

**PROPOSED FOUR STOREY
RESIDENTIAL APARTMENT BUILDING SITE
LOT 23 (SOUTH MURRAY STREET)
R-PLAN 42482
168 – 174 MURRAY STREET
CITY OF OTTAWA**

**SERVICEABILITY REPORT
REPORT R-822-43A (REV. #1)
DECEMBER 2023**

**T.L. MAK ENGINEERING CONSULTANTS LTD.
JUNE 2023
REFERENCE FILE NUMBER 822-43**

Introduction

The developer of this site is proposing to redevelop the existing (2) residential lots described as Lot 23 (South Murray Street) Registered Plan 42482 City of Ottawa by constructing a (4) storey residential apartment building consisting of twenty (20)-units, including seven (2)-bedroom units and thirteen (1)-bedroom units.

The municipal address of the (2) properties are referenced as 168 and 174 Murray Street and it is located in the City Ward (Ward 12 – Rideau-Vanier). A portion of the existing building at 168 and 174 Murray Street will be kept while the remaining will be demolished and be replaced by new construction. The site is situated on the south side of Murray Street, west of Cumberland Street and east of Dalhousie Street. See site plan and legal survey plan in **Appendix A** for details.

The area of this property is ± 0.0654 hectares. In addition to the four (4) storey residential apartment building, the other development features will comprise of a hard surface pathway to the front of the building and along east limit of the site with pedestrian access to the rear yard, amenity area is proposed in the rear yard, as well as (3) proposed bicycle parking spaces at the front of the lot including landscaped areas throughout the site, etc., to meet the City of Ottawa's site plan requirements.

A site geotechnical report was prepared by the owner's soils engineer Paterson Group entitled Geotechnical Investigation – Proposed Residential Building (Project No. PG6242-1) dated August 11, 2022 for this proposed development property.

The City of Ottawa requires the owner to apply and consolidate the parcels (168 and 174 Murray Street) of land into one ownership otherwise the proposed stormwater works will be servicing more than one parcel of land and thus does not meet the exemption set out in O.Reg. 525/98. This would mean an Environmental applications for Certification of Approval (ECA) would be required regardless of who owns the parcels. However, the owners have confirmed that the two (2) properties at 168 and 174 Murray Street is under one ownership and therefore no ECA would be required for this site development.

This serviceability report will provide the City of Ottawa with our serviceability brief to address the proposed servicing scheme for this site.

Existing Site Conditions and Servicing

This amalgamated property is presently occupied by two residential buildings. Each of the building shares a centrally located gravelled driveway for vehicle access and parking. Approximately one half of the existing site is currently hard surface covered and consisting of

roof areas, concrete/gravel areas with the remaining areas being porches, decks, sheds, grass and landscaped areas. For additional details of the site's pre-development conditions, refer to the coloured Google Image and aerial photography from (GeoOttawa 2021) in **Appendix B**.

The existing topography of the land is found to be sloped primarily to drain from south to north (back to front) across the site. The existing average gradient of the properties are sloping at an approximate gradient of 2.1%.

Existing water service and sanitary lateral currently servicing the existing dwelling on 168 and 174 Murray Street will be removed. The existing water services shall be blanked at the main and the existing house laterals shall be capped at the front property line for re-development of this site.

As for the availability of underground municipal services, there are existing municipal services along Murray Street in front of this property consisting of a 675mm diameter storm sewer, a 375mm diameter sanitary sewer, and a 200mm diameter watermain for development of this property. Refer to the City of Ottawa Murray Street UCC and As-Built plan and profile drawings included in **Appendix C** for details.

Because the site will be connecting to and outletting into the separated storm sewer system along Murray Street in the City of Ottawa, therefore, the approval exemption under Ontario Regulations 525/98 would apply since storm water discharges from this site will outlet flow into a downstream storm sewer. Thus, an Environmental Compliance Approval (ECA) application will not be required to be submitted to the Ministry.

Proposed Residential Apartment Building Site

Pedestrian access to the front entrance and east side yard entrance and rear yard are provided by means of interlock pathway. Bicycle parking, (3) spaces are available at the front yard. A hard surface pathway and hard landscaping area are proposed at the rear yard including landscaped and amenity areas.

A. Water Supply

The proposed building located within Pressure Zone 1W at 168-174 Murray Street is a 4-storey residential building, with a basement. A portion of the existing buildings at 168 and 174 Murray Street will be kept, while the remaining will be demolished and be replaced by new construction.

The proposed building contains twenty (20) residential units, namely thirteen (13) 1-bedroom units, and seven (7) 2-bedroom units. The total gross floor area of the proposed building is

approximately 1,292.0m², excluding the basement. The building is to be serviced by the 203mm diameter watermain along Murray Street, via a 10.5m long service line.

The ground elevation on the property is approximately 59m, as obtained from geoOttawa elevation contours (See **Figure 1** – Elevation Contours in **Appendix D**).

Demand Projections

The domestic demands were calculated using the City of Ottawa’s Water Design Guidelines. For residential units, a consumption rate of 280 L/cap/d was used to estimate average day demands (AVDY). Persons per unit (PPU) for each unit were estimated based on the City of Ottawa’s Water Design Guidelines. Following discussions with the City, peaking factors are to be estimated from Table 3-3 of the MECP Design Guidelines for Drinking-Water Systems, given that the proposed development population is less than 500 people. Maximum day (MXDY) demands were calculated by multiplying AVDY demands by a factor of 9.4. Peak hour (PKHR) demands were calculated by multiplying AVDY by a factor of 14.1. **Table 1** shows the estimated domestic demands of the proposed building.

Table 1 : Estimated Domestic Demand

Unit Type	Unit Count	PPU	Consumption	AVDY		MXDY		PKHR	
				L/d	L/s	L/d	L/s	L/d	L/s
Apartment, 1-Bedroom	13	1.4	280	5,096	0.06	47,845	0.55	72,023	0.83
Apartment, 2-Bedroom	7	2.1	280	4,116	0.05	38,644	0.45	58,172	0.67
Total	20			9,212	0.11	86,490	1.00	130,195	1.51

The fire flow requirement was determined following the Fire Underwriter Survey (FUS) method. For this analysis, the building was classified as wood frame construction, with building contents that are limited in combustibility. It is understood that the building will have a sprinkler system. The anticipated sprinkler demand for the proposed building shall be assessed at the design stage by the sprinkler designer, as per NFPA 13¹. For reference, using the Hydraulically Calculated Systems method described in NFPA 13, a flow rate of 950 L/min (15.8 L/s) is suggested for ordinary hazard, and 1,900 L/min (31.7 L/s) for extra hazard (see Table 19.2.3.1.2).

Note that the proposed building is proposed to be within 3 m of the adjacent property (166 Murray Street). The recently updated 2020 FUS Guidelines do not consider wood frame structures separated by less than 3 metres as a single fire area. As such, only the effective building area of the proposed building was considered in the calculations.

¹ NFPA. (2022) Standard for the Installation of Sprinkler System. NFPA 13.

The resulting total required fire flow (RFF) is 14,000 L/min (233 L/s) for a duration of 3 hours. Details are provided in the attached **FUS Fire Flow Calculations** in **Appendix D**. The proposed **Site Plan** attached in **Appendix D** was used to determine distances from the proposed building to the property lines. **Figure 2** in **Appendix D** provides separation distances from adjacent buildings.

In summary, the estimated water demands for the proposed building are as follows:

- AVDY = 9,212 L/d (0.11 L/s)
- MXDY = 86,490 L/d (1.00 L/s);
- PKHR = 130,195 L/d (1.31 L/s); and,
- Fire Flow FUS = 14,000 L/min (233 L/s)

Boundary Conditions

The hydraulic gradeline (HGL) boundary conditions for 168-174 Murray Street, as presented in **Table 2**, were provided by the City on June 22, 2023 (see attached **Water Boundary Conditions Email** in **Appendix D**). It should be noted that the boundary condition values presented in **Table 2** were provided for previously identified water demands, using different peaking factors, as per the attached **Water Boundary Conditions Email** in **Appendix D**. However, given the marginal difference in flows (less than 1 L/s), it is assumed that the values listed in Table 2 are representative of the expected hydraulic conditions at the proposed site.

Table 2 : Boundary Conditions

Demand Scenario	Head (m)
Minimum HGL (Peak Hour)	106.3
Maximum HGL (Average Day)	115.4
Maximum Day + Fire Flow (FUS – 14,000 L/min)	98.1

Hydraulic Analysis

Peak Hour & Average Day Demand

During average day demands, the resulting maximum hydraulic gradeline of 115.4 m corresponds to a maximum pressure of 553 kPa (80 psi). This value is marginally higher than the maximum pressure objective of 552 kPa (80 psi) and is therefore considered acceptable.

During peak hour demands, the resulting minimum hydraulic gradeline of 106.3 m corresponds to a peak hour pressure of 464 kPa (67 psi). This value is above the minimum pressure objective of 276 kPa (40 psi) for residential buildings up to two storeys. From a servicing perspective, the peak hour pressure exceeds this objective and is therefore considered acceptable. Given that this building consists of a total of 4 storeys, further consideration will be needed to service the

higher floors. Adding 5 psi per floor above two stories (i.e., 2 additional floors), a minimum pressure of 345 kPa (50 psi) would be required for the fourth floor. The peak hour pressure calculated is greater than this objective and is therefore considered acceptable. **Supporting Hydraulic Calculations** are attached in **Appendix D**.

For the proposed building (20 units), about 257 fixture units are to be considered based on the Ontario Building Code (Table 7.6.3.2.A) and the hydraulic load per fixture. **Table 3** summarizes the fixture units estimated based on the attached **Site Plan** in **Appendix D**. For domestic flows, a minimum service line of 1 ½ inches (40 mm) can service up to 286 fixture units, based on the National Plumbing Code² (see Table A-2.6.3.1.(2)-A).

Table 3 : Fixture Counts

Fixture Type	No. of Fixtures	Hydraulic Load/Fixture	Hydraulic Load/Fixture Units
Lavatory	33	1.2	49.5
Toilet	33	2.2	72.6
Hose Bib (5/8)	4	2.5	10.0
Tub/Shower	33	1.5	49.5
Dishwasher	20	1.4	28.0
Sink	20	1.4	28.0
Washer	20	1.0	20.0
Total			257.6

However, a larger service line is needed due to the sprinkler system servicing the proposed building. The sprinkler line size shall be validated upon identification of the sprinkler flow at the design stage. For reference, the lower 950 L/min (15.8 L/s) flow for ordinary hazard would result in 0.9 m/s velocity and 0.1 m of head losses through a 150 mm diameter line (10.5 m long). A flow of 1,900 L/min (31.7 L/s) for extra hazard would result in 1.8 m/s velocity and 0.4 m of head losses through a 150 mm diameter line.

² National Research Council of Canada (2020). National Plumbing Code of Canada. Issued by the Canadian Commission on Building and Fire Codes. 11th Edition.

Maximum Day + Fire Flow

A maximum day plus fire flow (14,000 L/min) hydraulic gradeline of 98.1 m corresponds to a residual pressure of 383 kPa (56 psi) at this location, which is above the minimal residual pressure requirement of 140 kPa (20 psi).

Based on Table 1 of Appendix I of the City of Ottawa Technical Bulletin ISTB-2018-02 and a desktop review (i.e., Google Street View) to confirm hydrant class, five (5) hydrants are located in the vicinity of the proposed building. Two (2) Class AA hydrants are within 75 m, both with a

capacity contribution of up to 5,700 L/min. Three (3) others Class AA hydrants are within 150 m from the site, both with a capacity contribution of up to 3,800 L/min. The combined hydrant flow coverage for 168-174 Murray Street is therefore 22,800 L/min, which is above the RFF obtained from the FUS (14,000 L/min) methods.

The hydrant coverage is illustrated in **Figure 3** attached in **Appendix D**. A breakdown of the hydrant coverage is summarized in **Table 4**.

Table 4 : Minimum Fire Hydrant Coverage

Building	Calculated Fire Flow Demand (L/min)	Fire Hydrants					Minimum Combined Hydrant Flow Coverage (L/min)
		Hydrant Class	Within 75 m		Between 75 m and 150 m		
			Quantity	Contrib. to RFF	Quantity	Contrib. to RFF	
168-174 Murray Street	14,000 (FUS)	AA	2	5,700	3	3,800	22,800
		A					
		B					
		C					

In conclusion, based on the boundary condition provided, 203 mm diameter watermain along Murray Street provides adequate fire flow capacity, as per the Fire Underwriters Survey (FUS) method, to the proposed development at 168-174 Murray Street. Resulting pressures during anticipated demand flows meet the pressure objectives during average and peak demand conditions, as per the City of Ottawa's Drinking Water Design Guidelines.

B. Sanitary Flow

The peak sanitary flow for the 20 units, which comprise of seven (2)-bedroom units and thirteen (1)-bedroom units, is estimated at $Q = 0.45$ L/s with an infiltration rate of 0.02 L/s. Refer to **Appendix E** sheet 1 of 1 regarding sanitary flow calculations. This flow will enter the existing 375 mm diameter sanitary sewer on Murray Street via the proposed 150 mm diameter PVC sanitary service lateral from the four (4)-storey residential apartment building.

The existing peak sanitary flow of the site for the (2) existing single detached dwelling units is $Q = 0.13$ L/s with an infiltration rate of 0.02 L/s. The net increase in flow from this proposed development is 0.32 L/s which is not expected to negatively impact the existing 375 mm dia. sanitary sewer.

Waste water from the Murray Street 375 mm dia. sanitary sewer then in turn outlets north into the existing downstream 450/525 mm dia. sanitary sewer located along Cumberland Street where the waste water further outlets northward to the existing 2100 mm dia. sanitary trunk sewer situated just north of Cathcart Street.

C. Storm Flow

The storm-water outlet for the proposed development property will be the existing 675mm diameter storm sewer located on Murray Street. Stormwater attenuation on site will be accomplished by means of rooftop storage with controlled roof drains that regulate flow off site.

Four (4) roof drains are proposed for this apartment building that will restrict maximum flow to a rate of 1.28 L/s (4×0.32 L/s) under a head of 150mm and into the Murray Street storm sewer. The calculated net allowable controlled release rate from this site is estimated at 7.01 L/s under the 2 year pre-development event.

Based on the residential site plan from the owner's architect, the average post-development runoff coefficient is estimated at $C = 0.72$ and $A = 0.0654$ hectares.

An estimation of the 2-year pre-development flow condition was carried out using the criteria accepted by the City of Ottawa. If post-development C value exceeds the lesser of the $C_{pre} = 0.57$ or $C_{allow} = 0.5$ (max) then SWM is required. So from our calculations, the $C_{allow} = 0.5$ (max) value will be used at $t_c = 10$ minutes for pre-development allowable flow calculation off-site.

The allowable $C = 0.5$ (max) flow rate calculated into the existing storm sewer for re-development of this residential area is the lesser of the two (2)-Year storm event where $C_{allow} = 0.5$ (max.) runoff value and $t_c = 10$ minutes versus the average C_{pre} value which is 0.57 using $t_c = 10$ minutes. Because the site $C_{post} = 0.72$ and $C_{pre} = 0.57$ then SWM measures are required.

Therefore, based on our calculation, on-site retention is required for this proposed development site, because the site post-development C value of 0.72 is greater than the $C_{pre} = 0.57$.

The storage volume for the two (2)-year and up to the 100-year storm event will be stored by means of flat rooftop on the top of the fourth floor of the apartment building. Also refer to the site storm drainage report (Report No. R-822-43) for further details.

To control the two (2)-Year storm-water release rate off-site from roof top to a rate of 1.28 L/s, a site storage volume of approximately 3.49 m^3 minimum is required during the two (2)-year event.

During the two (2)-year storm event for the flat rooftop storage, the ponding depth of rooftop area 1, 2, 3 and 4 is estimated at 100mm at the drain and 0mm at the roof perimeter, assuming a 1.6% minimum roof pitch to the drain and controlling the flow rate at 0.32 L/s per drain. The

rooftop storage available at Roof Area 1 is 1.12 m^3 , rooftop storage available at Roof Area 2 is 1.35 m^3 , rooftop storage available at Roof Area 3 is 1.40 m^3 and the rooftop storage available at Roof Area 4 is 0.70 m^3 , for a total storage volume of 4.57 m^3 , which is greater than the required volume of 3.49 m^3 .

During the 100-year storm event for the flat rooftop storage, the ponding depth of Roof Area 1, 2, 3 and 4 is estimated at 150 mm at the drain and 0mm at the roof perimeter, assuming a 1.6% minimum roof pitch to the drain and controlling the flow rate at 0.32 L/s per drain. The rooftop storage available at Roof Area 1 is 3.65 m^3 , rooftop storage available at Roof Area 2 is 4.55 m^3 , rooftop storage available at Roof Area 3 is 5.0 m^3 and the rooftop storage available at Roof Area 4 is 2.46 m^3 , for a total storage volume of 15.66 m^3 , which is greater than the required volume of 13.13 m^3 .

Therefore, by means of flat building rooftop storage as shown on the Proposed Rooftop Stormwater Management Plan and grading the site to the proposed grades as shown on the Proposed Grading and Servicing Plan Dwg. 822-43 SWM-1 and 822-43 G-1 respectively, the desirable two (2)-year storm and 100-year storm event detention volume of 4.57 m^3 and 15.66 m^3 respectively will be available on site. Refer to Appendix D in the Storm Drainage Report (Report No. R-822-43) for detailed calculations of available storage volumes.

At this development site, for storm events up to the 100-year event, the maximum post development flow draining off-site is the controlled roof top flow plus the 100-year uncontrolled flow from the site draining to the front which totals to 11.75 L/s ($1.28 \text{ L/s} + 10.47 \text{ L/s}$) and is 4.74 L/s greater than the allowable flow of 7.01 L/s.

In comparing the pre-development flow of the current site conditions to the post development flow and with the SWM regulated flow plus uncontrolled flow from the proposed site under the post development conditions at the 2-Year event = 5.22 L/s and the 100-Year event = 11.75 L/s whereupon the post development flow events are less than the current 2-Year event and less than the current 100-Year event pre-development flow estimate for the site at 2-Year $_{Pre} = 7.01 \text{ L/s}$ and 100-Year $_{Pre} = 21.43 \text{ L/s}$. Therefore with this proposed development, stormwater flow off-site is considered improved from that of the existing conditions.

The building weeping tile drainage will outlet via a proposed 150mm dia. PVC storm lateral. The roof drains will also be outletted via a separate 150mm dia. PVC lateral from the building which is then wye'd into the proposed 150mm dia. storm lateral on private property and connected to the existing Murray Street 675mm dia. storm sewer. The City of Ottawa recommends that pressurized drain pipe material be used in the building for the roof drain leader pipe in the event of surcharging in the City Storm sewer system. Refer to the proposed site grading and servicing plan Dwg. 822-43 G-1 for details.

Erosion and Sediment Control

The contractor shall implement Best Management Practices to provide for protection of the receiving storm sewer during construction activities. These practices are required to ensure no sediment and/or associated pollutants are released to the receiving watercourse. These practices include installation of a "silsack" catch basin sediment control device or equal in catch basins as recommended by manufacturer on-site and off-site within the Murray Street road right of way adjacent to this property. Siltsack shall be inspected every 2 to 3 weeks and after major storm. The deposits will be disposed of as per the requirements of the contract. See Dwg. #822-43 ESC-1 for details.

Refer to **Appendix F** for the summary of the Development Servicing Study Checklist that is applicable to this development.

PREPARED BY T.L. MAK ENGINEERING CONSULTANTS LTD.



TONY L. MAK, P.ENG



**PROPOSED FOUR STOREY
RESIDENTIAL APARTMENT BUILDING SITE
LOT 23 (SOUTH MURRAY STREET)
R-PLAN 42482
168 – 174 MURRAY STREET
CITY OF OTTAWA**

**APPENDIX A
SITE PLAN AND LEGAL SURVEY PLAN**

— LOT LOCATION

**TOPOGRAPHIC PLAN OF SURVEY OF
LOT 23 (South Murray Street)
REGISTERED PLAN 42482
CITY OF OTTAWA**

Surveyed by Annis, O'Sullivan, Vollebek Ltd.

Scale 1:150



Metric
DISTANCES SHOWN ON THIS PLAN ARE IN METRES AND
CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048

Surveyor's Certificate

I CERTIFY THAT:
1. This survey and plan are correct and in accordance with the Survey Act and the regulations made thereunder.
2. This survey was completed on the 7th day of January, 2021.

Jan 12/21
Date

T. Hartwick
Ontario Land Surveyor

Notes & Legend

- Denotes**
- Survey Monument Planted
 - Survey Monument Found
 - Standard Iron Bar
 - Short Standard Iron Bar
 - Iron Bar
 - Cut Cross
 - Concrete Pin
 - Witness
 - Measured
 - Knot, O'Sullivan, Vollebek Ltd.
 - Origin Unknown
 - Registered Plan 42482
 - (1602) Plan dated February 3, 2004
 - Plan 48-11000
 - Plan 58-3646
 - Plan 58-14850
 - Deciduous Tree
 - Fire Hydrant
 - Maintenance Hole (Sanitary)
 - Maintenance Hole (Unidentified)
 - Catch Basin
 - Top of Grate
 - Gas Meter
 - Bell Terminal Box
 - Board
 - Board Fence
 - Concrete Sidewalk
 - Light Standard
 - Air Conditioner
 - Diameter
 - Location of Elevations
 - Top of Concrete Curb Elevation
 - Centreline
 - Property Line

Bearings are astronomic and are referred to the southerly limit of
Murray Street, shown to be N59°05'00"E of Registered Plan 42482.

ELEVATION NOTES

1. Elevations shown are geodetic and are referred to the CGVD28 geoid datum.
2. It is the responsibility of the user of this drawing to verify that the benchmark agrees with the information shown on this drawing.

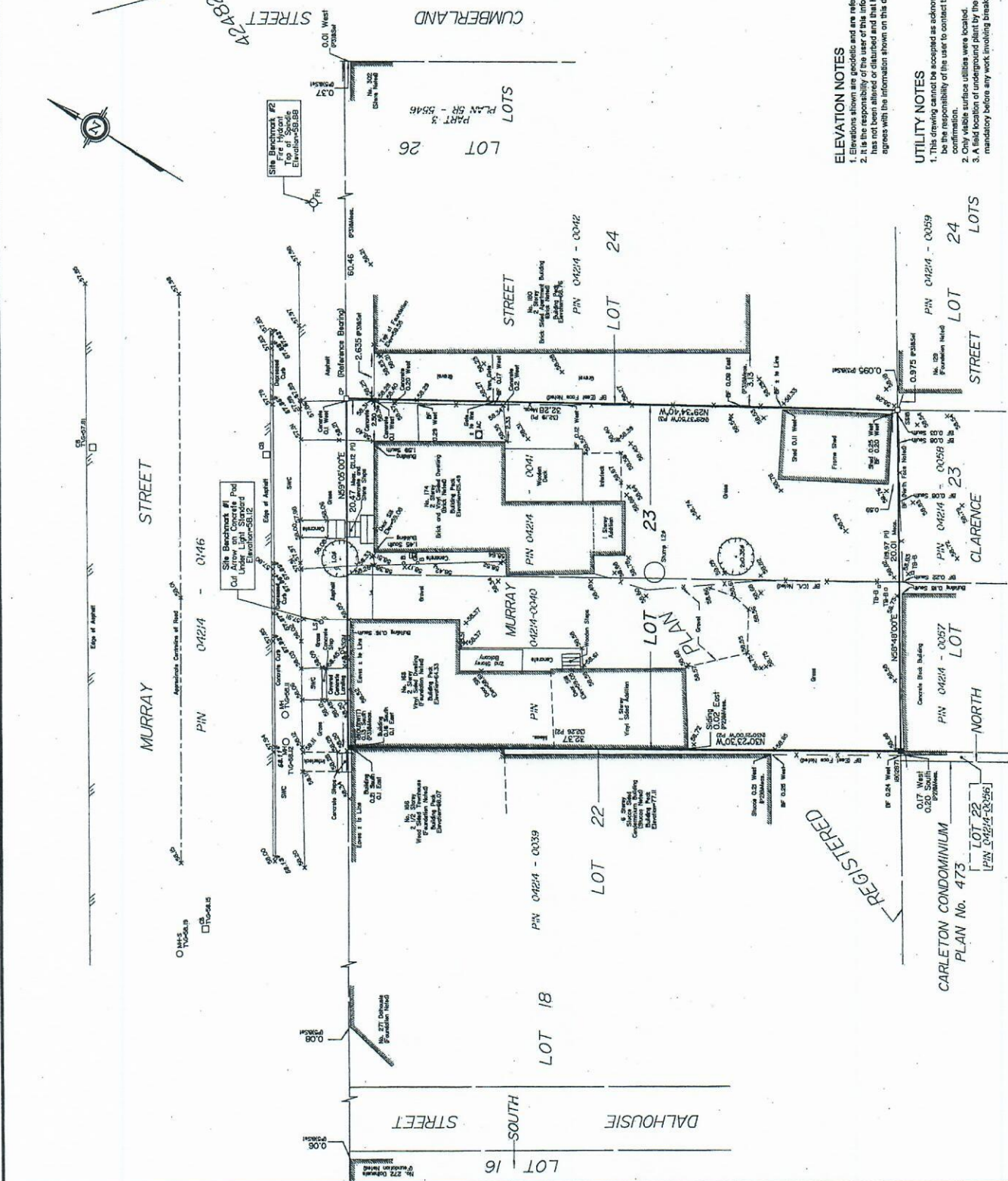
UTILITY NOTES

1. This drawing cannot be accepted as acknowledging all of the utilities and it will be the responsibility of the user to contact the respective utility authorities for confirmation.
2. Only visible surface utilities were located.
3. A field location of underground plant by the pertinent utility authority is mandatory before any work involving breaking ground, probing, excavating etc.

ASSOCIATION OF ONTARIO
LAND SURVEYORS
PLAN SUBMISSION FORM
2150043



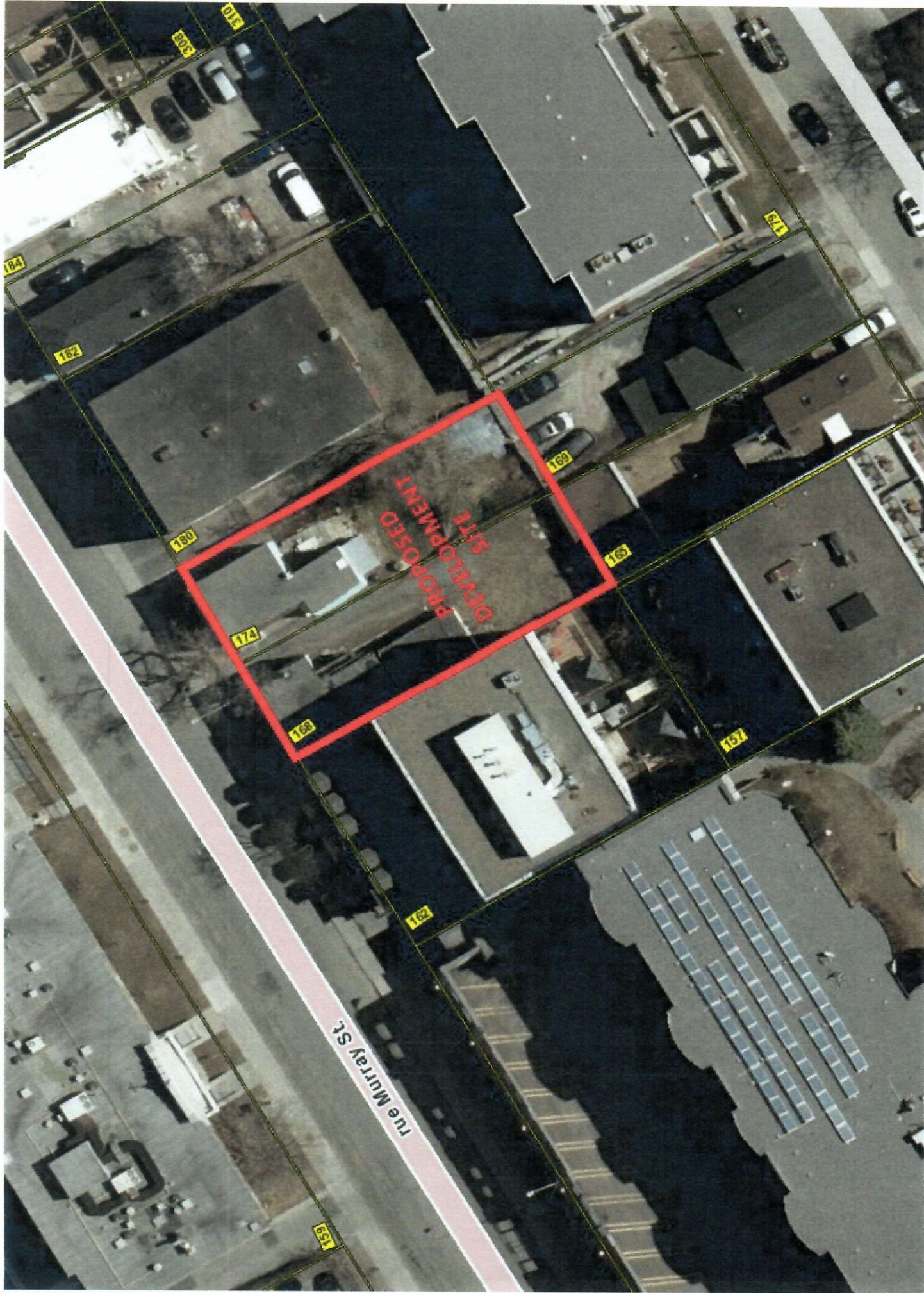
ANNIS, O'SULLIVAN, VOLLEBEK LTD.
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LOT 23 (SOUTH MURRAY STREET)
R-PLAN 42482
168 – 174 MURRAY STREET
CITY OF OTTAWA**

**APPENDIX B
SITE PRE-DEVELOPMENT CONDITION
GOOGLE IMAGE (2021)
AND
AERIAL PHOTOGRAPHY 2021 (GEOOTTAWA)**







**PROPOSED FOUR STOREY
RESIDENTIAL APARTMENT BUILDING SITE
LOT 23 (SOUTH MURRAY STREET)
R-PLAN 42482
168 – 174 MURRAY STREET
CITY OF OTTAWA**

**APPENDIX C
MURRAY STREET
CITY OF OTTAWA
PLAN AND PROFILE
AND
UCC DRAWINGS**

2401-10 10 OF 26

NOTE:

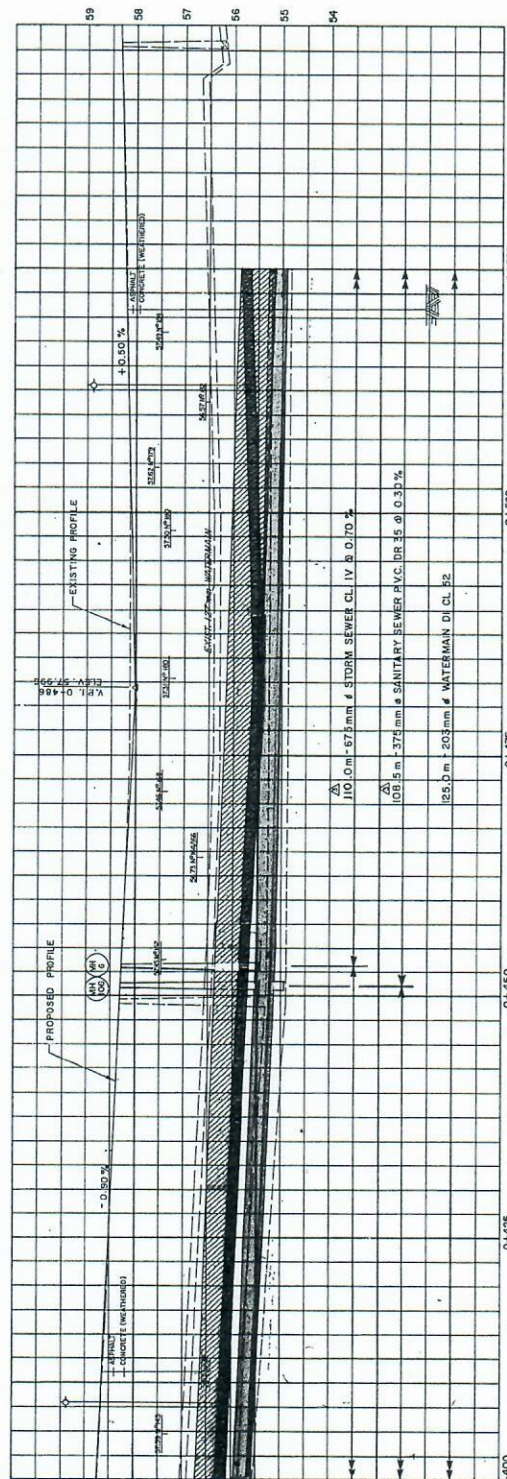
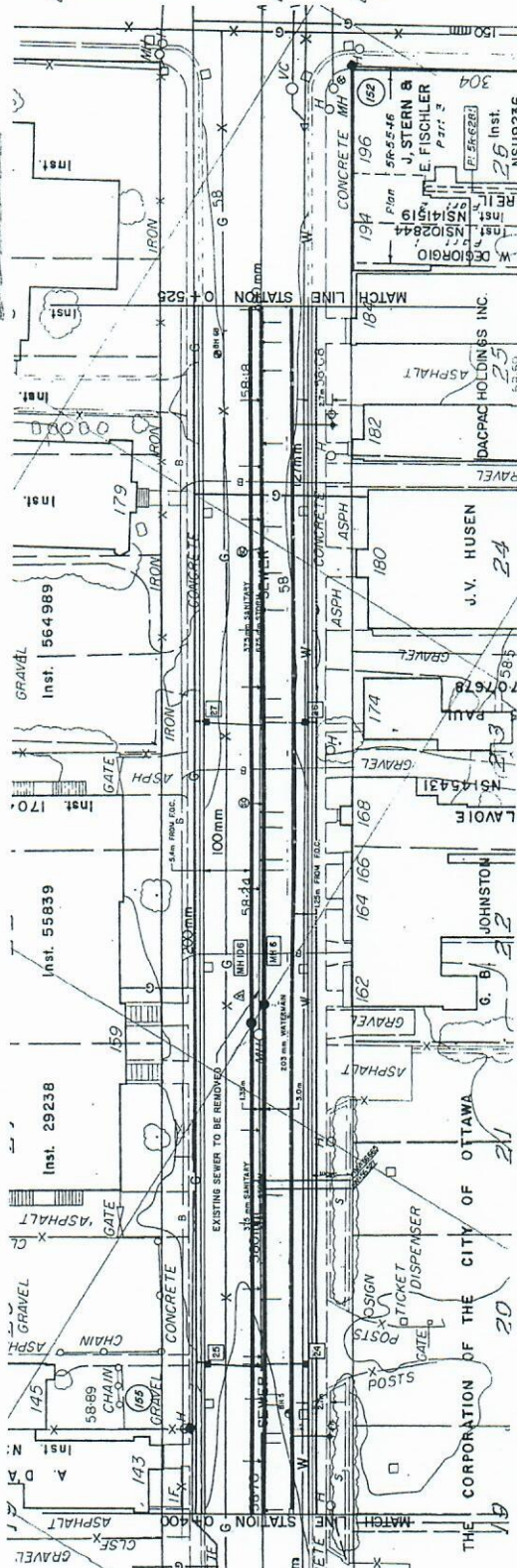
The location of the utilities is approximate only, and the exact location should be determined by consulting the municipal authorities and utility companies. The contractor shall prove the location of utilities and shall be responsible for adequate protection from damage.



NOVATECH
ENGINEERING CONSULTANTS LTD.
OTTAWA, ONTARIO

NO.	REVISION	DATE	BY
1	ISSUED FOR PERMITTING & PRELIMINARY DESIGN	06/07/00	ENG
2	ISSUED FOR TENDER	08/02/00	ENG
3	AS BUILT RECORD LOCATION	03/02/02	RJD

THE REGIONAL MUNICIPALITY OF OTTAWA-CITY OF OTTAWA TRANSPORTATION DEPARTMENT SHEET NO. OF 26 PROJECT NO. 009-0000 DATE: JANUARY 1990 DRAWN BY: M. M. SEP, P. ENG. CHECKED BY: R. CHARTAND, P. ENG. STA. 0+140 TO STA. 0+525	DWG. NO. R 1750-R-10 SHEET NO. OF 26 PROJECT NO. 009-0000 DATE: JANUARY 1990 DRAWN BY: M. M. SEP, P. ENG. CHECKED BY: R. CHARTAND, P. ENG. STA. 0+140 TO STA. 0+525
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STATION	0+140	0+1425	0+425	0+475	0+500	0+525
TOP OF WATERMAIN	56.37	56.37	56.37	56.37	56.37	56.37
PROF. ELEV.	56.37	56.37	56.37	56.37	56.37	56.37
EARTH EXCAVATION						
ROCK EXCAVATION						
EARTH FILL						

STORM SEWER
SANITARY SEWER
WATERMAIN

ASPECT FOR INSPECTION
AND CORRESPONDING DMC
ADDRESS
SERVICE CONNECTION AS
IDENTIFIED IN VIDEO INSPECTION
SERVICE CONNECTION TO SANITARY
SEWER AS IDENTIFIED IN VIDEO
INSPECTION OF SANITARY

TYPE: 41 DMS FRAME 750mm x 575mm
#2401

M 372-4
 THE REGIONAL MUNICIPALITY OF OTTAWA-CALLAHAN
 TRANSPORTATION DEPARTMENT
 R 1730-R-11
 SHEET 11 OF 20
 CONTRACT NO.
 89-507
 DATE: JANUARY 1990
 PROJECT: GRADING AND DRAINAGE
 STR. 04525 TO STR. 04575
 R. CHARTLAND, P. ENG. M.M. SEP. P. ENG.
 Chief Engineer & Designer

NO.	REVISION	BY	DATE
1	DESIGN FOR EXISTING & NEW	END	04/07/90
2	ISSUED FOR TENDER	END	04/07/90
3	STORM SEWER REVISIONS	END	04/07/90
4	REBUILT KEY INFRASTRUCTURE	END	04/07/90



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NOTE:
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 The contractor shall prove the location of utilities and shall be responsible for adequate protection from damage.

EXISTING MANHOLE & CONNECTION DATA	
NO.	LOCATION
1	MANHOLE 1
2	MANHOLE 2
3	MANHOLE 3
4	MANHOLE 4
5	MANHOLE 5
6	MANHOLE 6
7	MANHOLE 7
8	MANHOLE 8
9	MANHOLE 9
10	MANHOLE 10
11	MANHOLE 11
12	MANHOLE 12
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53	MANHOLE 53
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56	MANHOLE 56
57	MANHOLE 57
58	MANHOLE 58
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100	MANHOLE 100

STORM SEWER DATA	
NO.	LOCATION
1	STORM SEWER 1
2	STORM SEWER 2
3	STORM SEWER 3
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98	STORM SEWER 98
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100	STORM SEWER 100

SANITARY SEWER DATA	
NO.	LOCATION
1	SANITARY SEWER 1
2	SANITARY SEWER 2
3	SANITARY SEWER 3
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99	SANITARY SEWER 99
100	SANITARY SEWER 100

WATERMAIN DATA	
NO.	LOCATION
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2	WATERMAIN 2
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100	WATERMAIN 100

RESIDENT FLOOR ELEVATION	
NO.	LOCATION
1	RESIDENT FLOOR 1
2	RESIDENT FLOOR 2
3	RESIDENT FLOOR 3
4	RESIDENT FLOOR 4
5	RESIDENT FLOOR 5
6	RESIDENT FLOOR 6
7	RESIDENT FLOOR 7
8	RESIDENT FLOOR 8
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59	RESIDENT FLOOR 59
60	RESIDENT FLOOR 60
61	RESIDENT FLOOR 61
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NOTE

The location of the utilities as represented only, and the exact location should be determined by consulting the municipal authorities and utility companies concerned.

The contractor shall locate the location of utilities and shall be responsible for adequate protection from damage.



NOVATECH
ENGINEERING CONSULTANTS LTD.
OTTAWA, ONTARIO

NO. 1
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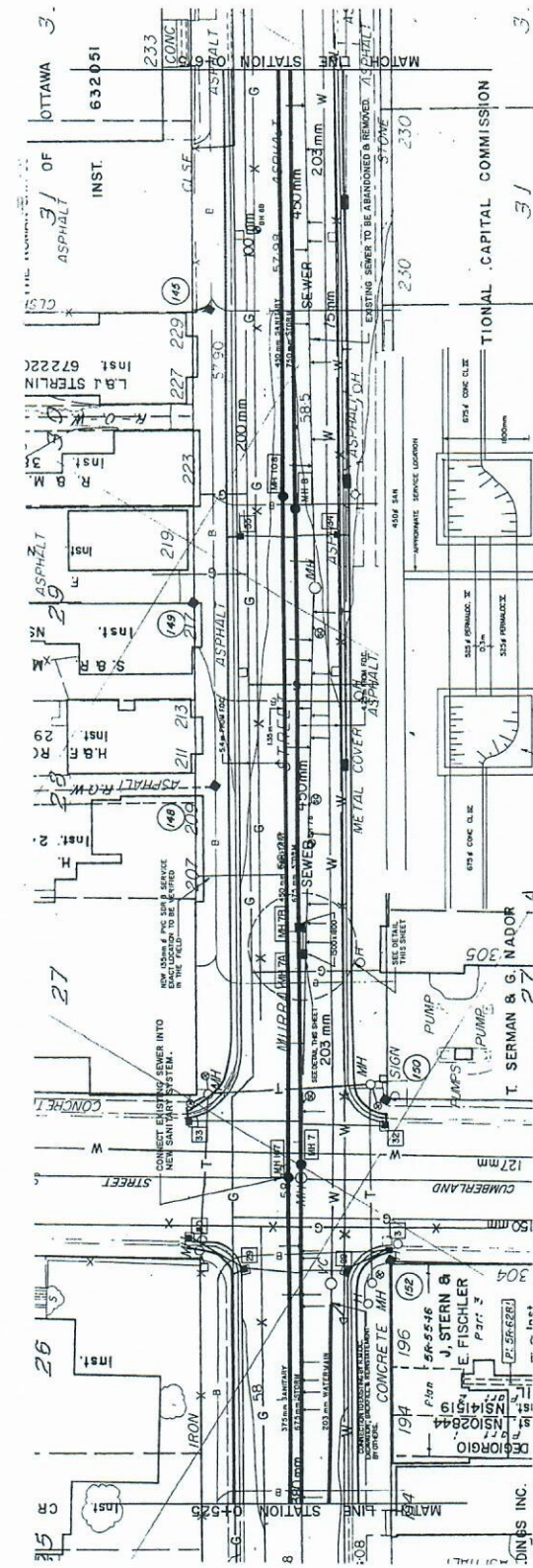
REVISION
1. FIELD OF WORK AND SCALE
2. DESIGN FOR TENDER
3. STORM SEWER REVISIONS
4. AS BUILT FOR WATER LOCATIONS

BY DATE
END 30/4/90
END 30/4/90
END 30/4/90
END 30/4/90

THE REGIONAL MUNICIPALITY OF OTTAWA-CARLETON
TRANSPORTATION DEPARTMENT
STREET
MURRAY STREET
SUSSEX DRIVE TO KING EDWARD AVENUE
DATE: JANUARY 1990

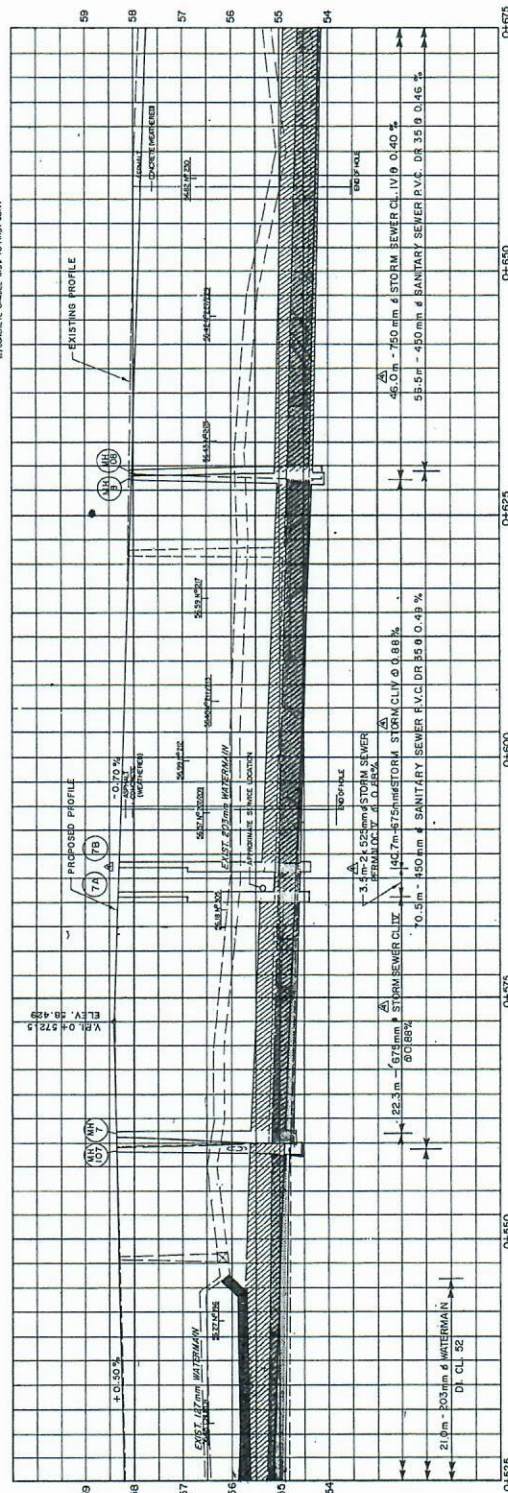
DWG. NO. R 730-R-11
SHEET 11 OF 25
CONTRACT NO. 99-507
DATE: JANUARY 1990

GRADING AND DRAINAGE
STA. 0+225 TO STA. 0+675
R. CHARTERED, P. ENG.
M.M. SEP, P. ENG.
Chief Engineer & Designer



NOTES (SEWER LIDS INVERT TO INVERT)
1. EXISTING LOCATION TO BE MAINTAINED & FIELD
2. EXISTING LOCATION TO BE MAINTAINED & FIELD

SCALE: 1:100



STORM SEWER
SANTARY SEWER
WATERMAIN

REASON FOR EXISTENCE
AND CONSTRUCTION

ADDRESS

SERVICE CONNECTION AS
IDENTIFIED IN VIDEO INSPECTION

IDENTIFIED IN VIDEO INSPECTION
REMARKS & NOTES

EARTH EXCAVATION
ROCK EXCAVATION
EARTH FILL

STATION	0+225	0+250	0+275	0+300	0+325	0+350	0+375	0+400	0+425	0+450	0+475	0+500	0+525	0+550	0+575	0+600	0+625	0+650	0+675
PROFILE	55.92	55.92	55.92	55.92	55.92	55.92	55.92	55.92	55.92	55.92	55.92	55.92	55.92	55.92	55.92	55.92	55.92	55.92	55.92
TOP OF WATERMAIN	55.92	55.92	55.92	55.92	55.92	55.92	55.92	55.92	55.92	55.92	55.92	55.92	55.92	55.92	55.92	55.92	55.92	55.92	55.92

TYPE-A1 DWG. FRAME 120mm x 274mm

4 2 4 0 1

THE REGIONAL MUNICIPALITY OF OTTAWA-CANLTON
TRANSPORTATION DEPARTMENT
MURRAY STREET
RECONSTRUCTION
SUSSEX DRIVE TO RIND DRIVE AVENUE
GRADING AND DRAINAGE
STA. 0+400 TO STA. 0+525
R. CHARTLAND, P. ENG. M. M. SEP. A. ENG.
DATE: JANUARY 1990

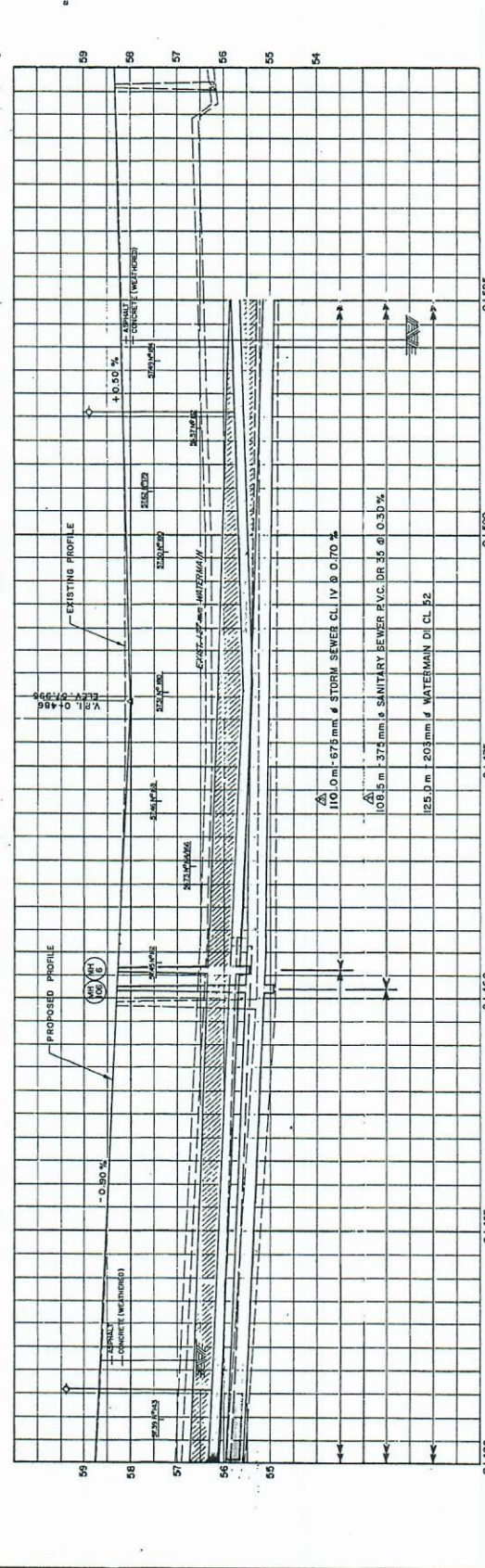
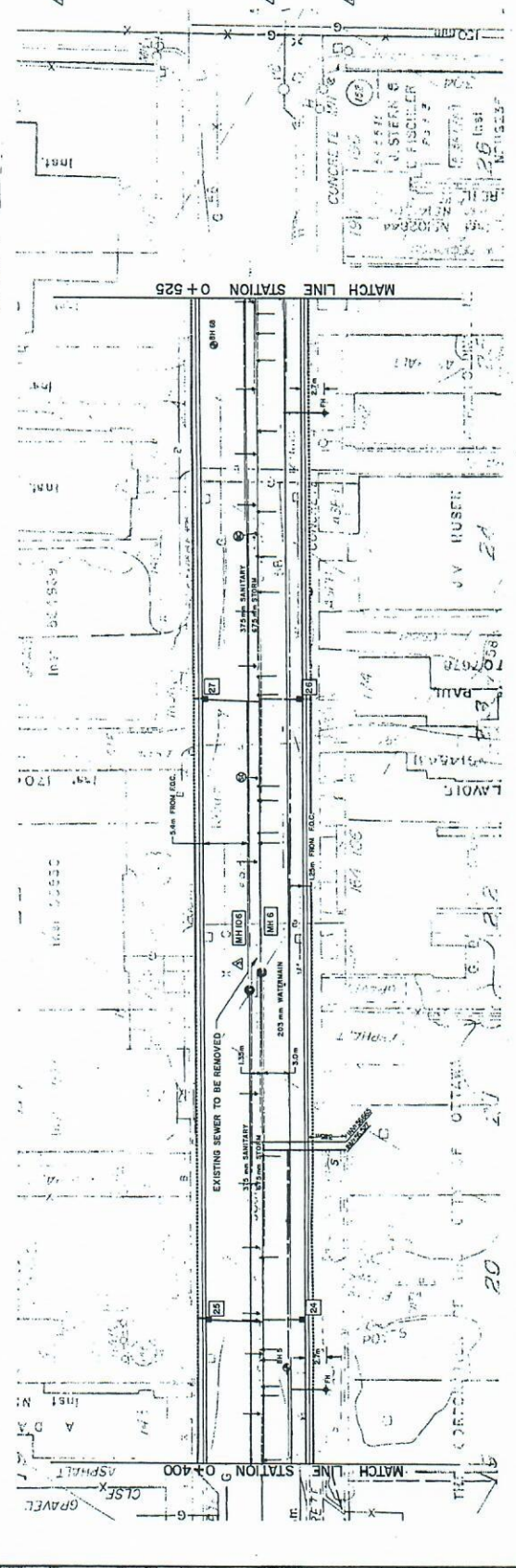
DWG. NO. R 1730-R-10
SHEET 3 OF 7
CONTRACT NO. 89-507
DATE: JANUARY 1990
NON-COMPLANT
VERTICAL

NOVATECH
ENGINEERING CONSULTANTS LTD.
OTTAWA, ONTARIO

REVISION
1 ISSUED FOR SALE APPROVAL B
2 ISSUED FOR TENDER
3 AS BUILT FOR REINSTALLATION

DATE
BY
NOV 1989
NOV 1989
NOV 1989

NOTE:
The location of the utilities is approximate only, and the exact location should be determined by consulting the municipal authorities and utility companies concerned.
The contractor shall show the location of utilities and shall be responsible for adequate protection from damage.



STATION	PROPOSED PROFILE	EXISTING PROFILE	TOP OF WATERMAIN
0+400	55.37	55.72	55.30
0+425	55.30	55.65	55.25
0+450	55.25	55.60	55.20
0+475	55.20	55.55	55.15
0+500	55.15	55.50	55.10
0+525	55.10	55.45	55.05

STORM MANHOLE & CATCHBASIN DATA	
NO.	TYPE
1	STORM
2	STORM
3	STORM
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SANITARY MANHOLE DATA	
NO.	TYPE
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STORM SEWER	
NO.	TYPE
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SANITARY SEWER	
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71	SANITARY
72	SANITARY
73	SANITARY
74	SANITARY
75	SANITARY
76	SANITARY
77	SANITARY
78	SANITARY
79	SANITARY
80	SANITARY
81	SANITARY
82	SANITARY
83	SANITARY
84	SANITARY
85	SANITARY
86	SANITARY
87	SANITARY
88	SANITARY
89	SANITARY
90	SANITARY
91	SANITARY
92	SANITARY
93	SANITARY
94	SANITARY
95	SANITARY
96	SANITARY
97	SANITARY
98	SANITARY
99	SANITARY
100	SANITARY

**PROPOSED FOUR STOREY
RESIDENTIAL APARTMENT BUILDING SITE
LOT 23 (SOUTH MURRAY STREET)
R-PLAN 42482
168 – 174 MURRAY STREET
CITY OF OTTAWA**

APPENDIX D

CITY OF OTTAWA

- **ELEVATION CONTOURS (FIGURE 1)**
- **SITE PLAN AND ARCHITECTURAL DRAWINGS**
- **FUS FIRE FLOW CALCULATION**
- **FUS EXPOSURE DISTANCES (FIGURE 2)**
- **WATER BOUNDARY CONDITIONS**
- **SUPPORTING HYDRAULIC CALCULATIONS**
- **HYDRANT SPACING (FIGURE 3)**

ATTACHMENT 1: FIGURE 1 – ELEVATION CONTOURS

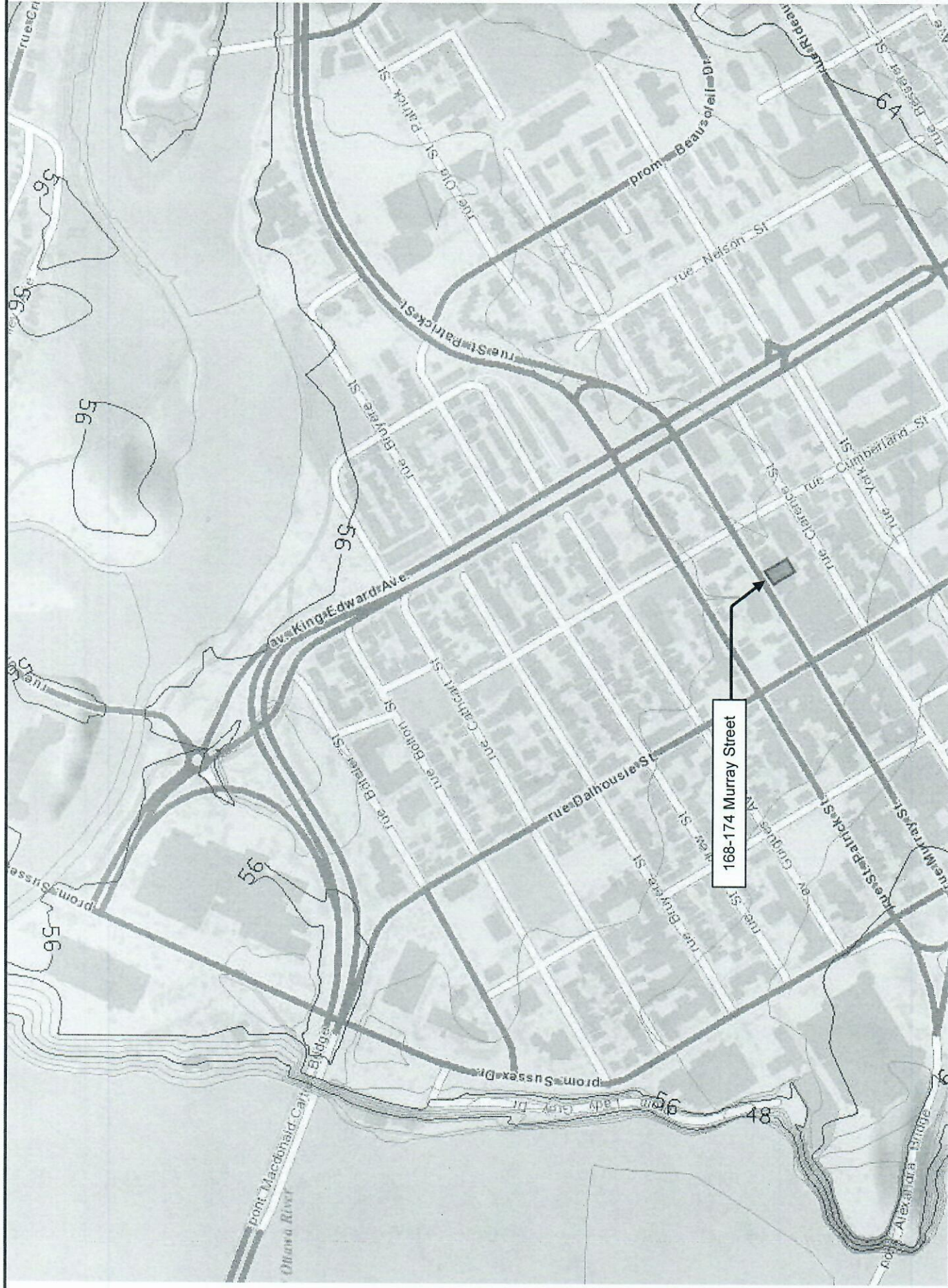
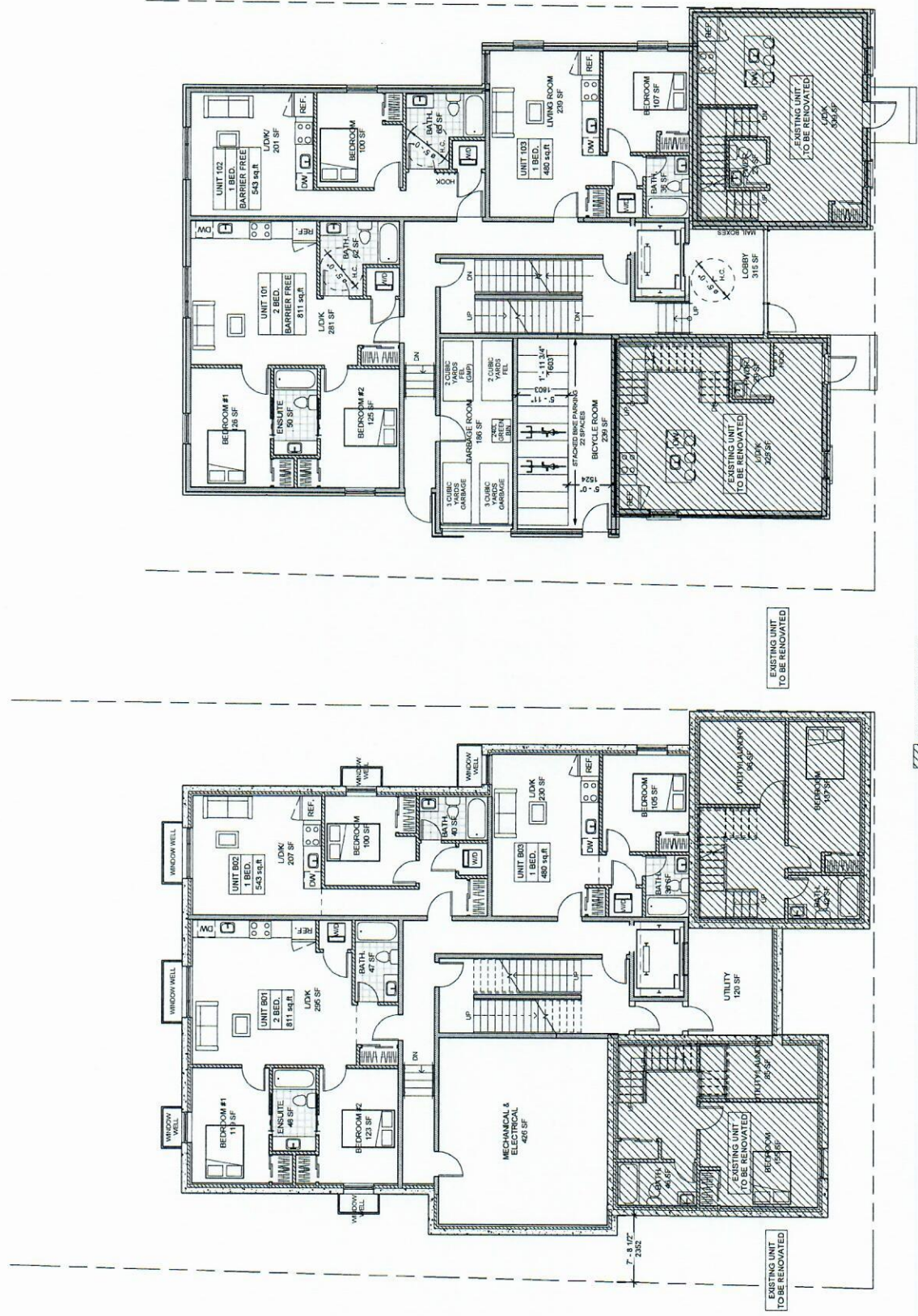


Figure 1: Elevation Contours

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ATTACHMENT 2: SITE PLAN AND ARCHITECTURAL DRAWINGS



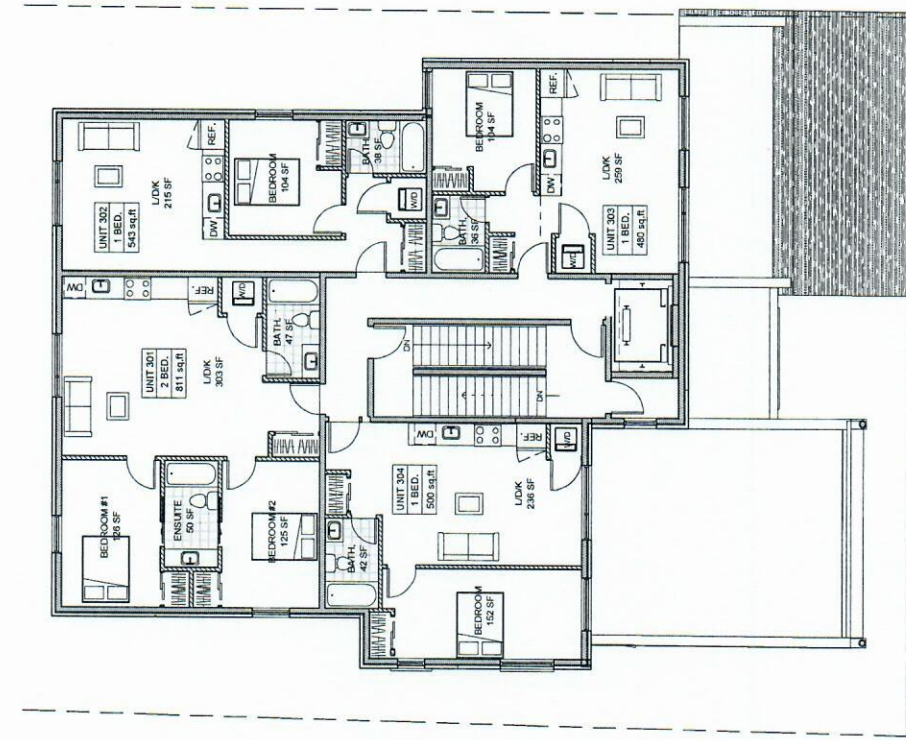
1 GROUND FLOOR
3/16" = 1'-0"

2 BASEMENT
3/16" = 1'-0"

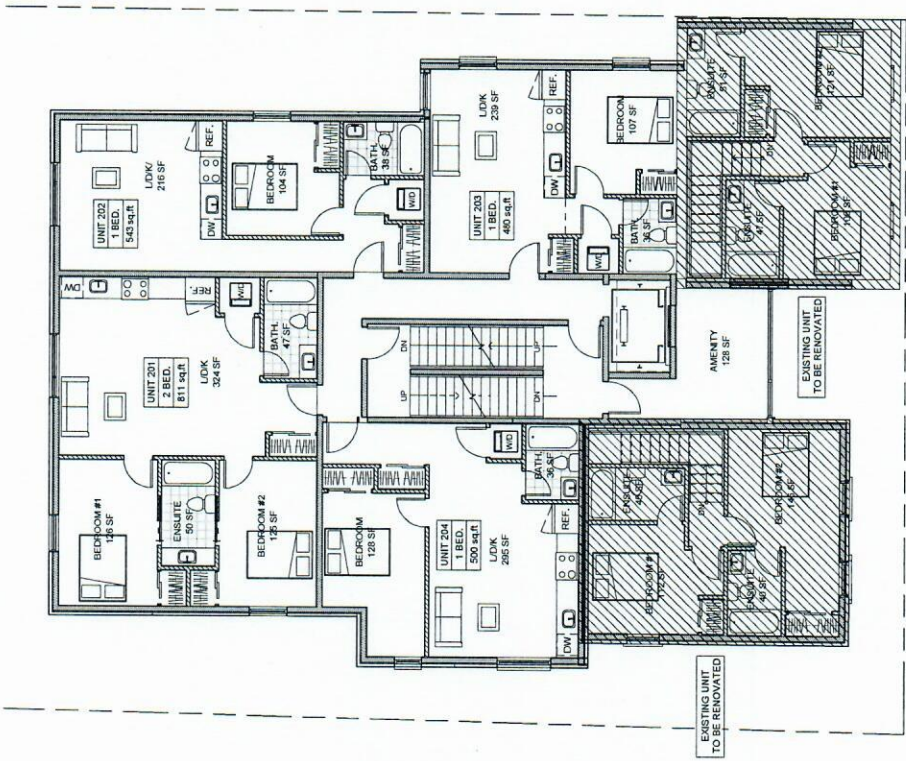
EXISTING BUILDING TO REMAIN

EXISTING UNIT
TO BE RENOVATED

EXISTING UNIT
TO BE RENOVATED



1 THIRD & FOURTH FLOORS
3/16" = 1'-0"



2 SECOND FLOOR
3/16" = 1'-0"

EXISTING BUILDING TO REMAIN

RAI:.....

168-174 MURRAY ST.
4 STOREY ADDITION TO EXISTING
TWO STOREY BUILDINGS

NOTES:
1. ALL WORK TO BE DONE IN ACCORDANCE WITH THE NATIONAL BUILDING REGULATIONS 2011.
2. THE DESIGNER HAS ASSUMED THAT THE EXISTING FOUNDATIONS AND STRUCTURE ARE SOUND AND CAPABLE OF SUPPORTING THE PROPOSED ADDITION.
3. THE PROPOSED ADDITION IS TO BE CONSTRUCTED IN ACCORDANCE WITH THE NATIONAL BUILDING REGULATIONS 2011.
4. THE PROPOSED ADDITION IS TO BE CONSTRUCTED IN ACCORDANCE WITH THE NATIONAL BUILDING REGULATIONS 2011.
5. THE PROPOSED ADDITION IS TO BE CONSTRUCTED IN ACCORDANCE WITH THE NATIONAL BUILDING REGULATIONS 2011.
6. THE PROPOSED ADDITION IS TO BE CONSTRUCTED IN ACCORDANCE WITH THE NATIONAL BUILDING REGULATIONS 2011.
7. THE PROPOSED ADDITION IS TO BE CONSTRUCTED IN ACCORDANCE WITH THE NATIONAL BUILDING REGULATIONS 2011.
8. THE PROPOSED ADDITION IS TO BE CONSTRUCTED IN ACCORDANCE WITH THE NATIONAL BUILDING REGULATIONS 2011.
9. THE PROPOSED ADDITION IS TO BE CONSTRUCTED IN ACCORDANCE WITH THE NATIONAL BUILDING REGULATIONS 2011.
10. THE PROPOSED ADDITION IS TO BE CONSTRUCTED IN ACCORDANCE WITH THE NATIONAL BUILDING REGULATIONS 2011.

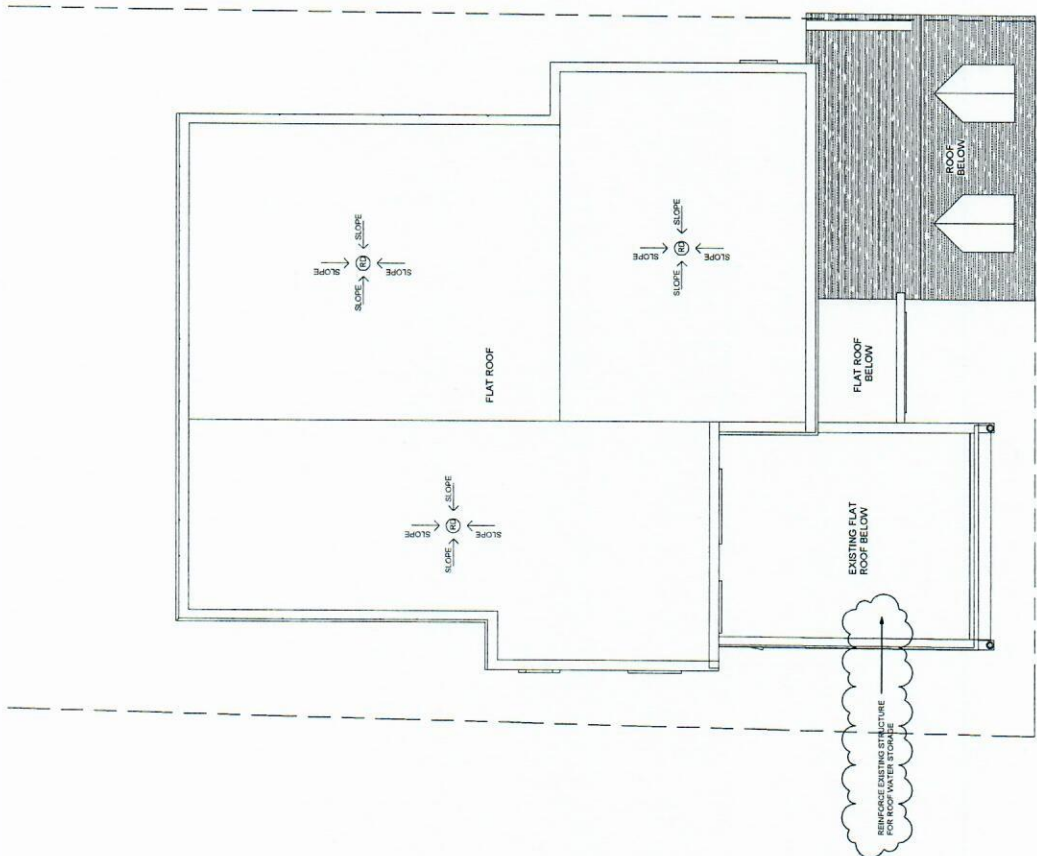


168-174 MURRAY ST.
4 STOREY ADDITION TO EXISTING
TWO STOREY BUILDINGS

NO.	DESCRIPTION	DATE
1	ISSUED FOR PERMIT	10/10/2018
2	REVISION	
3	REVISION	
4	REVISION	
5	REVISION	
6	REVISION	
7	REVISION	
8	REVISION	
9	REVISION	
10	REVISION	

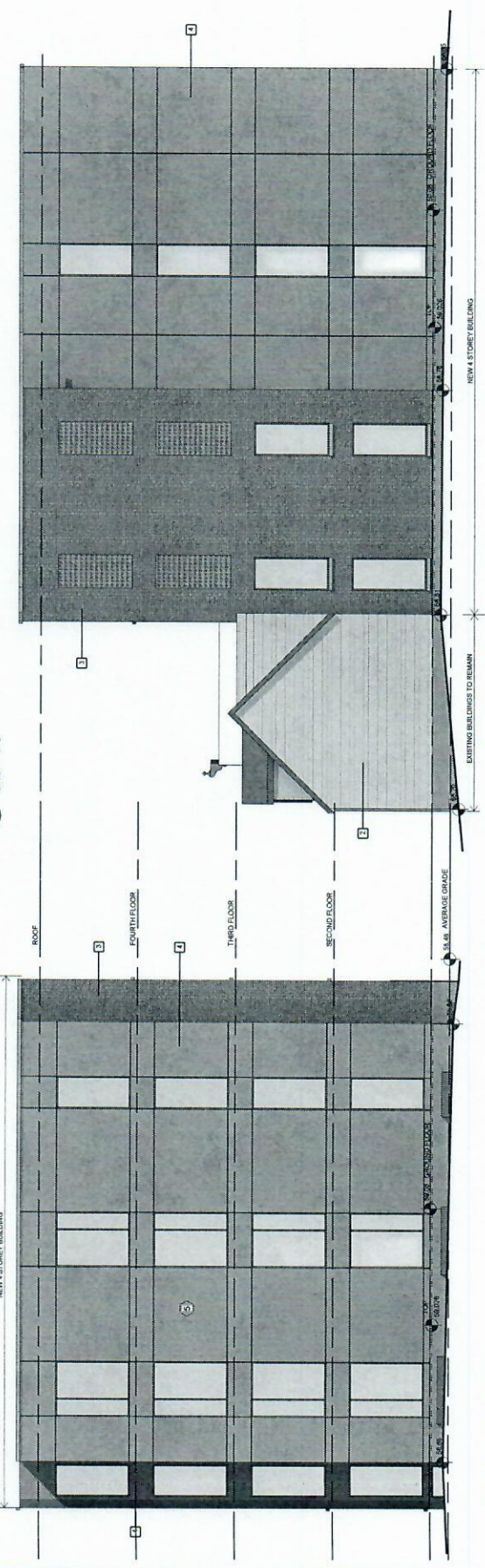
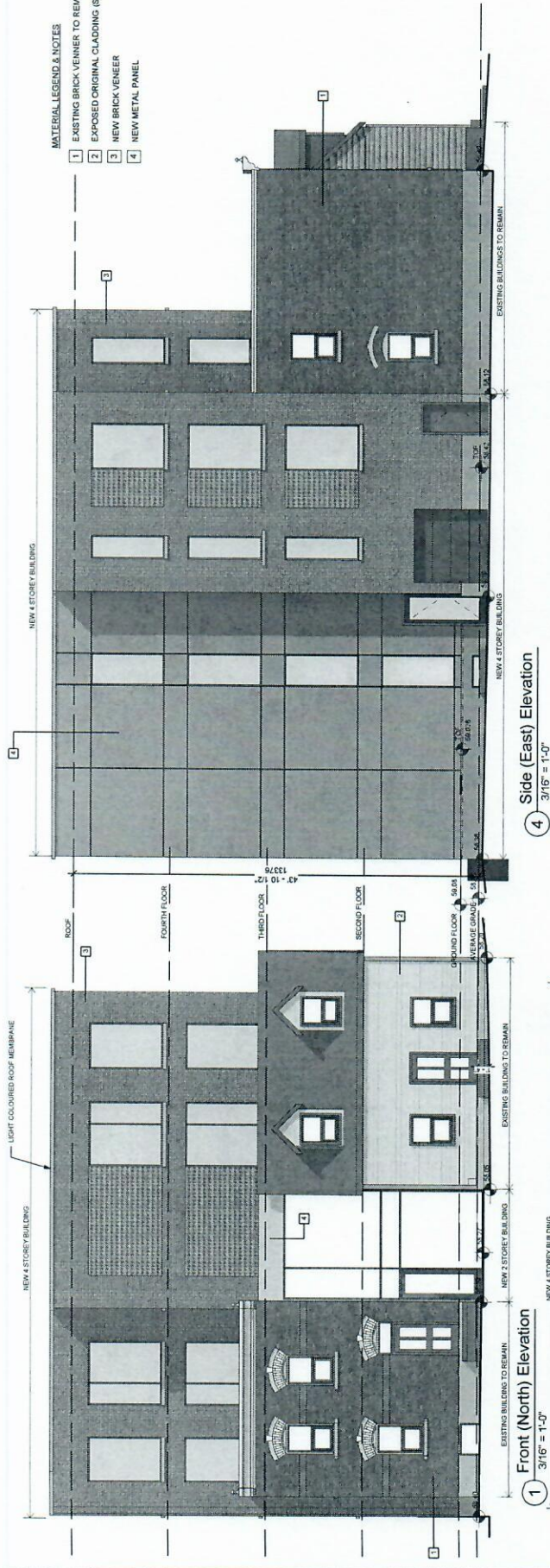
FLOOR PLANS
168-174 MURRAY ST.
4 STOREY ADDITION TO EXISTING
TWO STOREY BUILDINGS
JOSHUA BURNHAM

A4



1 ROOF
3/16" = 1'-0"

- MATERIAL LEGEND & NOTES**
- 1 EXISTING BRICK VENER TO REMAIN
 - 2 EXPOSED ORIGINAL CLADDING (SIDING)
 - 3 NEW BRICK VENER
 - 4 NEW METAL PANEL



3 Rear (South) Elevation
3/16" = 1'-0"

ATTACHMENT 3: FUS FIRE FLOW CALCULATION



FUS Fire Flow Calculation - Long Method

Calculations based on: "Water Supply for Public Fire Protection" by Fire Underwriters' Survey, 2020

Stantec Project #: 163401084

Project Name: 168-174 Murray Street

Date: January 4, 2023

Data inputted by: Alexandre Mineault-Guitard, ing., P.Eng.

Data reviewed by: Kevin Alemany, P.Eng.

Residential Building, Wood Frame, Sprinklered building.

Notes: 4 storeys + basement.

Building setbacks per site plan (dated 2021/05/11).

Fire Flow Calculation #: 1

Building Type/Description/Name: Residential

Fire Underwriters Survey Determination of Required Fire Flow - Long Method								
Step	Task	Term	Options	Multiplier Associated with Option	Choose:	Value Used	Unit	Total Fire Flow (L/min)
1	Choose Frame Used for Construction of Unit	Coefficient related to type of construction (C)	Framing Material					
			Type V - Wood Frame	1.5	Type V - Wood Frame	1.5	m	
			Type IV-A - Mass Timber	0.8				
			Type IV-B - Mass Timber	0.9				
			Type IV-C - Mass Timber	1				
			Type IV-D - Mass Timber	1.5				
			Type III - Ordinary construction	1				
			Type II - Non-combustible construction	0.8				
			Type I - Fire resistive construction	0.6				
2	Choose Type of Housing (if TH, Enter Number of Units Per TH Block)	Floor Space Area						
		Type of Housing	Single Family	0	Other (Comm, Ind, Apt etc.)	20	Units	
			Townhouse - indicate # of units	0				
2.2	# of Storeys	Number of Floors/Storeys in the Unit (do not include basement if 50% below grade):			4	4	Storeys	
3	Enter Ground Floor Area of One Unit	Average Floor Area (A) based on total floor area of all floors for one unit (non-fire resistive construction):			323	323	Area in Square Metres (m ²)	
					Square Metres (m2)			
3.1	Obtain Total Effective Building Area	Total Effective Building Area (# of Storeys x # of Units (if single family or townhouse) x Average Floor Area):			1,292	1292		
4	Obtain Required Fire Flow without Reductions	Required Fire Flow (without reductions or increases per FUS) (F = 220 * C * √A) Round to nearest 1,000 L/min						12,000
5	Apply Factors Affecting Burning	Reductions/Increases Due to Factors Affecting Burning						
5.1	Choose Combustibility of Building Contents	Occupancy Content Hazard Reduction or Surcharge	Non-combustible	-0.25	Limited combustible	-0.15	N/A	10,200
			Limited combustible	-0.15				
			Combustible	0				
			Free burning	0.15				
			Rapid burning	0.25				
5.2	Choose Reduction Due to Presence of Sprinklers	Sprinkler Reduction	Adequate Sprinkler conforms to NFPA13	-0.3	Adequate Sprinkler conforms to NFPA13	-0.3	N/A	-3,060
			None	0				
		Water Supply Credit	Water supply is standard for sprinkler and fire dept. hose line	-0.1	Water supply is standard for sprinkler and fire dept. hose line	-0.1	N/A	-1,020
			Water supply is not standard or N/A	0				
5.3	Choose Presence of Sprinklers for Exposures within 30m	Sprinkler Conforms to NFPA13	Adequate sprinkler for exposures conforms to NFPA13		None for exposures	0	N/A	0
			None for exposures					
		Water Supply	Water supply is standard for sprinkler and fire dept. hose line of exposures		Water supply is not standard or N/A for exposures		N/A	
			Water supply is not standard or N/A for exposures					
		Sprinkler Supervision	Sprinkler system of exposures is fully supervised		Sprinkler not fully supervised or N/A for exposures		N/A	
			Sprinkler not fully supervised or N/A for exposures					
5.4	Choose Separation Distance Between Units	Exposure Distance Between Units	Front Yard	20.1 to 30.1m	0.1	0.75	m	7,650
			Right Side	3.1 to 10.0m	0.2			
			Rear Yard	3.1 to 10.0m	0.2			
			Left Side	0 to 3.0m	0.25			
6	Obtain Required Fire Flow, Duration & Volume	Total Required Fire Flow, rounded to nearest 1,000 L/min, with max/min limits applied:						14,000
		Total Required Fire Flow (above) in L/s:						233
		Required Duration of Fire Flow (hrs)						3.00
		Required Volume of Fire Flow (m ³)						2,520

ATTACHMENT 4: FIGURE 2 – FUS EXPOSURE DISTANCES

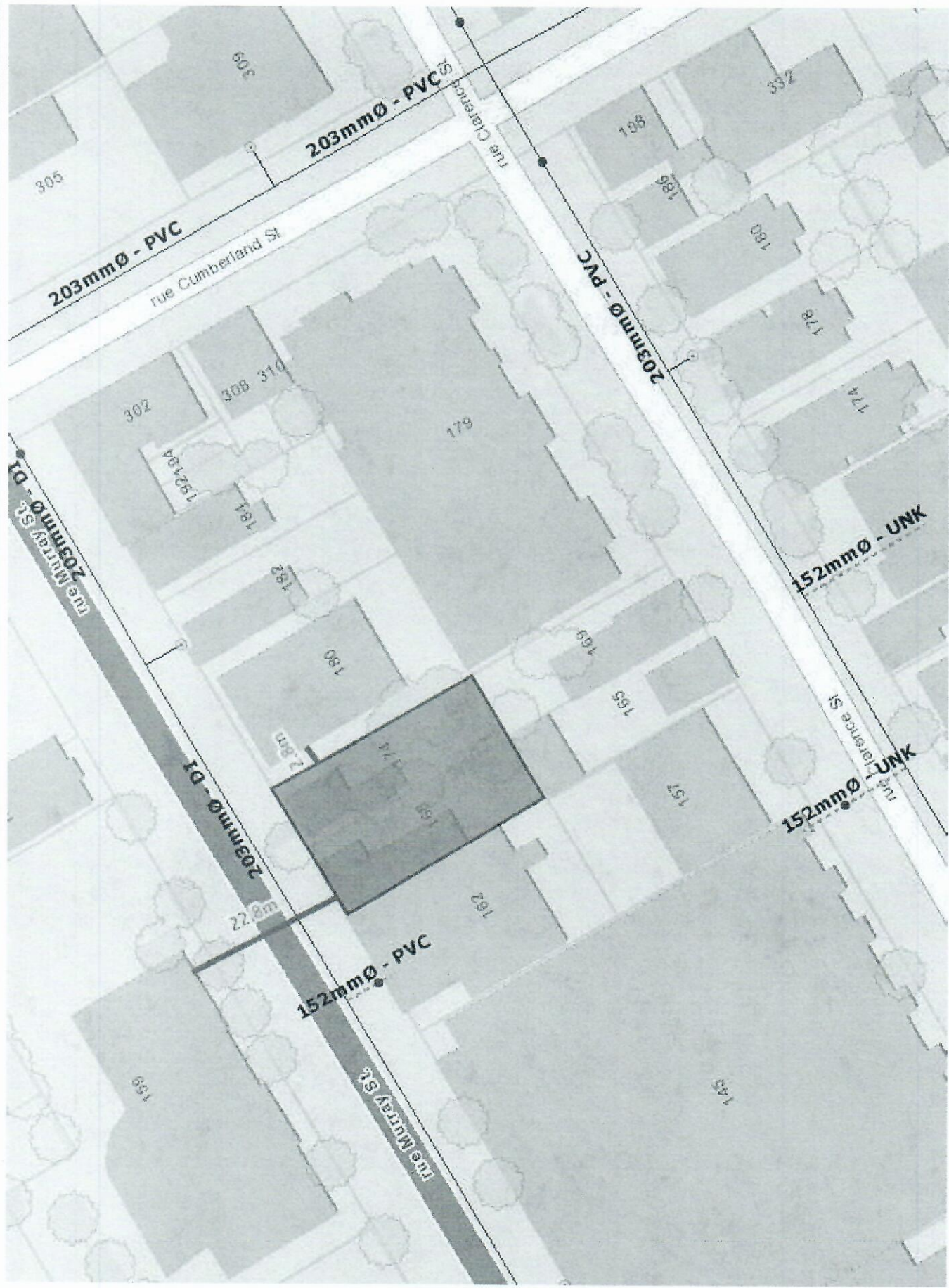


Figure 2: FUS Exposure Distances (Property Line to Adjacent Buildings)

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ATTACHMENT 5: WATER BOUNDARY CONDITIONS

Mineault-Guitard, Alexandre

From: TL MaK <tlmakecl@bellnet.ca>
Sent: Thursday, June 22, 2023 9:57 AM
To: Mineault-Guitard, Alexandre
Cc: Alemany, Kevin
Subject: FW: 168-174 Murray Street - Water Boundary Conditions Request
Attachments: 168-174 Murray Street January 2023.pdf

Hi Alex,

Attached please find the City's water boundary conditions for your calculations received on June 22, 2023.

Could you please proceed with your calculations ASAP for our serviceability report preparation.

Thank You,

Tony Mak

T.L. Mak Engineering Consultants Ltd.
1455 Youville Drive, Suite 218
Ottawa, ON. K1C 6Z7
Tel. 613-837-5516 | Fax: 613-837-5277
E-mail: tlmakecl@bellnet.ca

From: Fawzi, Mohammed [<mailto:mohammed.fawzi@ottawa.ca>]
Sent: June 22, 2023 8:52 AM
To: 'TL MaK'
Subject: RE: 168-174 Murray Street - Water Boundary Conditions Request

Hi Tony,

The following are boundary conditions, HGL, for hydraulic analysis at 168-174 Murray Street (zone 1W) assumed to be connected to the 203 mm on Murray Street (see attached PDF for location).

Minimum HGL: 106.3 m

Maximum HGL: 115.4 m

Max Day + FF (150 L/s): 104.3 m

Max Day + FF (233 L/s): 98.1 m

These are for current conditions and are based on computer model simulation.

Disclaimer: The boundary condition information is based on current operation of the city water distribution system. The computer model simulation is based on the best information available at the time. The operation of the water distribution system can change on a regular basis, resulting in a variation in boundary conditions. The physical properties of watermains deteriorate over time, as such must be assumed in the absence of actual field test data. The variation in physical watermain properties can therefore alter the results of the computer model simulation.

Best Regards,

Mohammed Fawzi, P.Eng.

Project Manager

Planning, Infrastructure and Economic Development Department - Services de la planification, de l'infrastructure et du développement économique

Development Review - Central Branch

City of Ottawa | Ville d'Ottawa

110 Laurier Avenue West Ottawa, ON | 110, avenue. Laurier Ouest. Ottawa (Ontario) K1P 1J1

613.580.2424 ext./poste 20120, Mohammed.Fawzi@ottawa.ca

****Please note that due to the current situation, I am working remotely. Email is currently the best way to contact me****

From: Fawzi, Mohammed

Sent: January 11, 2023 2:47 PM

To: TL MaK <tlmakecl@bellnet.ca>

Subject: RE: 168-174 Murray Street - Water Boundary Conditions Request

Hi Tony,

Thank you. Your request is being processed.

Best Regards,

Mohammed Fawzi, P.Eng.

Project Manager

Planning, Infrastructure and Economic Development Department - Services de la planification, de l'infrastructure et du développement économique

Development Review - Central Branch

City of Ottawa | Ville d'Ottawa

110 Laurier Avenue West Ottawa, ON | 110, avenue. Laurier Ouest. Ottawa (Ontario) K1P 1J1

613.580.2424 ext./poste 20120, Mohammed.Fawzi@ottawa.ca

****Please note that due to the current situation, I am working remotely. Email is currently the best way to contact me****

From: TL MaK <tlmakecl@bellnet.ca>

Sent: January 09, 2023 4:31 PM

To: Fawzi, Mohammed <mohammed.fawzi@ottawa.ca>

Subject: 168-174 Murray Street - Water Boundary Conditions Request

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ATTENTION : Ce courriel provient d'un expéditeur externe. Ne cliquez sur aucun lien et n'ouvrez pas de pièce jointe, excepté si vous connaissez l'expéditeur.

Mohammed,

Regarding this site, we are requesting for water boundary conditions from the City of Ottawa to be provided for our hydraulic analysis. The particulars are as follows:

The proposed building located within Pressure Zone 1W at 168-174 Murray Street is a 4-storey residential building, with a basement. A portion of the existing buildings at 168 & 174 Murray Street will be kept, while the remaining will be demolished and be replaced by new construction.

The proposed building contains twenty (20) residential units, namely thirteen (13) 1-bedroom units, and seven (7) 2-bedroom units. The total gross floor area of the proposed building is approximately 1,292 m², excluding the basement. The building is to be serviced by the 203 mm diameter watermain along Murray Street.

The domestic demands were calculated using the City of Ottawa's Water Design Guidelines. For residential units, a consumption rate of 280 L/cap/d was used to estimate average day demands (AVDY). Maximum day (MXDY) demands were calculated by multiplying AVDY demands by a factor of 2.5. Peak hour (PKHR) demands were calculated by multiplying MXDY by a factor of 2.2. Persons per unit (PPU) for each unit were estimated based on the City of Ottawa's Water Design Guidelines. Table 1 shows the estimated domestic demands of the proposed building.

Table 1: Estimated Domestic Demand

Unit Type	Unit Count	PPU	Consumption (L/c/d)	AVDY		MXDY		PKHR	
				L/d	L/s	L/d	L/s	L/d	L/s
Apartment, 1-Bedroom	13	1.4	280	5,096	0.06	12,740	0.15	28,028	0.32
Apartment, 2-Bedroom	7	2.1		4,116	0.05	10,290	0.12	22,638	0.26
Total	20			9,212	0.11	23,030	0.27	50,666	0.59

The fire flow requirement was determined following the Fire Underwriter Survey (FUS, 2020) method and is provided in the attached worksheet. It is understood that the building will have a sprinkler system, and the basement will be more than 50% below grade. For this analysis, the building was analyzed under two construction types (both with building contents that are limited in combustibility): Wood Frame Construction (Scenario A), and Ordinary Mass Timber Construction (Scenario B). As defined by the 2020 FUS Guidelines, an Ordinary Mass Timber Construction consists of a building with:

- Exterior walls are of Mass Timber Construction with at least 1-hour fire-resistance rating, and
- Other structural elements, such as interior bearing walls and the roof may not have a fire-resistance rating.

Note that the proposed building is proposed to be within 3 m of the adjacent property (166 Murray Street). For separation distances less than 3 m, the recently updated 2020 FUS only considers the effective building area of the proposed building and the respective exposure correction factor which is 0.25 for 0 to 3 m distances.

The resulting total required fire flow (RFF) for Scenario A is 14,000 L/min (233 L/s) for a duration of 3 hours, while the RFF for Scenario B is 9,000 L/min (150 L/s) for a duration of 2 hours.

In summary:

- AVDY = 9,212 L/d (0.11 L/s);

- MXDY = 23,030 L/d (0.27 L/s);
- PKHR = 50,666 L/d (0.59 L/s); and
- Fire Flow (FUS)
 - Scenario A = 14,000 L/min (233 L/s).
 - Scenario B = 9,000 L/min (150 L/s).

The City is requested to provide boundary conditions for the Average Day, Maximum Day, Peak Hour and Fire Flow conditions indicated above.

Thank you for your prompt attention to this matter. Please forward the boundary conditions as soon as possible.

Have a good day.

Regards,

Tony Mak

T.L. Mak Engineering Consultants Ltd.
 1455 Youville Drive, Suite 218
 Ottawa, ON. K1C 6Z7
 Tel. 613-837-5516 | Fax: 613-837-5277
 E-mail: tlmakecl@bellnet.ca

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Boundary Conditions for 168-174 Murray Street

Legend

— Private

— Public

Private

Public

ATTACHMENT 6: SUPPORTING HYDRAULIC CALCULATIONS



Supporting Hydraulic Calculations

Stantec Project #: 163401084

Project Name: 168-174 Murray Street

Date: June 23, 2023

Data inputted by: Alexandre Mineault-Guitard M.A.Sc., ing., P.Eng.

Data reviewed by: Kevin Alemany, M.A.Sc., P.Eng.

Boundary Conditions provided by the City:

Scenario 1: Peak Hour (Min HGL): 106.3 m;

Scenario 2: Average Day (Max HGL): 115.4 m; and

Scenario 3: Maximum Day plus Fire Flow: 98.1 m.

Sample Calculations

$$HGL(m) = hp + hz \quad (1)$$

where: hp = Pressure Head (m); and hz = Elevation Head (m), estimated from topography.

For Scenario 1, we have:

$$HGL(m) = 106.3 \text{ and } hz(m) = 59.$$

Rearranging Equation 1, we can calculate the Pressure Head (hp) as follow:

$$hp(m) = HGL - hz$$

$$\therefore hp = 106.3 - 59.0 \text{ m} = 47.3 \text{ m}.$$

To convert from Pressure Head (m) to a pressure value (kPa), the following equation can be used:

$$P(kPa) = (\rho * g * hp) / 1000 \quad (2)$$

where: ρ = density of water = 1000 kg/m³; and g = gravitational acceleration = 9.81 m/s².

Using Equation 2, we can calculate the Pressure Head (hp) as follow:

$$P(kPa) = (1000 * 9.81 * 47.3) / 1000$$

$$\therefore P = 464 \text{ kPa}.$$

Considering that 1 kPa = 0.145 psi, the pressure under Scenario 1 is equal to:

$$P = 67 \text{ psi}.$$

Applying the same procedures, the pressures under Scenario 2 and Scenario 3 are calculated as follows:

Scenario 2: $P = 80$ psi; and Scenario 3: $P = 56$ psi.

To summarize:

Scenario 1: Minimum Pressure under Peak Hour Demand: 464 kPa (67 psi)
Scenario 2: Maximum Pressure under Average Day Demand: 553 kPa (80 psi)
Scenario 3: Minimum Pressure under Maximum Day + Fire Flow Demand: 383 kPa (56 psi)

ATTACHMENT 7: FIGURE 3 – HYDRANT SPACING



Figure 3: Hydrant Spacing

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**PROPOSED FOUR STOREY
RESIDENTIAL APARTMENT BUILDING SITE
LOT 23 (SOUTH MURRAY STREET)
R-PLAN 42482
168 – 174 MURRAY STREET
CITY OF OTTAWA**

**APPENDIX E
CITY OF OTTAWA
SANITARY SEWER DESIGN SHEET
SHEET No. 1 OF 1**

$$M = 1 + \frac{14}{4} \sqrt{P} \quad \text{where } P = \text{population in } 1000's$$

2. BED ROOM - 2.1 ppm

1 BEDROOM - 1.4 ppm

q = average daily per capita flow ($\frac{22}{22}$ L/cap. d)
 I = unit of peak extraneous flow ($\frac{0.23}{0.23}$ L/ha. s)
 M = peaking factor
 $Q(p)$ = peak population flow (L/s)
 $Q(I)$ = peak extraneous flow (L/s)
 $Q(d)$ = peak design flow

LOCATION			INDIVIDUAL		CUMULATIVE		Peaking factor M	Pop. flow Q(p) (L/s)	Peak extraneous flow Q(i) (L/s)	Peak design flow Q(d) (L/s)	Length (m)	Pipe size (mm)	Type of pipe	Grade %	Capacity (L/s) $n=0.013$	Full flow velocity (m/s)	Actual velocity at Q(d)
STREET	FROM	TO	Pop.	Area A hectares	Pop.	Area A (hectares)											
168-134 MURRAY STREET	SITE	EX-3750 SAN SEWR	32.9	0.0654	32.9	0.0654	4	0.43	0.02	0.45	14.5	150	PVC	1.0 (unveg)	19.8	1.12	

DESIGN	TLM	PROJECT 168-174 MURRAY STREET	SHEET NO. 1 of 1
CHECKED	TLM	PROPOSED FOUR STOREY APARTMENT	
DATE	JUNE 2023	BUILDING SITE - CITY OF OTTAWA	

FILE# 822-431

**PROPOSED FOUR STOREY
RESIDENTIAL APARTMENT BUILDING SITE
LOT 23 (SOUTH MURRAY STREET)
R-PLAN 42482
168 – 174 MURRAY STREET
CITY OF OTTAWA**

**APPENDIX F
DEVELOPMENT SERVICING STUDY CHECKLIST SUMMARY**

Servicing study guidelines for development applications

4. Development Servicing Study Checklist

The following section describes the checklist of the required content of servicing studies. It is expected that the proponent will address each one of the following items for the study to be deemed complete and ready for review by City of Ottawa Infrastructure Approvals staff.

The level of required detail in the Servicing Study will increase depending on the type of application. For example, for Official Plan amendments and re-zoning applications, the main issues will be to determine the capacity requirements for the proposed change in land use and confirm this against the existing capacity constraint, and to define the solutions, phasing of works and the financing of works to address the capacity constraint. For subdivisions and site plans, the above will be required with additional detailed information supporting the servicing within the development boundary.

4.1 General Content

- ☐ Executive Summary (for larger reports only).
- ☒ Date and revision number of the report.
- ☒ Location map and plan showing municipal address, boundary, and layout of proposed development.
- ☒ Plan showing the site and location of all existing services.
- ☐ Development statistics, land use, density, adherence to zoning and official plan, and reference to applicable subwatershed and watershed plans that provide context to which individual developments must adhere.
- ☐ Summary of Pre-consultation Meetings with City and other approval agencies.
- ☐ Reference and confirm conformance to higher level studies and reports (Master Servicing Studies, Environmental Assessments, Community Design Plans), or in the case where it is not in conformance, the proponent must provide justification and develop a defensible design criteria.
- ☒ Statement of objectives and servicing criteria.
- ☒ Identification of existing and proposed infrastructure available in the immediate area.
- ☐ Identification of Environmentally Significant Areas, watercourses and Municipal Drains potentially impacted by the proposed development (Reference can be made to the Natural Heritage Studies, if available).
- ☐ Concept level master grading plan to confirm existing and proposed grades in the development. This is required to confirm the feasibility of proposed stormwater management and drainage, soil removal and fill constraints, and potential impacts to neighbouring properties. This is also required to confirm that the proposed grading will not impede existing major system flow paths.
- ☐ Identification of potential impacts of proposed piped services on private services (such as wells and septic fields on adjacent lands) and mitigation required to address potential impacts.
- ☐ Proposed phasing of the development, if applicable.

- ☒ Reference to geotechnical studies and recommendations concerning servicing.
- ☒ All preliminary and formal site plan submissions should have the following information:
 - Metric scale
 - North arrow (including construction North)
 - Key plan
 - Name and contact information of applicant and property owner
 - Property limits including bearings and dimensions
 - Existing and proposed structures and parking areas
 - Easements, road widening and rights-of-way
 - Adjacent street names

4.2 Development Servicing Report: Water

- ☐ Confirm consistency with Master Servicing Study, if available
- ☒ Availability of public infrastructure to service proposed development
- ☒ Identification of system constraints
- ☒ Identify boundary conditions
- ☒ Confirmation of adequate domestic supply and pressure
- ☒ Confirmation of adequate fire flow protection and confirmation that fire flow is calculated as per the Fire Underwriter's Survey. Output should show available fire flow at locations throughout the development.
- ☒ Provide a check of high pressures. If pressure is found to be high, an assessment is required to confirm the application of pressure reducing valves.
- ☐ Definition of phasing constraints. Hydraulic modeling is required to confirm servicing for all defined phases of the project including the ultimate design
- ☐ Address reliability requirements such as appropriate location of shut-off valves
- ☒ Check on the necessity of a pressure zone boundary modification.
- ☒ Reference to water supply analysis to show that major infrastructure is capable of delivering sufficient water for the proposed land use. This includes data that shows that the expected demands under average day, peak hour and fire flow conditions provide water within the required pressure range

- ☒ Description of the proposed water distribution network, including locations of proposed connections to the existing system, provisions for necessary looping, and appurtenances (valves, pressure reducing valves, valve chambers, and fire hydrants) including special metering provisions.
- ☐ Description of off-site required feeder mains, booster pumping stations, and other water infrastructure that will be ultimately required to service proposed development, including financing, interim facilities, and timing of implementation.
- ☒ Confirmation that water demands are calculated based on the City of Ottawa Design Guidelines.
- ☒ Provision of a model schematic showing the boundary conditions locations, streets, parcels, and building locations for reference.

4.3 Development Servicing Report: Wastewater

- ☒ Summary of proposed design criteria (Note: Wet-weather flow criteria should not deviate from the City of Ottawa Sewer Design Guidelines. Monitored flow data from relatively new infrastructure cannot be used to justify capacity requirements for proposed infrastructure).
- ☐ Confirm consistency with Master Servicing Study and/or justifications for deviations.
- ☐ Consideration of local conditions that may contribute to extraneous flows that are higher than the recommended flows in the guidelines. This includes groundwater and soil conditions, and age and condition of sewers.
- ☒ Description of existing sanitary sewer available for discharge of wastewater from proposed development.
- ☐ Verify available capacity in downstream sanitary sewer and/or identification of upgrades necessary to service the proposed development. (Reference can be made to previously completed Master Servicing Study if applicable)
- ☒ Calculations related to dry-weather and wet-weather flow rates from the development in standard MOE sanitary sewer design table (Appendix 'C') format.
- ☐ Description of proposed sewer network including sewers, pumping stations, and forcemains.
- ☐ Discussion of previously identified environmental constraints and impact on servicing (environmental constraints are related to limitations imposed on the development in order to preserve the physical condition of watercourses, vegetation, soil cover, as well as protecting against water quantity and quality).
- ☐ Pumping stations: impacts of proposed development on existing pumping stations or requirements for new pumping station to service development.
- ☐ Forcemain capacity in terms of operational redundancy, surge pressure and maximum flow velocity.
- ☐ Identification and implementation of the emergency overflow from sanitary pumping stations in relation to the hydraulic grade line to protect against basement flooding.
- ☐ Special considerations such as contamination, corrosive environment etc.

4.4 Development Servicing Report: Stormwater Checklist

- ☒ Description of drainage outlets and downstream constraints including legality of outlets (i.e. municipal drain, right-of-way, watercourse, or private property)
- ☐ Analysis of available capacity in existing public infrastructure.
- ☒ A drawing showing the subject lands, its surroundings, the receiving watercourse, existing drainage patterns, and proposed drainage pattern.
- ☒ Water quantity control objective (e.g. controlling post-development peak flows to pre-development level for storm events ranging from the 2 or 5 year event (dependent on the receiving sewer design) to 100 year return period); if other objectives are being applied, a rationale must be included with reference to hydrologic analyses of the potentially affected subwatersheds, taking into account long-term cumulative effects.
- ☐ Water Quality control objective (basic, normal or enhanced level of protection based on the sensitivities of the receiving watercourse) and storage requirements.
- ☒ Description of the stormwater management concept with facility locations and descriptions with references and supporting information.
- ☐ Set-back from private sewage disposal systems.
- ☐ Watercourse and hazard lands setbacks.
- ☐ Record of pre-consultation with the Ontario Ministry of Environment and the Conservation Authority that has jurisdiction on the affected watershed.
- ☐ Confirm consistency with sub-watershed and Master Servicing Study, if applicable study exists.
- ☒ Storage requirements (complete with calculations) and conveyance capacity for minor events (1:5 year return period) and major events (1:100 year return period).
- ☐ Identification of watercourses within the proposed development and how watercourses will be protected, or, if necessary, altered by the proposed development with applicable approvals.
- ☒ Calculate pre and post development peak flow rates including a description of existing site conditions and proposed impervious areas and drainage catchments in comparison to existing conditions.
- ☐ Any proposed diversion of drainage catchment areas from one outlet to another.
- ☒ Proposed minor and major systems including locations and sizes of stormwater trunk sewers, and stormwater management facilities.
- ☐ If quantity control is not proposed, demonstration that downstream system has adequate capacity for the post-development flows up to and including the 100 year return period storm event.
- ☐ Identification of potential impacts to receiving watercourses
- ☐ Identification of municipal drains and related approval requirements.
- ☒ Descriptions of how the conveyance and storage capacity will be achieved for the development.
- ☒ 100 year flood levels and major flow routing to protect proposed development from flooding for establishing minimum building elevations (MBE) and overall grading.

- ☐ Inclusion of hydraulic analysis including hydraulic grade line elevations.
- ☒ Description of approach to erosion and sediment control during construction for the protection of receiving watercourse or drainage corridors.
- ☐ Identification of floodplains – proponent to obtain relevant floodplain information from the appropriate Conservation Authority. The proponent may be required to delineate floodplain elevations to the satisfaction of the Conservation Authority if such information is not available or if information does not match current conditions.
- ☐ Identification of fill constraints related to floodplain and geotechnical investigation.

4.5 Approval and Permit Requirements: Checklist

The Servicing Study shall provide a list of applicable permits and regulatory approvals necessary for the proposed development as well as the relevant issues affecting each approval. The approval and permitting shall include but not be limited to the following:

- ☐ Conservation Authority as the designated approval agency for modification of floodplain, potential impact on fish habitat, proposed works in or adjacent to a watercourse, cut/fill permits and Approval under Lakes and Rivers Improvement Act. The Conservation Authority is not the approval authority for the Lakes and Rivers Improvement Act. Where there are Conservation Authority regulations in place, approval under the Lakes and Rivers Improvement Act is not required, except in cases of dams as defined in the Act.
- ☐ Application for Certificate of Approval (CofA) under the Ontario Water Resources Act.
- ☐ Changes to Municipal Drains.
- ☐ Other permits (National Capital Commission, Parks Canada, Public Works and Government Services Canada, Ministry of Transportation etc.)

4.6 Conclusion Checklist

- ☒ Clearly stated conclusions and recommendations
- ☐ Comments received from review agencies including the City of Ottawa and information on how the comments were addressed. Final sign-off from the responsible reviewing agency.
- ☒ All draft and final reports shall be signed and stamped by a professional Engineer registered in Ontario