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Barrie Waterfront Developments

STORMWATER MANAGEMENT & FUNCTIONAL SERVICING REPORT

Barrie Waterfront Developments Inc.

File 418392 | June 23, 2020

Document Control

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Issue	Date	Description
1	April 29, 2019	Issued for re-zoning application
2	February 14, 2020	SPA – Pre-Consultation Submission
3	June 23, 2020	SPA – First Submission

Document Contents

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1 Introduction

Tatham Engineering Limited (Tatham) has been retained by Barrie Waterfront Developments Inc. to prepare a stormwater management (SWM) and functional servicing report in support of a Site Plan Approval (SPA) application for 39-67 Dunlop Street West and 35-37 Mary Street, in the City of Barrie.

This report presents a municipal servicing strategy, covering:

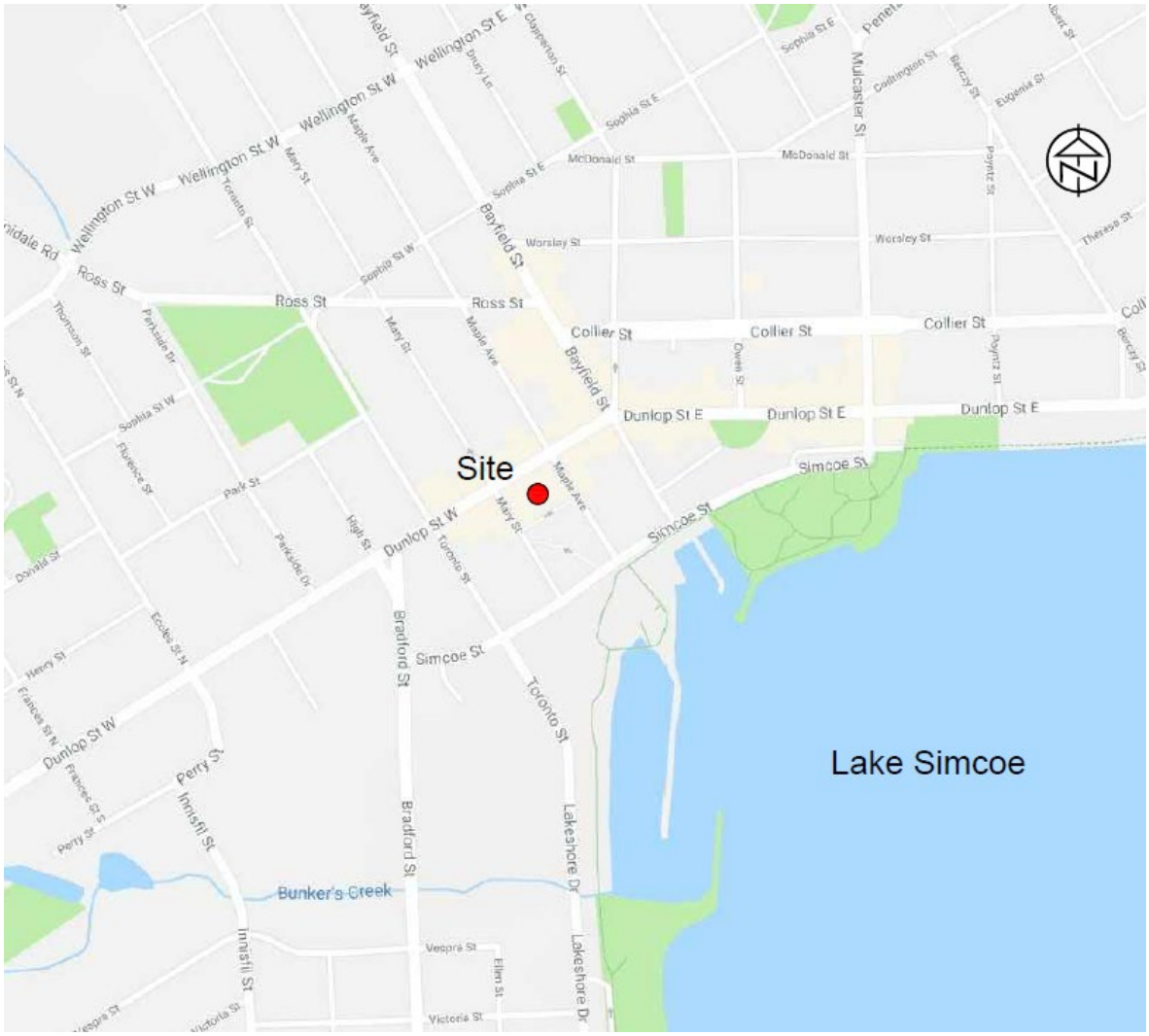
- water supply and distribution;
- sanitary sewage collection;
- drainage and stormwater management;
- grading and landscaping; and
- utility servicing.

1.1 SITE DESCRIPTION & SURROUNDING LAND USE

The subject property is located along the south side of Dunlop Street, bordered by Mary Street to the west, Maple Avenue to the east and the City of Barrie Bus Terminal to the south. The location of the property is illustrated on the Site Location Plan (Figure 1), overleaf.

The site consists of approximately 0.43 ha of land with existing buildings fronting on Dunlop Street, Mary Street and Maple Avenue. The topography of the site slopes in a southerly direction toward Lake Simcoe.

Figure 1: Site Location



Source: Google Maps

1.2 PROPOSED DEVELOPMENT

The proposed development will be constructed in two phases. Phase 1 will consist of a 32-storey tower containing 290 units, 290 parking spaces and 696 m^2 of commercial space. Phase 2 will consist of a 32-storey tower containing 282 units, an additional 255 parking spaces and 847 m^2 of commercial space. The main entrance to Phase 1 will be located on Mary Street while Phase 2 will be entered from Maple Avenue.

The proposed development will be serviced by municipal water, sanitary and storm systems. All existing water and sanitary services to the property will be permanently capped/cut off at the main to the satisfaction of the City of Barrie.

2 Water Supply & Distribution

2.1 WATER SYSTEM

The site is located in the downtown area of the City, which is fully serviced by the municipal water system. As such, the subject property is within the planned service area for the City's water system. The population for Phase 1 and 2 is based on 1.67 people per unit from the City of Barrie's engineering standards for high density apartment dwellings. For the commercial units a design flow of 28 m^3/(ha-day) was used.

The estimated water system demands for Phase 1 are:

- Average Day Demand (ADD): 484 persons x 300 L/person/day = 145,290 L/day = 1.68 L/s;
- Average Day Demand (Commercial) = 0.070 ha X 28 m^3/(ha-day) = 1,949 L/day = 0.023 L/s;
- Maximum Daily Demand (MDD): 147,239 L/day x 2.75 = 404,907 L/day = 4.69 L/s; and
- Peak Hourly Demand (PHD): 147,239 L/day x 4.13 = 608,096 L/day = 7.04 L/s.

The estimated water system demands for Phase 2 are:

- Average Day Demand (ADD): 471 persons x 300 L/person/day = 141,282 L/day = 1.64 L/s;
- Average Day Demand (Commercial) = 0.085 ha X 28 m^3/(ha-day) = 2,372 L/day = 0.027 L/s;
- Maximum Daily Demand (MDD): 143,654 L/day x 2.75 = 395,047 L/day = 4.57 L/s; and
- Peak Hourly Demand (PHD): 143,654 L/day x 4.13 = 593,289 L/day = 6.87 L/s.

MDD and PHD factors correspond to the total population as per Table 3-1 of the Ministry of Environment, Conservation & Parks (MECP) *Design Guidelines for Drinking Water Systems.* Detailed water system demand calculations are provided in Appendix B.

Phase 1 will receive its domestic water supply from a proposed 200 mm dia. service connection to the 300 mm dia. watermain on Mary Street and Phase 2 will receive its domestic water supply from a proposed 200 mm dia. service connection to the 300 mm dia. watermain on Dunlop Street. It should be noted the domestic and water service for Phase 2 have been recently installed (May 2020) as part of the Dunlop Street reconstruction project. The water servicing information is provided on the Site Servicing Plan (Drawing SS-2). Based on the fire flow test completed by Vipond Inc., the static watermain pressure is 80 psi, which is sufficient for the proposed domestic use.

2.2 FIRE PROTECTION

The proposed towers will be equipped with sprinkler systems for fire suppression, details of which are to be provided by the mechanical engineer. However, fire fighting water demands have been calculated using the *Water Supply for Public Fire Protection* (1999) prepared by Fire Underwriters Survey (FUS). Fire flow demands have been calculated for both Phase 1 and 2. Detailed fire flow calculations are provided in Appendix B, and the results are summarized as follows:

- Phase 1 = 7000 L/min = 116 L/s; and
- Phase 2 = 7000 L/min = 116 L/s.

As such, the MDD plus fire flow for Phase 1 is approximately 119.7 L/s and Phase 2 is 120.4 L/s. Phase 1 will receive a fire supply service from Mary Street, where Phase 2 will receive its fire water supply from Dunlop Street.

As mentioned, a fire flow test was completed by Vipond Inc. using nearby fire hydrants on Dunlop and Mary Street as documented in Appendix B. Using the fire hydrant flow equation provided on page 4 of the City of Barrie "Water Transmission and Distribution policies and Design Guidelines" the available flow at 20 psi is between 2,556.2 GPM (161.0 L/s) and 2,920.2 GPM (184.0 L/s) and is therefore sufficient for the proposed development. Detailed calculations are provided in Appendix B.

3 Sanitary Sewer Collection

3.1 SANITARY SYSTEM

The downtown area of Barrie is serviced with a sanitary sewer collection system that conveys flows to the Barrie Waste Water Treatment Plant (WWTP) located at the west end of Kempenfelt Bay on Lake Simcoe.

There are existing 250 mm dia. sanitary sewers in Dunlop Street, a 250 mm dia. sanitary sewer in Maple Avenue and a 300 mm dia. sanitary sewer in Mary Street. Municipal record drawings are provided in Appendix C for reference.

Phase 1 will direct its sanitary sewage to the existing 300 mm dia. sanitary sewer in Mary Street while Phase 2 will direct its sanitary sewage to the existing 250 mm dia. sanitary sewer in Maple Avenue. Inspection and testing manholes between the building and the main sewer have also been provided. Refer to the Site Servicing Plan (Drawing SS-1) for the servicing layout.

A 200 mm dia. service lateral will be provided for each of the Phase 1 and Phase 2 towers. The full flow capacity of each 200 mm dia. sanitary sewer service lateral is 32.80 L/s, which can accommodate the design peak flow of 7.37 L/s for Phase 1 and 7.21 L/s for Phase 2 as per the summary below. The existing 300 mm dia. sanitary sewer on Mary Street has a full flow capacity of 50.25 L/s, which is greater than the peak design flow (including the flows from the proposed development) of 46.58 L/s. Therefore, the proposed development can be adequately serviced by from the existing municipal sanitary sewer system. The sanitary sewer design sheet is provided in Appendix C.

Estimated sanitary design flows for Phase 1:

- Average Day Design Flow: 1.67 ppu X 290 units = 484 persons x 225 L/cap/day = 1.26 L/s; and
- Peak Flow (incl. Infiltration) = 1.26 L/s * 3.98 = 5.09 L/s (incl. commercial flow of 0.023 L/s).

Estimated sanitary design flows for Phase 2:

- Average Day Design Flow: 1.67 ppu X 282 units = 471 persons x 225 L/cap/day = 1.23 L/s; and
- Peak Flow (incl. Infiltration) = 1.23 L/s * 3.99 = 4.96 L/s (incl. commercial flow of 0.027 L/s).

4 Drainage & Stormwater Management

4.1 EXISTING CONDITIONS

Under existing conditions, the site is fully developed with existing buildings. It is unknown where the existing buildings discharge to, however, reasonable assumptions have been made and are reflected on the Pre-Development Drainage Plan (Drawing DP-1), appended. It is assumed Catchment 101 discharges into Dunlop Street and/or Mary Street. The Dunlop Street storm sewer connects to an existing 1.2 m x 2.4 m concrete box storm sewer on Mary Street which conveys the collected runoff a short distance to Lake Simcoe. It is assumed Catchment 102 discharges into Maple Street. The Maple Street storm sewer conveys runoff to the south, connecting into the 1.2 m x 2.4 m box storm sewer on Simcoe Street. The existing storm sewers are designed to convey the 5-year peak flow from the contributing drainage area. Using City standards, the rational method has been used to calculate peak flow rates from each catchment under pre-development conditions. The results are summarized in Table 3, while detailed calculations are provided in Appendix D.

Table 1: Existing Conditions Peak Flow Summary

DESIGN STORM	PEAK FLOW RATE (m^3/s) (MARY STREET OUTLET - CATCHMENT 101)	PEAK FLOW RATE (m^3/s) (MAPLE STREET OUTLET - CATCHMENT 102)
2-year	0.12	0.06
5-year	0.15	0.08
10-year	0.17	0.09
25-year	0.21	0.11
50-year	0.23	0.12
100-year	0.25	0.13

Water quantity or quality controls are not provided for the runoff from Catchments 101 or 102 under existing conditions.

4.2 SWM REQUIREMENTS

This preliminary SWM plan is subject to the review and approval of the City of Barrie. The site located within the Lake Simcoe watershed, however, is not within the Lake Simcoe Region

Conservation Authority (LSRCA) regulated area. Applicable stormwater management design criteria for the proposed site development are presented below.

4.2.1 Stormwater Quality Control

Typically, water quality controls must be provided to satisfy the *MECP SWM Practices Planning and Design Manual*. Enhanced level water quality protection, which corresponds to 80% long term total suspended solids (TSS) removal, is required. However, rooftop runoff is considered clean by MECP and does not require specific stormwater quality treatment. Therefore, it is assumed no water quality controls are required for the site.

4.2.2 Stormwater Quantity Control

The City requires that post-development peak flow rates be controlled to pre-development levels at a given outlet location to ensure no adverse impacts for downstream landowners. Water quantity controls will be provided to attenuate post-development peak flow rates to pre-development levels. As the development will not increase impervious area on the site, quantity controls would not typically be required. However, as all runoff from the site will be conveyed to the municipal storm sewers which are designed to convey the 5-year storm events, the 100-year runoff from the site must be controlled to the pre-development 5-year peak flow rates.

4.2.3 Water Balance & Infiltration

The proposed development is categorized as “major development” under the LSPP, which requires that best efforts are provided towards maintaining pre-development infiltration rates through the completion of a water balance. As the existing site is 100% impervious, the annual infiltration volume is zero. As such, and based on the density of the proposed development, we have assumed that a water balance will not be required.

4.2.4 Phosphorous

The proposed development will also be subject to the Lake Simcoe Phosphorous Offsetting Policy (LSPOP), which requires all major development project to implement LID controls to facilitate net zero phosphorous loading from the site.

4.2.5 Siltation & Erosion Control

Recommendations for a siltation and erosion control strategy will be provided for implementation during construction.

4.3 PROPOSED SWM PLAN

The SWM strategy involves the use of rooftop storage to provide water quantity control for the site. Controlled runoff will be conveyed to the existing municipal storm infrastructure, as depicted on the Site Servicing Plan (Drawing SS-1). We have assumed that water quality controls are not required as all runoff will be generated from the rooftops and will be considered clean. We have assumed a water balance is not required, as the site is fully impervious under existing and proposed conditions and provide no opportunity for infiltration controls.

4.3.1 Water Quantity

Under proposed conditions, the total impervious area of the site will not increase in comparison to the existing conditions. However, as the existing storm sewers on Maple Avenue and Mary Street are only designed to convey runoff from the 5-year storm event and runoff from the site will be directly connected to the storm sewers, water quantity controls are required. The modified rational method was used to estimate the storage volume required to reduce the post-development peak flow rates to the 5-year storm release rate. Catchments 201, 202 and 203 represent the Phase 1 Tower, while Catchments 204, 205, 206 and 207 represent the Phase 2 Tower, as depicted on the appended Post-Development Drainage Plan (Drawing DP-2). As Phase 1 will outlet to Mary Street and Phase 2 will outlet to Maple Avenue, two separate water quantity storage calculations are provided.

Mary Street Outlet - Phase 1

Catchment 201 represents the lower roof area of the Phase 1 Tower, while Catchment 202 represents the upper tower roof. Rooftop storage will be provided for Catchment 202 which has been designed to overcontrol the uncontrolled catchments which discharge to the Mary Street outlet (Catchments 201, 203 and 206). Uncontrolled roof drainage from Catchment 201 will be connected internally to the controlled discharge from Catchment 202 before discharging directly into the Mary Street storm sewer.

A summary of the peak flow rates for post-development conditions as well as the required storage volumes are provided in Table 2. Detailed calculations are provided in Appendix D.

Table 2: Proposed Conditions Peak Flow Summary for Mary Street Outlet/Phase 1

STORM EVENT	EXISTING CONDITIONS PEAK FLOW RATE (m^3/s)	UNCONTROLLED PEAK FLOWS (CATCHMENT 201, 203, 206)	PROPOSED CONTROLLED PEAK FLOW DIRECTED TO STORM SEWER (202) RATE (m^3/s)	STORAGE VOLUME REQUIRED (m^3)	TOTAL POST-DEV PEAK FLOW DIRECTED TO STORM SEWER (m^3/s)
2-year	0.12	0.07	0.03	0.0	0.07
5-year	0.15	0.09	0.04	0.0	0.09
10-year	0.17	0.10	0.05	0.0	0.11
25-year	0.21	0.12	0.06	0.0	0.13
50-year	0.23	0.13	0.06	1.9	0.14
100-year	0.25	0.15	0.06	3.3	0.15

A storage volume of 3.3 m^3 is required for Phase 1 to control the 100-year post development runoff directed to the storm sewer to the 5-year pre-development release rate. Rooftop storage will be used to provide the required storage volume. The total rooftop area for Phase 1 is 821 m^2 and a maximum storage depth of 0.01 m will be provided, corresponding to a total storage volume of 8.2 m^3. Catchment 202 will contain a total of 12 roof drains. Each drain will be designed to allow a maximum permissible release rate of 5.00 L/s. This will result in a total release rate of 60 L/s (0.06 m^3/s) for Catchment 202. The detailed design of the roof drains is to be provided by the mechanical engineer.

Maple Avenue Outlet – Phase 2

Catchment 204 represents the lower roof area of the Phase 2 Tower, while Catchment 205 represents the upper tower roof. Rooftop storage will be provided for Catchment 205, which has been designed to overcontrol the uncontrolled catchments which discharge to the Maple Avenue outlet (Catchments 204, 205 and 207). Uncontrolled roof drainage from Catchment 204 will be connected internally to the controlled discharge from Catchment 205 before discharging directly into the Maple Avenue storm sewer.

A summary of the peak flow rates for post-development conditions as well as the required storage volumes are provided in Table 3. Detailed calculations are provided in Appendix D.

Table 3: Proposed Conditions Peak Flow Summary for Maple Avenue Outlet/Phase 2

STORM EVENT	EXISTING CONDITIONS PEAK FLOW RATE (m^3/s)	UNCONTROLLED PEAK FLOWS (204, 207)	PROPOSED CONTROLLED PEAK FLOW DIRECTED TO STORM SEWER (205) RATE (m^3/s)	STORAGE VOLUME REQUIRED (m^3)	TOTAL POST-DEV PEAK FLOW DIRECTED TO STORM SEWER (m^3/s)
2-year	0.06	0.04	0.01	10.8	0.04
5-year	0.08	0.05	0.01	16.7	0.05
10-year	0.09	0.06	0.01	21.0	0.06
25-year	0.11	0.07	0.01	29.0	0.07
50-year	0.12	0.08	0.01	33.6	0.07
100-year	0.13	0.08	0.01	38.9	0.08

A storage volume of 38.9 m^3 is required for Phase 2 to control the 100-year post development runoff directed to the storm sewer to the 5-year pre-development release rate. Rooftop storage will be used to provide the required storage volume. The total rooftop area for Phase 2 is 824 m^2 and a maximum storage depth of 0.05 m will be provided, corresponding to a total storage volume of 41.2 m^3. Catchment 205 will contain a total of 12 roof drains. Each drain will be designed to allow a maximum permissible release rate of 0.83 L/s. This will result in a total release rate of 10 L/s (0.01 m^3/s) for Catchment 205. The detailed design of the roof drains is to be provided by the mechanical engineer.

The post-development drainage plan Drawing DP-2 is appended for reference.

4.4 PHOSPHOROUS BUDGET

In order to comply with LSRCA requirements, a phosphorous budget for the site has been completed using the loading rates and removal efficiency values from the MECP Phosphorous Budget tool through a spreadsheet method, summarized below in Table 6.

4.4.1 Existing Conditions

Under existing conditions, the 0.43 ha site has been categorized as High Intensity Development – Commercial/Industrial, which has a phosphorous loading rate of 1.82 kg/ha/year.

Applying this loading rate, the annual pre-development phosphorous load is 0.79 kg.

4.4.2 Future Conditions

The proposed development has also been modelled as High Intensity Development – Residential. Applying the loading rate of 1.32 kg/ha/year, the annual post-development phosphorous loading is 0.57 kg, therefore there is a decrease in the phosphorous load of 0.22 kg. However, this site will be subject to the LSRCA's 'Phosphorous Offsetting Policy', which requires all major development projects to implement LID controls to facilitate net zero phosphorous loading from the site. Due to site constraints phosphorous controls cannot be provided on site, and a phosphorous offsetting fee will be required. Detailed calculations for the phosphorous loading are provided in Appendix D.

Table 4: Phosphorus Loading Summary

SCENARIO	AREA (ha)	PHOSPHORUS LOADING RATE (kg/year/ha)	PHOSPHORUS LOADING (kg/year)
Pre-Development			
High Intensity Development	0.43	1.82	0.79
Total	**0.43**		**0.79**
Post-Development (No Mitigation)			
High Intensity Development – Residential	0.43	1.32	0.57
Total	**0.43**		**0.57**

5 Grading & Landscaping

The grading of the proposed development will match the existing grades along the limits of the property, as the proposed building footprint will cover the majority of the site with minimal setbacks along the Dunlop Street, Mary Street and Maple Street frontages. A walkway is located between Phase 1 and 2. The proposed grading of the development is shown on Drawing SG-1.

6 Utilities

All utilities (electrical, gas, telecommunications) are available from Dunlop Street, and utility services will be provided to the proposed development.

The proponent will make suitable arrangements with all required utilities to accommodate the development.

7 Conclusions

1.1. WATER SUPPLY & DISTRIBUTION

Phase 1 will be serviced by separate 200 mm dia. water services for both domestic and fire protection from the Dunlop Street watermain. Phase 2 will be serviced by separate 200 mm dia. water services for both domestic and fire protection from the Maple Avenue watermain. There are 2 existing fire hydrants located on Dunlop Street and Mary Street which will provide adequate fire protection for the site.

1.2. SANITARY SEWAGE COLLECTION

Phase 1 will be serviced by a 200 mm dia. sanitary service connected to the existing 300 mm dia. sanitary sewer on Mary Street. Phase 2 will be serviced by a 200 mm dia. sanitary service connected to the existing 250 mm dia. sanitary sewer on Maple Avenue. There is sufficient capacity in both the proposed service laterals, as well as the existing sanitary sewer to accommodate the proposed development.

1.3. DRAINAGE & STORMWATER MANAGEMENT

The SWM strategy is to direct runoff from the site to existing municipal storm sewers on Maple Avenue and Mary Street. Rooftop storage will be provided to control the 100-year runoff to the 5-year allowable peak flow rates. Water quality controls are not required as the runoff will be generated from the rooftop and will be considered clean. Infiltration based SWM controls are not provided as there is no opportunity to implement them on the proposed site plan. As the site is 100% impervious under existing conditions, there will be no impact to the existing site level water balance.

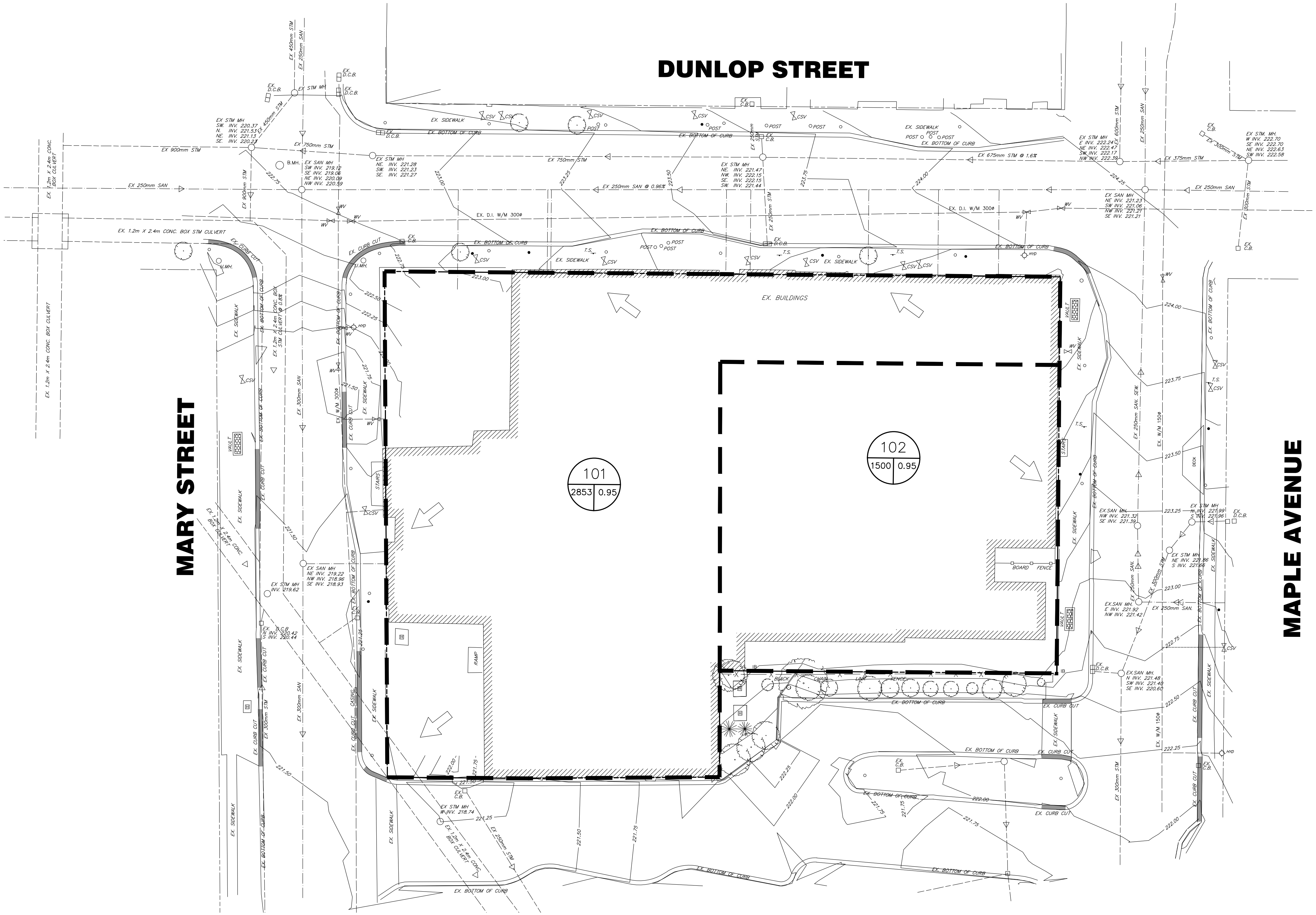
1.4. GRADING & LANDSCAPING

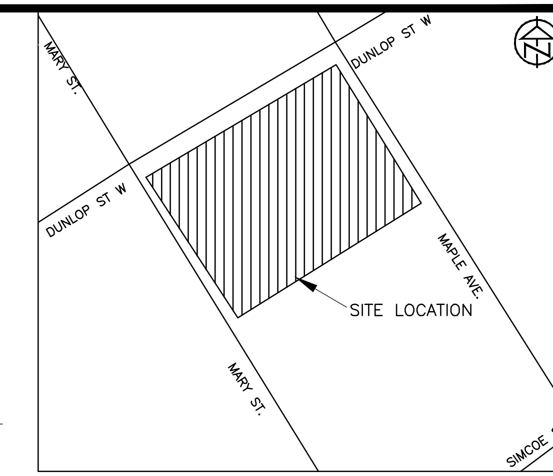
The grading of the proposed development will match to the existing grades along the limits of the development, as there are minimal setbacks to the property line.

1.5. UTILITIES

All utilities (electrical, gas, telecommunications) are available from Dunlop Street, Mary Street or Maple Avenue, and utility services will be provided to the proposed development.

It is concluded that the proposed development of can be serviced in a satisfactory manner.





KEY PLAN
NTS

101 — CATCHMENT AREA LABEL
AREA (m²) 250 — RUNOFF COEFFICIENT 0.95

PRE-DEVELOPMENT CATCHMENT BOUNDARY

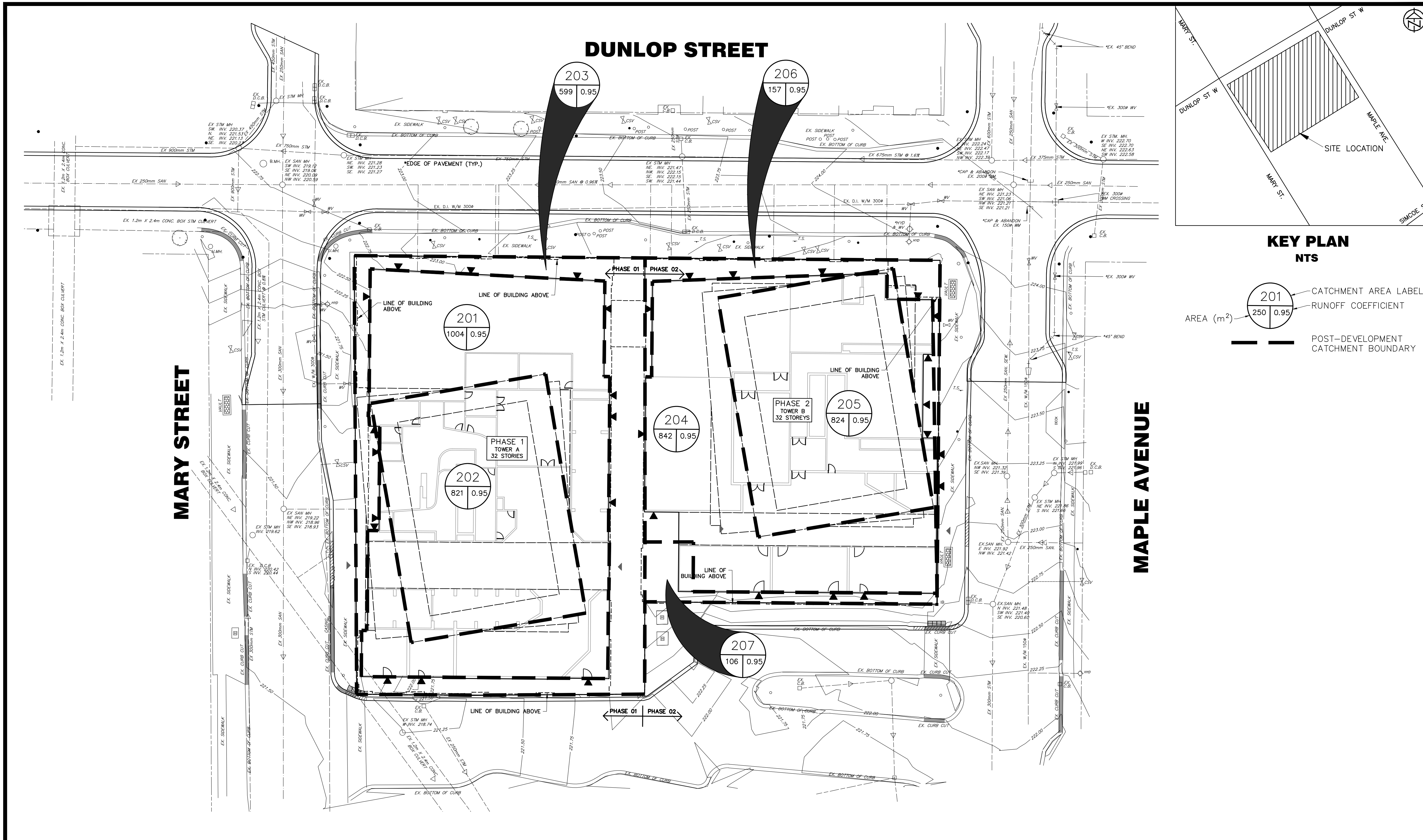
EXISTING DIRECTION OF DRAINAGE FLOW

TATHAM ENGINEERING

BARRIE WATERFRONT DEVELOPMENTS
CITY OF BARRIE
PRE-DEVELOPMENT DRAINAGE PLAN

DWG. No. **DP-1**

SCALE: 1:500	DRAWN: LCG	DATE: FEB/2020	JOB NO. 418392



TATHAM ENGINEERING

BARRIE WATERFRONT DEVELOPMENTS
CITY OF BARRIE
POST-DEVELOPMENT DRAINAGE PLAN

DWG. No. **DP-2**

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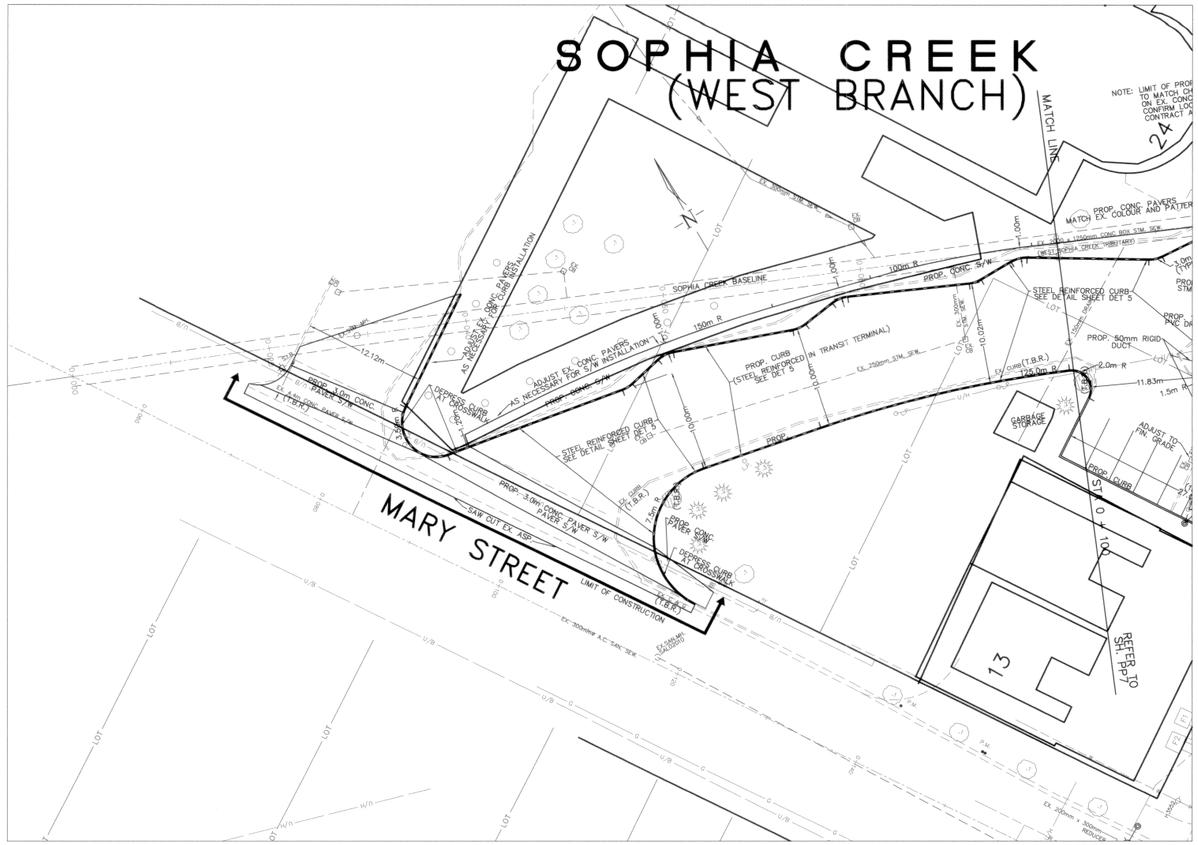
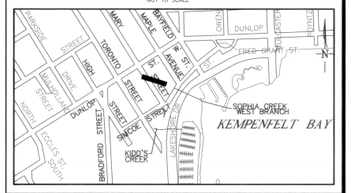
Appendix A:
Municipal Record Documents

SOPHIA CREEK (WEST BRANCH)



KEY PLAN
NOT TO SCALE



GENERAL NOTES

1. EXISTING SANITARY SERVICE TO BE MAINTAINED AT ALL TIMES.
2. ALL SINGLE CATCH BASIN LEADS TO BE 250mmø AND DOUBLE CATCH BASIN LEADS TO BE 300mmø (SEE GENERAL NOTES, SHEET DET3).
3. LOCATION OF GAS MAIN PER ENBRIDGE CONSUMERS GAS MARKED DRAWINGS. ALL EXISTING MAINS AND SERVICES TO BE FIELD LOCATED.
4. EXISTING HYDRO, BELL AND CABLE SERVICES MARKED ON DRAWINGS. ARE AS PER UTILITY COMPANY DRAWINGS. ALL SERVICES TO BE FIELD LOCATED.
5. FOR TYPICAL SECTIONS SEE SHEET DET1 AND DET2
6. ALL MAINTENANCE HOLES TO BE 1200mmø UNLESS OTHERWISE NOTED.
7. ALL CONCRETE STORM SEWER TO BE CL 65-D
8. MAINTAIN STORM DRAINAGE SYSTEM DURING CONSTRUCTION AND AND AVOID SILTATION AND EROSION.
9. (T.B.R.) – (TO BE REMOVED) ; (T.B.A.) – (TO BE ABANDONED)
10. CONCRETE CURB AS PER OPSD 600.110 BARRIER CURB
11. CONCRETE CURB AND GUTTER AS PER OPSD 600.040
12. STEEL REINFORCED CONCRETE CURB IN TRANSIT TERMINAL AS PER DETAIL ON SHEET DET5.
13. PROPOSED DECORATIVE STREET LIGHT
14. PROPOSED TRAFFIC SIGNAL POLE AND STREET LIGHT
15. CONTRACTOR TO CONFIRM WITH BARRIE HYDRO THAT ALL EX. U/G HYDRO MARKED TO BE ABANDONED IS IN FACT ABANDONED AND NOT STILL LIVE.
16. EX. U/G FIBRE OPTIC CABLE TV UNDER SIMCOE STREET WILL BE ABANDONED WHEN THE NEW CTV LINE IS PLACED ACROSS SIMCOE STREET AND UNDER SOPHIA CREEK.
    THE NEW FIBRE OPTIC LINE WILL BE PLACED IN THE SHARED DUCT STRUCTURE INSTALLED AS PART OF THIS CONTRACT.
17. WHERE CONC. PAVERS ARE TO BE PLACED IN DRIVEWAYS USE 80mm THICK PAVERS.
18. CONFIRM PAVING STONE PATTERN AND COLOUR WITH CONTRACT ADMINISTRATOR PRIOR TO PLACEMENT.
19. CONTRACTOR TO SUBMIT DETAILS FOR TEMPORARY DIVERSION DAM A AND B TO CONTRACT ADMINISTRATOR FOR APPROVAL.

WATERMAIN NOTES

- ALL WATERMAIN TO BE PVC DR18 CL150, UNLESS NOTES OTHERWISE.
- TRANSFER WATER SERVICES AFTER ALL TESTING AND CHLORINATING HAS BEEN COMPLETED.
- FOR GENERAL WATERMAIN NOTES SEE DETAIL SHEET DET3.

BENCH MARKS

DISTANCE NOTE
DISTANCES SHOWN HEREON ARE GROUND DISTANCES AND CAN BE CONVERTED TO GRID DISTANCES BY MULTIPLYING BY THE COMBINED SCALE FACTOR OF 0.9996884.

BEARING NOTE
BEARINGS HEREIN ARE GRID BEARINGS AND ARE DERIVED FROM CONTROL MONUMENTS 001673109 (N=4915700.133, E=604482.056) AND 031910022 (N=4914360.013, E=604496.349), AND ARE REFERRED TO THE CENTRAL MERIDIAN (81 DEGREES OF LONGITUDE) IN ZONE, 17 AND ARE BASED ON NAD83.

BENCH MARK 001673109
220.210 – BRASS TABLET SET IN THE GOVERNMENT DOCK THE BENCH MARK IS LOCATED ON THE GOVERNMENT DOCK AT THE BOTTOM OF BAYFIELD STREET AT A POINT WHERE THE DOCK TAKES A DOG LEG TO THE RIGHT.

BENCH MARK 4585
224.243 – CN RAIL STATION, TABLET SET HORIZONTALLY IN NORTH FOUNDATION WALL OF THE CENTRE OF THREE BUILDINGS, 5.5m WEST OF THE NORTHEAST CORNER, 71.1m WEST OF A LIGHT STANDARD, 5cm ABOVE GRADE (DO NOT USE FOR HORIZONTAL CONTROL).

BENCH MARKS WILL BE FROM CITY OF BARRIE VERTICAL CONTROL NETWORK. INITIAL BENCH MARK TO BE OF 2nd ORDER ACCURACY

NO.	REVISIONS	DATE	APPROVED

CITY OF BARRIE
APPROVED
DATE: May 28/07
DIRECTOR OF ENGINEERING

LICENCED PROFESSIONAL ENGINEER
L. H. BORGDORFF
PROVINCE OF ONTARIO

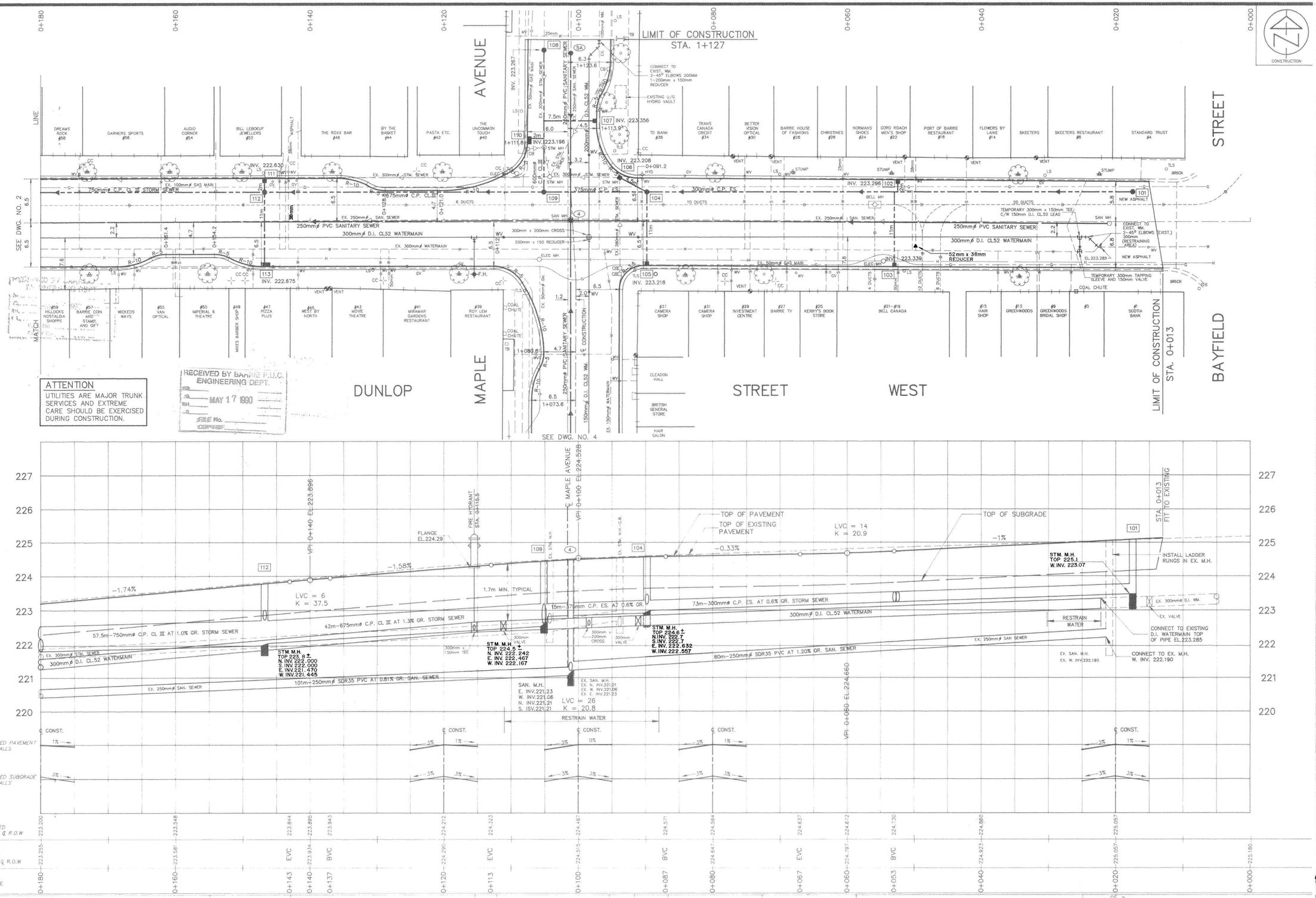
SIMCOE STREET RECONSTRUCTION (MARY ST. TO BAYFIELD ST.)

SOPHIA CREEK (WEST BRANCH)
AT MARY STREET
STA. 0+030 TO 0+100

CITY of BARRIE
ENGINEERING DEPARTMENT

SCALE HOR. 1:250	VERT. 1:50	DRAWING NO.	2006-11
DESIGN M.R.M.	DRAWN M.R.M.	SHEET NO.	PP6
REVIEWED L.H.B.	DATE 2007.05.25		

2006-011-008



GENERAL NOTES SEE DWG. NO. 189281–8 FOR GENERAL NOTES.

PLOTTED 4/30/90

T M PROKOPEC — REGISTERED PROFESSIONAL ENGINEER — PROVINCE OF ONTARIO — 90-09-30

BENCH MARKS

GEODETIC BENCH MARK ELEV. 229.107

FUNDAMENTAL BENCH MARK IN QUEENS PARK 12.2m N.E. OF CURB AT N.E. SIDE OF PARKSIDE DR. 1.8m N.E. OF BOUNDARY PARK AND DRILL HALL TABLET IN TOP.

NO.	REVISIONS	DATE	APPROVED
1	WM. DESIGN REVISED AS PER P.U.C.	4/4/90	
2	PAV'T. AND WM. LAYOUT INFO ADDED	4/18/90	
3	AS CONSTRUCTED	9/19/91	

CITY OF BARRIE APPROVED DATE May 14/90 CITY ENGINEER

PUBLIC UTILITIES COMMISSION APPROVED DATE June 15/90 ENGINEER

DUNLOP STREET WEST

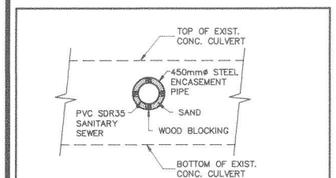
300mm D.I. WEST
BAYFIELD ST. TO N°58
DUNLOP ST. WEST
STA 0+000 TO STA 0+180

1990-506-003

CITY of BARRIE
ENGINEERING DEPARTMENT
P.U.C. Dwg N°002,509

DESIGN	AINLEY & ASSOC. LTD.	SCALE HOR. 1:250	VERT. 1:50
DRAWN	L.G.B./J.K.F.	REVIEWED	DRAWING NO. 189281–1
DATE	APRIL 1990.	SHEET NO. 3	

002,509

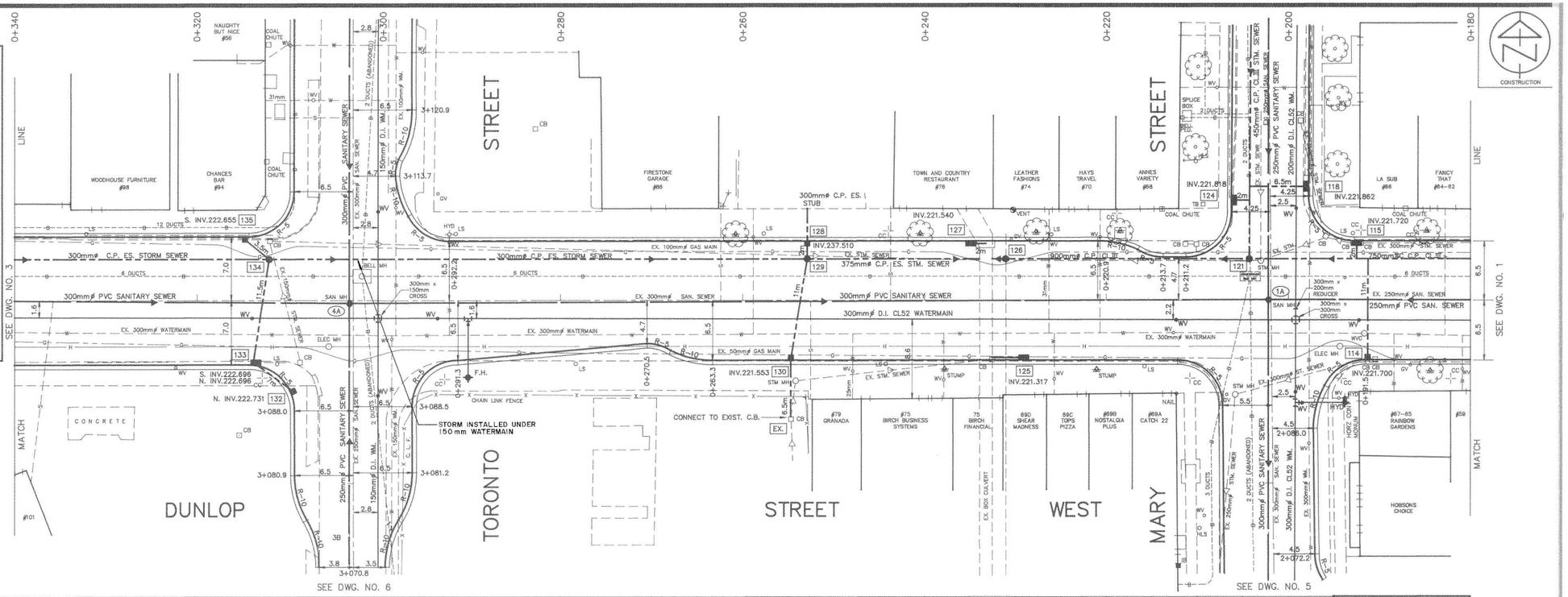


NOTES
1. BREAKOUT EXISTING SANITARY SEWER AND INSTALL 4m OF 450mmø STEEL ENCASEMENT PIPE, WALL THICKNESS 7.1mm.
2. OPEN CUT OF ROOF OF CONCRETE STORM CULVERT WILL NOT BE PERMITTED.
3. INSTALL ONE LENGTH OF PVC SDR35 SUCH THAT THERE WILL NOT BE A JOINT WITHIN THE LENGTH OF THE ENCASEMENT PIPE.
4. PROVIDE WOOD BLOCKING AND SAND THROUGHOUT ENCASEMENT PIPE.
5. GROUT IN ENDS OF ENCASEMENT PIPE, WITH APPROVED MORTAR COMPOUND, A MINIMUM LENGTH OF 200mm.

SANITARY PIPE ENCASEMENT DETAIL
(N.T.S.)

RECEIVED BY BARRIE P.U.C. ENGINEERING DEPT.
MAY 17 1990
FILE No.
COPY OF

ATTENTION
UTILITIES ARE MAJOR TRUNK SERVICES AND EXTREME CARE SHOULD BE EXERCISED DURING CONSTRUCTION.



GENERAL NOTES SEE DWG. NO. 189281-8 FOR GENERAL NOTES.

PLOTTED 4/30/90

REGISTERED PROFESSIONAL ENGINEER T. M. PROKOPEC 90-09-30 PROVINCE OF ONTARIO

BENCH MARKS
GEODETIC BENCH MARK ELEV. 229.107
FUNDAMENTAL BENCH MARK IN QUEENS PARK 12.2m N.E. OF CURB AT N.E. SIDE OF PARKSIDE DR. 1.6m N.E. OF BOUNDARY PARK AND DRILL HALL TABLET IN TOP.

NO.	REVISIONS	DATE	APPROVED
1	WM. DESIGN REVISED AS PER P.U.C.	4/4/90	
2	PAVT. AND WM. LAYOUT INFO ADDED	4/18/90	
3	AS CONSTRUCTED	9/19/91	

CITY OF BARRIE APPROVED DATE May 14/90 CITY ENGINEER

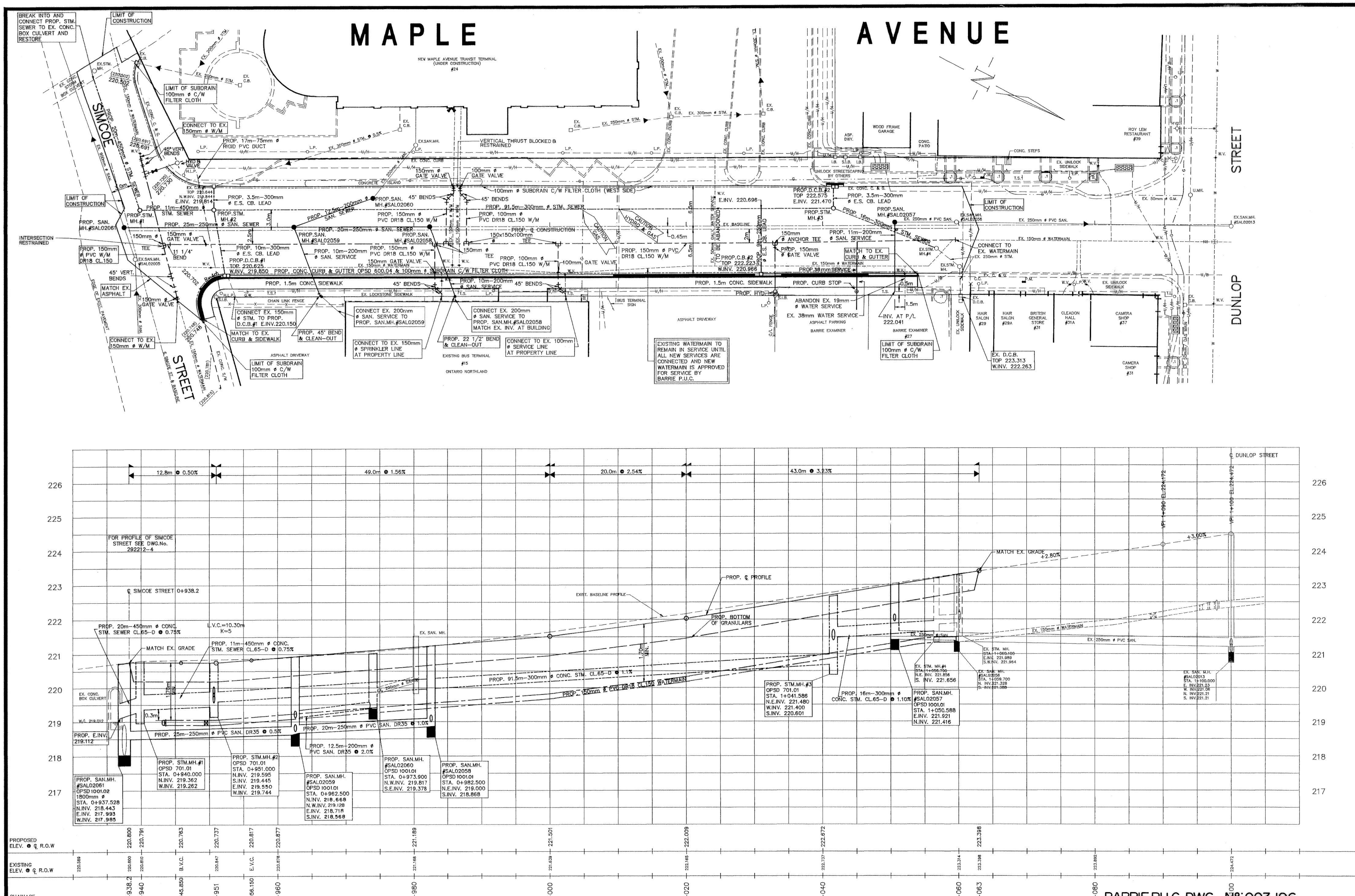
PUBLIC UTILITIES COMMISSION APPROVED DATE ENGINEER

DUNLOP STREET WEST
300mm DI. WM
MARY ST. TO N°95
DUNLOP ST. WEST
STA 0+180 TO STA 0+342
1990-506-005

CITY OF BARRIE INCORPORATED 1959
CITY of BARRIE
ENGINEERING DEPARTMENT
P.U.C. Dwg. N°002,510

DESIGN	AINLEY & ASSOC. LTD.	SCALE HOR. 1:250	VERT. 1:50
DRAWN	L.G.B./J.K.F.	REVIEWED	DRAWING NO. 189281-2
DATE	APRIL 1990	SHEET NO. 5	

002510



BARRIE P.U.C. DWG. N°: 003,196

003,196

GENERAL NOTES	BENCH MARKS
FOR NOTES AND DETAILS SEE DWG. No. 292212-5	220.210 – GOVERNMENT WHARF AT SOUTHEAST END OF BAYFIELD STREET, TABLET SET FLUSH WITH CONCRETE SURFACE NEAR END OF WHARF, 3.8m WEST OF EAST CORNER OF BEND IN WHARF, 4.8m EAST OF WEST CORNER OF BEND.
(EXISTING ELEVATION) PROP. ELEVATION	

BARRIE P.U.C.
APPROVED
FOR WATER ONLY
DATE Sept 23/92

NO.	REVISIONS	DATE	APPROVED
1	AS PER CITY OF BARRIE COMMENTS	92/09/16	J.G.K.
2	AS PER CITY OF BARRIE P.U.C.	92/09/21	J.G.K.
3	AS BUILT INFO	93/01/08	K.F.R.

CITY OF BARRIE
APPROVED
DATE 1992·09·23
DIRECTOR OF MUNICIPAL WORKS

LICENSED PROFESSIONAL ENGINEER
D. G. CARR
PROVINCE OF ONTARIO

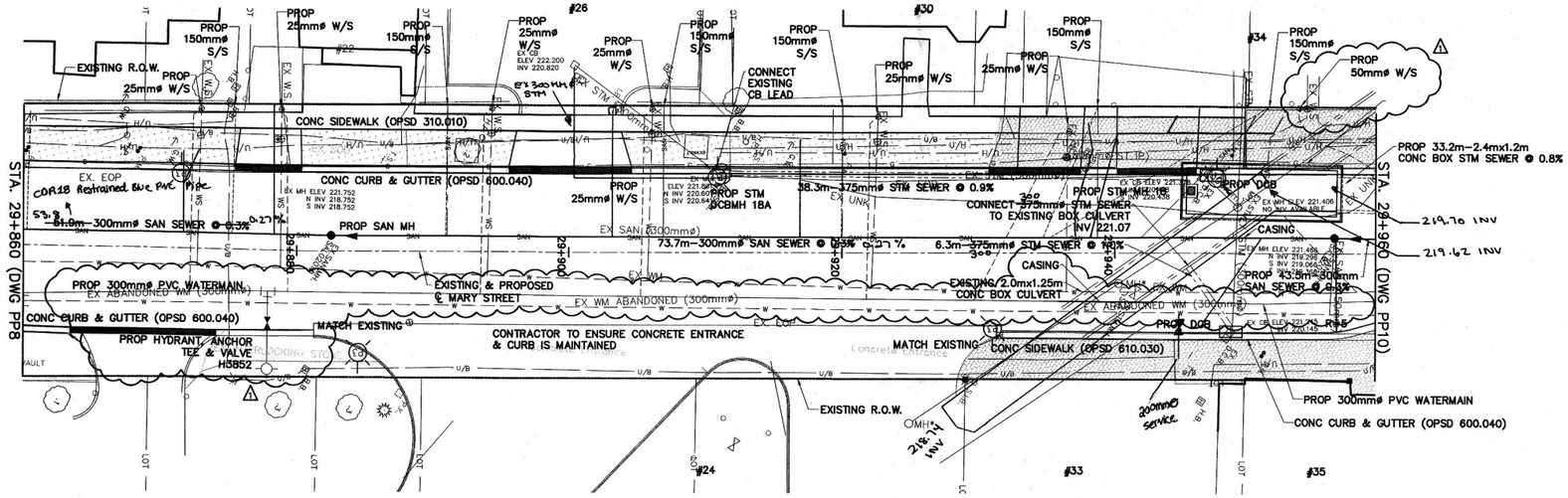
MAPLE AVENUE RECONSTRUCTION CONTRACT 92–18

SIMCOE STREET TO DUNLOP STREET
NEW CONSTRUCTION

CITY of BARRIE
MUNICIPAL WORKS DEPARTMENT

DESIGN	AINLEY & ASSOC. LTD.	SCALE HOR. 1:250	VERT. 1:50
DRAWN	J.R.C.	REVIEWED J.G.K./D.G.C.	DRAWING NO.

MARY STREET



BENCHMARKS

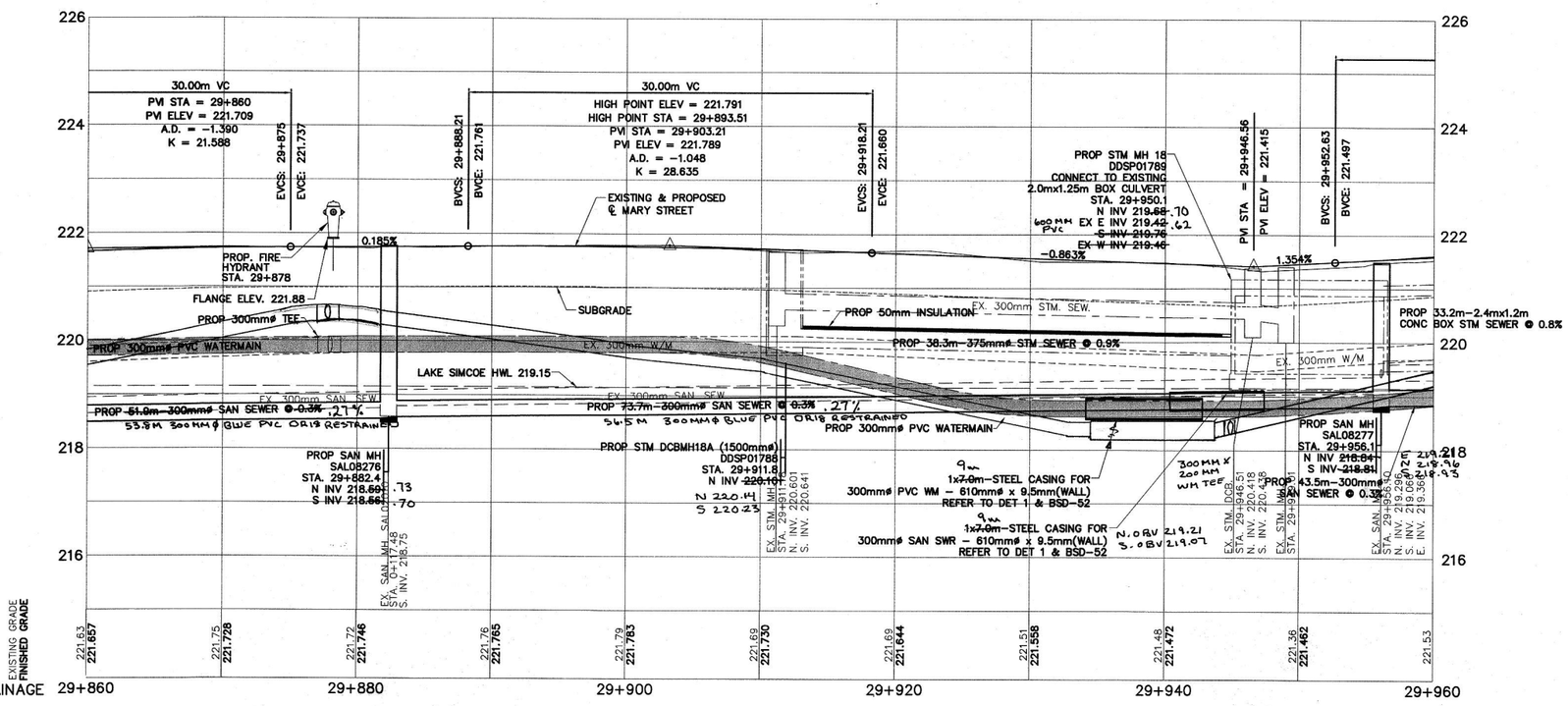
1. MNR NO: 0011984U119 BENCH MARK NO: 84U119
232.449 – DESCRIPTION OF LOCATION: DEEP BM IN 0.2m DIAMETER MANHOLE IN QUEEN'S PARK NEAR INTERSECTION OF TORONTO STREET AND ROSS STREET 10.8m SOUTH OF SOUTH EDGE OF SOUTH SIDEWALK ON ROSS STREET, 44m FROM NORTHEAST CORNER OF SIDEWALK INTERSECTION AT ROSS ST. AND TORONTO ST. NOTE HAS A PROTECTIVE COVER.

2. BENCH MARK NO: 31U455S
229.1128 – DESCRIPTION OF LOCATION: FUNDAMENTAL BENCH–MARK IN QUEEN'S PARK, 12.2m NORTHEAST OF CURB AT NORTHEAST SIDE OF PARKSIDEDRIVE, 1.8m NORTHEAST OF BOUNDARY BETWEEN PARK AND DRILL HALL GROUNDS, TABLET IN TOP OF CONCRETE SLAB.

BEARINGS

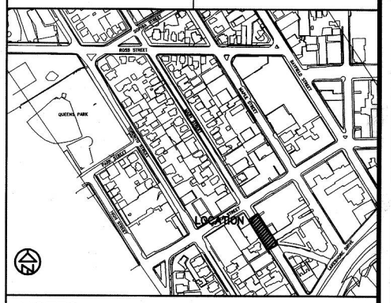
1. MNR MONUMENT NUMBER 03120040037
THE HORIZONTAL MONUMENT 03120040037 IS LOCATED ON THE EAST SIDE OF BAYFIELD STREET BETWEEN WELLINGTON STREET AND SOPHIA STREET.
LATITUDE 44–23–33.80769 NORTH, LONGITUDE 79–41–34.70019 WEST
EASTING 604096.311 METRES, NORTHING 4916324.065 METRES

2. MNR MONUMENT NUMBER 03120040046
THE HORIZONTAL MONUMENT 03120040046 IS LOCATED IN QUEEN'S PARK ON SOUTHEAST CORNER OF ROSS STREET AND PARKSIDE DRIVE. NOTE: A PROTECTIVE WATER VALVE COVER HAS BEEN PLACED OVER MONUMENT CAP.
LATITUDE44–23–26.21328 NORTH, LONGITUDE79–41–54.48049 WEST
EASTING 603862.430 METRES NORTHING 4916082.773 METRES



BURNSIDE

R. J. Burnside & Associates Limited
3 Ronell Crescent, Collingwood, Ontario
telephone (705) 446-0515 **fax** (705) 446-2399
web www.rjburnside.com



NOTES

1. LOCATION AND ELEVATION OF ALL EXISTING SANITARY & WATER SERVICES TO BE FIELD VERIFIED PRIOR TO CONSTRUCTION
2. ALL PVC SANITARY SEWER TO BE PVC DR–35 UNLESS OTHERWISE NOTED
3. EXISTING SANITARY SERVICE TO BE MAINTAINED AT ALL TIMES
4. PROPOSED SANITARY LATERALS TO BE A MINIMUM 150mmø, DR–28 UNLESS OTHERWISE NOTED OR EXISTING SERVICE FOUND IN THE FIELD TO BE LARGER, INSTALLED FROM NEW MAIN WITH APPROVED MANUFACTURED TEES AND CONNECT TO EXISTING LATERALS AT PROPERTY LINE UNLESS SHOWN OTHERWISE.
5. ALL SINGLE CATCH BASIN LEADS TO BE 250mmø AND DOUBLE CATCHBASIN LEADS TO BE 300mmø UNLESS OTHERWISE NOTED WITH MIN GRADE OF 2.0%
6. LOCATION OF ALL EXISTING UTILITY MAINS AND SERVICES PROVIDED TO BE FIELD LOCATED.
7. FOR TYPICAL SECTIONS SEE SHEET DET1
8. ALL MAINTENANCE HOLES TO BE 1200mmø UNLESS OTHERWISE NOTED
9. ALL CONCRETE STORM SEWER TO BE CL 65–D
10. MAINTAIN STORM DRAINAGE DURING CONSTRUCTION AND AVOID SILTATION AND EROSION.
11. CONTRACTOR TO CONTACT BELL, ROGERS, POWERSTREAM AND ENBRIDGE PRIOR TO CROSSING EXISTING SERVICING.
12. ALL WATERMAIN TO BE PVC CLASS 150
13. ALL WATERMAIN TO BE RESTRAINED AS PER DETAIL WM1 ON SHEET DET 2 INCLUDING THROUGH ALL CASINGS
14. ALL FIRE HYDRANTS TO HAVE ANCHOR TEE & VALVE INSTALLED
15. CONTRACTOR TO INSTALL WATER SERVICES FROM NEW PVC WATERMAIN TO NEW CURB STOP AT PROPERTY LINE INCLUDING CONNECTION TO EXISTING SERVICE. UNLESS OTHERWISE NOTED.
16. CONTRACTOR TO TRANSFER WATER SERVICE AFTER ALL TESTING AND CHLORINATION HAS BEEN COMPLETED
17. FOR GENERAL SERVICING NOTES SEE DET4
18. IN THE CASE A SANITARY SERVICE REQUIRES EMBEDMENT IN THE PILECAP CONTRACTOR TO ENSURE THE PILECAP ENDS RECEIVE THE APPROPRIATE END TREATMENT AS PER DETAIL PC1 ON SHEET S–005

NO.	REVISIONS	DATE	APPROVED
0	ISSUED FOR TENDER	10.04.09	R.K.
1	WATERMAIN ALIGNMENT, 34 SIMCOE ST 50mm WS	10.07.08	R.K.

CITY OF BARRIE
APPROVED
DATE. . . . . .
. . . . . .
DIRECTOR OF ENGINEERING

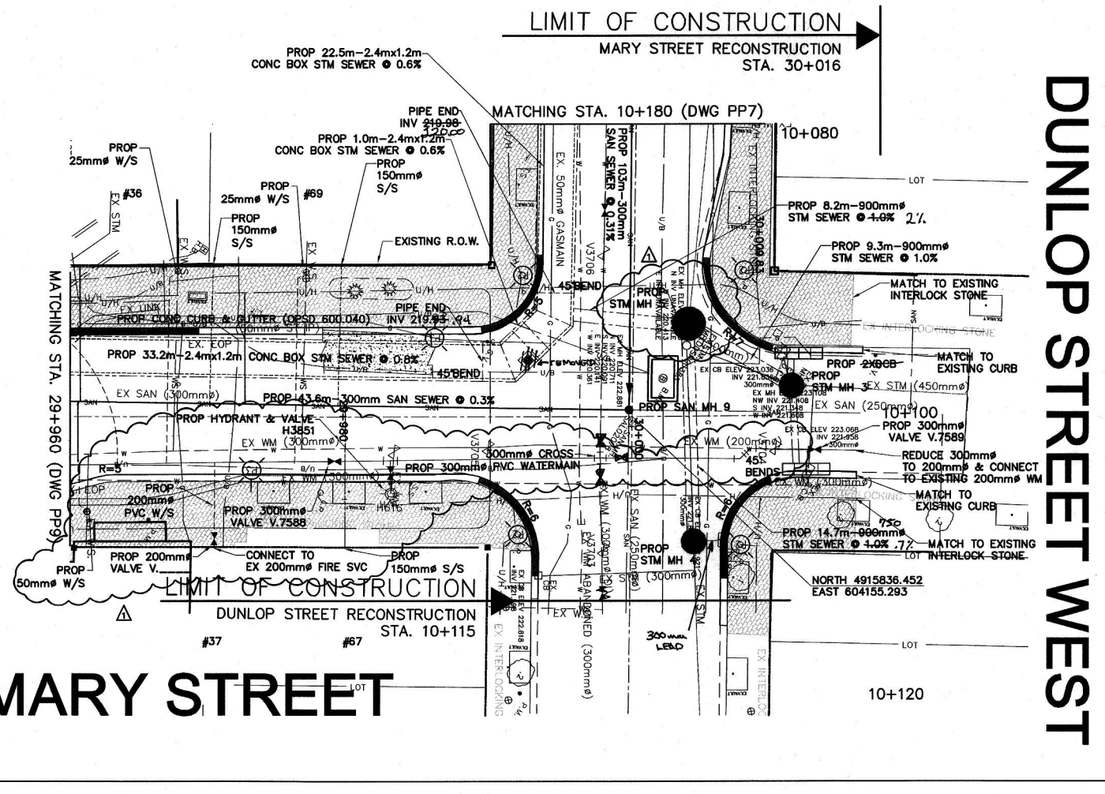
MARY STREET RECONSTRUCTION

CONSTRUCTION PLAN AND PROFILE
MARY STREET
(STA. 29+860 TO STA. 29+960)

CITY of BARRIE
ENGINEERING DEPARTMENT

SCALE	1:200 H. 1:50 V.	CONTRACT NO.	2010–025T
DESIGN	R.Y.	DRAWN	R.Y.
REVIEWED	R.W.K.	DATE	09.04.15
		SHEET NO.	PP9

2010-025-018


LIMIT OF CONSTRUCTION
MARY STREET RECONSTRUCTION
STA. 30+016
MATCHING STA. 10+180 (DWG PP7)
PROP 22.5m-2.4mx1.2m CONC BOX STM SEWER @ 0.6%
PIPE END INV 219.98
PROP 1.0m-2.4mx1.2m CONC BOX STM SEWER @ 0.6%
PROP 25mmø W/S
PROP 150mmø S/S
EXISTING R.O.W.
PROP 103m-300mm SAN SEWER @ 0.3%
10+080
PROP 8.2m-900mmø STM SEWER @ 1.0%
PROP 9.3m-900mmø STM SEWER @ 1.0%
MATCH TO EXISTING INTERLOCK STONE
45° BEND
PROP STM MH 4
PROP 2XDCB
MATCH TO EXISTING CURB
PROP STM MH 3
EX STM (450mmø)
EX SAN (250mmø)
10+100
PROP SAN MH 9
PROP 43.6m-300mm SAN SEWER @ 0.3%
PROP HYDRANT & VALVE H3851
PROP 300mmø VALVE V.7589
EX WM (300mmø)
EX WM (200mmø)
300mmø CROSS
PROP 300mmø WATERMAIN
REDUCE 300mmø TO 200mmø & CONNECT TO EXISTING 200mmø WM
45° BENDS
MATCH TO EXISTING CURB
PROP 200mmø PVC W/S
PROP 300mmø VALVE V.7588
PROP 14.7m-900mmø STM SEWER @ 1.0%
MATCH TO EXISTING INTERLOCK STONE
PROP 200mmø VALVE V.
CONNECT TO EX 200mmø FIRE SVC
PROP 150mmø S/S
PROP 50mmø W/S
NORTH 4915836.452
EAST 604155.293
LIMIT OF CONSTRUCTION
DUNLOP STREET RECONSTRUCTION
STA. 10+115
10+120
MATCHING STA. 29+960 (DWG PP9)
MARY STREET
DUNLOP STREET WEST
#36
#37
#67
#69
45°08'W 221.32
300mmø VALVE
300x200 REDUCER
45°08'W 220.19
NTS
LOCATION

BENCHMARKS

1. MNR NO: 0011984U119 BENCH MARK NO: 84U119
232.449 – DESCRIPTION OF LOCATION: DEEP BM IN 0.2m DIAMETER MANHOLE IN QUEEN'S PARK NEAR INTERSECTION OF TORONTO STREET AND ROSS STREET 10.8m SOUTH OF SOUTH EDGE OF SOUTH SIDEWALK ON ROSS STREET, 44m FROM NORTHEAST CORNER OF SIDEWALK INTERSECTION AT ROSS ST. AND TORONTO ST. NOTE HAS A PROTECTIVE COVER.

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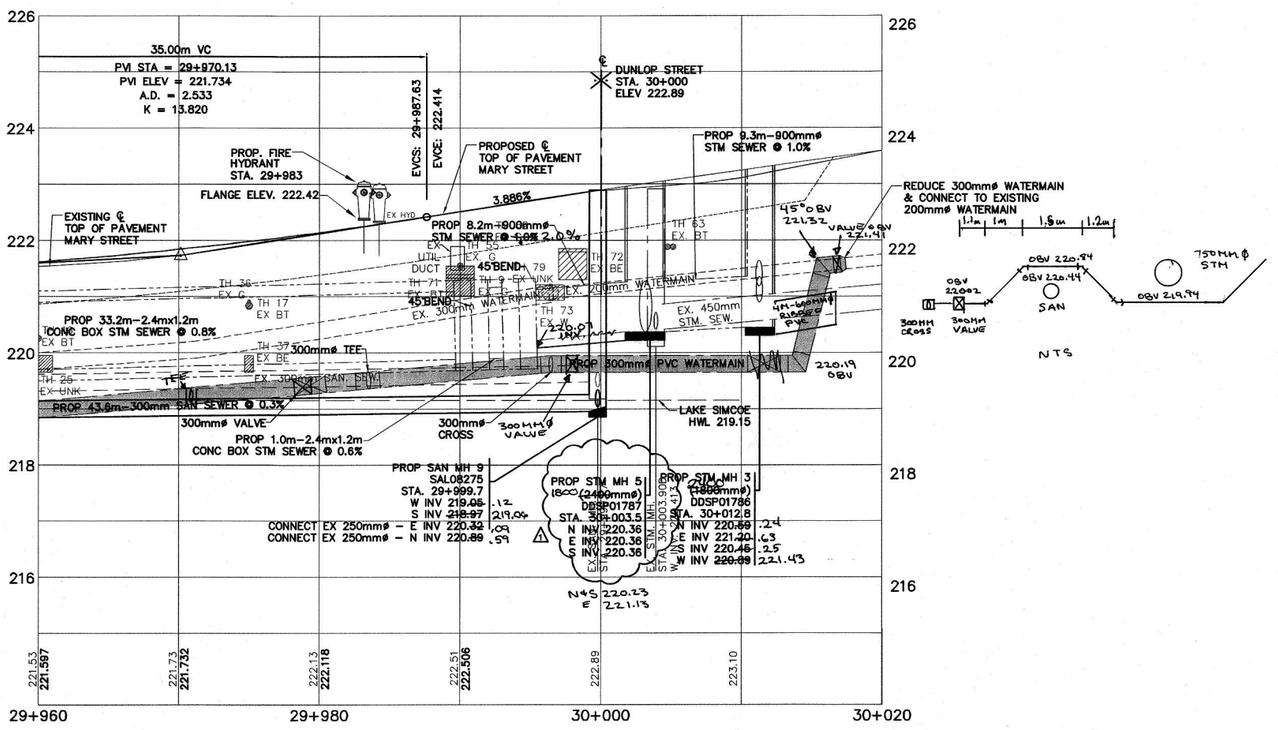

NOTES

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4. PROPOSED SANITARY LATERALS TO BE A MINIMUM 150mmø, DR-28 UNLESS OTHERWISE NOTED OR EXISTING SERVICE FOUND IN THE FIELD TO BE LARGER, INSTALLED FROM NEW MAIN WITH APPROVED MANUFACTURED TEES AND CONNECT TO EXISTING LATERALS AT PROPERTY LINE UNLESS SHOWN OTHERWISE.
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11. CONTRACTOR TO CONTACT BELL, ROGERS, POWERSTREAM AND ENBRIDGE PRIOR TO CROSSING EXISTING SERVICING.
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13. ALL WATERMAIN TO BE RESTRAINED AS PER DETAIL WM1 ON SHEET DET 2 INCLUDING THROUGH ALL CASINGS
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18. IN THE CASE A SANITARY SERVICE REQUIRES EMBEDMENT IN THE PILECAP CONTRACTOR TO ENSURE THE PILECAP ENDS RECEIVE THE APPROPRIATE END TREATMENT AS PER DETAIL PC1 ON SHEET S-005

NO.	REVISIONS	DATE	APPROVED
0	ISSUED FOR TENDER	10.04.09	R.K.
1	STMMH 5 2400mmø, WM ALIGNMENT, 37 MARY WS	10.07.08	R.K.

"This Record Drawing has been prepared, in part, based upon information furnished by others. While this information is believed to be reliable, the City does not warrant the accuracy of this information, and shall not be held responsible for damages arising from the use of the Record Drawing. The user hereby releases and discharges the City, its employees or agents from any claims, losses or damages and agrees to indemnify and save harmless, the City, from any claims, losses, or damages arising from the use of the Record Drawing."

CITY OF BARRIE
APPROVED
DATE. . . . . .
. . . . . .
DIRECTOR OF ENGINEERING

TORONTO STREET RECONSTRUCTION

CONSTRUCTION PLAN AND PROFILE
MARY STREET
(STA. 29+960 TO STA. 30+016)

CITY of BARRIE
ENGINEERING DEPARTMENT

SCALE	1:200 H. 1:50 V.	CONTRACT NO.	2010-025T
DESIGN	R.Y.	DRAWN	R.Y.
REVIEWED	R.W.K.	DATE	07.12.07
		SHEET NO.	PP10

BURNSIDE
R. J. Burnside & Associates Limited
3 Ronell Crescent, Collingwood, Ontario
telephone (705) 446-0515 fax (705) 446-2399
web www.rjburnside.com

Appendix B:
Water Demand Calculations & Hydrant Flow Test Results

Project:	Barrie Waterfront Developments	Date:	February 14, 2020
File No.:	419392	Designed:	DJR
Subject:	Water Demand Calculations	Checked	NM
Revisions:			

PHASE 1

Number of Units =	290	units
Population per Unit =	1.67	ppu
Population =	484	persons
Domestic Water Demand =	300	L/person/day
Average Daily Demand (Residential)=	145,290	L/day
	1.68	L/s
Commercial Area =	696	m^2
Commercial Water Demand =	28	m^3/(ha-day)
Average Daily Demand (Commercial)=	1,949	L/day
	0.023	L/s
Total Average Daily Demand =	147,239	L/day
	1.70	L/s
Maximum Day Factor =	2.75	From MOE Design Guidelines for Drinking Water Systems - Table 3-1
Peak Rate Factor =	4.13	From MOE Design Guidelines for Drinking Water Systems - Table 3-1
Maximum Daily Demand =	404,907	L/day
	4.69	L/s
Peak Hourly Demand =	608,096	L/day
	7.04	L/s

PHASE 2

Number of Units =	282	units
Population per Unit =	1.67	ppu
Population =	470.94	persons
Domestic Water Demand =	300	L/person/day
Average Daily Demand (Residential)=	141,282	L/day
	1.64	L/s
Commercial Area =	847	m^2
Commercial Water Demand =	28	m^3/(ha-day)
Average Daily Demand (Commercial)=	2,372	L/day
	0.027	L/s
Total Average Daily Demand =	143,654	L/day
	1.66	L/s
Maximum Day Factor =	2.75	From MOE Design Guidelines for Drinking Water Systems - Table 3-1
Peak Rate Factor =	4.13	From MOE Design Guidelines for Drinking Water Systems - Table 3-1
Maximum Daily Demand =	395,047	L/day
	4.57	L/s
Peak Hourly Demand =	593,289	L/day
	6.87	L/s

Project:	Barrie Waterfront Developments - Phase 1	Date:	February 14, 2020
File No.:	419392	Designed:	DJR
Subject:	Preliminary Fire Flow Calculations	Checked	NM
Revisions:			

Fire Underwriters Survey Fire Flow Calculations
Long Method

Calculation Based on 1999 Publication "Water Supply for Public Fire Protection" by Fire Underwriters Survey (FUS).

Step	Description	Term	Options	Multiplier Associated with Option	Choose	Value used	Unit	Total Fire Flow (L/min)	
		Framing Material							
1	Frame Use for Construction of Unit	Coefficient related to type of construction (C)	Wood Frame	1.5	Ordinary Construction	**0.6**	-	N/A	
			Ordinary Construction	1					
			Non-combustible construction	0.8					
			Fire resistive construction (< 2 hrs)	0.7					
			Fire resistive construction (> 2 hrs)	0.6					
		Floor Space Area							
2	Type of Housing (if Tow House, enter number of units per TH block)	Type of Housing	Single Family	1		**0**	Units	N/A	
			Townhouse / Apartment- inform # of units	1		**1**			
			Other (Comm. Ind., etc.)	1					
2.1	Number of Storeys	Number of Floors / Storeys in the unit (do not include basement)				**30**	Storeys	N/A	
3	Floor Area	Largest Floor Area				**1864**	m^2	N/A	
		Ground Floor Area = Largest Floor + 25% of 2 immediately adjoining floors	Square Feet (ft2)	0.093	Square metres	2796			
			Square Metres (m^2)	1					
			Hectares (ha)	10000					
4	Required Fire Flow without Reductions or Increases	Required Fire Flows without Reductions or Increases per FUS): (FF= 220 x C x $A^{0.5}$)					L/min	7,000	
5	Factors Affecting Burning	**Reductions / Increases Due to Factors Affecting Burning**							
5.1	Combustibility of Building Contents	Occupancy content hazard reduction or surcharge	Non-combustible	-0.25	Limited combustible	-0.15	N/A	0	(1,050)
			Limited combustible	-0.15					
			Combustible	0.00					
			Free burning	0.15					
			Rapid burning	0.25					
5.2	Reduction Due to Presence of Sprinklers	Sprinkler reduction	Complete automatic sprinkler protection	-0.3	None	-0.3	N/A	0	(2,100)
			None	0					
5.3	Separation Distance Between Units	Exposure distance between units	North Side	10.1-20	0.15	0.6	m	0	3,570
			East Side	3.1-10	0.2				
			South Side	10.1-20	0.15				
			West Side	20.1-30	0.1				
					Total Required Fire Flow, rounded to nearest 1000 L/min, with max/min limits applied:			0	7,000
6	Required Fire Flow, Duration and Volume				Total Required Fire Flow (above) in L/s:			0	117
					Required Duration of Fire Flow of 7,000 L/min (hrs):			2	
					Required volume for Fire Flow of 7,000 L/min (m^3):			840	

Project:	Barrie Waterfront Developments - Phase 2	Date:	February 14, 2020
File No.:	419392	Designed:	2
Subject:	Preliminary Fire Flow Calculations	Checked	NM
Revisions:			

Fire Underwriters Survey Fire Flow Calculations
Long Method

Calculation Based on 1999 Publication "Water Supply for Public Fire Protection" by Fire Underwriters Survey (FUS).

Step	Description	Term	Options	Multiplier Associated with Option	Choose	Value used	Unit	Total Fire Flow (L/min)	
		Framing Material							
1	Frame Use for Construction of Unit	Coefficient related to type of construction (C)	Wood Frame	1.5	Ordinary Construction	**0.6**	-	N/A	
			Ordinary Construction	1					
			Non-combustible construction	0.8					
			Fire resistive construction (< 2 hrs)	0.7					
			Fire resistive construction (> 2 hrs)	0.6					
		Floor Space Area							
2	Type of Housing (if Tow House, enter number of units per TH block)	Type of Housing	Single Family	1		**0**	Units	N/A	
			Townhouse / Apartment- inform # of units	1		**1**			
			Other (Comm. Ind., etc.)	1					
2.1	Number of Storeys	Number of Floors / Storeys in the unit (do not include basement)				**34**	Storeys	N/A	
3	Floor Area	Largest Floor Area				**1780**	m^2	N/A	
		Ground Floor Area = Largest Floor + 25% of 2 immediately adjoining floors	Square Feet (ft2)	0.093	Square metres	2670			
			Square Metres (m^2)	1					
			Hectares (ha)	10000					
4	Required Fire Flow without Reductions or Increases	Required Fire Flows without Reductions or Increases per FUS): (FF= 220 x C x $A^{0.5}$)					L/min	7,000	
5	Factors Affecting Burning	**Reductions / Increases Due to Factors Affecting Burning**							
5.1	Combustibility of Building Contents	Occupancy content hazard reduction or surcharge	Non-combustible	-0.25	Limited combustible	-0.15	N/A	0	(1,050)
			Limited combustible	-0.15					
			Combustible	0.00					
			Free burning	0.15					
			Rapid burning	0.25					
5.2	Reduction Due to Presence of Sprinklers	Sprinkler reduction	Complete automatic sprinkler protection	-0.3	None	-0.3	N/A	0	(2,100)
			None	0					
5.3	Separation Distance Between Units	Exposure distance between units	North Side	10.1-20	0.15	0.55	m	0	3,273
			East Side	20.1-30	0.1				
			South Side	20.1-30	0.1				
			West Side	3.1-10	0.2				
					Total Required Fire Flow, rounded to nearest 1000 L/min, with max/min limits applied:			0	7,000
6	Required Fire Flow, Duration and Volume				Total Required Fire Flow (above) in L/s:			0	117
					Required Duration of Fire Flow of 7,000 L/min (hrs):			2	
					Required volume for Fire Flow of 7,000 L/min (m^3):			840	

BARRIE WATERFRONT DEVELOPMENTS
CITY OF BARRIE
TATHAM No. 418392

AVAILABLE FIRE FLOW AT 20 P.S.I.

TEST 1

$QA = QT\ (ha/ht)^{0.5}$ From City of Barrie "Water transmission and Distribution Policies and Design Guidelines" page 4

			Value	
Where QA =	Flow at 20 P.S.I.			
QT =	Flow at Test		660	GPM from Fire Flow Test by Vipond
ha=	Pressure Drop Available	80-20 =	60	P.S.I.
ht =	Pressure Drop at Test	80-76 =	4	P.S.I.

QA=	2,556.17	GPM
	161.04	L/s

TEST 2

$QA = QT\ (ha/ht)^{0.5}$ From City of Barrie "Water transmission and Distribution Policies and Design Guidelines" page 4

			Value	
Where QA =	Flow at 20 P.S.I.			
QT =	Flow at Test		843	GPM from Fire Flow Test by Vipond
ha=	Pressure Drop Available	80-20 =	60	P.S.I.
ht =	Pressure Drop at Test	80-75 =	5	P.S.I.

QA=	2,920.24	GPM
	183.97	L/s

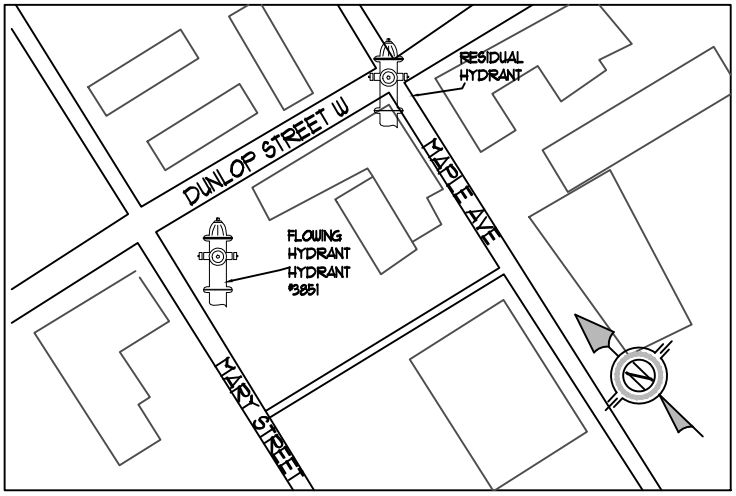
FLOW TEST RESULTS

FIRST FOR FIRE, LIFE SAFETY & SECURITY
VIPOND INC
est. 1945

DATE : MARCH 19, 2019 TIME : 8:30 AM

LOCATION : DUNLOP & MARY STREET
BARRIE
ONTARIO

TEST BY : VIPOND FIRE PROTECTION AND LOCAL PUC



STATIC PRESSURE : 80 PSI UNDERGROUND TYPE & SIZE : N/A

TEST NO.	NO. OF NOZZLES	NOZZLE DIAMETER (INCHES)	DISCHARGE CO-EFFICIENT	RESIDUAL PRESSURE (PSI)	PITOT PRESSURE (PSI)	DISCHARGE (U.S.G.P.M)
1	1	1 3/4"	0.995	76	55	660
2	1	2 1/2"	0.90	75	25	843

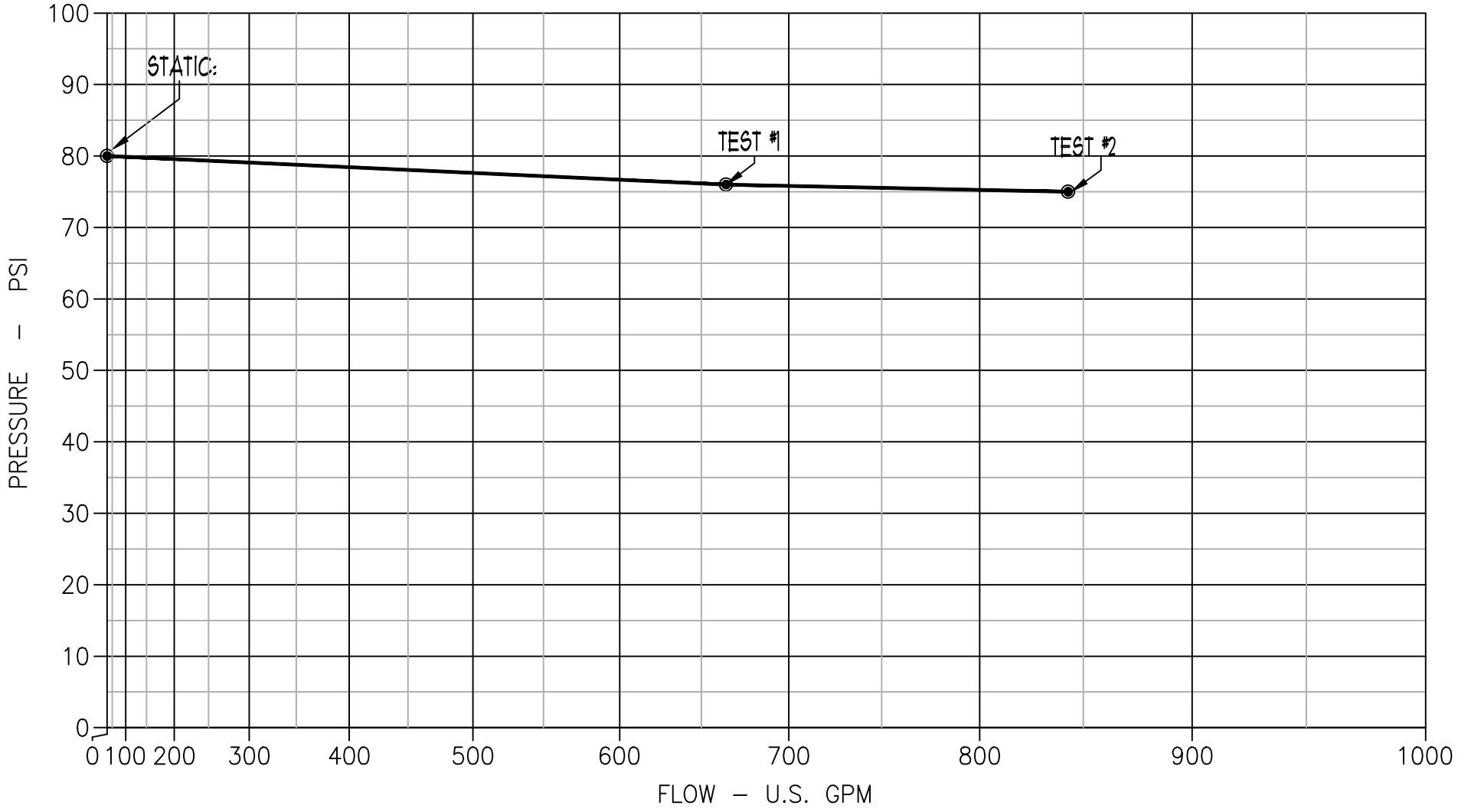
FIRST FOR FIRE, LIFE SAFETY & SECURITY

VIPOND INC

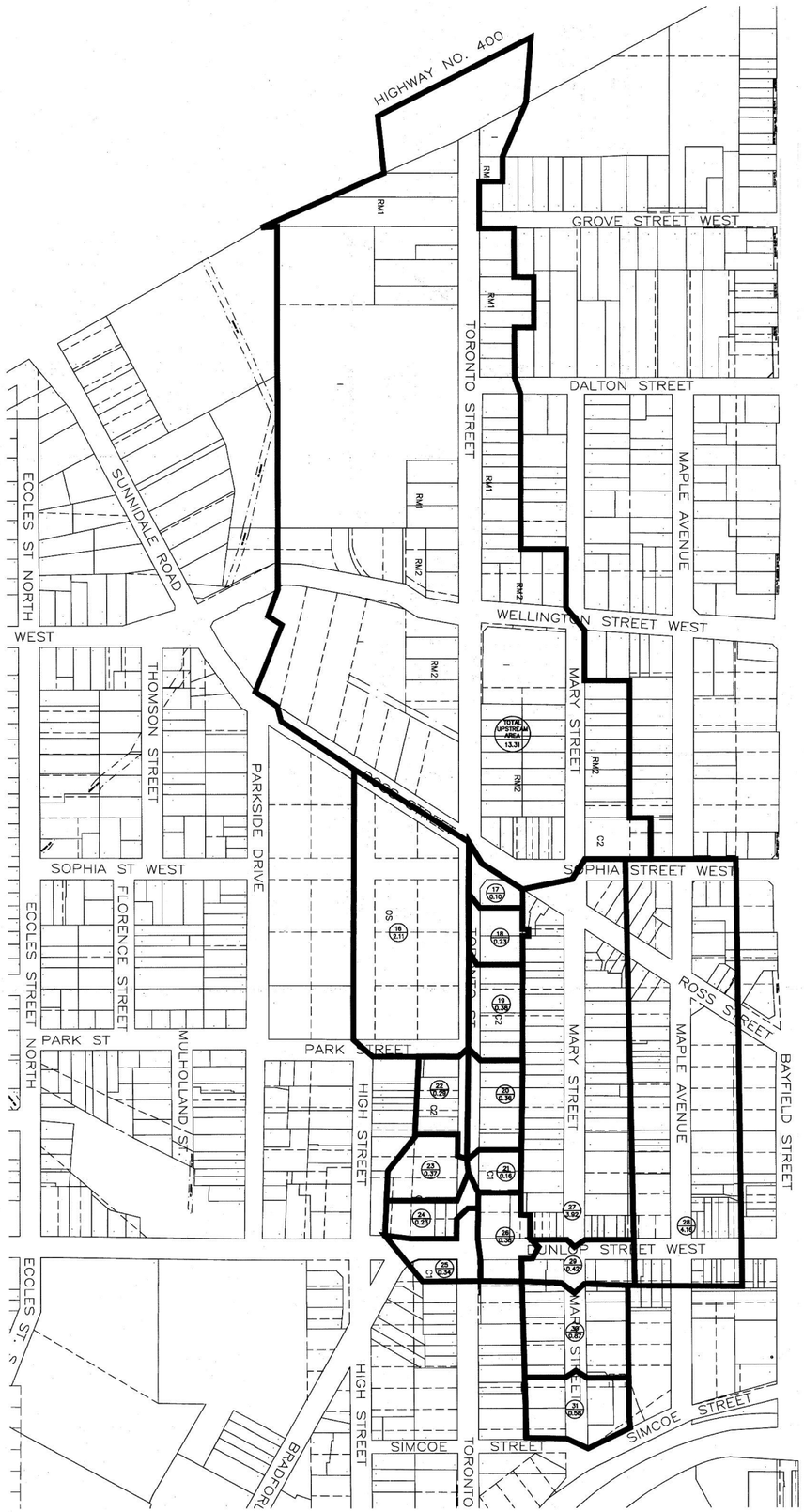
est. 1945

DUNLOP & MARY STREET		BY :	LEN K.
BARRIE		VIPOND OFFICE :	BARRIE
ONTARIO		TEST BY :	VIPOND & PUC
		DATE :	MARCH 19, 2019

STATIC:		RESIDUAL:		FLOW:
80 PSI	TEST#1	76 PSI	@	660 GPM
	TEST#2	75 PSI	@	843 GPM



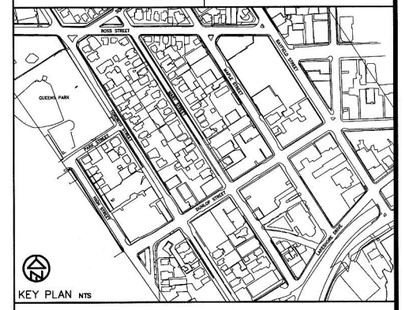
Appendix C:
Sanitary Sewer Design Sheets



CITY OF BARRIE
COUNTY OF SIMCOE

BURNSIDE

R. J. Burnside & Associates Limited
3 Ronell Crescent, Collingwood, Ontario
telephone (705) 446-0515 **fax** (705) 446-2399
web www.rjburnside.com



NO.	REVISIONS	DATE	APPROVED
0	ISSUED FOR TENDER	10.04.09	R.K.

CITY OF BARRIE
APPROVED
DATE April 9/10
DIRECTOR OF ENGINEERING

REGISTERED PROFESSIONAL ENGINEER
R. W. KERR
2010/04/09
PROVINCE OF ONTARIO

TORONTO STREET RECONSTRUCTION

SANITARY DRAINAGE AREA PLAN

CITY of BARRIE
ENGINEERING DEPARTMENT

SCALE	1:2500		
DESIGN	T.L.	DRAWN	R.Y.
REVIEWED	R.W.K.	DATE	09.03.20

CONTRACT NO. **2010-025T**
SHEET NO. **SAN1**

SANITARY SEWER DESIGN - PHASE 1 & 2

Development Details Basis

DESIGN SHEET #1
FILE NO 418392
CONTRACT / PROJECT Barrie Waterfront Developments

n ≥ 0.013
M = 5/P^0.2 Babbit

Numbers in blue or text in red are equations
(Harmon or Babbitt peaking factor where; M ≥ 2), the greater of the two is used in the spreadsheet. Please refer to Section 3.3.1.1 of the Barrie Sanitary Design Guidelines for additional guidance on which peaking factor to use.

$Q_p = P*q*M/86400$ (Peak population flow where; q = 225 L/day/person; P = population) 225
$Q_i = I*A$ (Peak extraneous flow: I= 0.1L/s/ha over development area)
$Q_{tot} = Q_p + Q_i$ (Total peak flow as the sum of peak population flow and peak extraneous flow)

STREET / AREA	MAINTENANCE HOLE FROM	MAINTENANCE HOLE TO	DWELL UNITS	DWELL (ACC) UNITS	DENSITY P.P.U.	POP. (P)	POP. (ACC)	M PEAKING FACTOR HARMON	Q_p (l/s)	AREA (ha)	AREA (ACC) (ha)	Q_i (l/s)	Q_{tot} (l/s)	L (m)	D (mm)	S (%)	Qf FULL (l/s)	d/D[2]	d/D[3] >0.5 or >0.85	Velocity FULL (m/s)	Velocity Partial[1] (m/s)	Velocity[4] > 0.6 (m/s)
Maple Avenue	Ex San MH	Prop SAN MH							0.000				0.000	13	250	0.81%	53.521	#N/A	#N/A	1.090	#N/A	#N/A
PHASE 2	N/A	SAN MH 3	282	282	1.67	471	471	3.987	4.910	0.21	0.21	0.021	4.960	7	200	1.00%	32.798	0.262	Ok	1.044	0.750	Ok
PHASE 2	SAN MH 3	Ex SAN MH	0	0	1.67	0	471	3.987	4.910	0.21	0.21	0.021	4.960	18	200	1.00%	32.798	0.262	Ok	1.044	0.750	Ok
Maple Avenue	Prop SAN MH	Ex SAN MH							4.910				4.960	10	250	0.27%	30.900	0.270	Ok	0.629	0.460	Check
Dunlop Street	Ex SAN MH	Ex SAN MH							11.910				9.920	101	250	0.96%	58.266	0.279	Ok	1.187	0.931	Ok
Mary Street	Ex SAN MH	Prop SAN MH							36.910				36.960	37	300	0.27%	50.247	0.637	Check	0.711	0.777	Ok
PHASE 1	N/A	SAN MH 1	290	290	1.67	484	484	3.981	5.041	0.21	0.21	0.021	5.094	4	200	1.00%	32.798	0.266	Ok	1.044	0.756	Ok
PHASE 1	SAN MH 1	SAN MH 2	0	0	1.67	0	484	3.981	5.041	0.21	0.21	0.021	5.094	14	200	1.00%	32.798	0.266	Ok	1.044	0.756	Ok
PHASE 1	SAN MH 2	Ex SAN MH	0	0	1.67	0	484	3.981	5.041	0.21	0.21	0.021	5.094	8	200	5.00%	73.340	0.178	Ok	2.334	1.334	Ok
Mary Street	Prop SAN MH	Ex SAN MH							41.951				42.054	8	300	0.27%	50.247	0.699	Check	0.711	0.796	Ok
DATE:	2019-04-29				CALCULATED BY:	DJR								CHECKED BY:	NM							

Notes:
(1) without extraneous flow
(2) with extraneous flow
(3) d/D>0.5 for pipes 375 and less, d/D>0.85 for pipes greater than 375
(4) Velocity check based on the lesser of full flow or partial velocity
(5) Flows from Dunlop Street Twin Towers includes flow from commercial units on ground floor at 28 m^3/day/ha
Phase 1 = 0.070 ha * 28m^3/day/ha = 1.95 m^3/day = 1,949 L/day = 0.023 L/s
Phase 2 = 0.085 ha * 28m^3/day/ha = 2.37 m^3/day = 2,372 L/day = 0.027 L/s
(6) Existing flows for Mary Street (32.0 L/s)and Dunlop Street (7.0 L/s) were provided by the City of Barrie

Numbers in Blue are cell formulas

Appendix D: Stormwater Management Calculations

TATHAM ENGINEERING	Project:	Barrie Waterfront Developments	Date:	14/02/2020
	File No.:	418392	Designed By:	DJR
	Subject:	Rational Method Calculations	Checked By:	NM

PRE DEVELOPMENT ANALYSIS

CATCHMENT 101 (PHASE 1)

Runoff Coefficient (Municipal Standard)

2 Year	0.95	
5 Year	0.95	
10 Year	0.95	
25 Year	1.00	$=C_5*1.10$
50 Year	1.00	$=C_5*1.20$
100 Year	1.00	$=C_5*1.25$

Peak Rainfall Intensity (Municipal Standard - Barrie)

	2 YR	5 YR	10 YR	25 YR	50 YR	100 YR
A	678.1	853.6	975.9	1146.3	1236.2	1426.4
B	4.70	4.70	4.699	4.92	4.70	5.273
C	0.781	0.766	0.76	0.757	0.751	0.759

2 Year	152.66	mm/hr	T_C =	2.05
5 Year	197.76	mm/hr	T_C =	2.05
10 Year	228.69	mm/hr	T_C =	2.05
25 Year	263.60	mm/hr	T_C =	2.05
50 Year	294.71	mm/hr	T_C =	2.05
100 Year	314.79	mm/hr	T_C =	2.05

Drainage Area 0.285 ha

Peak Runoff Rate - Rational Method (Q=CiA/360)

2 Year	0.115	m^3/s
5 Year	0.149	m^3/s
10 Year	0.172	m^3/s
25 Year	0.209	m^3/s
50 Year	0.234	m^3/s
100 Year	0.249	m^3/s

PRE DEVELOPMENT ANALYSIS

CATCHMENT 102 (PHASE 2)

Runoff Coefficient (Municipal Standard)

2 Year	0.95	
5 Year	0.95	
10 Year	0.95	
25 Year	1.00	$=C_5*1.10$
50 Year	1.00	$=C_5*1.20$
100 Year	1.00	$=C_5*1.25$

Peak Rainfall Intensity (Municipal Standard - Barrie)

	2 YR	5 YR	10 YR	25 YR	50 YR	100 YR
A	678.1	853.6	975.9	1146.3	1236.2	1426.4
B	4.70	4.70	4.699	4.92	4.70	5.273
C	0.781	0.766	0.76	0.757	0.751	0.759

2 Year	150.30	mm/hr	T_C =	2.18
5 Year	194.76	mm/hr	T_C =	2.18
10 Year	225.25	mm/hr	T_C =	2.18
25 Year	259.78	mm/hr	T_C =	2.18
50 Year	290.33	mm/hr	T_C =	2.18
100 Year	310.43	mm/hr	T_C =	2.18

Drainage Area 0.150 ha

Peak Runoff Rate - Rational Method (Q=CiA/360)

2 Year	0.059	m^3/s
5 Year	0.077	m^3/s
10 Year	0.089	m^3/s
25 Year	0.108	m^3/s
50 Year	0.121	m^3/s
100 Year	0.129	m^3/s

TATHAM ENGINEERING	Project: Barrie Waterfront Developments	Date:	14/02/2020
	File No.: 418392	Designed By:	DJR
	Subject: Rational Method Calculations	Checked By:	NM

POST DEVELOPMENT ANALYSIS

CATCHMENT 201 (PHASE 1)

Runoff Coefficient (Municipal Standard)

2 Year	0.95	
5 Year	0.95	
10 Year	0.95	
25 Year	1.00	$=C_5*1.10$
50 Year	1.00	$=C_5*1.20$
100 Year	1.00	$=C_5*1.25$

Peak Rainfall Intensity (Municipal Standard - Barrie)

	2 YR	5 YR	10 YR	25 YR	50 YR	100 YR
A	678.1	853.6	975.9	1146.3	1236.2	1426.4
B	4.70	4.70	4.699	4.92	4.70	5.273
C	0.781	0.766	0.76	0.757	0.751	0.759

2 Year	150.28	mm/hr	T_C	=	2.19
5 Year	194.74	mm/hr	T_C	=	2.19
10 Year	225.22	mm/hr	T_C	=	2.19
25 Year	259.74	mm/hr	T_C	=	2.19
50 Year	290.29	mm/hr	T_C	=	2.19
100 Year	310.38	mm/hr	T_C	=	2.19

Drainage Area 0.100 ha (uncontrolled)

Peak Runoff Rate - Rational Method (Q=CiA/360)

2 Year	0.040	m^3/s
5 Year	0.052	m^3/s
10 Year	0.060	m^3/s
25 Year	0.072	m^3/s
50 Year	0.081	m^3/s
100 Year	0.087	m^3/s

POST DEVELOPMENT ANALYSIS

CATCHMENT 202 (PHASE 1)

Runoff Coefficient (Municipal Standard)

2 Year	0.95	
5 Year	0.95	
10 Year	0.95	
25 Year	1.00	$=C_5*1.10$
50 Year	1.00	$=C_5*1.20$
100 Year	1.00	$=C_5*1.25$

Peak Rainfall Intensity (Municipal Standard - Barrie)

	2 YR	5 YR	10 YR	25 YR	50 YR	100 YR
A	678.1	853.6	975.9	1146.3	1236.2	1426.4
B	4.70	4.70	4.699	4.92	4.70	5.273
C	0.781	0.766	0.76	0.757	0.751	0.759

2 Year	149.53	mm/hr	T_C	=	2.23
5 Year	193.78	mm/hr	T_C	=	2.23
10 Year	224.12	mm/hr	T_C	=	2.23
25 Year	258.52	mm/hr	T_C	=	2.23
50 Year	288.89	mm/hr	T_C	=	2.23
100 Year	308.99	mm/hr	T_C	=	2.23

Drainage Area 0.082 ha

Peak Runoff Rate - Rational Method (Q=CiA/360)

		Q_{DIST}		
2 Year	0.032	**0.032**	0.000	m^3/s
5 Year	0.042	**0.042**	0.000	m^3/s
10 Year	0.049	**0.049**	0.000	m^3/s
25 Year	0.059	**0.059**	0.000	m^3/s
50 Year	0.066	**0.062**	0.004	m^3/s
100 Year	0.070	**0.062**	0.008	m^3/s

Required Storage Volumes

Dur.	2 YR	5 YR	10 YR	25 YR	50 YR	100 YR
1	-0.8	-1.1	-1.4	-1.6	-1.4	-1.2
2	-0.1	-0.2	-0.2	-0.2	0.2	0.8
3	0.3	0.4	0.4	0.6	1.2	2.0
4	**0.5**	0.6	0.6	0.9	1.7	2.8
5	0.5	**0.6**	**0.7**	**1.0**	**1.9**	3.2
6	0.4	0.5	0.5	0.8	1.8	**3.3**
7	0.2	0.2	0.1	0.5	1.5	3.2
8	-0.1	-0.2	-0.3	0.0	1.0	2.9
9	-0.5	-0.7	-0.9	-0.6	0.4	2.5
10	-0.9	-1.3	-1.5	-1.4	-0.3	1.9
11	-1.4	-1.9	-2.2	-2.2	-1.1	1.2

TATHAM ENGINEERING	Project: Barrie Waterfront Developments	Date:	14/02/2020
	File No.: 418392	Designed By:	DJR
	Subject: Rational Method Calculations	Checked By:	NM

POST DEVELOPMENT ANALYSIS
CATCHMENT 204 (PHASE 2)

Runoff Coefficient (Municipal Standard)

2 Year	0.95	
5 Year	0.95	
10 Year	0.95	
25 Year	1.00	$=C_5*1.10$
50 Year	1.00	$=C_5*1.20$
100 Year	1.00	$=C_5*1.25$

Peak Rainfall Intensity (Municipal Standard - Barrie)

	2 YR	5 YR	10 YR	25 YR	50 YR	100 YR
A	678.1	853.6	975.9	1146.3	1236.2	1426.4
B	4.70	4.70	4.699	4.92	4.70	5.273
C	0.781	0.766	0.76	0.757	0.751	0.759

2 Year	149.62 mm/hr	T_C	=	2.22
5 Year	193.90 mm/hr	T_C	=	2.22
10 Year	224.26 mm/hr	T_C	=	2.22
25 Year	258.67 mm/hr	T_C	=	2.22
50 Year	289.06 mm/hr	T_C	=	2.22
100 Year	309.16 mm/hr	T_C	=	2.22

Drainage Area 0.084 ha (uncontrolled)

Peak Runoff Rate - Rational Method (Q=CiA/360)

2 Year	0.033 m^3/s
5 Year	0.043 m^3/s
10 Year	0.050 m^3/s
25 Year	0.061 m^3/s
50 Year	0.068 m^3/s
100 Year	0.072 m^3/s

POST DEVELOPMENT ANALYSIS
CATCHMENT 205 (PHASE 2)

Runoff Coefficient (Municipal Standard)

2 Year	0.95	
5 Year	0.95	
10 Year	0.95	
25 Year	1.00	$=C_5*1.10$
50 Year	1.00	$=C_5*1.20$
100 Year	1.00	$=C_5*1.25$

Peak Rainfall Intensity (Municipal Standard - Barrie)

	2 YR	5 YR	10 YR	25 YR	50 YR	100 YR
A	678.1	853.6	975.9	1146.3	1236.2	1426.4
B	4.70	4.70	4.699	4.92	4.70	5.273
C	0.781	0.766	0.76	0.757	0.751	0.759

2 Year	149.54 mm/hr	T_C	=	2.23
5 Year	193.80 mm/hr	T_C	=	2.23
10 Year	224.14 mm/hr	T_C	=	2.23
25 Year	258.54 mm/hr	T_C	=	2.23
50 Year	288.91 mm/hr	T_C	=	2.23
100 Year	309.01 mm/hr	T_C	=	2.23

Drainage Area 0.082 ha

Peak Runoff Rate - Rational Method (Q=CiA/360)

		Q_{DIST}	
2 Year	0.033	**0.006**	0.027 m^3/s
5 Year	0.042	**0.006**	0.036 m^3/s
10 Year	0.049	**0.006**	0.043 m^3/s
25 Year	0.059	**0.006**	0.053 m^3/s
50 Year	0.066	**0.006**	0.060 m^3/s
100 Year	0.071	**0.006**	0.065 m^3/s

Required Storage Volumes

Dur.	2 YR	5 YR	10 YR	25 YR	50 YR	100 YR
25	10.7	15.8	19.3	25.1	28.3	31.9
30	10.8	16.3	20.0	26.3	29.7	33.5
35	**10.8**	16.5	20.5	27.1	30.7	34.8
40	10.6	16.6	20.8	27.7	31.5	35.8
45	10.3	**16.7**	20.9	28.2	32.2	36.6
50	10.0	16.6	21.0	28.5	32.6	37.2
55	9.7	16.4	**21.0**	28.8	33.0	37.7
60	9.2	16.2	20.9	28.9	33.3	38.1
65	8.8	15.9	20.8	**29.0**	33.4	38.4
70	8.3	15.6	20.6	29.0	33.6	38.6
75	7.8	15.3	20.4	28.9	**33.6**	38.8
80	7.3	14.9	20.1	28.8	33.6	38.9
85	6.7	14.5	19.8	28.7	33.6	**38.9**
90	6.2	14.1	19.5	28.5	33.5	38.9
95	5.6	13.7	19.1	28.3	33.4	38.8

TATHAM ENGINEERING	Project: Barrie Waterfront Developments	Date:	14/02/2020
	File No.: 418392	Designed By:	DJR
	Subject: Rational Method Calculations	Checked By:	NM

POST DEVELOPMENT ANALYSIS
CATCHMENT 203

Runoff Coefficient (Municipal Standard)

2 Year	0.95	
5 Year	0.95	
10 Year	0.95	
25 Year	1.00	$=C_5*1.10$
50 Year	1.00	$=C_5*1.20$
100 Year	1.00	$=C_5*1.25$

Peak Rainfall Intensity (Municipal Standard - Barrie)

	2 YR	5 YR	10 YR	25 YR	50 YR	100 YR
A	678.1	853.6	975.9	1146.3	1236.2	1426.4
B	4.70	4.70	4.699	4.92	4.70	5.273
C	0.781	0.766	0.76	0.757	0.751	0.759

2 Year	133.82	mm/hr	T_C =	3.29
5 Year	173.80	mm/hr	T_C =	3.29
10 Year	201.18	mm/hr	T_C =	3.29
25 Year	232.89	mm/hr	T_C =	3.29
50 Year	259.65	mm/hr	T_C =	3.29
100 Year	279.56	mm/hr	T_C =	3.29

Drainage Area 0.060 ha

Peak Runoff Rate - Rational Method (Q=CiA/360)

2 Year	0.021	m^3/s
5 Year	0.027	m^3/s
10 Year	0.032	m^3/s
25 Year	0.039	m^3/s
50 Year	0.043	m^3/s
100 Year	0.047	m^3/s

POST DEVELOPMENT ANALYSIS
CATCHMENT 206

Runoff Coefficient (Municipal Standard)

2 Year	0.95	
5 Year	0.95	
10 Year	0.95	
25 Year	1.00	$=C_5*1.10$
50 Year	1.00	$=C_5*1.20$
100 Year	1.00	$=C_5*1.25$

Peak Rainfall Intensity (Municipal Standard - Barrie)

	2 YR	5 YR	10 YR	25 YR	50 YR	100 YR
A	678.1	853.6	975.9	1146.3	1236.2	1426.4
B	4.70	4.70	4.699	4.92	4.70	5.273
C	0.781	0.766	0.76	0.757	0.751	0.759

2 Year	137.83	mm/hr	T_C =	2.99
5 Year	178.90	mm/hr	T_C =	2.99
10 Year	207.05	mm/hr	T_C =	2.99
25 Year	239.46	mm/hr	T_C =	2.99
50 Year	267.13	mm/hr	T_C =	2.99
100 Year	287.13	mm/hr	T_C =	2.99

Drainage Area 0.015 ha (uncontrolled)

Peak Runoff Rate - Rational Method (Q=CiA/360)

2 Year	0.006
5 Year	0.007
10 Year	0.008
25 Year	0.010
50 Year	0.011
100 Year	0.012

TATHAM ENGINEERING	Project: Barrie Waterfront Developments	Date:	14/02/2020
	File No.: 418392	Designed By:	DJR
	Subject: Rational Method Calculations	Checked By:	NM

POST DEVELOPMENT ANALYSIS

CATCHMENT 207

Runoff Coefficient (Municipal Standard)

2 Year	0.95	
5 Year	0.95	
10 Year	0.95	
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Peak Rainfall Intensity (Municipal Standard - Barrie)

	2 YR	5 YR	10 YR	25 YR	50 YR	100 YR
A	678.1	853.6	975.9	1146.3	1236.2	1426.4
B	4.70	4.70	4.699	4.92	4.70	5.273
C	0.781	0.766	0.76	0.757	0.751	0.759

2 Year	133.82	mm/hr	T_C	=	3.29
5 Year	173.80	mm/hr	T_C	=	3.29
10 Year	201.18	mm/hr	T_C	=	3.29
25 Year	232.89	mm/hr	T_C	=	3.29
50 Year	259.65	mm/hr	T_C	=	3.29
100 Year	279.56	mm/hr	T_C	=	3.29

Drainage Area 0.011 ha

Peak Runoff Rate - Rational Method (Q=CiA/360)

2 Year	0.004	m^3/s
5 Year	0.005	m^3/s
10 Year	0.006	m^3/s
25 Year	0.007	m^3/s
50 Year	0.008	m^3/s
100 Year	0.008	m^3/s

TATHAM ENGINEERING	Project:	Barrie Waterfront Developments	Date:	14/02/2020
	File No.	418392	Designed By:	DJR
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RUNOFF COEFFICIENTS

CATCHMENT 101 (EXISTING CONDITION)

Land Use	***RC***	***Area (ha)***
Impervious Area	0.95	0.285

Weighted RC **0.95**

CATCHMENT 102 (EXISTING CONDITION)

Land Use	***RC***	***Area (ha)***
Impervious Area	0.95	0.150

Weighted RC **0.95**

TIME OF CONCENTRATION

CATCHMENT 101 (EXISTING CONDITION)

Slope = 3.2 %
Length 40 m
RC= 0.95
Area= 0.285 ha

Airport Method tc= 2.11 minutes
Bransby Williams M tc= 2.05 minutes

tc= 2.05 minutes

CATCHMENT 102 EXISTING CONDITIONS

Slope = 3.2 %
Length 40 m
RC= 0.95
Area= 0.150 ha

Airport Method tc= 2.11 minutes
Bransby Williams M tc= 2.18 minutes

tc= 2.18 minutes

TATHAM ENGINEERING	Project:	Barrie Waterfront Developments	Date:	14/02/2020
	File No.	418392	Designed By:	DJR
	Subject:	Rational Method Calculations	Checked By:	NM

RUNOFF COEFFICIENTS

CATCHMENT 201 (PROPOSED CONDITION)

Land Use	*RC*	*Area (ha)*
Impervious Area	0.95	0.100

Weighted RC **0.95**

CATCHMENT 202 (PROPOSED CONDITION)

Land Use	*RC*	*Area (ha)*
Impervious Area	0.95	0.082

Weighted RC **0.95**

CATCHMENT 203 (PROPOSED CONDITION)

Land Use	*RC*	*Area (ha)*
Impervious Area	0.95	0.060

Weighted RC **0.95**

CATCHMENT 204 (PROPOSED CONDITION)

Land Use	*RC*	*Area (ha)*
Impervious Area	0.95	0.084

Weighted RC **0.95**

CATCHMENT 205 (PROPOSED CONDITION)

Land Use	*RC*	*Area (ha)*
Impervious Area	0.95	0.082

Weighted RC **0.95**

CATCHMENT 206 (PROPOSED CONDITION)

Land Use	*RC*	*Area (ha)*
Impervious Area	0.95	0.154

Weighted RC **0.95**

CATCHMENT 207 (PROPOSED CONDITION)

Land Use	*RC*	*Area (ha)*
Impervious Area	0.95	0.011

Weighted RC **0.95**

TIME OF CONCENTRATION

CATCHMENT 201 (PROPOSED CONDITION)

Slope = 2 %
Length 35 m
RC= 0.95
Area= 0.100 ha

Airport Method tc= 2.30 minutes
Bransby Williams M tc= 2.19 minutes

tc= 2.19 minutes

CATCHMENT 202 (PROPOSED CONDITION)

Slope = 2 %
Length 35 m
RC= 0.95
Area= 0.082 ha

Airport Method tc= 2.30 minutes
Bransby Williams M tc= 2.23 minutes

tc= 2.23 minutes

CATCHMENT 203 (PROPOSED CONDITION)

Slope = 2 %
Length 50 m
RC= 0.95
Area= 0.060 ha

Airport Method tc= 2.75 minutes
Bransby Williams M tc= 3.29 minutes

tc= 3.29 minutes

CATCHMENT 204 (PROPOSED CONDITION)

Slope = 2 %
Length 35 m
RC= 0.95
Area= 0.084 ha

Airport Method tc= 2.30 minutes
Bransby Williams M tc= 2.22 minutes

tc= 2.22 minutes

TATHAM ENGINEERING	Project:	Barrie Waterfront Developments	Date:	14/02/2020
	File No.	418392	Designed By:	DJR
	Subject:	Rational Method Calculations	Checked By:	NM

CATCHMENT 205 (PROPOSED CONDITION)

Slope = 2 %
Length 35 m
RC= 0.95
Area= 0.082 ha

Airport Method tc= 2.30 minutes
Bransby Williams M tc= 2.23 minutes

tc= 2.23 minutes

CATCHMENT 206 (PROPOSED CONDITION)

Slope = 2 %
Length 50 m
RC= 0.95
Area= 0.154 ha

Airport Method tc= 2.75 minutes
Bransby Williams M tc= 2.99 minutes

tc= 2.99 minutes

CATCHMENT 206 (PROPOSED CONDITION)

Slope = 2 %
Length 20 m
RC= 0.95
Area= 0.011 ha

Airport Method tc= 1.74 minutes
Bransby Williams M tc= 1.56 minutes

tc= 1.56 minutes

BARRIE WATERFRONT DEVELOPMENTS
CITY OF BARRIE
PROJECT NO. 418392

RATIONAL METHOD CALCULATIONS - SUMMARY

PRE-DEVELOPMENT FLOW RATES (m^3/s)

	Catchment 101 (Mary Street)	Catchment 102 (Maple Avenue)
2 Year	0.115	0.059
5 Year	0.149	0.077
10 Year	0.172	0.089
25 Year	0.209	0.108
50 Year	0.234	0.121
100 Year	0.249	0.129

POST-DEVELOPMENT FLOW RATES (m^3/s) (MARY STREET)

	Catchment 201	Catchment 202 (Controlled)	Catchment 203	Catchment 204	Total (Directed to Storm Sewer) (Catcment 201 and 202)	Total (Catchment 201, 202, 203 and 204)
2 Year	0.040	0.032	0.021	0.006	0.072	0.099
5 Year	0.052	0.042	0.027	0.007	0.094	0.128
10 Year	0.060	0.049	0.032	0.008	0.109	0.149
25 Year	0.072	0.059	0.039	0.010	0.131	0.180
50 Year	0.081	0.062	0.043	0.011	0.143	0.198
100 Year	0.087	0.062	0.047	0.012	0.149	0.207

POST-DEVELOPMENT FLOW RATES (m^3/s) (MAPLE AVENUE)

	Catchment 204	Catchment 205 (Controlled)	Catchment 207	Total (Directed to Storm Sewer) (Catchment 204 and 205)	Total (Catchment 204, 205 and 207)
2 Year	0.033	0.006	0.004	0.039	0.043
5 Year	0.043	0.006	0.005	0.049	0.054
10 Year	0.050	0.006	0.006	0.056	0.061
25 Year	0.061	0.006	0.007	0.067	0.073
50 Year	0.068	0.006	0.008	0.074	0.081
100 Year	0.072	0.006	0.008	0.078	0.087

BARRIE WATERFRONT DEVELOPMENTS
CITY OF BARRIE
PHOSPHOROUS BUDGET ASSESSMENT

			Existing		Proposed	
LAND USE CATEGORY	**Existing Phosphorous Loading Rate (kg/ha/year)**	**Future Phosphorous Loading Rate (kg/ha/year)**	**Existing Area (ha)**	**Existing Phosphorous Loading (kg/year)**	**Area (ha)**	**Phosphorous Load (kg/year)**
Hay - Pasture	0.07	0.07	0.00	0.00	0.00	0.00
Cropland	0.19	0.19	0.00	0.00	0.00	0.000
Turf -Sod	0.12	0.12	0.00	0.00	0.00	0.00
Quarry	0.08	0.08	0.00	0.00	0.00	0.00
Low Intensity Development	0.13	0.13	0.00	0.00	0.00	0.00
Unpaved Road	0.83	0.83	0.00	0.00	0.00	0.00
High Intensity Development - C/I	1.82	1.82	0.43	0.79	0.00	0.00
High Intensity Development - R	1.32	1.32	0.00	0.00	0.43	0.57
Transition	0.06	0.06	0.00	0.00	0.00	0.00
Polder	0.00	0.00	0.00	0.00	0.00	0.00
Forest	0.05	0.05	0.00	0.00	0.00	0.00
Wetland	0.05	0.05	0.00	0.00	0.00	0.00
Total			**0.43**	**0.79**	**0.43**	**0.57**

Notes: 1) Phosphorus Loading Rates determined from MOE's Phosphorus Budget Tool in Support of Sustainable Development for the Lake Simcoe Watershed (2012)

Summary		
Existing Phosphorous Load	0.791	kg/year
Post Development Phosphorous Load (no cont	0.568	kg/year
Increase	-0.224	kg/year

Phosphorous Offsetting Policy		
Post Development Phosphorous Load (no controls)	0.568	kg/year
Offset Calculation (2.5 * P deficit * $35,000)	**$49,665.00**	