



PORTEOS
HARVEST ROAD AND 56TH AVENUE
MASTER UTILITY REPORT AMENDMENT
CITY OF AURORA, COLORADO
REVISED MAY 2020

PREPARED FOR: ACP DIA 1287 INVESTORS, LLC
 4530 E. SHEA BLVD., SUITE 100
 PHOENIX, ARIZONA 85028
 ATTN: BILL WICHTERMAN
 PHONE: (602) 494-7800

PREPARED BY: CVL CONSULTANTS OF COLORADO, INC.
 10333 E. DRY CREEK AVENUE, SUITE 240
 ENGLEWOOD, COLORADO 80112
 PHONE: (720) 482-9526

CVL PROJECT #: 8.13.02497.03

PROJECT MANAGER: Joseph Ferris

MASTER UTILITY REPORT
FOR
PORTEOS

City of Aurora Approval Block

Aurora Water

Date

Please revise to
"Fire Department".

***Response: Revised per
comment***

Date

Life Safety

Date

FACSIMILE

This electronic plan is a facsimile of the signed and sealed pdf set

CO Professional Engineer
Joseph F. Ferris, CO P.E. No. 55846

Date

ENGINEER'S STATEMENT:

This utility study "Porteos – Master Utility Report" 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.

Joseph F. Ferris CO P.E. 55846
CVL Consultants of Colorado, Inc.

Date

THIS AMENDMENT IS BEING PREPARED TO PRESENT THE WATER AND SANITARY SEWER INFRASTRUCTURE AS IT RELATES TO THE REALIGNMENT OF THE 64TH AVENUE RIGHT OF WAY, THE EXTENSION OF 60TH AVENUE AS PUBLIC RIGHT OF WAY, AND REVISIONS TO THE ADJACENT PLANNING AREA ACREAGES AND CONFIGURATIONS. IN ADDITION, THE EAST HALF OF JACKSON GAP STREET FROM 56TH AVENUE TO 68TH AVENUE, THE SOUTH HALF OF 68TH AVENUE ALONG THE PLANNING AREA 4 FRONTAGE AND PORTIONS OF THE WATER AND SEWER ALONG THESE RIGHTS OF WAYS', HAS BEEN CONSTRUCTED AND WILL BE DEFINED WITHIN.

STATEMENT OF ACKNOWLEDGEMENT

THE FOLLOWING DOCUMENT IS AN AMENDMENT TO THE PORTEOS MASTER UTILITY REPORT WRITTEN BY MARTIN/MARTIN CONSULTING ENGINEERS AUGUST 2012, REVISED FEBRUARY 2016, AND REVISED MAY 2020
FOR CLARITY, THE FORMAT AND PORTIONS OF THIS DOCUMENT ARE ORIGINAL TEXT AS PREPARED BY MARTIN/MARTIN WITH AMENDMENTS DEPICTED IN ITALIC FORMAT.

TABLE OF CONTENTS

A. INTRODUCTION.....	5
1. Location	
2. Proposed Development	
B. SANITARY SEWER MASTER PLAN.....	6
1. On-Site System	
2. Contributing Off-Site Flows	
C. SANITARY SEWER DESIGN CRITERIA.....	8
D. SANITARY SEWER CALCULATIONS.....	8
E. SANITARY SEWER PHASING.....	8
F. WATER DISTRIBUTION MASTER PLAN.....	9
G. WATER DESIGN CRITERIA.....	10
H. WATERCAD MODEL.....	10
I. WATER SYSTEM PHASING.....	11
J. CONCLUSION.....	11
1. Compliance with Standards	
2. Summary of Concept	
K. REFERENCES.....	13
Appendix A - Vicinity Map	
OS-3 Basin Exhibit	
Appendix B - Sanitary Sewer Calculations	
Porteos - Lift Station Wastewater Generation Worksheet	
Appendix C - Water Calculations	
Appendix D - Master Sanitary Sewer System Plan	
Master Water Distribution System Plan	

A. INTRODUCTION

The Master Utility Report is provided in support of the Framework Development Plan (FDP) to discuss relevant issues and to provide preliminary sizing of proposed water and sanitary sewer infrastructure which will serve the Porteos Development in Aurora, Colorado. The proposed utility layout has been prepared in compliance with the Aurora Water Standards and Specifications Regarding Water, Sanitary Sewer and Storm Drainage Infrastructure.

More specifically, this amendment is being prepared to present the water and sanitary sewer infrastructure as it relates to the realignment of the 64th avenue right of way, the extension of 60th avenue as public right of way, and revisions to the adjacent planning area acreages, configurations and land uses. In addition, portions of the water and sewer infrastructure have been constructed and will be defined within.

1. Location

The Porteos site is bordered by existing West 56th Avenue and undeveloped Aurora to the south, the future Harvest Road alignment and undeveloped Aurora to the west, and Denver International Airport (DIA) property to the north and east. The property is located in the Southwest ¼ of Section 4, the South ½ of Section 5, the North ½ of Section 8, the Southwest ¼ of Section 8 and the West ½ of Section 9, Township 3 South, Range 65 West of the Sixth Principal Meridian, in the City of Aurora, County of Adams, State of Colorado. Figure 1.1 below shows the general vicinity of the Porteos Property.



(Figure 1.1)

2. Proposed Development

The proposed Porteos Development encompasses approximately 1287 acres and is divided into 12 large planning areas that range in size from approximately 19 acres to 186 acres. Planning areas 6, 8, 9 and 10 are divided into sub-planning areas (i.e. PA-8a and PA-8b). PA-1 through PA-3 and PA-8 through PA-11, excluding PA-9b; are planned for mixed use commercial developments consisting of a combination of retail, hotels and offices. PA-5 through PA-7, PA-9b and PA-12 are planned for industrial uses. PA-4 has been constructed and is designated as an industrial land use.

The individual planning areas have been grouped into Planning Areas A, B, C, D, E, F, G, H, I, J, K, L, M, N, O, P, Q, R, S, T, U, V, W, X, Y, Z, AA, AB, AC, AD, AE, AF, AG, AH, AI, AJ, AK, AL, AM, AN, AO, AP, AQ, AR, AS, AT, AU, AV, AW, AX, AY, AZ, BA, BB, BC, BD, BE, BF, BG, BH, BI, BJ, BK, BL, BM, BN, BO, BP, BQ, BR, BS, BT, BU, BV, BW, BX, BY, BZ, CA, CB, CC, CD, CE, CF, CG, CH, CI, CJ, CK, CL, CM, CN, CO, CP, CQ, CR, CS, CT, CU, CV, CW, CX, CY, CZ, DA, DB, DC, DD, DE, DF, DG, DH, DI, DJ, DK, DL, DM, DN, DO, DP, DQ, DR, DS, DT, DU, DV, DW, DX, DY, DZ, EA, EB, EC, ED, EE, EF, EG, EH, EI, EJ, EK, EL, EM, EN, EO, EP, EQ, ER, ES, ET, EU, EV, EW, EX, EY, EZ, FA, FB, FC, FD, FE, FF, FG, FH, FI, FJ, FK, FL, FM, FN, FO, FP, FQ, FR, FS, FT, FU, FV, FW, FX, FY, FZ, GA, GB, GC, GD, GE, GF, GG, GH, GI, GJ, GK, GL, GM, GN, GO, GP, GQ, GR, GS, GT, GU, GV, GW, GX, GY, GZ, HA, HB, HC, HD, HE, HF, HG, HH, HI, HJ, HK, HL, HM, HN, HO, HP, HQ, HR, HS, HT, HU, HV, HW, HX, HY, HZ, IA, IB, IC, ID, IE, IF, IG, IH, II, IJ, IK, IL, IM, IN, IO, IP, IQ, IR, IS, IT, IU, IV, IW, IX, IY, IZ, JA, JB, JC, JD, JE, JF, JG, JH, JI, JJ, JK, JL, JM, JN, JO, JP, JQ, JR, JS, JT, JU, JV, JW, JX, JY, JZ, KA, KB, KC, KD, KE, KF, KG, KH, KI, KJ, KK, KL, KM, KN, KO, KP, KQ, KR, KS, KT, KU, KV, KW, KX, KY, KZ, LA, LB, LC, LD, LE, LF, LG, LH, LI, LJ, LK, LL, LM, LN, LO, LP, LQ, LR, LS, LT, LU, LV, LW, LX, LY, LZ, MA, MB, MC, MD, ME, MF, MG, MH, MI, MJ, MK, ML, MM, MN, MO, MP, MQ, MR, MS, MT, MU, MV, MW, MX, MY, MZ, NA, NB, NC, ND, NE, NF, NG, NH, NI, NJ, NK, NL, NM, NN, NO, NP, NQ, NR, NS, NT, NU, NV, NW, NX, NY, NZ, OA, OB, OC, OD, OE, OF, OG, OH, OI, OJ, OK, OL, OM, ON, OO, OP, OQ, OR, OS, OT, OU, OV, OW, OX, OY, OZ, PA, PB, PC, PD, PE, PF, PG, PH, PI, PJ, PK, PL, PM, PN, PO, PP, PQ, PR, PS, PT, PU, PV, PW, PX, PY, PZ, QA, QB, QC, QD, QE, QF, QG, QH, QI, QJ, QK, QL, QM, QN, QO, QP, QQ, QR, QS, QT, QU, QV, QW, QX, QY, QZ, RA, RB, RC, RD, RE, RF, RG, RH, RI, RJ, RK, RL, RM, RN, RO, RP, RQ, RR, RS, RT, RU, RV, RW, RX, RY, RZ, SA, SB, SC, SD, SE, SF, SG, SH, SI, SJ, SK, SL, SM, SN, SO, SP, SQ, SR, SS, ST, SU, SV, SW, SX, SY, SZ, TA, TB, TC, TD, TE, TF, TG, TH, TI, TJ, TK, TL, TM, TN, TO, TP, TQ, TR, TS, TT, TU, TV, TW, TX, TY, TZ, UA, UB, UC, UD, UE, UF, UG, UH, UI, UJ, UK, UL, UM, UN, UO, UP, UQ, UR, US, UT, UU, UV, UW, UX, UY, UZ, VA, VB, VC, VD, VE, VF, VG, VH, VI, VJ, VK, VL, VM, VN, VO, VP, VQ, VR, VS, VT, VU, VV, VW, VX, VY, VZ, WA, WB, WC, WD, WE, WF, WG, WH, WI, WJ, WK, WL, WM, WN, WO, WP, WQ, WR, WS, WT, WU, WV, WW, WX, WY, WZ, XA, XB, XC, XD, XE, XF, XG, XH, XI, XJ, XK, XL, XM, XN, XO, XP, XQ, XR, XS, XT, XU, XV, XW, XX, XY, XZ, YA, YB, YC, YD, YE, YF, YG, YH, YI, YJ, YK, YL, YM, YN, YO, YP, YQ, YR, YS, YT, YU, YV, YW, YX, YY, YZ, ZA, ZB, ZC, ZD, ZE, ZF, ZG, ZH, ZI, ZJ, ZK, ZL, ZM, ZN, ZO, ZP, ZQ, ZR, ZS, ZT, ZU, ZV, ZW, ZX, ZY, ZZ.

B. SANITARY SEWER MASTER PLAN

Off-site sanitary sewer improvements shall be required for all planning areas. Per plans provided by the City, the new system is located within 48th Avenue near Harvest Road. However, the new system is in elevation than the existing sewer outfall system, although beyond a gravity system and connection will be required. Discussions with Aurora Water and based upon their "Master Sewer Plans" a future permanent gravity system will most likely be constructed to connect to the Denver Metro infrastructure and northern treatment plant. A time table for these improvements has yet to be determined;

With the Porteos lift station under construction and the Second Creek lift station operational temporary systems such as septic is no longer necessary and should be removed from the report.

Response: Text updated for existing lift station conditions

however, Aurora and Porteos ownership have identified parameters and other development triggers outlining both temporary and final alternative systems as follows:

- Initial Wastewater System: Site Plans within the limits of an Individual Sewage Disposal System (ISDS) will require authorization from the City during site plan review and permitted through Tri-County Health Department. If a system will be required, it will also require authorization and permitted by the Colorado Department of Public Health and Environment. **Since both liftsations are either operational or under construction this section is to be removed.**

Response: Section has been removed per comment.

- Interim Wastewater System: Development Site Plans that exceed the limits of an ISDS, as identified in the section above, or are not an approved site plan use by the authorities having jurisdiction shall require a temporary lift station and force main to be constructed to the existing gravity sanitary sewer system main located within 48th Avenue near Harvest Road, or the 56th Avenue gravity main, depending on the City's current Master Plan at the time.

Currently, an interim lift station and dual 10" force main system with a connection to the existing gravity sanitary sewer system near 48th Avenue and Harvest Road is in process. It is anticipated that future developments, exceeding the above ISDS limits will be served by this lift station.

It is understood that there is an ongoing discussion between the owner and the City to relocate the above-mentioned lift station downstream to provide a regional lift station facility to the area. This option is still in the conceptual stages and no agreements have been made.

Based on the design and approval and construction timeline of future planning areas, the proposed interim lift station is anticipated to provide the needed sanitary sewer outfall for the Porteos project site.

- Final Wastewater System: At such time a connection to Denver Metro Wastewater facilities or alternative City of Aurora outfall systems are available, the Development will be required to connect to this system.

Per discussions with Aurora Water the Interim Wastewater System (*interim lift station*) shall only be required to facilitate the Porteos development including off-site basins OS-1, OS-2 (*Fine Point Business Park*) and OS-3. Refer to section "B.2 Contributing Off-site Flow" for further off-site basin information. Other surrounding developments will be responsible for providing their own force main sanitary systems until the permanent sewer system and associated infrastructure is in place and operational.

Per discussions with Aurora, it is assumed a permanent City of Aurora system will be on-line prior to full build out and development of Porteos. As such, the Porteos *interim lift station* is

not anticipated to be initially constructed or equipped to provide capacity for the entirety of the development but will be phased and expanded as needed, *refer to Appendix B: Porteos – Lift Station Wastewater Generation Worksheet. Should the site achieve the full development schedule build out at 3.8 mgd as shown in the Porteos – Lift Station Wastewater Generation Worksheet, one of the proposed pumps installed with Phase I will need to be upsized in addition to an upsized fourth pump to meet the 2,630 gpm anticipated peak flow at final build out. The configuration of the wet well will accommodate upsizing to meet the final development as shown in the worksheet.*

The sanitary load rates developed from Porteos will be routed through the property to an 18" main in 68th Avenue and an 18" main in Harvest Road, which will then convey the flows to either the *interim lift station* or permanent connection at the northwest corner of the development. In the interim condition, sanitary flows will be pumped south from this lift station through *dual 10" force mains to the existing gravity sanitary main in 48th Avenue.*

1. On-Site System

The proposed sanitary sewer system has been designed and analyzed with the utilization of three main trunk lines servicing the development and the off-site basins to the south. The generalized sanitary sewer alignments were established based upon the proposed roadway alignments, the location of the drainage channels, and the anticipated basins for each planning area. As such, two of these trunk lines combine at Design Node B and will convey flows to the northwest corner of the development and ultimate connection point. The third trunk line is conveyed north to the northwest corner from Node U within Harvest Road.

Per discussions between the City and the developer, the anticipated sanitary sewer flows were calculated for each planning area utilizing the land use classification, the anticipated building square footages per planning area and a reduced peaking factor. The entire development, including the off-site flows from OS-1, OS-2 (Fine Point Business Park); and off-site residential flows from OS-3 (see Appendix A for basin limits), will contribute a total routed peak flow rate of approximately 8 MGD (12.4 cfs) to the outfall location. As each planning area is developed, interior sanitary mains and services will be provided within the individual development parcels and will connect into the Porteos sanitary mains.

As other planning areas come online, a lift station near the intersection of E. 68th Avenue and Powhatan Road will be required. That lift station and force main will connect from the mentioned intersection to the existing 18" gravity pipeline located within E. 68th Avenue at the eastern boundary of PA-4. A gravity pipeline from the intersection of E. 68th Avenue and Powhatan Road going west to Harvest Road is not feasible as the gravity pipeline would be in excess of 30 feet below existing ground.

2. Contributing Off-Site Flow

Per discussions with Aurora Water, the Porteos development has provided additional capacity within the on-site system to convey the flow rates from the future residential off-site basin south of the property (OS-3). *Additionally, the parcel of land north of 56th Avenue and surrounded by the Porteos development known as Fine Point Business Park located between PA-11 and PA-12. The flow rates used for this parcel of land (OS-1 and OS-2) are from the "Fine Point Business Park Master Utility Study" as approved April 2016.*

C. SANITARY SEWER DESIGN CRITERIA

All sanitary sewer lines were designed according to the City of Aurora Standards and Specifications as noted below:

1. There are no horizontal or vertical curves on sanitary sewers.
2. A Manning's "n" value of 0.011 was used for new PVC pipe as per City of Aurora Criteria.
3. A minimum slope of 0.4% was observed in the design.
4. Minimum slopes were also determined as the greater of 0.40% or the slope required to achieve a minimum velocity of 2.0 feet per second without exceeding the allowed maximum full flow capacity.
5. The flow velocity does not exceed ten feet per second at any point in the system for either the "pipe-full" or the "pipe-half-full" conditions.
6. A minimum drop of 0.2 feet will be provided through the manholes from the inlet to the outlet for "straight-through" manholes.
7. A minimum drop of 0.3 feet will be provided for manholes which act as a significant bend (deflection angle of 45 degrees or greater).
8. The depth of flow in pipes does not exceed 75% of capacity for pipe 12 inches or smaller and 90% for pipes larger than 12 inches.
9. Direct service line taps will not be allowed on sewer mains 24-inches in diameter and larger.

D. SANITARY SEWER CALCULATIONS

The Porteos sanitary sewer mains within the site were sized in this report based on *the anticipated land use classification, the anticipated building square footages per planning area and a reduced peaking factor, coinciding with the factor used to develop the lift station calculations* for the future planning area development. Refer to Appendix B for peak flow calculations, flow routing and sanitary sewer sizing calculations.

E. SANITARY SEWER PHASING

It is anticipated that the sanitary sewer for the Porteos development may be phased as individual planning areas develop. The phasing will be dependent on the order in which planning area groups begin development. The Public Improvement Plan maps show which sanitary sewer mains will be required to serve each planning area group (A through G).

At this time, the 18" sanitary sewer main located in Jackson Gap Street from 64th Avenue north to 68th Avenue has been constructed. Additionally, the 15" sanitary sewer main in 68th Avenue

along the Planning Area 4 frontage is constructed. These mains combine at Node B. The 18" sanitary outfall from Node B has not been completed but is currently in the review and approval process. (See Appendix D – Master Sanitary Sewer System Plan).

F. WATER DISTRIBUTION MASTER PLAN

The Porteos development is located within pressure Zone 3 as identified by the City of Aurora Water Shop Plots. *Per the Water Shop Plots a 24" PVC Zone 3 water main has been extended from 48th Avenue north along Harvest Road to the 56th Avenue intersection. This line will provide water service to the on-site water network.*

On-Site Pressure Zone 3:

As analyzed and determined through initial water system modeling, the entirety of the Porteos Development experiences high to very high water pressures. The resultant water pressures within the central and northern land parcels exceeded Aurora Water limits. Per discussions with Aurora Water, Porteos will be required to operate on two separate hydraulic zones. Various pressure reducing valve (PRV) models were analyzed adjusting the PRV(s) locations on-site; but water pressure limits were still exceeded and remained high along the southern boundary. Per further discussions with Aurora Water, the southern portion of Porteos will remain on Zone 3 and have higher water pressures. The hydraulic zone delineation was determined to be approximately along the 5420' contour (plus or minus 5 vertical feet). As a result, pressure reducing valves are proposed to be installed at five (5) different locations in the Porteos water system.

Discussions with Aurora Water indicate the required 24" transmission main looped system will be via Harvest Road from 56th Avenue, turn east and follow 64th Avenue, then south in Powhatan Road, and connect back to Harvest Road and 56th Avenue. Construction of the 24" transmission main will occur as necessitated by the development of the planning areas as a looped system is not required from the on-set of the project. 16" water mains will loop off of the 24" transmission main within the rest of the roadways as identified with the Porteos PIP to serve the development; (See Section I – Water System Phasing for discussion on completed water distribution infrastructure). 12" mains internal to the planning areas PA-5, PA-6 and PA-12 shall be required to complete the 16" loops located within the roadways. Additionally, as planning areas are developed, smaller water mains shall be looped within the individual planning areas per city criteria. This looped network will provide service to all twelve planning area developments.

As each planning area is developed, interior water mains and services will be provided by the individual development parcels which will connect into the Porteos water mains and serve their developments. The 24" and 16" mains shall be extended from the perimeter of the site and installed to the future adjacent developments by others when necessary.

G. Water Design Criteria

All water mains were designed in accordance with the City of Aurora Standards and Specifications as follows:

1. The water distribution system was designed to meet the maximum hour and maximum day to average day ratios for commercial developments.
2. The maximum day demand plus fire flow results in a residual pressure greater or equal to 20 psi.
3. The maximum day demand residual pressure is greater or equal to 50 psi.
4. The maximum acceptable velocity in a public water main (16-inch or greater) is 5 ft/sec during maximum day demand plus fire flow.
5. The maximum acceptable velocity in a 12-inch water main is 10 ft/sec during maximum day demand plus fire flow.
6. Twelve-inch feeder lines shall be spaced between transmission lines less than 3000 feet apart and looped.
7. Sampling stations will be provided at a frequency of one per 1280 people or 400 single-family households and located within five feet of a fire hydrant.

Water demands for all future on-site developments were determined based on the Domestic Water Demand per Land Classification for Commercial Use in Section 5 of the City of Aurora Standards and Specifications. Refer to Appendix C for average day, maximum day, maximum hour, and fire flow demand calculations.

H. WATER CAD MODEL

Per discussions with Aurora Water, Porteos will be required to operate on two separate hydraulic zones. Five pressure reducing valves were modeled approximately along the 5420' contour (plus or minus 5 feet). WaterCAD software was used to determine pressures and flow velocities of the proposed Porteos water mains. A hydraulic grade line was provided by the City of Aurora for the water system connection and was used in the model. Per Aurora Water, the Pressure Zone 3 HGL is at an elevation of 5,720 feet and shall be used to serve the southern portion of Porteos. The lower Zone 3 pressure, Pressure Zone 3C, shall utilize PRVs to reduce the HGL to 5,600 feet to serve the central and northern portions of the Porteos development. A Hazen-Williams roughness factor of 150 was used in the model. Four model runs were completed in this report:

1. Average Day Demand
2. Maximum Hour Demand
3. Maximum Day Demand
4. Maximum Day Demand with a 4,000 GPM fire flow modeled at Nodes J-13, and J-44.

All on-site water mains to be built with this development were sized as either 24 or 16 inch mains. The water mains to be built by others as individual planning areas are developed were assumed to be 12 inch lines but will need to be sized with individual CSP processes. The City of Aurora criteria was met as described in the Water Design Criteria section of this report using a total fire flow of 8,000 gpm split between the two nodes with the lowest residual pressures within the Porteos development. Based on the outcome of this model, water pressures within Porteos were reduced; the water pressures at all design nodes remained within required/acceptable pressure ranges. The water network resulted in pressures from 82 *psi* along Powhaton Road (just downstream of the PRV) to 130 *psi* *at the intersection of 60th*

Avenue and Jackson Gap Street (just upstream of the PRVs). This intersection and PRV have been constructed as part of the Jackson Gap Street improvements (Porteos ISP No.1). It should be noted, however, that the maximum day demand plus 8,000 GPM fire flow scenario yielded pipe velocities that slightly exceed City of Aurora criteria, of which are primarily located along 56th Avenue. Aurora Water has accepted the higher velocities as an interim condition which will be reduced as additional off-site city system water loops are connected to the overall Porteos Development.

I. WATER SYSTEM PHASING

At present, a portion of the proposed water distribution system has been completed within the Porteos development. As stated previously, the 24" water main from 48th Avenue to the intersection of Harvest Road and 56th Avenue has been completed. From here, the 24" water main runs east along 56th Avenue to Jackson Gap Street where a stub has been provided for future improvements to the east. Per the PIP, a 16" water main has been constructed within the Jackson Gap Street right-of-way. This 16" main extends north to 68th Avenue and then east to the eastern limits of planning area 4, a stub has been provided for future infrastructure connection.

Additionally, the Fine Point Business Park Filing No. 1 development documents relative to the construction of the proposed 16" water main located within the 60th Avenue right-of-way and extending east approximately 1800lf, the construction of the proposed 16" water main located in Jackson Gap Way extending north from 56th Avenue to 60th Avenue and the 24" water main in 56th Avenue between Jackson Gap Street and Way are currently in the review and approval process with the City.

An 8" water main in PA-1 & 2 will be added to service the temporary lift station. The water main will be connect to the existing 16" main in Jackson Gap Street and parallel the PA-1 & 2 boundary within PA-2 and turn north to the temporary lift station before the Harvest Road R.O.W.

It is anticipated that the water network for the Porteos development *will continue to be* phased as individual planning areas develop. The phasing will be dependent on the order in which planning area groups begin development. The Public Improvement Plan maps show which water mains will be required to serve each planning area group (A through G).

J. CONCLUSION

1. Compliance with Standards

This Master Utility Report for the Porteos development was prepared in accordance with the Aurora Water Standards and Specifications Regarding Water, Sanitary Sewer and Storm Drainage Infrastructure and per discussions with Aurora Water. The purpose of this report was to size the water and sanitary sewer infrastructure to serve the Porteos development.

2. Summary of Concept

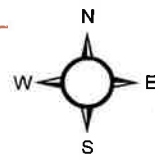
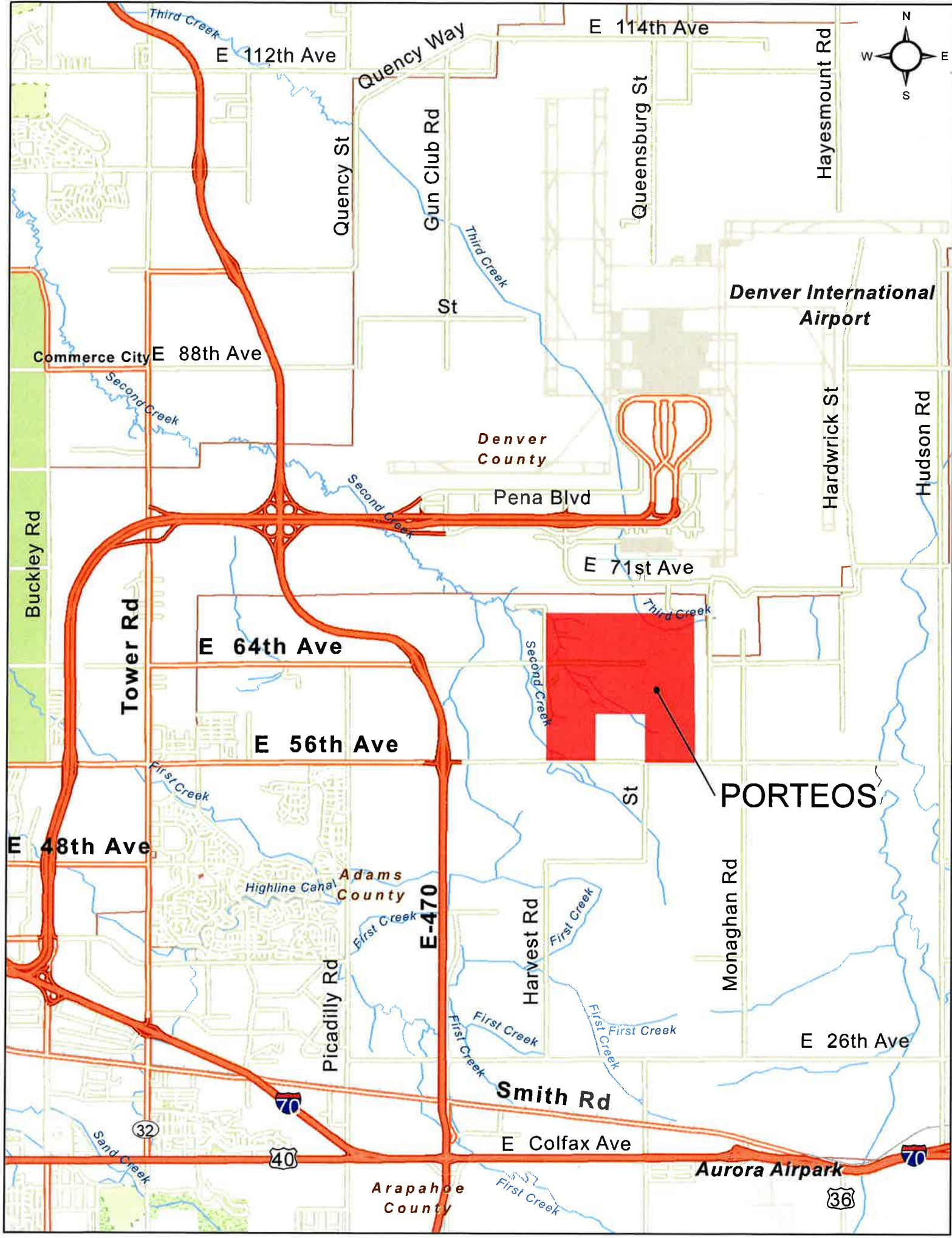
The proposed sanitary sewer system was sized for the anticipated on-site demands contributing to the system, including anticipated flows from off-site property *OS-1, OS-2 (Fine Point Business Park)* and upstream tributary area *OS-3* should they be developed in the future. Minimum and maximum slopes were determined for each reach of pipe to provide acceptable flow velocities and capacities. All sanitary flows from the Porteos development will be routed to the northwest corner of the property. During initial build out, sanitary flows will be pumped south via *an interim lift station and dual 10" force main system* to a point at which the sanitary main can connect via a gravity line to the public gravity sanitary main in 48th Avenue. Ultimately, sewer flows will be redirected north via a permanent City of Aurora gravity system to the Denver Metro Wastewater treatment facility.

The proposed water distribution system was sized to meet the pressure and velocity requirements of the City of Aurora. The minimum pressure requirements have been met for the maximum day demand as well as the maximum day demand plus fire flow with a residual pressure greater than 20psi. At this time, 16 and 24 inch water mains are designed to serve the Porteos development. Smaller water mains will be fed off of these mains by others as individual planning areas are developed in the future.

K. REFERENCES

1. Aurora Water, Standards and Specifications Regarding Water, Sanitary Sewer and Storm Drainage Infrastructure, Aurora, Colorado, effective date January, 2012.
2. Porteos Public Improvement Plan Amendment, CVL Consultants of Colorado, Inc., Englewood, Colorado, November 2016.
3. Porteos Master Utility Report, Martin/Martin, Inc., Lakewood, Colorado, Revised February 2016.

Appendix A



PORTEOS

Monaghan Rd

Smith Rd

Aurora Airpark

Denver International Airport

Pena Blvd

Quency Way

Quency St

Gun Club Rd

Queensburg St

Hayesmount Rd

Hardwick St

Hudson Rd

E 64th Ave

E 56th Ave

E 48th Ave

Tower Rd

Picadilly Rd

Harvest Rd

Arapahoe County

Adams County

Denver County

Highline Canal

Third Creek

Second Creek

Third Creek

Second Creek

Third Creek

Second Creek

First Creek

First Creek

First Creek

First Creek

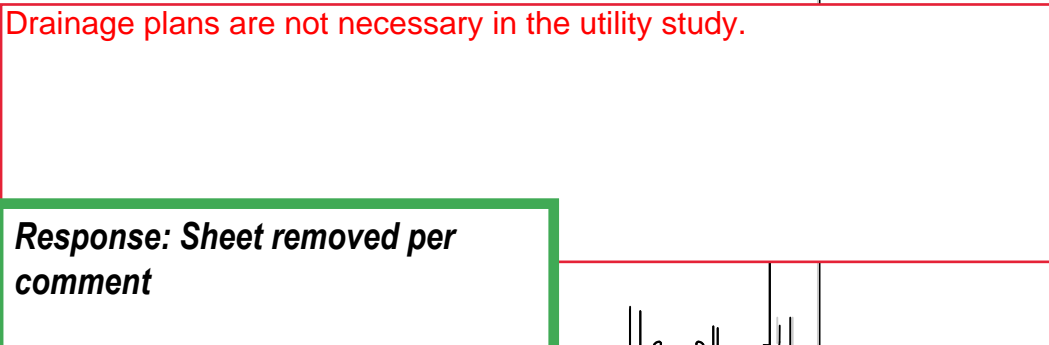
First Creek



First Creek

First Creek

Sand Creek

First Creek



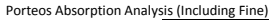
SHEET NUMBER D2.1	DRAWN BY: AYK	SCALE: AS SHOWN	PORTEOS ULTIMATE DRAINAGE PLAN	<div><div>A&C PROPERTIES INC 4530 EAST SHEA BOULEVARD PHOENIX, AZ 85028 Tel: (602.494.7800)</div><div></div></div>	10333 E. Dry Creek Rd. Suite 240 Englewood, CO 80112 Tel: (720) 482-9526 Fax: (720) 482-9546	No.	Revisions	Date	Init.	Appr.	
	CHECKED BY: MRS	FILE NO: 8130249702									
	DATE: NOVEMBER 2016										

Appendix B

EPA recommends 2-8 fps with a max. of 10 fps

10" HDPE DR11=8.68 in. ave. I.D.	
flow $2 < v < 8$	- single 10" pipe
flow $2 < v < 8$	- dual 10" pipes

<u>generation rates</u>	<u>sources</u>
neighborhood store	Southgate Water and Sanitation District
hotels and motels	Southgate Water and Sanitation District
sit down restaurants	City and County of Denver
drive thru restaurants	City and County of Denver
retail	Southgate Water and Sanitation District
industrial	Southgate Water and Sanitation District
office buildings	Southgate Water and Sanitation District
commercial parking facility	City of Los Angeles Bureau of Sanitation
peaking factor	per agreement with COA at meeting Jan. 28, 2016
inflow and infiltration	Aurora Stds and Spec (Southgate Water and Sanitation District)

[illegible]

Duplicate sheet?

Response: Revised per comment.

FINE POINTS AND POPULATION						
Basin	Area (Ac)	Type of Development	Avg. Daily Flow/Ac (gpd)	Avg. Daily Flow (MGD)	Equivalent Population/Ac	Population
Fine Point PA-1	47.11	Mixed Commercial	4000	0.188	50	2355.50
Fine Point PA-2	16.60	Mixed Commercial	4000	0.066	50	830.00
Fine Point PA-3	4.99	Mixed Commercial	4000	0.020	50	249.50
Fine Point PA-4	16.60	Mixed Commercial	4000	0.066	50	830.00
Fine Point PA-5	39.38	Mixed Commercial	4000	0.158	50	1969.00
Fine Point PA-6	17.24	Mixed Commercial	4000	0.069	50	862.00
Fine Point PA-7	6.40	Mixed Commercial	4000	0.026	50	320.00
TOTAL FINE (OS-1 and OS-2)	148.32			0.593		7416
OS-3	69.60	Residential	1856	0.129	23.2	1614.72

Note:

1. Off site values from previously approved Porteos MUS done by Martin & Martin, February 2016
2. OS-1 and OS-2 are comprised of Fine Point's total

PORTEOS OFF SITE SANITARY SEWER AVERAGE FLOWS AND POPULATION						
Basin	Area (Ac)	Type of Development	Avg. Daily Flow/Ac (gpd)	Avg. Daily Flow (MGD)	Equivalent Population/Ac	Population
Fine Point PA-1	47.11	Mixed Commercial	4000	0.188	50	2355.50
Fine Point PA-2	16.60	Mixed Commercial	4000	0.066	50	830.00
Fine Point PA-3	4.99	Mixed Commercial	4000	0.020	50	249.50
Fine Point PA-4	16.60	Mixed Commercial	4000	0.066	50	830.00
Fine Point PA-5	39.38	Mixed Commercial	4000	0.158	50	1969.00
Fine Point PA-6	17.24	Mixed Commercial	4000	0.069	50	862.00
Fine Point PA-7	6.40	Mixed Commercial	4000	0.026	50	320.00
TOTAL FINE (OS-1 and OS-2)	148.32			0.593		7416
OS-3	69.60	Residential	1856	0.129	23.2	1614.72

Note:

1. Off site values from previously approved Porteos MUS done by Martin & Martin, February 2016
2. OS-1 and OS-2 are comprised of Fine Point's total

<div> <div>PORTEOS</div> <div>SANITARY SEWER FLOWS AND POPULATION</div> </div>									
Basin	Use	Building Use Size (1000 sf)	% of SF (1)	Building Use Size (1000 sf)	Building Use Size (Ac)	Avg. Daily Flow (GPD/sf)	Avg. Daily Flow (MGD)	Equivalent Population/ Ac	Population
PA-1	Commercial	403.88	25	100.97	2.32	0.5	0.050	50	115.90
	Hotel		50	201.94	4.64	0.5	0.101	50	231.80
	Office		25	100.97	2.32	0.2	0.020	50	115.90
	Sub Total		100	403.88	9.27		0.172	50	463.59
PA-2	Commercial	574.36	25	143.59	3.30	0.5	0.072	50	164.82
	Hotel		50	287.18	6.59	0.5	0.144	50	329.64
	Office		25	143.59	3.30	0.2	0.029	50	164.82
	Sub Total		100	574.36	13.19		0.244	50	659.27
PA-3	Retail	783.77	25	195.94	4.50	0.15	0.029	50	224.91
	Hotel		50	391.88	9.00	0.5	0.196	50	449.82
	Office		25	195.94	4.50	0.2	0.039	50	224.91
	Sub Total		100	783.77	17.99		0.265	50	899.64
PA-4	Parking	921.40	100	921.40	21.15	0.02	0.018	15	317.29
PA-5	Industrial	1592.86	100	1592.86	36.57	0.05	0.080	15	548.51
PA-6A	Industrial	2592.89	100	2592.89	59.52	0.05	0.130	15	892.87
PA-6A ESMT	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PA-6B	Industrial	1978.74	100	1978.74	45.43	0.05	0.099	15	681.39
PA-6B ESMT	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PA-7	Industrial	1322.94	100	1322.94	30.37	0.05	0.066	15	455.56
PA-8(A, B1, B2, B3)	Commercial	1013.20	39	395.15	9.07	0.5	0.198	50	453.57
	Office		61	618.05	14.19	0.2	0.124	50	709.42
	Sub Total		100	1013.20	23.26		0.321	50	1162.99
PA-9A	Commercial	226.43	40	90.57	2.08	0.5	0.045	50	103.96
	Hotel		15	33.96	0.78	0.5	0.017	50	38.99
	Event Venue		45	101.89	2.34	0.5	0.051	50	116.96
	Sub Total		100	226.43	5.20		0.113	50	259.91
PA-9B	Industrial	141.74	100	141.74	3.25	0.05	0.007	15	48.81
PA-9C	Commercial	156.62	15	23.49	0.54	0.5	0.012	50	26.97
	Hotel		10	15.66	0.36	0.5	0.008	50	17.98
	Office		75	117.47	2.70	0.2	0.023	50	134.83
	Sub Total		100	156.62	3.60		0.043	50	179.78
PA-9D	Commercial	238.26	15	35.74	0.82	0.5	0.018	50	41.02
	Hotel		10	23.83	0.55	0.5	0.012	50	27.35
	Office		75	178.70	4.10	0.2	0.036	50	205.11
	Sub Total		100	238.26	5.47		0.066	50	273.48
PA-10(A-B)	Commercial	830.59	50	415.29	9.53	0.5	0.208	50	476.69
	Office		50	415.29	9.53	0.2	0.083	50	476.69
	Sub Total		100	830.59	19.07		0.291	50	953.38
PA-11	Commercial	339.90	75	254.93	5.85	0.5	0.127	50	292.61
	Office		25	84.98	1.95	0.2	0.017	50	97.54
	Sub Total		100	339.90	7.80		0.144	50	390.15
PA-12	Industrial	3268.49	100	3268.49	75.03	0.05	0.163	15	1125.51
PA-12 ESMT	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Notes:

1. Land use and Building square foot values determined in the Traffic Impact Study (provided by FHU).
2. Avg. Daily Flow (GPD/sf) values provided Stan Tec. (See Lift Station analysis)
3. Equivalent Population per acre as City of Aurora Standard.
4. PA-12 to be used as a distribution center.

<p style="text-align: center;">PORTEOS SANITARY SEWER PEAK FLOW CALCULATIONS</p>								
Node	Basins Added to System	Total Avg. Daily Flow @ Node (MGD)	Total Upstream Population	Peaking Factor = 2.75	Peak Flow (MGD)	Infiltration (MGD)	Peak Flow + Infiltration (MGD)	Peak Flow + Infiltration (cfs)
DD	55% PA-10	0.160	524.36	2.75	0.440	0.016	0.456	0.705
CC	100% OS-1+ 100% OS-2 + 25% PA 9-D	0.610	7484.37	2.75	1.677	0.061	1.738	2.688
BB	PA-11 + Node CC	0.754	7874.52	2.75	2.074	0.075	2.149	3.325
AA	45% PA-10 + Node BB	0.885	8303.54	2.75	2.434	0.088	2.522	3.902
Z	Node AA + Node DD	1.045	8827.90	2.75	2.873	0.104	2.978	4.607
Y	25% PA-8 +Node Z	1.125	9118.65	2.75	3.094	0.113	3.207	4.961
X	100% PA-9C	0.043	179.78	2.75	0.118	0.004	0.123	0.190
W	20% PA-2 + 15% PA-8	0.097	306.30	2.75	0.267	0.010	0.276	0.428
V	60% PA-8 + Node W + NodeX	0.333	1183.87	2.75	0.915	0.033	0.948	1.467
U	Node V + Node Y	1.458	10302.52	2.75	4.009	0.146	4.155	6.429
T	100% PA-12	0.163	337.65	2.75	0.449	0.016	0.466	0.721
S	OS-3 + Node T	0.293	1952.37	2.75	0.805	0.029	0.834	1.290
TT	Node S	0.293	2740.23	2.75	0.805	0.029	0.834	1.290
EE	75% PA-9D	0.049	205.11	2.75	0.135	0.005	0.140	0.217
FF	Node EE + Node TT	0.342	2945.35	2.75	0.940	0.034	0.974	1.507
OO	Node FF + 70% PA-7	0.388	3218.68	2.75	1.067	0.039	1.106	1.711
R	30% PA-6B	0.030	204.42	2.75	0.082	0.003	0.085	0.131
Q	30% PA-6B	0.030	204.42	2.75	0.082	0.003	0.085	0.131
P	Node Q + Node R + 40% PA-6B	0.099	726.94	2.75	0.272	0.010	0.282	0.436
O	Node OO + 30% PA-7	0.408	3355.35	2.75	1.122	0.041	1.162	1.799
N	Node O + 55% PA-9(A&B) + 5% PA-5	0.478	3552.57	2.75	1.315	0.048	1.362	2.108
L	Node N + 45% PA9-(A&B) + 25% PA-3	0.598	3916.40	2.75	1.645	0.060	1.705	2.638
K	Node L + 75% PA-3 + 80% PA-2 + 40% PA-1	1.061	5303.98	2.75	2.917	0.106	3.023	4.677
C	Node J + Lift Station 2	0.311	1626.93	2.75	0.854	0.031	0.885	1.370
G	Node P + 30% PA-5	0.123	891.49	2.75	0.338	0.012	0.350	0.542
F	30% PA-6A	0.039	267.86	2.75	0.107	0.004	0.111	0.172
E	Node F + Node G + 70% PA-6A	0.252	1159.35	2.75	0.694	0.025	0.720	1.113
Lift Station 2	65% PA-5 + Node E	0.304	1515.88	2.75	0.837	0.030	0.867	1.342
B	Node C + 65% PA-4 + Node K	1.383	7137.15	2.75	3.804	0.138	3.942	6.100
A	Node B + 60% PA-1	1.486	7415.31	2.75	4.087	0.149	4.236	6.554
J	35% PA-4	0.006	111.05	2.75	0.018	0.001	0.018	0.028

Notes:

1. peaking factor of 2.75 provided by Stan-Tec as approbed by City of Aurora is previous meetings.

PORTEOS
SANITARY SEWER ROUTING CALCULATIONS

From Node:	To Node:	Basins Added to System	Total Flow (cfs)	Pipe Size (in)	Minimum Slope* (%)	Maximum Slope* (%)	Percentage Full (%)
DD	Z	55% PA-10A	0.705	8	0.40	4.44	66.5
CC	BB	100% OS-1 + 100% OS-2 + 25% PA 9-D	2.688	15	0.40	2.59	53.3
BB	AA	PA-11	3.325	15	0.40	2.59	61.0
AA	Z	45% PA-10	3.902	15	0.40	2.59	68.2
Z	Y	N/A Junction Only	4.607	15	0.43	2.59	78.1
Y	U	25% PA-8	4.961	15	0.40	2.03	83.7
X	V	100% PA-9C	0.190	8	0.40	4.44	31.1
W	V	20% PA-2 + 15% PA-8	0.428	8	0.40	5.98	46.6
V	U	60% PA-8	1.467	10	0.40	2.59	68.3
U	Lift Station	N/A Junction Only	6.429	18	0.40	2.03	67.3
OS-3	S	OS-3	0.570	8	0.40	2.59	57.6
T	S	N/A Junction Only	0.721	8	0.40	4.44	67.6
S	TT	OS-3	1.290	10	0.40	3.48	66.9
TT	FF	N/A Junction Only	1.290	10	0.40	2.59	66.9
EE	FF	75% PA-9D	0.217	8	0.40	2.59	33.3
FF	OO	N/A Junction Only	1.507	12	0.40	2.59	53.8
OO	O	70% PA-7	1.711	12	0.40	2.59	58.3
R	P	30% PA-6B	0.131	8	0.51	4.44	24.2
Q	P	30% PA-6B	0.131	8	0.51	5.98	25.7
P	G	40% PA-6B	0.436	8	0.40	4.44	49.0
O	N	30% PA-7	1.799	12	0.40	2.59	60.2
N	L	55% PA-9(A&B) + 5% PA-5	2.108	12	0.40	2.59	67.1
L	K	45% PA9-(A&B) + 25% PA-3	2.638	18	0.40	2.03	39.9
K	B	75% PA-3 + 80% PA-2 + 40% PA-1	4.677	18	0.40	2.03	55.6
C	B	N/A Junction Only	1.370	15	0.40	2.59	36.5
G	E	30% PA-5	0.542	8	0.40	4.44	55.8
F	E	30% PA-6A	0.172	8	0.41	5.98	29.4
E	Lift Station 2	70% PA-6A	1.113	10	0.40	3.48	60.5
Lift Station 2	C	65% PA-5	1.342	10	0.40	5.98	68.8
B	A	65% PA-4	6.100	18	0.40	1.65	66.3
A	Lift Station	60% PA-1	6.554	18	0.40	1.65	69.9
J	C	35% PA-4	0.028	8	1.85	5.98	8.4

* Note: Minimum slopes were determined as the greater of 0.40% as required by the City of Aurora of the slope required to achieve a minimum velocity of 2.0ft/sec and a maximum percent full capacity of 75% for pipe 12" and smaller or 90% for pipes larger than 12"

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

Refer to attached Flow Master analysis sheets for slope calculations.

Node "D" to be future lift station to force flows from Node D to Node C

Worksheet for A to Lift Station

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.011	
Channel Slope	0.40000	%
Diameter	18.00	in
Discharge	6.55	ft ³ /s

Results

Normal Depth	12.57	in
Flow Area	1.32	ft ²
Wetted Perimeter	2.97	ft
Hydraulic Radius	5.33	in
Top Width	1.38	ft
Critical Depth	0.99	ft
Percent Full	69.9	%
Critical Slope	0.00466	ft/ft
Velocity	4.97	ft/s
Velocity Head	0.38	ft
Specific Energy	1.43	ft
Froude Number	0.90	
Maximum Discharge	8.45	ft ³ /s
Discharge Full	7.85	ft ³ /s
Slope Full	0.00279	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	in
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	in
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	69.86	%
Downstream Velocity	Infinity	ft/s

Worksheet for A to Lift Station

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	12.57	in
Critical Depth	0.99	ft
Channel Slope	0.40000	%
Critical Slope	0.00466	ft/ft

Worksheet for AA to Z

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.011	
Channel Slope	0.40000	%
Diameter	15.00	in
Discharge	3.90	ft ³ /s

Results

Normal Depth	10.22	in
Flow Area	0.89	ft ²
Wetted Perimeter	2.43	ft
Hydraulic Radius	4.40	in
Top Width	1.16	ft
Critical Depth	0.80	ft
Percent Full	68.2	%
Critical Slope	0.00479	ft/ft
Velocity	4.38	ft/s
Velocity Head	0.30	ft
Specific Energy	1.15	ft
Froude Number	0.88	
Maximum Discharge	5.19	ft ³ /s
Discharge Full	4.83	ft ³ /s
Slope Full	0.00261	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	in
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	in
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	68.16	%
Downstream Velocity	Infinity	ft/s

Worksheet for AA to Z

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	10.22	in
Critical Depth	0.80	ft
Channel Slope	0.40000	%
Critical Slope	0.00479	ft/ft

Worksheet for B to A

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.011	
Channel Slope	0.40000	%
Diameter	18.00	in
Discharge	6.10	ft ³ /s

Results

Normal Depth	11.93	in
Flow Area	1.24	ft ²
Wetted Perimeter	2.85	ft
Hydraulic Radius	5.23	in
Top Width	1.42	ft
Critical Depth	0.95	ft
Percent Full	66.3	%
Critical Slope	0.00449	ft/ft
Velocity	4.91	ft/s
Velocity Head	0.37	ft
Specific Energy	1.37	ft
Froude Number	0.92	
Maximum Discharge	8.45	ft ³ /s
Discharge Full	7.85	ft ³ /s
Slope Full	0.00241	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	in
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	in
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	66.26	%
Downstream Velocity	Infinity	ft/s

Worksheet for B to A

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	11.93	in
Critical Depth	0.95	ft
Channel Slope	0.40000	%
Critical Slope	0.00449	ft/ft

Worksheet for BB to AA

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.011	
Channel Slope	0.40000	%
Diameter	15.00	in
Discharge	3.33	ft ³ /s

Results

Normal Depth	9.15	in
Flow Area	0.78	ft ²
Wetted Perimeter	2.24	ft
Hydraulic Radius	4.20	in
Top Width	1.22	ft
Critical Depth	0.74	ft
Percent Full	61.0	%
Critical Slope	0.00447	ft/ft
Velocity	4.24	ft/s
Velocity Head	0.28	ft
Specific Energy	1.04	ft
Froude Number	0.93	
Maximum Discharge	5.19	ft ³ /s
Discharge Full	4.83	ft ³ /s
Slope Full	0.00190	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	in
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	in
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	60.97	%
Downstream Velocity	Infinity	ft/s

Worksheet for BB to AA

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	9.15	in
Critical Depth	0.74	ft
Channel Slope	0.40000	%
Critical Slope	0.00447	ft/ft

Worksheet for C to B

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.011	
Channel Slope	0.40000	%
Diameter	15.00	in
Discharge	1.37	ft ³ /s

Results

Normal Depth	5.47	in
Flow Area	0.40	ft ²
Wetted Perimeter	1.62	ft
Hydraulic Radius	3.00	in
Top Width	1.20	ft
Critical Depth	0.46	ft
Percent Full	36.5	%
Critical Slope	0.00378	ft/ft
Velocity	3.39	ft/s
Velocity Head	0.18	ft
Specific Energy	0.63	ft
Froude Number	1.03	
Maximum Discharge	5.19	ft ³ /s
Discharge Full	4.83	ft ³ /s
Slope Full	0.00032	ft/ft
Flow Type	SuperCritical	

GVF Input Data

Downstream Depth	0.00	in
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	in
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	36.45	%
Downstream Velocity	Infinity	ft/s

Worksheet for C to B

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	5.47	in
Critical Depth	0.46	ft
Channel Slope	0.40000	%
Critical Slope	0.00378	ft/ft

Worksheet for CC to BB

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.011	
Channel Slope	0.40000	%
Diameter	15.00	in
Discharge	2.69	ft ³ /s

Results

Normal Depth	8.00	in
Flow Area	0.67	ft ²
Wetted Perimeter	2.05	ft
Hydraulic Radius	3.90	in
Top Width	1.25	ft
Critical Depth	0.66	ft
Percent Full	53.3	%
Critical Slope	0.00418	ft/ft
Velocity	4.04	ft/s
Velocity Head	0.25	ft
Specific Energy	0.92	ft
Froude Number	0.98	
Maximum Discharge	5.19	ft ³ /s
Discharge Full	4.83	ft ³ /s
Slope Full	0.00124	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	in
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	in
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	53.31	%
Downstream Velocity	Infinity	ft/s

Worksheet for CC to BB

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	8.00	in
Critical Depth	0.66	ft
Channel Slope	0.40000	%
Critical Slope	0.00418	ft/ft

Worksheet for DD to Z

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.011	
Channel Slope	0.40000	%
Diameter	8.00	in
Discharge	0.71	ft ³ /s

Results

Normal Depth	5.32	in
Flow Area	0.25	ft ²
Wetted Perimeter	1.27	ft
Hydraulic Radius	2.33	in
Top Width	0.63	ft
Critical Depth	0.40	ft
Percent Full	66.5	%
Critical Slope	0.00556	ft/ft
Velocity	2.86	ft/s
Velocity Head	0.13	ft
Specific Energy	0.57	ft
Froude Number	0.81	
Maximum Discharge	0.97	ft ³ /s
Discharge Full	0.90	ft ³ /s
Slope Full	0.00244	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	in
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	in
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	66.48	%
Downstream Velocity	Infinity	ft/s

Worksheet for DD to Z

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	5.32	in
Critical Depth	0.40	ft
Channel Slope	0.40000	%
Critical Slope	0.00556	ft/ft

Worksheet for E to Lift Station 2

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.011	
Channel Slope	0.40000	%
Diameter	10.00	in
Discharge	1.11	ft ³ /s

Results

Normal Depth	6.04	in
Flow Area	0.34	ft ²
Wetted Perimeter	1.48	ft
Hydraulic Radius	2.78	in
Top Width	0.82	ft
Critical Depth	0.47	ft
Percent Full	60.4	%
Critical Slope	0.00497	ft/ft
Velocity	3.23	ft/s
Velocity Head	0.16	ft
Specific Energy	0.66	ft
Froude Number	0.88	
Maximum Discharge	1.76	ft ³ /s
Discharge Full	1.64	ft ³ /s
Slope Full	0.00184	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	in
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	in
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	60.35	%
Downstream Velocity	Infinity	ft/s

Worksheet for E to Lift Station 2

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	6.04	in
Critical Depth	0.47	ft
Channel Slope	0.40000	%
Critical Slope	0.00497	ft/ft

Worksheet for EE to FF

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.011	
Channel Slope	0.40000	%
Diameter	8.00	in
Discharge	0.22	ft ³ /s

Results

Normal Depth	2.67	in
Flow Area	0.10	ft ²
Wetted Perimeter	0.82	ft
Hydraulic Radius	1.49	in
Top Width	0.63	ft
Critical Depth	0.21	ft
Percent Full	33.3	%
Critical Slope	0.00462	ft/ft
Velocity	2.13	ft/s
Velocity Head	0.07	ft
Specific Energy	0.29	ft
Froude Number	0.93	
Maximum Discharge	0.97	ft ³ /s
Discharge Full	0.90	ft ³ /s
Slope Full	0.00023	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	in
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	in
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	33.35	%
Downstream Velocity	Infinity	ft/s

Worksheet for EE to FF

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	2.67	in
Critical Depth	0.21	ft
Channel Slope	0.40000	%
Critical Slope	0.00462	ft/ft

Worksheet for F to E

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.011	
Channel Slope	0.41000	%
Diameter	8.00	in
Discharge	0.17	ft ³ /s

Results

Normal Depth	2.35	in
Flow Area	0.09	ft ²
Wetted Perimeter	0.76	ft
Hydraulic Radius	1.35	in
Top Width	0.61	ft
Critical Depth	0.19	ft
Percent Full	29.4	%
Critical Slope	0.00461	ft/ft
Velocity	2.01	ft/s
Velocity Head	0.06	ft
Specific Energy	0.26	ft
Froude Number	0.94	
Maximum Discharge	0.98	ft ³ /s
Discharge Full	0.91	ft ³ /s
Slope Full	0.00015	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	in
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	in
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	29.40	%
Downstream Velocity	Infinity	ft/s

Worksheet for F to E

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	2.35	in
Critical Depth	0.19	ft
Channel Slope	0.41000	%
Critical Slope	0.00461	ft/ft

Worksheet for FF to OO

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.011	
Channel Slope	0.40000	%
Diameter	12.00	in
Discharge	1.51	ft ³ /s

Results

Normal Depth	6.46	in
Flow Area	0.43	ft ²
Wetted Perimeter	1.65	ft
Hydraulic Radius	3.14	in
Top Width	1.00	ft
Critical Depth	0.52	ft
Percent Full	53.8	%
Critical Slope	0.00448	ft/ft
Velocity	3.50	ft/s
Velocity Head	0.19	ft
Specific Energy	0.73	ft
Froude Number	0.94	
Maximum Discharge	2.86	ft ³ /s
Discharge Full	2.66	ft ³ /s
Slope Full	0.00128	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	in
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	in
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	53.85	%
Downstream Velocity	Infinity	ft/s

Worksheet for FF to OO

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	6.46	in
Critical Depth	0.52	ft
Channel Slope	0.40000	%
Critical Slope	0.00448	ft/ft

Worksheet for G to E

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.011	
Channel Slope	0.40000	%
Diameter	8.00	in
Discharge	0.54	ft ³ /s

Results

Normal Depth	4.47	in
Flow Area	0.20	ft ²
Wetted Perimeter	1.13	ft
Hydraulic Radius	2.14	in
Top Width	0.66	ft
Critical Depth	0.35	ft
Percent Full	55.8	%
Critical Slope	0.00511	ft/ft
Velocity	2.70	ft/s
Velocity Head	0.11	ft
Specific Energy	0.49	ft
Froude Number	0.87	
Maximum Discharge	0.97	ft ³ /s
Discharge Full	0.90	ft ³ /s
Slope Full	0.00144	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	in
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	in
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	55.83	%
Downstream Velocity	Infinity	ft/s

Worksheet for G to E

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	4.47	in
Critical Depth	0.35	ft
Channel Slope	0.40000	%
Critical Slope	0.00511	ft/ft

Worksheet for J to C

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.011	
Channel Slope	1.85000	%
Diameter	8.00	in
Discharge	0.03	ft ³ /s

Results

Normal Depth	0.67	in
Flow Area	0.01	ft ²
Wetted Perimeter	0.39	ft
Hydraulic Radius	0.43	in
Top Width	0.37	ft
Critical Depth	0.08	ft
Percent Full	8.4	%
Critical Slope	0.00534	ft/ft
Velocity	2.00	ft/s
Velocity Head	0.06	ft
Specific Energy	0.12	ft
Froude Number	1.81	
Maximum Discharge	2.09	ft ³ /s
Discharge Full	1.94	ft ³ /s
Slope Full	0.00000	ft/ft
Flow Type	SuperCritical	

GVF Input Data

Downstream Depth	0.00	in
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	in
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	8.37	%
Downstream Velocity	Infinity	ft/s

Worksheet for J to C

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	0.67	in
Critical Depth	0.08	ft
Channel Slope	1.85000	%
Critical Slope	0.00534	ft/ft

Worksheet for K to B

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.011	
Channel Slope	0.40000	%
Diameter	18.00	in
Discharge	4.68	ft ³ /s

Results

Normal Depth	10.00	in
Flow Area	1.01	ft ²
Wetted Perimeter	2.52	ft
Hydraulic Radius	4.80	in
Top Width	1.49	ft
Critical Depth	0.83	ft
Percent Full	55.6	%
Critical Slope	0.00404	ft/ft
Velocity	4.64	ft/s
Velocity Head	0.33	ft
Specific Energy	1.17	ft
Froude Number	0.99	
Maximum Discharge	8.45	ft ³ /s
Discharge Full	7.85	ft ³ /s
Slope Full	0.00142	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	in
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	in
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	55.58	%
Downstream Velocity	Infinity	ft/s

Worksheet for K to B

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	10.00	in
Critical Depth	0.83	ft
Channel Slope	0.40000	%
Critical Slope	0.00404	ft/ft

Worksheet for L to K

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.011	
Channel Slope	0.40000	%
Diameter	18.00	in
Discharge	2.64	ft ³ /s

Results

Normal Depth	7.19	in
Flow Area	0.66	ft ²
Wetted Perimeter	2.05	ft
Hydraulic Radius	3.85	in
Top Width	1.47	ft
Critical Depth	0.62	ft
Percent Full	39.9	%
Critical Slope	0.00362	ft/ft
Velocity	4.01	ft/s
Velocity Head	0.25	ft
Specific Energy	0.85	ft
Froude Number	1.05	
Maximum Discharge	8.45	ft ³ /s
Discharge Full	7.85	ft ³ /s
Slope Full	0.00045	ft/ft
Flow Type	SuperCritical	

GVF Input Data

Downstream Depth	0.00	in
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	in
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	39.94	%
Downstream Velocity	Infinity	ft/s

Worksheet for L to K

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	7.19	in
Critical Depth	0.62	ft
Channel Slope	0.40000	%
Critical Slope	0.00362	ft/ft

Worksheet for Lift Station 2 to C

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.011	
Channel Slope	0.40000	%
Diameter	10.00	in
Discharge	1.34	ft ³ /s

Results

Normal Depth	6.88	in
Flow Area	0.40	ft ²
Wetted Perimeter	1.63	ft
Hydraulic Radius	2.94	in
Top Width	0.77	ft
Critical Depth	0.52	ft
Percent Full	68.8	%
Critical Slope	0.00534	ft/ft
Velocity	3.35	ft/s
Velocity Head	0.17	ft
Specific Energy	0.75	ft
Froude Number	0.82	
Maximum Discharge	1.76	ft ³ /s
Discharge Full	1.64	ft ³ /s
Slope Full	0.00268	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	in
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	in
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	68.77	%
Downstream Velocity	Infinity	ft/s

Worksheet for Lift Station 2 to C

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	6.88	in
Critical Depth	0.52	ft
Channel Slope	0.40000	%
Critical Slope	0.00534	ft/ft

Worksheet for N to L

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.011	
Channel Slope	0.40000	%
Diameter	12.00	in
Discharge	2.11	ft ³ /s

Results

Normal Depth	8.05	in
Flow Area	0.56	ft ²
Wetted Perimeter	1.92	ft
Hydraulic Radius	3.50	in
Top Width	0.94	ft
Critical Depth	0.62	ft
Percent Full	67.1	%
Critical Slope	0.00502	ft/ft
Velocity	3.76	ft/s
Velocity Head	0.22	ft
Specific Energy	0.89	ft
Froude Number	0.86	
Maximum Discharge	2.86	ft ³ /s
Discharge Full	2.66	ft ³ /s
Slope Full	0.00251	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	in
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	in
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	67.12	%
Downstream Velocity	Infinity	ft/s

Worksheet for N to L

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	8.05	in
Critical Depth	0.62	ft
Channel Slope	0.40000	%
Critical Slope	0.00502	ft/ft

Worksheet for O to N

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.011	
Channel Slope	0.40000	%
Diameter	12.00	in
Discharge	1.80	ft ³ /s

Results

Normal Depth	7.23	in
Flow Area	0.49	ft ²
Wetted Perimeter	1.78	ft
Hydraulic Radius	3.34	in
Top Width	0.98	ft
Critical Depth	0.57	ft
Percent Full	60.2	%
Critical Slope	0.00471	ft/ft
Velocity	3.64	ft/s
Velocity Head	0.21	ft
Specific Energy	0.81	ft
Froude Number	0.90	
Maximum Discharge	2.86	ft ³ /s
Discharge Full	2.66	ft ³ /s
Slope Full	0.00183	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	in
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	in
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	60.22	%
Downstream Velocity	Infinity	ft/s

Worksheet for O to N

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	7.23	in
Critical Depth	0.57	ft
Channel Slope	0.40000	%
Critical Slope	0.00471	ft/ft

Worksheet for OO to O

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.011	
Channel Slope	0.40000	%
Diameter	12.00	in
Discharge	1.71	ft ³ /s

Results

Normal Depth	7.00	in
Flow Area	0.48	ft ²
Wetted Perimeter	1.74	ft
Hydraulic Radius	3.28	in
Top Width	0.99	ft
Critical Depth	0.56	ft
Percent Full	58.3	%
Critical Slope	0.00464	ft/ft
Velocity	3.60	ft/s
Velocity Head	0.20	ft
Specific Energy	0.78	ft
Froude Number	0.91	
Maximum Discharge	2.86	ft ³ /s
Discharge Full	2.66	ft ³ /s
Slope Full	0.00165	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	in
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	in
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	58.30	%
Downstream Velocity	Infinity	ft/s

Worksheet for OO to O

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	7.00	in
Critical Depth	0.56	ft
Channel Slope	0.40000	%
Critical Slope	0.00464	ft/ft

Worksheet for P to G

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.011	
Channel Slope	0.40000	%
Diameter	8.00	in
Discharge	0.44	ft ³ /s

Results

Normal Depth	3.92	in
Flow Area	0.17	ft ²
Wetted Perimeter	1.03	ft
Hydraulic Radius	1.97	in
Top Width	0.67	ft
Critical Depth	0.31	ft
Percent Full	49.0	%
Critical Slope	0.00488	ft/ft
Velocity	2.57	ft/s
Velocity Head	0.10	ft
Specific Energy	0.43	ft
Froude Number	0.90	
Maximum Discharge	0.97	ft ³ /s
Discharge Full	0.90	ft ³ /s
Slope Full	0.00093	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	in
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	in
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	48.96	%
Downstream Velocity	Infinity	ft/s

Worksheet for P to G

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	3.92	in
Critical Depth	0.31	ft
Channel Slope	0.40000	%
Critical Slope	0.00488	ft/ft

Worksheet for Q to P

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.011	
Channel Slope	0.51000	%
Diameter	8.00	in
Discharge	0.13	ft ³ /s

Results

Normal Depth	1.94	in
Flow Area	0.07	ft ²
Wetted Perimeter	0.69	ft
Hydraulic Radius	1.14	in
Top Width	0.57	ft
Critical Depth	0.17	ft
Percent Full	24.2	%
Critical Slope	0.00460	ft/ft
Velocity	2.01	ft/s
Velocity Head	0.06	ft
Specific Energy	0.22	ft
Froude Number	1.05	
Maximum Discharge	1.10	ft ³ /s
Discharge Full	1.02	ft ³ /s
Slope Full	0.00008	ft/ft
Flow Type	SuperCritical	

GVF Input Data

Downstream Depth	0.00	in
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	in
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	24.23	%
Downstream Velocity	Infinity	ft/s

Worksheet for Q to P

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	1.94	in
Critical Depth	0.17	ft
Channel Slope	0.51000	%
Critical Slope	0.00460	ft/ft

Worksheet for R to P

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.011	
Channel Slope	0.51000	%
Diameter	8.00	in
Discharge	0.13	ft ³ /s

Results

Normal Depth	1.94	in
Flow Area	0.07	ft ²
Wetted Perimeter	0.69	ft
Hydraulic Radius	1.14	in
Top Width	0.57	ft
Critical Depth	0.17	ft
Percent Full	24.2	%
Critical Slope	0.00460	ft/ft
Velocity	2.01	ft/s
Velocity Head	0.06	ft
Specific Energy	0.22	ft
Froude Number	1.05	
Maximum Discharge	1.10	ft ³ /s
Discharge Full	1.02	ft ³ /s
Slope Full	0.00008	ft/ft
Flow Type	SuperCritical	

GVF Input Data

Downstream Depth	0.00	in
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	in
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	24.23	%
Downstream Velocity	Infinity	ft/s

Worksheet for R to P

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	1.94	in
Critical Depth	0.17	ft
Channel Slope	0.51000	%
Critical Slope	0.00460	ft/ft

Worksheet for S to TT

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.011	
Channel Slope	0.40000	%
Diameter	10.00	in
Discharge	1.29	ft ³ /s

Results

Normal Depth	6.69	in
Flow Area	0.39	ft ²
Wetted Perimeter	1.60	ft
Hydraulic Radius	2.92	in
Top Width	0.78	ft
Critical Depth	0.51	ft
Percent Full	66.9	%
Critical Slope	0.00525	ft/ft
Velocity	3.32	ft/s
Velocity Head	0.17	ft
Specific Energy	0.73	ft
Froude Number	0.83	
Maximum Discharge	1.76	ft ³ /s
Discharge Full	1.64	ft ³ /s
Slope Full	0.00248	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	in
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	in
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	66.93	%
Downstream Velocity	Infinity	ft/s

Worksheet for S to TT

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	6.69	in
Critical Depth	0.51	ft
Channel Slope	0.40000	%
Critical Slope	0.00525	ft/ft

Worksheet for T to S

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.011	
Channel Slope	0.40000	%
Diameter	8.00	in
Discharge	0.72	ft ³ /s

Results

Normal Depth	5.41	in
Flow Area	0.25	ft ²
Wetted Perimeter	1.29	ft
Hydraulic Radius	2.34	in
Top Width	0.62	ft
Critical Depth	0.40	ft
Percent Full	67.6	%
Critical Slope	0.00560	ft/ft
Velocity	2.87	ft/s
Velocity Head	0.13	ft
Specific Energy	0.58	ft
Froude Number	0.80	
Maximum Discharge	0.97	ft ³ /s
Discharge Full	0.90	ft ³ /s
Slope Full	0.00255	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	in
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	in
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	67.59	%
Downstream Velocity	Infinity	ft/s

Worksheet for T to S

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	5.41	in
Critical Depth	0.40	ft
Channel Slope	0.40000	%
Critical Slope	0.00560	ft/ft

Worksheet for TT to FF

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.011	
Channel Slope	0.40000	%
Diameter	10.00	in
Discharge	1.29	ft ³ /s

Results

Normal Depth	6.69	in
Flow Area	0.39	ft ²
Wetted Perimeter	1.60	ft
Hydraulic Radius	2.92	in
Top Width	0.78	ft
Critical Depth	0.51	ft
Percent Full	66.9	%
Critical Slope	0.00525	ft/ft
Velocity	3.32	ft/s
Velocity Head	0.17	ft
Specific Energy	0.73	ft
Froude Number	0.83	
Maximum Discharge	1.76	ft ³ /s
Discharge Full	1.64	ft ³ /s
Slope Full	0.00248	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	in
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	in
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	66.93	%
Downstream Velocity	Infinity	ft/s

Worksheet for TT to FF

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	6.69	in
Critical Depth	0.51	ft
Channel Slope	0.40000	%
Critical Slope	0.00525	ft/ft

Worksheet for U to Lift Station

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.011	
Channel Slope	0.40000	%
Diameter	18.00	in
Discharge	6.24	ft ³ /s

Results

Normal Depth	12.12	in
Flow Area	1.27	ft ²
Wetted Perimeter	2.89	ft
Hydraulic Radius	5.26	in
Top Width	1.41	ft
Critical Depth	0.97	ft
Percent Full	67.3	%
Critical Slope	0.00454	ft/ft
Velocity	4.93	ft/s
Velocity Head	0.38	ft
Specific Energy	1.39	ft
Froude Number	0.92	
Maximum Discharge	8.45	ft ³ /s
Discharge Full	7.85	ft ³ /s
Slope Full	0.00253	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	in
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	in
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	67.34	%
Downstream Velocity	Infinity	ft/s

Worksheet for U to Lift Station

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	12.12	in
Critical Depth	0.97	ft
Channel Slope	0.40000	%
Critical Slope	0.00454	ft/ft

Worksheet for V to U

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.011	
Channel Slope	0.40000	%
Diameter	10.00	in
Discharge	1.33	ft ³ /s

Results

Normal Depth	6.83	in
Flow Area	0.40	ft ²
Wetted Perimeter	1.62	ft
Hydraulic Radius	2.94	in
Top Width	0.78	ft
Critical Depth	0.52	ft
Percent Full	68.3	%
Critical Slope	0.00532	ft/ft
Velocity	3.34	ft/s
Velocity Head	0.17	ft
Specific Energy	0.74	ft
Froude Number	0.82	
Maximum Discharge	1.76	ft ³ /s
Discharge Full	1.64	ft ³ /s
Slope Full	0.00263	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	in
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	in
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	68.28	%
Downstream Velocity	Infinity	ft/s

Worksheet for V to U

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	6.83	in
Critical Depth	0.52	ft
Channel Slope	0.40000	%
Critical Slope	0.00532	ft/ft

Worksheet for W to V

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.011	
Channel Slope	0.40000	%
Diameter	8.00	in
Discharge	0.40	ft ³ /s

Results

Normal Depth	3.73	in
Flow Area	0.16	ft ²
Wetted Perimeter	1.00	ft
Hydraulic Radius	1.91	in
Top Width	0.67	ft
Critical Depth	0.29	ft
Percent Full	46.6	%
Critical Slope	0.00482	ft/ft
Velocity	2.51	ft/s
Velocity Head	0.10	ft
Specific Energy	0.41	ft
Froude Number	0.90	
Maximum Discharge	0.97	ft ³ /s
Discharge Full	0.90	ft ³ /s
Slope Full	0.00078	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	in
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	in
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	46.59	%
Downstream Velocity	Infinity	ft/s

Worksheet for W to V

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	3.73	in
Critical Depth	0.29	ft
Channel Slope	0.40000	%
Critical Slope	0.00482	ft/ft

Worksheet for X to V

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.011	
Channel Slope	0.40000	%
Diameter	8.00	in
Discharge	0.19	ft ³ /s

Results

Normal Depth	2.49	in
Flow Area	0.09	ft ²
Wetted Perimeter	0.79	ft
Hydraulic Radius	1.41	in
Top Width	0.62	ft
Critical Depth	0.20	ft
Percent Full	31.1	%
Critical Slope	0.00462	ft/ft
Velocity	2.05	ft/s
Velocity Head	0.07	ft
Specific Energy	0.27	ft
Froude Number	0.93	
Maximum Discharge	0.97	ft ³ /s
Discharge Full	0.90	ft ³ /s
Slope Full	0.00018	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	in
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	in
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	31.14	%
Downstream Velocity	Infinity	ft/s

Worksheet for X to V

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	2.49	in
Critical Depth	0.20	ft
Channel Slope	0.40000	%
Critical Slope	0.00462	ft/ft

Worksheet for Y to U

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.011	
Channel Slope	0.40000	%
Diameter	15.00	in
Discharge	4.91	ft ³ /s

Results

Normal Depth	12.55	in
Flow Area	1.10	ft ²
Wetted Perimeter	2.89	ft
Hydraulic Radius	4.56	in
Top Width	0.92	ft
Critical Depth	0.90	ft
Percent Full	83.7	%
Critical Slope	0.00551	ft/ft
Velocity	4.48	ft/s
Velocity Head	0.31	ft
Specific Energy	1.36	ft
Froude Number	0.73	
Maximum Discharge	5.19	ft ³ /s
Discharge Full	4.83	ft ³ /s
Slope Full	0.00414	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	in
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	in
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	83.67	%
Downstream Velocity	Infinity	ft/s

Worksheet for Y to U

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	12.55	in
Critical Depth	0.90	ft
Channel Slope	0.40000	%
Critical Slope	0.00551	ft/ft

Worksheet for Z to Y

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.011	
Channel Slope	0.40000	%
Diameter	15.00	in
Discharge	4.61	ft ³ /s

Results

Normal Depth	11.72	in
Flow Area	1.03	ft ²
Wetted Perimeter	2.71	ft
Hydraulic Radius	4.55	in
Top Width	1.03	ft
Critical Depth	0.87	ft
Percent Full	78.1	%
Critical Slope	0.00527	ft/ft
Velocity	4.48	ft/s
Velocity Head	0.31	ft
Specific Energy	1.29	ft
Froude Number	0.79	
Maximum Discharge	5.19	ft ³ /s
Discharge Full	4.83	ft ³ /s
Slope Full	0.00364	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	in
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	in
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	78.13	%
Downstream Velocity	Infinity	ft/s

Worksheet for Z to Y

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	11.72	in
Critical Depth	0.87	ft
Channel Slope	0.40000	%
Critical Slope	0.00527	ft/ft

Worksheet for OS-3 to S

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.011	
Channel Slope	0.40000	%
Diameter	8.00	in
Discharge	0.57	ft ³ /s

Results

Normal Depth	4.61	in
Flow Area	0.21	ft ²
Wetted Perimeter	1.15	ft
Hydraulic Radius	2.18	in
Top Width	0.66	ft
Critical Depth	0.35	ft
Percent Full	57.6	%
Critical Slope	0.00518	ft/ft
Velocity	2.74	ft/s
Velocity Head	0.12	ft
Specific Energy	0.50	ft
Froude Number	0.86	
Maximum Discharge	0.97	ft ³ /s
Discharge Full	0.90	ft ³ /s
Slope Full	0.00159	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	in
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	in
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	57.64	%
Downstream Velocity	Infinity	ft/s

Worksheet for OS-3 to S

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	4.61	in
Critical Depth	0.35	ft
Channel Slope	0.40000	%
Critical Slope	0.00518	ft/ft

Appendix C

Porteos												
Water Calculations												
Average & Maximum Demand Calculation												
Planning Area	Type of Development	Total Acres	Maximum Building Area (Ac)	AVG Day Demand (gpm/ based on land use)	Avg Day Demand (GPM)	Max Day Demand (gmp/ based on land use)	Max Day Demand GPM	Max Hour Demand (gpm/ based on land use)	Max Hour Demand GPM	Required Fire Flow	Max Day Demand + Fire Flow GPM	
PA-1	Mixed Commercial	30.3	9.27	4.52	41.91	2.8	117.35	4.50	188.59	1500	1617.35	
PA-2	Mixed Commercial	60.2	13.19	4.52	59.60	2.8	166.87	4.50	268.18	1500	1666.87	
PA-3	Mixed Commercial	58.8	17.99	4.52	81.33	2.8	229.22	4.50	365.97	1500	1727.72	
PA-4	Industrial	57.9	21.15	1.00	21.15	2.8	59.60	4.50	95.18	1500	1559.22	
PA-5	Industrial	111.11	36.57	1.00	36.57	2.8	102.40	4.50	164.57	1500	1602.40	
PA-6A	Industrial	155.65	59.52	1.00	59.52	2.8	166.67	4.50	267.86	1500	1666.67	
PA-6A ESMT	N/A	16.8	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
PA-6B	Industrial	121.21	45.43	1.00	45.43	2.8	127.19	4.50	204.42	1500	1627.19	
PA-6B ESMT	N/A	14.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
PA-7	Industrial	79.4	30.37	1.00	30.37	2.8	85.04	4.50	136.67	1500	1585.04	
PA-8A	Mixed Commercial	39.4	6.94	4.52	31.37	2.8	87.83	4.50	141.16	1500	1587.83	
PA-8B-1	Mixed Commercial	29.8	5.25	4.52	23.73	2.8	66.44	4.50	106.79	1500	1566.44	
PA-8B-2	Commercial	51.7	9.07	1.00	9.07	2.8	25.40	4.50	40.82	1500	1525.40	
PA-8B-3	Mixed Commercial	11.3	2.00	4.52	9.04	2.8	25.31	4.50	40.68	1500	1525.31	
PA-9A	Mixed Commercial	45.3	5.20	4.52	23.49	2.8	65.79	4.50	105.73	1500	1565.79	
PA-9B	Industrial	15.4	3.25	1.00	3.25	2.8	9.11	4.50	14.64	1500	1509.11	
PA-9C	Mixed Commercial	18.8	3.60	4.52	16.25	2.8	45.50	4.50	73.12	1500	1545.50	
PA-9D	Mixed Commercial	28.6	5.47	4.52	24.71	2.8	69.19	4.50	111.20	1500	1569.19	
PA-10A	Mixed Commercial	59.3	11.34	4.52	51.26	2.8	143.52	4.50	230.66	1500	1643.52	
PA-10B	Mixed Commercial	40.4	7.73	4.52	34.94	2.8	97.83	4.50	157.23	1500	1597.83	
PA-11	Mixed Commercial	40.8	7.80	4.52	35.27	2.8	98.75	4.50	158.71	1500	1598.75	
PA-12	Industrial	166.5	75.03	1.00	75.03	2.8	210.08	4.50	337.64	1500	1710.08	
PA-12 ESMT	N/A	19.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	

Notes:

1. Building square foot values determined in the Traffic Impact Study (provided by FHU)

Average Day

FlexTable: Pipe Table

Label	Length (Scaled) (ft)	Start Node	Stop Node	Diam eter (in)	Material	Hazen- Williams C	Flow (gpm)	Velocity (ft/s)	Hydraulic Grade (Start) (ft)	Hydraulic Grade (Stop) (ft)
P-1	1,048	J-1	J-2	16.0	PVC	150.0	7	0.01	5,599.99	5,599.99
P-2	1,200	J-2	J-3	16.0	PVC	150.0	22	0.03	5,599.99	5,599.99
P-3	942	J-3	J-4	16.0	PVC	150.0	-44	0.07	5,599.99	5,599.99
P-4	889	J-4	J-5	16.0	PVC	150.0	-74	0.12	5,599.99	5,600.00
P-5	2,266	J-2	J-6	16.0	PVC	150.0	-25	0.04	5,599.99	5,599.99
P-9	1,938	J-9	J-10	24.0	PVC	150.0	437	0.31	5,719.98	5,719.95
P-10	733	J-10	J-11	24.0	PVC	150.0	316	0.22	5,719.95	5,719.94
P-11	698	J-11	J-12	24.0	PVC	150.0	251	0.18	5,719.94	5,719.94
P-12	1,323	J-12	J-13	24.0	PVC	150.0	215	0.15	5,719.94	5,719.93
P-13	556	J-13	J-14	24.0	PVC	150.0	186	0.13	5,719.93	5,719.93
P-14	2,458	J-14	J-15	24.0	PVC	150.0	123	0.09	5,719.93	5,719.93
P-15	2,649	J-15	J-16	12.0	PVC	150.0	48	0.14	5,719.93	5,719.91
P-16	2,483	J-16	J-17	12.0	PVC	150.0	-35	0.10	5,719.91	5,719.92
P-17	1,267	J-17	J-18	16.0	PVC	150.0	-98	0.16	5,719.92	5,719.93
P-18	1,386	J-18	J-14	16.0	PVC	150.0	-63	0.10	5,719.93	5,719.93
P-19	1,356	J-13	J-19	12.0	PVC	150.0	28	0.08	5,719.93	5,719.93
P-20	1,341	J-12	J-20	12.0	PVC	150.0	36	0.10	5,719.94	5,719.93
P-21	1,328	J-11	J-21	12.0	PVC	150.0	47	0.13	5,719.94	5,719.93
P-22	533	J-18	J-19	12.0	PVC	150.0	-34	0.10	5,719.93	5,719.93
P-23	755	J-19	J-22	12.0	PVC	150.0	-6	0.02	5,719.93	5,719.93
P-24	571	J-22	J-20	12.0	PVC	150.0	-42	0.12	5,719.93	5,719.93
P-25	718	J-20	J-21	12.0	PVC	150.0	-6	0.02	5,719.93	5,719.93
P-26	1,324	J-21	J-23	12.0	PVC	150.0	41	0.12	5,719.93	5,719.93
P-27	1,311	J-23	J-24	16.0	PVC	150.0	38	0.06	5,719.93	5,719.92
P-28	1,269	J-24	J-17	16.0	PVC	150.0	74	0.12	5,719.92	5,719.92
P-30	695	J-23	J-25	16.0	PVC	150.0	3	0.00	5,719.93	5,719.93
P-37	2,763	J-27	J-28	16.0	PVC	150.0	13	0.02	5,600.00	5,599.99
P-39	1,237	J-5	J-29	24.0	PVC	150.0	-46	0.03	5,600.00	5,600.00
P-40	296	J-29	J-30	24.0	PVC	150.0	-64	0.05	5,600.00	5,600.00
P-45	877	J-30	J-32	12.0	PVC	150.0	26	0.07	5,600.00	5,600.00
P-46	2,044	J-32	J-6	12.0	PVC	150.0	15	0.04	5,600.00	5,599.99
P-47	812	J-28	J-33	16.0	PVC	150.0	27	0.04	5,599.99	5,599.99
P-48	904	J-33	J-6	16.0	PVC	150.0	10	0.02	5,599.99	5,599.99
P-50	456	J-34	J-28	16.0	PVC	150.0	44	0.07	5,600.00	5,599.99
P-53	611	J-22	J-36	12.0	PVC	150.0	36	0.10	5,719.93	5,719.93
P-54	695	J-36	J-24	12.0	PVC	150.0	36	0.10	5,719.93	5,719.92
P-55	1,180	J-10	J-37	16.0	PVC	150.0	121	0.19	5,719.95	5,719.94
P-58	467	J-38	J-8	16.0	PVC	150.0	5	0.01	5,600.00	5,600.00
P-59	972	J-5	J-39	24.0	PVC	150.0	10	0.01	5,600.00	5,600.00
P-60	1,049	J-39	J-7	24.0	PVC	150.0	-22	0.02	5,600.00	5,600.00
P-61	947	J-30	J-40	24.0	PVC	150.0	-90	0.06	5,600.00	5,600.00
P-62	764	J-40	J-31	24.0	PVC	150.0	-90	0.06	5,600.00	5,600.00
P-65	105	J-25	PRV-2	16.0	PVC	150.0	51	0.08	5,719.93	5,719.93
P-67	225	J-25	PRV-3	16.0	PVC	150.0	38	0.06	5,719.93	5,719.93
P-68	2,437	PRV-3	J-5	16.0	PVC	150.0	38	0.06	5,600.00	5,600.00
P-69	660	J-35	PRV-4	16.0	PVC	150.0	42	0.07	5,719.92	5,719.92
P-70	699	PRV-4	J-31	16.0	PVC	150.0	42	0.07	5,600.00	5,600.00
P-71	938	J-31	PRV-5	24.0	PVC	150.0	-105	0.07	5,600.00	5,600.00

Average Day

FlexTable: Pipe Table

Label	Length (Scaled) (ft)	Start Node	Stop Node	Diam eter (in)	Material	Hazen- Williams C	Flow (gpm)	Velocity (ft/s)	Hydraulic Grade (Start) (ft)	Hydraulic Grade (Stop) (ft)
P-72	1,580	PRV-5	J-26	24.0	PVC	150.0	-105	0.07	5,719.80	5,719.81
P-73	68	PRV-2	J-41	16.0	PVC	150.0	51	0.08	5,600.00	5,600.00
P-74	1,338	J-38	J-41	16.0	PVC	150.0	-30	0.05	5,600.00	5,600.00
P-75	1,411	J-37	J-42	16.0	PVC	150.0	104	0.17	5,719.94	5,719.93
P-76	61	J-42	J-25	16.0	PVC	150.0	86	0.14	5,719.93	5,719.93
P-78	1,271	R-1	J-9	24.0	PVC	150.0	507	0.36	5,720.00	5,719.98
P-80	2,345	J-44	J-27	12.0	PVC	150.0	13	0.04	5,600.00	5,600.00
P-81	330	J-31	J-45	16.0	PVC	150.0	57	0.09	5,600.00	5,600.00
P-82	1,960	J-45	J-34	16.0	PVC	150.0	44	0.07	5,600.00	5,600.00
P-83	2,520	J-44	J-45	12.0	PVC	150.0	-13	0.04	5,600.00	5,600.00
P-86	2,669	J-8	J-7	24.0	PVC	150.0	76	0.05	5,600.00	5,600.00
P-64	334	J-9	PRV-1	24.0	PVC	150.0	71	0.05	5,719.98	5,719.98
P-63	2,321	PRV-1	J-8	24.0	PVC	150.0	71	0.05	5,600.00	5,600.00
P-94	76	J-49	J-48	8.0	PVC	150.0	0	0.00	5,599.99	5,599.99
P-95	74	J-49	H-1	6.0	PVC	150.0	0	0.00	5,599.99	5,599.99
P-96	860	J-1	J-50	16.0	PVC	150.0	-28	0.05	5,599.99	5,599.99
P-97	1,764	J-50	J-7	16.0	PVC	150.0	-54	0.09	5,599.99	5,600.00
P-98	31	J-49	J-50	8.0	PVC	150.0	-5	0.03	5,599.99	5,599.99
P-99	126	J-51	J-3	8.0	PVC	150.0	5	0.03	5,599.99	5,599.99
P-101	438	J-52	J-49	8.0	PVC	150.0	-5	0.03	5,599.99	5,599.99
P-102	1,100	J-51	J-52	8.0	PVC	150.0	-5	0.03	5,599.99	5,599.99
P-35	2,276	J-53	J-26	12.0	PVC	150.0	128	0.36	5,719.90	5,719.81
P-105	339	J-17	J-54	16.0	PVC	150.0	86	0.14	5,719.92	5,719.92
P-106	917	J-54	J-35	16.0	PVC	150.0	42	0.07	5,719.92	5,719.92
P-107	2,494	J-53	J-54	12.0	PVC	150.0	-44	0.12	5,719.90	5,719.92
P-108	340	J-16	J-53	12.0	PVC	150.0	84	0.24	5,719.91	5,719.90

Average Day

FlexTable: Junction Table

ID	Label	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
30	J-1	21	5,599.99	101
31	J-2	10	5,599.99	96
33	J-3	70	5,599.99	94
35	J-4	30	5,599.99	82
37	J-5	0	5,600.00	85
39	J-6	0	5,599.99	90
41	J-7	0	5,600.00	89
43	J-8	0	5,600.00	84
45	J-9	0	5,719.98	128
47	J-10	0	5,719.95	120
49	J-11	18	5,719.94	109
51	J-12	0	5,719.94	100
53	J-13	0	5,719.93	97
55	J-14	0	5,719.93	98
57	J-15	75	5,719.93	103
59	J-16	0	5,719.91	101
61	J-17	50	5,719.92	119
63	J-18	0	5,719.93	113
66	J-19	0	5,719.93	112
68	J-20	0	5,719.93	114
70	J-21	0	5,719.93	117
73	J-22	0	5,719.93	113
77	J-23	0	5,719.93	131
79	J-24	0	5,719.92	125
83	J-25	0	5,719.93	130
89	J-26	23	5,719.81	123
91	J-27	0	5,600.00	81
93	J-28	30	5,599.99	103
96	J-29	18	5,600.00	79
98	J-30	0	5,600.00	79
100	J-31	0	5,600.00	82
105	J-32	11	5,600.00	81
108	J-33	18	5,599.99	98
111	J-34	0	5,600.00	95
114	J-35	0	5,719.92	127
117	J-36	0	5,719.93	119
120	J-37	17	5,719.94	119
123	J-38	26	5,600.00	86
126	J-39	32	5,600.00	94
129	J-40	0	5,600.00	80
147	J-41	21	5,600.00	80
150	J-42	18	5,719.93	131
161	J-44	0	5,600.00	72
164	J-45	0	5,600.00	84
197	J-48	0	5,599.99	99
199	J-49	0	5,599.99	99
204	J-50	21	5,599.99	99
208	J-51	0	5,599.99	98

Average Day

FlexTable: Junction Table

ID	Label	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
210	J-52	0	5,599.99	94
214	J-53	0	5,719.90	103
217	J-54	0	5,719.92	121

Max Day

FlexTable: Pipe Table

Label	Length (Scaled) (ft)	Start Node	Stop Node	Diam eter (in)	Material	Hazen- Williams C	Flow (gpm)	Velocity (ft/s)	Hydraulic Grade (Start) (ft)	Hydraulic Grade (Stop) (ft)
P-1	1,048	J-1	J-2	16.0	PVC	150.0	92	0.15	5,599.86	5,599.85
P-2	1,200	J-2	J-3	16.0	PVC	150.0	117	0.19	5,599.85	5,599.84
P-3	942	J-3	J-4	16.0	PVC	150.0	-216	0.35	5,599.84	5,599.87
P-4	889	J-4	J-5	16.0	PVC	150.0	-369	0.59	5,599.87	5,599.93
P-5	2,266	J-2	J-6	16.0	PVC	150.0	-78	0.12	5,599.85	5,599.86
P-9	1,938	J-9	J-10	24.0	PVC	150.0	2,741	1.94	5,719.31	5,718.48
P-10	733	J-10	J-11	24.0	PVC	150.0	2,026	1.44	5,718.48	5,718.30
P-11	698	J-11	J-12	24.0	PVC	150.0	1,663	1.18	5,718.30	5,718.18
P-12	1,323	J-12	J-13	24.0	PVC	150.0	1,427	1.01	5,718.18	5,718.01
P-13	556	J-13	J-14	24.0	PVC	150.0	1,218	0.86	5,718.01	5,717.96
P-14	2,458	J-14	J-15	24.0	PVC	150.0	714	0.51	5,717.96	5,717.87
P-15	2,649	J-15	J-16	12.0	PVC	150.0	330	0.94	5,717.87	5,717.21
P-16	2,483	J-16	J-17	12.0	PVC	150.0	-168	0.48	5,717.21	5,717.39
P-17	1,267	J-17	J-18	16.0	PVC	150.0	-779	1.24	5,717.39	5,717.77
P-18	1,386	J-18	J-14	16.0	PVC	150.0	-504	0.80	5,717.77	5,717.96
P-19	1,356	J-13	J-19	12.0	PVC	150.0	209	0.59	5,718.01	5,717.86
P-20	1,341	J-12	J-20	12.0	PVC	150.0	236	0.67	5,718.18	5,718.00
P-21	1,328	J-11	J-21	12.0	PVC	150.0	306	0.87	5,718.30	5,718.01
P-22	533	J-18	J-19	12.0	PVC	150.0	-275	0.78	5,717.77	5,717.86
P-23	755	J-19	J-22	12.0	PVC	150.0	-66	0.19	5,717.86	5,717.87
P-24	571	J-22	J-20	12.0	PVC	150.0	-308	0.87	5,717.87	5,718.00
P-25	718	J-20	J-21	12.0	PVC	150.0	-71	0.20	5,718.00	5,718.01
P-26	1,324	J-21	J-23	12.0	PVC	150.0	235	0.67	5,718.01	5,717.83
P-27	1,311	J-23	J-24	16.0	PVC	150.0	447	0.71	5,717.83	5,717.69
P-28	1,269	J-24	J-17	16.0	PVC	150.0	689	1.10	5,717.69	5,717.39
P-30	695	J-23	J-25	16.0	PVC	150.0	-212	0.34	5,717.83	5,717.85
P-37	2,763	J-27	J-28	16.0	PVC	150.0	71	0.11	5,599.89	5,599.88
P-39	1,237	J-5	J-29	24.0	PVC	150.0	-72	0.05	5,599.93	5,599.93
P-40	296	J-29	J-30	24.0	PVC	150.0	-363	0.26	5,599.93	5,599.94
P-45	877	J-30	J-32	12.0	PVC	150.0	186	0.53	5,599.94	5,599.86
P-46	2,044	J-32	J-6	12.0	PVC	150.0	12	0.03	5,599.86	5,599.86
P-47	812	J-28	J-33	16.0	PVC	150.0	157	0.25	5,599.88	5,599.86
P-48	904	J-33	J-6	16.0	PVC	150.0	66	0.11	5,599.86	5,599.86
P-50	456	J-34	J-28	16.0	PVC	150.0	238	0.38	5,599.89	5,599.88
P-53	611	J-22	J-36	12.0	PVC	150.0	241	0.68	5,717.87	5,717.79
P-54	695	J-36	J-24	12.0	PVC	150.0	241	0.68	5,717.79	5,717.69
P-55	1,180	J-10	J-37	16.0	PVC	150.0	715	1.14	5,718.48	5,718.17
P-58	467	J-38	J-8	16.0	PVC	150.0	75	0.12	5,599.98	5,599.98
P-59	972	J-5	J-39	24.0	PVC	150.0	-85	0.06	5,599.93	5,599.93
P-60	1,049	J-39	J-7	24.0	PVC	150.0	-185	0.13	5,599.93	5,599.94
P-61	947	J-30	J-40	24.0	PVC	150.0	-550	0.39	5,599.94	5,599.96
P-62	764	J-40	J-31	24.0	PVC	150.0	-550	0.39	5,599.96	5,599.98
P-65	105	J-25	PRV-2	16.0	PVC	150.0	178	0.28	5,717.85	5,717.85
P-67	225	J-25	PRV-3	16.0	PVC	150.0	213	0.34	5,717.85	5,717.85
P-68	2,437	PRV-3	J-5	16.0	PVC	150.0	213	0.34	5,600.00	5,599.93
P-69	660	J-35	PRV-4	16.0	PVC	150.0	247	0.39	5,717.31	5,717.29
P-70	699	PRV-4	J-31	16.0	PVC	150.0	247	0.39	5,600.00	5,599.98
P-71	938	J-31	PRV-5	24.0	PVC	150.0	-612	0.43	5,599.98	5,600.00

FlexTable: Pipe Table

Label	Length (Scaled) (ft)	Start Node	Stop Node	Diam eter (in)	Material	Hazen- Williams C	Flow (gpm)	Velocity (ft/s)	Hydraulic Grade (Start) (ft)	Hydraulic Grade (Stop) (ft)
P-72	1,580	PRV-5	J-26	24.0	PVC	150.0	-612	0.43	5,714.52	5,714.57
P-73	68	PRV-2	J-41	16.0	PVC	150.0	178	0.28	5,600.00	5,600.00
P-74	1,338	J-38	J-41	16.0	PVC	150.0	-157	0.25	5,599.98	5,600.00
P-75	1,411	J-37	J-42	16.0	PVC	150.0	659	1.05	5,718.17	5,717.86
P-76	61	J-42	J-25	16.0	PVC	150.0	602	0.96	5,717.86	5,717.85
P-78	1,271	R-1	J-9	24.0	PVC	150.0	3,106	2.20	5,720.00	5,719.31
P-80	2,345	J-44	J-27	12.0	PVC	150.0	71	0.20	5,599.92	5,599.89
P-81	330	J-31	J-45	16.0	PVC	150.0	309	0.49	5,599.98	5,599.96
P-82	1,960	J-45	J-34	16.0	PVC	150.0	238	0.38	5,599.96	5,599.89
P-83	2,520	J-44	J-45	12.0	PVC	150.0	-71	0.20	5,599.92	5,599.96
P-86	2,669	J-8	J-7	24.0	PVC	150.0	440	0.31	5,599.98	5,599.94
P-64	334	J-9	PRV-1	24.0	PVC	150.0	365	0.26	5,719.31	5,719.31
P-63	2,321	PRV-1	J-8	24.0	PVC	150.0	365	0.26	5,600.00	5,599.98
P-94	76	J-49	J-48	8.0	PVC	150.0	0	0.00	5,599.87	5,599.87
P-95	74	J-49	H-1	6.0	PVC	150.0	0	0.00	5,599.87	5,599.87
P-96	860	J-1	J-50	16.0	PVC	150.0	-159	0.25	5,599.86	5,599.87
P-97	1,764	J-50	J-7	16.0	PVC	150.0	-254	0.41	5,599.87	5,599.94
P-98	31	J-49	J-50	8.0	PVC	150.0	-28	0.18	5,599.87	5,599.87
P-99	126	J-51	J-3	8.0	PVC	150.0	28	0.18	5,599.84	5,599.84
P-101	438	J-52	J-49	8.0	PVC	150.0	-28	0.18	5,599.86	5,599.87
P-102	1,100	J-51	J-52	8.0	PVC	150.0	-28	0.18	5,599.84	5,599.86
P-35	2,276	J-53	J-26	12.0	PVC	150.0	728	2.07	5,717.03	5,714.57
P-105	339	J-17	J-54	16.0	PVC	150.0	477	0.76	5,717.39	5,717.35
P-106	917	J-54	J-35	16.0	PVC	150.0	247	0.39	5,717.35	5,717.31
P-107	2,494	J-53	J-54	12.0	PVC	150.0	-230	0.65	5,717.03	5,717.35
P-108	340	J-16	J-53	12.0	PVC	150.0	498	1.41	5,717.21	5,717.03

Max Day

FlexTable: Junction Table

ID	Label	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
30	J-1	67	5,599.86	101
31	J-2	53	5,599.85	96
33	J-3	361	5,599.84	94
35	J-4	153	5,599.87	82
37	J-5	0	5,599.93	85
39	J-6	0	5,599.86	90
41	J-7	0	5,599.94	89
43	J-8	0	5,599.98	84
45	J-9	0	5,719.31	128
47	J-10	0	5,718.48	119
49	J-11	56	5,718.30	108
51	J-12	0	5,718.18	100
53	J-13	0	5,718.01	96
55	J-14	0	5,717.96	97
57	J-15	384	5,717.87	102
59	J-16	0	5,717.21	99
61	J-17	822	5,717.39	118
63	J-18	0	5,717.77	112
66	J-19	0	5,717.86	111
68	J-20	0	5,718.00	113
70	J-21	0	5,718.01	116
73	J-22	0	5,717.87	112
77	J-23	0	5,717.83	130
79	J-24	0	5,717.69	124
83	J-25	0	5,717.85	129
89	J-26	116	5,714.57	120
91	J-27	0	5,599.89	81
93	J-28	152	5,599.88	103
96	J-29	291	5,599.93	79
98	J-30	0	5,599.94	79
100	J-31	0	5,599.98	82
105	J-32	174	5,599.86	81
108	J-33	91	5,599.86	97
111	J-34	0	5,599.89	95
114	J-35	0	5,717.31	126
117	J-36	0	5,717.79	118
120	J-37	56	5,718.17	118
123	J-38	82	5,599.98	86
126	J-39	101	5,599.93	94
129	J-40	0	5,599.96	80
147	J-41	21	5,600.00	80
150	J-42	56	5,717.86	130
161	J-44	0	5,599.92	72
164	J-45	0	5,599.96	84
197	J-48	0	5,599.87	99
199	J-49	0	5,599.87	99
204	J-50	67	5,599.87	99
208	J-51	0	5,599.84	98

Max Day

FlexTable: Junction Table

ID	Label	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
210	J-52	0	5,599.86	94
214	J-53	0	5,717.03	102
217	J-54	0	5,717.35	120

Max Hour

FlexTable: Pipe Table

Label	Length (Scaled) (ft)	Start Node	Stop Node	Diam eter (in)	Material	Hazen- Williams C	Flow (gpm)	Velocity (ft/s)	Hydraulic Grade (Start) (ft)	Hydraulic Grade (Stop) (ft)
P-1	1,048	J-1	J-2	16.0	PVC	150.0	53	0.09	5,599.84	5,599.84
P-2	1,200	J-2	J-3	16.0	PVC	150.0	80	0.13	5,599.84	5,599.84
P-3	942	J-3	J-4	16.0	PVC	150.0	-215	0.34	5,599.84	5,599.86
P-4	889	J-4	J-5	16.0	PVC	150.0	-349	0.56	5,599.86	5,599.92
P-5	2,266	J-2	J-6	16.0	PVC	150.0	-74	0.12	5,599.84	5,599.85
P-9	1,938	J-9	J-10	24.0	PVC	150.0	3,041	2.16	5,719.16	5,718.15
P-10	733	J-10	J-11	24.0	PVC	150.0	2,228	1.58	5,718.15	5,717.94
P-11	698	J-11	J-12	24.0	PVC	150.0	1,806	1.28	5,717.94	5,717.80
P-12	1,323	J-12	J-13	24.0	PVC	150.0	1,537	1.09	5,717.80	5,717.61
P-13	556	J-13	J-14	24.0	PVC	150.0	1,294	0.92	5,717.61	5,717.55
P-14	2,458	J-14	J-15	24.0	PVC	150.0	706	0.50	5,717.55	5,717.46
P-15	2,649	J-15	J-16	12.0	PVC	150.0	369	1.05	5,717.46	5,716.65
P-16	2,483	J-16	J-17	12.0	PVC	150.0	-158	0.45	5,716.65	5,716.81
P-17	1,267	J-17	J-18	16.0	PVC	150.0	-893	1.43	5,716.81	5,717.30
P-18	1,386	J-18	J-14	16.0	PVC	150.0	-588	0.94	5,717.30	5,717.55
P-19	1,356	J-13	J-19	12.0	PVC	150.0	243	0.69	5,717.61	5,717.41
P-20	1,341	J-12	J-20	12.0	PVC	150.0	268	0.76	5,717.80	5,717.57
P-21	1,328	J-11	J-21	12.0	PVC	150.0	343	0.97	5,717.94	5,717.58
P-22	533	J-18	J-19	12.0	PVC	150.0	-305	0.87	5,717.30	5,717.41
P-23	755	J-19	J-22	12.0	PVC	150.0	-62	0.18	5,717.41	5,717.42
P-24	571	J-22	J-20	12.0	PVC	150.0	-340	0.97	5,717.42	5,717.57
P-25	718	J-20	J-21	12.0	PVC	150.0	-72	0.20	5,717.57	5,717.58
P-26	1,324	J-21	J-23	12.0	PVC	150.0	271	0.77	5,717.58	5,717.35
P-27	1,311	J-23	J-24	16.0	PVC	150.0	495	0.79	5,717.35	5,717.18
P-28	1,269	J-24	J-17	16.0	PVC	150.0	773	1.23	5,717.18	5,716.81
P-30	695	J-23	J-25	16.0	PVC	150.0	-224	0.36	5,717.35	5,717.38
P-37	2,763	J-27	J-28	16.0	PVC	150.0	72	0.11	5,599.88	5,599.87
P-39	1,237	J-5	J-29	24.0	PVC	150.0	-53	0.04	5,599.92	5,599.92
P-40	296	J-29	J-30	24.0	PVC	150.0	-413	0.29	5,599.92	5,599.93
P-45	877	J-30	J-32	12.0	PVC	150.0	192	0.55	5,599.93	5,599.85
P-46	2,044	J-32	J-6	12.0	PVC	150.0	-23	0.07	5,599.85	5,599.85
P-47	812	J-28	J-33	16.0	PVC	150.0	177	0.28	5,599.87	5,599.86
P-48	904	J-33	J-6	16.0	PVC	150.0	97	0.16	5,599.86	5,599.85
P-50	456	J-34	J-28	16.0	PVC	150.0	239	0.38	5,599.89	5,599.87
P-53	611	J-22	J-36	12.0	PVC	150.0	279	0.79	5,717.42	5,717.31
P-54	695	J-36	J-24	12.0	PVC	150.0	279	0.79	5,717.31	5,717.18
P-55	1,180	J-10	J-37	16.0	PVC	150.0	813	1.30	5,718.15	5,717.77
P-58	467	J-38	J-8	16.0	PVC	150.0	63	0.10	5,599.97	5,599.97
P-59	972	J-5	J-39	24.0	PVC	150.0	-65	0.05	5,599.92	5,599.92
P-60	1,049	J-39	J-7	24.0	PVC	150.0	-207	0.15	5,599.92	5,599.93
P-61	947	J-30	J-40	24.0	PVC	150.0	-605	0.43	5,599.93	5,599.95
P-62	764	J-40	J-31	24.0	PVC	150.0	-605	0.43	5,599.95	5,599.97
P-65	105	J-25	PRV-2	16.0	PVC	150.0	199	0.32	5,717.38	5,717.37
P-67	225	J-25	PRV-3	16.0	PVC	150.0	231	0.37	5,717.38	5,717.37
P-68	2,437	PRV-3	J-5	16.0	PVC	150.0	231	0.37	5,600.00	5,599.92
P-69	660	J-35	PRV-4	16.0	PVC	150.0	263	0.42	5,716.73	5,716.70
P-70	699	PRV-4	J-31	16.0	PVC	150.0	263	0.42	5,600.00	5,599.97
P-71	938	J-31	PRV-5	24.0	PVC	150.0	-653	0.46	5,599.97	5,600.00

Max Hour

FlexTable: Pipe Table

Label	Length (Scaled) (ft)	Start Node	Stop Node	Diam eter (in)	Material	Hazen- Williams C	Flow (gpm)	Velocity (ft/s)	Hydraulic Grade (Start) (ft)	Hydraulic Grade (Stop) (ft)
P-72	1,580	PRV-5	J-26	24.0	PVC	150.0	-653	0.46	5,713.77	5,713.81
P-73	68	PRV-2	J-41	16.0	PVC	150.0	199	0.32	5,600.00	5,600.00
P-74	1,338	J-38	J-41	16.0	PVC	150.0	-178	0.28	5,599.97	5,600.00
P-75	1,411	J-37	J-42	16.0	PVC	150.0	734	1.17	5,717.77	5,717.39
P-76	61	J-42	J-25	16.0	PVC	150.0	655	1.04	5,717.39	5,717.38
P-78	1,271	R-1	J-9	24.0	PVC	150.0	3,448	2.45	5,720.00	5,719.16
P-80	2,345	J-44	J-27	12.0	PVC	150.0	72	0.20	5,599.92	5,599.88
P-81	330	J-31	J-45	16.0	PVC	150.0	311	0.50	5,599.97	5,599.95
P-82	1,960	J-45	J-34	16.0	PVC	150.0	239	0.38	5,599.95	5,599.89
P-83	2,520	J-44	J-45	12.0	PVC	150.0	-72	0.20	5,599.92	5,599.95
P-86	2,669	J-8	J-7	24.0	PVC	150.0	471	0.33	5,599.97	5,599.93
P-64	334	J-9	PRV-1	24.0	PVC	150.0	408	0.29	5,719.16	5,719.16
P-63	2,321	PRV-1	J-8	24.0	PVC	150.0	408	0.29	5,600.00	5,599.97
P-94	76	J-49	J-48	8.0	PVC	150.0	0	0.00	5,599.85	5,599.85
P-95	74	J-49	H-1	6.0	PVC	150.0	0	0.00	5,599.85	5,599.85
P-96	860	J-1	J-50	16.0	PVC	150.0	-148	0.24	5,599.84	5,599.86
P-97	1,764	J-50	J-7	16.0	PVC	150.0	-264	0.42	5,599.86	5,599.93
P-98	31	J-49	J-50	8.0	PVC	150.0	-22	0.14	5,599.85	5,599.86
P-99	126	J-51	J-3	8.0	PVC	150.0	22	0.14	5,599.84	5,599.84
P-101	438	J-52	J-49	8.0	PVC	150.0	-22	0.14	5,599.85	5,599.85
P-102	1,100	J-51	J-52	8.0	PVC	150.0	-22	0.14	5,599.84	5,599.85
P-35	2,276	J-53	J-26	12.0	PVC	150.0	755	2.14	5,716.45	5,713.81
P-105	339	J-17	J-54	16.0	PVC	150.0	492	0.79	5,716.81	5,716.76
P-106	917	J-54	J-35	16.0	PVC	150.0	263	0.42	5,716.76	5,716.73
P-107	2,494	J-53	J-54	12.0	PVC	150.0	-229	0.65	5,716.45	5,716.76
P-108	340	J-16	J-53	12.0	PVC	150.0	527	1.49	5,716.65	5,716.45

Max Hour

FlexTable: Junction Table

ID	Label	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
30	J-1	94	5,599.84	101
31	J-2	47	5,599.84	96
33	J-3	317	5,599.84	94
35	J-4	134	5,599.86	82
37	J-5	0	5,599.92	85
39	J-6	0	5,599.85	90
41	J-7	0	5,599.93	89
43	J-8	0	5,599.97	84
45	J-9	0	5,719.16	128
47	J-10	0	5,718.15	119
49	J-11	79	5,717.94	108
51	J-12	0	5,717.80	100
53	J-13	0	5,717.61	96
55	J-14	0	5,717.55	97
57	J-15	338	5,717.46	101
59	J-16	0	5,716.65	99
61	J-17	1,017	5,716.81	118
63	J-18	0	5,717.30	111
66	J-19	0	5,717.41	111
68	J-20	0	5,717.57	113
70	J-21	0	5,717.58	116
73	J-22	0	5,717.42	112
77	J-23	0	5,717.35	130
79	J-24	0	5,717.18	124
83	J-25	0	5,717.38	129
89	J-26	102	5,713.81	120
91	J-27	0	5,599.88	81
93	J-28	134	5,599.87	103
96	J-29	360	5,599.92	79
98	J-30	0	5,599.93	79
100	J-31	0	5,599.97	82
105	J-32	216	5,599.85	81
108	J-33	80	5,599.86	97
111	J-34	0	5,599.89	95
114	J-35	0	5,716.73	126
117	J-36	0	5,717.31	118
120	J-37	79	5,717.77	118
123	J-38	115	5,599.97	86
126	J-39	142	5,599.92	94
129	J-40	0	5,599.95	80
147	J-41	21	5,600.00	80
150	J-42	79	5,717.39	130
161	J-44	0	5,599.92	72
164	J-45	0	5,599.95	84
197	J-48	0	5,599.85	99
199	J-49	0	5,599.85	99
204	J-50	94	5,599.86	99
208	J-51	0	5,599.84	98

Max Hour

FlexTable: Junction Table

ID	Label	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
210	J-52	0	5,599.85	94
214	J-53	0	5,716.45	102
217	J-54	0	5,716.76	120

Max Day with Fire Flow

FlexTable: Pipe Table

Label	Length (Scaled) (ft)	Start Node	Stop Node	Diam eter (in)	Material	Hazen- Williams C	Flow (gpm)	Velocity (ft/s)	Hydraulic Grade (Start) (ft)	Hydraulic Grade (Stop) (ft)
P-1	1,048	J-1	J-2	16.0	PVC	150.0	459	0.73	5,599.10	5,598.98
P-2	1,200	J-2	J-3	16.0	PVC	150.0	-370	0.59	5,598.98	5,599.07
P-3	942	J-3	J-4	16.0	PVC	150.0	-663	1.06	5,599.07	5,599.28
P-4	889	J-4	J-5	16.0	PVC	150.0	-817	1.30	5,599.28	5,599.57
P-5	2,266	J-2	J-6	16.0	PVC	150.0	778	1.24	5,598.98	5,598.30
P-9	1,938	J-9	J-10	24.0	PVC	150.0	10,193	7.23	5,712.70	5,703.21
P-10	733	J-10	J-11	24.0	PVC	150.0	8,049	5.71	5,703.21	5,700.89
P-11	698	J-11	J-12	24.0	PVC	150.0	7,030	4.99	5,700.89	5,699.17
P-12	1,323	J-12	J-13	24.0	PVC	150.0	6,429	4.56	5,699.17	5,696.41
P-13	556	J-13	J-14	24.0	PVC	150.0	2,275	1.61	5,696.41	5,696.24
P-14	2,458	J-14	J-15	24.0	PVC	150.0	1,375	0.98	5,696.24	5,695.95
P-15	2,649	J-15	J-16	12.0	PVC	150.0	991	2.81	5,695.95	5,690.88
P-16	2,483	J-16	J-17	12.0	PVC	150.0	-808	2.29	5,690.88	5,694.14
P-17	1,267	J-17	J-18	16.0	PVC	150.0	-1,666	2.66	5,694.14	5,695.70
P-18	1,386	J-18	J-14	16.0	PVC	150.0	-900	1.44	5,695.70	5,696.24
P-19	1,356	J-13	J-19	12.0	PVC	150.0	154	0.44	5,696.41	5,696.33
P-20	1,341	J-12	J-20	12.0	PVC	150.0	601	1.70	5,699.17	5,698.16
P-21	1,328	J-11	J-21	12.0	PVC	150.0	962	2.73	5,700.89	5,698.49
P-22	533	J-18	J-19	12.0	PVC	150.0	-766	2.17	5,695.70	5,696.33
P-23	755	J-19	J-22	12.0	PVC	150.0	-612	1.73	5,696.33	5,696.92
P-24	571	J-22	J-20	12.0	PVC	150.0	-1,060	3.01	5,696.92	5,698.16
P-25	718	J-20	J-21	12.0	PVC	150.0	-459	1.30	5,698.16	5,698.49
P-26	1,324	J-21	J-23	12.0	PVC	150.0	502	1.42	5,698.49	5,697.77
P-27	1,311	J-23	J-24	16.0	PVC	150.0	1,557	2.48	5,697.77	5,696.34
P-28	1,269	J-24	J-17	16.0	PVC	150.0	2,006	3.20	5,696.34	5,694.14
P-30	695	J-23	J-25	16.0	PVC	150.0	-1,055	1.68	5,697.77	5,698.14
P-37	2,763	J-27	J-28	16.0	PVC	150.0	-1,872	2.99	5,593.06	5,597.29
P-39	1,237	J-5	J-29	24.0	PVC	150.0	217	0.15	5,599.57	5,599.57
P-40	296	J-29	J-30	24.0	PVC	150.0	-78	0.05	5,599.57	5,599.57
P-45	877	J-30	J-32	12.0	PVC	150.0	565	1.60	5,599.57	5,598.98
P-46	2,044	J-32	J-6	12.0	PVC	150.0	385	1.09	5,598.98	5,598.30
P-47	812	J-28	J-33	16.0	PVC	150.0	-1,070	1.71	5,597.29	5,597.73
P-48	904	J-33	J-6	16.0	PVC	150.0	-1,162	1.85	5,597.73	5,598.30
P-50	456	J-34	J-28	16.0	PVC	150.0	955	1.52	5,597.49	5,597.29
P-53	611	J-22	J-36	12.0	PVC	150.0	449	1.27	5,696.92	5,696.65
P-54	695	J-36	J-24	12.0	PVC	150.0	449	1.27	5,696.65	5,696.34
P-55	1,180	J-10	J-37	16.0	PVC	150.0	2,143	3.42	5,703.21	5,700.89
P-58	467	J-38	J-8	16.0	PVC	150.0	292	0.47	5,599.89	5,599.87
P-59	972	J-5	J-39	24.0	PVC	150.0	-454	0.32	5,599.57	5,599.59
P-60	1,049	J-39	J-7	24.0	PVC	150.0	-556	0.39	5,599.59	5,599.61
P-61	947	J-30	J-40	24.0	PVC	150.0	-643	0.46	5,599.57	5,599.60
P-62	764	J-40	J-31	24.0	PVC	150.0	-643	0.46	5,599.60	5,599.62
P-65	105	J-25	PRV-2	16.0	PVC	150.0	396	0.63	5,698.14	5,698.13
P-67	225	J-25	PRV-3	16.0	PVC	150.0	580	0.93	5,698.14	5,698.10
P-68	2,437	PRV-3	J-5	16.0	PVC	150.0	580	0.93	5,600.00	5,599.57
P-69	660	J-35	PRV-4	16.0	PVC	150.0	1,071	1.71	5,693.03	5,692.67
P-70	699	PRV-4	J-31	16.0	PVC	150.0	1,071	1.71	5,600.00	5,599.62
P-71	938	J-31	PRV-5	24.0	PVC	150.0	-2,655	1.88	5,599.62	5,600.00

Max Day with Fire Flow

FlexTable: Pipe Table

Label	Length (Scaled) (ft)	Start Node	Stop Node	Diam eter (in)	Material	Hazen- Williams C	Flow (gpm)	Velocity (ft/s)	Hydraulic Grade (Start) (ft)	Hydraulic Grade (Stop) (ft)
P-72	1,580	PRV-5	J-26	24.0	PVC	150.0	-2,655	1.88	5,659.02	5,659.66
P-73	68	PRV-2	J-41	16.0	PVC	150.0	396	0.63	5,600.00	5,599.99
P-74	1,338	J-38	J-41	16.0	PVC	150.0	-375	0.60	5,599.89	5,599.99
P-75	1,411	J-37	J-42	16.0	PVC	150.0	2,089	3.33	5,700.89	5,698.24
P-76	61	J-42	J-25	16.0	PVC	150.0	2,031	3.24	5,698.24	5,698.14
P-78	1,271	R-1	J-9	24.0	PVC	150.0	11,116	7.88	5,720.00	5,712.70
P-80	2,345	J-44	J-27	12.0	PVC	150.0	-1,872	5.31	5,578.50	5,593.06
P-81	330	J-31	J-45	16.0	PVC	150.0	3,083	4.92	5,599.62	5,598.35
P-82	1,960	J-45	J-34	16.0	PVC	150.0	955	1.52	5,598.35	5,597.49
P-83	2,520	J-44	J-45	12.0	PVC	150.0	-2,128	6.04	5,578.50	5,598.35
P-86	2,669	J-8	J-7	24.0	PVC	150.0	1,215	0.86	5,599.87	5,599.61
P-64	334	J-9	PRV-1	24.0	PVC	150.0	923	0.65	5,712.70	5,712.68
P-63	2,321	PRV-1	J-8	24.0	PVC	150.0	923	0.65	5,600.00	5,599.87
P-94	76	J-49	J-48	8.0	PVC	150.0	0	0.00	5,599.22	5,599.22
P-95	74	J-49	H-1	6.0	PVC	150.0	0	0.00	5,599.22	5,599.22
P-96	860	J-1	J-50	16.0	PVC	150.0	-526	0.84	5,599.10	5,599.22
P-97	1,764	J-50	J-7	16.0	PVC	150.0	-658	1.05	5,599.22	5,599.61
P-98	31	J-49	J-50	8.0	PVC	150.0	-65	0.42	5,599.22	5,599.22
P-99	126	J-51	J-3	8.0	PVC	150.0	65	0.42	5,599.08	5,599.07
P-101	438	J-52	J-49	8.0	PVC	150.0	-65	0.42	5,599.18	5,599.22
P-102	1,100	J-51	J-52	8.0	PVC	150.0	-65	0.42	5,599.08	5,599.18
P-35	2,276	J-53	J-26	12.0	PVC	150.0	2,773	7.87	5,688.92	5,659.66
P-105	339	J-17	J-54	16.0	PVC	150.0	2,044	3.26	5,694.14	5,693.53
P-106	917	J-54	J-35	16.0	PVC	150.0	1,071	1.71	5,693.53	5,693.03
P-107	2,494	J-53	J-54	12.0	PVC	150.0	-973	2.76	5,688.92	5,693.53
P-108	340	J-16	J-53	12.0	PVC	150.0	1,800	5.11	5,690.88	5,688.92

Max Day with Fire Flow

FlexTable: Junction Table

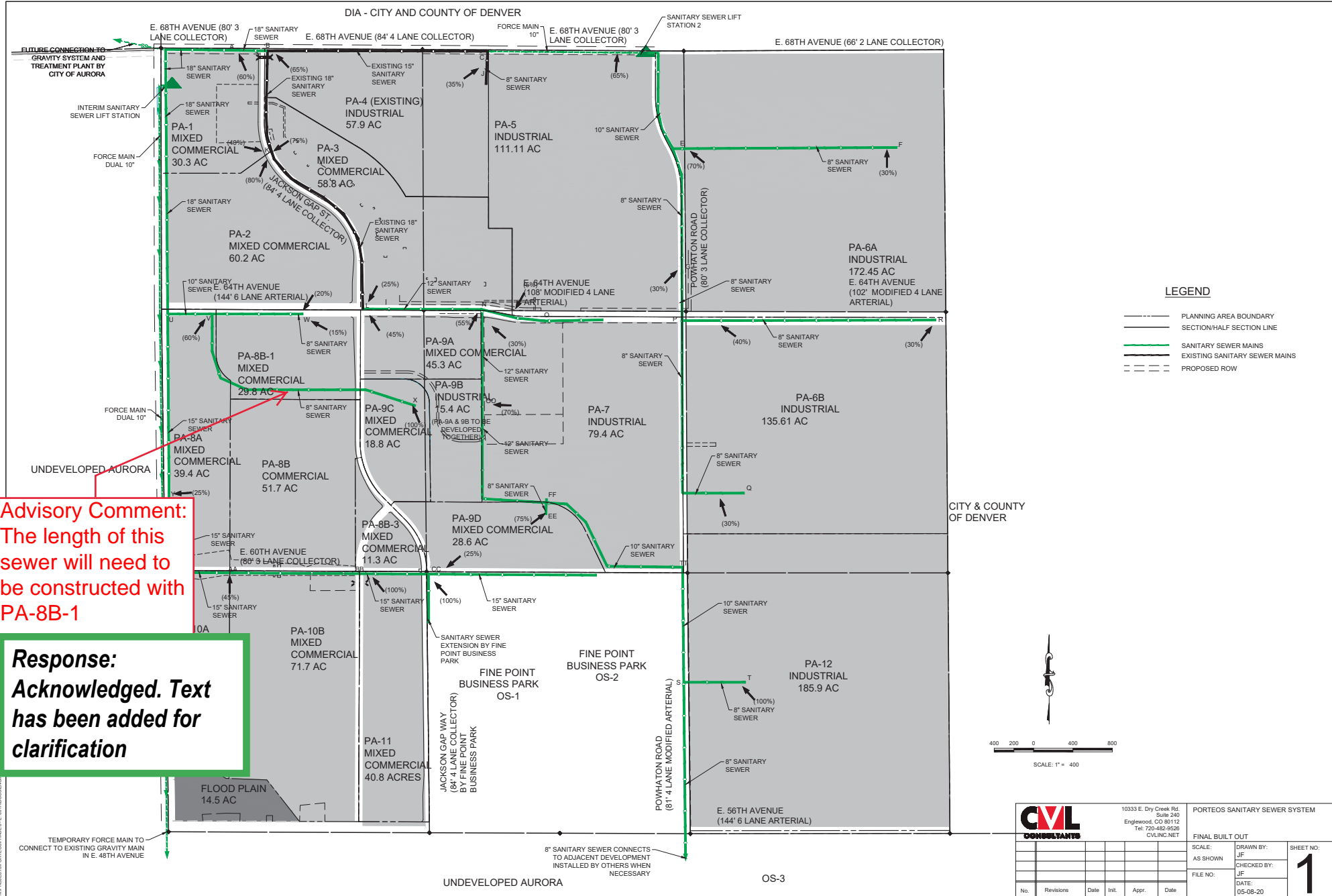
ID	Label	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
30	J-1	67	5,599.10	101
31	J-2	51	5,598.98	95
33	J-3	358	5,599.07	94
35	J-4	154	5,599.28	82
37	J-5	0	5,599.57	85
39	J-6	0	5,598.30	89
41	J-7	0	5,599.61	89
43	J-8	0	5,599.87	84
45	J-9	0	5,712.70	125
47	J-10	0	5,703.21	113
49	J-11	58	5,700.89	101
51	J-12	0	5,699.17	91
53	J-13	4,000	5,696.41	87
55	J-14	0	5,696.24	88
57	J-15	384	5,695.95	92
59	J-16	0	5,690.88	88
61	J-17	819	5,694.14	108
63	J-18	0	5,695.70	102
66	J-19	0	5,696.33	102
68	J-20	0	5,698.16	105
70	J-21	0	5,698.49	107
73	J-22	0	5,696.92	103
77	J-23	0	5,697.77	122
79	J-24	0	5,696.34	115
83	J-25	0	5,698.14	121
89	J-26	118	5,659.66	97
91	J-27	0	5,593.06	78
93	J-28	154	5,597.29	102
96	J-29	295	5,599.57	79
98	J-30	0	5,599.57	79
100	J-31	0	5,599.62	82
105	J-32	180	5,598.98	81
108	J-33	92	5,597.73	97
111	J-34	0	5,597.49	94
114	J-35	0	5,693.03	115
117	J-36	0	5,696.65	109
120	J-37	54	5,700.89	110
123	J-38	83	5,599.89	86
126	J-39	102	5,599.59	93
129	J-40	0	5,599.60	80
147	J-41	21	5,599.99	80
150	J-42	58	5,698.24	121
161	J-44	4,000	5,578.50	63
164	J-45	0	5,598.35	84
197	J-48	0	5,599.22	99
199	J-49	0	5,599.22	98
204	J-50	67	5,599.22	98
208	J-51	0	5,599.08	98

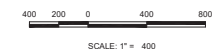
Max Day with Fire Flow

FlexTable: Junction Table

ID	Label	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
210	J-52	0	5,599.18	94
214	J-53	0	5,688.92	90
217	J-54	0	5,693.53	110





Appendix D






Response: Leader had been added per comment.

Response: Leader had been added per comment.

	PLANNING AREA BOUNDARY
	SECTION/HALF SECTION LINE
	WATER MAIN
	EXISTING WATER MAIN
	PROPOSED ROW



10333 E. Dry Creek Rd.
Suite 240
Englewood, CO 80112
Tel: 720-402-9526
CVM-INC.NET

FINAL BUILT OUT

<p>SCALE:</p> <p>AS SHOWN</p> <p>FILE NO:</p>	<p>DRAWN BY:</p> <p>JF</p> <p>CHECKED BY:</p> <p>JF</p> <p>DATE:</p> <p>05-08-20</p>
---	--

SHEET NO:

1

No.	Revisions	Date	Init.	Appr.	Date
-----	-----------	------	-------	-------	------

Rotate this so that north is up.

Response: Sheet rotated per comment.

