

**Kilbourne Subdivision
Water Servicing Report**



Prepared for:
York Developments

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Sign-off Sheet

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1.0 WATER SERVICING REPORT

The following report describes the watermain infrastructure that will be required to service the proposed Kilbourne Subdivision located in the southwestern portion of the City of London. The development is generally bounded by the Bostwick Subdivision and Southdale Road to the north, Wonderland Commercial lands and Wonderland Road to the east, Bostwick Road and Wharncliffe Road to the south, and Bostwick Road the west.

1.1 EXTERNAL WATER SERVICING REQUIREMENTS

The Kilbourne Subdivision will incorporate connections from both the high-level and low-level water supply systems in the area. There is an existing 400mm PVC high-level watermain along Southdale Road West which is anticipated to be extended along Bostwick Road; from Southdale Road to 150 meters south of Pack Road, as per the City of London One Water Growth Servicing DC Study 2019 attached in Appendix B. The implementation year for this work is scheduled in 2025. Therefore, the Kilbourne Subdivision at full build-out is anticipated to utilize this high-level water system which has a hydraulic-grade-line (HGL) of 335.0 m.

The Bostwick Subdivision to the north will include a looped 250 mm watermain extended from the high-level system along Southdale Road West. This looped system is anticipated to be available prior to the construction of the Kilbourne Subdivision, and thus will be extended along Future Street 'A' to provide water supply to the proposed development.

The existing low-level system along Wonderland Road and Wharncliffe Road will also be utilized as a water supply source for the Kilbourne Subdivision. During Phase 1 of the Subdivision, it is anticipated that only the low-level system (Hydraulic Grade Line of 301.8m) will be utilized. Future Phases will incorporate the high-level system, connection points and interconnections between the high-level and low-level system is further detailed in this report.

1.2 CAPACITY REQUIREMENTS

The minimum pressure requirements for this development for average day demand and peak hour demand of 40psi or 28.16m H₂O, and for maximum day plus fire demand of 20psi or 14.08 m H₂O, are provided in accordance with City of London standards. The fire demand analysis was done at all junctions within the system, to ensure that fire supply will be available throughout the system when fire hydrant locations are set in the detailed design stage. There is also a required 72-hour maximum turnover period of water in all pipes that is attained during average day demand conditions. Detailed results from modeling, supporting this, have been included in Appendix A. Figures and Tables in Appendix B show the areas and the population calculation for the demand at each junction for the development.

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The proposed water system is modelled in accordance with the City of London standards, as summarized herein.

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

The minimum pressure requirements for this development for average day demand and peak hour demand of 40psi or 28.16m H₂O, and for maximum day plus fire demand of 20psi or 14.08 m H₂O, are provided in accordance with City of London standards. The fire demand analysis was done at all junctions as locations of fire hydrant are yet to be determined in the detailed design stage.

In accordance with City of London common design practice, a conservative fire flow demand required for the single-family lots is 4,560 L/min (76 L/s). The fire flow requirement for the single-family lots were estimated using the "Water Supply for Public Fire Protection - A Guide to Recommended Practice" prepared by Fire Underwriters Survey Insurers' Advisory Organization (F.U.S.). For medium density blocks and high density blocks a conservative fire flow of 6,300 L/min (105 L/s) and 9,000 L/min (150 L/s) respectively, can be initially assumed. During Site Plan Approval process water servicing design for the medium density blocks and high density blocks will occur confirming adequate water supply for fire protection in accordance with the Ontario Building Code and the City of London Standards.

There is also a required 72-hour maximum turnover period of water in all pipes that is attained during average day demand conditions. Detailed results from modeling, supporting this, have been included in Appendix A.

1.3 SUBDIVISION PHASING

The development is planned to progress in four major stages, with phasing limits to be determined. The first phase is anticipated to encompass the southeastern limit of the development which includes an access easement to Wharncliffe Road for the purpose of providing a sanitary connection, this easement will also be utilized as a secondary watermain connection point to the existing 600mm diameter low-level watermain along Wharncliffe Road for looping purposes. The primary watermain connection will include the tie-in into the Wonderland Road existing 600mm low-level PVC watermain, through the future Kilbourne Road right-of-way (ROW) crossing into the Wonderland Commercial Development to the east.

The remaining Phases of the development will utilize connections to the high-level system for water supply. This includes the connection into the existing 250mm watermain at the northern limit of the development through 'Street A' / Yorkville Street. This is serviced by the 400mm PVC watermain along Southdale Road. Two additional connections will be made through the future (2025) high-level system Bostick Road watermain. One connection will be made from the Bostwick Road and the Proposed Bradley Avenue intersection. The other connection will be from the W3 Subdivision from the west through 'Street J'. The W3 subdivision watermain will ultimately

be serviced by the Bostwick Road watermain through the Westwind's Subdivision, just north of the W3 Subdivision.

The extension of the Phase 1 low-level watermain will require periodic and appropriate number of interconnections between the high-level and low-level system, this will be complete through the installation of a checked connection between the systems. The interconnections will be sized in order to provide adequate water supply under all situations including emergency scenarios. Emergency conditions are further detailed in Section 1.8 of this report.

This report and appended modeling results consider ultimate condition with full-build out of subdivision. The ultimate capacity requirements are based on the Proposed Draft Plan of Subdivision completed by MHBC. The unit counts provided by MHBC have been utilized to estimate a population for each block. Populations and junction breakdown demands are included in a table in Appendix B. The population densities are in accordance with the City of London DSRM and are stated below:

- Low density @ 3 people/unit
- Medium Density @ 2.4 people/unit
- High Density @ 1.6 people/unit

Corresponding water reports and modeling will be included in support of detailed design of each phase of development.

1.4 CONSTRUCTION OF EXTERNAL WORKS

External works are required for the servicing of the proposed development. This includes 880 m of 300 mm high-level watermain along Bostwick Road to 150 m south of Pack Road as identified in Table 2.1 of the One Water – Growth Servicing DC Study 2019, attached in Appendix B. It is also anticipated that Road works will be complete in this area, which includes the re-alignment of Pack Road to connect to the future proposed Bradley Avenue via roundabout. Extension of the Bostwick watermain to service the Westwind and W3 Subdivisions is required to complete the watermain loop into the Kilbourne Subdivision through Street 'J'. This is anticipated to be readily available at the time of construction of the Kilbourne Subdivision future phase.

1.5 OVERSIZING OF WATERMAIN

The proposed watermain system in the ultimate condition may be initially oversized at some locations due to conservative approaches taken such as the supply of fire flow through the entirety of the system due to the uncertainty of fire hydrant locations at this stage. However, during the detailed design stage of each phase, the watermain system will be re-modelled to portray a more accurate representation of the system including all demand scenarios and extensions into medium and/or high-density blocks. Nonetheless, the proposed watermain system is deemed adequate with future internal upgrades to be confirmed.

1.6 WATER QUALITY

With the ultimate build-out of the subdivision, water quality issues are not anticipated. As such, a three (3) day turnover under average day demand is achieved. However, we anticipate that automatic flushing devices will be required prior to occupancy and at dead-ends near future phase limits. These locations will be identified at the design of each phase including the appropriate size of the automatic flushing device (25mm or 50mm) and flushing calculations. The City of London has primary responsibility to ensure that the minimum chlorine residuals are maintained in the watermain system and therefore reserve the right to require additional watermain looping and/or automatic flushing devices to facilitate the maintenance of the required chlorine residual under the Safe Drinking Water Act.

Moreover, there are limitations to the modeling, and it should be noted that there are pipes in the age analysis scenario that indicate turnover within 72 hours is not achieved. This is a result of that watermain segment being connected to the low-level system and controlled with a check valve. The check-valve chamber will include a bypass that will be designed to provide the necessary cross flow between the high and low level system to maintain water quality. Therefore, no water quality issues are anticipated in those pipes.

1.7 PRESSURE REDUCING VALVES

Pressure reducing valves are required in areas of the City where pressures in the supply mains exceed 80 psi. With the main source of supply being the high-level system (with a hydraulic-grade-line of 335.0 m), pressures are anticipated to exceed 80 psi. As a result, pressure reducing valves are required in these areas. Currently the model utilizes existing topography grades at the junctions and with double check valve assemblies at the connection points into the low-level system. Therefore, during detailed design of each phase, proposed ground elevations shall be used with double check valve assemblies relocated at the limit of development which cannot be serviced by the low-level system, to indicate an accurate representation of the proposed system's pressures. A summary of the location of lots and/or blocks to be equipped with pressure reducing valves will be presented and incorporated with the detailed design drawings.

1.8 EMERGENCY CONDITION

An emergency condition considering a failure of the high-level system has been provided to indicate the water pressures available during that condition. During this scenario a simultaneous break in the following pipes are considered:

- PIPE-1; connected to the high-level system through the Bostwick Subdivision
- PIPE-11 & PIPE-12; connected to the high-level system through the future Bostwick Road watermain.

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- PIPE-65; connected to the high-level system through the future W3 phase 2 Subdivision and ultimately the Bostwick Road watermain.

The scenarios modelled include maximum hour demand and maximum day plus fire flow scenarios under ultimate buildout conditions of the Kilbourne Subdivision, supplied by the low-level system with a HGL of 301.8 m at Wonderland Road South (modeled through reservoirs R-7 & R-8) and Wharncliffe Road South (modeled through reservoir R-9).

As indicated in the results found in Appendix A, majority of areas experience lower than standard pressures and velocities greater than the allowable maximum during the maximum hour scenario for two pipe segments. Fire protection is satisfactory under this emergency condition and hydrants within Kilbourne Subdivision should be expected to operate at or above the minimum pressure requirements. Velocity in the pipes under fire flow scenario is anticipated to exceed 2.4 m/s, this is assumed acceptable in order to avoid up-sizing of watermain to address rare emergency condition.

1.9 CONCLUSION

The Kilbourne Subdivision located in the south-western quadrant of the City of London will be serviced from the high-level system during ultimate condition, with additional checked connections to the low-level system for looping and emergency condition purposes. As shown in the modeling results, all areas of the development will have criteria that meet the City of London standards under the various demand scenarios during full build-out.

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

Sincerely,

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**KILBOURNE SUBDIVISION
WATER SERVICING REPORT**

Appendix A
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APPENDIX A

- Water Model Results Summary Full Build-out (Average Day, Max Hour, Fire Flow)
 - Water Model Results Summary (Emergency Condition)

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Active Scenario: Average Day

Label	Length (m)	Start Node	Stop Node	Diameter (mm)	Hazen- Williams C	Flow (L/min)	Velocity (m/s)
P-1	66	R-1	J-1	250.0	110.0	416.47	0.14
P-2	27	J-1	HYD-1	250.0	110.0	392.21	0.13
P-3	44	HYD-1	J-3	250.0	110.0	392.21	0.13
P-4	13	J-3	J-4	200.0	110.0	70.66	0.04
P-5	34	J-1	J-5	200.0	110.0	21.25	0.01
P-6	86	J-3	J-6	250.0	110.0	317.30	0.11
P-7	76	J-6	J-7	250.0	110.0	230.09	0.08
P-8	62	J-7	J-8	250.0	110.0	-5.25	0.00
P-9	243	J-8	J-9	250.0	110.0	-52.53	0.02
P-10	36	J-9	J-10	250.0	110.0	-263.97	0.09
P-11	46	J-10	J-11	250.0	110.0	-268.93	0.09
P-12	72	J-11	J-12	250.0	110.0	-318.16	0.11
P-13	46	J-12	HYD-2	250.0	110.0	-361.19	0.12
P-14	34	HYD-2	J-13	250.0	110.0	-361.19	0.12
P-15	25	J-13	J-15	200.0	110.0	56.49	0.03
P-16	28	J-13	J-16	250.0	110.0	-417.68	0.14
P-17	32	J-16	R-2	250.0	110.0	-420.87	0.14
P-18	20	R-3	HYD-3	600.0	120.0	2.20	0.00
P-19	27	HYD-3	R-4	600.0	120.0	2.20	0.00
P-20	27	R-5	J-17	300.0	120.0	40.35	0.01
P-21	24	J-17	R-6	300.0	120.0	-42.71	0.01
P-22	32	J-17	J-18	200.0	110.0	73.14	0.04
PIPE-1	135	J-7	K-1	250.0	110.0	124.49	0.04
PIPE-2	82	K-1	K-2	250.0	110.0	92.61	0.03
PIPE-3	30	K-2	K-3	250.0	110.0	74.19	0.03
PIPE-4	113	K-3	K-4	250.0	110.0	42.31	0.01
PIPE-5	97	K-4	K-5	250.0	110.0	3.17	0.00
PIPE-6	190	K-5	K-6	250.0	110.0	-338.55	0.11
PIPE-7	146	K-6	K-7	250.0	110.0	-160.96	0.05
PIPE-8	243	K-7	K-8	250.0	110.0	-167.87	0.06
PIPE-9	184	K-6	K-9	250.0	110.0	-190.34	0.06
PIPE-10	75	K-10	K-9	250.0	110.0	295.35	0.10
PIPE-11	154	K-10	K-8	300.0	120.0	187.88	0.04
PIPE-12	63	K-5	K-11	250.0	110.0	335.70	0.11
PIPE-12	38	R-10	K-10	300.0	120.0	483.23	0.11
PIPE-13	62	K-11	K-12	250.0	110.0	322.95	0.11
PIPE-14	93	K-12	K-13	250.0	110.0	319.05	0.11
PIPE-15	113	K-13	K-14	250.0	110.0	116.54	0.04
PIPE-16	60	K-14	K-15	250.0	110.0	108.57	0.04
PIPE-17	87	K-15	K-16	250.0	110.0	100.78	0.03
PIPE-18	52	K-16	K-17	250.0	110.0	93.52	0.03
PIPE-19	92	K-17	K-18	250.0	110.0	72.98	0.02
PIPE-20	62	K-18	K-19	250.0	110.0	-94.63	0.03
PIPE-21	69	K-19	K-20	250.0	110.0	-100.47	0.03
PIPE-22	78	K-20	K-13	250.0	110.0	-198.79	0.07
PIPE-23	61	K-20	K-21	250.0	110.0	89.83	0.03
PIPE-24	154	K-21	K-22	250.0	110.0	79.20	0.03

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Active Scenario: Average Day

Label	Length (m)	Start Node	Stop Node	Diameter (mm)	Hazen- Williams C	Flow (L/min)	Velocity (m/s)
PIPE-25	90	K-22	K-23	250.0	110.0	42.63	0.01
PIPE-26	183	K-23	K-24	250.0	110.0	26.16	0.01
PIPE-27	97	K-24	K-25	250.0	110.0	18.19	0.01
PIPE-28	58	K-25	K-26	250.0	110.0	-68.53	0.02
PIPE-29	87	K-26	K-22	250.0	110.0	-29.65	0.01
PIPE-30	81	K-26	K-27	250.0	110.0	-45.79	0.02
PIPE-31	53	K-27	K-18	250.0	110.0	-50.04	0.02
PIPE-32	90	K-28	K-18	250.0	110.0	-113.84	0.04
PIPE-33	81	K-25	K-28	250.0	110.0	78.58	0.03
PIPE-34	127	K-28	K-29	250.0	110.0	39.95	0.01
PIPE-35	377	K-30	K-29	250.0	110.0	0.00	0.00
PIPE-36	42	K-51	K-30	250.0	110.0	0.00	0.00
PIPE-37	38	K-51	R-7	600.0	120.0	0.04	0.00
PIPE-38	39	K-51	R-8	600.0	120.0	-0.04	0.00
PIPE-39	160	K-29	K-31	250.0	110.0	-11.35	0.00
PIPE-40	47	K-31	K-32	250.0	110.0	-15.60	0.01
PIPE-41	87	K-32	K-33	250.0	110.0	73.73	0.03
PIPE-42	141	K-33	K-34	250.0	110.0	48.05	0.02
PIPE-43	86	K-34	K-35	250.0	110.0	34.41	0.01
PIPE-44	46	K-35	K-36	250.0	110.0	25.02	0.01
PIPE-45	151	K-37	K-36	250.0	110.0	0.00	0.00
PIPE-46	20	K-52	K-37	250.0	110.0	0.00	0.00
PIPE-47	33	K-52	R-9	600.0	120.0	0.00	0.00
PIPE-48	94	K-36	K-38	250.0	110.0	-6.15	0.00
PIPE-49	58	K-38	K-39	250.0	110.0	-8.81	0.00
PIPE-50	51	K-39	K-40	250.0	110.0	-62.47	0.02
PIPE-51	134	K-40	K-32	250.0	110.0	-75.22	0.03
PIPE-52	72	K-32	K-41	250.0	110.0	-167.57	0.06
PIPE-53	43	K-41	K-42	250.0	110.0	-180.85	0.06
PIPE-54	130	K-42	K-43	250.0	110.0	119.94	0.04
PIPE-55	134	K-43	K-29	250.0	110.0	101.17	0.03
PIPE-56	206	K-42	K-44	250.0	110.0	-315.30	0.11
PIPE-57	79	K-44	K-45	250.0	110.0	-146.65	0.05
PIPE-58	81	K-45	K-46	250.0	110.0	-163.83	0.06
PIPE-59	140	K-46	K-47	250.0	110.0	-174.99	0.06
PIPE-60	94	K-48	K-47	250.0	110.0	-185.66	0.06
PIPE-61	159	K-44	K-48	250.0	110.0	-177.69	0.06
PIPE-62	111	K-47	K-49	250.0	110.0	-371.27	0.13
PIPE-63	41	K-49	K-50	250.0	110.0	-374.99	0.13
PIPE-64	52	K-50	K-51	250.0	110.0	-420.50	0.14
PIPE-65	53	R-11	K-51	300.0	120.0	540.39	0.13

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Active Scenario: Average Day

Label	Elevation (m)	Demand (L/min)	Pressure (psi)
HYD-1	274.56	0.00	85.8
HYD-2	274.00	0.00	86.6
HYD-3	273.52	0.00	40.1
J-1	274.10	3.01	86.4
J-3	274.50	4.25	85.8
J-4	275.10	70.66	85.0
J-5	274.40	21.25	86.0
J-6	274.34	87.21	86.1
J-7	273.76	110.85	86.9
J-8	273.00	47.28	88.0
J-9	273.30	211.44	87.5
J-10	273.03	4.96	87.9
J-11	273.01	49.23	88.0
J-12	273.03	43.03	87.9
J-13	273.51	0.00	87.3
J-15	275.00	56.49	85.2
J-16	273.60	3.19	87.1
J-17	275.20	9.92	84.9
J-18	275.25	73.14	84.8
K-1	273.14	31.88	87.8
K-2	272.61	18.42	88.5
K-3	272.41	31.88	88.8
K-4	271.14	39.14	90.6
K-5	270.61	6.02	91.3
K-6	273.68	12.75	87.0
K-7	274.41	6.91	86.0
K-8	274.70	20.01	85.6
K-9	273.49	105.01	87.3
K-10	274.40	0.00	86.0
K-11	270.80	12.75	91.1
K-12	271.11	3.90	90.6
K-13	271.51	3.72	90.0
K-14	271.52	7.97	90.0
K-15	271.80	7.79	89.6
K-16	272.21	7.26	89.0
K-17	272.16	20.54	89.1
K-18	272.48	3.72	88.7
K-19	272.25	5.84	89.0
K-20	271.91	8.50	89.5
K-21	272.13	10.63	89.2
K-22	272.23	6.91	89.0
K-23	271.12	16.47	90.6
K-24	270.02	7.97	92.1
K-25	271.98	8.15	89.4
K-26	272.41	6.91	88.8
K-27	272.75	4.25	88.3
K-28	271.61	152.47	89.9

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Active Scenario: Average Day

Label	Elevation (m)	Demand (L/min)	Pressure (psi)
K-29	270.47	152.47	91.5
K-30	269.65	0.00	92.7
K-31	269.01	4.25	93.6
K-32	268.64	3.01	94.1
K-33	268.10	25.68	94.9
K-34	266.74	13.64	96.8
K-35	265.84	9.39	98.1
K-36	264.93	31.17	99.4
K-37	264.29	0.00	100.3
K-38	264.76	2.66	99.6
K-39	265.64	53.66	98.4
K-40	266.49	12.75	97.2
K-41	268.12	13.28	94.9
K-42	268.02	14.52	95.0
K-43	269.22	18.77	93.3
K-44	266.59	9.03	97.1
K-45	267.00	17.18	96.5
K-46	267.44	11.16	95.8
K-47	268.65	10.63	94.1
K-48	268.07	7.97	95.0
K-49	269.85	3.72	92.5
K-50	270.44	45.51	91.6
K-51	271.05	119.89	90.8
K-51	269.55	0.00	45.8
K-52	264.20	0.00	53.4

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Active Scenario: Max Hour

Label	Length (m)	Start Node	Stop Node	Diameter (mm)	Hazen- Williams C	Flow (L/min)	Velocity (m/s)
P-1	66	R-1	J-1	250.0	110.0	3,248.47	1.10
P-2	27	J-1	HYD-1	250.0	110.0	3,059.24	1.04
P-3	44	HYD-1	J-3	250.0	110.0	3,059.24	1.04
P-4	13	J-3	J-4	200.0	110.0	551.15	0.29
P-5	34	J-1	J-5	200.0	110.0	165.75	0.09
P-6	86	J-3	J-6	250.0	110.0	2,474.94	0.84
P-7	76	J-6	J-7	250.0	110.0	1,794.70	0.61
P-8	62	J-7	J-8	250.0	110.0	-40.96	0.01
P-9	243	J-8	J-9	250.0	110.0	-409.74	0.14
P-10	36	J-9	J-10	250.0	110.0	-2,058.98	0.70
P-11	46	J-10	J-11	250.0	110.0	-2,097.67	0.71
P-12	72	J-11	J-12	250.0	110.0	-2,481.66	0.84
P-13	46	J-12	HYD-2	250.0	110.0	-2,817.29	0.96
P-14	34	HYD-2	J-13	250.0	110.0	-2,817.29	0.96
P-15	25	J-13	J-15	200.0	110.0	440.62	0.23
P-16	28	J-13	J-16	250.0	110.0	-3,257.92	1.11
P-17	32	J-16	R-2	250.0	110.0	-3,282.80	1.11
P-18	20	R-3	HYD-3	600.0	120.0	22.55	0.00
P-19	27	HYD-3	R-4	600.0	120.0	22.55	0.00
P-20	27	R-5	J-17	300.0	120.0	314.71	0.07
P-21	24	J-17	R-6	300.0	120.0	-333.16	0.08
P-22	32	J-17	J-18	200.0	110.0	570.49	0.30
PIPE-1	135	J-7	K-1	250.0	110.0	971.03	0.33
PIPE-2	82	K-1	K-2	250.0	110.0	722.37	0.25
PIPE-3	30	K-2	K-3	250.0	110.0	578.69	0.20
PIPE-4	113	K-3	K-4	250.0	110.0	330.03	0.11
PIPE-5	97	K-4	K-5	250.0	110.0	24.74	0.01
PIPE-6	190	K-5	K-6	250.0	110.0	-2,640.66	0.90
PIPE-7	146	K-6	K-7	250.0	110.0	-1,255.47	0.43
PIPE-8	243	K-7	K-8	250.0	110.0	-1,309.37	0.44
PIPE-9	184	K-6	K-9	250.0	110.0	-1,484.64	0.50
PIPE-10	75	K-10	K-9	250.0	110.0	2,303.72	0.78
PIPE-11	154	K-10	K-8	300.0	120.0	1,465.45	0.35
PIPE-12	63	K-5	K-11	250.0	110.0	2,618.44	0.89
PIPE-12	38	R-10	K-10	300.0	120.0	3,769.17	0.89
PIPE-13	62	K-11	K-12	250.0	110.0	2,518.99	0.86
PIPE-14	93	K-12	K-13	250.0	110.0	2,488.57	0.84
PIPE-15	113	K-13	K-14	250.0	110.0	908.98	0.31
PIPE-16	60	K-14	K-15	250.0	110.0	846.81	0.29
PIPE-17	87	K-15	K-16	250.0	110.0	786.05	0.27
PIPE-18	52	K-16	K-17	250.0	110.0	729.42	0.25
PIPE-19	92	K-17	K-18	250.0	110.0	569.21	0.19
PIPE-20	62	K-18	K-19	250.0	110.0	-738.07	0.25
PIPE-21	69	K-19	K-20	250.0	110.0	-783.63	0.27
PIPE-22	78	K-20	K-13	250.0	110.0	-1,550.58	0.53
PIPE-23	61	K-20	K-21	250.0	110.0	700.66	0.24
PIPE-24	154	K-21	K-22	250.0	110.0	617.74	0.21

161413971 - Kilbourne Subdivision

Active Scenario: Max Hour

Label	Length (m)	Start Node	Stop Node	Diameter (mm)	Hazen- Williams C	Flow (L/min)	Velocity (m/s)
PIPE-25	90	K-22	K-23	250.0	110.0	332.55	0.11
PIPE-26	183	K-23	K-24	250.0	110.0	204.08	0.07
PIPE-27	97	K-24	K-25	250.0	110.0	141.91	0.05
PIPE-28	58	K-25	K-26	250.0	110.0	-534.55	0.18
PIPE-29	87	K-26	K-22	250.0	110.0	-231.30	0.08
PIPE-30	81	K-26	K-27	250.0	110.0	-357.15	0.12
PIPE-31	53	K-27	K-18	250.0	110.0	-390.30	0.13
PIPE-32	90	K-28	K-18	250.0	110.0	-887.96	0.30
PIPE-33	81	K-25	K-28	250.0	110.0	612.90	0.21
PIPE-34	127	K-28	K-29	250.0	110.0	311.59	0.11
PIPE-35	377	K-30	K-29	250.0	110.0	0.00	0.00
PIPE-36	42	K-51	K-30	250.0	110.0	0.00	0.00
PIPE-37	38	K-51	R-7	600.0	120.0	0.41	0.00
PIPE-38	39	K-51	R-8	600.0	120.0	-0.41	0.00
PIPE-39	160	K-29	K-31	250.0	110.0	-88.57	0.03
PIPE-40	47	K-31	K-32	250.0	110.0	-121.72	0.04
PIPE-41	87	K-32	K-33	250.0	110.0	575.11	0.20
PIPE-42	141	K-33	K-34	250.0	110.0	374.80	0.13
PIPE-43	86	K-34	K-35	250.0	110.0	268.41	0.09
PIPE-44	46	K-35	K-36	250.0	110.0	195.17	0.07
PIPE-45	151	K-37	K-36	250.0	110.0	0.00	0.00
PIPE-46	20	K-52	K-37	250.0	110.0	0.00	0.00
PIPE-47	33	K-52	R-9	600.0	120.0	0.00	0.00
PIPE-48	94	K-36	K-38	250.0	110.0	-47.96	0.02
PIPE-49	58	K-38	K-39	250.0	110.0	-68.71	0.02
PIPE-50	51	K-39	K-40	250.0	110.0	-487.25	0.17
PIPE-51	134	K-40	K-32	250.0	110.0	-586.70	0.20
PIPE-52	72	K-32	K-41	250.0	110.0	-1,307.01	0.44
PIPE-53	43	K-41	K-42	250.0	110.0	-1,410.59	0.48
PIPE-54	130	K-42	K-43	250.0	110.0	935.51	0.32
PIPE-55	134	K-43	K-29	250.0	110.0	789.11	0.27
PIPE-56	206	K-42	K-44	250.0	110.0	-2,459.36	0.84
PIPE-57	79	K-44	K-45	250.0	110.0	-1,143.85	0.39
PIPE-58	81	K-45	K-46	250.0	110.0	-1,277.85	0.43
PIPE-59	140	K-46	K-47	250.0	110.0	-1,364.90	0.46
PIPE-60	94	K-48	K-47	250.0	110.0	-1,448.11	0.49
PIPE-61	159	K-44	K-48	250.0	110.0	-1,385.95	0.47
PIPE-62	111	K-47	K-49	250.0	110.0	-2,895.93	0.98
PIPE-63	41	K-49	K-50	250.0	110.0	-2,924.94	0.99
PIPE-64	52	K-50	K-51	250.0	110.0	-3,279.92	1.11
PIPE-65	53	R-11	K-51	300.0	120.0	4,215.06	0.99

161413971 - Kilbourne Subdivision

Active Scenario: Max Hour

Label	Elevation (m)	Demand (L/min)	Pressure (psi)
HYD-1	274.56	0.00	84.9
HYD-2	274.00	0.00	85.7
HYD-3	273.52	0.00	40.1
J-1	274.10	23.48	85.8
J-3	274.50	33.15	84.6
J-4	275.10	551.15	83.8
J-5	274.40	165.75	85.4
J-6	274.34	680.24	84.3
J-7	273.76	864.63	84.9
J-8	273.00	368.78	86.0
J-9	273.30	1,649.23	85.6
J-10	273.03	38.69	86.2
J-11	273.01	383.99	86.4
J-12	273.03	335.63	86.8
J-13	273.51	0.00	86.7
J-15	275.00	440.62	84.6
J-16	273.60	24.88	86.8
J-17	275.20	77.38	84.9
J-18	275.25	570.49	84.8
K-1	273.14	248.66	85.7
K-2	272.61	143.68	86.4
K-3	272.41	248.66	86.6
K-4	271.14	305.29	88.4
K-5	270.61	46.96	89.2
K-6	273.68	99.45	86.1
K-7	274.41	53.90	85.3
K-8	274.70	156.08	85.3
K-9	273.49	819.08	86.8
K-10	274.40	0.00	85.9
K-11	270.80	99.45	88.5
K-12	271.11	30.42	87.7
K-13	271.51	29.02	86.6
K-14	271.52	62.17	86.4
K-15	271.80	60.76	86.0
K-16	272.21	56.63	85.4
K-17	272.16	160.21	85.4
K-18	272.48	29.02	84.9
K-19	272.25	45.55	85.3
K-20	271.91	66.30	85.8
K-21	272.13	82.91	85.4
K-22	272.23	53.90	85.2
K-23	271.12	128.47	86.8
K-24	270.02	62.17	88.3
K-25	271.98	63.57	85.6
K-26	272.41	53.90	85.0
K-27	272.75	33.15	84.5
K-28	271.61	1,189.27	86.0

161413971 - Kilbourne Subdivision

Active Scenario: Max Hour

Label	Elevation (m)	Demand (L/min)	Pressure (psi)
K-29	270.47	1,189.27	87.7
K-30	269.65	0.00	88.8
K-31	269.01	33.15	89.7
K-32	268.64	23.48	90.3
K-33	268.10	200.30	91.0
K-34	266.74	106.39	92.9
K-35	265.84	73.24	94.2
K-36	264.93	243.13	95.5
K-37	264.29	0.00	96.4
K-38	264.76	20.75	95.7
K-39	265.64	418.55	94.4
K-40	266.49	99.45	93.2
K-41	268.12	103.58	91.1
K-42	268.02	113.26	91.4
K-43	269.22	146.41	89.5
K-44	266.59	70.43	94.6
K-45	267.00	134.00	94.1
K-46	267.44	87.05	93.6
K-47	268.65	82.91	92.2
K-48	268.07	62.17	92.8
K-49	269.85	29.02	91.3
K-50	270.44	354.98	90.8
K-51	271.05	935.14	90.5
K-51	269.55	0.00	45.8
K-52	264.20	0.00	53.4

161413971 - Kilbourne Subdivision
Active Scenario: Design Fire Flow

Label	Fire Flow (Available) (L/min)	Pressure (Residual Lower Limit) (psi)	Pressure (psi)	Junction w/ Minimum Pressure (System)	Pipe w/ Maximum Velocity	Velocity of Maximum Pipe (m/s)
HYD-1	8,861.41	20.0	85.6	HYD-3	P-1	2.40
HYD-2	8,080.45	20.0	86.4	HYD-3	P-17	2.40
HYD-3	75,285.82	20.0	40.1	K-51	P-18	2.40
J-1	8,213.63	20.0	86.3	HYD-3	P-1	2.40
J-3	9,822.17	20.0	85.6	HYD-3	P-1	2.40
J-4	4,276.57	20.0	84.7	HYD-3	P-4	2.40
J-5	4,449.61	20.0	85.9	HYD-3	P-5	2.40
J-6	11,726.84	20.0	85.7	HYD-3	P-1	2.40
J-7	13,977.52	20.0	86.5	HYD-3	P-1	2.40
J-8	10,763.69	20.0	87.6	HYD-3	P-8	2.40
J-9	10,831.51	20.0	87.1	HYD-3	P-17	2.40
J-10	10,334.65	20.0	87.6	HYD-3	P-17	2.40
J-11	9,725.70	20.0	87.6	HYD-3	P-17	2.40
J-12	8,760.31	20.0	87.7	HYD-3	P-17	2.40
J-13	7,498.92	20.0	87.2	HYD-3	P-17	2.40
J-15	4,326.24	20.0	85.0	HYD-3	P-15	2.40
J-16	6,785.12	20.0	87.1	HYD-3	P-17	2.40
J-17	19,503.05	20.0	84.9	HYD-3	P-21	2.40
J-18	4,267.90	20.0	84.8	HYD-3	P-22	2.40
K-1	11,711.09	20.0	87.3	HYD-3	PIPE-1	2.40
K-2	13,046.93	20.0	88.1	HYD-3	PIPE-1	2.40
K-3	13,611.58	20.0	88.3	HYD-3	PIPE-1	2.40
K-4	11,922.71	20.0	90.1	HYD-3	PIPE-5	2.40
K-5	13,487.30	20.0	90.9	HYD-3	PIPE-6	2.40
K-6	13,161.86	20.0	86.8	HYD-3	PIPE-12	2.40
K-7	11,922.08	20.0	85.8	HYD-3	PIPE-12	2.40
K-8	10,237.99	20.0	85.5	HYD-3	PIPE-12	2.40
K-9	9,546.54	20.0	87.2	HYD-3	PIPE-10	2.40
K-10	9,396.91	20.0	86.0	HYD-3	PIPE-12	2.40
K-11	8,318.85	20.0	90.5	HYD-3	PIPE-12	2.40
K-12	8,860.16	20.0	90.0	HYD-3	PIPE-12	2.40
K-13	9,624.45	20.0	89.3	HYD-3	PIPE-12	2.40
K-14	9,717.82	20.0	89.3	HYD-3	PIPE-12	2.40
K-15	9,753.83	20.0	88.9	HYD-3	PIPE-12	2.40
K-16	9,828.02	20.0	88.3	HYD-3	PIPE-12	2.40
K-17	9,887.10	20.0	88.3	HYD-3	PIPE-12	2.40
K-18	10,059.16	20.0	87.9	HYD-3	PIPE-12	2.40
K-19	9,987.26	20.0	88.2	HYD-3	PIPE-12	2.40
K-20	9,880.82	20.0	88.7	HYD-3	PIPE-12	2.40
K-21	9,970.77	20.0	88.4	HYD-3	PIPE-12	2.40
K-22	10,054.29	20.0	88.2	HYD-3	PIPE-12	2.40
K-23	10,071.82	20.0	89.8	HYD-3	PIPE-12	2.40
K-24	10,098.49	20.0	91.4	HYD-3	PIPE-12	2.40
K-25	10,123.69	20.0	88.6	HYD-3	PIPE-12	2.40
K-26	10,093.83	20.0	88.0	HYD-3	PIPE-12	2.40
K-27	10,096.43	20.0	87.5	HYD-3	PIPE-12	2.40

161413971 - Kilbourne Subdivision
Active Scenario: Design Fire Flow

Label	Fire Flow (Available) (L/min)	Pressure (Residual Lower Limit) (psi)	Pressure (psi)	Junction w/ Minimum Pressure (System)	Pipe w/ Maximum Velocity	Velocity of Maximum Pipe (m/s)
K-28	10,312.59	20.0	89.1	HYD-3	PIPE-12	2.40
K-29	11,385.67	20.0	90.7	HYD-3	PIPE-12	2.40
K-30	7,068.58	20.0	91.9	HYD-3	PIPE-35	2.40
K-31	11,158.08	20.0	92.8	HYD-3	PIPE-64	2.40
K-32	11,133.90	20.0	93.3	HYD-3	PIPE-64	2.40
K-33	9,262.50	20.0	94.1	HYD-3	PIPE-41	2.40
K-34	11,133.95	20.0	96.0	HYD-3	PIPE-64	2.40
K-35	11,134.33	20.0	97.3	HYD-3	PIPE-64	2.40
K-36	11,133.94	20.0	98.6	HYD-3	PIPE-64	2.40
K-37	7,068.58	20.0	99.5	HYD-3	PIPE-45	2.40
K-38	11,133.92	20.0	98.8	HYD-3	PIPE-64	2.40
K-39	10,759.89	20.0	97.5	HYD-3	PIPE-51	2.40
K-40	9,974.24	20.0	96.3	HYD-3	PIPE-51	2.40
K-41	9,504.02	20.0	94.1	HYD-3	PIPE-53	2.40
K-42	10,853.77	20.0	94.2	HYD-3	PIPE-64	2.40
K-43	11,160.67	20.0	92.5	HYD-3	PIPE-64	2.40
K-44	9,136.99	20.0	96.5	HYD-3	PIPE-64	2.40
K-45	8,909.30	20.0	96.0	HYD-3	PIPE-64	2.40
K-46	8,736.34	20.0	95.4	HYD-3	PIPE-64	2.40
K-47	8,499.79	20.0	93.7	HYD-3	PIPE-64	2.40
K-48	8,690.76	20.0	94.5	HYD-3	PIPE-64	2.40
K-49	7,408.25	20.0	92.2	HYD-3	PIPE-64	2.40
K-50	6,850.72	20.0	91.5	HYD-3	PIPE-64	2.40
K-51	8,903.68	20.0	90.7	HYD-3	PIPE-65	2.40
K-51	80,956.50	20.0	45.8	HYD-3	PIPE-37	2.40
K-52	40,715.08	20.0	53.4	HYD-3	PIPE-47	2.40

**Junctions highlighted in yellow indicate fire flow at Medium Density Blocks*

**Junctions highlighted in green indicate fire flow at High Density Blocks*

**Junctions highlighted in red indicate fire flow at Commercial/Medium Density Blocks*

161413971 - Kilbourne Subdivision
Active Scenario: Age (Full Build-out)
Current Time: 336.00 hours

Label	Length (m)	Start Node	Stop Node	Diameter (mm)	Hazen- Williams C	Flow (L/min)	Velocity (m/s)	Age (Calculated) (hours)
P-1	66	R-1	J-1	250.0	110.0	416.47	0.14	0.023
P-2	27	J-1	HYD-1	250.0	110.0	392.21	0.13	0.130
P-3	44	HYD-1	J-3	250.0	110.0	392.21	0.13	0.230
P-4	13	J-3	J-4	200.0	110.0	70.66	0.04	0.330
P-5	34	J-1	J-5	200.0	110.0	21.25	0.01	0.505
P-6	86	J-3	J-6	250.0	110.0	317.30	0.11	0.394
P-7	76	J-6	J-7	250.0	110.0	230.09	0.08	0.640
P-8	62	J-7	J-8	250.0	110.0	-5.25	0.00	9.423
P-9	243	J-8	J-9	250.0	110.0	-52.53	0.02	2.681
P-10	36	J-9	J-10	250.0	110.0	-263.97	0.09	0.739
P-11	46	J-10	J-11	250.0	110.0	-268.93	0.09	0.618
P-12	72	J-11	J-12	250.0	110.0	-318.16	0.11	0.450
P-13	46	J-12	HYD-2	250.0	110.0	-361.19	0.12	0.304
P-14	34	HYD-2	J-13	250.0	110.0	-361.19	0.12	0.200
P-15	25	J-13	J-15	200.0	110.0	56.49	0.03	0.268
P-16	28	J-13	J-16	250.0	110.0	-417.68	0.14	0.100
P-17	32	J-16	R-2	250.0	110.0	-420.87	0.14	0.000
P-20	27	R-5	J-17	300.0	120.0	40.35	0.01	0.339
P-21	24	J-17	R-6	300.0	120.0	-42.71	0.01	0.282
P-22	32	J-17	J-18	200.0	110.0	73.14	0.04	0.785
PIPE-1	135	J-7	K-1	250.0	110.0	124.49	0.04	1.519
PIPE-2	82	K-1	K-2	250.0	110.0	92.61	0.03	2.326
PIPE-3	30	K-2	K-3	250.0	110.0	74.19	0.03	2.858
PIPE-4	113	K-3	K-4	250.0	110.0	42.31	0.01	4.118
PIPE-5	97	K-4	K-5	250.0	110.0	3.17	0.00	17.717
PIPE-6	190	K-5	K-6	250.0	110.0	-338.55	0.11	2.148
PIPE-7	146	K-6	K-7	250.0	110.0	-160.96	0.05	2.572
PIPE-8	243	K-7	K-8	250.0	110.0	-167.87	0.06	1.607
PIPE-9	184	K-6	K-9	250.0	110.0	-190.34	0.06	0.652
PIPE-10	75	K-10	K-9	250.0	110.0	295.35	0.10	0.155
PIPE-11	154	K-10	K-8	300.0	120.0	187.88	0.04	0.534
PIPE-12	63	K-5	K-11	250.0	110.0	335.70	0.11	2.718
PIPE-12	38	R-10	K-10	300.0	120.0	483.23	0.11	0.000
PIPE-13	62	K-11	K-12	250.0	110.0	322.95	0.11	2.873
PIPE-14	93	K-12	K-13	250.0	110.0	319.05	0.11	3.070
PIPE-15	113	K-13	K-14	250.0	110.0	116.54	0.04	3.582
PIPE-16	60	K-14	K-15	250.0	110.0	108.57	0.04	4.210
PIPE-17	87	K-15	K-16	250.0	110.0	100.78	0.03	4.786
PIPE-18	52	K-16	K-17	250.0	110.0	93.52	0.03	5.366
PIPE-19	92	K-17	K-18	250.0	110.0	72.98	0.02	6.107
PIPE-20	62	K-18	K-19	250.0	110.0	-94.63	0.03	4.341
PIPE-21	69	K-19	K-20	250.0	110.0	-100.47	0.03	3.792
PIPE-22	78	K-20	K-13	250.0	110.0	-198.79	0.07	3.348
PIPE-23	61	K-20	K-21	250.0	110.0	89.83	0.03	3.787
PIPE-24	154	K-21	K-22	250.0	110.0	79.20	0.03	4.861

161413971 - Kilbourne Subdivision
Active Scenario: Age (Full Build-out)
Current Time: 336.00 hours

Label	Length (m)	Start Node	Stop Node	Diameter (mm)	Hazen-Williams C	Flow (L/min)	Velocity (m/s)	Age (Calculated) (hours)
PIPE-25	90	K-22	K-23	250.0	110.0	42.63	0.01	6.524
PIPE-26	183	K-23	K-24	250.0	110.0	26.16	0.01	10.250
PIPE-27	97	K-24	K-25	250.0	110.0	18.19	0.01	15.285
PIPE-28	58	K-25	K-26	250.0	110.0	-68.53	0.02	8.249
PIPE-29	87	K-26	K-22	250.0	110.0	-29.65	0.01	6.862
PIPE-30	81	K-26	K-27	250.0	110.0	-45.79	0.02	7.076
PIPE-31	53	K-27	K-18	250.0	110.0	-50.04	0.02	5.920
PIPE-32	90	K-28	K-18	250.0	110.0	-113.84	0.04	5.809
PIPE-33	81	K-25	K-28	250.0	110.0	78.58	0.03	10.879
PIPE-34	127	K-28	K-29	250.0	110.0	39.95	0.01	9.546
PIPE-35	377	K-30	K-29	250.0	110.0	0.00	0.00	335.729
PIPE-36	42	K-51	K-30	250.0	110.0	0.00	0.00	336.011
PIPE-37	38	K-51	R-7	600.0	120.0	0.00	0.00	336.005
PIPE-38	39	K-51	R-8	600.0	120.0	0.00	0.00	336.008
PIPE-39	160	K-29	K-31	250.0	110.0	-11.35	0.00	11.093
PIPE-40	47	K-31	K-32	250.0	110.0	-15.60	0.01	4.116
PIPE-41	87	K-32	K-33	250.0	110.0	73.73	0.03	3.380
PIPE-42	141	K-33	K-34	250.0	110.0	48.05	0.02	5.062
PIPE-43	86	K-34	K-35	250.0	110.0	34.41	0.01	7.286
PIPE-44	46	K-35	K-36	250.0	110.0	25.02	0.01	9.071
PIPE-45	151	K-37	K-36	250.0	110.0	0.00	0.00	335.201
PIPE-46	20	K-52	K-37	250.0	110.0	0.00	0.00	336.011
PIPE-47	33	K-52	R-9	600.0	120.0	0.00	0.00	336.011
PIPE-48	94	K-36	K-38	250.0	110.0	-6.15	0.00	16.662
PIPE-49	58	K-38	K-39	250.0	110.0	-8.81	0.00	7.727
PIPE-50	51	K-39	K-40	250.0	110.0	-62.47	0.02	4.685
PIPE-51	134	K-40	K-32	250.0	110.0	-75.22	0.03	3.623
PIPE-52	72	K-32	K-41	250.0	110.0	-167.57	0.06	2.722
PIPE-53	43	K-41	K-42	250.0	110.0	-180.85	0.06	2.449
PIPE-54	130	K-42	K-43	250.0	110.0	119.94	0.04	2.795
PIPE-55	134	K-43	K-29	250.0	110.0	101.17	0.03	3.779
PIPE-56	206	K-42	K-44	250.0	110.0	-315.30	0.11	2.086
PIPE-57	79	K-44	K-45	250.0	110.0	-146.65	0.05	1.793
PIPE-58	81	K-45	K-46	250.0	110.0	-163.83	0.06	1.368
PIPE-59	140	K-46	K-47	250.0	110.0	-174.99	0.06	0.841
PIPE-60	94	K-48	K-47	250.0	110.0	-185.66	0.06	0.722
PIPE-61	159	K-44	K-48	250.0	110.0	-177.69	0.06	1.294
PIPE-62	111	K-47	K-49	250.0	110.0	-371.27	0.13	0.396
PIPE-63	41	K-49	K-50	250.0	110.0	-374.99	0.13	0.218
PIPE-64	52	K-50	K-51	250.0	110.0	-420.50	0.14	0.118
PIPE-65	53	R-11	K-51	300.0	120.0	540.39	0.13	0.014

*Highlighted pipes are located at the low-level system connections comprised of a check valve which restricts the flow between the low and high level system resulting in lack of water turnover in the model. However, these connections will include a by-pass system to ensure adequate turnover is achieved and therefore no issues are anticipated.

161413971 - Kilbourne Subdivision
Active Scenario: Age (Full Build-out)
Current Time: 336.00 hours

Label	Elevation (m)	Demand (L/min)	Pressure (psi)	Age (Calculated) (hours)
HYD-1	274.56	0.00	85.8	0.230
HYD-2	274.00	0.00	86.6	0.300
J-1	274.10	3.01	86.4	0.130
J-3	274.50	4.25	85.8	0.330
J-4	275.10	70.66	85.0	0.430
J-5	274.40	21.25	86.0	0.978
J-6	274.34	87.21	86.1	0.551
J-7	273.76	110.85	86.9	1.123
J-8	273.00	47.28	88.0	4.621
J-9	273.30	211.44	87.5	0.840
J-10	273.03	4.96	87.9	0.729
J-11	273.01	49.23	88.0	0.590
J-12	273.03	43.03	87.9	0.404
J-13	273.51	0.00	87.3	0.200
J-15	275.00	56.49	85.2	0.427
J-16	273.60	3.19	87.1	0.100
J-17	275.20	9.92	84.9	0.716
J-18	275.25	73.14	84.8	0.945
K-1	273.14	31.88	87.8	2.014
K-2	272.61	18.42	88.5	2.737
K-3	272.41	31.88	88.8	3.072
K-4	271.14	39.14	90.6	5.263
K-5	270.61	6.02	91.3	2.683
K-6	273.68	12.75	87.0	1.965
K-7	274.41	6.91	86.0	2.248
K-8	274.70	20.01	85.6	1.065
K-9	273.49	105.01	87.3	0.307
K-10	274.40	0.00	86.0	0.100
K-11	270.80	12.75	91.1	2.836
K-12	271.11	3.90	90.6	2.995
K-13	271.51	3.72	90.0	3.234
K-14	271.52	7.97	90.0	4.030
K-15	271.80	7.79	89.6	4.484
K-16	272.21	7.26	89.0	5.188
K-17	272.16	20.54	89.1	5.639
K-18	272.48	3.72	88.7	5.534
K-19	272.25	5.84	89.0	4.123
K-20	271.91	8.50	89.5	3.557
K-21	272.13	10.63	89.2	4.113
K-22	272.23	6.91	89.0	5.708
K-23	271.12	16.47	90.6	7.439
K-24	270.02	7.97	92.1	13.160
K-25	271.98	8.15	89.4	10.504
K-26	272.41	6.91	88.8	7.952
K-27	272.75	4.25	88.3	6.403
K-28	271.61	152.47	89.9	8.292

161413971 - Kilbourne Subdivision
Active Scenario: Age (Full Build-out)
Current Time: 336.00 hours

Label	Elevation (m)	Demand (L/min)	Pressure (psi)	Age (Calculated) (hours)
K-29	270.47	152.47	91.5	7.013
K-30	269.65	0.00	92.7	336.011
K-31	269.01	4.25	93.6	5.388
K-32	268.64	3.01	94.1	2.944
K-33	268.10	25.68	94.9	3.914
K-34	266.74	13.64	96.8	6.310
K-35	265.84	9.39	98.1	8.362
K-36	264.93	31.17	99.4	12.454
K-37	264.29	0.00	100.3	336.011
K-38	264.76	2.66	99.6	10.488
K-39	265.64	53.66	98.4	5.067
K-40	266.49	12.75	97.2	4.400
K-41	268.12	13.28	94.9	2.594
K-42	268.02	14.52	95.0	2.401
K-43	269.22	18.77	93.3	3.287
K-44	266.59	9.03	97.1	1.867
K-45	267.00	17.18	96.5	1.620
K-46	267.44	11.16	95.8	1.216
K-47	268.65	10.63	94.1	0.563
K-48	268.07	7.97	95.0	0.978
K-49	269.85	3.72	92.5	0.318
K-50	270.44	45.51	91.6	0.218
K-51	271.05	119.89	90.8	0.116
K-51	269.55	0.00	45.8	336.008
K-52	264.20	0.00	53.4	336.011

*Highlighted junctions are located at the low-level system connections comprised of a check valve which restricts the flow between the low and high level system resulting in lack of water turnover in the model. However, these connections will include a by-pass system to ensure adequate turnover is achieved and therefore no issues are anticipated.

161413971 - Kilbourne Subdivision

Active Scenario: Max Hour (Emergency Condition)

Label	Length (m)	Start Node	Stop Node	Diameter (mm)	Hazen- Williams C	Flow (L/min)	Velocity (m/s)
PIPE-2	82	K-1	K-2	250.0	110.0	-248.66	0.08
PIPE-3	30	K-2	K-3	250.0	110.0	-392.34	0.13
PIPE-4	113	K-3	K-4	250.0	110.0	-641.00	0.22
PIPE-5	97	K-4	K-5	250.0	110.0	-946.30	0.32
PIPE-6	190	K-5	K-6	250.0	110.0	1,128.51	0.38
PIPE-7	146	K-6	K-7	250.0	110.0	209.98	0.07
PIPE-8	243	K-7	K-8	250.0	110.0	156.08	0.05
PIPE-9	184	K-6	K-9	250.0	110.0	819.08	0.28
PIPE-10	75	K-10	K-9	250.0	110.0	0.00	0.00
PIPE-12	63	K-5	K-11	250.0	110.0	-2,121.76	0.72
PIPE-13	62	K-11	K-12	250.0	110.0	-2,221.21	0.75
PIPE-14	93	K-12	K-13	250.0	110.0	-2,251.63	0.76
PIPE-15	113	K-13	K-14	250.0	110.0	-715.39	0.24
PIPE-16	60	K-14	K-15	250.0	110.0	-777.56	0.26
PIPE-17	87	K-15	K-16	250.0	110.0	-838.32	0.28
PIPE-18	52	K-16	K-17	250.0	110.0	-894.95	0.30
PIPE-19	92	K-17	K-18	250.0	110.0	-1,055.16	0.36
PIPE-20	62	K-18	K-19	250.0	110.0	999.85	0.34
PIPE-21	69	K-19	K-20	250.0	110.0	954.30	0.32
PIPE-22	78	K-20	K-13	250.0	110.0	1,565.25	0.53
PIPE-23	61	K-20	K-21	250.0	110.0	-677.25	0.23
PIPE-24	154	K-21	K-22	250.0	110.0	-760.17	0.26
PIPE-25	90	K-22	K-23	250.0	110.0	-309.98	0.11
PIPE-26	183	K-23	K-24	250.0	110.0	-438.44	0.15
PIPE-27	97	K-24	K-25	250.0	110.0	-500.61	0.17
PIPE-28	58	K-25	K-26	250.0	110.0	946.00	0.32
PIPE-29	87	K-26	K-22	250.0	110.0	504.09	0.17
PIPE-30	81	K-26	K-27	250.0	110.0	388.02	0.13
PIPE-31	53	K-27	K-18	250.0	110.0	354.87	0.12
PIPE-32	90	K-28	K-18	250.0	110.0	1,729.16	0.59
PIPE-33	81	K-25	K-28	250.0	110.0	-1,510.18	0.51
PIPE-34	127	K-28	K-29	250.0	110.0	-4,428.61	1.50
PIPE-35	377	K-30	K-29	250.0	110.0	3,947.41	1.34
PIPE-36	42	K-51	K-30	250.0	110.0	3,947.41	1.34
PIPE-37	38	K-51	R-7	600.0	120.0	-1,985.25	0.12
PIPE-38	39	K-51	R-8	600.0	120.0	-1,962.16	0.12
PIPE-39	160	K-29	K-31	250.0	110.0	-1,585.04	0.54
PIPE-40	47	K-31	K-32	250.0	110.0	-1,618.19	0.55
PIPE-41	87	K-32	K-33	250.0	110.0	-1,914.31	0.65
PIPE-42	141	K-33	K-34	250.0	110.0	-2,114.61	0.72
PIPE-43	86	K-34	K-35	250.0	110.0	-2,221.00	0.75
PIPE-44	46	K-35	K-36	250.0	110.0	-2,294.25	0.78
PIPE-45	151	K-37	K-36	250.0	110.0	5,007.85	1.70
PIPE-46	20	K-52	K-37	250.0	110.0	5,007.85	1.70
PIPE-47	33	K-52	R-9	600.0	120.0	-5,007.85	0.30
PIPE-48	94	K-36	K-38	250.0	110.0	2,470.48	0.84
PIPE-49	58	K-38	K-39	250.0	110.0	2,449.73	0.83

161413971 - Kilbourne Subdivision

Active Scenario: Max Hour (Emergency Condition)

Label	Length (m)	Start Node	Stop Node	Diameter (mm)	Hazen- Williams C	Flow (L/min)	Velocity (m/s)
PIPE-50	51	K-39	K-40	250.0	110.0	2,031.19	0.69
PIPE-51	134	K-40	K-32	250.0	110.0	1,931.74	0.66
PIPE-52	72	K-32	K-41	250.0	110.0	2,204.38	0.75
PIPE-53	43	K-41	K-42	250.0	110.0	2,100.80	0.71
PIPE-54	130	K-42	K-43	250.0	110.0	231.84	0.08
PIPE-55	134	K-43	K-29	250.0	110.0	85.43	0.03
PIPE-56	206	K-42	K-44	250.0	110.0	1,755.70	0.60
PIPE-57	79	K-44	K-45	250.0	110.0	863.50	0.29
PIPE-58	81	K-45	K-46	250.0	110.0	729.49	0.25
PIPE-59	140	K-46	K-47	250.0	110.0	642.45	0.22
PIPE-60	94	K-48	K-47	250.0	110.0	759.60	0.26
PIPE-61	159	K-44	K-48	250.0	110.0	821.77	0.28
PIPE-62	111	K-47	K-49	250.0	110.0	1,319.14	0.45
PIPE-63	41	K-49	K-50	250.0	110.0	1,290.12	0.44
PIPE-64	52	K-50	K-51	250.0	110.0	935.14	0.32

**Highlighted pipes in excess of maximum allowable velocity of 1.5 m/s during emergency condition.*

161413971 - Kilbourne Subdivision

Active Scenario: Max Hour (Emergency Condition Low Level Only)

Label	Elevation (m)	Demand (L/min)	Pressure (psi)
K-1	273.14	248.66	30.9
K-2	272.61	143.68	31.6
K-3	272.41	248.66	31.9
K-4	271.14	305.29	33.8
K-5	270.61	46.96	34.6
K-6	273.68	99.45	30.0
K-7	274.41	53.90	28.9
K-8	274.70	156.08	28.5
K-9	273.49	819.08	30.1
K-10	274.40	0.00	28.8
K-11	270.80	99.45	34.6
K-12	271.11	30.42	34.5
K-13	271.51	29.02	34.4
K-14	271.52	62.17	34.4
K-15	271.80	60.76	34.1
K-16	272.21	56.63	33.6
K-17	272.16	160.21	33.7
K-18	272.48	29.02	33.3
K-19	272.25	45.55	33.6
K-20	271.91	66.30	34.0
K-21	272.13	82.91	33.7
K-22	272.23	53.90	33.7
K-23	271.12	128.47	35.3
K-24	270.02	62.17	36.9
K-25	271.98	63.57	34.1
K-26	272.41	53.90	33.4
K-27	272.75	33.15	33.0
K-28	271.61	1,189.27	34.8
K-29	270.47	1,189.27	38.6
K-30	269.65	0.00	45.1
K-31	269.01	33.15	41.1
K-32	268.64	23.48	41.8
K-33	268.10	200.30	42.9
K-34	266.74	106.39	45.4
K-35	265.84	73.24	47.1
K-36	264.93	243.13	48.6
K-37	264.29	0.00	52.8
K-38	264.76	20.75	48.3
K-39	265.64	418.55	46.7
K-40	266.49	99.45	45.3
K-41	268.12	103.58	42.2
K-42	268.02	113.26	42.1
K-43	269.22	146.41	40.4
K-44	266.59	70.43	43.5
K-45	267.00	134.00	42.9
K-46	267.44	87.05	42.2
K-47	268.65	82.91	40.4

161413971 - Kilbourne Subdivision

Active Scenario: Max Hour (Emergency Condition Low Level Only)

Label	Elevation (m)	Demand (L/min)	Pressure (psi)
K-48	268.07	62.17	41.3
K-49	269.85	29.02	38.5
K-50	270.44	354.98	37.6
K-51	271.05	935.14	36.7
K-51	269.55	0.00	45.8
K-52	264.20	0.00	53.4

161413971 - Kilbourne Subdivision

Active Scenario: Max Day + Fire (Emergency Condition)

Label	Fire Flow (Available) (L/min)	Pressure (Residual Lower Limit) (psi)	Pressure (psi)	Junction w/ Minimum Pressure (System)	Pipe w/ Maximum Velocity	Velocity of Maximum Pipe (m/s)
K-1	3,987.12	20.0	38.5	K-2	PIPE-34	2.03
K-2	4,173.29	20.0	39.2	K-1	PIPE-34	2.09
K-3	4,250.37	20.0	39.5	K-1	PIPE-34	2.12
K-4	4,564.64	20.0	41.3	K-8	PIPE-34	2.22
K-5	4,563.44	20.0	42.1	K-8	PIPE-34	2.22
K-6	3,923.13	20.0	37.7	K-8	PIPE-34	2.01
K-7	3,621.06	20.0	36.6	K-8	PIPE-34	1.90
K-8	3,245.54	20.0	36.2	K-7	PIPE-34	1.78
K-9	3,569.46	20.0	37.9	K-10	PIPE-34	1.89
K-10	3,451.54	20.0	36.6	K-9	PIPE-34	1.85
K-11	4,890.00	20.0	41.9	K-8	PIPE-34	2.34
K-12	5,081.39	20.0	41.5	K-8	PIPE-34	2.40
K-13	5,081.39	20.0	41.0	K-8	PIPE-34	2.40
K-14	5,081.39	20.0	41.0	K-8	PIPE-34	2.40
K-15	5,081.39	20.0	40.7	K-8	PIPE-34	2.40
K-16	5,081.39	20.0	40.1	K-8	PIPE-34	2.40
K-17	5,081.39	20.0	40.2	K-8	PIPE-34	2.40
K-18	5,081.38	20.0	39.7	K-8	PIPE-34	2.40
K-19	5,081.39	20.0	40.0	K-8	PIPE-34	2.40
K-20	5,081.39	20.0	40.5	K-8	PIPE-34	2.40
K-21	5,081.39	20.0	40.2	K-8	PIPE-34	2.40
K-22	5,081.39	20.0	40.1	K-8	PIPE-34	2.40
K-23	5,081.39	20.0	41.7	K-8	PIPE-34	2.40
K-24	5,081.39	20.0	43.2	K-8	PIPE-34	2.40
K-25	5,081.39	20.0	40.5	K-8	PIPE-34	2.40
K-26	5,081.39	20.0	39.8	K-8	PIPE-34	2.40
K-27	5,081.39	20.0	39.4	K-8	PIPE-34	2.40
K-28	5,081.39	20.0	41.0	K-8	PIPE-34	2.40
K-29	9,104.55	20.0	43.1	K-8	PIPE-45	2.40
K-30	5,950.79	20.0	45.5	K-8	PIPE-36	2.40
K-31	8,539.00	20.0	45.3	K-8	PIPE-45	2.40
K-32	8,383.59	20.0	45.9	K-8	PIPE-45	2.40
K-33	8,078.99	20.0	46.7	K-8	PIPE-45	2.40
K-34	7,696.73	20.0	48.8	K-8	PIPE-45	2.40
K-35	7,466.62	20.0	50.2	K-8	PIPE-45	2.40
K-36	7,335.66	20.0	51.5	K-8	PIPE-45	2.40
K-37	5,119.23	20.0	53.1	K-8	PIPE-46	2.40
K-38	7,618.96	20.0	51.6	K-8	PIPE-45	2.40
K-39	7,783.59	20.0	50.3	K-8	PIPE-45	2.40
K-40	7,927.25	20.0	49.0	K-8	PIPE-45	2.40
K-41	8,518.16	20.0	46.5	K-8	PIPE-45	2.40
K-42	8,548.54	20.0	46.6	K-8	PIPE-45	2.40
K-43	8,723.54	20.0	44.9	K-8	PIPE-45	2.40
K-44	6,280.77	20.0	48.5	K-51	PIPE-56	2.40
K-45	6,280.77	20.0	47.9	K-51	PIPE-56	2.40
K-46	6,280.77	20.0	47.3	K-51	PIPE-56	2.40

161413971 - Kilbourne Subdivision

Active Scenario: Max Day + Fire (Emergency Condition)

Label	Fire Flow (Available) (L/min)	Pressure (Residual Lower Limit) (psi)	Pressure (psi)	Junction w/ Minimum Pressure (System)	Pipe w/ Maximum Velocity	Velocity of Maximum Pipe (m/s)
K-47	6,280.77	20.0	45.6	K-51	PIPE-56	2.40
K-48	6,280.77	20.0	46.4	K-51	PIPE-56	2.40
K-49	6,038.68	20.0	43.8	K-51	PIPE-56	2.32
K-50	5,800.79	20.0	42.9	K-51	PIPE-56	2.24
K-51	5,540.15	20.0	42.1	K-50	PIPE-56	2.15
K-51	79,372.44	20.0	45.8	K-8	PIPE-37	2.40
K-52	38,631.77	20.0	53.4	K-8	PIPE-47	2.40

**Junctions highlighted in yellow indicate fire flow at Medium Density Blocks*

**Junctions highlighted in green indicate fire flow at High Density Blocks*

**Junctions highlighted in red indicate fire flow at Commercial/Medium Density Blocks*

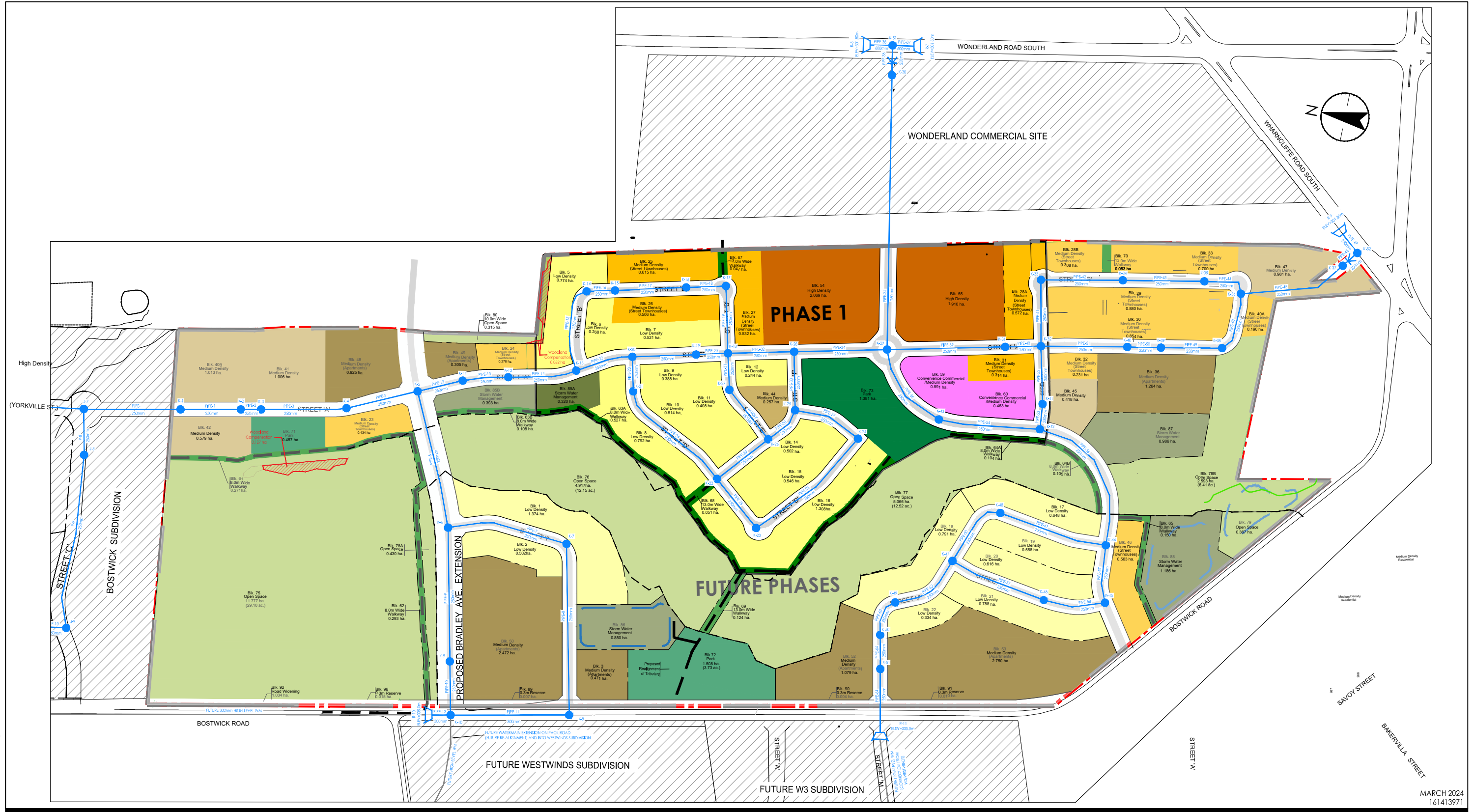
**KILBOURNE SUBDIVISION
WATER SERVICING REPORT**

Appendix B
April 3, 2024

APPENDIX B

- Proposed Draft Plan of Subdivision – MHBC Dec. 22, 2023
 - Water Analysis – Kilbourne Full Build-out - Figure 1.0
 - Kilbourne Water Demand Summary
 - 3080 Bostwick Subdivision Water Model Figure
 - 3080 Bostwick Subdivision Water Demand Summary Table
- Table 2.1 – City of London One Water – Growth Servicing DC Study 2019

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600-171 Queens Avenue
London ON N6A 5J7
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Legend

- RESERVOIR
- JUNCTION/HYDRANT
- PIPE
- CHECK VALVE
- PROPERTY LINE

Client/Project
YORK DEVELOPMENTS
KILBOURNE SUBDIVISION

Figure No.

1.0

Title

WATER ANALYSIS FIGURE
FULL BUILD-OUT

MARCH 2024
161413971

Subject: Demand Summary
Project: Kilbourne Subdivision
Draft Plan Date: 22-Dec-23
Project No.: 161413971
Client: York Developments
Date: 28-Feb-24

Table 1: Demand Breakdown

Block	Junction	Residential Type	Area	Units	Population	Average Day Demand (L/min)	Max Day Demand (L/min)	Max Hour Demand (L/min)
Block 1	K-6	LD	1.374	24	72	12.75	44.63	99.45
Block 2	K-7	LD	0.502	13	39	6.91	24.17	53.87
Block 3	K-8	MD (APARTMENTS)	0.471	47	113	20.01	70.04	156.08
Block 5	K-14	LD	0.774	15	45	7.97	27.89	62.16
Block 6	K-13	LD	0.268	7	21	3.72	13.02	29.01
Block 7	K-20	LD	0.521	16	48	8.50	29.75	66.30
Block 8	K-21	LD	0.792	20	60	10.63	37.19	82.88
Block 9	K-19	LD	0.389	11	33	5.84	20.45	45.58
Block 10	K-22	LD	0.515	13	39	6.91	24.17	53.87
Block 11	K-27	LD	0.408	8	24	4.25	14.88	33.15
Block 12	K-18	LD	0.245	7	21	3.72	13.02	29.01
Block 14	K-26	LD	0.502	13	39	6.91	24.17	53.87
Block 15	K-24	LD	0.546	15	45	7.97	27.89	62.16
Block 16	K-23	LD	1.308	31	93	16.47	57.64	128.46
Block 17	K-44	LD	0.648	17	51	9.03	31.61	70.44
Block 18	K-47	LD	0.792	20	60	10.63	37.19	82.88
Block 19	K-48	LD	0.558	15	45	7.97	27.89	62.16
Block 20	K-45	LD	0.616	17	51	9.03	31.61	70.44
Block 21	K-46	LD	0.788	21	63	11.16	39.05	87.02
Block 22	K-49	LD	0.334	7	21	3.72	13.02	29.01
Block 23	K-5	MD (ST TH)	0.435	14	34	6.02	21.07	46.96
Block 24	K-12	MD (ST TH)	0.278	9	22	3.90	13.64	30.39
Block 25	K-15	MD (ST TH)	0.616	18	44	7.79	27.27	60.78
Block 26	K-16	MD (ST TH)	0.506	17	41	7.26	25.41	56.63
Block 27	K-17	MD (ST TH)	0.533	48	116	20.54	71.90	160.23
Block 28A	K-33	MD (ST TH)	0.491	48	116	20.54	71.90	160.23
Block 28B	K-33	MD (ST TH)	0.308	12	29	5.14	17.97	40.06
Block 29	K-34	MD (ST TH)	0.880	32	77	13.64	47.72	106.36
Block 30	K-40	MD (ST TH)	0.854	30	72	12.75	44.63	99.45
Block 31	K-31	MD (ST TH)	0.314	10	24	4.25	14.88	33.15
Block 32	K-32	MD (ST TH)	0.231	7	17	3.01	10.54	23.48
Block 33	K-35	MD (ST TH)	0.700	22	53	9.39	32.85	73.21
Block 36	K-39	MD (APARTMENTS)	1.264	126	303	53.66	187.80	418.52
Block 40A	K-38	MD (ST TH)	0.190	6	15	2.66	9.30	20.72
Block 40B	K-1	MD (CLUSTER)	1.013	75	180	31.88	111.56	248.63
Block 41	K-3	MD (CLUSTER)	1.006	75	180	31.88	111.56	248.63
Block 42	K-2	MD (CLUSTER)	0.579	43	104	18.42	64.46	143.65
Block 44	K-25	MD (CLUSTER)	0.258	19	46	8.15	28.51	63.54
Block 45	K-41	MD (CLUSTER)	0.419	31	75	13.28	46.48	103.59
Block 46	K-45	MD (ST TH)	0.563	19	46	8.15	28.51	63.54
Block 47	K-36	MD (CLUSTER)	0.981	73	176	31.17	109.08	243.10
Block 48	K-4	MD (Apartments)	0.925	92	221	39.14	136.97	305.26
Block 49	K-11	MD (Apartments)	0.305	30	72	12.75	44.63	99.45
Block 50	K-9	MD (Apartments)	2.472	247	593	105.01	367.54	819.08
Block 52	K-50	MD (Apartments)	1.079	107	257	45.51	159.29	354.98
Block 53	K-51	MD (Apartments)	2.750	282	677	119.89	419.60	935.11
Block 54	K-28	HD	2.069	538	861	152.47	533.64	1189.26
Block 55	K-29	HD	1.910	538	861	152.47	533.64	1189.26
Block 59	K-43	COM/MD	0.592	44	106	18.77	65.70	146.41
Block 60	K-42	COM/MD	0.463	34	82	14.52	50.82	113.26
TOTAL			37.335	2983	6483	1148	4018	8955

Notes:

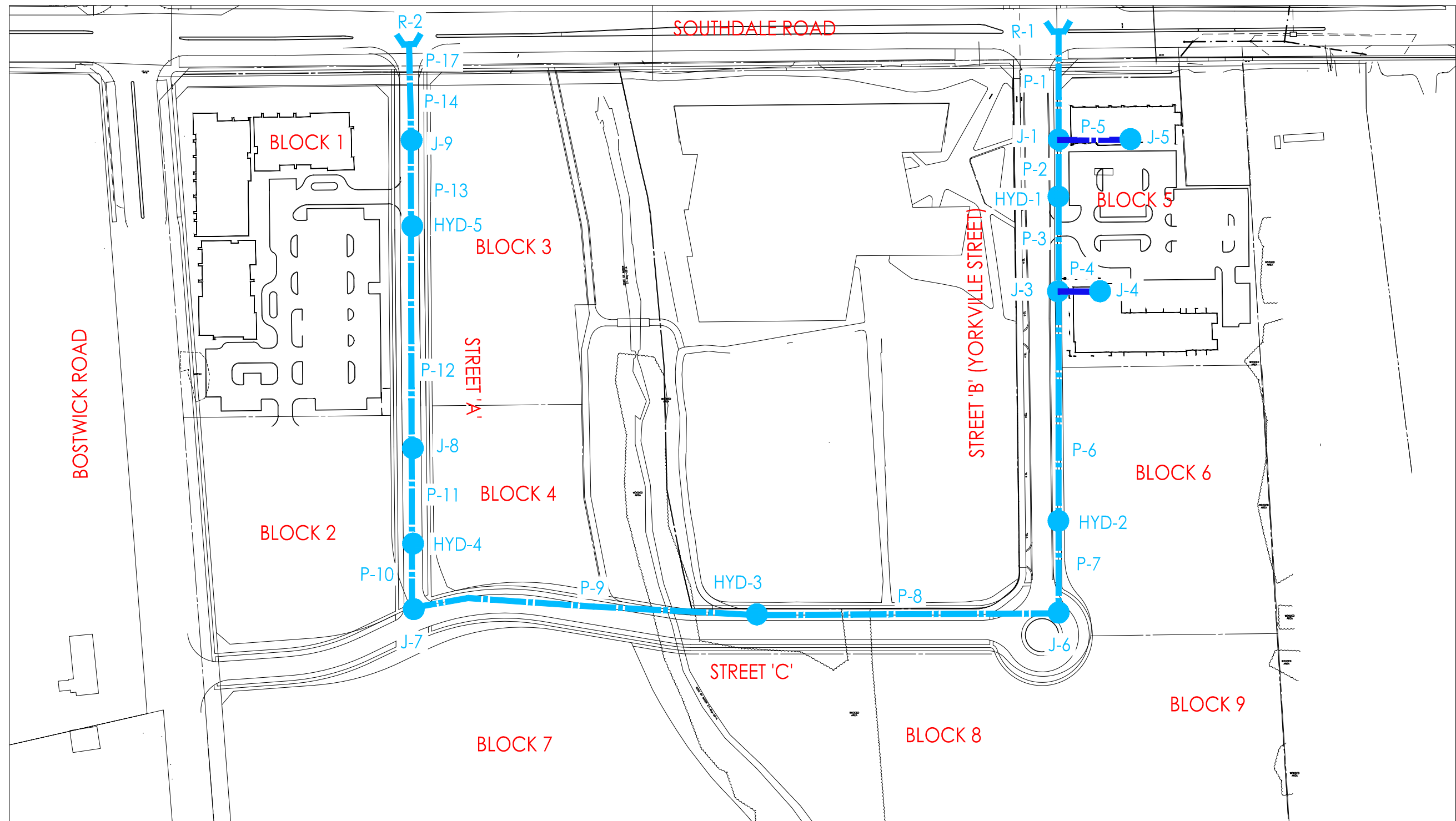
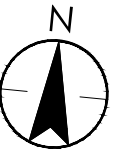
*LD = Low-Density, MD = Medium-Density, HD = High Density, COM/MD = Commercial/Medium Density

*1.6 people/unit for HD, 2.4 people/unit for MD, 3 people/unit for LD

*Unit counts provided by MHBC Planning.

*Parks, Open Space, Walkways, Reserves, Roads, Road Widening and SWM Blocks are not included in this table

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DECEMBER 2023
161403290



600-171 Queens Avenue
London ON N6A 5J7
Tel. 519-645-2007

Legend

-  RESERVOIR
-  JUNCTION
-  200mm WATERMAIN
-  250mm WATERMAIN

Client/Project
YORK DEVELOPMENTS
3080 BOSTWICK ROAD SUBDIVISION
London, ON Canada

Figure No.
1.0

Title
WATER MODEL FIGURE

Subject: Demand Summary
Project: 3080 Bostwick Road Subdivision
Project No.: 161403290
Client: York Development Group
Date: December 14, 2023

Table 1

Block	Junction	Population	Average Day Demand (L/min)
Block 1*	J-9	-	46.22
Block 2	J-8	278	49.23
Block 3	HYD-5	240	42.50
Block 4	-	0	0.00
Block 5*	J-5	-	41.44
Block 5*	J-4	-	72.78
Block 6	HYD-2	491	86.95
Block 7	J-7	1194	211.44
Block 8	HYD-3	267	47.28
Block 9	J-6	626	110.85

NOTES:

*Future populations estimated at high Density (HD) = 150 units/hectare @ 1.6 people/unit. Master Plan Concept prepared by MHBC.

*Block 1 Average Day Demand modeled per Stantec Bostwick Block 1 - Water Servicing Brief.

*Block 5 Average Day Demand modeled per Stantec Bostwick Site 5 - Water Servicing Brief

TABLE 2.1
CITY OF LONDON
ONE WATER - GROWTH SERVICING DC STUDY 2019
2019 - 2038 Growth Watermain Servicing Plan
February 2019 (Final)

RECOMMENDED STRATEGIC LINKS WATERMAINS

DC ID	ID	GMS Tracking Number	Road Name	From	To	Implementation Year	Note	Estimated Construction Cost								
								Characteristics		Watermain Construction Cost (\$/m)	Restoration (3) (\$/m)	Total Construction Cost	Engineering (15%)	Contingency (20%)	Total Estimated Cost	
								Diameter, mm	Length, m							
	SDW1		Bradley Ave.	White Oak Rd.	Wharmcliffe Rd.	2022		300	1,520	\$ 1,254,000	\$ 188,100	\$ 1,254,000	\$ 188,100	\$ 250,800	\$ 1,692,900	
	SDW2		Bostwick Rd.	Southdale Rd.	150m S of Pack Rd.	2025		300	880	\$ 726,000	\$ 108,900	\$ 726,000	\$ 108,900	\$ 145,200	\$ 980,100	
DC19-WD01003									2019-2038							\$ 2,673,000

WATERMAIN - INDUSTRIAL

DC Number	City Project Number	Growth Requirements/ Area	From	To	Implementation Year	Note	Estimated Construction Cost								
							Characteristics		Watermain Construction Cost (\$/m)	Restoration (3) (\$/m)	Total Construction Cost	Engineering (15%)	Contingency (20%)	Total Estimated Cost	
DC19-WD01004		Industrial Water Servicing Internal Oversizing (250ha)			2019-2028		Diameter, mm	Length, m							\$ 104,000
DC19-WD01005		Industrial Water Servicing Internal Oversizing (300ha)			2029-2038										\$ 207,900
DC14-WD01006		Industrial Water Servicing (250ha)			2019-2028										\$ 14,236,600
DC19-WD01007		Industrial Water Servicing (300ha)			2029-2038										\$ 15,436,600
															\$ 29,985,100

(1) See Figure 2.1
(2) Costs are in 2018 dollars
(3) Restoration includes Landscape, Rural, Urban, and Ecosystem where applicable
(4) Restoration costs not included, to be coordinated with transportation projects.
(5) Construction cost includes \$150,000 for 100m of steel casing for Hwy. 401 crossing as required by MTO
(6) Urban Restoration costs on 100m for Hubon Pl. and Open space restoration for 300m in Greenway Park. Construction costs include \$1.4M for 250m trenchless crossing of Thames River