
SITE SERVICING AND STORMWATER MANAGEMENT BRIEF

DATE: 2018-12-07 [EMAIL](#)

TO: Greatwise Developments

SUBJECT: **Site Servicing and Stormwater Management Brief for Fresh Towns, 2710 Draper Avenue – Phase 3-2**

OUR FILE: 17-927

- ATTACHMENTS:
- Site Plan (SP-1) prepared by Roderick Lahey Architects Inc., November 30, 2018;
 - Proposed Water Calculations prepared by DSEL, dated December 2018;
 - EPANet Hydraulic Modelling – Phase 3-2 prepared by DSEL, dated September 2018;
 - Water Boundary Conditions prepared by the City of Ottawa;
 - Proposed Wastewater Calculations prepared by DSEL, dated December 2018;
 - Previously Approved Storm Sewer Calculation Sheet prepared by DSEL, dated September 2018;
 - Previously Approved Hydrologic Model Schematic prepared by DSEL, dated August 2018;
 - EPASWMM Hydrologic Modelling prepared by DSEL, dated September 2018.
-

DSEL has been retained by Greatwise Developments to provide a Site Servicing and Stormwater Management Brief in support of the Site Plan for the proposed Fresh Towns – Phase 3-2 townhomes at 2710 Draper Avenue. The following servicing brief will demonstrate that the site has been designed in accordance with the Servicing and Stormwater Management Report, 2710 Draper Avenue – Fresh Towns – Phase 3-1 (**Phase 3-1 Report**).

The site is bound by Morrison Drive to the west and Draper Avenue to the north, and an existing residential development to the east. Phase 3 of the development will occupy **1.3 ha** of the property and is zoned High Density Residential [R5A].

The **Phase 3-1 Report** contemplated servicing for **86** slab on grade townhome units, **32 units** in Phase 3-1, **54 units** in Phase 3-2. Based on the Site Plan provided by Roderick Lahey Architect Inc., dated November 30th, 2018, the Phase 3-2 development proposes **54** townhomes. This is consistent with the previously approved **Phase 3-1 Report**. Refer to **Appendix** for Phase 3-2 Site Plan.

1.0 Water Supply Servicing

As identified by the **Design Report**, an internal 200 mm diameter watermain network was installed within the private right-of-ways and is available to service the proposed Phase 3-2 development. Townhomes fronting Draper Avenue, within Block 6, will have independent connections to the existing infrastructure within the Draper Avenue right-of-way via 19 mm diameter service laterals. The remaining Blocks will have connections to the internal watermain via 19 mm diameter service laterals in accordance with the **Phase 3-1 Report**.

There are no proposed changes to the internal watermain network indicated by the **Phase 3-1 Report**.

EPANet was utilized to determine pipe sizing and the availability of pressures throughout the system during average day demand, max day plus fire flow, and peak hour demands. For the purposes of providing sufficient fire flow, **5,500 L/min** for a total of **11,000 L/min** was modelled at the proposed fire hydrants during the Phase 3-2 conditions.

Table 1, below, summarizes the model results for the Phase 3-2 development, as was specified by the **Phase 3-1 Report**. Refer to **Appendix** for output reports and model schematics for each scenario.

Table 1: Model Simulation Output Summary – Phase 3-2

Nodes	Average Day (kPa)	Max Day + Fire Flow (kPa)	Peak Hour (kPa)
4	437.5	209.1	343.4
5	432.8	203.1	338.6
7	429.3	198.3	335.1
8	435.7	205.7	340.9
9	440.4	225.4	346.2
10	438.9	216.1	344.7
11	437.5	222.4	342.9
12	436.1	213.0	341.4
13	434.4	202.7	339.7
14	430.0	220.0	335.3
15	427.9	206.7	333.2
16	425.8	193.0	331.1
17	437.0	205.5	342.9
18	432.8	223.1	338.6
19	430.9	209.9	336.7
20	428.4	195.8	334.2
21	429.6	219.4	334.5
22	428.3	207.0	333.2
23	426.0	193.0	330.9
24	435.7	207.1	340.9
26	436.9	221.6	341.9
27	435.7	212.5	340.6
28	433.6	201.7	338.5
FHYD1	438.5	181.3	344.3
FHYD2	428.5	169.2	334.3

† indicates pressures exceeded required pressure values as outlined in *Table 1*

Based on the EPANET model, pressures during average day, max day + fire flow and peak hour, and peak hour respect the requirements of the **Water Supply Guidelines**. Refer to **Appendix** for hydraulic modelling and water calculation.

The proposed water supply design conforms to all relevant City Guidelines and Policies.

2.0 Wastewater Servicing

As identified by the **Phase 3-1 Report**, an internal 250 mm diameter sanitary sewer network was installed within the private right-of-ways and is available to service the proposed Phase 3-2 development. Townhomes fronting Draper Avenue, within Block 6,

will have independent connections to the existing 225 mm diameter sanitary sewer within Draper Avenue via 135 mm diameter service laterals. The remaining Blocks will have connections to the internal network via 135 mm diameter service laterals in accordance with the **Phase 3-1 Report**.

In order to service units within proposed Block 8, a 9.7 m extension to the previously approved sanitary sewer network within Foliage Private is proposed. The proposed sanitary sewer slope has been increased to 1% in accordance with **City Standards**. Refer to drawing **SSP-1** and **PP-1** for the detailed servicing layout.

As indicated by the **Phase 3-1 Report**, a peak wet weather flow of **6.38 L/s** was estimated for the ultimate development. There are no proposed changes to the previously approved sanitary flows. Sufficient capacity to support the Phase 3-2 development is available as demonstrated by the detailed calculations included in the **Appendix**.

The proposed wastewater design conforms to all relevant **City Standards**.

3.0 Stormwater Management

In accordance with the **Phase 3-1 Report**, the proposed stormwater management system will include private storm sewer system with three underground storage units to achieve the established release rate of **126.3 L/s**. The stormwater management design consists of a private storm sewer system with a connection to the existing 450 mm diameter storm sewer within the Draper Avenue right-of-way. No change to the stormwater management calculations identified by the **Phase 3-1 Report** are proposed as the network was designed to accommodate the Phase 3-2 development.

Due to the updated Site Plan, minor relocations of catchbasins are required to accommodate adjusted driveways. Refer to drawing **SSP-1** for the detailed servicing layout.

Townhomes fronting Draper Avenue, within Block 6, will have independent connections to the existing 450 mm diameter storm sewer within Draper Avenue via 100 mm diameter service laterals. The remaining Blocks will have connections to the internal network via 100 mm diameter service laterals in accordance with the **Phase 3-1 Report**.

The proposed stormwater design conforms to all relevant **City Standards** and Policies for approval.

3.1 Hydraulic Grade Line Analysis

In accordance with the **Phase 3-1 Report**, a Hydraulic Grade Line (HGL) analysis was completed using EPASWMM. The minimum freeboard between the slab elevation and the HGL will be 0.30 m. The 100-year 6-Hour Chicago storm event yielded the highest peak flows and was, therefore, used in the HGL analysis.

Table 2, below, summarizes modeled results of selected nodes that resulted in the smallest difference between slab elevation and HGL as modelled by the **Phase 3-1 Report**. Relevant excerpts from the **Phase 3-1 Report** are included in the **Appendix**.

Table 2
Hydraulic Grade Line Analysis 100-Year 6-Hour Storm – Phase 3-2

Node ID	Building ID	Building Slab Elevation (m)	Maximum HGL* (m)	Freeboard (m)
MH2	BLOCK 11	73.95	72.50	1.45
MH3	BLOCK 5	73.95	72.15	1.80
	BLOCK 7 (SOUTH SIDE)	73.91		1.76
MH4	BLOCK 8	73.81	71.97	1.84
	BLOCK 10	73.48		1.51
MH6	BLOCK 6 (SOUTH SIDE)	73.07	71.97	1.10
	BLOCK 7 (NORTH SIDE)	73.01		1.04
MH7	BLOCK 9	72.87	71.97	0.90

*Maximum HGL specified by the previously approved stormwater analysis included in the **Phase 3-1 Report**.

As demonstrated by **Table 2**, above, the minimum freeboard between the slab elevation and the maximum HGL is respected per the previously approved stormwater analysis included in the **Phase 3-1 Report**. Relevant hydrologic modelling excerpts from the **Phase 3-1 Report** are included in the **Appendix**.

4.0 Conclusion

DSEL has been retained by Greatwise Developments to provide a Site Servicing and Stormwater Management Brief in support of the Site Plan for the proposed Fresh Towns – Phase 3-2 townhomes at 2710 Draper Avenue. Based on the Site Plan provided by Roderick Lahey Architect Inc., dated November 30th, 2018, the Phase 3-2 development proposes **54** townhomes. This is consistent with the previously approved Site Servicing and Stormwater Management report for the Phase 3-1 development.

There are no proposed changes to the previously approved watermain network. In accordance with the previously approved **Phase 3-1 Report**, pressures during average day, max day + fire flow and peak hour, and peak hour respect the requirements of the **Water Supply Guidelines**.

A sanitary sewer extension within Foliage Private is proposed to service townhomes within Block 8. No change to the estimated peak wet weather wastewater flow of **6.38 L/s** for the ultimate development is proposed. As a result, sufficient capacity is available to service the Phase 3-2 development.

No change to the previously approved stormwater management calculations are proposed as the network was designed to accommodate the Phase 3-2 development.

In accordance with the **Phase 3-1 Report**, a hydraulic grade line analysis was reviewed, confirming that a minimum freeboard of 0.30 m between the slab elevation of the Phase 3-2 buildings and the maximum HGL within the storm sewer has been respected.

Yours truly,
David Schaeffer Engineering Ltd.



Per: Robert D. Freel, P.Eng.

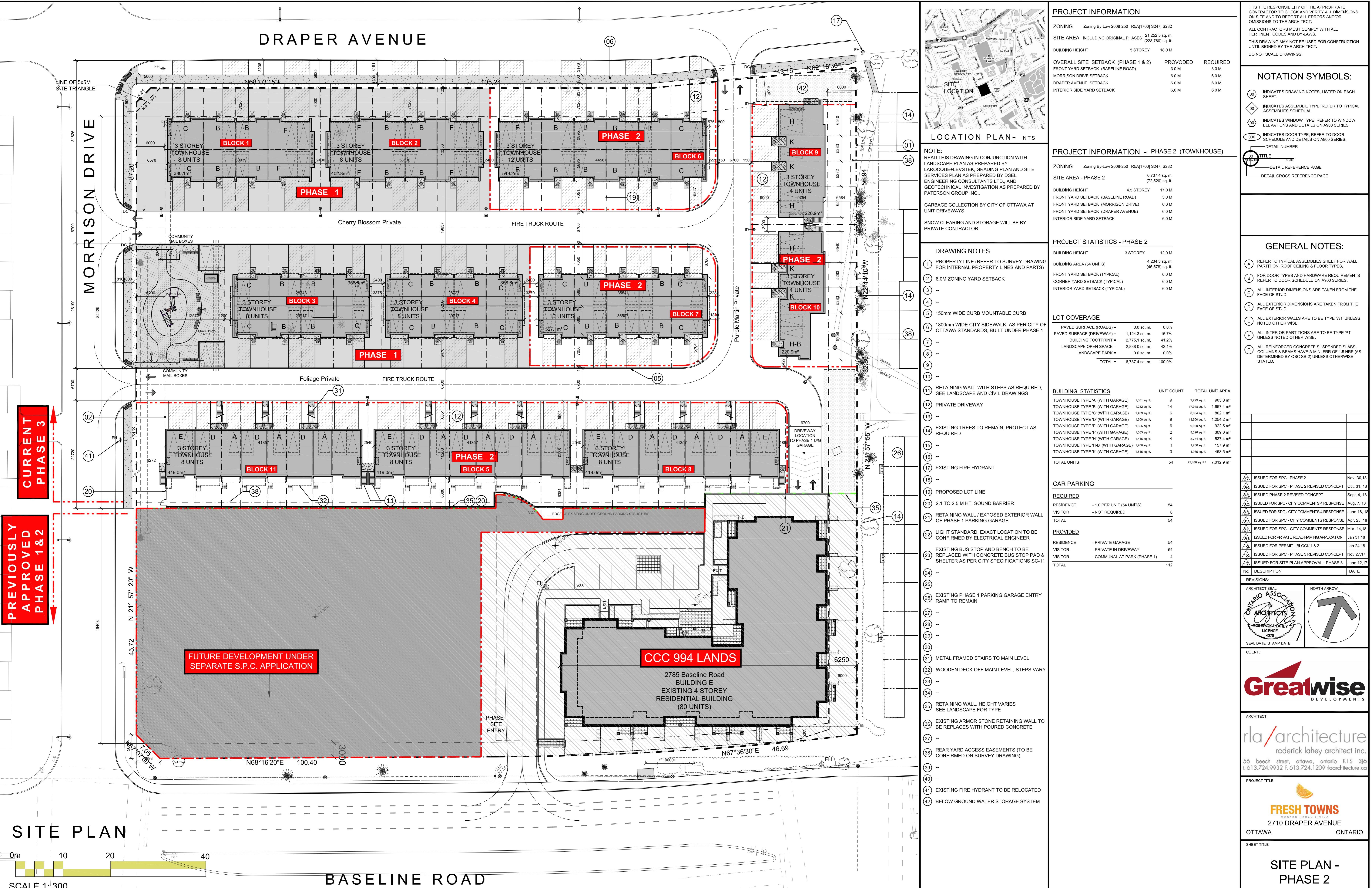
Yours truly,
David Schaeffer Engineering Ltd.

A handwritten signature in black ink that appears to read "Alison Gosling".

Per: Alison Gosling, EIT.

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APPENDIX



PROJECT DEVELOPER

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SURVEYOR

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CIVIL ENGINEER

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SITE PLAN SYMBOLS

- TWO WAY VEHICLE CIRCULATION
- HARD SURFACE WALKWAY
- ENTRANCE LOCATION
- NEW CITY CONCRETE SIDEWALK
- BOLLARD STYLE BIKE RACK
- EXISTING CITY STREET LIGHT
- FIRE HYDRANT
- DEPRESSED CURB
- LIGHT STANDARD
- STOP SIGN

TOPOGRAPHICAL SKETCH OF:

MORRISON COURT & PART OF DRAPER COURT
(Closed by Judge's Order CR483411)
PART OF BLOCK G, REGISTERED PLAN 447761
OTTAWA-CARLETON STANDARD CONDOMINIUM PLAN No.
994, CITY OF OTTAWA
Prepared by Annis, O'Sullivan, Vollebekk Ltd.
Field Work Completed May 4, 2017

IT IS THE RESPONSIBILITY OF THE APPROPRIATE CONTRACTOR TO CHECK AND VERIFY ALL DIMENSIONS ON SITE AND TO REPORT ALL ERRORS AND/OR OMISSIONS TO THE ARCHITECT.
ALL CONTRACTORS MUST COMPLY WITH ALL PERMIT CONDITIONS AND CONDITIONS.
THIS DRAWING MAY NOT BE USED FOR CONSTRUCTION UNTIL SIGNED BY THE ARCHITECT.
DO NOT SCALE DRAWINGS.

NOTATION SYMBOLS:

- (00) INDICATES DRAWING NOTES, LISTED ON EACH SHEET.
- (00) INDICATES ASSEMBLY TYPE; REFER TO TYPICAL ASSEMBLIES SCHEDULE.
- (00) INDICATES WINDOW TYPE; REFER TO WINDOW ELEVATIONS AND DETAILS ON A900 SERIES.
- (00) INDICATES DOOR TYPE; REFER TO DOOR SCHEDULE AND DETAILS ON A900 SERIES.
- (00) DETAIL NUMBER
- (00) TITLE
- (00) SCALE
- (00) CROSS REFERENCE PAGE
- (00) DETAIL CROSS REFERENCE PAGE

GENERAL NOTES:

- (A) REFER TO TYPICAL ASSEMBLIES SHEET FOR WALL, PARTITION, ROOF, CEILING & FLOOR TYPES.
- (B) REFER TO DOOR TYPES AND HARDWARE REQUIREMENTS REFER TO DOOR SCHEDULE ON A900 SERIES.
- (C) ALL INTERIOR DIMENSIONS ARE TAKEN FROM THE FACE OF STUD
- (D) ALL EXTERIOR DIMENSIONS ARE TAKEN FROM THE FACE OF STUD
- (E) ALL EXTERIOR WALLS ARE TO TYPE 'W1' UNLESS NOTED OTHERWISE
- (F) ALL INTERIOR PARTITIONS ARE TO BE TYPE 'P1' UNLESS NOTED OTHER WISE.
- (G) ALL REINFORCED CONCRETE SUPERIPLIED SLABS, COLUMNS & BEAMS HAVE A MIN. PRF. OF 1.4HR AS STATED.

FRESH TOWNS
MODERN URBAN LIVING
2710 DRAPER AVENUE
OTTAWA ONTARIO

SHEET TITLE:

SITE PLAN - PHASE 2

DRAWN: R.V. CHECKED: R.V.
SCALE: 1:300 SHEET No.:
PROJECT No. 1733 DO:
SP-2

PLOT DATE: Monday, December 03, 2018 Plan No.: #

***Servicing and Stormwater Management Report
2710 Draper Avenue – Fresh Towns – Phase 3-1***

Water Calculations

Water Demand Design Flows per Unit Count
City of Ottawa - Water Distribution Guidelines, July 2010



Domestic Demand

Type of Housing	Per / Unit	Units	Pop	Pop	Avg. Daily m³/d	Max Day † m³/d	Peak Hour ‡ m³/d	L/min	L/min
Single Family	3.4		0						
Semi-detached	2.7		0						
Townhouse	2.7	54	146						
Apartment			0						
Bachelor	1.4		0						
1 Bedroom	1.4		0						
2 Bedroom	2.1		0						
3 Bedroom	3.1		0						
Average	1.8		0						
Total Domestic Demand		146	51.1	35.5	184.0	127.8	275.9	191.6	
Total Demand			51.1	35.5	184.0	127.8	275.9	191.6	

Max Day Peaking Factor (Residential) † = 3.6

Peak Hour Peaking Factor (Residential) ‡ = 5.4

Water Demand Design Flows per Unit Count
City of Ottawa - Water Distribution Guidelines, July 2010



Domestic Demand

Type of Housing	Per / Unit	Units	Pop	Pop	Avg. Daily	Max Day t	Peak Hour tt
				m ³ /d	L/min	m ³ /d	L/min
Single Family	3.4		0				
Semi-detached	2.7		0				
Townhouse	2.7	86	233				
Apartment			0				
1 Bedroom	1.4		0				
2 Bedroom	2.1		0				
3 Bedroom	3.1		0				
Average	1.8		0				
Total Domestic Demand			233	81.6	56.6	293.6	203.9
Total Demand				81.6	56.6	293.6	203.9
Max Day Peaking Factor (Residential) t =			3.6	Peak Hour Peaking Factor (Residential)tt =			5.4

Fire Flow Estimation per Fire Underwriters Survey

Water Supply For Public Fire Protection - 1999



Fire Flow Required

1. Base Requirement

$$F = 220C\sqrt{A}$$

L/min

Where **F** is the fire flow, **C** is the Type of construction and **A** is the Total floor area

Type of Construction:

Non-Combustible Construction

C	0.8	Type of Construction Coefficient per FUS Part II, Section 1
A	1257.0	m ² Total floor area based on FUS Part II section 1

Fire Flow

6239.9 L/min

6000.0 L/min rounded to the nearest 1,000 L/min

Adjustments

2. Reduction for Occupancy Type

Combustible

0%

Fire Flow

6000.0 L/min

3. Reduction for Sprinkler Protection

Non-Sprinklered

0%

Reduction

0 L/min

4. Increase for Separation Distance

Cons. of Exposed Wall

	S.D	Lw	Ha	LH	EC
N Non-Combustible	20.1m-30m	43	3	129	10%
S Non-Combustible	30.1m-45m	88	3	264	5%
E Non-Combustible	0m-3m	13.3	3	40	23%
W Non-Combustible	0m-3m	13.3	3	40	23%
% Increase					61% value not to exceed 75%

Increase

3660.0 L/min

Lw = Length of the Exposed Wall (of the adjacent structure)

Ha = number of storeys of the adjacent structure (maximum 5 stories)

LH = Length-height factor of exposed wall. Value rounded up.

EC = Exposure Charge

Total Fire Flow

Fire Flow

9660.0 L/min

fire flow not to exceed 45,000 L/min nor be less than 2,000 L/min per FUS Section 4

10000.0 L/min rounded to the nearest 1,000 L/min

Notes:

- Type of construction, Occupancy Type and Sprinkler Protection information provided Roderick Lahey Architects.
- Calculations based on Fire Underwriters Survey - Part II

Fire Flow Estimation per Fire Underwriters Survey

Water Supply For Public Fire Protection - 1999



Fire Flow Required

1. Base Requirement

$$F = 220C\sqrt{A}$$

L/min

Where **F** is the fire flow, **C** is the Type of construction and **A** is the Total floor area

Type of Construction:

Non-Combustible Construction

C	0.8	Type of Construction Coefficient per FUS Part II, Section 1
A	1647.9	m ² Total floor area based on FUS Part II section 1

Fire Flow	7144.5 L/min
	7000.0 L/min rounded to the nearest 1,000 L/min

Adjustments

2. Reduction for Occupancy Type

Combustible	0%
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Fire Flow	7000.0 L/min
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3. Reduction for Sprinkler Protection

Non-Sprinklered	0%
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Reduction	0 L/min
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4. Increase for Separation Distance

Cons. of Exposed Wall	S.D	Lw	Ha	LH	EC
N Wood Frame	30.1m-45m	33.5		1	34 5%
S Non-Combustible	10.1m-20m	119		3	357 15%
E Non-Combustible	10.1m-20m	45		3	135 15%
W Non-Combustible	0m-3m	143		3	429 25%
	% Increase				60% value not to exceed 75%

Increase	4200.0 L/min
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Lw = Length of the Exposed Wall

Ha = number of storeys of the adjacent structure (maximum 5 stories)

LH = Length-height factor of exposed wall. Value rounded up.

EC = Exposure Charge

Total Fire Flow

Fire Flow	11200.0 L/min fire flow not to exceed 45,000 L/min nor be less than 2,000 L/min per FUS Section 4
	11000.0 L/min rounded to the nearest 1,000 L/min

- Notes:**
 -Type of construction, Occupancy Type and Sprinkler Protection information provided Roderick Lahey Architects.
 -Calculations based on Fire Underwriters Survey - Part II

Fire Flow Estimation per Fire Underwriters Survey

Water Supply For Public Fire Protection - 1999



Fire Flow Required

1. Base Requirement

$$F = 220C\sqrt{A}$$

L/min

Where **F** is the fire flow, **C** is the Type of construction and **A** is the Total floor area

Type of Construction:

Non-Combustible Construction

C	0.8	Type of Construction Coefficient per FUS Part II, Section 1
A	1581.3	m ² Total floor area based on FUS Part II section 1

Fire Flow

6998.7 L/min

7000.0 L/min rounded to the nearest 1,000 L/min

Adjustments

2. Reduction for Occupancy Type

Combustible

0%

Fire Flow

7000.0 L/min

3. Reduction for Sprinkler Protection

Non-Sprinklered

0%

Reduction

0 L/min

4. Increase for Separation Distance

Cons. of Exposed Wall

	S.D	Lw	Ha	LH	EC
N Wood Frame	20.1m-30m	43	0	0	8%
S Non-Combustible	20.1m-30m	35	0	0	8%
E Non-Combustible	10.1m-20m	13.3	0	0	12%
W Non-Combustible	3.1m-10m	13.3	0	0	17%
% Increase					45% value not to exceed 75%

Increase

3150.0 L/min

Lw = Length of the Exposed Wall (of the adjacent structure)

Ha = number of storeys of the adjacent structure (maximum 5 stories)

LH = Length-height factor of exposed wall. Value rounded up.

EC = Exposure Charge

Total Fire Flow

Fire Flow

10150.0 L/min

fire flow not to exceed 45,000 L/min nor be less than 2,000 L/min per FUS Section 4

10000.0 L/min

rounded to the nearest 1,000 L/min

Notes:

- Type of construction, Occupancy Type and Sprinkler Protection information provided Roderick Lahey Architects.
- Calculations based on Fire Underwriters Survey - Part II

Fire Flow Estimation per Fire Underwriters Survey

Water Supply For Public Fire Protection - 1999



Fire Flow Required

1. Base Requirement

$$F = 220C\sqrt{A}$$

L/min

Where **F** is the fire flow, **C** is the Type of construction and **A** is the Total floor area

Type of Construction:

Non-Combustible Construction

C	0.8	Type of Construction Coefficient per FUS Part II, Section 1
A	1257.0	m ² Total floor area based on FUS Part II section 1

Fire Flow	6239.9 L/min
	6000.0 L/min rounded to the nearest 1,000 L/min

Adjustments

2. Reduction for Occupancy Type

Combustible	0%
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Fire Flow	6000.0 L/min
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3. Reduction for Sprinkler Protection

Non-Sprinklered	0%
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Reduction	0 L/min
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4. Increase for Separation Distance

Cons. of Exposed Wall	S.D	Lw	Ha	LH	EC
N Non-Combustible	20.1m-30m	43	3	129	10%
S Ordinary - Unprotected Openings	10.1m-20m	18	3	54	11%
E Non-Combustible	10.1m-20m	45	3	135	15%
W Non-Combustible	0m-3m	12	3	36	23%
% Increase					

59% value not to exceed 75%

Increase	3540.0 L/min
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Lw = Length of the Exposed Wall (of the adjacent structure)

Ha = number of storeys of the adjacent structure (maximum 5 stories)

LH = Length-height factor of exposed wall. Value rounded up.

EC = Exposure Charge

Total Fire Flow

Fire Flow	9540.0 L/min	fire flow not to exceed 45,000 L/min nor be less than 2,000 L/min per FUS Section 4
	10000.0 L/min	rounded to the nearest 1,000 L/min

- Notes:**
 -Type of construction, Occupancy Type and Sprinkler Protection information provided Roderick Lahey Architects.
 -Calculations based on Fire Underwriters Survey - Part II

Fire Flow Estimation per Fire Underwriters Survey

Water Supply For Public Fire Protection - 1999



Fire Flow Required

1. Base Requirement

$$F = 220C\sqrt{A}$$

L/min

Where **F** is the fire flow, **C** is the Type of construction and **A** is the Total floor area

Type of Construction:

Non-Combustible Construction

C	0.8	Type of Construction Coefficient per FUS Part II, Section 1
A	662.7	m ² Total floor area based on FUS Part II section 1

Fire Flow	4530.8 L/min
	5000.0 L/min rounded to the nearest 1,000 L/min

Adjustments

2. Reduction for Occupancy Type

Combustible	0%
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Fire Flow	5000.0 L/min
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3. Reduction for Sprinkler Protection

Non-Sprinklered	0%
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Reduction	0 L/min
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4. Increase for Separation Distance

Cons. of Exposed Wall	S.D	Lw	Ha	LH	EC
N Wood Frame	20.1m-30m	10	1	10	8%
S Non-Combustible	0m-3m	13	3	39	23%
E Wood Frame	3.1m-10m	35	1	35	18%
W Non-Combustible	20.1m-30m	14	3	42	8%
	% Increase				57% value not to exceed 75%

Increase	2850.0 L/min
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Lw = Length of the Exposed Wall (of the adjacent structure)

Ha = number of storeys of the adjacent structure (maximum 5 stories)

LH = Length-height factor of exposed wall. Value rounded up.

EC = Exposure Charge

Total Fire Flow

Fire Flow	7850.0 L/min fire flow not to exceed 45,000 L/min nor be less than 2,000 L/min per FUS Section 4
	8000.0 L/min rounded to the nearest 1,000 L/min

- Notes:**
 -Type of construction, Occupancy Type and Sprinkler Protection information provided Roderick Lahey Architects.
 -Calculations based on Fire Underwriters Survey - Part II

Fire Flow Estimation per Fire Underwriters Survey

Water Supply For Public Fire Protection - 1999



Fire Flow Required

1. Base Requirement

$$F = 220C\sqrt{A}$$

L/min

Where **F** is the fire flow, **C** is the Type of construction and **A** is the Total floor area

Type of Construction:

Non-Combustible Construction

C	0.8	Type of Construction Coefficient per FUS Part II, Section 1
A	689.7	m ² Total floor area based on FUS Part II section 1

Fire Flow

4622.1 L/min

5000.0 L/min rounded to the nearest 1,000 L/min

Adjustments

2. Reduction for Occupancy Type

Combustible

0%

Fire Flow

5000.0 L/min

3. Reduction for Sprinkler Protection

Non-Sprinklered

0%

Reduction

0 L/min

4. Increase for Separation Distance

Cons. of Exposed Wall

	S.D	Lw	Ha	LH	EC
N Non-Combustible	3.1m-10m	13.3	3	40	18%
S Non-Combustible	10.1m-20m	36	3	108	15%
E Non-Combustible	3.1m-10m	40	3	120	20%
W Non-Combustible	10.1m-20m	13.3	3	40	13%
% Increase					66% value not to exceed 75%

Increase

3300.0 L/min

Lw = Length of the Exposed Wall (of the adjacent structure)

Ha = number of storeys of the adjacent structure (maximum 5 stories)

LH = Length-height factor of exposed wall. Value rounded up.

EC = Exposure Charge

Total Fire Flow

Fire Flow

8300.0 L/min fire flow not to exceed 45,000 L/min nor be less than 2,000 L/min per FUS Section 4

8000.0 L/min rounded to the nearest 1,000 L/min

- Notes:**
 -Type of construction, Occupancy Type and Sprinkler Protection information provided Roderick Lahey Architects.
 -Calculations based on Fire Underwriters Survey - Part II

Fire Flow Estimation per Fire Underwriters Survey

Water Supply For Public Fire Protection - 1999



Fire Flow Required

1. Base Requirement

$$F = 220C\sqrt{A}$$

L/min

Where **F** is the fire flow, **C** is the Type of construction and **A** is the Total floor area

Type of Construction:

Non-Combustible Construction

C	0.8	Type of Construction Coefficient per FUS Part II, Section 1
A	1257.0	m ² Total floor area based on FUS Part II section 1

Fire Flow

6239.9 L/min

6000.0 L/min rounded to the nearest 1,000 L/min

Adjustments

2. Reduction for Occupancy Type

Combustible

0%

Fire Flow

6000.0 L/min

3. Reduction for Sprinkler Protection

Non-Sprinklered

0%

Reduction

0 L/min

4. Increase for Separation Distance

Cons. of Exposed Wall	S.D	Lw	Ha	LH	EC
N Non-Combustible	20.1m-30m	33		3	99 10%
S Non-Combustible	>45m				0 0%
E Non-Combustible	0m-3m	13.3		3	40 23%
W Wood Frame	30.1m-45m	13.3		3	40 5%
	% Increase				38% value not to exceed 75%

Increase

2280.0 L/min

Lw = Length of the Exposed Wall (of the adjacent structure)

Ha = number of storeys of the adjacent structure (maximum 5 stories)

LH = Length-height factor of exposed wall. Value rounded up.

EC = Exposure Charge

Total Fire Flow

Fire Flow

8280.0 L/min

fire flow not to exceed 45,000 L/min nor be less than 2,000 L/min per FUS Section 4

8000.0 L/min rounded to the nearest 1,000 L/min

- Notes:**
 -Type of construction, Occupancy Type and Sprinkler Protection information provided Roderick Lahey Architects.
 -Calculations based on Fire Underwriters Survey - Part II

Boundary Conditions Unit Conversion**Connection 1 (Morrison Drive - Northern Connection)**

	Height (m)	Elevation (m)	m H ₂ O	PSI	kPa	L/s	L/min
Avg. DD	115.5	70.5	45.0	64.1	441.6	Fire Flow	183
Fire Flow	94.5	70.5	24.0	34.2	235.6		10980
Peak Hour	105.9	70.5	35.4	50.4	347.5		

Connection 3 (Morrison Drive - Southern Connection)

	Height (m)	Elevation (m)	m H ₂ O	PSI	kPa	L/s	L/min
Avg. DD	115.5	71.7	43.8	62.3	429.3	Fire Flow	183
Fire Flow	95.5	71.7	23.8	33.8	233.1		10980
Peak Hour	105.9	71.7	34.2	48.6	335.1		

Connection 3 (Draper Avenue)

	Height (m)	Elevation (m)	m H ₂ O	PSI	kPa	L/s	L/min
Avg. DD	115.5	69.8	45.7	65.1	448.7	Fire Flow	183
Fire Flow	94.0	69.8	24.2	34.5	237.8		10980
Peak Hour	105.9	69.8	36.1	51.4	354.5		

Minor Loss Coefficients

Fitting	Loss Coefficient
Globe valve, fully open	10
Angle valve, fully open	5
Swing check valve, fully open	2.5
Gate valve, fully open	0.2
Short-radius elbow	0.9
Medium-radius elbow	0.8
Long-radius elbow	0.6
45 degree elbow	0.4
Closed return bend	2.2
Standard tee - flow through run	0.6
Standard tee - flow through branch	1.8
Square Entrance	0.5
Exit	1

Pipe Diameter vs. "C" Factor

Pipe Diameter (m)	C-Factor
150	100
200 to 250	110
300 to 600	120
Over 600	130

*Minor loss coefficients based on EPANET 2 USERS MANUAL, dated September 2000

Node Pressures

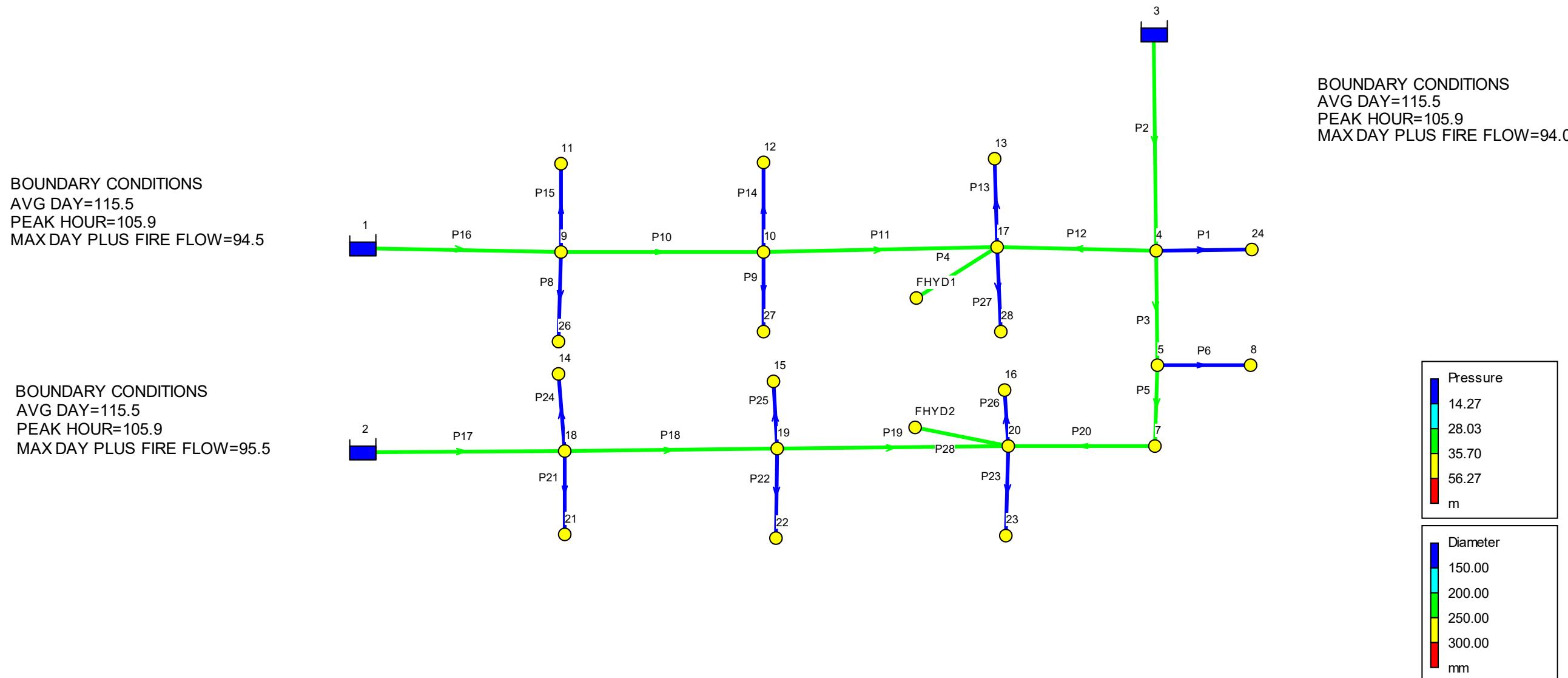
Kpa	Pressure (kPa)	Pressure (m H2O)
Max	552	56.3
Rec Max	480	49.0
Rec Min	350	35.7
Min	275	28.1

Location	Average Day (L/min)	Max Day + Fire Flow (L/min)	Peak Hour (L/min)
4	2.0	7.1	10.7
5	2.0	7.1	10.7
7	0.0	0.0	0.0
8	0.7	2.4	3.6
9	4.0	14.2	21.3
10	4.0	14.2	21.3
11	0.7	2.4	3.6
12	0.7	2.4	3.6
13	0.7	2.4	3.6
14	0.7	2.4	3.6
15	0.7	2.4	3.6
16	0.7	2.4	3.6
17	5.9	21.3	32.0
18	6.6	23.7	35.6
19	6.6	23.7	35.6
20	7.2	26.1	39.1
21	0.7	2.4	3.6
22	0.7	2.4	3.6
23	0.7	2.4	3.6
24	0.7	2.4	3.6
26	0.7	2.4	3.6
27	0.7	2.4	3.6
28	0.7	2.4	3.6
FHYD1	0.0	5500.0	0.0
FHYD2	0.0	5500.0	0.0

Location	Average Day (kPa)	Max Day + Fire Flow (kPa)	Peak Hour (kPa)
4	437.5	209.1	343.4
5	432.8	203.1	338.6
7	429.3	198.3	335.1
8	435.7	205.7	340.9
9	440.4	225.4	346.2
10	438.9	216.1	344.7
11	437.5	222.4	342.9
12	436.1	213.0	341.4
13	434.4	202.7	339.7
14	430.0	220.0	335.3
15	427.9	206.7	333.2
16	425.8	193.0	331.1
17	437.0	205.5	342.9
18	432.8	223.1	338.6
19	430.9	209.9	336.7
20	428.4	195.8	334.2
21	429.6	219.4	334.5
22	428.3	207.0	333.2
23	426.0	193.0	330.9
24	435.7	207.1	340.9
26	436.9	221.6	341.9
27	435.7	212.5	340.6
28	433.6	201.7	338.5
FHYD1	438.5	181.3	344.3
FHYD2	428.5	169.2	334.3

2710 DRAPER AVENUE PHASE III - AVERAGE DAY DEMAND

Day 1, 12:00 AM




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*****
*          E P A N E T                      *
*          Hydraulic and Water Quality       *
*          Analysis for Pipe Networks        *
*          Version 2.0                       *
*****
```

Link - Node Table:

Link ID	Start Node	End Node	Length m	Diameter mm
P2	4	3	34.8	200
P3	4	5	18.7	200
P4	17	FHYD1	1.2	200
P5	5	7	14.2	200
P10	9	10	35.1	200
P11	10	17	39.7	200
P12	17	4	24.7	200
P13	17	13	6.1	19
P14	10	12	6.1	19
P15	9	11	6.1	19
P16	9	1	29.3	200
P17	2	18	33.3	200
P18	18	19	36.4	200
P19	19	20	38.4	200
P20	20	7	20.5	200
P21	18	21	10.8	19
P22	19	22	10.8	19
P23	20	23	10.8	19
P24	18	14	6.1	19
P25	19	15	6.1	19
P26	20	16	6.1	19
P1	4	24	6.7	19
P8	9	26	10.6	19
P9	10	27	10.6	19
P27	17	28	10.6	19
P28	FHYD2	20	3	200
P6	8	5	6.7	19



2018-09-19_ph3_avg.rpt

Node Results:

Node ID	Demand LPM	Head m	Pressure m	Quality hours
4	1.98	115.50	44.60	0.00
5	1.98	115.50	44.12	0.00
FHYD1	0.00	115.50	44.70	0.00
7	0.00	115.50	43.76	0.00
9	3.95	115.50	44.89	0.00
10	3.95	115.50	44.74	0.00
11	0.66	115.50	44.60	0.00
12	0.66	115.50	44.45	0.00
13	0.66	115.50	44.28	0.00
14	0.66	115.50	43.83	0.00
15	0.66	115.50	43.62	0.00
16	0.66	115.50	43.40	0.00
17	5.93	115.50	44.55	0.00
18	6.59	115.50	44.12	0.00
19	6.59	115.50	43.92	0.00
20	7.24	115.50	43.67	0.00
21	0.66	115.50	43.79	0.00
22	0.66	115.50	43.66	0.00
23	0.66	115.50	43.42	0.00
24	0.66	115.50	44.41	0.00
26	0.66	115.50	44.54	0.00
27	0.66	115.50	44.41	0.00
28	0.66	115.50	44.20	0.00
FHYD2	0.00	115.50	43.68	0.00
8	0.66	115.50	44.41	0.00
1	-14.41	115.50	0.00	0.00 Reservoir
2	-17.32	115.50	0.00	0.00 Reservoir
3	-15.73	115.50	0.00	0.00 Reservoir
6	0.00	0.00	0.00	0.00 Reservoir

Link Results:

Link ID	Flow LPM	Velocity m/s	Unit Headloss m/km	Status
P2	-15.73	0.01	0.00	Open
P3	9.70	0.01	0.00	Open
P4	0.00	0.00	0.00	Open
P5	7.06	0.00	0.00	Open
P10	9.14	0.00	0.00	Open
P11	3.87	0.00	0.00	Open
P12	-3.38	0.00	0.00	Open
P13	0.66	0.04	0.36	Open

2018-09-19_ph3_avg.rpt

P14	0.66	0.04	0.36	Open
P15	0.66	0.04	0.36	Open
P16	-14.41	0.01	0.00	Open
P17	17.32	0.01	0.00	Open

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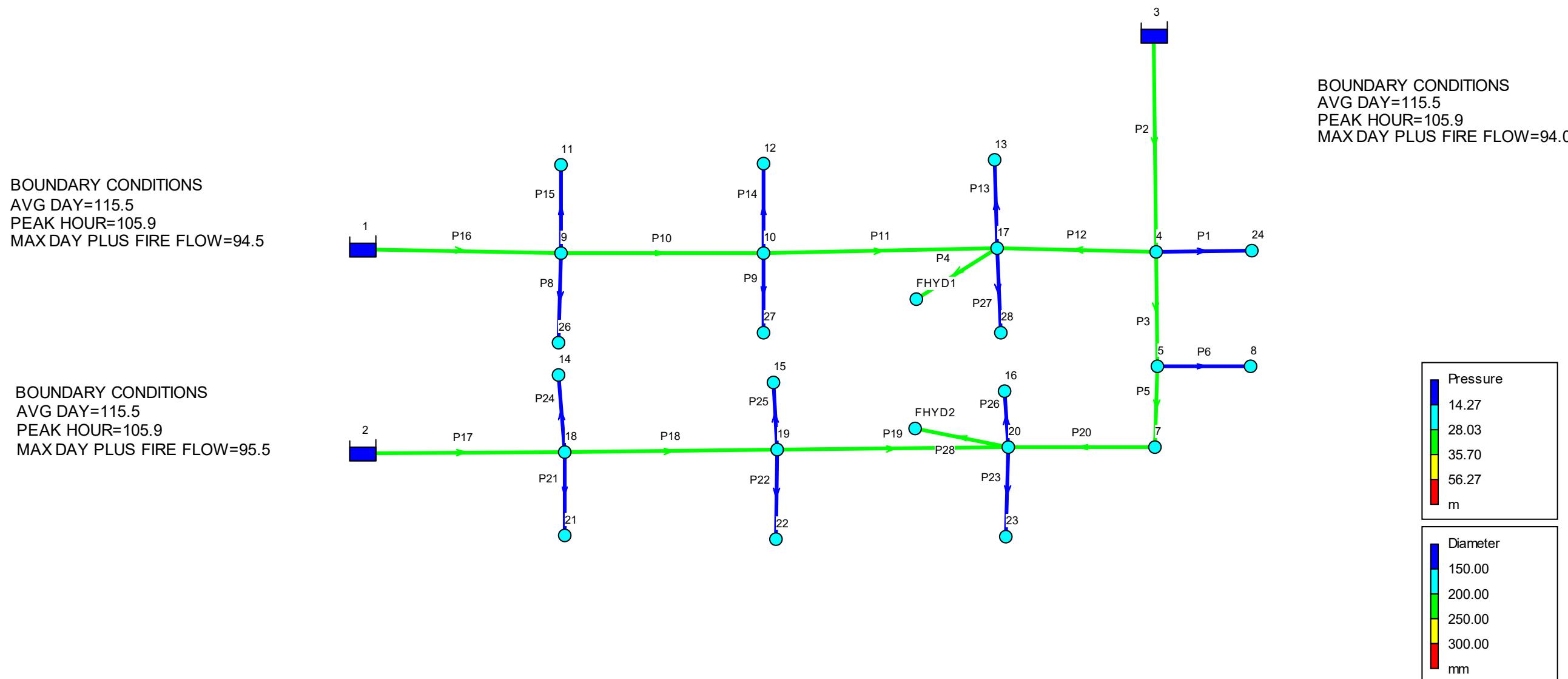
Page 3

Link Results: (continued)

Link ID	Flow LPM	Velocity m/s	Unit Headloss m/km	Status
P18	9.41	0.00	0.00	Open
P19	1.50	0.00	0.00	Open
P20	-7.06	0.00	0.00	Open
P21	0.66	0.04	0.35	Open
P22	0.66	0.04	0.35	Open
P23	0.66	0.04	0.35	Open
P24	0.66	0.04	0.36	Open
P25	0.66	0.04	0.36	Open
P26	0.66	0.04	0.36	Open
P1	0.66	0.04	0.36	Open
P8	0.66	0.04	0.35	Open
P9	0.66	0.04	0.35	Open
P27	0.66	0.04	0.35	Open
P28	0.00	0.00	0.00	Open
P6	-0.66	0.04	0.36	Open

2710 DRAPER AVENUE PHASE III - MAX DAY + FIRE FLOW DEMAND

Day 1, 12:00 AM




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*****
*          E P A N E T                      *
*          Hydraulic and Water Quality       *
*          Analysis for Pipe Networks        *
*          Version 2.0                       *
*****
```

Link - Node Table:

Link ID	Start Node	End Node	Length m	Diameter mm
P2	4	3	34.8	200
P3	4	5	18.7	200
P4	17	FHYD1	1.2	200
P5	5	7	14.2	200
P10	9	10	35.1	200
P11	10	17	39.7	200
P12	17	4	24.7	200
P13	17	13	6.1	19
P14	10	12	6.1	19
P15	9	11	6.1	19
P16	9	1	29.3	200
P17	2	18	33.3	200
P18	18	19	36.4	200
P19	19	20	38.4	200
P20	20	7	20.5	200
P21	18	21	10.8	19
P22	19	22	10.8	19
P23	20	23	10.8	19
P24	18	14	6.1	19
P25	19	15	6.1	19
P26	20	16	6.1	19
P1	4	24	6.7	19
P8	9	26	10.6	19
P9	10	27	10.6	19
P27	17	28	10.6	19
P28	FHYD2	20	3	200
P6	8	5	6.7	19



2018-09-19_ph3_max-rpt.rpt

Node Results:

Node ID	Demand LPM	Head m	Pressure m	Quality hours
4	7.11	92.22	21.32	0.00
5	7.11	92.08	20.70	0.00
FHYD1	5500.00	89.28	18.48	0.00
7	0.00	91.95	20.21	0.00
9	14.22	93.59	22.98	0.00
10	14.22	92.79	22.03	0.00
11	2.37	93.57	22.67	0.00
12	2.37	92.76	21.71	0.00
13	2.37	91.88	20.66	0.00
14	2.37	94.10	22.43	0.00
15	2.37	92.95	21.07	0.00
16	2.37	91.77	19.67	0.00
17	21.34	91.90	20.95	0.00
18	23.71	94.12	22.74	0.00
19	23.71	92.98	21.40	0.00
20	26.08	91.79	19.96	0.00
21	2.37	94.08	22.37	0.00
22	2.37	92.94	21.10	0.00
23	2.37	91.75	19.67	0.00
24	2.37	92.20	21.11	0.00
26	2.37	93.55	22.59	0.00
27	2.37	92.75	21.66	0.00
28	2.37	91.86	20.56	0.00
FHYD2	5500.00	89.07	17.25	0.00
8	2.37	92.06	20.97	0.00
1	-3271.13	94.50	0.00	0.00 Reservoir
2	-3893.17	95.50	0.00	0.00 Reservoir
3	-4006.39	94.00	0.00	0.00 Reservoir
6	0.00	0.00	0.00	0.00 Reservoir

Link Results:

Link ID	Flow LPM	Velocity m/s	Unit Headloss m/km	Status
P2	-4006.39	2.13	51.03	Open
P3	1704.03	0.90	7.47	Open
P4	5500.00	2.92	2186.01	Open
P5	1694.55	0.90	9.55	Open
P10	3252.17	1.73	22.89	Open
P11	3233.21	1.72	22.35	Open
P12	-2292.87	1.22	13.07	Open
P13	2.37	0.14	3.90	Open

2018-09-19_ph3_max-rpt.rpt

P14	2.37	0.14	3.90	Open
P15	2.37	0.14	3.90	Open
P16	-3271.13	1.74	30.99	Open
P17	3893.17	2.07	41.38	Open



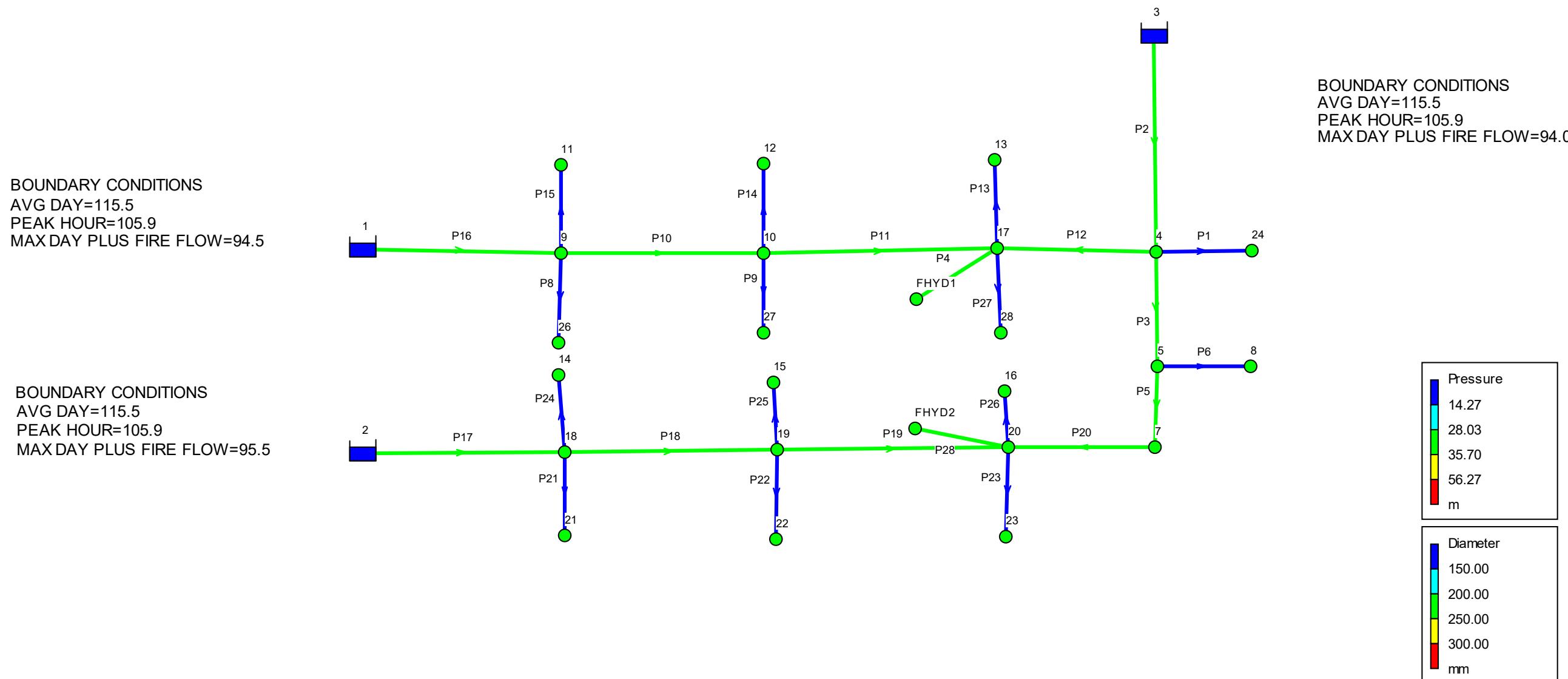
Page 3

Link Results: (continued)

Link ID	Flow LPM	Velocity m/s	Unit Headloss m/km	Status
P18	3864.72	2.05	31.47	Open
P19	3836.27	2.04	30.86	Open
P20	-1694.55	0.90	7.68	Open
P21	2.37	0.14	3.76	Open
P22	2.37	0.14	3.76	Open
P23	2.37	0.14	3.76	Open
P24	2.37	0.14	3.90	Open
P25	2.37	0.14	3.90	Open
P26	2.37	0.14	3.90	Open
P1	2.37	0.14	3.87	Open
P8	2.37	0.14	3.76	Open
P9	2.37	0.14	3.76	Open
P27	2.37	0.14	3.76	Open
P28	-5500.00	2.92	906.63	Open
P6	-2.37	0.14	3.87	Open

2710 DRAPER AVENUE PHASE III - PEAK HOUR DEMAND

Day 1, 12:00 AM




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*****
*          E P A N E T                      *
*          Hydraulic and Water Quality       *
*          Analysis for Pipe Networks        *
*          Version 2.0                       *
*****
```

Link - Node Table:

Link ID	Start Node	End Node	Length m	Diameter mm
P2	4	3	34.8	200
P3	4	5	18.7	200
P4	17	FHYD1	1.2	200
P5	5	7	14.2	200
P10	9	10	35.1	200
P11	10	17	39.7	200
P12	17	4	24.7	200
P13	17	13	6.1	19
P14	10	12	6.1	19
P15	9	11	6.1	19
P16	9	1	29.3	200
P17	2	18	33.3	200
P18	18	19	36.4	200
P19	19	20	38.4	200
P20	20	7	20.5	200
P21	18	21	10.8	19
P22	19	22	10.8	19
P23	20	23	10.8	19
P24	18	14	6.1	19
P25	19	15	6.1	19
P26	20	16	6.1	19
P1	4	24	6.7	19
P8	9	26	10.6	19
P9	10	27	10.6	19
P27	17	28	10.6	19
P28	FHYD2	20	3	200
P6	8	5	6.7	19



2018-09-19_ph3_peak-rpt.rpt

Node Results:

Node ID	Demand LPM	Head m	Pressure m	Quality hours
4	10.67	105.90	35.00	0.00
5	10.67	105.90	34.52	0.00
FHYD1	0.00	105.90	35.10	0.00
7	0.00	105.90	34.16	0.00
9	21.34	105.90	35.29	0.00
10	21.34	105.90	35.14	0.00
11	3.56	105.85	34.95	0.00
12	3.56	105.85	34.80	0.00
13	3.56	105.85	34.63	0.00
14	3.56	105.85	34.18	0.00
15	3.56	105.85	33.97	0.00
16	3.56	105.85	33.75	0.00
17	32.00	105.90	34.95	0.00
18	35.56	105.90	34.52	0.00
19	35.56	105.90	34.32	0.00
20	39.12	105.90	34.07	0.00
21	3.56	105.81	34.10	0.00
22	3.56	105.81	33.97	0.00
23	3.56	105.81	33.73	0.00
24	3.56	105.84	34.75	0.00
26	3.56	105.81	34.85	0.00
27	3.56	105.81	34.72	0.00
28	3.56	105.81	34.51	0.00
FHYD2	0.00	105.90	34.08	0.00
8	3.56	105.84	34.75	0.00
1	-78.14	105.90	0.00	0.00 Reservoir
2	-93.67	105.90	0.00	0.00 Reservoir
3	-84.29	105.90	0.00	0.00 Reservoir
6	0.00	0.00	0.00	0.00 Reservoir

Link Results:

Link ID	Flow LPM	Velocity Unit m/s	Headloss m/km	Status
P2	-84.29	0.04	0.03	Open
P3	52.16	0.03	0.01	Open
P4	0.00	0.00	0.00	Open
P5	37.93	0.02	0.01	Open
P10	49.68	0.03	0.01	Open
P11	21.22	0.01	0.00	Open
P12	-17.90	0.01	0.00	Open
P13	3.56	0.21	8.32	Open

2018-09-19_ph3_peak-rpt.rpt

P14	3.56	0.21	8.32	Open
P15	3.56	0.21	8.32	Open
P16	-78.14	0.04	0.03	Open
P17	93.67	0.05	0.04	Open



Page 3

Link Results: (continued)

Link ID	Flow LPM	Velocity m/s	Unit Headloss m/km	Status
P18	50.99	0.03	0.01	Open
P19	8.31	0.00	0.00	Open
P20	-37.93	0.02	0.01	Open
P21	3.56	0.21	8.01	Open
P22	3.56	0.21	8.01	Open
P23	3.56	0.21	8.01	Open
P24	3.56	0.21	8.32	Open
P25	3.56	0.21	8.32	Open
P26	3.56	0.21	8.32	Open
P1	3.56	0.21	8.26	Open
P8	3.56	0.21	8.01	Open
P9	3.56	0.21	8.01	Open
P27	3.56	0.21	8.01	Open
P28	0.00	0.00	0.00	Open
P6	-3.56	0.21	8.26	Open

Please update the hydraulic analysis based on the below updated boundary conditions which are based on the proposed water demand requirements presented in Appendix B. The boundary conditions have been provided in advance of a formal request to expedite the update.

Interim Site Conditions - Phase 3-1

Average Day Demand: 0.35 L/s (21.1 L/min)

Maximum Daily Demand: 1.26 L/s (76.1 L/min)

Maximum Hourly Demand: 1.90 L/s (114.2 L/min)

Fire Flow: 10,000 L/min

Minimum HGL = 106.2m, same at all connections

Maximum HGL = 115.5m, same at all connections

Max Day + Fire Flow (167L/s) = 97.8m, southern connection on Morrison

Max Day + Fire Flow (167L/s) = 97.0m, northern connection on Morrison

Max Day + Fire Flow (167L/s) = 96.5m, Draper connection

Ultimate Site Conditions - Phase 3-1 & Phase 3-2

Average Day Demand: 0.94 L/s (56.6 L/min)

Maximum Daily Demand: 3.40 L/s (203.9 L/min)

Maximum Hourly Demand: 5.09 L/s (305.8 L/min)

Fire Flow: 11,000 L/min

Minimum HGL = 105.9m, same at all connections

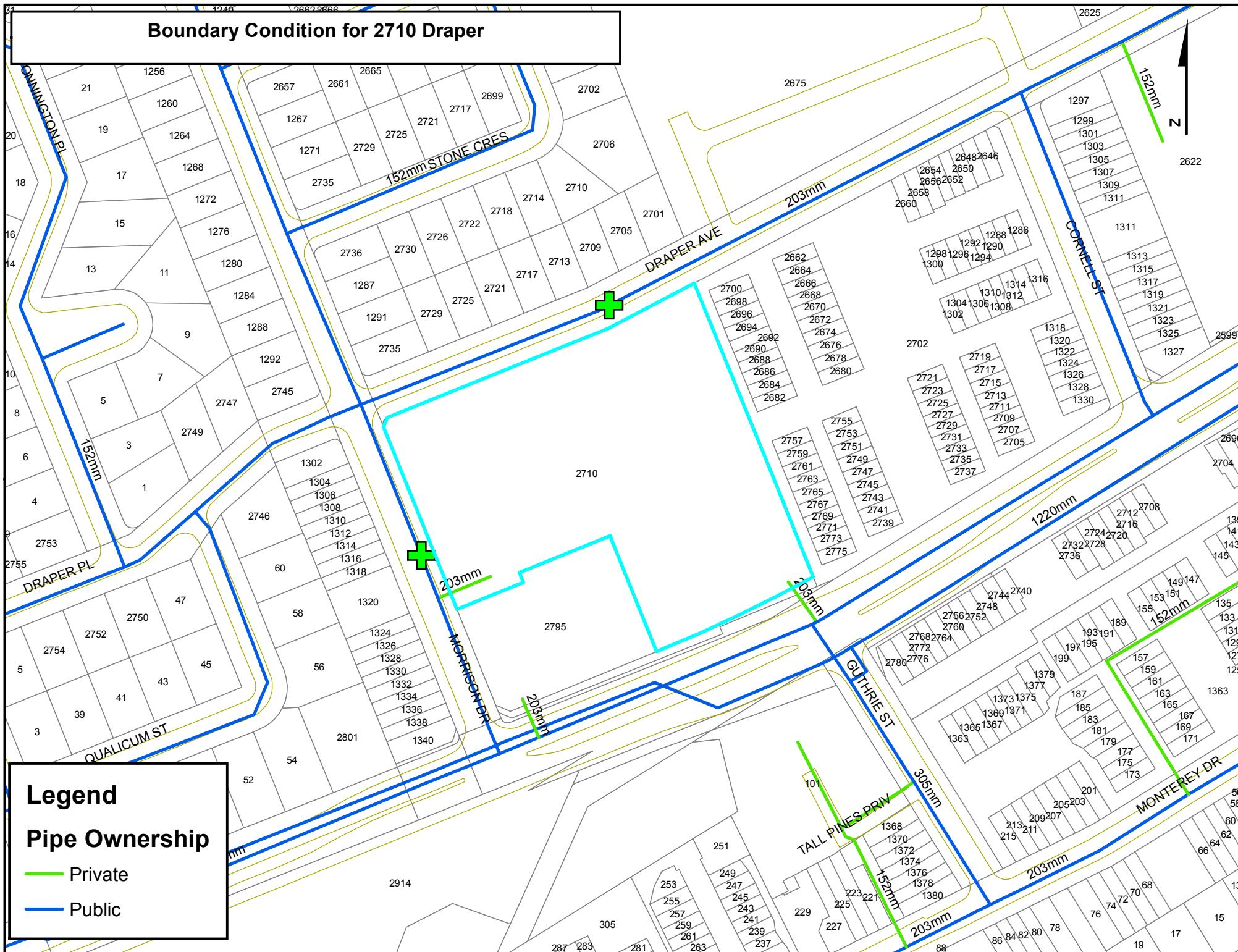
Maximum HGL = 115.5m, same at all connections

Max Day + Fire Flow (183L/s) = 95.5m, southern connection on Morrison

Max Day + Fire Flow (183L/s) = 94.5m, northern connection on Morrison

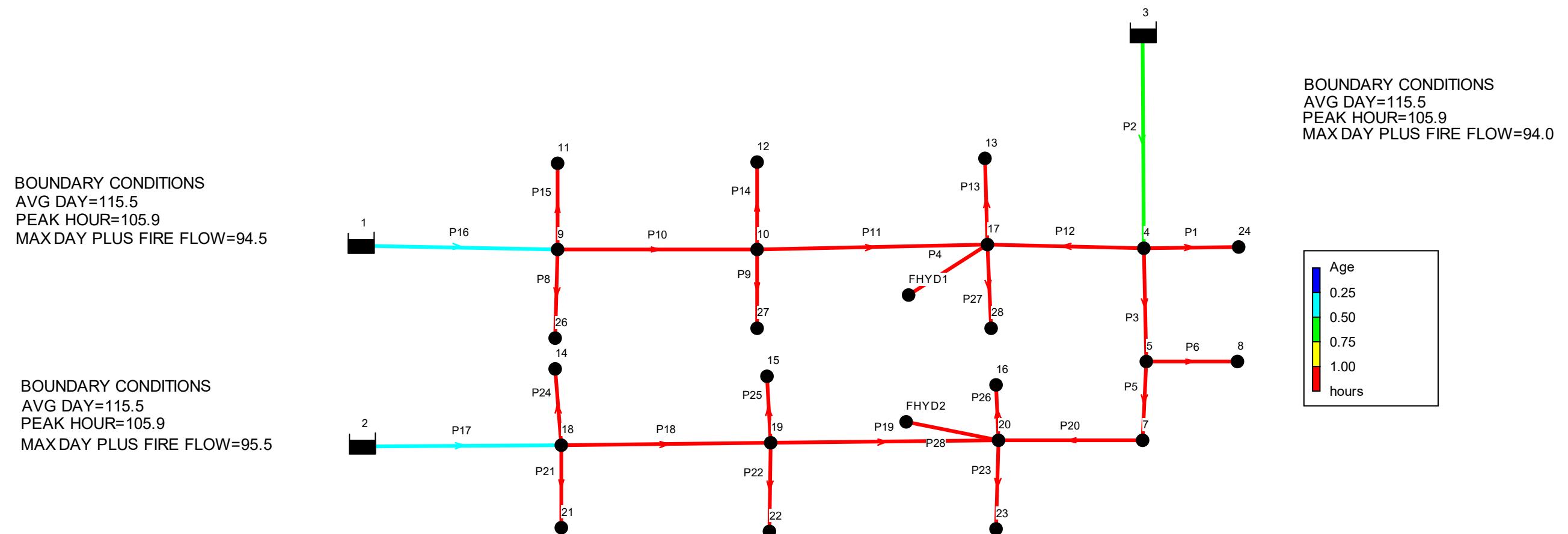
Max Day + Fire Flow (183L/s) = 94.0m, Draper connection

Boundary Condition for 2710 Draper



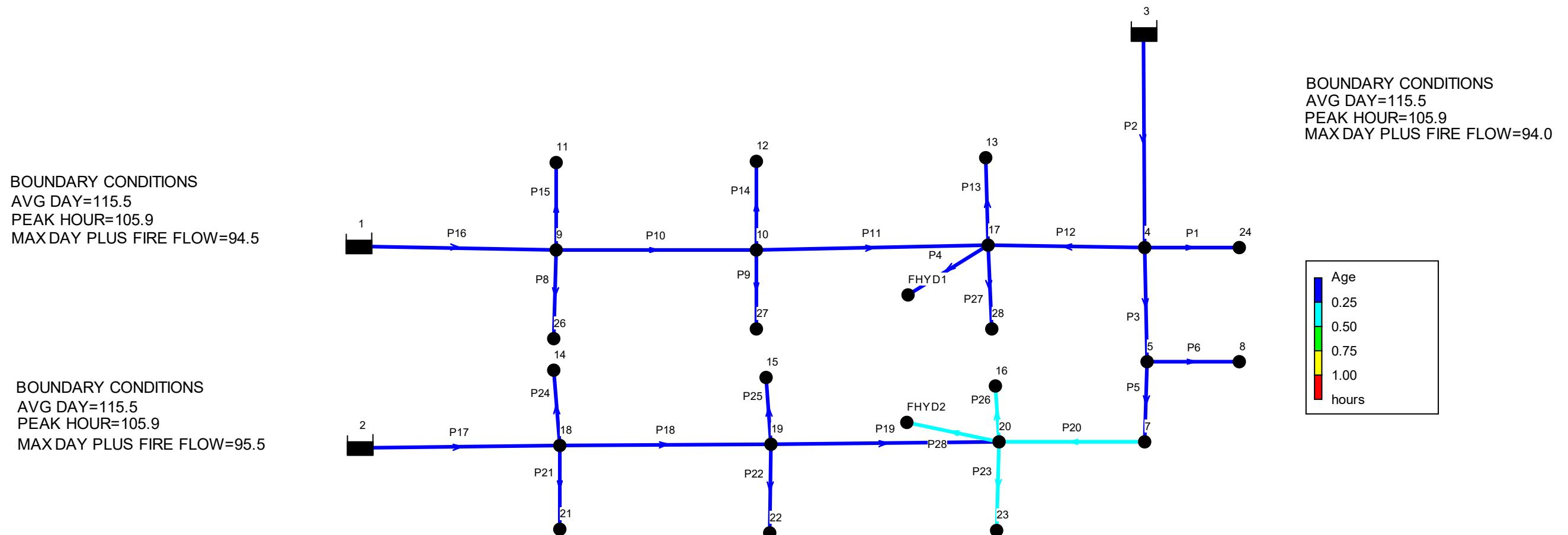
2710 DRAPER AVENUE PHASE III - AVERAGE DAY DEMAND (WATER AGE)

Day 2, 12:00 AM



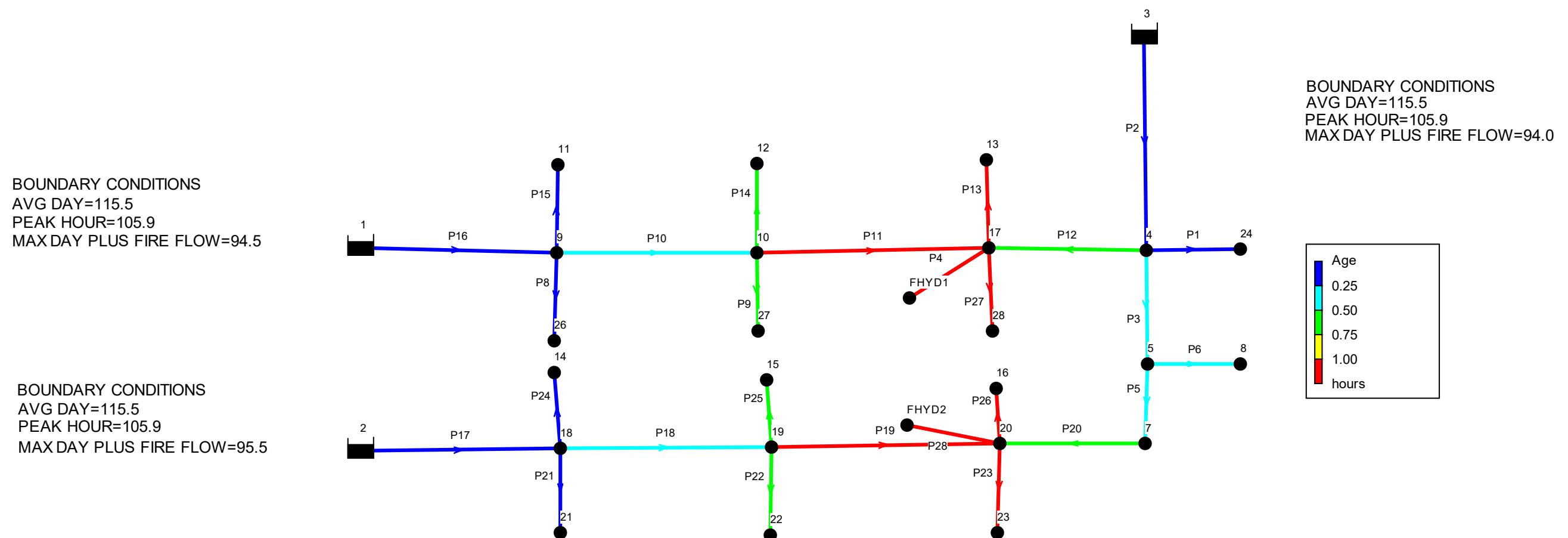
2710 DRAPER AVENUE PHASE III - MAX DAY + FIRE FLOW DEMAND (WATER AGE)

Day 2, 12:00 AM



2710 DRAPER AVENUE PHASE III - PEAK HOUR DEMAND (WATER AGE)

Day 2, 12:00 AM



***Servicing and Stormwater Management Report
2710 Draper Avenue – Fresh Towns – Phase 3-1***

Wastewater Calculations

Wastewater Design Flows per Unit Count
City of Ottawa Sewer Design Guidelines, 2012



Site Area 1.33 ha

Extraneous Flow Allowances

Infiltration / Inflow (Dry)	0.07 L/s
Infiltration / Inflow (Wet)	0.37 L/s
Infiltration / Inflow (Total)	0.44 L/s

Domestic Contributions

Unit Type	Unit Rate	Units	Pop
Single Family	3.4		0
Semi-detached and duplex	2.7		0
Townhouse	2.7	86	233
Stacked Townhouse	2.3		0
Apartment			
1 Bedroom	1.4		0
2 Bedroom	2.1		0
		Total Pop	233

Average Domestic Flow **0.76 L/s**

Peaking Factor **3.50**

Peak Domestic Flow **2.64 L/s**

Total Estimated Average Dry Weather Flow Rate	0.76 L/s
Total Estimated Peak Dry Weather Flow Rate	2.71 L/s
Total Estimated Peak Wet Weather Flow Rate	3.15 L/s

Residential demands, Harmon's Correction Factor, Extraneous Flow Rates and Commercial Peaking Factor established by the City of Ottawa Technical Bulletin ISTB-2018-01. Commercial demands established by City of Ottawa Sewer Design Guidelines Appendix 4A.

Wastewater Design Flows per Unit Count
City of Ottawa Sewer Design Guidelines, 2012



Site Area 2.130 ha

Extraneous Flow Allowances

Infiltration / Inflow (Dry)	0.11 L/s
Infiltration / Inflow (Wet)	0.60 L/s
Infiltration / Inflow (Total)	0.70 L/s

Domestic Contributions

Unit Type	Unit Rate	Units	Pop	
Single Family	3.4		0	
Semi-detached and duplex	2.7		0	
Townhouse	2.7	86	233	<i>Phase 3 Townhomes</i>
Stacked Townhouse	2.3		0	
Apartment				

Existing CCC 994 Lands (Building E)

1 Bedroom	1.4	56	79
2 Bedroom	2.1	24	51

Proposed Building F

1 Bedroom	1.4	43	61
2 Bedroom	2.1	37	78

139 pop

Total Pop 502

Average Domestic Flow 1.63 L/s

Peaking Factor 3.38

Peak Domestic Flow 5.50 L/s

Institutional / Commercial / Industrial Contributions

Property Type	Unit Rate	No. of Units	Avg Wastewater (L/s)
Commercial floor space*	5 L/m ² /d	598	0.07
Industrial - Light	35,000 L/gross ha/d		0.00
Industrial - Heavy	55,000 L/gross ha/d		0.00

Average I/C/I Flow 0.07

Peak Institutional / Commercial Flow 0.07

Peak Industrial Flow** 0.00

Peak I/C/I Flow 0.07

* assuming a 12 hour commercial operation

Total Estimated Average Dry Weather Flow Rate	1.70 L/s
Total Estimated Peak Dry Weather Flow Rate	5.67 L/s
Total Estimated Peak Wet Weather Flow Rate	6.38 L/s

Residential demands, Harmon's Correction Factor, Extraneous Flow Rates and Commercial Peaking Factor established by the City of Ottawa Technical Bulletin ISTB-2018-01. Commercial demands established by City of Ottawa Sewer Design Guidelines Appendix 4A.

SANITARY SEWER CALCULATION SHEET



Manning's n=0.013

LOCATION			RESIDENTIAL AREA AND POPULATION						COMM		INSTIT		PARK		C+I		INFILTRATION			PIPE									
STREET	FROM M.H.	TO M.H.	AREA (ha)	UNITS	POP.	CUMULATIVE		PEAK FACT.	PEAK FLOW (l/s)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	PEAK FLOW (l/s)	TOTAL AREA (ha)	ACCU. AREA (ha)	INFILT. FLOW (l/s)	TOTAL FLOW (l/s)	DIST (m)	DIA (mm)	SLOPE (%)	CAP. (FULL) (l/s)	Q act/Q cap (%)	VEL.					
						AREA (ha)	POP.																						
Cherry Blossom Private						0.00									0.06	0.06	0.06	0.06	0.00168										
	5A	6A	0.19	13.00	35.00	0.19	35.00	4.00	0.45						0.06	0.01	0.19	0.25	0.08	0.54	54.2	250	0.30	32.57	0.02	0.66	0.04		
	6A	7A	0.19	14.00	38.00	0.38	73.00	4.00	0.95						0.06	0.01	0.19	0.44	0.15	1.10	61.6	250	0.30	32.57	0.03	0.66	0.06		
To Purple Martin Private, Pipe 7A - 8A						0.38	73.00								0.06		0.44		0.00										
Foliage Private																													
	2A	3A	0.26	17.00	46.00	0.26	46.00	4.00	0.60						0.26	0.26	0.09	0.68	57.9	250	0.30	32.57	0.02	0.66	0.06				
	3A	4A	0.24	20.00	54.00	0.50	100.00	4.00	1.30						0.24	0.50	0.17	1.46	57.9	250	0.30	32.57	0.04	0.66	0.08				
To Purple Martin Private, Pipe 4A - 70A						0.50	100.00								0.50														
Purple Martin Private																													
Contribution From Foliage Private, Pipe 3A - 4A						0.50	100.00								0.50	0.50													
	4A	7A	0.16	4.00	8.00	0.66	108.00	4.00	1.40						0.16	0.66	0.22	1.62	31.4	250	0.30	32.57	0.05	0.66	0.08				
Contribution From Cherry Blossom Private, Pipe 6A - 7A						0.38	73.00								0.06	0.44	1.10	0.00											
	7A	8A	0.09	4.00	11.00	1.13	192.00	4.00	2.49						0.06	0.01	0.09	1.19	0.39	2.89	29.6	250	0.30	32.57	0.09	0.66	0.09		
	8A	9A				1.13	192.00	4.00	2.49						0.06	0.01	0.00	1.19	0.39	2.89	10.6	250	0.30	32.57	0.09	0.66	0.09		
DESIGN PARAMETERS													Designed:		PROJECT: 2710 DRAPER AVENUE - PHASE 3-1														
Park Flow =	9300	L/ha/da	0.10764	l/s/Ha																									
Average Daily Flow =	280	l/p/day																											
Comm/Inst Flow =	50000	L/ha/da	0.5787	l/s/Ha																									
Industrial Flow =	35000	L/ha/da	0.40509	l/s/Ha																									
Max Res. Peak Factor =	4.00																												
Commercial/Inst./Park Peak Factor:	1.00																												
Institutional =	0.58	l/s/Ha																											
														Checked:		LOCATION: City of Ottawa													
														Dwg. Reference: 3 of 3		File Ref: 17-927		Date: 2018-09-18		Sheet No. 1 of 1									
														Sanitary Drainage Plan, Dwgs. No. SAN-1															

SANITARY SEWER CALCULATION SHEET

CLIENT: MORLEY HOPPNER
 LOCATION: 175 CARRUTHERS AVENUE
 FILE REF: 17-915
 DATE: 24-May-17

DESIGN PARAMETERS

Avg. Daily Flow Res.	350	L/p/d	Peak Fact Res. Per Harmons: Min = 2.0, Max =4.0	Infiltration / Inflow	0.28 L/s/ha
Avg. Daily Flow Comm	50,000	L/ha/d	Peak Fact. Comm.	Min. Pipe Velocity	0.60 m/s full flowing
Avg. Daily Flow Instit.	50,000	L/ha/d	Peak Fact. Instit.	Max. Pipe Velocity	3.00 m/s full flowing
Avg. Daily Flow Indust	35,000	L/ha/d	Peak Fact. Indust. per MOE graph	Mannings N	0.013



Location			Residential Area and Population										Commercial			Institutional			Industrial			Infiltration			Pipe Data							
Area ID	Up	Down	Number of Units				Pop.	Cumulative	Peak.	Q_{res}	Area		Accu.		Area		Accu.		Area		Accu.		Infiltration		DIA	Slope	Length	$A_{hydraulic}$	R	Velocity	Q_{cap}	Q / Q_{full}
			by type								Area	Pop.	Fact.	(-)	(L/s)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(L/s)	(mm)	(%)	(m)	(m ²)	(m)	(m/s)	(L/s)	(-)	
			(ha)	Singles	Semi's	Town's	Apt's																									
CARRUTHERS	C	B	1.280	14			13	71.0	1.280	71.0	4.00	1.15		0.00		0.00		0.00	0.0	1.280	1.280	0.358	1.51	250	2.88	0.049	0.063	2.06	100.9	0.01		
SCOTT STREET	A		5.190	60	2	28	123	506.0	5.190	506.0	3.97	8.14	1.58	1.58	0.00	0.88	0.88	2.1	7.650	7.650	2.142	12.37	300	0.30	0.071	0.075	0.75	53.0	0.23			
			0.000					0.0	5.190	506.0	3.97	8.14		1.58	0.00	0.88	0.88	2.1	0.000	7.650	2.142	12.37	250	0.26	0.049	0.063	0.62	30.3	0.41			
		B	0.000					0.0	5.190	506.0	3.97	8.14		1.58	0.00	0.88	0.88	2.1	0.000	7.650	2.142	12.37	300	0.29	0.071	0.075	0.74	52.1	0.24			
	B		1.810	20	8		55	189.0	8.280	766.0	3.87	12.01	0.40	1.98	0.14	0.14	0.88	2.6	2.350	11.280	3.158	17.73	375	0.44	0.110	0.094	1.05	116.3	0.15			
			0.000					0.0	8.280	766.0	3.87	12.01		1.98	0.14	0.88	0.88	2.6	0.000	11.280	3.158	17.73	375	0.30	0.110	0.094	0.87	96.0	0.18			
	D		0.000					0.0	8.280	766.0	3.87	12.01		1.98	0.14	0.88	0.88	2.6	0.000	11.280	3.158	17.73	375	0.78	0.110	0.094	3.09	340.9	0.05			

***Servicing and Stormwater Management Report
2710 Draper Avenue – Fresh Towns – Phase 3-1***

Stormwater Calculations

Greatwise Developments
2710 Draper Avenue - Phase 3-1
Storm Sewer Calculation Sheet - 5-Year Storm Event

Area ID	Up	Down	Area	C	Indiv AxC	Acc AxC	T _c	I	Q	Sewer Data									
										(ha)	(-)	(min)	(mm/hr)	(L/s)	DIA (mm)	Slope (%)	Length (m)	A _{hydraulic} (m ²)	R (m)
Cherry Blossom Private				0.05	0.50	0.03	0.03	10.0	104.2	7.2	300	1.00	3.5	0.071	0.075	1.37	96.7	0.0	0.07
	MH 5	MH 6		0.19	0.75	0.14	0.17	10.0	104.0	48.4	600	0.14	58.0	0.283	0.150	0.81	229.7	1.2	0.21
	MH 6	MH 7		0.19	0.75	0.14	0.31	11.2	98.1	84.5	675	0.15	61.6	0.358	0.169	0.91	325.6	1.1	0.26
								12.4											
Foliage Private	MH 2	MH 3		0.26	0.75	0.20	0.20	10.0	104.2	56.4	600	0.16	58.1	0.283	0.150	0.87	245.6	1.1	0.23
	MH 3	MH 4		0.07	0.75	0.05	0.25	11.1	98.7	67.8	600	0.16	59.6	0.283	0.150	0.87	245.6	1.1	0.28
								12.3											
Purple Martin Private				0.25	0.75	0.19	0.44												
	MH 4	MH 7		0.08	0.75	0.06	0.50	12.3	93.6	128.7	600	0.14	31.4	0.283	0.150	0.81	229.7	0.6	0.56
								12.9											
	MH 7	MH 8		0.10	0.75	0.08	0.88	12.9	91.0	222.5	675	0.15	29.7	0.358	0.169	0.91	325.6	0.5	0.68
	MH 8**	OGS				0.00	0.88	13.4	88.9	125.5	450	3.40	0.3	0.159	0.113	3.31	525.7	0.0	0.24
	OGS	MH 9				0.00	0.88	13.4	88.9	125.5	450	0.30	13.8	0.159	0.113	0.98	156.2	0.2	0.80
								13.7											

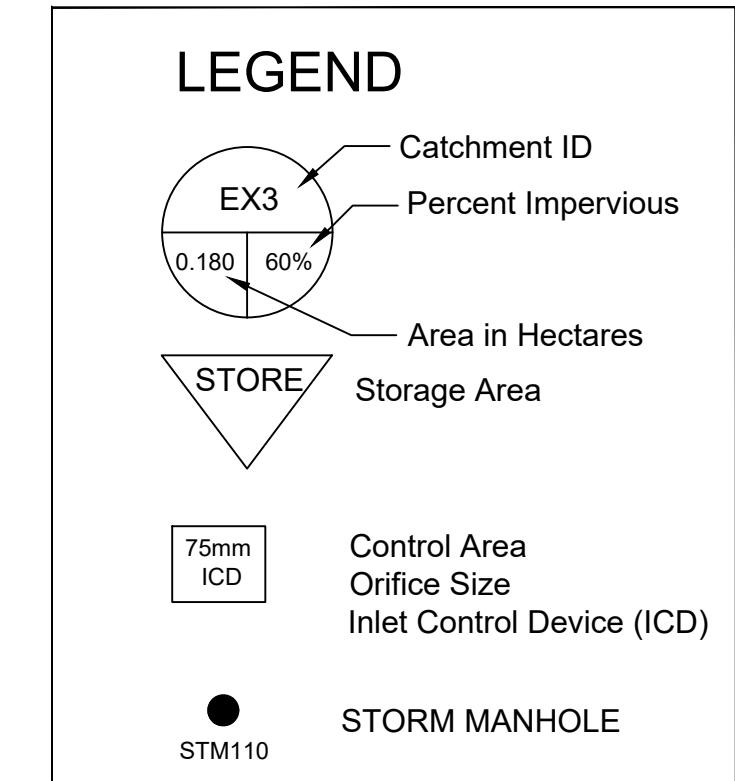
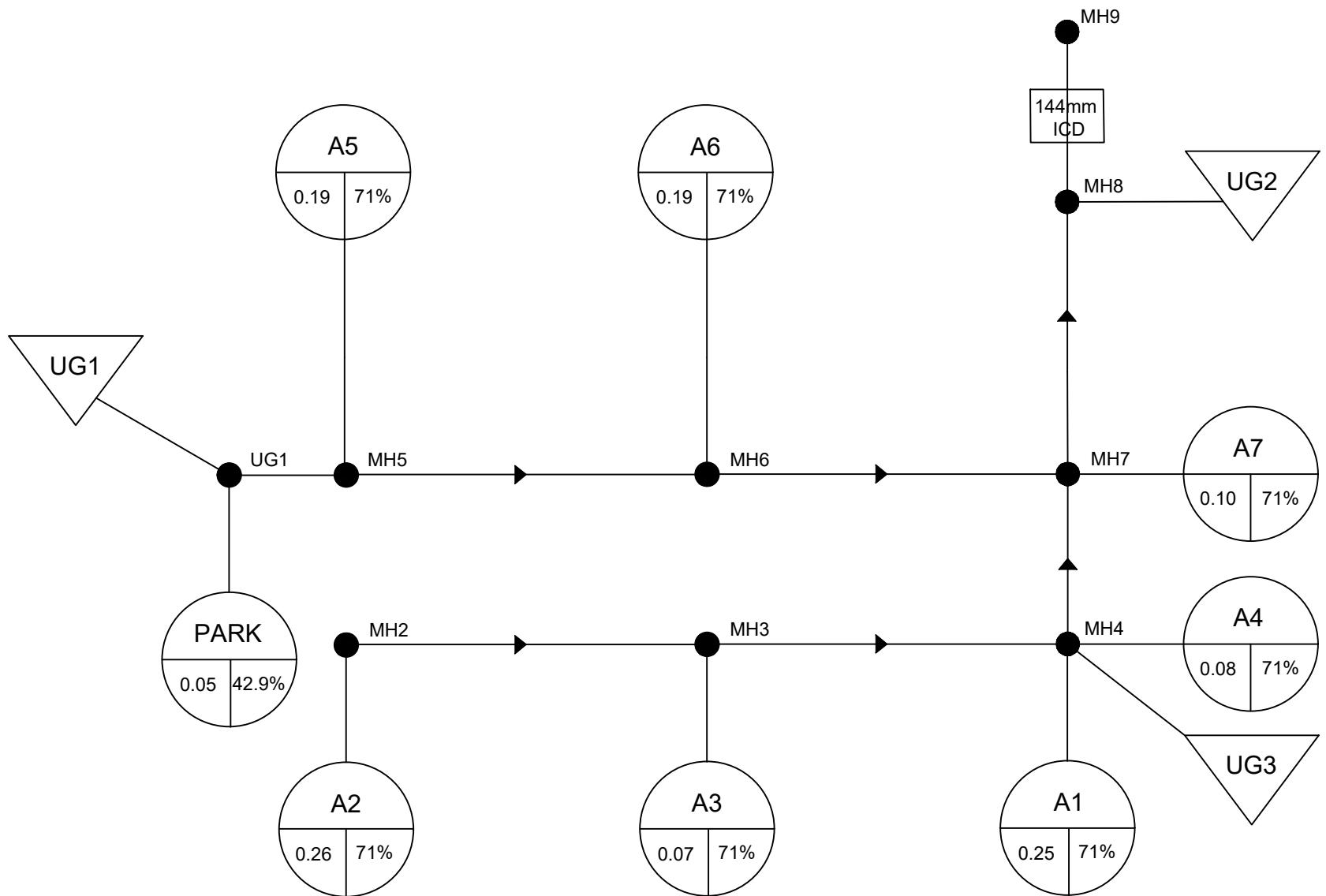
** Controlled flow rate based on EPASWMM Mode 125.49

Greatwise Developments
2710 Draper Avenue - Phase 3-1
Storm Sewer Calculation Sheet - 2-Year Storm Event

Area ID	Up	Down	Area	C	Indiv AxC	Acc AxC	T _c	I	Q	Sewer Data									
										(ha)	(-)	(min)	(mm/hr)	(L/s)	DIA (mm)	Slope (%)	Length (m)	A _{hydraulic} (m ²)	R (m)
Cherry Blossom Private				0.05	0.50	0.03	0.03	10.0	76.8	5.3	300	1.00	3.5	0.071	0.075	1.37	96.7	0.0	0.06
	MH 5	MH 6		0.19	0.75	0.14	0.17	10.0	76.6	35.7	600	0.14	58.0	0.283	0.150	0.81	229.7	1.2	0.16
	MH 6	MH 7		0.19	0.75	0.14	0.31	11.2	72.4	62.3	675	0.15	61.6	0.358	0.169	0.91	325.6	1.1	0.19
								12.4											
Foliage Private	MH 2	MH 3		0.26	0.75	0.20	0.20	10.0	76.8	41.6	600	0.16	58.1	0.283	0.150	0.87	245.6	1.1	0.17
	MH 3	MH 4		0.07	0.75	0.05	0.25	11.1	72.8	50.0	600	0.16	59.6	0.283	0.150	0.87	245.6	1.1	0.20
								12.3											
Purple Martin Private				0.25	0.75	0.19	0.19												
	MH 4	MH 7		0.08	0.75	0.06	0.25	12.3	69.1	47.5	600	0.14	31.4	0.283	0.150	0.81	229.7	0.6	0.21
								12.9											
	MH 7	MH 8		0.10	0.75	0.08	0.63	12.9	67.2	118.1	675	0.15	29.7	0.358	0.169	0.91	325.6	0.5	0.36
	MH 8**	OGS				0.00	0.63	13.4	65.7	125.5	450	3.40	0.3	0.159	0.113	3.31	525.7	0.0	0.24
	OGS	MH 9				0.00	0.63	13.4	65.7	125.5	450	0.30	13.8	0.159	0.113	0.98	156.2	0.2	0.80
								13.7											

** Controlled flow rate based on EPASWMM Mode 125.49

FIGURE 1 - HYDROLOGIC MODEL SCHEMATIC



2018-09-19_927_ajg.inp

[TITLE]
;;Project Title/Notes

[OPTIONS]
;;Option Value
FLOW_UNITS LPS
INFILTRATION HORTON
FLOW_ROUTING DYNWAVE
LINK_OFFSETS ELEVATION
MIN_SLOPE 0
ALLOW_PONDING YES
SKIP_STEADY_STATE NO

START_DATE 01/01/2000
START_TIME 00:01:00
REPORT_START_DATE 01/01/2000
REPORT_START_TIME 00:01:00
END_DATE 01/02/2000
END_TIME 00:00:00
SWEEP_START 01/01
SWEEP_END 12/31
DRY_DAYS 0
REPORT_STEP 00:01:00
WET_STEP 00:01:00
DRY_STEP 00:01:00
ROUTING_STEP 0:00:02

INERTIAL_DAMPING PARTIAL
NORMAL_FLOW_LIMITED BOTH
FORCE_MAIN_EQUATION H-W
VARIABLE_STEP 0.75
LENGTHENING_STEP 0
MIN_SURFAREA 1.14
MAX_TRIALS 8
HEAD_TOLERANCE 0.0015
SYS_FLOW_TOL 5
LAT_FLOW_TOL 5
MINIMUM_STEP 0.5
THREADS 1

[EVAPORATION]
;;Data Source Parameters
;;-----
CONSTANT 0.0
DRY_ONLY NO

[RAINGAGES]
;;Name Format Interval SCF Source

2018-09-19_927_a.jg.inp

;;-----
1 INTENSITY 0:10 1.0 TIMESERIES CH6H100

[SUBCATCHMENTS]
;;Name Rain Gage Outlet Area %Imperv Width %Slope
CurbLen SnowPack
;;-----
A5 0 1 MH5 0.19 71 65 2.0
PARK 0 1 UG1 0.05 42.9 21 4
A6 0 1 MH6 0.19 71 63 2.0
A2 0 1 MH2 0.26 71 66.6 2.0
A3 0 1 MH3 0.07 71 60 2.0
A1 0 1 MH4 0.25 71 27 2.0
A4 0 1 UG3 0.08 71 33 2.0
A7 0 1 MH7 0.1 71 34 2.0
U1 0 1 1 0.16 71 120 5

[SUBAREAS]
;;Subcatchment N-Imperv N-Perv S-Imperv S-Perv PctZero RouteTo
PctRouted
;;-----
A5 0.013 0.25 1.57 4.67 0 OUTLET
PARK 0.013 0.25 1.57 4.67 0 OUTLET
A6 0.013 0.25 1.57 4.67 0 OUTLET
A2 0.013 0.25 1.57 4.67 0 OUTLET
A3 0.013 0.25 1.57 4.67 0 OUTLET
A1 0.013 0.25 1.57 4.67 0 OUTLET
A4 0.013 0.25 1.57 4.67 0 OUTLET
A7 0.013 0.25 1.57 4.67 0 OUTLET
U1 0.013 0.25 1.57 4.67 0 OUTLET

[INFILTRATION]
;;Subcatchment MaxRate MinRate Decay DryTime MaxInfil
;;-----
A5 76.2 13.2 4.14 7 0
PARK 76.2 13.2 4.14 7 0
A6 76.2 13.2 4.14 7 0

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A2	76.2	13.2	4.14	7	0
A3	76.2	13.2	4.14	7	0
A1	76.2	13.2	4.14	7	0
A4	76.2	13.2	4.14	7	0
A7	76.2	13.2	4.14	7	0
U1	76.2	13.2	4.14	7	0

[JUNCTIONS]

;;Name	Elevation	MaxDepth	InitDepth	SurDepth	Apended
;;-----					
MH8	70.15	2.04	0	0	0
MH7	70.227	2.601	0	0	0
MH6	70.454	2.402	0	0	0
MH4	70.34	2.428	0	0	0
MH5	70.613	2.182	0	0	0
MH2	70.925	3.105	0	0	0
MH3	70.809	2.88	0	0	0

[OUTFALLS]

;;Name	Elevation	Type	Stage	Data	Gated	Route	To
;;-----							
1	69.89	FIXED	70.44		NO		

[STORAGE]

;;Name	Elev.	MaxDepth	InitDepth	Shape	Curve Name/Params
N/A	Fevap	Psi	Ksat	IMD	
;;-----					
UG1	70.65	1.8	0	TABULAR	UG1
0	0				
UG2	70.19	2	0	TABULAR	UG2
0	0				
UG3	70.52	1.8	0	TABULAR	UG3
0	0				

[CONDUITS]

;;Name	From Node	To Node	Length	Roughness	InOffset
OutOffset	InitFlow	MaxFlow			
;;-----					
P7-8	MH7	MH8	31.5	0.013	*
* 0	0				
P2-3	MH2	MH3	58.1	0.013	*
* 0	0				
P3-4	MH3	MH4	59.6	0.013	*
* 0	0				
P5-6	MH5	MH6	58	0.013	*
* 0	0				

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P6-7		MH6	MH7	61.6	0.013	*
*	0	0				
P1		MH5	UG1	3.5	0.013	*
*	0	0				
P4-7		MH4	MH7	31.4	0.013	*
*	0	0				
P2		UG2	MH8	10	0.013	*
*	0	0				
P3		UG3	MH4	15.6	0.013	*
*	0	0				

[ORIFICES]

;	Name	From Node	To Node	Type	Offset	Qcoeff
;	Gated	CloseTime				
;						
ICD1		MH8	1	SIDE	*	0.61
YES	0					

[XSECTIONS]

;	Link	Shape	Geom1	Geom2	Geom3	Geom4
;	Barrels	Culvert				
;						
P7-8		CIRCULAR	0.675	0	0	0
P2-3		CIRCULAR	0.600	0	0	0
P3-4		CIRCULAR	0.600	0	0	0
P5-6		CIRCULAR	0.6	0	0	0
P6-7		CIRCULAR	0.675	0	0	0
P1		CIRCULAR	0.3	0	0	0
P4-7		CIRCULAR	0.6	0	0	0
P2		CIRCULAR	0.45	0	0	0
P3		CIRCULAR	0.3	0	0	0
ICD1		CIRCULAR	0.144	0	0	0

[LOSSES]

;	Link	Kentry	Kexit	Kavg	Flap	Gate	Seepage
;							
P7-8		0.5	0.5	0	NO	0	

	2018-09-19_927_atg.inp				
P2-3	0.5	0.5	0	NO	0
P3-4	0.5	1.3	0	NO	0
P5-6	1.3	0.5	0	NO	0
P6-7	0.5	1.3	0	NO	0
P1	0	1.3	0	NO	0
P4-7	1.3	0.5	0	NO	0
P2	0	1.3	0	NO	0
P3	0	1.3	0	NO	0

[CURVES]

;;Name	Type	X-Value	Y-Value
;	-----	-----	-----
BLDGD3	Rating	0	0
BLDGD3		0.025	1.14
BLDGD3		0.05	2.31
BLDGD3		0.075	3.42
BLDGD3		0.10	4.56
BLDGD3		0.15	6.84
;			
BLDGC1	Rating	0	0
BLDGC1		0.025	0.76
BLDGC1		0.05	1.54
BLDGC1		0.075	2.28
BLDGC1		0.10	3.04
BLDGC1		0.15	4.56
;			
BLDGE2	Rating	0	0
BLDGE2		0.025	1.90
BLDGE2		0.05	3.85
BLDGE2		0.075	5.70
BLDGE2		0.1	7.60
BLDGE2		0.15	11.40
;			
BLDGD1D2	Rating	0	0
BLDGD1D2		0.025	7.22
BLDGD1D2		0.05	14.63
BLDGD1D2		0.075	21.66
BLDGD1D2		0.10	28.88
BLDGD1D2		0.15	43.32
;			
BLDGB2	Rating	0	0
BLDGB2		0.025	1.52
BLDGB2		0.05	3.08
BLDGB2		0.075	4.56
BLDGB2		0.10	6.08
BLDGB2		0.15	9.12
;			
BLDGB3	Rating	0	0

2018-09-19_927_atg.inp

BLDGB3		0.025	0.76
BLDGB3		0.05	1.54
BLDGB3		0.075	2.28
BLDGB3		0.1	3.04
BLDGB3		0.15	4.56
;			
BLDGC2	Rating	0	0
BLDGC2		0.025	1.14
BLDGC2		0.05	2.31
BLDGC2		0.075	3.42
BLDGC2		0.10	4.56
BLDGC2		0.15	6.84
;			
BLDGC3	Rating	0	0
BLDGC3		0.025	1.9
BLDGC3		0.05	3.85
BLDGC3		0.075	5.70
BLDGC3		0.1	7.60
BLDGC3		0.15	11.40
;			
BLDGB4	Rating	0	0
BLDGB4		0.025	0.76
BLDGB4		0.05	1.54
BLDGB4		0.075	2.28
BLDGB4		0.1	3.04
BLDGB4		0.15	4.56
;			
BLDGB1	Rating	0	0
BLDGB1		0.025	2.66
BLDGB1		0.05	5.39
BLDGB1		0.075	7.98
BLDGB1		0.1	10.64
BLDGB1		0.15	15.96
;			
BLDGA	Rating	0	0
BLDGA		0.025	19
BLDGA		0.05	38.5
BLDGA		0.075	57
BLDGA		0.1	76
BLDGA		0.15	114
;			
BLDGE	Rating	0	0
BLDGE		0.025	3.04
BLDGE		0.05	6.16
BLDGE		0.075	9.12
BLDGE		0.1	12.16
BLDGE		0.15	18.24
;			

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UG1	Storage	0	110
UG1		0.25	110
UG1		1.8	110
UG1		1.81	0
;			
CB	Storage	0	0
CB		1.5	0.4
CB		1.55	274.6
;			
UG3	Storage	0	20
UG3		0.25	20
UG3		0.5	20
UG3		1.8	20
UG3		1.81	0
;			
CB9	Storage	0	0.4
CB9		1.5	0.4
CB9		1.55	47.97
;			
CB11	Storage	0	0.4
CB11		1.5	0.4
CB11		1.59	134.2
;			
CB17	Storage	0	0.4
CB17		1.5	0.4
CB17		1.59	147.8
;			
UG2	Storage	0	110
UG2		1.8	110
UG2		1.81	0
UG2		2	0
;			
100-YEAR	Tidal	0	94.81
100-YEAR		6	94.81
100-YEAR		12	0
100-YEAR		24	0
 [TIMESERIES]			
;;Name	Date	Time	Value
;	-----	-----	-----
;2yr12hrS			
2yr12hrS	FILE "P:\General Administrative\5 - DSEL Templates\Site Plan\EPASWMM Template\rainfall\2yr12hrS.dat"		
;			
;5yr12hrS			
5yr12hrS	FILE "P:\General Administrative\5 - DSEL Templates\Site Plan\EPASWMM Template\rainfall\5yr12hrS.dat"		
;			

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;10yr12hrs
10yr12hrs FILE "P:\General Administrative\5 - DSEL Templates\Site Plan\EPASWMM Template\rainfall\10yr12hrs.dat"
;
;25yr12hrs
25yr12hrs FILE "P:\General Administrative\5 - DSEL Templates\Site Plan\EPASWMM Template\rainfall\25yr12hrs.dat"
;
;50yr12hrs
50yr12hrs FILE "P:\General Administrative\5 - DSEL Templates\Site Plan\EPASWMM Template\rainfall\50yr12hrs.dat"
;
;100yr12hrs
100yr12hrs FILE "P:\General Administrative\5 - DSEL Templates\Site Plan\EPASWMM Template\rainfall\100yr12hrs.dat"
;
CH4H005 FILE "P:\General Administrative\5 - DSEL Templates\Site Plan\EPASWMM Template\rainfall\CH4H005.dat"
;
;100-year Storm, 4 Hour Chicago Distribution
CH4H100 FILE "P:\General Administrative\5 - DSEL Templates\Site Plan\EPASWMM Template\rainfall\CH4H100.dat"
;
CH6H100 FILE "P:\General Administrative\5 - DSEL Templates\Site Plan\EPASWMM Template\rainfall\CH6H100.dat"
;
CH3H100 FILE "P:\General Administrative\5 - DSEL Templates\Site Plan\EPASWMM Template\rainfall\CH3H100.dat"
;
;3 hour chicago storm + 20%
CH3H100x FILE "P:\General Administrative\5 - DSEL Templates\Site Plan\EPASWMM Template\rainfall\CH3H100x.dat"

[REPORT]
;;Reporting Options
INPUT NO
CONTROLS NO
SUBCATCHMENTS ALL
NODES ALL
LINKS ALL

[TAGS]

[MAP]
DIMENSIONS -2500.000 0.000 12500.000 10000.000
Units None

[COORDINATES]

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;;Node	X-Coord	Y-Coord
MH8	7698.962	6862.745
MH7	7702.419	5120.925
MH6	3995.366	5120.051
MH4	7681.388	3238.696
MH5	-200.084	5132.687
MH2	-225.358	3237.152
MH3	4008.003	3237.152
1	7698.962	8004.614
UG1	-1130.389	4321.767
UG2	8512.907	6857.464
UG3	8591.470	3243.547

[VERTICES]

;;Link	X-Coord	Y-Coord

[Polygons]

;;Subcatchment	X-Coord	Y-Coord
A5	-194.367	6599.074
A5	121.555	6043.051
A5	-447.105	6043.051
A5	-194.367	6624.348
PARK	-1880.792	5612.890
PARK	-1564.869	5006.318
PARK	-2221.988	4993.682
PARK	-1842.881	5650.800
A6	4008.003	6560.657
A6	4374.473	5991.997
A6	3666.807	6004.634
A6	4020.640	6548.020
A2	-210.220	2461.401
A2	143.614	1753.734
A2	-589.327	1753.734
A2	-197.583	2474.038
A3	3970.093	2314.659
A3	4450.295	1632.266
A3	3603.623	1619.629
A3	3970.093	2327.296
A1	8130.936	2507.537
A1	8585.865	1787.233
A1	7701.282	1812.507
A1	8130.936	2520.174
A4	9242.879	4272.768
A4	9672.534	3704.107
A4	8863.772	3678.833

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A4	9255.516	4285.405
A7	9043.078	6011.675
A7	9472.733	5341.919
A7	8727.156	5354.556
A7	9043.078	6036.948
U1	1922.915	7394.693
U1	2327.296	6788.121
U1	1581.719	6788.121
U1	1948.189	7419.966

[SYMBOLS]

;;Gage	X-Coord	Y-Coord
;;-----	-----	-----
1	-777.143	7405.714

NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.

Analysis Options

Flow Units LPS
Process Models:
Rainfall/Runoff YES
RDII NO
Snowmelt NO
Groundwater NO
Flow Routing YES
Ponding Allowed YES
Water Quality NO
Infiltration Method HORTON
Flow Routing Method DYNWAVE
Starting Date 01/01/2000 00:01:00
Ending Date 01/02/2000 00:00:00
Antecedent Dry Days 0.0
Report Time Step 00:01:00
Wet Time Step 00:01:00
Dry Time Step 00:01:00
Routing Time Step 2.00 sec
Variable Time Step YES
Maximum Trials 8
Number of Threads 1
Head Tolerance 0.001500 m

Runoff Quantity Continuity Volume Depth
Runoff Quantity Continuity hectare-m mm

Total Precipitation 0.111 82.291
Evaporation Loss 0.000 0.000
Infiltration Loss 0.021 15.898
Surface Runoff 0.088 65.377
Final Storage 0.001 1.099
Continuity Error (%) -0.100

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	Volume hectare-m	Volume 10^6 ltr
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.088	0.883
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	0.085	0.847
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.004	0.039
Continuity Error (%)	-0.379	

Time-Step Critical Elements

Link P1 (4.89%)

Highest Flow Instability Indexes

Link ICD1 (12)

Routing Time Step Summary

Minimum Time Step	:	0.50 sec
Average Time Step	:	1.96 sec
Maximum Time Step	:	2.00 sec
Percent in Steady State	:	-0.00
Average Iterations per Step	:	2.02
Percent Not Converging	:	0.17

Subcatchment Runoff Summary

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Total	Peak	Runoff	Total	Total	Total	Total	Total
Runoff	Runoff	Coeff	Precip	Runon	Evap	Infil	Runoff
Subcatchment			mm	mm	mm	mm	mm
10^6 ltr	LPS						
A5			82.29	0.00	0.00	15.27	65.99
0.13	87.99	0.802					
PARK			82.29	0.00	0.00	30.14	51.57
0.03	21.20	0.627					
A6			82.29	0.00	0.00	15.28	65.98
0.13	87.83	0.802					
A2			82.29	0.00	0.00	15.35	65.90
0.17	118.12	0.801					
A3			82.29	0.00	0.00	15.13	66.17
0.05	33.39	0.804					
A1			82.29	0.00	0.00	15.75	65.47
0.16	104.84	0.796					
A4			82.29	0.00	0.00	15.23	66.04
0.05	37.41	0.802					
A7			82.29	0.00	0.00	15.28	65.99
0.07	46.29	0.802					
U1			82.29	0.00	0.00	15.10	66.20
0.11	76.54	0.804					

Node Depth Summary

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
		Meters	Meters	Meters	days hr:min	Meters
MH8	JUNCTION	0.46	1.82	71.97	0 02:25	1.82
MH7	JUNCTION	0.39	1.74	71.97	0 02:25	1.74
MH6	JUNCTION	0.18	1.52	71.97	0 02:25	1.52
MH4	JUNCTION	0.28	1.63	71.97	0 02:25	1.63
MH5	JUNCTION	0.14	1.36	71.97	0 02:26	1.36
MH2	JUNCTION	0.09	1.58	72.50	0 01:56	1.05
MH3	JUNCTION	0.10	1.34	72.15	0 01:56	1.16
1	OUTFALL	0.55	0.55	70.44	0 00:00	0.55
UG1	STORAGE	0.13	1.32	71.97	0 02:26	1.32
UG2	STORAGE	0.42	1.78	71.97	0 02:25	1.78

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UG3 STORAGE 0.16 1.45 71.97 0 02:25 1.45

Node Inflow Summary

Total Inflow	Flow Balance	Volume Node	Flow Error	Maximum Lateral Inflow	Maximum Total Inflow	Time of Max Occurrence	Lateral Inflow Volume
ltr	Percent		Type	LPS	LPS	days hr:min	10^6 ltr 10^6
MH8 0.942	0.262		JUNCTION	0.00	285.75	0 01:59	0
MH7 0.795	0.672		JUNCTION	46.29	286.11	0 01:59	0.066
MH6 0.358	-0.101		JUNCTION	87.83	101.03	0 01:51	0.125
MH4 0.443	0.305		JUNCTION	104.84	255.89	0 01:59	0.164
MH5 0.34	-0.117		JUNCTION	87.99	174.76	0 01:59	0.125
MH2 0.171	-0.295		JUNCTION	118.12	118.12	0 01:59	0.171
MH3 0.218	-0.114		JUNCTION	33.39	151.90	0 01:56	0.0463
1 0.847	0.000		OUTFALL	76.54	125.49	0 01:59	0.106
UG1 0.151	0.018		STORAGE	21.20	195.68	0 01:59	0.0258
UG2 0.198	0.268		STORAGE	0.00	236.05	0 01:59	0
UG3 0.0604	0.000		STORAGE	37.41	90.73	0 01:56	0.0528

Node Surcharge Summary

Surcharging occurs when water rises above the top of the highest conduit.

Node	Type	Hours Surcharged	Max. Height Above Crown Meters	Min. Depth Below Rim Meters
MH8	JUNCTION	3.96	1.142	0.223
MH7	JUNCTION	3.60	1.068	0.858
MH6	JUNCTION	2.73	0.841	0.886
MH4	JUNCTION	3.44	1.032	0.796
MH5	JUNCTION	2.45	0.758	0.824
MH2	JUNCTION	1.65	0.977	1.528
MH3	JUNCTION	1.91	0.744	1.536

Node Flooding Summary

No nodes were flooded.

Storage Volume Summary

of Max Occurrence Storage hr:min	Maximum Outflow Unit LPS	Average Volume 1000 m3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m3	Max Pcnt Full	Time days
UG1 02:26	14.93	0.014	7	0	0	0.145	73	0
UG2 02:25	14.66	0.046	23	0	0	0.196	98	0
UG3 02:25	56.00	0.003	9	0	0	0.029	81	0

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Outfall Loading Summary

Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10^6 ltr
1	44.14	23.82	125.49	0.847
System	44.14	23.82	125.49	0.847

Link Flow Summary

Link	Type	Maximum Flow LPS	Time of Max Occurrence days hr:min	Maximum Veloc m/sec	Max/Full Flow	Max/Full Depth
P7-8	CONDUIT	285.75	0 01:59	0.80	0.69	1.00
P2-3	CONDUIT	118.93	0 01:56	0.95	0.43	1.00
P3-4	CONDUIT	154.15	0 01:56	0.57	0.28	1.00
P5-6	CONDUIT	92.68	0 02:00	0.42	0.29	1.00
P6-7	CONDUIT	57.72	0 01:51	0.27	0.11	1.00
P1	CONDUIT	174.49	0 01:59	2.47	1.75	1.00
P4-7	CONDUIT	240.54	0 01:59	0.85	0.65	1.00
P2	CONDUIT	236.05	0 01:59	1.48	1.31	1.00
P3	CONDUIT	56.00	0 02:00	0.79	0.54	1.00
ICD1	ORIFICE	54.11	0 02:25			1.00

Flow Classification Summary

Inlet Conduit Ctrl	Length	Adjusted /Actual		Fraction of Time in Flow Class						
		Dry	Dry	Up	Down	Sub	Sup	Up	Down	Norm
		Crit	Crit	Crit	Crit	Crit	Crit	Ltd		

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-	P7-8	1.00	0.02	0.00	0.00	0.98	0.00	0.00	0.00	0.01
0.00										
0.00	P2-3	1.00	0.02	0.00	0.00	0.98	0.00	0.00	0.00	0.02
0.00										
0.00	P3-4	1.00	0.02	0.27	0.00	0.71	0.00	0.00	0.00	0.81
0.00										
0.00	P5-6	1.00	0.02	0.00	0.00	0.98	0.00	0.00	0.00	0.10
0.00										
0.00	P6-7	1.00	0.02	0.00	0.00	0.98	0.00	0.00	0.00	0.73
0.00										
0.00	P1	1.00	0.02	0.00	0.00	0.97	0.00	0.00	0.00	0.39
0.00										
0.00	P4-7	1.00	0.02	0.00	0.00	0.98	0.00	0.00	0.00	0.04
0.00										
0.00	P2	1.00	0.02	0.01	0.00	0.97	0.00	0.00	0.00	0.00
0.00										
0.00	P3	1.00	0.02	0.19	0.00	0.79	0.00	0.00	0.00	0.75
0.00										

Conduit Surcharge Summary

Conduit	Hours Full			Hours	Hours
	Both Ends	Upstream	Dnstream	Above Normal	Full Capacity Limited
P7-8	3.60	3.60	3.96	0.01	0.01
P2-3	1.65	1.65	1.91	0.01	0.01
P3-4	1.91	1.91	3.44	0.01	0.01
P5-6	2.45	2.45	2.99	0.01	0.01
P6-7	2.73	2.73	3.60	0.01	0.01
P1	3.34	3.34	3.54	0.15	0.01
P4-7	3.44	3.44	3.96	0.01	0.01
P2	4.86	4.86	5.07	0.07	0.01
P3	4.00	4.00	4.87	0.01	0.01

Analysis begun on: Wed Sep 19 11:11:33 2018

Analysis ended on: Wed Sep 19 11:11:34 2018

Total elapsed time: 00:00:01