Arva Subdivision Water Servicing Report

Prepared for:
York Developments Inc.

303 Richmond Street #201
London Ontario Canada
N6A 4L9

Prepared by:
Stantec Consulting Ltd.
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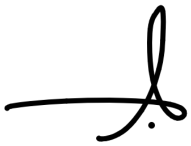
November 19, 2024

Sign-off Sheet

This document entitled Arva Subdivision Water Servicing Report was prepared by Stantec Consulting Ltd. ("Stantec") for the account of York Developments (the "Client") to support the permitting process for Client's application for a Subdivision Approval for the Arva subdivision development project (the "Project"). In connection thereto, this document may be reviewed and used by the provincial and municipal government agencies participating in the permitting process in the normal course of their duties. Except as set forth in the previous sentence, any reliance on this document by any third party for any other purpose is strictly prohibited. The material in it reflects Stantec's professional judgment in light of the scope, schedule and other limitations stated in the document and in the contract between Stantec and the Client. The opinions in the document are based on conditions and information existing at the time the document was published and do not take into account any subsequent changes. In preparing the document, Stantec did not verify information supplied to it by others. Any unauthorized use which a third party makes of this document is the responsibility of such third party. Such third party agrees that Stantec shall not be responsible for costs or damages of any kind, if any, suffered by it or any other third party as a result of decisions made or actions taken based on unauthorized use of this document.



Prepared by _____
(signature)

Ahmed Abduljaleel, E.I.T.

Reviewed by _____
(signature)

Dan Vucetic, MESc., P.Eng.

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1.0 WATER SERVICING REPORT

This report outlines the required watermain infrastructure to service the proposed future subdivision development within the settlement boundary of Arva, located in the Municipality of Middlesex Centre. According to the latest draft subdivision plan prepared by MHBC Ltd. (see Appendix A), the ultimate build-out of this development includes approximately 932 residential units. The development comprises a mix of low, medium, and high-density residential blocks, including 122 single-family (low-density) units, 358 townhouse/apartment (medium-density) units, and 452 apartment (high-density) units.

For the interim phase of development, it is anticipated that 80 single-family (low-density) units will be constructed. This phased approach will guide the implementation of watermain infrastructure to ensure adequate service for current and future growth as the subdivision develops over time.

1.1 SUPPORTING DOCUMENTS

Stantec Consulting Ltd. (Stantec) was engaged by the Municipality of Middlesex Centre to update the Master Servicing Plan (MSP), last updated in 2024. The MSP serves as a roadmap for managing the Municipality's water, wastewater, stormwater, and solid waste infrastructure, setting a 20-year planning horizon to 2046. The potable water servicing infrastructure component of the 2023 MSP, submitted on April 22, 2024, specifically evaluates existing water systems within various settlements, focusing on supply, pumping, storage, and conveyance. This assessment also identifies key issues under both current and projected growth conditions and explores alternative solutions to meet anticipated demands. The MSP was used to support the development of this report by providing a structured framework to ensure consistency with the Municipality's strategic planning objectives:

- Middlesex Center Master Servicing Plan – Water Servicing, prepared by Stantec Consulting Ltd. dated April 22, 2024.

1.2 EXTERNAL WATER SERVICING REQUIREMENTS

The water supply system for the proposed subdivision in Arva, within the Municipality of Middlesex Centre, has been planned in two key phases for now: the **Interim Phase** and the **Ultimate Phase** (full site build-out).

1. **Interim Phase**
   The Interim Phase involves the development of 80 low-density single-family units. As outlined in the Middlesex Centre Master Servicing Plan (MSP), water servicing for this phase will be supplied from the City of London's 1,050 mm feeder main along Richmond Street. A 200 mm watermain is connected to this feeder main and runs along Richmond Street, serving as the primary water supply line for the area. For this phase, the water connection will tie directly into the 200 mm watermain along Richmond Street. The primary connection point for the development is anticipated to be near the intersection of Richmond Street and Future Street "B." This configuration adheres to the hydraulic grade line (HGL) requirement of 301.8 m and meets the design standards of both the City of London and the Municipality of Middlesex Centre.

   Since this phase will be serviced by the City of London's low-level watermain system, City of London standards apply. According to these standards, developments with up to 80 units do not require looping within the watermain network. However, as shown in the Municipality of Middlesex Center Master Servicing Plan attached in Appendix A below, it has been noted that there is an existing 200mm watermain on Croydon Drive at the cul-de-sac near Block 43 (6.0m Wide Pathway). Establishing a connection to this watermain could provide looping for the interim phase, ensuring redundancy in the system and enabling the servicing of developments exceeding 80 units as part of the ultimate design condition

2. **Ultimate Phase (Full Site Build-Out)**
   The Ultimate Phase accounts for the full build-out of the subdivision, encompassing approximately 932 residential units in total. Arva's current water supply is primarily derived from a single 1,050 mm diameter feeder main connected to the City of London's distribution system. While this provides the main source of water, the MSP identifies the need to enhance system reliability by diversifying the supply to mitigate potential service interruptions associated with this single-feed source. An additional supply source, extended from the west, has been modeled as part of this report to reflect potential future infrastructure enhancements. This western connection is anticipated to strengthen the overall system's resilience, in line with the recommendations set forth in the MSP.

   For the purposes of this analysis, a hydraulic grade line (HGL) of 301.8 m has been conservatively assumed, aligning with the City of London's HGL for low-level systems. While this assumption provides a baseline for the design, further fine-tuning will be necessary as more detailed information about the proposed additional supply source and its implementation becomes available. This approach ensures the system can adapt to future conditions while maintaining compliance with City standards.

Upon finalizing the supply strategy, further phasing beyond the current Interim and Ultimate Phases may be introduced to address site-specific needs. For now, the development will proceed under the assumptions and configurations outlined above, with future adjustments to be made once supply solutions for Arva are formally established.

1.3 CAPACITY REQUIRMENTS

The proposed water system for the future subdivision development in Arva has been modeled in accordance with the standards of both the City of London and the Municipality of Middlesex Centre (Arva), with differences in specific requirements noted below.

London
Average Domestic Water Demand = 255 l/cap/day
Maximum Day Peaking Factor = 3.5
Maximum Hour Peaking Factor = 7.8

Arva
Average Domestic Water Demand = 350 l/cap/day
Maximum Day Peaking Factor = 2.5
Maximum Hour Peaking Factor = 3.75

The minimum pressure requirements for this development for average day demand and peak hour demand of 40psi or 28.16m H_20, and for maximum day plus fire demand of 20psi or 14.08 m H_20, are provided in accordance with both the Municipality of Middlesex Center and the City of London standards.

1.4 FIRE FLOW REQUIRMENTS

According to the Middlesex Centre Master Servicing Plan (MSP), the water system in Arva under current demand conditions is capable of delivering fire flows of 76 L/s (4,500 L/min) or greater at a residual pressure of 20 psi throughout most of the system. Exceptions to this capacity occur in dead-end areas served by small-diameter (100 mm) watermains. This standard ensures that pressures remain above 20 psi across the majority of the network, aligning with both the City of London and Middlesex Centre design standards. Additionally, these standards specify a maximum velocity of 2.4 m/s during fire flow events to maintain system integrity.

For this model, fire hydrants have not yet been designed due to insufficient information about their final locations. However, hydrant locations will be determined during detailed design, and the model will be updated accordingly. The fire flows available in Arva are currently limited by the single source of supply from the City of London, and the MSP specifies a maximum fire flow of 76 L/s for the area. Consequently, this development is constrained by this limitation.

Given that the Middlesex Centre Master Servicing Plan (MSP) specifies a maximum fire flow of 76 L/s for the area, this development is inherently constrained by the limitations of the existing system. Industry best practices recommend fire flow requirements of 76 L/s for single-family homes (low density), 90 L/s for medium-density developments, and 150 L/s for high-density developments to ensure adequate fire protection.

For the current low-density single-family development, the modeled fire flow of 76 L/s is sufficient to meet the necessary standards. However, for medium- and high-density developments, the available fire flow from the current system may be insufficient. In such scenarios, implementing additional measures such as booster pumps or storage systems may be required to meet the higher fire flow demands effectively. This aligns with standard requirements, where the Owner is responsible for installing booster pumps and/or storage systems if flows and pressures exceed system capacity or minimum design standards. These considerations will be further explored during the Site Plan Approval stage.

A comprehensive fire flow analysis was conducted for both the interim and ultimate phases of the system. While the initial analysis assumed the MSP-specified fire flow of 76 L/s would comply with the velocity restriction of 2.4 m/s, the model revealed that such a flow rate results in velocities exceeding this limit. To meet the velocity constraint, the maximum fire flow must be adjusted to approximately 73 L/s.

This refinement ensures compliance with the operational standards and provides a reliable framework for the development. The results of the fire flow analysis, including adjustments and supporting details, are attached below for reference.

Both municipalities mandate a maximum water turnover period of 72 hours across all pipes under average day demand conditions. Detailed modeling results confirming compliance with this requirement are provided for ultimate build-out conditions. During interim conditions, automatic flushing devices will be required to maintain water quality, as outlined in Section 1.5.

Note: The model utilizes a boundary condition HGL of 301.8 m. During interim conditions, a single reservoir is modeled to represent the available supply. For ultimate build-out conditions, the model includes two reservoirs at an HGL of 301.8 m, reflecting the well-looped supply network anticipated in this area. The 200mm diameter mains from the reservoir to the next junction node is a modeling technique used to address the transition from the reservoir to the elevation of the actual pipe without introducing unnecessary friction losses.

Figures and Tables in Appendix A show the areas and the population calculation for the demand at each junction for the development.

1.5 WATER QUALITY

We note that automatic flushing devices will be required to maintain water turnover prior to unit demands coming online (pre-building permit & occupancy). The modeling results at the end of this report include an age analysis of the scenario where Interim Phase is serviced but there is no demand (pre-building permit). The results of this modeling indicate that temporary flushing devices will be required at the immediate vicinity of the following junction:

- J-9 at Street 'B' with a 50mm Automatic Flushing Device set to flush for 88.0 minutes once daily or 264 minutes every 72 hours.

- J-14 at Street 'C' with a 50mm Automatic Flushing Device set to flush for 96 minutes once daily or 269 minutes every 72 hours.

The above listed locations are shown in the Water Analysis Figure along with the pertaining automatic flushing device flow setting requirements. Supporting calculations are included in Appendix A.

Upon occupancy, the flusher settings may be reduced or eliminated entirely depending on the proximity of the last service to the dead end watermain junction.

1.6 CONCLUSION

The proposed Arva subdivision within the Municipality of Middlesex Centre will be serviced by the City of London's low-level system, with the initial Interim Phase of 80 single-family units connecting to London's 1,050 mm feeder main along Richmond Street. The Ultimate Phase anticipates a full build-out of approximately 932 residential units, comprising a mix of low, medium, and high-density housing. As per the Middlesex Centre Master Servicing Plan, additional water sources are under consideration to support future demand and ensure system reliability, pending final approval.

Modeling results confirm that the development will maintain pressure, velocity, and quality standards set by both the City of London and Middlesex Centre for various demand scenarios. The report notes that, in accordance with Middlesex Centre guidelines, automatic flushing devices will be installed to maintain water quality in all pipes prior to occupancy. Fire flow demand has been conservatively modeled.

We trust this meets your requirements for the Water Servicing Report for Arva Future Subdivision Development. Should you have any questions or require more information, please do not hesitate to contact the undersigned.

Sincerely,

STANTEC CONSULTING LTD.

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Ahmed.Abduljaleel@stantec.com

Dan Vucetic, MESc., P.Eng.
Project Manager, Team Lead
Direct:519-675-6655
Dan.Vucetic@stantec.com

APPENDIX A

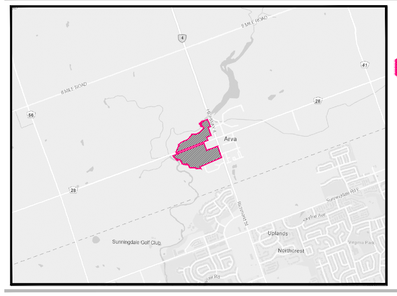
- Draft Subdivison Plan Prepared by MHBC Ltd.
- Municipality of Middlesex Center Master Servicing Plan.
- Water Analysis - Figure 1.0
- Table 1.0 - Water Demand Summary - Interim Phase - London
- Table 1.1 - Water Demand Summary - Interim Phase - Arva
- Table 2.0 - Water Demand Summary - Ultimate Phase - London
- Table 2.1 - Water Demand Summary - Ultimate Phase - Arva
- Automatic Flushing Devices Settings Calculations

PART OF LOT 17,
CONCESSION 6 & 7
MUNICIPALITY OF MIDDLESEX CENTRE
COUNTY OF MIDDLESEX

I HEREBY AUTHORIZE MACNAUGHTON HERMSEN BRITTON CLARKSON PLANNING LIMITED TO SUBMIT THIS PLAN FOR APPROVAL.

Surveyor's Certificate

I HEREBY AUTHORIZE CERTIFY THAT THE BOUNDARIES OF THE LAND TO BE SUBDIVIDED ON THIS PLAN AND THEIR RELATIONSHIP TO THE ADJACENT LANDS ARE ACCURATELY AND CORRECTLY SHOWN.



SUBJECT TO THE CONDITIONS, IF ANY, SET FORTH IN OUR IN OUR LETTER DATED_____,2020 THIS DRAFT PLAN IS APPROVED UNDER SECTION 51 OF THE *PLANNING ACT*
_____ DAY OF _____ ,2020

3	October 18, 2024	Request from Client	PL
2	October 1, 2024	Revised Apartment blocks, SWM	PL
1	July 26, 2024	Issued	CCF
	Date	**Issued / Revision**	**By**

Additional Information Required Under Section 51(17) of the Planning Act R.S.O. 1990, c.P.13 as Amended

A. As Shown	B. As Shown	C. As Shown
D. Residential	E. As Shown	F. As Shown
G. As Shown	H. Municipal Water Supply Available	I. Silt Loam
J. As Shown	J. All Services As Required	L. As Shown

Description	Lots/Blocks	Units	Area (ha)
Low Density Residential	1, 3, 7, 16 - 21, 24, 25	122	7.964
Medium Density Residential (Street Townhouses)	5, 9, 10, 12, 22, 27	49	1.594
Medium Density Residential (Cluster Townhouses)	13 - 15	62	1.893
Medium Density Residential (Apartments)	8, 11, 23	699	4.254
Park	35		0.603
Walkway	31, 43		0.082
Maintenance Setback	4, 6		0.584
Storm Water Management	30, 37		1.275
Pump Station	36		0.161
Open Space	2, 29		0.753
0.3m Reserves	40 - 42		0.008
Road Widening	32, 33		0.457
Roads			3.890
Total	38	932	23.516 ha.

York DEVELOPMENTS

MHBC PLANNING URBAN DESIGN & LANDSCAPE ARCHITECTURE
540 BINGEMANS CENTRE DRIVE, SUITE 200, KITCHENER, ON, N2B 3X9 | P: 519 576 3650 | WWW.MHBCPLAN.COM

File No.	Drawn By	Date
1094 'BE'	L.M./P.L./C.C.F.	October 18, 2024

PRELIMINARY DRAFT PLAN OF SUBDIVISION

Plan Scale 1:2000
10 20 40 60 80 100

north

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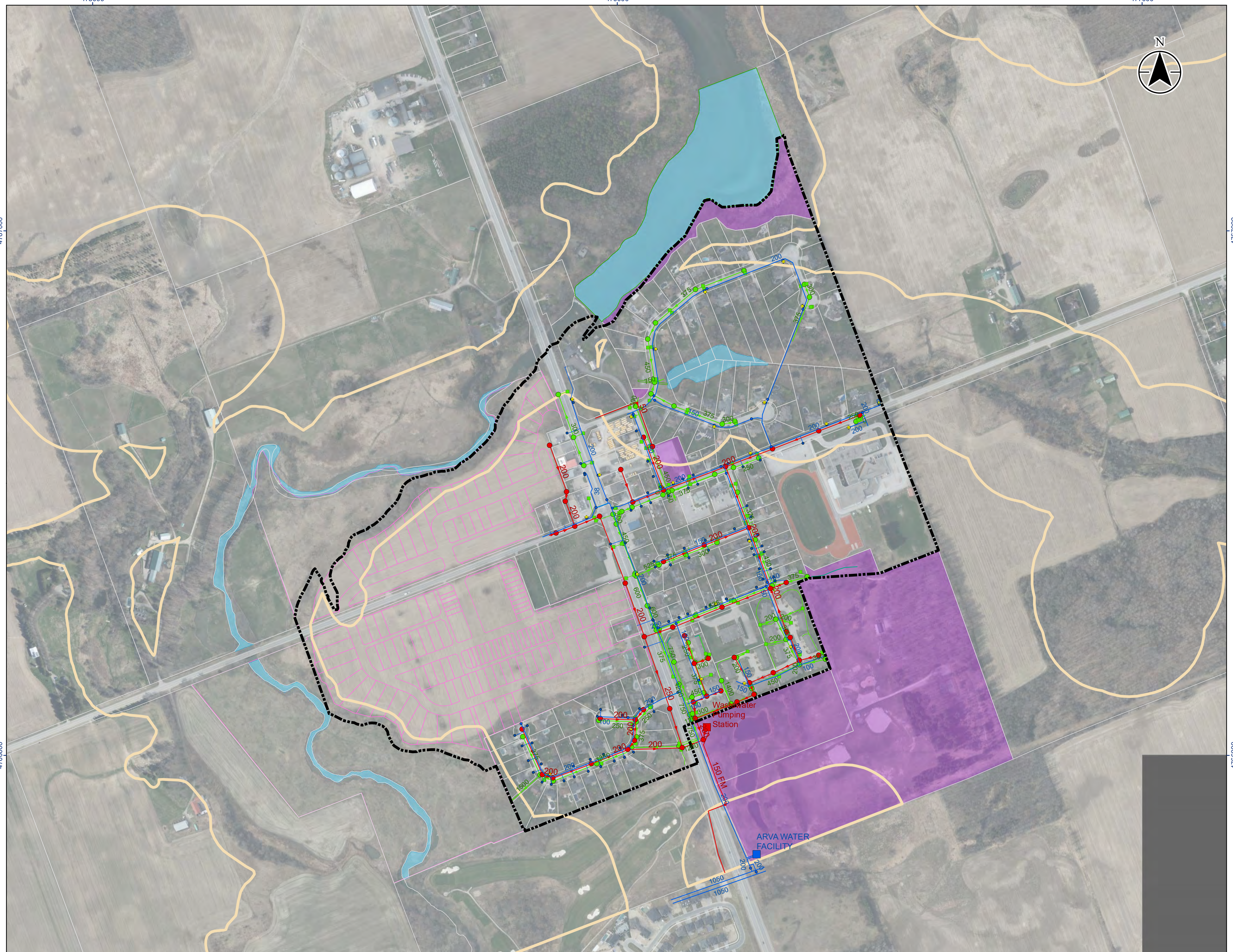


Stantec

Legend

- Settlement Boundary
- Regulated
- Parcel
- Subdivision
- Municipally Owned Parcel

Water System

- Facility
- Hydrant
- Chamber
- Curb Stop Valve
- Pump
- Test Station
- Valve
- Lateral
- Watermain
- General Structure

Sanitary System

- Facility
- MH
- Sewer

Storm System

- Catchbasin
- MH
- General Feature
- Lateral
- Sewer
- Swale
- SWM Facility

0 260 520 m

1:7,500 (At original document size of 11x17)

Notes
1. Coordinate System: NAD 1983 UTM Zone 17N
2. Base features produced under license with the Ontario Ministry of Natural Resources and Forestry © Queen's Printer for Ontario, 2018.
3. Orthoimagery © First Base Solutions, 2018. Imagery Date, 20XX.

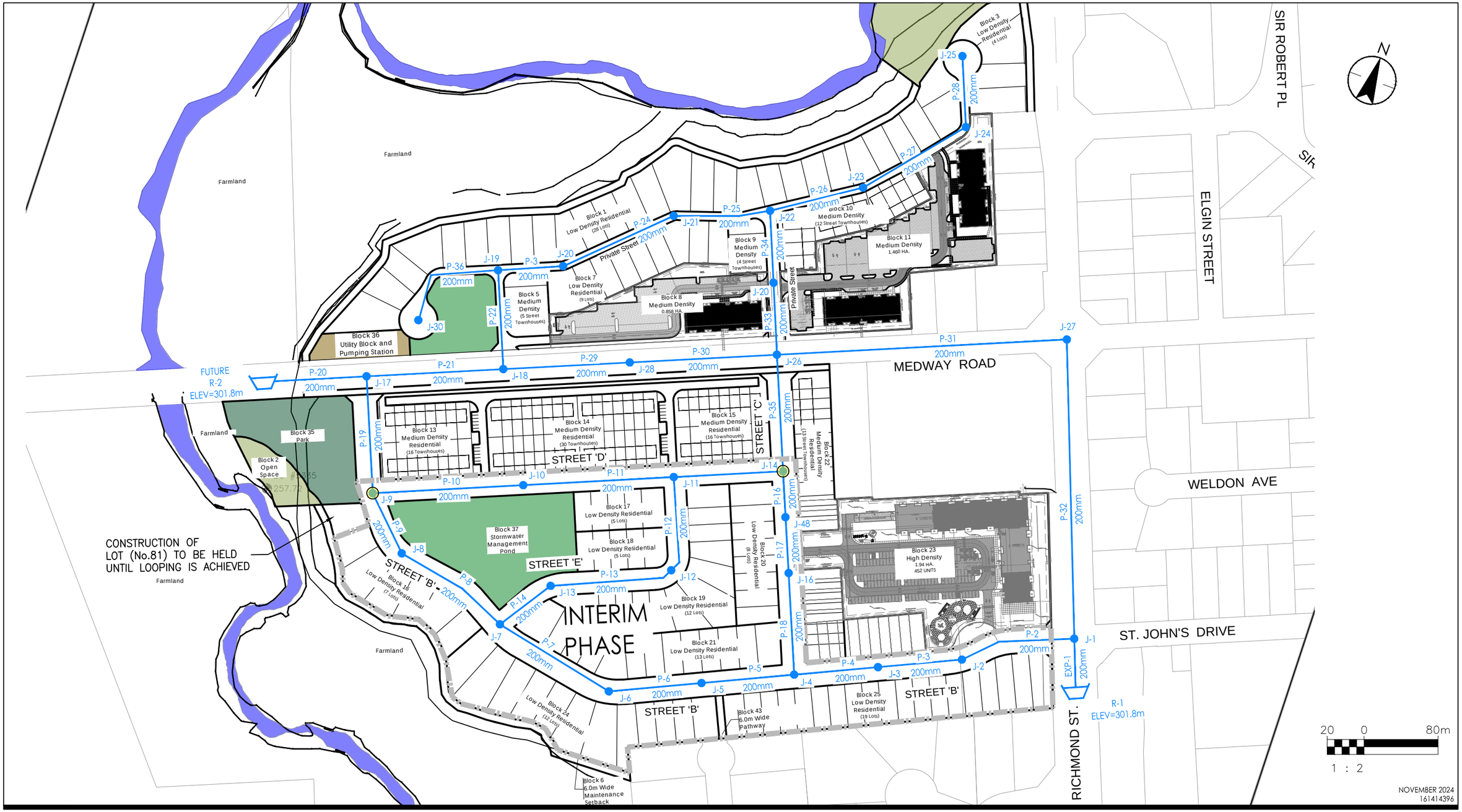
Project Location
Municipality of

165630236 REVA
Prepared by KDB on 2023-02-06

Client/Project
MUNICIPALITY OF MIDDLESEX CENTRE
MASTER SERVICING PLAN

Figure No.
2-1

Title
Asset Shapefile Overview
Arva



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Stantec

400-1305 Riverbend Road
London ON N6K 0J5
Tel. 519-645-2007
www.stantec.com

Legend

- RESERVOIR
- JUNCTION/HYDRANT
- PIPE
- INTERIM PHASE BOUNDARY
- AUTO FLUSHER (AF) PROPOSED FOR INTERIM PHASE

Client/Project
YORK DEVELOPMENTS
ARVA PROPOSED FUTURE SUBDIVISION DEVELOPMENT

Figure No.
1.0

Title
WATER ANALYSIS - ULTIMATE / INTERIM PHASE

NOVEMBER 2024
161414396

	TABLE 1.0					
	Junction Demand Breakdown					
	CoL Standards - Full Occupancy (Interim PHASE)					
	161414396					
Phase	Junction	Elevation (m)	Land Use	Number of Units (LD)	Population	Average Day Demand (L/min)
INTERIM PHASE	J-1	269.50	LD	2	6	1.06
	J-2	268.87	LD	7	21	3.72
	J-3	268.78	LD	7	21	3.72
	J-4	267.01	LD	3	9	1.59
	J-5	266.93	LD	7	21	3.72
	J-6	262.80	LD	7	21	3.72
	J-7	261.70	LD	5	15	2.66
	J-8	262.40	LD	7	21	3.72
	J-9	262.57	LD	8	24	4.25
	J-10	262.50	LD	6	18	3.19
	J-11	266.58	LD	4	12	2.13
	J-12	266.49	LD	7	21	3.72
	J-13	263.22	LD	7	21	3.72
	J-14	268.24	LD	0	0	0.00
	J-15	269.21	LD	0	0	0.00
	J-16	268.35	LD	3	9	1.59

Note -

1. Number of units based on full occupancy 80 SF lots in Interim Phase
2. Elevation are based on received Lidar Data
3. Unit counts as per Draft Plan prepared by MHBC dated Oct18, 2024

TABLE 1.1						
Junction Demand Breakdown						
Arva Guidelines - Full Occupancy (Interim Phase)						
161414396						
Phase	Junction	Elevation (m)	Land Use	Number of Units	Population	Average Day Demand (L/min)
INTERIM PHASE	J-1	269.50	LD	2	6	1.46
	J-2	268.87	LD	7	21	5.10
	J-3	268.78	LD	7	21	5.10
	J-4	267.01	LD	3	9	2.19
	J-5	266.93	LD	7	21	5.10
	J-6	262.80	LD	7	21	5.10
	J-7	261.70	LD	5	15	3.65
	J-8	262.40	LD	7	21	5.10
	J-9	262.57	LD	8	24	5.83
	J-10	262.50	LD	6	18	4.38
	J-11	266.58	LD	4	12	2.92
	J-12	266.49	LD	7	21	5.10
	J-13	263.22	LD	7	21	5.10
	J-14	268.24	LD	0	0	0.00
	J-15	269.21	LD	0	0	0.00
	J-16	268.35	LD	3	9	2.19

Note -

1. Number of units based on full occupancy 80 SF lots in Interim Phase
2. Elevation are based on received Lidar Data
3. Unit counts as per Draft Plan prepared by MHBC dated Oct18, 2024

TABLE 2.0

Junction Demand Breakdown

CoL Standards - Full Occupancy (Ultimate)

161414396

Phase	Junction	Elevation (m)	Land Use	Number of Units (LD)	Number of Units (MD)	Number of Units (HD)	Population	Average Day Demand (L/min)
ULTIMATE	J-1	269.50	LD/HD	2		51	88	15.58
	J-2	268.87	LD/MD/HD	7	2	51	108	19.13
	J-3	268.78	LD/MD/HD	7	2	51	108	19.13
	J-4	267.01	LD/MD/HD	3	2	52	97	17.18
	J-5	266.93	LD/MD/HD	7	3	51	110	19.48
	J-6	262.80	LD/MD	7	3		29	5.14
	J-7	261.70	LD/MD	5	3		23	4.07
	J-8	262.40	LD/MD	7	3		29	5.14
	J-9	262.57	LD/MD	9	6		42	7.44
	J-10	262.50	LD/MD	6	6		33	5.84
	J-11	266.58	LD/MD	4	6		27	4.78
	J-12	266.49	LD	7			21	3.72
	J-13	263.22	LD	7			21	3.72
	J-14	268.24	LD/MD/HD	0	4	66	116	20.54
	J-15	269.21	LD/MD/HD	0	4	66	116	20.54
	J-16	268.35	LD/MD/HD	3	4	64	121	21.43
	J-17	261.91	MD		14		34	6.02
	J-18	263.44	MD		10		24	4.25
	J-19	263.78	LD/MD	7	3		29	5.14
	J-20	265.20	LD	7			21	3.72
	J-21	266.80	LD/MD	7	4		31	5.49
	J-22	267.92	LD/MD	4	39		106	18.77
	J-23	268.92	LD/MD	4	39		106	18.77
	J-24	270.32	LD/MD	4	35		96	17.00
	J-25	268.18	LD	4			12	2.13
	J-26	268.90	MD		43		104	18.42
	J-27	273.09	MD		49		118	20.90
	J-28	265.65	MD		39		94	16.65
	J-29	267.71	MD		35		84	14.88
	J-30	262.60	LD	4			12	2.13

Note -

1. Number of units based on full occupancy 122 SF Low Density, 358 Medium Density and 452 High Density lots in Ultimate Phase (Full Buildout)
2. Elevation are based on received Lidar Data
3. Unit counts as per Draft Plan prepared by MHBC dated Oct18, 2024

TABLE 2.1

Junction Demand Breakdown

Arva Guidelines - Full Occupancy (Ultimate)

161414396

Phase	Junction	Elevation (m)	Land Use	Number of Units (LD)	Number of Units (MD)	Number of Units (HD)	Population	Average Day Demand (L/min)
ULTIMATE	J-1	269.50	LD/HD	2		51	88	21.39
	J-2	268.87	LD/MD/HD	7	2	51	108	26.25
	J-3	268.78	LD/MD/HD	7	2	51	108	26.25
	J-4	267.01	LD/MD/HD	3	2	52	97	23.58
	J-5	266.93	LD/MD/HD	7	3	51	110	26.74
	J-6	262.80	LD/MD	7	3		29	7.05
	J-7	261.70	LD/MD	5	3		23	5.59
	J-8	262.40	LD/MD	7	3		29	7.05
	J-9	262.57	LD/MD	9	6		42	10.21
	J-10	262.50	LD/MD	6	6		33	8.02
	J-11	266.58	LD/MD	4	6		27	6.56
	J-12	266.49	LD	7			21	5.10
	J-13	263.22	LD	7			21	5.10
	J-14	268.24	LD/MD/HD	0	4	66	116	28.19
	J-15	269.21	LD/MD/HD	0	4	66	116	28.19
	J-16	268.35	LD/MD/HD	3	4	64	121	29.41
	J-17	261.91	MD		14		34	8.26
	J-18	263.44	MD		10		24	5.83
	J-19	263.78	LD/MD	7	3		29	7.05
	J-20	265.20	LD	7			21	5.10
	J-21	266.80	LD/MD	7	4		31	7.53
	J-22	267.92	LD/MD	4	39		106	25.76
	J-23	268.92	LD/MD	4	39		106	25.76
	J-24	270.32	LD/MD	4	35		96	23.33
	J-25	268.18	LD	4			12	2.92
	J-26	268.90	MD		43		104	25.28
	J-27	273.09	MD		49		118	28.68
	J-28	265.65	MD		39		94	22.85
	J-29	267.71	MD		35		84	20.42
	J-30	262.60	LD	4			12	2.92

Note -

1. Number of units based on full occupancy 122 SF Low Density, 358 Medium Density and 452 High Density lots in Ultimate Phase (Full Buildout)
2. Elevation are based on received Lidar Data
3. Unit counts as per Draft Plan prepared by MHBC dated Oct18, 2024

Subject: **Blowoff Calculation - Prior to Occupancy**
Project: **Arva Proposed Future Subdivision - Interim Phase**
Project No.: **161414396**
Client: **York Developments Inc.**
Date: **11/11/2024**

PSI	J-9 Flusher Flow Rate	
Size	50 mm	25 mm
60	10.64 Lps	1.98 Lps
55.7	10.23 Lps	1.90 Lps
55	10.16 Lps	1.89 Lps

PSI	J-14 Flusher Flow Rate	
Size	50 mm	25 mm
50	9.67 Lps	1.80 Lps
47.6	9.42 Lps	1.91 Lps
45	9.15 Lps	1.60 Lps

Table above per City Standard DWG W-CS-5 Sheet 4 "Table 2 & 3 : Discharge Rates at Various Pressures for Automatic Flushing Devices - 25mm & 50mm Automatic Flushing Device"

Estimate the time required to flush the design volume from the proposed watermain.

Per WaterCAD Water Quality (Age) Analysis the following Junction Demands or Flushing Volumes are found to provide adequete water turnover as per both the Municipality of Middlesex Center and the City of London Standards

PROPOSED FLUSHERS

Flushing at J-14 (Street 'C')

72 hour Flushing Volume, J-14 (L):	**54000**	**(based waterCAD, 12.5 L/min demand at J-14)**
Pressure at J-14 (PSI)	47.60	*per WaterCAD hydraulic modelling.
Discharge 50mm AF (Lps):	**10.227**	
Blowoff Duration (s):	**5280**	
Blowoff Duration (min):	**88.0**	

Therefore, using a 50mm automatic flushing device assembly (City of London Standard Drawing W-CS-5 & Middlesex Center Standard Figure 5.4) the blowoff valve must be programmed to flush 88 minutes, once daily or 264 minutes every 72 hours (9.42 L/s).

Flushing at J-9 (Street 'B')

72 hour Flushing Volume, J-9 (L):	**54000**	**(based waterCAD, 12.5 L/min demand at J-9)**
Pressure at J-9 (PSI)	55.70	*per WaterCAD hydraulic modelling.
Discharge 50mm AF (Lps):	**9.420**	
Blowoff Duration (s):	**5732**	
Blowoff Duration (min):	**95.5**	

Therefore, using a 50mm automatic flushing device assembly (City of London Standard Drawing W-CS-5 & Middlesex Center Standard Figure 5.4) the blowoff valve must be programmed to flush 96 minutes, once daily or 269 minutes every 72 hours (10.23 L/s).

APPENDIX B

Modelling Results Summary

- Ultimate Phase - City of London Engineering Guidelines
- Interim Phase - City of London Engineering Guidelines
- Ultimate Phase - Municipality of Middlesex Center Engineering Standards
- Interim Phase - Municipality of Middlesex Center Engineering Standards

ULTMATE PHASE

LONDON/ARVA

161414396 - Arva Water Model

Active Scenario: Age (London - Ultimate - Full Occupancy)

Current Time: 336.00 hours

Label	Start Node	Stop Node	Diameter (mm)	Length (m)	Hazen-Williams C	Flow (L/min)	Velocity (m/s)	Headloss (m)	Age (Maximum) (hours)
P-1	R-1	J-1	200.0	33	110.0	188.26	0.10	0.00	0.000
P-2	J-1	J-2	200.0	95	110.0	102.28	0.05	0.00	0.295
P-3	J-2	J-3	200.0	72	110.0	83.15	0.04	0.00	0.770
P-4	J-3	J-4	200.0	64	110.0	64.02	0.03	0.00	1.256
P-5	J-4	J-5	200.0	71	110.0	11.95	0.01	0.00	3.066
P-6	J-5	J-6	200.0	86	110.0	-7.53	0.00	0.00	10.405
P-7	J-6	J-7	200.0	96	110.0	-12.67	0.01	0.00	5.408
P-8	J-7	J-8	200.0	102	110.0	-30.99	0.02	0.00	2.557
P-9	J-8	J-9	200.0	54	110.0	-36.13	0.02	0.00	1.309
P-10	J-9	J-10	200.0	122	110.0	30.99	0.02	0.00	1.950
P-11	J-10	J-11	200.0	123	110.0	25.15	0.01	0.00	4.264
P-12	J-11	J-12	200.0	78	110.0	-6.81	0.00	0.00	13.280
P-13	J-12	J-13	200.0	88	110.0	-10.53	0.01	0.00	8.081
P-14	J-13	J-7	200.0	67	110.0	-14.25	0.01	0.00	4.649
P-15	J-11	J-14	200.0	92	110.0	27.18	0.01	0.00	8.720
P-16	J-14	J-15	200.0	49	110.0	7.08	0.00	0.00	13.177
P-17	J-15	J-16	200.0	49	110.0	-13.46	0.01	0.00	3.487
P-18	J-16	J-4	200.0	68	110.0	-34.89	0.02	0.00	2.027
P-19	J-9	J-17	200.0	96	110.0	-74.55	0.04	0.00	0.580
P-20	J-17	R-2	200.0	88	110.0	-158.87	0.08	0.01	0.097
P-21	J-17	J-18	200.0	111	110.0	78.30	0.04	0.00	0.612
P-22	J-18	J-19	200.0	82	110.0	40.77	0.02	0.00	1.509
P-23	J-19	J-20	200.0	51	110.0	33.50	0.02	0.00	2.437
P-24	J-20	J-21	200.0	97	110.0	29.78	0.02	0.00	3.691
P-25	J-21	J-22	200.0	77	110.0	24.29	0.01	0.00	5.376
P-26	J-22	J-23	200.0	80	110.0	37.90	0.02	0.00	6.862
P-27	J-23	J-24	200.0	99	110.0	19.13	0.01	0.00	8.764
P-28	J-24	J-25	200.0	56	110.0	2.13	0.00	0.00	17.019
P-29	J-18	J-28	200.0	100	110.0	33.27	0.02	0.00	1.767
P-30	J-28	J-26	200.0	122	110.0	16.62	0.01	0.00	4.476
P-31	J-26	J-27	200.0	231	110.0	-49.50	0.03	0.00	3.075
P-32	J-27	J-1	200.0	242	110.0	-70.40	0.04	0.00	0.952
P-33	J-26	J-29	200.0	54	110.0	47.26	0.03	0.00	5.126
P-34	J-29	J-22	200.0	59	110.0	32.38	0.02	0.00	5.906
P-35	J-14	J-26	200.0	97	110.0	-0.44	0.00	0.00	62.194
P-36	J-19	J-30	200.0	94	110.0	2.13	0.00	0.00	13.585

161414396 - Arva Water Model

Active Scenario: Age (London - Ultimate - Full Occupancy)

Current Time: 336.00 hours

Label	Elevation (m)	Demand (L/min)	Pressure (psi)	Age (Maximum) (hours)
J-1	269.50	15.58	45.8	0.100
J-2	268.87	19.13	46.7	0.589
J-3	268.78	19.13	46.9	1.044
J-4	267.10	17.18	49.2	1.565
J-5	266.93	19.48	49.5	8.064
J-6	262.80	5.14	55.3	7.451
J-7	261.70	4.07	56.9	3.465
J-8	262.40	5.14	55.9	1.748
J-9	262.57	7.44	55.7	0.974
J-10	262.50	5.84	55.8	3.031
J-11	266.58	4.78	50.0	7.885
J-12	266.49	3.72	50.1	10.329
J-13	263.22	3.72	54.7	5.932
J-14	268.24	20.54	47.6	11.423
J-15	269.21	20.54	46.2	8.123
J-16	268.35	21.43	47.5	2.587
J-17	261.91	6.02	56.6	0.290
J-18	263.44	4.25	54.4	1.030
J-19	263.78	5.14	54.0	2.086
J-20	265.20	3.72	51.9	2.890
J-21	266.80	5.49	49.7	4.593
J-22	267.92	18.77	48.1	6.358
J-23	268.92	18.77	46.7	7.465
J-24	270.32	17.00	44.7	10.163
J-25	268.18	2.13	47.7	23.975
J-26	268.90	18.42	46.7	4.875
J-27	273.09	20.90	40.7	1.903
J-28	265.65	16.65	51.3	2.603
J-29	267.71	14.88	48.4	5.476
J-30	262.60	2.13	55.6	25.184

161414396 - Arva Water Model

Active Scenario: Average Day (London - Ultimate)

Label	Start Node	Stop Node	Diameter (mm)	Length (m)	Hazen-Williams C	Flow (L/min)	Velocity (m/s)	Headloss (m)
P-1	R-1	J-1	200.0	33	110.0	188.26	0.10	0.00
P-2	J-1	J-2	200.0	95	110.0	102.28	0.05	0.00
P-3	J-2	J-3	200.0	72	110.0	83.15	0.04	0.00
P-4	J-3	J-4	200.0	64	110.0	64.02	0.03	0.00
P-5	J-4	J-5	200.0	71	110.0	11.95	0.01	0.00
P-6	J-5	J-6	200.0	86	110.0	-7.53	0.00	0.00
P-7	J-6	J-7	200.0	96	110.0	-12.67	0.01	0.00
P-8	J-7	J-8	200.0	102	110.0	-30.99	0.02	0.00
P-9	J-8	J-9	200.0	54	110.0	-36.13	0.02	0.00
P-10	J-9	J-10	200.0	122	110.0	30.99	0.02	0.00
P-11	J-10	J-11	200.0	123	110.0	25.15	0.01	0.00
P-12	J-11	J-12	200.0	78	110.0	-6.81	0.00	0.00
P-13	J-12	J-13	200.0	88	110.0	-10.53	0.01	0.00
P-14	J-13	J-7	200.0	67	110.0	-14.25	0.01	0.00
P-15	J-11	J-14	200.0	92	110.0	27.18	0.01	0.00
P-16	J-14	J-15	200.0	49	110.0	7.08	0.00	0.00
P-17	J-15	J-16	200.0	49	110.0	-13.46	0.01	0.00
P-18	J-16	J-4	200.0	68	110.0	-34.89	0.02	0.00
P-19	J-9	J-17	200.0	96	110.0	-74.55	0.04	0.00
P-20	J-17	R-2	200.0	88	110.0	-158.87	0.08	0.01
P-21	J-17	J-18	200.0	111	110.0	78.30	0.04	0.00
P-22	J-18	J-19	200.0	82	110.0	40.77	0.02	0.00
P-23	J-19	J-20	200.0	51	110.0	33.50	0.02	0.00
P-24	J-20	J-21	200.0	97	110.0	29.78	0.02	0.00
P-25	J-21	J-22	200.0	77	110.0	24.29	0.01	0.00
P-26	J-22	J-23	200.0	80	110.0	37.90	0.02	0.00
P-27	J-23	J-24	200.0	99	110.0	19.13	0.01	0.00
P-28	J-24	J-25	200.0	56	110.0	2.13	0.00	0.00
P-29	J-18	J-28	200.0	100	110.0	33.27	0.02	0.00
P-30	J-28	J-26	200.0	122	110.0	16.62	0.01	0.00
P-31	J-26	J-27	200.0	231	110.0	-49.50	0.03	0.00
P-32	J-27	J-1	200.0	242	110.0	-70.40	0.04	0.00
P-33	J-26	J-29	200.0	54	110.0	47.26	0.03	0.00
P-34	J-29	J-22	200.0	59	110.0	32.38	0.02	0.00
P-35	J-14	J-26	200.0	97	110.0	-0.44	0.00	0.00
P-36	J-19	J-30	200.0	94	110.0	2.13	0.00	0.00

161414396 - Arva Water Model

Active Scenario: Average Day (London - Ultimate)

Label	Elevation (m)	Demand (L/min)	Pressure (psi)
J-1	269.50	15.58	45.8
J-2	268.87	19.13	46.7
J-3	268.78	19.13	46.9
J-4	267.10	17.18	49.2
J-5	266.93	19.48	49.5
J-6	262.80	5.14	55.3
J-7	261.70	4.07	56.9
J-8	262.40	5.14	55.9
J-9	262.57	7.44	55.7
J-10	262.50	5.84	55.8
J-11	266.58	4.78	50.0
J-12	266.49	3.72	50.1
J-13	263.22	3.72	54.7
J-14	268.24	20.54	47.6
J-15	269.21	20.54	46.2
J-16	268.35	21.43	47.5
J-17	261.91	6.02	56.6
J-18	263.44	4.25	54.4
J-19	263.78	5.14	54.0
J-20	265.20	3.72	51.9
J-21	266.80	5.49	49.7
J-22	267.92	18.77	48.1
J-23	268.92	18.77	46.7
J-24	270.32	17.00	44.7
J-25	268.18	2.13	47.7
J-26	268.90	18.42	46.7
J-27	273.09	20.90	40.7
J-28	265.65	16.65	51.3
J-29	267.71	14.88	48.4
J-30	262.60	2.13	55.6

161414396 - Arva Water Model

Active Scenario: Max Hour (London - Ultimate)

Label	Start Node	Stop Node	Diameter (mm)	Length (m)	Hazen-Williams C	Flow (L/min)	Velocity (m/s)	Headloss (m)
P-1	R-1	J-1	200.0	33	110.0	1,468.40	0.78	0.15
P-2	J-1	J-2	200.0	95	110.0	797.79	0.42	0.14
P-3	J-2	J-3	200.0	72	110.0	648.57	0.34	0.07
P-4	J-3	J-4	200.0	64	110.0	499.36	0.26	0.04
P-5	J-4	J-5	200.0	71	110.0	93.23	0.05	0.00
P-6	J-5	J-6	200.0	86	110.0	-58.71	0.03	0.00
P-7	J-6	J-7	200.0	96	110.0	-98.80	0.05	0.00
P-8	J-7	J-8	200.0	102	110.0	-241.71	0.13	0.02
P-9	J-8	J-9	200.0	54	110.0	-281.80	0.15	0.01
P-10	J-9	J-10	200.0	122	110.0	241.69	0.13	0.02
P-11	J-10	J-11	200.0	123	110.0	196.14	0.10	0.01
P-12	J-11	J-12	200.0	78	110.0	-53.13	0.03	0.00
P-13	J-12	J-13	200.0	88	110.0	-82.15	0.04	0.00
P-14	J-13	J-7	200.0	67	110.0	-111.16	0.06	0.00
P-15	J-11	J-14	200.0	92	110.0	211.99	0.11	0.01
P-16	J-14	J-15	200.0	49	110.0	55.24	0.03	0.00
P-17	J-15	J-16	200.0	49	110.0	-104.97	0.06	0.00
P-18	J-16	J-4	200.0	68	110.0	-272.12	0.14	0.01
P-19	J-9	J-17	200.0	96	110.0	-581.53	0.31	0.08
P-20	J-17	R-2	200.0	88	110.0	-1,239.21	0.66	0.30
P-21	J-17	J-18	200.0	111	110.0	610.73	0.32	0.10
P-22	J-18	J-19	200.0	82	110.0	318.04	0.17	0.02
P-23	J-19	J-20	200.0	51	110.0	261.34	0.14	0.01
P-24	J-20	J-21	200.0	97	110.0	232.32	0.12	0.01
P-25	J-21	J-22	200.0	77	110.0	189.50	0.10	0.01
P-26	J-22	J-23	200.0	80	110.0	295.62	0.16	0.02
P-27	J-23	J-24	200.0	99	110.0	149.21	0.08	0.01
P-28	J-24	J-25	200.0	56	110.0	16.61	0.01	0.00
P-29	J-18	J-28	200.0	100	110.0	259.54	0.14	0.02
P-30	J-28	J-26	200.0	122	110.0	129.67	0.07	0.01
P-31	J-26	J-27	200.0	231	110.0	-386.07	0.20	0.09
P-32	J-27	J-1	200.0	242	110.0	-549.09	0.29	0.18
P-33	J-26	J-29	200.0	54	110.0	368.59	0.20	0.02
P-34	J-29	J-22	200.0	59	110.0	252.53	0.13	0.01
P-35	J-14	J-26	200.0	97	110.0	-3.47	0.00	0.00
P-36	J-19	J-30	200.0	94	110.0	16.61	0.01	0.00

161414396 - Arva Water Model

Active Scenario: Max Hour (London - Ultimate)

Label	Elevation (m)	Demand (L/min)	Pressure (psi)
J-1	269.50	121.52	45.6
J-2	268.87	149.21	46.3
J-3	268.78	149.21	46.3
J-4	267.10	134.00	48.7
J-5	266.93	151.94	48.9
J-6	262.80	40.09	54.8
J-7	261.70	31.75	56.3
J-8	262.40	40.09	55.4
J-9	262.57	58.03	55.1
J-10	262.50	45.55	55.2
J-11	266.58	37.28	49.4
J-12	266.49	29.02	49.5
J-13	263.22	29.02	54.2
J-14	268.24	160.21	47.0
J-15	269.21	160.21	45.7
J-16	268.35	167.15	46.9
J-17	261.91	46.96	56.2
J-18	263.44	33.15	53.9
J-19	263.78	40.09	53.4
J-20	265.20	29.02	51.3
J-21	266.80	42.82	49.0
J-22	267.92	146.41	47.4
J-23	268.92	146.41	46.0
J-24	270.32	132.60	44.0
J-25	268.18	16.61	47.0
J-26	268.90	143.68	46.1
J-27	273.09	163.02	40.3
J-28	265.65	129.87	50.7
J-29	267.71	116.06	47.8
J-30	262.60	16.61	55.0

161414396 - Arva Water Model

Active Scenario: Max Day + Fire @76 L/s (London - Ultimate)

Label	Flow (Total Available) (L/min)	Junction w/ Minimum Pressure (System)	Pipe w/ Maximum Velocity	Pressure (Calculated Residual) (psi)	Velocity of Maximum Pipe (m/s)	Pressure (Calculated System Lower Limit) (psi)
J-16	4,635.00	J-27	P-1	42.9	1.63	39.0
J-27	4,633.15	J-24	P-1	35.4	1.85	42.4
J-14	4,631.89	J-27	P-1	43.9	1.58	38.9
J-15	4,631.89	J-27	P-1	41.8	1.61	39.0
J-5	4,628.18	J-27	P-1	44.3	1.62	39.1
J-2	4,626.95	J-27	P-1	43.2	1.93	39.3
J-3	4,626.95	J-27	P-1	42.8	1.80	39.2
J-22	4,625.70	J-24	P-33	41.8	1.62	38.4
J-23	4,625.70	J-24	P-26	35.8	2.49	33.8
J-26	4,624.47	J-27	P-1	43.0	1.58	38.4
J-4	4,620.13	J-27	P-1	45.3	1.69	39.1
J-24	4,619.50	J-25	P-26	28.4	2.49	31.4
J-28	4,618.27	J-27	P-20	46.2	1.54	38.6
J-1	4,614.53	J-27	P-1	44.4	2.13	39.4
J-29	4,612.08	J-27	P-33	43.1	1.84	38.5
J-9	4,586.04	J-27	P-20	51.8	1.59	39.2
J-17	4,581.07	J-27	P-20	54.1	1.71	39.3
J-10	4,580.44	J-27	P-20	50.4	1.55	39.1
J-21	4,579.21	J-27	P-1	42.9	1.54	38.6
J-6	4,577.99	J-27	P-1	50.0	1.59	39.1
J-8	4,577.99	J-27	P-20	51.2	1.56	39.1
J-19	4,577.99	J-27	P-22	48.1	1.63	38.7
J-11	4,576.73	J-27	P-1	45.7	1.55	39.1
J-18	4,574.87	J-27	P-20	50.3	1.58	38.8
J-7	4,574.24	J-27	P-1	52.3	1.54	39.1
J-12	4,573.02	J-27	P-1	44.8	1.55	39.1
J-13	4,573.02	J-27	P-1	49.4	1.54	39.1
J-20	4,573.02	J-27	P-20	45.5	1.54	38.6
J-25	4,567.45	J-24	P-26	28.4	2.49	28.4
J-30	4,567.45	J-27	P-36	44.7	2.42	38.7

161414396 - Arva Water Model

Active Scenario: Max Day + Fire @2.4 m/s (London - Ultimate)

Label	Flow (Total Available) (L/min)	Junction w/ Minimum Pressure (System)	Pipe w/ Maximum Velocity	Pressure (Calculated Residual) (psi)	Velocity of Maximum Pipe (m/s)	Pressure (Calculated System Lower Limit) (psi)
J-16	4,635.00	J-27	P-1	42.9	1.63	39.0
J-27	4,633.15	J-24	P-1	35.4	1.85	42.4
J-14	4,631.89	J-27	P-1	43.9	1.58	38.9
J-15	4,631.89	J-27	P-1	41.8	1.61	39.0
J-5	4,628.18	J-27	P-1	44.3	1.62	39.1
J-2	4,626.95	J-27	P-1	43.2	1.93	39.3
J-3	4,626.95	J-27	P-1	42.8	1.80	39.2
J-22	4,625.70	J-24	P-33	41.8	1.62	38.4
J-26	4,624.47	J-27	P-1	43.0	1.58	38.4
J-4	4,620.13	J-27	P-1	45.3	1.69	39.1
J-28	4,618.27	J-27	P-20	46.2	1.54	38.6
J-1	4,614.53	J-27	P-1	44.4	2.13	39.4
J-29	4,612.08	J-27	P-33	43.1	1.84	38.5
J-9	4,586.04	J-27	P-20	51.8	1.59	39.2
J-17	4,581.07	J-27	P-20	54.1	1.71	39.3
J-10	4,580.44	J-27	P-20	50.4	1.55	39.1
J-21	4,579.21	J-27	P-1	42.9	1.54	38.6
J-6	4,577.99	J-27	P-1	50.0	1.59	39.1
J-8	4,577.99	J-27	P-20	51.2	1.56	39.1
J-19	4,577.99	J-27	P-22	48.1	1.63	38.7
J-11	4,576.73	J-27	P-1	45.7	1.55	39.1
J-18	4,574.87	J-27	P-20	50.3	1.58	38.8
J-7	4,574.24	J-27	P-1	52.3	1.54	39.1
J-12	4,573.02	J-27	P-1	44.8	1.55	39.1
J-13	4,573.02	J-27	P-1	49.4	1.54	39.1
J-20	4,573.02	J-27	P-20	45.5	1.54	38.6
J-30	4,531.43	J-27	P-36	44.8	2.40	38.7
J-23	4,464.48	J-24	P-26	36.5	2.40	34.5
J-24	4,458.28	J-25	P-26	29.4	2.40	32.4
J-25	4,406.24	J-24	P-26	29.6	2.40	29.4

161414396 - Arva Water Model

Active Scenario: Age (Arva - Ultimate - Full Occupancy)

Current Time: 336.00 hours

Label	Start Node	Stop Node	Diameter (mm)	Length (m)	Hazen-Williams C	Flow (L/min)	Velocity (m/s)	Headloss (m)	Age (Maximum) (hours)
P-1	R-1	J-1	200.0	33	110.0	258.35	0.14	0.01	0.000
P-2	J-1	J-2	200.0	95	110.0	140.36	0.07	0.01	0.232
P-3	J-2	J-3	200.0	72	110.0	114.11	0.06	0.00	0.575
P-4	J-3	J-4	200.0	64	110.0	87.86	0.05	0.00	0.930
P-5	J-4	J-5	200.0	71	110.0	16.40	0.01	0.00	2.248
P-6	J-5	J-6	200.0	86	110.0	-10.34	0.01	0.00	7.567
P-7	J-6	J-7	200.0	96	110.0	-17.39	0.01	0.00	3.927
P-8	J-7	J-8	200.0	102	110.0	-42.53	0.02	0.00	1.850
P-9	J-8	J-9	200.0	54	110.0	-49.58	0.03	0.00	0.941
P-10	J-9	J-10	200.0	122	110.0	42.53	0.02	0.00	1.407
P-11	J-10	J-11	200.0	123	110.0	34.51	0.02	0.00	3.094
P-12	J-11	J-12	200.0	78	110.0	-9.35	0.00	0.00	9.664
P-13	J-12	J-13	200.0	88	110.0	-14.45	0.01	0.00	5.875
P-14	J-13	J-7	200.0	67	110.0	-19.55	0.01	0.00	3.374
P-15	J-11	J-14	200.0	92	110.0	37.30	0.02	0.00	6.341
P-16	J-14	J-15	200.0	49	110.0	9.73	0.01	0.00	9.588
P-17	J-15	J-16	200.0	49	110.0	-18.46	0.01	0.00	2.555
P-18	J-16	J-4	200.0	68	110.0	-47.87	0.03	0.00	1.492
P-19	J-9	J-17	200.0	96	110.0	-102.31	0.05	0.00	0.409
P-20	J-17	R-2	200.0	88	110.0	-218.02	0.12	0.01	0.058
P-21	J-17	J-18	200.0	111	110.0	107.45	0.06	0.00	0.433
P-22	J-18	J-19	200.0	82	110.0	55.95	0.03	0.00	1.087
P-23	J-19	J-20	200.0	51	110.0	45.98	0.02	0.00	1.764
P-24	J-20	J-21	200.0	97	110.0	40.88	0.02	0.00	2.677
P-25	J-21	J-22	200.0	77	110.0	33.35	0.02	0.00	3.904
P-26	J-22	J-23	200.0	80	110.0	52.01	0.03	0.00	4.998
P-27	J-23	J-24	200.0	99	110.0	26.25	0.01	0.00	6.385
P-28	J-24	J-25	200.0	56	110.0	2.92	0.00	0.00	12.405
P-29	J-18	J-28	200.0	100	110.0	45.67	0.02	0.00	1.275
P-30	J-28	J-26	200.0	122	110.0	22.82	0.01	0.00	3.247
P-31	J-26	J-27	200.0	231	110.0	-67.92	0.04	0.00	2.255
P-32	J-27	J-1	200.0	242	110.0	-96.60	0.05	0.01	0.707
P-33	J-26	J-29	200.0	54	110.0	64.84	0.03	0.00	3.744
P-34	J-29	J-22	200.0	59	110.0	44.42	0.02	0.00	4.310
P-35	J-14	J-26	200.0	97	110.0	-0.62	0.00	0.00	44.700
P-36	J-19	J-30	200.0	94	110.0	2.92	0.00	0.00	9.895

161414396 - Arva Water Model

Active Scenario: Age (Arva - Ultimate - Full Occupancy)

Current Time: 336.00 hours

Label	Elevation (m)	Demand (L/min)	Pressure (psi)	Age (Maximum) (hours)
J-1	269.50	21.39	45.8	0.100
J-2	268.87	26.25	46.7	0.456
J-3	268.78	26.25	46.8	0.788
J-4	267.10	23.58	49.2	1.168
J-5	266.93	26.74	49.5	5.893
J-6	262.80	7.05	55.3	5.429
J-7	261.70	5.59	56.9	2.525
J-8	262.40	7.05	55.9	1.274
J-9	262.57	10.21	55.7	0.705
J-10	262.50	8.02	55.8	2.208
J-11	266.58	6.56	50.0	5.746
J-12	266.49	5.10	50.1	7.528
J-13	263.22	5.10	54.7	4.323
J-14	268.24	28.19	47.6	8.324
J-15	269.21	28.19	46.2	5.938
J-16	268.35	29.41	47.5	1.913
J-17	261.91	8.26	56.6	0.211
J-18	263.44	5.83	54.4	0.750
J-19	263.78	7.05	53.9	1.520
J-20	265.20	5.10	51.9	2.105
J-21	266.80	7.53	49.7	3.347
J-22	267.92	25.76	48.1	4.645
J-23	268.92	25.76	46.6	5.451
J-24	270.32	23.33	44.7	7.417
J-25	268.18	2.92	47.7	17.492
J-26	268.90	25.28	46.7	3.572
J-27	273.09	28.68	40.7	1.414
J-28	265.65	22.85	51.3	1.897
J-29	267.71	20.42	48.4	4.011
J-30	262.60	2.92	55.6	18.369

161414396 - Arva Water Model

Active Scenario: Average Day (Arva - Ultimate)

Label	Start Node	Stop Node	Diameter (mm)	Length (m)	Hazen-Williams C	Flow (L/min)	Velocity (m/s)	Headloss (m)
P-1	R-1	J-1	200.0	33	110.0	258.35	0.14	0.01
P-2	J-1	J-2	200.0	95	110.0	140.36	0.07	0.01
P-3	J-2	J-3	200.0	72	110.0	114.11	0.06	0.00
P-4	J-3	J-4	200.0	64	110.0	87.86	0.05	0.00
P-5	J-4	J-5	200.0	71	110.0	16.40	0.01	0.00
P-6	J-5	J-6	200.0	86	110.0	-10.34	0.01	0.00
P-7	J-6	J-7	200.0	96	110.0	-17.39	0.01	0.00
P-8	J-7	J-8	200.0	102	110.0	-42.53	0.02	0.00
P-9	J-8	J-9	200.0	54	110.0	-49.58	0.03	0.00
P-10	J-9	J-10	200.0	122	110.0	42.53	0.02	0.00
P-11	J-10	J-11	200.0	123	110.0	34.51	0.02	0.00
P-12	J-11	J-12	200.0	78	110.0	-9.35	0.00	0.00
P-13	J-12	J-13	200.0	88	110.0	-14.45	0.01	0.00
P-14	J-13	J-7	200.0	67	110.0	-19.55	0.01	0.00
P-15	J-11	J-14	200.0	92	110.0	37.30	0.02	0.00
P-16	J-14	J-15	200.0	49	110.0	9.73	0.01	0.00
P-17	J-15	J-16	200.0	49	110.0	-18.46	0.01	0.00
P-18	J-16	J-4	200.0	68	110.0	-47.87	0.03	0.00
P-19	J-9	J-17	200.0	96	110.0	-102.31	0.05	0.00
P-20	J-17	R-2	200.0	88	110.0	-218.02	0.12	0.01
P-21	J-17	J-18	200.0	111	110.0	107.45	0.06	0.00
P-22	J-18	J-19	200.0	82	110.0	55.95	0.03	0.00
P-23	J-19	J-20	200.0	51	110.0	45.98	0.02	0.00
P-24	J-20	J-21	200.0	97	110.0	40.88	0.02	0.00
P-25	J-21	J-22	200.0	77	110.0	33.35	0.02	0.00
P-26	J-22	J-23	200.0	80	110.0	52.01	0.03	0.00
P-27	J-23	J-24	200.0	99	110.0	26.25	0.01	0.00
P-28	J-24	J-25	200.0	56	110.0	2.92	0.00	0.00
P-29	J-18	J-28	200.0	100	110.0	45.67	0.02	0.00
P-30	J-28	J-26	200.0	122	110.0	22.82	0.01	0.00
P-31	J-26	J-27	200.0	231	110.0	-67.92	0.04	0.00
P-32	J-27	J-1	200.0	242	110.0	-96.60	0.05	0.01
P-33	J-26	J-29	200.0	54	110.0	64.84	0.03	0.00
P-34	J-29	J-22	200.0	59	110.0	44.42	0.02	0.00
P-35	J-14	J-26	200.0	97	110.0	-0.62	0.00	0.00
P-36	J-19	J-30	200.0	94	110.0	2.92	0.00	0.00

161414396 - Arva Water Model

Active Scenario: Average Day (Arva - Ultimate)

Label	Elevation (m)	Demand (L/min)	Pressure (psi)
J-1	269.50	21.39	45.8
J-2	268.87	26.25	46.7
J-3	268.78	26.25	46.8
J-4	267.10	23.58	49.2
J-5	266.93	26.74	49.5
J-6	262.80	7.05	55.3
J-7	261.70	5.59	56.9
J-8	262.40	7.05	55.9
J-9	262.57	10.21	55.7
J-10	262.50	8.02	55.8
J-11	266.58	6.56	50.0
J-12	266.49	5.10	50.1
J-13	263.22	5.10	54.7
J-14	268.24	28.19	47.6
J-15	269.21	28.19	46.2
J-16	268.35	29.41	47.5
J-17	261.91	8.26	56.6
J-18	263.44	5.83	54.4
J-19	263.78	7.05	53.9
J-20	265.20	5.10	51.9
J-21	266.80	7.53	49.7
J-22	267.92	25.76	48.1
J-23	268.92	25.76	46.6
J-24	270.32	23.33	44.7
J-25	268.18	2.92	47.7
J-26	268.90	25.28	46.7
J-27	273.09	28.68	40.7
J-28	265.65	22.85	51.3
J-29	267.71	20.42	48.4
J-30	262.60	2.92	55.6

161414396 - Arva Water Model

Active Scenario: Max Hour (Arva - Ultimate)

Label	Start Node	Stop Node	Diameter (mm)	Length (m)	Hazen-Williams C	Flow (L/min)	Velocity (m/s)	Headloss (m)
P-1	R-1	J-1	200.0	33	110.0	968.81	0.51	0.07
P-2	J-1	J-2	200.0	95	110.0	526.34	0.28	0.07
P-3	J-2	J-3	200.0	72	110.0	427.90	0.23	0.03
P-4	J-3	J-4	200.0	64	110.0	329.46	0.17	0.02
P-5	J-4	J-5	200.0	71	110.0	61.51	0.03	0.00
P-6	J-5	J-6	200.0	86	110.0	-38.76	0.02	0.00
P-7	J-6	J-7	200.0	96	110.0	-65.20	0.03	0.00
P-8	J-7	J-8	200.0	102	110.0	-159.48	0.08	0.01
P-9	J-8	J-9	200.0	54	110.0	-185.92	0.10	0.01
P-10	J-9	J-10	200.0	122	110.0	159.47	0.08	0.01
P-11	J-10	J-11	200.0	123	110.0	129.39	0.07	0.01
P-12	J-11	J-12	200.0	78	110.0	-35.07	0.02	0.00
P-13	J-12	J-13	200.0	88	110.0	-54.19	0.03	0.00
P-14	J-13	J-7	200.0	67	110.0	-73.32	0.04	0.00
P-15	J-11	J-14	200.0	92	110.0	139.86	0.07	0.01
P-16	J-14	J-15	200.0	49	110.0	36.47	0.02	0.00
P-17	J-15	J-16	200.0	49	110.0	-69.24	0.04	0.00
P-18	J-16	J-4	200.0	68	110.0	-179.53	0.10	0.01
P-19	J-9	J-17	200.0	96	110.0	-383.68	0.20	0.04
P-20	J-17	R-2	200.0	88	110.0	-817.58	0.43	0.14
P-21	J-17	J-18	200.0	111	110.0	402.93	0.21	0.05
P-22	J-18	J-19	200.0	82	110.0	209.81	0.11	0.01
P-23	J-19	J-20	200.0	51	110.0	172.42	0.09	0.00
P-24	J-20	J-21	200.0	97	110.0	153.29	0.08	0.01
P-25	J-21	J-22	200.0	77	110.0	125.06	0.07	0.00
P-26	J-22	J-23	200.0	80	110.0	195.04	0.10	0.01
P-27	J-23	J-24	200.0	99	110.0	98.44	0.05	0.00
P-28	J-24	J-25	200.0	56	110.0	10.95	0.01	0.00
P-29	J-18	J-28	200.0	100	110.0	171.26	0.09	0.01
P-30	J-28	J-26	200.0	122	110.0	85.57	0.05	0.00
P-31	J-26	J-27	200.0	231	110.0	-254.71	0.14	0.04
P-32	J-27	J-1	200.0	242	110.0	-362.26	0.19	0.08
P-33	J-26	J-29	200.0	54	110.0	243.16	0.13	0.01
P-34	J-29	J-22	200.0	59	110.0	166.58	0.09	0.00
P-35	J-14	J-26	200.0	97	110.0	-2.32	0.00	0.00
P-36	J-19	J-30	200.0	94	110.0	10.95	0.01	0.00

161414396 - Arva Water Model

Active Scenario: Max Hour (Arva - Ultimate)

Label	Elevation (m)	Demand (L/min)	Pressure (psi)
J-1	269.50	80.21	45.7
J-2	268.87	98.44	46.5
J-3	268.78	98.44	46.6
J-4	267.10	88.42	49.0
J-5	266.93	100.27	49.2
J-6	262.80	26.44	55.1
J-7	261.70	20.96	56.7
J-8	262.40	26.44	55.7
J-9	262.57	38.29	55.4
J-10	262.50	30.08	55.5
J-11	266.58	24.60	49.7
J-12	266.49	19.12	49.8
J-13	263.22	19.12	54.5
J-14	268.24	105.71	47.4
J-15	269.21	105.71	46.0
J-16	268.35	110.29	47.2
J-17	261.91	30.97	56.4
J-18	263.44	21.86	54.2
J-19	263.78	26.44	53.7
J-20	265.20	19.12	51.7
J-21	266.80	28.24	49.4
J-22	267.92	96.60	47.8
J-23	268.92	96.60	46.4
J-24	270.32	87.49	44.4
J-25	268.18	10.95	47.4
J-26	268.90	94.80	46.4
J-27	273.09	107.55	40.5
J-28	265.65	85.69	51.0
J-29	267.71	76.57	48.1
J-30	262.60	10.95	55.4

161414396 - Arva Water Model

Active Scenario: Max Day + Fire @76 L/s (Arva - Ultimate)

Label	Flow (Total Available) (L/min)	Junction w/ Minimum Pressure (System)	Pipe w/ Maximum Velocity	Pressure (Calculated Residual) (psi)	Velocity of Maximum Pipe (m/s)	Pressure (Calculated System Lower Limit) (psi)
J-16	4,633.52	J-27	P-1	43.0	1.63	39.1
J-27	4,631.70	J-24	P-1	35.4	1.85	42.4
J-14	4,630.47	J-27	P-1	43.9	1.58	38.9
J-15	4,630.47	J-27	P-1	41.9	1.60	39.0
J-5	4,626.85	J-27	P-1	44.3	1.62	39.1
J-2	4,625.62	J-27	P-1	43.2	1.92	39.3
J-3	4,625.62	J-27	P-1	42.8	1.79	39.2
J-22	4,624.40	J-24	P-33	41.8	1.62	38.4
J-23	4,624.40	J-24	P-26	35.9	2.49	33.9
J-26	4,623.20	J-27	P-1	43.0	1.57	38.4
J-4	4,618.95	J-27	P-1	45.3	1.68	39.2
J-24	4,618.32	J-25	P-26	28.4	2.49	31.5
J-28	4,617.12	J-27	P-20	46.2	1.53	38.6
J-1	4,613.47	J-27	P-1	44.5	2.13	39.4
J-29	4,611.05	J-27	P-33	43.1	1.84	38.5
J-9	4,585.53	J-27	P-20	51.8	1.58	39.2
J-17	4,580.65	J-27	P-20	54.1	1.71	39.3
J-10	4,580.05	J-27	P-20	50.4	1.54	39.1
J-21	4,578.82	J-27	P-1	42.9	1.53	38.6
J-6	4,577.62	J-27	P-1	50.0	1.58	39.1
J-8	4,577.62	J-27	P-20	51.3	1.55	39.2
J-19	4,577.62	J-27	P-22	48.1	1.63	38.7
J-11	4,576.40	J-27	P-1	45.7	1.54	39.1
J-18	4,574.57	J-27	P-20	50.3	1.58	38.8
J-7	4,573.97	J-27	P-1	52.3	1.54	39.1
J-12	4,572.75	J-27	P-1	44.8	1.54	39.1
J-13	4,572.75	J-27	P-1	49.4	1.54	39.1
J-20	4,572.75	J-27	P-20	45.5	1.54	38.7
J-25	4,567.30	J-24	P-26	28.4	2.49	28.4
J-30	4,567.30	J-27	P-36	44.7	2.42	38.7

161414396 - Arva Water Model

Active Scenario: Max Day + Fire @2.4 m/s (Arva - Ultimate)

Label	Flow (Total Available) (L/min)	Junction w/ Minimum Pressure (System)	Pipe w/ Maximum Velocity	Pressure (Calculated Residual) (psi)	Velocity of Maximum Pipe (m/s)	Pressure (Calculated System Lower Limit) (psi)
J-16	4,633.52	J-27	P-1	43.0	1.63	39.1
J-27	4,631.70	J-24	P-1	35.4	1.85	42.4
J-14	4,630.47	J-27	P-1	43.9	1.58	38.9
J-15	4,630.47	J-27	P-1	41.9	1.60	39.0
J-5	4,626.85	J-27	P-1	44.3	1.62	39.1
J-2	4,625.62	J-27	P-1	43.2	1.92	39.3
J-3	4,625.62	J-27	P-1	42.8	1.79	39.2
J-22	4,624.40	J-24	P-33	41.8	1.62	38.4
J-26	4,623.20	J-27	P-1	43.0	1.57	38.4
J-4	4,618.95	J-27	P-1	45.3	1.68	39.2
J-28	4,617.12	J-27	P-20	46.2	1.53	38.6
J-1	4,613.47	J-27	P-1	44.5	2.13	39.4
J-29	4,611.05	J-27	P-33	43.1	1.84	38.5
J-9	4,585.53	J-27	P-20	51.8	1.58	39.2
J-17	4,580.65	J-27	P-20	54.1	1.71	39.3
J-10	4,580.05	J-27	P-20	50.4	1.54	39.1
J-21	4,578.82	J-27	P-1	42.9	1.53	38.6
J-6	4,577.62	J-27	P-1	50.0	1.58	39.1
J-8	4,577.62	J-27	P-20	51.3	1.55	39.2
J-19	4,577.62	J-27	P-22	48.1	1.63	38.7
J-11	4,576.40	J-27	P-1	45.7	1.54	39.1
J-18	4,574.57	J-27	P-20	50.3	1.58	38.8
J-7	4,573.97	J-27	P-1	52.3	1.54	39.1
J-12	4,572.75	J-27	P-1	44.8	1.54	39.1
J-13	4,572.75	J-27	P-1	49.4	1.54	39.1
J-20	4,572.75	J-27	P-20	45.5	1.54	38.7
J-30	4,531.43	J-27	P-36	44.9	2.40	38.7
J-23	4,465.81	J-24	P-26	36.5	2.40	34.5
J-24	4,459.73	J-25	P-26	29.4	2.40	32.4
J-25	4,408.71	J-24	P-26	29.6	2.40	29.4

INTERIM PHASE

LONDON/ARVA

161414396 - Arva Water Model

Active Scenario: Age (London - Interim Phase - Prior Occupancy)

Current Time: 336.00 hours

Label	Start Node	Stop Node	Diameter (mm)	Length (m)	Hazen-Williams C	Flow (L/min)	Velocity (m/s)	Headloss (m)	Age (Maximum) (hours)
P-1	R-1	J-1	200.0	33	110.0	25.00	0.01	0.00	0.294
P-2	J-1	J-2	200.0	95	110.0	25.00	0.01	0.00	1.637
P-3	J-2	J-3	200.0	72	110.0	25.00	0.01	0.00	3.394
P-4	J-3	J-4	200.0	64	110.0	25.00	0.01	0.00	4.819
P-5	J-4	J-5	200.0	89	110.0	10.80	0.01	0.00	7.646
P-6	J-5	J-6	200.0	68	110.0	10.80	0.01	0.00	11.458
P-7	J-6	J-7	200.0	96	110.0	10.80	0.01	0.00	15.448
P-8	J-7	J-8	200.0	102	110.0	7.60	0.00	0.00	21.284
P-9	J-8	J-9	200.0	54	110.0	7.60	0.00	0.00	26.635
P-10	J-9	J-10	200.0	122	110.0	-4.90	0.00	0.00	70.153
P-11	J-10	J-11	200.0	123	110.0	-4.90	0.00	0.00	57.034
P-12	J-11	J-12	200.0	78	110.0	-3.19	0.00	0.00	49.684
P-13	J-12	J-13	200.0	88	110.0	-3.19	0.00	0.00	36.039
P-14	J-13	J-7	200.0	67	110.0	-3.19	0.00	0.00	23.289
P-15	J-11	J-14	200.0	92	110.0	-1.70	0.00	0.00	25.723
P-16	J-14	J-15	200.0	49	110.0	-14.20	0.01	0.00	10.697
P-17	J-15	J-16	200.0	49	110.0	-14.20	0.01	0.00	8.897
P-18	J-16	J-4	200.0	68	110.0	-14.20	0.01	0.00	6.742

161414396 - Arva Water Model

Active Scenario: Age (London - Interim Phase - Prior Occupancy)

Current Time: 336.00 hours

Label	Elevation (m)	Demand (L/min)	Pressure (psi)	Age (Maximum) (hours)
J-1	269.50	0.00	45.8	0.687
J-2	268.87	0.00	46.7	2.687
J-3	268.78	0.00	46.9	4.201
J-4	267.10	0.00	49.3	5.536
J-5	266.93	0.00	49.5	9.857
J-6	262.80	0.00	55.4	13.160
J-7	261.70	0.00	56.9	17.836
J-8	262.40	0.00	55.9	24.832
J-9	262.57	12.50	55.7	47.413
J-10	262.50	0.00	55.8	63.675
J-11	266.58	0.00	50.0	50.493
J-12	266.49	0.00	50.1	43.336
J-13	263.22	0.00	54.8	28.841
J-14	268.24	12.50	47.6	11.646
J-15	269.21	0.00	46.3	9.847
J-16	268.35	0.00	47.5	8.047

161414396 - Arva Water Model

Active Scenario: Age (London - Interim Phase - Full Occupancy)

Current Time: 336.00 hours

Label	Start Node	Stop Node	Diameter (mm)	Length (m)	Hazen-Williams C	Flow (L/min)	Velocity (m/s)	Headloss (m)	Age (Maximum) (hours)
P-1	R-1	J-1	200.0	33	110.0	42.51	0.02	0.00	0.153
P-2	J-1	J-2	200.0	95	110.0	41.45	0.02	0.00	0.957
P-3	J-2	J-3	200.0	72	110.0	37.73	0.02	0.00	2.062
P-4	J-3	J-4	200.0	64	110.0	34.01	0.02	0.00	3.055
P-5	J-4	J-5	200.0	89	110.0	17.63	0.01	0.00	4.869
P-6	J-5	J-6	200.0	68	110.0	13.91	0.01	0.00	7.475
P-7	J-6	J-7	200.0	96	110.0	10.19	0.01	0.00	11.236
P-8	J-7	J-8	200.0	102	110.0	5.33	0.00	0.00	18.706
P-9	J-8	J-9	200.0	54	110.0	1.61	0.00	0.00	32.458
P-10	J-9	J-10	200.0	122	110.0	-2.64	0.00	0.00	36.633
P-11	J-10	J-11	200.0	123	110.0	-5.83	0.00	0.00	18.999
P-12	J-11	J-12	200.0	78	110.0	5.24	0.00	0.00	17.364
P-13	J-12	J-13	200.0	88	110.0	1.52	0.00	0.00	36.466
P-14	J-13	J-7	200.0	67	110.0	-2.20	0.00	0.00	21.717
P-15	J-11	J-14	200.0	92	110.0	-13.20	0.01	0.00	11.646
P-16	J-14	J-15	200.0	49	110.0	-13.20	0.01	0.00	8.859
P-17	J-15	J-16	200.0	49	110.0	-13.20	0.01	0.00	6.923
P-18	J-16	J-4	200.0	68	110.0	-14.79	0.01	0.00	4.750

161414396 - Arva Water Model

Active Scenario: Age (London - Interim Phase - Full Occupancy)

Current Time: 336.00 hours

Label	Elevation (m)	Demand (L/min)	Pressure (psi)	Age (Maximum) (hours)
J-1	269.50	1.06	45.8	0.404
J-2	268.87	3.72	46.7	1.610
J-3	268.78	3.72	46.9	2.614
J-4	267.10	1.59	49.3	3.595
J-5	266.93	3.72	49.5	6.242
J-6	262.80	3.72	55.4	8.807
J-7	261.70	2.66	56.9	13.765
J-8	262.40	3.72	55.9	23.748
J-9	262.57	4.25	55.7	45.939
J-10	262.50	3.19	55.8	24.583
J-11	266.58	2.13	50.0	13.515
J-12	266.49	3.72	50.1	21.313
J-13	263.22	3.72	54.8	38.756
J-14	268.24	0.00	47.6	9.876
J-15	269.21	0.00	46.3	7.941
J-16	268.35	1.59	47.5	6.005

161414396 - Arva Water Model

Active Scenario: Average Day (London - Interim Phase)

Label	Start Node	Stop Node	Diameter (mm)	Length (m)	Hazen-Williams C	Flow (L/min)	Velocity (m/s)	Headloss (m)
P-1	R-1	J-1	200.0	33	110.0	42.51	0.02	0.00
P-2	J-1	J-2	200.0	95	110.0	41.45	0.02	0.00
P-3	J-2	J-3	200.0	72	110.0	37.73	0.02	0.00
P-4	J-3	J-4	200.0	64	110.0	34.01	0.02	0.00
P-5	J-4	J-5	200.0	89	110.0	17.63	0.01	0.00
P-6	J-5	J-6	200.0	68	110.0	13.91	0.01	0.00
P-7	J-6	J-7	200.0	96	110.0	10.19	0.01	0.00
P-8	J-7	J-8	200.0	102	110.0	5.33	0.00	0.00
P-9	J-8	J-9	200.0	54	110.0	1.61	0.00	0.00
P-10	J-9	J-10	200.0	122	110.0	-2.64	0.00	0.00
P-11	J-10	J-11	200.0	123	110.0	-5.83	0.00	0.00
P-12	J-11	J-12	200.0	78	110.0	5.24	0.00	0.00
P-13	J-12	J-13	200.0	88	110.0	1.52	0.00	0.00
P-14	J-13	J-7	200.0	67	110.0	-2.20	0.00	0.00
P-15	J-11	J-14	200.0	92	110.0	-13.20	0.01	0.00
P-16	J-14	J-15	200.0	49	110.0	-13.20	0.01	0.00
P-17	J-15	J-16	200.0	49	110.0	-13.20	0.01	0.00
P-18	J-16	J-4	200.0	68	110.0	-14.79	0.01	0.00

161414396 - Arva Water Model

Active Scenario: Average Day (London - Interim Phase)

Label	Elevation (m)	Demand (L/min)	Pressure (psi)
J-1	269.50	1.06	45.8
J-2	268.87	3.72	46.7
J-3	268.78	3.72	46.9
J-4	267.10	1.59	49.3
J-5	266.93	3.72	49.5
J-6	262.80	3.72	55.4
J-7	261.70	2.66	56.9
J-8	262.40	3.72	55.9
J-9	262.57	4.25	55.7
J-10	262.50	3.19	55.8
J-11	266.58	2.13	50.0
J-12	266.49	3.72	50.1
J-13	263.22	3.72	54.8
J-14	268.24	0.00	47.6
J-15	269.21	0.00	46.3
J-16	268.35	1.59	47.5

161414396 - Arva Water Model

Active Scenario: Max Hour (London - Interim Phase)

Label	Start Node	Stop Node	Diameter (mm)	Length (m)	Hazen-Williams C	Flow (L/min)	Velocity (m/s)	Headloss (m)
P-1	R-1	J-1	200.0	33	110.0	331.58	0.18	0.01
P-2	J-1	J-2	200.0	95	110.0	323.31	0.17	0.03
P-3	J-2	J-3	200.0	72	110.0	294.29	0.16	0.02
P-4	J-3	J-4	200.0	64	110.0	265.28	0.14	0.01
P-5	J-4	J-5	200.0	89	110.0	137.48	0.07	0.01
P-6	J-5	J-6	200.0	68	110.0	108.47	0.06	0.00
P-7	J-6	J-7	200.0	96	110.0	79.45	0.04	0.00
P-8	J-7	J-8	200.0	102	110.0	41.57	0.02	0.00
P-9	J-8	J-9	200.0	54	110.0	12.55	0.01	0.00
P-10	J-9	J-10	200.0	122	110.0	-20.60	0.01	0.00
P-11	J-10	J-11	200.0	123	110.0	-45.48	0.02	0.00
P-12	J-11	J-12	200.0	78	110.0	40.90	0.02	0.00
P-13	J-12	J-13	200.0	88	110.0	11.88	0.01	0.00
P-14	J-13	J-7	200.0	67	110.0	-17.14	0.01	0.00
P-15	J-11	J-14	200.0	92	110.0	-102.99	0.05	0.00
P-16	J-14	J-15	200.0	49	110.0	-102.99	0.05	0.00
P-17	J-15	J-16	200.0	49	110.0	-102.99	0.05	0.00
P-18	J-16	J-4	200.0	68	110.0	-115.39	0.06	0.00

161414396 - Arva Water Model

Active Scenario: Max Hour (London - Interim Phase)

Label	Elevation (m)	Demand (L/min)	Pressure (psi)
J-1	269.50	8.27	45.8
J-2	268.87	29.02	46.7
J-3	268.78	29.02	46.8
J-4	267.10	12.40	49.2
J-5	266.93	29.02	49.4
J-6	262.80	29.02	55.3
J-7	261.70	20.75	56.8
J-8	262.40	29.02	55.8
J-9	262.57	33.15	55.6
J-10	262.50	24.88	55.7
J-11	266.58	16.61	49.9
J-12	266.49	29.02	50.0
J-13	263.22	29.02	54.7
J-14	268.24	0.00	47.5
J-15	269.21	0.00	46.2
J-16	268.35	12.40	47.4

161414396 - Arva Water Model

Active Scenario: Max Day + Fire @76 L/s (London - Interim Phase)

Label	Flow (Total Available) (L/min)	Junction w/ Minimum Pressure (System)	Pipe w/ Maximum Velocity	Pressure (Calculated Residual) (psi)	Velocity of Maximum Pipe (m/s)	Pressure (Calculated System Lower Limit) (psi)
J-9	4,574.87	J-15	P-1	33.8	2.50	29.4
J-2	4,573.02	J-15	P-1	39.4	2.50	38.9
J-3	4,573.02	J-15	P-1	35.4	2.50	34.8
J-5	4,573.02	J-15	P-1	31.8	2.50	30.6
J-6	4,573.02	J-15	P-1	36.6	2.50	30.2
J-8	4,573.02	J-15	P-1	34.5	2.50	29.5
J-12	4,573.02	J-15	P-1	29.5	2.50	29.4
J-13	4,573.02	J-15	P-1	34.2	2.50	29.5
J-10	4,571.16	J-15	P-1	34.1	2.50	29.4
J-7	4,569.31	J-15	P-1	37.4	2.50	29.7
J-11	4,567.45	J-15	P-1	30.4	2.50	29.2
J-4	4,565.56	J-15	P-1	34.2	2.50	31.2
J-16	4,565.56	J-15	P-1	30.2	2.50	29.2
J-1	4,563.71	J-15	P-1	44.0	2.50	44.4
J-14	4,560.00	J-15	P-1	28.8	2.50	28.5
J-15	4,560.00	J-14	P-1	28.1	2.50	29.7

161414396 - Arva Water Model

Active Scenario: Max Day + Fire @2.4 m/s (London - Interim Phase)

Label	Flow (Total Available) (L/min)	Junction w/ Minimum Pressure (System)	Pipe w/ Maximum Velocity	Pressure (Calculated Residual) (psi)	Velocity of Maximum Pipe (m/s)	Pressure (Calculated System Lower Limit) (psi)
J-9	4,397.52	J-15	P-1	35.3	2.40	30.6
J-2	4,395.67	J-15	P-1	39.9	2.40	39.4
J-3	4,395.67	J-15	P-1	36.2	2.40	35.6
J-5	4,395.67	J-15	P-1	33.0	2.40	31.6
J-6	4,395.67	J-15	P-1	37.9	2.40	31.3
J-8	4,395.67	J-15	P-1	35.9	2.40	30.6
J-12	4,395.67	J-15	P-1	30.9	2.40	30.5
J-13	4,395.67	J-15	P-1	35.6	2.40	30.6
J-10	4,393.81	J-15	P-1	35.6	2.40	30.5
J-7	4,391.96	J-15	P-1	38.7	2.40	30.8
J-11	4,390.10	J-15	P-1	31.8	2.40	30.3
J-4	4,388.21	J-15	P-1	35.3	2.40	32.3
J-16	4,388.21	J-15	P-1	31.4	2.40	30.4
J-1	4,386.36	J-15	P-1	44.1	2.40	44.5
J-15	4,382.65	J-14	P-1	29.3	2.40	31.0
J-14	4,382.65	J-15	P-1	30.1	2.40	29.7

161414396 - Arva Water Model

Active Scenario: Age (Arva - Interim Phase - Prior Occupancy)

Current Time: 336.00 hours

Label	Start Node	Stop Node	Diameter (mm)	Length (m)	Hazen-Williams C	Flow (L/min)	Velocity (m/s)	Headloss (m)	Age (Maximum) (hours)
P-1	R-1	J-1	200.0	33	110.0	25.00	0.01	0.00	0.294
P-2	J-1	J-2	200.0	95	110.0	25.00	0.01	0.00	1.637
P-3	J-2	J-3	200.0	72	110.0	25.00	0.01	0.00	3.394
P-4	J-3	J-4	200.0	64	110.0	25.00	0.01	0.00	4.819
P-5	J-4	J-5	200.0	89	110.0	10.80	0.01	0.00	7.646
P-6	J-5	J-6	200.0	68	110.0	10.80	0.01	0.00	11.458
P-7	J-6	J-7	200.0	96	110.0	10.80	0.01	0.00	15.448
P-8	J-7	J-8	200.0	102	110.0	7.60	0.00	0.00	21.284
P-9	J-8	J-9	200.0	54	110.0	7.60	0.00	0.00	26.635
P-10	J-9	J-10	200.0	122	110.0	-4.90	0.00	0.00	70.153
P-11	J-10	J-11	200.0	123	110.0	-4.90	0.00	0.00	57.034
P-12	J-11	J-12	200.0	78	110.0	-3.19	0.00	0.00	49.684
P-13	J-12	J-13	200.0	88	110.0	-3.19	0.00	0.00	36.039
P-14	J-13	J-7	200.0	67	110.0	-3.19	0.00	0.00	23.289
P-15	J-11	J-14	200.0	92	110.0	-1.70	0.00	0.00	25.723
P-16	J-14	J-15	200.0	49	110.0	-14.20	0.01	0.00	10.697
P-17	J-15	J-16	200.0	49	110.0	-14.20	0.01	0.00	8.897
P-18	J-16	J-4	200.0	68	110.0	-14.20	0.01	0.00	6.742

161414396 - Arva Water Model

Active Scenario: Age (Arva - Interim Phase - Prior Occupancy)

Current Time: 336.00 hours

Label	Elevation (m)	Demand (L/min)	Pressure (psi)	Age (Maximum) (hours)
J-1	269.50	0.00	45.8	0.687
J-2	268.87	0.00	46.7	2.687
J-3	268.78	0.00	46.9	4.201
J-4	267.10	0.00	49.3	5.536
J-5	266.93	0.00	49.5	9.857
J-6	262.80	0.00	55.4	13.160
J-7	261.70	0.00	56.9	17.836
J-8	262.40	0.00	55.9	24.832
J-9	262.57	12.50	55.7	47.413
J-10	262.50	0.00	55.8	63.675
J-11	266.58	0.00	50.0	50.493
J-12	266.49	0.00	50.1	43.336
J-13	263.22	0.00	54.8	28.841
J-14	268.24	12.50	47.6	11.646
J-15	269.21	0.00	46.3	9.847
J-16	268.35	0.00	47.5	8.047

161414396 - Arva Water Model

Active Scenario: Age (Arva - Interim Phase - Full Occupancy)

Current Time: 336.00 hours

Label	Start Node	Stop Node	Diameter (mm)	Length (m)	Hazen-Williams C	Flow (L/min)	Velocity (m/s)	Headloss (m)	Age (Maximum) (hours)
P-1	R-1	J-1	200.0	33	110.0	58.32	0.03	0.00	0.098
P-2	J-1	J-2	200.0	95	110.0	56.86	0.03	0.00	0.685
P-3	J-2	J-3	200.0	72	110.0	51.76	0.03	0.00	1.491
P-4	J-3	J-4	200.0	64	110.0	46.66	0.02	0.00	2.214
P-5	J-4	J-5	200.0	89	110.0	24.17	0.01	0.00	3.536
P-6	J-5	J-6	200.0	68	110.0	19.07	0.01	0.00	5.436
P-7	J-6	J-7	200.0	96	110.0	13.97	0.01	0.00	8.178
P-8	J-7	J-8	200.0	102	110.0	7.31	0.00	0.00	13.624
P-9	J-8	J-9	200.0	54	110.0	2.21	0.00	0.00	23.638
P-10	J-9	J-10	200.0	122	110.0	-3.62	0.00	0.00	26.701
P-11	J-10	J-11	200.0	123	110.0	-8.00	0.00	0.00	13.838
P-12	J-11	J-12	200.0	78	110.0	7.19	0.00	0.00	12.648
P-13	J-12	J-13	200.0	88	110.0	2.09	0.00	0.00	26.581
P-14	J-13	J-7	200.0	67	110.0	-3.01	0.00	0.00	15.822
P-15	J-11	J-14	200.0	92	110.0	-18.11	0.01	0.00	8.477
P-16	J-14	J-15	200.0	49	110.0	-18.11	0.01	0.00	6.445
P-17	J-15	J-16	200.0	49	110.0	-18.11	0.01	0.00	5.033
P-18	J-16	J-4	200.0	68	110.0	-20.30	0.01	0.00	3.449

161414396 - Arva Water Model

Active Scenario: Age (Arva - Interim Phase - Full Occupancy)

Current Time: 336.00 hours

Label	Elevation (m)	Demand (L/min)	Pressure (psi)	Age (Maximum) (hours)
J-1	269.50	1.46	45.8	0.295
J-2	268.87	5.10	46.7	1.174
J-3	268.78	5.10	46.9	1.906
J-4	267.10	2.19	49.3	2.620
J-5	266.93	5.10	49.5	4.551
J-6	262.80	5.10	55.4	6.421
J-7	261.70	3.65	56.9	10.035
J-8	262.40	5.10	55.9	17.312
J-9	262.57	5.83	55.7	33.489
J-10	262.50	4.38	55.8	17.921
J-11	266.58	2.92	50.0	9.854
J-12	266.49	5.10	50.1	15.541
J-13	263.22	5.10	54.8	28.264
J-14	268.24	0.00	47.6	7.200
J-15	269.21	0.00	46.3	5.789
J-16	268.35	2.19	47.5	4.377

161414396 - Arva Water Model

Active Scenario: Average Day (Arva - Interim Phase)

Label	Start Node	Stop Node	Diameter (mm)	Length (m)	Hazen-Williams C	Flow (L/min)	Velocity (m/s)	Headloss (m)
P-1	R-1	J-1	200.0	33	110.0	58.32	0.03	0.00
P-2	J-1	J-2	200.0	95	110.0	56.86	0.03	0.00
P-3	J-2	J-3	200.0	72	110.0	51.76	0.03	0.00
P-4	J-3	J-4	200.0	64	110.0	46.66	0.02	0.00
P-5	J-4	J-5	200.0	89	110.0	24.17	0.01	0.00
P-6	J-5	J-6	200.0	68	110.0	19.07	0.01	0.00
P-7	J-6	J-7	200.0	96	110.0	13.97	0.01	0.00
P-8	J-7	J-8	200.0	102	110.0	7.31	0.00	0.00
P-9	J-8	J-9	200.0	54	110.0	2.21	0.00	0.00
P-10	J-9	J-10	200.0	122	110.0	-3.62	0.00	0.00
P-11	J-10	J-11	200.0	123	110.0	-8.00	0.00	0.00
P-12	J-11	J-12	200.0	78	110.0	7.19	0.00	0.00
P-13	J-12	J-13	200.0	88	110.0	2.09	0.00	0.00
P-14	J-13	J-7	200.0	67	110.0	-3.01	0.00	0.00
P-15	J-11	J-14	200.0	92	110.0	-18.11	0.01	0.00
P-16	J-14	J-15	200.0	49	110.0	-18.11	0.01	0.00
P-17	J-15	J-16	200.0	49	110.0	-18.11	0.01	0.00
P-18	J-16	J-4	200.0	68	110.0	-20.30	0.01	0.00

161414396 - Arva Water Model

Active Scenario: Average Day (Arva - Interim Phase)

Label	Elevation (m)	Demand (L/min)	Pressure (psi)
J-1	269.50	1.46	45.8
J-2	268.87	5.10	46.7
J-3	268.78	5.10	46.9
J-4	267.10	2.19	49.3
J-5	266.93	5.10	49.5
J-6	262.80	5.10	55.4
J-7	261.70	3.65	56.9
J-8	262.40	5.10	55.9
J-9	262.57	5.83	55.7
J-10	262.50	4.38	55.8
J-11	266.58	2.92	50.0
J-12	266.49	5.10	50.1
J-13	263.22	5.10	54.8
J-14	268.24	0.00	47.6
J-15	269.21	0.00	46.3
J-16	268.35	2.19	47.5

161414396 - Arva Water Model

Active Scenario: Max Hour (Arva - Interim Phase)

Label	Start Node	Stop Node	Diameter (mm)	Length (m)	Hazen-Williams C	Flow (L/min)	Velocity (m/s)	Headloss (m)
P-1	R-1	J-1	200.0	33	110.0	218.70	0.12	0.00
P-2	J-1	J-2	200.0	95	110.0	213.23	0.11	0.01
P-3	J-2	J-3	200.0	72	110.0	194.10	0.10	0.01
P-4	J-3	J-4	200.0	64	110.0	174.98	0.09	0.01
P-5	J-4	J-5	200.0	89	110.0	90.65	0.05	0.00
P-6	J-5	J-6	200.0	68	110.0	71.52	0.04	0.00
P-7	J-6	J-7	200.0	96	110.0	52.40	0.03	0.00
P-8	J-7	J-8	200.0	102	110.0	27.41	0.01	0.00
P-9	J-8	J-9	200.0	54	110.0	8.29	0.00	0.00
P-10	J-9	J-10	200.0	122	110.0	-13.57	0.01	0.00
P-11	J-10	J-11	200.0	123	110.0	-30.00	0.02	0.00
P-12	J-11	J-12	200.0	78	110.0	26.96	0.01	0.00
P-13	J-12	J-13	200.0	88	110.0	7.83	0.00	0.00
P-14	J-13	J-7	200.0	67	110.0	-11.29	0.01	0.00
P-15	J-11	J-14	200.0	92	110.0	-67.90	0.04	0.00
P-16	J-14	J-15	200.0	49	110.0	-67.90	0.04	0.00
P-17	J-15	J-16	200.0	49	110.0	-67.90	0.04	0.00
P-18	J-16	J-4	200.0	68	110.0	-76.12	0.04	0.00

161414396 - Arva Water Model

Active Scenario: Max Hour (Arva - Interim Phase)

Label	Elevation (m)	Demand (L/min)	Pressure (psi)
J-1	269.50	5.48	45.8
J-2	268.87	19.12	46.7
J-3	268.78	19.12	46.8
J-4	267.10	8.21	49.2
J-5	266.93	19.12	49.4
J-6	262.80	19.12	55.3
J-7	261.70	13.69	56.9
J-8	262.40	19.12	55.9
J-9	262.57	21.86	55.6
J-10	262.50	16.43	55.7
J-11	266.58	10.95	49.9
J-12	266.49	19.12	50.1
J-13	263.22	19.12	54.7
J-14	268.24	0.00	47.6
J-15	269.21	0.00	46.2
J-16	268.35	8.21	47.4

161414396 - Arva Water Model

Active Scenario: Max Day + Fire @76 L/s (Arva - Interim Phase)

Label	Flow (Total Available) (L/min)	Junction w/ Minimum Pressure (System)	Pipe w/ Maximum Velocity	Pressure (Calculated Residual) (psi)	Velocity of Maximum Pipe (m/s)	Pressure (Calculated System Lower Limit) (psi)
J-9	4,574.57	J-15	P-1	33.8	2.50	29.5
J-2	4,572.75	J-15	P-1	39.4	2.50	38.9
J-3	4,572.75	J-15	P-1	35.4	2.50	34.8
J-5	4,572.75	J-15	P-1	31.8	2.50	30.6
J-6	4,572.75	J-15	P-1	36.6	2.50	30.2
J-8	4,572.75	J-15	P-1	34.5	2.50	29.5
J-12	4,572.75	J-15	P-1	29.5	2.50	29.4
J-13	4,572.75	J-15	P-1	34.2	2.50	29.5
J-10	4,570.95	J-15	P-1	34.1	2.50	29.4
J-7	4,569.13	J-15	P-1	37.4	2.50	29.7
J-11	4,567.30	J-15	P-1	30.5	2.50	29.2
J-4	4,565.47	J-15	P-1	34.2	2.50	31.2
J-16	4,565.47	J-15	P-1	30.3	2.50	29.2
J-1	4,563.65	J-15	P-1	44.0	2.50	44.4
J-14	4,560.00	J-15	P-1	28.8	2.50	28.5
J-15	4,560.00	J-14	P-1	28.1	2.50	29.7

161414396 - Arva Water Model

Active Scenario: Max Day + Fire @2.4 m/s (Arva - Interim Phase)

Label	Flow (Total Available) (L/min)	Junction w/ Minimum Pressure (System)	Pipe w/ Maximum Velocity	Pressure (Calculated Residual) (psi)	Velocity of Maximum Pipe (m/s)	Pressure (Calculated System Lower Limit) (psi)
J-9	4,400.21	J-15	P-1	35.3	2.40	30.6
J-2	4,398.38	J-15	P-1	39.9	2.40	39.4
J-3	4,398.38	J-15	P-1	36.2	2.40	35.6
J-5	4,398.38	J-15	P-1	33.0	2.40	31.6
J-6	4,398.38	J-15	P-1	37.8	2.40	31.3
J-8	4,398.38	J-15	P-1	35.9	2.40	30.6
J-12	4,398.38	J-15	P-1	30.9	2.40	30.5
J-13	4,398.38	J-15	P-1	35.6	2.40	30.6
J-10	4,396.58	J-15	P-1	35.6	2.40	30.5
J-7	4,394.76	J-15	P-1	38.7	2.40	30.8
J-11	4,392.93	J-15	P-1	31.8	2.40	30.3
J-4	4,391.11	J-15	P-1	35.3	2.40	32.3
J-16	4,391.11	J-15	P-1	31.4	2.40	30.4
J-1	4,389.28	J-15	P-1	44.1	2.40	44.5
J-14	4,385.63	J-15	P-1	30.1	2.40	29.7
J-15	4,385.63	J-14	P-1	29.3	2.40	31.0