

SITE SERVICING & STORMWATER MANAGEMENT

ANALYSIS BRIEF

for

PROPOSED REZONING FROM INDUSTRIAL TO RESIDENTIAL

at

112 NELSON ST., OTTAWA, K1N 7R5

by

CARLETON CONDOMINIUM CORP. #396  
C/O DOMICILE DEVELOPMENTS INC.

prepared by

ERION ASSOCIATES  
Proj. No. EA 17<sup>1</sup>297

November 2017  
Rev. April 2018

Submitted in support of an application for Rezoning to the City of Ottawa.

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&  
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SITE SERVICES & STORMWATER MANAGEMENT  
ANALYSIS BRIEF

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112 NELSON ST., OTTAWA, ON, K1N 7R5  
APPLICATION FOR REZONING (INDUSTRIAL TO RESIDENTIAL)  
APPLICANT: CARELTON CONDOMINIUM CORP. #396  
C/O DOMICILE DEVELOPMENTS INC.

1. GENERAL

This analysis of servicing issues for future re-development is in reference to an application for rezoning the subject property from IG1H(11), General Industrial Subzone 1, 11m Height limit to R5 to permit a 9 storey residential building. The future project will replace an existing industrial building containing small offices and warehousing that was created in 1987 by partial demolition of an existing large furniture warehouse, renovating and dividing the remaining building into a 16 unit commercial/industrial condominium (CCC #396).

2. SITE DESCRIPTION

2.1 Location: West side of Nelson St., midway between Rideau St. and York St.

2.2 P.I.N. 15396-0001 to 0033

2.3 Total Site Area: 2949 sq. metres (0.295 ha.)

2.4 Street Frontage: 18.47 metres

3. RECENT SITE HISTORY

With reference to Surveyor's Real Property Report, Part 1, November 7, 2017 by A.O.V. Ltd., a copy of which has been filed as part of the application for rezoning, the site in 1987 originally included what is now an 8 storey apt. building at the north-east corner of a rectangle having a total of 80.63 m frontage on Nelson St. The remnant L-shaped parcel was then serviced with new on-site sanitary and storm sewer and watermain as shown on Site Plan, Dwg. M-1 by Everest Engineering Ltd., Rev. 6 (As-built), Oct 28/87.

The new site services to 112 Nelson St. connected to City sewers through the reduced (18.47m) site frontage while previous services (sanitary, combined and water) that connected through the severed parcel were capped and abandoned. An 8 storey apartment building (#110 Nelson St.) was constructed on the severed parcel after 1987 with separate new service connections to Nelson St.

4. EXISTING SITE CONDITIONS

4.1 Site Topography

In the absence of a detailed topographic survey of the site at this time, reference to City topo mapping together with on-site observations, it is obvious that this site neither discharges nor receives overland flow to/from adjacent lands. The site is 99% covered by building roof and paved parking as shown on the surveyor's plan dated 7 Nov/2017 referred to in Section 3.0, above.

4.2 Adjacent Lands

South Boundary: #134 Nelson St., small restaurant with parking in rear.

West Boundary: #365 King Edward Ave., Hydro Ottawa transformer substation

#339 King Edward, commercial outdoor parking lot

#331 King Edward, performing arts theatre outdoor parking and access to  
underground parking.

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North Boundary: #100 Nelson St., outdoor parking  
                                  #110 Nelson St., outdoor parking and access to apt. building  
East Boundary: #110 Nelson St., parking garage and outdoor terrace for apt. building  
                                  Nelson St. roadway

#### 4.3 Site Services

The following service connections were installed as part of site development in 1987.

- Sanitary – 150 mm dia. @ 1.0% connected to 300 dia. City sewer constructed in 1978. (SAN 39117)
- Storm – 300 dia. @ 1.0% connected to 450 dia. City sewer constructed in 1978 (STM39307)
- Water – 200 dia. service to renovated building and on-site private fire hydrant connected to 200 dia. City watermain. In 2006, under City Contract #ISB03-3000 (Dwg. 6050-06, the existing 200 dia. water service was reconfigured within the road allowance to permit abandonment of a 125 dia. watermain in the roadway north of #112 Nelson St. to York St.

#### 4.4 Site Drainage

Site runoff is collected by roof drains on flat roofs and by 2 paved surface catchbasins all of which are connected to a 150, 200, 250, 300 on-site storm sewer system delivering flow directly to the 450 dia. City storm sewer.

#### 4.5 Natural Gas

The site is connected to a gas line on the east side of Nelson St. road allowance.

#### 4.6 Wire Utilities

- Hydro: an on-site transformer is connected to a large underground Hydro vault located below the sidewalk on the west side of Nelson St. adjacent to the north end of the site frontage.
- Communication lines are located underground along both sides of Nelson St. across the site frontage.

#### 4.7 Geotechnical Factors

From the ESA Phase I report it is known that the site is underlain by 5m to 15m soil overburden above limestone bedrock. Rock removal is therefore not anticipated on any new building construction that is not deeper than 1 floor level below grade.

### 5. FUTURE DEVELOPMENT CONCEPT

The proposed rezoning will allow a 9 storey building with 151 residential apartments and 1 level of underground parking for 67 cars to be constructed on the site as shown on Dwg. A-01 by AWA Architects, Inc. (Rev. #03, Apr 6/2018)

Both pedestrian and vehicular access are necessarily located along the 18.47 m frontage on Nelson St. with the building taking the same L-shape as the property parcel using minimum setbacks along each boundary.

The proposed site plan is conceptual only to be used for analysis of all impacts, including site servicing and stormwater management.

Any detailed site grading and on-site services design including connection to the City sewer and water systems, will be part of a future submission by others for Site Plan Control.

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6. WATER SUPPLY

The site is presently connected to a 200 dia. watermain on Nelson St. by a 200 dia. extension to the City main into the centre of the site to supply a private hydrant (HP239) installed in 1987, including a 200 dia. valve in a valve chamber at the property line on Nelson St. In 2006, the City, under Contract ISB03-3000, transferred the connection to a new location on the City watermain as shown on Dwg. 6050-06, partial copy of which is included in Appendix 'A'.

The site plan concept attached to this application would require that the on-site watermain and hydrant be removed. Under this scenario, the existing connection could remain in service to the property line to supply both domestic and fire demand for a fully sprinklered building. A new hydrant would be required to be installed on the roadway within 10 m of a Fire Department building connection on the front wall.

Referring to detail calculations in Appendix 'A', the results are summarized as follows:

Maximum Pressure at Bldg.	= 561 kPa 81.4 psi > 80 psi max. allowed
Minimum Pressure at Ground Fl.	= 473 kPa 68.6 psi > 40 psi min. allowed
Minimum Pressure at 9 <sup>th</sup> Fl.	= 233 kPa 33.8 psi < 40 psi min. allowed
*Residual Pressure at Street Hydrant	= 357 kPa 51.8 psi > 20 psi min. allowed

\*For fire flow of 13,000 L/min.

It can therefore be concluded that a pressure reducing valve may be required for the lower floors, a booster pump will be necessary for supply to the upper floors and that there is more than adequate residual pressure for a fire flow of 13,000 L/min.

7. WASTE WATER

In 1978 the existing 9" and 12" combined sewers on Nelson St. between Rideau St. and York St. were removed and replaced with a 300 dia. (12") concrete sanitary sewer under City Contract 77-32/Dwg. 1423 (sheet 1/6)/As-built March/92. The upstream end of this sewer is approximately 18 m north of Rideau St. and receives flow from a connection to 333 Rideau St., a small 1 storey commercial building on the N/W corner of Rideau and Nelson. The existing 300 mm sanitary sewer on Nelson St. discharges to a 24" (600 mm) on York St. that was also constructed under Contract 77-32 and which discharges into a 42" (1050 mm) at King Edward Ave. The York St. sewer has a maximum capacity of 500 L/s and does not receive any upstream flows other than Nelson St. from Rideau St. to York St.

In 1997, redevelopment of the subject site included a new 150 dia. connection to the 300 dia. sanitary sewer. Referring to Dwg. M-1 by Everest Engineering, the invert of 300 dia. sanitary sewer is 56.14 at the point of connection. Calculation of the invert elevation as detailed in Appendix 'B' results in an invert of 56.3 at the front wall of a future 9 storey building. Assuming that the future first floor elevation is 300 mm above centre line of Nelson St. roadway, the following calculation determines the elevation of basement floor:

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Centre Line Nelson St.	= 59.2+	
Add	<u>0.3</u>	
First Floor elevation	59.5	
Subtract	min = <u>2.7</u> (Fl. to Fl.)	max = <u>3.0</u>
Basement Floor elevation	56.8 (highest)	56.5 (lowest)
Compared to invert 150		
dia. at front wall	<u>56.3</u> (Appendix 'B')	<u>56.3</u>
Difference	0.5 m	0.2 m

It can be concluded that either a 150 dia. or 200 dia. sanitary service could be installed with invert of pipe below basement floor at the point of entry depending upon detail design of future building.

However, there will not be sufficient grade difference to allow gravity flow in basement floor drain pipes connected directly to the service connection.

Pumping of basement floor drainage will be necessary and will protect against possible back-up from the street sewer.

From calculations in Appendix 'B', it is obvious that the 150 dia. pipe connection has capacity to convey the expected peak wastewater flow. It may be necessary to relocate the existing pipe connection and/or to provide a 200 dia. pipe size in replacement to reduce the chance of flow obstruction affecting such a large number of residents. In such case, a new manhole would be required at the point of connection to the City sewer since the connection is greater than 50% of the diameter of the concrete pipe sewer.

## 8. STORMWATER MANAGEMENT

### 8.1 EXISTING DRAINAGE

The subject property is 98% covered by impervious surfaces consisting of flat roofs and paved parking and access routes. Roof drains and 2 surface catchbasins collect all runoff and are directly connected to a storm sewer on site which, in turn, delivers all runoff to the City storm sewer on Nelson St. midway between Rideau St. and York St.

Nelson St. storm sewer (450 dia.) is connected to York St. (600 dia.) draining westerly to King Edward Ave. where it drops approximately 1 m (invert to obvert) into a 1800 dia. trunk storm sewer. Both Nelson St. and York St. storm sewers can be considered slightly oversized in relation to the relatively small catchment area served.

Using the Rational Method formula, existing site runoff peak flow can be estimated for both 1:5 yr. and 1:100 yr. storm events as detailed in Appendix 'D' and as summarized below:

	Tc = 10 min.	Tc = 15 min.
1:5 yr. event	56.9 L/s	45.6 L/s
1:100 yr. event	146.5 L/s	117.1 L/s

These flows are compared to the capacity of Nelson St. and York St. storm sewers as follows:

Nelson St.	450 dia. @ 0.82% = 269 L/s
York St.	600 dia. @ 1.51% = 457 L/s

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It is obvious that the existing sewers that were designed to serve a 1:5 yr. storm event are vulnerable to serious overloading during larger storms. However, City staff have indicated that these 2 street sections are not subject to regular backup with street flooding during major storms.

This block of Nelson St. has no sag points in the longitudinal road profile that would give rise to roadway surface ponding that could impact adjacent properties.

#### 8.2 POST-DEVELOPMENT S.W.M. \*

The concept site plan shows maximum building coverage permitted by minimum building setbacks applied along all boundaries. This arrangement will give rise to maximum site runoff that must be controlled by on-site detention storage induced by restrictive flow relief devices(s). The only practical options for detention storage in this concept are roof ponding storage OR structural (tank) storage in the basement OR a combination of both. In the building configuration shown, only the 9<sup>th</sup> floor roof would be suitable for roof ponding storage and it could only be utilized in combination with basement tank storage for runoff from balconies and terraces shown on all other floors. For purposes of this analysis, all detention storage is located in the basement in order to determine the maximum tank size required.

Similarly, the maximum permitted release rate is calculated in Appendix 'D' using a time of concentration (Rational Method) of 15 min. which gives rise to a lower release rate that results in a maximum detention storage volume required.

For collection and conveyance of outside ground level runoff (Area A3/FIG.1/Appendix 'C') a series of area drains (inlets) are connected to longitudinal drain pipes attached to the inside basement walls leading to the detention tank attached to the east wall (Nelson St.)

Detailed calculations in Appendix 'D' indicate that a detention tank can be provided for approximately 52 cu. metres (1:100 yr. storm event) storage volume that can be configured to fit available space both vertically and horizontally and will discharge by gravity to the existing 300 dia. service connection that has capacity to spare for the controlled release rate using a circular orifice plate having a diameter in the range of 100 mm to 120 mm.

\* SEE NOTE 10 AT BOTTOM OF PAGE 6

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9. SUMMARY

Rezoning of 112 Nelson St. from industrial to residential that allows a 9 storey building with 151 apartments can be serviced by connection to existing City infrastructure in the roadway based on the following conclusions:

- Water supply: the existing 200 dia. service connection constructed by the City in 2006 can be utilized to supply both domestic and fire demands for a fully sprinklered building subject to replacement of the existing private hydrant with a new hydrant located within 10 m of the fire department building connection.
- A new 200 dia. sanitary service complete with a manhole at the 300 dia. City sewer connection point is preferable to utilization of the existing 150 mm dia. pipe.
- The existing 300 dia. storm service connection, constructed in 1987 has the capacity to serve as outlet for a storm detention storage tank complete with a restrictive flow device to meet City requirements for reducing flows from major storms up to a 1:100 yr. event. Reduction of site runoff to the existing 450 dia. City storm sewer can be in the order of 66% (1:5 yr.) and 70% (1:100 yr.) based on the concept plan that maximizes building coverage on the site. A future application for site plan approval based on any lesser building area or other hard surface coverage can therefore be capable of achieving a similar degree of runoff reduction.

10. SPECIAL NOTE/REVISED CONCEPT PLAN

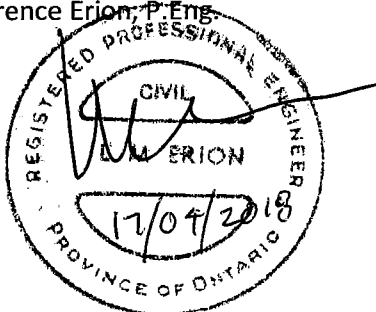
Section 8.2 and APPENDICES 'C' & 'D' are written with specific reference to the original concept design in Nov/2017 without revision.

Comparison of the original and revised concepts can be summarized as follows:

Dwg. A-01	Building Coverage	Total Site Area = 2949 m <sup>2</sup>	
Rev. #	Area (m <sup>2</sup> )	Captured/Uncap.	Pervious/Imperv.
01	2120	2857/ 92	645 (22%)/2304 (78%)
03	1870	2857/ 92	895 (30%)/ 2054 (70%)

While both concepts can capture the same area runoff, the latest concept (Rev. 03) has slightly less impervious area that will require a slightly smaller detention tank for the same release rate of the 1:100 year storm event. For this reason the calculations in Appendix "C" & "D" have not been revised from the original analysis since they yield only a slightly more conservative result. The original analysis therefore remains valid for proving the feasibility of both concepts and will necessarily be adjusted in future when a specific design is submitted for site plan approval.

Prepared and Submitted by  
Lawrence Erion, P. Eng.



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## **APPENDIX 'A'**

**MISCELLANEOUS DRAWINGS**

**7 PAGES**

**Water Analysis for 112 Nelson Street**

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Boundary condition by City of Ottawa on Nelson Street adjacent to site

Max HGL 115.6 m  
 PXHR 106.8 m  
 MXDY + Fire\* 94.9 m  
 \*based on fire flow 13,000 L/m

**Elevations**

Proposed Building Ground Floor 59.50 m  
 9<sup>th</sup> Floor 83.50 m  
 Road elevation at hydrant 59.20 m

**Maximum Pressure at Building**

Max HGL elevation	115.60 m	
Ground Floor	<u>59.50</u> m	
Difference	56.10	
Pressure	561 kPa	81.4 psi

**Pressure Reducing Valve (PVR) required as max pressure exceeds 552 kPa (80 psi)****Minimum Pressure at Building**

PKHR elevation	106.8 m	
Ground Floor	<u>59.50</u> m	
Difference	47.30	
Pressure	473 kPa	68.6 psi

**Minimum pressure at ground floor exceeds minimum required value 276 kPa (40 psi)**

PKHR elevation	106.80 m	
9 <sup>th</sup> Floor	<u>83.50</u> m	
Difference	23.30 m	
Pressure	233 kPa	33.8 psi

**Minimum pressure at 9<sup>th</sup> floor is less than minimum required value of 276 kPa (40 psi)**  
**Booster pump required**

**Fire Flow at Street Hydrant**

MXDY + Fire elevation	94.90 m	
Hydrant elevation	<u>59.20</u> m	
Difference	35.70 m	
Pressure	357 kPa	51.8 psi

**For fire flow of 13,000 L/min residual pressure at hydrant exceeds minimum requirement of 140 kPa (20 psi)**

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**Lawrence Erion**

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**From:** "Wu, John" <John.Wu@ottawa.ca>  
**Date:** April-13-18 3:37 PM  
**To:** "David Renfroe" <renfroe@domicile.ca>; "Lawrence Erion" <erion@rideau.net>  
**Attach:** 112 Nelson April 2018.pdf  
**Subject:** RE: 112 Nelson St./Proposed Re-zoning/ 2nd Submission/ Request for Boundary Conditions EA 17-297

Just got it back.

**\*\*\*\*The following information may be passed on to the consultant, but do NOT forward this e-mail directly.\*\*\*\***

The following are boundary conditions, HGL, for hydraulic analysis at 112 Nelson (zone 1W) assumed to be connected to the 203 mm on Nelson (see attached PDF for location).

Minimum HGL = 106.8 m

Maximum HGL = 115.6 m

The maximum pressure is estimated to be above 80 psi. A pressure check at completion of construction is recommended to determine if pressure control is required.

Max Day (2.73 L/s) + Fire Flow (217 L/s) = 94.9 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.*

John

**From:** David Renfroe <renfroe@domicile.ca>  
**Sent:** Friday, April 13, 2018 3:16 PM  
**To:** Lawrence Erion <erion@rideau.net>; Wu, John <John.Wu@ottawa.ca>  
**Subject:** RE: 112 Nelson St./Proposed Re-zoning/ 2nd Submission/ Request for Boundary Conditions EA 17-297

Hi John,

I hope you are well. I'm just following up on this, could you please provide the current boundary conditions. We are looking to resubmit at the end of next week and I need this information to help Lawrence. Thank you.

Regards,

**David S. Renfroe, B.S., M.B.A.**  
 Director of Business Development and Planning

Boundary Condition for 112 Nelson



**Legend**  
 Water Pipe  
 Ownership  
 Private  
 Public

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renfroe@domicile.ca | www.domicile.ca  
T.613.728.0388 x 235  
1-371A Richmond Rd., Ottawa ON K2A 0E7

# domicile

Find potential and build on it.

“Celebrating 40 years in business”



**From:** Lawrence Erion [mailto:erion@rideau.net]

**Sent:** April-11-18 12:02 PM

**To:** john.wu@ottawa.ca

**Cc:** David Renfroe <renfroe@domicile.ca>

**Subject:** 112 Nelson St./Proposed Re-zoning/ 2nd Submission/ Request for Boundary Conditions EA 17-297

John

As discussed in our phone conversation yesterday, I am requesting a new set of boundary conditions for 2nd submission of the proposed re-zoning based upon the results of planning meetings that have led to a reduction of dwelling units from 174 to 151.

The revised estimate of domestic demand based on 350 Lcd is as follows:

Unit Type	No. Units	P.P.U	AVDY	MXDY x 2.5	PK HR x 2.2
1 Bed	58	1.4	25,970	64,925	142,835
2 Bed	93	2.1	68,355	1,70888	375,953
Total	151		94,325 L/d (1.09 L/s)	235,813 L/d (2.73 L/s)	518,788 L/d (6.0 L/s)

Fire Flow, as detailed in the attached, remains at 13,000 L/min (217 L/s) using an occupant adjustment of -15 % as per your comment regarding the 1st submission, although I disagree with this interpretation of the 1999 F.O.S. method.

To summarize:

AVDY	94,325 L/d	(1.09 L/s)
MXDY	235,813 L/d	(2.73 L/s)
PK HR	518,788 L/s	(6.0 L/s)
Fire Flow	13,000 L/min	(217 L/s)

I am also attaching the Boundary Condition Plan from the 1st Submission.

Please provide current boundary conditions to be used for hydraulic analysis assuming the existing 203 mm water main and service on Nelson St. will remain.

112 Nelson St./Proposed Re-zoning  
Fire Flow Estimate per F.U.S. 1999

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Building Floor Area = 7,055 m<sup>2</sup>  
(based on 2 largest floors + 50% of floors above to 8 max).

1.  $F = 220 \cdot C \cdot A^{0.5}$   
where C = 0.6 (fire resistive)  
F = 11,087 L/min  
Use 11,000 L/min

2. Occupancy Adjustment  
Use – 15% (non-combustible)  
Adjustment = -1,650 L/min  
Fire Flow = 9,350 L/min

3. Sprinkler Adjustment  
Assume 30% reduction  
Adjustment – 2,805 L/m

4. Exposure Adjustment

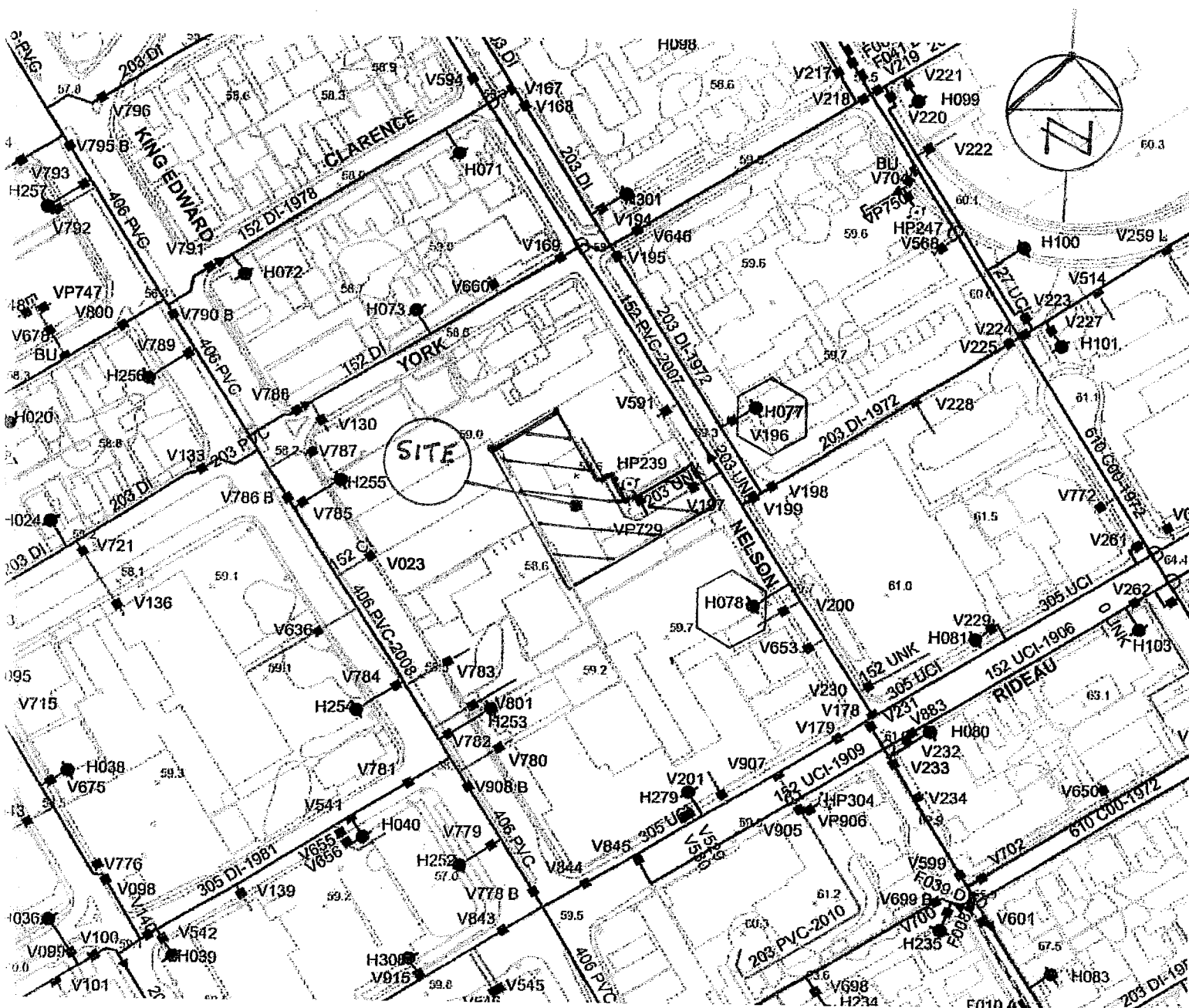
<u>Bldg. Face</u>	<u>Separation</u>	<u>Change</u>
north	16.2 m	+15%
east	15.0 m	15%
south	4.5 m	20%
west	7 m	<u>20 %</u>
	Total	+ 70%

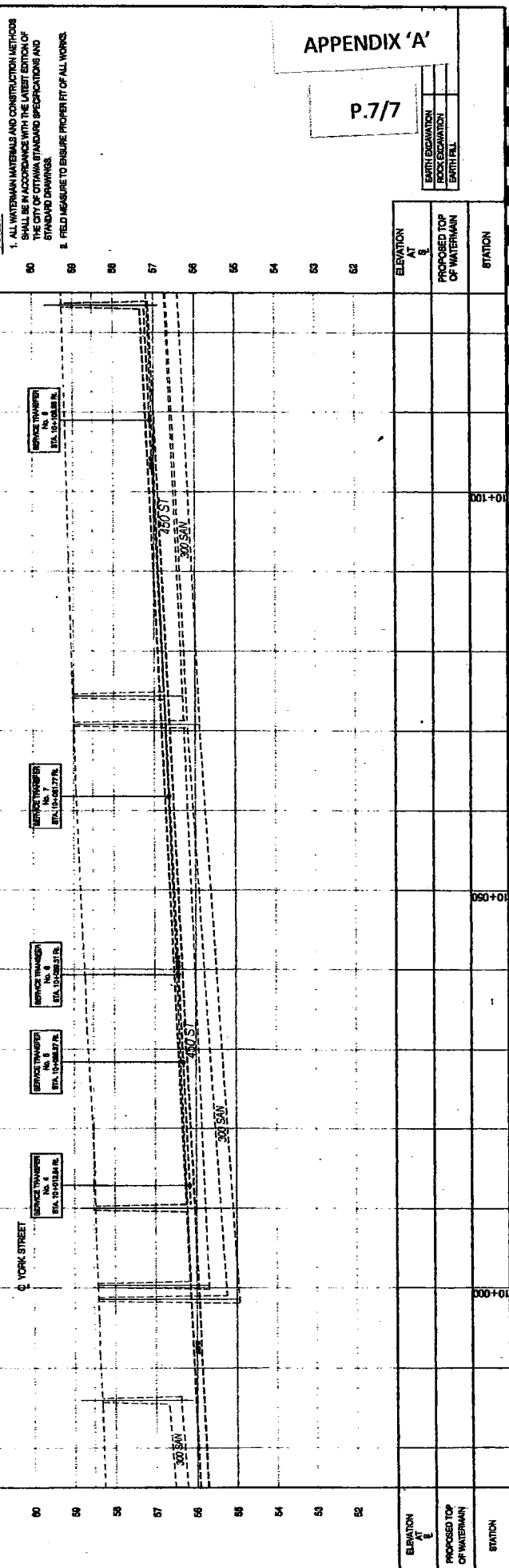
Adjustment + 6,300

5. Summary  
Fire Flow per2      9,000 L/m  
Add exposure      +6,545  
Less sprinkler      -2,805

Total Fire Flow      13,090 L/m  
USE      13,000 L/m (217 L/s)

Lawrence Erion, P.Eng  
Erion Associates





EARTH EXCAVATION	
ROCK EXCAVATION	
EARTH FILL	

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## **APPENDIX 'B'**

### **SANITARY SEWER CONNECTION SIZING**

**2 PAGES**

## APPENDIX 'B'

112 NELSON ST./OTTAWA

PROPOSED RE-ZONING FROM INDUSTRIAL TO RESIDENTIALSANITARY SEWER CONNECTIONA. PER OTTAWA SEWER DESIGN GUIDELINES (O.S.D.G.)

Assume 9 storey bldg. with 151 res. Apartments

1 Bed	58 @ 1.4 p.p.u.	81.2
2 Bed	93 @ 2.1 p.p.u.	195.3
	151	276.5 persons

$$\text{Peak Res. Flow} = Q_p = \frac{350 \text{ Lcd} \times 277 \times 4.0 \text{ (P.F.)}}{86,400} = 4.49 \text{ L/s}$$

$$\text{Infiltration Allowance} = 0.30 \text{ ha} \times 0.28 \text{ L/s/ha} = 0.08$$

$$\text{Total Peak Design Flow} = 4.57 \text{ L/s}$$

B. SELECT SANITARY CONNECTION PIPE SIZEExisting site connection\* = 150 dia. @ 1.0% ( $Q^{CAP} = 15.7 \text{ L/s}$ ,  $V^{FULL} = 0.89 \text{ m/s}$ )Future replacement = 200 dia. @ 1.0% ( $Q^{CAP} = 62.0 \text{ L/s}$ ,  $V^{FULL} = 1.22 \text{ m/s}$ )

\*Constructed in 1987

C. CAPACITY OF NELSON ST. SANITARY SEWERExisting sewer constructed in 1978 (concrete pipe) is 300 dia. @ 0.92% ( $Q^{CAP} = 96.8 \text{ L/s}$ ,  $V^{FULL} = 1.32 \text{ m/s}$ )D. PEAK DESIGN FLOW =  $4.57/15.7 \times 100 = 29\%$  of capacity of existing 150 dia. connectionCAPACITY RATIOS     $4.57/62 \times 100 = 7.4\%$  of capacity of future 200 dia. connection $4.57/96.8 \times 100 = 4.7\%$  of capacity of existing 300 dia. sanitary sewer.E. CALCULATE INVERT OF 150 DIA. SERVICE AT FRONT BUILDING WALL

Invert 300 dia. at connection = 56.14 m (Dwg. M1/Everest Eng.)

+ 0.07

Invert 150 dia. at connection = 56.21

+ 9.3 m @ 1% = 0.09 (Pipe slope)

Invert 150 dia. at front wall = 56.30 m

...2



F. EXISTING SITE PEAK SANITARY FLOW

Mixed Use Industrial/Commercial/Office/Warehouse

Use 50,000 L/d ADF with P.F. = 1.5

Site Area = 0.295 ha.

Peak Flow  $\frac{50,000 \times 0.295 \times 1.5}{86,400}$  = 0.256 L/s

+ Infiltration =  $0.295 \times 0.28$  = 0.083

Total 0.239

(0.24 L/s)

G. INCREASE IN PEAK FLOW ABOVE EXISTING

Proposed Peak Flow = 4.57 L/s

Minus Existing Peak Flow = (0.24)

Increase in Peak Flow = 4.33 L/s

H. DOWNSTREAM FLOW/CAPACITY COMPARISON

Street	Sewer I.D.*	Dia. mm	Slope %	$Q^{CAP}$ L/s	Site Increase L/s	% of $Q^{CAP}$	Comments
NELSON	SAN 39117	300	0.92	96.8	4.3	4.4	SITE CONNECTION
NELSON	SAN 39116	300	1.2	109.3	4.3	3.9	
YORK	SAN 39115	600	0.61	498	4.3	0.09	
YORK	SAN 39114	600	0.87	597	4.3	0.07	
YORK	SAN 39113	600	1.39	755	4.3	0.06	TO 1050 DIA. TRUNK @ KING EDWARD AVE.

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## APPENDIX 'C'

### STORM SEWER CONNECTION ANALYSIS

2 PAGES

# APPENDIX 'C'

P.1/2

112 NELSON ST./OTTAWA

## PROPOSED REZONING- INDUSTRIAL to RESIDENTIAL STORM SEWER CONNECTION ANALYSIS

Reference: (1) OTTAWA SEWER DESIGN GUIDELINES (O.S.D.G.)  
(2) CONCEPT SITE PLAN – DWG. SP-1 (AWA ARCHITECT)  
(3) STORM DRAINAGE AREAS (FIGURE 1)

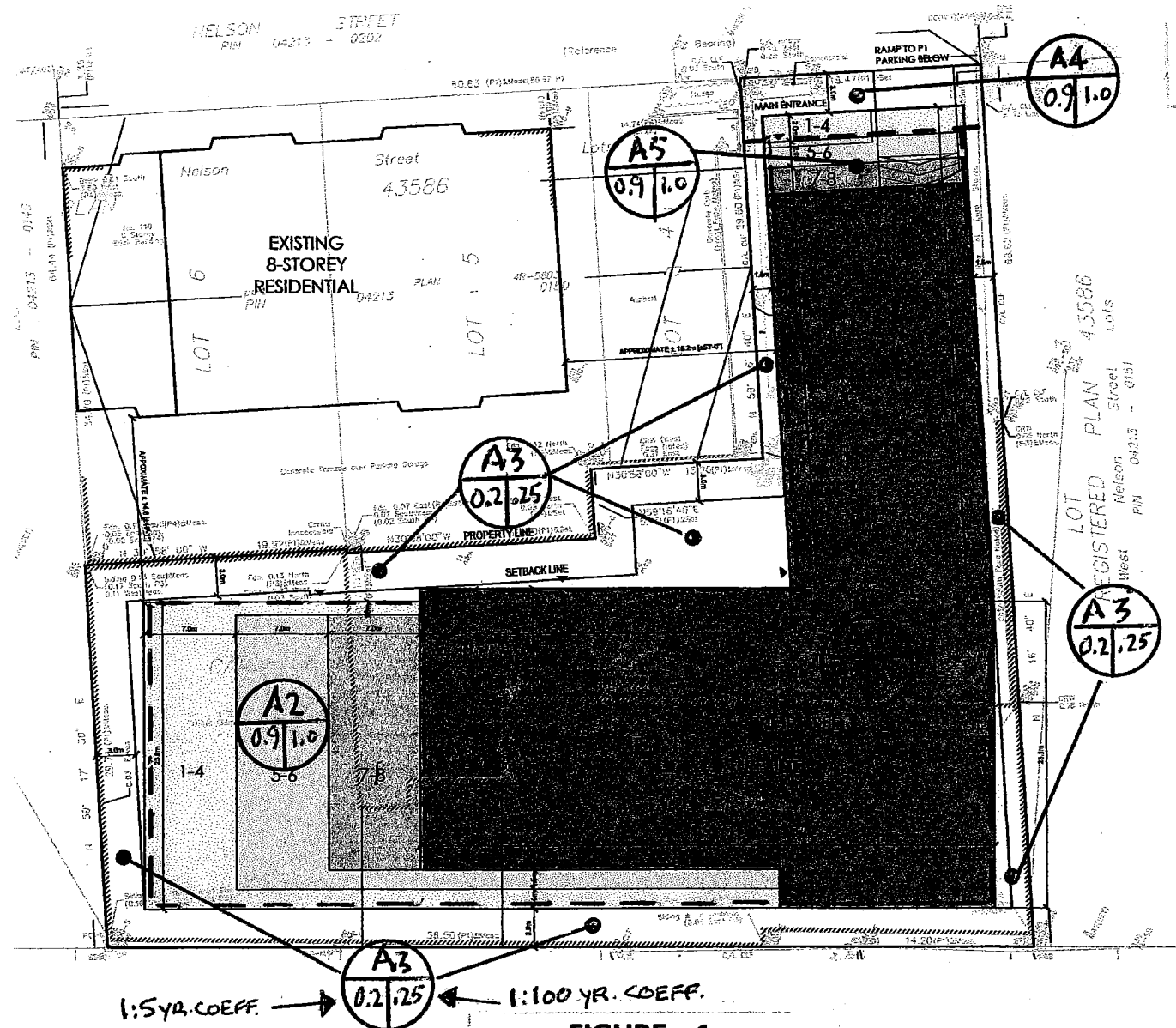
Storm sewer connection is sized to convey the peak runoff flow resulting from a 1:5yr rainfall event applied to all captured surface areas on the site. Pipe capacity to be equal or greater than the resulting peak flow without surcharging and with no restrictive flow control devices in place.

- From Table 1, pg.2

Total site area captured	= 2857 (96.9%)
Total site area uncaptured	= <u>92</u> (3.1 %)
Total site area	= 2949 (100%)
 Total A x C captured	 = 1963.7 (96%)
Total A x C uncaptured	= <u>82.8</u> (4%)
Total A x C	= 2046.5 (100%)
  - Peak Captured Flow (1:5 yr.) =  $Q_{p5} = 2.78 \times A \times C \times I$   
 $A \times C = 0.19637$   
for  $T_c = 10 \text{ min.}$ ,  $Q_{p5} = 2.78 \times 0.19637 \times 104.2 \text{ mm/hr.} = 56.9 \text{ L/sec}$   
for  $T_c = 15 \text{ min.}$ ,  $Q_{p5} = 2.78 \times 0.19637 \times 83.6 \text{ mm/hr.} = 45.6 \text{ L/sec}$
  - Existing Service Connection:

Pipe Diameter	300 mm
Slope	1.0%
Capacity	100.9 L/sec $Q_p/Q_c = 56\% \text{ to } 45\%$
Velocity (full)	1.38 m/sec
  - Capacity of City Storm Sewers
    - (a) Nelson St. (ST 39307): 450 dia. @ 0.82% = 269 L/sec
    - (b) York St. (ST 39305): 600 dia. @ 0.51% = 457 L/sec
  - Elevation of Existing 300 dia. service connection

Inv. 450 dia. on Nelson St.	= 56.57 m
+	<u>0.07</u>
Inv. 300 dia. @ connection	= 56.64
+ 12 m @ 1.0% slope	= <u>0.12</u>
Inv. 300 dia. @ Bldg. wall	= 56.76
+	<u>0.30</u>
Obvert 300 dia. @ Bldg. wall	= 57.06
- |                                 |                |                     |
|---------------------------------|----------------|---------------------|
| Future Basement Floor Elevation | 56.8 ± highest | EA 17-297<br>NOV/17 |
| (Per Appendix 'B')              | 56.5 ± lowest  |                     |



**FIGURE 1**  
POST-DEV. DRAINAGE AREAS

AREA I.D.	AREA m <sup>2</sup> (A)	RUNOFF COEFF (C)				COMMENT
		1:5yr.	1:100 yr.	1:5 yr.	1:100 yr.	
A1	1263	0.9	1.0	1136.7	1263	CAPTURED
A2	664	0.9	1.0	597.6	664	CAPTURED
A3	868	0.2	0.25	173.6	217	CAPTURED
A4	92	0.9	1.0	82.8	92	UNCAPTURED
A5	62	0.9	1.0	55.8	62	CAPTURED

**TOTAL 2949**

	1:5yr.	1:100 yr.
TOTAL A x C CAPTURED	1963.7	2206
A X C UNCAPTURED	82.8	92

**TABLE 1**  
POST-DEV. DRAINAGE DATA  
(RATIONAL METHOD)

## **APPENDIX 'D'**

### **STORMWATER MANAGEMENT ANALYSIS**

**3 PAGES**

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P.1/3

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APPENDIX 'D'

112 NELSON ST.

PROPOSED REZONING (INDUSTRIAL to RESIDENTIAL

STORMWATER MANAGEMENT ANALYSIS

Reference: Appendix 'C' (FIG 1/TABLE 1)

1. EXISTING SITE RUNOFF

Using Rational Method formula  $Q = 2.78 \times A \times C \times I$

where  $A = 0.295$  ha.

$C = 0.9$  (1:5 yr. = 1.0 (1:100 yr.)

$$Q_5 = 2.78 \times 0.295 \times 0.9 \times 83.6 = 61.7 \text{ L/sec (Tc = 15 min.)}$$

$$= 2.78 \times 0.295 \times .09 \times 104.2 = 76.9 \text{ /sec (Tc = 10 min.)}$$

$$Q_{100} = 2.78 \times 0.295 \times 1.0 \times 142.9 = 117.2 \text{ L/sec (Tc = 15 min)}$$

$$2.78 \times 0.295 \times 1.0 \times 178.6 = 146.5 \text{ L/sec (Tc = 10 min)}$$

Existing service 300 @ 1.0%  $Q_{CAP} = 100.9$  L/sec  $Q_5/Q_{CAP} = 61\%$  (Tc = 15), 76% (Tc = 10)

Existing storm sewer (ST 39307)  $Q_{CAP} = 269$  L/sec (Appendix 'C')

2. POST-DEV. RUNOFF

2.1 - Max. allowable site release (1:5 yr./C = 0.50)

$$Q_{ALLOW} = 2.78 \times 0.295 \times 0.50 \times 83.6 = 34.3 \text{ L/sec (Tc = 15 min)}$$

$$= 2.78 \times 0.295 \times 0.50 \times 104.2 = 42.7 \text{ L/sec (Tc = 10 min)}$$

2.2 – Uncaptured + uncontrolled release (1:100) yr. Area A4)

$$Q_{UNCAP} = 2.78 \times 0.0092 \times 1.0 \times 142.9 = 37 \text{ L/sec (Tc = 15 min)}$$

$$= 2.78 \times 0.0092 \times 1.0 \times 178.6 = 46 \text{ L/sec (Tc = 10 min)}$$

2.3 – Max. controlled release from SWM storage

$$Q_{CONT} = Q_{ALLOW} - Q_{UNCAP}$$

$$= 34.3 - 3.7 = 30.6 \text{ L/sec (Tc = 15 min)}$$

$$= 42.7 - 4.6 = 38.1 \text{ L/sec (Tc = 10 min)}$$





### 3. STORAGE REQUIRED

Assume all storage to be provided in a structural tank located in the basement adjacent to the frontage wall at Nelson St.

For purposes of this analysis using the modified rational method formula, the lower allowance release derived from  $T_c = 15$  minutes (30.6 L/sec) will be used to derive a maximum storage volume requirement.

$$Q_{100} = 2.78 \times (A \times C) \times I_{100} = 2.78 \times 0.2206 \times I_{100} = 0.61323 \times I_{100}$$

$T_c$ (min)	$I_{100}$ (mm/hr.)	$Q_{100}$ (L/s)	$Q_{RELEASE}$ (L/s)	$= Q_{STORAGE}$ (L/s)	$\times T$ (sec/1000)	$= V_{STORAGE}$ c.m.
10	178.6	109.5	30.6	78.9	0.6	47.3
15	142.9	87.6	30.6	57	0.9	51.3
20	120.0	73.6	30.6	43	1.2	51.6 <
25	103.9	63.7	30.6	33.1	1.5	49.7

Therefore: Required storage volume for 1:100 yr. = 51.6 cu.m.

### 4. STORAGE PROVIDED

For the concept design of the building, a concrete storage tank could be constructed adjacent to the inside of the front basement wall including the area below the access ramp to underground parking. Listed below are a few possible rectangular configurations with the resulting depth of water for 51.6 cubic metres of storage.

Alternative tank configurations:

W m	L m	A m <sup>2</sup>	D m
6	7	42	1.23
6	8	48	1.14
7	8	56	0.92
7	7.5	52.5	0.98

Where W = distance along front wall from south wall

L = distance perpendicular to front wall

A = floor area of tank

D = depth of water to contain 51.6 cu. m.

Allowance for additional storage depth of 0.30 m above 1:100 yr. storm level (1.4 m above highest tank floor level) would provide an additional 15 c.m.  $\pm$  before overflow in pipe connected to 300 dia. storm service downstream of the control device. The top of the tank wall would then be set 0.4 m above invert of overflow pipe (200 dia.) or 2.1 m above tank floor.



APPENDIX 'D'

5. CONTROL DEVICE

Selection of circular plate-type orifice installed in the end of 300 dia. outlet pipe with centre of orifice set at centre of 300 dia. (57.06) and bottom of tank at 57.20, the size of orifice can be set as follows using storage depth of 1.0 m:

$$\begin{aligned} A &= \text{Area of orifice} = Q^R / 0.61 A (2gh)^{0.5} \\ \text{where } Q^R &= 30.6 \text{ L/s} = 0.0306 \text{ m}^3/\text{s} \\ g &= 9.81 \text{ m/s}^2 \\ h &= 57.20 + 1.00 - 57.06 = 1.14 \text{ m} \\ A &= \frac{0.0306}{0.61(19.62 \times 1.14)^{0.5}} = 0.0106 \text{ m}^2 \\ \text{Diameter} &= \frac{(4 \times A)^{0.5}}{(\pi)} = \frac{(4 \times 0.0106)^{0.5}}{(\pi)} = 0.116 \text{ m} = 116 \text{ mm} \end{aligned}$$

For a water depth (1:100 yr.) = 1.23 m, Diameter of orifice = 97 mm

6. RUNOFF REDUCTION

A comparison of existing vs. post-dev. runoff is calculated as follows using  $T_c = 15$  min.

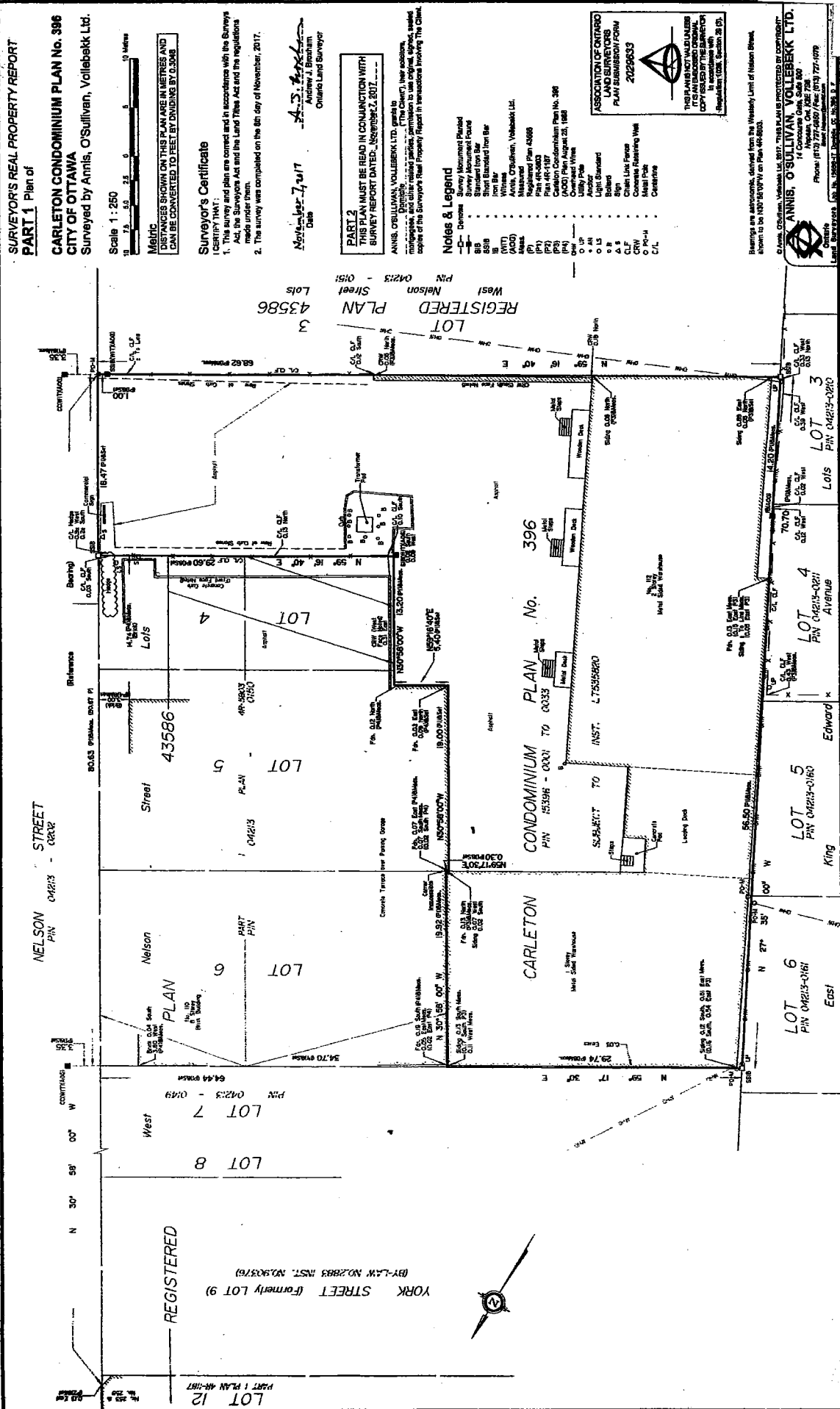
- Existing Runoff (per sec. 1.0 above).  
 $Q_5 = 61.7 \text{ L/s}$      $Q_{100} = 117.2 \text{ L/s}$
- Post-Dev. Runoff  

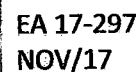
1:5 yr. – Uncaptured	$= 2.78 \times 0.0092 \times 83.6$	$= 1.9 \text{ L/s}$
+ Storage tank release (h = 0.45, $Q_R$ )		$= 19.2$
		21.1 L/s
1:100 yr. – Uncaptured	$= 2.78 \times 0.0092 \times 1.0 \times 142.9$	3.7 L/s
+ Storage tank release		30.6
		34.3 L/s
- Flow Reduction  
1:5 yr:     $61.7 - 21.1 = 40.6 \text{ L/s}$  (66%)  
1:100 yr:  $117.2 - 34.3 = 82.9 \text{ L/s}$  (70%)

## APPENDIX 'E'

MISCELLANEOUS DRAWINGS

5 PAGES





### Legend

**Old**

SUBTYPE

Combined Pipe

— Sanitary Pipe

Storm Pipe

## Structure

SUBTYPE

- **Combined**

- **Sanitary Manhole**

Storm Inlet

- Storm Manhole

+ Storm Outlet

GISADM.SAM tera

## ROAD SEGMENT

----- Road Edge

[illegible]

795

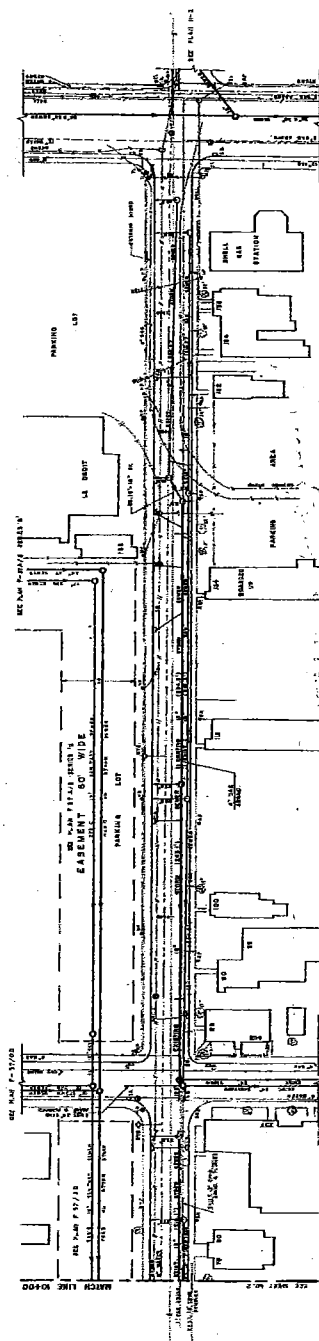
**STMS**

**Figure 1**

NOTES

1. PLAN AND SET. SUPERSEDES PART OF PLAN 1-14.  
2. --- INDICATES NEW CONSTRUCTION AS PER T.E.  
INSTRUCTION.

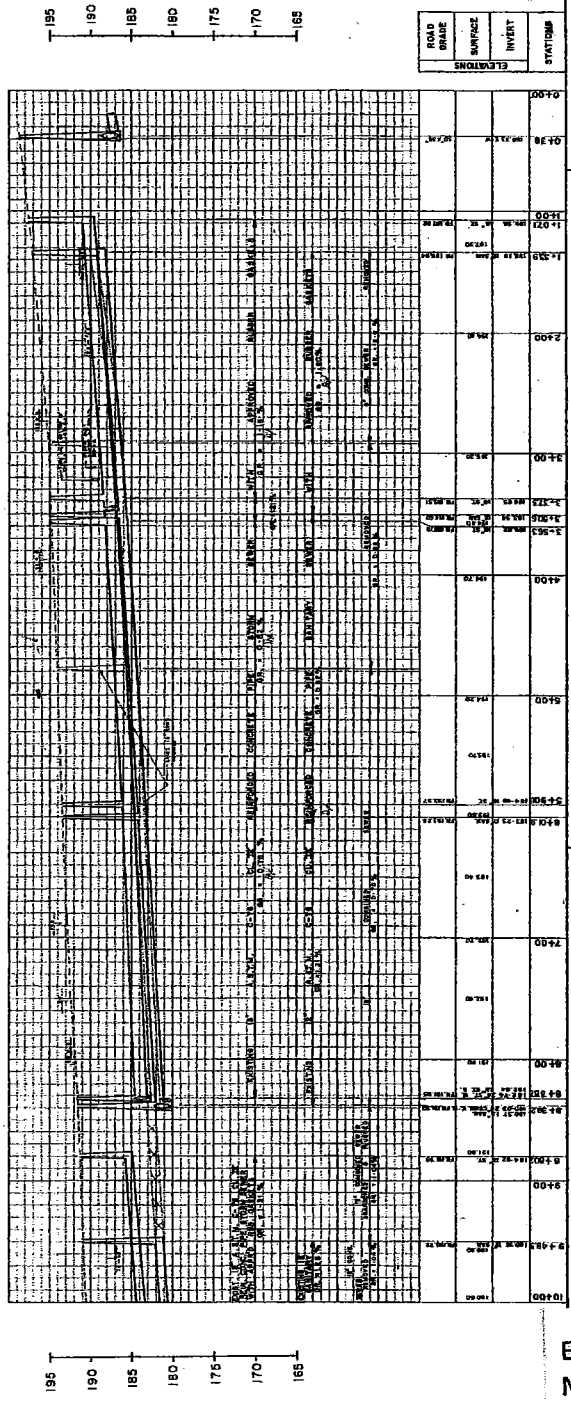
NELSON STREET



HUDSON ST.  
100' 0\"/>

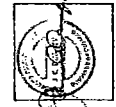
YORK ST.  
100' 0\"/>

NOTE: NELSON STREET FROM YORK TO HUDSON ST. IS 8' 6\"/>



APPENDIX 'E'

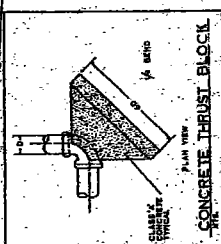
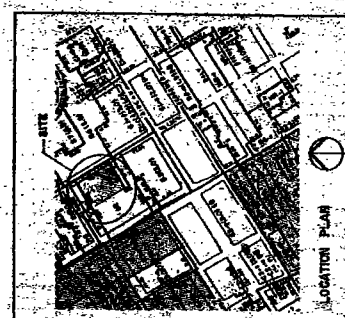
NOTES:  
1. THE SEWER LINE IS TO BE CONSTRUCTED IN ACCORDANCE WITH THE CITY OF NEW YORK DEPARTMENT OF PUBLIC WORKS, BUREAU OF SANITARY ENGINEERING, AND BUREAU OF STREET DESIGN.  
2. ALL TIE-INS TO EXISTING SEWER LINES SHALL BE MADE IN ACCORDANCE WITH THE CITY OF NEW YORK DEPARTMENT OF PUBLIC WORKS, BUREAU OF SANITARY ENGINEERING, AND BUREAU OF STREET DESIGN.  
3. THE SEWER LINE IS TO BE CONSTRUCTED IN ACCORDANCE WITH THE CITY OF NEW YORK DEPARTMENT OF PUBLIC WORKS, BUREAU OF SANITARY ENGINEERING, AND BUREAU OF STREET DESIGN.



CITY OF NEW YORK  
DEPARTMENT OF PUBLIC WORKS  
BUREAU OF SANITARY ENGINEERING  
AND BUREAU OF STREET DESIGN  
NELSON STREET  
HUDSON ST. TO YORK ST.  
100' 0\"/>

ROAD GRADE	SEWER GRADE	INVERT	STATIONING
195.00	194.00	194.00	0+00
194.00	193.00	193.00	0+10
193.00	192.00	192.00	0+20
192.00	191.00	191.00	0+30
191.00	190.00	190.00	0+40
190.00	189.00	189.00	0+50
189.00	188.00	188.00	0+60
188.00	187.00	187.00	0+70
187.00	186.00	186.00	0+80
186.00	185.00	185.00	0+90
185.00	184.00	184.00	1+00

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It is the responsibility of the Applicant to ensure that all dimensions are correct and that all dimensions are shown on the drawing. All dimensions must comply with the relevant codes and standards. All dimensions are measured from the face of the wall unless otherwise indicated. Do not make alterations. This drawing may not be used for construction until signed by the Professional Engineer.

112 NELSON ST.  
DOMICILE DEVELOPMENTS  
112 NELSON ST.  
OTTAWA, ON

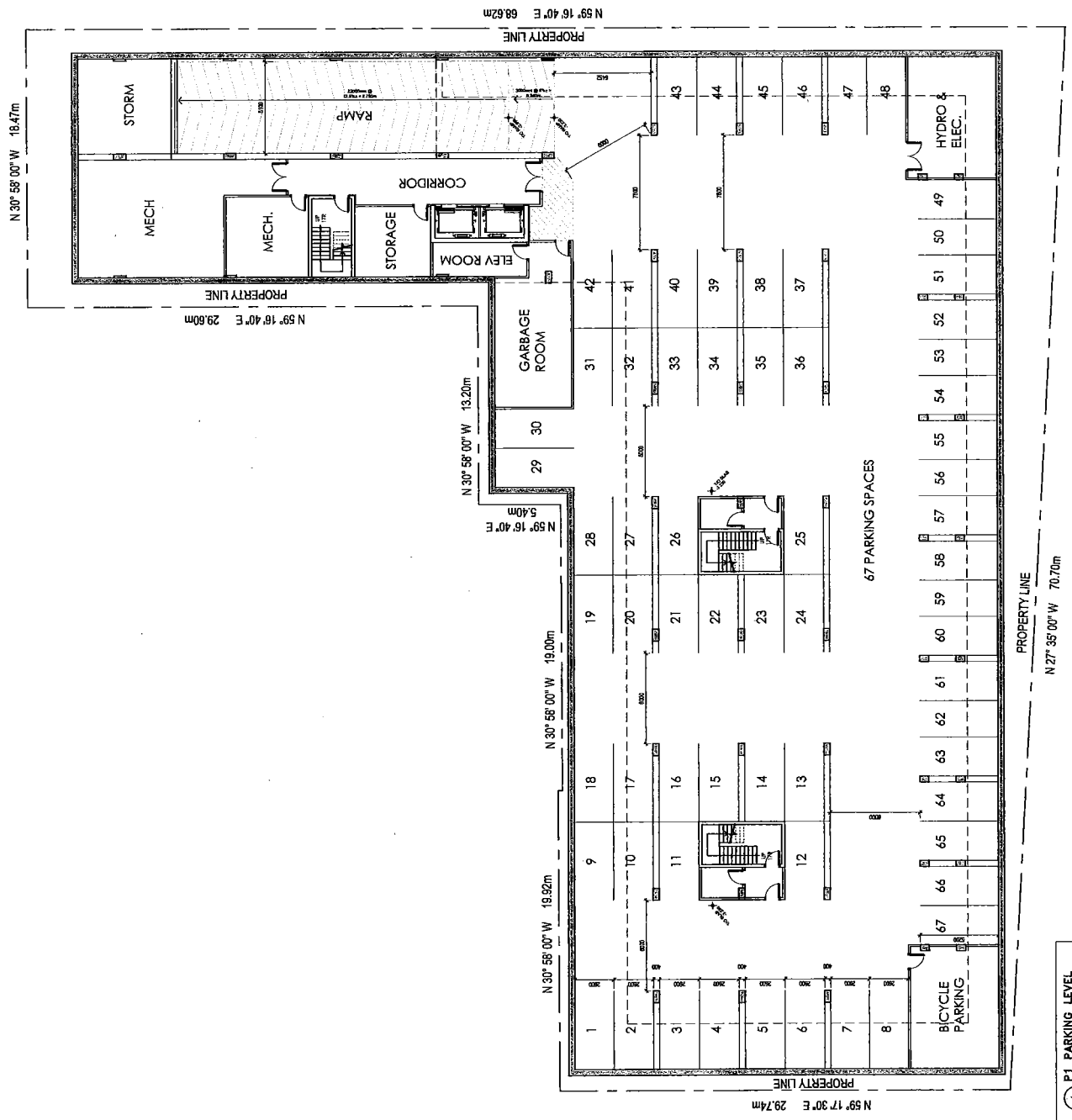
ALCAIDE  
WEBSTER  
ARCHITECTS INC.  
1125 VICTORIA PARKWAY  
OTTAWA, ON K1H 2G4  
TEL: 613-745-1111  
FAX: 613-745-1112

PROFESSIONAL ENGINEER  
AND COLLUM VOLLBERG LTD. - SURVEYOR

112 NELSON ST.  
DOMICILE DEVELOPMENTS  
112 NELSON ST.  
OTTAWA, ON

P.5/5  
P1 PARKING LEV  
DRAWING TITLE  
DATE  
BY  
CHECKED BY  
DATE

02  
A050



EA 17-297  
Rev. April/18

1 P1 PARKING LEVEL  
SCALE: 1/8" = 1'-0"