

MASTER UTILITY STUDY

FOR

Gun Club Business Park Development

Submit:

June 17, 2024

Prepared For:

Westside Investment Partners, Inc.

4100 East Mississippi Avenue, Suite 500 Denver, CO 80246

303.984.9800

Megan Waldschmidt

Prepared By:

Martin/Martin, Inc.

12499 West Colfax Avenue

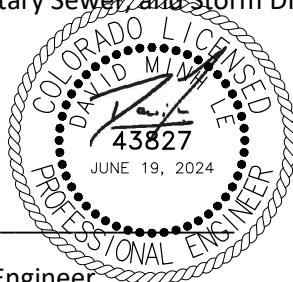
303.431.6100

David Le PE, Greg Proulx, PE, Ben Meis PE, Trevor Steenerson EIT

APPROVED FOR ONE YEAR FROM THIS DATE	
Aurora Water Department	Date
Fire Department	Date

Engineer's Statement:

I hereby certify that this Master Utility Report and plan for the development, Gun Club Business Park Development, was prepared by me (or under my direct supervision) in accordance with the provisions of the Aurora Water, Sanitary Sewer and Storm Drainage Infrastructure Standards and Specifications for the owners thereof.



Colorado Professional Engineer

David M. Le, P.E.

Registered Professional Engineer

State of Colorado No. 43827

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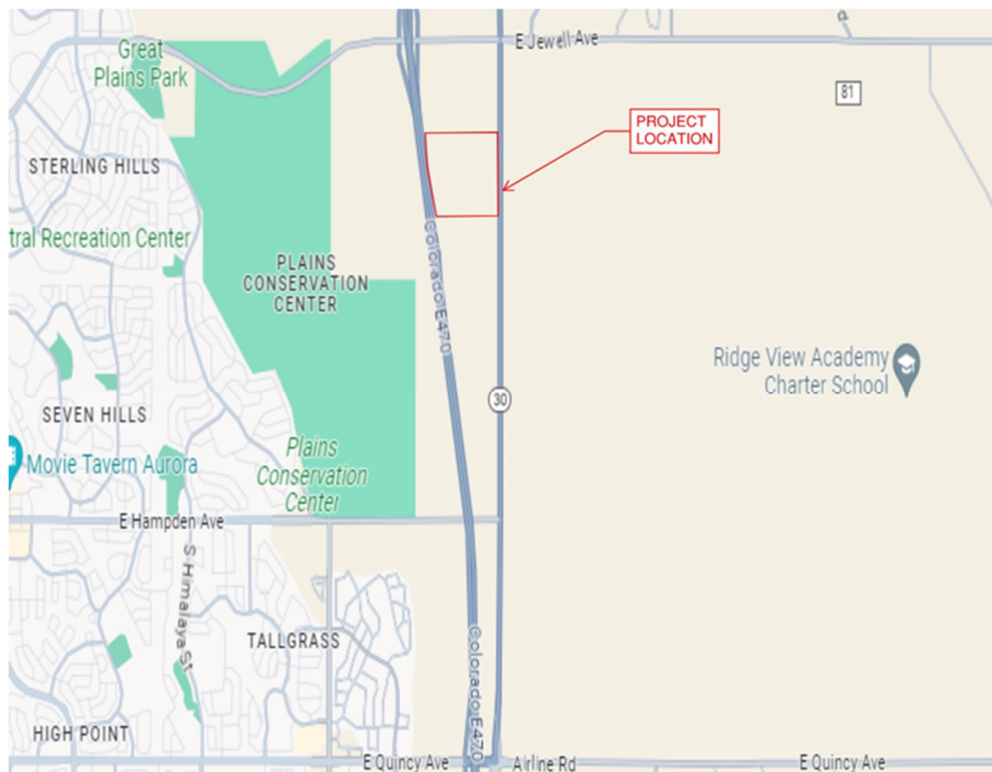
Scope

This report is prepared to provide the necessary analysis of the Gun Club Business Park overall water and sanitary systems and provide the anticipated proposed water and sanitary sewer demands. The operation of these on-site systems relies heavily upon neighboring developments and their associated master utility reports, which include parcels surrounding the site to the north and south sides. As part of this report the capacity of each system has been analyzed in accordance with standard engineering practice and City of Aurora standards.

I. Introduction

A. Location

The property is located in the East half of Section 25, Township 4 South, Range 66 West, of the Sixth Principal Meridian, City of Aurora, Arapahoe County, Colorado. The site is bounded to the south by the Aspen Park development, to the north by the Jewell Marketplace development, to the west by E-470, and to the east by Gun Club Road. The vicinity map is included in Appendix A of this report. The total area covered by this study is 118 acres.



B. Proposed Development

The property is currently zoned as Mixed Use Regional District on the north side of the property and Airport District (AD) on the south side of the property, to take advantage of the nearby regional and national transportation hubs and infrastructure. The development will include a mix of heavy industrial, light industrial, and commercial buildings.

Phasing of the Gun Club Business Park site will more than likely be developed into smaller phases aligned with the planning areas outlined in Framework Development Plan and the Public Improvement Plan. Looped water to support public fire hydrants and private fire suppression systems are required with each phase of development. A sewer outfall must be constructed to serve any individual planning area. 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 shall work with the City of Aurora to determine the best option for connecting to the city's existing sanitary sewer system. At the time of this report, it is known that the phases shall consist of PA-1 through PA-4, as well as open space and drainage channel improvements. Additional information pertaining to the required improvements associated with each planning area can be found within the Public Improvement Plan exhibits and narrative. The actual sequential development of this project shall more than likely be determined by market demands. Furthermore, dependent upon market needs, and associated infrastructure improvement costs, identified planning areas may be combined or partially skipped as needed. This report is focused on the anticipated master water and sanitary sewer infrastructure that would be needed to support the full buildout of the development.

The developer is responsible for construction of all on-site and off-site infrastructure needed to establish two points of emergency access to the overall site and each internal phase of construction. This requirement includes, but is not limited to, the construction of any emergency crossings improvements, looped water supply and fire hydrants as required the adopted fire code and city ordinances.

II. Domestic Water

A. Existing Water Infrastructure

An existing 12" water transmission main can be found near the intersection of S. Gun Club Road and S. Addison Way. There is another existing 8" transmission main located within S. Gun Club Road that runs east from the intersection of S. Gun Club Road and E. Asbury Place. There is another existing 24" line near the intersection of E-470 and Jewell Avenue. There is another existing nearby 12" waterline that services the E-470 toll booth.

B. Proposed Water Infrastructure

The Gun Club Business Park site is located within Zone 4 of the City of Aurora water network. Pressure Reducing Valves (PRVs) are not anticipated to be installed within the proposed development since all proposed sites lie within Zone 4. On-site water pressures range from 64 psi to 94 psi across the site in the built-out condition. Individual building PRVs may be necessary to reduce supplied water pressure and will need to be further evaluated with each site plan process.

The proposed development within Gun Club Business Park will provide a proposed offsite water line within South Gun Club Road. Specifically, included with proposed Gun Club Business Park development are proposed 12-inch diameter PVC (C900) water lines

which will loop the system for each planning area. Refer to the Overall Utility Water Plan MUS-W, in Appendix D for the water line locations and sizes.

Per email correspondence with Chong Woo on January 11, 2024: M/M has received direction that the 42-inch waterline along Gun Club Road, from Jewell to Hampden, can be deferred to a later date. A 12-inch waterline along Gun Club Road can be proposed as long as two points of connection and fire hydrants are provided. See Appendix A for email correspondence mentioned above.

A 12" waterline throughout the property is proposed to connect to multiple existing waterlines, including the existing 12" waterline along E-470 to the west, the 12" waterline to the south along the boundary between Gun Club Business Park and Aspen Business Park.

C. Water System Design Criteria

Updated criteria was provided by the City of Aurora. The updated criteria simplified the water demand per zoning classification for different types of developments. Water demands for residential water use are based on a criteria of 2.77 people per unit and an average day per capita flow of 101 gallon per day. Non- residential demands were generated using the criteria in the table below:

Land Use	Ave Day (gpd/acre)	Max Day (gpd/acre)	Peak Hour (gpd/acre)
Commercial	1,500	4,200	6,750
Industrial	1,200	3,360	5,400
Parks and Greenbelts	1,800	5,040	N/A

Water mains in the system were analyzed in the model and were compared to the following City of Aurora Criteria for pipe size, velocity, and head loss:

Pipe Diameter (in)	Max Velocity (fps)	Max Head Loss (ft/1,000 ft)
6	2.5	5
8 to 12	3	5
16-24	4.5	5
Over 24	7.8	4

According to City of Aurora Criteria, the system was analyzed to meet the maximum day plus fire flow demand (as determined by ISO criteria) with a residual pressure of no less than 20 psi at any point in the water distribution system. The fire flow demands by land use type used for the system modeling are summarized in the table below:

Use Classification	Fire Flow Demand
Residential	1,500 gpm for 2 hours
Commercial/Multifamily	2,500 gpm for 2 hours
Industrial	4,000 gpm for 3 hours

D. Hydraulic Model

WaterCAD software was used to analyze the proposed water system for build-out supply. The water model and output calculations for the average day demand (ADD), maximum day demand (MDD), maximum hour demand (MHD), and maximum day demand plus the fire flow (MDD+FF) modeled at each node based on the domestic and fire demand for each corresponding development zoning classification are provided within the Appendix C. The updated City criteria yields ADD, MDD, MHD, and MDD+FF demands in gallons per day per acre. These values were then converted to gallons per minute and then applied to the corresponding node that was nearest the planning area.

E. Hydraulic Modeling Results

Scenario	Max Velocity	Lowest Pressure	Highest Pressure
Average Day	0.14 fps (P-32)	64 psi (J-9)	94 psi (J-15)
Max Day	0.40 fps (P-32)	64 psi (J-9)	94 psi (J-15)
Max Day + Fire Flow	9.72 fps (P-32)	61 psi (J-10)	84 psi (J-15)
Max Hour	0.64 fps (P-32)	64 psi (J-9)	94 psi (J15)

III. Sanitary Sewer

A. Existing Sanitary Sewer Infrastructure

The following reports were used to determine existing conditions, previous design assumptions, and potential offsite flows for the Gun Club Business Park project. The Aspen Business Park property is located to the south and is associated with the Master Utility Report dated 04/12/2023, herein referred to as the ASPEN PARK WM REPORT (Ref. No. 1). The Jewell Marketplace property is located to the north and is associated with Master Utility Report dated 06/14/2007, herein referred to as the JEWELL MARKETPLACE CLC REPORT (Ref. No. 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 shall work with the City of Aurora to determine the best option for connecting to the city's existing sanitary sewer system.

Per the ASPEN PARK WM REPORT, a sanitary main will convey flows from the Aspen Business Park property to the north into the Gun Club Business Park property. The design and sizing of this main was determined in said report. It is anticipated that approximately 1.97 MGD from Aspen Business Park property will be routed into the Gun Club Business Park property. This 1.97 MGD includes the flow generated from the separate project, *Lot of E-470 Toll Plaza B Subdivision Filing No. 1 (Applegreen Property)* (RSN:1697843). Please see *Appendix A* for details of this basin inclusion into the sanitary system. Although currently the ASPEN PARK WM REPORT shows the sanitary main

entering the Gun Club Business Park property on the west side adjacent to E-470, the plans will be amended to show that the sanitary main will enter the Gun Club Business Park property on the east side adjacent to S. Gun Club Road. The Sanitary Sewer Map of the Aspen Business Park property is included in Appendix A of this report.

B. Proposed Sanitary Sewer Infrastructure

Updated criteria was provided by the City of Aurora. The updated criteria simplified the recommended sewer loading rates for different types of developments. Design excerpts from the updated City of Aurora Master Utility Design Criteria for Water and Sanitary Sewer dated January 2024 has been included in Appendix A of this report for reference.

Analysis of the updated proposed sanitary flows consists of calculating the acreage for each planning area and applying demands based on types of land usage. The land usage and associated size of each planning area was provided by PCS Group CO in the Gun Club Business Park Framework Development Plan Land Use Map, which is included in Appendix A of this report.

C. Sanitary Sewer Design Criteria

Analysis of the hydraulic capacity and characteristics of the pipe assumed open channel flow (not pressurized) and was completed using Manning's Equation. Bentley Flow Master was utilized for computations. Based on Aurora Water's Requirements, a minimum slope of 0.40% was used for the basis of design and a Manning's n value of 0.011 was used for PVC pipe unless specified differently. The depth of flow in the pipes shall not exceed 75% of capacity for pipes 12 inches or smaller and 80% for pipes larger than 12 inches. Peak factors were calculated by using the equation:

$$\text{Peaking Factor} = 5 \div p^{0.167}$$

where p = population in thousands. A minimum peaking factor of 1.7 and a maximum peaking factor of 4 was used for the calculations. Infiltration and inflow was calculated at 10% of average day flows and added to the peaked flows.

Due to meetings with the Aspen Business Park owners after the approval of the ASPEN PARK WM REPORT was written, the off-site flows from the Aspen Business Park property is assumed to be conveyed at Node B (Not the design point A associated with these plans), which is located near the intersection of S. Gun Club Road and S. Addison Way. Since approved the approved Aspen Park Plans show the sanitary sewer on the west side of the property, a plan amendment will be submitted showing the sanitary sewer on the east instead. Offsite existing flows from Aspen Business Park as approved is 1.97 GPD.

FlowMaster software was used to calculate the pipe velocities and pipe sizes for each segment of pipe between the design nodes. In general, the Gun Club Business Park property needs pipe sizes verifying from 8" through 16" to meet proposed Gun Club Business Park demands, increased pipe size based on the COA comments, other offsite COA tributary flows, etc. The calculated demands, routing assumptions, peak flows, and pipe cross sections are provided in Appendix B.

D. Sanitary Sewer Flow Generations

- *Sanitary sewer loading calculations have been completed and applied to the proposed sanitary sewer system in accordance with COA Standards and Specifications.*
 - *Average Commercial flow generation of 1,500 gpd/acre (This land use has been applied to undeveloped basins within the Gun Club Road Off-site sanitary serviceable area to be conservative.)*
 - *Commercial Equivalent Population 22 capita/acre*
 - *Average Industrial flow generation of 1,200 gpd/acre*
 - *Industrial Equivalent Population 18 capita/acre*
 - *Infiltration factor of 10% has been applied to peak flow*
 - *Estimated pipe slope has been assigned as 0.4% to be conservative with pipe sizing.*
 - *Minimum velocity of 2 ft/sec has been applied to proposed sanitary pipes*
 - *Maximum velocity of 10 ft/sec has been applied to proposed sanitary pipes*
 - *Minimum size of 8" PVC has been applied to proposed sanitary pipes*
 - *Peak factors were based on Curve "A" of Figure 3-1 of ASCE Manuals and Reports on Engineering Practice No. 60, Gravity Sanitary Sewer Design and Construction.*

The equation for Curve "A" is:

$$\frac{5}{p^{0.167}} \text{ where } p = \text{population in thousands}$$

E. Sanitary Sewer Variances

A variance from the City of Aurora 2024 Water, Sanitary and Storm Infrastructure Standards and Specifications Section 22.01 is hereby being requested for the proposed on-site 8" sanitary sewer lines. This variance is being requested to due the relatively low tie in into the sanitary sewer line that is proposed with the *Gun Club Business Park – Offsite Sanitary Improvements (RSN:1777354)*. The variance requested is to provide the on-site 8" sanitary lines a material of C900 instead of the standard ASTM D3034-SDR-35. Although the depth of the proposed on-site sanitary sewer lines may not exceed 20-feet below existing grade, we would prefer to use a more conservative material in the case that proposed grade exceeds the 20-foot depth.

IV. Conclusions

A. Recommendations and Phasing

The proposed water system is designed to provide adequate fire protection and the domestic demands of each type of use classification. The proposed water system is composed of an onsite 12-inch PVC that will cater to each planning area depending on which area is developed first. A Public Improvement Plan has been developed along side this Master Utility Plan to provide necessary utilities per planning area. There is an existing water line located within Gun Club Road and adjacent to E-470. These existing water lines will be utilized to loop each planning area.

The proposed sanitary system is design to provide adequate capacity for the proposed development itself and with anticipation of future sites upstream of this site. The proposed sanitary system will be composed of sanitary pvc pipes than range form 8-inch to 16-inch based on planning area needs. A Public Improvement Plan has been developed alongside this Master Utility Plan to provide necessary utilities per planning area. There are currently no existing sanitary connections in the immediate area of the proposed development. Therefore, a proposed off-site 16-inch sanitary line *Gun Club Business Park – Offsite Sanitary Improvements* (RSN:1777354) is currently being designed to provide the proposed development with a sanitary outfall. The proposed on-site sanitary lines will connect into this off-site sanitary line located within Gun Club Road.

References

- 1) Water, Sanitary Sewer and Storm Drainage Infrastructure Standards and Specifications, 2024 Edition, City of Aurora, Colorado
- 2) Master Utility Report, prepared by Ware Malcomb for Aspen Business Park, dated April 12, 2023.
- 3) Master Utility Report, prepared by CLC for Jewell Marketplace, dated June 14, 2007.
- 4) Gun Club Business Park – Offsite Sanitary Improvements, prepared by Martin/Martin Inc., dated April 19th, 2024. (RSN:1777354)

V. Appendices

- A) Vicinity Map & Relevant Reports
- B) Sanitary Sewer Exhibit
- C) Sanitary Sewer Routing Diagram
- D) Sanitary Sewer Calculations
- E) Master Water Distribution Exhibit
- F) Water Demand Tables
- G) Water Model Diagram
- H) Water Model Result Tables

APPENDIX A

Email Correspondence with Chong Woo (COA) discussing 42-inch waterline
Gun Club Business Park Framework Development Plan Land Use Map by PCS Group CO
Aspen Business Park Master Water Plan
Aspen Business Park Master Sanitary Plan
Jewell Marketplace Master Utility Plan
Gun Club Offsite Sanitary Service Area Map / Vicinity Map
Gun Club Business Park – Offsite Sanitary Improvements (RSN:1777354)

Benjamin Meis

From: Woo, Chong <cwoo@auroragov.org>
Sent: Thursday, January 11, 2024 5:05 PM
To: Ted Laudick; David Le; Patrick F. Horn
Cc: Adam, Vern
Subject: 42-inch Gun Club Waterline

Hello,

Vern has received direction from Sarah Young that the 42-inch waterline along Gun Club, from Jewell to Hampden, can be deferred to a later date. You may provide a 12-inch along Gun Club or provide an alternate alignment through your site to provide the two points of connection and fire hydrants. In addition, we had some thoughts on how the water loop at Addison Way may be accomplished with a potential connection to the future 42-inch.

Please let us know if you would like to further discuss or when preliminary plans are prepared we would be happy to review.

Thanks.

Chong Woo, P.E.

Preferred pronouns: he, him, his

City of Aurora | Aurora Water | Engineering Supervisor

office 303.739.7249 | mobile 303.435.9154

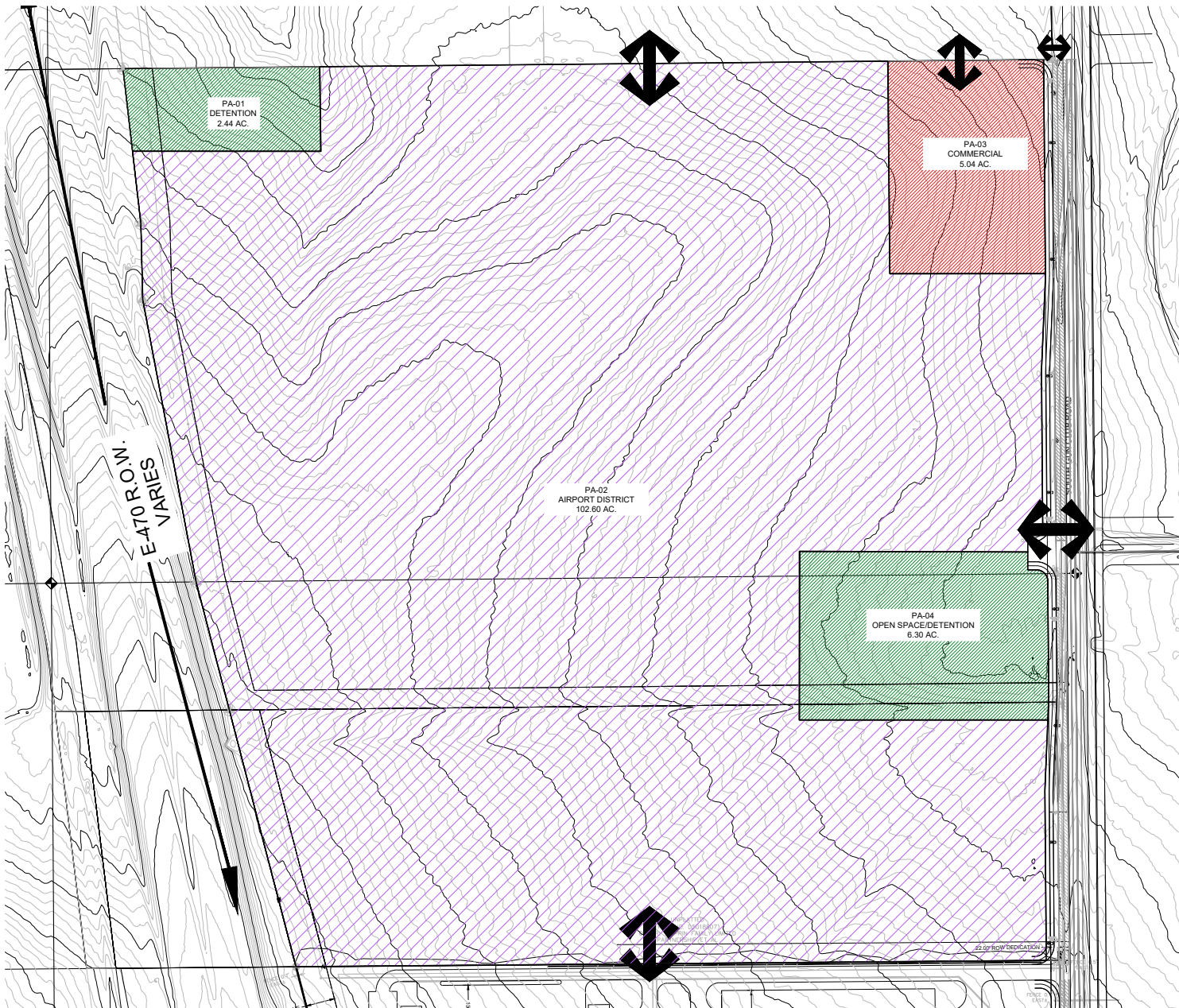
Out of Office Dates: 1/15, 1/19



THE CORE
Integrity • Customer Service
Respect • Professionalism

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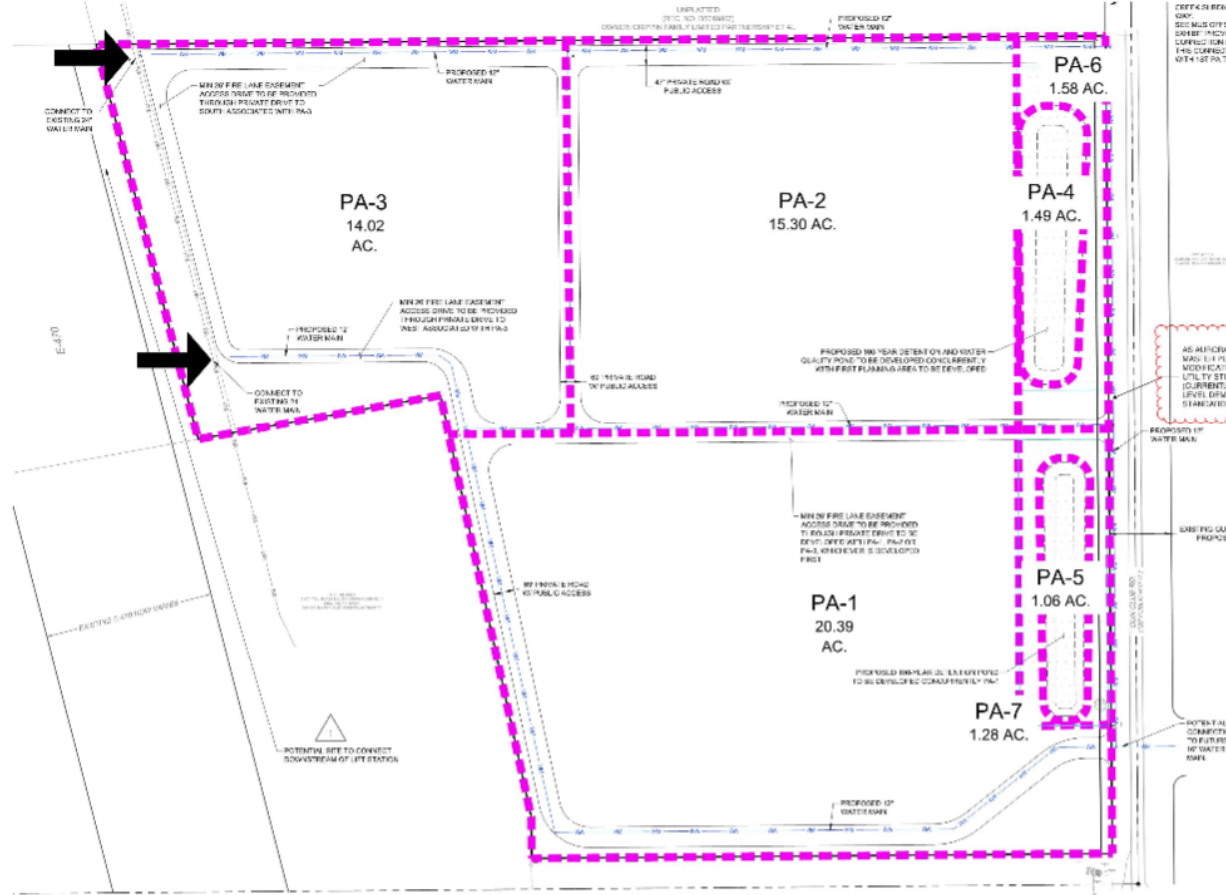
One of Aurora's core values is respect. Sharing personal gender pronouns is one way to practice respect for the diversity that makes Aurora great.



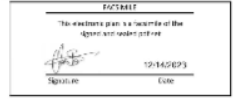
SITE SUMMARY		
PA-1	DETENTION	2.44 AC.
PA-2	AIRPORT DISTRICT	102.60 AC.
PA-3	COMMERCIAL	5.04 AC.
PA-4	DETENTION / OS	6.30 AC.

MASTER PLAN ASPEN BUSINESS PARK

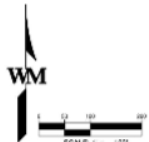
SE QUARTER OF SECTION 25, TOWNSHIP 4 SOUTH, RANGE 66 WEST OF THE 6TH P.M.,
CITY OF AURORA, COUNTY OF ARAPAHOE, STATE OF COLORADO



DEVELOPER: BROWN & ASSOCIATES
DESIGNER: BROWN & ASSOCIATES
DATE: 01/12/2024



AS AURORA WATER UPDATES THE CITY MAP, THE APPLICANT AGREE TO MAKE MODIFICATIONS TO THE APPLICANT'S MASTER UTILITY STUDY. THE CITY OF AURORA WATER DEPARTMENT WILL BE REQUIRED TO UPDATE THE UTILITY STUDY TO MEET SERVICE LEVEL STANDARDS AND WATER QUALITY STANDARDS.



APPROVED FOR ONE YEAR FROM THIS DATE	01/12/2024
DATE	01/10/2024
DATE	01/10/2024
DATE	01/10/2024
DATE	01/10/2024

WARE MALCOMB
LAND DESIGN FOR COMMERCIAL AND RESIDENTIAL

900 South Broadway
Suite 300
Aurora, CO 80012
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www.waremalcomb.com

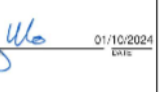
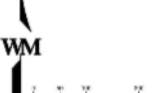
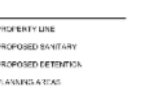
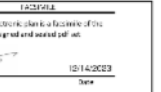
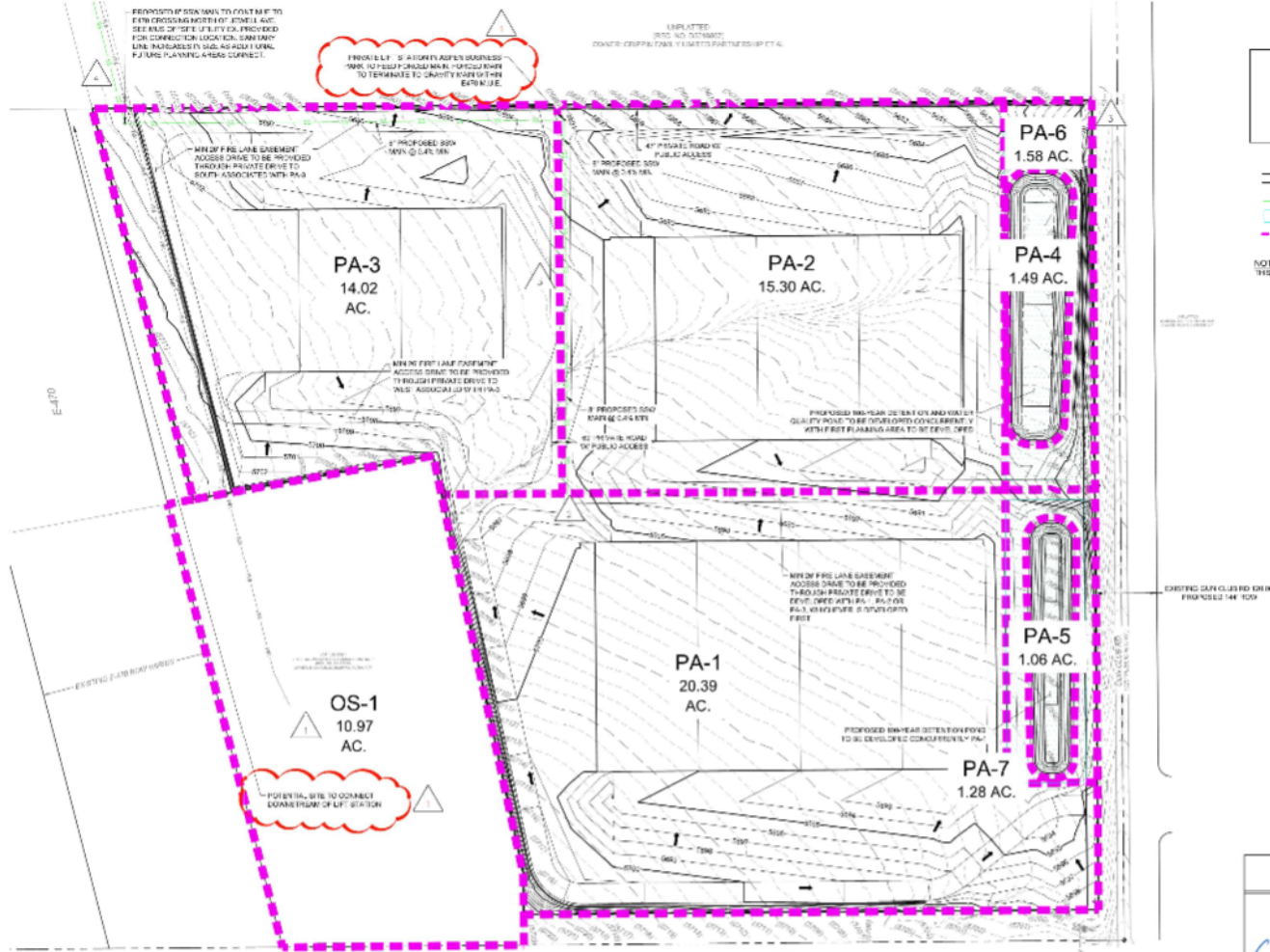
ASPEN BUSINESS PARK
YALE AVE & S GUN CLUB RD.
AURORA, CO

DATE	01/12/2024
DATE	01/12/2024
DATE	01/12/2024
DATE	01/12/2024

C1

MASTER PLAN ASPEN BUSINESS PARK

SE QUARTER OF SECTION 25, TOWNSHIP 4 SOUTH, RANGE 66 WEST OF THE 6TH P.M.,
CITY OF AURORA, COUNTY OF ARAPAHOE, STATE OF COLORADO



WARE MALCOMB
LANDING DESIGN FOR COMMERCIAL REAL ESTATE

1000 South Broadway
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Aurora, CO 80019
303.733.1111
waremalcomb.com

1000 South Broadway
Suite 320
Aurora, CO 80019
303.733.1111
waremalcomb.com

ASPEN BUSINESS PARK
YALE AVE & S GUN CLUB RD.
AURORA, CO
OVERALL UTILITY PLAN (SANITARY)

NO.	DATE	REVISION	BY
1	01/10/2024	ISSUED FOR PERMIT	JER
2	01/10/2024	ISSUED FOR PERMIT	JER
3	01/10/2024	ISSUED FOR PERMIT	JER

APP NO: 00001-111
NO. PM: 111
DATE: 01/10/2024
BY: JER
DATE: 01/10/2024

C2

WARE MALCOMB

ARCHITECTURE | PLANNING | INTERIORS

BRANDING | CIVIL ENGINEERING

Aspen Business Park

DCS21-4114

DATE: 4/6/2023

BY: JRR

SANITARY FLOW SUMMARY (LOCAL)									
PLANNING AREA	ZONING	AVG. DAY FLOW	TOTAL AREA	LOCAL AVG. FLOW	EQUIVALENT POPULATION PER ACRE	TOTAL POPULATION (P)	I/I	TOTAL LOCAL AVERAGE FLOW	
		GPD/ACRE	ACRES	GPD			0.1* LOCAL AVG FLOW	GPD	CFS
OS01	M-O	1,500	11.0	16,455	18	197	1,646	18,101	0.03
PA-1	M-O	1,200	22.9	27,528	18	413	2,753	30,281	0.05
PA-2	M-O	1,200	18.2	21,804	18	327	2,180	23,984	0.04
PA-3	M-O	1,200	14.0	16,824	18	252	1,682	18,506	0.03
OS02	M-O	1,200	119.0	142,752	18	2,141	14,275	157,027	0.24
OS03	M-O	1,500	61.2	91,725	22	1,345	9,173	100,898	0.16
OS04	M-O	1,500	148.8	223,230	22	3,274	22,323	245,553	0.38

Avg Flow = *AREA (AC)* × *AVG. DAY FLOW* ($\frac{GDP}{AC}$) =

Peak Factor (PF) = $\frac{5}{P^{0.167}}$ =
where P=Population in thousands

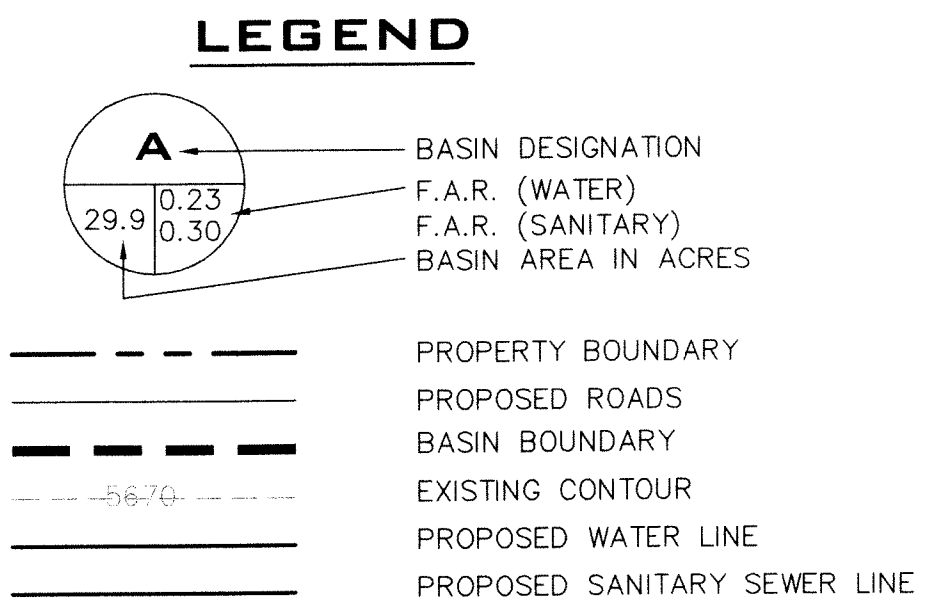
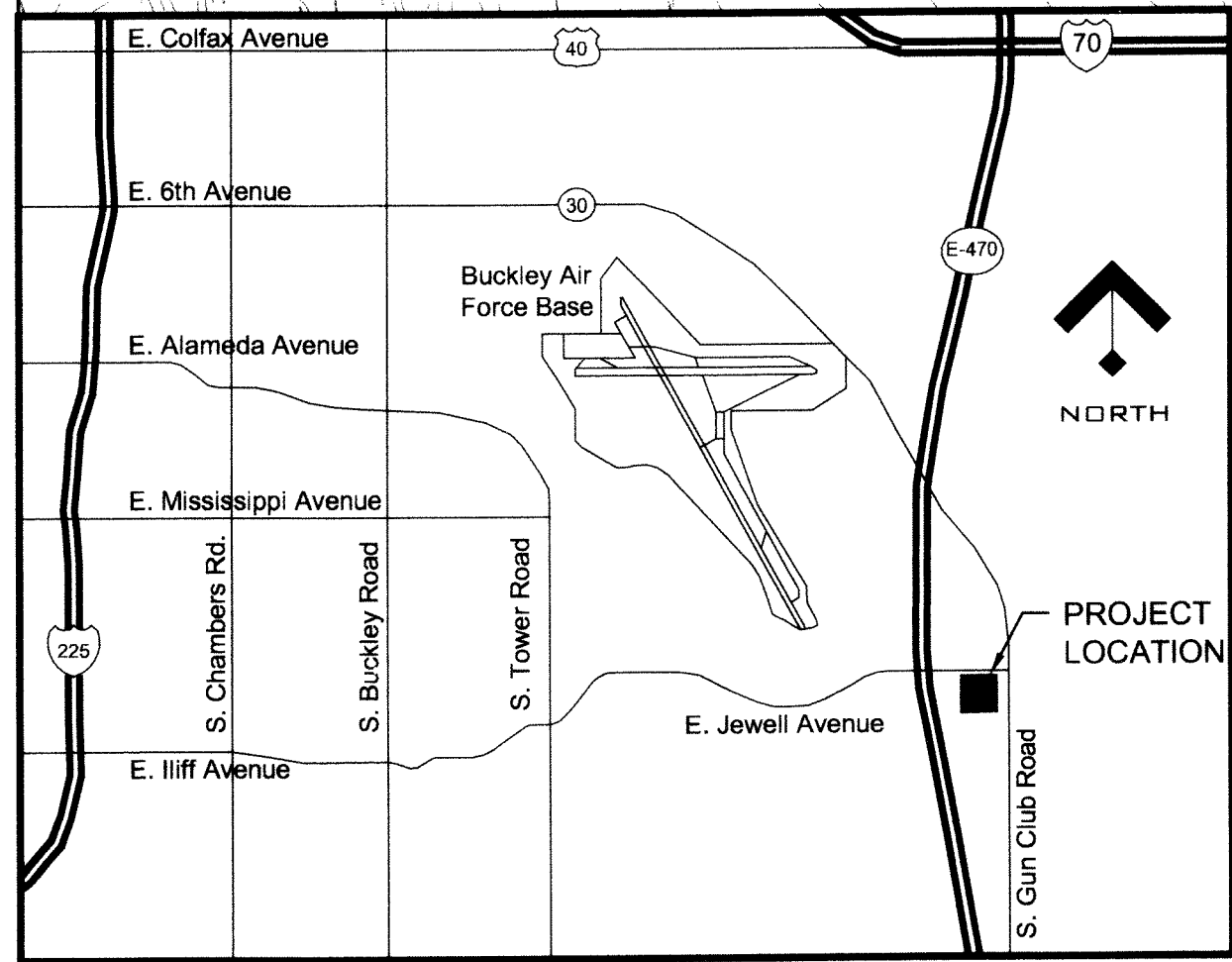
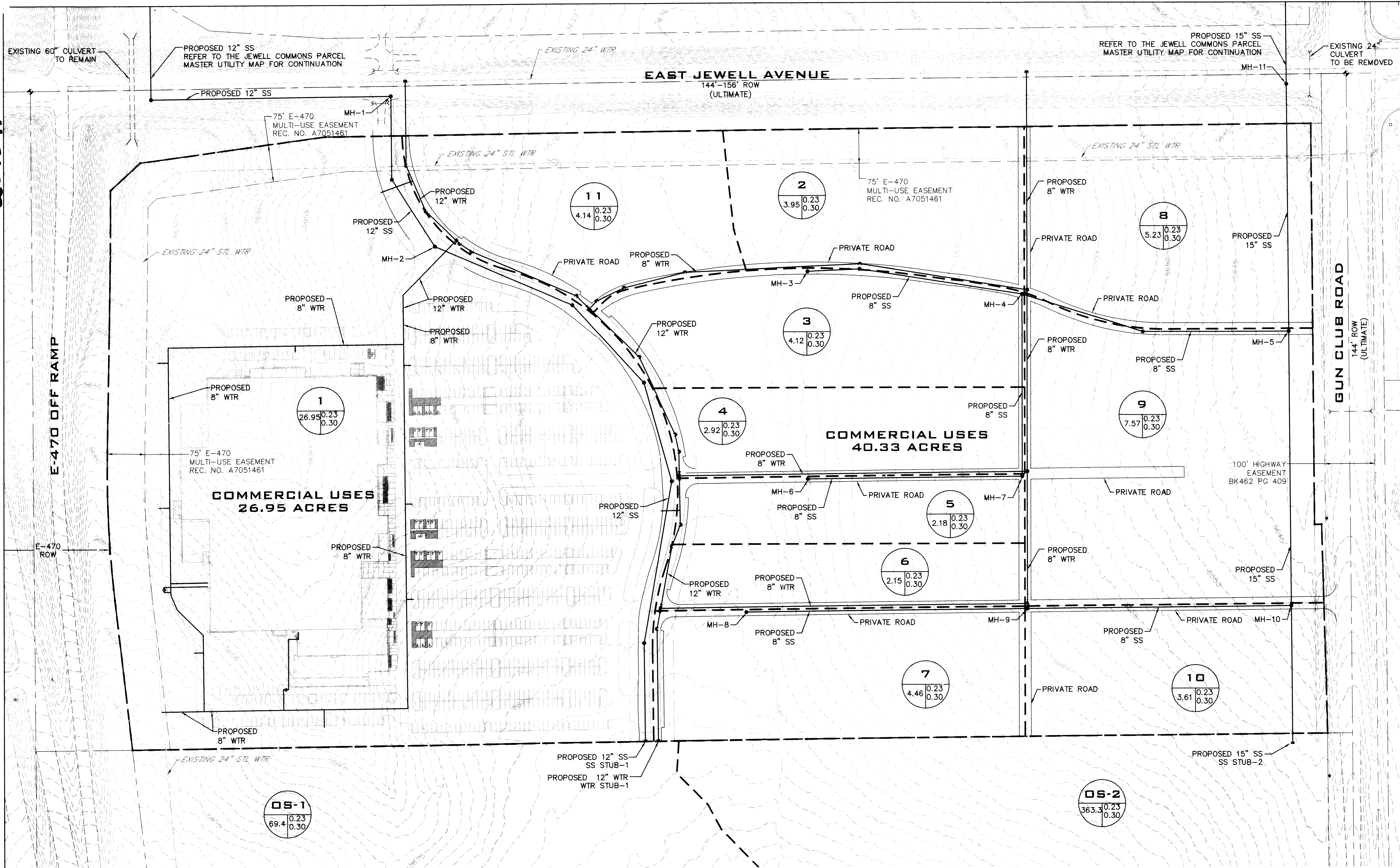
Peak Flow = *Peak Factor* × *Avg Flow* =

I/I = *Avg Flow* × 0.1 =

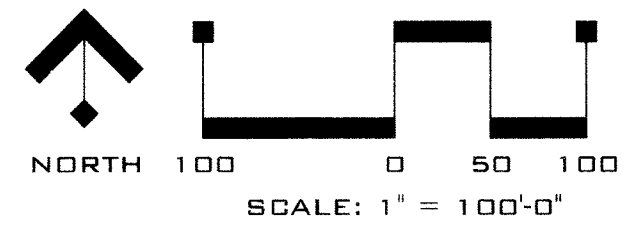
TOTAL AVERAGE FLOW = *Avg Flow* + (*Avg Flow* × 0.1) =

TOTAL PEAK FLOW = *Peak Flow* + (*Avg Flow* × 0.1) =

207091 1



- NOTES:**
1. THE SANITARY SEWER AND WATER LAYOUTS SHOWN ON THIS PLAN ARE CONCEPTUAL ONLY. ACTUAL LAYOUTS WILL BE DETERMINED AT THE TIME OF THE FINAL DEVELOPMENT LAYOUT.
 2. REFER TO THE MASTER DRAINAGE REPORT FOR THE STORM SEWER INFORMATION.
 3. REFER TO THE PUBLIC IMPROVEMENTS PHASING MAP FOR UTILITY PHASING INFORMATION.
 4. FUTURE LAND USES FOR ALL BASINS AND SEWER LOADS ARE AS SHOWN IN THE CITY OF AURORA WASTE WATER UTILITY PLAN.



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 OF THE COMPLETENESS AND/OR ACCURACY OF THIS DOCUMENT.

APPROVED ONE YEAR FROM THIS DATE	
07.18.07	
	7/18/07
CITY ENGINEER	DATE
	6-29-07
UTILITIES DEPARTMENT	DATE

CLC ASSOCIATES

8480 E. ORCHARD RD.
SUITE 2000
GREENWOOD VILLAGE
COLORADO 80111
P 303 770 5600
F 303 770 2349
CLC@SDG.COM

ARCHITECTURE
ENGINEERING PLANNING
LANDSCAPE ARCHITECTURE
LAND SURVEYING

MASTER UTILITY MAP

**JEWELL MARKETPLACE
SUBDIVISION FILING NO. 1**

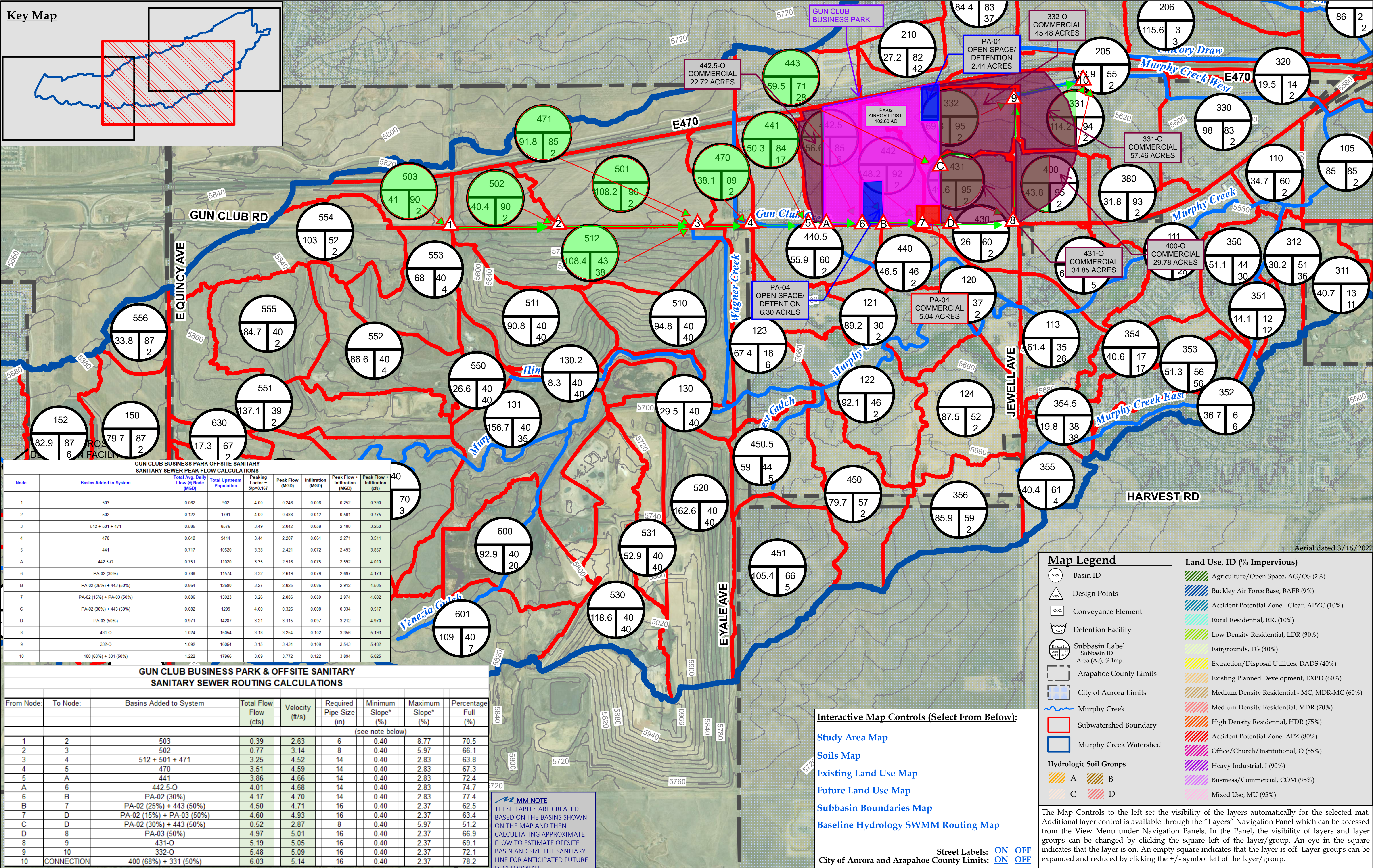
(EAST JEWELL AVENUE & E 470)
AURORA, CO

COLORADO REGISTERED
TIFFANY D. WATSON
40360

PREPARED UNDER THE
TIFFANY D. WATSON
COLORADO REGISTRATION
NO. 40360 FOR AND ON
BEHALF OF CLC ASSOCIATES

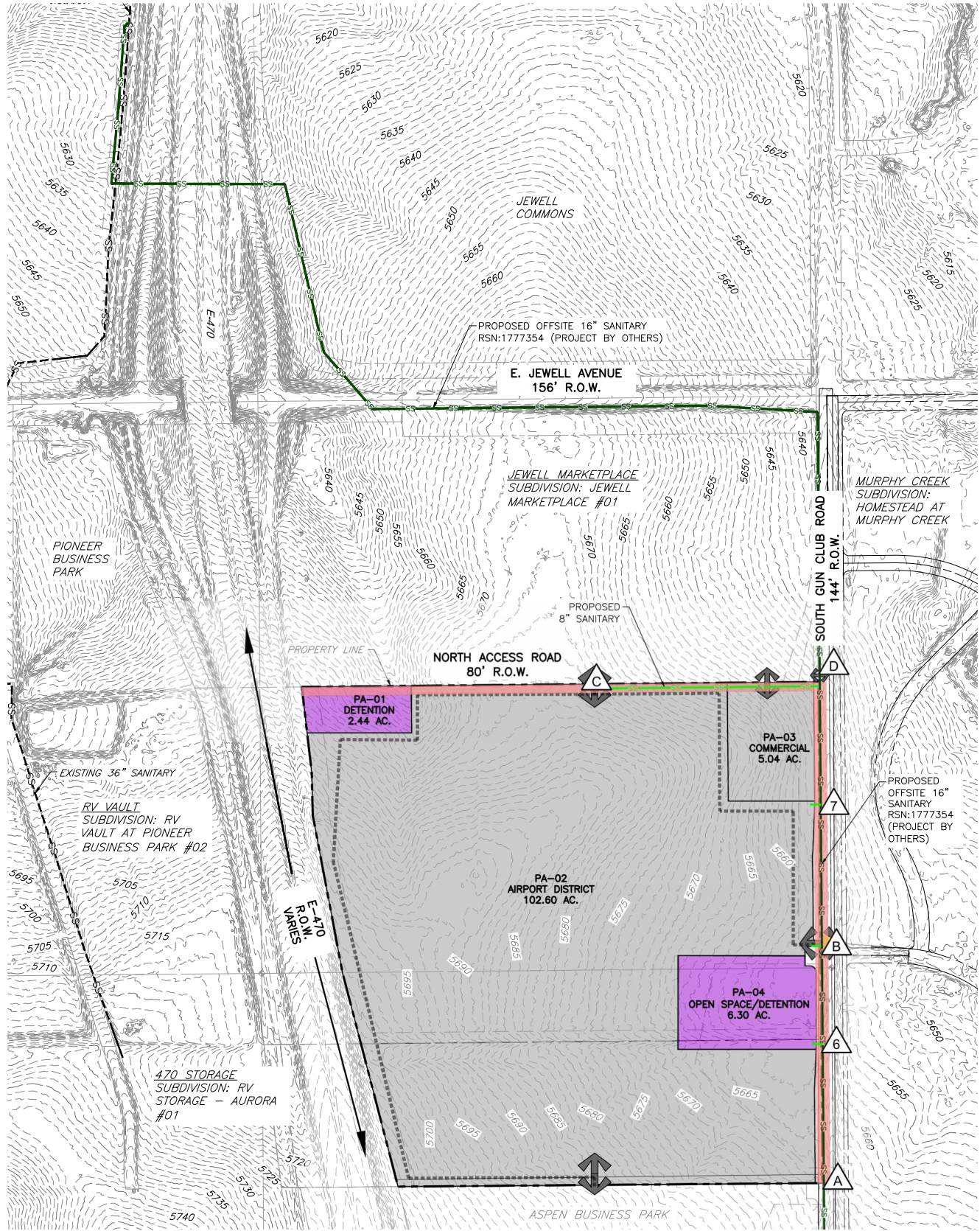
DATE	DESCRIPTION
03/05/07	PDF SUBMITTAL 1
06/15/07	NYLAR SUBMITTAL
PROJECT #: 06.0044	
DRAWN BY: TDW	
DESIGNED BY: TDW	
CHECKED BY: KDM	

1 OF 1



APPENDIX B
SANITARY SEWER MASTER PLAN

GUN CLUB BUSINESS PARK
MASTER SANITARY PLAN
A PARCEL OF LAND SITUATED IN THE WEST HALF OF SECTION 31 AND NORTHEAST
QUARTER OF SECTION 36, TOWNSHIP 4 SOUTH, RANGE 65 WEST OF THE SIXTH
PRINCIPAL MERIDIAN,
CITY OF AURORA, COUNTY OF ARAPAHOE
STATE OF COLORADO

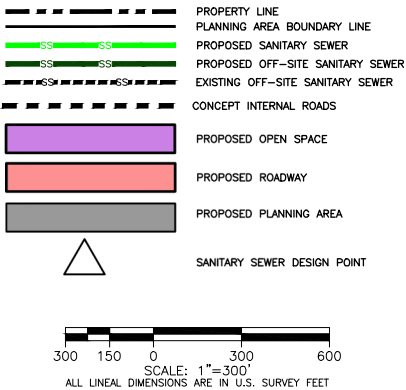


NOTES:

- 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.
- IF THE OFF-SITE SANITARY SEWER SYSTEM INFRASTRUCTURE HAS NOT YET BEEN INSTALLED, THE DEVELOPING PLANNING AREA MAY 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.
- THE DEVELOPER IS RESPONSIBLE FOR THE CONSTRUCTION OF ALL ON-SITE AND OFF-SITE INFRASTRUCTURE NEEDED TO ESTABLISH TWO POINTS OF EMERGENCY ACCESS TO THE OVERALL SITE AND EACH INTERNAL PHASE OF CONSTRUCTION. THIS REQUIREMENT INCLUDES BUT IS NOT LIMITED TO, THE CONSTRUCTION OF ANY EMERGENCY CROSSINGS IMPROVEMENTS, LOOPED WATER SUPPLY, AND FIRE HYDRANT AS REQUIRED BY THE ADOPTED FIRE CODE AND CITY ORDINANCES.

LEGEND

* SYMBOLS MAY NOT BE TO SCALE FOR BETTER GRAPHICAL REPRESENTATION.



BENCHMARK:

CITY OF AURORA BENCHMARK ID 4S6625SE002, BEING A RAILROAD SPIKE IN POWER POLE - WEST SIDE GUN CLUB (HWY 30) 0.25 MILES NORTH OF YALE LAND LINE.
ELEVATION: 5671.27 FEET (NAVD88 DATUM)

APPROVED FOR ONE YEAR FROM THIS DATE

AURORA WATER - UTILITY DIVISION

DATE

GUN CLUB BUSINESS PARK

No.	Description of Revisions	Date	Name
1	CITY SUBMITAL	05/03/24	MM

Job Number 23.1060	Project Manager G. PROULX
Design By JAR, BAM, DUB, TJS	Drawn By J. RODRIGUEZ
Principal In Charge DLE	

Sheet Number:

S1

MASTER UTILITY PLAN

OVERALL SANITARY PLAN

NOT FOR CONSTRUCTION

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

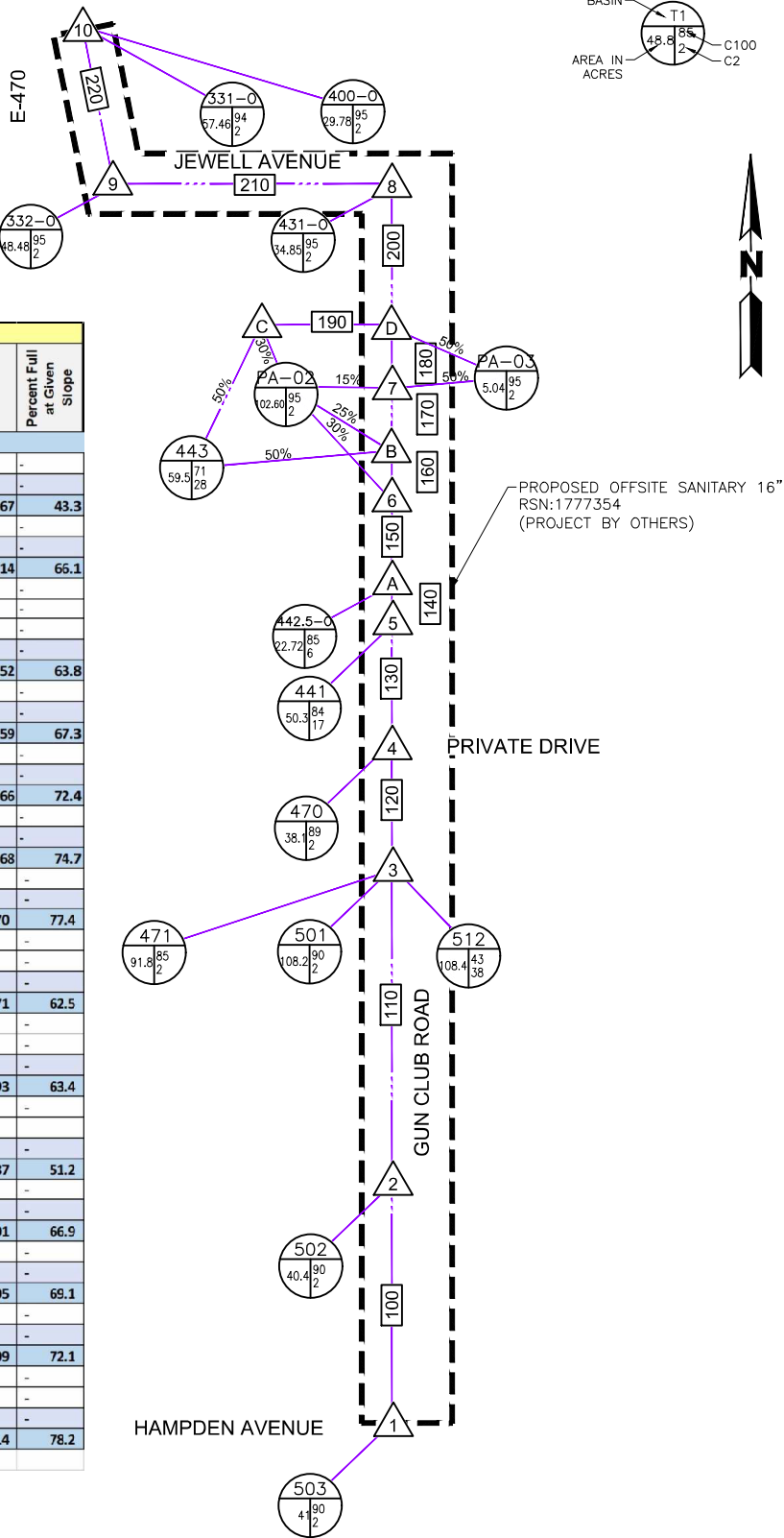
APPENDIX C
SANITARY SEWER ROUTING DIAGRAM

GUN CLUB BUSINESS PARK
MASTER SANITARY PLAN
A PARCEL OF LAND SITUATED IN THE WEST HALF OF SECTION 31 AND NORTHEAST
QUARTER OF SECTION 36, TOWNSHIP 4 SOUTH, RANGE 65 WEST OF THE SIXTH
PRINCIPAL MERIDIAN,
CITY OF AURORA, COUNTY OF ARAPAHOE
STATE OF COLORADO

NOTES:

1. BASELINE HYDROLOGIC DATA IS BASED ON THE MURPHY CREEK AND TRIBUTARIES MAJOR DRAINAGEWAY PLAN BASELINE HYDROLOGY REPORT, PREPARED BY MERRICK, DATED APRIL, 2023.
2. CITY OF AURORA PLAN REVIEW IS ONLY FOR GENERAL CONFORMANCE WITH CITY DESIGN CRITERIA AND THE CITY CODE. THE CITY IS NOT RESPONSIBLE FOR THE ACCURACY AND ADEQUACY OF THE DESIGN CONCEPT, 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.
3. THE DEVELOPER IS RESPONSIBLE FOR THE CONSTRUCTION OF ALL ON-SITE AND OFF-SITE INFRASTRUCTURE NEEDED TO ESTABLISH TWO POINTS OF EMERGENCY ACCESS TO THE OVERALL SITE AND EACH INTERNAL PHASE OF CONSTRUCTION. THIS REQUIREMENT INCLUDES BUT IS NOT LIMITED TO, THE CONSTRUCTION OF ANY EMERGENCY CROSSINGS IMPROVEMENTS, LOOPED WATER SUPPLY, AND FIRE HYDRANT AS REQUIRED BY THE ADOPTED FIRE CODE AND CITY ORDINANCES.

Design Point		Planning Area	Flow Split	COMMERCIAL / SCHOOLS / INDUSTRIAL						CUMMULATIVE TOTALS							PIPE PARAMETERS						
				Land Use	Total Acres	Population Density	Equivalent Population	Average Flow Generation (gpd/acre)	Average Day Flow (mgd)	Average Day Flow (gpm)	Total Acres	Total Average Flow (mgd)	Infil. @ 10% (mgd)	Cumulative Population	Peak Factor	Peak Flow (mgd)	Peak Flow + Infil. (mgd)	Peak Flow + Infil. (gpm)	Estimated Pipe Slope (%)	Estimated Size at Given Slope	Pipe Name	Velocity (ft/sec)	Percent Full at Given Slope
Sub Regional Basin such as Murphy Creek, Sand Creek, etc.																							
1	503			COMMERCIAL	41.0	22	902	1,500	0.062	42.71	41.0	0.06	0.006	902	4.00	0.25	0.25	175.10	0.4	-	-	-	
	On-Site Total			-	41.0	-	902	-	0.062	42.71	41.0	0.06	0.006	902	4.00	0.25	0.25	175.10	-	-	-	-	
	Design Point Total			-	41.0	-	902	-	0.062	42.71	41.0	0.06	0.006	902	4.00	0.25	0.25	175.10	0.4	8"	100*	2.67	43.3
2	502			COMMERCIAL	40.4	22	889	1,500	0.061	42.08	40.4	0.06	0.006	889	4.00	0.24	0.25	172.54	0.4	-	-	-	
	On-Site Total			-	40.4	-	889	-	0.061	42.08	40.4	0.06	0.006	889	4.00	0.24	0.25	172.54	-	-	-	-	
	Design Point Total			-	81.4	-	1,791	-	0.122	84.79	81.4	0.12	0.012	1,791	4.00	0.49	0.50	347.65	0.4	8"	110*	3.14	66.1
3	512			COMMERCIAL	108.4	22	2,385	1,500	0.163	112.92	108.4	0.16	0.016	2,385	4.00	0.65	0.67	462.96	0.4	-	-	-	
	501			COMMERCIAL	108.2	22	2,380	1,500	0.162	112.71	108.2	0.16	0.016	2,380	4.00	0.65	0.67	462.10	0.4	-	-	-	
	471			COMMERCIAL	91.8	22	2,020	1,500	0.138	95.63	91.8	0.14	0.014	2,020	4.00	0.55	0.56	392.06	0.4	-	-	-	
	On-Site Total			-	308.4	-	6,785	-	0.463	321.25	308.4	0.46	0.046	6,785	3.63	1.68	1.73	1198.79	-	-	-	-	
4	Design Point Total			-	389.8	-	8,576	-	0.585	406.04	389.8	0.58	0.058	8,576	3.49	2.04	2.10	1458.63	0.4	14"	120*	4.52	63.8
	470			COMMERCIAL	38.1	22	838	1,500	0.057	39.69	38.1	0.06	0.006	838	4.00	0.23	0.23	162.72	0.4	-	-	-	
5	On-Site Total			-	38.1	-	838	-	0.057	39.69	38.1	0.06	0.006	838	4.00	0.23	0.23	162.72	-	-	-	-	
	Design Point Total			-	427.9	-	9,414	-	0.642	445.73	427.9	0.64	0.064	9,414	3.44	2.21	2.27	1577.15	0.4	14"	130*	4.59	67.3
	441			COMMERCIAL	50.3	22	1,107	1,500	0.075	52.40	50.3	0.08	0.008	1,107	4.00	0.30	0.31	214.82	0.4	-	-	-	
6	On-Site Total			-	50.3	-	1,107	-	0.075	52.40	50.3	0.08	0.008	1,107	4.00	0.30	0.31	214.82	-	-	-	-	
	Design Point Total			-	478.2	-	10,520	-	0.717	498.13	478.2	0.72	0.072	10,520	3.38	2.42	2.49	1731.05	0.4	14"	140*	4.66	72.4
	442.5-O			COMMERCIAL	22.7	22	500	1,500	0.034	23.67	22.7	0.03	0.003	500	4.00	0.14	0.14	97.03	0.4	-	-	-	
7	On-Site Total			-	22.7	-	500	-	0.034	23.67	22.7	0.03	0.003	500	4.00	0.14	0.14	97.03	-	-	-	-	
	Design Point Total			-	500.9	-	11,020	-	0.751	521.79	500.9	0.75	0.075	11,020	3.35	2.52	2.59	1799.70	0.4	14"	150*	4.68	74.7
	PA-02	PA-02 (30%)		INDUSTRIAL	30.8	18	554	1,200	0.037	25.7	30.8	0.037	0.004	554	4.00	0.15	0.15	105.17	0.4	-	-	-	
8	On-Site Total			-	30.8	-	554	-	0.037	25.7	30.8	0.037	0.004	554	4.00	0.15	0.15	105.17	-	-	-	-	
	Design Point Total			-	531.7	-	11,574	-	0.788	547.4	531.7	0.788	0.079	11,574	3.32	2.62	2.70	1,873.21	0.4	14"	160*	4.70	77.4
	PA-02	PA-02 (25%)		INDUSTRIAL	25.7	18	462	1,200	0.031	21.4	25.7	0.031	0.003	462	4.00	0.12	0.13	87.54	0.4	-	-	-	
9	443	443 (50%)		COMMERCIAL	29.8	22	655	1,500	0.045	31.0	29.8	0.045	0.004	655	4.00	0.18	0.18	127.06	0.4	-	-	-	
	On-Site Total			-	55.4	-	1,116	-	0.075	52.4	55.4	0.075	0.008	1,116	4.00	0.30	0.31	214.69	-	-	-	-	
	Design Point Total			-	587.1	-	12,690	-	0.864	599.8	587.1	0.864	0.086	12,690	3.27	2.83	2.91	2,021.99	0.4	16"	170*	4.71	62.5
10	PA-02	PA-02 (15%)		INDUSTRIAL	15.4	18	277	1,200	0.018	12.8	15.4	0.018	0.002	277	4.00	0.07	0.08	52.58	0.4	-	-	-	
	PA-03	PA-03 (50%)		COMMERCIAL	2.5	22	55	1,500	0.004	2.6	2.5	0.004	0.000	55	4.00	0.02	0.02	10.76	0.4	-	-	-	
	On-Site Total			-	17.9	-	332	-	0.022	15.5	17.9	0.022	0.002	332	4.00	0.09	0.09	63.35	-	-	-	-	
11	Design Point Total			-	605.0	-	13,023	-	0.886	615.3	605.0	0.886	0.089	13,023	3.26	2.89	2.97	2,065.40	0.4	16"	180*	4.93	63.4
	PA-02	PA-02 (30%)		INDUSTRIAL	30.8	18	554	1,200	0.037	25.7	30.8	0.037	0.004	554	4.00	0.15	0.15	105.17	0.4	-	-	-	
12	443	443 (50%)		COMMERCIAL	29.8	22	655	1,500	0.045	31.0	29.8	0.045	0.004	655	4.00	0.18	0.18	127.06	0.4	-	-	-	
	On-Site Total			-	60.5	-	1,209	-	0.082	56.6	60.5	0.082	0.008	1,209	4.00	0.33	0.33	232.22	-	-	-	-	
	Design Point Total			-	60.5	-	1,209	-	0.082	56.6	60.5	0.082	0.008	1,209	4.00	0.33	0.33	232.22	0.4	8"	190	2.87	51.2
13	PA-03	PA-03 (50%)		COMMERCIAL	2.5	22	55	1,500	0.004	2.6	2.5	0.004	0.000	55	4.00	0.02	0.02	10.76	0.4	-	-	-	
	On-Site Total			-	2.5	-	55	-	0.004	2.6	2.5	0.004	0.000	55	4.00	0.02	0.02	10.76	-	-	-	-	
	Design Point Total			-	668.1	-	14,287	-	0.971	674.5	668.1	0.971	0.097	14,287	3.21	3.11	3.21	2,230.62	0.4	16"	200*	5.01	66.9
14	431-O			COMMERCIAL	34.9	22	767	1,500	0.052	36.3	34.9	0.052	0.005	767	4.00	0.21	0.21	148.84	0.4	-	-	-	
	On-Site Total			-	34.9	-	767	-	0.052	36.3	34.9	0.052	0.005	767	4.00	0.21	0.21	148.84	-	-	-	-	
	Design Point Total			-	702.9	-	15,054	-	1.024	710.8	702.9	1.024	0.102	15,054	3.18	3.25	3.36	2,330.86	0.4	16"	210*	5.05	69.1
15	332-O			COMMERCIAL	45.5	22	1,001	1,500	0.068	47.4	45.5	0.068	0.007	1,001	4.00	0.27	0.28	194.24	0.4	-	-	-	
	On-Site Total			-	45.5	-	1,001	-	0.068	47.4	45.5	0.068	0.007	1,001	4.00	0.27	0.28	194.24	-	-	-	-	
	Design Point Total			-	748.4	-	16,054	-	1.092	758.2	748.4	1.092	0.109	16,054	3.15	3.43	3.54	2,460.44	0.4	16"	220*	5.09	72.1
16	400	400 (68%)		COMMERCIAL	29.8	22	655	1,500	0.045	31.0	29.8	0.045	0.004	655	4.00	0.18	0.18	127.20	0.4	-	-	-	
	331	331 (50%)		COMMERCIAL	57.1	22	1,256	1,500	0.086	59.5	57.1	0.086	0.009	1,256	4.00	0.34	0.35	243.86	0.4	-	-	-	
	On-Site Total			-	86.9	-	1,911	-	0.130	90.5	86.9	0.130	0.013	1,911	4.00	0.52	0.53	371.07	-	-	-	-	
17	Design Point Total			-	835.3	-	17,966	-	1.222	848.7	835.3	1.222	0.122	17,966	3.09	3.77	3.89	2,704.46	0.4	16"	230*	5.14	78.2
	*Sanitary pipes are included for information and sizing purposes only. These pipes are associated with the Gun Club Business Park - Offsite Sanitary Improvements Project (RSN:1777354).																						



GUN CLUB BUSINESS PARK

No.	Description of Revisions	Date	Name
1	QTY SUBMITAL	05/03/24	MM

Job Number 123.1060	Project Manager G. PROULX
Design By JAR, BAM, DUB, TJS	Drawn By J. RODRIGUEZ
Principal In Charge DLE	

Sheet Number:

S2

MASTER UTILITY PLAN
SANITARY ROUTING DIAGRAM

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

NOT FOR CONSTRUCTION

APPENDIX D
SANITARY SEWER CALCULATIONS

POPULATION DENSITY		
Multi-Family	2.77	People per Unit
Single-Family	2.77	People per Unit
Age Restricted	2.77	People per Unit
Average Flow Generation	68	gpcpd

COMMERCIAL / SCHOOLS / INDUSTRIAL			
	Commercial	Schools / Industrial	
Average Flow Generation	1,500	1,200	gpd/acre
Equivalent Population	22	18	capita

Use the below colors for up to three different sub basins such as First Creek, Second Creek, or Box Elder.

- Sub Basin 1
- Sub Basin 2
- Sub Basin 3

Design Point	Planning Area	Flow Split	COMMERCIAL / SCHOOLS / INDUSTRIAL							CUMMULATIVE TOTALS								Peak Flow + Infil. (gpm)	PIPE PARAMETERS					
			Land Use	Total Acres	Population Density	Equivalent Population	Average Flow Generation (gpd/acre)	Average Day Flow (mgd)	Average Day Flow (gpm)	Total Acres	Total Average Flow (mgd)	Infil. @ 10% (mgd)	Cumulative Population	Peak Factor	Peak Flow (mgd)	Peak Flow + Infil. (mgd)	Peak Flow + Infil. (gpm)	Estimated Pipe Slope (%)	Estimated Size at Given Slope	Pipe Name	Velocity (ft/sec)	Percent Full at Given Slope		
Sub Regional Basin such as Murphy Creek, Sand Creek, etc.																								
1	503		COMMERCIAL	41.0	22	902	1,500	0.062	42.71	41.0	0.06	0.006	902	4.00	0.25	0.25	175.10	0.4	-	-	-	-		
	On-Site Total		-	41.0	-	902	-	0.062	42.71	41.0	0.06	0.006	902	4.00	0.25	0.25	175.10	-	-	-	-	-		
	Design Point Total		-	41.0	-	902	-	0.062	42.71	41.0	0.06	0.006	902	4.00	0.25	0.25	175.10	0.4	8"	100*	2.67	43.3		
2	502		COMMERCIAL	40.4	22	889	1,500	0.061	42.08	40.4	0.06	0.006	889	4.00	0.24	0.25	172.54	0.4	-	-	-	-		
	On-Site Total		-	40.4	-	889	-	0.061	42.08	40.4	0.06	0.006	889	4.00	0.24	0.25	172.54	-	-	-	-	-		
	Design Point Total		-	81.4	-	1,791	-	0.122	84.79	81.4	0.12	0.012	1,791	4.00	0.49	0.50	347.65	0.4	8"	110*	3.14	66.1		
3	512		COMMERCIAL	108.4	22	2,385	1,500	0.163	112.92	108.4	0.16	0.016	2,385	4.00	0.65	0.67	462.96	0.4	-	-	-	-		
	501		COMMERCIAL	108.2	22	2,380	1,500	0.162	112.71	108.2	0.16	0.016	2,380	4.00	0.65	0.67	462.10	0.4	-	-	-	-		
	471		COMMERCIAL	91.8	22	2,020	1,500	0.138	95.63	91.8	0.14	0.014	2,020	4.00	0.55	0.56	392.06	0.4	-	-	-	-		
	On-Site Total		-	308.4	-	6,785	-	0.463	321.25	308.4	0.46	0.046	6,785	3.63	1.68	1.73	1198.79	-	-	-	-	-		
4	Design Point Total		-	389.8	-	8,576	-	0.585	406.04	389.8	0.58	0.058	8,576	3.49	2.04	2.10	1458.63	0.4	14"	120*	4.52	63.8		
	470		COMMERCIAL	38.1	22	838	1,500	0.057	39.69	38.1	0.06	0.006	838	4.00	0.23	0.23	162.72	0.4	-	-	-	-		
	On-Site Total		-	38.1	-	838	-	0.057	39.69	38.1	0.06	0.006	838	4.00	0.23	0.23	162.72	-	-	-	-	-		
5	Design Point Total		-	427.9	-	9,414	-	0.642	445.73	427.9	0.64	0.064	9,414	3.44	2.21	2.27	1577.15	0.4	14"	130*	4.59	67.3		
	441		COMMERCIAL	50.3	22	1,107	1,500	0.075	52.40	50.3	0.08	0.008	1,107	4.00	0.30	0.31	214.82	0.4	-	-	-	-		
	On-Site Total		-	50.3	-	1,107	-	0.075	52.40	50.3	0.08	0.008	1,107	4.00	0.30	0.31	214.82	-	-	-	-	-		
6	Design Point Total		-	478.2	-	10,520	-	0.717	498.13	478.2	0.72	0.072	10,520	3.38	2.42	2.49	1731.05	0.4	14"	140*	4.66	72.4		
	442.5-O		COMMERCIAL	22.7	22	500	1,500	0.034	23.67	22.7	0.03	0.003	500	4.00	0.14	0.14	97.03	0.4	-	-	-	-		
	On-Site Total		-	22.7	-	500	-	0.034	23.67	22.7	0.03	0.003	500	4.00	0.14	0.14	97.03	-	-	-	-	-		
7	Design Point Total		-	500.9	-	11,020	-	0.751	521.79	500.9	0.75	0.075	11,020	3.35	2.52	2.59	1799.70	0.4	14"	150*	4.68	74.7		
	PA-02	PA-02 (30%)	INDUSTRIAL	30.8	18	554	1,200	0.037	25.7	30.8	0.037	0.004	554	4.00	0.15	0.15	105.17	0.4	-	-	-	-		
	On-Site Total		-	30.8	-	554	-	0.037	25.7	30.8	0.037	0.004	554	4.00	0.15	0.15	105.17	-	-	-	-	-		
8	Design Point Total		-	531.7	-	11,574	-	0.788	547.4	531.7	0.788	0.079	11,574	3.32	2.62	2.70	1,873.21	0.4	14"	160*	4.70	77.4		
	PA-02	PA-02 (25%)	INDUSTRIAL	25.7	18	462	1,200	0.031	21.4	25.7	0.031	0.003	462	4.00	0.12	0.13	87.64	0.4	-	-	-	-		
	443	443 (50%)	COMMERCIAL	29.8	22	655	1,500	0.045	31.0	29.8	0.045	0.004	655	4.00	0.18	0.18	127.06	0.4	-	-	-	-		
9	On-Site Total		-	55.4	-	1,116	-	0.075	52.4	55.4	0.075	0.008	1,116	4.00	0.30	0.31	214.69	-	-	-	-	-		
	Design Point Total		-	587.1	-	12,690	-	0.864	599.8	587.1	0.864	0.086	12,690	3.27	2.83	2.91	2,021.99	0.4	16"	170*	4.71	62.5		
	PA-02	PA-02 (15%)	INDUSTRIAL	15.4	18	277	1,200	0.018	12.8	15.4	0.018	0.002	277	4.00	0.07	0.08	52.58	0.4	-	-	-	-		
10	PA-03	PA-03 (50%)	COMMERCIAL	2.5	22	55	1,500	0.004	2.6	2.5	0.004	0.000	55	4.00	0.02	0.02	10.76	0.4	-	-	-	-		
	On-Site Total		-	17.9	-	332	-	0.022	15.5	17.9	0.022	0.002	332	4.00	0.09	0.09	63.35	-	-	-	-	-		
	Design Point Total		-	605.0	-	13,023	-	0.886	615.3	605.0	0.886	0.089	13,023	3.26	2.89	2.97	2,065.40	0.4	16"	180*	4.93	63.4		
11	PA-02	PA-02 (30%)	INDUSTRIAL	30.8	18	554	1,200	0.037	25.7	30.8	0.037	0.004	554	4.00	0.15	0.15	105.17	0.4	-	-	-	-		
	443	443 (50%)	COMMERCIAL	29.8	22	655	1,500	0.045	31.0	29.8	0.045	0.004	655	4.00	0.18	0.18	127.06	0.4	-	-	-	-		
	On-Site Total		-	60.5	-	1,209	-	0.082	56.6	60.5	0.082	0.008	1,209	4.00	0.33	0.33	232.22	-	-	-	-	-		
12	Design Point Total		-	60.5	-	1,209	-	0.082	56.6	60.5	0.082	0.008	1,209	4.00	0.33	0.33	232.22	0.4	8"	190	2.87	51.2		
	PA-03	PA-03 (50%)	COMMERCIAL	2.5	22	55	1,500	0.004	2.6	2.5	0.004	0.000	55	4.00	0.02	0.02	10.76	0.4	-	-	-	-		
	On-Site Total		-	2.5	-	55	-	0.004	2.6	2.5	0.004	0.000	55	4.00	0.02	0.02	10.76	-	-	-	-	-		
13	Design Point Total		-	668.1	-	14,287	-	0.971	674.5	668.1	0.971	0.097	14,287	3.21	3.11	3.21	2,230.62	0.4	16"	200*	5.01	66.9		
	431-O		COMMERCIAL	34.9	22	767	1,500	0.052	36.3	34.9	0.052	0.005	767	4.00	0.21	0.21	148.84	0.4	-	-	-	-		
	On-Site Total		-	34.9	-	767	-	0.052	36.3	34.9	0.052	0.005	767	4.00	0.21	0.21	148.84	-	-	-	-	-		
14	Design Point Total		-	702.9	-	15,054	-	1.024	710.8	702.9	1.024	0.102	15,054	3.18	3.25	3.36	2,330.86	0.4	16"	210*	5.05	69.1		
	332-O		COMMERCIAL	45.5	22	1,001	1,500	0.068	47.4	45.5	0.068	0.007	1,001	4.00	0.27	0.28	194.24	0.4	-	-	-	-		
	On-Site Total		-	45.5	-	1,001	-	0.068	47.4	45.5	0.068	0.007	1,001	4.00	0.27	0.28	194.24	-	-	-	-	-		
15	Design Point Total		-	748.4	-	16,054	-	1.092	758.2	748.4	1.092	0.109	16,054	3.15	3.43	3.54	2,460.44	0.4	16"	220*	5.09	72.1		
	400	400 (68%)	COMMERCIAL	29.8	22	655	1,500	0.045	31.0	29.8	0.045	0.004	655	4.00	0.18	0.18	127.20	0.4	-	-	-	-		
	331	331 (50%)	COMMERCIAL	57.1	22	1,256	1,500	0.086	59.5	57.1	0.086	0.009	1,256	4.00	0.34	0.35	243.86	0.4	-	-	-	-		
16	On-Site Total		-	86.9	-	1,911	-	0.130	90.5	86.9	0.130	0.013	1,911	4.00	0.52	0.53	371.07	-	-	-	-	-		
	Design Point Total		-	835.3	-	17,966	-	1.222	848.7	835.3	1.222	0.122	17,966	3.09	3.77	3.89	2,704.46	0.4	16"	230*	5.14	78.2		

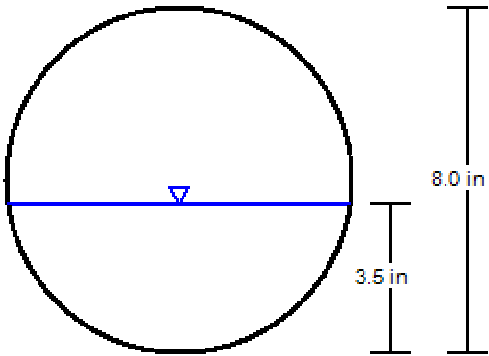
*Sanitary pipes are included for information and sizing purposes only. These pipes are assoaited with the Gun Club Business Park - Offsite Sanitary Improvements Project (RSN:1777354).

Worksheet for Node 1 - 2 8" pipe

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth
Input Data	
Roughness Coefficient	0.010
Channel Slope	0.004 ft/ft
Diameter	8.0 in
Discharge	0.25 MGD
Results	
Normal Depth	3.5 in
Flow Area	0.1 ft ²
Wetted Perimeter	1.0 ft
Hydraulic Radius	1.8 in
Top Width	0.66 ft
Critical Depth	3.5 in
Percent Full	43.3 %
Critical Slope	0.004 ft/ft
Velocity	2.67 ft/s
Velocity Head	0.11 ft
Specific Energy	0.40 ft
Froude Number	1.005
Maximum Discharge	0.69 MGD
Discharge Full	0.64 MGD
Slope Full	0.001 ft/ft
Flow Type	Supercritical
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	
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	43.3 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	3.5 in
Critical Depth	3.5 in
Channel Slope	0.004 ft/ft
Critical Slope	0.004 ft/ft

Cross Section for Node 1 - 2 8" pipe

Project Description	
Friction Method	Manning
	Formula
Solve For	Normal Depth
Input Data	
Roughness Coefficient	0.010
Channel Slope	0.004 ft/ft
Normal Depth	3.5 in
Diameter	8.0 in
Discharge	0.25 MGD



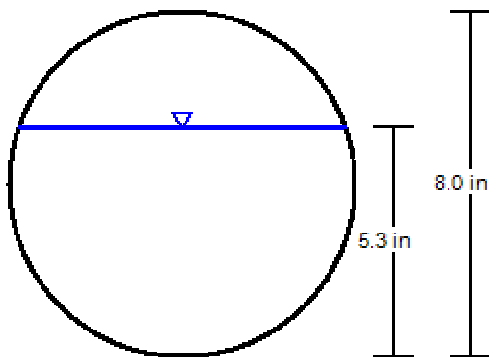
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H: 1

Worksheet for Node 2 - 3 8" pipe

Project Description	
Friction Method	Manning
	Formula
Solve For	Normal Depth
Input Data	
Roughness Coefficient	0.010
Channel Slope	0.004 ft/ft
Diameter	8.0 in
Discharge	0.50 MGD
Results	
Normal Depth	5.3 in
Flow Area	0.2 ft ²
Wetted Perimeter	1.3 ft
Hydraulic Radius	2.3 in
Top Width	0.63 ft
Critical Depth	5.0 in
Percent Full	66.1 %
Critical Slope	0.005 ft/ft
Velocity	3.14 ft/s
Velocity Head	0.15 ft
Specific Energy	0.59 ft
Froude Number	0.889
Maximum Discharge	0.69 MGD
Discharge Full	0.64 MGD
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	
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	25.7 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	5.3 in
Critical Depth	5.0 in
Channel Slope	0.004 ft/ft
Critical Slope	0.005 ft/ft

Cross Section for Node 2 - 3 8" pipe

Project Description	
Friction Method	Manning
	Formula
Solve For	Normal Depth
Input Data	
Roughness Coefficient	0.010
Channel Slope	0.004 ft/ft
Normal Depth	5.3 in
Diameter	8.0 in
Discharge	0.50 MGD



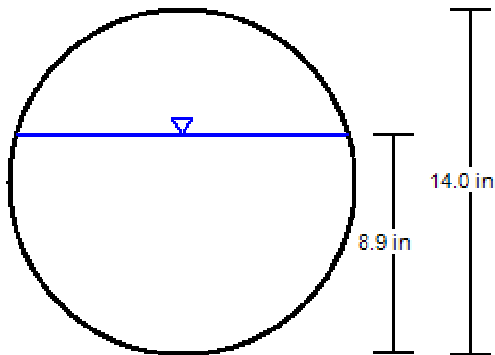
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Worksheet for Node 3 - 4 14" pipe

Project Description	
Friction Method	Manning
	Formula
Solve For	Normal Depth
Input Data	
Roughness Coefficient	0.010
Channel Slope	0.004 ft/ft
Diameter	14.0 in
Discharge	2.10 MGD
Results	
Normal Depth	8.9 in
Flow Area	0.7 ft ²
Wetted Perimeter	2.2 ft
Hydraulic Radius	4.0 in
Top Width	1.12 ft
Critical Depth	8.9 in
Percent Full	63.8 %
Critical Slope	0.004 ft/ft
Velocity	4.52 ft/s
Velocity Head	0.32 ft
Specific Energy	1.06 ft
Froude Number	0.994
Maximum Discharge	3.07 MGD
Discharge Full	2.86 MGD
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	
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	50.9 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	8.9 in
Critical Depth	8.9 in
Channel Slope	0.004 ft/ft
Critical Slope	0.004 ft/ft

Cross Section for Node 3 - 4 14" pipe

Project Description	
Friction Method	Manning
	Formula
Solve For	Normal Depth
Input Data	
Roughness Coefficient	0.010
Channel Slope	0.004 ft/ft
Normal Depth	8.9 in
Diameter	14.0 in
Discharge	2.10 MGD



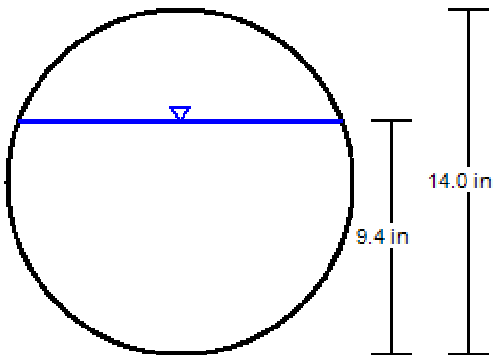
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Worksheet for Node 4 - 5 14" pipe

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth
Input Data	
Roughness Coefficient	0.010
Channel Slope	0.004 ft/ft
Diameter	14.0 in
Discharge	2.27 MGD
Results	
Normal Depth	9.4 in
Flow Area	0.8 ft ²
Wetted Perimeter	2.2 ft
Hydraulic Radius	4.1 in
Top Width	1.09 ft
Critical Depth	9.3 in
Percent Full	67.3 %
Critical Slope	0.004 ft/ft
Velocity	4.59 ft/s
Velocity Head	0.33 ft
Specific Energy	1.11 ft
Froude Number	0.967
Maximum Discharge	3.07 MGD
Discharge Full	2.86 MGD
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	
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	32.0 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	9.4 in
Critical Depth	9.3 in
Channel Slope	0.004 ft/ft
Critical Slope	0.004 ft/ft

Cross Section for Node 4 - 5 14" pipe

Project Description	
Friction Method	Manning
	Formula
Solve For	Normal Depth
Input Data	
Roughness Coefficient	0.010
Channel Slope	0.004 ft/ft
Normal Depth	9.4 in
Diameter	14.0 in
Discharge	2.27 MGD



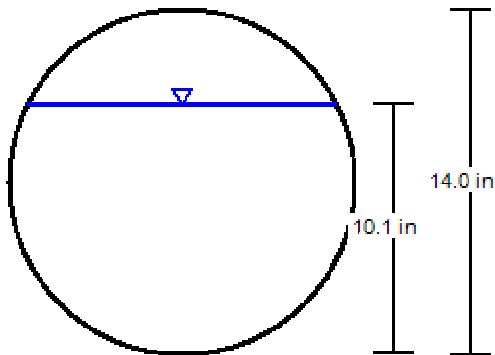
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Worksheet for Node 5 - A 14" pipe

Project Description	
Friction Method	Manning
	Formula
Solve For	Normal Depth
Input Data	
Roughness Coefficient	0.010
Channel Slope	0.004 ft/ft
Diameter	14.0 in
Discharge	2.49 MGD
Results	
Normal Depth	10.1 in
Flow Area	0.8 ft ²
Wetted Perimeter	2.4 ft
Hydraulic Radius	4.2 in
Top Width	1.04 ft
Critical Depth	9.7 in
Percent Full	72.4 %
Critical Slope	0.004 ft/ft
Velocity	4.66 ft/s
Velocity Head	0.34 ft
Specific Energy	1.18 ft
Froude Number	0.922
Maximum Discharge	3.07 MGD
Discharge Full	2.86 MGD
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	
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	57.3 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	10.1 in
Critical Depth	9.7 in
Channel Slope	0.004 ft/ft
Critical Slope	0.004 ft/ft

Cross Section for Node 5 - A 14" pipe

Project Description	
Friction Method	Manning
	Formula
Solve For	Normal Depth
Input Data	
Roughness Coefficient	0.010
Channel Slope	0.004 ft/ft
Normal Depth	10.1 in
Diameter	14.0 in
Discharge	2.49 MGD



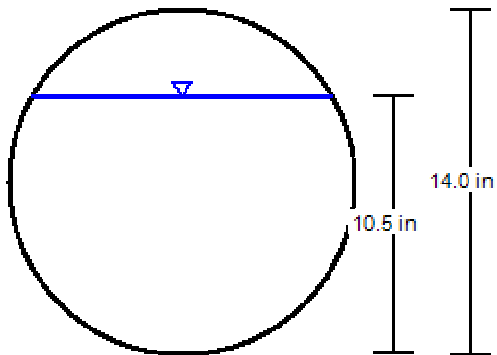
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Worksheet for Node A - 6 14" pipe

Project Description	
Friction Method	Manning
Solve For	Formula
	Normal Depth
Input Data	
Roughness Coefficient	0.010
Channel Slope	0.004 ft/ft
Diameter	14.0 in
Discharge	2.59 MGD
Results	
Normal Depth	10.5 in
Flow Area	0.9 ft ²
Wetted Perimeter	2.4 ft
Hydraulic Radius	4.2 in
Top Width	1.01 ft
Critical Depth	9.9 in
Percent Full	74.7 %
Critical Slope	0.005 ft/ft
Velocity	4.68 ft/s
Velocity Head	0.34 ft
Specific Energy	1.21 ft
Froude Number	0.898
Maximum Discharge	3.07 MGD
Discharge Full	2.86 MGD
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	
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	10.5 in
Critical Depth	9.9 in
Channel Slope	0.004 ft/ft
Critical Slope	0.005 ft/ft

Cross Section for Node A - 6 14" pipe

Project Description	
Friction Method	Manning
	Formula
Solve For	Normal Depth
Input Data	
Roughness Coefficient	0.010
Channel Slope	0.004 ft/ft
Normal Depth	10.5 in
Diameter	14.0 in
Discharge	2.59 MGD



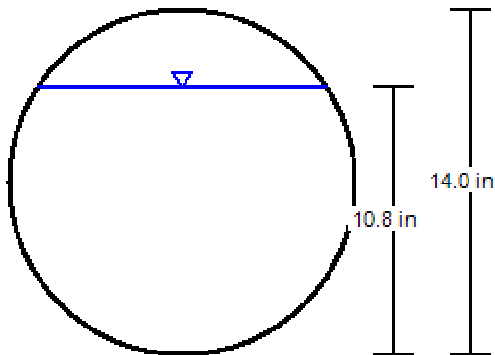
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Worksheet for Node 6 - B 14" pipe

Project Description	
Friction Method	Manning
Solve For	Formula
	Normal Depth
Input Data	
Roughness Coefficient	0.010
Channel Slope	0.004 ft/ft
Diameter	14.0 in
Discharge	2.70 MGD
Results	
Normal Depth	10.8 in
Flow Area	0.9 ft ²
Wetted Perimeter	2.5 ft
Hydraulic Radius	4.2 in
Top Width	0.98 ft
Critical Depth	10.1 in
Percent Full	77.4 %
Critical Slope	0.005 ft/ft
Velocity	4.70 ft/s
Velocity Head	0.34 ft
Specific Energy	1.25 ft
Froude Number	0.869
Maximum Discharge	3.07 MGD
Discharge Full	2.86 MGD
Slope Full	0.004 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	
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	52.6 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	10.8 in
Critical Depth	10.1 in
Channel Slope	0.004 ft/ft
Critical Slope	0.005 ft/ft

Cross Section for Node 6 - B 14" pipe

Project Description	
Friction Method	Manning
	Formula
Solve For	Normal Depth
Input Data	
Roughness Coefficient	0.010
Channel Slope	0.004 ft/ft
Normal Depth	10.8 in
Diameter	14.0 in
Discharge	2.70 MGD



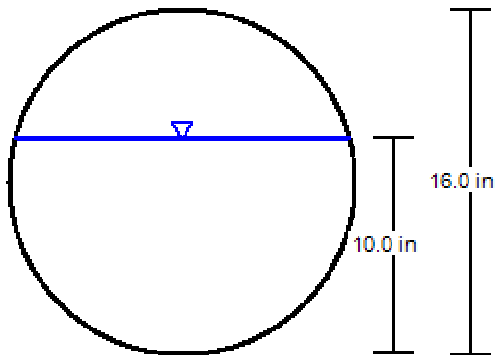
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Worksheet for Node B - 7 16" pipe

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth
Input Data	
Roughness Coefficient	0.010
Channel Slope	0.004 ft/ft
Diameter	16.0 in
Discharge	2.91 MGD
Results	
Normal Depth	10.0 in
Flow Area	0.9 ft ²
Wetted Perimeter	2.4 ft
Hydraulic Radius	4.5 in
Top Width	1.29 ft
Critical Depth	10.1 in
Percent Full	62.5 %
Critical Slope	0.004 ft/ft
Velocity	4.91 ft/s
Velocity Head	0.37 ft
Specific Energy	1.21 ft
Froude Number	1.026
Maximum Discharge	4.39 MGD
Discharge Full	4.08 MGD
Slope Full	0.002 ft/ft
Flow Type	Supercritical
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	
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	62.5 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	10.0 in
Critical Depth	10.1 in
Channel Slope	0.004 ft/ft
Critical Slope	0.004 ft/ft

Cross Section for Node B - 7 16" pipe

Project Description	
Friction Method	Manning
	Formula
Solve For	Normal Depth
Input Data	
Roughness Coefficient	0.010
Channel Slope	0.004 ft/ft
Normal Depth	10.0 in
Diameter	16.0 in
Discharge	2.91 MGD



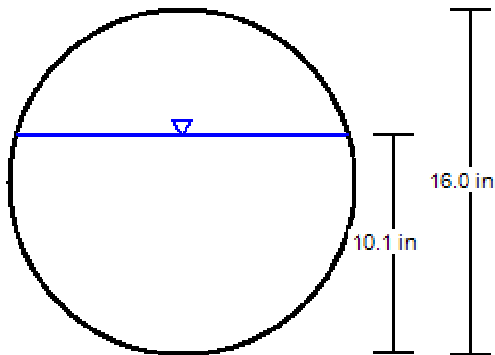
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Worksheet for Node 7 - D 16" pipe

Project Description	
Friction Method	Manning
Solve For	Formula
	Normal Depth
Input Data	
Roughness Coefficient	0.010
Channel Slope	0.004 ft/ft
Diameter	16.0 in
Discharge	2.97 MGD
Results	
Normal Depth	10.1 in
Flow Area	0.9 ft ²
Wetted Perimeter	2.5 ft
Hydraulic Radius	4.6 in
Top Width	1.28 ft
Critical Depth	10.2 in
Percent Full	63.4 %
Critical Slope	0.004 ft/ft
Velocity	4.93 ft/s
Velocity Head	0.38 ft
Specific Energy	1.22 ft
Froude Number	1.020
Maximum Discharge	4.39 MGD
Discharge Full	4.08 MGD
Slope Full	0.002 ft/ft
Flow Type	Supercritical
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	
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	63.4 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	10.1 in
Critical Depth	10.2 in
Channel Slope	0.004 ft/ft
Critical Slope	0.004 ft/ft

Cross Section for Node 7 - D 16" pipe

Project Description	
Friction Method	Manning
	Formula
Solve For	Normal Depth
Input Data	
Roughness Coefficient	0.010
Channel Slope	0.004 ft/ft
Normal Depth	10.1 in
Diameter	16.0 in
Discharge	2.97 MGD



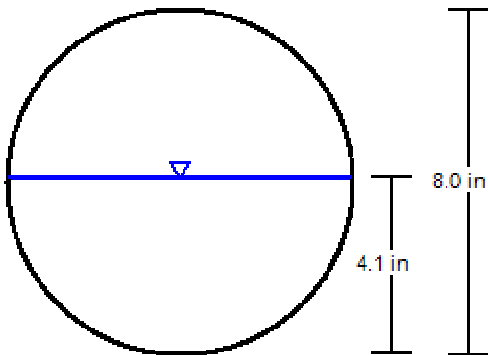
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Worksheet for Node C - D 8" pipe

Project Description	
Friction Method	Manning
	Formula
Solve For	Normal Depth
Input Data	
Roughness Coefficient	0.010
Channel Slope	0.004 ft/ft
Diameter	8.0 in
Discharge	0.33 MGD
Results	
Normal Depth	4.1 in
Flow Area	0.2 ft ²
Wetted Perimeter	1.1 ft
Hydraulic Radius	2.0 in
Top Width	0.67 ft
Critical Depth	4.0 in
Percent Full	51.2 %
Critical Slope	0.004 ft/ft
Velocity	2.87 ft/s
Velocity Head	0.13 ft
Specific Energy	0.47 ft
Froude Number	0.976
Maximum Discharge	0.69 MGD
Discharge Full	0.64 MGD
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	
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	29.7 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	4.1 in
Critical Depth	4.0 in
Channel Slope	0.004 ft/ft
Critical Slope	0.004 ft/ft

Cross Section for Node C - D 8" pipe

Project Description	
Friction Method	Manning
	Formula
Solve For	Normal Depth
Input Data	
Roughness Coefficient	0.010
Channel Slope	0.004 ft/ft
Normal Depth	4.1 in
Diameter	8.0 in
Discharge	0.33 MGD



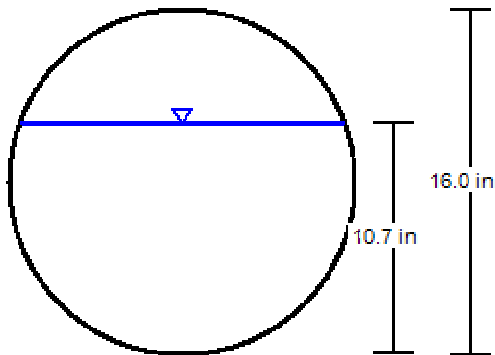
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Worksheet for Node D - 8 16" pipe

Project Description	
Friction Method	Manning
Solve For	Formula
	Normal Depth
Input Data	
Roughness Coefficient	0.010
Channel Slope	0.004 ft/ft
Diameter	16.0 in
Discharge	3.21 MGD
Results	
Normal Depth	10.7 in
Flow Area	1.0 ft ²
Wetted Perimeter	2.6 ft
Hydraulic Radius	4.7 in
Top Width	1.25 ft
Critical Depth	10.7 in
Percent Full	66.9 %
Critical Slope	0.004 ft/ft
Velocity	5.01 ft/s
Velocity Head	0.39 ft
Specific Energy	1.28 ft
Froude Number	0.992
Maximum Discharge	4.39 MGD
Discharge Full	4.08 MGD
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	
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	30.3 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	10.7 in
Critical Depth	10.7 in
Channel Slope	0.004 ft/ft
Critical Slope	0.004 ft/ft

Cross Section for Node D - 8 16" pipe

Project Description	
Friction Method	Manning
	Formula
Solve For	Normal Depth
Input Data	
Roughness Coefficient	0.010
Channel Slope	0.004 ft/ft
Normal Depth	10.7 in
Diameter	16.0 in
Discharge	3.21 MGD



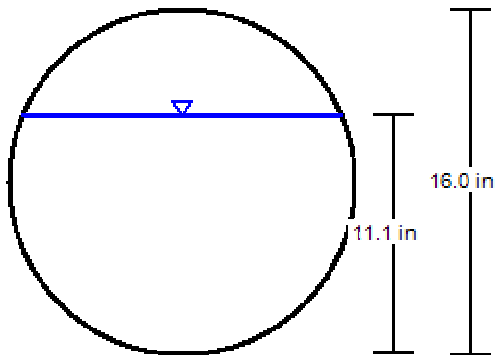
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Worksheet for Node 8 - 9 16" pipe

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth
Input Data	
Roughness Coefficient	0.010
Channel Slope	0.004 ft/ft
Diameter	16.0 in
Discharge	3.36 MGD
Results	
Normal Depth	11.1 in
Flow Area	1.0 ft ²
Wetted Perimeter	2.6 ft
Hydraulic Radius	4.7 in
Top Width	1.23 ft
Critical Depth	10.9 in
Percent Full	69.1 %
Critical Slope	0.004 ft/ft
Velocity	5.05 ft/s
Velocity Head	0.40 ft
Specific Energy	1.32 ft
Froude Number	0.973
Maximum Discharge	4.39 MGD
Discharge Full	4.08 MGD
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	
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	17.1 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	11.1 in
Critical Depth	10.9 in
Channel Slope	0.004 ft/ft
Critical Slope	0.004 ft/ft

Cross Section for Node 8 - 9 16" pipe

Project Description	
Friction Method	Manning
	Formula
Solve For	Normal Depth
Input Data	
Roughness Coefficient	0.010
Channel Slope	0.004 ft/ft
Normal Depth	11.1 in
Diameter	16.0 in
Discharge	3.36 MGD



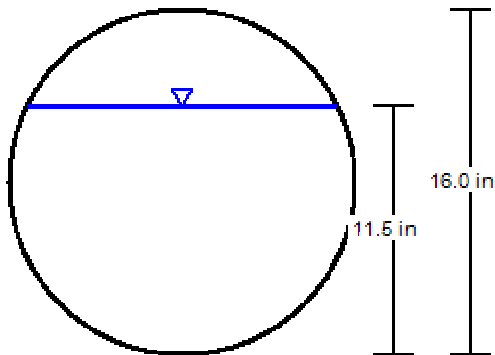
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Worksheet for Node 9 - 10 16" pipe

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth
Input Data	
Roughness Coefficient	0.010
Channel Slope	0.004 ft/ft
Diameter	16.0 in
Discharge	3.54 MGD
Results	
Normal Depth	11.5 in
Flow Area	1.1 ft ²
Wetted Perimeter	2.7 ft
Hydraulic Radius	4.8 in
Top Width	1.20 ft
Critical Depth	11.2 in
Percent Full	72.1 %
Critical Slope	0.004 ft/ft
Velocity	5.09 ft/s
Velocity Head	0.40 ft
Specific Energy	1.36 ft
Froude Number	0.945
Maximum Discharge	4.39 MGD
Discharge Full	4.08 MGD
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	
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	54.8 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	11.5 in
Critical Depth	11.2 in
Channel Slope	0.004 ft/ft
Critical Slope	0.004 ft/ft

Cross Section for Node 9 - 10 16" pipe

Project Description	
Friction Method	Manning
	Formula
Solve For	Normal Depth
Input Data	
Roughness Coefficient	0.010
Channel Slope	0.004 ft/ft
Normal Depth	11.5 in
Diameter	16.0 in
Discharge	3.54 MGD



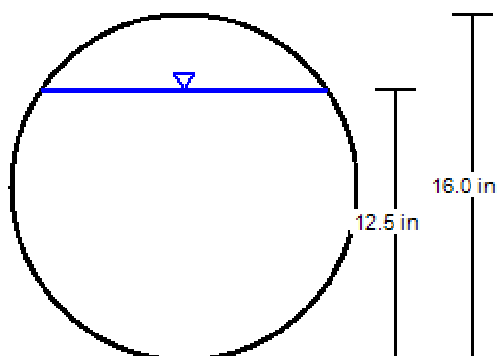
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Worksheet for Node 10 - CONNECTION 16" pipe

Project Description	
Friction Method	Manning
Solve For	Formula
	Normal Depth
Input Data	
Roughness Coefficient	0.010
Channel Slope	0.004 ft/ft
Diameter	16.0 in
Discharge	3.89 MGD
Results	
Normal Depth	12.5 in
Flow Area	1.2 ft ²
Wetted Perimeter	2.9 ft
Hydraulic Radius	4.9 in
Top Width	1.10 ft
Critical Depth	11.8 in
Percent Full	78.2 %
Critical Slope	0.005 ft/ft
Velocity	5.14 ft/s
Velocity Head	0.41 ft
Specific Energy	1.45 ft
Froude Number	0.879
Maximum Discharge	4.39 MGD
Discharge Full	4.08 MGD
Slope Full	0.004 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	
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	48.1 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	12.5 in
Critical Depth	11.8 in
Channel Slope	0.004 ft/ft
Critical Slope	0.005 ft/ft

Cross Section for Node 10 - CONNECTION 16" pipe

Project Description	
Friction Method	Manning
	Formula
Solve For	Normal Depth
Input Data	
Roughness Coefficient	0.010
Channel Slope	0.004 ft/ft
Normal Depth	12.5 in
Diameter	16.0 in
Discharge	3.89 MGD



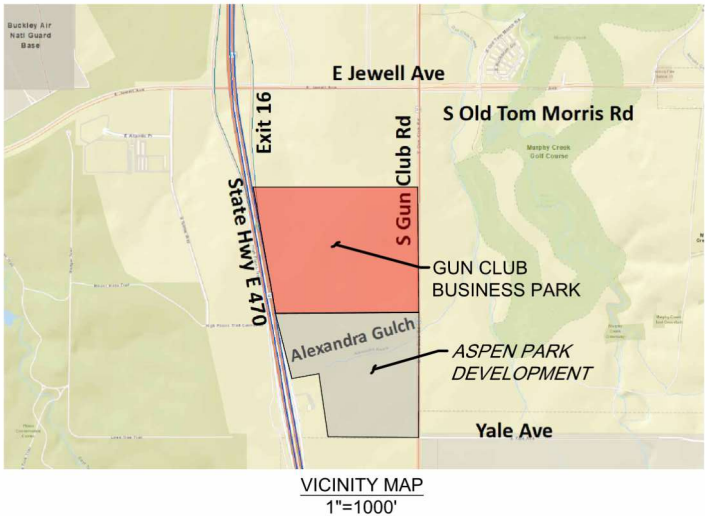
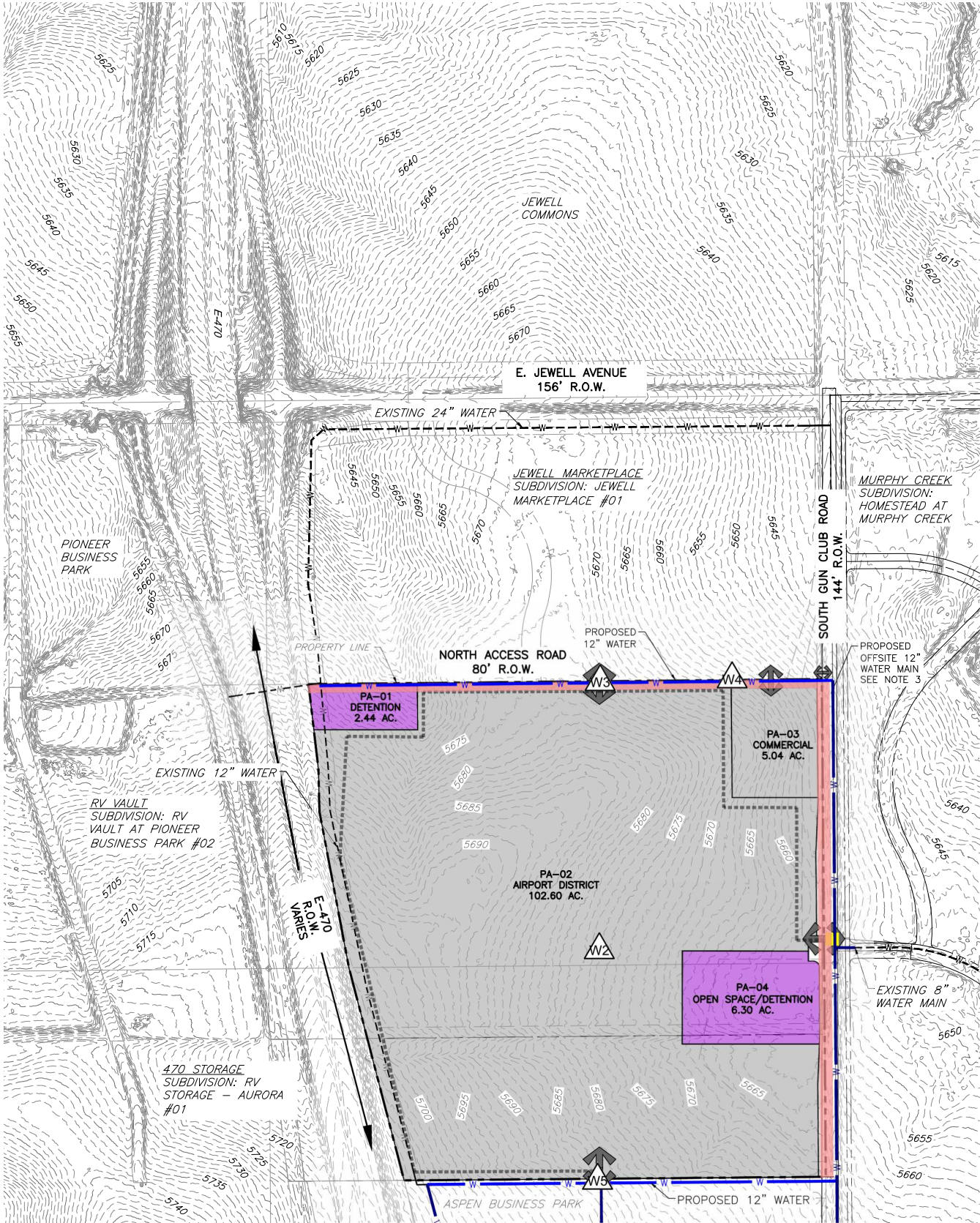
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APPENDIX E
WATER MASTER PLAN

GUN CLUB BUSINESS PARK

MASTER WATER PLAN

A PARCEL OF LAND SITUATED IN THE WEST HALF OF SECTION 31 AND NORTHEAST QUARTER OF SECTION 36, TOWNSHIP 4 SOUTH, RANGE 65 WEST OF THE SIXTH PRINCIPAL MERIDIAN,
CITY OF AURORA, COUNTY OF ARAPAHOE
STATE OF COLORADO



LEGEND * SYMBOLS MAY NOT BE TO SCALE FOR BETTER GRAPHICAL REPRESENTATION.

---	PROPERTY LINE
---	PLANNING AREA BOUNDARY LINE
---	PROPOSED WATER
---	PROPOSED OFF-SITE WATER MAIN
---	EXISTING OFF-SITE WATER MAIN
---	CONCEPT INTERNAL ROADS
---	PROPOSED OPEN SPACE
---	PROPOSED ROADWAY
---	PROPOSED PLANNING AREA
---	WATER NETWORK DESIGN POINT

- NOTES:**
- LOOPEd WATER TO SUPPORT PUBLIC FIRE HYDRANTS AND PRIVATE FIRE SUPPRESSION SYSTEMS ARE REQUIRED WITH EACH PHASE OF DEVELOPMENT.
 - IF THE OFF-SITE WATER SYSTEM INFRASTRUCTURE HAS NOT YET BEEN INSTALLED, OR IS LABELED AS BY-OTHERS, THE DEVELOPING PLANNING AREA WILL BE RESPONSIBLE FOR BUILDING THE NECESSARY OFF-SITE WATER SYSTEM 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 WATER SYSTEM, BY EXTENDING THE EXISTING WATER SYSTEM, UPDATING THE DEMANDS AND DESIGN POINTS DESCRIBED IN THIS REPORT. THIS REPORT SHOWS GRAPHICAL WATER SYSTEM LOCATIONS THAT WILL BE LOCATED IN MORE DETAIL DURING THE CITY OF AURORA CSP PROCESS AND CAN BE UPDATED OR AMENDED IF NECESSARY, TO SUPPORT THE WATER NEEDS FOR PLANNING AREAS DETERMINED IN THE FUTURE.
 - PER EMAIL CORRESPONDENCE WITH CHONG WOO ON JANUARY 11, 2024: M/M HAS RECEIVED DIRECTION THAT THE 42-INCH WATERLINE ALONG GUN CLUB, FROM JEWELL TO HAMPDEN, CAN BE DEFERRED TO A LATER DATE. A 12-INCH ALONG GUN CLUB ROAD CAN BE PROPOSED AS LONG AS TWO POINTS OF CONNECTION AND FIRE HYDRANTS ARE PROVIDED.
 - THE DEVELOPER IS RESPONSIBLE FOR THE CONSTRUCTION OF ALL ON-SITE AND OFF-SITE INFRASTRUCTURE NEEDED TO ESTABLISH TWO POINTS OF EMERGENCY ACCESS TO THE OVERALL SITE AND EACH INTERNAL PHASE OF CONSTRUCTION. THIS REQUIREMENT INCLUDES BUT IS NOT LIMITED TO, THE CONSTRUCTION OF ANY EMERGENCY CROSSINGS IMPROVEMENTS, LOOPEd WATER SUPPLY, AND FIRE HYDRANT AS REQUIRED BY THE ADOPTED FIRE CODE AND CITY ORDINANCES.

BENCHMARK:

CITY OF AURORA BENCHMARK ID 456625SE002, BEING A RAILROAD SPIKE IN POWER POLE - WEST SIDE GUN CLUB (HWY 30) 0.25 MILES NORTH OF YALE LAND LINE.
ELEVATION: 5671.27 FEET (NAVD88 DATUM)

APPROVED FOR ONE YEAR FROM THIS DATE	
AURORA WATER - UTILITY DIVISION	DATE
FIRE & LIFE SAFETY DEPARTMENT	DATE

GUN CLUB BUSINESS PARK

No.	Description of Revisions	Date	Name
1	CITY SUBMITAL	05/03/24	WM

Job Number	23.1060
Project Manager	G. PROULX
Design By	JAR, BAM, DUB, TJS
Drawn By	J. RODRIGUEZ
Principal In Charge	DLE

Sheet Number:

W1

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

NOT FOR CONSTRUCTION

MASTER UTILITY PLAN

OVERALL WATER PLAN

THE DESIGN SHOWN HEREIN INCLUDING ALL TECHNICAL DRAWINGS, SPECIFICATIONS, AND NOTES, IS THE PROPERTY OF MARTIN/MARTIN CONSULTING ENGINEERS. NO PART OF THIS DESIGN SHALL BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS, ELECTRONIC OR MECHANICAL, INCLUDING PHOTOCOPYING, RECORDING, OR BY ANY INFORMATION STORAGE AND RETRIEVAL SYSTEM, WITHOUT THE WRITTEN PERMISSION OF MARTIN/MARTIN CONSULTING ENGINEERS. THE USER OF THIS DESIGN ASSUMES ALL LIABILITY FOR THE DESIGN AND NOT MARTIN/MARTIN CONSULTING ENGINEERS.

APPENDIX F
WATER DEMAND TABLES AND CALCULATIONS



PROJECTED WATER DEMAND GENERATION

GUN CLUB BUSINESS PARK

RESIDENTIAL WATER USE	101	GPCD	SINGLE-FAMILY POPULATION DENSITY	2.77	PEOPLE/UNIT
COMMERCIAL/MIXED USE	1,500	GPD/ACRE	MULTI-FAMILY POPULATION DENSITY	2.77	PEOPLE/UNIT
INDUSTRIAL/SCHOOL USE	1,200	GPD/ACRE			
PARKS & GREEN BELTS	1,800	GPD/ACRE	RESIDENTIAL FIRE FLOW	1,500	GPM FOR 2 HOURS
MAX DAY / AVG. DAY RATIO	2.80		COMMERCIAL/MULTI FAMILY FIRE FLOW	2,500	GPM FOR 2 HOURS
MAX HOUR / AVG. DAY RATIO	4.50		INDUSTRIAL/SCHOOL FIRE FLOW	4,000	GPM FOR 3 HOURS

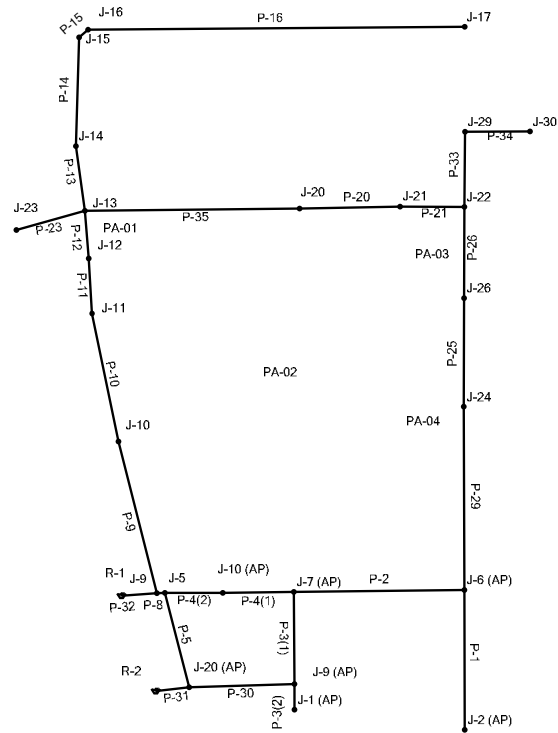
BASIN (PLANNING AREA)	LAND USE	ACRES	NO. OF SF UNITS	NO. OF MF UNITS	AVG. DAY DEMAND (GPD)	AVG. DAY DEMAND (GPM)	MAX DAY DEMAND (GPM)	MAX HOUR DEMAND (GPM)	MAX DAY + FIRE FLOW (GPM)	DEMAND POINT
PA-02	INDUSTRIAL	102.60	-	-	123,120	86	239	385	4,239	W2
PA-03	COMMERCIAL	5.04	-	-	7,560	5	15	24	2,515	W4
SUB-TOTALS	RESIDENTIAL	-	-	-	-	-	-	-	-	
	COMMERCIAL	5.04	-	-	7,560	5	15	24	2,515	
	INDUSTRIAL	102.60	-	-	123,120	86	239	385	4,239	
	SCHOOL	-	-	-	-	-	-	-	-	
	PARKS	-	-	-	-	-	-	-	-	
TOTALS		107.64	-	-	130,680	91	254	408	6,754	

APPENDIX G
WATER MODEL DIAGRAM

CRIPPEN WATERCAD.wtg

Scenario: **STATIC**

Active Scenario: **STATIC**



APPENDIX H
WATER MODEL RESULT TABLES

CRIPPEN WATERCAD.wtg**FlexTable: Pipe Table****Active Scenario: STATIC**

Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen- Williams C	Flow (gpm)	Velocity (ft/s)
P-32	223	R-1	J-9	12.0	PVC	150.0	0	0.00
P-8	49	J-5	J-9	12.0	PVC	150.0	0	0.00
P-33	469	J-22	J-29	12.0	PVC	150.0	0	0.00
P-5	609	J-5	J-20 (AP)	12.0	PVC	150.0	0	0.00
P-31	211	R-2	J-20 (AP)	12.0	PVC	150.0	0	0.00
P-25	677	J-24	J-26	12.0	PVC	150.0	0	0.00
P-26	572	J-26	J-22	12.0	PVC	150.0	0	0.00
P-2	1,067	J-6 (AP)	J-7 (AP)	12.0	PVC	150.0	0	0.00
P-29	1,145	J-6 (AP)	J-24	12.0	PVC	150.0	0	0.00
P-20	629	J-20	J-21	12.0	PVC	150.0	0	0.00
P-35	1,344	J-20	J-13	12.0	PVC	150.0	0	0.00
P-21	403	J-21	J-22	12.0	PVC	150.0	0	0.00
P-11	344	J-11	J-12	12.0	PVC	150.0	0	0.00
P-10	817	J-10	J-11	12.0	PVC	150.0	0	0.00
P-9	977	J-9	J-10	12.0	PVC	150.0	0	0.00
P-12	300	J-12	J-13	12.0	PVC	150.0	0	0.00
P-4(2)	362	J-10 (AP)	J-5	12.0	PVC	150.0	0	0.00
P-4(1)	446	J-7 (AP)	J-10 (AP)	12.0	PVC	150.0	0	0.00
P-14	680	J-14	J-15	24.0	PVC	150.0	0	0.00
P-15	74	J-15	J-16	24.0	PVC	150.0	0	0.00
P-13	407	J-13	J-14	24.0	PVC	150.0	0	0.00
P-3(1)	576	J-7 (AP)	J-9 (AP)	12.0	PVC	150.0	0	0.00
P-23	445	J-13	J-23	24.0	PVC	150.0	0	0.00
P-30	660	J-20 (AP)	J-9 (AP)	12.0	PVC	150.0	0	0.00
P-3(2)	161	J-9 (AP)	J-1 (AP)	12.0	PVC	150.0	0	0.00
P-34	406	J-29	J-30	8.0	PVC	150.0	0	0.00
P-16	2,357	J-16	J-17	24.0	PVC	150.0	0	0.00
P-1	874	J-2 (AP)	J-6 (AP)	12.0	PVC	150.0	0	0.00

CRIPPEN WATERCAD.wtg**FlexTable: Junction Table****Active Scenario: STATIC**

Label	Elevation (ft)	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
J-15	5,633.04	0	5,850.00	94
J-30	5,633.85	0	5,850.00	94
J-16	5,633.87	0	5,850.00	94
J-17	5,634.16	0	5,850.00	93
J-29	5,638.38	0	5,850.00	92
J-22	5,645.44	0	5,850.00	89
J-26	5,650.42	0	5,850.00	86
J-24	5,653.33	0	5,850.00	85
J-21	5,656.02	0	5,850.00	84
J-14	5,658.71	0	5,850.00	83
J-20	5,668.90	0	5,850.00	78
J-6 (AP)	5,670.25	0	5,850.00	78
J-13	5,671.34	0	5,850.00	77
J-12	5,677.00	0	5,850.00	75
J-23	5,681.10	0	5,850.00	73
J-2 (AP)	5,682.45	0	5,850.00	72
J-7 (AP)	5,686.28	0	5,850.00	71
J-11	5,687.75	0	5,850.00	70
J-9 (AP)	5,691.90	0	5,850.00	68
J-10 (AP)	5,692.15	0	5,850.00	68
J-10	5,695.43	0	5,850.00	67
J-1 (AP)	5,697.51	0	5,850.00	66
J-5	5,701.75	0	5,850.00	64
J-20 (AP)	5,701.94	0	5,850.00	64
J-9	5,703.18	0	5,850.00	64

CRIPPEN WATERCAD.wtg**FlexTable: Pipe Table****Active Scenario: AVG DAY DEMAND**

Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen- Williams C	Flow (gpm)	Velocity (ft/s)
P-32	223	R-1	J-9	12.0	PVC	150.0	51	0.14
P-31	211	R-2	J-20 (AP)	12.0	PVC	150.0	40	0.11
P-9	977	J-9	J-10	12.0	PVC	150.0	34	0.10
P-2	1,067	J-6 (AP)	J-7 (AP)	12.0	PVC	150.0	-26	0.07
P-4(1)	446	J-7 (AP)	J-10 (AP)	12.0	PVC	150.0	-22	0.06
P-4(2)	362	J-10 (AP)	J-5	12.0	PVC	150.0	-22	0.06
P-3(1)	576	J-7 (AP)	J-9 (AP)	12.0	PVC	150.0	-22	0.06
P-30	660	J-20 (AP)	J-9 (AP)	12.0	PVC	150.0	22	0.06
P-10	817	J-10	J-11	12.0	PVC	150.0	21	0.06
P-29	1,145	J-6 (AP)	J-24	12.0	PVC	150.0	20	0.06
P-5	609	J-5	J-20 (AP)	12.0	PVC	150.0	-18	0.05
P-8	49	J-5	J-9	12.0	PVC	150.0	-17	0.05
P-11	344	J-11	J-12	12.0	PVC	150.0	9	0.03
P-12	300	J-12	J-13	12.0	PVC	150.0	9	0.03
P-35	1,344	J-20	J-13	12.0	PVC	150.0	-9	0.03
P-25	677	J-24	J-26	12.0	PVC	150.0	4	0.01
P-26	572	J-26	J-22	12.0	PVC	150.0	4	0.01
P-20	629	J-20	J-21	12.0	PVC	150.0	-4	0.01
P-21	403	J-21	J-22	12.0	PVC	150.0	-4	0.01
P-34	406	J-29	J-30	8.0	PVC	150.0	0	0.00
P-33	469	J-22	J-29	12.0	PVC	150.0	0	0.00
P-14	680	J-14	J-15	24.0	PVC	150.0	0	0.00
P-15	74	J-15	J-16	24.0	PVC	150.0	0	0.00
P-16	2,357	J-16	J-17	24.0	PVC	150.0	0	0.00
P-13	407	J-13	J-14	24.0	PVC	150.0	0	0.00
P-23	445	J-13	J-23	24.0	PVC	150.0	0	0.00
P-3(2)	161	J-9 (AP)	J-1 (AP)	12.0	PVC	150.0	0	0.00
P-1	874	J-2 (AP)	J-6 (AP)	12.0	PVC	150.0	0	0.00

CRIPPEN WATERCAD.wtg

FlexTable: Junction Table

Active Scenario: AVG DAY DEMAND

Label	Elevation (ft)	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
J-15	5,633.04	0	5,849.99	94
J-30	5,633.85	0	5,849.99	94
J-16	5,633.87	0	5,849.99	94
J-17	5,634.16	0	5,849.99	93
J-29	5,638.38	0	5,849.99	92
J-22	5,645.44	0	5,849.99	89
J-26	5,650.42	0	5,849.99	86
J-24	5,653.33	17	5,849.99	85
J-21	5,656.02	0	5,849.99	84
J-14	5,658.71	0	5,849.99	83
J-20	5,668.90	13	5,849.99	78
J-6 (AP)	5,670.25	6	5,849.99	78
J-13	5,671.34	0	5,849.99	77
J-12	5,677.00	0	5,849.99	75
J-23	5,681.10	0	5,849.99	73
J-2 (AP)	5,682.45	0	5,849.99	72
J-7 (AP)	5,686.28	19	5,850.00	71
J-11	5,687.75	13	5,849.99	70
J-9 (AP)	5,691.90	0	5,850.00	68
J-10 (AP)	5,692.15	0	5,850.00	68
J-10	5,695.43	13	5,849.99	67
J-1 (AP)	5,697.51	0	5,850.00	66
J-5	5,701.75	13	5,850.00	64
J-20 (AP)	5,701.94	0	5,850.00	64
J-9	5,703.18	0	5,850.00	64

CRIPPEN WATERCAD.wtg**FlexTable: Pipe Table****Active Scenario: MAX DAY DEMAND**

Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen- Williams C	Flow (gpm)	Velocity (ft/s)
P-32	223	R-1	J-9	12.0	PVC	150.0	142	0.40
P-31	211	R-2	J-20 (AP)	12.0	PVC	150.0	112	0.32
P-9	977	J-9	J-10	12.0	PVC	150.0	98	0.28
P-2	1,067	J-6 (AP)	J-7 (AP)	12.0	PVC	150.0	-78	0.22
P-10	817	J-10	J-11	12.0	PVC	150.0	67	0.19
P-29	1,145	J-6 (AP)	J-24	12.0	PVC	150.0	63	0.18
P-4(1)	446	J-7 (AP)	J-10 (AP)	12.0	PVC	150.0	-62	0.18
P-4(2)	362	J-10 (AP)	J-5	12.0	PVC	150.0	-62	0.18
P-3(1)	576	J-7 (AP)	J-9 (AP)	12.0	PVC	150.0	-62	0.18
P-30	660	J-20 (AP)	J-9 (AP)	12.0	PVC	150.0	62	0.18
P-5	609	J-5	J-20 (AP)	12.0	PVC	150.0	-51	0.14
P-8	49	J-5	J-9	12.0	PVC	150.0	-43	0.12
P-11	344	J-11	J-12	12.0	PVC	150.0	36	0.10
P-12	300	J-12	J-13	12.0	PVC	150.0	36	0.10
P-35	1,344	J-20	J-13	12.0	PVC	150.0	-36	0.10
P-25	677	J-24	J-26	12.0	PVC	150.0	22	0.06
P-26	572	J-26	J-22	12.0	PVC	150.0	22	0.06
P-20	629	J-20	J-21	12.0	PVC	150.0	-22	0.06
P-21	403	J-21	J-22	12.0	PVC	150.0	-22	0.06
P-1	874	J-2 (AP)	J-6 (AP)	12.0	PVC	150.0	0	0.00
P-33	469	J-22	J-29	12.0	PVC	150.0	0	0.00
P-3(2)	161	J-9 (AP)	J-1 (AP)	12.0	PVC	150.0	0	0.00
P-14	680	J-14	J-15	24.0	PVC	150.0	0	0.00
P-13	407	J-13	J-14	24.0	PVC	150.0	0	0.00
P-15	74	J-15	J-16	24.0	PVC	150.0	0	0.00
P-23	445	J-13	J-23	24.0	PVC	150.0	0	0.00
P-34	406	J-29	J-30	8.0	PVC	150.0	0	0.00
P-16	2,357	J-16	J-17	24.0	PVC	150.0	0	0.00

CRIPPEN WATERCAD.wtg**FlexTable: Junction Table****Active Scenario: MAX DAY DEMAND**

Label	Elevation (ft)	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
J-15	5,633.04	0	5,849.95	94
J-30	5,633.85	0	5,849.95	93
J-16	5,633.87	0	5,849.95	93
J-17	5,634.16	0	5,849.95	93
J-29	5,638.38	0	5,849.95	92
J-22	5,645.44	0	5,849.95	88
J-26	5,650.42	0	5,849.95	86
J-24	5,653.33	41	5,849.95	85
J-21	5,656.02	0	5,849.94	84
J-14	5,658.71	0	5,849.95	83
J-20	5,668.90	57	5,849.94	78
J-6 (AP)	5,670.25	15	5,849.96	78
J-13	5,671.34	0	5,849.95	77
J-12	5,677.00	0	5,849.95	75
J-23	5,681.10	0	5,849.95	73
J-2 (AP)	5,682.45	0	5,849.96	72
J-7 (AP)	5,686.28	46	5,849.98	71
J-11	5,687.75	31	5,849.95	70
J-9 (AP)	5,691.90	0	5,849.99	68
J-10 (AP)	5,692.15	0	5,849.98	68
J-10	5,695.43	31	5,849.96	67
J-1 (AP)	5,697.51	0	5,849.99	66
J-5	5,701.75	31	5,849.99	64
J-20 (AP)	5,701.94	0	5,849.99	64
J-9	5,703.18	0	5,849.99	64

CRIPPEN WATERCAD.wtg**FlexTable: Pipe Table****Active Scenario: MAX HOUR**

Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen- Williams C	Flow (gpm)	Velocity (ft/s)
P-32	223	R-1	J-9	12.0	PVC	150.0	227	0.64
P-31	211	R-2	J-20 (AP)	12.0	PVC	150.0	181	0.51
P-9	977	J-9	J-10	12.0	PVC	150.0	158	0.45
P-2	1,067	J-6 (AP)	J-7 (AP)	12.0	PVC	150.0	-125	0.35
P-10	817	J-10	J-11	12.0	PVC	150.0	108	0.31
P-29	1,145	J-6 (AP)	J-24	12.0	PVC	150.0	101	0.29
P-4(1)	446	J-7 (AP)	J-10 (AP)	12.0	PVC	150.0	-100	0.28
P-4(2)	362	J-10 (AP)	J-5	12.0	PVC	150.0	-100	0.28
P-30	660	J-20 (AP)	J-9 (AP)	12.0	PVC	150.0	99	0.28
P-3(1)	576	J-7 (AP)	J-9 (AP)	12.0	PVC	150.0	-99	0.28
P-5	609	J-5	J-20 (AP)	12.0	PVC	150.0	-81	0.23
P-8	49	J-5	J-9	12.0	PVC	150.0	-69	0.20
P-11	344	J-11	J-12	12.0	PVC	150.0	57	0.16
P-12	300	J-12	J-13	12.0	PVC	150.0	57	0.16
P-35	1,344	J-20	J-13	12.0	PVC	150.0	-57	0.16
P-25	677	J-24	J-26	12.0	PVC	150.0	35	0.10
P-26	572	J-26	J-22	12.0	PVC	150.0	35	0.10
P-20	629	J-20	J-21	12.0	PVC	150.0	-35	0.10
P-21	403	J-21	J-22	12.0	PVC	150.0	-35	0.10
P-3(2)	161	J-9 (AP)	J-1 (AP)	12.0	PVC	150.0	0	0.00
P-33	469	J-22	J-29	12.0	PVC	150.0	0	0.00
P-15	74	J-15	J-16	24.0	PVC	150.0	0	0.00
P-13	407	J-13	J-14	24.0	PVC	150.0	0	0.00
P-14	680	J-14	J-15	24.0	PVC	150.0	0	0.00
P-16	2,357	J-16	J-17	24.0	PVC	150.0	0	0.00
P-34	406	J-29	J-30	8.0	PVC	150.0	0	0.00
P-1	874	J-2 (AP)	J-6 (AP)	12.0	PVC	150.0	0	0.00
P-23	445	J-13	J-23	24.0	PVC	150.0	0	0.00

CRIPPEN WATERCAD.wtg
FlexTable: Junction Table
Active Scenario: MAX HOUR

Label	Elevation (ft)	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
J-15	5,633.04	0	5,849.88	94
J-30	5,633.85	0	5,849.87	93
J-16	5,633.87	0	5,849.88	93
J-17	5,634.16	0	5,849.88	93
J-29	5,638.38	0	5,849.87	92
J-22	5,645.44	0	5,849.87	88
J-26	5,650.42	0	5,849.87	86
J-24	5,653.33	66	5,849.87	85
J-21	5,656.02	0	5,849.87	84
J-14	5,658.71	0	5,849.88	83
J-20	5,668.90	92	5,849.86	78
J-6 (AP)	5,670.25	24	5,849.91	78
J-13	5,671.34	0	5,849.88	77
J-12	5,677.00	0	5,849.88	75
J-23	5,681.10	0	5,849.88	73
J-2 (AP)	5,682.45	0	5,849.91	72
J-7 (AP)	5,686.28	75	5,849.95	71
J-11	5,687.75	50	5,849.88	70
J-9 (AP)	5,691.90	0	5,849.96	68
J-10 (AP)	5,692.15	0	5,849.96	68
J-10	5,695.43	50	5,849.91	67
J-1 (AP)	5,697.51	0	5,849.96	66
J-5	5,701.75	50	5,849.97	64
J-20 (AP)	5,701.94	0	5,849.98	64
J-9	5,703.18	0	5,849.97	64

CRIPPEN WATERCAD.wtg**FlexTable: Pipe Table****Active Scenario: MAX DAY DEMAND + FIRE FLOW**

Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen-Williams C	Flow (gpm)	Velocity (ft/s)	Headloss Gradient (ft/ft)
P-1	874	J-2 (AP)	J-6 (AP)	12.0	PVC	150.0	0	0.00	0.000
P-2	1,067	J-6 (AP)	J-7 (AP)	12.0	PVC	150.0	-2,632	7.47	0.012
P-5	609	J-5	J-20 (AP)	12.0	PVC	150.0	-1,249	3.54	0.003
P-8	49	J-5	J-9	12.0	PVC	150.0	-1,093	3.10	0.002
P-9	977	J-9	J-10	12.0	PVC	150.0	2,614	7.41	0.012
P-10	817	J-10	J-11	12.0	PVC	150.0	2,107	5.98	0.008
P-11	344	J-11	J-12	12.0	PVC	150.0	1,600	4.54	0.005
P-12	300	J-12	J-13	12.0	PVC	150.0	1,600	4.54	0.005
P-13	407	J-13	J-14	24.0	PVC	150.0	0	0.00	0.000
P-14	680	J-14	J-15	24.0	PVC	150.0	0	0.00	0.000
P-15	74	J-15	J-16	24.0	PVC	150.0	0	0.00	0.000
P-16	2,357	J-16	J-17	24.0	PVC	150.0	0	0.00	0.000
P-20	629	J-20	J-21	12.0	PVC	150.0	297	0.84	0.000
P-21	403	J-21	J-22	12.0	PVC	150.0	297	0.84	0.000
P-23	445	J-13	J-23	24.0	PVC	150.0	0	0.00	0.000
P-25	677	J-24	J-26	12.0	PVC	150.0	547	1.55	0.001
P-26	572	J-26	J-22	12.0	PVC	150.0	547	1.55	0.001
P-29	1,145	J-6 (AP)	J-24	12.0	PVC	150.0	2,037	5.78	0.007
P-4(1)	446	J-7 (AP)	J-10 (AP)	12.0	PVC	150.0	-1,936	5.49	0.007
P-4(2)	362	J-10 (AP)	J-5	12.0	PVC	150.0	-1,936	5.49	0.007
P-3(1)	576	J-7 (AP)	J-9 (AP)	12.0	PVC	150.0	-1,798	5.10	0.006
P-3(2)	161	J-9 (AP)	J-1 (AP)	12.0	PVC	150.0	0	0.00	0.000
P-30	660	J-20 (AP)	J-9 (AP)	12.0	PVC	150.0	1,798	5.10	0.006
P-31	211	R-2	J-20 (AP)	12.0	PVC	150.0	3,047	8.64	0.015
P-32	223	R-1	J-9	12.0	PVC	150.0	3,707	10.52	0.022
P-33	469	J-22	J-29	12.0	PVC	150.0	0	0.00	0.000
P-34	406	J-29	J-30	8.0	PVC	150.0	0	0.00	0.000
P-35	1,344	J-20	J-13	12.0	PVC	150.0	-1,600	4.54	0.005

CRIPPEN WATERCAD.wtg

FlexTable: Junction Table

Active Scenario: MAX DAY DEMAND + FIRE FLOW

Label	Elevation (ft)	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
J-2 (AP)	5,682.45	0	5,827.19	63
J-6 (AP)	5,670.25	595	5,827.19	68
J-7 (AP)	5,686.28	1,102	5,839.64	66
J-1 (AP)	5,697.51	0	5,842.96	63
J-5	5,701.75	407	5,844.98	62
J-20 (AP)	5,701.94	0	5,846.77	63
J-9	5,703.18	0	5,845.09	61
J-10	5,695.43	507	5,833.83	60
J-11	5,687.75	507	5,827.52	60
J-12	5,677.00	0	5,825.92	64
J-13	5,671.34	0	5,824.53	66
J-14	5,658.71	0	5,824.53	72
J-15	5,633.04	0	5,824.53	83
J-16	5,633.87	0	5,824.53	82
J-17	5,634.16	0	5,824.53	82
J-20	5,668.90	1,303	5,818.29	65
J-21	5,656.02	0	5,818.16	70
J-22	5,645.44	844	5,818.08	75
J-23	5,681.10	0	5,824.53	62
J-24	5,653.33	1,490	5,818.87	72
J-26	5,650.42	0	5,818.44	73
J-10 (AP)	5,692.15	0	5,842.59	65
J-9 (AP)	5,691.90	0	5,842.96	65
J-29	5,638.38	0	5,818.08	78
J-30	5,633.85	0	5,818.08	80