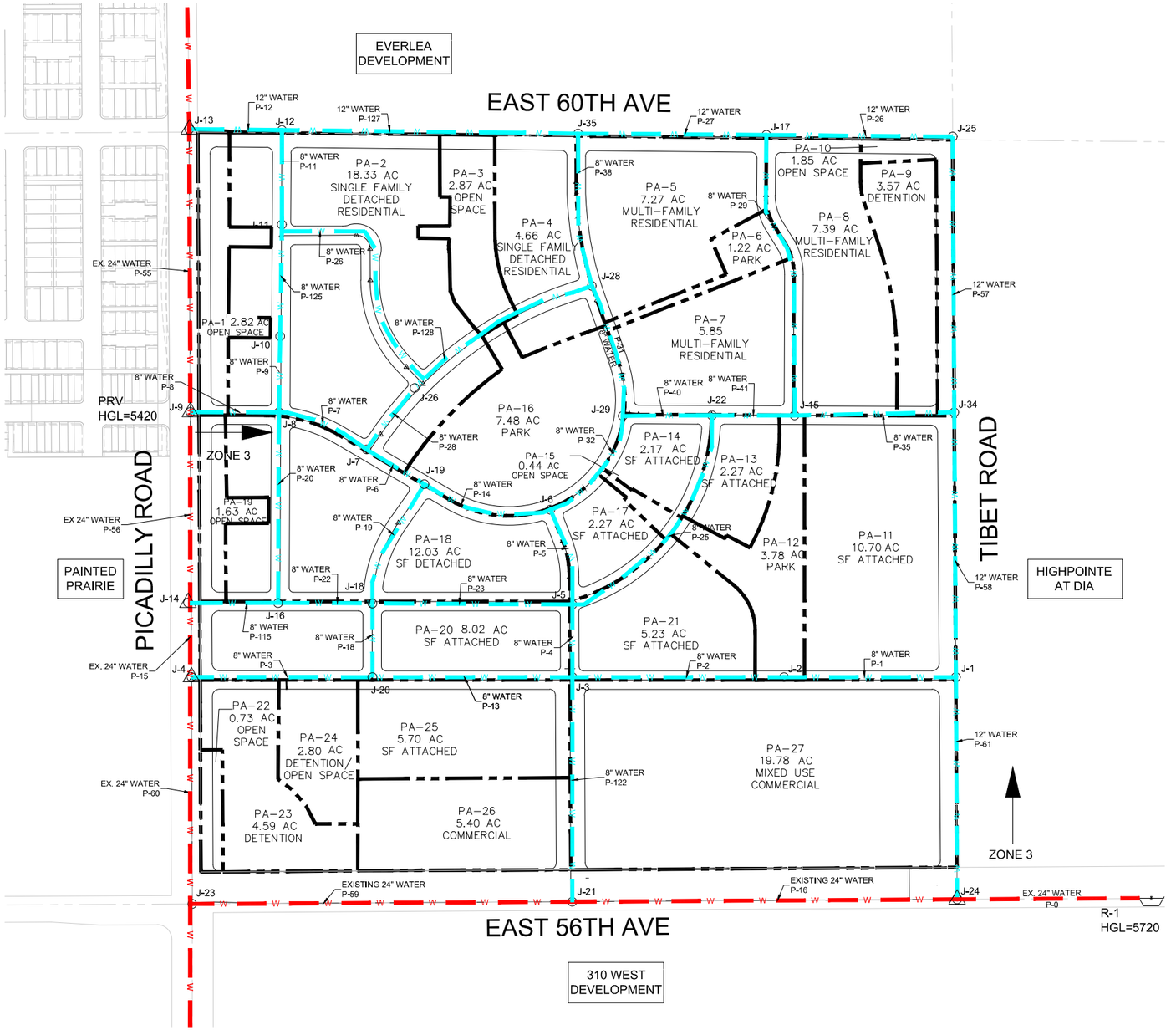
SKYDANCE
PUBLIC IMPROVEMENT
PLAN

SCALE: AS NOTED
FILE NO: R0029250.01
DRAWN BY: NJ
CHECKED BY: CCN
DATE: OCTOBER 2024
SHEET NUMBER: 1

N:\PROJECTS\MOFFITT\CAD\ENGINEERING\EXHIBITS\PIP_EXHIBITS\PIP-AMENDMENT 1.DWG, CONORTHAM, 10/28/2024 8:34 AM

APPENDIX B

Water Demands, Calculations, and Layout



200 100 0 200 400

SCALE: 1" = 200'

LEGEND

- XX / Z / XX — SERVICE AREA ACRES, Z= PHASE
- POINT OF WATER CONNECTION TO CITY OF AURORA SERVICE
- PROPOSED WATER LINE
- EXISTING WATER LINE
- SERVICE AREA BOUNDARY
- JUNCTION
- RESERVOIR

N:\PROJECTS\MOFFITT\CAD\ENGINEERING\EXHIBITS\MASTER UTILITY STUDY\WATER REPORT EXHIBIT-AMENDMENT 1.DWG, CONORTHAM, 10/24/2024 8:46 AM

PREPARED UNDER THE SUPERVISION OF

CRAIG C. NORTHAM
COLORADO P.E. 30276

APPROVED ONE YEAR FROM THIS DATE

CITY ENGINEER — DATE

WATER DEPARTMENT — DATE

FIRE DEPARTMENT — DATE

No.	Revisions	Date	Init.	Appr.	Date

Westwood
10333 E DRY CREEK RD.
SUITE 400
ENGLEWOOD, CO 80112
TEL: 720.482.9526
Westwoodps.com
Westwood Professional Services, Inc.

WESTSIDE INVESTMENT PARTNERS, INC
4100 EAST MISSISSIPPI AVENUE, SUITE 500
DENVER, CO 80246
TEL: (303) 984-9800

SKYDANCE
MASTER UTILITY REPORT
WATER LAYOUT PLAN

SCALE:	FILE NO:
AS SHOWN	R00229250.01

DRAWN BY:	CHECKED BY:	DATE:
NJ	CON	OCTOBER 2024

SHEET NUMBER: WL1

SKYDANCE AMENDMENT 1
CITY OF AURORA
WATER CALCULATIONS

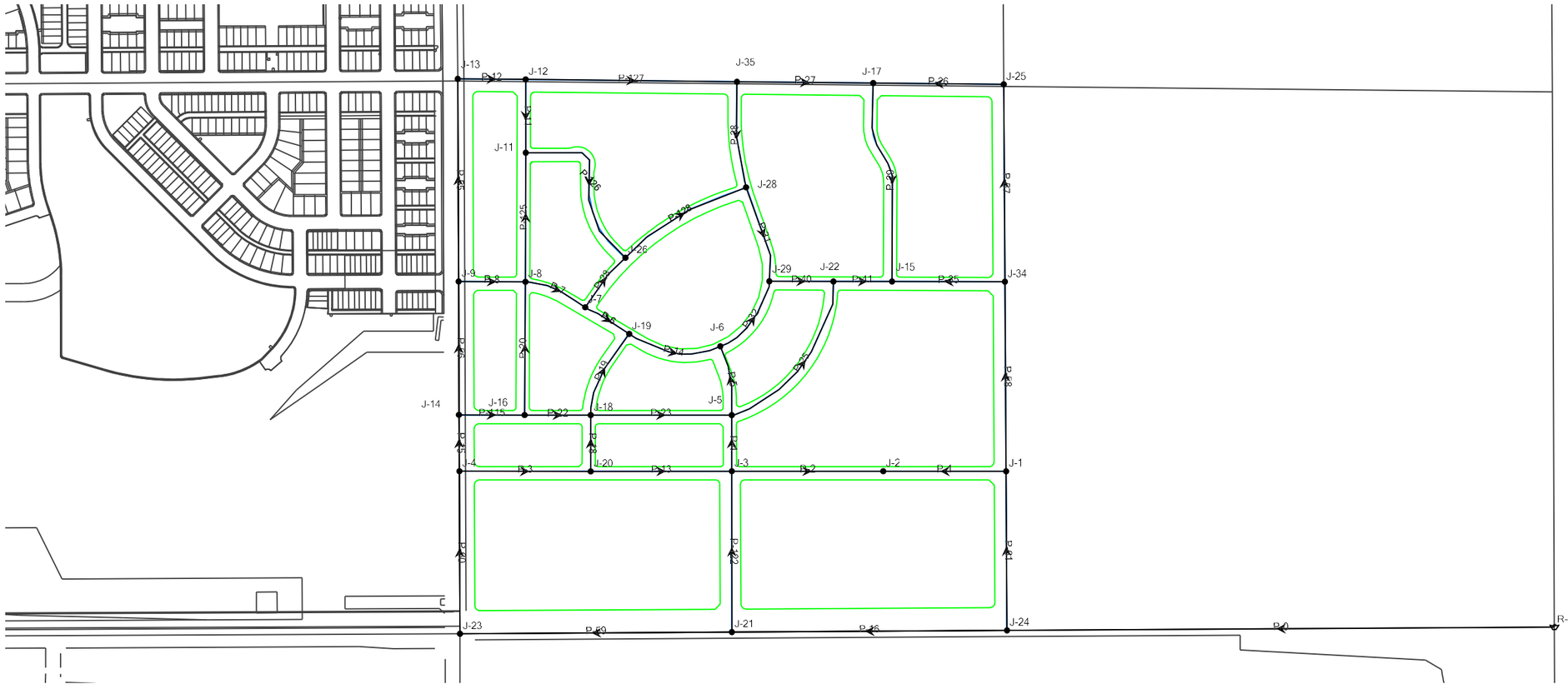
Basin/Planning Area	Max DU/ACRE (Per the Master Plan)	Max Total DU (Per the Master Plan)	Max Res. Population (Per the Master Plan)	Area Acres	Use	Residential People/Unit	Residential Units	Residential Population	Commercial Acres	Irrigation Acres	Average Day (GPM)	Max Day (GPM) 2.8:1	Max Hour (GPM) 4.5:1	Required Fire Flow (GPM)	Max Day + Fire Flow (GPM)
1	0	0	0	2.82	OPEN					2.82	3.53	9.87	15.86	1500	1509.87
2	40	86	733	18.33	SFD		86	239			16.76	46.94	75.43	1500	1546.94
3	0	0	0	2.87	OPEN					2.87	3.59	10.05	16.14	1500	1510.05
4	40	22	186	4.66	SFD		22	61			4.28	11.98	19.25	1500	1511.98
5	40	291	291	7.27	MF		291	807			56.60	158.49	254.71	2500	2658.49
6	0	0	0	1.22	PARK					1.22	1.53	4.27	6.86	1500	1504.27
7	40	234	234	5.85	MF		234	649			45.52	127.46	204.84	2500	2627.46
8	40	296	296	7.39	MF		296	820			57.51	161.04	258.81	2500	2661.04
9	0	0	0	3.57	POND					3.57	4.46	12.50	20.08	1500	1512.50
10	0	0	0	1.85	OPEN					1.85	2.31	6.48	10.41	1500	1506.48
11	40	124	428	9.84	SFA		124	344			24.13	67.56	108.58	1500	1567.56
12	0	0	0	3.78	PARK					3.78	4.73	13.23	21.26	1500	1513.23
13	40	20	91	2.27	SFA		20	56			3.93	11.00	17.68	1500	1511.00
14	40	14	87	2.17	SFA	2.77	14	39			2.74	7.66	12.31	1500	1507.66
15	0	0	0	0.44	OPEN					0.44	0.55	1.54	2.48	1500	1501.54
16	0	0	0	7.48	PARK					7.48	9.35	26.18	42.08	1500	1526.18
17	40	14	91	2.27	SFA		14	39			2.74	7.66	12.31	1500	1507.66
18	40	51	481	12.03	SFD		51	142			9.96	27.89	44.82	1500	1527.89
19	0	0	0	1.63	OPEN					1.63	2.04	5.71	9.17	1500	1505.71
20	40	62	321	8.02	SFA		62	172			12.06	33.78	54.29	1500	1533.78
21	40	34	209	5.23	SFA		34	95			6.66	18.66	29.98	1500	1518.66
22	0	0	0	0.73	OPEN					0.73	0.91	2.56	4.11	1500	1502.56
23	0	0	0	4.59	POND					4.59	5.74	16.07	25.82	1500	1516.07
24	0	0	0	2.80	POND/OS					2.80	3.50	9.80	15.75	1500	1509.80
25	40	58	228	5.70	SFA		58	161			11.29	31.62	50.82	1500	1531.62
26	0	0	0	5.40	COMM				5.40		5.63	15.75	25.31	2500	2515.75
27	0	0	0	19.78	COMM				19.78		20.60	57.69	92.72	2500	2557.69
Total		1306	3676	150.0			1306	3624	25.18	33.8	322.6	903.4	1451.9		

Notes:

1. SFD = Single Family Detached, SFA = Single Family Attached, MF = Multi Family, COMM = Commercial
2. GPM = Gallons Per Minute
3. Average Day (GPD) = (101 x Residential Populaton) + (1500 x Commercial Acres) + (1800 * Irrigation Acres)

Max DU/AC values appear correct
Max Res. Population values do not appear correct per COA 2.77 People/Unit criteria
From the Amended FDP Land Use Matrix values (provided 1st submittal)
Population calcs per COA standards and Amended FDP units don't match Amended FDP population

MOFFIT/SKYDANCE
Scenario: AVERAGE DAY
Active Scenario: AVERAGE DAY



MOFFIT/SKYDANCE

FlexTable: Pipe Table

Active Scenario: AVERAGE DAY

Label	Start Node	Stop Node	Length (Scaled) (ft)	Diameter (in)	Material	Hazen-Williams C	Velocity (ft/s)	Flow (gpm)	Headloss Gradient (ft/ft)
P-0	R-1	J-24	2,637	24.0	PVC	150.0	0.33	461.20	0.000
P-1	J-1	J-2	592	8.0	PVC	150.0	0.15	24.16	0.000
P-2	J-2	J-3	729	8.0	PVC	150.0	0.01	-2.23	0.000
P-3	J-20	J-4	633	8.0	PVC	150.0	0.24	-37.27	0.000
P-4	J-3	J-5	270	8.0	PVC	150.0	0.09	14.44	0.000
P-5	J-5	J-6	339	8.0	PVC	150.0	0.03	5.13	0.000
P-6	J-19	J-7	248	8.0	PVC	150.0	0.12	-18.61	0.000
P-7	J-7	J-8	318	8.0	PVC	150.0	0.20	-31.45	0.000
P-8	J-8	J-9	322	8.0	PVC	150.0	0.24	-38.10	0.000
P-11	J-11	J-12	353	8.0	PVC	150.0	0.09	-14.83	0.000
P-12	J-12	J-13	327	12.0	PVC	150.0	0.28	-97.17	0.000
P-13	J-3	J-20	680	8.0	PVC	150.0	0.14	-21.44	0.000
P-14	J-6	J-19	464	8.0	PVC	150.0	0.17	-25.94	0.000
P-15	J-4	J-14	271	24.0	PVC	150.0	0.13	181.67	0.000
P-16	J-24	J-21	1,325	24.0	PVC	150.0	0.23	318.24	0.000
P-18	J-18	J-20	271	8.0	PVC	150.0	0.04	-5.86	0.000
P-19	J-18	J-19	441	8.0	PVC	150.0	0.08	11.89	0.000
P-20	J-8	J-16	641	8.0	PVC	150.0	0.02	-3.22	0.000
P-22	J-18	J-16	318	8.0	PVC	150.0	0.21	-33.05	0.000
P-23	J-5	J-18	680	8.0	PVC	150.0	0.15	-23.17	0.000
P-25	J-22	J-5	862	8.0	PVC	150.0	0.13	-20.87	0.000
P-26	J-17	J-25	629	12.0	PVC	150.0	0.05	-16.96	0.000
P-27	J-35	J-17	657	12.0	PVC	150.0	0.14	48.95	0.000
P-28	J-7	J-26	309	8.0	PVC	150.0	0.06	9.44	0.000
P-29	J-15	J-17	977	8.0	PVC	150.0	0.11	-17.55	0.000
P-31	J-28	J-29	472	8.0	PVC	150.0	0.11	16.99	0.000
P-32	J-29	J-6	411	8.0	PVC	150.0	0.15	-23.76	0.000
P-35	J-15	J-34	544	8.0	PVC	150.0	0.18	-27.48	0.000
P-38	J-28	J-35	512	8.0	PVC	150.0	0.07	-11.60	0.000
P-40	J-29	J-22	309	8.0	PVC	150.0	0.13	21.04	0.000
P-41	J-22	J-15	282	8.0	PVC	150.0	0.15	23.12	0.000
P-55	J-9	J-13	974	24.0	PVC	150.0	0.07	98.06	0.000
P-56	J-14	J-9	642	24.0	PVC	150.0	0.10	138.14	0.000
P-57	J-34	J-25	949	12.0	PVC	150.0	0.06	21.35	0.000
P-58	J-1	J-34	912	12.0	PVC	150.0	0.20	70.26	0.000
P-59	J-21	J-23	1,310	24.0	PVC	150.0	0.16	228.97	0.000
P-60	J-23	J-4	782	24.0	PVC	150.0	0.16	225.12	0.000
P-61	J-24	J-1	765	12.0	PVC	150.0	0.40	140.00	0.000
P-115	J-14	J-16	317	8.0	PVC	150.0	0.26	40.11	0.000
P-122	J-21	J-3	773	8.0	PVC	150.0	0.30	46.38	0.000
P-125	J-8	J-11	621	8.0	PVC	150.0	0.04	6.46	0.000
P-126	J-11	J-26	852	8.0	PVC	150.0	0.12	18.49	0.000
P-127	J-12	J-35	1,018	12.0	PVC	150.0	0.23	80.45	0.000
P-128	J-26	J-28	680	8.0	PVC	150.0	0.17	26.03	0.000

MOFFIT/SKYDANCE

FlexTable: Junction Table

Active Scenario: AVERAGE DAY

Label	Elevation (ft)	Demand (gpm)	Pressure (psi)	Hydraulic Grade (ft)
J-1	5,437.50	45.59	122	5,719.92
J-2	5,438.34	26.39	122	5,719.91
J-3	5,443.55	51.14	120	5,719.91
J-4	5,446.32	6.18	118	5,719.94
J-5	5,444.08	11.61	119	5,719.91
J-6	5,444.98	7.31	119	5,719.91
J-7	5,447.89	3.40	118	5,719.92
J-8	5,448.70	3.40	117	5,719.93
J-9	5,449.66	1.98	117	5,719.94
J-11	5,452.56	2.80	116	5,719.93
J-12	5,454.50	1.90	115	5,719.93
J-13	5,453.50	0.89	115	5,719.94
J-14	5,447.31	3.42	118	5,719.94
J-15	5,439.44	68.14	121	5,719.90
J-16	5,446.63	3.84	118	5,719.93
J-17	5,442.50	48.36	120	5,719.90
J-18	5,445.94	3.84	119	5,719.92
J-19	5,446.89	4.57	118	5,719.92
J-20	5,444.98	9.98	119	5,719.92
J-21	5,434.34	42.89	124	5,719.95
J-22	5,441.55	18.79	120	5,719.90
J-23	5,431.22	3.85	125	5,719.94
J-24	5,437.50	2.96	122	5,719.96
J-25	5,434.50	4.39	123	5,719.90
J-26	5,447.40	1.90	118	5,719.92
J-28	5,445.77	20.64	119	5,719.91
J-29	5,443.72	19.71	119	5,719.90
J-34	5,432.50	21.43	124	5,719.91
J-35	5,446.50	19.90	118	5,719.91

MOFFIT/SKYDANCE

FlexTable: Reservoir Table

Active Scenario: AVERAGE DAY

ID	Label	Elevation (ft)	Flow (Out net) (gpm)	Hydraulic Grade (ft)
30	R-1	5,720.00	461.20	5,720.00

MOFFIT/SKYDANCE

FlexTable: Pipe Table

Active Scenario: MAX. DAY

Label	Start Node	Stop Node	Length (Scaled) (ft)	Diameter (in)	Material	Hazen-Williams C	Velocity (ft/s)	Flow (gpm)	Headloss Gradient (ft/ft)
P-0	R-1	J-24	2,637	24.0	PVC	150.0	0.92	1,291.36	0.000
P-1	J-1	J-2	592	8.0	PVC	150.0	0.43	67.64	0.000
P-2	J-2	J-3	729	8.0	PVC	150.0	0.04	-6.26	0.000
P-3	J-20	J-4	633	8.0	PVC	150.0	0.67	-104.36	0.000
P-4	J-3	J-5	270	8.0	PVC	150.0	0.26	40.43	0.000
P-5	J-5	J-6	339	8.0	PVC	150.0	0.09	14.37	0.000
P-6	J-19	J-7	248	8.0	PVC	150.0	0.33	-52.12	0.000
P-7	J-7	J-8	318	8.0	PVC	150.0	0.56	-88.07	0.000
P-8	J-8	J-9	322	8.0	PVC	150.0	0.68	-106.67	0.000
P-11	J-11	J-12	353	8.0	PVC	150.0	0.26	-41.51	0.000
P-12	J-12	J-13	327	12.0	PVC	150.0	0.77	-272.09	0.000
P-13	J-3	J-20	680	8.0	PVC	150.0	0.38	-60.02	0.000
P-14	J-6	J-19	464	8.0	PVC	150.0	0.46	-72.63	0.000
P-15	J-4	J-14	271	24.0	PVC	150.0	0.36	508.67	0.000
P-16	J-24	J-21	1,325	24.0	PVC	150.0	0.63	891.06	0.000
P-18	J-18	J-20	271	8.0	PVC	150.0	0.10	-16.40	0.000
P-19	J-18	J-19	441	8.0	PVC	150.0	0.21	33.30	0.000
P-20	J-8	J-16	641	8.0	PVC	150.0	0.06	-9.01	0.000
P-22	J-18	J-16	318	8.0	PVC	150.0	0.59	-92.53	0.000
P-23	J-5	J-18	680	8.0	PVC	150.0	0.41	-64.87	0.000
P-25	J-22	J-5	862	8.0	PVC	150.0	0.37	-58.43	0.000
P-26	J-17	J-25	629	12.0	PVC	150.0	0.13	-47.48	0.000
P-27	J-35	J-17	657	12.0	PVC	150.0	0.39	137.05	0.000
P-28	J-7	J-26	309	8.0	PVC	150.0	0.17	26.43	0.000
P-29	J-15	J-17	977	8.0	PVC	150.0	0.31	-49.13	0.000
P-31	J-28	J-29	472	8.0	PVC	150.0	0.30	47.57	0.000
P-32	J-29	J-6	411	8.0	PVC	150.0	0.42	-66.53	0.000
P-35	J-15	J-34	544	8.0	PVC	150.0	0.49	-76.94	0.000
P-38	J-28	J-35	512	8.0	PVC	150.0	0.21	-32.48	0.000
P-40	J-29	J-22	309	8.0	PVC	150.0	0.38	58.91	0.000
P-41	J-22	J-15	282	8.0	PVC	150.0	0.41	64.72	0.000
P-55	J-9	J-13	974	24.0	PVC	150.0	0.19	274.58	0.000
P-56	J-14	J-9	642	24.0	PVC	150.0	0.27	386.80	0.000
P-57	J-34	J-25	949	12.0	PVC	150.0	0.17	59.78	0.000
P-58	J-1	J-34	912	12.0	PVC	150.0	0.56	196.72	0.000
P-59	J-21	J-23	1,310	24.0	PVC	150.0	0.45	641.11	0.000
P-60	J-23	J-4	782	24.0	PVC	150.0	0.45	630.33	0.000
P-61	J-24	J-1	765	12.0	PVC	150.0	1.11	392.01	0.000
P-115	J-14	J-16	317	8.0	PVC	150.0	0.72	112.29	0.000
P-122	J-21	J-3	773	8.0	PVC	150.0	0.83	129.86	0.000
P-125	J-8	J-11	621	8.0	PVC	150.0	0.12	18.09	0.000
P-126	J-11	J-26	852	8.0	PVC	150.0	0.33	51.76	0.000
P-127	J-12	J-35	1,018	12.0	PVC	150.0	0.64	225.25	0.000
P-128	J-26	J-28	680	8.0	PVC	150.0	0.47	72.88	0.000

MOFFIT/SKYDANCE

FlexTable: Junction Table

Active Scenario: MAX. DAY

Label	Elevation (ft)	Demand (gpm)	Pressure (psi)	Hydraulic Grade (ft)
J-1	5,437.50	127.65	122	5,719.46
J-2	5,438.34	73.89	122	5,719.40
J-3	5,443.55	143.19	119	5,719.40
J-4	5,446.32	17.30	118	5,719.59
J-5	5,444.08	32.51	119	5,719.39
J-6	5,444.98	20.47	119	5,719.39
J-7	5,447.89	9.52	117	5,719.45
J-8	5,448.70	9.52	117	5,719.50
J-9	5,449.66	5.54	117	5,719.57
J-11	5,452.56	7.84	115	5,719.50
J-12	5,454.50	5.32	115	5,719.51
J-13	5,453.50	2.49	115	5,719.57
J-14	5,447.31	9.58	118	5,719.58
J-15	5,439.44	190.79	121	5,719.30
J-16	5,446.63	10.75	118	5,719.50
J-17	5,442.50	135.41	120	5,719.35
J-18	5,445.94	10.75	118	5,719.45
J-19	5,446.89	12.80	118	5,719.44
J-20	5,444.98	27.94	119	5,719.45
J-21	5,434.34	120.09	123	5,719.65
J-22	5,441.55	52.61	120	5,719.33
J-23	5,431.22	10.78	125	5,719.61
J-24	5,437.50	8.29	122	5,719.72
J-25	5,434.50	12.29	123	5,719.36
J-26	5,447.40	5.32	118	5,719.45
J-28	5,445.77	57.79	118	5,719.37
J-29	5,443.72	55.19	119	5,719.35
J-34	5,432.50	60.00	124	5,719.37
J-35	5,446.50	55.72	118	5,719.39

MOFFIT/SKYDANCE

FlexTable: Reservoir Table

Active Scenario: MAX. DAY

ID	Label	Elevation (ft)	Flow (Out net) (gpm)	Hydraulic Grade (ft)
30	R-1	5,720.00	1,291.36	5,720.00

MOFFIT/SKYDANCE

FlexTable: Pipe Table

Active Scenario: MAX HR

Label	Start Node	Stop Node	Length (Scaled) (ft)	Diameter (in)	Material	Hazen-Williams C	Velocity (ft/s)	Flow (gpm)	Headloss Gradient (ft/ft)
P-0	R-1	J-24	2,637	24.0	PVC	150.0	1.47	2,075.40	0.000
P-1	J-1	J-2	592	8.0	PVC	150.0	0.69	108.70	0.000
P-2	J-2	J-3	729	8.0	PVC	150.0	0.06	-10.05	0.000
P-3	J-20	J-4	633	8.0	PVC	150.0	1.07	-167.72	0.001
P-4	J-3	J-5	270	8.0	PVC	150.0	0.41	64.98	0.000
P-5	J-5	J-6	339	8.0	PVC	150.0	0.15	23.10	0.000
P-6	J-19	J-7	248	8.0	PVC	150.0	0.53	-83.77	0.000
P-7	J-7	J-8	318	8.0	PVC	150.0	0.90	-141.55	0.000
P-8	J-8	J-9	322	8.0	PVC	150.0	1.09	-171.44	0.001
P-11	J-11	J-12	353	8.0	PVC	150.0	0.43	-66.72	0.000
P-12	J-12	J-13	327	12.0	PVC	150.0	1.24	-437.28	0.000
P-13	J-3	J-20	680	8.0	PVC	150.0	0.62	-96.46	0.000
P-14	J-6	J-19	464	8.0	PVC	150.0	0.75	-116.72	0.000
P-15	J-4	J-14	271	24.0	PVC	150.0	0.58	817.50	0.000
P-16	J-24	J-21	1,325	24.0	PVC	150.0	1.02	1,432.06	0.000
P-18	J-18	J-20	271	8.0	PVC	150.0	0.17	-26.35	0.000
P-19	J-18	J-19	441	8.0	PVC	150.0	0.34	53.52	0.000
P-20	J-8	J-16	641	8.0	PVC	150.0	0.09	-14.48	0.000
P-22	J-18	J-16	318	8.0	PVC	150.0	0.95	-148.71	0.000
P-23	J-5	J-18	680	8.0	PVC	150.0	0.67	-104.26	0.000
P-25	J-22	J-5	862	8.0	PVC	150.0	0.60	-93.90	0.000
P-26	J-17	J-25	629	12.0	PVC	150.0	0.22	-76.31	0.000
P-27	J-35	J-17	657	12.0	PVC	150.0	0.62	220.26	0.000
P-28	J-7	J-26	309	8.0	PVC	150.0	0.27	42.48	0.000
P-29	J-15	J-17	977	8.0	PVC	150.0	0.50	-78.95	0.000
P-31	J-28	J-29	472	8.0	PVC	150.0	0.49	76.45	0.000
P-32	J-29	J-6	411	8.0	PVC	150.0	0.68	-106.92	0.000
P-35	J-15	J-34	544	8.0	PVC	150.0	0.79	-123.66	0.000
P-38	J-28	J-35	512	8.0	PVC	150.0	0.33	-52.20	0.000
P-40	J-29	J-22	309	8.0	PVC	150.0	0.60	94.68	0.000
P-41	J-22	J-15	282	8.0	PVC	150.0	0.66	104.02	0.000
P-55	J-9	J-13	974	24.0	PVC	150.0	0.31	441.29	0.000
P-56	J-14	J-9	642	24.0	PVC	150.0	0.44	621.64	0.000
P-57	J-34	J-25	949	12.0	PVC	150.0	0.27	96.07	0.000
P-58	J-1	J-34	912	12.0	PVC	150.0	0.90	316.16	0.000
P-59	J-21	J-23	1,310	24.0	PVC	150.0	0.73	1,030.36	0.000
P-60	J-23	J-4	782	24.0	PVC	150.0	0.72	1,013.03	0.000
P-61	J-24	J-1	765	12.0	PVC	150.0	1.79	630.02	0.001
P-115	J-14	J-16	317	8.0	PVC	150.0	1.15	180.47	0.001
P-122	J-21	J-3	773	8.0	PVC	150.0	1.33	208.70	0.001
P-125	J-8	J-11	621	8.0	PVC	150.0	0.19	29.08	0.000
P-126	J-11	J-26	852	8.0	PVC	150.0	0.53	83.19	0.000
P-127	J-12	J-35	1,018	12.0	PVC	150.0	1.03	362.01	0.000
P-128	J-26	J-28	680	8.0	PVC	150.0	0.75	117.12	0.000

MOFFIT/SKYDANCE

FlexTable: Junction Table

Active Scenario: MAX HR

Label	Elevation (ft)	Demand (gpm)	Pressure (psi)	Hydraulic Grade (ft)
J-1	5,437.50	205.15	122	5,718.69
J-2	5,438.34	118.76	121	5,718.55
J-3	5,443.55	230.13	119	5,718.56
J-4	5,446.32	27.81	118	5,719.01
J-5	5,444.08	52.24	119	5,718.53
J-6	5,444.98	32.90	118	5,718.53
J-7	5,447.89	15.30	117	5,718.68
J-8	5,448.70	15.30	117	5,718.80
J-9	5,449.66	8.91	117	5,718.98
J-11	5,452.56	12.60	115	5,718.79
J-12	5,454.50	8.55	114	5,718.82
J-13	5,453.50	4.01	115	5,718.96
J-14	5,447.31	15.39	118	5,718.99
J-15	5,439.44	306.63	121	5,718.32
J-16	5,446.63	17.28	118	5,718.81
J-17	5,442.50	217.62	119	5,718.45
J-18	5,445.94	17.28	118	5,718.68
J-19	5,446.89	20.57	118	5,718.65
J-20	5,444.98	44.91	118	5,718.68
J-21	5,434.34	193.01	123	5,719.15
J-22	5,441.55	84.56	120	5,718.38
J-23	5,431.22	17.33	125	5,719.06
J-24	5,437.50	13.32	122	5,719.32
J-25	5,434.50	19.75	123	5,718.46
J-26	5,447.40	8.55	117	5,718.67
J-28	5,445.77	92.88	118	5,718.49
J-29	5,443.72	88.69	119	5,718.44
J-34	5,432.50	96.43	124	5,718.48
J-35	5,446.50	89.55	118	5,718.52

MOFFIT/SKYDANCE

FlexTable: Reservoir Table

Active Scenario: MAX HR

ID	Label	Elevation (ft)	Flow (Out net) (gpm)	Hydraulic Grade (ft)
30	R-1	5,720.00	2,075.40	5,720.00

MOFFIT/SKYDANCE

FlexTable: Pipe Table

Active Scenario: MAX DAY + FIRE FLOW

Label	Start Node	Stop Node	Length (Scaled) (ft)	Diameter (in)	Material	Hazen-Williams C	Velocity (ft/s)	Flow (gpm)	Headloss Gradient (ft/ft)
P-0	R-1	J-24	2,637	24.0	PVC	150.0	4.46	6,291.36	0.002
P-1	J-1	J-2	592	8.0	PVC	150.0	12.26	1,920.78	0.047
P-2	J-2	J-3	729	8.0	PVC	150.0	10.55	-1,653.12	0.036
P-3	J-20	J-4	633	8.0	PVC	150.0	3.42	-536.19	0.004
P-4	J-3	J-5	270	8.0	PVC	150.0	3.69	-578.50	0.005
P-5	J-5	J-6	339	8.0	PVC	150.0	1.34	-210.48	0.001
P-6	J-19	J-7	248	8.0	PVC	150.0	0.55	-85.48	0.000
P-7	J-7	J-8	318	8.0	PVC	150.0	2.26	-353.40	0.002
P-8	J-8	J-9	322	8.0	PVC	150.0	4.16	-652.17	0.006
P-11	J-11	J-12	353	8.0	PVC	150.0	4.71	-738.39	0.008
P-12	J-12	J-13	327	12.0	PVC	150.0	4.19	-1,477.17	0.004
P-13	J-3	J-20	680	8.0	PVC	150.0	2.97	-465.81	0.003
P-14	J-6	J-19	464	8.0	PVC	150.0	1.51	-236.01	0.001
P-15	J-4	J-14	271	24.0	PVC	150.0	1.96	2,762.77	0.000
P-16	J-24	J-21	1,325	24.0	PVC	150.0	2.98	4,199.14	0.001
P-18	J-18	J-20	271	8.0	PVC	150.0	0.27	-42.44	0.000
P-19	J-18	J-19	441	8.0	PVC	150.0	1.04	163.33	0.000
P-20	J-8	J-16	641	8.0	PVC	150.0	1.20	-188.75	0.001
P-22	J-18	J-16	318	8.0	PVC	150.0	2.66	-416.32	0.003
P-23	J-5	J-18	680	8.0	PVC	150.0	1.82	-284.67	0.001
P-25	J-22	J-5	862	8.0	PVC	150.0	0.74	115.86	0.000
P-26	J-17	J-25	629	12.0	PVC	150.0	0.51	180.56	0.000
P-27	J-35	J-17	657	12.0	PVC	150.0	1.28	449.61	0.000
P-28	J-7	J-26	309	8.0	PVC	150.0	1.65	258.40	0.001
P-29	J-15	J-17	977	8.0	PVC	150.0	0.85	-133.64	0.000
P-31	J-28	J-29	472	8.0	PVC	150.0	0.84	131.97	0.000
P-32	J-29	J-6	411	8.0	PVC	150.0	0.03	-5.06	0.000
P-35	J-15	J-34	544	8.0	PVC	150.0	0.92	-143.77	0.000
P-38	J-28	J-35	512	8.0	PVC	150.0	1.46	-228.13	0.001
P-40	J-29	J-22	309	8.0	PVC	150.0	0.52	81.84	0.000
P-41	J-22	J-15	282	8.0	PVC	150.0	0.55	-86.62	0.000
P-55	J-9	J-13	974	24.0	PVC	150.0	1.05	1,479.66	0.000
P-56	J-14	J-9	642	24.0	PVC	150.0	1.52	2,137.38	0.000
P-57	J-34	J-25	949	12.0	PVC	150.0	0.48	-168.27	0.000
P-58	J-1	J-34	912	12.0	PVC	150.0	0.10	35.51	0.000
P-59	J-21	J-23	1,310	24.0	PVC	150.0	2.36	3,327.04	0.001
P-60	J-23	J-4	782	24.0	PVC	150.0	2.35	3,316.26	0.001
P-61	J-24	J-1	765	12.0	PVC	150.0	5.91	2,083.94	0.008
P-115	J-14	J-16	317	8.0	PVC	150.0	3.93	615.82	0.006
P-122	J-21	J-3	773	8.0	PVC	150.0	4.80	752.00	0.008
P-125	J-8	J-11	621	8.0	PVC	150.0	3.05	478.00	0.004
P-126	J-11	J-26	852	8.0	PVC	150.0	1.86	-291.45	0.001
P-127	J-12	J-35	1,018	12.0	PVC	150.0	2.08	733.46	0.001
P-128	J-26	J-28	680	8.0	PVC	150.0	0.24	-38.37	0.000

MOFFIT/SKYDANCE

FlexTable: Junction Table

Active Scenario: MAX DAY + FIRE FLOW

Label	Elevation (ft)	Demand (gpm)	Pressure (psi)	Hydraulic Grade (ft)
J-1	5,437.50	127.65	117	5,708.92
J-2	5,438.34	3,573.89	105	5,681.14
J-3	5,443.55	143.19	114	5,707.07
J-4	5,446.32	17.30	115	5,712.18
J-5	5,444.08	32.51	114	5,708.44
J-6	5,444.98	20.47	114	5,708.71
J-7	5,447.89	9.52	113	5,709.19
J-8	5,448.70	9.52	113	5,709.84
J-9	5,449.66	5.54	113	5,711.88
J-11	5,452.56	1,507.84	110	5,707.62
J-12	5,454.50	5.32	111	5,710.44
J-13	5,453.50	2.49	112	5,711.75
J-14	5,447.31	9.58	115	5,712.06
J-15	5,439.44	190.79	116	5,708.71
J-16	5,446.63	10.75	114	5,710.25
J-17	5,442.50	135.41	115	5,709.04
J-18	5,445.94	10.75	114	5,709.37
J-19	5,446.89	12.80	113	5,709.15
J-20	5,444.98	27.94	114	5,709.38
J-21	5,434.34	120.09	121	5,713.46
J-22	5,441.55	52.61	116	5,708.66
J-23	5,431.22	10.78	122	5,712.66
J-24	5,437.50	8.29	120	5,714.72
J-25	5,434.50	12.29	119	5,708.98
J-26	5,447.40	5.32	113	5,708.84
J-28	5,445.77	57.79	114	5,708.86
J-29	5,443.72	55.19	115	5,708.71
J-34	5,432.50	60.00	120	5,708.92
J-35	5,446.50	55.72	114	5,709.33

MOFFIT/SKYDANCE

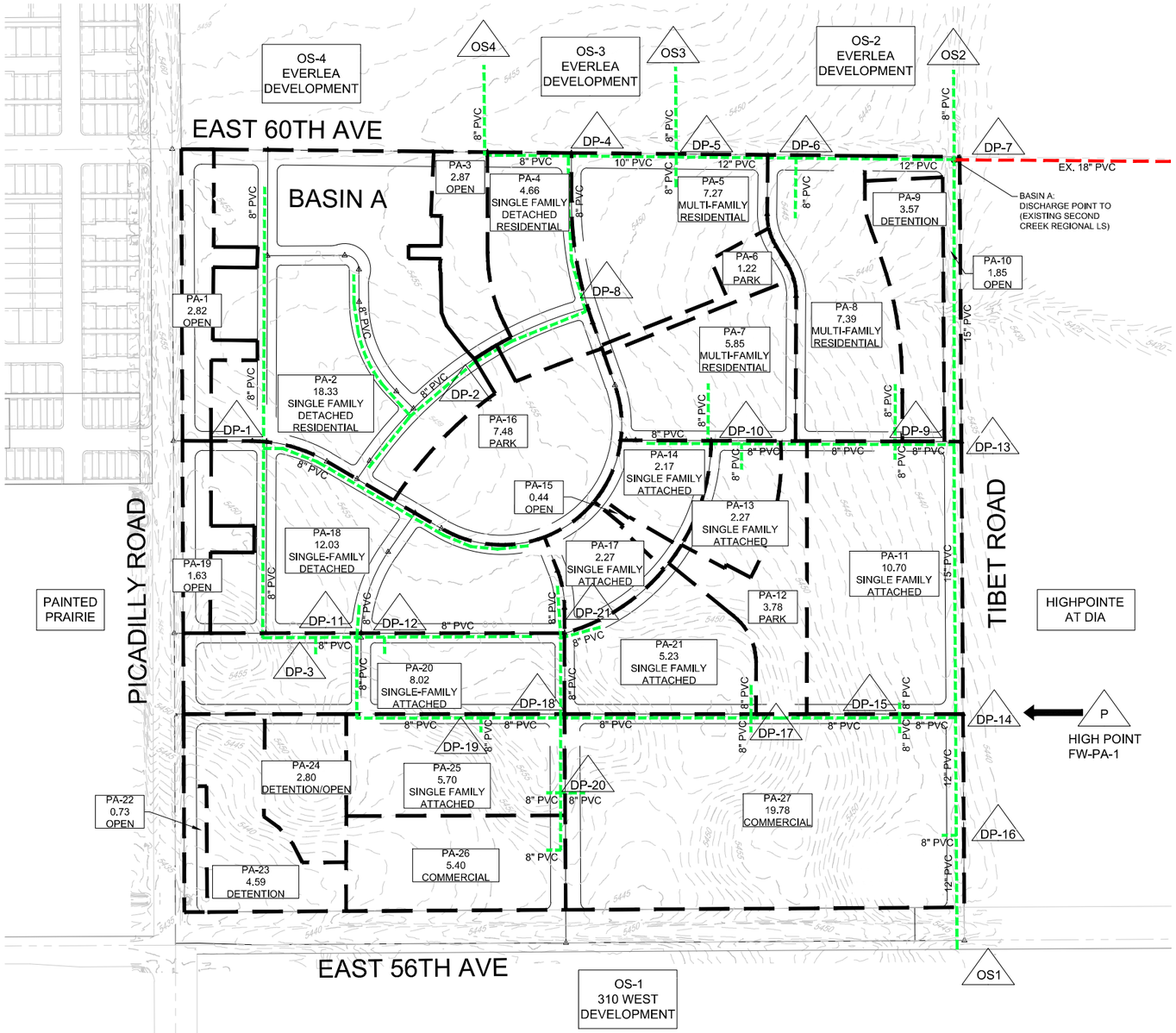
FlexTable: Reservoir Table

Active Scenario: MAX DAY + FIRE FLOW

ID	Label	Elevation (ft)	Flow (Out net) (gpm)	Hydraulic Grade (ft)
30	R-1	5,720.00	6,291.36	5,720.00

APPENDIX C

Wastewater Demands, Calculations, and Layout



200 100 0 200 400

SCALE: 1" = 200'

LEGEND

XX
XX — PLANNING AREA BASIN
ACRES
LAND USE

XX — DESIGN POINT

PROPOSED SANITARY LINE

EXISTING SANITARY LINE

BASIN BOUNDARY

No.	Revisions	Date	Init.	Appr.	Date

Westwood
10333 E DRY CREEK RD.
SUITE 400
ENGLEWOOD, CO 80112
TEL: 720.482.9526
Westwoodps.com
Westwood Professional Services, Inc.

WESTSIDE INVESTMENT PARTNERS, INC
4100 EAST MISSISSIPPI AVENUE, SUITE 500
DENVER, CO 80246
TEL: (303) 984-9800

SKYDANCE
MASTER UTILITY REPORT
SANITARY MODEL LAYOUT

SCALE:	FILE NO:
AS SHOWN	R0029250.01

DRAWN BY:	CHECKED BY:	DATE:
NJ	CDK	OCTOBER 2024

SHEET NUMBER: SS1

APPROVED ONE YEAR FROM THIS DATE

CITY ENGINEER _____ DATE _____

WATER DEPARTMENT _____ DATE _____

FIRE DEPARTMENT _____ DATE _____

N:\PROJECTS\MOFFITCAD\ENGINEERING\EXHIBITS\MASTER UTILITY STUDY\SANITARY REPORT EXHIBIT-AMENDMENT 1.DWG, CCNORTHAM, 10/24/2024 9:34 AM

SKYDANCE-AMENDMENT 1

CITY OF AURORA

SANITARY SEWER LOADING CALCULATIONS (BY ACREAGE)

PLANNING AREA	DESCRIPTION	AREA (AC)	MAX ALLOWABLE DENSITY (DU/AC)	MAX ALLOWABLE UNITS	PROPOSED UNITS	OCCUPANCY (PEOPLE/UNIT)	LOADING RATE (GPCD)	AVERAGE DAY (GPD/AC)	EQUIVALENT (POPULATION/AC)	AVG DAY FLOW (GPD)	POPULATION (THOUSANDS)
A		**150.85**			**885**					**283,655**	**4.176**
A	PA-1	OPEN	2.82								
	PA-2	SFD	18.33			86	2.77	68			16,199	0.239
	PA-3	OPEN	2.87								
	PA-4	SFD	4.66			22	2.77	68			4,144	0.061
	PA-5	MF	7.27	40	291	142	2.77	68			54,775	0.806
	PA-6	PARK	1.22									
	PA-7	MF	5.85	40	234	114	2.77	68			44,076	0.649
	PA-8	MF	7.39	40	296	144	2.77	68			55,679	0.819
	PA-9	POND	3.57									
	PA-10	OPEN	1.85									
	PA-11	SFA	10.70			124	2.77	68			23,357	0.344
	PA-12	PARK	3.78									
	PA-13	SFA	2.27			20	2.77	68			3,767	0.056
	PA-14	SFA	2.17			14	2.77	68			2,637	0.039
	PA-15	OPEN	0.44									
	PA-16	PARK	7.48									
	PA-17	SFA	2.27			14	2.77	68			2,637	0.039
	PA-18	SFD	12.03			51	2.77	68			9,606	0.142
	PA-19	OPEN	1.63									
	PA-20	SFA	8.02			62	2.77	68			11,678	0.172
	PA-21	SFA	5.23			34	2.77	68			6,404	0.095
	PA-22	OPEN	0.73									
	PA-23	POND	4.59									
	PA-24	POND/OPEN	2.80									
	PA-25	SFA	5.70			58	2.77	68			10,925	0.161
	PA-26	COMM	5.40						1500	22	8,100	0.119
	PA-27	COMM	19.78						1500	22	29,670	0.435
A		**98.08**			**1064**					**240,615**	**3.54**
	EVERLEA*	SF	19.33			230	2.77	68			43,323	0.637
	OS-2	MF	7.06	40.0	282.4	186	2.77	68			35,035	0.515
		COMM	11.32						1500	22	16,980	0.249
	EVERLEA*	SF	9.09			44	2.77	68			8,288	0.122
	OS-3											
	EVERLEA*	SF	23.24			184	2.77	68			34,658	0.510
	OS-4	COMM	15.48						1500	22	23,220	0.341
		MF	12.56	40.0	502.4	420	2.77	68			79,111	1.163

A

	FLOWS FOR 310 WEST PROVIDED TO WESTWOOD PROFESSIONAL SERVICES FROM DEWBERRY PER EMAIL ON 4/25/2022. 310 WEST DEVELOPMENT IS LOCATED AT THE SOUTH EAST CORNER OF THE PICADILLY ROAD AND E. 56TH AVENUE INTERSECTION. FLOWS WILL CROSS E. 56TH AVENUE AND FLOW ALONG TIBET ROAD AT THE SOUTHEAST CORNER OF THE PROJECT SITE.	AVG DAY FLOW (GPD)	POPULATION (THOUSANDS)
		375,000	2.449

BASIN A = Existing Second Creek Regional LS.
BASIN OS-1 = Flows from south - 310 West Development
BASIN OS-2-4 = Flows from north - Everlea Development

SF = Single Family. Includes Single Family attached, Single Family detached, townhomes, paired homes, and garden court homes.
MF = Multi Family. Includes condos and apartments.

COMM = Commercial.
Peaking Factor = 4.0 max, $5/P^{0.167}$ where P=population (thousands)
Sanitary Sewer loading rates, factors, and calculations based on City of Aurora Master Utility Design Criteria for Water and Sanitary Sewer
Occupancy factors were used based on City of Aurora Master Utility Design Criteria for Water and Sanitary Sewer
*Offsite flow from the Everlea(North) Development located between 64th & 60th Avenue, east of Picadilly Road provided via Everlea MUR COA EDN #223281)

MOFFIT/SKYDANCE TOWN CENTER

CITY OF AURORA

SANITARY SEWER PEAK ROUTING CALCULATIONS

Design Point	Added Upstream Routing Planning Areas	Included Upstream Routing Design Pts	Design Point Loading (gpd)	Cumulative Loading (gpd)	Design Point Population (thousand)	Cumulative Population (thousand)	Cumulative Infiltration 10% (gpd)	Peaking Factor	Cumulative Peak Loading (gpd)	Cumulative Peak Loading (cfs)	Required Pipe Size (in)	Minimum Slope* (%)	Maximum Slope* (%)	Percentage Full (%)
DP-1	45% PA-2, 30% PA-18		10,171	10,171	0.150	0.150	1,017	4.00	41,703	0.06	8	0.4	97.0	17.5
DP-2	55% PA-2		8,909	19,081	0.131	0.282	1,908	4.00	78,232	0.12	8	0.4	53.9	24.6
DP-3	40% PA-20	1	4,671	14,843	0.069	0.219	1,484	4.00	60,855	0.09	8	0.4	69.5	21.3
DP-8	25% PA-4,40% PA-5, 40% PA-7	2	40,577	59,657	0.597	0.879	5,966	4.00	244,595	0.38	8	0.4	19.7	45.2
DP-4	75% PA-4, OS-4	2, 8	140,097	199,755	2.059	2.938	19,975	4.00	818,995	1.27	10	0.4	7.4	66.2
DP-5	60% PA-5, OS-3	2,4, 8, OS-4	41,153	240,908	0.605	3.544	24,091	4.00	987,721	1.53	12	0.4	7.1	54.3
DP-6	50% PA-8	2,4-5, 8, OS-3,4	27,840	268,747	0.410	3.953	26,875	3.97	1,095,003	1.69	12	0.4	6.5	57.8
DP-11	15% PA-18	1, 3, 12	1,441	24,732	0.021	0.365	2,473	4.00	101,400	0.16	8	0.4	41.5	28.5
DP-21	PA-17, 40% PA-21		5,199	5,199	0.077	0.077	520	4.00	21,315	0.03	8	0.4	180.0	12.5
DP-12	15% PA-18, 60% PA-20		8,448	8,448	0.125	0.125	845	4.00	34,637	0.05	8	0.4	110.0	16.0
DP-10	PA-13, PA-14, 60% PA-7		32,850	32,850	0.484	0.484	3,285	4.00	134,685	0.21	8	0.4	32.8	32.8
DP-19	50% PA-25	1,3,11,12	5,462	30,194	0.081	0.445	3,019	4.00	123,796	0.19	8	0.4	35.8	31.1
DP-20	50% PA-25, PA-26, 25% PA-27		20,980	20,980	0.308	0.308	2,098	4.00	86,018	0.13	8	0.4	48.8	25.6
DP-18		1,3,11-12,19-21		45,975		0.676	4,598	4.00	188,499	0.29	8	0.4	24.9	38.9
DP-17	60% PA-21, 25% PA-27	1,3,11-12,18-21	11,260	57,235	0.166	0.842	5,724	4.00	234,665	0.36	8	0.4	20.7	43.9
DP-OS-1	OS-1***		375,000	375,000	2.449	2.449	37,500	4.00	1,537,500	2.38	12	0.4	5.0	73.7
DP-16	25% PA-27	OS-1	7,418	382,418	0.109	2.558	38,242	4.00	1,567,912	2.43	12	0.4	4.9	75.0
DP-15	25% PA-27, 50% PA-11	1,3,11-12,17-21	19,096	76,331	0.281	1.123	7,633	4.00	312,958	0.48	8	0.4	16.3	51.8
DP-14	50% FW-PA-1*	1,3,11-12,15-21	113,000	571,749	1.662	5.343	57,175	3.78	2,218,096	3.43	15	0.4	3.9	62.3
DP-9	50% PA-11, 50% PA-8	10	39,518	72,368	0.582	1.066	7,237	4.00	296,708	0.46	8	0.4	16.7	50.5
DP-13		1,3,9-12,14-21		644,117		6.409	64,412	3.67	2,426,004	3.75	15	0.4	3.6	66.2
DP-7	OS-2	1-6,8-21,OS-1,3,4	95,338	1,008,202	1.401	11.763	100,820	3.31	3,440,768	5.32	18	0.4	2.9	60.3
OUTFALL	**TOTAL OUTFALL FROM MOFFIT SITE**								**3,440,768**	**5.32**	**18**	**0.4**	**2.9**	**60.3**

Off-Site

HP-DP-FW1	FW PA-1(50%) & 12*	DP-7 & FW-O & P*	128,000	1,136,202	1.882	13.645	12,800	3.23	3,684,641	5.70	18	0.4	2.7	63.2
HP-DP-16	HP-B2**	HP-DP-FW1*	119,000	1,255,202	1.753	15.398	11,900	3.17	3,987,256	6.17	18	0.4	2.6	66.8
HP-DP-17	HP-B3**	HP-DP-16**	48,000	1,303,202	0.724	16.122	4,800	3.14	4,100,629	6.35	18	0.4	2.5	68.2
HP-DP-19	HP-B4**	HP-DP-17 & 18**	124,000	1,427,202	1.863	17.985	12,400	3.09	4,416,777	6.83	18	0.4	2.4	72.1
HP-DP-20	HP-B5, B6, & B7**	HP-DP-15 & 19**	563,000	1,990,202	8.371	26.356	56,300	2.90	5,818,385	9.00	21	0.4	2.0	65.2
HP-DP-25	HP-B8 & B9**	HP-DP-20 & 26**	77,000	2,067,202	1.146	27.502	7,700	2.87	5,950,327	9.21	21	0.4	1.9	66.3
HP-DP-21/LS		HP-DP-25**							**5,950,327**	**9.21**	**21**	**0.4**	**1.9**	**66.3**

Refer to attached Flow Master analysis sheets for pipe calculations.

Achieve a minimum velocity of 2.0 ft/sec and a maximum percent full capacity of 75% for pipes 12" and smaller or 80% for pipes larger than 12"

* Fulenwider Master Utility Report by Martin/Martin, July 22, 2019 (COA #220131MU1)

** High Point at DIA-FDP Amendment No. 4-Master Utility Study Amendment

*** 310 West email from Dewberry on 4/25/22

Worksheet for DP-1

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.011
Channel Slope	0.004 ft/ft
Diameter	8.0 in
Discharge	0.06 cfs

Results	
Normal Depth	1.4 in
Flow Area	0.0 ft²
Wetted Perimeter	0.6 ft
Hydraulic Radius	0.9 in
Top Width	0.51 ft
Critical Depth	1.3 in
Percent Full	17.5 %
Critical Slope	0.005 ft/ft
Velocity	1.47 ft/s
Velocity Head	0.03 ft
Specific Energy	0.15 ft
Froude Number	0.910
Maximum Discharge	0.97 cfs
Discharge Full	0.90 cfs
Slope Full	0.000 ft/ft
Flow Type	Subcritical

GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	39.4 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	1.4 in
Critical Depth	1.3 in
Channel Slope	0.004 ft/ft
Critical Slope	0.005 ft/ft

Worksheet for DP-2

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.011
Channel Slope	0.004 ft/ft
Diameter	8.0 in
Discharge	0.12 cfs

Results	
Normal Depth	2.0 in
Flow Area	0.1 ft²
Wetted Perimeter	0.7 ft
Hydraulic Radius	1.2 in
Top Width	0.57 ft
Critical Depth	1.9 in
Percent Full	24.6 %
Critical Slope	0.005 ft/ft
Velocity	1.80 ft/s
Velocity Head	0.05 ft
Specific Energy	0.21 ft
Froude Number	0.929
Maximum Discharge	0.97 cfs
Discharge Full	0.90 cfs
Slope Full	0.000 ft/ft
Flow Type	Subcritical

GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	39.4 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	2.0 in
Critical Depth	1.9 in
Channel Slope	0.004 ft/ft
Critical Slope	0.005 ft/ft

Worksheet for DP-3

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.011
Channel Slope	0.004 ft/ft
Diameter	8.0 in
Discharge	0.09 cfs

Results	
Normal Depth	1.7 in
Flow Area	0.1 ft²
Wetted Perimeter	0.6 ft
Hydraulic Radius	1.0 in
Top Width	0.55 ft
Critical Depth	1.6 in
Percent Full	21.3 %
Critical Slope	0.005 ft/ft
Velocity	1.65 ft/s
Velocity Head	0.04 ft
Specific Energy	0.18 ft
Froude Number	0.923
Maximum Discharge	0.97 cfs
Discharge Full	0.90 cfs
Slope Full	0.000 ft/ft
Flow Type	Subcritical

GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	39.4 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	1.7 in
Critical Depth	1.6 in
Channel Slope	0.004 ft/ft
Critical Slope	0.005 ft/ft

Worksheet for DP-4

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.011
Channel Slope	0.004 ft/ft
Diameter	10.0 in
Discharge	1.27 cfs

Results	
Normal Depth	6.6 in
Flow Area	0.4 ft²
Wetted Perimeter	1.6 ft
Hydraulic Radius	2.9 in
Top Width	0.79 ft
Critical Depth	6.0 in
Percent Full	66.2 %
Critical Slope	0.005 ft/ft
Velocity	3.32 ft/s
Velocity Head	0.17 ft
Specific Energy	0.72 ft
Froude Number	0.839
Maximum Discharge	1.76 cfs
Discharge Full	1.64 cfs
Slope Full	0.002 ft/ft
Flow Type	Subcritical

GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	39.4 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	6.6 in
Critical Depth	6.0 in
Channel Slope	0.004 ft/ft
Critical Slope	0.005 ft/ft

Worksheet for DP-5

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.011
Channel Slope	0.004 ft/ft
Diameter	12.0 in
Discharge	1.53 cfs

Results	
Normal Depth	6.5 in
Flow Area	0.4 ft²
Wetted Perimeter	1.7 ft
Hydraulic Radius	3.2 in
Top Width	1.00 ft
Critical Depth	6.3 in
Percent Full	54.3 %
Critical Slope	0.004 ft/ft
Velocity	3.51 ft/s
Velocity Head	0.19 ft
Specific Energy	0.73 ft
Froude Number	0.935
Maximum Discharge	2.86 cfs
Discharge Full	2.66 cfs
Slope Full	0.001 ft/ft
Flow Type	Subcritical

GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	39.4 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	6.5 in
Critical Depth	6.3 in
Channel Slope	0.004 ft/ft
Critical Slope	0.004 ft/ft

Worksheet for DP-6

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.011
Channel Slope	0.004 ft/ft
Diameter	12.0 in
Discharge	1.69 cfs

Results	
Normal Depth	6.9 in
Flow Area	0.5 ft²
Wetted Perimeter	1.7 ft
Hydraulic Radius	3.3 in
Top Width	0.99 ft
Critical Depth	6.6 in
Percent Full	57.8 %
Critical Slope	0.005 ft/ft
Velocity	3.59 ft/s
Velocity Head	0.20 ft
Specific Energy	0.78 ft
Froude Number	0.917
Maximum Discharge	2.86 cfs
Discharge Full	2.66 cfs
Slope Full	0.002 ft/ft
Flow Type	Subcritical

GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	24.9 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	6.9 in
Critical Depth	6.6 in
Channel Slope	0.004 ft/ft
Critical Slope	0.005 ft/ft

Worksheet for DP-7

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.011
Channel Slope	0.004 ft/ft
Diameter	18.0 in
Discharge	5.32 cfs

Results	
Normal Depth	10.9 in
Flow Area	1.1 ft²
Wetted Perimeter	2.7 ft
Hydraulic Radius	5.0 in
Top Width	1.47 ft
Critical Depth	10.7 in
Percent Full	60.3 %
Critical Slope	0.004 ft/ft
Velocity	4.77 ft/s
Velocity Head	0.35 ft
Specific Energy	1.26 ft
Froude Number	0.966
Maximum Discharge	8.45 cfs
Discharge Full	7.85 cfs
Slope Full	0.002 ft/ft
Flow Type	Subcritical

GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	34.7 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	10.9 in
Critical Depth	10.7 in
Channel Slope	0.004 ft/ft
Critical Slope	0.004 ft/ft

Worksheet for DP-8

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.011
Channel Slope	0.004 ft/ft
Diameter	8.0 in
Discharge	0.38 cfs

Results	
Normal Depth	3.6 in
Flow Area	0.2 ft²
Wetted Perimeter	1.0 ft
Hydraulic Radius	1.9 in
Top Width	0.66 ft
Critical Depth	3.4 in
Percent Full	45.2 %
Critical Slope	0.005 ft/ft
Velocity	2.48 ft/s
Velocity Head	0.10 ft
Specific Energy	0.40 ft
Froude Number	0.909
Maximum Discharge	0.97 cfs
Discharge Full	0.90 cfs
Slope Full	0.001 ft/ft
Flow Type	Subcritical

GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	39.4 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	3.6 in
Critical Depth	3.4 in
Channel Slope	0.004 ft/ft
Critical Slope	0.005 ft/ft

Worksheet for DP-9

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.011
Channel Slope	0.004 ft/ft
Diameter	8.0 in
Discharge	0.46 cfs

Results	
Normal Depth	4.0 in
Flow Area	0.2 ft²
Wetted Perimeter	1.1 ft
Hydraulic Radius	2.0 in
Top Width	0.67 ft
Critical Depth	3.8 in
Percent Full	50.5 %
Critical Slope	0.005 ft/ft
Velocity	2.60 ft/s
Velocity Head	0.11 ft
Specific Energy	0.44 ft
Froude Number	0.890
Maximum Discharge	0.97 cfs
Discharge Full	0.90 cfs
Slope Full	0.001 ft/ft
Flow Type	Subcritical

GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	32.2 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	4.0 in
Critical Depth	3.8 in
Channel Slope	0.004 ft/ft
Critical Slope	0.005 ft/ft

Worksheet for DP-10

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.011
Channel Slope	0.004 ft/ft
Diameter	8.0 in
Discharge	0.21 cfs

Results	
Normal Depth	2.6 in
Flow Area	0.1 ft²
Wetted Perimeter	0.8 ft
Hydraulic Radius	1.5 in
Top Width	0.63 ft
Critical Depth	2.5 in
Percent Full	32.8 %
Critical Slope	0.005 ft/ft
Velocity	2.11 ft/s
Velocity Head	0.07 ft
Specific Energy	0.29 ft
Froude Number	0.930
Maximum Discharge	0.97 cfs
Discharge Full	0.90 cfs
Slope Full	0.000 ft/ft
Flow Type	Subcritical

GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	4.2 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	2.6 in
Critical Depth	2.5 in
Channel Slope	0.004 ft/ft
Critical Slope	0.005 ft/ft

Worksheet for DP-11

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.011
Channel Slope	0.004 ft/ft
Diameter	8.0 in
Discharge	0.16 cfs

Results	
Normal Depth	2.3 in
Flow Area	0.1 ft²
Wetted Perimeter	0.8 ft
Hydraulic Radius	1.3 in
Top Width	0.60 ft
Critical Depth	2.2 in
Percent Full	28.5 %
Critical Slope	0.005 ft/ft
Velocity	1.95 ft/s
Velocity Head	0.06 ft
Specific Energy	0.25 ft
Froude Number	0.934
Maximum Discharge	0.97 cfs
Discharge Full	0.90 cfs
Slope Full	0.000 ft/ft
Flow Type	Subcritical

GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	26.8 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	2.3 in
Critical Depth	2.2 in
Channel Slope	0.004 ft/ft
Critical Slope	0.005 ft/ft

Worksheet for DP-12

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.011
Channel Slope	0.004 ft/ft
Diameter	8.0 in
Discharge	0.05 cfs

Results	
Normal Depth	1.3 in
Flow Area	0.0 ft²
Wetted Perimeter	0.5 ft
Hydraulic Radius	0.8 in
Top Width	0.49 ft
Critical Depth	1.2 in
Percent Full	16.0 %
Critical Slope	0.005 ft/ft
Velocity	1.39 ft/s
Velocity Head	0.03 ft
Specific Energy	0.14 ft
Froude Number	0.903
Maximum Discharge	0.97 cfs
Discharge Full	0.90 cfs
Slope Full	0.000 ft/ft
Flow Type	Subcritical

GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	3.0 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	1.3 in
Critical Depth	1.2 in
Channel Slope	0.004 ft/ft
Critical Slope	0.005 ft/ft

Worksheet for DP-13

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.011
Channel Slope	0.004 ft/ft
Diameter	15.0 in
Discharge	3.75 cfs

Results	
Normal Depth	9.9 in
Flow Area	0.9 ft²
Wetted Perimeter	2.4 ft
Hydraulic Radius	4.4 in
Top Width	1.18 ft
Critical Depth	9.4 in
Percent Full	66.2 %
Critical Slope	0.005 ft/ft
Velocity	4.35 ft/s
Velocity Head	0.29 ft
Specific Energy	1.12 ft
Froude Number	0.897
Maximum Discharge	5.19 cfs
Discharge Full	4.83 cfs
Slope Full	0.002 ft/ft
Flow Type	Subcritical

GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	19.0 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	9.9 in
Critical Depth	9.4 in
Channel Slope	0.004 ft/ft
Critical Slope	0.005 ft/ft

Worksheet for DP-14

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.011
Channel Slope	0.004 ft/ft
Diameter	15.0 in
Discharge	3.43 cfs

Results	
Normal Depth	9.3 in
Flow Area	0.8 ft²
Wetted Perimeter	2.3 ft
Hydraulic Radius	4.2 in
Top Width	1.21 ft
Critical Depth	9.0 in
Percent Full	62.3 %
Critical Slope	0.005 ft/ft
Velocity	4.27 ft/s
Velocity Head	0.28 ft
Specific Energy	1.06 ft
Froude Number	0.924
Maximum Discharge	5.19 cfs
Discharge Full	4.83 cfs
Slope Full	0.002 ft/ft
Flow Type	Subcritical

GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	19.5 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	9.3 in
Critical Depth	9.0 in
Channel Slope	0.004 ft/ft
Critical Slope	0.005 ft/ft

Worksheet for DP-15

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.011
Channel Slope	0.004 ft/ft
Diameter	8.0 in
Discharge	0.48 cfs

Results	
Normal Depth	4.1 in
Flow Area	0.2 ft²
Wetted Perimeter	1.1 ft
Hydraulic Radius	2.0 in
Top Width	0.67 ft
Critical Depth	3.9 in
Percent Full	51.8 %
Critical Slope	0.005 ft/ft
Velocity	2.63 ft/s
Velocity Head	0.11 ft
Specific Energy	0.45 ft
Froude Number	0.884
Maximum Discharge	0.97 cfs
Discharge Full	0.90 cfs
Slope Full	0.001 ft/ft
Flow Type	Subcritical

GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	15.4 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	4.1 in
Critical Depth	3.9 in
Channel Slope	0.004 ft/ft
Critical Slope	0.005 ft/ft

Worksheet for DP-16

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.011
Channel Slope	0.004 ft/ft
Diameter	12.0 in
Discharge	2.43 cfs

Results	
Normal Depth	9.0 in
Flow Area	0.6 ft²
Wetted Perimeter	2.1 ft
Hydraulic Radius	3.6 in
Top Width	0.87 ft
Critical Depth	8.0 in
Percent Full	75.0 %
Critical Slope	0.005 ft/ft
Velocity	3.84 ft/s
Velocity Head	0.23 ft
Specific Energy	0.98 ft
Froude Number	0.793
Maximum Discharge	2.86 cfs
Discharge Full	2.66 cfs
Slope Full	0.003 ft/ft
Flow Type	Subcritical

GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	34.3 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	9.0 in
Critical Depth	8.0 in
Channel Slope	0.004 ft/ft
Critical Slope	0.005 ft/ft

Worksheet for DP-17

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.011
Channel Slope	0.004 ft/ft
Diameter	8.0 in
Discharge	0.36 cfs

Results	
Normal Depth	3.5 in
Flow Area	0.1 ft²
Wetted Perimeter	1.0 ft
Hydraulic Radius	1.8 in
Top Width	0.66 ft
Critical Depth	3.3 in
Percent Full	43.9 %
Critical Slope	0.005 ft/ft
Velocity	2.44 ft/s
Velocity Head	0.09 ft
Specific Energy	0.39 ft
Froude Number	0.913
Maximum Discharge	0.97 cfs
Discharge Full	0.90 cfs
Slope Full	0.001 ft/ft
Flow Type	Subcritical

GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	15.3 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	3.5 in
Critical Depth	3.3 in
Channel Slope	0.004 ft/ft
Critical Slope	0.005 ft/ft

Worksheet for DP-18

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.011
Channel Slope	0.004 ft/ft
Diameter	8.0 in
Discharge	0.29 cfs

Results	
Normal Depth	3.1 in
Flow Area	0.1 ft²
Wetted Perimeter	0.9 ft
Hydraulic Radius	1.7 in
Top Width	0.65 ft
Critical Depth	3.0 in
Percent Full	38.9 %
Critical Slope	0.005 ft/ft
Velocity	2.31 ft/s
Velocity Head	0.08 ft
Specific Energy	0.34 ft
Froude Number	0.925
Maximum Discharge	0.97 cfs
Discharge Full	0.90 cfs
Slope Full	0.000 ft/ft
Flow Type	Subcritical

GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	8.0 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	3.1 in
Critical Depth	3.0 in
Channel Slope	0.004 ft/ft
Critical Slope	0.005 ft/ft

Worksheet for DP-19

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.011
Channel Slope	0.004 ft/ft
Diameter	8.0 in
Discharge	0.19 cfs

Results	
Normal Depth	2.5 in
Flow Area	0.1 ft²
Wetted Perimeter	0.8 ft
Hydraulic Radius	1.4 in
Top Width	0.62 ft
Critical Depth	2.4 in
Percent Full	31.1 %
Critical Slope	0.005 ft/ft
Velocity	2.05 ft/s
Velocity Head	0.07 ft
Specific Energy	0.27 ft
Froude Number	0.932
Maximum Discharge	0.97 cfs
Discharge Full	0.90 cfs
Slope Full	0.000 ft/ft
Flow Type	Subcritical

GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	11.0 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	2.5 in
Critical Depth	2.4 in
Channel Slope	0.004 ft/ft
Critical Slope	0.005 ft/ft

Worksheet for DP-20

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.011
Channel Slope	0.004 ft/ft
Diameter	8.0 in
Discharge	0.13 cfs

Results	
Normal Depth	2.1 in
Flow Area	0.1 ft²
Wetted Perimeter	0.7 ft
Hydraulic Radius	1.2 in
Top Width	0.58 ft
Critical Depth	2.0 in
Percent Full	25.6 %
Critical Slope	0.005 ft/ft
Velocity	1.84 ft/s
Velocity Head	0.05 ft
Specific Energy	0.22 ft
Froude Number	0.930
Maximum Discharge	0.97 cfs
Discharge Full	0.90 cfs
Slope Full	0.000 ft/ft
Flow Type	Subcritical

GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	8.6 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	2.1 in
Critical Depth	2.0 in
Channel Slope	0.004 ft/ft
Critical Slope	0.005 ft/ft

Worksheet for DP-21

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.011
Channel Slope	0.004 ft/ft
Diameter	8.0 in
Discharge	0.03 cfs

Results	
Normal Depth	1.0 in
Flow Area	0.0 ft²
Wetted Perimeter	0.5 ft
Hydraulic Radius	0.6 in
Top Width	0.44 ft
Critical Depth	0.9 in
Percent Full	12.5 %
Critical Slope	0.005 ft/ft
Velocity	1.20 ft/s
Velocity Head	0.02 ft
Specific Energy	0.11 ft
Froude Number	0.883
Maximum Discharge	0.97 cfs
Discharge Full	0.90 cfs
Slope Full	0.000 ft/ft
Flow Type	Subcritical

GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	3.0 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	1.0 in
Critical Depth	0.9 in
Channel Slope	0.004 ft/ft
Critical Slope	0.005 ft/ft

Worksheet for DP-OS-1

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.011
Channel Slope	0.004 ft/ft
Diameter	12.0 in
Discharge	2.38 cfs

Results	
Normal Depth	8.8 in
Flow Area	0.6 ft²
Wetted Perimeter	2.1 ft
Hydraulic Radius	3.6 in
Top Width	0.88 ft
Critical Depth	7.9 in
Percent Full	73.7 %
Critical Slope	0.005 ft/ft
Velocity	3.83 ft/s
Velocity Head	0.23 ft
Specific Energy	0.97 ft
Froude Number	0.805
Maximum Discharge	2.86 cfs
Discharge Full	2.66 cfs
Slope Full	0.003 ft/ft
Flow Type	Subcritical

GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	41.9 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	8.8 in
Critical Depth	7.9 in
Channel Slope	0.004 ft/ft
Critical Slope	0.005 ft/ft

Worksheet for HP-DP-16

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.011
Channel Slope	0.004 ft/ft
Diameter	18.0 in
Discharge	6.17 cfs

Results	
Normal Depth	12.0 in
Flow Area	1.3 ft²
Wetted Perimeter	2.9 ft
Hydraulic Radius	5.2 in
Top Width	1.41 ft
Critical Depth	11.5 in
Percent Full	66.8 %
Critical Slope	0.005 ft/ft
Velocity	4.92 ft/s
Velocity Head	0.38 ft
Specific Energy	1.38 ft
Froude Number	0.921
Maximum Discharge	8.45 cfs
Discharge Full	7.85 cfs
Slope Full	0.002 ft/ft
Flow Type	Subcritical

GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	36.2 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	12.0 in
Critical Depth	11.5 in
Channel Slope	0.004 ft/ft
Critical Slope	0.005 ft/ft

Worksheet for HP-DP-17

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.011
Channel Slope	0.004 ft/ft
Diameter	18.0 in
Discharge	6.35 cfs

Results	
Normal Depth	12.3 in
Flow Area	1.3 ft²
Wetted Perimeter	2.9 ft
Hydraulic Radius	5.3 in
Top Width	1.40 ft
Critical Depth	11.7 in
Percent Full	68.2 %
Critical Slope	0.005 ft/ft
Velocity	4.95 ft/s
Velocity Head	0.38 ft
Specific Energy	1.40 ft
Froude Number	0.909
Maximum Discharge	8.45 cfs
Discharge Full	7.85 cfs
Slope Full	0.003 ft/ft
Flow Type	Subcritical

GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	36.2 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	12.3 in
Critical Depth	11.7 in
Channel Slope	0.004 ft/ft
Critical Slope	0.005 ft/ft

Worksheet for HP-DP-19

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.011
Channel Slope	0.004 ft/ft
Diameter	18.0 in
Discharge	6.83 cfs

Results	
Normal Depth	13.0 in
Flow Area	1.4 ft²
Wetted Perimeter	3.0 ft
Hydraulic Radius	5.4 in
Top Width	1.35 ft
Critical Depth	12.1 in
Percent Full	72.1 %
Critical Slope	0.005 ft/ft
Velocity	5.00 ft/s
Velocity Head	0.39 ft
Specific Energy	1.47 ft
Froude Number	0.876
Maximum Discharge	8.45 cfs
Discharge Full	7.85 cfs
Slope Full	0.003 ft/ft
Flow Type	Subcritical

GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	38.7 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	13.0 in
Critical Depth	12.1 in
Channel Slope	0.004 ft/ft
Critical Slope	0.005 ft/ft

Worksheet for HP-DP-20

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.011
Channel Slope	0.004 ft/ft
Diameter	21.0 in
Discharge	9.00 cfs

Results	
Normal Depth	13.7 in
Flow Area	1.7 ft²
Wetted Perimeter	3.3 ft
Hydraulic Radius	6.1 in
Top Width	1.67 ft
Critical Depth	13.4 in
Percent Full	65.2 %
Critical Slope	0.004 ft/ft
Velocity	5.42 ft/s
Velocity Head	0.46 ft
Specific Energy	1.60 ft
Froude Number	0.957
Maximum Discharge	12.74 cfs
Discharge Full	11.84 cfs
Slope Full	0.002 ft/ft
Flow Type	Subcritical

GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	41.2 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	13.7 in
Critical Depth	13.4 in
Channel Slope	0.004 ft/ft
Critical Slope	0.004 ft/ft

Worksheet for HP-DP-25

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data		
Roughness Coefficient	0.011	
Channel Slope	0.004	ft/ft
Diameter	21.0	in
Discharge	9.21	cfs

Results		
Normal Depth	13.9	in
Flow Area	1.7	ft^2
Wetted Perimeter	3.3	ft
Hydraulic Radius	6.1	in
Top Width	1.65	ft
Critical Depth	13.5	in
Percent Full	66.3	%
Critical Slope	0.004	ft/ft
Velocity	5.44	ft/s
Velocity Head	0.46	ft
Specific Energy	1.62	ft
Froude Number	0.949	
Maximum Discharge	12.74	cfs
Discharge Full	11.84	cfs
Slope Full	0.002	ft/ft
Flow Type	Subcritical	

GVF Input Data		
Downstream Depth	0.0	in
Length	0.0	ft
Number Of Steps	0	

GVF Output Data		
Upstream Depth	0.0	in
Profile Description	N/A	
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.0	%
Normal Depth Over Rise	40.2	%
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	13.9	in
Critical Depth	13.5	in
Channel Slope	0.004	ft/ft
Critical Slope	0.004	ft/ft

Worksheet for HP-DP-FW1

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.011
Channel Slope	0.004 ft/ft
Diameter	18.0 in
Discharge	5.70 cfs

Results	
Normal Depth	11.4 in
Flow Area	1.2 ft²
Wetted Perimeter	2.8 ft
Hydraulic Radius	5.1 in
Top Width	1.45 ft
Critical Depth	11.1 in
Percent Full	63.2 %
Critical Slope	0.004 ft/ft
Velocity	4.85 ft/s
Velocity Head	0.36 ft
Specific Energy	1.31 ft
Froude Number	0.947
Maximum Discharge	8.45 cfs
Discharge Full	7.85 cfs
Slope Full	0.002 ft/ft
Flow Type	Subcritical

GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	36.2 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	11.4 in
Critical Depth	11.1 in
Channel Slope	0.004 ft/ft
Critical Slope	0.004 ft/ft

APPENDIX D

Wastewater Routing capacity allocation through High Point at DIA

217021MU1
2004-3087
94P

MASTER UTILITY REPORT
FOR
High Point at DIA
Starwood CPG Operations, LLC

February 3, 2017

Prepared for:

Aurora Water
15151 E. Alameda Pkwy
Aurora, Colorado
Phone: 303.739.7370
Contact: Vern Adam, Engineering Services Manager

Prepared by:

ENGINEERING CONSULTANTS

6505 South Paris Street, Suite B
Centennial, Colorado 80111
Phone: 303-368-5601
Fax: 303-368-5603
Contact: Cliff Stephens, P.E.

CITY OF AURORA APPROVAL BLOCK

City Engineer	03/02/2017 Date
Aurora Water Department	2/28/2017 Date
Aurora Fire Department	3/01/2017 Date

Sanitary Sewer Routing - Basin B

Design Point	Basin(s)	Average Daily Flow (gpd)	Cumulative Equivalent Pop	Peak Factor	Peak Flow (gpd)	Inflow and Infiltration (gpd)	Design Flow (gpd)	Design Flow (mgd)	Design Flow (cfs)	Req'd Pipe Diameter (in)
DP-21	HPB-5	120600.00								
Total		**120600.00**	**1773.53**	**4.00**	**482400.00**	**12060.00**	**494460.00**	**0.49**	**0.77**	**8.00**

Design Point	Basin(s)	Average Daily Flow (gpd)	Cumulative Equivalent Pop	Peak Factor	Peak Flow (gpd)	Inflow and Infiltration (gpd)	Design Flow (gpd)	Design Flow (mgd)	Design Flow (cfs)	Req'd Pipe Diameter (in)
DP-15	HPB-5	120600.00								
	HPB-1	276600.00								
Total		**397200.00**	**5841.18**	**3.72**	**1479018.78**	**39720.00**	**1518738.78**	**1.52**	**2.35**	**12.00**

Design Point	Basin(s)	Average Daily Flow (gpd)	Cumulative Equivalent Pop	Peak Factor	Peak Flow (gpd)	Inflow and Infiltration (gpd)	Design Flow (gpd)	Design Flow (mgd)	Design Flow (cfs)	Req'd Pipe Diameter (in)
DP-16	HPB-2	119487.60								
Total		**119487.60**	**1757.17**	**4.00**	**477950.40**	**11948.76**	**489899.16**	**0.49**	**0.76**	**8.00**

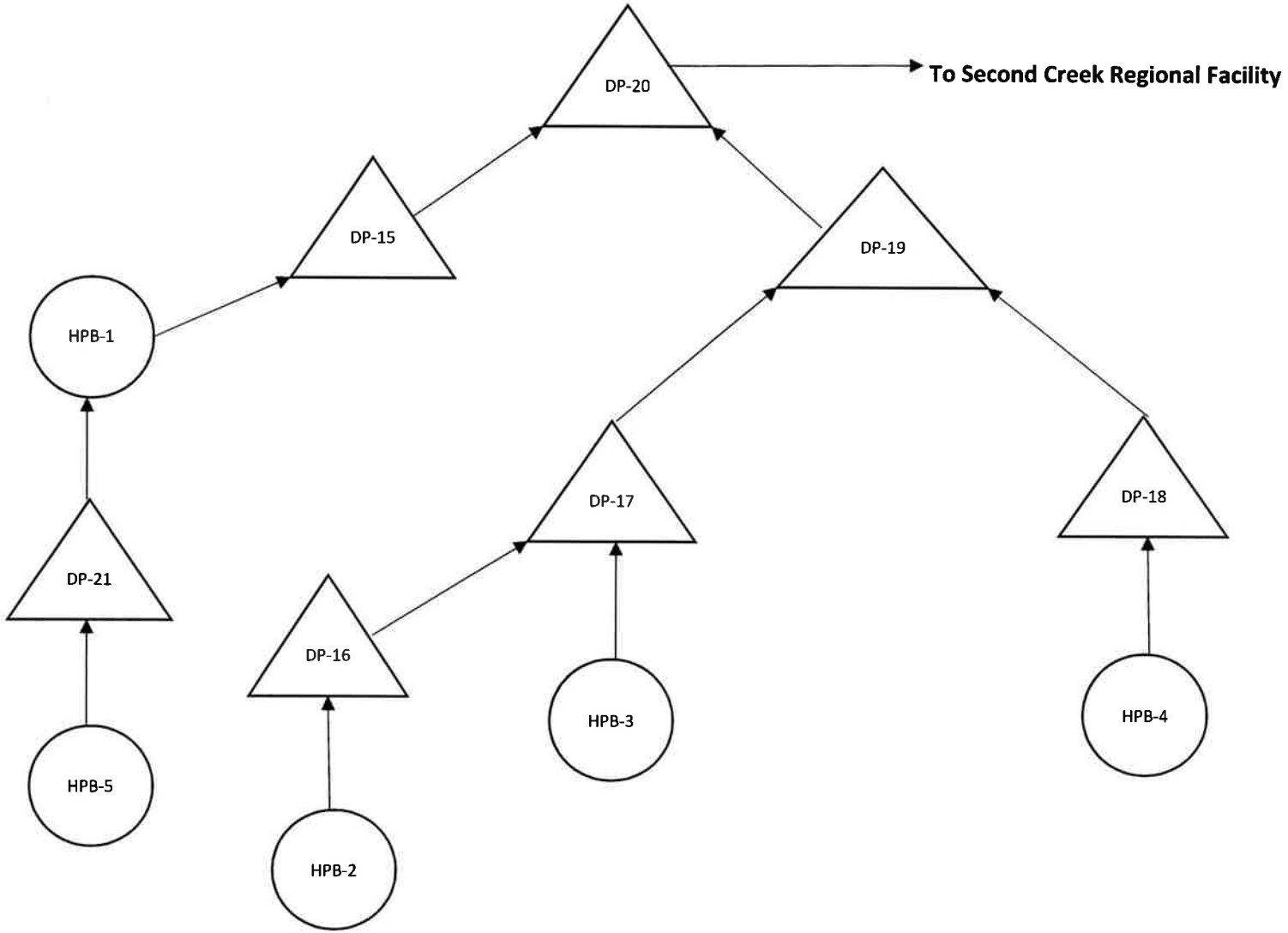
Design Point	Basin(s)	Average Daily Flow (gpd)	Cumulative Equivalent Pop	Peak Factor	Peak Flow (gpd)	Inflow and Infiltration (gpd)	Design Flow (gpd)	Design Flow (mgd)	Design Flow (cfs)	Req'd Pipe Diameter (in)
DP-17	HPB-2	119487.60								
	HPB-3	68850.00								
Total		**188337.60**	**2769.67**	**4.00**	**753350.40**	**18833.76**	**772184.16**	**0.77**	**1.19**	**12.00**

Design Point	Basin(s)	Average Daily Flow (gpd)	Cumulative Equivalent Pop	Peak Factor	Peak Flow (gpd)	Inflow and Infiltration (gpd)	Design Flow (gpd)	Design Flow (mgd)	Design Flow (cfs)	Req'd Pipe Diameter (in)
DP-18	HPB-4	181950.00								
Total		**181950.00**	**2675.74**	**4.00**	**727800.00**	**18195.00**	**745995.00**	**0.75**	**1.15**	**12.00**

Design Point	Basin(s)	Average Daily Flow (gpd)	Cumulative Equivalent Pop	Peak Factor	Peak Flow (gpd)	Inflow and Infiltration (gpd)	Design Flow (gpd)	Design Flow (mgd)	Design Flow (cfs)	Req'd Pipe Diameter (in)
DP-19	HPB-2	119487.60								
	HPB-3	68850.00								
	HPB-4	181950.00								
Total		**370287.60**	**5445.41**	**3.77**	**1395057.54**	**37028.76**	**1432086.30**	**1.43**	**2.22**	**12.00**

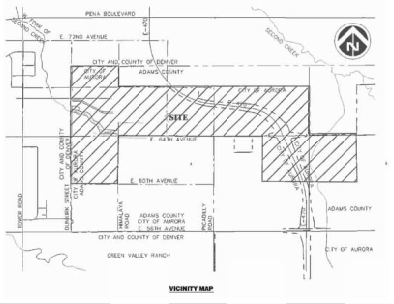
Design Point	Basin(s)	Average Daily Flow (gpd)	Cumulative Equivalent Pop	Peak Factor	Peak Flow (gpd)	Inflow and Infiltration (gpd)	Design Flow (gpd)	Design Flow (mgd)	Design Flow (cfs)	Req'd Pipe Diameter (in)
DP-20	HPB-5	120600.00								
	HPB-1	276600.00								
	HPB-2	119487.60								
	HPB-3	68850.00								
	HPB-4	181950.00								
Total		**767487.60**	**11286.58**	**3.34**	**2560138.39**	**76748.76**	**2636887.15**	**2.64**	**4.08**	**15.00**

Basin B Routing Schematic



LEGEND

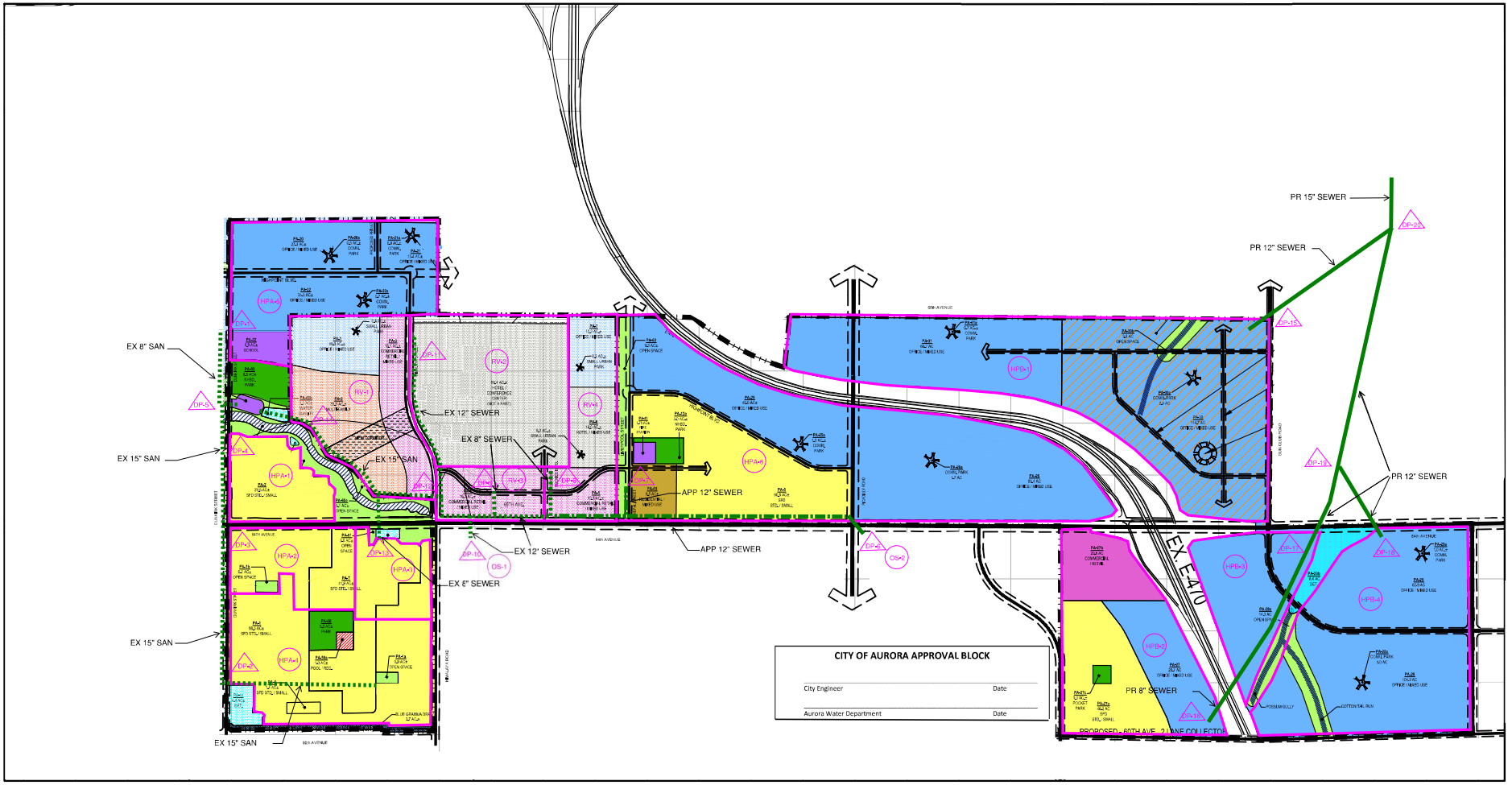
- OFFICE / MIXED USE
- CIVIC USES
- COMMERCIAL RETAIL
- SFD STANDARD / SMALL
- FLOODPLAIN
- WATER QUALITY / DETENTION
- RESIDENTIAL / MIXED USE
- REGIONAL ACTIVITY CENTER (RAC)
- COMMUNITY ACTIVITY CENTER (CAC)
- COMMERCIAL PARK
- PARK
- OPEN SPACE
- BASIN BOUNDARY
- BASIN DESIGNATION (HPA-)
- DESIGN POINT (DP-)
- EXISTING SANITARY SEWER
- APPROVED SANITARY SEWER
- PROPOSED SANITARY SEWER



NORTH

0 300 600 1200

SCALE: 1" = 600'



ENGINEERING CONSULTANTS
Contact: Jason D. Margraf, PE
6539 S. Pena St., Suite 3 - Centennial, CO 80111-6500
(303) 368-8501 - FAX: (303) 368-5603
Email: jmargraf@jdengineering.net

LNR CPI HIGH POINT, LLC
HIGH POINT AT DIA

SANITARY SEWER EXHIBIT

LNR CPI HIGH POINT, LLC
385 Inverness Pkwy #310
Englewood, CO 80112
Tel. (303) 858-9992
Contact: Craig Campbell

No.	Date	Description
1	08/12/2016	INITIAL SUBMITTAL
2	09/30/2016	SECOND SUBMITTAL
3	11/4/2016	THIRD SUBMITTAL
4	12/14/2016	FOURTH SUBMITTAL

DOCUMENT AMENDMENTS

Project Number: 128003
Designed By: CS
Drawn By: AMC
Checked By: JDM
Sheet Number: 2 of 2

MARTIN/MARTIN
CONSULTING ENGINEERS

Fulenwider– Master Utility Report

56TH AVENUE AND HARVEST ROAD
CITY OF AURORA, COLORADO

Martin/Martin, Inc. Project No.: 19.0001

July 22, 2020

City of Aurora Approval Block

~~THT~~	Vernon A. Adam	08/05/2020
	Aurora Water	Date
	Craig Paul for Victor Rachael	07/31/2020
	City Engineer	Date
	Will Polk	07/30/2020
	Fire Department	Date

Prepared For:
L. C. Fulenwider
1125 17th Street, Suite 2500
Denver, CO 80202
303-295-3071

Prepared By:
Martin/Martin, Inc.
12499 West Colfax Avenue
Lakewood, Colorado 80215
303.431.6100

Principal-in-Charge: Patrick F. Horn, P.E. CFM
Project Manager: David M. Le, P.E.
Project Engineer: Gregory R. Proulx, P.E.

FULENWIDER
SANITARY SEWER AVERAGE FLOWS AND POPULATION

Planning Area	Area (Ac)	Type of Development	Avg. Daily Flow/Ac (gpd/ac)	Avg. Daily Flow (MGD)	Equivalent Population /Ac	Population
PA-2	37.5	MU-COMM	1500	0.056	22	825
PA-3	48.1	MU-COMM	1500	0.072	22	1058
PA-4	81.8	MU-INDUSTIRAL	1200	0.098	18	1472
PA-5	117.4	MU-INDUSTIRAL	1200	0.141	18	2113
PA-6	84.0	MU-INDUSTIRAL	1200	0.101	18	1512
PA-7	59.7	MU-INDUSTIRAL	1200	0.072	18	1075
PA-8	16.7	MU-COMM	1500	0.025	22	367
PA-9	37.5	MU-COMM	1500	0.056	22	825
PA-10	75.4	MU-INDUSTIRAL	1200	0.090	18	1357
PA-11	1.7	LIFT STATION	1200	0.002	18	31
PA-12	12.2	XCEL SUBSTATION	1200	0.015	18	220
PA-13	5.0	N.P				
PA-14	4.0	N.P				
PA-15	4.6	2ND CREEK OPEN SPACE				
PA-16	19.7	DETENTION / OPEN SPACE				
PA-17	12.9	DETENTION / OPEN SPACE				
PA-18	3.8	DETENTION / OPEN SPACE				
PA-19	2.4	DETENTION / OPEN SPACE				
PA-20	12.5	FLOOD PLAIN				
PA-21	20.5	FLOOD PLAIN				
PA-22	15.6	FLOOD PLAIN				
PA-23	0.8	LAND ACQUISITION				
PA-24	3.4	LAND ACQUISITION				
PA-25	3.9	2ND CREEK OPEN SPACE				
PA-26	0.5	TRAILHEAD OPEN SPACE				

SANITARY DEMANDS NOT APPLICABLE TO PARKS, OPEN SPACE, DRAINAGE CHANNEL, OR LAND ACQUISITION AREAS

50% of PA-1 + PA-12 = 0.128 MGD

Planning Area	Area (Ac)	Type of Development	Dwelling Units (DU)	CAP/DU	CAP	Avg. Daily Demand gpd/CAP	Avg. Daily Flow (MGD)
PA-1	40.0	MU-RESIDENTIAL	30	2.77	3324	68	0.226

50% of PA-1 = 0.113 MGD

FULENWIDER

SANITARY SEWER PEAK FLOW CALCULATIONS

	Node	Basins Added to System	Total Avg. Daily Flow @ Node (MGD)	Total Upstream Population	Peaking Factor = 5/p^0.167	Peak Flow (MGD)	Infiltration (MGD)	Peak Flow + Infiltration (MGD)	Peak Flow + Infiltration (cfs)
4	T	OFFSITE (page 165 of WINDLER HOMSTEAD REPORT)	0.690	3,250	4.00	2.760	0.069	2.829	4.377
1	S	OFFSITE from 310 West Development	0.403	5,928	3.71	1.497	0.040	1.537	2.378
2	R	OFFSITE from Avelon Development	0.362	5,327	3.78	1.369	0.036	1.405	2.174
	P	50% PA-1	0.878	12,917	3.26	2.864	0.088	2.951	4.566
	O	50% PA-1 + PA-12	1.006	14,799	3.19	3.206	0.101	3.307	5.116
	N	NODE O + PA-2	1.062	15,624	3.16	3.355	0.106	3.461	5.355
	M	PA-3	0.072	1,058	4.00	0.289	0.007	0.296	0.458
	L.1	50% PA-4 + 30% PA-5	0.091	1,370	4.00	0.365	0.009	0.375	0.579
	L	NODE L.1 + 50% PA-4	0.140	2,106	4.00	0.562	0.014	0.576	0.891
3	K	OFFSITE (2nd Creek Tributary WINDLER HOMSTEAD REPORT)	3.683	54,718	2.56	9.439	0.368	9.807	15.174
	J	35% PA-5 + OFFSITE NODE K + OFFSITE NODE T	4.423	58,708	2.53	11.201	0.442	11.644	18.015
	I	PA-8	0.025	367	4.00	0.100	0.003	0.103	0.159
	H	35% PA-5 + NODE L + NODE J + NODE I	4.6	61,554	2.51	11.653	0.464	12.117	18.747
	G	35% PA-6 + NODE H	4.673	62,083	2.51	11.725	0.467	12.192	18.863
	F	PA-9	0.056	825	4.00	0.225	0.006	0.231	0.357
	E.1	30% PA-6	0.030	529	4.00	0.121	0.003	0.124	0.192
	E	OFFSITE + NODE E.1	0.030	529	4.00	0.121	0.003	0.124	0.192
	D	35% PA-6 + NODE G + NODE F	4.764	63,437	2.50	11.911	0.476	12.388	19.166
	C	50% PA-7 + NODE D	4.800	63,974	2.50	11.984	0.480	12.464	19.284
	B	PA-10	0.090	1,357	4.00	0.362	0.009	0.371	0.574
	A	50% PA-7 + NODE B + NODE C + NODE N + NODE M	6.091	145,988	2.18	13.249	0.609	13.858	21.441

1 OFFSITE from 310 West 1.54 MGD based on COA email from Aurora Planning Department & Aurora Water Engineering 11/1/2019

2 Offsite from Avelon Development MUS prepared by Dewberry/J3 dated 8/9/2019 currently under COA Review: DP-19 0.362 MGD & 5,327 Population - 1.84 CFS

3 OFFSITE from 2nd Creek Tributary Area meeting on 06/30/2020

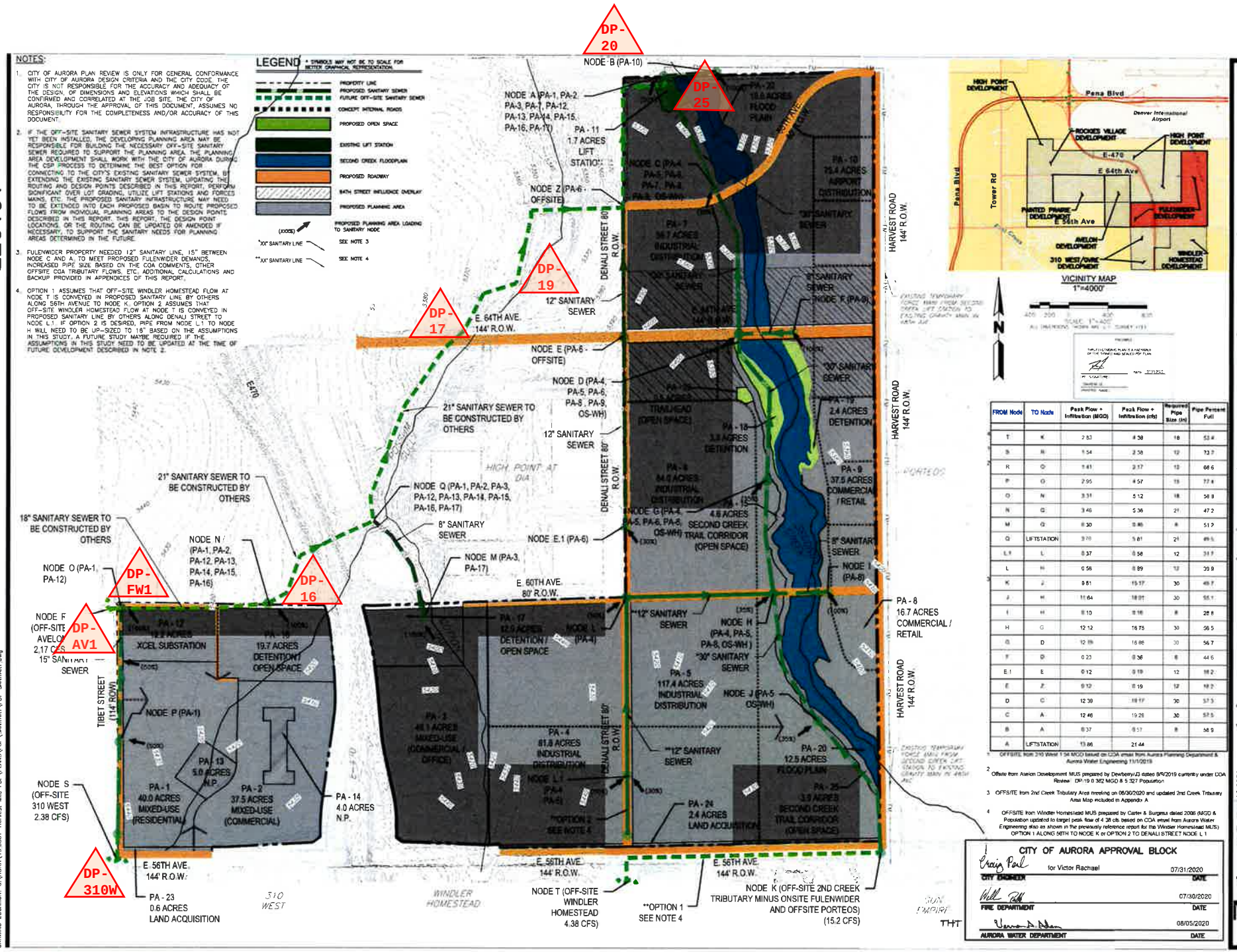
4 OFFSITE from Windler Homestead MUS prepared by Carter & Burgess dated 2006 (MGD & Population updated to target peak flow of 4.38 cfs based on COA email from Aurora Water Engineering also as shown in the previously reference report for the Windler Homestead MUS) OPTION 1 ALONG 56TH TO NODE K or OPTION 2 TO DENALI STREET NODE L.1

FULENWIDER
SANITARY SEWER ROUTING CALCULATIONS

From Node:	To Node:	Basins Added to System	Total Flow Flow (cfs)	Required Pipe Size (in)	Minimum Slope* (%)	Maximum Slope* (%)	Percentage Full (%)
					(see note below)		
T	K	OFFSITE FROM WINDLER HOMESTEAD	4.377	18	0.40	2.03	53.4
S	R	OFFSITE FROM 310 WEST (310)	2.378	12	0.40	2.87	73.7
R	O	OFFSITE FROM AVELON (AV)	2.174	12	0.40	2.87	68.6
P	O	PA-1, AV, 310	4.566	15	0.40	2.13	77.4
O	N	PA-1, PA-12, AV, 310	5.116	18	0.40	2.03	58.8
N	Q	PA-2, AV, 310	5.355	21	0.40	1.65	47.2
M	Q	PA-3	0.458	8	0.40	4.94	51.2
Q	LIFTSTATION	PA-1, PA-2, PA-3, PA-12 AV, 310	5.813	21	0.40	1.65	49.5
K	J	OFFSITE FROM WINDLER HOMESTEAD (WH	15.174	30	0.40	1.00	49.7
J	H	PA-5, WH	18.015	30	0.40	1.00	55.1
L.1	L	PA-5	0.579	12	0.40	2.87	31.7
L	H	PA-4	0.891	12	0.40	2.87	39.9
I	H	PA-8	0.159	8	0.40	4.94	28.8
H	G	PA-4, PA-5, PA-8, WH	18.747	30	0.40	1.00	56.5
G	D	PA-4, PA-5, PA-6, PA-8, WH	18.863	30	0.40	1.00	56.7
E.1	E	PA-6	0.192	12	0.40	2.87	18.2
E	Z	OFFSITE HIGHPOINT	0.192	12	0.40	2.87	18.2
F	D	PA-9	0.357	8	0.40	4.94	44.6
D	C	PA-4, PA-5, PA-6, PA-8, PA-9, WH	19.166	30	0.40	1.00	57.3
C	A	PA-4, PA-5, PA6, PA-7, PA-8, PA-9, WH	19.284	30	0.40	1.00	57.5
B	A	PA-10	0.574	8	0.40	4.94	58.9
A	LIFTSTATION	PA-1 THROUGH PA-10 & WH, AV, 310	21.441				

* Note:

achieve a minimum velocity of 2.0 ft/sec and a maximum percent full capacity of 75% for pipes 12" and smaller or 80% for pipes larger than 12".



FROM Node	TO Node	Peak Flow + Infiltration (MGD)	Peak Flow + Infiltration (cfs)	Required Pipe Size (in)	Pipe Percent Full
T	K	2.83	4.38	18	53.4
S	R	1.54	2.38	12	73.7
R	Q	1.41	2.17	15	66.6
P	O	2.95	4.57	15	77.4
O	N	3.31	5.12	18	58.9
N	Q	3.46	5.36	21	47.2
M	Q	0.30	0.46	8	51.7
Q	LIFTSTATION	3.76	5.81	24	49.5
L1	L	0.37	0.58	12	34.7
L	H	0.58	0.89	12	39.9
K	J	9.81	15.17	30	49.7
J	H	11.64	18.01	30	58.1
I	H	0.10	0.16	8	28.8
H	G	12.12	18.75	30	56.5
G	D	12.19	18.86	30	56.7
F	D	0.23	0.36	8	44.6
E.1	E	0.12	0.19	12	18.2
E	Z	0.12	0.19	12	18.2
D	C	12.39	19.17	30	57.5
C	A	12.46	19.28	30	57.5
B	A	0.37	0.57	8	58.9
A	LIFTSTATION	13.86	21.44		

1 OFFSITE from 2N5 West 1.54 MGD based on COA email from Aurora Planning Department & Aurora Water Engineering 11/1/2019

2 Offsite from Avelon Development MUS prepared by Dewberry/JD dated 8/9/2019 currently under COA Review DP-19 0.362 MGD 8.5.327 Population

3 OFFSITE from 2nd Creek Tributary Area meeting on 06/30/2020 and updated 2nd Creek Tributary Area Map included in Appendix A

4 OFFSITE from Windler Homestead MUS prepared by Carter & Burgess dated 2006 (MGD & Population updated to target peak flow of 4.38 cfs based on COA email from Aurora Water Engineering also as shown in the previously reference report for the Windler Homestead MUS) OPTION 1 ALONG 56TH TO NODE K or OPTION 2 TO DENALI STREET NODE L 1

CITY OF AURORA APPROVAL BLOCK

Craig Paul for Victor Rachael — CITY ENGINEER — 07/31/2020 DATE

Will Pike — FIRE DEPARTMENT — 07/30/2020 DATE

Vanessa A. Allen — AURORA WATER DEPARTMENT — 08/05/2020 DATE

MARTIN/MARTIN CONSULTING ENGINEERS
12499 WEST COLFAX AVENUE, LAKEWOOD, COLORADO 80215
303 431 6100 MARTINMARTIN.COM

FULENWIDER

MASTER UTILITY PLAN (SANITARY)

No	Issue / Revision	Date	Name
1	ODE TEK COA APPROVAL	07/31/20	N/A

Job Number: 19.0001
Project Manager: D.L.E. & C. PROULX
Design By: C. PROULX
Drawn By: C. PROULX
Principal In Charge: P. HORN

Sheet Number: MUS-S

2
220131

PLOT DATE: Wednesday, July 22, 2020 1:10 PM LAST SAVED BY: CPROULX
DRAWING LOCATION: G:\HORN\19.0001-Harvest Mile FDP\PLANS\FDP\SANITARY\FDP SANITARY.dwg

APPROVED ON 08/05/2020

Craig Northam

From: Craig Northam
Sent: Monday, April 25, 2022 5:02 PM
To: Sarah Kolz
Subject: FW: 310 West sewer

fyi

From: Margraf, Jason D. <jmargraf@Dewberry.com>
Sent: Monday, April 25, 2022 5:00 PM
To: Craig Northam <Craig.Northam@westwoodps.com>
Subject: RE: 310 West sewer

Craig:

Things are good here and I hope the same for you. I just received the Aurora 310 MUR comments from our 1st submittal. I haven't even had a chance to review those yet to see what the comments are. However, we are planning our discharge point to be at the Tibet/56th intersection. We had a reduction from the 2.38cfs number that Aurora assumed but 0.48cfs doesn't sound right (i.e. too small). Since we are not yet approved, it is likely the best course of action to maintain the 2.38cfs amount from Aurora Water, which based upon Martin & Martin's study, generated a 10" Pipe stub for the 310 parcel. I'm planning on looking over the comments in the next day or two and will let you know if there is anything in those comments that would impact the information I stated above.

Thanks,

J

Jason Margraf, PE

Associate Vice President, Department Manager
Real Estate and Commercial Development Market Segment
D 720.386.4325 C 303-520-4575
LICENSED PE: CO, UT

Dewberry

www.dewberry.com

From: Craig Northam <Craig.Northam@westwoodps.com>
Sent: Monday, April 25, 2022 4:53 PM
To: Margraf, Jason D. <jmargraf@Dewberry.com>
Subject: 310 West sewer

Hi Jason. Hope things are well with you. One of my new projects is the south half of the Avelon project across 56th Avenue from 310 West. Past studies that started including 310 West into the sewer basin of the Second Creek Lift Station had their line coming down Tibet, but I believe that has shifted west to about the midpoint between Tibet and Picadilly based on my recollections of discussions with you about it. Can you confirm this location? If you have any recent flow info as well, you might as well send that too. The past studies back in 2017 had it at 2.38 cfs, but we've had discussions with Vern back in 2019 that revised that down to 0.48 cfs, which seems like a lot. I'm trying to confirm this with him, but haven't heard a confirmation yet, so I figured I'd check with you directly. Let me know shortly if you can. Thanks.

Craig Northam
Project Engineer
craig.northam@westwoodps.com
main (720)-482-9526

Westwood
10333 E. Dry Creek Road, Suite 240
Englewood, CO 80112

westwoodps.com
(888) 937-5150

2004-3087
94P

MARTIN/MARTIN
CONSULTING ENGINEERS

High Point at DIA - FDP Amendment No. 4 – Master Utility Study Amendment

64TH AVENUE AND PICADILLY ROAD
CITY OF AURORA, COLORADO

Martin/Martin, Inc. Project No.: 19.0397

May 11, 2020

City of Aurora Approval Block

07/29/2020

CWB Vernon D. Adam — 07/23/2020
Aurora Water — Date

Craig Paul for Victor Rachael — 07/28/2020
City Engineer — Date

[signature] — 07/27/2020
Life Safety — Date

Prepared For: Westside Investment Partners, Inc.
4100 East Mississippi Avenue, Suite 500
Glendale, Colorado 80246
Attn: Kevin Smith

Prepared By: Martin/Martin, Inc.
12499 West Colfax Avenue
Lakewood, Colorado 80215
303.431.6100

Principal-in-Charge: Pat Horn, P.E.
Project Manager: Jeff White, P.E.
Project Engineer: Gregory R. Proulx, P.E.

BASIN B ROUTING

	Design Point	Basins Added to System	Total Avg. Daily Flow @ Node (MGD)	Total Upstream Population	Peaking Factor = 5/p^0.167	Peak Flow (MGD)	Infiltration (MGD)	Peak Flow + Infiltration (MGD)	Peak Flow + Infiltration (cfs)
	DP-24	HP-B7	0.085	1,249	4.00	0.339	0.008	0.348	0.538
	DP-23	HP-B6	0.166	2,441	4.00	0.664	0.017	0.681	1.053
	DP-22	DP-23 + DP-24	0.251	3,690	4.00	1.003	0.025	1.028	1.591
	DP-15	DP-22+ HP-B1	0.462	6,856	3.63	1.675	0.046	1.721	2.663
1	DP-FW1	Offsite flow from Fulenwider MUS Report Node Q (INCLUDES DP-AV1 & DP-310W	1.134	16,682	3.13	3.544	0.113	3.657	5.813
2	DP-AV1	Offsite flow from Avelon MUS Report DP-19	0.362	5,327	3.78	1.369	0.036	1.405	2.174
3	DP-310W	Offsite flow from 310 West MUS Report DP-1	0.403	5,928	3.71	1.497	0.040	1.537	2.378
	DP-16	HP-B2 + DP-FW1	1.253	18,435	3.07	3.849	0.125	3.975	6.336
	DP-17	DP-16 + HP-B3	1.301	19,159	3.05	3.974	0.130	4.104	6.535
	DP-18	HP-B4	0.124	1,863	4.00	0.497	0.012	0.509	0.788
	DP-19	DP-17 + DP-18	1.426	21,022	3.01	4.286	0.143	4.429	7.038
	DP-20	DP-15 + DP-19 + HP-B5	1.989	29,393	2.84	5.654	0.199	5.853	9.242
	DP-26	HP-B9	0.025	370	4.00	0.101	0.003	0.103	0.160
	DP-25	DP-20 + DP-26 + HP-B8	2.066	30,539	2.82	5.837	0.207	6.044	9.537

[1] Offsite from Fulenwider MUS prepared by Martin/Martin Inc, dated 05/2020 currently under COA Review: Node Q-5.813 CFS

[2] Offsite from Avelon Development MUS prepared by Dewberry/J3 dated 8/9/2019 currently under COA Review: DP-19 0.362 MGD & 5,327 Population

[3] Offsite from 310 West Development MUS prepared by Calibre Engineering Inc, dated 10/2017 currently under COA Review: DP-1 0.444 MGD & 5,928 Population

HIGH POINT
SANITARY SEWER ROUTING CALCULATIONS
BASIN A

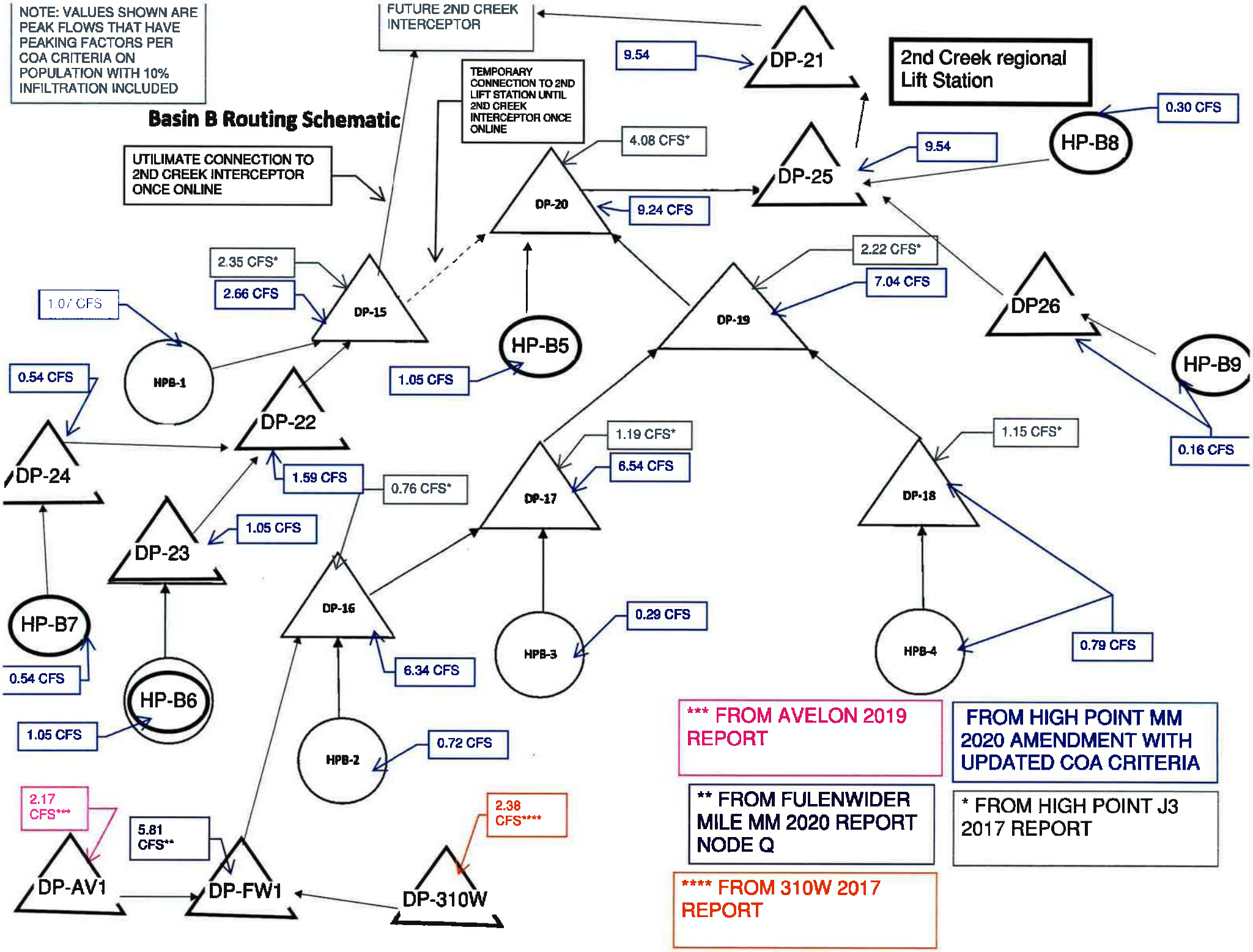
From Design Point:	To Design Point:	Basins Added to System	Total Flow Flow (cfs)	Required Pipe Size (in)	Minimum Slope* (%)	Maximum Slope* (%)	Percentage Full** (%)
				(see note below)			
DP-6	DP-7	OS-2 FROM AVELON	0.641	12	0.40	2.87	33.4
DP-7	DP-8	HP-A6	2.119	15	0.40	2.13	46.2
DP-8	DP-9	RV4	2.819	15	0.40	2.13	54.9
DP-9	DP-10	RV3	2.963	15	0.40	2.13	56.6
DP-10	DP-12	OS-1 FROM PAINTED PRAIRIE	4.493	15	0.40	2.13	76.3
DP-11	DP-12	RV2	1.313	12	0.40	2.87	49.5
DP-12	DP-13	OS-1 FROM PAINTED PRAIRIE & RV2	5.403	15	0.60	2.13	75.1
DP-13	DP-14	HP-A3	5.722	15	0.60	2.13	79.2
DP-14	LIFT STATION	RV1	6.314	15	0.70	2.13	80.8
DP-2	DP-3	HP-A4	0.471	12	0.40	2.87	28.4
DP-3	DP-4	HP-A2	0.925	12	0.40	2.87	40.8
DP-1	DP-5	HP-A5	0.831	8	0.40	4.94	74.7
DP-4	DP-5	HP-A1	1.207	12	0.40	2.87	47.1
DP-5	LIFT STATION		1.961	12	0.40	2.87	61.3

* Note: Minimum slopes were determined as the greater of 0.40% as required by the City of Aurora or the slope required to achieve a minimum velocity of 2.0 ft/sec and a maximum percent full capacity of 75% for pipes 12" and smaller or 80% for pipes larger than 12".

Maximum slopes were determined based on a velocity of 10 ft/sec for full or half pipe conditions.

Refer to attached Flow Master analysis sheets for slope calculations

**Pipes exceeding 80% full were designed to previous City of Aurora Criteria for pipes which was 90% full for pipes larger than 12". Also these lines were constructed at greater than the minimum slope to increase capacity and Painted Prarie MUS comment from COA that proposed 15" parallel line to be constructed.


NOTE: VALUES SHOWN ARE PEAK FLOWS THAT HAVE PEAKING FACTORS PER COA CRITERIA ON POPULATION WITH 10% INFILTRATION INCLUDED
Basin B Routing Schematic
FUTURE 2ND CREEK INTERCEPTOR
TEMPORARY CONNECTION TO 2ND LIFT STATION UNTIL 2ND CREEK INTERCEPTOR ONCE ONLINE
UTILIMATE CONNECTION TO 2ND CREEK INTERCEPTOR ONCE ONLINE
2nd Creek regional Lift Station
9.54
DP-21
0.30 CFS
HP-B8
9.54
DP-25
4.08 CFS*
DP-20
9.24 CFS
2.35 CFS*
2.66 CFS
DP-15
1.07 CFS
HPB-1
HP-B5
1.05 CFS
2.22 CFS*
7.04 CFS
DP-19
DP26
HP-B9
0.16 CFS
0.54 CFS
DP-22
1.59 CFS
0.76 CFS*
DP-24
1.05 CFS
DP-23
1.19 CFS*
6.54 CFS
DP-17
1.15 CFS*
DP-18
DP-16
6.34 CFS
HP-B7
0.54 CFS
HP-B6
1.05 CFS
HPB-3
0.29 CFS
HPB-4
0.79 CFS
HPB-2
0.72 CFS
2.17 CFS***
DP-AV1
5.81 CFS**
DP-FW1
2.38 CFS****
DP-310W
*** FROM AVELON 2019 REPORT
** FROM FULENWIDER MILE MM 2020 REPORT NODE Q
**** FROM 310W 2017 REPORT
FROM HIGH POINT MM 2020 AMENDMENT WITH UPDATED COA CRITERIA
* FROM HIGH POINT J3 2017 REPORT

2

220127

COA BENCHMARK:

CITY OF AURORA BENCHMARK, COA ID 356611NW002 (OLD BENCHMARK ID AD-075A), BEING A 3" BRASS DISK ON 30" STEEL PIPE IN CONCRETE, SET ON SOUTH SIDE OF 64TH AVE. IN E-W 3/ STRAND BARBED WIRE FENCE, 3' WEST OF BENCHMARK IS 4' HIGH 2 ½" YELLOW COLORED PIPE VICINITY OF THE N ¼ CORNER SECTION 11, T3S R66W. ELEVATION=5424.588 NAVD 88

LEGEND

BASIN BOUNDARY

PROPOSED SANITARY SEWER

PROPOSED OFF-SITE SANITARY SEWER

EXISTING SANITARY SEWER

PROPOSED FUTURE 2ND CREEK SANITARY SEWER INTERCEPTOR MAIN

DESIGN POINT 1

SANITARY BASIN B

NOTES:

1. CITY OF AURORA PLAN REVIEW IS ONLY FOR GENERAL CONFORMANCE WITH CITY OF AURORA DESIGN CRITERIA AND THE CITY CODE. THE CITY IS NOT RESPONSIBLE FOR THE ACCURACY AND ADEQUACY OF THE DESIGN, OF DIMENSIONS AND ELEVATIONS WHICH SHALL BE CONFIRMED AND CORRELATED AT THE JOB SITE. THE CITY OF AURORA, THROUGH THE APPROVAL OF THIS DOCUMENT, ASSUMES NO RESPONSIBILITY FOR THE COMPLETENESS AND/OR ACCURACY OF THIS DOCUMENT.
2. IF THE OFF-SITE SANITARY SEWER SYSTEM INFRASTRUCTURE HAS NOT YET BEEN INSTALLED, THE DEVELOPING PLANNING AREA WILL BE RESPONSIBLE FOR BUILDING THE NECESSARY OFF-SITE SANITARY SEWER REQUIRED TO SUPPORT THE PLANNING AREA. THE PLANNING AREA DEVELOPMENT SHALL WORK WITH THE CITY OF AURORA DURING THE CSP PROCESS TO DETERMINE THE BEST OPTION FOR CONNECTING TO THE CITY'S EXISTING SANITARY SEWER SYSTEM, BY EXTENDING THE EXISTING SANITARY SEWER SYSTEM, UPDATING THE ROUTING AND DESIGN POINTS DESCRIBED IN THIS REPORT, PERFORM SIGNIFICANT OVER LOT GRADING, UTILIZE LIFT STATIONS AND FORCES MAINS, ETC. THE PROPOSED SANITARY INFRASTRUCTURE MAY NEED TO BE EXTENDED INTO EACH PROPOSED BASIN TO ROUTE PROPOSED FLOWS FROM INDIVIDUAL PLANNING AREAS TO THE DESIGN POINTS DESCRIBED IN THIS REPORT. THIS REPORT, THE DESIGN POINT LOCATIONS, OR THE ROUTING CAN BE UPDATED OR AMENDED IF NECESSARY, TO SUPPORT THE SANITARY NEEDS FOR PLANNING AREAS DETERMINED IN THE FUTURE.
3. DASHED CONNECTION FROM DP 15 TO DP 20 UTILIZED FOR INTERIM CONDITION AND INITIAL BUILD OUT UNTIL THE 2ND CREEK INTERCEPTOR IS CONSTRUCTED AND ONLINE. INITIAL DEVELOPMENT CAN UTILIZE INTERIM CONNECTION UNTIL CAPACITY OF PIPE DOWNSTREAM OF DP 20 IS EXCEEDED.

N

6000 300 0 600 1200

1"=600'

ALL DIMENSIONS SHOWN ARE U.S. SURVEY FEET

BASIN A SUMMARY TABLE:

	From Design Point:	To Design Point:	Peak Flow + Infiltration (MGD)	Peak Flow + Infiltration (cfs)	Required Pipe Size for min slope (in)	Min Pipe Slope (%)	Pipe Percent Full**
1	DP-6	DP-7	0.414	0.641	12	0.40	33.4%
	DP-7	DP-8	1.370	2.119	15	0.40	46.2%
2	DP-8	DP-9	1.822	2.819	15	0.40	54.9%
3	DP-9	DP-10	1.915	2.963	15	0.40	56.6%
4	DP-10	DP-12	2.904	4.493	15	0.40	76.3%
5	DP-11	DP-12	0.849	1.313	12	0.40	49.5%
	DP-12	DP-13	3.493	5.403	15	0.60	75.1%
	DP-13	DP-14	3.699	5.722	15	0.60	79.2%
6	DP-14	LIFT STAT	4.081	6.314	15	0.70	80.8%
	DP-2	DP-3	0.304	0.471	12	0.40	28.4%
	DP-3	DP-4	0.598	0.925	12	0.40	40.8%
	DP-1	DP-5	0.537	0.831	8	0.40	74.7%
	DP-4	DP-5	0.780	1.207	12	0.40	47.1%
	DP-5	LIFT STAT	1.264	1.955	12	0.40	61.3%

1 OS-2 which is DP-20 from Avelon Development MUS prepared by Dewberry/J3 dated 8/9/2019 0.101 MGD & 1,483 population for 0.64 cfs

2 RV4 from Rockies Village MUS prepared by J3 dated 02/03/2017, COA #21702 - 0.15 MGD & 25.8 acres of 22 equivalent population per acre (568) plus 800 units at 2.77 people per unit (2216) = (2784 population)

3 RV3 from Rockies Village MUS prepared by J3 dated 02/03/2017, COA #21702 - 0.03 MGD & 19.3 acres of 22 equivalent population per acre (425 population)

4 OS-1 from Painted Prairie MUS, prepared by CVL approved 04/13/2020 design ponits A, F, & I 1.53 CFS

5 RV2 from Rockies Village MUS prepared by J3 dated 02/03/2017, COA #21702 - 0.21 MGD & 1500 units at 2.77 people per unit (4155 population)

6 RV1 from Rockies Village MUS prepared by J3 dated 02/03/2017, COA #21702 - 0.14 MGD & 600 units at 2.77 people per unit (1662) plus 36.1 acres of 22 equivalent populations per acre (795) = (2457 population)

** **Pipes exceeding 80% full were designed to previous City of Aurora Criteria for pipes which was 90% full for pipes larger than 12". Also these lines were constructed at greater than the minimum slope to increase capacity and Painted Prarie MUS comment from COA that proposed 15" parallel line to be constructed.

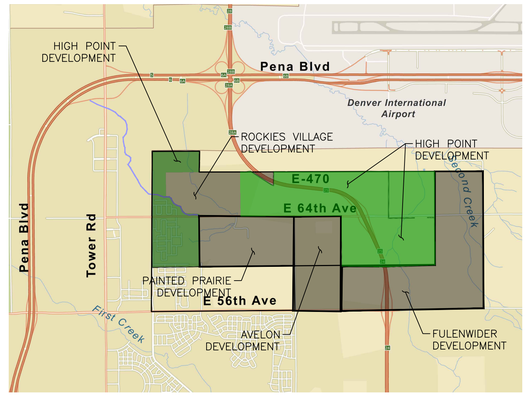
BASIN B SUMMARY TABLE:

	From Design Point:	To Design Point:	Peak Flow + Infiltration (MGD)	Peak Flow + Infiltration (cfs)	Required Pipe Size at min slope (in)	Min Pipe Slope (%)	Pipe Percent Full
1, 2, & 3	DP-24	DP-22	0.35	0.54	12	0.40	30.5
	DP-23	DP-22	0.68	1.05	12	0.40	43.7
	DP-22	DP-15	1.03	1.59	12	0.40	55.7
	DP-16	DP-17	4.10	6.34	21	0.40	52.1
	DP-17	DP-19	4.22	6.54	21	0.40	53.1
	DP-18	DP-19	0.51	0.79	12	0.40	41.2
	DP-15	DP-20	1.72	2.66	15	0.40	53
	DP-19	DP-20	4.55	7.04	21	0.40	55.5
	DP-20	DP-25	5.97	9.24	12	0.40	16.6
	DP-26	DP-25	0.10	0.16	21	0.40	68
	DP-25	DP-21	6.16	9.54	21	0.00	68
	DP-21	SECOND CREEK LIFT STATION	ANTICIPATED OUTFALL TO 2ND CREEK REGIONAL FACILITY LOCATED NEAR NORTHWEST CORNERN OF FULENWIDER PROPERTY SEE NOTES				

1 Offsite from Fulenwider MUS prepared by Martin/Martin Inc. dated 05/2020 currently under COA Review: Node Q-5 813 CFS

2 Offsite from Avelon Development MUS prepared by Dewberry/J3 dated 8/9/2019 currently under COA Review: DP-19 0.362 MGD & 5,327 Population

3 Offsite from 310 West Development MUS prepared by Calibre Engineering Inc. dated 10/2017 currently under COA Review: DP-1 0.444 MGD & 5,928 Population



VICINITY MAP
1"=4000'

CITY OF AURORA APPROVAL BLOCK

CITY ENGINEER — DATE

LIFE SAFETY — 07/27/2020 DATE

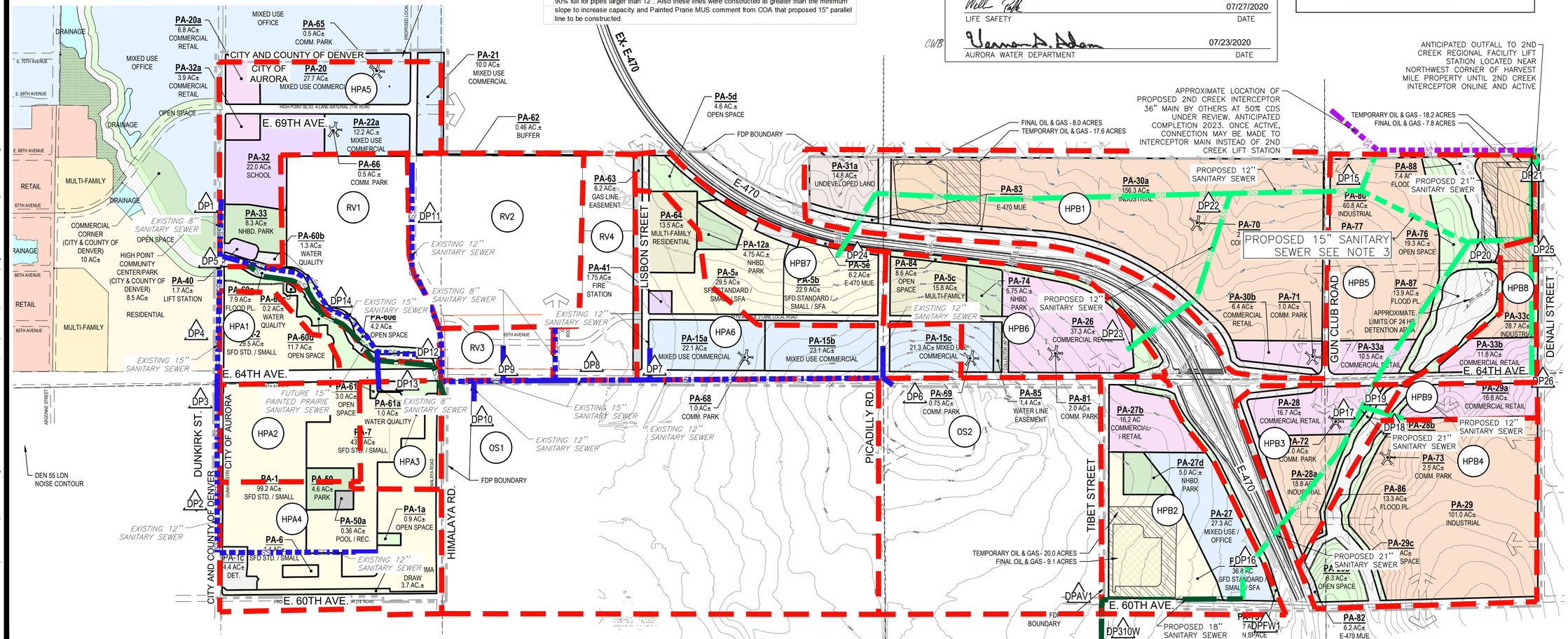
CWB

AURORA WATER DEPARTMENT — 07/23/2020 DATE

FACSIMILE
THIS ELECTRONIC PLAN IS A FACSIMILE OF THE SIGNED AND SEALED PDF PLAN

(PE SIGNATURE) — DATE 05/11/2020

PATRICK F. HORN
(PRINTED NAME)



PLOT DATE: Monday, May 11, 2020 2:06 PM LAST SAVED BY: GPROULX
DRAWING LOCATION: G:\SCHLAPPE\19.0397-High Point FDP Amendment 4\ENG\UTILITY\SANITARY\High Point Sanitary Exhibit.dwg

APPROVED ON 07/29/2020

MARTIN/MARTIN
CONSULTING ENGINEERS
12499 WEST COLFAX AVENUE, LAKEWOOD, COLORADO 80215
303.431.6100 MARTINMARTIN.COM

HIGH POINT AT DIA FDP AMENDMENT NO. 4

MASTER UTILITY STUDY

SANITARY BASIN MAP

No.	Issue / Revision	Date	Name
1	ISSUED FOR COA REVIEW	05/31/19	M/M
2	PER COA COMMENTS	09/11/19	M/M
3	PER COA COMMENTS	10/11/19	M/M
4	PER COA COMMENTS	12/13/19	M/M
5	UPDATED LAND USE MAP	04/08/20	M/M
6	PER COA COMMENTS	05/11/20	M/M

Job Number 19.0397
Project Manager J.WHITE &G.PROULX
Design By G. PROULX
Drawn By G. PROULX
Principal In Charge P. HORN

Sheet Number:

SS

BASIN B ROUTING SCHEMATIC

FUT. 2ND CREEK INTERCEPTOR

2ND CREEK REGIONAL LIFT STATION

ULT. CONNECTION TO 2ND CREEK INTERCEPTOR ONCE ONLINE

TEMP. CONNECTION TO 2ND CREEK LIFT STATION UNTIL 2ND CREEK INTERCEPTOR GOES ONLINE

DP−21

9.21 CFS

DP−20

9.00 CFS

DP−15

2.66 CFS

DP−25

9.21 CFS

HPB-1

HP-B8

HP-B5

DP−24

0.54 CFS

DP−22

1.59 CFS

DP−19

6.83 CFS

DP−26

0.16 CFS

HP-B7

HP-B9

DP−23

1.05 CFS

6.35 CFS

DP−17

1.15 CFS

DP−18

HP-B6

6.17 CFS

DP−16

HPB-3

HPB-4

HPB-2

5.32 CFS

DP−AV1

DP−FW1

5.70 CFS

DP−310W

2.38 CFS