Functional Site Servicing and Stormwater Management Report 1356 Clyde Avenue, Ottawa, ON

Client:
Golpro Holdings Inc.
200-30 Colonnade Road
Ottawa, ON K2E 7J6

Submitted for:
Zoning By-law Amendment

Project Name:
1356 Clyde Avenue

Project Number:
OTT-00257949-A0

Prepared By:
EXP
2650 Queensview Drive
Ottawa, ON K2B 8H8
t: +1.613.688.1899
f: +1.613.225.7337

Date Submitted:
March 24, 2020

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EXP
2650 Queensview Drive
Ottawa, ON K2B 8H8
t: +1.613.688.1899
f: +1.613.225.7337

Prepared by:

Jason Fitzpatrick, P.Eng.
Project Engineer

LICENSED PROFESSIONAL ENGINEER
J.L. FITZPATRICK
2020-03-24
PROVINCE OF ONTARIO

Approved by:

Bruce Thomas, P.Eng.
Senior Project Manager

Date Submitted:
March 18, 2020

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1 Introduction

1.1 Overview

EXP Services Inc. (EXP) was retained by Golpro Holdings Inc. (Golpro) to prepare a Functional Site Servicing and Stormwater Management Report for the proposed redevelopment of 1356 Clyde Avenue in support of a Zoning By-Law Amendment.

The 0.742hectare site is situated at the north-west corner of Clyde Avenue and Baseline Road and as illustrated in **Figure 2-1** below. The site is within the City of Ottawa urban boundary and situated in College Ward (Ward 8). The description of the subject property is noted below:

- PIN 039950221 comprised of:
  - Part 1, Part 3 Plan 4R-6220
  - Part 2 Plan 4R-6220 (right of way for Civic # 1485 Baseline Rd)
  - Part 3 Plan 4R-6220
  - Part 1, Part 2, Part 3, Part 4, and Part 5 Plan 4R-1111
- PIN 03995-0231 comprised of:
  - Part 2 Plan 4R-11538

The development proposed will consist of two high-rise buildings, each with a six-storey podium. Below the towers three levels of underground parking will be provided.

The north tower (Tower 1) is a 26-storey high-rise comprised of 210 residential units located on the 3rd to 26th floors, with ground floor retail and 2nd floor office space. The south tower (Tower 2) is a 28-storey tower, with 258 residential units located on the 3rd to 28th floors, having ground floor retail and 2nd floor office space.

This report will discuss the adequacy of the adjacent municipal watermain, sanitary sewers and storm sewers to provide the required water supply, convey the sewage and stormwater flows that will result from the proposed development.

2 Existing Conditions

Within the site, there are two (2) existing buildings. The current zoning of the property is Arterial Mainstreet Zone, (AM1) and includes retail and commercial uses. The following summarizes the current building uses within the property.

- Existing Building 1 (north) Retail and restaurant uses. Parking areas.
- Existing Building 2 (south) Retail and office uses. Parking areas.

The topography of the subject site falls in a southerly direction towards Baseline Road, with depressions evident in the parking lot. Currently, there are three (3) vehicular access points from the site. There are two (2) access points to Clyde Avenue, and one (1) to Baseline Road.

Figure 2-1 - Site Location

The northern access to Clyde Avenue consists of a narrow 6.0-metre wide lane having 2-way (in and out) access. The access allows for northbound and southbound access from Clyde Avenue, but only southbound access onto Clyde Avenue. The southern access on Clyde Avenue is a wider entrance having an approximate 10m width and allows for in or out access to Clyde Avenue. Inbound traffic using this access would be south-bound from Clyde Avenue only. The single outbound access point to Baseline Road is for westbound access due to the raised concrete median present on Baseline Road.

3 Existing Infrastructure

The site includes two buildings that will be removed during the redevelopment of the site. It is proposed to develop the site in two phases. The northern tower (tower 1) will be constructed first, with the southern tower 2 to follow.

From review of the sewer and watermain mapping, as-built drawings and Utility Central Registry (UCC) plans, the following summarizes the onsite and adjacent offsite infrastructure:

Within property

- Storm sewers and catchbasins, sanitary sewer laterals and manhole, watermain services to the two existing buildings.
- 200mm watermain connected to Civic #1465 Baseline Road.

On Clyde Avenue

- 305mm, 610mm, 914 mm watermains
- 225mm sanitary sewer
- 900mm storm sewer
- Rogers plant
- 100mm & 150mm Gas / Bell (2) / Streetlighting/ Hydro / Traffic

On Baseline Road

- 300mm watermain
- 375mm sanitary sewer
- 900mm storm sewer
- 300mm Gas / Hydro /Bell / Streetlighting / Traffic

4 Pre-Consultation / Permits / Approvals

A pre-consultation meeting was held with the City prior to design commencement. This meeting, held Dec 09, 2019, outlined the submission requirements and provided information to assist with the development proposal.

The proposed site is located within the Rideau Valley Conservation Authority (RVCA) jurisdiction, therefore signoff from the RVCA will be required prior to Site Plan approval. The RVCA will be contacted to confirm the stormwater management quality control requirements.

The subject site is located within the Pinecrest Creek subcatchment as identified in Figure 3.2 of the Pinecrest Creek/Westboro Area SWM Guidelines (June 2012). As such, additional quantity and quality control requirements for stormwater will be required. Additional information on this will be provided in proceeding sections.

It is noted that the City of Ottawa has begun Stage II LRT construction works, which will include a new stormwater management facility at Baseline Road / Woodroffe Avenue to support the new Baseline LTR station at Algonquin College. The new SWM facility will provide water quality treatment for subcatchments upstream of the new pond, which the subject site at 1356 Baseline Road is included. A copy of the correspondence with the RCVA is attached in **Appendix B**.

Generally, an Environmental Compliance Approval (ECA) would be obtained from the Ministry of Environment, Conservation and Parks (MECP), formerly the Ministry of the Environment and Climate Change (MOECC), for any onsite private Sewage Works. The onsite Sewage Works would generally include the onsite stormwater works such as flow controls, associated stormwater detention, and treatment works. However, an Approval Exemption under Ontario Regulation 525/98 can be applied. Under Section 3 of O'Reg 525/98, Section 53 (1) and (3) do not apply to the alteration, extension, replacement or a change to a stormwater management facility that 1) is designed to service one lot or parcel of land, b) discharges into a storm sewer that is not a combined sewer, c) does not service industrial land or a structure located on industrial land, and finally d) is not located on industrial land. Based on this exemption, if the stormwater management works within the site remain located within one property parcel, then an Approval Exemptions under O'Reg 525/98and would apply and therefore not necessitate an ECA.

In addition, various design guidelines were referred to in preparing the current report including:

- Bulletin ISDTB-2012-4 (20 June 2012)
  - Technical Bulletin ISDTB-2014-01 (05 February 2014)
  - Technical Bulletin PIEDTB-2016-01 (September 6, 2016)
  - Technical Bulletin ISDTB-2018-01 (21 March 2018)
  - Technical Bulletin ISDTB-2018-04 (27 June 2018)
- Ottawa Design Guidelines – Water Distribution, July 2010 (WDG001), including:
  - Technical Bulletin ISDTB-2014-02 (May 27, 2014)
  - Technical Bulletin ISTB-2018-02 (21 March 2018)
- Stormwater Management Planning and Design Manual, Ontario Ministry of the Environment and Climate Change, March 2003 (SMPDM).
- Design Guidelines for Drinking-Water Systems, Ontario Ministry of the Environment and Climate Change, 2008 (GDWS).
- Fire Underwriters Survey, Water Supply for Public Fire Protection (FUS), 1999.
- Ontario Building Code 2012, Ministry of Municipal Affairs and Housing.

5 Water Servicing

5.1 Existing Water Servicing

The subject site is within the City of Ottawa 2W/2C pressure zone. The site is currently serviced by two of the three existing watermains onsite. From GeoOttawa it is shown that a 102 mm water service supplies the existing northern building, a 203mm water service supplies the southern building, and a 203mm watermain connects through the property to supply Civic # 1465 Baseline Road. All three noted water services are connected of the existing 300mm watermain in Clyde Avenue. Figure 5-1 below illustrates the existing water services onsite.

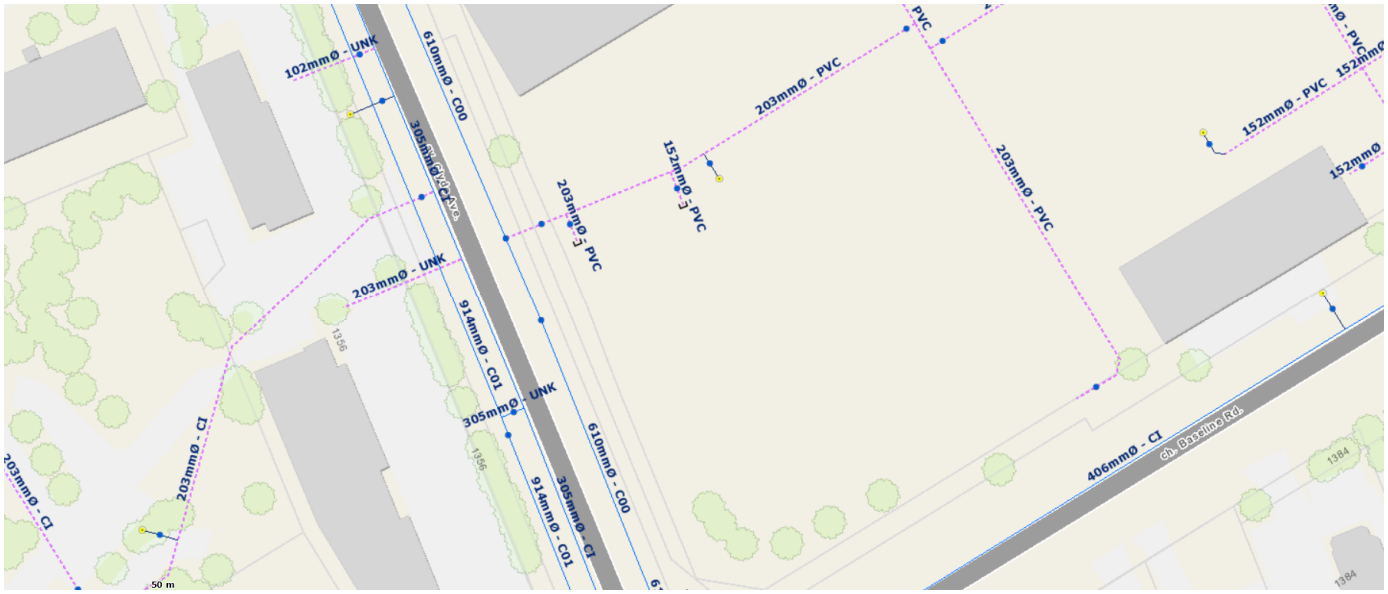


Figure 5-1 – Water Servicing for Existing Buildings

5.2 Water Servicing Proposal

The proposed development will consist of two high-rise buildings. Tower 1 is comprised of 210 residential units and ±2,185 square metres of office and retail space. Tower B is comprised of 258 units and ±2,600 square metres of office and retail space. Architectural plans and rendering of the proposed building along with building statistics are provided in **Appendix D.**

Water supply for the site will be provided by twin 200mm watermains supplied from the existing 300mm watermain on Clyde Avenue. As each tower will be constructed in phases, it is necessary to provide separate services for each. In addition, each building will require independent and twin watermain, which is the result of the average day water demands exceeding 50 m^3/day. The watermain feeds from the underground parking level will connect directly to the existing 300mm watermain on Clyde Avenue and will have an isolation valve between them, consistent with City of Ottawa Water Design Guidelines. **Figure 1** in **Appendix A** illustrates the conceptual water servicing of the property.

The buildings will be protected by an automatic sprinkler system. A fire department connection (or siamese) will be located within 45 metres of an adjacent municipally owned fire hydrant. In order to achieve this, it is proposed that a new hydrant will be installed off the existing 300mm watermain within Clyde Avenue right-of-way.

5.3 Water Servicing Design

The water servicing requirements for the proposed building is designed in accordance with the City Design Guidelines (July 2010). The following steps indicate the basic methodology that was used in our analysis:

- Estimated water demands under average day, maximum day and peak hour conditions. As the total population estimate was greater than 500, standard residential peaking factors were used, rather than based on MECP Table 3-3 which would be necessary when the design population is than 500 persons.
- Estimated the required fire flow (RFF) based on the Fire Underwriters Survey (FUS).
- Obtained hydraulic boundary conditions (HGL) from the City, based on the above water demands and required fire flows.
- Boundary condition data and water demands were used to estimate the pressure at the proposed building, and this was compared to the City's design criteria.

Since the average day demand exceed 50 m^3 per day, two watermain feeds for each building will be necessary as per Section 4.31 of the WDG001. Please refer to **Table A-1** in **Appendix A** for detailed calculations of the total water demands.

A review of the estimated watermain pressure at the building connection, based on the boundary conditions provided, was completed based on using two watermains. **Table A-4** in **Appendix A** provides a comparison of anticipated pressures at the building connection based on using a single or double watermain feed. A single watermain analysis was completed to determined if the water pressure still met the City requirement during either the maximum day plus fire flow or peak hour condition, if one of the laterals was out of service.

Based on the hydraulic grade line (HGL) provided from the City it is evident that low pressures already exist in the water distribution system at the property. Static pressures of ± 40 psi – 50 psi are typically available. This is simply due to the far distance from the reservoir. Due of the relatively short distance that would be necessary between the buildings and the watermain connection, minimal pressure loss is anticipated. The pressure available at the building connection would be within ±1.5 psi of the pressure in the city main based on a 200mm supply. If only one of the two mains were in operation, the pressure at the building would be ±3.6 psi of the pressure in the city main.

Under peak hour conditions, there is little difference if either one or two 200mm watermains are in use, with anticipated pressure at the building of ±1.5 psi of the city's distribution main pressure.

During the detailed design stage of the project the final selection of the watermain diameter required for each building will be coordinated with the mechanical consultant. Due to the relatively low pressure, and height of the building, onsite boosters will be necessary.

Based on the results, the installation of two 200mm watermains with a shut-off valve between them is proposed. No pressure reducing measures are required as operating pressures are less than 80 psi.

5.4 Water Servicing Design Criteria

Table 5-1 below summarizes the Design Criteria that was used to establish the water demands and the required fire flows, based on the proposed building uses. The design parameters that apply to this project and used for calculations are identified below.

Table 5-1 - Summary of Water Supply Design Criteria

Design Parameter	Value	Applies
Population Density – Single-family Home	3.4 persons/unit	
Population Density – Semi-detached Home	2.7 persons/unit	
Population Density – Townhome or Terrace Flat	1.8 persons/unit	
Population Density – Bachelor Apartment	1.4 persons/unit	
Population Density – Bachelor + Den Apartment	1.4 persons/unit	
Population Density – One Bedroom Apartment	1.4 persons/unit	✓
Population Density – One Bedroom plus Den Apartment	1.4 persons/unit	
Population Density – Two Bedroom Apartment	2.1 persons/unit	✓
Population Density – Two Bedroom plus Den Apartment	2.1 persons/unit	
Average Day Demands – Residential	350 L/person/day	✓
Average Day Demands – Commercial / Institutional	28,000 L/gross ha/day	✓
Average Day Demands – Light Industrial / Heavy Industrial	35,000 or 55,000 L/gross ha/day	
Maximum Day Demands – Residential	2.5 x Average Day Demands	✓
Maximum Day Demands – Commercial / Institutional	1.5 x Average Day Demands	✓
Peak Hour Demands – Residential	5.5 x Average Day Demands	✓
Peak Hour Demands – Commercial / Institutional	2.7 x Average Day Demands	✓
Fire Flow Requirements Calculation	FUS	✓
Depth of Cover Required	2.4m	✓
Maximum Allowable Pressure	551.6 kPa (80 psi)	✓
Minimum Allowable Pressure	275.8 kPa (40 psi)	✓
Minimum Allowable Pressure during fire flow conditions	137.9 kPa (20 psi)	✓

5.5 Estimated Water Demands

The following **Table 5-2** below summarizes the anticipated water demands for the proposed development based on following:

- Tower 1 having 210 units and 2,185 m^2 of office and retail space. Estimated residential population of 358 persons.
- Tower 1 having 258 units and 2,599 m^2 of office and retail space. Estimated residential population of 430 persons.

Table 5-2 : Water Demand Summary

Water Demand Conditions	Tower 1 - Water Demands (L/sec)	Tower 2 - Water Demands (L/sec)	Total Water Demands (L/sec)
Average Day	1.6	1.9	3.5
Max Day	3.8	4.6	8.4
Peak Hour	8.3	10.0	18.3

5.6 Boundary Conditions

Hydraulic Grade Line (HGL) boundary conditions were obtained from the City for design purposes. A copy of the correspondence received from the City is provided in **Appendix B**.

The following hydraulic grade line (HGL) boundary conditions were provided:

- Minimum HGL = 126.5 m
- Maximum HGL = 132.2 m

The provided HGL ranges of 126.5 m – 132.2 m were used to estimate pressures at the building. Under Max Day Plus fire flow conditions, the lower HGL of 126.5 m was used, whereas for Peak Hour conditions the HGL of 132.2 m was used.

5.7 Fire Flow Requirements

Water for fire protection will be available utilizing the proposed fire hydrants located along on Clyde Avenue. The required fire flows for the proposed buildings were calculated based on typical values as established by the Fire Underwriters Survey 1999 (FUS).

The following equation from the Fire Underwriters document "Water Supply for Public Fire Protection", 1991, was used for calculation of the on-site supply rates required to be supplied by the hydrants:

$F = 200 * C * \sqrt{(A)}$

where:

F = Required Fire flow in Litres per minute
C = Coefficient related to type of Construction
A = Total Floor Area in square metres

The proceeding **Table 5-3** summarizes the parameters used for estimating the Required Fire Flows (RFF) based on the Fire Underwriters Survey (FUS) and the latest City of Ottawa Technical Bulletins. The RFFs were estimated in accordance with ISTB-2018-02, and based on floor areas provided by the architect, which are illustrates in **Appendix D.** The following summarizes the parameters used for both proposed buildings.

- Type of Construction Non-combustible
- Occupancy Limited combustible
- Sprinkler Protection Fully Supervised Automatic Sprinkler

Table 5-3 - Summary of Design Parameters Used in Calculating Required Fire Flows (RFF) Using FUS

Design Parameter	Value
Coefficient Related to type of Construction C	0.80 (Towers 1) 0.80 (Towers 2)
Total Floor Area (m2)	21,332 (Tower 1) 47,170 (Tower 2)
Fire Flow. Prior to rounding to closest 1,000 (L/min),	14,728 (Tower 1) 15,745 (Tower 2)
Fire Flow. Rounded to closest 1,000 (L/min),	15,000 (Tower 1) 16,000 (Tower 2)
Reduction Due to Occupancy Non-combustible (-25%), Limited Combustible (-15%), Combustible (0%), Free Burning (+15%), Rapid Burning (+25%)	-15% (Tower 1) -15% (Tower 2)
Reduction due to Sprinkler (Max 50%) Sprinkler Conforming to NFPA 13 (-30%), Standard Water Supply (-10%), Fully Supervised Sprinkler (-10%)	-50% (Tower 1) -50% (Tower 2)
Exposures	+32% (Tower 1) +21% (Tower 2)
Required Fire Flow, RFF, before rounded to closest 1,000 (L/min)	10,455 (Tower 1) 9,656 (Tower 2)

The estimated required fire flows (RFF) rounded to the closest 1,000, based on the FUS methods is: 10,000 (or 167 L/sec) for Tower 1, and 10,000 (or 167 L/sec) for Tower 2.

5.8 Review of Hydrant Spacing

A review of the hydrant spacing was completed to ensure compliance with Appendix I of Technical Bulletin ISTB-2018-02. As per Section 3 of Appendix I all hydrants within 150 metres were reviewed to assess the total possible available flow from these contributing hydrants.

For each hydrant the distance to the proposed building was determined to arrive at the contribution of fire flow from each. All hydrants are expected to be of Class AA as per Section 5.1 of Appendix I. For each hydrant the straight-line distance, distance measured along a fire route or roadway, whether its location is accessible, and its contribution to the required fire flow.

Figure 5-2 below illustrates all the hydrants that are within the 75 metre and 150 metre offsets from the subject property. Fire hydrants that are denoted with a number having a HP versus H represents a PRIVATE hydrant rather than a CITY owner hydrant.

All hydrants where reviewed to determine if they were accessible or non-accessible. A hydrant would not be accessible if they were located on the opposite side of a median, limiting fire truck access.

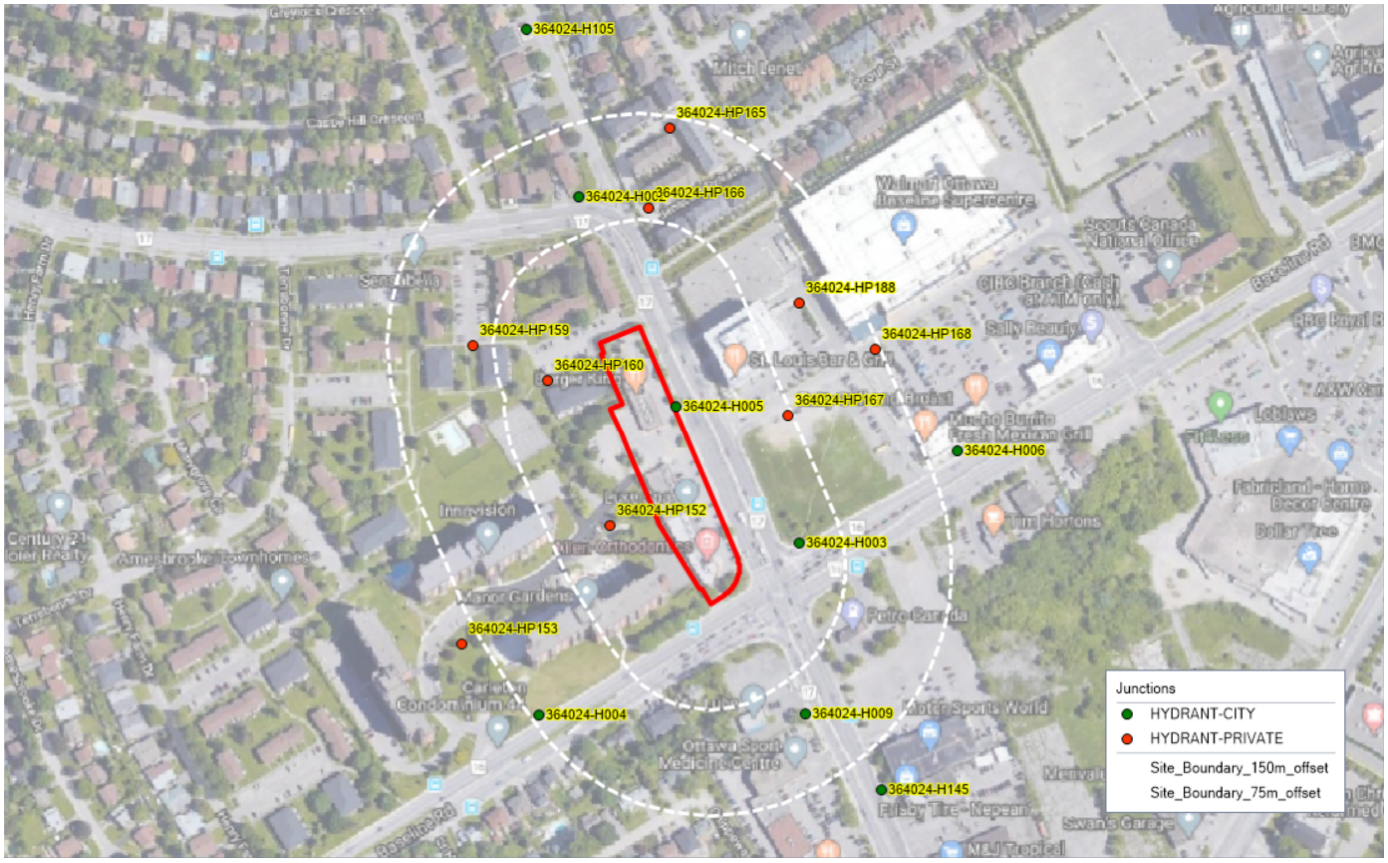


Figure 5-2 – Review of Hydrant Spacing

A summary table of the total fire flows available versus the required fire flows (RFFs) is presented in **Table 5-4** below. Detailed calculations of the available fire flows based on hydrant spacing is provided in **Table A-5** in **Appendix A.**

Table 5-4 –Fire Flows Based on Hydrant Spacing

Building	Required Fire Flow (L/min)	Available Fireflow Based on Hydrant Spacing as per ISTB-2018-02 (L/min)
Tower 1	10,000 (or 167 L/sec)	15,200
Tower 2	10,000 (or 167 L/sec)	11,400

The total available contribution of flow from hydrants was estimated at 15,200 L/min and 11,400 L/min for Towers 1 and 2, whereas the required fire flows (RFF) for each building is only 10,000 L/min. The total fire flow contributions include one (1) NEW fire hydrant to be installed on Clyde Avenue adjacent to Tower 2.

Without the addition of a NEW hydrant the fire flow available for each tower would drop to approximately 9,500 L/min and 5,700 L/min, which are both below their required 10,000 L/min.

Therefore, the available flows from hydrants exceed each building's fire flow requirements as identified in Appendix I of Technical Bulletin ISTB-2018-02. This is based on a NEW hydrant being installed.

6 Sewage Servicing

6.1 Existing Sewage Conditions

The subject property is located within the Pinecrest Sewershed. Sewage is discharged westerly to the Pinecrest Collector at Woodroffe Avenue, which then discharges northerly to the West Nepean Collector. The route is as follows:

- South on Clyde Ave (±70m of 225mm pipe),
- West on Baseline Road (±2,100m of 375mm, 450mm, 600mm, 675mm pipes) to Pinecrest Collector
- North on Woodroffe Avenue, east on Carling Avenue, north on Woodroffe Avenue, east on Saville, and north on Sherbrook Road (±3900m of 900mm pipe) to West Nepean Collector

Sewage flows within the property were estimated in order to compare with developed conditons. **Table 6-1** below summarizes the approximate sewage flows generated from the existing properties, based on a commerical flow allowance of 28,000 m3/ha/day, commercial peaking factor of 1.5, and infiltration allowance of 0.33 L/sec/gross hectare.

Table 6-1 – Summary of Existing Sewage Flows

Sewage Condition	Sanitary Sewage Flow (L/sec)
Average Day Sewage Flow	0.24
Infiltration Flow (at 0.33 L/ha/sec)	0.24
Peak Wet Weather Sewage Flow	0.60

6.2 Proposed Sewage Conditions

It is proposed to provide separate sanitary sewer connections from each building to a sanitary manhole onsite, which will then discharge to the sewer on Clyde Avenue. This manhole will be installed between the two towers near the property line and be used as a monitoring manhole. The sanitary sewer system was designed based on a population flow with an area-based infiltration allowance. A 300mm diameter sanitary sewer is proposed with a minimum 2% slope, having a capacity of 143 L/sec based on Manning's Equation under full flow conditions. **Table 6-2** below summarizes the design parameters used.

Table 6-2 – Summary of Wastewater Design Criteria / Parameters

Design Parameter	Value	Applies
Population Density – Single-family Home	3.4 persons/unit	
Population Density – Semi-detached Home	2.7 persons/unit	
Population Density – Duplex	2.3 persons/unit	
Population Density – Townhome (row)	2.7 persons/unit	
Population Density – Bachelor Apartment	1.4 persons/unit	
Population Density – Bachelor + Den Apartment	1.4 persons/unit	
Population Density – One Bedroom Apartment	1.4 persons/unit	✓

Population Density – One Bedroom plus Den Apartment	1.4 persons/unit	
Population Density – Two Bedroom Apartment	2.1 persons/unit	✓
Population Density – Two Bedroom plus Den Apartment	2.1 persons/unit	
Average Daily Residential Sewage Flow	280 L/person/day	✓
Average Daily Commercial / Intuitional Flow	28,000 L/gross ha/day	✓
Average Light / Heavy Industrial Daily Flow	35,000 / 55,000 L/gross ha/day	
Residential Peaking Factor – Harmon Formula (Min = 2.0, Max =4.0, with K=0.8)	$M = 1 + \frac{14}{4 + P^{0.5}} * k$	✓
Commercial Peaking Factor	1.5	✓
Institutional Peaking Factor	1.5	
Industrial Peaking Factor	As per Table 4-B (SDG002)	
Unit of Peak Extraneous Flow (Dry Weather / Wet Weather)	0.05 or 0.28 L/s/gross ha	
Unit of Peak Extraneous Flow (Total I/I)	0.33 L/s/gross ha	✓

The estimated peak sanitary flow rate from the proposed property is **8.9 L/sec** based on City Design Guidelines. Sewage rates below include a total infiltration allowance of 0.33 L/ha/sec based on the total gross site area.

Table 6-3 – Summary of Anticipated Sewage Rates

Sewage Condition	Sanitary Sewage Flow (L/sec)
Peak Residential / Commercial Flow	8.69
Infiltration Flow	0.24
Peak Design Flow	8.93

The City of Ottawa was contacted to discuss the downstream sanitary sewer and to determine if any additional analysis would be required to support this Zoning By-law application. The estimated above-noted peak sewage flows were provided to the City, and as a result, they have indicated that no additional downstream analysis would be necessary based on the peak sewage flows anticipated.

As each building will require its own sanitary sewer connection, 250mm diameter PVC sewers, each having a slope of 2.0% will be installed. The estimated capacity of each 250mm pipe at 2% is 85.4 L/sec. Each of these laterals would permit 4,500 fixture units as per OBC.

Figure 1 in **Appendix D** illustrates the conceptual sanitary servicing of the property.

7 Storm Servicing & Stormwater Management

Since the subject properties are located within the Pinecrest Creek subwatershed, stormwater works are therefore subject to both the Rideau Valley Conservation Authority (RVCA) and City of Ottawa (COO) approval.

The proposed stormwater system is designed in conformance with the latest version of the City of Ottawa Design Guidelines (October 2012). Section 5 "Storm and Combined Sewer Design" and Section 8 "Stormwater Management". A summary of the design criteria that relates to this design report is the proceeding sections below.

7.1 Minor System Design Criteria

- The storm sewer was sized based on the Rational Method and Manning's Equation under free flow conditions for the 2-year storm using a 10-minute inlet time.
- The allowable discharge from the site shall be controlled to 2-year rate with a runoff coefficient of not less than 0.50.
- Onsite storage shall be provided up to the 100-year event based on the controlled allowable discharge previously noted.
- Additional requirements from the pre-consultation meeting are noted below:
    - *The 100-year post development runoff are controlled to the 2-year predevelopment runoff rate with a runoff coefficient less than 0.5.*
    - *When using the modified rational method to calculate the storage requirements for the site any underground storage (pipe storage etc.) should not be included in the overall available storage. The modified rational method assumes that the restricted flow rate is constant throughout the storm which underestimates the storage requirement prior to the 1:100-year head elevation being reached. Please note that if you wish to utilize any underground storage as available storage, the Q(release) must be modified to compensate for the lack of head on the orifice. An assumed average release rate equal to 50% of the peak allowable rate shall be applied. Otherwise, disregard the underground storage as available storage or provide modeling to support SWM strategy.*
    - *A stress-test (100-year plus 20%) of the stormwater management system shall be performed as per Section 8.3.12 of the City's sewer design guidelines. Drainage systems shall be stress tested using design storms calculated on the basis of a 20% increase in the City's IDF curves rainfall values.*
- The minimum orifice dia. for a plug style ICD is 83mm and the minimum flow rate from a vortex ICD is 6 L/s in order to reduce the likelihood of plugging.
- Minimum sewer slopes to be based on minimum velocities for storm sewers of 0.80 m/sec.

7.2 Major System Design Criteria

- As per Technical Bulletin PIEDTB-2016-01 section 8.3.11.1 (p.12 of 14) there shall be no surface ponding on private parking areas during the 2-year storm rainfall event. Depending on the SWM strategy proposed underground or additional underground storage may be required to satisfy this requirement.
- The major system has been designed to accommodate on-site detention with sufficient capacity to attenuate the 100-year design storm. On-site storage is calculated based on the 100-year design storm with on-site detention storage provided on the roof and within the underground parking structure (stormwater cistern).
- Overland flow routes are provided.

- The vertical distance from the spill elevation on the street and the ground elevation at the buildings is at least 15cm.
- The emergency overflow spill elevation is at least 30 cm below the lowest building opening.

7.3 Runoff Coefficients

Runoff coefficients used were based on a review of current land cover within the site. Rather than estimating the actual level of imperviousness a conservative value of 100% was used for both pre and post development conditions. Using the standard conversion between runoff coefficient and imperviousness of C=IMP*0.70 + 0.2, a runoff coefficient of 0.90 was used. A minimum time of concentration of 10-minutes was used for both pre-development and post-development subcatchments. The runoff coefficients for pre-development and post-development catchments are summarized in **Table 7-1** below.

Table 7-1 – Summary of Runoff Coefficients

Location	Area (hectares)	Pre-Development Runoff Coefficient, C_{AVG}	Post-Development Runoff Coefficient, C_{AVG}
Entire Site	0.742	0.90	0.90

7.4 Pre-Development Conditions

Under current conditions stormwater runoff from the 0.742-hectare site flows via a single outlet to the existing 900m storm sewer on Clyde Avenue. The overland flow route for stormwater is south towards Clyde Avenue and west on Baseline Road. **Table 7-2** below summarizes the estimated peak flows under pre-development conditions using the standard 10-minute time of concentration (time to inlet).

Table 7-2 – Summary of Pre-Development Flows

Return Period Storm	Total Peak Flows (L/sec)
2-year	142.6
5-year	193.6
100-year	368.3

7.5 Allowable Release Rate

Rather than meeting pre-development released rates, the City of Ottawa imposes a more restrictive stormwater release rate as noted in Section 8.3.7.3 of the SDG002. The allowable discharge release rate from the site was established using the peak flows derived based on a 2-year return period storm, a maximum runoff coefficient of 0.50 and a standard time of concentration of 10 minutes.

The allowable release rate of 79.2 L/sec from the proposed site will be based on a 2-year storm event. **Table A-8** provides detailed calculations on the total allowable peak flow.

7.6 Proposed Stormwater System

Stormwater runoff from the proposed site will drain from a combination of controlled and uncontrolled areas. Although there is no change in the runoff coefficient a reduction in the allowable release rate will result in control of runoff and stormwater detention. A storm drainage plan is illustrated on **Figure 7-1** below. A total three (3) subcatchments (or drainage areas) within the development site are shown on this drawing with average runoff coefficients calculated for each drainage area. As the entire site property contains underground parking structures, the stormwater works shall consist of the following elements:

- Flow-control roof drains for Towers 1 & 2. Each building to have a separate storm lateral connection, which will discharge to an onsite storm manhole. This will then be connected to the municipal system on Clyde Avenue.
- Runoff from surface areas will be collected by area drains and discharge to underground storage (stormwater cisterns) located in the underground parking structures. This in turn discharges to one of the storm laterals noted above.

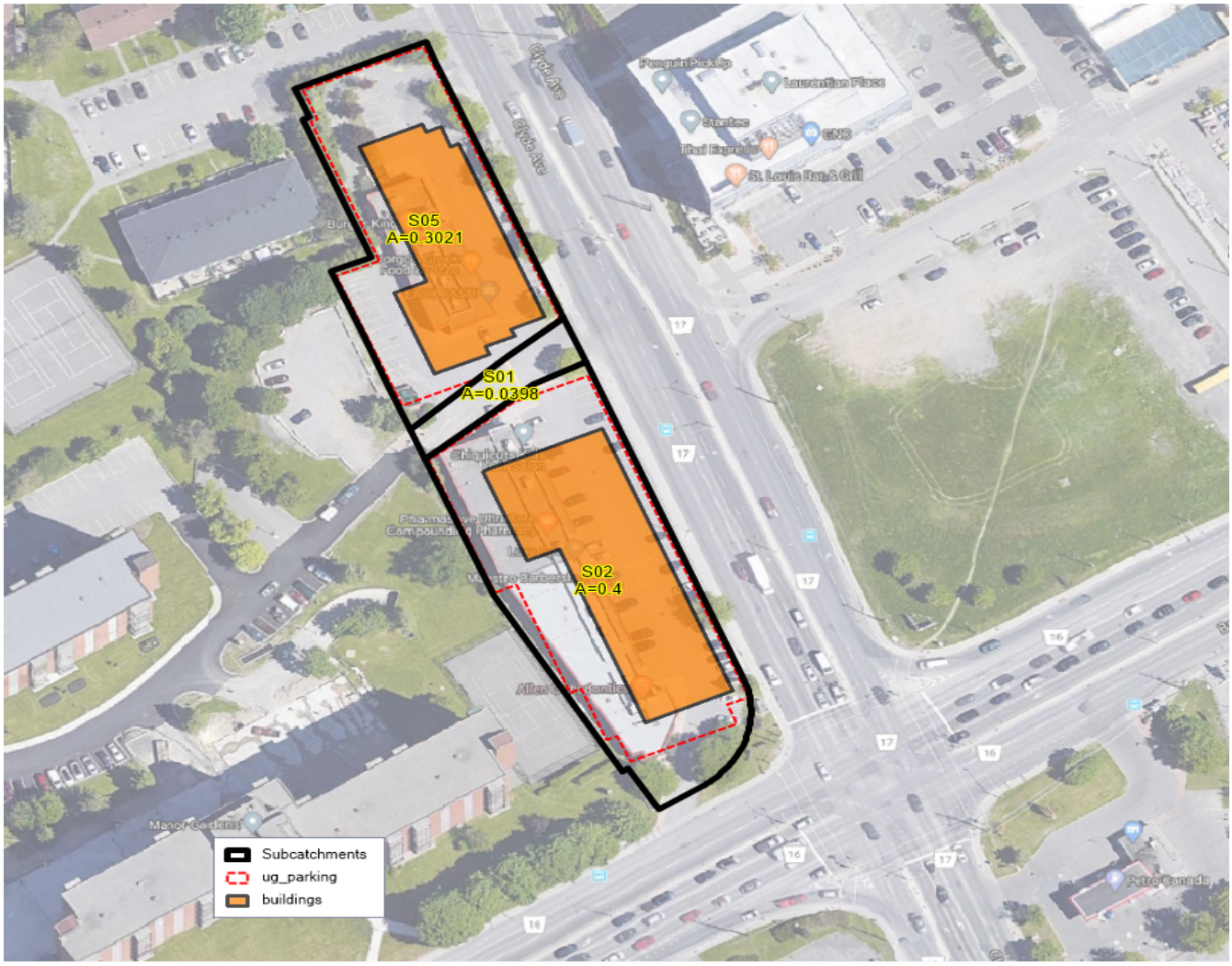


Figure 7-1 – Post-Development Storm Drainage

In order to achieve the quantity control requirements and meet the allowable discharge rates roof drains on both Towers will require flow-controlled weirs. Based on the roof areas, an estimate of the number of roof drains required was completed. WATTS ACCUTROL weirs were used to determine the total discharge rates from the roof areas based on the number of drains. In addition, the total cumulative prism volumes on the roofs were calculated at a maximum permitted depth of 150mm. **Figure 1** in **Appendix A** illustrates the conceptual storm servicing of the property. Additional information on the estimated 100-year volumes is provided in **Table A-17** and **Table A-18** in **Appendix A.**

Table 7-3 below provides a summary of the stormwater peak flows under post-development conditions.

Table 7-3 – Summary of Post-Development Flows

Return Period Storm	Max Allowable Peak Flow (L/sec)	[1]Total Uncontrolled Peak Stormwater Flows (L/sec)	[2]Total Controlled Peak Stormwater Flows (L/sec)
2-year	79.2 L/sec Based on 2-year Storm and C=0.50	142.6	29.6
5-year		193.4	40.1
100-year		368.3	76.4
Note 1-Uncontrolled peak flows, or peak flows that would result if no flow control used. *Note 2-Contolled flows.*			

Since flow control is being utilized onsite, it is necessary to provide appropriate flow attenuation (storage). Additional information on the estimated 100-year volumes is provided in **Section 7.7** below.

7.7 Flow Attenuation & Storage

The attenuation of stormwater will be achieved by utilizing roof storage and stormwater storage in the underground parking structure. Using the allowable release rates, the Modified Rational Method was used to determine the 2-year, 5-year, and 100-year volumes that will occur for corresponding release rates.

Table A-12 through **Table A-16**, provide the storage volumes necessary on the roof and in the underground parking structure to attenuate the controlled release rates. **Table A-11** summarizes the combined controlled and uncontrolled flows leaving the subject site. A summary of release rates, storage volume requirements, and provided storage volumes are identified in **Table 7-4** below.

Table 7-4 – Summary of Post-Development Storage

Area	Desc	Release Rate (L/s)			Storage Required (m^3) (MRM)			Storage Provided (m^3)		Flow Control Method
		2-yr	5-yr	100-yr	2-yr	5-yr	100-yr	Roof	Cistern	
Tower 1	Roof	4.4	5.9	11.3	15.6	21.0	39.6	48.9		Flow Controlled Roof Drains
	Surface	7.7	10.5	20.0	17.5	23.6	62.1		62.1	Pump Rate from Cistern
Tower 2	Roof	5.8	7.9	15.1	20.1	26.9	50.8	63.6		Flow Controlled Roof Drains
	Surface	9.7	13.1	25.0	24.5	33.0	85.7		85.7	Pump Rate from Cistern
Middle	Surface	1.9	2.6	5.0	3.9	5.2	14.0		14.0	Pump Rate from Cistern (see note 1)
Totals =		29.6	40.1	76.4	81.7	109.7	252.1	112.5	161.8	
Note 1) The storage of stormwater for the middle area will be provided in either Tower 1 or Tower 2, depending on detailed design.										

8 Erosion & Sediment Control

During all construction activities, erosion and sedimentation shall be controlled by the following techniques:

- Filter cloth shall be installed between the frame and cover of all adjacent catch basins and catch basin manhole structures.
- Heavy duty silt fencing will be used to control runoff around the construction area. Silt fencing locations are identified on the site grading and erosion control plan.
- A mud mat will be installed at the construction entrance to help avoid mud from being transported to offsite roads.
- Visual inspection shall be completed daily on sediment control barriers and any damage repaired immediately. Care will be taken to prevent damage during construction operations.
- In some cases, barriers may be removed temporarily to accommodate the construction operations. The affected barriers will be reinstated at night when construction is completed.
- Sediment control devices will be cleaned of accumulated silt as required. The deposits will be disposed of as per the requirements of the contract.
- During the course of construction, if the engineer believes that additional prevention methods are required to control erosion and sedimentation, the contractor will install additional silt fences or other methods as required to the satisfaction of the engineer.
- Construction and maintenance requirements for erosion and sediment controls are to comply with Ontario Provincial Standard Specification (OPSS) OPSS 805 and City of Ottawa specifications.

9 Conclusions and Recommendations

This Functional Servicing & Stormwater Report outlines the rationale which will be used to service the proposed development. The following summarizes the servicing requirements for the site:

Water

- Two parallel 200mm watermains are proposed to service each of Towers 1 and 2, as the average day demands exceed 50 m^3 per day, which is mandatory as per Section 4.31 of the WDG001.
- The Required Fire Flows (RFFs) were estimated at **10,000 L/min** (167 L/sec) for Tower 1, and **10,000 L/min** (167 L/sec) for Tower 2. The total minimum available flows for firefighting purposes, based on the contribution from hydrants, was estimated at **15,200 L/min** and **11,400 L/min** for each tower respectively. The available flows are based on the installation of one new fire hydrant along Clyde Avenue along the frontage of Tower 2.
- Based on hydraulic boundary conditions (HGL) provided by the City of Ottawa, a system pressure of **±40.5 psi** under peak hourly demands is anticipated at the proposed building. This exceeds the City's guideline of 40 psi.

Sewage

- Estimated peak sewage flows of **9.0 L/sec** are anticipated. This exceeds sewage flows of **0.60 L/sec** under existing conditions. Discussions with City staff regarding the downstream sanitary sewer were held to determine if they had any concerns with the increase of peak sewage flows to 9.0 L/sec. The city responded that they did not see it necessary to complete any downstream capacity analysis.

Stormwater

- For the stormwater system, the allowable capture rate from the entire site was calculated based on a runoff coefficient of 0.50, time of concentration of 10 minutes for a 2-year storm event. The allowable release rate for the entire site was calculated to be **79.2 L/sec**. Runoff in excess of this will be detained onsite for up to the 100-year storm.
- In order to meet the allowable release rate, a total retention volume of **± 252 m^3** metres is required.
- Runoff on the building roofs will be controlled using flow-controlled roof drains. For each roof-drain is equipped with WATTS ACCUTROL weirs and set at the OPEN position are proposed. Each drain having maximum discharge rate of 30 gpm at 150mm depth. An estimate of the number of roof drains, based on roof areas was completed, resulting in maximum 100-year discharge rates of **11.3 L/sec and 15.1 L/sec for Towers 1 & 2** was established.
- A total 100-year storage volume requirements on the roofs of Tower 1 and Tower 2 was estimated as **90.3 m^3** (39.6 m^3 and 50.8 m^3 respectively), based on the above release rates, using the Modified Rational Method. The volumes available on the roofs are **112.5 m^3** (48.9 m^3 and 63.6 m^3 respectively), therefore exceeding the required volumes.
- Runoff from the surface areas above the parking structure will be collected and detained in underground stormwater chamber (cisterns) located in the parking structure. Since each tower will have its own underground parking structure two separate cisterns will be necessary. Definition of runoff from the area between the building can be directed to either cistern, as long as the combined volume requirement is met. The maximum allowable discharge from the surface areas is **50.0 L/sec**. This allowable discharge rate from the cisterns will be met using an equal pump rate.
- The volume necessary to detain the 100-year event from the surface areas (via pumping form cisterns) is **161.8 m^3**, based on using 50% of the allowable release rate as required by the City of Ottawa. The stormwater tank (cistern) will be sized to hold a minimum volume of **161.8 m^3.**

10 Legal Notification

This report was prepared by EXP Services Inc. for the account of 11061917 Canada Inc.

Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. EXP Services Inc. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this project.

Appendix A – Design Tables

TABLE A-1
WATER DEMAND CHART

Location:	1356 Clyde Avenue
Project No:	OTT-00257949
Designed by:	M. Ghadban
Checked By:	J.Fitzpatrick
Date Revised:	March 2020

Water Consumption

Residential =	**350**	L/cap/day
Commercial =	5.0	$L/m^2/day$

Population Densities

Single Family	3.4	person/unit
Semi-Detahced	2.7	person/unit
Duplex	2.3	person/unit
Townhome (Row)	2.7	person/unit
Bachelor Apartment	1.4	person/unit
1 Bedroom Apartment	1.4	person/unit
2 Bedroom Apartment	2.1	person/unit
3 Bedroom Apartment	3.1	person/unit
4 Bedroom Apartment	4.1	person/unit
Avg. Apartment	1.8	person/unit

Proposed Buildings	No. of Residential Units										Total Persons (pop)	Residential Demands in (L/sec)					Commercial						Total Demands (L/sec)		
	Singles/Semis/Towns				Apartments								Peaking Factors (x Avg Day)						Peaking Factors (x Avg Day)						
	Single Family	Semi-Detached	Duplex	Townhome	Studio	1 Bedroom	2 Bedroom	3 Bedroom	4 Bedroom	Avg Apt.		Avg. Day Demand (L/day)	Max Day	Peak Hour	Max Day Demand (L/day)	Peak Hour Demand (L/day)	Area (m^2)	Avg Demand (L/day)	Max Day	Peak Hour	Max Day Demand (L/day)	Peak Hour Demand (L/day)	Avg Day (L/s)	Max Day (L/s)	Max Hour (L/s)
Tower 1 - Floor 1																	821.3	4,106.5	1.50	2.70	6,159.75	11,088	0.05	0.07	0.13
Tower 1 - Floor 2																	1,363.7	6,818.5	1.50	2.70	10,227.75	18,410	0.08	0.12	0.21
Tower 1 - Floor 3 to 6						40	20				98.0	34,300	2.50	5.50	85,750	188,650							0.40	0.99	2.18
Tower 1 - Floor 7						3	4				12.6	4,410	2.50	5.50	11,025	24,255							0.05	0.13	0.28
Tower 1 - Floor 8 to 22						75	60				231.0	80,850	2.50	5.50	202,125	444,675							0.94	2.34	5.15
Tower 1 - Floor 23 to 24							8				16.8	5,880	2.50	5.50	14,700	32,340							0.07	0.17	0.37
Sub Total Tower 1 =						**118**	**92**				**358**	**125,440**	**10**		**313,600**	**689,920**	**2,185**						**1.58**	**3.82**	**8.33**
Tower 2 - Floor 1																	903.8	4,519.0	1.50	2.70	6,778.50	12,201	0.05	0.08	0.14
Tower 2 - Floor 2																	1,695.6	8,478.0	1.50	2.70	12,717.00	22,891	0.10	0.15	0.26
Tower 2 - Floor 3 to 6						60	12				109.2	38,220	2.50	5.50	95,550	210,210							0.44	1.11	2.43
Tower 2 - Floor 7						5	2				11.2	3,920	2.50	5.50	9,800	21,560							0.05	0.11	0.25
Tower 2 - Floor 8 to 22						75	60				231.0	80,850	2.50	5.50	202,125	444,675							0.94	2.34	5.15
Tower 2 - Floor 23 to 24						10	8				30.8	10,780	2.50	5.50	26,950	59,290							0.12	0.31	0.69
Tower 2 - Floor 25 to 26						10	8				30.8	10,780	2.50	5.50	26,950	59,290							0.12	0.31	0.69
Tower 2 - Floor 27 to 28							8				16.8	5,880	2.50	5.50	14,700	32,340							0.07	0.17	0.37
Sub Total Tower 2=						**160**	**98**				**430**	**150,430**	**15**		**376,075**	**827,365**	**2,599**						**1.89**	**4.58**	**9.98**
Total =						**278**	**190**				**788**	**275,870**			**689,675**	**1,517,285**	**4,784**						**3.47**	**8.40**	**18.31**

TABLE A-2
FIRE FLOW REQUIREMENTS BASED ON FIRE UNDERWRITERS SURVEY(FUS) 1999 FOR TOWER 1

An estimate of the Fire Flow required for a given fire area may be estimated by:

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

where: F = required fire flow in litres per minute
A = total floor area in m^2 (including all storeys, but excluding basements at least 50% below grade)
C = coefficient related to the type of construction

Task	Options	Multiplier	Input				Value Used	Fire Flow Total (L/min)
Choose Building Frame (C)	Wood Frame	1.5	Non-combustible Construction				0.8	
	Ordinary Construction	1						
	Non-combustible Construction	0.8						
	Fire Resistive Construction	0.6						
Input Building Floor Areas (A)			Area	% Used	Area Used	Comment		
	Floor 23 to 24		552.5	0%	0	Two largest adjoining floors+ 50% of floors above (up to eight)		
	Floor 11 to 22		745.7	0%	0			
	Floor 10		745.7	50%	373			
	Floor 9		745.7	50%	373			
	Floor 8		745.7	50%	373			
	Floor 7		745.7	50%	373			
	Floor 6		1392	50%	696			
	Floor 5		1392	50%	696			
	Floor 4		1392	50%	696			
	Floor 3		1392	50%	696			
	Floor 2		1363.7	100%	1,364			
	Floor 1 (Ground)		1363.7	100%	1,364			
	Basement (At least 50% below grade, not included)							
Fire Flow (F)	F = 220 * C * SQRT(A)							14,728
Fire Flow (F)	Rounded to nearest 1,000							**15,000**

Reductions/Increases Due to Factors Effecting Burning

Task	Options	Multiplier	Input	Value Used	Fire Flow Change (L/min)	Fire Flow Total (L/min)
Choose Combustibility of Building Contents	Non-combustible	-25%	Limited Combustible	-15%	-2,250	12,750
	Limited Combustible	-15%				
	Combustible	0%				
	Free Burning	15%				
	Rapid Burning	25%				
Choose Reduction Due to Sprinkler System	**Adequate** Sprinkler Conforms to NFPA13	-30%	Adequate Sprinkler Conforms to NFPA13	-30%	-3,825	8,925
	No Sprinkler	0%				
	Standard Water Supply for Fire Department Hose Line and for Sprinkler System	-10%	Standard Water Supply for Fire Department Hose Line and for Sprinkler System	-10%	-1,275	7,650
	Not Standard Water Supply or Unavailable	0%				
	Fully Supervised Sprinkler System	-10%	Fully Supervised Sprinkler System	-10%	-1,275	6,375
	Not Fully Supervised or N/A	0%				

Choose Structure Exposure Distance	Exposures	Separ-ation Dist (m)	Cond	Separation Conditon	Exposed Wall type	Exposed Wall Length: Length (m)	No of Storeys	Lenth-height Factor	Sub-Conditon	Charge (%)	Total Charge (%)	Total Exposure Charge (L/min)	
	Side 1 (west)	38	5	30.1 to 45	Type A	11	2	22	5A	5%	32%	4,080	10,455
	Side 2 (east)	27	4	20.1 to 30	Type B	28	7	196	4E	10%			
	Front (north)	39	5	30.1 to 45	Type B	39	9	351	5E	5%			
	Back (south)	14.0	3	10.1 to 20	Type A	18	2	30	3A	12%			
Obtain Required Fire Flow											Total Required Fire Flow, Rounded to the Nearest 1,000 L/min =		**10,000**
											Total Required Fire Flow, L/s =		**167**

Exposure Charges for Exposing Walls of Wood Frame Construciton (from Table G5)

Type A	Wood-Frame or non-conbustible
Type B	Ordinary or fire-resisitve with unprotected openings
Type C	Ordinary or fire-resisitve with semi-protected openings
Type D	Ordinary or fire-resisitve with blank wall

Conditons for Separation

Separation Dist	Condition
0m to 3m	1
3.1m to 10m	2
10.1m to 20m	3
20.1m to 30m	4
30.1m to 45m	5
> 45.1m	6

TABLE A-3
FIRE FLOW REQUIREMENTS BASED ON FIRE UNDERWRITERS SURVEY(FUS) 1999 FOR TOWER 2

An estimate of the Fire Flow required for a given fire area may be estimated by:

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

where: F = required fire flow in litres per minute
A = total floor area in m^2 (including all storeys, but excluding basements at least 50% below grade)
C = coefficient related to the type of construction

Task	Options	Multiplier	Input				Value Used	Fire Flow Total (L/min)
Choose Building Frame (C)	Wood Frame	1.5	Non-combustible Construction				0.8	
	Ordinary Construction	1						
	Non-combustible Construction	0.8						
	Fire Resistive Construction	0.6						
Input Building Floor Areas (A)			Area	% Used	Area Used	Comment		
	Floor 27 to 28		618.1	0%	0	Two largest adjoining floors+ 50% of floors above (up to eight)		
	Floor 25 to 26		749.4	0%	0			
	Floor 23 to 24		749.4	0%	0			
	Floor 11 to 22		749.4	0%	0			
	Floor 10		749.4	50%	375			
	Floor 9		749.4	50%	375			
	Floor 8		749.4	50%	375			
	Floor 7		749.4	50%	375			
	Floor 6		1556.7	50%	778			
	Floor 5		1556.7	50%	778			
	Floor 4		1556.7	50%	778			
	Floor 3		1556.7	50%	778			
	Floor 2		1695.6	100%	1,696			
	Floor 1 (Ground)		1695.6	100%	1,696			
	Basement (At least 50% below grade, not included)							
Fire Flow (F)	F = 220 * C * SQRT(A)							15,745
Fire Flow (F)	Rounded to nearest 1,000							**16,000**

Reductions/Increases Due to Factors Effecting Burning

Task	Options	Multiplier	Input	Value Used	Fire Flow Change (L/min)	Fire Flow Total (L/min)
Choose Combustibility of Building Contents	Non-combustible	-25%	Limited Combustible	-15%	-2,400	13,600
	Limited Combustible	-15%				
	Combustible	0%				
	Free Burning	15%				
	Rapid Burning	25%				
Choose Reduction Due to Sprinkler System	**Adequate** Sprinkler Conforms to NFPA13	-30%	Adequate Sprinkler Conforms to NFPA13	-30%	-4,080	9,520
	No Sprinkler	0%				
	Standard Water Supply for Fire Department Hose Line and for Sprinkler System	-10%	Standard Water Supply for Fire Department Hose Line and for Sprinkler System	-10%	-1,360	8,160
	Not Standard Water Supply or Unavailable	0%				
	Fully Supervised Sprinkler System	-10%	Fully Supervised Sprinkler System	-10%	-1,360	6,800
	Not Fully Supervised or N/A	0%				

Choose Structure Exposure Distance	Exposures	Separ-ation Dist (m)	Cond	Separation Conditon	Exposed Wall type	Exposed Wall Length: Length (m)	No of Storeys	Lenth-height Factor	Sub-Conditon	Charge (%)	Total Charge (%)	Total Exposure Charge (L/min)	
	Side 1 (west)	27	4	20.1 to 30	Type B	28	7	196	4E	10%	21%	2,856	9,656
	Side 2 (east)	50	6	> 45.1	Type B	2	2	4	6	0%			
	Front (north)	38	5	30.1 to 45	Type B	80	2	160	5E	5%			
	Back (south)	30.0	4	20.1 to 30	Type B	19	13	30	4A	6%			
Obtain Required Fire Flow										Total Required Fire Flow, Rounded to the Nearest 1,000 L/min =			**10,000**
										Total Required Fire Flow, L/s =			**167**

Exposure Charges for Exposing Walls of Wood Frame Construciton (from Table G5)

Type A	Wood-Frame or non-conbustible
Type B	Ordinary or fire-resisitve with unprotected openings
Type C	Ordinary or fire-resisitve with semi-protected openings
Type D	Ordinary or fire-resisitve with blank wall

Conditons for Separation

Separation Dist	Condition
0m to 3m	1
3.1m to 10m	2
10.1m to 20m	3
20.1m to 30m	4
30.1m to 45m	5
> 45.1m	6

TABLE B-5

ESTIMATED WATER PRESSURE AT PROPOSED BUILDING

Description	From	To	Demand (L/sec)	Pipe Length (m)	Pipe Dia (mm)	Dia (m)	Q (m3/sec)	Area (m2)	C	Vel (m/s)	Slope of HGL (m/m)	Head Loss (m)	Elev From (m)	Elev To (m)	*Elev Diff (m)	Pressure From kPa	(psi)	Pressure To kPa	(psi)	Pressure Drop (psi)
Avg Day Conditons																				
Single 200mm watermain	Main	bldg.	1.6	13.0	204	0.204	0.0016	0.032685	110	0.0483	2.6E-05	0.0003	97.50	98.00	-0.5	340.4	(49.4)	335.5	(48.7)	0.7
Double 200mm watermain	Main	bldg.	0.8	13.0	204	0.204	0.0008	0.032685	110	0.0242	7.3E-06	1E-04	97.50	98.00	-0.5	340.4	(49.4)	335.5	(48.7)	0.7
Max Day Conditons																				
Single 200mm watermain	Main	bldg.	3.8	13.0	204	0.204	0.0038	0.032685	110	0.1169	0.00014	0.0018	97.50	98.00	-0.5	340.4	(49.4)	335.5	(48.7)	0.7
Double 200mm watermain	Main	bldg.	1.9	13.0	204	0.204	0.0019	0.032685	110	0.0584	3.7E-05	0.0005	97.50	98.00	-0.5	340.4	(49.4)	335.5	(48.7)	0.7
Peak Hour Conditons																				
Single 200mm watermain	Main	bldg.	8.3	13.0	204	0.204	0.0083	0.032685	110	0.2549	0.00057	0.0075	97.50	98.00	-0.5	284.5	(41.3)	279.5	(40.5)	0.7
Double 200mm watermain	Main	bldg.	4.2	13.0	204	0.204	0.0042	0.032685	110	0.1274	0.00016	0.0021	97.50	98.00	-0.5	284.5	(41.3)	279.6	(40.5)	0.7
Max Day Plus Fireflow Conditons																				
Single 200mm watermain	Main	bldg.	170.8	13.0	204	0.204	0.1708	0.032685	110	5.2262	0.15422	2.0048	97.50	98.00	-0.5	284.5	(41.3)	259.9	(37.7)	3.6
Double 200mm watermain	Main	bldg.	85.4	13.0	204	0.204	0.0854	0.032685	110	2.6131	0.04272	0.5554	97.50	98.00	-0.5	284.5	(41.3)	274.1	(39.8)	1.5

Water Demand Info	**Tower 1**	**Tower 2**
Average Demand (L/sec) =	1.58	1.89
Max Day Demand (L/sec) =	3.82	4.58
Peak Hr Deamand (L/sec) =	8.33	9.98
Fireflow Requriement (L/sec) =	167	167
Max Day Plus FF Demand (L/sec) =	170.8	171.6

Pipe Lengths

From watermain to Building (m) = 13.0

Hazen Williams C Factor for Friction Loss in Pipe, C= 110

Boundary Conditons (from City of Ottawa)	**Min HGL**	**Max HGL**	**HGL Under Avg Day Demands**	**HGL Under Max Day Demands**	**HGL Under Peak Hr Demands**	**HGL Under Max Day Plus FF Demands**
HGL (m)	126.5	132.2	132.2	126.5	132.2	126.5
Approx Ground Elev at Connection (m) =	97.5	97.5	97.5	97.5	97.5	97.5
Approx Bldg FF Elev (m) =	98.0	98.0	98.0	98.0	98.0	98.0
Pressure (m) =	29	34.7	34.7	29	34.7	29.0
Pressure (Pa) =	284,490	340,407	340,407	284,490	340,407	284,490
Pressure (psi) =	41.3	49.4	49.4	41.3	49.4	41.3

Notes:

1) Used Max HGL elevation during AVERAGE Day Demands
2) Used Max HGL elevation during Max Day Demands
3) Used Min HGL elevation during Peak Hr Demands
4) Used Min HGL elevation during Max Day Plus Fireflow Demands

TABLE A-5

AVAILABLE FIRE FLOWS BASED ON HYDRANT SPACING

Hydrant #	Location	City / Private	Accessible (yes/no)	Tower 1		Tower 2		Comment
				[1]Distance (m)	[2]Fire Flow Contribution (L/min)	[1]Distance (m)	[2]Fire Flow Contribution (L/min)	
364024-H002	CLYDE AVE	Hydrant-City	Yes	140	3,800	230		
364024-H003	BASELINE RD	Hydrant-City	No					no access - median
364024-H004	BASELINE RD	Hydrant-City	Yes	>150		>150		
364024-H005	CLYDE AVE	Hydrant-City	Yes	15	5,700	70	5,700	
364024-H006	BASELINE RD	Hydrant-City	No					no access - median
364024-H009	CLYDE AVE	Hydrant-City	No					no access - major intersection
364024-H105	CLYDE AVE	Hydrant-City	No					no access - median
364024-H145	CLYDE AVE	Hydrant-City	No					no access - median
364024-HP152	1485 BASELINE RD	Hydant-Private	yes	>150		>150		
364024-HP153	1485 BASELINE RD	Hydant-Private	yes	>150		>150		
364024-HP159	1312 MAITLAND AVE	Hydant-Private	yes	>150		>150		
364024-HP160	1312 MAITLAND AVE	Hydant-Private	yes	>150		>150		
364024-HP165	JENSCOTT PRIVATE	Hydant-Private	No					no access - fencing
364024-HP166	JENSCOTT PRIVATE	Hydant-Private	No					no access - fencing
364024-HP167	1357 BASELINE RD	Hydant-Private	No					no access - median
364024-HP168	1357 BASELINE RD	Hydant-Private	No					no access - median
364024-HP188	1357 BASELINE RD	Hydant-Private	No					no access - median
NEW HYDRANT	1356 Clyde Ave	Hydrant-City	yes	70	5,700	20	5,700	NEW HYDRANT
Total (L/min)					15,200		11,400	
FUS RFF in L/min or (L/sec)					10,000 (167)		10,000 (167)	
Meets Requreiment (Yes/No)					Yes		Yes	

Notes:

[1]Distance is measured along a road or fire route.

[2]Fire Flow Contribution for Class AA Hydrant from Table 1 of Appendix I, ISTB-2018-02

Table A-6

SANITARY SEWER CALCULATION SHEET

LOCATION			RESIDENTIAL AREAS AND POPULAITONS												COMMERCIAL				INFILTRATION				SEWER DATA						
				NUMBER OF UNITS							POPULATION				AREA (ha)				AREA (ha)										
Street	U/S MH	D/S MH	Area (ha)	Single	Semi	1-Bed Apt.	1-Bed + Den Apt	2-Bed Apt.	2-Bed + Den Apt	3-Bed Apt.	INDIV	ACCU	Peak Factor	Peak Flow (L/sec)	INDIV	ACCU	Peak Factor	Peak Flow (L/sec)	INDIV	ACCU	INFILT FLOW (L/s)	TOTAL FLOW (L/s)	Nom Dia (mm)	Actual Dia (mm)	Slope (%)	Length (m)	Capacity (L/sec)	Q/Q_{CAP} (%)	Full Velocity (m/s)
Clyde	Tower 1	SANMH	0.3710			118		92			358.4	358.4	4.00	4.65	0.2185	0.2185	1.0	0.071	0.3710	0.3710	0.12	4.84	250	251.46	2.0	5.0	85.4	6%	1.72
	Tower 2	SANMH	0.3710			160		98			429.8	429.8	4.00	5.57	0.2599	0.2599	1.0	0.1504	0.3710	0.3710	0.12	5.84	250	251.46	2.0	5.0	85.4	7%	1.72
	SANMH	city main										788.2	3.29	8.40		0.4784	1.0	0.2769		0.7420	0.24	8.93	250	251.46	2.0	12.0	85.4	10%	1.72
			0.742			**278**		**190**			**788.2**				**0.4784**				**0.742**										

Residential Avg. Daily Flow, q (L/p/day) = 280
Commercial Avg. Daily Flow (L/gross ha/day) = 28,000
or L/gross ha/sec = 0.324
Institutianal Avg. Daily Flow (L/s/ha) = 28,000
or L/gross ha/sec = 0.324
Light Industrial Flow (L/gross ha/day) = 35,000
or L/gross ha/sec = 0.4051
Light Industrial Flow (L/gross ha/day) = 55,000
or L/gross ha/sec = 0.637

Commercial Peak Factor = 1.5 (when area >20%)
1.0 (when area <20%)
Institutional Peak Factor = 1.5 (when area >20%)
1.0 (when area <20%)
Residential Correction Factor, K = 0.80
Manning N = 0.013
Peak extraneous flow, I (L/s/ha) = 0.33 (Total I/I)

Peak Population Flow, (L/sec)
= P*q*M/86.4
Peak Extraneous Flow, (L/sec)
= I*Ac
Residential Peaking Factor, M
= 1 + (14/(4+P^0.5)) * K
Sewer Capacity, Qcap (L/sec)
$= 1/N \; S1^{/2} \; R^{2/3} \; A_c$

Unit Type	Ppu
Singles =	3.4
Semi-Detached =	2.7
1-bed Apt =	1.4
1-bed + Den Apt =	1.4
2-bed Apt. Unit =	2.1
2-bed + Den Apt =	2.1
3-bed Apt. Unit =	3.1

Designed:	Project:
J. Fitzpatrick, P.Eng.	1356 Clyde Ave
Checked:	Location:
B. Thomas, P.Eng.	Ottawa, Ontario
File Reference:	Page No:
257949 Sanitary - Sewer Design Sheet, Mar 2020.xlsx	**1 of 1**

Table A-7 ESTIMATION OF PRE-DEVELOPMENT PEAK FLOWS

Catchment No.	Area (ha)	Outlet Location	Time of Conc, Tc (min)	Storm = 2 yr			Storm = 5 yr			Storm = 100 yr		
				I_2 (mm/hr)	Cavg	Q_{2PRE} (L/sec)	I_5 (mm/hr)	Cavg	Q_{5PRE} (L/sec)	I_{100} (mm/hr)	Cavg	Q_{100PRE} (L/sec)
Entire Site	0.7420	To Clyde Ave	10.0	76.81	0.90	142.6	104.29	0.90	193.6	178.56	1.00	368.3
Totals	0.7420					142.6			193.6			368.3

Notes

1) Intensity, $I = 732.951/(Tc+6.199)^{0.810}$ (2-year, City of 0ttawa)

2) Intensity, $I = 998.071/(Tc+6.035)^{0.814}$ (5-year, City of 0ttawa)

3) Intensity, $I = 1735.688/(Tc+6.014)^{0.820}$ (100-year, City of Ottawa)

4) Cavg for 100-year is increased by 25% to a maximum of 1.0

Table A-8 ESTIMATION OF ALLOWABLE PEAK FLOWS (Based on Max C=0.50 with Tc=10mins & 2-yr Storm)

Area (onsite)	Area (ha)	Time of Conc, Tc (min)	Storm = 2 yr			Storm = 5 yr		
			I_5 (mm/hr)	Cavg	Q_{5ALLOW} (L/sec)	I_5 (mm/hr)	Cavg	Q_{5ALLOW} (L/sec)
Entire Site	0.7420	10	76.81	0.50	79.2	104.29	0.50	107.6
Totals	0.7420				**79.2**			**107.6**

Notes

1) Allowable Capture Rate is based on 2-year storm at Tc=10 minutes.

Allowable Discharge (based on 2-yr storm)

Table A-9 AVERAGE RUNOFF COEFFICIENTS FOR POST-DEVELOPMENT

Runoff Coeffients $C_{ASPH/CONC}$ = 0.90 C_{ROOF} = 0.90 C_{GRASS} = 0.20

Area No.	Outlet Location	Asphalt & Conc Areas (m^2)	A * C_{ASPH}	Roof Areas (m^2)	A * C_{ROOF}	Grassed Areas (m^2)	A * C_{GRASS}	Sum AC	Total Area (m^2)	C_{AVG} (see note)	Comment
PST-1a	Clyde Ave			1303.0	1172.7			1172.7	1303	0.90	Tower 1 - Roof
PST-1b		1718	1546.2					1546.2	1718	0.90	Tower 1 - Surface Areas
PST-2a				1695.9	1526.3			1526.3	1696	0.90	Tower 2 - Roof
PST-2b		2304.1	2073.7					2073.7	2304	0.90	Tower 2 - Surface Areas
PST-3		398.2	358.4					358.4	398	0.90	Surface Areas - Middle
Totals		4,420	3,978.3	2,999	2,699.0			6,677	7,419	0.90	

Notes
1) Cavg derived with area-weighting command in PCSWMM

Table A-10 SUMMARY OF POST-DEVELOPMENT PEAK FLOWS (Uncontrolled and Controlled)

Area No	Area (ha)	Time of Conc, Tc (min)	Storm = 2 yr				Storm = 5 yr				Storm = 100 yr				Outlet	Comments
			C_{AVG}	I_2 (mm/hr)	Q (L/sec)	Q_{CAP} (L/sec)	C_{AVG}	I_5 (mm/hr)	Q (L/sec)	Q_{CAP} (L/sec)	C_{AVG}	I_{100} (mm/hr)	Q (L/sec)	Q_{CAP} (L/sec)		
PST-1a	0.1303	10	0.90	76.81	25.0	**(4.4)**	0.90	104.19	34.0	**(5.9)**	1.00	178.56	64.7	**(11.3)**	Clyde Ave	Tower 1 - Roof
PST-1b	0.1718	10	0.90	76.81	33.0	**(7.7)**	0.90	104.19	44.8	**(10.5)**	1.00	178.56	85.3	**(20.0)**		Tower 1 - Surface Areas
PST-2a	0.1696	10	0.90	76.81	32.6	**(5.8)**	0.90	104.19	44.2	**(7.9)**	1.00	178.56	84.2	**(15.1)**		Tower 2 - Roof
PST-2b	0.2304	10	0.90	76.81	44.3	**(9.7)**	0.90	104.19	60.1	**(13.1)**	1.00	178.56	114.4	**(25.0)**		Tower 2 - Surface Areas
PST-3	0.0398	10	0.90	76.81	7.7	**(1.9)**	0.90	104.19	10.4	**(2.6)**	1.00	178.56	19.8	**(5.0)**		Surface Areas - Middle
Totals	0.7419				142.6	**29.6**			193.4	**40.1**			368.3	**76.4**		

Notes 79.2 <--- allowable
2-yr Storm Intensity, I = 732.951/(Tc+6.199)^0.810 (City of Ottawa)
5-yr Storm Intensity, I = 998.071/(Tc+6.035)^0.814 (City of Ottawa)
100-yr Storm Intensity, I = 1735.688/(Tc+6.014)&^0.820 (City of Ottawa)
Time of Concentration (min), Tc = ***10***
For Flows under column Qcap which are shown in brackets ***(0.0)*** *, denotes flows that are controlled*

Table A-11 SUMMARY OF STORAGE

Area No	Release Rate (L/s)			Storage Required (m^3) (MRM)			Storage Provided (m^3)		Control Method	Area Desc
	2-yr	5-yr	100-yr	2-yr	5-yr	100-yr	Roof	Cistern		
PST-1a	4.4	5.9	11.3	15.6	21.0	39.6	48.9		Flow Controlled Roof Drains	Tower 1 - Roof
PST-1b	7.7	10.5	20.0	17.5	23.6	62.1		62.1	Pump Rate from Cistern	Tower 1 - Surface Areas
PST-2a	5.8	7.9	15.1	20.1	26.9	50.8	63.6		Flow Controlled Roof Drains	Tower 2 - Roof
PST-2b	9.7	13.1	25.0	24.5	33.0	85.7		85.7	Pump Rate from Cistern	Tower 2 - Surface Areas
PST-3	1.9	2.6	5.0	3.9	5.2	14.0		14.0	Pump Rate from Cistern	Surface Areas - Middle
Totals	**29.6**	**40.1**	**76.4**	**81.7**	**109.7**	**252.1**	**112.5**	**161.8**		

TABLE A-12

Storage Volumes for 2-year, 5-Year and 100-Year Storms

Area No: **PST-1a** **Tower 1 - Roof**

C_{AVG} = 0.90 (2-yr)

C_{AVG} = 0.90 (5-yr)

C_{AVG} = 1.00 (100-yr, Max 1.0)

Time Interval = 5.00 (mins)

Drainage Area = 0.1303 (hectares)

Duration (min)	Release Rate = 4.4 (L/sec); Return Period = 2 (years); IDF Parameters, A = 732.951, B = 0.810, C = 6.199; (I = A/(T_c+C)					Release Rate = 5.9 (L/sec); Return Period = 5 (years); IDF Parameters, A = 998.071, B = 0.814, C = 6.053; (I = A/(T_c+C)					Release Rate = 11.3 (L/sec); Return Period = 100 (years); IDF Parameters, A = 1735.688, B = 0.820, C = 6.014; (I = A/(T_c+C)				
	Rainfall Intensity, I (mm/hr)	Peak Flow (L/sec)	Release Rate (L/sec)	Storage Rate (L/sec)	Storage (m^3)	Rainfall Intensity, I (mm/hr)	Peak Flow (L/sec)	Release Rate (L/sec)	Storage Rate (L/sec)	Storage (m^3)	Rainfall Intensity, I (mm/hr)	Peak Flow (L/sec)	Release Rate (L/sec)	Storage Rate (L/sec)	Storage (m^3)
0	167.2	54.5	4.37	50.1	0.00	230.5	75.1	5.934	69.2	0.00	398.6	144.4	11.300	133.1	0.00
5	103.6	33.8	4.37	29.4	8.82	141.2	46.0	5.934	40.1	12.03	242.7	87.9	11.300	76.6	22.98
10	76.8	25.0	4.37	20.7	12.40	104.2	34.0	5.934	28.0	16.82	178.6	64.7	11.300	53.4	32.03
15	61.8	20.1	4.37	15.8	14.19	83.6	27.2	5.934	21.3	19.18	142.9	51.8	11.300	40.5	36.42
20	52.0	17.0	4.37	12.6	15.11	70.3	22.9	5.934	17.0	20.36	120.0	43.5	11.300	32.2	38.58
25	45.2	14.7	4.37	10.4	15.53	60.9	19.9	5.934	13.9	20.88	103.8	37.6	11.300	26.3	39.48
30	40.0	13.1	4.37	8.7	15.62	53.9	17.6	5.934	11.6	20.96	91.9	33.3	11.300	22.0	39.56
35	36.1	11.8	4.37	7.4	15.50	48.5	15.8	5.934	9.9	20.75	82.6	29.9	11.300	18.6	39.09
40	32.9	10.7	4.37	6.3	15.21	44.2	14.4	5.934	8.5	20.33	75.1	27.2	11.300	15.9	38.21
45	30.2	9.9	4.37	5.5	14.81	40.6	13.2	5.934	7.3	19.74	69.1	25.0	11.300	13.7	37.02
50	28.0	9.1	4.37	4.8	14.30	37.7	12.3	5.934	6.3	19.02	64.0	23.2	11.300	11.9	35.60
55	26.2	8.5	4.37	4.2	13.72	35.1	11.5	5.934	5.5	18.20	59.6	21.6	11.300	10.3	33.98
60	24.6	8.0	4.37	3.6	13.07	32.9	10.7	5.934	4.8	17.30	55.9	20.2	11.300	8.9	32.21
65	23.2	7.5	4.37	3.2	12.37	31.0	10.1	5.934	4.2	16.33	52.6	19.1	11.300	7.8	30.30
70	21.9	7.1	4.37	2.8	11.63	29.4	9.6	5.934	3.6	15.29	49.8	18.0	11.300	6.7	28.29
75	20.8	6.8	4.37	2.4	10.85	27.9	9.1	5.934	3.2	14.21	47.3	17.1	11.300	5.8	26.18
80	19.8	6.5	4.37	2.1	10.03	26.6	8.7	5.934	2.7	13.08	45.0	16.3	11.300	5.0	23.99
85	18.9	6.2	4.37	1.8	9.19	25.4	8.3	5.934	2.3	11.91	43.0	15.6	11.300	4.3	21.72
90	18.1	5.9	4.37	1.5	8.32	24.3	7.9	5.934	2.0	10.71	41.1	14.9	11.300	3.6	19.40
95	17.4	5.7	4.37	1.3	7.42	23.3	7.6	5.934	1.7	9.48	39.4	14.3	11.300	3.0	17.01
100	16.7	5.5	4.37	1.1	6.51	22.4	7.3	5.934	1.4	8.22	37.9	13.7	11.300	2.4	14.58
Max =					**15.62**					**20.96**					**39.56**

Notes

1) Peak flow is equal to the product of 2.78 x C x I x A

2) Rainfall Intensity, $I = A/(Tc+C)^B$

3) Release Rate = Min (Release Rate, Peak Flow)

4) Storage Rate = Peak Flow - Release Rate

5) Storage = Duration x Storage Rate

6) Maximium Storage = Max Storage Over Duration

7) Parameters a,b,c are for City of Ottawa

TABLE A-13

Storage Volumes for 2-year, 5-Year and 100-Year Storms

Area No: **PST-1b** **Tower 1 - Surface Areas**

C_{AVG} = 0.90 (2-yr)

C_{AVG} = 0.90 (5-yr)

C_{AVG} = 1.00 (100-yr, Max 1.0)

Time Interval = 5.00 (mins)

Drainage Area = 0.1718 (hectares)

Actual Release Rate (L/sec) = 20.0

Percentage of Actual Rate (City of Ottawa requirement) 50%

Release Rate Used for Estimation of 100-year Storage (L/sec) = 10.0

Duration (min)	Release Rate = 7.7 (L/sec), Return Period = 2 (years), IDF Parameters, A = 732.951, B = 0.810, C = 6.199 (I = A/(T_c+C)					Release Rate = 10.5 (L/sec), Return Period = 5 (years), IDF Parameters, A = 998.071, B = 0.814, C = 6.053 (I = A/(T_c+C)					Release Rate = 10.0 (L/sec), Return Period = 100 (years), IDF Parameters, A = 1735.688, B = 0.820, C = 6.014 (I = A/(T_c+C)				
	Rainfall Intensity, I (mm/hr)	Peak Flow (L/sec)	Release Rate (L/sec)	Storage Rate (L/sec)	Storage (m^3)	Rainfall Intensity, I (mm/hr)	Peak Flow (L/sec)	Release Rate (L/sec)	Storage Rate (L/sec)	Storage (m^3)	Rainfall Intensity, I (mm/hr)	Peak Flow (L/sec)	Release Rate (L/sec)	Storage Rate (L/sec)	Storage (m^3)
0	167.2	71.9	7.74	64.1	0.00	230.5	99.1	10.503	88.6	0.00	398.6	190.4	10.000	180.4	0.00
5	103.6	44.5	7.74	36.8	11.03	141.2	60.7	10.503	50.2	15.05	242.7	115.9	10.000	105.9	31.77
10	76.8	33.0	7.74	25.3	15.16	104.2	44.8	10.503	34.3	20.57	178.6	85.3	10.000	75.3	45.17
15	61.8	26.6	7.74	18.8	16.93	83.6	35.9	10.503	25.4	22.87	142.9	68.2	10.000	58.2	52.42
20	52.0	22.4	7.74	14.6	17.55	70.3	30.2	10.503	19.7	23.63	120.0	57.3	10.000	47.3	56.75
25	45.2	19.4	7.74	11.7	17.51	60.9	26.2	10.503	15.7	23.51	103.8	49.6	10.000	39.6	59.40
30	40.0	17.2	7.74	9.5	17.05	53.9	23.2	10.503	12.7	22.82	91.9	43.9	10.000	33.9	60.98
35	36.1	15.5	7.74	7.8	16.29	48.5	20.9	10.503	10.4	21.74	82.6	39.4	10.000	29.4	61.82
40	32.9	14.1	7.74	6.4	15.32	44.2	19.0	10.503	8.5	20.37	75.1	35.9	10.000	25.9	62.14
45	30.2	13.0	7.74	5.3	14.19	40.6	17.5	10.503	7.0	18.79	69.1	33.0	10.000	23.0	62.04
50	28.0	12.1	7.74	4.3	12.93	37.7	16.2	10.503	5.7	17.04	64.0	30.5	10.000	20.5	61.63
55	26.2	11.2	7.74	3.5	11.57	35.1	15.1	10.503	4.6	15.16	59.6	28.5	10.000	18.5	60.97
60	24.6	10.6	7.74	2.8	10.13	32.9	14.2	10.503	3.7	13.17	55.9	26.7	10.000	16.7	60.10
65	23.2	10.0	7.74	2.2	8.61	31.0	13.3	10.503	2.8	11.08	52.6	25.1	10.000	15.1	59.06
70	21.9	9.4	7.74	1.7	7.04	29.4	12.6	10.503	2.1	8.91	49.8	23.8	10.000	13.8	57.87
75	20.8	8.9	7.74	1.2	5.42	27.9	12.0	10.503	1.5	6.68	47.3	22.6	10.000	12.6	56.56
80	19.8	8.5	7.74	0.8	3.75	26.6	11.4	10.503	0.9	4.39	45.0	21.5	10.000	11.5	55.14
85	18.9	8.1	7.74	0.4	2.04	25.4	10.9	10.503	0.4	2.05	43.0	20.5	10.000	10.5	53.63
90	18.1	7.8	7.74	0.1	0.30	24.3	10.4	10.503	-0.1	-0.34	41.1	19.6	10.000	9.6	52.03
95	17.4	7.5	7.74	-0.3	-1.47	23.3	10.0	10.503	-0.5	-2.77	39.4	18.8	10.000	8.8	50.35
100	16.7	7.2	7.74	-0.5	-3.27	22.4	9.6	10.503	-0.9	-5.23	37.9	18.1	10.000	8.1	48.62
Max =					**17.55**					**23.63**					**62.14**

Notes

1) Peak flow is equal to the product of 2.78 x C x I x A

2) Rainfall Intensity, $I = A/(Tc+C)^B$

3) Release Rate = Min (Release Rate, Peak Flow)

4) Storage Rate = Peak Flow - Release Rate

5) Storage = Duration x Storage Rate

6) Maximium Storage = Max Storage Over Duration

7) Parameters a,b,c are for City of Ottawa

TABLE A-14

Storage Volumes for 2-year, 5-Year and 100-Year Storms

Area No: **PST-2a** **Tower 2 - Roof**

C_{AVG} = 0.90 (2-yr)

C_{AVG} = 0.90 (5-yr)

C_{AVG} = 1.00 (100-yr, Max 1.0)

Time Interval = 5.00 (mins)

Drainage Area = 0.1696 (hectares)

Duration (min)	Release Rate = 5.8 (L/sec); Return Period = 2 (years); IDF Parameters, A = 732.951, B = 0.810, C = 6.199; (I = A/(T_c+C)					Release Rate = 7.9 (L/sec); Return Period = 5 (years); IDF Parameters, A = 998.071, B = 0.814, C = 6.053; (I = A/(T_c+C)					Release Rate = 15.1 (L/sec); Return Period = 100 (years); IDF Parameters, A = 1735.688, B = 0.820, C = 6.014; (I = A/(T_c+C)				
	Rainfall Intensity, I (mm/hr)	Peak Flow (L/sec)	Release Rate (L/sec)	Storage Rate (L/sec)	Storage (m^3)	Rainfall Intensity, I (mm/hr)	Peak Flow (L/sec)	Release Rate (L/sec)	Storage Rate (L/sec)	Storage (m^3)	Rainfall Intensity, I (mm/hr)	Peak Flow (L/sec)	Release Rate (L/sec)	Storage Rate (L/sec)	Storage (m^3)
0	167.2	71.0	5.85	65.1	0.00	230.5	97.8	7.930	89.9	0.00	398.6	187.9	15.100	172.8	0.00
5	103.6	43.9	5.85	38.1	11.43	141.2	59.9	7.930	52.0	15.59	242.7	114.4	15.100	99.3	29.80
10	76.8	32.6	5.85	26.7	16.05	104.2	44.2	7.930	36.3	21.77	178.6	84.2	15.100	69.1	41.45
15	61.8	26.2	5.85	20.4	18.33	83.6	35.5	7.930	27.5	24.77	142.9	67.4	15.100	52.3	47.04
20	52.0	22.1	5.85	16.2	19.48	70.3	29.8	7.930	21.9	26.25	120.0	56.6	15.100	41.5	49.74
25	45.2	19.2	5.85	13.3	19.98	60.9	25.8	7.930	17.9	26.86	103.8	49.0	15.100	33.9	50.79
30	40.0	17.0	5.85	11.1	20.06	53.9	22.9	7.930	15.0	26.91	91.9	43.3	15.100	28.2	50.78
35	36.1	15.3	5.85	9.5	19.85	48.5	20.6	7.930	12.7	26.58	82.6	38.9	15.100	23.8	50.05
40	32.9	13.9	5.85	8.1	19.44	44.2	18.7	7.930	10.8	25.96	75.1	35.4	15.100	20.3	48.79
45	30.2	12.8	5.85	7.0	18.86	40.6	17.2	7.930	9.3	25.13	69.1	32.6	15.100	17.5	47.13
50	28.0	11.9	5.85	6.1	18.16	37.7	16.0	7.930	8.0	24.14	64.0	30.2	15.100	15.1	45.15
55	26.2	11.1	5.85	5.3	17.35	35.1	14.9	7.930	7.0	23.01	59.6	28.1	15.100	13.0	42.93
60	24.6	10.4	5.85	4.6	16.47	32.9	14.0	7.930	6.0	21.77	55.9	26.4	15.100	11.3	40.51
65	23.2	9.8	5.85	4.0	15.51	31.0	13.2	7.930	5.2	20.44	52.6	24.8	15.100	9.7	37.91
70	21.9	9.3	5.85	3.5	14.50	29.4	12.5	7.930	4.5	19.04	49.8	23.5	15.100	8.4	35.17
75	20.8	8.8	5.85	3.0	13.44	27.9	11.8	7.930	3.9	17.56	47.3	22.3	15.100	7.2	32.30
80	19.8	8.4	5.85	2.6	12.33	26.6	11.3	7.930	3.3	16.03	45.0	21.2	15.100	6.1	29.33
85	18.9	8.0	5.85	2.2	11.18	25.4	10.8	7.930	2.8	14.45	43.0	20.3	15.100	5.2	26.27
90	18.1	7.7	5.85	1.9	10.00	24.3	10.3	7.930	2.4	12.83	41.1	19.4	15.100	4.3	23.12
95	17.4	7.4	5.85	1.5	8.80	23.3	9.9	7.930	2.0	11.16	39.4	18.6	15.100	3.5	19.90
100	16.7	7.1	5.85	1.3	7.56	22.4	9.5	7.930	1.6	9.46	37.9	17.9	15.100	2.8	16.62
Max =					**20.06**					**26.91**					**50.79**

Notes

1) Peak flow is equal to the product of 2.78 x C x I x A

2) Rainfall Intensity, $I = A/(Tc+C)^B$

3) Release Rate = Min (Release Rate, Peak Flow)

4) Storage Rate = Peak Flow - Release Rate

5) Storage = Duration x Storage Rate

6) Maximium Storage = Max Storage Over Duration

7) Parameters a,b,c are for City of Ottawa

TABLE A-15

Storage Volumes for 2-year, 5-Year and 100-Year Storms

Area No: **PST-2b** **Tower 2 - Surface Areas**

C_{AVG} = 0.90 (2-yr)

C_{AVG} = 0.90 (5-yr)

C_{AVG} = 1.00 (100-yr, Max 1.0)

Time Interval = 5.00 (mins)

Drainage Area = 0.2304 (hectares)

Actual Release Rate (L/sec) = 25.0

Percentage of Actual Rate (City of Ottawa requirement) 50%

Release Rate Used for Estimation of 100-year Storage (L/sec) = 12.5

Duration (min)	Release Rate = 9.7 (L/sec), Return Period = 2 (years), IDF Parameters, A = 732.951, B = 0.810, (I = A/(T_c+C), C = 6.199					Release Rate = 13.1 (L/sec), Return Period = 5 (years), IDF Parameters, A = 998.071, 0.814, (I = A/(T_c+C), C = 6.053					Release Rate = 12.5 (L/sec), Return Period = 100 (years), IDF Parameters, A = 1735.688, 0.820, (I = A/(T_c+C), C = 6.014				
	Rainfall Intensity, I (mm/hr)	Peak Flow (L/sec)	Release Rate (L/sec)	Storage Rate (L/sec)	Storage (m^3)	Rainfall Intensity, I (mm/hr)	Peak Flow (L/sec)	Release Rate (L/sec)	Storage Rate (L/sec)	Storage (m^3)	Rainfall Intensity, I (mm/hr)	Peak Flow (L/sec)	Release Rate (L/sec)	Storage Rate (L/sec)	Storage (m^3)
0	167.2	96.4	9.68	86.7	0.00	230.5	132.9	13.129	119.7	0.00	398.6	255.3	12.500	242.8	0.00
5	103.6	59.7	9.68	50.0	15.01	141.2	81.4	13.129	68.3	20.48	242.7	155.5	12.500	143.0	42.89
10	76.8	44.3	9.68	34.6	20.76	104.2	60.1	13.129	46.9	28.16	178.6	114.4	12.500	101.9	61.13
15	61.8	35.6	9.68	25.9	23.34	83.6	48.2	13.129	35.0	31.54	142.9	91.5	12.500	79.0	71.13
20	52.0	30.0	9.68	20.3	24.38	70.3	40.5	13.129	27.4	32.84	120.0	76.8	12.500	64.3	77.20
25	45.2	26.0	9.68	16.4	24.54	60.9	35.1	13.129	22.0	32.97	103.8	66.5	12.500	54.0	81.03
30	40.0	23.1	9.68	13.4	24.13	53.9	31.1	13.129	18.0	32.33	91.9	58.8	12.500	46.3	83.42
35	36.1	20.8	9.68	11.1	23.33	48.5	28.0	13.129	14.8	31.17	82.6	52.9	12.500	40.4	84.83
40	32.9	18.9	9.68	9.3	22.24	44.2	25.5	13.129	12.3	29.62	75.1	48.1	12.500	35.6	85.52
45	30.2	17.4	9.68	7.8	20.94	40.6	23.4	13.129	10.3	27.79	69.1	44.2	12.500	31.7	85.67
50	28.0	16.2	9.68	6.5	19.46	37.7	21.7	13.129	8.6	25.73	64.0	41.0	12.500	28.5	85.40
55	26.2	15.1	9.68	5.4	17.85	35.1	20.2	13.129	7.1	23.49	59.6	38.2	12.500	25.7	84.78
60	24.6	14.2	9.68	4.5	16.12	32.9	19.0	13.129	5.9	21.10	55.9	35.8	12.500	23.3	83.89
65	23.2	13.3	9.68	3.7	14.31	31.0	17.9	13.129	4.8	18.59	52.6	33.7	12.500	21.2	82.77
70	21.9	12.6	9.68	3.0	12.41	29.4	16.9	13.129	3.8	15.97	49.8	31.9	12.500	19.4	81.45
75	20.8	12.0	9.68	2.3	10.44	27.9	16.1	13.129	2.9	13.27	47.3	30.3	12.500	17.8	79.96
80	19.8	11.4	9.68	1.8	8.42	26.6	15.3	13.129	2.2	10.48	45.0	28.8	12.500	16.3	78.33
85	18.9	10.9	9.68	1.2	6.34	25.4	14.6	13.129	1.5	7.63	43.0	27.5	12.500	15.0	76.57
90	18.1	10.5	9.68	0.8	4.22	24.3	14.0	13.129	0.9	4.71	41.1	26.3	12.500	13.8	74.70
95	17.4	10.0	9.68	0.4	2.06	23.3	13.4	13.129	0.3	1.75	39.4	25.3	12.500	12.8	72.73
100	16.7	9.7	9.68	0.0	-0.14	22.4	12.9	13.129	-0.2	-1.27	37.9	24.3	12.500	11.8	70.67
Max =					**24.54**					**32.97**					**85.67**

Notes

1) Peak flow is equal to the product of 2.78 x C x I x A

2) Rainfall Intensity, $I = A/(Tc+C)^B$

3) Release Rate = Min (Release Rate, Peak Flow)

4) Storage Rate = Peak Flow - Release Rate

5) Storage = Duration x Storage Rate

6) Maximium Storage = Max Storage Over Duration

7) Parameters a,b,c are for City of Ottawa

TABLE A-16

Storage Volum Storage Volumes for 2-year, 5-Year and 100-Year Storms Area: PST-3

Area No: PST-3 Tower 2 Roof

C_{AVG} = 0.90 (2-yr)

C_{AVG} = 0.90 (5-yr)

C_{AVG} = 1.00 (100-yr, Max 1.0)

Time Interval = 2.00 (mins)

Drainage Area = 0.0398 (hectares)

Actual Release Rate (L/sec) = 5.0

Percentage of Actual Rate (City of Ottawa requirement) 50%

Release Rate Used for Estimation of 100-year Storage (L/sec) = 2.5

Duration (min)	Release Rate = 1.9 (L/sec), Return Period = 2 (years), IDF Parameters, A = 732.951, B = 0.810, (I = A/(T_c+C), C = 6.199					Release Rate = 2.6 (L/sec), Return Period = 5 (years), IDF Parameters, A = 998.071, 0.814, (I = A/(T_c+C), C = 6.053					Release Rate = 2.50 (L/sec), Return Period = 100 (years), IDF Parameters, A = 1735.688, 0.820, (I = A/(T_c+C), C = 6.014				
	Rainfall Intensity, I (mm/hr)	Peak Flow (L/sec)	Release Rate (L/sec)	Storage Rate (L/sec)	Storage (m^3)	Rainfall Intensity, I (mm/hr)	Peak Flow (L/sec)	Release Rate (L/sec)	Storage Rate (L/sec)	Storage (m^3)	Rainfall Intensity, I (mm/hr)	Peak Flow (L/sec)	Release Rate (L/sec)	Storage Rate (L/sec)	Storage (m^3)
0	167.2	16.7	1.94	14.7	0.00	230.5	23.0	2.626	20.3	0.00	398.6	44.1	2.5	41.6	0.00
2	133.3	13.3	1.94	11.3	1.36	182.7	18.2	2.626	15.6	1.87	315.0	34.9	2.5	32.4	3.88
4	111.7	11.1	1.94	9.2	2.21	152.5	15.2	2.626	12.6	3.02	262.4	29.0	2.5	26.5	6.37
6	96.6	9.6	1.94	7.7	2.77	131.6	13.1	2.626	10.5	3.77	226.0	25.0	2.5	22.5	8.11
8	85.5	8.5	1.94	6.6	3.16	116.1	11.6	2.626	8.9	4.29	199.2	22.1	2.5	19.6	9.38
10	76.8	7.7	1.94	5.7	3.43	104.2	10.4	2.626	7.8	4.65	178.6	19.8	2.5	17.3	10.36
12	69.9	7.0	1.94	5.0	3.62	94.7	9.4	2.626	6.8	4.90	162.1	17.9	2.5	15.4	11.12
14	64.2	6.4	1.94	4.5	3.75	86.9	8.7	2.626	6.0	5.07	148.7	16.5	2.5	14.0	11.73
16	59.5	5.9	1.94	4.0	3.83	80.5	8.0	2.626	5.4	5.17	137.5	15.2	2.5	12.7	12.22
18	55.5	5.5	1.94	3.6	3.88	75.0	7.5	2.626	4.8	5.23	128.1	14.2	2.5	11.7	12.61
20	52.0	5.2	1.94	3.2	3.90	70.3	7.0	2.626	4.4	5.25	120.0	13.3	2.5	10.8	12.93
22	49.0	4.9	1.94	2.9	3.89	66.1	6.6	2.626	4.0	5.23	112.9	12.5	2.5	10.0	13.20
24	46.4	4.6	1.94	2.7	3.87	62.5	6.2	2.626	3.6	5.19	106.7	11.8	2.5	9.3	13.41
26	44.0	4.4	1.94	2.5	3.82	59.3	5.9	2.626	3.3	5.13	101.2	11.2	2.5	8.7	13.57
28	41.9	4.2	1.94	2.2	3.77	56.5	5.6	2.626	3.0	5.04	96.3	10.7	2.5	8.2	13.71
30	40.0	4.0	1.94	2.1	3.70	53.9	5.4	2.626	2.7	4.94	91.9	10.2	2.5	7.7	13.81
32	38.3	3.8	1.94	1.9	3.62	51.6	5.1	2.626	2.5	4.83	87.9	9.7	2.5	7.2	13.88
34	36.8	3.7	1.94	1.7	3.53	49.5	4.9	2.626	2.3	4.70	84.3	9.3	2.5	6.8	13.93
36	35.4	3.5	1.94	1.6	3.43	47.6	4.7	2.626	2.1	4.57	81.0	9.0	2.5	6.5	13.96
38	34.1	3.4	1.94	1.5	3.32	45.8	4.6	2.626	1.9	4.42	77.9	8.6	2.5	6.1	13.97
40	32.9	3.3	1.94	1.3	3.21	44.2	4.4	2.626	1.8	4.26	75.1	8.3	2.5	5.8	13.97
Max =					**3.90**					**5.25**					**13.97**

Notes

1) Peak flow is equal to the product of 2.78 x C x I x A

2) Rainfall Intensity, $I = A/(Tc+C)^B$

3) Release Rate = Min (Release Rate, Peak Flow)

4) Storage Rate = Peak Flow - Release Rate

5) Storage = Duration x Storage Rate

6) Maximium Storage = Max Storage Over Duration

7) Parameters a,b,c are for City of Ottawa

TABLE A-17
ESTIMATION OF ROOF STORAGE AND OUTFLOW - TOWER 1

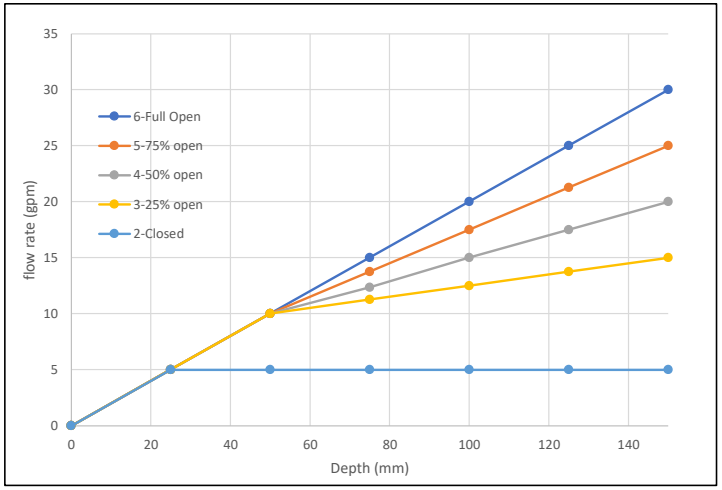
WATTS ADJ ACCUTROL WEIR FLOW RATES (Flow Rates at Various Depths)

Depth	Weir Position					
	1-None	2-Closed	3-25% open	4-50% open	5-75% open	6-Full Open
	Max Flow Rate per wier @150mm in gpm					
0	0	0	0	0	0	0
0.025	0	5	5	5	5	5
0.05	0	5	10	10	10	10
0.075	0	5	11.25	12.35	13.75	15
0.1	0	5	12.5	15	17.5	20
0.125	0	5	13.75	17.5	21.25	25
0.15	0	5	15	20	25	30

WATTS ADJ ACCUTROL WEIR FLOW RATES (Data From Manufacturer's Catalog)

Weir Position	Flow (gpm) per depth							Max Flow Rate per Weir @150mm
	0	25	50	75	100	125	150	
	0	0.025	0.05	0.075	0.1	0.125	0.15	
1-None	0	0	0	0	0	0	0	0
2-Closed	0	5	5	5	5	5	5	0.315
3-25% open	0	5	10	11.25	12.5	13.75	15	0.946
4-50% open	0	5	10	12.35	15	17.5	20	1.262
5-75% open	0	5	10	13.75	17.5	21.25	25	1.577
6-Full Open	0	5	10	15	20	25	30	1.893

GRAPH OF FLOW RATE VERSUS DEPTH FOR VARIOUS WEIR POSITIONS



BUILDING ROOF INFORMATION

Buidling Number	**Tower 1**	
Total Roof Area (m2)	**1304**	
Minimum Number of Drains Required	1.4	*Minimium of 1 drain every 900 sqaure metres (OBC 7.4.10.4)*
15-min Rainfall Factor for Ottawa (mm)	**23**	*(OBC Supp SB-1)*
Max Permitted Load from All Drains (Litres)	29,992	
Max Permitted Load from All Drains (L/sec)	33.3	*Hydraulic Load expressed in L/sec (OBC Section 7.4.10.3)*
Estimated area per drain (m2)	400	
Estimated Distance from roof edge to drains (m)	**10**	*Not more than 15m from Edge of Roof and 30m to Adjacent Dains (OBC Section 7.4.10.3)*
Estimated No. of Drains Requried	4	*Based on Total Roof Area / Area per Drain*
Actual No. of Drains Used	6	*Use if known*
Effecive Roof Percentage (%)	**75%**	*Allowance for 100 s.m. of Mechanical units on roof plus 130 s.m terrace*
Effecive Total Roof Area (m2)	978	
Area per Drain (m2)	163	*Based on Effectiive Roof Area / Actual Number of Drains Used*
Max Depth of Ponding at Drains (mm)	**150**	
Estimated Total Volume for Ponding on Roof (m3)	65.2	*Prisim formula, V = 1/3*A*d*
Maximium release rate per drain at 150mm (usgpm)	**30**	*Based on 1 Wier Per Drain and Fully Open Position*
Max Release Rate from Roof (L/sec)	11.4	*Based on Maximum Depth of Ponding of 150mm*
Equiv Runoff C for 100-yr Storm	0.18	*Based on 100-yr storm Intensity of 178.6 mm/hr, where I =1735.688 / (Tc + 6.014)^0.820, with Tc=10min)*

RATING CURVE FOR ROOF

DISCHARGE VERSUS DEPTH				AREA VERSUS DEPTH			Total Ponding Volume - All Drains (m3)
Ponding Depth (m)	Discharge Rate Per Drain (gpm)	Discharge Rate Per Drain (m3/sec)	Total Discharge All Drains (m3/sec)	Ponding Depth (m)	Ponding Area (m2)	Ponding Volume Per Drain (m3)	
0	0	0.00	0.00000	0	0.0	0.0	0.0
0.025	5	0.32	0.00189	0.025	4.5	0.0	0.2
0.05	10	0.63	0.00379	0.05	18.1	0.3	1.8
0.075	15	0.95	0.00568	0.075	40.8	1.0	6.1
0.1	20	1.26	0.00757	0.1	72.4	2.4	14.5
0.125	25	1.58	0.00946	0.125	113.2	4.7	28.3
0.15	30	1.89	0.01136	0.15	163.0	8.2	48.9
Weir Position = **6-Full Open**							

RATING CURVE FOR MODELLING OUTLET

Head or Ponding Depth (m)	Outlfow (L/sec)
0	0.0000
0.025	1.8927
0.05	3.7854
0.075	5.6781
0.1	7.5708
0.125	9.4635
0.15	11.3562

RATING CURVE FOR MODELLING ROOF STORAGE

Head or Ponding Depth (m)	Ponding Area (m2)
0	0.0
0.025	4.5
0.05	18.1
0.075	40.8
0.1	72.4
0.125	113.2
0.15	163.0

TABLE A-18
ESTIMATION OF ROOF STORAGE AND OUTFLOW - TOWER 2

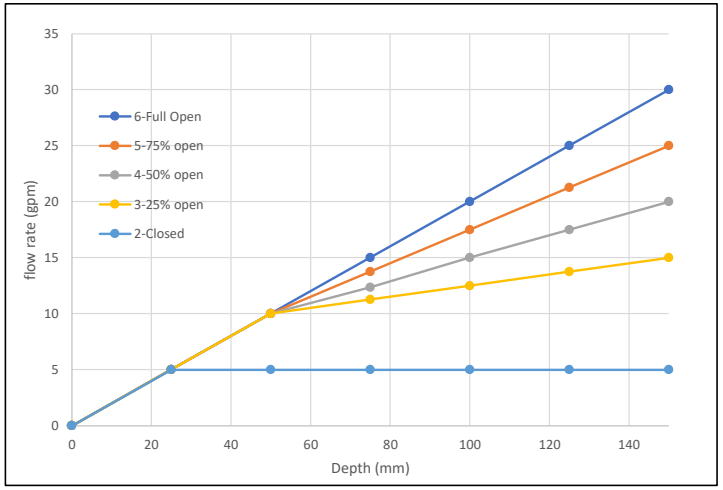
WATTS ADJ ACCUTROL WEIR FLOW RATES (Flow Rates at Various Depths)

Depth	Weir Position					
	1-None	2-Closed	3-25% open	4-50% open	5-75% open	6-Full Open
	Max Flow Rate per wier @150mm in gpm					
0	0	0	0	0	0	0
0.025	0	5	5	5	5	5
0.05	0	5	10	10	10	10
0.075	0	5	11.25	12.35	13.75	15
0.1	0	5	12.5	15	17.5	20
0.125	0	5	13.75	17.5	21.25	25
0.15	0	5	15	20	25	30

WATTS ADJ ACCUTROL WEIR FLOW RATES (Data From Manufacturer's Catalog)

Weir Position	Flow (gpm) per depth							Max Flow Rate per Weir @150mm
	0	25	50	75	100	125	150	
	0	0.025	0.05	0.075	0.1	0.125	0.15	
1-None	0	0	0	0	0	0	0	0
2-Closed	0	5	5	5	5	5	5	0.315
3-25% open	0	5	10	11.25	12.5	13.75	15	0.946
4-50% open	0	5	10	12.35	15	17.5	20	1.262
5-75% open	0	5	10	13.75	17.5	21.25	25	1.577
6-Full Open	0	5	10	15	20	25	30	1.893

GRAPH OF FLOW RATE VERSUS DEPTH FOR VARIOUS WEIR POSITIONS



BUILDING ROOF INFORMATION

Buidling Number	**Tower 2**	
Total Roof Area (m2)	**1696**	
Minimium Number of Drains Required	1.9	*Minimium of 1 drain every 900 sqaure metres (OBC 7.4.10.4)*
15-min Rainfall Factor for Ottawa (mm)	**23**	*(OBC Supp SB-1)*
Max Permitted Load from All Drains (Litres)	39,008	
Max Permitted Load from All Drains (L/sec)	43.3	*Hydraulic Load expressed in L/sec (OBC Section 7.4.10.3)*
Estimated area per drain (m2)	400	
Estimated Distance from roof edge to drains (m)	**10**	*Not more than 15m from Edge of Roof and 30m to Adjacent Dains (OBC Section 7.4.10.3)*
Estimated No. of Drains Requried	5	*Based on Total Roof Area / Area per Drain*
Actual No. of Drains Used	8	*Use if known*
Effecive Roof Percentage (%)	**75%**	*Allowance for 100 s.m. of Mechanical units on roof plus 208s.m terrace*
Effecive Total Roof Area (m2)	1272	
Area per Drain (m2)	159	*Based on Effectiive Roof Area / Actual Number of Drains Used*
Max Depth of Ponding at Drains (mm)	**150**	
Estimated Total Volume for Ponding on Roof (m3)	84.8	*Prisim formula, V = 1/3*A*d*
Maximium release rate per drain at 150mm (usgpm)	**30**	*Based on 1 Wier Per Drain and Fully Open Position*
Max Release Rate from Roof (L/sec)	15.1	*Based on Maximum Depth of Ponding of 150mm*
Equiv Runoff C for 100-yr Storm	0.18	*Based on 100-yr storm Intensity of 178.6 mm/hr, where I =1735.688 / (Tc + 6.014)^0.820, with Tc=10min)*

RATING CURVE FOR ROOF

DISCHARGE VERSUS DEPTH				AREA VERSUS DEPTH			Total Ponding Volume - All Drains (m3)
Ponding Depth (m)	Discharge Rate Per Drain (gpm)	Discharge Rate Per Drain (m3/sec)	Total Discharge All Drains (m3/sec)	Ponding Depth (m)	Ponding Area (m2)	Ponding Volume Per Drain (m3)	
0	0	0.00	0.00000	0	0.0	0.0	0.0
0.025	5	0.32	0.00252	0.025	4.4	0.0	0.3
0.05	10	0.63	0.00505	0.05	17.7	0.3	2.4
0.075	15	0.95	0.00757	0.075	39.8	1.0	8.0
0.1	20	1.26	0.01009	0.1	70.7	2.4	18.8
0.125	25	1.58	0.01262	0.125	110.4	4.6	36.8
0.15	30	1.89	0.01514	0.15	159.0	8.0	63.6
Weir Position =	**6-Full Open**						

RATING CURVE FOR MODELLING OUTLET

Head or Ponding Depth (m)	Outlfow (L/sec)
0	0.0000
0.025	2.5236
0.05	5.0472
0.075	7.5708
0.1	10.0944
0.125	12.6180
0.15	15.1416

RATING CURVE FOR MODELLING ROOF STORAGE

Head or Ponding Depth (m)	Ponding Area (m2)
0	0.0
0.025	4.4
0.05	17.7
0.075	39.8
0.1	70.7
0.125	110.4
0.15	159.0

Appendix B – Consultation / Correspondence

Email from City of Ottawa on Water System Boundary Conditions

Moe Ghadban

From: Elsayed, Ahmed <ahmed.elsayed@ottawa.ca>
Sent: Monday, March 2, 2020 9:42 AM
To: Moe Ghadban
Cc: Dickinson, Mary
Subject: FW: Request for Boundary Conditions - 1356 Clyde Ave
Attachments: 1356 Clyde Feb 2020.pdf

Hi Moe,

Below are the boundary conditions as requested.

Regards,

Ahmed Elsayed, P. Eng.
Project Manager, Planning Services
Development Review West Branch
City of Ottawa | Ville d'Ottawa
Planning, Infrastructure and Economic Development Department
110 Laurier Avenue West. 4th Floor, Ottawa ON, K1P 1J1
Tel:613.580.2424 ext. 21206
Fax: 613-580-2576

From: Khawam, Walid <Walid.Khawam@ottawa.ca>
Sent: March 02, 2020 9:26 AM
To: Elsayed, Ahmed <ahmed.elsayed@ottawa.ca>
Subject: RE: Request for Boundary Conditions - 1356 Clyde Ave

Please refer to Guidelines and Technical bulletin ISDTB-2014-02 concerning basic day demands greater than 0.5 L/s.

The following are boundary conditions, HGL, for hydraulic analysis at 1356 Clyde (zone 2W2C) assumed to be connected to the 305mm on Clyde (see attached PDF for locations).

The HGL is the same at both connections:

Minimum HGL = 126.5m

Maximum HGL = 132.8m

MaxDay + FireFlow (167 L/s) = 127.5m

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.

Walid Khawam, P.Eng.
Water Resources Engineer
Planning and Infrastructure Portfolio
City of Ottawa
P: 613-580-2424 Ext. 16658

From: Elsayed, Ahmed <ahmed.elsayed@ottawa.ca>
Sent: 2020/02/28 1:13 PM
To: Khawam, Walid <Walid.Khawam@ottawa.ca>
Subject: FW: Request for Boundary Conditions - 1356 Clyde Ave

Hi Walid,

Please refer to below email.

Thanks,
Ahmed

From: Moe Ghadban <Moe.Ghadban@exp.com>
Sent: February 28, 2020 12:37 PM
To: Elsayed, Ahmed <ahmed.elsayed@ottawa.ca>
Subject: RE: Request for Boundary Conditions - 1356 Clyde Ave

Please see the average day demands below for each tower:

Tower 1 – 1.7 L/sec

Tower 2 – 1.8 L/sec

Thank you.

Regards,

Moe Ghadban, P.Eng
EXP | Engineering Designer
t : +1.613.688.1899 | m : +1.613.808.4089 | e : moe.ghadban@exp.com

From: Elsayed, Ahmed <ahmed.elsayed@ottawa.ca>
Sent: Friday, February 28, 2020 12:11 PM
To: Moe Ghadban <Moe.Ghadban@exp.com>
Subject: FW: Request for Boundary Conditions - 1356 Clyde Ave

Hi Moe,

Can you please provide the average day demands.

Regards,

Ahmed Elsayed, P. Eng.
Project Manager, Planning Services
Development Review West Branch
City of Ottawa | Ville d'Ottawa
Planning, Infrastructure and Economic Development Department
110 Laurier Avenue West. 4th Floor, Ottawa ON, K1P 1J1
Tel:613.580.2424 ext. 21206
Fax: 613-580-2576

From: Khawam, Walid <Walid.Khawam@ottawa.ca>
Sent: February 27, 2020 3:43 PM
To: Elsayed, Ahmed <ahmed.elsayed@ottawa.ca>
Subject: RE: Request for Boundary Conditions - 1356 Clyde Ave

Hi Ahmed,

Can you please provide average day demands as well.

thanks

From: Tousignant, Eric <Eric.Tousignant@ottawa.ca>
Sent: February 27, 2020 9:40 AM
To: Khawam, Walid <Walid.Khawam@ottawa.ca>
Cc: Steele, Matt <Matt.Steele@ottawa.ca>
Subject: FW: Request for Boundary Conditions - 1356 Clyde Ave

Guys

This is a watermain boundary condition request.
Eric

From: Elsayed, Ahmed <ahmed.elsayed@ottawa.ca>
Sent: February 21, 2020 9:38 AM

To: Tousignant, Eric <Eric.Tousignant@ottawa.ca>
Subject: FW: Request for Boundary Conditions - 1356 Clyde Ave

Good morning Eric,

Can you please help with the below request for 1356 Clyde ave.?
I have also included your previous email that had some comments on that and there pre. Plans.

If you have any questions, please let me know.
Thanks
Ahmed

From: Moe Ghadban <Moe.Ghadban@exp.com>
Sent: February 21, 2020 9:04 AM
To: Elsayed, Ahmed <ahmed.elsayed@ottawa.ca>
Cc: Dickinson, Mary <mary.dickinson@ottawa.ca>; Jason Fitzpatrick <jason.fitzpatrick@exp.com>; Bruce Thomas <Bruce.Thomas@exp.com>
Subject: FW: Request for Boundary Conditions - 1356 Clyde Ave

We are working on a site plan application for 1356 Clyde Ave , and would appreciate if you could arrange for IAD/water Resources to provide hydraulic boundary conditions that we will need for the watermain design. I have attached a sketch of the site and the approximate boundary condition locations.

There are 3 separate watermains on Clyde Ave (914mm, 305mm, & 610mm in that order coming off the site), please make comment on which watermain we'll be connecting into (assuming 305mm).

The following is a summary of the demands and the required fire flows (RFF) we have estimated. We would appreciate the hydraulic boundary conditions based on our estimated water demands and required fire flows as noted below:

There are 2 separate Towers, and they shall both connect into Clyde Ave.

Tower 1, Boundary Location #1:
Max Day: 4.2 L/sec
Peak Hour: 9.2 L/sec
Fire flow (RFF): 167 L/sec (based on FUS method)
Max Day + FF: 176.2 L/sec.

Tower 2, Boundary Location #2:
Max Day: 4.4 L/sec
Peak Hour: 9.5 L/sec
Fire flow (RFF): 167 L/sec (based on FUS method)
Max Day + FF: 176.5 L/sec.

In the event you require confirmation of the above demands and the RFF, I've attached the design tables for reference.

Regards,

Moe Ghadban, P.Eng
EXP | Engineering Designer
t : +1.613.688.1899 | m : +1.613.808.4089 | e : moe.ghadban@exp.com
2650 Queensview Drive
Suite 100
Ottawa, ON K2B 8H6
CANADA

exp.com | legal disclaimer
keep it green, read from the screen

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'

Appendix C – Background Information

City of Ottawa Vault Drawings (Plan and Profiles)

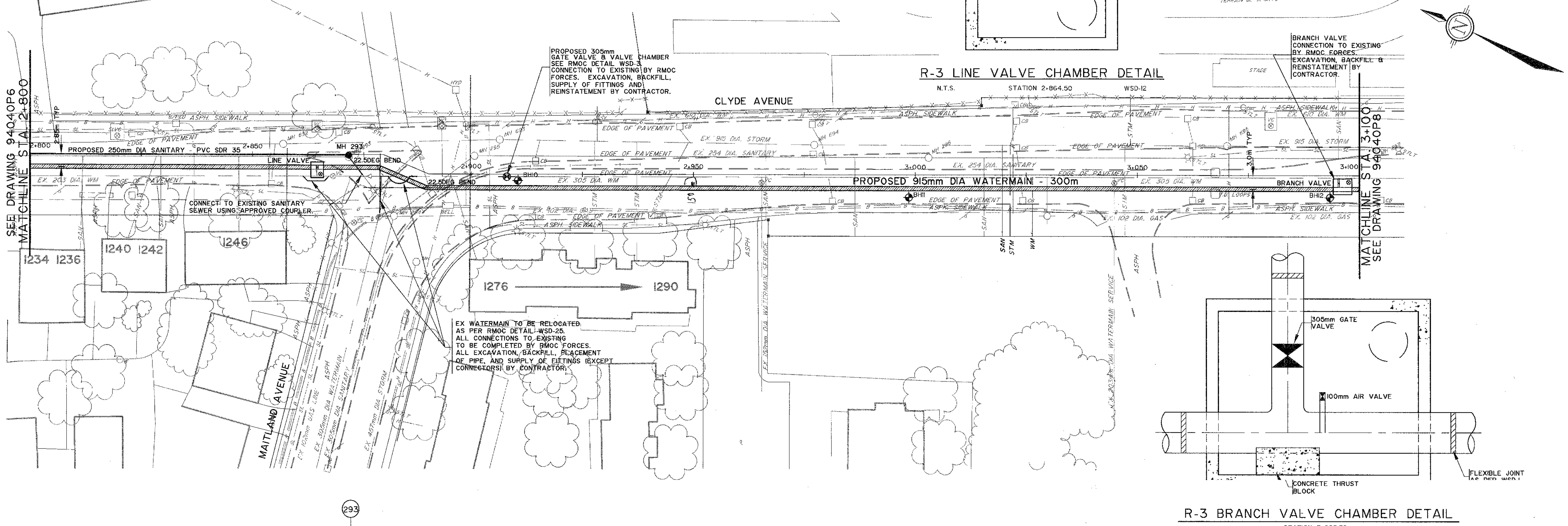
SANITARY MANHOLE DATA					
NO.	STATION	OFFSET	TYPE	ELEVATION T/GRATE	ELEVATION LOW/INV.
293	2+871.85	0.15 R	OPSD 1001.01 (1200mmφ)	~~96.99~~ 97.137	~~93.70~~ 93.757

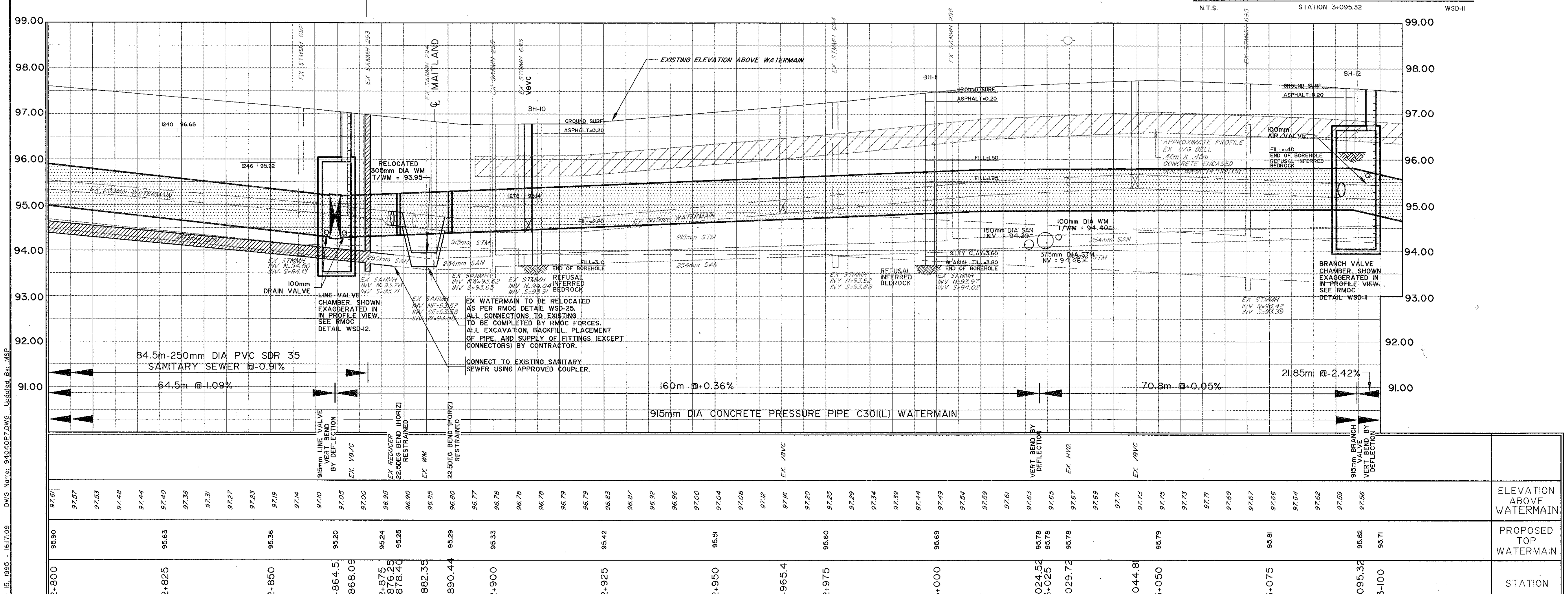
OFFSETS ARE FROM BASELINE TO CENTRE OF STRUCTURE

SANITARY SEWER DATA					
SEWER	DIA	TYPE	LENGTH	INVERT ELEVATION UP STR.	INVERT ELEVATION DOWN STR.
292 - 293	250	PVC	85.657 ~~84.5~~	94.50	93.787 ~~93.73~~

● AS BUILT ELEV. & DIST. ADDED

FROM STATION 2+875 TO 3+275
REINSTATE TRENCH TO:
40mm - HL3
2x50mm - HL8
150mm - GRAN "A"
675mm - GRAN "B" TYPE II





REGIONAL MUNICIPALITY OF OTTAWA-CARLETON

ENVIRONMENTAL SERVICES DEPARTMENT

M.J.E. SHEFLIN, P.Eng.
ACTING ENVIRONMENTAL SERVICES COMMISSIONER

Approved by: T. DAVIS, Manager of Design & Construction

Date: 15/02/95

Project Officer		Date
FERN MARCUCCIO P.ENG		FEB./95
Drawn by: NOVATECH ENGINEERING CONSULTANTS LTD	Verified by: J.G.R.	Date: FEB./95
Survey details by: NOVATECH ENGINEERING CONSULTANTS LTD	Book #	Date: NOV./DEC./94
"As Built" Inspection by: RMOC SURVEY SECTION		Date: SEP/95

NOTES:

1. ALL UTILITY LOCATIONS TO BE VERIFIED BY CONTRACTOR PRIOR TO ORDERING PIPE. UTILITY LOCATIONS SHOWN ON PLAN ARE NOT GUARANTEED.
2. ALL WATERMAIN MATERIALS AND CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE LATEST EDITION OF THE RMOC STANDARD SPECIFICATIONS AND STANDARD DRAWINGS.
3. ALL CONNECTIONS TO EXISTING WATERMAINS AND BLANKINGS TO BE MADE BY RMOC FORCES, UNLESS OTHERWISE DIRECTED.
4. WATER SERVICE LATERALS MIN. 2.4m COVER, UNLESS OTHERWISE APPROVED BY RMOC ENGINEER.
5. THE CONTRACTOR SHALL PROTECT ALL SERVICE (STORM, SANITARY & WATER) LATERALS NOT IN CONFLICT WITH PROPOSED WATERMAIN ENCOUNTERED DURING CONSTRUCTION.
6. REINSTATEMENT SHALL BE IN ACCORDANCE WITH REQUIREMENTS OF THE LOCAL MUNICIPAL AUTHORITIES OR AS SPECIFIED.
8. CATHODIC PROTECTION IS REQUIRED FOR ALL DUCTILE IRON WATERMAIN RELOCATION PER WSD-39
9. BOREHOLE AND PROBEHOLE DATA TAKEN FROM REPORT ON SOILS INVESTIGATION PREPARED BY JOHN D. PATTERSON & ASSOCIATES LIMITED. PROVIDED FOR CONVENIENCE ONLY. CONTRACTORS ARE ADVISED TO COLLECT ADDITIONAL SOIL INFORMATION AS DEEMED NECESSARY.
10. CONTRACTOR SHALL SUPPLY AND USE A CONCRETE PRESSURE PIPE NIGHT CAP TO COVER END OF PIPELINE DURING ANY WORK INTERRUPTIONS.
11. LOCATION OF FIELD OFFICE TO BE COORDINATED WITH RMOC
12. BASEMENT ELEVATIONS (CIVIC ADDRESS 5, ELEVATION IN METERS 93.47) ARE SHOWN FOR REFERENCE PURPOSES ONLY.
13. ALL SEWERS TO HAVE CLASS "B" BEDDING AND APPROVED BACKFILL MATERIAL.

NOVATECH ENGINEERING CONSULTANTS LTD
CIVIL ENGINEERS & PLANNERS
Suite 17, 77 Auriga Dr.
Nepean, Ontario K2E 7Z7
Tel(613)727-1658 Fax:727-6972

No.	Revision	Date
8.	FOR AS BUILT INFO. SEE "P2"	FEB 29/96
7.	REVISED WATERMAIN PROFILE	MAY 15/95
6.	ISSUED FOR CONSTRUCTION	APR 18/95
5.	REVISED PER RMOC COMMENTS	FEB 28/95
4.	ISSUED FOR TENDER	FEB 22/95
3.	ISSUED FOR M.O.E.E. APPROVAL	FEB 15/95
2.	ISSUED FOR APPROVAL	FEB 8/95
1.	FUNCTIONAL DESIGN CIRCULATION	SEPT 2/94

Scales: HORIZONTAL 1:500, VERTICAL 1:50

Project Title:

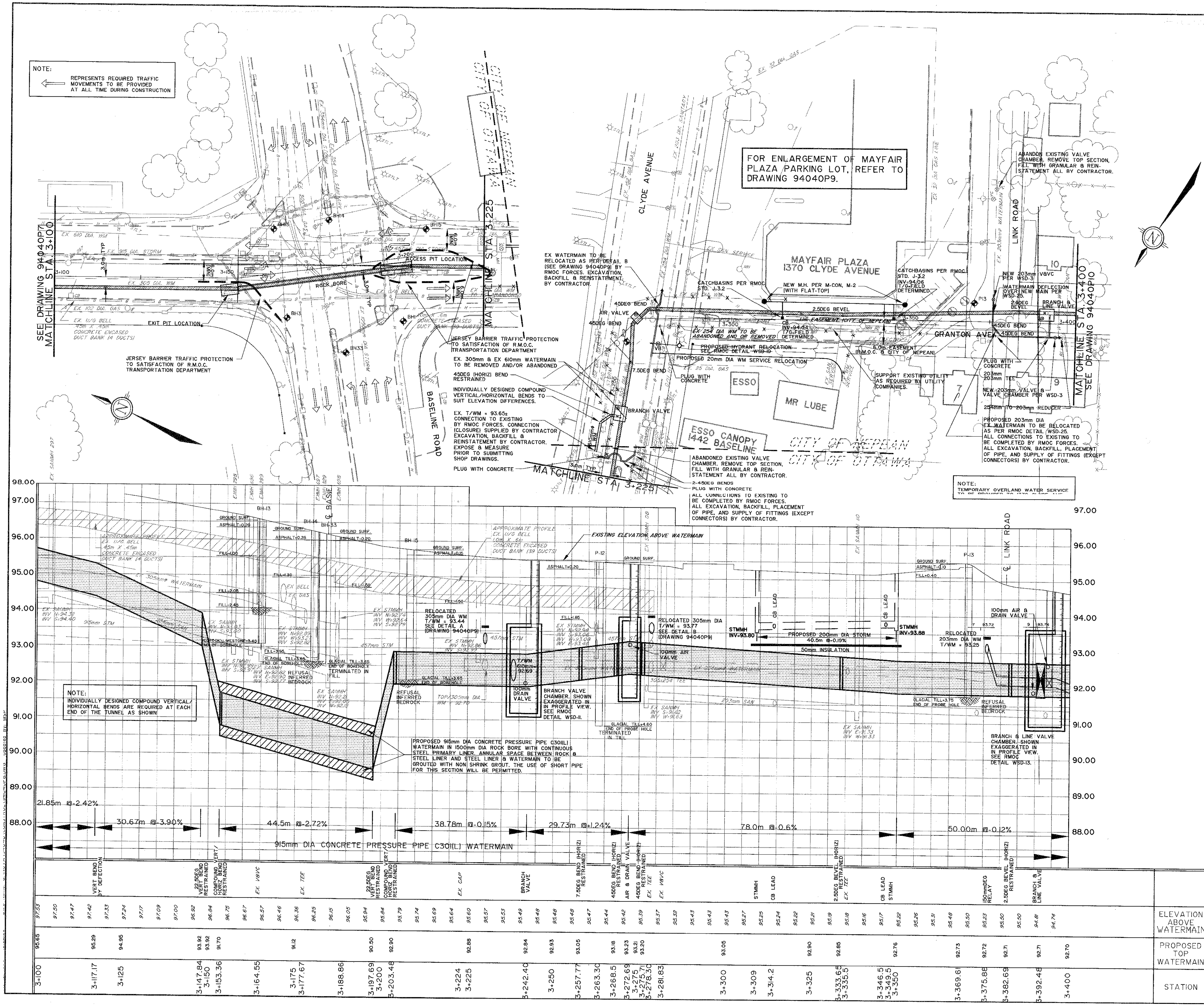
CLYDE AVENUE FEEDERMAIN

PROPOSED 915mm DIA WATERMAIN
STATION 2+800 to STATION 3+100

4730-7

Drawing No.: 94040-P7 Rev. No.: 7

May 15, 1995 - 16:17:09 DWG Name: 94040P7.DWG Updated By: MSP



REGIONAL MUNICIPALITY OF OTTAWA-CARLETON

ENVIRONMENTAL SERVICES DEPARTMENT

M.J.E. SHEFLIN, P.Eng.
ACTING ENVIRONMENTAL SERVICES COMMISSIONER

Approved by: T. DAVIS
Manager of Design & Construction
Date: 15/02/95

Project Officer: FERN MARCUCCIO P.ENG. — Date: FEB./95

Drawn by: NOVATECH ENGINEERING CONSULTANTS LTD — Verified by: J.G.R. — Date: FEB./95

Survey details by: NOVATECH ENGINEERING CONSULTANTS LTD — Book # — Date: NOV./DEC./94

"As Built" Inspection by: RMOC SURVEY SECTION — Date: SEP/95

NOTES:

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3. ALL CONNECTIONS TO EXISTING WATERMAINS AND BLANKINGS TO BE MADE BY RMOC FORCES, UNLESS OTHERWISE DIRECTED.
4. WATER SERVICE LATERALS MIN. 2.4m COVER, UNLESS OTHERWISE APPROVED BY RMOC ENGINEER.
5. THE CONTRACTOR SHALL PROTECT ALL SERVICE (STORM, SANITARY & WATER) LATERALS NOT IN CONFLICT WITH PROPOSED WATERMAIN ENCOUNTERED DURING CONSTRUCTION.
6. REINSTATEMENT SHALL BE IN ACCORDANCE WITH REQUIREMENTS OF THE LOCAL MUNICIPAL AUTHORITIES RMOC DETAIL WSD-18.
8. CATHODIC PROTECTION IS REQUIRED FOR ALL DUCTILE IRON WATERMAIN RELOCATION PER WSD-39
9. BOREHOLE AND PROBEHOLE DATA TAKEN FROM REPORT ON SOILS INVESTIGATION PREPARED BY JOHN D. PATTERSON & ASSOCIATES LIMITED. PROVIDED FOR CONVENIENCE ONLY. CONTRACTORS ARE ADVISED TO COLLECT ADDITIONAL SOIL INFORMATION AS DEEMED NECESSARY.
10. CONTRACTOR SHALL SUPPLY AND USE A CONCRETE PRESSURE PIPE NIGHT CAP TO COVER END OF PIPELINE DURING ANY WORK INTERRUPTIONS.
11. LOCATION OF FIELD OFFICE TO BE COORDINATED WITH RMOC
12. BASEMENT ELEVATIONS (CIVIC ADDRESS 5 / ELEVATION IN METERS 93.47) ARE SHOWN FOR REFERENCE PURPOSES ONLY.
13. ALL SEWERS TO HAVE CLASS "B" BEDDING AND APPROVED BACKFILL MATERIAL.

NOVATECH
ENGINEERING CONSULTANTS LTD
CIVIL ENGINEERS & PLANNERS
Suite 17, 77 Auriga Dr.
Nepean, Ontario K2E 7Z7
Tel:(613)727-1658 Fax:727-5972

No.	Revision	Date
8.	FOR AS BUILT INFO. SEE "P2, P3"	FEB 29/96
7.	REVISED WATERMAIN PROFILE	MAY 15/95
6.	ISSUED FOR CONSTRUCTION	APR 18/95
5.	REVISED PER RMOC COMMENTS	FEB 28/95
4.	ISSUED FOR TENDER	FEB 22/95
3.	ISSUED FOR M.O.E.E. APPROVAL	FEB 15/95
2.	ISSUED FOR APPROVAL	FEB 8/95
1.	FUNCTIONAL DESIGN CIRCULATION	SEPT 12/94

Scales: HORIZONTAL 1:500, VERTICAL 1:50

Project Title:

CLYDE AVENUE FEEDERMAIN

PROPOSED
915mm DIA WATERMAIN
STATION 3+100 to STATION 3+400

4730-8

Drawing No: 94040-P8 — Rev. No: 7

Appendix D – Drawings

Figure 1 – Conceptual Servicing

Architectural Plans (16 pages)

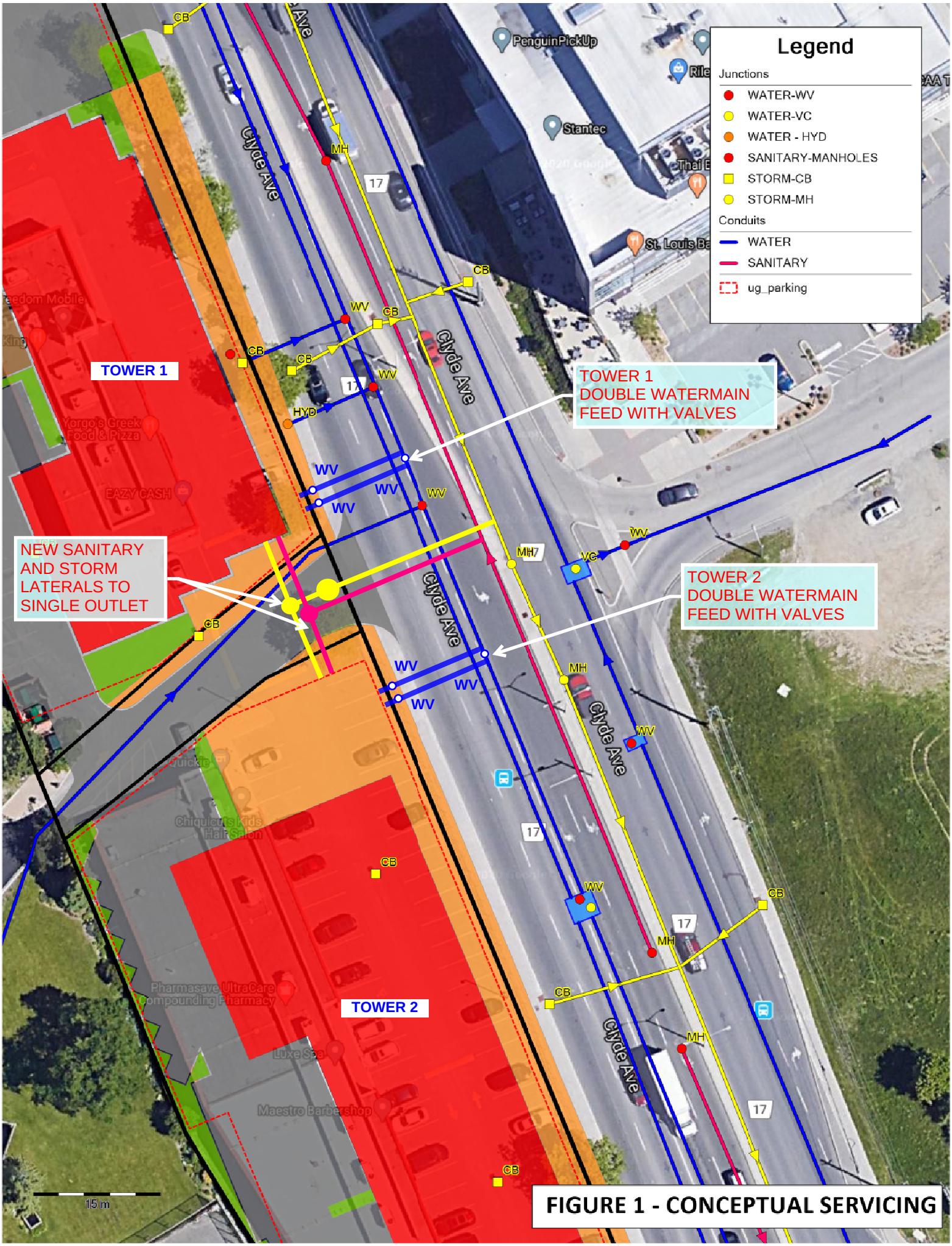
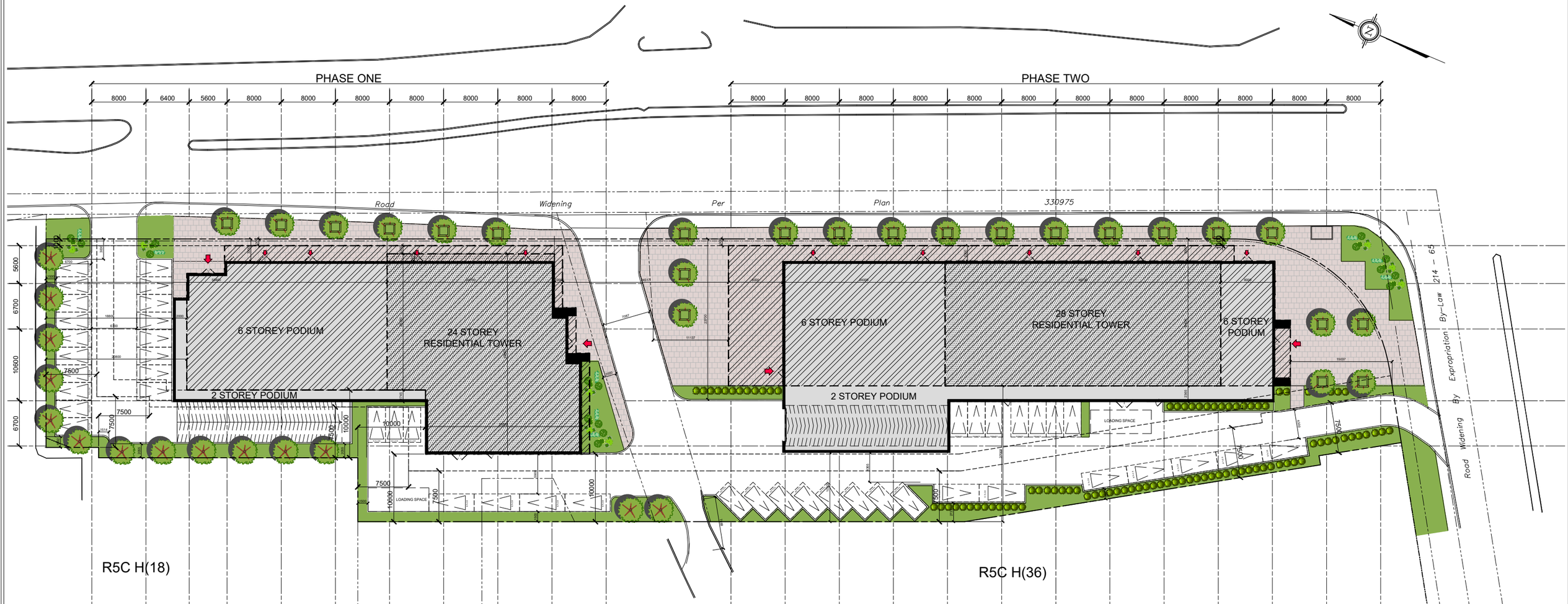


FIGURE 1 - CONCEPTUAL SERVICING



PROJECT INFORMATION

EXISTING ZONING	AM1 H(9)
SITE AREA	7020.8 sq. m.
SITE AREA - PHASE 1	3020.4 sq. m.
SITE AREA - PHASE 2	4000.4 sq. m.
PHASE ONE	
GROSS FLOOR AREA (ZONING DEFINITION)	16907.2 sq. m.
PHASE TWO	
GROSS FLOOR AREA (ZONING DEFINITION)	20528.2 sq. m.
TOTAL	37435.4 sq. m.
FSI	5.4

PHASE ONE

BUILDING HEIGHT	26
RESIDENTIAL UNITS (3RD TO 26TH FLOOR)	210
OFFICE (2ND FLOOR)	1363.7 sq. m.
RETAILS (GROUND FLOOR)	821.3 sq. m.

PHASE ONE

CAR PARKING REQUIRED	171
RESIDENTIAL (0.6)	126
OFFICE	25
RETAIL	20
BIKE PARKING REQUIRED	114
RESIDENTIAL (0.5)	105
OFFICE	6
RETAIL	3
CAR PARKING PROVIDED	217
P1	62
P2	75
P3	55
OUTDOOR	25
BIKE PARKING PROVIDED	143
P1	13
P2	33
P3	97

PHASE ONE

AMENITY REQUIRED (6SQ.M. PER UNITS)	1368 SQ.M.
COMMUNAL	684 SQ.M.
PRIVATE BALCONY	684 SQ.M.
AMENITY PROVIDED	
COMMUNAL (ROOF DECK AND INDOOR)	809 SQ.M.
PRIVATE BALCONY	1101.5 SQ.M.

PHASE TWO

BUILDING HEIGHT	28
RESIDENTIAL UNITS (3RD TO 28TH FLOOR)	258
OFFICE (2ND FLOOR)	1695.6 sq. m.
RETAILS (GROUND FLOOR)	903.8 sq. m.

PHASE TWO

CAR PARKING REQUIRED	209
RESIDENTIAL (0.6)	155
OFFICE	31
RETAIL	23
BIKE PARKING REQUIRED	140
RESIDENTIAL (0.5)	129
OFFICE	7
RETAIL	4
CAR PARKING PROVIDED	256
P1	85
P2	108
P3	41
OUTDOOR	22
BIKE PARKING PROVIDED	157
P1	115
P2	39
P3	3

PHASE TWO

AMENITY REQUIRED (6SQ.M. PER UNITS)	1548 SQ.M.
COMMUNAL	774 SQ.M.
PRIVATE BALCONY	774 SQ.M.
AMENITY PROVIDED	1548 SQ.M.
COMMUNAL (ROOF DECK AND INDOOR)	830 SQ.M.
PRIVATE BALCONY	2601 SQ.M.

SITE PLAN

rla/architecture

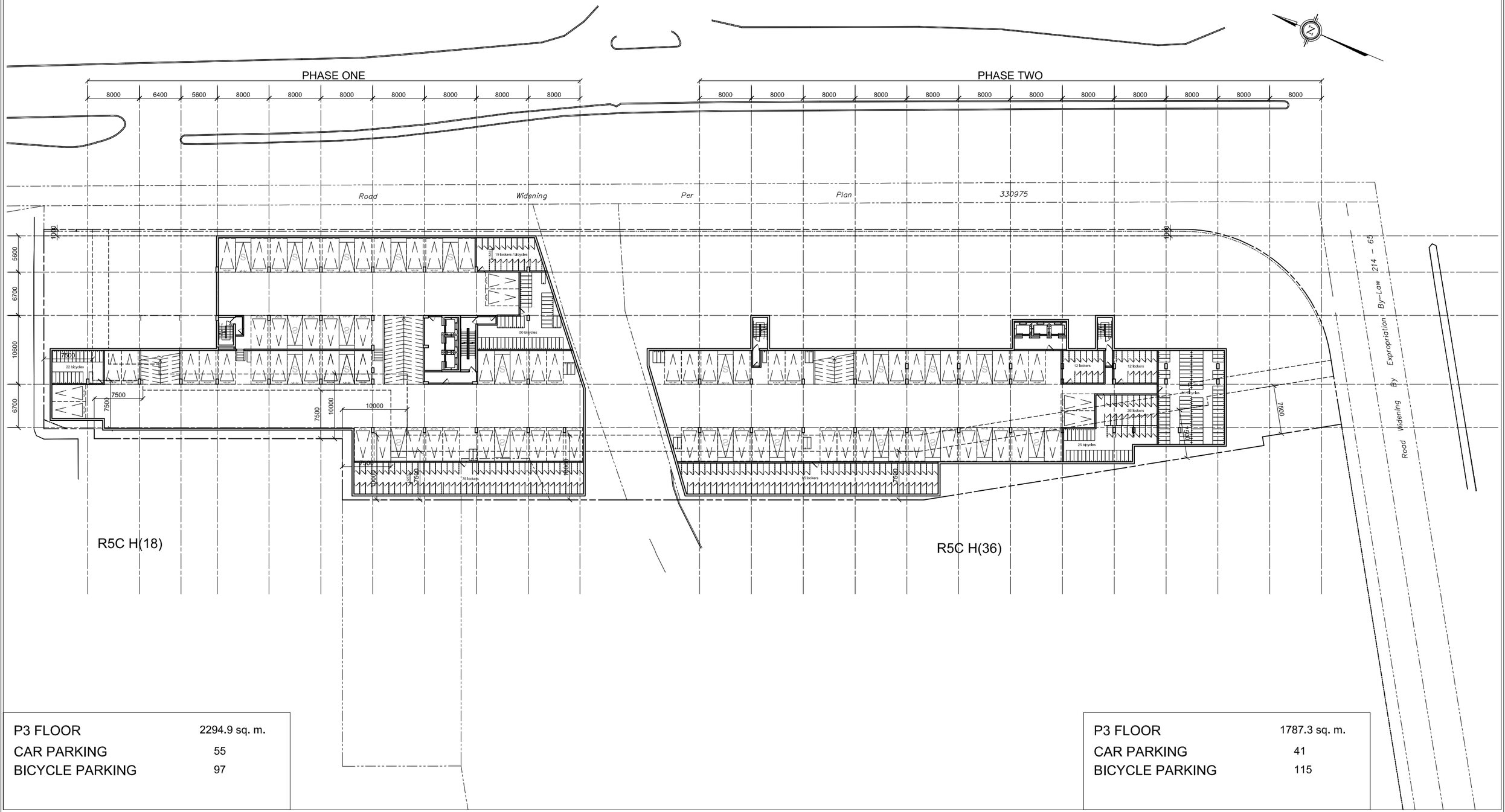
PLOT DATE: Wednesday, March 18, 2020

1356 CLYDE AVENUE
OTTAWA ONTARIO

GOLPRO HOLDINGS INC.

SHEET # 01

PROJ. # 1941



P3 FLOOR	2294.9 sq. m.
CAR PARKING	55
BICYCLE PARKING	97

P3 FLOOR	1787.3 sq. m.
CAR PARKING	41
BICYCLE PARKING	115

P3 FLOOR PLAN

rla/architecture

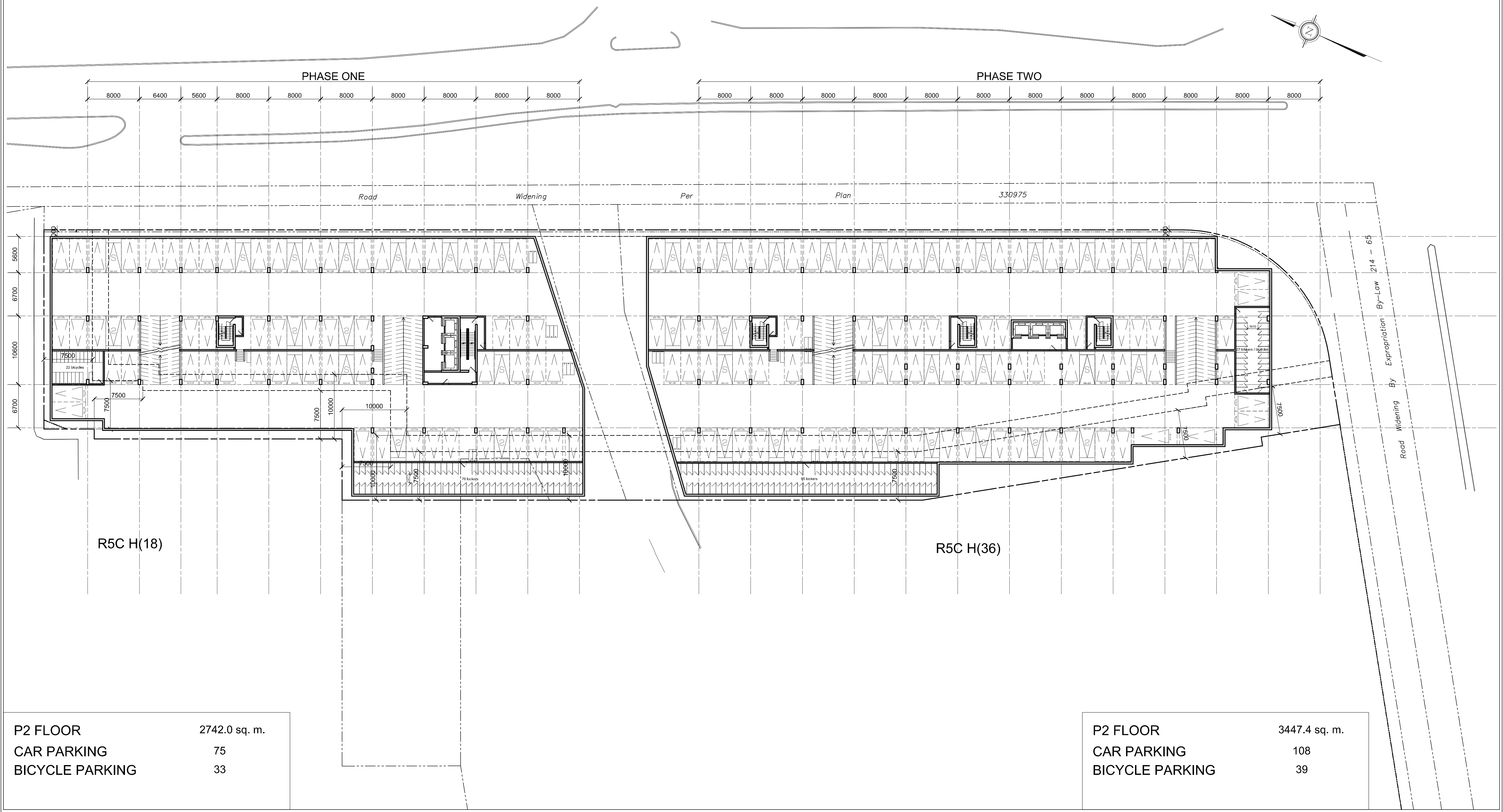
PLOT DATE: Wednesday, March 11, 2020

1356 CLYDE AVENUE
OTTAWA ONTARIO

GOLPRO HOLDINGS INC.

SHEET # 02

PROJ, # 1941



P2 FLOOR	2742.0 sq. m.
CAR PARKING	75
BICYCLE PARKING	33

P2 FLOOR	3447.4 sq. m.
CAR PARKING	108
BICYCLE PARKING	39

P2 FLOOR PLAN

rla/architecture

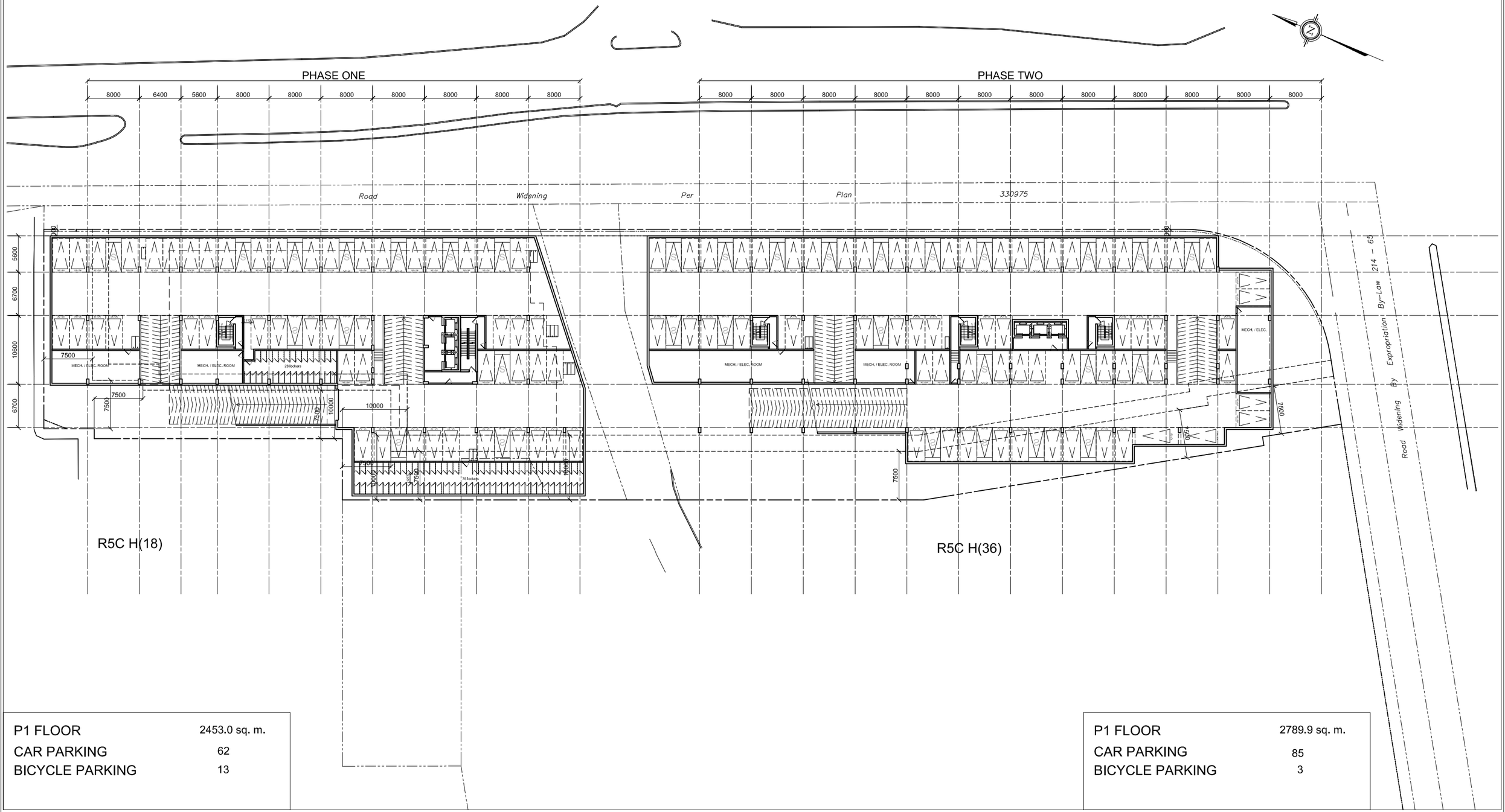
PLOT DATE: Wednesday, March 11, 2020

1356 CLYDE AVENUE
OTTAWA ONTARIO

GOLPRO HOLDINGS INC.

SHEET # 03

PROJ. # 1941



P1 FLOOR	2453.0 sq. m.
CAR PARKING	62
BICYCLE PARKING	13

P1 FLOOR	2789.9 sq. m.
CAR PARKING	85
BICYCLE PARKING	3

P1 FLOOR PLAN

rla/architecture

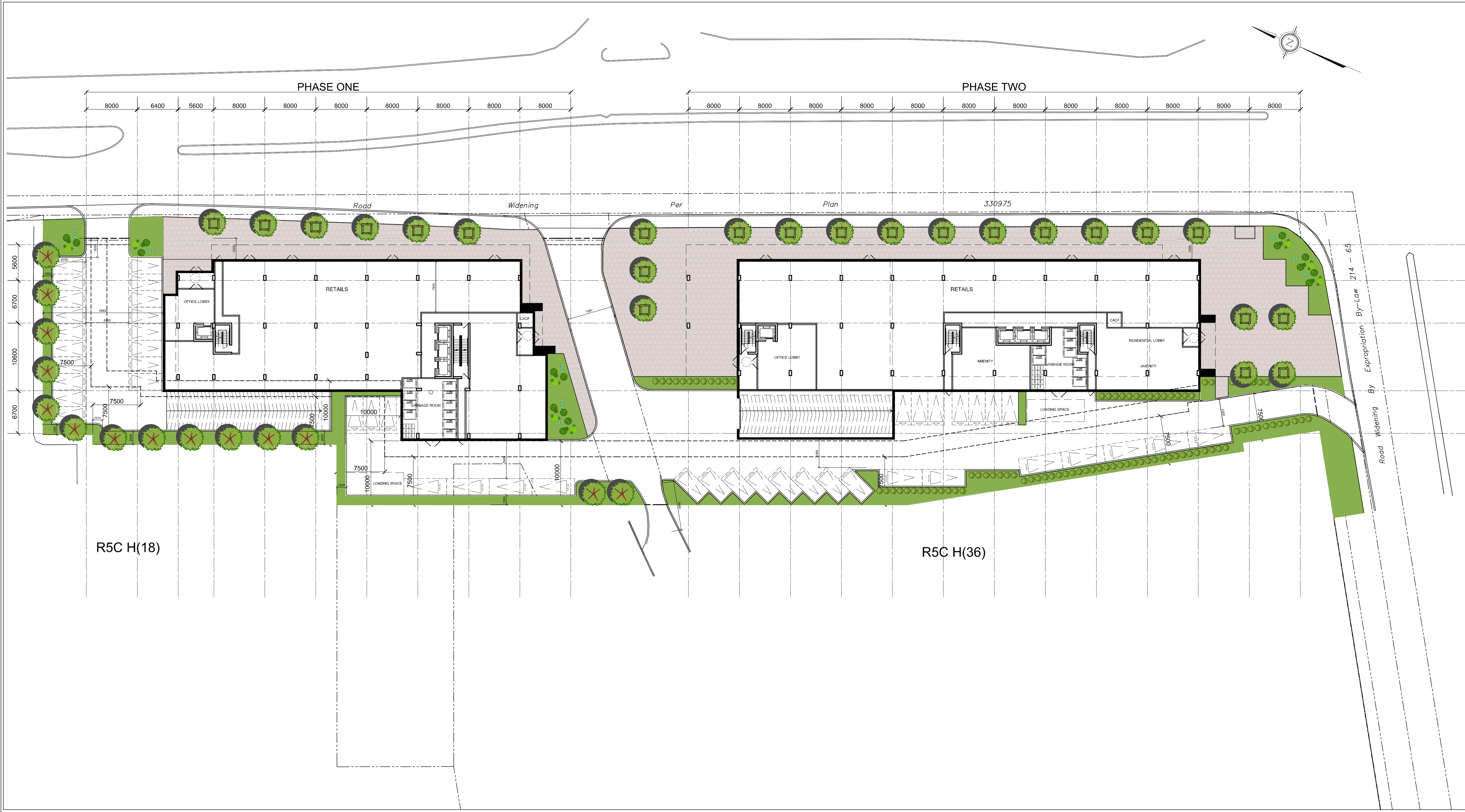
PLOT DATE: Wednesday, March 11, 2020

1356 CLYDE AVENUE
OTTAWA ONTARIO

GOLPRO HOLDINGS INC.

SHEET # 04

PROJ. # 1941



GROUND FLOOR PLAN

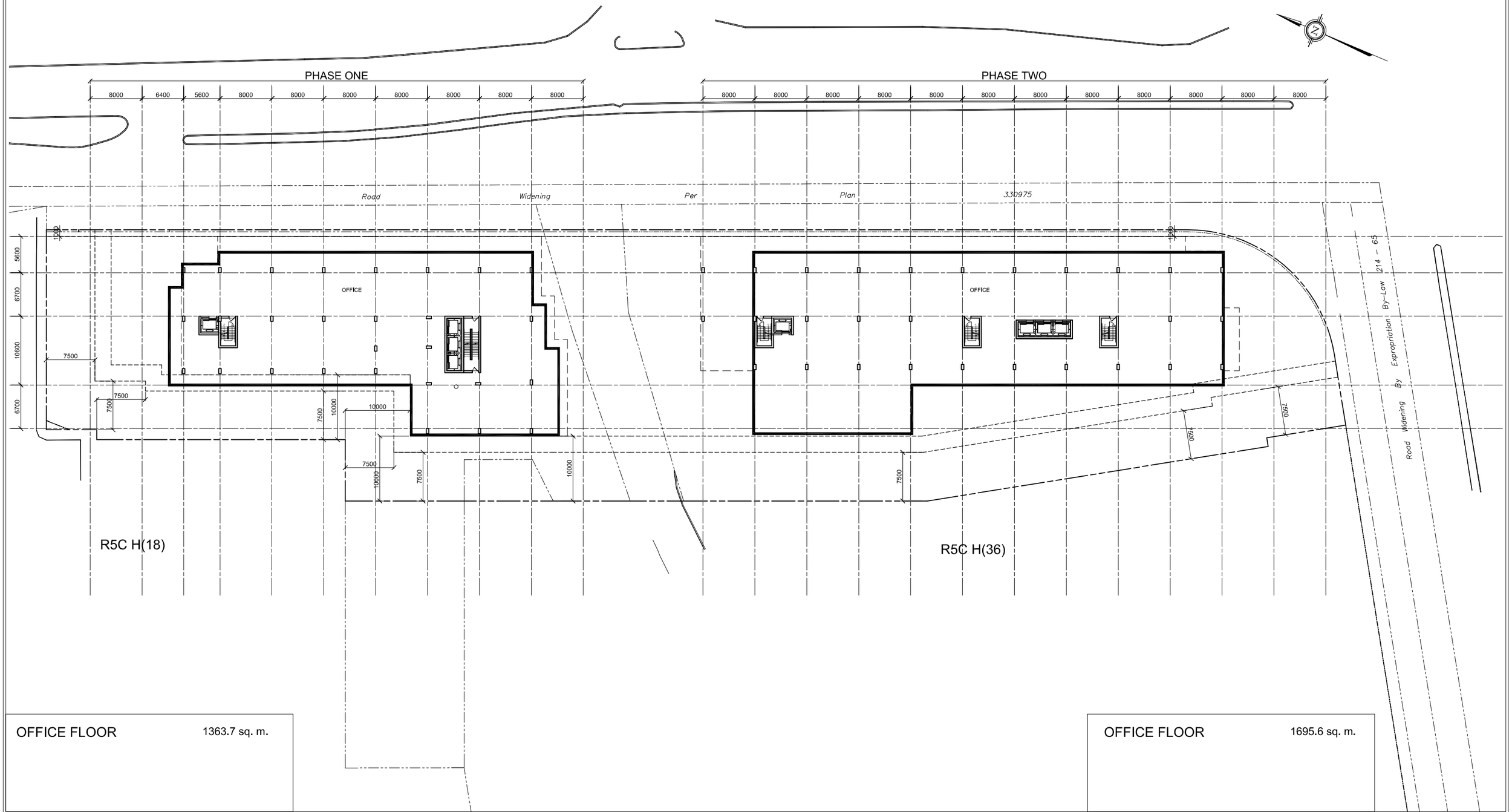
rla / architecture

PLOT DATE: Wednesday, March 11, 2020

1356 CLYDE AVENUE
OTTAWA ONTARIO

GOLPRO HOLDINGS INC.

SHEET #
05
PROJ. # 1941



OFFICE FLOOR	1363.7 sq. m.

OFFICE FLOOR	1695.6 sq. m.

2ND FLOOR PLAN

rla/architecture

PLOT DATE: Wednesday, March 11, 2020

1356 CLYDE AVENUE
OTTAWA ONTARIO

GOLPRO HOLDINGS INC.

SHEET # 06

PROJ, # 1941

PHASE ONE

PHASE TWO

8000 6400 5600 8000 8000 8000 8000 8000 8000 8000

8000 8000 8000 8000 8000 8000 8000 8000 8000 8000 8000 8000

Road Widening Per Plan 330975

1000

5600 6700 10600 6700

7500 7500 7500 10000 7500 10000 7500 10000 7500 7500 7500

UNIT TYPE TWO BED 1198 SQ. FT.
UNIT TYPE ONE BED + DEN 786 SQ. FT.
UNIT TYPE ONE BED + DEN 799 SQ. FT.
UNIT TYPE ONE BED + DEN 799 SQ. FT.
UNIT TYPE TWO BED 897 SQ. FT.
UNIT TYPE ONE BED 737 SQ. FT.
UNIT TYPE TWO BED 1069 SQ. FT.
UNIT TYPE ONE BED 606 SQ. FT.
UNIT TYPE ONE BED + DEN 792 SQ. FT.
UNIT TYPE ONE BED + DEN 792 SQ. FT.
UNIT TYPE TWO BED 900 SQ. FT.
UNIT TYPE ONE BED + DEN 660 SQ. FT.
UNIT TYPE ONE BED + DEN 804 SQ. FT.
UNIT TYPE TWO BED 942 SQ. FT.
UNIT TYPE TWO BED 929 SQ. FT.

UNIT TYPE TWO BED 1390 SQ. FT.
UNIT TYPE ONE BED + DEN 724 SQ. FT.
UNIT TYPE ONE BED + DEN 733 SQ. FT.
UNIT TYPE ONE BED + DEN 733 SQ. FT.
UNIT TYPE ONE BED + DEN 733 SQ. FT.
UNIT TYPE ONE BED + DEN 733 SQ. FT.
UNIT TYPE ONE BED + DEN 733 SQ. FT.
UNIT TYPE ONE BED + DEN 733 SQ. FT.
UNIT TYPE ONE BED + DEN 588 SQ. FT.
UNIT TYPE TWO BED 1021 SQ. FT.
UNIT TYPE ONE BED + DEN 736 SQ. FT.
UNIT TYPE ONE BED 733 SQ. FT.
UNIT TYPE ONE BED 733 SQ. FT.
UNIT TYPE ONE BED + DEN 831 SQ. FT.
UNIT TYPE ONE BED 739 SQ. FT.
UNIT TYPE ONE BED 739 SQ. FT.
UNIT TYPE ONE BED + DEN 874 SQ. FT.
UNIT TYPE TWO BED 1036 SQ. FT.

7500 7500 7500

1000

214 – 65 By–Law Expropriation By Widening Road

R5C H(18)

R5C H(36)

TYPICAL FLOOR	1392.0 sq. m.
RESIDENTIAL UNITS	15 units / per floor
	5 two bed units
	10 one bed units
	total 60 units

TYPICAL FLOOR	1556.7 sq. m.
RESIDENTIAL UNITS	18 units / per floor
	3 two bed units
	15 one bed units
	total 72 units

3RD TO 6TH FLOOR PLAN

rla/architecture

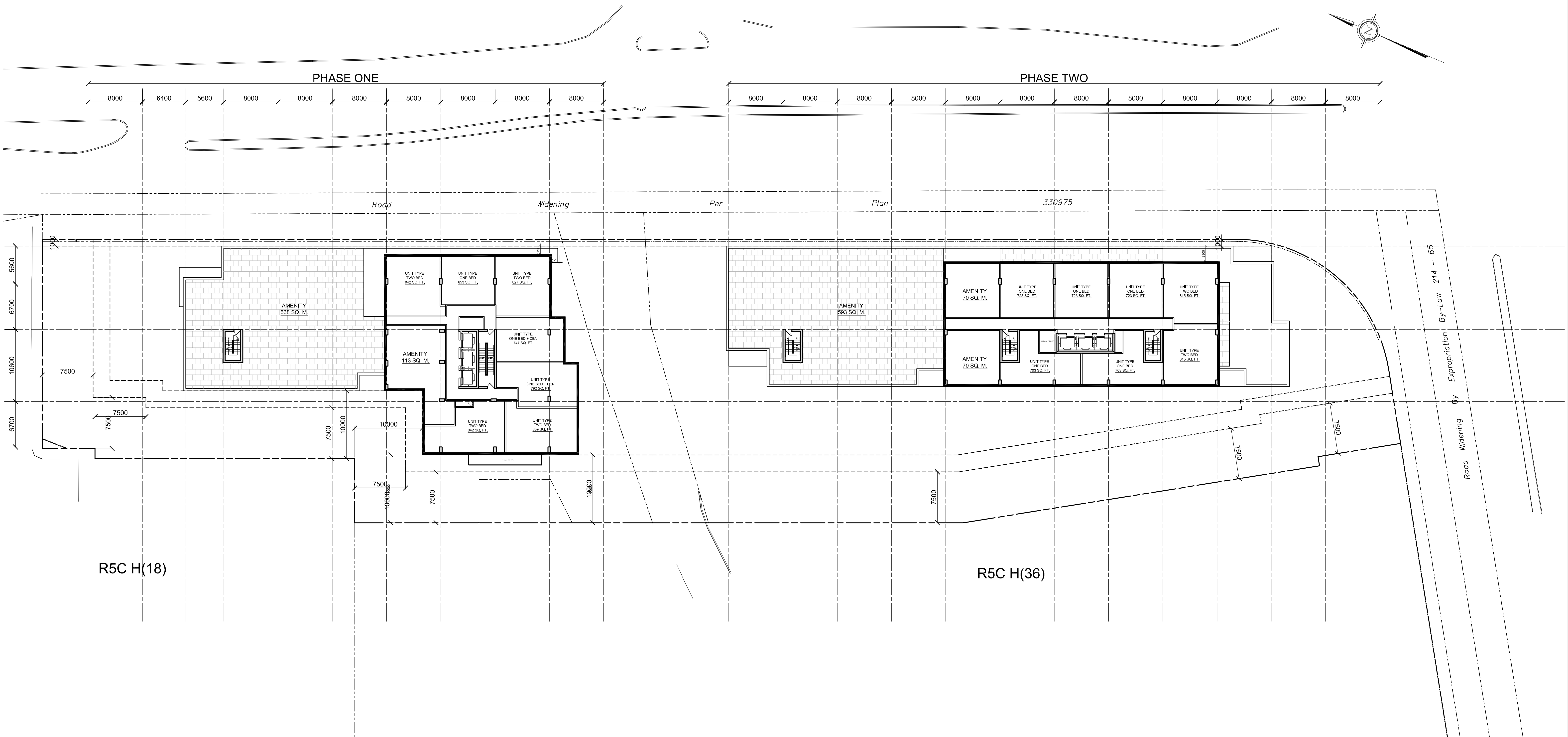
PLOT DATE: Wednesday, March 11, 2020

1356 CLYDE AVENUE
OTTAWA ONTARIO

GOLPRO HOLDINGS INC.

SHEET # 07

PROJ. # 1941



7TH FLOOR	745.7 sq. m.
RESIDENTIAL UNITS	7 units / per floor
	4 two bed units
	3 one bed units
	total 7 units

7TH FLOOR	749.4 sq. m.
RESIDENTIAL UNITS	7 units / per floor
	2 two bed units
	5 one bed units
	total 7 units

7TH FLOOR PLAN

rla/architecture

PLOT DATE: Wednesday, March 11, 2020

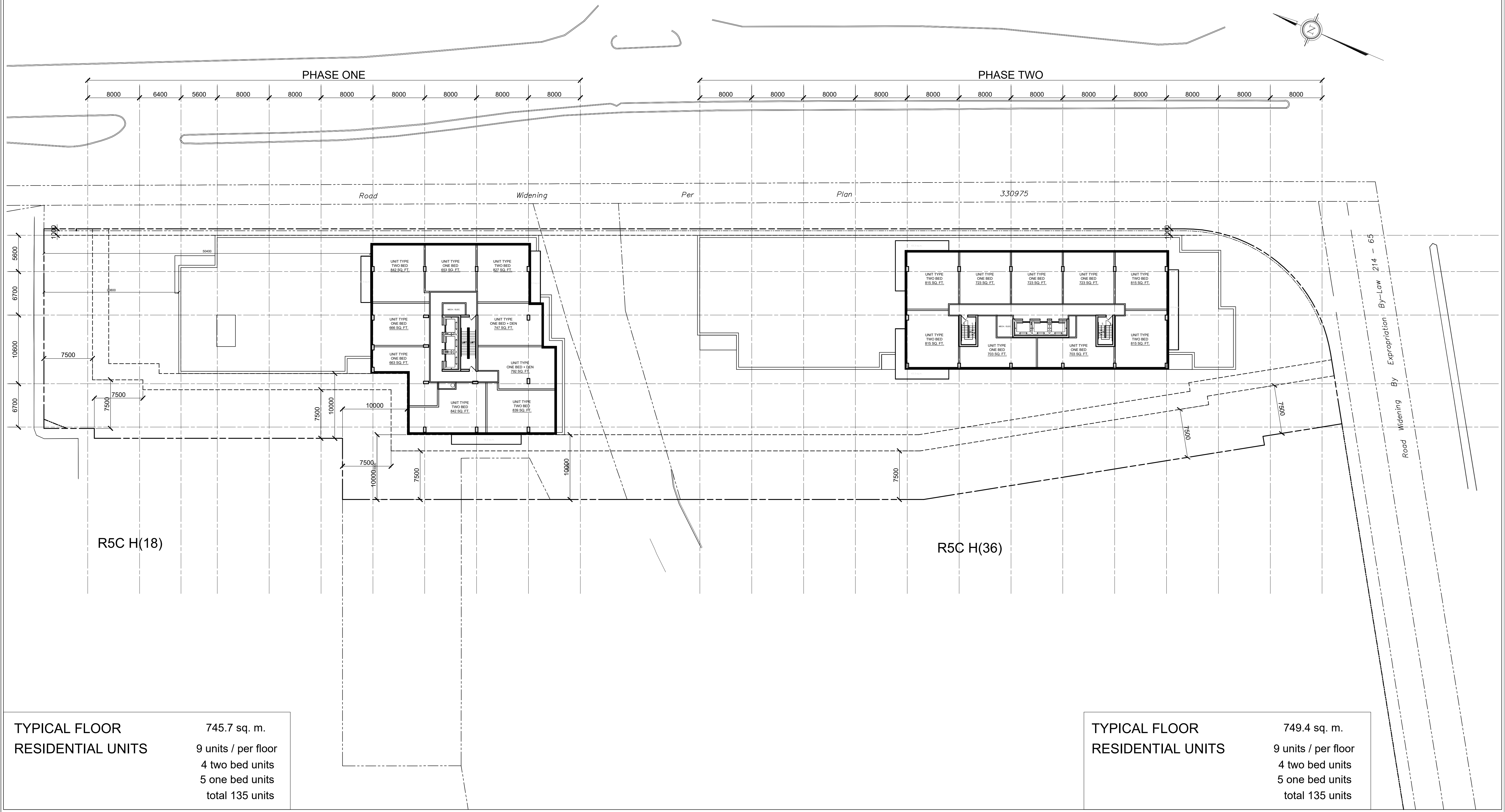
1356 CLYDE AVENUE

OTTAWA ONTARIO

GOLPRO HOLDINGS INC.

SHEET # 08

PROJ. # 1941



TYPICAL FLOOR 745.7 sq. m.
RESIDENTIAL UNITS 9 units / per floor
4 two bed units
5 one bed units
total 135 units

TYPICAL FLOOR 749.4 sq. m.
RESIDENTIAL UNITS 9 units / per floor
4 two bed units
5 one bed units
total 135 units

8TH TO 22TH FLOOR PLAN

rla/architecture

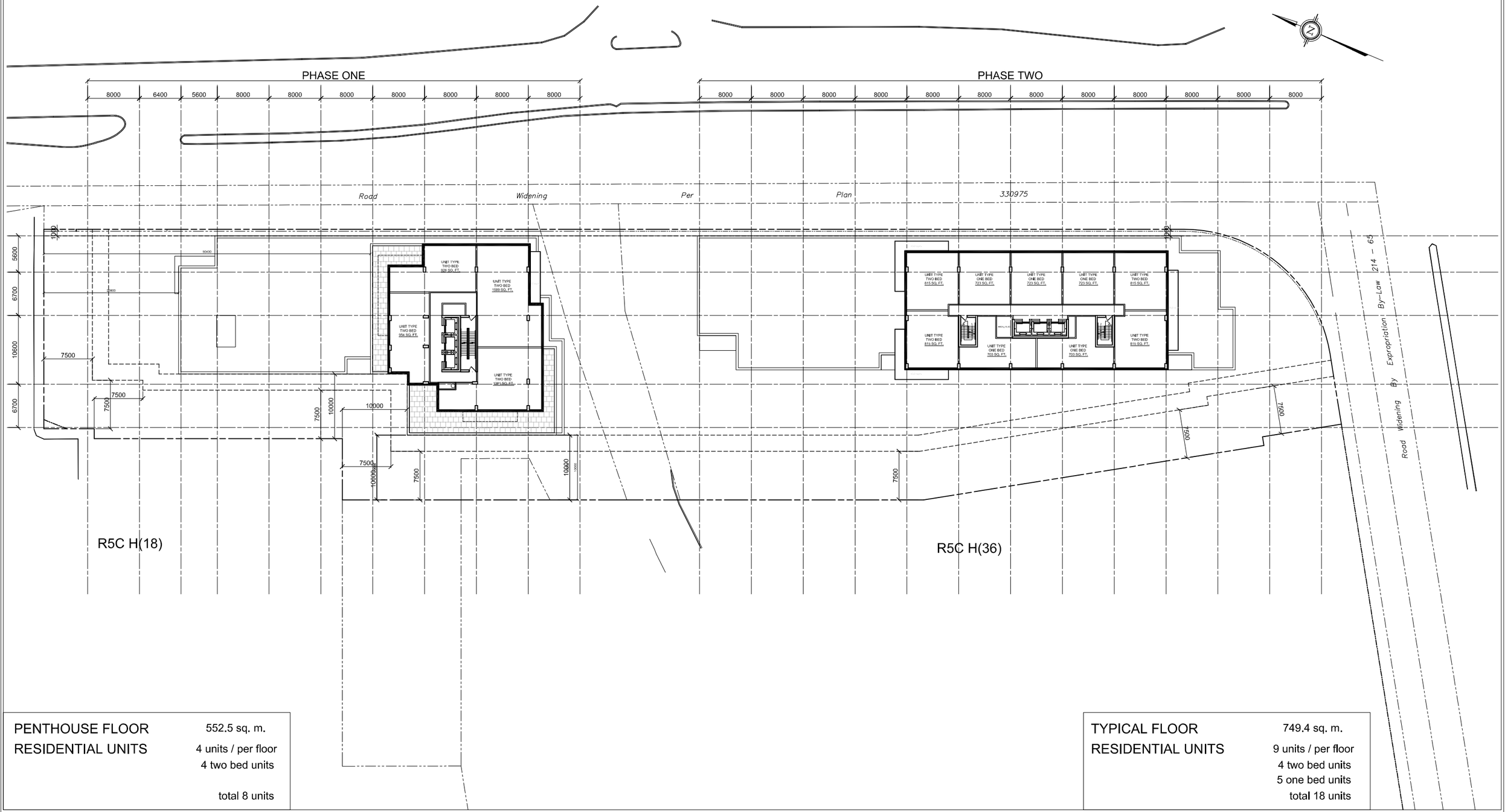
PLOT DATE: Wednesday, March 18, 2020

1356 CLYDE AVENUE
OTTAWA ONTARIO

GOLPRO HOLDINGS INC.

SHEET # 09

PROJ. # 1941



PENTHOUSE FLOOR	552.5 sq. m.
RESIDENTIAL UNITS	4 units / per floor 4 two bed units total 8 units

TYPICAL FLOOR	749.4 sq. m.
RESIDENTIAL UNITS	9 units / per floor 4 two bed units 5 one bed units total 18 units

23TH TO 24TH FLOOR PLAN

rla/architecture

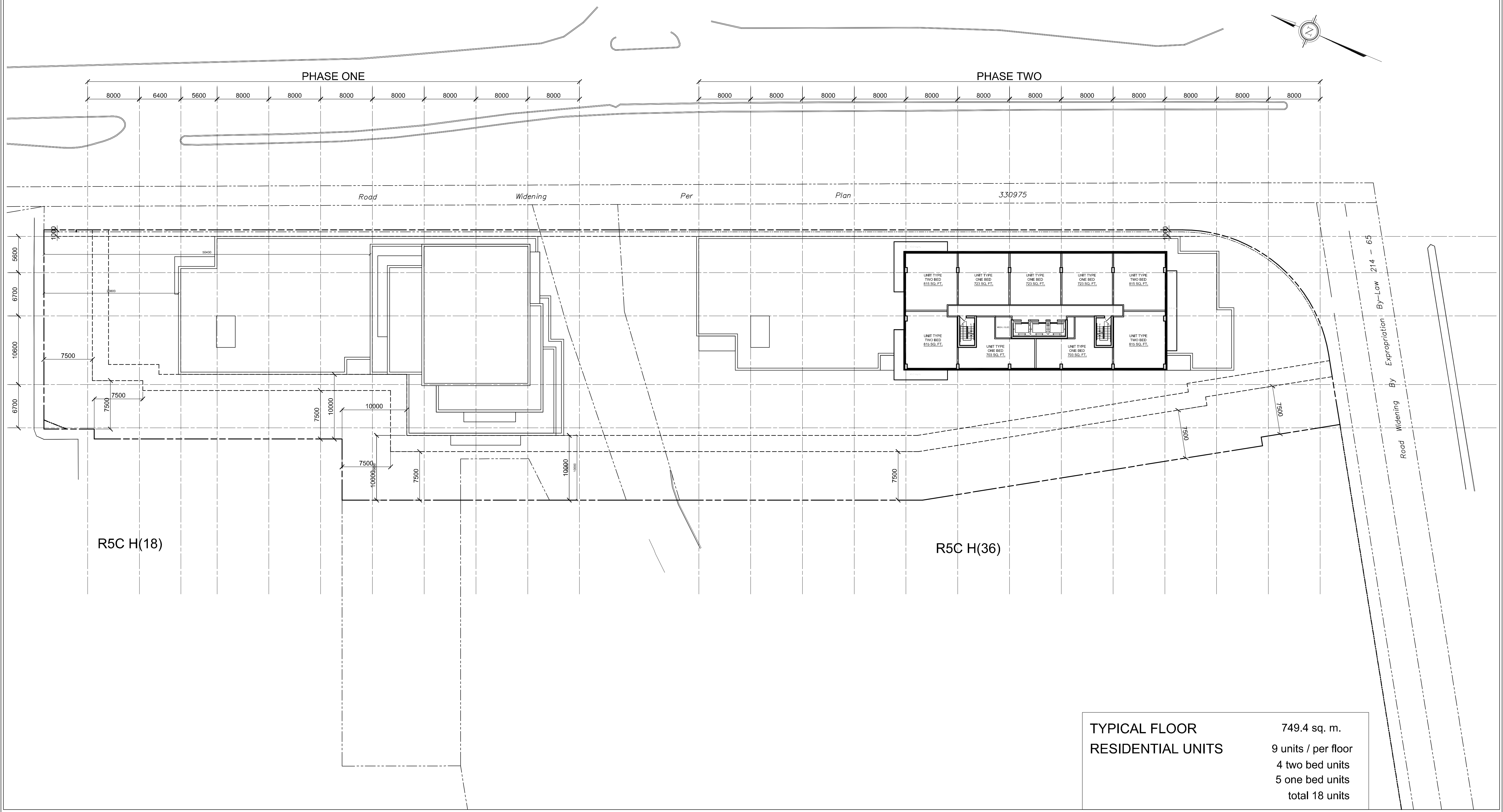
PLOT DATE: Wednesday, March 11, 2020

1356 CLYDE AVENUE
OTTAWA ONTARIO

GOLPRO HOLDINGS INC.

SHEET # 10

PROJ. # 1941



TYPICAL FLOOR	749.4 sq. m.
RESIDENTIAL UNITS	9 units / per floor 4 two bed units 5 one bed units total 18 units

25TH TO 26TH FLOOR PLAN

rla/architecture

PLOT DATE: Wednesday, March 11, 2020

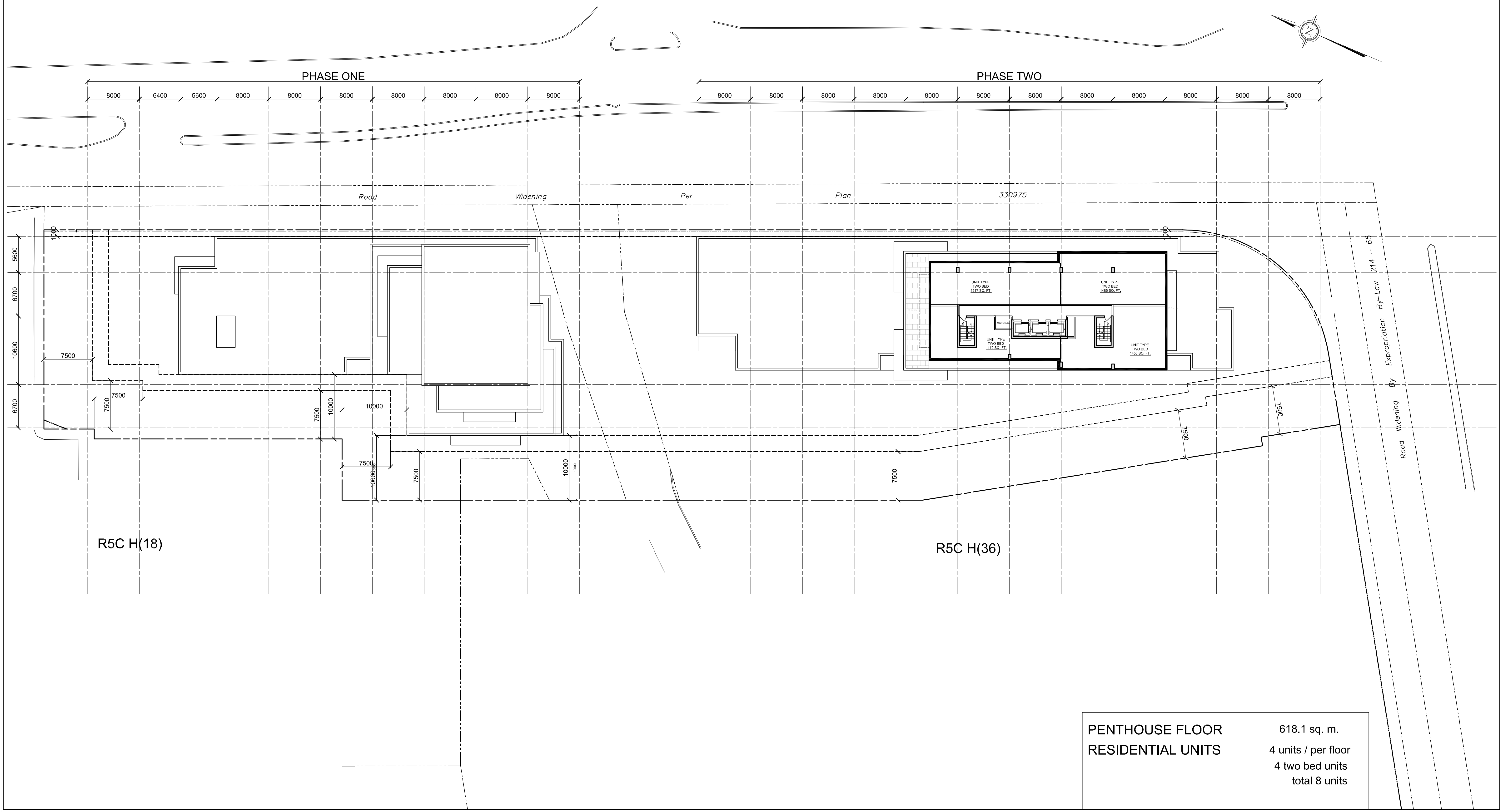
1356 CLYDE AVENUE

OTTAWA ONTARIO

GOLPRO HOLDINGS INC.

SHEET # 11

PROJ. # 1941



PENTHOUSE FLOOR	618.1 sq. m.
RESIDENTIAL UNITS	4 units / per floor 4 two bed units total 8 units

27TH TO 28TH FLOOR PLAN

rla/architecture

PLOT DATE: Wednesday, March 11, 2020

1356 CLYDE AVENUE

OTTAWA ONTARIO

GOLPRO HOLDINGS INC.

SHEET # 12

PROJ. # 1941

PHASE ONE

PHASE TWO

8000 6400 5600 8000 8000 8000 8000 8000 8000 8000 8000

8000 8000 8000 8000 8000 8000 8000 8000 8000 8000 8000 8000

Road Widening Per Plan 330975

1000

5600 6700 10600 6700

7500 7500 7500 10000 10000 7500 10000 7500 10000 7500 7500 7500

Expropriation By-Law 214 - 65

By Road Widening

R5C H(18)

R5C H(36)

ROOF PLAN

rla/architecture

PLOT DATE: Wednesday, March 11, 2020

1356 CLYDE AVENUE

OTTAWA ONTARIO

GOLPRO HOLDINGS INC.

SHEET # 13

PROJ, # 1941

EAST ELEVATION

rla/architecture

PLOT DATE: Thursday, March 12, 2020

1356 CLYDE AVENUE
OTTAWA ONTARIO

GOLPRO HOLDINGS INC.

SHEET #
14

PROJ. # 1941

WEST ELEVATION

rla/architecture

PLOT DATE: Thursday, March 12, 2020

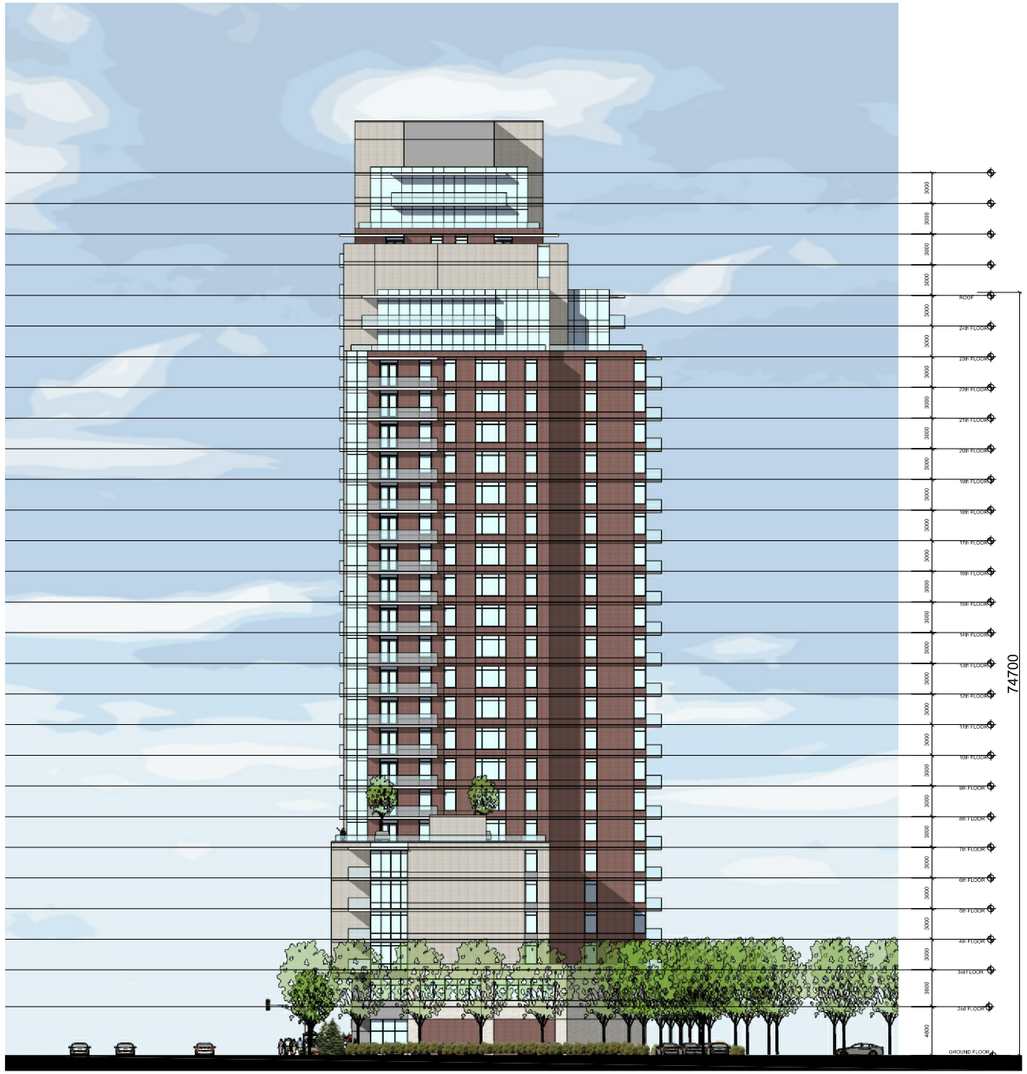
1356 CLYDE AVENUE
OTTAWA ONTARIO

GOLPRO HOLDINGS INC.

SHEET # 15

PROJ. # 1941

SOUTH ELEVATION



NORTH ELEVATION

rla/architecture

PLOT DATE: Thursday, March 12, 2020

1356 CLYDE AVENUE
OTTAWA ONTARIO

GOLPRO HOLDINGS INC.

SHEET # 16

PROJ. # 1941