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PROPOSED REDEVELOPMENT
1755 & 1805 Pickering Parkway,
City of Pickering, Ontario

MASTER SERVICING AND STORM WATER MANAGEMENT REPORT

Prepared For:

Pickering Ridge Lands Inc.
&
Bayfield Realty Advisors

ORIGINAL: January 25, 2022

REVISED: March 14, 2022 (for Submission)

REVISED: April 13, 2022 (for Submission)

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TABLE OF CONTENTS

DESCRIPTION **Page**

LIST OF FIGURES

LIST OF TABLES

APPENDIX A

Aerial Photo of Existing Site
Site Plan of the Proposed Development (reduced)

APPENDIX B

Existing condition sanitary sewer design sheet

Redeveloped site Phase 1 sanitary sewer design sheet - REQUIRED SIZES

Redeveloped site Phase 1 sanitary sewer design sheet - PROPOSED SIZES

Redeveloped sites (subject, 1899 Brock Road and surrounding tributaries) sanitary sewer design sheet

Region of Durham Tributary Maps & Correspondence indicating population densities

APPENDIX C

Hydrant Flow tests

APPENDIX D

XPSWMM models and output upon request

APPENDIX E

1. INTRODUCTION

Site Description

The subject development has a total area of 9.484 ha and is bound by Pickering Parkway to the north, Highway 401 to the south, Notion Road and Saint Francis De Sales Cemetery to the east and Brock Road to the west. Currently, the site is developed with multi-tenant, “big box” and smaller commercial retail establishments with associated asphalt parking lots. The topography of the site is relatively flat sloping northeast. The subject site known as First Pickering Place (FPP) is currently designated as “Mixed Use Areas – Specialty Retailing Node” in the Pickering Official Plan; the lands with this designation are intended to have the widest variety of uses and highest levels of activities. An aerial view of the site can be found in Appendix A showing surrounding uses. Refer to Exhibit 1 below for the site location. Exhibit 2 shows the plan of the redeveloped site and location of Phase 1 within the site.

Background

The objective of this report is to define a feasible servicing plan focusing on the Full Development Build out in order to allow Phase 1 of the development to proceed, which includes Towers A1 and A2. This report will evaluate servicing schemes for the proposed redevelopment at the full build out with respect to sanitary, water and storm servicing and also evaluate the stormwater management (SWM) strategy to meet the SWM requirements set out by regulatory agencies.

Exhibit 1 Location of the project site

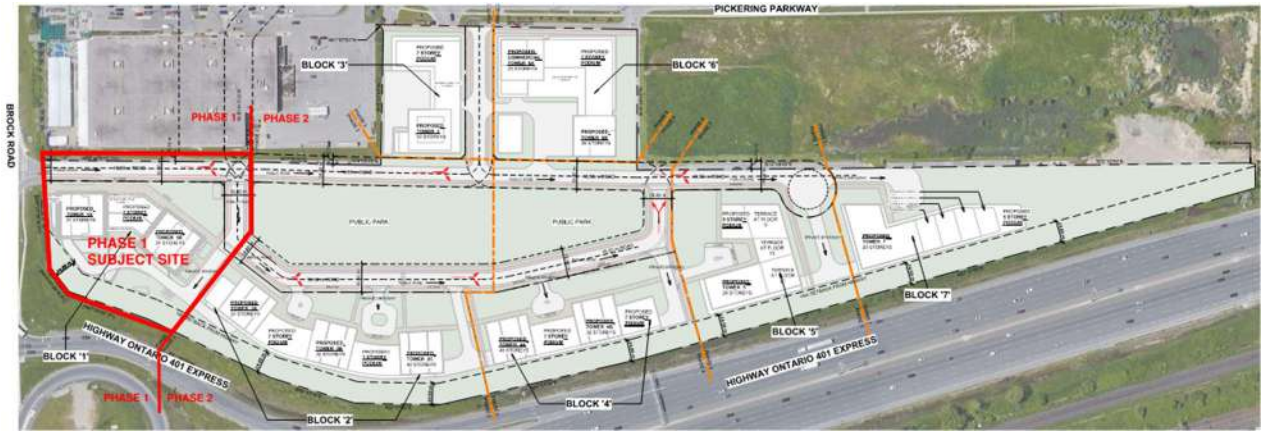


Exhibit 2 Full build out layout and location of Phase 1

2. SCOPE OF WORK

The Odan/Detech Group Inc. was retained by the owners, **Pickering Ridge Lands Inc. & Bayfield Realty Advisors** to propose a servicing scheme(s) for the Redevelopment of 1755 & 1805 Pickering Parkway (Pickering Design Centre). The scope of work in brief involves the following:

a) Gather information on the existing services for the Site and surrounding the Site.

b) Work with or assemble a team of Consultants and Vendors to perform specialized tasks required for the global servicing assessment.

c) Meetings/conversations with consulting team and land owners in order to coordinate developments.

d) Produce Servicing Schemes that will allow for the development of the intensified site at full build out and focus on the development of Phase 1. The servicing analysis entails a review for sanitary waste water, water distribution, storm water management and grading.

Currently, the proposed development area is divided into 7 blocks (Block ‘1’ to Block ’7’), of which Phase one corresponds to Block ‘1’. The proposed redevelopment in Phase 1 will consist of a mixed-use development with two towers of 31 storeys. The proposed building will have retail at grade, 630 apartment dwelling units, 4 level of underground parking and surface parking, and 1,690 m2 of indoor and 1,264 m2 of outdoor amenity space. Refer to site plan prepared by Turner Fleischer Architects Inc. in Appendix A for additional information.

3. SANITARY SERVICING

Existing Sanitary Sewer Infrastructure

As-constructed and design drawings obtained from the Region of Durham and the Town of Pickering show that an existing 250 mm diameter sanitary sewer in Pickering Parkway are located as the main sanitary outlet of the subject site.

There are two existing sanitary sewer connections to the site, a 250mm sanitary outlet toward Pickering Parkway at the north of the site and a 150 mm sanitary outlet toward Notion Road at the east of the site.

Refer to Exhibit 3 for the location of the Site and the layout of the existing sanitary sewers in the area.

The majority of sanitary flow from the existing commercial site is conveyed through an existing 250 mm diameter sanitary sewer west to east along Pickering Parkway. Then connected to a 250 mm diameter sanitary sewer at the intersection with Marshcourt Dr, which conveys the sanitary flow to the north. The 250 mm diameter sanitary sewer on Marshcourt Dr then increases to a 375 mm diameter sewer at the Region's easement and the sanitary sewer conveys the collected sanitary flow to a 375 mm diameter sanitary sewer on Notion Road. The 375 mm diameter sanitary sewer on Notion Road is connected to a 750 mm sanitary sewer on Orchard Road that conveys the collected flow to the east. The 750mm pipe is the outlet for the subject site.

The sanitary analysis will be conducted considering the flow from all sites that presently flow to Orchard Road and the future flow from the redevelopment of 1899 Brock Road and surrounding tributary areas which have been provided by the Region. Refer to Region sanitary maps and correspondence in Appendix B for additional information.

In completing the analysis, the following information will be used or relied upon:

- Drawings from City of Pickering.
- Drawings from The Regional Municipality of Durham.
- Sanitary system Maps from The Regional Municipality of Durham
- Design guidelines for sanitary sewers systems from The Regional Municipality of Durham
- Master Servicing & Stormwater Management Report -1899 Brock Road, SCHAEFFERS Consulting Engineers, May 2021
- Functional Servicing & Stormwater Management Report Residential Townhouse Development - 1856 Notion Road, GHD, Jan 2018

EXISTING SYSTEM REVIEW

Based on review of the existing sanitary sewer sheets in Appendix B, the redeveloped site cannot be routed through the existing sewer system along Pickering Pkwy, Marshcourt Drive, easement between homes to Notion Road to Orchard Drive. Due to limitations of the existing sanitary sewer capacity, it would mean replacing a relatively deep sewer between two existing homes. The recommended and preferred routing would be along Pickering Pkwy to Notion Road to Orchard Drive.

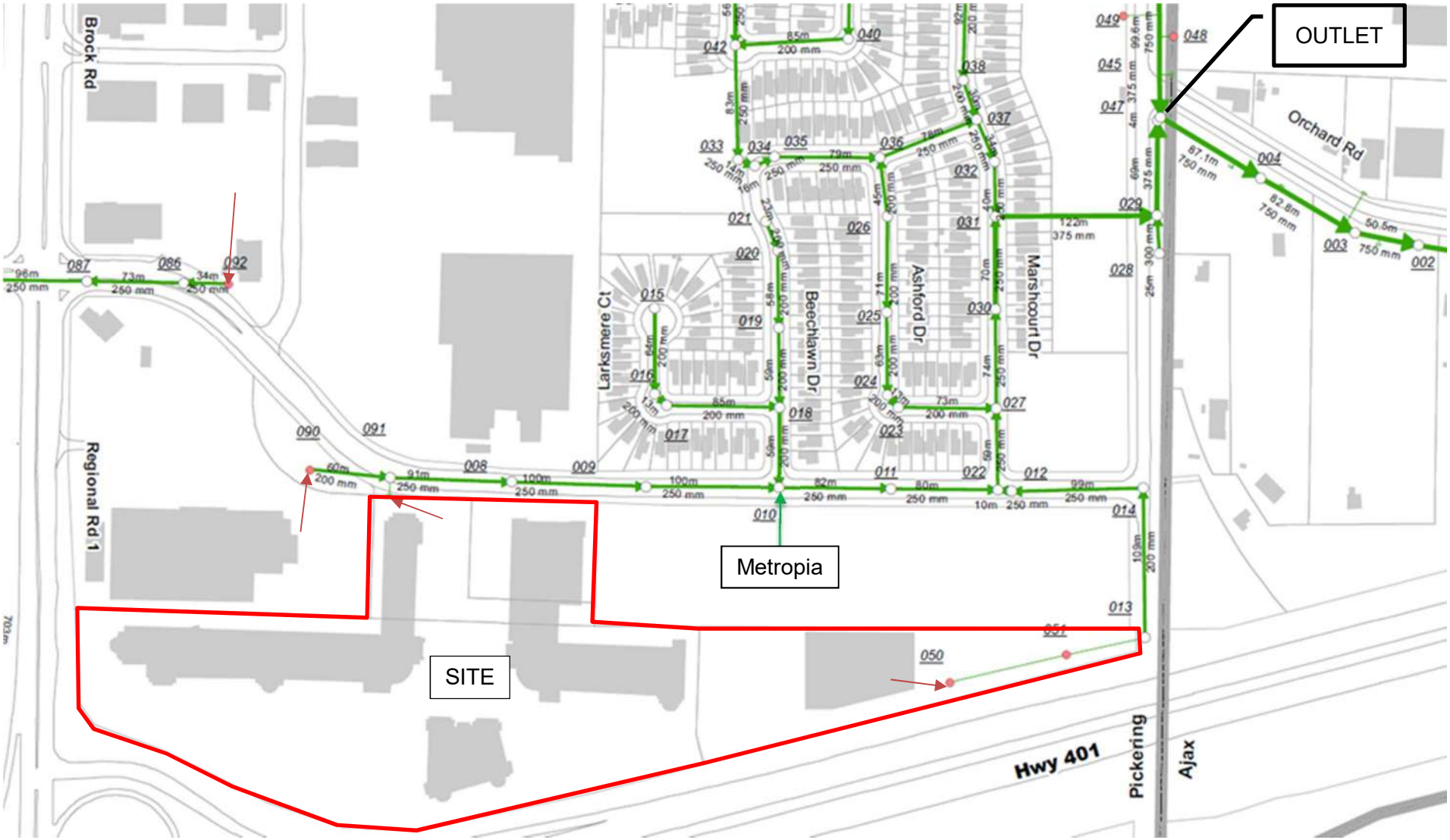


Exhibit 3 Durham Region layout of existing sanitary sewers

REGION OF DURHAM PREFERRED SYSTEM

Discussion with the Region of Durham (Aaron Christie), regarding redevelopment of the subject site and intensification of future development lands, can be summarized as follows:

1) The Region solution for the intensification is to provide a sewage pump station (SP) on the south side of HWY 401. From this SP a large trunk sewer will be extended North under HWY 401 to Notion Road, then continue North on Notion Road. The design and EA for this project will start shortly.

2) Sanitary mapping has been provided by the Region which indicates proposed future development lands and the associated tributary areas which will ultimately discharge to the SP on the south side of HWY 401 via Pickering Parkway and the Notion Road trunk sewer. Population densities for these proposed development lands were provided by the Region. Refer to Exhibits 4, 5 & 6 below for the Region's sanitary mapping and related population densities.

Region of Durham Sanitary Maps & Correspondence indicating population densities

Exhibit 4 – Region Map 1 North [1899 Brock Rd & Mixed-use Lands]

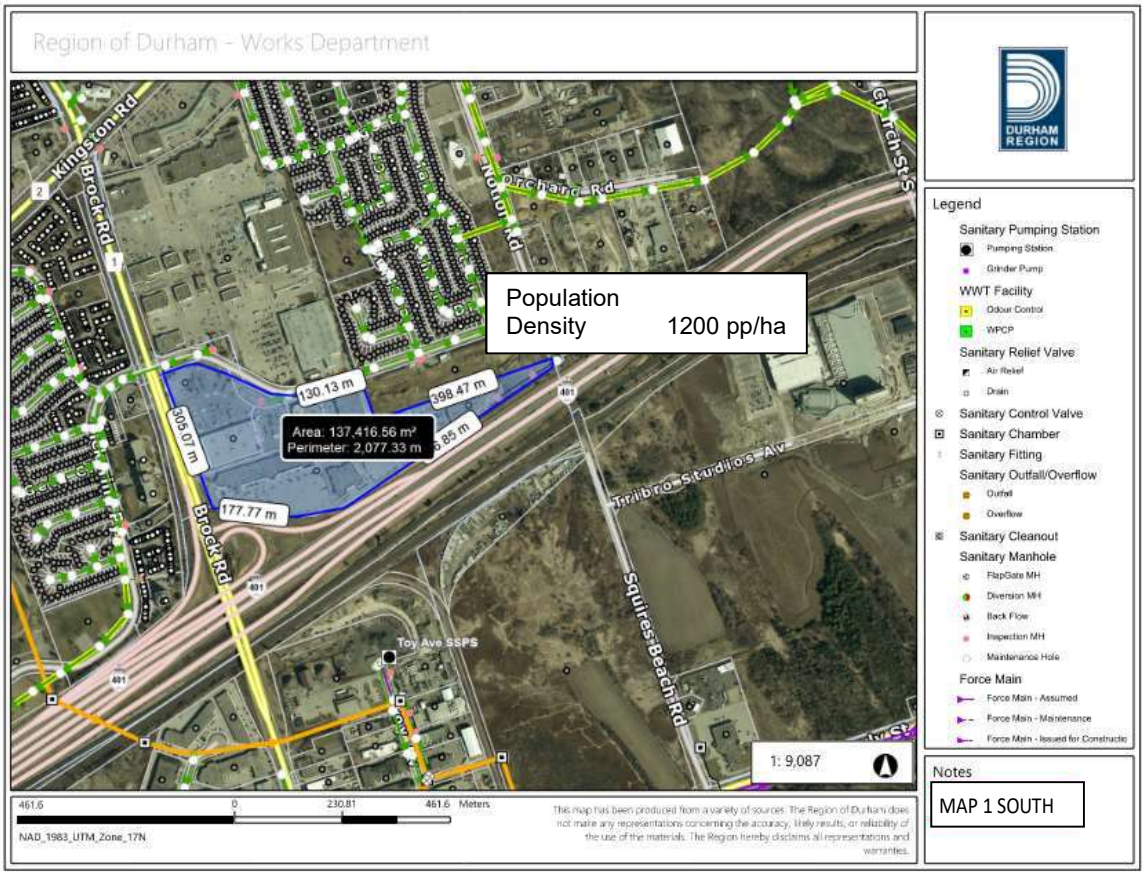


Exhibit 5 – Region Map 1 South [Subject site and 1731/1735 Pickering Pkwy]

Exhibit 6 – Region Map 2 South [Metropia Lands]

3) The Region has allowed for the Phase 1 of 1899 Brock Road to be discharged west ward to Brock Road and will therefore not be included in our Phase 1 downstream sanitary analysis.

4) The Phase 1 for the subject site will be allowed to discharge to Orchard Drive North on Notion Road, for the interim condition.

5) In the full build out condition the temporary sewers on Notion Road will be replaced by the Region with a trunk sewer. Thus, all the sewage from the existing and redeveloped sites will flow south in the Notion Road trunk, under HWY 401 to the new Region SP.

6) The Region prefers that the Sewer to Notion Road along Pickering Parkway be installed to accommodate the fully built out sites and the existing sites along the way.

7) The Region will allow a smaller sewer diameter pipe on Notion Road than on Pickering Parkway for the interim condition since the trunk sewer will replace this to flow South under the HWY 401.

8) The Region did not offer a real time table for the SP and Notion Road trunk sewer, however stated that it would be available for the Phase 2 of either development.

The Region has also given us the approximate reserve capacity of the Orchard Drive sewer from where we show it on Exhibit 3 eastward. See the following e-mail from Aaron Christie.

Hello Mark,

At this time base your study on the assumption that there could be up to a capacity of 150 l/s available within the 750mm sanitary sewer at Orchard Road. This is based on preliminary input received from the Region of Durham and is subject to change as your application and development of the surrounding lands moves forward.

Based on my interpretation of the mapping, the 600mm watermain on Brock Road has a 300mm dia. tee to the west and then there is a 300mm x 300mm dia. tee and 90 degree bend providing the 300mm dia. watermain to the east across Brock Road to Pickering Parkway.

Thanks,

Aaron Christie, P.Eng. | Manager, Engineering Planning & Studies
Works Department
The Regional Municipality of Durham
Aaron.Christie@durham.ca | 905-668-7711 extension 3608 | durham.ca
My pronouns are he/his

The analysis will proceed to:

- Provide an existing sewer system analysis to show that the Marshcourt Drive route cannot be used.
- Provide a redeveloped site Phase 1 sanitary sewer design sheet (with Required pipe sizes for context only as this sewer would not be sufficient for future developments and full build out)
- Provide a redeveloped site Phase 1 sanitary sewer design sheet (with Proposed pipe sizes)
- Provide a redeveloped sites (subject, 1899 Brock Road and future tributaries) fully developed sanitary sewer design sheet to Notion Road.

Design Criteria

Sanitary flows for the subject site are calculated based on the Regional Municipality of Durham design specifications for sanitary sewers. The summary is as follows:

Residential

- Average flow: 364 L/person/day
- Infiltration: 22.5 m^3 gross ha/day (0.26 l/s/ha/day) – when foundation drains are not connected to the sanitary sewer.
- Peaking Factor:

$$K = 1 + \frac{14}{4 + P^{1/2}}$$

Where K=Harmon Peaking Factor, P = Population in thousands.
K-Maximum= 3.8m, K-Minimum= 1.5

- When the number and type of housing units within a proposed development are known, the calculation of population for the proposed development shall be based on the following:

Type of Housing	**Persons/ha**
Single Family Dwelling,	60
Semi-detached & Duplex	100
Townhouses	125
Apartment(s)	
- Low density (62 u/ha)	150
- Medium to low density (86 u/ha)	210
- Medium density (124 u/ha)	300
- High Density (274 u/ha)	600
u/ha = units per hectare	

Type of Housing	**Persons/Unit**
Single Family Dwelling, Semi-Detached and Links	3.5
Townhouses/Stacked Townhouses	3.0
Apartment(s)	
- 1 Bedroom or smaller (Bachelor)	1.5
- 2 Bedroom	2.5
- 3 Bedroom	3.5
- 4 Bedroom or larger	4.5

Commercial

Design Flow: 180 m^3/gross floor area ha/day (2.08 l/s/day) including infiltration and peaking effect.

EXISTING SANITARY SEWER CAPACITY CALCULATION

The capacity of the existing sanitary sewer system located from the subject site to Orchard Rd was evaluated using a sanitary sewer design sheet based on the above parameters. The design sheet for the existing conditions has been completed based on the drainage areas and existing sewer information provided by the Region of Durham and the City of Pickering. Refer to Appendix B for the existing conditions sewer spread sheet and further details. The existing sanitary tributary areas are found in Appendix E.

PROPOSED SANITARY SEWER DESIGN CONSIDERATION

Based on our discussion with the Region of Durham (Aaron Christie), that they (the Region) want the redeveloped flow from 1899 Brock Road and the updated tributary areas, provided by the Region, to flow from their Site east on Pickering Parkway to Notion Road.

Metropia is planning to develop a new townhouse development at 1856 Notion Road known as the Metropia Site. The details are contained within the "Functional Servicing and Stormwater Management Report", by GHD, Jan 2018. The sanitary flow (11.67 L/s) from the development will be routed to the existing manhole (MH35-6) on Pickering Parkway.

Since four existing retail buildings will remain operational within the site for Phase 1 construction. The construction of new sewers will need to be phased to ensure drainage is maintained to the existing buildings.

Table 1 is a summary of the flows generated by the Site during Phase 1.

Table 1 – Proposed population and sanitary peak flow estimate (Phase 1)

Unit Type /Land Use	Number of Units /Gross floor Area	Persons/ Unit	Population	Peaking Factor	Infiltration (L/sec)	Sanitary Flow (L/sec)
North Sanitary Outlet to Pickering Parkway						
Commercial (Ex.)	1.78 ha	-	-	1	-	3.71
Commercial (Prop.)	0.167 ha	-	-	1		0.35
Apartments (Prop.)	630 Units	2.5	1,575	3.66	0.26	24.50
Total	-	-	-	-		28.56
East Sanitary Outlet to Notion Road						
Commercial (Ex.)	0.425 ha	-	0.425 ha	1		0.88
Total	-	-	-	-		0.88

Table 2 – Proposed population and sanitary peak flow estimate (Full Build out)

Unit Type /Land Use	Number of Units /Gross floor Area	Persons/ Unit	Population	Peaking Factor	Infiltration (L/sec)	Sanitary Flow (L/sec)
North Sanitary Outlet to Pickering Parkway						
Commercial (Prop.)	2.67 ha	-	-	1		5.56
Apartments (Prop.)	5226 Units	2.5	13,065	2.84	2.47	156.24
Total						164.27

The total flow to the Pickering Parkway sanitary sewer at full build out of the subject site is 164.27 L/sec.

We will show **3 Scenarios** in order to evaluate the improvements required to accommodate the redevelopment. The scenarios are as follows:

1. Existing conditions
2. Phase 1 of subject site
3. Full development of subject site and full development of 1899 Brock Road and future tributaries

Find enclosed in **Appendix B**, spread sheets for each scenario. Sanitary tributary plan maps are included in **Appendix E** for reference.

The purpose of **Scenario 1** (existing conditions) is to establish the base rate into MH 17 at Orchard Road. Durham Region has suggested that the excess capacity in the Orchard Road sewer system is approximately 150 L/sec. The reason for the existing condition is to establish the flow into existing MH 17 from the south side. MH 17 is located at the south side intersection of Orchard Road and Notion Road. If the **Scenario 2** flow into the south side of MH 17 is less than **Scenario 1** plus 150 L/sec, then Phase 1 of First Pickering Place can be accommodated.

The purpose for **Scenario 2** is to establish the flow rate to size the pipes from Pickering Parkway to Orchard Road along Notion Road. These pipes along Notion Road are interim for Phase 1 until the Region replaces them with a trunk sewer along Notion Road. Essentially these pipes will be a throw away along Notion Road.

The purpose for **Scenario 3** is to establish the flow rate to size the pipes from 1899 Brock Road along Pickering Parkway to Notion Road. These pipes will be sized to handle the existing flows and the full future build out of the development sites proposed in the Region's sanitary mapping provided and included in Appendix B for reference.

SUMMARY AND RECOMMENDATION

Based on the above review and analysis we offer the following summary and recommendations:

1) Phase 1 of First Pickering Place cannot be accommodated by the existing sanitary sewer system and present routing path. Refer to spread sheet for existing conditions.

2) The present path would require the replacement of a sewer between two existing homes. This is not recommended.

3) The 750 mm sanitary sewer on Orchard Road has sufficient capacity to accommodate Phase 1 of First Pickering Place and the existing uses.

4) We recommend that the owners of First Pickering Place build the sanitary sewer on Pickering Parkway from 1899 Brock Road site to Notion Road to accommodate the full build out of all future development sites and the existing flows. This section of sanitary sewer will be subject to development charges as discussed with the Region of Durham.

5) The sanitary pipe on Notion Road (from Pickering Parkway to Orchard Rd) will be sized to convey existing flows and flows from Phase 1 (First Pickering Place) to the existing Orchard Road sanitary sewer. The Region will allow this interim condition at limited capacity until such time that the Ultimate Trunk Sewer is constructed in the future to convey flows to the South SP. The interim pipe will be downsized from that on Pickering Parkway, the Region will allow this, since it is a temporary measure until the Region replaces it with a trunk sewer on Notion Road.

Table 3 – Offsite sewer improvements

Sewer location	Upstream MH	Downstream MH	Sewer size, length and slope	Comments
Pickering Parkway	1899 Brock Road	EX MH 34-82	525mm – 112m @ 1.0%	New pipe
Pickering Parkway	EX MH 34-82	Prop MH9A	675mm – 45m @ 0.37%	Replacement pipe
Pickering Parkway	Prop MH9A	EX MH 34-83	675mm – 45m @ 0.42%	Replacement pipe
Pickering Parkway	EX MH 34-83	EX MH 35-5	675mm – 100m @ 0.47%	Replacement pipe
Pickering Parkway	EX MH 35-5	EX MH 35-6	675mm – 100m @ 0.48%	Replacement pipe
Pickering Parkway	EX MH 36-6	EX MH 36-7	750mm – 83m @ 0.38%	Replacement pipe
Pickering Parkway	EX MH 36-7	EX MH 36-8	750mm – 80m @ 0.46%	Replacement pipe
Pickering Parkway	EX MH 35-8	EX MH 35-28	750mm – 101m @ 0.57%	Replacement pipe
Notion Road	EX MH 35-28	Prop MH 13A	375mm – 15m @ 0.22%	New pipe
Notion Road	Prop MH 13A	Prop MH 14A	375mm – 100m @ 0.22%	New pipe
Notion Road	Prop MH 14A	SAN MH 35-29	375mm – 102m @ 0.22%	New pipe
Notion Road	Prop MH 35-29	Prop MH 35-30	450mm – 72m @ 0.22%	Replacement pipe
Notion Road	Prop MH 35-30	Prop MH 17	450mm – 4m @ 0.23%	Replacement pipe

Note: Notion Road pipes are temporary and will be replaced by the Ultimate Regional Trunk sewer that will be directed South on Notion Road to the downstream SP.

CONCLUSION

Based on the above findings the sanitary pipe along Pickering Parkway will be replaced and constructed to accommodate the full build out of all future development sites and the existing flows.

The sanitary pipe on Notion Road (from Pickering Parkway to Orchard Rd) will be sized and constructed to temporarily convey existing flows and flows from Phase 1 (First Pickering Place) to the existing Orchard Road sanitary sewer.

Notion Road pipes will be removed when the Region constructs their SP and Trunk Sewer.

4. WATER SUPPLY AND DISTRIBUTION

EXISTING SYSTEM:

First Pickering Place (FPP) existing water service is fed from a 300 mm Ø City main on Pickering Parkway. The Plaza has a 300mm Ø service main off of Pickering Parkway with a series of hydrants and lateral services inside the Plaza to feed the multiple buildings. Refer to Exhibit 7 for the Regions existing water system.

The purpose of this report is not to evaluate the existing water distribution system, but to evaluate if the existing system can accommodate the proposed intensification. The rest of this section will deal with the intensified site.

REDEVELOPED SITE:

The unit rate and peaking factors of water consumption, minimum pipe size and allowable pressure in line were established from the Durham Region Criteria. Refer to table 4 for the domestic at demand nodes. The fire demand for First Pickering Place is unknown at this stage, since the building designs are not advanced enough. KYPIPE has a unique algorithm to calculate the available fire flows at all hydrants or selected nodes. We will report the available fire flow + maximum day demand at all hydrants and at the block nodes. The demand from Beechlawn Drive and Marshcourt Drive was taken from the homes from the intersection of Beechlawn Drive and Marshcourt Drive to Pickering Parkway.

Table 4 – Demand Calculations at Select Nodes.

NODE	DESCRIPTION OF DEVELOPMENT	NUMBER OF UNITS	Shopping (m2)	POPULATION	Average Day (RESIDENTIAL + ICI) (L/sec)	Peak Day (L/sec)	Peak Hour (L/sec)	Assummed Fire flow required (L/sec)	Total Flow required (Fire + max day) (L/sec)
A-100	BLOCK 1	630	1669	1575	6.73	12.79	19.19	190	202.8
B-200	BLOCK 2	1090	1006	2725	11.54	21.92	32.88	190	211.9
C-300	BLOCK 3	446	920	1115	4.75	9.03	13.54	190	199.0
D-400	BLOCK 4	1022	696	2555	10.80	20.53	30.79	190	210.5
E-500	BLOCK 5	617	665	1543	6.54	12.42	18.63	190	202.4
F-600	BLOCK 6	762	21737	1905	9.28	17.64	26.46	190	207.6
G-700	BLOCK 7	659	0	1648	6.94	13.19	19.78	190	203.2
1899 Brock Rd	Mix use		49522	3366	17.05	32.39	48.58	n/a	n/a
Metropia	Residential		0	672	2.83	5.38	8.07	n/a	n/a
Beechlawn Dr	ex residential	104	0	364	1.53	2.91	4.37	n/a	n/a
Marshcourt Dr	ex residential	120	0	420	1.77	3.36	5.04	n/a	n/a
CTC	ex Canadian Tire		7900	0	0.46	0.87	1.30	n/a	n/a
GAS	ex Gas Bar		600	0	0.03	0.07	0.10	n/a	n/a
TOTALS		**5450**	**84715**	**17887**	**80.26**	**152.49**	**228.74**	-	-

PEAK DAY FACTOR	1.9	APARTMENT UNITS (average 2 Bedroom)	2.5 ppu
PEAK HOUR FACTOR	2.85	Single family homes	3.5 ppu
		TOWNHOME UNITS	3.0 ppu
		Shopping DEMAND IS	5000 L/Day/1000m2
AVERAGE DAY (364 L/CAP/DAY)			

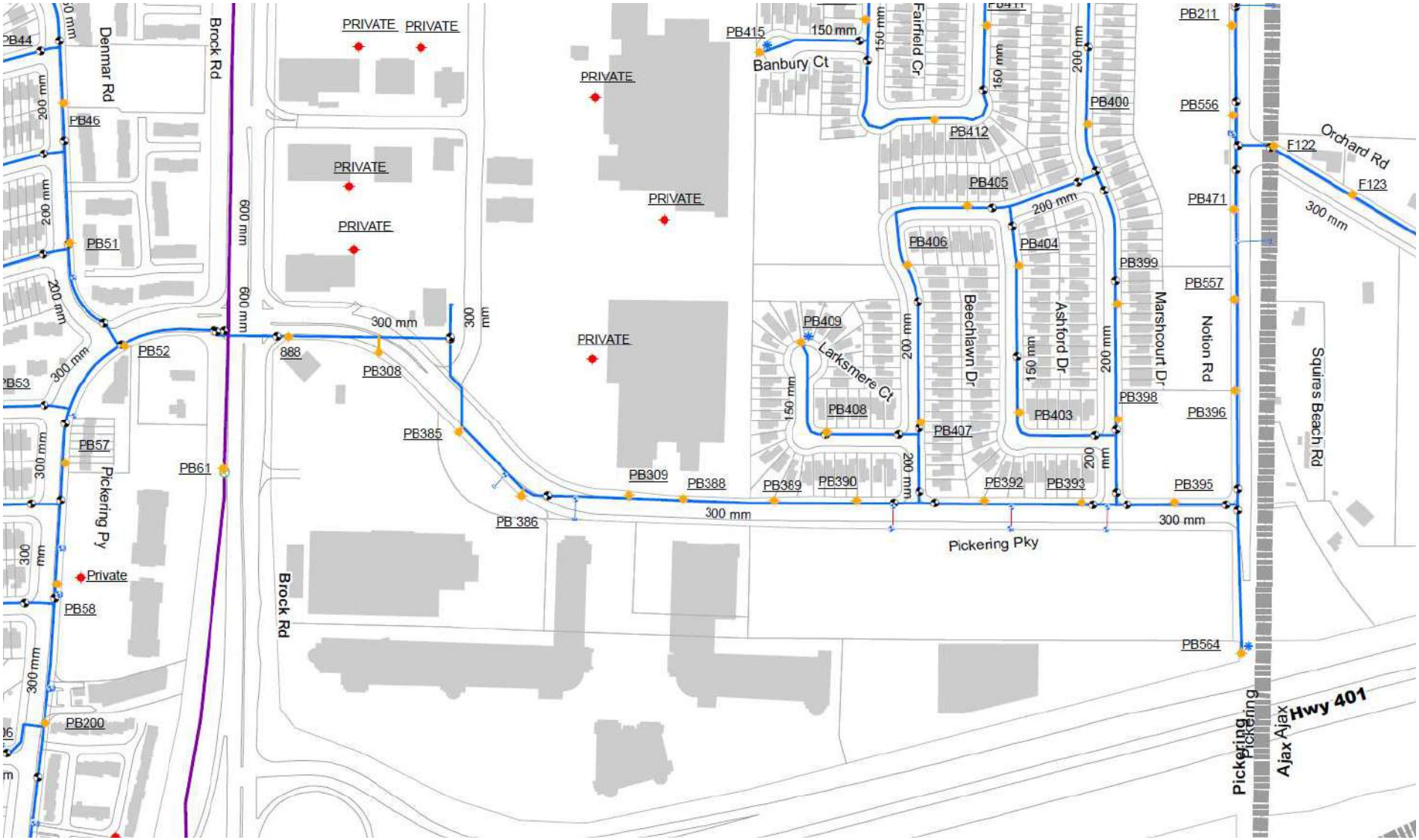


Exhibit 7 Durham Region layout of existing water system

PRESSURE CRITERIA:

The pressures and volumes must be sufficient for Peak hour conditions and under fire conditions as established by the Ontario Building Code. The MOE minimal residual pressure under fire conditions is 140 kPa (20.3 psi). According to the Durham Region, Design Criteria for Water mains the allowable pressures are as per table 5.

Table 5 – Allowable pressures

SCENERIO	DURHAM REGION CRITERIA Allowable Pressure (kPa)		MOE Allowable Pressure (kPa)	
	min	max	max	max
Min. Hour	275	700	275	700
Average Day	275	700	275	700
Max Day	275	700	275	700
Max Hour	275	700	275	700
Maximum Day + Fire	140	700	140	700

Note, the subject development will have development blocks that will require booster pumps to deliver domestic supply to upper levels. Where the pressure is greater than 550 kPa at the development blocks, a pressure reducing valve shall be installed to limit the maximum static pressure to not more than 550 kPa as per The Ontario Building Code.

The maximum allowable velocity in the pipes will be limited to 5.0 m/sec for all flow conditions.

First Pickering Place is located Durham Region pressure district A1. The supply points were derived by data from hydrant flow tests. Refer to Appendix C

The existing First Pickering Place water supply will be kept intact with minor variation. The existing ring main will be moved out of the future ROW and future park and town easements for the sewers.

SYSTEM MODEL:

The hydraulic model KYPIPE was used to analyze the water distribution system for the redeveloped Site. See below the KYPIPE model with explanation. The Elevation information within the redeveloped Site is provided by the Odan/Detech Group Inc. Pressure district A1 will continue to provide service to the mall. In addition, a new 300 mm main will be introduced to service the new development contemplated within First Pickering Place. See model in Exhibit 8.

1.0 Friction Factors

The water mains have been designed using a Hazen-Williams C-factor as follows:

Pipe size (mm)	Hazen-Williams C-factor
150 or smaller	100
200 and 300	110
>300 to 600	120
Over 600	130

2.0 Pipe Diameters

The diameter of the proposed water main is 300 mm which is at and above the minimum diameter for water mains that provide fire protection and that are required under the Regions criteria. The 300mm diameter water mains are also capable of providing a flushing velocity of 0.8 m/s during cleaning and flushing procedures.

3.0 Pipe System Design and Minimum Pipe Cover

Fire hydrants have been located at dead end location to provide a means for adequate flushing. The minimum cover over the water main shall be 1.8 m which provides for adequate frost protection. The junction elevations were taken from finished grade elevations at the centerline of the road.

4.0 Service Pipes

Suitable Water services will be provided for domestic and for fire at the detailed design stage. The material provided will be acceptable material under Part 7, Division B of the Building Code (O. Reg. 350/13) and AWWA Standards. Water services were not modelled.

5.0 Source node

Water supply for the site is based on the hydrant flow tests as given in Appendix C. The KYPIPE model will use a Variable pressure supply node at the pipe elevation. The input data is summarized in table 6.

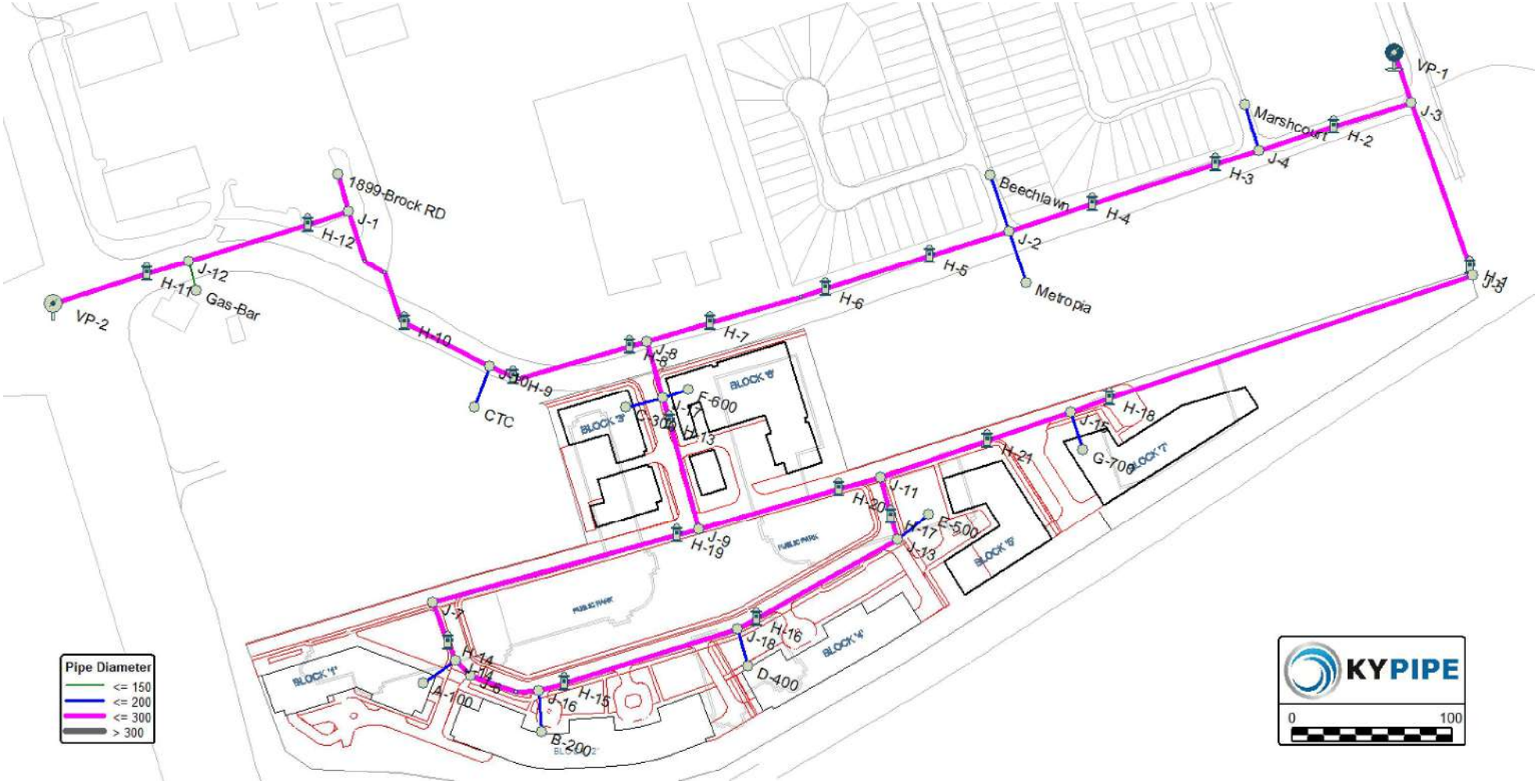
Table 6 – Supply Pressure/flow table

Supply (Notion Road) VP-1		Supply (Brock Road) VP-2	
Pressure (kPa)	Flow (L/s)	Pressure (kPa)	Flow (L/s)
621	0	552	0
517	121.9	510	109.0
310	219.7	310	269.0
138	285.3	138	358.8

The above data will be entered into KYPIPE variable pressure supply node. KYPIPE will take the above data points. The raw data is shown in Appendix C.

Exhibit 8 shows the KYPIPE node numbering and hydrant numbering used in the output tables.

Exhibit 8 - KYPIPE MODEL: node number and hydrants numbers



INPUT INFORMATION

U N I T S S P E C I F I E D

FLOWRATE ..... = liters/second
HEAD (HGL) ..... = meters
PRESSURE ..... = kpa

P I P E L I N E D A T A

STATUS CODE: XX -CLOSED PIPE CV -CHECK VALVE

PIPE NAME	NODE NAMES #1	#2	LENGTH (m)	DIAMETER (mm)	ROUGHNESS COEFF.	MINOR LOSS COEFF.
P-1	VP-2	J-12	88.18	300.00	110.0000	0.00
P-2	VP-1	J-3	32.86	300.00	110.0000	0.00
P-3	J-1	J-10	140.53	300.00	110.0000	0.00
P-4	J-2	J-4	163.07	300.00	110.0000	0.00
P-5	J-4	J-3	99.18	300.00	110.0000	0.00
P-6	J-2	Metropia	33.89	200.00	110.0000	0.00
P-7	J-2	Beechlawn	36.42	200.00	110.0000	0.00
P-8	J-4	Marshcourt	30.17	200.00	110.0000	0.00
P-9	J-8	J-2	234.78	300.00	110.0000	0.00
P-10	J-8	J-17	36.36	250.00	110.0000	0.00
P-11	J-10	J-8	101.91	300.00	110.0000	0.00
P-12	J-10	CTC	27.23	200.00	110.0000	0.00
P-13	J-12	J-1	103.93	300.00	110.0000	0.00
P-14	J-12	Gas-Bar	18.48	100.00	100.0000	0.00
P-15	J-11	899-Brock	23.64	300.00	110.0000	0.00
P-16	J-3	J-5	113.84	300.00	110.0000	0.00
P-17	J-9	J-7	171.04	300.00	110.0000	0.00
P-18	J-7	J-14	38.49	300.00	110.0000	0.00
P-19	J-6	J-16	44.21	300.00	110.0000	0.00
P-20	J-13	J-11	40.11	300.00	110.0000	0.00
P-21	J-11	J-9	117.10	300.00	110.0000	0.00
P-22	J-11	J-15	124.65	300.00	110.0000	0.00
P-23	J-14	J-6	13.13	300.00	110.0000	0.00
P-24	J-14	A-100	24.49	200.00	110.0000	0.00
P-25	J-16	J-18	128.74	300.00	110.0000	0.00
P-26	J-16	B-200	24.98	200.00	110.0000	0.00
P-27	J-18	J-13	113.76	300.00	110.0000	0.00
P-28	J-18	D-400	23.46	200.00	110.0000	0.00
P-29	J-13	E-500	24.93	200.00	110.0000	0.00
P-30	J-15	J-5	263.98	300.00	110.0000	0.00
P-31	J-15	G-700	24.80	200.00	110.0000	0.00
P-32	J-17	J-9	84.95	250.00	110.0000	0.00
P-33	J-17	C-300	23.33	200.00	110.0000	0.00
P-34	J-17	F-600	16.55	200.00	110.0000	0.00

P U M P/L O S S E L E M E N T D A T A

THERE IS A DEVICE AT NODE VP-1 DESCRIBED BY THE FOLLOWING DATA: (ID= 1)

HEAD (m)	FLOWRATE (l/s)	EFFICIENCY (%)	
63.32	0.00	75.00	(Default)
52.72	122.00	75.00	(Default)
31.61	220.00	75.00	(Default)
14.07	285.00	75.00	(Default)

THERE IS A DEVICE AT NODE VP-2 DESCRIBED BY THE FOLLOWING DATA: (ID= 2)

HEAD (m)	FLOWRATE (l/s)	EFFICIENCY (%)
56.29	0.00	75.00 (Default)
52.00	109.00	75.00 (Default)
31.61	269.00	75.00 (Default)
14.07	359.00	75.00 (Default)

N O D E D A T A

NODE NAME	NODE TITLE	EXTERNAL DEMAND (l/s)	JUNCTION ELEVATION (m)	EXTERNAL GRADE (m)
Beechlawn		1.53	84.40	
CTC		0.46	85.90	
Marshcourt		1.77	83.30	
Metropia		2.83	84.40	
1899-Brock		17.05	86.40	
A-100		6.73	89.50	
B-200		11.54	88.90	
C-300		4.75	85.80	
D-400		10.80	87.50	
E-500		6.54	86.50	
F-600		9.28	85.80	
G-700		6.94	86.20	
Gas-Bar		0.03	88.80	
J-1		0.00	86.30	
J-2		0.00	84.10	
J-3		0.00	83.40	
J-4		0.00	83.30	
J-5		0.00	87.00	
J-6		0.00	89.20	
J-7		0.00	88.50	
J-8		0.00	85.50	
J-9		0.00	86.00	
J-10		0.00	85.90	
J-11		0.00	86.00	
J-12		0.00	88.70	
J-13		0.00	86.20	
J-14		0.00	89.00	
J-15		0.00	85.80	
J-16		0.00	88.50	
J-17		0.00	85.70	
J-18		0.00	87.10	
VP-1		----	83.40	83.40
VP-2		----	88.50	88.50

SYSTEM ANALYSIS AND RESULTS

SIMULATION RESULTS: Fully connected

Table 7- Average Day

Table 8- Maximum Day

Table 9- Peak Hour

Table 10- Maximum Day + Fire Flow

Table 7 – Average Day: At Select Nodes

N O D E R E S U L T S

NODE NAME	NODE TITLE	EXTERNAL DEMAND lps	HYDRAULIC GRADE m	NODE ELEVATION m	PRESSURE HEAD m	NODE PRESSURE kPa
Beechlawn		1.53	144.34	84.40	59.94	587.85
CTC		0.46	144.28	85.90	58.38	572.47
Marshcourt		1.77	144.43	83.30	61.13	599.50
Metropia		2.83	144.34	84.40	59.94	587.83
1899-Brock		17.05	144.29	86.40	57.89	567.72
A-100		6.73	144.07	89.50	54.57	535.15
B-200		11.54	144.05	88.90	55.15	540.81
C-300		4.75	144.18	85.80	58.38	572.49
D-400		10.80	144.06	87.50	56.56	554.62
E-500		6.54	144.10	86.50	57.60	564.85
F-600		9.28	144.17	85.80	58.37	572.41
G-700		6.94	144.18	86.20	57.98	568.56
Gas-Bar		0.03	144.39	88.80	55.59	545.14
J-1		0.00	144.30	86.30	58.00	568.77
J-2		0.00	144.35	84.10	60.25	590.80
J-3		0.00	144.49	83.40	61.09	599.13
J-4		0.00	144.43	83.30	61.13	599.51
J-5		0.00	144.40	87.00	57.40	562.92
J-6		0.00	144.08	89.20	54.88	538.18
J-7		0.00	144.09	88.50	55.59	545.15
J-8		0.00	144.26	85.50	58.76	576.25
J-9		0.00	144.13	86.00	58.13	570.06
J-10		0.00	144.28	85.90	58.38	572.47
J-11		0.00	144.13	86.00	58.13	570.05
J-12		0.00	144.39	88.70	55.69	546.12
J-13		0.00	144.11	86.20	57.91	567.89
J-14		0.00	144.08	89.00	55.08	540.15
J-15		0.00	144.19	85.80	58.39	572.60
J-16		0.00	144.08	88.50	55.58	545.02
J-17		0.00	144.18	85.70	58.48	573.52
J-18		0.00	144.08	87.10	56.98	558.78
VP-1		----	144.58	83.40	61.18	599.96
VP-2		----	144.46	88.50	55.96	548.83

Table 8 – Maximum Day: At Select Nodes

N O D E R E S U L T S

NODE NAME	NODE TITLE	EXTERNAL DEMAND lps	HYDRAULIC GRADE m	NODE ELEVATION m	PRESSURE HEAD m	NODE PRESSURE kPa
Beechlawn		2.91(1.90)	141.55	84.40	57.15	560.44
CTC		0.87(1.90)	141.60	85.90	55.70	546.27
Marshcourt		3.36(1.90)	141.70	83.30	58.40	572.67
Metropia		5.38(1.90)	141.54	84.40	57.14	560.38
1899-Brock		32.40(1.90)	141.81	86.40	55.41	543.43
A-100		12.79(1.90)	140.68	89.50	51.18	501.88
B-200		21.93(1.90)	140.60	88.90	51.70	507.03
C-300		9.02(1.90)	141.11	85.80	55.31	542.41
D-400		20.52(1.90)	140.63	87.50	53.13	521.01
E-500		12.43(1.90)	140.77	86.50	54.27	532.20
F-600		17.63(1.90)	141.09	85.80	55.29	542.17
G-700		13.19(1.90)	140.97	86.20	54.77	537.14
Gas-Bar		0.06(1.90)	142.35	88.80	53.55	525.19
J-1		0.00	141.84	86.30	55.54	544.67
J-2		0.00	141.55	84.10	57.45	563.42
J-3		0.00	141.81	83.40	58.41	572.79
J-4		0.00	141.70	83.30	58.40	572.70
J-5		0.00	141.57	87.00	54.57	535.13
J-6		0.00	140.71	89.20	51.51	505.13
J-7		0.00	140.74	88.50	52.24	512.32
J-8		0.00	141.44	85.50	55.94	548.57
J-9		0.00	140.88	86.00	54.88	538.15
J-10		0.00	141.60	85.90	55.70	546.27
J-11		0.00	140.87	86.00	54.87	538.07
J-12		0.00	142.35	88.70	53.65	526.17
J-13		0.00	140.80	86.20	54.60	535.46
J-14		0.00	140.71	89.00	51.71	507.12
J-15		0.00	141.01	85.80	55.21	541.42
J-16		0.00	140.70	88.50	52.20	511.89
J-17		0.00	141.13	85.70	55.43	543.56
J-18		0.00	140.71	87.10	53.61	525.71
VP-1		----	141.99	83.40	58.59	574.61
VP-2		----	142.79	88.50	54.29	532.42

Table 9 – Peak Hour: At Select Nodes

N O D E R E S U L T S

NODE NAME	NODE TITLE	EXTERNAL DEMAND lps	HYDRAULIC GRADE m	NODE ELEVATION m	PRESSURE HEAD m	NODE PRESSURE kPa
Beechlawn		4.36(2.85)	136.83	84.40	52.43	514.21
CTC		1.31(2.85)	137.08	85.90	51.18	501.91
Marshcourt		5.04(2.85)	137.09	83.30	53.79	527.47
Metropia		8.07(2.85)	136.82	84.40	52.42	514.08
1899-Brock		48.59(2.85)	137.63	86.40	51.23	502.36
A-100		19.18(2.85)	134.99	89.50	45.49	446.10
B-200		32.89(2.85)	134.83	88.90	45.93	450.43
C-300		13.54(2.85)	135.94	85.80	50.14	491.73
D-400		30.78(2.85)	134.88	87.50	47.38	464.69
E-500		18.64(2.85)	135.18	86.50	48.68	477.40
F-600		26.45(2.85)	135.89	85.80	50.09	491.21
G-700		19.78(2.85)	135.59	86.20	49.39	484.39
Gas-Bar		0.09(2.85)	138.89	88.80	50.09	491.19
J-1		0.00	137.68	86.30	51.38	503.87
J-2		0.00	136.84	84.10	52.74	517.22
J-3		0.00	137.29	83.40	53.89	528.46
J-4		0.00	137.09	83.30	53.79	527.55
J-5		0.00	136.80	87.00	49.80	488.38
J-6		0.00	135.06	89.20	45.86	449.69
J-7		0.00	135.13	88.50	46.63	457.25
J-8		0.00	136.66	85.50	51.16	501.72
J-9		0.00	135.41	86.00	49.41	484.57
J-10		0.00	137.08	85.90	51.18	501.91
J-11		0.00	135.39	86.00	49.39	484.36
J-12		0.00	138.89	88.70	50.19	492.18
J-13		0.00	135.25	86.20	49.05	481.03
J-14		0.00	135.06	89.00	46.06	451.72
J-15		0.00	135.67	85.80	49.87	489.08
J-16		0.00	135.03	88.50	46.53	456.33
J-17		0.00	135.98	85.70	50.28	493.07
J-18		0.00	135.05	87.10	47.95	470.25
VP-1		----	137.64	83.40	54.24	531.95
VP-2		----	139.91	88.50	51.41	504.20

Table 10 – Maximum Day + Fire: At Hydrants

```
================================================================================

          Fireflow/Hydrant Report:
         ___________________________

Scenario: No Title
Global Demand Factor for this Scenario: 1.900

Specified Minimum Pressure(kPa):  140.0
Minimum Static Pressure(kPa)   :  140.0

 Flow-1: Flowrate to maintain the specified
         pressure at (hydrant) node
 Node-2: Node that has a lower pressure than
         specified value at Flow-1
 Flow-2: Flowrate to maintain the specified
         pressure at Node-2

 Hose Constant =    0.00
```

Hydrant Node	Hydrant Constant	Elevation	Static Pressure	Flow-1 lps	Flow-2 lps	Node-2 lps	Flow Capacity	NFPA Color
H-11	0.0	88.7	527.5	408.7			408.7	RED
H-10	0.0	86.1	545.3	376.6	368.0	A-100	368.0	RED
H-4	0.0	83.8	566.8	353.9			353.9	RED
H-3	0.0	83.5	570.5	361.4	352.7	A-100	352.7	RED
H-2	0.0	83.3	573.2	374.4	351.2	A-100	351.2	RED
H-7	0.0	85.3	550.7	357.1	341.3	A-100	341.3	RED
H-6	0.0	84.8	556.0	351.9	345.4	A-100	345.4	RED
H-5	0.0	84.4	560.2	350.2			350.2	RED
H-9	0.0	85.9	546.0	368.5	353.3	A-100	353.3	RED
H-8	0.0	85.6	547.8	362.9	340.6	A-100	340.6	RED
H-12	0.0	86.4	545.0	393.6			393.6	RED
H-1	0.0	87.0	535.2	330.6	323.8	A-100	323.8	RED
H-19	0.0	86.1	537.1	297.7	280.5	A-100	280.5	RED
H-14	0.0	88.9	508.2	262.2	259.6	A-100	259.6	RED
H-17	0.0	86.2	535.7	292.2	279.7	A-100	279.7	RED
H-20	0.0	86.0	538.1	298.0	283.6	A-100	283.6	RED
H-21	0.0	85.9	539.8	300.8	288.5	A-100	288.5	RED
H-15	0.0	88.5	511.9	262.1			262.1	RED
H-16	0.0	87.1	525.8	273.2	269.4	B-200	269.4	RED
H-18	0.0	85.8	542.0	305.0	295.3	A-100	295.3	RED
H-13	0.0	85.7	543.1	325.1	307.3	A-100	307.3	RED

At development blocks:

```
================================================================================
FireFlow/Hydrant Report
          Fireflow/Hydrant Report:
         _________________________

Scenario: No Title
Global Demand Factor for this Scenario: 1.900

Specified Minimum Pressure(kPa):  140.0
Minimum Static Pressure(kPa)   :  140.0

 Flow-1: Flowrate to maintain the specified
         pressure at (hydrant) node
 Node-2: Node that has a lower pressure than
         specified value at Flow-1
 Flow-2: Flowrate to maintain the specified
         pressure at Node-2

 Hose Constant =    0.00

 Hydrant   Hydrant  Elevation  Demand    Static       Flow-1    Flow-2    Node-2    Flow    NFPA
 Node      Constant             lps      Pressure     lps       lps       lps     Capacity  Color

_____________________________________________________________________________________________
____
     A-100       0.0      89.5      12.8     501.9       233.7
     B-200       0.0      88.9      21.9     507.0       241.4
     C-300       0.0      85.8       9.0     542.4       282.3
     D-400       0.0      87.5      20.5     521.0       250.8
     E-500       0.0      86.5      12.4     532.2       254.7
     F-600       0.0      85.8      17.6     542.2       302.6
     G-700       0.0      86.2      13.2     537.1       264.3
```

The following table 11 provides a summary of the flows:

Table 11 – Summary of required flows and available flows at Select Nodes.

NODE	Description of development	Total Flow Assumed required (L/sec) (Fire + max day)	Available Flow from KYPIPE (L/sec) (Fire + max day)
A-100	BLOCK 1	202.8	234
B-200	BLOCK 2	211.9	241
C-300	BLOCK 3	199.0	282
D-400	BLOCK 4	210.5	251
E-500	BLOCK 5	202.4	255
F-600	BLOCK 6	207.6	303
G-700	BLOCK 7	203.2	264

Note, fire flows to building blocks are based on a 200mm service pipe to the building. A bigger pipe would allow larger flows.

DISCUSSION OF RESULTS:

- The pipe sizes shown are required for the fire flows and to ensure velocities are below 5.0 m/sec for fire flows.
- First Pickering Place will require new mains and hydrants. Some will be relocated to suit the development.
- Pressures for normal operation (average, maximum and peak day) have been achieved in the fully connected scenario.
- The pipe sizes chosen are adequate.
- Where pressures are greater than 80 psi (550 kPa) buildings will require pressure reducing valves prior to meter connection. Hydrant tests prior to permit stage will confirm this.
- Looping to Notion Road or Brock Road is required to provide redundancy to the development since many buildings are taller than 84 m. The OBC requires a second connection to a public system when buildings are greater than 84 m.

DESIGN CRITERIA: The following data was used in the design of the system:

1.0 ***Transient Pressures***

The proposed water main will be designed to withstand pressures up to 1034 kPa (150 psi) which is sufficient to withstand the maximum operating pressure of 150 psi, plus any transient pressure it may be subjected to.

The pipes and joints have also been designed to withstand the maximum operating pressure plus the surge pressure that would be created by stopping a water column moving at 0.6 m/s.

The transient pressure surge in a PVC Class 150 DR 18 pipe is 0.6m/s water column is 35 psi.

2.0 ***Pipe Strength***

The proposed water main pipe material is PVC Class 150 DR18 conforming to CSA B137.3 and AWWA C900.

Loading calculations for pipe strength are based on the internal pressures of the system. The pipe stiffness values for the specified pipe class are relatively high; therefore deflection from static and/or live loads is not a critical design factor.

For water main pipe material consisting of PVC Class 150 DR18 conforming to CSA B137.3 and AWWA C900, the maximum internal pressure is 150 psi with a long-term FS of 2.5 and 4 for short term surge pressures.

3.0 Fire Hydrants

All hydrants shall be 3-way hydrants and shall be spaced as detailed on the engineering drawings. All hydrants shall

- Be in accordance with the approved water main materials list
- Be dry-barrel type in accordance with AWWA C502: Dry-Barrel Fire Hydrants
- Be 3-way, two nozzles which are 180˚ to each other and parallel to the street and a 100mm pumper "STORZ" connection facing the street
- Open as per Region Standard.
- Have a 25mm top operating nut size
- Be painted as per Region Standard
- Be controlled by a secondary valve close-coupled to the hydrant
- Have a hydrant lead of 150mm from the water main to the hydrant
- Be installed plumb and in accordance with the Region Standard drawing which provides adequate thrust blocking to prevent movement caused by thrust forces.

The water table is not expected to rise above the hydrant drain ports.

4.0 Valves

The water main will be designed such that there are a minimum of 3 gate valves at each T-intersection and 4 at cross intersections.

All gate valves shall be in accordance with the Regions approved water main materials list which conforms to AWWA standards.

5.0. Air Release and Vacuum Release Valves

Not applicable

6.0 Valve, Meter and Blow-off Chambers

Not applicable

7.0 Separation Distances from Contamination Sources

The water main has been located such that there is a minimum of 2.5m horizontal separation from the nearest sewer. Crossing of sewers as per MOE criteria.

8.0 Restraints

Mechanical joint restraints are to be installed on bell and spigot joints for all water mains constructed in fill material and at all tees, horizontal bends, vertical bends, hydrants, end of mains and valves. Concrete thrust blocks are not permitted unless expressly approved by the Region. All mechanical restraint systems shall be installed with cathodic protection.

9.0 Additional Design Considerations

The water mains within the proposed site shall be installed in accordance with the current Region specifications and requirements.

If there is a crossing of the water main and a sewer, the water main shall cross above the sewer with sufficient vertical separation to allow for proper bedding and structural support of the water main, (0.5m minimum).

In cases where there is a conflict with the elevation of the sewer and the water main such that the water main cannot cross above the sewer, the water main has been designed to cross below the sewer subject to the following conditions.

a) There shall be a minimum vertical separation of 0.5m between the bottom of the sewer pipe and the top of the water main,
b) The water main shall be lowered below the sewer using vertical thrust blocks and restraining joints,
c) The length of the water main pipe shall be centered at the point of crossing so that the joints are equidistant and as far as possible from the sewer, and
d) The sewer shall be adequately supported to prevent joint deflection and settling.

DEVELOPMENT PHASING:

The Site will be developed in phases. Refer to Appendix A. The above analysis assumes a completed development of the First Pickering Place. The waterman around the Mall is looped and will remain that way.

The Developer has indicated that the new development will proceed with Block 1 first. The following is the watermain staging.

Phase	Block	Install
Phase 1	Block 1	New 300mm to Pickering Parkway and new 300 mm redundant line from Pickering Parkway with valve on Pickering Parkway main line. Refer to Figure S-1b for details
Phase 2	Block 2	New 300mm to Pickering Parkway and new 300 mm redundant line from Pickering Parkway with valve on Pickering Parkway main line. Refer to Figure S-1b for details
Phase 3 to 7	Block 3 to 7	As per final layout. 300mm to Pickering Parkway looped and redundant new 300mm line from Notion Road. Refer to Figure S-1a for details.

Refer to Figure S-1b in Appendix E for the proposed water service system for Phase 1 and 2. Refer to Figure S-1a in Appendix E for the proposed water service system for Phase 3 to 7. Based on the recent KYPIPE model results, the system can deliver the above noted service.

5. STORMWATER MANAGEMENT & FOUNDATION WATERPROOFING

Design Criteria

Stormwater management for the proposed development will follow the stormwater management criteria set out by the City of Pickering, Toronto and Region Conservation Authority and the Ontario Ministry of the Environment, Conservation and Parks.

A summary of the stormwater management criteria applicable to the site are as follows:

Quantity Control:

Stormwater Management Criteria, prepared by TRCA, 2012. The TRCA criteria for Duffin's Creek are to control post-development peak flows to pre-development levels for all storms up to and including the 100-year storm (i.e., 2-, 5-, 10-, 25-, 50-, and 100-year storms) **except** for the main branches of the East and West Duffin's Creek where no quantity control is required. The subject site is located within the watershed designated by the TRCA as not requiring quantity control.

At the Pre-consultation for 1755 & 1805 Pickering Parkway the City of Pickering Storm water management criteria was outlined as follows:

Stormwater Management Criteria that must be included in the FSSR are as follows:

- Control of post-development peak flow rates to pre-development levels.
- A maximum runoff coefficient of 0.5 should be used to represent pre-development conditions.
- Follow Stormwater Management Design Guidelines, prepared by City of Pickering. Runoff Conveyance will be as follows, the minor system is to be designed to accommodate the 5-year storm, while the major overland system is to be designed for the 100-year storm event. Where there is no suitable overland flow route, the minor system must convey the 100-year storm after on site attenuation.

Quality Control:

Quality control measures are to be designed to provide Enhanced Protection - long term average removal of 80% of Total Suspended Solids (TSS) on an annual loading basis from all runoff leaving the proposed development site based on the post-development level of imperviousness.

Water Balance:

Retention of the runoff from up to a 5mm storm event on site for reuse, evaporation or infiltration.

Existing Storm Servicing and Drainage Patterns

As-constructed and design plans and profiles drawings obtained from the Region of Durham and the City of Pickering show that the following storm sewers are located within and around the site.

Refer to Exhibit 9 for the existing storm sewer system in and around the Site.

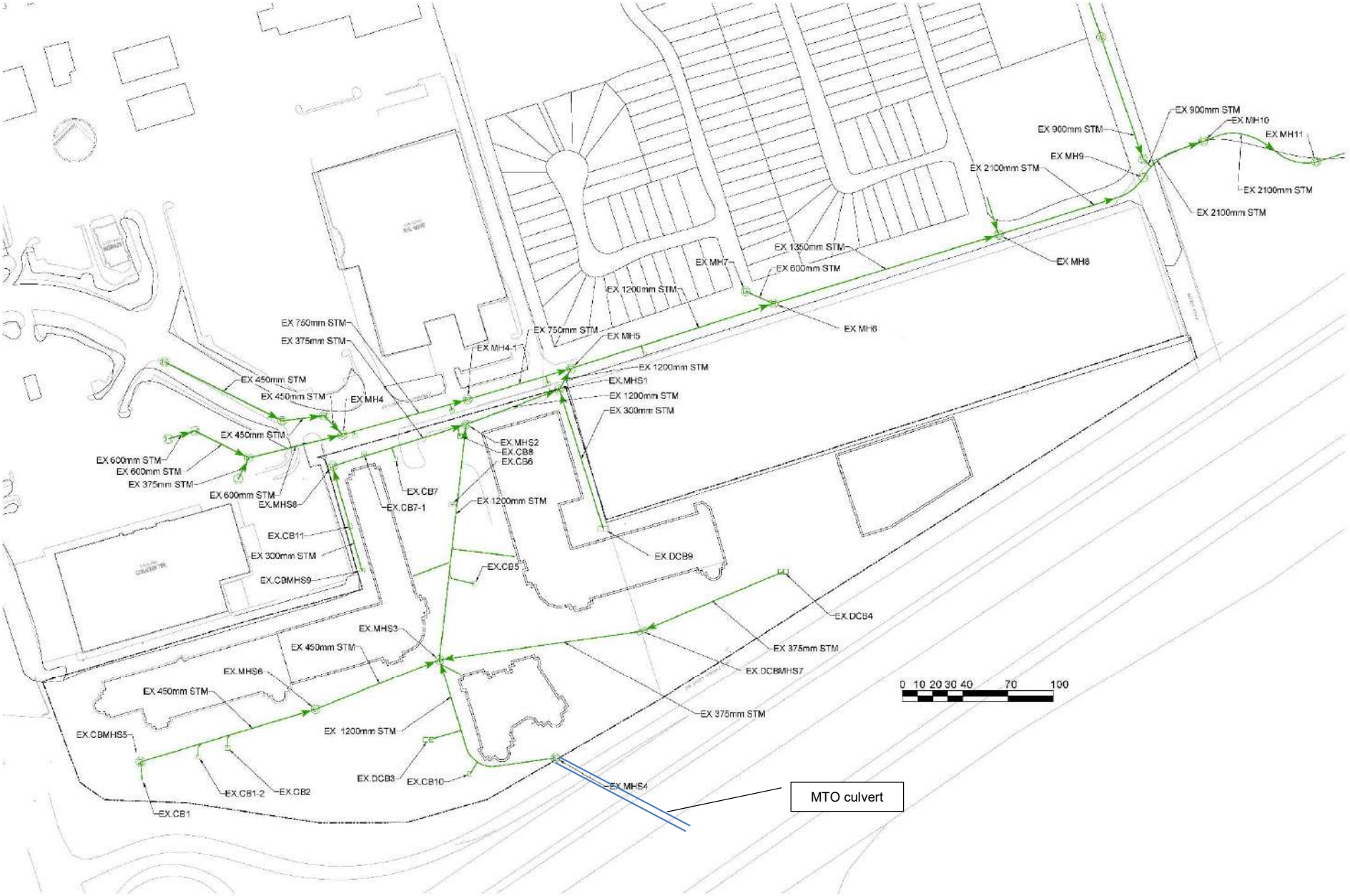


Exhibit 9 - City layout of existing Storm sewers and Site sewers

Exhibit 10 - City layout of existing Storm sewers and Site sewers

The subject site is located within the Duffin's Creek watershed. Refer to Exhibits 9 and 10 for the existing storm drainage infrastructure for the subject site and surrounding area. Note Exhibit 10 is from the AECOM Class EA environmental report for the Notion Road overpass of Hwy 401.

The drainage from the subject site can be summarized as follow:

1. MTO box culvert discharges flow from Hwy # 401 to a short ditch on the south side of the subject site. The flow is captured by an inlet structure attached to an existing 1200 ø storm sewer system which is routed north to Pickering Parkway where it discharges to a 1200 ø existing storm on Pickering Parkway. The pipe continues east on Pickering parkway, changes pipe sizes as shown on Exhibit 10, crosses Notion Road, continues east and discharges via a head wall to a drainage channel which empties into Duffin's Creek.

2. The subject site drains via a series of catch basins and sewers which connect to the 1200 ø storm from the 401 to Pickering Parkway as described in 1 above.

3. The overland flow from the site is conveyed more or less from the south through the lands onto the Pickering Parkway and ultimately conveyed via Pipes and existing channel, east of the Notion Road, to the Duffin's Creek.

4. Currently, there is no stormwater quantity, quality control measures implemented within the existing site.

A pre-development tributary plan has been prepared based on a drainage pattern analysis of the site's digital terrain model created from existing topographic survey and information obtained from the Region and the City. The pre-development storm tributary plan is included in Appendix E.

Pre-development/Allowable Flow Rates

The post-development flows from the site will be limited to the pre-development flows for the 2-year to 100-year design storm event. The pre-development flows were calculated based on pre-development tributary area of **9.48 ha** with runoff coefficient of 0.5. Please note that the actual runoff coefficient for the existing site condition is much higher than 0.5. The flows were calculated using both rational method and hydrologic model. The City of Pickering's Intensity Duration Frequency (IDF) curve values were used for rational method calculation.

The hydrodynamic model (XPSWMM) was used to simulate flows for pre-development condition. The Atmospheric Environment Service (AES) 1-hour and 12-hour storm hyetographs and the Chicago 4-hour storms provided in the City of Pickering's SWM design guidelines were used for pre-development condition peak flow simulation. For modeling the site under existing condition, the calculation of effective rainfall in XPSWMM was accomplished using the EPA runoff method. Losses are calculated using the Horton infiltration method and initial abstraction of 1 mm and 5 mm for impervious and pervious areas respectively.
The allowable flows for the site are presented in Table 13.

- The City 2 to100 year Chicago 4 hour, AES 1-hour and 12-hour Storms were used.
- Horton infiltration parameters were used for soil types C.

  F_0 = 75 mm/hr, F_c = 5 mm/hr, decay rate ά = 0.000556 1/sec
- Flows were calculated using the EPA SWMM5 runoff method (similar to Stanhyd in VO2).
- Area = 9.48 ha, w= 188.5 m, C= 0.5 → % impervious = 43%

  TIMP = (C - 0.2) ÷ 0.7 = 0.43

  TIMP = total impervious fraction (dimensionless)
  C = runoff coefficient

In order to review the existing storm system an XPSWMM model was created. See Exhibit 11 below. The model is not detailed within the report, since it is not the target flows for the redeveloped site. The model was created for review in order to determine how much flow reduction the redevelopment would create. Table 12 below summarizes the comparison of existing (as is) flows to Pickering Parkway sewers to that of the fully redeveloped site.

Legend: Δ - storage node, o – node/MH, Tan colour shows existing, Link (pipe or open channel), Link with pipe and channel above or orifice

Exhibit 11 – XPSWM model of existing conditions

Table 12 – Comparison Existing flows to Full Redeveloped - Pickering Parkway sewers						
Storm Event	**Storm Type**					
	Existing Conditions			**Full redeveloped Conditions**		
	Chicago 4 hr (m3/s)	AES 1 hour (m3/s)	AES 12 hour (m3/s)	Chicago 4 hr (m3/s)	AES 1 hour (m3/s)	AES 12 hour (m3/s)
2- year	2.136	1.726	0.601	1.236	0.858	0.552
5- year	3.015	2.563	0.779	1.886	1.376	0.719
10- year	3.556	3.103	0.900	2.356	1.781	0.831
25- year	4.287	3.855	1.083	2.942	2.320	1.018
50- year	4.834	4.396	1.204	3.439	2.720	1.146
100- year	5.258	4.822	1.322	4.038	3.124	1.265

Table 13 shows the flows from the site only to Pickering Parkway. The flows shown in table 12 is flow from the MTO culvert and the site.

Table 13 – Target Peak Flows to Pickering Parkway sewer (**allowable**)				
Storm Event	**Storm Type**			
	Chicago 4 hr (m3/s)	AES 1 hour (m3/s)	AES 12 hour (m3/s)	Rational method for comparison using IDF curves
2- year	1.366	1.235	0.383	0.811
5- year	1.878	1.677	0.496	1.116
10- year	2.182	1.961	0.574	1.320
25- year	2.615	2.406	0.705	1.734
50- year	2.861	2.721	0.785	2.117
100- year	2.951	2.934	0.862	2.447

Rational method uses C = 0.5 for 2 to10 year events, Tc = 15 min (conservative)
As per City criteria for;
25-year storm - Ca = 1.10
50-year storm - Ca = 1.20
100-year storm - Ca = 1.25

Rational method is very similar to EPA runoff using the City IDF curves (Chicago storms).

The City of Pickering uses the AES storm for sizing SWMM facilities.

POST-DEVELOPMENT

1. The SWM for the redeveloped First Pickering Place will establish/analyse the following:
2. Flows to the Pickering Parkway storm sewer based on the criteria established above.
3. Establish SWM criteria for the redeveloped First Pickering Place in order to limit the flows.
4. Evaluate the flows entering the down-stream sewer system.
5. Evaluate the water quality requirements.
6. Evaluate the water balance for the Site.
7. Make recommendations as to the implementation of the SWM.
8. Evaluate the staging of construction.

Hydrology and Hydraulics:

We will utilize a Hydrodynamic model to evaluate the sewer items such as flow, velocity, HGL along with the above-mentioned items. The Hydrodynamic model we will use is XPSWMM by INNOVYZE version 2021. XPSWMM is using the modified EPA SWMM 5 engine. SWMM 5 models can be imported and exported into XPSWMM. The Hydrodynamic models provide the most accurate, reliable and defensible representation of flows in the collection system. They account for varying inflows, non-coincident peak flows, in system storage, hydrograph attenuation, and tail and backwater effects. The hydrology will be done using the SWM runoff methods which is similar to Otthymo Standhyd. In addition, if rural watersheds are required, XPSWMM fully implements the Nash unit hydrograph technique. The peak flows for these small tributary areas can be hand verified using the rational equation. XPSWMM will balance the entire system such as stage/storage/discharge without having to input orifice type equations. The added feature of XPSWMM is the integrated 1D/2D capability.

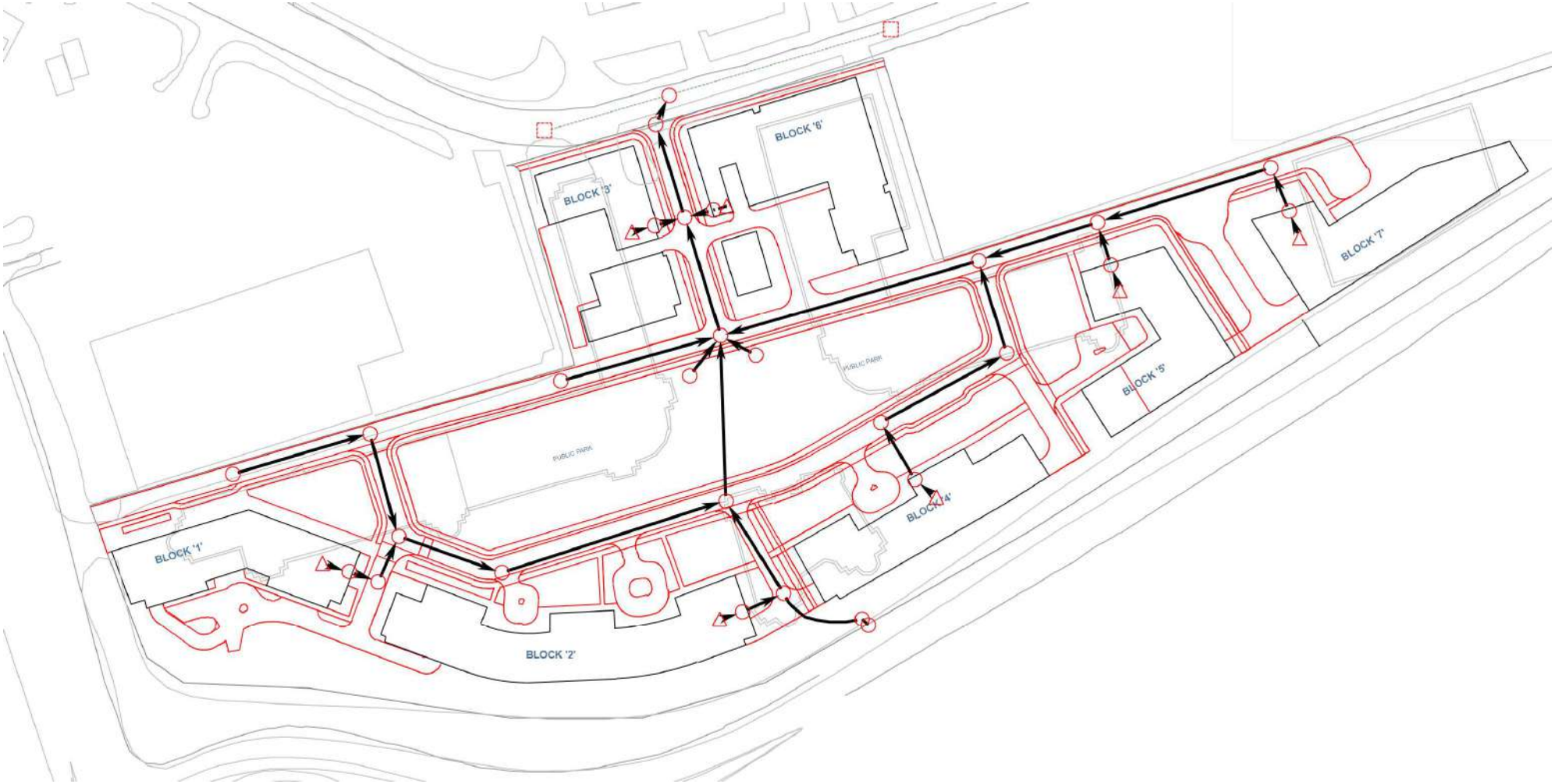
What to Model:

Based on the description of the existing system, and the imposition by the City of flow reduction to a C =0.5 from the existing site C= 0.85 (See table 13 above). The post developed site will reduce flows to the sewers on Pickering Parkway, therefore the outlet can be the sewer on Pickering Parkway. The new Site layout will not allow outlet to the existing 1200 ø sewer. The new development will require to partially replace the existing 750 ø pipe with a 1200 ø pipe. Refer to Appendix E for the site servicing drawings. The existing downstream 1200 ø sewer is at a 0.50% slope. The new 1200 ø sewer extension will be at 0.61% slope. Thus the new sewer will offer more capacity than the existing outlet sewer.

Therefore, the model will include the flow from the MTO culvert and the new site sewers. The boundary conditions are outfall at the new MH17 at Pickering Parkway.

The City of Pickering uses the AES storm for sizing SWM facilities. It will be shown that the 4 hour Chicago storm is the critical storm for all storage facilities.

Exhibit 12- XPSWMM POST DEVELOPED GLOBAL MODEL



Legend: Δ - storage node, o – node/MH, Link (pipe or open channel), Tan colour shows existing
Link with pipe and channel above or orifice

Exhibit 13- XPSWMM POST DEVELOPED MODEL WITH PROPOSED TOPOGRAPHY

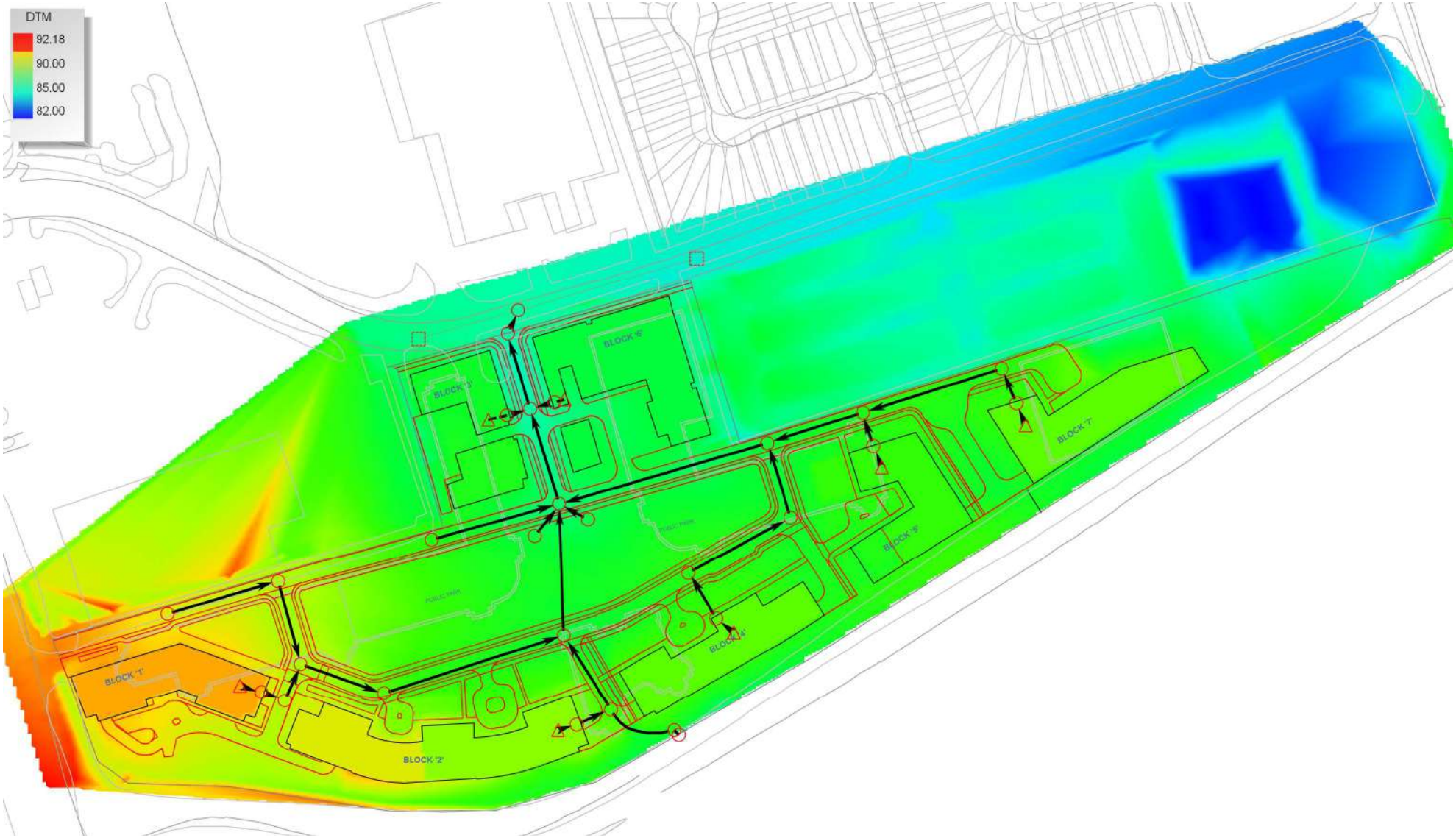


Exhibit 14- XPSWMM POST DEVELOPED MODEL WITH NODE LABELS

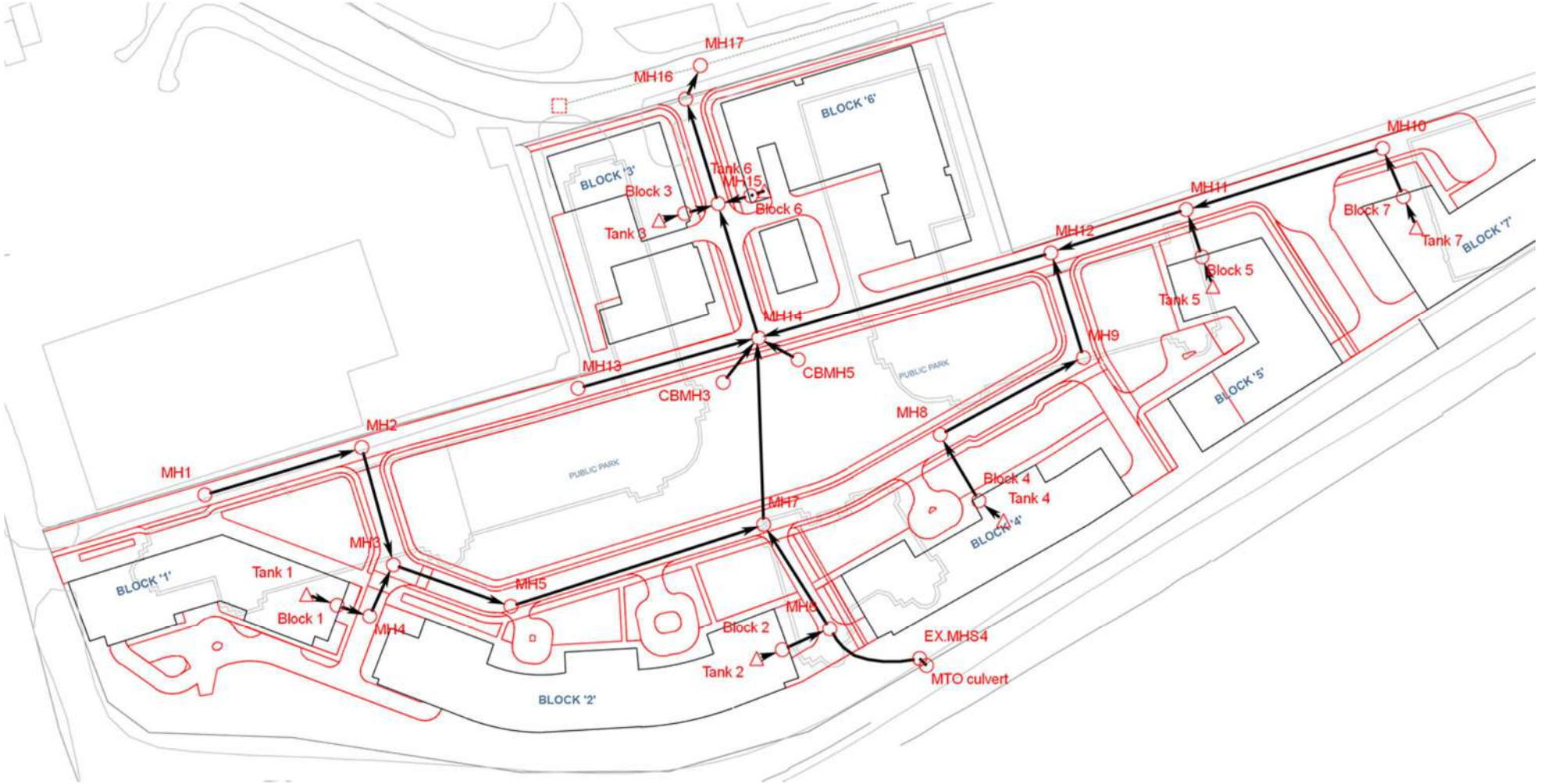


Exhibit 15- XPSWMM POST DEVELOPED MODEL WITH TRIBUTARY AREAS

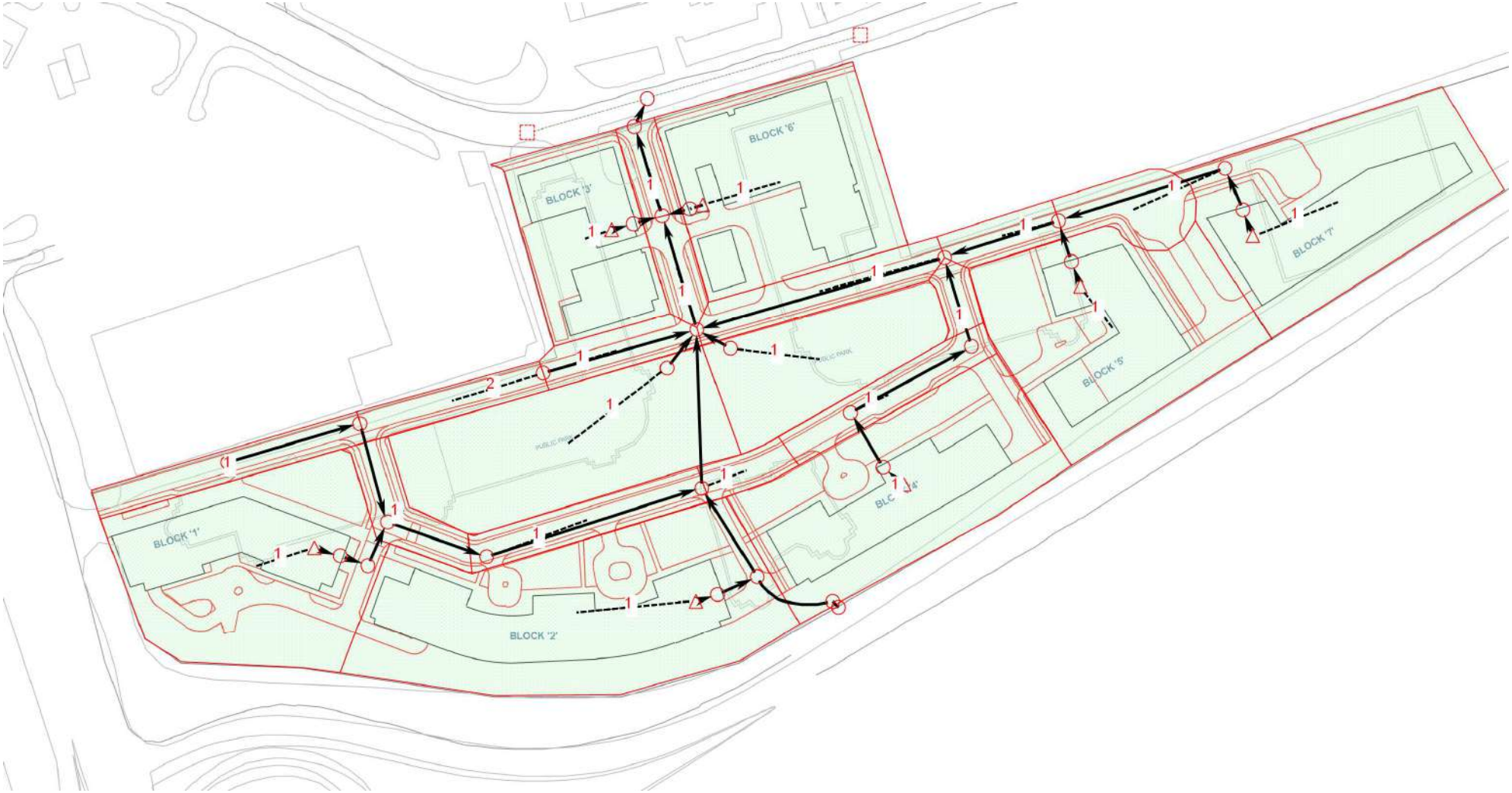
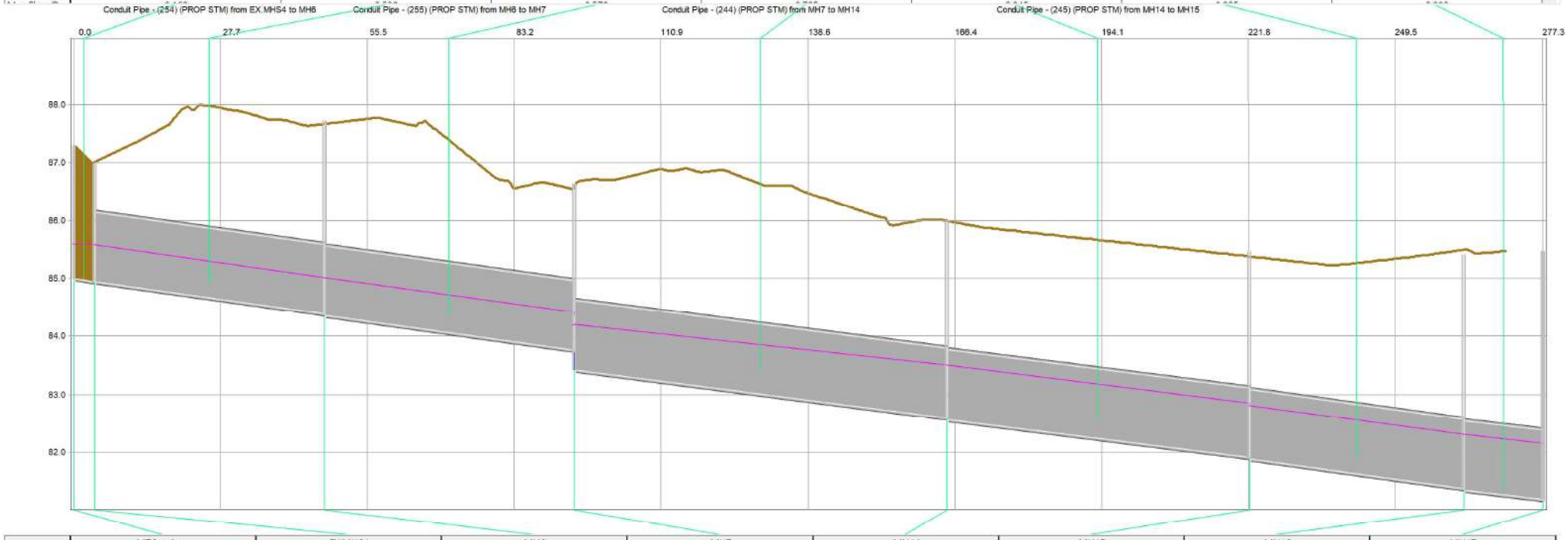


Exhibit 16- XPSWMM profile plot MTO CULVERT to MH17- 100-YR Chicago

PIPE DATA

	Inlet ditch	Pipe - (254) (PROP STM)	Pipe - (255) (PROP STM)	Pipe - (244) (PROP STM)	Pipe - (245) (PROP STM)	Pipe - (253) (PROP STM).1	Out-Pipe
Storm	100vr4hrChicago	100vr4hrChicago	100vr4hrChicago	100vr4hrChicago	100vr4hrChicago	100vr4hrChicago	100vr4hrChicago
Diameter (Hei	1.200	1.200	1.200	1.200	1.200	1.200	1.200
Conduit Slope	1.250	1.292	1.254	1.161	1.135	1.258	1.116
Max Flow	2.396	2.369	2.484	2.960	3.924	4.041	4.039
Max Velocity	1.046	3.977	3.968	3.836	4.173	4.365	4.149
Design Full Fl	14.819	4.431	4.366	4.201	4.154	4.373	4.117

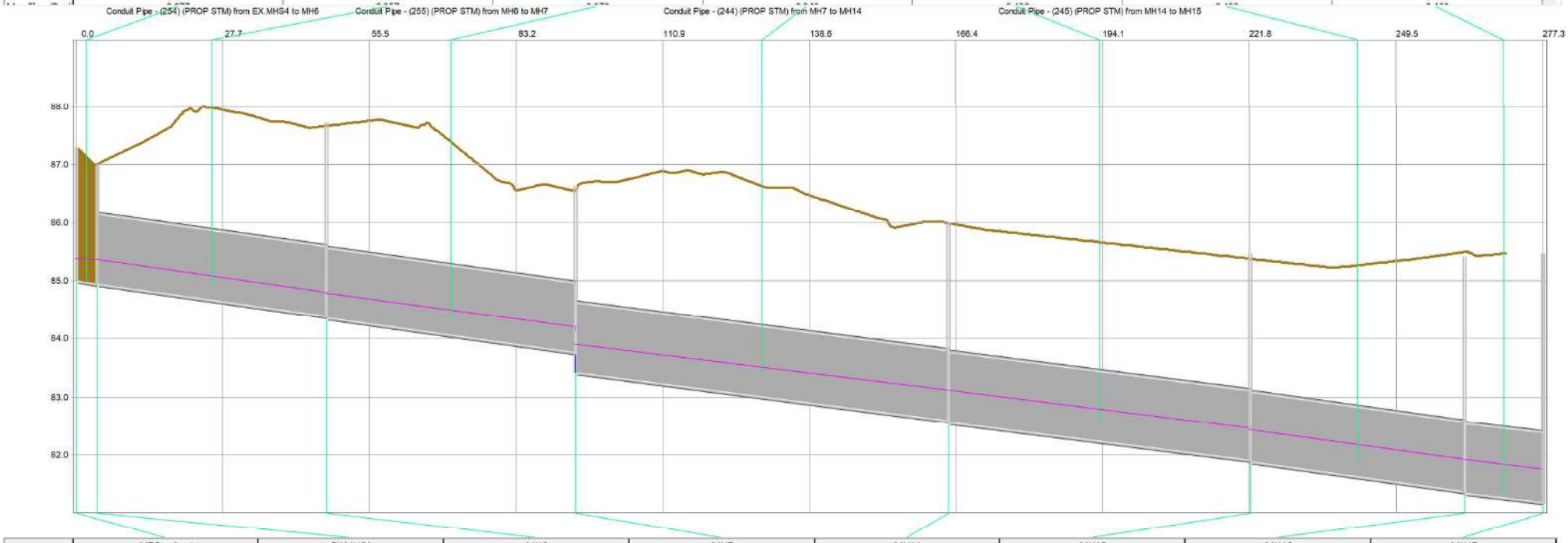


	MTO culvert	EX.MHS4	MH6	MH7	MH14	MH15	MH16	MH17
Storm	100vr4hrChicago	100vr4hrChicago	100vr4hrChicago	100vr4hrChicago	100vr4hrChicago	100vr4hrChicago	100vr4hrChicago	100vr4hrChicago
Ground Elevat	87.300	86.991	87.735	86.645	85.994	85.462	85.407	85.475
Max Water Ele	85.598	85.581	85.015	84.195	83.502	82.815	82.319	82.125
Max Water De	0.598	0.631	0.654	0.778	0.933	0.926	0.964	0.964
Invert Elevatio	85.000	84.950	84.361	83.417	82.569	81.889	81.355	81.161
Max Volume	0.730	0.770	0.798	0.952	1.139	1.130	1.178	1.177

Exhibit 17- XPSWMM profile plot MTO CULVERT to MH17- 5-YR Chicago

PIPE DATA

	Inlet ditch	Pipe - (254) (PROP STM)	Pipe - (255) (PROP STM)	Pipe - (244) (PROP STM)	Pipe - (245) (PROP STM)	Pipe - (253) (PROP STM).1	Out-Pipe
Storm	5yr4hrChicago	5yr4hrChicago	5yr4hrChicago	5yr4hrChicago	5yr4hrChicago	5yr4hrChicago	5yr4hrChicago
Diameter (Heig	1.200	1.200	1.200	1.200	1.200	1.200	1.200
Conduit Slope	1.250	1.292	1.254	1.161	1.135	1.258	1.116
Max Flow	1.141	1.135	1.193	1.428	1.821	1.889	1.886
Max Velocity	0.915	3.276	3.277	3.298	3.553	4.178	3.560
Design Full Flo	14.819	4.431	4.366	4.201	4.154	4.373	4.117

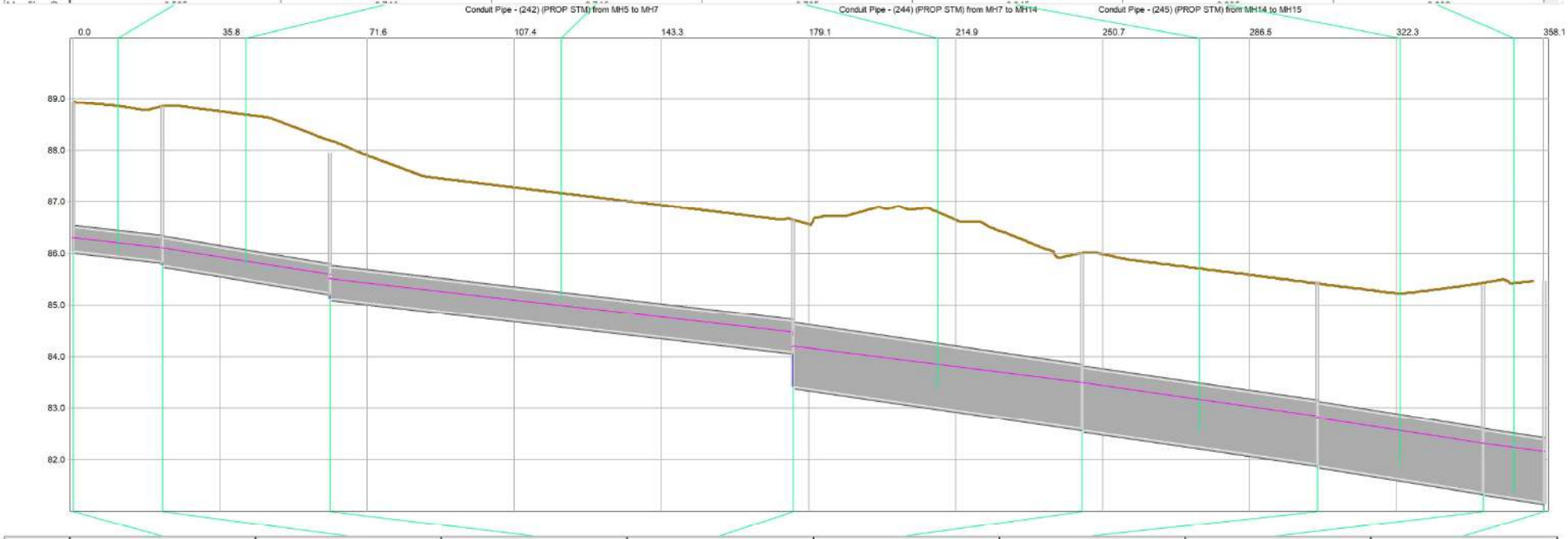


	MTO culvert	EX.MHS4	MH6	MH7	MH14	MH15	MH16	MH17
Storm	5yr4hrChicago	5yr4hrChicago	5yr4hrChicago	5yr4hrChicago	5yr4hrChicago	5yr4hrChicago	5yr4hrChicago	5yr4hrChicago
Ground Elevati	87.300	86.991	87.735	86.645	85.994	85.462	85.407	85.475
Max Water Ele	85.390	85.366	84.791	83.903	83.127	82.443	81.927	81.732
Max Water De	0.390	0.416	0.430	0.486	0.558	0.554	0.572	0.571
Invert Elevatio	85.000	84.950	84.361	83.417	82.569	81.889	81.355	81.161
Max Volume	0.476	0.507	0.525	0.594	0.681	0.676	0.699	0.697

Exhibit 18- XPSWMM profile plot MH 4 to MH17- 100-YR Chicago

PIPE DATA

	Pipe - (240) (PROP STM)	Pipe - (241) (PROP STM)	Pipe - (242) (PROP STM)	Pipe - (244) (PROP STM)	Pipe - (245) (PROP STM)	Pipe - (253) (PROP STM).1	Out-Pipe
Storm	100yr4hrChicago	100yr4hrChicago	100yr4hrChicago	100yr4hrChicago	100yr4hrChicago	100yr4hrChicago	100yr4hrChicago
Diameter (Hei	0.450	0.525	0.600	1.200	1.200	1.200	1.200
Conduit Slope	0.917	1.273	0.923	1.161	1.135	1.258	1.116
Max Flow	0.163	0.362	0.440	2.960	3.924	4.041	4.039
Max Velocity	1.790	2.456	2.285	3.836	4.173	4.365	4.149
Design Full Fl	0.273	0.485	0.590	4.201	4.154	4.373	4.117

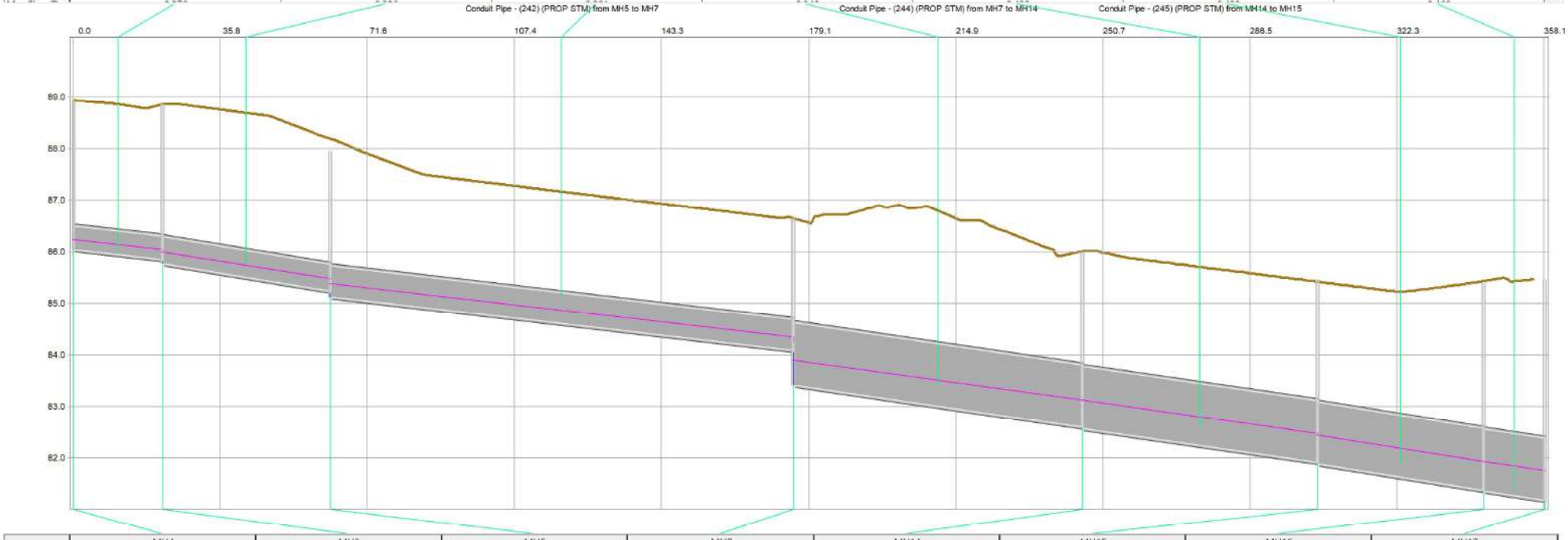


	MH4	MH3	MH5	MH7	MH14	MH15	MH16	MH17
Storm	100yr4hrChicago	100yr4hrChicago	100yr4hrChicago	100yr4hrChicago	100yr4hrChicago	100yr4hrChicago	100yr4hrChicago	100yr4hrChicago
Ground Elevat	88.934	88.853	87.952	86.645	85.994	85.462	85.407	85.475
Max Water Ele	86.295	86.109	85.518	84.195	83.502	82.815	82.319	82.125
Max Water De	0.250	0.339	0.388	0.778	0.933	0.926	0.964	0.964
Invert Elevatio	86.045	85.770	85.130	83.417	82.569	81.889	81.355	81.161
Max Volume	0.305	0.413	0.473	0.952	1.139	1.130	1.178	1.177

Exhibit 19- XPSWMM profile plot MH 4 to MH17- 5-YR Chicago

PIPE DATA

	Pipe - (240) (PROP STM)	Pipe - (241) (PROP STM)	Pipe - (242) (PROP STM)	Pipe - (244) (PROP STM)	Pipe - (245) (PROP STM)	Pipe - (253) (PROP STM).1	Out-Pipe
Storm	5yr4hrChicago	5yr4hrChicago	5yr4hrChicago	5yr4hrChicago	5yr4hrChicago	5yr4hrChicago	5yr4hrChicago
Diameter (Hei	0.450	0.525	0.600	1.200	1.200	1.200	1.200
Conduit Slope	0.917	1.273	0.923	1.161	1.135	1.258	1.116
Max Flow	0.103	0.187	0.224	1.428	1.821	1.889	1.886
Max Velocity	1.593	2.097	1.944	3.298	3.553	4.178	3.560
Design Full Fl	0.273	0.485	0.590	4.201	4.154	4.373	4.117

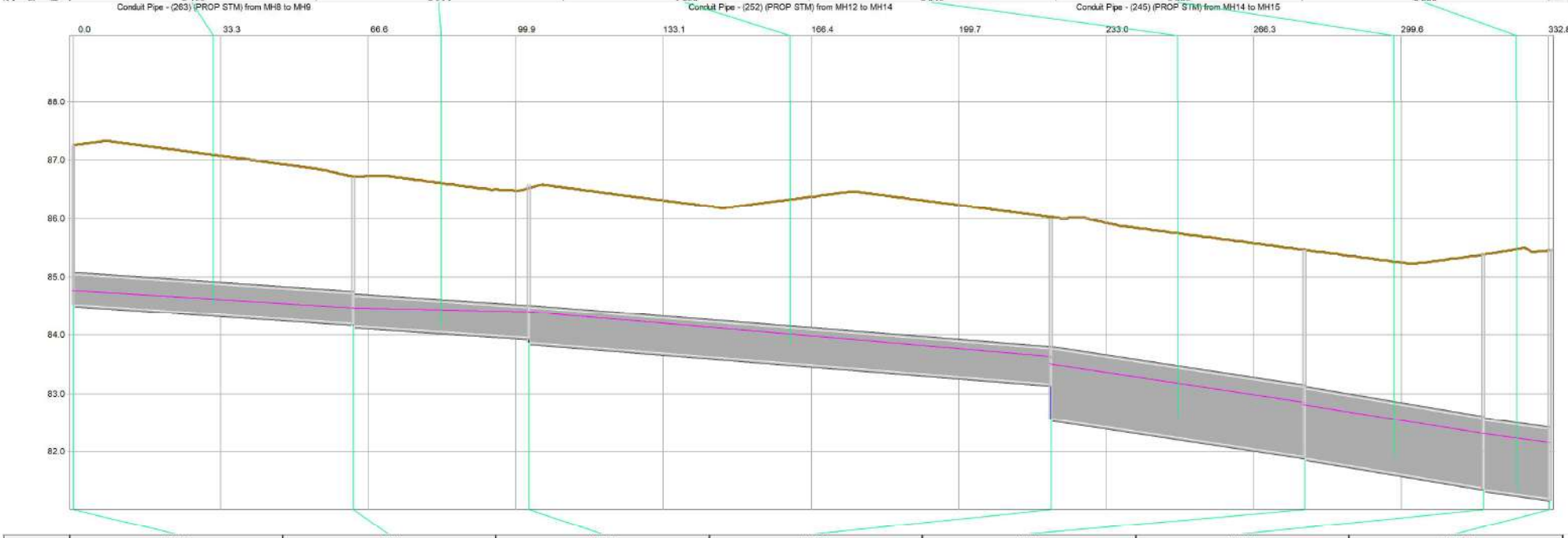


	MH4	MH3	MH5	MH7	MH14	MH15	MH16	MH17
Storm	5yr4hrChicago	5yr4hrChicago	5yr4hrChicago	5yr4hrChicago	5yr4hrChicago	5yr4hrChicago	5yr4hrChicago	5yr4hrChicago
Ground Elevat	88.934	88.853	87.952	86.645	85.994	85.462	85.407	85.475
Max Water Ele	86.236	85.997	85.387	83.903	83.127	82.443	81.927	81.732
Max Water De	0.191	0.227	0.257	0.486	0.558	0.554	0.572	0.571
Invert Elevatio	86.045	85.770	85.130	83.417	82.569	81.889	81.355	81.161
Max Volume	0.233	0.276	0.314	0.594	0.681	0.676	0.699	0.697

Exhibit 20- XPSWMM profile plot MH 8 to MH17- 100-YR Chicago

PIPE DATA

	Pipe - (263) (PROP STM)	Pipe - (264) (PROP STM)	Pipe - (252) (PROP STM)	Pipe - (245) (PROP STM)	Pipe - (253) (PROP STM).1	Out-Pipe
Storm	100yr4hrChicago	100yr4hrChicago	100yr4hrChicago	100yr4hrChicago	100yr4hrChicago	100yr4hrChicago
Diameter (Hei	0.525	0.525	0.600	1.200	1.200	1.200
Conduit Slope	0.500	0.519	0.600	1.135	1.258	1.116
Max Flow	0.141	0.159	0.499	3.924	4.041	4.039
Max Velocity	1.370	1.213	1.939	4.173	4.365	4.149
Design Full Fl	0.304	0.310	0.476	4.154	4.373	4.117

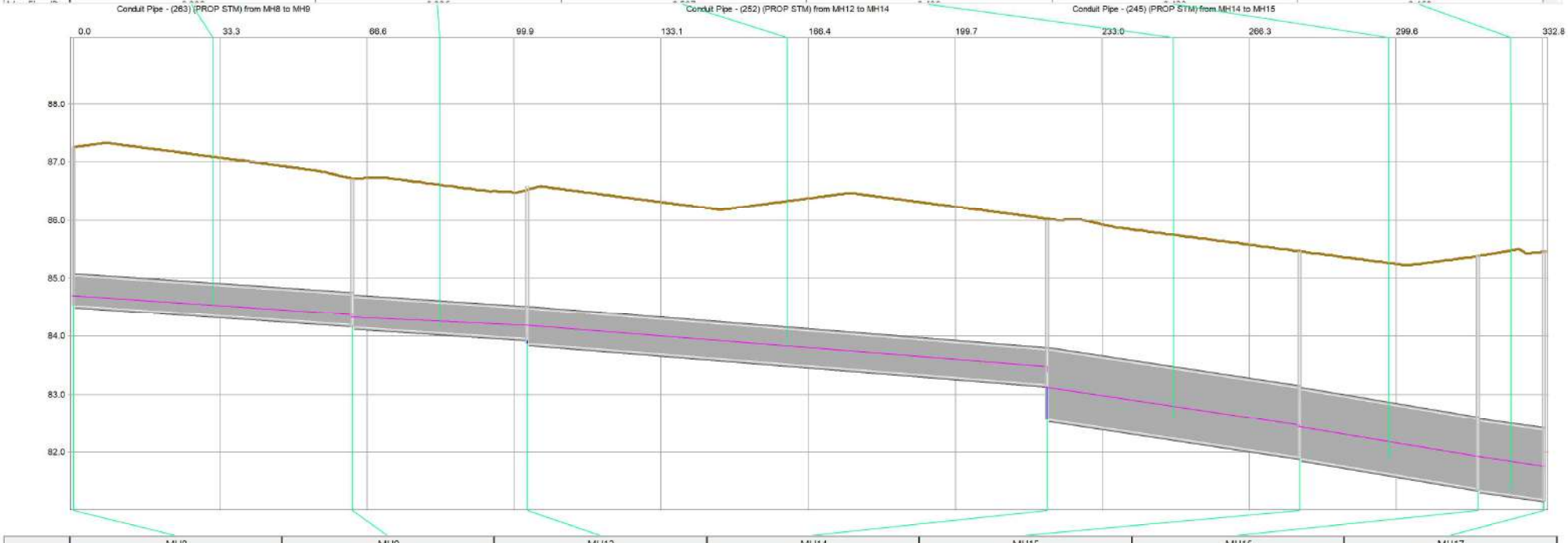


	MH8	MH9	MH12	MH14	MH15	MH16	MH17
Storm	100yr4hrChicago	100yr4hrChicago	100yr4hrChicago	100yr4hrChicago	100yr4hrChicago	100yr4hrChicago	100yr4hrChicago
Ground Elevat	87.258	86.720	86.585	85.994	85.462	85.407	85.475
Max Water Ele	84.779	84.471	84.399	83.502	82.815	82.319	82.125
Max Water De	0.253	0.308	0.524	0.933	0.926	0.964	0.964
Invert Elevatio	84.526	84.163	83.875	82.569	81.889	81.355	81.161
Max Volume	0.308	0.376	0.639	1.139	1.130	1.178	1.177

Exhibit 21- XPSWMM profile plot MH 8 to MH17- 5-YR Chicago

PIPE DATA

	Pipe - (263) (PROP STM)	Pipe - (264) (PROP STM)	Pipe - (252) (PROP STM)	Pipe - (245) (PROP STM)	Pipe - (253) (PROP STM).1	Out-Pipe
Storm	5yr4hrChicago	5yr4hrChicago	5yr4hrChicago	5yr4hrChicago	5yr4hrChicago	5yr4hrChicago
Diameter (Hei	0.525	0.525	0.600	1.200	1.200	1.200
Conduit Slope	0.500	0.519	0.600	1.135	1.258	1.116
Max Flow	0.069	0.073	0.251	1.821	1.889	1.886
Max Velocity	1.138	1.104	1.703	3.553	4.178	3.560
Design Full Fl	0.304	0.310	0.476	4.154	4.373	4.117

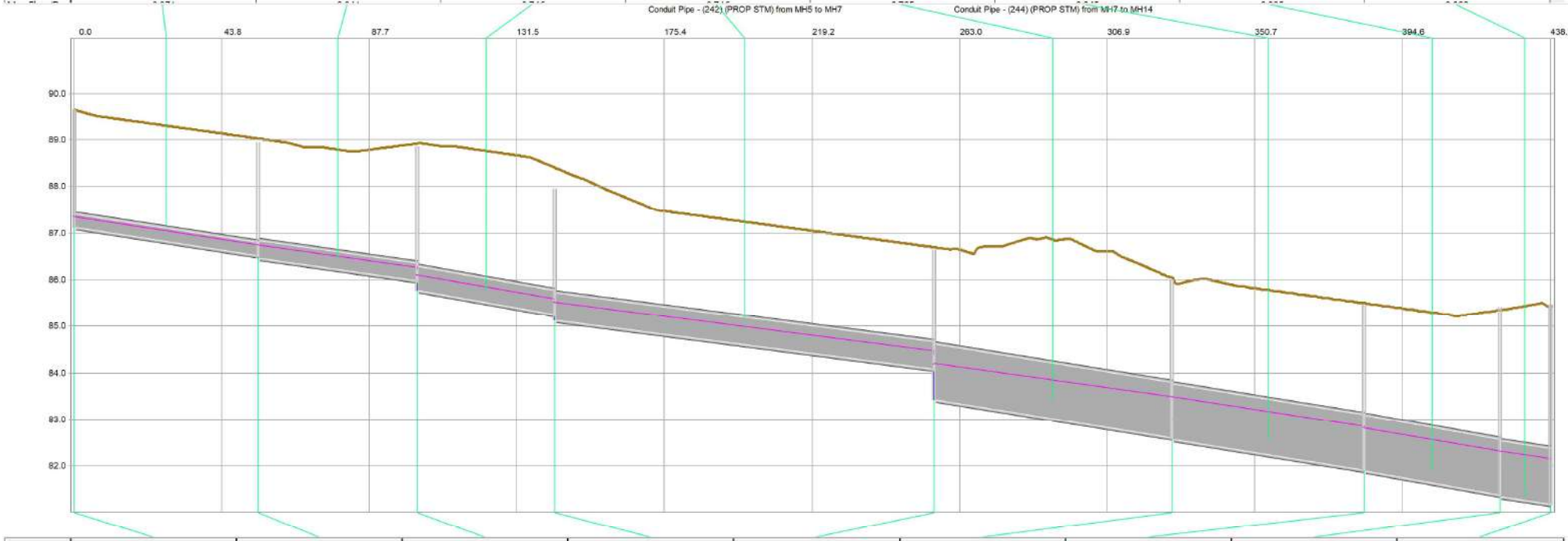


	MH8	MH9	MH12	MH14	MH15	MH16	MH17
Storm	5yr4hrChicago	5yr4hrChicago	5yr4hrChicago	5yr4hrChicago	5yr4hrChicago	5yr4hrChicago	5yr4hrChicago
Ground Elevat	87.258	86.720	86.585	85.994	85.462	85.407	85.475
Max Water Ele	84.697	84.339	84.185	83.127	82.443	81.927	81.732
Max Water De	0.171	0.176	0.310	0.558	0.554	0.572	0.571
Invert Elevatio	84.526	84.163	83.875	82.569	81.889	81.355	81.161
Max Volume	0.208	0.215	0.378	0.681	0.676	0.699	0.697

Exhibit 22- XPSWMM profile plot MH 1 to MH17- 100-YR Chicago

PIPE DATA

	Pipe - (260) (PROP STM)	Pipe - (261) (PROP STM)	Pipe - (241) (PROP STM)	Pipe - (242) (PROP STM)	Pipe - (244) (PROP STM)	Pipe - (245) (PROP STM)	Pipe - (253) (PROP STM).1	Out-Pipe
Storm	100yr4hrChicago	100yr4hrChicago	100yr4hrChicago	100yr4hrChicago	100yr4hrChicago	100yr4hrChicago	100yr4hrChicago	100yr4hrChicago
Diameter (Hei	0.300	0.375	0.525	0.600	1.200	1.200	1.200	1.200
Conduit Slope	1.122	0.999	1.273	0.923	1.161	1.135	1.258	1.116
Max Flow	0.089	0.165	0.362	0.440	2.960	3.924	4.041	4.039
Max Velocity	1.627	1.804	2.456	2.285	3.836	4.173	4.365	4.149
Design Full Fl	0.102	0.175	0.485	0.590	4.201	4.154	4.373	4.117

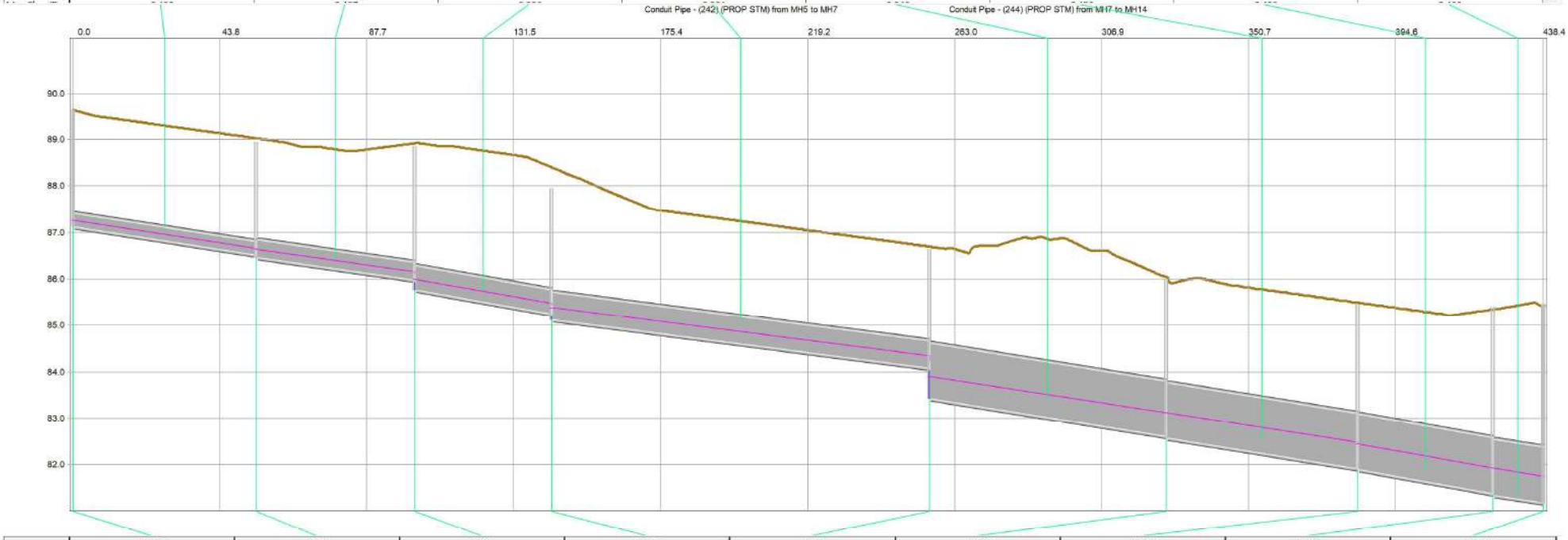


	MH1	MH2	MH3	MH5	MH7	MH14	MH15	MH16	MH17
Storm	100yr4hrChicago	100yr4hrChicago	100yr4hrChicago	100yr4hrChicago	100yr4hrChicago	100yr4hrChicago	100yr4hrChicago	100yr4hrChicago	100yr4hrChicago
Ground Elevat	89.639	88.945	88.853	87.952	86.645	85.994	85.462	85.407	85.475
Max Water Ele	87.345	86.743	86.109	85.518	84.195	83.502	82.815	82.319	82.125
Max Water De	0.218	0.290	0.339	0.388	0.778	0.933	0.926	0.964	0.964
Invert Elevatio	87.127	86.453	85.770	85.130	83.417	82.569	81.889	81.355	81.161
Max Volume	0.266	0.354	0.413	0.473	0.952	1.139	1.130	1.178	1.177

Exhibit 23- XPSWMM profile plot MH 1 to MH17- 5-YR Chicago

PIPE DATA

	Pipe - (260) (PROP STM)	Pipe - (261) (PROP STM)	Pipe - (241) (PROP STM)	Pipe - (242) (PROP STM)	Pipe - (244) (PROP STM)	Pipe - (245) (PROP STM)	Pipe - (253) (PROP STM).1	Out-Pipe
Storm	5yr4hrChicago	5yr4hrChicago	5yr4hrChicago	5yr4hrChicago	5yr4hrChicago	5yr4hrChicago	5yr4hrChicago	5yr4hrChicago
Diameter (Hei	0.300	0.375	0.525	0.600	1.200	1.200	1.200	1.200
Conduit Slope	1.122	0.999	1.273	0.923	1.161	1.135	1.258	1.116
Max Flow	0.044	0.082	0.187	0.224	1.428	1.821	1.889	1.886
Max Velocity	1.396	1.558	2.097	1.944	3.298	3.553	4.178	3.560
Design Full Fl	0.102	0.175	0.485	0.590	4.201	4.154	4.373	4.117

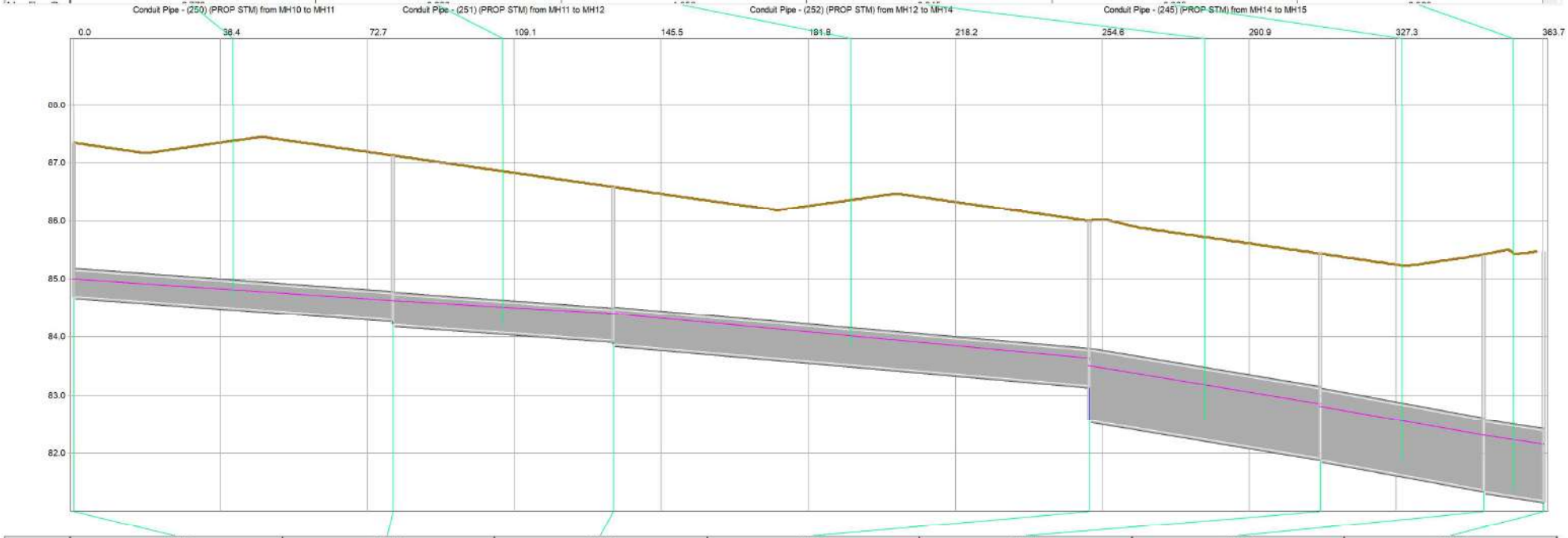


	MH1	MH2	MH3	MH5	MH7	MH14	MH15	MH16	MH17
Storm	5yr4hrChicago	5yr4hrChicago	5yr4hrChicago	5yr4hrChicago	5yr4hrChicago	5yr4hrChicago	5yr4hrChicago	5yr4hrChicago	5yr4hrChicago
Ground Elevat	89.639	88.945	88.853	87.952	86.645	85.994	85.462	85.407	85.475
Max Water Ele	87.264	86.634	85.997	85.387	83.903	83.127	82.443	81.927	81.732
Max Water De	0.137	0.181	0.227	0.257	0.486	0.558	0.554	0.572	0.571
Invert Elevatio	87.127	86.453	85.770	85.130	83.417	82.569	81.889	81.355	81.161
Max Volume	0.168	0.220	0.276	0.314	0.594	0.681	0.676	0.699	0.697

Exhibit 24- XPSWMM profile plot MH 10 to MH17- 100-YR Chicago

PIPE DATA

	Pipe - (250) (PROP STM)	Pipe - (251) (PROP STM)	Pipe - (252) (PROP STM)	Pipe - (245) (PROP STM)	Pipe - (253) (PROP STM).1	Out-Pipe
Storm	100yr4hrChicago	100yr4hrChicago	100yr4hrChicago	100yr4hrChicago	100yr4hrChicago	100yr4hrChicago
Diameter (Hei	0.450	0.525	0.600	1.200	1.200	1.200
Conduit Slope	0.500	0.500	0.600	1.135	1.258	1.116
Max Flow	0.156	0.272	0.499	3.924	4.041	4.039
Max Velocity	1.375	1.570	1.939	4.173	4.365	4.149
Design Full Fl	0.202	0.304	0.476	4.154	4.373	4.117

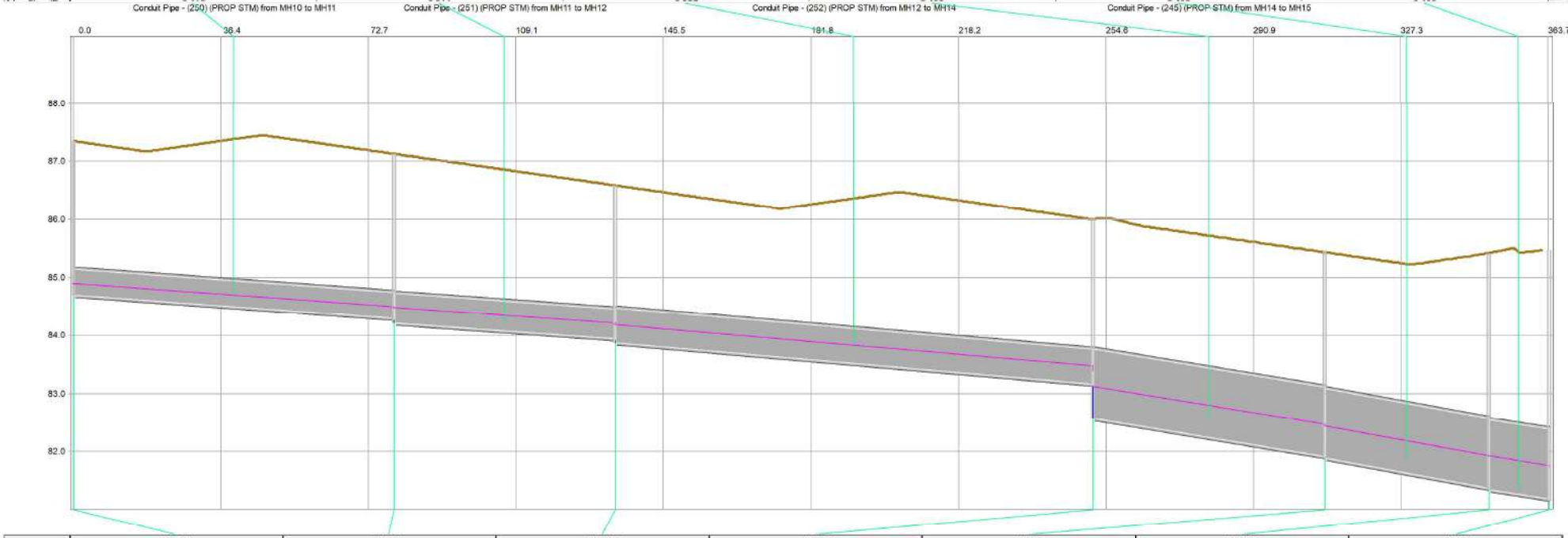


	MH10	MH11	MH12	MH14	MH15	MH16	MH17
Storm	100yr4hrChicago	100yr4hrChicago	100yr4hrChicago	100yr4hrChicago	100yr4hrChicago	100yr4hrChicago	100yr4hrChicago
Ground Elevat	87.347	87.127	86.585	85.994	85.462	85.407	85.475
Max Water Ele	84.996	84.626	84.399	83.502	82.815	82.319	82.125
Max Water De	0.300	0.404	0.524	0.933	0.926	0.964	0.964
Invert Elevatio	84.696	84.222	83.875	82.569	81.889	81.355	81.161
Max Volume	0.366	0.493	0.639	1.139	1.130	1.178	1.177

Exhibit 25- XPSWMM profile plot MH 10 to MH17- 5-YR Chicago

PIPE DATA

	Pipe - (250) (PROP STM)	Pipe - (251) (PROP STM)	Pipe - (252) (PROP STM)	Pipe - (245) (PROP STM)	Pipe - (253) (PROP STM).1	Out-Pipe
Storm	5yr4hrChicago	5yr4hrChicago	5yr4hrChicago	5yr4hrChicago	5yr4hrChicago	5yr4hrChicago
Diameter (Hei	0.450	0.525	0.600	1.200	1.200	1.200
Conduit Slope	0.500	0.500	0.600	1.135	1.258	1.116
Max Flow	0.083	0.155	0.251	1.821	1.889	1.886
Max Velocity	1.204	1.411	1.703	3.553	4.178	3.560
Design Full Fl	0.202	0.304	0.476	4.154	4.373	4.117



	MH10	MH11	MH12	MH14	MH15	MH16	MH17
Storm	5yr4hrChicago	5yr4hrChicago	5yr4hrChicago	5yr4hrChicago	5yr4hrChicago	5yr4hrChicago	5yr4hrChicago
Ground Elevat	87.347	87.127	86.585	85.994	85.462	85.407	85.475
Max Water Ele	84.898	84.489	84.185	83.127	82.443	81.927	81.732
Max Water De	0.202	0.267	0.310	0.558	0.554	0.572	0.571
Invert Elevatio	84.696	84.222	83.875	82.569	81.889	81.355	81.161
Max Volume	0.247	0.325	0.378	0.681	0.676	0.699	0.697

XPSWMM MODEL:

The XPSWMM model is a series of node Links forming a 1D dynamic model with hydrology and hydraulics coupled together. Flow (runoff) is calculated at nodes and dynamically routed through pipes, culverts, storage structures and open channels. The following are the info used in the model:

- All plastic and concrete pipes Manning n = 0.013.
- All CSP pipes Manning n = 0.024.
- All open channels Manning n = 0.040 (considering dense vegetation along the channels).
- Pipe Manhole loss coefficients for entrance and exit were accounted for via drop in manhole inverts.
- Pipe obverts were more or less matched.
- XPSWMM was chosen to accurately show the HGL.
- Refer to sewer profile plots for calculations of flows and other hydraulic stats.
- XPSWMM in 1D, uses a Finite difference Runge-Kutta explicit scheme. Scheme solves all terms of the St. Venant equations. 1D and 2D schemes automatically switch between upstream and downstream controlled flow regimes to represent shocks.

  TIME STEP:
  We have adapted the following time steps:
  1D model start with 15.0 sec. Note the explicit nature of the algorithm automatically reduces the time step. In the case of this model the program has reduced the time step to 1.25 sec or less.

- The City 2 to 100 year 4-hour Chicago, AES 1-hr and AES 12-hr Storms were used.
- Horton infiltration parameters were used for soil types C and D.

  F_0 = 75 mm/hr, F_c = 5 mm/hr, decay rate ά = 0.000556 1/sec

  Depression storage 1mm impervious and 5mm pervious

Refer to table 14 for the existing XPSWMM model hydrology parameters. Refer to Exhibit 12 for the Proposed Site XPSWMM model.

Table 14 – Proposed XPSWMM model hydrology parameters

Name (node)	Subcatchment	Area (ha)	Impervious Percentage %	Width m	Slope m/m	Hydrology Methods	Infiltration Reference	Time to peak Tp (min)
MH1	1	0.190	85.0	10.0	0.01	RUNOFF	Urban-C-soils	
MH8	1	0.175	85.0	10.0	0.01	RUNOFF	Urban-C-soils	
MH13	1	0.124	85.0	10.0	0.01	RUNOFF	Urban-C-soils	
MH13	2	0.121	85.0	10.0	0.01	RUNOFF	Urban-C-soils	
MH2	1	0.160	85.0	10.0	0.01	RUNOFF	Urban-C-soils	
MH9	1	0.052	85.0	10.0	0.01	RUNOFF	Urban-C-soils	
MH3	1	0.137	85.0	10.0	0.01	RUNOFF	Urban-C-soils	
MH5	1	0.183	85.0	10.0	0.01	RUNOFF	Urban-C-soils	
MH7	1	0.070	85.0	10.0	0.01	RUNOFF	Urban-C-soils	
MH14	1	0.090	85.0	10.0	0.01	RUNOFF	Urban-C-soils	
MH10	1	0.162	85.0	10.0	0.01	RUNOFF	Urban-C-soils	
MH11	1	0.095	85.0	10.0	0.01	RUNOFF	Urban-C-soils	
MH12	1	0.207	85.0	10.0	0.01	RUNOFF	Urban-C-soils	
CBMH3	1	0.730	15.0	54.2	0.01	RUNOFF	Urban-C-soils	
CBMH5	1	0.500	15.0	40.6	0.01	RUNOFF	Urban-C-soils	
MH15	1	0.080	85.0	10.0	0.01	RUNOFF	Urban-C-soils	
MTO culvert	1	41.900	10.0	396.0	0.01	RUNOFF	OFF SITE	
Tank 1	1	0.919	85.0	58.7	0.01	RUNOFF	ROOF	
Tank 2	1	1.230	85.0	67.7	0.01	RUNOFF	ROOF	
Tank 4	1	0.902	85.0	31.7	0.01	RUNOFF	ROOF	
Tank 5	1	0.890	85.0	57.8	0.01	RUNOFF	ROOF	
Tank 7	1	1.020	85.0	57.8	0.01	RUNOFF	ROOF	
Tank 6	1	0.818	85.0	55.4	0.01	RUNOFF	ROOF	
Tank 3	1	0.478	85.0	42.3	0.01	RUNOFF	ROOF	
	Total	51.23						

DISCUSSION OF XPSWMM MODEL:

1) The Model tributary areas follow the minor system tributary areas. See model above.

2) There are no celerity issues with the model. There were no warnings or errors.

3) All conduits were stable. The continuity error was less than 1% in all storm runs which is considered excellent.

4) There were no warnings or error messages from the analysis.

5) In a dynamic model the orifice size and co-efficient are entered. The Model calculates the HGL and volume required. There is no need for a rating curve.

6) Outfalls are considered free flow, since the outlet is to a trunk sewer.

7) The HGL plots show the brown service line as the spill crest when representing surface storage nodes and rim elevation for MH nodes. The plots are for the 5 year and 100-year storms.

8) The long plots (profile) have tables that give hydraulic stats for each length of run.

9) The stats show that the City criteria for sewers has been achieved.

Post-Development Analysis Results

Table 15 – Peak Flows to Pickering Parkway sewer from Site

Storm Event	Allowable Peak Flow (m3/s)			Post-Development Peak Flow (m3/s)		
	Chicago 4 hr (m3/s)	AES 1 hour (m3/s)	AES 12 hour (m3/s)	Chicago 4 hr (m3/s)	AES 1 hour (m3/s)	AES 12 hour (m3/s)
2 year	1.366	1.235	0.383	0.466	0.367	0.333
5 year	1.878	1.677	0.496	0.745	0.491	0.436
10 year	2.182	1.961	0.574	0.974	0.636	0.504
25 year	2.615	2.406	0.705	1.258	0.857	0.637
50 year	2.861	2.721	0.785	1.444	1.026	0.725
100 year	2.951	2.934	0.862	1.642	1.207	0.803

Post development Site Flow is site out-pipe flow – MTO inlet ditch flow.

Note the post development flows to the City sewer is reduced considerably due to storage tanks.

SUMMARY OF SWM Quantity Control Features:

Refer to table 16 for the SWM used for quantity control on the redeveloped Site.

Table 16 – Summary Table of SWMM Quantity Features for Redeveloped Site

BLOCK OR DESCRIPTION AND FLOW AREA TO TANK (ha)	SWMM FEATURE DESCRIPTION & FOOTPRINT (m2)	VOLUME REQUIRED 100-year flow (m3) max of 4 hr Chicago or AES	ORIFICE CONTROL C=0.62	ORIFICE max head (m)	Maximum 100-year flow (L/sec)
BLOCK 1 (0.919 ha)	1-Storage Tank (150)	TANK 1 – 236	250 mm	1.57	163
BLOCK 2 (1.230 ha)	1-Storage Tank (300)	TANK 1 – 400	250 mm	1.33	147
BLOCK 3 (0.478 ha)	1-Storage Tank (150)	TANK 1 – 168	150 mm	1.12	50
BLOCK 4 (0.902 ha)	1-Storage Tank (200)	TANK 1 – 302	200 mm	1.51	98
BLOCK 5 (0.890 ha)	1-Storage Tank (200)	TANK 1 – 294	200 mm	1.47	102
BLOCK 6 (0.818 ha)	1-Storage Tank (200)	TANK 1 – 316	150 mm	1.58	62
BLOCK 7 (1.02 ha)	1-Storage Tank (200)	TANK 1 – 350	200 mm	1.75	111

All Maximum Volumes created by 4-hour Chicago storm

FOUNDATION WATERPROOFING STRATEGY

Dewatering discharge during construction and long term will be as follows:

At the Pre-consultation for 1755 & 1805 Pickering Parkway the City of Pickering made the following statement:

Please note that the City will not accept discharge of foundation drainage to the storm system due to the potential for adverse impacts.

Please note that Region of Durham will not accept discharge of foundation drainage to the sanitary sewers. This statement is part of their sewer bylaw.

Based on the above we recommend the Architect, Structural Engineer, Geotechnical Engineer and Mechanical Engineer devise a waterproofing system with the shoring and foundation design.

Based on the above we have not incorporated any allowance for foundation drainage in the SWM for the site.

6. WATER BALANCE

The City Pickering and TRCA will require that the first 5mm of any storm be captured and reused or returned to the environment. Water balance can be addressed by various methods including, infiltration by use of soak-away pit or permeable pavers, irrigation, vegetative cover and water reuse for toilet flushing of commercial uses. It is recommended that a separate cistern be installed for storm water reuse adjacent to the SWM tank with an overflow baffle to the SWM tank for when the site has reached its reuse potential.

LIDS:

- Imbrium Filterra Bioretention System
- Silva Cells
- Soak away pits
- Bio swales
- others

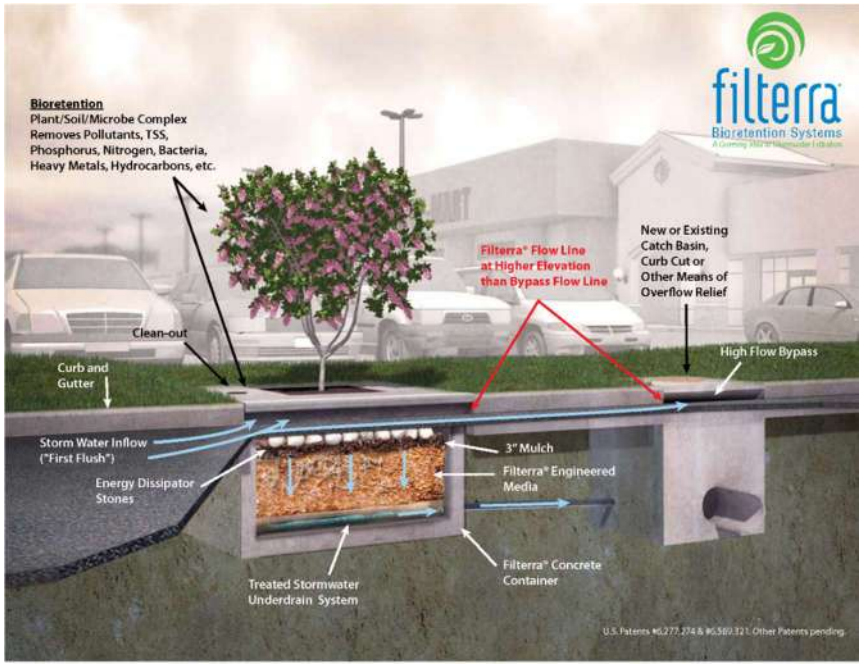
Infiltration gallery footprints are to be designed considering in-situ percolation rates.

A drain-down time of 48 hours should be applied to any infiltration gallery calculations.

Other Options:

1. Imbrium Filterra Bio retention System

This is an appropriate method for water quality treatment in a train treatment environment. Storm water runoff enters the Filterra system through a curb-inlet opening and flows through a specially designed filter media mixture contained in a landscaped modular container. The following photos show the installed Filterra unit and a section through the unit.



2. Silva Cells

The Silva Cell is a modular suspended pavement system that uses soil volumes to support large tree growth and provide powerful on-site storm water management through absorption, evapotranspiration, and interception. The system is typically installed under pavement applications and can be configured in several different ways:

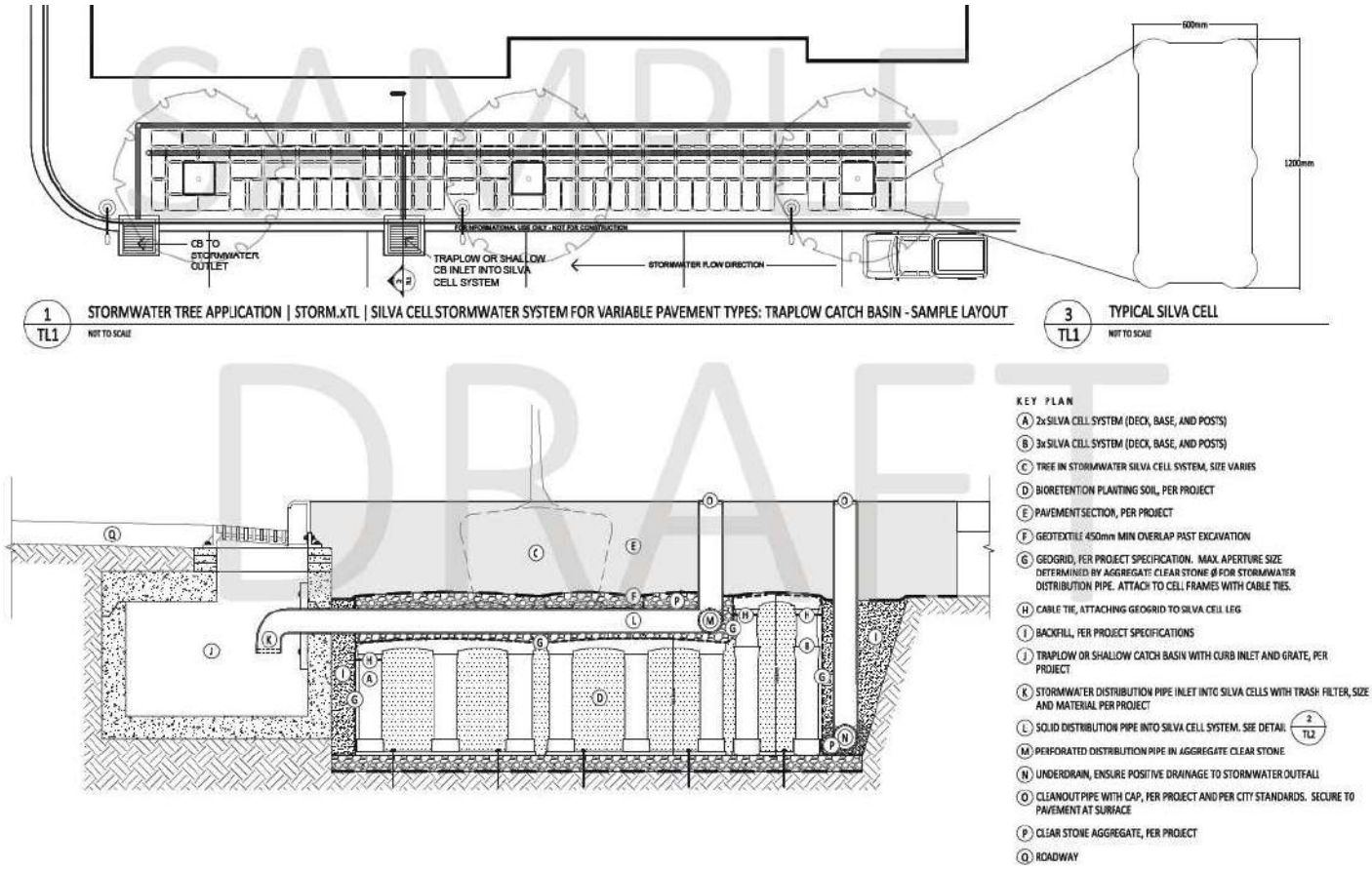
Streetscapes
Adjacent to or under sidewalks
Between buildings and streets.

Parking Areas
Under parking stalls adjacent
to medians or islands.

Public Spaces
Under plazas, promenades, courtyards, or other public spaces at office buildings, museums, schools, and transit centers

The Region of York is using Silva Cells on the widening and reconstruction of Yonge Street.

The following detail is a typical Silva Cell application.



3. Bio swales

We have reviewed the possibility of bio swales. The use of boulevard bio swales was dismissed due to lack of room. The opportunity to deploy bios swales in the blocks is a possibility but based on our past experience not practical. The Park area could have soak away pits rather than bio swales.

The individual quality control and water balance methods can be determined at the site plan stage.

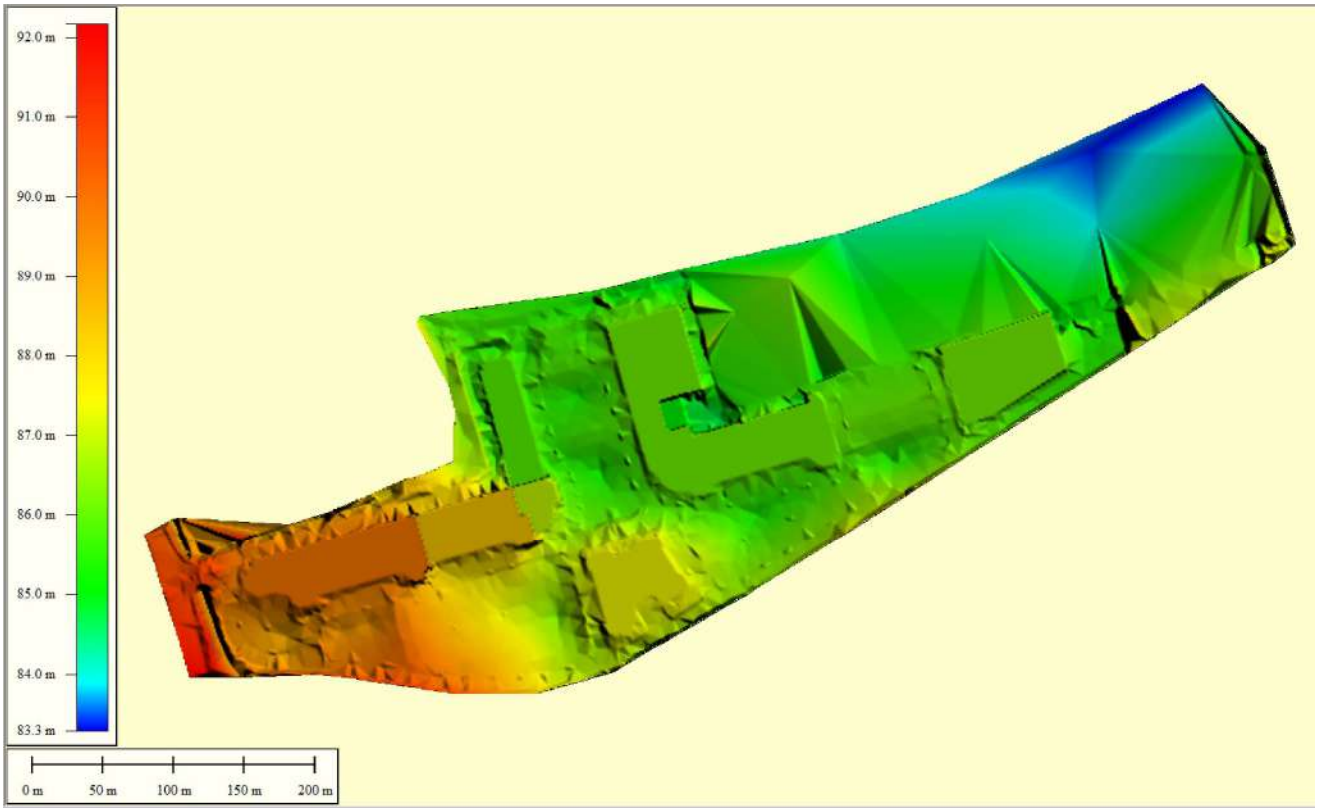
7. GRADING CONSIDERATIONS

The existing topography of the site generally slopes from west to northeast towards the low point of the site located on the east side of the Site. Under the new development and existing adjacent developments there will be several grading constraints for this development to match. The constraints are the existing commercial buildings, Metropia new residential, Pickering Parkway and Notion Road right of ways.

Refer to Exhibit 26 for the color-coded existing topography for the Site.

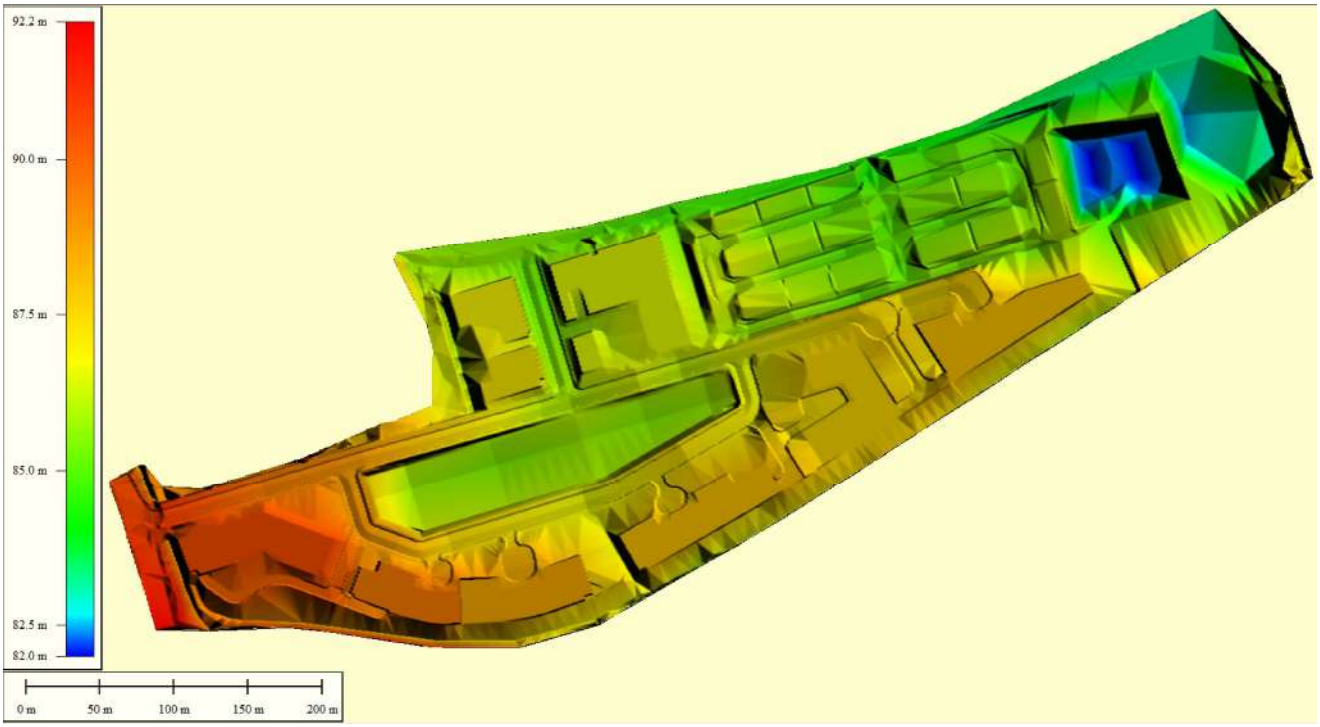
Refer to the concept grading plan in Appendix E for details of the proposed grades for the fully developed site. The proposed grading of the redeveloped site will follow the general lay of the land as shown in Exhibit 26.

Exhibit 26 – Colour coded existing Site topography



Refer to Exhibit 27 for the colour coded proposed Site topography.

Exhibit 27 – Colour coded Proposed Site topography



Refer to the Conceptual Grading Plan included in Appendix E for additional detail. Grading for each parcel will be detailed at the Site Plan stage of development.

8. EROSION AND SEDIMENT CONTROL

Erosion and sediment controls for the site will be implemented according to the Golden Horseshoe Area Conservation Authorities' Erosion and Sediment Control Guidelines for Urban Construction. A detailed erosion control plan will be prepared upon final design and each Site Plan Stage.

9. SOILS REPORT AND HYDROGEOLOGY:

A preliminary Geotechnical investigation has been completed for the site. The purpose of the study is to characterize hydrogeological conditions and determine permitting requirements for the proposed development at the First Pickering Place. The study was completed by Terraprobe dated May 27, 2021 for Pickering Ridge Lands Inc. & Bayfield Realty Advisors.

Native clayey silt glacial till, underlying dense to very dense matrix of sandy silt to silty sand till is the typical soil underlying the site. The soils have some infiltration capacity. The water table underneath varies from 4 to 6 m below grade. Based on the grading it may be possible to provide infiltration galleries. The water table should be monitored further in order to get a wide range of potential water table levels. Monitoring will provide better confidence in the potential maximum ground water levels.

10. RECOMMENDATIONS:

1) We recommend that the owners of First Pickering Place build the sanitary sewer on Pickering Parkway from 1899 Brock Road site to Notion Road to accommodate the full build out of all future development sites and the existing flows. This section of sanitary sewer will be subject to development charges as discussed with the Region of Durham.

2) The sanitary pipe on Notion Road (from Pickering Parkway to Orchard Rd) will be sized to convey existing flows and flows from Phase 1 (First Pickering Place) to the existing Orchard Road sanitary sewer. The Region will allow this interim condition at limited capacity until such time that the Ultimate Trunk Sewer is constructed in the future to convey flows to the South SP. The interim pipe will be downsized from that on Pickering Parkway, the Region will allow this, since it is a temporary measure until the Region replaces it with a trunk sewer on Notion Road.

3) We recommend looping the watermain to Notion Road or Brock Road to provide redundancy to the development since many buildings are taller than 84 m. The OBC requires a second connection to a public system when buildings are greater than 84 m.

11. CONCLUSIONS

The findings of our investigation and analysis can be concluded as follows:

The proposed site is serviceable with the added density with respect to sanitary, water and storm by connecting to the existing infrastructure surrounding the site as outlined in this report.

12. REFERENCES

1. City of Pickering (September 18, 2020**). Summary of Comments**, Pre-consultation for 1755 & 1805 Pickering Parkway. City of Pickering, Ontario.
2. City of Pickering (July 2019). **Stormwater Management Design Guidelines**. City of Pickering, Ontario.
3. TRCA (August 2012). **Stormwater Management Criteria**, Version 1.0. Toronto and Region Conservation Authority, Ontario.
4. GGHA CAs (December, 2006). **Erosion and Sediment Control Guideline for Urban Construction**, Greater Golden Horseshoe Area Conservation Authorities, Ontario.
5. Ontario Ministry of the Environment (March, 2003). **Stormwater Management Planning and Design** Manual. Ministry of the Environment, Ontario. ISBN 0-7794-2969-9.
6. Ontario Ministry of the Environment (2008). **Design Guidelines for Drinking-Water Systems**. Ministry of Environment, Ontario. ISBN 978-1-4249-8517-3.
7. Ontario Ministry of the Environment (2008). **Design Guidelines for Sewage Works**. Ministry of Environment, Ontario. ISBN 978-1-4249-8438-1.
8. Fire Underwriter Survey (1999). **Water Supply for Public Fire Protection**, Ontario.
9. **NEW JERSEY STORM WATER BEST MANAGEMENT PRACTICES MANUAL**, April 2004.
10. **MNR Technical Guide – River and Streams Systems: Flooding Hazard Limits**, 2002.
11. **FEMA Chapter 4 - Flood Risk Assessment**.
12. **ROAD AND BRIDGE DECK DRAINAGE SYSTEMS** by MTO, November 1982.
13. **XPSWMM users Guide** by INNOVYZE 2021.
14. **EPA SWMM 5**, Build 5.1.012, Manual.
15. **LOW IMPACT DEVELOPMENT STORMWATER MANAGEMENT MANUAL**, 2008, by Credit Valley Conservation Authority and Toronto Town Conservation Authority.
16. **Master Servicing and Stormwater Management Report**, for 1899 Brock Road, City of Pickering, May 2021 by SCHAEFFERS.
17. **Functional Servicing & Stormwater Management Report Residential Townhouse Development – 1856 Notion Road Durham Region – City of Pickering**, January 19, 2018, by GHD.
18. City of Pickering and Pickering Developments Inc. – **New Highway 401 Road Crossing (from Notion Road to Squires Beach Road) Schedule "C' Municipal Class Environmental Assessment**, October 2019, by AECOM.

Respectfully Submitted:
The Odan Detech Group Inc.
April 13, 2022

John Krpan, M.S.C.E., P.Eng.

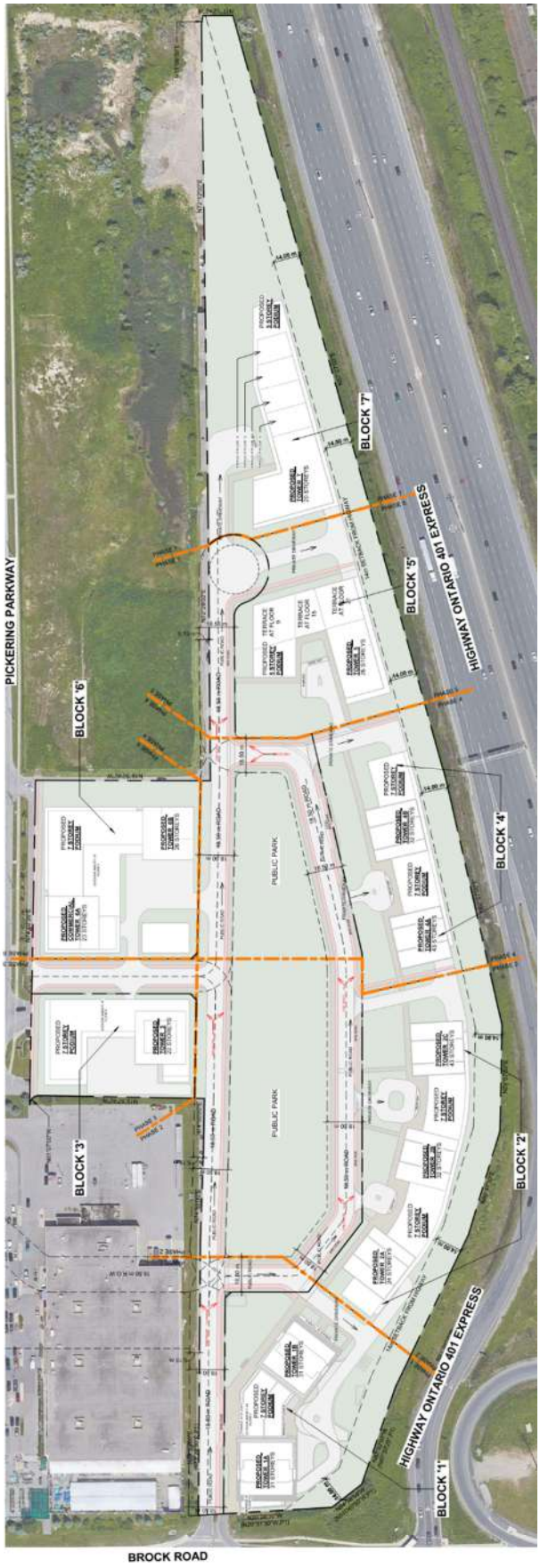
Scott Ahonen, B.Eng.

APPENDIX A

Aerial Photo of Existing Site
Site Plan of the Proposed Development (reduced)

Aerial Photo of Existing Site

Site Plan of the Proposed Development (reduced)



APPENDIX B

Existing condition sanitary sewer design sheet

Redeveloped site Phase 1 sanitary sewer design sheet - REQUIRED SIZES

Redeveloped site Phase 1 sanitary sewer design sheet - PROPOSED SIZES

Redeveloped sites (subject, 1899 Brock Road and surrounding tributaries) sanitary sewer design sheet

Region of Durham Tributary Maps & Correspondence indicating population densities

Existing condition sanitary sewer design sheet

FIGURE S-3

SCENARIO 1: EXISTING CONDITIONS
1755 and 1805 Pickering Parkway Existing Conditions Sanitary Flow Calculation

DESIGNED BY: S. Ahonen DATE: 2022-01-14
CHECKED BY: M. Al-Awad

STREET	TRIB ID	UPSTREAM MH	DOWNSTREAM MH	RESIDENTIAL							COMMERCIAL				FLOW (L/s)				EXISTING SEWER					PRESENT CONDITION	NOTES
				LOT AREA		POP. DENSITY	POP. DENSITY	# OF UNITS	POP.	PEAK FLOW FACTOR, K_H	LOT AREA (Ha)	FLOOR SPACE INDEX	GROSS FLOOR AREA		RESIDENTIAL FLOW		COMM. 2.08 l/s	TOTAL FLOW l/s	Length	Size	Slope	Full Flow Capacity	Full Flow Velocity	% Full	
				UNIT (ha)	ACCUM. (ha)	(Persons/ ha)	(Persons /Unit)						GFA (ha)	ACCUM. (ha)	INFIL. 0.26 (L/s)	SEWAGE 0.0042 (L/s)			L (m)	D (mm)	S (%)	Qcap (L/s)	V (m/s)	Q(d)/Qcap	
Canadian Tire Site	4	EX.MH090	EX MH 34-82										0.79	0.79			1.65	1.65	59.8	200	0.30	17.96	0.57	9.2	
Subject Site	1	CAP-3	EX.MH4A										0.28	0.28			0.59	0.59	12.0	150	1.00	15.23	0.86	3.9	
Subject Site		EX.MH4A	EX.MH3A											0.28			0.59	0.59	53.9	150	0.96	14.92	0.84	3.9	
Subject Site	2	EX.MH5A	EX.MH3A										0.92	0.92			1.91	1.91	51.8	150	0.97	15.00	0.85	12.8	
Subject Site	3	CAP-1	EX.MH3A										0.94	0.94			1.96	1.96	13.0	150	0.92	14.61	0.83	13.4	
Subject Site		EX.MH3A	EX.MH2A											2.15			4.46	4.46	85.0	250	0.53	43.29	0.88	10.3	
Subject Site		EX.MH2A	EX.MH1A											2.15			4.46	4.46	38.1	250	0.45	39.89	0.81	11.2	
Subject Site		EX.MH1A	EX MH 34-82											2.15			4.46	4.46	14.0	250	0.50	42.05	0.86	10.6	
Pickering Parkway	13	EX MH 34-82	EX MH 34-83	0.25	0.25									2.94	0.07		6.11	6.17	91.2	250	0.35	35.18	0.72	17.5	
Pickering Parkway	14	EX MH 34-83	EX MH 35-5	0.24	0.49									2.94	0.13		6.11	6.23	100.0	250	0.49	41.63	0.85	15.0	
Pickering Parkway	15	EX MH 35-5	EX MH 35-6	0.28	0.77									2.94	0.20		6.11	6.31	99.8	250	0.48	41.20	0.84	15.3	
BEECHLAWN DR	7	EX MH018	EX MH 35-6	2.89	2.89	60			173	3.8					0.75	2.77		3.52	59.0	200	0.95	31.97	1.02	11.0	
METROPIA	6	EX MH3A	EX MH 35-6	3.65	3.65				672	3.8					0.95	10.73		11.67	38.2	200	0.75	28.40	0.90	41.1	
Pickering Parkway	16	EX MH 35-6	EX MH 35-7	0.22	7.53				845	3.8				2.94	1.96	13.49	6.11	21.56	82.5	250	0.36	35.68	0.73	60.4	
Pickering Parkway	17	EX MH 35-7	EX MH 35-8	0.24	7.77				845	3.8				2.94	2.02	13.49	6.11	21.62	80.1	250	0.46	40.33	0.82	53.6	
Subject Site	5	EX MH 35-34	EX MH 35-33										0.42	0.42			0.88	0.88	145.7	150	1.00	15.23	0.86	5.8	
Notion Road	20	EX MH 35-33	EX MH 35-28	0.20	0.20									0.42	0.05		0.88	0.93	109.4	200	1.82	44.25	1.41	2.1	
Pickering Parkway	19	EX MH 35-28	EX MH 35-9	0.22	0.42									0.42	0.11		0.88	0.99	99.7	250	0.58	45.29	0.92	2.2	
Pickering Parkway	18	EX MH 35-9	EX MH 35-8	0.01	0.43									0.42	0.11		0.88	0.99	10.4	250	1.12	62.93	1.28	1.6	
MARSHCOURT DR		EX MH 35-8	EX MH 35-25	0.00	8.20				845	3.8				3.36	2.13	13.49	6.99	22.62	58.7	250	0.41	38.08	0.78	59.4	
ASHFORD DR	8	EX.MH023	EX MH 35-25	1.93	1.93	60			116	3.8					0.50	1.85		2.35	73.0	200	0.40	20.74	0.66	11.3	
MARSHCOURT DR	9	SAN MH 35-25	EX MH 35-26	0.29	10.42	60			979	3.8				3.36	2.71	15.62	6.99	25.32	72.8	250	0.55	44.10	0.90	57.4	
MARSHCOURT DR	10	SAN MH 35-26	EX MH 35-27	0.60	11.02	60			1014	3.8				3.36	2.86	16.17	6.99	26.03	70.3	250	0.55	44.10	0.90	59.0	
MARSHCOURT DR	11, 12	EX MH 032	EX MH 35-27	17.39	17.39	60			1043	3.8			0.67	0.67	4.52	16.60	1.39	22.52	40.5	250	0.27	30.90	0.63	72.9	
EASEMENT		SAN MH 35-27	SAN MH 35-29		28.41				2058	3.6				4.03	7.39	30.91	8.38	46.68	124.0	375	0.16	70.13	0.63	66.6	
NOTION ROAD		SAN MH 35-29	SAN MH 35-30															46.68	71.8	375	0.22	82.24	0.74	56.8	
NOTION ROAD		SAN MH 35-30	SAN MH 17															46.68	4.0	375	0.23	84.09	0.76	55.5	
ORCHARD ROAD																		46.68		750	Available capacity at Orchard Rd 750mm dia. pipe is 150 L/s. Total flow calculated here does not include the existing sanitary flows conveyed south on Notion Rd to Orchard Rd.				see note below about capacity*

Design Criteria as per The Regional Municipality of Durham '*Design Specifications for Sanitary Sewers*'
Average daily per capita flow = 364 L/cap/day (Residential)
Average daily per capita flow = 180,000 L/GFA hectares/day (commercial&industrial)
I = Unit of peak extraneous flow when foundation drains are NOT connected to the storm sewer = 0.26 L/s/Ha
Q(p) = peak population flow (L/s) Q(I) = peak extraneous flow (L/s)
Q(d) = peak design flow (L/s)
PEAKING FACTOR (Harmon; Residential) M =1 + 14/(4+(P/1000^0.5))
PEAK POPULATION FLOW, Q (p) = q*P*M / 86400 L / Sec.
PEAK EXTRANEOUS FLOW, Q(i) = I*A L / Sec.
PEAK DESIGN FLOW, Q(d) = Q(p) + Q(i) L / Sec.
PIPE ROUGHGNESS, n = 0.013 For Manning's Equation

NOTES:
1) MINIMUM VELOCITY = 0.60 m/s
2) MAXIMUM VELOCITY = 3.65 m/s
3) INFILTRATION 0.26 l/s = 22.5 m3/Ha/DAY
INFILTRATION 0.52 l/s = 45.0 m3/Ha/DAY (Foundation Drain Connections)
4) COMMERCIAL 2.08 l/s (local sewers) 1.04 l/s (trunk sewers)
5) EXISTING CONDITION INCLUDES COMMITTED DEVELOPMENT
6) USE ACTUAL METRIC I.D. PIPE SIZE IN mm
7) COMMERCIAL FLOOR SPACE INDEX=50% UNLESS OTHERWISE KNOWN

Population Density by Land Use

Housing Type	Density
Single & Semi Detached	3.5 P/u
Townhouse	3.0 P/u
Apartment-2Bdrm	2.5 P/u

Housing Type	Density
Single Family	60 persons/ha
Semi Detached & Duplex	100 persons/ha

* ASSUMED 150 L/s AVAILABLE EXCESS FLOW CAPACITY AT ORCHARD ROAD as per correspondence with Durham Region

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Redeveloped site Phase 1 sanitary sewer design sheet – REQUIRED PIPE SIZES (SEE FOLLOWING SHEET FOR PROPOSED)

FIGURE S-4

NOTE: THIS DESIGN SHEET IS PROVIDED FOR REFERENCE ONLY, AND INTENDED TO PROVIDE CONTEXT OF REQUIRED PHASE 1 PIPE SIZES WITH NO FUTURE BUILD OUT.

SCENARIO 2: PHASE 1 CONDITIONS — DESIGNED BY: S. Ahonen — DATE: 2022-04-06

Redeveloped subject site Phase 1 sanitary sewer design sheet **REQUIRED PIPE SIZES** — CHECKED BY: M. Al-Awad

STREET	TRIB ID	UPSTREAM MH	DOWNSTREAM MH	RESIDENTIAL							COMMERCIAL				FLOW (L/s)				EXISTING SEWER					PRESENT CONDITION	NOTES
				LOT AREA		POP. DENSITY	POP. DENSITY	# OF UNITS	POP.	PEAK FLOW FACTOR, K_H	LOT AREA	FLOOR SPACE INDEX	GROSS FLOOR AREA		RESIDENTIAL FLOW		COMM. 2.08 l/s	TOTAL FLOW l/s	Length	Size	Slope	Full Flow Capacity	Full Flow Velocity	% Full	
				UNIT (ha)	ACCUM. (ha)	(Persons/ ha)	(Persons /Unit)				(Ha)		GFA (ha)	ACCUM. (ha)	INFIL. 0.26 (L/s)	SEWAGE 0.0042 (L/s)			L (m)	D (mm)	S (%)	Qcap (L/s)	V (m/s)	Q(d)/Qcap	
Canadian Tire Site	4	EX.MH090	EX MH 34-82										0.79	0.79			1.65	1.65	59.8	200	0.30	17.96	0.57	9.2	
Pickering Parkway		EX MH 34-82	Prop MH9A	0.52	0.52									0.79	0.14	0.00	1.65	1.78	49.4	250	0.33	34.16	0.70	5.2	required pipe see following sheet
Subject Site	P1	Prop MH1A	Prop MH2A	1.18	1.18		2.5	630	1575	3.66			0.17	0.17	0.31	24.24	0.35	24.90	20.7	300	0.87	90.20	1.28	27.6	required pipe see following sheet
Subject Site		Prop MH2A	Prop MH3A		1.18				1575	3.66				0.17	0.31	24.24	0.35	24.90	44.7	300	0.95	94.25	1.33	26.4	required pipe see following sheet
Subject Site	P2	Prop MH3A	Prop MH4A		1.18				1575	3.66			0.28	0.45	0.31	24.24	0.93	25.48	83.5	300	0.78	85.40	1.21	29.8	required pipe see following sheet
Subject Site		Prop MH4A	Prop MH1A-1		1.18				1575	3.66				0.45	0.31	24.24	0.93	25.48	97.4	300	0.55	71.72	1.01	35.5	Interim pipe Phase 1
Subject Site	P3,2	Prop MH1A-1	Prop MH7A		1.18				1575	3.66			1.50	1.95	0.31	24.24	4.05	28.60	45.4	300	0.31	53.84	0.76	53.1	Interim pipe Phase 1
Subject Site		Prop MH7A	Prop MH8A		1.18				1575	3.66				1.95	0.31	24.24	4.05	28.60	29.9	300	0.52	69.73	0.99	41.0	required pipe see following sheet
Subject Site		Prop MH8A	Prop MH9A		1.18				1575	3.66				1.95	0.31	24.24	4.05	28.60	14.3	300	0.72	82.05	1.16	34.9	required pipe see following sheet
Pickering Parkway		Prop MH9A	EX MH 34-83	0.25	1.95				1575	3.66				2.74	0.51	24.24	5.70	30.44	42.0	300	0.33	55.55	0.79	54.8	required pipe see following sheet
Pickering Parkway		EX MH 34-83	EX MH 35-5	0.24	2.19				1575	3.66				2.74	0.57	24.24	5.70	30.51	100.0	300	0.49	67.69	0.96	45.1	required pipe see following sheet
Pickering Parkway	15	EX MH 35-5	EX MH 35-6	0.28	2.47				1575	3.66				2.74	0.64	24.24	5.70	30.58	99.8	300	0.48	67.00	0.95	45.6	required pipe see following sheet
BEECHLAWN DR		EX MH018	EX MH 35-6	2.89	2.89	60			173	3.80					0.75	2.77		3.52	59.0	200	0.95	31.97	1.02	11.0	
METROPIA	6	EX MH3A	EX MH 35-6	3.65	3.65				672	3.80					0.95	10.73		11.67	38.2	200	0.75	28.40	0.90	41.1	
Pickering Parkway	16	EX MH 35-6	EX MH 35-7	0.22	9.23				2420	3.52				2.74	2.40	35.78	5.70	43.88	82.5	300	0.38	59.61	0.84	73.6	required pipe see following sheet
Pickering Parkway	17	EX MH 35-7	EX MH 35-8	0.24	9.47				2420	3.52				2.74	2.46	35.78	5.70	43.94	80.0	300	0.46	65.59	0.93	67.0	required pipe see following sheet
Pickering Parkway	18	EX MH 35-8	SAN MH 35-28	0.22	9.69				2420	3.52				2.74	2.52	35.78	5.70	44.00	110.1	300	0.57	73.01	1.03	60.3	required pipe see following sheet
Subject Site	5	EX MH 35-34	EX MH 35-33										0.42	0.42	0.00		0.88	0.88	145.7	150	1.00	15.23	0.86	5.8	
Notion Road	20	EX MH 35-33	SAN MH 35-28	0.50	0.50									0.42	0.13		0.88	1.01	109.4	200	1.82	44.25	1.41	2.3	
MARSHCOURT DR		EX MH 35-8	EX MH 35-25		0.00					0.00					0.00	0.00	0.00	0.00	58.9	250	0.41	38.08	0.78	0.0	pipe to remain as cleanout access
ASHFORD DR	8	EX.MH023	SAN MH 35-25	1.93	1.93	60			116	3.80					0.50	1.85		2.35	73.0	200	0.40	20.74	0.66	11.3	
MARSHCOURT DR	9	SAN MH 35-25	SAN MH 35-26	0.29	2.22	60			133	3.80					0.58	2.13	0.00	2.70	72.8	250	0.55	44.10	0.90	6.1	
MARSHCOURT DR	10	SAN MH 35-26	SAN MH 35-27	0.60	2.82	60			169	3.80					0.73	2.70	0.00	3.43	70.3	250	0.55	44.10	0.90	7.8	
MARSHCOURT DR	11, 12	EX MH 032	SAN MH 35-27	17.39	17.39	60			1043	3.79			0.67	0.67	4.52	16.60	1.39	22.52	40.5	250	0.27	30.90	0.63	72.9	
EASEMENT		SAN MH 35-27	SAN MH 35-29	0.00	20.21				1212	3.74				0.67	5.25	19.07	1.39	25.71	124.0	375	0.16	70.13	0.63	36.7	
Pickering Parkway		SAN MH 35-28	Prop MH 13A	0.01	10.20				2420	3.52				3.16	2.65	35.78	6.58	45.02	14.5	375	0.22	82.24	0.74	54.7	Interim pipe Phase 1
NOTION ROAD		Prop MH 13A	Prop MH 14A	0.25	10.45				3904	3.34				3.16	2.72	54.82	6.58	64.11	100.0	375	0.22	82.24	0.74	78.0	Interim pipe Phase 1
NOTION ROAD		Prop MH 14A	SAN MH 35-29	0.25	10.70				3904	3.34				3.16	2.78	54.82	6.58	64.18	101.8	375	0.22	82.24	0.74	78.0	Interim pipe Phase 1
NOTION ROAD		SAN MH 35-29	SAN MH 35-30	0.25	31.16				5117	3.24				3.83	8.10	69.54	7.98	85.61	71.8	450	0.22	133.73	0.84	64.0	Interim pipe Phase 1
NOTION ROAD		SAN MH 35-30	SAN MH 17	0.25	31.41				5117	3.24				3.83	8.17	69.54	7.98	85.68	4.0	450	0.23	136.73	0.86	62.7	Interim pipe Phase 1
ORCHARD ROAD		SAN MH 17	SAN MH 18		31.41													85.68		750	Available capacity at Orchard Rd 750mm dia. pipe is 150 L/s. Total flow calculated here does not include the existing sanitary flows conveyed south on Notion Rd to Orchard Rd.				see note below about capacity*

Design Criteria as per The Regional Municipality of Durham '*Design Specifications for Sanitary Sewers*'
Average daily per capita flow = 364 L/cap/day (Residential)
Average daily per capita flow = 180,000 L/GFA hectares/day (commercial&industrial)
I = Unit of peak extraneous flow when foundation drains are NOT connected to the storm sewer = 0.26 L/s/Ha
Q(p) = peak population flow (L/s) Q(I) = peak extraneous flow (L/s)
Q(d) = peak design flow (L/s)
PEAKING FACTOR (Harmon; Residential) M =1 + 14/(4+(P/1000^0.5))
PEAK POPULATION FLOW, Q (p) = q*P*M / 86400 L / Sec.
PEAK EXTRANEOUS FLOW, Q(i) = I*A L / Sec.
PEAK DESIGN FLOW, Q(d) = Q(p) + Q(i) L / Sec.
PIPE ROUGHGNESS, n = 0.013 For Manning's Equation

NOTES:
1) MINIMUM VELOCITY = 0.60 m/s
2) MAXIMUM VELOCITY = 3.65 m/s
3) INFILTRATION 0.26 l/s = 22.5 m3/Ha/DAY
   INFILTRATION 0.52 l/s = 45.0 m3/Ha/DAY (Foundation Drain Connections)
4) COMMERCIAL 2.08 l/s (local sewers) 1.04 l/s (trunk sewers)
5) EXISTING CONDITION INCLUDES COMMITTED DEVELOPMENT
6) USE ACTUAL METRIC I.D. PIPE SIZE IN mm
7) COMMERCIAL FLOOR SPACE INDEX=50% UNLESS OTHERWISE KNOWN

Population Density by Land Use

Housing Type	Density
Single & Semi Detached	3.5 P/u
Townhouse	3.0 P/u
Apartment-2Bdrm	2.5 P/u

Housing Type	Density
Single Family	60 persons/ha
Semi Detached & Duplex	100 persons/ha

* ASSUMED 150 L/s AVAILABLE EXCESS FLOW CAPACITY AT ORCHARD ROAD as per correspondence with Durham Region

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FIGURE S-4

Redeveloped site Phase 1 sanitary sewer design sheet – PROPOSED PIPE SIZES TO ACCOMMODATE FUTURE BUILD OUT

SCENARIO 2: PHASE 1 CONDITIONS — DESIGNED BY: S. Ahonen — DATE 2022-04-06
Redeveloped subject site Phase 1 sanitary sewer design sheet **PROPOSED PIPE SIZES** — CHECKED BY: M. Al-Awad

STREET	TRIB ID	UPSTREAM MH	DOWNSTREAM MH	RESIDENTIAL							COMMERCIAL				FLOW (L/s)				EXISTING SEWER					PRESENT CONDITION	NOTES
				LOT AREA		POP. DENSITY (Persons/ ha)	POP. DENSITY (Persons /Unit)	# OF UNITS	POP.	PEAK FLOW FACTOR, K_H	LOT AREA (Ha)	FLOOR SPACE INDEX	GROSS FLOOR AREA		RESIDENTIAL FLOW		COMM. 2.08 l/s	TOTAL FLOW l/s	Length	Size	Slope	Full Flow Capacity	Full Flow Velocity	% Full	
				UNIT (ha)	ACCUM. (ha)								GFA (ha)	ACCUM. (ha)	INFIL. 0.26 (L/s)	SEWAGE 0.0042 (L/s)			L (m)	D (mm)	S (%)	Qcap (L/s)	V (m/s)	Q(d)/Qcap	
Canadian Tire Site	4	EX.MH090	EX MH 34-82										0.79	0.79			1.65	1.65	59.8	200	0.30	17.96	0.57	9.2	
Pickering Parkway		EX MH 34-82	Prop MH9A	0.52	0.52									0.79	0.14	0.00	1.65	1.78	49.4	675	0.37	511.31	1.43	0.3	pipe sized for full build-out
Subject Site	P1	Prop MH1A	Prop MH2A	1.18	1.18		2.5	630	1575	3.66			0.17	0.17	0.31	24.24	0.35	24.90	20.7	300	0.87	90.20	1.28	27.6	pipe sized for full build-out
Subject Site		Prop MH2A	Prop MH3A		1.18				1575	3.66				0.17	0.31	24.24	0.35	24.90	44.7	300	0.95	94.25	1.33	26.4	pipe sized for full build-out
Subject Site	P2	Prop MH3A	Prop MH4A		1.18				1575	3.66			0.28	0.45	0.31	24.24	0.93	25.48	83.5	300	0.78	85.40	1.21	29.8	pipe sized for full build-out
Subject Site		Prop MH4A	Prop MH1A-1		1.18				1575	3.66				0.45	0.31	24.24	0.93	25.48	97.4	300	0.55	71.72	1.01	35.5	Interim pipe Phase 1
Subject Site	P3,2	Prop MH1A-1	Prop MH7A		1.18				1575	3.66			1.50	1.95	0.31	24.24	4.05	28.60	45.4	300	0.31	53.84	0.76	53.1	Interim pipe Phase 1
Subject Site		Prop MH7A	Prop MH8A		1.18				1575	3.66				1.95	0.31	24.24	4.05	28.60	29.9	450	0.52	205.59	1.29	13.9	pipe sized for full build-out
Subject Site		Prop MH8A	Prop MH9A		1.18				1575	3.66				1.95	0.31	24.24	4.05	28.60	14.3	450	0.72	241.92	1.52	11.8	pipe sized for full build-out
Pickering Parkway		Prop MH9A	EX MH 34-83	0.25	1.95				1575	3.66				2.74	0.51	24.24	5.70	30.44	42.0	675	0.33	482.88	1.35	6.3	pipe sized for full build-out
Pickering Parkway		EX MH 34-83	EX MH 35-5	0.24	2.19				1575	3.66				2.74	0.57	24.24	5.70	30.51	100.0	675	0.49	588.41	1.64	5.2	pipe sized for full build-out
Pickering Parkway	15	EX MH 35-5	EX MH 35-6	0.28	2.47				1575	3.66				2.74	0.64	24.24	5.70	30.58	99.8	675	0.48	582.38	1.63	5.3	pipe sized for full build-out
BEECHLAWN DR		EX MH018	EX MH 35-6	2.89	2.89	60			173	3.80					0.75	2.77		3.52	59.0	200	0.95	31.97	1.02	11.0	
METROPIA	6	EX MH3A	EX MH 35-6	3.65	3.65				672	3.80					0.95	10.73		11.67	38.2	200	0.75	28.40	0.90	41.1	
Pickering Parkway	16	EX MH 35-6	EX MH 35-7	0.22	9.23				2420	3.52				2.74	2.40	35.78	5.70	43.88	82.5	675	0.38	518.17	1.45	8.5	pipe sized for full build-out
Pickering Parkway	17	EX MH 35-7	EX MH 35-8	0.24	9.47				2420	3.52				2.74	2.46	35.78	5.70	43.94	80.0	675	0.46	570.11	1.59	7.7	pipe sized for full build-out
Pickering Parkway	18	EX MH 35-8	SAN MH 35-28	0.22	9.69				2420	3.52				2.74	2.52	35.78	5.70	44.00	110.1	675	0.57	634.63	1.77	6.9	pipe sized for full build-out
Subject Site	5	EX MH 35-34	EX MH 35-33										0.42	0.42	0.00		0.88	0.88	145.7	150	1.00	15.23	0.86	5.8	
Notion Road	20	EX MH 35-33	SAN MH 35-28	0.50	0.50									0.42	0.13		0.88	1.01	109.4	200	1.82	44.25	1.41	2.3	
MARSHCOURT DR		EX. MH 35-8	EX. MH 35-25		0.00					0.00					0.00	0.00	0.00	0.00	58.9	250	0.41	38.08	0.78	0.0	pipe to remain as cleanout access
ASHFORD DR	8	EX.MH023	SAN MH 35-25	1.93	1.93	60			116	3.80					0.50	1.85		2.35	73.0	200	0.40	20.74	0.66	11.3	
MARSHCOURT DR	9	SAN MH 35-25	SAN MH 35-26	0.29	2.22	60			133	3.80					0.58	2.13	0.00	2.70	72.8	250	0.55	44.10	0.90	6.1	
MARSHCOURT DR	10	SAN MH 35-26	SAN MH 35-27	0.60	2.82	60			169	3.80					0.73	2.70	0.00	3.43	70.3	250	0.55	44.10	0.90	7.8	
MARSHCOURT DR	11, 12	EX MH 032	SAN MH 35-27	17.39	17.39	60			1043	3.79			0.67	0.67	4.52	16.60	1.39	22.52	40.5	250	0.27	30.90	0.63	72.9	
EASEMENT		SAN MH 35-27	SAN MH 35-29	0.00	20.21				1212	3.74				0.67	5.25	19.07	1.39	25.71	124.0	375	0.16	70.13	0.63	36.7	
Pickering Parkway		SAN MH 35-28	Prop MH 13A	0.01	10.20				2420	3.52				3.16	2.65	35.78	6.58	45.02	14.5	375	0.22	82.24	0.74	54.7	Interim pipe Phase 1
NOTION ROAD		Prop MH 13A	Prop MH 14A	0.25	10.45				3904	3.34				3.16	2.72	54.82	6.58	64.11	100.0	375	0.22	82.24	0.74	78.0	Interim pipe Phase 1
NOTION ROAD		Prop MH 14A	SAN MH 35-29	0.25	10.70				3904	3.34				3.16	2.78	54.82	6.58	64.18	101.8	375	0.22	82.24	0.74	78.0	Interim pipe Phase 1
NOTION ROAD		SAN MH 35-29	SAN MH 35-30	0.25	31.16				5117	3.24				3.83	8.10	69.54	7.98	85.61	71.8	450	0.22	133.73	0.84	64.0	Interim pipe Phase 1
NOTION ROAD		SAN MH 35-30	SAN MH 17	0.25	31.41				5117	3.24				3.83	8.17	69.54	7.98	85.68	4.0	450	0.23	136.73	0.86	62.7	Interim pipe Phase 1
ORCHARD ROAD		SAN MH 17	SAN MH 18		31.41													85.68		750	Available capacity at Orchard Rd 750mm dia. pipe is 150 L/s. Total flow calculated here does not include the existing sanitary flows conveyed south on Notion Rd to Orchard Rd.				see note below about capacity

Design Criteria as per The Regional Municipality of Durham '*Design Specifications for Sanitary Sewers*'
Average daily per capita flow = 364 L/cap/day (Residential)
Average daily per capita flow = 180,000 L/GFA hectares/day (commercial&industrial)
I = Unit of peak extraneous flow when foundation drains are NOT connected to the storm sewer = 0.26 L/s/Ha
Q(p) = peak population flow (L/s) Q(I) = peak extraneous flow (L/s)
Q(d) = peak design flow (L/s)
PEAKING FACTOR (Harmon; Residential) M =1 + 14/(4+(P/1000^0.5))
PEAK POPULATION FLOW, Q (p) = q*P*M / 86400 L / Sec.
PEAK EXTRANEOUS FLOW, Q(i) = I*A L / Sec.
PEAK DESIGN FLOW, Q(d) = Q(p) + Q(i) L / Sec.
PIPE ROUGHGNESS, n = 0.013 For Manning's Equation

NOTES:
1) MINIMUM VELOCITY = 0.60 m/s
2) MAXIMUM VELOCITY = 3.65 m/s
3) INFILTRATION 0.26 l/s = 22.5 m3/Ha/DAY
INFILTRATION 0.52 l/s = 45.0 m3/Ha/DAY (Foundation Drain Connections)
4) *COMMERCIAL 2.08 l/s (local sewers) 1.04 l/s (trunk sewers)*
5) EXISTING CONDITION INCLUDES COMMITTED DEVELOPMENT
6) USE ACTUAL METRIC I.D. PIPE SIZE IN mm
7) COMMERCIAL FLOOR SPACE INDEX=50% UNLESS

Population Density by Land Use

Housing Type	Density
Single & Semi Detached	3.5 P/u
Townhouse	3.0 P/u
Apartment-2Bdrm	2.5 P/u

Housing Type	Density
Single Family	60 persons/ha
Semi Detached & Duplex	100 persons/ha

* ASSUMED 150 L/s AVAILABLE EXCESS FLOW CAPACITY AT ORCHARD ROAD as per correspondence with Durham Region

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Redeveloped sites (subject site, 1899 Brock Road and surrounding tributaries) fully developed sanitary sewer design sheet

FIGURE S-5

SCENARIO 3: CONCEPTUAL FULL BUILDOUT CONDITIONS — DESIGNED BY: S. Ahonen — DATE: 2022-04-13
Full development of subject site and future tributary sanitary design sheet — CHECKED BY: M. Al-Awad

STREET	TRIB ID	UPSTREAM MH	DOWNSTREAM MH	RESIDENTIAL							COMMERCIAL				FLOW (L/s)				EXISTING SEWER					PRESENT CONDITION	NOTES
				LOT AREA		POP. DENSITY (Persons/ ha)	POP. DENSITY (Persons /Unit)	# OF UNITS	POP.	PEAK FLOW FACTOR, K_H	LOT AREA (Ha)	FLOOR SPACE INDEX	GROSS FLOOR AREA		RESIDENTIAL FLOW		COMM. 2.08 l/s	TOTAL FLOW l/s	Length	Size	Slope	Full Flow Capacity	Full Flow Velocity	% Full	
				UNIT (ha)	ACCUM. (ha)								GFA (ha)	ACCUM. (ha)	INFIL. 0.26 (L/s)	SEWAGE 0.0042 (L/s)			L (m)	D (mm)	S (%)	Qcap (L/s)	V (m/s)	Q(d)/Qcap	
1899 Brock Road	P9	Prop MH16A	EX MH 34-82	29.50	29.50	800			23600	2.58					7.67	255.78	0.00	263.45	112.0	525	1.00	430.06	1.99	61.3	FUTURE PROPOSED
Canadian Tire Lands	4	EX.MH090	EX MH 34-82	4.10	4.10	1200			4920	3.25					1.07	67.19	0.00	68.25	59.8	450	0.30	156.16	0.98	43.7	EX PIPE OUTSIDE SCOPE OF WORK
Pickering Parkway	13	EX MH 34-82	Prop MH9A	0.25	33.85				28520	2.50				0.00	8.80	299.32	0.00	308.12	49.4	675	0.37	511.31	1.43	60.3	PROPOSED
Subject Site	P1	Prop MH1A	Prop MH2A	1.18	1.18		2.5	630	1575	3.66			0.17	0.17	0.31	24.24	0.35	24.90	20.7	300	0.87	90.20	1.28	27.6	PROPOSED
Subject Site		Prop MH2A	Prop MH3A		1.18				1575	3.66				0.17	0.31	24.24	0.35	24.90	44.7	300	0.95	94.25	1.33	26.4	PROPOSED
Subject Site	P2	Prop MH3A	Prop MH4A	1.23	2.41		2.5	1090	4300	3.31			0.10	0.27	0.63	59.69	0.56	60.88	83.5	300	0.78	85.40	1.21	71.3	PROPOSED
Subject Site		Prop MH4A	Prop MH5A		2.41				4300	3.31				0.27	0.63	59.69	0.56	60.88	47.2	300	1.31	110.68	1.57	55.0	PROPOSED
Subject Site	P3,P4	Prop MH5A	Prop MH6A	3.11	5.52		2.5	1022	6855	3.12			0.07	0.34	1.44	89.69	0.71	91.84	37.6	300	1.46	116.84	1.65	78.6	PROPOSED
Subject Site	P5,P6	Prop MH6A	Prop MH7A	2.51	8.03		2.5	1276	10045	2.95			0.07	0.41	2.09	124.57	0.85	127.51	19.0	450	0.77	250.18	1.57	51.0	PROPOSED
Subject Site	P7,P8	Prop MH7A	Prop MH8A	1.45	9.48		2.5	1208	13065	2.84			2.26	2.67	2.46	155.76	5.55	163.78	29.9	450	0.52	205.59	1.29	79.7	PROPOSED
Subject Site		Prop MH8A	Prop MH9A		9.48				13065	2.84				2.67	2.46	155.76	5.55	163.78	14.3	450	0.72	241.92	1.52	67.7	PROPOSED
Pickering Parkway	13	Prop MH9A	EX MH 34-83	0.25	43.58				41585	2.34				2.67	11.33	408.68	5.55	425.56	41.8	675	0.42	544.76	1.52	78.1	PROPOSED
Pickering Parkway	14	EX MH 34-83	EX MH 35-5	0.24	43.82				41585	2.34				2.67	11.39	408.68	5.55	425.62	100.0	675	0.47	576.28	1.61	73.9	PROPOSED
Pickering Parkway	15	EX MH 35-5	EX MH 35-6	0.28	44.10				41585	2.34				2.67	11.47	408.68	5.55	425.70	99.8	675	0.48	582.38	1.63	73.1	PROPOSED
BEECHLAWN DR	7	EX MH018	EX MH 35-6	2.89	2.89	60			173	3.80					0.75	2.77		3.52	59.0	200	0.95	31.97	1.02	11.0	EX
METROPIA	20	EX MH3A	EX MH 35-6	3.65	3.65				672	3.80					0.95	10.73		11.67	38.2	200	0.75	28.40	0.90	41.1	EX
~~MARSHCOURT DR~~		~~EX. MH 35-8~~	~~EX. MH 35-25~~						~~0.00~~						~~0.00~~	~~0.00~~	~~0.00~~	~~0.00~~	~~58.9~~	~~250~~	~~0.41~~	~~38.08~~	~~0.78~~	~~0.0~~	pipe to remain as cleanout access
ASHFORD DR	8	EX.MH023	SAN MH 35-25	1.93	1.93	60			116	3.80					0.50	1.85		2.35	73.0	200	0.40	20.74	0.66	11.3	EX
MARSHCOURT DR	9	SAN MH 35-25	SAN MH 35-26	0.29	2.22	60			133	3.80					0.58	2.13	0.00	2.70	83.6	250	0.55	44.10	0.90	6.1	EX
MARSHCOURT DR	10	SAN MH 35-26	SAN MH 35-27	0.60	2.82	60			169	3.80					0.73	2.70	0.00	3.43	69.5	250	0.55	44.10	0.90	7.8	EX
MARSHCOURT DR	11	EX MH 032	SAN MH 35-27	17.39	17.39	60			1044	3.79			0.67	0.67	4.52	16.61	1.39	22.52	40.5	250	0.27	30.90	0.63	72.9	EX
EASEMENT		SAN MH 35-27	SAN MH 35-29		20.21				1213	3.74				0.67	5.25	19.08	1.39	25.72	124.0	375	0.16	70.13	0.63	36.7	outlet to Region Trunk on Notion Rd*
Pickering Parkway	16	EX MH 35-6	EX MH 35-7	0.22	50.86				42430	2.33				2.67	13.22	415.50	5.55	434.28	82.5	750	0.38	686.27	1.55	63.3	PROPOSED
Pickering Parkway	17	EX MH 35-7	EX MH 35-8	0.24	51.10				42430	2.33				2.67	13.29	415.50	5.55	434.34	80.0	750	0.46	755.06	1.71	57.5	PROPOSED
Pickering Parkway	18	EX MH 35-8	EX MH 35-28	0.22	51.32				42430	2.33				2.67	13.34	415.50	5.55	434.40	110.1	750	0.57	840.51	1.90	51.7	outlet to Region Trunk on Notion Rd

Design Criteria as per The Regional Municipality of Durham '*Design Specifications for Sanitary Sewers*'
Average daily per capita flow = 364 L/cap/day (Residential)
Average daily per capita flow = 180,000 L/GFA hectares/day (commercial&industrial)
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Q(p) = peak population flow (L/s) Q(I) = peak extraneous flow (L/s)
Q(d) = peak design flow (L/s)
PEAKING FACTOR (Harmon; Residential) M =1 + 14/(4+(P/1000^0.5))
PEAK POPULATION FLOW, Q (p) = q*P*M / 86400 L / Sec.
PEAK EXTRANEOUS FLOW, Q(i) = I*A L / Sec.
PEAK DESIGN FLOW, Q(d) = Q(p) + Q(i) L / Sec.
PIPE ROUGHGNESS, n = 0.013 For Manning's Equation

NOTES:
1) MINIMUM VELOCITY = 0.60 m/s
2) MAXIMUM VELOCITY = 3.65 m/s
3) INFILTRATION 0.26 l/s = 22.5 m3/Ha/DAY
   INFILTRATION 0.52 l/s = 45.0 m3/Ha/DAY (Foundation Drain Connections)
4) COMMERCIAL 2.08 l/s (local sewers) 1.04 l/s (trunk sewers)
5) EXISTING CONDITION INCLUDES COMMITTED DEVELOPMENT
6) USE ACTUAL METRIC I.D. PIPE SIZE IN mm
7) COMMERCIAL FLOOR SPACE INDEX=50% UNLESS OTHERWISE KNOWN

Population Density by Land Use

Housing Type	Density
Single & Semi Detached	3.5 P/u
Townhouse	3.0 P/u
Apartment-2Bdrm	2.5 P/u

Housing Type	Density
Single Family	60 persons/ha
Semi Detached & Duplex	100 persons/ha

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*ASSUMED FLOW FROM EASEMENT SEWER AND PICKERING PARKWAY WILL OUTLET TO REGION TRUNK ON NOTION RD

Region of Durham Tributary Maps & Correspondence indicating population densities

Hello Mark,

I have attached some maps showing the approximate areas. If you can get more precise areas from your base, please use them, otherwise just use the numbers below:

- Map 1 North +/- 30 ha @ 800 people/ha = 24,000
- Map 1 South +/- 14 ha @ 1200 people/ha = 16,800
- Map 2 South – approved application for 130 units x 3 people per unit = population of 390 (connection at Beachlawn)

Be sure that the pipe on Pickering Parkway is sized to be at no more than 80% capacity based on these populations.

Let me know if you have any questions.

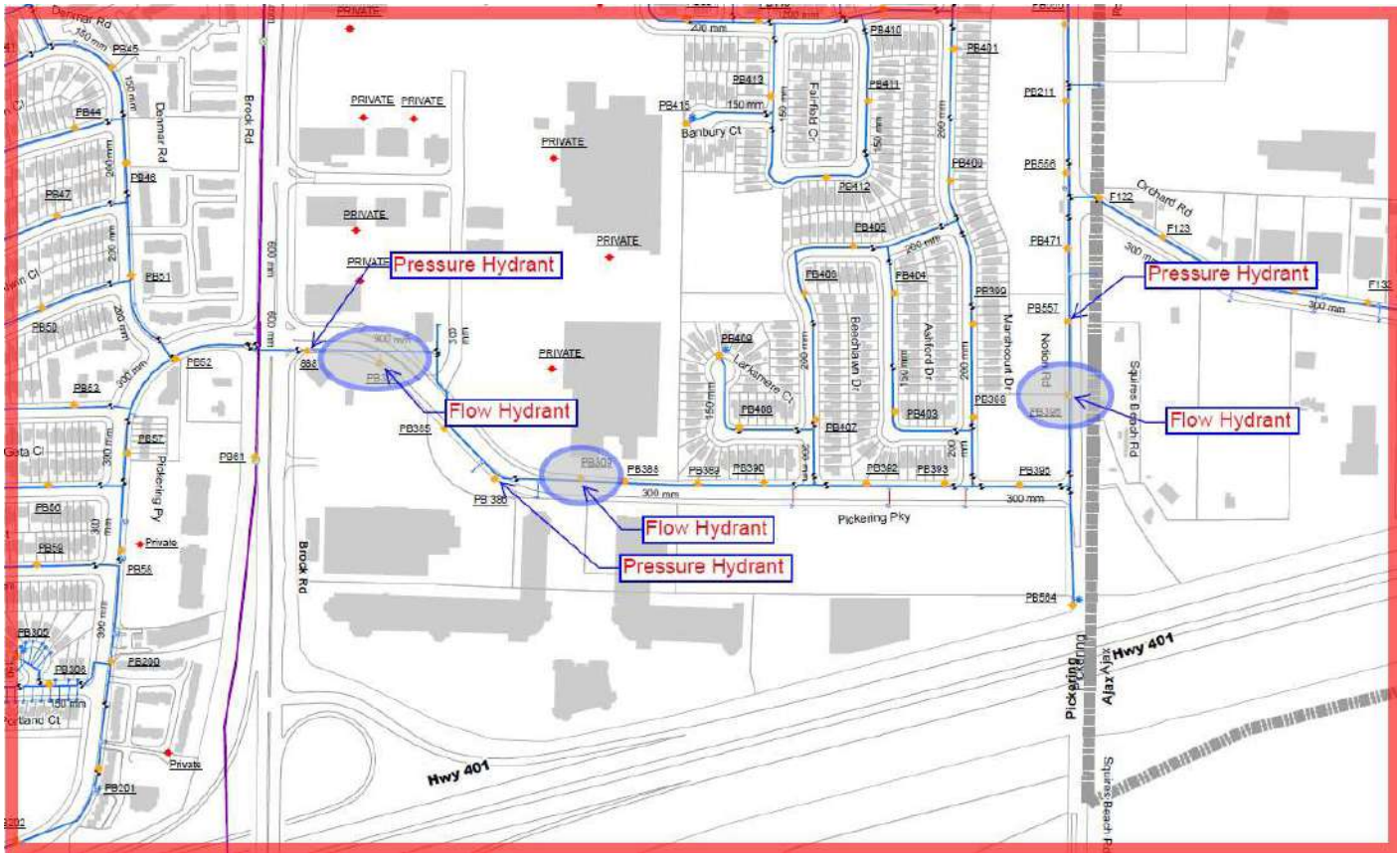
Thanks,

Aaron Christie, P.Eng.| Manager, Engineering Planning & Studies
Works Department
The Regional Municipality of Durham
Aaron.Christie@durham.ca | 905-668-7711 extension 3608 | durham.ca
My pronouns are he/his

APPENDIX C

Location of hydrant flow tests
Hydrant flow tests

Location of hydrant flow tests



FLOWMETRIX
INDU-TECH
PROCESS
WESTCAN

Fire Flow Testing Report

Residual Hydrant # **PB557**
NFPA Colour Code **BLUE**

DATE: September 8, 2021
TIME: 10:30 AM

ADDRESS: 1972 Notion Rd
Pickering, ON

SIZE-Inches/mm: 12 300
MATERIAL: PVC

CONTACT INFO: The Odan/Detech Group Inc.
Mark Harris
C: (905) 632-3811 ext.122
E: mark@odandetech.com

RESIDUAL HYDRANT INFO.

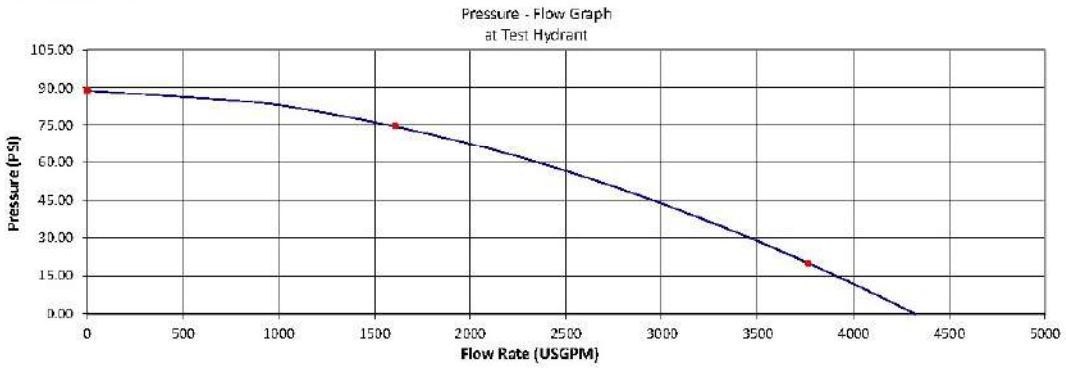
HYDRANT #	PB557	
N.F.P.A. COLOUR CODE	BLUE	
STATIC PRESSURE	88.9	psi
RESIDUAL PRESSURE	74.6	psi
PRESSURE DROP	14.3	psi
% PRESSURE DROP	16.0	% psi

Flow on Water Main At Test Hydrant - 20 psi 3766 USGPM

FLOW HYDRANT(S) INFO.

HYDRANT ASSET ID	HYD. # PORTS	OUTLET DIAMETER (INCHES)	NOZZLE COEFFICIENT	DIFFUSER TYPE	DIFFUSER COEFFICIENT	PITOT READING (psi)	PITOT FLOW (USGPM)	FLOW METER (USGPM)
PB396	2	2.5	Round	LPD250	0.90	28.4	804	0
		2.5	Round	LPD250	0.90	28.4	804	0
				Total Flow (USGPM)			1609	0
				Total Flow (USGPM)			1609	

FIRE FLOW CHART



COMMENTS

OPERATOR	FMX	Jordan Whitlock
OPERATOR	FMX	Denis Kriventsev
OPERATOR		Region of Durham

CDG_FireFlowTestingReport_Pickering

"If we don't measure it, how do you manage it?"

FLOWMETRIX
INDU-TECH
PROCESS
WESTCAN

Fire Flow Testing Report

Residual Hydrant # **PB386**
NFPA Colour Code **BLUE**

DATE	September 8, 2021
TIME	10:45 AM
ADDRESS	1735 Pickering Pkwy
	Pickering, ON
SIZE-Inches/mm	12 300
MATERIAL	PVC
CONTACT INFO	The Odan/Detech Group Inc.
	Mark Harris
	C: (905) 632-3811 ext.122
	E: mark@odandetech.com

RESIDUAL HYDRANT INFO.

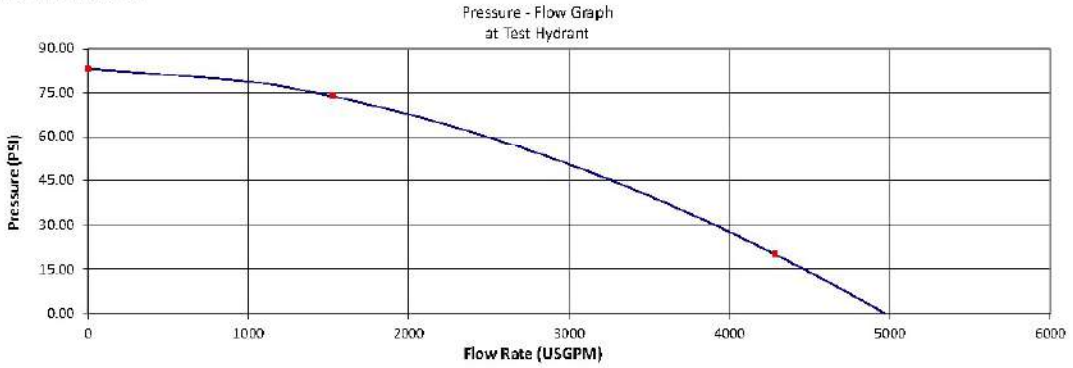
HYDRANT #	PB386	
N.F.P.A. COLOUR CODE	BLUE	
STATIC PRESSURE	83.2	psi
RESIDUAL PRESSURE	73.8	psi
PRESSURE DROP	9.3	psi
% PRESSURE DROP	11.2	% psi

Flow on Water Main At Test Hydrant - 20 psi 4283 USGPM

FLOW HYDRANT(S) INFO.

HYDRANT ASSET ID	HYD. # PORTS	OUTLET DIAMETER (INCHES)	NOZZLE COEFFICIENT	DIFFUSER TYPE	DIFFUSER COEFFICIENT	PITOT READING (psi)	PITOT FLOW (USGPM)	FLOW METER (USGPM)
PB309	2	2.5	Round	LPD250	0.90	25.5	762	0
		2.5	Round	LPD250	0.90	25.5	762	0
					Total Flow (USGPM)		1525	0
					Total Flow (USGPM)		1525	

FIRE FLOW CHART



COMMENTS

OPERATOR	FMX	Jordan Whitlock
OPERATOR	FMX	Denis Kriventsev
OPERATOR		Region of Durham

ODG_FireFlowTestingReport_Pickering

"If we don't measure it, how do you manage it?"

FLOWMETRIX
INDU-TECH
PROCESS
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Fire Flow Testing Report

Residual Hydrant # **PB888**
NFPA Colour Code **BLUE**

DATE	September 8, 2021
TIME	11:00 AM
ADDRESS	1785 Pickering Pkwy
	Pickering, ON
SIZE-inches/mm	12 300
MATERIAL	PVC
CONTACT INFO	The Odan/Detech Group Inc.
	Mark Harris
	O: (905) 632-3811 ext.122
	E: mark@odandetech.com

RESIDUAL HYDRANT INFO.

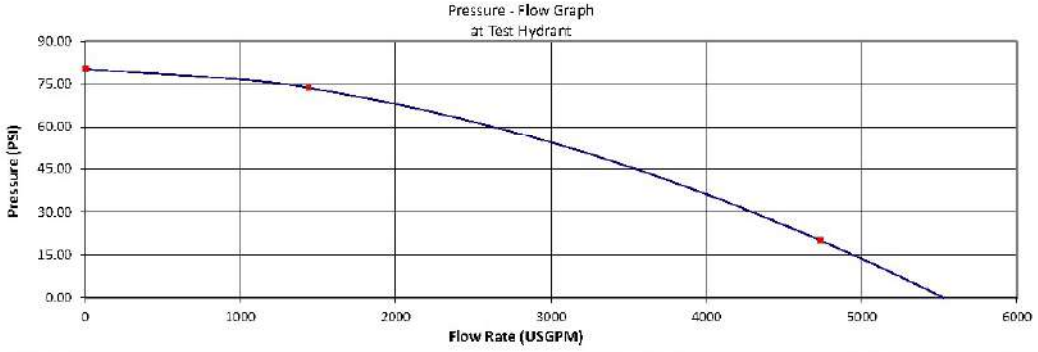
HYDRANT #	PB888	
N.F.P.A. COLOUR CODE	BLUE	
STATIC PRESSURE	80.3	psi
RESIDUAL PRESSURE	73.7	psi
PRESSURE DROP	6.7	psi
% PRESSURE DROP	8.3	% psi

Flow on Water Main At Test Hydrant - 20 psi 4735 USGPM

FLOW HYDRANT(S) INFO.

HYDRANT ASSET ID	HYD. # PORTS	OUTLET DIAMETER (INCHES)	NOZZLE COEFFICIENT	DIFFUSER TYPE	DIFFUSER COEFFICIENT	PITOT READING (psi)	PITOT FLOW (USGPM)	FLOW METER (USGPM)
PB308	2	2.5	Round	LPD250	0.90	22.7	720	0
		2.5	Round	LPD250	0.90	22.7	720	0
					Total Flow (USGPM)		1439	0
					Total Flow (USGPM)		1439	

FIRE FLOW CHART



COMMENTS

OPERATOR	FMX	Jordan Whitlock
OPERATOR	FMX	Denis Kriventsev
OPERATOR		Region of Durham

ODG_FireFlowTestingReport_Pickering

"If we don't measure it, how do you manage it?"

APPENDIX D

XPSWMM models and output upon request

APPENDIX E

Figure S-1a – Conceptual Servicing Layout Plan
Figure S-1b – Conceptual Phase 1 Servicing Plan

Figure S-2 – Conceptual Grading Plans

Figure S-3 – Existing conditions Sanitary Tributary Plan
Figure S-4 – Phase 1 conditions Sanitary Tributary Plan
Figure S-5 – Conceptual conditions Sanitary Tributary Plan

Figure S-6 – Existing Storm Drainage Boundary Plan
Figure S-7 – Conceptual Storm Tributary Area Plan

FIGURE S-1a

CONCEPTUAL SERVICING LAYOUT PLAN

PICKERING BRIDGE LANDS INC.
PROPOSED MIX-USE DEVELOPMENT
1755 + 1805 PICKERING PARKWAY
PICKERING, ON

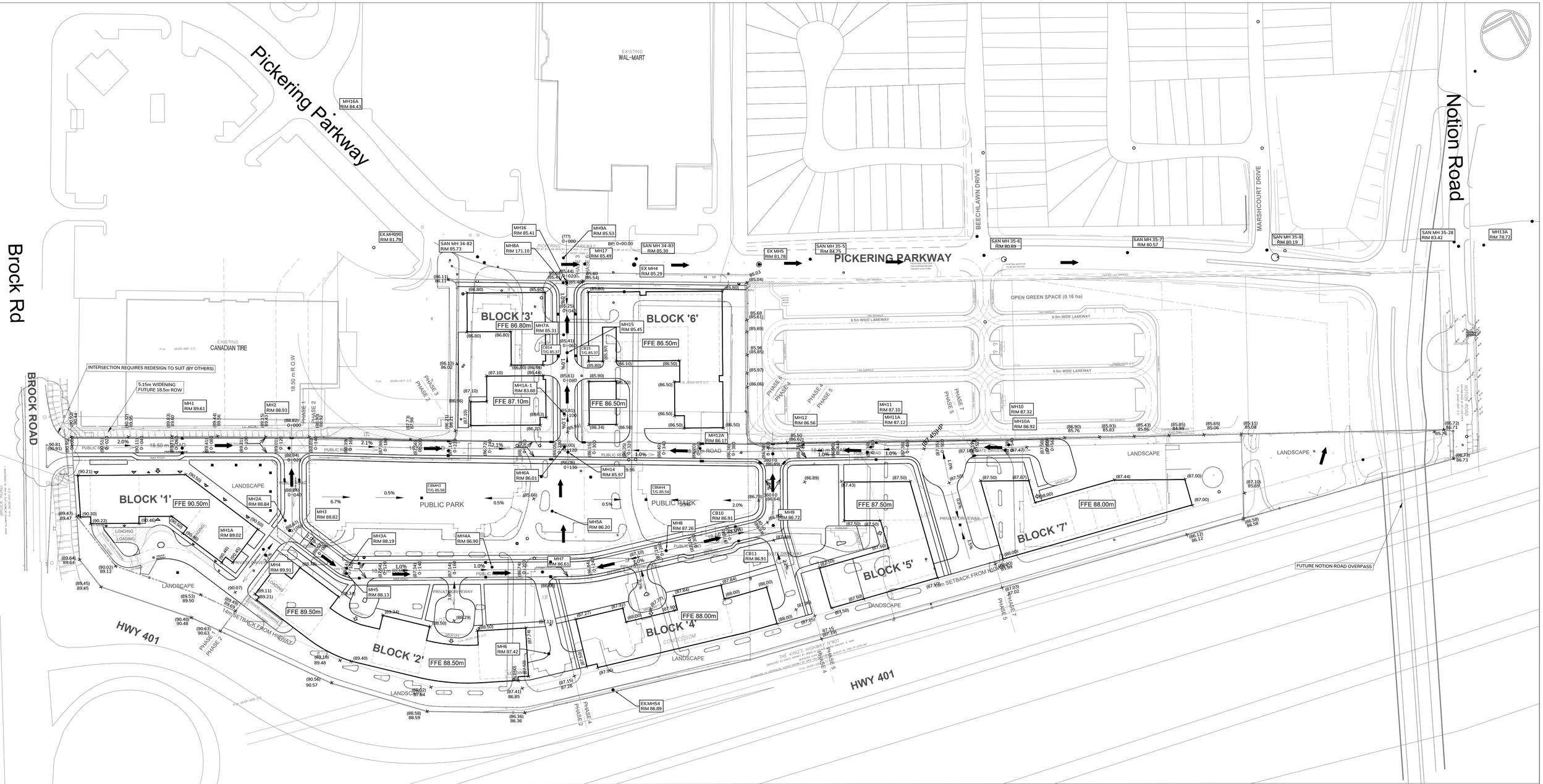
DATE:	PROJ. NO.:	SCALE:
SEPT 2021	20266	1:1000

ODAN·DETECH
CONSULTING ENGINEERS

The Odan/Detech Group Inc. P: (905) 632-3811 F: (905) 632-3363
5230 SOUTH SERVICE ROAD, BURLINGTON, ONTARIO, L7L 5K2

P:\2020\20266\2020\Drawings\01_Functional\02_FD_Production Dwgs\20266 - CONCEPTUAL SS ULTIMATE

LEGEND:
EXISTING STORM MANHOLE
PROPOSED STORM MANHOLE
EXISTING CATCH BASIN MANHOLE
PROPOSED CATCH BASIN MANHOLE
PROPOSED STORMCEPTOR
EXISTING CATCH BASIN
PROPOSED CATCH BASIN
EXISTING STORM SEWER
PROPOSED STORM SEWER
EXISTING SANITARY MANHOLE
PROPOSED SANITARY MANHOLE
PROPOSED SANITARY TRUNK SEWER (BY REGION)
PROPOSED SANITARY SEWER
FUTURE SANITARY SEWER (BY OTHERS)
EXISTING SANITARY SEWER
EXISTING WATER MAIN
PROPOSED WATER MAIN
PROPERTY LINE
Pickering Pkwy
Brock Rd
Orchard Rd
Notion Rd
Ashford Dr
Beechlawn Dr
Marshcourt Dr
HWY 401
HIGHWAY 401
METROPIA
EXISTING WAL-MART
EXISTING CANADIAN TIRE
EXISTING MARK'S WORK WEARHOUSE
EXISTING REITMAN'S
EXISTING McDONALD'S
BUILDING A
EXISTING 1 STOREY BRICK BUILDING
BUILDING B
EXISTING 1 STOREY BRICK & STUCCO BUILDING
BUILDING C
EXISTING 1 STOREY BRICK & STUCCO BUILDING
BUILDING D
EXISTING 1 STOREY CONCRETE BUILDING
PARTIAL DEMOLITION OF EXISTING BUILDING A DURING PHASE 1
INTERSECTION REQUIRES REDESIGN TO SUIT (BY OTHERS)
5.15m WIDENING FUTURE 18.5m ROW
SAN MH 17 RIM=77.49 SINV=76.17 In
PROP 3.46m 450mmØ CONC SAN @ 0.23%
SAN MH 35-30 RIM=77.62 SINV=76.30 In N INV=76.18 Out
SAN MH 35-29 RIM=77.44 SINV=76.46 In N INV=76.46 Out
MH14A RIM=78.22 SINV=76.96 In N INV=76.96 Out
MH13A RIM=78.72 WINV=77.46 In N INV=77.47 Out
PROP 14.47m 375mmØ PVC SAN @ 0.50%
SAN MH 35-28 RIM=83.42 WINV=77.54 In E INV=77.54 Out
SAN MH 35-8 RIM=80.19 WINV=78.94 In E INV=78.16 Out
SAN MH 35-7 RIM=80.57 WINV=79.32 In E INV=79.31 Out
SAN MH 35-6 RIM=80.89 WINV=79.64 In E INV=79.62 Out
SAN MH 35-5 RIM=84.75 WINV=80.14 In E INV=80.12 Out
SAN MH 34-83 RIM=85.30 WINV=80.61 In E INV=80.61 Out
MH9A RIM=85.53 SINV=80.86 In WINV=80.67 In E INV=80.78 Out
SAN MH 34-82 RIM=85.73 WINV=80.98 In E INV=80.85 Out
ISOLATION VALVE
CONNECT TO EXISTING 300mm PVC WM
PROP 14.30m 450mmØ CONC SAN @ 0.72%
PROP 29.89m 450mmØ CONC SAN @ 0.88%
MH8A RIM=171.10 EX T/G=85.74 SINV=81.01 In N INV=80.97 Out
MH7A RIM=85.31 EX T/G=85.83 SINV=81.29 In N INV=81.27 Out
MH1A-1 RIM=83.88 EX T/G=85.65 SINV=82.20 In N INV=81.43 Out
MH2 RIM=88.93 EX T/G=89.43 W INV=86.51 In N INV=85.98 In S INV=86.45 Out
PROP 47.35m 375mmØ PVC STM @ 1.00%
MH2A RIM=88.84 EX T/G=89.90 SINV=83.84 In E INV=83.84 Out
MH1 RIM=89.61 EX T/G=89.46 E INV=87.13 Out
PROP 61.38m 300mmØ PVC STM @ 1.00%
MH3 RIM=88.82 EX T/G=89.60 SW INV=85.84 In N INV=85.98 In E INV=85.77 Out
PROP FIRST FIRE & DOMESTIC 300mm WM
PROP SECOND FIRE 300mm WM
PROP 44.67m 300mmØ PVC SAN @ 0.95%
MH3A RIM=88.19 EX T/G=88.44 WINV=83.41 In E INV=83.41 Out
PROP 20.73m 300mmØ PVC SAN @ 0.87%
PROP 9.41m 250mmØ PVC SAN @ 1.06%
PROP 12.43m 375mmØ PVC STM @ 2.00%
PROP 40.84m 525mmØ CONC STM @ 1.27%
PROP 19.78m 450mmØ CONC STM @ 1.01%
MH5 RIM=88.13 EX T/G=88.50 W INV=85.25 In E INV=85.13 Out
PROP 83.51m 300mmØ PVC SAN @ 0.78%
PROP 89.73m 600mmØ CONC STM @ 0.92%
MH1A RIM=89.02 EX T/G=89.45 WINV=84.10 In N INV=84.02 Out
MH4 RIM=89.91 EX T/G=89.46 W INV=86.12 In NE INV=86.04 Out
MH4A RIM=86.90 EX T/G=86.83 WINV=82.76 In N INV=82.73 Out
MH6-2 EX T/G=86.65 S INV=83.80 In
PROP 18.56m 600mmØ CONC STM @ 1.02%
MH6-1 EX T/G=86.98 W INV=84.30 In N INV=83.99 Out
PROP 300mmØ PVC W/M
EX 150mmØ W/M
1:1,000
0 10 20 40 70 100
FIGURE S-1b
SITE SERVICING PHASE 1 LAYOUT PLAN
PICKERING BRIDGE LANDS INC.
PROPOSED MIX-USE DEVELOPMENT
1755 + 1805 PICKERING PARKWAY
PICKERING, ON
DATE: SEPT 2021
PROJ. NO.: 20266
SCALE: 1:1000
ODAN·DETECH CONSULTING ENGINEERS



GRADING LEGEND:

- DENOTES EXISTING STORM MANHOLE
- DENOTES PROPOSED STORM MANHOLE
- DENOTES EXISTING CATCH BASIN
- DENOTES PROPOSED CATCHBASIN
- DENOTES PROPOSED STORMCEPTOR
- DENOTES PROPOSED AREA DRAIN
- DENOTES EXISTING SANITARY MANHOLE
- DENOTES PROPOSED SANITARY MANHOLE

- 112.62 100.00 DENOTES EXISTING SPOT ELEVATION
- (100.00) DENOTES PROPOSED ELEVATION
- (100.00)T/C DENOTES PROPOSED TOP OF CURB ELEVATION
- (100.00)G/L DENOTES PROPOSED GUTTER LINE ELEVATION
- (100.00)T/W DENOTES PROPOSED TOP OF WALL ELEVATION
- (100.00)B/W DENOTES PROPOSED BOTTOM OF WALL ELEVATION
- 1.0% DENOTES PROPOSED FLOW ARROW AND SLOPE
- 1.0% DENOTES EXISTING FLOW ARROW AND SLOPE
- DENOTES OVERLAND FLOW

FIGURE S-2

CONCEPTUAL GRADING PLAN (ULTIMATE)

PICKERING BRIDGE LANDS INC.
PROPOSED MIX-USE DEVELOPMENT
1755 + 1805 PICKERING PARKWAY
PICKERING, ON

DATE:	PROJ. NO.:	SCALE:
SEPT 2021	20266	1:1000

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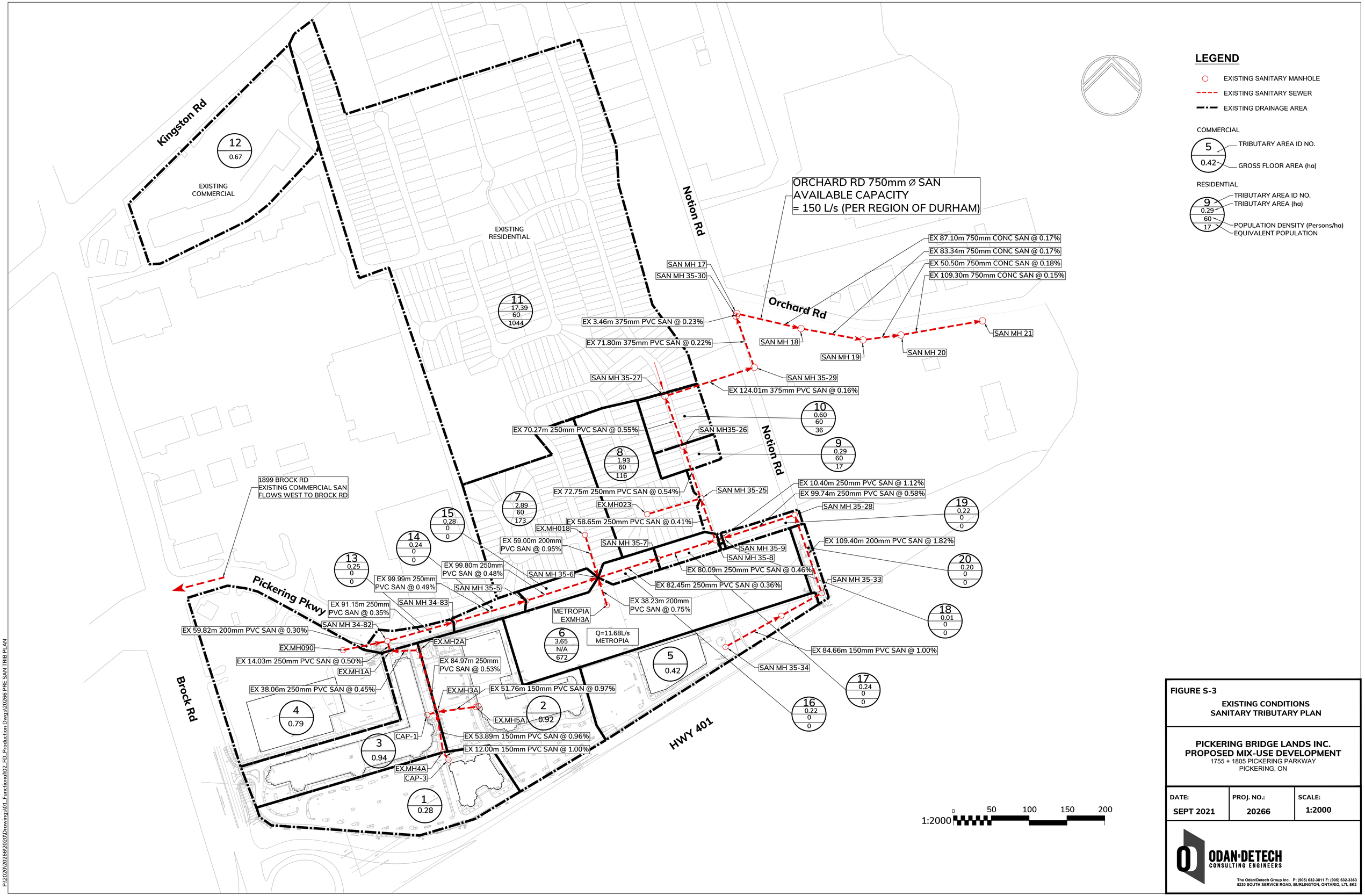

P:\2020\20266\2020\Drawings\01_Functional\02_FD_Production Dwgs\20266 PRE SAN TRIB PLAN

FIGURE S-3

EXISTING CONDITIONS SANITARY TRIBUTARY PLAN

PICKERING BRIDGE LANDS INC.
PROPOSED MIX-USE DEVELOPMENT
1755 + 1805 PICKERING PARKWAY
PICKERING, ON

DATE:	PROJ. NO.:	SCALE:
SEPT 2021	20266	1:2000

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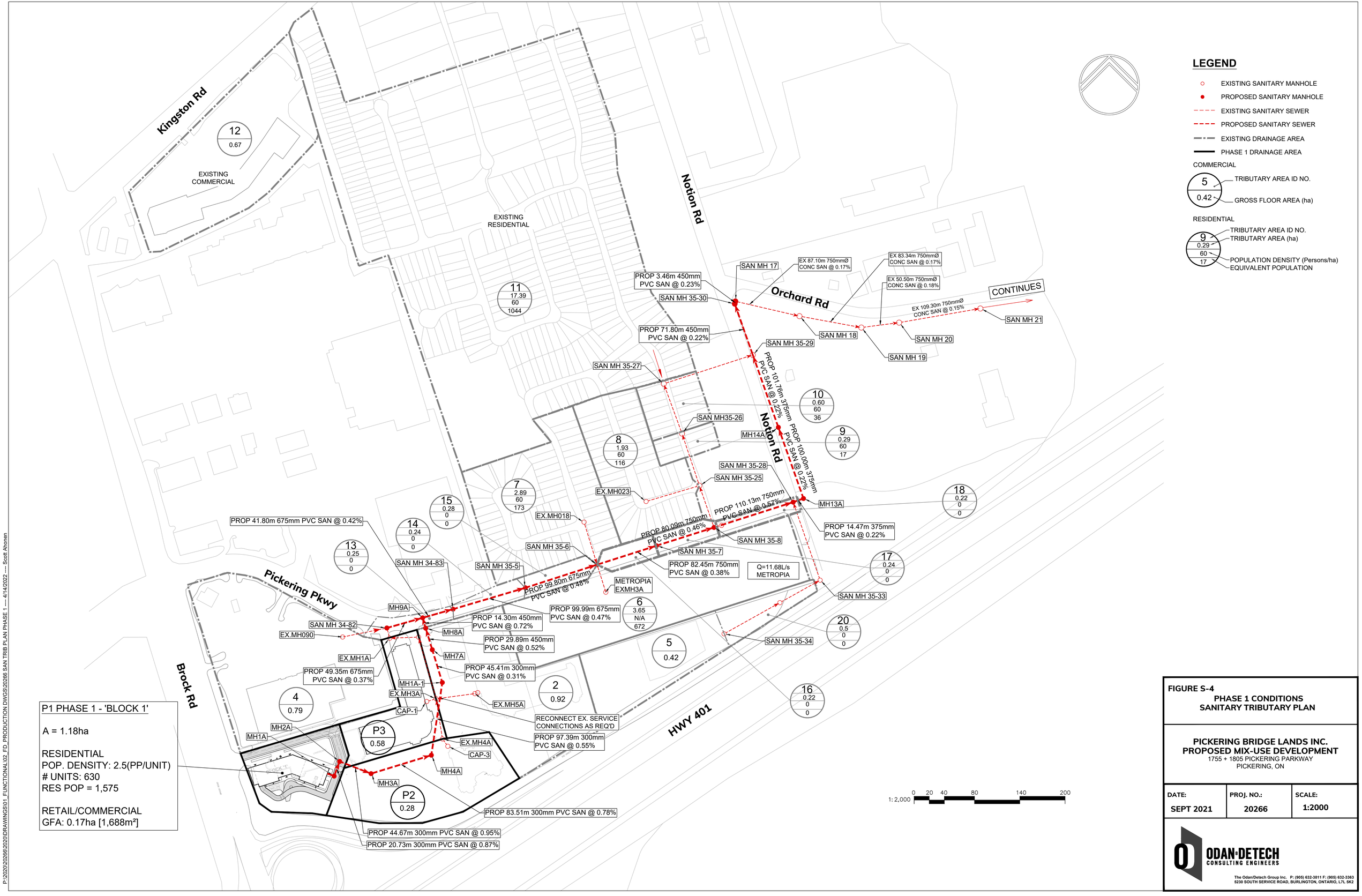

LEGEND

- EXISTING SANITARY MANHOLE
- PROPOSED SANITARY MANHOLE
- EXISTING SANITARY SEWER
- PROPOSED SANITARY SEWER
- EXISTING DRAINAGE AREA
- PHASE 1 DRAINAGE AREA

COMMERCIAL

5 — TRIBUTARY AREA ID NO.
0.42 — GROSS FLOOR AREA (ha)

RESIDENTIAL

9 — TRIBUTARY AREA ID NO.
0.29 — TRIBUTARY AREA (ha)
60 — POPULATION DENSITY (Persons/ha)
17 — EQUIVALENT POPULATION

P1 PHASE 1 - 'BLOCK 1'

A = 1.18ha

RESIDENTIAL
POP. DENSITY: 2.5(PP/UNIT)
UNITS: 630
RES POP = 1,575

RETAIL/COMMERCIAL
GFA: 0.17ha [1,688m²]

FIGURE S-4
PHASE 1 CONDITIONS
SANITARY TRIBUTARY PLAN

PICKERING BRIDGE LANDS INC.
PROPOSED MIX-USE DEVELOPMENT
1755 + 1805 PICKERING PARKWAY
PICKERING, ON

DATE:	PROJ. NO.:	SCALE:
SEPT 2021	20266	1:2000

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5230 SOUTH SERVICE ROAD, BURLINGTON, ONTARIO, L7L 5K2

LEGEND

- EXISTING SANITARY MANHOLE
- PROPOSED SANITARY MANHOLE
- EXISTING SANITARY SEWER
- PROPOSED SANITARY SEWER
- REGION TRUNK SEWER
- SANITARY SEWER REMOVALS
- EXISTING DRAINAGE AREA
- PHASED DRAINAGE AREA

COMMERCIAL

5 / 0.42 — 5: TRIBUTARY AREA ID NO.; 0.42: GROSS FLOOR AREA (ha)

RESIDENTIAL

9 / 0.29 / 60 / 17 — 9: TRIBUTARY AREA ID NO.; 0.29: TRIBUTARY AREA (ha); 60: POPULATION DENSITY (Persons/ha); 17: EQUIVALENT POPULATION

Kingston Rd

EXISTING COMMERCIAL

EXISTING RESIDENTIAL

Notion Rd

Orchard Rd

SAN MH 17

SAN MH 18

SAN MH 19

SAN MH 20

SAN MH 21

CONTINUES

SAN MH 35-29

SAN MH 35-27

SAN MH35-26

SAN MH 35-25

SAN MH 35-28

EX.MH023

EX.MH018

PROP. 80.1m 750mm∅ SAN. @ 0.46%

PROP. 110.1m 750mm∅ SAN. @ 0.57%

PROP. 14.5m 750mm∅ SAN. @ 0.50%

SAN MH 35-9 TO BE REMOVED

SAN MH 35-8

SAN MH 35-7

SAN MH 35-6

METROPIA EXMH3A

PROP. 82.5m 750mm∅ SAN. @ 0.38%

PROP. 99.8m 675mm∅ SAN. @ 0.48%

PROP. 100.0m 675mm∅ SAN. @ 0.47%

PROP. 41.8m 675mm∅ SAN. @ 0.42%

SAN MH 35-5

SAN MH 34-83

SAN MH 34-82

MH16A

FUT. 116.0m 525mm∅ SAN. @ 1.09%

MH9A

MH8A

MH7A

MH10A

MH11A

MH12A

MH6A

MH5A

MH4A

MH3A

MH2A

MH1A

EX 59.8m 200mm∅ PVC SAN @ 0.30%

EX.MH090

PROP. 14.3m 450mm∅ SAN. @ 0.72%

PROP. 29.9m 450mm∅ SAN. @ 0.52%

PROP. 19.0m 450mm∅ SAN. @ 0.77%

PROP. 49.4m 675mm∅ SAN. @ 0.37%

PROP. 20.7m 300mm∅ SAN. @ 0.87%

PROP. 44.7m 300mm∅ SAN. @ 0.95%

PROP. 83.5m 300mm∅ SAN. @ 0.78%

PROP. 47.2m 300mm∅ SAN. @ 1.31%

PROP. 79.1m 300mm∅ SAN. @ 0.50%

PROP. 98.2m 300mm∅ SAN. @ 0.50%

PROP. 77.9m 300mm∅ SAN. @ 0.49%

PROP. 37.6m 300mm∅ SAN. @ 1.46%

Q=11.68L/s METROPIA

Brock Rd

Pickering Pkwy

HWY 401

11 / 17.39 / 60 / 1044

10 / 0.60 / 60 / 36

9 / 0.29 / 60 / 17

8 / 1.93 / 60 / 116

7 / 2.89 / 60 / 173

6 / 3.65 / N/A / 672

13 / 0.25 / 0 / 0

15 / 0.28 / 0 / 0

14 / 0.24 / 0 / 0

18 / 0.22 / 0 / 0

17 / 0.24 / 0 / 0

16 / 0.22 / 0 / 0

P9 - FUTURE DEVELOPMENT
A = 29.5ha

MIXED-USE
POP. DENSITY: 800(PP/ha) [PER REGION]
POP = 23,600

P8 - 'BLOCK 6'
A = 0.82ha

RESIDENTIAL
POP. DENSITY: 2.5(PP/UNIT)
UNITS: 762
RES POP = 1,905

RETAIL/COMMERCIAL
GFA: 2.17ha

1899 BROCK ROAD & FUTURE DEVELOPMENT (FROM REGION)

P7 - 'BLOCK 3'
A = 0.63ha

RESIDENTIAL
POP. DENSITY: 2.5(PP/UNIT)
UNITS: 446
RES POP = 1,115

RETAIL/COMMERCIAL
GFA: 0.09ha

P10 - FUTURE DEVELOPMENT
A = 4.1ha
MIXED-USE
POP. DENSITY: 1,200(PP/ha) [PER REGION]
POP = 4,920

P4 - 'PARK'
A = 2.21ha

P1 PHASE 1 - 'BLOCK 1'
A = 1.18ha

RESIDENTIAL
POP. DENSITY: 2.5(PP/UNIT)
UNITS: 630
RES POP = 1,575

RETAIL/COMMERCIAL
GFA: 0.17ha [1,688m²]

P2 - 'BLOCK 2'
A = 1.23ha

RESIDENTIAL
POP. DENSITY: 2.5(PP/UNIT)
UNITS: 1090
RES POP = 2,725

RETAIL/COMMERCIAL
GFA: 0.10ha

P5 - 'BLOCK 7'
A = 1.42ha

RESIDENTIAL
POP. DENSITY: 2.5(PP/UNIT)
UNITS: 659
RES POP = 1,648

P6 - 'BLOCK 5'
A = 1.09ha

RESIDENTIAL
POP. DENSITY: 2.5(PP/UNIT)
UNITS: 617
RES POP = 1,543

RETAIL/COMMERCIAL
GFA: 0.07ha

P3 - 'BLOCK 4'
A = 0.90ha

RESIDENTIAL
POP. DENSITY: 2.5(PP/UNIT)
UNITS: 1,022
RES POP = 2,555

RETAIL/COMMERCIAL
GFA: 0.07ha

FUTURE PROP TRUNK SEWER TO BE DESIGNED BY REGIONAL MUNICIPALITY OF DURHAM

FUTURE PROP PUMPING STATION LOCATION TBD BY REGIONAL MUNICIPALITY OF DURHAM

1: 2,000 (0, 20, 40, 80, 140, 200)

FIGURE S-5
CONCEPTUAL CONDITIONS SANITARY TRIBUTARY PLAN

PICKERING BRIDGE LANDS INC.
PROPOSED MIX-USE DEVELOPMENT
1755 + 1805 PICKERING PARKWAY
PICKERING, ON

DATE:	PROJ. NO.:	SCALE:
SEPT 2021	20266	1:2000

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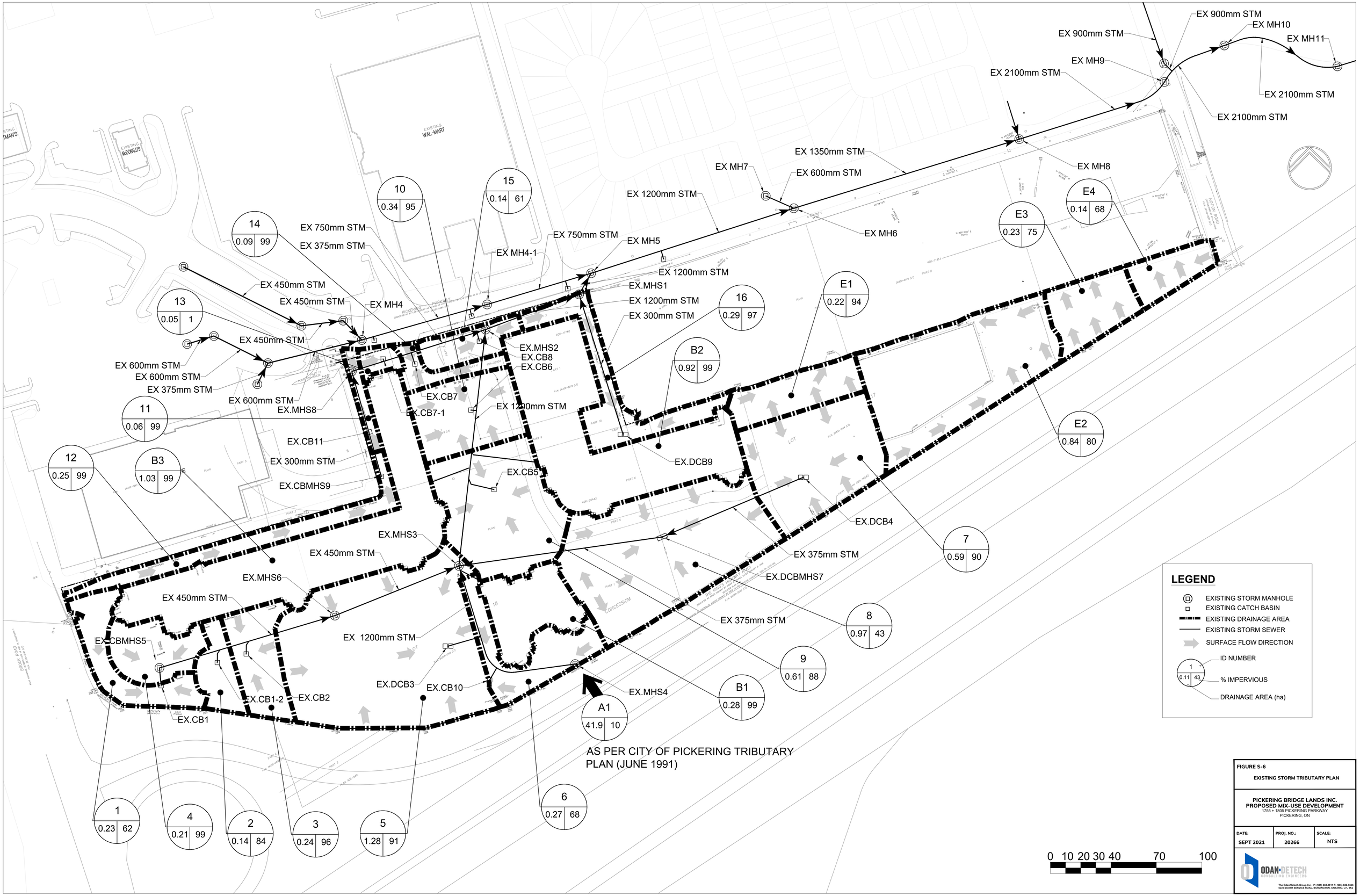

FIGURE S-6

EXISTING STORM TRIBUTARY PLAN

PICKERING BRIDGE LANDS INC.
PROPOSED MIX-USE DEVELOPMENT
1755 + 1805 PICKERING PARKWAY
PICKERING, ON

DATE:	PROJ. NO.:	SCALE:
SEPT 2021	20266	NTS

ODAN·DETECH CONSULTING ENGINEERS
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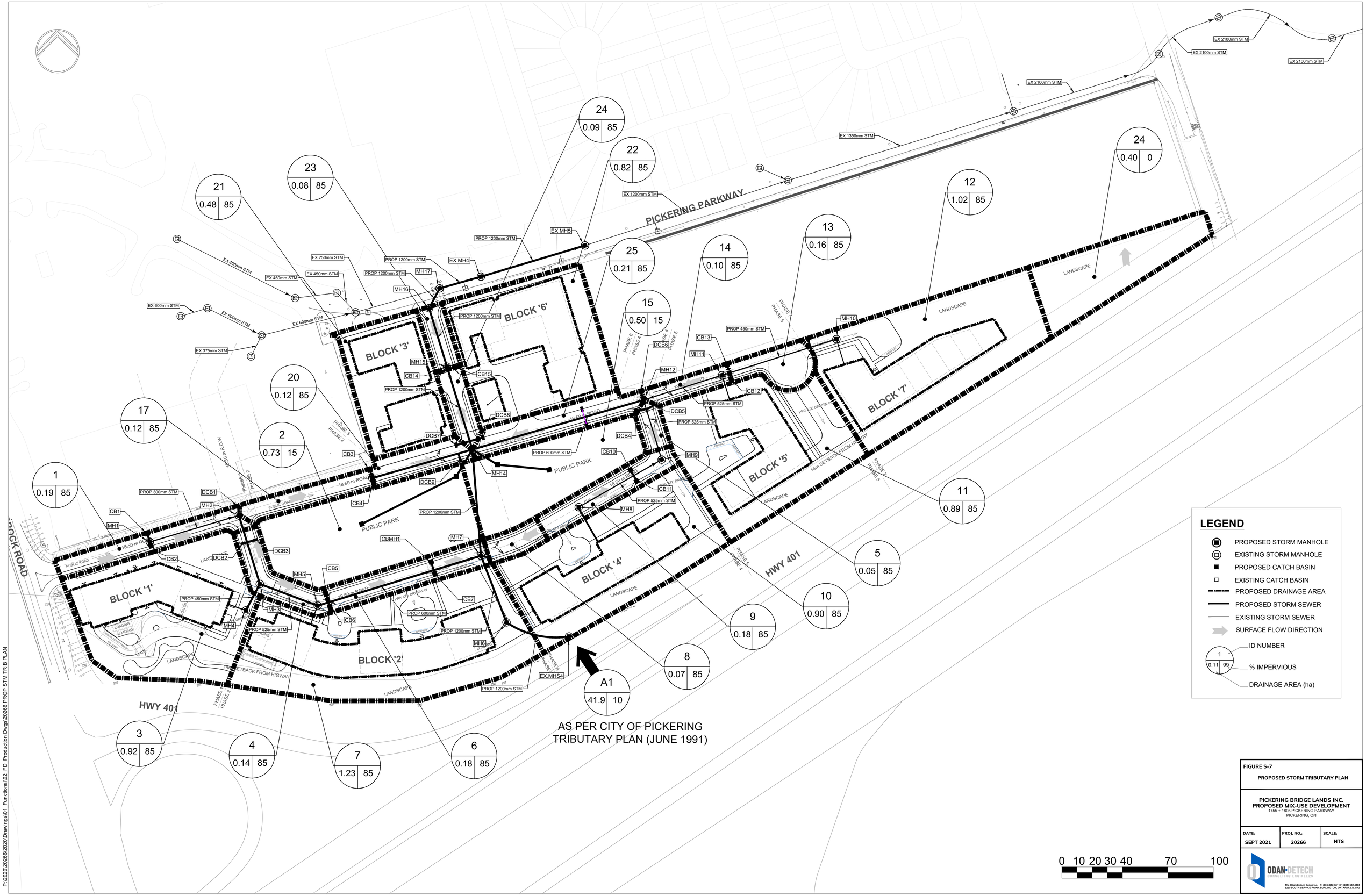

FIGURE S-7

PROPOSED STORM TRIBUTARY PLAN

PICKERING BRIDGE LANDS INC.
PROPOSED MIX-USE DEVELOPMENT
1755 + 1805 PICKERING PARKWAY
PICKERING, ON

DATE:	PROJ. NO.:	SCALE:
SEPT 2021	20266	NTS

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P:\2020\20266\2020\Drawings\01_Functional\02_FD_Production Dwgs\20266 PROP STM TRIB PLAN